

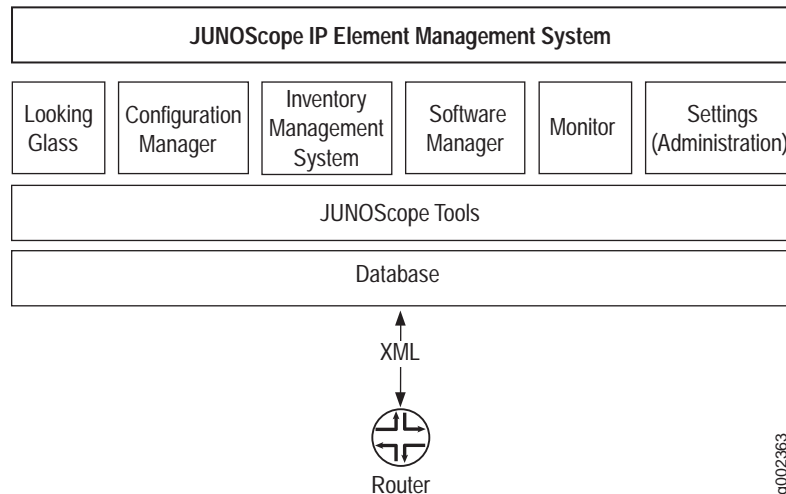
Chapter 1

JUNOScope Software Overview

This chapter provides an overview of the JUNOScope software.

The JUNOScope software is an element management application that provides tools for managing IP services for the J-series, M-series, and T-series routing platforms. (See Figure 1.)

Figure 1: JUNOScope Element Management Tools



JUNOScope element management tools include:

- Looking Glass for viewing real-time device operational, diagnostics, and troubleshooting information.
- Configuration Manager for archiving, importing, comparing, displaying, and restoring the configuration files on devices in the network. The Configuration Manager also includes a Web-based Configuration Browser and a Configuration Editor for managing configuration file content.
- Inventory Management System for scanning software, license, and hardware inventory and activity, such as adds, deletes, or changes of inventory on selected devices on the network. The Inventory Management System also allows you to view predefined reports or generate custom reports. The system also includes a demo database from which you can generate demo reports.

- Monitoring logs for viewing the status of completed, scheduled, or pending operations. An Audit Log lets you view the status all authentication activities and privileged operations performed by authorized users.
- Settings (Administration) for modifying JUNOScope settings. Using JUNOScope administration tools you can:
 - Define the user IDs and passwords used to log in to a device.
 - Define how to connect to devices and the authentication information used to log in.
 - Connect the JUNOScope software to devices on the network.
 - Define a dynamic group of devices so JUNOScope tasks can operate on many devices at the same time.
 - Apply labels to statically organize a large group of devices on the network so JUNOScope operations, such as archive a configuration or inventory scan, can be performed on them.
 - Define the date, time, and interval when you want a JUNOScope software operation to occur on devices in the network.
 - Set up local accounts and template accounts so that local users and users with RADIUS accounts can log in to JUNOScope with appropriate permissions. Set up an Authentication Policy for users having local accounts and remote RADIUS accounts.
 - Set up RADIUS authentication sever host information so that users with RADIUS accounts can log in to JUNOScope with appropriate permissions. Set up RADIUS accounting server host information so that authentication records and privileged operations can be audited.
 - Import and export all JUNOScope settings data to the local file system.
 - Create, edit, view, and run saved operations, such archive (Settings > Archive), restore (Settings > Restore), and inventory scan (Inventory Management > Scan) operations.

