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About This Guide

Objectives
The Network and Security Manager (NSM) is a software application that centralizes control and management of your Juniper Networks devices. With NSM, Juniper Networks delivers integrated, policy-based security and network management for all security devices.

NSM uses the technology developed for Juniper Networks ScreenOS to enable and simplify management support for previous and future versions of ScreenOS. By integrating management of all Juniper Networks security devices, NSM enhances the overall security of the Internet gateway.

This guide explains how to configure NSM ScreenOS and IDP devices. Use this guide in conjunction with the Network and Security Manager Administration Guide, Network and Security Manager Installation Guide, and Network and Security Manager Online Help.

Audience
This guide is intended for system administrators responsible for the security infrastructure of their organization. Specifically, this book discusses concepts of interest to firewall and VPN administrators, network/security operations center administrators; and system administrators responsible for user permissions on the network.

Conventions
The sample screens used throughout this guide are representations of the screens that appear when you install and configure the NSM software. The actual screens may differ.
All examples show default file paths. If you do not accept the installation defaults, your paths will vary from the examples.

Table 1 on page xxii defines notice icons used in this guide.

**Table 1: Notice Icons**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Informational note icon" /></td>
<td>Informational note</td>
<td>Indicates important features or instructions.</td>
</tr>
<tr>
<td><img src="image" alt="Caution icon" /></td>
<td>Caution</td>
<td>Indicates a situation that might result in loss of data or hardware damage.</td>
</tr>
<tr>
<td><img src="image" alt="Warning icon" /></td>
<td>Warning</td>
<td>Alerts you to the risk of personal injury or death.</td>
</tr>
<tr>
<td><img src="image" alt="Laser warning icon" /></td>
<td>Laser warning</td>
<td>Alerts you to the risk of personal injury from a laser.</td>
</tr>
</tbody>
</table>

Table 2 on page xxii defines text conventions used in this guide.

**Table 2: Text Conventions**

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold typeface</strong></td>
<td>Represents commands and keywords in text.</td>
<td>Issue the clock source command.</td>
</tr>
<tr>
<td></td>
<td>Represents keywords</td>
<td>Specify the keyword exp-msg</td>
</tr>
<tr>
<td></td>
<td>Represents UI elements</td>
<td>Click User Objects</td>
</tr>
<tr>
<td><strong>Bold sans serif typeface</strong></td>
<td>Represents text that the user must type.</td>
<td>user input</td>
</tr>
<tr>
<td><strong>fixed-width font</strong></td>
<td>Represents information as displayed on the terminal screen.</td>
<td>host1# show ip ospf Routing Process OSPF 2 with Router ID 5.5.0.250 Router is an area Border Router (ABR)</td>
</tr>
<tr>
<td><strong>Key names linked with a plus (+) sign</strong></td>
<td>Indicates that you must press two or more keys simultaneously.</td>
<td>Ctrl + d</td>
</tr>
<tr>
<td><strong>Italics</strong></td>
<td>Emphasizes words</td>
<td>The product supports two levels of access, user and privileged.</td>
</tr>
<tr>
<td></td>
<td>Identifies variables</td>
<td>clusterID, ipAddress.</td>
</tr>
<tr>
<td></td>
<td>Identifies chapter, appendix, and book names</td>
<td>Appendix A, System Specifications.</td>
</tr>
<tr>
<td><strong>The angle bracket (&gt;)</strong></td>
<td>Indicates navigation paths through the UI by clicking menu options and links.</td>
<td>Object Manager &gt; User Objects &gt; Local Objects</td>
</tr>
</tbody>
</table>
Table 3 on page xxiii defines syntax conventions used in this guide.

### Table 3: Syntax Conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words in plain text</td>
<td>Represent keywords</td>
<td>terminal length</td>
</tr>
<tr>
<td>Words in italics</td>
<td>Represent variables</td>
<td>mask, accessListName</td>
</tr>
<tr>
<td>Words separated by the pipe (</td>
<td>) symbol</td>
<td>Represent a choice to select one keyword or variable to the left or right of this symbol. The keyword or variable can be optional or required.</td>
</tr>
<tr>
<td>Words enclosed in brackets ( [ ] )</td>
<td>Represent optional keywords or variables.</td>
<td>internal</td>
</tr>
<tr>
<td>Words enclosed in brackets followed by and asterisk ( [ ]*)</td>
<td>Represent optional keywords or variables that can be entered more than once.</td>
<td>level1</td>
</tr>
<tr>
<td>Words enclosed in braces ( { } )</td>
<td>Represent required keywords or variables.</td>
<td>permit clusterId</td>
</tr>
</tbody>
</table>

### Documentation

Table 4 on page xxiii describes documentation for the NSM.

### Table 4: Network and Security Manager Publications

<table>
<thead>
<tr>
<th>Book</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network and Security Manager Installation Guide</td>
<td>Details the steps to install the NSM management system on a single server or on separate servers. It also includes information on how to install and run the NSM user interface. This guide is intended for IT administrators responsible for the installation and/or upgrade to NSM.</td>
</tr>
<tr>
<td>Network and Security Manager Administration Guide</td>
<td>describes how to use and configure key management features in the NSM. It provides conceptual information, suggested workflows, and examples where applicable. This guide is best used in conjunction with the Network and Security Manager Online Help, which provides step-by-step instructions for performing management tasks in the NSM UI. This guide is intended for application administrators or those individuals responsible for owning the server and security infrastructure and configuring the product for multi-user systems. It is also intended for device configuration administrators, firewall and VPN administrators, and network security operation center administrators.</td>
</tr>
</tbody>
</table>
Table 4: Network and Security Manager Publications (continued)

<table>
<thead>
<tr>
<th>Book</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network and Security Manager ScreenOS and IDP Devices Guide</td>
<td>Describes NSM features that relate to device configuration and management. It also explains how to configure basic and advanced NSM functionality, including deploying new device configurations, managing Security Policies and VPNs, and general device administration.</td>
</tr>
<tr>
<td>Network and Security Manager Online Help</td>
<td>Provides task-oriented procedures describing how to perform basic tasks in the NSM user interface. It also includes a brief overview of the NSM system and a description of the GUI elements.</td>
</tr>
<tr>
<td>Network and Security Manager API Guide</td>
<td>Provides complete syntax and description of the SOAP messaging interface to the Network and Security Manager.</td>
</tr>
<tr>
<td>Network and Security Manager Release Notes</td>
<td>Provides the latest information about features, changes, known problems, resolved problems, and system maximum values. If the information in the Release Notes differs from the information found in the documentation set, follow the Release Notes. Release notes are included on the corresponding software CD and are available on the Juniper Networks Website. The documentation is also available on the Internet. You can order a set of printed documents from your Juniper Networks sales representative.</td>
</tr>
</tbody>
</table>

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need postsales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at http://www.juniper.net/customers/support/downloads/710059.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
- JTAC Hours of Operation —The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
Find solutions and answer questions using our Knowledge Base:
http://kb.juniper.net/

Download the latest versions of software and review release notes:
http://www.juniper.net/customers/csc/software/

Search technical bulletins for relevant hardware and software notifications:
https://www.juniper.net/alerts/

Join and participate in the Juniper Networks Community Forum:
http://www.juniper.net/company/communities/

Open a case online in the CSC Case Manager: http://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool located at https://tools.juniper.net/SerialNumberEntitlementSearch/.

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Manager tool in the CSC at http://www.juniper.net/cm/.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, visit us at http://www.juniper.net/support/requesting-support.html.
Part 1

Configuring

- Overview on page 3
- Device Configuration Overview on page 21
- Fundamentals on page 33
- Administration on page 121
- Security on page 141
- Configuring VPNs on page 161
- Voice-Over-Internet Protocol on page 227
- Routing on page 237
- Virtual Systems on page 277
- User Authentication on page 281
- High Availability on page 283
- WAN, ADSL, Dial, and Wireless on page 297
- General Packet Radio Service on page 317
Chapter 1
Overview

Juniper Network and Security Manager (NSM) provides IT departments with an easy-to-use solution that controls all aspects of the Juniper Networks FW/VPN and IDP devices including device configuration, network settings, and security policy. NSM enables IT departments to control the entire device lifecycle with a single, centralized solution. Using NSM, you can configure all your Juniper Networks security devices from one location, at one time.

The Network and Security Manager: Configuring ScreenOS and IDP Devices Guide provides overview and conceptual information on device configuration: setting up security, policies, zones and other device administration and management tasks.

The Network and Security Manager Administration Guide describes NSM features and provides a technical overview of the management system architecture. It also explains how to configure basic and advanced NSM functionality, including adding new devices, deploying new device configurations, updating device firmware, managing Security Policies and VPNs, viewing log information, and monitoring the status of your network. Use these guides in conjunction with the Network and Security Manager Online Help, which provides step-by-step instructions for the NSM functionality.

For detail on ScreenOS functionality, see the Concepts & Examples ScreenOS Reference Guide.

This chapter contains the following sections:

- About NSM on page 3
- Working in the User Interface on page 10

About NSM

At its foundation, a management system integrates your individual security devices into a single, effective security system that you control from a central location. With NSM, you can manage your network at the system level, using policy-based central management, as well as at the device level, managing all device parameters for devices.

NSM is designed to work with networks of all sizes and complexity. You can add a single device, or create device templates to help you deploy multiple devices; you can create new policies, or edit existing policies for security devices. The management system tracks and logs each administrative change in real-time, providing you with a complete administrative record and helping you perform fault management.
NSM also simplifies control of your network with an intuitive UI. Making all changes to your devices from a single, easy-to-use interface can reduce deployment costs, simplify network complexity, speed configuration, and minimize troubleshooting time.

The following sections detail the key management features of NSM.

**Security Integration**

True security integration occurs when you can control every security device on your network and see every security event in real-time from one location. In NSM, this location is the NSM UI, a graphical user interface that contains a virtual representation of every security device on your network. The idea behind this virtual-physical abstraction is that you can access your entire network from one location—use this console to view your network, the devices running on it, the policies controlling access to it, and the traffic that is flowing through it.

**Complete Support**

You can create and manage device configurations for security devices or systems. NSM provides support for ScreenOS configuration commands, so you can retain complete control over your devices when using system-level management features like VPNs.

**Network Organization**

Divide and conquer with NSM—use domains to segment your network functionally or geographically to define specific network areas that multiple administrators can manage easily.

A domain logically groups devices, their policies, and their access privileges. Use a single domain for small networks with a few security administrators, or use multiple domains for enterprise networks to separate large, geographically distant or functionally distinct systems, control administrative access to individual systems, or obfuscate systems for service provider deployments.

With multiple domains, you can create objects, policies, and templates in the global domain, then create subdomains that automatically inherit these definitions from the global domain.

**Role-Based Administration**

Control access to management with NSM—define strategic roles for your administrators, delegate management tasks, and enhance existing permission structures with new task-based functionality.

Use NSM to create a security environment that reflects your current offline administrator roles and responsibilities. Because management is centralized, it’s easy to configure multiple administrators for multiple domains. By specifying the exact tasks your NSM administrators can perform within a domain, you minimize the probability of errors and security violations, and enable a clear audit trail for every management event.
Initially, when you log in to NSM as the super administrator, you have full access to all functionality within the global domain. From the global domain, you can add NSM administrators, configure their roles, and specify the subdomains to which they have access:

- **Activities and Roles**—An activity is a predefined task performed in the NSM system, and a role is a collection of activities that defines an administrative function. Use activities to create custom roles for your NSM administrators.

- **Administrators**—An administrator is a user of NSM or IDP; each administrator has a specific level of permissions. Create multiple administrators with specific roles to control access to the devices in each domain.

- **Default Roles**—Use the predefined roles System Administrator, Read-Only System Administrator, Domain Administrator, Read-Only Domain Administrator, IDP Administrator, or Read-Only IDP Administrator to quickly create permissions for your administrators.

### Centralized Device Configuration

No network too large—because you manage your security devices from one location, you can use several system management mechanisms to help you quickly and efficiently create or modify multiple device configurations at one time:

- **Templates**—A template is a predefined device configuration that helps you reuse specific information. Create a device template that defines specific configuration values, then apply that template to devices to quickly configure multiple devices at one time. For more flexibility, you can combine and apply multiple device templates to a single device configuration (63 maximum). In addition, you can make global-domain templates available for reference in subdomains.

- **Shared Objects**—An object is a NSM definition that is valid in the global domain and all subdomains. Any object created in the global domain is a shared object that is shared by all subdomains; the subdomain automatically inherits any shared objects defined in the global domain. You will not see global objects in the Object Manager of a subdomain, however, you can use the objects when selecting objects in a policy.

  The global domain is a good location for security devices and systems that are used throughout your organization, address book entries for commonly used network components, or other frequently used objects. A subdomain, alternatively, enables you to separate firewalls, systems, and address objects from the global domain and other subdomains, creating a private area to which you can restrict access.

- **Grouping**—A group is a collection of similar devices or objects. Use device groups and object groups to update multiple devices simultaneously, simplify rule creation and deployment, and enable group-specific reporting. You can even link groups using Group Expressions to create a custom group.

### Migration Tools

If you have existing security devices deployed on your network or are using a previous Juniper Networks management system, you can use the NSM migration tools to
quickly import your existing security devices and their configurations, address books, service objects, policies, VPNs, and administrator privileges. As NSM imports your existing device configurations, it automatically creates your virtual network based on the configuration information.

You can import device configurations directly from your security device, or from your Juniper Networks Global PRO or Global PRO Express system. Import all your security devices at one time, or, if your network is large, import one domain at a time. When importing from Global PRO or Global PRO Express, NSM automatically transfers your existing domain structure.

For details on migrating from a previous management system, see the NSM Migration Guide.

Device Management

A production network is a living entity, constantly evolving to adapt to the needs of your organization. As your network grows, you might need to add new devices, reconfigure existing devices, update software versions on older devices, or integrate a new network to work with your existing network. NSM helps you take control of your network by providing a virtual environment in which to first model, verify, then updated your managed devices with changes.

Device Modeling

Using your virtual network to change, review, and test your network configuration before deploying it to your physical network can help you discover problems like routing issues, IP conflicts, and version mismatches across your entire network before they actually occur. NSM includes configuration validation to help you identify device configuration errors and missing information, then points you to the trouble spot so you can quickly fix the problem. When you have designed a virtual configuration that works, you can push this configuration to your devices with a single update.

With NSM, you can implement a new routing protocol across your network, design and deploy a new Security Policy with traffic shaping, or create a new VPN tunnel that connects a branch office to your corporate network—then deploy all changes with a single click.

Rapid Deployment (RD)

Rapid Deployment (RD) enables deployment of multiple security devices in a large networked environment with minimal user involvement. RD is designed to simplify the staging and configuration of security devices in non-technical environments, enabling the secure and efficient deployment of a large number of devices.

To use RD, the NSM administrator creates a small file (called a configlet) in NSM, then sends that configlet to an on-site administrator that has local access to the security device. With the help of the Rapid Deployment wizard, the on-site administrator installs the configlet on the device, which automatically contacts NSM and establishes a secure connection for device management.
RD is ideal for quickly bringing new security devices under NSM management for initial configuration. You can model and verify your device configurations for undeployed devices, then install the completed device configuration when the device contacts NSM.

**Policy-Based Management**

Create simplified and efficient Security Policies for your managed devices using:

- **Groups**—Group your devices by platform, ScreenOS version, location, or function, then add them to your Security Policies.
- **Zone Exceptions**—To simplify your rules, define a common To Zone and From Zone for all devices in the rule, then specify zone exceptions to change the To and From zones for specific devices. Zone exceptions add flexibility to your firewall rules, enabling you to manage more devices in a single rule.
- **Filtering**—Filter on From and To Zones to see rules between zones.
- **Scheduling**—Schedule a period during which a Security Policy is in effect on the devices in a rule. Create schedule objects as one-time, recurring, or both; you can even select multiple schedule objects in a firewall rule.
- **Security and Protection**—Configure a rule to look for attacks, viruses, or specific URLs (devices running ScreenOS 5.x only).
- **Traffic Shaping**—Use your firewall rules to control the amount of traffic permitted through your security devices.

**Error Prevention, Recovery, and Auditing**

Persistent management control is essential when managing large networks. You need to be sure that configuration and policies you send to your managed devices are correct before you install them on your devices.

Using NSM’s error prevention and recovery features, you can ensure that you are consistently sending stable configurations to your devices, and that your device remained connected to NSM. Additionally, you can track each change made by an NSM administrator to help you identify when, how, and what changes were made to your managed devices.

**Device Configuration Validation**

NSM automatically alerts you to configuration errors while you work in the UI. Each field that has incorrect or incomplete data displays a icon—move your mouse cursor over the icon to get details on the missing data. For more details on validation, see “Validation Icons in the User Interface” on page 16.

**Policy Validation**

The policy validation tool checks your Security Policies and alerts you to possible problems before you install that policy on your managed devices.
Atomic Configuration and Updating

On devices running ScreenOS 5.x, if the configuration deployment fails for any reason, the device automatically uses the last installed stable configuration. Additionally, if the configuration deployment succeeds, but the device loses connectivity to the management system, the device restores the last installed configuration. This minimizes downtime and ensures that NSM always maintains a stable connection to the managed device.

Devices running ScreenOS 5.1 and higher also support atomic updating, which enables the device to receive the entire modeled configuration (all commands) before executing those commands (instead of executing commands as they are received from the management system). Because the device no longer needs to maintain a constant connection to the management system during updating, you can configure changes to management connection from the NSM UI.

Device Image Updates

You can update the software that runs on your devices by installing a new ScreenOS image on all your security devices:

- NSM updates—Use NSM to upload the new image file to multiple security devices with a single click.
- RMA updates—To replace failed devices, set the device to the RMA state, which enables NSM to retain the device configuration without a serial number or connection statistics. When you install the replacement device, activate the device with the serial number of the replacement unit.

Auditing

Use the Audit Log Viewer to track administrative actions so you’ll always know exactly when and what changes were made using the management system. The Audit Log Viewer displays log entries in the order generated, and includes:

- Date and time the administrative action occurred
- NSM administrator who performed the action
- Action performed
- Domain (global or a subdomain) in which the action occurred
- Object type and name

The detail view of the Audit Log Viewer displays changes from the previous version.

Complete System Management

NSM provides the tools and features you need to manage your devices as a complete system, as well as individual networks and devices:

- To manage an individual device, create a single device configuration, define a Security Policy for that device, and monitor the device status.
To manage a network, create multiple device configurations, define and install policies for multiple devices, and view the status of all devices in the same UI.

To manage at the system level, create templates and use them to quickly configure multiple policies and VPNs that control the flow of traffic through your network, view system-wide log information for network security events, and monitor the status of NSRP.

VPN Abstraction

Use VPN Manager to design a system level VPN and automatically set up all connections, tunnels, and rules for all devices in the VPN. Instead of configuring each device as a VPN member and then creating the VPN, start from a system perspective: Determine which users and networks need access to each other, then add those components to the VPN.

Using AutoKey IKE, you can create the following VPNs with VPN Manager:

- Dynamic, route-based VPNs—Provide resilient, always-on access across your network. Add firewall rules on top of a route-based VPNs to control traffic flow.
- Policy-based VPNs—Connect devices, remote access service (RAS) users, and control traffic flow (can also create with L2TP).
- Mixed-mode VPNs—Connect route-based VPNs with policy-based VPNs, giving you flexibility.

Integrated Logging and Reporting

You use the security devices on your network for multiple reasons: to control access to and from your network, to detect and prevent unwanted intruders, and to record security events so you can monitor the important activities occurring on your network. You can use NSM to monitor, log, and report on network activity in real-time to help you understand what is happening on your network:

- View traffic log entries generated by network traffic events, configuration log entries generated by administrative changes, or create custom views to see specific information in the Log Viewer.
- Create detailed reports from traffic log information in the Report Manager.
- Inspect suspicious events by correlating log information in the Log Investigator.

Monitoring Status

NSM keeps you up-to-date on the health of your network.

- View critical information about your devices and IDP sensors in the Device Monitor:
  - Configuration and connection status of your security devices
  - Individual device details, such as memory usage and active sessions
Device statistics

- View the status of each individual VPN tunnel in the VPN Monitor.
- View NSRP status in the NSRP Monitor.
- View the status of your IDP Clusters in the IDP Cluster Monitor.
- View the health of the NSM system itself, including CPU utilization, memory usage, and swap status in the Server Monitor.

Job Management

You can view the progress of communication to and from your devices in the Job Manager. NSM sends commands to managed devices at your request, typically to import, update or reboot devices, and view configuration and delta configuration summaries. When you send a command to a device or group of devices, NSM creates a job for that command and displays information about that job in the Job Manager module.

Job Manager tracks the progress of the command as it travels to the device and back to the management system. Each job contains:

- Name of the command
- Date and time the command was sent
- Completion status for each device that received the command
- Detailed description of command progress
- Command output, such as a configuration list or CLI changes on the device

**NOTE:** Job Manager configuration summaries and job information details do not display passwords in the list of CLI commands for administrators that do not have the assigned activity “View Device Passwords”. By default, only the super administrator has this assigned activity.

Working in the User Interface

The NSM User Interface (UI) is used to control the NSM system. Using the UI, you can configure NSM administrators, add devices, edit policies, view reports—access the full functionality of the NSM system.

**NOTE:** For step-by-step instructions on using the User Interface, click the icon in the menu bar of the UI to access the NSM Online Help.
Configuring UI Preferences

You can configure preferences for UI behavior, such as appearance, external tool use, polling statistics, and UI timeout. For details on configuring these settings, see the topics under “NSM User Interface” in the Network and Security Manager Online Help.

UI Overview

The NSM User Interface (UI) appears after you log in, and displays a set of menus and toolbar icons at the top of the UI window. Depending on the component displayed, right-click menus are available to perform various tasks. The UI is shown below:

Navigation Tree

The navigation tree displays the 11 NSM modules in the left pane of the NSM window. Double-click a module to display its contents in a hierarchical tree format. For details about each module, see “Network and Security Manager Modules” on this page.

Main Display Area

The main display area displays content for the selected module or module contents.

- Menu Bar—The menu bar contains clickable commands. You can access many menu bar commands using keyboard shortcuts such as add, edit, delete. For a complete list of keyboards shortcuts, see the Network and Security Manager Online Help.
- ToolBar—The toolbar contains buttons for common tasks. The buttons displayed in the toolbar are determined by the selected module.
- Status Bar—The status bar displays additional information for a selected module.

NSM Modules

The navigation tree contains 11 top-level modules that contain specific NSM functionality, as detailed in the following sections.

Log Viewer

The Log Viewer displays log entries that your security devices generate based on criteria that you defined in your Security Policies, on the GUI Server, and in the device configuration. Log entries appear in table format; each row contains a single log entry, and each column defines specific information for a log entry.

You can customize the view (which log entries and what log information is shown) using log filters or by changing the column settings.

Use the Log Viewer to:
■ View summarized information about security events and alarms
■ View information about a specific log entry
■ Show, hide, or move columns to customize the Log Viewer
■ Filter log entries by column headings
■ Create and save custom views that display your filters/column settings
■ Set flags on Log Viewer entries to indicate a specific priority or action

For more details on using the Log Viewer, see the Network and Security Manager Administration Guide.

Report Manager

The Report Manager contains summary, graphs, and charts that detail specific security events that occur on your network. NSM generates reports to visually represent the information contained in your log entries. You can use reports to quickly summarize security threats to your network, analyze traffic behavior, and determine the efficiency of NSM. To share reports or to use report information in other application, you can print or export report data.

Log Investigator

The Log Investigator contains tools for analyzing your log entries in depth. Use the Log Investigator to:
■ Manipulate and change constraints on log information
■ Correlate log entries visually and rapidly
■ Filter log entries while maintaining the broader picture

Device Manager

The Device Manager contains the device objects that represent your security devices. You can create:
■ Security devices and systems—The devices you use to enable access to your network and to protect your network against malicious traffic.
■ Vsys devices—A vsys is a virtual device that exists within a physical security device.
■ Clusters—A cluster is two security devices joined together in a high availability configuration to ensure continued network uptime.
■ Vsys cluster—A Vsys cluster device is vsys device that has a cluster as its root device.
■ Extranet devices—Firewalls or VPN devices that are not Juniper Networks security devices.
Templates—A template is a partial device configuration that you can define a single time then use for multiple devices.

Device Groups—A device group is a user-defined collection of devices.

Security Policies

Security Policies contains the firewall, multicast, and VPN rules that control traffic on your network. Using a graphical, easy-to-use rule building platform, you can quickly create and deploy new policies to your security devices.

Use Security Policies to:

- Add or modify existing Security Policies
- Add or modify existing VPN rules
- Add or modify existing IDP rules
- Create new policies based on existing policies
- Install policies on one or multiple security devices
- Delete policies

If the device configurations that you imported from your security devices contained policies, Security Policies displays those imported policies. For details on editing those imported policies or creating new policies, see Chapter 9, “Configuring Security Policies” or Chapter 10, “Configuring VPNs” of the Network and Security Manager Administration Guide.

VPN Manager

The VPN Manager contains the VPN abstractions that control the VPN tunnels between your managed devices and remote users. Using VPN objects, such as Protected Resources and IKE Proposals, you can create multiple VPNs for use in your Security Policies.

Use the VPN Manager to:

- Define the protected resources on your network. Protected Resources represent the network resources you want to protect in a VPN.
- Create custom IKE Phase 1 and 2 Proposals.
- Configure AutoKey IKE, L2TP, and L2TP-over-AutoKey IKE VPNs in policy-based or route-based modes. You can also create an AutoKey IKE mixed mode VPN to connect policy-based VPN members with route-based VPN members.
- Configure AutoKey IKE and L2TP policy-based VPNs for remote access services (RAS) and include multiple users.

Object Manager

The Object Manager contains object, which are re-usable, basic NSM building blocks that contains specific information. You use objects to create device configurations,
policies, and VPNs. All objects are shared, meaning they can be shared by all devices
and policies in the domain.

You can create the following objects in NSM:

- **Address Objects**—Represent components of your network (hosts, networks,
servers).
- **Schedule Objects**—Represent specific dates and times. You can use schedule
objects in firewall rules to specify a time or time period that the rule is in effect.
- **DI Profiles**—Define the attack signature patterns, protocol anomalies, and the
action you want a security device to take against matching traffic.
- **IDP Attack Objects**—Attack patterns that detect known and unknown attacks.
You use IDP attack objects within IDP rules.
- **AV Objects**—Represent the AV servers, software, and profiles available to devices
managed by NSM.
- **ICAP Objects**—Represents the Internet Content Adaptation Protocol (ICAP) servers
and server groups used in ICAP AV objects.
- **Web Filtering Objects (Web Profiles)**—Define the URLs, the Web categories, and
the action you want a security device to take against matching traffic.
- **Service Objects**—Represent services running on your network, such as FTP,
HTTP, and Telnet. NSM contains a database of Service Objects for well-known
services; you can also create new Service Objects to represent the custom services
you are running on your network.
- **User Objects**—Represent the remote users that access the network protected by
the security device. To provide remote users with access, create a user object
for each user, then create a VPN that includes those user objects.
- **IP Pools**—Represent a range of IP addresses. You use IP pools when you configure
a DHCP Server for your managed devices.
- **Authentication Servers**—Represent external authentication servers, such as
RADIUS and SecureID servers. You can use an authentication server object to
authenticate NSM administrators (RADIUS only), XAuth users, IKE RAS users,
and L2TP users.
- **Group Expressions**—Are OR, AND, and NOT statements that set conditions for
authentication requirements.
- **Remote Settings**—Represent DNS and WINS servers. You use remote settings
object when configuring XAuth or L2TP authentication in a VPN.
- **NAT Objects**—Represent MIPs, VIPs, and DIPs.
- **GTP Objects**—Represent GTP client connections.
- **CA Objects**—Represent the certificate authority’s certificate.
- **CRL Objects**—Represent the certificate authority’s certificate revocation list.

You can use the Object Manager to:

- View and/or edit the Object properties
- Create, edit, or delete Objects
Create custom groups of Objects

For more details on objects, see Chapter 8, “Configuring Objects,” of the *Network and Security Manager Administration Guide*.

**Server Manager**

Server Manager contains server objects that represent your management system components. Use Server Manager to manage and monitor the individual server processes that comprise your NSM system.

**Realtime Monitor**

Realtime Monitor provides a graphical view of the current status of all devices managed by NSM:

- Device Monitor—Tracks the connection state and configuration state of your security devices and IDP sensors. You can also view device details to see CPU utilization and memory usage for each device, or check device statistics.
- VPN Monitor—Tracks the status of all VPN tunnels.
- NSRP Monitor—Tracks the status of security devices in clusters.
- IDP Cluster Monitor—Tracks the status of IDP clusters.

You can customize Realtime Monitor to display only the information you want to see, as well as update information at specified time periods. You can also set alarm criteria for a device or process. For more details on Realtime Monitor, see “Realtime Monitoring” in the *Network and Security Manager Administration Guide*.

**Security Monitor**

Security Monitor provides access to the Dashboard, Profiler and Security Explorer. These tools enable you to track, correlate and visualize aspects about your internal network, enabling you to create more effective Security Policies and minimize unnecessary log records. For more details, refer to “Analyzing Your Network” in the *Network and Security Manager Administration Guide*.

**Job Manager**

Job Manager contains the status of commands (also called directives) that NSM sends to your managed devices. You can view summaries or details for active jobs and completed jobs. For more details on Job Manager, refer to “Tracking Device Updates” in the *Network and Security Manager Administration Guide*.

**Audit Log Viewer**

The Audit Log Viewer contains a log entry for every change made by a NSM administrator. For more details on Audit Log Viewer, see “Using the Audit Log Viewer” in the *Network and Security Manager Administration Guide*. 
Action Manager

The Action Manager enables you to forward logs on a per domain basis. For more details on using the Action Manager, refer to “Using the Action Manager to Forward Logs by Domain” in the Network and Security Manager Administration Guide.

Validation Icons in the User Interface

NSM uses automatic validation to help you identify the integrity of a configuration or specific parameter with at a glance. Table 5 on page 16 lists the validation signs that may appear as you work in the UI:

Table 5: Validation Status for Devices

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>Indicates that a configuration or parameter is not configured correctly in the NSM UI. Updating a device with this modeled configuration causes problems on the device.</td>
</tr>
<tr>
<td>Warning</td>
<td>Indicates that a configuration or parameter is not configured correctly in the NSM UI. Updating a device with this modeled configuration might cause problems on the device.</td>
</tr>
<tr>
<td>Needs Validation</td>
<td>Indicates that a configuration or parameter has not been validated. Although NSM automatically validates all parameters when entered, this icon might appear for a template-driven value after you have changed a template. We highly recommend that you validate all parameters before updating a device.</td>
</tr>
<tr>
<td>Valid</td>
<td>Indicates that a configuration or parameter is configured correctly in the NSM UI.</td>
</tr>
</tbody>
</table>

Validation and Data Origination Icons

Data origin tooltips show the user where field data originates. These are implemented as additional types of validation messages (beyond the current Error and Warning messages), adding Template Value, Override, and From Object messages. Each has its own icon and text color in the tooltips. Table 6 on page 16 lists the validation and data origination icons.

Table 6: Validation Icons

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>Indicates that a configuration or parameter is not configured correctly in the NSM UI. Updating a device with this modeled configuration causes problems on the device.</td>
</tr>
<tr>
<td>Warning</td>
<td>Indicates that a configuration or parameter is not configured correctly in the NSM UI. Updating a device with this modeled configuration might cause problems on the device.</td>
</tr>
<tr>
<td>Override</td>
<td>Indicates that the displayed value was set manually and that the value overrides whatever value might come from a template. The icon can also indicate an override of a VPN-provided value or a cluster-provide value.</td>
</tr>
</tbody>
</table>
Table 6: Validation Icons (continued)

<table>
<thead>
<tr>
<th>Template Value</th>
<th>Indicates that the displayed value was set manually. Changes to the same field in the template will be applied to the device when it is updated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Object</td>
<td>Indicates that the displayed value came from the device when the device was imported. Changes to a template will not change this value unless “Remove conflicted device values” is selected in the template Operations dialog.</td>
</tr>
</tbody>
</table>

From Object messages only appear when viewing template objects to help find fields set in the template.

When more than one type of icon appears within a panel, the highest priority icon appears next to the icon in the tree and the panel title bar.

Working with Other NSM Administrators

When multiple NSM administrators are accessing the NSM system at the same time, NSM ensures that all edits are synchronized by locking an active object. Only one administrator at a time can edit existing values for an object, but multiple administrators can still view the existing values for that object.

- When an NSM administrator begins editing an object, the UI locks that object to prevent other administrators from editing the object’s value.
- During lockout, NSM makes “lazy” saves of all edits made and stores them in an in-memory database. If NSM crashes during a lazy save, edits made since the last lazy save are lost, and NSM prompts the NSM administrator to rollback to the last lazy save.
- When the completes and saves the edit, that object is unlocked, enabling other administrators to edit it. However, because the UI does not immediately refresh the object values, you must manually refresh the UI to view the most recent versions.

When you attempt to open a locked object, a warning message appears indicating that the object is locked and can be opened only as a read-only object. The warning message also contains the name of the NSM administrator that is currently editing the object. Depending on your administrator privileges, you can locate contact information for the administrator in the Manage Administrators and Domains area of the UI (From the file menu, select Tools > Manage Administrators and Domains). For details on working with administrators and domains, see the Network and Security Manager Administration Guide.

For example, let’s say Bob and Carol are both NSM administrators with the same roles. If both administrators view the same object, but Bob also edits and saves the object, NSM does not notify Carol that a newer version of the object exists. To see the newest version, Carol must first close, then open the object again or refresh the console.
**Searching in the User Interface**

You can use the integrated search feature in NSM to quickly locate a specific setting within a UI screen or dialog box.

To locate a word, begin entering the word and the search window automatically appears in the top left of the selected screen or dialog box. The UI attempts to match your entry to an existing value; as you enter more characters, the UI continues to search for a match. Use the arrow keys to move between each matching value. If your entry appears in red, no matching value was found within the selected screen or dialog box.

To locate a different data type, such as an IP address, change the search mode. To display all available search modes, press the backslash key (\). The search mode window appears.

Press the key that represents the search mode you want to use, then begin entering the search criteria. Switching to another view or pressing the ESC key ends the search operation and closes the tool window. The following sections detail each search mode.

**Contains String [C] Search Mode**

Use to locate a pattern anywhere in a string. For example, to locate the pattern “RPC” in Service Objects:

1. In the main navigation tree, select Object Manager > Service Objects > Predefined Service Objects, then select the Service Object icon at the top of the Service Tree tab.
2. Press the backslash key (\) to display the search mode window.
3. Enter C, then enter RPC. The UI automatically highlights the first match, MS-RPC-ANY.

**Starts With [S] Search Mode**

Use to locate a pattern at the beginning of a string. For example, to locate the pattern “OR” in security devices:

1. In the main navigation tree, select Device Manager > Devices, then select the security devices icon at the top of the Device Tree window.
2. Press the backslash key (\) to display the search mode window.
3. Enter S, then enter OR. The UI automatically highlights the first match, OR_EU_208.

**Regular Expression [R] Search Mode**

Use to locate a value using a regular expression. For example, to locate all attack objects that detect denial-of-service attacks:
1. In the main navigation tree, select Object Manager > Attack Objects, then select the Predefined Attacks tab.
2. Select the first entry in the column Name, then press the backslash key (\) to display the search mode window.
3. Enter R, then enter the following characters: DoS|enial.

The UI automatically highlights the first match; click the down arrow key to highlight the next match.

**NOTE:** The regular expression search mode supports all common regular expressions. For more information about regular expressions, refer to a dedicated resource, such as Mastering Regular Expressions, 2nd Edition, by Jeffrey E. F. Friedl.

### IP [I] Search Mode

Use to locate an IP address. For example, to locate the IP address 5.5.5.50 and 5.5.5.51 in Address Objects:

1. In the main navigation tree, select Object Manager > Address Objects, then select the Address Table tab.
2. Select the first entry in the column IP/Domain Name, then press the backslash key (\) to display the search mode window.
3. Enter I, then enter 5.5.5.*. The UI automatically highlights the first match, 5.5.5.50. Click the down arrow key to highlight the next match, 5.5.5.51.

When searching in a table, your search criteria is applied only to the selected column. If you select a different column, such as Name, and perform the same search, your results differ.
Chapter 2

Device Configuration Overview

Security devices are the Juniper Networks security components that you use to enable access to your network components and to protect your network against malicious traffic. When you use Network and Security Manager (NSM) to manage your security devices, you are creating a virtual network that represents your physical network. Using this virtual network, you can create, control, and maintain the security of your physical network at a system-level.

This chapter provides a brief overview on how best to create your virtual network and simplify management tasks. For detailed information, see the Network and Security Manager Administration Guide.

This chapter contains the following sections:

- About Device Configuration on page 21
- Using Templates on page 29
- Using Device Groups on page 30
- Configuring Network Overview on page 31

About Device Configuration

Device configuration contains the configuration settings for a managed device, such as interface, routing, and authentication settings. You can edit configurations after you add or import a managed device, or create configurations when you model a device. When you are satisfied with your changes, you can then update the managed device with the modeled device configuration to make your changes effective.

**NOTE:** When you open a device for viewing or editing, the NSM UI loads the entire device configuration into memory to enhance UI performance while configuring the device. When you close a device to which you made changes, the UI unloads some of the device configuration from the client memory. Although this memory optimization occurs quickly, you might see the following message appear: “Optimizing client memory usage for device”.

NSM does not support all device configuration settings. You may need to make some changes to the device directly using a Web UI or CLI. Additionally, some changes can affect the management connection between the NSM Device Server and the managed device.
About Configuring Security Devices

A security device provides perimeter and boundary protection using data encryption, authentication, access control, and some attack detection and prevention. Firewalls and virtual private networks (VPNs) are designed for high speed operation at the network layer.

