CA Identity Manager

Java Connector Server Implementation Guide

r12.5 SP1

CA Product References

This document references the following CA products:

- CA Identity Manager

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Chapter 1: Java Connector Server

The Java Connector Server (Java CS) is a server component which handles hosting, routing to, and management of Java connectors. The Java CS provides a Java alternative to the C++ Connector Server (CCS). The Java CS is architecturally and functionally similar to the CCS, except that it is implemented in Java rather than C++. Consequently this allows you to write your connectors in Java. In addition, to the extent to which it is possible the Java CS is data-driven rather than code-driven, which allows the container (i.e. Java CS) to do much of the connector's work for it.

The Provisioning Server handles provisioning of users, and then delegates to connectors (using the Java CS or CCS) to manage endpoint accounts, groups, and so on.

Note: For the most current technical information, see the JavaDoc included with the JCS SDK install. It may be slightly more up to date then the JavaDoc integrated with this Guide.

This section contains the following topics:

Knowledge Requirements

This guide is intended for administrators who have the following technical background:

- An understanding of J2EE architecture and standards
- Experience with application servers and related tasks
- Familiarity with Provisioning Manager and CA Identity Manager

Endpoint Systems

An *endpoint* is a specific target system or application, such as Active Directory or Microsoft Exchange, that the Provisioning Server manages.

A *connector* is the software that enables communication between a Provisioning Server and an endpoint system. For each endpoint that you want to manage, you must have a connector. Connectors are responsible for representing each of the object classes in your endpoint in a consistent manner. Connectors translate add, modify, delete, rename, and search LDAP operations on those objects into corresponding actions against the endpoint system.

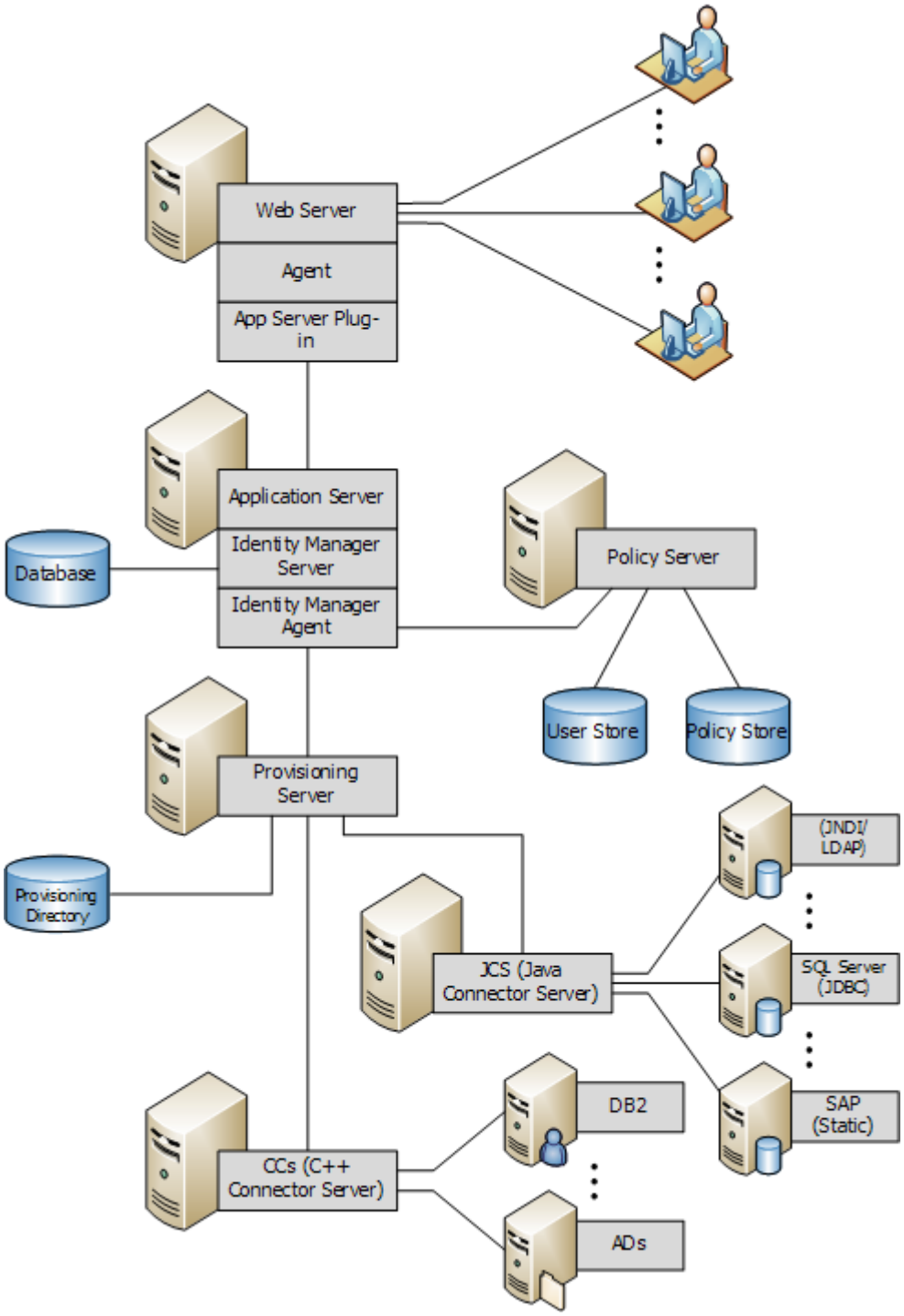
Users use Connector Xpress to generate and maintain XML metadata for JDBC and JNDI dynamic connectors. Developers can also maintain data for other connectors manually, or adjust metadata for released connectors (for instance adding site-specific mappings for custom attributes).

Connector Deployment

A connector's software is deployed to a Connector Server using an implementation bundle .jar file for a Java CS or as a dynamic-link library or shared library for a C++ Connector Server. The Connector Server then creates connector instances when requests are received to add new Provisioning Directories.

Java CS Architecture

This following illustration shows the Java CS in a typical installation.



Java CS Framework

The Java CS makes extensive use of third party open source Java software libraries. It is built on top of Apache Directory Service (ApacheDS) and relies on the Spring Framework for XML configuration support.

You can find documentation at the following web sites:

- http://directory.apache.org
- http://www.springframework.org

The Java CS framework supports:

- Run-time configurable data model and operation bindings using XML metadata
- Mapping of object and attribute names to / from LDAP to native equivalents
- Built-in connection resiliency
- Consistent data representation, validation, and conversion
- Extension and reuse of existing connector components
- (Optional) Reverse association handling, where associative relationships need only be expressed in one direction

What Java CS Does

The Java CS provides services to the connector implementations deployed to it while forcing standardized behavior in the same way that a J2EE application server provides for its hosted applications.