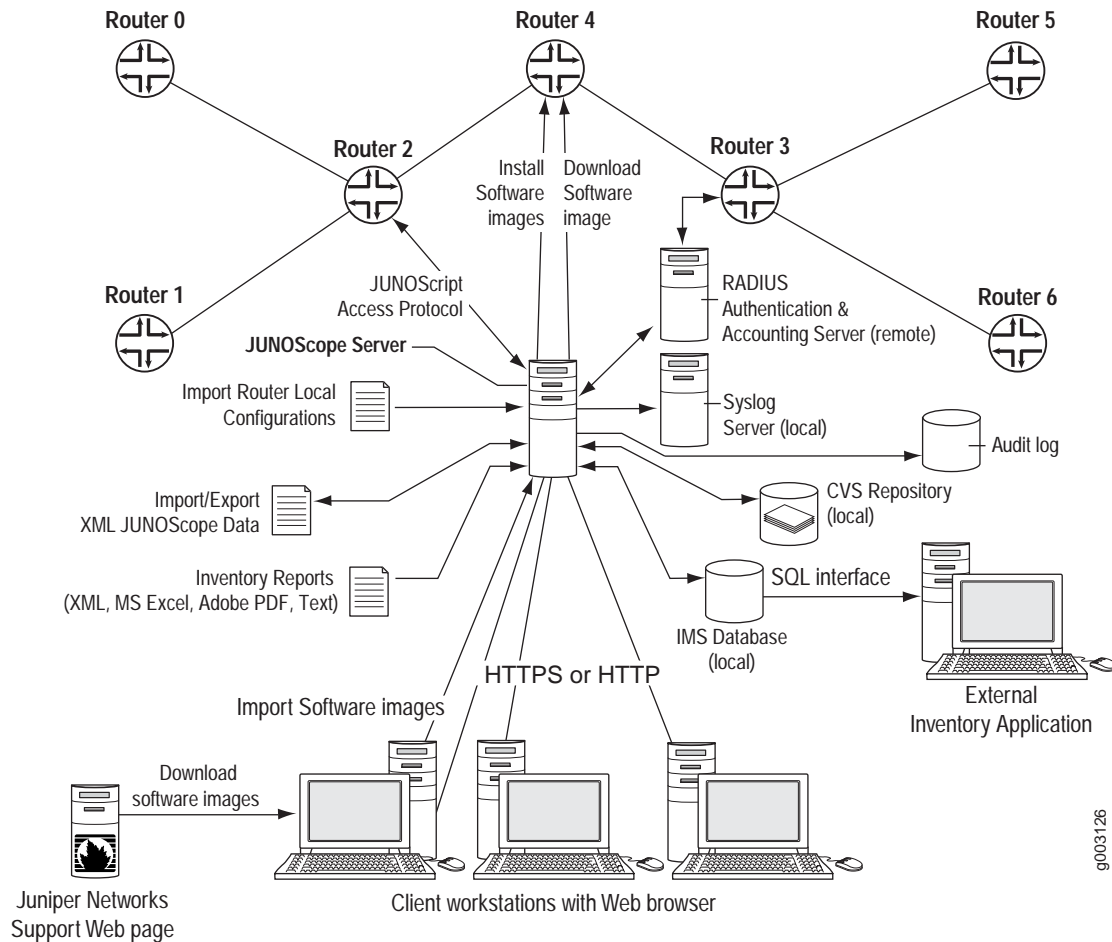
The following topics provide an overview of the JUNOScope software:

- JUNOScope Software Architecture on page 5
- Licensed JUNOScope Modules on page 7
- JUNOScope Software Features on page 8
- JUNOScope Software Task and Privilege Summary on page 15

JUNOScope Software Architecture

The JUNOScope software is a Web server application that runs on a UNIX workstation. You can connect to the JUNOScope software and log in from a client workstation running a Microsoft Internet Explorer 6 or Netscape Navigator 6 Web browser or later with JavaScript enabled. JUNOScope accepts Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS) or Hypertext Transfer Protocol (HTTP) connections. (See Figure 2.)

Figure 2: JUNOScope Software Architecture



The JUNOScope software includes a Structured Query Language (SQL) database for storing the data collection. The JUNOScope software is bundled with MySQL, a relational database management system (RDBMS) which provides an SQL interface for extracting Inventory Management System information to an external inventory application. The JUNOScope software also includes a Concurrent Versions System (CVS) repository for archiving revisions of configuration files.

The JUNOScope software is a client of the JUNOScript server that runs on the router. The JUNOScope software connects to the JUNOScript server, which allows connection to routers using JUNOScript-specific access protocols, such as secure sockets layer (SSL) (a protocol for sending encrypted text over a Transmission Control Protocol [TCP] connection), and clear-text. The JUNOScope software uses the JUNOScript application programming interface (API) to interact with the router, sending and receiving information in Extensible Markup Language (XML) for operations such as archiving, restoring, and browsing a configuration file, and obtaining router operational status information.