While firewalls provide protection, there are attacks contained within the allowed traffic that firewalls are not designed to detect.

About Configuring IDP-Capable Devices

Juniper Networks Intrusion Detection and Prevention (IDP) technology can detect and then stop attacks when deployed inline to your network. Unlike IDS, IDP uses multiple methods to detect attacks against your network and prevent attackers from gaining access and doing damage. IDP can drop malicious packets or connections before the attacks can enter your network. IDP is designed to reduce false positives and ensure that only actual malicious traffic is detected and stopped. You can also deploy IDP as a passive sniffer, similar to a traditional IDS, but with greater accuracy and manageability.

NSM is the sole means for configuring and managing IDP on the ISG 2000, ISG 1000, and standalone IDP Sensors running IDP 4.x. Standalone IDP Sensors running IDP 3.x and older are managed using the IDP Management Server and UI.

The ISG 2000 and ISG 1000 security module, an optional component installed in the device, provides IDP functionality. If you purchased a ISG 2000 or ISG 1000 device that does not have IDP capability, you can upgrade the device to be an IDP-capable system by replacing the memory chip in the CPU, installing up to three security modules, and installing the Advanced and IDP license keys for IDP.

About Configuring Extranet Devices

NSM also enables you to configure an existing extranet device (that is, third-party router). You can do this by creating a script to perform the required actions on the extranet device. These scripts are saved by default on the GUI Server at:

Add the extranet device in the Device Manager, then configure the required meta data in a shared object in the Object Manager under “Extranet Policies.” This data may include: credential info (user/password), IP, Interface List, comments, Action Script and other additional data. When you update the device, the specified script is invoked. The device update job displays the XML output.

Configuring Security Device Details

This section provides details about configuring some specific features of ScreenOS, IDP, and Extranet devices.

Configuring ScreenOS Security Device Details

A security device provides perimeter and boundary protection using data encryption, authentication, access control, and some attack detection and prevention. Firewalls
network layer.

While firewalls provide protection, there are attacks contained within the allowed traffic that firewalls are not designed to detect.

**Configuring Advanced Properties of Security Devices**

When a denial of Service (DoS) attack occurs, the CPU recognizes the attack and drops the traffic. A DoS attack can cause high CPU utilization and cause the security device to drop all packets. To prevent high CPU utilization during a DoS attack, the packet dropping feature was moved to the application-specific integrated circuit (ASIC) in ScreenOS 6.0.

Network traffic is categorized as critical and noncritical. Critical traffic includes management traffic such as Telnet and SSH. When a DoS attack occurs, CPU usage increases and when it reaches the throttling threshold, it triggers the dropping of noncritical traffic, which is not blacklisted. To prevent this, you can configure the security device to drop malicious packets within the device that processed them. In this mechanism, you create a blacklist with source and destination network addresses from which malicious traffic reaches the security device.

When a packet reaches the security device, the packets are checked against a list of configured blacklisted entries. If a match occurs, the device drops that packet. If the packet does not match the blacklisted entry, the device passes the packet to the next stage that prioritizes the packet. For each entry in the blacklist, the security device maintains a drop counter to record the number of packets dropped against that entry.

**Configuring a Blacklist**

To configure a blacklisted entry:

1. In the NSM main navigation tree, click **Device Manager > Devices**.
2. Select an ISG 1000, ISG 2000, NetScreen 5200, or NetScreen 5400 device.
3. Click the Edit icon to edit the device. The Device dialog box for the selected device appears.
4. In the navigation tree, click **Advanced > CPU > Blacklist/Throttling Threshold**. Click the Add icon. The New Blacklist Entry dialog box appears.
5. Enter the following information and click OK. See Table 7 on page 23 for an explanation of the fields.

**Table 7: Blacklist Configuration Fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>The ID of the blacklist is generated automatically.</td>
</tr>
<tr>
<td>Source IP</td>
<td>The source IP address from which the DoS attack traffic originated.</td>
</tr>
<tr>
<td>Destination IP</td>
<td>The destination IP address.</td>
</tr>
</tbody>
</table>
### Table 7: Blacklist Configuration Fields (continued)

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Port</td>
<td>The source port in a TCP or UDP session. Set this to 0 to match all ports.</td>
</tr>
<tr>
<td>Destination Port</td>
<td>The destination port in a TCP or UDP session. Set this to 0 to match all ports.</td>
</tr>
<tr>
<td>Protocol</td>
<td>The source port and destination port are valid only when you have set the protocol as UDP or TCP. Set this value to 0 to match any protocol.</td>
</tr>
<tr>
<td>Source IP Net Mask</td>
<td>The range is 0-32. Set this field to 0 to match all source IP addresses.</td>
</tr>
<tr>
<td>Destination IP Mask</td>
<td>The range is 0-32. Set this field to 0 to match all destination IP addresses.</td>
</tr>
</tbody>
</table>

**NOTE:** A blacklist with 0 timeout will not expire.

---

### Configuring ALGs

In ScreenOS 6.0, the following modifications were made to prevent high CPU utilization.

- Some existing application-level gateways (ALGs) are disabled by default on high-end platforms (ISG 1000, ISG 2000, NS2000, and NS5000). The affected ALGs are H.323, SIP, MGCP, SCCP, MSRPC, SunRPC, and SQL.
- New ALGs are included in ScreenOS 6.0 and are enabled by default. They are FTP, DNS, Real, Rlogin, RSH, TALK, TFTP, and XING.

For efficient CPU utilization, you can enable or disable the ALGs.

To enable or disable the ALGs:

1. In the NSM main navigation tree, click **Device Manager > Devices**.
2. Select a device or a model device.
3. Click the Edit icon to edit the device. The relevant device dialog box appears.
4. In the navigation tree, click **Advanced > ALGs**.
5. ALGs are listed depending on the type of device you selected and the OS version. ALGs can be enabled or disabled by checking or clearing their check boxes. See Table 8 on page 25.
### Table 8: ALGs Default Status

<table>
<thead>
<tr>
<th>ALGs</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.323, SIP, MGCP, SCCP, MSRPC, SunRPC, and SQL</td>
<td>Disabled by default on ISG 1000, ISG 2000, NetScreen 2000, and NetScreen 5000 running ScreenOS 6.0.</td>
</tr>
<tr>
<td>FTP, DNS, Real, Rlogin, RSH, TALK, TFTP, and XING</td>
<td>Enabled by default on a device running ScreenOS 6.0 or later.</td>
</tr>
</tbody>
</table>

### About Configuring Devices Running ScreenOS 5.4 FIPS

The following features are disabled on security devices running the Federal Information Processing Standards (FIPS) certified release of ScreenOS (ScreenOS 5.4FIPS):

- SNMP management
- MD5 algorithm use
- Group 5 Phase 2 IKE proposals

For more information about FIPS-enabled security devices, refer to the ScreenOS 5.0FIPS Reference Note.

---

**NOTE:** To configure and manage security devices running ScreenOS 5.0FIPS using NSM, you must first configure a VPN tunnel between the device and the NSM GUI Server. After establishing this tunnel, you cannot reconfigure tunnel parameters in NSM.

---

### About Configuring Devices Running Future Releases of ScreenOS

You can use NSM to configure security devices running future releases of ScreenOS in one of three levels of support:

- **Forward Support (Basic)**—When a new version of ScreenOS is available, you can download a schema patch that includes changes to the DCF and schema files, as well as the firmware tables, enabling you to manage devices using a previously known version of ScreenOS.

- **Forward Support (Blended)**—When a new version of ScreenOS is available, you can download a schema patch, enabling you to manage devices using the new ScreenOS version. You cannot, however, manage the new features in ScreenOS with this level of support.

- **Full Support**—When a new version of ScreenOS is available, you can download a schema patch, enabling you to manage devices using the new ScreenOS version. In addition, you can manage all the new features in that version of ScreenOS.
The support level is indicated in the Information screen for the device in the Device Manager.

**Configuring IDP-Capable Device Details**

Juniper Networks Intrusion Detection and Prevention (IDP) technology can detect and stop attacks when deployed inline to your network. Unlike IDS, IDP uses multiple methods to detect attacks against your network and prevent attackers from gaining access and doing damage. IDP can drop malicious packets or connections before the attacks can enter your network. IDP is designed to reduce false positives and ensure that only actual malicious traffic is detected and stopped. You can also deploy IDP as a passive sniffer, similar to a traditional IDS, but with greater accuracy and manageability.

NSM is the sole means for configuring and managing IDP on the ISG 2000, ISG 1000, and standalone IDP Sensors running IDP 4.x. Standalone IDP Sensors running IDP 3.x and older are managed using the IDP Management Server and UI.

The ISG 2000 or ISG 1000 security module—an optional component installed in the device—provides IDP functionality. If you purchased an ISG 2000 or ISG 1000 device that does not have IDP capability, you can upgrade the device to be an IDP-capable system by replacing the memory chip in the CPU, installing up to three security modules, and installing the Advanced and IDP license keys for IDP.

**Configuring IDP Sensor Global Settings**

Use Global Settings to specify syslog and SNMP servers.

In device templates, find these settings under IDP Device Settings. In an individual device, find these settings under Global Settings.

**Syslog Server**

To have all IDP logs sent to a Syslog server, enable the check box and specify the syslog server’s IP address. Then load the new configuration onto the Sensor.

**SNMP Server for Health Monitoring Alerts**

The IDP Sensor creates and sends a log entry whenever one of the following statistics reaches 90%. It also sends a log when the value drops below 90 percent. Logs are sent no more than once a minute. The log entry specifies the value of the setting at the time the log is sent.

- **CPU Usage**—Log entry generated when CPU usage reaches 90 percent.
- **Hard Disk Usage**—Log entry generated when disk space reaches 90 percent.
- **Memory Usage**—Log entry generated when memory usage reaches 90 percent.
- **Session Count**—Log entry generated when session count reaches 90 percent of the total possible session count. (Maximum total session count for each device is specified on that device’s product sheet.)
These logs are generated and sent to NSM automatically. However, you can also tell the Sensor to send the entries to your SNMP server. To do so, enable SNMP and specify the server’s community and IP address, then load the new configuration onto the Sensor.

**Configuring Extranet Device Details**

NSM also enables you to configure an existing extranet device (a third-party router). You can do this by creating a script to perform the required actions on the extranet device. These scripts are saved by default on the GUI Server at:

```
GuiSvr/var/scripts
```

Add the extranet device in the Device Manager, and then configure the required metadata in a shared object in the Object Manager under Extranet Policies. This data might include: credential info (user/password), IP, Interface List, comments, Action Script and other additional data. When you update the device, the specified script is invoked. The device update job displays the XML output.

**Example: Configuring an Extranet Device**

This example shows how to update an existing rule on a third-party router to deny certain HTTP traffic with integer fields matching 1-10.

This process involves first creating a script that updates the policy on the router. For example, the script can contain certain validation instructions for the policy. It can also include instructions on sending alerts or messages in the event that the policy update succeeds or fails. When you are done creating the script, save it in the appropriate directory.

Next, use the Object Manager to create a custom policy field object that contains the specific integer fields that you are referencing in the extranet policy (for example, integer fields matching 1-10).

To create a custom policy field:

1. In the Object Manager, select **Custom Policy Fields**.
2. In the Field Definition tab, click **New**. The New Custom Policy Fields Meta Data window appears.
3. Configure the Custom Policy Field:
   - Enter a name for the field, for example, call it **ID**.
   - Click the **Required** check box.
   - Select **Integer** from the Type list.
   - Enter any appropriate comments.
   - Click **OK**. A folder for the ID custom policy field object appears.
In the Objects tab, click on the ID folder. Click New. The New Custom Policy Fields Data window appears.

Enter a value in the Data Value field, for example, enter 1. Click OK. The new value appears in the ID folder.

Repeat this step for all ten integer values.

In the Object Manager, create the Extranet Policy object with the appropriate rules.

To create an Extranet Policy object:
1. In the Object Manager, select Extranet Policies. The New ExtranetPolicyObject window appears.
2. Enter the name of the Extranet Policy, for example, Extranet Policy1. Add a comment in the Comments field.
3. Configure the Extranet Policy object:
   - Click New. The New - Rule window appears.
   - Use the up or down arrow to specify an ID for the rule.
   - Add a comment for the rule.
   - Click Deny in the Action field.
   - Select a Source Address in the Source tab.
   - Select a Destination Address in the Destination tab.
   - Select services in the Service tab.
   - Select the integer IDs that you created in the Custom Policy Field object in the Options tab.
4. Click OK.

Create the router as an extranet device in the Device Manager. You will need to configure the IP address of the device, any interfaces, and then bind the extranet policy to the appropriate interface.

To create an Extranet Device:
1. In the Device Manager, select Devices.
2. Click New, and select Extranet Device. The New Extranet Device window appears.
3. Configure the Extranet Device:
Enter a name for the device, for example, Cisco Router1.

Select a color to represent the device.

Enter the IP address for the device.

Click Show in the Supplemental Data field. Additional fields appear, allowing you to configure supplemental information for the device, including the netmask, interfaces, and device root administrator.

Click the Add icon in the Interfaces field. The New Extranet Device Interface window appears.

Configure the interface. Enter a name for the interface, IP address, and interface mask, and assign an extranet policy to it, for example, the Extranet Policy1 object you configured previously. Click OK.

Configure the device root administrator. Enter the administrator user name, and password, and specify the script you created previously in the Action field. Click OK.

When you update the device, NSM invokes the script you created. Any XML output appears in the Job Information window.

**About Configuring Devices Running ScreenOS 5.0 FIPS**

The following features are disabled on security devices running the Federal Information Processing Standards (FIPS) certified release of ScreenOS (ScreenOS 5.0FIPS):

- SNMP management
- MD5 algorithm use
- Group 5 Phase 2 IKE proposals

For more information about FIPS-enabled security devices, refer to the ScreenOS 5.0FIPS Reference Note.

---

**NOTE:** To configure and manage security devices running ScreenOS 5.0FIPS using NSM, you must first configure a VPN tunnel between the device and the NSM GUI Server. After establishing this tunnel, you can not reconfigure tunnel parameters in Network and Security Manager.

---

**Using Templates**

Use templates to define a common device configuration and then reuse that configuration information across multiple devices. In a template, you can define only those configuration parameters that you want to set; you do not need to specify a complete device configuration. Templates provide two benefits:

- You can configure parameter values for a device by referring to one or more templates when configuring the device.
When you change a parameter value in a template and save the template, the value also changes for all device configurations that refer to that template.

When you apply a template to a device, NSM applies the template settings to the device. For example, you can create a template that specifies the IP address of the NTP server to which all managed security devices synchronize their clocks. You can apply this template to the configuration of each device in your domain so that all devices use the same NTP server. You can apply the same template to different types of security devices, from NetScreen-5XT appliances to NetScreen-5200 systems.

A template contains all possible fields for all possible devices. Not all devices have all fields. You can apply a template to any device. NSM will ignore any fields that do not apply to the given device.

A template can refer to other templates, enabling you to combine multiple templates into a single template. When you make changes to any of the referenced templates, those changes are propagated through the combined template.

**NOTE:** For more information on using templates, template limitations, and exporting and importing device templates, see *Network and Security Manager Administration Guide*. For instructions on creating and applying templates, see the *Network and Security Manager Online Help* topics “Adding Device Templates” and “Applying Templates”

### Global Device Templates

In NSM, you can make global-domain templates available for reference in subdomains. However, if an administrator disables the Allow use of global templates in subdomains flag in the preferences, the administrator must also identify and remove all uses of the global templates in the subdomains. You can do this by removing the template from subdomain devices with the template operations directive in each relevant subdomain.

### Using Device Groups

Use device groups to organize your managed devices, making it easier for you to configure and manage devices within a domain. You can group devices by type (such as all the NetScreen-5GTs in a domain), by physical location (such as all the security devices in the San Jose office), or logically, (such as all the security devices in sales offices throughout western Europe.)

Groups enable you to execute certain NSM operations on multiple security devices at the same time. For example, if you have a group of the same type of devices running similar ScreenOS versions, you can upload the firmware on all devices in the group at the same time. You can also add devices to the NSM UI, place the devices in a group, and then import the device configurations for all devices in the group at one time.

The devices that you add to a group must exist; that is, you must have previously added or modeled the devices in the domain. You can group devices before...
configuring them. You can add a device to more than one group. You can also add a group to another group.

**NOTE:** You cannot apply a template to a group. You must apply templates to individual devices in a group. If you need to apply the same set of templates to multiple devices, you can create a single template that includes all the templates that are to be applied to a device, and then apply the combined template to each device. For examples on creating a device group or configuring device information, see *Network and Security Manager Administration Guide*. 

---

**Configuring Network Overview**

The Network screens contain the options that enable the device to connect to and operate in the network. In the Device navigation tree, open the Network heading in the navigation tree to see the network settings options.

The following sections detail configuring the following network settings:

- **“Vsys DHCP Enhancement”** on page 317. This option is available only for NetScreen-5GT Wireless security devices running ScreenOS 5.0.0-WLAN; this device can act as a wireless access point (WAP). The wireless settings specify how the WAP connects multiple wireless networks or a wireless network to a wired network.

- **“Configuring the Network Module”** on page 310 (Slot and Chassis). This option is only available for security device systems, such as the NetScreen-5000 series, ISG 1000/2000, and SSG 520 /550, that contain a motherboard or physical slots in which you can install optional modules. You can view or edit the type of network module installed in each available slot in the physical device.

- **“Configuring Virtual Routers”** on page 237. A virtual router (VR) supports static routes, dynamic routing protocols, and multicast protocols. The virtual router configuration includes the configuration for dynamic routing protocols and multicast protocols.

- **“Configuring Zones”** on page 34. A security zone is a specific network segment for which you can control inbound and outbound traffic. You can configure predefined zones or create user-defined security zones. You can also create a tunnel zone, which is a logical segment to which a VPN tunnel interface is bound.

- **“Configuring Interfaces”** on page 44. You bind interfaces to predefined or user-defined security zones or to tunnel zones to permit traffic to pass into or out of the zone. For an interface in Route or NAT mode, you assign an IP address to the interface.

- **“Configuring DIP Groups”** on page 83. You can configure a range of IP addresses from which security device can take addresses when performing network address translation (NAT) on the source IP address of outgoing or incoming IP packets.

- **“Configuring PPPoE”** on page 86. This option is only available for some security devices. You can configure PPPoE to enable the security device to connect to remote sites.
“Configuring PPP” on page 86. This option is only available for some security devices. You can configure PPP to enable the security device to connect to remote sites.

“Configuring PPPoA” on page 92. On the ADSL interface (available on the NetScreen-5GTADSL security device), you can configure a PPPoA client instance with a user name, password, and other parameters, then bind the instance to the ADSL interface (or subinterface) to enable Internet access for an internal network.

“Configuring NACN” on page 92. This option is only available for security devices running ScreenOS 5.x. You configure NetScreen Address Change Notification to enable the security device to alert NSM of any change in the IP address assigned by a DHCP or PPPoE server.

“Configuring Interface Failover” on page 92. This option is only available for some security devices. When there are both primary and backup interfaces to the Untrust zone, you can configure traffic failover traffic from the primary to the backup interface, and from the backup to the primary interface.

“Configuring Modem Connection” on page 93. This option is only available for some security devices. You can connect and configure an external modem to the RS-232 serial port as a backup dialup interface for traffic to the Untrust zone.

“Configuring DNS” on page 95. Before the security device can use DNS for domain name and address resolution, you must configure the addresses for the primary and secondary DNS servers.

“Configuring Advanced Network Settings” on page 99. This option contains additional network settings you can configure.
Chapter 3
Fundamentals

The Device Manager module in Juniper Network and Security Manager (NSM) enables you to configure the managed Juniper Networks security devices in your network. You can edit configurations after you add or import a managed device, or create configurations when you model a device. For details about adding, importing, or modeling a device, see the Network and Security Manager Administration Guide.

This chapter details the device configuration parameters, and provides configuration examples when possible. For instructions on configuring specific device settings, see the Network and Security Manager Online Help.

After you edit or create a configuration for a device, you must update the configuration on the managed device for your changes to take effect. For details on updating devices, see the Network and Security Manager Administration Guide.

Use Security Policies to configure firewall and VPN rules that control traffic on your network. Use the VPN Manager to configure VPNs.

- Configuring Zones on page 34
- Configuring Interfaces on page 44
- Configuring DIP Groups on page 83
- Configuring PPP on page 86
- Configuring PPPoE on page 86
- Configuring PPPoA on page 92
- Configuring NACN on page 92
- Configuring Interface Failover on page 92
- Configuring Modem Connection on page 93
- Setting ISP Priority for Failover on page 94
- Configuring DNS on page 95
- Configuring Advanced Network Settings on page 99
- Configuring Advanced Device Settings on page 100
- Forced Session Timeout for Authentication on page 117
- Log Reason for Session Close on page 118
- Policy Schedule on page 118
Configuring Zones

The Zone screen is where you can configure predefined zones or create user-defined security zones. You can also create a tunnel zone, a logical segment to which a VPN tunnel interface is bound.

A security device supports two types of zones:

■ Security zone—A Layer 3 security zone binds to NAT or Route mode interfaces; a Layer 2 security zone binds to Transparent mode interfaces.

NOTE: When you add a device and configure it to operate in Transparent mode, the L2 zone names appear in the NSM UI without the “V1-” prefix. When you update the configuration on the device from the UI, the correct L2 zone names are configured.

■ Tunnel zone—A zone that binds to a carrier zone.

To add a zone to a security device, in the device navigation tree, select Network > Zones and add the desired zone. For Security Zones, you might define the name of the zone and the virtual router in which you want to place the zone; For tunnel zones, you must also specify the carrier zone, which is the security zone with which the tunnel zone is logically associated. A carrier zone provides firewall protection to the encapsulated traffic.

For more information about zones on security devices, refer to the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

You can configure general properties and SCREEN attack protection for predefined or custom Security Zones.

Zone General Properties

For predefined zones, some general properties are already configured for you, such as the Name and Virtual Router settings. For custom security zones, you can enter a name and select the virtual router that handles traffic to and from the new zone.

For both predefined and custom zones, you can configure the following settings:

■ TCP/IP Reassembly for ALG—Select this option when using application layer gateway (ALG) filtering on the security device. By reassembling fragmented IP packets and TCP segments, the security device can accurately filter traffic.

■ Block Intrazone Traffic—Select this option to block traffic between hosts within the security zone.

■ TCP-RST—Select this option to return a TCP segment with the RESET flag set to 1 when a TCP segment with a flag other than SYN is received.

■ Asymmetric VPN—In asymmetrical encryption, one key in a pair is used to encrypt and the other to decrypt VPN traffic. When configuring multiple VPN tunnels to enable tunnel failover, enable this option for the Trust zones on each security device in the VPN so that if an existing session established on one VPN
tunnel transfers to another, the security device at the other end of the tunnel does not reject it.

**SCREEN Attack Protection**

Typically, a network forwarding device such as a router or switch does not reassemble fragmented packets that it receives. It is the responsibility of the destination host to reconstruct the fragmented packets when they all arrive. Because the purpose of forwarding devices is the efficient delivery of traffic, queuing fragmented packets, reassembling them, then refragmenting them, and forwarding them is unnecessary and inefficient. However, passing fragmented packets through a firewall is insecure. An attacker can intentionally break up packets to conceal traffic strings that the firewall otherwise would detect and block.

You can enable predefined screen options that detect and block various kinds of traffic that the security device determines to be potentially harmful. To secure all connection attempts, security devices use a dynamic packet filtering method known as stateful inspection. Using this method, the device notes various components in a packet header, such as source and destination IP addresses, source and destination port numbers, and packet sequence numbers. The device uses this information to maintain the state of each session traversing the firewall.

A security device uses stateful inspection to secure a zone by inspecting, and then permitting or denying, all connection attempts that require crossing an interface from and to that zone. To protect against attacks from other zones, you can enable defense mechanisms known as screen attack protections, which detect and deflect TCP, UDP, IP, and ICMP packet attacks. Common Screen attacks are SYN floods, packet fragments, and SYN and FIN bits set. When Screen attack protections are enabled, the device generates a screen alarm log entry for each violation.

To configure Screen attack protections, open a device configuration and select Network > Zones to display the Zone configuration. Double-click a zone to display the Predefined Zone dialog box and select SCREEN.

**NOTE:** For instructions for configuring the SCREEN options, see the Network and Security Manager Online Help topic “Configuring SCREEN Options”. For information about the SCREEN alarm log entries that enabling these options can generate, see the Network and Security Manager Administration Guide.

**Defending Against Floods**

Configure flood defense settings to prevent denial-of-service (DoS) attacks from overwhelming the security device with large numbers or floods of certain packet types. You can protect targets in the security zone from ICMP, SYN, and UDP floods.

**Configuring ICMP Flooding Protection**

An ICMP flood occurs when incoming ICMP echo requests overload a target system with so many requests that the system expends all its resources responding until it can no longer process valid network traffic. You can protect targets in the security
zone from ICMP floods by setting a packet-per-second threshold for ICMP requests (default setting: 1000 packets per second). When the ICMP packet flow exceeds the defined threshold, the security device ignores further ICMP echo requests for the remainder of that second and the next second.

**Configuring SYN Flooding Protection**

A SYN flood occurs when a target becomes so overwhelmed by SYN segments initiating invalid connection requests that it can no longer process legitimate connection requests. You can configure thresholds for the zone that, when exceeded, prompt the security device to begin acknowledging incoming SYN segments and queuing incomplete connection requests. Incomplete connection requests remain in the queue until the connection completes or the request times out.

To protect targets in the security zone from SYN floods, enable SYN Flood Protection and configure the following thresholds for SYN segments passing through the zone:

- **Threshold**—Configure the number of SYN packets (TCP segments with the SYN flag set) per second required for the security device to begin SYN proxy. This threshold is the total number of packets passing through the zone, from all sources to all destinations.

- **Alarm Threshold**—Configure the number of proxied TCP connection requests required to generate an alarm in an alarm log entry for the event.

- **Source Threshold**—Configure the number of SYN packets per second from a single IP address required for the security device to begin rejecting new connection requests from that source.

- **Destination Threshold**—Configure the number of SYN packets per second to a single IP address required for the security device to begin rejecting new connection requests to that destination.

- **Timeout Value**—Configure the number of seconds the security device holds an incomplete TCP connection attempt in the proxied connection queue.

- **Queue Size**—Configure the number of proxied TCP connection requests held in the proxied connection queue before the security device begins rejecting new connection requests.

**Configuring UDP Flooding Protection**

Security devices currently support UDP for incoming SIP calls. To protect targets in the security zone against UDP flooding by incoming SIP traffic, enable UDP Flooding Protection. The security device can limit the number of UDP packets that can be received by an IP address, preventing incoming SIP calls from overwhelming a target.

---

**NOTE:** UDP Flood Protection appears only for devices running ScreenOS 5.1 and higher.

SIP signaling traffic consists of request and response messages between client and server and uses transport protocols such as UDP or TCP. The media stream carries
the data (for example, audio data), and uses application layer protocols such as RTP (Real-time Transport Protocol) over UDP.

In this example, enable UDP Flooding Protection and set a threshold of 80000 per second for the number of UDP packets that can be received on IP address 1.1.1.5, in the Untrust zone. When this limit is reached, the device generates an alarm and drops subsequent packets for the remainder of that second.

1. Add a NetScreen-208 security device. Choose Model when adding the device and configure the device as running ScreenOS 5.1 or higher.

2. In the device navigation tree, select Network > Zone. Double-click the Untrust zone. The General Properties screen appears.

3. In the zone navigation tree, select Screen > Flood Defense, then click the UDP Flood Defense tab.

4. Select UDP Flood Protection and ensure that the Threshold is set to 1000.

5. Click the Add icon to display the New Destination IP based UDP Flood Protection dialog box. Configure the following, then click OK:
   - For Destination IP, enter 1.1.1.5.
   - For Threshold, enter 80000.
   - Click OK to save your changes to the zone, then click OK again to save your changes to the device.

### Blocking HTTP Components

Attackers might use HTTP to send ActiveX controls, Java applets, .zip files, or .exe files to a target system, enabling them to load and control applications on hosts in a protected network. You can configure the security device to block the following components (the device monitors incoming HTTP headers for blocked content types):

- **Java**—Java applets enable Web pages to interact with other programs. The applet runs by downloading itself to the Java Virtual Machine (VM) on a target system. Because attackers can program Java applets to operate outside the VM, you might want to block them from passing through the security device.

- **ActiveX**—Microsoft’s ActiveX enables different programs to interact with each other and might contain Java applets, .exe file, or .zip files. Web designers use ActiveX to create dynamic and interactive Web pages that function similarly across different operating systems and platforms. However, attackers might use ActiveX to gain control over a target computer system. When blocking ActiveX components, the security device also blocks Java applets, .exe files, and .zip files whether they are contained within an ActiveX control or not.

- **ZIP files**—Files with .zip extensions contain one or more compressed files, some of which might be .exe files or other potentially malicious files. You can configure the security device to block all .zip files from passing through the zone.

- **EXE files**—Files with .exe extensions might contain malicious code. You can configure the security device to block all .exe files from passing through the zone.
Configuring MS-Windows Defense

Microsoft Windows contains the WinNuke vulnerability, which can be exploited using a DoS attack targeting any computer on the Internet running Microsoft Windows. Attackers can send a TCP segment (usually to NetBIOS port 139 with the urgent (URG) flag set) to a host with an established connection; this packet causes a NetBIOS fragment overlap that can crash Windows systems.

To protect targets in the security zone from WinNuke attacks, configure the security device to scan incoming Microsoft NetBIOS session service (port 139) packets for set URG flags. If such a packet is detected, the security device unsets the URG flag, clears the URG pointer, forwards the modified packet, and generates a log entry for the event.

Defending Against Scans, Spoofs, and Sweeps

Attackers often perform address sweeps and/or port scans to gain targeted information about a network. After they have identified trusted addresses or ports, they might launch an attack against the network by spoofing a trusted IP address. To protect targets in the zone from sweeps, scans, and spoofing attempts, configure the following detection and blocking settings:

- **IP Address Spoof Protection**—Attackers can insert a bogus source address in a packet header to make the packet appear to come from a trusted source. When the interfaces in the zone operate in Route or NAT mode, the security device relies on route table entries to identify IP spoofing attempts. When the interfaces in the zone operate in Transparent mode, the security device relies on address book entries to identify IP spoofing attempts.

  - To enable interface-based IP spoofing protection, configure the security device to drop packets that have source IP addresses that do not appear in the route table.

  - To enable zone-based IP spoofing protection (supported on devices running ScreenOS 5.2), configure the security device to drop packets whose source IP addresses do not appear in the selected zone. If you are routing traffic between two interfaces in the same zone, you should leave this option disabled (unchecked).

- **IP Address Sweep Protection**—An address sweep occurs when one source IP address sends 10 ICMP packets to different hosts within a defined interval. If a host responds with an echo request, attackers have successfully discovered a target IP address. You can configure the security device to monitor ICMP packets from one remote source to multiple addresses. For example, if a remote host sends ICMP traffic to 10 addresses in 0.005 seconds (5000 microseconds), the security device rejects the 11th and all further ICMP packets from that host for the remainder of that second.

- **Port Scan Protection**—A port scan occurs when one source IP address sends IP packets containing TCP SYN segments to 10 different ports at the same destination IP address within a defined interval (5000 microseconds is the default). If a port responds with an available service, attackers have discovered a service to target. You can configure the security device to monitor TCP SYN segments from one remote source to multiple addresses. For example, if a remote host scans 10 ports in 0.005 seconds (5000 microseconds), the security device...
rejects all further packets from the remote source for the remainder of that second.

**Configuring IP Option Anomaly Detection**

The Internet Protocol standard “RFC 791, Internet Protocol” specifies a set of eight options that provide special routing controls, diagnostic tools, and security. Attackers can misconfigure IP options to evade detection mechanisms and/or perform reconnaissance on a network.

To detect (and block) anomalous IP fragments as they pass through the zone, configure the following settings:

- **Block Bad IP Options**—Select this option to block packets with an IP datagram header that contains an incomplete or malformed list of IP options.

- **Timestamp IP Option Detection**—Select this option to block packets in which the IP option list includes option 4 (Internet Timestamp). The timestamp option records the time when each network device receives the packet during its trip from the point of origin to its destination, as well as the IP address of each network device and the transmission duration of each one. If the destination host has been compromised, attackers can discover the network topology and addressing scheme through which the packet passed.

- **Security IP Option Detection**—Select this option for hosts to send security, compartmentation, TCC (closed user group) parameters, and Handling Restriction Codes compatible with U.S. Department of Defense requirements.

- **Stream IP Option Detection**—Select this option to block packets in which the IP option is 8 (Stream ID). Packets must use the 16-bit SATNET stream identifier to be carried through networks that do not support the stream concept.

- **Record Route IP Option Detection**—Select this option to block packets in which the IP option is 7 (Record Route). Attackers might use this option to record the series of Internet addresses through which a packet passes, enabling them to discover network addressing schemes and topologies.

- **Loose Source IP Option Detection**—Select this option to block packets in which the IP option is 3 (Loose Source Routing). The Loose Source Routing option enables the packet to supply routing information used by the gateways when forwarding the packet to the destination; the gateway or host IP can use any number of routes from other intermediate gateways to reach the next address in the route.

- **Strict Source IP Option Detection**—Select this option to block packets in which the IP option is 9 (Strict Source Routing). The Strict Source Routing enables the packet to supply routing information used by the gateways when forwarding the packet to the destination; the gateway or host IP must send the datagram directly to the next address in the source route, and only through the directly connected network indicated in the next address to reach the next gateway or host specified in the route.

- **Source Route IP Option Filter**—Select this option to block all IP traffic that contains the Source Route option. The Source Route option enables the IP header to contain routing information that specifies a different source than the header source. Attackers can use the Source Route option to send a packet with a phony
source IP address; all responses to the packet are sent to the attacker’s real IP address.

Configuring TCP/IP Anomaly Protection

Attackers can craft malicious packets (and packet fragments) that contain anomalies designed to bypass detection mechanisms and gain targeted information about a network. Because different operating systems (OS) respond differently to anomalous packets, attackers can determine the OS running on a target by examining the target’s response to the packet. To protect targets in the security zone from these reconnaissance attempts, you can configure the following settings:

■ SYN Fragment Detection—Select this option to detect TCP fragments that contain a SYN flag. A SYN flag in TCP segment initiates a connection but does not usually contain a payload. Because the packet is small, it should not be fragmented.

■ Drop Packet without TCP Flags Set—Select this option to detect TCP segment headers that do not have at least one flag control set.

■ Block SYN with FIN TCP Segments—Select this option to detect packets in which both the SYN and FIN flags are set. The SYN flag synchronizes sequence numbers to initiate a TCP connection and the FIN flag indicates the end of data transmission to finish a TCP connection, so both flags should never be set in the same packet.

■ Block FIN without ACK TCP Segments—Select this option to detect packets in which the FIN flag is set, but the ACK flag is not. The FIN flag signals the conclusion of a session and terminates the connection; normally the ACK flag is also set to acknowledge the previous packet received.

■ Drop Packets with an Unknown Protocol—Select this option to drop packets in which the protocol field is set to 101 or greater. Protocol types 101 and higher are currently reserved and undefined.

Denial of Service Defense

Attackers use denial-of-service (DoS) attacks to overwhelm a target with traffic from a single source IP, preventing the target from processing legitimate traffic. A more advance version of a DoS attack is a distributed DoS (DDoS) attack, in which attackers use multiple source addresses. Typically, attackers use a spoofed IP address or a previously compromised IP address as the source address to avoid detection.

To protect targets in the security zone from DoS and DDoS attacks, configure the following settings:

■ Ping of Death Attack Protection—Select this option to reject oversized and irregular ICMP packets. Attackers might send a maliciously crafted ping (ICMP packet) that is larger than the allowed size of 65,507 bytes to cause a DoS.

■ Teardrop Attack Protection—Select this option to drop teardrop attack packets, designed to exploit vulnerabilities in the reassembly of fragmented IP packets. In the IP header, the fragment offset field indicates the starting position, or “offset”, of the data contained in a fragmented packet relative to the data of the original unfragmented packet. When the sum of the offset and size of one
fragmented packet differ from that of the next fragmented packet, the packets overlap, and the server attempting to reassemble the packet can crash.

- Block ICMP Fragments—Select this option to block ICMP packets with the More Fragments flag set or with an offset value in the offset field. ICMP packets are typically very short messages containing error reports or network probe information. Because ICMP packets do not carry large payloads, they should not be fragmented.

- Block Large ICMP Packets—Select this option to block ICMP packets larger than 1024 bytes. ICMP packets are typically very short messages containing error reports or network probe information; a large ICMP packet is suspicious.

- Block IP Packet Fragments—Select this option to block IP fragments destined for interfaces in the security zone. As packets traverse different networks, it is sometimes necessary to break a packet into smaller pieces (fragments) based upon the maximum transmission unit (MTU) of each network. Attackers can use IP fragments to exploit vulnerabilities in the packet reassembly code of specific IP stack implementations.

- Land Attack Protection—Select this option to block SYN floods and IP spoofing combinations. Attackers can initiate a Land attack by sending spoofed SYN packets that contain the IP address of the target as both the destination and source IP address. The target responds by sending the SYN-ACK packet to itself, creating an empty connection that lasts until the idle timeout value is reached; in time, these empty connections overwhelm the system.

