

HP Network Automation Software

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Windows® and Linux® operating systems

Administration Guide

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The title page of this document contains the following identifying information:

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Chapter 1: About This Guide

This guide contains a collection of information and best practices for administering HP Network Automation Software (NA). This guide is for an expert system administrator, network engineer, or HP support engineer with experience deploying and managing networks in large installations.

This guide assumes that you have already installed NA and that you are familiar with start-up configuration tasks. To learn more about these tasks, see the *NA Installation and Upgrade Guide* and the NA help.

HP updates this guide between product releases as new information becomes available. For information about retrieving an updated version of this document, see "[Documentation Updates](#)" on page 2.

Revision History

The following table lists the major changes for each new release of this document.

Document Changes

Document Release Date	Description of Major Changes
May 2014 (10.00)	Entirely updated.

Chapter 2: HP Network Automation Software Architecture and Ports

The *NA Architecture* diagram illustrates the NA Core components and their logical connections. The diagram also includes external products and components with which NA integrates.

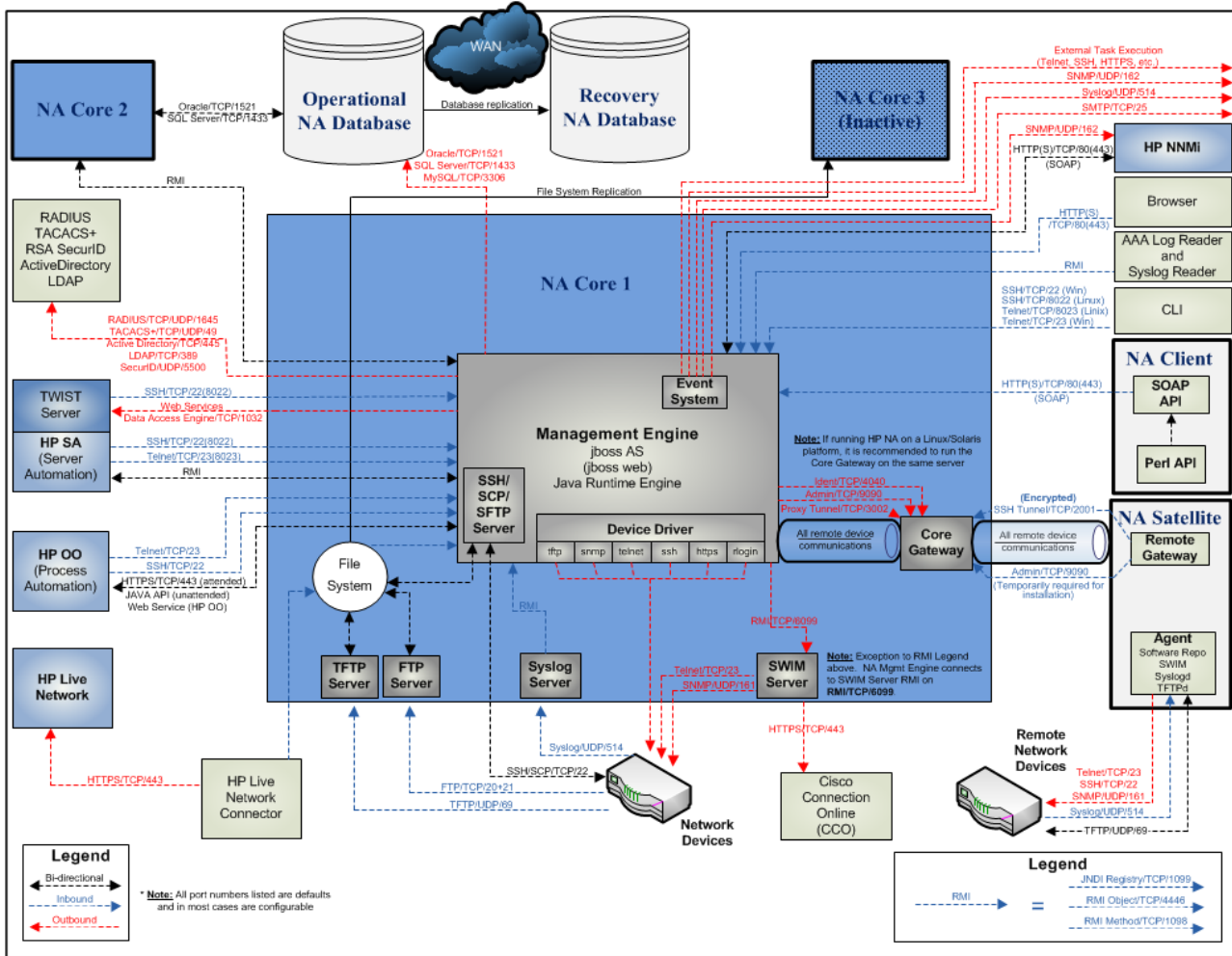
An NA Core is comprised of both an NA server and a database server. The center of the diagram shows the NA server, identified as both the Multimaster Core (MM) #1 and Horizontal Scalability (HS) App #1. Just above the NA server is the database server that is part of Multimaster (MM) Core #1 or the Horizontal Scalability configuration.

NA Cores can be meshed together to provide data replication, high availability, and disaster recovery. In the upper left of the diagram are a second NA server and a second database server, both identified as MM Core #2, along with the required connections between the database servers of MM Core #1 and MM Core #2 to create the mesh.

Included in the NA server are the NA Management Engine, the Core Gateway, the TFTP server, the FTP server, the Syslog server, and the SWIM server processes. The SSH/SCP/SFTP server and the Event System shown inside the NA Management Engine are embedded within the NA Management Engine process.

Around the perimeter of the diagram are the external entities with which the NA Core server integrates. Each connection from the NA Management Engine to an external entity identifies the service name, protocol, port number, and direction (bidirectional, inbound, or outbound) with respect to the NA Management Engine.

NA Architecture



HP Network Automation Software Ports

The following table shows the ports used by HP Network Automation (NA Core).

Ports Used by HP Network Automation (NA Core)

Port	Type	Name	Purpose	Change Configuration
22	TCP	SSH Server Port	SSH port from the NA client to the NA server on the Windows operating system	See "Telnet/SSH Page Fields" in the NA help.
23	TCP	Telnet Server Port	Telnet port from the NA client to the NA server on the Windows operating system	See "Telnet/SSH Page Fields" in the NA help.
69	UDP	TFTP Port	Network devices to the NA server	Change not supported
80	TCP	HTTP Port	HTTP port from the NA client to the NA server	Contact your Support representative for assistance.
443	TCP	HTTPS Port	HTTPS port from the NA client to the NA server	Contact your Support representative for assistance.
514	UDP	Syslog Port	Receive syslog messages from network devices on the NA server	See "Configuring the NA Syslog Server" in the NA Installation and Upgrade Guide.
1098	TCP	RMI Activation Port	Port between NA clients and the NA Management Engine and between the NA Management Engines in separate NA Cores. NA clients can include: -NA Syslog Server -NA Connectors -AAA Log Reader -Syslog Reader -Customer-written API scripts (For information, see the NA API User Guide and the NA CLI/API Command Reference.)	Contact your Support representative for assistance.
1099	TCP	RMI Registration Port	Port between NA clients and the	Contact your Support

Ports Used by HP Network Automation (NA Core), continued

Port	Type	Name	Purpose	Change Configuration
			NA Management Engine and between the NA Management Engines in separate NA Cores. NA clients can include: -NA Syslog Server -NA Connectors -AAA Log Reader -Syslog Reader -Customer-written API scripts (For information, see the NA API User Guide and the NA CLI/API Command Reference.)	representative for assistance.
1433	TCP	Microsoft SQL Server Port	Port on the Microsoft SQL Server that communicates with the NA Core. In a Distributed System configuration, the SQL Server databases communicate with each other on port 1433.	Contact your Support representative for assistance.
1521	TCP	Oracle SQL*Net Port	Port on the Oracle database server that communicates with the NA Core. In a Distributed System configuration, the Oracle processes connect to each other on port 1521.	Contact your Support representative for assistance.
3306	TCP	MySQL Port	Port on the MySQL database server that communicates with the NA Core	Contact your Support representative for assistance.
4446	TCP	jboss Remoting Port	Port between NA clients and the NA Management Engine and between the NA Management Engines in separate NA Cores. NA clients can include: -NA Syslog Server -NA Connectors -AAA Log Reader -Syslog Reader -Customer-written API scripts (For information, see the NA API User Guide and the NA CLI/API	Contact your Support representative for assistance.

Ports Used by HP Network Automation (NA Core), continued

Port	Type	Name	Purpose	Change Configuration
			Command Reference.)	
4712	TCP	jbossTS Recovery Manager Port	jboss transaction management	Contact your Support representative for assistance.
4713	TCP	jbossTS Transaction Status Manager Port	jboss transaction management	Contact your Support representative for assistance.
4714	TCP	jbossTS Socket Process ID Port	jboss transaction management	Contact your Support representative for assistance.
5445	TCP	jboss HornetQ netty port	jboss Messaging service	Contact your Support representative for assistance.
5455	TCP	jboss HornetQ netty-batch port	jboss Messaging service	Contact your Support representative for assistance.
6099	TCP	Software Image Management Server Port	HTTPS port from the NA server to the Software Image Management server	See "Server Page Fields" in the NA help.
8022	TCP	SSH Server Port	SSH port from the NA client to the NA server on the Linux operating system	See "Telnet/SSH Page Fields" in the NA help.
8023	TCP	Telnet Server Port	Telnet port from the NA client to the NA server on the Linux operating system	See "Telnet/SSH Page Fields" in the NA help.
8080	TCP	HTTP Port	HTTP port from the NA client to the NA server. Use instead of 80 when NA coexists with NNMI.	Contact your Support representative for assistance.
8443	TCP	HTTPS Port	HTTPS port from the NA client to the NA server. Use instead of 443 when NA coexists with NNMI.	Contact your Support representative for assistance.

The following table shows the ports used by HP Network Automation (NA Satellite).

Ports Used by HP Network Automation (NA Satellite)

Port	Type	Name	Purpose	Change Configuration
2001	TCP	Gateway Tunnel Port	TunnelPort from the Satellite to the Core Gateway. The Core Gateway listens for tunnel connections.	Contact your Support representative for assistance.
3002	TCP	Gateway Proxy Port	ProxyPort from the NA Core to the Core Gateway and from the Satellite agent to the Satellite	See "Device Access Page Fields" in the NA help.
4040	TCP	Gateway Ident Port	IdentPort from the NA Core to the Core Gateway	Contact your Support representative for assistance.
8005	TCP	Tomcat Server Port	Port for Tomcat to listen for commands like SHUTDOWN	Contact your Support representative for assistance.
8009	TCP	Tomcat AJP Port	Port for Tomcat to listen for AJP messages	Contact your Support representative for assistance.
8443	TCP	Tomcat HTTPS Port	RpcPort from the Satellite to the management agent (Tomcat), Syslog, TFTP	Contact your Support representative for assistance.
9090	TCP	Gateway Admin Port	AdminPort from the Satellite to the Core Gateway. Note that the Satellite uses all of the ports that the NA Core uses for managing devices (from the Satellite to the device: 22, 23, 514, 80, and 443).	See "Device Access Page Fields" in the NA help.

Chapter 3: IPv6 Readiness

HP Network Automation (NA) is a robust network element management and automation tool. NA communicates with network elements via numerous protocols and authentication methods to gather information. NA then parses the information, normalizing it in a searchable and presentable format.

NA supports IPv6, both as transport and as parsed searchable and presentable bits of IPv6 specific information. NA supports IPv6 connections to DBMS. This includes Microsoft SQL Server 2005.

The NA adoption of IPv6 is focused on providing:

- Transparent access to network elements via IPv4 and/or IPv6
- Information on network element IPv6 configurations
- IPv6 support across NA features

Installation

NA installs and automatically detects network provisioning on the server. The available protocol determines what protocol NA uses for communicating to elements and NA listening servers. This includes:

- IPv4 only
- IPv6 only
- Dual stack environments (whether native or using a transition mechanism)

If NA is installed on a server that is to be updated to support IPv6, the following procedure is recommended:

1. Shut down NA.
2. Add IPv6 support to the server.
3. Restart NA.
4. Check the Admin options for various servers to ensure correct IPv6 address discovery.

Network Services

NA has several network services that will appropriately listen on IPv4-only, IPv6-only, and dual stack environments. These include:

- Web Server (TCP 80 and 443) — Clients using IPv6-enabled OS and browser can access NA via IPv6.
- TFTP Server (UDP 69) — Network elements can upload/download information via TFTP IPv6.
- TELNET Server (TCP 23) — Network elements can upload/download information via TELNET IPv6. Clients accessing the NA CLI can do it via TELNET IPv6.
- SSH/SCP Server (TCP 22) — Network elements can upload/download information via SSH/SCP IPv6. Clients accessing

the NA CLI can do it via SSH IPv6.

- SYSLOG Server (UDP 514) — Network elements reporting change can do it via SYSLOG IPv6.

NA functions that instruct network elements to access these services will correctly determine which protocol to use based on a number of factors.

Clients

NA uses numerous protocols for intra-communication and communicating with network elements. These include:

- HTTP (TCP 80) — Access network elements
- HTTP (TCP 443) — Access network elements
- FTP (TCP 21) — Access network elements
- SNMP (UDP 161) — Access network elements
- Telnet (TCP 23) — Access network elements
- SSH/SCP (TCP 22) — Access network elements
- SYSLOG (UDP 514) — Send logging message
- SMTP (TCP 25) — Send email

IPv6 Presentation

The NA user interface supports IPv6 notation. This includes correct understanding, parsing, input, and display of IPv6 addresses. NA provides unique searching features for searching for IPv6 addresses within the system.

NA Features Supporting IPv6

The following NA features support IPv6:

- Detect Network Device
- Discover Driver
- Device Reservation
- Take Snapshot
- Configure Syslog
- Deploy Passwords
- Reboot Device
- Run Command Script
- Run Diagnostics
- Synchronize Startup and Running
- Update Device Software
- Import
- Deduplication
- Check Policy Compliance
- Resolve FQDN
- Searching

- Reporting
- Real time change management
- Work Flow
- CLI and API
- Satellites

Drivers

NA architecture is such that a driver layer exists between the NA Core and the managed network elements. This layer abstracts information from network elements, interprets it, and then forwards the information to NA. NA has IPv6 driver dependencies. As a result, not all drivers support all features of IPv6. Primary adoption includes the Cisco family of network elements.

Currently, the following NA components do not support IPv6:

- Dynamic IPv6 addresses — NA does not gather or track information on device elements or dynamically assigned IPv6 addresses (for example, link local and multicast).
- IPv6 ACLs — The ACL specific feature does not parse/process IPv6 ACLs, though functionality to search, add, delete, and edit IPv6 ACLs exists.
- NMAP — Using NMAP with the NA Detect Network Device feature do not work.
- Multimaster Distributed System and Horizontal Scalability — Dual stack is supported, however with the replication/RMI using IPv4-only.
- Topology Diagramming — Topology diagramming does not support IPv6.
- SA/NA integration — HP Server Automaton does not support IPv6.
- OO/NA integration — HP Operations Orchestration does not support IPv6.
- NNMi/NA integration - HP Network Node Manager with dual stack is supported, but not with IPv6-only.
- BSAE/NA integration — Business Service Automaton Essentials does not support IPv6.
- DDS integration — The Driver Delivery System does not support IPv6.

Chapter 4: Tuning NA Performance

This chapter describes several ways to tune the performance of HP Network Automation Software (NA). It includes the following topics:

- ["Tuning the NA Management Engine" below](#)
- ["Configuring the Java Virtual Machine" on page 21](#)
- ["Configuring MySQL for NA" on page 22](#)
- ["Configuring Oracle for NA" on page 22](#)
- ["Configuring SQL Server for NA" on page 23](#)

Tuning the NA Management Engine

This section describes recommended tuning of the NA Management Engine. If you update the maximum number of concurrent tasks, also update the maximum data source pool size and the number of connections from NA to the Oracle database.

Task Scheduling

It is recommended that scheduled tasks be planned to run throughout the day to balance the use of NA core server resources.

It is recommend that snapshot tasks occur after the work day ends to capture that day's changes.

Maximum Concurrent Tasks

The maximum number of concurrent tasks tunes the NA task functionality.

The recommended value for the maximum number of concurrent tasks depends on the size of the NA deployment, as described in "Tuning Settings" in the *NA Support Matrix*. A higher value is not necessarily better.

To set the maximum number of concurrent tasks, follow these steps:

1. Log on to the NA console as an NA administrator.
2. On the Administrative Settings - Server page (**Admin > Administrative Settings > Server**), under Tasks, set Max Concurrent Tasks to the value recommended in "Tuning Settings" in the *NA Support Matrix*, and then click **Save**.

Tip: After changing the maximum number of concurrent tasks, see ["Maximum Data Source Pool Size" on the next page](#) and ["Number of Database Connections from NA" on page 22](#).

Maximum Data Source Pool Size

If you change the Max Concurrent Tasks setting or the Max Concurrent Group Tasks setting or if the expected maximum number of concurrent users of the NA console changes considerably, update the maximum data source pool size configuration.

The correct maximum data source pool size is the sum of the following factors:

- The Max Concurrent Tasks setting
This value is listed under Tasks on the Administrative Settings - Server page.
- The Max Concurrent Group Tasks setting
This value is listed under Tasks on the Administrative Settings - Server page.
- The expected maximum number of concurrent NA users
This number depends on the way your company uses NA.

Tip: The All Users page (**Admin >Users**) lists all user accounts that can connect to NA.

- A buffer of 20

To set the maximum data source pool size configuration, follow these steps:

1. Stop all NA services. See "[Start, Stop, or Restart All NA Services](#)" on page 97.
2. To set the maximum data source pool size value, do the following:

- a. Change to the following directory:

- **Windows:** <NA_HOME>\server\ext\jboss\server\default\deploy
- **Linux:** <NA_HOME>/server/ext/jboss/server/default/deploy

- b. Back up the `db-ds.xml` file to a location outside the <NA_HOME> directory.

