# Contents

###Preface
- About This Manual ........................................... 1
- Overview ..................................................... 1
- Intended Audience ........................................... 2
- Text Conventions ............................................. 2
- Other Documentation ......................................... 3

###Chapter 1 Key Concepts ........................................ 5
- Connection Types ........................................... 5
- About WS-Trust STS ........................................ 6
- Connection-Based Policy ...................................... 6
  - IdP Configuration ........................................ 6
  - SP Configuration .......................................... 6
- Token Processors and Generators .............................. 7
  - Bundled Token Plug-ins .................................. 7
  - Commercial Token Plug-ins ............................... 7
- WSC and WSP Support ........................................ 8
- Client SDK .................................................. 8
  - Windows Identity Foundation Clients ..................... 8
- STS OAuth Integration .................................... 9
- About OAuth ................................................ 10
  - Delegated Access Types ................................ 10
  - Token Models ............................................ 11
  - Token Data Model ....................................... 11
  - Token Security Model ................................... 11
  - Grant Types ............................................. 11
    - Primary Grant Types ................................ 11
    - Extension Grant Types ................................. 12
    - Persistent vs. Transient Grants ....................... 12
<table>
<thead>
<tr>
<th>Chapter 2</th>
<th>System Administration</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Starting and Stopping PingFederate</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Managing Log Files</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Administrator Audit Logging</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Runtime Transaction Logging</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Transaction Logging Modes</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Security Audit Logging</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Server Logging</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Using the Server Log Filter</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Writing Logs to Other Formats</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Writing Logs to Databases</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Writing Audit Logs to CEF</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Exporting Metadata</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Choosing the Metadata Export Mode</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Defining a Metadata Attribute Contract</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Including a Signing Key</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Signing Metadata</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>XML Encryption Certificates</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Completing the Export</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Signing XML Files</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Using the Configuration Archive Utility</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Using the Archive Import Screen</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Account Management</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Setting or Resetting Passwords</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Changing Passwords</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Alternative Console Authentication</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Using LDAP Authentication</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Using Certificate-Based Authentication</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Managing Email Configuration</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Using Virtual Host Names</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Changing Configuration Parameters</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Installing a New License Key</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Automating Configuration Migration</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Administrative Console Migration</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Using the Migration Tool</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>SaaS Provisioning CLI</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Customizing User-Facing Screens</td>
<td>76</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>System Settings</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Managing Server Settings</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Setting Administration Options</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Entering System Information</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Configuring Runtime Notifications</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Configuring Runtime Reporting</td>
<td>84</td>
</tr>
</tbody>
</table>

Chapter 2: System Administration

Chapter 3: System Settings
## OAuth Configuration

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling the OAuth AS</td>
<td>121</td>
</tr>
<tr>
<td>Using OAuth Menu Selections</td>
<td>122</td>
</tr>
<tr>
<td>Authorization Server Settings</td>
<td>123</td>
</tr>
<tr>
<td>Client Management</td>
<td>126</td>
</tr>
<tr>
<td>Configuring a Client</td>
<td>127</td>
</tr>
<tr>
<td>Access Token Management</td>
<td>128</td>
</tr>
<tr>
<td>Specifying Federation Information</td>
<td>91</td>
</tr>
<tr>
<td>Setting System Options</td>
<td>93</td>
</tr>
<tr>
<td>Managing System Updates</td>
<td>94</td>
</tr>
<tr>
<td>Configuring SaaS Provisioning Settings</td>
<td>95</td>
</tr>
<tr>
<td>Configuring Auto-Connect Metadata Signing</td>
<td>96</td>
</tr>
<tr>
<td>Configuring Auto-Connect Metadata Lifetime</td>
<td>97</td>
</tr>
<tr>
<td>Saving and Editing Server Settings</td>
<td>98</td>
</tr>
<tr>
<td>Managing Data Stores</td>
<td>98</td>
</tr>
<tr>
<td>Configuring a JDBC Database Connection</td>
<td>99</td>
</tr>
<tr>
<td>Setting Advanced Options</td>
<td>102</td>
</tr>
<tr>
<td>Configuring an LDAP Connection</td>
<td>103</td>
</tr>
<tr>
<td>Defining an LDAP Type</td>
<td>105</td>
</tr>
<tr>
<td>Setting Pooling Options</td>
<td>105</td>
</tr>
<tr>
<td>Configuring a Custom Data Store</td>
<td>106</td>
</tr>
<tr>
<td>Configuring a Custom Data Store Instance</td>
<td>106</td>
</tr>
<tr>
<td>Adapter Actions</td>
<td>107</td>
</tr>
<tr>
<td>Editing and Saving a Data Store</td>
<td>107</td>
</tr>
<tr>
<td>Defining an Account-Linking Data Store</td>
<td>107</td>
</tr>
<tr>
<td>Defining an OAuth Grant Data Store</td>
<td>109</td>
</tr>
<tr>
<td>Configuring IdP Discovery</td>
<td>110</td>
</tr>
<tr>
<td>Standard IdP Discovery</td>
<td>110</td>
</tr>
<tr>
<td>Choosing Domain Cookie Settings</td>
<td>111</td>
</tr>
<tr>
<td>Configuring a Common Domain Service</td>
<td>112</td>
</tr>
<tr>
<td>Configuring a Local Common Domain Server</td>
<td>113</td>
</tr>
<tr>
<td>Editing and Saving the Configuration</td>
<td>113</td>
</tr>
<tr>
<td>IdP Discovery Using a Persistent Cookie</td>
<td>114</td>
</tr>
<tr>
<td>Configuration</td>
<td>114</td>
</tr>
<tr>
<td>IdP-to-SP Adapter Mapping</td>
<td>115</td>
</tr>
<tr>
<td>Managing Mappings</td>
<td>115</td>
</tr>
<tr>
<td>Assigning a License Group</td>
<td>116</td>
</tr>
<tr>
<td>Configuring Attribute Lookup for IdP-to-SP Adapter Mapping</td>
<td>116</td>
</tr>
<tr>
<td>Choosing a Data Store (Optional)</td>
<td>117</td>
</tr>
<tr>
<td>Adapter Contract Fulfillment</td>
<td>118</td>
</tr>
<tr>
<td>Using the Summary Screen</td>
<td>119</td>
</tr>
</tbody>
</table>

---

### Chapter 4

Using SNMP Monitoring ........................................................................... 84
Runtime Monitoring Using JMX ............................................................... 86
Managing Accounts ................................................................................... 88
Choosing Roles and Protocols .................................................................. 89
Specifying Federation Information ......................................................... 91
Setting System Options ........................................................................... 93
Disabling Automatic Connection Validation ............................................. 93
Managing System Updates ........................................................................ 94
Configuring SaaS Provisioning Settings ................................................. 95
Configuring Auto-Connect Metadata Signing ......................................... 96
Configuring Auto-Connect Metadata Lifetime .......................................... 97
Saving and Editing Server Settings ....................................................... 98
Managing Data Stores .............................................................................. 98
Configuring a JDBC Database Connection ............................................... 99
Setting Advanced Options ....................................................................... 102
Configuring an LDAP Connection ............................................................ 103
Defining an LDAP Type ........................................................................... 105
Setting Pooling Options .......................................................................... 105
Configuring a Custom Data Store ............................................................ 106
Configuring a Custom Data Store Instance .............................................. 106
Adapter Actions ....................................................................................... 107
Editing and Saving a Data Store ............................................................. 107
Defining an Account-Linking Data Store ................................................ 107
Defining an OAuth Grant Data Store ....................................................... 109
Configuring IdP Discovery ....................................................................... 110
Standard IdP Discovery ........................................................................... 110
Choosing Domain Cookie Settings ........................................................... 111
Configuring a Common Domain Service ................................................... 112
Configuring a Local Common Domain Server .......................................... 113
Editing and Saving the Configuration ..................................................... 113
IdP Discovery Using a Persistent Cookie ................................................. 114
Configuration ......................................................................................... 114
IdP-to-SP Adapter Mapping ................................................................. 115
Managing Mappings .................................................................................. 115
Assigning a License Group ...................................................................... 116
Configuring Attribute Lookup for IdP-to-SP Adapter Mapping ................. 116
Choosing a Data Store (Optional) ............................................................. 117
Adapter Contract Fulfillment .................................................................... 118
Using the Summary Screen ...................................................................... 119
Specifying Federation Information ......................................................... 91
Setting System Options ........................................................................... 93
Disabling Automatic Connection Validation ............................................. 93
Managing System Updates ........................................................................ 94
Configuring SaaS Provisioning Settings ................................................. 95
Configuring Auto-Connect Metadata Signing ......................................... 96
Configuring Auto-Connect Metadata Lifetime .......................................... 97
Saving and Editing Server Settings ....................................................... 98
Managing Data Stores .............................................................................. 98
Configuring a JDBC Database Connection ............................................... 99
Setting Advanced Options ....................................................................... 102
Configuring an LDAP Connection ............................................................ 103
Defining an LDAP Type ........................................................................... 105
Setting Pooling Options .......................................................................... 105
Configuring a Custom Data Store ............................................................ 106
Configuring a Custom Data Store Instance .............................................. 106
Adapter Actions ....................................................................................... 107
Editing and Saving a Data Store ............................................................. 107
Defining an Account-Linking Data Store ................................................ 107
Defining an OAuth Grant Data Store ....................................................... 109
Configuring IdP Discovery ....................................................................... 110
Standard IdP Discovery ........................................................................... 110
Choosing Domain Cookie Settings ........................................................... 111
Configuring a Common Domain Service ................................................... 112
Configuring a Local Common Domain Server .......................................... 113
Editing and Saving the Configuration ..................................................... 113
IdP Discovery Using a Persistent Cookie ................................................. 114
Configuration ......................................................................................... 114
IdP-to-SP Adapter Mapping ................................................................. 115
Managing Mappings .................................................................................. 115
Assigning a License Group ...................................................................... 116
Configuring Attribute Lookup for IdP-to-SP Adapter Mapping ................. 116
Choosing a Data Store (Optional) ............................................................. 117
Adapter Contract Fulfillment .................................................................... 118
Using the Summary Screen ...................................................................... 119
Managing SP Connections .......................................................... 177
Viewing Protocol Endpoints ..................................................... 175
Accessing Connections ............................................................ 178
Choosing Connection Options .................................................. 184
Choosing a Connection Type ..................................................... 183
Choosing a Connection Template .............................................. 182
Configuring Adapter Selectors .................................................. 169
Configuring Credentials ......................................................... 231
Configuring a Default URL and Error Message ......................... 174
Viewing Application Endpoints ............................................... 175
General Information ............................................................... 186
Configuring the Attribute Query Profile ................................... 226
Configuring Browser-Based SSO .............................................. 188
Specifying Security Policy ...................................................... 230
Configuring the Authorization Context .................................... 168
Editing and Saving Adapter Instances ...................................... 169
Choosing a Selector Type ....................................................... 170
Configuring the CIDR Adapter Selector .................................... 170
Configuring the AuthN Context Selector ................................... 171
Defining AuthN Context Results .............................................. 172
Finishing the Selector-Instance Configuration ........................ 172
Mapping Selector Results to Adapter Instances ....................... 173
Configuring Back-Channel Authentication .................................. 232
Editing and Saving Credential Configurations ............................ 241
Selecting a Decryption Key (SAML) .......................................... 240
Configuring Signature Verification Settings .............................. 236
Selecting an Encryption Certificate (SAML) .............................. 239
Defining Retrievable Attributes .............................................. 226
Editing and Saving Attribute Query Configurations ................... 231
Configuring Data Store Lookup .............................................. 229
Attribute Mapping Fulfillment ................................................ 229
Specifying Security Policy ...................................................... 230
Editing and Saving Attribute Query Configurations ................... 231
Configuring Credentials ......................................................... 231
Configuring Back-Channel Authentication ................................ 232
Configuring Digital Signature Settings .................................... 235
Configuring Signature Verification Settings .............................. 236
Selecting an Encryption Certificate (SAML) .............................. 239
Selecting a Decryption Key (SAML) .......................................... 240
Editing and Saving Credential Configurations ............................ 241
<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importing IdP Metadata</td>
<td>284</td>
</tr>
<tr>
<td>Importing a Certificate</td>
<td>285</td>
</tr>
<tr>
<td>Viewing the Summary</td>
<td>285</td>
</tr>
<tr>
<td>General Connection Information</td>
<td>285</td>
</tr>
<tr>
<td>Configuring Browser SSO</td>
<td>287</td>
</tr>
<tr>
<td>Connection Configuration Steps</td>
<td>288</td>
</tr>
<tr>
<td>Choosing SAML Profiles</td>
<td>290</td>
</tr>
<tr>
<td>User-Session Creation</td>
<td>292</td>
</tr>
<tr>
<td>Configuring OAuth Attribute Mapping</td>
<td>308</td>
</tr>
<tr>
<td>Configuring SAML Protocol Settings</td>
<td>311</td>
</tr>
<tr>
<td>Editing and Saving SSO Settings</td>
<td>320</td>
</tr>
<tr>
<td>Using Express Provisioning</td>
<td>320</td>
</tr>
<tr>
<td>Selecting Attribute Sources (SAML 2.0)</td>
<td>321</td>
</tr>
<tr>
<td>Identifying the User Repository</td>
<td>321</td>
</tr>
<tr>
<td>Specifying an LDAP User-Record Location</td>
<td>322</td>
</tr>
<tr>
<td>Defining an LDAP Filter</td>
<td>323</td>
</tr>
<tr>
<td>Identifying Provisioning Attributes for LDAP</td>
<td>324</td>
</tr>
<tr>
<td>Selecting a SQL Method</td>
<td>324</td>
</tr>
<tr>
<td>Specifying a Database User-Record Location</td>
<td>325</td>
</tr>
<tr>
<td>Specifying a Unique-ID Database Column</td>
<td>326</td>
</tr>
<tr>
<td>Specifying a Stored-Procedure Location</td>
<td>327</td>
</tr>
<tr>
<td>Mapping Attributes to User Accounts</td>
<td>328</td>
</tr>
<tr>
<td>Choosing an Event Trigger</td>
<td>331</td>
</tr>
<tr>
<td>Error Handling</td>
<td>331</td>
</tr>
<tr>
<td>Using the Provisioning Summary Screen</td>
<td>332</td>
</tr>
<tr>
<td>Configuring the Attribute Query Option</td>
<td>332</td>
</tr>
<tr>
<td>Setting the Attribute Authority Service URL</td>
<td>332</td>
</tr>
<tr>
<td>Mapping Attribute Names</td>
<td>333</td>
</tr>
<tr>
<td>Defining Security Policy</td>
<td>334</td>
</tr>
<tr>
<td>Saving the Attribute Query Configuration</td>
<td>334</td>
</tr>
<tr>
<td>Configuring Security Credentials</td>
<td>334</td>
</tr>
<tr>
<td>Back-Channel Authentication</td>
<td>335</td>
</tr>
<tr>
<td>Digital Signature Settings</td>
<td>337</td>
</tr>
<tr>
<td>Signature Verification Settings</td>
<td>339</td>
</tr>
<tr>
<td>Choosing an Encryption Certificate</td>
<td>342</td>
</tr>
<tr>
<td>Choosing a Decryption Key</td>
<td>344</td>
</tr>
<tr>
<td>Saving Credential Configurations</td>
<td>344</td>
</tr>
<tr>
<td>IdP Connection Activation and Summary</td>
<td>345</td>
</tr>
<tr>
<td>Configuring IdP Auto-Connect</td>
<td>345</td>
</tr>
<tr>
<td>Configuring the Initial Setup</td>
<td>346</td>
</tr>
<tr>
<td>Choosing a Certificate</td>
<td>346</td>
</tr>
<tr>
<td>Configuring User-Session Creation</td>
<td>347</td>
</tr>
<tr>
<td>Connection Activation and Summary</td>
<td>347</td>
</tr>
<tr>
<td>Specifying Allowed IdP Domains</td>
<td>348</td>
</tr>
</tbody>
</table>
Chapter 8  WS-Trust STS Configuration ........................................ 351
  Server Settings .................................................................. 351
  Enabling the WS-Trust STS ............................................ 351
  Configuring STS Authentication ...................................... 353
    Selecting Authentication Methods ................................ 353
    Configuring Basic Authentication ................................ 354
    Configuring Mutual SSL Authentication ...................... 355
    Using the STS Summary Screen .................................... 357
  IdP Configuration for STS .............................................. 358
    Configuring Token Processors ..................................... 358
      Selecting a Token Processor Type ............................... 359
      Configuring a SAML Token Processor Instance .......... 360
      Configuring an OAuth Token Processor Instance ....... 361
      Extending a Processor Contract ............................... 361
      Setting Attribute Masking ...................................... 362
      Editing and Saving Processor Instances .................... 363
    Managing STS Request Parameters ............................... 363
    Configuring SP Connections for STS ......................... 364
      Configuring IdP Protocol Settings ............................ 365
      Setting a Token Lifetime ....................................... 366
      Configuring Token Creation .................................. 367
  SP Configuration for STS ............................................. 386
    Configuring Token Generators .................................... 386
      Selecting a Token Generator Type ........................... 387
      Configuring a Token Generator Instance .................. 387
      Extending a Generator Contract .............................. 389
      Editing and Saving Generator Instances .................... 389
    Configuring IdP Connections for STS ......................... 390
      Configuring STS Protocol Settings .......................... 390
      Configuring Token Generation ............................... 391
  Appendix A  OpenToken Adapter Configuration .................. 407
    Configuring the IdP OpenToken Adapter ..................... 408
    Configuring the SP OpenToken Adapter ....................... 411
  Appendix B  HTTP Basic Adapter Configuration .................. 415
    Configuring the HTTP Basic IdP Adapter ...................... 415
  Appendix C  HTML Form Adapter Configuration .................. 419
    Configuring the HTML Form IdP Adapter ...................... 419
  Appendix D  Composite Adapter Configuration .................... 423
    Configuring the Composite Adapter ........................... 423
  Appendix E  Application Endpoints ................................. 429
    IdP Endpoints ..................................................... 429
    SP Endpoints ..................................................... 432
    System-Services Endpoints ....................................... 437
## Appendix F OAuth 2.0 Endpoints

- Token Endpoint: 439
- Client Identification and Authentication: 439
- Grant Type Parameters: 440
  - Authorization Code Grant Type: 440
  - Refresh Token Grant Type: 441
  - Resource Owner Credentials (Password) Grant Type: 441
  - Client Credentials Grant Type: 442
  - Access Token Verification/Validation Grant Type: 442
- Authorization Endpoint: 443
- Grant-Management Endpoint: 444

## Appendix G Web Service Interfaces

- Connection Management Service: 445
- Exporting a Connection: 446
- Exporting Manually: 446
- Using the Connection Service: 446
- Code Sample: 446
- Importing Connections: 447
- Sample Code: 447
- Deleting Connections: 448
- Code Example: 448
- Cluster Configuration Replication: 448
- Example Code: 448
- Validation Disclaimer: 449
- SSO Directory Service: 449
- Coding Example: 450
- SOAP Request and Response Example: 451

## Appendix H Using Attribute Mapping Expressions

- About OGNL: 453
- Enabling and Disabling Expressions: 454
- Using the OGNL Edit Screen: 455

## Appendix I Troubleshooting

- Data Store Issues: 457
- Installation Issues: 458
- Runtime Issues: 458
- Server Startup: 458
- Glossary: 459
- List of Acronyms: 465
Preface

About This Manual

This manual provides information about using Ping Identity’s PingFederate to deploy a secure Internet single sign-on (SSO) solution based on the latest security and e-business standards.

Overview

The manual consists of:

- **Chapter 1, “Key Concepts”** — A discussion of central concepts needed to understand Internet SSO, the WS-Trust Security Token Service (STS), and PingFederate deployment and administration.
- **Chapter 2, “System Administration”** — Information about maintaining the PingFederate server and deployment, using log files, managing users, and handling other administrative functions.
- **Chapter 3, “System Settings”** — How to configure your local PingFederate server settings.
- **Chapter 4, “OAuth Configuration”** — How to configure PingFederate to act as an OAuth Authorization Server.
- **Chapter 5, “Security Management”** — Information about importing, exporting, and maintaining certificates and keys in PingFederate.
- **Chapter 6, “Identity Provider SSO Configuration”** — How to configure PingFederate to act as an Identity Provider (IdP) and establish connections to Service Providers.
- **Chapter 7, “Service Provider SSO Configuration”** — How to configure PingFederate to act as a Service Provider (SP) and establish connections to Identity Providers.
- **Chapter 8, “WS-Trust STS Configuration”** — How to configure PingFederate to act as a Security Token Service for Web Service Clients and Providers in either an IdP or SP environment.
Preface

- Appendix A, “OpenToken Adapter Configuration” — How to configure PingFederate to use the packaged OpenToken Adapter for interfacing with your Web applications.
- Appendix B, “HTTP Basic Adapter Configuration” — How to configure PingFederate to use the packaged HTTP Basic Adapter.
- Appendix C, “HTML Form Adapter Configuration” — How to configure PingFederate to use the packaged HTML Form Adapter.
- Appendix D, “Composite Adapter Configuration” — How to configure PingFederate to use the packaged Composite Adapter.
- Appendix E, “Application Endpoints” — Detailed information about using PingFederate connection endpoints for Web single sign-on and single logout.
- Appendix G, “Web Service Interfaces” — Information developers can use to automate connection-configuration management and runtime SSO partner discovery.
- Appendix H, “Using Attribute Mapping Expressions” — How to enable and use expressions in conjunction with mapping attributes.
- Appendix I, “Troubleshooting” — Solutions for difficulties that may be encountered.
- Glossary — Definitions of terms used in the manual and in identity federation parlance.
- List of Acronyms

Intended Audience

This manual is intended for security and network administrators and other IT professionals responsible for identity management among business entities, both internal and external.

Note: The information in this manual is presented from the viewpoint of an administrative user with full permissions (see “Account Management” on page 56).

Text Conventions

This document uses the text conventions identified below.

Table 1: Text Conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Width</td>
<td>Indicates text that must be typed exactly as shown in the instructions. Also used to represent program code, file names, and directory paths.</td>
</tr>
<tr>
<td>Blue text</td>
<td>Indicates hypertext links.</td>
</tr>
<tr>
<td>Italic</td>
<td>Used for emphasis and document titles.</td>
</tr>
<tr>
<td>► [text]</td>
<td>Used for procedures where only one step is required.</td>
</tr>
</tbody>
</table>
The documents listed below are available under Product Documentation at pingidentity.com.

**Tip:** PingFederate provides context-sensitive Help. Click Help in the upper-right portion of the administrative console for immediate, relevant guidance and links to related information.

**Getting Started** – Provides an introduction to secure Internet SSO and PingFederate, including background information about federated identity management and standards, product installation instructions, and a primer on using the PingFederate administrative console.

**Integration Overview** – A high-level description of options available for integrating identity-management systems and applications with PingFederate.

**Server Clustering Guide** – Describes how to deploy PingFederate in a cluster to increase throughput and availability.

**SDK Developer’s Guide** – Provides technical guidance for using the Java Software Developer Kit for PingFederate version 4 and higher.

**Quick-Start Guide** – Provides instructions for deploying a preconfigured PingFederate server to run with demonstration Web applications. Newcomers to PingFederate may wish to follow this Guide as a first step to establishing a simple SSO identity federation between two Web applications and to become familiar with PingFederate. The Guide is contained in a separate quick-start package available for download on the Ping Identity Web site.

**Web Resources** – Ping Identity continually updates its Resource Center (www.pingidentity.com/resource-center) with general and technical information in the form of white papers, demonstrations, webinars, and other resources.

**Note:** If you encounter any difficulties with configuration or deployment, please look for help at the Ping Identity Support Center (www.pingidentity.com/support).

PingFederate documents may include hypertext links to third-party Web sites that provide installation instructions, file downloads, and reference documentation. These links were tested prior to publication, but they may not remain current throughout the life of these documents. Please contact Ping Identity Support (www.pingidentity.com/support) if you encounter a problem.
This chapter provides background information and preparation to help you understand and use PingFederate.

- “Connection Types” below
- “About WS-Trust STS” on page 6
- “About OAuth” on page 10
- “SSO Integration Kits and Adapters” on page 14
- “Identity Mapping” on page 16
- “About Attributes” on page 17
- “Security Infrastructure” on page 23
- “About PingFederate Express” on page 27
- “Using Auto-Connect” on page 28
- “User Provisioning” on page 31
- “Federation Planning Checklist” on page 32

Tip: For an introduction to secure Internet single sign-on (SSO), federated identity management, and PingFederate product features, see the “About Identity Federation and SSO” chapter in Getting Started.

Connection Types

PingFederate features an integrated administrative console for configuring three kinds of connections to identity-federation partners:

- Browser-based SSO – Also called Browser SSO in the administrative console, this term is often used to refer to standards-based secure Internet
SSO, which generally depends on a user’s browser to transport identity assertions and other messaging between partner endpoints (see the “Supported Standards” chapter in Getting Started).

- WS-Trust STS – This type of connection employs the PingFederate Security Token Service (STS), which enables Web Service Client and Provider applications to extend SSO to identity-enabled Web Services at provider sites, using another set of standards (see the next section, “About WS-Trust STS”). These standards, including WS-Trust, do not rely on the user’s browser for message transport.

- OAuth SAML Grant - This type of connection exchanges a SAML assertion for an OAuth access token with the PingFederate Authorization Server (AS) (see “About OAuth” on page 10).

The three types of connections can be configured together for the same partner or independently (see “WS-Trust STS Configuration” on page 351).

About WS-Trust STS

The PingFederate WS-Trust STS allows organizations to extend SSO identity management to Web Services. (For information about WS-Trust and the role of an STS, see “Web Services Standards” in the “Supported Standards” chapter of Getting Started.)

The WS-Trust STS can be configured for partner connections independently or in conjunction with browser-based SSO for either an IdP or an SP deployment. The STS is bundled with separate plug-ins for standard SAML (Security Assertion Markup Language) token processing and generation (see “Token Processors and Generators” on page 7).

Connection-Based Policy

For both the IdP and SP roles, PingFederate employs a partner-connection configuration, which enables the association of Web Services authentication policies with federation partners. For STS processing, these policies define configurations for handling WS-Trust requests and transferring identity information between security domains (see “Web Services Standards” in the “Supported Standards” chapter of Getting Started).

IdP Configuration

In an IdP role, you use the administrative console to configure WS-Trust request-processing policy for your SP partner including:

- The type of SAML token to create—suitable for consumption by the intended Web Service Provider (WSP, at the SP site)—in response to an “Issue” request from a Web Service Client (WSC) application
- The mapping of attributes to include within the issued SAML token
- The key used to create a digital signature for the issued SAML token

SP Configuration

In an SP role, you use the administrative console to configure WS-Trust request-processing policy for your IdP partner including:
- Whether to validate the incoming SAML token only, or to validate the incoming token and also issue a local token
- The mapping of attributes to include in the locally issued token (when applicable)
- The certificate used to verify the digital signature for the incoming SAML token
- The key used to decrypt the incoming SAML token (when needed)

Token Processors and Generators

PingFederate provides support for a variety of security-token formats, through token processors and generators that plug into the PingFederate server. These plug-ins deploy similarly to browser-based SSO adapters (see “SSO Integration Kits and Adapters” on page 14).

For an IdP, token processors provide a mechanism through which PingFederate can validate an incoming token from a WSC and map attributes to be included in the issued SAML token.

For an SP, token generators provide a mechanism through which PingFederate can generate a local token based upon the incoming SAML token from a WSP and map attributes to be included in that token.

Only SAML 1.1 or 2.0 tokens are generated by PingFederate configured as an IdP for sending across trust boundaries to a federated SP partner. Likewise, only SAML tokens are accepted by PingFederate configured as an SP. Token plug-ins allow a modular approach for validating and producing the various token types used by different applications or systems within a conceptual trust domain. PingFederate provides bundled and separately available token plug-ins.

Bundled Token Plug-ins

PingFederate is installed with token processors for an IdP configuration that accept and validate SAML 1.1, 2.0 tokens, and OAuth Bearer access tokens (see “Token Models” on page 11). (SAML tokens are issued on the IdP side via built-in browser-based SSO capabilities.)

For an SP configuration, token generators are provided for issuing local SAML 1.1 or 2.0 tokens. (Incoming SAML tokens are validated, once again, by using built-in capabilities.)

Commercial Token Plug-ins

Separately available token plug-ins include:

- Username – Accepts and validates Web Services Security (WSS) Username tokens against a password or an LDAP v3-compliant directory (PasswordText is currently the only supported password type)

This token is based on the OASIS specification "Web Services Security Username Token Profile 1.0" (docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0.pdf)


Chapter 1
Key Concepts

- **X.509** – Accepts and validates WSS X.509 tokens against the PingFederate trust store
  This token is based on the OASIS specification “Web Services Security X.509 Certificate Token Profile” (docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0.pdf)

- **Kerberos** – Accepts and validates Kerberos binary tokens
  This token is based on the OASIS specification “Web Services Security Kerberos Token Profile 1.1” (www.oasis-open.org/committees/download.php/16788/wss-v1.1-spec-os-KerberosTokenProfile.pdf)

- **CA SiteMinder** – Accepts and validates SMSESSION binary tokens

- **Oracle Access Manager (formerly COREid)** – Accepts and validates OBSSO binary tokens

- **OpenToken** – Accepts and validates an OpenToken at an IdP PingFederate and issues an OpenToken at the PingFederate SP

Ping Identity regularly develops token plug-ins to work with various authentication systems and leading identity management systems. Available plug-ins, together known as Token Translators, may be downloaded from the Ping Identity Web site (www.pingidentity.com/support-and-downloads).

WSC and WSP Support

Ping Identity provides the Java client Software Development Kit (SDK) for enabling Web Service applications (WS clients or providers) to interact with the PingFederate STS.

In addition, for WSC STS clients PingFederate provides built-in protocol support for Windows Identity Foundation (WIF) applications based on the Windows Communication Foundation (WCF) framework.

**Note:** The WIF framework includes WS-* protocol support and can interact natively with PingFederate.

Client SDK

The STS Java client SDK provides interfaces that create the WS-Trust Request Security Token (RST) and Request Security Token Response (RSTR) messaging to interact with the PingFederate STS endpoints. Using the SDK library, applications are not responsible for forming these WS-Trust protocol messages, and instead interact only with the tokens themselves.

The SDK is available for download at the Ping Identity Web site (www.pingidentity.com/support-and-downloads).

Windows Identity Foundation Clients

PingFederate natively supports STS clients using claims-based WIF technology. Claims-based federated identity for Web Services is a part of the WS-Trust standard that permits client applications to make access-policy decisions, when specifically categorized user attributes are sent in the security token (see “STS Namespaces” on page 19).
The PingFederate STS supports the following bindings in the .NET federated-security scenarios with WS-Trust:

- WSFederationHttpBinding
- WS2007FederationHttpBinding

Additionally, the PingFederate STS supports the following bindings for RST and RSTR interactions with .NET. (Support for these bindings is limited to the Username, x509, SAML 1.1, and SAML 2.0 token types.):

- WSHttpBinding
- WS2007HttpBinding

**Note:** For token types such as Kerberos, where customizing default bindings may be necessary, the PingFederate STS supports the use of customBinding.

For more information about bindings, see Microsoft's System-Provided Bindings (msdn.microsoft.com/en-us/library/ms730879.aspx).

Developers can obtain PingFederate STS metadata to expedite configuring their applications (see /pf/ws-trust_sts_metadata.ping on page 438). PingFederate offers two varieties of metadata, which are often used together to arrive at functional WSC and WSP configurations:

- Federation Metadata, which contains details on the PingFederate public signing certificate and other information required to establish the trust relationship.
- Metadata Exchange, which contains connection details relating to the SP partner.


### STS OAuth Integration

PingFederate STS provides several ways to facilitate the use of issued tokens with an OAuth Authorization Server (AS) (see the next section, “About OAuth” on page 10).

#### OAuth Token Processor

This token processor provides a mechanism through which PingFederate STS can validate an incoming OAuth Bearer access token. The token processor reads and validates the access token and returns any additional user attributes defined (see "Configuring an OAuth Token Processor Instance" on page 361 and "Defining the Access Token Attribute Contract" on page 130).

#### SAML 2.0 Bearer Assertion Grant Type

urn:ietf:params:oauth:grant-type:saml2-bearer

This token request returns an encoded SAML assertion that a WSC can use to request OAuth access tokens from any OAuth AS that supports the SAML 2.0 Bearer Assertion Profiles for OAuth 2.0 specification (http://tools.ietf.org/html/draft-ietf-oauth-saml2-bearer). This capability provides a bridge between the WS-Trust client-STS relationship and
Chapter 1
Key Concepts

the trust relationship the same client may have with an OAuth AS, allowing the
client to obtain additional resources on behalf of already-authenticated users in
follow-on transactions.

**OAuth Access Token via SAML 2.0 Bearer Assertion**

(oauth-v2:access:token:response
|via|urn:ietf:params:oauth:grant-type:saml2-bearer)

This proprietary token request is similar to the one above but returns an OAuth
access token directly. Acting as an IdP, PingFederate generates the intermediate,
extended SAML assertion and requests an access token from the OAuth AS on
behalf of the WSC. (The AS endpoint is obtained from the element
<AppliesTo> of the WS-Trust RST message.)

**About OAuth**

PingFederate can be configured to act as an **OAuth Authorization Server**
(OAuth AS), allowing a resource owner (typically, an end user) to grant
authorization to an **OAuth Client** requesting access to resources hosted by a
Resource Server (RS). (For information about OAuth and the role of an AS, see
“OAuth 2.0” in the “Supported Standards” chapter of Getting Started.) The
OAuth AS issues tokens to clients on behalf of a resource owner for use in
authenticating a subsequent API call to the RS—typically, but not exclusively, a
Representational State Transfer (REST) API call.

**Note:** OAuth AS capabilities are available under special licensing. If your
license does not include the OAuth AS, please contact
sales@pingidentity.com.

The PingFederate OAuth AS can be configured independently or in
conjunction with STS or browser-based SSO for either an IdP or an SP
deployment. In an SP deployment, the inbound SAML assertion can be used to
provide authentication information about the user that can be associated with
the access token (see “Configuring OAuth Attribute Mapping” on page 308). In
an IdP deployment, an IdP adapter can be used to authenticate and provide user
information for the access token. See “OAuth Configuration” on page 121 for
more information.

For an STS IdP, an OAuth token processor is provided with the PingFederate
installation (see “IdP Configuration for STS” on page 358).

**Delegated Access Types**

**Explicit Delegation** – This is the most common OAuth use case, which
involves a resource owner who explicitly delegates to a client the authority to
make API calls to a Resource Server and is asked to approve the transaction.
This is the type of delegation inherent in Web Redirect transactions (see “Web
Redirect Flow” in the “Supported Standards” chapter of Getting Started).

**Implicit Delegation** – Implicit delegation also generally involves a client who
calls an API on behalf of a user; however, the client’s authority is implied by the
nature of the transaction, and the user is not specifically asked to approve the
transaction.
Token Models

Successful OAuth transactions require an OAuth AS to issue access tokens for use in authenticating an API call. These tokens may be characterized by both their data model and security model.

Note: PingFederate supports different token models through a plug-in architecture.

Token Data Model

A token data model refers to whether the token carries identity and security information or acts as a pointer to the information.

By Reference – Serves as a reference to some set of attributes. The RS must dereference the token for the corresponding identity and security information at the OAuth AS that issued it.

Token Security Model

A token security model refers to the conditions that must be met by a client in order to use a token on an API call.

Bearer – The client presents the token to the RS (for example, adds it as a parameter on the API call). Possession of the access token is interpreted as providing sufficient proof to the RS that the client received the same token from the OAuth AS.

Grant Types

To obtain an access token, a client interacts with an OAuth AS, sending a request for an access token that includes an access grant. An access grant is also used when an RS requests validation of an access token from the OAuth AS.

Primary Grant Types

OAuth defines several different access grant types—each reflecting different authorization mechanisms.

Authorization Code – An authorization code is returned to the client through a browser redirect after the resource owner gives consent to the OAuth AS. The client subsequently exchanges the authorization code for an access (and often a refresh) token. Resource owner credentials are never exposed to the client.

Implicit – An access token is returned to the client through a browser redirect in response to the resource owner authorization request (rather than an intermediate authorization code). This grant type is suitable for clients incapable of keeping client credentials confidential (for use in authenticating with the OAuth AS) such as client applications implemented in a browser using a scripting language like Javascript.

Resource Owner Credentials – The client collects the resource owner’s password and exchanges it at the OAuth AS for an access token, and often a refresh token (see below). This grant type is suitable in cases where the RO has a trust relationship with the client, such as its computer operation system or a
highly privileged application since the client must discard the password after using it to obtain the access token.

**Refresh Token** – A refresh token is often returned with an access token. Once the original access token expires, the corresponding refresh token can be sent to the OAuth AS to obtain a fresh access token without requiring the resource owner to re-authenticate. Allows short-lived tokens to exist between the client and the Resource Server, and long-lived tokens between the client and the AS.

**Client Credentials** – The client presents its own credentials to the OAuth AS in order to obtain an access token. This access token is either associated with the client’s own resources, and not a particular resource owner, or is associated with a resource owner for whom the client is otherwise authorized to act.

**Extension Grant Types**

OAuth provides an extension mechanism for defining new extension grant types to support additional clients or to provide a bridge between OAuth and other trust frameworks. An OAuth client uses an extension grant type by specifying an absolute URI as the value of the `grant_type` parameter and by adding any additional parameters necessary.

PingFederate supports the following extension grant types:

- **SAML 2.0 Bearer** – The client obtains a SAML 2.0 Bearer Assertion and uses it to request an access token from the OAuth AS. This grant type allows a client to use an existing trust relationship, expressed through a SAML assertion, without a direct user approval step at the AS.

- **Validation Grant Type** – This proprietary PingFederate OAuth extension enables an RS to act as a client in the request/response exchange with the OAuth AS. The grant type allows an RS to check with the OAuth AS on the validity of a bearer access token received from a client making a protected-resources call.

**Persistent vs. Transient Grants**

Several grant types are usually regarded as persistent, valid until they are explicitly cancelled. Depending on configuration settings, persistent grants can result from the Authorization Code, Resource Owner Credentials, and Implicit grant types (see “Configuring a Client” on page 127).

Transient grants are valid only for the lifetime of the access token itself. Client Credential access grants, for example, are considered transient.

Support for persistent grants requires PingFederate to use a database for long-term storage. The database contains a table defining a `USER_KEY`, which can be populated according to information mapped using attributes obtained during a
user's initial authentication verification within PingFederate (see “Mapping OAuth Attributes”, next).

**Important:** A pre-installed, default Hypersonic database is available for initial setup and testing. However, we strongly recommend that you choose your own, secured database for production deployments. See “Defining an OAuth Grant Data Store” on page 109 for more information.

### Mapping OAuth Attributes

For OAuth persistent grants, user attributes are mapped in the administrative console for a two-stage processing flow, as shown in the following illustration. (Note that this mapping is different from other mapping scenarios in PingFederate, which involve just a one-phase configuration—see “About Attributes” on page 17.)

To accomplish the first stage (top of diagram), mapping is required for setting up persistent grants, including a user key (see the previous section, “Persistent vs. Transient Grants”). The mappings may use attributes obtained during initial authentication events within PingFederate—via SAML assertions (for Service Providers’ IdP connections for SSO), IdP adapters, and/or Resource Owner credentials (see “Using OAuth Menu Selections” on page 122). Data-store lookup is provided as needed (for example, to retrieve an LDAP ID for storage as the user key).

The second mapping configuration involves mapping user keys derived from the first mapping(s) into OAuth access tokens. Data stores may also be used here to retrieve any required user attributes.

At runtime, the first time a client requests an OAuth token the two mapping sequences are employed sequentially. The second mapping is invoked every time a new access token is requested based on an existing persistent grant.
Chapter 1
Key Concepts

Scopes

Where OAuth provides a mechanism to constrain the privileges associated with an access token, scopes provide a way to more specifically define the privileges requested and granted.

Generally, a client specifies the scopes desired when asking for authorization. The issued access token is associated with these approved scopes. Scopes are configured globally (see “Authorization Server Settings” on page 123).

OAuth User-Facing Screens

The PingFederate OAuth AS provides two screens presented to end users (resource owners) during OAuth transactions, one requesting approval of the scope of protected resources requested and one providing a means of revoking persistent access grants.

Tip: These screens can be customized and branded as needed (see “Customizing User-Facing Screens” on page 76).

SSO Integration Kits and Adapters

As a stand-alone server, PingFederate must be programmatically integrated with end-user applications and identity management (IdM) systems to complete the “first- and last-mile” implementation of a federated identity network for browser-based SSO.

Note: See the PingFederate SSO Integration Overview for more information.

For an IdP (the first mile), this integration process involves providing a mechanism through which PingFederate can look up a user's current authenticated session data (for example, a cookie) or authenticate a user without such a session. For an SP, the last mile involves enabling PingFederate to supply information needed by the target application to set a valid session cookie or other application-specific security context for the user.

To enable both sides of this integration, PingFederate provides bundled and commercial integration kits, which include adapters that plug into the PingFederate server and agent toolkits that interface with local IdM systems or applications, as needed.

In addition, for IdP deployments PingFederate provides plug-in adapter selectors, which enable dynamic selection of adapter instances based on administrator-specified criteria (see “Bundled IdP Adapter Selectors” on page 15).

PingFederate also includes a robust software development kit (SDK), which software developers can use to write their own adapters for specific systems. Adapters can be written to retrieve attributes from custom data stores, connect to application- or IdM-specific user authentication systems, or provide complex attribute transformations or processing.
Bundled Adapters

PingFederate packages these adapters:

- An OpenToken Adapter, which provides a generic interface for integrating with various applications, including Java- and .NET-based applications (see “OpenToken Adapter Configuration” on page 407).

- An IdP Composite Adapter, which allows multiple configured adapters to execute in sequence for browser SSO. This capability, called adapter chaining, may be used either for single-adapter usage, depending on authentication context, or to support multi-factor authentication via a series of adapters.

- HTTP Basic and HTML Form IdP Adapters, which are used in conjunction with Password Credential Validators (see “Validating Password Credentials” on page 158). These adapters provide integration, for example, with LDAP user-data stores such as Active Directory or direct user logon via credentials maintained by PingFederate. (See “Configuring the HTTP Basic IdP Adapter” on page 415 and “Configuring the HTML Form IdP Adapter” on page 419.)

Bundled IdP Adapter Selectors

For an IdP, PingFederate also includes two types of global (cross-connection) adapter selectors to allow for dynamic integration with an organization’s authentication or authorization policies:

CIDR Selector – Provides a means of choosing adapters at runtime based on whether an end-user’s IP address falls within a specified range, or ranges (using Classless Inter-Domain Routing notation). This selector allows administrators to determine, for example, whether an SSO request originates inside or outside the corporate firewall and use different authentication integration accordingly (see “Configuring the CIDR Adapter Selector” on page 170).

Authentication-Context Selector – Picks an adapter at runtime based on the authentication context requested by an SP, for SP-initiated SSO (see “Browser-based SSO” in the “Supported Standards” chapter of Getting Started). Configured adapters are mapped either to SAML-specified contexts or any ad-hoc context agreed upon between the IdP and SP partners (see “Configuring the AuthN Context Selector” on page 171).

Commercial Adapters and Selectors

Ping Identity regularly develops and maintains integration kits, including adapters, to work with applications and leading identity management systems. Available kits may be downloaded from the Ping Identity Web site (www.pingidentity.com/support-and-downloads). Adapter Selectors may also be added to the download site periodically; contact your Ping Identity sales representative if you are looking for specific adapter-selection capabilities.

Software Development Kit

The PingFederate SDK provides a flexible means of creating custom integration kits to integrate federated identity management into your system environment. See the PingFederate SDK Developer's Guide.
Identity Mapping

Identity mapping is at the core of identity federation. One of the primary goals of SAML is to provide a way for an identity provider (IdP) to send a secure token (the assertion) containing user-identity information that a service provider (SP) can translate, or map, to local user stores. (For more information about SAML, see the “Supported Standards” chapter in Getting Started.)

For browser-based SSO, PingFederate enables two modes of identity mapping between domains:

- Account Linking
- Account Mapping

For WS-Trust STS, account mapping is used.

Account Linking

Under the standards, account linking can be used for browser-based SSO in cases where each domain maintains separate accounts for the same user. Account linking uses the SAML assertion to create a persistent association between these distinct user accounts. The account link, or name identifier, may be either a unique attribute, such as an email address, or a pseudonym generated by the IdP to uniquely identify individual users. Pseudonyms can be used when privacy is a concern; they cannot easily be traced back to a user's identity at the partner site.

During the user's first SSO request, the SP prompts for local credentials, which enables the SP to link the name identifier contained within the assertion—either an open attribute or a pseudonym—with the user's local account. Subsequent SSO events will not prompt the user to authenticate with the SP, since the SP federation server keeps a table associating remote users' name identifiers with local user accounts. The SP associates the link to the user's corresponding local account and provides access to the account without separate authentication.

Tip: An SP PingFederate uses a default, Hypersonic database to handle account linking. You can use your own data store instead, as needed. For more information, see “Configuring an LDAP Connection” on page 103.

Optionally, additional attributes may be sent with the name identifier. When a pseudonym is used as the account link, however, care must be taken to send only general attributes (a user's organizational role or department, for example) that will not compromise privacy.

Linking Permission and “Defederation”

The SAML specification also allows the SP application to build in user verification and approval of account linking and provides a means for the user to permanently cancel the linking, known as defederation (see “/sp/defederate.ping” on page 435). A user who has defederated may later elect to reassociate with a local user account.
SP Affiliations

Under the SAML 2.0 specifications, an IdP can configure PingFederate to enable a group of SPs—an SP affiliation—to share the same persistent name identifier (see “Defining SP Affiliations” on page 254). This capability facilitates the use case in which a number of business partners have an existing relationship and sharing a single name identifier among all parties reduces the federation integration effort.

Account Mapping

Account mapping (also called “attribute mapping”) enables an SP to use PingFederate to perform a user lookup and map a user's identity dynamically based on one or more attributes received in the assertion. The attributes used to look up the user are always “exposed”; that is, they are known to both the IdP and SP. An email address, for example, is a commonly used identifying attribute.

Account mapping can be used to achieve one-to-one mapping (individual user accounts exist on both sides of federated connection) or many-to-few (IdP users without accounts at destination sites may be mapped to guest accounts or to a role-based general account).

For browser-based SSO, transient identifiers provide an additional level of privacy—virtual anonymity—by generating a different opaque ID each time the user initiates SSO. Transient IDs are often used in conjunction with federation role mapping, whereby the user is mapped to a guest account or to a role-based account based on the user's association with the IdP organization rather than personal attributes.

As with pseudonyms, additional attributes may be sent with the transient identifier. Again, care should be taken to preserve privacy.

Account mapping is commonly implemented in B-to-B or B-to-E use cases where it might be appropriate for the administrator to create a user lookup on behalf of the user.

About Attributes

Federation transactions require, at a minimum, the transmission of a unique piece of information (such as an email address) that identifies the user for identity mapping between security domains.

In addition to attributes used for identity mapping, the IdP can pass other user attributes in an assertion (including SAML tokens for Web Services). This supplemental information can be used by the SP for several purposes. For example, attributes may be used to map and authorize the user into a specific role, with associated site permissions. In other cases, attributes may be used to customize the end application display for a more robust user experience.

The SP also has the option of incorporating additional attributes prior to creating a session for the target application. This is commonly done where the SP also maintains an account for the user and wants to pass additional information for profiling or access-policy purposes.
Attributes must be carefully managed between IdPs and SPs. PingFederate facilitates the process by providing configuration steps that enable administrators to:

- Define and enforce attribute contracts for each partner connection.
- Define and retrieve attributes from the adapter or STS token processor to populate an attribute contract directly or use these attributes to look up additional attributes in IdP data stores.
- Define and enforce a set of required attributes needed by SP adapters or STS token generators to interface local systems or applications (see “Adapter Contracts” on page 19).
- Set up connections to local data stores (see “Data Stores” on page 21).
- Configure specific attribute sources and lookups—based on the data stores—and map attributes into IdP assertions or into SP adapters or token generators used to interface target applications (see “SSO Integration Kits and Adapters” on page 14 or “Token Processors and Generators” on page 7).
- Selectively mask attribute values recorded in transaction logs (see “Attribute Masking” on page 22).

**Attribute Contracts**

An attribute contract represents an agreement between an SP and an IdP about user attributes sent in a SAML assertion, either for browser-based SSO or WS-Trust STS. The contract is a list of case-sensitive attribute names. IdPs and SPs must configure attribute contracts to match.

**Tip:** When privacy is required for sensitive attributes, you can configure PingFederate to mask their values in log files (see “Attribute Masking” on page 22).

For an IdP, the attribute contract defines which attributes PingFederate sends in an assertion. While this contract is fixed for all users authenticating to the SP partner, the values used to fulfill the contract may differ from one user to the next. The attribute contract may be fulfilled by relying on a combination of different data sources:

- The IdP adapter or STS token processor
- An IdP attribute source, which identifies the location of individual attributes in a data store
- Static text values for some attributes, or text values combined with variables
- Expressions (see “Using Attribute Mapping Expressions” on page 453)

For an SP, the attribute contract defines the attributes PingFederate expects in a SAML assertion. PingFederate can be configured to pass these attributes to the SP adapter or, for Web Services, to the SP token generator (see “Configuring SP Adapters” on page 266 or “Configuring Token Generators” on page 386). You can also use attributes to look up additional attributes in local data stores, which may be needed to start a user session or create a local security token for Web Services (see “Adapter Contracts” below or “STS Token Contracts” on page 20).

The attribute contract must contain the attribute `SAML_SUBJECT`, the primary information used to identify the user, unless you are using account linking for
About Attributes

browser-based SSO. This attribute is automatically included when creating a new contract.

Note: You create attribute contracts on a per-connection basis. For example, if an SP has deployed two session-creation adapters for two separate applications, a single attribute contract can be created for the IdP connection partner. This single contract would be constructed to supply all the attributes needed by both SP adapters.

Name Formats

By agreement with an SP partner, an IdP may specify a format (email, for example) associated with the SAML_SUBJECT. The SP may require this information to facilitate handling of the format.

The partner agreement may also include a requirement for the IdP to provide format specifications associated with other attributes.

For browser-based SSO connections, PingFederate provides a means for an IdP administrator to select from among standard subject and/or attribute formats, depending on the relevant SAML specifications. An administrator can also define a customized selection of additional attribute formats (see “Creating an Attribute Contract” on page 196).

Note: The designation of formats is not applicable to SP administrators. The information is simply available in the incoming assertion to an SP application that might need it for particular processing requirements.

For the WS-Trust IdP configuration, attribute-name formats cannot be specified. If needed, however, an administrator can use a special variable in the attribute contract to set the subject-name format (see “Defining an STS Attribute Contract” on page 368). (The same variable is also available for browser-based SSO attribute contracts, but the feature is deprecated.)

STS Namespaces

By agreement with an SP partner for a WS-Trust STS connection, an IdP may specify an XML namespace to be associated with an attribute (for example, to use claims-based authorization with WIF clients—see “Windows Identity Foundation Clients” on page 8). Namespaces can be specified only for attributes of a WS-Trust IdP configuration using SAML 1.1 as the default token type (see “Defining an STS Attribute Contract” on page 368).

Adapter Contracts

An adapter contract represents an agreement between the PingFederate server and an external application. In concert with the attribute contract between partners, adapter contracts specify the transfer of attributes. Adapter contracts consist of a list of case-sensitive attribute names.

On the IdP side of a federation, adapter attributes are supplied to PingFederate by an IdP adapter (see “SSO Integration Kits and Adapters” on page 14 and “Configuring IdP Adapters” on page 164).
On the SP side, adapter contract attributes are those required by an adapter to start a session with an application. At least one adapter type is needed for each security domain. Then an adapter instance must be configured for each target application. (See “Configuring SP Adapters” on page 266.)

Adapter contracts on the SP side are fulfilled using attributes from the attribute contract, possibly enhanced through other attributes looked up from local data stores. For example, if several target applications are controlled by the same security context (for example, SiteMinder) and can receive the same set of attributes to start a session for the user, you would deploy an adapter type and configure an adapter instance for each protected application (see “Configuring Adapter Mapping and User Lookup” on page 295).

**Extended Adapter Contract**

Adapter contracts are created when an adapter type is deployed with PingFederate. When developed, these adapters are "hard-wired" to look up or set a specific set of attributes. After deployment, your attribute requirements may change. To streamline adjustment of adapter contracts, PingFederate allows an administrator to add additional attributes to the adapter instance through the administrative console. These adjustments are called extended adapter contracts.

**STS Token Contracts**

Similar to an adapter contract for browser-based SSO, an STS token-processor or token-generator contract represents an agreement between the PingFederate server and an external application in the context of a Web Services transaction. In concert with the attribute contract between partners, token contracts specify the transfer of attributes, consisting of a list of case-sensitive attribute names.

On the IdP side of a federation, token-processor attributes are supplied to PingFederate (see “Token Processors and Generators” on page 7 and “Configuring Token Processors” on page 358).

On the SP side, token-generator contract attributes are those required by a token generator to pass identity information from the token to the Web Service client application. At least one token generator type is needed for each security domain. Then a token generator instance must be configured for each target application (see “Configuring Token Generators” on page 386). If several target applications are controlled by the same security context (for example, SiteMinder) and can receive the same set of attributes for the user, you would deploy a token generator type and configure a token generator instance for each target application (see “Mapping Token Generators” on page 393).

**Extended Token Generator Contract**

Token-generator contracts are created when a token-generator type is deployed with PingFederate. When developed, these token generators are “hard-wired” to look up or set a specific set of attributes. After deployment, your attribute requirements may change. To streamline adjustment of token-generator contracts, PingFederate allows an administrator to add additional attributes to the token-generator instance through the administrative console. These adjustments are called extended token-generator contracts.
Data Stores

PingFederate can be configured to use local data stores to supply attributes for either the IdP’s attribute contract, the SP’s adapter contract, or STS token contracts (see sections above). Standard data stores may include any JDBC-accessible database or an LDAP v3-compliant directory server (see “Managing Data Stores” on page 98).

Alternatively, you can use the PingFederate Custom Source SDK to create your own driver for non-JDBC/LDAP data stores—including, for example, flat files or SOAP-connected databases (see the PingFederate SDK Developer's Guide).

Data stores can be used across multiple connections.

Multiple Data Source Attribute Mapping

When querying data stores for attributes to help fulfill the attribute contract, PingFederate can be configured to use more than one attribute source when mapping values to an assertion. For browser SSO for an IdP, multiple data stores can be used in two ways:

- Set up search parameters separately for each data store and for “fall-through” searches. For example, you can add the same data store more than once, using different search queries for each instance, or you can search different data stores successively. If any search fails to find a user in the specified attribute source, the next search is executed until a match is found. A failsafe attribute source can also be configured, providing a default set of attributes from the IdP adapter and using text values (see “Attribute Source Setup” on page 202).

- Configure separate data stores to look up attributes for a single mapping. For example, you can query multiple data stores for values and map those values in one mapping, or query a data store for a value and use that value as input for subsequent queries of other data stores. (see “Attribute Source Setup” on page 202).
Chapter 1
Key Concepts

Attribute Masking

At runtime PingFederate logs user attributes (see “Managing Log Files” on page 38). To preserve user privacy, you may wish to mask the values of logged attributes.

PingFederate provides this masking capability at all points where the server logs attributes. These points include:

- Data-store lookup at either the IdP or SP site (see “Managing Data Stores” on page 98).
- Retrieval of attributes from an IdP adapter or token processor (see “Setting Pseudonym Values and Masking” on page 168 and “Setting Attribute Masking” on page 362).
- SP-server processing of incoming attributes based on the SSO attribute contract, (see “Defining an Attribute Contract” on page 294).

Note that the SAML Subject ID is not masked: the SAML specifications provide for either pseudonymous account linking or transient identification to support privacy for the Subject ID (see “Account Linking” on page 16).

- SP-server processing of incoming attributes in response to an Attribute Request under XASP (see “Defining Security Policy” on page 334).

For information about XASP, see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started.

Important: Many adapter implementations, as well as other product extensions, may independently write unmasked attribute values to the PingFederate server log. These implementations are beyond the control of PingFederate. If sensitive attribute values are a concern when using such a component, a system administrator can adjust the component’s logging threshold in log4j.xml to prevent the recording of attributes (see “Managing Log Files” on page 38).
Security Infrastructure

This section describes the PingFederate security infrastructure that supports encrypted messaging, certificates, and digital signing. These functions are integrated into PingFederate’s configuration screens to provide complete control over certificate generation and authentication verification (see “Security Management” on page 145).

Digital Signatures

A digital signature is a way to verify the identity of a person or entity who originates an electronic document and ensure that the message has not been altered. Digital signatures are used in both SAML (including STS tokens) and WS-Federation electronic documents.

Handling a digital signature involves message signing, signature and certificate validation, and signing-policy coordination between connection partners.

Message Signing

Certificates contain information about the owner of the certificate along with a public key. Applying a digital signature creates and encrypts a hash from the message you are signing, using your private key. PingFederate provides a choice of signature encryption algorithms when a stronger algorithm is required.

To ensure the integrity of SAML messages or STS tokens, we recommend digital signing practices using public/private keypairs in conjunction with X.509 certificates.

Note: Digital signatures do not encrypt the contents of a message; SSL/TLS and/or XML encryption is used for this purpose.

The certificate should be signed by a Certificate Authority (recommended), but it can be self-signed or signed by an untrusted third party. After generating a keypair and a self-signed certificate, you can use PingFederate to create a Certificate Signing Request (CSR) and send it to a CA for signing. After the CA has generated a Certificate Signing Response, you can import it into PingFederate’s certificate management system. (The CA’s certificate must be in PingFederate’s trusted store or in the Java runtime cacerts store.)

PingFederate enables signing and validation of responses, requests, and/or the assertion message. In addition, PingFederate provides for certificate generation, import and export functionality, CSR generation, and application of digital signatures. You can create reusable global signing certificates across your federated connection base and import signature verification certificates for each partner (see “Digital Signing and Decryption Keys and Certificates” on page 151).

Note: Ping Identity recommends generating unique certificates for each connection, which limits exposure if the private key becomes compromised.
Signature Validation

After receiving a signed message, PingFederate verifies the signature using the public key that corresponds with the private key used to sign the message or token. Verification involves creating a hash of the received message, using the signing partner’s public key to decrypt the hash sent with the original message, and verifying that both hash values are equal.

Certificate Validation

PingFederate always checks certificates to see if they have expired, both when they are initially imported and at runtime when they are used to encrypt, decrypt, and digitally sign or verify assertions.

PingFederate can also check to see whether a certificate has been revoked, using either Certificate Revocation Lists (CRLs) or the Online Certificate Status Protocol (OSCP). Depending on the content of the certificate in question and your requirements, the server will perform either of these checks during SSO or SLO processing for the following cases:

- Signature verification
- Validation of a client certificate used for authentication to PingFederate when the server is handling direct client requests
- Validation of the server SSL certificate when PingFederate is acting as the client making an HTTPS request to a separate server

If a certificate is expired or revoked, the associated SSO or SLO transaction fails at runtime and an error is written to the transaction log. In the administrative console, an expired or revoked certificate is identified as such in the Status column of its respective Certificate Management list.

CRL Revocation Checking

This process involves querying a CRL distribution-point URL and ensuring that a certificate is not on the returned revocation list maintained at the site. The URL is specified in the certificate.

No setup is needed in the administrative console to enable CRL checking. PingFederate automatically checks CRLs if all of the following conditions are met:

- The certificate contains the URL where the CA maintains its CRL.
- The URL is accessible.
- The returned CRL is signed and the signature verified.
- CRL validation is not explicitly disabled as a failover option in the OCSP setup (see “Certificate Revocation Checking” on page 153).

OCSP Revocation Checking

OCSP was developed as an alternative to CRL validation and provides a more centralized and potentially more reliable means of checking certificate status. In this scenario, an OCSP Responder URL is normally embedded in the incoming certificate (a configured default URL may be used, alternatively). The URL, maintained by the issuing CA, is used to query the certificate status.

The primary difference between OCSP and CRL checking is how the verification occurs. OCSP checking requires the requesting client to determine if the certificate has been revoked (or if any of the certificates in the chain of issuer
certificates has been revoked), based on the returned CRL. With OCSP, the client sends the certificate itself, and revocation checking is handled by the Responder server, which returns the certificate status.

A PingFederate administrator can enable and configure OCSP processing in the administrative console (see “Certificate Revocation Checking” on page 153). The protocol may be used exclusively or in conjunction with CRL checking as a backup.

For more information about OCSP, see www.ietf.org/rfc/rfc2560.txt.

Digital Signing Policy Coordination

To coordinate digital signature policy, partners must first agree about whether they will sign SAML messages or tokens. In some cases, the protocol specifications require signatures—for example, all SAML STS tokens and all SSO assertions sent across the POST binding must be signed. (These requirements are enforced by the PingFederate administrative console and the runtime protocol engine.) Other uses of the digital signatures are optional between partners and enforced if specified for a partner connection.

If a digital-signing certificate is not issued by a trusted CA (that is, “self-signed”), then the signing partner must send the public-key certificate out-of-band (for example, via email) to the partner. The partner must import the certificate into PingFederate when configuring a connection to the signing partner for SSO/SLO or STS.

If the certificate is signed by a trusted CA and the signing partner chooses to embed the certificate in all signed messages, then the verifying partner can elect to use the embedded certificate for signature verification, after validating it against the Subject DN of the original certificate. The public-key certificate may or may not be sent out-of-band (just the Subject DN is required).

Tip: PingFederate can extract the Subject DN from the certificate, when available, during the signature-verification configuration.

The next section provides more information about the two alternative signature-verification trust models described above, from the standpoint of the verifying partner.

Trust Models

For validating digital signatures, PingFederate provides a selection of trust models in the administrative console for each partner connection, based on the certificate categories listed below. Note that for each trust model, PingFederate always verifies that the certificate is current and that the signature in the message can be verified using the certificate specified. Additional checks depend upon the trust model selected.

- Anchored Certificate

In this case, certificates used for signature verification must be issued by a trusted CA, and the certificate chain must be verifiable recursively back to the root issuer. PingFederate validates the certificate (including recursive
revocation checking, when enabled, back to the issuer) for all signed messages from the partner.

In addition, when this option is selected, the incoming message must include the verification certificate for the signature. PingFederate uses that certificate to verify signatures from the partner if its Subject DN matches the partner’s public certificate, as specified in the administrative console, and the issuer CA certificate is part of the trusted store. This feature provides a dynamic trust model that overcomes the problem of interrupting service to change out expired certificates.

- **Unanchored Certificate**

  When this option is chosen, incoming signatures are verified exclusively using a specific certificate imported for a connection into PingFederate (or a secondary, backup certificate when specified). The certificate may be self-signed or issued by a trusted CA. The certificate chain, if any, is not verified. However, revocation checking, when enabled, is performed up any existing chain as far as available.

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**Secure Sockets Layer**

SSL certificates signed by a CA can be used to identify one or both ends of the federation. SSL/TLS provides an encrypted connection between the two parties in which the content of a message is not exposed, thus ensuring confidentiality and message integrity.

**SAML SSL and TLS Scenarios**

SSL/TLS should be used in association with the SOAP responder URL and Single Sign-on Service located at an IdP site. On the SP side, the Artifact Resolution Service should also use SSL/TLS. Optionally, SSL/TLS may also be used to secure communication between internal data stores and PingFederate and between the PingFederate STS and Web Service client or provider applications.

**Authentication**

Three methods of authentication, described below, are available for use with PingFederate for browser-based SSO to authenticate connection partners making SOAP requests. For SOAP authentication by STS clients, a separate option using either or both of the first two methods, may be configured (the third method, digital signing, is automatically required). The selection of one or more method(s) must be agreed upon between partners and synchronized within IdP and SP federation implementations:

- **HTTP Basic Authentication**: partners identify themselves by passing username and password credentials.
- **SSL Client Certificate Authentication**: partners use SSL Client Certificates presented during SOAP request transactions. Each partner needs to import
the other’s certificate out-of-band (see “SSL Client Keys and Certificates” on page 149).

**Important:** The SSL/TLS server-client handshake involves negotiating cipher suites to be used for encryption/decryption on each side of a secured Internet transaction. PingFederate supports only stronger cipher suites; to enhance security, weaker cipher suites are commented out of two configuration files located in <pf_install>/server/default/data/config-store:
- com.pingidentity.crypto.SunJCEManager.xml
- com.pingidentity.crypto.NcipherJCEManager.xml

To ensure the most secure transactions, we recommend that administrators retain this cipher-suite configuration.

Due to import control restrictions, the standard Java Runtime Environment (JRE) distribution supports strong but not unlimited encryption. For this reason, the strongest cipher suites in the same configuration files are also commented out. To use the strongest encryption, when permissible, remove the comments from the AES 256 cipher suites and download and install the appropriate version of “Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files” from the Sun download Web site (http://java.sun.com/javase/downloads).

- Digital Signatures: partners sign the XML message transmitted via the SSL/TLS connection. Signatures are verified by the receiver based upon the certificate(s) configured for that connection. Each partner should import the other’s certificate(s) out-of-band (see “Digital Signing and Decryption Keys and Certificates” on page 151).

**Verifying Trusted Certificates**

PingFederate validates the trust of all certificates. A certificate is trusted if the certificate of its issuer is in PingFederate’s trusted certificate store. The root certificate of the CA, by which a certificate is issued, must be imported into PingFederate’s trusted certificate store or contained in the Java runtime cacerts store.

**XML Encryption**

PingFederate supports the optional SAML 2.0 specification allowing for encryption of assertions (including STS SAML tokens), which further enhances confidentiality when required.

For SAML 2.0 SSO connections you can choose to encrypt entire assertions, the user’s name identifier, and/or other user attributes. You can use signature verification and signing keys to encrypt and decrypt messages, respectively.

**About PingFederate Express**

PingFederate Express™ is a lightweight SAML 2.0 endpoint for federation partners who want a quick and easy way for an SP to process SAML assertions.
sent from an IdP partner who is using PingFederate. Available separately for specific platforms, PingFederate Express provides a convenient, highly automated approach to configuring end-to-end basic Internet SSO between partners.

For an IdP, PingFederate provides a built-in template that an administrator uses to configure Express connections. The template automatically configures most settings (see “Using the Express Connection Template” on page 257). Once the configuration is complete, the administrator exports the connection metadata into a ZIP file.

On the SP side, a PingFederate Express administrator uses the ZIP as part of an automated installation procedure to configure the corresponding IdP connection in a matter of minutes.

Using Auto-Connect

PingFederate allows organizations to provide secure Internet SSO on the fly—that is, without the need for configuring partner-specific, browser-based SSO connection parameters. This feature—Auto-Connect™—extends SAML 2.0 SP-initiated SSO or SLO and metadata specifications to enable deployments to retrieve partner connection information securely on an as-needed basis. (For information about SAML 2.0, see the “Supported Standards” chapter in Getting Started.)

The feature is especially useful to an SP who wants to provide SSO capability to more than one partner. A Software-as-a-Service (SaaS) provider, for example, can provide SSO to innumerable clients without specifying redundant connection information for each one. Auto-Connect can also help an enterprise, acting as an IdP, to provide easily scalable SSO for multiple outsourced services.

For either an IdP or SP PingFederate server, you can implement Auto-Connect for any number of partners by configuring a common initial setup and a list of domain names. For an IdP, the domain-name list contains SP partners from whom your site will accept Auto-Connect authentication requests. For an SP, the list contains IdP-partner domains to which your site can send authentication requests and receive SSO assertions.

For information about configuring Auto-Connect for your federation partners, see “Configuring SP Auto-Connect” on page 261 or “Configuring IdP Auto-Connect” on page 345.

Providing Metadata

You enable Auto-Connect as part of Server Settings from the Main Menu (see “Choosing Roles and Protocols” on page 89). Once Auto-Connect is enabled and the initial setup is fully configured and activated, partners can retrieve your connection metadata via HTTP. At runtime, Auto-Connect deployments at partner sites use the endpoints provided in the metadata to interact with your server and complete SSO or SLO processing.

The metadata, which follows SAML 2.0 specifications, must be signed, and the validity of the data is time-limited (see “Auto-Connect Security Model” on page 30 and “Configuring Auto-Connect Metadata Lifetime” on page 97).
Runtime Processing

Auto-Connect runtime processing starts when a user tries to reach a protected SP resource. The process depends on SP Web-application functionality that determines the user's IdP domain (for example, from a submitted email address) and passes it to the SP PingFederate server in the SSO request.

Figure 1 and the accompanying “Processing Steps” describe the complete SSO processing flow:

Figure 1: Auto-Connect Processing Flow

Processing Steps

1. Internet user sends a logon request with an email address to an SP application. For example:
   
   john@mycompany.com

2. The application parses the email address and sends a request to PingFederate. For example:
   
   https://hostname.com:9031/sp/startSSO.ping/?Domain=mycompany.com

3. The SP PingFederate server looks up the domain in a list of domain names allowed to use Auto-Connect.

4. If the domain is in the list, the SP retrieves connection metadata from the IdP's public endpoint.
   
   By default, PingFederate looks for the metadata by prepending http://saml to the domain. For example:
   
   http://saml.mycompany.com
   
   This default location can be changed, if necessary, in the Allowed Domains lists configured in the PingFederate administrative console.

5. After validating the metadata (see “Auto-Connect Security Model” on page 30), the SP sends an authentication request to the IdP's SSO service.
6. If the request `<Issuer>` is not among the IdP's static-connection partners, the IdP PingFederate server looks for the issuer's domain name in the list of domains allowed to use Auto-Connect.

7. The IdP retrieves the SP's metadata via its public endpoint and verifies the metadata signature.

   The process is the same as that used by the SP in Step 4.

8. The IdP requests user authentication via the configured adapter instance.

9. Once the user is authenticated, the IdP returns a signed SAML assertion to the SP's Assertion Consumer Service (ACS) endpoint.

10. (Not shown) The SP logs the user on to the requested resource via the configured SP adapter.

**Auto-Connect Security Model**

Auto-Connect processing requires digital signatures to ensure the authenticity of the published metadata as well as all subsequent SSO or SLO requests and responses. The certificate used to sign the metadata is included in the metadata, and all certificates must be signed by a trusted Certificate Authority; thus, partners need not exchange certificates out of band.

In addition to validating certificates, the PingFederate runtime server compares the partner certificate with the entity ID (the “Issuer”) found in the SAML message. Then the server matches the entity ID against the configured list of allowed Auto-Connect domains.

Figure 2 illustrates the security validation process:

![Figure 2: Auto-Connect Security Model](image)

Note that the diagram assumes that the same certificate is used for signing both the metadata and the runtime SAML messages. This is convenient, but not required.
**User Provisioning**

PingFederate provides two different kinds of user provisioning for browser-based SSO, one designed for an IdP and one for an SP:

- At an IdP site, you can provision and maintain user accounts (including “deprovisioning”) at selected hosted-software providers (see the next section, “SaaS Provisioning”).
- At an SP site, you can provision accounts for your own organization automatically, using information from SAML assertions received during SSO events (see “Express Provisioning” on page 32).

**SaaS Provisioning**

For IdP sites, PingFederate offers automated provisioning and deprovisioning to facilitate SSO to selected SaaS providers.

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**Tip:** SaaS Provisioning, including quick-connection templates for partner SSO, is available separately from Ping Identity. Contact sales@pingidentity.com for more information.

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When SaaS Provisioning is enabled, the PingFederate runtime engine polls the IdP organization’s user store periodically. The server uses a separate database internally to monitor the state of the user store and keep user data synchronized between the organization and the hosted SaaS application (see Figure 3).

![Figure 3: SaaS Provisioning Processing](image)

PingFederate provides built-in support for Microsoft’s Active Directory and the Sun Directory Server (formerly Sun ONE) as user-data sources; templates are used to preconfigure many provisioning settings. Although these are the only data stores formally tested and supported, other LDAP data stores will likely work as well (see “Identifying the Source Data Store” on page 245). For convenience, PingFederate provides a sample template that can be used for other types of LDAP servers to simplify the provisioning configuration (see “Configuring an LDAP Connection” on page 103).

Tested internal data stores include Hypersonic, MySQL, and Oracle databases (a demonstration-only, embedded Hypersonic database is installed by default).
Chapter 1

Key Concepts

Again, any relational database may be used—scripts are provided to aid setup (see “Configuring SaaS Provisioning Settings” on page 95).

Tip: Administrators have access to a command-line utility that can be used to monitor and make adjustments to the internal database as needed (see “SaaS Provisioning CLI” on page 73).

Express Provisioning

At an SP site, PingFederate can create and update local user accounts in an external LDAP directory or Microsoft SQL Server 2005 as part of SSO processing—Express Provisioning. This feature allows SPs to maintain accounts for users that authenticate from IdP partners without having to provision accounts manually prior to a user’s first SSO.

When configured, the PingFederate SP server writes user information to the local user store using attributes from the incoming SAML assertion. For SAML 2.0 partner connections, assertion attributes can be supplemented with user attributes returned from an Attribute Query (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

PingFederate can also update existing user accounts. When this option is enabled, PingFederate can add or overwrite attributes for a local user account each time SSO for a user is processed. (Note that once user attributes are provisioned, they cannot be removed using Express Provisioning.)

For information about enabling Express Provisioning, see “Choosing IdP Connection Options” on page 284. For configuration information, see “Using Express Provisioning” on page 320.

Federation Planning Checklist

An essential first step in establishing an identity federation involves discussions and agreements between you and your connection partners. The sections below comprise a partial checklist of items that should be coordinated before you deploy PingFederate.

Tip: For basic SSO deployment between partners, PingFederate Express virtually eliminates the need for much of the coordination described in this section, in addition to simplifying and expediting the configuration for both an IdP and an SP (see “About PingFederate Express” on page 27).

Tip: Extensive coordination and configuration may also be avoided by using Auto-Connect (see “Using Auto-Connect” on page 28).

Standards and Specifications Choose which federation protocol(s) your deployment will support. For SAML SSO configurations, decide which profiles and bindings will be used. (See the “Supported Standards” chapter in Getting Started.)

Signing and Validation Decide which SAML messages—assertions, responses, requests—will be digitally signed and how the messages will be verified by your
federation partner. If messages are signed, decide how certificates will be exchanged (for example, secure email). (See “Security Infrastructure” on page 23.)

Also, if a stronger signature algorithm is required, determine what RSA algorithm will be used for signing. (The optional algorithm selection is available throughout the administrative console, where signing certificates are specified for various uses.)

**Back-Channel Security** Determine what type of SOAP channel authentication will be used: Basic or SSL/TLS. If SSL/TLS is used, determine whether server-only or both server and client certificates will be needed and how they will be managed. Also decide what level of security will be required for connections to back-end data stores or identity management systems.

**Trusted Certificate Management** Determine whether both partners are using SSL/TLS and/or signing certificates that have been signed by a major CA. (If self-signed certificates or nonstandard CAs are used, the signed certificates must be exchanged and imported into Trusted Certificate stores.) Also, determine whether you want to adopt a trust model that uses embedded certificates (see “Trust Models” on page 25).

**Deployment** Decide how PingFederate fits into your existing network. Also, determine whether high-availability and/or failover options are required (see the PingFederate Server Clustering Guide).

**Federation Server Identification** Determine how you and your partner(s) will identify your respective federation deployments. Under federation standards, both the sender (IdP) and the receiver (SP) of an assertion must be uniquely identified within the identity federation (see “Configuration Data Exchange” on page 34).

With PingFederate, you define a unique ID for each supported protocol (see “Specifying Federation Information” on page 91). Optionally, you can also use Virtual Server IDs on a connection-by-connection basis. This option provides more configuration flexibility in cases where you need more than one connection to the same partner for different purposes. For example, you would want to use virtual IDs if you are an IdP and you have an SP partner who requires a different set of attributes to launch different applications. Assigning virtual IDs allows you to configure multiple connections to such a partner, each set up to manage attributes differently. (Note that the partner must also have a federation deployment that supports multiple federation IDs.)

You can assign virtual server IDs either as an IdP during configuration of an SP connection (see “General Information” on page 186) or as an SP configuring an IdP connection (see “General Connection Information” on page 285).

**Tip:** PingFederate also provides for virtual host names, which differ from virtual IDs (but are not mutually exclusive); they are intended to be used when your network configuration is such that you receive federation messages under more than one domain name (see “Using Virtual Host Names” on page 64).

**Server Clock Synchronization** Ensure that both the SP and IdP server clocks are synchronized. SAML messages and STS tokens provide a time window that
allows for small synchronization differentials. However, wide disparities will result in assertion or request time-outs.

**User Data Stores** Identify the type of data store that contains user data when needed: LDAP, JDBC, or Custom (see “Data Stores” on page 21).

**Web Application and Session Integration** Decide how PingFederate as an IdP receives subject identity information, either from an STS token or a user session.

For an SP, decide how PingFederate will forward user identity information to the destination Web application or system to start a session.

(See “SSO Integration Kits and Adapters” on page 14 and “Token Processors and Generators” on page 7.)

**Transaction Logging** PingFederate provides basic transaction logging and monitoring. Decide whether transaction logging should be integrated with a systems management application and whether you have regulatory compliance requirements that affect your logging processes. (For more information, see “Managing Log Files” on page 38.)

**Identity Mapping** For browser-based SSO, decide whether you will use PingFederate to link accounts on your respective systems using a persistent name identifier, or whether you will use account mapping (see “Identity Mapping” on page 16).

**Attribute Contract Agreement** If your federation partnership will not use account linking, or will not use it exclusively, then you and your partner must agree on a set of attributes that the IdP will send in an assertion for either SSO or Web Service access. (For more information, see “Attribute Contracts” on page 18.)