Java CS provides a framework and a standard set of service to ease connector development. Java CS:

- Uses XML files to simplify development and allow uniform configuration of all attributes.
- Enforces standardized representation of data types.
- Enables reuse among connector implementations, thus reducing the time, effort, and risk required to develop new connectors.

Connectors

A *connector* is the software that enables communication between a Provisioning Server and an endpoint system. The connector virtual directory maps LDAP operations such as add, modify, delete, search, and rename to equivalent APIs calls and protocols specific to endpoint systems.

Note: Traditionally, Provisioning Manager connector implementations (previously known as Options) are written in C++ and are deployed to the C++ Connector Server. These C++ connectors perform the same job as Java connectors, and the C++ Connector Server performs a similar role to the Java CS although it provides less assistance to the connector developer. For more information, see the *Programming Guide for Provisioning.*

Connector Interfaces

Connectors are responsible for translating incoming LDAP operations to the equivalent operations on endpoint systems. Each connector that the Java CS hosts must implement at least one (and possibly all, for example, like the JDBC connector) of the following processing styles defined by the Java CS framework:

- **Attribute Style Processor –** Maps LDAP attributes to endpoint attributes, usually through Java CS framework support driven by datamodel metadata.
- **Method Style Processor –** Maps LDAP operations to PRE/OP/POST methods invoked on the endpoint system (for example, stored procedure support in JDBC connector). The opbindings metadata drives this.
- **Scripting Style Processor –** Maps LDAP operations and attribute into scripted output which is then submitted to the endpoint system for processing. The opbindings metadata drives this.

Note: For more information about Style Processors, see the *Programming Guide for Java Connector Server.*

Connector Implementation

You implement Connectors using a combination of the following:

- Core connector code targeting an endpoint type technology.
- Validator and converter plug-in code which can be wired into your implementation using XML configuration.
- User maintained XML metadata, managed with Connector Xpress, drives configured plug-ins.

- Reusing existing connector implementations through inheritance, and only coding the minimal specializations required.
- Specializing existing connector behavior by using method-style or script-style opbindings, which are run before, instead of, or after targeted LDAP operations on specified target object classes.

Chapter 2: Installing Java CS

This section contains the following topics:

System Requirements

Java CS requires CA Identity Manager r12.5 SP1.

Note: You do not need to install the Java CS SDK (or Java CS SDK) on the same computer as the Provisioning Server or CA Identity Manager Server.

Java Connectors require that the following software products are installed for the Provisioning Server:

- Oracle Connector (required for Oracle Java Connector only)
- OS/400 Connector (required for OS/400 Java Connector only)
- MS SQL Connector (required for MS SQL Java Connector only)

  Note: This software is required for their Provisioning Server (parser tables) and Provisioning Manager (GUI) components.

Java CS SDK requires the following software products:

- Sun J2SE Development Kit 6.0 Update 10 or later
- Apache Ant 1.7.0

Important! We recommend that you disable all antivirus software before installing Java CS, Java CS SDK, and Connector Xpress. If anti-virus software is enabled while installation processes are taking place problems can occur. Remember to reenable your antivirus protection after you complete installation.

Required Privileges

Administrative or root privileges are required to run the Java CS installer.

Any user can run the Java CS SDK installer, or the Connector Xpress installer.

Solaris Considerations

We recommend that you consider carefully the ulimit -n setting for the user for which you install the Java CS. The default setting is too low to allow the Java CS to function properly under load.

When this problem occurs the Java virtual machine shuts down and the following message appears in the jcs_daily log:

exiting because of 120 exceptions in a row: Too many open files

A minimum ulimit -n setting of around 80 is required for the Java CS to start.

We recommend that you set the ulimit -n to at least 50 + 2 x ("configuration.maxThreads" in conf/override/server_jcs.xproperties[defaults=200]). For example, 450.

Time Zone Considerations

To achieve consistent results when setting and querying times (some stored in the Provisioning Server and some on endpoints referred to by the Java CS), we recommended that you install all components on computers configured to use the same time zone.

The Java CS is neutral regarding all time values passed in and out of it, and does not perform time zone transformations on them. The DYN Provisioning Manager Plug-in, which deals with dynamic endpoint types, accepts times in the local time zone and converts them to UTC. The plug-in passes them on to the Java CS, and does the opposite transformation from UTC to the local time zone for query results.

JCS Upgrade Considerations

We only support communication between an r12.5 SP1 Provisioning Server and an r12.5 SP1 Java CS.

- If you have a Java CS SDK from a previous release installed and you have made any source file changes or modifications that you want to keep, we recommend that you back up your SDK directory, as the upgrade process overrides any changes you have made.
- The SDK code for previous releases compiles against the latest SDK, however we have deprecated some methods and classes. We recommend that you use the alternatives presented in the JavaDoc. In comparison to the previous SDK APIs, there may have been some minor changes in areas not directly used by the SDK example. For example, primarily classes moving into new subpackages, impacting only Java import statements.

Note: For more information about classes put in the new subpackages in the SDK, see the *Programming Guide for Java CS* and the *JCS Javadoc*.

Override server_jcs.xml Settings

The installer overrides the server_jcs.xml file during upgrades. If you make any manual customizations, we recommend that you use the matching property settings in the jcs_home\conf\override\sample.server_jcs.properties file instead, as the installer does not overwrite this file.

You can find examples of the settings which you can manually set in the file jcs_home\conf\override\SAMPLE.server_jcs.properties.

You can also override most other settings by using property names matching the nested structure of the entries in server_jcs.xml, as shown in the SAMPLE.server_jcs.properties file.

To override server_jcs.xml file settings

1. Rename jcs-home/conf/override/SAMPLE.server_jcs.properties to server_jcs.properties.
2. In the new server_jcs.properties file, remove the leading # character from the property you want to override.

   For example, the property configuration.ldapsCertificatePassword overrides <property name=ldapsCertificatePassword><value>…<value></property> nested within <bean id=configuration in server_jcs.xml.
3. Update value of property (text after the '=' character) to the new value.
4. Restart the JCS.

Copy Customized server_jcs.xml Settings

Any customizations to the server_jcs.xml file you have made are overwritten during the upgrade. If you have changed any properties in the jcs-home/conf/server_jcs.xml file for an 8.1SP2 installation, copy the customized settings to the new server_jcs.properties file.

