Universal CMDB

Software Version: 10.33

FIPS Deployment Guide

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Document Changes

Publication Date	Summary of Changes
10.33 (2nd Edition, May 2018)	• Added clarification that when prompted for the **server-fips.keystore** password, users should enter their password, instead of updating the password. • Updated the Azul OpenJDK JCE dependencies download link to **Zulu Cryptography Extension Kit**. • Updated the Oracle JRE path example from *jre1.8.0_**45*** (Oracle JRE version used in 10.22) to *jre1.8.0_**92*** (Oracle JRE version used in 10.33) • Other minor improvements

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Contents

Chapter 1: Introduction to FIPS Deployment

Welcome to the *Universal CMDB FIPS Deployment Guide*.

The Federal Information Processing Standard (FIPS) Publication 140-2, “Security Requirements for Cryptographic Modules,” was issued by the National Institute of Standards and Technology (NIST) in May 2001. The standard specifies the security requirements for cryptographic modules utilized within a security system that protects sensitive or valuable data.

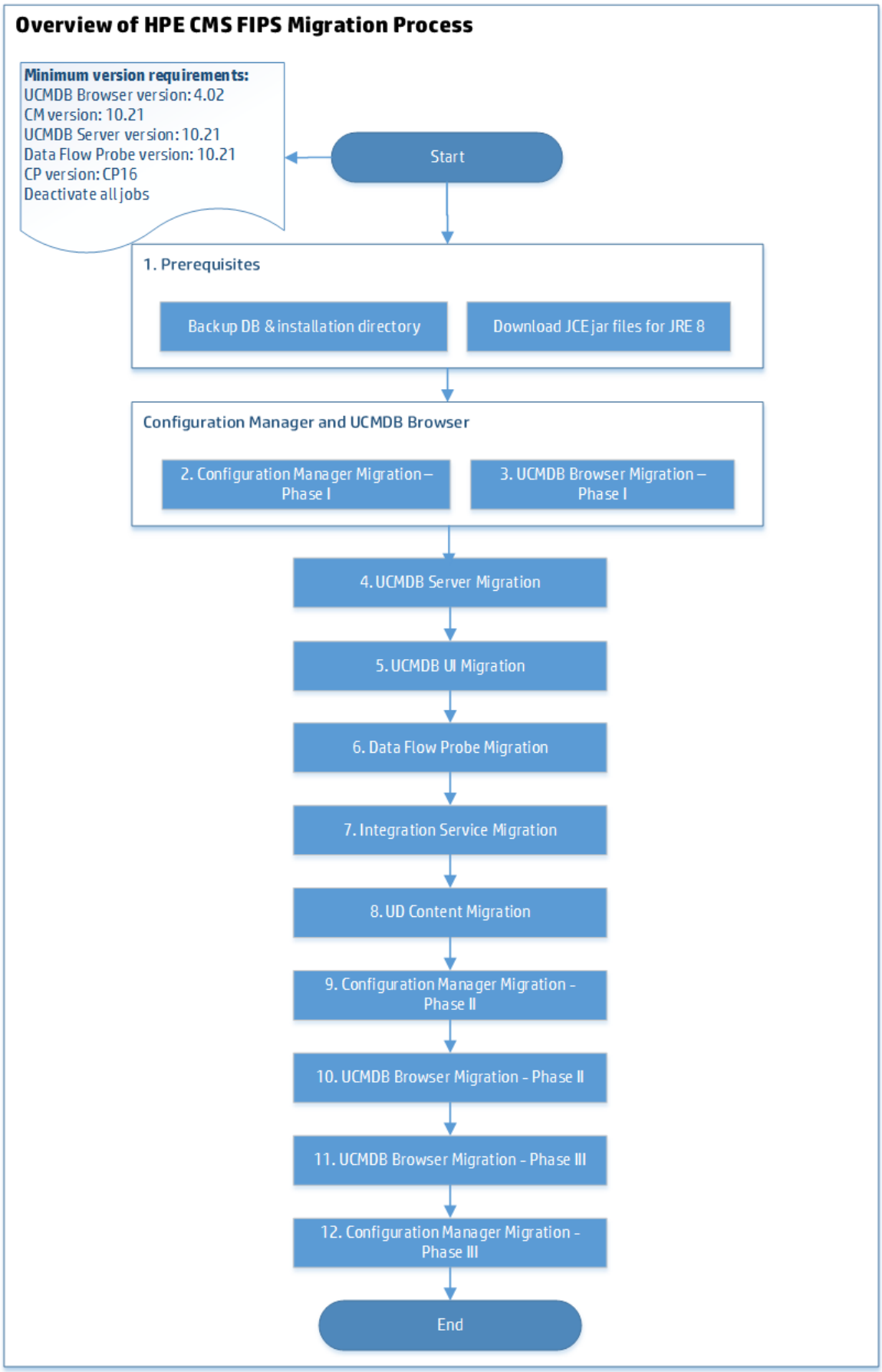
Starting from version 10.21, CMS supports running in FIPS mode. The FIPS mode covers all parts of the CMS system, including UCMDB Server, Universal Discovery, UCMDB Browser, and Configuration Manager.

This guide provides guidelines for switching the CMS system to the FIPS mode. We strongly recommends you to follow the guidelines strictly to avoid any unforeseen risk that may be introduced by the complex FIPS solution. This guide also walks you through the entire FIPS migration process step-by-step to ensure that the FIPS mode can be successfully turned on for CMS 10.21.

Chapter 2: Overview of the FIPS Migration Process

The diagram below illustrates the overall FIPS migration process for the CMS system.

> **Note:** This step by step FIPS migration process applies to the HTTPS configuration. This is also the strongly recommended configuration. Considering the limitation with the HTTP configuration, organizations adopting FIPS security standards would find HTTP configuration insufficient.


Overview of HPE CMS FIPS Migration Process
Minimum version requirements:
UCMDB Browser version: 4.02
CM version: 10.21
UCMDB Server version: 10.21
Data Flow Probe version: 10.21
CP version: CP16
Deactivate all jobs
Start
1. Prerequisites
Backup DB & installation directory
Download JCE jar files for JRE 8
Configuration Manager and UCMDB Browser
2. Configuration Manager Migration – Phase I
3. UCMDB Browser Migration – Phase I
4. UCMDB Server Migration
5. UCMDB UI Migration
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7. Integration Service Migration
8. UD Content Migration
9. Configuration Manager Migration - Phase II
10. UCMDB Browser Migration - Phase II
11. UCMDB Browser Migration - Phase III
12. Configuration Manager Migration - Phase III
End

Important Notes

Before you decide to switch your CMS system to the FIPS mode, you should be aware of the following important notes:

- The FIPS mode is not compatible with non-FIPS mode. For example, data flow probes in FIPS mode cannot connect to a non-FIPS compliant UCMDB Server.
- Once the FIPS mode is enabled, there is no way to disable it.
- Always switch Configuration Manager and UCMDB Browser to FIPS mode before you start to switch the UCMDB server to FIPS mode.
- **Basic Authentication.** Basic Authentication must be disabled before you start to enable the FIPS mode.
- **Data Flow Probes.** Before switching to FIPS mode, make sure that you have deactivated all discovery jobs.
- **Integration Service.** You have deactivated all integration jobs.
- **DDMI agents.** The FIPS mode does not support DDMI agents. You need to ensure that all DDMI agents have been successfully migrated to UD agents before you start the whole FIPS migration process.

  The table below describes different types of agents you might have in your environment and if any action is required from you:

Agent type	Covered by the automatic FIPS migration process?	Action required
DDMI agents	No	Migrate all DDMI agents to UD agents before the FIPS migration process starts.
Pre-10.33 UD Agents	Yes	None
10.33 (or later) non-FIPS UD Agents	Yes	None

  For details about how to migrate DDMI agents to UD agents, see the *DDMI to Universal Discovery Migration Walkthrough Guide*.

- **Download and copy the Zulu Cryptography Extension Kit**. Before running the upgrade script to upgrade UCMDB from version 10.2x in FIPS mode to version 10.3x, stop the UCMDB Server first,

and then copy the **Zulu Cryptography Extension Kit** to the **%UCMDB_HOME%/bin/jre/lib/security/** directory.

- **Set master key before upgrade.** Before running the upgrade, make sure the master key is set. You can set it by invoking the **changeMasterKey** JMX method. For detailed instructions, see *Universal CMDB JMX Reference Guide*.

Chapter 3: FIPS Concepts

Out of the Box (OOTB) UCMDB Certificates and Keystores Used in FIPS Mode

After switching the UCMDB Server to FIPS mode, it will use the new out of the box (OOTB) keystore and truststore files which contain new certificates. The keystores are of type PKCS12 and we have used the JsafeJCE cryptography provider (from Crypto-J toolkit) for creating them. In FIPS mode UCMDB uses a new certificate chain which is composed of two self-signed certificates: HPE Universal CMDB Root (**hproot**) > signs > HPE Universal CMDB (**hpcert**).

In order to be able to securely communicate with the UCMDB Server, for all the SSL clients (UCMDB UI, UCMDB Browser, UCMDB Configuration Manager), you should import either the hproot or hpcert certificate into their truststores. Since hpcert should be re-generated, and in order to avoid the manual import on all the probes' truststores, the hproot certificate is imported into the probe truststore by default. Since hproot signs hpcert, hpcert will also be trusted.

You can use your own certificates. You should import them manually into the corresponding keystores. The OOTB keystore/certificates configuration can be a starting example. The "Improving Security" sections contain keytool commands examples for importing certificates into the keystores.

The OOTB FIPS stores on UCMDB Server side are:

- UCMDBServer\conf\security**hproot.keystore** - contains the private key entry and the hproot public certificate
- UCMDBServer\conf\security**server-fips.keystore** - contains the hpcert certificate which is signed by hproot
- UCMDBServer\conf\security**server-fips.truststore** - contains the hproot certificate and the hpprobe certificate

The OOTB FIPS stores on Probe side are:

- DataFlowProbe\conf\security**FIPS_HPProbeKeyStore.jks** - contains the hpprobe certificate
- DataFlowProbe\conf\security**FIPS_HPProbeTrustStore.jks** - contains the hpprobe certificate and hproot certificate

Chapter 4: Step by Step FIPS Migration

> **Note:** This step by step FIPS migration process applies to the HTTPS configuration.
>
> After performing the tasks below, you migrate CMS 10.3x to FIPS mode and you will use the OOTB self-signed certificates, keystores, and truststore files.
>
> If you wish to perform additional customization, see "Improving Security" on page 44.

The step-by-step instructions for switching the CMS 10.3x system to the FIPS mode consists of the following tasks:

Task 1. Prerequisites

- **Version requirements:**
  - UCMDB Server version 10.33
  - Configuration Manager version 10.23
  - Data Flow Probe version 10.33
  - UCMDB Browser version 4.14 (or later)
  - Content Pack version 24.00 (or later)

- **Back up UCMDB database and UCMDB Server installation directory.** Before switching the UCMDB Server to FIPS mode, perform a backup of the UCMDB database and the entire UCMDB Server installation directory.
- **Download the correct version of the JCE Unlimited Strength Policy Files** for the JRE version you use, because the JCE Unlimited Strength Policy Files are different for each JRE version.

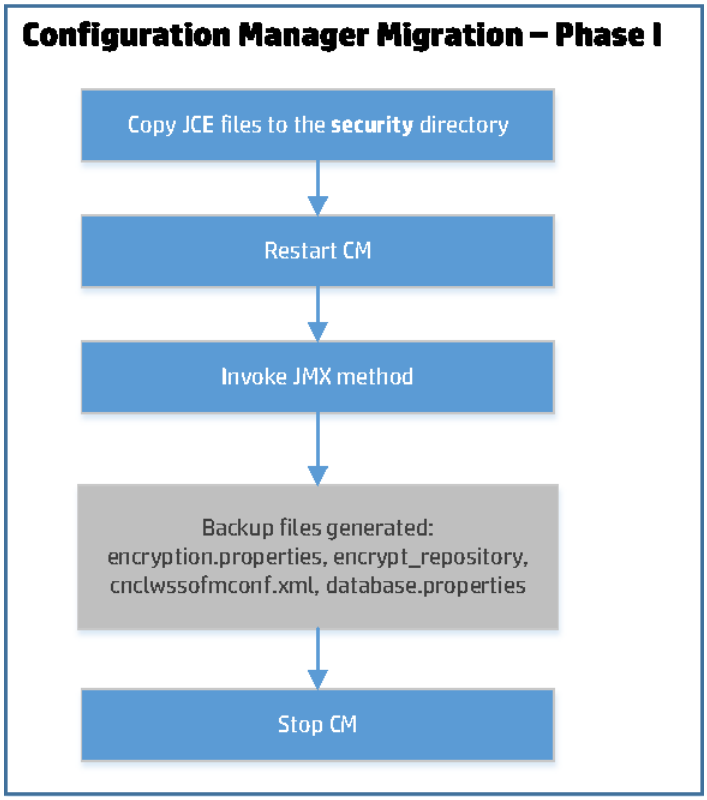
  For example, for version 10.3x, UCMDB Server uses OpenJDK, the JCE Unlimited Strength Policy Files should be downloaded from Zulu Cryptography Extension Kit provided by OpenJDK.

  > **Note:** Configuration Manager (CM) version 10.23 still uses JRE 8, the JCE Unlimited Strength Policy Files should be downloaded from Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files 8 Download.

- Understand that you should strictly follow the sequence in this step-by-step FIPS migration process.

  For example, always switch Configuration Manager and UCMDB Browser to the FIPS mode before you switch the UCMDB server to FIPS mode. Because switching the UCMDB Server to the FIPS mode also updates the LW-SSO configuration, which means that you will not be able to log in to Configuration Manager if it is still in non-FIPS mode.
- **For Data Flow Probes and Integration Service**, you have deactivated all discovery jobs and integration jobs.