**Metadata Exchange** If you are using SAML, decide whether you will use the metadata standard to exchange XML files containing configuration information. PingFederate makes it easy to use this protocol, which provides a significant shortcut to setting up your partner connections. (If your partner is also using PingFederate or supports standards permitting runtime metadata exchange, the process can be even simpler—see “Using Auto-Connect” on page 28. The process is also simplified and mostly automated using PingFederate Express—see “About PingFederate Express” on page 27).

**Configuration Data Exchange**

If your partner's deployment does not produce or consume a metadata file that conforms to SAML metadata specifications, you may need to exchange connection information manually. The following sections list some common configuration details that must be exchanged if metadata files are not used. (These lists are not exhaustive.)

**IdP to SP**

If you are the IdP, your SP partner will need some or all of the following connection information (depending upon which profiles and bindings you are configuring):
Federation Planning Checklist

- **Unique ID**—Identifies the IdP that issues an assertion or other SAML message. For SAML 2.0, the ID is the IdP Entity ID; for SAML 1.x, it is the IdP Issuer; for WS-Federation, it is the IdP Realm.

PingFederate also supports the optional use of virtual IDs (see “Federation Server Identification” on page 33).

- **SOAP Artifact Resolution URL**—The endpoint your site uses to receive an SP’s SOAP requests when the artifact binding is used.

- **Single Logout Service URL**—The destination of SLO request messages.

- **Single Sign-On Service URL**—The endpoint where you receive and process assertions.

**SP to IdP**

If you are the SP, your IdP partner will need some or all of the following connection information (depending upon which profiles and bindings you are configuring):

- **Unique ID**—Identifies the SP. For SAML 2.0, the ID is the Entity ID; for SAML 1.x, it is the SP’s Audience; for WS-Federation, it is the SP’s Realm.

PingFederate also supports the optional use of virtual IDs (see “Federation Server Identification” on page 33).

- **SOAP Artifact Resolution Service URL**—The endpoint to use for SOAP requests when the artifact binding is used.

- **Single Logout Service URL (SAML 2.0)**—The destination of SLO request messages.

- **Assertion Consumer Service URL**—The location where the SP receives assertions.

- **Target URLs**—The URLs for the protected resources that a user is trying to access.

**Mutual Settings Between Parties**

Many settings must be mutually set by the parties. This information might include such items as:

- **Attributes**—User information that will be sent in an assertion, if any (see “About Attributes” on page 17).

- **Signing certificates**—The SAML and WS-Federation protocols specify a number of conditions under which digital signatures are either required or optional (these conditions are built into the PingFederate connection-setup screens).

- **SOAP connection type and authentication style**—For SAML connections using the back channel (using the artifact binding, for example), HTTP Basic authentication, SSL client certificate authentication, digital signatures, or some combination of the three is required. You and your partner must exchange the necessary credentials, certificates, and/or signing keys.
This chapter describes general administrative functions for PingFederate, including:

- “Starting and Stopping PingFederate” on page 38
- “Managing Log Files” on page 38
- “Exporting Metadata” on page 48
- “Signing XML Files” on page 53
- “Using the Configuration Archive Utility” on page 54
- “Account Management” on page 56
- “Alternative Console Authentication” on page 60
- “Managing Email Configuration” on page 62
- “Using Virtual Host Names” on page 64
- “Changing Configuration Parameters” on page 65
- “Installing a New License Key” on page 67
- “Automating Configuration Migration” on page 68
- “SaaS Provisioning CLI” on page 73
- “Customizing User-Facing Screens” on page 76

**Note:** The information in this chapter is presented from the viewpoint of an administrative user with “Admin” permissions (see “Account Management” on page 56).
Chapter 2
System Administration

Starting and Stopping PingFederate

(Windows)

To start PingFederate:

- From Start > Run dialog or a command prompt, run the batch file:
  `<pf_install>\pingfederate\bin\run.bat`
  Or:
  Open the `\bin` folder in Windows and double-click the file.
  Wait a moment for the script to execute. The server is started when you see the message “Started in [xx]:[yy]ms” in the command window, near the end of the start-up sequence.

To shut down PingFederate:

1. Enter Ctrl+C in the command-prompt window.
2. Enter y to terminate when prompted.

(Unix and Linux)

To start PingFederate:

1. From a command prompt, change directories to `<pf_install>/pingfederate/bin`.
2. Execute the `run.sh` file.
   Wait a moment for the script to execute. The server is started when you see the message “Started in [xx]:[yy]ms” in the command window, near the end of the start-up sequence.

To shut down PingFederate:

- Enter Ctrl+C in the terminal window.

(All Platforms)

To access the PingFederate administrative console:

- Launch a Web browser and go this location:
  `https://<DNS_NAME>:<port>/pingfederate/app`
  where `<DNS_NAME>` is the fully qualified name of the machine running the PingFederate server and `<port>` is the port where the administrative console listens. The default port is 9999.

Managing Log Files

PingFederate generates these logs that document server events:

- `admin.log` — Records all actions performed by administrative-console users (see “Administrator Audit Logging” on page 40).
- `transaction.log` — Records individual identity-federation runtime transactions at specified levels of detail.

The level of detail can be set globally or on a connection-by-connection basis (see “Runtime Transaction Logging” on page 41).
Managing Log Files

- **audit.log** — Records a selected, configurable subset of transaction log information plus additional details, intended for security-audit and regulatory compliance purposes (see “Security Audit Logging” on page 42).

- **server.log** — Records all PingFederate runtime and administrative server operational activity (see “Server Logging” on page 44).

  **Tip:** PingFederate provides a utility for filtering server log entries (see “Using the Server Log Filter” on page 44).

- **provisioner.log** — Records only SaaS Provisioning activity.

  (For information about SaaS Provisioning, see “SaaS Provisioning” on page 31.)

  **Tip:** PingFederate logs user attributes, when they are present, in the server log, the transaction log, and the audit log (if configured). When privacy is required for sensitive user attributes, you can configure PingFederate to obfuscate (mask) their values in these logs (see “Attribute Masking” on page 22).

The logs are stored by default in the `<pf_install>/pingfederate/log` directory. You can change the location to any network directory by using the runtime parameter `pf.log.dir` (see “Changing Configuration Parameters” on page 65).

**Note:** The server, provisioner, and audit logs may be output to alternate formats, including database tables (see “Writing Logs to Other Formats” on page 46).

Other logs contained in the `pingfederate/log` directory are generated by the PingFederate Web container. These logs, `<date>.request.log`, record all HTTP requests for the given date.

**Note:** Properties controlling request logging are contained in the Web-container configuration file `jboss-service.xml` located in the PingFederate-installation directory: `pingfederate/server/default/deploy/jetty.sar/META-INF`

In addition, a JBoss-generated start-up log, `boot.log`, is located in the directory: `pingfederate/server/default/log`

The PingFederate-generated logs are controlled through the `log4j.xml` file located in `pingfederate/server/default/conf/`. See comments in the file for more information. Any changes to the log configuration requires a server restart.

**Note:** By default, initial server requests are always recorded in the `server.log` with a tracking ID number, which is then used to identify subsequent, related transactions. This ID can be useful for debugging and support purposes to aggregate and analyze log entries tied to the same original request. The ID may also be added to the configuration for `transaction.log` or `audit.log`, or it may be removed from the `server.log <layout>` element in the `log4j.xml` file, as needed for performance considerations.
Refer to the log4j open-source project for more information about logging levels and other configuration parameters (http://logging.apache.org/log4j/1.2/manual.html).

By default, PingFederate installs with a highly verbose level of logging. However, verbose logging may have a performance impact and clutter the log files. You may choose to lower the level, but we recommend that you not set it below WARN. For the transaction.log and the audit.log, note that any setting below INFO turns logging off.

**Important**: The transaction.log, the admin.log, the audit.log and the provisioner.log files roll over at midnight each day. The system keeps all of the resulting historical log files. The transaction.log and audit.log can become quite large, depending on your production load and settings; you may want to back up or remove older files on a routine basis.

Other PingFederate log files roll over when they reach 10MB. The system keeps five old log files of each type before overwriting the oldest. (This number can be changed in the log4j.xml file.)

The following sections provide more information about the primary logs:

- “Administrator Audit Logging”
- “Runtime Transaction Logging” on page 41
- “Security Audit Logging” on page 42
- “Server Logging” on page 44
- “Writing Logs to Other Formats” on page 46

**Administrator Audit Logging**

PingFederate records actions performed by server administrators. This information is recorded in the admin.log file. While the events themselves are not configurable, log4j.xml configuration settings may be adjusted to deliver the desired level of detail surrounding each event.

Each entry in the admin.log file is on a separate line and represents a single administrator action. The general format of each entry is the same, though specific events are recorded with information relevant to each type. Events are recorded when the corresponding Save button in the administrative console is clicked.

A log entry is generated for each of the events listed below:

- Password change or reset
- Account activation or deactivation
- Role change
- Login attempt
- Explicit user logouts (no time-outs)
- Data store created, modified, or deleted
- Certificate management
- SP connection created, modified, or deleted
- IdP connection created, modified, or deleted
- URL-to-adapter mapping management
- SP Adapter created, modified, or deleted
Managing Log Files

- IdP Adapter created, modified, or deleted
- Server settings management
- Metadata export
- Configuration archive
- IdP Discovery management
- SP Affiliation created, modified, or deleted
- Attribute requester mapping
- IdP default URL modified
- SP default URLs modified
- XML file signatures applied

Each log entry contains information relating to the event, including:
- The time the event occurred on the PingFederate server.
- The username of the administrator performing the action.
- The role(s) assigned to the administrator at the time the event occurred.
- The type of event that occurred.
- Details about the event.

Each of the above fields is separated by a vertical pipe (|) for easier parsing.

Runtime Transaction Logging

PingFederate provides for flexible, scalable logging of all federated-identity transactions (inbound and outbound XML messaging). Transaction logging can be configured to any of four modes on a connection-by-connection basis (see "General Information" in either the IdP or SP “SSO Configuration” chapters).

You also have the option of overriding transaction logging for all connections (to find this feature, click the relevant Manage All . . . link under IdP/SP Connections on the Main Menu). You may want to use this override for troubleshooting or as a one-step means of raising or lowering all connection logging modes to the same level.

Transaction Logging Modes

The table below describes the four transaction logging modes:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No transaction logging.</td>
</tr>
</tbody>
</table>
Table 2: Transaction Logging Modes (Continued)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>(Default) Logs summary information for each transaction message, including:</td>
</tr>
<tr>
<td></td>
<td>- Timestamp</td>
</tr>
<tr>
<td></td>
<td>- Hostname:Port</td>
</tr>
<tr>
<td></td>
<td>- Log Mode</td>
</tr>
<tr>
<td></td>
<td>- Connection ID</td>
</tr>
<tr>
<td></td>
<td>- SAML Status Code&gt; (for SAML responses only)</td>
</tr>
<tr>
<td></td>
<td>- Context</td>
</tr>
<tr>
<td></td>
<td>- Message Type</td>
</tr>
<tr>
<td></td>
<td>- SAML ID (for SAML messages only)</td>
</tr>
<tr>
<td></td>
<td>- Endpoint (for outbound messages only)</td>
</tr>
<tr>
<td></td>
<td>- Target URL (if SSO transaction)</td>
</tr>
<tr>
<td>Enhanced</td>
<td>Includes everything logged at the Standard level plus:</td>
</tr>
<tr>
<td></td>
<td>- SAML_SUBJECT*</td>
</tr>
<tr>
<td></td>
<td>- Binding</td>
</tr>
<tr>
<td></td>
<td>- Relay State (if available)</td>
</tr>
<tr>
<td></td>
<td>- Signature Policy</td>
</tr>
<tr>
<td></td>
<td>- Signature Status</td>
</tr>
<tr>
<td></td>
<td>- HTTP Request Parameters (outbound messages only)</td>
</tr>
<tr>
<td></td>
<td>* Only when available in a SAML assertion, a single-signoff request, a Request Security Token Response (RSTR), or an authentication request (AuthnRequest)</td>
</tr>
<tr>
<td>Full</td>
<td>Includes everything logged at the Enhanced level plus the complete XML message for every transaction.</td>
</tr>
</tbody>
</table>

Each of the above fields is separated by a vertical pipe (|) for easier parsing.

Security Audit Logging

The PingFederate audit.log records a selected subset of transaction log information at runtime plus additional details, intended to facilitate security auditing and regulatory compliance. Elements of this log are described in the following table and configurable in the log4j.xml file located in pingfederate/server/default/conf.

![Note: The audit log records only SSO and SLO transactions. WS-Trust STS and SaaS provisioning transactions are not included.

Audit-log elements may be output to different formats, including databases. For information, see “Writing Logs to Other Formats” on page 46.

Table 3: Audit Log Configuration

<table>
<thead>
<tr>
<th>Item*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%d</td>
<td>Transaction time.</td>
</tr>
</tbody>
</table>
### Table 3: Audit Log Configuration (Continued)

<table>
<thead>
<tr>
<th>Item*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>adapterid</td>
<td>The ID of an adapter instance.</td>
</tr>
<tr>
<td>app</td>
<td>The target SP application (when available).</td>
</tr>
<tr>
<td>assertionid</td>
<td>The unique ID for the SAML assertion.</td>
</tr>
<tr>
<td>attributes</td>
<td>User attributes received (for an SP log) or sent (for an IdP log).</td>
</tr>
<tr>
<td>connectionid</td>
<td>The connection identifier associated with the transaction.</td>
</tr>
<tr>
<td>description</td>
<td>Description of an authentication failure (when information is available from an IdP adapter).</td>
</tr>
<tr>
<td>event</td>
<td>The type of transaction (e.g. SSO).</td>
</tr>
<tr>
<td>host</td>
<td>PingFederate host name or IP address.</td>
</tr>
<tr>
<td>initiator</td>
<td>(SAML 2.0 only) The federation role that initiated the SSO or SLO: SP or IDP.</td>
</tr>
<tr>
<td>inmessagetype</td>
<td>Incoming message type. Possible values are Request or Response.</td>
</tr>
<tr>
<td>inresponseto</td>
<td>The value of the InResponseTo attribute of an SSO or SLO Response.</td>
</tr>
<tr>
<td>inxmlmsg</td>
<td>The incoming XML message.</td>
</tr>
<tr>
<td>ip</td>
<td>Incoming IP address.</td>
</tr>
<tr>
<td>localuserid</td>
<td>The local ID used for the transaction (when account linking is enabled at the SP).</td>
</tr>
<tr>
<td>outxmlmsg</td>
<td>The outgoing XML message.</td>
</tr>
<tr>
<td>pfversion</td>
<td>The PingFederate version.</td>
</tr>
<tr>
<td>protocol</td>
<td>The associated identity protocol (e.g., SAML 2.0).</td>
</tr>
<tr>
<td>requestid</td>
<td>The ID of a request.</td>
</tr>
<tr>
<td>responseid</td>
<td>The ID of a response.</td>
</tr>
<tr>
<td>role</td>
<td>The partner’s role in the transaction.</td>
</tr>
<tr>
<td>status</td>
<td>Transaction success or failure.</td>
</tr>
<tr>
<td>subject</td>
<td>The subject of the transaction.</td>
</tr>
<tr>
<td>trackingid</td>
<td>The tracking ID used for debugging purposes in the server log (see the last “Note” on page 39 in the section “Managing Log Files”).</td>
</tr>
</tbody>
</table>

* Italicsed items are not configured by default for this log but may be added. Refer to log4j.xml for syntax requirements.*
Server Logging

The server log records all PingFederate runtime and administrative events, including status and error messages that can be used for troubleshooting. By default, the information is also sent to the terminal or command window running the PingFederate server.

**Note:** Alternatively, you can output the server log to a database (see “Writing Logs to Other Formats” on page 46).

To facilitate troubleshooting, administrators can use a filter utility to aggregate related events (see “Using the Server Log Filter” on page 44).

Elements of this log are described in the following table.

**Table 4: Server Log Components**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%d</td>
<td>Event date and time.</td>
</tr>
<tr>
<td>%X{trackingid}</td>
<td>The tracking ID for runtime events, used for debugging purposes (see the last “Note” on page 39 in the section “Managing Log Files”).</td>
</tr>
<tr>
<td>%p</td>
<td>Logging level.</td>
</tr>
<tr>
<td>%c</td>
<td>The Java class issuing the status or error message, when applicable.</td>
</tr>
<tr>
<td>%X{connectionid}</td>
<td>The partner ID associated with a runtime event.</td>
</tr>
<tr>
<td>%X{subject}</td>
<td>The SAML subject of the transaction, when applicable.</td>
</tr>
<tr>
<td>%m</td>
<td>Status or error message.</td>
</tr>
</tbody>
</table>

**Using the Server Log Filter**

PingFederate provides a utility that administrators can use to filter server logs. The tool, `logfilter.bat|sh`, is located in the `<pf_install>/pingfederate/bin` directory.

By default the utility sorts through all the server logs in the log directory, or you can move or copy one or more files to a different directory that can be specified as an input parameter.

The log filter returns lists of log entries based on either:

- Entity ID and Subject
- Tracking ID
- Session Cross-reference ID

The following table describes the utility's command options. The table afterward describes optional parameters available for all of the commands.
The log filter creates its own log file, `logfilter.log`, located in the log directory. You can control settings for this log, as needed, in the file `logfilter.log4j.properties`, located in the `bin` directory.

### Table 5: Server Log Filter Command Options

<table>
<thead>
<tr>
<th>Command Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>– entityid &lt;entity-id&gt;</td>
<td>These two commands must be used together and return a list of transactions for the specified federation partner’s entity ID and transaction subject.</td>
</tr>
<tr>
<td>– subject &lt;subject&gt;</td>
<td></td>
</tr>
<tr>
<td>– trackingid &lt;tracking_id&gt;</td>
<td>This command returns a list of transactions with the same tracking ID.</td>
</tr>
</tbody>
</table>
| – sessionxrefid <session_xref_id> | This command returns a list of transactions for an ID assigned by PingFederate to associate different transactions according to the user session under which they occurred. The value of <session_xref_id> may be the value of any of the following transaction tags in the target server log(s):  
  • Artifact  
  • Session Index  
  • Assertion ID |

### Table 6: Server Log Filter Parameters*

<table>
<thead>
<tr>
<th>Parameter*</th>
<th>Description</th>
</tr>
</thead>
</table>
| – logsdir <log-files-directory> | Full or relative path to source directory for the log(s).  
  Default: all server.log files in pf.log.dir  
  The installed location is:  
  `<pf_install>/pingfederate/log`  
  (For information about changing the default location, see “Changing Configuration Parameters” on page 65.) |
| – outputfile <output-file>      | Output path and file for the returned list.  
  Default: pf.log.dir/logfilter_output.log  
  The installed location is:  
  `<pf_install>/pingfederate/log`  
  (For information about changing the default location, see “Changing Configuration Parameters” on page 65.) |
| – outputtoconsole               | Returns list to the command console rather than to a file.                                                                                                                                                   |

*Optional for all commands.

The log filter creates its own log file, `logfilter.log`, located in the log directory. You can control settings for this log, as needed, in the file `logfilter.log4j.properties`, located in the `bin` directory.
Writing Logs to Other Formats

PingFederate provides the option of writing the audit, server, and provisioner logs to commonly used databases (with failover to file logging).

For the audit log, you may choose instead to write the information to the ArcSight Common Event Format (see “Writing Audit Logs to CEF” on page 47).

Writing Logs to Databases

You can enable database logging for the audit log, the server log, and the provisioner log in the log4j.xml file in pingfederate/server/default/conf. Scripts for selected database types are provided to create the necessary table(s).

Note: Database logging replaces file logging. For the server log, database logging also replaces logging to the terminal or command window running PingFederate. Failover file logging is provided, however, in the event that database logging fails for any reason.

Important: Ensure that your database-driver JAR file is installed in the pingfederate/server/default/lib directory. You must restart the server after installing the driver.

To configure database logging:

1. In log4j.xml, uncomment one of the preset log-appender configurations listed below (or one from each list to configure all logs):

   For the server log:
   - ServerLogToOracleDB (for Oracle)
   - ServerLogToSQLServerDB (for Microsoft SQL Server)
   - ServerLogToMySQLDB (for MySQL)

   For the provisioner log:
   - ProvisionerLogToOracleDB (for Oracle)
   - ProvisionerLogToSQLServerDB (for Microsoft SQL Server)
   - ProvisionerLogToMySQLDB (for MySQL)

   For the audit log:
   - SecurityAuditToOracleDB (for Oracle)
   - SecurityAuditToSQLServerDB (for Microsoft SQL Server)
   - SecurityAuditToMySQLDB (for MySQL)

   Note: Each appender is followed by a related appender that creates a running *failover.log file in the log directory. The failover appender must also be enabled (uncommented).

2. Replace placeholder parameter values for the appender(s).

   The parameter values provide access to the database. We recommend that they be tested and validated prior to production deployment.

   Note: See the NOTES in log4j.xml above the appender for more details.
3. Uncomment the appender reference in the associated logger element(s), as described in the appender NOTES:

   For the server log:
   Uncomment the appender reference located under Set up the Root Logger near the end of the log4j.xml configuration file.

   For the provisioner log:
   Uncomment the appender reference located under Limit categories near the end of the log4j.xml configuration file.

   For the audit log:
   Uncomment the appender in one or both of the following loggers located under Limit categories in the log4j.xml configuration file:
   - org.sourceid.websso.profiles.sp.SpAuditLogger
   - org.sourceid.websso.profiles.idp.IdpAuditLogger

   Tip: You can obfuscate the password used to access the database by running either obfuscate.sh or obfuscate.bat, located in pingfederate/bin. Use the actual password as an argument and copy the entire result into the value for the password parameter in log4j.xml.

   Note: As indicated in the IMPORTANT comment for the loggers, you must remove the existing appender reference(s).

4. (Optional) For the audit log, you can configure elements for database logging in the ConversionPattern appender parameter, as needed (see Table 3 on page 42).

   To create database tables:
   - Scripts to create database tables for each of the three databases are provided for the audit, server log, and provisioner logs. The scripts are located in the directory:
     pingfederate/server/default/conf/log4j/sql-scripts

   Note: The scripts are written to handle the default list of elements for the relevant database log-appender in log4j.xml. Any changes to the list requires corresponding changes to the SQL table-creation script (or to the table itself if it is already created).

Writing Audit Logs to CEF

The Common Event Format (CEF) is an open logging standard developed by the security-management company ArcSight. PingFederate provides an option of writing audit-log elements at runtime to a syslog receiver for parsing and analysis via ArcSight tools. Alternatively, you can write CEF to a flat file; however, using syslog, when available, is recommended.

You can enable this capability in the log4j.xml file (in pingfederate/server/default/conf).

Note: PingFederate is certified with ArcSight for interoperability using the default elements defined in log4j.xml. Any additions to these elements may render your CEF logging incompatible with ArcSight.
Chapter 2
System Administration

For more information about CEF, see the ArcSight Web site:
http://www.arcsight.com/solutions/solutions-cef

To configure CEF logging:

▶ In log4j.xml, uncomment one of the preset log-appender configurations:
  - SecurityAuditToCEFSyslog
  - SecurityAuditToCEFFile

Replace the placeholder parameter value for the syslog host (if you are configuring the syslog appender), and uncomment the appender reference in one or both of the indicated logger elements (for either appender).

![Note: See the NOTES in log4j.xml above the appender for more details. Also notice the IMPORTANT comment for the loggers (org.sourceforge.webssoprofiles.sp.SpAuditLogger and/or org.sourceforge.webssoprofiles.idp.IdpAuditLogger): for syslog implementations, you must remove the existing appender reference.]

Exporting Metadata

For SAML deployments PingFederate supports the export and import of metadata files, which federation partners can use to expedite their configuration. You can export metadata for any connection (or select certain nonconnection-specific metadata for export) via the Main Menu. You can import your partner’s metadata file, when available, at the beginning of the connection-configuration process (see “Managing IdP Connections” on page 278 or “Managing SP Connections” on page 177).

![Tip: Connection-metadata export is also available from the Manage Connections screens, which can be reached from the Main Menu via the Manage All... link under either SP Connections or IdP Connections.]

![Tip: IdP administrators can use the Manage Connections screen to export metadata for PingFederate Express SP connections in a one-step process (see “Via the Manage Connections Screen” on page 179). (For information about Express connections, see “About PingFederate Express” on page 27.)]
To reach the Metadata Export task:

Click **Metadata Export** under **Administrative Functions** on the **Main Menu**.

To export connection metadata:

1. If your PingFederate server is configured to act as both an IdP and an SP, indicate which type of configuration you will export and click **Next**.
2. On the Metadata Mode screen, choose the option to **Use a connection . . .** and click **Next**.
   For more information, see “Choosing the Metadata Export Mode” on page 50.
3. On the Connection Metadata screen, select the connection from the drop-down menu and click **Next**.
4. (Optional) On the Metadata Signing screen, select a certificate to use for signing the metadata XML file and click **Next**.

   **Note:** If you want to include the public-key information in the signed XML file, select the Key Info option.

   For more information, see “Signing Metadata” on page 51.

   For SP connections using PingFederate Express, this screen does not appear; Express metadata is not signed.
5. On the Export & Summary screen click the **Export** button, save the file, and then click **Done**.

To export selected metadata:

1. If your PingFederate server is configured to act as both an IdP and an SP, indicate which type of configuration you will export and click **Next**.
2. On the Metadata Mode screen, select the option to **Select information . . .** and click **Next**.
   For more information, see “Choosing the Metadata Export Mode” on page 50.
3. If you support more than one federation protocol, select the desired protocol on the Protocol screen and click **Next**.
4. Configure any or all of the remaining steps in the task (click **Next** to skip steps).
   For information see:
   - “Defining a Metadata Attribute Contract” on page 50.
   - “Including a Signing Key” on page 51.
   - “Signing Metadata” on page 51.
   - “XML Encryption Certificates” on page 52.
5. (Optional) On the Metadata Signing screen, select a certificate to use for signing the metadata XML file and click **Next**.

   **Note:** If you want to include the public-key information in the signed XML file, select the Key Info option.

   For more information, see “Signing Metadata” on page 51.

6. On the Export & Summary screen click the **Export** button, save the file, and then click **Done**.

### Choosing the Metadata Export Mode

If you want to export metadata for a specific connection, keep that default selection on the Metadata Mode screen. Or you may choose instead to export metadata that is not bound to specific connection endpoints at your site.

**Note:** If the PingFederate secondary SSL port is configured and you want to use it for the SOAP channel, select the checkbox on the screen. If client-certificate authentication is configured for the SOAP channel, the secondary port is required and you must check this box. (For more information, see the description of the runtime property `pf.secondary.https.port` in the table under “Changing Configuration Parameters” on page 65.)

### Defining a Metadata Attribute Contract

The Attribute Contract screen allows you to define the attribute contract you want to export in the metadata. For more information, see “Attribute Contracts” on page 18.

To reach this screen:

1. Click **SAML Metadata Export** under Administrative Functions on the Main Menu.
2. On the Metadata Mode screen, click the button for selecting the information manually and click **Next**.

To add an attribute:

1. Enter an attribute on the Attribute Contract screen and click **Add**.
2. Continue to add attributes as needed and click **Next**.
To edit an attribute name:
1. Click **Edit** and make your change.
2. Click **Update**.

To delete an attribute:
- Click **Delete**.

**Including a Signing Key**

In a metadata file you can manually include the public key for partners to use to verify the digital signature you will use to sign SAML messages. For more information, see “Digital Signing and Decryption Keys and Certificates” on page 151.

To export your public signature verification key:
- Select the certificate from the drop-down list and click **Next**.

**Signing Metadata**

Choose your organizational signing certificate on the Metadata Signing screen. The metadata XML file must be signed using a certificate trusted by your federation partner.
To specify a certificate:

1. Select the certificate from the drop-down list.
   If you have not yet created or imported your certificate into PingFederate, click Manage Certificates (see “Digital Signing and Decryption Keys and Certificates” on page 151).

2. (Optional) If you have agreed to send your public key with the SAML message, select the checkbox to include the certificate.

3. (Optional) Select the Signing Algorithm from the drop-down list.
   The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.

**XML Encryption Certificates**

In your metadata file you can manually include the XML encryption key and certificate your partners can use to encrypt SAML messages.

To export an XML encryption key:

- Select the key from the drop-down list and click Next.
  If the certificate is not shown, click Manage Certificates to import it.
Completing the Export

On the Export & Summary screen, you can complete the XML-file download or change any information by clicking any of the headings in the Summary.

Important: To finish the download, you must click the Export button at the bottom left of the Export Metadata screen.

Signing XML Files

PingFederate supports digital signing of SAML metadata files or any other XML files that you and your partner might want to exchange. A signature applied to an XML file ensures that the file is from the original source and that its contents have not been modified by a third party.

When you configure a partner connection, you can also verify and import signed metadata files. For information:

- As an SP configuring an IdP connection, see “Importing IdP Metadata” on page 284.
- As an IdP configuring an SP connection, see “Importing Metadata” on page 185.

XML file signing is available from the Main Menu under Administrative Functions.

To sign an XML file

1. On the Select XML File screen, locate and open the file.
2. On the Digital Signature Settings screen, choose the certificate containing your signing key from the drop-down list.

Note: By default, certificate and public-key information is included in the signed XML file. If you do not wish to include this information, clear the Key Info checkbox.

3. On the Export & Summary screen, click the Export button to save the signed file.

Important: Be sure to click Export in the lower-left portion of the Export & Summary screen; clicking Done does not complete the operation.
Using the Configuration Archive Utility

PingFederate’s archive utility allows you to export the current administrative-console configuration to a ZIP file and to import an existing archive for immediate deployment into a running PingFederate server.

Tip: A time-stamped configuration archive is created as a backup automatically every time you log on to the administrative console and before an existing archive is imported. The archives are stored in pingfederate/server/default/data/archive.

Tip: PingFederate includes a separate command-line utility that provides a finer level of control over configuration migration, as well as providing for scripting of routine configuration-management tasks (see “Automating Configuration Migration” on page 68).

Configuration archives can be used as backups or to transfer data from one PingFederate server to another, including migration to a new PingFederate release.

Important: Draft connections in archives are not imported. Complete any unfinished partner connections if you wish to include them in a full backup archive or in an archive to be used for configuration migration.

Note: The archive utility is intended for administrative-console configuration data only. It does not include error-page or other end-user HTML templates (see “Customizing User-Facing Screens” on page 76), nor any files under <pf_install>/server/default/conf. If any changes have been made to the default templates or configuration files, you must copy them over to new installations or other instances of PingFederate (assuming the changes are applicable).

The archive also does not capture license files, adapter JAR files, database drivers, or any other plug-ins; these also must be copied into any new instance of PingFederate. The import utility checks for and reports on any missing components (see “Using the Archive Import Screen,” next).

To reach this screen:

► Click Configuration Archive on the Main Menu.
To create an archive:
1. On the Select Import/Export screen, ensure Export is selected and click Next.
2. On the Export screen, click Export, save the download to your file system, and click Done.

To import and deploy an archive:
- On the Select Import/Export screen, click Import and then Next.
  
  See the next section, “Using the Archive Import Screen,” for more information.

Note: Alternatively, you can deploy an archive manually, using the procedure below.

Caution: Deploying a configuration archive, either manually or by using the administrative console, always overwrites all existing configuration data.

To deploy an archive manually:
1. Copy a previously stored archive into the directory:
   \<pf_install>/pingfederate/server/default/data/drop-in-deployer
2. Rename the copied file to data.zip.
   
   When the PingFederate server is running, the file is again renamed with a timestamp after a moment and the data automatically deploys, replacing the current UI configuration. Restarting the server is not required.
3. Consult the PingFederate server start-up window, or the server log file, for any messages concerning missing plug-in components or other errors.

Note: A data archive imported via the drop-in-deployer directory is deployed by default regardless of errors, unlike the default behavior using the Import screen.

Using the Archive Import Screen

When you initiate deployment of a configuration archive using the Import screen, PingFederate displays error messages if there are any missing plug-in components (such as adapters, database drivers, or token translators) on which the archive depends, or any mismatches of PingFederate licensing authorization.
If there are missing components or license inconsistencies, the import is halted by default to allow you to install the necessary components or license. However, you can choose to force the deployment and then install the necessary files later.

**Note:** Installation of any missing database drivers or other third-party libraries will require a PingFederate server restart.

To deploy a configuration archive:

1. On the Import screen, click **Browse** to locate the required ZIP file.
2. (Optional) Select **Force Import** to deploy the archive regardless of whether dependencies are detected.
3. Click **Import**.
4. Read the on-screen caution statement and indicate whether you want to continue.
   When you click **Yes**, a message is displayed indicating the deployment result.
5. Click **Done**.

### Account Management

PingFederate provides a choice of single- or multi-user system administration (see “Setting Administration Options” on page 82).

**Note:** This choice is not presented if you are using your network’s LDAP user store or client certificates for authentication to the PingFederate administrative console (see “Alternative Console Authentication” on page 60).

If you choose native multi-user administration or if you are using alternative authentication, PingFederate provides role-based access control, as shown in the following table. For native multi-user administration, you can choose to use email for password setting and resetting notifications.
Table 7: PingFederate User Access Control

<table>
<thead>
<tr>
<th>Role Assignment</th>
<th>Access Privileges</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Admin</td>
<td>Manage users, select administration style (single- or multi-user), define email notification policies, and configure an SMTP server connection. (This role is not provided if you are using LDAP authentication for administrative logon, since user management is handled outside of PingFederate.)</td>
</tr>
<tr>
<td>Admin</td>
<td>Configure partner connections and most system settings (except user management and local key/certificate handling).</td>
</tr>
<tr>
<td>Crypto Admin</td>
<td>Manage local keys and certificates.</td>
</tr>
<tr>
<td>Auditor</td>
<td>View-only permissions for all administrative functions.</td>
</tr>
</tbody>
</table>

When Auditor is assigned, no other roles may be set. Admin users may have multiple roles set.

**Tip:** The same user may log on from more than one browser or location. Also, by default, more than one user can log on to PingFederate at a time. You can change this default to restrict the administrative console to one administrative user at a time (see “Changing Configuration Parameters” on page 65).

Any number of auditors may log on at any time, regardless of the property setting.

**Note:** For security, after three failed logon attempts from the same location within a short time period, the administrative console will temporarily lock out further attempts by the same user. The user must wait one minute to try again.

**To reach the Account Management screen:**

- Click Account Management under Administrative Functions on the Main Menu.

**Note:** If you are using alternative PingFederate authentication, the Account Management configuration is not available. Set PingFederate-specific permissions for users in configuration files located in `<pf_install>/pingfederate/bin` (see “Alternative Console Authentication” on page 60).
Users with User Admin permissions can add other users, assign them any role, or reset their passwords, as well as change their own passwords. Other types of users can change only their own passwords from this screen (see “Changing Passwords” on page 60).

To add a user:

1. Click Create User.
2. On the User Information screen, enter the required fields (indicated by asterisks).

   Note: Only Username is required, unless you elected on the Account Management screen to have PingFederate send passwords via email, in which case you must supply an email address.

3. (Optional) Enter additional information.
4. Click Next to set up a password (see “Setting or Resetting Passwords” on page 59).

   Important: After you set the password and return to the Account Management screen, you must select permissions for the new user and click Save to complete the process.

To define a user’s permissions:

- Select or clear the checkboxes under the permission categories you want to assign or remove (see the table above).

   Clicking the Auditor button deactivates other permission selections.

   Note: For traceability and accountability purposes, users cannot be deleted; their records are retained and they can be reactivated if needed.

To enable password notification:

1. Select the password-notification checkbox.
2. If you have not yet configured PingFederate to use your email server, click Email Server Settings and complete the configuration (see “Managing Email Configuration” on page 62).

3. Click Save (or Next if you are installing PingFederate).

Note: If you are setting up email notifications for the first time, you must click Email Server Settings and configure the settings. If you are not sure of the correct settings, enter placeholders on the Email Notification screen; you can return later and update the information.

Setting or Resetting Passwords

A user administrator can generate or assign temporary passwords for other users, either during user setup or at a later time (for example, if a user forgets his or her password).

Note: If you are using an LDAP user-data store for PingFederate authentication, password management is handled at the network level.

Initial or reset passwords may be used only once; the administrative console requires the user to change the password immediately after logging on.

To reach this screen:
1. Click Account Management on the Main Menu.
2. Click Reset Password under Action for a user.

To set or reset a user’s password:
1. Either:
   • Click Generate one-time password.
   Or:
   • Enter a password in the text box (no restrictions apply for a temporary password).

2. Click Done.

Important: The password and any other changes, including new user records, are not stored until you click Save on the Account Management screen.
After you click **Save** on the Account Management screen, the new password is emailed to the user automatically, if you have enabled email notifications (see “Account Management” on page 56).

### Changing Passwords

Any user can change his or her own password. For information about resetting another user's password (if you are a user administrator), see the previous section.

> **Note:** If you logged on to PingFederate using your network ID and password, you can change your password only at the network level. The new password will apply to PingFederate automatically the next time you log on.

#### Alternative Console Authentication

You can configure PingFederate to use either your network's LDAP user-data store or client certificates for authentication to the administrative console, as an alternative to using PingFederate's own internal data store. You can configure either of these alternatives at any time.

Note that most user-management functions are handled outside the scope of the PingFederate administrative console when either LDAP or certificate-based authentication is used.
authentication is enabled. Authorization levels, however, as described in “Account Management” on page 56, must be assigned in PingFederate configuration files.

Using LDAP Authentication

The LDAP authentication setup is available via configuration files in the `<pf_install>/pingfederate/bin` directory.

To configure PingFederate to use network LDAP authentication:

1. In the `pingfederate/bin/run.properties` file, change the value of `pf.console.authentication` as shown below:
   ```
   pf.console.authentication=LDAP
   ```

   **Note:** You can restore internal user-management control at any time by returning the value to `native` and restarting the PingFederate server.

2. In the `pingfederate/bin/ldap.properties` file, change property values as needed for your LDAP network configuration.

   See the comments in the file for instructions and additional information.

   **Important:** Be sure to assign LDAP users or designated LDAP groups (or both) to at least one of the PingFederate administrative roles as indicated in the properties file. For information about permissions attached to the PingFederate roles, see “Account Management” on page 56.

Using Certificate-Based Authentication

To enable client-certificate authentication, PingFederate administrative users must have imported into their Web browsers an X.509 key and certificate suitable for user authentication. In addition, the corresponding root CA certificate(s) must be contained in the Java runtime or the PingFederate trusted store (see “Trusted Certificate Authorities” on page 146).

Other setup steps, including designating user permissions, are required via configuration files in the `<pf_install>/pingfederate/bin` directory.

To enable certificate-based PingFederate console authentication:

1. If not already done, import the necessary client key and certificate into the Web browser used to access PingFederate.
   Refer to the browser's documentation, as needed, for instructions.

2. Log on normally (using username and password) to the PingFederate console as a user with permissions that include the role Crypto Admin.
   The default administrator includes this role. (For more information, see “Account Management” on page 56.)
3. Ensure the client-certificate's root CA and any intermediate CA certificates are contained in the trusted store (either for the Java runtime or PingFederate, or both).

To import a certificate, click **Trusted CAs** in the Security section under My Server.

**Tip:** You may wish to click the Serial number and copy the Issuer DN to use at Step 5.

4. In the pingfederate/bin/run.properties file, change the value of pf.console.authentication as shown below:
   
   ```
   pf.console.authentication=cert
   ```

5. In the pingfederate/bin/cert_auth.properties file, enter the Issuer DN for the client certificate as a value for the property:
   
   ```
   rootca.issuer.x
   ```

   where x is a sequential number starting at 1 (see the properties file for more information).

   If you copied the Issuer DN at Step 3, paste this value.

6. Repeat the previous step for any additional CAs as needed.

7. Enter the certificate user's Subject DN for the applicable PingFederate permission role(s), as described in the properties file.

   See “Account Management” on page 56 for more information about PingFederate permissions.

8. Repeat the previous step for all users as needed.

   **Note:** Other settings in the properties file are used to display the user’s ID (the Subject DN) in abbreviated form in the administrative console.

9. Restart the PingFederate server (see “Starting and Stopping PingFederate” on page 38).

---

### Managing Email Configuration

If you are using email notification for password resets, licensing events, or certificate-expiration warnings, you must set up and maintain a connection to the email server that PingFederate will use to send messages (see “Account Management” on page 56 and “Configuring Runtime Notifications” on page 83).
### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“From” Address</td>
<td>The email address that appears in the “From” header line in email messages generated by PingFederate. The address must be in valid format but need not be set up on your system.</td>
</tr>
<tr>
<td>Email Server</td>
<td>The IP address or hostname of your email server.</td>
</tr>
<tr>
<td>SMTP Port</td>
<td>The SMTP port on your email server (default: 25).</td>
</tr>
<tr>
<td>SSL SMTP Port</td>
<td>The secure SMTP port on your email server (default: 465). This field is not active unless Use SSL is enabled below.</td>
</tr>
<tr>
<td>Connection Timeout</td>
<td>The amount of time in seconds that PingFederate will wait before it times out connecting to the SMTP server.</td>
</tr>
<tr>
<td>Use SSL</td>
<td>(Optional) Requires the use of the SMTP secure channel.</td>
</tr>
<tr>
<td>Use TLS</td>
<td>(Optional) Requires the use of the secure transport layer.</td>
</tr>
</tbody>
</table>
Chapter 2
System Administration

To reach this screen:

Click Email Configuration on the Main Menu under Administrative Functions.

If this link is not displayed, then no email notifications are configured (see “Configuring Runtime Notifications” on page 83 or “Account Management” on page 56).

To configure access to your email server:

1. Enter information into required fields, at minimum (Username and Password are not required.)

2. (Recommended) Enter an email address (or addresses) in the Test Address field and click Test Email Connectivity.

   A message next to the button indicates a successful test. Verify that the test email address received a message from the server.

   Test reports are also written to the server.log file in the /log directory.

Using Virtual Host Names

In certain contexts, the SAML specifications require that XML messages include a URL identifying the host name to which the sender directed the message. (The name of the XML element containing the URL varies among protocols.) In addition, the recipient must verify that the value matches the location where the message is received.

Depending on your networking requirements, this specification can present problems—for example, in the case of proxy forwarding, where the final destination host name might be unknown to your federation partner. To provide more flexibility in such cases, you can set up a list of alternative host names for PingFederate to use as part of its message-security validation.

Note that virtual host names are used for a different purpose than virtual server IDs, which provide separate unique identifiers for a federation deployment, normally in the same domain (see “Federation Server Identification” on page 33). Depending on your needs, however, you can configure virtual server IDs and virtual hosts in the same installation of PingFederate.
Changing Configuration Parameters

PingFederate's default administrative-console and runtime behavior is controlled in part by configuration properties contained in the file `run.properties`, located in: `<pf_install>/pingfederate/bin`. The table below describes the properties; refer to the file itself for default settings not specified here.

You can change these settings as needed. Restart the PingFederate server for changes to take effect.

**Note:** Properties related to server clustering and provisioning failover are described in the PingFederate **Server Clustering Guide**.

**Important:** If PingFederate is deployed in a cluster, changes to default settings for runtime-server properties must be applied to other server nodes manually. The settings in `run.properties` are not replicated using automated synchronization methods.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pf.admin.https.port</code></td>
<td>Defines the port on which the PingFederate administrative console runs. Default is 9999.</td>
</tr>
<tr>
<td><code>pf.console.bind.address</code></td>
<td>Defines the IP address over which the PingFederate administrative console communicates. Use for deployments where multiple network interfaces are installed on the machine running PingFederate.</td>
</tr>
<tr>
<td><code>pf.console.login.mode</code></td>
<td>Indicates whether more than one Admin user may access the administrative console at one time (see <strong>“Setting Administration Options”</strong> on page 82). Values: Single</td>
</tr>
</tbody>
</table>
Table 8: PingFederate Configuration Properties (Continued)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pf.console.authentication</td>
<td>Indicates whether administrators log on to PingFederate using credentials managed internally, by PingFederate, or externally (see &quot;Alternative Console Authentication&quot; on page 60).</td>
</tr>
<tr>
<td>ldap.properties.file</td>
<td>When LDAP administrative-console authentication is enabled, indicates the name of the file containing configuration properties.</td>
</tr>
<tr>
<td>cert.properties.file</td>
<td>When certificate-based authentication is enabled, indicates the name of the file containing configuration properties.</td>
</tr>
<tr>
<td>pf.http.port</td>
<td>Defines the port on which PingFederate listens for unencrypted HTTP traffic at runtime. For security reasons, this port is turned off by default.</td>
</tr>
<tr>
<td></td>
<td><strong>Caution:</strong> This port should remain disabled in production if your deployment configuration directly exposes the PingFederate server to the Internet.</td>
</tr>
<tr>
<td>pf.https.port</td>
<td>Defines the port on which PingFederate listens for encrypted HTTPS (SSL/TLS) traffic. Default is 9031.</td>
</tr>
<tr>
<td>pf.secondary.https.port</td>
<td>Defines a secondary HTTPS port that can be used, for example, with SOAP or artifact SAML bindings or for WS-Trust STS calls. To use this port, change the placeholder value to the port number you want to use.</td>
</tr>
<tr>
<td></td>
<td><strong>Important:</strong> If you are using mutual SSL/TLS for either WS-Trust STS authentication or for SAML back-channel authentication, you must use this port for security reasons or use a similarly configured new listener, with either WantClientAuth or NeedClientAuth set to true—see “Note” at the end of this table.</td>
</tr>
<tr>
<td>pf.engine.bind.address</td>
<td>Defines the IP address over which the PingFederate server communicates with partner federation gateways. Use for deployments where multiple network interfaces are installed on the machine running PingFederate.</td>
</tr>
</tbody>
</table>
Installing a New License Key

If your license key is going to expire or has expired recently, you can install a new one without interrupting services.

**Tip:** You can configure the server to send administrators email warnings regarding the license status (see “Configuring Runtime Notifications” on page 83).

You will also need to install a new license key as a new user, or after you obtain PingFederate software updates (other than patch releases).

**To request a new license key:**

- Go to the Ping Identity Web-site licensing page (www.pingidentity.com/support/licensing).

### Table 8: PingFederate Configuration Properties (Continued)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pf.monitor.bind.address</td>
<td>Defines the IP address over which an SNMP agent and JMX communicate with PingFederate (see “Configuring Runtime Reporting” on page 84). Use for deployments where multiple network interfaces are installed on the machine running PingFederate.</td>
</tr>
<tr>
<td>pf.engine.prefer_ipv4</td>
<td>Defines the protocol to be used by PingFederate. <em>True</em> enables use of ipv_4 only. <em>False</em> (the default) enables use of both ipv_4 and ipv_6.</td>
</tr>
<tr>
<td>pf.log.dir</td>
<td>Network path to the output location of log files. The default is: &lt;pf_install&gt;/pingfederate/log</td>
</tr>
<tr>
<td>pf.hsm.mode</td>
<td>Enables or disables (the default) a FIPS-compliance Hardware Security Module (see Appendix A in Getting Started).</td>
</tr>
<tr>
<td>pf.provisioner.mode</td>
<td>Enables or disables (the default) SaaS Provisioning (see “SaaS Provisioning” on page 31). Also used to enable provisioning failover (see the PingFederate Server Clustering Guide).</td>
</tr>
</tbody>
</table>

**Note:** Additional configuration of the listener ports (including adding new listeners) is available via the <pf_install>/pingfederate/server/default/deploy/jetty.sar/META-INF/jboss-service.xml file. For example, options include WantClientAuth and NeedClientAuth flags, which indicate that a client certificate is either requested or required, respectively, for mutual SSL/TLS. (For the preconfigured SSL secondary port, WantClientAuth is set to true by default; NeedClientAuth is set to false.)
After you receive the new license key, you can either install it manually or by using the PingFederate administrative console, with or without a previous license installed.

**Tip:** When you use the administrative console and a previous license exists, PingFederate compares the new license with the existing one and warns of any potential problems (or aborts the import if the license is invalid for any reason). After the license key is imported, the previous license file is saved with a timestamp in the filename.

**To install a license key manually:**

- Copy the license file as `pingfederate.lic` file to:
  
  `<pf_install>/pingfederate/server/default/conf`

**Important:** For manual installation, the license file *must* be named `pingfederate.lic`. It may take up to a minute for a running server to recognize a new key.

**To install a license key using the administrative console (when no previous license is configured):**

1. Start PingFederate and access the administrative console (see “Starting and Stopping PingFederate” on page 38).
2. On the Import License screen, click **Browse** to select the file and then click **Import**.
   
   The license file is verified for use with the current instance of PingFederate and copied as `pingfederate.lic` to:
   
   `<pf_install>/pingfederate/server/default/conf`

**To install a replacement license key from the Main Menu:**

1. Click **License Management** under Administrative Functions.
2. On the License Management screen, click **Browse** to select the file and then click **Import**.

   No filename restrictions are imposed for importing the file; it is renamed before installation if necessary. The previous `pingfederate.lic` license file is renamed with a timestamp in the configuration directory:
   
   `<pf_install>/pingfederate/server/default/conf`

   If the new license does not include support for features covered by your existing license, or if there is some other potential problem with the license, you will be advised and prompted on whether to continue.

   **Note:** If the license is for the wrong version of PingFederate or is found to be invalid for some other reason, PingFederate displays the error(s) and reverts to the previous license.

### Automating Configuration Migration

PingFederate provides a configuration-migration tool that can be used for scripting the transfer of administrative-console configurations and configuration property files from one PingFederate server to another—for example, from a test environment to production. The tool may also be used to manage certificates for the target server.
The command-line utility, configcopy in <pf_install>/pingfederate/bin, uses PingFederate's built-in Connection Management Web Service in conjunction with an internal Web Service to export and import connections and other configurations, and to obtain lists (see “Connection Management Service” on page 445).

**Important:** The Connection Management Service must be activated for both the source and target servers before the configcopy tool can be used (see “Authentication” on page 156.)

**Caution:** For security reasons, the Management Service should be disabled whenever it is not in use.

### Administrative Console Migration

For migrating data configured with the source PingFederate server's administrative console, this tool performs these overall processing steps:

1. Retrieves specified connection and/or other configuration data (XML) from a source PingFederate server.
2. Modifies the configuration with any changes required for the target environment, according to settings in one or more properties files and/or command-line arguments.
3. Imports the updated configuration into the PingFederate target server.

The configcopy tool can perform these functions in real time, from server to server, or by using an intermediate file. The latter option is useful when both the source and target PingFederate servers are either not running at the same time or not accessible from the same operating-system command window.

**Important:** For one-time configuration transfers from one version of PingFederate to a newer version, we recommend using a complete configuration archive, either with configcopy archive export/import commands or manually (see “Using the Configuration Archive Utility” on page 54). Other configcopy commands are not supported for this purpose.

Operational capabilities include:

- Listing of source partner connections, adapter or STS token-translator instances, SaaS-provisioning channels, or data-store connections.
  - List commands include optional filter settings, when applicable.
- Copying one or more partner connections, SaaS-provisioning channels, or instances of adapters or token translators.
- Copying one or more data-store connections.
- Copying server settings.
- Exporting and importing full configuration archives.

### Configuration File Copying

The configcopy tool supports copying configuration files containing runtime properties (including those needed for server clustering) that may have been
manually customized for the source configuration and need to be migrated. The file-copy command may also be used to copy the PingFederate internal, hypersonic database when needed.

Certificate Management

Administrators may use the configcopy tool to perform the following certificate-management tasks on the target PingFederate server:

- List source trusted CAs and target key aliases
- Copy one or all trusted CAs from the source server
- Create certificates
- Create Certificate Signing Requests (CSRs)
- Import CA-signed and PKCS-12 certificates

Using the Migration Tool

The configcopy tool may be used in conjunction with one or more property files to define the operational command and other parameters, including the source and/or target PingFederate servers, and to modify configuration settings as needed for the target environment.

Property-file templates are available for each command option in `<pf_install>/pingfederate/bin/configcopy_templates`.

Note: Refer to the README.txt file in the configcopy_templates directory for a list of all commands and summary information. See the template files themselves for parameters associated with each command (or with use cases), as well as lists of Override Properties (configuration settings that can be modified in transit), where applicable.

Copies of the templates can be configured as needed and then used together (or combined into one file). Use the applicable filenames as an argument when running configcopy.bat or configcopy.sh (depending on your operating system) for particular configurations, using the following command syntax:

(On Windows)
```
configcopy.bat -Dconfigcopy.conf.file=<properties_file1>;<properties_file2>;...
```

When paths are included with the filenames, you cannot use backslashes (\). Use forward slashes (/) or escape the backslash (\\).

(On Unix/Linux)
```
configcopy.sh -Dconfigcopy.conf.file=<properties_file1>:<properties_file2>:
```

Note that the file separators are platform specific, corresponding to the syntax used for system-level path separators.

Alternatively (or in addition), you can specify any property values via command-execution arguments, using the following syntax:
```
configcopy[.sh] -Dproperty=<value> ...
```

where `<property>` is any property named in the properties file and `<value>` is the value.
Automating Configuration Migration

Command-line property designations take precedence over any values set in the properties file.

**Note:** Access to the Connection Management Web Services are password-protected (see "Authentication" on page 156). The usernames and passwords may be set in the properties file for both the source and target Web Services (passwords can be obfuscated). If passwords are set in the properties file, they cannot be overridden using the command line. If a password is not set, the configcopy tool prompts for it. Usernames always must be supplied where applicable, either in the command line or in the properties file.

The configcopy utility generates its own log file, configcopy.log, which is located in the \<pf_install>/pingfederate/log directory. You can control settings for this log, as needed, in the file configcopy.log4j.properties, located in the bin directory.

**Caution:** Importing connections or other discrete configurations at the target server is not subject to the same rigorous data validation performed by the administrative console during manual configuration. Although some checks are made, it is possible to create invalid connections using the connection-migration process. Therefore, you should not use the configcopy tool to attempt to create settings at the target that do not exist at the source; for connections and other configurations copied separately, the tool is designed only for modifying the values of existing source settings to make them applicable to the target environment.

In addition, to avoid errors and prevent unstable target configurations due to missing components or faulty cross-component references (for example, invalid ID references from connection configurations to data-store configurations), be sure to adhere closely to the instructions provided in the following procedure.

**To use configcopy:**

1. Ensure access to the Connection Management Web Service is enabled for both the source and target PingFederate servers (see "Authentication" on page 156).

2. Determine which component configurations need to be copied, including plugins.
   
   For example, connection configurations always reference either adapter or token-translator configurations (or both) and may reference data-store configurations. These are all separate configurations, and must be copied separately (unless they already exist at the target) in conjunction with copying connection configurations.

   Server Settings, unless preconfigured at the target, also need to be copied over separately.

   SaaS Provisioning settings are part of connection configurations but may be copied separately as needed to update target connections.

3. Determine whether any configuration property files or other supporting files need to be copied.
4. Ensure necessary plug-in JAR files are installed on the target server. The configcopy tool does not copy over these files, which include libraries for adapters, token translators, and JDBC or any custom database drivers. The JAR files are located in either:
   `<pf_install>/pingfederate/server/default/deploy`
   or:
   `<pf_install>/pingfederate/server/default/lib`

5. On the target server, ensure that signing certificates (or certificates used for XML decryption) are already in place (see “Security Management” on page 145).
   Private keys are not copied from server to server (public certificates may be copied); however, you may use configcopy to upload keys/certificates to the target server.
   Make note of identifying information about the target keys so you can reference the certificates in connection-copy properties.

6. If you have not yet installed your organization’s (CA-issued) SSL server certificate on both the target and source servers, either do so—you can use a configcopy command for this—or use one of the following work-arounds to ensure that configcopy can contact both servers:
   Either:
   - (Recommended) Install the Issuer certificate for the PingFederate SSL certificate in a separately managed trust store. Then the location of the file can be specified when running configcopy using the property `configcopy.connection.trust.keystore`.
   Or:
   - Install the Issuer certificate for the PingFederate SSL certificate into the trust store for the JDK under which configcopy runs.

   **Note:** If different SSL certificates are installed on the two servers, the configcopy tool must be able to trust both. In this case, both certificates must be installed in the trust store used by configcopy, or in the trust store for the JDK under which configcopy runs.

7. Create properties files for the necessary commands and associated command-parameter values needed to copy the required configurations and any additional files.
   Refer to the README.txt file and to the properties-file templates in the directory:
   `<pf_install>/pingfederate/bin/configcopy_templates`

   **Note:** This step and those following assume the use of properties files based on the templates provided; you may also use command-line parameters (see information earlier in this section).

8. If you are copying connections, override ID properties referencing adapter, data stores or other plug-in configurations, as needed (see Step 2).

   **Important:** Ensure that the plug-in configurations are either previously defined at the target or are part of the same configcopy process used to copy the connections that depend on them.
9. Create a script or run a command (or command series) that executes configcopy for each of the prepared properties files.

See the discussion above for syntax requirements, or the README file.

## SaaS Provisioning CLI

PingFederate provides as command-line interface (CLI) to help manage automated provisioning for SaaS users at IdP sites (see “SaaS Provisioning” on page 31). Administrators can use this tool to view the status of user provisioning, either globally or one provisioning channel at a time, and to rectify unusual situations where provisioning at the SaaS provider may get out of sync with the enterprise user store (see “Configuring SaaS Provisioning” on page 241).

The CLI tool, `provmgr.bat` or `provmgr.sh`, is located in the directory `<pf_install>/pingfederate/bin`. The tool interacts with the internal data store PingFederate uses to maintain provisioning synchronization between the LDAP user store and the target service (see “Configuring SaaS Provisioning Settings” on page 95).

Note that the tool creates its own log file, `provmgr.log`, located in the directory `<pf_install>/pingfederate/log`. You can control settings for this log, as needed, in the file `provmgr.log4j.properties`, located in the `bin` directory.

The following tables describes the available global and channel-specific command arguments:

### Table 9: SaaS Provisioning CLI Global Options

<table>
<thead>
<tr>
<th>Command Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help</td>
<td>Describes the available options. The help is also displayed if the command is run with no arguments.</td>
</tr>
<tr>
<td>--show-channels</td>
<td>Lists all channels in a table format, showing for each:</td>
</tr>
<tr>
<td></td>
<td>• ID - A numeric channel ID (channel-specific commands need this ID)</td>
</tr>
<tr>
<td></td>
<td>• Name - The channel name</td>
</tr>
<tr>
<td></td>
<td>• Connection ID</td>
</tr>
<tr>
<td></td>
<td>• Status (active/inactive) - Both the connection and the channel status are shown (see “Channel Activation and Summary” on page 253)</td>
</tr>
<tr>
<td></td>
<td>• User count/dirty-user-record count (e.g.: 5000/12 means 5000 users and 12 dirty records)</td>
</tr>
<tr>
<td></td>
<td>• Source (as LDAP URL)</td>
</tr>
<tr>
<td></td>
<td>• Target code</td>
</tr>
<tr>
<td>--show-nodes</td>
<td>Shows all the provisioning-server nodes with their status and the last timestamp (applies only to a failover configuration—see the PingFederate Server Cluster Guide).</td>
</tr>
<tr>
<td>--force-node-backup</td>
<td>Sets the provisioner mode to FAILOVER for the associated PingFederate server node (see the Server Clustering Guide).</td>
</tr>
<tr>
<td>Use with node number:</td>
<td></td>
</tr>
<tr>
<td>-n &lt;node ID&gt;</td>
<td></td>
</tr>
</tbody>
</table>
The following table describes the available channel-specific command arguments:

**Note:** With each command, specify the channel with the argument:
- `-c <channel-id-number>`

**Example:**
```
provmgr -c 1 --show-source
```

You can determine channel ID numbers by using the global command:
```
provmgr --show-channels
```

<table>
<thead>
<tr>
<th>Command Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>--reset-group-timestamp</code></td>
<td>Deletes the user-group timestamp, which forces the provisioner to process the provisioning group on the next cycle, even if the timestamp on that group did not actually change. Depending on your LDAP server and administrative practices, you may want to schedule this command to run periodically to catch up with any users that may have been deleted (rather than deactivated) in the directory server: some directory servers do not update the group timestamp for deleted users. <strong>Important:</strong> This option should seldom be needed if users are deactivated rather than deleted. If it is needed, you may wish to schedule it when other network activity is low.</td>
</tr>
<tr>
<td><code>--reset-attribute-sync</code></td>
<td>Sets the attribute sync timestamp to 1, which forces the provisioner to look at all users for changes, not only those that have a newer timestamp on their LDAP entry. <strong>Important:</strong> This option should be needed rarely and may consume considerable network resources, depending on the number of users. If it is needed, you may wish to schedule it when other network activity is low.</td>
</tr>
<tr>
<td><code>--reset-values-hash</code></td>
<td>Removes the values hash for all users. (The database stores a hash of attribute values for users to determine whether any values have been changed.) This argument forces users that have a newer timestamp on their LDAP entry to be updated at the SaaS provider, regardless of the actual field values. Note, however, that users whose recorded timestamp is unchanged are not updated.</td>
</tr>
<tr>
<td><code>--reset-all</code></td>
<td>Equivalent to using all three of the arguments above. <strong>Important:</strong> This option should be needed rarely if ever and may consume considerable network resources, depending on the number of users. If it is needed, you may wish to schedule it when other network activity is low.</td>
</tr>
</tbody>
</table>
Table 10: SaaS Provisioning CLI Channel-Specific Options (Continued)

<table>
<thead>
<tr>
<th>Command Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--show-dirty-records</td>
<td>Lists all users or groups that have not been provisioned or updated at the SaaS site.</td>
</tr>
<tr>
<td>--show-dirty-group-records</td>
<td>List groups that have not been provisioned or updated at the SaaS site.</td>
</tr>
<tr>
<td>--show-dirty-user-records</td>
<td>List all users that have not been provisioned or updated at the SaaS site.</td>
</tr>
<tr>
<td>--show-group</td>
<td>Shows all internal database fields related to the specified user or group, including transitory mapping fields (fields waiting to be pushed to the SaaS provider); for a user, shows all LDAP attributes retrieved from the directory server.</td>
</tr>
<tr>
<td>--show-user</td>
<td>Use with: -u &lt;SaaS name&gt; Or: -g &lt;LDAP GUID&gt;</td>
</tr>
<tr>
<td></td>
<td>Note: You can obtain user or group names and GUIDs for dirty records, as needed, using any of the --show-dirty-* options (described above). The LDAP GUID, if used and if it is binary, should be entered in hexadecimal format (as shown in log files).</td>
</tr>
<tr>
<td></td>
<td>Examples: provmgr.sh --show-user -u john@example,com provmgr.sh --show-user -g ffd448643f812b43a0bee2504173f0</td>
</tr>
<tr>
<td>--clear-dirty-records</td>
<td>Clears the dirty flag on all records.</td>
</tr>
<tr>
<td>--clear-dirty-group-records</td>
<td>Clears the dirty flag on all group records.</td>
</tr>
<tr>
<td>--clear-dirty-user-records</td>
<td>Clears the dirty flag on all user records.</td>
</tr>
<tr>
<td>--delete-dirty-records</td>
<td>Removes all dirty records from the internal store.</td>
</tr>
<tr>
<td>--delete-dirty-group-records</td>
<td>Removes all dirty group records from the internal store.</td>
</tr>
<tr>
<td>--delete-dirty-user-records</td>
<td>Removes all dirty user records from the internal store.</td>
</tr>
</tbody>
</table>
Customizing User-Facing Screens

PingFederate supplies HTML templates to provide information to the end user or to request user input during SSO/SLO processing. These template pages utilize the Velocity template engine, an open-source Apache project, and are located in the `<pf_install>/pingfederate/server/default/conf/template` directory.

You can modify most of these pages in a text editor to suit the particular branding and informational needs of your PingFederate installation. (Cascading style sheets and images for these pages are included in the `template/assets` subdirectory.) Each page contains both Velocity constructs and standard HTML. The Velocity engine interprets the commands embedded in the template page before the HTML is rendered in the user's browser. At runtime, the PingFederate server supplies values for the Velocity variables used in the template.

For information about Velocity, please refer to the Velocity project documentation on the Apache Web site:

http://velocity.apache.org/engine/releases/velocity-1.4

Changing Velocity or Javascript code is not recommended.

At runtime, the user's browser is directed to the appropriate page, depending on the operation being performed and where the related condition occurs (see tables below). For example, if an SSO error occurs during IdP-initiated SSO, the user's browser is directed to the IdP's SSO error-handling page.

Applications can override the PingFederate server-hosted pages provided specifically for SSO and SLO errors by specifying a URL value in the relevant endpoint's

<table>
<thead>
<tr>
<th>Command Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--delete-all</td>
<td>The delete-all parameter removes all users and groups from the internal store and deletes the provisioning group timestamp and the last attribute-sync timestamp. The delete-all-users parameter deletes users and timestamps but retains groups. The effect of either command is to reset the channel to its initial state for user provisioning. All user metadata is lost and provisioning for the channel will start from the beginning, picking up all users (and groups if deleted) and pushing them to the SaaS provider when the synchronization frequency interval is expired (see “Configuring SaaS Provisioning Settings” on page 95). <strong>Important</strong>: These options should be needed rarely if ever. If needed, you may wish to schedule the operation when other network activity is low.</td>
</tr>
<tr>
<td>--show-target</td>
<td>Displays the target configuration.</td>
</tr>
<tr>
<td>--show-source</td>
<td>Displays all source LDAP configuration parameters, including settings and location.</td>
</tr>
</tbody>
</table>
In the `InErrorResource` parameter (see “Application Endpoints” on page 429), Administrators can override SSO/SLO success pages by specifying default URLs in the administrative console (for the IDP configuration, see “Configuring a Default URL and Error Message” on page 174; for the SP, see “Configuring Default URLs” on page 272).

The following tables describe each of the templates. To help identify the templates from the end user’s point of view, the tables are organized by the titles that appear at the top of the user’s browser window.

**Note:** Because the templates can be customized, the default titles listed in the tables may not be accurate for your PingFederate installation or your partner’s.

### Table: IdP User-Facing Pages

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error - Single Logout</strong>&lt;br&gt;<code>idp.slo.error.page.template.html</code></td>
<td>Displayed when an SLO request fails and no other SLO error landing page is specified.</td>
<td>Error</td>
<td>User should close browser</td>
</tr>
<tr>
<td><strong>Error - Single Sign-On</strong>&lt;br&gt;<code>idp.sso.error.page.template.html</code></td>
<td>Displayed when IdP-initiated SSO fails and no other SSO error landing page is specified. Displays system errors and information for the user.</td>
<td>Error</td>
<td>Consult log and Web developer</td>
</tr>
<tr>
<td><strong>IdP Logout</strong>&lt;br&gt;<code>idp.logout.success.page.template.html</code></td>
<td>Default page may be displayed when user is logged out of the IdP by the HTTP Basic and HTML Form adapters (see “Configuring the HTTP Basic IdP Adapter” on page 415 and “Configuring the HTML Form IdP Adapter” on page 419).</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Please Select Authentication System</strong>&lt;br&gt;<code>sourceid-choose-idp-adapter-form-template.html</code></td>
<td>Displayed when the user must choose from several IdP security domains. Based on the user’s selection, the server redirects the browser to the appropriate adapter instance for authentication.</td>
<td>Normal</td>
<td>User must make selection</td>
</tr>
<tr>
<td><strong>Signed Out</strong>&lt;br&gt;<code>sourceid-wsfed-idp-signout-cleanup-template.html</code></td>
<td>Indicates user signed out of the IdP under the WS-Federation protocol and lists each successful SP logout, when applicable.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Signing Out</strong>&lt;br&gt;<code>sourceid-wsfed-idp-signout-cleanup-invisible-template.html</code></td>
<td>WS-Federation IdP sign-out processing page. <strong>Note:</strong> No HTML is rendered in the browser.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Success - Single Logout</strong>&lt;br&gt;<code>idp.slo.success.page.template.html</code></td>
<td>Displayed when an SLO request succeeds but no other SLO landing page is specified.</td>
<td>Normal</td>
<td>None</td>
</tr>
</tbody>
</table>
### Table 11: IdP User-Facing Pages (Continued)

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Working . . .</strong>&lt;br&gt;<code>sourceid-wsfed-http-post-template.html</code></td>
<td>Used to auto-submit a WS-Federation assertion to the SP. If Javascript is disabled, the user is prompted to click a button to POST the assertion directly. <strong>Note:</strong> Normally not displayed if Javascript executes properly.</td>
<td>Normal</td>
<td>None</td>
</tr>
</tbody>
</table>

### Table 12: SP User-Facing Pages

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Account Link Removed</strong>&lt;br&gt;<code>TerminateAccountLinks.page.template.html</code></td>
<td>Communicates a user’s successful “defederation” operation.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Account Linking</strong>&lt;br&gt;<code>LocalIdPasswordLookup.form.template.html</code></td>
<td>Used to authenticate a user at the SP when an account link needs to be established.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Authentication Failed</strong>&lt;br&gt;<code>sourceid-wsfed-idp-exception-template.html</code></td>
<td>Displayed when an authentication challenge fails during WS-Federation processing.</td>
<td>Error</td>
<td>Consult log and Web developer</td>
</tr>
<tr>
<td><strong>Error - Single Logout</strong>&lt;br&gt;<code>sp.slo.error.page.template.html</code></td>
<td>Displayed when an SLO request fails and no other SLO error landing page is specified.</td>
<td>Error</td>
<td>User should close the browser</td>
</tr>
<tr>
<td><strong>Error - Single Sign-On</strong>&lt;br&gt;<code>sp.sso.error.page.template.html</code></td>
<td>Displayed when SP-initiated SSO fails and no other SSO error landing page is specified.</td>
<td>Error</td>
<td>Consult log and Web developer</td>
</tr>
<tr>
<td><strong>Select Identity Provider</strong>&lt;br&gt;<code>sourceid-saml2-idp-selection-template.html</code></td>
<td>The user requested SP-initiated SSO, but the IdP partner was not specified in the appropriate query parameter or cookie. This page allows the user to select the IdP manually. Based on the user’s selection, the server redirects the browser to the appropriate IdP partner’s SSO service.</td>
<td>Normal</td>
<td>User must make selection</td>
</tr>
<tr>
<td><strong>Signed Out - Service Provider</strong>&lt;br&gt;<code>sourceid-wsfed-sp-signout-cleanup-template.html</code></td>
<td>Displays the user’s sign-out status.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Success - Single Logout</strong>&lt;br&gt;<code>sp.slo.success.page.template.html</code></td>
<td>Displayed when an SLO request succeeds and no other SLO success landing page is specified.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Single Sign-On Target Unspecified</strong>&lt;br&gt;<code>sp.sso.success.page.template.html</code></td>
<td>Displayed when an SSO request succeeds but no target-resource parameter is specified by the incoming URL, and no default URL is set (see “Configuring Default URLs” on page 272).</td>
<td>Error</td>
<td>Consult Web developer, or specify default URL</td>
</tr>
</tbody>
</table>
### Table 12: SP User-Facing Pages (Continued)

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Consent</td>
<td>Displayed when a request requires a user’s consent for an SSO to an SP.</td>
<td>Normal</td>
<td>None</td>
</tr>
</tbody>
</table>

### Table 13: Either IdP or SP User-Facing Pages

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
</table>
| Error - Single Sign-On           | For an Auto-Connect SSO transaction, indicates a range of possible error conditions (see “Using Auto-Connect” on page 28):  
  - The requesting Auto-Connect partner is not found in the PingFederate server’s list of allowed domains.  
  - The partner’s metadata is not accessible.  
  - The server is not configured for Auto-Connect.  
  - General error, with error code. | Error | Consult log, check configuration, or contact partner. If unresolved, contact Ping Identity support. |
| Error                            | Indicates that an unknown error has occurred and provides a error reference number and (optionally) an error message. | Error | Consult log, contact Ping Identity support |
| Multiple SSO in Progress         | Displayed to a user when response is slow due to simultaneous SSO requests coming from multiple browser tabs. | Normal | None |
| Page Expired                     | Displayed when simultaneous SSO requests from multiple tabs using the same key value cause a user session to be overwritten or deleted and remaining requests attempt to retrieve the state fail. | Error | None |
| Sign On                          | Challenges user for credentials when authentication can take place via HTTP Basic Authentication or an HTML form, depending on the operational mode. | Normal | User must sign on |
| Submit Form                      | Whenever the server posts a form, this template is used to auto-submit the form. If Javascript is disabled, the user is prompted to click a button to post the form manually.  
**Note:** Normally not displayed if Javascript executes properly. | Normal | None |
Table 14: OAuth User-Facing Pages

<table>
<thead>
<tr>
<th>Page Title and template file name</th>
<th>Purpose</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access Revocation</strong>&lt;br&gt;oauth.access.grants.page.template.html</td>
<td>Provides a means for end-users (resource owners) to revoke persistent access grants.</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td><strong>Information Access Approval</strong>&lt;br&gt;oauth.approval.page.template.html</td>
<td>Advises resource owners that their information is being requested by the identified OAuth client and provides for approval/disapproval.&lt;br&gt;This page appears for Implicit or Authorization Code grant types, either one time only or repeatedly depending on OAuth AS settings (see “Authorization Server Settings” on page 123).</td>
<td>Normal</td>
<td>None</td>
</tr>
</tbody>
</table>
The System Settings links on the Main Menu (under My Server) provide access to global settings that may apply to either an IdP or an SP federation configuration.

This chapter covers:

- “Managing Server Settings” on page 81
- “Managing Data Stores” on page 98
- “Configuring IdP Discovery” on page 110
- “IdP-to-SP Adapter Mapping” on page 115

Note: The information in this chapter is presented from the viewpoint of an administrative user with “Admin” permissions (see “Account Management” on page 56).

Managing Server Settings

Server settings include unique federation server identifiers, the designation of your site's federation role (SP, IdP, or both), and your enabled federation protocols (see the “Supported Standards” chapter in Getting Started).

Server settings also include system-administration configuration (one-user or multi-user), email notification options and setup, and a shortcut link to account management (when multi-user administration is enabled).

If you have enabled Auto-Connect and/or a SaaS Connector, then you will need to configure several parameters specific to those features in the System Settings task flow.
You configure many of these settings initially during the installation setup (see “Running PingFederate for the First Time” in the “Installation” chapter of Getting Started), but you can change or add to them as needed from the Main Menu.

**Note:** For information about WS-Trust STS Settings, see “Configuring STS Authentication” on page 353.

Information in this section covers:
- “Setting Administration Options” on page 82
- “Entering System Information” on page 83
- “Configuring Runtime Notifications” on page 83
- “Configuring Runtime Reporting” on page 84
- “Managing Accounts” on page 88
- “Choosing Roles and Protocols” on page 89
- “Specifying Federation Information” on page 91
- “Setting System Options” on page 93
- “Configuring SaaS Provisioning Settings” on page 95
- “Configuring Auto-Connect Metadata Signing” on page 96
- “Configuring Auto-Connect Metadata Lifetime” on page 97
- “Saving and Editing Server Settings” on page 98

**Setting Administration Options**

On the System Administration screen, PingFederate provides a choice of single- or multi-user access to the administrative console.

**Note:** If you are using your network’s LDAP user-data store or client certificates for administrative-console authentication, this screen is not presented (see “Alternative Console Authentication” on page 60).

If you choose Single-user Administration, the console is accessible only by using the default Administrator ID, for which full privileges are provided. Multi-user
Managing Server Settings

Administration (the default) provides role-based access control (see “Account Management” on page 56).

Tip: To return to single-user administration after having previously enabled multi-user, only one user can be marked as active under Account Management.

Entering System Information

On the System Info screen, you provide general information about your company.

To reach this screen:

1. Click Server Settings on the Main Menu.
2. Click System Info under the Server Settings tab.

Configuring Runtime Notifications

Depending on your licensing agreement, your PingFederate license may have an expiration date. Under Runtime Notifications you can set up the server to send an email warning when your license is about to expire.

Note: The license-notification option does not appear if you have a perpetual license.

You can also configure the server to send an email notification to a specific administrator (or a group) when a certificate used by PingFederate is about to expire, or has expired.

Note: When a certificate expires, PingFederate always writes an error in the server log, regardless of whether runtime notification is configured (see “Managing Log Files” on page 38).
To reach this screen:
1. Click **Server Settings** on the Main Menu.
2. Click **Runtime Notifications** on the Summary screen.

To configure notifications:
1. Select the checkbox next to the type of notification you want, and enter an email address.
2. If you are configuring certificate-expiration notification, enter an advance-warning time period in the Initial Warning field (optional) and in the Final Warning field.

   **Note:** When advance certificate-expiration notification is configured, the server also sends notification if a license expires.

3. If you have not previously configured PingFederate to access your email server, click **Email Server Settings** (see “Managing Email Configuration” on page 62).

### Configuring Runtime Reporting

PingFederate supports runtime monitoring and reporting through the Simple Network Management Protocol (SNMP), a standard used by network-management consoles to monitor network and server activity across an enterprise.

PingFederate also supports runtime monitoring and reporting through Java Management Extensions (JMX) (see “Runtime Monitoring Using JMX” on page 86).

### Using SNMP Monitoring

The SNMP Management Information Base (MIB) defines network data available for SNMP monitoring. The MIB file is located in:

```plaintext
<pf_install>/pingfederate/SNMP
```
The MIB describes the object identifiers that PingFederate uses to communicate information through SNMP. These identifiers are globally unique and managed by the Internet Assigned Numbers Authority (IANA).

Configure access to SNMP monitoring on the Runtime Reporting screen.

SNMP supports Gets and Traps. A Get is a request for status information sent by a network-management console to an SNMP agent. Embedded within each PingFederate server is an SNMP agent that brokers the communication between the management console and the PingFederate runtime engine (for each engine separately when PingFederate is deployed in a cluster—see the PingFederate Server Clustering Guide).