The JUNOScope software connects to Juniper Networks J-series, M-series, and T-series routing platforms running the current JUNOS software release and including at least two previous releases.

The JUNOScope software provides security between the client and the server. MD5 RSA certification is available between the JUNOScope server and the client Web browser. All communication is encrypted between the client Web browser and the JUNOScope server. The JUNOScope software installation creates an X.509 digital certificate for the HTTPS server. The JUNOScope software administrator can use self-assigned certificates or have one assigned by a trusted certificate authority.

The JUNOScope software installer installs the JUNOScope software. The JUNOScope installation program creates an administrator account that allows the JUNOScope administrator to log in to the software and set up access methods, devices (routers), device groups, operation schedules, and other user accounts.

You must have privilege levels to perform certain JUNOScope tasks. There are three levels of user authorization: read-only, read-write, and superuser. For information about privilege levels and tasks, see Table 5 on page 15.

You must log in to the JUNOScope software with a username and password.

The JUNOScope software provides security-enhanced audit logging of user authentication activity and privileged operations that change information in the JUNOScope system and on the network to an internal audit log, the system log server, and an optional RADIUS accounting server if one is configured.

The JUNOScope software also enforces an authentication policy for each JUNOScope user. The JUNOScope administrator can edit the user authentication policy, including locking the account, specifying maximum login attempts, and setting an access window within which the failed login attempts occur.

Licensed JUNOScope Modules

Some JUNOScope software modules, such as Looking Glass, Configuration Management, Inventory Management, and Software Management, are available only if they are licensed and if the software administrator has installed them. If a software module is not installed, it is disabled (unavailable) on the JUNOScope main window, and you cannot use it.

In the JUNOScope main window shown below, Looking Glass and Software Manager are neither licensed nor installed.

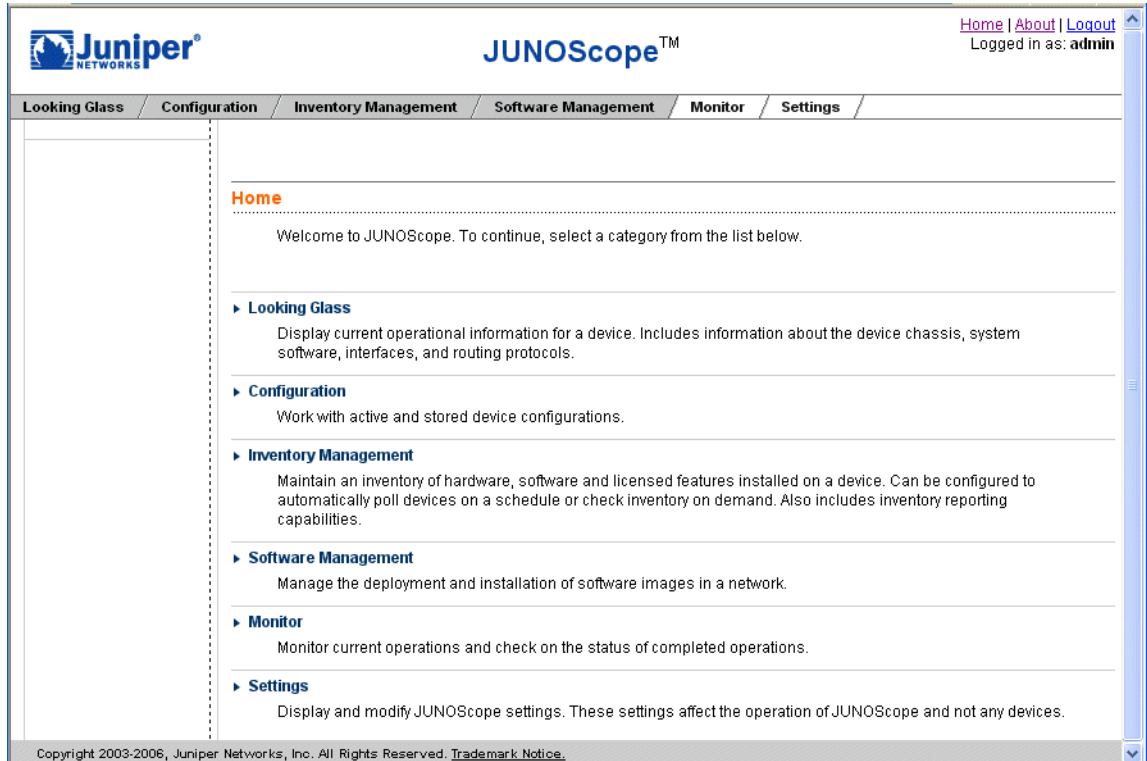
The screenshot shows the JUNOScope main window. At the top left is the Juniper Networks logo. To its right is the text 'JUNOScope™'. Further right are links for 'Home | About | Logout' and the text 'Logged in as: admin'. Below this is a navigation bar with tabs for 'Looking Glass', 'Configuration', 'Inventory Management', 'Software Management', 'Monitor', and 'Settings'. The main content area has a 'Home' heading and a welcome message: 'Welcome to JUNOScope. To continue, select a category from the list below.' Below this is a list of modules, each with a description:

- Looking Glass**: Display current operational information for a device. Includes information about the device chassis, system software, interfaces, and routing protocols.
- Configuration**: Work with active and stored device configurations.
- Inventory Management**: Maintain an inventory of hardware, software and licensed features installed on a device. Can be configured to automatically poll devices on a schedule or check inventory on demand. Also includes inventory reporting capabilities.
- Software Management**: Manage the deployment and installation of software images in a network.
- Monitor**: Monitor current operations and check on the status of completed operations.
- Settings**: Display and modify JUNOScope settings. These settings affect the operation of JUNOScope and not any devices.

At the bottom of the window, there is a copyright notice: 'Copyright 2003-2006, Juniper Networks, Inc. All Rights Reserved. Trademark Notice.'

JUNOScope Software Features

The main window is displayed when you log in to the software using a Web browser on a client workstation. The main window includes the main command links to all of the various JUNOScope software modules. For more information about the parts of the JUNOScope main window, see Figure 12 on page 353.



The JUNOScope software provides the following main modules. They appear as main command menus and as tabs in the JUNOScope software user interface. Each main menu has a set of submenus that correspond to administrator or user tasks.

- Looking Glass on page 9
- Configuration Management on page 9
- Inventory Management on page 10
- Monitor on page 12
- Settings on page 12

Looking Glass

The Looking Glass module provides a graphical user interface (GUI) for viewing device status and troubleshooting information from connected devices, including router chassis, system management, Adaptive Services (AS) Physical Interface Card (PIC), Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), Multiprotocol Label Switching (MPLS), and Resource Reservation Protocol (RSVP) status information. For more information about Looking Glass, see “Using Looking Glass” on page 325.

Configuration Management

The JUNOScope software configuration management module lets users perform the software features described in the following sections.

Configuration Browser

(Configuration > Current > View) Provides a GUI for viewing the setup of the currently committed configuration that is running on a selected device. Use the Configuration Browser to view the configuration statement hierarchy in brief or detailed mode, including viewing statement inheritance. For more information, see “Using the Configuration Browser” on page 333.

Configuration Editor

(Configuration > Current > Edit) Provides a GUI for editing a configuration on a selected device. Use the Configuration Editor to modify the existing configuration. You can also use the Configuration Editor to commit the modified configuration, as well as discard any unwanted configuration changes. If a device has redundant Routing Engines, committed changes will be synchronized on both the master and backup. For more information, see “Using the Configuration Editor” on page 341.

Archive

(Configuration > Repository > Archive) Lets you download the active configuration file from a device or group of devices. The downloaded version of the configuration file is archived in the JUNOScope software CVS repository. You can save configuration archive operations and combine them with other operations, such as restore and inventory scan, to be run concurrently or sequentially in real time or at a scheduled interval. For more information, see “Archiving a Configuration File” on page 181.

