CA Process Automation

Installation Guide

Release 04.1.00

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CA Process Automation

Documentation Changes

The following documentation updates have been made since the last release of this documentation:

- The following topics were updated or added to support the CA EEM authentication of CA Process Automation users using the NTLM protocol.
  - Prerequisites for Configuring NTLM Authentication (see page 39)—This topic from the CA EEM *Getting Started Guide* was added to this document.
  - Download and Install CA EEM (see page 37)—This topic was updated to mention the Enable NTLM Pass-Through Authentication check box in the notes.
  - Install the Domain Orchestrator (see page 70) —This topic was updated to include the new Enable NTLM Pass-Through Authentication check box.

    Note: The label, Operate in FIPS Mode, was also updated for the specification to use FIPS-approved algorithms.
  - Create a Response File (see page 85)—This topic was updated to provide the example enableNTLM=true, to enable NTLM authentication.
  - Enable NTLM Pass-Through Authentication After Installation (see page 91)—This new topic was added to describe how to enable NTLM pass-through authentication when it was not enabled during installation.

Contents

Chapter 1: About this Guide

Click the link for the procedure you want to perform:

Initial Installation

Architecture and CA Process Automation Components (see page 11).

Platform Support and Hardware Requirements (see page 19).

Installing the Domain Orchestrator (see page 23).

Notes: After installing the Domain Orchestrator:

- See the first section in Online Help, "Task Flows by Role" for an overview of CA Process Automation.
- See the *Content Administrator Guide* for details on configuring CA Process Automation and setting up users in CA EEM.

Upgrade

Upgrading to the Current Release (see page 97).

Additions

Installing an Agent (see page 113).

Adding a Node to the Domain Orchestrator (see page 125).

Installing an Additional Orchestrator (see page 133).

Adding a Node to an Additional Orchestrator (see page 141).

Problems?

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Other

Using CA SiteMinder with CA Process Automation (see page 147)

Using Self-Contained Mode CA Process Automation (see page 167)

Chapter 2: Architecture and CA Process Automation Components

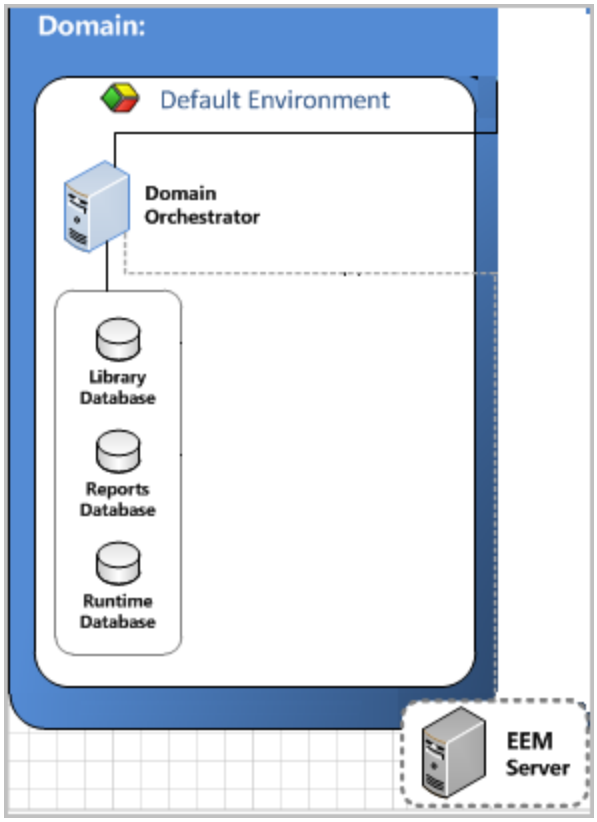
This section contains the following topics:

A Simple Architecture

The basic architecture is sufficient for many applications. A minimal CA Process Automation installation consists of:

- A single Domain Orchestrator
- Three databases (Library database, Reports database, and Runtime database) installed on the database server you specify.

  Note: CA Process Automation supports Oracle, Microsoft SQL Server and MySQL database servers.
- Access to a single CA Embedded Entitlement Management (CA EEM) server for user authentication and authorization to CA Process Automation.



Your first installation installs the CA Process Automation Domain with the Domain Orchestrator in the Default Environment. One Library database (Repository database) and one Reporting database are installed with the Domain Orchestrator; these databases can be shared with additional Orchestrators. The Domain Orchestrator includes a Runtime database. Each Orchestrator has its own Runtime database.

More information:

A Complex Architecture (see page 14)

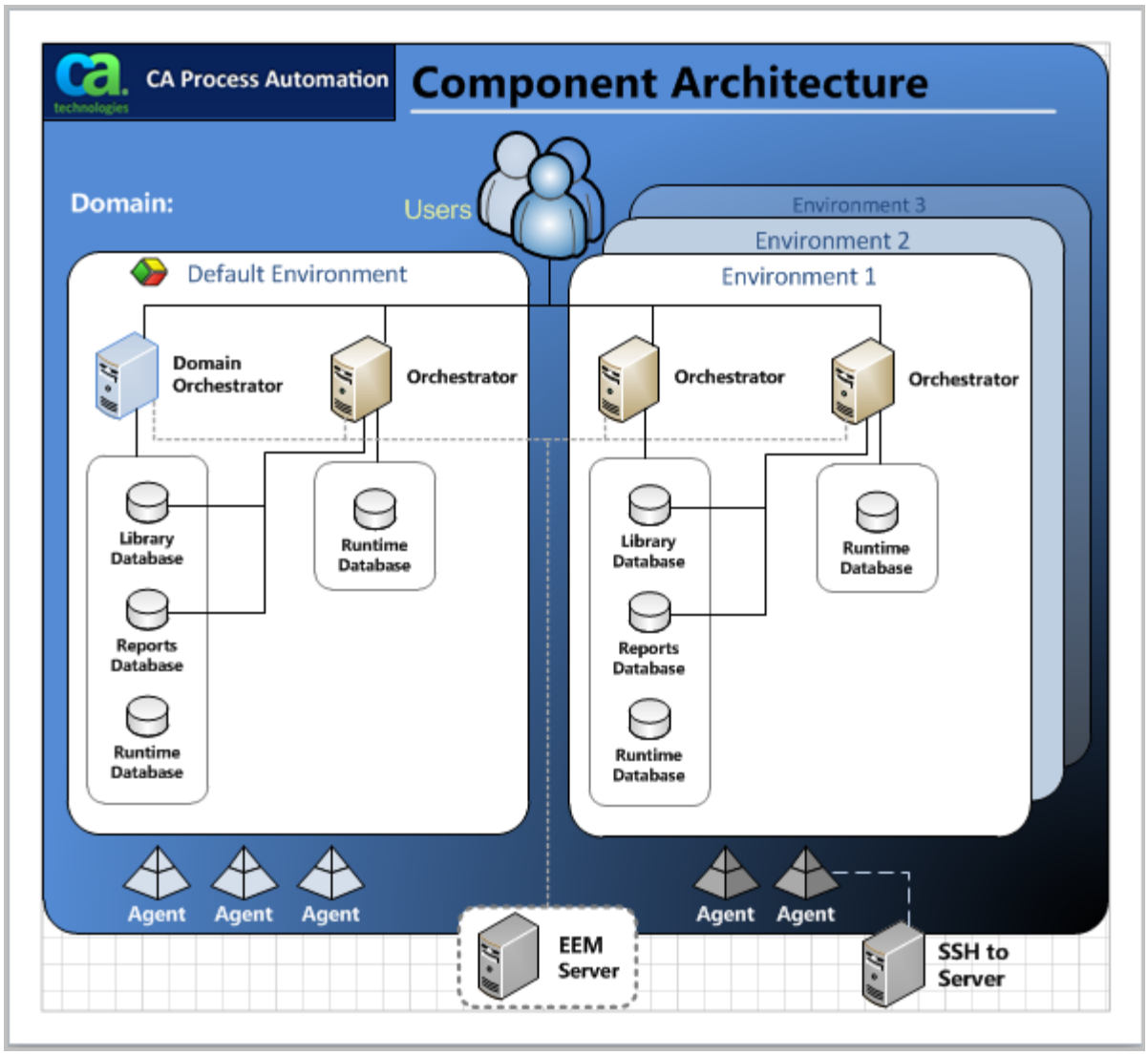
More Information:

A Simple Architecture (see page 12)

A Complex Architecture

You can deploy CA Process Automation to meet high processing volume, high availability, and organizational requirements. The following illustration shows a CA Process Automation installation with the following components:

- A CA EEM server for the Domain.
- Multiple database servers, one per environment.
- The initial installation results, that is, the Default Environment with the Domain Orchestrator, a Library database, a Reports database, and a Runtime database.
- An Orchestrator that has been installed and added to the Default Environment, where this Orchestrator has its own Runtime database but shares the Library database and Reports database that were installed with the Domain Orchestrator. Optionally, you can set up an additional Orchestrator with its own Library database and Reports database.
- Additional Environments with Orchestrators.
- Agents, installed components on which operators can run.
- A remote host to which an agent has an SSH connection.
- Users with user accounts in CA EEM. When users log in, CA EEM authenticates that user and presents a browser-based UI appropriate for the associated role.


CA Process Automation
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Runtime Database
Library Database
Runtime Database
Reports Database
Runtime Database
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EEM Server
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Planning the Locations of Supporting Components

Part of planning a CA Process Automation system is determining what new components you can colocate on the same server with the CA Process Automation Domain Orchestrator and which ones to install on separate servers. Let us consider these components of a CA Process Automation network.

- JDK - must be colocated
- CA Embedded Entitlements Manager (CA EEM) - can be colocated, but not recommended
- Database servers for the CA Process Automation databases - can be colocated, but not recommended
- Load balancer (if planning to cluster) - cannot be colocated
- Other Orchestrators - cannot be colocated
- Cluster Nodes - cannot be colocated
- NTP server - external to network
- CA SiteMinder (optional)

Each cluster node and each Orchestrator is typically installed on a separate server. The NTP server can be external to the network.

For a lightly loaded CA Process Automation, you could install the following entities on the same server on which you installed the Domain Orchestrator:

- CA EEM.
- Database server for the Library, Reports, and Runtime databases.

Consider the following factors when determining whether to colocate entities or use multiple servers:

- Characteristics of the server.

  Major factors include the quantity and speed of CPUs, memory, disk storage and networks.

- Volume of processes.

  Consider not only the total number of processes, but also their max sustained rates during periods of peak activity.

- Process implementation.

  Not all processes are equal. Some processes have few operators, others have hundreds. Some processes contain many CPU intensive activities, while others spend most of their time waiting for events or user interactions. This variability makes it difficult to specify loading in terms of process volume/rate. Even at the finer granularity of operators, throughput varies.

- Required level of responsiveness.

  Real-time responsiveness is never attainable with the current implementation. However, even less stringent requirements factor into when more hardware for additional Orchestrators come into play. With a stringent SLA, the system needs more spare capacity so that the peak periods still perform well. Without an SLA, the system needs only sufficient capacity to cover the average load.

- Intensity of usage for shared components.

  Consider what else the CA EEM and the RDBMS are used for.

In anticipation of future growth, we recommend against colocating CA EEM and the database server with the Domain Orchestrator. The only sure way to determine when you have enough resources is by actual full load testing.

Prepare for Failover to a Standby CA EEM

Consider setting up two CA EEM instances in a High Availability configuration. If CA EEM is configured in this way, the primary CA EEM acts as the active security authorization server for CA Process Automation. The secondary CA EEM is the standby security authorization server. The secondary CA EEM mirrors the primary CA EEM. The two CA EEM instances can point to the same external directory.

CA Process Automation automatically and transparently fails over from the primary CA EEM to the secondary CA EEM if the primary CA EEM fails after CA Process Automation makes the initial connection. Failover occurs even if the primary server is initially down when you configure both CA EEM servers in CA Process Automation.

See the CA EEM documentation for the CA EEM version that is deployed at your site for information about how to set up CA EEM in a High Availability configuration. Additional information is available on the CA Process Automation Implementation Best Practices page (accessible through a Quick Link on the CA Process Automation Home tab).

Chapter 3: Platform Support and Hardware Requirements

This section contains the following topics:

Platform Support and Requirements for CA Process Automation Components

The following table summarizes the platforms that CA Process Automation components support.

Note: The listed operating system and software support can change over time. For the latest information about version support, see “Compatibilities” on support.ca.com.

CA Process Automation Component	Supported Operating Systems	Required Software	Other Requirements
Orchestrator	Microsoft Windows Server 2003, 2003 R2, 2008 (32-bit or 64-bit), 2008 R2 Solaris SPARC 10, 11 Red Hat Enterprise Linux 5x, 6.0, 6.1, 6.2 CentOS 6.2 SUSE Linux Enterprise Server 10, 11 SP1 HP-UX 11iv2, 11iv3 AIX 5.3, 6.1, 7.1	One of the following Java Development Kits (JDK) supported by your operating system. ■ For Windows, Solaris SPARC, and Linux: Oracle Java 1.6.23, 1.6.26, 1.6.27, 1.6.30, 1.6.34 (except 1.6.0_29), and 1.7 Development Kit (JDK) ■ For HP-UX, minimum requirement level for JDK is 1.6_04. ■ For AIX, IBM Java 1.6 Development Kit (JDK). **Note:** When the hardware and operating system support both 32-bit and 64-bit versions of the JDK, select the 64-bit version.	■ CA EEM 8.4 SP4 or CA EEM r12.0 ■ One of the following Database servers: Microsoft SQL Server 2005, SQL Server 2008 (32-bit or 64-bit), or SQL Server 2012

CA Process Automation Component	Supported Operating Systems	Required Software	Other Requirements
Agent	Microsoft Windows Server 2003, 2003 R2,2008, 2008 R2 Solaris SPARC 10, 11 Solaris x86 10 Red Hat Enterprise Linux 5x, 6.0, 6.1, 6.2 CentOS 6.2 SUSE 10, 11 SP1 HP-UX 11iv2, 11iv3 AIX 5.3,6.1, 7.1 Red Hat Enterprise Linux 6.2 for IBM System z Series SUSE Linux Enterprise Server (SLES) 11 SP1 for IBM System z Series	One of the following Java Runtime Environment (JRE) releases supported by the operating system. ■ For Windows, Solaris SPARC, and Linux: Oracle Java 1.6 and 1.7. ■ For AIX, IBM JRE 1.6 ■ For HP-UX, minimum level is 1.6_04. HP Java 1.6 (JRE). Do not use Java 6 Runtime Environment updates 27 (1.6.0_27) through 29 (1.6.0_29). An issue with those versions affects applications including CA Process Automation that use JDBC to connect to Microsoft SQL Server. The SDN bug database lists this issue as bug 7105007. **Note:** When the hardware and operating system support both 32-bit and 64-bit versions of the JDK, select the 64-bit version.	For proxy touchpoints and host groups, each remote host must run an SSHv2 server. A UNIX remote host must have ksh.
Database Server	See the vendor documentation for supported operating systems.	One of the following relational databases: ■ MySQL r5.5 ■ Microsoft SQL Server 2005, 2008, 2008 R2, 2012 ■ Oracle 10g or 11g R2	Enable XA support. See Database Server Prerequisites (see page 25) for detailed requirements.
Directory Server	See CA Embedded Entitlements Manager (CA EEM) documentation.	CA Embedded Entitlements Manager (CA EEM) 8.4 SP4 or CA EEM r12	N/A
Browser-based UI	N/A	One of the following browsers: ■ Microsoft Internet Explorer 9x ■ Google Chrome Release 17, 18 ■ Mozilla Firefox 4.*x* through 15.0 **Note:** If you use a Firefox or Chrome browser, disable the inline spell check feature to avoid unnecessary processing.	Enable JavaScript. Adobe Flash Player

Hardware Requirements

The following table provides the minimum hardware requirements for each CA Process Automation component:

CA Process Automation Component	Required Hardware
Orchestrator	■ Server class hardware running multiple CPUs or multiple core CPUs ■ 4-GB RAM ■ Minimum 40-GB free disk space required ■ Minimum 100-Mbps network connection (1000 Mbps recommended)
Agent	■ Host capable of running a supported OS ■ 2-GB RAM ■ 4-GB disk space
Database server	See vendor specifications. Additional storage as required for the databases being hosted. **Note:** We recommended a minimum of 40 GB for your databases.
CA EEM	See CA Embedded Entitlement Manager documentation.
Browser-based user interface	Any host capable of running a supported browser.

Note: The configurations could be for physical and virtual machines.

Chapter 4: Installing the Domain Orchestrator

The Domain Orchestrator is what is installed when you install CA Process Automation for the first time. Before you install the Domain Orchestrator, you must complete the prerequisites. You can install the Domain Orchestrator interactively with a wizard. Or, you can create a response file with values for parameters that have no defaults and then run the script to install the Domain Orchestrator silently. After installation, configure ports and firewalls. Then you configure CA Process Automation as described in the *Content Administrator Guide*.

This section contains the following topics:

Prerequisites to Install the Domain Orchestrator

Before you begin, plan the initial installation. You can start small and incrementally expand your CA Process Automation instance over time. Consider implementing the following products or capabilities for your first installation to prepare for later expansion:

- (Optional) A load balancer. Specifying the Domain Orchestrator as node1 in a load balancer prepares this Orchestrator for clustering. (Adding cluster nodes can be done when the need arises.)
- (Optional) Single Sign On (SSO) capability through CA SiteMinder.
- (Optional) NTLM Pass-Through Authentication

You can plan your initial CA Process Automation installation.

Follow these steps:

1. Identify a host for the Domain Orchestrator that meets requirements.

   See the Orchestrator component in the following two topics:

   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).

2. Verify that the host for the Domain Orchestrator has a supported JDK, and if missing, download it.

   See JDK Prerequisites (see page 35).

3. Plan whether to locate supporting components on the host with the Domain Orchestrator.

   See Planning the Locations of Supporting Components (see page 16).

4. Identify the database server to host the Library, Reporting, and Runtime databases for the Domain Orchestrator.

   See the Database Server component in the following two topics:

   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).

5. Prepare the database server.

   See Database Server Prerequisites (see page 25).

6. Identify the host for CA EEM, if a CA EEM is not already in use with another CA Technologies product.

   See the Directory Server component in the following two topics:

   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).

7. Evaluate configuration options for CA EEM.

   See CA EEM Prerequisites (see page 36), including Prerequisites for Configuring NTLM Authentication (see page 39).

8. If CA EEM and an Apache load balancer are configured with CA SiteMinder, then prepare to configure CA Process Automation to use the SSO capability.

   See Using CA SiteMinder with CA Process Automation (see page 147).

9. Evaluate the need for a load balancer for the Domain Orchestrator. CA Process Automation supports two methods of balancing clustered Orchestrators.

   See Apache Load Balancer Prerequisites (see page 40).

   See F5 Load Balancer Prerequisites (see page 58).

Database Server Prerequisites

CA Process Automation requires that you have one of the following third-party database servers in which CA Process Automation can store and persist its data:

- MySQL Server r5.5
- Microsoft SQL Server 2005, 2008, 2008 R2, 2012
- Oracle Database 10g or 11g Release 2

If you do not have a server for CA Process Automation, download one with its prerequisites. We recommend that the database server and CA Process Automation reside on separate hosts.

Follow the guidelines for the database server you are using for the Orchestrator you are installing.

- Prepare MySQL Server for CA Process Automation (see page 26).
- Prepare Microsoft SQL Server for CA Process Automation (see page 27).
- Prepare Oracle Database Server for CA Process Automation.

About CA Process Automation Databases

Each Orchestrator requires three logical databases in its associated database server:

- The Repository database, or *Library database*, is a database that stores the automation objects created in folders in the Library tab in CA Process Automation. The stored data includes the library tree structure, the complete definition of each object, as well as ownership, and versioning information.

  Note: Multiple Orchestrators can share the Repository database on the Domain Orchestrator or each Orchestrator can have its own.

- The *Runtime database* is an Orchestrator-specific database that stores process instance data for a single Orchestrator. Data includes information on currently running process instances, instances that have been run but have not yet been moved to the archive table, and archived instances. You can access current and archived data from the Operations tab. Each runtime record includes the state, dataset, and owner for the object instance, as well as scheduling information.

  Note: Each Orchestrator requires a separate Runtime database.

- The *Reporting database* stores historical data for automation object instances, including processes, resources, schedules, process watches. Administrators can generate near real-time reports with this data using the predefined report definitions and custom report definitions in the Reports tab.

  Note: The Reporting database is typically shared among all Orchestrators.

These logical databases can share a physical database but the best practice is to have separate databases. CA Process Automation requires databases to be case insensitive.

We recommended a minimum of 40 GB for your databases. Specific operations such as upgrading CA Process Automation make unusually large demands. Having ample space and periodically monitoring space consumption is a good practice.

Depending on your CA Process Automation archiving policy, your runtime databases grow as processes run and are archived. You can set an archive purging policy to delete older records automatically, or you can perform this maintenance task outside of CA Process Automation.

Note: See Configure Orchestrator Policies in the *Content Administrator Guide*.

Prepare MySQL Server for CA Process Automation

During installation of the Domain Orchestrator or an additional Orchestrator, the installer creates CA Process Automation databases in the specified MySQL server. The installer requires the following prerequisites:

- A MySQL JDBC driver that supports XA.

  During installation, browse to the MySQL JDBC driver. This driver is not included in the CA Process Automation installation media. MySQL database servers support XA distributed transactions by default.
- User credentials with Administrative privileges to create the Library, Reporting, and Runtime databases.
- Two MySQL variables that are customized for CA Process Automation.

Before you install an Orchestrator that uses the MySQL database server, prepare the MySQL server for CA Process Automation.

Follow these steps:

1. Download the JDBC driver from the MySQL website. For example, get the MySQL Connector/J 5.0.8.

   Note: The MySQL Connector/J 5.0.x, a JDBC driver, supports XA directly.
2. Save the driver to a location that you can browse to during installation.

3. Open the MySQL Workbench and select the Options File under Configuration.
4. Set the variable for the time a transaction waits for a lock before being rolled back:
   a. Select the InnoDB tab.
   b. Scroll to the Various group.
   c. Select innodb_lock_wait_timeout.
   d. Change the value from the default, 50, to a value greater than 60.

      ```
      innodb_lock_wait_timeout = 90
      ```
5. Set the maximum packet length to 33554432 Bytes (32 MB) to send to the server and receive from the server. The default is 1048576.
   a. Select the Networking tab.
   b. Locate the Data / Memory size group.
   c. Select max_allowed_packet.
   d. Enter the required value.
6. Click Apply.

   A confirmation of the changes to apply to the MySQL Configuration File appears.

Prepare Microsoft SQL Server for CA Process Automation

Before installing the CA Process Automation Domain Orchestrator or an additional Orchestrator, where the CA Process Automation databases reside on SQL Server, do the following tasks:

- Verify that the SQL Server meets CA Process Automation requirements (see page 28).
- Understand how the JDBC 3.0 driver is referenced (see page 29).
- Enable XA support for the SQL Server (see page 29).

Verify that the SQL Server Meets CA Process Automation Requirements

The SQL Server you prepare for CA Process Automation databases must meet the following requirements:

- SQL Server must be installed or configured with mixed mode authentication. You specify an account with SQL Server authentication during the Orchestrator installation.
- The Orchestrator installer requires user credentials with Administrator privileges to create the CA Process Automation databases.
- SQL Server collation for CA Process Automation databases must be SQL_Latin1_General_CP1_CI_AS. By default, the CA Process Automation installer creates databases with this collation.

Examine the configuration file for your SQL Server to verify that your SQL Server meets CA Process Automation requirements.

Follow these steps:

1. Navigate to the ConfigurationFile.ini file, which is created in a path similar to the following:

   ```
   C:\ Program Files\Microsoft SQL Server\100\Setup Bootstrap\Log\ yyyymmdd_hhmmss
   ```

2. Verify that the security mode setting resembles the following:

   ```
   ; The default is Windows Authentication. Use "SQL" for Mixed Mode Authentication.

   SECURITYMODE="SQL"
   ```

3. Verify that the setting for the SQL system administrator account credentials resembles the following:

   ```
   ; Windows account(s) to provision as SQL Server system administrators.
   SQLSYSADMINACCOUNTS=".\Administrator"
   ```

4. Verify that the setting for collation resembles the following:

   ```
   ; Specifies a Windows collation or an SQL collation to use for the Database Engine.
   SQLCOLLATION="SQL_Latin1_General_CP1_CI_AS"
   ```

Understand How the JDBC 3.0 Driver Is Referenced

During installation of the Orchestrator, the installer requires the JDBC 3.0 driver for SQL Server, which is included in DVD1. The path is:

```
.../DVD1/drivers/sqljdbc.jar
```

Note: The path and the JAR file name have not been changed because the JDBC 2.0 driver was used. Use the JAR file included in the installation media; it contains the JDBC 3.0 driver for SQL Server.

Enable XA Support for the SQL Server Before Initial Installation

The JBoss release that the CA Process Automation server runs on requires support for Extended Distributed Transactions (XA) at the database level before initial installation. Microsoft SQL Server must be configured to support and enable XA transactions.