**Gets**

PingFederate responds to two SSO/SLO types of Get requests:

- The total number of transactions that the server instance has processed since installation
- The total number of failed transactions that the server instance has encountered since installation

In addition, because PingFederate is built within an existing JBoss framework, Gets include a variety of server information available via JBoss-standard Managed Beans (MBeans). A detailed list of this information is provided in the MIB file in the pingfederate/SNMP directory. (For more information about MBeans, see the next section, "Runtime Monitoring Using JMX").

**Note:** Some operating systems (Solaris 10, for example) may not allow the SNMP agent to bind to privileged ports: those below 1024. Consult your operating system's documentation on how to get around this limitation, or change the default port 161 to a port above 1023.

**Traps**

A Trap is a spontaneous communication from an agent to a network-management console. PingFederate generates a Trap at regular intervals—the server “heartbeat.” Each Trap contains the amount of time the server instance has been running since its most recent start-up.
If you configure Traps, change settings as needed and then click **Test SNMP Configuration** to send a single Trap to your network-management console.

You can also use an HTTP call at any time to verify that the PingFederate server is running (see “System-Services Endpoints” on page 437).

**Runtime Monitoring Using JMX**

Similar to SNMP, JMX technology represents a Java-centric approach to application management and monitoring. JMX exposes instrumented code in the form of MBeans. Application management systems that support JMX technology—for example, the standard Sun JDK client, JConsole—may request runtime information from PingFederate’s JMX server.

PingFederate’s JMX server reports monitoring data for SSO and SLO transactions as well as for SaaS Provisioning (see “SaaS Provisioning” on page 31). In addition, as with SNMP monitoring, numerous JBoss-standard MBeans are available to the PingFederate server’s JMX clients.

---

Important: Authentication is required for JMX-client access to PingFederate runtime data (see “Authentication” on page 156).

---

**SSO-SLO Monitoring**

For SSO/SLO transaction processing, PingFederate provides these MBeans:

- pingfederate:type=TOTAL_FAILED_TRANSACTIONS
- pingfederate:type=TOTAL_TRANSACTIONS

Each type contains a single attribute, **Count**, which reports the same information as an SNMP Get (see the previous section, “Configuring Runtime Reporting” on page 84).

**Provisioning Monitoring**

For SaaS Provisioning, PingFederate provides an MBean called

pf.provisioning:type=saas.provisioning.events

The MBean exposes five JMX Operations, each corresponding to the Java methods described in the following table. Each method returns a CompositeData object, which allows
for the retrieval of complex data without requiring application-specific code to reside with the JMX client.

### Table 15 SaaS Provisioning JMX Monitoring Options

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
</table>
| `viewEvents()`                  | Gets an array of specific events based on the given criteria. The parameters filter the data collectively; that is, they are joined logically by “and”. | `wasSuccessful` – If true, returns information only on successful transactions; false returns information only on failed transactions; null returns all transactions.  
  `eventTypeStr` – The type of event. Valid values are: CREATE, UPDATE, DISABLE, ENABLE; null or an empty string returns all types.  
  `fromDate` – See Note below.  
  `toDate` – See Note below. |
| `eventSummaryReport()`          | Gets a summary of transactions counts for the given time period. Counts are provided for success, failure, and total. Each count includes a drill-down capability, providing counts by event type. | See Note below. |
| `provisioningCycleSummary()`    | Gets a total count of provisioning cycles for the given time period. The drill-down provides information for each cycle, including success totals for users and groups added, modified, or removed in the internal tracking database; for the SaaS data store, success and failure totals are listed for each type of transaction. | See Note below. |
| `eventSummaryReportAllData()`   | Gets a summary of transaction counts with no time constraints (equivalent to `eventSummaryReport()` with null or empty strings used as parameters). | N/A. |
| `eventSummaryRollup()`          | Gets a report representing an aggregate of multiple Summary Reports covering the last 0, 1, 2, 7, 30, 60, 90, 180, and 360 days. | N/A. |

**Note:** Date parameters may be formatted as either `yyyy`, `yyyy-MM-dd`, or `yyyy-MM-dd HH:mm:ss`. A null value or empty string for a date parameter indicates no constraint for that end of the range.
Chapter 3  
System Settings

Advanced JMX Configuration

By default, PingFederate uses port 1099 for its JMX server. To change the port or other JMS configuration items, if needed, modify the configuration file `jmx-remote-config.xml` in the directory `<pf_install>/server/default/data/config-store`.

**Note:** When connecting to the JMX service using SSL (the default), ensure that the client trusts the PingFederate SSL server certificate presented (see “SSL Server Certificates” on page 146). (This should be a consideration only during testing, when using the certificate installed with PingFederate or another self-signed certificate.)

Managing Accounts

When you choose multi-user system administration, you can create users during installation or while configuring Server Settings (see “Setting Administration Options” on page 82).

<table>
<thead>
<tr>
<th>Configuring My Server</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Administration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Info</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runtime Notifications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runtime Reporting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roles &amp; Protocols</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federation Info</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Options</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Manage administrative-console users and their role assignments.

<table>
<thead>
<tr>
<th>Username</th>
<th>User Admin</th>
<th>Admin</th>
<th>Crypto Admin</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>Deactivate / Change Password</td>
</tr>
</tbody>
</table>

**Note:** If you are using your network’s LDAP user-data store or client certificates for PingFederate authentication, the Account Management screen is not presented (see “Alternative Console Authentication” on page 60).

Alternatively, you can set up and maintain user accounts later as a separate task (assuming you have user administration permissions—see “Account Management” on page 56). By default for installation, the user “Administrator” has full system permissions.

- To continue, click **Next** or **Save**.
- For information about adding or managing users, see “Account Management” on page 56.
Choosing Roles and Protocols

On the Roles and Protocols screen, select which role(s) your organization plays and which sets of standards you will use with your PingFederate server (see the “Supported Standards” chapter in Getting Started).

**Note:** If you are using the PingFederate WS-Trust STS for either an IdP, an SP, or both, notice that a new configuration step, WS-Trust STS Settings, appears under the Server Settings tab. For information about this configuration, see “WS-Trust STS Configuration” on page 351.

<table>
<thead>
<tr>
<th>Configuring My Server</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main</strong></td>
<td><strong>Server Settings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ System Administration</td>
<td>✓ System Info</td>
<td>✓ Runtime Notifications</td>
<td>✓ Runtime Reporting</td>
<td>✓ Account Management</td>
</tr>
<tr>
<td>✓ Roles &amp; Protocols</td>
<td>✓ Federation Info</td>
<td>✓ System Options</td>
<td>✓ Summary</td>
<td></td>
</tr>
</tbody>
</table>

- Select the role(s) and protocol(s) that you intend to use with your federation partners.
  - Enable OAuth 2.0 Authorization Server (AS) role
  - Enable Identity Provider (IdP) role and support the following:
    - SAML 2.0
    - Auto-Connect Profile
    - SAML 1.1
    - SAML 1.0
    - WS-Federation
    - SaaS Provisioning
    - WS-Trust
  - Enable Service Provider (SP) role and support the following:
    - SAML 2.0
    - Auto-Connect Profile
    - Attribute Requester Mapping for X.509 Attribute Sharing Profile (XASP)
    - SAML 1.1
    - SAML 1.0
    - WS-Federation
    - WS-Trust
  - Enable IdP Discovery role (SAML 2.0 only)

Also on this screen, you can choose any of several options:
- Enable the PingFederate OAuth AS (see “About OAuth” on page 10).
- As an IdP, if you have installed a PingFederate SaaS Connector, you can enable the SaaS Provisioning option (see “SaaS Provisioning” on page 31).
- As an SP, if you are using SAML 2.0 XASP for multiple IdP connections, you may choose to have PingFederate determine dynamically which connection to use (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).
### System Settings

- For either role you can enable Auto-Connect for SAML 2.0 connections (see “Using Auto-Connect” on page 28).

  ![Note:](Note) If you do not choose a role during installation, you must return to this screen to do so before you can configure connections to federation partners.

#### To reach this screen for editing:

1. On the Main Menu under System Settings, click **Server Settings**.
2. Click **Roles and Protocols** under the **Server Settings** tab.

#### To choose roles and protocols:

1. Select your federation role(s) and then select at least one protocol.

   ![Note:](Note) SaaS Provisioning requires the use of the SAML 2.0. (For more information, refer to the *Quick Connection Guide* contained in the PingFederate SaaS Connector package for your service provider.)

2. (Optional) If you are using SAML 2.0 and want to configure Auto-Connect, select that feature for your role(s) (see “Using Auto-Connect” on page 28).

   ![Note:](Note) Clearing this checkbox does *not* deactivate an existing Auto-Connect configuration in production. If you have already deployed Auto-Connect and wish to suspend the deployment for any reason, use the **Initial Setup** Summary screens (accessible from the Main Menu) for your respective role.

When you make this selection, two additional steps are added to the System Settings task:

- Metadata Signing (see “Configuring Auto-Connect Metadata Signing” on page 96)
- Metadata Lifetime (see “Configuring Auto-Connect Metadata Lifetime” on page 97)

3. (Optional) If you are using PingFederate as an IdP and have installed a SaaS Connector package, select the **SaaS Provisioning** checkbox.

   (For more information, see “SaaS Provisioning” on page 31.)

   ![Note:](Note) After provisioning is configured for a connection, you cannot clear this checkbox—you must delete all provisioning configurations first. To suspend provisioning for an SP partner, you can deactivate the specific configuration (see “Channel Activation and Summary” on page 253). Alternatively, you can deactivate the associated SP connection; note, however, that this will also disable SSO/SLO transactions (see “Editing and Activating a Connection” on page 253).

4. (Optional) If you are using SAML 2.0 XASP as an SP for multiple IdP connections, you may select the option to determine dynamically which
connection to use, based on the X.509 certificate presented (see “Attribute Requester Mapping” on page 275).

Tip: After you make this selection and create XASP IdP connections (see “Configuring the Attribute Query Profile” on page 226), configure dynamic IdP discovery via the Attribute Requester Mapping link on the Main Menu. Once the mapping is configured, you cannot clear the checkbox on the Roles and Protocols screen unless you first delete the mapping.

For general information about XASP, see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started.

5. Click Next (or Save, if you are modifying existing selections).

For information about configuring settings associated with your selections, see these relevant portions of this manual:

- Chapter 4, “OAuth Configuration”
- Chapter 6, “Identity Provider SSO Configuration”
- Chapter 7, “Service Provider SSO Configuration”
- Chapter 8, “WS-Trust STS Configuration”
- “Configuring IdP Discovery” on page 110

Specifying Federation Information

This information identifies your federation deployment to your partners, according to the protocol(s) you support.

Notes: You must provide an ID that uniquely identifies your federation gateway for each protocol you support. For WS-Trust STS, IDs are required for both SAML 2.0 and SAML 1.x, regardless of browser-based SSO protocol support or the type of token expected to be issued, to ensure that the STS will perform correctly under all conditions.

Each ID normally applies across all connection partners for a given protocol; however, if your implementation requires different IDs for the same protocol, you can use virtual server IDs (see “Federation Server Identification” on page 33).

You can also use a different ID for Auto-Connect transactions (see “Using Auto-Connect” on page 28).
Chapter 3
System Settings

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base URL</td>
<td>The fully qualified host name, port, and path (if applicable) on which the PingFederate server runs. This field is used to populate configuration settings in metadata files (see “Exporting Metadata” on page 48).</td>
</tr>
<tr>
<td>SAML 2.0 Entity ID</td>
<td>This ID defines your organization as the entity operating the server for SAML 2.0 transactions. It is usually defined as an organization’s URL or a DNS address; for example: pingidentity.com. The SAML SourceID used for artifact resolution is derived from this ID using SHA1.</td>
</tr>
<tr>
<td>Auto-Connect Entity ID (URL)</td>
<td>(Optional) If you are using Auto-Connect, you can specify a unique ID here for Auto-Connect processing. The value must be a fully qualified URL and should match the CN of your Auto-Connect certificates (see “Auto-Connect Security Model” on page 30). When a value is supplied, this ID is used instead of the SAML 2.0 Entity ID in your server’s Auto-Connect metadata, as well as in associated SSO/SLO requests and responses. Use this field if you have configured regular, static SAML 2.0 connections to other partners and your SAML 2.0 Entity ID is not a fully qualified URL (see “Using Auto-Connect” on page 28).</td>
</tr>
</tbody>
</table>

You must create a unique identifier for your server for use with your federation partners. A unique identifier is required for each protocol enabled. You will need to communicate this with your partners out-of-band or through metadata exchange. The Base URL is used to construct other URLs in the system and may be used as part of your system ID. The SAML 2.0 Source ID defaults to the SHA-1 hash of the SAML 2.0 Issuer. Enter an alternate Source ID value if desired.

Table:

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base URL</td>
<td><a href="http://localhost:9030">http://localhost:9030</a></td>
</tr>
<tr>
<td>SAML 2.0 Entity ID</td>
<td>localhost/default-entity-id</td>
</tr>
<tr>
<td>Auto-Connect Entity ID (URL)</td>
<td><a href="https://mycompany/sso">https://mycompany/sso</a></td>
</tr>
<tr>
<td>SAML 1.1 Issuer/Audience</td>
<td>urn:uuid:mycompany:issuer</td>
</tr>
<tr>
<td>SAML 1.1 Source ID</td>
<td></td>
</tr>
<tr>
<td>WS-Federation Realm</td>
<td>urn:wsfederation:mycompany:soo</td>
</tr>
</tbody>
</table>
Managing Server Settings

To reach this screen:
1. Click **Server Settings** on the Main Menu.
2. Click **Federation Info** under the Server Settings tab.

### Setting System Options

The System Options screen provides global settings that allow you to:
- Turn off automatic multi-connection error checking
- Manage system updates

#### Disabling Automatic Connection Validation

Automatic multi-connection error checking occurs by default for all configured connections whenever you access connection lists (Manage Connections screens available via **Manage All...** links on the Main Menu). The same multi-connection checking also occurs when you access the Manage IdP/SP Adapter Instances screens.

Because validation time increases with the number of connections and adapter instances, this option is provided in case you experience any noticeable delays in loading either of the Manage Connection screens or the adapter management
screens. Disabling the feature results in immediate display of the screens, deferring error checking to manual controls on Manage Connection screens.

**Note:** This option does not affect the validation of connections as they are being configured or modified. Also, individual connections are always validated automatically when accessed for editing, regardless of the setting on this screen.

The multi-connection error checking is intended to verify that completed connections have not been affected by any subsequent changes in adapter configurations or other dependencies such as datastore access (see “Data Stores” on page 21).

For more information about connection validation, see:
- “Managing Connection Validation” on page 181 (for SP connections)
- “Managing IdP Connection Validation” on page 282 (for IdP connections)

### Managing System Updates

The *Manage System Updates* option on the System Options screen provides online update management for system components. Each component can be configured to use a polling interval to retrieve and install updates automatically. An administrator can also update components manually at any time.

Each system component displays a series of messages regarding the current status for the update. PingFederate currently supports updating the context-sensitive *Help* system for the administrative console.

**To allow automatic updates at scheduled intervals:**

- Select *Enable*.

**To check for an update and install the component immediately:**

- Click *Update*.

**To configure polling intervals and other settings as needed:**

- Click *Manage Update Settings*.

  See the next section for more information.

### Configuring Update Settings

On this screen you can set the polling interval for automatic updates and indicate proxy server settings (if applicable).
Managing Server Settings

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polling Interval (days)</td>
<td>The number of days used to determine how often PingFederate checks for new updates. Valid values range from 1 to 90.</td>
</tr>
<tr>
<td>Proxy Host</td>
<td>The domain name or IP address of the proxy host.</td>
</tr>
<tr>
<td>Proxy Port</td>
<td>The proxy port number. This field is an integer between 1 and 65535.</td>
</tr>
</tbody>
</table>

To reach this screen:
1. Click Server Settings on the Main Menu.
2. Click System Options under the Server Settings tab.
3. On the System Options screen, click Manage System Updates.
4. On the System Updates screen, click Manage Update Settings.

Configuring SaaS Provisioning Settings

On the SaaS Provisioning screen, you can select the database that PingFederate uses internally to facilitate provisioning for SaaS providers when PingFederate is configured as an IdP (see “SaaS Provisioning” on page 31).

This screen is presented only if you have installed a SaaS Connector package and SaaS Provisioning is enabled for the IdP federation role (see “Choosing Roles and Protocols” on page 89).

Caution: A pre-installed, default Hypersonic database is selected for initial setup and testing. However, we strongly recommend that you choose your own, secured database for production deployments.

On this screen, you can also change the provisioning synchronization frequency—that is, how often PingFederate checks the local user store for changes.
Chapter 3
System Settings

The database stores the state of synchronization between the source data store and the target data store, enabling periodic checking to determine whether updates are required at the target SaaS site. (For information on configuring provisioning as an IdP, see “Configuring SaaS Provisioning” on page 241.)

To configure the internal data store:
1. Select the data store from the drop-down list.

   If the data store you want is not shown in the list, then PingFederate is not yet configured to access the store; click Manage Data Stores to create a connection to the data store (see “Managing Data Stores” on page 98).

2. (Optional) Change the Synchronization Frequency value.

Configuring Auto-Connect Metadata Signing

When Auto-Connect is enabled, PingFederate generates publicly available, signed metadata for partners to use. The metadata contains information about your server configuration (see “Providing Metadata” on page 28).

On the Metadata Signing screen, choose a certificate to use for signing the metadata.

Important: The certificate CN must match the domain name associated with the Entity ID (see “Specifying Federation Information” on page 91).
Managing Server Settings

This screen appears only if Auto-Connect is enabled for either an IdP or SP (see “Choosing Roles and Protocols” on page 89).

To specify a certificate:

1. Select the certificate from the drop-down list.
   - If you have not yet created or imported your certificate into PingFederate, click Manage Certificates (see “Digital Signing and Decryption Keys and Certificates” on page 151).

2. (Optional) Select the Signing Algorithm from the drop-down list.
   - The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.

   **Note:** The public certificate is included as part of the metadata and must be trusted by your partner (see “Auto-Connect Security Model” on page 30).

Configuring Auto-Connect Metadata Lifetime

Partners using Auto-Connect metadata will cache it to use for the future requests during the “lifetime” in which the metadata is valid, as configured on the Metadata Lifetime screen. After the metadata lifetime is expired, the metadata is retrieved again.

This metadata expiration ensures that partners always have reasonably up-to-date information about your server. You may elect to use the default time period or change it on the Metadata Lifetime screen.
Saving and Editing Server Settings

On the Server Settings Summary screen you can view, edit, and save your configuration.

- Click Save if you are finished with this configuration, or click any heading to make changes.

Managing Data Stores

PingFederate can connect to local data stores to retrieve user attributes on either the IdP or SP side of an SSO transaction (or both).

**Tip:** Whenever attributes are retrieved from a data store at runtime, PingFederate logs the activity (see “Managing Log Files” on page 38). When you set up access to a data store, you can choose to mask the values of all retrieved attributes in the log files to enhance security and privacy of personal information (see “Attribute Masking” on page 22).

As an IdP, you use this feature whenever you need to fulfill an attribute contract that requires information beyond that which can be derived from the user’s session (see “Configuring Attribute Sources and User Lookup” on page 201). For example, this information may include such attributes as an email address, a job title, or any data that can be used to customize a user’s experience at the SP site.

As an SP, you can use data stores to retrieve additional attributes to package with the IdP’s assertion data to meet SP adapter requirements (see “SSO Integration Kits and Adapters” on page 14). Such attributes may be needed, for example, to establish authorization levels or to manage the local account.

Either IdP or SP organizations configuring PingFederate for user provisioning must set up connections to data stores (see “User Provisioning” on page 31).

You can add data stores at any time. Standard data stores include JDBC-enabled databases and LDAP v3-compliant directories. Alternatively, you can develop a driver using the PingFederate Custom Source SDK to connect to non-JDBC databases (see the PingFederate SDK Developer’s Guide).

**Note:** You cannot delete or modify a data-store connection if it is associated with an attribute source as part of a partner-connection configuration. You must remove the association first.
To reach this screen:

- Click Data Stores on the Main Menu.

To add a data store:

1. Click Add New Data Store.
2. Select Database, LDAP, or Custom and click Next.
3. Continue the configuration:
   - For Database configuration information see “Configuring a JDBC Database Connection” on page 99.
   - For LDAP configuration information see “Configuring an LDAP Connection” on page 103.
   - For Custom configuration information see “Configuring a Custom Data Store” on page 106.
4. Click Save when you return to this screen.

To modify a data store:

- Click the data store Description.

To delete a data store:

1. Click delete under Action for the data store you want to delete.
   (To undo the deletion, click undelete.)
2. Click Save.

Configuring a JDBC Database Connection

You configure access to a database by providing basic JDBC information.

**Note:** Ensure that your database driver JAR file is installed in the pingfederate/server/default/lib directory. You must restart the server after installing the driver.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| JDBC URL       | The location of the JDBC database, in the format: `jdbc:mysql://databaseservername/ databasename` where `databaseservername` is the DNS host name (or IP) of the server hosting the database, and `databasename` is the name of a database on that server. 
**Note:** For MySQL, to enable automatic reconnection attempts if the connection is not available at runtime, enter a SQL statement in the Validate Connection SQL field below and add the following query string to the JDBC URL: `?autoReconnect=true` For more information, see the field description for Validate Connection SQL below. |
| Driver Class   | The name of the driver class used to communicate with the source database. For example, `org.hsqldb.jdbcdriver`. This class should be supplied by the database software vendor in a JAR file, which must be present in the `pingfederate/server/default/lib` directory. |
| Username       | The name that identifies the user when connecting to the database. |
| Password       | The password needed to access the database. |
To reach this screen for editing:
1. Click Data Stores on the Main Menu.
2. Click the data-store Description link on the Manage Data Stores screen.

To configure a new data store:
1. Click Data Stores on the Main Menu.
2. Click Add New Data Store.
3. Select Database and click Next.

To establish access to a database:
1. Enter the applicable JDBC URL.
   This URL is used to identify the data store in lists. Example:
   jdbc:mysql://10.0.1.81:3306/idp
2. Enter the Driver Class.
   Example: com.mysql.jdbc.Driver

   **Note:** The driver JAR file must be loaded into the directory:
   pingfederate/server/default/lib

3. Enter a valid Username and Password.
4. (Optional) Enter a valid SQL statement in the Validate Connection SQL field.
   For information, see the Description of this field in the “Field Descriptions” table above.
5. (Optional) Select Mask Values in Log.
   For information, see “Attribute Masking” on page 22.
6. (Optional) Click **Advanced**.
   Use this option to change default sizes or look-up time-outs, or to validate the connection using a specific SQL call (see “Setting Advanced Options” on page 102).

7. Click **Next**.

**Note:** PingFederate will try to connect to the database at this point. If it cannot, there may be a problem with your settings.

8. On the Summary screen, click **Done**.
9. Click **Save** on the Manage Data Stores screen.

**Setting Advanced Options**

Use the Advanced Database Options screen to change default pool sizes or look-up time-outs, or to validate the connection using a specific SQL call.

### Field Descriptions

To reach this screen for editing:
1. Click **Data Stores** on the Main Menu.
2. Click the Data Store Description link on the Manage Data Stores screen.
3. Click the **Advanced** button on the Database Config screen.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Pool Size</td>
<td>The smallest number of database connections in the connection pool for the given data store.</td>
</tr>
<tr>
<td>Maximum Pool Size</td>
<td>The largest number of database connections in the connection pool for the given data store.</td>
</tr>
<tr>
<td>Blocking Timeout (ms)</td>
<td>The amount of time a request waits to get a connection from the connection pool before it fails.</td>
</tr>
<tr>
<td>Idle Timeout (ms)</td>
<td>The length of time the connection can be idle in the pool before it is closed.</td>
</tr>
</tbody>
</table>
To configure a new data store:
1. Click **Data Stores** on the Main Menu.
2. Click **Add New Data Store**.
3. Select Database and click **Next**.
4. Enter information on the Database Config and click the **Advanced** button.

Internally, PingFederate is preconfigured to use published JBoss server default values. To view or restore these values, click **Apply Defaults**.

### Configuring an LDAP Connection
This screen establishes a connection between the PingFederate server and an LDAP data store.

<table>
<thead>
<tr>
<th>Configuring My Server</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄 Main</td>
<td>Manage Data Stores</td>
<td>Data Store</td>
<td></td>
<td></td>
</tr>
<tr>
<td>🔄 Data Store Type</td>
<td>🔄 LDAP Configuration</td>
<td>Summary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Hostname(s)**
  - The DNS name or IP address of the data store, which may include a port number; example: `181.20.42.130:389`. For failover, you can enter one or more backup LDAP servers, each separated by a space.
  - Note: If more than one Hostname is entered, each server must be accessible using the same User DN and Password (or via Bind Anonymously).

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostname(s)</td>
<td>The DNS name or IP address of the data store, which may include a port number; example: <code>181.20.42.130:389</code>. For failover, you can enter one or more backup LDAP servers, each separated by a space. <strong>Note:</strong> If more than one Hostname is entered, each server must be accessible using the same User DN and Password (or via Bind Anonymously).</td>
</tr>
</tbody>
</table>
To establish a connection to an LDAP data store:

1. Enter the applicable Hostname(s).
   For more information, see the description for this field in the table above.
   Hostnames identify this LDAP configuration in selection lists elsewhere in the administrative console.

2. (Optional) Select an LDAP Type from the drop-down list.
   For more information, see the description for this selection in the table above.

3. Either:
   - Check Bind Anonymously if your LDAP interface supports anonymous binding and if no credentials are needed to access the data store.
Or:

- Enter a valid User DN and Password.

**Note:** If you choose an anonymous binding, ensure that this access level provides permission to search the directory for user-account information.

4. (Optional) Select Use SSL.
   For more information, see the description for this selection in the table above.

5. (Optional) Select Mask Values in Log.
   For more information, see the description for this selection in the table above.

6. Click **Next**.
   PingFederate tries to connect to the LDAP server at this point. If it cannot, there may be a problem with your settings.

7. On the Summary screen, click **Done**.

8. Click **Save** on the Manage Data Stores screen.

### Defining an LDAP Type

If you are using SaaS Provisioning and your user-management LDAP server is not Active Directory or the Sun Directory Server, you can define a custom LDAP Type for PingFederate to use to streamline the SaaS provisioning configuration (see “SaaS Provisioning” on page 31).

When the LDAP server is defined, its type appears in the **LDAP Type** drop-down list on the **LDAP Configuration** screen (see previous section). When the data store is selected as the source for provisioning, a number of other settings can be automatically configured (see “Modifying Source Settings” on page 245).

**To define an LDAP Type:**

1. If you are using the LDAP Configuration screen, click **Previous** or **Cancel**.

2. Copy and rename the file `sample.template.txt`:
   
   `<pf_install>/pingfederate/server/default/conf/template/ldap-templates`

3. Change the `template.name` in the new template file.
   
   The `template.name` you specify will appear in the LDAP Type list on the LDAP Configuration screen when you save the template.

4. Modify other property values in the file to match the corresponding configuration of your LDAP server.
   
   The properties are used in the SaaS Provisioning setup (see “Modifying Source Settings” on page 245).

5. Save the new template file.

### Setting Pooling Options

LDAP connection pooling is maintained by the Java runtime environment. Normally, default settings are optimal. However, if you need to customize pooling for particular applications, you can find a list of the properties controlling pooling at:


Note: If you choose an anonymous binding, ensure that this access level provides permission to search the directory for user-account information.
Using the format `<prop_name>=<value>`, enter any of the properties into the `run.properties` file located in the directory:

`<pf_install>/pingfederate/bin`

### Configuring a Custom Data Store

Developers can use the PingFederate Custom Source SDK to create specific drivers for non-JDBC/LDAP data stores (or more sophisticated JDBC/LDAP lookups) including, for example, flat files or SOAP-connected databases (see the PingFederate SDK Developer's Guide).

Once the data-store driver is installed, you can select it on the Custom Data Store Type page.

1. Enter a unique **Instance Name**.
   You can create more than one instance of the same **Data Store Type** for use with different connection partners, as needed.

2. Select the **Data Store Type**.

3. (Optional) Select **Mask Values in Log**.
   For information see “Attribute Masking” on page 22.

4. Click **Next**.

### Configuring a Custom Data Store Instance

This screen will vary depending on the implementation. Below is a sample for a SOAP-enabled database driver. The screen shown below is only an example of a custom data store and is not available in the PingFederate distribution.
To configure the driver instance for use with a partner connection:

- Enter or select required information and click Next.

**Adapter Actions**

Custom data store adapters may be written to interface PingFederate to perform configuration assistance or validation actions (for example, testing a connection to a database). Actions may also include generation of parameters that might need to be set manually in a configuration file.

- To invoke an adapter action (when applicable), click its link on the Adapter Actions screen.

**Editing and Saving a Data Store**

On the Data Store Summary page, you can view or edit your configuration.

**To modify the configuration:**

- Click the heading above the information you want to change.

**To save a new configuration:**

- Click Done on the Summary screen and then Save on the Manage Data Stores screen.

**Defining an Account-Linking Data Store**

When an SP is configured to use account linking for an IdP connection, PingFederate uses an embedded Hypersonic database as the account-link repository (see “Account Linking” on page 16). This default implementation does not require any changes to PingFederate to support account linking. However, you can manually customize PingFederate to store account links in a different data store—either a different database or an LDAP directory. You might want to do this for any of several reasons, including:
Chapter 3
System Settings

- You are running a cluster of PingFederate runtime engines (see the PingFederate Server Clustering Guide). This scenario requires that you use an external database or directory for account links to ensure proper local user lookup.
- You have performance or scalability requirements that exceed the Hypersonic database's capabilities.
- You and your federation partner previously established a different system for creating and mapping opaque pseudonyms, and PingFederate needs access to the system.

Changing the Account-linking Database

Changing the default database involves creating a table in your JDBC database to support account linking, and modifying PingFederate configuration XML files to use the database.

To create a database table for account linking:

1. Run one of the table-setup scripts provided in the directory:
   `<pf_install>/server/default/conf/account-linking/sql-scripts`
   If a script is not provided for your database, you can derive the setup from information available in any of the other scripts.

To change the account-linking database:

1. If you have not already done so, create a connection to the database you want to use (see “Configuring a JDBC Database Connection” on page 99).
   Be sure to save the configuration on the Manage Data Stores screen.
2. Any time after saving the database connection, return to the Manage Data Stores screen from the Main Menu.
   (To reach the screen, click Data Stores under System Settings.)
3. Copy the System ID for the database you want.
4. In the directory `<pf_install>/server/default/data/config-store`, open the file:
   Between the XML tags for the item named `PingFederateDSJNDIName`, insert the System ID you copied at Step 3 and save the file.
5. Start or restart PingFederate.

Note: If you are running PingFederate in a cluster, push the new configuration to other server nodes. For more information, see the PingFederate Server Clustering Guide.

Changing the Default Data Store to use LDAP

Changing the default data store to use LDAP involves modifying PingFederate configuration XML files to use the LDAP directory.

To use an LDAP directory:

1. If you have not already done so, create a connection to the LDAP data store you want to use (see “Configuring an LDAP Connection” on page 103).
   Be sure to save the configuration on the Manage Data Stores screen.
2. Any time after saving the LDAP data store connection, return to the Manage Data Stores screen from the Main Menu.
   (To reach the screen, click Data Stores under System Settings.)

3. Copy the System ID for the data store you want.

4. In the directory `<pf_install>/server/default/conf/META-INF`, open the file:

   hivemodule.xml

   Locate the Service-Point ID for AccountLinkingService and change the value of the create-instance class to:

   org.sourceforge.saml20.service.impl.AccountLinkingServiceLDAPImpl

5. In the directory `<pf_install>/server/default/data/config-store`, open the file:

   org.sourceforge.saml20.service.impl.AccountLinkingServiceLDAPImpl.xml

   Insert the following values between the XML tags for these items:
   - PingFederateDSJNDIName: System ID you copied at Step 3
   - UserSearchBase: LDAP location where searches begin—for example, CN=Users, DC=LDAPDir, DC=com
   - UsernameAttribute: LDAP attribute that represents the user identifier—for example, Active Directory is sAMAccountName
   - AccountLinkDataAttribute: LDAP attribute used to store account linking data

   **Note:** The AccountLinkDataAttribute can be any multi-valued string attribute on a user object class. We recommend that you extend the LDAP schema with a custom attribute for use here. See the [MSDN article](http://msdn.microsoft.com/en-us/library/ms676900(v=VS.85).aspx) for further information on extending the Active Directory schema.

   **Important:** You must manually apply the changes made in Step 4 to the hivemodule.xml file on each server node in a cluster and then start or restart PingFederate.

6. Start or restart PingFederate.

7. If you are running PingFederate in a cluster, push the new configuration to other server nodes (see the PingFederate Server Clustering Guide).

   **Note:** User accounts to be linked must exist in the LDAP directory prior to establishing the account link. The Account Linking service does not add users to the LDAP data store but simply updates AccountLinkDataAttribute for a given user.

---

**Defining an OAuth Grant Data Store**

As is the case for Account Linking (see previous section), PingFederate uses its internal Hypersonic database by default to maintain persistent access-token grants for the OAuth AS (see “Persistent vs. Transient Grants” on page 12 for more...
information). In a production environment, an administrator should change this configuration to use an external enterprise database. For server clustering, an external database is required.

Changing the default data store for OAuth persistent grant storage involves modifying PingFederate configuration XML files to point to the appropriate database.

**To create the database table for grant storage:**

- Run one of the table-setup scripts provided in the directory:
  
  `<pf_install>server\default\conf\access-grant\sql-scripts`

If a script is not provided for your database, you can derive the setup from information available in any of the other scripts.

**To change the database:**

1. If you have not already done so, create a connection to the database you want to use (see “Configuring a JDBC Database Connection” on page 99).
   
   Be sure to save the configuration on the Manage Data Stores screen.

2. Any time after saving the database connection, return to the Manage Data Stores screen from the Main Menu.
   
   (To reach the screen, click Data Stores under System Settings.)

3. Copy the System ID for the database you want.

4. In the directory `<pf_install>/server/default/data/config-store`, open the file:

   `org.sourceid.oauth20.token.AccessGrantManagerJdbcImpl.xml`

   Change the value of the item named `PingFederateDSJNDIName` to the System ID you copied at Step 3 and save the file.

5. Start or restart PingFederate.

**Note:** If you are running PingFederate in a cluster, push the new configuration to other server nodes. For more information see the PingFederate Server Clustering Guide and restart PingFederate.

---

**Configuring IdP Discovery**

PingFederate provides two kinds of IdP discovery:

- SAML 2.0 standard IdP Discovery (see “IdP Discovery” in the “Supported Standards” chapter of Getting Started)

- Proprietary IdP discovery using a persistent cookie written by an SP PingFederate server

Standard IdP Discovery is configured in the administrative console (see the next section).

Discovery based on a PingFederate proprietary cookie is configured in an XML file (see “IdP Discovery Using a Persistent Cookie” on page 114). Note that this method can be used in conjunction with any of the federation standards.

**Standard IdP Discovery**

SAML IdP Discovery provides a cookie-based look-up mechanism used to identify a user’s IdP dynamically during an SP-initiated SSO event, when the IdP is not
Configuring IdP Discovery

otherwise specified. To enable this feature, IdP Discovery must be selected on the Roles and Protocols screen in the System Settings configuration (see “Choosing Roles and Protocols” on page 89). Then click IdP Discovery under System Settings on the Main Menu to reach this screen:

![Configuring My Server](image)

For an overview of this SAML 2.0 profile, see “IdP Discovery” in the “Supported Standards” chapter of Getting Started.

To continue, click Configure IdP Discovery.

Choosing Domain Cookie Settings

On the Domain Cookie Settings screen, you choose the discovery role or roles that PingFederate will play.

![Configuring My Server](image)

The choices that appear on this screen depend on whether PingFederate is acting as an SP, an IdP, or both; or as an IdP Discovery server only (see “Choosing Roles and Protocols” on page 89).

To reach this screen:
1. Click IdP Discovery under System Settings on the Main Menu.
   If this link is not available, then IdP Discovery is not yet enabled (see “Choosing Roles and Protocols” on page 89).
2. On the IdP Discovery screen, click Configure IdP Discovery.

For a detailed discussion of selections on this screen, see “IdP Discovery” in the “Supported Standards” chapter of Getting Started.
Configuring a Common Domain Service

A Common Domain Service is where PingFederate reads and/or writes authentication information contained in shared cookies, as determined by whether your site is an SP or IdP, respectively. (The service is shared if your PingFederate server is acting in both roles.)

To reach this screen:
1. Click **IdP Discovery** under System Settings on the Main Menu.
   If this link is not available, then IdP Discovery is not yet enabled (see “Choosing Roles and Protocols” on page 89).
2. On the IdP Discovery screen, click **Configure IdP Discovery**.
3. Click **Common Domain Service** under the Configure IdP Discovery tab.
   This step is not available if your server is configured for IdP Discovery only (see “Choosing Roles and Protocols” on page 89).

To configure the Common Domain Service:
1. Enter the **Base URL**.
   You must use SSL/TLS (HTTPS) for a common domain.
2. Enter and confirm a **Pass phrase** that a Web application must use to access the domain.
Configuring a Local Common Domain Server

A Local Common Domain Server is where PingFederate reads (as an SP) or writes (as an IdP) cookies for IdP Discovery.

To reach this screen:
1. Click IdP Discovery under System Settings on the Main Menu. If this link is not available, then IdP Discovery is not yet enabled (see “Choosing Roles and Protocols” on page 89).
2. On the IdP Discovery screen, click Configure IdP Discovery.
3. Click Local Common Domain Server under the Configure IdP Discovery tab.
   This step is available only if the common-server option is selected under Domain Cookie Settings (see “Configuring IdP Discovery” on page 110).

To configure the Local Common Domain Server:
1. Enter the Common Domain. Your entry must include an initial period (.), for example: .pingidentity.com
2. Enter the Cookie Lifetime. The range is 1 to 1,825 days; or to indicate a nonpersistent, session cookie, enter -1.
3. Enter and confirm a Pass phrase that a Web application must use to access the domain.

Editing and Saving the Configuration

After configuring or modifying IdP Discovery settings, you can review the configuration on the Summary screen.

- If you are finished with the configuration, click Save; otherwise, click any heading to make changes.
IdP Discovery Using a Persistent Cookie

PingFederate’s proprietary IdP-discovery method makes use of an IdP Persistent Reference Cookie (IPRC) to track the identity provider with whom a user last authenticated. There are three significant differences between standard IdP Discovery and the IPRC method:

- Standard IdP Discovery may be used only with SAML 2.0; the IPRC may be used with any federation protocol.
- The Common Domain Cookie (CDC) may be configured as a temporary, session-based cookie; the IPRC always persists for a configurable period of time.
- The CDC is set by the IdP and readable by both federation partners; the IPRC is set by the SP, using information in the SAML assertion, and cannot be accessed by the IdP.

Configuration

Enable the IPRC feature for your SP site using the configuration file org.sourceid.websso.profiles.sp.IdpIdCookieSupport.xml located in the directory <pf_install>/pingfederate/server/default/data/config-store.

Note that the deployed connection configuration between SP and IdP partners must include SP-initiated SSO (see “Configuring SAML Protocol Settings” on page 311).

To enable IPRC:

1. In the XML configuration file cited above, set the value of EnableIdpIdCookie to true.
2. (Optional) Change the default value(s) of any of the remaining elements in the configuration, as described in the following table:

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IdpIdCookieName</td>
<td>The name of the IPRC set by the SP installation (default: IdPId). Note that the cookie name cannot contain any of the following characters: &amp; , &gt;, &lt;, comma, semicolon, space.</td>
</tr>
<tr>
<td>IdpIdCookieLifeTimeInDays</td>
<td>The maximum lifetime for the cookie (default 365 days). The browser will delete the cookie when the period is expired.</td>
</tr>
<tr>
<td>ShowIdpSelectionList</td>
<td>If set to true (the default), the SP displays a list of IdPs that can be used to initiate the SSO event if the cookie is not set. If set to false, the SP installation generates an error page.</td>
</tr>
</tbody>
</table>

3. Start or restart PingFederate.

Note: Once an IPRC cookie is set, the only way to change the IdP to whom the SP will send Authentication Requests for the user is to do one of the following: wait for the cookie to expire, delete the cookie, or perform IdP-initiated SSO using the new IdP.
IdP-to-SP Adapter Mapping

This configuration is provided for special use cases in which PingFederate is acting as both an IdP and an SP, and user attributes from an IdP adapter are used to create an authenticated session via an SP adapter on the same PingFederate server. Generally, these cases involve SaaS providers who may not support standards-based SSO but do provide proprietary SSO with “delegated authentication” (for example, Salesforce and Workday).

The mapping may also be used to enable the Google Apps Password Manager (available separately with the Google Apps Connector—see “SaaS Provisioning” on page 31).

In effect, this configuration provides an alternative to setting up complete connections to send SAML assertions and other messages back and forth between an IdP and an SP running on the same PingFederate server (a loopback configuration) to enable nonstandard use cases. Instead, attributes that would normally be sent in an assertion are mapped directly from the IdP authentication adapter to an SP adapter, resulting in a secure SP user session.

To use this configuration, ensure that you have already configured the required IdP and SP adapter instances. Note that you may reuse instances that are also in use for connection configurations. For more information, see:

- “Configuring IdP Adapters” on page 164
- “Configuring SP Adapters” on page 266

Managing Mappings

On the Manage Mappings screen you can add, modify, or delete IdP-to-SP Adapter Mappings.

To add a mapping:

- Select the adapter Source Instance (IdP) and Target Instance (SP) and click Add Mapping.

  Note: You can create only one mapping of a source to the same target. However, you can map different sources to the same target, and vice versa.

To edit a mapping:

- Click the mapping name.
To delete a mapping:
▶ Click **Delete** under **Actions** for the mapping and then click **Save**.

Assigning a License Group

Adapter-to-adapter mapping is considered a connection for licensing purposes. If your PingFederate license manages connections by groups, select a license group for this mapping configuration.

**Note:** This screen is not displayed for unrestricted or other types of licenses.

To assign a License Group:
▶ Select the **License Group** from the drop-down list and click **Next**.

Configuring Attribute Lookup for IdP-to-SP Adapter Mapping

Attribute sources are specific data store or directory locations containing information that may be required to fulfill the SP adapter contract.

This portion of the IdP-to-SP adapter configuration allows you to configure one or more data stores to look up attributes and to set up search parameters.

▶ If data-store lookup is not required, click **Next**.
▶ If data-store lookup is required, click **Add Attribute Source** and complete the setup steps (see “Choosing a Data Store (Optional)” on page 117 next).

To modify an attribute source configuration:
1. Click the attribute source **Description** link.

**Note:** This screen is not displayed for unrestricted or other types of licenses.
2. Click **Save** on the screen you change.

**Note:** Depending on what you change, you may need to modify dependent data in subsequent steps, as indicated. Click **Save** or **Done** when either of those options appears.

### Choosing a Data Store (Optional)

Under some circumstances, to fulfill the SP adapter contract, you may need to look up user attributes in data stores to supplement those available from the user’s session via the IdP adapter. This screen provides that option.

To define an attribute source:

1. Enter an **Attribute Source Id** to uniquely identify the data source for the mapping.

2. Use **Attribute Source Description** to specify an attribute source name that distinguishes this user lookup for the selected data store.

**Note:** PingFederate appends this description to the data store type in the Source list on the Adapter Contract Fulfillment screen (see “Adapter Contract Fulfillment” on page 118).

3. Choose an **Active Data Store** and click **Next**.

A data-store configuration must be defined under **System Settings** for use within a connection. If the data store you want is not shown in the drop-down menu, click **Manage Data Stores** to add it (see “Managing Data Stores” on page 98).

**Note:** Data-store lookup screens for this configuration are functionally identical to those used for an IdP connection. Refer to the table below to find applicable sections in this manual containing configuration information and procedures. Then continue to the next section, “Adapter Contract Fulfillment”.
For information about data-store lookup configuration screens, depending the type of data store, use this table:

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Manual Sections</th>
</tr>
</thead>
</table>
| JDBC            | • "Selecting a JDBC Database Table and Columns" on page 204  
|                 | • "Configuring a Database Filter (WHERE Clause)" on page 206 |
| LDAP            | • "Configuring an LDAP Directory Search" on page 208  
|                 | • "Configuring an LDAP Filter" on page 209 |
| Custom          | • "Configuring Custom Source Filters" on page 211  
|                 | • "Selecting Custom Source Fields" on page 211 |

**Adapter Contract Fulfillment**

The last step in this configuration is to map values from the IdP adapter into the attributes required by the SP adapter (the Adapter Contract).

Map each attribute to fulfill the Adapter Contract from one of these Sources:

- Adapter
  
  When you make this selection, the associated Value drop-down list is populated by the IdP adapter.

- LDAP/JDBC/Custom (if a data store is configured)
  
  Values are returned from a data source. When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes you identified.

  **Note:** PingFederate appends a description in parentheses for configured data store lookups (see “Configuring Attribute Lookup for IdP-to-SP Adapter Mapping” on page 116).

- Expression (when enabled)
  
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute
IdP-to-SP Adapter Mapping

Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  
The value is what you enter. This can be text only, or you can mix text with references to any of the values from the IdP Adapter, using the \$\{attribute\} syntax.
  
  You can also enter values from your data store, when applicable, using this syntax:
  
  \$\{ds[attr-source-id][attribute]\}
  
  where attr-source-id is the Attribute Source Id value (see “Choosing a Data Store (Optional)” on page 117) and attribute is any of the data store attributes you select.

**To map attributes:**

1. Choose a Source for each SP Adapter Contract attribute.
   
   See the list above, under “Map each attribute to fulfill the Adapter Contract from one of these Sources:” above.

2. Choose (or enter) a Value for each attribute.
   
   All values must be mapped.

3. Click **Next** (or **Done**, if you are finished with the configuration, and then **Save** on the Manage Mappings screen).

**Using the Summary Screen**

When you have finished configuring IdP-to-SP Adapter Mapping, you can review the configuration on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you are finished, click **Done** and then **Save** on the Manage Mappings screen.
OAuth Configuration

To use the OAuth Authorization Server (AS), start by enabling that role for PingFederate under Server Settings on the Roles and Protocols screen. Then configure the OAuth AS using options available under My Server on the Main Menu, as described in this section.

For more information about the OAuth AS, see “About OAuth” on page 10.

**Tip:** Service providers may also add OAuth capabilities to the Browser SSO configuration for IdP connection partners—see “Configuring OAuth Attribute Mapping” on page 308.

Enabling the OAuth AS

You can enable the OAuth AS when you first install PingFederate (see “Running PingFederate for the First Time” in the “Installation” chapter of Getting Started). If you have already installed PingFederate or are upgrading to a new version, use the following procedure.

**Note:** OAuth AS capabilities are available under special licensing. If your license does not include the OAuth AS, please contact sales@pingidentity.com.

To enable the OAuth Authorization Server:
1. On the Main Menu under System Settings, click Server Settings.
2. Click Roles and Protocols under the Server Settings tab.
Chapter 4
OAuth Configuration

4. Click Save.

Using OAuth Menu Selections

PingFederate provides a choice of ways for administrators and software developers to take advantage of OAuth AS capabilities, depending on configuration and application needs (see “About OAuth” on page 10). The Main Menu provides links to most of the configuration pathways, including global settings for the AS, client management, and required and optional mappings (see “Mapping OAuth Attributes” on page 13). (An additional optional mapping scenario is provided for SPs as part of the IdP Connection task flow—see “Configuring OAuth Attribute Mapping” on page 308.)

At a minimum from the Main Menu, an administrator must:
2. Configure settings for OAuth clients (see “Client Management” on page 126).
3. Configure how access tokens are handled, including setting up an Attribute Contract (see “Access Token Management” on page 128).
4. Configure a default attribute mapping from persistent grants to access tokens (see “Access Token Mapping” on page 135).

Additionally, optional mappings may be configured, depending on applicable authentication-context mappings (see “Mapping OAuth Attributes” on page 13), as described in the following procedure.

To configure additional, optional mappings:

Map persistent grants based on contexts, as described below, and then return to the Access Token Mapping screen to complete the mapping(s) (see “Access Token Mapping” on page 135).

- “Resource-Owner Credentials Mapping” on page 131
  Use this option to map persistent grants based on authentication handled by PingFederate via Password Credential Validators (see “Validating Password Credentials” on page 158).

- “IdP Adapter Mapping for OAuth” on page 133
  Use this option to map persistent grants based on user authentication information provided by PingFederate IdP adapters (see “Configuring IdP Adapters” on page 164).

- “Configuring OAuth Attribute Mapping” on page 308
  This mapping option can be configured for Service Providers as part of an IdP connection, using incoming assertion attributes to populate persistent grants.

Authorization Server Settings

The Authorization Server Settings screen provides overall controls over the usage and behavior of the PingFederate OAuth AS, including scope descriptions, authorization-code policy, and refresh-token and persistent-grant policy.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Scope Description</td>
<td>Description of the permissions implied when no scope values are indicated or in addition to any values. This description displays when the user is prompted for authorization.</td>
</tr>
<tr>
<td>Scope Value</td>
<td>A value that represents access to a resource or API on the Resource Server (RS). Applicable values require coordination with a developer or someone familiar with details of the RS OAuth implementation.</td>
</tr>
<tr>
<td>Scope Description</td>
<td>A description of the Scope Value. This description appears when the user is prompted for authorization.</td>
</tr>
<tr>
<td>Authorization Code Timeout (seconds)</td>
<td>The amount of time (in seconds) that an authorization code is considered valid.</td>
</tr>
<tr>
<td>Authorization Code Entropy (bytes)</td>
<td>The length (in bytes) of the authorization code returned to the OAuth Client.</td>
</tr>
<tr>
<td>Refresh Token Length (characters)</td>
<td>The number of characters the OAuth AS uses to generate the refresh token returned to the client.</td>
</tr>
</tbody>
</table>
To define Authorization Server settings:

- Fill in information or change defaults, as needed, and click **Save**.

 Default Scope Description, Authorization Code Timeout, and Authorization Code Entropy are required (see **Field Descriptions** above).

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>

**Roll Refresh Token Values (default policy) (checkbox)**

When selected, the OAuth AS generates a new refresh token value when a new access token is obtained.

**Note:** New refresh token values are not issued during the defined interval (see the Minimum Interval to Roll Refresh Tokens box below).

Not selecting the checkbox means the refresh token value is used until it becomes invalid (either by manually revoking or by some other security setting that renders it invalid).

**Minimum Interval to Roll Refresh Tokens (hours)**

The minimum number of hours that must pass before a new refresh token value can be issued. Provides a way to allow for rolling a refresh token value without having to send a new value on every request.

**Reuse Existing Persistent Access Grants for Grant Types (checkboxes)**

If a client makes multiple requests for the same user and same (or lesser) scope, select the grant types you want the OAuth AS to reuse rather than creating a new grant for each request.

When Implicit is selected, consent from the user is requested only for the first OAuth resource request associated with the grant. When Authorization Code is selected, the same is true if the checkbox Allow Automatic Authorization for the Authorization Code Flow is also selected.

**Allow Automatic Authorization for the Authorization Code Flow (checkbox)**

When selected, consent from the user is requested only once. The user is not asked for authorization on subsequent requests until the access grant is revoked. This function applies only when using the Authorization Code grant type and when the Reuse Existing Persistent Access Grants for Grant Types checkbox is selected.

**Allow unidentified clients to make Resource Owner Password Credentials grant type requests**

When selected, allows Resource Owners to obtain access tokens without defining a client.

**Allow unidentified clients to make extension grant type requests**

When selected, allows user-initiated or client-initiated events (for example, a mobile application or scheduled task) to obtain access tokens without defining a client for extension grant types (see “Extension Grant Types” on page 12).
To add a Scope Value:
1. Enter a value that represents access to a resource or API on the RS.
2. Enter a description of the scope. This description appears when the user is prompted for authorization.
3. Click Add.
4. Click Save.

To modify a Scope Value:
1. Click Edit under Action for the Scope Value.
2. Edit the name and click Update.

Note: If you change your mind, be sure to click the Cancel link in the Actions column, not the Cancel button, which discards any other changes you might have made.

3. Click Save on the Authorization Server Settings screen.

To delete a Scope Value:
1. Click Delete for the Scope Value.
2. Click Save on the Authorization Server Settings screen.

Client Management

An OAuth client application interacts with the PingFederate OAuth AS to obtain access tokens needed to retrieve OAuth-protected information from a Resource Server. Use this screen flow to specify how the OAuth AS manages these applications.

Note: For detailed developer information on client usage, see “OAuth 2.0 Endpoints” on page 439.

To add a new Client:
▶ Click Add Client.

To edit an existing Client:
1. Click the Client name and make the necessary changes on the Manage Client screen.
2. Click Done and then Save.

To delete a Client:
1. Click Delete next to the Client name. (To undo the deletion, click Undelete.)
2. Click Save to confirm the deletion.
Configuring a Client

The Manage Client screen provides controls over the usage and behavior of the applications requesting access to protected resources through the PingFederate AS.

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Identifier</td>
<td>A unique identifier the client provides to the Resource Server to identify itself. This identifier is included with every request the client makes.</td>
</tr>
<tr>
<td>Client Secret</td>
<td>Used to authenticate a client. When using the Client Credentials or Access Token Validation grant types, a Client Secret is required. For more information, see &quot;Grant Types&quot; on page 11. Click <strong>Generate Secret</strong> to create a very strong random alphanumeric string or manually enter a secret. <strong>Note</strong>: If the Generate Secret button does not appear, select the <strong>Change Secret</strong> checkbox.</td>
</tr>
<tr>
<td>Name</td>
<td>A descriptive name for the client instance. This name appears when the user is prompted for authorization.</td>
</tr>
<tr>
<td>Description</td>
<td>A description of what the client application does. This description appears when the user is prompted for authorization.</td>
</tr>
</tbody>
</table>
Chapter 4
OAuth Configuration

To define a client:

1. Make the necessary changes on the Manage Client screen. Client Identifier, Name, and selecting one allowed grant type are required (see Field Descriptions above).

2. When you finish, click Done and then Save.

Access Token Management

Use this screen flow to specify how the PingFederate AS manages OAuth access tokens.

To continue, select the token-management type, if not already selected, from the drop-down list and click Next.

This configuration varies depending on the plug-ins deployed on your server. For information about adding a customized plug-in, please contact a support representative via the Support Center (pingidentity.com/support).

For the reference-token management type, bundled with PingFederate, see the next section, “Configuring Reference-Token Management”.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redirection URI</td>
<td>The URI to which the OAuth AS redirects the resource owner’s user agent once authorization is obtained for example, <a href="https://client.example.com">https://client.example.com</a>. A redirection URI is used with the Authorization Code and Implicit grant types. For more information, see “Grant Types” on page 11.</td>
</tr>
<tr>
<td>Logo URL</td>
<td>The location of the logo used on the OAuth Client Revocation page. The recommended image size is 72 x 72 pixels. This logo also appears when the user is prompted for authorization.</td>
</tr>
<tr>
<td>Allowed Grant Types</td>
<td>Available grant types that this client is allowed to use. Note: Access Token Validation cannot be used in conjunction with any other grant type.</td>
</tr>
<tr>
<td>Refresh Token Rolling Policy</td>
<td>Select Don’t Roll or Roll to override the Roll Refresh Token Values setting on the Authorization Server Settings screen (see “Authorization Server Settings” on page 123). Leave Server Default selected to default to the Roll Refresh Token Values setting on the Authorization Server Setting screen.</td>
</tr>
</tbody>
</table>
Configuring Reference-Token Management

On this screen, you can make changes to preset default settings for Reference Tokens.

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token Length</td>
<td>The number of characters the AS uses to define the token reference. Increasing the length will enhance token security if desired. (Maximum: 256.)</td>
</tr>
<tr>
<td>Token Lifetime</td>
<td>The amount of time (in minutes) that an access token is considered valid.</td>
</tr>
</tbody>
</table>

Make changes as needed (see Field Descriptions below), or click Next to continue.
Defining the Access Token Attribute Contract

On this screen, create a list of attributes to be referenced in an OAuth access token.

### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime Extension Policy</td>
<td>Indicates whether the OAuth AS should reset token lifetimes each time a token is validated. The token plug-in checks the policy before updating the lifetime of an access token. Options are: no extension policy, reset token lifetimes only for transient tokens (not backed by a persistent policy), or reset lifetimes for all tokens.</td>
</tr>
<tr>
<td>Lifetime Extension Threshold Percentage</td>
<td>When PingFederate is deployed in a cluster and token-lifetime extension is enabled, there must be a cluster-group remote procedure call (RPC) to extend the life of a token. This setting limits RPC overhead by suspending the calls until the set threshold is crossed. For example, if the token lifetime is one hour and the threshold is 50%, the lifetime will not be extended until the remaining time is less than 30 minutes. This option could potentially reduce RPC traffic between nodes by orders of magnitude while still supporting the LifeTime Extension Policy.</td>
</tr>
</tbody>
</table>

### Advanced Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode for Synchronous RPC</td>
<td>Some RPC events require that the caller get some data from the remote nodes, so the call is synchronous and blocks waiting on the responses. This configuration setting indicates whether the caller should wait for a response from all nodes in the cluster or just a majority of nodes. This is designed to eliminate the need for a complete state synchronization at startup. Synchronous RPC calls occur when a node receives a verification request for a token it does not recognize and for token issuance.</td>
</tr>
<tr>
<td>RPC Timeout</td>
<td>Timeout between cluster nodes during synchronous communication. Recommended setting is from 100 milliseconds to 1000 (1 second).</td>
</tr>
</tbody>
</table>
Using OAuth Menu Selections

To add an attribute:
1. Enter the attribute name in the text box.
   Attribute names are case-sensitive and must correspond to the attribute names expected by the Resource Server.
2. Click Add.

To modify an attribute name:
1. Click Edit under Action for the attribute.
2. Make the change and click Update.

To delete an attribute:
1. Click Delete under Action for the attribute.

Using the Access Token Management Summary Screen

When you have finished the configuration, you can review it on the Summary screen.
If you need to make any changes, click the heading over the information you want to edit. When you are finished, click Save.

Resource-Owner Credentials Mapping

This configuration allows you to map attributes based on validated user credentials into the USER_KEY for a persistent grant (see “Mapping OAuth Attributes” on page 13). You may supplement credential-validation mapping sources with attribute look-ups from your user data source.

Note: At least one credential validator instance must be configured in order to map attributes (see “Validating Password Credentials” on page 158).
Chapter 4
OAuth Configuration

To create a token mapping:

1. Select a Source Instance from the drop-down list and click Add Mapping.
   If the list does not contain any instances or the instance you want, return to the Main Menu and click Password Credential Validators (see “Validating Password Credentials” on page 158).

2. (Optional) On the Data Store screen, choose an Active Data Store.

   **Note:** The Data Store screen provides an option to look up alternate attributes based on the ID returned from the validator instance. The setup is identical for all OAuth mapping configurations—for information, see “OAuth Attribute Mapping Using a Data Store” on page 141.

   If you are not using a data store, see the next section, “Resource-Owner Contract Fulfillment”.

To edit an existing mapping:

- Click its link and then on the Summary screen click the heading over the information that needs updating.

Resource-Owner Contract Fulfillment

On this screen, you map values into the USER_KEY for a persistent grant. Use this mapping for the Resource Credential grant type (see “Grant Types” on page 11).
Map an attribute to populate the USER_KEY from one of these Sources:

- **Password Credential Validator**
  When you make this selection, the associated Value drop-down list consists of the attributes (for example, `username`) associated with the credential-validation instance.

- **LDAP/JDBC/Custom (when a data store is used)**
  Values are returned from your data store (if used). When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes identified for this data store (see “Searching LDAP for OAuth Mapping” on page 143, “Defining a JDBC Location for OAuth” on page 142, or “Configuring OAuth Custom Source Filters” on page 144).

- **Expression (when enabled)**
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  The value is what you enter. This can be text only, or you can mix text with references to the unique user ID returned from the credentials validator, using the syntax `attribute`. You can also enter values from your data store, when applicable, using this syntax: `attribute` where `attribute` is any of the data store attributes you have selected.

To map attributes:

1. Choose a **Source** for the attribute.
   (For descriptions, see “Map an attribute to populate the USER_KEY from one of these Sources:” above.)
2. Choose (or enter) a **Value**.
3. Click **Next**.

**Using the Credentials-Mapping Summary Screen**

When you have finished the configuration, you can review it on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you are finished, click **Done** and then **Save** on the Manage Mappings screen.

**IdP Adapter Mapping for OAuth**

This configuration allows you to map attributes based on an IdP adapter configuration into the USER_KEY for a persistent grant and USER_NAME (presented to the user for authorization permission). You may supplement values returned from the adapter with attribute look-ups from your user data source. (For more information about adapters, see “Configuring IdP Adapters” on page 164.)

Use this mapping for Authorization Code and Implicit grant types (see “Grant Types” on page 11).
Chapter 4
OAuth Configuration

To create a token mapping:
1. Select a Source Instance from the drop-down list and click Add Mapping.
2. (Optional) On the Data Store screen, choose an Active Data Store.

Note: The Data Store screen provides an option to look up alternate attributes based on attributes returned from the IdP adapter instance. The setup is identical for all OAuth mapping configurations—for information, see “OAuth Attribute Mapping Using a Data Store” on page 141.

If you are not using a data store, see the next section, “Grant Contract Fulfillment”.

To edit an existing mapping:
- Click its link and then on the Summary screen click the heading over the information that needs updating.

Grant Contract Fulfillment

On this screen, you map values into the USER_KEY and USER_NAME for the persistent grant and the user’s display name on the authorization page, respectively.

Map an attribute to populate the USER_KEY from one of these Sources:
- Adapter
  When you make this selection, the associated Value drop-down list contains attributes configured in the IdP adapter instance.
- LDAP/JDBC/Custom (when a data store is used)
  Values are returned from your data store (if used). When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes identified for this data store (see “Searching LDAP for OAuth Mapping” on page 143, “Defining a JDBC Location for OAuth” on page 142, or “Configuring OAuth Custom Source Filters” on page 144).

- Expression (when enabled)
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- Text
  The value is what you enter. This can be text only, or you can mix text with references to the attributes returned from the adapter instance, using the syntax `${attribute}`.

  You can also enter values from your data store, when applicable, using this syntax:
  `_${ds.attribute}_`

  where `attribute` is any of the data store attributes you have selected.

**To map attributes:**

1. Choose a Source for the attribute.
   (For descriptions, see “Map an attribute to populate the USER_KEY from one of these Sources:” above.)

2. Choose (or enter) a Value.

3. Click Next.

**Using the Adapter-Mapping Summary Screen**

When you have finished the configuration, you can review it on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you are finished, click **Done** and then **Save** on the Manage Mappings screen.

**Access Token Mapping**

In this required configuration, an administrator maps attributes to be requested from the OAuth resource server with the access token—the token attribute contract (see “Defining the Access Token Attribute Contract” on page 130). In the configuration, you define one or more contexts for controlling how the OAuth AS maps values into the attributes based the persistent-grant USER_KEY.

The mapping used at runtime depends on the authentication context of the original grant.
Chapter 4
OAuth Configuration

To create a token mapping:
1. Select a Context from the drop-down list and click **Add Mapping**.
   Contexts for mappings include:
   - (Required) The default mapping when no other contexts are configured
   - The user key for a grant request as determined by instances of a credentials validator (see “Validating Password Credentials” on page 158)
   - User key from the OAuth IdP adapter-mapping configurations (see “IdP Adapter Mapping for OAuth” on page 133)
   - SP-connection OAuth mappings (see “Configuring OAuth Attribute Mapping” on page 308)

2. (Optional) On the Data Store screen, choose an Active Data Store.

To edit an existing mapping:
- Click its link and then on the Summary screen click the heading over the information that needs updating.

**Token Attribute Contract Fulfillment**

On this screen, you map values into the token attribute contract (see “Defining the Access Token Attribute Contract” on page 130). These are the attributes that will be included or referenced in the access token.
Map each attribute to fulfill the Token Attribute Contract from one of these Sources:

- **Persistent Grant**
  
  When you make this selection, the associated Value drop-down list is populated by the USER_KEY from the persistent access-token grant.

- **LDAP/JDBC/Custom (when a data store is used)**
  
  Values are returned from your user-data store. When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes identified for this data store (see “Searching LDAP for OAuth Mapping” on page 143, “Defining a JDBC Location for OAuth” on page 142, or “Configuring OAuth Custom Source Filters” on page 144).

- **Expression (when enabled)**
  
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  
  The value is what you enter. This can be text only, or you can mix text with references to the USER_KEY using the syntax `${USER_KEY}`.
  
  You can also enter values from your data store, when applicable, using this syntax:
  
  ```
  ${ds.attribute}
  ```
  
  where attribute is any of the data store attributes you have selected.

To map attributes:

1. Choose a Source for each attribute.
   
   (For descriptions, see “Map each attribute to fulfill the Token Attribute Contract from one of these Sources:” above.)

2. Choose (or enter) a Value for each Attribute.
   
   All values must be mapped.

3. Click **Next**.

**Using the Token-Mapping Summary Screen**

When you have finished the configuration, you can review it on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you are finished, click **Done** and then **Save** on the Manage Mappings screen.
Chapter 4
OAuth Configuration

Configuring an OAuth SAML Grant IdP Connection

An OAuth SAML Grant connection exchanges a SAML assertion for an OAuth access token with the PingFederate Authorization Server. You can configure an OAuth SAML Grant connection with an IdP partner either in conjunction with browser-based SSO, WS-Trust, or independently.

**To enable OAuth SAML Grant for a new connection, or to add the capability to an existing connection:**

- On the Connection Type screen, select OAuth SAML Grant (see “Choosing an IdP Connection Type” on page 283).

**Note:** Before you can select this option, you must enable the OAuth 2.0 protocol in Server Settings (see “Choosing Roles and Protocols” on page 89) and configure an access token plug-in (see “Access Token Management” on page 128).

When the option is enabled, the configuration starts on the OAuth SAML Grant Attribute Mapping screen.

- To continue, click **Configure OAuth SAML Grant Attribute Mapping**.

Specifying an Attribute Contract for the OAuth SAML Grant

An attribute contract is a set of user attributes the IdP sends in the SAML assertion for this connection. You identify these attributes on this screen.

SAML_SUBJECT is always sent in a SAML assertion and contains the name identifier of the user for whom the access token is being requested.

Optionally, you can mask the values of attributes (other than SAML_SUBJECT) in the log files that PingFederate writes when it receives security tokens (see “Attribute Masking” on page 22).
To add an attribute:
1. Enter the attribute name in the text box.
   Attribute names are case-sensitive and must correspond to the attribute names expected by your partner.
2. (Optional) Select the checkbox under Mask Values in Log.
3. Click Add.

To modify an attribute name or masking selection:
1. Click Edit under Action for the attribute.
2. Make the change and click Update.

**Note:** If you change your mind, ensure that you click the Cancel link in the Actions column, not the Cancel button, which discards any other changes you might have made in the configuration steps.

To delete an attribute:
- Click Delete under Action for the attribute.

Choosing a Data Store for OAuth SAML Grant Attribute Mapping
This optional configuration is the same for all OAuth attribute-mapping task flows. For detailed instructions, see “OAuth Attribute Mapping Using a Data Store” on page 141.

- If you do not need additional attributes from a data store, just click Next on the Data Store screen.

To reach this screen for editing:
1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click **OAuth SAML Grant Attribute Mapping** under the IdP Connection tab.

3. Click **Configure OAuth SAML Grant Attribute Mapping**.

4. Click **Data Store** on the Summary screen.

**Contract Fulfillment**

The last step in configuring OAuth SAML Grant attribute mapping is to map SAML grant attributes to the attribute values of the access token (see “Access Token Mapping” on page 135).

Map attributes from one of the following Sources:

- **Assertion**
  
  Values are contained in the assertions from this IdP. When you make this selection, the associated Value drop-down list is populated by the attribute contract.

- **JDBC/LDAP/Custom**
  
  Values are returned from your user-data store. When you make this selection, the Value list is populated by the LDAP, JDBC, or Custom attributes identified for this data store (see “Defining a JDBC Location for OAuth” on page 142 or “Configuring an OAuth Database Filter (WHERE Clause)” on page 143).

- **Expression (when enabled)**
  
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the assertion, using the `${attribute}` syntax.

  You can also enter values from your data store, when applicable, using this syntax:

  `${ds.attribute}`

  where attribute is any of the data store attributes you have selected.

**To reach this screen:**

1. Click the connection name on the Main Menu.
   
   Click **Manage All IdP**, if needed, to see a full list of connections.

2. Click **OAuth SAML Grant Attribute Mapping Configuration** under the IdP Connection tab.

3. Click **Configure OAuth SAML Grant Attribute Mapping Configuration**.
4. Click **Contract Fulfillment**.

**To map attributes:**

1. Choose a Source for each attribute.
   (For descriptions, see “Map attributes from one of the following Sources” above.)
2. Choose (or enter) a Value for each attribute.
   All values must be mapped.
3. Click **Next**.

**Summary**

When you finish the configuration, you can review it on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you finish, click **Done**.

**OAuth Attribute Mapping Using a Data Store**

This optional configuration is the same for all of the OAuth attribute-mapping task flows described under “Using OAuth Menu Selections”, including:

- Resource-Owner Credentials Mapping
- IdP Adapter Mapping for OAuth
- Access Token Mapping

The same configuration is also used for attribute mapping in an IdP connection (see “Configuring OAuth Attribute Mapping” on page 308) and when configuring an OAuth SAML Grant connection (see “Configuring an OAuth SAML Grant IdP Connection” on page 138).

▶ If you do not need additional attributes from a data store for the respective mapping configuration, just click **Next** when you reach the Data Store screen.

**To look up user attributes for an OAuth mapping configuration:**

1. Choose an **Active Data Store** and click **Next**.
   A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click **Manage Data Stores** to add it (see “Managing Data Stores” on page 98).

2. See the following sections, depending on the type of data store:

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Related Sections</th>
</tr>
</thead>
</table>
| JDBC            | - “Defining a JDBC Location for OAuth” on page 142  
|                 | - “Configuring an OAuth Database Filter (WHERE Clause)” on page 143  
| LDAP            | - “Searching LDAP for OAuth Mapping” on page 143  
|                 | - “Configuring an LDAP Filter for OAuth Mapping” on page 144  
| Custom          | - “Configuring OAuth Custom Source Filters” on page 144  
|                 | - “Selecting OAuth Custom Source Fields” on page 144  


Defining a JDBC Location for OAuth

When you choose to use a database source for attributes, you follow this path through the configuration steps.

On the Database Tables and Columns screen you begin to specify exactly where additional data can be found to complete the attribute contract. Only one table may be used as a source of data for a JDBC lookup.

**Important: (For MySQL users)** To allow for table and column names that may contain spaces, PingFederate inserts double quotes around the names at runtime. To avoid SQL syntax errors resulting from the quotes, add the property `ANSI_QUOTES` to `sql-mode` in the configuration file `my.cnf` (on Unix/Linux) or `my.ini` (on Windows). For example:

```
sql-mode="...,ANSI_QUOTES"
```

For more information, see:

- dev.mysql.com/doc/refman/5.0/en/identifiers.html
- dev.mysql.com/doc/refman/5.1/en/option-files.html

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Lists the table structure that stores information within a database. Some databases, such as Oracle, require selection of a specific schema for a JDBC query. Other databases, such as MySQL, do not require selection of a schema.</td>
</tr>
<tr>
<td>Table</td>
<td>The name of the table contained in the database. Use the drop-down to change the table.</td>
</tr>
<tr>
<td>Columns to return from SELECT</td>
<td>Displays selected table columns. Select the columns associated with the desired attributes you would like to return from the JDBC query.</td>
</tr>
</tbody>
</table>

**To select a database table and columns for queries:**

1. Choose a Schema file (when applicable) from the drop-down list.
2. Choose a Table from the drop-down list.
3. Choose a name under Columns to Return from Select and click **Add Attribute**.

**Tip:** Click **Refresh** if you are updating an existing configuration and changes may have been made to the database.

Repeat this step for other columns as needed.

**Note:** You do not need to add a column here for it to be used as part of a search filter (see “Configuring an OAuth Database Filter (WHERE Clause)” next).
Configuring an OAuth Database Filter (WHERE Clause)

The JDBC `WHERE` clause in PingFederate queries the data table you selected to retrieve a record associated with a particular value (or values) from the assertion. The clause is in the form:

```
WHERE column1=value1 [AD column2=value2] [O...]
```

The left side of the first variable pair uses a column name in the database table you selected (see “Defining a JDBC Location for OAuth” on page 142).

You can also apply additional search criteria from your own database, using any other columns from the targeted table.

**Tip:** To determine what attributes to look up during a query, click the View Attribute Contract link to see what information must be collected (see “Defining the Access Token Attribute Contract” on page 130). Then determine if sufficient information is available from the mapping context.

For more information about `WHERE` clauses, consult your DBMS documentation.

To construct the `WHERE` clause:

1. Enter the statement in the space provided, following the guidelines and example above.
   - The initial `WHERE` is optional.
2. Ensure the syntax and variable names are correct.

Searching LDAP for OAuth Mapping

When you choose to use an LDAP source for attributes, you follow this path through the configuration steps.

On this screen you specify the branch of the LDAP hierarchy where you want PingFederate to look up user data.

**Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DN</td>
<td>The base distinguished name of the tree structure in which the search begins. This field is optional if records are located at the LDAP root.</td>
</tr>
<tr>
<td>Search Scope</td>
<td>Determines the node depth of the query. Select Subtree, One level or Object.</td>
</tr>
<tr>
<td>Root Object Class</td>
<td>The class containing the attributes you want.</td>
</tr>
<tr>
<td>Attributes to return from search</td>
<td>A list of attributes added from the drop-down list below. Subject DN is a default attribute, which may be used as the primary user identifier.</td>
</tr>
</tbody>
</table>
Chapter 4
OAuth Configuration

To select LDAP attributes:
1. (Optional) Enter a Base DN.
2. Select a Search Scope.
3. Select a Root Object Class.
4. Under Attributes to return from search, choose an attribute and click Add Attribute.
   Note that the attribute Subject DN is always returned by default.
5. Repeat the last step for other attributes as needed.
6. (Optional) Change the Search Scope or the Root Object Class if you want attributes from other locations.

Note: You do not need to add an attribute here for it to be used in a search filter (see “Configuring an LDAP Filter for OAuth Mapping”). Add only attributes from which you need actual values.

Configuring an LDAP Filter for OAuth Mapping

The LDAP filter queries the data you selected to retrieve a record associated with a particular value (or values) from the user's session. The filter is in the form: 
\{attribute=${value}\}.

The left-side variable is an attribute you selected earlier (see “Searching LDAP for OAuth Mapping” on page 143).

The right side generally uses values passed in from the mapping context (variables, including the correct syntax, are listed under “Values available…”)

You can also apply additional search criteria from your data store, using any other attributes from the targeted object classes.

Tip: Click “View List of Available LDAP Attributes” for a list from which you can copy and paste.

For general information about search filters, consult your LDAP documentation.

Configuring OAuth Custom Source Filters

When you choose to use a custom source for attributes, you follow this path through the configuration steps.

On this screen you specify a filter, or lookup query, for your custom data source. This screen display and the syntax of the filter depends on your developer's implementation of the custom source SDK.

Selecting OAuth Custom Source Fields

On the Configure Custom Source Fields screen, you can choose from among the fields shown to map to the adapter contract. These choices are supplied by the driver implementation. Select only those needed to fulfill the token contract for this partner connection.
Chapter 5

Security Management

PingFederate provides built-in certificate management to handle SSL/TLS server security, as well as certificate signing and verification of SSO and other transactions, when required.

In addition, the server provides authentication capabilities for applications making use of secured system features, or for protocol features requiring management and validation of end-user password credentials.

This section covers:
- “Certificate Management” (next)
- “Authentication” on page 156

Note: This information is presented from the viewpoint of an administrative user with “Crypto Admin” permissions (see “Account Management” on page 56).

Certificate Management

PingFederate administrators manage certificates via the Security section under My Server on the Main Menu.

<table>
<thead>
<tr>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trusted CAs</td>
</tr>
<tr>
<td>SSL Server Certificates</td>
</tr>
<tr>
<td>SSL Client Keys &amp; Certificates</td>
</tr>
<tr>
<td>Digital Signing &amp; XML Decryption Keys &amp; Certificates</td>
</tr>
<tr>
<td>Certificate Revocation Checking</td>
</tr>
</tbody>
</table>
Chapter 5
Security Management

Trusted Certificate Authorities

You can import your federation partner's CA certificate or self-signed certificate(s) into PingFederate's global trust list. If the Certificate Authority is not one of the major authorities, you may also need to import the certificate from the CA that signed the partner certificate.

Note: If a required CA certificate is already available in cacerts in the Java runtime, it is not necessary to import the same certificate into the PingFederate store.

To import a certificate:
1. Click Import.
2. Click Browse to locate the certificate.
3. Highlight the file and click Open.
4. Click Next.
5. Click Done.
6. Click Save on the Manage Trusted CAs screen.

To export a certificate:
1. Click Export under Action for the certificate you want to export.
2. On the Summary page, click the Export button.
3. Save the file on your system.

To delete a certificate:
1. Click Delete under Action for the certificate you want to delete.
   To undo the deletion, click Undelete.
2. Click Save.

To view certificate details:
1. Click the certificate Serial number.

SSL Server Certificates

PingFederate provides built-in SSL/TLS certificate management. Use this feature to establish and maintain the certificate(s) presented for access to the PingFederate administrative console and for incoming SSL/TLS connections at runtime (see “Setting Administration Options” on page 82).
To create a new certificate:
1. Click Create New.
2. Enter the requested information on the form.
3. Click Next.
4. On the Summary screen, click Done.
5. Click Save on the Manage SSL Server Certificates screen.

To import a certificate and private key:
1. Click Import.
2. Click Browse to locate the certificate.
3. Highlight the file and click Open.
4. Enter the certificate password.
5. Click Next.
6. Click Done.
7. Click Save on the Manage SSL Server Certificates screen.