- SYN-ACK-ACK Proxy Protection—Select this option and configure a threshold to prevent SYN-ACK-ACK sessions from flooding the security device session table. After successfully receiving a login prompt from the security device, attackers can continue initiating SYN-ACK-ACK sessions, flooding the security device session table and causing the device to reject legitimate connection requests. When proxy protection is enabled and the number of connections from the same IP address reaches the SYN-ACK-ACK proxy threshold, the security device rejects further connection requests from that IP address. By default, the threshold is 512 connections from any single IP address; you can customize this threshold (1 to 250,000) to meet your networking requirements.

- Source IP-Based Session Limit—Select this option and configure a threshold to limit the number of concurrent sessions from the same source IP address. The default threshold is 128 sessions; you can customize this threshold to meet your networking requirements.

- Destination IP-Based Session Limit—Select this option and configure a threshold to limit the number of concurrent sessions to the same destination IP address. The default threshold is 128 sessions; you can customize this threshold to meet your networking requirements.

Configuring Mal Web Protection

Enable malicious URL protection on a security device to drop incoming HTTP packets that reference URLs with specific user-defined patterns. You can define up to 48 malicious URL string patterns per zone, each of which can be up to 64 characters long, for malicious URL protection at the zone level. When the Malicious URL blocking feature is selected, the security device examines the data payload of all HTTP packets. If it locates a URL and detects that the beginning of its string—up to a specified
number of characters—matches the pattern you defined, the device blocks that packet from passing the firewall.

A resourceful attacker, realizing that the string is known and might be guarded against, can deliberately fragment the IP packets or TCP segments to make the pattern unrecognizable during a packet-by-packet inspection. However, security devices use Fragment Reassembly to buffer fragments in a queue, reassemble them into a complete packet, and then inspect that packet for a malicious URL. Depending on the results of this reassembly process and subsequent inspection, the device performs one of the following steps:

■ If the device discovers a malicious URL, it drops the packet and enters the event in the log.
■ If the device cannot complete the reassembly process, a time limit is imposed to age out and discard fragments.
■ If the device determines that the URL is not malicious but the reassembled packet is too big to forward, the device fragments that packet into multiple packets and forwards them.
■ If the device determines that the URL is not malicious and does not need to fragment it, it then forwards the packet.

To configure a malicious URL string, you must specify the following properties:

■ Malicious URL ID—Enter the ID that you want use to identify the URL string.
■ HTTP Header Pattern—Enter the malicious URL string (also called a pattern) that you want the security device to match.
■ Minimum Length Before CRLF—Enter the number of characters in the URL string (pattern) that must be present in a URL—starting from the first character—for a positive match (not every character is required for a match). CRLF represents “carriage return/line feed”; HTTP uses a CR or LF character to mark the end of a code segment.

For more information about Mal-URL on security devices, refer to the “Attack Detections and Defense Mechanisms”, volume 4 in the Concepts & Examples ScreenOS Reference Guide.

In this example, you define three malicious URL strings and enable the malicious URL blocking option. Then, enable fragment reassembly for the detection of the URLs in fragmented HTTP traffic arriving at an Untrust zone interface.

1. Add a NetScreen-5GT security device. Choose Model when adding the device and configure the device as running ScreenOS 5.x.
2. In the device navigation tree, select Network > Zone. Double-click the Untrust zone. The General Properties screen appears.
3. Select TCP/IP Reassembly for ALG.
4. In the Zone navigation tree, select Mal-URL. Configure three malicious URL strings:
   a. Click the Add icon to display the new Malicious URL ID dialog box. Configure the following and click OK:
For Malicious URL ID, enter Perl.
For HTTP Header Pattern, enter scripts/perl.exe.
For Minimum Length Before CRLF, enter 14.

b. Click the Add icon to display the new Malicious URL ID dialog box. Configure the following and click OK:
   - For Malicious URL ID, enter CMF.
   - For HTTP Header Pattern, enter cgi-bin/phf.
   - For Minimum Length Before CRLF, enter 11.

c. Click the Add icon to display the new Malicious URL ID dialog box. Configure the following and click OK:
   - For Malicious URL ID, enter DLL.
   - For HTTP Header Pattern, enter 210.1.1.5/msadcs.dll.
   - For Minimum Length Before CRLF, enter 18.
   - Click OK to save your changes to the zone, then click OK again to save the device configuration.

### Configuring UDP Flooding Protection

Security devices currently support UDP for incoming SIP calls. To protect the managed device against UDP flooding by incoming SIP traffic, enable UDP Flooding Protection. The device can limit the number of UDP packets that can be received by an IP address, preventing incoming SIP calls from overwhelming the device.

**NOTE:** UDP Flood Protection appears only for devices running ScreenOS 5.1 and higher.

SIP signaling traffic consists of request and response messages between client and server and uses transport protocols such as UDP or TCP. The media stream carries the data (for example, audio data), and uses application layer protocols such as RTP (Real-time Transport Protocol) over UDP.

In this example, enable UDP Flooding Protection and set a threshold of 80000 per second for the number of UDP packets that can be received on IP address 1.1.1.5, in the Untrust zone. When this limit is reached, the device generates an alarm and drops subsequent packets for the remainder of that second.

1. Add a NetScreen-208 security device. Choose Model when adding the device and configure the device as running ScreenOS 5.1.
2. In the device navigation tree, select Network > Zone. Double-click the Untrust zone. The General Properties screen appears.
3. In the zone navigation tree, select Screen > Flood Defense, then click the UDP Flood Defense tab.
4. Select **UDP Flood Protection** and ensure that the Threshold is set to 1000.

5. Click the Add icon to display the New Destination IP based UDP Flood Protection dialog box. Configure the following, then click **OK**.

   - For Destination IP, enter **1.1.1.5**.
   - For Threshold, enter **80000**.
   - Click **OK** to save your changes to the zone, then click **OK** again to save your changes to the device.

**Configuring Interfaces**

The Interface screen displays the physical interfaces available on the security device. Some security devices support functional zone interfaces, which are either a separate physical MGT interface for management traffic or a high availability (HA) interface used to link two devices together to form a redundant group or cluster.

Interfaces and subinterfaces enable traffic to enter and exit a security zone. To enable network traffic to flow in and out of a security zone, you must bind an interface to that zone and, if it is a Layer 3 zone, assign it an IP address. You can assign multiple interfaces to a zone, but you cannot assign a single interface to multiple zones.

**NOTE:** Not all devices support all features described in this guide. For device-specific datasheets that include an updated feature list for each device, go to: [http://www.juniper.net/products/integrated/dsheet/](http://www.juniper.net/products/integrated/dsheet/). This link is provided for your convenience and may change without notice. You can also find these information by going to the Juniper web site ([http://www.juniper.net/](http://www.juniper.net/)).

**Interface Types**

You can add the following interfaces on a security device:

- **Aggregate interface**—A logical interface that combines two or more physical interfaces on the device, for the purpose of sharing the traffic load to a single IP address. This type of interface is only supported on certain security device systems.
- **Multilink interface**—On available devices, you configure and access multiple serial links called a bundle, through a virtual interface called a multilink interface. The multilink interface emulates a physical interface for the transport of frames.
- **Loopback interface**—A logical interface that emulates a physical interface and is always in the up state.
- **Virtual security interfaces (VSIs)**—The virtual interfaces that two security devices share when forming a virtual security device (VSD) in a high availability cluster.
- **Redundant interface**—Two physical interfaces bound to the same security zone. One of the two physical interfaces acts as the primary interface and handles all the traffic directed to the redundant interface; the other physical interface acts as a backup.
Subinterface—A logical division of a physical interface. A subinterface borrows the bandwidth it needs from the physical interface.

Tunnel interface—Acts as a doorway to a VPN tunnel. Traffic enters and exits a VPN tunnel through a tunnel interface. When you configure a tunnel interface, you can also encapsulate IP multicast packets in GREv1 unicast packets.

ADSL interface—A NetScreen-5GT ADSL security device uses ATM as its transport layer. The interface can support multiple permanent virtual circuits (PVCs) on a single physical line. Before you can configure the adsl1 interface, however, you must obtain the DSLAM configuration details for the ADSL connection from the service provider.

WAN Subinterface—A logical division of a physical WAN interface. This type of interface is only supported on available devices.

ISDN BRI interface—Integrated Services Digital Network (ISDN) is an international communications standard for sending voice, video, and data over digital telephone lines. ISDN in NSM supports Basic Rate Interface (BRI).

Wireless interface—A NetScreen-5GT Wireless security device interface handles wireless traffic to and from that wireless access point (WAP).

For information about configuring specific interface types, see “Interface Configuration Examples” on page 64.

**Configuring Physical and Function Zone Interfaces**

In the Interface screens, you can configure the physical interfaces and, if available, the function zone interfaces. Double-click the interface in the Interface screen. For physical and function zone interfaces, you can configure the following:

- “Interface General Properties” on page 46
- “WAN Properties” on page 46
- “Port Properties” on page 47
- “Interface Advanced Properties” on page 47
- “Interface Service Options” on page 48
- “Dynamic Host Configuration Protocol” on page 49
- “Interface Protocol” on page 52
  - For information about configuring dynamic routing protocols (BGP, RIP, OSPF) in the virtual router and on the interfaces, see “Configuring Dynamic Routing” on page 250.
  - For information about configuring multicast routing protocols (PIM-SIM, IGMP, IGMP-Proxy) and multicast route entries, see “Configuring Multicast Routing” on page 265
- “Interface Secondary IP” on page 52
- “Interface Monitoring” on page 52
- “Generic Routing Encapsulation” on page 52
- “Interface Network Address Translation” on page 52
For more information about interfaces on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

**Interface General Properties**

Use the General Properties screen to configure the following properties on an interface:

- Name of the interface
- Sub Interface Type
- Zone to which the interface is bound
- VLAN tag
- Bundle into—used to configure virtual interfaces on a Multilink Frame Relay (MLFR) for User-to-Network Interface (UNI) (on available devices).
- Encapsulation Type—used to configure the following encapsulation protocols on WAN interfaces: Frame Relay, Multilink Frame Relay (MLFR), Point-to-Point Protocol (PPP), Multilink PPP (MLPPP), and Cisco High-Level Data Link Control (HDLC) (only available on available devices).
- Loopback interface group to which the interface belongs
- Redundant interface group to which the interface belongs
- IP address, netmask, and gateway of the interface

**NOTE:** NSM does not permit you to unset the management IP Address. You can, however, still do this on each separate device out of band, using CLI, Web UI or the Supplemental CLI. Refer to “Configuring Supplemental Command Line Interface (CLI)” on page 115 for more information.

- Mode of the interface (NAT or route)
- Select DNS Proxy (for details, see “Configuring DNS Proxy” on page 95.)
- PPP Settings

On ADSL interfaces, you can also configure ADSL options (VPI, VCI, Multiplexing mode) as part of the General Properties for the ADSL interface. For information about ADSL, see “Configuring an ADSL Interface” on page 74.

On wireless interfaces, you can also shutdown the interface by enabling the Shutdown Interface option.

Some interfaces, such as the VLAN1 or Serial interface, accept service option settings as part of the General Properties for the interface. For information about service options, see “Interface Service Options” on page 48.

**WAN Properties**

Use the WAN Properties screen to configure the following WAN properties for port cards on available devices:
Port Properties

Use the Port Properties screen to configure the following properties for port cards on available devices:

- Port Configuration (Serial, E1, T1, or DS3)
- DCE Options
- DTE Options
- Line encoding
- Loopback mode
- Encapsulation support

For more information about configuring properties, refer to the ScreenOS Wide Area Network Interfaces and Protocols Reference.

MLFR and MLPPP Options

Use the MLFR and MLPPP screens to change the default frame relay and PPP properties on a multilink interface. For more information about configuring frame relay properties, refer to the ScreenOS Wide Area Network Interfaces and Protocols Reference.

Interface Advanced Properties

Set attributes of the physical link for the interface:

- Physical Settings
  - Extended Bandwidth Settings. Use the Egress Bandwidth options to set the minimum (or guaranteed) and maximum bandwidth allowed to pass through the security device. Be careful not to allocate more bandwidth than the interface can support because you might lose data if the guaranteed bandwidth on contending policies surpasses the traffic bandwidth set on the interface.

For security devices running ScreenOS 5.3, you can also manage the flow of traffic through the security device by limiting bandwidth at the point of ingress. To configure the maximum amount of traffic allowed at the point of the ingress interface, set the number of kilobits per second (kbps) using the Ingress Minimum Bandwidth field.
For more information about configuring traffic shaping parameters, see “Configuring Traffic Shaping” on page 104.

- **Holddown Time.** Use this option to configure the amount of time (in milliseconds) that the security device uses to bring the interface up or down after detecting a change in the link status.
  - **Bring Down Link.** Select this option to bring down the physical link to the interface.
- **Link and MTU Size**
- **WebAuth**
  - **Enable Webauth.** Select this option to enable device administrators to authenticate management connections to the device using WebAuth.
  - **WebAuth IP.** Enter the IP address of the WebAuth service on the interface.
  - **Allow Webauth via SSL only (ScreenOS 5.1 and higher only).** Select this option to require WebAuth users to use SSL when connecting to the WebAuth IP address on a device running ScreenOS 5.1 and higher. When this option is disabled, device administrators can access the WebAuth IP address of the interface using clear text.

**NOTE:** When you enable WebAuth, you must also enable SSL as a service option for the interface. For details, see “Interface Service Options” on page 48.

- **Deny Routing**
- **Port Settings**

**Interface Service Options**

Enable management service options for the interface:

- **Web**—Selecting this option enables the interface to receive HTTP traffic for management from the Web user interface (Web UI).
- **Telnet**—A terminal emulation program for TCP/IP networks such as the Internet, Telnet is a common way to remotely control network devices. Selecting this option enables Telnet manageability.
- **SSH**—You can administer the security device from an Ethernet connection or a dial-in modem using Secure Command Shell (SSH). You must have an SSH client that is compatible with Version 1.5 of the SSH protocol. These clients are available for Windows 95 and later, Windows NT, Linux, and UNIX. The security device communicates with the SSH client through its built-in SSH server, which provides device configuration and management services. Selecting this option enables SSH manageability.
- **SNMP**—The security device supports both SNMPv1 and SNMPv2c, and all relevant Management Information Base II (MIB II) groups, as defined in RFC1213. Selecting this option enables SNMP manageability.
SSL—Select this option to enable the interface to receive HTTPS traffic for secure management of the security device using the Web UI. Additionally, when this option is enabled, you can also require WebAuth users to use SSL when connecting to the WebAuth IP address on a device running ScreenOS 5.1 and higher.

Global Pro (Security Manager)—Selecting this option enables the interface to receive NSM traffic.

Ping—Selecting this option enables the interface to respond to an ICMP echo request, or ping, which determines whether a specific IP address is accessible over the network.

Ident-Reset—Services like Mail and FTP send identification requests. If they receive no acknowledgement, they send the request again. While the request is processing, there is no user access. By enabling the Ident-reset option, the interface sends a TCP reset announcement in response to an IDENT request to port 113 and restores access that has been blocked by an unacknowledged identification request.

NSGP—Select this option to enable the interface to handle NSGP traffic. When enabled, you can also select to enforce IPSec authentication for NSGP traffic.

Dynamic Host Configuration Protocol

The Dynamic Host Configuration Protocol (DHCP) automatically assigns TCP/IP settings for the hosts on the network. Different security devices support different DHCP roles:

- DHCP clients receive a dynamically assigned IP address.
- DHCP servers allocate dynamic IP addresses to clients.
- DHCP relay agents receive information from a DHCP server and relay that information to clients.

Some devices can simultaneously act as a DHCP client, server, and relay agent.

1. In the main navigation tree, select Device Manager > Security Devices.
2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.
3. In the main navigation tree, select Network > Interface.
5. Select DHCP in the navigation tree, and for the DHCP Mode, select Server.
6. Configure the Server Settings as follows:
- For DHCP Server Auto Processing, select **Enable DHCP Server**.
- For DNS #1, #2, and #3, enter 1.1.1.1
- For Domain Name, enter .acme.com
- For Client Gateway, enter 1.1.1.1
- For Lease Time (Minutes), the default is 4320 minutes.
- For Netmask, the default is 0
- For NetInfo Server #1 and Server #2, enter 1.1.1.1
- For POP3, enter 1.1.1.1
- For SMTP, enter 1.1.1.1
- For WINS#1 and WINS#2, enter 1.1.1.1.
- Select Enable Next Server IP.
- Click **OK** to apply the settings.

**Configuring Custom DHCP Options**

When configuring a DHCP server, you can also configure custom DHCP options to handle address assignment for Voice-over-IP (VOIP) phones.

**NOTE**: Custom DHCP options are **not** supported on the NetScreen-500, the NetScreen-5200, the NetScreen-5400, the ISG 1000 and the ISG 2000.

A custom DHCP option contains:

- **Option Name**—The option name is a user-defined, unique name that identifies the custom option.
- **Code**—The option code is an arbitrary integer that represents the option type. Use the option code to represent the custom option you want to configure. For each DHCP server, you can configure an unlimited number of custom DHCP options; however, the option code for each custom option must be unique, and cannot match the option code for a predefined option (DHCP contains several predefined option codes). The following table lists the predefined option codes and associated RFC2132 terms:

**Table 9: DHCP Option Codes**

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netmask</td>
<td>1</td>
</tr>
<tr>
<td>Gateway</td>
<td>3</td>
</tr>
<tr>
<td>DNS1, DNS2, DNS3</td>
<td>6</td>
</tr>
<tr>
<td>Domain Name</td>
<td>15</td>
</tr>
<tr>
<td>WINS1, WINS2</td>
<td>44</td>
</tr>
</tbody>
</table>
Table 9: DHCP Option Codes (continued)

<table>
<thead>
<tr>
<th>Option Code</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lease</td>
<td>51</td>
</tr>
<tr>
<td>SMTP</td>
<td>69</td>
</tr>
<tr>
<td>POP3</td>
<td>70</td>
</tr>
<tr>
<td>News</td>
<td>71</td>
</tr>
<tr>
<td>NIS1, NIS2</td>
<td>112</td>
</tr>
<tr>
<td>NISTAG</td>
<td>113</td>
</tr>
</tbody>
</table>

In addition to predefined option codes, the codes 0, 255, and 53 cannot be used to create a custom DHCP option. All other integers between 2 and 254 are valid.

- **Data Type**—The data type controls the type of data required for the option code. Available data types are String, IP Address, and Integer.
- **Value**—The value of the option code. When the data type is string, the acceptable length is 1-128 characters.

Your network recently added support for VoIP, and you now need to support DHCP for Voice-over-IP (VOIP) phones. You edit the existing DHCP server configuration to send the following custom options to IP phones acting as DHCP clients:

- Option code 444, containing string “Server 4”
- Option code 66, containing IP address 1.1.1.1
- Option code 160, containing integer 2004

The example assumes that you have already configured a security device to act as a DHCP server.

1. In the main navigation tree, select Device Manager > Devices. Double-click the device currently handling your DHCP assignments.
3. In the interface navigation tree, select DHCP, set the DHCP mode to Server, then select the Custom Options tab.
4. Click the Add icon to add the first custom option. Configure the following, then click OK:
   - For **Option Name**, enter **IP Address**.
   - For **Code**, enter **66**.
   - For **Data Type**, select **IP ADDR**.
   - For **Value**, enter **1.1.1.1**.
Click the Add icon to add the second custom option. Configure the following, then click OK:

5. Click OK to save your changes to the interface, then click OK again to save your changes to the device.

**Interface Protocol**

You can enable and configure dynamic routing protocol and multicast protocol operations on the interface:

- For information about dynamic routing protocols (BGP, RIP, OSPF) in the virtual router and on the interfaces, see “Configuring Dynamic Routing” on page 250.
- For information about multicast routing protocols (PIM-SIM, IGMP, IGMP-Proxy) and multicast route entries, see “Configuring Multicast Routing” on page 265

**Interface Secondary IP**

This option is not available for interfaces in the Untrust zone. Each interface has a single, unique primary IP address. You can also set one or more secondary IP addresses for the interface.

**Interface Monitoring**

You can enable the security device to monitor the reachability of certain IP addresses through the interface to determine interface failure. For each IP address to be tracked, specify the following:

- Interval at which pings are sent to the tracked address
- Number of consecutive unsuccessful ping attempts before the connection to the address is considered failed
- Weight of the failed IP connection

The Failover Threshold is compared to the sum of the weights of failed IP connections. Instead of tracking specific IP addresses, you can alternatively set the device to track the interface’s default gateway.

**Generic Routing Encapsulation**

You can configure a tunnel interface to support Generic Routing Encapsulation version 1 (GREv1) encapsulation. When enabled, the interface encapsulates IP packets in the tunnel in IPv4 packets using GREv1. You must specify the key parameter to append the value to outgoing packets (incoming packets must have this value too).

You can use GRE to forward multicast packets through non-multicast aware routers and devices.

**Interface Network Address Translation**

You can configure the following address translation methods on the security device:
■ Mapped IP (MIP) settings—For information about MIP settings, see “Configuring MIPs” on page 53.

■ Dynamic IP (DIP) settings—For information about DIP settings, see “Configuring DIPs” on page 57. For information about DIP groups in an NSRP configuration, see “Configuring DIP Groups” on page 83.

■ Virtual IP (VIP) settings—For information about VIP settings, see “Configuring VIPs” on page 54.

**Configuring MIPs**

A mapped IP (MIP) is a direct one-to-one mapping of one IP address to another. The security device forwards incoming traffic destined for a MIP to the host with the address to which the MIP points. A MIP is static destination address translation that maps the destination IP address in an IP packet header to another static IP address, enabling inbound traffic to reach private addresses in a zone whose interface is in NAT mode. When a MIP host initiates outbound traffic, the security device translates the source IP address of the host to that of the MIP address. You can map an address-to-address or subnet-to-subnet relationship (the netmask applies to both the mapped IP subnet and the original IP subnet).

You can also use a MIP to handle overlapping address spaces at two sites connected by a VPN tunnel (an overlapping address space is when the IP address range in two networks are partially or completely the same).

The zone you configure the MIP in determines the subnet of IP address that you can assign the MIP:

■ When defining a MIP in a tunnel zone or security zone other than untrust, you must use the same subnet as a tunnel interface with an IP address and netmask, or in the same subnet as the IP address and netmask of an interface bound to a Layer 3 (L3) security zone.

■ When defining a MIP an interface in the Untrust zone, you can use a different subnet than the Untrust zone interface IP address. However, you must add a route on the external router pointing to an Untrust zone interface so that incoming traffic can reach the MIP. You must also define a static route that associates the MIP with the interface that hosts it.

■ On some security devices, you can assign a MIP the same address as an interface, but you cannot use that MIP address in a DIP pool.

You can use a MIP as the destination addresses in rules between any two zones or in a Global rule. For the destination zone, use either the Global zone or the zone with the address to which the MIP points.

In this example, you create a MIP to handle inbound traffic to your Web server. After configuring the MIP, you create a Global MIP to represent the MIP you created for the device, then use the Global MIP object in a Security Policy rule that permits HTTP traffic from any address in the Untrust zone to the MIP—and to the host with the address to which the MIP points—in the Trust zone. All security zones are in the trust-vr routing domain.
1. Add a NetScreen-50 security device. Choose Model when adding the device and configure the device as running ScreenOS 5.x.

2. Configure the Trust interface for ethernet1.
   - In the device navigation tree, select Network > Interface.
   - Double-click ethernet1 (trust interface). The General Properties screen appears.
   - Configure the IP address as 10.1.1.1 and the Netmask as 24. Leave all other settings as default.
   - Click OK to save your changes.

3. Configure the Untrust interface for ethernet2.
   - In the device navigation tree, select Network > Interface.
   - Double-click ethernet2 (untrust interface). The General Properties screen appears.
   - Configure the IP address as 1.1.1.1 and the Netmask as 24. Leave all other settings as default.
   - Click OK to save your changes.

4. In the interface navigation tree, select NAT > MIP to display the MIP screen.

5. Click the Add icon and configure the following:
   - For Mapped IP, enter 1.1.1.5
   - For Netmask, enter 32.
   - For Host IP, enter 10.1.1.5
   - For virtual router, select trust-vr
   - Click OK to save the MIP.

6. Click OK to save your changes to the interface, then click OK to save your changes to the device.

7. Create a Global MIP to reference the MIP you created for the device. You use a Global MIP when configuring NAT in a Security Policy rule; the Global MIP references the MIP for an individual device, enabling you to use one object (the Global MIP object) to represent multiple MIPs in a single rule.

8. In the navigation tree, select Object Manager > NAT Objects > MIP.

9. Click the Add icon to display the new Global MIP dialog box.

10. Configure the Global MIP.

11. Configure a firewall rule to route inbound HTTP traffic to the MIP address.

**Configuring VIPs**

A virtual IP (VIP) address maps traffic received at one IP address to another address based on the destination port number in the TCP or UDP segment header. The destination IP addresses are the same, and the destination port numbers determine
the host to that receives the traffic. The security device forwards incoming traffic destined for a VIP to the host with the address to which the VIP points. When a VIP host initiates outbound traffic, the security device translates the source IP address of the host to that of the VIP address.

You can set a VIP only on an interface in the Untrust zone, and you must assign the VIP an IP address that is in the same subnet as an interface in the Untrust zone. Some security devices also support:

- Assigning the VIP the exact same address as the interface.
- Assigning the VIP to a dynamic IP address. When using a VIP with an interface in the Untrust zone that receives its IP address dynamically via DHCP or PPPoE, select **Same as the untrusted interface IP address** when setting up the VIP.

Additionally, the host to which the security device maps VIP traffic must be reachable from the trust-vr. If the host is in a routing domain other than that of the trust-vr, you must define a route to reach it.

You can use a VIP as the destination addresses in rules between any two zones or in a Global rule. For the destination zone, use either the Global zone or the zone with the address to which the VIP points.

### Mapping Services and Ports

You can use virtual port numbers for well-known services when running multiple server processes on a single machine. For example, you can run two FTP servers on the same machine, one server on port 21 and the other on port 2121. Only users who know the virtual port number can append it to the IP address in the packet header to gain access to the second FTP server.

You can map predefined and custom services in a VIP. A single VIP can support custom services with:

- The same source and destination port numbers but different transports.
- Single port entries (by default).
- Multiple port entries, when you creating multiple service entries under a VIP (one service entry in the VIP for each port entry in the service).
- Any destination port number or number range from 1 to 65,535, not just from 1024 to 65,535.

In this example, you create a VIP to handle inbound traffic to your Web server. After configuring the VIP, you create a Global VIP to represent the VIP you created for the device, then use the Global VIP object in a Security Policy rule that permits HTTP traffic on port 80 from any address in the Untrust zone to the MIP—and to the host with the address and port to which the MIP points—in the Trust zone. All security zones are in the trust-vr routing domain.

Because the VIP is in the same subnet as the Untrust zone interface, you do not need to define a route for traffic from the Untrust zone to reach it. (To route HTTP traffic from a security zone other than the Untrust zone to the VIP, you must set a route.
1. Add a NetScreen-204 security device. Choose Model when adding the device and configure the device as running ScreenOS 5.x.

2. Configure the Trust interface for ethernet1.

3. In the device navigation tree, select Network > Interface.


5. Configure the IP address as 10.1.1.1 and the Netmask as 24. Leave all other settings as default.

6. Click OK to save your changes.

7. Configure the Untrust interface for ethernet3.

8. In the device navigation tree, select Network > Interface.


10. Configure the IP address as 1.1.1.1 and the Netmask as 24. Leave all other settings as default.

11. Click OK to save your changes.

12. Configure the VIP for ethernet3:

   ■ Double-click ethernet3. The General Properties screen appears.
   
   ■ In the interface navigation tree, select NAT > VIP to display the VIP screen.
   
   ■ Click the Add icon to display the Virtual IP dialog box. Enter the Virtual IP as 1.1.1.10.

13. Click the Add icon to display the VIP mapping dialog box. Configure the following:

   ■ For Virtual Port, enter 80.
   
   ■ For Mapped IP, 10.1.1.10.
   
   ■ For Mapped Service, enter HTTP.
   
   ■ Click OK to save the VIP mapping, then click OK to save the VIP.

   ■ Click OK to save your changes to the interface, then click OK to save your changes to the device.

14. In the navigation tree, select Object Manager > NAT Objects > VIP.

15. Click the Add icon to display the new Global VIP dialog box.

16. Configure the Global VIP.

17. Configure a firewall rule to route inbound HTTP traffic on port 80 to the VIP address.
**Configuring DIPs**

A dynamic IP (DIP) pool is a range of IP addresses. The security device can dynamically or deterministically use these IP addresses when performing network address translation on the source IP address (NAT-src) in IP packet headers.

- If the range of addresses in a DIP pool is in the same subnet as the interface IP address, the pool must exclude the interface IP address, router IP addresses, and any mapped IP (MIP) or virtual IP (VIP) addresses that might also be in that subnet.

- If the range of addresses is in the subnet of an extended interface, the pool must exclude the extended interface IP address.

You can assign DIP pools to physical interfaces and subinterfaces for network and VPN traffic, and tunnel interfaces for VPN tunnels only.

**Port Address Translation**

Use Port Address Translation (PAT) to enable multiple hosts (up to 64,500) to share the same IP address. The security device maintains a list of assigned port numbers to distinguish which session belongs to which host. Use PAT in conjunction with a MIP and a DIP pool to resolve the problem of overlapping address spaces.

Some applications, such as NetBIOS Extended User Interface (NetBEUI) and Windows Internet Naming Service (WINS), require specific port numbers and do not work with PAT. For these applications, you cannot use PAT; you must configure the DIP pool to use a fixed port (numbered IP). For fixed-port DIP, the security device hashes and saves the original host IP address in its host hash table, enabling the device to associate the right session with each host.

In this example, you want to create a VPN tunnel for users at one site to reach an FTP server at another site. However, the internal networks at both sites use the same private address space of 10.1.1.0/24.

On the first device, an NetScreen-HSC, you create a tunnel interface in the Untrust zone with IP address 10.10.1.1/24, and associate it with a DIP pool containing the IP address range 10.10.1.2–10.10.1.2 (addresses in the neutral address space of 10.10.1.0/24). You enable port address translation for the DIP pool. On the second device, an NetScreen-208, you create a tunnel interface with an IP address in a neutral address space and set up a Mapped IP (MIP) address to its FTP server. This example provides details on configuring the NetScreen-HSC to use a DIP pool with PAT; details on configuring the second device in the VPN are not provided.

1. Add a NetScreen-HSC security device. Choose Model when adding the device and configure the device as running ScreenOS 5.x.

2. Configure the tunnel interface:
   - In the device navigation tree, select Network > Interface.
   - Click the Add icon and select New > Tunnel Interface. The General Properties screen appears.

3. Configure the tunnel interface.
4. Configure the DIP pool:
   ■ In the interface navigation tree, select NAT > DIP to display the DIP screen.
   ■ Click the Add icon to display the DIP pool dialog box.

5. Configure the following then click **OK**:
   ■ For DIP ID, enter 5.
   ■ For Start, enter 10.10.1.2
   ■ For End, enter 10.10.1.2

6. Click **OK** to save your changes to the interface, then click OK to save your changes to the device.

**DIP with Extended Interface**

If circumstances require that the source IP address in outbound firewall traffic be translated to an address in a different subnet from that of the egress interface, you can use the extended interface option. This option enables you to graft a second IP address and an accompanying DIP pool onto an interface that is in a different subnet. You can then enable NAT on a per-policy basis and specify the DIP pool built on the extended interface for the translation.

In this example, two branch offices have leased lines to a central office. The central office requires them to use only the authorized IP addresses it has assigned them. However, the offices receive different IP addresses from their ISPs for Internet traffic. For communication with the central office, you use the extended interface option to configure the security device in each branch office to translate the source IP address in packets it sends to the central office to the authorized address. Table 10 on page 58 lists the authorized and assigned IP addresses for branch offices A and B.

**Table 10: Sample Branch Office Addresses**

<table>
<thead>
<tr>
<th>Office</th>
<th>Authorized IP Address</th>
<th>Assigned IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>195.1.1.1/24</td>
<td>211.10.1.1/24</td>
</tr>
<tr>
<td>B</td>
<td>201.1.1.1/24</td>
<td>211.20.1.1/24</td>
</tr>
</tbody>
</table>

The security devices at both sites have a Trust zone and an Untrust zone. All security zones are in the trust-vr routing domain. You bind ethernet1 to the Trust zone and assign it IP address 10.1.1.1/24. You bind ethernet3 to the Untrust zone and give it the IP address assigned by the ISPs: 195.1.1.1/24 for Office A and 201.1.1.1/24 for Office B. You then create an extended interface with a DIP pool containing the authorized IP address on ethernet3:

- Office A—extended interface IP 211.10.1.10/24; DIP pool 211.10.1.1 – 211.10.1.1; PAT enabled
- Office B—extended interface IP 211.20.1.10/24; DIP pool 211.20.1.1 – 211.20.1.1; PAT enabled
You set the Trust zone interface in NAT mode. It uses the Untrust zone interface IP address as its source address in all outbound traffic except for traffic sent to the central office. You configure a policy to the central office that translates the source address to an address in the DIP pool in the extended interface. (The DIP pool ID number is 5. It contains one IP address, which, with port address translation, can handle sessions for ~64,500 hosts.) The MIP address that the central office uses for inbound traffic is 200.1.1.1, which you enter as "HQ" in the Untrust zone address book on each security device.

Each ISP must set up a route for traffic destined to a site at the end of a leased line to use that leased line. The ISPs route any other traffic they receive from a local security device to the Internet.

1. Add the devices:
   - For Office A, add a NetScreen-208 security device.
   - For Office B, add a NetScreen-204 security device.

2. Configure ethernet1 (Trust Zone) for Office A:
   - Double-click Office A device to open the device configuration. In the device navigation tree, select Network > Interface.
   - Double-click ethernet1. The General Properties screen appears.

3. Configure IP address/netmask as 10.1.1.1/24 and Interface Mode as NAT.

4. Click OK to save your changes.

5. Configure ethernet3 (Untrust Zone) for Office A:
   - In the device navigation tree, select Network > Interface.
   - Double-click ethernet3. The General Properties screen appears.
   - Configure IP address/netmask as 195.1.1.1/24 and Interface Mode as Route.

6. In the interface navigation tree, select NAT > DIP. Click the Add icon to display the DIP pool dialog box. Configure the DIP as shown below, then click OK:
   - For Start, enter 211.10.1.1.
   - For End, enter 211.10.1.1.
   - For Extended IP, enter 211.10.1.10.
   - For Netmask, enter 24.

7. Add the route to the Corporate Office on the trust-vr of Office A:
   - In the device navigation tree, select Network > Routing. Double-click the trust-vr router. The General Properties screen appears.

8. In the trust-vr navigation tree, select Routing Table. Click the Add icon and configure the new route:
   - Set the IP address/netmask to 0.0.0.0/0.
   - For Next Hop, select Gateway; the gateway options appear.
9. Leave all other defaults, then click **OK** to save the route.

10. Click **OK** to save your changes to the trust-vr, then click **OK** to save your changes and close the Office A device configuration.

11. **Configure ethernet1 (Trust Zone) for Office B:**
   - Double-click Office B device to open the device configuration. In the device navigation tree, select **Network > Interface**.
   - Double-click ethernet1. The General Properties screen appears.

12. **Configure ethernet3 (Untrust Zone) for Office B:**
   - In the device navigation tree, select **Network > Interface**.
   - Double-click ethernet3. The General Properties screen appears.
   - Configure IP address/netmask as 201.1.1.1/24 and Interface Mode as Route.

13. **Configure ethernet3 (Untrust Zone) for Office B:**
   - In the device navigation tree, select **Network > Interface**.
   - Double-click ethernet3. The General Properties screen appears.
   - Configure IP address/netmask as 201.1.1.1/24 and Interface Mode as Route.

14. In the interface navigation tree, select **NAT > DIP**. Click the Add icon to display the DIP pool dialog box. Configure the DIP as shown below, then click **OK**:
   - For Start, enter 211.20.1.1.
   - For End, enter 211.20.1.1.
   - For Extended IP, enter 211.20.1.10.
   - For Netmask, enter 24.

15. Add the route to the Corporate Office on the trust-vr of Office B:
   - In the device navigation tree, select **Network > Routing**. Double-click the trust-vr router. The General Properties screen appears.

16. In the trust-vr navigation tree, select **Routing Table**. Click the Add icon and configure the new route:
   - Set the IP address/netmask to 0.0.0.0/0.
   - For Next Hop, select **Gateway**, the gateway options appear.
   - For Interface, select ethernet3.
   - For Gateway IP Address, enter 201.1.1.254.
   - Leave all other defaults, then click **OK** to save the route.
   - Click **OK** to save your changes to the trust-vr, then click **OK** to save your changes and close the Office A device configuration.

17. Add the Address Object that represents HQ:
In the main navigation tree, select **Object Manager > Address Objects**. Click the Add icon and select Host. The New Host dialog box appears.

18. Configure the Host as detailed below, then click OK:
   - For Name, enter Central Office HQ.
   - Select **IP**, then enter the IP Address 200.1.1.1.

19. Create a Global DIP to reference the DIP pool on each device. You use a Global DIP when configuring NAT in a firewall rule; the Global DIP references the DIP pool for an individual device, enabling you to use one object (the Global DIP object) to represent multiple DIP pools in a single rule.
   - In the navigation tree, select **Object Manager > NAT Objects > DIP**.
   - Click the Add icon to display the new Global DIP dialog box. Configure the Global DIP then click **OK**.

20. Configure two firewall rules, one which uses the Global DIP object for NAT translation.

**Incoming DIP for SIP Traffic**

Use an Incoming DIP to enable the managed device to handle incoming Session Initiation Protocol (SIP) calls. SIP is an Internet Engineering Task Force (IETF)-standard protocol for initiating, modifying, and terminating multimedia sessions (such as conferencing, telephony, or multimedia) over the Internet. SIP is used to distribute the session description, to negotiate and modify the parameters of an existing session, and to terminate a multimedia session.