- c. In a text editor such as WordPad or vi, open the `db-ds.xml` file.

- d. Search for the string `NASDataSource` to locate the following lines:

```
<attribute name="DataSourceName">NASDataSource</attribute>
<attribute name="InitialPoolSize">0</attribute>
<attribute name="MinPoolSize">0</attribute>
<attribute name="MaxPoolSize">50</attribute>
```

- e. Set the `MaxPoolSize` attribute to the calculated value.

- f. Search for the string `NASReportDataSource` to locate the following lines:

```
<attribute name="DataSourceName">NASReportDataSource</attribute>
<attribute name="InitialPoolSize">0</attribute>
<attribute name="MinPoolSize">0</attribute>
<attribute name="MaxPoolSize">50</attribute>
```

- g. Identify, but do *not* change, the value of the `MaxPoolSize` attribute for the NA report data source configuration.

The values of both maximum pool size attributes factor into the calculation of the number of available database connections.

- h. Save the `db-ds.xml` file.

3. In an NA Horizontal Scalability environment, repeat [step 2](#) on each NA server.
4. On each NA server, start all NA services. See "[Start, Stop, or Restart All NA Services](#)" on page 97.

Configuring the NA Cache Size

This topic describes how to tune the NA cache for specific object types. Experience has shown that tuning these values so that NA caches all of the corresponding object types improves NA performance without impacting memory consumption.

To tune the NA cache

1. In the NA console, on the System Status page (**Admin > System Status**), click **Run Now** in the DatabaseMonitor row.
2. On the Monitor Details page, note the count for each of the database objects in the following table.

NA Database Object Description	NA Database Object Name	Current Count	New Value	Configuration Parameter
Identifier of the authentication rule and the protocol used for the last successful access to the device	RN_DEVICE_LASTUSED			jcs.region.DEVICE_LASTUSEDVO_REGION.cacheattributes.MaxObjects
Device	RN_DEVICE			jcs.region.DEVICE_VO_REGION.cacheattributes.MaxObjects
Name of the driver and family for a device	RN_DRIVER_LOOKUP			jcs.region.DRIVERLOOKUP_VO_REGION.cacheattributes.MaxObjects
Device IP address	RN_IP			jcs.region.IPVO_REGION.cacheattributes.MaxObjects

3. For each of these values, determine a new configuration value by adding a buffer to account for network growth.
4. Set the cache size for the identified object types.
 - a. Change to the following directory:
 - **Windows:** <NA_HOME>\jre
 - **Linux:** <NA_HOME>/jre
 - b. Back up the `cache.ccf` file to a location outside the <NA_HOME> directory.
 - c. In a text editor such as WordPad or vi, open the `cache.ccf` file.
 - d. For each row of the table in [step2](#), set the configuration parameter to the new value.
 - e. Save the `cache.ccf` file.
5. In an NA Horizontal Scalability or Multimaster Distributed System environment, repeat the previous steps on each

NA core server.

6. On each NA core server, restart all NA services. See ["Start, Stop, or Restart All NA Services"](#) on page 97.

Configuring the Java Virtual Machine

The recommended configuration of the Java virtual machine (JVM) heap and young generation sizes depend on the size of the NA core server, as described in “Tuning Settings” in the *NA Support Matrix*.

Note: The JVM configuration is specified in megabytes.

To set the JVM heap and young generation size, follow these steps:

1. Change to the directory that contains the JVM configuration files:

- **Windows:** <HA_HOME>\server\ext\wrapper\conf
- **Linux:** <HA_HOME>/server/ext/wrapper/conf

2. Back up the `jboss_wrapper.conf` file to a location outside the <NA_HOME> directory.

3. In a text editor such as WordPad or vi, open the `jboss_wrapper.conf` file.

4. Search for the string `initmemory` to locate the lines similar to the following lines:

```
# Initial Java Heap Size (in MB)
wrapper.java.initmemory=8192
# Maximum Java Heap Size (in MB)
wrapper.java.maxmemory=8192
```

5. Compare the values of the `wrapper.java.initmemory` and `wrapper.java.maxmemory` parameters to the minimums given for the initial and maximum Java heap size, respectively, in “Tuning Settings” in the *NA Support Matrix*.

- If the values meet or exceed the recommendations, no action is required and you can stop here.
- If the values are lower than the recommendations, continue with [step 6](#).

6. If necessary, set the `wrapper.java.initmemory` and `wrapper.java.maxmemory` parameters to the minimums given for the initial and maximum Java heap size, respectively, in “Tuning Settings” in the *NA Support Matrix*.

7. Set the young generation size as follows:

- a. Determine whether the young generation size has been set previously by searching for the string `-Xmn`.
 - If this string is in the file, edit this line to set the recommended value for the young generation size in “Tuning Settings” in the *NA Support Matrix*.

For example:

```
wrapper.java.additional.3=-Xmn2730m
```

- If this string is not in the file, add continue with [step b](#).
- b. Search for the string `Additional` to locate the `Java Additional Parameters` section.
- c. After the last uncommented line in this section, add the following line:

```
wrapper.java.additional.N=-XmnYGm
```

d. In the newly added line, make the following substitutions:

- Replace *N* with the next number in the sequence of uncommented `wrapper.java.additional` parameters.

For example, if the `wrapper.java.additional.11` parameter is uncommented and the `wrapper.java.additional.12` parameter is commented out with a number sign (#), set *N* to 12.

- Replace *YG* with the recommended value for the young generation size in “Tuning Settings” in the *NA Support Matrix*.

For example:

```
wrapper.java.additional.12=-Xmn2730m
```

8. Restart all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Configuring MySQL for NA

Restricting MySQL to a small number of concurrent threads can reduce NA performance. To avoid this problem, configure MySQL to use an infinite number of threads. This configuration varies across versions of MySQL. NA ships with MySQL 5.0.8, which interprets the value 20 for `innodb_thread_concurrency` as infinite.

For new installations of NA 9.20 or later, MySQL is configured with this setting.

For upgrades to NA from a version before 9.20, the recommended tuning is described in “Verify the MySQL Configuration” in the *NA Installation and Upgrade Guide*.

Configuring Oracle for NA

This section describes known tuning of Oracle for NA.

Number of Database Connections from NA

The number of database connections is the total number of connections that NA can make to the database at any moment. This number depends primarily on the NA configuration for the maximum number of concurrent tasks.

If you change the maximum data source pool size, update the Oracle database configuration for the number of database connections.

Additionally, the following errors indicate the need to update the configuration for the number of database connections:

- This task did not complete. Connections could not be acquired from the underlying database!
- This task did not complete. An `SQLException` was provoked by the following failure:
`com.mchange.v2.resourcepool.ResourcePoolException: A ResourcePool cannot acquire a new resource -- the factory or source appears to be down.`

- This task did not complete. Can't find CustomScript

Find failed: java.sql.SQLException: Connections could not be acquired from the underlying database!

For an Oracle database, the value of the `processes` parameter sets the number of database connections. The value of the `processes` parameter should be greater than or equal to the sum of the following factors:

- For *each* active NA core, the value of the maximum pool size attribute for the NA data source configuration
- For *each* active NA core, the value of the maximum pool size attribute for the NA report data source configuration
- For *each* active NA core, a buffer of 50

Tip: If the active NA cores in an NA Horizontal Scalability environment are configured identically, the calculation in this step is the same as multiplying the result of the calculation for one NA core by the number of active NA cores in the NA Horizontal Scalability environment.

According to the Oracle documentation, the values of the `sessions` and `transactions` parameters are relative to the value of the `processes` parameter. If the value of the `processes` parameter needs to be changed, the values of the `sessions` and `transactions` parameters should also be updated.

Size of the NA Tablespace

The following error suggests that the NA tablespace does not have sufficient space for its contents:

The system could not save the data for device id 50851 - An SQLException was provoked by the following failure: com.mchange.v2.resourcepool.ResourcePoolException: A ResourcePool cannot acquire a new resource -- the factory or source appears to be down.

Contact Technical Support. (Reference stack trace ID 1690)"

Report this message to the database administrator (DBA), and suggest that the DBA evaluate the free space of the NA tablespace.

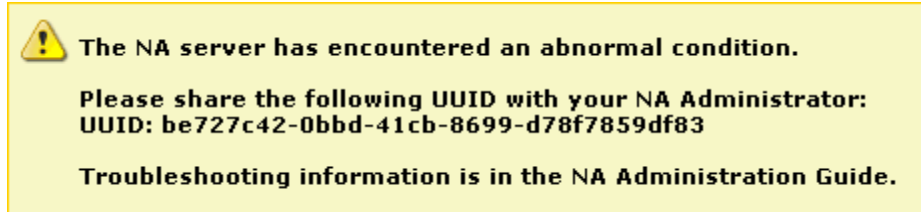
Also see "[Reclaiming Unused Space \(Oracle\)](#)" on page 93.

Configuring SQL Server for NA

At this time, there is no recommended tuning for Microsoft SQL Server with NA.

Chapter 5: Troubleshooting an Abnormal Condition on the NA Server

Occasionally, NA users might see a message similar to that shown here:



When such a condition occurs, NA logs a detailed message to the following file:

- **Windows:** %NA_HOME%\server\log\jboss_wrapper.log
- **Linux:** \$NA_HOME/server/log/jboss_wrapper.log

In the log file, a UUID identifies the message that describes this occurrence of the abnormal condition. This UUID is included in the message presented to the NA console user. The user can copy the UUID from the message for pasting into communication with the NA administrator. In the example message shown here, the UUID is `be727c42-0bbd-41cb-8699-d78f7859df83`.

For information about a specific condition, search the `jboss_wrapper.log` file for the UUID listed in the message. The relevant troubleshooting information is included in a block that begins with the following string:

```
=====MSG BEGIN=====
```

The block ends with the following string:

```
=====MSG END=====
```


Chapter 6: Configuring the NA Determination of Which User Changed a Device

The HP Network Automation Software (NA) administrator can adjust the priorities that NA uses for associating a user to a specific device change. By default, NA uses the first match from the following list:

- User who scheduled a password change that was run on the device.
- User who scheduled a software update that was run on the device.
- User who deployed a configuration to the device.
- User who ran a script on the device.
- User who connected to the device through the system's proxy.
- User information gathered from AAA logs.
- User information parsed from a syslog message.
- User who scheduled a diagnostic that was run on the device.

NA associates a weighted value to each priority. These weights can be adjusted using settings in the `adjustable_options.rcx` file.

To change the default order of these priorities, follow these steps:

1. Change to the directory that contains the `.rcx` files:

- **Windows:** `<NA_HOME>\jre`
- **Linux:** `<NA_HOME>/jre`

2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.

3. In the `adjustable_options.rcx` file, add the following lines:

```
<option name="changepriority/ACL_DELETE_PRIORITY">21</option>
<option name="changepriority/PASSWORD_CHANGE_PRIORITY">20</option>
<option name="changepriority/SOFTWARE_UPDATE_PRIORITY">18</option>
<option name="changepriority/CONFIGURE_SYSLOG_PRIORITY">17</option>
<option name="changepriority/CONFIG_DEPLOY_PRIORITY">16</option>
<option name="changepriority/SCRIPT_RUN_PRIORITY">15</option>
<option name="changepriority/PROXY_PRIORITY">12</option>
<option name="changepriority/SYSLOG_PRIORITY">10</option>
<option name="changepriority/AAA_PRIORITY">8</option>
<option name="changepriority/DIAGNOSTIC_RUN_PRIORITY">2</option>
<option name="changepriority/NONE_PRIORITY">0</option>
```

4. As needed, change the value for each priority to reflect the desired priority order. The higher the value, the higher the priority.

Note: Each value must be an integer and unique within this list of priorities.

5. Save the `adjustable_options.rcx` file.
6. Reload the `.rcx` settings by doing *one* of the following:

- Run the `reload server options` command from the NA proxy.
- On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
- Restart the NA management engine.

To verify that the new values are being used, set Feature/ChangeDetection to trace.

Chapter 7: Using Certificates with NA

A certificate provides proof of identification in any of the following exchanges:

- The web server identifies itself to the browser.
- One server identifies itself to another server.
- A user identifies themselves to a web server.

This certificate can be self-signed or signed by a certificate authority (CA). HP Network Automation Software (NA) uses the following certificate files:

- The Truecontrol key store file stores private keys and certificates with their corresponding public keys. It is located as follows:

- *Windows:*

- `<NA_HOME>\server\ext\jboss\server\default\conf>truecontrol.keystore`

- *Linux:*

- `<NA_HOME>/server/ext/jboss/server/default/conf>truecontrol.keystore`

- The Truecontrol trust store file contains certificates from other parties that you expect to communicate with, or from certificate authorities that you trust to identify other parties. It is located as follows:

- *Windows:*

- `<NA_HOME>\server\ext\jboss\server\default\conf>truecontrol.truststore`

- *Linux:*

- `<NA_HOME>/server/ext/jboss/server/default/conf>truecontrol.truststore`

- The CAcerts key store file also stores private keys and certificates with their corresponding public keys. The NA Java processes use the cacerts file when connecting to an SSL-based service (for example LDAP over SSL). It is part of the Java Development Kit (JDK) installed with NA and is located as follows:

- *Windows:* `<NA_HOME>\jre\lib\security\cacerts`

- *Linux:* `<NA_HOME>/jre/lib/security/cacerts`

This chapter contains the following topics:

- ["Default NA Certificates" on the next page](#)
- ["Adding a Self-Signed Certificate to NA" on page 30](#)
- ["Adding a CA-Signed Certificate to NA" on page 33](#)
- ["Adding a CA Root Certificate to NA for Enabling PKI" on page 37](#)
- ["Troubleshooting" on page 39](#)

Default NA Certificates

At installation, NA includes self-signed certificates in the Truecontrol key store, Truecontrol trust store, and the CAcerts key store. The NA-provided certificates are the same on all NA servers. For that reason, it is recommended to replace the default self-signed certificates with a new self-signed or CA-signed certificate. For information, see ["Adding a Self-Signed Certificate to NA" on page 30](#) or ["Adding a CA-Signed Certificate to NA" on page 33](#).

Truecontrol Key Store

The `truecontrol.keystore` file contains the certificate that the web browser uses to identify the NA server. The following table lists the key properties of the NA-provided self-signed certificate. Property labels and value formats vary across web browsers.

Properties of the Default Certificate for Accessing the NA Console

Property	Default Value
Issued to and by	localhost, Hewlett Packard Company <ul style="list-style-type: none">• CN = localhost• OU = Hewlett Packard Company• O = Hewlett Packard Company• L = Palo Alto• S = CA• C = US
Serial number	48 4e 9d 84
Valid date range	June 10, 2008 to June 08, 2018
SHA1 fingerprint	05 de dc 68 58 45 ca ea 88 ff 16 05 e7 65 a9 5b 23 29 d7 65
MD5 fingerprint	65:94:D1:A0:44:84:E2:69:A4:23:DC:B9:5E:EB:91:A8

By default, web browsers do not trust self-signed certificates. Therefore, NA console users see an unknown certificate warning before the NA console logon page appears.

Accepting the Truecontrol Certificate in a Web Browser

When the Truecontrol certificate is not in a web browser's list of trusted certificates, the web browser might display a warning message regarding the validity of the certificate. To resolve this issue, follow these steps:

1. Verify that the certificate values are as expected.
For the default NA-provided certificate, the values should match the information described in ["Truecontrol Key Store" above](#), though the formatting and display order might be different.
2. Follow the web browser procedure for adding the verified certificate to the list of trusted certificates.

Viewing the Truecontrol Key Store

To view the contents of the `truecontrol.keystore` file from the command line, follow these steps:

1. Change to the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:** `<NA_HOME>\server\ext\jboss\server\default\conf`
 - **Linux:** `<NA_HOME>/server/ext/jboss/server/default/conf`
2. Examine the contents of the Truecontrol key store file by entering the following command:
 - **Windows:**
`<NA_HOME>\jre\bin\keytool.exe -list -keystore truecontrol.keystore`
 - **Linux:**
`<NA_HOME>/jre/bin/keytool -list -keystore truecontrol.keystore`

When prompted for the key store password, enter: **sentinel**

The key store output is of the following form:

```
Keystore type: JKS
Keystore provider: SUN
Your keystore contains 1 entry
sentinel, 10-Jun-2008, PrivateKeyEntry,
Certificate fingerprint (MD5): 65:94:D1:A0:44:84:E2:69:A4:23:DC:B9:5E:EB:91:A8
```

Alternatively, use the `-v` (verbose) option for more output in the following form:

```
Keystore type: JKS
Keystore provider: SUN
Your keystore contains 1 entry
Alias name: sentinel
Creation date: 10-Jun-2008
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
Owner: CN=localhost, OU=Hewlett Packard Company, O=Hewlett Packard Company, L=Pa
lo Alto, ST=CA, C=US
Issuer: CN=localhost, OU=Hewlett Packard Company, O=Hewlett Packard Company, L=P
alo Alto, ST=CA, C=US
Serial number: 484e9d84
Valid from: Tue Jun 10 16:28:04 BST 2008 until: Fri Jun 08 16:28:04 BST 2018
Certificate fingerprints:
    MD5: 65:94:D1:A0:44:84:E2:69:A4:23:DC:B9:5E:EB:91:A8
    SHA1: 05:DE:DC:68:58:45:CA:EA:88:FF:16:05:E7:65:A9:5B:23:29:D7:65
Signature algorithm name: SHA1withRSA
Version: 3
```

Truecontrol Trust Store

At NA installation, the `truecontrol.truststore` file contains one self-signed certificate. You can add other products' certificates to this file to support inter-application communication across secure sockets layer (SSL).

For information about importing the HP Network Node Manager i Software certificate into the `truecontrol.truststore` file, see the *HP Network Node Manager i Software—HP Network Automation Integration Guide*.

Adding a Self-Signed Certificate to NA

You can create a new self-signed certificate that is unique to your environment. Using a new self-signed certificate does not require third-party involvement but could require that each NA console user configure their web browser to trust the new self-signed certificate.