Import

(Configuration > Repository > Import) Lets you import into JUNOScope a portion or all of a device configuration that you have saved in ASCII file format to a file on the local file system. The imported configuration is stored in the CVS repository. You can then compare, display, or restore the imported configuration. For more information about importing configuration files, see “Importing a Configuration File” on page 193.

Compare

(Configuration > Repository > Compare) Lets you compare the differences between the contents of two revisions of a configuration file that you select in JUNOScope. By default, the JUNOScope software compares the newer revision of a configuration file to an older one. You can also select to compare an older revision of a configuration file with a newer one. For more information, see “Comparing Configuration Files” on page 187.

Display

(Configuration > Repository > Display) Displays the contents of a configuration file revision that you select in JUNOScope. For more information, see “Displaying a Configuration File” on page 197.

Restore

(Configuration > Repository > Restore) Uploads an archived configuration file to the device from which it was archived or uploads an imported configuration to a selected device. JUNOScope locks the device configuration and loads the new configuration on the device, overriding or merging (discarding) the old configuration. JUNOScope issues a **commit confirmed** command and a **commit-configuration JUNOScript XML tag** command. If the target device has installed and configured dual Routing Engines, JUNOScope issues a **commit synchronize** command. JUNOScope then unlocks the configuration. If an error occurs, JUNOScope issues a **rollback** command, causing the configuration to revert to the last saved configuration.

You can save configuration restore operations and combine them with other operations, such as archive and inventory scan, to be run concurrently or sequentially in real time or at a scheduled interval.

For more information, see “Restoring a Configuration File” on page 201.

Inventory Management

The Inventory Management System module consists of two main features: Scan and Reports.

If the Inventory Management System software module is not licensed for use, the JUNOScope software administrator should select not to install it. If this software module is not installed, it is disabled (unavailable) in the JUNOScope main window.

An external inventory application can connect to the Inventory Management System database and extract inventory data, such as hardware, software, licensed features, and inventory scan events, from the database by way of a Structured Query Language (SQL) interface. A unique username and password must be configured during the JUNOScope software installation to enable read-only access to the Inventory Management System database.

The Inventory Management System includes Demo reports generated from a demonstration database so you can learn how to use report features with having to actually scan device inventory on the production network.

Scan

The Scan feature scans the inventory of one or more selected devices for hardware, software feature licenses, and JUNOS software and its installed packages. The Inventory Management System scans devices in real time or as part of a scheduled operation. You can save inventory scan operations and combine them with other operations, such as archive and restore, to be run concurrently or sequentially in real time or at a scheduled interval.

For more information about scanning inventory items on devices, see “Scanning Inventory Data” on page 231.

Reports

Once device inventory has been scanned and stored in the JUNOScope database, you can generate various predefined or user-specified reports. You can manipulate inventory reports using tools to sort, query, and configure columns. You can save custom inventory reports, including user-specified definitions and controls. All JUNOScope users can view and share saved inventory reports. The Inventory Management System displays reports in a browser in HTML, and can also be exported in Extensible Markup Language (XML), comma-separated values (CSV) text, Adobe PDF, and Microsoft Excel formats. For more information, see “Using Inventory Reports” on page 239.

Repository

The Inventory Management System repository allows you to schedule custom inventory reports to run at a specified time without intervention and to view archived custom inventory reports that have been run.

- **Schedule**—The JUNOScope Inventory Management System now allows you to run custom inventory reports (such as event, hardware, software, and license) at a specified time without intervention. You can schedule custom inventory reports that you save to a filename. You can also save scheduled custom inventory report operations and combine them using Task Manager (Settings > Saved Operations) with other operations, such as archive, restore, inventory scan, install software image, and download software image.
- **Repository**—You can view scheduled report status using Monitor > Status. Scheduled reports are archived in the Inventory Management System repository for future viewing in Adobe PDF or Microsoft Excel format.

For more information about scheduling and viewing custom inventory reports, see “Scheduling Custom Inventory Reports and Viewing Archived Inventory Reports” on page 279.