**NOTE:** SIP is a predefined service that uses port 5060 as the destination port. To specify the SIP service in the Service column of a firewall rule, you must select the predefined service group **VOIP**, which includes the H.323 and SIP service objects.

To use SIP, a caller must register with the registrar before SIP proxies and location servers can identify where the caller wants to be contacted. A caller can register one or more contact locations by sending a REGISTER message to the registrar. The REGISTER message contains the address-of-record URI and one or more contact URIs. When the registrar receives the message, it creates bindings in a location service that associates the address-of-record with the contact addresses.

The security device monitors outgoing REGISTER messages from SIP users, performs NAT on these addresses, and stores the information in an Incoming DIP table. When the device receives an INVITE message from the external network, it uses the Incoming DIP table to identify which internal host to route the INVITE message to.

To enable the device to perform NAT on incoming SIP calls, you must configure an interface DIP or DIP pool on the egress interface of the device. A single interface DIP is adequate for handling incoming calls in a small office; a DIP pool is recommended for larger networks or an enterprise environment.
NOTE: SIP uses UDP as its transport protocol. When using your managed device to handle SIP traffic, you might also want to enable UDP Flood Protection. For details on configuring UDP Flood Protection, see “Configuring UDP Flooding Protection” on page 43.

In this example, you configure an interface-based DIP on the Untrust interface of the security device, then configure a firewall rule that permits SIP traffic from the Untrust zone to the Trust zone and references the interface DIP. You also configure a rule that permits SIP traffic from the Trust to the Untrust zone using NAT Source, which enables hosts in the Trust zone to register with the proxy in the Untrust zone.

1. Add a NetScreen-208 device named Office A. Choose Model when adding each device and configure as running ScreenOS 5.1.

2. Configure ethernet1 (Trust Zone) for Office A:
   - Double-click Office A device to open the device configuration. In the device navigation tree, select Network > Interface.
   - Double-click ethernet1. The General Properties screen appears.
   - Configure IP address/netmask as 10.1.1.1/24 and Interface Mode as NAT.
   - Click OK to save your changes.

3. Configure ethernet3 (Untrust Zone) for Office A:
   - Double-click ethernet3. The General Properties screen appears.
   - Configure IP address/netmask as 1.1.1.1/24.
   - In the interface navigation tree, select NAT > DIP, then click the Interface DIP tab.
   - Select Incoming NAT.

4. Click OK to save your changes to the interface, then click OK again to save your changes to the device.

5. Create a Global DIP to reference the Interface DIP on Office A. You use a Global DIP when configuring NAT in a firewall rule; the Global DIP references the Interface DIP for an individual device.

6. In the navigation tree, select Object Manager > NAT Objects > DIP.

7. Click the Add icon to display the new Global DIP dialog box.

8. Configure the Global DIP.

9. Configure firewall rules:
   - Rule 1 handles outgoing SIP traffic, and uses the outgoing interface to perform NAT.
   - Rule 2 handles incoming SIP traffic, and uses the Interface DIP as the Destination to perform NAT.
NOTE: SIP is a predefined service that uses port 5060 as the destination port. To specify the SIP service in the Service column of a firewall rule, you must select the predefined service group VOIP, which includes the H.323 and SIP service objects.

In this example, you configure a DIP pool on the Untrust interface to perform NAT on incoming SIP calls. After creating the DIP pool and Global DIP object, you configure a firewall rule to permit SIP traffic from the Untrust zone to the Trust zone and reference the DIP pool. You also configure a rule to permit SIP traffic from the Trust to the Untrust zone, which enables hosts in the Trust zone to register with the proxy in the Untrust zone.

1. Add a NetScreen-204 device named Office B. Choose Model when adding each device and configure as running ScreenOS 5.1.

2. Configure ethernet1 (Trust Zone) for Office B:
   - Double-click Office B device to open the device configuration. In the device navigation tree, select Network > Interface.
   - Double-click ethernet1. The General Properties screen appears.
   - Configure IP address/netmask as 10.1.1.1/24 and Interface Mode as NAT.
   - Click OK to save your changes.

3. Configure ethernet3 (Untrust Zone) for Office B:
   - Double-click ethernet3. The General Properties screen appears.
   - Configure IP address/netmask as 1.1.1.1/24.

4. In the interface navigation tree, select NAT > DIP, then click the Add icon. The new DIP Pool dialog box appears. Configure as detailed below, then click OK:
   - For ID, enter 4.
   - For Start, enter 1.1.1.20.
   - For End, enter 1.1.1.40.
   - Select Incoming NAT.
   - Click OK again to save your changes to the device.

5. Create a Global DIP to reference the Incoming NAT DIP on Office B. You use a Global DIP when configuring NAT in a firewall rule; the Global DIP references the Incoming NAT DIP for an individual device.
   - In the navigation tree, select Object Manager > NAT Objects > DIP.
   - Click the Add icon to display the new Global DIP dialog box.

6. Configure the Global DIP.

7. Configure firewall rules:
   - Rule 1 handles outgoing SIP traffic, and uses the outgoing interface to perform NAT.
Rule 2 handles incoming SIP traffic, and uses the Interface DIP to perform NAT.

**Interface Configuration Examples**

The following sections explain each interface type and provide configuration examples.

**Configuring an Aggregate Interface**

An aggregate interface combines two or more physical interfaces, enabling each member to share equally the traffic load on the aggregate interface IP address. Use an aggregate interface to increase the amount of bandwidth available to a single IP address. You can also provide redundancy: If one member of an aggregate interface fails, the other members can continue processing traffic—although with less bandwidth than previously available.

The NetScreen-5000 series supports aggregate interfaces with Secure Port Modules (SPMs):

- The 5000-8G SPM supports up to four aggregate interfaces.
- The 5000-24FE SPM supports up to five aggregate interfaces.

You must assign one of the following names to the aggregate interface: aggregate1, aggregate2, aggregate3, aggregate4, or aggregate5.

In this example, you combine two Gigabit Ethernet mini-GBIC ports, each running at 1 Gbps, into an aggregate interface (aggregate1) running at 2-Gbps. The aggregate interface combines Ethernet ports 1 and 2 on a 5000-8G SPM (residing in Slot 2) and is bound to the Trust zone.

1. Add a NetScreen-5200 device running ScreenOS 5.x, then configure the network module:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Slot**.
   - Double-click slot 2 to display the slot configuration dialog box. For Card Type, select **5000-8G SPM**.
   - Click **OK** to save the slot configuration.

2. Configure the aggregate interface:
   - In the device navigation tree, select **Network > Interface**.
   - Click the Add icon and select **Aggregate Interface**. The General Properties screen appears.

3. Configure the following:
   - For Zone, select **Trust**.
   - For IP address/netmask, enter **10.1.1.0/24**.
For Interface Mode, ensure that the mode is set to **NAT**.

Click **OK** to save your changes.

4. Add the ethernet 2/1 interface as a member of the aggregate1 interface.
   - In the device navigation tree, select **Network > Interface**. Double-click **ethernet2/1**. The General Properties screen appears.
   - Configure the Parent Aggregate Interface as aggregate1.
   - Click **OK** to save your changes.

5. Add the ethernet 2/2 interface as a member of the aggregate1 interface.
   - In the device navigation tree, select **Network > Interface**. Double-click **ethernet2/2**. The General Properties screen appears.

6. Configure the Parent Aggregate Interface as aggregate1.

7. Click **OK** to save your changes.

8. Click **OK** to save your changes to the device.

### Configuring a Multilink Interface

On available devices, you can configure and access multiple serial links called a bundle, through a virtual interface called a multilink interface. The multilink interface emulates a physical interface for the transport of frames.

In this example, you combine two WAN subinterfaces into an multilink interface. The name of the multilink interface must be mlid_num. For example, multilink interface names can be ml1, ml2, and so on.

1. Add an SSG 520 device running ScreenOS 5.1SSG, then configure the network module:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Slot**.
   - Double-click **slot 2** to display the slot configuration dialog box. Select a Card Type.
   - Click **OK** to save the slot configuration.

2. Configure the multilink interface:
   - In the device navigation tree, select **Network > Interface**.
   - Click the Add icon and select **Multilink Interface**. The General Properties screen appears.

3. Configure the following:
   - For Name, accept the default.
   - For Zone, select **Trust**.
   - For Encapsulation Type, select **mlfr-uni-nni**.
4. Configure MLFR options:
   - For Name, accept the default.
   - For Zone, select Trust.

5. Click OK to save your changes.

Configuring a Loopback Interface

A loopback interface emulates a physical interface on a security device. However, unlike a physical interface, a loopback interface is always in the up state as long as the device on which it resides is up. You might want to use a loopback interface as:

- The management interface—You can manage the device using either the IP address of a loopback interface or the manage IP address that you assign to a loopback interface.
- A Virtual Security Interface (VSIs) for NSRP—The physical state of the VSI on the loopback interface is always up. The interface can be active or not, depending upon the state of the VSD group to which the interface belongs.
- A source interface for specific traffic (such as syslog packets) that originates from the device—When you define a source interface for an application, the specified source interface address is used instead of the outbound interface address to communicate with an external device.

Loopback interfaces are named loopback.id_num, where id_num is a number greater than or equal to 1 (the maximum id_num value you can specify is platform-specific) and denotes a unique loopback interface on the device. Like a physical interface, you must assign an IP address to a loopback interface and bind it to a security zone.

**NOTE:** You cannot bind a loopback interface to a HA zone, nor can you configure a loopback interface for layer 2 operation or as a redundant/aggregate interface. You cannot configure the following features on loopback interfaces: NTP, DNS, VIP, secondary IP, track IP, or Webauth.

After defining a loopback interface, you can then define other interfaces as members of its group. Traffic can reach a loopback interface if it arrives through one of the interfaces in its group. Any interface type can be a member of a loopback interface group—physical interface, subinterface, tunnel interface, redundant interface, or VSI.

In this example, you create the loopback interface loopback.1, bind it to the Untrust zone, and assign the IP address 1.1.1.27/24 to it.

1. Add a device.
2. Configure the loopback interface:
   a. In the device navigation tree, select Network > Interface.
   b. Click the Add icon and select Loopback Interface. The General Properties screen appears.
c. Configure the following:
   - For zone, select **Untrust**.
   - For IP Address/Netmask, enter **1.1.1.27/24**.
   - Ensure that Manageable is enabled.
   - Ensure that the Management IP is 1.1.1.27.

d. Click **OK** to save the new interface.

e. Click **OK** to save your changes to the device.

**Configuring Virtual Security Interfaces (VSIs)**

Virtual security interfaces (VSIs) are the virtual interfaces that two security devices forming a virtual security device (VSD) share when operating in high availability (HA) mode. Network and VPN traffic use the IP address and virtual MAC address of a VSI. The VSD then maps the traffic to the physical interface, subinterface, or redundant interface to which you have previously bound the VSI. When two security devices are operating in HA mode, you must bind security zone interfaces that you want to provide uninterrupted service in the event of a device failover to one or more virtual security devices (VSDs). When you bind an interface to a VSD, the result is a virtual security interface (VSI).

For more information about VSIs, see “Configuring NSRP Clusters” on page 283.

**Configuring a Redundant Interface**

A redundant interface combines two physical interfaces to create one redundant interface, which you can then bind to a security zone. One of the two physical interfaces acts as the primary interface and handles all the traffic directed to the redundant interface; the other physical interface is the secondary interface and stands by. If the primary interface fails, traffic to the redundant interface fails over to the secondary interface, which becomes the new primary interface.

Because redundant interfaces enable failover at the interface level, before a failure escalates to the device failover level, they are often used when deploying two security devices in a High Availability configuration. You can use the dedicated physical redundant HA interfaces or bind two generic interfaces to the HA zone (you can also create redundant security zone interfaces). Then, if the link from the primary interface to the switch becomes disconnected, the link fails over to the secondary interface, preventing a device failover from the VSD primary to backup.

**NOTE:** You cannot combine subinterfaces in a redundant interface. However, you can define a VLAN on a redundant interface in the same way that you can define a VLAN on a subinterface.

In this example, devices A and B are members of two VSD groups—VSD group 0 and VSD group 1—in an active/active configuration. Device A is the primary device of VSD group 0 and the backup in VSD group 1. Device B is the primary device of
VSD group 1 and the backup in VSD group 0. The devices are linked to two pairs of redundant switches—switches A and B in the Untrust zone, and switches C and D in the Trust zone.

Because devices A and B are members of the same NSRP cluster, device A propagates all interface configurations to device B except the manage IP address, which you enter on the redundant2 interface on both devices. You put ethernet1/1 and ethernet1/2 in redundant1, and ethernet2/1 and ethernet2/2 in redundant2. On the redundant2 interface, you define a manage IP of 10.1.1.21 for device A and a manage IP of 10.1.1.22 for device B on this interface.

The physical interfaces that are bound to the same redundant interface connect to different switches:

- Physical interfaces bound to a redundant interface in the Untrust zone: ethernet1/1 to switch A, ethernet1/2 to switch B
- Physical interfaces bound to a redundant interface in the Trust zone: ethernet2/1 to switch C, ethernet2/2 to switch D.

By putting ethernet1/1 and ethernet2/1 in their respective redundant interfaces first, you designate them as primary interfaces. If the link to a primary interface becomes disconnected, the device reroutes traffic through the secondary interface to the other switch without requiring the VSD primary device to fail over.

The physical interfaces do not have to be in the same security zone as the redundant interface to which you bind them. IP addresses for multiple VSIs can be in the same subnet or in different subnets if the VSIs are on the same redundant interface, physical interface, or subinterface. If the VSIs are on different interfaces, they must be in different subnets. The following table lists IP addresses for the VSIs.

<table>
<thead>
<tr>
<th>Table 11: VSI IP Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>redundant1 210.1.1.2/24</td>
</tr>
<tr>
<td>redundant2 10.1.1.1/24</td>
</tr>
</tbody>
</table>

In this example, if the cable from ethernet1/1 becomes disconnected, the port fails over to ethernet1/2. Consequently, all the traffic to and from devices A and B passes through switch B. Reconnecting the cable from ethernet1/1 on device A to switch A automatically causes that interface to regain its former priority.

1. Add the cluster and member devices:
   - For cluster, specify NetScreen-500 security devices running ScreenOS 5.1.
   - Add member Device A.
   - Add member Device B.

2. Create a new VSD definition for the cluster:
   - Double-click the Office 1 Cluster to open the cluster configuration.
   - In the cluster navigation tree, select Members.
In the VSD Definitions area, click the Add icon.

Enter 2, then click **OK** to save the new VSD definition.

3. Configure the cluster network module (slot1):
   - In the cluster navigation tree, select **Network > Slot**.
   - Double-click **slot 1** to display the slot configuration dialog box. For Card Type, select **2 Interfaces (10/100)**.
   - Click **OK** to save the slot configuration. Repeat process to add a new network module for slot 2.

4. Configure the redundant1 interface:
   - In the cluster navigation tree, select **Network > Interface**.
   - Click the **Add** icon and select Redundant Interface. The General Properties screen appears.

5. Configure the following, then click **OK**:
   - For Zone, select **Untrust**.
   - For IP address/netmask, enter **210.1.1.1/24**.
   - Ensure that Manageable is enabled.
   - Ensure that the Management IP is 210.1.1.1.

6. Add ethernet1/1 as a member of the redundant1 interface:
   - In the cluster navigation tree, select **Network > Interface**. Double-click ethernet1/1. The General Properties screen appears.
   - Configure the Redundant Interface Group as redundant1, then click **OK** to save your changes.

7. Add ethernet1/2 as a member of the redundant1 interface:
   - In the cluster navigation tree, select **Network > Interface**. Double-click ethernet1/1. The General Properties screen appears.
   - Configure the Redundant Interface Group as redundant1, then click **OK** to save your changes.

8. Configure the redundant2 interface:
   - In the cluster navigation tree, select **Network > Interface**.
   - Click the **Add** icon and select Redundant Interface. The General Properties screen appears.

9. Configure the following, then click **OK**:
   - For Zone, select **Trust**.
   - For IP address/netmask, enter **10.1.1.1/24**.

10. Add ethernet2/1 as a member of the redundant2 interface:
In the cluster navigation tree, select **Network > Interface**. Double-click `ethernet1/1`. The General Properties screen appears.

For Redundant Interface Group, select `redundant2`.

Click **OK** to save your changes.

11. Add `ethernet2/2` as a member of the `redundant2` interface:
   - In the cluster navigation tree, select **Network > Interface**. Double-click `ethernet1/1`. The General Properties screen appears.
   - For Redundant Interface Group, select `redundant2`.
   - Click **OK** to save your changes.

12. Add the VSI interface for `redundant1`:
   - In the cluster navigation tree, select **Network > Interfaces**. Click the Add icon and select **VSI**. The General Properties screen appears.

13. Configure the following, then click **OK**:
   - For Name, select `redundant1`, then select 1 (for VSD Group 1).
   - For IP address/Netmask, enter `210.1.1.2/24`.
   - Ensure that Manageable is enabled.

14. Add the VSI interface for `redundant2`:
   - In the cluster navigation tree, select **Network > Interfaces**. Click the Add icon and select **VSI**. The General Properties screen appears.

15. Configure the following, then click **OK**:
   - For Name, select `redundant2`, then select 1 (for VSD Group 1).
   - For IP address/Netmask, enter `10.1.1.2/24`.
   - Ensure that Manageable is enabled.
   - Click **Apply** to apply your changes to the cluster and propagate the settings to each member device.

16. Configure the Manage IP address for each member device:
   - In the cluster navigation tree, select **Members**, then double-click **Device A**.
   - In the device navigation tree, select **Network > Interfaces**, then double-click `redundant2`. The General Properties screen appears.
   - For Management IP, enter `10.1.1.21`, then click **OK** to save your changes.

   - In the cluster navigation tree, select **Members**, then double-click **Device B**.
   - In the device navigation tree, select **Network > Interfaces**, then double-click `redundant2`. The General Properties screen appears.
   - For Management IP, enter `10.1.1.22`, then click **OK** to save your changes.

17. Click **OK** to save your changes to the cluster.
Configuring a Subinterface

A subinterface, like a physical interface, is a doorway through which traffic enters and exits a security zone. You can logically divide a physical interface into several virtual subinterfaces, each of which borrows the bandwidth it needs from the physical interface. Subinterfaces use names that indicate their physical interface, such as ethernet3/2.1 or ethernet2.1.

You can create three types of subinterfaces:

- None (For ScreenOS 5.0 devices only)—The subinterface does not use VLAN tagging.
- Tagged interface (VLAN)—Using VLAN tagging, the subinterface distinguishes between traffic bound for it from traffic bound for other interfaces. For details on configuring VLAN tagging, see “Using VLAN IDs” on page 205.
- Encapsulated (For ScreenOS 5.1 and higher devices only)—Using encapsulation, you can create a PPPoE subinterface that does not use VLAN tagging. PPPoE subinterfaces enable the device to handle multiple PPPoE sessions over one physical interface.

**NOTE:** The number of PPPoE sessions per physical interface is determined by the security device platform. For information about configuring multiple PPPoE instances on one interface, see “Configuring PPPoE” on page 86.

You can create a subinterface on any physical interface in the root system or virtual system, and you can bind a subinterface to the same zone as its physical interface or to a different zone. However, the IP address of a subinterface must be in a different subnet from the IP addresses of all other physical interfaces and subinterfaces.

In this example, you create a subinterface for the Trust zone in the root system. You configure the subinterface on ethernet1, which is bound to the Trust zone. You bind the subinterface to a user-defined zone named “accounting”, which is in the trust-vr. You assign it subinterface ID 3, IP address 10.2.1.1/24, and VLAN tag ID 3. The interface mode is NAT.

1. Add a device.
2. Configure a new zone:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Zone.
   - Click the Add icon and select Security Zone. The General Properties Screen appears.
3. Configure the following, then click OK:
   - For Name, enter accounting.
   - For Virtual Router, select trust-vr.
4. Configure the Subinterface:
   - In the device navigation tree, select Network > Interface.
5. Configure the following, then click OK:
   - For Name, select `ethernet1`, then select 3.
   - For VLAN tag, enter 3.
   - For Zone, select `accounting`.
   - For IP Address/Netmask, enter `10.2.1.1/24`.
   - Ensure that Manageability is enabled.
   - Ensure that the Management IP is 10.2.1.1.
   - For Interface Mode, select NAT.

6. Click OK to save your changes to the device.

**Configuring a WAN Subinterface**

Multilink Frame Relay (MLFR) for User-to-Network Interface (UNI) on available devices allow for the creation of one or more permanent virtual circuits (PVCs) within the bundle. You create a PVC by configuring a subinterface to the multilink interface. Each subinterface maps to a PVC, which is identified by a data-link connection identifier (DLCI). Note that each PVC can be associated with a separate security zone; the security zone for each PVC can be different from the security zone assigned to the multilink interface.

In this example, you create a subinterface for the multilink interface and assign it to a security zone. Then assign a Frame Relay DLCI and IP address to the subinterface.

1. On an SSG 520 device running ScreenOS 5.1SSG, add a multilink interface and assign it to the Trust zone.

2. Add and configure a WAN-Sub Interface:
   - In the device navigation tree, select `Network > Interface`.
   - Click the Add icon and select **WAN-Sub Interface**. The General Properties screen appears.

3. Configure the following, then click OK:
   - For Name, select the multilink interface that you want to assign the subinterface to. The subinterface name consists of the multilink interface name and a subinterface number. For example, if the multilink interface name is ml1, its subinterfaces can be ml1.1 and ml1.2
   - For Zone, select Trust.

4. Click OK to save your changes to the device.
Configuring a Tunnel Interface

A tunnel interface is a doorway to a VPN tunnel. VPN traffic enters and exits a VPN tunnel via a tunnel interface. When you bind a tunnel interface to a VPN tunnel, you can use that tunnel interface to route VPN traffic to a specific destination.

**NOTE:** VPN Manager automatically creates the necessary tunnel interfaces for route-based VPNs. For device-level VPNs, you can create the tunnel interfaces before or after creating the VPN.

When creating a route-based VPNs, you must create a tunnel interface to enable the security device to route traffic VPN traffic. You can bind a route-based VPNs tunnel to a tunnel interface that is either numbered (with IP address/netmask) or unnumbered (without IP address/netmask).

**Using Numbered Tunnel Interfaces**

When the tunnel interface is numbered, you must give the interface an IP address and bind the tunnel interface to a tunnel zone. Using numbered tunnel interfaces enables you to use NAT services for policy-based VPN tunnels. Assign an IP address to a tunnel interface if you want the interface to support one or more dynamic IP (DIP) pools for source address translation (NAT-src) and mapped IP (MIP) addresses for destination address translation (NAT-dst).

You can create a numbered tunnel interface in a security zone or a tunnel zone.

**Using Unnumbered Tunnel Interfaces**

When the tunnel interface is unnumbered, you must specify the interface from which the tunnel interface borrows an IP address. The security device uses the borrowed IP address as a source address when the device itself initiates traffic—such as OSPF messages—through the tunnel. Use unnumbered tunnel interfaces when the tunnel interface does not need to support NAT services, and your configuration does not require the tunnel interface to be bound to a tunnel zone.

You can created an unnumbered tunnel interface that borrows the IP address from an interface in the same security zone or from an interface in a different zone, as long as both zones are in the same routing domain. However, you cannot bind the tunnel interface to a tunnel zone.

**Configuring Maximum Transmission Unit (MTU) Size**

(This option is supported by some security devices.) As packets traverse different networks, a networking component sometimes needs to break a packet into smaller pieces (fragments) based upon the maximum transmission unit (MTU) of each network. The networking component for the destination network must then reassemble the received fragments into a packet. Because fragmentation and reassembly can impact network performance, you might want to fragment a packet destined for a VPN tunnel as it passes through the tunnel interface (before the packet is encrypted and/or encapsulated).
For devices running ScreenOS 5.1 and higher, you can define an MTU size that controls the size of packets sent through the tunnel. When the tunnel interface receives the packet, it breaks the packet into fragments based on the specified MTU size, encrypts and/or encapsulates each fragment, then sends the traffic through the tunnel. As these packets (fragments) pass through other networks, they might be small enough that networking components do not need to perform further fragmentation—which reduces the network load and can decrease the time it takes to send VPN traffic. The receiving networking component (security device or external device) must still reassemble the fragments as they exit the other end of the VPN tunnel.

To configure an MTU size for a tunnel interface, in the tunnel interface navigation tree, select Advanced Properties and enter a value for MTU Size. By default, the size is set to none (the interface does fragment packets entering a VPN tunnel). The acceptable range is from 800 to 1500.

**Configuring an ADSL Interface**

Asymmetric Digital Subscriber Line (ADSL) is a Digital Subscriber Line (DSL) technology that enables existing telephone lines to carry both voice telephone service and high-speed digital transmission. To use ADSL with a security device, you must configure the adsl1 interface on the NetScreen-5GT ADSL security device (which supports ADSL).

**About ADSL**

Traditional telephone lines use analog signals to carry voice service through twisted-pair copper wires. However, when using analog transmission, the service provider can use only a small portion of the available bandwidth. To work around this limitation, the service provider can use digital transmission to access a wider bandwidth on the same media, at the same time. Because the service provider separates analog and digital transmissions, you can use your telephone and connect the Internet with your computer at the same time on the same line.

At the service provider’s central office, the Digital Subscriber Line Access Multiplexer (DSLAM) connects many DSL lines to a high-speed network such as an Asynchronous Transfer Mode (ATM) network. ADSL transmission is *asymmetric* because the rate at which you can send data (the *upstream* rate) is considerably less than the rate at which you can receive data (the *downstream* rate). ADSL is ideal for Internet access because most messages sent to the Internet are small and do not require much upstream bandwidth, while most data received from the Internet require greater downstream bandwidth.

You can use the ADSL port on the NetScreen-5GT ADSL security device to enable Internet access for a network—without adding additional phone lines, and without using an additional ADSL modem. For details on connecting and cabling the NetScreen-5GT ADSL, see the *NetScreen-5GT ADSL User’s Guide*.

**About the ADSL Interface**

The ADSL interface on the NetScreen-5GT ADSL security device uses ATM as its transport layer. The interface supports multiple permanent virtual circuits (PVCs),
which are continuously-available logical connections to the network, on a single physical line (the adsl1 interface). You can configure additional virtual circuits on the device by creating subinterfaces (such as adsl1.1, adsl1.2).

Before you can configure the adsl1 interface, however, you must obtain the DSLAM configuration details for the ADSL connection from the service provider, as detailed below.

**ADSL Settings (Provided by the Service Provider)**

The service provider for ADSL Internet access must provide you with some details about the ADSL connection so you can configure the security device to connect to their servers. Not all service providers use the same implementation of ADSL; you might be given any combination of the following ADSL parameters:

- Virtual Path Identifier and Virtual Channel Identifier (VPI/VCI), which identify the virtual circuit on the DSLAM.
- ATM encapsulation method (Multiplexing mode). The ADSL interface on the security device supports the following ATM Adaptation Layer 5 (AAL5) encapsulations:
  - Virtual Circuit (VC)-based multiplexing, in which each protocol is carried over a separate ATM virtual circuit.
  - Logical Link Control (LLC), which enables several protocols to be carried on the same ATM virtual circuit (default encapsulation method). This is the default option for the ADSL1 interface on the NetScreen-5GTADSL security device.

The service provider must tell you the type of multiplexing used on the ADSL line.

- Point-to-Point Protocol (PPP) is a standard protocol for transmitting IP packets over serial point-to-point links, such as an ATM PVC. The security device supports the following methods of transporting PPP packets:
  - PPP over Ethernet (PPPoE). RFC 2516 describes the encapsulation of PPP packets over Ethernet. For more information about PPPoE, see “Configuring PPPoE” on page 86.
  - PPP over AAL5 (PPPoA). RFC 1483 describes the encapsulation of network traffic over AAL5. For more information about PPPoA, see “Configuring PPPoA” on page 92.

If the service provider’s network uses PPPoE or PPPoA, the service provider must give you the user name and password for the connection, the authentication method used, and any other protocol-specific parameters.

- IP addresses. The service provider might give the network a static IP address or a range of IP addresses. The service provider should also give you the address of the DNS server to use for DNS name and address resolution.

- Discrete multitone (DMT) is a method for encoding digital data in an analog signal. By default, the ADSL interface uses Auto Detect mode, in which it automatically negotiates the DMT operating mode with the service provider.
DSLAM. You can change the mode on the adsl1 interface to force the interface to use only one of the following DMT standards:

- American National Standards Institute (ANSI) T1.413 Issue 2, which supports rates up to 8 Mbps downstream and 1 Mbps upstream.
- International Telecommunications Union (ITU) G.992.1 (also known as G.dmt), which supports minimum data rates of 6.144 Mbps downstream and 640 kbps upstream.
- ITU 992.2 (also known as G.lite), which supports up to data rates of 1.536 Mbps downstream and 512 kbps upstream. This standard is also called “splitterless DSL” because you do not have to install a signal splitter on your ADSL line (the service provider’s equipment splits the signal remotely).

**Supported Port Modes**

The port mode of a NetScreen-5GT ADSL device determines the binding of physical ports, logical interfaces, and zones.

- **Trust-Untrust port mode** (default)—This port mode uses the following default settings:
  - Binds the ADSL port to the adsl1 interface, which is bound to the Untrust zone.
  - Binds ethernet ports 1-4 to the ethernet1 interface, which is bound to the Trust zone.

- **Home-Work port mode**—Creates special Home and Work zones to segregate business and home users, while allowing users in both zones to access the Internet (the Untrust zone) through the ADSL interface. This port mode uses the following default settings:
  - Binds ethernet ports 1 and 2 to the ethernet1 interface, which is bound to the Work security zone.
  - Binds ethernet ports 3 and 4 to the ethernet2 interface, which is bound to the Home security zone.
  - Permits all traffic from the Work zone to the Untrust zone.
  - Permits all traffic from the Home zone to the Untrust zone.
  - Permits all traffic from the Work zone to the Home zone.
  - Denies all traffic from the Home zone to the Work zone (you cannot remove this policy)

  In the Home-Work port mode, you must manage the device from the Work zone. You cannot configure the device from the Home zone, nor can you use any management services on the Home zone interface. The default IP address of ethernet1, the Work zone interface, is 192.168.1.1/24.

- **Trust-Untrust-DMZ port mode**—This port mode uses the following default settings:
  - Binds ethernet ports 1 and 2 to the ethernet1 interface, which is bound to the Trust security zone.
Binds ethernet ports 3 and 4 to the ethernet2 interface, which is bound to the DMZ security zone.

Binds the ADSL port to the adsl1 interface, which is bound to the Untrust security zone.

**NOTE:** The Trust/Untrust/DMZ port mode is supported only on the Extended version of the NetScreen-5GT ADSL device.

For all supported port modes, the adsl1 interface is the only interface bound to the Untrust zone by default.

You can change the port mode to use different port, interface, and zone bindings on the device. For more information about port modes, see the “Zones” chapter in the “Fundamentals” volume of the Concepts & Examples ScreenOS Reference Guide.

**Creating a Backup Link**

When using ADSL, the adsl1 interface serves as the primary connection to the Internet. However, you can configure a backup connection to the Internet using the Untrusted ethernet port or the Modem port on the security device.

**NOTE:** You can configure only one backup interface.

To configure the backup interface, bind both the adsl1 and backup interface to the Untrust zone to automatically configure the interface failover. If the ADSL interface becomes unavailable, the security device automatically sends outgoing traffic to the backup interface, which connects to the ISP account. When the ADSL interface is again available, the device automatically sends outgoing traffic to the adsl1 interface.

To configure the serial interface for the Modem, you must have the following information:

- Login and password for the account to the dialup service provider

**NOTE:** All passwords handled by NSM are case-sensitive.

- Primary phone connection for dialing into the account
- Modem initialization string

For more information about configuring the serial interface on a security device, see the “Interface Redundancy” chapter in the “High Availability” volume of the Concepts & Examples ScreenOS Reference Guide.

For details on configuring the Modem and ISP settings for the serial interface in NSM, see “Configuring Modem Connection” on page 93.
In this example, you configure a NetScreen-5GT ADSL security device to permit internal hosts to access the Internet through the ADSL interface and permit Internet users to access a local Web server while protecting other internal hosts. To segregate traffic flow to the Web server from the rest of the internal network, configure the Web server in the DMZ, then create a firewall rule that permits HTTP traffic only to the DMZ zone.

1. Add the NetScreen-5GT ADSL security device as ADSL 1 (device name). To enable the DMZ zone, select the Trust/Untrust/DMZ port mode.

2. Configure the ADSL interface (adsl1 interface in the Untrust zone):
   - Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Interface.

3. Right click the adsl1 interface and select Edit. The General Properties screen appears. Using the information you previously obtained from the service provider, configure the following:
   - For VPI, enter 0; for VCI, enter 35.
   - For Multiplexing Mode, select VC Multiplexing.
   - For IP address/netmask, enter 1.1.1.1/24.
   - Ensure that Manageable is enabled.
   - Ensure that the Management IP is 1.1.1.1.
   - Ensure that the Mode is NAT.

4. In the interface navigation tree, select NAT > MIP. Configure the following:
   - For Mapped IP, enter 1.1.1.5.
   - For Netmask, enter 32.
   - For Host IP, enter 10.1.1.5.
   - Ensure that the Host Virtual Router is set to trust-vr.

5. Click OK to add the MIP, then click OK again to save your changes to the ADSL interface.

6. Configure the Trust interface (ethernet1 in the Trust zone).

7. Right-click ethernet1 and select Edit. The General Properties screen appears. Configure the interface to use an IP address and netmask of 192.168.1.1/24. For Interface Mode, select NAT.

8. Select the DHCP Server IP Pools tab, then configure the following:
   - For starting IP, enter 192.168.1.3.
   - For Value, select End IP.
   - For ending IP, enter 192.168.1.33.

9. In the interface navigation tree, select DHCP. For DHCP Mode, select DHCP Server.
10. Click **OK** to add the new IP pool, then click **OK** again to save your changes to the Trust interface.

11. Configure the DMZ interface (ethernet2 in the DMZ zone).

12. Double-click ethernet2. The General Properties screen appears. Configure the interface to use an IP address and netmask of 10.1.1.1/24. For Interface Mode, select **NAT**.

13. Click **OK** to save your changes to the DMZ interface, then click **OK** again to save and apply your changes to the device configuration.

14. Create a Global MIP to reference the MIP you created for the adsl1 interface. You use a Global MIP when configuring NAT in a Security Policy rule; the Global MIP references the MIP for an individual device, enabling you to use one object (the Global MIP object) to represent multiple MIPs in a single rule.

15. In the navigation tree, select **Object Manager > NAT Objects > MIP**.

16. Click the **Add** icon to display the new Global MIP dialog box.

17. Configure the Global MIP.

18. Create a firewall rule that routes inbound HTTP traffic from any address in the Untrust zone to the MIP host (the Web server) in the DMZ zone. Configure the rule.

In this example, you configure a NetScreen-5GT ADSL security device to connect to the Internet using PPPoA and the ADSL interface. The device acts as both a PPPoA client and a DHCP server:

- As a PPPoA client, the device receives the IP address for the ADSL interface. However, the device also receives one or more IP addresses for DNS servers.
- As DHCP server, the device provides hosts in the Trust zone with their IP addresses and the IP addresses of the DNS servers.

1. Add the NetScreen-5GT ADSL security device.
   - For device name, enter **ADSL PPPoA**.
   - Select **Model Device**.
   - For device platform, select **ns5GTadsl-Trust-Untrust**.

2. Configure the ADSL Interface. In the device navigation tree, select **Network > Interface**. Right-click the ADSL1 interface and select **Edit**. Configure the General Properties tab following:
   - For VPI, enter 0; for VCI, enter 35.
   - For Multiplexing Mode, select **LLC/SNAP Encapsulation**.
   - Ensure that Manageable is enabled and that the Management IP is 0.0.0.0.
   - Ensure that the zone is Untrust and the Mode is Route.

3. Leave all other defaults and click **OK** to save your changes to the interface.

4. Configure the Trust interface:
Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Interfaces**.

Right-click **ethernet1** and select **Edit**. The General Properties screen appears. Configure the interface to use an IP address and netmask of 192.168.1.1/24. For Interface Mode, select **NAT**.

In the interface navigation tree, select **DHCP**. For DHCP Mode, select **DHCP Server**.

5. Select the DHCP Server IP Pools tab, then configure the following:
   - For starting IP, enter **192.168.1.3**.
   - For Value, select **End IP**.
   - For ending IP, enter **192.168.1.33**.

6. Click **OK** to add the new IP pool, then click **OK** again to save your changes to the Trust interface.

7. Configuring the PPPoA instance:
   - In the device navigation tree, select **Network > PPPoA**. Right-click the Trust interface and select **Edit**.

8. Click the Add icon to create a new PPPoA instance, then configure the following:
   - For PPPoA Instance, enter **poa1**.
   - For Interface, select the **adsl1** interface.
   - For Username, enter **Alex**.
   - For Password, enter `tSOCbme4NW5iYPshGxCy67Ww48ngtHC0Bw==`
   - Select **Update DHCP Server**.

9. Leave all other defaults and click **OK** to save the PPPoA instance, then **OK** to save the device configuration.

After you have updated the device with the modeled configuration, the device administrator can activate PPPoA on local network.

First, the device administrator powers down the NetScreen-5GTADSL security device and all workstations in the Trust zone, then powers on just the device. The device makes a PPPoA connection to the DSLAM, and obtains the IP address for the ADSL interface and the IP addresses for the DNS servers.