To create a self-signed certificate and add it to NA, follow these steps:

1. Generate a new self-signed certificate as follows:
 - a. Change to the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:** `<NA_HOME>\server\ext\jboss\server\default\conf`
 - **Linux:** `<NA_HOME>/server/ext/jboss/server/default/conf`
 - b. Create a backup copy of the `truecontrol.keystore` file.
 - c. Use the `keytool` command to generate a new certificate in the Truecontrol key store file. For example:
 - **Windows:**
`<NA_HOME>\jre\bin\keytool.exe -genkey -keyalg RSA -keysize 2048 \
-validity 3650 -alias nacert -keystore truecontrol.keystore`
 - **Linux:**
`<NA_HOME>/jre/bin/keytool -genkey -keyalg RSA -keysize 2048 \
-validity 3650 -alias nacert -keystore truecontrol.keystore`

When prompted for the key store password, enter: **sentinel**

Tip: For more information, run the `keytool` command with no options.

- d. Enter the requested information:
 - When prompted for your first and last name, enter the identifier of the NA server, which could be `localhost`, the short hostname, or the IP address.

Note: Do *not* enter the fully-qualified domain name (FQDN) of the NA server.

Tip: Using a value other than `localhost` adds an additional configuration step that requires restarting the NA services.
 - When prompted to confirm the organization information (for example, `Is CN=hostname, OU=someOU, O=someORG, L=someCITY, ST=someSTATE, C=AB correct? [no] :`), type **yes**, and then press **Enter**.
 - When prompted for a password, press **Enter** to use the key store password.
2. Use the `keytool` command to export the newly-created certificate to a file. For example, from the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:**
`<NA_HOME>\jre\bin\keytool.exe -export -alias nacert \
-file nacert.cer -keystore truecontrol.keystore`

- **Linux:**
`<NA_HOME>/jre/bin/keytool -export -alias nacert -file nacert.cer \
-keystore truecontrol.keystore`

When prompted for the key store password, enter: **sentinel**

Tip: Specify the alias used when generating the certificate in [step 1](#) on page 94.

The output file (for example, `nacert.cer`) is created in the location from which the command is run.

The command output is of the following form:

```
Certificate stored in file nacert.cer
```

3. Import the exported certificate into the CACerts key store as follows:
 - a. Move the export file from its current location to the directory that contains the `cacerts` file. For example, from the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:** `move nacert.cer <NA_HOME>\jre\lib\security`
 - **Linux:** `mv nacert.cer <NA_HOME>/jre/lib/security`
 - b. Change to the directory that contains the `cacerts` file:
 - **Windows:** `<NA_HOME>\jre\lib\security`
 - **Linux:** `<NA_HOME>/jre/lib/security`
 - c. Create a backup copy of the `cacerts` file.
 - d. Use the `keytool` command to import the new certificate into the CACerts key store file. For example:
 - **Windows:**
`<NA_HOME>\jre\bin\keytool.exe -import -alias nacert \
-file nacert.cer -keystore cacerts`
 - **Linux:**
`<NA_HOME>/jre/bin/keytool -import -alias nacert -file nacert.cer \
-keystore cacerts`

When prompted for the key store password, enter: **changeit**

When prompted to trust the certificate, type **yes**, and then press **Enter**.

Tip: Specify the file (for example, `nacert.cer`) created in [step 2](#).

The alias is the identifier of the new certificate in the `cacerts` file. It does not need to match the alias in the `truecontrol.keystore` file.

The command output is of the following form:

```
Owner: CN=myhost, OU=Some OU, O=Some O, L=Mytown, ST=My State, C=AB  
Issuer: CN=myhost, OU=Some OU, O=Some O, L=Mytown, ST=My State, C=AB  
Serial number: 4e79d241  
Valid from: Wed Sep 21 13:02:09 BST 2011 until: Sat Sep 18 13:02:09 BST 2021  
Certificate fingerprints:  
MD5: FA:B1:86:18:18:47:43:30:8B:38:38:E6:8E:73:DB:84  
SHA1: CC:F2:69:F3:2C:7E:8E:03:BE:EC:F2:18:78:80:41:0A:BA:95:48:F8  
Signature algorithm name: SHA1withRSA  
Version: 3
```

```
Trust this certificate? [no]: yes
Certificate was added to keystore
```

4. To force NA to use the new certificate, remove the NA-provided certificate from the Truecontrol key store as follows:

- a. Change to the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:

- **Windows:** `<NA_HOME>\server\ext\jboss\server\default\conf`
- **Linux:** `<NA_HOME>/server/ext/jboss/server/default/conf`

- b. Use the `keytool` command to export the sentinel certificate to a backup file. For example:

- **Windows:**

```
<NA_HOME>\jre\bin\keytool.exe -export -alias sentinel \
-file sentinel_from_truecontrol_keystore.cer \
-keystore truecontrol.keystore
```
- **Linux:**

```
<NA_HOME>/jre/bin/keytool -export -alias sentinel \
-file sentinel_from_truecontrol_keystore.cer \
-keystore truecontrol.keystore
```

When prompted for the key store password, enter: **sentinel**

The command output is of the following form:

```
Certificate stored in file sentinel_from_truecontrol_keystore.cer
```

- c. Move the backup file (for example, `sentinel_from_truecontrol_keystore.cer`) to a safe location.
- d. Use the `keytool` command to delete the existing sentinel certificate from the Truecontrol key store. For example:

- **Windows:**

```
<NA_HOME>\jre\bin\keytool.exe -delete -alias sentinel \
-keystore truecontrol.keystore
```
- **Linux:**

```
<NA_HOME>/jre/bin/keytool -delete -alias sentinel \
-keystore truecontrol.keystore
```

When prompted for the key store password, enter: **sentinel**

The command output is of the following form:

```
[Storing truecontrol.keystore]
```

5. *Optional.* In [step 1](#), if the identifier of the NA server was `notlocalhost`, update the NA configuration as follows:

- a. Change to the directory that contains the `.rcx` files:

- **Windows:** `<NA_HOME>\jre`
- **Linux:** `<NA_HOME>/jre`

- b. Back up the `adjustable_options.rcx` file to a location outside of the `<NA_HOME>` directory.

- c. In the `adjustable_options.rcx` file, add the following line:

```
<option name="startup/precompile/http.prefix">http://"hostname"/</option>
```


- d. In the new line, replace `hostname` with the identifier entered for first and last name in [step d of step 1](#).
- e. Save the `adjustable_options.rcx` file.

Completing this step improves the NA console user experience by removing the wait time for each new page within the NA console.

6. Restart all NA services. See "[Start, Stop, or Restart All NA Services](#)" on page 97.
7. Instruct each NA console user to add the new certificate to their web browser's list of trusted certificates.

Adding a CA-Signed Certificate to NA

Using a new CA-signed certificate requires interaction with a third-party but does not require that each NA console user configure their web browser to trust the certificate.

To request a CA-signed certificate and add it to NA, follow these steps:

1. Generate a new local certificate as follows:
 - a. Change to the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:** `<NA_HOME>\server\ext\jboss\server\default\conf`
 - **Linux:** `<NA_HOME>/server/ext/jboss/server/default/conf`
 - b. Create a backup copy of the `truecontrol.keystore` file.
 - c. Use the `keytool` command to generate a new certificate in the Truecontrol key store file. For example:
 - **Windows:**

```
<NA_HOME>\jre\bin\keytool.exe -genkey -keyalg RSA -keysize 2048 \
-validity 3650 -alias nacacert -keystore truecontrol.keystore
```
 - **Linux:**

```
<NA_HOME>/jre/bin/keytool -genkey -keyalg RSA -keysize 2048 \
-validity 3650 -alias nacacert -keystore truecontrol.keystore
```

When prompted for the key store password, enter: **sentinel**

Note: Note the alias used for generating the new certificate. You must use this same alias for generating the certificate signing request in [step 2](#) and for importing the generated certificates into the `truecontrol.keystore` and `truecontrol.truststore` files in [step 4, step d](#).

Tip: For more information, run the `keytool` command with no options.

- d. Enter the requested information:
 - When prompted for your first and last name, enter the fully-qualified domain name (FQDN) of the NA server.
 - When prompted to confirm the organization information (for example, Is `CN=hostname, OU=someOU, O=someORG, L=someCITY, ST=someSTATE, C=AB` correct? [no] :), type **yes**, and then press **Enter**.
 - When prompted for a password, press **Enter** to use the key store password.

2. Use the `keytool` command to create a certificate signing request (CSR) from the new local certificate. For example, from the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:

- **Windows:**

```
<NA_HOME>\jre\bin\keytool.exe -certreq -alias nacacert \
-file narequest.csr -keystore truecontrol.keystore
```

- **Linux:**

```
<NA_HOME>/jre/bin/keytool -certreq -alias nacacert -file narequest.csr \
-keystore truecontrol.keystore
```

Tip: Specify the alias used when generating the local certificate in [step 1](#).

The output file (for example, `narequest.csr`) is created in the location from which the command is run.

3. Submit the CSR to the CA. If given the option, request that the new certificate be in a Tomcat-compatible or Apache-compatible format.

The CA should return one of the following:

- One file, a signed certificate, referred to as `server.crt` in this procedure.

The `server.crt` file contains both the server certificate (the top certificate contained in the file) and one or more CA certificates (the last certificates contained in the file).

In a text editor such as WordPad or `vi`, copy the contents of the CA certificate into a new file, the `CA.crt` file.

Use the `server.crt` file when importing the server certificate into the `truecontrol.keystore` file and the `CA.crt` file when importing the CA certificate into the `truecontrol.truststore` file.

- Two files, referred to as `server.crt` and `CA.crt` in this procedure.

In a text editor such as WordPad or `vi`, add the contents of the `CA.crt` file to the end of the `server.crt` file.

Use the modified `server.crt` file when importing the server certificate into the `truecontrol.keystore` file and the `CA.crt` file when importing the CA certificate into the `truecontrol.truststore` file.

The following examples show what the CA-provided files might look like:

Combined server and CA certificates in one file:

```
-----BEGIN CERTIFICATE-----
Sample1/VQQKExNQU0EgQ29ycG9yYXRpb24gTHRkMRAwDgYDVQQLEwdOZXR3b3Js
eGV5ZSZZvY2F0aW9uTG1zdD9iYXNlP29iamVjdENsYXNzPWNSTERpc3RyaWJ1dG1w
.....
TZImiZPyLGQBGRYDaW50MRIwEAYKcZImiZPyLGQBGRYCC2cxEzARBgNVBAMTCmNb
pSo6o/76yShtT7Vr1fz+mXjWyEHaIy/QLCpPebYhejHEg4dZgzWWT/lQt==
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
Sample2/Gh0dHA6Ly9jb3JwMWRjc2cyLnNlLmludC5wc2FnbG9iYWwuY29tL0Nlc
RaOApwggKYMBOGA1UdDgQWBBSqaWZzCRcpvJWOFpZ/Be9b+QSPyDAfBgNVHSMC
.....
Wp5Lz1ZJA0u1VHbPVdQnXn1Bkx7V65niLoaT90Eqd61aliVlJHj7GBriJ90uvVGu
```

```
BQagggEChoG9bGRhcDovLy9DTj1jb3JwMWRjc2cyL==  
-----END CERTIFICATE-----
```

Separate server and CA certificate files:

```
-----BEGIN CERTIFICATE-----  
Sample/AVQQKExNQU0EgQ29ycG9yYXRpb24gTHRkMRAwDgYDVQQLLEwdOZXR3b3Js  
eGVSZXXZvY2F0aW9uTG1zdD9iYXNlP29iamVjdENsYXNzPWNSTERpc3RyaWJldG1w  
.....  
.....  
TZImiZPyLGQBGRYDaW50MRIwEAYKZCZImiZPyLGQBGRYCC2cxZzARBgNVBAMTCmNb  
pSo6o/76yShtT7Vr1fz+mXjWyEHaIy/QLCpPebYhejHEg4dZgzWWT/lQt==  
-----END CERTIFICATE-----
```

4. Import the (modified if necessary) server.crt file into the Truecontrol key store and the CA.crt file into the Truecontrol trust store as follows:

a. Copy the server.crt and CA.crt files to the directory that contains the truecontrol.keystore and truecontrol.truststore files:

- **Windows:** <NA_HOME>\server\ext\jboss\server\default\conf
- **Linux:** <NA_HOME>/server/ext/jboss/server/default/conf

b. Change to the directory that contains the truecontrol.keystore and truecontrol.truststore files:

- **Windows:** <NA_HOME>\server\ext\jboss\server\default\conf
- **Linux:** <NA_HOME>/server/ext/jboss/server/default/conf

c. Create backup copies of the truecontrol.keystore and truecontrol.truststore files.

d. Use the keytool command to import the new certificates into the correct files. (One command for each certificate.) For example:

- **Windows:**
<NA_HOME>\jre\bin\keytool.exe -import -trustcacerts \
-alias nacacert -file server.crt -keystore truecontrol.keystore

<NA_HOME>\jre\bin\keytool.exe -import -trustcacerts \
-alias nacacert -file CA.crt -keystore truecontrol.truststore
- **Linux:**
<NA_HOME>/jre/bin/keytool -import -trustcacerts -alias nacacert \
-file server.crt -keystore truecontrol.keystore

<NA_HOME>/jre/bin/keytool -import -trustcacerts -alias nacacert \
-file CA.crt -keystore truecontrol.truststore

When prompted for the key store or trust store password, enter: **sentinel**

When prompted to trust the certificate, type **yes**, and then press **Enter**.

Tip: The alias is the identifier of the new certificate in each file. It must match the alias used to generate the certificate signing request in [step 2](#).

The command output is of the following form:

```
Owner: CN=NA_server.example.com  
Issuer: CN=NA_server.example.com
```

```

Serial number: 4e79d241
Valid from: Wed Sep 21 13:02:09 BST 2011 until: Sat Sep 18 13:02:09 BST 2021
Certificate fingerprints:
    MD5:  FA:B1:86:18:18:47:43:30:8B:38:38:E6:8E:73:DB:84
    SHA1: CC:F2:69:F3:2C:7E:8E:03:BE:EC:F2:18:78:80:41:0A:BA:95:48:F8
    Signature algorithm name: SHA1withRSA
    Version: 3
Trust this certificate? [no]:  yes
Certificate was added to keystore

```

- e. Repeat [step d](#) until all CA-provided certificates have been imported into the `truecontrol.keystore` file.
5. To force NA to use the new certificate, remove the NA-provided certificate from the Truecontrol key store as follows:
 - a. Change to the directory that contains the `truecontrol.keystore` and `truecontrol.truststore` files:
 - **Windows:** `<NA_HOME>\server\ext\jboss\server\default\conf`
 - **Linux:** `<NA_HOME>/server/ext/jboss/server/default/conf`
 - b. Use the `keytool` command to export the sentinel certificate to a backup file. For example:

- **Windows:**

```

<NA_HOME>\jre\bin\keytool.exe -export -alias sentinel \
-file sentinel_from_truecontrol_keystore.cer \
-keystore truecontrol.keystore

```
- **Linux:**

```

<NA_HOME>/jre/bin/keytool -export -alias sentinel \
-file sentinel_from_truecontrol_keystore.cer \
-keystore truecontrol.keystore

```

When prompted for the key store password, enter: **sentinel**

The command output is of the following form:

```
Certificate stored in file sentinel_from_truecontrol_keystore.cer
```

- c. Move the backup file (for example, `sentinel_from_truecontrol_keystore.cer`) to a safe location.
- d. Use the `keytool` command to delete the existing sentinel certificate from the Truecontrol key store. For example:

- **Windows:**

```

<NA_HOME>\jre\bin\keytool.exe -delete -alias sentinel \
-keystore truecontrol.keystore

```
- **Linux:**

```

<NA_HOME>/jre/bin/keytool -delete -alias sentinel \
-keystore truecontrol.keystore

```

When prompted for the key store password, enter: **sentinel**

The command output is of the following form:

```
[Storing truecontrol.keystore]
```

6. Update the NA configuration as follows:

- a. Change to the directory that contains the `.rcx` files:
 - *Windows:* `<NA_HOME>\jre`
 - *Linux:* `<NA_HOME>/jre`
- b. Back up the `adjustable_options.rcx` file to a location outside of the `<NA_HOME>` directory.
- c. In the `adjustable_options.rcx` file, add the following line:


```
<option name="startup/precompile/http.prefix">http://"hostname"/</option>
```
- d. In the new line, replace `hostname` with the identifier entered for first and last name in [step d](#) of [step 1](#).
- e. Save the `adjustable_options.rcx` file.

Completing this step improves the NA console user experience by removing the wait time for each new page within the NA console.

7. Restart all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).
8. Test the new certificate by logging on to the NA console. If the web browser trusts the CA, it will trust the connection to the NA console with no warning message.

Adding a CA Root Certificate to NA for Enabling PKI

One step in enabling Public Key Infrastructure (PKI) user authentication is to import a copy of the certificate authority (CA) root certificate into the Truecontrol trust store. Completion of this step ensures that NA trusts the issuer of the certificates that users present while logging on to NA.

Import one copy of the root certificate for each CA that generates user certificates.

To import the CA root certificate into NA, follow these steps:

1. Obtain the root certificate from the CA.

This procedure identifies the root certificate as `root.crt`.

2. Import the `root.crt` file into the Truecontrol trust store as follows:

- a. Copy the `root.crt` file to the directory that contains the `truecontrol.truststore` file:
 - *Windows:* `<NA_HOME>\server\ext\jboss\server\default\conf`
 - *Linux:* `<NA_HOME>/server/ext/jboss/server/default/conf`
- b. Change to the directory that contains the `truecontrol.truststore` file:
 - *Windows:* `<NA_HOME>\server\ext\jboss\server\default\conf`
 - *Linux:* `<NA_HOME>/server/ext/jboss/server/default/conf`
- c. Create a backup copy of the `truecontrol.truststore` file.
- d. Use the `keytool` command to import the root certificate into the Truecontrol trust store file. For example:
 - *Windows:*

```
<NA_HOME>\jre\bin\keytool.exe -import -trustcacerts \  
-alias rootcert -file root.crt -keystore truecontrol.truststore
```
 - *Linux:*

```
<NA_HOME>/jre/bin/keytool -import -trustcacerts -alias rootcert \  
-file root.crt -keystore truecontrol.truststore
```

When prompted for the trust store password, enter: **sentinel**

Tip: For more information, run the `keytool` command with no options.