Task 2. Configuration Manager Migration - Phase I



To switch Configuration Manager to FIPS mode,

1. Copy the necessary files.
   - Copy the JCE Unlimited Strength Jurisdiction Policy Files to the **<*Configuration_Manager_installation_directory*>\java\windows\x86_64\lib\security** directory.
   - From the **<*Configuration_Manager_installation_directory*>\lib** folder, copy the following CryptoJ jars:
     - **cryptojce-*.jar**
     - **cryptojcommon-*.jar**
     - **jcmFIPS-*.jar**

into:

<*Configuration_Manager_installation_directory*>\java\windows\x86_64\lib\ext

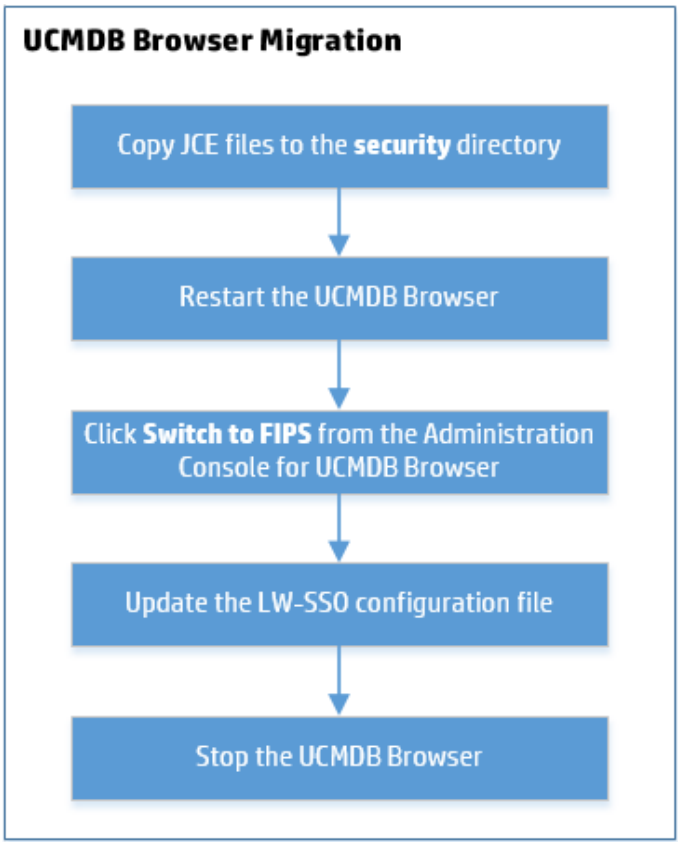
2. Restart Configuration Manager.
3. Invoke the JMX method to switch Configuration Manager to FIPS mode.
   a. Check and make sure that the FIPS mode is not yet enabled.
      i. On the UCMDB server, go to **JMX Console > UCMDB:service=Settings Services > showSettingsByCategory**.
      ii. Invoke the **showSettingsByCategory** method with the following parameters:
         - **customerID:** Enter your Customer ID. The default value is 1.
         - **category:** enable.fips.mode
      iii. If the return message is "No settings found", the FIPS mode is not yet enabled.
   b. Go to the Configuration Manager's JMX console, click **Configuration set service**, and invoke **switchAllConfigurationSetsToFips**.

      > **Note:** You can also run the switch in a test mode, which makes no changes to the system.

4. Backup copies for the following files are generated in a folder specified by you:
   - encryption.properties
   - encrypt_repository
   - cnclwssofmconf.xml
   - database.properties

   A dump of the database entries are also updated in **encryptedProperties.db**.
5. Stop Configuration Manager.

Task 3. UCMDB Browser Migration - Phase I



To switch the UCMDB Browser to the FIPS mode,

1. Copy the JCE Unlimited Strength Policy Files to the **lib\security** directory.

   The UCMDB Browser does not have a JRE. It uses the one available on the machine, so the JCE Unlimited Strength Policy Files must be copied to that JRE. For example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\security**.

2. Restart UCMDB Browser.
3. Check and make sure that the FIPS mode is not yet enabled.
   a. On the UCMDB server, go to **JMX Console > UCMDB:service=Settings Services > showSettingsByCategory**.
   b. Invoke the **showSettingsByCategory** method with the following parameters:

- **customerID:** Enter your Customer ID. The default value is 1.
- **category:** enable.fips.mode

c. If the return message is "No settings found", the FIPS mode is not yet enabled.

4. Switch the UCMDB Browser to the FIPS mode from the UCMDB Browser Administration Console.

   a. Log in to Universal CMDB Browser, hover your mouse over the **<username>** in the top right corner and select **Administration Console** (only admin users have access to it).

   b. In the Administration Console for UCMDB Browser page, Click the **SWITCH TO FIPS** tab in the navigation pane.

      The old files are backed up in the Browser's **temp** folder, where a new folder named as the current timestamp is created.

      You can click the **Show encrypted properties** button to display encrypted properties.

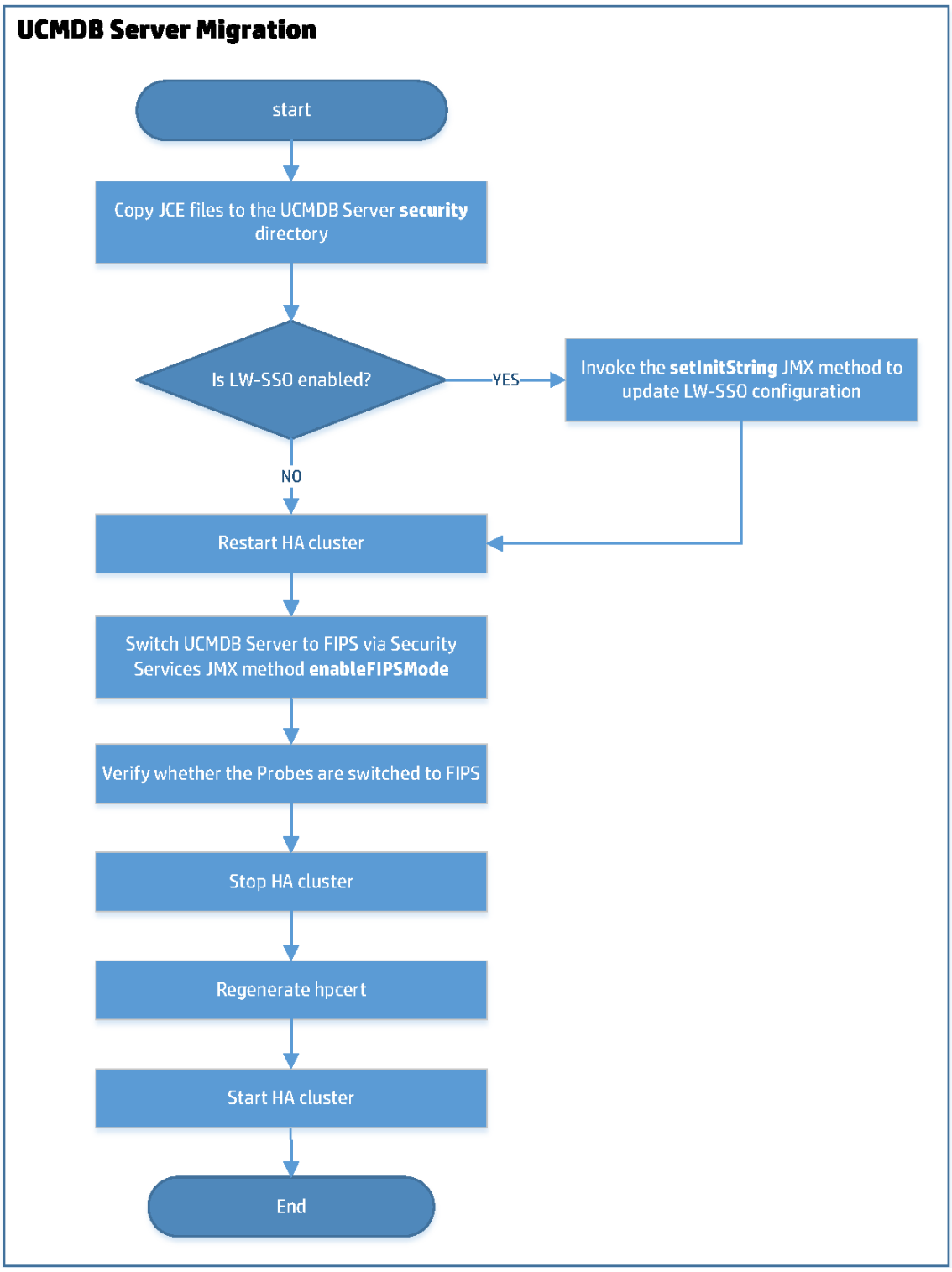
5. After the switch is done, update the LW-SSO configuration file.

   The LW-SSO configuration file **ucmdb_browser_lwsso_config.xml** must be updated to use the FIPS compliant algorithms.

```
<crypto cryptoSource="jce" cipherType="symmetricBlockCipher"
engineName="AES" paddingModeName="CBC" keySize="256"
pbeDigestAlgorithm="SHA1" encodingMode="Base64Url"
jceProviderName="JsafeJCE" jcePbeAlgorithmName="AES"
jcePbeMacAlgorithmName="AES" macType="hmac" macAlgorithmName="SHA1"
directKeyEncoded="true" directKeyEncoding="Base64Url"
algorithmPaddingName="PKCS5Padding" pbeCount="20" macKeySize="256"
macPbeCount="20" initString="what is the init string"></crypto>
```

6. Stop UCMDB Browser.

Task 4. UCMDB Server Migration



This task includes the following:

1. "Switch the UCMDB Server to the FIPS mode" below
2. "Regenerate a new self-signed hpcert and sign it with the default UCMDB root certificate" on the next page

Switch the UCMDB Server to the FIPS mode

1. Copy the JCE Unlimited Strength Policy Files (**local_policy.jar** and **US_export_policy.jar**) into the corresponding server JRE directory (**<UCMDB Server directory>\bin\jre\lib\security**) of all the UCMDB Servers in the HA cluster to overwrite the existing files.
2. If LW-SSO is enabled, go to the **JMX Console > UCMDB-UI:name=LW-SSO Configuration**, invoke the **setInitString** method to set a 32-character length LW-SSO init string.

   > **Note:**
   > - Check and make sure that the all Data Flow Probes are connected to the UCMDB server.
   > - Make sure that UCMDB Browser and UCMDB CM have the same init string, and the configuration works.

3. Restart the HA cluster and make sure that all the UCMDB servers are up and running.
4. Switch the UCMDB Servers from the HA cluster (both writer and readers) to the FIPS mode.
   a. From the writer machine, go to **JMX Console > UCMDB:service=Security Services**.
   b. Invoke the **enableFIPSMode** JMX method with the current passwords for **admin**, **sysadmin**, **UISysadmin** and the CM integration user (if you use UCMDB Configuration Manager).

   > **Important:** For all other users, their passwords will be changed to use the default password from the **security.user.password.default** global setting.
   >
   > Make sure you inform the users that their password will be reset to the default one.

5. Verify and make sure that all the Data Flow Probes are switched to FIPS mode.

   To verify if a probe is switched to the FIPS mode, invoke the probe's JMX method **Get FIPS status** (located in the **MainProbe** category).

   This step is important especially when the Probe and the Server are communicating through HTTPS. In case the automatic migration of the probe to FIPS mode fails and the server is restarted, you need to perform several manual steps on the probe side. For detailed instructions, see "Troubleshooting the Data Flow Probes" on page 51.

6. Stop the HA cluster.
7. Regenerate a new self-signed hpcert and sign it with the default UCMDB root certificate.

   In case you use the UCMDB UI, it is recommended to regenerate the **hpcert** certificate now to add the corresponding Subject Alternative Name (SAN) extensions (DNS name for the Server machine).

   For detailed instructions, see "Regenerate a new self-signed hpcert and sign it with the default UCMDB root certificate" below.
8. Restart the HA cluster.

Regenerate a new self-signed hpcert and sign it with the default UCMDB root certificate

Limitation with the default hpcert Certificate

The default hpcert certificate from **server-fips.keystore** uses a SAN extension with DNS field set to **localhost**. This limits the access to the UCMDB UI only from the UCMDB Server Machine (localhost). That is to say, UCMDB UI must be on the same machine with UCMDB Server, and you can only use URL **https://localhost:8443/** to access the UCMDB Server, neither **https://<UCMDB_Server_Name>:8443/** nor **https://<UCMDB_Server_IP_Address>:8443/**. Therefore, we strongly recommend to generate a new hpcert certificate with appropriate SAN extensions with a DNS field, which should match your server's full qualified domain name (FQDN).

In case of High Availability, you should add DNS extensions for all the servers in the cluster. The new hpcert should reside in the **server-fips.keystore** and it will be signed with hproot. Since the probes already contain the hproot certificate in their truststore by default, no changes are needed on the probe side after hpcert is regenerated. In the truststores of the UCMDB UI JRE, UCMDB Browser, and UCMDB Configuration Manager, you should add the hproot certificate or the newly generated hpcert certificate. (The corresponding steps from the FIPS deployment guide are giving all the details regarding this in each corresponding submodule procedure: UCMDB UI, UCMDB Browser, and so on).

For instructions about regenerating the hpcert, signed by hproot, with corresponding SAN extensions, see the section below.

1. Set up the UCMDB Server JRE with Crypto-J Toolkit and the JCE Unlimited Strength Jurisdiction Policy jars

   In this step-by-step guide, we will use the UCMDB Server's JRE located by default in the **<UCMDB_Server_Home>\bin\jre** directory (for example, **C:\hp\UCMDB\UCMDBServer\bin\jre**).

   > **Note:** We need to revert all the changes done to the UCMDB Server's JRE after the new certificates and keystore files are generated.

   a. Make sure you have stopped the UCMDB Server.

   b. Copy the Crypto-J toolkit files (**cryptojce-6.2.jar**, **cryptojcommon-6.2.jar**, and **jcmFIPS-6.2.jar**) from the **<UCMDB_server_home>\lib** directory and place them inside the **<UCMDB_server_home>\bin\jre\lib\ext** folder.

   c. Copy the Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files (**local_policy.jar** and **US_export_policy.jar** into the **<UCMDB_server_home>\bin\jre\lib\security** folder.

      > **Note:** The JCE Unlimited Strength Policy Files should be already present there if you have enabled FIPS mode on the UCMDB Server.
      >
      > UCMDB Server version 10.3x uses OpenJDK, the JCE Unlimited Strength Policy Files can be downloaded from Zulu Cryptography Extension Kit.

   d. Add the **JsafeJCE** security provider as follows into the **java.security** file located in the **<UCMDB_server_home>\bin\jre\lib\security** directory.

      JsafeJCE in java.security:

      Windows: `security.provider.11=com.rsa.jsafe.provider.JsafeJCE`

      Linux: `security.provider.10=com.rsa.jsafe.provider.JsafeJCE`

2. Generate a new self-signed certificate (hpcert) and sign it with the default UCMDB root certificate (hproot)

   a. **Prerequisites**

      You have followed the instructions in Set up the UCMDB Server JRE with Crypto-J Toolkit and the JCE Unlimited Strength Jurisdiction Policy jars above.

> **Note:** The prerequisites steps for switching UCMDB UI to FIPS when the server is in FIPS mode are the same. Therefore, it is recommended that you proceed with the UCMDB UI Migration after you finished generating the new hpcert certificate in task b below. Then you proceed with reverting the changes made to the UCMDB Server's JRE (see Revert the changes made to the UCMDB Server's JRE after the certificate stores generation is completed). This way you do not need to set up twice a JRE with Crypto-J toolkit and JCE Unlimited Strength Policy files.

b. **Generate a new self-signed certificate (hpcert) and sign it with the default UCMDB root certificate (hproot)**

On Windows:

On the UCMDB Server machine, inside the **C:\hp\UCMDB\UCMDBServer\tools\security** folder, we provided a new tool **keystoregen.bat**. This tool runs the needed keytool commands for generating the **server-fips.keystore** file, which contains the hpcert certificate signed by hproot.

First, the **keystoregen.bat** tool verifies the following prerequisites:

- UCMDB Server JRE contains the Crypto-J Toolkit
- The JCE Unlimited Strength Jurisdiction Policy jars are present in the UCMDB Server JRE
- JsafeJCE provider is present in the security providers list

Then it takes the hproot certificate from the **C:\hp\UCMDB\UCMDBServer\conf\security\hproot.keystore** file, and generates a new hpcert. It also prompts the user for the DNS of the UCMDB Server machine and an IP address. You can supply multiple DNS names and IP addresses separated by comma (,), which will be added as SAN extensions to the hpcert certificate.

To generate the new **server-fips.keystore** file using the **keystoregen.bat** tool,

i. Navigate to the **C:\hp\UCMDB\UCMDBServer\tools\security** directory.

ii. Run the **keystoregen.bat** tool from a command prompt.