Finally, the device administrator powers on the workstations to activate DHCP; the workstations automatically receive the IP address for the DNS server and obtain an IP address for themselves when they attempt a TCP/IP connection.

In this example, you configure the NetScreen-5GTADSL security device as a firewall with the primary Internet connection through the ADSL interface using PPPoE and a backup Internet connection through the serial modem port and dialup connection.

1. Add the NetScreen-5GT ADSL security device.
   - For device name, enter **ADSL PPPoE**.
1. Select **Model Device**.
   - For device platform, select `ns5GTadsl-Home-Work`.

2. Configure the ADSL Interface. In the device navigation tree, select **Network > Interface**. Right-click the ADSL1 interface and select **Edit**. Configure the General Properties tab:
   - For VPI, enter 0; for VCI, enter 35.
   - For Multiplexing Mode, select **LLC/SNAP Encapsulation**.
   - Ensure that the zone is Untrust and the Mode is Route.

3. Leave all other defaults and click **OK** to save your changes to the ADSL interface.

4. Configure the Work interface:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Interfaces**.
   - Right-click `ethernet1` and select **Edit**. The General Properties screen appears. Configure the interface to use an IP address and netmask of 192.168.1.1/24. For Interface Mode, select **NAT**.

5. In the interface navigation tree, select **DHCP**. For DHCP Mode, select **DHCP Server**.

6. Select the DHCP Server IP Pools tab, then configure the following:
   - For starting IP, enter **192.168.1.3**.
   - For Value, select **End IP**.
   - For ending IP, enter **192.168.1.33**.
   - Click OK to add the new IP pool, then click **OK** again to save your changes to the Work interface.

7. Configure the Home interface:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Interfaces**.
   - Right-click `ethernet2` and select **Edit**. The General Properties screen appears. Configure the interface to use an IP address and netmask of 192.168.2.1/24. For Interface Mode, select **NAT**.

8. In the interface navigation tree, select **DHCP**. For DHCP Mode, select **DHCP Server**.

9. Select the DHCP Server IP Pools tab, then configure a new DHCP IP Pool:
   - For starting IP, enter **192.168.2.2**.
   - For Value, select **End IP**.
   - For ending IP, enter **192.168.2.5**.
10. Click **OK** to add the new IP pool, then click **OK** again to save your changes to the Home interface.

11. Configuring the PPPoE instance:
   - In the device navigation tree, select **Network > PPPoE**. Right-click the Trust interface and select **Edit**.

12. Click the **Add** icon to create a new PPPoE instance:
   - For PPPoE Instance, enter **poe1**.
   - For Interface, select the **adsl1** interface.
   - For Username, enter **Alex**.
   - For Password, enter `tSOCbme4NW5iYPshGxCy67Ww48ngtHC0Bw = =`
   - Select **Update DHCP Server**.

13. Leave all other defaults, then click **OK** to save the PPPoE instance.

14. Configure the backup interface (the serial interface on the modem port):
   - Double-click the device icon to open the device configuration. In the device navigation tree, select **Network > Interfaces**.
   - Right-click serial interface and select **Edit**. The General Properties screen appears.
   - For Zone, select **Untrust**.

15. Configure the ISP settings for the serial interface:
   - In the device navigation tree, select **Network > Dial > ISP**.

16. Create a new ISP and configure the following:
   - For ISP Name, enter **isp1**.
   - For Login Name, enter **kgreen**.
   - For Password, enter **98765432**.
   - For Primary Number, enter **4085551111**.
   - For Alternative Number, enter **4085552222**.
   - Ensure that the Priority is **1**.

17. Click **OK** to save the new ISP.

18. Configure the Modem settings for the serial interface:
   - In the device navigation tree, select **Network > Dial > Modem**.

19. Select the Modem tab and configure the following:
   - For Modem Name, enter **mod1**.
   - For Init String, enter `AT&FS7=255S32=6`
Select Is Active.

20. Click OK to save the new modem settings, then click OK again to save your changes to the device configuration.

**NOTE:** The ISP and Modem settings automatically apply to the serial interface; you do not need to manually assign them to the Modem port.

**Configuring a Wireless Interface**

A wireless interface handles wireless traffic on a NetScreen-5GT Wireless security device that is configured as a wireless access point (WAP). The following table lists the wireless interfaces are prebound to security zones.

**Table 12: Wireless Interfaces Prebound to Security Zones**

<table>
<thead>
<tr>
<th>Wireless1</th>
<th>Wzone1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless2</td>
<td>Trust or Work (binding depends on port mode)</td>
</tr>
<tr>
<td>Wireless3</td>
<td>DMZ or Home (binding depends on port mode)</td>
</tr>
<tr>
<td>Wireless4</td>
<td>Wzone2 (available only on the NetScreen-5GT Wireless security device with Extended license key and Extended port mode)</td>
</tr>
</tbody>
</table>

Each wireless interface must use a separate subnet from all other wireless and wired interfaces. To shutdown an interface, enable the option Shutdown Interface in the General Properties for the interface.

To enable the wireless interface to handle wireless traffic, you must associate the interface with a service set identifier (SSID). The SSID links its basic service set (BSS) with the interface, which in turn is prebound to a security zone. Because there can be only one BSS per security zone, the rules you apply to that zone also apply to the BSS in that zone. For details on binding a wireless interface to an SSID, see “Configuring Wireless SSIDs” on page 304.

**Configuring DIP Groups**

Use a DIP group to combine two DIP pools for two security devices that are in an active/active NRSP configuration. When specifying the NAT settings in the rule options for a Security Policy rule, you can select a DIP group instead of a single DIP pool.

Selecting a DIP group in the policy enables NAT using the DIP pool that exists on either device in the HA configuration. Typically, two security devices in an active/active configuration share the same configuration, and both devices process traffic simultaneously. When you define a policy to perform NAT using a DIP pool located on one VSI, because that VSI is active only on the device acting as the primary device of the VSD group to which the VSI is bound, any traffic sent to the other device—the one acting as the backup of that VSD group—cannot use that DIP pool and is dropped.
To solve this problem, you can create two DIP pools—one on the Untrust zone VSI for each VSD group—and combine the two DIP pools into one DIP group, which you reference in the policy. Each VSI uses its own VSD pool even though the policy specifies the DIP group.

If you do not use a DIP group, the security device that acts as the backup of a VSD group cannot use a DIP pool located on the VSI of the primary of the VSD group. For more details about DIP groups on security devices, see the “Fundamentals” volume in the *Concepts & Examples ScreenOS Reference Guide*.

In this example, you configure a DIP group that includes the DIP pools of two security devices in an active/active NRSP configuration. By combining the DIP pools located on both Untrust zone VSIs (for VSD groups 0 and 1) into one DIP group, Devices A and B can both process traffic matching policy “out-nat”, which references not an interface-specific DIP pool but the shared DIP group.

1. Create the Cluster.

   In the navigation tree, select **Device Manager > Devices**. Click the **Add** icon and select Cluster. Configure the Cluster as shown below:

   - Add the following two cluster members to the cluster: NS-208 A, NS-208 B. Choose Model when adding each device.
   - Configure the untrust interface for VSD group 0.
   - In the cluster navigation tree, select **Network > Interface**.
   - Double-click **ethernet3** (untrust interface on the NS-208 A). The General Properties screen appears.
   - Configure the IP address as 1.1.1.1 and the Netmask as 24. Leave all other settings as default.

2. Select **NAT > DIP** to display the Dynamic IP dialog box. Configure the following and click **OK**:

   - For DIP ID, enter 5.
   - For Start, enter 1.1.1.20.
   - For End, enter 1.1.1.29.
   - Click **OK** to save your changes.

3. Configure the trust interface for VSD group 0.

4. In the cluster navigation tree, select **Network > Interface**.


6. Configure the IP address as 10.1.1.1, the Netmask as 24. Leave all other settings as default.

7. Click **OK** to save your changes.

8. Configure the untrust interface for VSD group 1:

   - In the cluster navigation tree, select **Network > Interface**.
• Right-click ethernet3 and select New > VSI.

9. Configure the IP address as 1.1.1.2 and the Netmask as 24. Leave all the default values for all other settings.

10. Select NAT > DIP to display the Dynamic IP dialog box. Configure the following and click OK:
   • For DIP ID, enter 6.
   • For Start, enter 1.1.1.30.
   • For End, enter 1.1.1.39.

11. Click OK to save your changes.

12. Configure the trust interface for VSD group 1.

13. In the cluster navigation tree, select Network > Interface.

14. Right-click ethernet1 and select New > VSI.

15. Configure the IP address as 10.1.1.2, the Netmask as 24. Leave all other settings as default.

16. Click OK to save your changes.

17. Create the DIP group:
   • In the cluster navigation tree, select Network > DIP Group.
   • Click the Add icon in the DIP Group configuration screen. The Dynamic IP dialog box appears.
   • Configure the DIP Group Name as 7, and select DIP members 5 and 6.
   • Click OK to close the Dynamic IP dialog box, then click OK to close save your changes.
   • Select DIP Translation Stickiness to ensure that the device assigns the same IP address from a DIP pool to a host for multiple concurrent sessions.
   • In the cluster navigation tree, select Network > Advanced > DIP.
   • Select DIP Translation Stickiness.
   • Click OK to save your changes.

   For details on DIP Translation Stickiness, see “Configuring DIP Options” on page 99.

18. Create a Global DIP to reference the DIP group for the cluster. You use a Global DIP when configuring NAT in a firewall rule; the Global DIP references the DIP pool or DIP group for an individual device or cluster, enabling you to use one object (the Global DIP object) to represent multiple DIP pools or DIP groups in a single rule.
   • In the navigation tree, select Object Manager > NAT Objects > DIP.
   • Click the Add icon to display the new Global DIP dialog box.
Configure the Global DIP.

Click OK to save your changes.

19. Configure a firewall rule to use the Global DIP object for NAT translation.

Configuring PPP

Use the PPP option to configure how the device handles Point-to-Point Protocol (PPP) connections. PPP encapsulation allows different Network Layer protocols to be multiplexed simultaneously over commonly used physical links. To establish a PPP connection, you configure each end of a PPP link by exchanging Link Control Protocol (LCP) packets. LCP is used to establish, configure, and test data-link options. These options include encapsulation format options, authentication of the peer on the link, handling of varying limits on sizes of packets, detecting a looped-back link and other common misconfiguration errors; determining when a link is functioning properly or failing; and terminating the link.

PPP allows for authentication during link establishment to permit or deny connection to a device. This authentication can be performed using either Password Authentication Protocol (PAP) or Challenge-Handshake Authentication Protocol (CHAP). These authentication protocols are intended for use primarily by hosts and routers that connect to a network server via switched circuits or dial-up lines but can also be used with dedicated lines.

For an interface with PPP encapsulation, you must configure a PPP access profile and bind it to the interface. You create an access profile with a user-defined name that is unique on the SSG device. You can bind the same access profile to more than one interface, but only one profile can be assigned to an interface. A PPP access profile includes the following information:

- PPP Profile Name
- Auth Local Name
- Auth Secret
- Auth Type
- Passive Mode Chap
- Static IP
- Netmask

Configuring PPPoE

Use the PPPoE option to configure how the device handles Point-to-Point Protocol over Ethernet (PPPoE) connections. PPPoE enables multiple users at a site to share the same digital subscriber line, cable modem, or wireless connection to the Internet. Some security devices support PPPoE, which enables them to operate compatibly on DSL, Ethernet Direct, and cable networks run by ISPs that use PPPoE for their clients’ Internet access.
NOTE: Some ISPs use DHCP for their clients’ Internet access. To configure DHCP on an interface, see “Dynamic Host Configuration Protocol” on page 49. For more detailed explanation about PPPoE or DHCP on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

On devices that support PPPoE, you can configure a PPPoE client instance on any or all interfaces. You configure a specific instance of PPPoE with a user name and password and other parameters, and bind the instance to an interface. When two Ethernet interfaces (a primary and a backup) are bound to the Untrust zone, you can configure one or both interfaces for PPPoE. Specifically:

- For all security devices running ScreenOS 5.0 and higher, you can enable PPPoE on multiple interfaces in any zone at the same time.
- For all security devices running ScreenOS 5.1 and higher, you can bind a PPPoE instance to a:
  - VSI interface. Use this option when running two devices using NSRP in Active-Passive mode: When failover occurs, the new primary device can use the same IP as the previous primary device to continue communicating with the ISP. Because the PPPoE connection is maintained, downtime during failover is minimized. To bind PPPoE instance to a VSI interface, you must have already created the NSRP cluster and the VSI interfaces.
  - Subinterface. Use this option to enable multiple PPPoE sessions on one physical interface. To bind the PPPoE instance to a subinterface, you must have already created the subinterface. For details, see “Configuring a Subinterface” on page 71.

NOTE: The number of PPPoE sessions per physical interface is determined by the security device platform.

**Automatic Update of DNS Servers**

When you initiate a PPPoE connection, your ISP automatically provides the IP addresses for the Untrust zone interface and the IP addresses for the Domain Name Service (DNS) servers. When the device receives DNS addresses via PPPoE, the new DNS settings overwrite the local settings by default.

If you do not want the new DNS settings to replace the local settings, enable the setting Manual IP Configuration when configuring a PPPoE instance. If you use a static IP address for the Untrust zone interface, you must obtain the IP addresses of the DNS servers and manually enter them on the security device and on the hosts in the Trust zone.

In this example, the security device receives a dynamically assigned IP address for its Untrust zone interface (ethernet3) from the ISP. Because the device also dynamically assigns IP addresses for the three hosts in its Trust zone, the device acts both as a PPPoE client and a DHCP server. The Trust zone interface must be in either NAT mode or Route mode. In this example, it is in NAT mode.
Before setting up the site in this example for PPPoE service, you must have the following: a Digital subscriber line (DSL) modem and line, an account with an ISP, and a user name and password (obtained from the ISP).

1. Add a NetScreen-5GT device running 5.0 named “Device A”.

2. Configure the ethernet1 interface (Trust Interface):
   - In the device navigation tree, select **Network > Interface**.
   - Double-click the ethernet1 interface. The General Properties screen appears.

3. Configure the General Properties:
   - For Zone, select **Trust** (default setting).
   - For IP Address, enter IP Address 172.16.30.10.
   - For Netmask, enter 24
   - Ensure that Manageable is enabled and that the Management IP is 172.16.30.10.
   - For Interface Mode, select **NAT** (default setting).

4. In the interface navigation tree, select **DHCP**. Set the DHCP mode to **DHCP Server** and configure as shown below:
   - For DNS #1, DNS #2, and Client Gateway, enter 0.0.0.0
   - For Lease Time, enter 60 (60 minutes).
   - Leave all other defaults

5. Select the IP Pools tab, then click the **Add** icon. The New DHCP IP Pool dialog box appears. Configure the following:
   - For IP Address, enter 172.16.30.2
   - For Value, select **End IP**.
   - For End of Dynamic IP Range, enter 172.16.30.5

6. Click **OK** to save the new IP Pool, then click **OK** to save your changes to the interface.

7. Configure the ethernet3 interface (Untrust Interface):
   - In the device navigation tree, select **Network > PPPoE**.

8. Click the **Add** icon. The New PPPoE Instance dialog box appears. Configure the following:
   - For PPPoE Instance, enter eth3-pppoe.
   - For Interface, select ethernet3.
   - For username, enter user1.
   - For password, enter 123456.
For Concentrator-Name, enter ac-11

Leave all other defaults.

9. Click **OK** to add the instance, then click **OK** again to save your changes to the device.

10. Activate PPPoE and DHCP on the network:

11. Turn off the power to the DSL modem, the security device, and any connected workstations.

12. Turn on the DSL modem.

13. Turn on the security device. The device makes a PPPoE connection to the ISP and, through the ISP, gets the IP addresses for the DNS servers.

14. To activate DHCP on the Internal Network, turn on the workstations. The workstations automatically receive the IP addresses for the DNS servers. They get an IP address for themselves when they attempt a TCP/IP connection. Every TCP/IP connection that a host in the Trust zone makes to the Untrust zone automatically goes through the PPPoE encapsulation process.

### Configuring Multiple PPPoE Sessions on a Single Interface

Some security devices support multiple PPPoE sub-interfaces (each with the same MAC address) for a given physical interface. On such devices, you can make a PPPoE connection on multiple instances by binding each sub-interface to a different PPPoE instance. You can determine which traffic the device sends over a particular PPPoE session by configuring routes that specify a specific PPPoE sub-interface for each session (no rules determine the flow of traffic). IPSec tunnels can terminate on such PPPoE sub-interfaces.

The maximum number of concurrent PPPoE sessions on a physical interface is limited only by number of sub-interfaces allowed by the device. There is no restriction on how many physical interfaces can support multiple sessions. You can specify username, static-ip, idle-timeout, auto-connect and other parameters separately for each PPPoE instance or session.

To support a PPPoE session, a sub-interface must be untagged. A tagged sub-interface uses an associated VLAN tag to enable the sub-interface to receive Layer 2 traffic and direct it selectively to a particular VLAN, which usually resides in a trusted zone. VLAN tags allow a single physical interface to direct exchanged packets selectively to and from VLANs, each through a different sub-interface.

By contrast, an untagged interface does not use a VLAN tag to identify a VLAN for a sub-interface. Instead, it uses a feature called encap, which binds the sub-interface to a particular defined PPPoE definition. By hosting multiple sub-interfaces, a single physical interface can host multiple PPPoE instances. You can configure each instance to go to a specified AC (Access Concentrator), thus enabling separate entities (such as ISPs) to manage the PPPoE sessions through a single interface.

In the following example you define three PPPoE instances:
Instance isp_new_york, password “swordfish,” bound to interface ethernet3. This instance provides access to a service named “Big_Apple_Service”. The AC is named “isp_ny_ac”.

Instance isp_los_angeles, password “marlin”, bound to sub-interface ethernet3.1. This instance provides access to a service named “Angels_Service”. The AC is named “isp_la_ac”.

Instance isp_chicago, password “trout”, bound to sub-interface ethernet3.2. This instance provides access to a service named “Windy_City_Service”. The AC is named “isp_c_ac”.

1. Add a NetScreen-208 device running ScreenOS 5.1 named “Device A”.
2. In the main navigation tree, select Devices > Security Devices. Double Device A to open the device configuration.
3. In the device navigation tree, select Network > Interfaces. Configure the subinterfaces for the Los Angeles and Chicago ISPs.

   Click the Add icon and select Sub Interface. The General Properties screen appears. Configure as shown below:
   - For Name, select ethernet 3.
   - For Tag, select 1.
   - For Sub Interface Type, select **encap**.
   - For Encap, select **pppoe**.
   - For Zone, select **Untrust**.

4. Leave all other defaults and click **OK** to save the new Sub Interface.
5. Click the Add icon and select Sub Interface. The General Properties screen appears. Configure as following:
   - For Name, select **ethernet 3**.
   - For Tag, select 2.
   - For Sub Interface Type, select **encap**.
   - For Encap, select **pppoe**.
   - For Zone, select **Untrust**.
   - Leave all other defaults and click **OK** to save the new Sub Interface.

6. Configure the PPPoE Instance for the New York ISP:
   - In the device navigation tree, select **Network > PPPoE**.
   - Click the Add icon. The New PPPoE Instance dialog box appears.

7. Configure the following, then click **OK**:
   - For Name, enter **isp_new_york**.
   - For Interface, select the physical interface **ethernet3**.
For Username, enter user1@domain1.

For Password, enter swordfish.

For Access Concentrator, enter isp_ny_ac.

For Service, enter Big_Apple_Service.

Select Clear On Disconnect.

Leave all other defaults.

8. Configure the PPPoE Instance for the Los Angeles ISP:
   - In the device navigation tree, select Network > PPPoE.
   - Click the Add icon. The New PPPoE Instance dialog box appears.

9. Configure the following then click OK:
   - For Name, enter isp_los_angeles.
   - For Interface, select the subinterface ethernet3.1.
   - For Username, enter user2@domain2.
   - For Password, enter marlin.
   - For Access Concentrator, enter isp_la_ac.
   - For Service, enter Angels_Service.
   - Select Clear On Disconnect.
   - Leave all other defaults.

10. Configure the PPPoE Instance for the Chicago ISP:
    - In the device navigation tree, select Network > PPPoE.
    - Click the Add icon. The New PPPoE Instance dialog box appears.

11. Configure the following, then click OK:
    - For Name, enter isp_chicago.
    - For Interface, select the subinterface ethernet3.2.
    - For Username, enter user3@domain3.
    - For Password, enter trout.
    - For Access Concentrator, enter isp_c_ac.
    - For Service, enter Windy_City_Service.
    - Select Clear On Disconnect.
    - Leave all other defaults.

12. Click OK to save your changes to the device.
Configuring PPPoA

PPPoA is typically used for PPP sessions that terminate on a security device with an ADSL interface (the NetScreen-5GT ADSL security device). On the ADSL interface (or its subinterfaces), you can configure a PPPoA client instance with a user name, password, and other parameters, then bind the instance to the ADSL interface (or subinterface).

When the NetScreen-5GT ADSL security device initiates a PPPoA connection to the PPPoA server (controlled by the service provider), the server automatically provides the IP addresses for the Untrust zone interface and for the Domain Name Service (DNS) servers. Using this information, the security device automatically updates the DNS server addresses in its DHCP server (you can disable this automatic update if desired).

For details and an example of configuring an ADSL interface with PPPoA, see “Configuring an ADSL Interface” on page 74.

Configuring NACN

Use the NACN option to configure NetScreen Address Change Notification (NACN). NACN is available only on security devices running ScreenOS 5.0.x. Before NSM can contact a security device, it must have the current IP address of the device interface. This is relatively easy when the security device has a static IP address on its interface. However, an interface on a security device can have a dynamically assigned IP address, using either PPPoE or DHCP. In these cases, the security device uses NACN to monitor a specific interface and then register with NSM the IP address of the interface whenever it changes. This prevents interruption of communication between NSM and the security device.

For more detailed explanation about NACN on security devices, see the “Administration” volume in the Concepts & Examples ScreenOS Reference Guide for ScreenOS 5.0.0.

Configuring Interface Failover

(This option is only available for some security devices.) Use the Failover option to configure the security device to switch over traffic from the primary interface to the backup interface, and from the backup to the primary when there are both primary and backup interfaces bound to the Untrust zone. An interface failover can occur when ScreenOS detects a physical link problem on the primary interface connection, such as an unplugged cable. You can also define the following types of interface failover:

- When certain IP addresses become unreachable through a given interface using IP tracking
- When certain VPN tunnels on the primary untrust interface become unreachable using VPN tunnel monitoring

You can also configure the security device to automatically switch to the backup interface if ScreenOS detects a failure on the primary interface connection. When
the connection through the primary interface is restored, ScreenOS automatically switches traffic from the backup interface to the primary.

By default, there is a 30-second interval before the failover occurs (the hold-down time). You can change this interval.

For more detailed explanation about interface failover on security devices, see the “High Availability” volume in the Concepts & Examples ScreenOS Reference Guide.

**Configuring Modem Connection**

(This option is only available for some security devices.) Use the Modem option to configure the security device for operation with an external modem. You can connect an external modem to the RS-232 serial port on certain security devices to enable the device to establish a PPP connection to an ISP. This provides a backup serial interface for traffic to the Untrust zone if there is a failure on the connection through the primary interface.

You can configure the following parameters for the serial link:

- **Speed (BPS)**—The maximum baud rate for the serial link (the default rate is 115200 bps).
- **Timeout**—The maximum amount of time that the serial link can be idle before ScreenOS automatically disconnects the modem (the default is 10 minutes).
- **Retry Number**—The number of times ScreenOS retries the dial-up connection if the line is busy or there is no response (the default is 3 times).
- **Retry Interval**—The interval, in seconds, between dial-up retries (the default is 10 seconds).

**Creating Modem Settings**

The modem you use for the dial-up connection must support the following features:

- Hardware flow control
- Provide clear to send (CTS) signals
- Able to respond to request to send (RTS) signals
- Asynchronous only
- Support AT command set

To create the settings for a modem:

1. Click the **Add** icon in the Modem Settings portion of the Modem configuration screen.
2. Specify the name for the modem setting.
3. Specify the modem initialization string. The modem initialization string must meet the following requirements:
Hardware flow control is recommended, but not required (you can specify no flow control)

Software flow control is not used

Result code must be displayed in verbal mode

4. Specify whether this modem setting is active. You can activate only one of the configured modem settings at a time.

5. Click OK.

Creating ISP Settings

You configure the security device to dial to an ISP account if a failover to the serial interface occurs and there is traffic to be sent. You can configure up to four ISP connections, assigning each a different priority number (1 is the highest priority). The priority number determines the order that the device uses in attempting the dial-up connection; the ISP with the highest priority is dialed first. If the device is unable to log in to the ISP account with the highest priority, it dials the ISP with the next highest priority number, and so on, until there are no more ISP configurations.

To create the settings for an ISP connection:

1. Click the Add icon in the ISP Settings portion of the Modem configuration screen.

2. Specify the name for the ISP setting.

3. Specify the login name and password for the ISP account.

4. Specify the primary phone number and optionally, an alternate phone number. If the modem uses pulse dial by default but you want to use tone dial, precede the phone number with a T. If the modem uses tone dial by default but you want to use pulse dial, precede the phone number with a P.

5. Specify the priority for this setting, relative to other configured ISP settings. The highest priority is 1.

6. Click OK.

For more detailed explanation about interface failover on security devices, see the “High Availability” volume in the Concepts & Examples ScreenOS Reference Guide.

Setting ISP Priority for Failover

When using a modem connection, a trustee administrator can manually change an ISP priority. If a failover situation occurs, the priority assigned to an ISP indicates in what order relative to other ISPs that a particular ISP will be contacted. The lower the value, the higher the priority of the ISP. The trustee admin can also check the availability of an ISP with a priority setting of zero (0).
A root administrator (not a trustee admin), can configure up to four ISPs. The priority of each ISP must be a unique number. You can also configure more than one ISP with a priority of zero.

**Configuring DNS**

Use the DNS option to configure DNS server information. Before the security device can use DNS for domain name/address resolution, you must configure the address for the primary DNS server the device should use.

**Configuring DNS Settings**

Specify the IP addresses for a Primary DNS server and a Secondary DNS server, then specify a refresh interval. You can configure the device to refresh all the entries in its DNS table by checking them with a specified DNS server at a specified time of day at regularly scheduled intervals. Alternatively, you can select Never Refresh to ensure that the device does not update its DNS table.

> **NOTE:** The device automatically attempts to refresh its DNS table after an HA failover occurs.

For more detailed explanation about configuring DNS on security devices, see the “Fundamentals” volume in the *Concepts & Examples ScreenOS Reference Guide*.

**Configuring DNS Proxy**

Use a DNS proxy to enable split DNS queries. The proxy selectively redirects the DNS queries to specific DNS servers according to partial or complete domain names. This is useful when VPN tunnels or PPPoE virtual links provide multiple network connectivity, and it is necessary to direct some DNS queries to one network, and other queries to another network.

> **NOTE:** You can configure DNS Proxy for the root device in a Vsys, but not for the individual Vsys devices.

You can use DNS proxies to make domain lookups more efficient. For example, to reduce load on the corporate server, you can route DNS queries meant for the corporate domain to the corporate DNS server, while routing other DNS queries to the ISP DNS server. You can also use DNS proxy to transmit selected DNS queries through a tunnel interface, preventing malicious users from learning about internal network configuration.

To use a DNS proxy, you must:

- Select DNS proxy on the device, in the DNS Proxy Setting screen, and
- Select DNS proxy on the interface, in the interface General Properties screen.
Additionally, you should also point the DNS servers (defined in DNS Settings) to the loopback IP address (127.0.0.1).

To configure a DNS proxy to use a default DNS server, set the Domain Name as the asterisk character (*) for the default DNS Proxy, then select the "failover" option for all non-default DNS Proxies.

In this example, you create two DNS proxy entries that selectively forward DNS queries to different servers:

- A DNS query with a FQDN containing the domain name acme.com goes out tunnel interface tunnel.1 to the corporate DNS server at 2.1.1.21. When a host sends a DNS query to the www.acme.com, the device automatically directs the query to this server, which resolves the query to 3.1.1.2.

- A DNS query with a FQDN containing the domain name acme_eng.com goes out tunnel interface tunnel.1 to the DNS server at 2.1.1.34. When a host sends a DNS query to the intranet.acme_eng.com, the device directs the query to this server, which resolves the query to 3.1.1.5.

- All other DNS queries bypass the corporate servers and go out interface ethernet3 to the DNS server at 1.1.1.23. When the host and domain name is www.juniper.net, the device automatically bypasses the corporate servers and directs the query to this server, which resolves the query to 207.17.137.68.

1. Add a NS-208 security device running ScreenOS 5.1.
2. In the main navigation tree, select Device Manager > Devices, then double-click the device to open the device configuration.
3. Add the tunnel.1 interface:
4. In the device navigation tree, select Network > Interface.
5. Click the Add icon and select tunnel interface.
6. Click OK to save the new interface.
7. Configure the Trust interface:
   - In the device navigation tree, select Network > Interface.
   - Double-click the trust interface. The General Properties screen appears.
   - Select Enable DNS Proxy.
   - Click OK to save the new interface.
8. Configure general DNS Proxy settings:
   - In the device navigation tree, select Network > DNS > DNS Proxy.
   - Select Configure DNS Proxy Instance.
   - Select Enable.
9. Add the DNS Proxy for acme.com:
   - Click the Add icon. The New DNS Proxy dialog box appears.
10. Configure as shown below, then click OK.
For Domain Name, enter .acme.com
■ For Outgoing Interface, enter tunnel.1
■ For Primary DNS Server, enter 2.1.1.21.
■ Select Failover.
■ Add the DNS Proxy for acme_eng.com:
■ Click the Add icon. The New DNS Proxy dialog box appears.

11. Configure as shown below, then click OK:
■ For Domain Name, enter .acme_eng.com.
■ For Outgoing Interface, enter tunnel.1.
■ For Primary DNS Server, enter 2.1.1.34.
■ Select Failover.
■ Add the DNS Proxy for all other DNS requests:
■ Click the Add icon. The New DNS Proxy dialog box appears.

12. Configure as shown below:
■ For Domain Name, enter *
■ For Outgoing Interface, enter ethernet3
■ For Primary DNS Server, enter 1.1.1.23.

13. Click OK to save your changes to the device.

**Configuring Dynamic DNS**

Use Dynamic DNS (DDNS) to enable client devices to dynamically update IP addresses for registered domain names. You might want to use DDNS for a security device that dynamically receives its IP address from an ISP via PPP, DHCP, or XAuth. When the device is protecting a web server, clients from the internet can access that web server using a domain name, even if the IP address of the security device changes.

**NOTE:** You can configure Dynamic DDNS for the root device in a Vsys, but not for the individual Vsys devices.

A DDNS server stores dynamically-changed addresses and associated domain names. To use DDNS, you must set up an account, including username and password, with the DDNS server, such as dyndns.org or ddo.jp. The security device updates DDNS servers with the account information periodically, or in response to IP address changes, and the DDNS server uses the account information to configure client devices.
To control how often the device updates the DDNS server, set the number of minutes between DDNS updates. The default (and recommended) value is 60 minutes; accepted range is 1-1440. However, the device might not update at every interval because the DNS server must first timeout the DDNS entry from its cache. If you set the Minimum Update Interval too low, the security device may lock you out.

In this example, you configure a security device to use the DDNS server dyndns.org for resolving changed addresses. In the DDNS settings, you define the web server as the protected host, then bind the host to the source interface (ethernet3). When the device sends an update to the ddo.jp server, the host name (www.my.host.com) is associated with the interface (ethernet3).

1. Add an NS-208 security device running ScreenOS 5.1.
2. In the main navigation tree, select Device Manager > Devices, then double-click the device to open the device configuration.
3. Configure general Dynamic DNS settings:
   - In the device navigation tree, select Network > DNS > Dynamic DNS.
   - Select Configure Dynamic DNS Instance.
   - Select Enable Dynamic DNS.
4. Add the DDNS instance for the web server:
   - Click the Add icon. The New Dynamic DNS dialog box appears.
5. Configure as shown below:
   - For ID, enter 12
   - For Server Type, select dyndns.
   - For FQDN Server Name, enter dyndns.org.
   - For Refresh Interval (Hours), enter 24.
   - For Minimum Update Interval (Minutes), enter 15.
   - For User Name of DDNS Account, enter swordfish.
   - For Password for DDNS Account, enter ad931vb.

   **NOTE:** You do not need to enter an Agent Name. The security device automatically generates the agent name using internal information, such as the ScreenOS version, serial name, and platform.

6. Click OK to save the new DDNS instance, then click OK to save your changes to the device.
Configuring Advanced Network Settings

In the Advanced Network screens, you can configure the following network settings:

- “Configuring ARP Cache Entries” on page 99
- “Configuring VIP Options” on page 99
- “Configuring DIP Options” on page 99

Configuring ARP Cache Entries

Use the ARP option to manually add entries to the Address Resolution Protocol (ARP) cache. The ARP cache contains associations of IP addresses to physical machine addresses known as Media Access Control (MAC) addresses. The ARP normally resolves unknown IP addresses and updates its cache automatically. You can manually add ARP cache entries, if necessary, for testing or troubleshooting purposes.

To add an ARP cache entry:

1. Click the Add icon in the ARP configuration screen.
2. Specify the IP address, interface, and MAC address for the ARP entry.
3. Click OK.

For more detailed explanation about configuring ARP entries on security devices, see the arp commands in the NetScreen CLI Reference Guide.

Configuring VIP Options

A virtual IP (VIP) address maps traffic received at one IP address to another address based on the destination port number in the TCP or UDP segment header. You can only set a VIP on an interface in the Untrust zone. The IP address for the VIP must be in the same subnet as an interface in the Untrust zone. (On some security devices, the IP address for the VIP can be the same address as the Untrust zone interface.) In addition, you need the following information to define a VIP:

- The IP addresses for the servers that process the requests
- The type of service you want the security device to forward from the VIP to the IP address of the host.

Use the VIP Options configuration screen to set multiple port entries for VIPs. A single VIP can support custom services with multiple port entries by creating multiple service entries under that VIP. To be able to use multiple-port services in a VIP, you need to enable multiple port services, then reset the security device.

For more detailed explanation about configuring VIPs on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

Configuring DIP Options

Use DIP Options to set DIP translation operation.
When DIP is configured on an interface, the security device normally assigns a
different source IP address for each session, even when a single host initiates several
sessions that require network address translation using the DIP pool. This random
address assignment can be problematic for services that create multiple sessions
that require the same source IP address for each session.

For example, it is important to have the same IP address for multiple sessions when
using the AOL Instant Messaging (AIM) client. You create one session when you log
in, and another for each chat. For the AIM server to verify that a new chat belongs
to an authenticated user, it must match the source IP address of the login session
with that of the chat session. If they are different—possibly because they were
randomly assigned from a DIP pool during the NAT process—the AIM server rejects
the chat session.

To ensure that the device assigns the same IP address from a DIP pool to a host for
multiple concurrent sessions, enable DIP Translation Stickiness.

For more detailed explanation about configuring DIP options on security devices,
see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference
Guide.

For details about creating a DIP group, see “Configuring DIP Groups” on page 83.

**Configuring Advanced Device Settings**

Use the advanced screens to configure advanced options for the security device. In
the device navigation tree, select Advanced to view configuration options.

The following sections detail the advanced options for security devices:

- Configuring Timeouts for Predefined Services on page 100
- Configuring SIP Settings on page 101
- Configuring MGCP Settings on page 279
- Configuring H.323 Settings on page 279
- Configuring Traffic Shaping on page 104
- Configuring Application Layer Gateways (ALGs) on page 105
- Configuring Packet Flow on page 106
- Configuring Supplemental Command Line Interface (CLI) on page 113
- Configuring TFTP/FTP Server Operation on page 113
- Configuring Host and Domain Name on page 114
- Configuring NSGP on page 114

**Configuring Timeouts for Predefined Services**

Use the Predefined Service Timeout option to configure timeouts for predefined
services. Services are types of IP traffic for which protocol standards exist. Each
service has a port number associated with it, where the access policy accepts a
request for that service. When you create an access policy, you must define a service
for it. You can select one of the predefined services or select a custom service that you have created. For predefined services, you can use the default timeout specified by the protocol or you can configure a different timeout value.

To configure a timeout for a predefined service:

1. Click the Add icon in the Predefined Service Timeout configuration screen. The Predefined Service Timeout dialog box appears.
2. Select the service from the Name scrolling list.
3. Select User-defined Value from the Timeout scrolling list.
4. Enter the timeout value.
5. Click OK.

For more information about configuring timeouts for predefined services on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

NOTE: For security devices running ScreenOS 5.2 and higher, you can also configure predefined service timeouts on virtual systems.

**Configuring SIP Settings**

Use the SIP Settings option to configure Session Initiation Protocol (SIP) as a service on the security device. SIP is an Internet Engineering Task Force (IETF)-standard protocol for initiating, modifying, and terminating multimedia sessions (such as conferencing, telephony, or multimedia) over the Internet. SIP is used to distribute the session description, to negotiate and modify the parameters of an existing session, and to terminate a multimedia session.

The device can then screen SIP traffic, permitting or denying it based on a Security Policy that you configure. SIP is a predefined service in ScreenOS and uses port 5060 as the destination port. Security devices currently do not support NAT (network address translation) with SIP.

SIP is used to distribute the session description and, during the session, to negotiate and modify the parameters of the session. SIP is also used to terminate the session.

SIP messages consist of requests from client to server and responses to requests from servers to clients with the purpose of establishing a session (or a call). A UA (User Agent) is an application that runs at the endpoints of the call and consists of two parts: the UAC (User Agent Client) that sends SIP requests on behalf of the user, and a UAS (User Agent Server) who listens to the responses and notifies the user when they arrive. Examples of User Agents are SIP proxy servers and SIP phones.