Software Manager

Software Manager is a licensable module that controls the deployment and installation of JUNOS software images in a network. Administrators can use Software Manager as the central management point from which to import, download and install software images in a controlled and auditable manner. Used with other JUNOScope features, such as the Task Manager, Scheduler and Inventory Manager, Software Manager allows the administrator to better control how and when JUNOS software images are rolled out in a network. For more information about Software Manager, see “Using the Software Manager” on page 309.

Monitor

The JUNOScope monitor operations component lets users perform the following tasks.

Operations

Display a schedule of pending operations that are configured. You can also delete operations. An operation appears in Manage Operations when you use the Configuration > Repository > Archive command and the Inventory Management > Scan command to set an archive schedule for a specified time and interval. An operation is not listed when you schedule an operation using the Now option. For more information, see “Managing Operations” on page 211.

Status

Display the status of all JUNOScope operations run on all devices, groups, or selected devices. You can apply a filter to see only specific operations, such as operations run at a specific time or with a particular status. The JUNOScope operations are listed by device or group name on which the operation occurs, operation status, operation start time, last update time, and any message about the operation. Operation status includes pending, connecting, writing, success, or error. For more information, see “Viewing Operation Status” on page 215.

Audit Log

Display the records of all JUNOScope user authentication activities and privileged operations that are stored in the database. Authentication activities include user logins, login failures, logouts, and session timeouts. Privileged operations are changes of information in the system or network, including configuration commits, configuration archives, user account additions, user account deletions, password changes, device additions, device deletions, label association changes, and authentication information changes. User authentication activity and privileged operation audit records are also sent as system log messages to the system log server and to an optional RADIUS accounting server if one is configured.

Settings

The JUNOScope system settings component lets the administrator set up the software to work with the following information.

Authentication Information

Specify the authentication information (login and password for accessing a device). The JUNOScope software administrator can choose to have sensitive data encrypted at export. For more information, see “Setting Up Authentication Information” on page 39.

Access Methods

Specify the access method (JUNOScript access protocol to connect to the JUNOScript server running on a device) configured on a device for remotely connecting to that device from the JUNOScope software. The JUNOScope software administrator can choose to have sensitive data encrypted at export. For more information, see “Setting Up Access Methods” on page 47.

Devices

Connect to and discover information about devices on the network. The JUNOScope software performs operations on devices, such as archive, display, compare, or restore. Additionally, the JUNOScope software scans devices for inventory information. You can associate a device with one or more text labels used to statically organize a group of devices for JUNOScope operations. For more information, see “Setting Up Devices” on page 59.

Groups

Group devices for performing immediate or scheduled operations using criteria, such as device name, model, hostname, comment, or label (see “Labels” on page 13). For more information, see “Setting Up Groups” on page 71.

Labels

Labels, in free text format, provide a way to statically associate a group of devices. A label must have a unique name, such as **Edge**; an optional category name, such as **Router Type**, so you can logically organize labels; and an optional comment to help you understand the label purpose. You can associate an existing label with one or more devices. You can use a label as a rule in the group criteria wizard for setting up groups of devices. For more information about setting up labels, see “Setting Up Labels” on page 93. For more information about associating a device with a label, see “Setting Up Devices” on page 59. For more information about using a label to create a group, see “Setting Up Groups” on page 71.

Schedules

Specify the time or interval when you want the JUNOScope software to perform operations on one or more devices, such as archive, display, or compare a device configuration, or scan device hardware, software, or licensed feature inventory. For more information, see “Setting Up Schedules” on page 103.

Users

Provides the following user authentication:

- Local authentication—Set up local accounts and a template account so that local users and users with RADIUS accounts can log in to JUNOScope with the appropriate permissions. For more information, see “Setting Up User Local Authentication” on page 111.
- Authentication Policy—Configure and enforce an authentication policy for each JUNOScope user. The JUNOScope administrator can edit the user authentication policy, including locking the account, specifying maximum login attempts, and setting an access window within which the failed login attempts occur.

RADIUS Configuration

Set up RADIUS server host information so that users with RADIUS accounts can log in to JUNOScope. The JUNOScope administrator can also specify the port to which all user authentication activity and privileged operation audit records are sent. For more information, see “Setting Up RADIUS Configuration” on page 127.