A. In case you use HA, it is recommended to add here both the Full Qualified Domain Names (FQDNs) of the Writer and the Reader machine separated by comma (,).

B. **You will be prompted for the UCMDB Server Machine DNS name.** Use comma (,) to separate multiple DNS names.

C. **You will be prompted for the UCMDB Server IP.** This is for the cases when

you will access the UCMDB Server by using the IP address.

D. **You will be prompted for the hpcert validity period.**

E. **You will be prompted for the server-fips.keystore password.** Enter your password.

iii. After entering all the needed information a new **server-fips.keystore** file is generated in the **C:\hp\UCMDB\UCMDBServer\tools\security** folder.

This keystore contains the newly generated hpcert certificate signed by hproot. It also contains all the needed extensions.

iv. Copy the newly generated **server-fips.keystore** file from **C:\hp\UCMDB\UCMDBServer\tools\security** to **C:\hp\UCMDB\UCMDBServer\conf\security** to overwrite the OOTB **server-fips.keystore** file.

In case you use HA, make sure you copy this new keystore file to all the HA servers.

v. Regenerate **server-fips.truststore** by running the following script:

C:\hp\UCMDB\UCMDBServer\tools\security\truststoregen.bat

When running **truststoregen.bat**, you will be prompted for two passwords:

- The original truststore password, which should be **hppass** if no manual change was made
- The new truststore password, which should be the one you specified during installation if no manual change was made since the installation

vi. i. Copy the new **server-fips.truststore** file to the **C:\hp\UCMDB\UCMDBServer\conf\security** folder to overwrite the OOTB **server-fips.truststore** file.

In case of HA, make sure you copy the new truststore file to all the HA servers.

On Linux:

In case of Linux, manual commands should be executed to regenerate hpcert with the needed SAN extensions and sign it with hproot:

i. Go to the **/opt/hp/UCMDB/UCMDBServer/bin/jre/bin** directory.

ii. Export **hproot** from OOTB **hproot.keystore** to **/opt/hp/newstores/hproot.crt**.

```
./keytool -exportcert -alias hproot -keystore
/opt/hp/UCMDB/UCMDBServer/conf/security/hproot.keystore -storetype
```

```
PKCS12 -storepass hppass -providername JsafeJCE -file
/opt/hp/newstores/hproot.crt
```

iii. Generate a self-signed certificate hpcert and place it inside **server-fips.keystore**.

Make sure you set the correct SAN extension to the appropriate DNS of your server machine. (In case of HA, set both the reader and the writer machines' FQDNs.

```
./keytool -genkey -alias hpcert -validity 365 -keyalg RSA -keysize
2048 -storetype PKCS12 -providername JsafeJCE -keystore
/opt/hp/newstores/server-fips.keystore -ext
san=dns:myucmdbserver.hp.com,dns:localhost,ip:127.0.0.1
```

When prompted, enter your password.

iv. Export hpcert from the keystore.

```
./keytool -exportcert -alias hpcert -keystore
/opt/hp/newstores/server-fips.keystore -storetype PKCS12 -storepass
<password> -providername JsafeJCE -file /opt/hp/newstores/hpcert.crt
```

v. Generate a certificate signing request for hpcert and place it in **/opt/hp/newstores**.

```
./keytool -certreq -alias hpcert -keystore /opt/hp/newstores/server-
fips.keystore -storetype PKCS12 -storepass <password> -providername
JsafeJCE -file /opt/hp/newstores/hpcert_sign_request.csr
```

vi. Generate the signed hpcert certificate which is signed by hproot and add the needed SAN extensions.

```
./keytool -gencert -infile /opt/hp/newstores/hpcert_sign_request.csr
-outfile /opt/hp/newstores/hpcert_issued_by_hproot.rsp -alias hproot
-storetype PKCS12 -providername JsafeJCE -keystore
/opt/hp/UCMDB/UCMDBServer/conf/security/hproot.keystore -storepass
hppass -ext san=dns:myucmdbserver.hp.com,dns:localhost,ip:127.0.0.1
```

vii. Concatenate the signed hpcert and hproot in the same file.

```
./keytool -printcert -rfc -file /opt/hp/newstores/hpcert_issued_by_
hproot.rsp >> /opt/hp/newstores/hpcertandroot.p7c

./keytool -printcert -rfc -file /opt/hp/newstores/hproot.crt >>
/opt/hp/newstores/hpcertandroot.p7c
```

viii. Import the hpcert signed with hproot into **server-fips.keystore**.

```
./keytool -importcert -keystore /opt/hp/newstores/server-
fips.keystore -storetype PKCS12 -providername JsafeJCE  -alias
hpcert -file /opt/hp/newstores/hpcertandroot.p7c
```

ix. Copy the new **server-fips.keystore** from **/opt/hp/newstores** to **/opt/hp/UCMDB/UCMDBServer/conf/security** to overwrite the OOTB **server-fips.keystore** file.

In case you use HA, make sure to copy this new keystore file to all the HA servers.

x. Regenerate **server-fips.truststore** by running the following script:

/opt/hp/UCMDB/UCMDBServer/tools/security/truststoregen.sh

When running **truststoregen.sh**, you will be prompted for two passwords:

- The original truststore password, which should be **hppass** if no manual change was made
- The new truststore password, which should be the one you specified during installation if no manual change was made since the installation

xi. Copy the new **server-fips.truststore** file to the **/opt/hp/UCMDB/UCMDBServer/conf/security** folder to overwrite the OOTB **server-fips.truststore** file.

In case of HA, make sure you copy the new truststore file to all the HA servers.

3. Revert the changes made to the UCMDB Server's JRE after the certificate stores generation is completed

After generating the needed files for UCMDB Server and UCMDB UI by executing the needed keytool commands and scripts, revert the changes done to the UCMDB Server's JRE. To do so,

a. Remove the Crypto-J toolkit files (**cryptojce-6.2.jar**, **cryptojcommon-6.2.jar** and **jcmFIPS-6.2.jar**) from the **<*UCMDB_Server_Home*>\bin\jre\lib\ext** directory.

b. Remove the **JsafeJCE** provider from the **java.security** file located at **<*UCMDB_Server_Home*>\bin\jre\lib\security**.

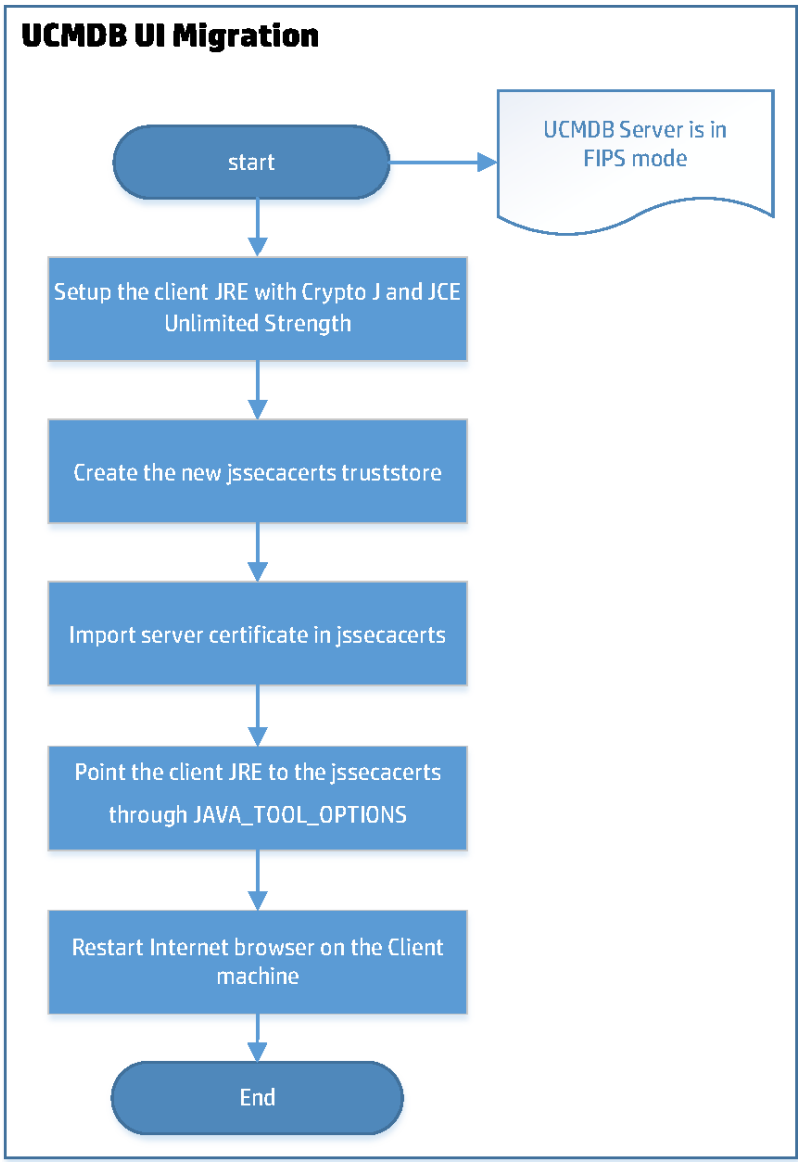
Remove JsafeJCE from the server's JRE

Remove the following line from **java.security**:

Windows: `security.provider.11=com.rsa.jsafe.provider.JsafeJCE`

Linux: `security.provider.10=com.rsa.jsafe.provider.JsafeJCE`

Task 5. UCMDB UI Migration



To Switch client machines to FIPS mode

1. **Prerequisites**

   You have completed steps described in Set up the UCMDB Server JRE with Crypto-J Toolkit and the JCE Unlimited Strength Jurisdiction Policy jars.

This is why you are recommended to run UCMDB UI migration steps after you "Generate a new self-signed certificate (hpcert) and sign it with the default UCMDB root certificate (hproot)". This way you do not need to set up twice a JRE with Crypto-J toolkit and JCE Unlimited Strength Policy Files.

2. **Copy the needed JCE Unlimited Strength Policy Files and Crypto-J Toolkit jars into the client JRE folder.**

   a. Copy the JCE Unlimited Strength Policy Files (**local_policy.jar** and **US_export_policy.jar**) to the client JRE **lib\security** folder (for example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\security**).

   b. Copy the Crypto-J Toolkit jars (**cryptojce-6.2.jar**, **cryptojcommon-6.2.jar**, and **jcmFIPS-6.2.jar**) from the **<*UCMDB_Server_Home*>\lib** folder to the **lib\ext** folder on the client machine (for example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\ext**).

   > **Note:** If the jars are not present in the client JRE **ext** folder, the UCMDB UI should also display a pop-up dialog box at login time with a URL link from where you can download the Crypto J toolkit jars and the JCE Unlimited Strength Policy files.
   >
   > Or, you can download the JCE Unlimited Strength Policy Files from the following locations:
   >
   > - For Oracle JRE8: http://www.oracle.com/technetwork/java/javase/downloads/jce8-download-2133166.html
   > - For OpenJDK JRE 8: Zulu Cryptography Extension Kit

   c. Edit the **java.security** file located at the client JRE **lib\security** folder (for example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\security**) and add the **JsafeJCE** provider.

   The **java.security** file should contain the **JsafeJCE** provider as a standard cryptography provider in the providers list. In addition, for SSL communication we also configure the **SunJSSE** SSL provider in the FIPS mode. This is done by performing the change to the security provider from the 5th position (`security.provider.5`, as shown below). **SunJSSE** is configured in FIPS mode by associating it with an appropriate FIPS 140-2 certified cryptographic provider (**JsafeJCE**) that supplies the implementations for all cryptographic algorithms required by SunJSSE.

   java.security:

   ```
   com.rsa.cryptoj.fips140initialmode=FIPS140_SSL_MODE
   com.rsa.cryptoj.kat.strategy=on.load

   security.provider.1=sun.security.provider.Sun
   security.provider.2=com.rsa.jsafe.provider.JsafeJCE
   ```

```
security.provider.3=sun.security.rsa.SunRsaSign
security.provider.4=sun.security.ec.SunEC
security.provider.5=com.sun.net.ssl.internal.ssl.Provider JsafeJCE
security.provider.6=com.sun.crypto.provider.SunJCE
security.provider.7=sun.security.jgss.SunProvider
security.provider.8=com.sun.security.sasl.Provider
security.provider.9=org.jcp.xml.dsig.internal.dom.XMLDSigRI
security.provider.10=sun.security.smartcardio.SunPCSC
security.provider.11=sun.security.mscapi.SunMSCAPI
```

3. **Create the FIPS-compliant client truststore.**

   a. **Create the jssecacerts trusted certificates store of type PKCS12 using the JsafeJCE provider**

   In FIPS mode the client JRE will use a different trusted certificate store, which is of type PKCS12, created using the JsafeJCE provider. The new jssecacerts file is generated by converting the client JRE cacerts file from JKS to PKCS12 and by copying all the trusted certificates from cacerts inside jssecacerts. In the **<UCMDB_Server_Home>/tools/security** folder, a new java tool **jks2pkcs12.jar** is added for performing this conversion. The keystore converter tool is getting two parameters, the keystore to be converted of type JKS (cacerts) and the newly generated keystore of type PKCS12 (jssecacerts).

   In this guide, we copied the cacerts file from the client JRE machine (for example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\security\cacerts**) to the **C:\newstores** folder on UCMDB server machine. Next, run the following command from **C:\hp\UCMDB\UCMDBServer\bin\jre\bin** in order to perform the needed conversion.

   Create jssecacerts by converting the client JRE cacerts file:

   For Windows:

   ```
   java -jar C:\hp\UCMDB\UCMDBServer\tools\security\jks2pkcs12.jar
   C:\newstores\cacerts C:\newstores\jssecacerts
   ```

   For Linux:

   ```
   java -jar /opt/hp/UCMDB/UCMDBServer/tools/security/jks2pkcs12.jar
   /opt/hp/newstores/cacerts /opt/hp/newstores/jssecacerts
   ```

   When prompted for the keystore password, you should use the password **changeit** since this is the default password for the cacerts file. The new jssecacerts will be also placed at **C:\newstores**.

   b. **Export the *hproot* server root certificate and place it inside C:\newstores**

For Windows:

```
keytool -exportcert -alias hproot -keystore
C:\hp\UCMDB\UCMDBServer\conf\security\hproot.keystore -storetype PKCS12
-providername JsafeJCE -file C:\newstores\hproot.crt
```

For Linux:

```
./keytool -exportcert -alias hproot -keystore
/opt/hp/UCMDB/UCMDBServer/conf/security/hproot.keystore -storetype
PKCS12 -storepass <password> -providername JsafeJCE -file
/opt/hp/newstores/hproot.crt
```

When prompted for the keystore **hproot.keystore** password, enter your password. .

c. **Import the *hproot* server root certificate into the client jssecacerts as a trusted certificate**

In this guide, we assume that the UCMDB Server root certificate **hproot.crt** resides in the **C:\newstores** folder.