Note: For more information, see the properties in SAMPLE.server_jcs.properties for a list of properties you can change.

To copy customized server_jcs.properties settings

1. Make a copy of the existing 8.1SP2 jcs-home/conf/server_jcs.xml file.
2. Install the most recent Java CS.

   The installation overwrites the old customized server_jcs.xml file.
3. Copy any custom modifications from the copy of the original 8.1SP2 server_jcs.xml file to jcs-home/conf/override/server_jcs.properties.

Delete Connector.xml Files

If you are upgrading from 8.1SP2, delete any *jcs-home*/conf/override/*/connector.xml files you have not explicitly modified manually. The connector.xml files are now only included as unused templates named SAMPLE.connector.xml.

To delete connector.xml Files

1. Rename the files to connector.xml and leave them in their original directory.
2. Edit them as required to override the properties in the file.
3. Restart the Java CS service.

   Your edits take effect when the JCS service restarts.

Java CS Cannot be Installed on Network Drives

You cannot install the Java CS on a network drive because Windows does not allow the Java CS Windows Service to start. To run the Java CS Windows service, install the Java CS onto a local drive, for example, C:\.

Installation Components

The Java CS related installation components include:

- Java CS

  The Java CS can be expanded through the static samples package (ZIP or TAR). The package contains binary versions of some additional connectors, including all the SDK samples.

- Java CS SDK
- Connector Xpress

Connectors which are part of the standard Java CS installer include:

- JDBC for databases
- JNDI for LDAP directories
- AS400
- Kerberos
- Lotus Notes Domino
- Oracle (Native Users)
- PeopleSoft
- SAP

Additional connectors which are part of the Java CS static samples package include the following:

- SDKDYN–Demonstrates flat connector implementation managing properties files on the local filesystem.
- SDKFS–The SDKFS connector has the same code as the SDKDYN connector but demonstrates implementation of a hierarchical connector, rather than a flat connector. In particular, the filesystem directories, and the properties files they contain, can be managed.
- SDKCOMPOUND – Demonstrates the use of JSON-encoded compound values, which means complex data structures can be flattened out into single attribute values.
- SDKSCRIPT– Similar functionality to the SDKDYN connector, but implemented in JavaScript.
- SDKUPOSCRIPT – Scripted connector which performs a similar function to the C++ UPO connector, that is, sending email.

Note: Unless otherwise stated, SDK connectors use the DYN schema and DYN plug-in within Provisioning Manager so no additional configuration is required to the Provisioning Server to use SDK connectors.

Provisioning Server Registration

We recommend that you always register the Java CS with the Provisioning Server.

Registering tells the Provisioning Server to use the Java CS being installed to manage all the static connectors that have been deployed to it. If you want a different Java CS to manage a specific static or dynamic connector, you can use Connector Xpress to specify the Java CS you want to manage the connector.

It is also possible to use Connector Xpress create new namespaces in a Provisioning Server, where the connector has already been deployed to a Java CS. Either use bundled template files, or where they are not available, create a project by importing the connector's metadata. When the metadata is available, deploy a new namespace.

Note: For more information see the *Connector Xpress Guide*.

More information:

Install the Java CS (see page 20)

Install the Java CS

To manage the hosting, routing to, and management of Java connectors, install the Java CS.

To install the Java CS

1. Locate the CA Identity Manager installation download or other media.
2. Extract the product files (ZIP or TAR).
3. Navigate to the following subfolder and double-click the setup file.

   Provisioning\ConnectorServer

4. When prompted, complete the following fields on the Provisioning Server Details screen to register the installation with a Provisioning Server.

   Domain

   Defines the Provisioning Manager domain.

   Server Host

   Defines the Provisioning Server.

   Server Port

   Defines the port on which the Provisioning Server runs.

Username

Specifies the Provisioning Manager administrator.

Password

Defines the Provisioning Manager administrator password.

5. When prompted, complete the following fields on the Connector Server (Java) Configuration screen.

LDAP Port

Defines the port Java CS listens to.

Production Java CS port: 20410

Development Java CS port: 20412

LDAPS Port

Defines the secure port Java CS listens to.

Production Java CS secure port: 20411

Development Java CS secure port: 20413

Component Password

Defines the password used to authenticate to this Java CS.

Limits: The minimum password length for the Java CS password is six characters.

Click Next.

6. When prompted, select whether you want to activate FIPS 140-2 Compliance Mode.

Click Next.

The wizard installs the Java CS.

Install the Java CS SDK

To learn how to write JCS connectors by looking at worked examples which are companions to the Java CS Programming Guide, install the Java CS SDK.

To install the Java CS SDK

1. Locate the CA Identity Manager installation download or other media.
2. Extract the product files (ZIP or TAR).

3. Navigate to the following subfolder and double-click setup file.

   Provisioning/ConnectorServerSDK

4. Follow the onscreen instructions to complete the installation.

Note: You do not need to install the Java CS SDK on the same computer as the Java CS.

Note: For more information about the contents of the Java CS SDK image, see the following:

c:\program files\CA\Identity Manager\Connector Server SDK\Readme.txt

Install the Java CS Silently

The Java CS supports a silent mode of installation. To run a silent install you must create a response file.

To install the Java CS silently

1. In a command window, navigate to where you extracted the Java CS files, then to the following subfolder:

   Provisioning/ConnectorServer

2. Do either of the following depending on whether you want to install the component as you create the response file, or whether you want to create a response file template to use with a silent install at a later time.

   Note: Use fully qualified path names when generating and running response files. For example, responsefile.txt is not valid but C:\responsefile.txt is valid.

   - To create a response file and install the component at the same time, enter the following command and then run through the installation:

     setup -options-record *install_response_file*

   - To create a response file, but not install the component, enter the following command and then enter the required values in the template:

     setup –options-template *install_response_file*

3. Start the silent installation using the following command:

   setup –options *install_response_file* -silent

Uninstall the Java CS Silently

The Java CS supports a silent mode of uninstallation. To run a silent uninstall you must create a response file.

To uninstall the Java CS silently

1. In a command window, navigate to the uninstall directory which is one of the following:
   - Windows

     C:\Program Files\CA\Identity Manager\Connector Server_uninst
   - UNIX

     /opt/CA/IdentityManager/ConnectorServer/_uninst
2. Do one of the following depending on whether you want to uninstall the component as you create the response file, or whether you want to create a response file template to use with a silent uninstall at a later time.