Brief definitions of XA-specific terms used in this topic:

XA - The term XA stands for eXtended Architecture.

XA transactions - XA transactions are global transactions that span multiple transaction resources. A non-XA transaction involves one resource, such as one database.

Microsoft JDBC Driver 3.0/4.0 for SQL Server - The two JDBC drivers that support XA on SQL Server.

xa_install.sql - The script that installs the extended stored procedures that implement distributed transaction and XA support for the Microsoft SQL Server JDBC Driver 3.0.

SQLJDBC_XA.dll - The file that must be copied from the JDBC installation directory to the Binn folder of every SQL Server that participates in distributed transactions. Copy this file before running the xa_install.sql script.

SqlJDBCXAUser - A SQL Server role. To grant permissions to *pamuser* to participate in distributed transactions with the JDBC driver, add the user to the SqlJDBCXAUser role.

By default, XA distributed transaction support is not enabled for Microsoft SQL Server. You can enable the XA support that CA Process Automation requires.

Follow these steps:

1. Navigate to the paths for your operating system:

   `DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\x64`

   `DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\x86`

   This directory contains the sqljdbc_xa.dll file.

2. Copy the sqljdbc_xa.dll file to the Binn directory of the SQL Server installation. For example:

   `mssql_install_dir``\MSSQL10.MSSQLSERVER\MSSQL\Binn`

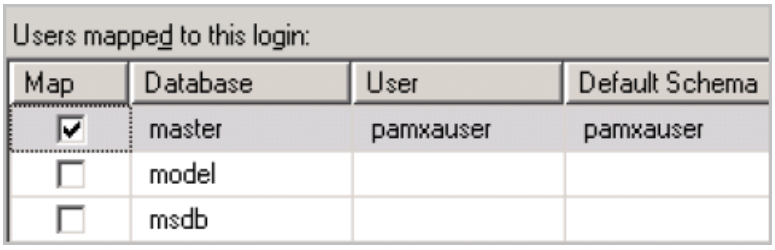
   `mssql_install_dir``\MSSQL.1\MSSQL\Binn`

3. Restart the SQL Server.

4. Create a non-'sa' account for CA Process Automation to use to access its internal databases.

   a. Log in to the master database in SQL Management Studio.

   b. Create a user (for example, *pamxauser*) and assign **master** as the default database. Click OK

   c. Select the *pamxauser*

   d. In the User Mappings, verify that the **public** database role is assigned to the master database. Click OK.

   e. In the Server Roles, verify that **public** is selected and select **dbcreator**. Click OK.

   f. Select File, Save All.

   g. Select File, Exit

5. Enable XA transactions for Distributed Transaction Coordinator.

   For Windows 2008

   a. From the Start menu, select Administrative Tools, Component Services.

   b. Expand Component Services, Computers, My Computer, and Distributed Transaction Coordinator.

   c. Right-click Local DTC and select Properties.

   d. Select the Security tab and select Enable XA Transactions.

   For Windows 2003

   e. Navigate to Administrative Tools, Component Services.

   f. Right-click My Computer and select Properties.

   g. Click the MSDTC tab.

   h. Click the Security Configuration button under Transaction Configuration.

   i. In the Security Configuration window, select Enable XA Transactions.

   j. Click Apply, click OK. Close Component Services.

6. Open Microsoft SQL Server Management Studio as the 'sa' user.

   a. Select File, Open, File and then browse to the xa_install.sql script.

   ```
   DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\xa_install.sql
   ```

   b. Click Execute to run the script and load the DLL.

   Note: Ignore the permissions message similar to the following message:

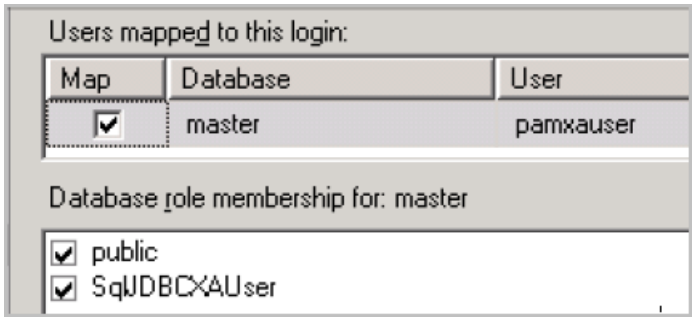
   > Msg 3701, Level 16, State 15, Procedure sp_dropextendedproc, Line 18
   > Cannot drop the procedure 'xp_sqljdbc_xa_init', because it does not exist or you do not have permission.

7. Run the following SQL commands to grant master database access to pamxauser and to add the SqlJDBCXAUser role to the master database.

   ```
   use master
   go
   exec sp_grantdbaccess 'pamxauser','pamxauser'
   go
   exec sp_addrolemember [SqlJDBCXAUser],'pamxauser'
   ```

   Note: An error message indicates that the user exists. Ignore this message.

8. Verify that the SqlJDBCXAUser role is selected for the *pamxauser* user for the master database, then exit Management Studio.



9. Restart your SQL Server.

   Coordinate with other users of the Database Server.

Prepare Oracle Database Server for CA Process Automation

Before you install the Domain Orchestrator or an additional Orchestrator, which uses Oracle to host its internal databases, preparation is required.

Follow these steps:

1. Create a user with connect and resource permissions.
2. Verify that Oracle has sufficient tablespace to host the following databases:
   - Library database
   - Runtime database
   - Reporting database

3. Create the Library, Reporting, and Runtime databases manually.
4. Configure the following settings:
   - Set maximum connections to 100 (or at least 150 for clustered).

     All connections are made through Orchestrators, but a few pooled connections are required for optimal behavior.
   - Set Online Transaction Processing (OLTP) to facilitate transactions.
5. Understand how the Oracle JDBC driver is referenced.

   During installation of the Orchestrator, the installer requires the Oracle JDBC driver for Oracle, which is included in DVD1. The path is:

   ```
   .../DVD1/drivers/ojdbc14.jar
   ```

Notes:

- Partitioning is *not* supported.
- No action is needed to enable XA distributed transactions, since Oracle supports it by default.

More information:

Oracle Bug # 9347941 (see page 158)

Database Owner Privileges

When you start CA Process Automation for the first time or you apply a patch, the application adjusts the database or schema structure.

The minimum database privileges that CA Process Automation requires are as follows:

- The right to access metadata (to determine the structure)
- The right to CAD (create/alter/drop) DDL rights for tables, indexes, constraints, and sequence in the database.
- The right to create/delete tables and indexes
- The right to alter tables
- Read or Write rights on all its tables

The CA Process Automation application has the following privileges of a database owner:

- Select all tables of CA Process Automation
- Update all tables of CA Process Automation
- Create sequences
- Create tables
- Drop tables
- Create indexes
- Drop indexes
- Alter tables

JDK Prerequisites

Before you install any Orchestrator, verify that the Java Development Kit (JDK) prerequisites are met. Ensure that you use the default Java version of the system with CA Process Automation using the following command:

```
Java –version
```

If the JDK you need is not present, download it.

Note: Use an appropriate version of JDK for your operating system. Except for AIX, or HP, use Java SDK that Oracle offers. For AIX, use Java SDK that IBM offers, and for HP, use Java SDK that HP offers. Ensure that you set the Java home path correctly. For more information, see Setting the Default Java Home Path (see page 36).

Follow these steps:

1. Log in to each host where you plan to install the Domain Orchestrator.
2. Verify that an appropriate version of a Java Development Kit exists.
   - For AIX, IBM Java 1.6 is required.
   - For all other platforms, Oracle JDK 1.6 is required.

   Note: For other details, see Platform Support and Requirements for CA Process Automation Components. If default Java version is different, change the default Java version on the shell where you will start the CA Process Automation installer. For more information, see Setting the Default Java Home Path (see page 36).
3. If the required JDK version is not installed, obtain it from the vendor. Free downloads are available from IBM (AIX JDK), and Oracle (other platforms).
4. Run the installation wizard to install the JDK. Select all the defaults, for example, Development Tools, Source Code, and Public JRE.

Setting the Default Java Home Path

If the default version is different, change the default Java version on the shell where you will start the CA Process Automation installation.

Follow these steps:

1. Browse to DVD1 folder
2. Set default java on the command prompt or shell.

   Windows

   ```
   set JAVA_HOME=<home_directory_of_jdk (not_bin)>
   set PATH=%JAVA_HOME%\bin;%PATH%
   ```

   UNIX or Linux

   ```
   export JAVA_HOME=<home_directory_of_jdk (not_bin)>
   export PATH=$JAVA_HOME/bin:$PATH
   ```

3. Start the installer from this command prompt or shell.

   Windows

   ```
   .\ Third_Party_Installer_windows_xx.exe
   ```

   UNIX or Linux

   ```
   ./ Third_Party_Installer_unix.sh
   ```

   The installer starts installing CA Process Automation.

CA EEM Prerequisites

CA Process Automation uses CA Embedded Entitlements Manager (CA EEM) for user authentication and authorization. CA EEM is a required prerequisite.

If you are using CA EEM with another CA Technologies product, check to see if it is a version supported by CA Process Automation.

- If you do not have CA EEM or if your CA EEM is an earlier version than the versions that CA Process Automation supports, then download and install CA EEM (see page 37).
- If your CA EEM is a version that CA Process Automation supports, gather information for the Domain Orchestrator installation (see page 38).
- To create two CA EEM instances at installation (one to use and the other as a standby for failover), see Prepare for Failover to a Standby CA EEM (see page 17). This procedure is optional and can be performed at a later time.
- If you are upgrading and you previously used AD or LDAP as your directory server, you can configure CA EEM to use AD as an external user store. With this approach, your existing user accounts are loaded into CA EEM during upgrade. Alternatively, you can use CA EEM directly, create user accounts, and assign each user one of the four default roles.

Download and Install CA EEM

If you are not using CA EEM with other CA Technologies products, you can download CA EEM and install it. If you are using a CA EEM version that CA Process Automation does not support, upgrade CA EEM.

Guidelines follow:

1. Log in to CA Support.
2. Download the CA Embedded Entitlements Manager (CA EEM) software. Select a release supported by the current release of CA Process Automation. See the Directory Server entry in Platform Support and Requirements for CA Process Automation Components (see page 20).
3. Download the CA EEM documentation.
4. Run the CA EEM installer.

Notes:

- When you configure CA EEM for CA Process Automation, you select whether to use the default user store or in an external user store such as Microsoft Active Directory. If you select the default user store (preferred), you can create user accounts for CA Process Automation users. If you point to an external user store, then user accounts from that store are automatically loaded into CA EEM as global users. See Reference Global Users and Global Groups from Microsoft Active Directory (see page 39).
- CA Process Automation encrypts the data that is transported between CA Process Automation and CA EEM. If FIPS mode is selected in CA EEM, then you can select to use or not to use FIPS-supported algorithms for communication between CA Process Automation and CA EEM. Select Use FIPS-Compliant Certificate to use FIPS-supported algorithms.
- During CA Process Automation installation, select the Enable NTLM Pass-Through Authentication check box to enable CA EEM to authenticate users with the NTLM protocol. This permits users to bypass the CA Process Automation Login dialog when authenticated by CA EEM.

Gather Information for the Domain Orchestrator Installation

Whether you install CA EEM or use an existing CA EEM, have at hand the following details of your CA EEM configuration when you begin the installation of the Domain Orchestrator.

CA EEM Server

Specifies the host name where your CA EEM server is installed.

Within CA EEM, click Configure, then click Failover Information. The Hostname of the CA EEM server is displayed.

CA EEM Application Name

Specifies the name to assign as the application name for CA Process Automation.

Default: Process Automation

CA EEM Certificate File

Specifies the Certificate File. Accept the default value.

Defaults:

FIPS enabled: PAM.cer

FIPS disabled: PAM.p12.

Certificate Key File

During registration, a certificate key is provided if CA EEM is configured for FIPS mode.

Default: PAM.key

CA EEM Certificate Password

Specifies the CA EEM Certificate password.

Important! You must be able to provide the CA EEM Certificate password to successfully install CA Process Automation.

FIPS Mode

Specifies whether you want to use FIPS mode for CA Process Automation. True is valid only if you installed CA EEM with FIPS mode set to On.

Values: True, False

Note: The isFIPSMode() method returns "true" if the CA EEM server is running in FIPS mode. See the *Web Services Reference* for details on web service methods.

Important! You must know the password for the EiamAdmin user to log into CA EEM.

Prerequisites for Configuring NTLM Authentication

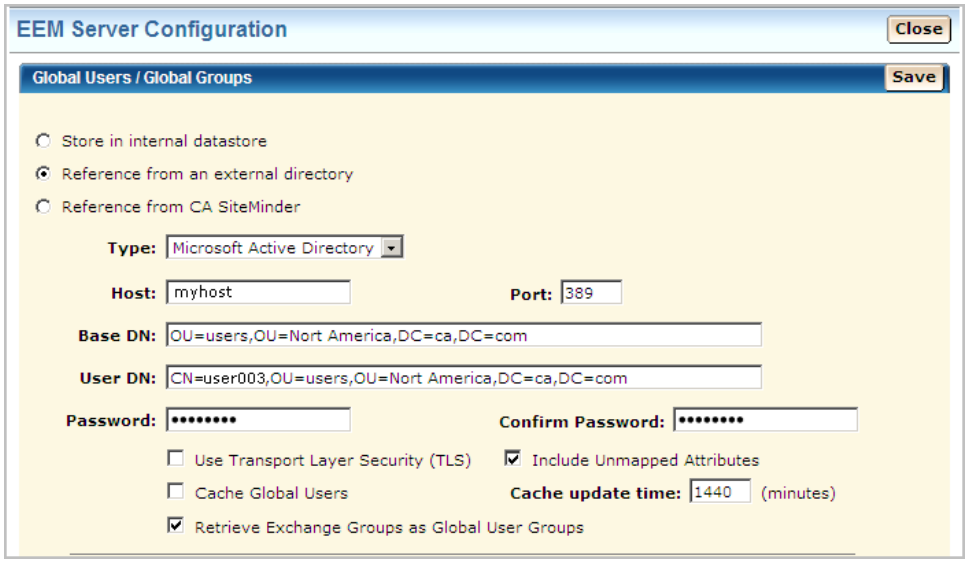
Do the following before your configure NTLM authentication:

- Verify that the CA EEM Server is installed on a Windows Server and is connected to an Active Directory.
- Verify that the users launch the application from a Windows computer.
- Verify that the CA EEM Server and the computer where the users are launching the application are part of the same network domain. If the computers are part of nested domains, ensure that the CA EEM Server and the computer where the application is launched belong to domains that have a trust relation established.
- Verify that the domain users are added to the User Groups on the computer where the application is being launched.

Reference Global Users and Global Groups from Microsoft Active Directory

While you are installing CA EEM, you can select the Reference from an External Directory option and then select Microsoft Active Directory as the type.

When you use NTLM for security, select the Retrieve Exchange Groups as Global User Groups check box as in the following example:



When you save the configuration, the following status messages appear:

- External directory bind succeeded.
- External directory data is loaded.

If NTLM is enabled and a global user logs in for the first time, an Authentication Required dialog opens. CA EEM then uses the NTLM protocol to authenticate users.

Apache Load Balancer Prerequisites

A *clustered Orchestrator* is a set of nodes that appear and act as a single Orchestrator and use a shared library. You can cluster any CA Process Automation Orchestrator for high availability, fault tolerance, and scalability.

A load balancer, such as the Apache HTTP Server, is required for clustering any Orchestrator, including the Domain Orchestrator. A load balancer is not part of the CA Process Automation installation.

While the load balancer can be configured on the same host as one of the Orchestrator nodes, it is more typical for the load balancer to reside on a separate host.

A load balancer is *only* required for an Orchestrator in a clustered configuration and in specific Single Sign On (SSO) configurations.

Important! If an Orchestrator is installed without first installing and configuring a load balancer, you cannot cluster that Orchestrator later.

Apache Load Balancer Configuration on Windows

This section provides instructions to install and configure the Apache Load Balancer on Windows.

You can configure in the following two modes:

- Basic Configuration (Windows)
- Secure Configuration (Windows)

Basic Configuration (Windows)

This section provides instructions to install and configure the Apache Load Balancer in the basic mode.

Note: You can use a load balancer other than Apache. However, a CA Process Automation Orchestrator requires that some classes of request be directed to a specific node in the clustered Orchestrator. Therefore, simple load balancing is insufficient. See the CA Process Automation Best Practices page, or contact CA support for assistance with alternatives. The Bookshelf includes links to these pages.

Follow these steps:

1. Install a load balancer and prepare configuration templates (Windows) (see page 41).
2. Configure basic communication (see page 43).
3. (Optional) Configure the Apache load balancer for Catalyst RESTful API (Windows) (see page 44)

   Note: For an Apache Web server to be able to forward https requests to Catalyst operators, the SSL certificates must be in PEM format. If needed, Generate SSL Certificate Files (see page 45).

Install a Load Balancer and Prepare Configuration Templates (Windows)

The CA Process Automation installation media includes the following sample configuration file for the Apache load balancer that you can use as a starting point for configuration:

```
ApacheConfig.zip
```

The following instructions assume that an Apache 2.2 load balancer is dedicated to CA Process Automation. First, install an Apache load balancer. Then, extract files from the CA Process Automation ApacheConfTemplates zip file to the Conf folder under the Apache installation folder.

Follow these steps:

1. Log in to the host where the load balancer is to run.

   The load balancer typically is not on the same host as your Domain Orchestrator. However, the host with your Domain Orchestrator must be routable from the load balancer.
2. Download and install the latest Apache load balancer with SSL support. Follow the vendor instructions.
3. Download the following file for the Apache version that you installed:

   ```
   mod_jk.so
   ```

   We recommend that you download the latest version.

4. Copy the mod_jk.so file to the following folder:

   apache_install_dir\modules

5. Navigate to the following folder on the CA Process Automation installation media:

   install_dir\DVD1\ApacheConfTemplates

6. Extract the following files from ApacheConfig.zip:

   mod-jk.conf

   httpd-proxy.conf

   uriworkermap.properties

   workers.properties

   httpd VIRTUALHOST_EXAMPLE FILE

   Note: The extracted httpd VIRTUALHOST_EXAMPLE FILE file contains text you can cut and paste into the Apache httpd file when you configure secure communications. The required text is also in the documentation.

7. Copy the following extracted files to the *apache_install_dir*\conf folder:

   mod-jk.conf

   httpd-proxy.conf

   uriworkermap.properties

   workers.properties

   Note: If you do not have an Apache 2.2 load balancer to dedicate, merge the configuration information in the example template properties and Conf files into your existing files. As a precaution, back up your files before you modify them.

Configure Basic Communication

You can configure a load balancer for basic communication with the nodes of the Domain Orchestrator or other Orchestrator.

Follow these steps:

1. Navigate to the following folder:

   apache_install_dir\conf

   This folder contains worker.properties and mod-jk.conf.

2. Open the workers.properties file.
3. Add the first node by defining node1 that begins with the following line:

   ```
   worker.node1.host=<Enter node1 hostname here>
   ```

4. From this line, replace the *Enter node1 hostname here* placeholder for worker.node1.host with the valid value.

   Note: The valid values are the IP address, the FQDN, or the DNS alias that resolves to the host where you are installing the initial Domain Orchestrator node. The valid value is the same value that is used for “Server Host” when installing the Domain Orchestrator.

5. Save and close the worker.properties file.
6. Open the mod-jk.conf file.
7. Uncomment the line JkMountFile conf/uriworkermap.properties.
8. Save and close the mod-jk.conf file.
9. Open the httpd.conf file.
10. Add the following entry at the end of httpd.conf file:

    ```
    #Load balancing module

    Include conf/mod-jk.conf
    ```

11. Save and close the httpd.conf file.

Configure the Apache Load Balancer for Catalyst RESTful API (Windows)

You can configure Apache Web server (load balancer) for Catalyst RESTful API. The Apache configuration changes are based on the apache load balancer that is configured for CA Process Automation already.

After you configure CA Process Automation in a cluster mode, perform the post installation tasks.

Follow these steps:

1. Navigate to the following folder on the CA Process Automation installation media:

   install_dir\DVD1\ApacheConfTemplates

2. Extract the following files from ApacheConfig.zip:

   `httpd-proxy.conf`

3. Copy the file httpd-proxy.conf to *apacheHome*/conf/extra directory.

4. Update the following lines in both http and https Virtual Hosts to replace the orchestrator host names for BalancerMember.

   UnSecured Node Members

   ```
   BalancerMember  http://< Enter node1 hostname>: 7000


   BalancerMember  http://< Enter node2 hostname>: 7000
   ```

   Secured Node Members

   ```
   BalancerMember  https://< Enter node1 hostname>: 7443


   BalancerMember  https://< Enter node2 hostname>: 7443
   ```

5. Replace the Enter node1 hostname here placeholder for worker.node1.host with the valid value.

   Note: The valid values are the IP address, the FQDN, or the DNS alias that resolves to the host where you are installing the initial Domain Orchestrator node. The valid value is the same value that is used for “Server Host” when installing the Domain Orchestrator.

6. Save the httpd-proxy.conf file.

7. Open *apacheHome*/conf/httpd.conf file and check the port 7000 and 7443 are not used.

8. Add the following line at the end of httpd.conf file:

   `Include conf/extra/httpd-proxy.conf`

9. Follow the procedure in Generate SSL Certificate Files (see page 45) to generate c2okey2.pem and c2ocert.pem files.
10. Copy the generated files to *apacheHome/*conf directory.
11. Save the modified files and restart Apache Web server.

Generate SSL Certificate Files

For Apache Web server to forward https requests to CA Process Automation (Catalyst connector), get c2okeystore from CA Process Automation and convert the c2okeystore from jks format to PEM format. The following steps describe how to generate the keystore and certificate files in case the certificate files must be re-generated.

Follow these steps:

1. Download and install OpenSSL from a third-party vendor.

   Note: Ensure that the host on which you install OpenSSL has JDK installed.

2. After you install CA Process Automation in cluster mode, the CA Process Automation installation wizard generates c2okeystore file in the following location:

   \server\c2o\.config

3. Use keytool in JDK to import the keystore to pksc12 format as follows.

   a. Go to JDK home\bin directory and run the following command:

   ```
   keytool -importkeystore -srckeystore c2okeystore
   -srcstoretype jks -destkeystore c2okeystore.p12
   -deststoretype pkcs12
   ```

   The console prompts you for the keystore password.

   b. By default, you can find the keystore password in *\server\c2o\.config\OasisConfig.properties* file. The value of KEYSTOREID=723e1830-a98c-49a1-8f16-a0794c872835. The password is 723e1830-a98c-49a1-8f16-a0794c872835.

   A *c2okeystore.p12* file is generated in the current directory.

   c. Run openssl command to convert the p12 formatted keystore to PEM formatted key and certificate files.

   ```
   openssl pkcs12 -nocert -in c2okeystore.p12 -out c2okey.pem

   openssl pkcs12 -clcerts -in c2okeystore.p12 -out c2ocert.pem

   # process rsa keys to remove extra info in the c2okey.pem

   openssl rsa -in c2okey.pem -out c2okey2.pem
   ```

Secure Configuration (Windows)

This section provides instructions to install and configure the Apache Load Balancer in the secure mode.

Note: You can use a load balancer other than Apache. However, a CA Process Automation Orchestrator requires that some classes of request be directed to a specific node in the clustered Orchestrator. Therefore, simple load balancing is insufficient. See the CA Process Automation Best Practices page, or contact CA support for assistance with alternatives. The Bookshelf includes links to these pages.

Follow these steps:

1. Install a load balancer and prepare configuration templates (Windows) (see page 41).
2. Configure Secure Communication (Windows) (see page 46).
3. Configure the Apache load balancer for Catalyst RESTful API (Windows) (see page 44)

   Note: For an Apache Web server to be able to forward https requests to Catalyst operators, the SSL certificates must be in PEM format. If needed, Generate SSL Certificate Files (see page 45).

Configure Secure Communication (Windows)

You can configure a load balancer for secure communication. In the following steps, *certloc* denotes your certificate location.

Follow these steps:

1. Install a load balancer and prepare configuration templates (see page 41).
2. Open the workers.properties file.
3. Add the first node by defining node1 that begins with the following line:

   ```
   worker.node1.host=<Enter node1 hostname here>
   ```

4. From this line, replace the *Enter node1 hostname here* placeholder for worker.node1.host with the valid value.

   Note: The valid values are the IP address, the FQDN, or the DNS alias that resolves to the host where you are installing the initial Domain Orchestrator node. The valid value is the same value that is used for “Server Host” when installing the Domain Orchestrator.

5. Save and close the workers file.

6. Review CA default locations in the openssl file in the following directory.

   `apache_install_location/conf`

7. Create or get a certificate file and private key file with a “Common Name” that matches the “ServerName” in httpd.conf.

   For example, the following steps show how to use the openssl utility that is provided with the Apache load balancer to create a certificate file. Additional options control certificate expiration, file names, and algorithms. If your site has special requirements, reference the vendor-provided documentation.

   a. Open a command prompt.

   b. Change directories to the Apache bin folder.