Import hproot into client truststore (jssecacerts):

```
keytool -import -trustcacerts -keystore C:\newstores\jssecacerts -
storetype PKCS12 -providername JsafeJCE -storepass changeit -alias
hproot -file C:\newstores\hproot.crt
```

d. Copy the newly generated JSSE cacerts file **jssecacerts** from the Server machine (**C:\newstores**) to the client JRE inside the **lib\security** folder (for example, **C:\Program Files (x86)\Java\jre1.8.0_92\lib\security**).

e. **Add a new environment variable for the current user on the client machine which will enable the client JRE to use the new jssecacerts file.**

Update the environment variable value to the correct path of the jssecacerts file as follows:

Point the client JRE to the correct truststore file

```
User defined environment variable name:

JAVA_TOOL_OPTIONS

Environment variable value:

-Djavax.net.ssl.trustStore="C:/Program Files (x86)/Java/jre1.8.0_
92/lib/security/jssecacerts" -Djavax.net.ssl.trustStoreType=PKCS12 -
Djavax.net.ssl.trustStoreProvider=JsafeJCE -
Djavax.net.ssl.trustStorePassword=changeit -
Djavax.net.ssl.keyStore="C:/Program Files (x86)/Java/jre1.8.0_
```

```
92/lib/security/jssecacerts" -Djavax.net.ssl.keyStorePassword=changeit -
Djavax.net.ssl.keyStoreType=PKCS12 -
Djavax.net.ssl.keyStoreProvider=JsafeJCE
```

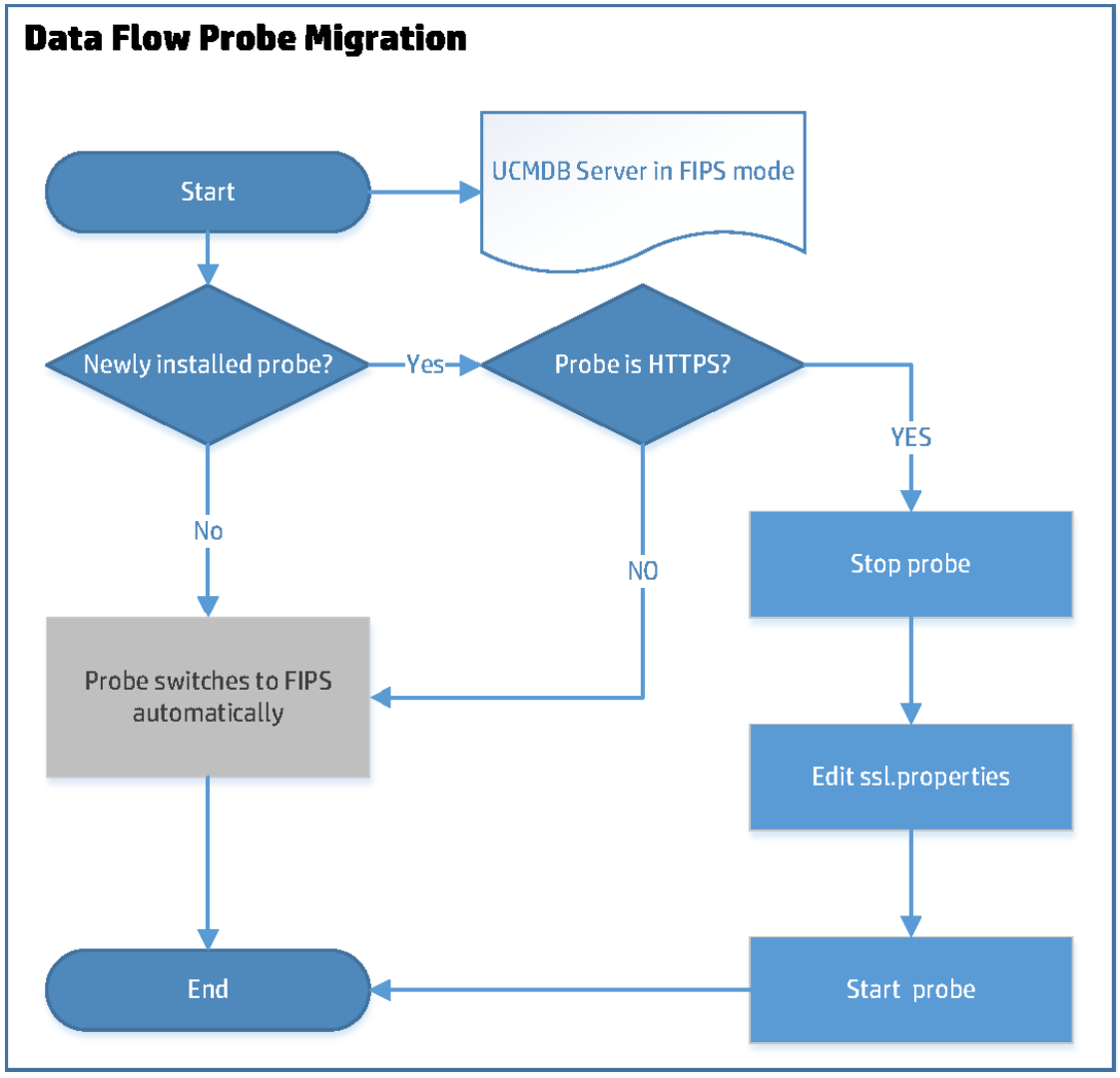
Note: All the java applications executed on the client machine may be affected by the **JAVA_TOOL_OPTIONS** environment variable set in this step.

4. Restart the Internet Browser for Java to be initialized with the new FIPS configuration.

Note: After you executed the keytool commands and bat files, do not forget to restore the UCMDB Server JRE to its original state as described in "Revert the changes made to the UCMDB Server's JRE after the certificate stores generation is completed" on page 23.

Note: After switching UCMDB client JRE to FIPS mode, you cannot connect it to a non-FIPS mode UCMDB server!

Task 6. Data Flow Probe Migration



After switching the UCMDB server to the FIPS mode,

- Data Flow Probes that are upgraded to version 10.33 are switched to the FIPS mode automatically.
- If you add a new probe to the UCMDB server,
  - If UCMDB server is running in FIPS+HTTP mode (the default mode), the new probe is switched to the FIPS mode automatically.
  - **If UCMDB server is running in FIPS+HTTPS mode, edit the ssl.properties file as**

described below to complete the FIPS migration process for the new probe. This is the scenario that requires manual steps.

Edit the ssl.properties file to enable the new probe to connect to the UCMDB server in FIPS+HTTPS mode

To do so,

1. Stop the probe.
2. Open the **<DataFlowProbe_Home>/conf/security/ssl.properties** file in a text editor.
3. Locate the following attributes, and update their values as follows:

```
javax.net.ssl.keyStore=FIPS_HPProbeKeyStore.jks
javax.net.ssl.trustStore=FIPS_HPProbeTrustStore.jks
```

4. Save the **ssl.properties** file.
5. Restart the probe.

Note: Backup copy of the following files are created when Data Flow Probes are switched to FIPS mode:

- **<DataFlowProbe_Home>\conf\DataFlowProbe.properties**
- **<DataFlowProbe_Home>\conf\security\ssl.properties**
- **<DataFlowProbe_Home>\bin\WrapperGateway.conf**
- **<DataFlowProbe_Home>\bin\WrapperManager.conf**

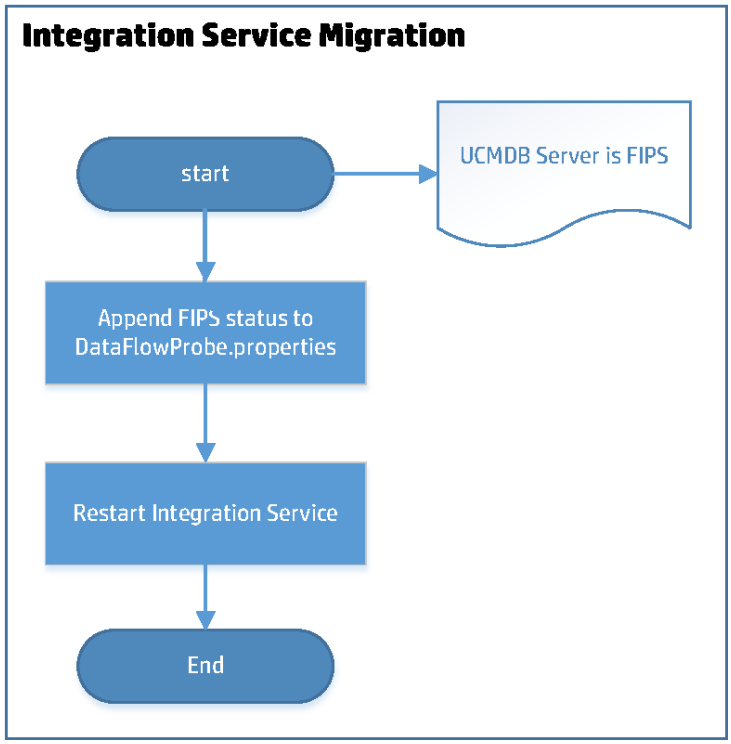
The backup copy of these files are saved to the **<Probe_Home>\conf\bak** directory.

Tip: How to check whether a probe or integration service is already switched to FIPS

To check whether a probe or integration service is already in FIPS mode,

1. Go to the probe or integration service's JMX Console. For example, **<Probe_IP>:<Probe_Port>/jmx-console/**.
2. Search for **getFipsStatus**.
3. On the result page, check whether the value of the **FipsStatus** attribute is "Current probe is in FIPS mode".

Task 7. UCMDB Integration Service Migration



To switch UCMDB Integration Service to FIPS mode, do the following,

1. Prerequisites
   a. You have successfully switched the UCMDB Server to FIPS mode.
   b. You have deactivated all integration jobs.

2. Append the probe.fips.status setting to the DataFlowProbe.properties file manually
   a. Go to the **<UCMDB_Server_Home>\integrations\conf** directory (for example, **C:\hp\UCMDB\UCMDBServer\integrations\conf**) and open the **DataFlowProbe.properties** file in a text editor.
   b. Append the following line to the end of the file:

```
probe.fips.status=1
```

This setting indicates that the integration service is ready for switching to FIPS mode.

c. (Upgrade only) Locate the **basic_discovery_minimal_classpath** parameter, and after the **../lib/shared-utils.jar;** value, append the following:

```
../lib/cryptojce.jar;../lib/cryptojcommon.jar;../lib/jcmFIPS.jar;
```

> **Note:** For new installation of UCMDB 10.3x, this step is not needed, the above jar files are already included in the value of the **basic_discovery_minimal_classpath** parameter.

d. Save the file.

3. Restart UCMDB Integration Service manually

If you have successfully switched the UCMDB Server to FIPS mode, restart UCMDB Integration Service manually.

This enables the system to do the following:

a. Create a backup copy of the following files:

- **<UCMDB_Server_Home>\integrations\conf\DataFlowProbe.properties**
- **<UCMDB_Server_Home>\integrations\conf\security\ssl.properties**
- **<UCMDB_Server_Home>\integrations\bin\WrapperGateway.conf**
- **<UCMDB_Server_Home>\\integrations\bin\WrapperManager.conf**

The backup copy of these files are saved to the **<UCMDB_Server_Home>\integrations\conf\bak** directory.

b. Check if the **enable.fips.mode** setting in the **infrastructureSettings.xml** file is already updated to **true**.

c. If yes, it proceeds to update the following files:

- Update the encrypted passwords in the **DataFlowProbe.properties** file.
- Update the keystore/truststore information in the **ssl.properties** file.
- Enable the **fipsmode** setting in both the **WrapperGateway.conf** and **WrapperManager.conf** files by uncommenting the following line:

```
wrapper.java.additional.30=-Dmindterm.jce.fipsmode=yes
```

d. Then, it updates the **probe.fips.status** setting in the **DataFlowProbe.properties** file to **2**.

This means that FIPS migration for the UCMDB Integration Service is completed.

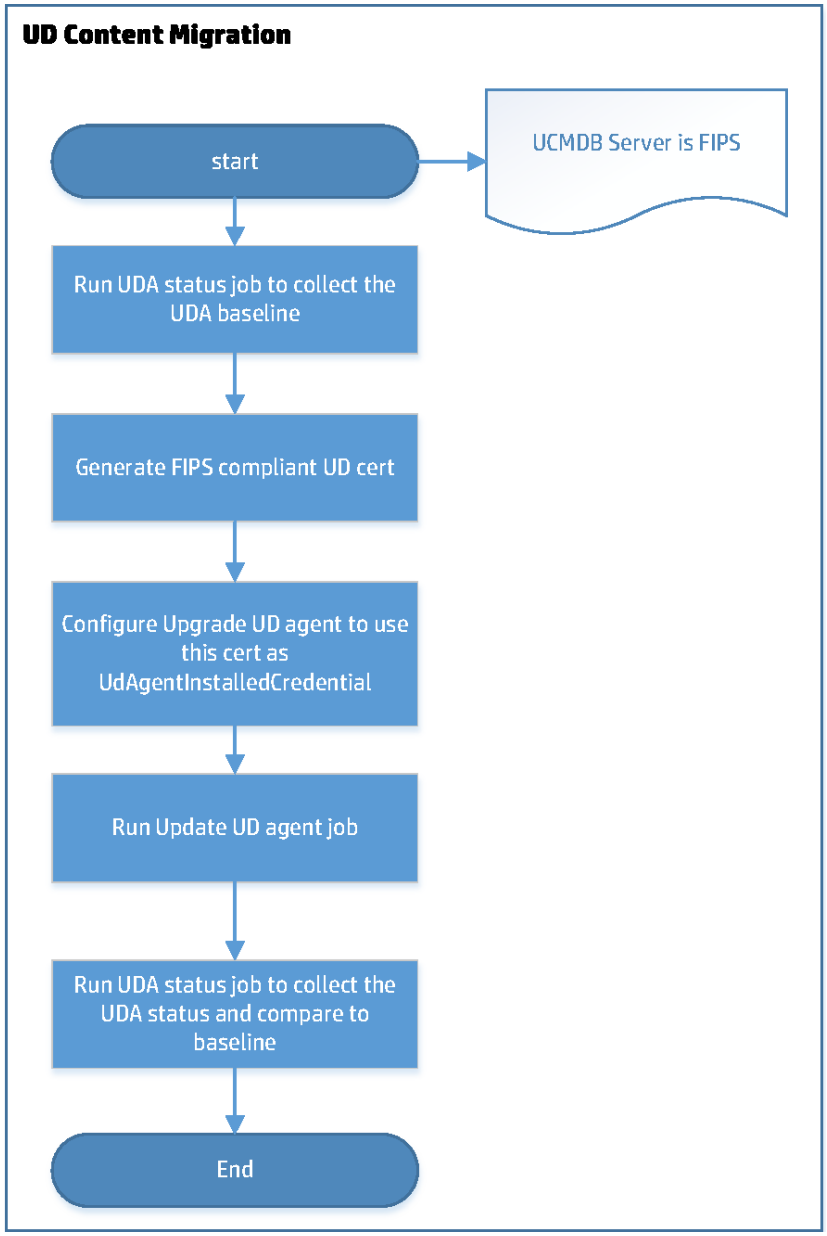
Tip: How to check whether a probe or integration service is already switched to FIPS

To check whether a probe or integration service is already in FIPS mode,

1. Go to the probe or integration service's JMX Console. For example, **<Probe_IP>:<Probe_Port>/jmx-console/**.
2. Search for **getFipsStatus**.
3. On the result page, check whether the value of the **FipsStatus** attribute is "Current probe is in FIPS mode".