To view certificate information:
► Click its Serial number.

Note: If a certificate has been revoked, PingFederate indicates this problem in the certificate information window.

To activate a certificate:
1. Click Activate for Runtime Server or Activate for Admin Console under Action for the certificate you want to activate.
   These choices are enabled only if you have created or imported more than one certificate. Otherwise, a single certificate is used for both the administrative console and runtime operations.
2. Click Save on the Manage SSL Server Certificates screen.

To export a certificate:
1. Click Export under Action for the certificate you want to export.
2. Select **Certificate Only** on the Export Certificate screen.
   Or:
   Select **Certificate and Private Key** and enter an Encryption Password.
3. Click **Next**.
4. On the Certificate Summary screen, click **Export**.
5. Save the file on your system and click **Done**.

**To create a certificate-authority signing request:**
1. Click **Certificate Signing** under Action for the desired certificate.

   **Note:** This selection is inactive if you have not yet saved a newly created or imported certificate. Click **Save** and then return to this screen from the Main Menu.

2. Select Generate Certificate Signing Request (CSR), if not already selected.
3. Click **Next**.
4. Click **Generate CSR** on the Generate CSR screen.
5. Click **Next**.
6. On the Certificate Summary screen, click **Export**.
7. Save the file on your system and click **Done**.

**To import a certificate authority response:**
1. Click **Certificate Signing** under Action for the relevant certificate.
2. Select **Import CSR Response** and click **Next**.
3. Click **Browse** and locate the CSR response to import.
4. Highlight the file and click **Open**.
5. Click **Next**.
6. Click **Done** on the Summary screen.
7. Click **Save** on the Manage SSL Server Certificates screen.

**To delete a certificate:**
1. Click **Delete** under Action for the certificate you want to delete.
   To undo the deletion, click **Undelete**.
2. Click **Save**.

**Create Certificate Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>The common name (CN) identifying the certificate.</td>
</tr>
<tr>
<td>Organization</td>
<td>The organization (O) or company name creating the certificate.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>The specific unit within the organization (OU).</td>
</tr>
<tr>
<td>City</td>
<td>The city or other primary location (L) where the company operates.</td>
</tr>
</tbody>
</table>
SSL Client Keys and Certificates

You can create and manage your authentication private keys and the certificates your server presents as a client in an SSL/TLS transaction.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>The state (ST) or other political unit encompassing the location.</td>
</tr>
<tr>
<td>Country</td>
<td>The country (C) where the company is based.</td>
</tr>
<tr>
<td>Validity (days)</td>
<td>The time during which the certificate is valid.</td>
</tr>
<tr>
<td>Key Algorithm (drop-down menu)</td>
<td>A mathematical formula used to generate a key. PingFederate uses either of two algorithms, RSA or DSA.</td>
</tr>
<tr>
<td>Key Size (bits)</td>
<td>The number of bits used in the key. (RSA-768 to 2048, DSA-768 and 1024)</td>
</tr>
</tbody>
</table>

To create a new certificate:
1. Click Create New.
2. Enter the information on the form.
3. Click Next.
4. On the Summary screen, click Done.
5. Click Save on the Manage SSL Auth Private Keys and Certificates screen.

To import a certificate:
1. Click Import.
2. Click Browse to locate the certificate.
3. Highlight the file and click Open.
4. Enter the certificate password.
5. Click Next.
6. Click Done on the Import Certificate Details screen.
7. Click Save on the Manage SSL Auth Private Keys and Certificates screen.
To view certificate information:

- Click the certificate Serial number.

---

**Note:** If a certificate has been revoked, PingFederate indicates this problem in the certificate information window.

---

To export a certificate:

1. Click **Export** under Action for the certificate you want to export.
2. Select **Certificate Only**.
   
   Or:
   
   Select **Certificate and Private Key** and enter an Encryption Password.
3. Click **Next**.
4. On the Certificate Summary screen, click **Export**.
5. Save the file on your system and click **Done**.

To create a certificate-authority signing request:

1. Click **Certificate Signing** under Action for the desired certificate.

   **Note:** This selection is inactive if you have not yet saved a newly created or imported certificate. Click **Save** and then return to this screen from the Main Menu.

2. Select Generate Certificate Signing Request (CSR), if not already selected.
3. Click **Next**.
4. Click **Generate CSR** on the Generate CSR screen.
5. Click **Next**.
6. On the Certificate Summary screen, click **Export**.
7. Save the file on your system and click **Done**.

To import a certificate authority response:

1. Click **Certificate Signing** under Action for the relevant certificate.
2. Select Import CSR Response and click **Next**.
3. Click **Browse** and locate the CSR response to import.
4. Highlight the file and click **Open**.
5. Click **Next**.
6. Click **Done** on the Summary screen.
7. Click **Save** on the Manage SSL Auth Private Keys and Certificates screen.

To delete a certificate:

1. Click **Delete** under Action for the certificate you want to delete.
   
   (To undo the deletion, click **Undelete**.)
2. Click **Save**.
Create Certificate Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>The common name (CN) identifying the certificate.</td>
</tr>
<tr>
<td>Organization</td>
<td>The organization (O) or company name creating the certificate.</td>
</tr>
<tr>
<td>Organizational Unit</td>
<td>The specific unit within the organization (OU).</td>
</tr>
<tr>
<td>City</td>
<td>The city or other primary location (L) where the company operates.</td>
</tr>
<tr>
<td>State</td>
<td>The state (ST) or other political unit encompassing the location.</td>
</tr>
<tr>
<td>Country</td>
<td>The country (C) where the company is based.</td>
</tr>
<tr>
<td>Validity (days)</td>
<td>The time during which the certificate is valid.</td>
</tr>
<tr>
<td>Key Algorithm (drop-down menu)</td>
<td>A mathematical formula used to generate a key. PingFederate uses either of two algorithms, RSA or DSA.</td>
</tr>
<tr>
<td>Key Size (bits)</td>
<td>The number of bits used in the key. (RSA-768 to 2048, DSA-768 and 1024)</td>
</tr>
</tbody>
</table>

Digital Signing and Decryption Keys and Certificates

You can use PingFederate to create and maintain your server’s signing certificates, which you may use to sign SAML requests, responses, and assertions. You can also use these certificates for XML decryption (“XML Encryption” on page 27).

<table>
<thead>
<tr>
<th>Serial</th>
<th>Subject DN</th>
<th>Expires</th>
<th>Status</th>
<th>Action</th>
</tr>
</thead>
</table>

To create a new certificate:

1. Click Create New.
2. Enter the information on the form.
3. Click Next.
4. On the Summary screen, click Done.
5. Click Save.

To import a certificate:
1. Click Import.
2. Click Browse to locate the certificate.
3. Highlight the file and click Open.
4. Enter the certificate password.
5. Click Next.
6. Click Done.
7. Click Save.

To view certificate information:
- Click the certificate Serial number.

Note: If a certificate has been revoked, PingFederate indicates this problem in the certificate information window.

To export a certificate:
1. Click Export under Action for the certificate you want to export.
2. Select Certificate Only.
   Or:
   Select Certificate and Private Key and enter an Encryption Password.
3. Click Next.
5. Save the file on your system and click Done.

To create a certificate-authority signing request:
1. Click Certificate Signing under Action for the desired certificate.

   Note: This selection is inactive if you have not yet saved a newly created or imported certificate. Click Save and then return to this screen from the Main Menu.

   2. Select Generate Certificate Signing Request (CSR), if not already selected.
   3. Click Next.
   4. Click Generate CSR on the Generate CSR screen.
   5. Click Next.
   7. Save the file on your system and click Done.

To import a certificate authority response:
1. Click Certificate Signing under Action for the relevant certificate.
2. Select Import CSR Response and click Next.
3. Click Browse and locate the CSR response to import.
4. Highlight the file and click **Open**.
5. Click **Next**.
6. Click **Done** on the Summary screen.
7. Click **Save** on the Manage Digital Signing Certificates screen.

**To delete a certificate:**

1. Click **Delete** under **Action** for the certificate you want to delete.
   (To undo the deletion, click **Undelete**.)
2. Click **Save**.

**Certificate Revocation Checking**

By default at runtime, PingFederate attempts to retrieve a CRL to verify that a signing certificate has not been revoked, whenever a CRL distribution-point URL is included within the certificate (see “Certificate Validation” on page 24). Optionally, on the Manage Certificate Revocation screen you can enable and configure OCSP checking as the preferred verification method, depending on your requirements (see “OCSP Revocation Checking” on page 24).

OCSP can be used in place of CRL checking, or CRLs can be retained as a backup method (for failover).

**Note:** When OCSP is enabled, CRL checking is not done independently—only as a failover option for one or more OCSP failure conditions.

Also on the Manage Certificate Revocation screen, you can change system-default settings for CRL checking, as needed.
To reach this screen:


Field Descriptions (For OCSP Checking)

<table>
<thead>
<tr>
<th>Field/Selection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable OCSP</td>
<td>Turns on OCSP certificate-revocation checking.</td>
</tr>
</tbody>
</table>

**Note:** No configuration changes are necessary on this screen if OCSP is not required for your federation deployment and the CRL defaults are acceptable.
<table>
<thead>
<tr>
<th>Field/Selection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default OCSP Responder URL</td>
<td>The location of a URL to use for certificate-revocation checking, a backup used only if the OCSP Responder URL is not contained in the certificate.</td>
</tr>
<tr>
<td>Default OCSP Responder Signature Verification</td>
<td>Certificate used to verify that the returned certificate status was sent from the Default OCSP Responder—required if the certificate is not included in the response (click <strong>Manage Certificates</strong> to import the verification certificate, as needed).</td>
</tr>
<tr>
<td>Do NOT allow Responder to use cached responses</td>
<td>When unchecked (the default), the OCSP Responder uses cached responses when available for the subject certificate (for an indicated period of time—see the description for &quot;Next Update Grace Period,&quot; below). If checked, PingFederate sends a nonce in the request to the Responder, effectively requiring that the status of the certificate be determined in real time. This option is intended to enhance the prevention of Internet replay attacks (in addition to timestamping), where required. <strong>Important:</strong> Making this selection may slow down OCSP response time for a request and will increase general processing overhead at the Responder site.</td>
</tr>
<tr>
<td>This Update Grace Period</td>
<td>For the response to be considered valid, the PingFederate server-clock time must correspond to the <code>&lt;thisUpdate&gt;</code> timestamp in the OCSP response, plus or minus the number of minutes set for this field (to compensate for clock variances).</td>
</tr>
<tr>
<td>Next Update Grace Period</td>
<td>If the response includes a <code>&lt;nextUpdate&gt;</code> timestamp indicating when updated certificate statuses will be available, then PingFederate checks to ensure that the timestamp is not earlier than the current server time, adding this grace period to compensate for clock variances.</td>
</tr>
<tr>
<td>Responder Timeout</td>
<td>The allowable response time before the OCSP Responder URL is considered unavailable and processing continues (see &quot;OCSP Responder is Unavailable,&quot; below).</td>
</tr>
<tr>
<td>Certificate is Unknown</td>
<td>The certificate does not fall under the purview of the CA associated with the OCSP Responder. The drop-down choices indicate whether an unknown certificate is to be considered valid or not, or whether to try CRL checking.</td>
</tr>
<tr>
<td>OCSP Responder is Unavailable</td>
<td>Indicates what action to take if the Responder cannot be reached.</td>
</tr>
<tr>
<td>OCSP Responder Returns Error</td>
<td>Indicates what action to take if the Responder returns an error.</td>
</tr>
</tbody>
</table>
### Field Descriptions (For CRL Checking)

<table>
<thead>
<tr>
<th>Field/Selection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable CRL Checking</td>
<td>Enables CRL revocation checking (the default). <strong>Note</strong>: CRL checking must remain enabled if any selections for OCSP Error Handling include failover. If OCSP is enabled and no CRL failover is specified, then this selection has no effect.</td>
</tr>
<tr>
<td>Treat Unretrievable CRLs as Revoked</td>
<td>If checked, PingFederate immediately aborts the processing associated with the certificate. If unchecked, the server treats the certificate as valid but continues trying to retrieve the CRL.</td>
</tr>
<tr>
<td>Next Retry on Resolution Failure</td>
<td>Specifies the number of minutes the server waits before trying to retrieve a CRL when the previous attempt failed—applies only when the selection above (Treat Unretrievable CRLs as Revoked) is unchecked.</td>
</tr>
<tr>
<td>Next Retry on Next Update Expiration</td>
<td>How long the server waits before requesting a new CRL when the most recently retrieved CRL (in cache) has a next-update time in the past.</td>
</tr>
<tr>
<td>Verify CRL Signature</td>
<td>When checked (recommended), PingFederate verifies the CRL signature using the public key of the issuer, which must be in the certificate chain or in the list of Trusted CAs (see “Trusted Certificate Authorities” on page 146).</td>
</tr>
<tr>
<td>Proxy Settings</td>
<td>If CRL checking is routed through a proxy server, specify the server’s Host (DNS name or IP address) and the Port number. The same proxy information applies to OCSP checking, when enabled.</td>
</tr>
</tbody>
</table>

## Authentication

This portion of the Main Menu, under My Server, allows administrators to manage Basic authentication to the PingFederate server, when needed, as well as authentication needs for secured protocol transactions.
When you use the SAML 2.0 Attribute Query profile as an SP, password security is required between the application requesting attributes and the SP PingFederate server. Basic authentication is also required for applications making calls to PingFederate's Connection Management Service and optional for the SSO Directory Service (see “Web Service Interfaces” on page 445).

If you are using the SAML 2.0 Attribute Query profile as an SP, then the requesting application(s) at your site must authenticate to the PingFederate server (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started and “/sp/startAttributeQuery.ping” on page 436).

In addition, authentication is required to access PingFederate runtime data via JMX (see “Runtime Monitoring Using JMX” on page 86) or to make SOAP calls to the Connection Management Web Service. Authentication is optional for the SSO Directory Service (see “Web Service Interfaces” on page 445).

**Note:** To help ensure network security, access to all of these services is deactivated when PingFederate is first installed.

Administrators can activate and configure authentication for any or all of the services on the Application Authentication screen.

**To enable access to a service:**

1. Click **Activate** for the Service under Action.
2. Where required, enter an Id, Shared Secret, and Confirm Shared Secret for the service.

   You and the application developer must agree to these values.

   This step is optional for the SSO Directory Service; the Service can be active without requiring authentication (the default setting).
3. Repeat the steps above for other Services, as needed.

4. Click **Save**.

**To change an application ID or password:**
- Replace the existing information in the necessary field(s) and click **Save**.

**To block access to an active service:**
- Click **Deactivate** for the Service under **Action** and then click **Save**.

---

**Validating Password Credentials**

PingFederate provides an authentication mechanism using plug-in Password Credential Validators. This feature provides centralized credential validation for other PingFederate configurations. Currently, instances of credential validators are used when configuring an HTTP Basic or HTML Form IdP Adapter (see “Configuring the HTTP Basic IdP Adapter” on page 415 and “Configuring the HTML Form IdP Adapter” on page 419) and for OAuth resource-owner grant configurations (see “Grant Types” on page 11 and “Resource-Owner Credentials Mapping” on page 131).

PingFederate is distributed with two plug-in Password Credential Validators:
- **LDAP Username/Password** – Validates credentials based on an LDAP look-up in an organization's user-data store.
- **Simple Username/Password** – Validates credentials maintained by PingFederate.

- Tip: Although not accessible when deactivated, the Connection Management Service and the SSO Directory Service are still deployed by default as part of PingFederate. If your organization does not plan to use one (or either) of these services, you may wish to remove the corresponding WAR file(s) from the `<pf_install>/pingfederate/server/deploy` or (and) `../deploy2` directories, respectively:
  - `pf-ws.war`
  - `pf-mgmt-ws.war`
Choosing a Type

The first step in this configuration is choosing a credentials-validator type. Available types are determined by plug-in JAR files loaded in the `<pf_install>/pingfederate/server/default/deploy` directory. Two validator plug-ins are bundled with PingFederate.

Other plug-ins are added periodically, available from Ping Identity (pingidentity.com/support-and-downloads).

<table>
<thead>
<tr>
<th>Configuring My Server</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage Credential Validator Instances</td>
<td>Create Credential Validator Instance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Instance Configuration</td>
<td>Summary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To specify a validator instance:

1. Enter the Instance Name and Instance Id on the Type screen.
2. Select the Type from the drop-down list.
   - If the validator type you need is not listed, click *Visit PingIdentity.com for additional types* to see if a suitable validator plug-in is available from the download site.
3. Click *Next* and enter information on the configuration screen for this validator instance.

This configuration varies depending on the validators deployed on your server. For add-on validators please consult the online documentation referenced in the download package, or look under Product Documentation at pingidentity.com.

For validators bundled with PingFederate, refer to one of the following sections:
- “Configuring the LDAP Username/Password Validator”, next
- “Configuring the Simple Username/Password Validator” on page 161
Configuring the LDAP Username/Password Validator

The LDAP validator verifies credentials using an organization’s user-data store.

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDAP Datastore</td>
<td>The LDAP data store configured in PingFederate. If you have not yet configured the server to communicate with the LDAP server you need, click <strong>Manage Data Stores</strong>.</td>
</tr>
<tr>
<td>Search Base</td>
<td>The location in the directory server from which the search begins.</td>
</tr>
<tr>
<td>Search Filter</td>
<td>Query used to produce the desired set of matching records.</td>
</tr>
<tr>
<td>Scope of Search</td>
<td>The level of search to be performed in the search base.</td>
</tr>
</tbody>
</table>

To complete the LDAP validation:

1. Select the LDAP Datastore and enter information into the required fields, as described above, and click **Next**.
2. On the Summary screen, click **Next** and then click **Save** on the Manage Credential Validators screen.
Configuring the Simple Username/Password Validator

This credentials validator is provided to enable the PingFederate OAuth AS to maintain specific credentials.

To add users:
1. Click Add a new row to ‘Users’.
2. Enter a Username and Password and click Update.
3. Repeat the previous steps for additional users as needed.

To edit user credentials:
1. Click Edit next to the user’s credentials.
2. Change information as needed, then click Update.

To delete a user:
- Click Delete next to the user’s credentials.

Finishing the Validator Configuration

To complete and save the configuration, click Done on the Summary screen and then Save on the Manage Credential Validators screen.
Identity Provider
SSO Configuration

In an IdP role, you use the PingFederate administrative console to configure local application-integration information and to manage connections to your SP-partner sites. You must configure Server Settings from the Main Menu to establish your site as an IdP before configuring connections to SPs (see “Choosing Roles and Protocols” on page 89).

Note that only one connection is needed per partner, even if you are targeting more than one Web application at the destination SP site. You can configure more than one connection, however, if your partner supports multiple protocols, or supports multiple federation IDs for the same protocol (see “Federation Server Identification” on page 33).

Note: This chapter applies to configuration settings needed for secure Internet SSO (“Browser SSO”). While there is some cross-over information also applicable to WS-Trust STS, if you are using PingFederate exclusively as an STS, start with “WS-Trust STS Configuration” on page 351.

Under some conditions, you can enable SSO for an unlimited number of partners at once by configuring a single, common connection (see “Using Auto-Connect” on page 28). You can also expedite single end-to-end connections by taking advantage of PingFederate Express (see “About PingFederate Express” on page 27).

This chapter covers the following topics:

- “Application Integration Settings” on page 164
- “Viewing Protocol Endpoints” on page 175
- “Managing SP Connections” on page 177
- “Defining SP Affiliations” on page 254
- “Using the Express Connection Template” on page 257
- “Configuring SP Auto-Connect” on page 261
Application Integration Settings

The integration of local applications with PingFederate is the essential “first-mile” configuration that allows end-users to access protected resources across domains. This process is facilitated through the use of application-integration kits and a robust Software Development Kit (see “SSO Integration Kits and Adapters” on page 14).

Under Application Integration Settings on the Main Menu, you configure the IdP Adapters that PingFederate needs to interact with applications or access-management systems used to authenticate users at your site. You can also set a Default URL to which users may be directed during SLO, and you can look up system endpoints that application developers at your site need to access PingFederate’s SSO/SLO services.

Note: If your PingFederate configuration enables the WS-Trust STS, the selections under Application Integration Settings also include links for configuring plug-in Token Processors and, optionally, STS Request Parameters. Locate configuration information under “IdP Configuration for STS” on page 358.

Configuring IdP Adapters

An IdP adapter is used to look up session information and provide user identification to PingFederate (see “SSO Integration Kits and Adapters” on page 14).

You must configure at least one instance of an IdP adapter in order to set up connections to SP partners.

For information about configuring the adapters packaged with PingFederate, see:

- “Configuring the IdP OpenToken Adapter” on page 408
- “Configuring the HTTP Basic IdP Adapter” on page 415
- “Configuring the HTML Form IdP Adapter” on page 419
- “Configuring the Composite Adapter” on page 423

You reach this screen by clicking Adapters under Application Integration Settings in My IdP Configuration.

To configure a new instance:
- Click Create New Instance.
To edit an existing adapter instance:
▶ Click the Instance Name and click the step you need to change.

To delete an adapter instance:
1. Click Delete next to the Instance Name. (To undo the deletion, click Undelete.)

   ![Note: This option is available only if the adapter instance is not in use for a connection.]

2. Click Save to confirm the deletion.

Selecting an IdP Adapter Type

The first step in creating an adapter instance is choosing an adapter type. Available adapter types are determined by JAR files loaded in the `<pf_install>/pingfederate/server/default/deploy` directory. Some adapters are bundled with PingFederate (see “SSO Integration Kits and Adapters” on page 14). Other adapters and integration kits are available from the Ping Identity Web site (www.pingidentity.com/support-and-downloads).

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance Name</td>
<td>A descriptive name for the adapter instance—for example, an identity management system name.</td>
</tr>
<tr>
<td>Instance ID</td>
<td>An internal identifier for the adapter instance. Must be alphanumeric with no spaces.</td>
</tr>
<tr>
<td>Type</td>
<td>A list of deployed IdP adapter types available for creating an adapter instance for the server. A developer typically deploys any new adapter types before an administrator sets up a connection partner.</td>
</tr>
</tbody>
</table>

To define an adapter instance:
1. Enter the Instance Name and Instance Id on the Type screen.
2. Select the Type from the drop-down menu.
   
   If the adapter you need is not listed, click **Visit PingIdentity.com for additional types** to see if a suitable adapter is available from the PingFederate download site, or create your own adapter (see “SSO Integration Kits and Adapters” on page 14).

3. Click **Next** and enter information on subsequent screens for this adapter setup.

   **Tip:** The setup steps and information needed at those steps vary with the adapters deployed on your server (see “SSO Integration Kits and Adapters” on page 14). For information about configuring the adapters packaged with PingFederate, see “OpenToken Adapter Configuration” on page 407, “Configuring the HTTP Basic IdP Adapter” on page 415, “Configuring the HTML Form IdP Adapter” on page 419, or “Configuring the Composite Adapter” on page 423.

4. Click **Done** on the Adapter Summary screen.

5. Click **Save** on the Manage IdP Adapter Instances screen.

### Configuring an IdP Adapter

Depending on the adapter you choose, different configuration parameters are available on the IdP Adapter screen. These options are controlled by the adapter software (see “SSO Integration Kits and Adapters” on page 14).

- For information about configuring the OpenToken Adapter, see “OpenToken Adapter Configuration” on page 407.
- For information about configuring the HTTP Basic IdP Adapter, see “Configuring the HTTP Basic IdP Adapter” on page 415.
- For information about configuring the HTML Form IdP Adapter, see “Configuring the HTML Form IdP Adapter” on page 419.
- For information about configuring the Composite Adapter, see “Configuring the Composite Adapter” on page 423.

### Important:
If you change adapters that are used by existing partner connections, you may need to reconfigure those connections. If so, a **Fix Errors** link appears on the Manage IdP Adapter Instances screen. Click the link to navigate to the screens you need to reconfigure. You cannot save the changes to the adapter until the existing connections have been repaired.

### Invoking Adapter Actions

Adapters may be written to provide configuration assistance or validation actions. Actions may also include generation of parameters that might need to be set manually in a configuration file.

For information about actions available using the OpenToken Adapter, see “Configuring the IdP OpenToken Adapter” on page 408.
To reach this screen:
1. Click **Adapters** on the Main Menu.
2. Click an Instance Name on the Manage IdP Adapter Instances screen.
3. Click **Actions** (if available).

To generate a properties list:
- Click **Download** under **Action Invocation Link**.

### Extending an Adapter Contract

Adapters may be written with an option allowing administrators to add to the attributes that the adapter returns from a user's session. The PingFederate OpenToken Adapter, for example, provides such an option (see "OpenToken Adapter Configuration" on page 407).

**Note:** For the Composite Adapter, attributes for IdP Adapter Instances that comprise the composite configuration must be added on this screen (see “Configuring the Composite Adapter” on page 423).
Chapter 6
Identity Provider SSO Configuration

To add an attribute:

- Enter the attribute name in the text box and click Add.

Setting Pseudonym Values and Masking

On the Adapter Attributes screen you must select attributes to use for generating a pseudonym identifier (see “Account Linking” on page 16).

Optionally on this screen, you can also choose to mask the values of any or all attributes that PingFederate logs from this adapter instance at runtime (see “Attribute Masking” on page 22).

<table>
<thead>
<tr>
<th>Configuring IdP Adapter</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage IdP Adapter Instances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create Adapter Instance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- As an IDP, some of your SP partners may choose to receive a pseudonym to uniquely identify a user. From the attributes in the authentication adapter, please select the values that you would like to use in constructing the unique identifier. Optionally, specify here any attributes that must be masked in log files.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Pseudonym</th>
<th>Mask Log Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Mask all OGNL-expression generated log values

To configure Pseudonym generation:

- Under Pseudonym select the value(s) to use.

   **Note:** A selection is required regardless of whether you will use pseudonyms for account linking. This allows account linking to be used later without having to delete and reconfigure the adapter. Ensure that you choose at least one attribute that is unique for each user (for example, email) to prevent the same pseudonym from being assigned to multiple users.

To mask attributes in log files:

- Under Mask Log Values select the attribute(s) whose value(s) you want to mask.

   If OGNL expressions might be used to map derived values into outgoing assertions and you want those values masked, select the related checkbox under the Attribute list (see “Using Attribute Mapping Expressions” on page 453).

To reach this screen:

1. Click Adapters on the Main Menu.
2. Click an Instance Name.
3. Click Adapter Attributes.

Selecting an Authentication Context

If you have deployed an integration kit that supports authentication context, you can specify the context in the IDP adapter configuration under Advanced Fields.
(For a discussion of authentication context, find that term under “Terminology” in the “Supported Standards” chapter of Getting Started. For detailed information, see the OASIS SAML document saml-authn-context-2.0-os.pdf.)

To enter an authentication context URI for an adapter that supports this feature, click **Advanced Fields** on the adapter configuration screen.

### Editing and Saving Adapter Instances

From the Adapter Instance Summary screen, you can reach adapter settings for editing.

**To edit the configuration:**

1. Click the heading above the information you want to change.
2. Make your changes.
3. Click **Save** on the configuration page and on the Manage IdP Adapter Instances screen.

**To save an adapter instance:**

1. Click **Done** on the Summary screen.
2. Click **Save** on the Manage IdP Adapter Instances screen.

### Configuring Adapter Selectors

Adapter selectors provide a plug-in capability for PingFederate to choose among configured IdP adapter instances for any SSO request, based on an end user’s IP address, **authentication context**, or other criteria. This optional feature provides for global and flexible authentication-adapter usage across SP connections.

**Important:** Before configuring adapter selectors, it is best to configure the IdP Adapters you want to use (see “Configuring IdP Adapters” on page 164). Also, before runtime the same instances of those adapters must be configured for attribute mapping in applicable SP connections (see “IdP Adapter Mapping” on page 198).

The configuration of plug-in selectors packaged in this PingFederate release—see “Bundled IdP Adapter Selectors” on page 15—is described in the following sections. For information on the configuration of other plug-ins, please consult the associated documentation.
Choosing a Selector Type

On this screen an administrator chooses the adapter selector to configure. Two selector plug-ins are bundled with PingFederate (see “Bundled IdP Adapter Selectors” on page 15). Other plug-ins may be added periodically, available from Ping Identity (pingidentity.com/support-and-downloads).

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance Name</td>
<td>A descriptive name for the selector instance.</td>
</tr>
<tr>
<td>Instance ID</td>
<td>An internal identifier for the selector instance—must be alphanumeric with no spaces.</td>
</tr>
<tr>
<td>Type</td>
<td>A list of deployed selector types available for creating an instance for the server.</td>
</tr>
</tbody>
</table>

To specify a selector instance:

1. Enter the Instance Name and Instance Id on the Type screen.
2. Select the Type from the drop-down list.
3. Click Next and enter information on the configuration screen for this adapter-selector instance.

This configuration varies depending on the selectors deployed on your server. For selectors bundled with PingFederate, refer to one of the following sections:
- “Configuring the CIDR Adapter Selector”, next
- “Configuring the AuthN Context Selector” on page 171

Configuring the CIDR Adapter Selector

This adapter selector determines which IdP adapter instance to use based on the IP address of an incoming SSO request.
To configure the selector:
1. Under Action, click **Add a new row to ‘Networks’**.
2. Enter a Network Range (IPv4 addresses only) and click **Update**.
3. Repeat the previous step as needed for additional ranges.
4. (Optional) Enter a value for Result Attribute Name.
   This field provides a means to indicate in the SAML assertion that a network range was matched during processing (values: Yes or No).
5. (Optional) Select the checkbox to use the XFF HTTP header field for identifying the originating client IP address when PingFederate is behind an HTTP proxy or load balancer.

**Configuring the AuthN Context Selector**

This adapter selector enables PingFederate to choose configured IdP adapters based on the authentication context requested by an SP partner. The Adapter Selector screen provides an option to use the authentication-context selection result in SAML assertions. (Context results are defined on the next screen—see “Defining AuthN Context Results” on page 172.)
When selected (the default), the checkbox on this screen provides a means of either:

- Adding the value of the authentication context determined by the selector into the SAML assertion; or,
- When applicable, replacing any value returned from the associated adapter instance with the selector-result value.

Adapter instances are mapped to the results of selector instances in a subsequent screen setup—see “Mapping Selector Results to Adapter Instances” on page 173.

**Defining AuthN Context Results**

On the Selector Result Values screen, list the authentication contexts to be associated with specific adapter instances (see “Mapping Selector Results to Adapter Instances” on page 173). These results are also used as the criteria for adapter selection.

To add values:

1. Enter a Result Value and click **Add**.
   
   Values may include URIs defined in the SAML specifications (see the OASIS SAML document saml-authn-context-2.0-os.pdf) or any other value agreed upon with an SP partner.

2. Add more values to differentiate criteria for adapter selection.

**Finishing the Selector-Instance Configuration**

To complete the selector-instance configuration, click **Done** on the Summary screen.
On the Manage Adapter Selector Instances screen, add more instances or click **Next** to complete the selector configuration (see the next section, “Mapping Selector Results to Adapter Instances”).

**Mapping Selector Results to Adapter Instances**

To complete the adapter-selector configuration, an administrator must map the results of selector instances to adapter instances—that is, define which IdP adapter instance to invoke under what condition, according to the criteria defined for the selector instance.

**Note:** At runtime, the order of adapter-instance selection attempts is determined by the order of selector-instance mappings on this screen. (The selection process stops when a match is found, and control is passed to the SP connection runtime configuration.) Change the order as needed using the arrows in the left column.

<table>
<thead>
<tr>
<th>Configuring My Server</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage Adapter Selector Instances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☑ Manage Adapter Selector Instances</td>
<td>☑ Map Results to Adapter Instances</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Enable Adapter Selector Instances to be applied as authentication policy during SSO processing. Multiple Selector instances are applied in the specified order. Map each selector result value to an IdP Adapter Instance.
- Enable Adapter Selection

<table>
<thead>
<tr>
<th>Selector Instance Name</th>
<th>Selector Values</th>
<th>IdP Adapter Instance</th>
<th>Status</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>odi</td>
<td>Yes</td>
<td>OpenToken</td>
<td>Active</td>
<td>Enable Deactivate</td>
</tr>
<tr>
<td>authn</td>
<td>no</td>
<td></td>
<td>Active</td>
<td>Enable Deactivate</td>
</tr>
</tbody>
</table>

**To complete this configuration:**

1. Ensure the checkbox Enable Adapter Selection is selected.

   **Tip:** This checkbox provides the capability of turning off adapter selection completely and is primarily useful during deployment testing. If this checkbox is not selected, all adapter-selection mappings are deactivated and adapter selection is based only on instances configured within SP connections. Note that each mapping may also be deactivated individually using links in the Action column.

2. For a Selector Instance Name that needs mapping, click **Edit** under Action.
3. Choose an IdP Adapter Instance from the drop-down lists for each Selector Result Value and click **Update**.

   If an applicable adapter instance is not listed, you can create it—click **Manage IdP Adapters**.

   **Note:** The default Yes/No values for CIDR instances indicate whether a requesting IP address falls within configured ranges.

4. Repeat the previous two steps for each Selector Instance Name.

5. (Optional) Select the checkbox **Fail If No Selection**.

   If no adapter instances match any of the selector-result mappings at runtime, by default PingFederate uses the adapter instance(s) configured for the applicable SP connection. This checkbox overrides this default behavior, allowing for cases where strict authentication policy might be required. When checked, an SSO request returns a failure message if no adapter instances satisfy requirements defined in the selector configuration.

### Configuring a Default URL and Error Message

As an IdP, you can specify a default URL indicating a successful SLO to the end-user (if no other page is designated). On the **IdP Default URL** page, you can also customize an error message to be displayed as part of the error page rendered in the end-user's browser if an error occurs during IdP-initiated SSO. For example, you might consider modifying the default text to include useful information regarding whom the user should contact or what their next step should be.

**Note:** The error message is displayed only when the application calling the start-SSO endpoint does not explicitly provide its own error page URL.

Your application or your partner’s application may supply the URL at runtime (see “IdP Endpoints” on page 429); but if none is provided, PingFederate will use the default value you enter on this screen.

**Tip:** If you leave the default URL blank, PingFederate provides a built-in landing page for the user. This Web page is among the templates you can modify with your own branding or other information (see “Customizing User-Facing Screens” on page 76).
Viewing Protocol Endpoints

Viewing Application Endpoints

Click Application Endpoints on the Main Menu to see a list of endpoints and descriptions applicable to your federation role (IdP or SP). These endpoints are built into PingFederate and cannot be changed.

Web-application developers at your site need to know the application endpoints to initiate transactions via PingFederate (see “SSO Integration Kits and Adapters” on page 14).

**Note:** For specific parameters required or allowed for Application Endpoints, see “IdP Endpoints” on page 429.

This screen also shows a Maintenance Endpoint that you can use to verify that the PingFederate server is running (see “System-Services Endpoints” on page 437).

Viewing Protocol Endpoints

Click Protocol Endpoints under Federation Settings in the IdP Configuration section of the Main Menu to see a list of SAML, WS-Federation, and/or WS-Trust STS endpoints—a pop-up window displays only those endpoints related to the federation protocols enabled in Server Settings (see “Choosing Roles and Protocols” on page 89). These endpoints are built into PingFederate and cannot be changed.

Your federation partners or STS clients need to know the applicable IdP Services endpoints to communicate with your PingFederate server. Configured service endpoints for SAML connections are included in metadata export files (see “Exporting Metadata” on page 48).
The table below describes each endpoint:

<table>
<thead>
<tr>
<th>Service</th>
<th>URL and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Logout Service (SAML 2.0)</td>
<td>/idp/SLO.saml2</td>
</tr>
<tr>
<td></td>
<td>The URL that receives and processes logout requests and responses.</td>
</tr>
<tr>
<td>Single Sign-on Service (SAML 2.0)</td>
<td>/idp/SSO.saml2</td>
</tr>
<tr>
<td></td>
<td>The SAML 2.0 implementation URL that receives authentication requests for processing.</td>
</tr>
<tr>
<td>Artifact Resolution Service (SAML 2.0)</td>
<td>/idp/ARS.ssaml2</td>
</tr>
<tr>
<td></td>
<td>The SOAP endpoint that processes artifacts returned from a federation partner to retrieve the referenced XML message on the back channel.</td>
</tr>
<tr>
<td></td>
<td>(See “Important” footnote in this table.)</td>
</tr>
<tr>
<td>Attribute Query Service (SAML 2.0)</td>
<td>/idp/attrsvc.ssaml2</td>
</tr>
<tr>
<td></td>
<td>The SAML implementation that receives and processes attribute requests.</td>
</tr>
<tr>
<td></td>
<td>(See “Important” footnote in this table.)</td>
</tr>
<tr>
<td>Metadata Service</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td>The default endpoint (empty path) from which partners can retrieve Auto-Connect metadata (see “Using Auto-Connect” on page 28).</td>
</tr>
<tr>
<td>Single Sign-on Service (SAML 1.x)</td>
<td>/idp/isx.saml1</td>
</tr>
<tr>
<td></td>
<td>The SAML 1.x implementation of IdP intersite transfer service (ISX) to which clients are redirected for SSO requests.</td>
</tr>
<tr>
<td>Artifact Resolution Service (SAML 1.x)</td>
<td>/idp/soap.ssaml1</td>
</tr>
<tr>
<td></td>
<td>The SOAP endpoint that processes artifacts returned from a federation partner to retrieve the referenced XML message on the back channel.</td>
</tr>
<tr>
<td></td>
<td>(See “Important” footnote in this table.)</td>
</tr>
<tr>
<td>Single Sign-on Service (WS-Federation)</td>
<td>/idp/prp.wsf</td>
</tr>
<tr>
<td></td>
<td>The WS-Federation implementation URL that receives and processes security-token requests and SLO messages.</td>
</tr>
</tbody>
</table>
Managing SP Connections

As an IdP, you manage connection settings to support the exchange of federation-protocol messages (SAML, WS-Federation, or WS-Trust) with an SP or STS client application at your site.

**Note:** If you are configuring a new connection only for WS-Trust STS, follow the sections in this part of the manual up to and including “General Information” on page 186. Then turn to “WS-Trust STS Configuration” on page 351.

These settings include:

- User attributes you expect to send in an SSO assertion (including STS SAML tokens).
- User attributes that may be sent using the Attribute Query profile (if that profile is used).
- The protocol and, for SAML, the profile you will use, including detailed security specifications (the use of digital signatures, signature verification, XML encryption, and SSL). For more information see the “Supported Standards” chapter in Getting Started.

To continue with the configuration, you and your connection partner must have decided this information in advance (see “Federation Planning Checklist” on page 32). Your federation partner must supply some connection settings and other information (see “Configuration Data Exchange” on page 34).

**Tip:** PingFederate provides the capability of using a template to create simple, lightweight connections for browser-based SSO to SP partners (see “About PingFederate Express” on page 27).
Chapter 6
Identity Provider SSO Configuration

Tip: If you are configuring connections to more than one partner under SAML 2.0 specifications, or if you intend to add partners in the future, consider using Auto-Connect (see “Configuring SP Auto-Connect” on page 261).

If your agreement includes sending assertions containing attribute values from a local data store, then you need to define the data store during this configuration if you have not done so already (see “Managing Data Stores” on page 98).

Accessing Connections

You can create or modify connections directly via the Main Menu. Note that the menu displays the four most-recently modified connections. To view a list of all SP connections, click the Manage All SP link.

Via the Main Menu

From the Main Menu under My IdP Configuration, you can configure a new connection, modify an existing connection, or view connections.

Tip: To copy or delete connections or to recover connection drafts, click Manage All SP (see “Via the Manage Connections Screen” on page 179).

Note that long connection names are truncated for this display and the list is limited to four connections, chronologically ordered according to most recently edited. The full connection names and a complete list are displayed on the Manage Connections screen (see “Via the Manage Connections Screen” on page 179).

To begin configuring a new connection:

- Click Create New under SP Connections on the Main Menu.
To modify a connection:

1. Click the connection name under SP Connections on the Main Menu. Only the four most recently edited connections are displayed. To see all connections, including drafts, click Manage All SP.

2. On the Activation & Summary screen, click the heading for the information you want to change.

3. Make your change and click Save.

**Tip:** If you want to use a virtual ID for a second connection to the same partner, the fastest way is to click Manage All SP and copy the first connection (see “Via the Manage Connections Screen” on page 179). For information about virtual IDs, see “Federation Server Identification” on page 33.

**To modify a connection:**

1. Click the connection name under SP Connections on the Main Menu. Only the four most recently edited connections are displayed. To see all connections, including drafts, click Manage All SP.

2. On the Activation & Summary screen, click the heading for the information you want to change.

3. Make your change and click Save.

**Note:** If Save is not available, it means your modification requires other changes or you are editing a screen that is part of a series of subtasks. Click Next and continue making indicated changes. The Done button indicates that further changes in the task are optional. When you have no further changes, click Done and then click Save on the task summary screen.

Via the Manage Connections Screen

From the Manage Connections screen you can:

- Create a new connection.
- Modify or copy an existing connection.
- Continue working on a connection draft.
- Delete a connection—if it is not active or referenced in other parts of the configuration (In Use).
- Export individual connection configurations.

**Note:** The connection export function results in an XML file that you can modify and import into another PingFederate server acting in the same federation role (IdP or SP) at your site (see “Connection Management Service” on page 445). You can also automate this process (see “Automating Configuration Migration” on page 68).

- Export metadata about a connection to expedite your partner’s corresponding configuration (see “Exporting Metadata” on page 48).

**Tip:** Use this function for PingFederate Express connections (see “About PingFederate Express” on page 27). Save the resulting ZIP file on your file system and send it to your Express partner.
Chapter 6
Identity Provider SSO Configuration

On this screen you can also globally override transaction logging levels set for individual connections or restore connection-based logging (see “Runtime Transaction Logging” on page 41).

**Tip:** A green icon (✔️) next to a Connection Name indicates that the connection has been checked for configuration errors. For more information about connection-validation features associated with this screen, see “Managing Connection Validation” on page 181.

To access the Manage Connections screen:

- Click **Manage All SP** under **SP Connections** on the Main Menu.

To begin configuring a new SP connection:

- Click **Create Connection** on the Manage Connections screen.

**Tip:** If you need to create a second connection to a partner using a Virtual ID, copy the existing connection and make necessary changes, including adding the Virtual ID on the General Info screen. For information about Virtual IDs, see “Federation Server Identification” on page 33.

To copy a connection:

1. Click **Copy** under **Action** for the connection you want to copy.
2. Enter new General Information for the connection (see “General Information” on page 186).
3. Make any further changes needed for the new connection.

**Note:** SaaS-Provisioning configurations are not copied for a connection (see “SaaS Provisioning” on page 31).

To edit a connection or continue working on a draft:

- Click the Connection Name link.

For a draft, you will return to where you left off.
To export a connection:
1. Click Export Connection under Action for the connection.
2. Save the XML file on your file system.
   You can change the name of the file, but keep the XML extension.

   **Tip:** You can import the connection programmatically or manually into another instance of PingFederate acting in the same role (see “Connection Management Service” on page 445).

To export connection metadata:
1. Click Export Metadata under Action for the connection.

   **Note:** For SP PingFederate Express connections, save the resulting ZIP file on your file system and send it your Express partner (see “About PingFederate Express” on page 27). For other connection types, continue to the next step.

   For non-Express connections this action takes you to the Export Metadata screen flow, with the connection selection preset (see “Exporting Metadata” on page 48).

2. Complete the steps remaining in the Export Metadata screen flow (starting at Step 4 under “To export connection metadata:” on page 49).

To delete a connection:
1. Under Action, click Delete for the connection.
   (To undo the deletion, click Undelete.)

   **Note:** The Delete function is not available if the connection is Active or In Use.

2. To confirm the deletion, click Save.

To sort the list of connections:
   ▶ Click the arrow next to any column heading to sort the list based on that column.

To filter the list by Protocol and/or Status:
   ▶ Select a filter criterion from either or both of the drop-down lists.

To override connection-based transaction logging:
1. Select On under Logging Mode Override.
2. Choose the logging mode you want to use for all connections.

To restore connection-based transaction logging:
   ▶ Select Off under Logging Mode Override.

Managing Connection Validation
By default PingFederate automatically validates all existing connections before displaying the Manage Connections screen. This validation ensures that any updates to supporting components—adapters or data-store configurations, for example—have not invalidated any connection settings.
If such errors are found, a warning icon (⚠️) appears next to the Connection Name.

To correct errors:

- Click the Connection Name to reach the top-level task in which reconfiguration is needed, and to see the error message. Then navigate into deeper tasks using Configure... buttons to find a link to the screen that needs updating.

  (For more information about console navigation, see “About Tasks and Steps” in the “Console Navigation” chapter of Getting Started.)

Note that the connection validation time increases with the number of connections and when connections are configured to access data stores for attribute mapping. Consequently, there may be noticeable delays in displaying the Manage Connections screen. For this reason, PingFederate provides a way to turn off the automatic validation under Server Settings (see “Setting System Options” on page 93).

When validation is turned off, administrators can check connections manually on the Manage Connections screen. A question-mark icon (❓) indicates the connection has not been validated. In addition, Action links are disabled (except for Delete, if the connection is Inactive and/or In Use). You may, however, still edit the connection by clicking its name.

When automatic validation is disabled, use one of the following procedures to validate connections:

To validate a single connection:

- Click ❓ next to the Connection Name.

  Note: Validating a single connection does not check connectivity for any configured data-store lookups (see “Selecting Assertion Mapping” on page 200). However, this check is performed when you access the connection for editing.

To validate all connections (including for data-store connectivity):

1. Click Check All Connections for Errors.
2. When prompted, click Yes.

Choosing a Connection Template

On the Connection Template screen (shown only for a new connection), you can choose a quick-connection template for PingFederate Express partners (see “About PingFederate Express” on page 27). Or if your installation includes an optional PingFederate SaaS Connector, you can choose the template indicated for the applicable SaaS vendor (see “SaaS Provisioning” on page 31).

Tip: When you select a Connection Template, many connection settings are configured for you automatically. For information about using the PingFederate Express template and what steps remain to be configured, see “Using the Express Connection Template” on page 257. For information about using SaaS Connector templates, refer to the Quick Connection Guide available with your PingFederate SaaS Connector.
To configure a connection without a template, click Next.

To use a template, select that option, then choose the template and enter additional information as required.

For guidance on any entries required on this screen, as well as for further template-configuration requirements and options, see either:

- “Using the Express Connection Template” on page 257
- The Quick Connection Guide contained in the distribution package for the selected SaaS Connector

Note: Once you have clicked Next, you cannot return to this screen and make a different selection. If you intended to use a different template or no template, you must create a new connection.

Choosing a Connection Type

If you are not using a connection template (which preconfigures browser-based SSO), indicate on the Connection Type screen whether the connection to this partner is for Browser SSO and WS-Trust STS (see “Connection Types” on page 5).

Note: Except for PingFederate Express connections, you can add STS and OAuth support to any existing SSO connection, or vice versa, at any time.
Chapter 6
Identity Provider SSO Configuration

If your federation deployment supports multiple protocols and you are not using a connection template, then for new SSO connections you can also select the applicable protocol on the Connection Type screen (see “Choosing Roles and Protocols” on page 89).

<table>
<thead>
<tr>
<th>Connection Template</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browser SSO Profiles</td>
<td>SAML 2.0</td>
</tr>
<tr>
<td>WS-Trust STS</td>
<td></td>
</tr>
</tbody>
</table>

If your federation deployment supports multiple protocols and you are not using a connection template, then for new SSO connections you can also select the applicable protocol on the Connection Type screen (see “Choosing Roles and Protocols” on page 89).

Note: If your partner’s deployment also supports multiple protocols and you intend to communicate using more than one, then you must set up a separate connection for each protocol.

- To configure a connection for secure Internet SSO, select Browser SSO Profiles and the Protocol (if necessary).
- To configure a connection for WS-Trust STS, make that selection and then select a Default Token Type.

  The Default Token Type, either SAML 1.1 or 2.0, is used when a Web Service client does not specify in the token request what token type the STS should issue.

  Note: The Default Token Type does not need to match the Protocol indicated on the screen for SSO (when applicable).

- (Optional) If your PingFederate license manages connections by groups, then you can select a group for this connection.

  This option is not displayed for unrestricted or other types of licenses.

Choosing Connection Options

On the Connection Options screen, if your installation includes a PingFederate SaaS Connector that supports provisioning and you are using the associated connection template, you can confirm whether to configure provisioning (the default) for this connection (see “SaaS Provisioning” on page 31).
Managing SP Connections

For SAML 2.0, you also have the option of configuring the Attribute Query profile, with or without SSO (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

**Note:** This screen is presented only for browser-based SSO connections (see “Choosing a Connection Type” on page 183).

- To create a connection for secure Internet SSO, ensure that Browser SSO is selected and click **Next**.
- If you are using a connection template for a SaaS provider but do not want to configure provisioning for this connection, clear the SaaS Provisioning checkbox.

### Importing Metadata

If you are using one of the SAML protocols (without a connection template) and have received a metadata file from your partner, click **Browse** on the Import Metadata screen, select the file, and click **Next**.

**Note:** If the endpoints in the metadata file share the same base URL (protocol, hostname, and port), PingFederate uses this information to populate the Base URL field (see “General Information” on page 186). Consequently, individual endpoints on other screens do not include this information—only relative paths are shown.

**Note:** If you are importing a signed metadata file that does not include the certificate and public key, you will be asked to import the certificate needed to verify the XML signature (see the next section).

If you are not using a metadata file, click **Next** on the Import Metadata screen.

### Importing a Verification Certificate

The Import Certificate screen appears only if the metadata file you have chosen to import is signed and the certificate needed to verify the signature is not contained in the file.

- Click **Browse** to locate and open the signature verification certificate for this partner.
Viewing the Metadata Summary

The Metadata Summary screen provides security information about an imported metadata file, including whether the file was signed and, if so, the trust status of the certificate used to verify the signature.

General Information

On the General Info screen, you provide a required unique identifier and display name for a connection, as well as optional contact information. In addition, on this screen you can set the level of transaction logging for this connection partner (see “Runtime Transaction Logging” on page 41).
# Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner’s Entity ID/ Audience/ Partner’s Realm (Connection ID)</td>
<td>(Required) The published, protocol-dependent, unique identifier of your partner. For a SAML 2.0 connection, this is your partner’s SAML Entity ID. For a SAML 1.x connection, this is the Audience your partner advertises. For a WS-Federation connection, this is your partner’s Realm. This ID may have been obtained out-of-band or via a metadata file if you are using a SAML protocol (see “Exporting Metadata” on page 48). For STS-only connections, this ID can be any unique identifier.</td>
</tr>
<tr>
<td>Connection Name</td>
<td>(Required) A plain-language identifier for the connection—for example, a company or department name. This name is displayed in the connection list on the Main Menu.</td>
</tr>
<tr>
<td>Virtual Server ID</td>
<td>Enter a unique server ID in this field if you want to identify your server to this connection partner using an ID other than the one you specified under Server Settings (see “Specifying Federation Information” on page 91).</td>
</tr>
<tr>
<td>Base URL</td>
<td>The fully qualified hostname and port on which your partner’s federation deployment runs (e.g., <code>https://www.pingidentity.com:9031</code>). This entry is an optional convenience, allowing you to enter relative paths to specific endpoints, instead of full URLs, during the configuration process.</td>
</tr>
<tr>
<td>Company</td>
<td>The name of the partner company to which you are connecting.</td>
</tr>
<tr>
<td>Contact Name</td>
<td>The contact person at the partner company.</td>
</tr>
<tr>
<td>Contact Number</td>
<td>The phone number of the contact person at the partner company.</td>
</tr>
<tr>
<td>Contact Email</td>
<td>The email address for the contact person at the partner company.</td>
</tr>
<tr>
<td>Logging Mode</td>
<td>The level of transaction logging applicable for this connection (see “Runtime Transaction Logging” on page 41).</td>
</tr>
</tbody>
</table>

**To reach this screen:**

1. Click a connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **General Info** under the SP Connection tab.
Chapter 6  
Identity Provider SSO Configuration

For a new connection:
- Fill in the information needed and click Next.
  
  Connection ID and Connection Name are required (see “Field Descriptions” above).

  Note that the Virtual ID identifies your own federation deployment for this connection only and overrides the ID you specified under Server Settings (see “Federation Server Identification” on page 33).

For an existing connection:
- If you are editing existing information, modify the fields as needed and click Save.

Configuring Browser-Based SSO

Browser-based SSO (also, Browser SSO) is another term for secure Internet SSO, which relies on a user’s Web browser and HTTP to broker XML identity-federation messaging between an IdP and an SP (in contrast to WS-Trust STS messaging, which is typically application-driven across the back channel and does not require browser mediation).

To continue, click Configure Browser SSO.

Configuration Steps

Many steps involved in setting up a federation connection are protocol-independent; that is, they are required steps for all connections, regardless of the associated standards (see the “Supported Standards” chapter in Getting Started). Also, for any given connection, some configuration steps are required under the applicable protocol, while others are optional. Still others are required only based on certain selections. The PingFederate administrative console determines the required and optional steps based on the protocol and dynamically presents additional requirements or options based on selections.
The following sections provides sequential information about every step you might encounter while configuring browser-based SSO, regardless of the protocol you are using for a particular connection.

**Note:** The configuration screens represented in this chapter show “SAML 2.0” in their left corners, unless they are exclusive to WS-Federation or SAML 1.x setup requirements. When the SAML 2.0 screens are also applicable to SAML 1.x and/or WS-Federation connections, the SAML 2.0 representations and discussions also apply to the other protocols, unless otherwise indicated.

After configuring SSO settings, you will normally need to configure authentication credentials, the range of which depends on your SSO selections (see “Configuring Credentials” on page 231). Also, other configuration tasks may remain to be configured for new or modified connections, depending on selected connection options (see “Choosing Connection Options” on page 184).

**Important:** For new connections you must completely configure these SSO settings and subsequent tasks before you can save the connection on the Activation & Summary screen. Until then, the configuration is temporary and can be lost; the console times out after several minutes of inactivity. At any time, however, you can click **Save Draft**, which is available on most screens after you enter General Information (see “Console Buttons” in the “Console Navigation” chapter of *Getting Started*).

Use the lists and links (or page references) below to find specific information about steps that may apply to your SSO connection requirements:

**SAML 2.0 SSO Configuration Steps**
- “Choosing Profiles (SAML 2.0)” on page 190
- “Setting an Assertion Lifetime” on page 192
- “Assertion Creation” on page 193
  - “Choosing an Identity Mapping Method” on page 194
  - “Creating an Attribute Contract” on page 196
  - “IdP Adapter Mapping” on page 198
- “Configuring Protocol Settings” on page 217
  - “Setting Assertion Consumer Service URLs (SAML)” on page 217
  - “Specifying SLO Service URLs (SAML 2.0)” on page 220
  - “Choosing Allowable SAML Bindings (SAML 2.0)” on page 221
  - “Setting an Artifact Lifetime (SAML)” on page 222
  - “Specifying Artifact Resolver Locations (SAML 2.0)” on page 222
  - “Defining Signature Policy” on page 223
  - “Configuring XML Encryption Policy (SAML 2.0)” on page 224

**WS-Federation SSO Configuration Steps**
- “Setting an Assertion Lifetime” on page 192
- “Assertion Creation” on page 193
  - “Choosing an Identity Mapping Method” on page 194
  - “Creating an Attribute Contract” on page 196
Choosing Profiles (SAML 2.0)

A SAML profile is the message-interchange scenario that you and your federation partner have agreed to use (see “Federation Planning Checklist” on page 32). For SAML 2.0, PingFederate supports all IdP- and SP-initiated SSO and SLO profiles.

For information on typical SSO/SLO profile configurations, including illustrations, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

Note: This screen is not presented for SAML 1.x connections because IdP SSO is assumed, the SLO profiles are not supported, and the server supports SP-initiated SSO automatically (see “SAML 1.x Profiles” in the “Supported Standards” chapter of Getting Started).

The screen is also not presented for WS-Federation connections because profile selection is not required (see “WS-Federation” in the “Supported Standards” chapter of Getting Started).
Managing SP Connections

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click SAML Profiles on the Summary screen.

To configure profiles:
1. Select the profile(s) applicable to this connection and click Next.
   You must select an SSO profile before you can enable SLO.
2. Continue through the remaining connection-configuration tasks.

The following topics provide more information on requirements for each SAML profile:

- “Configuring IdP-Initiated SSO” on page 191
- “Configuring SP-Initiated SSO” on page 191
- “Configuring IdP-Initiated SLO” on page 192 (SAML 2.0)
- “Configuring SP-Initiated SLO” on page 192 (SAML 2.0)

Configuring IdP-Initiated SSO

When PingFederate is operating as an IdP, the IdP-initiated SSO profile configuration defines the message-transport mechanisms (bindings) your enterprise has agreed to use for this partner, plus optional digital signature requirements for outbound assertions (see “Security Infrastructure” on page 23).

For illustrations of typical profile and binding scenarios, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

For this configuration you need to know:

- The transport binding(s) to which you and your partner have agreed
- The certificate to be used for signing assertions (not always required for the artifact binding)
- The URL(s) of your partner’s Assertion Consumer Service(s)

Configuring SP-Initiated SSO

The SP-initiated profile configuration for SSO defines the message-transport mechanisms (bindings) and security requirements for receiving authentication requests and sending assertions when your SP partner initiates SSO transactions (see “Single Sign-on” in the “Supported Standards” chapter of Getting Started).

For SAML 1.x, the SP-initiated SSO profile is also known as the “destination-first” profile, which was added as a supported “non-normative” use case after the release of the SAML 2.0 specifications. As an IdP, you do not need to configure this profile; when the SP sends an authentication request to your SSO Service endpoint, PingFederate will handle the response automatically.

For illustrations of typical profile and binding scenarios, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

For this configuration you will need to know:

- The endpoint URL(s) for your SP’s Assertion Consumer Service(s)
- The transport bindings that you and your partner have agreed upon inbound and outbound
Chapter 6
Identity Provider SSO Configuration

- The certificates you will use to sign outbound assertions and to verify incoming digital signatures from your SP, when either is required

When Artifact is an allowable inbound SAML binding, you also need to know the endpoint(s) to your partner’s Artifact Resolution Service(s) and the SOAP client authentication mechanism to use: either HTTP Basic, SSL client certificates, a digital signature, or a combination of these mechanisms.

**Configuring IdP-Initiated SLO**

The SAML 2.0 IdP-initiated SLO profile configuration defines the message-transport mechanisms (bindings) and security requirements for exchanging SLO requests and responses.

For more information about SLO, see “Single Logout” in the “Supported Standards” chapter of Getting Started.

For this configuration you need to know:

- The transport bindings to which you and your partner have agreed to send SLO requests and receive responses
- The certificates to be used for signing outgoing messages and for verifying incoming digital signatures from your SP (not always required for the artifact binding)
- The URL(s) of your SP’s Single Logout Service(s)

**Configuring SP-Initiated SLO**

The SAML 2.0 SP-initiated SLO profile configuration defines the message-transport mechanisms (bindings) and security requirements that you and your partner have agreed upon for exchanging SAML requests and responses.

For more information about SLO, see “Single Logout” in the “Supported Standards” chapter of Getting Started.

For this configuration you need to know:

- The transport bindings that you and your partner have agreed upon to send SLO requests and receive responses
- The certificates to be used for signing outgoing messages and for verifying incoming digital signatures from your SP (not always required for the artifact binding)
- The URL(s) of your SP’s Single Logout Service(s)
- The URL of your SP’s Artifact Resolution Service(s)—if this binding and endpoint are different from your SSO configuration—and SOAP client authentication requirements

**Setting an Assertion Lifetime**

Identity-federation standards require a window of time during which an assertion is considered valid. Each assertion has a time-stamp XML element as well as elements indicating the allowable lifetime of the assertion (in minutes) before and after the assertion time stamp.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Before</td>
<td>The amount of time before the assertion was issued during which it is to be considered valid.</td>
</tr>
<tr>
<td>Minutes After</td>
<td>The amount of time after the assertion was issued during which it is to be considered valid.</td>
</tr>
</tbody>
</table>

To change the default times:

- (Optional) Edit the desired setting(s) and click **Next** or **Save**.

Assertion Creation

As an IdP, you must specify how PingFederate will obtain user-authentication information and use it to create assertions appropriate for your SP partner, including additional user attributes as needed. This configuration includes:

- Choosing an identity-mapping method (see “Choosing an Identity Mapping Method” next).
- Defining the attribute contract you will use with this partner, if any (see “Creating an Attribute Contract” on page 196).
- Configuring instances of one or more adapters (see “IdP Adapter Mapping” on page 198) and specifying how they are used to fulfill the attribute contract.
Choosing an Identity Mapping Method

PingFederate allows your SP partner to use either account linking or account mapping to associate remote users with local accounts for SSO between business partners (see "Identity Mapping" on page 16). At the Identity Mapping step, you choose the type of name identifier your partner needs to facilitate one of these options. You and your partner may want to decide in advance which option to use (see “Federation Planning Checklist” on page 32).

The choices of name-identifier types depend on which protocol you are using:

- For information about SAML selections, see “SAML Name ID Selections” next.
- For information about WS-Federation selections, see “WS-Federation Name ID Selections” on page 196.

SAML Name ID Selections

The allowable types of name identifiers for SAML connections are described below. These choices affect how SPs make use of account mapping or account linking.
If your SP is using account linking, then establishing an attribute contract is not required. Depending on your partner agreement, however, you may choose to supplement the account link with an attribute contract. In this configuration the account link is used to determine the user's identity, while the additional attributes might be used for authorization decisions, customized Web pages, and so on, at the SP site (see “About Attributes” on page 17).

**Important:** If you have previously set up a configuration to use an attribute contract and want to change the configuration to use account linking without additional attributes, then the existing attribute contract will be discarded.

Account linking can be used with either a clear, standard name identifier or an opaque pseudonym.

- If you want to send a known attribute to identify a user—for example, a username or email address—then select **Standard**.

- If you and your partner have agreed to use an opaque persistent name identifier (often used for account linking), then select **Pseudonym** on the Identity Mapping screen.

The pseudonym is based on values pulled from the IdP adapter instance used to authenticate the user. You select these values when you configure IdP adapter instances (see “Setting Pseudonym Values and Masking” on page 168).

To set up an attribute contract to use in conjunction with an opaque identifier, select the checkbox next to “Include attributes . . .” after selecting **Pseudonym**.
Select **Transient** to enhance the privacy of a user's identity. Unlike a pseudonym, a transient identifier is different each time a user initiates SSO (see “Account Linking” on page 16).

A typical application for this selection might be, for example, when an SP provides generalized group accounts based on organizational rather than individual identity.

To set up an attribute contract to use in conjunction with an opaque identifier, select the checkbox next to “Include attributes . . .” after selecting **Transient**.

**To reach this screen:**
1. Click the connection name on the Main Menu.
   Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the SP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Assertion Creation** under the Browser SSO tab.
5. Click **Configure Assertion Creation**.
6. Click **Identity Mapping** on the Summary screen.

**WS-Federation Name ID Selections**
For WS-Federation purposes a name identifier is a uniquely identifying user attribute.

- **Email Address**: This attribute is commonly used as a unique identifier for SSO and SLO. Make this selection, for example, if a user logs in using an email address or if the information is available for lookup in a local data store.

- **User Principal Name**: The username or other unique ID of the subject initiating the transaction. Make this selection, for example, if a username will be available from the current user session as part of a cookie or can be derived from a local data store.

- **Common Name**: This selection provides for anonymous SSO to your SP, generally using a hard-coded generalized logon. Make this selection if your partner agreement involves a many-to-one use case—for example, if the SP has a group account set up for all users in a particular domain.

Later, you will map your choice to the **SAML_SUBJECT** attribute in the SAML assertion (see “Mapping Default Attribute Contract Fulfillment” on page 215).

**Creating an Attribute Contract**
An attribute contract is the set of user attributes that you and your partner have agreed will be sent in SAML assertions for this connection (see “Attribute Contracts” on page 18). You identify these attributes on this screen.

If you are sending a “standard” name identifier (see “Choosing an Identity Mapping Method” on page 194), then the contract includes the default **SAML_SUBJECT**, which identifies the user in the assertion. You will configure this variable later to contain a user ID or another agreed-upon attribute—for instance, an email address—that uniquely identifies the user (see “Attribute Contract Fulfillment” on page 211).

**Note:** Creating an attribute contract is optional if you are sending either a pseudonym or a transient identifier to your connection partner (see “Choosing an Identity Mapping Method” on page 194).
Managing SP Connections

To reach this screen:

1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click Attribute Contract on the Summary screen.

   If this step is not in the list, then you have chosen to send either a pseudonym or a transient identifier without additional attributes (see “Choosing an Identity Mapping Method” on page 194).

   Note: For WS-Federation connections, the Subject Name Format is determined by the previous screen (see “WS-Federation Name ID Selections” on page 196).

To add an attribute:

1. Enter the attribute name in the text box.

   Attribute names are case-sensitive and must correspond to the attribute names expected by your partner.

   Tip: You can add a special attribute, SAML_AUTHN_CTX, to indicate to the SP (if required) the type of credentials used to authenticate to the IdP application—authentication context. Map a value for the authentication context on the attribute-mapping screen later in the configuration, from any available attribute source (see “Attribute Contract Fulfillment” on page 211).

2. (Optional) Select the Attribute Name Format.

   Note: This option is not available for SAML 1.0 connections.

   Change the default Name Format selection if you and your SP partner have agreed to a specific format (see “Name Formats” on page 19).
3. Click **Add**.

**(Optional) For SAML connections, to modify the Subject Name Format:**

- Make your selection in the drop-down list and click **Done**.

  The default selection is usually applicable, unless you and your partner have agreed to a different format specification (see “Name Formats” on page 19).

**Note:** This selection is not available if you are sending a pseudonym as the subject, or a transient identifier (see “Choosing an Identity Mapping Method” on page 194).

---

**To modify an attribute name or format:**

1. Click **Edit** under **Action** for the attribute.
2. Make the change and click **Update**.

**Note:** If you change your mind, ensure that you click the **Cancel** link in the Actions column, not the **Cancel** button, which discards any other changes you might have made in the configuration steps.

---

**To delete an attribute:**

- Click **Delete** under **Action** for the attribute.

---

**IdP Adapter Mapping**

IdP adapters are responsible for handling user authentication as part of an SSO operation (see “SSO Integration Kits and Adapters” on page 14). A configured and deployed adapter in PingFederate is known as an adapter instance. The same instance may be mapped by multiple connections.

Map one or more IdP adapter instances into each SP connection so that when a user authenticates with a particular external identity management system the user attributes are returned to PingFederate.

Regardless of how many IdP adapter instances are mapped in an SP connection, PingFederate uses only one instance to authenticate a user. Because each instance may return different user attributes, each IdP adapter mapping must define how the **attribute contract** is fulfilled; you must map attributes from each adapter—and/or attributes retrieved from your local data stores—into the assertions PingFederate sends to this SP to fulfill the attribute contract.

You begin this configuration on the **IdP Adapter Mapping** screen, where you choose to map instances of IdP adapters. If you have not yet configured an instance of the adapter you intend to use within this SP connection, see “Configuring IdP Adapters” on page 164.
To modify an existing Adapter Instance:

► Click its Name link.

To begin configuring an Adapter Instance for this connection:

► Click Map New Adapter Instance.

To reach this screen:

1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.

Selecting an Adapter Instance

A configured and deployed adapter in PingFederate is known as an adapter instance. The same adapter instance may be mapped by multiple connections (see “Configuring IdP Adapters” on page 164).

You can use attributes returned from the adapter (the adapter contract) to fulfill the attribute contract with this partner, and/or use them to look up additional attributes in a user-data store. You make this choice on the Assertion Mapping screen (see “Selecting Assertion Mapping” on page 200).
Choose an Adapter Instance from the drop-down list and click Next.

To create or change an adapter instance, as needed, click Manage Adapter Instances.

To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Adapter Instance on the Summary screen.

Selecting Assertion Mapping

For SAML assertions, you can query local user-data stores to help fulfill the attribute contract, in conjunction with attribute values supplied by the IdP adapter you are using with PingFederate (see “SSO Integration Kits and Adapters” on page 14).

When using data stores, you can use one or more data stores to look up attributes for a single mapping. Additionally, you can define alternate data stores and a failsafe mapping.

The attributes supplied by the adapter you have chosen are shown under Adapter Contract on the Assertion Mapping screen.

- If you use only the Adapter Contract values, then you map values for the attribute contract next (see “Mapping Default Attribute Contract Fulfillment” on page 215).
- If you choose to retrieve additional attributes, then you identify data stores and specify lookup queries next (see “Configuring Attribute Sources and User Lookup” on page 201).
To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Assertion Mapping on the Summary screen.

Tip: To determine whether you need to look up additional values, compare the attribute contract against the adapter contract (see “Creating an Attribute Contract” on page 196 and “IdP Adapter Mapping” on page 198). If the attribute contract requires more information, determine whether local data stores can supply it. (You can also choose to use text constants or expressions for certain information—see “Mapping Default Attribute Contract Fulfillment” on page 215.)

Configuring Attribute Sources and User Lookup
Attribute sources are specific data store or directory locations containing information that may be needed for the attribute contract (see “Creating an Attribute Contract” on page 196). Attribute sources can be reused across connections to other SP partners.

You can use more than one attribute source when mapping values to an assertion:
- Set up search parameters for your data stores, including “fall-through” searches. If any search fails, the next search executes until all searches are exhausted, at which point a configured failsafe mapping executes. If the failsafe mapping is not configured, the SSO transaction fails.

Note: Queries are executed in the order of Attribute Sources shown. Use the up/down arrows as needed to adjust the order. Note, however, that data can originate from only one source.

- Configure separate data stores to look up attributes for a single mapping. If any search fails to find a user, then the SSO transaction fails.
To configure an attribute source:

- Click Add Attribute Source and complete the setup steps (see “Attribute Source Setup” next).

To modify an attribute source configuration:

1. Click the attribute source Description link.
2. Click Save on the screen you change.

Note: Depending on what you change, you may need to modify dependent data in subsequent steps, as indicated. Click Save or Done when either of those options appears.

To reach this screen:

1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Attribute Sources & User Lookup under the IdP Adapter Mapping tab.

   If this step is not listed, then this instance is configured to use adapter values only (see “Selecting Assertion Mapping” on page 200).

Attribute Source Setup

For attribute-source setup information, refer to the sections indicated in the following steps.

Note: As you make selections on configuration screens, ensure that you allow enough time for PingFederate to access your data store and populate drop-down lists.

1. See “Selecting a Data Store” (next section).
2. See the following sections in this manual, depending on the type of data store:

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Related Manual Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDBC</td>
<td>“Selecting a JDBC Database Table and Columns” on page 204</td>
</tr>
<tr>
<td></td>
<td>“Configuring a Database Filter (WHERE Clause)” on page 206</td>
</tr>
<tr>
<td>LDAP</td>
<td>“Configuring an LDAP Directory Search” on page 208</td>
</tr>
<tr>
<td></td>
<td>“Configuring an LDAP Filter” on page 209</td>
</tr>
<tr>
<td>Custom</td>
<td>“Configuring Custom Source Filters” on page 211</td>
</tr>
<tr>
<td></td>
<td>“Selecting Custom Source Fields” on page 211</td>
</tr>
</tbody>
</table>
3. See “Attribute Contract Fulfillment” on page 211.

Selecting a Data Store

This screen allows you to choose a data store from a previously configured list (see “Managing Data Stores” on page 98). Attribute values extracted from this data store are used to help fulfill the attribute contract for this partner (see “Creating an Attribute Contract” on page 196).

To reach this screen:

1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Attribute Sources & User Lookup under the IdP Adapter Mapping tab.
   If this step is not shown, you have elected not to look up attributes in data stores (see “Selecting Assertion Mapping” on page 200).
9. Click the attribute source Description link.

To define an attribute source:

1. Enter an Attribute Source Id to uniquely identify the data source for the mapping.

   Note: This field appears only if you are retrieving additional attributes from multiple data stores using one mapping (see “Selecting Assertion Mapping” on page 200).

2. Use Attribute Source Description to specify an attribute source name that distinguishes this user lookup for the selected data store.

   Note: When using multiple data stores for one mapping, PingFederate appends this description to the data store type in the Source list on the Attribute Contract Fulfillment screen (see “Attribute Contract Fulfillment” on page 211).
3. Choose an Active Data Store and click **Next**.

A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click **Manage Data Stores** to add it (see “Managing Data Stores” on page 98).

**Selecting a JDBC Database Table and Columns**

When you choose to use a database source for attributes, you follow this path through the configuration steps.

On this screen you begin to specify exactly where additional data can be found to complete the attribute contract when you send an assertion to this SP (see “Creating an Attribute Contract” on page 196). Only one table may be used as a source of data for a JDBC lookup.

---

**Important: (For MySQL users)** To allow for table and column names that may contain spaces, PingFederate inserts double quotes around the names at runtime. To avoid SQL syntax errors resulting from the quotes, add the property `ANSI_QUOTES` to `sql-mode` in the configuration file `my.cnf` (on Unix/Linux) or `my.ini` (on Windows). For example:

```
sql-mode="...,ANSI_QUOTES"
```

For more information, see:

- dev.mysql.com/doc/refman/5.0/en/identifiers.html
- dev.mysql.com/doc/refman/5.1/en/option-files.html

---

**Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Lists the table structure that stores information within a database. Some databases, such as Oracle, require selection of a specific schema for a JDBC query. Other databases, such as MySQL, do not require selection of a schema.</td>
</tr>
</tbody>
</table>
To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Attribute Sources & User Lookup under the IdP Adapter Mapping tab.
   If this step is not shown, you have elected not to look up attributes in data stores
   (see “Selecting Assertion Mapping” on page 200).
9. Click the attribute source Description link.
10. Click Database Table and Columns.

To select a database table and columns for queries:
1. Choose a Schema file (when applicable) from the drop-down list.
2. Choose a Table from the drop-down list.
3. Choose a name under Columns to Return from Select and click Add Attribute.

Tip: Click Refresh if you are updating an existing configuration and changes may have been made to the database.

Repeat this step for other columns as needed.

Note: You do not need to add a column here for it to be used as part of a search filter (see “Configuring a Database Filter (WHERE Clause)” next). Add only attributes from which you need actual values to pass in an assertion.
Tip: To determine what attributes to look up during a query, click the View Attribute Contract link to see what information must be collected (see “Creating an Attribute Contract” on page 196). Then determine what information is coming in from the session lookup adapter (see “Selecting Assertion Mapping” on page 200). Information not contained in the adapter contract may be pulled from the data store look-up query.

Configuring a Database Filter (WHERE Clause)

The JDBC WHERE clause in PingFederate queries the data table you selected to retrieve a record associated with a particular value (or values) from the assertion. The clause is in the form:

\[ \text{WHERE column1=value1 [AND column2=value2] [OR ...]} \]

The left side of the first variable pair uses a column name in the database table you selected (see “Selecting a JDBC Database Table and Columns” on page 204). The right side generally uses values passed in from your session lookup adapter (variables, including the correct formatting, are listed under Adapter Values—see “Configuring IdP Adapters” on page 164).

Note: If you are retrieving attributes from multiple data stores using one mapping, attributes available from other sources, if previously configured, are listed near the bottom of the screen. For more information on multiple data-store mapping, see “Multiple Data Source Attribute Mapping” on page 21.

You can also apply additional search criteria from your own database, using any other columns from the targeted table.

Tip: Click “View List of Columns . . .” to see a list from which to copy and paste.

For more information about WHERE clauses, consult your DBMS documentation.

**EXAMPLE:**

\[ \text{userid='\{username\}\}} \]

In this example userid is the name of a column in the JDBC data store. On the right side, ‘\{username\}’ returns the value of the username variable from the IdP adapter.

**Important:** You must use the \{} syntax to retrieve the value of the enclosed variable and use single quotation marks around the \{} characters.
Managing SP Connections

To reach this screen:
1. Click the connection name on the Main Menu. Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click Attribute Sources & User Lookup under the IdP Adapter Mapping tab.
   If this step is not shown, you have elected not to look up attributes in data stores (see “Selecting Assertion Mapping” on page 200).
7. Click the attribute source Description link.
8. Click Database Filter from the steps list.

To construct the WHERE clause:
1. Enter the statement in the space provided, following the guidelines and example above.
   The initial WHERE is optional.
2. Ensure the syntax and variable names are correct.
   When you click Next, you will map attribute values returned from the database into the assertion (see “Attribute Contract Fulfillment” on page 211).

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where</td>
<td>WHERE clause statements conditionally select data from a table. Enter the WHERE clause statement in the space provided. For example: WHERE email='<a href="mailto:clive@company.com">clive@company.com</a>'.</td>
</tr>
</tbody>
</table>
Configuring an LDAP Directory Search

When you choose to use an LDAP source for attributes, you follow this path through the configuration steps.

On this screen you specify the branch of your LDAP hierarchy where you want PingFederate to look up user data.

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Base DN</td>
</tr>
<tr>
<td>Search Scope</td>
</tr>
<tr>
<td>Root Object Class</td>
</tr>
<tr>
<td>Attributes to return from search</td>
</tr>
</tbody>
</table>

To reach this screen:

1. Click the connection name on the Main Menu.
2. Click Manage All SP, if needed, to see a full list of connections.
3. Click Browser SSO under the SP Connection tab.
4. Click Configure Browser SSO.
5. Click Assertion Creation under the Browser SSO tab.
6. Click Configure Assertion Creation.
7. Click IdP Adapter Mapping on the Summary screen.
8. Click the Adapter Instance Name.
8. Click **Attribute Sources & User Lookup** under the IdP Adapter Mapping tab.

   If this step is not shown, you have elected not to look up attributes in data stores (see “Selecting Assertion Mapping” on page 200).