      `cd apache_install_location/bin`

   c. Create a Certificate Signing Request file (CSR) and PEM files. To do so, type the following command where “mypamserver” is a name of your choice:

      `openssl req -config ../conf/openssl.cnf -new -out mypamserver.csr`

      You are prompted for the passphrase for the PEM file and other identifying information.

      - You can accept default values for most identifying information (for example, Country Name, State or Province Name, Locality Name, Organization Name, and Organization Unit Name). To leave a field blank, enter a period (.).
      - When the Common Name prompt appears, enter the host name portion of “ServerName” as the value in *apache_install_location/*conf/httpd.conf.

        For example, if “ServerName” in httpd.conf has the value myhost.mycompany.com:80, specify **myhost.mycompany.com** as the “Common Name”.
      - The following fields are optional: Email address, dir, a challenge password, and an optional company name.

      The Apache load balancer creates *mypamserver.*csr and *privkey.*pem in the current directory.

   d. Create your private RSA key. To do so, enter a passphrase for *privkey*.pem when the Apache load balancer prompts you.

      `openssl rsa -in privkey.pem -out mypamserver.key`

   e. Create your certificate.

      `openssl x509 -in mypamserver.csr -out mypamserver.cert -req -signkey mypamserver.key`

8. Close the command prompt and open Windows Explorer to copy and delete generated files:
   a. Select the *certloc* folder or create a folder to hold your certificate and private key files.
   b. Open the *apache_install_dir*\bin folder at the location where the CERT and KEY files were generated.
   c. Drag-and-drop (that is, move) *mypamserver*.cert and *mypamserver*.key to *certloc*.
   d. Delete the intermediate files that were created in the *apache_install_dir/*bin folder. The intermediate files include *mypamserver*.CSR, *privkey*.PEM, and .RND.
9. Back up the files you created.
10. Use a text editor to modify the httpd text file (*apache_install_location*\conf\httpd.conf) as follows:
    a. Uncomment the following lines:

```
LoadModule rewrite_module modules/mod_rewrite.so

LoadModule ssl_module modules/mod_ssl.so

Include conf/extra/httpd-ssl.conf
```

    b. Add the following lines at the end of "httpd.conf". You can copy and paste the text from httpd VIRTUALHOST_EXAMPLE file that you extracted from the SecureDomainConfig_Template.zip.

```
<VirtualHost *:80>
JkMountFile conf/uriworkermap.properties
RewriteEngine On
RewriteCond %{HTTPS} off
RewriteCond http://%{HTTP_HOST}%{REQUEST_URI}
!^http://.*c2orepository*|MirroringRequestProcessor*|mirror
ingrepository*|StartAgent*|genericNoSecurity*|soapAttachmen
t*
RewriteRule (.*) https://%{HTTP_HOST}%{REQUEST_URI}
</VirtualHost>
# Load balancing module
include conf/mod-jk.conf
```

    c. Save the modified httpd.conf file and close the editor.
11. Back up the files you edited.

12. Use a text editor to modify the *apache_install_location/*conf/extra/httpd-ssl.conf configuration file as follows:
    a. Uncomment (if it is commented) the following text: “Listen 443”
    b. Change the SSLCertificateFile location to .../*certloc/mypamserver.*cert.

       ```
       SSLCertificateFile "C:/certloc/mypamserver.cert"
       ```

    c. Change the SSLCertificateKeyFile location to .../*certloc/mypamserver.*key.

       ```
       SSLCertificateKeyFile "C:/certloc/mypamserver.key"
       ```

    d. Add the following lines to the end of the <VirtualHost> element, before the </VirtualHost> element:

       ```
       SSLOptions +StdEnvVars +ExportCertData
       JkMountFile conf/uriworkermap.properties
       ```

    e. Save the modified httpd.conf-ssl file and close the editor.
13. Restart the Apache service. To do so, click Programs, Apache HTTP Server 2.2, Control Apache Server, Restart on the Start menu.

    The changes take effect.

Apache Load Balancer Configuration on Non-Windows

This section provides instructions to install and configure the Apache Load Balancer on Non-Windows.

You can configure in the following two modes:

- Basic Configuration (Non-Windows)
- Secure Configuration (Non-Windows)

Basic Configuration (Non-Windows)

This section provides instructions to install and configure the Apache Load Balancer in the basic mode.

Note: You can use a load balancer other than Apache. However, a CA Process Automation Orchestrator requires that some classes of request be directed to a specific node in the clustered Orchestrator. Therefore, simple load balancing is insufficient. See the CA Process Automation Best Practices page, or contact CA support for assistance with alternatives. The Bookshelf includes links to these pages.

Follow these steps:

1. Install a load balancer and prepare configuration templates (Non-Windows) (see page 50).
2. Configure basic communication (see page 43).
3. Configure the Apache load balancer for Catalyst RESTful API (Non-Windows) (see page 52)

   Note: For an Apache Web server to be able to forward https requests to Catalyst operators, the SSL certificates must be in PEM format. If needed, Generate SSL Certificate Files (see page 45).

Install a Load Balancer and Prepare Configuration Templates (Non-Windows)

The CA Process Automation installation media includes the following sample configuration file for the Apache load balancer that you can use as a starting point for configuration:

`ApacheConfig.zip`

The following instructions assume that an Apache 2.2 load balancer is dedicated to CA Process Automation. First, install an Apache load balancer. Then, extract files from the CA Process Automation ApacheConfTemplates zip file to the Conf folder under the Apache installation folder.

Follow these steps:

1. Log in to the host where the load balancer is to run.

   The load balancer typically is not on the same host as your Domain Orchestrator. However, the host with your Domain Orchestrator must be routable from the load balancer.

2. Download and install the latest Apache Load Balancer. For example, navigate to the extracted folder and run the following commands:

   ```
   ./configure -prefix=<install location>-enable-so -enable-mods-shared=all
   -enable-mod-rewrite --with-z=<zlib home>--with-included-apr  --with-mpm=worker
   --enable-ssl --with-ssl=<ssl home>
   ```

   ```
   Make
   ```

   ```
   Make install
   ```

3. Download and install the Tomcat connector to build mod_jk module. For example, navigate to *<Tomcat connector extracted location>/*native/ and run the following commands:

   ```
   ./configure --with-apxs=<install location>/bin/apxs
   make
   make install
   ```

4. Ensure the Apache server is up and running.

5. Navigate to the following folder on the CA Process Automation installation media:

   install_dir\DVD1\ApacheConfTemplates

6. Extract the following files from ApacheConfig.zip:

   ```
   mod-jk.conf
   ```

   ```
   httpd-proxy.conf
   uriworkermap.properties
   workers.properties
   httpd VIRTUALHOST_EXAMPLE FILE
   ```

   Note: The extracted httpd file contains text you can cut and paste into the Apache httpd file when you configure secure communications. The required text is also in the documentation.

7. Copy the extracted files to the following folder:

   apache_install_dir\conf

Configure the Apache Load Balancer for Catalyst RESTful API (Non-Windows)

You can configure Apache Web server (load balancer) for Catalyst RESTful API. Make the Apache configuration changes on the Apache load balancer that is configured for CA Process Automation.

Ensure that the following binaries are installed in the Apache server.

```
mod_proxy.so
mod_proxy_balancer.so
mod_proxy_http.so
```

Follow these steps:

1. Navigate to the following folder on the CA Process Automation installation media:

   install_dir\DVD1\ApacheConfTemplates

2. Extract the following file from ApacheConfig.zip:

   `httpd-proxy.conf`

3. Copy httpd-proxy.conf to the following directory:

   `apacheHome/conf/extra`

4. Open httpd-proxy.conf and comment the following lines:

   ```
   LoadModule proxy_module modules/mod_proxy.so

   LoadModule proxy_balancer_module modules/mod_proxy_balancer.so

   LoadModule proxy_http_module modules/mod_proxy_http.so
   ```

5. Navigate back to the *apache_install_dir*\conf folder, open httpd.conf, and uncomment the following lines (if commented):

   ```
   LoadModule proxy_module modules/mod_proxy.so

   LoadModule proxy_balancer_module modules/mod_proxy_balancer.so

   LoadModule proxy_http_module modules/mod_proxy_http.so
   ```

6. Update the following lines in both http and https Virtual Hosts to replace the Orchestrator host names for BalancerMember.

   UnSecured Node Members

   - Node 1

     `BalancerMember  http://< Enter node1 hostname>:7000`

   - Node 2

     `BalancerMember  http://< Enter node2 hostname>:7000`

   Secured Node Members

- Node 1

  ```
  BalancerMember  https://< Enter node1 hostname>:7443
  ```

- Node 2

  ```
  BalancerMember  https://< Enter node2 hostname>:7443
  ```

7. Replace the "Enter node1 hostname here" placeholder for worker.node1.host with the valid value.

   Note: The valid values are the IP address, the FQDN, or the DNS alias that resolves to the host where you are installing the initial Domain Orchestrator node. The valid value is the same value that is used for “Server Host” when installing the Domain Orchestrator.

8. Save the httpd-proxy.conf file.
9. Open apacheHome/conf/httpd.conf file and check the port 7000 and 7443 are not used.
10. Add the following line at the end of httpd.conf file:

    ```
    Include conf/extra/httpd-proxy.conf
    ```

11. Generate SSL Certificate Files (see page 45) to generate c2okey2.pem and c2ocert.pem files.
12. Copy the generated files to *apacheHome*/conf directory.
13. Restart the Apache Web server.

Configure Secure Configuration (Non-Windows)

This section provides instructions to install and configure the Apache Load Balancer in the secure mode.

Note: You can use a load balancer other than Apache. However, a CA Process Automation Orchestrator requires that some classes of request be directed to a specific node in the clustered Orchestrator. Therefore, simple load balancing is insufficient. See the CA Process Automation Best Practices page, or contact CA support for assistance with alternatives. The Bookshelf includes links to these pages.

Follow these steps:

1. Install a load balancer and prepare configuration templates (Non-Windows) (see page 50).
2. Configure Secure Communication (Non-Windows) (see page 54).
3. Configure the Apache load balancer for Catalyst RESTful API (Non-Windows) (see page 52)

   Note: For an Apache Web server to be able to forward https requests to Catalyst operators, the SSL certificates must be in PEM format. If needed, regenerate SSL certificate files (see page 45).

Configure Secure Communication (Non-Windows)

You can configure a load balancer for secure communication. In the following steps, *certloc* denotes your certificate location.

Follow these steps:

1. Install a load balancer and prepare configuration templates (see page 41).
2. Open the workers.properties file.
3. Add the first node by defining node1 that begins with the following line:

   ```
   worker.node1.host=<Enter node1 hostname here>
   ```

4. From this line, replace the *Enter node1 hostname here* placeholder for worker.node1.host with the valid value.

   Note: The valid values are the IP address, the FQDN, or the DNS alias that resolves to the host where you are installing the initial Domain Orchestrator node. The valid value is the same value that is used for “Server Host” when installing the Domain Orchestrator.

5. Save and close the workers file.

6. Review CA default locations in the openssl file in the following directory.

   apache_install_location/conf

7. Create or get a certificate file and private key file with a “Common Name” that matches the “ServerName” in httpd.conf.

   For example, the following steps show how to use the openssl utility that is provided with the Apache load balancer to create a certificate file. Additional options control certificate expiration, file names, and algorithms. If your site has special requirements, reference the vendor-provided documentation.

   a. Open a command prompt.

   b. Change directories to the Apache bin folder.

      cd *apache_install_location*/bin

   c. Create a Certificate Signing Request file (CSR) and PEM files. To do so, type the following command where “mypamserver” is a name of your choice:

      openssl req -new -out mypamserver.csr

      You are prompted for the passphrase for the PEM file and other identifying information.

      - You can accept default values for most identifying information (for example, Country Name, State or Province Name, Locality Name, Organization Name, and Organization Unit Name). To leave a field blank, enter a period (.).
      - When the Common Name prompt appears, enter the host name portion of “ServerName” as the value in *apache_install_location/*conf/httpd.conf.

        For example, if “ServerName” in httpd.conf has the value myhost.mycompany.com:80, specify **myhost.mycompany.com** as the “Common Name”.

      - The following fields are optional: Email address, dir, a challenge password, and an optional company name.

      The Apache load balancer creates *mypamserver.*csr and *privkey.*pem in the current directory.

   d. Create your private RSA key. To do so, enter a passphrase for *privkey*.pem when the Apache load balancer prompts you.

      openssl rsa -in *privkey*.pem -out *mypamserver*.key

   e. Create your certificate.

      openssl x509 -in *mypamserver*.csr -out *mypamserver*.cert -req -signkey *mypamserver*.key

8. Close the command prompt and open Windows Explorer to copy and delete generated files:
   a. Select the *certloc* folder or create a folder to hold your certificate and private key files.
   b. Open the *apache_install_dir*\bin folder at the location where the CERT and KEY files were generated.
   c. Drag-and-drop (that is, move) *mypamserver*.cert and *mypamserver*.key to *certloc*.
   d. Delete the intermediate files that were created in the *apache_install_dir/*bin folder. The intermediate files include *mypamserver*.CSR, *privkey*.PEM, and .RND.
9. Back up the files you created.
10. Use a text editor to modify the httpd text file (*apache_install_location*\conf\httpd.conf) as follows:
    a. Uncomment the following lines:

```
LoadModule rewrite_module modules/mod_rewrite.so

LoadModule ssl_module modules/mod_ssl.so

Include conf/extra/httpd-ssl.conf
```

    b. Add the following lines at the end of "httpd.conf". You can copy and paste the text from httpd VIRTUALHOST_EXAMPLE file that you extracted from the SecureDomainConfig_Template.zip.

```
<VirtualHost *:80>
JkMountFile conf/uriworkermap.properties
RewriteEngine On
RewriteCond %{HTTPS} off
RewriteCond http://%{HTTP_HOST}%{REQUEST_URI}
!^http://.*c2orepository*|MirroringRequestProcessor*|mirror
ingrepository*|StartAgent*|genericNoSecurity*|soapAttachmen
t*
RewriteRule (.*) https://%{HTTP_HOST}%{REQUEST_URI}
</VirtualHost>
# Load balancing module
include conf/mod-jk.conf
```

    c. Save the modified httpd.conf file and close the editor.
11. Back up the files you edited.

12. Use a text editor to modify the *apache_install_location/*conf/extra/httpd-ssl.conf configuration file as follows:
    a. Uncomment (if it is commented) the following text: “Listen 443”
    b. Change the SSLCertificateFile location to .../*certloc/mypamserver.*cert.

       ```
       SSLCertificateFile "/usr/local/certloc/mypamserver.cert"
       ```

    c. Change the SSLCertificateKeyFile location to .../*certloc/mypamserver.*key.

       ```
       SSLCertificateKeyFile "/usr/local/certloc/mypamserver.key"
       ```

    d. Add the following lines to the end of the <VirtualHost> element, before the </VirtualHost> element:

       ```
       SSLOptions +StdEnvVars +ExportCertData
       JkMountFile conf/uriworkermap.properties
       ```

    e. Save the modified httpd.conf-ssl file and close the editor.
13. Restart the Apache service. To do so, click Programs, Apache HTTP Server 2.2, Control Apache Server, Restart on the Start menu.

    The changes take effect.

F5 Load Balancer Prerequisites

If you have an F5 load balancer, you can use it to balance operator requests or web services requests to CA Process Automation clustered nodes. The F5 functionality is likely used for network nodes, pools, virtual machines, and iRules that are not used for CA Process Automation.

To prepare for F5 load balancing with CA Process Automation, the F5 nodes must be defined up front. This can be done before installing the Orchestrator node. It can be done from your plan of how you intend to build out the CA Process Automation system.

You must have the following information as a prerequisite to use F5 to load balance an Orchestrator cluster:

- F5 load balancer technology.
- Identification of servers or virtual servers where Orchestrator nodes will be deployed.
- A virtual server.
- Credentials to log in to the F5 interface.

You must configure the following F5 elements so that the elements function with CA Process Automation.

1. Create an F5 node for each cluster node (see page 59).

   For CA Process Automation, a node is any server on which an Orchestrator or Orchestrator node is installed (or could be installed in the future).

2. Create an F5 pool for each CA Process Automation cluster (see page 60).

   For CA Process Automation, each pool includes Orchestrators belonging to the same cluster.

3. Create am F5 iRule for CA Process Automation (see page 61).

   For CA Process Automation, an iRule is code that routes CA Process Automation operator requests that target the touchpoint of a clustered Orchestrator. iRules specify how to determine the destination node. We supply the iRule; you set the variables.

4. Create an F5 virtual server for CA Process Automation (see page 63).

   F5 can have several virtual servers. CA Process Automation is set up as one of the virtual servers.

5. Prepare the F5 Load Balancer for Communication Verification (see page 64).

Create an F5 Node for Each Cluster Node

Rather than configuring cluster nodes after they are present in CA Process Automation, you configure the nodes that you expect to add to any clustered Orchestrator up front.

Follow these steps:

1. Log in to F5.
2. Select the Main tab, click Local Traffic, and then click Nodes.

   The Node List displays the following details for each network node that has been defined to F5: the status, the IP address, the partition, and the host name.
3. Click Create.

   The New Node page appears.
4. Complete the General Properties section.

   Address

   Specifies the IP address of the new node.

   Name

   Specifies the host name of the associated IP address.
5. Complete the Configuration section.

   Health Monitors

   Specifies the health monitor for this node. If it is not configured, select None.

   Default: Node Default

   Ratio

   Specifies a weighted value to assign to the node. If the nodes that belong to the same cluster all have the same capacity, enter 1 as the Ratio value for each node.

   Connection Limit

   Specifies the maximum number of connections that this node can handle.
6. Click Finished.

   The added node is displayed in the Node List.

Create an F5 Pool for Each CA Process Automation Cluster

Create an F5 pool for each CA Process Automation cluster. To each F5 pool that you create, add the nodes that belong to the associated cluster.

Follow these steps:

1. Log in to F5.
2. Select the Main tab, click Local Traffic, and then click Pools.

   The Pool List is empty if you are setting up pools for the first time. The Pool List displays the following details for each pool: the status, the pool name, the partition, and the number of members in the pool.
3. Click Create.

   The New Pool page appears.
4. Complete the Configuration section.
   a. Select Basic from the drop-down list.
   b. Enter a name for the new pool.
   c. From the available health monitors, select http and move it to the active list.
5. Select Round Robin from the Load Balancing Method drop-down list.
6. Select Disabled from the Priority Group Activation drop-down list.
7. Add each node to the new F5 pool as follows:
   a. Select Node List because you are adding a node that is defined.
   b. Select the IP address (host name) from the Address drop-down list that identifies the node to add to this F5 pool.
   c. Type **8080** for Service port.
   d. Click Add.

   The details that you added for this node appear in the New Members list.
8. Click Finished.

   The new pool is added to the F5 Pool List.

Create an F5 iRule for CA Process Automation

For CA Process Automation, an iRule is code that routes operator requests that target the touchpoint of a clustered Orchestrator. iRules specify how to determine the destination node. We supply the iRule; you set the variables.

You can create an F5 iRule for CA Process Automation. An iRule definition is provided for you. For each iRule, copy the provided definition into the Description text box and set the variables, *MyPool*, *PrimaryIP*, and *PrimaryPort* to values specific to this iRule.

Note: An iRule is equivalent to uriworkermap.properties in apache. It tells F5 which node to forward traffic to based on the URL.

Follow these steps:

1. Log in to F5.
2. Select the Main tab, click Local Traffic, and then click iRules.

   The iRules List is empty if you are setting up iRules for the first time. The iRules List displays the following details for each iRule: the iRule name and the partition.
3. Click Create.

   The New iRule page appears.
4. Complete the Properties section.

   Name

   Specifies the iRule name.

   Definition

   Specifies the iRule definition. Copy the text from The iRule Definition (see page 62) into this text box.

   Note: The programming language that is used for iRules is Tcl, Tool Command Language.

   Extend Text Area

   Specifies whether to extend the text area of the Definition text box to its maximum size.

   Selected - Extends text area to its maximum size.

   Cleared - Presents text area in a size that is less than maximum.

   Wrap Text

   Specifies whether to wrap the text to fit in the Definition text box rather than display a horizontal scroll bar.

   Selected - Wraps text that extends beyond the viewable portion of the Definition text box, excluding a horizontal scroll.

   Cleared - Presents text as entered, with a horizontal scroll bar if needed.

5. Click Finished.

   The iRule you enter appears in the iRule List.

The iRule Definition

Type the following definition in the Definition text box for your new iRule. Set the variables, *MyPool*, *PrimaryIP*, and *PrimaryPort* to values specific to the current pool. The PrimaryIP and PrimaryPort can refer to the IP address and port of the Domain Orchestrator, if clustered. These variables can also identify an additional Orchestrator, one not added as a cluster node.

```
when HTTP_REQUEST {
set PAMPOOL "[MyPool]"
set PRIMARY "[PrimaryIP]"
set PRIMPORT "[PrimaryPort]"
   switch -glob [HTTP::uri] {
          "/jmx-console*" { pool $PAMPOOL }
          "/web-console*" { pool $PAMPOOL }
          "/itpam*" { pool $PAMPOOL }
          "/c2orepository/oasisHelp*" { pool $PAMPOOL }
          "/c2orepository/htmlFile/aboutUs/*" { pool $PAMPOOL }
          "/c2orepository/htmlFile/language/*" { pool $PAMPOOL }
          "/c2orepository/MainInstallerConfiguration.properties" { pool $PAMPOOL
member $PRIMARY $PRIMPORT }
          "/itpam/MirroringRequestProcessor*" { pool $PAMPOOL member $PRIMARY
$PRIMPORT }
          "/c2orepository/*" { pool $PAMPOOL }
          "/mirroringrepository*" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/itpam/StartAgent*" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/itpam/OasisPrimary" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/c2orepository/htmlFile/installation/*" { pool $PAMPOOL }
          "/itpam/AgentConfigurationRequestServlet" { pool $PAMPOOL }
          "/birt/*" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/itpam/JNLPRequestProcessor*" { pool $PAMPOOL }
          "/itpam/JNLPRequestProcessor/installation" { pool $PAMPOOL member
$PRIMARY $PRIMPORT }
          "/c2orepository/media*" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/c2orepository/thirdParty*" { pool $PAMPOOL member $PRIMARY $PRIMPORT }
          "/itpam/clientproxy/c2oresourceaction" { pool $PAMPOOL member $PRIMARY
$PRIMPORT }
          "/itpam/clientproxy/c2oreportaction" { pool $PAMPOOL member $PRIMARY
$PRIMPORT }
          default { pool $PAMPOOL }
   }
}
```

Create an F5 Virtual Server for CA Process Automation

You can create an F5 Virtual Server. Specify that a CA Process Automation pool is the default pool. Specify the iRule that you created for this pool. If the Domain Orchestrator is clustered, the pool for this cluster is a good choice for the default pool.

Follow these steps:

1. Log in to F5.
2. Select the Main tab, click Local Traffic, and then click Virtual Servers.

   The Virtual Servers List displays the following details for each Virtual Server: the status, the name, the partition, the destination IP address, the service port, the type, and an Edit link for Resources.
3. Click Create.

   The New Virtual Server page appears.
4. Complete the General Properties section.

   Name

   Specifies the name of the virtual server, for example, PAMLB.

   Destination Type

   Specifies Host for a single IP address.

   Destination Address

   Specifies the IP address of the Virtual Server, for example, 10.130.5.149.

   Service Port

   Specifies a port, for example, 80 for HTTP.

   State

   Specifies whether the virtual server is available for load balancing. Specify Enabled.
5. Complete the Configuration section. Accept all defaults, except for HTTP Profile.

   Type

   Specifies the type of virtual server. Standard is a virtual server that directs all traffic to the pool you defined as the default load balancing pool.

   Default: Standard

   HTTP Profile

   Specifies the HTTP profile for managing HTTP traffic. Select http.

6. Complete the Resources section.

   iRules

   Specifies the iRules to enable for this virtual server. Select the iRules script that you created for the Domain Orchestrator.

   Default Pool

   Specifies the name of the pool that the virtual server routes traffic to, unless the selected iRules script redirects traffic.

   Default Persistence Profile

   Specifies the persistence profile for this virtual server. For example, source_addr.

   Fallback Persistence Profile

   Specifies the persistence profile that this virtual server uses when the default persistence profile cannot be used. For example, dest_addr.

7. Click Finished.

Prepare the F5 Load Balancer for Communication Verification

The F5 load balancer works on port 80 for basic communication and on port 443 for secure communication. After installation, you browse to CA Process Automation by pointing to the appropriate port on the F5 load balancer host.

- Secure communication:

  ```
  https://loadBalancer_host:443/itpam
  ```

- Basic communication:

  ```
  http://loadBalancer_host:80/itpam
  ```

When using an F5 load balancer with CA Process Automation, take one of the following work-arounds during the installation. This step is required for CA Process Automation to validate communication with the F5 load balancer.

- Configure the F5 so that it forwards the 'open http stream' request from the installer to a valid HTTP port.

  Note: See the F5 documentation for details.