   Note: Use fully qualified path names when generating and running response files. For example, responsefile.txt is not valid but C:\responsefile.txt is valid.
   - To create a response file and uninstall the component at the same time, enter the following command and then run through the uninstallation:

     uninstaller -options-record *uninstall_response_file*
   - To create a response file, but not install the component, enter the following command and then enter the required values in the template:

     uninstaller –options-template *uninstall_response_file*
3. Start the silent installation using the following command:

   uninstaller –options *uninstall_response_file* -silent

Connector Uninstall

We do not support uninstallation of any connectors (including the samples) for this release.

Manual Activation of JDBC Vendor Support

Manual activation of JDBC connection for several vendors is required, as it is not possible to bundle various third-party drivers and licenses, or both, with the Java CS, or because additional specific manual configuration is required.

More information:

How to Activate JDBC DB2 for Z/Os Vendor Support (see page 24)
How to Activate Microsoft SQL Native Authentication on Windows (see page 26)
How to Activate JDBC Sybase Vendor Support (see page 26)
How to Activate Informix Vendor Support (see page 24)
How to Activate MySQL Vendor Support (see page 25)

How to Activate JDBC DB2 for Z/Os Vendor Support

To activate JDBC connection to DB2 for Z/Os, you need do download a driver and license for DB2 Connect.

To activate JDBC DB2 for Z/Os vendor support, do the following:

1. Download the file db2_v9_db2driver_for_jdbc_sqlj.zip from the drivers section of:

   http://www-306.ibm.com/software/data/db2/java/

   Note: You need an IBM Registration to download the files.

2. Copy the files db2jcc.jar and db2jcc_license_cisuz.jar into the following locations:

   jcs_dir/extlib/

   conxp_dir/lib/

3. Shutdown and restart the Java CS service.
4. Shutdown and restart all Connector Xpress sessions.

How to Activate Informix Vendor Support

A JDBC connection to Informix requires a license for Informix. To activate Informix vendor support, do the following:

1. Register with IBM.
2. Search for the ifxjdbc.jar file using the following URL:

   http://www14.software.ibm.com/webapp/download/search.jsp?go=y&rs=ifxjdbc

3. Download the JDBC.3.00.JC3.tar archive.
4. Extract the file ifxjdbc.jar from the archive.
5. Copy the file into the following two locations:

   jcs_dir/extlib/

   conxp_dir/lib/

6. Shutdown and restart the Java CS service.
7. Shutdown and restart all Connector Xpress sessions.

How to Activate Ingres Vendor Support

A JDBC connection to Ingres requires a license for Ingres. To activate Ingres vendor support, do the following:

1. Register with Ingres.
2. Search for the iijdbc-9.2-v3.4.8.zip file using the following URL:

   http://esd.ingres.com/product/Community_Projects/Drivers/java/JDBC/iijdbc-9.2-v3.4.8.zip
3. Download the iijdbc-9.2-v3.4.8.zip archive.
4. Extract the file iijdbc.jar from the archive.
5. Copy the file into the following two locations:

   jcs_dir/extlib/

   conxp_dir/lib/
6. Shutdown and restart the Java CS service.
7. Shutdown and restart all Connector Xpress sessions.

How to Activate MySQL Vendor Support

A JDBC connection to MySQL requires you to download the MySQL driver from the MySQL web site and install the driver in the appropriate Connector Xpress and Java CS libraries directories. To activate MySQL vendor support, do the following:

1. Download the mysql-connector_java-5.0.8.tar.gz archive from the following location:

   http://dev.mysql.com/downloads/connector/j/5.0.html
2. Extract the jar filemysql-connector-java-5.0.8-bin.jar and copy it to the following locations:

   jcs_dir/extlib/

   conxp_dir/lib/
3. Shutdown and restart the Java CS service.
4. Shutdown and restart all Connector Xpress sessions.

How to Activate Microsoft SQL Native Authentication on Windows

Microsoft SQL Native Authentication on Windows can only be activated when both Connector Xpress and the Java CS are running on Windows operating systems. The required library sqljdbc_auth.dll is bundled with the Java CS.

The user must run Connector Xpress on the same domain as the Microsoft SQL server, and the Microsoft SQL server must be configured to allow that user to access the appropriate database instances.

To activate Microsoft SQL Native Authentication on Windows, do the following:

1. Update the Java CS service to run as the required Windows user and restart the service.
2. By default the Java CS service is set to run as the local SYSTEM user, however if you are using trusted authentication you must run the service as a domain user. Do the following:
   a. Click Start, Control Panel, Administrative Tools, Services.

      The Services window appears.

   b. Right-click CA Identity Manager-Java Connector Server, then click Properties.

      The Properties dialog appears.

   c. Select the This account check box, and then complete the details of the domain user under which you want to run the service.
3. Shutdown and restart the Java CS service.
4. When you set up Microsoft SQL datasource in Connector Xpress, select the Native check box on the Edit Sources dialog.

   Connector Xpress adds the following to the JDBC URL used for the connection:

   integratedSecurity=true

   Note: For more information about configuring data sources, see the *Connector Xpress Guide*.

How to Activate JDBC Sybase Vendor Support

A JDBC connection to Sybase requires a license for Sybase. To activate JDBC Sybase vendor support, do the following:

1. Download the 6.0.5 driver .zip file from http://www.sybase.com, or from your Sybase product media.

2. Extract the following file:

   jConnect-6_0\classes\jconn3.jar

   from the following archive:

   jConnect-6_05.zip

3. Copy the file into the following two locations:

   jcs_dir/extlib/

   conxp_dir/lib/

4. Shutdown and restart the Java CS service.
5. Shutdown and restart all Connector Xpress sessions.

64 Bit Java Virtual Machine Support

The Java CS installer does not provide explicit support for 64-bit Java virtual machines. Therefore, compatibility mode is used to run a 32-bit Java virtual machine on a 64-bit computer. As a result, connectors that require third-party binary libraries require 32-bit versions.

Connectors Requiring Third-party Libraries

Some connectors, for example, SAP and PeopleSoft, use third-party libraries which CA is not authorized to bundle with the Java CS installation.

If you do not install the required third-party libraries, the following errors can occur:

- The connector does not function
- An error message similar to the following can appear in the jcs_daily.log file when you try when to acquire a connector:

  SAP: failed to resolve connectorTypeClass=' com.ca.jcs.sap.SAPMetaConnectorType' due to missing connector .jar or non-bundled dependency of it (i.e. dependency requires manual customer installation)"

Some connectors, for example, SAP, require binary libraries (accessed through the Java JNDI API) in addition to java libraries. In such cases, use the 32-bit versions of these libraries.

Note: For more information about third-party library requirements for such connectors, see the installation requirements for each connector in the CA Identity Manager Connectors Guide.