Tip: If, after you restart the UCMDB Integration Service manually, the FIPS migration process fails and UCMDB Integration Service is not switched to FIPS mode, you can restore the original settings by using the three backup files described in step 3.a, and then repeat step 2 and step 3 to start over the migration process again.

Task 8. Universal Discovery Content Migration



1. Prerequisites
   - **DDMI agents.** The FIPS mode does not support DDMI agents. Make sure that all DDMI agents have been successfully migrated to UD agents before they are switched to the FIPS mode.

The table below describes different types of agents you might have in your environment and if any action is required from you:

Agent type	Covered by the automatic FIPS migration process?	Action required
DDMI agents	No	Migrate all DDMI agents to UD agents before the FIPS migration process starts. **Note:** 10.32 was the last UCMDB version to support any kind of DDMI migration. Version 10.33 dropped the support for DDMI migration completely.
Pre-10.33 UD Agents	Yes	None
10.33 non-FIPS UD Agents	Yes	None

- **Ensure that both UCMDB server and data flow probes are FIPS-compliant before you enable the UD Agents to work under the FIPS mode.**

  Once switched to the FIPS mode, the old credentials are not supported by the UD Agents under FIPS mode any more, a new UDA credential need to be regenerated through UCDMB UI.

  To switch an existing UD Agent to the FIPS mode, you need to choose the newly generated credential in the **Update UD Agent** job.

  To install a new UD Agent under the FIPS mode, you need to choose the newly generated credential in the **Install UD Agent** job.

2. Switch UD Content to the FIPS mode

   a. (Optional) Go to **Data Flow Management > Universal Discovery > Discovery Modules/Jobs > Tools and Samples > UD Agent Management**, and run the **UDA Status Collector** job to collect the UDA baseline.

   b. Generate new FIPS compliant UD Agent certificates for the **Universal Discovery Protocol** through UCMDB UI.

i. Go to **Data Flow Management > Data Flow Probe Setup**.

ii. In the Domains and Probes pane, select your domain and expand **Credentials > Universal Discovery Protocol**.

iii. In the **Universal Discovery Protocol** pane, click  to create a new credential.

iv. In the Universal Discovery Protocol Parameters dialog, provide values for the fields as necessary and click **OK**.

For the **User Label** field, provide a meaningful name. You will need this credential to install or upgrade your UD agents later.

Your new credential is added to the credential list.

v. Click **OK** again to save your credential.

c. Run the **Update UD Agent** job.

For Advanced mode:

i. Go to **Data Flow Management > Discovery Modules/Jobs > Update UD Agent**, and click the **Properties** tab.

ii. Modify the **Update UD Agent** job parameters as follows:

A. Select the **Override** checkbox for the **UdAgentInstallCredentialId** parameter, and then click  to select the FIPS-compliant Universal Discovery Protocol.

B. Select the **Override** checkbox for the **UpgradeAgent** parameter, specify its value to **true** for pre-10.33 UD agents; it can be either **true** or **false** for 10.33 non-FIPS UD agents.

C. Click **OK** to save the job.

iii. Run/Rerun the **Update UD Agent** job.

For Management Zone-based mode:

i. Go to **Data Flow Management > Zone-Based Discovery**, select the Infrastructure activity which you created for updating UD agents, then click  .

ii. On the Define Credentials page, select the FIPS compliant Universal Discovery Protocol, then click **Next**.

iii. On the Universal Discovery Agent Deployment page, click **Select Credential** for **Credential for UD Agent Update** and select the FIPS compliant Universal Discovery Protocol; then click **Next** until finish to save the changes.

iv. On the Universal Discovery Agent Deployment page, select the **Upgrade Agent**

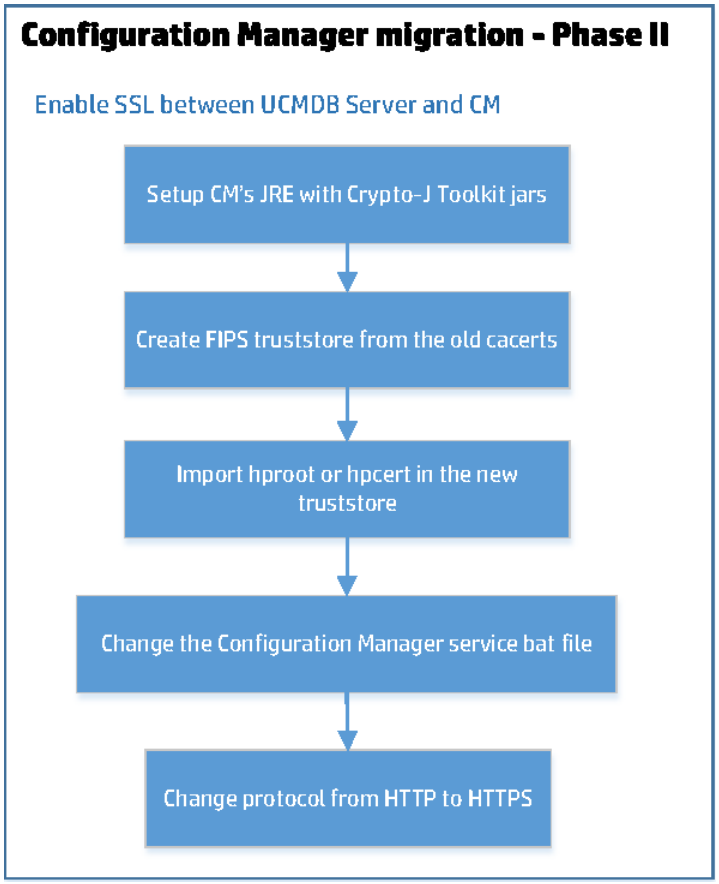
checkbox for pre-10.33 UD agents; while for 10.33 non-FIPS UD agents, the **Upgrade Agent** checkbox can be either checked or unchecked.

v. Run/Rerun this Infrastructure activity.

d. (Optional) Run the **UDA Status Collector** job again to collect the UDA status and compare the result against the baseline you collected in step a.

Check the UD Agent status report, delete the old Universal Discovery Protocol only after this report shows that all the agents have been migrated successfully.

Task 9. Configuration Manager Migration - Phase II



Enable SSL between the UCMDB Server and the Configuration Manager

To do so,

1. Copy the Crypto-J Toolkit jars (**cryptojce-6.2.jar**, **cryptojcommon-6.2.jar**, and **jcmFIPS-6.2.jar**) from the **<Configuration Manager directory>\servers\server-0\webapps\cnc\WEB-INF\lib** folder to the **<Configuration Manager directory>\java\windows\x86_64\lib\ext** directory.
2. Modify the **<Configuration Manager directory>\java\windows\x86_64\lib\security\java.security** file.
   a. Update the **keystore.type** property value to **PKCS12** as follows:

   ```
   keystore.type=PKCS12
   ```

   b. Add the following two lines:

   ```
   com.rsa.cryptoj.fips140initialmode=FIPS140_SSL_MODE
   com.rsa.cryptoj.kat.strategy=on.load
   ```

   c. Replace all the security providers with the following lines:

   ```
   security.provider.1=com.rsa.jsafe.provider.JsafeJCE
   security.provider.2=sun.security.provider.Sun
   security.provider.3=sun.security.rsa.SunRsaSign
   security.provider.4=sun.security.ec.SunEC
   security.provider.5=com.sun.net.ssl.internal.ssl.Provider JsafeJCE
   security.provider.6=com.sun.crypto.provider.SunJCE
   security.provider.7=sun.security.jgss.SunProvider
   security.provider.8=com.sun.security.sasl.Provider
   security.provider.9=org.jcp.xml.dsig.internal.dom.XMLDSigRI
   security.provider.10=sun.security.smartcardio.SunPCSC
   security.provider.11=sun.security.mscapi.SunMSCAPI
   ```

3. Run the following command to convert cacerts to pkcs12.

   In FIPS mode, the UCMDB Configuration Manager uses a different trusted certificates store file which is of type PKCS12, created using the JsafeJCE cryptography provider. The new truststore file is generated by converting the default JRE cacerts file from JKS to PKCS12 and by copying all the trusted certificates from cacerts into truststore.p12. The java command should be run from the UCMDB Configuration Manager's JRE folder (**<Configuration Manager directory>\java\windows\x86_64\bin**).

   You can find this jar in **<UCMDB Server directory>\UCMDBServer\tools\security**. The password is **changeit**.

   ```
   java -jar jks2pkcs12.jar <Configuration Manager directory>\java\windows\x86_
   64\lib\security\cacerts <Configuration Manager directory>\java\windows\x86_
   64\lib\security\truststore.p12
   ```

4. Add the following parameters to the Configuration Manager's service if you run CM as a Windows service; Or, add the following parameters to the **JAVA_OPTS** parameter located in **<Configuration Manager directory>\start_server.bat** if you run it from the command line:

```
SET JAVA_OPTS=%JAVA_OPTS% -Djavax.net.ssl.trustStore=<Configuration Manager
directory>\java\windows\x86_64\lib\security\truststore.p12 -
Djavax.net.ssl.trustStorePassword=changeit -
Djavax.net.ssl.trustStoreProvider=JsafeJCE
```

5. Import either the server root certificate or the server certificate into the p12 truststore.

   You can import the server certificate from a web browser by clicking the HTTPS lock icon. The **cert.txt** file is the server certificate file.

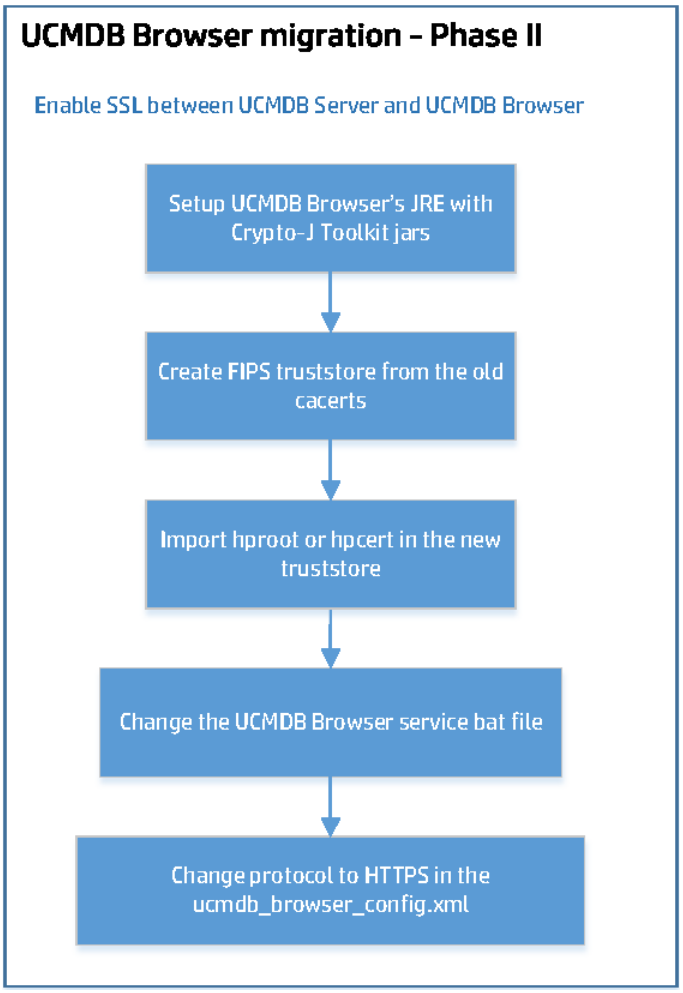
```
keytool.exe -importcert -alias hpcert -file cert.txt -providername JsafeJCE
-keystore truststore.p12
```

6. Change the protocol in CM's database from **HTTP** to **HTTPS**, and change the port from **8080** to **8443**.

```
UPDATE [database_name].[dbo].[CCM_CONFIG_PROPERTIES] set value='HTTPS' where
name='ucmdb.connection.strategy';

UPDATE [database_name].[dbo].[CCM_CONFIG_PROPERTIES] SET value='8443' where
name like 'ucmdb.server.port';
```

Task 10. UCMDB Browser Migration - Phase II



Enable SSL between the UCMDB Server and the UCMDB Browser

To do so,

1. Copy the Crypto-J Toolkit jars (**cryptojce-6.2.jar**, **cryptojcommon-6.2.jar**, and **jcmFIPS-6.2.jar**) from the **<UCMDB Browser directory>\webapps\ucmdb-browser\WEB-INF\lib** folder to the **<JRE_directory>\lib\ext** directory.
2. Modify the **<JRE_directory>\lib\security\java.security** file.

a. Update the **keystore.type** property value to **PKCS12** as follows:

```
keystore.type=PKCS12
```

b. Add the following two lines:

```
com.rsa.cryptoj.fips140initialmode=FIPS140_SSL_MODE
com.rsa.cryptoj.kat.strategy=on.load
```

c. Replace all the security providers with the following lines:

```
security.provider.1=com.rsa.jsafe.provider.JsafeJCE
security.provider.2=sun.security.provider.Sun
security.provider.3=sun.security.rsa.SunRsaSign
security.provider.4=sun.security.ec.SunEC
security.provider.5=com.sun.net.ssl.internal.ssl.Provider JsafeJCE
security.provider.6=com.sun.crypto.provider.SunJCE
security.provider.7=sun.security.jgss.SunProvider
security.provider.8=com.sun.security.sasl.Provider
security.provider.9=org.jcp.xml.dsig.internal.dom.XMLDSigRI
security.provider.10=sun.security.smartcardio.SunPCSC
security.provider.11=sun.security.mscapi.SunMSCAPI
```

3. Run the following command to convert cacerts to pkcs12. You can find this jar in **<UCMDB Server directory>\UCMDBServer\tools\security**. The password is **changeit**.

```
java -jar jks2pkcs12.jar <JRE_directory>\lib\security\cacerts <JRE_
directory>\lib\security\truststore.p12
```

4. Add the following parameters to the UCMDB Browser's service if you run the Browser as a Windows service; Or, add the following parameters to the **CATALINA_OPTS** parameter located in **bin\setenv.bat** if you run it from the command line:

```
-Djavax.net.ssl.trustStore=<JRE directory>\lib\security\truststore.p12 -
Djavax.net.ssl.trustStorePassword=changeit -
Djavax.net.ssl.trustStoreProvider=JsafeJCE -DenableServerCertValidation=true
-DenableServerCertHostValidation=true
```

> **Note:** If the **setenv.bat** file does not exist, create it, and add the following line:
>
> ```
> set CATALINA_OPTS=-Djavax.net.ssl.trustStore=<JRE
> directory>\lib\security\truststore.p12 -
> Djavax.net.ssl.trustStorePassword=changeit -
> Djavax.net.ssl.trustStoreProvider=JsafeJCE -
> ```

```
DenableServerCertValidation=true -DenableServerCertHostValidation=true
```

5. Import either the server root certificate or the server certificate into the p12 truststore.

   You can import the server certificate from a web browser by clicking the HTTPS lock icon. The **cert.txt** file is the server certificate file.

   ```
   keytool.exe -importcert -alias hpcert -file cert.txt -providername JsafeJCE
   -keystore truststore.p12
   ```

6. Change the connection parameters, the protocol, and the port in the **ucmdb_browser_config.xml** file.

   ```
   <ucmdb_configuration name="your_ucmdb_server">
       <protocol>https</protocol>
       <host_port>8443</host_port>
   </ucmdb_configuration>
   ```

Task 11. UCMDB Browser Migration - Phase III

Enable SSL on the UCMDB Browser

To do so,

1. Use the FIPS compliant keystore that you generated earlier for the UCMDB Server.
2. Enable SSL on the UCMDB Browser.

   For detailed instructions, see the *Configure SSL* section in the *Universal CMDB Browser Installation and Configuration Guide*.