- Change the hosts file temporarily so that the load balancer name points to a valid HTTP port. After the installer proceeds past the load balancer page, remove this value from the hosts file.

Time Synchronization Prerequisites

It is recommended that you synchronize the Domain Orchestrator time with a standard external time server. This prepares the Domain Orchestrator for the time when a cluster node is added. A cluster node for any Orchestrator must have the exact same clock time as the primary node. Time synchronization is not handled by the load balancer.

More information:

Synchronize Time for a Cluster Node (see page 131)

Port Planning Prerequisites

Ports are configured during installation. When configuring network ports, accept defaults except when:

- The default port is used by another application on the host.
- A firewall restriction prevents communication on the default port.

Review the use of the following ports and plan for substitutions for any ports listed here that are in use in your network or on the applicable host. With the exception of the port for agents and for CA EEM, all other properties are stored in the OasisConfig.properties file in *install_dir*/server/c2o/.config. If a conflict occurs after installation, you can modify this file manually.

162 oasis.snmptrigger.service.port

1090 jboss.remoting.port

1098 jboss.rmi.port

1099 jboss.jndi.port

1100 jboss.ha.jndi.port

1101 jboss.ha.jndi.rmi.port

1102 jboss.mcast.jndi.autodiscovery.port

3306 oasis.database.dbport

3306 oasis.reporting.database.dbport

3306 oasis.runtime.database.port

3528 OAPort

3529 OASSLPort

3873 jboss.remoting.transport.Connector.port

4444 jboss.rmi.object.port

4445 jboss.ha.pooledinvoker.serverbind.port

4446 jboss.pooledinvoker.serverbind.port

4447 jboss.ha.rmi.object.port

4448 remoting.transport.connector.port

4457 jboss.service.binding.port

4712 jboss.tx.recovery.manager.port

4714 jboss.tx.manager.sock.pid.port

5445 jboss.jbm2.port

5446 jboss.hbm2.netty.ssl.port

5250 *default port for CA EEM*

7001 oasis.jxta.port

7003 *default port for agents*

7600 jboss.jgroups.tcp.tcp_port

7650 jboss.jgroups.tcp_sync.tcp_port

7900 jboss.messaging.datachanneltcpport

7901 jboss.messaging.controlchanneltcpport

8009 tomcat.connector.ajp.port

8080 tomcat.connector.http.port

8083 jboss.rmi.classloader.webservice.port

8093 jboss.uil.serverbind.port

8181 ucf.pax.web.http.port

8443 tomcat.secure.port

45566 jboss.mcast.ha.partition.port

45567 jboss.mcast.http.sessionreplication.port

61616 ucf.bus.port

61617 ucf.bus.http.port

Interactive Domain Orchestrator Installation

Installation of the CA Process Automation Domain Orchestrator depends on certain components being present. Therefore, installation of CA Process Automation is done in two major phases:

1. Installing the third-party software.
2. Installing the Domain Orchestrator.

Both steps must be performed whenever installing, reinstalling, or upgrading CA Process Automation.

Installation can be performed from physical media, from a copy that you make of the physical media or that you obtain though download.

You can exit the installation process at any time. If you cancel, a confirmation pop-up displays. If you confirm the cancelation, the installation steps you have taken are rolled back.

Subsequent installations require certain values that you configure during Domain Orchestrator installation. For example, certain passwords must be reentered during upgrade or installation of other Orchestrators. A simple way to retain a record of values you enter is to create a plan for passwords before you begin interactive installation. For example, record passwords for the following plus any database server specific passwords.

- CA Process Automation certificate.
- CA EEM certificate.
- Repository database.
- Reporting database.
- Runtime database.
- CA EEM administrator.

More information:

Unattended Domain Orchestrator Installation (see page 85)

Installing CA Process Automation in Self-Contained Mode

During the CA Process Automation Domain installation, you are asked to select the type of installation to perform:

- Standard installation
- Self-contained mode installation

  See Using Self-Contained Mode CA Process Automation (see page 167).

If you select self-contained mode, you do not configure CA EEM and you do not provide settings for an external database. Instead, you specify a few parameter values for Derby, such as port, host, and network mode.

After you install CA Process Automation in self-contained mode, you can override it with the standard installation. However, after you install CA Process Automation using the standard installation, you cannot override it with self-contained mode.

Install the Third Party Software

You can install the third party software.

Follow these steps:

1. Insert DVD1 of the CA Process Automation installation media into a drive or browse to the location where the installation files were copied.
2. Run the installation program appropriate to your platform and media:

   Windows

   - DVD1: Domain_Installer_windows.bat
   - Copied location:
     - Third_Party_Installer_Windows_32.exe
     - Third_Party_Installer_Windows_64.exe (Required If only a 64-bit JDK is installed.)

   HP-UNIX

   - DVD1: Domain_Installer_hpux.sh
   - Copied location: Third_Party_Installer_hpux.sh

   Linux or UNIX

   - DVD1: Domain_Installer_unix.sh
   - Copied location: Third_Party_Installer_Unix.sh

3. Select the preferred language from the Language Selection dialog.

   This sets the default language. Regardless of the language selected, CA Process Automation is installed with support for all available localizations.

   The Welcome to the CA Process Automation 3rd Party Installer Setup Wizard appears.

4. Click Next to begin installation of third party components.

5. Read the license agreement. To accept, select I accept the terms of the License Agreement and click Next.

6. Click Next to install the components in the default destination directory. Or, browse to a different directory and then, click Next.

   The installer creates the folder automatically if it does not exist. A minimum of 8GB disk space is required.

   Important! Ensure that the CA Process Automation folder structure including installation location does not exceed 255 characters. CA Technologies recommends keeping the installation location to 64 characters or less.

   The list of prerequisites appears. Prerequisites for the Domain Orchestrator include JBoss Installation, Hibernate Installation, and JDBC Jar Installation.

7. Click Next.

   Monitor the installation of JBoss and third party components.

   The JDBC Jars Installation appears.

8. Select one or more database server applications to use for internal access to CA Process Automation databases and specify the path to the appropriate JDBC driver jar file. Then, click Next.

   - MySQL - Browse to a JDBC driver jar file you have previously downloaded for MySQL. For example:

     `...`*`your_dir`*`\mysql-connector-java-5.1.19-bin.jar`

   - MS SQL - Accept the default path to the JDBC jar file on DVD1 installation disk. For example:

     `...\DVD1\drivers\sqljdbc.jar`

     (Optionally, you can browse to a different JDBC jar file.)

   - Oracle - Accept the default path to the JDBC jar file on DVD1 installation disk. For example:

     `...DVD1\drivers\ojdbc14.jar`

     (Optionally, you can browse to a different JDBC jar file.)

   Note: You must specify at least one JDBC driver. Specifying multiple JDBC drivers for internal communication is typically not necessary. During the Domain Installation, you can install additional JDBC drivers for use by other Orchestrators, or Agents with the Database operators (formerly the JDBC Module).

9. When the Completing the CA Process Setup Wizard displays, insert the CA Process Automation installation DVD2 or browse to the directory that contains the files from the DVD2 installation media. Then, click Finish.

   The Third Party Installer passes control to the CA Process Automation Domain Orchestrator installer. There may be a short interval where the UI for the Third Party Installer will have closed and the UI for the CA Process Automation Domain install has not yet appeared. This is normal.

Install the Domain Orchestrator

This section describes how to install a standalone Domain Orchestrator or the first node of a clustered Domain Orchestrator.

After the Third-Party Installer installs third-party components, the installer copies the CA Process Automation installation files to the host and starts the Domain Orchestrator installer.

Follow these steps:

1. On the Welcome page, click Next.
2. Accept the license agreement, and click Next.

3. Verify that the displayed path is the path to the Java Home Directory. If the path to the Java Home Directory is not displayed, complete the following steps:
   a. Click Browse
   b. Navigate to the correct location
   c. Select the Java Development Kit (JDK) to use (for example: C:\Program Files\Java\jdk1.7.0).
   d. Click Next.

   The JDK is validated.
4. Monitor the progress as files are copied.
5. Complete the following steps to configure CA Process Automation for use with CA SiteMinder :
   a. Verify that all CA SiteMinder prerequisites are met.
   b. Complete the following fields on the CA Process Automation Domain Configuration screen:

      Configure Single Sign-on (SSO)

      Select this check box to configure CA SiteMinder with the Domain Orchestrator.

      Verify that the CA SiteMinder WebAgent is configured with the same Apache Load Balancer you will use for CA Process Automation.

      SSO Authentication Type

      Select **Header** as the authentication type when CA SiteMinder is configured.

      The authentication type determines how CA Process Automation is informed of the User ID when a user is logged in through CA SiteMinder. Users can select the default values populated in the SSO Authentication Type list.

      SSO Authentication Parameter

      Defines the name of the authentication parameter when CA SiteMinder is configured.

      Accept the default values or enter new values depending on your CA SiteMinder configuration.

      - Select **sm_user** as the SSO Authentication Parameter for IIS.
      - Select **SM_User** as the SSO Authentication Parameter for Apache.

      Type of Server

      Specifies the type of installation as New Orchestrator.

6. Take the appropriate action:
   - If you are not using an Apache load balancer, go to Step 7.
   - If you plan to configure a clustered Domain Orchestrator, read the instructions and then complete this Configuration Screen.
   - If you are configuring the Domain Orchestrator for use with CA SiteMinder, read the instructions and then complete this Configuration Screen.

   Configure Load Balancer

   Specifies whether to install the Domain Orchestrator with the potential for clustering.

   Selected

   Install the Domain Orchestrator with the potential for clustering. Before you select this option, ensure that you have completed the Apache Load Balancer Prerequisites (see page 40).

   Cleared

   Install the Domain Orchestrator with no potential for clustering.

   Load Balancer Worker Node (Apache)

   Defines the name of the Load Balancer Worker Node. Because the Domain Orchestrator is the first node in the cluster, this value is node1.

   If Apache is your load balancer, your entry must match the name that you specified for worker.node1.host in the Apache workers.properties file in *apache_install_dir*\conf. For example:

   `worker.`**`node1`**`.host=`*`DomainOrchestratorHost.mycompany`*`.com`

   Public Host Name

   Specifies the public host name. For example:

   `loadbalancerhost.mycompany``.com`

   - Set this field to the FQDN of the IIS/Apache where the CA SiteMinder WebAgent is configured if you selected the Configure Single Sign-on (SSO) check box.
   - Set this field to the FQDN of the load balancer if you selected the Configure Load Balancer check box without the Configure Single Sign-on (SSO) option.

Public Host Port Number

Defines the HTTP port for IIS/Apache (the Public Host) if the Support Secure Communication check box is cleared.

If you change this value during the Load Balancer installation and configuration, update this value accordingly. This port is used with the Public Host Name value to browse to CA Process Automation. For example:

`http://public-host-name:80/itpam`

Default: 80

Public Host Secure Port

Defines the HTTPS port for IIS/Apache (the Public Host) if the Support Secure Communication check box is selected.

This port is part of the URL used to access CA Process Automation web services. This port is used with the Public Host Name value to browse to CA Process Automation. For example:

`https://public-host-name:443/itpam`

Default: 443

Support Secure Communication

Specifies whether to use HTTPS for secure communication.

Selected

Indicates that IIS or Apache (the Public Host) uses HTTPS to communicate.

Note: If you performed the "Configure Secure Communication" steps for Apache, select this option.

Cleared

Indicates that IIS or Apache (the Public Host) uses HTTP to communicate.

7. Click Next.
8. In the Company field, type your company name, and then click Next.

   CA Process Automation displays your entry as the This Product is Licensed To value when you click Help, About.

9. Type a certificate password, then type it again as verification, and then click Next.

   Certificate Password

   Defines the password that controls access to the keys that encrypt passwords and other critical data. Use this same password when you install any other Orchestrator or when you add cluster nodes to an Orchestrator. The certificate password is specific to a single CA Process Automation Domain.

   Confirm Certificate Password

   Matches your entry in this field with your entry in the Certificate Password field to verify the password.

   Important! In the Set Certificate Password page, before you click Next, record your Certificate Password entry in a secure location for later reference.

10. (Windows only) Specify the following Start Menu preferences, then click Next.

    [Start menu folder name]

    Defines the name of the CA Process Automation Start menu folder if you cleared the Do Not Create a Start Menu Folder check box. Accept the default or type the name of the Start menu folder for CA Process Automation.

    Default: CA Process Automation 4.0

    Create shortcuts for all users

    Specifies whether the specified short menu folder name is displayed for all users who log in to the server with the CA Process Automation Domain Orchestrator.

    Selected: Display shortcuts.

    Cleared: Do not display shortcuts.

    Do not create a Start menu folder

    Specifies whether to create an entry for CA Process Automation in the Start menu.

    Selected: Create a Start menu entry for CA Process Automation.

    Cleared: Do not create a Start menu entry for CA Process Automation.

11. Complete the following fields to define how the Domain Orchestrator communicates with other CA Process Automation components and applications, then click Next.

Server Host

Defines one of the following properties:

- The host name or IP address of the host system on which the Domain Orchestrator is deployed
- A DNS Alias that resolves to the host system

Display Name

Defines the Domain Orchestrator name displayed in the CA Process Automation Configuration browser.

- If you do not configure a load balancer, the Display Name is the same as the Server Host Name.
- If you configure a load balancer, the Display Name is the FQDN of the server on which the load balancer is installed.

Server Port

Defines the port that the Domain Orchestrator uses to communicate with other Orchestrators and agents.

Default: 7001

HTTP Port

Defines the HTTP port that is used for the web server if the Support Secure Communication check box is cleared.

Note: This port is part of the URL that is used to access CA Process Automation web services and the CA Process Automation login screen.

Default: 8080

JNDI Port

Defines the Java naming server port that the web server uses.

Note: This port must not be accessed from outside of this host system.

Default: 1099

RMI Port

Defines the RMI port that the web server uses.

Note: This port must not be accessed from outside of this host system.

Default: 1098

SNMP Port

Defines the SNMP trap listener port for CA Process Automation.

Default: 162

HTTPS port

When you select Support Secure Communication, this field specifies the port used in the URL that accesses CA Process Automation Web services and the browser-based CA Process Automation UI.

Default: 8443

Note: Select “Support Secure Communication” to enable input to this field.

Support Secure Communication

Specifies whether communication to CA Process Automation is secure, as opposed to the standard basic communication. This value controls whether the HTTP Port or the HTTPS Port is enabled.

Selected: Use the HTTPS protocol for communication.

Cleared: Do not use the HTTPS protocol for communication. Use HTTP instead.

Install as Windows service

Specifies whether to install the Domain Orchestrator as a Windows service.

Selected: Install CA Process Automation as a Windows service. Selecting this check box is only valid when CA Process Automation is installed on a Windows server.

Cleared: Do not install CA Process Automation as a Windows service.

12. Accept the default path or browse to a temporary directory in which to run scripts, then click Next.

    This directory must be writable by all users.

13. Complete the following fields to define PowerShell settings, then click Next.

    Set PowerShell Execution Policy

    Specifies whether to enable the use of PowerShell.

    Selected: Enable the use of PowerShell, setting the PowerShell execution policy at the specified path to Remote Signed.

    Cleared: Do not enable the use of PowerShell.

    PowerShell Path

    CA Process Automation auto-detects the PowerShell path.

    Note: When you click Next, the installation program validates the provided PowerShell path.

14. Define the CA EEM security settings, then register CA Process Automation with CA EEM and test the CA EEM settings.

Use FIPS-Compliant Certificate

Specifies whether to use a FIPS-compliant certificate.

Selected: Use a FIPS-compliant certificate. This is a pem certificate type that includes the Certificate Key File that is retrieved from CA EEM when you register CA Process Automation with CA EEM. Selecting this option is only valid if FIPS Mode was set "on" when CA EEM was installed.

Note: When selected, FIPS-compliant encryption algorithms are used to transfer data between CA Process Automation and CA EEM.

Cleared: Use the specified EEM Certificate File (PAM.p12 is the default) with the specified EEM Certificate password.

Note: When cleared, CA Process Automation and CA EEM use other encryption algorithms to encrypt data during transfer.

EEM Server

Defines the FQDN of the CA EEM server that CA Process Automation uses to authenticate and authorize CA Process Automation users. If you are configuring EEM for High Availability (HA), you can also define a backup CA EEM server. Use a comma as the delimiter between the server names.

EEM Application Name

Defines the CA Process Automation application name for CA EEM. You can typically accept the default value. However if you use the same CA EEM server with multiple CA Process Automation Domains, each CA Process Automation domain must have a unique application name.

Default: Process Automation

EEM Certificate File

Defines the CA EEM certificate file to use for CA Process Automation. You can typically accept the default value.

Defaults:

- PAM.pem if you selected the Use FIPS-Compliant Certificate check box.
- PAM.p12 if you cleared the Use FIPS-Compliant Certificate check box.

Certificate Key File

Skip this field. During registration, the installation process provides a certificate key if CA EEM is configured for FIPS mode.

EEM Certificate Password

Defines the CA EEM Certificate password.

Enable NTLM Pass-Through Authentication

Specifies whether CA EEM uses the NTLM protocol to authenticate CA Process Automation users.

Selected: Enables NTLM pass-through authentication. CA EEM uses the NTLM protocol to authenticate users who browse to CA Process Automation.

Cleared: Disables NTLM pass-through authentication is not enabled. Users who browse to CA Process Automation must enter CA EEM credentials in the CA Process Automation login dialog. CA EEM authenticates users.

Register Application with EEM

Specifies whether to enable options for registering CA Process Automation with CA EEM.

Selected: Enables the Register button.

Cleared: Disables the Register button.

15. If you selected the Register Application with EEM check box, click Register, complete the following fields on the EEM Credentials window, and click OK.

    EEM Admin Username

    Defines the CA EEM administrator user name. Type **EiamAdmin**.

    Default: EiamAdmin

    EEM Admin Password

    Defines the password for the EiamAdmin user account. If you installed CA EEM, enter the password that you created for the EiamAdmin user. Otherwise, contact the CA EEM administrator to get the password.

16. Click OK when the Application Registered confirmation appears.
17. If CA EEM points to an external directory, you must log in to CA EEM and add a predefined group to your user account before clicking the Test CA EEM Settings button. Use the following procedure:
    a. Log in to CA EEM with the credentials defined in Step 15.
        - Browse to the CA EEM that CA Process Automation uses. The URL follows, where hostname is the host name or IP address of the server where CA EEM is installed. https://hostname:5250/spin/eiam
        - Select Process Automation from the Application drop-down list.
        - Type EiamAdmin and the password for the EiamAdmin user.
        - Click Log In.
    b. Click the Manage Identities tab.
    c. Under Search Users, where Global Users is selected, enter your name in the Value field and click Go. (Partial values are accepted.)

       Your name appears under Users in the Users pane.
    d. Double-click your name to display your loaded user account.

       Your user account has two User Details sections. The top section lets you define a group for your role in CA Process Automation. The bottom section, Global User Details" contains information from the external directory.
    e. Click the Add Application User Details button under the top section.

       The Available User Groups list contains a group for each of three CA Process Automation roles:
        - Designers - for content designers who automate processes.
        - PAMAdmins - for administrators who configure CA Process Automation and install Orchestrators and agents.
        - Production Users - for users who start, monitor, and interact with CA Process Automation processes in a production environment.
    f. Select PAMAdmins and click the right arrow to move that group to the Selected User Groups list.
    g. Click Save.

    Note: NTLM SSO authentication uses user credentials defined in CA EEM.
18. Test the CA EEM settings. This step requires you to enter the credentials of a user defined in CA EEM. If you are using CA EEM as a local directory, you can enter credentials of one of the default users. If CA EEM points to an external directory, you enter your own credentials (or the credentials of the user to which you added the group in the previous step).
    a. Click Test CA EEM Settings.

b. If using CA EEM as a local directory, type pamadmin for Username, type pamadmin for Password, and click OK.

c. If using a referenced user account from an external directory, type your user credentials as defined in the external directory.

The Verify EEM Settings screen displays the following fields:

Connect

Indicates whether a connection can be established to the specified CA EEM server with the values provided in the CA EEM settings screen.

Limits: OK, NOT OK

Note: If the value evaluates to NOT OK, the following fields are not displayed.

User provided belongs to User Group

Indicates whether pamadmin belongs to the application user group (PAMUsers, formerly ITPAMUsers).

Limits: OK, NOT OK

User is an Admin

Indicates whether the user credentials you entered belong to the application group (PAMAdmins, formerly ITPAMAdmins).

Limits: Yes, No

EEM Upgrade

Indicates whether the CA Process Automation application schema in the EEM server is upgraded.

Note: This field is displayed only when the value is NOT OK. When the value is NOT OK, upgrade the instance.

19. After you review the results, click OK, then click Next.

20. Complete the following fields to define the Library database (that is, the Repository database) settings.

Type of Database

Specifies the Database system type. Select a supported type from the drop-down list.

Values: MySQL, MS SQL, Oracle

Note: If this installation is for production use, best practice is to select either MS SQL or Oracle. MySQL is an appropriate choice for a lightly-loaded Domain Orchestrator. Self-contained mode uses the Derby database.

User Name

Defines a user name that is authorized to create and access the database on the database server. The account must have permissions to create the database on the server or ownership (DBO) for an existing database. For example:

- If you selected MS SQL, enter **sa** as the User Name.
- If you selected MySQL, enter **root** as the User Name.

Password

Defines the password that is associated with the specified User Name.

Database Server

Defines the host name or IP address of the database server.

Database Port

Defines the connection port that is configured on the database server.

- For MS SQL, the default port is 1433.
- For MySQL, the default port is 3306.
- For Oracle, the default port is 1521.

Repository Database

Defines the name of the database in which to store Library objects and other data.

Each Orchestrator can have its own repository, or library, database. You can also share the library database across Orchestrators. Each database must have a unique name. Consider establishing a naming convention for your CA Process Automation databases with this initial installation.

For MS SQL and MySQL, you need to provide a database instance name. For Oracle, you need to provide a SID name.

Driver Jar

Defines the JDBC driver JAR file for the specified database type. The drivers folder in the DVD1 folder of the installation media provides default drivers for Microsoft SQL Server and Oracle database servers.

Defaults:

SQL Server: sqljdbc

Oracle: ojdbc14

MySQL: Click Browse, then navigate to the JAR file you downloaded (for example, mysql-connector-java-5.1.18-bin.jar).

Database Collation

Defines the rules for sorting data for MS SQL and Oracle. Case-sensitivity, accent marks, kana character types, and character width can be part of the rule set. This field is a drop-down list. It is best practice to accept the default value. This field is not applicable to MySQL.

Default: SQL_Latin1_General_CP1_CI_AS

21. Click Test Database Settings to test connectivity from CA Process Automation to the specified database server using the specified database port and JAR file.

    If a message indicates that databases are missing, close the message and click Create Database. Except for Oracle, databases that the Orchestrator requires can be created during installation.

    Create Database

    Create the repository database if you specified MS SQL or MySQL.

    Note: When using an Oracle database server, you already created the repository database as part of the database server prerequisite tasks.

    A message indicates that a database has been created with the name you provided.

22. Click Next.

23. Enter the Runtime Database information, either manually or by copying specifications from your entries for the Repository Database. Click Create Database if the Type of Database is MSSQL or MySQL. Click Test Database Settings.

    The Runtime Database fields are similar to the Database Setting fields for the Repository (Library) Database except for two fields. See Step 18 for descriptions of other fields.

    copy from main repository

    Specifies whether to copy library database settings to the run-time database settings screen.

    Selected: Copies the library database settings to this dialog. This option can save you time if you are using the same database server for both CA Process Automation databases. If you select this option, type the run-time database name in the Runtime Database field. Then click Test Database Settings. Then click Create Database.

    Cleared: Does not copy the library database settings to this dialog. This option is appropriate if you are using a different type of database for run-time data than you are using for library records.

    Runtime Database

    Defines the name of the database or schema in which run-time instances are stored. No two Orchestrators can point to the same run-time database. Enter a unique name.

    Default: pam

    Important! You cannot share a run-time database across Orchestrators. If you uninstall and then reinstall CA Process Automation, the Runtime database you configure here does not change.

24. Click Next.

25. Configure the Reporting database in one of the following ways:
    - If you are using the same database server for the Reporting database than you are using for the Repository database:
        a. Type a unique name for the reporting database in the Reporting Database field.
        b. Select the copy from main repository check box to automatically enter shared data.
        c. Click Test Database Settings.
        d. If the Type of Database is MS SQL or MySQL, click Create Database.
    - If you are using a different database server for the Reporting database than you are using for the Repository database:
        a. Type a unique name for the reporting database in the Reporting Database field.
        b. Clear the copy from main repository check box.
        c. Select the database type form the Type of Database drop-down list.
        d. In the User Name field, enter a user name that is authorized to create and access the database on the database server. (For example, type sa for MS SQL; type root for MySQL.)
        e. Click Test Database Settings.
        f. If the Type of Database is MS SQL or MySQL, click Create Database. (Do not click this button if the Reporting database runs on an Oracle database server.)