9. Click the attribute source Description link.

10. Click **LDAP Directory Search** from the steps list or fill out the appropriate screens and advance to this screen.

    If you have not yet defined an LDAP data store, see “Selecting a Data Store” on page 203.

**To select LDAP attributes:**

1. (Optional) Enter a **Base DN**.
2. Select a **Search Scope**.
3. Select a **Root Object Class**.
4. Under Attributes to return from search, choose an attribute and click **Add Attribute**.

   Note that the attribute **Subject DN** is always returned by default.
5. Repeat the last step for other attributes as needed.
6. (Optional) Change the **Search Scope** or the **Root Object Class** if you want attributes from other locations.

   **Note:** You do not need to add an attribute here for it to be used in a search filter (see “Configuring an LDAP Filter”). Add only attributes from which you need actual values to pass in an assertion.

---

**Configuring an LDAP Filter**

The LDAP filter queries the data you selected to retrieve a record associated with a particular value (or values) from the user's session. The filter is in the form: `(attribute=${value})`.

The left-side variable is an attribute you selected earlier (see “Configuring an LDAP Directory Search” on page 208).

The right side generally uses values passed in from your session lookup adapter (variables, including the correct syntax, are listed under Adapter Values—see “Configuring IdP Adapters” on page 164).

   **Note:** If you are retrieving attributes from multiple data stores using one mapping, attributes available from other sources, if previously configured, are listed near the bottom of the screen. For more information on multiple data-store mapping, see "Multiple Data Source Attribute Mapping" on page 21.

You can also apply additional search criteria from your data store, using any other attributes from the targeted object classes.

   **Tip:** Click “View List of Available LDAP Attributes” for a list from which you can copy and paste.

For general information about search filters, consult your LDAP documentation.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Narrows a search to locate requested data by either including or excluding specific records. An LDAP filter includes the attributes in the search and the value or range of values that the search is attempting to match. Searches are conducted by using three components: 1) at least one attribute (attribute data type) to search on, 2) a search filter operator that will determine what to match, and 3) the value of the attribute being sought. Searches must have at least one of each of these three components.</td>
</tr>
</tbody>
</table>

To reach this screen:

1. Click the connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Assertion Creation under the Browser SSO tab.
5. Click Configure Assertion Creation.
6. Click IdP Adapter Mapping on the Summary screen.
7. Click the Adapter Instance Name.
8. Click Attribute Sources & User Lookup under the IdP Adapter Mapping tab.
   - If this step is not shown, you have elected not to look up attributes in data stores (see “Selecting Assertion Mapping” on page 200).
9. Click the attribute source Description link.
10. Click LDAP Filter from the steps list.
    - If you have not yet defined an LDAP data store, see “Selecting a Data Store” on page 203.
To construct the LDAP filter:

1. Enter the statement in the space provided, following the guidelines and example above.

   **Note:** If you used an anonymous binding to create this LDAP connection, your access might be restricted (see “Configuring an LDAP Connection” on page 103).

2. Ensure the syntax and variable names are correct.
3. Click Next.

**Configuring Custom Source Filters**

When you choose to use a custom source for attributes, you follow this path through the configuration steps.

On this screen you specify a filter, or lookup query, for your custom data source. This screen display and the syntax of the filter depends on your developer’s implementation of the custom source SDK.

**Selecting Custom Source Fields**

On the Configure Custom Source Fields screen, you can choose from among the fields shown to map to the adapter contract. These choices are supplied by the driver implementation. Select only those needed to fulfill the attribute contract for this partner connection.

**Attribute Contract Fulfillment**

The last step in configuring an attribute source is to map values into the attribute contract (see “Creating an Attribute Contract” on page 196). These are the values included in assertions sent to this SP (provided the information is found in this attribute source).

You map attributes on the Attribute Contract Fulfillment screen.

   **Note:** This is an example screen. The screen presented may look and behave differently depending on how you are mapping assertions (see “Selecting Assertion Mapping” on page 200).
Map each attribute to fulfill the Attribute Contract from one of these Sources:

- **Adapter**
  Values are returned from the session. When you make this selection, the associated value drop-down list is populated by the session-lookup adapter (see “SSO Integration Kits and Adapters” on page 14).

  For example, you might choose the adapter attribute `username` to map to `SAML_SUBJECT`.

- **LDAP/JDBC/Custom**
  Values are returned from your attribute source. When you make this selection, the value list is populated by the LDAP, JDBC or Custom attributes you identified for this Attribute Source (see “Configuring an LDAP Directory Search” on page 208, “Selecting a JDBC Database Table and Columns” on page 204, or “Configuring Custom Source Filters” on page 211).

- **Expression (when enabled)**
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the adapter, using the `$\{attribute\}` syntax.

  You can also enter values from your data store, when applicable, using this syntax:

  `$\{ds.attr-source-id.attribute\}`

  where `attr-source-id` is the Attribute Source Id value (see “Selecting a Data Store” on page 203) and `attribute` is any of the data store attributes you select.

  When using alternate data stores and/or a failsafe mapping, the Attribute Source Id field is not presented. Use the following syntax in this instance:

  `$\{ds.attribute\}`

  where `attribute` is any of the data store attributes you select.
There are a variety of reasons why you might hard code a text value. For example, if your SP's Web application provides a service based on your company's name, you might provide that attribute value as a constant.

### To reach this screen:
1. Click the connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the SP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Assertion Creation** under the Browser SSO tab.
5. Click **Configure Assertion Creation**.
6. Click **IdP Adapter Mapping** on the Summary screen.
7. Click the Adapter Instance Name.
8. Click **Attribute Sources & User Lookup** under the IdP Adapter Mapping tab.
   - If this step is not shown, you have elected not to look up attributes in data stores (see “Selecting Assertion Mapping” on page 200).
9. Click the attribute source Description link.
10. Click **Attribute Contract Fulfillment** from the steps list.
   - (If you have not yet defined a data store, see “Selecting a Data Store” on page 203).

### To map attributes:
1. Choose a **Source** for each **Target** attribute.
   - See “Map each attribute to fulfill the Attribute Contract from one of these Sources:” above.
2. Choose (or enter) a **Value** for each **Attribute**.
   - All values must be mapped.
3. Click **Next**.

### Using the Attribute Source Summary Screen
When you have finished configuring Attribute Sources and User Lookup, you can review the configuration on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you are finished, click **Done** to continue with IdP Adapter Mapping configuration. If you are editing an existing connection, click **Done** on successive screens until you reach the Assertion Creation screen and then click **Save**.
Chapter 6  
Identity Provider SSO Configuration

### Specifying a Failsafe Attribute Source

When a data store is configured and the attribute mappings under Attribute Sources & User Lookup fail to complete the attribute contract, you can choose to configure a set of “failsafe” Attribute Contract Fulfillment mappings under IdP Adapter Mapping. (For example, you might configure a set of attributes to identify the SSO subject as a “guest” user at the SP.) The failsafe mapping is used instead of the mapping configured with the data-store setup.

**Note:** This screen does not appear if you chose to retrieve attributes from multiple data stores using a single mapping (see “Selecting Assertion Mapping” on page 200).

**Important:** The attribute contract is fulfilled using either the mapping configured under Attribute Sources & User Lookup or the failsafe mapping, not both. In other words, you cannot use the failsafe mapping to fill in missing attributes when some are found via the data-store mapping setup but others are not.

The failsafe mapping is used only when all of the mappings configured in the data-store setup fail to return values for any reason. If any mapping succeeds (an attribute mapped to text, for example), failover does not occur.

Alternatively, you can have PingFederate stop the SSO transaction. This choice depends on your agreement with the SP.

**Note:** If you chose to have PingFederate stop the SSO transaction, the Attribute Contract Fulfillment screen is not presented.

To specify whether to use a failsafe attribute source:

- Make the relevant selection to use either a default set of attributes or to terminate the SSO, and then click **Next**.

To reach this screen:

1. Click the connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the SP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Assertion Creation** under the Browser SSO tab.
5. Click **Configure Assertion Creation**.
6. Click **IdP Adapter Mapping** on the Summary screen.
7. Click the Adapter Instance Name.
8. Click **Failsafe Attribute Source** on the Summary screen.

   This step appears only if you chose to use alternate data stores and/or a failsafe mapping when retrieving attributes (see “Selecting Assertion Mapping” on page 200).

### Mapping Default Attribute Contract Fulfillment

Fulfillment of the attribute contract must be specified whether or not data sources are used. You accomplish this on the Attribute Contract Fulfillment screen, either by choosing to configure default mappings after setting up attribute sources (see “Attribute Contract Fulfillment” on page 211) or if you choose not to set up attribute sources (see “Selecting Assertion Mapping” on page 200).

**Map each attribute to fulfill the Attribute Contract from one of these Sources:**

- **Adapter**
  
  Values are returned from the session. When you make this selection, the associated Value drop-down list is populated by the session-lookup adapter (see “SSO Integration Kits and Adapters” on page 14).

  For example, you might choose the adapter attribute `username` to map to `SAML_SUBJECT`.

- **Expression (when enabled)**
  
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

  **Tip:** You can use an expression to insert an OAuth access token into the assertion for SP-partner use in OAuth transactions (see “About OAuth” on page 10). For information about this feature and a sample expression, refer to the PingFederate SDK Javadoc entry for the class `com.pingidentity.sdk.oauth20.AccessTokenIssuer`. Javadocs are located in the PingFederate installation: `<pf_install>/pingfederate/sdk/doc/index.html`.

- **Text**
  
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the adapter, using the `$\{attribute\}` syntax.
There are a variety of reasons that you might hard code a text value. For example, if your SP’s Web application provides a consumer service, you might want to supply a particular promotion code.

**Tip:** Two other variables are also available: \${SAML_SUBJECT} and \${TargetResource}. SAML_SUBJECT is the initiating user (or other entity). TargetResource is a reference to the protected application or other resource for which the user requested SSO access; this variable is available only if specified as a query parameter for the relevant PingFederate endpoint (either as TargetResource for SAML 2.0 or TARGET for SAML 1.x—see “Application Endpoints” on page 429).

To map attributes:
1. Choose a Source for each Target attribute (see descriptions of each Source under “Map each attribute to fulfill the Attribute Contract from one of these Sources” above).
2. Choose (or enter) a Value for each Attribute.
   - All values must be mapped.
3. Click **Next**.

To reach this screen:
1. Click the connection name on the **Main Menu**.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the SP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Assertion Creation** under the Browser SSO tab.
5. Click **Configure Assertion Creation**.
6. Click **IdP Adapter Mapping** on the Summary screen.
7. Click the Adapter Instance Name.
8. Click **Attribute Contract Fulfillment** on the Summary screen.

If you are using data stores for attribute mapping and this step does not appear, see “Specifying a Failsafe Attribute Source” on page 214.
Configuring Protocol Settings

The Protocol Settings screen provides the launching point for configuring bindings, partner endpoints, and other settings needed for the selected SAML profiles (if you are using SAML 2.0—see “Choosing Profiles (SAML 2.0)” on page 190). The screen also displays configured information.

(For WS-Federation, the configuration of bindings is not applicable.)

<table>
<thead>
<tr>
<th>Protocol Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound SSO Bindings</td>
</tr>
<tr>
<td>Outbound SLO Bindings</td>
</tr>
<tr>
<td>Inbound Bindings</td>
</tr>
<tr>
<td>Signature Policy</td>
</tr>
<tr>
<td>Encryption Policy</td>
</tr>
</tbody>
</table>

To configure Protocol Settings, you need to know:

- For SSO profiles, the URL(s) of your SP’s Assertion Consumer Service(s)
- For SLO profiles, the URL(s) of your SP’s Single Logout Service(s)
- When artifact is an allowable inbound binding, the URL of your SP’s Artifact Resolution Service(s)
- The transport configurations (bindings) that you will use to send and receive data for SSO/SLO connections
- Digital signature policies and certification requirements to which you and your connection partner have agreed
- XML encryption policies to which you and your connection partner have agreed

**Important:** After modifying Protocol Settings, you must click **Done** on the Protocol Settings screen and then **Save** on the Browser SSO screen.

Setting Assertion Consumer Service URLs (SAML)

At this step for SAML connections, you associate bindings to the Assertion Consumer Service (ACS) endpoint(s) where your SP will receive assertions. This configuration applies to either SSO Profile (see “Choosing Profiles (SAML 2.0)” on page 190).
To reach this screen for editing:
1. Click a connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Assertion Consumer Service URL on the Summary screen.

To define an Endpoint URL:
1. Select the Binding your partner specifies for the Endpoint.
2. (Optional) Enter an Index value — 0 or 1, for example.
   - For SAML 2.0 the specifications provide for the use of index numbers to identify multiple ACS endpoints. PingFederate supplies this number automatically; however, you can manually set the number to match your partner's configuration as needed.
3. Enter the fully qualified Endpoint URL or just a relative path if you have defined a base URL (see “General Information” on page 186).

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default (SAML 2.0)</td>
<td>A check in this checkbox indicates that the URL configuration in that row will be used as a default.</td>
</tr>
<tr>
<td>Index (SAML 2.0)</td>
<td>Uniquely identifies multiple ACS endpoints.</td>
</tr>
<tr>
<td>Binding</td>
<td>The method of transmission: POST or Artifact.</td>
</tr>
<tr>
<td>Endpoint URL</td>
<td>A location to which the assertion is sent, according to partner requirements.</td>
</tr>
</tbody>
</table>
4. For SAML 2.0 connections, if this is the default (or only) endpoint, select the checkbox under Default.

5. Click Add.

**Setting a Default Target URL (SAML 1.x)**

This URL is used whenever PingFederate receives an SSO request from a local application that does not include the user's target resource URL at the SP site. The URL is required regardless of whether you expect your local application(s) to specify the target—to ensure that the server functions correctly during SSO events.

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Target URL</td>
<td>The URL of the target SP resource.</td>
</tr>
</tbody>
</table>

To reach this screen for editing:

1. Click a connection name on the Main Menu. 
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Default Target URL on the Summary screen.

**Defining a Service URL (WS-Federation)**

The Service URL is the WS-Federation endpoint of your SP partner where you send SAML assertions and SLO cleanup messages. The assertions are transmitted within an RSTR (Request for Security Token Response) message in response to a request for authentication from the SP. SLO cleanup messages are sent to WS-Federation SP partners when the IdP receives a user's SLO request. Such cleanup messages indicate that the user's local session has been terminated.
Chapter 6
Identity Provider SSO Configuration

Specifying SLO Service URLs (SAML 2.0)

At this step you associate bindings to the endpoints where your SP receives logout requests when SLO is initiated at your site and where you send SLO responses when you receive SLO requests from the SP.

This step applies only to SAML 2.0 connections when you select either SLO profile (see “Configuring IdP-Initiated SLO” on page 192 or “Configuring SP-Initiated SLO” on page 192).

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding</td>
<td>The method of transmission: POST, Artifact, Redirect, or SOAP.</td>
</tr>
<tr>
<td>Endpoint URL</td>
<td>A location to which logout messages are sent, according to SP requirements.</td>
</tr>
<tr>
<td>Response URL</td>
<td>(Optional) A location on this IdP to which logout responses are sent.</td>
</tr>
</tbody>
</table>
**Managing SP Connections**

**To reach this screen for editing:**
1. Click a connection name on the Main Menu.
   * Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the SP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Protocol Settings** on the Summary screen.
5. Click **Configure Protocol Settings**.
6. Click **SLO Service** URLs on the Summary screen.

**To add a URL**
1. Select the Binding type.
2. Enter the fully qualified URL (or the relative path, if you have specified a base URL—see “General Information” on page 186).
3. (Optional) Enter the Response URL.
4. Click **Add**.

**To edit an endpoint:**
1. Click **Edit** under Action for the endpoint.
2. Make your change and click **Update**.

**To delete an entry:**
1. Click **Delete** under Action for the endpoint.

**Choosing Allowable SAML Bindings (SAML 2.0)**

At this step for SAML 2.0 connections, you select the binding(s) that your SP partner will use to send SAML authentication requests or SLO messages.

This configuration applies to SP-initiated SSO and to either SLO profile.

```
<table>
<thead>
<tr>
<th>SAML 2.0</th>
<th>Configuring 'HR_provider' SP Connection</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protocol Settings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Assertion Consumer Service URL
- SLO Service URLs
- Allowable SAML Bindings
- Signature Policy
- Encryption Policy
- Summary

When the SP sends messages, what SAML bindings do you want to allow?

- [] Artifact
- [X] POST
- [] Redirect
- [] SOAP
```

**To reach this screen for editing:**
1. Click a connection name on the Main Menu.
   * Click **Manage All SP**, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Allowable SAML Bindings on the Summary screen.

Setting an Artifact Lifetime (SAML)

When you send an artifact to your SP's Assertion Consumer Service or SLO service (for SAML 2.0), an element in the message indicates how long it should be considered valid.

You can change the default value per your requirements, if needed. Also consider synchronizing clocks between your server and your partner's SAML gateway server. If clocks are not synchronized, you might need to set the artifact lifetime to a higher value.

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Artifact Lifetime on the Summary screen.
   - This step appears only if you have selected the artifact binding for either an SSO or SLO Service (under SAML 2.0) at the SP site.

Specifying Artifact Resolver Locations (SAML 2.0)

This endpoint or group of endpoints is where your server will send back-channel requests to resolve artifacts received from your partner. The locations are also known collectively under SAML specifications as the Artifact Resolution Service.
Managing SP Connections

To reach this screen for editing:

1. Click a connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Artifact Resolver Locations on the Summary screen.
   - If this step does not appear, you do not have Artifact selected under Allowable SAML Bindings.

To configure the Artifact Resolver Location(s):

1. Enter a URL on the Artifact Resolver Locations screen and click Add.
   - The URL must be fully qualified (defining protocol, host, and port) unless you have entered a base URL (see “General Information” on page 186).
   - Repeat this step if your SP supports multiple services. The SAML 2.0 specifications permit multiple artifact resolution services through the use of Index numbers, which PingFederate automatically supplies when you add a service. Alternatively, if needed per partner specifications, you may assign these index numbers manually.

   **Note:** When specifying multiple artifact resolution endpoints, each endpoint must share the same transport protocol. That is, if one endpoint uses HTTP, then all must use HTTP. Similarly, if one endpoint uses HTTPS, then all must use HTTPS.

2. Click Next.

Defining Signature Policy

The Signature Policy screen provides options controlling how digital signatures are used for SSO Internet messaging. The choices made on this screen depend on your partner agreement (see “Digital Signing Policy Coordination” on page 25).

Digital signing is required for SAML Response messages sent from your site via POST (or Redirect for SAML 2.0). Optionally, SSO authentication requests from the SP (SP-initiated SSO) may also be signed to enforce security. (This option
appears only for SAML 2.0 connections and only if you have enabled SP-initiated SSO using the POST or redirect bindings.)

The assertions inside SAML Responses may be also be signed. When you make this choice, only the assertion portion of the Response is signed, not the complete Response. (This is the only option that appears for SAML 1.x connections.)

Make your selection(s) and click Next, or just click Next if no additional security is required.

Configuring XML Encryption Policy (SAML 2.0)

For SAML 2.0 configurations, in addition to using signed assertions to ensure authenticity, you and your partner may also agree to encrypt all or part of an assertion to improve privacy. This feature is commonly used if the assertion might pass through an intermediary (such as a user’s browser) and HTTPS is not used.

If the name identifier (or SAML_SUBJECT) of an assertion is encrypted, you and your partner may also want to encrypt the identifier in subsequent single-signoff messages (if you are using an SLO profile).

Note that “The entire assertion” selection on the Encryption Policy screen includes the SAML_SUBJECT and all attributes.
To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click Browser SSO under the SP Connection tab.
3. Click Configure Browser SSO.
4. Click Protocol Settings under the Browser SSO tab.
5. Click Configure Protocol Settings.

To define XML encryption:
1. Choose whether you want to encrypt the entire assertion or one or more attributes.
2. If you are encrypting the name-identifier attribute, use the checkboxes near the bottom of the screen to indicate whether you will also encrypt this attribute in outbound SLO messages and/or allow its encryption for inbound messages.
3. Click Next or Done.

To disable previously configured XML encryption selections:
1. Select None and then Done.
2. Click Save on the Protocol Settings screen.

Editing and Saving Protocol Settings
On the Summary screen you can review or edit your Protocol Settings.

Important: When you finish editing existing settings, be sure to click Done on the Summary screen and then Save on the Protocol Settings screen. For a new connection, click Done and then click Next on the Protocol Settings screen. Save the entire connection on the Activation & Summary screen (see “Editing and Activating a Connection” on page 253).

To reconfigure saved settings:
1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   If you need to make dependent or other changes, do so and continue by clicking Done until you reach the Protocol Settings screen.
3. Click Save on the Protocol Settings screen.
Editing and Saving Browser SSO Settings

On the Summary screen for Browser SSO, you can review or edit your SSO configuration.

Important: When you finish editing existing settings, be sure to click Done on the Summary screen and then Save on the Browser SSO screen. For a new connection, click Done and then click Next on the Browser SSO screen. Save the entire connection on the Activation & Summary screen (see “Editing and Activating a Connection” on page 253).

To reconfigure saved settings:
1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   If you need to make dependent or other changes, do so and continue by clicking Done until you reach the Browser SSO screen.
3. Click Save on the Browser SSO screen.

Configuring the Attribute Query Profile

At the Attribute Query step you configure your connection to respond to requests for user attributes from your partner SP, if you have chosen this option (see “Choosing Connection Options” on page 184). Attribute queries are not dependent on single sign-on but may be used independently or in conjunction with Browser SSO or provisioning to provide flexibility in how a user authenticates with SP applications (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

![Configure Attribute Query Profile](image)

To continue, click **Configure Attribute Query Profile**.

Defining Retrievable Attributes

On this screen you specify the user attributes you and your partner have agreed to allow in an attribute query transaction. Note that the SP may not necessarily request all of these attributes in each attribute-query request. Instead, the list simply limits the request to a subset of these attributes.
To add an attribute:
► Enter the attribute name in the text box and click Add.

To edit an attribute name:
1. Click Edit and make your change.
2. Click Update.

To delete an attribute:
► Click Delete.

Configuring Attribute Lookup

Attribute sources are specific data store or directory locations containing information that may be returned to the SP in response to an attribute request.

This portion of the attribute query configuration allows you to configure one or more data stores to look up attributes and to set up search parameters.

To configure an attribute source:
► Click Add Attribute Source and complete the setup steps (see “Choosing a User-Data Store” on page 228 next).

To modify an attribute source configuration:
1. Click the attribute source Description link.
2. Click Save on the screen you change.

Note: Depending on what you change, you may need to modify dependent data in subsequent steps, as indicated. Click Save or Done when either of those options appears.
Chapter 6
Identity Provider SSO Configuration

To reach this screen for editing:
1. Click the connection name on the Main Menu.
2. Click Manage All SP, if needed, to see a full list of connections.
3. Click Attribute Query under the SP Connection tab.
4. Click Configure Attribute Query Profile.
5. Click Attribute Source & User Lookup on the Summary screen.

Choosing a User-Data Store

Because no user authentication is performed in response to an attribute-query request, you cannot use attributes drawn from the user’s session (see “IdP Adapter Mapping” on page 198). Therefore, you must identify the data stores that contain the attributes on your system.

To define an attribute source:
1. Use Attribute Source Id to uniquely identify the data source for the mapping.
2. Use Attribute Source Description to specify an attribute source name that distinguishes this user lookup for the selected data store.

Note: PingFederate appends this description to the data store type in the Source list on the Attribute Mapping Fulfillment screen.

3. Choose an Active Data Store and click Next.
   A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click Manage Data Stores to add it (see “Managing Data Stores” on page 98).
Configuring Data Store Lookup

The process of configuring PingFederate to look up attributes in a data store for attribute-query responses is similar to that used for SSO Attribute Sources and User Lookup. For detailed information, see the step-by-step procedures in the sections indicated below.

If you use a JDBC data store, see:
- “Selecting a JDBC Database Table and Columns” on page 204
- “Configuring a Database Filter (WHERE Clause)” on page 206

If you use a LDAP data store, see:
- “Configuring an LDAP Directory Search” on page 208
- “Configuring an LDAP Filter” on page 209

If you use a Custom data store, see:
- “Configuring Custom Source Filters” on page 211
- “Selecting Custom Source Fields” on page 211

Note that the screen text may differ slightly. In addition, note that the variable ${SAML_SUBJECT} is available on the Database or LDAP Filter screens to retrieve the subject identifier from the Attribute Query for use in data-store query statements.

Important: When attribute queries are sent using XASP, use the variable ${SubjectDN}—rather than ${SAML_SUBJECT}—to retrieve the subject identifier. You may also use any of these DN-parsing variables: ${CN}, ${OU}, ${O}, ${L}, ${S}, ${C}, and ${DC}.

If more than one value exists for any of the parsing variables, then they are enumerated. For example, if the Subject DN is:

`cn=John Smith,ou=service,ou=employee`

then you could use any of these elements in your filter qualifier:

`${SubjectDN}=cn=John Smith,ou=service,ou=employee`

`${ou}=service`

`${ou1}=employee`

For more information about XASP see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started.

Attribute Mapping Fulfillment

The last step in configuring an attribute source is to map values into the assertion to be sent in response to an attribute query.

You map attributes on the Attribute Mapping Fulfillment screen.
Chapter 6
Identity Provider SSO Configuration

Map each attribute into the assertion from one of these Sources:

- **LDAP/JDBC/Custom**
  Values are returned from your attribute source. When you make this selection, the Value list is populated by the LDAP, JDBC, or Custom attributes you identified for this Attribute Source.

  **Note:** PingFederate appends a description in parentheses for each data store lookup (see “Choosing a User-Data Store” on page 228).

- **Expression** (when enabled)
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  This can be text only, or you can mix text with references to any of the values from your user-data store using this syntax:

  $$\{\text{ds.attr-source-id.attribute}\}$$

  where *attr-source-id* is the Attribute Source Id value (see “Choosing a User-Data Store” on page 228) and *attribute* is any of the data store attributes you have selected.

  There are a variety of reasons why you might hard code a text value. For example, if your SP’s Web application provides a service based on your company’s name, you might provide that attribute value as a constant.

**Specifying Security Policy**

This screen allows you to specify the digital signing and encryption policy to which you and your partner have agreed. These selections will trigger requirements for setting up Credentials (see “Configuring Credentials” on page 231).
Managing SP Connections

To configure attribute-query security policy for this partner:

- Check or clear the checkboxes and click Next or Done.

Editing and Saving Attribute Query Configurations

To reconfigure saved profiles:

1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   If you need to make additional changes, do so and continue by clicking Done until you reach the Attribute Query screen.
3. Click Save on the Attribute Query screen.

Configuring Credentials

The Credentials screen presents a list of possible security requirements you might need, depending on the federation protocol you are using and the choices you have made.

Your connection configuration may involve any or all of the following:

- Configuring Back-Channel Authentication
- Configuring Digital Signature Settings
- Configuring Signature Verification Settings
- Selecting an Encryption Certificate (SAML)
- Selecting a Decryption Key (SAML)
Configuring Back-Channel Authentication

When you configure a profile for inbound SAML messages via the artifact binding, you must specify authentication information for outbound artifact resolution requests over SOAP to your SP’s Artifact Resolution Service.

Similarly, if you configure outbound Assertion Consumer Service or SLO Service URLs to use the artifact binding, then you must configure SOAP authentication requirements for inbound messages such as artifact resolution requests. If you configure outbound SLO Service URLs to use the SOAP binding, then you must also configure authentication requirements for outbound SOAP messages.

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click Credentials under the SP Connection tab.
3. Click Configure Credentials.
4. Click **Back-Channel Authentication** on the Summary screen.

   If this step is not present, then it is not applicable to your configuration—you have not configured any profiles that use an artifact or SOAP binding or allowed artifact as an inbound SAML binding.

**To configure back-channel authentication requirements for sending SOAP messages:**

1. On the Back-Channel Configuration screen, click the **Configure** link to the right of the list of messages to be sent to your partner.

2. Make one or more selections on the Outbound SOAP Authentication Type screen:
   - **Basic** — you will enter SOAP Basic credentials on a later screen.
   - **SSL Client Certificate** — you will specify the certificate on a later screen.
     This option is enabled only if you have specified an endpoint that uses SSL.
   - **Use Digital Signatures . . .** — you will sign the message.
     You will be asked to select a signing certificate on a later screen.

   For SAML 2.0, these options may be used in any combination or independently.
   For SAML 1.x, you must use either Basic or SSL authentication; digital signing may be added to ensure message integrity.

   By default, PingFederate validates your partner's SSL server certificate—verifying that the certificate chain is rooted by a trusted Certificate Authority and that the hostname matches the certificate's Common Name. Clear the associated checkbox if you do not want this validation to occur.

3. Click **Next**.

4. If you chose Basic at Step 2, enter the SOAP Username and Password to use for this partner under Basic SOAP Authentication.
   You must obtain these credentials from your partner.

5. If you are using an SSL certificate, select the certificate under SSL Authentication Certificate and click **Next**.

   If you have not yet created or imported the client SSL certificate you need into PingFederate, click **Manage Certificates** (see “SSL Client Keys and Certificates” on page 149). You will need to export the certificate (only) and send it your partner.

6. On the Summary screen, click **Done**.

**To configure back-channel authentication requirements for receiving SOAP messages:**

1. On the Back-Channel Configuration screen, click the **Configure** link to the right of the list of messages to be received from your partner.

2. Select one or more options on the Inbound SOAP Authentication Type screen:
   - **Basic** — Enter the logon username and password your partner will use on the next screen.
   - **SSL Certificate** — Specify certificate verification information on a later screen.
   - **Use Digital Signatures . . .** — Incoming messages must be signed.
• Require SSL (checkbox) — When selected, incoming SOAP transmissions must use a secure channel.

You will be asked to select a signature verification certificate on a later screen.

For SAML 2.0, these options may be used in any combination or independently. For SAML 1.x, you must use either Basic or SSL authentication; digital signing may be added to ensure message integrity.

3. Click **Next**.

4. If you chose Basic at Step 2, enter the SOAP Username and Password under Basic SOAP Authentication.

   **Important:** If you are configuring more than one connection that uses the artifact or SOAP profile, you must ensure that the Username is unique for each connection.

5. If you are using an SSL certificate, select Anchored or Unanchored under Certificate Verification Method.

   • Anchored — The certificate must be signed by a trusted Certificate Authority, and the CA’s certificate must be imported into the PingFederate Trusted CA store (see “Trusted Certificate Authorities” on page 146).

   • Unanchored — The certificate is self-signed or you wish to trust a specified certificate.

   **Note:** When anchored certificates are used between partners, certificates may be changed without sending the update to your partner. If the certificate is unanchored, any changes must be promulgated.

6. Click **Next**.

7. If you chose anchored SSL certificate verification at Step 5, enter the Subject DN and click **Next**.

   **Tip:** If you have not yet defined the certificate in PingFederate or you do not know the DN, return to the previous screen and check Unanchored. Then click **Next** and click **Manage Certificates** on the SSL Verification Certificate screen to import the certificate, if needed, or to view its DN.

8. If you chose unanchored SSL certificate verification at Step 5, select the certificate you will use to validate the SSL connection.

   If you have not yet imported the certificate into PingFederate, click **Manage Certificates**.

9. Click **Next**.

10. On the Summary screen, click **Done**.
Configuring Digital Signature Settings

This step defines the private key/certificate that you will use to sign assertions and SLO messages for this SP.

**Note:** Digital signing is required for SSO assertions and SLO messages sent via POST or redirect bindings. Signing is not always required for profiles using the artifact or SOAP bindings.

The step applies to both IdP- and SP-initiated SSO and to either SLO profile (see “Choosing Profiles (SAML 2.0)” on page 190) whenever outbound POST or redirect bindings are used. The step also is required for WS-Trust STS and for SSO if you chose to sign the SAML assertion, SAML response, or artifact resolution messages (see “Configuring Back-Channel Authentication” on page 232).

To reach this screen for editing:

1. Click a connection name on the Main Menu.
   
   Click Manage All SP, if needed, to see a full list of connections.

2. Click Credentials under the SP Connection tab.

3. Click Configure Credentials.

4. Click Digital Signature Settings on the Summary screen.

To specify a certificate:

1. Select the certificate from the drop-down list.
   
   If you have not yet created or imported your certificate into PingFederate, click Manage Certificates (see “Digital Signing and Decryption Keys and Certificates” on page 151).

2. (Optional) If you have agreed to send your public key with the SAML message, select the checkbox to include the certificate.

**Note:** This step does not appear if a connection configuration does not require it.
3. (Optional) Select the Signing Algorithm from the drop-down list.
   The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.

### Configuring Signature Verification Settings

Under SAML 2.0 specifications, when your site receives any SAML 2.0 messages via the POST or Redirect bindings, the messages must be digitally signed. Signing is also always required for the SAML 1.x POST binding and for WS-Federation assertions, as well as incoming SAML 1.1 or 2.0 tokens for WS-Trust STS processing.

Depending on your agreement with this SP, SSO assertions, SAML 2.0 artifacts, or SOAP messages might also require signatures.

Whenever signatures are required, PingFederate provides a choice of trust models, including an option to use anchored signature-verification certificates embedded in incoming messages (see “Trust Models” on page 25). When this option is chosen in Signature Verification Settings, you must provide the Subject DN for embedded certificates coming from this partner, and the Issuer CA certificate must be part of the PingFederate trusted store (see “Trusted Certificate Authorities” on page 146).

Alternatively, you may choose to use unanchored certificates, in which case you must import your partner’s public-key certificate during this configuration (or select it if it is already imported). To prevent any interruption of service due to an expired certificate, you can ask your partner for a new certificate in advance and import it as backup.

To continue, click **Manage Signature Verification Settings**.

**To reach this screen for editing:**

1. Click a connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Credentials** under the SP Connection tab.
3. Click **Configure Credentials**.
4. Click **Signature Verification Settings** on the Summary screen.

   If this step does not appear, then your configuration does not require verification settings.

**Choosing a Trust Model**

This screen allows you to choose the Trust Model you want to use for signature verification (see “Trust Models” on page 25).

Starting with PingFederate 10, the Trust Model will have a greater impact in the context.

Depending on the selection, the next step in this task varies:

- For **Anchored**, the next step is to enter the Subject DN for your partner's certificate (see the next section, “Anchored Certificates--Specifying a Subject DN”).

   **Important:** If you are using the Redirect binding for SLO, you cannot use anchored certificates because SAML 2.0 does not permit certificates to be included using this transport method.

- For **Unanchored**, the next step is to import your partner's certificate (see “Selecting Unanchored Certificates” on page 238).

**To reach this screen for editing:**

1. Click a connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Credentials** under the SP Connection tab.
3. Click **Configure Credentials**.
4. Click **Signature Verification Settings** on the Summary screen.
   - If this step does not appear, then your configuration does not require verification settings.
5. Click **Manage Signature Verification Settings**.
6. Click **Trust Model** on the Summary screen.

**Anchored Certificates--Specifying a Subject DN**

When you choose to use an anchored certificate for signature verification, incoming SAML messages must contain the partner's verification certificate (see “Trust Models” on page 25). PingFederate verifies that the Issuer CA is trusted and checks to see that the embedded certificate's Subject DN matches the one specified on this screen. If so, PingFederate uses that certificate to verify the message signature.
You can either enter the Subject DN or extract it from your partner's certificate if the certificate is stored on an accessible file system.

**Important:** Ensure that you enter the Subject DN correctly or extract the DN from the correct partner certificate.

---

**To extract the Subject DN from a certificate:**

1. Click browse to select your SP partner's public certificate.
2. Click **Extract**.

**To reach this screen for editing:**

1. Click a connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **Credentials** under the SP Connection tab.
3. Click **Configure Credentials**.
4. Click **Signature Verification Settings** on the Summary screen.
   - If this step does not appear, then your configuration does not require verification settings.
5. Click **Manage Signature Verification Settings**.
6. Click **Certificate Subject DN** on the Summary screen.

**Selecting Unanchored Certificates**

On the Signature Verification Certificate screen, you identify your partner's imported public certificate and, optionally, a secondary certificate to use when the first expires (see “Trust Models” on page 25).
Managing SP Connections

To reach this screen for editing:

1. Click a connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.

2. Click Credentials under the SP Connection tab.

3. Click Configure Credentials.

4. Click Signature Verification Settings on the Summary screen.
   - If this step does not appear, then your configuration does not require verification settings.

5. Click Manage Signature Verification Settings.

6. Click Signature Verification Certificate on the Summary screen.

To specify a verification certificate:

1. Select the certificate from the drop-down list.
   - If you have not yet imported the certificate into PingFederate, click Manage Certificates.

2. (Optional) Select a Secondary certificate for backup.
   - Use this field if your partner has sent you a new certificate to replace one that is ready to expire. The server will automatically verify against the secondary certificate when the primary one expires.

Selecting an Encryption Certificate (SAML)

To enable XML encryption of all or part of an SSO assertion, you must identify the encryption certificate you will use (see “Configuring XML Encryption Policy (SAML 2.0)” on page 224).

You must also select a certificate if your requirements include encrypting an assertion in response to an attribute query (see “Specifying Security Policy” on page 230).
To reach this screen for editing:

1. Click a connection name on the Main Menu.
   
   Click Manage All SP, if needed, to see a full list of connections.

2. Click Credentials under the SP Connection tab.

3. Click Configure Credentials.

4. Click Select XML Encryption Certificate.

   If this step is not present, you have chosen not to encrypt the assertion or the SAML_SUBJECT (see “Configuring XML Encryption Policy (SAML 2.0)” on page 224).

To identify the encryption certificate:

1. (Optional) Change the default settings under Block Encryption Algorithm and/or Key Transport Algorithm.

   Due to import control restrictions, the standard JRE distribution supports strong but not unlimited encryption. To use the strongest AES encryption, when permissible, download and install the appropriate version of “Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files” from the Sun download Web site (http://java.sun.com/javase/downloads).

   For more information about XML block encryption and key transport algorithms, see the “XML Encryption Syntax and Processing W3C Recommendation” (http://www.w3.org/TR/xmlenc-core/).

2. From the drop-down list, select the applicable certificate and click Next.

   If the certificate is not in the list, click Manage Certificates to import it.

   **Note:** If you have already imported a signature verification certificate for this partner, you can reuse it for XML encryption as long as it is an RSA certificate.

Selecting a Decryption Key (SAML)

If SAML_SUBJECT is encrypted, either by itself or as part of a whole assertion, then all references to this name identifier in SLO requests from your partner may also be encrypted (if the connection uses SP-initiated SLO under SAML 2.0).
To enable XML encryption, you must identify a certificate for PingFederate to use to decrypt incoming SLO messages.

To reach this screen for editing:
1. Click a connection name on the Main Menu. Click Manage All SP, if needed, to see a full list of connections.
2. Click Credentials under the SP Connection tab.
3. Click Configure Credentials.
4. Click Select XML Decryption Key.
   If this step is not present, you have chosen not to encrypt the assertion or the SAML_SUBJECT attribute (see “Configuring XML Encryption Policy (SAML 2.0)” on page 224).

To identify the decryption key:
- From the drop-down list, select the applicable certificate and click Next.
  If the certificate is not in the list, click Manage Certificates to import it (see “Digital Signing and Decryption Keys and Certificates” on page 151).

Note: If you have imported a certificate to use for digital signing, you can reuse it for XML decryption as long as it is an RSA certificate.

Editing and Saving Credential Configurations

From the Summary screen you can review or edit your credentials configuration.

Important: When you finish editing existing settings, you must click Done on the Summary screen and then Save on the Credentials screen. For a new connection, click Done and then click Next on the Credentials screen. Save the entire connection on the Activation screen (see “Editing and Activating a Connection” next).

Configuring SaaS Provisioning

PingFederate’s SaaS Provisioning (available separately) allows an IdP to create and maintain user accounts at selected service-provider sites in order to streamline SSO
Chapter 6
Identity Provider SSO Configuration

(see “SaaS Provisioning” on page 31). Detailed configuration of this feature begins on the SaaS Provisioning screen.

**Note:** This configuration task is presented in the administrative console only when SaaS Provisioning has been enabled and selected as an option for the current connection (see “Choosing Connection Options” on page 184). For new connections, you must first configure Browser SSO and Credentials settings (see “Identity Provider SSO Configuration” on page 163).

To continue, click **Configure Provisioning**.

**Note:** Screen illustrations in this section are presented in most cases for Salesforce. However, the screens are comparable for other SaaS vendors for whom provisioning is supported, and the information and instructions provided are the same unless otherwise noted.

### Defining a Provisioning Target

Information on the Target screen indicates what account name and password PingFederate will use for authentication to the provisioning API for the selected SaaS provider. To use this screen, you must have a registered domain with the SaaS provider and a valid account and password that can be used to access the provider’s public Web-service endpoint for provisioning.

For Salesforce, the screen also provides a choice of environments (production or testing).
To configure the Target:

1. Enter valid credentials (username/password) for the SaaS provider.
2. For Salesforce channels, select the Environment.
3. Click **Next**.

**Note:** When you first enter or change credentials and click **Next**, PingFederate immediately tests connectivity to the target.

### Managing SaaS Channels

A provisioning channel is a mapping configuration between user attributes contained in a source user store and attributes supported or required by the targeted software-service application. You can have multiple channels to the same target as needed—for example, if your organization has separate LDAP stores (or different nodes in the same store) for various user groups needing SSO access and provisioning to the same SaaS domain.

**Tip:** There can be only one target SaaS domain for a connection ("Defining a Provisioning Target" on page 242). If your organization subscribes to multiple SaaS domains for which you need provisioning and SSO support, you will need a separate SP connection for each domain.
Channels are created and managed from the Manage Channels screen.

To access the Manage Channels screen:
1. In the task headings for a connection, click SaaS Provisioning.
   If this task is not present, provisioning is not enabled (see “Choosing Roles and Protocols” on page 89).
2. On the SaaS Provisioning screen, click Configure Provisioning.

To configure a new channel:
► Click Create and follow the configuration steps.

Tip: If you are creating a second channel to a SaaS vendor, you may wish to copy an existing channel and make necessary changes.

To copy a channel:
1. Click Copy under Action for the channel you want to copy.
2. Enter new General Info for the channel (see “Specifying Channel Information” on page 244).
3. Make any further changes needed for the new channel.

To edit a channel:
► Click the Channel Name link.

To delete a channel:
1. Under Action, click Delete for the channel.
   (To undo the deletion, click Undelete.)

   Note: The Delete function is not available if the channel is active (see “Channel Activation and Summary” on page 253).
2. To confirm the deletion, click Done and then Save on the Configure SaaS Provisioning screen.

Specifying Channel Information

On the Channel Info screen, specify a unique identifier for the channel.
Managing SP Connections

Identifying the Source Data Store

PingFederate fully supports Active Directory and the Sun Directory Server as source user repositories for SaaS Provisioning. However, you can use other types of LDAP servers, either identifying them as Generic or registering them with PingFederate (see “Configuring an LDAP Connection” on page 103).

Information from your user-data store is used to supply mapped values for each user attribute required by the SaaS provider (see “Mapping Attributes” on page 250).

Tip: Adjust the Max Threads setting as needed to optimize data-transfer performance, particularly if large numbers of records need to be provisioned at the target site.

On the Source screen, choose the LDAP store to use for this channel.

Note: If the correct data store is not listed, then it has not yet been identified to PingFederate; click Manage Data Stores to set a connection to a user store (see “Configuring an LDAP Connection” on page 103).

Modifying Source Settings

The Source Settings screen shows the default configuration of the data store selected on the previous screen, including settings used by the PingFederate provisioner to determine when user information has been added, changed, or removed.
If you are using the Sun Directory Server or Active Directory, in most cases no changes are needed on this screen unless your data store uses a customized schema.

If you are using a different LDAP directory, you must supply the required information on this screen unless you have defined a template for the data store (see “Defining an LDAP Type” on page 105).
# Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry GUID Attribute</td>
<td>The name of the attribute in the data store representing the user’s Globally Unique Identifier.</td>
</tr>
<tr>
<td>GUID Type</td>
<td>Indicates whether the GUID is stored in binary or text format. Active Directory is always binary. Other LDAP stores most often use text.</td>
</tr>
<tr>
<td>Member of Group Attribute</td>
<td>A multi-value user attribute containing the DNs of the groups to which an entry belongs. This attribute does not apply to some LDAP servers, including the Sun Directory Server. The attribute below is used instead. Active Directory uses both values to provide a two-way mapping between User and Group objects.</td>
</tr>
<tr>
<td>Group Member Attribute</td>
<td>The name of a multi-value group attribute used to track membership in the group using either DN or GUID values.</td>
</tr>
<tr>
<td>User Object Class</td>
<td>The LDAP object class to which user entries belong, used to restrict search results to user entries only.</td>
</tr>
<tr>
<td>Changed Users Algorithm</td>
<td>The method by which PingFederate determines if user records have been updated or new records added, thus requiring provisioning updates at the target SaaS site. The three choices are:</td>
</tr>
<tr>
<td></td>
<td><strong>Active Directory USN</strong> – For Active Directory only, this algorithm queries for update sequence numbers on user records that are larger than the last time records were checked.</td>
</tr>
<tr>
<td></td>
<td><strong>Timestamp</strong> – Queries for timestamps on user records that are not older than the last time records were checked. This check is more efficient from the point of view of the PingFederate provisioner but can be more time consuming on the LDAP side, particularly with the Sun Directory Server.</td>
</tr>
<tr>
<td></td>
<td><strong>Timestamp No Negation</strong> – Queries for timestamps on user records that are newer than the last time records were checked. This algorithm is recommended for the Sun Directory Server.</td>
</tr>
<tr>
<td>USN Attribute</td>
<td>The name of the attribute used to store the update sequence number—applicable when the Active Directory algorithm is chosen above.</td>
</tr>
<tr>
<td>Timestamp Attribute</td>
<td>The name of the attribute used to store the timestamp on user records.</td>
</tr>
<tr>
<td>Account Status Attribute</td>
<td>The name of the attribute in which the user’s account status (active or inactive) is stored.</td>
</tr>
</tbody>
</table>
Chapter 6
Identity Provider SSO Configuration

Specifying a Source Location

Indicate on the Source Location screen where PingFederate should look for user records in the data store. The same location may be used to retrieve user-group DNs for maintaining corresponding groups at the SaaS provider.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Status</td>
<td>Indicates the user’s status if the attribute is missing.</td>
</tr>
<tr>
<td>Account Status Algorithm</td>
<td>The method by which PingFederate determines a user’s account status. The values are:</td>
</tr>
<tr>
<td></td>
<td><strong>Active Directory Bitmap</strong> – For Active Directory, which uses a bitmap for each user entry.</td>
</tr>
<tr>
<td></td>
<td><strong>Flag</strong> – For Sun and other LDAP directories, which use a separate attribute to store the user’s status. When this option is selected, the two fields below are also used.</td>
</tr>
<tr>
<td>Flag Comparison Value</td>
<td>Indicates what value to check the flag against — for example, ENABLED or ACTIVE.</td>
</tr>
<tr>
<td>Flag Comparison Status</td>
<td>Indicates whether the user is enabled or disabled when the flag has the value specified in the Flag Comparison Value field. For any other value the user will have the opposite status.</td>
</tr>
</tbody>
</table>

**Note:** Group provisioning is supported for the Google Apps Connector (version 2.0 and higher) but may not be supported for other SaaS Connectors. If not, the associated fields on the Source Location screen are grayed out. Support for the feature may become available in future Connector releases; contact Ping Identity Support (pingidentity.com/support-and-downloads/support-request-form.cfm) for more information.

After specifying the required Base DN, you have two options for indicating which users and user groups (optionally) are to be provisioned. In each case, the search can be based either on group membership (the containing Group DN in the case of user groups) or on a specified LDAP filter. If needed for special situations, both methods can be used.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DN</td>
<td>The base Distinguished Name of the tree structure where user records and user groups are stored. PingFederate looks only at this node level or below it for user accounts and groups that need to be provisioned.</td>
</tr>
<tr>
<td>Group DN</td>
<td>For <strong>Users</strong>, the group Distinguished Name associated with the user store, if applicable—required if a Filter is not used (see below).&lt;br&gt;(Optional) For <strong>Groups</strong>, the DN of the higher-level group that contains the user groups, if applicable. <strong>Important</strong>: If a Group DN is used for Active Directory Groups, the Windows Server 2003 domain functional level must be set to <strong>Windows 2000 native</strong> or <strong>Windows Server 2003</strong>. For Windows Server 2008, use one of the 2003 levels or choose <strong>Windows Server 2008</strong>. (Refer to Windows Server documentation or support for more information.)</td>
</tr>
<tr>
<td>Filter</td>
<td>An LDAP search filter—for <strong>Users</strong>, required if a Group DN is not used; optional for <strong>Groups</strong>. For information about LDAP filters, refer to your LDAP documentation. Note that you may need to escape any special characters.</td>
</tr>
</tbody>
</table>

To specify a location:
1. Enter the Base DN.
2. For **Users**, enter either a Group DN or a Filter (or both if needed).
3. (Optional) For **Groups**, enter either a Group DN or a Filter (or both if needed).

**Mapping Attributes**

The Attribute Mapping screen provides a means of managing how attributes from your user store are mapped to the provisioning fields supported for your organization’s SaaS-customer account.

---

**Tip:** PingFederate automatically retrieves from the SaaS vendor the Field Names shown on this screen, but only on the first pass through the screen flow. If you are using this screen to modify an existing mapping configuration, click **Refresh Fields** near the bottom of the screen to synchronize the list with the target data store if needed.

---

**Important:** Refer to connection-template setup steps in your SaaS Connector Quick Connection Guide for information about any special fields and how to map them.
Managing SP Connections

For each field, the screen provides a means of adding or modifying the mapping details (see the next section, “Specifying Mapping Details”).

Note: All required attributes listed in the Field column, indicated with asterisks, must be mapped. Click View Partner Field Specifications near the bottom-left of the screen for a summary of requirements for all fields specified for the target SaaS partner.

For some fields, PingFederate preselects LDAP attributes commonly used to store the required values.

To configure attribute mapping:
1. Click Edit under Action for a field.
2. On the Specify Attribute Mapping screen, provide mapping details. (For more information, see the next section, “Specifying Mapping Details”.)
3. Repeat for each attribute shown in the Field Name column as needed.

Tip: If you need to map more than one attribute from your data store into a single field at the target location, then you must use an OGNL expression to indicate how the attribute values are to be combined. The use of OGNL expressions may not be enabled for your PingFederate installation (see “Using Attribute Mapping Expressions” on page 453).

Specifying Mapping Details

On this screen, you define specific mapping information for each field required for provisioning (and for any optional fields, as needed).
Caution: If end-users at your site are permitted to edit some of their own attributes directly in the LDAP store, ensure that the attributes are restricted and do not include any needed by the SaaS provider to grant permissions.

To define mapping information for an attribute:

1. (Optional) Select the Root Object Class containing a user-store attribute that you want to map to the SaaS attribute shown under Field.

   Note: For some fields, you may not need to map specific user attributes. If so, supply a Default Value instead—skip this step and go to Step 5. You can also do both for certain attributes, as needed: that is, specify LDAP attributes as well as a Default Value.

2. Under Attribute, select an attribute from the class.

3. Click Add Attribute.

4. Repeat the steps above to add additional applicable attributes, as needed, to use in a mapping expression.

5. Under Value Definition, enter or select a Default Value (optional, if one or more attributes is specified above).

   A drop-down list is shown for this field if the SaaS vendor requires a choice among specified values. When an expression is also supplied, the default value is sent during provisioning if an error occurs evaluating the expression.

6. If more than one attribute is used for mapping, enter an Expression.

   Tip: Click Test to validate the expression.

   For information about the expression language supported by PingFederate, OGNL, see “Using Attribute Mapping Expressions” on page 453.

   Important: The use of OGNL expressions may not be enabled for your PingFederate installation (see “Enabling and Disabling Expressions” on page 454).

7. (Optional) Select one or more processing Options, as defined below:

   Create Only – The field is provisioned only once and not subsequently updated.

   Trim – Removes any white space from the attribute value(s).

   Upper Case/Lower Case/None – Transforms the attribute value(s) to the case indicated, unless None is selected (the default).

   Parsing-->Extract CN from DN – For attributes in the form of a Distinguished Name (for example, Group DNs in Active Directory), maps only the Common Name portion of the DN.

   Parsing-->Extract Username from Email – For attributes containing an email address, maps only the username.

   Tip: Refer to your SaaS Connector Quick Connection Guide for instructions on mapping options or requirements for particular provisioning fields.
**Managing SP Connections**

When you finish setting up a channel, you may choose to activate it immediately; or you can return to the Activation & Summary screen and activate the channel when needed. Note that the overall SP connection for the SaaS partner also must be active for any provisioning channels to be enabled (see “Editing and Activating a Connection” on page 253).

---

**Caution:** When a connection containing a newly activated channel is itself activated, initial provisioning occurs as soon as the synchronization-frequency time period expires (see “Configuring SaaS Provisioning Settings” on page 95). The default is 60 seconds. Initial provisioning can consume considerable processing time, depending on the amount of data that needs to be transmitted; administrators may wish to plan accordingly.

---

**Important:** Regardless of whether you choose to activate a new channel immediately or later, if you want to save the channel configuration, click **Done** on the Summary screen and then **Save** on the connection Activation and & Summary screen. (For a new channel in an existing connection, click **Save** on the SaaS Provisioning screen.)

You can deactivate a channel at any time (for maintenance, for example). When a channel is inactive, SSO/SLO transactions may still occur (if the connection is active), but provisioning is suspended.

**To change a channel status:**

- Select either **Active** or **Inactive** and then click **Done**.

**To modify a channel setting:**

- If you know which step needs to be modified, click its link under the SaaS Channels tab.
  
  If you do not know where to change a setting, locate the currently configured setting under one of the summary headings and then click the subheading above the information.

---

**Editing and Activating a Connection**

When you finish setting up a connection, you may choose to activate it immediately.

---

**Important:** Regardless of whether you choose to activate a new connection now or later, you must click **Save** on the Summary screen for a new connection if you want to keep the configuration.

---

You can deactivate a connection at any time (for maintenance, for example). When a connection is inactive, all SSO or SLO transactions to or from this partner are...
disabled, as well as access to the WS-Trust STS for Web Service Clients associated with this connection.

**Tip:** The SSO Application Endpoint near the top of the Summary screen is an example URL that webmasters or Web application developers at your site might use to invoke SSO for the connection. For details about SSO and other server endpoints, including optional query parameters, see “Application Endpoints” on page 429.

To change a Connection Status:

- Select either Active or Inactive and then click **Save**.

To modify a connection setting:

1. If you know which step needs to be modified, click its link under the SP Connection tab.
   
   If you do not know where to change the setting, locate the currently configured data under one of the summary headings and then click the subheading above the data.

2. Change the information on the step screen and click **Save**, if available.

   If **Save** is not available, you are in the middle of a task (see “About Tasks and Steps” in the “Console Navigation” chapter of Getting Started); click **Next** or **Done** until you reach a screen containing a **Save** button. Then click **Save** and continue as needed until you return to the Main Menu.

   If your modification requires related configuration changes, PingFederate provides error messages indicating the necessary steps and then guides you to the related screens (unless you click **Cancel**).

   **Important:** Be sure to click **Save** whenever that button appears, if you want to keep your changes.

---

### Defining SP Affiliations

An SP affiliation is a SAML 2.0 specification that permits a group of service providers to make use of the same persistent name identifier for account linking (see “Account Linking” on page 16).

This may be of use when multiple service providers share a business relationship in which users need services from each affiliated provider. By agreement among the affiliation members, the same pseudonym can be used to populate the `SAML_SUBJECT` of assertions sent to all of the SP partners contained in this affiliation.

**Important:** Each connection in the affiliation must be configured to use the same IdP adapter instance for generating account links (see “IdP Adapter Mapping” on page 198).

You can create or modify an SP affiliation from the Main Menu or from a list of affiliations (click **Manage All Affiliations**).
Defining SP Affiliations

To create an SP affiliation:
- Click Create New under SP Affiliations on the Main Menu.
  Or:
- Click Manage All Affiliations and then click Create Affiliation on the Select an Affiliation screen.

To delete an affiliation:
1. Click Manage All Affiliations under SP Affiliations on the Main Menu.
2. Click Delete under Action for the affiliation you want to delete.
3. Click Save to confirm the deletion (or click undelete).

To view or modify an affiliation:
- Click the affiliation name, or click Manage All Affiliations if the ID does not appear.

Using the Manage Affiliations Screen

You can manage SP affiliations on this screen.

To reach this screen for editing:
- Click Manage All Affiliations under SP Affiliations on the Main Menu.

To begin creating a new affiliation:
- Click Create Affiliation (see the next sections for more information).

To delete an affiliation:
1. Click Delete under Action for the affiliation you want to delete.
2. Click Save to confirm the deletion (or click undelete).

To view or modify an affiliation:
- Click the affiliation ID.

Importing Affiliation Metadata

An IdP may send a metadata file containing information that automatically specifies members of an SP affiliation for use in PingFederate.

- If you do not have a metadata file, click Next.

To import metadata:
1. Click Browse to locate and import the file and then click Next.
2. Review the information on the Create Affiliation page (see the next section).
3. Click **Save** on the Summary screen.

**Entering Affiliation Information**

Enter or modify basic information about an affiliation on the Affiliation General Info screen.

If you imported a metadata file, this information is already supplied. However, you may change the Affiliation ID or select a different Affiliation Owner, if required.

![Affiliation General Info Screen](image)

**Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affiliation ID</td>
<td>A unique identifier for this affiliation. This value serves as the Name ID qualifier for SAML assertions sent to affiliated SP partners.</td>
</tr>
<tr>
<td>Affiliation Owner</td>
<td>Any SAML 2.0 SP connection may serve as the Owner.</td>
</tr>
</tbody>
</table>

**Managing Affiliation Membership**

On the Affiliation Membership screen, you create and manage a list of SP connections to be included in the affiliation.

If you imported a metadata file, this information is already supplied. However, you may add or remove connections from the affiliation.

![Affiliation Membership Screen](image)
Using the Express Connection Template

To add an SP partner connection to the affiliation, select the connection from the drop-down list and click Add.

Important: Each connection in the affiliation must be configured to use the same IdP adapter instance for generating account links (see “IdP Adapter Mapping” on page 198).

To remove a member of the affiliation, click Delete under Action for the connection and click Save.

Note: If you delete an affiliation member supplied by an imported metadata file and then save the affiliation, that connection will not appear in the drop-down list for re-adding in the future.

Activating and Editing the Affiliation

From the Affiliation Management Summary screen you can activate or deactivate an SP affiliation. You also save new affiliations on this screen, or you can click heading links to go back and modify information.

To change an Affiliation Status:

Select either Active or Inactive and then click Save.

Important: Be sure to click Save. Otherwise, the status will not be changed.

To edit a connection:

1. Click the heading above the information you want to modify.
2. Make your change and click Save.

Using the Express Connection Template

When creating a new connection, an administrator can choose to load the PingFederate Express template (see “About PingFederate Express” on page 27). This template configures most browser-based SSO settings automatically for an Express-enabled SP partner, who can then use the exported metadata for rapid end-to-end SSO configuration and deployment.
This section provides step-by-step instructions for filling in the minimal site-specific information needed after you select the template, and then for exporting the metadata.

**Important:** The PingFederate Express SP software supports a basic, lightweight configuration needed for simplified end-to-end deployment of SAML 2.0 IdP- and SP-initiated SSO, exclusively. While some minor settings may be modified for an Express SP connection (as indicated in the following section), an IdP administrator cannot extend the configuration to include broader use cases such as different protocols or bindings, WS-Trust STS, provisioning, or SLO. Although these and other features are not explicitly disabled, the connection metadata cannot be exported if any unsupported extensions are included.

### Finishing an Express Connection

After selecting the PingFederate Express template, two site-specific setups must be completed, including at least one IdP adapter instance and the selection of a signing certificate for SAML assertions.

**Tip:** The administrative console guides you to required configuration steps automatically by displaying prompts (in the form of error messages) at entry points for the task flows (see “About Tasks and Steps” in the “Console Navigation” chapter of Getting Started).

Once the connection is saved, you can export its metadata into a configuration ZIP file for your partner to use when setting up PingFederate Express (see “About PingFederate Express” on page 27).

**To complete a PingFederate Express SSO Connection:**

1. After selecting the PingFederate Express template on the Connection Template screen, enter the Target Application URL (see “Choosing a Connection Template” on page 182 or the online Help page).

   **Important:** You cannot return to this screen and change the URL (or make a different selection). If the target URL should change at the SP site in the future, you will need to create a new connection and send a new configuration file for the SP administrator to reload into PingFederate Express.

2. (Optional) On the General Info screen, enter further identifying information about this SP partner.

   You may also use a Virtual Server ID or adjust the Logging Mode. (See “Federation Server Identification” on page 33 and “Transaction Logging Modes” on page 41, respectively; or see the online Help pages.)

3. On the Browser SSO screen, click **Configure Browser SSO.**
4. On the Assertion Creation screen, click **Configure Assertion Creation**.

5. (Optional) If you wish to extend the **Attribute Contract**, click that step. For more information, see “Creating an Attribute Contract” on page 196 or the online Help page.

6. On the IdP Adapter Mapping screen, click **Map New Adapter Instance**.

7. Follow procedures to map an Adapter Instance (see “IdP Adapter Mapping” on page 198 or the online Help pages).

8. Map additional Adapter Instances as needed.

9. Click **Done** on the IdP Adapter Mapping screen and **Done** again on the Assertion Creation screen.

10. On the Browser SSO screen, click **Next** to reach the Credentials screen.
11. Click **Configure Credentials**.

12. On the **Digital Signature Settings** screen, select a signing certificate to use for this partner.

   For more information, see “Configuring Digital Signature Settings” on page 235 or the online Help page.

   **Important:** Retain the check-box selection to include the certificate (public key).

   **Tip:** If you choose a CA-signed certificate, the SP Express installation will automatically use an anchored-certificate trust model (see “Trust Models” on page 25), and the CA certificate will be sent along with the verification (public-key) certificate in the exported metadata. If you choose a self-signed certificate, the SP installation will use an unanchored-certificate trust model, which means you and the SP will need to reconfigure when the certificate expires or is updated.

13. Click **Done** and then **Next** to reach the Activation & Summary screen.

14. Activate (optional) and **Save** the connection.

   For more information, see “Editing and Activating a Connection” on page 253 or the online Help page.

**To export metadata for your partner’s configuration, either:**

- On the Main Menu under Administrative Functions, click **Metadata Export** and follow the steps, selecting the desired Express connection on the Connection Metadata screen.

  See “Exporting Metadata” on page 48 or the online Help pages.

  Or:

1. On the Main Menu under SP Connections, click **Manage All SP**.
2. On the Manage Connections screen, click **Export Metadata** under Action for the Express connection.
3. Save the ZIP file.

Your Express partner needs the exported ZIP file to configure the SP end of the connection.
Configuring SP Auto-Connect

When your SP partner is also using PingFederate 5 or higher (or is otherwise able to provide interoperable SAML 2.0 metadata via HTTP on demand), you may choose to use Auto-Connect for that partner (see “Using Auto-Connect” on page 28). This configuration can be shared among an unlimited number of SAML 2.0 partners.

Note: You enable the SAML 2.0 Auto-Connect profile under System Settings (see “Choosing Roles and Protocols” on page 89).

Once Auto-Connect is enabled on your PingFederate server, complete the configuration from the Main Menu under My IdP Configuration. This configuration entails:

- Setting up a common connection for all Auto-Connect partners
- Establishing a list of SP partner domains authorized to use the connection

Initial Setup

The basic configuration for SP Auto-Connect requires only:

- Defining a period of validity for assertions (assertion lifetime)
- Choosing a signing certificate for assertions and other SAML messages
- Configuring assertion-creation information

All other partner-connection specifications are handled automatically at runtime.

Specify an Assertion Lifetime

Identity-federation standards require a window of time during which an assertion is considered valid. Each assertion has a time-stamp XML element as well as elements indicating the allowable lifetime of the assertion (in minutes) before and after the assertion time stamp.

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Before</td>
<td>The amount of time before the assertion was issued during which it is to be considered valid.</td>
</tr>
<tr>
<td>Minutes After</td>
<td>The amount of time after the assertion was issued during which it is to be considered valid.</td>
</tr>
</tbody>
</table>
To change the default times:

- (Optional) Edit the desired setting(s) and click Next or Save.

**Choosing a Signing Certificate**

For Auto-Connect runtime processing, assertions and SLO messages must be signed, since they are sent over either the POST or redirect bindings (see “SAML 2.0 Profiles” in the “Supported Standards” chapter of *Getting Started*).

**Note:** The signing certificate is embedded in your server’s Auto-Connect metadata (see “Using Auto-Connect” on page 28); there is no need to exchange certificates with your partners.

You can use the same certificate used for signing metadata (see “Configuring Auto-Connect Metadata Signing” on page 96). If you use a different certificate, ensure that it meets Auto-Connect validation requirements (see “Auto-Connect Security Model” on page 30).

**To specify a certificate:**

1. Select the certificate from the drop-down list.
   - If you have not yet created or imported your certificate into PingFederate, click Manage Certificates (see “Digital Signing and Decryption Keys and Certificates” on page 151).

2. (Optional) Select the Signing Algorithm from the drop-down list.
   - The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.

**Configuring Assertion Creation**

Configuring assertion creation for Auto-Connect is similar to configuring the same settings for regular partner connections.
Configuring SP Auto-Connect

For configuration information, refer to sections under “Assertion Creation” on page 193.

**Auto-Connect Activation and Summary**

When you finish configuring your SP Auto-Connect initial setup, you may choose to activate the common connection immediately on the Activation & Summary screen. (No runtime processing occurs until your partner’s Auto-Connect gateway is also established and a user initiates an SSO or SLO event.)

**Important:** Regardless of whether you choose to activate a newly configured connection now or later, you must click Save on the Activation & Summary screen if you want to keep the configuration.

You can deactivate the connection at any time (for maintenance, for example). While a connection is inactive, all SSO or SLO transactions to or from Auto-Connect partners are disabled.

To change a Connection Status:

- Select Active or Inactive and then click Save.

To modify a setting:

1. Locate the currently configured setting under one of the summary headings and then click the subheading above the data.

**Note:** Changes made to Auto-Connect settings will be out of sync, temporarily, with metadata caches that any currently active partners might be using. If your connection is in production, you might wish to lower your server’s metadata lifetime in advance of making configuration changes (see “Configuring Auto-Connect Metadata Lifetime” on page 97).

2. Change the information and click Save, if available.

If Save is not available, additional, dependent changes are required; click Next or Done until you reach a screen containing a Save button. Then click Save and continue as needed until you return to the Main Menu.
Specifying Allowed SP Domains

This screen provides PingFederate with a list of trusted domain names of your Auto-Connect partners.

Normally, when PingFederate receives an authentication request from a domain in this list, the runtime engine completes the connection automatically using metadata obtained from a standard, public location—\texttt{http://saml.<domain_name>}. (See “Using Auto-Connect” on page 28.) Alternatively, if an Auto-Connect partner elects not to use the standard location, you can supply the applicable URL.
In an SP role, you use the PingFederate administrative console to configure local application-integration information and to manage connections to your IdP-partner sites. You must configure Server Settings from the Main Menu to establish your site as an SP before configuring connections to IdPs (see “Choosing Roles and Protocols” on page 89).

Note that only one connection is needed per partner, even if you are integrating more than one Web application. You can configure more than one connection, however, if your partner supports multiple protocols, or supports multiple federation IDs for the same protocol (see “Federation Server Identification” on page 33).

Under some conditions, you can enable SSO for an unlimited number of partners at once by configuring a single, common connection (see “Using Auto-Connect” on page 28).

This chapter covers the following major topics:

- “SP Application Integration Settings” on page 266
- “Federation Settings” on page 275
- “Managing IdP Connections” on page 278
- “Configuring IdP Auto-Connect” on page 345
SP Application Integration Settings

The integration of local applications with PingFederate is the essential “last-mile” configuration that allows end-users at your IdP partner’s Web site to access your protected resources. This process is facilitated through the use of application-integration kits and a robust Software Development Kit (see “SSO Integration Kits and Adapters” on page 14).

Under Application Integration Settings on the Main Menu, you configure the SP Adapters that PingFederate uses to create user sessions that allow SSO access to your protected resources. You can also set Default URLs to which users may be directed during SSO or SLO, and you can look up system endpoints that application developers at your site need to access PingFederate’s SSO/SLO services.

**Note:** If your PingFederate configuration enables the WS-Trust STS, the selections under Application Integration Settings also include a link for configuring plug-in Token Generators (see “Configuring Token Generators” on page 386).

Configuring SP Adapters

SP adapters are used to create a local-application session for a user in order to provide SSO access to your application(s) or other protected resources (see “SSO Integration Kits and Adapters” on page 14). You can configure multiple instances of adapters (based on one or more adapters) to accommodate the varying needs of your IdP partners.

**Note:** If you are configuring an OpenToken Adapter, see “Configuring the IdP OpenToken Adapter” on page 408.

If you configure more than one adapter instance, then you must map a target URL to at least one instance (see “Mapping URLs to Adapter Instances” on page 270).

SP adapter setup is available only if your server is configured as an SP (see “Choosing Roles and Protocols” on page 89).

**Important:** If you install a new version of an adapter JAR file after setting up connections to instances of that adapter, you might need to reconfigure those connections. To find out, click each connection that uses the adapter (see “Accessing IdP Connections” on page 279). Errors indicating reconfiguration points may be presented.
To create a new adapter instance:

- Click Create New Instance.

See the next section.

To edit an adapter instance:

- Click the Instance Name link.

To delete an adapter instance:

1. Click Delete next to the Instance Name on the Manage SP Adapter Instances screen. (To undo the deletion, click Undelete.)

   Note: This option is available only if the adapter instance is not in use for a connection.

2. Click Save to confirm the deletion.

Creating an Adapter Instance

On the Type screen, you begin creating an instance of an adapter that PingFederate will use for creating security sessions for your applications.

Note: This option is available only if the adapter instance is not in use for a connection.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance Name</td>
<td>A descriptive name for the adapter instance—for example the target application or group of applications.</td>
</tr>
<tr>
<td>Instance ID</td>
<td>An internal identifier for the adapter instance. Must be alphanumeric with no spaces.</td>
</tr>
<tr>
<td>Type</td>
<td>A list of previously deployed session creation adapter types that are available to create an adapter instance for the server. You can configure any number of instances for a server acting as an SP.</td>
</tr>
</tbody>
</table>

To reach this screen:
1. Click Adapters on the Main Menu.
2. Click Create New Instance on the Manage SP Adapter Instances screen.

To define an adapter instance:
1. Enter the Instance Name and Instance Id on the Type screen.
2. Select the Type from the drop-down menu.
   - If the adapter you need is not listed, click Visit PingIdentity.com for additional types to see if a suitable adapter is available from the PingFederate download site. You can also create your own adapter (see “SSO Integration Kits and Adapters” on page 14).
3. Click Next and enter information on subsequent screens for this adapter setup, as indicated in the following sections.
   - **Tip:** The setup steps and information needed vary with the adapters deployed on your server (see “SSO Integration Kits and Adapters” on page 14). For information about configuring the adapters packaged with PingFederate, see “OpenToken Adapter Configuration” on page 407.

4. Click Done on the Summary screen.
5. Click Save on the Manage SP Adapter Instances screen.

To view or modify adapter settings:
- Click the Instance Name.

To delete an adapter instance:
1. Click Delete next to the Instance Name on the Manage SP Adapter Instances screen. (To undo the deletion, click Undelete.)
   - **Note:** This option is available only if the adapter instance is not in use for any connection.
2. Click Save to confirm the deletion.
Configuring an Adapter Instance

Configuration parameters on the SP Adapter Instance screen vary according to the adapter you choose. These options are controlled by the adapter software (see “SSO Integration Kits and Adapters” on page 14).

> For information about configuring the OpenToken Adapter, see “Configuring the SP OpenToken Adapter” on page 411.

Choosing Adapter Actions

Adapters can be written to perform configuration assistance or validation actions—for example, testing a connection to an active directory. Actions may also include generation of parameters that might need to be set manually in a configuration file.

> For information about actions available using the OpenToken Adapter, see “OpenToken Adapter Configuration” on page 407.

To reach this screen for editing:

1. On the Main Menu under Application Integration Settings for My SP Configuration, click Adapters.
2. Click an Instance Name.
3. Click Actions (if available).

To generate a properties list:

> Click Download under Action Invocation Link.

Extending Adapter Contracts

Adapters may be written with an option allowing administrators to add to the attributes required for creating usable sessions. This feature might be needed, for example, by a legacy application that requires different authentication than other applications under the same enterprise identity-management system.
Chapter 7
Service Provider SSO Configuration

To reach this screen for editing:
1. On the Main Menu under Application Integration Settings for My SP Configuration, click Adapters.
2. Click an Instance Name.
3. Click Extended Contract (if available).

To add an attribute:
1. Enter the attribute name in the text box and click Add.
2. Click Done then click Save on the Manage SP Adapter Instances page.

Editing and Saving SP Adapter Instances

From the Adapter Instance Summary screen, you can reach adapter settings for editing.

To edit the configuration:
1. Click the heading above the information you want to change.
2. Click Save on the configuration page and on the Manage SP Adapter Instances screen.

To save an adapter instance:
1. Click Done on the Summary screen.
2. Click Save on the Manage SP Adapter Instances screen.

Note: If this is the second adapter instance you have configured, then Save is not yet available; you must choose whether to map the new adapter instance to an application or resource URL. In this case, click Next to continue (see “Mapping URLs to Adapter Instances” next).

Mapping URLs to Adapter Instances

When you configure more than one SP adapter instance, you must map target URLs to at least one adapter instance. Mapping enables you to direct inbound SAML messages to the appropriate application.
For example, this mapping configuration may be necessary in an IdP-initiated SSO scenario that connects to multiple applications at your site. For transactions initiated at your site, this mapping is needed for default situations, in cases where the target and adapter instance are not specified when the SSO/SLO is started (see “SP Endpoints” on page 432). (When this information is provided with the SP request, the mapping table is ignored.)

This screen is available only if your server is configured as an SP and if you are using more than one adapter instance, or if you have previously mapped an adapter instance on this screen.

**Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>The target URLs that align with your configured adapter instances. The URLs instruct the PingFederate SP server to route session-creation processing through an adapter instance. If the URL in the incoming request is not matched by the first entry in this table, subsequent entries are tried until a match is found.</td>
</tr>
<tr>
<td>Adapter Instance (drop-down menu)</td>
<td>A selection of configured SP adapter instances.</td>
</tr>
</tbody>
</table>

The order of mapping is significant in that the first matching mapping, from top to bottom, determines which adapter instance receives the SAML message. For example, if two URLs are mapped in the following order:

a) `http://yourapp.com/subapp/*` Adapter 1

b) `http://yourapp.com/*` Adapter 2

The URL `http://yourapp.com/subapp/start` will map to Adapter 1 because it matches mapping a. If the order of the mappings were reversed, `http://yourapp.com/subapp/start` would map to Adapter 2 because it would find and match mapping b first. (No URLs would fall through if the order were reversed.)

Note that you can use only one wildcard (*) per URL.

**To reach this screen for editing:**

1. On the Main Menu under Application Integration Settings for My SP Configuration, click Adapters.
2. Click **Map URLs to Adapter Instances**.
   
   If this step does not appear, then you have created only one adapter instance (see “Configuring SP Adapters” on page 266).

**To create adapter mappings:**
1. Enter the URL and select an adapter from the drop-down menu.
2. Click **Add Mapping**.
3. Click **Save**.

**To edit adapter mappings:**
1. Click **Edit** next to the Adapter Instance. You can change the URL or select a different adapter from the drop-down menu.
2. Click **Update**.
3. Click **Save**.

**To delete adapter mappings:**
1. Click **Delete** next to the Adapter Instance.
2. Click **Save**.
   
   (Click **Cancel** to abort the deletion.)

**To change the order of adapter mappings:**
1. Click the up or down arrows at the left to rearrange the order.
2. Click **Save**.

### Configuring Default URLs

As an SP, you can supply a default URL that the end-user may see when SSO succeeds (that is, a session is created at your site) but the target resource is not available or not specified. Similarly, you can specify a default URL indicating a successful SLO to the end-user (if no other page is designated).

Your application or your partner’s application may supply these URLs at runtime (see “SP Endpoints” on page 432); but if none is provided, PingFederate will use the default values you enter on this screen.

**Tip:** If you leave the default URLs blank, PingFederate provides built-in landing pages for the user. These Web pages are among the templates you can modify with your own branding or other information (see “Customizing User-Facing Screens” on page 76).
Setting Target Validation

Several SP adapters can be configured to pass security tokens or other user credentials from PingFederate to the target resource via HTTP query parameters or POST transmittal. In both cases, these transport methods open the possibility that a third party (with specific knowledge of aspects of the IdP and/or SP network, as well as PingFederate endpoints and configuration) might be able to obtain and use valid security tokens to gain improper access to the target resource.

This potential security vulnerability would involve using well-formed SSO links to start an SSO request for a resource at the SP site. However, the target resource designated in the link would be intended to intercept the security token by redirection to a malicious Web site.

To prevent such an attack, PingFederate provides a means of validating SSO transactions to ensure that the designated target resource exists in a domain controlled by the SP.

Note: This configuration is optional, though recommended, if you have an SP adapter configured to use query parameters or POST transmittals. Adapter configurations that use cookies to pass session tokens do not pose any known security risks—target validation is not needed.
## Service Provider SSO Configuration

### To reach this screen:

1. Click **Target Resource Validation** on the Main Menu.

### To enable target resource validation:

1. Select the first checkbox.
2. Indicate whether to require HTTPS for query and POST transmittals.

**Note:** This selection is recommended to ensure that target validation will always prevent message interception for this type of potential attack, under all conceivable permutations.