When prompted to trust the certificate, type **yes**, and then press **Enter**.

Tip: The alias is the identifier of the certificate in each file. The CA must provide the alias used in its root certificate.

The command output is of the following form:

```
Owner: CN=Issuer.FTC.PKI Root CA, DC=ftcpki, DC=com
Issuer: CN=Issuer.FTC.PKI Root CA, DC=ftcpki, DC=com
Serial number: 6a265b0a1f77939d49c0055415511857
Valid from: Sat Feb 23 09:20:01 MST 2013 until: Mon Feb 23 09:30:00 MST 2043
Certificate fingerprints:
    MD5: 6A:35:83:40:67:76:9C:D7:21:4E:C4:D4:CC:4B:6E:15
    SHA1: 93:08:EB:27:77:79:23:F9:6D:9A:B9:5E:8F:DB:EF:91:6C:6E:9C:D8
    Signature algorithm name: SHA1withRSA
    Version: 3
Extensions:

#1: ObjectId: 2.5.29.15 Criticality=true
KeyUsage [
    DigitalSignature
    Key_CertSign
    Crl_Sign
]

#2: ObjectId: 2.5.29.19 Criticality=true
BasicConstraints:[
    CA:true
    PathLen:2147483647
]

#3: ObjectId: 2.5.29.14 Criticality=false
SubjectKeyIdentifier [
KeyIdentifier [
0000: 41 A9 C7 28 B3 36 11 18    F8 91 4D 58 51 8F 97 16    A..(.6....MXQ...
0010: E8 5C 03 E1                .\..
]
]

#4: ObjectId: 1.3.6.1.4.1.311.21.1 Criticality=false

#5: ObjectId: 1.3.6.1.4.1.311.20.2 Criticality=false

#6: ObjectId: 2.5.29.32 Criticality=false
CertificatePolicies [
    [CertificatePolicyId: [1.2.3.4.1455.67.89.5]
    [PolicyQualifierInfo: [
        qualifierID: 1.3.6.1.5.5.7.2.2
        qualifier: 0000: 30 2E 1E 2C 00 4C 00 65    00 67 00 61 00 6C 00 20    0...L.
        e.g.a.l.
        0010: 00 50 00 6F 00 6C 00 69    00 63 00 79 00 20 00 53    .P.o.l.i.c.y. .S
        0020: 00 74 00 61 00 74 00 65    00 6D 00 65 00 6E 00 74    .t.a.t.e.m.e.n.t
    ]], PolicyQualifierInfo: [
        qualifierID: 1.3.6.1.5.5.7.2.1
        qualifier: 0000: 16 1F 68 74 74 70 3A 2F    2F 70 6B 69 2E 66 61 62
```

```
..http://pki.fab
0010: 72 69 6B 61 6D 2E 63 6F    6D 2F 63 70 73 2E 74 78    rikam.com/cps.tx
0020: 74                                     t

[] ]
]

Trust this certificate? [no]: yes
Certificate was added to keystore
```

3. Restart the NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Troubleshooting

This section contains information about errors you might see while working with certificates in NA.

Incorrect Magic

Some operating systems, such as RedHat Linux, include a `keytool` utility. If the version of the `keytool` provided with the operating system does not match the NA JRE version, you will see an error message similar to the following:

```
keytool error: gnu.javax.crypto.keyring.MalformedKeyringException: incorrect magic
```

In this case, use the `keytool` utility provided with NA:

- **Windows:** `<NA_HOME>\jre\bin\keytool.exe`
- **Linux:** `<NA_HOME>/jre/bin/keytool`

httpmonitor Errors

If you change the certificate and do not import it into the CAcerts key store, you will see `httpmonitor` errors.

Correct this problem by importing the new certificate into the NA key store as described in ["Adding a Self-Signed Certificate to NA" on page 30](#).

Chapter 8: Enabling FIPS Mode

The Federal Information Processing Standardization (FIPS) specifies cryptography requirements for both software and hardware. FIPS applies to SSH connections to and from NA. When enabled, the default FIPS configuration applies to both of the following:

- SSH connections to the NA core
- SSH connections from the NA core to devices

For NA managed devices, FIPS functionality is only pertinent for SSH/SCP device access or SNMPv3 use. Devices that do not support SSH/SCP or SNMPv3 are not affected.

Enabling FIPS mode affects device access as follows:

- Restricts the encryption algorithms that can be used. For example, AES and 3DES are permitted; however Blowfish and DES are not.

Note: Because of this restriction, NA might not be able to communicate with non-FIPS compliant devices. In this case, do one of the following:

- Configure NA to use a protocol other than SSH or SCP for connecting to non-FIPS compliant devices.
- Disable FIPS for connections to all devices as described in the procedure for enabling FIPS.

- Replaces implementation of other encryption algorithms with a FIPS-compliant encryption algorithm.

To enable FIPS mode

1. Add the following line to the `adjustable_options.rcx` file:

```
<option name="crypto/fips/enabled">true</option>
```

2. *Optional.* Configure the permitted encryption algorithms.

- a. Copy the following lines from the `appserver.rcx` file to the `adjustable_options.rcx` file:

```
<array name="crypto/fips/cipher_list">  
  <value>3des-cbc</value>  
  <value>aes128-cbc</value>  
  <value>aes128-ctr</value>  
  <value>aes192-cbc</value>  
  <value>aes192-ctr</value>  
  <value>aes256-cbc</value>  
  <value>aes256-ctr</value>  
</array>  
<array name="crypto/fips/mac_list">  
  <value>hmac-sha1</value>  
  <value>hmac-sha1-96</value>
```



```
</array>
```

b. For each encryption algorithm to block, delete the associated line in the `adjustable_options.rcx` file.

3. *Optional.* Disable FIPS for connections to all devices by adding the following line to the `adjustable_options.rcx` file:

```
<option name="crypto/fips/disabled_for_device_
access">true</option>crypto/fips/disabled_for_device_access
```

4. Restart the NA management engine.

In the log file, a message indicates that FIPS mode is enabled. For example:

```
{system/crypto} [main] 75 FIPS140Mode: Loading FIPS JCE Provider
```

5. Log on to the NA console as an NA administrator.
6. Open the View Details page (**Admin > System Status > BaseServerMonitor > View Details**).

In the text, the following line indicates that FIPS mode is enabled.

```
crypto/fips/enabled = true
```

To disable FIPS mode

1. Add the following line to the `adjustable_options.rcx` file:

```
<option name="crypto/fips/enabled">false</option>
```

2. Restart the NA management engine.

Chapter 9: Configuring NA to Support PKI User Authentication

NA can authenticate a user based on the information in an X.509 format certificate. The certificate can be installed into the browser that runs the NA console. Alternatively, the certificate can be on a separate device, such as a smart card, that the user connects to the computer before opening the NA console. Public Key Infrastructure (PKI) user authentication enables both Common Access Card (CAC) and Personal Identity Verification (PIV) for user authentication into NA.

Enabling PKI user authentication impacts all users on all NA cores. Ensure that all NA users have X.509-format certificates or use an alternate user authentication method.

Enabling PKI user authentication does not impact device authentication.

While PKI user authentication is enabled, NA proxy sessions initiated from the NA console also use PKI user authentication. The NA API and NA proxy sessions initiated outside the NA console (for example, through telnet or SSH) do not support PKI user authentication.

This chapter contains the following topics:

- ["Configure NA for PKI User Authentication" below](#)
- ["Configure NA for Smart Card Authentication" on the next page](#)
- ["Distinguished Names Example" on page 44](#)
- ["Clear Authentication Data in the Browser" on page 46](#)
- ["Disable PKI User Authentication" on page 46](#)

For information about how NA determines whether to grant access to a PKI certificate user, see "User Authentication" in the *NA User Guide*.

Configure NA for PKI User Authentication

To configure NA to use X.509 format certificate authentication for accessing the NA console and the NA proxy from the NA console, follow these steps:

1. Import the certificate authority root certificate into the NA trust store as described in ["Adding a CA Root Certificate to NA for Enabling PKI" on page 37](#).

In a Horizontal Scalability or Multimaster Distributed System environment, import the certificate authority root certificate into the NA trust store on each NA core.

2. After restarting the NA services, log on to the NA console as a user with administrator privileges.
3. Configure NA user names and privileges.

NA consults a user directory to determine each user's access privileges. Each NA user name must match the certificate subject according to the mapping rules set on the Administrative Settings – User Authentication page

of the NA console. For information about available mapping options, see “User Authentication” in the *NA User Guide*.

Note: When the certificate subject includes the at sign (@), replace this character with the underscore character (_) in the NA user name.

- To use the NA database as the user directory, create and configure each NA user from the All Users page (**Admin > Users**) in the NA console.

Note: With PKI user authentication, the process of connecting to the NA console validates that the password for the NA user in the NA database meets the security policies and has not expired. Additionally NA user passwords might be used for device authentication.

- To use a directory service as the user directory, use the LDAP Set-up Wizard as described in “LDAP External Authentication Setup” in the *NA User Guide*.

4. Verify that at least one of the NA users configured in [step 3](#) belongs to the Administrator group.

Note: While PKI user authentication is enabled, if the user name of the administrator user account created during NA installation does not correspond to a certificate, that account is not available for connecting to the NA console

5. In the PKI Authentication section of the Administrative Settings – User Authentication page (**Admin > Administrative Settings > User Authentication**), specify the following:
 - The location of the NA user directory
 - The certificate fields that contain the NA user name (see ["Distinguished Names Example" on the next page](#))
 - The distinguished names of the trusted certificate issuers
 - The certificate revocation checking configuration

For more information about these fields, see “User Authentication” in the *NA User Guide*.

6. In the External Authentication Type section of the Administrative Settings – User Authentication page, select **PKI**.
7. Click **Save**.

Configure NA for Smart Card Authentication

To configure NA to use smart card authentication for accessing the NA console and the NA proxy from the NA console, follow the steps in ["Configure NA for PKI User Authentication" on the previous page](#). In the PKI Authentication section of the Administrative Settings – User Authentication page (**Admin > Administrative Settings > User Authentication**), for the Extended Key Usage field, enter 1.3.6.1.4.1.311.20.2.2 (for smart card certificates).

Distinguished Names Example

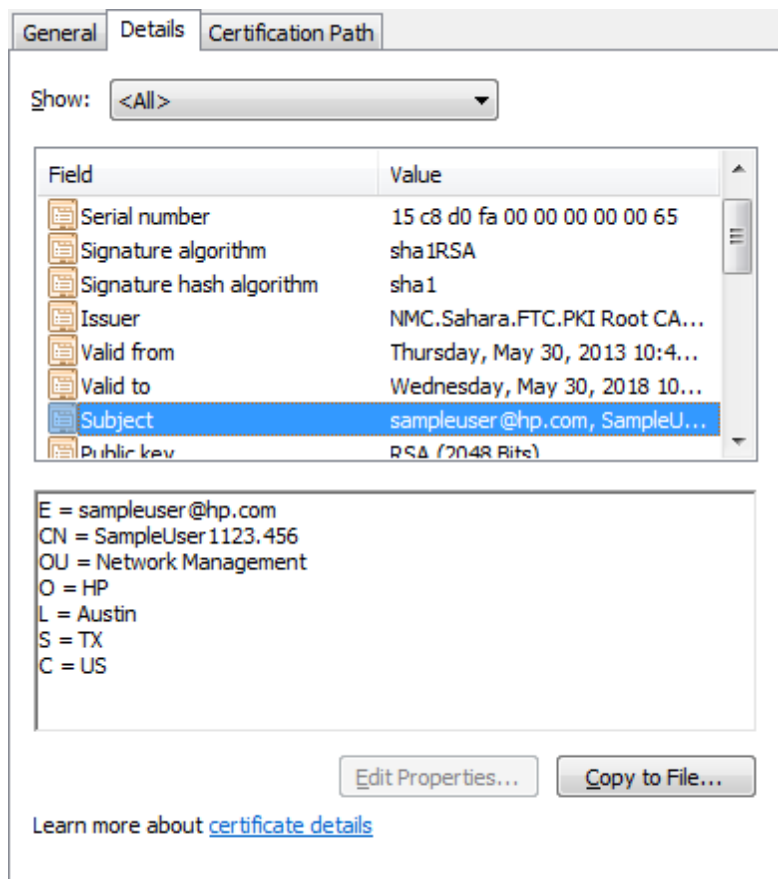
This section contains the following examples:

- "Certificate Subject" below
- "Certificate Subject Alternative Name" on the next page

Certificate Subject

The following image shows the Subject field of an X.509 format certificate. This Subject field contains the distinguished name of the certificate owner.

Subject Example



In this example, the elements of the distinguished name are as follows:

- Email address (sampleuser@hp.com)
- Common name (SampleUser1123.456)
- Organizational unit (Network Management)
- Organization (HP)
- Location (Austin)

- State (TX)
- Country (US)

To use the entire email address as the NA user name, enter `EMAILADDRESS` in the **Ordered Subject Attribute** field on the Administrative Settings – User Authentication page. In this case, create the NA user name as `sampleuser_hp.com` because NA does not support the use of the at sign (@) in user names.

To use a portion of the email address as the NA user name, enter `EMAILADDRESS=<regular_expression>` in the **Ordered Subject Attribute** field on the Administrative Settings – User Authentication page. Craft the regular expression to extract the NA user name from the email address.

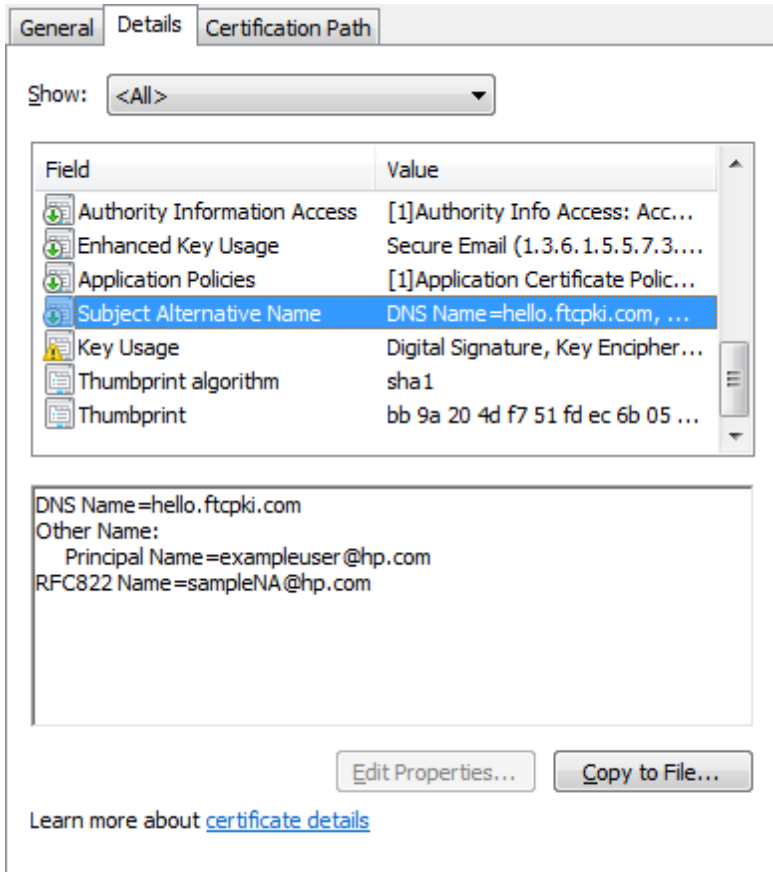
To use the common name as the NA user name, enter `COMMONNAME` in the Ordered Subject Attribute field on the Administrative Settings – User Authentication page.

Note: NA does not support spaces in the user name. Therefore, the common name value cannot contain spaces when used as the NA user name.

Certificate Subject Alternative Name

The following image shows the Subject Alternative Name field of an X.509 format certificate. This Subject Alternative Name field contains alternate identifiers of the certificate owner.

Subject Alternative Name Example



In this example, the elements of the subject alternative name that NA can process are as follows:

- Other Name with Principal Name value of `exampleuser@hp.com`
- RFC822 Name with value `sampleNA@hp.com`

For Other Name, NA supports the Principal Name (object identifier 1.3.6.1.4.1.311.20.2.3) only. The value of the Principal Name can be any kind of string, but the entire Principal Name value must match the NA user name.

To use the Principal Name value as the NA user name, enter `otherName` in the **Ordered Subject Alternative Name Types** field on the Administrative Settings – User Authentication page. Then, in the **Subject Alternative Name OID** field, enter `1.3.6.1.4.1.311.20.2.3`. In this case, create the NA user name as `exampleuser_hp.com` because NA does not support the use of the at sign (@) in user names.

To use the RFC822 Name as the NA user name, enter `rfc822Name` in the **Ordered Subject Alternative Name Types** field on the Administrative Settings – User Authentication page. In this case, create the NA user name as `sampleNA_hp.com` because NA does not support the use of the at sign (@) in user names.

Clear Authentication Data in the Browser

If the browser stores PKI certificate authentication data, logging out from NA is not sufficient to prevent unauthorized access to the NA console. Anyone who clicks **Log In** gains access to the NA console without further authorization. In this case, instruct all NA console users to close all browser windows after logging out from NA. Alternatively, users can clear all PKI certificate authentication data.

Note: Clearing PKI certificate authentication data from the browser impacts all applications that used certificate-based user authentication to run in the browser.

To clear PKI certificate authentication data in Microsoft Internet Explorer, in the Internet Options dialog box, select the **Content** tab, and then click **Clear SSL State**.