    See the following field descriptions:

    copy from main repository

    Specifies whether to copy library database settings to the Reporting database settings screen. The Reporting Database fields are similar to the Database Setting fields for the Repository (Library) Database except for two fields. See Step 18 for descriptions of other fields.

    Selected: Copies the repository database settings to this dialog. This option can save you time if you are using the same database server for both CA Process Automation databases.

    Cleared: Does not copy the repository database settings to this dialog. This option is appropriate if you are using a different type of database for reporting data than you are using for run-time records.

    Reporting Database

    Defines the name of the reporting database that stores all the generated reports. Enter a unique name.

26. Click Next.

27. Select the additional JAR files, typically JDBC drivers that you want to include in the installation.

    By default, the JDBC drivers uploaded in the Third-Party Software installation are displayed and are not selected. You can use the Add Files button to add more JAR files.

    Select each JAR file that you want deployed. Verify that you selected all of the drivers that you want to deploy for JDBC Operator usage on CA Process Automation agents and Orchestrators. Use the Add Files button to add more drivers.

    It is not necessary to anticipate the needs of designers for JDBC drivers. A domain administrator can deploy JDBC drivers as they are needed.

    Note: For more information about adding and managing Orchestrator and agent resources, including JDBC JAR files, see the Content Administrator Guide.

    When you are satisfied with your selection of JAR files, click Next.

28. Monitor the installation progress. The installation program copies and signs all CA Process Automation components. Installation can take a few minutes.

29. Click Finish to exit the installation program.

    Installation of the Domain Orchestrator is complete.

For information about starting the Domain Orchestrator, see How to Start or Stop an Orchestrator. Verify the correct operation of this initial Orchestrator before proceeding with configuration.

Unattended Domain Orchestrator Installation

CA Process Automation provides the option to install the Domain Orchestrator silently, or unattended, by using a response file. The response file contains various predefined parameters for use during the installation process. Once you create a response file, you can edit and run the install script file to begin the installation.

An example response file has been provided in the root folder of DVD1. We recommend that you use a copy of this file as the base for your response file.

Create a Response File

The first step in performing a silent installation of CA Process Automation is to create a response file.

Consider the following notes about the response file:

- Do not change the variable names as the installation uses the existing variable names.
- Use forward slashes (/) as directory separators to specify folder locations.
- Use the number sign (#) to comment out variables that you do not want to use.
- See the following installation log to review errors:

  ```
  ${install_dir}/server/c2o/installation.log
  ```

Follow these steps:

1. Insert Disc 1 of the CA Process Automation installation media or browse to the location where you previously copied the installation files from the installation media.
2. Open the DVD1 folder.
3. Open the following file.

   ```
   response.varfile
   ```

4. Provide the appropriate parameter values.

   The varfile includes parameter descriptions. For example, to enable CA EEM to use the NTLM protocol to authenticate CA Process Automation users, use the following setting:

   ```
   enableNTLM=true
   ```

5. Save the varfile to the path that contains the silent installation script file.

   The response file is created.

Run or Edit the Silent Install Script File

After you create the response file, use one of the following options to start the silent installation:

- Run the silent installation script file and pass its parameters through the command prompt. This option is the best practice when you are installing a single Orchestrator.
- Edit the installation script file parameters, then run the script. This option is the best practice when you are installing multiple Orchestrators.

Use the installation script file that is appropriate for your operating environment:

Windows

Syntax

```
Silent_Install_windows.bat [Parameter1] [Parameter2]
[Parameter3]...
```

Usage:

```
Silent_Install_windows.bat -VcertPassword=a
-VeiamCertPass=eiamadmin -VeiamPassword=eiamadmin
-VdbPassword=sa -VreportingDbPassword=sa -VruntimeDbPassword=sa
-VeiamAdminPass=eiamadmin
```

UNIX

Syntax

```
Silent_Install_unix.sh [Parameter1] [Parameter2] [Parameter3]...
```

Usage:

```
Silent_Install_unix.sh -VcertPassword=a -VeiamCertPass=eiamadmin
-VeiamPassword=eiamadmin -VdbPassword=sa
-VreportingDbPassword=sa -VruntimeDbPassword=sa
-VeiamAdminPass=eiamadmin
```

HP-UX

Syntax

```
Silent_Install_hpux.sh [Parameter1] [Parameter2] [Parameter3]...
```

Usage:

```
Silent_Install_hpux.sh -VcertPassword=a -VeiamCertPass=eiamadmin
-VeiamPassword=eiamadmin -VdbPassword=sa
-VreportingDbPassword=sa -VruntimeDbPassword=sa
-VeiamAdminPass=eiamadmin
```

The installation scripts include the following parameters:

-VcertPassword=*value*

Defines the password that controls access to the keys that encrypt passwords.

-VeiamCertPass

Defines the CA EEM certificate password (for example, pamadmin).

-VeiamPassword

Defines the password for the database that is used for automation objects (for example, pamadmin).

Note: VeiamPassword is the Windows domain password.

-VdbPassword

Defines the password for the database that is used for automation (for example, objectsroot).

-VreportingDbPassword

Defines the password for the reporting database (for example, root).

-VruntimeDbPassword

Defines the password for the database that is used at run time (for example, root).

-VeiamAdminPass

Defines the password for the CA EEM administrator, where the username value is EiamAdmin (for example, eiamadmin).

Important! Password parameters, whether passed through the command line or stored in the installation script file, are *not* encrypted.

When the installation completes, you can start the Orchestrator.

Post-Installation Tasks for the Domain Orchestrator

Perform the post-installation tasks that are applicable.

- If you reinstalled (not upgraded) the Domain Orchestrator so you could set secure communication using HTTPS, see Enable Secure Communications for Existing CA Process Automation.
- If you installed CA Process Automation for the first time:
  - Verify the Port Planning Prerequisites (see page 65) to configure ports.
  - Configure firewalls for bi-directional communication (see page 90).
- To use Databases operators to connect to databases using a different RDBMS than CA Process Automation uses, install drivers for Database operators (see page 90).

  To use Windows Authentication (integrated security) with JDBC for MSSQL Server, install drivers for Database operators (see page 90).
- If you installed the Domain Orchestrator on a server with the HP-UX operating system, perform additional configuration steps on HP-UX. (see page 92)
- If you installed CA EEM with Microsoft Active Directory as the external directory, CA EEM can authenticate users using the NTLM protocol. If you did not elect to enable NTLM pass-through authentication during installation, you can enable it manually now. See Enable NTLM Pass-Through Authentication After Installation (see page 91).
- Tasks such as deploying drivers for Database operators require that you restart the Domain Orchestrator.
  - See Stop the Orchestrator (see page 95).
  - See Start the Orchestrator (see page 96).
- Before you configure the first administrator in CA EEM, you can browse to CA Process Automation and log in as the default administrator.

  See Browse to CA Process Automation and Log In as Default Administrator (see page 93).

Configure Firewalls for Bi-directional Communication

You must configure firewalls to allow bi-directional communication. Bi-directional communication is needed between the following component pairs:

- The Domain Orchestrator and the database server used for the Library database.
- The Domain Orchestrator and the database server it uses for its Reporting database.
- The Domain Orchestrator and the database server it uses for its Runtime database.
- The Domain Orchestrator and CA EEM.
- Each Orchestrator and the database server used for the Library database.
- Each Orchestrator and the database server it uses for its Reporting database.
- Each Orchestrator and the database server it uses for its Runtime database.

If you use local firewalls on Orchestrator or Agent host machines, make sure that CA Process Automation executables can listen and connect bi-directionally through the firewall on each host. Some host-based firewall programs (such as Windows Firewall) allow exceptions for executables.

Install Drivers for Database Operators

CA Process Automation designers can use operators from the Database category (formerly the JDBC module) to connect to various Relational Database Management Systems (RDBMSs). When the connection is to a MySQL database, an Oracle database, or a Microsoft SQL Server database, the correct drivers are available. (Availability of all three drivers depends on your selection during the Domain Orchestrator installation.) When the connection is to a database from a different vendor, you can deploy the JDBC driver for Database operators for that database from the CA Process Automation Configuration tab. For example, if a designer wants to use the Database operators for Sybase, an administrator deploys the JDBC drivers for Sybase. An administrator can deploy JDBC drivers on Orchestrators or on hosts with CA Process Automation agents.

Note: See How to Deploy JDBC Drivers for Database Operators in the Manage User Resources chapter of the *Content Administrator Guide* for procedures.

Enable NTLM Pass-Through Authentication After Installation

NTLM pass-through authentication enables CA EEM to authenticate users using the NTLM protocol. This is an alternative to using credentials that users enter on the form-based login dialog. With the NTLM pass-through authentication, the login dialog is bypassed.

The following procedure does *not* apply if you already enabled NTLM pass-through authentication, for example:

- You selected the Enable NTLM Pass-Through Authentication during interactive installation of CA Process Automation.
- You specified enableNTLM=true in the response.varfile used for installing CA Process Automation silently.

You can enable NTLM pass-through authentication by manually adding ntlm.enabled=true to the OasisConfig.properties file. Use the following procedure only when you want to enable this feature but did not do it at installation.

Follow these steps:

1. Log in as an administrator to the server where the Domain Orchestrator is installed.
2. Navigate to the following folder, where install_dir refers to the path where the Domain Orchestrator is installed:

   `install_dir/server/c2o/.config`
3. Open the OasisConfig.properties file with an editor.
4. Use Find to locate the following property: ntlm.enabled=
5. Change the value for the property to true, that is:

   `ntlm.enabled=true`
6. Save the file and exit.
7. Restart the Orchestrator service.
   a. Stop the Orchestrator (see page 95).
   b. Start the Orchestrator (see page 96).
8. Repeat this process for each Orchestrator.

More information:

Prerequisites for Configuring NTLM Authentication (see page 39)

Additional Configuration Steps on HP- UX

For Orchestrators running on HP-UX, CA Process Automation requires max_thread_proc to be set to a value of 3000 or higher. If this is set to a value lower than 3000, the OS will be configured with an insufficient number of system threads, and you may encounter the following error when running Processes:

```
java.lang.OutOfMemoryError: unable to create new native thread
```

To change the value for max_thread_proc, do the following:

1. Start the SAM utility.
2. Click Kernel Configuration > Configurable Parameters.
3. For each of the parameters in the table, perform this procedure:
   a. Highlight the parameter to change.
   b. Click Actions > Modify Configurable Parameter.
   c. Type the new value in the Formula/Value field.
   d. Click OK.

Interact with the Desktop Configuration

Orchestrators and Agents normally run as console services and do not need to interact with the desktop. If an Orchestrator or Agent must interact with the Windows desktop, the Orchestrator or Agent service must start by using either a user account or by using the Local System account with the Allow service to interact with the desktop option selected. This option is selected by default when an Orchestrator or Agent is installed. Alternatively, this service can be configured using the Services console under Windows Administrative Tools. The check box to allow this privilege is under the Log On tab of the Properties Window for the service.

Enable Secure Communications for Existing CA Process Automation

If you previously selected HTTP as the protocol over which the Domain Orchestrator communicates, you can begin communicating over the secure HTTPS protocol.

Follow these steps:

1. Reinstall the Domain Orchestrator in one of the following ways:
   - Interactive Domain Orchestrator Installation (see page 67). In Step 10 of the installation procedure, select Support Secure Communication.
   - Unattended Domain Orchestrator Installation (see page 85). Set the isSecure variable in the Response file as follows to enable secure (HTTPS) communications:
     `isSecure=true`
2. Restart agents.

   HTTPS is used for all the communication between agents and the Domain Orchestrator.
3. Verify that all agents are updated and restarted.
4. Verify that all process instances that are using existing SOAP attachments are complete.

   Note: Existing SOAP attachments are accessible over HTTP only.
5. Define firewall rules to block the HTTP communications.

Browse to CA Process Automation and Log In as Default Administrator

Many of the topics in this guide assume that you have access to the CA Process Automation UI. Tasks such as deploying drivers, installing Orchestrators, and adding nodes are initiated from the Configuration tab in CA Process Automation. Administrators typically log in to CA Process Automation with their own credentials to perform such tasks.

Note: For more information about creating your own user account, see the *Content Administrator Guide*.

To be available, CA Process Automation requires that the following conditions are met:

- CA EEM is running.
- The load balancer, if used, is running.
- The Domain Orchestrator service is started. For more information, see Start the Orchestrator (see page 96).

To perform tasks that require CA Process Automation access before you have a CA Process Automation user account, log in to CA Process Automation with the default administrator credentials.

Follow these steps:

1. Access the appropriate CA Process Automation URL. In the following examples, *server* refers to the server where a nonclustered Domain Orchestrator is installed. For a clustered Domain Orchestrator, *server* refers to the server with the load balancer.

   - For secure communication, use the following syntax:

     `https://server:port/itpam`

     Examples:

     `https://domainOrchestrator_host:8443/itpam`

     `https://loadBalancer_host:443/itpam`

   - For basic communication, use the following syntax:

     `http://server:port/itpam`

     Examples:

     `http://domainOrchestrator_host:8080/itpam`

     `http://loadBalancer_host:80/itpam`

   The CA Process Automation login page opens.

   Note: If NTLM Authentication is enabled and your Domain credentials match credentials in an CA EEM user account, the Home tab displays. To support NTLM authentication in Mozilla Firefox, you configure browser settings. For more information, see Mozilla support.

2. Enter **pamadmin** for Username.
3. Enter **pamadmin** for Password.
4. Click Log In.

   CA Process Automation opens. The Home tab is displayed.

Stop the Orchestrator

Only administrators with administrator credentials on the server where the Orchestrator is installed can stop the Orchestrator.

Follow these steps:

1. Using Administrator credentials, log on to host where the target Orchestrator is installed.
2. If you logged in to a Windows host, you can stop the Orchestrator service from the Start menu, the Services window, or the command line. Do one of the following:
   - Select Programs, CA, CA Process Automation 4.0, and Stop Orchestrator Service from the Start menu.
   - Select Administrative Tools and Services from the Control Panel. Select the following service and click Stop:

     `CA Process Automation Orchestrator (C:\Program Files\CA\PAM\server\c2o)`
   - Open a command prompt and run the following script, where XX is either 32 or 64, depending on the system.

     `install_dir``\\server\c2o\bin\wrapper_XX\stopc2osvc.bat`
3. If you logged in to a UNIX or Linux host, do the following:
   a. Change directories to ${PAM_HOME}/server/c2o/. For example, change directories to:

      `/usr/local/CA/PAM/server/c2o`
   b. Run the c2osvrd.sh script with the - stop option. That is, run:

      `c2osvrd.sh stop`

Start the Orchestrator

Only administrators with administrator credentials on the server where the Orchestrator is installed can restart the Orchestrator service.

Follow these steps:

1. Using Administrator credentials, log on to host where the target Orchestrator is installed.
2. If you logged in to a Windows host, you can restart the Orchestrator service from the Start menu, the Services window, or the command line. Do one of the following:
   - Select Programs, CA, CA Process Automation 4.0, and Start Orchestrator Service from the Start menu.
   - Select Administrative Tools and Services from the Control Panel. Select the following service and click Start:

     `CA Process Automation Orchestrator (C:\Program Files\CA\PAM\server\c2o)`
   - Open a command prompt and run the following script, where XX is either 32 or 64, depending on the system.

     `install_dir``\server\c2o\bin\wrapper_XX\startc2osvc.bat`
3. If you logged in to a UNIX or Linux host, do the following:
   a. Change directories to ${PAM_HOME}/server/c2o/. For example, change directories to:

      `/usr/local/CA/PAM/server/c2o`
   b. Run the c2osvrd.sh script with the start option. That is, run:

      `c2osvrd.sh start`

Note: After starting the service for the Domain Orchestrator, start CA Process Automation.

Chapter 5: Upgrading to the Current Release

This section contains the following topics:

Upgrade Prerequisites

When you upgrade CA Process Automation:

Note: Before you upgrade to CA Process Automation r4.1, ensure that existing processes are complete. You should stop the existing environment (Domain Orchestrator, agents, or any Orchestrators) and perform upgrade. After the upgrade is complete, you can start the environment.

- Enable XA support if you use Microsoft SQL Server as the database server.

  Note: For more information, see Prepare Microsoft SQL Server for CA Process Automation (see page 27).

- If you previously used LDAP or Microsoft Active Directory (AD) for authentication and authorization, install CA EEM. CA EEM is the directory server for CA Process Automation 4.0 and later. Take one of the following actions:

  - If you installed CA EEM to point to the local directory, create user accounts in CA EEM for the CA Process Automation users. Assign each user to a default group: PAMAdmins (full rights), Designers, or Production Users. (PAMUsers is a default group with limited rights that you can use as the basis for custom groups.)

    Note: For more information, see the Knowledge Base article Scenario: How to Set Up Roles in a New System.

  - If you installed CA EEM to point to the local directory, create user accounts. To simulate the authorizations you used with LDAP, create custom policies in CA EEM.

    Note: For more information, see the Knowledge Base article Scenario: How to Retain LDAP Roles After Upgrade.

  - If you installed CA EEM to reference an external directory that is Microsoft Active Directory, CA EEM loads the AD user accounts to CA EEM as global users. You can assign default application groups or custom groups to global users.

    Note: For more information, see the Knowledge Base article Scenario: How to Set Up Roles for Referenced Accounts.

- If you installed CA EEM to point to a Microsoft Active directory, you can enable NTLM authentication.

  Note: We recommend you to enable NTLM authentication after you upgrade CA Process Automation. For more information about how to enable NTLM authentication, see Enable NTLM Pass-Through Authentication After Installation *(see page 91).*

- Update your current Apache settings for cluster upgrades to the latest values. For more information, see Prerequisites to Installing a Cluster Node for the Domain Orchestrator (see page 125).

- If the DNS host name defined when you installed CA Process Automation contained restricted characters (such as underscores), correct the DNS host name. For more information, see Resolve Invalid Character in CA Process Automation DNS Name (see page 154).
- You cannot directly upgrade from CA IT Process Automation Manager (CA IT PAM) Release 2.x to CA Process Automation Release 4.1. To upgrade from CA IT PAM Release 2.x to CA Process Automation Release 4.1, upgrade through the following releases:

  a. Upgrade from CA IT PAM Release 2.x to CA IT PAM Service Pack 03.0.01. For more information, see Special Considerations to Upgrade from CA IT PAM Release 2.x to CA IT PAM Service Pack 03.0.01 (see page 99).

  b. Upgrade from CA IT PAM Release 3.x to CA Process Automation Release 4.1. For more information, see the appropriate section, Special Considerations to Upgrade from CA IT PAM Service Pack 03.0.01 (see page 102).

Special Considerations to Upgrade from CA IT PAM Release 2.x to CA IT PAM Service Pack 03.0.01

Note: If you upgrade CA IT PAM Release 2.x to CA IT PAM Service Pack 03.0.01, ensure that you upgrade JDK to JDK version 1.6.

Follow these steps:

1. Stop the environment (Domain Orchestrator, agents, or any Orchestrators)
2. Install JDK version 1.6
3. Reinstall the Domain Orchestrator in the same location as the CA IT PAM r2.x Domain Orchestrator.
4. Reinstall the subsequent Orchestrators.
5. Restart the Agents.

   Agents are automatically upgraded to CA IT PAM Service Pack 03.0.01 of the Domain Orchestrator.

To upgrade from CA IT PAM r2.x to Service Pack 03.0.01 with CA EEM

If you are using CA IT PAM r2.2 with the CA EEM server, upgrade to CA IT PAM Service Pack 03.0.01 by running the itpam_eem_upgrade3.0.xml in CD2 folder of CA IT PAM Service Pack 03.0.01 installation to maintain the same registered name in CA EEM for CA IT PAM Service Pack 03.0.01.

If you are using the LDAP server, you can start the CA IT PAM Service Pack 03.0.01 installation directly.

Upgrade CA IT PAM r2.2 on CA EEM

You can upgrade CA IT PAM r2.2 on CA EEM.

Follow these steps:

1. Open disc 2 of the installation media.
2. Copy the itpam_eem_upgrade3.0.xml file to the CA EEM installation directory.
3. Open the itpam_eem_upgrade3.0.xml file.
4. Change the Application Instance name to the name by which CA IT PAM r2.2x is registered with CA EEM.
5. Run the safex command.

   ```
   safex –h <hostname> -u <user> -p <password> -f
   <installdir>\itpam_eem_upgrade3.0.xml
   ```

Database Considerations when Upgrading from CA IT PAM 2.x to CA Process Automation Release 04.1.00

There are certain actions you must take on your database during the upgrade process.

When upgrading from a CA IT Process Automation Manager (CA IT PAM) release prior to r3.0 sp1, you need to do a two-step upgrade. First upgrade from your current release to CA Process Automation Release 03.1.00. After you complete the appropriate steps of following procedure, upgrade from CA Process Automation Release 03.1.00 to CA Process Automation Release 04.1.00.

Follow these steps:

1. Upgrade your CA IT PAM release prior to r3.0 sp1 to CA Process Automation Release 03.1.00
2. If CA Process Automation databases are hosted on MySQL and tables are of MYISAM table type, convert the table types to innoDB.
3. If CA Process Automation databases are hosted on Microsoft SQL Server, delete the JMS_MESSAGE_TXOP_TXID index instances from the JMS_MESSAGES table for each Orchestrator. Follow these steps:
   a. Open the Services window from your Windows Control panel.
   b. Right-click the Orchestrator service and click stop.

      Note: If your Orchestrator is clustered, shut down both the Primary and Secondary nodes.

   c. Launch SQL Server Management studio, and log in as the CA Process Automation user.
   d. Expand the database tables that you are using for CA Process Automation and browse to the JMS_MESSAGES table.
   e. Expand the indexes of the JMS_MESSAGES table.
   f. Right-click the JMS_MESSAGES_TXOP_TXID index, and select Delete.

      The JMS_MESSAGES_TXOP_TXID index is deleted.

   g. Right-click the Orchestrator service and click restart.
4. If CA IT PAM was using a 1.5 version of the JDK, upgrade to JDK 1.6 version.
5. Purge unnecessary archive records.

How Dates Are Saved

All dates are saved in the database in Coordinated Universal Time (UTC). UTC is an international locale-independent standard which closely corresponds to the older Greenwich Mean Time (GMT).

At upgrade from a release of CA IT PAM before r3.0, all dates that CA Process Automation stored in the database are automatically converted to UTC. Dates are converted to UTC from the local time zone of the CA Process Automation Domain Orchestrator server.

Special Considerations to Upgrade from CA IT PAM Service Pack 03.0.01

Upgrading from CA IT Process Automation Manager r3.0 SP1 requires twice the available disk space that the existing CA IT PAM databases require. To provide adequate space to your Database Server and to speed the upgrade process, the best practice is to purge unnecessary archive records before upgrading.

Note: The upgrade process does not migrate your existing CA EEM policies. However, if CA EEM is configured to point to the Microsoft Active Directory (an external directory), you can directly enable NTLM authentication during installation.

Upgrade to JDK Version 1.6

When upgrading CA Process Automation, verify that you are using the supported JDK version. You must upgrade if you are using a JDK version before 1.6. See Platform Support and Requirements for CA Process Automation Components (see page 20).

Enable XA Transaction Support in SQL Server Before Upgrade

The CA Process Automation server runs on JBoss release 5.1.0. JBoss release 5.1.0 requires support for XA transactions at the database level. Microsoft SQL Server must be configured to support and enable XA transactions. These instructions assume that you previously used SQL Server for your CA Process Automation databases and that you configured **itpam** as your non-'sa' user.

Assumptions

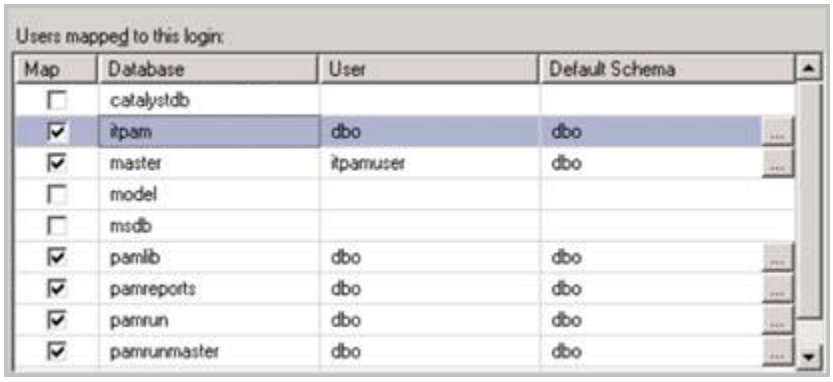
Your SQL Server for a Domain Orchestrator houses the following CA Process Automation databases:

- Library (pamlib)

  Note: CA Process Automation uses the terms Library database and Repository database interchangeably.

- Runtime (pamrun)
- Reporting (pamreports).

The following example shows how each database maps to the dbo user and to the dbo default schema:



The "itpamuser" is a dedicated non-SA user. The itpamuser has "dbo" access right to all schemas related to CA Process Automation. The itpamuser has the "db_owner" role and the "SqlJDBCXAUser" role for the "master" schema.