Import/Export All Data

Import or export required JUNOScope database data from or to another JUNOScope server.

Export All

The JUNOScope administrator can now export all JUNOScope data, with the following options for sensitive data:

- Encrypt sensitive data and provide key at import time—Sensitive data is exported encrypted and the key to decrypt it is not included in the exported data, but is supplied during import.
- Encrypt sensitive data and include decryption key—Sensitive data is exported encrypted, along with the key needed to decrypt the data. This lets you easily export authentication information to another system.
- Export sensitive data unencrypted—Sensitive data is not encrypted at export.

Import All

The JUNOScope administrator can import sensitive data by supplying a key if the data was exported using the “encrypt sensitive data and provide key at import time” method. Select an import method to be used if a conflict occurs between existing records stored in the JUNOScope server and imported records when synchronizing JUNOScope settings imported from multiple servers. The available import method options include ignore, merge, and override.

For more information, see “Importing and Exporting All Settings Data” on page 147.

Saved Operations (Task Manager)

You can save operations such as archive, restore, and inventory scan from devices on the network and reuse them to build compound operations. You can specify the order in which you want these compound operations to be executed. Reusing operations reduces production time and errors.

Use the Task Manager (Setting > Saved Operations) to create compound operations from archive, restore, or inventory operations that you save to reuse later. From Task Manager (the Saved Operations page), you can add compound operations, specify their execution order, run operations in real time or as part of an existing schedule, view simple operation settings, edit the order in which compound operations run (concurrently or sequentially), and delete operations.

JUNOScope Software Task and Privilege Summary

This section describes the network planning that is necessary to run the JUNOScope software. Additionally, it describes the tasks and privilege levels required to use the JUNOScope software.

No user privilege level is required to perform network planning tasks for the JUNOScope software. Planning tasks can be performed in the network operations center (NOC) by a network designer or engineer. These network planning tasks include the following:

- Determine which routers to connect to and manage
- Determine which users can access and use the software, and their permission levels
- Configure the JUNOS software on each router for the supported JUNOScript access protocols
- Configure the JUNOS software on each router for a digital certificate for the JUNOScript server
- Configure the JUNOS software on each router for each user you want to use the JUNOScope software
- Determine how often you want archive operations to occur on routers

Table 5 summarizes the tasks and privilege levels required to use the JUNOScope software.

Table 5: Required JUNOScope Software Tasks and Privilege Levels (1 of 2)

JUNOScope Software Task	Superuser	Read-Write	Read-Only
Installation			
Install, reinstall, upgrade, or downgrade JUNOScope software	X	—	—
Looking Glass	X	X	X
Configuration Management			
Configuration Browser (Current > View)	X	X	X
Configuration Editor (Current > Edit)	X	X	—
Archive (Repository > Archive)	X	X	—
Import (Repository > Import)	X	X	—
Compare (Repository > Compare)	X	X	X
Display (Repository > Display)	X	X	X
Restore (Repository > Restore)	X	X	—

Table 5: Required JUNOScope Software Tasks and Privilege Levels (2 of 2)

JUNOScope Software Task	Superuser	Read-Write	Read-Only
Inventory Management	X	X	X
Scan Inventory (Inventory Management > Scan)	X	X	—
Reports—View and generate (Inventory Management > Reports)	X	X	X Cannot save or delete custom reports
Demo Reports—View and generate (Inventory Management > Reports > Demo)	X	X	X Cannot save or delete custom reports
Repository			
■ Schedule and save custom inventory reports	X	X	—
■ View archived reports that have run	X	X	—
Software Manager			
Images	X	—	—
Monitor			
Operations	X	X	X Cannot delete operations
Status	X	X	X
Audit Log	X	—	—
Settings			
Authentication Information	X	—	—
Access Methods	X	—	—
Devices	X	—	—
Groups	X	—	—
Labels	X	—	—
Schedules	X	—	—
Users > Local Authentication	X	—	—
Users > Authentication Policy	X	—	—
Import/Export Data	X	—	—
RADIUS Configuration	X	—	—
Saved Operations (Task Manager)	X	X	—