To clear PKI certificate authentication data in Mozilla Firefox, do one of the following:

- On the menu bar, click **Tools**, then click **Clear Recent History**. In the Clear Recent History window, select **Active Logins** from the Details list, and then click **Clear Now**.
- Press **Ctrl+Shift+Delete**. In the Clear Recent History window, select **Active Logins** from the Details list, and then click **Clear Now**.

Disable PKI User Authentication

If you have access to the NA console, disable PKI user authentication by following these steps:

1. Log on to the NA console as a user with administrator privileges.
2. On the Administrative Settings – User Authentication page (**Admin > Administrative Settings > User Authentication**), set External Authentication Type to anything other than **PKI**.
3. Click **Save**.

If you do not have access to the NA console, disable PKI user authentication by following these steps:

Caution: This procedure requires editing configuration files that are crucial to NA functionality. Only follow these steps if you do not have access to the NA console. Verify all changes before saving the configuration files.

1. Stop the NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

2. Disable PKI user authentication in the PKI configuration file.

a. Change to the directory that contains the configuration file:

- **Windows:** <NA_HOME>\server\ext\jboss\server\default\conf
- **Linux:** <NA_HOME>/server/ext/jboss/server/default/conf

b. Back up the `nms-auth-config.xml` file to a location outside the <NA_HOME> directory.

c. In the `nms-auth-config.xml` file, locate the following lines:

```
<realms>
  <!-- valid modes are X509, BASIC or FORM. Not all realms support
  all modes. -->
  <realm name="console">
    <mode>X509</mode>
  </realm>
</realms>
```

d. Change the mode line to read:

```
<mode>FORM</mode>
```

3. Disable PKI user authentication at the NA console level.

a. Change to the directory that contains the `.rcx` files:

- **Windows:** <NA_HOME>\jre
- **Linux:** <NA_HOME>/jre

b. Back up the `site_options.xml` file to a location outside the <NA_HOME> directory.

c. In the `site_options.xml` file, locate the following lines:

```
<option name="authentication/external/type">
  <title>External Authentication Type</title>
  ...
  <comment>Choose the type of external authentication you would like to
  use. &lt;br&gt;
  If you choose TACACS+, RADIUS, HP Server Automation Software, or
  PKI, configure that type in the related section on this page.
  &lt;br&gt;SecurID has no additional external authentication
  options. &lt;br&gt;
  </comment>certificate</option>
```

d. Change the option type from certificate to local:

```
</comment>local</option>
```

Tip: Be sure that you are working in the `<option name="authentication/external/type">` block.

4. Start the NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Users should now be able to log on to the NA console with the user name and password configured on the All Users (**Admin > Users**) page in the NA console.

Customizing LDAP User Authentication in NA

When NA is integrated with a directory service using LDAP, NA creates a corresponding user in the NA database the first time that user logs in to the NA console. NA then updates that user information in the NA database with subsequent changes.

By default, NA sets the user's email address to the value of the `userprincipalname` field in the directory service. To configure NA to use the value of the `mail` field in the directory service as the user's email address, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.

2. In the `appserver.rcx` file, locate the following line:

```
<option name="ldap_server/attr_mapping/ActiveDirectory/email">userprincipalname,mail</option>
```

3. Copy the line from the `appserver.rcx` file to the `adjustable_options.rcx` file.

4. In the `adjustable_options.rcx` file, change the copied line to:

```
<option name="ldap_server/attr_mapping/ActiveDirectory/email">mail,userprincipalname</option>
```

5. Save the `adjustable_options.rcx` file.

6. Reload the `.rcx` settings by doing one of the following:

- From the NA proxy, run the `reload server options` command.
- Restart the NA management engine.

7. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database:

- **On Windows:** Open the **Services** control panel. In the list of services, right-click each of the following services, and then click **Restart**:
 - TrueControl ManagementEngine
 - TrueControl FTP Server
 - TrueControl SWIM Server
 - TrueControl Syslog Server
 - TrueControl TFTP Server
- **On Linux:** Run the following command:

```
/etc/init.d/truecontrol restart
```

Chapter 10: Configuring NA to Store Duplicate MAC Addresses

By default, NA stores only one copy of a MAC address for each device. This behavior means that for devices that use the same MAC address for multiple ports, NA stores information for one port only and excludes other ports that use the same MAC address.

To configure NA to store all copies of each MAC address for a Cisco IOS device

1. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In the `adjustable_options.rcx` file, add the following line:

```
<option name="Drivers/CiscoIOS/allowDupeMacs">true</option>
```
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA management engine.
6. Run a new Run Diagnostics task to run the NA Topology Data Gathering diagnostic against the device.

Chapter 11: Configuring NA to Permit Editing of Tasks Waiting for Approval

This topic applies only when NA is configured with workflow approval rules.

As of NA 10.00, tasks in the REQUESTED state can be viewed but cannot be edited.

To permit editing of tasks waiting for approval

1. Change to the directory that contains the `.rcx` files:
 - *Windows:* `<NA_HOME>\jre`
 - *Linux:* `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In the `adjustable_options.rcx` file, add the following line:

```
<option name="workflow/disable_task_edit">false</option>
```
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA management engine.

Chapter 12: Configuring Dynamic Group Calculation

NA provides the following types of dynamic group recalculation:

- Periodic dynamic group recalculation for all devices

By default, NA determines the membership of all dynamic groups for all devices in the NA inventory every 60 minutes. This frequency is configurable.

- Event-driven dynamic group recalculation for one device

After a device change event, NA compares the impacted device to the dynamic group definitions and updates dynamic group membership as needed for that device only.

NA supports the following time frames for event-driven focused dynamic group recalculation:

- Immediate — Recalculation occurs immediately after the device change event.
- Queued — NA collects the list of devices impacted by device change events in a queue. After a device has been in the queue for a designated waiting period, NA runs recalculation for that device. If other events for that device have arrived during the waiting period, NA processes all events for that device at the same time. By default, the frequency of checking the queue for updates is one minute and the length of the waiting period is ten minutes. Both values are configurable.

It is recommended to enable immediate or queued event-driven dynamic group recalculation, but not both.

All types of dynamic group recalculation can be disabled.

Tip: Enable and disable the dynamic group monitor (DynamicDeviceGroupMonitor) on the Administrative Settings - Server Monitoring page.

Configuration Options for Periodic Dynamic Group Calculation for All Devices

NA provides the following options for configuring periodic dynamic group recalculation for all devices:

- Frequency

To set the frequency, on the Administrative Settings - Server page (**Admin > Administrative Settings > Server**), change the value of the **Dynamic Group Auto-Recalculation** field (under Dynamic Groups).

- Enabled or disabled

To disable this calculation, in the `adjustable_options.rcx` file, add the following line:

```
<option name="dynamic_group/disable">true</option>
```

For information about editing RCX files and forcing NA to re-read RCX files, see ["Working with .rcx Files" on page 98](#).

Configuration Options for Event-Driven Dynamic Group Calculation for One Device

Triggering Events

To select the device change events that cause dynamic group calculation, on the Administrative Settings - Server page (**Admin > Administrative Settings > Server**), select the relevant events in the **Device Change Events** list (under Dynamic Groups).

Tip: This list of events applies to both immediate and queued event-driven dynamic group calculation.

Immediate Calculation

In addition to the list of device events, NA provide the following option for configuring dynamic group recalculation for one device immediately after a device change event:

- Enabled or disabled

To disable this calculation, in the `adjustable_options.rcx` file, add the following line:

```
<option name="dynamic_group/disable_event_listener">true</option>
```

Queued Calculation

In addition to the list of device events, NA provide the following options for configuring dynamic group recalculation for one device queued to take place some time after a device change event:

- Frequency of checking the queue

To set the frequency, in the `adjustable_options.rcx` file, add the following line:

```
<option name="dynamic_group/queued_update_interval">M</option>
```

Replace *M* with the frequency in minutes.

- The length of the waiting period

To set the waiting period, in the `adjustable_options.rcx` file, add the following line:

```
<option name="performance/device_group_commit_interval">M</option>
```

Replace *M* with the length in minutes.

- Enabled or disabled

To disable this calculation, in the `adjustable_options.rcx` file, add the following line:

```
<option name="dynamic_group/disable_queued">true</option>
```

For information about editing RCX files and forcing NA to re-read RCX files, see ["Working with .rcx Files" on page 98](#).

Chapter 13: Configuring the Task Completion Email Content

For each task, you can set NA to send an email message upon task completion. A group task is one that works on multiple devices. The devices on which a group task runs can be identified individually, through device groups, or by a combination of both approaches. As of NA 9.22, for a group task NA sends only one email message upon completion of the group task. Prior to NA 9.22, NA sent one email message upon completion of each child task.

Note: Enabled event rules might send email messages regarding child task completion. To prevent these additional email messages, disable these event rules.

The format of the email content (subject and body) is the same for all tasks types but depends on whether the task is for one device or is a group task.

Single Task Completion Email Message Format

For a non-device task or a task that works on only one device, the default email message recipient is the task originator. This default is configurable.

For a non-device task or a task that works on only one device, the default format of the email message subject is as follows:

```
Task $TaskName$ completed. Task status: $TaskStatus$
```

For a non-device task or a task that works on only one device, the default format of the email message body is as follows:

```
Task           : $TaskName$
originated by  : $OriginatorName$
scheduled on   : $TaskScheduleDate$
completed with the following status:
                $TaskStatus$.
The following devices have been processed:
                $TaskDevices$.
Task comments  : $TaskComments$
View the task information here:
                $AppURL$/task.view.htm?taskID=$TaskID$
```

The default format produces an email message similar to the example shown in the following table.

Example of the Default Task Completion Email Message for a Single Task

Content Type	Example
Subject	Task Run Diagnostics completed. Task status: Succeeded
Body	<p>Task : Run Diagnostics</p> <p>originated by : admin</p> <p>scheduled on : 2013-05-18 03:53:04.0</p> <p>completed with the following status:</p> <p style="padding-left: 40px;">Succeeded.</p> <p>The following devices have been processed:</p> <p style="padding-left: 40px;">cisco_c3560 (10.78.60.36)</p> <p>Task comments :</p> <p>View the task information here:</p> <p>https://server.example.com:8443//task.view.htm?taskID=2801</p>

Alternatively, the email message body can contain details of the task results. Enabling the task results option overrides the message body. The following table shows an example email message with task results.

Example Email Message with Task Results

Content Type	Example
Subject	Task Run Diagnostics completed. Task status: Succeeded
Body	<p>Task Name: Run Diagnostics</p> <p>Task ID: 192511</p> <p>Status: Succeeded</p> <p>Comments:</p> <p>Added by: admin (chris admin)</p> <p>Task Priority: 3</p> <p>Create Date: 2013-05-18 04:29:19.0</p> <p>Device: cisco_c3560 (10.78.60.36)</p> <p>Schedule Date: As Soon As Possible</p> <p>Start Date: As Soon As Possible</p> <p>Complete Date: Sat May 18 04:29:19 MDT 2013</p> <p>Duration: 1</p> <p>Repeat type: Non-recurring</p>

Example Email Message with Task Results, continued

Content Type	Example
	<p>View Task Details (may not be available if the records were pruned)</p> <p>Result Details: Diagnostic 'Hardware Information for Cisco IOS enable' completed.</p> <p>Policy check has failed. View Policy Events</p> <p>Connect - Succeeded</p> <p>Connected via telnet to 10.78.60.36 [in realm Default Realm]</p> <p>Login / Authentication - Succeeded</p> <p>Successfully used: Last successful password (Password rule Manager)</p> <p>View Hardware Information</p>

To change the any of the format, contents, language, or default recipient of the email content for a single task, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
 2. In the `appserver.rcx` file, locate the following comment line:

```
<!-- task email notification options -->
```
 3. Copy the following blocks from the `appserver.rcx` file to the `adjustable_options.rcx` file:
 - `<option name="task/email/subject">...</option>`
 - `<option name="task/email/text">...</option>`
 - `<option name="task/email/includeResultDetails">>false</option>`
 4. Edit the subject and text values. The [Variables for the Task Completion Email Content](#) table lists the available variables for use in these options.
 5. To enable the inclusion of detailed task results in the message, set the `task/email/includeResultDetails` option to `true`:

```
<option name="task/email/includeResultDetails">>true</option>
```
 6. To change the default email message recipient, do the following:
 - a. In the `adjustable_options.rcx` file, add the following line:

```
<option name="task/email/recipient"></option>
```
 - b. Insert a comma-separated list of email address recipients.
- Tip:** To remove the default email message recipient, do not enter any email addresses. In this case, if the NA user who schedules the task neglects to enter an email address, the resulting message cannot be delivered.
7. Save the `adjustable_options.rcx` file.
 8. Restart the NA services on all cores in the NA environment.

Variables for the Task Completion Email Content

Variable	Description
\$ApprovalDate\$	Task approval date.
\$ApproverEmails\$	Comma separated list of email addresses of the task approvers.
\$ApprovalPriority\$	Task approval priority.
\$OriginatorEmail\$	The email address of the task originator.
\$OriginatorFirstName\$	The first name of the task originator.
\$OriginatorLastName\$	The last name of the task originator.
\$OriginatorName\$	The name of the task originator.
\$TaskName\$	The task name.
\$TaskComments\$	The task comments.
\$TaskDevices\$	A list of devices affected by the task.
\$TaskFrequency\$	The frequency of the task.
\$TaskID\$	The task identifier.
\$TaskScheduleDate\$	The task scheduled timestamp.
\$TaskStatus\$	The task status. For example; Succeeded, Failed, or Skipped.

Group Task Completion Email Message Format

For a task that works on multiple devices, the default email message recipient is the task originator. This default is configurable.

For a task that works on multiple devices, the default format of the email message subject is as follows:

```
$TaskName$ on group <device group name> completed with status $TaskStatus$
```

For example:

```
Take Snapshot on group Group1 completed with status Succeeded
```

For a task that works on multiple devices, the email message body contains a summary of the group task and a table of details for each child task associated with the group task. For more information, click the **View details of this task on HP NA** link.

For a task that works on multiple devices, the format of the email message body is not configurable.

An example group task completion email message follows:

```

Task Name: Take Snapshot
Task ID: 99701
Status: Succeeded
Comments:
Added by: Chris (Chris Admin)
Task Priority: 3
Create Date: 2013-01-22 20:02:56.0
Device Group: Group1
Schedule Date: As Soon As Possible
Start Date: As Soon As Possible
Complete Date: Tue Jan 22 20:03:16 MST 2013
Duration: 21
Repeat type: Non-recurring

```

View details of this task on HP NA (may not be available if the records were pruned)

Child tasks:

```

Succeeded      3
Failed         0
Skipped/Others 0
Total          3

```

Child task details:

Task ID	Task Name	Schedule Date	Host/Group	Task Status	Prior	Partition	Sched By	Comments
99711	Take Snapshot	As Soon As Possible	"TFastIronEdge X424 Premium" (16.78.58.55)	Succeeded	3	Default Site	Chris (Chris Admin)	
99721	Take Snapshot	As Soon As Possible	lab-HPProc-540 6z1 (16.78.58.116)	Succeeded	3	Default Site	Chris (Chris Admin)	
99731	Take Snapshot	As Soon As Possible	ProCurveHPSwit ch*4204*v1 (16.78.58.138)	Succeeded	3	Default Site	Chris (Chris Admin)	

To change the default email message recipient, the format of the email message subject, or both for a group task, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
2. To change the default email message recipient, do the following:
 - a. In the `adjustable_options.rcx` file, add the following line:

```
<option name="task/email/recipient"></option>
```
 - b. Insert a comma-separated list of email address recipients.

Tip: To remove the default email message recipient, do not enter any email addresses. In this case, if the NA user who schedules the task neglects to enter an email address, the resulting message cannot be delivered.

3. To change the format of the email message subject, do the following:

a. In the `adjustable_options.rcx` file, add the following line:

```
<option name="grouptask/email/subject">$TaskName$ on group <device group name> completed with status $TaskStatus$</option>
```

b. Edit the subject and text values. The *Variables for the Task Completion Email Content* table in ["Single Task Completion Email Message Format"](#) on page 54 lists the available variables for use in these options.

4. Save the `adjustable_options.rcx` file.

5. Restart the NA services on all cores in the NA environment.

Chapter 14: Disabling the Use of Adobe Flash

HP Network Automation Software (NA) uses Adobe® Flash for displaying the device selector. If you disable the use of Flash, the NA console uses a pure HTML and JavaScript version of the device selector. Generally speaking, this version is slower than the Flash version because of the underlying protocol for communication between NA and the NA console, especially for large data sets (for example, 10,000 devices).

To disable the use of Adobe Flash in the NA console, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.

2. In the `appserver.rcx` file, locate the following line:

```
<option name="flexui/devicechooser">true</option>
```

3. Copy the line from the `appserver.rcx` file to the `adjustable_options.rcx` file.

4. In the `adjustable_options.rcx` file, change the copied line to:

```
<option name="flexui/devicechooser">false</option>
```

5. In the `adjustable_options.rcx` file, to control how many items the search box should return, add the following line:

```
<option name="flexui/devicechooser/return_count">12</option>
```

Optionally change the default value of 12 in this line.

Tip: To reduce the number of search results, narrow the search pattern. For example, "192.168" might yield too many results to be displayed. Use "192.168.5" instead.

6. Save the `adjustable_options.rcx` file.
7. Restart all NA services. See ["Start, Stop, or Restart All NA Services"](#) on page 97.

Chapter 15: Configuring the Default Setting of the Force Save Option for New Tasks

For many NA device tasks, the Force Save task option specifies whether NA should overwrite the startup configuration with the current running configuration at the completion of the task. The setting applies to only those devices that support a startup configuration. The default value of this setting is configurable per task type in the `appserver.rcx` file.