3. Enter the domain or IP address containing a target resource and click **Add**.
   
   Use the domain only, without qualifiers. For example:
   
   `mycompany.com`
   
   Using an initial wildcard and period for a domain name will cover multiple subdomains. For example:
   
   `*.mycompany.com`
   
   covers `hr.mycompany.com` or `email.mycompany.com`.

4. Repeat the previous step as needed.

### Viewing SP Application Endpoints

Click **Application Endpoints** on the Main Menu to see a list of endpoints and descriptions applicable to your federation role (IdP or SP). These endpoints are built into PingFederate and cannot be changed.

Web-application developers at your site need to know the application endpoints to initiate transactions via PingFederate (see “SSO Integration Kits and Adapters” on page 14).

**Note:** For specific parameters required or allowed for Application Endpoints, see “SP Endpoints” on page 432.
This screen also shows a Maintenance Endpoint that you can use to verify that the PingFederate server is running (see “System-Services Endpoints” on page 437).

**Federation Settings**

If your identity federation uses the SAML 2.0 XASP profile (see “Attribute Query and XASP” in the “Supported Standards” chapter of *Getting Started*), you may need to identify the IdP connection to which an attribute request applies. If so, click **Attribute Requester Mapping** under the Federation Settings section for the SP on the Main Menu.

Also under Federation Settings, you can view protocol endpoints that your federation partners need to know to access your services via PingFederate.

**Attribute Requester Mapping**

If you are using the XASP profile, the application(s) at your site must supply the Subject Distinguished Name (DN) to identify a user’s X.509 authentication certificate (see “Attribute Query and XASP” in the “Supported Standards” chapter of *Getting Started*). Optionally, an application may also supply an Issuer DN, which can be used to determine the correct IdP (Attribute Authority) to use for a set of users associated with an IdP.

**Note:** A Format query parameter must be set to a specified value for XASP (see “/sp/startAttributeQuery.ping” on page 436).

On the Attribute Requester Mapping screen, you can map X.509 identifying information to connections and specify a default connection. You reach this screen from the Main Menu under Federation Settings.

**Note:** The Attribute Requester Mapping link does not appear on the Main Menu unless you have enabled the SAML 2.0 protocol for the SP role (see “Choosing Roles and Protocols” on page 89). You must also select the associated XASP checkbox.
At runtime, PingFederate tries to match the certificate’s Issuer DN (if provided) against the list of Issuer DN(s), in the order shown on this screen, until a match is found. If no match is found, the server tries the Subject DN(s) in order. If no match is found, the Default connection is used.

For Issuer and Subject DNs, you can use a regular expression to match different DNs to the same connection. Only one expression may be used in any single entry. DN values must be entered in all lower-case characters.

**To map attribute requesters to connections:**

1. (Optional) Enter an Issuer DN when applicable, select a SAML 2.0 IdP Connection Name, and click **Add**.
   Repeat this step as needed for additional DNs.
2. Enter an Subject DN, select a SAML 2.0 IdP Connection Name, and click **Add**.
   Repeat this step as needed for additional DNs.
3. Select a Default IdP connection.

**To edit a mapping:**

1. Click **Edit** for the mapping in the Action column.
2. Make your changes and click **Update** in the Action column.
3. If you are editing an existing configuration, click **Save** to confirm the change.

**To reorder the mapping list:**

- Click the up or down arrow next to a DN.
To delete a mapping:
1. Click **Delete** for the mapping in the Action column.
2. If you are editing an existing configuration, click **Save** to confirm the deletion.

Viewing SP Protocol Endpoints

Click Protocol Endpoints under Federation Settings in the SP Configuration section of the Main Menu to see a list of SAML, WS-Federation, and/or WS-Trust STS endpoints—a pop-up window displays only those endpoints related to the federation protocols enabled in Server Settings (see “Choosing Roles and Protocols” on page 89). These endpoints are built into PingFederate and cannot be changed.

Your federation partners or STS clients need to know the applicable SP Services endpoints to communicate with your PingFederate server. Configured service endpoints for SAML connections are included in metadata export files (see “Exporting Metadata” on page 48).

The table below describes each endpoint:

**Table 17: PingFederate SP Endpoints**

<table>
<thead>
<tr>
<th>Service</th>
<th>URL and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Logout Service (SAML 2.0)</td>
<td>/sp/SLO.saml2&lt;br&gt;The URL that receives and processes logout requests and responses.</td>
</tr>
<tr>
<td>Assertion Consumer Service (SAML 2.0)</td>
<td>/sp/ACS.saml2&lt;br&gt;A SAML 2.0 implementation that receives and processes assertions from an IdP. The numbers reflect the index value PingFederate uses to handle each binding.</td>
</tr>
<tr>
<td>Artifact Resolution Service (SAML 2.0)</td>
<td>/sp/ARS.ssaml2&lt;br&gt;The SOAP endpoint that processes artifacts returned from a federation partner to retrieve the referenced XML message on the back channel. (See “Important” footnote in this table.)</td>
</tr>
<tr>
<td>Metadata Service</td>
<td>/&lt;br&gt;The default endpoint (empty path) from which partners can retrieve Auto-Connect metadata (see “Using Auto-Connect” on page 28).</td>
</tr>
<tr>
<td>Assertion Consumer Service (SAML 1.x)</td>
<td>/sp/acssaml1&lt;br&gt;A SAML 1.x implementation URL that receives and processes assertions from an IdP.</td>
</tr>
<tr>
<td>Single Sign-on Service (WS-Federation)</td>
<td>/sp/prp.wsf&lt;br&gt;The WS-Federation implementation URL that receives and processes security tokens and SLO messages.</td>
</tr>
</tbody>
</table>
Managing IdP Connections

As an SP, you manage connection settings to support the exchange of federation-protocol messages (SAML, WS-Federation, or WS-Trust) with an IdP or STS client application at your site.

Note: If you are configuring a new connection only for WS-Trust STS, follow the sections in this part of the manual up to and including “General Connection Information” on page 285. Then turn to “WS-Trust STS Configuration” on page 351.

These settings include:

- User attributes you expect to receive in an SSO assertion (including STS SAML tokens).
- User attributes that may be requested using the Attribute Query profile (if that profile is used).
- The protocol and, for SAML, the profile you will use, including detailed security specifications (the use of digital signatures, signature verification, XML encryption, and SSL). For more information see the “Supported Standards” chapter in Getting Started.

To continue with the configuration, you and your connection partner must have decided this information in advance (see “Federation Planning Checklist” on page 32). Your federation partner must supply some connection settings and other information (see “Configuration Data Exchange” on page 34).

Tip: If you are configuring connections to more than one partner under SAML 2.0 specifications, or if you intend to add partners in the future, consider using Auto-Connect (see “Configuring IdP Auto-Connect” on page 345).

As an SP, you respond to user requests for SSO and SLO by creating or closing user sessions, respectively, in local applications. You integrate these applications with PingFederate by configuring them with SP adapter instances (see “Configuring SP Adapters” on page 266). In preparation for configuring a new SSO connection, you will need to know which adapter instance to use (see “Configuring Adapter Mapping and User Lookup” on page 295). (No adapters are required for a connection that uses only the Attribute Query profile—see “Configuring the Attribute Query Option” on page 332.)
Managing IdP Connections

If you intend to pass attribute values to an adapter instance from a local data store, you must define the data store during this configuration, if you have not done so already (see “Managing Data Stores” on page 98).

Accessing IdP Connections

You can create or modify connections directly via the Main Menu. Note that the menu displays the four most-recently modified connections. To view a list of all IdP connections, click the Manage All IdP link.

From the Main Menu

From the Main Menu, you can configure a new connection, modify an existing connection, or view connections.

Tip: To copy or delete connections or to find connection drafts, click Manage All IdP (see “From the Manage Connections Screen” on page 280).

Note that long connection names are truncated for this display and the list is limited to four connections, chronologically ordered according to most recently edited. The full connection names and a complete list are displayed on the Manage Connections screen (see “From the Manage Connections Screen” on page 280).

To begin configuring a new connection:

▶ Click Create New under IdP Connections on the Main Menu.

Tip: If you want to use a virtual ID for a second connection to the same partner, the fastest way is to click Manage All IdP and copy the first connection (see “From the Manage Connections Screen” on page 280). For information about virtual IDs, see “Federation Server Identification” on page 33.
To modify a connection:

1. Click the connection name under IdP Connections on the Main Menu. Only the four most recently edited connections are displayed. To see all connections, including drafts, click Manage All IdP.

2. On the Activation & Summary screen, click the heading for the information you want to change.

3. Make your change and click Save.

**Note:** If Save is not available, it means your modification requires other changes or you are editing a screen that is part of a series of subtasks. Click Next and continue making indicated changes. The Done button indicates that further changes in the task are optional. When you have no further changes, click Done and then click Save on the task summary screen.

From the Manage Connections Screen

From the Manage Connections screen you can:

- Create a new connection.
- Modify or copy an existing connection.
- Continue working on a connection draft.
- Delete a connection—if it is not active or referenced in other parts of the configuration (In Use).
- Export individual connection configurations.

**Note:** The connection export function results in an XML file that you can modify and import into another PingFederate server acting in the same federation role (IdP or SP) at your site (see “Connection Management Service” on page 445). You can also automate this process (see “Automating Configuration Migration” on page 68).

- Export metadata about a connection to expedite your partner’s corresponding configuration (see “Exporting Metadata” on page 48).

On this screen you can also globally override transaction logging levels set for individual connections or restore connection-based logging (see “Runtime Transaction Logging” on page 41).

**Tip:** A green icon (✔️) next to a Connection Name indicates that the connection has been checked for configuration errors. For more information about connection-validation features associated with this screen, see “” on page 282.
Managing IdP Connections

To access the Manage Connections screen:
- Click Manage All IdP under IDP Connections on the Main Menu.

To begin configuring a new connection:
- Click Create Connection on the Manage Connections screen.
  See “Managing IdP Connections” on page 278 for step-by-step information.

**Tip:** If you need to create a second connection to a partner using a Virtual ID, copy the existing connection and make necessary changes, including adding the Virtual ID on the General Info screen. For information about Virtual IDs, see “Federation Server Identification” on page 33.

To copy a connection:
1. Click Copy under Action for the connection you want to copy.
2. Enter new General Information for the connection (see “General Connection Information” on page 285).
3. Make any further changes needed for the new connection.

To edit a connection or continue working on a draft:
- Click the Connection Name link.
  For a draft, you will return to where you left off.

To export a connection:
1. Click Export Connection under Action for the connection.
2. Save the XML file on your file system.
   You can change the name of the file, but keep the XML extension.

**Tip:** You can import the connection programmatically or manually into another instance of PingFederate acting in the same role (see “Connection Management Service” on page 445).
Chapter 7
Service Provider SSO Configuration

To export connection metadata:
1. Click Export Metadata under Action for the connection.
   This action takes you to the Export Metadata screen flow, with the connection
   selection preset (see “Exporting Metadata” on page 48).
2. Complete the steps remaining in the Export Metadata screen flow (starting at
   Step 4 under “To export connection metadata:” on page 49).

To delete a connection:
1. Under Action, click Delete for the connection.
   (To undo the deletion, click Undelete.)

   Note: The Delete function is not available if the connection is
   Active or In Use.

2. To confirm the deletion, click Save.

To sort the list of connections:
► Click the arrow next to any column heading to sort the list based on that
   column.

To filter the list by Protocol and/or Status:
► Select a filter criterion from either or both of the drop-down lists.

To override connection-based transaction logging:
1. Select On under Logging Mode Override.
2. Choose the logging mode you want to use for all connections.

To restore connection-based transaction logging:
► Select Off under Logging Mode Override.

Managing IdP Connection Validation

By default PingFederate automatically validates all existing connections before
displaying the Manage Connections screen. This validation ensures that any
updates to supporting components—adapters or data-store configurations, for
example—have not invalidated any connection settings.

If such errors are found, a warning icon (⚠️) appears next to the Connection
Name.

To correct errors:
► Click the Connection Name to reach the top-level task in which
   reconfiguration is needed, and to see the error message. Then navigate into
dereper tasks using Configure . . . buttons to find a link to the screen that needs
   updating.
   (For more information about console navigation, see “About Tasks and Steps” in
   the “Console Navigation” chapter of Getting Started.)

Note that the connection validation time increases with the number of connections
and when connections are configured to access data stores for adapter mapping.
Consequently, there may be noticeable delays in displaying the Manage
Connections screen. For this reason, PingFederate provides a way to turn off the
automatic validation under Server Settings (see “Setting System Options” on
page 93).
When validation is turned off, administrators can check connections manually on the Manage Connections screen. A question-mark icon (❓) indicates the connection has not been validated. In addition, Action links are disabled (except for **Delete**, if the connection is Inactive and/or In Use). You may, however, still edit the connection by clicking its name.

When automatic validation is disabled, use one of the following procedures to validate connections:

**To validate a single connection:**
- Click 📚 next to the Connection Name.

**Note:** Validating a single connection does not check connectivity for any configured data-store lookups (see “Selecting an Adapter Data Store” on page 297). However, this check is performed when you access the connection for editing.

**To validate all connections (including for data-store connectivity):**
1. Click **Check All Connections for Errors**.
2. When prompted, click **Yes**.

**Choosing an IdP Connection Type**

Indicate on the Connection Type screen whether the connection to this partner is for Browser SSO, WS-Trust STS, and/or OAuth SAML (see “Connection Types” on page 5).

**Note:** You can add STS and OAuth support to any existing SSO connection, or vice versa, at any time.

If your federation deployment supports multiple protocols, then for new SSO connections you can also select the applicable protocol on the Connection Type screen (see “Choosing Roles and Protocols” on page 89).

**Note:** If your partner’s deployment also supports multiple protocols and you intend to communicate using more than one, then you must set up a separate connection for each protocol.

- To configure a connection for secure Internet SSO, select Browser SSO Profiles and the Protocol (if necessary).
- To configure a connection for WS-Trust STS, make that selection.
To configure an OAuth SAML Grant connection, make that selection.

**Note:** This option is available only after you configure an access token plug-in (see “Access Token Management” on page 128).

(Official) If your PingFederate license manages connections by groups, then you can select a group for this connection.

This option is not displayed for unrestricted or other types of licenses.

**Choosing IdP Connection Options**

On the Connection Options screen, you can choose to enable User Provisioning in conjunction with Browser SSO (see “Express Provisioning” on page 32).

You can also choose to map user attributes for persistent grants used by the optional PingFederate OAuth Authorization Server (see “About OAuth” on page 10).

**Note:** The OAuth Attribute Mapping option is active only when the OAuth 2.0 Authorization Server (AS) role is enabled on the Roles & Protocol screen (see “Choosing Roles and Protocols” on page 89).

For SAML 2.0, you also have the option of configuring the Attribute Query profile, with or without SSO (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

**Note:** This screen is presented only for browser-based SSO connections (see “Choosing an IdP Connection Type” on page 283).

To create a connection for secure Internet SSO, ensure that Browser SSO is selected and click **Next**.

**Importing IdP Metadata**

If you are using one of the SAML protocols and have received a metadata file from your partner, click **Browse** on the Import Metadata screen, select the file, and click **Next**.

**Note:** If the endpoints in the metadata file share the same base URL (protocol, hostname, and port), PingFederate uses this information to populate the Base URL field (see “General Connection Information” on page 285). Consequently, individual endpoints on other screens do not include this information—only relative paths are shown.
Managing IdP Connections

If you are not using a metadata file, click **Next** on the Import Metadata screen.

**Importing a Certificate**

The Import Certificate screen appears only if the metadata file you have chosen to import is signed and the certificate needed to verify the signature is not contained in the file.

- Click **Browse** to locate and open the signature verification certificate for this partner.

**Viewing the Summary**

The Metadata Summary screen provides security information about an imported metadata file, including whether the file was signed and, if so, the trust status of the certificate used to verify the signature.

**General Connection Information**

On the General Info screen, you provide a required unique identifier and display name for a connection, as well as optional contact information. In addition, on this screen you can define a default error message that end users will see in the event that SSO fails, and you can set the level of transaction logging for this connection partner (see “Runtime Transaction Logging” on page 41).

---

**Note:** If you are importing a signed metadata file that does not include the certificate and public key, you will be asked to import the certificate needed to verify the XML signature (see the next section).

If you are not using a metadata file, click **Next** on the Import Metadata screen.
## Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Partner’s Entity ID/Issuer/Partner’s Realm (Connection ID)</strong></td>
<td>(Required) The published, protocol-dependent, unique identifier of your partner. For a SAML 2.0 connection, this is your partner’s SAML Entity ID. For a SAML 1.x connection, this is the Issuer your partner advertises. For a WS-Federation connection, this is your partner’s Realm. This ID may have been obtained out-of-band or via a metadata file if you are using a SAML protocol (see “Exporting Metadata” on page 48). For STS-only connections, this ID can be any unique identifier.</td>
</tr>
</tbody>
</table>
Managing IdP Connections

For a new connection:

- Fill in the information needed and click Next.
  - Connection ID and Connection Name are required (see “Field Descriptions” above).
  - Note that the Virtual ID identifies your own federation deployment for this connection only and overrides the ID you specified under Server Settings (see “Federation Server Identification” on page 33).

For an existing connection:

- If you are editing existing information, modify the fields as needed and click Save.

Configuring Browser SSO

Browser-based SSO (also, Browser SSO) is another term for secure Internet SSO, which relies on a user’s Web browser and HTTP to broker XML identity-federation
messaging between an IdP and an SP (in contrast to WS-Trust STS messaging, which is typically application-driven across the back channel and does not require browser mediation).

To continue, click **Configure Browser SSO**.

### Connection Configuration Steps

Many steps involved in setting up a federation connection are protocol-independent; that is, they are required steps for all connections, regardless of the associated standards (see the “Supported Standards” chapter in Getting Started). Also, for any given connection, some configuration steps are required under the applicable protocol, while others are optional. Still others are required only based on certain selections. The PingFederate administrative console determines the required and optional steps based on the protocol and dynamically presents additional requirements or options based on selections.

The following sections provides sequential information about every step you might encounter while configuring browser-based SSO, regardless of the protocol you are using for a particular connection.

**Note:** The configuration screens represented in this chapter show “SAML 2.0” in their left corners, unless they are exclusive to WS-Federation or SAML 1.x setup requirements. When the SAML 2.0 screens are also applicable to SAML 1.x and/or WS-Federation connections, the SAML 2.0 representations and discussions also apply to the other protocols, unless otherwise indicated.

After configuring SSO settings, you will normally need to configure authentication credentials, the range of which depends on your SSO selections (see “Configuring Security Credentials” on page 334). Also, other configuration tasks may remain to be
Managing IdP Connections

configured for new or modified connections, depending on selected connection options (see “Choosing IdP Connection Options” on page 284).

**Important:** For new connections you must completely configure these SSO settings and subsequent tasks before you can save the connection on the Activation & Summary screen. Until then, the configuration is temporary and can be lost; the console times out after several minutes of inactivity. At any time, however, you can click **Save Draft**, which is available on most screens after you enter General Information (see “Console Buttons” in the “Console Navigation” chapter of *Getting Started*).

Use the lists and links (or page references) below to find specific information about steps that may apply to your SSO connection requirements:

**SAML 2.0 SSO Steps**
- “Choosing SAML Profiles” on page 290
- “User-Session Creation” on page 292
  - “Selecting an Identity-Mapping Method” on page 293
  - “Defining an Attribute Contract” on page 294
  - “Configuring Adapter Mapping and User Lookup” on page 295
- “Configuring SAML Protocol Settings” on page 311
  - “Specifying SSO Service URLs (SAML)” on page 312
  - “Specifying SLO Service URLs” on page 313
  - “Choosing Allowable SAML Bindings (SAML)” on page 314
  - “Setting an Artifact Lifetime (SAML 2.0)” on page 315
  - “Specifying Artifact Resolver Locations” on page 316
  - “Configuring Signature Policy” on page 317
  - “Configuring XML Encryption Policy (for SAML 2.0)” on page 318

**WS-Federation SSO Steps**
- “User-Session Creation” on page 292
  - “Selecting an Identity-Mapping Method” on page 293
  - “Defining an Attribute Contract” on page 294
  - “Configuring Adapter Mapping and User Lookup” on page 295
- “Configuring SAML Protocol Settings” on page 311
  - “Specifying a Service URL (WS-Federation)” on page 313

**SAML 1.x SSO Steps**
- “Choosing SAML Profiles” on page 290
- “User-Session Creation” on page 292
  - “Selecting an Identity-Mapping Method” on page 293
  - “Defining an Attribute Contract” on page 294
  - “Configuring Adapter Mapping and User Lookup” on page 295
- “Configuring SAML Protocol Settings” on page 311
  - “Specifying SSO Service URLs (SAML)” on page 312
  - “Choosing Allowable SAML Bindings (SAML)” on page 314
  - “Specifying Artifact Resolver Locations” on page 316
Choosing SAML Profiles

A SAML profile is the message-interchange scenario that you and your federation partner have agreed to use (see “Federation Planning Checklist” on page 32). For SAML 2.0, PingFederate supports all IdP- and SP-initiated SSO and SLO profiles.

The SAML 1.x implementation supports standard IdP-initiated SSO as well as nonstandard SP-initiated SSO.

For information on typical SSO/SLO profile configurations, including illustrations, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

To configure profiles:

1. Select the profile(s) applicable to this connection and click Next.
   For SAML 2.0 connections, you must select an SSO profile before you can enable SLO.

2. Continue through the remaining connection-configuration tasks.

About IdP-Initiated SSO

When PingFederate is operating as an SP, the IdP-initiated SSO profile configuration defines the message-transport mechanisms (bindings) your enterprise has agreed to.
allow for receiving SAML assertions, plus any digital signature verification requirements for inbound assertions (see “Security Infrastructure” on page 23).

For illustrations of typical profile and binding scenarios, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

For this configuration you need to know:

- The transport binding(s) to which you and your partner have agreed
- The certificate to be used for verifying incoming digital signatures from your IdP (optional for the artifact binding)

When Artifact is an allowable inbound SAML binding, you also need to know the endpoint(s) to your partner’s Artifact Resolution Service(s) and the SOAP client authentication mechanism to use: either HTTP Basic, SSL client certificates, a digital signature, or a combination of these mechanisms.

**About SP-Initiated SSO**

The SP-initiated SSO profile configuration defines the message-transport mechanisms (bindings) and security requirements for sending authentication requests and receiving assertions when your site initiates SSO transactions.

For SAML 1.x, the SP-initiated SSO profile is also known as the “destination-first” profile, which was added as a supported “non-normative” use case after the release of the SAML 2.0 specifications.

For illustrations of typical profile and binding scenarios, see the “Profiles” sections in the “Supported Standards” chapter in Getting Started.

For this configuration you will need to know:

- The endpoint URL(s) for your IdP’s Single Sign-on Service(s)
- The transport bindings to which you and your partner have agreed (inbound and outbound)
- The certificates you will use to sign outbound authentication requests and to verify incoming digital signatures from your IdP

When Artifact is an allowable inbound SAML binding, you also need to know the endpoint(s) to your partner’s Artifact Resolution Service(s) and the SOAP client authentication mechanism to use: either HTTP Basic, SSL client certificates, a digital signature, or a combination of these mechanisms.

**About IdP-Initiated SLO**

The SAML 2.0 IdP-initiated SLO profile configuration defines the message-transport mechanisms (bindings) and security requirements that you and your partner have agreed upon for exchanging SLO requests and responses.

*Note:* SLO is not supported by the SAML 1.x specifications.

For more information about SLO, see “Single Logout” in the “Supported Standards” chapter of Getting Started.

For this configuration you need to know:

- The transport bindings that you and your partner have agreed upon to send SLO requests and receive responses
- The certificates to be used for signing outgoing messages and for verifying incoming digital signatures from your IdP (optional for the artifact binding)
- The URL(s) of your IdP’s Single Logout Service(s)
Chapter 7
Service Provider SSO Configuration

- The URL of your IdP’s Artifact Resolution Service(s) (to resolve artifacts from the IdP) and SOAP client authentication requirements

**About SP-Initiated SLO**

The SAML 2.0 SP-initiated profile configuration for SLO defines the message-transport mechanisms (bindings) and security requirements that you and your partner have agreed upon for exchanging SAML requests and responses.

**Note:** SLO is not supported by the SAML 1.x specifications.

For more information about SLO, see “Single Logout” in the “Supported Standards” chapter of Getting Started.

For this configuration you need to know:

- The transport bindings that you and your partner have agreed upon to send SLO requests and receive responses
- The certificates to be used for signing outgoing messages and for verifying incoming digital signatures from your IdP (optional for the artifact binding)
- The URL(s) of your IdP’s Single Logout Service(s)
- The URL of your IdP’s Artifact Resolution Service(s) (to resolve artifacts from the IdP) and SOAP client authentication requirements

**User-Session Creation**

As an SP, you must specify how you will use information sent from the IdP in SSO assertions to create user sessions for enabling access to protected resources at your site. This configuration includes:

- Choosing an identity-mapping method (see “Selecting an Identity-Mapping Method” next).
- Defining the attribute contract you will use with this partner, if any (see “Defining an Attribute Contract” on page 294).
- Configuring instances of one or more adapters (see “Configuring Adapter Mapping and User Lookup” on page 295) and specifying how they are used to fulfill the adapter contract.

To continue, click **Configure User-Session Creation**.
Selecting an Identity-Mapping Method

PingFederate allows an SP to use either account linking or account mapping to associate remote users with local accounts for SSO between business partners (see “Identity Mapping” on page 16). At the Identity Mapping step, you choose which method to use with a particular IdP connection. You and your partner may want to decide in advance which option to use (see “Federation Planning Checklist” on page 32).

If your site is using account linking, then establishing an attribute contract is not required. Depending on your partner agreement, however, you may choose to supplement the account link with an attribute contract. In this configuration the account link is used to determine the user's identity, while the additional attributes might be used for authorization decisions, customized Web pages, and so on, at your site (see “About Attributes” on page 17).

**Important:** If you have previously set up a configuration to use an attribute contract and want to change the configuration to use account linking without additional attributes, then the existing attribute contract will be discarded.

Account linking can be used with either a clear, standard name identifier or an opaque pseudonym.

- If you want to dynamically associate remote users with local accounts using a known attribute to identify a user—for example, a username or email address—then select **Account Mapping**.

Account mapping uses the value passed in the SAML assertion's `SAML_SUBJECT` and associated user attributes to create an association between a remote user and a local account.

**Tip:** if you are using PingFederate’s Express Provisioning, choose Account Mapping (see “Using Express Provisioning” on page 320).
If you want to create a long-term association between a remote user and a local account, then select **Account Linking** on the Identity Mapping screen.

To set up an attribute contract to use in conjunction with account linking, select the checkbox next to “The assertion includes attributes . . .” after selecting **Account Linking**.

**Tip:** An SP PingFederate uses a default, Hypersonic database to handle account linking. You can use your own database instead, as needed. For more information, see “Configuring an LDAP Connection” on page 103.

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**To reach this screen:**

1. Click the connection name on the Main Menu.
   - Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **User-Session Creation** under the Browser SSO tab.
5. Click **Configure User-Session Creation**
6. Click **Identity Mapping** on the Summary screen.

**Defining an Attribute Contract**

An attribute contract is the set of user attributes that you and your partner have agreed will be sent in SAML assertions for this connection (see “Attribute Contracts” on page 18). You identify these attributes on this screen.

**SAML_SUBJECT** is always sent in a SAML assertion and contains the name identifier of the user requesting SSO. When you select account mapping as the identity mapping technique, the **SAML_SUBJECT** is available to help map the incoming user to a local ID on your system (see “Selecting an Identity-Mapping Method” on page 293).

For **account linking**, the **SAML_SUBJECT** contains an identifier that the SP server uses to make a permanent association between the remote user and a local account. The **SAML_SUBJECT** itself is not available to the SP application and thus does not appear in the Attribute Contract on this screen.

Optionally, you can mask the values of attributes (other than **SAML_SUBJECT**) in the log files that PingFederate writes when it receives assertions (see “Attribute Masking” on page 22).
Managing IdP Connections

To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation.
6. Click Attribute Contract on the Summary screen.

If this step is not in the list, then you have chosen to use account linking and specified that the IdP is not including additional attributes in the assertion (see “Selecting an Identity-Mapping Method” on page 293).

To add an attribute:
1. Enter the attribute name in the text box.
   Attribute names are case-sensitive and must correspond to the attribute names expected by your partner.
2. (Optional) Select the checkbox under Mask Values in Log.
3. Click Add.

To modify an attribute name or masking selection:
1. Click Edit under Action for the attribute.
2. Make the change and click Update.

To delete an attribute:
 ⊲ Click Delete under Action for the attribute.

Configuring Adapter Mapping and User Lookup

Remote users arriving at your site via an SSO request do so in order to use specific applications or gain access to protected resources. Based on the nature of the business...
relationship and the agreement with your partner, you may be expected to provide access to these applications. Therefore, integration between your federation SP server and local applications is important.

The PingFederate server for an SP uses integration adapters to identify the user to your applications based on attributes sent in an assertion. The server uses this information to create a local session that enables access to user-requested resources (the “target”) at your site. (See “SSO Integration Kits and Adapters” on page 14.)

Each adapter instance requires a set of attributes into which you map values found in the assertion. You can map additional attributes, as needed, from local data stores, or you can use static or variable text values. An adapter instance will fail to create a local session for the incoming user if it is unable to find values for each of its required attributes.

You must associate at least one adapter instance with an IdP connection. If you have multiple integration requirements—for example, if you are using more than one IdM system or an application not covered by a centralized system—then you should map multiple adapter instances.

Note: If you configure only one adapter instance for a connection, the server will use that instance at runtime without checking for any associated URLs (see “Mapping URLs to Adapter Instances” on page 270).

To reach this screen:
1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation

To begin mapping an adapter:
- Click Map New Adapter Instance and follow the configuration screens (see the following sections for more information).
Managing IdP Connections

To begin modifying an existing adapter mapping:

- Click the Adapter Instance Name and navigate through the steps to the information you want to change.

Choosing an Adapter Instance

An SP adapter instance is available for use within an IdP connection only after it has been deployed in PingFederate.

To select an adapter instance:

- Choose an adapter instance from the drop-down menu and click Next to continue.

If the adapter instance you need is not available, click Manage Adapter Instances to define one or more adapter instances you need for this connection.

Note that an adapter instance can be mapped only once per connection.

Tip: Adapter contracts for some adapters can be customized for individual connection requirements (see “Configuring SP Adapters” on page 266).

Selecting an Adapter Data Store

To populate the attributes required by the adapter (the adapter contract), you can use values supplied by SAML assertions from the IdP exclusively, or in addition to values retrieved from local user-data stores (see “Managing Data Stores” on page 98).
If you choose to look up additional values, click the applicable button and then Next. This selection allows you to identify data sources and specify lookup queries in subsequent screens (see “Data Store Setup” next).

Or:

If you choose not to look up additional values, click the applicable button (if it is not already selected) and then Next. This selection takes you directly to a screen where you can map attribute values from the assertion (see “Configuring Adapter Contract Fulfillment” on page 307).

**Tip:** To determine whether you need to look up additional values, compare your attribute contract against your adapter contract (see “Defining an Attribute Contract” on page 294 and “Choosing an Adapter Instance” on page 297). If the adapter requires more information, determine whether your local data stores can supply it. (You can also choose to use text constants or expressions for certain information—see “Configuring Adapter Contract Fulfillment” on page 307.)

### Data Store Setup

For data-store setup information, refer to the sections indicated in the following steps.

**Note:** As you make selections on configuration screens, ensure that you allow enough time for PingFederate to access your data store and populate drop-down lists.

1. See “Choosing a Data Store” on page 298.
2. See the following sections in this manual, depending on the type of data store:

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Related Manual Sections</th>
</tr>
</thead>
</table>
| JDBC            | • “Selecting a Database Table and Columns” on page 299  
                  • “Configuring a Database Filter” on page 302 |
| LDAP            | • “Configuring a Directory Search” on page 303  
                  • “Specifying an LDAP Filter” on page 305 |
| Custom          | • “Configuring Custom Data-Source Filters” on page 306  
                  • “Selecting Custom Data-Source Fields” on page 306 |


### Choosing a Data Store

This screen allows you to choose a data store from a previously configured list (see “Managing Data Stores” on page 98). Attribute values extracted from this data store are used in combination with the values from the attribute contract to fulfill the adapter contract for this adapter instance (see “Configuring Adapter Mapping and User Lookup” on page 295).
To reach this screen:

1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.

2. Click Browser SSO under the IdP Connection tab.

3. Click Configure Browser SSO.

4. Click User-Session Creation under the Browser SSO tab.

5. Click Configure User-Session Creation.

6. Click Adapter Mapping & User Lookup under the User-Session Creation tab.

7. Click the Adapter Instance Name.

8. Click Data Store on the Summary screen.
   - If this step is not present, then the use of a data store has not been selected (see “Selecting an Adapter Data Store” on page 297).

To define an attribute source:

- Choose an Active Data Store and click Next.

  A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click Manage Data Stores to add it (see “Managing Data Stores” on page 98).

Selecting a Database Table and Columns

When you choose to use a database source for attributes, you follow this path through the configuration steps.
On this screen you specify a database table and columns where user data is located. You will specify the user lookup query next (see “Configuring a Database Filter” on page 302).

**Important: (For MySQL users)** To allow for table and column names that may contain spaces, PingFederate inserts double quotes around the names at runtime. To avoid SQL syntax errors resulting from the quotes, add the property `ANSI_QUOTES` to `sql-mode` in the configuration file `my.cnf` (on Unix/Linux) or `my.ini` (on Windows). For example:

```
sql-mode="...,ANSI_QUOTES"
```

For more information, see:

- [dev.mysql.com/doc/refman/5.0/en/identifiers.html](http://dev.mysql.com/doc/refman/5.0/en/identifiers.html)

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Lists the table structure that stores information within a database. Some databases, such as Oracle, require selection of a specific schema for a JDBC query. Other databases, such as MySQL, do not require selection of a schema.</td>
</tr>
<tr>
<td>Table</td>
<td>The name of the table contained in the database. The name is used to construct the SQL query to retrieve data from the data store.</td>
</tr>
</tbody>
</table>
Managing IdP Connections

Field | Description
--- | ---
Add Attribute | Adds the column to be executed in the SQL query to the data store to retrieve the attribute value.
(Drop-down menu) | The available columns of attribute names for the selected table are displayed. Select the columns that are associated with the desired attributes you would like to return from the JDBC query.

To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation.
6. Click Adapter Mapping & User Lookup under the User-Session Creation tab.
7. Click the Adapter Instance Name.
8. Click Database Table and Columns on the Summary screen.
   If this step is not shown, this connection is not yet configured to use a database to look up attributes. For information about changing this configuration, see “Choosing a Data Store” on page 298.

To select a database table and columns for queries:
1. Choose a Schema file (when applicable) from the drop-down list.
2. Choose a Table from the drop-down list.
3. Choose a name under Columns to Return from Select and click Add Attribute.

Tip: Click Refresh if you are updating an existing configuration and changes may have been made to the database.

Repeat this step for other columns as needed.

Note: You do not need to add a column here for it to be used as part of a search filter (see “Configuring a Database Filter” next). Add only attributes from which you need actual values to pass to the adapter.

Tip: To determine which attributes to look up during a query, click Adapter Contract to Fulfill to see what information must be collected (see “Choosing an Adapter Instance” on page 297). Then determine what information is coming in from the assertion (see “Defining an Attribute Contract” on page 294). Information not contained in the Attribute Contract may be pulled from the data store look-up query.
Configuring a Database Filter

On this screen you begin to specify exactly where additional data can be found to complete the attribute contract when you receive an assertion from this IdP (see “Creating an Attribute Contract” on page 196).

The JDBC \texttt{WHERE} clause queries your data store to locate a user record. Once the record is located, the configured \texttt{SELECT} statements retrieve the attribute values. The clause is in the form:

\[ \text{WHERE } \text{column1} = \text{value1} \[\text{AND}\] \text{column2} = \text{value2} \[\text{OR} \ldots \] \]

The left side of the first variable pair uses a column name in the database table you selected (see “Selecting a Database Table and Columns” on page 299).

The right side generally uses values passed in from the assertion. Possible variables for these, including the correct syntax, are listed under Assertion Values.

You can also apply additional search criteria from your own database, using any other columns from the targeted table.

\textbf{Tip:} Click “View List of Columns . . .” to see a list from which to copy and paste.

For more information about \texttt{WHERE} clauses, consult your DBMS documentation.

\textbf{Example:}

\begin{verbatim}
userid='${username}'
\end{verbatim}

In this example \texttt{userid} is the name of a column in the JDBC data store. On the right side, \texttt{'${username}'} returns the value of the \texttt{username} from the assertion.

\textbf{Important:} You must use the \texttt{${} syntax to retrieve the value of the enclosed variable and use single quotation marks around the \texttt{${} characters.
To reach this screen:
1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation
6. Click Adapter Mapping & User Lookup under the User-Session Creation tab.
7. Click the Adapter Instance Name.
8. Click Database Filter on the Summary screen.
   If this step is not shown, this connection is not yet configured to use a database to look up attributes. For information about changing this configuration, see “Choosing a Data Store” on page 298.

To construct the WHERE clause:
1. Enter the statement in the space provided, following the guidelines and example above.
   The initial WHERE is optional.
2. Ensure the syntax and variable names are correct.
   When you click Next, you will map attribute values returned from the database into the attribute contract (see “Selecting an Adapter Data Store” on page 297).

Configuring a Directory Search

When you choose to use an LDAP source for attributes, you follow this path through the configuration steps.

On this screen you begin to specify exactly where additional data can be found to supply to the SP adapter in order to access a resource on your system (see “SSO Integration Kits and Adapters” on page 14).
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DN</td>
<td>The base distinguished name of the tree structure in which the search begins. This field is optional if records are located at the LDAP root.</td>
</tr>
<tr>
<td>Search Scope</td>
<td>Determines the node depth of the query. Select Subtree, One level or Object.</td>
</tr>
<tr>
<td>Root Object Class</td>
<td>Specifies the object type within the LDAP hierarchy from which attributes will be returned.</td>
</tr>
<tr>
<td>Attribute</td>
<td>The available attribute names for the selected directory structure. Select the names associated with the attributes that you would like to return from the query.</td>
</tr>
</tbody>
</table>

**To reach this screen:**
1. Click the connection name on the Main Menu.
   Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **User-Session Creation** under the Browser SSO tab.
5. Click **Configure User-Session Creation**.
6. Click **Adapter Mapping & User Lookup** under the User-Session Creation tab.
7. Click the **Adapter Instance Name**.
8. Click **LDAP Directory Search** on the Summary screen.
   If this step is not shown, this connection is not yet configured to use LDAP to look up attributes (see “Choosing a Data Store” on page 298).

**To select LDAP attributes:**
1. (Optional) Enter a Base DN.
2. Select a Search Scope.
3. Select a Root Object Class.
4. Under Attributes to return from search, choose an attribute and click Add Attribute.
   Note that the attribute Subject DN is always returned by default.
5. Repeat the last step for other attributes as needed.
6. (Optional) Change the Search Scope or the Root Object Class if you want attributes from other locations.

**Note:** You do not need to add an attribute here for it to be used in a search filter (see “Specifying an LDAP Filter”). Add only attributes from which you need values to map to the adapter.
Specifying an LDAP Filter

The LDAP filter queries the data store to retrieve a user record associated with a particular value (or values) from the assertion. The filter is in the form:

\[(attribute=${value})\]

The left-side variable is an attribute from the data store (see “Configuring a Directory Search” on page 303).

The right side generally uses values passed in from the assertion.

You can also apply additional search criteria from your data store, using any other attributes from the targeted object classes.

Tip: Click “View List of Available LDAP Attributes” for a list from which you can copy and paste.

For general information about search filters, consult your LDAP documentation.

Example:

\[(UNAME=${username})\]

In this example UNAME is the name of an attribute in the LDAP data store. On the right side, ${username} returns the value of username in the assertion.

Important: You must use the ${} syntax to retrieve the value of the enclosed variable.
Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>A filter narrows a search to locate requested data by either including or excluding specific records. An LDAP filter includes the attributes in the search and the value or range of values that the search is attempting to match. Searches are conducted by using at least three components: 1) at least one attribute (attribute data type) to search on, 2) a search filter operator that will determine what to match, and 3) the value of the attribute being sought. Searches must have at least one of each of these three components.</td>
</tr>
</tbody>
</table>

To reach this screen:
1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation.
6. Click Adapter Mapping & User Lookup under the User-Session Creation tab.
7. Click the Adapter Instance Name.
8. Click LDAP Filter on the Summary screen.
   - If this step is not shown, this connection is not configured to use LDAP to look up attributes (see “Choosing a Data Store” on page 298).

To construct the LDAP filter:
1. Enter the statement in the space provided, following the guidelines and example above.

   **Note:** If you used an anonymous binding to create this LDAP connection, your access might be restricted (see “Configuring an LDAP Connection” on page 103).

2. Ensure the syntax and variable names are correct.
3. Click Next.

**Configuring Custom Data-Source Filters**

When you choose to use a custom source for attributes, you follow this path through the configuration steps.

On this screen you specify a filter, or lookup query, for your custom data source. This screen display and the syntax of the filter depends on your developer's implementation of the custom source SDK.

**Selecting Custom Data-Source Fields**

On the Configure Custom Source Fields screen, you can choose from among the fields shown to map to the adapter contract. These choices are supplied by the driver
Managing IdP Connections

implementation. Select only those needed to fulfill the attribute contract for this partner connection.

Configuring Adapter Contract Fulfillment

The last step in configuring an adapter is to map each attribute required for the adapter contract to a value (see "Selecting an Adapter Data Store" on page 297). These are the values that will be used to create a local session. An SSO operation fails if the SP is unable to fulfill the mapping requirements defined here.

Map attributes from one of these Sources:

- **Account Link**
  This source appears only if you have elected to use account linking (see “Selecting an Identity-Mapping Method” on page 293). When you make this selection, the associated Value drop-down list is populated with Local User ID. Normally, you would map this identifier to target an adapter attribute that represents the local user ID.

- **Assertion**
  Values are contained in the assertions from this IdP. When you make this selection, the associated Value drop-down list is populated by the attribute contract (see “Defining an Attribute Contract” on page 294).

- **JDBC/LDAP/Custom**
  Values are returned from your query. When you make this selection, the Value list is populated by the database columns or LDAP or custom attributes you identified for this data store (see “Selecting a Database Table and Columns” on page 299, “Configuring a Directory Search” on page 303, or “Selecting Custom Data-Source Fields” on page 306).

- **Expression (when enabled)**
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the assertion, using the ${attribute} syntax.

  You can also enter values from your data store, when applicable, using this syntax:

  ${ds.attribute}

  where attribute is any of the data store attributes you select.

  **Tip:** Two other variables are also available: ${SAML_SUBJECT} and ${TargetResource}. SAML_SUBJECT is the initiating user (or other entity). TargetResource is a reference to the protected application or other resource for which the user requested SSO access; this variable is available only if specified as a query parameter for the relevant PingFederate endpoint (either as TargetResource for SAML 2.0 or TARGET for SAML 1.x—see “Application Endpoints” on page 429).

  There are a variety of reasons why you might hard code a text value. For example, if your Web application provides a consumer service, you might want to supply a particular promotion code for this partner.
Chapter 7
Service Provider SSO Configuration

To reach this screen:
1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
4. Click User-Session Creation under the Browser SSO tab.
5. Click Configure User-Session Creation
6. Click Adapter Mapping & User Lookup under the User-Session Creation tab.
7. Click the Adapter Instance Name.
8. Click Adapter Contract Fulfillment on the Summary screen.

To map attributes:
1. Choose a Source for each Target attribute (see descriptions of each Source type above).
2. Choose (or enter) a Value for each Attribute.
   - All values must be mapped.
3. Click Done.

Configuring OAuth Attribute Mapping

This configuration allows administrators to use assertion attributes for mapping into OAuth persistent-grant USER_KEY values (see “About OAuth” on page 10).

**Note:** This option is presented only when enabled for a connection (see “Choosing IdP Connection Options” on page 284).
Managing IdP Connections

To continue, click **Configure OAuth Attribute Mapping**.

**Choosing an OAuth Data Store**

This optional configuration is the same for all OAuth attribute-mapping task flows. For detailed instructions, see “**OAuth Attribute Mapping Using a Data Store**” on page 141.

- If you do not need additional attributes from a data store, just click **Next** on the **Data Store** screen.

**To reach this screen for editing:**

1. Click the connection name on the **Main Menu**.
   - Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the **IdP Connection** tab.
3. Click **Configure Browser SSO**.
4. Click **OAuth Attribute Mapping** under the **Browser SSO** tab.
5. Click **Configure OAuth Attribute Mapping**.
6. Click **Data Store** on the **Summary** screen.

**Configuring Contract Fulfillment**

The last step in configuring OAuth attribute mapping is to map attributes for the **USER_KEY** (to look up persistent OAuth grants) and **USER_NAME** (the name shown to end-users on permissions screens) for persistent access-token grants.
Map attributes from one of the following Sources:

- **Assertion**
  Values are contained in the assertions from this IdP. When you make this selection, the associated Value drop-down list is populated by the token Contract.

- **JDBC/LDAP/Custom**
  Values are returned from your user-data store. When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes identified for this data store (see “Selecting a Database Table and Columns” on page 299 or “Configuring a Database Filter” on page 302).

- **Expression (when enabled)**
  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

- **Text**
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the assertion, using the \$\{attribute\} syntax.

  You can also enter values from your data store, when applicable, using this syntax:

  \$\{ds.attribute\}

  where attribute is any of the data store attributes you have selected.

**To reach this screen:**

1. Click the connection name on the Main Menu.
   Click **Manage All IdP**, if needed, to see a full list of connections.

2. Click **Browser SSO** under the IdP Connection tab.

3. Click **Configure Browser SSO**.

4. Click **OAuth Attribute Mapping** under the Browser SSO tab.

5. Click **Configure OAuth Attribute Mapping**.

6. Click **Contract Fulfillment** on the Summary screen.
Managing IdP Connections

To map attributes:
1. Choose a Source for each attribute.
   (For descriptions, see “Map attributes from one of the following Sources:” above.)
2. Choose (or enter) a Value for each Attribute.
   All values must be mapped.
3. Click Next.

Using the OAuth Attribute Mapping Summary Screen
When you finish the configuration, you can review it on the Summary screen.

If you need to make any changes, click the heading over the information you want to edit. When you finish, click Done.

Configuring SAML Protocol Settings
The Protocol Settings screen provides the launching point for configuring bindings, partner endpoints, and other settings needed for the selected SAML profiles (if you are using SAML—see “Choosing SAML Profiles” on page 290). The screen also displays configured information.
(For WS-Federation, the configuration of bindings is not applicable.)

To configure Protocol Settings, you need to know:
- For SP-initiated SSO profiles, the URL(s) of your IdP’s Single Sign-on Service(s).
- For SLO profiles, the URL(s) of your IdP’s Single Logout Service(s)
- When artifact is an allowable inbound binding, the URL of your IdP’s Artifact Resolution Service(s)
- The transport configurations (bindings) that you will use to send and receive data for SSO/SLO connections
- Digital signature policies and certification requirements to which you and your connection partner have agreed
Chapter 7
Service Provider SSO Configuration

- XML encryption policies to which you and your connection partner have agreed
  - To continue, click Configure Protocol Settings.

**Important:** After modifying any settings, you must click Save on the Protocol Settings screen.

### Specifying SSO Service URLs (SAML)

At this step for SAML 2.0 connections, you associate bindings to the endpoints where your IdP wants PingFederate to send authentication requests when SSO is initiated at your site.

For SAML 1.x, only one endpoint is allowed, and the binding selection is not required.

This configuration applies only to the SP-initiated SSO Profile (see “About SP-Initiated SSO” on page 291).

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Binding (SAML 2.0)</strong></td>
</tr>
<tr>
<td><strong>Endpoint URL</strong></td>
</tr>
</tbody>
</table>

**To reach this screen for editing:**
1. Click a connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click **SSO Service URLs** on the Summary screen.
   If this step is not displayed, you have not selected SP-initiated SSO (see "Choosing SAML Profiles" on page 290).

**To define an Endpoint URL:**

1. If you are using SAML 2.0, select the **Binding** your partner specifies for the **Endpoint**.
2. Enter the fully qualified **Endpoint URL** or a relative path if you have defined a base URL (see “General Connection Information” on page 285).
3. If you are using SAML 2.0, click **Add**.
4. If your partner has additional SSO endpoints established under SAML 2.0, repeat the steps above.

**Specifying a Service URL (WS-Federation)**

The Service URL is the WS-Federation endpoint of your IdP partner. This endpoint is where you send RST (Request for Security Token) and SLO messages.

![WS-Fed Configuring 'wsf' IdP Connection](image)

To reach this screen for editing:

1. Click a connection name on the Main Menu.
   Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Protocol Settings** under the Browser SSO tab.
5. Click **Configure Protocol Settings**.
6. Click **Service URL** on the Summary screen.

**Specifying SLO Service URLs**

At this step you associate bindings to the endpoints where your IdP receives logout requests when SLO is initiated at your site and where you send SLO responses when you receive SLO requests from the IdP.

This step applies only for SAML 2.0 connections when you have selected an SLO profile (see "Choosing SAML Profiles" on page 290).
Chapter 7
Service Provider SSO Configuration

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding</td>
<td>The transport type agreed upon by you and your partner: Artifact, POST, Redirect, or SOAP.</td>
</tr>
<tr>
<td>Endpoint URL</td>
<td>The location where your IdP receives SLO request messages.</td>
</tr>
<tr>
<td>Response URL</td>
<td>(Optional) The location where the IdP receives logout responses. Use this endpoint when you are part of a chain of session participants.</td>
</tr>
</tbody>
</table>

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   - Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Protocol Settings** on the Summary screen.
5. Click **Configure Protocol Settings**.
6. Click **SLO Service** on the Summary screen.

To define an Endpoint URL:
1. Select the Binding your partner specifies for the Endpoint.
2. Enter the fully qualified Endpoint URL or a relative path if you have defined a base URL (see “General Connection Information” on page 285).
3. (Optional) Enter the Response URL or a relative path and click **Add**.
4. If your partner provides additional endpoints for SLO, repeat the steps above.

Choosing Allowable SAML Bindings (SAML)

At this step you configure binding(s) that the IdP will use to send SAML assertions or SLO messages (under SAML 2.0) to your PingFederate server.
Managing IdP Connections

This configuration applies to all profile types (see “Choosing SAML Profiles” on page 290). You and your partner can agree to standardize on one binding type or select different bindings for different profile scenarios.

<table>
<thead>
<tr>
<th>IdP Connection</th>
<th>Main</th>
<th>Protocol Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**To reach this screen for editing:**
1. Click a connection name on the Main Menu.
   - Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Protocol Settings** on the Summary screen.
5. Click **Configure Protocol Settings**.
6. Click **Allowable SAML Bindings** on the Summary screen.

**To define binding requirements for this connection:**

- Make your selections and click **Next** (or **Done**).

**Setting an Artifact Lifetime (SAML 2.0)**

When you send an artifact to your IdP’s SSO or SLO service, an element in the message indicates how long it should be considered valid.

<table>
<thead>
<tr>
<th>IdP Connection</th>
<th>Main</th>
<th>Protocol Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You can change the default value per your requirements, if needed. Also consider synchronizing clocks between your server and your partner's SAML gateway server. If clocks are not synchronized, you might need to set the artifact lifetime to a higher value.
To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Artifact Lifetime on the Summary screen.
   This step appears only if you have selected the artifact binding for either a SSO or SLO Service at the IdP site.

Specifying Artifact Resolver Locations
This endpoint or group of endpoints is where your server will send back-channel requests based on artifacts. The location or locations are also known under SAML specifications as the Artifact Resolution Service. SAML 2.0 provides for multiple, indexed endpoints for the service.

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Browser SSO under the IdP Connection tab.
3. Click Configure Browser SSO.
5. Click Configure Protocol Settings.
6. Click Artifact Resolver Locations on the Summary screen.
   If this step does not appear, you do not have Artifact selected under Allowable SAML Bindings.
Managing IdP Connections

For a SAML 2.0 connection:

1. Enter a URL on the Artifact Resolver Locations screen and click Add.
   
   The URL must be fully qualified (defining protocol, host, and port) unless you have entered a base URL (see “General Connection Information” on page 285).

   Repeat this step if your IdP supports multiple services. The SAML 2.0 specifications permit multiple artifact resolution services through the use of Index numbers, which PingFederate automatically supplies when you add a service. Alternatively, if needed per partner specifications, you may assign these index numbers manually.

   Note: When specifying multiple artifact resolution endpoints, each endpoint must share the same transport protocol. That is, if one endpoint uses HTTP, then all must use HTTP. Similarly, if one endpoint uses HTTPS, then all must use HTTPS.

2. Click Next.

For a SAML 1.x connection:

1. Enter the Endpoint on the Artifact Resolution Location screen.
   
   The URL must be fully qualified (defining transport protocol, host, and port) unless you have entered a base URL (see “General Connection Information” on page 285).

2. (Optional) Enter your partner's Source ID.
   
   The Source ID is usually a generated value based on a federation partner's Connection ID; the SP will correctly generate the Source ID. If that is the case for this partner, then leave this field blank. If your partner uses a Source ID that is not based on the Issuer ID, then enter the Source ID supplied by your IdP partner.

3. Click Next.

Configuring Signature Policy

The Signature Policy screen provides options controlling how digital signatures are used for SSO Internet messaging. The choices made on this screen depend on your partner agreement (see “Digital Signing Policy Coordination” on page 25).

Digital signing is required for SAML Response messages sent from the IdP via POST (or Redirect for SAML 2.0). Optionally, SSO authentication requests from the SP (SP-initiated SSO) may also be signed to enforce security. (This option appears only for SAML 2.0 connections and only if you have enabled SP-initiated SSO using the POST or redirect bindings.)

The assertions inside SAML Responses may be also be signed. When you make this choice, only the assertion portion of the Response is signed, not the complete Response. (This is the only option that appears for SAML 1.x connections.)
To choose one or more enhancement options, select the second button, make your selection(s), and click **Next**.

Alternatively, select the first option (if not already selected) and click **Next**.

**Configuring XML Encryption Policy (for SAML 2.0)**

For SAML 2.0 configurations, in addition to using signed assertions to ensure authenticity, you and your partner may also agree to encrypt all or part of an assertion to improve privacy. This feature is commonly used if the assertion might pass through an intermediary (such as a user's browser) and HTTPS is not used.

If the name identifier (or `SAML_SUBJECT`) of an assertion is encrypted, you and your partner may also want to encrypt the identifier in subsequent singleLogout messages (if you are using an SLO profile).

Note that “The entire assertion” selection on the Encryption Policy screen includes the `SAML_SUBJECT` and all attributes.
**Managing IdP Connections**

**To reach this screen for editing:**
1. Click a connection name on the Main Menu.
   - Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Browser SSO** under the IdP Connection tab.
3. Click **Configure Browser SSO**.
4. Click **Protocol Settings** under the Browser SSO tab.
5. Click **Configure Protocol Settings**.
6. Click **Encryption Policy** on the Summary screen.

**To define XML encryption:**
1. Select **Allow encrypted SAML Assertions and SLO messages**.
2. Choose whether this IdP partner will encrypt the entire assertion, the `SAML_SUBJECT`, one or more other attributes, or some combination.
3. If your partner is encrypting the name-identifier attribute, use the checkboxes near the bottom of the screen to indicate whether you will encrypt this attribute in outbound SLO messages and/or allow its encryption for inbound messages.
4. Click **Next** or **Done**.

**To disable previously configured XML encryption selections:**
1. Select **None** and then **Done**.
2. Click **Save** on the Browser SSO screen.

**Saving Protocol Settings**

On the Summary screen you can review or edit your Protocol Settings.

---

**Important:** When you finish editing existing settings, be sure to click **Done** on the Summary screen and then **Save** on the Protocol Settings screen. For a new connection, click **Done** and then click **Next** on the Protocol Settings screen. Save the entire connection on the Activation & Summary screen (see “IdP Connection Activation and Summary” on page 345).

---

**To reconfigure saved settings:**

1. Click the heading over the information you want to change.
2. Click **Done** on the screen containing your change.
   - If you need to make dependent or other changes, do so and continue by clicking **Done** until you reach the Protocol Settings screen.
3. Click **Save** on the Protocol Settings screen.
Chapter 7
Service Provider SSO Configuration

Editing and Saving SSO Settings

On the Summary screen for Browser SSO, you can review or edit your SSO configuration.

Important: When you finish editing existing settings, be sure to click Done on the Summary screen and then Save on the Browser SSO screen. For a new connection, click Done and then click Next on the Browser SSO screen. Save the entire connection on the Activation & Summary screen (see “IdP Connection Activation and Summary” on page 345).

To reconfigure saved settings:
1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   If you need to make dependent or other changes, do so and continue by clicking Done until you reach the Browser SSO screen.
3. Click Save on the Browser SSO screen.

Using Express Provisioning

PingFederate’s Express Provisioning allows SPs to create user accounts “on the fly” during SSO events, based on attributes received from IdPs (see “Express Provisioning” on page 32). An SP can also use the feature to update existing user records.

To continue, click Configure User Provisioning.

Note: This configuration task is presented in the administrative console only when User Provisioning is selected as an option (see “Choosing IdP Connection Options” on page 284).
Selecting Attribute Sources (SAML 2.0)

For SAML 2.0 connections, the server can be configured to use only assertion attributes for user provisioning or to retrieve more attributes from the IdP in a follow-on Attribute Query transaction (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started). The User Attributes screen displays the attributes expected in the assertion from this IdP (see “Defining an Attribute Contract” on page 294).

**Note:** Attribute Query is a SAML 2.0 profile. For SAML 1.x and WS-Federation connections, this screen is not presented: PingFederate uses only attributes from the assertion for user provisioning.

![Image of PingFederate interface]

User accounts are provisioned with attributes from the SAML Assertion by default. You can also retrieve additional attributes from the IdP using the Attribute Query profile.

**Attribute Contract**

- **SAMLSUBJECT**
  - Use only these user attributes
  - Issue an Attribute Query back to the IdP to retrieve additional user attributes

> If you and your IdP partner have agreed to use the Attribute Query profile for provisioning, select that option before leaving this screen.

You will configure the Attribute Query profile later in the task flow, if you have not already done so (see “Configuring the Attribute Query Option” on page 332).

Identifying the User Repository

PingFederate’s Express Provisioning currently supports LDAP v3-compliant user stores and the JDBC-compliant Microsoft SQL Server 2005.

**Note:** We recommend using the latest version of the Microsoft SQL Server JDBC Driver (version 4 or higher), which is compatible with current and recent JDK versions.
Choose the Active Data Store on the User Repository screen.

If the correct data store is not shown in the drop-down list, then PingFederate is not yet configured to access the store (see “Managing Data Stores” on page 98).

If you are using an LDAP store, refer to the sections immediately following:

- “Specifying an LDAP User-Record Location”
- “Defining an LDAP Filter” on page 323
- “Identifying Provisioning Attributes for LDAP” on page 324

If you are using MSSQL, skip to this section:

- “Selecting a SQL Method” on page 324

**Specifying an LDAP User-Record Location**

After choosing a data store, indicate where in the store PingFederate should write new user records or update existing ones (see “Choosing an Event Trigger” on page 331). Start by specifying where user records are located in your data store.

![Note: This screen appears only for LDAP data stores (see “Identifying the User Repository” on page 321).]
Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DN</td>
<td>The base distinguished name of the tree structure in which the search begins. Leave this field blank if records are located at the LDAP root.</td>
</tr>
</tbody>
</table>

Defining an LDAP Filter

On the Unique ID screen, create an LDAP filter to identify user accounts to be provisioned (or updated) during SSO events. PingFederate uses this expression in conjunction with the Base DN (see the previous section) to locate existing account records and to add new ones.

Note: This screen appears only for LDAP data stores (see “Identifying the User Repository” on page 321).

The filter is in the form:

\[\text{attribute} = \$\{\text{value}\}\]

Note that the statement must not be enclosed in parentheses, unlike filters used to retrieve LDAP attributes for adapter mapping (see “Specifying an LDAP Filter” on page 305).

The left-side variable is an attribute in your user-data store—click the link near the left corner of the screen to see a list of available attributes. The right side of the filter generally uses one or more attribute values passed in from the assertions (see “Defining an Attribute Contract” on page 294). Variables for these attributes, including the correct syntax, are listed under Assertion Values.

Note: If you are unfamiliar with writing LDAP queries, please refer to the documentation accompanying your LDAP installation.
Identifying Provisioning Attributes for LDAP

On the Attributes screen, select the data-store attributes to be provisioned.

**Tip:** Multiple-value IdP attributes are handled automatically: when you map a multi-value assertion attribute to an LDAP attribute, each value is stored separately for the LDAP attribute name. If you need to provide additional values for particular attributes, add the same attribute name to this list multiple times. You can then map the additional values on the Attribute Fulfillment screen (see “Mapping Attributes to User Accounts” on page 328).

### To select attributes:

1. Choose a Root Object Class and an Attribute from the drop-down lists and click **Add Attribute**.
   
   Repeat this step for the same attribute if needed for multi-value attributes (see “Tip” above).

   **Important:** For the Sun Directory Server or Active Directory, the attribute `objectClass` must be among attributes added—select `<Show All Attributes>` under Root Object Class to locate and add this attribute.

2. Repeat the previous step for each attribute requiring provisioning.

### Selecting a SQL Method

For JDBC data stores, PingFederate allows you to map attributes directly to a single database table (the default) or to SQL stored-procedure parameters.
Make a selection as needed and click Next.

Depending on the selection, different steps appear under the User Provisioning task. Refer to the manual sections indicated below for more information:

- If you are mapping attributes directly to a Table, refer to the sections immediately following:
  - “Specifying a Database User-Record Location” (next)
  - “Specifying a Unique-ID Database Column” on page 326
- If you are using a Stored Procedure, skip to this section:
  - “Specifying a Stored-Procedure Location” on page 327

**Specifying a Database User-Record Location**

For database provisioning to a table, indicate where PingFederate should write new user records or update existing ones (see “Choosing an Event Trigger” on page 331).

Note: This screen appears only for MSSQL data stores when Table is selected on the SQL Method screen (see the previous section, “Selecting a SQL Method”).
Chapter 7
Service Provider SSO Configuration

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Select the table structures that store information within the database.</td>
</tr>
<tr>
<td>Table</td>
<td>Select the name of the database table that contains user records.</td>
</tr>
<tr>
<td>Columns to fulfill when provisioning</td>
<td>For the selected table, all attributes and their data types are displayed. All attributes must be mapped for the database insertion to succeed, although a null entry may be used for optional attributes (see “Mapping Attributes to User Accounts” on page 328).</td>
</tr>
</tbody>
</table>

Specifying a Unique-ID Database Column

PingFederate uses the column specified on this screen to check whether a user record already exists for the incoming assertion.

Note: This screen appears only when Table is selected on the SQL Method screen (see “Selecting a SQL Method” on page 324).
Select a column that represents a unique characteristic about the database entry for a particular user (email, for example).

**Specifying a Stored-Procedure Location**

If you are using a stored procedure for provisioning the user database, specify its location on this screen.

**Important:** The database account used by PingFederate must have access to the schema in which the stored procedure is located, as well as execute permission for the procedure.

**Note:** This screen appears only when Stored Procedure is selected on the SQL Method screen (see “Selecting a SQL Method” on page 324).
Chapter 7
Service Provider SSO Configuration

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Select the table structure that contains stored procedures within the database.</td>
</tr>
<tr>
<td>Stored Procedure</td>
<td>Select the stored procedure needed to provision the user database.</td>
</tr>
<tr>
<td>Procedure parameters to fulfill</td>
<td>For the selected procedure, all parameters and their data types are displayed. You will map assertion values to the parameters on the next screen.</td>
</tr>
</tbody>
</table>

- To see a list of attributes expected from SAML assertions, click **View Attribute Contract**.
- If the list of parameters is not or might not be current (due to any recent procedure revisions), click **Refresh**.

Mapping Attributes to User Accounts

The Attribute Fulfillment screen provides a means of mapping the values of incoming attributes into local account attributes or, for JDBC stores, into SQL stored-procedure parameter values (see “Selecting a SQL Method” on page 324). You can also provide values of your own for any data store attributes (except JDBC system-managed) or for SQL procedure parameters—either as hard-coded text or derived values based on assertion attributes.

For JDBC, this screen also provides a means of testing the insertion of attribute values into the database or stored procedure.

**Tip:** For mapping to a database datetime or smalldatetime column, if you are not using a stored procedure to convert the incoming string value, you may use a PingFederate Java conversion method via OGNL expressions (see “Using Attribute Mapping Expressions” on page 453). Note that expressions must be enabled to use the PingFederate conversion method—see “Enabling and Disabling Expressions” on page 454.
Managing IdP Connections

**Map attributes from one of these Sources:**

- **Assertion**
  
  Values are contained in the assertions from this IdP. When you make this selection, the associated Value drop-down list is populated by the attribute contract (see “Defining an Attribute Contract” on page 294).

- **Attribute Query**
  
  This choice appears only if you have chosen to use the Attribute Query profile for provisioning (see “Selecting Attribute Sources (SAML 2.0)” on page 321).

  To map an attribute-query value, use this syntax:
  
  \$\{query\_attribute\}

  You can also combine attribute-query values with references to attributes in the attribute contract. For example:

  \$\{query\_attribute\}+$\{attribute\}

  References to attributes not contained in the attribute contract result in an Attribute Query back to the IdP partner.

- **Expression** (when enabled—see “Enabling and Disabling Expressions” on page 454)

  This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute
Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

Tip: For JDBC mapping, if the data type of a Target Attribute/Parameter is datetime or smalldatetime, you can use an expression to convert date-time strings from the assertion. After selecting Expression for such attributes, click Datetime OGNL Examples under the text box for syntax information and examples.

- System Managed (if applicable)
  This mapping option appears only when any automatically assigned JDBC attributes are among columns to be provisioned—for example, an identity or timestamp column for the MSSQL Server.
- Text
  The value is what you enter. This can be text only, or you can mix text with references to any of the values from the assertion, using the $\{\text{attribute}\}$ syntax.

Note: If no entry is required in a JDBC database for a column, you can leave the text box blank. A blank entry results in an empty string in the database for string data types and null for all other data types. Alternatively, for string types, you can enter null in the text box to explicitly set null in the table column.

To map attributes:
1. Choose a Source for provisioning each Target Attribute or Target Parameter (see descriptions of each Source type above).

Note: For JDBC table mapping, select System Managed as the Source for any columns that are automatically provisioned by the database server.

Tip: For LDAP mapping, choose Text as the Source for the objectClass attribute.

2. Choose (or enter) a Value for each Attribute.
   All values must be mapped. However, for optional JDBC table columns, you may leave a text box blank (or, for string data types, enter null to avoid empty strings).
   Note that no value is required for System Managed attributes.

Tip: For Active Directory, enter user in the text box for objectClass. For the Sun Directory Server, enter inetOrgPerson.

3. Click Done.

To test the insertion of attributes into a JDBC table or stored procedure:
1. Click the Test insert into . . . or Test call to . . . link.
2. For each Target Attribute or Target Parameter (for a stored procedure), enter text into the boxes under Test Value and click Test Insert (or Test Stored Procedure Call).

   For table insertions, if the test is successful, a confirmation is displayed along with the values inserted. For stored procedures, only a confirmation is displayed if the test is successful, indicating that the procedure was populated with parameter values.

3. For table insertions, unless you wish to keep test values in the database, click Roll Back All Test Inserts.

   If you are using a stored procedure, this option is not provided since PingFederate cannot know the result of the procedure. Database rollback, if needed, must be handled manually.

4. When finished, click Next or Done; or click the link Return to Attribute Fulfillment to continue or change any mapping.

Choosing an Event Trigger

On the Event Trigger screen, choose whether PingFederate initiates user provisioning only when the user identifier is new or every time your site receives a SAML assertion. In the latter case (for all assertions), an existing user account is always updated with incoming attributes.

Note: This screen does not appear for JDBC data stores if provisioning is accomplished using a stored procedure (see “Selecting a SQL Method” on page 324), because the procedure is always called for all assertions. The procedure should handle both provisioning new users and updating existing ones (if desired).

Error Handling

If user provisioning fails for any reason during SSO events, you can choose to stop the SSO or continue the process by passing assertion attributes on to your application (via the SP adapter configuration—see “Configuring Adapter Mapping and User Lookup” on page 295).
Chapter 7
Service Provider SSO Configuration

When SSO is aborted, the user is redirected to an error page, and the failure is written to the log and added to the Transaction Failure Count at the bottom of the administrative console.

Using the Provisioning Summary Screen

The Summary screen provides an overview of your provisioning configuration.

- When you are finished with a new configuration, click Done and then Save on the User Provisioning screen.

To change the configuration:

1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   - If you need to make additional changes, do so and continue by clicking Done until you reach the User Provisioning screen.
3. Click Save on the User Provisioning screen.

Configuring the Attribute Query Option

At the Attribute Query step you configure your connection to request user attributes from your partner IdP, if you have chosen this option (see “Choosing IdP Connection Options” on page 284). Attribute queries are not dependent on single sign-on but may be used independently or in conjunction with Browser SSO or provisioning to provide flexibility in how a user authenticates with SP applications (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

Setting the Attribute Authority Service URL

Attribute Authority is the term used to refer to an IdP that provides user attributes to an Attribute Requester (your SP site). The Attribute Authority Service URL corresponds to the endpoint location where Attribute Query requests are received by your IdP partner (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).
Managing IdP Connections

To configure the URL:

- Enter the fully qualified URL or a relative path if you have defined a base URL (see “General Connection Information” on page 285).

Mapping Attribute Names

If the application at your site uses different names for user attributes than the names defined by the Attribute Authority, then you need to map them on this screen. When the SP receives a request from a local application to send an Attribute Query to this Attribute Authority partner, the requested user attributes are replaced with the names mapped here.

This information must be predetermined in your agreement with this connection partner.

To map attributes:

1. Enter the Local Name and Remote Name of an attribute and click Add.
   Repeat this step for all attributes requiring mapping.

2. Click Next.

To edit a mapping:

1. Click Edit under Action for the mapping.

2. Make your change(s) and click Update.

   **Note:** If you change your mind, ensure that you click the Cancel link in the Actions column, not the Cancel button, which discards any other changes you might have made in this configuration.

3. Click Done and then Save on the Attribute Query screen.
Defining Security Policy

This screen allows you to specify the digital signing and encryption policy to which you and your partner have agreed. These selections will trigger requirements for setting up Credentials (see “Configuring Security Credentials” on page 334).

This screen also allows you to mask incoming attribute values in log files (see “Attribute Masking” on page 22). When you enable this selection, all user attributes returned from this IdP are masked.

To configure attribute-query security policy for this partner:

▶ Check or clear the check boxes and click Next or Done.

Saving the Attribute Query Configuration

On the Summary screen you can review the Attribute Query configuration.

To reconfigure saved profiles:

1. Click the heading over the information you want to change.
2. Click Done on the screen containing your change.
   - If you need to make additional changes, do so and continue by clicking Done until you reach the Attribute Query screen.
3. Click Save on the Attribute Query screen.

Configuring Security Credentials

The Credentials screen presents a list of possible security requirements you might need, depending on the federation protocol you are using and the choices you have made.

Your connection configuration may involve any or all of the following:

- Back-Channel Authentication
- Digital Signature Settings
- Signature Verification Settings
- Choosing an Encryption Certificate
- Choosing a Decryption Key
Managing IdP Connections

To configure or modify credentials, click **Configure Credentials**.

### Back-Channel Authentication

When you configure a profile for the inbound artifact binding or the outbound SOAP binding, you must specify back-channel authentication information for sending SOAP messages or artifact resolution requests to your partner IdP.

Similarly, if you send artifacts or SOAP messages to your partner IdP, then you must configure SOAP authentication requirements for receiving SOAP responses or artifact resolution requests from your partner.

This step also applies to attribute-request configurations, since this profile always uses the SOAP back channel (see “Choosing SAML Profiles” on page 290).

**Note:** A yellow triangle next to a listing indicates that you have not completely configured back-channel authentication requirements.
To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **Credentials** under the IdP Connection tab.
3. Click **Configure Credentials**.
   If the Back-Channel Authentication step is not shown, then it is not applicable to your configuration—you are not using the Attribute Query profile and have not configured any profiles to use the artifact or SOAP bindings.

To configure back-channel authentication requirements for sending SOAP messages:
1. On the Back-Channel Configuration screen, click the **Configure** link to the right of the list of messages to be sent to your partner.
2. Make one or more selections on the Outbound SOAP Authentication Type screen:
   - Basic — you will enter SOAP Basic credentials on a later screen.
   - SSL Client Certificate — you will specify the certificate on a later screen.
     This option is enabled only if you have specified an endpoint that uses SSL.
   - Use Digital Signatures . . . — you will sign the message.
     You will be asked to select a signing certificate on a later screen.
   For SAML 2.0, these options may be used in any combination or independently. For SAML 1.x, you must use either Basic or SSL authentication; digital signing may be added to ensure message integrity.

   By default, PingFederate validates your partner’s SSL server certificate—verifying that the certificate chain is rooted by a trusted Certificate Authority and that the hostname matches the certificate’s Common Name. Clear the associated checkbox if you do not want this validation to occur.
3. (Optional) On the Outbound SOAP Authentication Type screen, select the checkbox requiring a valid certificate chain for your partner’s SSL certificate.
   Make this selection only if you and your partner have agreed that the chain of authority is required for SSL federation transactions.
4. Click **Next**.
5. If you chose Basic at **Step 2**, enter the SOAP Username and Password to use for this partner under Basic SOAP Authentication.
   You must obtain these credentials from your partner.
6. If you are using an SSL certificate, select the certificate under SSL Authentication Certificate and click **Next**.
   If you have not yet created or imported the client SSL certificate you need into PingFederate, click **Manage Certificates** (see “SSL Client Keys and Certificates” on page 149). You will need to export the certificate (only) and send it your partner.
7. On the Summary screen, click **Done**.

To configure back-channel authentication requirements for receiving SOAP messages:
1. On the Back-Channel Configuration screen, click the **Configure** link to the right of the list of messages to be received from your partner.
2. Select one or more options on the Inbound SOAP Authentication Type screen:
   - Basic — Enter the logon username and password your partner will use on the next screen.
Managing IdP Connections

- **SSL Certificate** — Specify certificate verification information on a later screen.
- **Use Digital Signatures** — Incoming messages must be signed.
- **Require SSL** (checkbox) — When selected, incoming SOAP transmissions must use a secure channel.

You will be asked to select a signature verification certificate on a later screen.

For SAML 2.0, these options may be used in any combination or independently. For SAML 1.x, you must use either Basic or SSL authentication; digital signing may be added to ensure message integrity.

3. **Click Next.**

4. If you chose Basic at Step 2, enter the SOAP Username and Password under Basic SOAP Authentication.

   **Important:** If you are configuring more than one connection that uses the artifact or SOAP profile, you must ensure that the Username is unique for each connection.

5. If you are using an SSL certificate, select Anchored or Unanchored under Certificate Verification Method.
   - Anchored — The certificate must be signed by a trusted Certificate Authority, and the CA’s certificate must be imported into the PingFederate Trusted CA store (see “Trusted Certificate Authorities” on page 146).
   - Unanchored — The certificate is self-signed or you wish to trust a specified certificate.

   **Note:** When anchored certificates are used between partners, certificates may be changed without sending the update to your partner. If the certificate is unanchored, any changes must be promulgated.

6. **Click Next.**

7. If you chose anchored SSL certificate verification at Step 5, enter the Subject DN and click Next.

   **Tip:** If you have not yet defined the certificate in PingFederate or you do not know the DN, return to the previous screen and check Unanchored. Then click Next and click Manage Certificates on the SSL Verification Certificate screen to import the certificate, if needed, or to view its DN.

8. If you chose unanchored SSL certificate verification at Step 5, select the certificate you will use to validate the SSL connection.

   If you have not yet imported the certificate into PingFederate, click Manage Certificates.

9. **Click Next.**

10. On the Summary screen, click **Done**.

**Digital Signature Settings**

This step defines the private key you will use to sign SSO authentication or attribute requests (optionally) or SAML 2.0 SLO messages for this IdP. In addition, the step
allows you to include “Key Info” with the XML message if you and your partner have agreed to this option.

Digital signing applies to SP-initiated SSO under SAML 2.0, when specified by your partner agreement, and to either SLO profile (see “Choosing SAML Profiles” on page 290) using the POST or redirect bindings. The step also applies if you are configuring an Attribute Query profile and have specified that you will sign attribute requests (see “Defining Security Policy” on page 334).

The step is not required for SAML 1.x IdP connections.

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Credentials under the IdP Connection tab.
3. Click Configure Credentials.
4. Click Digital Signature Settings on the Summary screen.

   If this step does not appear, then your configuration does not require digital signatures. You do not have SLO configured using the POST or redirect bindings, and you have not elected to sign either authentication or attribute requests (see “Configuring Signature Policy” on page 317 and “Defining Security Policy” on page 334).

To specify a certificate:
1. Select the certificate from the drop-down list.
   If you have not yet created or imported your certificate into PingFederate, click Manage Certificates (see “Digital Signing and Decryption Keys and Certificates” on page 151).
2. (Optional) If you have agreed to send your public key with the SAML message, select the checkbox to include the certificate.
3. (Optional) Select the Signing Algorithm from the drop-down list.
   The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.
Signature Verification Settings

Under SAML 2.0 specifications, when your site receives any SAML 2.0 messages via the POST or Redirect bindings, the messages must be digitally signed. Signing is also always required for the SAML 1.x POST binding and for WS-Federation assertions, as well as incoming SAML 1.1 or 2.0 tokens for WS-Trust STS processing.