A call can have one or more voice channels. Each voice channel has two sessions (or two media streams), one for RTP and one for RTCP. When managing the sessions, the security device considers the sessions in each voice channel as one group. Settings such as the inactivity timeout apply to a group as opposed to each session.
Setting SIP Inactivity Timeouts

You can configure the following types of inactivity timeouts that determine the lifetime of a group:

- **Signaling Inactivity Timeout**—This parameter indicates the maximum length of time (in seconds) a call can remain active without any SIP signaling traffic. Each time a SIP signaling message occurs within a call, this timeout resets. The default setting is 43200 seconds (12 hours).

- **Media Inactivity Timeout**—This parameter indicates the maximum length of time (in seconds) a call can remain active without any media (RTP or RTCP) traffic within a group. Each time a RTP or RTCP packet occurs within a call, this timeout resets. The default setting is 120 seconds.

If either of these timeouts expire, the security device removes all sessions for this call from its table, thus terminating the call.

Select any of the appropriate checkboxes to pass messages that cannot be decoded by the device in either Route Mode or NAT Mode:

- Pass Nonparsable packets in Router Mode
- Pass Nonparsable packets in NAT Mode

Configuring SIP Firewall Features

Multiple SIP INVITE requests can overwhelm a SIP proxy server. You can configure the security device to monitor INVITE requests (and the proxy server replies) to protect SIP proxy servers.

- **SIP Attack Protection**—To drop multiple, identical SIP INVITE messages, configure SIP Attack Protection and enter the number of seconds for which you want to drop similar packets. If SIP proxy server reply contains a 3xx, 4xx, or 5xx response code, the ALG stores the source IP address of the request and the IP address of the proxy server in a table. The security device checks all INVITE requests against this table and discards matching packets for the specified number of seconds.

- **Destination IP Server Protection**—To protect a specific SIP proxy server from multiple identical SIP INVITE requests, configure Destination IP Server Protection for a specific IP address and netmask.

  - If you do not specify a specific SIP proxy server, SIP Attack Protection monitors all SIP traffic for multiple identical SIP INVITE messages.
  - If you do specify a specific SIP proxy server, SIP Attack Protection monitors only SIP traffic destined for the specified SIP proxy server.

For more detailed explanation about configuring SIP on security devices, see the “Fundamentals” volume in the *Concepts & Examples ScreenOS Reference Guide.*
Configuring MGCP Settings

To configure Media Gateway Control Protocol (MGCP), use the MGCP Settings option. MGCP is a text-based, application layer protocol that can be used for call setup and call control. The protocol is based on a master/slave call control architecture: the media gateway controller (call agent) maintains call control intelligence, and media gateways carry out the instructions from the call agent.

Setting MGCP Inactivity Timeouts

You can configure the following types of inactivity timeouts that determine the lifetime of a group:

- Inactive Media Timeout in seconds—This parameter indicates the range a call can remain inactive without any MGCP traffic. Each time an MGCP message occurs within a call, this timeout resets. If the timeout value is reached, the security device removes all sessions for this call from its table, thus terminating the call. The default setting is 120 seconds and the range of values is 10-255 seconds.

- Transaction Timeout in seconds—This parameter indicates the range of time a call can remain inactive between the gateway and the Certificate Authority (CA). If the timeout value is reached, the security device removes all sessions for this call from its table, thus terminating the call. The default setting is 30 seconds and the available values range from 5-50 seconds.

- Maximum call duration in minutes—This parameter indicates the maximum length of time a call can remain inactive between the gateway and the Certificate Authority (CA). The call is cleared if the transaction times out. The default is 720 minutes.

As a firewall, it might be necessary to parse all messages strictly and drop the unidentified messages. However, the following options are available to pass messages that cannot be decoded by the device in either Route Mode or NAT Mode:

- Pass unidentified MGCP message in route mode
- Pass unidentified MGCP message in nat mode

Configuring MGCP Firewall Features

The MGCP firewall features allow you to enable flood protection to and from the gateway.

- Connection Flood Protection to/from Gateway—Control pinhole connections by setting a limit to the rate of CRCX command processing. CRCX commands that exceed the limit are dropped. The range is 1-65,535 and the default is 1,000.

- Message Flood Protection to/from Gateway—Messages are dropped if they arrive at a rate (in seconds) higher than the configured rate. The range is 1-200 and the default is 200 seconds.

For more information about configuring MGCP on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.
Configuring H.323 Settings

H.323 application layer gateway (ALG) lets you to secure Voice-over-IP (VoIP) communication between terminal hosts, such as IP phones and multimedia devices. In such a telephony system, gatekeeper devices manage call registration, admission, and call status for VoIP calls. Gatekeepers can reside in the two different zones, or in the same zone.

The H.323 protocol ALG is enhanced to support incoming calls in NAT mode and slow start in gatekeeper routed mode. In gatekeeper routed mode, all control channel negotiations (Q.931 and H.245) are performed between the gatekeeper and the end points. The media channels, on the other hand, are opened directly between the end points.

Setting H.323 Inactivity Timeouts

When you enable H.323, the gateway is registered to the flow and reassembly. In addition, the port is also registered. If you do not enable H.323, none are registered. You can configure the following inactivity timeout that determine the lifetime of a group:

- Set incoming-table timeout value—Sets or resets the default timeout value (in seconds) for the NAT table entry. The default value is 3,600 seconds (60 minutes).

Select any of the appropriate checkboxes to pass messages that cannot be decoded by the device in either Route Mode or NAT Mode:

- Pass Nonparsable packets in Router Mode
- Pass Nonparsable packets in NAT Mode

For more detailed explanation about configuring H.323 on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

Configuring Traffic Shaping

Use the traffic shaping option to allocate an appropriate amount of network bandwidth to every user and application on a specific device interface. The appropriate amount of bandwidth is defined as cost-effective carrying capacity at a guaranteed Quality of Service (QoS). To classify traffic, you create security policies and specify the amount of guaranteed bandwidth and maximum bandwidth, and the priority for each class of traffic. You can also shape traffic at the policy level to allocate bandwidth for particular types of traffic. For information about using traffic shaping within a rule, see “Configuring Traffic Shaping in a Security Policy” on page 541.

Guaranteed bandwidth and maximum bandwidth are not strictly policy based but, with multiple physical interfaces in the egress zone, are based on both policy and total egress physical interface bandwidth available. The physical bandwidth of every interface is allocated to the guaranteed bandwidth parameter for all policies. If there is any bandwidth left over, it is sharable by any other traffic. In other words, each policy gets its guaranteed bandwidth and shares whatever is left over, on a priority basis (up to the limit of its maximum bandwidth specification), with all other policies.
Refer to “Interface Advanced Properties” on page 47 for more information describing how to configure physical settings on the device interface.

Using the traffic shaping option, you can configure the following traffic shaping parameters:

- **Priority Levels**—You can use the Traffic Shaping screen to perform priority queuing on bandwidth that is not allocated to guaranteed bandwidth, or unused guaranteed bandwidth. Queuing allows the security device to buffer traffic in up to eight different priority queues. The security device maps the eight priority levels to the first three bits in the DiffServ field, or to the IP precedence field in the ToS byte in the IP packet header. By default, the highest priority (priority 0) on the security device maps to 111 in the IP precedence field. The lowest priority (priority 7) maps to 000 in the IP precedence field.

- **Traffic Shaping Mode**—Traffic shaping is automatically determined by the device, but you can set it to on or off.

- **Clear DSCP Class Selector**—The class selector controls the number of bits affected in the DiffServ field. By default, the priority levels affect only the first three bits in the eight bit DiffServ field. The remaining bits are untouched, but can be altered by an upstream router, which might change the IP priority preference. When the DSCP class selector is enabled, the class selector zeroes the remaining five bits in the DiffServ field, which prevents upstream routers from altering priority levels.

For a more detailed explanation about configuring traffic shaping on security devices, see the “Fundamentals” volume in the Concepts & Examples ScreenOS Reference Guide.

**Configuring Application Layer Gateways (ALGs)**

Application layer gateways manage specific protocols by intercepting traffic as it passes through the security device. After analyzing the traffic, the ALG allocates resources to permit the traffic to pass securely. By default, all ALGs are enabled on a security device. In situations where a security device is receiving an excessive amount of malicious or accidental traffic of a particular type, you might want to disable the associated ALG.

You can enable or disable the following ALG protocols:

- **H323** —the H323 ALG set includes three ALGs that handle specific tasks for H.323 traffic. To disable H.323 on the security device, you must disable all of the following ALGs:
  - **H245** —This ALG is a control signaling protocol used to exchange messages between H.323 endpoints.
  - **Q931** —This ALG is a layer 3 protocol used for Integrated Services Digital Network (ISDN) call establishment, maintenance, and termination between H.323 endpoints.
- **RAS** — The Registration, Admission, and Status (RAS) ALG is used to register, control admission, change bandwidth, check status, and perform disengage procedures between H.323 endpoints and gatekeepers.
- **MSRPC** — The Microsoft Remote Procedure Call (MS-RPC) ALG enables a program running on one host to call procedures in a program running on another host. Because of the large number of RPC services and the need to broadcast, the transport address of an RPC service is dynamically negotiated based on the service program’s Universal Unique IDentifier (UUID).
- **RTSP** — The Real Time Streaming Protocol (RTSP) is used to control delivery of one or more synchronized streams of multimedia, such as audio and video.
- **SIP** — The Session Initiation Protocol (SIP) is an Internet Engineering Task Force (IETF)-standard protocol for initiating, modifying, and terminating multimedia sessions (such as conferencing, telephony, or multimedia) over the Internet. SIP is used to distribute the session description, to negotiate and modify the parameters of an existing session, and to terminate a multimedia session.
- **SQL** — The SQL ALG is used to handle SQL, a relational database management system.
- **SUNRPC** — The Sun Remote Procedure Call (SUNRPC) enables a program running on one host to call procedures in a program running on another host. Because of the large number of RPC services and the need to broadcast, the transport address of an RPC service is dynamically negotiated based on the service’s program number and version number.
- **MGCP** — The Media Gateway Control Protocol (MGCP) is supported on security devices in Route, Transparent, and Network Address Translation (NAT) modes. MGCP is a text-based Application Layer protocol used for call setup and control. MGCP is based on a master-slave call control architecture. The media gateway controller (call agent) maintains call control intelligence, while the media gateways carry out instructions from the call agent.

### Configuring Packet Flow

Use the packet flow options to configure the security device to regulate packet flow, including:
- “ICMP Path MTU Discovery” on page 107
- “Allow DNS Reply Without Matched Request” on page 107
- “Allow MAC Cache for Management Traffic” on page 108
- “Allow Unknown MAC Flooding” on page 108
- “Skip TCP Sequence Number Check” on page 108
- “TCP RST Invalid Session” on page 108
- “Check TCP SYN Bit Before Create Session” on page 109
- “Check TCP SYN Bit Before Create Session for Tunneled Packets” on page 109
- “Use SYN-Cookie for SYN Flood Protection” on page 109
- “Enforce TCP Sequence Number Check on TCP RST Packet” on page 110
The following sections detail each packet flow option.

ICMP Path MTU Discovery

The ICMP Path MTU Discovery option controls how a security device handles a packet that meets the following conditions: the Don’t Fragment (DF) bit is set in the IP header, the packet is intended for IPSec encapsulation, and the size of the packet after encapsulation exceeds the maximum transfer unit (MTU) of the egress interface, which is 1500 bytes:

- When this option is enabled, the security device sends the source host an ICMP message indicating the packet size is too large (ICMP type 3, code 4 “Fragmentation needed and DF set”).
- When this option is disabled, the security device ignores the DF bit, encapsulates the packet, fragments the packet so that none of the fragmented packets exceeds the MTU of the egress interface, and forwards them through the appropriate VPN tunnel.

By default, this option is disabled.

Allow DNS Reply Without Matched Request

Use the Allow DNS Reply Without Matched Request option to control how a security device handles DNS reply packets that do not have a matching DNS request:

- When this option is enabled, the security device does not verify that a DNS reply packet has a matching request.
- When this option is disabled and the security device receives an incoming UDP first-packet that has a destination port of 53, the device checks the DNS message packet header to verify that the query (QR) bit is 0 (0 = query message). If the QR bit is 1 (1 = response message) the device drops the packet, does not create a session, and increments the illegal packet flow counter for receiving interface.

By default, this option is disabled.
Allow MAC Cache for Management Traffic

Use the Allow Mac Cache for Management Traffic option to control how the a security device handles a source MAC address for administrative traffic:

- When this option is enabled, the security device caches the source MAC address from incoming administrative traffic, then uses that address when replying. You might need to enable this option for managed devices that use source-based routing.
- When disabled, the security device does not cache the source MAC address from incoming administrative traffic.

By default, this option is disabled.

Allow Unknown MAC Flooding

Use the Allow Unknown MAC Flooding option to control how a security device handles a packet that has a destination MAC address that is not in the MAC learning table:

- When this option is enabled, the security device permits the packet to cross the firewall.
- When this option is disabled, the security device drops the packet and does not permit it to cross the firewall.

By default, this option is enabled.

Skip TCP Sequence Number Check

Use the Skip TCP Sequence Number Check to control how a security device handles TCP packets with an out-of-sequence TCP number:

- When this option is enabled, the security device does not monitor the TCP sequence number in TCP segments during stateful inspection.
- When this option is disabled, the security device detects the window scale specified by both hosts in a session and adjusts a window for an acceptable range of sequence numbers according to their specified parameters. The device monitors the sequence numbers in packets sent between these hosts; if the device detects a sequence number outside this range, it drops the packet.

By default, this option is enabled.

TCP RST Invalid Session

Use the TCP RST Invalid Session to control how the security device handles a TCP reset packet (a TCP packet with the RST flag set):

- When this option is enabled and the security device receives a TCP reset packet, the device marks the session for immediate termination.
When this option is disabled, the security device marks the session to termination after the normal session timeout interval. Normal session timeout intervals for common protocols:

- The TCP session timeout is 30 minutes.
- The UDP session timeout is 1 minute.
- The HTTP session timeout is 5 minutes.

By default, this option is disabled.

**Check TCP SYN Bit Before Create Session**

Use the TCP SYN Bit Before Create Session option to control how a security device handles a set SYN bit in the first packet of a session:

- When this option is enabled, the security device checks that the SYN bit is set in the first packet of a session. If the SYN bit is not set, the device drops the packet and does not create the session.
- When this option is disabled, the security device does not enforce SYN checking before creating a session.

By default, security devices running ScreenOS 5.1 and higher have this option enabled. However, in previous versions of ScreenOS, this option was disabled. If you upgraded from a ScreenOS release prior to ScreenOS 5.1 and higher and did not change the default setting for this option, SYN checking remains disabled.

**Check TCP SYN Bit Before Create Session for Tunneled Packets**

Use the TCP SYN Bit Before Create Session for Tunneled Packets option to control how a security device handles a set SYN bit in the first packet arriving in a VPN tunnel:

- When this option is enabled, the security device checks that the SYN bit is set in the first packet arriving in a VPN tunnel. If the SYN bit is not set, the device drops the packet and does not create the session.
- When this option is disabled, the security device does not enforce SYN checking before creating a session in a VPN tunnel.

By default, this option is enabled.

**Use SYN-Cookie for SYN Flood Protection**

Use the Use SYN-Cookie for SYN Flood Protection option as an alternative to traditional SYN proxying mechanisms to help reduce CPU and memory usage:

- When this option is enabled on the security device, SYN-Cookie becomes the TCP-negotiating proxy for the destination server, and replies to each incoming SYN segment with a SYN/ACK containing an encrypted cookie as its Initial Sequence Number (ISN). The cookie is a MD5 hash of the original source address and port number, destination address and port number, and ISN from the original
SYN packet. After sending the cookie, the security device drops the original SYN packet and deletes the calculated cookie from memory.

- When this option is disabled, traditional SYN-Proxy becomes the TCP-negotiating proxy for the destination server.

By default, this option is disabled.

**NOTE:** This option is only available on devices running ScreenOS 5.2 and higher.

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**Enforce TCP Sequence Number Check on TCP RST Packet**

Use the Check TCP Sequence Number Check on TCP RST Packet option to control how a security device handles TCP reset (RST) packets with an out-of-sequence TCP number:

- When this option is enabled, the security device monitors the TCP sequence number in a TCP segment with the RST bit enabled. If the sequence number matches the previous sequence number for a packet in that session or is the next higher number incrementally, the device permits the packet to cross the firewall. If the sequence number does not match either of these expected numbers, the device drops the packet and sends the host a TCP ACK segment with the correct sequence number.

- When this option is disabled, the security device does not monitor the TCP sequence number in TCP segments that have a RST bit enabled.

By default, this option is disabled.

**NOTE:** The NetScreen-5000 series does not support this option.

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**Use Hub-and-Spoke Policies for Untrust MIP Traffic**

Use this option to control how the security device handles the forwarding of packets arriving in a VPN tunnel to and from a mapped IP (MIP) address:

- When this option is enabled, the security device forwards traffic arriving through a VPN tunnel to a mapped IP (MIP) address on one tunnel interface to the MIP host at the end of another VPN tunnel. The two tunnels form a hub-and-spoke configuration, with the traffic looping back on the same outgoing interface.

- When this option is disabled, the security device does not forward VPN traffic arriving at a MIP to a MIP at the other end of the VPN tunnel.

By default, this option is enabled.

**NOTE:** This option affects traffic forwarding only when the outgoing interface is bound to the Untrust zone.
**Max Fragmented Packet Size**

Use the Max Fragmented Packet Size option to control the maximum size of a packet fragment generated by the security device. You can set the number value between 1024 and 1500 bytes inclusive. For example, if a received packet is 1500 bytes and this option is set to 1460 bytes, the device generates two fragment packets: The first is 1460 bytes and the second is 40 bytes. If you reset this option to 1024, the first fragment packet is 1024 bytes and the second is 476 bytes.

By default, this option is set to none.

**Flow Initial Session Timeout (Seconds)**

Use the Flow Initial Session Timeout to control the number of seconds the security device keeps an initial TCP session in the session table before dropping it or receiving a FIN or RST packet. You can set the number of seconds from 20 seconds to 300 seconds.

By default, this option is set to 20 seconds.

**TCP MSS**

Use the TCP MSS option to control how the security device handles the TCP-MSS value for TCP SYN packets in an IPSec VPN tunnel:

- When this option is set to Packet Size, the security device modifies the MSS value in a TCP packet to avoid fragmentation caused by the IPSec operation. The default MSS for this option is 1400.
- When this option is set to Disable, the security device does not modify the MSS value in a TCP packet.

By default, this option is set to Disabled.

---

**NOTE:** When you configure a value for the All TCP MSS option, that value overrides the settings defined for this option.

---

**All TCP MSS**

Use the All TCP-MSS to control how security device handles the TCP MSS value for TCP SYN packets in all network traffic:

- When this option is set to Packet Size, the security device modifies the MSS value in a TCP packet to avoid fragmentation by other network components. You can set the TCP MSS range from 0 to 65,535 bytes; the default MSS for this option is set to none.

Additionally, this option overrides the configuration for TCP MSS (described above):
If the TCP MSS option for IPSec VPN traffic is not set, the security device applies the value specified in this option for TCP packets in an IPSec VPN tunnel.

If the TCP MSS option for IPSec VPN traffic is set, the security device overrides that value with the value from the All TCP MSS option.

When this option is set to Disable, the security device does not modify the MSS value of a TCP packet in network traffic.

By default, this option is set to Disable.

**GRE In TCP MSS**

Use the GRE in TCP MSS option to control how security device handles the TCP MSS value for Generic Routing Encapsulation (GRE) packets destined for an IPSec VPN tunnel.

- When this option is set to Packet Size, the security device modifies the MSS value in a GRE packet to avoid fragmentation caused by the IPSec operation. The TCP MSS range is 64 to 1420 bytes inclusive; the default MSS for this option is 1320.

- When this option is set to Disable, the security device does not modify the MSS value in a GRE packet entering an IPSec VPN tunnel.

By default, this option is set to Disable.

**GRE Out TCP MSS**

Use the GRE Out TCP MSS option to control how security device handles the TCP MSS value for Generic Routing Encapsulation (GRE) packets leaving an IPSec VPN tunnel.

- When this option is set to Packet Size, the security device modifies the MSS value in a GRE packet to avoid fragmentation caused by the IPSec operation. The TCP MSS range is 64 to 1420 bytes inclusive; the default MSS for this option is 1320.

- When this option is set to Disable, the security device does not modify the MSS value in a GRE packet leaving an IPSec VPN tunnel.

By default, this option is set to Disable.

**Aging**

Use the Aging options to control how the security device uses aggressive aging to affect session timeout. Aggressive aging begins when the number of entries in the session table exceeds the high-watermark setting, and ends when the number of sessions falls below the low-watermark setting. When aggressive aging is in effect, the security device ages out sessions—beginning with the oldest sessions first—at the rate you specify.

When the session table is in any other state, the normal session timeout value is applied. Normal session timeout intervals for common protocols:
The TCP session timeout is 30 minutes.

The UDP session timeout is 1 minute.

The HTTP session timeout is 5 minutes.

**Early Ageout Time Before the Session’s Normal Ageout**

Use this aging option to control how the security device uses aggressive aging to age out a session from its session table. The value range is 2 to 10 units, where each unit is 10 seconds; by default, the early-ageout value is 2, or 20 seconds.

**Percentage of Used Sessions Before Early Aging Begins**

Use this aging option to control when the security device begins aggressive aging. The value range is 1 to 100, which indicates percent of the session table capacity. By default, this option is set to 100% (used sessions must account for 100% of the session table capacity before aggressive aging begins).

**Percentage of Used Sessions Before Early Aging Stops**

Use this aging option to control when the security device ends aggressive aging. The value range is 1 to 100, which indicates percent of the session table capacity. By default, this option is set to 100% (used sessions must account for 100% of the session table capacity before aggressive aging ends).

**Configuring Supplemental Command Line Interface (CLI)**

Use the Supplemental CLI option to configure features on security devices not yet formally supported in NSM. This applies to security devices running a future release of ScreenOS.

**NOTE:** We recommend that you use the Supplemental CLI to configure features in future versions of ScreenOS only. When you perform an update, the CLI commands that you specify are sent unconditionally to the security device. NSM does not validate whether or not these commands are sent successfully. Validation errors may occur if you edit the actual configuration on the device using the supplemental CLI.

**Configuring TFTP/FTP Server Operation**

Use the TFTP/FTP option to configure a security device running to enable TFTP or FTP servers to save or import external files, such as configuration files (.cfg), ScreenOS firmware versions, public keys, error messages, certificates, and other items.

For security devices running ScreenOS 5.0 or higher, NSM does not use the TFTP server on the security device to download ScreenOS firmware versions, certificates, and CRLs to the managed device. To perform these tasks, you must install a TFTP server on the NSM Device Server. For details, see the Network and Security Manager Installation Guide.
NOTE: For security devices running ScreenOS 5.1 and higher, Network Security Manager uses SSP to download ScreenOS firmware versions, certificates, and CRLs to the managed device.

For TFTP servers, you can specify the following:

■ Source interface
■ Number of times that the server can retry a TFTP communication before the security device ends the attempt
■ Timeout (in seconds) before the device terminates an inactive TFTP connection.

You can also enable FTP servers to dynamically negotiate a data port other than port 20.

For more detailed explanation about configuring TFTP or FTP servers for security devices, see the `ip` commands in the *NetScreen CLI Reference Guide*.

**Configuring Host and Domain Name**

The Host/Domain Name option enables you to configure a host and domain name for the security device. The host name is a character string that identifies the device. The host name, combined with a domain name, enables other devices to access the security device through a DNS server. If you define a fully-qualified domain name (FQDN) for the device, you can use the FQDN as a gateway for a VPN tunnel.

For information about how to configure a hostname or domain name for a security device, see the `hostname` and `domain` commands in the *NetScreen CLI Reference Guide*.

**Configuring NSGP**

NetScreen Gatekeeper Protocol (NSGP) is a Juniper Networks proprietary peer-to-peer protocol that enables a security device to act as a server for Voice-over-IP (VoIP) traffic:

■ NetScreen-500 security devices running ScreenOS 5.0GPRS can be both the NSGP server and client.
■ NetScreen-500 and NetScreen-5000 series security devices running ScreenOS 5.0NSGP or 5.1 and higher can only be an NSGP server.

NOTE: To use NSGP on a NetScreen-500 or -5000 device, you must first enable NSGP using a license key. For information about activating NSGP using a license key, see the *Network and Security Administration Guide*.

You can use NSGP to prevent overbilling attacks that can occur when using GPRS Tunneling Protocol (GTP) for VoIP. By configuring one security device as an NSGP
server and another security device as a GTP client, you can keep both server and client aware of the connection status. When a user initiates a call, the NSGP server and GTP client establish a session; when the user completes the call, the client notifies the server, prompting the server to close the session.

Configuring NSGP on a device does not automatically enable the device to handle GTP traffic—it enables the GTP client and NSGP server to close a session at the same time. To enable the GTP client to manage GPRS traffic, you must create a GTP object, then add that object to the Security Policy installed on the device. For details on creating a GTP object and adding a GTP Object to a Security Policy, see the Network and Security Manager Administration Guide.

About Overbilling

Because each mobile station (MS) gets an IP address from an IP pool, an overbilling attack can occur when a legitimate subscriber returns an IP address to the IP pool, but the session is still open. Attackers can hijack the open session without being detected and reported, then download data at the expense of the legitimate subscriber, or send data to other subscribers. Overbilling can also occur when a newly-returned IP address is reassigned to another MS; traffic initiated by the previous MS might be forwarded to the new MS, causing the new MS to be billed for unsolicited traffic. To protect subscribers of a public land mobile network (PLMN) from Overbilling attacks, you can use the NetScreen Gatekeeper Protocol (NSGP) module and two security devices.

The NSGP module includes two components: the client and the server. The client connects to the server and sends requests, which the server processes. Both client and server support multiple connections to each other and to others simultaneously. Using TCP, NSGP monitors the connectivity between client and server by sending Hello messages at set intervals.

NSGP uses a session context to ensure that the server and client know that status of the connection. The session context stores is identified by a unique number (context ID); when configuring NSGP on the client and server devices, you must use the same context ID on each devices. When the client sends a “clear session” request to the server, the request includes the context ID and IP address of the server. When the server receives the “clear session” message, it matches the context ID and then clears the session from its table.

The security device acting as the NSGP server must run the ScreenOS 5.0GPRS firmware, and the other device acting as the GTP client must run the ScreenOS 5.0NSGP firmware. After you have deployed the two devices, you must:

- Configure NSGP on the GTP server to recognize when a GTP tunnel is deleted and to notify the GTP client.
- Configure NSGP on the GTP client to automatically clear sessions whenever the NSGP server gets a notification from the GTP client that a GTP tunnel was deleted.

By clearing the sessions, the NSGP server stops the unsolicited traffic and prevents overbilling.

In this example, you configure NSGP on both the GTP firewall (client) and the Gi firewall (server). First, you must create the GTP Object for the client connection.
Then, to enable NSGP on the security device, you must configure both the server and client side connection parameters:

- For the NSGP server connection, you enable NSGP on an interface.
- For the GTP client connection, you select a source interface, then copy the NSGP server settings (from the NSGP server device) to configure the destination interface.

Finally, you create a firewall rule that includes the GTP object, the GTP firewall, and the Gi firewall.

1. Create a GTP object named GPRS1. For information about how to create a GTP object, see the Network and Security Manager Administration Guide.

2. Add the Gi Firewall (server) as a NetScreen-500 running 5.1, then configure the network module:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Slot.
   - Double-click slot 1 to display the slot configuration dialog box. For Card Type, select 2 Interfaces (10/100), then click OK.

3. Add the GTP firewall (client) as a NetScreen-500 running 5.0GPRS, then configure the network module:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Slot.
   - Double-click slot 1 to display the slot configuration dialog box. For Card Type, select 2 Interfaces (10/100).
   - Click OK to save the slot configuration.

4. Configure the Gi firewall (server):
   - In the device navigation tree, select Advanced > NSGP Server Side.
   - Leave the default port number and enter an MD5 password.

5. In the NSGP Context IDs area, click the Add icon to display the New Context Entry dialog box. Configure the following, then click OK:
   - For Context Entry, enter 2.
   - For Zone, select untrust.

6. In the Interface NSGP Settings area, right-click ethernet1/2 and select Edit. The General Properties screen appears. Configure the following:
   - Ensure that the Zone is untrust and the Mode is Route.
   - For IP Address, enter 2.2.1.4.
   - For Netmask, enter 24.
   - Ensure that Manageable is enabled and that the Management IP is 2.2.1.4.

7. In the interface navigation tree, select Service Options. Configure the following:
   - Select Telnet.
Select NSGP Enabled.

Select Enforce IPSec to encrypt the GTP connection.

8. Click OK to save your changes to the interface, then click OK to save your changes to the device.

9. Configure the GTP firewall (client):

- In the device navigation tree, select Advanced > NSGP > NSGP Connections. Click the Add icon to display the New NSGP Connection dialog box.
- For Source Interface, select ethernet 1/2.
- For Destination, click Copy Existing NSGP Server Setting. The Copy Existing NSGP Server Info dialog box appears.

10. Configure the following:

- For NSGP Server Info, select Gi firewall (server).
- For Destination Interface, select ethernet 1/2.

11. Click OK to copy the NSGP server settings to the GTP client. NSM automatically completes the destination server settings for the GTP client.

12. In GTP Objects, select the GPRS1 object.

13. Click OK to save the NSGP Connection.

14. Configure a firewall rule to handle GTP traffic.

---

**Forced Session Timeout for Authentication**

Forced timeout, unlike idle timeout, does not depend on the idleness of the user, but on an absolute timeout after which access for the authenticated user is terminated. The auth table entry for the user is removed, as are all associated sessions for the auth table entry. The default is 0 (disabled), the range is 0 to 10000 (6.9 days).

**Defining Forced Timeout**

In the following example, if you change the authentication idle timeout value from the default (10 minutes) to 30 minutes and the RADIUS retry timeout from 3 seconds to 4 seconds, the session could theoretically remain open indefinitely (as long as one keystroke is sent every 30 minutes). You can limit total session time by setting forced-timeout to 60 minutes. With this setting, after one hour the auth table entry for the user is removed, as are all associated sessions for the auth table entry, and the user needs to reauthenticate.

**NOTE:** For detailed information on changing authentication server settings, see Concepts & Examples ScreenOS Reference Guide.
1. In the main navigation tree, select **Device Manager > Security Devices**.

2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.

3. In the main navigation tree, select **Auth > Default Servers**.

4. In the main display area, specify a valid range in minutes for the Local Auth Server Timeout.

5. Specify a valid range in minutes for the Local Auth Server Forced Timeout.

6. Click **OK** to apply your settings.

---

**Log Reason for Session Close**

NSM supports the log reason for session close feature. NSM displays the reason for session close so that you can differentiate session creation messages from session close messages. If you do not want the reason to display, you can explicitly configure the device not to display the field. Table 15 on page 118 lists the reasons for session close that NSM identifies are listed below. Any session that cannot be identified is labeled OTHER.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP FIN</td>
<td>TCP connection torn down due to FIN packet.</td>
</tr>
<tr>
<td>TCP RST</td>
<td>TCP connection torn down due to RST packet.</td>
</tr>
<tr>
<td>RESP</td>
<td>Special sessions, such as PING and DNS, close when response is received.</td>
</tr>
<tr>
<td>ICMP</td>
<td>ICMP error received.</td>
</tr>
<tr>
<td>AGE OUT</td>
<td>Connection aged out normally.</td>
</tr>
<tr>
<td>ALG</td>
<td>ALG forced session close either due to error or other reasons specific to that ALG.</td>
</tr>
<tr>
<td>NSRP</td>
<td>NSRP session close message received.</td>
</tr>
<tr>
<td>AUTH</td>
<td>Session closed due to auth failure.</td>
</tr>
<tr>
<td>OTHER</td>
<td>Reason for close not identified.</td>
</tr>
</tbody>
</table>

---

**Policy Schedule**

By associating a schedule to a policy, you can determine when the policy is in effect. You can configure schedules on a recurring basis and as a one-time event. Schedules provide a powerful tool in controlling the flow of network traffic and in enforcing network security. For an example of the latter, if you were concerned about employees transmitting important data outside the company, you might set a policy that blocked outbound FTP-Put and MAIL traffic after normal business hours.
NOTE: In the Web UI, scheduled policies appear with a gray background to indicate that the current time is not within the defined schedule. When a scheduled policy becomes active, it appears with a white background.

1. In the main navigation tree, select Object Manager > Schedule Objects.
2. Click New and fill in the schedule form.
3. Click OK to save the schedule.

You can attach a schedule to a policy as you create the policy, or you can bind the schedule later in the Web UI. For more information on Policies and Schedules, see the Network and Security Manager Administration Guide and the Concepts & Examples ScreenOS Reference Guide.
This chapter details the administrative options for the managed device, and provides administration examples when possible. For instructions on configuring specific device settings, see the Network and Security Manager Online Help.

This chapter contains the following sections:

- Configuring Device Administration on page 121
- Configuring Admin Accounts for Dialup Connections on page 126
- Configuring Authentication on page 134
- Configuring Reporting on page 279

**Configuring Device Administration**

Use the Device Administration screens to configure administrative options for the managed device. In the device navigation tree, select Device Admin to view configuration options.

This section describes configuring the following device administration options for security devices:

- “Configuring Device Administrators” on page 121
- “Configuring Permitted IPs” on page 126
- “Configuring CLI Management” on page 127
- “Configuring Web Management” on page 131
- “Configuring Date and Time Settings” on page 133

For more detailed explanation about configuring device administration on security devices, see the “Fundamentals” and “Administration” volumes in the Concepts & Examples ScreenOS Reference Guide.

**Configuring Device Administrators**

A device administrator is the person responsible for managing a device locally using ScreenOS (command line or Web UI). A security device includes one default device administrator account, the root device administrator, which has complete access to all functionality on the device. Using the Network and Security Manager (NSM), you can create 20 additional device administrators with different privilege levels.
**NOTE:** To enable a device administrator to use NAM to manage devices, you must create a NSM administrator account for the device admin. For details, see *Network and Security Manager Administration Guide*.

When you import a device configuration into NSM, device administrator accounts are not automatically imported—you must manually import the accounts from the device using a separate directive. You cannot manage device administrator functionality in NSM until you have imported the device administrator information from the physical device (the device admin screens do not appear).

To notify you when device administrator information needs to be imported, NSM displays the message “Need to Migrate Admin Info From Device.” To view this message, in the device navigation tree, select Device Administration; the message appears in the main display area. When present, this message indicates that you have not yet imported device administrators for that device. This message automatically appear after you perform the following operations:

- Adjust the ScreenOS version—For details, see *Network and Security Administration Guide*.

To import device administrator information, from the file menu, select Devices > Configuration > Import Admins.

**NOTE:** The Import Admin directive lists only ScreenOS devices.

### Configuring Authentication Servers

To authenticate device administrators when they attempt to connect to the security device, you can use the default authentication server (on the device), or an external authentication server.

The root device administrator is always stored and authenticated using the local database; however, for non-root read/write and read-only device admins (including vsys device admins), you can specify an external auth server (RADIUS, SecurID, or LDAP server) that stores device administrator accounts. To select an external server from the auth server list, you must have already created and configured an Authentication Server object in the NSM UI (for details, see “Configuring Authentication Servers” on page 122).

After the device administrator is authenticated, the auth server checks the privilege level of the device admin. A privilege level defines the privileges that are accessible to the device admin after successful logging in to the device:

- For device administrators stored in the local database, the security device uses the privilege level specified in the local device administrator account.
- For device administrators stored on an external auth server, select one of the following privilege settings:
  - Get privilege from RADIUS server—Select this option to query a RADIUS server for all external device administrator privileges. The RADIUS server
must contain the device administrator accounts and the netscreen.dct (Juniper Networks dictionary file).

- Read-Write, Read-Only—Select a privilege level that applies to all external device administrators. Although the device administrator accounts are stored on the external server, the security device provides the device administrator privilege level. Use this option when storing accounts on a SecurID or LDAP server, or when using a RADIUS server that does not contain the Juniper Networks dictionary file. By default, the external device administrator privilege level is set to Read-Only.

### Configuring Device Administrator Accounts

You must create an account for each device administrator on the managed device. The device administrator account contains a device admin privilege level, user name, password, and optional PKA keys for the admin.

Additionally, for security devices that run ScreenOS 5.0 or higher, you can configure privileges for the Trustee, such as granting the permission to configure the untrust Ethernet interface and the permission to configure the untrust modem interface.

### Configuring Privilege Level

A security device supports multiple device administrators. NSM connects to the device as the root device administrator, and has complete administrative privileges for the device.

A security device can have only one root device administrator, which cannot be deleted. Additionally, after you create the root device administrator (or import from an existing device) you cannot change the name of the root device administrator. To delete an existing root device administrator, you can change the privilege level of the administrator to a non-root privilege, then save and delete the administrator. If you delete the root device administrator, however, you must then create a new root device administrator before installing the modeled configuration on the managed device (NSM must use the root device administrator account to communicate with the managed device).

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**NOTE:** For ScreenOS 5.x devices, you can set or change the root device admin password using the directive “Set Root Admin”. To execute this directive, right-click the device in the Device Manager device list and select Device > Set Root Admin.