For each device task, the `appserver.rcx` file contains an option in the following format:

```
<option name="DeviceInteraction/EnforceConfigurationSave/task_name">setting</option>
```

Possible values for *task_name* are:

- Take Snapshot
- Discover Driver
- Run ICMP Test
- Deploy Passwords
- Deploy Config
- Configure Syslog
- Run Command Script
- Run Diagnostics
- Synchronize Startup and Running
- Update Device Software
- Backup Device Software
- Reboot Device
- Run Device Script
- Delete ACLs
- VLAN Task
- Port Scan
- Add Device Context
- Remove Device Context
- OS Analysis
- Provision Device
- Batch Insert ACL Line
- Batch Remove ACL Line

Possible values for *setting* are:

- **true**—The Force Save option is visible for this task type and defaults to selected (overwrite the startup configuration). The user running the task can override the default setting by clearing the **If applicable, save the running configuration to the startup configuration upon task completion** check box.
- **false**—The Force Save option is visible for this task type and defaults to cleared (do not change the startup configuration). The user running the task can override the default setting by selecting the **If applicable, save the running configuration to the startup configuration upon task completion** check box.

- **disabled**—The Force Save option is not visible for this task type. The task will never attempt to overwrite the startup configuration with the running configuration.

To change the default setting of the **If applicable, save the running configuration to the startup configuration upon task completion** check box for a specific device task type, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
2. In the `appserver.rcx` file, locate the following line for the task that you want to change:

```
<option name="DeviceInteraction/EnforceConfigurationSave/task_name">setting</option>
```
3. Copy the line to change from the `appserver.rcx` file to the `adjustable_options.rcx` file.
4. In the `adjustable_options.rcx` file, edit the `setting` value.
5. Save the `adjustable_options.rcx` file.
6. Restart all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Note: The change takes effect for new tasks only.

Chapter 16: Configuring the Update Device Software Task Status to Be Cumulative

By default, the status of the Update Device Software task reflects the status of that one task and does not consider the status of any child tasks that the Update Device Software task spawns. In this way, the Update Device Software task can have status `SUCCEEDED` when one of its child tasks failed.

This topic describes how to change this behavior so that the Update Device Software task has status `WARNING` if one of its child tasks fails.

To configure the Update Device Software task status to consider the status of its child tasks

1. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In the `adjustable_options.rcx` file, add the following line:

```
<option name="deploy/child/warning">true</option>
```
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA management engine.

Chapter 17: Configuring the Diagnostic Policy Compliance Check Setting Default

Prior to NA 9.22, when the output of a Run Diagnostics task differed from the output of the previous diagnostic for a device, NA always initiated the diagnostic policy rules for the policy checks associated with that device. Such action can result in a large number of Check Policy Compliance tasks.

As of NA 9.22, this behavior is configurable on a per task basis with the **Run compliance check when change detected** check box. By default, this check box is selected. This default setting mirrors the behavior prior to NA 9.22.

To change default setting of the **Run compliance check when change detected** check box to unselected, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
2. In the `adjustable_options.rcx` file, add the following line:

```
<option name="Device/Diagnostics/RunComplianceCheckDefault">false</option>
```
3. Save the `adjustable_options.rcx` file.
4. Restart all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Note: The change takes effect for new tasks only.

Chapter 18: Configuring the Size of the Output from the Command-Line Interface

By default, the commands in the NA command-line interface return no more than 10,000 items.

To configure the maximum command output

1. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In the `adjustable_options.rcx` file, add the following line:

```
<option name="cli/max_rows_returned">10000</option>
```

Replace `1000` with the maximum number of items to return.
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA management engine.

Chapter 19: Configuring the NA Syslog Server

The following configuration settings are available for the HP Network Automation Software (NA) syslog server:

- The interface to listen for syslog messages. The default is to listen on all interfaces.
- The UDP port to listen for syslog messages. The default is 514.
- A hostname to forward syslog messages. Syslog forwarding is off by default.
- The UDP port to forward syslog messages to. The default is 514.

To change the default configuration for incoming syslog messages, follow these steps:

1. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In a text editor, such as Word or vi, edit the `adjustable_options.rcx` file as follows:
 - a. Add the following lines:

```
<option name="syslog/listener_address">192.168.1.12</option>
<option name="syslog/listener_port">514</option>
```
 - b. Change `192.168.1.12` to the IP address of the NA syslog server.
 - c. Change `514` to the UDP port on the NA syslog server that should receive syslog messages.
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA services.

To enable syslog forwarding, follow these steps:

1. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In a text editor, such as Word or vi, edit the `adjustable_options.rcx` file as follows:

a. Add the following lines:

```
<array name="syslog/handlers">  
  <value>com.hp.nas.syslog.NASSyslogHandler</value>  
  <value>com.hp.nas.syslog.NASSyslogForwarder</value>  
</array>  
<option name="syslog/forward_host">10.1.2.3</option>  
<option name="syslog/forward_port">514</option>
```

b. Change 10.1.2.3 to the IP address of the system to receive the forwarded syslog messages.**c. Change 514 to the UDP port on the system to receive the forwarded syslog messages.**

Note: If the `NASSyslogHandler` is removed from the array of syslog handlers, NA forwards syslog messages but does not initiate any device snapshots after receiving a syslog message.

4. Save the `adjustable_options.rcx` file.**5. Reload the `.rcx` settings by doing *one* of the following:**

- Run the `reload server options` command from the NA proxy.
- On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
- Restart the NA services.

To set up logging for syslog forwarding, follow these steps:

1. Open the Troubleshooting page (**Admin > Troubleshooting**) of the NA console.
2. In the **Enable logging for** field, select **external/syslog/forward**.
3. In the **at level** field, select **Trace (most messages)**.
4. Click **Submit**.

With this configuration, NA logs syslog status to the `syslog_wrapper.log` file.

Chapter 20: Configuring NA to Warn Before Deleting a Device Group Linked With Policies

On the NA console, when the user tries to delete a device group that has one or more policies linked to it, the confirmation prompt displays a warning indicating that policies are linked to the selected device group.

To configure NA to display the warning message, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
2. Set the following line in the `adjustable_options.rcx` file to `false`:

```
<option name="allow/delete_device_group/with_policy">false</option>
```
3. Save the `adjustable_options.rcx` file.
4. Reload the `.rcx` settings by doing one of the following:
 - In the NA console, on the Administrative Settings - User Interface page (**Admin > Administrative Settings > User Interface**), click **Save**.
 - Run the `reload server options` command from the NA proxy.
 - Restart the NA services.

Chapter 21: Configuring NA to Not Override Host Names

In the HP Network Automation Software (NA) context, each network device has the following host names:

- Operating system host name—the name of a network device in the operating system running on the device
- DNS host name—the name associated with the IP address of a network device
- NA host name—the name of a network device in the NA database

It is recommended that the same value be used for all of these host names.

By default, NA stores the operating system host name as the NA host name for each managed device. When NA detects a configuration change on a device (for example, after driver discovery), NA sets the NA host name to be the same as the operating system host name.

If you want NA to store a host name that is different from the operating system host name of each device, configure NA to not update any NA host names when device operating system host names change. Follow these steps:

1. Change to the directory that contains the `.rcx` files:
 - *Windows:* `<NA_HOME>\jre`
 - *Linux:* `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In a text editor, such as Word or vi, edit the `adjustable_options.rcx` file to add the following line:

```
<option name="FastLookup/Hostname"></option>
```
4. Save the `adjustable_options.rcx` file.
5. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
 - Restart the NA services.

To restore the default behavior of the NA host name always matching the operating system host name of each devices, follow these steps:

1. Change to the directory that contains the `.rcx` files:
 - *Windows:* `<NA_HOME>\jre`
 - *Linux:* `<NA_HOME>/jre`
2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
3. In a text editor, such as Word or vi, edit the `adjustable_options.rcx` file to locate the following line:

```
<option name="FastLookup/Hostname"></option>
```

4. Edit the located line to read as follows:

```
<option name="FastLookup/Hostname">Device.HostName</option>
```

5. Save the `adjustable_options.rcx` file.

6. Reload the `.rcx` settings by doing *one* of the following:

- Run the `reload server options` command from the NA proxy.
- On the User Interface page (**Admin > Administrative Settings > User Interface**) of the NA console, click **Save**.
- Restart the NA services.

Chapter 22: Parsing Cisco ACS 5.x Logs for Change Detection

HP Network Automation Software (NA) provides a mechanism for parsing Cisco Secure Access Control System (ACS) 5.x logs for change detection when those logs are forwarded by ACS 5.x to the NA Syslog server.

Note: The NA AAA Log Reader Agent cannot be used to process ACS 5.x logs because ACS 5.x uses a format different from that of standard RFC-compliant logs. Also, the NA AAA Log Reader Agent is a Windows application while ACS 5.x is installable on a Cisco Secure ACS appliance or VMware.

To enable the use of ACS 5.x logs for change detection, follow these steps:

1. Configure the ACS 5.x server to forward ACS logs to the NA syslog server:
 - a. On ACS 5.x, use System Administration > Log Configuration > Remote Log Targets > Create to set the IP address of the NA Syslog server.
Use Advanced Syslog Options to verify that the Port and Facility Code values match the configuration of the NA Syslog server.
 - b. On ACS 5.x, use System Administration > Log Configuration > Log Categories > Global (or Per Instance) to set the categories of logs to be forwarded (for example, AAA Audit).
For the selected categories, use the Remote Log Target tab to add the NA Syslog server configured in the previous step as a target.
For more information, see:
http://www.cisco.com/en/US/products/ps9911/products_user_guide_list.html
2. On the NA server, update the syslog configuration
 - a. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
 - b. In the `appserver.rcx` file, locate the following line:

```
<option name="syslog/process_other_treatments">false</option>
```
 - c. Copy the line from the `appserver.rcx` file to the `adjustable_options.rcx` file.
 - d. In the `adjustable_options.rcx` file, change the copied line to:

```
<option name="syslog/process_other_treatments">>true</option>
```
 - e. Save the `adjustable_options.rcx` file.
3. Restart all NA services. See "[Start, Stop, or Restart All NA Services](#)" on page 97.
4. In the NA console, go to Admin > Administrative Settings > Configuration Mgmt, and then add the pattern "CSCOacs" to the Syslog Detection Patterns list.

Chapter 23: Extending the Number of Custom Enhanced Fields

In the NA console, you can configure up to 31 custom data fields each for the Device Details page and the Device Interfaces page. These fields are available as follows:

- Six fields can be configured on the Admin > Custom Data Setup page.
- 25 fields can be configured on the Admin > Enhanced Custom Fields Setup page (when the Enable Enhanced Custom Fields check box is selected on the Admin > Administrative Settings > User Interface page).

To extend the available number of enhanced custom fields for the Device Details page, the Device Interfaces page, or both pages, follow these steps:

1. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
2. In a text editor, such as Word or vi, edit the `adjustable_options.rcx` file as follows:
 - To extend the number of enhanced custom fields for the Device Details page, add the following line:

```
<option name=" metadata/field_limit/RN_DEVICE">100</option>
```
 - To extend the number of enhanced custom fields for the Device Interfaces page, add the following line:

```
<option name=" metadata/field_limit/RN_DEVICE_PORT">100</option>
```

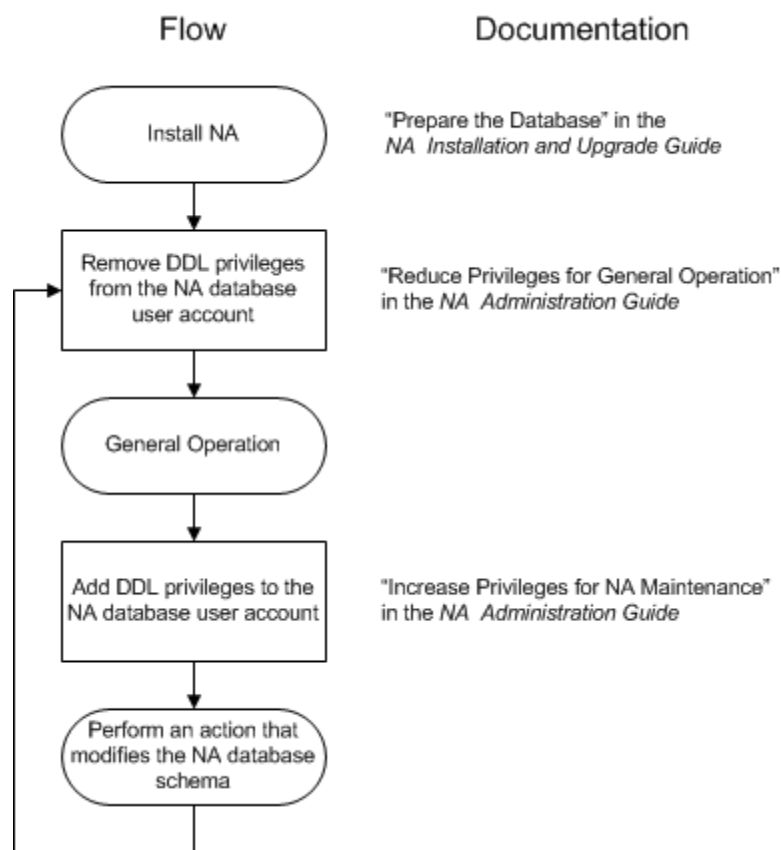
Tip: To restrict the number of available enhanced custom fields, replace 100 with a smaller value. (Specifying a larger value has the same effect as the leaving the value at 100.)

3. Save the `adjustable_options.rcx` file.
4. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - Restart the NA management engine.

Chapter 24: Running NA with Minimal Database User Privileges

During installation of HP Network Automation Software (NA), the database user account that accesses the NA database must have data definition language (DDL) privileges for creating and manipulating tables in the NA schema. For general operation, this database user account requires only data manipulation language (DML) privileges. However, some database maintenance operations (including upgrading NA) require that the database user account have DDL privileges.

This chapter describes optional procedures for removing the DDL privileges from the NA database user account for general operation and for re-adding the DDL privileges when needed. The following diagram presents an overview of the privileges needed on the NA database user account at various points in time.



This chapter describes how to reduce database user account privileges after NA installation and how to increase those privileges for database maintenance operations. It contains the following topics:

- ["Reduce Privileges for General Operation" on the next page](#)
- ["Increase Privileges for NA Maintenance" on page 76](#)

For information about the database user account privileges required for initial NA installation, see “Prepare the Database” in the *NA Installation and Upgrade Guide*.

Reduce Privileges for General Operation

For general NA operation, the database user account requires only DML privileges and not DDL privileges. After NA installation or maintenance, you can reduce the privileges granted to the NA database user account.

Reducing Privileges for Oracle

Complete this procedure any time you want to limit the NA database user account privileges.

1. With Oracle, revoke the following DDL privileges from the NA database user:

- CREATE SEQUENCE
- CREATE SESSION
- CREATE TABLE
- CREATE PROCEDURE
- SELECT ANY DICTIONARY

For example (for Oracle user name `nauser`):

```
REVOKE CREATE SEQUENCE,CREATE SESSION, CREATE TABLE from nauser;  
REVOKE CREATE PROCEDURE, SELECT ANY DICTIONARY from nauser;
```

2. With Oracle, grant the following DML privileges to the NA database user:

- SELECT ANY TABLE
- INSERT ANY TABLE
- UPDATE ANY TABLE
- DELETE ANY TABLE

For example (for Oracle user name `nauser`):

```
GRANT SELECT ANY TABLE, INSERT ANY TABLE to nauser;  
GRANT UPDATE ANY TABLE, DELETE ANY TABLE to nauser;
```

After following this procedure, the following DML privileges remain on the NA database user:

- CONNECT (a data control language privilege)
- SELECT ANY TABLE
- INSERT ANY TABLE
- UPDATE ANY TABLE
- DELETE ANY TABLE
- EXECUTE on `CTXSYS.ctx_ddl`

Reducing Privileges for SQL Server

The procedure for restricting database access depends on account history. For more information about specific use cases, see each procedure:

- ["First Time Modification" below](#)
- ["Subsequent Modification" on the next page](#)

First Time Modification

Complete this procedure the first time you want to limit the NA database user account privileges. This procedure removes the `db_owner` role from the NA database user account. This action removes all privileges from the account. The procedure then sets DML privileges on the account by initially re-adding all privileges and then removing DDL privileges.

To modify the SQL Server NA database user account to set privileges for general NA operation, follow these steps (for SQL Server user name `nauser`):

1. Stop all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).
2. Log on to SQL Server as a SQL Server administrator user with the `sysadmin` role (for example, SA).
3. Remove the `db_owner` role from the NA database user account.
 - a. In Microsoft SQL Management Studio, right-click `nauser`, click Properties, and then click **User Mapping**.
 - b. Under **Users mapped to this login**, select the NA schema.
 - c. Under **Database role membership for <NA schema>**, clear the `db_owner` check box.
 - d. Click **OK**.

At this point, the NA database user account has no privileges and cannot access SQL Server.

4. Set permissions for the NA database user account.
 - a. Give access to the NA database user account. For example:

```
use NA; GRANT CONTROL to nauser; go
```

This command returns all privileges associated with the `db_owner` role.
 - b. Remove the schema modification privileges from the NA database user account. For example:

```
use NA; DENY ALTER to nauser; go
```

This command retains read and write privileges for the NA database user account.
 - c. *Optional.* Verify the permissions required by the NA schema. For example:

```
SELECT * FROM fn_my_permissions(NULL, 'DATABASE') order by permission_name;
```

This command lists the 18 permissions provided to the NA schema.
 - d. *Optional.* Verify the permissions granted to the NA database user account. For example:

```
EXEC sp_helpprotect NULL, 'nauser';
```
5. Start all NA services. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Subsequent Modification

Complete this procedure sometime after using the `REVOKE ALTER` command to re-add DDL privileges to the NA database user account.

To remove the DDL privileges from the NA database user account that does not have the `db_owner` role, follow these steps:

1. Log on to SQL Server as a SQL Server administrator user with the `sysadmin` role (for example, SA).
2. Remove the schema modification privileges from the NA database user account. For example:

```
use NA; DENY ALTER to nauser; go
```

Increase Privileges for NA Maintenance

The following NA maintenance scenarios require DDL privileges:

- Upgrading NA by running a service pack installer (SPI)
- Applying an NA patch or hotfix that changes the NA database schema
- Enabling case-insensitive search or full-text search; this enablement modifies the NA database schema

The information in this section restores to the NA database user the privilege level used to create the NA database tables. After completing NA maintenance, you can follow the steps in ["Reduce Privileges for General Operation" on page 74](#) to remove the DDL privileges.