Depending on your agreement with this IdP, SSO assertions, SAML 2.0 artifacts, or SOAP messages might also require signatures.

Whenever signatures are required, PingFederate provides a choice of trust models, including an option to use anchored signature-verification certificates embedded in incoming messages (see “Trust Models” on page 25). When this option is chosen in Signature Verification Settings, you must provide the Subject DN for embedded certificates coming from this partner, and the Issuer CA certificate must be part of the PingFederate trusted store (see “Trusted Certificate Authorities” on page 146).

Alternatively, you may choose to use unanchored certificates, in which case you must import your partner’s public-key certificate during this configuration (or select it if it is already imported). To prevent any interruption of service due to an expired certificate, you can ask your partner for a new certificate in advance and import it as backup.

To continue, click Manage Signature Verification Settings.

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Credentials under the IdP Connection tab.
3. Click Configure Credentials.
4. Click Signature Verification Settings on the Summary screen.
   If this step does not appear, then your configuration does not require verification settings.

Selecting a Trust Model

This screen allows you choose the Trust Model you want to use for signature verification (see “Trust Models” on page 25).
Chapter 7
Service Provider SSO Configuration

Depending on the selection, the next step in this task varies:

- For **Anchored**, the next step is to enter the Subject DN for your partner's certificate (see the next section, “Specifying a Subject DN”).

  **Important:** If you are using the Redirect binding for SLO, you cannot use anchored certificates because SAML 2.0 does not permit certificates to be included using this transport method.

- For **Unanchored**, the next step is to import your partner’s certificate (see “Selecting an Unanchored Certificate” on page 341).

**To reach this screen for editing:**

1. Click a connection name on the Main Menu.
   
   Click **Manage All IDP**, if needed, to see a full list of connections.

2. Click **Credentials** under the IdP Connection tab.

3. Click **Configure Credentials**.

4. Click **Signature Verification Settings** on the Summary screen.
   
   If this step does not appear, then your configuration does not require verification settings.

5. Click **Manage Signature Verification Settings**.

6. Click **Trust Model** on the Summary screen.

**Specifying a Subject DN**

When you choose to use an anchored certificate for signature verification, incoming SAML messages must contain the partner's verification certificate (see “Trust Models” on page 25). PingFederate verifies that the Issuer CA is trusted and checks to see that the embedded certificate's Subject DN matches the one specified on this screen. If so, PingFederate uses that certificate to verify the message signature.
You can either enter the Subject DN or extract it from your partner’s certificate if the certificate is stored on an accessible file system.

**Important:** Ensure that you enter the Subject DN correctly or extract the DN from the correct partner certificate.

**To extract the Subject DN from a certificate:**

1. Click browse to select your IdP partner’s public certificate.
2. Click **Extract**.

**To reach this screen for editing:**

1. Click a connection name on the Main Menu.
2. Click **Manage All IdP**, if needed, to see a full list of connections.
3. Click **Credentials** under the IdP Connection tab.
4. Click **Configure Credentials**.
5. Click **Signature Verification Settings** on the Summary screen. If this step does not appear, then your configuration does not require verification settings.
6. Click **Manage Signature Verification Settings**.
7. Click **Certificate Subject DN** on the Summary screen.

**Selecting an Unanchored Certificate**

On the Signature Verification Certificate screen, you identify your partner’s imported public certificate and, optionally, a secondary certificate to use when the first expires (see “Trust Models” on page 25).
To reach this screen for editing:

1. Click a connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click Credentials under the IdP Connection tab.
3. Click Configure Credentials.
4. Click Signature Verification Settings on the Summary screen.
   - If this step does not appear, then your configuration does not require verification settings.
5. Click Manage Signature Verification Settings.
6. Click Signature Verification Certificate on the Summary screen.

To specify a verification certificate:

1. Select the certificate from the drop-down list.
   - If you have not yet imported the certificate into PingFederate, click Manage Certificates.
2. (Optional) Select a Secondary certificate for backup.
   - Use this field if your partner has sent you a new certificate to replace one that is ready to expire. The server will automatically verify against the secondary certificate when the primary one expires.

Choosing an Encryption Certificate

If SAML_SUBJECT is encrypted, either by itself or as part of a whole assertion, then all references to this name identifier in SAML 2.0 SLO requests from your site may also be encrypted (if the connection uses SP-initiated SLO). For more information, see “Configuring XML Encryption Policy (for SAML 2.0)” on page 318.

To enable this XML encryption, you must identify an encryption certificate for this partner.

You must also choose a certificate if encryption of the Name Identifier is required for an Attribute Request profile (see “Defining Security Policy” on page 334).
Managing IdP Connections

To reach this screen for editing:
1. Click a connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click Credentials under the IdP Connection tab.
3. Click Configure Credentials.
   If this step is not present, then you have either not configured this connection to use the SP-initiated SLO profile (see “Choosing SAML Profiles” on page 290) or you have chosen not to encrypt the assertion or the SAML_SUBJECT (see “Configuring XML Encryption Policy (for SAML 2.0)” on page 318).

To identify the encryption certificate:
1. (Optional) Change the default settings under Block Encryption Algorithm and/or Key Transport Algorithm.
   Due to import restrictions, the standard JRE distribution supports strong but not unlimited encryption. To use the strongest AES encryption, when permissible, download and install the appropriate version of “Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files” from the Sun download Web site (http://java.sun.com/javase/downloads).
   For more information about XML block encryption and key transport algorithms, see the “XML Encryption Syntax and ProcessingW3C Recommendation” (http://www.w3.org/TR/xmlenc-core).
2. From the drop-down list, select the applicable certificate and click Next.
   If the certificate is not in the list, click Manage Certificates to import it.

Note: If you have already imported a signature verification certificate for this partner, you can reuse it for XML decryption as long as it is an RSA certificate.
Choosing a Decryption Key

As part of XML encryption, you must identify a signing certificate and key for PingFederate to use to decrypt incoming assertions or assertion elements (see “Configuring XML Encryption Policy (for SAML 2.0)” on page 318).

<table>
<thead>
<tr>
<th>SAML 2.0 Configuration</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>IdP Connection</td>
<td>Credentials</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To reach this screen for editing:

1. Click a connection name on the Main Menu. Click Manage All IdP, if needed, to see a full list of connections.
2. Click Credentials under the IdP Connection tab.
3. Click Configure Credentials.
4. Click Select XML Decryption Key.

If this step is not present, you have not chosen to require encryption of all or part of the SAML assertion (see “Configuring XML Encryption Policy (for SAML 2.0)” on page 318).

To identify the decryption key:

- From the drop-down list, select the applicable certificate and click Next.
  
  If the certificate is not in the list, click Manage Certificates to import it (see “Digital Signing and Decryption Keys and Certificates” on page 151).

  **Note:** If you have imported a certificate for this partner to use for digital signing, you can reuse it for XML decryption as long as it is an RSA certificate.

Saving Credential Configurations

From the Summary screen you can review or edit your credentials configuration.

**Important:** When you finish editing existing settings, you must click Done on the Summary screen and then Save on the Credentials screen. For a new connection, click Done and then click Next on the Credentials screen. Save the entire connection on the Activation screen (see “IdP Connection Activation and Summary” next).
IdP Connection Activation and Summary

When you finish setting up a connection, you may choose to activate it immediately.

Important: Regardless of whether you choose to activate a new connection now or later, you must click Save on the Summary screen for a new connection if you want to keep the configuration.

You can deactivate a connection at any time (for maintenance, for example). When a connection is inactive, all SSO or SLO transactions to or from this partner are disabled, as well as access to the WS-Trust STS for Web Service Providers associated with this connection.

Tip: The SSO Application Endpoint near the top of the Summary screen is an example URL that webmasters or Web application developers at your site might use to invoke SSO for the connection. For details about SSO and other server endpoints, including optional query parameters, see "Application Endpoints" on page 429.

To change a Connection Status:

Select either Active or Inactive and then click Save.

To modify a connection setting:

1. If you know which step needs to be modified, click its link under the IdP Connection tab.
   
   If you do not know where to change the setting, locate the currently configured data under one of the summary headings and then click the subheading above the data.

2. Change the information on the step screen and click Save, if available.
   
   If Save is not available, you are in the middle of a task (see “About Tasks and Steps” in the “Console Navigation” chapter of Getting Started); click Next or Done until you reach a screen containing a Save button. Then click Save and continue as needed until you return to the Main Menu.
   
   If your modification requires related configuration changes, PingFederate provides error messages indicating the necessary steps and then guides you to the related screens (unless you click Cancel).

Important: Be sure to click Save whenever that button appears, if you want to keep your changes.

Configuring IdP Auto-Connect

When your IdP partner is also using PingFederate 5 or higher (or is otherwise able to provide interoperable SAML 2.0 metadata via HTTP on demand), you may choose to use Auto-Connect for that partner (see “Using Auto-Connect” on page 28). This configuration can be shared among an unlimited number of SAML 2.0 partners.

Note: You enable the SAML 2.0 Auto-Connect profile under System Settings (see "Choosing Roles and Protocols" on page 89).
Once Auto-Connect is enabled on your PingFederate server, complete the configuration from the Main Menu under My SP Configuration. This configuration entails:

- Setting up a common connection for all Auto-Connect partners
- Establishing a list of IdP partner domains authorized to use the connection

### Configuring the Initial Setup

The basic configuration for IdP Auto-Connect requires only:

- Choosing a signing certificate for authentication requests and other SAML messages
- Configuring user-session creation information

All other partner-connection specifications are handled automatically at runtime.

### Choosing a Certificate

For Auto-Connect runtime processing, authentication requests and SLO messages must be signed, since they are sent over either the POST or redirect bindings (see “SAML 2.0 Profiles” in the “Supported Standards” chapter of Getting Started).

**Note:** The signing certificate is embedded in your server’s Auto-Connect metadata (see “Using Auto-Connect” on page 28); there is no need to exchange certificates with your partners.

---

You can use the same certificate used for signing metadata (see “Configuring Auto-Connect Metadata Signing” on page 96). If you use a different certificate, ensure that it meets Auto-Connect validation requirements (see “Auto-Connect Security Model” on page 30).

**To specify a certificate:**

1. Select the certificate from the drop-down list.
   
   If you have not yet created or imported your certificate into PingFederate, click **Manage Certificates** (see “Digital Signing and Decryption Keys and Certificates” on page 151).

2. (Optional) Select the Signing Algorithm from the drop-down list.
   
   The default selection, RSA SHA1, is the most commonly used. Make a different selection only if you and your connection partner have agreed to use a stronger algorithm.
Configuring User-Session Creation

Configuring user-session creation for Auto-Connect is similar to configuring the same settings for regular partner connections.

Click **Configure User-Session Creation** to continue.

For configuration information, refer to sections under “User-Session Creation” on page 292.

**Note:** Attributes sent from the IdP via Auto-Connect are passed to your applications, regardless of whether they are listed in the attribute contract (see “Defining an Attribute Contract” on page 294).

Connection Activation and Summary

When you finish configuring your IdP Auto-Connect initial setup, you may choose to activate the common connection immediately on the Activation & Summary screen. (No runtime processing occurs until your partner’s Auto-Connect gateway is also established and a user initiates an SSO or SLO event.)

**Important:** Regardless of whether you choose to activate a newly configured connection now or later, you must click **Save** on the Activation & Summary screen if you want to keep the configuration.

You can deactivate the connection at any time (for maintenance, for example). While a connection is inactive, all SSO or SLO transactions to or from Auto-Connect partners are disabled.

**To change a Connection Status:**

- Select Active or Inactive and then click **Save**.
To modify a setting:

1. Locate the currently configured setting under one of the summary headings and then click the subheading above the data.

   **Note:** Changes made to Auto-Connect settings will be out of sync, temporarily, with metadata caches that any currently active partners might be using. If your connection is in production, you might wish to lower your server’s metadata lifetime in advance of making configuration changes (see “Configuring Auto-Connect Metadata Lifetime” on page 97).

2. Change the information and click **Save**, if available.

   If **Save** is not available, additional, dependent changes are required; click **Next** or **Done** until you reach a screen containing a **Save** button. Then click **Save** and continue as needed until you return to the **Main Menu**.

### Specifying Allowed IdP Domains

This screen provides PingFederate with a list of trusted domain names of your Auto-Connect partners.

![Image](image_url)

Normally, when PingFederate receives an SSO request from a Web application at your site (see “/sp/startSSO.ping” on page 432), the runtime engine completes the connection automatically using metadata obtained from a standard, public location—http://saml.<domain_name>. (See “Using Auto-Connect” on page 28.) Alternatively, if an Auto-Connect partner elects not to use the standard location, you can supply the applicable URL.

**To add a domain:**

- Enter a Domain Name and click **Add**.

**To specify a URL for metadata retrieval:**

1. Click **Advanced View**.
2. Enter the Domain Name if you have not already done so.
3. Enter the Metadata Service URL.

   This entry must be obtained from your Auto-Connect partner.
4. Click **Add**.

**Note:** Once you have added the URL, you cannot return to the Basic View unless you first remove the URL value using the procedure below.

**To edit an entry:**
1. Click **Edit** under Action for the entry.
2. Make your change and click **Update**.

**To delete an entry:**
1. Click **Delete** under Action for the entry.
WS-Trust STS Configuration

The PingFederate WS-Trust STS provides security-token validation and creation to extend SSO access to identity-enabled Web Services (see “About WS-Trust STS” on page 6).

The chapter provides instructions for configuring the WS-Trust STS, including:
- “Server Settings”
- “IdP Configuration for STS”
- “SP Configuration for STS”

Server Settings

To use the PingFederate WS-Trust STS for partner connections, start by enabling the WS-Trust protocol under Server Settings on the Roles and Protocols screen (see “Choosing Roles and Protocols” on page 89). Once the protocol is enabled, you must identify the STS server with a unique federation identifier for both SAML 2.0 and SAML 1.1 tokens (unless these IDs are already established for corresponding browser-based SSO protocols).

In addition, also under Server Settings, you have the option of requiring authentication globally for access to STS endpoints—(see “Configuring STS Authentication” on page 353).

Enabling the WS-Trust STS

You can enable the WS-Trust STS when you first install PingFederate (see “Running PingFederate for the First Time” in the “Installation” chapter of Getting Started). If you have already installed PingFederate or are upgrading to a new version, use the following procedure.

To enable WS-Trust and make the STS available for partner connections:
1. On the Main Menu under System Settings, click Server Settings.
2. Click Roles and Protocols under the Server Settings tab.
3. Select WS-Trust for either the IdP or the SP role, or both, depending on your requirements.

   **Note:** PingFederate fully supports the STS with or without selections of any of the Browser SSO protocols listed above the WS-Trust selections. SAML 1.1 and 2.0 token handling is independent of supported SSO protocols chosen here.

4. Click **Next**.

5. On the Federation Info screen, ensure all required fields are completed.

   **Note:** Identifiers are needed for both SAML 2.0 and SAML 1.x to enable the STS to issue either type of token when requested. If you have not established a federation ID for either of these protocols or do not expect to use one or the other, enter a placeholder (in any format) and return later if needed. (For more information about the fields on this screen, see “Specifying Federation Information” on page 91).

6. (Optional) Click **Next** to go to the WS-Trust STS Settings screen (see the next section, “Configuring STS Authentication”).

7. Click **Save** (on any screen).
Configuring STS Authentication

Server settings may be configured to require that client applications provide credentials to access the PingFederate STS. This is recommended for IdP configurations using the Username Token Processor (available separately).

For other token processors and token generators, trust in the identity of the client is conveyed within the token itself and verified as part of processing. However, administrators may wish to add another layer of security by limiting access to only authenticated clients.

**Note:** When STS authentication is configured, the configuration applies globally for all IdP and SP partner connections configured for STS clients and to all token formats.

To continue, click **Configure WS-Trust STS Authentication**.

**Selecting Authentication Methods**

You can choose either HTTP Basic or mutual SSL/TLS authentication (or both) on the Authentication Methods screen. (Note that if both methods are configured, all clients must authenticate using both, not one or the other.)

**Important:** If you choose mutual SSL/TLS authentication, you must configure a secondary PingFederate SSL port (see the property `pf.secondary.https.port` in the table under "Changing Configuration Parameters" on page 65).
Chapter 8
WS-Trust STS Configuration

Configuring Basic Authentication

For HTTP Basic authentication, create username/password pairs (“Users”) for all client applications needing access to the STS.

On the HTTP Basic Authentication screen, you can also delete users and update account passwords.

To add users:
1. Click Create User.
2. On the User Account screen, enter a Username and Password, and confirm the password.
   Passwords must be at least six characters long, containing at least one uppercase, one lowercase, and one numeric character.
3. Click Done.
4. Repeat the preceding steps as needed.
5. On the HTTP Basic Authentication screen, click Next.
   (If you are also configuring SSL authentication, complete that configuration and click Next to reach the Summary screen (see “Configuring Mutual SSL Authentication” on page 355).)
6. On the Summary screen, click Done.
7. On the WS-Trust STS Settings screen, click Save.

To update an account password:
1. Click the Username.
2. On the User Account screen, enter the Current User Password and a New Password, with confirmation. Passwords must be at least six characters long, containing at least one uppercase, one lowercase, and one numeric character.

3. Click Done.

4. On the HTTP Basic Authentication screen, click Done.

5. On the WS-Trust STS Settings screen, click Save.

To delete a user:
1. Click Delete under Action for the Username.
2. Click Done (or Next for new configuration).
3. Click Save when you reach the WS-Trust STS Settings screen.

Configuring Mutual SSL Authentication

When SSL authentication is selected on the Authentication Methods screen, the configuration begins on the Mutual SSL Authentication screen.

---

**Important:** If you choose mutual SSL/TLS authentication, you must configure a secondary PingFederate SSL port (see the property `pf.secondary.https.port` in the table under “Changing Configuration Parameters” on page 65).

---

Choosing Certificate Authentication Options

On the Authentication Options screen, select whether to verify client SSL certificates against a list of Subject Distinguished Names (DNs) or a list of issuer public certificates imported into PingFederate.

**Note:** You can choose both options. However, note that they are not used alternatively at runtime; both validations are applied.
To continue, select one or both methods and click **Next**.

For information about restricting access by Subject DN, see the next section. For information about restricting access by certificate, see “Managing Allowed Issuer Certificates” on page 357.

### Managing Allowed Subject DNs

On the Allowed Subject DNs screen you can add, edit, or delete Subject DNs for clients allowed to access the PingFederate STS.

#### To add DNs:

1. Enter a valid Subject DN for a partner STS client and click **Add**.
2. Add other DNs as needed.
3. For a new configuration, click **Next** or **Done** to continue.
4. If you are finished with a new or existing configuration, continue clicking **Done** until you reach the WS-Trust STS Settings screen and then click **Save**.

#### To edit DNs:

1. Click **Edit** under Action for the Subject DN.
2. Make changes and click **Update**.
3. Click **Done**.
4. If you are finished with a new or existing configuration, continue clicking **Done** until you reach the WS-Trust STS Settings screen and then click **Save**.

#### To delete entries:

1. Click **Delete** under Action for the Subject DN.
2. Click **Done**.

3. If you are finished with a new or existing configuration, continue clicking **Done** until you reach the WS-Trust STS Settings screen and then click **Save**.

### Managing Allowed Issuer Certificates

When STS access is restricted by issuer certificate, the Allowed Issuer Certificates screen provides a means of maintaining a list of valid certificates.

On this screen you can add or remove certificates.

**To add certificates:**

1. Select the certificate from the drop-down list and click **Add**.
   
   If the certificate you are looking for is not in the list, click **Manage Certificates** to import it from your file system.

2. Add other certificates as needed.

3. For a new configuration, click **Next** or **Done** to continue.

4. If you are finished with a new or existing configuration, continue clicking **Done** until you reach the WS-Trust STS Settings screen and then click **Save**.

**To delete a certificate from the list:**

1. Click **Remove** under **Action** for the Issuer Certificate.

2. Click **Done**.

3. If you are finished with a new or existing configuration, continue clicking **Done** until you reach the WS-Trust STS Settings screen and then click **Save**.

### Using the Mutual SSL Summary Screen

When you have finished configuring Mutual SSL Authentication, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.

- To save a new or modified configuration, click **Done** on successive screens until you reach the WS-Trust STS Settings screen and then click **Save**.

### Using the STS Summary Screen

When you have finished configuring WS-Trust STS Settings, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.
If you are editing an existing connection, click Done and on the WS-Trust STS Settings screen click Save.

IdP Configuration for STS

This section covers the IdP configuration for the PingFederate WS-Trust STS, which involves:

- "Configuring Token Processors"
- "Managing STS Request Parameters" (Optional)
- "Configuring SP Connections for STS"

Configuring Token Processors

Token Processors are used to validate incoming tokens and token requests to the STS (see "Token Processors and Generators" on page 7). Token Processors for SAML and OAuth tokens are included with the PingFederate installation. This section provides guidance on configuring “instances” of these installed Token Processors.

You must configure at least one processor in order to set up an STS connection.

Important: If more than one instance of the same token processor is configured and used in the same connection, WSCs calling the PingFederate STS endpoint must add a query parameter, TokenProcessorId, and specify the Instance Id. For example:

```
https://<pf_host>:<pf_port>/idp/sts.wst
?TokenProcessorId=saml2firstinstance
```

Additional Token Processors may be downloaded from the Ping Identity Web site (www.pingidentity.com/support-and-downloads). For configuration information, please consult documentation provided for the respective add-on processor.

To begin configuring Token Processors:

- On the Main Menu, click Token Processors under Application Integration Settings for My IdP Configuration.

If this link is not shown, ensure that the WS-Trust STS is enabled in Server Settings (see “Enabling the WS-Trust STS” on page 351).
To configure a new token-processor instance:

> Click Create New Instance.

To edit an existing instance:

> Click the Instance Name and click the step you need to change.

To delete an instance:

1. Click Delete next to the Instance Name. (To undo the deletion, click Undelete.)

   **Note:** This option is available only if the processor instance is not in use for a connection.

2. Click Save to confirm the deletion.

**Selecting a Token Processor Type**

The first step in creating a token-processor instance is choosing the processor type.

To define an instance:

1. Enter the Instance Name and Instance Id on the Type screen.
2. Select the processor Type from the drop-down menu.
3. Click Next and enter information on the configuration screen for this token-processor instance.
   
   This configuration varies depending on the token processors deployed on your server. For add-on processors please consult the online documentation.
referenced in the download package, or look under Product Documentation at pingidentity.com.

For token processors bundled with PingFederate, refer to one of the following sections:
- “Configuring a SAML Token Processor Instance”, next
- “Configuring an OAuth Token Processor Instance” on page 361

## Configuring a SAML Token Processor Instance

On the Instance Configuration screen, you may use signing-certificate DN checking to limit the valid signatures and certificates for token requests accepted for this SAML token type. (By default, the STS validates digital signatures using all trusted Certificate Authorities (CAs) imported into PingFederate.)

At minimum on this screen, you must indicate a unique identifier for the PingFederate STS. To be accepted, an incoming SAML token must contain this ID in its <audience> element.

To configure the token-processor instance for certificate validation:

1. Enter a URI for Audience.
   - This is the ID for the STS for either SAML 1.1 or SAML 2.0 tokens, depending on which processor you are configuring (see “Specifying Federation Information” on page 91).
2. (Optional) Click the **Add a new** ... link under Action for either Valid Certificate Issuer DN or Valid Certificate Subject DN.

   You can use both lists.

   **Important:** When both types of validation are configured, then the certificate used to validate signatures must match an entry in both lists. If only Subject DNs are listed on this screen, then the certificate Issuer DN is not checked and its Subject DN must match one of the entries in the Subject DNs list. If only Issuer DNs are listed here, then the certificate Subject DN is not checked and its Issuer DN must match one of the entries in the Issuer DNs list. If neither Issuer DNs nor Subject DNs are listed, then all certificates are treated as valid for purposes of verification.

3. (Optional) Enter a Valid DN and click **Update**.

4. (Optional) Repeat the previous steps as needed to add more DNs.

### Configuring an OAuth Token Processor Instance

The PingFederate STS provides validation for OAuth Bearer tokens (see “About OAuth” on page 10). Generally, a client would send the token in order to receive a SAML token in exchange.

**Note:** To use this token processor, you must first configure an access-token attribute contract (see “Access Token Management” on page 128).

### Extending a Processor Contract

Token processors allow administrators to add to a built-in list of user attributes that the processor returns from an incoming token—an extended processor-attribute contract.
Chapter 8

WS-Trust STS Configuration

To add an attribute:

- Enter the attribute name in the text box and click **Add**.

**Important:** For the OAuth 2.0 Bearer Token Processor, added attributes must also be among those configured under Access Token Management (see “Defining the Access Token Attribute Contract” on page 130).

### Setting Attribute Masking

On the Token Attributes screen, you can choose to mask attribute values that PingFederate logs from this processor instance at runtime (see “Attribute Masking” on page 22).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mask Log Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAML_SUBJECT</td>
<td></td>
</tr>
</tbody>
</table>

To mask an attribute in log files:

- (Optional) Under Mask Log Values select the attribute whose value you want to mask.

If OGNL expressions might be used to map derived values into outgoing tokens and you want those values masked, select the related checkbox under the Attribute list (see “Using Attribute Mapping Expressions” on page 453).
Editing and Saving Processor Instances

From the Summary screen, you can reach processor settings for editing.

**To edit the configuration:**
1. Click the heading above the information you want to change.
2. Make your changes.
3. Click **Done** on the configuration page and **Save** on the Manage Token Processors screen.

**To save a processor instance:**
1. Click **Done** on the Summary screen.
2. Click **Save** on the Manage Token Processors screen.

Managing STS Request Parameters

As an option for configuring PingFederate to act as a WS-Trust STS, an administrator can define sets of RST metadata parameters that can be used to map attribute values into issued security tokens. After these request contracts are defined, you can make them available when configuring WS-Trust STS settings for SP-partner connections (see “Selecting a Request Contract” on page 369).

To reach this screen, click **STS Request Parameters** under Application Integration Settings on the Main Menu.

If this link is not present, WS-Trust is not enabled (see “Enabling the WS-Trust STS” on page 351).

To add a new set of request parameters, click **Add New Request Contract**.

To edit an existing contract, click its Contract Name.

Creating a Request Contract

On the Create Request Contract screen, identify the contract and define parameters that will be available in token requests (as associated with this contract for partner connections—see “Managing STS Request Parameters” on page 363).
Configuring SP Connections for STS

You can configure an STS connection to an SP partner either in conjunction with browser-based SSO or independently.

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Name</td>
<td>A descriptive name for the Contract—for example, a Web Service Client or Provider.</td>
</tr>
<tr>
<td>Contract ID</td>
<td>An internal identifier—must be alphanumeric with no spaces.</td>
</tr>
<tr>
<td>Parameters to be provided in the request</td>
<td>A list of request parameters for this Contract (see instructions below).</td>
</tr>
</tbody>
</table>

**To add a Parameter:**

- Enter the Parameter Name in the text box and click **Add**.

**To modify a Parameter Name:**

1. Click **Edit** under Action for the Parameter Name.
2. Edit the name and click **Update**.

**Note:** If you change your mind, be sure to click the **Cancel** link in the Actions column, not the **Cancel** button, which discards any other changes you might have made.

**To delete a Parameter:**

- Click **Delete** for the Parameter Name.
To enable STS for a new connection, or to add the capability to an existing connection:

1. Select the WS-Trust STS option on the Connection Type screen (see “Choosing a Connection Type” on page 183).

   **Note:** Before this option can be selected, the WS-Trust protocol must be enabled in Server Settings (see “Server Settings” on page 351).

2. Select a Default Token Type.
   The Default Token Type, either SAML 1.1 or 2.0, is used when a Web Service client does not specify in the token request what token type the STS should issue.

   **Note:** The Default Token Type does not need to match the Protocol indicated on the screen for SSO (when applicable).

When the option is enabled, the configuration starts on the WS-Trust STS screen.

To continue, click **Configure WS-Trust STS**.

**Configuring IdP Protocol Settings**

On the Protocol Settings screen, enter a URL identifier for your partner’s Web Service (Partner Service Identifier). This identifier corresponds to the element `<AppliesTo>` in Requests for Security Tokens (RSTs) and may be either a complete URL or a base URL, which will match potentially various ports or paths.
Also on this screen, options are available for adding signature or encryption protection to outgoing SAML tokens and for enabling support of two additional token-type requests:

- For SAML 1.1 and SAML 2.0, you can choose to generate a symmetric key to be used in conjunction with the “Holder of Key” designation for the assertion's Subject Confirmation Method (for information about HoK assertions, see, for example, “Web Services Security SAML Token Profile” (docs.oasis-open.org/wss/oasis-wss-saml-token-profile-1.0.pdf).
- For SAML 2.0, you can choose to encrypt the assertion.
- Enabling the OAuth SAML Bearer Profile permits two additional token-type requests based on these OAuth grant types:
  - SAML 2.0 Bearer Assertion Grant Type
  - OAuth Access Token via SAML 2.0 Bearer Assertion Grant Type

See “STS OAuth Integration” on page 9 for more information on the use of these token-type requests.

**Note:** You can make any or all selections if you expect requests for these types of tokens. These selections are independent of the Default Token Type selected previously (see “Configuring SP Connections for STS” on page 364).

When you make one (or all) of these selections, you are asked to choose a signing or XML encryption certificate later in the connection setup, unless required certificates are already in place for an existing browser-based SSO connection. (PingFederate uses the same certificates to handle signing/encryption requirements for both Browser SSO and WS-Trust STS—for more information, see “Configuring Credentials” on page 231.)

**Setting a Token Lifetime**

Standards require a window of time during which a security token is considered valid. Each token has a time-stamp XML element as well as elements indicating the allowable lifetime of the token (in minutes) before and after the token time stamp.
To change the default times:

- (Optional) Edit the desired setting(s) and click Next or Save.

Configuring Token Creation

For the PingFederate STS to issue a security token in response to requests for partner services, you must indicate what user attributes are to be included in the token (the "attribute contract"). The attribute values sent in the token are then derived by mapping those available from the Token Processor you select (see “Fulfilling the Attribute Contract” on page 382). As with Browser SSO, the mapping can be augmented using local data stores, variable or constant text, or expressions.

Details of this configuration are handled under the Token Creation task.

- To continue, click Configure Token Creation.
Defining an STS Attribute Contract

An attribute contract is the set of user attributes that a Web Service Client at your site expects to receive in security tokens issued for this connection (see “Attribute Contracts” on page 18). You identify these attributes on this screen.

To reach this screen for editing:

1. Click the connection name on the Main Menu.
2. Click Manage All SP, if needed, to see a full list of connections.
3. Click WS-Trust STS under the SP Connection tab.
4. Click Configure WS-Trust STS.
5. Click Token Creation under the WS-Trust STS tab.
6. Click Configure Token Creation
7. Click Attribute Contract on the Summary screen.

To add an attribute:

1. Enter the attribute name in the text box.
   Attribute names are case-sensitive and must correspond to the attribute names (including claims) expected by the requesting WSC.

   **Tip:** The Format attribute associated with the NameID element in outgoing SAML tokens may be set when needed by adding an attribute called SAML_NAME_FORMAT. The value of that attribute can then be mapped later (see “Fulfilling the Attribute Contract” on page 382).

   For information about the NameID elements and applicable URI values, locate the SAML 2.0 specification at oasis-open.org/specs.
2. (Optional) For SAML 1.1 tokens, select the Attribute Namespace.

   This field appears only when SAML 1.1 is chosen as the Default Token Type on the Connection Type screen (see “Configuring SP Connections for STS” on page 364).

   Change the default Namespace selection if you and your SP partner have agreed to a specific namespace (see “STS Namespaces” on page 19).

   **Note:** If needed, an administrator can customize namespace alternatives via the custom-name-formats.xml configuration file located in this directory:

   `<pf_install>/pingfederate/server/default/data/config-store`

3. Click Add.

   **To modify an attribute name or namespace:**
   1. Click Edit under Action for the attribute.
   2. Make the change and click Update.

   **To delete an attribute:**
   ▶ Click Delete under Action for the attribute.

**Selecting a Request Contract**

This optional setting allows you to use XML parameters contained in RSTs for token-attribute mapping (see “Managing STS Request Parameters” on page 363).

- If you are not using request parameters, click Next to continue.
Chapter 8
WS-Trust STS Configuration

To use request parameters, select the checkbox and choose a Request Contract from the drop-down list.

If the contract you want is not shown, click Manage STS Request Parameters.

When you choose a contract, you will enable an option to select Request from the drop-down Source list on the attribute-mapping screen (see “Fulfilling the Attribute Contract” on page 382).

IdP Token Processor Mapping

IdP token processors are responsible for validating incoming security tokens as part of an STS operation (see “Token Processors and Generators” on page 7). A configured and deployed token processor in PingFederate is known as a token processor instance. The same instance may be mapped by multiple connections.

Map one or more IdP token processor instances into each SP connection to handle all the token types that may be received from Web Service Clients associated with this SP partner.

You begin this configuration on the IdP Token Processor Mapping screen, where you choose to map instances of IdP token processors. If you have not yet configured an instance of the token processor you intend to use within this SP connection, see “Configuring Token Processors” on page 358.

To reach this screen for editing:
1. Click the connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the SP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Creation under the WS-Trust STS tab.
5. Click Configure Token Creation
6. Click IdP Token Processor Mapping on the Summary screen.

To modify an existing Token Processor Instance:
▶ Click its Name link.

To begin configuring an Token Processor Instance for this connection:
▶ Click Map New Token Processor Instance.
Selecting a Token Processor Instance

On this screen for a new connection, choose an instance of the Token Processor needed for this connection (see “Token Processors and Generators” on page 7).

You will use attributes returned from the token processor (the token-processor contract) to fulfill the attribute contract required for this partner and/or use them to look up additional attributes in a user-data store. You make this choice on the next screen (see “Retrieving Additional Attributes” on page 394).

1. Choose a Token Processor Instance from the drop-down list and click Next to continue.

   To create or change a processor instance, as needed, click Manage Token Processor Instances.

   To reach this screen for editing:
   1. Click the connection name on the Main Menu.
      - Click Manage All SP, if needed, to see a full list of connections.
   2. Click WS-Trust STS under the SP Connection tab.
   3. Click Configure WS-Trust STS.
   4. Click Token Creation under the WS-Trust STS tab.
   5. Click Configure Token Creation
   6. Click IdP Token Processor Mapping on the Summary screen.
   7. Click the Token Processor Instance Name.

Retrieving Attributes

For token creation, you can query local user-data stores to help fulfill the attribute contract, in conjunction with attribute values supplied by the token processor you are using with PingFederate (see “Configuring Token Processors” on page 358).

The values supplied by the token processor are shown under Token Processor Contract on the Attribute Retrieval screen.
To reach this screen for editing:

1. Click the connection name on the Main Menu.
   
   Click Manage All SP, if needed, to see a full list of connections.

2. Click WS-Trust STS under the SP Connection tab.

3. Click Configure WS-Trust STS.

4. Click Token Creation under the WS-Trust STS tab.

5. Click Configure Token Creation.

6. Click IdP Token Processor Mapping on the Summary screen.

7. Click the Token Processor Instance Name.

8. Click Attribute Retrieval on the Summary screen.

   ▶ If you choose to “Retrieve additional attributes . . .”, then you identify data stores and specify lookup queries next (see the next section “Configuring STS Attribute Sources and User Lookup” on page 372).

   ▶ If you “Use only the Token Processor Contract values . . .”, then you map values for the attribute contract next (see “Fulfilling the Attribute Contract” on page 382).

Tip: To determine whether you need to look up additional values, compare the token-processor contract against the attribute contract (see “Defining an STS Attribute Contract” on page 368). If the attribute contract requires more information, determine whether a local data store can supply it. (You can also choose to use text constants or expressions for certain information—see “Fulfilling the Attribute Contract” on page 382.)

Configuring STS Attribute Sources and User Lookup

Attribute sources are specific database, directory, or custom data store locations containing information that may be needed for the attribute contract (see “Defining an STS Attribute Contract” on page 368). Attribute sources can be reused across connections to other SP partners.

This portion of the connection configuration allows you to configure one or more data stores to look up attributes and to set up search parameters.
To configure an attribute source:

- Click **Add Attribute Source** and complete the setup steps (see “Configuring a Data Store for STS” on page 373, next).

To modify an attribute source configuration:

1. Click the attribute source Description link.
2. Click **Save** on the screen you change.

**Note:** Depending on what you change, you may need to modify dependent data in subsequent steps, as indicated. Click **Save** or **Done** when either of those options appears.

To reach this screen for editing:

1. Click the connection name on the Main Menu.
   
   Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **WS-Trust STS** under the SP Connection tab.
3. Click **Configure WS-Trust STS**.
4. Click **Token Creation** under the WS-Trust STS tab.
5. Click **Configure Token Creation**
6. Click **IdP Token Processor Mapping** on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click **Attribute Source & User Lookup** under the IdP Token Processor Mapping tab.
   
   If this step is not listed, then this instance is configured to use token-processor values only (see “Retrieving Attributes” on page 371).

**Configuring a Data Store for STS**

This screen allows you to choose a data store from a previously configured list (see “Managing Data Stores” on page 98). Attribute values extracted from one or more data stores are used to help fulfill the attribute contract (see “Defining an STS Attribute Contract” on page 368).
To reach this screen for editing:

1. Click the connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the SP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Creation under the WS-Trust STS tab.
5. Click Configure Token Creation
6. Click IdP Token Processor Mapping on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click Attribute Source & User Lookup under the IdP Token Processor Mapping tab.
   - If this step is not listed, then this instance is configured to use token-processor values only (see “Retrieving Attributes” on page 371).
9. Click the attribute source Description link.

To define an attribute source:

1. Enter an Attribute Source Id to uniquely identify the data source for the mapping.
2. Use Attribute Source Description to specify an attribute source name that distinguishes this user lookup for the selected data store.

**Note:** PingFederate appends this description to the data store type in the Source list on the Attribute Contract Fulfillment screen (see “Fulfilling the Attribute Contract” on page 382).

3. Choose an Active Data Store and click Next.
   - A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click Manage Data Stores to add it (see “Managing Data Stores” on page 98).

**Setting Up the Attribute Source**

See the following sections in this manual, depending on the type of data store:
Selecting an STS JDBC Database Table and Columns

When you choose to use a database source for attributes, you follow this path through the configuration steps.

On this screen you begin to specify exactly where additional data can be found to complete the attribute contract when you send a security token to this SP (see “Defining an STS Attribute Contract” on page 368). Only one table may be used as a source of data for a JDBC lookup.

Important: (For MySQL users) To allow for table and column names that may contain spaces, PingFederate inserts double quotes around the names at runtime. To avoid SQL syntax errors resulting from the quotes, add the property ANSI_QUOTES to sql-mode in the configuration file my.cnf (on Unix/Linux) or my.ini (on Windows). For example:

```sql
sql-mode="...,ANSI_QUOTES"
```

For more information, see:

- dev.mysql.com/doc/refman/5.0/en/identifiers.html
- dev.mysql.com/doc/refman/5.1/en/option-files.html

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Related Manual Sections</th>
</tr>
</thead>
</table>
| JDBC            | • “Selecting an STS JDBC Database Table and Columns” on page 375  
                 | • “Configuring an STS Database Filter” on page 377 |
| LDAP            | • “Configuring an LDAP Search” on page 379  
                 | • “Configuring an LDAP Filter for STS” on page 380 |
| Custom          | • “Configuring STS Custom Source Filters” on page 382  
                 | • “Selecting Custom STS Source Fields” on page 382 |
To reach this screen for editing:
1. Click the connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the SP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Creation under the WS-Trust STS tab.
5. Click Configure Token Creation.
6. Click IdP Token Processor Mapping on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click Database Table and Columns under the IdP Token Processor Mapping tab.

To select a database table and columns for queries:
1. Choose a Schema file (when applicable) from the drop-down list.

Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Lists the table structure that stores information within a database. Some databases, such as Oracle, require selection of a specific schema for a JDBC query. Other databases, such as MySQL, do not require selection of a schema.</td>
</tr>
<tr>
<td>Table</td>
<td>The name of the table contained in the database. Use the drop-down to change the table.</td>
</tr>
<tr>
<td>Columns to return from SELECT</td>
<td>Displays selected table columns. Select the columns that are associated with the desired attributes you would like to return from the JDBC query.</td>
</tr>
</tbody>
</table>
2. Choose a Table from the drop-down list.
3. Choose a name under Columns to Return from Select and click Add Attribute.

**Tip:** Click Refresh if you are updating an existing configuration and changes may have been made to the database.

Repeat this step for other columns as needed.

**Note:** You do not need to add a column here for it to be used as part of a search filter (see “Configuring a Database Query” next). Add only attributes from which you need actual values to pass in a token.

**Tip:** To determine what attributes to look up during a query, click the View Attribute Contract link to see what information must be collected (see “Defining an STS Attribute Contract” on page 368). Then determine what information is coming in from the token processor (see “Retrieving Attributes” on page 371). Information not contained in the token-processor contract may be pulled from the data store look-up query.

**Configuring an STS Database Filter**

The JDBC WHERE clause in PingFederate queries the data table you selected to retrieve a record associated with a particular value (or values) from the incoming security token. The clause is in the form:

```
WHERE column1=value1 [AND column2=value2] [OR ...]
```

The left side of the first variable pair uses a column name in the database table you selected (see “Selecting an STS JDBC Database Table and Columns” on page 375).

The right side generally uses values passed in from a token processor (variables, including the correct formatting, are listed under Token Processor Values—see “Configuring Token Processors” on page 358).

**Note:** If you are retrieving attributes from multiple data stores using one mapping, attributes available from other sources, if previously configured, are listed near the bottom of the screen. For more information on multiple data-store mapping, see “Multiple Data Source Attribute Mapping” on page 21.

You can also apply additional search criteria from your own database, using any other columns from the targeted table.

**Tip:** Click “View List of Columns . . .” to see a list from which to copy and paste.

For more information about WHERE clauses, consult your DBMS documentation.
EXAMPLE:

```plaintext
userid='${username}'
```

In this example `userid` is the name of a column in the JDBC data store. On the right side, `${username}` returns the value of the `username` variable from the IdP token processor.

---

**Important:** You *must* use the `${}` syntax to retrieve the value of the enclosed variable and use single quotation marks around the `${}` characters.

---

### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where</td>
<td>WHERE clause statements conditionally select data from a table. Enter the WHERE clause statement in the space provided. For example: <code>WHERE email='clive@company.com'</code>.</td>
</tr>
</tbody>
</table>

**To reach this screen for editing:**
1. Click the connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **WS-Trust STS** under the SP Connection tab.
3. Click **Configure WS-Trust STS**.
4. Click **Token Creation** under the WS-Trust STS tab.
5. Click **Configure Token Creation**
6. Click **IdP Token Processor Mapping** on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click **Database Filter** under the IdP Token Processor Mapping tab.
To construct the **WHERE** clause:

1. Enter the statement in the space provided, following the guidelines and example above.
   
   The initial **WHERE** is optional.

2. Ensure the syntax and variable names are correct.
   
   When you click **Next**, you will map attribute values returned from the database into the security token (see “Fulfilling the Attribute Contract” on page 382).

### Configuring an LDAP Search

When you choose to use an LDAP source for attributes, you follow this path through the configuration steps.

On this screen you specify the branch of your LDAP hierarchy where you want PingFederate to look up user data.

<table>
<thead>
<tr>
<th>Field Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Base DN</td>
</tr>
<tr>
<td>Search Scope</td>
</tr>
<tr>
<td>Root Object Class</td>
</tr>
<tr>
<td>Attributes to return from search</td>
</tr>
</tbody>
</table>
To reach this screen for editing:
1. Click the connection name on the Main Menu.
   Click Manage All SP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the SP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Creation under the WS-Trust STS tab.
5. Click Configure Token Creation
6. Click IdP Token Processor Mapping on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click LDAP Directory Search under the IdP Token Processor Mapping tab.

To select LDAP attributes:
1. (Optional) Enter a Base DN.
2. Select a Search Scope.
3. Select a Root Object Class.
4. Under Attributes to return from search, choose an attribute and click Add Attribute.
   Note that the attribute Subject DN is always returned by default.
5. Repeat the last step for other attributes as needed.
6. (Optional) Change the Search Scope or the Root Object Class if you want attributes from other locations.

   Note: You do not need to add an attribute here for it to be used in a search filter (see “Configuring an LDAP Filter for STS”). Add only attributes from which you need actual values to pass into the outgoing security token.

Configuring an LDAP Filter for STS

The LDAP filter queries the data you selected to retrieve a record associated with a particular value (or values) from the incoming token. The filter is in the form:

\[
\text{attribute}={\$\{value\}}
\]

The left-side variable is an attribute you selected earlier (see “Configuring an LDAP Search” on page 379).

The right side generally uses values passed in from the security token (variables, including the correct syntax, are listed under Security Token Values—see “Configuring Token Processors” on page 358).

You can also apply additional search criteria from your data store, using any other attributes from the targeted object classes.

Tip: Click “View List of Available LDAP Attributes” for a list from which you can copy and paste.

For general information about search filters, consult your LDAP documentation.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Narrows a search to locate requested data by either including or excluding specific records. An LDAP filter includes the attributes in the search and the value or range of values that the search is attempting to match. Searches are conducted by using three components: 1) at least one attribute (attribute data type) to search on, 2) a search filter operator that will determine what to match, and 3) the value of the attribute being sought. Searches must have at least one of each of these three components.</td>
</tr>
</tbody>
</table>

To reach this screen for editing:
1. Click the connection name on the Main Menu.
   - Click Manage All SP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the SP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Creation under the WS-Trust STS tab.
5. Click Configure Token Creation
6. Click IdP Token Processor Mapping on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click LDAP Filter under the IdP Token Processor Mapping tab.
To construct the LDAP filter:
1. Enter the statement in the space provided, following the guidelines and example above.

   Note: If you used an anonymous binding to create this LDAP connection, your access might be restricted (see “Configuring an LDAP Connection” on page 103).

2. Ensure the syntax and variable names are correct.
3. Click Next.

Configuring STS Custom Source Filters

When you choose to use a custom source for attributes, you follow this path through the configuration steps.

On this screen you specify a filter, or lookup query, for your custom data source. This screen display and the syntax of the filter depends on your developer's implementation of the custom source SDK.

Selecting Custom STS Source Fields

On the Configure Custom Source Fields screen, you can choose from among the fields shown to map to the attribute contract. These choices are supplied by the driver implementation. Select only those needed to fulfill the attribute contract for this partner connection.

Fulfilling the Attribute Contract

You map attributes for outgoing security tokens for this partner on the Attribute Contract Fulfillment screen.

<table>
<thead>
<tr>
<th>Attribute Contract</th>
<th>Source</th>
<th>Value</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAML_SUBJECT</td>
<td>LDAP</td>
<td>SubjectDN</td>
<td>None available</td>
</tr>
</tbody>
</table>

Map each attribute to fulfill the Attribute Contract from one of these Sources:
- Token

When you make this selection, the associated Value drop-down list is populated by the token processor.
IdP Configuration for STS

- LDAP/JDBC/Custom

**Note:** PingFederate appends a description in parentheses for configured data store lookups (see “Configuring STS Attribute Sources and User Lookup” on page 372).

Values are returned from your attribute source (if you are using data store—see “Retrieving Attributes” on page 371). When you make this selection, the Value list is populated by the LDAP, JDBC, or Custom attributes you identified as an Attribute Source (see “Configuring an LDAP Search” on page 379, “Selecting an STS JDBC Database Table and Columns” on page 375, or “Configuring STS Custom Source Filters” on page 382).

- Request

Values are supplied from parameters in the token request received from the Web Service Client. This selection is available only if a Request Contract was selected earlier (see “Selecting a Request Contract” on page 369).

- Expression (when enabled)

This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

**Tip:** You can use an expression to insert an OAuth access token into the assertion for SP-partner use in OAuth transactions (see “About OAuth” on page 10). For information about this feature and a sample expression, refer to the PingFederate SDK Javadoc entry for the class

```java
com.pingidentity.sdk.oauth20.AccessTokenIssuer
```

Javadocs are located in the PingFederate installation:

`<pf_install>/pingfederate/sdk/doc/index.html`

- Text

The value is what you enter. This can be text only, or you can mix text with references to any of the values from the incoming token, using the \$(attribute) syntax.

You can also enter values from your data store, when applicable, using this syntax:

\$(ds.attr-source-id.attribute)

where `attr-source-id` is the Attribute Source Id value (see “Configuring STS Attribute Sources and User Lookup” on page 372) and `attribute` is any of the data store attributes you select.

To reach this screen for editing:

1. Click the connection name on the Main Menu.
   - Click **Manage All SP**, if needed, to see a full list of connections.
2. Click **WS-Trust STS** under the SP Connection tab.
3. Click **Configure WS-Trust STS**.
4. Click **Token Creation** under the WS-Trust STS tab.
5. Click **Configure Token Creation**
6. Click **IdP Token Processor Mapping** on the Summary screen.
7. Click the Token Processor Instance Name.
8. Click **Attribute Contract Fulfillment** under the IdP Token Processor Mapping tab.

**To map attributes:**

1. Choose a Source for each Target attribute.

2. Choose (or enter) a Value for each Attribute.

   See “Map each attribute to fulfill the Attribute Contract from one of these Sources” above. All values must be mapped.

3. Click **Next**.

**Using the Mapping Summary Screen**

When you have finished configuring IdP Token Processor Mapping, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.

- If you are editing an existing connection, click **Done** on successive screens until you reach the WS-Trust STS screen, and then click **Save**.

**To save a new configuration:**

1. Click **Done** to return to the IdP Token Processor Mapping screen.

2. Click **Next** to go to the Token Creation Summary screen, and then click **Done**.

3. On the Token Creation screen, click **Done**.

4. On the WS-Trust STS screen, click **Save**.

**Request Error Handling**

If you are using request parameters to fulfill the attribute contract and the parameter values are not supplied, you can choose whether to continue or abort the token-creation process.

**Note:** The Error Handling screen is presented only if a Request Contract is used for this configuration (see “Selecting a Request Contract” on page 369).

**Using the Token Creation Summary Screen**

When you have finished configuring Token Creation, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.
If you are editing an existing connection, click **Done** on successive screens until you reach the WS-Trust STS screen, and then click **Save**.

On the WS-Trust STS Summary screen, you can review the configuration for this connection.

If you need to make any changes to a new or existing connection, click the heading over the information you want to modify.
Chapter 7
WS-Trust STS Configuration

SP Configuration for STS

This section covers the SP configuration for STS, including:
- “Configuring Token Generators”
- “Configuring IdP Connections for STS”

Configuring Token Generators

Token Generators are used to issue security tokens that can be consumed by Web Services at your site (see “Token Processors and Generators” on page 7). Token Generators for SAML 2.0 and SAML 1.1 tokens are included with the PingFederate installation. This section provides guidance on configuring “instances” of either of the SAML Token Generators. You must configure at least one generator in order to set up an STS connection.

Only one instance of any Token Generator may be configured.

Additional Token Generators are available from the Ping Identity Web site (at www.pingidentity.com/products/PingFederate-Token-Translators.cfm).

To begin configuring SAML 1.1 or 2.0 Token Generators:
- On the Main Menu, click Token Generators under Application Integration Settings for My SP Configuration.

If this link is not shown, ensure that the WS-Trust STS is enabled in Server Settings (see “Enabling the WS-Trust STS” on page 351).

To configure a new token-generator instance:
- Click Create New Instance

To edit an existing instance:
- Click the Instance Name and click the step you need to change.

To delete an instance:
1. Click Delete next to the Instance Name. (To undo the deletion, click Undelete.)

   \[Note: This option is available only if the generator instance is not in use for a connection.\]

2. Click Save to confirm the deletion.
Selecting a Token Generator Type

The first step in creating a SAML token-generator instance is choosing the generator type.

To define an instance:

1. Enter the Instance Name and Instance Id on the Type screen.
2. Select SAML 1.1 Token Generator <version> or SAML 2.0 Token Generator <version> from the drop-down menu.
3. Click Next.

Configuring a Token Generator Instance

On the Instance Configuration screen, you specify parameters for generated SAML tokens.
Field Instructions

<table>
<thead>
<tr>
<th>Field</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Before</td>
<td>Enter a numerical value. This element in a SAML token allows for any server clock variability.</td>
</tr>
<tr>
<td>Minutes After</td>
<td>Enter a numerical value. This element in a SAML token allows for any server clock variability.</td>
</tr>
<tr>
<td>Issuer</td>
<td>Enter the SAML 2.0 Entity ID or SAML 1.1 Issuer specified on the Federation Information screen in Server Settings (see “Specifying Federation Information” on page 91).</td>
</tr>
<tr>
<td>Signing Certificate</td>
<td>Responses containing SAML tokens must be signed. If the signing certificate you need is not in the drop-down list, click Manage Signing Certificates near the bottom of the screen.</td>
</tr>
</tbody>
</table>
Extending a Generator Contract

Token generators allow administrators to add to a built-in list of user attributes that the generator includes in the outgoing token—an extended generator-attribute contract.

<table>
<thead>
<tr>
<th>Field</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include Certificate in KeyInfo</td>
<td>If selected, the entire public certificate is included with the assertion. Otherwise, a short hash reference to the certificate is sent instead.</td>
</tr>
<tr>
<td>Audience</td>
<td>This is a unique identifier for the target Web service, used for the &lt;audience&gt; element of the generated SAML token.</td>
</tr>
<tr>
<td>Confirmation Method</td>
<td>(Optional) Choose from among available methods:</td>
</tr>
<tr>
<td></td>
<td>• ...cm:sender-vouches (default)</td>
</tr>
<tr>
<td></td>
<td>• ...cm:bearer</td>
</tr>
<tr>
<td></td>
<td>• ...cm:holder-of-key</td>
</tr>
<tr>
<td>Encryption Certificate</td>
<td>The WSP’s public certificate for encryption, required only if holder-of-key is selected as the Confirmation Method. If the certificate is not yet part of the PingFederate store, click Manage Encryption Certificates to import it.</td>
</tr>
</tbody>
</table>

To add an attribute:

▷ Enter the attribute name in the text box and click Add.

Editing and Saving Generator Instances

From the Summary screen, you can reach token-generator settings for editing.

To edit the configuration:

1. Click the heading above the information you want to change.
2. Make your changes.
3. Click **Done** on the configuration page and **Save** on the Manage Token Generators screen.

**To save a generator instance:**
1. Click **Done** on the Summary screen.
2. Click **Save** on the Manage Token Generators screen.

### Configuring IdP Connections for STS

You can configure an STS connection to an IdP partner either in conjunction with browser-based SSO or independently.

**To enable STS for a new connection, or to add the capability to an existing connection:**

- Select the **WS-Trust STS** option on the **Connection Type** screen (see “Choosing an IdP Connection Type” on page 283).

**Note:** Before this option can be selected, the WS-Trust protocol must be enabled in Server Settings (see “Server Settings” on page 351)

When the option is enabled, the configuration starts on the WS-Trust STS screen.

![Configuring STS Protocol Settings](image)

- To continue, click **Configure WS-Trust STS**.

### Configuring STS Protocol Settings

On the Protocol Settings screen, choose whether to validate incoming SAML tokens or to validate and then also generate different tokens to enable SSO access to Web Services at your site.
Also on this screen, if incoming SAML 2.0 tokens for this connection are required to be encrypted, select the checkbox for decrypting assertions. When you make this selection, you will be required to choose a decryption certificate for this partner later in the connection configuration (if one is not already selected for Browser SSO purposes—see “Choosing a Decryption Key” on page 344).

If you choose not to generate new tokens, then no further settings are needed for this task—click Next and refer to “Using the Token Generation Summary Screen” on page 405 for instructions on saving this configuration.

You will be asked later to choose a certificate with which to verify the signature on the incoming SAML token (see “Configuring Signature Verification Settings” on page 236).

Configuring Token Generation

For the PingFederate STS to issue a security token that meets identity requirements of Web Services at your site, you must indicate what user attributes are included in the incoming token (the “attribute contract”). The attribute values from the incoming token can be then mapped to attributes in the token generator you select (see “Mapping Token Attributes” on page 403). As with Browser SSO, the mapping can be augmented using local data stores, variable or constant text, or expressions.

Details of this configuration are handled under the Token Generation task.

To continue, click Configure Token Creation.
Specifying an Attribute Contract

An attribute contract is the set of user attributes expected in incoming security tokens (see “Attribute Contracts” on page 18). You identify these attributes on this screen.

Optionally, you can mask the values of attributes (other than SAML_SUBJECT) in the log files that PingFederate writes when it receives security tokens (see “Attribute Masking” on page 22).

To reach this screen for editing:

1. Click the connection name on the Main Menu.
   
   Click Manage All IdP, if needed, to see a full list of connections.

2. Click WS-Trust STS under the IdP Connection tab.

3. Click Configure WS-Trust STS.

4. Click Token Generation under the WS-Trust STS tab.
   
   If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).

5. Click Configure Token Generation

6. Click Attribute Contract on the Summary screen.

To add an attribute:

1. Enter the attribute name in the text box.
   
   Attribute names are case-sensitive and must correspond to the attribute names expected by the requester.

2. (Optional) Select the checkbox under Mask Values in Log.

3. Click Add.

To modify an attribute name:

1. Click Edit under Action for the attribute.

2. Make the change and click Update.

To delete an attribute:

1. Click Delete under Action for the attribute.
Mapping Token Generators

Token generators provide a mechanism through which PingFederate can generate a local token based upon an incoming SAML token, including mapping user attributes to be included in the generated token. A configured and deployed token generator in PingFederate is known as a token-generator instance.

You can map one or more token generator instances into each IdP connection to satisfy multiple session-management requirements where needed. The same instances may be mapped by multiple connections.

The configuration begins on the Token Generator Mapping & User Lookup screen. If you have not yet configured an instance of a token generator you need for this connection, see “Configuring Token Generators” on page 386.

To reach this screen for editing:

1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the IdP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Generation under the WS-Trust STS tab.
   - If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
5. Click Configure Token Generation
6. Click Token Generator Mapping & User Lookup on the Summary screen.

To modify an existing Token Generator Instance:

- Click its Name link.

To begin configuring an Token Generator Instance for this connection:

- Click Map New Token Generator Instance.

Selecting a Token Generator Instance

On this screen for a new connection, choose an instance of the Token Generator needed for this connection (see “Token Processors and Generators” on page 7).

You will use attributes contained in the incoming security token to fulfill the token generator contract for this STS connection and/or use them to look up additional attributes in a user-data store. You make this choice on the next screen (see “Retrieving Attributes” on page 371).
Choose a Token Generator Instance from the drop-down list and click Next to continue.

To create or change a Token Generator Instance, as needed, click Manage Token Generator Instances.

**Retrieving Additional Attributes**

For token generation, you can query local user-data stores to help fulfill the token-generator contract, in conjunction with attribute values supplied by the incoming token.

The values supplied by the token are shown under Attribute Contract on the Attribute Retrieval screen.

**To reach this screen for editing:**

1. Click the connection name on the Main Menu. Click Manage All IdP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the IdP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Generation under the WS-Trust STS tab.
   If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
5. Click Configure Token Generation.
6. Click Token Generator Mapping & User Lookup on the Summary screen.
7. Click the Token Generator Instance Name.
8. Click Attribute Retrieval on the Summary screen.
If you choose to look up additional information, then you will identify a data store and specify lookup queries next (see the next section “Identifying a Data Store” on page 395).

If you use only the attributes available (the default), then you will map values for the attribute contract next (see “Mapping Token Attributes” on page 403).

**Tip:** To determine whether you need to look up additional values, compare the attribute contract against the token-generator contract on the previous screen (see “Selecting a Token Generator Instance” on page 393). If the token-generator contract requires more information, determine whether your local data stores can supply it. (You can also choose to use text constants or expressions for certain information—see “Mapping Token Attributes” on page 403.)

### Identifying a Data Store

This portion of the connection configuration allows you to set up search parameters for a data store.

<table>
<thead>
<tr>
<th>Active Data Store</th>
<th>Data Store Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select</td>
<td>None</td>
</tr>
</tbody>
</table>

To reach this screen for editing:

1. Click the connection name on the Main Menu. Click **Manage All IdP**, if needed, to see a full list of connections.
2. Click **WS-Trust STS** under the IdP Connection tab.
3. Click **Configure WS-Trust STS**.
4. Click **Token Generation** under the WS-Trust STS tab.
   - If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
5. Click **Configure Token Generation**
6. Click **Token Generator Mapping & User Lookup** on the Summary screen.
7. Click the Token Generator Instance Name.
8. Click **Data Store** under the Token Generator Mapping & User Lookup tab.
   - If this step is not presented, this Token Generator Instance is not configured to look up user attributes in a data store (see “Retrieving Additional Attributes” on page 394).
Chapter 7
WS-Trust STS Configuration

To define an attribute source:

▶ Choose an Active Data Store and click Next.

A data-store configuration must be defined under System Settings for use within a connection. If the data store you want is not shown in the drop-down menu, click Manage Data Stores to add it (see “Managing Data Stores” on page 98).

Configuring Attribute Lookup for WS-Trust STS

See the following sections in this manual, depending on the type of data store:

<table>
<thead>
<tr>
<th>Data Store Type</th>
<th>Related Manual Sections</th>
</tr>
</thead>
</table>
| JDBC            | • “Selecting a Data Table and Columns” on page 396  
                  • “Configuring a Database Query” on page 398 |
| LDAP            | • “Configuring LDAP Search Parameters” on page 400  
                  • “Configuring a Directory Filter” on page 401 |
| Custom          | • “Configuring Custom Filters” on page 403  
                  • “Selecting Custom Data Fields” on page 403 |

Selecting a Data Table and Columns

When you choose to use a database source for attributes, you follow this path through the configuration steps.

On this screen you begin to specify exactly where additional data can be found to complete the token-generator contract (see “Retrieving Additional Attributes” on page 394). Only one table may be used as a source of data for a JDBC lookup.

Important: (For MySQL users) To allow for table and column names that may contain spaces, PingFederate inserts double quotes around the names at runtime. To avoid SQL syntax errors resulting from the quotes, add the property ANSI_QUOTES to sql-mode in the configuration file my.cnf (on Unix/Linux) or my.ini (on Windows). For example:

```
sql-mode="...,ANSI_QUOTES"
```

For more information, see:

- [dev.mysql.com/doc/refman/5.0/en/identifiers.html](dev.mysql.com/doc/refman/5.0/en/identifiers.html)
To reach this screen for editing:

1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the IdP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Generation under the WS-Trust STS tab.
   If this step is not shown, token generation is not selected for the connection (see "Configuring STS Protocol Settings" on page 390).
5. Click Configure Token Generation
6. Click Token Generator Mapping & User Lookup on the Summary screen.
7. Click the Token Generator Instance Name.
8. Click Database Table and Columns under the Token Generator Mapping & User Lookup tab.

To select a database table and columns for queries:

1. Choose a Schema file (when applicable) from the drop-down list.

**Field Descriptions**

<table>
<thead>
<tr>
<th><strong>Field</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Lists the table structure that stores information within a database. Some databases, such as Oracle, require selection of a specific schema for a JDBC query. Other databases, such as MySQL, do not require selection of a schema.</td>
</tr>
<tr>
<td>Table</td>
<td>The name of the table contained in the database. Use the drop-down to change the table.</td>
</tr>
<tr>
<td>Columns to return from SELECT</td>
<td>Displays selected table columns. Select the columns that are associated with the desired attributes you would like to return from the JDBC query.</td>
</tr>
</tbody>
</table>
Chapter 7
WS-Trust STS Configuration

2. Choose a Table from the drop-down list.
3. Choose a name under Columns to Return from Select and click Add Attribute.

Tip: Click Refresh if you are updating an existing configuration and changes may have been made to the database.

Repeat this step for other columns as needed.

Note: You do not need to add a column here for it to be used as part of a search filter (see “Configuring an STS Database Filter” next). Add only attributes from which you need actual values to pass in a token.

Tip: To determine what attributes to look up during a query, click the View Attribute Contract link to see what information must be collected (see “Specifying an Attribute Contract” on page 392). Then determine what information is coming in from the token processor (see “Retrieving Additional Attributes” on page 394). Information not contained in the token-processor contract may be pulled from the data store look-up query.

Tip: Click “View List of Columns . . .” to see a list from which to copy and paste.

Important: You must use the ${} syntax to retrieve the value of the enclosed variable and use single quotation marks around the ${} characters.

Configuring a Database Query

The JDBC WHERE clause in PingFederate queries the data table you selected to retrieve a record associated with a particular value (or values) from the incoming security token. The clause is in the form:

WHERE column1=value1 [AND column2=value2] [OR ...]

The left side of the first variable pair uses a column name in the database table you selected (see “Selecting a Data Table and Columns” on page 396).

The right side generally uses values passed in from the incoming SAML token (variables, including the correct formatting, are listed under Assertion Values).

You can also apply additional search criteria from your own database, using any other columns from the targeted table.

For more information about WHERE clauses, consult your DBMS documentation.

EXAMPLE:

userid='${username}'

In this example userid is the name of a column in the JDBC data store. On the right side, '${username}' returns the value of the username variable from the IdP token processor.

Important: You must use the ${} syntax to retrieve the value of the enclosed variable and use single quotation marks around the ${} characters.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where</td>
<td>WHERE clause statements conditionally select data from a table. Enter the WHERE clause statement in the space provided. For example: WHERE email='<a href="mailto:clive@company.com">clive@company.com</a>'.</td>
</tr>
</tbody>
</table>

To reach this screen for editing:
1. Click the connection name on the Main Menu.
   - Click Manage All IdP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the IdP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Generation under the WS-Trust STS tab.
   - If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
5. Click Configure Token Generation
6. Click Token Generator Mapping & User Lookup on the Summary screen.
7. Click the Token Generator Instance Name.
8. Click Database Filter from the steps list under the Token Generator Mapping & User Lookup tab.

To construct the WHERE clause:
1. Enter the statement in the space provided, following the guidelines and example above.
   - The initial WHERE is optional.
2. Ensure the syntax and variable names are correct.
   - When you click Next, you will map attribute values returned from the database into the security token (see “Mapping Token Attributes” on page 403).
### Configuring LDAP Search Parameters

When you choose to use an LDAP source for attributes, you follow this path through the configuration steps.

On this screen you specify the branch of your LDAP hierarchy where you want PingFederate to look up user data.

#### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DN</td>
<td>The base distinguished name of the tree structure in which the search begins. This field is optional if records are located at the LDAP root.</td>
</tr>
<tr>
<td>Search Scope</td>
<td>Determines the node depth of the query. Select Subtree, One level or Object.</td>
</tr>
<tr>
<td>Root Object Class</td>
<td>The class containing the attributes you want.</td>
</tr>
<tr>
<td>Attributes to return from search</td>
<td>A list of added from the drop-down list below. Subject DN is a default attribute, which may be used as the primary user identifier.</td>
</tr>
</tbody>
</table>

#### To reach this screen for editing:

1. Click the connection name on the Main Menu.
   
   Click **Manage All IdP**, if needed, to see a full list of connections.

2. Click **WS-Trust STS** under the IdP Connection tab.

3. Click **Configure WS-Trust STS**.

4. Click **Token Generation** under the WS-Trust STS tab.
   
   If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).

5. Click **Configure Token Generation**
6. Click **Token Generator Mapping & User Lookup** on the Summary screen.

7. Click the Token Generator Instance Name.

8. Click **LDAP Directory Search** under the Token Generator Mapping & User Lookup tab.

**To select LDAP attributes:**

1. (Optional) Enter a Base DN.

2. Select a Search Scope.

3. Select a Root Object Class.

4. Under Attributes to return from search, choose an attribute and click Add Attribute.  
   Note that the attribute Subject DN is always returned by default.

5. Repeat the last step for other attributes as needed.

6. (Optional) Change the Search Scope or the Root Object Class if you want attributes from other locations.

   **Note:** You do not need to add an attribute here for it to be used in a search filter (see “Configuring a Directory Filter”). Add only attributes from which you need actual values to pass into the outgoing security token.

**Configuring a Directory Filter**

The LDAP filter queries the data you selected to retrieve a record associated with a particular value (or values) from the incoming token. The filter is in the form:

```
attribute=${value}
```

The left-side variable is an attribute you selected earlier (see “Configuring LDAP Search Parameters” on page 400).

The right side generally uses values passed in from the incoming SAML token (variables, including the correct syntax, are listed under Assertion Values).

You can also apply additional search criteria from your data store, using any other attributes from the targeted object classes.

   **Tip:** Click “**View List of Available LDAP Attributes**” for a list from which you can copy and paste.

For general information about search filters, consult your LDAP documentation.
Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Narrows a search to locate requested data by either including or excluding specific records. An LDAP filter includes the attributes in the search and the value or range of values that the search is attempting to match. Searches are conducted by using three components: 1) at least one attribute (attribute data type) to search on, 2) a search filter operator that will determine what to match, and 3) the value of the attribute being sought. Searches must have at least one of each of these three components.</td>
</tr>
</tbody>
</table>

To reach this screen for editing:

1. Click the connection name on the Main Menu.
2. Click Manage All IdP, if needed, to see a full list of connections.
3. Click WS-Trust STS under the IdP Connection tab.
4. Click Configure WS-Trust STS.
5. Click Token Generation under the WS-Trust STS tab.
   - If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
6. Click Configure Token Generation.
7. Click Token Generator Mapping & User Lookup on the Summary screen.
8. Click LDAP Filter under the Token Generator Mapping & User Lookup tab.

If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
To construct the LDAP filter:
1. Enter the statement in the space provided, following the guidelines and example above.

   **Note:** If you used an anonymous binding to create this LDAP connection, your access might be restricted (see “Configuring an LDAP Connection” on page 103).

2. Ensure the syntax and variable names are correct.
3. Click Next.

Configuring Custom Filters

When you choose to use a custom source for attributes, you follow this path through the configuration steps.

On this screen you specify a filter, or lookup query, for your custom data source. This screen display and the syntax of the filter depends on your developer's implementation of the custom source SDK.

Selecting Custom Data Fields

On the Configure Custom Source Fields screen, you can choose from among the fields shown to map to the token processor contract. These choices are supplied by the driver implementation. Select only those needed to fulfill the attribute contract for this partner connection.

Mapping Token Attributes

You map attributes for outgoing security tokens for this partner on the Token Generator Contract Fulfillment screen.

Map each attribute to fulfill the Token Generator Contract from one of these Sources:

- **Assertion**
  
  When you make this selection, the associated Value drop-down list is populated by the incoming SAML token (“Assertion”).

- **LDAP/JDBC/Custom**
  
  Values are returned from the selected data store (see “Retrieving Additional Attributes” on page 394). When you make this selection, the Value list is populated by the LDAP, JDBC or Custom attributes specified in previous screens (see “Configuring LDAP Search Parameters” on page 400, “Selecting a Data Table and Columns” on page 396, or “Configuring Custom Filters” on page 403).
Expression (when enabled)
This option provides more complex mapping capabilities—for example, transforming incoming values into different formats (see “Using Attribute Mapping Expressions” on page 453). All of the variables available for text entries (see below) are also available for expressions.

Text
The value is what you enter. This can be text only, or you can mix text with references to any of the values from the incoming token, using the $\{attribute\}$ syntax.
You can also enter values from your data store, when applicable, using this syntax:

$\{ds.attribute\}$
where $attribute$ is any of the data store attributes you select.

To reach this screen for editing:
1. Click the connection name on the Main Menu.
   Click Manage All IdP, if needed, to see a full list of connections.
2. Click WS-Trust STS under the IdP Connection tab.
3. Click Configure WS-Trust STS.
4. Click Token Generation under the WS-Trust STS tab.
   If this step is not shown, token generation is not selected for the connection (see “Configuring STS Protocol Settings” on page 390).
5. Click Configure Token Generation
6. Click Token Generator Mapping & User Lookup on the Summary screen.
7. Click the Token Generator Instance Name.
8. Click Token Generator Contract Fulfillment under the Token Generator Mapping & User Lookup tab.

To map attributes:
1. Choose a Source for each Target attribute.
2. Choose (or enter) a Value for each Attribute.
   See “Map each attribute to fulfill the Token Generator Contract from one of these Sources:” above. All values must be mapped.
3. Click Next.

Saving the Mapping
When you have finished configuring Token Generator Mapping & User Lookup, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.

► If you are editing an existing connection, click Done on successive screens until you reach the WS-Trust STS screen, and then click Save.

To save a new configuration:
1. Click Done to return to the Token Generator Mapping & User Lookup screen.
2. Click Next to go to the Token Generation Summary screen, and then click Done.
3. On the Token Generation screen, click **Done**.
4. On the WS-Trust STS screen, click **Save**.

**Using the Token Generation Summary Screen**

When you have finished configuring Token Generation, you can review the configuration on the Summary screen. If you need to make any changes, click the heading over the information you want to edit.

- If you are editing an existing connection, click **Done** on successive screens until you reach the WS-Trust STS screen, and then click **Save**.

On the WS-Trust STS Summary screen, you can review the configuration for this connection.

- If you need to make any changes to a new or existing connection, click the heading over the information you want to modify.
OpenToken Adapter Configuration

In order to transfer identity and other user information between the PingFederate server and an end application, the product architecture allows for custom adapters to be deployed with the server (see “SSO Integration Kits and Adapters” on page 14).

PingFederate ships with a deployed OpenToken Adapter, which uses a secure token format (OpenToken) to transfer user attributes between an application and the PingFederate server. On the IdP side, the OpenToken Adapter allows the PingFederate server to receive a user's identity from the IdP application. On the SP side, the OpenToken Adapter can be used to transfer user-identity information to the target SP application.

Specialized application integration kits are available from www.pingidentity.com. Many kits leverage the OpenToken Adapter to integrate applications with the PingFederate server. The agent portions of the integration kits reside with the application and use the OpenToken to communicate with the OpenToken Adapter.

Note: To integrate applications for use with the OpenToken Adapter, download an integration kit for PingFederate from www.pingidentity.com and follow instructions for installing and using Agent Toolkits in the accompanying documentation. Follow the configuration instructions in this appendix to set up the OpenToken Adapter to use with your applications.
The following figure shows a basic IdP-initiated SSO scenario using PingFederate with the Java Integration Kit on both sides of an identity federation.

**Figure 4:** SP-Initiated SSO: POST/POST

**Processing Steps:**
1. A user initiates an SSO transaction.
2. The IdP application inserts attributes into the Agent Toolkit for Java, which encrypts the data internally and generates an OpenToken. Attributes are encrypted and decrypted using the Java Cryptography Extension (JCE). For more information, see [http://java.sun.com/products/jce](http://java.sun.com/products/jce).
3. A request containing the OpenToken is redirected to the PingFederate IdP server.
4. The server invokes the OpenToken IdP Adapter, which retrieves the OpenToken, decrypts, parses, and passes it to the PingFederate IdP server. The PingFederate IdP server then generates a Security Assertion Markup Language (SAML) assertion.
5. The SAML assertion is sent to the SP site.
6. The PingFederate SP server parses the SAML assertion and passes the user attributes to the OpenToken SP Adapter. The Adapter encrypts the data internally and generates an OpenToken.
7. A request containing the OpenToken is redirected to the SP application.
8. The Agent Toolkit for Java decrypts and parses the OpenToken and makes the attributes available to the SP Application.

**Configuring the IdP OpenToken Adapter**

1. If you have not already done so, log on to the PingFederate administrative console and click **Adapters** under **My IdP Configuration** on the Main Menu.
2. On the Manage Adapter Instances screen, click **Create Adapter Instance**.
3. On the adapter Type screen, enter an Instance Name and Instance Id, select OpenToken Adapter 2.3 (or higher) as the Type, and click Next.

The Instance Id may not contain spaces or underscores.

<table>
<thead>
<tr>
<th>Configuring IdP Adapter</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage IdP Adapter Instances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create Adapter Instance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Type</td>
<td>IdP Adapter</td>
<td>Actions</td>
<td>Extended Contract</td>
<td>Adapter Attributes</td>
</tr>
</tbody>
</table>

Enter an adapter instance name and Id, and select the Adapter Type. The Adapter Type is limited to the adapters currently installed on your server.

- Instance Name: OpenToken
- Instance Id: OTK
- Type: OpenToken Adapter 2.3

4. On the IdP Adapter screen, enter the values as described for the adapter configuration.

These values are dependent on your developer's implementation.

<table>
<thead>
<tr>
<th>Configuring IdP Adapter</th>
<th>Help</th>
<th>Support</th>
<th>About</th>
<th>Logout (Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage IdP Adapter Instances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create Adapter Instance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Type</td>
<td>IdP Adapter</td>
<td>Actions</td>
<td>Extended Contract</td>
<td>Adapter Attributes</td>
</tr>
</tbody>
</table>

Complete the configuration necessary to look up user security contexts in your environment. This configuration was designed into the adapter for use at your site.

<table>
<thead>
<tr>
<th>OpenToken Adapter 2.3</th>
<th>Field Name</th>
<th>Field Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password</td>
<td></td>
<td>*</td>
<td>Password to use for generating the encryption key.</td>
</tr>
<tr>
<td>Confirm Password</td>
<td></td>
<td>*</td>
<td>Must match password field.</td>
</tr>
<tr>
<td>Authentication Service</td>
<td></td>
<td>*</td>
<td>The URL to which the user is redirected for an SSO event. The URL is part of an external application, which performs user authentication.</td>
</tr>
</tbody>
</table>

5. (Optional) Click **Show Advanced Fields** to reconfigure default settings for the OpenToken, as needed.

Refer to the on-screen field descriptions for more information.

6. Click Next.
7. On the Actions screen, click **Download** under Action Invocation Link.

8. On the next screen, click **Export** and save the properties file. The values in the resulting file, `agent-config.txt`, represents the console configuration and are used by the IdP application. Refer to your respective Integration Kit User Guide for more information.

9. (Optional) On the Extended Contract screen, you can configure additional attributes for the adapter (see “Extending an Adapter Contract” on page 167).