When you create other device administrators, you must assign a privilege level; these privileges are accessible to the device admin after successful login to the device:

- Read/Write Device Administrator—The read/write administrator has the same privileges as the root device administrator, but cannot create, modify, or remove other device administrators. Privileges include:
  - Creates virtual systems and assigns virtual system administrators
  - Monitors any virtual system
Tracks statistics (this privilege cannot be delegated to a virtual system administrator)

Read-Only Device Administrator—The read-only device administrator has only viewing privileges using the Web UI, and can only issue the get and ping CLI commands. Privileges include:

- Read-only privileges in the root system, using the following four commands: enter, exit, get, and ping
- Read-only privileges in virtual systems

**NOTE:** All System Administrators, including those assigned a Read-Only role, can create and run their own reports.

Virtual System Device Administrator (available on security devices that support virtual systems)—Each virtual system (vsys) is a unique security domain, which can be managed by virtual system device administrators with privileges that apply only to that vsys. Virtual system administrators independently manage virtual systems through the CLI or Web UI. Privileges include:

- Creates and edits auth, IKE, L2TP, XAuth, and Manual Key users
- Creates and edits services
- Creates and edits policies
- Creates and edits addresses
- Creates and edits VPNs
- Modifies the virtual system administrator login password
- Creates and manages security zones
- Adds and removes virtual system read-only administrators

Virtual System Read-Only Device Administrator (available on security devices that support virtual systems)—A virtual system read-only administrator has the same set of privileges as a read-only administrator, but only within a specific virtual system. A virtual system read-only administrator has viewing privileges for a particular vsys through the Web UI, and can only issue the enter, exit, get, and ping CLI commands within that vsys.

For any configuration change made by a device administrator, the managed device generates a log entry with the name of the device administrator making the change, the IP address from which the change was made, and the time of the change. These log entries appear as configuration logs in the NSM Log Viewer.

**Configuring Authentication**

A device administrator can authenticate a connection to a security device using one of two authentication methods: Password or Public Key (ScreenOS 5.x devices only). However, regardless of the authentication method you want the device administrator...
to use, you must initially define a password for the admin account. If you later bind a public key to the admin, the password becomes irrelevant.

Use password authentication for device administrators who need to configure or monitor the managed device. You can use this authentication method for device administrators on ScreenOS 5.x devices.

**NOTE:** All passwords handled by NSM are case-sensitive.

- To configure, enter a user name, password, and privilege level for the device administrator account, then select SSH Password Authentication.

- To connect using an SSH-aware application, the device administrator (the SSH client) initiates an SSH connection to the managed device (the SSH server). When SSH is enabled on the interface receiving the connection request, the managed device prompts the admin for user name and password, then compares that information to the information in the device admin account. If the user name and passwords match, the device authenticates the connection; if they do not match, the device rejects the connection request.

Use Public Key Authentication (PKA) for greater security, or to run automated scripts. You can use this authentication method for device administrators on a ScreenOS 5.x device.

- To configure, generate the PKA public/private key pair using the key generate program in an SSH client application (see the SSH client application documentation for more information). The key pair is RSA for SSHv1 and DSA for SSHv2. Assign the private key to the device administrator account, then load the public key on the managed device using a TFTP server or SSP (ScreenOS 5.1 and higher only).

- To connect using an SSH-aware application, the device administrator (the SSH client) initiates an SSH connection to the managed device (the SSH server). When SSH is enabled on the interface receiving the connection request, the managed device prompts the admin for user name and public key (of a public/private key pair), then compares that information with up to four public keys for that device admin account. If one of the keys matches, the device authenticates the connection; if no keys match, the device rejects the connection request.

When the managed device receives the connection request, it first checks the device administrator account for a public key bound to that administrator. If a matching key is found, the managed device authenticates the administrator using PKA; if no matching key is found, the managed device prompts for a user name and password. You can store up to four PKA keys for each device administrator.

You must enable SSH on the interface through which the device administrator connects to the managed device using an SSH connection.
**Configuring Admin Accounts for Dialup Connections**

The NS-5XT and the NS-5GT devices support a modem connection for outbound dial-up disaster recovery situations. You can set up trustee accounts for the interface or for the modem. This section describes the two types of trustees:

- **Interface trustee**
  
  An interface trustee has access only to the Untrust interface through the Web UI. An interface trustee can configure only assign the IP address for the primary Untrust zone interface. Also, an interface trustee accounts can enable or disable ping responses from an interface. Interface trustees can select either a PPPoE or DHCP client using automatic IP address assignment or a static address assignment client.

- **Modem trustee**

  A modem trustee can access, configure, and modify only the ISP1 and ISP2 settings. A modem trustee can also test and view the configurations for the ISP3 and ISP4 settings.

You can configure Modem Trustee and Interface Trustee accounts to have Read/Write or Read-Only levels of access.

The connection type to a device by a Trustee administrative account occurs exclusively, preventing any other connection type from occurring. The secure trustee connection prevents local console, Telnet, and SSH sessions to connect to the device if these other connection types attempt to use the trustee’s name or password.

**Configuring Permitted IPs**

Use permitted IPs to restrict management connections (a connection in which a device administrator attempts to log in) to specific IP addresses. By default, any host on the trust interface of the managed device can connect to the security device and attempt to log in. You can configure the device to permit management connections from one or more user-defined IP addresses only.

After you create Permitted IPs (and update the device with the modeled configuration), the device immediately begins rejecting management connections from non-permitted IP addresses. If a device administrator is managing the device using a remote network connection and the workstation is not included as a permitted IP, the security device immediately terminates the device administrator’s session.

To create a Permitted IP, click the Add icon in the Permitted IP area, then configure an IP address and netmask.

**NOTE:** Configuring a permitted IP for a device administrator does not affect the NSM–managed device connection.
Corporation A has a small network, in which a single device administrator at 172.16.40.42 is allowed to manage the security device. For this device, you create a permitted IP with an IP/Netmask of 172.16.41.42/32.

Corporation B has a large network with multiple devices. Several device administrators on the 172.16.40.0 subnet require access to all devices. For each device, you create a permitted IP with an IP/Netmask of 172.16.40.0/24.

**Configuring CLI Management**

Use the CLI management options to configure local access using a console connection, or remote access using Telnet or SSH. A device administrator can connect directly to most security devices using the console port. CLI management settings apply to all device administrators for the security device.

Additionally, to manage a device remotely using Telnet or SSH, the device administrator must use a permitted IP address to initiate a Telnet or SSH connection to the device, and the correct service option must be enabled for the interface that the device administrator connects to on the device. For details on configuring permitted IP addresses, see “Configuring Permitted IPs” on page 126; for details on configuring service options for a device interface, see the *Network and Security Manager Administration Guide*.

**Configuring the File Format**

The file format determines the format (dos or unix) of a device configuration files. The CLI commands that configure the security device are automatically stored in a text-based configuration file. Occasionally, for troubleshooting purposes, a device administrator might need to view this configuration file outside of the security device.

To configure the file format of the configuration file, select the format that matches the computer system on which the configuration files will be viewed:

- In a UNIX text file, a line of text is terminated by a line feed character. When viewing a UNIX text file on a UNIX or DOS-based system, this line feed character does not appear. If you typically view configuration files on a UNIX system, select UNIX as the file format.

- In a DOS text file, a line of text is terminated by a line feed and a carriage return (^M). When viewing a DOS text file on a UNIX system, the carriage return character appears on screen. If you typically view configuration files on a DOS-based system, select DOS as the file format.

**Configuring SSH and Telnet Ports**

You can configure the port numbers to use for SSH and Telnet connections:

- The default port for SSH client connections is 22; to change this default, enter a port number between 1024 and 32767.

- The default port for Telnet client connections is 23; to change this default, enter a port number between 1024 and 32767.
In a vsys system, the root and vsys share the same SSH port number. For example, if you change the SSH port from the default port 22, the port is also changed for all vsys.

**NOTE:** For ScreenOS 5.x devices, you can set or change the device port numbers that accept Telnet and/or SSH connections. “Set Admin Ports”. To execute this directive, right-click the device in the Device Manager device list and select **Device > Set Admin Ports**.

### Configuring Connection Attempts

To minimize unauthorized access, you can limit the number of unsuccessful login attempts allowed before the security device terminates a Telnet session. This restriction also protects against certain types of attacks, such as automated dictionary attacks.

By default, a security device allows up to three unsuccessful login attempts before it closes the Telnet session.

### Configuring Password Length Restriction

To prevent a root device administrator from using short passwords (which are easier to decode and discover), you can set the minimum length requirement for the root device administrator password to any number from 1 to 31.

However, to set this restriction, the current root device administrator password must meet the minimum length requirement you are attempting to set. If the current password is too short, NSM displays an error message.

### Configuring Asset Recovery and Reset Hardware

If the root device administrator password is lost, the device administrator can restore access in one of two ways:

- **Using Asset Recovery**—Using a console connection, the device administrator uses the **unset all** command to clear all existing configuration settings and return the device to factory defaults (for details, see the “Administration” volume in the Concepts & Examples ScreenOS Reference Guide). Device recovery is enabled by default. To disable it, clear the checkbox next to Enable Asset Recovery in the CLI Management configuration screen.

**NOTE:** A security device in FIPS mode automatically disables asset recovery.

- **Reset Hardware**—The device administrator performs a manual operation on the physical device hardware to return the device to factory defaults (for details, see the “Administration” volume in the Concepts & Examples ScreenOS Reference Guide). Reset Hardware is enabled by default. To disable it, clear the checkbox next to Enable Reset Hardware in the CLI Management configuration screen.
All configuration settings stored on the managed device are lost during an asset recovery or hardware reset. After restoring access to the device, the device administrator should perform the following tasks to enable the device to reconnect to NSM:

1. Configure the interface that connects to the management system
2. Send the new root device administrator user name and password to the NSM administrator, who should update the existing root user name and password for the device in the modeled configuration.

 NOTE: All passwords handled by NSM are case-sensitive.

3. Enable the NSM agent on the managed device.

After the device has re-connected to the management system, you (the NSM administrator) can update the device with the modeled configuration.

**Configuring Console-Only Connections**

You can require the root device administrator to log in to the security device through the console port only. This restriction requires the root device admin to have physical access to the device to log in, preventing unauthorized persons from logging in remotely.

By default, this restriction is not enabled (the root device administrator can log in remotely). To restrict access to console only, select the checkbox next to Root Access Console Only in the CLI Management screen. When enabled, the managed device denies access to all Web UI, Telnet, or SSH connections for the root device administrator. This setting overrides the management options enabled on the ingress interface.

 NOTE: This option does not appear for the Juniper Networks NSMXpress, which does not contain a console port.

Enabling the console-only setting does not affect the NSM–managed device connection.

**Configuring SSH**

Each security device includes a built-in Secure Shell (SSH) server. Device administrators can use an SSH-aware application to open a remote command shell on the device and execute commands. When using SSH, the connection is protected against IP or DNS spoofing attacks, and password or data interception.

The maximum number of SSH sessions is a device-wide limit and is between 2 and 24, depending upon the device. If the maximum number of SSH clients are already logged into the device, no other SSH client can log in to the SSH server.
To enable SSH connections to the managed device, select SSH Enable and configure an SSH Version. Because SSHv1 and SSHv2 are incompatible, you must use the same SSH version for both the client and server. For example, you cannot use an SSHv1 client to connect to an SSHv2 server on the managed device, or vice versa.

For the SSH server (the security device), you can also enable Secure Copy (SCP). A device administrator can use SCP to transfer files to or from the managed device using SSH (SSH authenticates, encrypts, and ensures data integrity for the SCP connection). When using SCP, the security device acts as an SCP server that accepts connections from SCP clients on remote hosts. Additionally, you must enable SSH for the managed device before you can enable SCP (disabled by default).

**NOTE:** For ScreenOS 5.x devices, you can enable or disable SSH for device admin connections using the directive “Set Admin SSH”. To execute this directive, right-click the device in the Device Manager device list and select **Device > Set Admin SSH**.

### Using SSH Version 1 (SSHv1)

SSHv1 is widely deployed and is commonly used. You can use a password or Public Key Authentication (PKA) to authenticate an SSHv1 connection.

When using PKA authentication for the SSHv1 server (the security device) you can also set the key generation interval for the host PKA key. When you enable SSH on a managed device, the device generates a unique host key that is permanently bound to the device (each vsys has its own host key). If SSH is disabled, then enabled again, the device uses the same host key. The security device uses the host key to identify itself to an SSH client (device administrator).

After the key is generated, it can be distributed to the SSH client in one of two ways:

- **Manually**—Send the host key to the client admin user via e-mail or phone. The device administrator stores the host key in the appropriate SSH file on the SSH client system (the SSH client application determines the file location and format).

- **Automatically**—When the SSH client connects to the managed device, the SSH server sends the unencrypted public component of the host key to the client. The SSH client searches its local host key database to see if the received host key is mapped to the address of the security device. If the host key is unknown (there is no mapping to the device address in the client’s host key database), the device admin user can accept the host key and authenticate the connection, or reject the host key and terminate the connection request.

To configure the SSH client, you must also bind the RSA PKA keys to the device administrator before that admin can make an SSH connection. For details on assigning PKA keys to a device admin, see “Configuring Device Administrator Accounts” on page 123.

**NOTE:** NSM supports PKA keys for device administrator authentication only for devices running ScreenOS 5.x.
Using SSH Version 2 (SSHv2)

SSHv2 is considered more secure than SSHv1 and is currently being developed as the IETF standard.

To configure the SSH client, you must also bind the DSA PKA keys to the device administrator before that admin can make an SSH connection. For details on assigning PKA keys to a device admin, see “Configuring Device Administrator Accounts” on page 123.

Configuring CLI Banners

You can customize the message that appears when a device administrator logs on to the security device using a console connection, Telnet, or SSH. This message, called a banner, provides confirmation to device administrators to let them know that they have successfully logged in. Banners are optional; you are not required to configure CLI banners for the security device.

A default banner already exists for Telnet and SSH, but you can write a new message to suit your needs. You can use one banner for console connection and a different banner for both Telnet and SSH connections.

To configure CLI banners:

- For console connections, enter a message in Console Login Banner text field. By default, the console banner is blank (no confirmation is provided to the device administrator upon successful login). The maximum number of characters permitted in a console banner is 127.

- For Telnet or SSH connections, enter a new message or edit the existing default message in the Telnet/SSH Login Banner text field. By default, the message “Remote Management Console” is provided to device administrators upon successful login. The maximum number of characters permitted in a Telnet or SSH banner is 127.

For ScreenOS 5.1 and higher devices, you can also configure a secondary banner for console, Telnet, or SSH connections. The secondary banner enables you to create a much longer message that appears for any successful CLI-based connection attempt. By default, the secondary banner is blank (no secondary message is provided for device administrators upon login).

Configuring Web Management

Use the Web management options to configure remote access using Hypertext Transfer Protocol (HTTP). A device administrator can use a standard Web browser and HTTP to remotely access the Web UI on the security device. Web management settings apply to all device administrators for the security device.

Additionally, to manage a device using the Web UI, the device administrator must use a permitted IP address to initiate an HTTP connection to the device, and the correct service option must be enabled for the interface that the device administrator connects to on the device. For details on configuring permitted IP addresses, see
“Configuring Permitted IPs” on page 126; for details on configuring service options for a device interface, see “Interface Service Options” on page 48.

**Configuring HTTP**

You can configure the following options for administrative connections that use HTTP:

- **Idle time for Web UI management**—The number of seconds that the HTTP connection remains idle (no traffic is flowing) before the device drops the connection.
- **Port number**—The default HTTP port number is 80. If you are running HTTP services on a different device port, enter that port number here.

Additionally, the device administrator must use a permitted IP address to initiate an HTTP connection to the device, and the Web service option must be enabled for the interface that the device administrator connects to on the device.

To secure HTTP administrative traffic, you can use the Secure Sockets Layer (SSL) protocol.

**Configuring SSL**

Secure Sockets Layer (SSL) is a set of protocols that can provide a secure connection between a Web client and a Web server communicating over a TCP/IP network. SSL consists of the SSL Handshake Protocol (SSLHP), which enables a client and server to authenticate each other and negotiate an encryption method, and the SSL Record Protocol (SSLRP), which provides basic security services to higher-level protocols such as HTTP. Using certificates, SSL authenticates the server (the security device), then encrypts the traffic sent during the session. Juniper Networks supports authentication only of the server (the security device), not the client (the device administrator); the device authenticates itself to the device administrator, but the device administrator does not use SSL to authenticate to the device. However, the device administrator must connect using a Web browser with SSL version 3 compatibility (not version 2). Netscape Communicator 4.7x and later and Internet Explorer 5.x later are SSL version 3 compatible.

During the SSL handshake, the security device sends the device administrator its self-signed certificate. The device admin encrypts a random number with the public key contained in the certificate and sends the number back to the device, which uses its private key to decrypt the number. Both participants then use the shared random number and a negotiated secret key cipher (3DES, DES, RC4, or RC4-40) to create a shared secret key, which they use to encrypt traffic between themselves. They also use an agreed-upon compression method (PKZip or gzip) to compress data and an agreed-upon hash algorithm (SHA-1 or MD-5) to generate a hash of the data to provide message integrity.

Additionally, the device administrator must use a permitted IP address to initiate an HTTP connection to the device, and the SSL service option must be enabled for the interface that the device administrator connects to on the device.
By default, SSL is disabled. To ensure that all HTTP connections to the Web UI are secure, you should enable this option. When enabled, the device automatically redirects administrative traffic using HTTP (default port 80) to HTTPS (SSL, default port 443) and authenticates using the local certificate. For device running ScreenOS 5.1 and higher, SSL uses the autogenerated, self-signed certificate on the device.

You can change the SSL configuration by editing the following SSL settings:

- Redirect HTTP to HTTPS—You can enable HTTP redirection for SSL troubleshooting, if desired.
- Certificate—By default, the security device uses an auto-generated self-signed certificate for SSL. To change the certificate used for SSL, select a certificate from the list of available certificates.
- Port—The default port for SSL connections is 443; to change this default, enter a different port number.
- Cipher—Select an encryption algorithm for SSL:
  - RC4-40 with 40-bit keys
  - RC4 with 128-bit keys
  - DES: Data Encryption Standard with 56-bit keys
  - 3DES: Triple DES with 168-bit keys
  The RC4 algorithms are paired with MD5; DES and 3DES with SHA-1.
- Authentication—Select an authentication method for SSL:
  - Message Digest version 5 (MD5)—128-bit keys
  - Secure Hash Algorithm version 1 (SHA-1)—160-bit keys

While SSL is enabled, any device administrator can connect to the security device using the SSL port. When administrative connections use SSL, in the Web browser URL field, the device admin must enter the https (instead of http) before the IP address used to manage the device. If you changed the default SSL port from 443, the device administrator must also append a colon and the SSL port number to the IP address. For example, to connect to the 5.5.5.5 interface and SSL port 1443, the device administrator must enter https://5.5.5.5:1443.

To use HTTP without SSL, disable SSL by clearing the Enable SSL checkbox. The device no longer redirects HTTP connections to SSL, and no authentication occurs for the connection.

**Configuring Date and Time Settings**

Use the Date/Time option to configure date and time synchronization on security devices. The date and time setting on the device affects VPN tunnel setup and schedule objects used in active Security Policies.

You configure the device time in relation to GMT.
Configuring Network Time Protocol (NTP)

To ensure that the security device always maintains the right time, the device can use NTP (Network Time Protocol) to synchronize its system clock with that of an NTP server on the Internet.

To use NTP, first enable Network Time Protocol, then configure the following settings:

- **Synchronization**—You can configure the security device to perform this synchronization automatically at time intervals that you specify. By default, the synchronization interface is set to 10 minutes, with a 3 second maximum adjustment threshold.

- **Authentication**—To secure NTP traffic, enable authentication. When using authentication, for each NTP server you configure on the security device, you must assign a unique Server Key ID and Preshare Key; the key id and preshare key serve to create an MD5 checksum, with which the device and the NTP server can authenticate NTP data. Select the authentication mode that the device uses when connecting to an NTP server:
  - **Required**. The device must include the authentication information—Server Key ID and MD5 checksum—in every packet it sends to a NTP server and must authenticate all NTP packets it receives from a NTP server. If authentication fails, the device denies NTP traffic from the NTP server.
  - **Preferred**. The device attempts to authenticate NTP traffic using the same methods as the Required options but continues to send and receive NTP traffic if authentication fails.
  - **None** (default mode). Select this mode if you do not want to authenticate NTP packets.

- **NTP Servers**—You can configure up to three NTP servers (one primary and two backups) from which the security device can regularly update its system clock. If you enable authentication by selecting the Required or Preferred authentication options, you must also provide a unique Server Key ID and Preshare Key for each NTP server that you configure.

Configuring an NTP Backup Server

You can specify an individual interface as the source address to direct NTP (Network Time Protocol) requests from the device over a VPN tunnel to the primary NTP server or a backup server as necessary. Among other interface types, you can select a loopback interface to perform this function.

The security device sends NTP requests from a source interface and optionally uses an encrypted preshared key when sending NTP requests to the NTP server. The encrypted preshared key provides authentication.

Configuring Authentication

The authentication screens contain the following device-wide authentication options you can configure on a security device:
The following sections explain authentication options.

**General Auth Settings**

For devices running ScreenOS 5.2, you can configure some general settings that determine how the security device handles authentication session cleanup and authentication requests.

**Clearing RADIUS Sessions**

Occasionally, overcharging can occur when a wireless user is assigned the same IP address that was used for a previously closed connection by a different user. Because the IP addresses are the same for both connections, the first wireless user might be charged for the second user’s connection time. You can prevent this problem by configuring the security device to clear RADIUS sessions for a specific IP address when the RADIUS accounting-stop message is received for that connection.

To enable session cleanup for a security device, in the device navigation tree, select Auth > General. Configure a RADIUS Accounting Listener port that monitors the connection for accounting-stop messages, then select the option RADIUS Accounting Cleanup Action: Session Cleanup.

**Assigning an Authentication Request Interface**

By default, the security device sends authentication requests using the route defined in the route table. For devices running ScreenOS 5.2, you can configure a specific outgoing source interface for requests sent to an authentication server. You might need to specify a specific interface for auth requests destined for a VPN tunnel or to route all auth requests through the same interface for authentication monitoring.

To configure a source interface, in the device navigation tree, select Auth > General, then click the Add icon in the Source Interface used for Outgoing Auth Request area. Select the Authentication Server object that represents the authentication server receiving the request, then select an interface on the device through which requests are sent.

NOTE: For details on configuring Authentication Server objects, see the *Network and Security Administration Guide*.

After you specify a source interface for auth requests, the security device routes all auth requests destined for a RADIUS, LDAP, or SecurID server through that interface (one source interface per authentication server object).
**Banners**

You can customize the message that appears when a device administrator logs on to the security device Telnet, FTP, HTTP, or via WebAuth. This message, called a banner, provides confirmation to device administrators to let them know the status of the connection. Default banners already exist, but you can write a new message to suit your needs. You can use different banners for each protocol.

**NOTE:** To configure the Telnet, SSH, or console connection banner, see “Configuring CLI Banners” on page 131.

To configure a protocol banner, select the protocol tab and edit the default Telnet, FTP, and HTTP messages:

- **Attempted Logins**—Enter a new message or edit the existing default message in the Login text field. Administrators receive this message when they are prompted for their authentication credentials.

- **Successful Logins**—Enter a new message or edit the existing default message in the Success text field. Administrators receive this message after their credentials have been authenticated and a connection has been established.

- **Failed Logins**—Enter a new message or edit the existing default message in the Fail text field. Administrators receive this message when authentication fails or when the administrator is not authorized to access the device.

To configure the WebAuth banner, select the WebAuth tab and enter a new message (or edit the existing default message in the Success text field. This message is provided to auth user when their WebAuth credentials have been authenticated and a connection has been established. The message appears at the top of a Web browser screen, after an auth user has successfully logged on to a WebAuth address. Typically, the message informs the user that the authentication was successful, but you can enter any message you want, up to a maximum of 220 characters.

Banners are optional; you are not required to configure banners for the security device.

**Default Servers**

The default servers for the security device define the authentication servers used to provide local, external, and WebAuth user authentication.

- **Local**—Each security device contains a local (database) server called auth server. The auth server is the default authentication server and can handle all types of authentication that occur on the device. User names and authentication credentials of all local users are stored in this database.

For the Local server only, you can set the authentication timeout, which is the number of minutes the connection remains active after an authentication request has been submitted and a successful authentication is received. By default, the authentication timeout on the Local authentication server is 10 minutes. To change this timeout, enter a new value.
■ External—Alternatively, you can select an external authentication server as the default server. To select an external server, you must have already created and configured an Authentication Server object in the NSM UI. You must also have defined the user accounts for all external users on the external server. For more information, see “Configuring Authentication Servers” on page 122 and the Network and Security Manager Administration Guide.

■ WebAuth—When using WebAuth, an auth user first initiates an HTTP session to the IP address of the security device that hosts WebAuth. After successful authentication, the auth user can send traffic to the destination as permitted by one or more security policies. To authenticate WebAuth users, you can use the Local authentication server (security device default) or select a previously-defined external auth server.

Infranet Settings

If you have deployed Juniper Networks Infranet Controllers as part of your network security infrastructure, you can use the Infranet Settings screen on devices running ScreenOS 5.3 and above to configure the following properties:

■ Contact Interval—this setting determines the time interval (in seconds) that the Infranet Enforcer waits before attempting to connect to the next available Infranet Controller; the default interval is set to 10 seconds.

■ Action on Timeout—if for any reason your connection to the Infranet Controller times out, the device terminates the SSH connection and clears all Infranet Controller related context. You can change this behavior by setting the timeout action to “Open”, in which case the Infranet Enforcer allows all traffic; or “No Change”, in which case the Infranet Enforcer preserves the current state of all existing tunnel sessions.

■ Enforcer Mode—use this setting to take the Infranet Enforcer out of regular mode and into “Test” mode, “Test” mode is recommended before you actually deploy the Infranet Enforcer enabling you to evaluate how the solution works. In this mode, the Infranet Enforcer allows all traffic that matches the Infranet policy. Logs are created indicating the behavior of the Infranet Enforcer as if it were operating in “Regular” mode.

■ Infranet Controllers—you can configure up to eight (8) Infranet Controllers. The order in which these are entered is used by the Infranet Enforcer to contact each Infranet Controller.

You can also configure security devices to authenticate using Infranet Controllers in a rule in a Security Policy. Refer to the Network and Security Manager Administration Guide for more information.

Configuring Reporting

The Report Settings screens contain reporting options that you can set for the device. In the Device dialog box, open the Report Settings heading to see configuration options.
For information about configuring reporting settings, “Configuring General Reporting Settings” on page 138.

For more information about reporting concepts for the security devices, see the “Administration” volume in the Concepts & Examples ScreenOS Reference Guide.

**Configuring General Reporting Settings**

Use the General reporting settings to configure the severity levels of the messages you want to log and where you want those messages sent. Each system event on a security device is assigned a level of severity. By default, packets that are dropped on the security device are logged to the self log. In the Firewall Options, you can disable or enable logging of dropped packets for specific traffic types, including ICMP, IKE, SNMP, and multicast packets.

You can also use this tab to set thresholds determining how many packets of a particular type the Packet Process Unit (PPU) sends to the CPU per second, before dropping subsequent packets of that type. The PPU is a hardware processor in some security device systems that forwards packets to the flow CPU. Enabling PPU packet drop thresholds adds an extra layer of DoS-attack protection to the device, similar to SYN-cookie and SYN-proxy. PPU protection prevents DoS attacks from overwhelming the flow CPU, keeping the CPU responsive to critical tasks even under heavy traffic. PPU protection processes three categories of traffic: Packets that do not use the IP protocol; Packets carrying contents other than TCP or UDP; and system-critical IP packets, including BGP, OSPF, RIP, SNMP, system management, SIP, and H323 traffic.

- **Email Notification Settings**—configure a device to send messages using email whenever a system event of Emergency, Alert, Critical, or Notification severity level occurs. To configure email notification, you must specify the SMTP mail server and at least one email address; if desired, you can enter a secondary email address as well.

- **NSM Reporting**—configures a device to report specified events to NSM. You configure the primary IP address of the NSM Device Server and select the categories of events that are tracked on the security device and reported to NSM. You can also set the interval at which the NSM Device Server polls for policy statistics and protocol distribution events.

- **SNMP Reporting**—configures the Simple Network Management Protocol (SNMP) agent for a device. The SNMP agent provides a view of statistical data about the network, the devices in it, and system events of interest.

You also must enable SNMP manageability on the interface through which the SNMP manager applicable communicates with the SNMP agent in the security device.

- **Syslog Reporting**—configures a device to generate syslog messages for system events at predefined severity levels and optionally for traffic that policies permit across a firewall. It sends these messages over UDP (port 514) to up to four designated syslog hosts running on UNIX/Linux systems. When you enable syslog reporting, you also specify which interface the security devices uses to send syslog packets.

To configure a syslog host:
1. Click the **Add** icon in the Syslog configuration screen. The host configuration dialog box appears.

2. Specify the hostname and the port to which the security device sends syslog messages.

3. For each syslog host, you specify the following:
   - Whether the security device includes traffic log entries, event log entries or both traffic and event log entries
   - The security facility, which classifies and sends messages to the Syslog host for security-related actions; and the regular facility, which classifies and sends messages for events unrelated to security
   - Which transport protocol (UDP or TCP) is used for sending syslog messages

4. Click **OK**.

5. Webtrends Reporting—configures a device to send syslog reports to a Webtrends Syslog host. Webtrends Firewall Suite enables you to customize syslog reports to display the information you want in a graphical format.

   To configure the security device to send syslog reports to a Webtrends Syslog host, you first enable Webtrends reporting, then specify the name of the Webtrends host and the port on which the syslog message are sent. If you are sending reports through a VPN tunnel, click **Use Trust Zone Interface** as Source box.

For more details on configuring these reporting options, see the *Network and Security Manager Administration Guide*. 
Chapter 5

Security

Before configuring security, you must first enable and set up the Profiler. The Profiler is a network-analysis tool that helps you learn about your internal network, enabling you to create effective Security Policies and minimize unnecessary log records. After you configure the Profiler, it automatically learns about your internal network and the elements that comprise it, including hosts, peers (which host is talking to which other host), ports (non-IP protocols, TCP/UDP ports, RPC programs), and Layer-7 data that uniquely identifies hosts, applications, commands, users, and filenames.

The Profiler is supported in all IDP modes and in HA configurations, and it queries and correlates information from multiple devices. For details on analyzing your network, see the Network and Security Manager Administration Guide. This chapter provides information on setting up the Profiler and configuring anti-virus settings, including anti-spam and web filtering.

This chapter contains the following sections:

- Setting Up the Profiler on page 141
- Configuring Security on page 145

Setting Up the Profiler

Using the Profiler involves the following steps:

- Collecting specific information about your internal network
- Starting the Profiler to enable your device to begin collecting data
- Customizing Profiler Preferences

You configure your device to collect specific information and compile it into the Profiler DB.

Configuring the Profiler

You configure the Profiler using the Profiler settings that are available on the device settings in the Device Manager. Using the Device Manager, double-click to access a device managed in Network and Security Manager (NSM), and click on Profiler Settings.
The Profile Configuration dialog box appears with the General tab selected. After selecting the device you want to use for profiling, you can then configure how that device collects data from your internal network.

Table 14 on page 142 lists and describes the Profiler settings that you can configure from the General tab:

**Table 14: General Profiler Settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Application Profiling</td>
<td>Enables the Profiler to collect and track application data.</td>
</tr>
<tr>
<td>Include Probe and Attempt</td>
<td>Enables the Profiler to collect and track specific probes and attempts.</td>
</tr>
<tr>
<td>Include Non-tracked IP Profiles</td>
<td>Enables the Profiler to collect and track data from external hosts.</td>
</tr>
<tr>
<td>db limit (in MB)</td>
<td>Maximum database size for the Profiler on each device. By default, the maximum database size is set to 3GB.</td>
</tr>
<tr>
<td>Enable OS Fingerprinting</td>
<td>Enables the Profiler to perform passive OS fingerprinting to determine the operating system of an end host.</td>
</tr>
<tr>
<td>Refresh Interval (in secs)</td>
<td>Time interval (in seconds) that the Profiler refreshes OS fingerprinting data every 3600 seconds (60 minutes).</td>
</tr>
</tbody>
</table>

**Enabling OS Fingerprinting**

OS Fingerprinting passively detects the operating system of an end-host by analyzing TCP handshake packets. To ensure that this works, you need to verify that OS Fingerprinting is first enabled on the profiled device. After you have configured the Profiler with the tracked hosts, contexts, you must update the device.

OS fingerprinting works only for packets that contain a full fledged TCP connection, that is the tcp connection should have a SYN, SYN/ACK and a FIN connection. OS fingerprinting only works for operating systems that are supported on the device. A list of the supported operating systems is available on the device in a file called fingerprints.set at the following location:

```
/usr/idp/device/cfg/fingerprints.set
```

**Configuring Network Objects**

The first part of configuring the Profiler is to tell the device which Network Objects you want the device to profile. When you start the Profiler, the device begins collecting data from the selected hosts.

In the Tracked Hosts tab, select the Network Objects that represent your internal hosts. The device collects detailed information about traffic that passes between internal hosts, and groups traffic that does not match an internal host in a special IP: 73.78.69.84. Communication between an internal hosts and an external host is
recorded only once. For example, the device records internal host A communicating to www.yahoo.com and www.cnn.com as one entry in the Profiler DB.

You can select unlimited internal network objects.

You can also use the Exclude List tab, to select the Network Objects that represent internal hosts you do NOT want to include in IDP profiling. You might want to exclude a host from the Profiler if you selected a group of Network Objects in the Tracked Host tab but want to exclude specific members of that group.

**Configuring Context Profiles**

Next, determine which contexts you want the device to record. In the Contexts to Profile tab, the context list includes only the contexts that can clearly identify a host, a user and/or an application. Select contexts that the device profiles. When you start the Profiler, the device begins collecting data on traffic that matches the selected contexts.

**Example: Selecting Contexts**

To track FTP logins, usernames, and commands, select the FTP contexts in the Contexts to Profile tab. After the Profiler is started, the device begins collecting information about FTP logins, usernames, and commands, enabling you to quickly identify who is using FTP on your network and what they are doing over that protocol.

When you first configure the Profiler, select all contexts. This enables the device to collect data about every context on your network, giving you a complete view of your network traffic. Later, when you have analyzed your traffic, you can eliminate contexts that you know will not be used on your network.

Select Profile Context to include context information. If you clear Profile Context, IDP profile data only includes higher-level traffic data such as source, destination, and service. If you want Profiler information to include context values and network probes (for example, port scans), also configure the Profiler to “Include Probes and Attempts” in the General tab.

**Configuring Alerts**

Use the Alert tab to configure the Profiler to indicate the appearance of a new host, protocol, or port on your internal network. When you enable New Host Detected, New Protocol Detected, or New Port Detected, the device generates a specific log record, such as PROFILER_NEW_HOST, in the Profiler Logs section of the Log Viewer, when the device discovers a new host, protocol, or port.

If you are configuring the Profiler for the first time, do not enable the new host, protocol, or port alerts. As the Profiler runs, the device views all network components as new, which can generate unnecessary log records. After the Profiler has learned about your network and has established a baseline of network activity, you should reconfigure the device to record new hosts, protocols, or ports discovered on your internal network. For details, see the *Network and Security Manager Administration Guide*. 
Enable the Database Limit Exceeded alert to indicate when you have reached the maximum limit of the database size. You can configure the maximum limit of the Profiler DB using the dbLimit parameter in the General tab of the Profiler Configuration dialog box. The default is 500 MB; the minimum-maximum range is 0-500 MB. After a device reaches this limit, it begins purging the database.

**Example: Using Alerts**

For example, a network host performs the normal connections required for Internet connectivity (SMTP, POP3, HTTP, and so on). The host becomes infected by a worm and begins making outbound connections on an arbitrary port. The device logs the unique event and generates PROFILER_NEWPROTO and PROFILER_NEW_PORT log records. The system immediately emails these log records to the Security Administrator, who can investigate the worm and take action to contain it.

Repeat the configuration process for each device in your network. When you have configured all devices on your network, you are ready to start the Profiler.

**Updating Profiler Settings**

After you have finished configuring settings on the Profiler, you must update those settings on the device. You can do this in the Device Manager by right-clicking on the device and selecting Update Device. The Device Update Options window appears and prompts you to Restart IDP Profiler After Device Update. Click OK to confirm. A Job Information window appears indicating the status of the update. After this is finished, the device begins collecting data for the Profiler DB.

**Starting the Profiler**

To manually start the Profiler, use the Devices menu, and select **IDP Profiler > Start Profiler**. In the Start Profiler dialog box, select the devices you want to use for profiling, then click OK. Alternatively, you can right-click on any device from the Device Manager, and select **IDP Profiler > Start Profiler**.

As your devices begin profiling your internal network, they gather information about your network hosts, their peers, ports, and Layer-7 data.

**Stopping the Profiler**

To manually stop the Profiler, use the Devices menu, and select **IDP Profiler > Stop Profiler**. In the Stop Profiler dialog box, select the appropriate devices, then click OK. Alternatively, you can right-click on any device from the Device Manager, and select **IDP Profiler > Stop Profiler**.

**Customizing Profiler Preferences**

Use the Profiler Settings under the Tools menu to configure the following preferences for the Profiler:
Purge Profiler Database if Size Exceeds - NSM purges the profiler database size if it exceeds 4GB (4000 MB) by default.

Max Profiler Database Size After Purging - If the database size exceeds its maximum limit, NSM purges the profiler database size until the size reaches 3GB (3000 MB) by default.

Profiler Query Timeout (120 seconds or 2 minutes by default)

Hour of Day to Perform Database Optimization (midnight GMT by default)

For more information on configuring and setting up the Profiler, see the “Analyzing your Network” section of the Network and Security Manager Administration Guide.