Increasing Privileges for Oracle

Complete this procedure to re-add DDL privileges to the NA database user account after following the procedure in ["Reducing Privileges for Oracle" on page 74](#).

With Oracle, grant the following DDL privileges to the NA database user:

- CREATE SEQUENCE
- CREATE SESSION
- CREATE TABLE
- CREATE PROCEDURE
- SELECT ANY DICTIONARY
- CREATE ANY INDEX
- ALTER ANY INDEX

For example (for Oracle user name `nauser`):

```
GRANT CREATE SEQUENCE, CREATE SESSION, CREATE TABLE to nauser;  
GRANT CREATE PROCEDURE, SELECT ANY DICTIONARY to nauser;  
GRANT CREATE ANY INDEX, ALTER ANY INDEX to nauser;
```

After granting DDL privileges, the NA database user has the privileges listed in "Oracle Database Options" in the *NA Installation and Upgrade Guide* version 10.00 or later. Additionally, the NA user has the following DML privileges which are eclipsed by the DDL `CREATE` privileges:

- SELECT ANY TABLE
- INSERT ANY TABLE
- UPDATE ANY TABLE
- DELETE ANY TABLE

These privileges are a result of following the procedure in ["Reducing Privileges for Oracle" on page 74](#).

Increasing Privileges for SQL Server

Complete this procedure to re-add DDL privileges to the NA database user account after following either of the procedures in ["Reducing Privileges for SQL Server " on page 75](#).

To modify the SQL Server NA database user account to grant DDL privileges to the NA database user account, follow these steps (for SQL Server user name `nauser`):

1. Log on to SQL Server as a SQL Server administrator user with the `sysadmin` role (for example, SA).
2. Grant database modification privileges to the NA database user account. For example:

```
use NA; REVOKE ALTER to nauser; go
```

Chapter 25: Changing NA Credentials When Connecting to a New Database Location

If the NA database has been moved to a different server, use the `tc_tools` utility to configure NA to connect to the new database location. This location must include a valid NA database. For information about installing the NA database, see the *NA Installation and Upgrade Guide* or consult your database administrator.

The `tc_tools` utility updates the following information on the NA server:

- Database server name
- Database port
- Database name
- Database username
- Database user password

To connect NA to a different NA database, follow these steps:

1. At a command prompt, run the following command:
 - **Windows:** `<installdir>\client\tc_tools.bat`
 - **Linux:** `<installdir>/client/tc_tools.sh`
2. Type **1** to change the database connection information.
3. At each prompt, do *one* of the following:
 - Type the new value for the prompt.
 - Press **Enter** to retain the value between the brackets ([]).
4. From the `tc_tools` prompt, exit the utility.
5. Restart the NA management engine.

Chapter 26: Full-Text Search of Configuration Text (Oracle and SQL Server)

HP Network Automation Software (NA) supports a contains (full text) search of Configuration Text. After full-text search is enabled, faster configuration text search is available for the following report options:

- Reports > Search For > Devices > Configuration Text > contains (full text)
- Reports > Search For > Configurations > Configuration Text > contains (full text)
- Reports > Search For > Device Templates > Configuration Text > contains (full text)
- Reports > Advanced Search > Search Criteria > Configuration Text > contains (full text)

Additionally, you can create a dynamic group or a dynamic policy scope based on the results of a Search Criteria > Configuration Text > contains (full text) search.

Similarly, these searches also support searching for configuration text that does not contain (full text). The search is always case insensitive for the contains (full text) and does not contain (full text) operators.

The contains (full text) search is an indexed search and requires that the database is enabled for full-text search.

Because the contains (full text) search is indexed, it returns results faster than does the contains search. However, the contains (full text) search supports fewer options than does the contains search.

Note: This feature is not supported on MySQL.

This topic contains the following topics:

- ["Enabling Full-Text Search of Configuration Text" below](#)
- ["Disabling Full-Text Search" on page 84](#)

Enabling Full-Text Search of Configuration Text

Full-text search accesses an index of the text records in the database. The initial index generation requires available time and disk space.

Note: If Oracle Text (for an Oracle database) or the SQL Server Full Text Search service (for a Microsoft SQL Server database) is not yet enabled, also plan for database downtime.

NA maintains the full text index by incrementally indexing new configurations added during snapshot tasks and by removing the index entries of deleted configurations.

Note: Note the following:

- Because index generation is CPU-intensive, NA tasks might run slower than normal during the process of enabling full text search.

- Do not restart the NA management engine while index generation is in progress.

In a Horizontal Scalability environment, enable full-text searching on *one* NA server.

In a Multimaster Distributed System environment, enable full-text searching on *each* NA server. Run the enablement procedures in parallel. That is, complete step 1 on each NA server before initiating step 2 on any NA server, and so forth.

Follow the steps appropriate to the database type:

- ["Enabling Full-Text Search on Oracle" below](#)
- ["Enabling Full-Text Search on Microsoft SQL Server" on the next page](#)

Enabling Full-Text Search on Oracle

To enable full-text search on an Oracle database, follow these steps:

1. Verify that Oracle Text is enabled and has the required privileges and space:

- a. Connect to the NA proxy with the credentials of the user created by the NA installer.
- b. Run the following command:

```
fulltextsearch -option analyze
```

c. Examine the output of the analyze command.

- If Oracle Text is not enabled, engage the Oracle database administrator to change the configuration. For information about enabling Oracle Text, see "Administering Oracle Text" in the *Oracle Text Application Developer's Guide*.

Tip: Another information source is the Oracle MetaLink document collection, for which you must have a MetaLink account with Oracle. Documents of interest include the following:

- 280713.1: *Manual installation, deinstallation of Oracle Text 10gR1*
- 979705.1: *Manual installation, deinstallation of Oracle Text 10gR2*
- 579601.1: *Manual installation, deinstallation and verification of Oracle Text 11gR1*
- 970473.1: *Manual installation, deinstallation and verification of Oracle Text 11gR2*

- If Oracle Text is enabled, do the following:

- Determine whether data pruning is needed. If the analyze command output recommends database pruning, complete this process before generating the full-text index. For more information, see "Data Pruning" in the *NA Installation and Upgrade Guide*.
- Verify that the approximate additional space required for the index generation process is available on the database server.

The index configuration process requires available disk space of 50% to 200% of the configuration text size. Actual space requirements depend on the database contents.

The index configuration process is resource-intensive. Actual time depends on database hardware and configuration as well as the volume of text to be indexed.

For more information, see “Frequently Asked Questions About Indexing Performance” in the *Oracle Text Application Developer’s Guide*.

- Consider the approximate time required for the index generation process. The `analyze` command calculates time based on the use of a single thread. You can reduce this time by using multiple threads while generating the index. To figure the adjusted approximate time, divide the suggested time by the number of threads that will be used in [step 3](#).
2. In the NA console, delay any Take Snapshot tasks that are scheduled to start before the end of the approximate time required for index generation to complete.
 3. Generate the full-text index:

- a. From the NA proxy, run the following command:

```
fulltextsearch -option enable -numthreads T
```

T is the number of parallel threads. Possible values range from 1 to one less than the number of database server cores.

- b. Examine the output of the enable command.

- The expected status is COMPLETE & VALID.
- If the status is IN PROGRESS, wait for index generation to complete.
- If the status is INVALID, remove the index with the `fulltextsearch -option disable` command, and then repeat [step a](#).

Tip: You can close the command prompt window during index generation. In this case, run the following command to determine the status of the index generation:

```
fulltextsearch -option status
```

Alternatively, you can watch the NA logs with the troubleshooting option `feature/proxy` set to debug.

4. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database. See ["Start, Stop, or Restart All NA Services" on page 97](#).
5. In the NA console, examine the status of recent Take Snapshot tasks. Rerun any that failed.

Note: On an Oracle database, the log file contains an error for any Take Snapshot tasks that were running during the generation of the full text index. You can ignore the following error:

```
java.sql.SQLException: ORA-29861: domain index is marked
LOADING/FAILED/UNUSABLE
```

Enabling Full-Text Search on Microsoft SQL Server

To enable full-text search on a Microsoft SQL Server database, follow these steps:

1. Verify that the SQL Server Full Text Search service is enabled and has the required privileges:
 - a. Log on to the NA proxy with the credentials used to install NA.
 - b. Run the following command:

```
fulltextsearch -option analyze
```

- c. Examine the output of the analyze command.
 - If the SQL Server Full Text Search service is not enabled, engage the SQL Server database administrator to change the configuration.
 - If the SQL Server Full Text Search service is enabled, determine whether data pruning is needed. If the analyze command output recommends database pruning, complete this process before generating the full-text index. For more information, see “Data Pruning” in the *NA Installation and Upgrade Guide*.
2. On SQL Server 2005, remove the SQL Server noise words as follows:
 - a. Change to the `$$SQL_Server_Install_Path\Microsoft SQL Server\MSSQL.1\MSSQL\FTDATA\` directory.
 - b. Back up the `noiseENU.txt` file.
 - c. Delete all entries in the `noiseENU.txt` file to leave an empty file.

For more information about editing noise words, see the “Noise Words” topic in the MSDN library:

[http://msdn.microsoft.com/en-us/library/ms142551\(v=sql.90\).aspx](http://msdn.microsoft.com/en-us/library/ms142551(v=sql.90).aspx)

Tip: On SQL Server 2008, by default no noise words are enabled.

3. Generate the full-text index:
 - a. Connect to the NA proxy with the credentials of the user created by the NA installer.
 - b. Run the following command:

```
fulltextsearch -option enable
```

Note: On SQL Server, this command returns immediately and starts full-text indexing. Wait some time before you start using the new search. In the output, verify that this run did not generate any SQL exceptions.

4. Determine the status of the index generation by running the following command:

```
fulltextsearch -option status
```

- The expected status is COMPLETE & VALID.
- If the status is IN PROGRESS, wait for index generation to complete.
- If the status is INVALID, remove the index with the `fulltextsearch -option disable` command. If necessary, increase the available disk space, and then repeat [step 3](#).

Tip: Alternatively, you can watch the NA logs with the troubleshooting option `feature/proxy` set to debug.

5. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Adding a Reminder to Use Full-Text Search Where Applicable

NA supports adding a custom message to the Configuration Text field on the applicable search pages. The message describes when NA users should use the **contains (full text)** search operator. The message is the same for all Configuration Text fields and is visible only when full-text search is enabled.

To add a message to the Configuration Text fields, follow these steps:

1. Change to the directory that contains the `.rcx` files:

- *Windows:* `<NA_HOME>\jre`
- *Linux:* `<NA_HOME>/jre`

2. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.

3. In the `adjustable_options.rcx` file, add the following line:

```
<option name="fulltextsearch/warning_msg">HTML_formatted_text</option>
```

4. Replace `HTML_formatted_text` with text formatted in an HTML table cell and the span identifier `fulltextwarning`. For example:

```
<option name="fulltextsearch/warning_msg">
<![CDATA[
<td> <span id="fulltextwarning"> It's highly recommended to use Full Text
Search. For more information check
<a class="help" href="#" onclick="var hw = window.open
('tcdocs/en/htmlHelp/naHelp/Content/NA_User_Guide/Performing_Searches/Using_the_
Full_Text_
Sear.htm', 'WWHFrame', 'scrollbars=yes,alwaysRaised=yes,resizable=yes,dependent=ye
s'); hw.focus(); return false;">Full Text Search</a>
</span> </td> ]]>
</option>
```

Note: Ensure that the hyperlink within the anchor tag is a continuous line.

5. Save the `adjustable_options.rcx` file.

6. Reload the `.rcx` settings by doing one of the following:

- Run the `reload server options` command from the NA proxy.
- Restart the NA management engine.

7. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database:

- *Windows:* Open the **Services** control panel. In the list of services, right-click each of the following services, and then click **Restart**:

- TrueControl ManagementEngine
 - TrueControl FTP Server
 - TrueControl SWIM Server
 - TrueControl Syslog Server
 - TrueControl TFTP Server
- **Linux:** Run the following command:

```
/etc/init.d/truecontrol restart
```

Disabling Full-Text Search

In a Horizontal Scalability environment, disable full-text searching on *one* NA server.

In a Multimaster Distributed System environment, disable full-text searching on *each* NA server. Run the disablement procedures in parallel. That is, complete step 1 on each NA server before initiating step 2 on any NA server, and so forth.

To permanently disable the contains (full text) search operator in the NA console and to remove the full-text index from the database, follow these steps:

1. If any dynamic groups are configured to use the contains (full text) or does not contain (full text) operator, edit or delete these dynamic group configurations.
2. If any dynamic policy scopes are configured to use the contains (full text) or does not contain (full text) operator, edit or delete these dynamic policy configurations.
3. Remove the full-text index:
 - a. Connect to the NA proxy with the credentials of the user created by the NA installer.
 - b. Run the following command:

```
fulltextsearch -option disable
```
4. Disable the full-text search feature by removing the contains (full text) and does not contain (full text) operators from the NA console:
 - a. Change to the directory that contains the `.rcx` files:
 - **Windows:** `<NA_HOME>\jre`
 - **Linux:** `<NA_HOME>/jre`
 - b. Back up the `adjustable_options.rcx` file to a location outside the `<NA_HOME>` directory.
 - c. In the `adjustable_options.rcx` file, add the following line:

```
<option name="fulltextsearch/enabled">>false</option>
```
 - d. Save the `adjustable_options.rcx` file.
 - e. Reload the `.rcx` settings by doing *one* of the following:
 - Run the `reload server options` command from the NA proxy.
 - Restart the NA management engine.

5. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database. See ["Start, Stop, or Restart All NA Services" on page 97](#).

Chapter 27: Enabling Case-Insensitive Search (Oracle)

HP Network Automation Software (NA) supports case-insensitive searches of many objects in the NA database on Oracle. (The MySQL and Microsoft SQL Server database searches are already case-insensitive.)

This topic contains the following sections:

- ["Affected Fields" below](#)
- ["Enabling Case-Insensitive Search of an Oracle Database \(Standalone and Horizontal Scalability\)" on page 88](#)
- ["Disabling Case-Insensitive Search \(Standalone and Horizontal Scalability\)" on page 89](#)
- ["Enabling or Disabling Case-Insensitive Search in an Oracle Multimaster Distributed System Environment" on page 90](#)

Affected Fields

When enabled, case-insensitive search is available for most text fields in the NA console, as described here. Additionally, the command-line interface is case-insensitive for device hostname.

Search Box

The IP or Hostname search box follows the case-sensitivity configuration.

Search Criteria

The Search Criteria field is available for the following functions:

- Defining a dynamic device group on the New Group and Edit Group pages.
- Defining a dynamic policy scope on the New Policy and Edit Policy pages.
- Creating a custom search on the Advanced Search page.

With an Oracle database, case-insensitive search is not available for the following fields:

- ACL Application
- ACL Configuration
- Comments
- Configuration Text with the contains and does not contain operators. (The contains (full text) and does not contain (full text) operators are always case-insensitive.)

All other fields follow the case-sensitivity configuration.

Device Selector

For the New Task and Rerun Task pages, the Filter box on the device selector follows the case-sensitivity configuration.

Reports

The following table lists the report fields that can be searched on a case-insensitive basis when the case-insensitive search feature is enabled.

Case Sensitivity of Report Search Fields

Search Type	Case-Insensitive Fields	Case-Sensitive Fields	
Device	<ul style="list-style-type: none"> • Host Name • Device Vendor • Device Model • FQDN • Access Methods • Device Location • Serial Number • Asset Tag • Device Software Version • Device Firmware Version • Device Description • Password Rule • ACL ID • ACL Handle 	<ul style="list-style-type: none"> • ACL Type • Module Slot • Module Description • Module Model • Module Serial • Module Firmware Version • Module Hardware Revision • ROM Version • Service Type • Custom Service Type • VTP Domain Name • VTP Operating Mode 	<ul style="list-style-type: none"> • Comments • Configuration Text • ACL Configuration • ACL Application
Interface	<ul style="list-style-type: none"> • Port Name • Port Type • Port Status • Running Port State • Description • Configured Duplex • Configured Speed • Negotiated Duplex 	<ul style="list-style-type: none"> • Negotiated Speed • VLAN Name • Host Name • Module Slot • Module Description • Module Model • Module Serial • Module Firmware Version 	
Module	<ul style="list-style-type: none"> • Host Name • Module Slot • Module Description • Module Model 	<ul style="list-style-type: none"> • Module Serial • Module Firmware Version • Module Hardware Revision 	<ul style="list-style-type: none"> • Comments
Policy	<ul style="list-style-type: none"> • Policy Name • CVE 	<ul style="list-style-type: none"> • Vendor URL • Solution URL 	<ul style="list-style-type: none"> • Solution
Policy, Rule, and Compliance	<ul style="list-style-type: none"> • Host Name 	<ul style="list-style-type: none"> • CVE 	

Case Sensitivity of Report Search Fields , continued

Search Type	Case-Insensitive Fields		Case-Sensitive Fields
Configuration	<ul style="list-style-type: none"> Host Name 	<ul style="list-style-type: none"> Changed By 	<ul style="list-style-type: none"> Comments Configuration Text
Diagnostic	<ul style="list-style-type: none"> Host Name 		<ul style="list-style-type: none"> Diagnostic Text
Task	<ul style="list-style-type: none"> Task Name Host Name 	<ul style="list-style-type: none"> Scheduled By 	<ul style="list-style-type: none"> Comments Result
Session	<ul style="list-style-type: none"> Host Name 	<ul style="list-style-type: none"> Created By 	<ul style="list-style-type: none"> Session Data
Event	<ul style="list-style-type: none"> Added By 	<ul style="list-style-type: none"> Host Name 	<ul style="list-style-type: none"> Description
User	<ul style="list-style-type: none"> First Name Last Name User Name 	<ul style="list-style-type: none"> Email Address AAA User Name Comments 	
ACL	<ul style="list-style-type: none"> Host Name ACL ID ACL Handle 	<ul style="list-style-type: none"> ACL Type Changed By 	<ul style="list-style-type: none"> ACL Configuration ACL Application Comments
MAC Address	<ul style="list-style-type: none"> Host Name Port Name 	<ul style="list-style-type: none"> Port Description VLAN 	
IP Address	<ul style="list-style-type: none"> Host Name Port Name Port Description 	<ul style="list-style-type: none"> VLAN Associated MAC 	
VLAN	<ul style="list-style-type: none"> Host Name VLAN Name VLAN Type 	<ul style="list-style-type: none"> VLAN Description Private VLAN 	
Device Template	<ul style="list-style-type: none"> Template Name Device Vendor 	<ul style="list-style-type: none"> Device Model Device Description 	<ul style="list-style-type: none"> Comments Configuration Text
Single Search	<ul style="list-style-type: none"> Added By Host Name 	<ul style="list-style-type: none"> Description 	

Enabling Case-Insensitive Search of an Oracle Database (Standalone and Horizontal Scalability)

For an Oracle database, case-insensitive search accesses a case-insensitive index of the text records in the database for each field in the query.