The database role membership for the itpam database includes db_owner and public, as the following sample configuration shows:

Procedure Summary

At a high level, enabling XA transaction support in SQL Server before upgrade requires the following steps:

- Have at hand the non-SA database user name you created (for example, itpam). This section refers to this user name as *pamuser*.
- Verify that *pamuser* is the database owner (DBO) of each CA Process Automation database (or set DBO access for *pamuser*).
- Verify that your current JDBC driver supports XA.
- Copy the required SQLJDBC XA DLL file to the SQL BINN folder, then restart the SQL Server.
- Enable XA Transactions in the Distributed Transaction Coordinator.
- Run the xa_install.sql stored procedure to enable the transactions and define the new role.
- Map the designated SQL Server user to the *SqlJDBCXAUser* role.

Have at hand the non-SA database user name you created for CA Process Automation (*pamuser*)

If you do not know the non-SA database user, identify that user now.

1. Log in to the server where you installed the Domain Orchestrator.
2. Navigate to:

   `install_dir\c2o\.config`
3. Open the OasisConfig.properties file in a text editor.
4. Find the following string:

   `oasis.database.username=`

   The value for this parameter is the CA Process Automation database user. This section refers to this user name as *pamuser*. *Yo*ur name for this user can be different.

Verify that *pamuser* is the owner (DBO) of each CA Process Automation database in each SQL Server

If the user who created the database schema specified a user name in the Owner field, a DBO association was created. Example user names include itpamuser, pamuser, and pamxauser. Verify that a DBO association with a user name was created. If the DBO was not created, create the association now.

1. Open Microsoft SQL Server Management Studio as the *sa* user.
2. Review the properties of *pamuser*. Verify that *pamuser* has DBO access to the following CA Process Automation databases:
   - Library database
   - Reporting database
   - Runtime database.
3. If *pamuser* does not have DBO access:
   - Select the CA Process Automation Library database, set *pamuser* as the DBO, and save the setting.
   - Select the CA Process Automation Runtime database, set *pamuser* as the DBO, and save the setting.
   - Select the CA Process Automation Reporting database, set *pamuser* as the DBO, and save the setting.

Verify that your current JDBC driver supports XA

The following JDBC drivers support XA transactions:

- Microsoft JDBC Driver 3.0 for SQL Server
- Microsoft JDBC Driver 4.0 for SQL Server

Verify that the currently installed JDBC driver supports XA transactions. If it does not, get the required JDBC driver from the following path on the CA Process Automation installation media:

```
.../DVD1/drivers/sqljdbc.jar
```

Copy the required SQLJDBC XA DLL file to the SQL BINN folder, then restart the SQL Server

1. Navigate to the appropriate *xa* directory:

   ```
   DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\x64
   ```

   ```
   DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\x86
   ```

   These directories contain the sqljdbc_xa.dll file.

2. Copy sqljdbc_xa.dll to the BINN folder on each SQL Server where a CA Process Automation database is installed. For example:

   ```
   mssql_install_dir\MSSQL10.MSSQLSERVER\MSSQL\Binn
   ```

   ```
   mssql_install_dir\MSSQL.1\MSSQL\Binn
   ```

   Note: To identify the path to the BINN folder for the SQL Server being used:

   a. Run services.msc to open Services (Local).

   b. Scroll to SQL Server (MSSQLServer).

   c. Right-click, then select Properties.

   d. On the General tab, find the path to the DLL file.

   e. Copy the path into a text file. Use the path up to \Binn as the destination BINN folder.

3. Restart the SQL Server.

   The SQL Server loads the SQLJDBC XA DLL installation script.

Enable XA Transactions in the Distributed Transaction Coordinator

If the SQL Server is using Windows 2008:

1. From the Start menu, select Administrative Tools, Component Services.
2. Expand Component Services, Computers, My Computer, and Distributed Transaction Coordinator.
3. Right-click Local DTC, then select Properties.
4. Select the Security tab and select Enable XA Transactions.
5. Click Apply and click OK.
6. Close Component Services.

If the SQL Server is using Windows 2003:

1. Navigate to Administrative Tools, Component Services.
2. Right-click My Computer, then select Properties.
3. Click the MSDTC tab.
4. Click the Security Configuration button under Transaction Configuration.
5. In the Security Configuration window, select Enable XA Transactions.
6. Click Apply and click OK.
7. Close Component Services.

Run the xa_install.sql stored procedure to enable the XA transactions and define the new role

1. Open Microsoft SQL Server Management Studio as the *sa* user.
2. Select File, Open, File, and then browse to the xa_install.sql script. For example, browse to:

   `DVD1\thirdparty\mssql\sqljdbc_3.0\enu\xa\xa_install.sql`
3. Click Execute.

   The xa_install.sql source script runs as an extended stored procedure in SQL Server.

   Note: Ignore messages about xp_sqljdbc_xa_init permissions.

Map the designated SQL Server user to the *SqlJDBCXAUser* role.

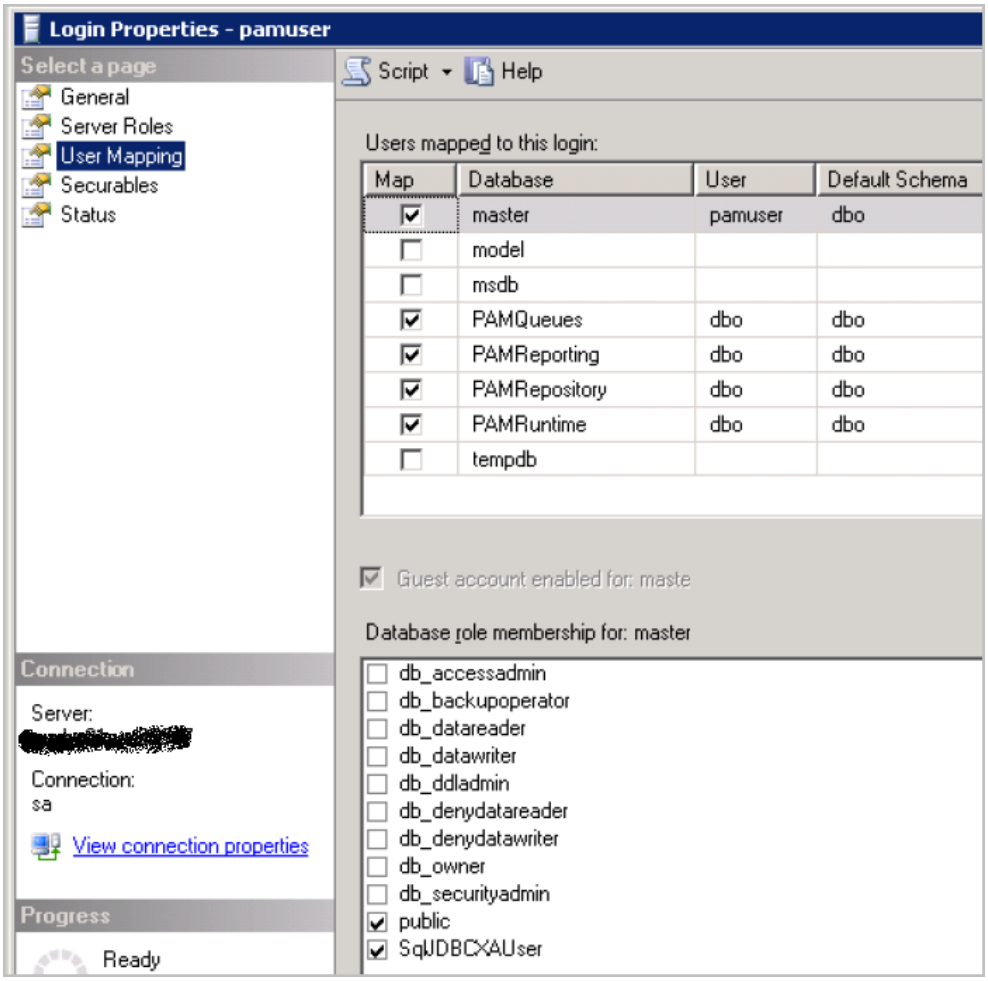
To grant *pamuser* permissions to participate in distributed transactions with the JDBC driver, add *pamuser* to the SqlJDBCXAUser role. The SqlJDBCXAUser role in the master database grants access to the SQL JDBC extended stored procedures in the master database. First grant *pamuser* access to master, then grant *pamuser* access to the SqlJDBCXAUser role while you are logged in to the master database.

1. With the extended stored procedures loaded, run the following lines of code. For 'pamuser', substitute the value you located in the OasisConfig.properties file for the oasis.database.username parameter.

   ```
   USE master
   GO
   EXEC sp_grantdbaccess 'pamuser', 'pamuser'
   GO
   EXEC sp_addrolemember [SqlJDBCXAUser],'pamuser'
   ```

   Note: Ignore the message that the user exists in the current database.

2. Verify that the SqlJDBCXAUser role is selected for the master database, where the master database user is *pamuser.*



3. Restart the SQL Server.

Browse to CA Process Automation and Log In

Browse to CA Process Automation. Enter either the fully qualified domain name (FQDN) or the IP address of the correct server.

Follow these steps:

1. Launch the URL where *server* refers to the server where the Domain Orchestrator is installed, if unclustered. For a clustered Domain Orchestrator, *server* refers to the server with the load balancer.

   - For secure communication, use the following syntax:
     `https://server:port/itpam`

     Examples:
     `https://domainOrchestrator_host:8443/itpam`
     `https://loadBalancer_host:443/itpam`

   - For basic communication, use the following syntax:
     `http://server:port/itpam`

     Examples:
     `http://domainOrchestrator_host:8080/itpam`
     `http://loadBalancer_host:80/itpam`

   The CA Process Automation login page opens.

2. Enter the user ID and password from the default administrator account or from your user account.

3. Click Log In.

   CA Process Automation opens. The Home tab displays.

Upgrade to CA Process Automation 04.1.00

You can upgrade directly to CA Process Automation 04.1.00 from the following CA Process Automation versions:

- CA IT Process Automation Manager Service Pack 03.0.01
- CA Process Automation Service Pack 03.1.01
- CA Process Automation Service Pack 04.0.01

If you use CA EEM as your directory server, use the installer to perform the upgrade. Using the installer lets you retain existing user accounts and policies and maintain the registered name.

Complete the following steps so that CA EEM can authenticate and authorize CA Process Automation users who have CA EEM user accounts:

- To retain existing policies, provide the *same* Application name.
- To upgrade the Process Automation application in CA EEM for CA Process Automation 04.1.00, select **Register**.

Note: If you provide the same application name, CA EEM retains the default users and groups after upgrade. That is, if you provide the same application name and select Register, CA EEM keeps the pamadmin (or itpamadmin) and pamuser (or itpamuser) accounts.

Follow these steps:

1. Reinstall the Domain Orchestrator in the same location where you installed the earlier version.

   See the installation steps in Interactive Domain Orchestrator Installation (see page 67).

   Note: CA IT Process Automation Manager Service Pack 03.1.01 installation program points to CA EEM, where CA EEM points to the Active Directory.

2. If appropriate, reinstall other Orchestrators. For more information, see Installing an Additional Orchestrator (see page 133).

   Important! When you reinstall orchestrators, the Configure button is not provided. Select the Reinstall option button instead.

3. Restart the agents.

   Agents are automatically upgraded to the latest version of the Domain Orchestrator.

Chapter 6: Installing an Agent

This section contains the following topics:

Prerequisites to Installing Agents

Use the following guidelines to prepare for agent installation:

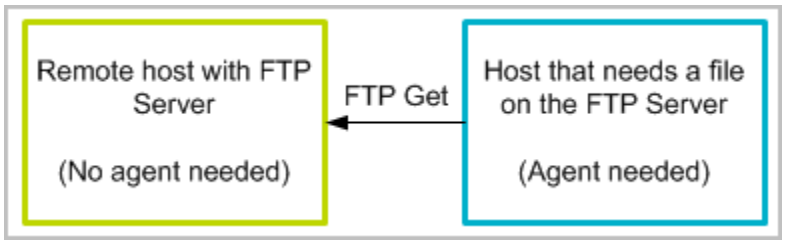
1. Identify hosts that need agents (see page 113).
2. Verify Java prerequisites for agents (see page 114).

Identify Hosts that Need Agents

In most cases, operators run on an Orchestrator. That is, the operator targets the touchpoint for an Orchestrator. Operators also run on hosts with agents. In this case, the operator targets a touchpoint associated with one or more agents.

Example: Install Agents on Hosts that Run Operators

Typically, you install CA Process Automation agents on hosts where operators execute, not on hosts that the operator connects to during execution. For example, consider a host that needs a file on the FTP server. The host that needs the file executes the FTP Get operator. An agent must be installed on the host where the operator runs. No agent is needed on the host with the FTP server



Note: When it is not possible to install an agent on a remote host where an operator must run, you can create an SSH connection from a host with an agent to the remote host. See the *Content Administrator Guide* for information on proxy touchpoints.

Verify Java Prerequisites for Agents

Before installing an agent on a host, verify that Java prerequisites are met.

Follow these steps:

1. Log on to the host. Make certain that a supported version of a Java Runtime Environment JRE is installed. If no suitable version is present, download the JRE from the vendor and install.
2. (Optional) Set JAVA_HOME environment variable to the path of the JRE for the agent. If this variable is not set, the CA Process Automation installer prompts you to browse to the directory where JRE is installed.

Determine Port Availability for Agent

Agents and Orchestrators communicate with each other using the following ports.

- Orchestrator port: 7001
- Agent port: 7003

During agent installation, you configure the ports that agents use. When configuring network ports for an agent, accept the default settings except when:

- Another application on the host is using the default port.
- A firewall restriction prevents communication on the default port.

To use a port other than the default port, select a valid, unused port.

Install an Agent Interactively

Processes can include operators that must run on servers with a target application, database, or system. If possible, install an agent on such a server. If not possible, install the agent on a host that can connect to that server through SSH.

Important! Before you install an agent, verify that the Domain Orchestrator is running.

Follow these steps:

1. Click the Configuration tab.
2. Click the Installation palette.
3. Click Install for Install Agent.

4. At the File Download prompt, click Run to start the installer. If you receive a security warning, click Run.

   The Language Selection dialog opens. The language of the host computer is selected by default.

5. Click OK or select another language and click OK.

   The welcome page of the CA Process Automation Agent Setup wizard appears.

6. Click Next.

   The License Agreement opens.

7. Read the license. If you accept the terms, click I accept the terms of the License Agreement. Click Next.

   The Set Java Home Directory page opens.

8. If the displayed Java home directory is not correct, browse to the JRE folder.

   The default JRE folder for Windows follows, where *jre* has a release-specific name:

   `C:\Program Files\Java\jre`

9. Click Next.

   The Select Destination Directory page opens. On Windows hosts, the default path follows:

   `C:\Program Files\CA\PAM Agent`

10. Click Next to accept the default or enter a destination directory for the new agent, and click Next.

    The Select Start Menu Folder page opens.

11. (Windows only) Click Next to accept CA Process Automation Agent as your Start menu shortcut or type a new name and click Next.

    - (Optional) Create short cuts for all users on this host.
    - (Optional) Suppress short-cut creation entirely

12. Examine the Domain URL and the URL of the Domain Orchestrator from which you launched the agent installation. Click Next.

13. Complete the General Properties page as follows:
    a. Accept the Agent Host name entry. This name identifies the host from which you started the installation.
    b. Change or accept the default Display Name, the host name.
    c. Accept 7003 as the Agent Port unless this port is used. Alternatively, enter another port number such as 57003.
    d. If you launched the agent installation from a Windows host, select Install as Windows Service.
    e. (Optional) Select Start Agent After Installation.

       Starting the agent lets you view the active agent and continue with the agent configuration.
14. Click Next to accept the default temporary directory for executing scripts or enter another path and then click Next.

    Note: An acceptable path contains no spaces.

    The Set PowerShell execution policy page appears.
15. Read the displayed explanation and complete the setting in one of the following ways.
    - If you use Windows PowerShell, select the Remote Signed check box to set the PowerShell execution policy and browse to the PowerShell host location. Click Next.

      This setting enables you to run Windows PowerShell scripts through this agent.
    - If you do not use Windows PowerShell, click Next.

    Agent installation begins.
16. Click Finish.
17. (Windows only) Start the agent service. Click Start, Programs, CA, *agent-name*, Start agent service.
18. Click the Configuration Browser palette on the Configuration tab.
19. Click Refresh.
20. Expand Agents and verify that your agent name is listed.

Perform an Unattended Agent Installation

CA Process Automation supports unattended agent installation to allow administrators to install agents remotely on a host computer. You can use an unattended installation to include the agent in the initial configuration routine for setting up new host computers. You can also use the unattended installation to support installation through software delivery solutions.

When you enter the domain URL with the -VdomainUrl=*domain_url*, the *domain_url* is http(s):<*FQDN_of_Domain_Orchestrator*>:<*port_number*>.

Important! The *domain_url* must be entered without **/itpam/**.

You can perform an unattended agent installation.

Follow these steps:

1. Log on as Administrator to the server where the Domain Orchestrator is installed.
2. Verify that the Domain Orchestrator is running.

   Note: An unattended agent installer must still have connectivity to the Domain Orchestrator to install an agent successfully.
3. Navigate to the following directory:

   install_dir/server/c2o/.c2orepository/media

   The media folder includes the following files:

   - AgentInstaller
   - AgentInstaller.sh
   - AgentInstaller_64
   - AgentInstaller-hpux.sh
   - CA_PAM_Agent_unix.sh
   - CA_PAM_Agent_windows_32
   - CA_PAM_Agent_windows_64
4. Locate two files for your operating system:
   - Windows 32-bit: AgentInstaller.bat and CA_PAM_Agent_windows_32.exe
   - Windows 64-bit: AgentInstaller_64.bat and CA_PAM_Agent_windows_64.exe
   - UNX and Linux: Agent Install.sh and CA_PAM_Agent_unix.sh
   - HP-UX: AgentInstaller-hpux.sh and CA_PAM_Agent_unix.sh
5. Copy both files for your operating system into a directory on the host where you want to install the agent.
6. Log on to the host where you want to install the agent and you navigate to the directory where you copied the agent installer and wrapper files.
7. (Optional) Run the agent installer without arguments to display help.
8. Use the following command line arguments with the agent installer:

```
AgentInstaller.bat -VdomainUrl=domain_url -VacceptLicense=true [-option1 -option2
...]
AgentInstaller.sh -VdomainUrl=domain_url –VacceptLicense=true[-option1 -option2
...]
```

   For example:

   -VdomainURL=https://*domainserver.company.com*:8443-VacceptLicense=true

   -VdomainURL=http://*domainserver.company.com*:8080

The agent installer accepts the following command line options:

–VlisteningAddress=*hostname*

Specifies the fully qualified domain name or IP address of the host machine on which you are installing the Agent. This is required if your host machine has multiple network interfaces.

-VdisplayName=*display_name*

Specifies the name that is displayed for this Agent.

-VnodePort=*port_number*

Specifies the port to use on the host.

-VwinService=*boolean*

Set the value to true to install the Agent as a Windows Service.

-Vsys.installationDir=*path*

Specifies the full path for installation on the host.

-VstartAgent=*boolean*

Set the value to true to start the Agent after the installation is complete.

-VjavaHome=*value*

Specifies the Java Home Location.

-Vscripts.tmpDir=*value*

Specifies the temporary directory to execute the scripts.

VcertPassword=*value*

Specifies the certificate password as configured in the Domain Orchestrator. This value is required when you are using SSL and/or are working in Secure mode.

VisLookUpDNSForIP=*boolean*

Set the value to true to look up the agent host name from DNS.

jetty.ssl.ciphers=*value*

The list of comma-separated ciphers that must be used during Domain Orchestrator-agent communication.

-VsetPowerShellExecPolicy=*value*

The execution of PowerShell scripts on windows platform requires execution policy setting to "Remote Signed". To run PowerShell scripts through CA Process Automation, set the value of this variable as true.

-VpowerShellPath=*value*

Specifies the PowerShell path on host machine.

Post-installation Tasks for Agents

Post-installation tasks for agents are conditional.

- If a port conflict arises after you install an agent, you can resolve port conflict for the agent (see page 120).
- If your site does not permit running agents with root privileges, you can run programs to configure agents to run as the standard low-privileged user (see page 121).

Resolve Port Conflict for an Agent

If a port becomes unavailable after an agent is installed, change the port assignment using one of the following approaches:

- **Windows**:
  1. Navigate to the following directory on the host where the agent is installed:
     `agent_install_dir\.config`
  2. Open the following file in an editor:
     `0asisConfig.properties`
  3. Modify the following port assignment:
     `oasis.jxta.port=`
  4. Save the file. Close the file.
  5. Navigate to the following directory on the server where the Domain Orchestrator is installed.
     `install_dir/server/c2o/.system`
  6. Remove the .c2o folder, if it exists.
- **UNIX or Linux**: Adjust the boot configuration.

Configure Agents to Run as the Standard Low-Privileged User

The programs described in this section apply to an agent installed on a host with a Windows operating system. These programs do the following:

- Create the standard user account used for all CA Process Automation agents.
- Assign this agent required rights on the local host.

Note: These programs have not been validated to work with all versions of Windows.

If these programs do not work on your version of Windows, configure the settings manually. Use the Group Policy Editor in the Windows Administrative Tools.

Before you begin, determine the user account *user_name* or *group_name* to use as a standard on all installed agents and Orchestrators. You can use an ordinary user account. It does not need to be a Domain account with Administrative rights.

Follow these steps:

1. Open a command prompt. For example, Run cmd.
2. Navigate to the following directory:

   agent_install_dir\PAMAgent\.c2orepository\public\tools
3. Type the following command:

   `itpamsvcacct.bat user_name|group_name`

   The user account is created with the name you specified.
4. Type the following five commands. (You can type a single command and use a space as a delimiter between rights.)

   `itpamassgnrights.exe user_name host_name + SeTcbPrivilege`

   `itpamassgnrights.exe user_name host_name + SeCreateTokenPrivilege`

   `itpamassgnrights.exe user_name host_name + SeServiceLogonRight`

   `itpamassgnrights.exe user_name host_name + SeBatchLogonRight`

   `itpamassgnrights.exe user_name host_name + SeAssignPrimaryTokenPrivilege`

   The user account you specified has the privileges required to run the agent on the specified local host.

How to Start or Stop an Agent

How you start and stop an agent depends on the operating system that the host on which the agent is installed uses.

- **Microsoft Windows:** Windows Service
- **UNIX or Linux:** command line

For Windows:

- Access the Services console from Administrative Tools in the Control Panel. From there, you can start or stop the agent service.
- Use the Start menu option. For example:
  - Programs, CA, CA Process Automation Agent, Start Agent Service
  - Programs, CA, CA Process Automation Agent, Stop Agent Service

For information about a UNIX or Linux operating system, see the following topics:

- Start a CA Process Automation Agent on a UNIX or Linux Host (see page 122)
- Stop a CA Process Automation Agent on a UNIX or Linux Host (see page 123)

Start CA Process Automation Agent on a UNIX or Linux Host

You can start a CA Process Automation Agent on UNIX or Linux host when you see that it displays as inactive on the Agents palette.

To start a CA Process Automation Agent on a UNIX or Linux host

1. Change directories to the AGENT_HOME/pamagent.

   Note: The default location is AGENT_HOME=usr/local/CA/PAMAgent.

2. Run the following command:

   ```
   ./c2oagtd.sh start
   ```

   The agent starts running.

Stop CA Process Automation Agent on a UNIX or Linux Host

You can stop a CA Process Automation agent running on a UNIX or Linux host.

To stop CA Process Automation Agent on a UNIX or Linux host

1. Change directories to the AGENT_HOME/pamagent.

   Note: The default location is AGENT_HOME=usr/local/CA/PAMAgent

2. Run the following command:

   ```
   ./c2oagtd.sh stop
   ```

   The agent stops running.

Chapter 7: Adding a Node to the Domain Orchestrator

You can build out the CA Process Automation Domain by extending the capacity of the Domain Orchestrator. Adding a cluster node helps achieve high availability for the Domain Orchestrator.

This section contains the following topics:

Prerequisites to Installing a Cluster Node for the Domain Orchestrator

You can install a cluster node for the Domain Orchestrator. A cluster node extends the processing power of the Domain Orchestrator and therefore can improve performance. A cluster node also serves as a failover for the primary Domain Orchestrator. A cluster node shares the same databases that were configured for the primary Orchestrator.

Before installation, perform the following prerequisites:

Follow these steps:

1. Identify a host for the Orchestrator cluster node that meets platform and hardware requirements. See the Orchestrator component in the following two topics:
   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).
2. Verify that this host is in the same subnet as the primary Domain Orchestrator.
3. Verify that this host is in the same timezone as the primary Domain Orchestrator.
4. Verify that the host for this cluster node has a supported JDK, and if missing, download it.

   See JDK Prerequisites (see page 35).

5. If the Domain Orchestrator was configured with an F5 load balancer, add this node to the load balancer.

   See Create an F5 Node for Each Cluster Node (see page 59).

6. If the Domain Orchestrator was configured with an Apache load balancer, add this node to the load balancer.

   a. Navigate to *apache_install_location*\conf.

   b. Open the workers.properties file.

   c. Uncomment the following lines under Define Node 2 in worker.properties file.