Install Connector Xpress

You do not need to install Connector Xpress on the same computer as the Java CS or any other server component, including the Provisioning Server.

Important! We recommend that you disable all antivirus software before installing Java CS, Java CS SDK, and Connector Xpress.

To install Connector Xpress

1. Locate the CA Identity Manager installation download or other media.
2. Extract the product files (ZIP or TAR).
3. Navigate to the following subfolder and double-click the setup file.
   Provisioning\ConnectorXpress
4. Follow the onscreen instructions to complete the installation.

Default Installation Directories

The Java CS and Java CS SDK installation programs create directories for the Java CS executables and associated files. The default Windows and Solaris directories are listed in the following table. Your actual installation directories depend on your operating system and selections during the installation process.

The following notation is used throughout this guide to refer to various CA product installation directories:

Path Notation	Default Directory (Windows)	Default Directory (Solaris)
jcs-sdk-home	C:\Program Files\CA\Identity Manager\Connector Server	/opt/CA/IdentityManager/Connector Server
jcs-home **Note:** Under production JCS, this has the same structure as JCS home	*jcs-sdk-home*\build\dist	*jcs-sdk-home*\build\dist
sample-home	C:\Program Files\CA\Identity Manager\Connector Server SDK\connectors\sdk	/opt/CA/IdentityManager/ConnectorServer SDK/connectors/sdk

Path Notation	Default Directory (Windows)	Default Directory (Solaris)
im-home	C:\Program Files\CA\Identity Manager	/opt/CA/IdentityManager
imps-home	C:\Program Files\CA\Identity Manager\Provisioning Server	/opt/CA/IdentityManager/ProvisioningServer
conxp-home	C:\Program Files\CA\Identity Manager\Connector Xpress	/opt/CA/IdentityManager/ConnectorXpress

Configure Provisioning Server for Testing

To perform testing during custom connector development, point your Provisioning Server at a JCS SDK installation.

Use the following settings:

- Production Java CS port: 20410
- Development Java CS port: 20412
- Production Java CS secure port: 20411
- Development Java CS secure port: 20413

The provisioning server is configured for testing.

Start the Java CS

You can start the Java CS using one of the following methods.

- Windows Service (see page 29)
- Unix Daemon (see page 30)
- Windows command line (see page 31)

Windows Service

You can start, stop, and configure the Java CS from the Windows Services application.

The Java CS installation process creates a Windows service to run the Java CS. This service is named CA Identity Manager -Connector Server.

Start the Java CS Service from the Windows Command Line

To start the Java CS service from the Command Prompt window, use the following command:

```
net start im_jcs
```

Stop the Java CS Service from the Command Prompt Window

To stop the Java CS service from the Command Prompt window, enter the following command:

```
net stop im_jcs
```

Start the Java CS Using the UNIX Daemon

The Java CS installation process creates a startup script named *-jcs* and links it to the rc.d system on the local system. The script responds to standard start, stop, restart and status requests, and automatically runs the Java CS in run levels 2-5, or shuts it down on 0,1, and 6 corresponding to system halt, single user mode, and reboot.

/etc/init.d/im_jcs start

Starts the Java CS daemon

/etc/init.D/im_jcs restart

Restarts the Java CS daemon

/etc/init.d/im_jcs stop

Stops the Java CS daemon

/etc/init.d/im_jcs status

Displays the status of the Java CS daemon

Run the Java CS from the Command Line

You can run Java CS interactively using the service launcher to diagnose problems.

cd *jcs-home*\bin

JCS.exe //TS//im_jcs

You can also use Apache procrun arguments to start, stop, disable, remove, or configure the service.

For a comprehensive list of command-line arguments, see the Procrun section in the Jakarta Commons section:

http://jakarta.apache.org

Chapter 3: Deploying Connectors

This section contains the following topics:

How you Deploy a Connector

The following describes two ways to deploy a connector:

- Use the Connector Xpress and connector metadata to map the generic DYN schema to an endpoint system. The metadata for the connector information is sent to a running Java CS through the Provisioning Server.

  Note: A Java CS restart is not required for the connector to become active.

- Deploy a custom Java connector to the Java CS by copying the connectors jcs-connector-*.jar file and any additional .jar files it depends on to the *jcs-home*/lib/ directory, and then restart the Java CS. Use the Provisioning Manager to acquire endpoints managed by this connector.

  Note: See the *Programming Guide for Java Connector Server* for more information.

When the Java CS is used with the Provisioning Server, the latter acts as the persistent store for connector metadata, therefore the Java CS is stateless.

Connector Deployment

You can use Connector Xpress to configure metadata settings and to deploy the connector. Connector Xpress lets you save metadata settings to a project file and then deploy a connector from that file. Saving metadata to a project file is useful in cases where the same settings apply on multiple Provisioning Servers. For example, when you move connectors from a test environment to a production environment after testing is complete.

Connector Undeployment

You can use Connector Xpress to undeploy connectors. Undeploying a connector deletes the connector from the Provisioning Servers persistent storage and from the Java CS. You can also delete connectors (or instances of their parent endpoint types) using the Provisioning Manager user interface. In both cases, you do not need to restart the Java CS, and Connector Xpress does not delete data on the endpoint.

Chapter 4: Configuring Java CS

This section contains the following topics:

Server Configuration File

The server_jcs.xml file contains configuration attributes for both the Java CS and the Apache DS directory which acts as its host. The server_jcs.xml file also includes settings that affect connector behavior.

The server_jcs.xml file uses Spring Framework XML support, which allows Java classes adhering to JavaBean standards (for example, property getters and setters) to be created and initialized using XML tags.

The default file path is:

jcs_home\conf\server_jcs.xml

Note: The installer overrides the server_jcs.xml file during upgrades. If you make any manual customizations, we recommend that you use the matching property settings in the *jcs_home*\conf\override\server_jcs.properties file, as the installer does not overwrite this file.

You can find examples of the settings which you can manually set in the file *jcs_home*\conf\override\SAMPLE.server_jcs.properties. You can also override most other settings by using property names matching the nested structure of the entries in server_jcs.xml, as shown in the SAMPLE.server_jcs.properties file.

server_jcs.xml file—Configure Attributes

The server_jcs.xml file contains the following configuration settings:

java.naming.security.authentication

Specifies the authentication methods. Only simple is currently supported.

java.naming.security.principal

Specifies the authentication principal. This is hardwired to uid=admin,ou=system by ApacheDS, but an optional java.naming.security.principal.alias= can be specified to ease integration. When this alias is received for authentication, it is treated exactly as uid=admin,ou=system.

java.naming.security.credentials

Specifies the authentication credentials for the configured principal. The authentication credentials can be stored in the file as plain text or as a SHA one-way hash.