3. Add the following two attributes to the **Connector** tag in the **server.xml** file:

   ```
   keystoreType="pkcs12" keystoreProvider="JsafeJCE"
   ```

4. Restart the UCMDB Browser.

Task 12. Configuration Manager Migration - Phase III

Enable SSL on the Configuration Manager

To do so,

1. Use the FIPS compliant keystore that you generated earlier for the UCMDB Server.
2. Enable SSL on the Configuration Manager.

   For detailed instructions, see *Universal CMDB Hardening Guide*.
3. Add the following two attributes to the **Connector** tag in the **server.xml** file:

   ```
   keystoreType="pkcs12" keystoreProvider="JsafeJCE"
   ```
4. Restart Configuration Manager.

Chapter 5: Improving Security

In case you do not want to use the OOTB certificates from UCMDB, you can generate or use your own FIPS keystores (probe, UI, UCMDB Browser, and so on).

When manipulating FIPS certificates and keystores (when executing keytool commands) you should use the provider from RSA BSAFE Crypto-J Toolkit (JsafeJCE). In addition, consider the fact that the certificate stores in FIPS mode are of type PKCS12.

The keytool commands from "Generate a Standalone Self-Signed Certificate (hpcert) Using JsafeJCE Cryptography Provider" below and from "Generate a Self-Signed Root Certificate (hproot) and a Self-Signed Certificate (hpcert) Which Will Be Signed by hproot Using JsafeJCE Cryptography Provider" on page 46 can be taken as examples on how to manipulate FIPS certificates and keystores. You can also modify them in case you use your own certificates signed by a specific Certificate Authority. For the sake of the example we have used here self signed certificates but the commands are similar when using custom certificates.

This chapter describes how to:

Generate a Standalone Self-Signed Certificate (hpcert) Using JsafeJCE Cryptography Provider

This section describes how to generate a new hpcert certificate which will be placed in the **server-fips.keystore** and **server-fips.truststore**. If you do not want to use the default certificate hierarchy comes with UCMDB, you will need to make sure the standalone certificate which is generated here is also placed on all the SSL clients truststores (Probe truststore, UCMDB UI FIPS truststore (jssecacerts), UCMDB Browser, and UCMDB Configuration Manager).

1. **Prerequisites**

   You have completed instructions in Set up the UCMDB Server JRE with Crypto-J Toolkit and the JCE Unlimited Strength Jurisdiction Policy jars.

2. **Generate a Server keystore of type PKCS12 using the JsafeJCE cryptography provider.**

> **Note:** All the generated files will be placed inside **C:\newstores**.

The keystore will contain a certificate with a Subject Alternative Name (SAN) extension with a DNS matching the URLs used to connect to the UCMDB Server. Change the SAN extension accordingly to match your UCMDB Server URL, IP address, and so on. For this guide, we are using the following DNS values: **myucmdbserver.example.com**, **localhost** and an IP address set to **127.0.0.1**.

We assume that the UCMDB Server is installed at the default path **C:\hp\UCMDB\UCMDBServer**. From **C:\hp\UCMDB\UCMDBServer\bin\jre\bin** run the following command and complete all the details when prompted for certificate details:

Generate server-fips.keystore. Add the correct parameters to the SAN extension before running the command!!!

```
keytool -genkey -alias hpcert -validity 365 -keyalg RSA -keysize 2048 -
storetype PKCS12 -providername JsafeJCE -keystore C:\newstores\server-
fips.keystore -ext
san=dns:myucmdbserver.example.com,dns:localhost,ip:127.0.0.1
```

3. **Export the Certificate from server-fips.keystore.**

   From **C:\hp\UCMDB\UCMDBServer\bin\jre\bin** run the following command:

   Export the Certificate from the keystore

   ```
   keytool -exportcert -alias hpcert -keystore C:\newstores\server-
   fips.keystore -storetype PKCS12 -storepass <password> -providername JsafeJCE
   -file C:\newstores\hpcert.crt
   ```

4. **Import Certificate into server-fips.truststore.**

   From **C:\hp\UCMDB\UCMDBServer\bin\jre\bin** run the following command:

   Import hpcert in truststore

   ```
   keytool -importcert -alias hpcert -file C:\newstores\hpcert.crt -
   providername JsafeJCE -storetype PKCS12 -keystore C:\newstores\server-
   fips.truststore
   ```

5. Copy the newly generated **server-fips.keystore** and **server-fips.truststore** from **C:\newstores** into the **security** folder of the UCMDB Server (**C:\hp\UCMDB\UCMDBServer\conf\security**) to overwrite the existing files.

6. **Copy the UCMDB certificate to each Probe machine.**

Copy the certificate file **C:\HP\UCMDB\UCMDBServer\conf\security\hpcert.crt** from the UCMDB Server machine to the following folder on each Data Flow Probe machine:

C:\HP\UCMDB\DataFlowProbe\conf\security

7. **Data Flow Probe Configuration.**

   > **Note:** You must configure each Data Flow Probe machine.

   Import the server's certificate **hpcert.crt** to the Probe's Truststore.

   a. Open the command prompt and run the command:

   ```
   keytool -import -alias hpcert -file
   C:\HP\UCMDB\DataFlowProbe\conf\security\hpcert.crt -storetype PKCS12 -
   providername JsafeJCE -keystore
   C:\HP\UCMDB\DataFlowProbe\conf\security\FIPS_HPProbeTrustStore.jks
   ```

   b. Enter the keystore password **logomania**.

   c. When prompted **Trust this certificate?**, press **y** and then **Enter**.

   The following message is displayed: `Certificate was added to keystore.`

8. **Restart the Machines**

   Restart both the UCMDB server and the Probe machines.

Generate a Self-Signed Root Certificate (hproot) and a Self-Signed Certificate (hpcert) Which Will Be Signed by hproot Using JsafeJCE Cryptography Provider

These commands are actually similar with the ones incorporated in the **keystoregen.bat** tool located in the **C:\hp\UCMDB\UCMDBServer\tools\security** directory.

This section describes how to manually generate a new self-signed root certificate (hproot) and a self-signed certificate (hpcert) which will be signed by hproot. All the files will be placed inside **C:\newstores**.

By default, UCMDB Server in FIPS mode already uses a certificate hierarchy similar to this.

1. **Prerequisites**

   You have completed instructions in Set up the UCMDB Server JRE with Crypto-J Toolkit and the JCE Unlimited Strength Jurisdiction Policy jars.

2. **Generate the self-signed root certificate hproot in C:\newstores.**

```
keytool -genkey -alias hproot -validity 365 -keyalg RSA -keysize 2048 -
storetype PKCS12 -providername JsafeJCE -keystore
C:\newstores\hproot.keystore -ext bc:c="ca:true"
```

3. **Export hproot in C:\newstores.**

```
keytool -exportcert -alias hproot -keystore C:\newstores\hproot.keystore -
storetype PKCS12 -storepass hppass -providername JsafeJCE -file
C:\newstores\hproot.crt
```

4. **Generate a self-signed certificate hpcert and place it inside server-fips.keystore. Make sure you set the correct SAN extension to the appropriate DNS.**

```
keytool -genkey -alias hpcert -validity 365 -keyalg RSA -keysize 2048 -
storetype PKCS12 -providername JsafeJCE -keystore C:\newstores\server-
fips.keystore -ext
san=dns:myucmdbserver.example.com,dns:localhost,ip:127.0.0.1
```

5. **Export hpcert from the keystore.**

```
keytool -exportcert -alias hpcert -keystore C:\newstores\server-
fips.keystore -storetype PKCS12 -storepass <password> -providername JsafeJCE
-file C:\newstores\hpcert.crt
```

6. **Generate a certificate sign request for hpcert and place it in C:\newstores.**

```
keytool -certreq -alias hpcert -keystore C:\newstores\server-fips.keystore -
storetype PKCS12 -storepass <password> -providername JsafeJCE -file
C:\newstores\hpcert_sign_request.csr
```

7. **Generate the signed hpcert certificate signed by hproot and add the needed SAN extensions.**

```
keytool -gencert -infile C:\newstores\hpcert_sign_request.csr -outfile
C:\newstores\hpcert_issued_by_hproot.rsp -alias hproot -storetype PKCS12 -
providername JsafeJCE -keystore C:\newstores\hproot.keystore -storepass
hppass -ext san=dns:myucmdbserver.example.com,dns:localhost,ip:127.0.0.1
```

8. **Concatenate the signed hpcert and hproot in the same file.**

```
keytool -printcert -rfc -file C:\newstores\hpcert_issued_by_hproot.rsp >>
C:\newstores\hpcertandroot.p7c
keytool -printcert -rfc -file C:\newstores\hproot.crt >>
C:\newstores\hpcertandroot.p7c
```

9. **Import the hpcert (which is signed by hproot) into server-fips.keystore.**

```
keytool -importcert -keystore C:\newstores\server-fips.keystore -storetype
PKCS12 -providername JsafeJCE  -alias hpcert -file
C:\newstores\hpcertandroot.p7c
```

10. Copy the newly generated **server-fips.keystore** into the **security** folder of the UCMDB Server (**C:\hp\UCMDB\UCMDBServer\conf\security**) to overwrite the existing files.

11. **Copy the UCMDB root certificate to each Probe machine**

    Copy the certificate file **C:\HP\UCMDB\UCMDBServer\conf\security\hproot.crt** from the UCMDB Server machine to the following folder on each Data Flow Probe machine:

    C:\HP\UCMDB\DataFlowProbe\conf\security

12. **Data Flow Probe Configuration**

    > **Note:** You must configure each Data Flow Probe machine.

    Import the server's root certificate **hproot.crt** to the Probe's Truststore.

    a. Open the command prompt and run the command:

    ```
    keytool -import -alias hproot -file
    C:\HP\UCMDB\DataFlowProbe\conf\security\hproot.crt - storetype PKCS12 -
    providername JsafeJCE -keystore
    C:\HP\UCMDB\DataFlowProbe\conf\security\FIPS_HPProbeTrustStore.jks
    ```

    b. Enter the keystore password **logomania**.

    c. When asked **Trust this certificate?**, press **y** and then **Enter**.

    The following message is displayed: `Certificate was added to keystore.`

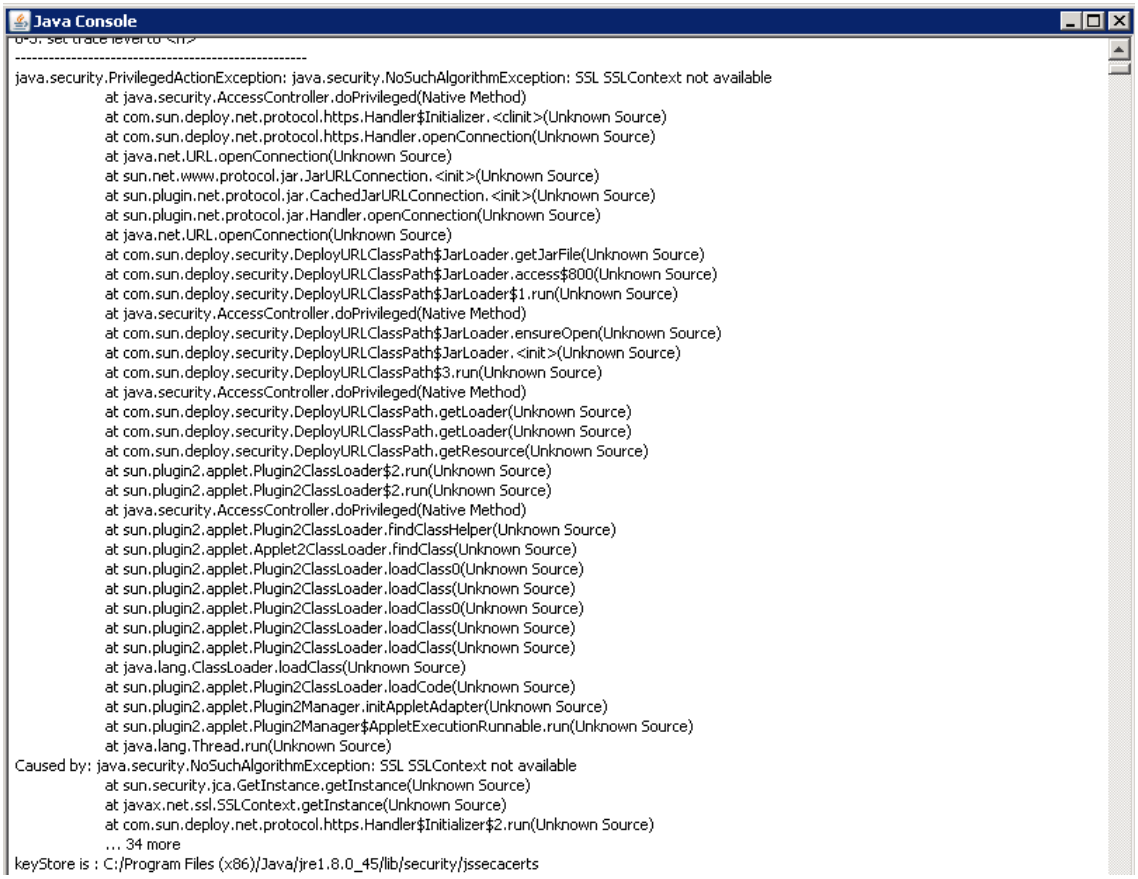
13. **Restart the Machines**

    Restart both the UCMDB server and the Probe machines.

Chapter 6: Known Problems and Limitations

- PosgresSQL will not be FIPS compatible but this should be acceptable because the communication is local from UCMDB Server/Probe to PosgresSQL Database.
- Limitations with SSH in FIPS mode
  - SSH does not support public key authentication.
  - SSH client does not support connecting remote host with non-FIPS compliant SSH server. The unsupported operating systems include, but not limited to, the following:
    - Solaris (both SPARK and x86)
    - RedHat AS3.

    One technical reason for the issue is that there is no common key exchange algorithm between client (probe side) and server: in FIPS mode, the probe will force to use **diffie-hellman-group14-sha1** as key exchange algorithm, which is not supported by remote host.
- The HPUX HPPA platform is not FIPS compliant. When the FIPS mode is on, the UD Agent can not start on the non-FIPS compliant HPUX HPPA platform. Therefore, the FIPS mode for the UD Agent is turned off in order to run the UD Agent on the HPUX HPPA platform. (QCCR1H100684)
- **UCMDB UI limitation:** If **–Djavax.net.debug=ssl** is present and Java console is also enabled, the following exception will always be printed in the console. **It can be ignored**, the UI will still be able to communicate through SSL with the Server.



- Common Access Card (CAC) does not support UI when the UCMDB Server is in the FIPS mode.
- **OOTB certificate (default hpcert) limitation.** The default hpcert certificate from **server-fips.keystore** uses a SAN extension with DNS field set to **localhost**. This limits the access to the UCMDB UI only from the UCMDB Server Machine (localhost). That is to say,
  - UCMDB UI must be on the same machine with UCMDB Server.
  - You can only use URL **https://localhost:8443/** to access the UCMDB Server. Neither **https://<UCMDB_Server_Name>:8443/** nor **https://<UCMDB_Server_IP_Address>:8443/**.