10. Click **Next**.

11. On the Adapter Attributes screen, select the subject checkbox under Pseudonym (optionally, select other attributes, if you added any at Step 9).

This selection is used if any of your SP partners will make use of pseudonyms for account linking (see “Account Linking” on page 16).
You can also choose to mask the values of any or all attributes that PingFederate logs from the adapter at runtime (see “Attribute Masking” on page 22).

12. Click **Next**.

13. On the Summary screen, review the configuration and click **Done**.
   You can also click any heading to go back and change information.

14. On the Manage IdP Adapter Instances screen, click **Save**.

---

**Important:** You must click **Save** if you wish to retain the adapter configuration.

---

### Configuring the SP OpenToken Adapter

1. If you have not already done so, log on to the PingFederate administrative console and click **Adapters** under My SP Configuration on the Main Menu.

2. On the Manage Adapter Instances screen, click **Create New Adapter Instance**.

3. Enter an Instance Name and Instance Id, select OpenToken Adapter 2.3 (or higher) as the Type, and click **Next**.
   The Instance Id may not contain spaces or underscores.

4. Enter values for the adapter configuration on the Instance Configuration screen.
   These values are dependent on your developer's implementation.
Appendix A
OpenToken Adapter Configuration

5. (Optional) Click **Show Advanced Fields** to reconfigure default settings for the OpenToken, as needed.
   Refer to the on-screen descriptions for more information.

6. Click **Next**.

7. On the Actions screen, click **Download** under Action Invocation Link.

8. On the next screen, click **Export** and save the properties file.
   The values in the resulting file, agent-config.txt, are set by the console configuration and used by the SP application. Refer to your respective Integration Kit User Guide for more information.

9. Click **Next**.

10. (Optional) On the Extended Contract screen, you can configure additional attributes for the adapter (see “Extending Adapter Contracts” on page 269).

11. Click **Next**.

12. On the Summary screen, review the configuration and click **Done**.
    You can also click any heading to go back and change information.

13. On the Manage Adapter Instances screen, click **Save**.

   **Important:** You must click **Save** if you wish to retain the adapter configuration.
**Note:** If this is the second instance of an OpenToken Adapter configuration, then you must first click **Next** and map target URLs to adapter instances (see “Mapping URLs to Adapter Instances” on page 270).
HTTP Basic Adapter Configuration

Initial user authentication is normally handled outside of the PingFederate server using an application or IdM system logon module. PingFederate’s adapter and application agents are typically used to integrate with these local authentication mechanisms (see “SSO Integration Kits and Adapters” on page 14).

PingFederate packages an HTTP Basic Adapter that delegates user authentication to a configured password credential validator (see “Validating Password Credentials” on page 158). This authentication mechanism validates credentials based on either an LDAP directory or a simple username validator that authenticates credentials maintained by PingFederate.

On the IdP side, when the PingFederate IdP server receives an authentication request for SP-initiated SSO or the user clicks a link for IdP-initiated SSO, the IdP server invokes the HTTP Basic Adapter and, if not already authenticated, prompts the user for local IdP credentials. The credentials are then validated using the designated password credential validator and, if validated, a SAML assertion is generated.

Configuring the HTTP Basic IdP Adapter

1. If you have not already done so, configure a password credential validator (see “Validating Password Credentials” on page 158).
2. Click Adapters under My IdP Configuration on the Main Menu screen.
3. On the Manage IdP Adapter Instances screen, click Create New Adapter Instance.
4. On the adapter Type screen, enter an Instance Name and Instance Id, select HTTP Basic IdP Adapter as the Type, and click Next.
   The Instance Id may not contain spaces or underscores.
Appendix B
HTTP Basic Adapter Configuration

5. Click **Add a new row to ‘Credential Validators’** to define a credential authentication mechanism instance for the adapter.

6. Select a password credential validator from the list and click **Update**. Add as many validators as necessary. Use **Move Up** and **Move Down** to adjust the order in which you want PingFederate to attempt credential authentication. If the first mechanism fails to validate the credentials, PingFederate moves sequentially through the list until credential validation succeeds. If none of the defined password credential validators is able to authenticate the user’s credentials, and the challenge retries maximum has been reached, the process fails.

7. Enter values for adapter configuration, as described below.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Realm          | The name of a protected area. The value of this field is sent as a part of the HTTP Basic authentication request. It appears in a dialog box that prompts the user for a username and password.  
**Note:** Once a user authenticates against a realm, if additional HTTP Basic adapters have the same realm, the user is not prompted to re-authenticate. |
| Challenge Retries | The number of attempts allowed for password authentication.                                                                                |

8. Click **Next**.
9. On the Adapter Attributes screen, select the username checkbox under Pseudonym (and, optionally, other attributes, if available).

This selection is used if any of your SP partners use pseudonyms for account linking (see “Account Linking” on page 16).

**Note:** A selection is required regardless of whether you will use pseudonyms for account linking. This allows account linking to be used later without having to delete and reconfigure the adapter. Ensure that you choose at least one attribute that is unique for each user (for example, email) to prevent the same pseudonym from being assigned to multiple users.

You can also choose to mask the values of any or all attributes that PingFederate logs from the adapter at runtime (see “Attribute Masking” on page 22).

If OGNL expressions might be used to map derived values into outgoing assertions and you want those values masked, select the related checkbox under the Attribute list (see “Using Attribute Mapping Expressions” on page 453).

10. Click **Next**.

11. On the Summary screen, review the configuration and click **Done**.

You can also click any heading to go back and change information.

12. On the Manage Adapter Instances screen, click **Save**.

**Important:** You must click **Save** if you want to retain the adapter configuration.
Initial user authentication is normally handled outside of the PingFederate server using an application or IdM system logon module. PingFederate's adapter and application agents are typically used to integrate with these local authentication mechanisms (see “SSO Integration Kits and Adapters” on page 14).

PingFederate packages an HTML Form Adapter that delegates user authentication to a configured password credential validator (see “Validating Password Credentials” on page 158). This authentication mechanism validates credentials based on either an LDAP directory or a simple username validator that authenticates credentials maintained by PingFederate.

On the IdP side, when the PingFederate IdP server receives an authentication request for SP-initiated SSO or the user clicks a link for IdP-initiated SSO, the IdP server invokes the HTML Form Adapter and, if not already authenticated, prompts the user for local IdP credentials. The credentials are then validated using the designated password credential validator and, if validated, a SAML assertion is generated.

The HTML Form Adapter allows you to customize a different login page for each configured adapter instance. You can also define a logout path and page or a logout redirect page.

**Configuring the HTML Form IdP Adapter**

1. If you have not already done so, configure a password credential validator (see “Validating Password Credentials” on page 158).
2. Click **Adapters** under My IdP Configuration on the Main Menu screen.
3. On the Manage IdP Adapter Instances screen, click **Create New Adapter Instance**.
4. On the adapter Type screen, enter an Instance Name and Instance Id, select HTML Form IdP Adapter as the Type, and click **Next**.
   The Instance Id may not contain spaces or underscores.
5. Click **Add a new row to ‘Credential Validators’** to define a credential authentication mechanism instance for the adapter.

6. Select a password credential validator from the list and click **Update**. Add as many validators as necessary. Use **Move Up** and **Move Down** to adjust the order in which you want PingFederate to attempt credential authentication. If the first mechanism fails to validate the credentials, PingFederate moves sequentially through the list until credential validation succeeds. If none of the defined password credential validators is able to authenticate the user’s credentials, and the challenge retries maximum has been reached, the process fails.

7. Enter values for adapter configuration, as described below.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge Retries</td>
<td>The number of attempts allowed for password authentication.</td>
</tr>
</tbody>
</table>
8. Click **Next**.

9. On the Adapter Attributes screen, select the username checkbox under **Pseudonym** (and, optionally, other attributes, if available).

   ![Configuring the HTML Form IdP Adapter](image)

   This selection is used if any of your SP partners use **pseudonyms** for account linking (see “Account Linking” on page 16).
You can also choose to mask the values of any or all attributes that PingFederate logs from the adapter at runtime (see “Attribute Masking” on page 22).

If OGNL expressions might be used to map derived values into outgoing assertions and you want those values masked, select the related checkbox under the Attribute list (see “Using Attribute Mapping Expressions” on page 453).

10. Click **Next**.

11. On the Summary screen, review the configuration and click **Done**.

You can also click any heading to go back and change information.

12. On the Manage Adapter Instances screen, click **Save**.

**Important:** You must click **Save** if you want to retain the adapter configuration.
Composite Adapter Configuration

For an IdP, PingFederate includes a Composite Adapter, which allows an administrator to “chain” the selection of available adapter instances for a connection. At runtime, adapter chaining means that SSO requests are passed sequentially through each adapter instance specified until one or more authentication results are found for the user.

Adapter chaining may be used to choose an adapter instance based on the method by which a user authenticated, or to integrate an organization’s multi-factor authentication policy.

Configuring the Composite Adapter

1. If you have not already done so, configure instances of IdP Adapters you want to use for adapter chaining (see “Configuring IdP Adapters” on page 164).

2. Click Adapters under My IdP Configuration on the Main Menu screen.

3. On the Manage Adapter Instances screen, click Create New Adapter Instance.

4. On the adapter Type screen, enter an Instance Name and Instance Id, select Composite Adapter 1.0 as the Type, and click Next.

   The Instance Id may not contain spaces or underscores.
5. On the IdP Adapter screen, click **Add a new row to ‘Adapters’**.

6. Select an Adapter Instance from the drop-down list.
   
   If a required adapter instance is not shown in the list, save or cancel this configuration and ensure that the instance has been configured **and** saved (see “Configuring IdP Adapters” on page 164).

7. (Optional) Change or enter different defaults under any or all of the adjacent column headings under Adapters, as described in the following table.

---

**Note:** This screen appears differently if the separately available adapter for Verisign Identity Protection (VIP) is installed on your system (see Step 12).
Configuring the Composite Adapter

8. Add at least one more Adapter Instance.

9. As needed, use the Move Down/Move Up links under Action to re-order the entries.

At runtime adapter chaining is sequential, starting at the top of the list.

10. (Optional) If any attributes are logically equivalent across two adapter instances but have different names, click Add a new row to ‘Attribute Name Synonyms’ and enter the attribute names under Name and Synonym.

The attribute name under Synonym and its value are used in the SAML assertion, when the two values returned from each adapter are identical. If returned values are different, both values are sent for the synonym (see the next step).

Note: If this table is not used to identify synonymous attribute names, both names and their values are sent in the SAML assertion.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td><strong>Required</strong> (the default) indicates authentication via this adapter instance is needed to continue SSO processing and invoke any remaining instances in the chain. If you are integrating multi-factor authentication, use this policy for each instance. <strong>Sufficient</strong> indicates that authentication via this adapter instance is enough to satisfy requirements (along with any required instances above). Any subsequent configured instances in the chain below are not invoked.</td>
</tr>
<tr>
<td>AuthN Context Weight</td>
<td>If more than one adapter instance in the chain is configured to return an authentication context, this relative weight is used to determine which value is included in the assertion—unless the value is overridden in the next column (see AuthN Context Override, below). If weights are the same for two or more contexts, the first one processed is included in the assertion.</td>
</tr>
<tr>
<td>AuthN Context Override</td>
<td>If provided, this value overrides any that may be returned from the adapter instance. The value in this field may be sent in the assertion if the associated adapter instance is invoked and its AuthN Context Weight is higher than other executed instances where authentication context is available.</td>
</tr>
</tbody>
</table>
11. (Optional) Change the Field Value selected for Attribute Insertion.

For attributes of the same name configured in different adapter instances, you can change the order of returned values when the values are different. (Values are merged if they are the same.)

By default (Add to Back) the value for an attribute name configured in the first instance is returned first and also listed first in the resulting SAML assertion. Then any different value from the same attribute name in a subsequently invoked instance is appended.

The order might not matter for many attributes, but in the case of the SAML-subject attribute, only the first value in the SAML assertion may be used for an SP connection partner under normal circumstances. Click Add to Front to reverse the default order, if needed.

12. If the VIP Adapter is installed on your system, complete the entries under Target Adapter.

The Target Adapter section appears only if the VIP Adapter is installed. This adapter is used exclusively for two-factor authentication and requires that a unique ID be passed in from a first-factor adapter. An administrator must specify the attribute containing the unique ID on this screen.

13. Click Next.

14. On the Extended Contract screen, Add attributes to be returned from each adapter instance configured on the previous screen.

**Important:** Attributes must correspond exactly to any or all of the attribute names listed on the Adapter Attribute screens for each configured adapter instance.

15. On the Adapter Attributes screen, select at least one attribute as a Pseudonym (and, optionally, other attributes, if available).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Pseudonym</th>
<th>Mask Log Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>email</td>
<td></td>
<td></td>
</tr>
<tr>
<td>first_name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>last_name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>subject</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

This selection is used if any of your SP partners will make use of pseudonyms for account linking (see “Account Linking” on page 16).
You can also choose to mask the values of any or all attributes that PingFederate logs from the adapter at runtime (see “Attribute Masking” on page 22).

If OGNL expressions might be used to map derived values into outgoing assertions and you want those values masked, select the related checkbox under the Attribute list (see “Using Attribute Mapping Expressions” on page 453).

16. Click Next.

17. On the Summary screen, review the configuration and click Done.

You can also click any heading to go back and change information.

18. On the Manage IdP Adapter Instances screen, click Save.

**Important:** You must click Save if you want to retain the adapter configuration.
Appendix D

Composite Adapter Configuration
Application Endpoints

These endpoints provide a means, via standard HTTP, by which external applications can communicate with the PingFederate server.

Note: Begin each URL with the fully qualified server name and port number of your IdP or SP PingFederate server: for example: https://pingidentity.com:9031/idp/startSSO.ping.

The SSO and SLO endpoints for an IdP and an SP include optional parameters which you can use to specify error pages that users will see in the event of an SSO or SLO failure. By default, PingFederate provides templates for these and other errors or conditions (see “Customizing User-Facing Screens” on page 76).

For either SP or IdP servers, a maintenance endpoint is also provided for administrators to verify that the server is running (see “System-Services Endpoints” on page 437).

IdP Endpoints

The following sections describe PingFederate IdP endpoints, including the query parameters that each accepts or requires. These endpoints accept either the HTTP GET or POST methods.

Important: When the parameter TargetResource (or TARGET) is used and includes its own query parameters, the parameter value must be URL-encoded. Any other parameters that contain restricted characters (many SAML URNs, for example) also must be URL-encoded.

For information about URL encoding, see, for example, “HTML URL-encoding Reference” (www.w3schools.com/tags/ref_urlencode.asp).
This is the path used to initiate an unsolicited IdP-initiated SSO transaction during which a SAML response containing an assertion is sent to an SP. Typically, a systems integrator or developer creates one or more links to this endpoint in the IdP application or portal to allow users to initiate SSO to various SPs.

For information about allowing applications to retrieve configuration data from the PingFederate server over SOAP, see “Web Service Interfaces” on page 445.

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PartnerSpId or PARTNER</td>
<td>The federation ID of the SP to whom the SAML response containing an assertion should be issued. One of these parameters is required unless the federation ID can be derived from TargetResource or TARGET (see below)</td>
</tr>
<tr>
<td>TargetResource or TARGET (optional)</td>
<td>For SAML 2.0, the value of either parameter is passed to the SP as the RelayState element of a SAML response message. This is the PingFederate implementation of the SAML 2.0 indicator for a desired resource at the SP during IdP-initiated SSO. For SAML 1.x, the value is sent to the SP as a parameter named TARGET. <strong>Note:</strong> If this parameter is not provided in the URL, then the target resource should be specified in the administrative console (see “Configuring a Default URL and Error Message” on page 174).</td>
</tr>
<tr>
<td>InErrorResource (optional)</td>
<td>Indicates where the user is redirected after an unsuccessful SSO. If this parameter is not included in the request, PingFederate redirects the user to the SSO error landing page hosted within PingFederate (see “Customizing User-Facing Screens” on page 76).</td>
</tr>
<tr>
<td>Binding (optional)</td>
<td>Indicates the binding to be used; allowed values are URIs defined in the SAML specifications. For example, the SAML 2.0 applicable URIs are: urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Artifact urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST When the parameter is not used, the default ACS URL configured for the SP-partner connection is used, unless an ACS index is specified (see the next parameter, ACSIdx).</td>
</tr>
<tr>
<td>ACSIdx (optional - SAML 2.0)</td>
<td>Specifies the index number of partner’s ACS (see “Setting Assertion Consumer Service URLs (SAML)” on page 217). Takes precedence over the Binding parameter if both are specified. If neither the binding nor index is specified in the call, the default ACS is used.</td>
</tr>
</tbody>
</table>
**IdP Endpoints**

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IdpAdapterId (optional)</td>
<td>Allows an application to call out what IdP adapter to use for authentication (in a configuration with multiple IdP adapters).</td>
</tr>
<tr>
<td>RequestedFormat (optional - SAML 2.0)</td>
<td>Allows control over the NameId format.</td>
</tr>
</tbody>
</table>

**/idp/startSLO.ping**

This is the path used to initiate an IdP-initiated SLO (under SAML 2.0). Typically, a systems integrator or developer creates one or more links to this endpoint in the protected resources of their IdP application or portal to allow users to end their sessions at various SPs. This endpoint uses the local PingFederate session to determine which SPs have been issued an SSO assertion and sends them a SAML logout request.

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TargetResource (optional)</td>
<td>Indicates where the user is redirected after a successful SLO. If this parameter is not included in the request, PingFederate uses as a default the URL for a successful SLO as entered on the IdP Default URL screen.</td>
</tr>
<tr>
<td>InErrorResource (optional)</td>
<td>Indicates where the user is redirected after an unsuccessful SLO. If this parameter is not included in the request, PingFederate redirects the user to the SLO error landing page hosted within PingFederate (see “Customizing User-Facing Screens” on page 76).</td>
</tr>
</tbody>
</table>
| Binding (optional - SAML 2.0) | Indicates the binding to be used; allowed values are URIs defined in the SAML specifications. The SAML 2.0 applicable URIs are:  
  urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Artifact  
  urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST  
  urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Redirect  
  urn:oasis:names:tc:SAML:2.0:bindings:SOAP  
  When the parameter is not used, the first SLO Service URL configured for the SP-partner connection is used (see “Specifying SLO Service URLs (SAML 2.0)” on page 220). |

**/idp/writecdc.ping**

This endpoint is used for SAML 2.0 IdP Discovery. This is the path used when the IdP wants to write to the Common Domain Cookie (CDC) held within the user’s browser. The information written to the cookie indicates from which IdP this user has authenticated.
The following table shows the one HTTP query parameter for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TargetResource</td>
<td>Indicates where the user is redirected after successful IdP Discovery. If this parameter is not included in the request, PingFederate redirects the user to the referrer in the HTTP header. If there is no TargetResource or referrer, the call to this endpoint will fail.</td>
</tr>
</tbody>
</table>

**System-Service Endpoints**

See “System-Services Endpoints” on page 437.

**SP Endpoints**

The following sections describe the PingFederate SP endpoints, including the query parameters that each accepts or requires. These endpoints accept either the HTTP GET or POST methods.

> **Important:** When the parameter TargetResource is used and includes its own query parameters, the parameter value must be URL-encoded. For information about URL encoding, see, for example, “HTML URL-Encoding Reference” (http://www.w3schools.com/tags/ref_urlencode.asp).

**/sp/startSSO.ping**

This is the path used to initiate SP-initiated SSO. In this scenario, the SP issues an SSO request to the IdP asking for an SSO authentication response. Typically, a systems integrator or developer creates one or more links to this endpoint in SP applications to allow users to access various protected resources via SSO using the IdP as an authentication authority.

For information about allowing applications to retrieve configuration data from the PingFederate server over SOAP, see “Web Service Interfaces” on page 445.

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PartnerIdpId</td>
<td>The federation ID of the IdP that will authenticate the user and issue an assertion.</td>
</tr>
<tr>
<td>Domain</td>
<td>The domain name associated with the requesting user’s IdP (see “Using Auto-Connect” on page 28). In this case, PartnerIdpId cannot be used.</td>
</tr>
</tbody>
</table>
### Parameter Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TargetResource or TARGET</td>
<td>This parameter indicates where the end-user is redirected after a successful SSO. Note: If this parameter is not provided in the URL, then the target resource should be specified in the administrative console (see “Configuring Default URLs” on page 272).</td>
</tr>
<tr>
<td>Binding (optional)</td>
<td>Indicates the binding to be used; allowed values are URLs defined in the SAML specifications. For example, the SAML 2.0 applicable URLs are:</td>
</tr>
<tr>
<td></td>
<td>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Artifact</td>
</tr>
<tr>
<td></td>
<td>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST</td>
</tr>
<tr>
<td></td>
<td>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Redirect</td>
</tr>
<tr>
<td></td>
<td>When the parameter is not used for SAML 2.0, the first SSO Service URL configured for the IdP-partner connection is used (see “Specifying SSO Service URLs (SAML)” on page 312).</td>
</tr>
<tr>
<td>InErrorResource (optional)</td>
<td>This parameter indicates where the end-user is redirected after an unsuccessful SSO. If this parameter is not included in the request, PingFederate redirects the user to the SLO error landing page hosted within PingFederate (see “Customizing User-Facing Screens” on page 76).</td>
</tr>
<tr>
<td>SpSessionAuthn AdapterId (optional)</td>
<td>The explicit SP adapter instance ID indicating the adapter to use to create an authenticated session or security context.</td>
</tr>
<tr>
<td>ForceAuthn (optional - SAML 2.0)</td>
<td>This parameter controls the attribute of the same name in the AuthnRequest. (The default is false.)</td>
</tr>
<tr>
<td>IsPassive (optional - SAML 2.0)</td>
<td>This parameter controls the attribute of the same name in the AuthnRequest. (The default is false.)</td>
</tr>
<tr>
<td>AllowCreate (optional - SAML 2.0)</td>
<td>Controls the value of the AllowCreate attribute of the NameIDPolicy element in the AuthnRequest. (The default is true.)</td>
</tr>
<tr>
<td>RequestedFormat (optional - SAML 2.0)</td>
<td>Specifies the value for the Format attribute in the NameIDPolicy element of the AuthnRequest. If not specified, the attribute is not included in the AuthnRequest.</td>
</tr>
<tr>
<td>RequestedACSIdx (optional - SAML 2.0)</td>
<td>The index number of your site’s Assertion Consumer Service, where you want to the assertion be sent to be sent.</td>
</tr>
</tbody>
</table>
Appendix E

Application Endpoints

If an adapter is specified in `SpSessionAuthnAdapterId`, then that adapter is used to create an authenticated session for SP-initiated SSO. If there is no `SpSessionAuthnAdapterId`, the ultimate destination of the user after SSO (either the `TargetResource` or the default SSO success URL) is used along with the mappings defined in the administrative console on the Map URLs to Adapter Instances screen (see “Mapping URLs to Adapter Instances” on page 270).

Note that adapter selection for SP-initiated SSO is similar to that for IdP-initiated SSO except that, because the adapter ID is dependent on the SAML deployment, PingFederate cannot expect it from an IdP. Therefore, it uses only the URL mapping for adapter selection for SSO.

/sp/startSLO.ping

This is the path used to initiate SP-initiated SLO. Typically, a systems integrator or developer creates one or more links to this endpoint in the protected resources of their SP application, which allows users to end a session by sending a logout request to the IdP that authenticated the session.

Note that the IdP might send additional logout request messages to other SPs when it receives a logout request from a PingFederate server acting as an SP.

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RequestedBinding (optional - SAML 2.0)</td>
<td>Indicates the binding requested for the response containing the assertion; allowed values are URLs defined in the SAML specifications.</td>
</tr>
<tr>
<td>RequestedAuthnCtx (optional - SAML 2.0)</td>
<td>Indicates the requested authentication context of the assertion; allowed values include URLs defined in the SAML specifications (see the OASIS SAML document saml-authn-context-2.0-os.pdf).</td>
</tr>
<tr>
<td>RequestedAuthnDeclRef (optional - SAML 2.0)</td>
<td>An alternative to RequestedAuthnCtx, above, indicating the requested authentication context of the assertion by declaring any URI reference (see section 2.7.2.2 of the OASIS SAML document saml-core-2.0-os.pdf).</td>
</tr>
<tr>
<td>RequestedSPNameQualifier (optional - SAML 2.0)</td>
<td>Indicates that the IdP should return the given name qualifier as part of the assertion (used primarily to identify SP affiliations—see “Defining SP Affiliations” on page 254).</td>
</tr>
<tr>
<td>TargetResource (optional)</td>
<td>Indicates where the user is redirected after a successful SLO. If this parameter is not included in the request, PingFederate uses as a default the URL for a successful SLO, as entered on the SP Default URLs screen.</td>
</tr>
</tbody>
</table>
An SP PingFederate session can be associated with one or more application sessions relying on any number of IdPs as the session authority. PingFederate must choose one session to terminate and also send an SLO request to the IdP that issued the assertion that created the session. Sessions are associated with the ID of the adapter instance that created them. Once an adapter ID is determined, the first session found with that ID is used. Determination of the adapter instance ID occurs in the following order:

1. If there is a value for the `SpSessionAuthnAdapterId` parameter, it is used.
2. If there is a value for the `SourceResource` parameter, PingFederate attempts to map a URL to an adapter using that value to determine the adapter ID.
3. If there is an HTTP header value for `Referer [sic]`, PingFederate attempts to map a URL to an adapter using that value to determine the adapter ID.
4. If none of the above is successful, the `TargetResource` parameter value or the value for the default SLO success URL are used to map a URL to an adapter.
5. Finally, if no adapter ID is determined, the first one in the list is used.

### /sp/defederate.ping

This is the path used to terminate an account link created during SSO. Account linking provides a means for subject identification on the SP side. Links are created and terminated entirely by a user on the SP side. The link contains the name

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding (optional - SAML 2.0)</td>
<td>Indicates the binding to be used; allowed values are URIs defined in the SAML specifications. The SAML 2.0 applicable URLs are:</td>
</tr>
<tr>
<td></td>
<td><code>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Artifact</code></td>
</tr>
<tr>
<td></td>
<td><code>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST</code></td>
</tr>
<tr>
<td></td>
<td><code>urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Redirect</code></td>
</tr>
<tr>
<td></td>
<td><code>urn:oasis:names:tc:SAML:2.0:bindings:SOAP</code></td>
</tr>
<tr>
<td></td>
<td>When the parameter is not used, the first SLO Service URL configured for the IdP-partner connection is used (see “Specifying SLO Service URLs” on page 313).</td>
</tr>
<tr>
<td>InErrorResource (optional)</td>
<td>Indicates where the user is redirected after an unsuccessful SLO. If this parameter is not included in the request, PingFederate redirects the user to the SLO error landing page hosted within PingFederate (see “Customizing User-Facing Screens” on page 76).</td>
</tr>
<tr>
<td>SpSessionAuthnAdapterId (optional)</td>
<td>The SP adapter instance ID indicating which session to terminate and which IdP will receive the logout request.</td>
</tr>
<tr>
<td>SourceResource (optional)</td>
<td>A URL indicating the origin of the logout request. It is mapped to an adapter ID in order to designate which session to terminate.</td>
</tr>
</tbody>
</table>
identifier from the IdP, the IdP’s federation ID, the adapter instance ID, and the local user identifier.

There are no HTTP parameters for this endpoint.

You can unlink a user session only if was established during SSO using an existing account link on the SP side. If more than one SP session was established via account linking on the same PingFederate session, each of those links will be terminated by this endpoint. A local logout is also performed for any link that is terminated.

/sp/cdcstartSSO.ping

This endpoint is used for IdP-Discovery implementations (see “IdP Discovery” in the “Supported Standards” chapter of Getting Started). This endpoint is similar to /sp/startSSO.ping and accepts the same parameters, with the exception of PartnerIdpId (see “/sp/startSSO.ping” on page 432). Instead of this parameter, the server attempts to use the common domain cookie to determine the IdP.

/sp/startAttributeQuery.ping

This endpoint is used to initiate an Attribute Query with a SAML 2.0 IdP (see “Attribute Query and XASP” in the “Supported Standards” chapter of Getting Started).

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>Uniquely identifies the user to the IdP. When user authenticates with an x.509 certificate, this is the Subject DN, which must be URL-encoding.</td>
</tr>
<tr>
<td>Issuer (optional)</td>
<td>The IssuerDN from the user’s x.509 certificate (when XASP is used), which uniquely identifies the entity that issued the user’s certificate. The parameter must be URL-encoded.</td>
</tr>
<tr>
<td>Note: When specified this parameter overrides the Subject parameter.</td>
<td></td>
</tr>
<tr>
<td>PartnerIdpId (except for XASP)</td>
<td>Used to identify the specific IdP partner to which the Attribute Query should be sent. If this parameter is not present, the Subject and Issuer are used to determine the correct IdP.</td>
</tr>
<tr>
<td>Note: For XASP, this parameter overrides both the Subject and Issuer parameters.</td>
<td></td>
</tr>
</tbody>
</table>
System-Services Endpoints

These endpoints apply to the PingFederate server generally, whether used as an IdP, SP, or both.

/pf/heartbeat.ping

This endpoint returns an “OK” browser message and an HTTP 200 status indication if the PingFederate server is running. If you receive an HTTP 404 error, the server associated with the endpoint is down.

Load balancers can use this endpoint to determine the status of PingFederate independently of checks used to determine the status of the supporting hardware.

You can also configure the server to provide regular status information to a network-management utility (see “Configuring Runtime Reporting” on page 84).

/pf/adapter2adapter.ping

This endpoint initiates direct IdP-to-SP adapter mapping, when that feature is configured (see “IdP-to-SP Adapter Mapping” on page 115).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format (required for XASP, otherwise optional)</td>
<td>Identifies the name-identifier format of the Subject query parameter. If included, the value must be one of the SAML 2.0 Name Identifier Format URIs (see section 8.3 of the SAML specifications (<a href="http://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf">http://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf</a>)). <strong>Note</strong>: For XASP, this parameter must be set to: <code>urn:oasis:names:tc:SAML:1.1:nameid-format:X509SubjectName</code> If not specified, the parameter defaults to: <code>urn:oasis:names:tc:SAML:1.1:nameid-format:unspecified</code>. <strong>Note</strong>: The parameter must be URL-encoded.</td>
</tr>
<tr>
<td>AppId</td>
<td>The unique identifier of the initiating application.</td>
</tr>
<tr>
<td>SharedSecret</td>
<td>Used to authenticate the initiating application. The AppId and SharedSecret must both match the application authentication settings within the PingFederate server.</td>
</tr>
<tr>
<td>RequestedAttrName (optional)</td>
<td>A name of a user attribute requested from the IdP. For each such desired user attribute, include this parameter. If this parameter is not present, then all allowable user attributes are returned from the IdP.</td>
</tr>
</tbody>
</table>
Appendix E
Application Endpoints

The following table shows the HTTP parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TargetResource (optional)</td>
<td>Indicates where the user is redirected after a successful SSO. If this parameter is not included in the request, PingFederate uses as a default the URL for a successful SSO (see “Configuring Default URLs” on page 272).</td>
</tr>
<tr>
<td>SpSessionAuthn AdapterId (optional)</td>
<td>The SP adapter instance ID to be used. If not provided and more than one SP adapter instance is configured with adapter-to-adapter mapping, PingFederate uses configured defaults (see “Mapping URLs to Adapter Instances” on page 270).</td>
</tr>
<tr>
<td>IdpAdapterId (optional)</td>
<td>Indicates the IdP adapter to use for authentication if more than one IdP adapter is configured in adapter-to-adapter mappings.</td>
</tr>
<tr>
<td>InErrorResource (optional)</td>
<td>Indicates where the user is redirected if the SSO is unsuccessful. If this parameter is not included in the request, PingFederate redirects the user to the SSO error landing page hosted within PingFederate (see “Customizing User-Facing Screens” on page 76).</td>
</tr>
</tbody>
</table>

/pf/ws-trust_sts_metadata.ping

This endpoint returns STS metadata for use in expediting configuration of Web-service applications.

The following table shows the HTTP parameters for this endpoint:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PartnerSpId</td>
<td>The Connection ID of the SP to whom the SAML token will be issued. This parameter determines the connection for which metadata will be generated.</td>
</tr>
<tr>
<td>Type (optional)</td>
<td>Determines the type of metadata to generate (see “Windows Identity Foundation Clients” on page 8). Possible values are mex and fed (the default).</td>
</tr>
<tr>
<td>PartnerIdpId</td>
<td>The Connection ID of the IdP issuing the SAML token to be consumed by PingFederate. This parameter determines the connection for which the metadata will be generated.</td>
</tr>
</tbody>
</table>
OAuth 2.0 Endpoints

The following sections describes OAuth-developer information on PingFederate endpoints for the OAuth AS.

Note: Unless otherwise indicated, these endpoints and associated parameters are defined in the OAuth 2.0 Authorization Protocol (see “OAuth 2.0” in the “Supported Standards” chapter of Getting Started).

Token Endpoint

The token endpoint is defined in the OAuth 2.0 specification and used by the client to obtain an access token and possibly a refresh token by presenting its authorization grant. The token endpoint is used with every authorization grant except for the Implicit grant type (since an access token is issued directly from the authorization endpoint).

Endpoint: /as/token.oauth2

Note: By default per OAuth specifications, this endpoint accepts only the HTTP POST method.

Client Identification and Authentication

Clients can authenticate to the OAuth AS using this endpoint by presenting their client identifier and client secret either using the HTTP Basic authentication...
scheme (where the client identifier is the username, and the client secret is the password) or with the following HTTP request parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>client_id (optional)</td>
<td>The client identifier (see “Configuring a Client” on page 127).</td>
</tr>
<tr>
<td>client_secret (optional)</td>
<td>The client secret (as defined on the client management UI page).</td>
</tr>
</tbody>
</table>

Whenever possible, the use of HTTP Basic is recommended over the use of the request parameters.

Clients without a client secret can use the client_id parameter to identify themselves to the OAuth AS and omit the client_secret parameter.

## Grant Type Parameters

Other parameters accepted by the /as/token.oauth2 endpoint vary by the grant type being presented and include both OAuth-defined standard parameters and PingFederate-specific parameters. The grant type of the access token request is indicated by the following parameter:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| grant_type (required)| Indicates the type of grant being presented in exchange for an access token and possibly a refresh token. The value is an extensibility mechanism of the OAuth 2.0 specification. Currently, PingFederate supports authorization_code, password, client_credentials, refresh_token and urn:pingidentity.com:oauth2:grant_type:validate_bearer.  
**Note:** Further parameters associated with each grant type are defined in the following sections. |

### Authorization Code Grant Type

These parameters apply when the grant_type parameter for /as/token.oauth2 is set to authorization_code.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>code (required)</td>
<td>The authorization code received from the authorization server during the redirect interaction at the authorization endpoint when the response_type parameter is code (see “Endpoint: /as/authorization.oauth2” on page 443).</td>
</tr>
</tbody>
</table>
Refresh Token Grant Type

These parameters apply when the grant_type parameter for /as/token.oauth2 is set to refresh_token.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>refresh_token</td>
<td>The refresh token issued to the client during a previous access-token request.</td>
</tr>
<tr>
<td>scope</td>
<td>The scope of the access request expressed as a list of space-delimited, case-sensitive strings. The requested scope must be equal or lesser than the scope originally granted by the resource owner, and if omitted is treated as equal to the scope originally granted by the resource owner.</td>
</tr>
</tbody>
</table>

Resource Owner Credentials (Password) Grant Type

These parameters apply when the grant_type parameter for /as/token.oauth2 is set to password.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username</td>
<td>The username, encoded as UTF-8.</td>
</tr>
<tr>
<td>password</td>
<td>The password, encoded as UTF-8.</td>
</tr>
<tr>
<td>scope</td>
<td>The scope of the access request.</td>
</tr>
<tr>
<td>validator_id</td>
<td>A PingFederate OAuth AS parameter indicating the instance ID of the password credential validator to be used to check the username and password (and the associated attribute mapping into the USER_KEY of the persistent grant). If multiple validator instances are configured and mapped and no validator_id is provided, each instance will be tried sequentially until one succeeds or they all fail.</td>
</tr>
</tbody>
</table>
### Client Credentials Grant Type

These parameters apply when the `grant_type` parameter for `/as/token.oauth2` is set to `client_credentials`.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>scope (optional)</td>
<td>The scope of the access request.</td>
</tr>
</tbody>
</table>

Client authentication is required, which means either HTTP Basic or `client_id` and `client_secret` must be included (see “Client Identification and Authentication” on page 439).

### Access Token Verification/Validation Grant Type

These parameters apply when the `grant_type` parameter for `/as/token.oauth2` is set to `urn:pingidentity.com:oauth2:grant_type:validate_bearer`.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>token (required)</td>
<td>The bearer access token to be validated.</td>
</tr>
</tbody>
</table>

The Validation grant type is a custom PingFederate OAuth extension that enables an RS to communicate with the OAuth AS while leveraging the established communication and encoding patterns from OAuth 2.0. The grant type allows an RS to check with the OAuth AS on the validity of a bearer access token that it has received from a client making a protected-resources call.

Client authentication is required and, for this grant type, the RS acts in the role of a client for the request/response exchange with the OAuth AS to make the validation call.

The response is a standard OAuth access-token response from the token endpoint with some extensions and minor semantic differences in the treatment of some of the parameters. The returned token is in a JSON structure with name-to-value attributes or name-to-array attributes.

The token type is `urn:pingidentity.com:oauth2:validated_token`—a URN indicating the token represents the attributes associated with the validated access token passed on the request. A `client_id` parameter is returned indicating the client identifier of the client to whom the grant was made. A `scope` parameter is returned, if the scope is greater than the default implied scope, indicating the approved scope of the grant. The `expires_in` parameter indicates for how many more seconds the token is valid (note that the value may increase on subsequent validation calls if a token lifetime extension policy is in place: see “Configuring Reference-Token Management” on page 129).

For example:

```json
{
"scope":"beer hockey donuts",
"token_type":"urn:pingidentity.com:oauth2:validated_token",
"expires_in":3172,
"client_id":"super_cool_mobile_client",
"access_token":
{
"uid":"sfHqhad9onMjXsQNI1mZP9mD7AQasmskd",
```
Authorization Endpoint

The authorization endpoint is defined in the OAuth 2.0 specification and is used by the OAuth AS to interact directly with resource owners, authenticate them, and obtains their authorization. Typically, an OAuth client makes an authorization request by directing a resource owner, via an HTTP user-agent, to the authorization endpoint. After completing its interaction with the resource owner, the OAuth AS redirects the resource owner’s user-agent back to the client’s redirect URI with the response to the authorization request.

Endpoint: /as/authorization.oauth2

The table below shows parameters for this endpoint:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>response_type</td>
<td>A value of code results in the Authorization Code grant type while a value of token implies the Implicit grant type.</td>
</tr>
<tr>
<td>client_id</td>
<td>The client identifier (see “Configuring a Client” on page 127).</td>
</tr>
<tr>
<td>redirect_uri</td>
<td>If present, the requested redirect_uri must match the one configured for the client.</td>
</tr>
<tr>
<td>scope</td>
<td>The scope of the access request expressed as a list of space-delimited, case sensitive strings. Valid scope values are defined on the OAuth AS settings page (see “Authorization Server Settings” on page 123), and requests for values not defined there result in an error response.</td>
</tr>
<tr>
<td>state</td>
<td>An opaque value used by the client to maintain state between the request and callback. If included, the AS returns this parameter and the given value when redirecting the user agent back to the client.</td>
</tr>
<tr>
<td>idp (or PartnerIdpId)</td>
<td>A PingFederate OAuth AS parameter indicating the Entity ID/Connection ID of the IdP with whom to initiate Browser SSO for user authentication.</td>
</tr>
<tr>
<td>pfidpadapterid</td>
<td>A PingFederate OAuth AS parameter indicating the IdP Adapter Instance ID of the adapter to use for user authentication.</td>
</tr>
</tbody>
</table>

If more than one source of authentication is configured in the system and no pfidpadapterid or idp parameter is provided, users are presented with an intermediate page asking them to choose among the available sources of authentication. The authentication results in a set of user attributes that must be mapped into the USER_KEY attribute for persistent grant storage and the USER_NAME attribute that is displayed on the user authorization page.
Grant-Management Endpoint

The grants endpoint (two are provided, one for use with parameters) is where end-users/resource owners go to view (and optionally revoke) the persistent access grants they have made. This endpoint is not part of the OAuth specification, but many OAuth providers offer a similar type of functionality. The grants displayed are those associated with the USER_KEY of the authenticated user. The same attribute mapping(s) from the authentication source to USER_KEY used for the authorization endpoint are used here to look up the user's existing grants.

Endpoints: /as/grants.oauth2 and /as/oauth_access_grants.ping

The table below shows parameters for this endpoint.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>idp (or PartnerIdpId)</td>
<td>Indicates the Entity ID/Connection ID of the IdP with whom to initiate Browser SSO for user authentication.</td>
</tr>
<tr>
<td>pfidpadapterid</td>
<td>Indicates the IdP Adapter Instance ID of the adapter to use for user authentication.</td>
</tr>
</tbody>
</table>

Note: Use only the endpoint /as/grants.oauth2 with these optional parameters.

Important: When a parameter is needed for this endpoint, use only one of these options.

If no recent user attributes are found for the session context, the user is redirected to /as/oauth_access_grants.ping to initiate the authentication process, which behaves in exactly the same way as the authorization endpoint (see “Token Endpoint” on page 439).
PingFederate provides two Web Services for remote clients. These services may be used by client applications to manage partner connections and support integration of Web applications, respectively:

- **Connection Management Service** — Enables creation and deletion of single connection configurations in PingFederate. This service may be used to migrate connections from one server environment to another (for example, from testing or staging to production) or to create new connections in a single server programmatically.

  **Tip:** PingFederate provides a command-line utility that can be used to export and modify connections, as well as other administrative-console configurations, and then import them to target environments (see “Automating Configuration Migration” on page 68).

- **SSO Directory Service** — Provides Web application developers with information regarding partner connections and adapter instances.

  **Tip:** Applications accessing the Connection Management Service must first authenticate themselves to the PingFederate server. SSO Directory Service authentication is optional by default, but may be required. For more information, see “Authentication” on page 156.

### Connection Management Service

The Connection Management Service supports basic connection management capabilities and is accessible only on a PingFederate server running the administrative console. This feature is useful in a variety of circumstances, but the following primary use cases were considered:
Appendix G
Web Service Interfaces

- As a utility to migrate changes to a partner connection though staging environments (for example: development, test, production).
  Changes to URLs and keys may be needed to make the connection appropriate to the next environment.
- As a way for an external application to update or delete connections programmatically, or create new ones using an exported connection XML file as a template.

The WAR file for this service, pf-mgmt-ws.war, is located in the pingfederate/server/default/deploy2 directory.

Note: If you do not want to allow use of the service, it should not be deployed: remove the WAR file from the deploy2 directory.

The SOAP-accessible service endpoint is pf-mgmt-ws/ws/ConnectionMigrationMgr.

The Web Services Description Language (WSDL) document describing this service can be retrieved from:
https://<host_server>:<admin_console_port>/pf-mgmt-ws/ws/ConnectionMigrationMgr?wsdl

Exporting a Connection

You can export a connection either manually, using the administrative console, or programmatically, via a call to the Connection Management Service.

In either case, the exported XML complies with the standard SAML 2.0 metadata format, with extensions to capture PingFederate’s proprietary configuration. Most connection configuration information is contained in the XML markup, with the exception of global configuration items such as adapter instances, data stores, and keypairs. Adapter instances and data stores are referenced by ID, and keypairs are referenced by the MD5 fingerprint of their X.509 certificate. Public certificates, such as the partner’s signature verification certificate, are included completely (base-64 encoded).

Exporting Manually

For information about using the administrative console to export SP connections at an IdP site, see “Via the Manage Connections Screen” on page 179.

For information about exporting IdP connection at an SP site, see “From the Manage Connections Screen” on page 280.

Using the Connection Service

The Connection Web Service exposes the following method for exporting connections:

```java
public string getConnection(
    String entityId,
    String role,) throws IOException
```

Code Sample

```java
Service service = new Service();
Call call = (Call)service.createCall();
call.setUsername("username");
call.setPassword("password");
```
call.setTargetEndpointAddress("https://localhost:9999/pf-mgmt-ws/ws/ConnectionMigrationMgr");
call.setOperationName("getConnection");
Object result = call.invoke(new Object[] {"entityId", "SP"});

Importing Connections

Moving a connection from one PingFederate server to another requires care, as the target server must contain the global configuration items (data stores, keypairs, and adapter instances) that the connection references. Changing the references in the XML file—either manually or programmatically—may be necessary to adjust the connection to the target PingFederate environment.

Once required changes are made to the XML file, developers can use the Connection Management Service to import the connection into a different instance of PingFederate.

**Tip:** Alternatively, you can import XML connection files into PingFederate manually by copying them into the directory:

```
<pf_install>/pingfederate/server/default/data/connection-deployer
```

PingFederate scans this directory periodically and imports connections automatically.

**Caution:** Manually importing a connection always overwrites an existing connection with the same ID (the Web Service provides a switch to disallow this behavior, if desired—see below).

The Web Service exposes the following method for importing connections:

```
public void saveConnection(
    String xml,
    boolean allowUpdate) throws IOException
```

The `xml` parameter is the complete representation of the connection retrieved by your application from an exported connection file (and optionally modified).

If `allowUpdate` is false, the Web Service can be used only to add a new connection. An error occurs if a connection already exists with the same connection ID and federation protocol in the XML. If `allowUpdate` is true and the connection already exists, it will be overwritten.

**Sample Code**

Below is example client code using the Apache AXIS libraries that invokes this Web Service to create a new connection:

```
Service service = new Service();
Call call = (Call) service.createCall();
call.setUsername("username");
call.setPassword("password");
String addr = "https://localhost:9999/pf-mgmt-ws/ws/ConnectionMigrationMgr";
call.setTargetEndpointAddress(addr);
call.setOperationName("saveConnection");
String xml = "<EntityDescriptor entityID="some_entity_id"
    ...
    </EntityDescriptor>";
```
boolean allowUpdate = false;
call.invoke(new Object[]{xml, allowUpdate});

Deleting Connections

The Web Service exposes the following method for connection deletion:

```java
public void deleteConnection(
    String entityId,
    String role
) throws IOException
```

The `entityId` parameter is the Connection ID, which identifies the connection to be deleted. The `role` parameter is the connection role—IDP or SP.

Code Example

Below is example client code using the Apache AXIS libraries that invokes this Web Service to delete a connection:

```java
Service service = new Service();
Call call = (Call) service.createCall();
call.setUsername("username");
call.setPassword("password");
call.setTargetEndpointAddress("https://localhost:9999/pf-mgmt-ws/ws/ConnectionMigrationMgr");
call.setOperationName("deleteConnection");
call.invoke(new Object[]{"entityId", "SP"});
```

Cluster Configuration Replication

A Web Service endpoint is available to replicate the administrative-console configuration to other nodes in a PingFederate cluster. This allows a client of this Web Service to create or update a new connection (or delete a connection) and then push the new configuration to the other cluster nodes.

The service endpoint is:

```
/pf-mgmt-ws/ws/ConfigReplication
```

The WSDL document describing this service can be retrieved from:

https://<host_server>:<admin_console_port>/pf-mgmt-ws/ws/ConfigReplication?wsdl

The Web Service exposes the following method:

```java
public void replicateConfiguration();
```

Example Code

Below is example client code using the Apache AXIS libraries that invokes the configuration replication functionality:

```java
Call call2 = (Call) service.createCall();
call2.setUsername("joe");
call2.setPassword("test");
String addr2 = "https://localhost:9999/pf-mgmt-ws/ws/ConfigReplication";
call2.setTargetEndpointAddress(addr2);
call2.setOperationName("replicateConfiguration");
```
call2.invoke(new Object[]{});

**Validation Disclaimer**

The import process is not subject to the same rigorous data validation performed by the administrative user interface. Although some checks are made, it is possible to create invalid connections using the connection-migration process. Therefore, because the XML is complex and validation is limited, attempting to create an XML connection from scratch is not recommended. Rather, the administrative console should be used to create the initial connection. That way, changes necessary to the exported connection's XML representation can be held to a minimum, reducing the risk of compromising data integrity.

**SSO Directory Service**

PingFederate SSO Directory Service allows applications to retrieve configuration data from a runtime PingFederate server. (A PingFederate server in a cluster configured as an administrative console does not support this Web Service.) This service allows Web applications to avoid storing and maintaining the data locally. These types of data can be retrieved:

- A list of IdP partners
- A list of SP partners
- A list of IdP adapter instances
- A list of SP adapter instances

The SSO Directory Service provides information useful for integrating an application with a PingFederate server. It is a way for the application to find out dynamically which partners can be used for SSO. This means applications need not be modified when new partners are configured in PingFederate.

The WAR file for this module, pf-ws.war, is located in the pingfederate/server/default/deploy directory.

---

**Note:** If you do not want to allow use of the service, it should not be deployed: remove the WAR file from the deploy directory.

The service endpoint is pf-ws/services/SSODirectoryService.

The WSDL document describing this service can be retrieved from:

http(s)://<pf_runtime_host>:<runtime_port>/pf-ws/services/SSODirectoryService.wsdl

You can retrieve a list using any of the following methods:

- **getIDPList** – Returns a list of active IdP connections configured for SP-initiated SSO. The list contains each IdP's Connection ID and Connection Name
- **getSPList** – Returns a list of active SP connections configured for IdP-initiated SSO. The list contains each SP's Connection ID and Connection Name

---

**Note:** For either IdP or SP lists, Connection IDs are returned as values for the XML tag `<entityId>`. Connection Names are returned as values for the XML tag `<company>` (see “SOAP Request and Response Example” on page 451).
Appendix G
Web Service Interfaces

- `getAdapterInstanceList` – Returns a list of SP adapter instances containing an ID and name.
- `getIDPAdapterInstanceList` – Returns a list of IdP adapter instances containing an ID and name.

**Note:** These methods do not require input parameters.

The service is also available over HTTP. The query string for retrieving any of the lists is:

```
/pf-ws/services/SSODirectoryService?method=<method_name>
```

### Coding Example

When you integrate a Web application with PingFederate, use the SSO Directory Service to generate a connection or adapter list. The code needed to create any of the lists is similar.

The following Java code example retrieves an IdP list from the Web Service. The program calls the `getIDPList` method in the SSO Directory Service to retrieve an IdP list and print it to the console. This example uses the Apache Axis library and includes optional code for authentication to the PingFederate server (see “Authentication” on page 156). We recommend the use of HTTPS when including credentials.

```java
import org.apache.axis.client.Call;
import org.apache.axis.client.Service;
import java.net.URL;
import javax.xml.namespace.QName;
import com.pingidentity.ws.SSOEntity;

public class SSODirectoryClientSample {
    public static void main(String[] args) throws Exception {
        Service service = new Service();
        Call call = (Call) service.createCall();
        call.setUsername("username");
        call.setPassword("pass");
        URL serviceUrl = new URL("https://localhost:9031/pf-ws/services/SSODirectoryService");
        QName qn = new QName("urn:BeanService", "SSOEntity");
        call.registerTypeMapping(SSOEntity.class, qn,
                                 new org.apache.axis.encoding.ser.BeanSerializerFactory(SSOEntity.class, qn),
                                 new org.apache.axis.encoding.ser.BeanDeserializerFactory(SSOEntity.class, qn));
        call.setTargetEndpointAddress( serviceUrl );
        call.setOperationName( new QName("http://www.pingidentity.com/servicesSSODirectoryService",
                                         "getIDPList"));
        Object result = call.invoke( new Object[] {} );
        if (result instanceof SSOEntity[]) {
            // Process the result
        }
    }
}
```
{  
    SSOEntity[] idpArray = (SSOEntity[]) result;  
    for (SSOEntity idp : idpArray)  
    {  
        System.out.println(idp.getEntityId() + " " +  
                           idp.getCompany());  
    }  
}  
else  
{  
    System.out.println("Received problem response from  
                        server: " + result);  
}  
}

SOAP Request and Response Example

A client application must send a SOAP request to the PingFederate server specifying  
the requested Web Service and the specific method. For example, the following is a  
typical SOAP request for an IdP list using the SSO Directory Service.  

<?xml version="1.0" encoding="UTF-8"?>  
<soapenv:Envelope  
      xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"  
      xmlns:xsd="http://www.w3.org/2001/XMLSchema"  
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">  
<soapenv:Body>  
<ns1:getIDPList  
    soapenv:encodingStyle=  
      "http://schemas.xmlsoap.org/soap/encoding/"  
    xmlns:ns1=  
      "https://localhost:9031/ssodir/services/SSODirectoryService"/>  
</soapenv:Body>  
</soapenv:Envelope>  

The PingFederate server’s Web Service will return a response containing the list you  
requested. The following is an example of a typical SOAP response for an IdP list:  

<?xml version="1.0" encoding="UTF-8"?>  
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"  
      xmlns:xsd="http://www.w3.org/2001/XMLSchema"  
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">  
<soapenv:Body>  
<getIDPListResponse  
    soapenv:encodingStyle=  
      "http://schemas.xmlsoap.org/soap/encoding/">  
<getIDPListReturn  
    soapenc:arrayType="ns1:IDP[2]" xsi:type="soapenc:Array"  
    xmlns:ns1="urn:BeanService"  
    xmlns:soapenc=  
      "http://schemas.xmlsoap.org/soap/encoding">  
<getIDPListReturn href="#id0" />
<getIDPListReturn href="#id1" />
</getIDPListReturn>
</getIDPListResponse>
<multiRef id="id0" soapenc:root="0"
    soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
    xsi:type="ns2:IDP"
    xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
    xmlns:ns2="urn:BeanService">
    <company xsi:type="xsd:string">MegaMarket</company>
    <entityId xsi:type="xsd:string">www.megamarket.com</entityId>
</multiRef>
<multiRef id="id1" soapenc:root="0"
    soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
    xsi:type="ns3:IDP"
    xmlns:ns3="urn:BeanService"
    xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/">
    <company xsi:type="xsd:string">Ping</company>
    <entityId xsi:type="xsd:string">pingfederate3:default:entityId</entityId>
</multiRef>
</soapenv:Body>
</soapenv:Envelope>
Using Attribute Mapping Expressions

PingFederate provides an advanced option allowing administrators to map user attributes by way of an expression language. Because the option carries with it a potential for misuse, however, it is disabled in the administrative console for security reasons.

**Tip:** If you are upgrading to PingFederate 5.1 or higher and importing a configuration archive that uses expression mapping, the feature will be enabled automatically.

This appendix describes the option, which is based on the Object-Graph Navigation Language (OGNL), and how to enable or disable it.

**Caution:** The security concern posed by OGNL is related to a potential for abuse by PingFederate administrative users within an organization; the concern is not related to any known external threats. We recommend, however, that the option be enabled only if required.

About OGNL

OGNL is based on the Java programming language. OGNL expressions are useful for evaluating and manipulating attribute values and returning information based on the results. You can also transform a range of values into a text description, or do the same for a sequence of ranges.

In the expression below, for example, the value of the attribute “net-worth” is transformed first to eliminate any dollar signs or commas, then the result is evaluated to determine whether the user’s net worth falls into a “bronze,” “silver,” or “gold” category:

```
#result=#this.get("net-worth").toString(),
#result=#result.replace("$",""),
#result=#result.replace(",",""),
#result < 500000 ? "bronze" :
```
Using Attribute Mapping Expressions

#result < 1000000 ? "silver" : "gold"

Use the # symbol to reference OGNL variables. For an IDP, PingFederate provides predefined OGNL variables for IDP-adapter attributes as well as any attributes retrieved from data stores. For an SP, variables are available for attributes received in an assertion or an attribute query. For example, the SAML_SUBJECT value may be retrieved using:

```
#SAML_SUBJECT
```

**Note:** Use the following construction for any attributes from any source that contain special characters (hyphens, for example), which cannot be parsed by OGNL:

```
#this.get("<attribute_name>")
```

**Important:** Because OGNL uses the “at” symbol (@) to reference static Java methods, expressions containing the symbol must be enclosed in double quotes; otherwise, expression parsing will fail. For example:

```
#SAML_SUBJECT="usr@msn.com"
```

```
#SAML_SUBJECT=usr@msn.com
```

For data-store attributes with an attribute source ID, use this syntax:

```
#this.get("ds.attr-source-id.attribute_name")
```

For data-store attributes without an attribute source ID, use this syntax:

```
#this.get("ds.attribute_name")
```

For more information, see “Using the OGNL Edit Screen” on page 455. For more information about OGNL, including detailed user documentation, see the OGNL Web site (www.opensymphony.com/ognl).

Enabling and Disabling Expressions

OGNL can be manually enabled or disabled for attribute mapping by editing a configuration file located in:

```
<pf_install>/pingfederate/server/default/data/config-store/
```

**Important:** If OGNL is enabled and expressions configured anywhere in the administrative console, disabling the feature will cause errors during runtime processing.

**To enable or disable OGNL expressions:**

1. In the directory cited above, open the file:

```
org.sourceforge.common.ExpressionManager.xml
```
Using the OGNL Edit Screen

2. Change the value of the element named `evaluateExpressions` to either `true` or `false` and save the file. For example:

   `<item name="evaluateExpressions">true</item>`

   **Note:** The absence of a value (the installed default) **does not** necessarily disable the use of OGNL expressions. To facilitate backward compatibility, when no value is present, configuration archives containing expressions can be imported successfully, and further use of the feature is enabled. (The term “silent” is used for this condition in the server log.)

3. Start or restart PingFederate.

   **Tip:** If you are enabling OGNL to use for mapping SaaS-provisioning attributes, it is not necessary to restart the PingFederate server.

When OGNL expressions are enabled, the selection Expression is available in the drop-down menus under Source in each of the administrative-console Fulfillment screens (see Figure 5), and the feature is available on the SaaS-provisioning attribute-mapping screen (when SaaS Provisioning itself is enabled—see “SaaS Provisioning” on page 31).

![Figure 5: Attribute Contract Fulfillment (Example)](image)

When you make this selection, you can enter the expression in the text field provided. You can also test expressions (see the next section).

**Using the OGNL Edit Screen**

An in-line editor is available for OGNL expressions. The editor validates the expression and allows an administrator to enter input values and test the resulting output.

**Tip:** For information about using OGNL, refer to the [OGNL Web site](http://www.opensymphony.com/ognl).

- To reach the OGNL editor, click **Edit** under Actions for an expression on any of the attribute Fulfillment screens.
Appendix H

Using Attribute Mapping Expressions

Here is an example of the edit screen, from the IdP configuration flow:

To test an expression:
1. Enter an input value in the Value text box associated with the attribute.
2. Click the Test link near the bottom right of the screen.
   If the expression contains no errors, the result is displayed under Test Results.

Important: If you make changes to an expression and want to save them, click Update under Actions. To discard changes, click the Cancel link under Actions; clicking the Cancel button near the bottom of the screen discards all changes you have made in the current task.
Basic troubleshooting tips are provided here to help overcome common difficulties. Help is also available from the Support Center at pingidentity.com.

This appendix contains the following sections:

- “Data Store Issues” on page 457
- “Installation Issues” on page 458
- “Runtime Issues” on page 458
- “Server Startup” on page 458

## Data Store Issues

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>When setting up the JDBC data store, a connection cannot be established.</td>
<td>Verify that the proper drivers and connectors have been installed. Also, verify the connection URL, username, and password. If unsuccessful, contact your database administrator.</td>
</tr>
<tr>
<td>Cannot connect to a Directory Service with the LDAP protocol.</td>
<td>Verify the connection URL, port, principal, and credentials. If unsuccessful, contact your system administrator. If using LDAP with SSL/TLS (ldaps://), ensure the LDAP server’s SSL certificate is signed by a trusted certificate authority, or import the certificate into PingFederate (see “Trusted Certificate Authorities” on page 146).</td>
</tr>
</tbody>
</table>
Installation Issues

Table 19: Troubleshooting Installation

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error message “Not enough memory on the server”</td>
<td>Verify that there is at least 1,024 MB of RAM installed on the server (see “System Requirements” in the “Installation” chapter of Getting Started).</td>
</tr>
</tbody>
</table>

Runtime Issues

Table 20: Troubleshooting Runtime Issues

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificates unexpectedly expire.</td>
<td>Verify that the server clocks are synchronized on both sides of the federation. Note that you can configure PingFederate to notify administrators in advance of impending certificate expiration (see “Configuring Runtime Notifications” on page 83).</td>
</tr>
<tr>
<td>Receiving CrossModule/Network Errors</td>
<td>Verify network connections to the Hardware Security Modules (HSMs) are active and running. Also ensure the HSMs have not been unintentionally shut down.</td>
</tr>
</tbody>
</table>

Server Startup

Table 21: Troubleshooting the PingFederate Server

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>PingFederate does not start.</td>
<td>Make sure that the Java SDK is installed (see “Installing the JDK” in the “Installation” chapter of Getting Started).</td>
</tr>
</tbody>
</table>
access token
A data object by which a client authenticates to a Resource Server and lays claim to authorizations for accessing particular resources.

account link
A persistent name identifier that enables federation of separately established accounts among disparate domains (see also account linking and pseudonym).

account linking
A form of identity mapping among separate user accounts managed under different Internet domains. The mapping typically involves a name identifier—which may be a pseudonym—used to link the user to each account. The identifier is persisted at the SP site to enable seamless SSO/SLO. Additional attributes may be sent with the identifier.

account mapping
A form of identity mapping by which one or more user attributes is passed in a single sign-on transaction. The attributes are used at the destination site as a means identifying the user and looking up local account information.

adapter
Supplementary software that allows PingFederate to interact with Web applications and systems. Two adapter choices are bundled with PingFederate: an OpenToken Adapter for use with separately available developer integration kits, and an LDAP adapter for use with your active directory data store.

adapter contract
A list of attributes “hard-wired” to an adapter and conveyed generally via cookies between the adapter and application.

artifact
A reference to a SAML protocol message. The federation partner that receives the artifact dereferences it, identifying the sender, and requests the complete message in a separate SOAP transaction.

Artifact Resolution Service
The SOAP endpoint that processes artifacts returned from a federation partner to retrieve the referenced XML message. Can be used to dereference authentication requests, assertion responses, and SLO messages.

assertion
A SAML XML document that contains identifying information about a particular subject; i.e., a person, company, application, or system. A SAML assertion can contain authentication, authorization, and attribute information about the subject.

Assertion Consumer Service
A SAML-compliant portion of PingFederate in an SP role that receives and processes assertions from an IdP.

attributes
Distinct characteristics that describe a subject. If the subject is a Web site user, attributes may include a name, group affiliation, email address, etc.
attribute contract
A list of attributes, agreed to by the partners in an identity federation, representing information about a user (SAML subject). The attributes are sent from the IdP to the SP during SSO or STS processing.

attribute mapping
A form of identity mapping between IdP and SP user accounts that uses attributes to identify the user or provide supplemental information.

attribute source
An data source used to fulfill a requestor’s attribute contract.

audience
The XML element in a SAML assertion that uniquely identifies a Service Provider.

authentication context
An element in a SAML assertion indicating the method or process used by an IdP to authenticate the subject of the assertion; may be used for authorization decisions or auditing compliance.

attribute source
Specific database or directory location containing data needed by an IdP to fulfill a connection partner’s attribute contract or by an SP to look up additional attributes to fulfill an adapter contract.

back-channel
Server-to-server, cross-domain communication path using a protocol, typically SOAP, that does not rely on a browser as an intermediary.

binding
A mapping of SAML request and response messages to specific transport protocols (redirect, POST, or artifact).

certificate
A digital file used for identity verification and other security purposes. The certificate, which is often issued by a Certificate Authority (CA), contains a public key, which can be used to verify the originator’s identity.

Certificate Revocation List (CRL) A list of revoked signing certificates, maintained by the issuing authority at a public URL.

channel
A dedicated SaaS Provisioning configuration specific to a particular service partner, data source, and target service.

classification
An element in an SAML assertion that describes the level of confidence that an attribute mapping has about the authenticity of the attribute information.

certificate
A digital file used for identity verification and other security purposes. The certificate, which is often issued by a Certificate Authority (CA), contains a public key, which can be used to verify the originator’s identity.

Certificate Revocation List (CRL) A list of revoked signing certificates, maintained by the issuing authority at a public URL.

channel
A dedicated SaaS Provisioning configuration specific to a particular service partner, data source, and target service.

classification
An element in an SAML assertion that describes the level of confidence that an attribute mapping has about the authenticity of the attribute information.

colocation
A unique name or identifier for a SAML connection partner.

data store
A database or directory location containing user account records and associated user attributes.

Data Encryption Standard (DES) A symmetric-key standard of encryption.

defederation
Optional user-initiated delinking of an identity federation that uses a persistent name identifier or pseudonym for account linking.

digital signature
A process for verifying the identity of the originator of an electronic document and whether the document has been intercepted or altered. The process involves message signing, signature validation, and signing policy coordination between partners.

domain
A collection of objects (nodes or components) that are subject to the same configuration rules and monitoring.

data store
A database or directory location containing user account records and associated user attributes.

Database Management System A system for storing and maintaining user account information and attributes. The tables and columns in the RDBMS are used by PingFederate to create user look-up and attribute retrieval queries. (See Java Database Connectivity.)

data store
A database or directory location containing user account records and associated user attributes.

Database Management System A system for storing and maintaining user account information and attributes. The tables and columns in the RDBMS are used by PingFederate to create user look-up and attribute retrieval queries. (See Java Database Connectivity.)

edged
A mapping of SAML request and response messages to specific transport protocols (redirect, POST, or artifact).

entity ID
The XML element in a SAML assertion that uniquely identifies an Identity Provider.

Extensible Markup Language A structured, hierarchical text format—based on SGML (Standard Generalized Markup Language)—for the flexible and organized exchange of data.

grant type
The intermediate credentials that represent a resource owner authorization. Grant types are exchanged by the client with the OAuth Authorization Server in order to obtain an access token.
HTTP cookie
Information sent from a server to a Web browser to identify a registered Web site user. Once the cookie is placed in the browser, it is sent back to the server to identify the user every time the user accesses the site. PingFederate’s integration adapters interface with the cookie.

HTTP header
The section of an HTTP request or response containing information about the client or the server. PingFederate can use HTTP headers to look up session information passed by the IdP’s Web application.

HTTP request parameter
A named parameter sent as part of a URL request from a browser to a Web server.

identity federation
A trust agreement between or among organizations, implemented using accepted standards, to provide user-authentication tokens and other user or system attributes securely across Internet domains, primarily to enable cross-domain SSO.

Identity Provider
The identity source or SAML authority that authenticates a subject and provides an SP with a security assertion vouching for that authentication.

IdP-initiated SSO or SLO
An identity federation transaction in which the initial action requiring a security context from an IdP occurs at the IdP’s site. For example, the user is logged on to the IdP and requests protected resources on an SP. The IdP sends authentication information to the SP.

inbound
A direction of message flow coming into a server relative to the server’s identity federation role (IdP or SP). For an IdP, inbound messages include SAML authentication requests. For an SP, inbound messages include SAML assertions.

Java Database Connectivity (JDBC)
A Java API that allows Java programs to interact with databases.

Kerberos ticket
The security token for the Kerberos protocol.

Key Distribution Center
The control center for authentication and authorization for Kerberos.

keypair
The private key and public key represented by a certificate. PingFederate uses the private key of its keypair(s) to generate signatures for assertions, requests, and responses, as applicable.

Lightweight Directory Access Protocol
A set of protocols used for accessing information directories. PingFederate uses the LDAP v3 protocol for user look-up and attribute processing.

metadata
The SAML 2.0 standards define a metadata exchange schema for conveying XML-formatted information between two SAML entities. Metadata includes endpoint URLs, binding types, attributes, and security-policy information.

OAuth Authorization Server
A server that issues access tokens to clients (sometimes on behalf of a resource owner) for use in authenticating a subsequent Representational State Transfer (REST) API call.

OAuth Client
An application that desires access to a resource protected by a Resource Server and interacts with an OAuth Authorization Server to obtain access tokens to do so.

Online Certificate Status Protocol (OCSP)
A standard developed by the Internet Engineering Task Force that enables Internet applications to obtain the current status of signing certificates, indicating whether a certificate has been revoked, via HTTP.

opaque
Not readable. If a user’s subject identifier is opaque, the an SSO partner cannot directly identify the user with reference to the source. An persistent identifier, or pseudonym, can be used for Account Linking.

outbound
A direction of message flow leaving a server. For an IdP, outbound messages include SAML assertions. For an SP, outbound messages include SAML authentication requests.

partner
See connection partner.

policy
A set of rules for handling security token requests in PingFederate.
**portal**
A Web-based application, accessed using a Web browser, that often aggregates content from multiple providers and/or serves as a central point of entry.

**POST**
An HTTP method of transmitting data contained in HTML forms, by which the data appears in the message body.

**Primary Domain Controller**
A role that is assigned to a particular server participating in a Windows network.

**principal**
A user, system, or process whose identity can be authenticated. See subject.

**profiles**
Rules that describe how to embed SAML assertions into and extract them out of other protocols in order to enable SSO or SLO. Profiles describe SAML request and response flows that fulfill specific use cases.

**protected resource**
Information, typically accessed via a Web URL, that is protected by an access management system. See target URL.

**protocol**
An agreed-upon format for transmitting data. XML format of SAML request or response messages.

**pseudonym**
A persistent name identifier assigned to a user and shared among entities, usually with the user's permission, to enable SSO and SLO. Pseudonyms are often used with the SAML account linking protocol to enable SSO while preventing the discovery of the user's identity or activities.

**Public Key Infrastructure (PKI)**
Enables users of an unsecured public network, such as the Internet, to securely and privately exchange data and money through the use of keypairs and certificates. The PKI provides for a digital certificate that can identify an individual or an organization and directory services that can store and, when necessary, revoke the certificates.

**redirect**
A SAML binding that conveys a request or response by sending the user's browser to another location. For instance, an authentication request can be sent from an SP through a browser to an IdP.

**refresh token**
A long-lived token used by the client to obtain a new access token without having to obtain fresh authorization from the resource owner.

**<RequestSecurityToken>**
(RST) WS-Trust or WS-Federation XML element identifying a request for validation of a security token, or for validation and then issuance of a replacement security token.

**<RequestSecurityTokenResponse>**
WS-Trust or WS-Federation XML element identifying a response to an RST and containing either the status of the submitted security token or both the status and (if requested and the received token is valid) a newly issued token for further SSO or Web-Services processing.

**Resource Server**
A server capable of accepting and responding to resource requests on which an access token is presented.

**SAML**
See Security Assertion Markup Language.

**SAML authority**
A security domain that issues SAML assertions.

**scope**
Permissions (for example, creating an event on a calendar) associated with an access token.

**Secure Sockets Layer (SSL)**
An encryption protocol that sends data between a client and server over a secure HTTP connection.

**Security Assertion Markup Language (SAML)**
A standard, XML-based, message-exchange framework enabling the secure transmittal of authentication tokens and other user attributes across Internet domains.

**security domain**
An application or group of applications that trust a common security token used for authentication, authorization, or session management. The token is issued to a user after the user has authenticated to the security domain.

**security token**
A collection of information used to establish acceptable identity for security purposes. Tokens can be in binary or XML format. A SAML assertion is one kind of security token.
Security Token Service
An entity responsible for responding to WS-Trust requests for validation and issuance of security tokens used for SSO authentication to Web Services.

service-oriented architecture
A loosely coupled application architecture in which all functions or services are accessible via standard protocols. Interfaces are platform and programming-language independent.

Service Provider
A system entity that provides access to a protected resource based on authentication information supplied by an IdP.

SP-initiated SSO or SLO
An identity-federation transaction in which the initial action requiring a security context from an IdP occurs at a SP's site.

session persistence
A mechanism for identifying a user or browser for subsequent requests to a server, needed because the HTTP protocol is stateless. This information is used to lookup state information for the user—for example, items in a shopping cart. PingFederate does not implement session persistence; it facilitates the communication of session information between systems that do.

Simple Object Access Protocol
(SOAP) Defines the use of XML and HTTP to access services, objects, and servers in a platform-independent manner.

Single Logout
The process of logging a user out of multiple “session participants” or sites where the user has started an SSO session.

Single Logout Return Service
The SAML implementation endpoint URL that returns logout requests.

Single Logout Service
The SAML implementation endpoint URL that receives logout requests for processing.

Single Sign-On
(SSO) The process of authenticating an identity (signing on) at one Web site (usually with a user ID and password) and then accessing resources secured by other domains without re-authenticating.

Single Sign-on Service
The SAML implementation endpoint URL that receives authentication requests for processing.

Source ID
A 20-byte sequence used to determine an IdP’s identity.

subject
A person, computer system, or application. In the SAML context, assertions make statements about subjects. See principal.

target URL
The SP’s protected resource; the end destination of an SSO event. See protected resource.

transient name identifier
A temporary ID used to preserve user anonymity while facilitating account linking.

token exchange
The process by which a security token is exchanged for another security token.

token translators
An aggregate term for both token processors (used by the IdP PingFederate Security Token Service (STS) to handle different types of incoming security tokens) and token generators (used by the SP PingFederate STS to issue various types of tokens).

Uniform Resource Identifier
Identifies an Internet resource with a string of characters conforming to a specified format.

Uniform Resource Locator
Identifies an Internet resource according to its Internet location.

virtual server ID
An optional unique identifier by which an identity federation deployment can be known to a specific connection partner.

Web Services Security
A standard mechanism for securing Web Service interactions, often by binding a security token to the Web Service request.

Web Services
Nonbrowser-based, loosely coupled applications that provide modular, programming-language-independent access to specific functions and data across the Internet, via XML and standard protocols.

Web Service Client
An entity that requests a Web Service interaction. In the context of an STS, the Web Service Client would request that a security token be issued for the interaction.
Glossary

Web Service Enhancement
Supplemental software for the .NET framework provided by Microsoft.

Web Service Provider
In the context of an STS, an entity that requests validation of the security token sent with a client’s request for service.

WS-SX
The OASIS committee working on WS-Trust.

WS-Trust
A standard protocol by which an application can request that an STS issue, validate, or exchange security tokens.
## List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS</td>
<td>Assertion Consumer Service</td>
</tr>
<tr>
<td>API</td>
<td>Application Programmer Interface</td>
</tr>
<tr>
<td>ARS</td>
<td>Artifact Resolution Service</td>
</tr>
<tr>
<td>CA</td>
<td>Certificate Authority</td>
</tr>
<tr>
<td>CRL</td>
<td>Certificate Revocation List</td>
</tr>
<tr>
<td>CSR</td>
<td>Certificate Signing Request</td>
</tr>
<tr>
<td>DBMS</td>
<td>Database Management System</td>
</tr>
<tr>
<td>DMZ</td>
<td>Demilitarized Zone</td>
</tr>
<tr>
<td>DN</td>
<td>Distinguished Name (certificate identifier)</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain Name System</td>
</tr>
<tr>
<td>EIM</td>
<td>Enterprise Identity Management</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>HTTP</td>
<td>HyperText Transfer Protocol</td>
</tr>
<tr>
<td>HTTPS</td>
<td>Secure HyperText Transfer Protocol</td>
</tr>
<tr>
<td>IdM</td>
<td>Identity Management</td>
</tr>
<tr>
<td>IdP</td>
<td>Identity Provider</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
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<tr>
<td>J2SDK</td>
<td>Java 2 Software Development Kit</td>
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<tr>
<td>JDBC</td>
<td>Java Database Connectivity (JDBC)</td>
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<tr>
<td>LDAP</td>
<td>Lightweight Directory Access Protocol</td>
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<tr>
<td>O</td>
<td>Organization</td>
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<tr>
<td>OASIS</td>
<td>Organization for the Advancement of Structured Information Standards</td>
</tr>
<tr>
<td>OCSP</td>
<td>Online Certificate Status Protocol</td>
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<tr>
<td>OU</td>
<td>Organizational Unit</td>
</tr>
<tr>
<td>PKI</td>
<td>Public Key Infrastructure</td>
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<tr>
<td>RDBMS</td>
<td>Relational Database Management System</td>
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<tr>
<td>RST</td>
<td>&lt;RequestSecurityToken&gt;</td>
</tr>
<tr>
<td>RSTR</td>
<td>&lt;RequestSecurityTokenResponse&gt;</td>
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<tr>
<td>SAML</td>
<td>Security Assertion Markup Language</td>
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<tr>
<td>SaaS</td>
<td>Software as a Service</td>
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<tr>
<td>SDK</td>
<td>Software Development Kit</td>
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<tr>
<td>SP</td>
<td>Service Provider</td>
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<tr>
<td>SLO</td>
<td>Single Logout</td>
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<tr>
<td>SOA</td>
<td>service-oriented architecture</td>
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<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
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<tr>
<td>SQL</td>
<td>Structured Query Language</td>
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<tr>
<td>SSL</td>
<td>Secure Sockets Layer</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>SSL/TLS</td>
<td>Secure Sockets Layer/Transport Level Security</td>
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<tr>
<td>SSO</td>
<td>Single Sign-On</td>
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<tr>
<td>SSTC</td>
<td>Security Services Technical Committee (of OASIS)</td>
</tr>
<tr>
<td>STS</td>
<td>Security Token Service</td>
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<tr>
<td>TCP</td>
<td>Transmission Control Protocol</td>
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<tr>
<td>URI</td>
<td>Uniform Resource Identifier</td>
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<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
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<tr>
<td>WCF</td>
<td>Windows Communication Foundation</td>
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<tr>
<td>WIF</td>
<td>Windows Identity Foundation</td>
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<tr>
<td>WSC</td>
<td>Web Service Client</td>
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<tr>
<td>WSP</td>
<td>Web Service Provider</td>
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<tr>
<td>WSS</td>
<td>Web Services Security</td>
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<tr>
<td>XASP</td>
<td>X.509 Attribute Sharing Profile</td>
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<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
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