We recommend that you store them as a SHA one-way hash, rather than as plain text.

We recommend that you do not change this password except through the installer, as the value specified in this file must match the value inside ApacheDS persistent store.

maxThreads

Specifies the maximum number of requests that can be processed concurrently for all activated connectors hosted by a Java CS. It defaults to 200 to match the Provisioning Servers configuration. When increasing it be sure to consider also increasing other configuration settings like heap-space for the Java Virtual Machine or "ulimit –n" setting for open files on Solaris.

Note: The manual settings in the server_jcs.properties file can potentially override this setting.

Note: For more information, see Solaris Considerations.

ldapPort

Specifies the port which the Java CS listens on for insecure connections. Set the port to one of the recommended ports unless multiple C++ Connector Servers or Java CSs run on the same computer. Where a secure port is configured, use the secure port instead.

The insecure port can be useful for debugging purposes. By default, the Java CS installer mandates the use of the ldapsPort exclusively. Set the port to one of the following port numbers:

- Production Java CS: 20410
- Development Java CS: 20412

ldapsPort

Specifies the port which the Java CS listens on for secure connections. The ldapsPort, with associated properties enableLdaps, ldapsCertificateFileldapsCertificateFile, and ldapsCertificatePassword, must be a different port from the one chosen for ldapPort. Traffic on this port is secured using the configured certificate and the Transport Layer Security (TLS) protocol. The ldapsPort can also be useful for debugging by setting the logging level in the Java CS log4j.properties file to trace LDAP requests as they are delivered to the Java CS.

Set the port to one of the following port numbers:

- Production Java CS secure port: 20411
- Development Java CS secure port: 20413

The ldapsCertificateFile is configured to reference a Java keystore containing the standard IM Provisioning Server certificate. The Java CS installer sets the default ldapsCertificatePassword.

bootstrapSchemas

Specifies which LDAP schemas the Java CS knows. This property incorporates schemas which have been converted to Java objects by the ApacheDS build process. Additional OpenLDAP formatted .schema files (see http://www.openldap.org/doc/admin23/schema.html) can be loaded by placing them in the Java CS conf/ directory (like eta_dyn_openldap.schema) or ideally contributed from the conf/ directory within a specific connector's JCS-connector-*.jar file (refer to SDK connector's conf/etaeta_sdk_openldap.schema _nds_openldap.schema registered through its conf/connector.xml descriptor in the jcs-connector-sdk.jar sample connector).

partitionLoaderService

Configures the service that detects LDAP traffic and determines when it is Java CS related. This service handles lazy activation of connectors as they are mentioned in LDAP ADD requests.

interceptorConfigurations

Specifies any other standard ApacheDS interceptor services. Interceptor services not required by the Java CS have been deactivated.

connectorPersister

Specifies the Persister for connector and connector levels of the DIT. The Persister is not required when the Java CS is accessed through the Provisioning Manager, but can be of interest in other deployment situations.

cryptoService

Users can configure the crypto service users who want to activate encryption convertors on specific fields according to their metadata properties, most importantly the isEncrypted boolean metadata setting.

server_jcs.xml — Initial TLS Settings

The server_jcs.xml file has the following initial TLS settings:

Note: Manual settings in the server_jcs.properties file can potentially override all these settings.

ldapsCertificateFile

Specifies the Java CS LDAPS certificate store. Specifies a path to the file which contains all the certificates used to verify the identity of the Java CS server during inbound LDAPS (TLS) connections. At least one certificate with an accompanying private key issued to represent Java CS is placed in this store.

ldapsCertificatePassword

Specifies the password protecting the Java CS certificate store specified in ldapsCertificateFile.

Note: The password can either be cleartext or obfuscated. For example:

{ALGORITHM}ciphertext where ALGORITHM would be typically set to 'CACRYPT' . For example, {AES}LQpBXeIjOMGSsGLU

connectorClientCertStore

Specifies the Java CS wide client certificate store. Specifies a path to the file which contains trusted certificates used to verify the identity of the endpoint server during SSL handshakes. Used for outbound TLS connections made by the connectors themselves, to the endpoint systems they manage. Import any issuer certificates for the endpoints to which TLS connections into this store.

connectorClientCertStoreType

connectorClientCertStoreType

Specifies the certificate store type (JKS or PKCS12).

connectorClientCertStorePassword

Specifies the password protecting the connector client store. The same rules apply as for the ldapsCertificatePassword.

connectorSSLVerifyPeer

If false, specifies that during SSL handshakes, the peer certificate sent by the endpoint to which a connection is made, is not verified for trust. That is, the connectorClientCertStore value is ignored and not required for outbound SSL connections in this configuration. If true, the endpoint host certificate presented to Java CS undergoes trust checks against connectorClientCertStore contents.

Default: False

connectorSSLTrace

Set to true if verbose SSL handshake information is output to log.

Validators and Converters

The server_jcs.xml file contains these configuration attributes for validators and converters:

- The global set of validators that is available for reuse in all contained connectors (see the validatorManager JavaBean for input reference.)
- The global set of converters that is available for reuse in all contained connectors (see the converterManager JavaBean for input reference)

Note: Any Java CS wide changes made to these attributes in the server_jcs.xml file are lost when upgrading, so achieve the same effect through the same attributes in individual connectors' connector.xml files instead.

Note: For more information about validators and converters, see the *Programming Guide for Java Connector Server.*

Connector Configuration File

The server_jcs.xml file contains configuration items that cover the whole Java CS, whereas each connector has a conf/connector.xml file which covers a single connector. Some sections like validator and converter configuration exist in both files, in which the connector.xml can add to, or override, values in server_jcs.xml.

Each connector's jar file has a connector.xml file in it. To allow easier customization of its values after deployment, a matching file under *jcs_home*/conf/override/*connector*/connector.xml can be used to override settings.Template files with the name SAMPLE.connector.xml are provided in each directory. To customize, rename the templates to connector.xml, edited as required, and then restart the JCS.

For an example of a connector.xml template file see, *jcs_home*/conf/override/jdbc/SAMPLE.connector.xml.

The following sections describe the important sections in the conf/connector.xml file.

Connector Pool Configuration

Most connectors use a connection pool configured in connector.xml, for example, through:

- poolConfig for JNDI and most connectors()

  Note: For more information, see the Class GenericObjectPool on http://jakarta.apache.org

- dataSourceConfigProps for JDBC

  Note: For more information, see http://jakarta.apache.org for a complete list and documentation of available configuration parameters.