  This limitation applies to both of the following:
  - UCMDB Server Migration, and
  - UCMDB UI Migration

Chapter 7: Troubleshooting - FIPS Deployment

Troubleshooting the Data Flow Probes

- When probes finish upgrading, the new keystore/truststore is in place. If the UCMDB Server does not perform the last step of turning on FIPS, and HTTPs communication is enabled, in the UCDMB UI, you will see probe disconnected until the UCMDB Server replaces the new FIPS keystore/truststore in JMX.
- If you want to find out whether an agent has been switched to the FIPS mode, follow the steps below:

  a. Run the **UDA Status Collector** job.

     In UCMDB UI, go to **Data Flow Management > Universal Discovery > Discovery Modules/Jobs** tab **> Discovery Modules** tree **> Tools and Samples > UD Agent Management**, right-click **UDA Status Collector**, and select **Activate**.

  b. Access the Data Flow Probe JMX console: On the probe machine, launch a Web browser and enter the following address: **https://localhost:8453**.

     You may have to log in with a user name and password.

  c. Locate the **exportUdaStatus** method, provide the path, for example, **C:**, and then click **Invoke**.

  d. Go to the probe node and find the **uda_status.csv** file under the path you specified and open it.

  e. Check the **agentVersion** column in the file. If the **agentVersion** value is in the **<agent version>-fips** format, for example, **v10.33.000 build:185-fips**, then it means the agent has been migrated to FIPS mode successfully. Otherwise, it is still a non-FIPS agent.

  f. Count the rows where **agentVersion** value is in the **<agent version>-fips** format.

- **Problem:** If HTTPS communication is enabled on the UCMDB Server side, after the UCMDB server is switched to FIPS mode, data flow probes cannot connect to the UCMDB server.

  Solution: Update keystore and truststore values in the **ssl.properties** file (located in the **<*DataFlowProbe_Home*>\conf\security** directory) manually.

  To do so,

a. Open the **ssl.properties** file in a text editor.

b. Locate the following two lines:

```
javax.net.ssl.keyStore=HPProbeKeyStore.jks
javax.net.ssl.trustStore=HPProbeTrustStore.jks
```

c. Update the values for the two settings manually to the following:

```
javax.net.ssl.keyStore=FIPS_HPProbeKeyStore.jks
javax.net.ssl.trustStore=FIPS_HPProbeTrustStore.jks
```

d. Save the file.

e. Restart the Probe.

- **PROBLEM:** After adding a new probe to the UCMDB server that was already switched to the FIPS mode, the automatic FIPS switch process for the new probe might fail. This is because once the newly installed probe is started, it downloads all the resources from the UCMDB server, and when the probe gets the probe upgrade package, it would schedule a restart, which blocks the automatic FIPS Switch process. (QCCR1H106144)

  Workaround: Once you find that the automatic FIPS Switch process for a new probe failed,

  a. Copy the jar files of Zulu JCE Unlimited Strength Policy Files 8 into the **%\DataFlowProbe_HOME%\bin\jre\lib\security** directory on the Data Flow Probe machine.

  b. Add the following line into the **DataFlowProbe.properties** file on the Data Flow Probe machine, and then save the file.

  ```
  probe.fips.status=1
  ```

  c. Restart the Data Flow Probe.

  > **Note:** If the Data Flow Probe is in separate mode, you need to perform the above steps for both the Probe Manager and Probe Gateway.

- **PROBLEM:** After switching to the FIPS mode, you cannot log in to the Data Flow Probe JMX Console using some of the latest versions of Internet Explorer 11, Microsoft Edge, or Firefox. And when using these browsers you may get “Unsupported Cipher” error message.

  Workaround: To resolve the issue, do either of the following:

- **Configure your web browser**
  - For Internet Explorer 11 or Microsoft Edge
    A. On Windows, click **Start**, in the Search box, enter **Edit Group Policy**, then click **Edit group policy** that shows under Control Panel. The Local Group Policy Editor window opens.
    B. In the navigation pane, go to **Computer Configuration > Administrative Templates > Network > SSL Configuration Settings**.
    C. In the right pane, double-click **SSL Cipher Suite Order**.
    D. In the SSL Cipher Suite Order, select the **Enabled** radio button.
    E. In the Options pane, edit the order of SSL Cipher Suites by placing a cipher that doesn't contain ECDHE in the first place.
    F. Click **Apply** and **OK**.
    G. Restart your computer.
  - For Firefox
    A. In the Address bar of the web browser, type **about:config** and press **Enter**.
    B. Click **I accept the risk!** when prompted.
    C. In the Search bar that appears below the Address bar, type **ssl3**.

    All preferences that contain **ssl3** are listed.
    D. Change the value of all Cipher preferences containing **ecdhe** to **false**.

    You can enable or disable a preference by toggling its value with a double-click on the preference name. **true** indicates that the cipher suite is enabled, **false** indicates not available.
    E. Restart Firefox.
- **Update the Crypto-J toolkit files to version 6.2.2**
  i. Close your web browser (Internet Explorer 11, Microsoft Edge, or Firefox).
  ii. Stop the UCMDB server and the Data Flow Probe.
  iii. Delete the browser cache under the **C:\Users\<user>\AppData\Local\Temp\UcmdbAppletJars** folder.
  iv. Obtain the Crypto-J toolkit files (**cryptojce-6.2.2.jar**, **cryptojcommon-6.2.2.jar**, and **jcmFIPS-6.2.2.jar**).

  > **Note:** For information about Crypto-J 6.2.2 files, you may go to

> https://community.rsa.com/community/products/bsafe/crypto-j-62.

v. On the UCMDB server side:

A. Delete the files under the **<UCMDB_server_home>\runtime\jetty-cache** folder.

B. Copy the Crypto-J toolkit files (**cryptojce-6.2.2.jar**, **cryptojcommon-6.2.2.jar**, and **jcmFIPS-6.2.2.jar**) to the following folders:

- **<UCMDB_server_home>\bin\jre\lib\ext**
- **<UCMDB_server_home>\deploy\ucmdb-ui\static\appletJars**
- **<UCMDB_server_home>\deploy\ucmdb-ui\WEB-INF\lib**
- **<UCMDB_server_home>\integrations\lib**

vi. On the Data Flow Probe side, copy the Crypto-J toolkit files (**cryptojce-6.2.2.jar**, **cryptojcommon-6.2.2.jar**, and **jcmFIPS-6.2.2.jar**) from the **<UCMDB_server_home>\lib** directory, and place them inside the **<DataFlowProbe>\lib** folder (for example, **C:\hp\UCMDB\DataFlowProbe\lib**).

vii. Restart the UCMDB server and the Data Flow Probe.

Troubleshooting the UCMDB Server

- **Manual steps to make a reader server FIPS ready**

In case the **enableFipsMode** JMX method reports a failure for a reader server, you can perform several manual steps to make the reader server FIPS-ready.

> **Note:** These steps are applicable only when the switch to FIPS mode was successful on the writer server.
>
> The JMX output page displayed after the **enableFipsMode** JMX method is executed contains detailed information about the status of the switch to FIPS mode on all the HA cluster servers. Only when the switch to FIPS mode was successful on the writer server, but failed on a reader server, you can follow the steps below to make the reader server FIPS ready.

a. Stop all the servers in the HA cluster, including the writer server.

b. Start only the writer server.

After the first startup since FIPS was enabled, the newly generated FIPS compliant files will reside on the writer's file system. To make the reader server FIPS ready, you need to manually copy these files to the reader server.

c. Copy the **encryption.bin** and **cmdbSuperIntegrationCredentials.bin** files from the writer server's **<*UCMDB_Server_Home*>/conf/persistence** folder and place them in the corresponding location on the reader server.

d. Copy the **fips.conf** file from the writer server's **<*UCMDB_Server_Home*>/bin** directory and place it in the corresponding directory on the reader server.

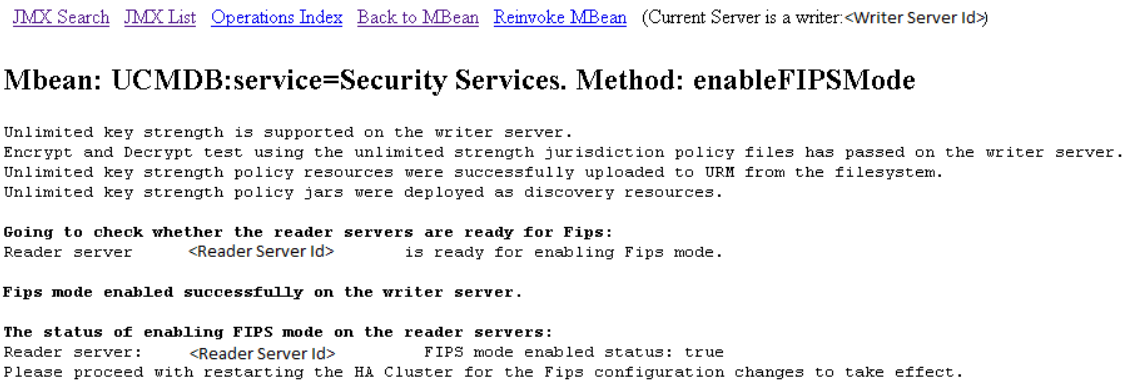
e. Copy the **cmdb.conf** file from the writer server's **<*UCMDB_Server_Home*>/conf** folder and place it in the corresponding directory on the reader server.

> **Note:** If necessary, correct the database connection details in the **dal.datamodel.host.name** parameter from the **cmdb.conf** file.

f. Start the reader server.

- **Switch to FIPS JMX output and important log files**

When switching the UCMDB Server to FIPS mode, the JMX output result should print information about whether the switch to FIPS mode succeeded on all the servers from the HA cluster:



The relevant logs that can be checked for detailed information are:

- **security.log** - contains detailed information about the switch to FIPS mode process. The following output is present in the **security.log** after calling the **enableFIPSMode** JMX method:

```
2017-07-10 19:18:13,155  INFO   [qtp325079998-215] - Switch to FIPS mode started:
2017-07-10 19:18:13,155  INFO   [qtp325079998-215] - Starting decrypt with Legacy
Providers.
2017-07-10 19:18:13,155  INFO   [qtp325079998-215] - Triggering the Master Key Decrypt
step.
```

```
...
...
2017-07-10 19:18:14,130  INFO   [qtp325079998-215] - Perform decrypt test for the new
super integration user file.
2017-07-10 19:18:14,131  INFO   [qtp325079998-215] - Super Integration user credentials
from new file are matching the credentials from input? Result: true
2017-07-10 19:18:14,131  INFO   [qtp325079998-215] - Switch to FIPS mode validation
succeeded!
```

After calling the **enableFIPSMode** JMX method, a lot of the FIPS changes will be present in temporary files on disk. When the UCMDB Server is restarted, the security log should also print details about the switch between the temporary and current files:

```
2017-07-10 19:25:33,382  INFO   [WrapperSimpleAppMain] - Copy new conf file:
..\conf\new_cmdb.conf into old one: ..\conf\cmdb.conf
2017-07-10 19:25:33,395  INFO   [WrapperSimpleAppMain] - New conf file was deleted?
true
2017-07-10 19:25:33,432  INFO   [WrapperSimpleAppMain] - Copy new file:
..\conf\persistence\encryption.bin.new into old one: ..\conf\persistence\encryption.bin
2017-07-10 19:25:33,439  INFO   [WrapperSimpleAppMain] - Going to delete:
..\conf\persistence\encryption.bin.new
2017-07-10 19:25:33,439  INFO   [WrapperSimpleAppMain] - Copy new file:
..\conf\persistence\cmdbSuperIntegrationCredentials.bin.new into old one:
..\conf\persistence\cmdbSuperIntegrationCredentials.bin
2017-07-10 19:25:33,443  INFO   [WrapperSimpleAppMain] - Going to delete:
..\conf\persistence\cmdbSuperIntegrationCredentials.bin.new
2017-07-10 19:25:36,239  INFO   [WrapperSimpleAppMain] - Master key was loaded with
success into memory!
2017-07-10 19:28:00,666  INFO   [WrapperSimpleAppMain] - LWSSO in FIPS mode
2017-07-10 19:28:00,666  INFO   [WrapperSimpleAppMain] - Reload configuration with
filename lwsso/ucmdb_fips_mode_lwsso_conf.xml
2017-07-10 19:28:00,819  INFO   [WrapperSimpleAppMain] - LWSSO in FIPS mode
2017-07-10 19:28:00,819  INFO   [WrapperSimpleAppMain] - Reload configuration with
filename lwsso/ucmdb_fips_mode_lwsso_conf.xml
```

- **startup.log** - contains information which can be consulted to determine whether the UCMDB server has performed the switch to FIPS.

```
2017-07-10 19:25:33,450  INFO   [WrapperSimpleAppMain] -
*********************************
2017-07-10 19:25:33,450  INFO   [WrapperSimpleAppMain] - *******  Starting Framework
*******
2017-07-10 19:25:33,458  INFO   [WrapperSimpleAppMain] - ***  Java Version: 1.8.0_92
2017-07-10 19:25:33,471  INFO   [WrapperSimpleAppMain] - ***  CMDB Version: 10.33.185
2017-07-10 19:25:33,471  INFO   [WrapperSimpleAppMain] - ***  Java Home:
C:\hp\UCMDB\UCMDBServer\bin\jre
2017-07-10 19:25:33,472  INFO   [WrapperSimpleAppMain] - ***  OS Name:      Windows
Server 2008 R2 6.1
2017-07-10 19:25:33,472  INFO   [WrapperSimpleAppMain] -
*********************************
2017-07-10 19:25:33,472  INFO   [WrapperSimpleAppMain] - Fips mode is enabled.
2017-07-10 19:25:33,472  INFO   [WrapperSimpleAppMain] - Switching to secure providers
2017-07-10 19:25:34,280  INFO   [WrapperSimpleAppMain] - Removing the current SunJSSE
provider.
```

```
2017-07-10 19:25:34,280  INFO   [WrapperSimpleAppMain] - Adding the new SunJSSE
provider which is configured in FIPS mode.
2017-07-10 19:25:34,280  INFO   [WrapperSimpleAppMain] - Changed SunJSSE to use JSafe
for SSL.
2017-07-10 19:25:34,280  INFO   [WrapperSimpleAppMain] - Added the JSafe provider.
2017-07-10 19:25:34,300  INFO   [WrapperSimpleAppMain] - Start framework init
```

- **Decryption error**

  In case a decryption error occurs, and the UCMDB server cannot start up, you can do the following:

  a. Regenerate the **server-fips.keystore/server-fips.truststore** files.