      ```
      worker.node2.port=8009
      worker.node2.host=hostname
      worker.node2.type=ajp13
      worker.node2.lbfactor=1
      ```

   d. Change *hostname* to the host name of the server where the Domain Orchestrator node is being installed.

   e. Add “node2” to the worker.loadbalancer.balance_workers= line under Load-balancing behaviour. The entry resembles the following:

      ```
      worker.loadbalancer.balance_workers=node1,node2
      ```

      Note: For third and subsequent nodes, follow the same instructions, but substitute the correct node number for node2, for example, node3 or node4.

   f. Restart Apache.

Install a Cluster Node for the Domain Orchestrator

Users with PAMAdmin privileges can optionally add additional cluster nodes to a Domain Orchestrator. Clustering helps to balance the processing load across the hosts that are clustered. Clustering is a good way to promote high availability. For the Domain Orchestrator to be eligible for clustering, you must have installed a Load Balancer before you installed the Domain Orchestrator.

Verify the completion of prerequisites to installing a cluster node for the Domain Orchestrator (see page 125). Then, install the cluster node.

Follow these steps:

1. Log in to the server where you plan to install this cluster node for the Domain Orchestrator
2. Browse to CA Process Automation and log in (see page 110).
3. Click the Configuration tab
4. Click the Installation palette.
5. Click Install for Install Cluster Node For Domain Orchestrator.
6. If the digital signature cannot be verified, click Run to start the installation.
7. On the Welcome to the CA Process Automation 3rd Party Installer Setup Wizard, click Next.
8. Accept the license agreement, and click Next.
9. Specify the destination directory to install the Orchestrator node, and click Next.

   The installer creates the folder automatically if it does not exist.
10. On the Prerequisites for CA Process Automation Installation screen, click Next.

    The Completing the CA Process Automation Setup Wizard for prerequisites displays a Use Domain checkbox and a path. The installation process uses the information gathered from the Domain Orchestrator installation. This check box is typically not changed during installation, but if you need to enter new information, click the check box and enter the new information.
11. Click Finish to launch the installation of the cluster node for the Domain Orchestrator.
12. On the Welcome screen, click Next.
13. Accept the license agreement, and click Next.
14. Accept the displayed path or browse to the Java Home Directory. Click Next.

    The JDK is validated, and the Orchestrator installation begins. It will take a minute to copy configuration files.

15. Enter the load balancer worker node information, verify the information in the other fields prepopulated with details entered during Domain Orchestrator installation. Click Next.

    Load Balancer Worker Node

    Specifies the node name, for example, node 2. This is the name of this node specified in the Apache workers.properties file, where *hostname* is the name of the host on which you are installing the cluster node:

    worker.**node2**.host=*hostname*.*mycompany*.com

    Note: The Domain Orchestrator is node1. For the second node, type **node2.**

    Public Host Name

    Specifies the FQDN of the server where the load balancer is installed, that is:

    loadbalancer_hostname.*mycompany*.com

16. View the Company Name, and click Next.
17. Enter the certificate password, and click Next.

    Certificate Password

    Specifies the *same* certificate password that was entered during the installation of the Domain Orchestrator.

18. Verify the entries on the General Properties for the Orchestrator. Most of the settings derived from the Domain Orchestrator installation. Click Next.

    Server Host

    Specifies the FQDN of the host where this cluster node for the Domain Orchestrator is being installed.

19. Specify a Start Menu Folder, and click Next.
20. View the PowerShell settings.
21. View the CA EEM Security settings, and click Next.
22. View the database settings for the repository (library) database, and click Next.
23. View the database settings for the runtime database, and click Next.
24. View the database settings for the reporting database, and click Next.
25. Monitor the progress messages as setup installs the cluster node for the Domain Orchestrator on the computer where you initiated the installation.
26. Click Finish.

Port Planning Prerequisites

Ports are configured during installation. When configuring network ports, accept defaults except when:

- The default port is used by another application on the host.
- A firewall restriction prevents communication on the default port.

Review the use of the following ports and plan for substitutions for any ports listed here that are in use in your network or on the applicable host. With the exception of the port for agents and for CA EEM, all other properties are stored in the OasisConfig.properties file in *install_dir*/server/c2o/.config. If a conflict occurs after installation, you can modify this file manually.

162 oasis.snmptrigger.service.port

1090 jboss.remoting.port

1098 jboss.rmi.port

1099 jboss.jndi.port

1100 jboss.ha.jndi.port

1101 jboss.ha.jndi.rmi.port

1102 jboss.mcast.jndi.autodiscovery.port

3306 oasis.database.dbport

3306 oasis.reporting.database.dbport

3306 oasis.runtime.database.port

3528 OAPort

3529 OASSLPort

3873 jboss.remoting.transport.Connector.port

4444 jboss.rmi.object.port

4445 jboss.ha.pooledinvoker.serverbind.port

4446 jboss.pooledinvoker.serverbind.port

4447 jboss.ha.rmi.object.port

4448 remoting.transport.connector.port

4457 jboss.service.binding.port

4712 jboss.tx.recovery.manager.port

4714 jboss.tx.manager.sock.pid.port

5445 jboss.jbm2.port

5446 jboss.hbm2.netty.ssl.port

5250 *default port for CA EEM*

7001 oasis.jxta.port

7003 *default port for agents*

7600 jboss.jgroups.tcp.tcp_port

7650 jboss.jgroups.tcp_sync.tcp_port

7900 jboss.messaging.datachanneltcpport

7901 jboss.messaging.controlchanneltcpport

8009 tomcat.connector.ajp.port

8080 tomcat.connector.http.port

8083 jboss.rmi.classloader.webservice.port

8093 jboss.uil.serverbind.port

8181 ucf.pax.web.http.port

8443 tomcat.secure.port

45566 jboss.mcast.ha.partition.port

45567 jboss.mcast.http.sessionreplication.port

61616 ucf.bus.port

61617 ucf.bus.http.port

Synchronize Time for a Cluster Node

A cluster node for any Orchestrator must have the exact same clock time as the primary node. Take one the following approaches to synchronize the time of all nodes in a cluster:

- Synchronize all Orchestrators and cluster nodes to a standard external time server (preferred).
- Manually synchronize the time of additional nodes to that of the primary node as follows:

  1. Verify the accuracy of the primary node time.
  2. Run the appropriate OS command on each cluster node to synchronize its time with the time of the primary node. For example, you can use command like the following for synchronizing a cluster node with the primary node.

     Windows

     `net time \\primarynodename /set /yes`

     Unix/Linux

     `ntpdate -u primarynodename`

Chapter 8: Installing an Additional Orchestrator

After installing the Domain Orchestrator, you can build out the Domain by installing additional Orchestrators. You can install multiple Orchestrators in one environment. If you create a new environment, for example, for production use, install an Orchestrator in that environment.

This section contains the following topics:

Prerequisites to Installing an Orchestrator

You can install an Orchestrator in the environment with the Domain Orchestrator or in a separate environment. Before installing an Orchestrator, perform the following prerequisites:

Follow these steps:

1. Identify a host for the Orchestrator that meets platform and hardware requirements. See the Orchestrator component in the following two topics:
   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).
2. Verify that the host for the Orchestrator has a supported JDK, and if missing, download it.

   See JDK Prerequisites (see page 35).

3. Identify the database server or servers to host the Runtime database and optionally, the Repository (Library) database for this Orchestrator. Consider the following factors:
   - Each Orchestrator must have its own Runtime database.
   - An Orchestrator can share the Library database of the Domain Orchestrator or have its own database.
   - Typically, all Orchestrators in the Domain use the Reporting database created for the Domain Orchestrator.
   - A database server must meet platform and hardware requirements. See the Database Server component in the following two topics:
     - Platform Support and Requirements for CA Process Automation Components (see page 20).
     - Hardware Requirements (see page 22).
4. Prepare the database server. The Runtime and Repository databases can be created on different database servers.

   See Database Server Prerequisites (see page 25).
5. Evaluate the need for a load balancer for this Orchestrator. CA Process Automation supports two methods of balancing clustered Orchestrators.

   See Apache Load Balancer Prerequisites (see page 40).

   See F5 Load Balancer Prerequisites (see page 58).
6. Identify a time server (NTP server). Configuring all Orchestrators to use the same external time server (or local time server) is the best way to ensure synchronization.
7. Ensure that the following are started before browsing to CA Process Automation to begin the installation of an Orchestrator:
   - CA EEM.
   - The load balancer, if used.
   - The Domain Orchestrator service.
   - The database server you plan to use for the Runtime database and optionally, a separate Repository (or Library) database.

Install an Orchestrator

After you install the Domain Orchestrator, you can add Orchestrators on other hosts. Each new environment needs at least one Orchestrator, but can have more than one Orchestrator. Multiple Orchestrators permit segmentation.

By default, the "Use Domain" check box is selected and disabled. New Orchestrators inherit CA EEM information from the Domain Orchestrator.

Before you use the following procedure, complete the prerequisites to installing an Orchestrator (see page 133).

Follow these steps:

1. Log in to the server on which to install the new Orchestrator.
2. Browse to CA Process Automation and log in (see page 110) with administrator credentials. For example, log in as a member of the PAMAdmins group.
3. Click the Configuration tab and select the Installation palette.
4. Click the prerequisites link and verify that all prerequisites have been met.
5. Click Install Orchestrator.

   If you use the Firefox web browser, open it with Java Web Start Launcher (the default).

   If necessary, install the required certificate as instructed.
6. Select a language and click OK.

   The Welcome to the CA Process Automation Third-Party Installer Setup wizard page appears.
7. Click Next.
8. Accept the licensing agreement, and click Next.
9. Specify the directory in which to install the Orchestrator, and click Next.

   If the folder does not exist, the installer creates it.
10. Click Next on the Prerequisites for CA Process Automation Installation page.

    Note: Within this wizard, the Use Domain check box is selected to let the installer use information from the Domain Orchestrator installation.

11. Specify JDBC jars for installation in one of the following ways:
    - Click Next to use the JDBC jars that the Domain Orchestrator installation configured.
    - Complete the following procedure:
        a. Clear the Use Domain check box.
        b. Click Add Files.
        c. Select the database server type.
        d. Click Browse and navigate to the JDBC JAR file for the selected server type.
        e. Click Next.
12. On the confirmation screen, click Next.
13. Click Finish to advance to the CA Process Automation installer.
14. Click Next on the Welcome screen.
15. Accept the license agreement and click Next.
16. Take one of the following actions on the Java Home Directory page:
    - Click Next to accept the default.
    - If the JAVA_HOME environment variable is not set on the host, type the JDK location and click Next.
17. View the Domain URL, and click Next.
18. If you are not using a load balancer, click Next and skip the following step.
19. If you are using a load balancer, complete this page and click Next.

    Configure Load Balancer

    Specifies whether to install this Orchestrator so it can cluster.

    Selected

    Indicates that a load balancer is configured for this Orchestrator.

    Cleared

    Indicates that no load balancer is configured for this Orchestrator.

    Load Balancer Worker Node (Apache)

    Specifies the name of this node. Because this Orchestrator is the first node in this cluster, specify **node1**.

    Note: For nodes other than node1 (for example, node 2), see:

    - Adding a Node to the Domain Orchestrator (see page 125).
    - Adding a Node to an Additional Orchestrator (see page 141).

Public Host Name

Specifies the public host name as in the following example:

loadbalancerhost.*mycompany*.com

- If the Domain Orchestrator uses Single Sign-on (SSO), this field specifies the FQDN of the Internet Information Services (IIS) application or the Apache application with the CA SiteMinder WebAgent.
- If the Domain Orchestrator does not use Single Sign-on (SSO), this field specifies the FQDN of the load balancer.

Public Host Port Number

If Support Secure Communication is cleared, this field specifies the HTTP port for the Public Host (IIS or Apache).

Default

80

Public Host Secure Port

If Support Secure Communication is selected, this field specifies the HTTPS port for the Public Host (IIS or Apache).

Default

443

Support Secure Communication

Specifies whether the Public Host uses HTTPS for secure communication.

Selected

The Public Host uses HTTPS for secure communication.

Cleared

The Public Host does not use HTTPS for secure communication; instead, it uses HTTP for basic communication.

20. View the Company Name, and click Next.
21. Enter a certificate password, and click Next.

    This certificate password is the one that the Domain Orchestrator uses.

22. Specify Start Menu Folder preferences and click Next.
23. Enter the General Properties for the Orchestrator, and click Next.

    Server Host

    Specifies the FQDN of this Orchestrator.

    Display Name

    Specifies the name that the Configuration Browser displays for this Orchestrator.

    - If you do not configure a load balancer, the Display Name is the Server Host name.
    - If you configure a load balancer, the Display Name is the FQDN of the server that hosts the load balancer.

24. Accept the default or set the temporary directory in which to run scripts, then click Next.
25. Set the PowerShell run policy and click Next.
26. Enter the Repository database settings for this Orchestrator in one of the following ways:

    - To share the Repository (Library) database that the Domain Orchestrator uses, complete the following procedure:
      a. Enter the same information that you configured for the Domain Orchestrator.
      b. Click Test Database Settings.
      c. Click Next.
    - To create a separate Repository (Library) database for this Orchestrator, complete the following procedure:
      a. Complete all fields.
      b. Provide a unique name for the Repository database.
      c. Click Create Database
      d. Click Test Database Settings
      e. Click Next.

27. Enter the Runtime database settings. Each Orchestrator requires a separate Runtime database.
    a. If the new Runtime database resides on the same database server as the Repository database for this Orchestrator, click Copy from the Main Repository to copy the defined User Name and Password.
    b. If the Database Server you specify hosts other Runtime databases, create a valid unique name for this Runtime database.
    c. Click Create Database.
    d. Click Test Database Settings.
    e. Click Next.
28. View Reporting Database Settings and click Next. All Orchestrators in the Domain share the same Reporting database.
29. Click Finish.

Post-Installation Tasks for an Orchestrator

Perform the following post-installation tasks as needed.

1. To configure an Apache load balancer to use secure communication through SSL, take the following steps:
   a. Navigate to the following folder:
   apache_install_dir\conf\extra\
   b. Open the following file:
   `httpd-ssl.conf`
   c. Add the following lines inside the <VirtualHost> </VirtualHost> tags at the end of the file:

   ```
   SSLOptions +StdEnvVars +ExportCertData
   JkMount /* loadbalancer
   ```

   Note: To configure a load balancer to use basic communication, comment out the previous statement.
   d. Save the file. Close the file.
   e. Restart the Apache HTTP Server.
2. Configure ports (see page 65).
3. Configure firewalls for bi-directional communication (see page 90).
4. If you installed the Domain Orchestrator on a server with the HP-UX operating system, perform additional configuration steps on HP-UX. (see page 92)
5. (Windows only) Start the Orchestrator service.

   The Orchestrator registers itself with the Domain Orchestrator.
6. Verify the installation of the additional Orchestrator.
   a. Browse to CA Process Automation and log in.
   b. Click the Configuration tab.
   c. Click the Orchestrators node in the Configuration Browser palette.
   d. View the new Orchestrator in this list.

Chapter 9: Adding a Node to an Additional Orchestrator

After installing an additional Orchestrator, you can extend its capacity and provide failover capability by adding a cluster node. If the primary node fails, the secondary node acts as the primary node. You can use interactive installation or unattended installation when you install cluster nodes.

This section contains the following topics:

Prerequisites to Installing a Cluster Node for an Orchestrator

You can install a cluster node for an Orchestrator. A cluster node extends the processing power of an Orchestrator and therefore can improve performance. A cluster node can serve a failover function should the primary Orchestrator fail. We recommend limiting a clustered Orchestrator to two nodes: the primary Orchestrator and the cluster node. A cluster node shares the same databases that were configured for the primary Orchestrator.

Before installation, perform the following prerequisites:

Follow these steps:

1. Identify a host for the Orchestrator cluster node that meets platform and hardware requirements. See the Orchestrator component in the following two topics:
   - Platform Support and Requirements for CA Process Automation Components (see page 20).
   - Hardware Requirements (see page 22).
2. Verify that this host is in the same subnet as the primary Orchestrator.
3. Verify that this host is in the same timezone as the primary Orchestrator.
4. Verify that the host for this cluster node has a supported JDK, and if missing, download it.

   See JDK Prerequisites (see page 35).

5. If the Orchestrator was configured with an F5 load balancer, add this node to the load balancer.

   See Create an F5 Node for Each Cluster Node (see page 59).

6. If the Orchestrator was configured with an Apache load balancer, add this node to the load balancer.

   a. Navigate to *apache_install_location*\conf.

   b. Open the workers.properties file.

   c. Uncomment the following lines under Define Node 2 in worker.properties file.

      ```
      worker.node2.port=8009
      worker.node2.host=hostname
      worker.node2.type=ajp13
      worker.node2.lbfactor=1
      ```

   d. Change *hostname* to the host name of the server where the Orchestrator node is being installed.

   e. Add “node2” to the worker.loadbalancer.balance_workers= line under Load-balancing behaviour. The entry resembles the following:

      ```
      worker.loadbalancer.balance_workers=node1,node2
      ```

      Note: For third and subsequent nodes, follow the same instructions, but substitute the correct node number for node2, for example, node3 or node4.

   f. Restart Apache.

Installing a Cluster Node for an Orchestrator

Users with PAMAdmins privileges can optionally add additional cluster nodes to an Orchestrator with a load balancer.

Follow these steps:

1. Log in to the server where you plan to install this cluster node for an additional Orchestrator.
2. Browse to CA Process Automation and log in (see page 110).
3. Click the Configuration tab and click the Installation palette.
4. Click Install for *Install Cluster Node For Orchestrator*.
5. If the digital signature cannot be verified, click Run to start the installation.
6. On the Third Party Installation screen, click Next.
7. Accept the license agreement, and click Next.
8. Specify the destination directory to install the Orchestrator node, and click Next.

   The installer creates the folder automatically if it does not exist.
9. On the Prerequisites for CA Process Automation Installation screen, click Next.

   A subsequent screen includes the following check box:

   Use Domain

   Specifies whether this cluster node is for the Domain Orchestrator

   Cleared - Specifies this cluster node is not for the Domain Orchestrator.

   On the confirmation screen, click Next.
10. Click Finish to move on to the CA Process Automation installer.
11. On the Welcome screen, click Next.
12. Accept the license agreement, and click Next.
13. Specify the Java Home Directory. The CA Process Automation installer will have prepopulated this field with the most recent suitable JDK it was able to locate in the path. If needed, browse to the directory where JDK is installed, and click Next.

    The JDK is validated, and the Orchestrator installation begins. This will take a minute or so as files are copied.
14. Enter the load balancer information, and click Next.

    Load Balancer Worker Node

    Specifies the name of this node as it corresponds to the name specified in the Apache workers.properties file.

    The first node in this cluster is the Orchestrator node. Name the second node as node2.

Public Host Name

Specifies the public host name.

- If Configure Single Sign-on(SSO) is selected, this field contains the host name of the IIS/Apache on which the CA SiteMinder WebAgent is configured.

  Note: If Configure Single Sign-on(SSO) is selected, then the CA SiteMinder WebAgent must be configured with the same Apache Load Balancer.

- If an Apache load balancer is selected without the Configure Single Sign-on(SSO) option, then this field contains the hostname of the Apache Load Balancer.

Public Host Port Number

Specifies the HTTP port for IIS/Apache which is the Public Host. The default is port 80. If you change this value during the Load Balancer installation and configuration, then you will have to update this value accordingly.

Public Host Secure Port

Specifies the HTTPS port for IIS/Apache which is the Public Host. Support Secure Communication (below) must be selected.

Support Secure Communication

Select this check box if IIS/Apache, the Public Host, is configured to communicate using HTTPS.

15. View the Company Name, and click Next.
16. Enter the certificate password, and click Next.

    This is the same certificate password that was entered during the installation of the Domain Orchestrator.
17. Specify a Start Menu Folder, and click Next.
18. Enter the General Properties for the Orchestrator, and click Next.

    For more information about each property see Install and Configure the Domain Orchestrator .
19. View the Security settings, and click Next.
20. View the database settings, and click Next.
21. View the Reporting database settings, and click Next to complete the installation.
22. Click Finish.

    The cluster node for the selected Orchestrator is installed.

Synchronize Time for a Cluster Node

A cluster node for any Orchestrator must have the exact same clock time as the primary node. Take one the following approaches to synchronize the time of all nodes in a cluster:

- Synchronize all Orchestrators and cluster nodes to a standard external time server (preferred).
- Manually synchronize the time of additional nodes to that of the primary node as follows:

  1. Verify the accuracy of the primary node time.
  2. Run the appropriate OS command on each cluster node to synchronize its time with the time of the primary node. For example, you can use command like the following for synchronizing a cluster node with the primary node.

     Windows

     ```
     net time \\primarynodename /set /yes
     ```

     Unix/Linux

     ```
     ntpdate -u primarynodename
     ```

Appendix A: Using SiteMinder with CA Process Automation

CA SiteMinder provides Single Sign-On (SSO) capabilities across single- and multiple-cookie domains, letting users access applications across different Web Servers and platforms while entering their credentials only once in each session.

This section contains the following topics:

CA SiteMinder Prerequisites

Verify that your system meets the following prerequisites to install CA Process Automation with CA SiteMinder:

- A CA EEM server that is integrated with the same LDAP/AD that is used as a User Directory in the SiteMinder Policy Server.
- A CA SiteMinder Web Agent that is integrated with either IIS or Apache.

You can use the SiteMinder Apache agent only when there is an Apache-based load balancer and clustered Orchestrator. For a standalone Orchestrator, set up port forwarding from Tomcat 8080 to IIS port 80 so the SM IIS agent functions.

Note: For more information, see the CA *SiteMinder WebAgent Installation Guide*.

For security, work directly with your CA SiteMinder Administrator to understand and follow all existing guidelines for your organization's use of CA SiteMinder.

Important! You must reinstall CA Process Automation Agents (instead of merely restarting) when the Domain Orchestrator URL changes. The following changes can affect the Domain Orchestrator URL:

- Changing the Domain Orchestrator from SSO-enabled to SSO-disabled.
- Changing the Domain Orchestrator from SSO-disabled to SSO-enabled.
- Pointing the Domain Orchestrator to a different SSO server.

Configure the CA SiteMinder Policy Server Objects

To configure CA SiteMinder, access the CA SiteMinder Policy Server Administrative UI. For more information, see the *CA SiteMinder Policy Server Configuration Guide*.

Important! Before you configure CA SiteMinder for CA Process Automation, consult your CA SiteMinder Administrator. Your company may have established policies for selecting or creating Domains, naming conventions for other entities, or other site-specific security considerations.

To configure a Web Agent object to integrate with CA Process Automation:

1. Create an Agent configuration Object in the Infrastructure Section of the CA SiteMinder Administrative UI. Select either ApacheDefaultSettings or IISDefaultSettings, depending on which web agent the web servers will host.
   - Navigate to the BadUrlChars property of the Web Agent and remove "/." and "//" from the property.
   - Navigate to the IgnoreExt property and remove ".gif,.jpg,.jpeg,.png" from the property value.
   - Navigate to LogoffUri property and set it to "/itpam/Logout".
2. Create a Host Configuration Object. Select either ApacheDefaultSettings or IISDefaultSettings, depending on which web agent the web servers will host.
3. Create a user Directory Object in the Infrastructure Section of the CA SiteMinder Administrative UI.
4. Create or select a domain in the Domain section of the CA SiteMinder Administrative UI.
5. Create a Realm in the Domain section of the CA SiteMinder Policy Server UI.
6. In the new Realm, specify the correct Agent name, set the resource filter to "/itpam", and select Protected in the Default Resource Protection section.
7. In the new Realm, create a rule with Resource as "*" so that the resource looks like web_agent/itpam* and select all in the Actions section.

   Note: Specify this rule in the Policies section by adding it to an existing policy or a new policy. For more information, see the *CA SiteMinder Policy Server Configuration Guide*.
8. Create a subrealm for each of the following URLs and select Unprotected in the Default Resource Protection section:
   - /swaref.xsd
   - /genericNoSecurity
   - /images
   - /StartAgent

- /itpamclient
- /ServerConfigurationRequestServlet
- /MirroringRequestProcessor
- /soapAttachment
- /AgentConfigurationRequestServlet
- /soap
- /css
- /js

9. Create a policy in the Policies section and add the rule that you created in Step 7 to the policy.

   For more information, see the *CA SiteMinder Policy Server Configuration Guide*.

10. (Optional) Use the default values to create a custom response variable and use it as the SSO Authentication Parameter.

    a. Create a custom response attribute **pamuser** of the type WebAgent-HTTP-Header-Variable.

    b. Set the Variable Value as the parameter used for LDAP/ActiveDirectory user ID.

    c. Add this custom response to the rule mentioned in Step 9.

       Note: During the CA Process Automation installation, specify the header parameter **pamuser** as the SSO Authentication Parameter with SSO Authentication Type as **Header**. For more information, see the *CA SiteMinder Policy Server Configuration Guide*.