In a Horizontal Scalability environment, enable case-insensitive searching on *one* NA server.

Caution: In a Multimaster Distributed System environment, follow the procedure described in ["Enabling or Disabling Case-Insensitive Search in an Oracle Multimaster Distributed System Environment"](#) on the next page.

To enable case-insensitive search of NA with an Oracle database, follow these steps to generate the case-insensitive indexes:

1. Connect to the NA proxy with the credentials of the user created by the NA installer.
2. Run the following command:

```
mod oraclecaseinsensitive -option enable
```

Note: An error message similar to the following example indicates that the NA database was locked when the command was run:

```
GEN_FAILURE: Failed to modify database
```

Wait several minutes for the database lock to clear, and then rerun the command.

Tip: Running this command triggers a recalculation of dynamic group membership.

3. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database. See ["Start, Stop, or Restart All NA Services"](#) on page 97.
4. If a previous implementation of case-insensitive search has been enabled in the NA environment, clean up the NA configuration by deleting the following deprecated configuration option:

```
<option name="database/oracle_case_insensitive">true</option>
```

- a. Change to the directory that contains the `.rcx` files:

- **Windows:** `<NA_HOME>\jre`
- **Linux:** `<NA_HOME>/jre`

- b. Search for the string `oracle_case_insensitive` in all `.rcx` files.

- c. If you locate the string, back up the containing file to a location outside the `<NA_HOME>` directory, and then delete the containing line.

Disabling Case-Insensitive Search (Standalone and Horizontal Scalability)

In a Horizontal Scalability environment, disable case-insensitive searching on *one* NA server.

Caution: In a Multimaster Distributed System environment, follow the procedure described in ["Enabling or Disabling Case-Insensitive Search in an Oracle Multimaster Distributed System Environment"](#) on the next page.

To permanently disable case-insensitive search of NA with an Oracle database and to remove the case-insensitive indexes from the database, follow these steps:

1. If any dynamic groups are configured with case-insensitive search criteria, edit or delete these dynamic group configurations.

2. If any policies are configured with case-insensitive search criteria, edit or delete these policy configurations.
3. Remove the case-insensitive indexes:
 - a. Connect to the NA proxy with the credentials of the user created by the NA installer.
 - b. Run the following command:

```
mod oraclecaseinsensitive -option disable
```

Tip: Running this command triggers a recalculation of dynamic group membership.

4. In a Horizontal Scalability environment, synchronize the database configuration by restarting NA on all other NA servers connected to the NA database. See "[Start, Stop, or Restart All NA Services](#)" on page 97.

Enabling or Disabling Case-Insensitive Search in an Oracle Multimaster Distributed System Environment

After enabling or disabling case-insensitive search, regenerate the database replication to ensure that the index information is synchronized.

To enable case-insensitive search in an Oracle Multimaster Distributed System environment

1. Prepare to stop NA.
 - a. Notify users to log out.
 - b. Log on to the NA console for one of the NA cores.
 - c. Pause tasks scheduled to start during the next few hours. Include time for the currently running tasks to complete. For example:
 - i. On the Search for Task page (**Reports > Search For > Tasks**), for the `Schedule Date` field, set since to `Now` and until to `2 hours later`.
 - ii. On the Task Search Results page, pause each listed task.
 - d. On the Running Tasks page (**Tasks > Running Tasks**), examine the list of running tasks.
If any critical tasks are running, wait for them to complete before continuing with [step 2](#), next.
2. On *each* NA core, generate case-insensitive indexes:
 - a. Connect to the NA proxy with the credentials of the user created by the NA installer.
 - b. Run the following command:

```
mod oraclecaseinsensitive -option enable
```

Note: An error message similar to the following example indicates that the NA database was locked when the command was run:

```
GEN_FAILURE: Failed to modify database
```

Wait several minutes for the database lock to clear, and then rerun the command.

Tip: Running this command triggers a recalculation of dynamic group membership.

- c. If a previous implementation of case-insensitive search has been enabled in the NA environment, clean up the NA configuration by deleting the following deprecated configuration option:

```
<option name="database/oracle_case_insensitive">true</option>
```

- i. Change to the directory that contains the `.rcx` files:
 - *Windows*: `<NA_HOME>\jre`
 - *Linux*: `<NA_HOME>/jre`
 - ii. Search for the string `oracle_case_insensitive` in all `.rcx` files.
 - iii. If you locate the string, back up the containing file to a location outside the `<NA_HOME>` directory, and then delete the containing line.
3. Stop all NA services on all NA cores. See ["Start, Stop, or Restart All NA Services" on page 97](#).
 4. Regenerate the database replication as described in "Regenerating Replication" in the *NA Multimaster Distributed System on Oracle Guide*.
 5. Start all NA services on all NA cores. See ["Start, Stop, or Restart All NA Services" on page 97](#).
 6. If necessary, resume the tasks that were paused in [step 1](#).
 - a. Log on to the NA console for one of the NA cores.
 - b. On the Search for Task page (**Reports > Search For > Tasks**), for the Task Status field, select `Paused`.
 - c. On the Task Search Results page, resume each listed task.

Tip: Later instances of periodic tasks remove the paused instances of those tasks.

To disable case-insensitive search in an Oracle Multimaster Distributed System environment

1. Prepare to stop NA.
 - a. Notify users to log out.
 - b. Log on to the NA console for one of the NA cores.
 - c. Pause tasks scheduled to start during the next few hours. Include time for the currently running tasks to complete. For example:
 - i. On the Search for Task page (**Reports > Search For > Tasks**), for the `Schedule Date` field, set since to `Now` and until to `2 hours later`.
 - ii. On the Task Search Results page, pause each listed task.
 - d. On the Running Tasks page (**Tasks > Running Tasks**), examine the list of running tasks.
If any critical tasks are running, wait for them to complete before continuing with [step 2](#), next.
2. On *each* NA core, permanently disable case-insensitive search and remove the case-insensitive indexes from the database:
 - a. If any dynamic groups are configured with case-insensitive search criteria, edit or delete these dynamic group configurations.
 - b. If any policies are configured with case-insensitive search criteria, edit or delete these policy configurations.
 - c. Remove the case-insensitive indexes:

- i. Connect to the NA proxy with the credentials of the user created by the NA installer.
- ii. Run the following command:

```
mod oraclecaseinsensitive -option disable
```

Tip: Running this command triggers a recalculation of dynamic group membership.

3. Stop all NA services on all NA cores. See "[Start, Stop, or Restart All NA Services](#)" on page 97.
4. Regenerate the database replication as described in "Regenerating Replication" in the *NA Multimaster Distributed System on Oracle Guide*.
5. Start all NA services on all NA cores. See "[Start, Stop, or Restart All NA Services](#)" on page 97.
6. If necessary, resume the tasks that were paused in [step 1](#).
 - a. Log on to the NA console for one of the NA cores.
 - b. On the Search for Task page (**Reports > Search For > Tasks**), for the Task Status field, select **Paused**.
 - c. On the Task Search Results page, resume each listed task.

Tip: Later instances of periodic tasks remove the paused instances of those tasks.

Chapter 28: Reclaiming Unused Space (Oracle)

Database maintenance often involves deleting data chunks within a database table, which results in free space inside the table. New records added after this maintenance populates the free space inside the table first, so the new records can be spread across several physical locations within the table. This fragmentation degrades database performance by extending data access times.

HP Network Automation Software (NA) pruning tasks can cause database table fragmentation. This section identifies one way to defragment an Oracle database tablespace. This procedure can be performed while the database is online.

Caution: This documentation describes one approach to this database administration task. Read the prerequisites to determine whether this approach applies to your situation. For other approaches and more detailed information, see the documentation for your database type and version.

Tablespace defragmentation can be run against all tables in the NA schema. The following table lists the NA database tables and the associated LOB columns that are most frequently affected by fragmentation.

NA Database Tables Frequently Affected by Fragmentation

Table Name	Target LOB Columns
RN_DEVICE_ACCESS_LOG	<ul style="list-style-type: none">• ChangeEventData• Comments
RN_DEVICE_DATA	<ul style="list-style-type: none">• DataBlock• Comments
RN_DEVICE_TOPOLOGY_DATA	
RN_DIAGNOSTIC_DATA	<ul style="list-style-type: none">• DataBlock• Comments
RN_EVENT	<ul style="list-style-type: none">• EventText• EventData
RN_EVENT_MESSAGE	<ul style="list-style-type: none">• MessageBody
RN_SCHEDULE_TASK	<ul style="list-style-type: none">• Comments• Result• TaskData

To defragment an Oracle database tablespace, follow these steps:

1. Verify that the tablespace meets the following prerequisites:
 - The tablespace must be set with automatic segment space management (ASSM).
 - The disk space available to the redo log must be sufficiently large relative to the size of the tablespace.

2. Enter the SQL*Plus command-line interface as the SYSDBA user.
3. Use the Oracle Segment Advisor to determine whether defragmentation is needed. Either check the results of the Automatic Segment Advisor or run the Segment Advisor manually.

For more information, see “Using the Segment Advisor” in the *Oracle Database Administrator’s Guide*.

4. For each table that requires defragmentation, do the following:

- a. Enable row movement by running the following command:

```
ALTER TABLE <table_name> ENABLE ROW MOVEMENT;
```

- b. Reclaim unused rows by running the following command:

```
ALTER TABLE <table_name> SHRINK SPACE;
```

- c. Reclaim unused LOB columns by running the following command:

```
ALTER TABLE <table_name> MODIFY LOB (<lob_column_name>) (SHRINK SPACE);
```

Tip: Alternatively, reclaim unused rows and columns with one command as follows:

```
ALTER TABLE <table_name> SHRINK SPACE CASCADE;
```

This CASCADE command replaces [step b](#) and [step c](#).

Chapter 29: Restoring Databases

Oracle

For information on restoring Oracle databases, see your Oracle database administrator.

SQL Server

To restore a Microsoft SQL Server database:

1. Make a backup of the database you are about to restore.
2. Launch SQL Server Management Studio.
3. Connect to the SQL Server database server and navigate to your database.
4. Right-click the database, and then select Tasks > Restore > Database.
5. Click the Restore: From Device button.
6. Click Select Devices.
7. Click Add.
8. Open the file browser under File name and select the filename you want to restore.
9. Click OK three times.
10. Click the Options tab.
11. Select Force restore over existing database.
12. Click OK. The database should be restored.

If you receive an error message, such as “Database is in use,” you need to either close the connection to that database (stop the jboss server), or go to the Options tab and change the names of the physical files listed to a different name. If you are not using the “sa” login to connect to the database, you may need to change the database login.

To do this, launch Query Analyzer from SQL Server Management Studio. In the database you just restored, enter the following command:

```
SQL command "sp_change_users_login 'auto_fix' 'username'
```

Where: `username` is the username that jboss is using to communicate to the SQL Server.

MySQL

To restore MySQL databases, there are two methods.

To restore using the copied files restores all MySQL databases that were on the server at the time of the backup, not just the NA database. This method should only be used if NA is the only application using the database server.

1. Make a backup of the MySQL.
2. Stop the MySQL service (click My Computer → Control Panel → Administrative Tools → Services).
3. Copy all of the files that were backed up from the `mysql\data` directory originally back into the `mysql\data` directory.
4. Restart the MySQL service.

To restore MySQL databases using the .sql backup file:

1. Make a backup of the MySQL database.
2. Edit the .sql file. Add the following line to the top of the file:

```
SET FOREIGN_KEY_CHECKS=0;
```

Note: If you are restoring to a different database name, the foreign key constraints inside the dump file reference '<Database_Name>.RN_DEVICE' ('DeviceID'), including the database name. If you restore this to a different database name, in effect you are referencing the database <Database_Name> for your FOREIGN_KEY checks. This is a bug in mysqldump and how it interacts with the InnoDB table types. The solution is to remove the "<Database_Name>."

3. Navigate to the `mysql\bin` directory and enter the following command to get to the mysql command interface:

```
mysql -h <hostname> -u <username> -p <password>
```

4. Enter the following commands in the mysql command interface. (Note that mysql needs forward slashes '/' in path names.)

```
drop database <DatabaseName>;  
create database <DatabaseName>;  
use <DatabaseName>;  
source <BackupFileName>.sql;  
grant all privileges on <DatabaseName>.* TO <username> identified by  
'<password>';
```

Where: `username` is the username that NA uses to connect to the database and `password` is the user's password.

```
grant all privileges on <DatabaseName>.* TO <username>@localhost identified by  
'<password>';
```

Where: `username` is the username that NA uses to connect to the database and `password` is the user's password.

Appendix A: Common Procedures

This section describes procedures that are common to many HP Network Automation Software (NA) configuration and maintenance tasks. It includes the following topics:

- ["Start, Stop, or Restart All NA Services" below](#)
- ["Disable All NA Services" on the next page](#)
- ["Working with .rcx Files" on the next page](#)

Start, Stop, or Restart All NA Services

Stopping the NA services before changing the NA configuration prevents conflicting data from being stored in the NA database. Some procedures call for restarting the NA services to read the updated configuration.

To start all NA services

- *Windows:* Open the **Services** control panel. In the list of services, right-click each of the following services, and then click **Start**:
 - **TrueControl ManagementEngine**
 - **TrueControl FTP Server**
 - **TrueControl SWIM Server**
 - **TrueControl Syslog Server**
 - **TrueControl TFTP Server**
- *Linux:* Run the following command:

```
/etc/init.d/truecontrol start
```

To stop all NA services

- *Windows:* Open the **Services** control panel. In the list of services, right-click each of the following services, and then click **Stop**:
 - **TrueControl ManagementEngine**
 - **TrueControl FTP Server**
 - **TrueControl SWIM Server**
 - **TrueControl Syslog Server**
 - **TrueControl TFTP Server**
- *Linux:* Run the following command:

```
/etc/init.d/truecontrol stop
```

To restart all NA services

- *Windows:* Open the **Services** control panel. In the list of services, right-click each of the following services, and then click **Restart**:
 - **TrueControl ManagementEngine**
 - **TrueControl FTP Server**

- **TrueControl SWIM Server**
- **TrueControl Syslog Server**
- **TrueControl TFTP Server**
- *Linux*: Run the following command:

```
/etc/init.d/truecontrol restart
```

Disable All NA Services

Some procedures call for disabling automatic startup of the NA services on system boot.

To disable all NA services

- *Windows*: Open the **Services** control panel. In the list of services, right-click each of the following services, click **Properties**, and then set Startup Type to **Disabled**:
 - **TrueControl ManagementEngine**
 - **TrueControl FTP Server**
 - **TrueControl SWIM Server**
 - **TrueControl Syslog Server**
 - **TrueControl TFTP Server**
- *Linux*:

```
mv /etc/rc.d/rc5.d/S99truecontrol /etc/S99truecontrol
```

Working with .rcx Files

The HP Network Automation Software (NA) property files use the `.rcx` extension. NA reads `.rcx` files in reverse alphabetical order. If a given setting is in multiple `.rcx` files, NA uses the last-read value. Thus, the settings in the `adjustable_options.rcx` file take precedence over the settings in the other `.rcx` files installed with NA.

Note: At startup, NA reads *all* files in the `jre` directory and interprets their contents for NA configuration options. For this reason, save all backup copies of `.rcx` files outside the root NA directory.

In Horizontal Scalability environments, NA shares the actual values of most settings, not the `.rcx` files, across the NA cores. When a setting is modified on one NA core, that setting is replicated to the other NA cores. If an NA core is not operational during the change replication, that NA core does not receive the change. In that case, at a later time, use the Admin > Distributed > Renew Configuration Options page to push changes to other NA cores.

Tip: The distributed system options section of the `appserver.rcx` file lists the settings that are specific to one NA core and are not shared across the NA cores.

Some configuration changes require `.rcx` file modifications. The `.rcx` files are located in the following directory:

- *Windows*: `<NA_HOME>\jre`
- *Linux*: `<NA_HOME>/jre`

Caution: Always edit `.rcx` files with care. These files use XML format. If a `.rcx` file change results in invalid XML, the NA console might not start correctly.

Tip: It is recommended to make all configuration changes in the `adjustable_options.rcx` file. NA patch installations and product upgrades might overwrite any of the other NA-installed `.rcx` files.

The general procedure for changing `.rcx` files is as follows:

1. Back up the `.rcx` file to a location outside the `<NA_HOME>` directory.
(NA reads all `.rcx` files within the NA directory structure.)
2. Add new content or update existing content as described in the instructions.
3. Save the `.rcx` file.
4. Reload the `.rcx` settings by doing *one* of the following:
 - In the NA console, on the Admin > Administrative Settings > User Interface page, click **Save**.
 - Run the `reload server options` command from the NA proxy.
 - Restart the NA services.

Tip: Some changes do not take effect until the NA services have been restarted.

We appreciate your feedback!

If you have comments about this document, you can [contact the documentation team](#) by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on Administration Guide, December 2015 (Network Automation Software 10.00)

Just add your feedback to the email and click send.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to network-management-doc-feedback@hpe.com.