  For detailed instructions, see "Regenerate a new self-signed hpcert and sign it with the default UCMDB root certificate" on page 18.

  b. Synchronize password in the database by running the following command:

  ```
  <UCMDBServer>\bin\key-truststore.bat <FIPS or not? true for FIPS>
  <keystore password> <truststore password>
  ```

  Example:

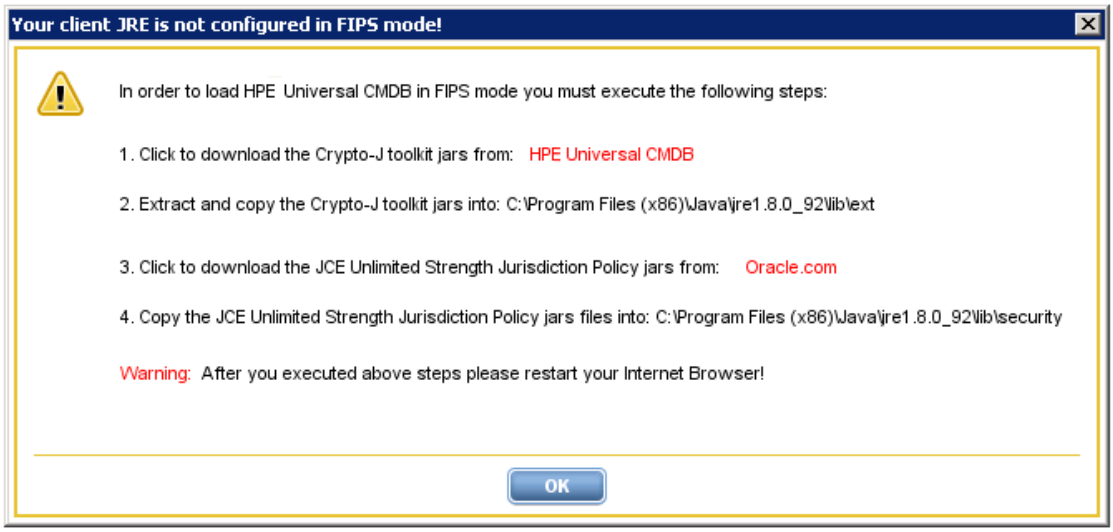
  ```
  C:\hp\UCMDB\UCMDBServer\bin\key-truststore.bat true mykeystorepass
  mytruststorepass
  ```

Troubleshooting the UCMDB UI

1. **Applet FIPS preliminary checks**

   After performing login in the UCMDB UI, there are basic checks done to make sure the Crypto J toolkit and the JCE Unlimited Strength Policy Files are present in the correct location in the JRE.

   Pop-up example from the UCMDB UI when the Crypto J toolkit jars and the Unlimited Strength Policy Files are missing:

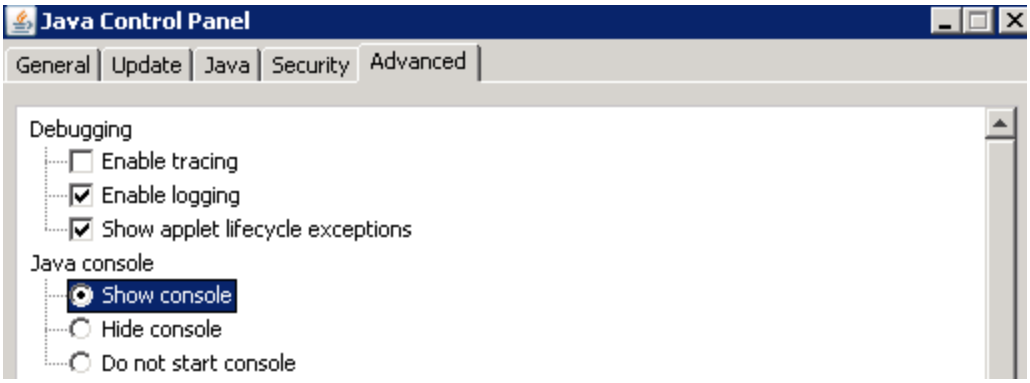


2. **Troubleshooting the SSL Communication between the UCMDB UI and the UCMDB Server**

   To investigate applet loading issues and SSL communication issues between the UCMDB UI and the UCMDB Server, Micro Focus recommends you to enable the Java console from the Java Control Panel.

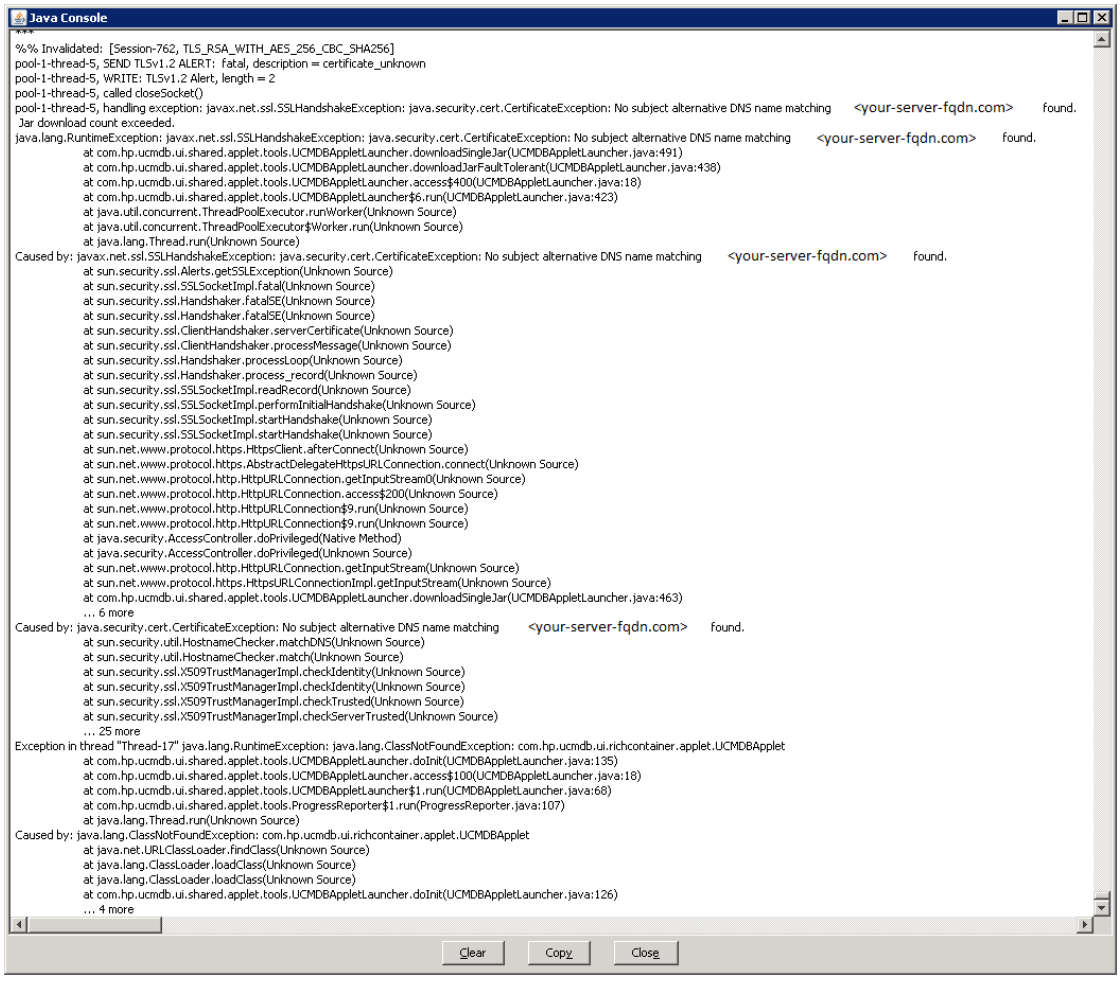
   a. In the **Advanced** tab of the Java Control Panel, under the **Java Console** category, select the **Show console** radio button.

   b. Make sure that under the **Debugging** category, the **Enable logging** radio button is selected.



   In addition to enabling the Java console, you should also add the `-Djavax.net.debug=ssl` parameter to the **JAVA_TOOL_OPTIONS** environment variable. (The environment variable should be present on the client machine if you performed steps in "Task 5. UCMDB UI Migration" for enabling the FIPS mode). After adding the SSL debug flag, you can inspect the output from the Java console when the UCMDB UI is loading.

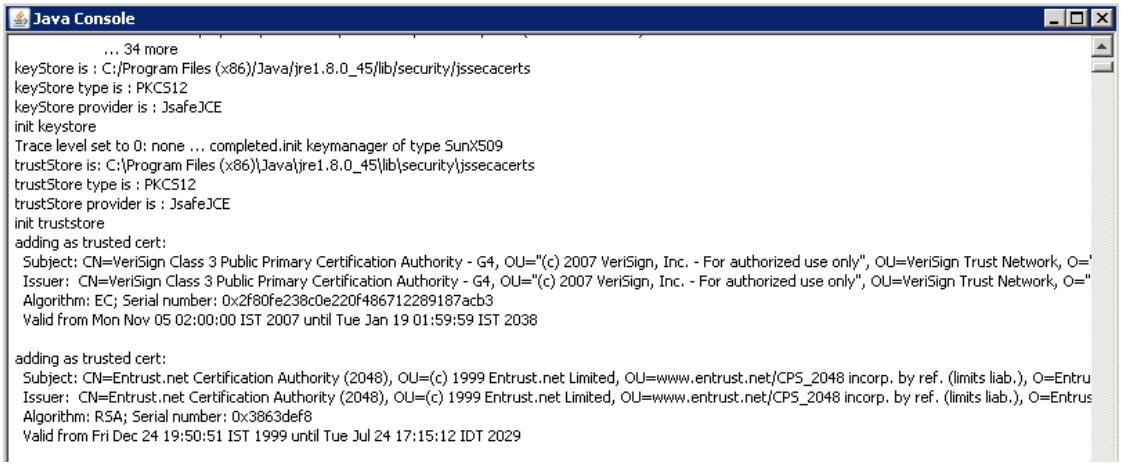
As an example on how to troubleshoot applet issues, we will use the default hpcert limitation. The default hpcert certificate from **server-fips.keystore** uses a SAN extension with DNS field set to **localhost**. This limits the access to the UCMDB UI only from the UCMDB Server Machine (localhost). That is to say, UCMDB UI must be on the same machine with UCMDB Server, and you can only use URL **https://localhost:8443/** to access the UCMDB Server, neither **https://<UCMDB_Server_Name>:8443/** nor **https://<UCMDB_Server_IP_Address>:8443/**. In case we try to access the UI with FQDN from a machine different than localhost, since the SAN extension DNS name (localhost) from the certificate does not match the URL we have used to access the UI (FQDN of the UCMDB Server), an SSL exception will be thrown in the Java Console and the loading of the UCMDB UI will stop.



This issue should not appear if you have followed the instructions in the "Task 4. UCMDB Server Migration" section, because a new hpcert certificate will be generated with appropriate SAN extensions (containing correct DNS names).

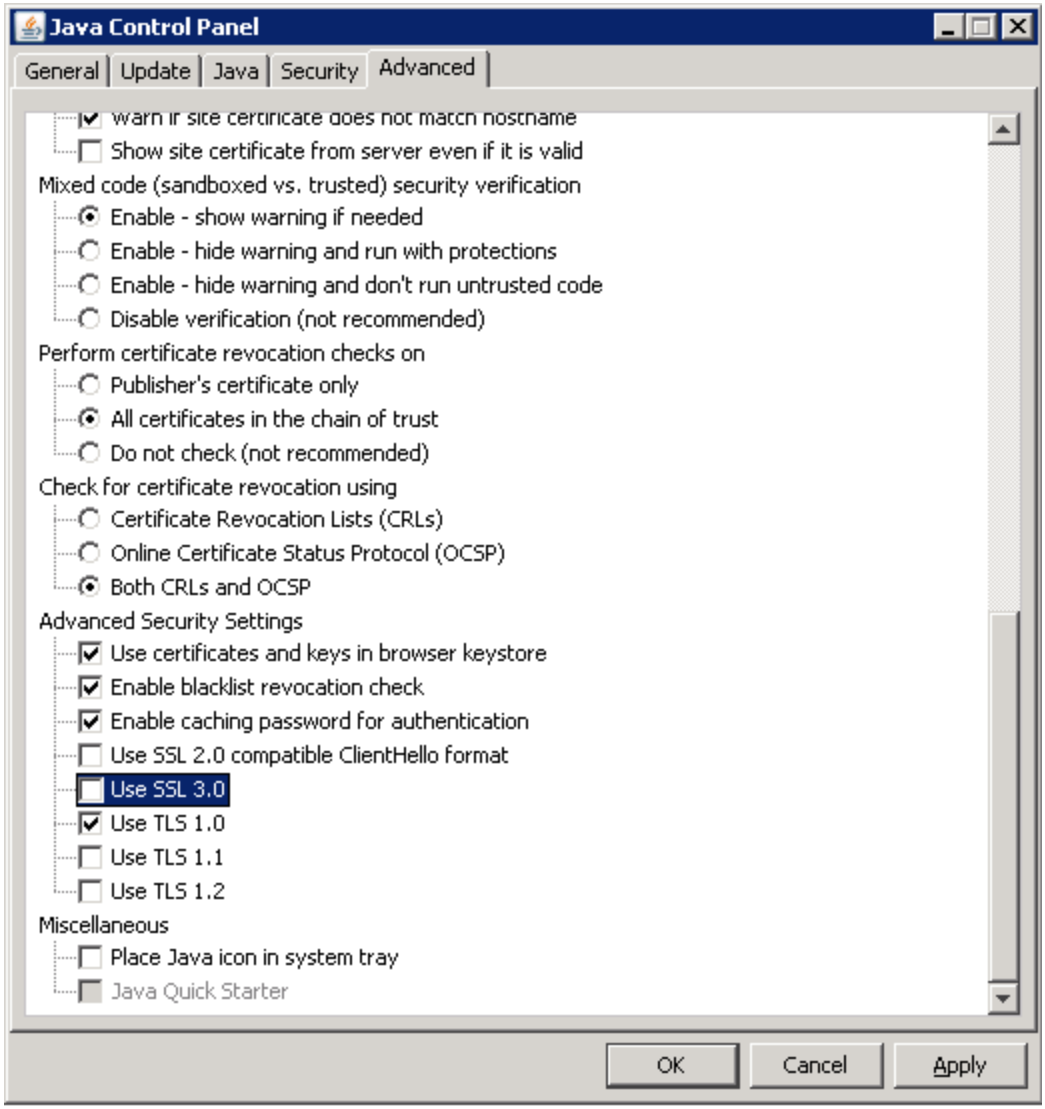
3. **Make sure the jssecacerts is loaded by the client JRE by checking the java**

console.



4. **Customize JRE 7 to use FIPS compliant protocols**

   If you use use JRE 7 for loading the UCMDB UI, make sure only TLS protocols are checked in the Java Control Panel. You need to un-check SSL 3.0.


Java Control Panel
General
Update
Java
Security
Advanced
Warn if site certificate does not match hostname
Show site certificate from server even if it is valid
Mixed code (sandboxed vs. trusted) security verification
Enable - show warning if needed
Enable - hide warning and run with protections
Enable - hide warning and don't run untrusted code
Disable verification (not recommended)
Perform certificate revocation checks on
Publisher's certificate only
All certificates in the chain of trust
Do not check (not recommended)
Check for certificate revocation using
Certificate Revocation Lists (CRLs)
Online Certificate Status Protocol (OCSP)
Both CRLs and OCSP
Advanced Security Settings
Use certificates and keys in browser keystore
Enable blacklist revocation check
Enable caching password for authentication
Use SSL 2.0 compatible ClientHello format
Use SSL 3.0
Use TLS 1.0
Use TLS 1.1
Use TLS 1.2
Miscellaneous
Place Java icon in system tray
Java Quick Starter
OK
Cancel
Apply

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