Integrate CA Process Automation with IIS for Single Sign-On

Note: To integrate CA SiteMinder with clustering, select the Apache SiteMinder agent.

To configure Single Sign-On with IIS

1. Have your CA SiteMinder Administrator install CA SiteMinder WebAgent on a computer that has IIS installed.
2. If IIS is configured for SSL, unzip the IIS_https_httpfolders.zip from the /SSO/IIS folder of the CA Process Automation Third-Party Prerequisites media to the home directory of the website on which CA SiteMinder is integrated.

3. Verify that the following folders are created in the home directory:
   - c2orepository +
   - itpam
   - mirroringrepository
4. Open IIS Manager and remove SSL mode from the following folders:

   In the website:

   - c2orepository
   - mirroringrepository

   In the itpam folder:

   - MirroringRequestProcessor
   - StartAgent
   - genericNoSecurity

   To remove the SSL mode:

   a. Open the properties of the corresponding folder.

   b. Select the Directory Security tab, then click Edit in the Secure communication section and clear the Require SSL Channel check box.

   Note: To integrate CA Process Automation, use the "Tomcat Redirector" filter when CA SiteMinder Web Agent is deployed on IIS.

How to Configure IIS to Redirect to Tomcat

Prerequisite

CA SiteMinder Agent should be running on the same IIS server, before configuring “Tomcat redirector” to redirect requests to CA Process Automation. For more information see the *CA SiteMinder Installation Guide*.

Follow these steps:

1. Verify that IIS web server is installed and running successfully.
2. Copy the TomcatRedirector folder to the computer on which IIS is installed, preferably in the following path:

   ```
   C:\Program Files\CA\SharedComponents
   ```

3. Edit the isapi_redirect.properties file from the bin folder to reflect the correct path if it is different.

   Example

   ```
   # Configuration file for the Jakarta ISAPI Redirector
   # The path to the ISAPI Redirector Extension, relative to the
   website
   # This must be in a virtual directory with execute privileges.
   extension_uri=/TomcatRedirector/isapi_redirect.dll
   ```

   Note: TomcatRedirector is the virtual directory name.

   ```
   # Full path to the log file for the ISAPI Redirector
   log_file=C:\Program
   Files\CA\SharedComponents\TomcatRedirector\logs\isapi_redirect.
   log
   # Log level (debug, info, warn, error or trace)
   log_level=error
   # Full path to the workers.properties file
   worker_file=c:\Program
   Files\CA\SharedComponents\TomcatRedirector\conf\workers.propert
   ies
   # Full path to the uriworkermap.properties file\
   worker_mount_file=c:\Program
   Files\CA\SharedComponents\TomcatRedirector\conf\uriworkermap.pr
   operties
   ```

4. Edit the host name in the TomcatRedirector\conf\workers.properties file to reflect the correct host name. Replace the references to localhost.

   Example:

   ```
   # statement and uncomment the three worker.ajp13w01 lines
   ##############################################################
   #######
   # The workers that jk should create and work with
   worker.list=ajp13w01
   # Defining a worker named ajp13w01 and of type ajp13
   # Note that the name and the type do not have to match.
   worker.ajp13w01.type=ajp13
   worker.ajp13w01.host=pa-w2k3
   worker.ajp13w01.port=8009
   ```

   Note: In the preceding code, pa-w2k3 is the computer on which CA Process Automation is installed.

5. Open the IIS Manager console.

6. Right-click Default web site and pick new virtual directory and reference the TomcatRedirector\bin folder you created in Step 4.

7. Navigate to the TomcatRedirector\logs folder in Windows Explorer and give all permissions to the log file in that folder to the Network Service user.

8. Right-click the virtual directory and pick properties, click “Create” beside application name, select “Scripts and Executables” for Execute permissions, and click OK.

   Note: Verify that the Application Name value is same as the Virtual directory name provided in the isapi_redirect.properties file (Step 3).

   a. Right-click Web Service Extensions, name it as TomcatRedirector, and select the path to the TomcatRedirector\bin\isapi_redirect.dll file to add a Web Service Extension. Select the Set extension status to allowed option.

   b. Recycle the IIS Admin Service

9. Add the isapi_redirect.dll as an ISAPI Filter in your IIS website. Open the IIS Manager and right-click the Web Sites folder to open the properties dialog for all web sites, select the ISAPI filter tab, click Add, and select the isapi_redirect.dll as executable.

10. Verify that requests are being forwarded to Tomcat by hitting http://localhost:80.

Integrate CA Process Automation with Apache for SSO

To configure Single Sign-On with Apache

1. Have your CA SiteMinder Administrator install CA SiteMinder WebAgent on a machine that has Apache installed on it.

2. Configure Apache with Public Host settings. For more information see Install the Domain Orchestrator (see page 70).

   Note: Contact your CA SiteMinder Administrator for more details.

Enable Logout in CA Process Automation for SSO

To enable logout in CA Process Automation for SSO

1. Navigate to the following location in the CA Process Automation installation media:

   ```
   PAM_INSTALL_DIR/server/c2o/.config
   ```

2. Double-click to open OasisConfig.propeties file and modify ALLOW_SSO_LOGOUT to true.

Appendix B: Maintain the Orchestrator DNS Name or IP Address

This section contains the following topics:

Maintain IP Addresses

The need to maintain IP addresses and or names can arise. Examples follow:

- Change IP address and name of an Orchestrator.

  Modify the name and IP address combination wherever they appear in the following files. An example install folder is C:\Program Files\CA\PAM\server\c2o.

  install_folder\.config\OasisConfig.properties

  install_folder\.config\Domain.xml

  Note: To continue to use an unchanged host name in all references in CA Process Automation, modify the DNS with the new IP address.

- If you install agents using IP address that change, reconfigure the agent by Updating the following file:

  install_folder\.config\OasisConfig.properties

  Change the value of the following property:

  oasis.jxta.host

- Use multiple IP addresses for CA Process Automation when you have two NICs, one internal, another external.

  To get CA Process Automation to bind at the external IP address, add the following property to OasisConfig.properties:

  jboss.bind.address=<x.x.x.x>

Resolve Invalid Character in CA Process Automation DNS Name

In Release 3.1, CA Process Automation accepted the installation of Orchestrators with DNS names containing restricted characters, such as underscores (_).

If you installed an Orchestrator with an invalid host name, you must take the following corrective actions:

1. Create a DNS record that maps the corrected host name to its IP address.

   See Syntax for DNS Host Names (see page 155) for standards.

2. Create a DNS record that maps the incorrect name to the corrected name.

   See Enable DNS to Resolve Invalid Host Name (see page 154).

3. Update the OasisConfig.properties file with the corrected name.

   See Maintain the DNS Host Name (see page 155).

Enable DNS to Resolve an Invalid Host Name

If you created an Orchestrator with a host name that includes an underscore or another invalid character, you can take steps that let the DNS server resolve the correct IP address from an invalid host name. This requires that you create two records in the DNS server. The first record states that the original invalid name is an alias of another canonical name.

Follow these steps:

1. In the Domain Name System, create a canonical record with new, valid host name.
2. Create a CNAME record that maps the canonical name to the original, invalid name.

Name	Type	Value
my_host.mycompany.com.	CNAME	myhost.mycompany.com.
myhost.mycompany.com	A	172.24.36.107

In this example, my_host.mycompany.com is an alias for the canonical name (CNAME) myhost.mycompany.com.

When the DNS resolver finds a CNAME record when querying for the original resource record, it restarts the query using the CNAME instead of the original name. The canonical name that a CNAME record points to can be anywhere in the DNS.

Maintain the DNS Host Name

You can modify the host name for an Orchestrator. For example, if the host name does not conform to the supported syntax, you can update it. If you installed CA Process Automation using an invalid DNS host name containing restricted characters such as underscores, create an alias that conforms to DNS standards. Then, manually replace the invalid host name with this alias in your OasisConfig.properties file.

Follow these steps:

1. Create an alias. See Enable DNS to resolve an invalid host name (see page 154).
2. Log in as an administrator to the server where the Domain Orchestrator is installed.
3. Navigate to the following folder, where install_dir refers to the path where the Domain Orchestrator is installed:

   install_dir`/server/c2o/.config`
4. Open the OasisConfig.properties file with an editor.
5. Use Find to locate the following property:

   `oasis.local.hostname`
6. Change the value for the property oasis.local.hostname=.
7. Save the file and exit.
8. Restart the Orchestrator service.
   a. Stop the Orchestrator (see page 95).
   b. Start the Orchestrator (see page 96).

Syntax for DNS Host Names

There are many places where you can enter a FQDN or an IP address. If your DNS host names include an underscore or in any way do not conform to the required syntax, specify the IP address.

Valid DNS host names:

- Begin with an alpha character.
- End with an alphanumeric character.
- Contain 2-24 alphanumeric characters.
- Can contain the special character (-) minus sign.

  Important! The minus sign (-) is the only valid special character permitted in DNS host names.

Appendix C: Troubleshooting

This section describes the troubleshooting methods to use CA Process Automation.

This section contains the following topics:

CA Process Automation Installation Fails

Symptom:

If an initial attempt to install CA Process Automation fails, subsequent attempts to install CA Process Automation at the same location also fail.

Solution:

To reinstall CA Process Automation, either clean up the leftover registry entries, files and folders at that location before you begin the installation, or use a different location.

Oracle Bug # 9347941

Important! When running with versions of the Oracle RDBMS prior to release 11.1.0.7 CA Process Automation would occasionally hit known Oracle RDBMS defect 9347941 in which concurrent inserts of CLOB data where the individual column values exceed 52K bytes in size have such columns updated incorrectly with data past the 52K offset replaced by spaces. This issue has been seen using both 10g and earlier 11g versions of the Oracle RDBMS.

Symptom:

CA Process Automation process would become stuck. You need to reset the process at the corresponding operator where the process is stuck to continue the process execution to complete. This problem is infrequent and occurs only with extremely high rates of update contention.

Solution:

This has not been seen when running either version 11.1.0.7 or 11.2.0.2 of Oracle, and It is recommended that sites using Oracle for their CA Process Automation databases be running version 11.1.0.7 or 11.2.0.2 or later.

Limitations in Internet Explorer

Internet Explorer limits the agent installation in a network other than the network where Domain Orchestrator is installed.

Symptom:

Access the Domain Orchestrator using Internet Explorer and install the CA Process Automation Agent in a network other than the network where Domain Orchestrator is installed. The installation may fail while downloading JAR files for installation.

Solution:

A possible cause of this sporadic issue might be that Java is unable to load JAR files while routing through the proxy in Internet Explorer. To mitigate this issue, change Java Network Settings to the Direct Connect option before you install the Agent.

Follow these steps:

1. Open the Java Control Panel on the host system where you install the Agent.
2. Open Network Settings from the General tab.

   The Network Settings page appears.
3. Select the Direct Connect option and click OK to save changes.
4. Install the Agent.

Limitations in Microsoft SQL Server SQL JDBC Driver's handling of Socket Read

Consider the scenario of a thread executing the driver code waiting on a socket read and a network packet is lost. The thread executing the socket read is blocked due to a Microsoft SQL Server JDBC driver that cannot specify a time-out. This socket reading limitation is present in any version of Microsoft SQL Server JDBC Driver that CA Process Automation supports, up to the latest version available at the time of publication (4.0.2206.100).

Symptom:

This issue is infrequent and has only been known to occur when the Orchestrator is running on a virtual machine configured with an E1000 NIC card. When the problem does occur, its most frequent symptom is that of CA Process Automation processes freezing. You can verify if a process is frozen by checking a JMX thread dump. If you think you might be experiencing this issue, contact support to confirm its occurrence.

Solution:

To mitigate the problem, we recommend using VMXNet NIC cards in the virtual machines where the Orchestrator and database for CA Process Automation are installed. While using VMXNet NIC cards does not address the fundamental limitation, it has been proven to be effective and gives better performance than an E1000 NIC card. Check support.ca.com to see if a complete solution for a later version of Microsoft SQL Server JDBC Driver exists.

CA Process Automation Installation on Dual Stack (IPv4 and IPv6) Network Environments

If you install CA Process Automation on dual stack (IPv4 and IPv6) network environments, CA Process Automation may fail to boot up.

Symptom:

When you install CA Process Automation on dual stack (IPv6 and IPv4) network environments, you may experience issues while bringing up or accessing the following CA Process Automation components across network:

- Domain Orchestrators
- Orchestrators
- Agents

Solution:

Disable IPv6 stack on the host system where any of the following CA Process Automation components are running and restart the services:

- Domain Orchestrators
- Orchestrators
- Agents

Catalyst Container in CA Process Automation does not support Java 7

If CA Process Automation uses Java 7, then the Catalyst container fails to initialize during Orchestrator startup.

Symptom:

PAM_install_folder/server/c2o/log/c2o.log contains a message similar to:

```
2012-10-08 12:54:26,590 WARNING
[com.ca.catalyst.container.impl.ContainerImpl] [onnectorManager]
Failed to get bundle information for container start reference bundle:
org.apache.felix.webconsole
```

```
2012-10-08 12:54:56,610 ERROR
[com.optinuity.c2o.ucf.UCFPAMConnectorManager] [onnectorManager]
UCFPAMConnectorManager failed to initialize UCF Connector.
```

All Catalyst container functionality, including web and REST services, running on this Orchestrator will not be available.

Solution:

Install or reconfigure CA Process Automation r4.1 to use Java 6, if you intend to use Catalyst REST services. Alternatively, open <PAM-HOME>PAM\server\c2o\bin\c2osvcw.conf file and update the following attributes to reflect the correct Java path:

```
wrapper.java.command=c:/program files/java/jdk1.6.0_26/bin/java
```

```
wrapper.java.classpath.2=c:/program
files/java/jdk1.6.0_26/lib/tools.jar
```

Slow Performance Using MySQL

Symptom:

When I install CA Process Automation using MySQL or Oracle as the database, I notice performance is lacking.

Solution:

Post-installation, modify the oasis-ds.xml file to enhance CA Process Automation performance.

Do the following:

1. Locate and open the oasis-ds.xml file, located in:]

   <PAM Install Directory>\server\c2o\ext-deploy

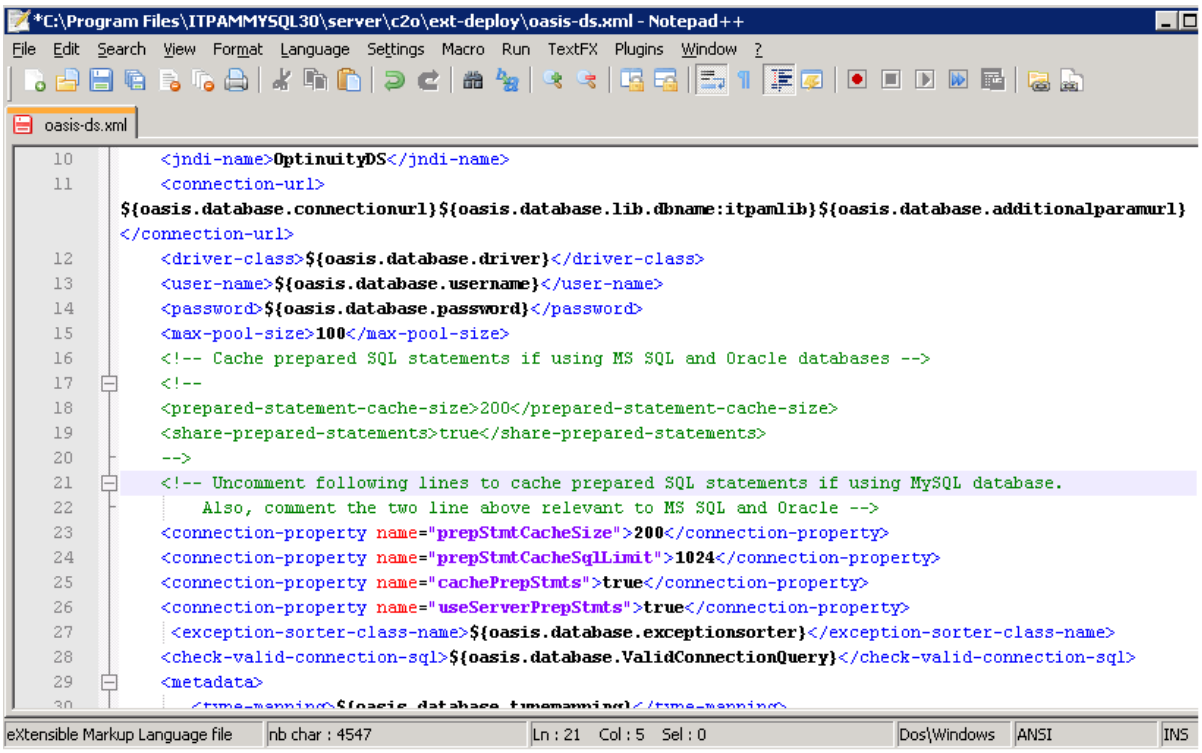
2. Uncomment the following lines:

```
21  <!--
22  <connection-property name="prepStmtCacheSize">200</connection-property>
23  <connection-property name="prepStmtCacheSqlLimit">1024</connection-property>
24  <connection-property name="cachePrepStmts">true</connection-property>
25  <connection-property name="useServerPrepStmts">true</connection-property>
26  -->
```

3. Comment the following lines:

```
16  <!-- Cache prepared SQL statements if using MS SQL and Oracle databases -->
17  <prepared-statement-cache-size>200</prepared-statement-cache-size>
18  <share-prepared-statements>true</share-prepared-statements>
```

The updated file should look like this:



4. Restart the Orchestrator.

Unable to Create Runtime Database

Symptom:

When I install an Orchestrator and provide the runtime database in the Runtime Database screen, the following exception is thrown:

```
The Runtime Database is being used by another orchestrator.
```

Solution:

CA Process Automation r4.0 does not allow you to share the same runtime database across Orchestrators. Typically the solution for this is to create the Runtime Database using another name, or hosted by a separate database server.

Use the following procedure **only** if you want to retain the runtime information in this database in a new CA Process Automation instance. This is rarely the case, and resetting the RuntimeDbOrchestratorID has many undesirable side effects, including making it impossible for running operators in this runtime database to complete. All agents and secondary Orchestrators must also be reinstalled, among other issues. If you have any doubt whether this procedure is appropriate for your problem, consult Technical Support before you proceed.

In this release, a new Properties table is created in the database with the following columns:

- PropKey
- PropValue

Whenever an Orchestrator uses a Runtime database, a new row is inserted in the Properties table. The PropKey is RuntimeDbOrchestratorID and the PropValue is the unique ID of the Orchestrator.

When another Orchestrator requests for the same database, the database is validated in the Properties table. If the unique ID of the requesting Orchestrator is not similar to the Propvalue, then the following message appears:

```
The Runtime Database is being used by another Orchestrator.
```

Important! The runtime database entries are not deleted even after you uninstall the product.

To use the same database again for Runtime, execute the following SQL query and delete the corresponding row form the Properties table.

```
delete from properties where propkey = 'RuntimeDbOrchestratorID'
```

Unable to Execute Run Script or Run Program Operators on RHEL6

Symptom:

The Run Script or Run Program operators fail when they are run on RHEL6.

Solution:

The Run Program and Run Script operators look for Korn shell (ksh) when they get execute on UNIX or Linux platforms. By default, RHEL 6 does not have ksh installed.

This issue can be resolved by following either of these options:

- Installing ksh:

  ksh can be installed using the following command:

  ```
  yum install ksh
  ```

- Pointing a symbolic link to a valid shell

  Create a symbolic link /bin/ksh and map the same to any shell (such as Bash) that exists on that computer. Use this command, where /bin/bash is the location of bashshell:

  ```
  ln -s /bin/bash /bin/ksh
  ```

Appendix D: Using Self-Contained Mode CA Process Automation

Self-contained mode is designed to install CA Process Automation with reduced prerequisites. Selecting self-contained mode at installation allows you to install CA Process Automation without first installing CA EEM and an external database server. Self-contained mode comes with an internal user directory and a dedicated Derby database instance as an internal database. Self-contained mode CA Process Automation supports the installation of only a stand-alone Domain Orchestrator and one or more agents (if necessary).

Important! It is not recommended to use CA Process Automation installed with self-contained mode for automating processes for production use. It is preferable to install CA Process Automation with CA EEM and an external database for production use.

This section contains the following topics:

Installation Procedure

Third-party prerequisites for an self-contained installation are the same as those required for a standard installation. You can install third-party prerequisites from DVD1.

The self-contained mode installation process consists of the following:

1. During the Domain installation, a drop-down menu presents you with the options to select a standard installation or an self-contained mode installation. Select the Self-contained option.
2. An additional screen provides the parameters for Derby, such as port, host, Network Mode and the default location for Derby files.

   Note: The fields are populated with default values. CA Process Automation is functional with these values.

You can convert an self-contained installation of CA Process Automation to a standard instance. Reinstall CA Process Automation and select standard mode.

Important! Reinstalling from self-contained mode to standard mode does not migrate data from the self-contained instance to the standard instance.

Overview of CA Process Automation in Self-Contained Mode

CA Process Automation in self-contained mode differs from CA Process Automation in standard mode. Consider the following differences:

- As an alternative to using CA EEM for user authentication and authorization, authorization information is kept in the pam-user.properties file.

  You can find this file in the c2o/conf/props folder. The pam-user.properties file holds the names and encrypted passwords of users.

- As an alternative to external RDBMS, CA Process Automation in self-contained mode uses an internal Derby database.

  By default, database files are populated in the c2o/data/derby folder. The following three databases are created by default:

  PAM_ LIB

  The Library database stores data for automation objects created in folders in the Library tab in CA Process Automation. The stored data includes the complete definition of each object, as well as ownership, versioning information, and the library tree structure.

  PAM_ RT

  The Runtime database stores information about currently running process instances and historical process instances. You can access this data from the Operations tab by selecting Current or Archived. The runtime records include the state, dataset, and owner for each object instance, and scheduling information.

  PAM_ REP

  The Reporting database stores historical data for automation object instances, including processes, resources, schedules, and process watches. You can generate near real-time reports with this data in the Reports tab using predefined report definitions and custom report definitions.

Default Users

CA Process Automation is installed with the following default roles:

- PAMUsers, a role with login permission.
- Designers, a role with content design permissions.
- Production Users, a role with permissions to use designed objects.
- PAMAdmins, a role with unlimited permissions including configuration.

Each default role has one default user.

Credentials for the default user for PAMUsers follow:

- Username: pamuser
- Password: pamuser

Credentials for the default user for Designers follow:

- Username: pamdesigner
- Password: pamdesigner

Credentials for the default user for Production Users follow:

- Username: pamproduser
- Password: pamproduser

Credentials for the default user for PAMAdmins follow:

- Username: pamadmin
- Password: pamadmin

Note: For more information on user permissions, see the topic Review Permissions for Default Groups in the *Content Administrator Guide*.

Encrypt and Save User Passwords

CA Process Automation uses the credentials stored in the pam-users.properties file for authenticating users when CA Process Automation is used in self-contained mode. When CA Process Automation is installed in self-contained mode, the properties file contains encrypted passwords for the default users. For example:

```
pamadmin=encrypted_password
pamproduser=encrypted_password
pamdesigner=encrypted_password
pamuser=encrypted_password
```

You can encrypt the passwords of your CA Process Automation users and then save the encrypted password with the associated user name in the pam-users.properties file. For example:

```
username1=encrypted_password
```

CA Process Automation provides the following encryption files:

- Windows: PasswordEncryption.bat
- UNIX or Linux: PasswordEncryption.sh

Follow these steps:

1. Add the user ID for each CA Process Automation user in the pam-users.properties file:
   a. Navigate to the following folder:

      install_dir/server/c2o/conf/props

   b. Open the pam-users.properties file in an editor.
   c. Add the user ID for each user on a separate line followed by an equal sign:

      username1=

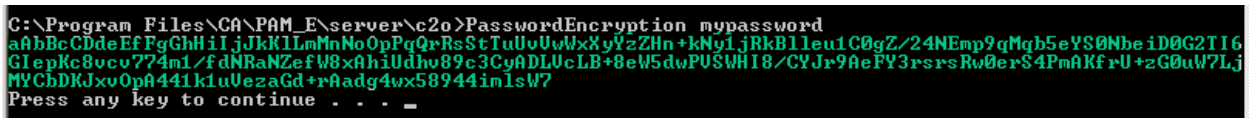
      username2=

   d. Save the file. Keep the file open.
2. Obtain a password for each user.
3. Open a command prompt and navigate to the CA Process Automation directory where the PasswordEncryption script resides:

   install_dir/server/c2o
4. For each user password, use the following procedure to update the pam-users.properties file:
   a. Run the following command once for each user password:

      PasswordEncryption *passwordtoencrypt*

The password is generated. Following the encrypted password is the message "Press any key to continue ..."



b. Copy the encrypted value that this process returns.

c. Paste the encrypted password value as the assignment for the corresponding user name.

username=encrypted_password

d. Save the file pam-users.properties file.

e. Press any key.

f. Repeat this procedure until you have added passwords for all users to the pam-users.properties file.

5. Close the pam-users.properties file.

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