Change Pool Related Settings

To maximize scalability for a connector by configuring it to match expected usage patterns, you can change pool related settings.

To change pool related settings

1. Copy *jcs-home*/conf/override/jdbc/SAMPLE.connector.xml to connector.xml.
2. Edit the connector.xml file.
3. Restart the Java CS.

Retry Configuration

You can configure the Exception Map setting to contain groups of exception messages that require special handling (and optionally associated retry delay and retry count settings).

In particular, the JDBC connector defines entries for exceptions signifying these conditions which drive retrying when connections to the endpoint experience problems:

- **Stale**—The connection to the endpoint has become stale and is reestablished immediately.
- **Retriable**—The connection to the endpoint has encountered what can be a transient soft failure, in which case a retry loop is started with the configured count and delay. If the count is exhausted before connectivity is restored, then the current request is considered to have suffered a hard failure which is reported to the Java CS client.

- **Busy**—The endpoint has reported it is too busy to complete a request in which case a retry loop is started with a separate retry delay and count settings. For example, the MSSQL and Ingres databases both report deadlock exceptions when they are unable to complete processing of a transaction within a certain time interval. The delay and recount settings are typically much longer than the Retriable case.

In addition to these triggering exceptions, each ExceptionRetryGroup has associated resilientDelay and resilientMaxRetries settings which specify how many retry attempts are required when a matching exception is encountered, and the delay between each attempt.

Edit JVM Memory Options on Windows

To edit the JVM memory options JvmMs, JvmMx, JvmSs and Classpath use the service update command or edit the following registry key on Windows:

HKEY_LOCAL_MACHINE\SOFTWARE\ComputerAssociates\Identity Manager\Procrun 2.0\JCS\Parameters\Java

Note: You can use Apache procrun arguments to update the service parameters. For more information, see Procrun service application at http://jakarta.apache.org

Edit JVM Memory Options on UNIX

To edit JVM options on UNIX, (for example, a basic 64-bit solaris configuration with low memory) create a file named jvm_options.conf in the data folder with the following Java arguments:

-Xms128M -Xmx192M -d64

-Xms

Specifies the minimum heap memory allowed for the Java CS

Example: -Xms128M, specifies the minimum heap memory allowed for the Java CS is 128 MB.

-Xmx

Specifies the maximum heap memory allowed for the Java CS.

Example: -Xmx192M, specifies the maximum heap memory allowed for the Java CS is 192 MB.

-d64

Specifies that the JVM is run in a 64 bit environment.

Note: For more information, see the documentation for the Java command tool at http://java.sun.com

JXplorer to Java CS Connection Parameters

If you have a standard installation, you can use the following parameters to connect to Java CS from an LDAP browser such as JXplorer.

Note: For more information on Jxplorer, see http://www.jxplorer.org.

Host

Specifies the host server name of the Java CS

Protocol

LDAP v3

Port

2041, when using level: SSL + User + Password (TLS)

20410, when using the less safe level: User + Password

User DN

uid=admin,ou=system

Password

As configured during installation.

These settings are configured in server_jcs.xml. Changing the User DN is problematic because of assumptions within ApacheDS. Consequently, the property *java.naming.security.principal.alias* has been added to simulate use of a different user DN (this is an alias to "uid=admin,ou=system").

Note: For more information on JXplorer see, http://www.jxplorer.org/

Change the Java CS Administration Stored Password

To ensure better security across a deployment you can change the Java CS administration users stored password.

To change the Java CS administration users stored password

1. Start Java CS.
2. Bind to Java CS using the following details:

   Host

   Specifies the host computer name of the Java CS

   Protocol

   LDAP v3

   Port

   2041, when using level: SSL + User + Password (TLS)

   20410, when using the less safe level: User + Password

   User DN

   uid=admin,ou=system

   Password

   As configured during installation.

3. Change the password for "uid=admin,ou=system" to a new value.

   This change takes effect immediately.

   Note: The Java CS remembers all passwords for the administrator user because the last restart and all passwords are accepted as valid for bind requests. This allows phased upgrade of passwords for a Java CS where multiple Provisioning Servers connect to the Java CS, but do not update their stored passwords for the Java CS at the same time.

Set the TLS Store Certificate Password

When LDAP clients request TLS secured connections to the Java CS, you can configure the password used on the Java keystore. We recommend that you configure the password to overwrite the temporary cached password for this keystore when freshly installed.

Note: If you want to install your own certificate instead of the default Provisioning Manager certificate configured by the installer, you can also manage the keystore using the keytool utility included in the Java Runtime Environment

To set the TLS Certificate store password

1. Shut down the Java CS.
2. On Windows, open a Command Prompt window, then enter the following command:

   cd *$jcs_home*/_uninst/_jvm/bin

   Windows changes the directory to the JVM's bin folder.
3. Enter the following command:

   cd *jcs_home*/bin
4. Do *one* of the following
   a. Run the following command:

      ldaps_password *new-password*../conf/override/server jcs.properties

      The encrypted ldapsCertificatePassword value in server_jcs.properties is updated.

   b. Run the following command:

      ldaps_password *new-password* ../conf/override/server_jcs.properties connectorManager.connectorClientCertStorePassword

      The encrypted connectorClientCertStorePassword value in server_jcs.properties is updated.
5. Restart the Java CS.

   Note: The password for the keystore is the password that you set during the Java CS installation.

How JCS uses the Keystore File

By default the Java CS uses the same keystore file for each of these three purposes:

1. To secure inbound TLS connections between an LDAP client (for example, Connector Xpress, Provisioning Server) and the Java CS. This involves adding public certificates used by the Java CS to any client-specific keystore (or allowing the clients to connect without verifying trust status of JCS certificate).

   The default JDK certs (from file <JDK>\jre\lib\security\cacerts) can be imported into the keystore of the third-party client to authenticate with JCS.

   Note: Currently the client SSL authentication is not available in ApacheDS. As a result, mutual inbound SSL authentication is not possible.

2. As the value of the javax.net.ssl.trustStore property for the Java Virtual Machine in which the Java CS runs. This is because some connector implementations (for example, AS400) implicitly use this keystore and cannot be configured to do otherwise.

3. To secure outbound SSL / TLS connections between the Java CS and endpoint systems. This involves adding certificates for endpoint systems to this keystore, so that they see the Java CS as trusted..

   Note: If you want to use a separate keystore to secure outbound SSL / TLS connections between the Java CS and endpoint systems, the relevant Java CS configuration properties are connectorClientCertStore*, as opposed to the ldapsCertificate* properties that configure the keystore used for the other purposes.

Adjust Java CS Service Start Parameters

To adjust any Java CS service start (including related JVM parameters), go to the following location in the Windows registry:

HKEY_LOCAL_MACHINE\ComputerAssociates\Identity Manager\Procrun 2.0\JCS\Parameters

Connection Pooling

Connection pooling is configured through the connector.xml file for an individual connector (for example, *jcs-home*/conf/override/jdbc/connector.xml, copied from SAMPLE.connector.xml in the same directory) file, rather than in the server_jcs.xml global configuration file.

Determine Java CS Version Number

To determine the version number of your Java CS installation, run the following at the command line:

cd *jcs_home*/lib

java -jar jcs.jar

The Java CS version number is printed. For example:

CA Identity Manager - Java Connector Server

Version 12.5..nnnnn

Where Connector Xpress Stores User Preferences

Connector Xpress stores user preferences through the Java Preferences API. On Windows, this stores data in the following registry key:

HKEY_CURRENT_USER\Software\JavaSoft\Prefs

On Unix, this stores data in the user's home directory under the .java/.userPrefs folder.

Note: The uninstaller does not remove this data, so subsequent installs preserve user preferences.

Chapter 5: Java CS Logging

This section contains the following topics:

Logging Configuration

Log files are critical aids in troubleshooting problems with the Java CS and hosted connectors. We recommend that you start with jcs_daily* files and work downwards to connector-specific log files as required.

How Logging is Managed

Both the Java CS and ApacheDS code bases use the NLOG4J library to manage logging, which is configured through the following file:

jcs-home\conf\log4j.properties

You should rarely (if ever) need to change the log levels of any ApacheDS classes. These classes perform fundamental functions such as parsing and formatting LDAP messages.

Note: This file contains a number of potentially interesting settings commented out, with a description of the circumstances under which they can be useful.

You can also use a file named log4j_verbose.properties in the same directory. When you raise an issue, copy log4j_verbose.properties to log4j.properties, restart the Java CS, cause the issue to occur, shutdown the Java CS, then zip up the entire the jcs-home/logs/ directory.

Connector Specific Logging

You can configure the logging level for connector-specific logs using the following attributes:

- eTLog=1 (active)
- eTLogDestination='F' (file)
- eTLogFileSeverity

Turn on Connector Instance Logging

You can specify that each destination receives only messages of a certain severity level or levels, such as error, warning, or fatal messages.

To turn on connector instance logging

1. In Provisioning Manager, click the Endpoint Types button.
2. Select the Endpoint Type from the Object Type list.
3. Click Search.

   The Endpoints under the Endpoint Types are displayed.
4. Right click the Directory from the DirectoryNameCommon column, then click Properties.

   The Global Properties sheet appears.
5. Click the Logging tab.

   The Logging tab appears.
6. Select the Enabled check box.

   Logging is enabled for the Provisioning Manager.

   Note: If you do not select this check box, the Provisioning Manager does not keep any log of its actions, except for any information that is available in the message window.
7. Enable logging for Provisioning Manager, and select to log all message types.

Logging Severities

The severities are mapped as follows:

IMPS Severity	IMPS Severity Code	Log4J Level
Information	'I'	DEBUG
Non-Admin Success	'S'	INFO
Warning	'W'	WARN
Error	'E'	ERROR
Fatal	'F'	FATAL

Note: Clients other than the Provisioning Manager can configure an attribute used to set the logging level in server_jcs.xml through the logLevelAttr attribute of the configured MetaConnectorFactory, in which case the Log4J Levels listed in the table above are the possible values.

Setting the Java CS Logging Level

To set the Java CS systemwide logging level, set the line of the form log4j.logger.com.ca=DEBUG, then restart the Java CS, or use the log4j_verbose.properties file instead. This setting controls the logging level for the Java CS framework.

Note: The file log4j.properties has properties that determine whether log files are appended daily, and the format of the lines output.

Note: For information about the settings in the file, see the comments in the file.

The endpoint-type/jcs_conn_connector-name.log file generated for each active connector instance contains most of the logging data related to its corresponding connector. However, also look for relevant logging in the jcs_daily.log* systemwide log file. Some examples of messages that are logged to the systemwide file include:

- Connectors that use third-party libraries
- Connectors developed without sufficient attention to logging
- Problems that occur while creating or activating a connector

Files in the Log Directory

The following table lists the log files which are written to the log directory *jcs-home*\logs

Log File Name	Description
jcs_daily.log	Today's ApacheDS and Java CS logging
jcs_daily.log.*YYYYMMDD*	ApacheDS and Java CS logging for date
endpoint-type/jcs_conn_*connector-name*.log	Specific logging output for named connector
endpoint-type/jcs_conn_*connector-name*.log.*YYYYMMDD*	Specific logging output for named connector for date

Provisioning Manager Logging

The following log files have relevant modification times that show what is happening on the Provisioning Manager or Provisioning Server side:

- *imps-home*\Logs\etatrans*.log
- *imps-home*\Logs\satrans*.log

Note: To view, compress or archive any log files for the current day, make a copy of the log file, as the Provisioning Manager continues to write to the log files. Save the log file copies using the original file name, but in a different directory.

These logs are also relevant to Java CS problems and to problems deploying new connectors from Connector Xpress.

Provisioning services-related installer log messages are written to:

%temp%\imps_*_install.log

where %temp% is the temp directory of the current user.

Provisioning Manager logs appear in files matching "*imps-home*\Logs\etayyyymmdd.log

Turn on Provisioning Server Logging

You can specify that the Provisioning Server logs only messages of a certain severity level or levels, such as error, warning, or fatal messages.

To turn on Provisioning Server logging

1. In the Provisioning Manager, click System, Global Properties.

   The Global Properties dialog appears.

2. Click the Logging tab.

   The Logging tab appears.

3. Select the Enabled check box.

   Logging is enabled for the Provisioning Server.

   Note: If you do not select this check box, the Provisioning Manager does not keep any log of its actions, except for any information that is available in the message window.

4. Enable logging for the Provisioning Manager, and select to log all message types.

Turn on Provisioning Manager Logging

You can specify that the Provisioning Manager logs only messages of a certain severity level or levels, such as error, warning, or fatal messages.

To turn on Provisioning Manager logging

1. In Provisioning Manager, click File, Preferences.

   The Preferences dialog appears.

2. Click the Logging tab.

   The Logging tab appears.

3. Enable logging for Provisioning Manager and select to log all message types.

   Provisioning Manager logging is enabled.

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