Configuring Security

The security screen contains security options that you can set for the device. In the Device dialog box, open the Security heading to see configuration options. For instructions for configuring specific device settings, see the Network and Security Manager Online Help.

This section describes the following security options:

- “Anti-Virus Settings” on page 145
- “Deep Inspection” on page 150
- “Attack Database” on page 151
- “Attack Objects” on page 152
- “Anti-Spam” on page 153
- “Web Filtering” on page 155
- “Stand-alone IDP Sensor and ISG Security Module Settings” on page 158

Anti-Virus Settings

A virus is executable code that infects or attaches itself to other executable code in order to reproduce itself. Some malicious viruses erase files or lock up systems, while other viruses merely infect files and can overwhelm the target host or network with bogus data.

Juniper Networks supports internal and external antivirus (AV) scanning on select security devices. Use the antivirus (AV) option to configure AV scanning. Security devices may provide one or more of the following antivirus scanning methods:

- External AV scanning—uses an external Trend Micro device for scanning. (Supported in ScreenOS 5.2. Not supported in ScreenOS 5.3 or later.) The security device forwards all traffic to be scanned to the Trend Micro device. To configure external AV scanning, use the AV Scanner settings.

- Internal AV scanning—uses the AV scanner on the security device and is not supported by all security devices. To configure internal AV scanning, use the AV Scan Manager settings (see “Configuring the Internal AV Scanner” on page 147).
Internet Content Adaptation Protocol (ICAP) scanning—uses an external ICAP server or server group for scanning. Supported in ScreenOS 5.4 and later. Use the ICAP object and ICAP AV object in Object Manager to create ICAP AV objects. These objects are not assigned to the security device. Instead, they are assigned via a Rule Option in a security policy. See “Configuring DNS Settings” on page 95.

You can also configure the internal AV scanner to scan webmail responses from a Web server to a client. For information, see “Configuring AV HTTP Webmail Settings” on page 148.

Configuring External AV Scanners

Use the AV Scanner Settings tab to configure the following:

- Maximum Number of TCP connections—The maximum number of connections between the security device and the external AV scanner.
- Fail Mode Traffic Permit—When enabled, the security device continues to permit traffic even if the device loses connectivity with the AV scanner.
- Fail Mode Scanner Threshold—The number of times the security device consecutively fails to make contact with the external scanner before going into a 5-minute wait period. After the wait period, the security device again attempts to reach the external scanner.
- Maximum AV resources allowed per AV client—Determines the maximum percentage of AV resources that an AV client can consume. The default is 70%; the acceptable range is from 1% to 100%, where 100% allows unrestricted resource consumption. You might want to edit this option to prevent a malicious user from generating a large amount of traffic in an attempt to consume all available resources.

- HTTP Settings
  - HTTP keep-alive—Directs the device to use the HTTP keep-alive connection option. Using this option prevents the device from sending a TCP FIN message to indicate termination of data transmission.
  - Skip scanning HTTP content with predefined content type—By default this option is enabled. This means HTTP scanning does not scan HTTP entities composed of any of the following Multipurpose Internet Mail Extensions (MIME) content types (and when followed by a slash, subtypes):
    - application/x-director
    - application/pdf; image
    - video
    - audio
    - text/css
    - text/html
Because most HTTP entities are composed of these content types, HTTP scanning only applies to a small subset of HTTP entities such as /zip and application /exe content types, where viruses are most likely to be hiding.

- **Trickling**—You can direct the device to forward specific amounts of unscanned traffic to the HTTP client to prevent the client from timing out while the scanner is busy examining downloaded HTTP files. If you select **Custom**, you can specify the amounts that are forwarded. Selecting **Default** resets the amounts to their default values.

### Configuring the Internal AV Scanner

Use the AV Scan Manager Settings tab to configure the following:

- **Pattern Server URL**—You specify the URL address of the server from which the device retrieves pattern file updates.

  Use one of the following two default pattern-update URLs:

  - To use the Kaspersky internal antivirus scanner
    
    http://update.juniper-updates.net/av/5gt
  
  - To use the Trend Micro internal antivirus scanner
    
    http://5gt-p.activeupdate.trendmicro.com/activeupdate/server.ini

- **Update Interval**—You can specify the interval at which the device starts an automatic pattern update.

  **NOTE:** You can direct a security device to immediately contact the pattern server and update its pattern file. To do this, right-click the device object and select **AV Scan Manager > Update Pattern**. (You can modify the pattern server URL and update interface if necessary.) Click **OK**.

- **Update type**—You can indicate whether you want to download the in-the-Wild Virus and Spyware pack, the All Virus and Spyware pack, or the All Virus and Spyware, plus adware/pornware/riskware/greyware pack.

- **Maximum Decompression level**—You can specify the number of levels of compression to examine. A setting of 2 will examine a compressed file within a compressed file. If the number of levels of compression in the file exceeds the number indicated here, the email will be blocked.

- **Content drop parameters**—You can specify that the device drop messages if the size of the content or the number of concurrent messages exceed configurable limits.

- **Content Protocol**—You can select the type of protocols (HTTP, SMTP, FTP, IMAP or POP3) that are to be examined for virus patterns. For each protocol, you can also specify the following (not all values applicable to all protocols):
- Scan Mode: All, Intelligent, or by File Extension. If you select Scan by File Extension, you must populate the Ext List Include field.

- Scanning Timeout: scans that take longer than this period are not completed.

- Decompress Layer: the number of levels of decompression to uncompress before scanning. Supported by ScreenOS 5.3 and higher. For ScreenOS 5.2 and lower, must be configured on an individual scanner basis.

- Skip Mime (HTTP only): if checked, causes the scanner to skip any mime types listed in the Mime List field. Supported by ScreenOS 5.3 and higher. For ScreenOS 5.2 and lower, must be configured on an individual scanner basis.

- Ext List Include: a list of file extensions to examine for viruses. Extension lists are created under Object Manager > AV Objects > Extension Lists.

- Ext List Exclude: a list of file extensions to not examine for viruses. Extension lists are created under Object Manager > AV Objects > Extension Lists.

- Mime List (HTTP only): the list of mime types to not scan. NSM ships with a default mime type list, or you can create your own under Object Manager > AV Objects > Custom Mime Lists.

- Email Notify Virus Sender (IMAP, POP3, SMTP only): Notifies an email sender if a virus was found in the email.

- Email Notify Scan-Error Sender (IMAP, POP3, SMTP only): Notifies an email sender if the email was dropped due to a scan error.

- Email Notify Scan-Error Recipient (IMAP, POP3, SMTP only): Notifies an email recipient if the email was passed due to a scan error.

### Configuring AV HTTP Webmail Settings

You can also configure the internal AV scanner to scan webmail responses from a Web server to a client. When a client makes an HTTP webmail request, the security device can intercept the Web Server response, scan the response for viruses, then forward to the client.

Because networks typically handle a large amount of HTTP traffic, you might want to enable scanning for WebMail only. When enabled, the internal AV scanner scans HTTP traffic for webmail only (non-webmail HTTP traffic is not scanned). When disabled, the device scans all HTTP traffic for viruses.

The internal AV scanner examines specific HTTP webmail patterns only (many popular providers are predefined). To configure Webmail scanning, you must define the URL parameters:

- **URL Pattern**—Specifies a URL pattern identifying a certain type of WebMail to examine for virus patterns. When the URL matches all of the following parameters, the AV scanner performs a virus scan.

- **Path in URL**—Specifies the download URL path for the webmail.
- Path Exclusion—Excludes the listed path from scans. Supported in ScreenOS 5.3 and higher.
- Argument in URL—Specifies the URL argument. Arguments begin with a question mark (?).
- Argument Exclusion—Excludes the listed argument from scans. Supported in ScreenOS 5.3 and higher.
- Host Name in URL—Specifies the host name in the URL.
- Host Exclusion—Excludes the listed host from scans. Supported in ScreenOS 5.3 and higher.

For more information about AV, refer to the “Attack Detection and Defense Mechanisms” volume in the Concepts & Examples ScreenOS Reference Guide.

**Configuring AV Scanner Settings**

The third tab in the Device-specific or Template-specific AntiVirus settings is the AV Scanner Settings tab. Use this tab to configure the following settings for your device:

- Fail Mode Traffic Permit—Check this checkbox if you want the device to forward unexamined traffic when it fails to contact the antivirus scanner. If you want the device to block unexamined traffic, leave the box unchecked.
- Maximum AV resources allowed per AV client—Sets the maximum percentage of device resources a single source can occupy at one time. Prevents one source from overwhelming the device.
- HTTP keep alive—Check this checkbox to keep the HTTP connection alive while antivirus scanning occurs.
- Trickling—Forwards some HTTP traffic to the requesting client so the browser doesn’t time out during the antivirus scan. Table 15 on page 149 lists the trickling settings.

**Table 15: Trickling Settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning/Steps for configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable</td>
<td>Disables HTTP trickling.</td>
</tr>
<tr>
<td>Default</td>
<td>Enables HTTP trickling using the stated predefined parameters:</td>
</tr>
<tr>
<td></td>
<td>If content length is larger than 3 MB, trickle 500 bytes for every 1 MB sent for scanning.</td>
</tr>
</tbody>
</table>
Table 15: Trickling Settings (continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning/Steps for configuration</th>
</tr>
</thead>
</table>
| Custom  | Enables HTTP trickling using user-defined parameters.  
To configure, perform the following steps:  
1. In the Minimum length to start trickling (MB) box, select the minimum size (in megabytes) of an HTTP file to trigger trickling. Note: You must enter a valid integer value less than 4096.  
2. In the Trickle for every (MB) box, select the size (in megabytes) of a block of traffic to which the security device applies trickling.  
3. In the Trickle size box (Bytes) box, select the size (in bytes) of unscanned traffic that the security device forwards. |

Deep Inspection

(This option is only available on some security devices.) Deep Inspection (DI) is a mechanism for filtering permitted traffic. When you enable Deep Inspection in a firewall rule, the device examines permitted traffic and takes action if the DI module in ScreenOS finds attack signatures or protocol anomalies.

**NOTE:** Deep inspection is only available on standalone devices. It cannot be used to disable attacks when the device is in a cluster.

The Juniper Security team provides multiple DI signature packs for different security needs. Packs are covered by license keys. You must get a license key to enable a signature pack. Only one signature pack can exist for a given device.

Available signature packs are as follows:

- Server Protection Pack
- Client Protection Pack
- Worm Mitigation Pack
- Baseline (Default) Pack

Use the Deep Inspection configuration screens to modify the default settings defined in RFCs and RFC extensions for the following protocols listed in Table 16 on page 151.

**NOTE:** You can also enable the validation of all TCP packets for TCP checksum by selecting Enable TCP Checksum.
Table 16: Deep Inspection: Supported Protocols

<table>
<thead>
<tr>
<th>AIM</th>
<th>IDENT</th>
<th>NTP</th>
<th>SNMP/Trap</th>
<th>SQL Mon</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHARGEN</td>
<td>IKE</td>
<td>POP3</td>
<td>RADIUS</td>
<td>SSH</td>
</tr>
<tr>
<td>DHCP</td>
<td>IMAP</td>
<td>PortMapper</td>
<td>RADIUS</td>
<td>SSL</td>
</tr>
<tr>
<td>DISCARD</td>
<td>IRC</td>
<td>RADIUS</td>
<td>RADIUS</td>
<td>Syslog</td>
</tr>
<tr>
<td>DNS</td>
<td>LDAP</td>
<td>Rexec</td>
<td>Rexec</td>
<td>TELNET</td>
</tr>
<tr>
<td>ECHO</td>
<td>LPR</td>
<td>rlogin</td>
<td>rlogin</td>
<td>TFTP</td>
</tr>
<tr>
<td>FINGER</td>
<td>MSN</td>
<td>SunRPC</td>
<td>SunRPC</td>
<td>VNC</td>
</tr>
<tr>
<td>FTP</td>
<td>MSRPC</td>
<td>Rsh</td>
<td>Rsh</td>
<td>WHOIS</td>
</tr>
<tr>
<td>GNUTELLA</td>
<td>MS-SQL</td>
<td>RTSP</td>
<td>RTSP</td>
<td>Yahoo Messenger</td>
</tr>
<tr>
<td>GOPHER</td>
<td>NBNAME</td>
<td>Rusers</td>
<td>Rusers</td>
<td></td>
</tr>
<tr>
<td>HTTP</td>
<td>NFS</td>
<td>SMB</td>
<td>SMB</td>
<td></td>
</tr>
<tr>
<td>ICMP</td>
<td>NNTOP</td>
<td>SMTP</td>
<td>SMTP</td>
<td></td>
</tr>
</tbody>
</table>

For details on each protocol and its settings, refer to the `di` command in the NetScreen CLI Reference Guide.

For more information about DI, refer to the “Attack Detection and Defense Mechanisms” volume in the Concepts & Examples ScreenOS Reference Guide.

**Attack Database**

(This option is only available on some security devices.) Use the Attack Database option to configure a database that contains all the predefined attack objects, organized into attack object groups by protocol and severity level.

Juniper Networks stores the attack object database on the attack object update server at https://services.netscreen.com/restricted/sigupdates. To gain access to the attack object update server, you must first obtain an attack object update subscription for your security device. To obtain a subscription for a device using the NSM UI, see.

After you have obtained a subscription, you must update the attack object database on the GUI Server and managed device. The update process differs slightly between devices running ScreenOS 5.1 and higher and devices running 5.0; for details, see the “Managing Devices” section of the Network and Security Manager Administration Guide.

For all devices, the attack object database on the managed device must match the version of the attack object database on the GUI Server. If the databases do not match, a validation icon appears next to the Attack Database Version setting, and the Disable Attack option does not appear in the device navigation tree.

To use the predefined attack objects, create a DI Profile object that references specific attack object groups and configure a firewall rule to use that profile object.

To configure the attack object database, specify the following:

- **URL of the attack object database server.** NSM downloads the latest version of the attack object database from https://services.netscreen.com/restricted/sigupdates.
When you update the attack object database for a device running ScreenOS 5.0.x or higher, the device connects to this URL and downloads the latest database version.

When you update the attack object database for a device running ScreenOS 5.1 and higher, the management system automatically connects to the URL specified in the UI Preferences and downloads the new database version to the GUI Server. ScreenOS 5.1 and higher devices do not contact the Attack Object Database server URL directly.

The mode for checking and updating the database (ScreenOS 5.0 devices only):

- Notification—Checks the attack object update server at specified times and notifies you if the database on the server is more recent than the database on the security device.
- Update—Checks the attack object update server at specified times and automatically updates the database on the device if the database on the attack object update server is more recent.

Schedule (daily, weekly, or monthly) on which the security device checks the attack object update server.

You can also direct a security device to update its attack object database immediately, either from the attack object update server (ScreenOS 5.0 devices) or the NSM GUI Server (ScreenOS 5.1 and higher devices). For more information, see the “Managing Devices” section of the Network and Security Manager Administration Guide.

**Attack Objects**

Occasionally, an attack object produces false positives when included in a Security Policy for your network. You can remove the attack from the firewall rule by removing the attack object group to which the attack belongs or by disabling the individual attack object at the device level. Although disabling attack objects does not improve throughput performance for the security device, this fine-tuning of the attacks detected by each device helps reduce false positives in your logs.

To disable attack objects, the attack object database on the managed device must match the version of the database on the GUI Server. If the databases do not match, the Disable Attacks option does not appear in the device navigation tree, and a validation icon appears next to the Attack Database Version setting in Security > Attack DB > Settings.

To disable an attack object on a device, double-click the device to open the device configuration. In the device navigation tree, select Security > Attack DB > Disable Attacks, then select the attack objects you want to disable.

**NOTE:** Disabled attack objects are device-specific. For example, disabling an attack object within the root system does not disable the attack object in any of its virtual systems, and disabling an attack object in one vsys does not affect that attack object in any other vsys.
For more information about the attack object database, see the “Attack Detection and Defense Mechanisms” volume in the *Concepts & Examples ScreenOS Reference Guide*.

**Anti-Spam**

Spam consists of unwanted email messages, usually sent by commercial, malicious, or fraudulent entities. The anti-spam feature examines transmitted messages to identify spam. When the device detects a message deemed to be spam, it either drops the message or tags the message field with a preprogrammed string. This anti-spam feature is not meant to replace your anti-spam server, but to complement it. Configuring this command prevents an internal corporate email server from receiving and distributing spams. Devices running ScreenOS 5.3 or higher support anti-spam functionality.

You can configure anti-spam to tag or block unwanted emails based on email ID, hostname, domain name, or IP address. SMTP is supported but not POP3 or IMAP. Advanced features such as Bayesian filtering are not supported.

Email is tagged or blocked based on blacklists and whitelists, which can be configured locally. Juniper Networks provides a server with a blacklist of known spammers. NSM first attempts to match each email against the local lists. If it does not match a local list, it then attempts to match the email against the list on the Juniper server. Table 17 on page 153 lists the match criteria for the local whitelist, local blacklist, Juniper blacklist and corresponding actions.

<table>
<thead>
<tr>
<th>Table 17: Whitelist and Blacklist Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match</td>
</tr>
<tr>
<td>Match</td>
</tr>
<tr>
<td>No Match</td>
</tr>
<tr>
<td>No Match</td>
</tr>
<tr>
<td>No Match</td>
</tr>
</tbody>
</table>

To configure a security device for Antispam, you must turn on anti-spam in a policy and configure anti-spam settings on a device.

**Configuring Anti-spam Settings for a Device**

1. Open a security device in Device Manager.
2. Select Security > Antispam.
3. Populate the listed fields:
Antispam Whitelist — Emails that contain email addresses, IP addresses, hostnames, or domain names in this list will always be accepted by the filter, even if the email also matches an entry in the blacklist.

Antispam Blacklist — Emails that contain email addresses, IP addresses, hostnames, and domain names in this list will be tagged or blocked, unless the email also contains a match in the whitelist.

Action for Spam — Indicates whether email that matches a blacklist entry will be tagged and passed along or blocked.

Tag Subject or Header — If blacklist emails are to be tagged, indicates whether the tag will be placed in the header or subject line of the email before it is passed on.

Tag String — If blacklist emails are to be tagged, indicates the character string that will be placed in the email.

Enable use default SBL server — If checked, compare emails that do not match the local blacklist or whitelist to the blacklist of known spammers on the Juniper server. If this checkbox is not checked, only the local lists will be used.

1. Install an anti-spam license key to enable the anti-spam option on the security device. For more information, see “Managing Devices” section of the Network and Security Manager Administration Guide. To check the status of the anti-spam option for a device, open the device configuration and select Info > Capabilities. If the license has been installed, Antispam Profiles is enabled.

2. Open the policy my_antispam_policy.

3. Double-click the Rule Options cell in the desired rule row.

4. Select the Antispam tab in the Configure Options dialog box.

5. Check the Enable Antispam Profile checkbox.

6. Select ns-profile from the Profile Name pull-down menu.

7. Click OK to close the Configure Options dialog.

In this example, you configure the device and put the string ***SPAM*** in the subject line of emails from wesendspam.com.

1. In the main navigation tree, select Device Manager > Security Device > Templates. Doubleclick a template to open it.

2. In the device navigation tree, select Security > Antispam.

3. Click the Add icon in the Antispam Blacklist area.

4. Enter wesendspam.com in the Entry field, then click OK.

5. In the Action for Spam field, select Tag Spam Email.

6. In the Tag Subject or Header field, select subject.

7. In the Tag String field, enter ***SPAM***.
Web Filtering

Web filtering enables you to manage Internet access by preventing access to inappropriate web content. For more information on anti-spam and web filtering, see the Concepts & Examples ScreenOS Reference Guide. Use the Web Filtering option to manage Internet access and prevent access to inappropriate web content.

To configure a security device for Web filtering, you must perform the following steps:

1. Install a Web license key to enable the Web Filtering option on the security device. For details, see “Managing Devices” section of the Network and Security Manager Administration Guide. To check the status of the Web Filtering option for a device, open the device configuration and select Info > Capabilities. If the license has been installed, Web filtering (Integrated) is enabled.

2. Configure at least one Domain Name Server (DNS) so the security device can resolve the SurfControl CPA server name to an address. For information about DNS, see “Configuring DNS Settings” on page 95.

3. Select a Web filtering method and configure the Web filtering settings on the security device. You can select one of the following Web filtering methods for each security device:
   - Integrated Web Filtering (SurfControl CPA)—Block or permit access to a requested website by binding a SurfControl-defined or custom Web filtering profile to a firewall rule for the security device. A Web filtering profile contains Web categories (list of predefined or custom URLs) and the action the security device takes (permit or block) when it receives a request to access a URL.
   - Redirect Web Filtering (SurfControl SCFP)—Block or permit access to different web sites based on SurfControl-defined URLs, domain names, and IP addresses.
   - Redirect Web Filtering (Websense)—Block or permit access to different web sites based on Websense-defined URLs, domain names, and IP addresses.

Optionally, you can define categories and profiles. You can also assign a Web filtering profile to a firewall rule. For information, see the Network and Security Manager Administration Guide.

Configuring Integrated Web Filtering

With integrated Web filtering, you can permit or block access to a requested website by binding a Web Filtering profile to a firewall rule. A Web Filtering profile contains Web Categories and the action the security device takes (permit or block) when it receives a request to access a URL.

A Web category is a list of URLs organized by content. SurfControl Content Portal Authority (CPA) servers maintain a large database of all types of web content classified...
into 40 categories. For a list of SurfControl Web Categories, see “Appendix C, SurfControl Web categories” in the Network and Security Manager Administration Guide.

SurfControl has three server locations that each serve a specific geographic area: the Americas, Asia Pacific, and Europe/Middle East/Africa. The default primary server is the Americas; the default backup server is Asia Pacific.

URLs and categories created and maintained by SurfControl appear in the NSM UI as predefined, and cannot be edited. You can also create custom URLs, then use those URLs within a custom Web Filtering Profile. For details on viewing predefined Web Categories and configuring Web Filtering Profiles, see .

In this example, you select SurfControl CPA (Integrated) as your Web Filtering profile.

1. In the main navigation tree, select Device Manager > Devices, then double-click the device for which you want to configure Web Filtering. The device configuration appears.
2. In the device navigation tree, select Security > Web Filtering, then click the SurfControl CPA (Integrated) tab.
3. Select CPA Server Enable, then configure the following SurfControl Settings:
   - For Server, select America.
   - For Primary Host, enter usi.SurfCA.com.
   - For Primary Port, enter 9020.
   - For Fail Mode select block.
   - Select Enable Cache, then configure the following cache settings:
     - For Cache Timeout (hours), enter 24.
     - For Cache Size (K bytes), enter 500.
     - For Query Interval (weeks), enter 2.
   - Click OK to save your settings and close the device configuration.

Redirect Web Filtering

Redirect Web Filtering enables you to block or permit access to different web sites based on their URLs, domain names, and IP addresses. NSM supports redirect Web Filtering using either the Websense Enterprise Engine or SurfControl Web Filter.


For Websense, ScreenOS supports up to eight Web-filtering servers. On vsys devices, one server is reserved for the root, leaving seven servers available for vsys (one
server per vsys, all remaining vsys must use root server). For vsys-capable devices running ScreenOS 5.2, you can assign the same server to multiple vsys devices, then configure a profile name for each vsys to enable the filtering server to distinguish between vsys devices.

Select the redirect Web Filtering method you want to use, enable Web Filtering for that method, then configure the settings:

- **Source Interface**—The source from which the security device initiates Web filter requests to a Web-filtering server.
- **Server Name**—The IP address or fully qualified domain name (FQDN) of the Websense or SurfControl server.
- **Server Port**—The port number on the filtering server that handles filtering requests. The default port for Websense is 15868; the default port for SurfControl is 15868.
- **Profile Name**—(vsys capable devices running ScreenOS 5.2 only) The profile name uniquely identifies the device when connecting to the filtering server. When configuring Websense (Redirect) Web-Filtering for multiple vsys devices using the same root device, you can assign the same Web-filtering server and port to multiple vsys devices as long as you use a unique profile name for each device.
- **Server Timeout**—The time interval, in seconds, that the security device waits for a response from the Web-filtering server. If the server does not respond within the time interval, the security device either blocks the request or permits it. For the time interval, you can enter a number between 10 and 240.
- **Fail Mode**—The fail mode (Block or Permit) determines how the security device handles HTTP requests if the device loses contact with the Web-filtering server.
- **Message Type**—The source of the message the user receives when Websense or SurfControl blocks a site.
  - If you select NetPartners Websense/SurfControl, the security device forwards the message it receives from the Websense or SurfControl server.
  - If you select NetScreen, the security device sends the message that you entered in the Message Sent to Blocked Client field.
- **Message Sent to Blocked Client**—The message the security device returns to the user after blocking a website. You can use the message sent from the Websense or SurfControl server, or create a message (up to 500 characters).

If you change the default port on the server you must also change the port on the security device.

All vsys devices assigned to the same WebSense Web-Filtering server use the same Server Timeout, Fail Mode, and Message Type. Although you can configure different values for these fields for different vsys devices in the NSM UI, the WebSense server uses only the values defined for the vsys device that most recently contacted the Web-Filtering server.

If you select NSM, some of the functionality that Websense provides, such as redirection, is suppressed.
Select Websense (Redirect) as your Web Filtering policy.

1. In the main navigation tree, select Device Manager > Devices, then double-click
   the device for which you want to configure Web Filtering. The device
   configuration appears.

2. In the device navigation tree, select Security > Web Filtering, then click the
   Websense (Redirect) tab.

3. Select Enable Web Filtering, then configure the following Websense settings:
   ■ For Source Interface, select untrust.
   ■ For Server Name, enter 10.1.2.5.
   ■ For Server Port, enter 15868.
   ■ For Server Timeout (in seconds), enter 10.
   ■ For Fail Mode, select Permit.
   ■ For Message Type, select NetScreen.
   ■ For Message Sent to Blocked Client, enter We're sorry, but the requested URL
     is prohibited. Contact ntwksec@mycompany.com.
   ■ Click OK to save your settings and close the device configuration.

Stand-alone IDP Sensor and ISG Security Module Settings

Table 18 on page 158 lists IDP inspects the following protocols.

Table 18: Intrusion Detection and Prevention: Supported Protocols

<table>
<thead>
<tr>
<th>AIM</th>
<th>HTTP</th>
<th>Oracle</th>
<th>SMTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHARGEN</td>
<td>ICMP</td>
<td>POP3</td>
<td>SNMP/Trap</td>
</tr>
<tr>
<td>DHCP</td>
<td>IDENT</td>
<td>PortMapper</td>
<td>SQL Mon</td>
</tr>
<tr>
<td>DISCARD</td>
<td>IKE</td>
<td>RADIUS</td>
<td>SSH</td>
</tr>
<tr>
<td>DNS</td>
<td>IMAP</td>
<td>Rexec</td>
<td>SSL</td>
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<tr>
<td>ECHO</td>
<td>IRC</td>
<td>rlogin</td>
<td>Syslog</td>
</tr>
<tr>
<td>FINGER</td>
<td>LDAP</td>
<td>SunRPC</td>
<td>TELNET</td>
</tr>
<tr>
<td>FTP</td>
<td>LPR</td>
<td>Rsh</td>
<td>TFTP</td>
</tr>
<tr>
<td>GNUTELLA</td>
<td>MSN</td>
<td>RTSP</td>
<td>VNC</td>
</tr>
<tr>
<td>Gopher</td>
<td>MSRPC</td>
<td>NBNAME</td>
<td>WHOIS</td>
</tr>
<tr>
<td>GRE*</td>
<td>MS-SQL</td>
<td>NFS</td>
<td>Yahoo</td>
</tr>
<tr>
<td>H.225**</td>
<td>GTP</td>
<td>NNTOP</td>
<td>Messenger</td>
</tr>
<tr>
<td></td>
<td>NTP</td>
<td>Rusers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SMB</td>
<td></td>
</tr>
</tbody>
</table>
* GRE inspection supported for IP (protocol 0x0800) and PPP for CDMA A10 channel (protocol 0x8881) only. PPP is a layer two protocol, which can carry any layer three protocols. Within PPP, IDP inspects IP and Van Jacobson compressed TCP.

**Standalone IDP only

**Sensor Settings**

The IDP SM and Sensor settings specify how the security module(s) on the ISG Series devices and IDP Sensors handle traffic. When you add IDP, default values for all security module parameters are used. As you fine-tune a Security Policy to fit network traffic, you may want to edit these default values. If you make changes to the default settings, the changes only affect that device to which the security module settings apply.

For detailed information on fields, refer to the NSM Online Help or the IDP Concepts and Examples Guide.

- Configuring Load Time Parameters—These options control the security module functions when it first powers on.
- Configuring Run-Time Parameters—These options control the security module operations.
- Configuring Router Parameters (stand-alone IDP only)—These options control packet handling for specific protocols.
- Router Parameters (Only applies to Standalone IDP Sensor in router or proxy modes)—Use these options to control IDP Sensor routing, if applicable.
Chapter 6
Configuring VPNs

VPNs route private data through a public Internet. Like normal Internet traffic, data in a VPN is routed from source to destination using public Internet networking equipment. Unlike normal traffic, however, the source and destination use a Security Association (SA) pair to create a secure, private tunnel through which the data traverses the Internet. A tunnel has a defined start point and end point, (usually an IP address), and is a private connection through which the data can move freely. By encrypting and authenticating the data while in the tunnel, you can ensure the security and integrity of the data.

VPNs can also connect widely distributed networks to make separate networks appear as a single Wide Area Network (WAN). VPNs replace costly point-to-point protocol (PPP) and frame relay connections that require dedicated lines (and sometimes even satellites!) between your private networks.

This chapter discusses the concepts involved in creating secure tunnels between devices, details the differences between VPN types, helps you determine the best VPN for your network, and guides you through creating and configuring your chosen VPN.

NOTE: For step-by-step instructions on creating VPNs, see the Network and Security Manager Online Help Topic “VPNs”.

- About VPNs on page 161
- Planning for Your VPN on page 163
- Preparing VPN Components on page 172
- Creating Device-Level VPNs on page 179
- Device-Level VPN Examples on page 193
- Configuring L2TP and XAuth Local Users on page 200
- Configuring vsys on page 202
- Configuring Certificates on page 215

About VPNs

With Juniper Networks Network and Security Manager (NSM), you can use basic networking principles and your Juniper Networks security devices to create VPNs
that connect your headquarters with your branch offices and your remote users with your protected networks.

NSM supports tunnel and transport modes for AutoKey IKE, Manual Key, L2TP, and L2TP-over-AutoKey IKE VPNS in policy or route-based configurations. You can create the VPN at the system-level or device-level:

- **System-Level VPN (VPN Manager)**—Design a system level VPN and automatically set up connections, tunnels, and rules for all devices in the VPN.
- **Device-Level VPN (Device Manager)**—Manually configure VPN information for each security device, then add VPN rules to a Security Policy to create a policy-based VPN or configure routes on each security device to create a route-based VPNs.

**NOTE:** Each VPN that a device belongs to reduces the maximum number of templates by one. This includes VPNS configured in VPN Manager and VPNS configured at the device-level. You can apply a maximum of 63 templates to a single device.

### Creating System-Level VPNS with VPN Manager

For AutoKey IKE and L2TP VPNS, create the VPN at the system-level using VPN Manager. VPN Manager supports:

- **AutoKey IKE VPNS**—In policy-based or route-based modes. You can also create a Mixed-Mode VPN to connect policy-based VPN members to route-based VPNs members in a single VPN.
- **L2TP-over-AutoKey IKE RAS VPNS and L2TP RAS VPNS**—Can connect and authenticate multiple L2TP remote access services (RAS) users and protected resources with or without encryption.
- **Re-usable VPN Components**—Create objects to represent your protected resources, CA certificates and CRLs, custom IKE proposals, and NAT configurations, then use these objects in multiple VPNS.
- **Compact and Expanded Views**—Choose the Compact (default) or Expanded view to create your VPN. Both views offer the same configuration options.
- **Autogenerated Tunnels**—Create tunnel interfaces on each route-based VPNs member automatically. Use the device tunnel summary to review all autogenerated tunnels in the VPN.
- **Autogenerated VPN Rules**—Create all VPN rules with a single click. NSM automatically generates the rules between each policy-based VPN member. You can review these rules, configure additional rule options (such as traffic shaping, attack protection, and logging), then insert the rules into a Security Policy.
- **Autogenerated VPN Routes**—Automatically add virtual router information using the VPN Manager for each device based on the routing type. Specify a routing type of topology to autogenerate a route for all VPN members based on the configured routing type (static or dynamic). This information changes the tunnel interface data and virtual router data for each device.
To view all VPNs created with VPN Manager, select VPN Manager in the navigation tree. A list of saved VPNs appears in the main display area in table format. You can add and delete VPNs from this view.

VPN Manager does not support Manual Key VPNs; to create a Manual Key VPN in NSM, you must create the VPN at the device-level in Device Manager.

**Creating Device-Level VPNs in Device Manager**

For Manual Key VPNs, create the VPN at the device-level by manually configuring VPN information for each security device.

After you have configured the VPN on each security device in the VPN, add VPN rules to a Security Policy to create the VPN tunnel (for policy-based VPNs) or to control traffic through the tunnel (for route-based VPNs).

You can also create AutoKey IKE, L2TP, and L2TP-over-AutoKey IKE VPNs at the device-level.

**Supported VPN Configurations**

NSM supports all possible VPN configurations that are supported by the CLI and Juniper Networks ScreenOS Web UI, including:

- **NAT-Traversal**—Because NAT obscures the IP address in some IPSec packet headers, VPN nodes cannot receive VPN traffic that passes through an external NAT device. To enable VPN traffic to traverse a NAT device, you can use NAT Traversal (NAT-T) to encapsulate the VPN packets in UDP. If a VPN node with NAT-T enabled detects an external NAT device, it checks every VPN packet to determine if NAT-T is necessary.

- **XAuth**—To authenticate remote access services (RAS) users, use XAuth to assign users an authentication token (such as SecureID) and to make TCP/IP settings (IP address, DNS server, and WINS server) for the peer gateway.

**Planning for Your VPN**

NSM offers you maximum flexibility for creating a VPN. You can choose your topology, authentication level, and creation method. Because you have so many choices, it’s a good idea to determine what your needs are before you create the VPN so you can make the right decisions for your network.

These decisions include:

- **VPN Topology**—What do you want to connect? How many devices? How do you want these devices to communicate? Will you have users as VPN members?

- **Data Protection**—How much security do you need? Do you need encryption, authentication, or both? Is security more or less important than performance?

- **Tunnel Type**—Do you want an always-on connection or traffic-based connection?

- **VPN Manager or Device-Level**—How do you want to create the VPN? Maintain the VPN?
The following sections provide information to help you make these decisions.

**Determining Your VPN Members and Topology**

You can use a VPN to connect:

- **Security devices**—Create a VPN between two or more security devices to establish secure communication between separate networks.
- **Network components**—Create a VPN between a two or more network components to establish secure communication between specific machines.
- **Remote users**—Create a VPN between a user and a security device to enable secure access to protected networks.

*NOTE:* In NSM, remote users are known as remote access service (RAS) users.

Each device, component, and RAS user in a VPN is considered a VPN node. The VPN connects each node to other nodes using a VPN tunnel. VPN tunnel termination points are the end points of the tunnel; traffic enters and departs the VPN tunnel through these end points. Each tunnel has two termination points: a source and destination, which are the source and destination zones on security device.

**Using Network Address Translation (NAT)**

Network Address Translation (NAT) maps private IP addresses to public, Internet-routeable IP addresses. Because your security device is also a NAT server, you can use private, unregistered IP addresses for your internal network, minimizing the number of registered IP addresses you must buy and use.

If you enable NAT, when an internal system connects to the Internet, the security device translates the unregistered IP address in the outbound data packets to the registered address of the security device. The security device also relays responses back to the original system. Additionally, because your internal systems do not have a valid Internet IP address, your systems are invisible to the outside Internet, meaning that attackers cannot discover the IP addresses in use on your network.

**Site-to-Site**

Site-to-site VPNs are the most common type of VPN. Typically, each remote site is an individual security device or RAS user that connects to a central security device.

- **Advantages**—Simple, easy to configure.
- **Disadvantages**—The central security device is a single point of failure.

Use a site-to-site VPN to connect remote networks to a single, central network inexpensively. An example is shown below:
**Hub and Spoke**

In a hub and spoke VPN, multiple security devices (spokes) communicate through a central device (the hub).

- **Advantages**—Can connect several devices and users. Hub and spoke VPNs are easy to maintain because you only need to reconfigure the spoke and the hub device, which save you administration and resource costs. If you have smaller security devices with limited tunnel capacity, you can use hub and spoke VPNs to increase the number of available tunnels.

- **Disadvantages**—The hub is a single point of failure; however, you can use NSRP for redundancy.

A hub acts as a concentrator for the other VPN members, but does not necessarily have resources that are available to other members. In fact, you can specify a security device that is not a VPN member to act as the hub: If you include the hub in the VPN, the hub device can send and receive traffic from all spokes; if you do not include the hub, the hub device routes traffic between spokes.

Use a hub and spoke topology when you want to route VPN traffic through a VPN member that does not contain protected resources. An example is shown below:

**Full Mesh**

In a full mesh VPN, all VPN member can communicate with all other VPN members.

- **Advantages**—Because a full mesh configuration uses redundant IPSec tunnels, traffic continues to flow even if a node fails.

- **Disadvantages**—When you add a member to the VPN, you must reconfigure all devices.

Use a full mesh VPN when you need to ensure that every VPN member can communicate with every other VPN member. An example is shown below:

**Creating Redundancy**

To ensure stable, continuous VPN connection, use redundant gateways to create multiple tunnels between resources. If a tunnel fails, the management system automatically reroutes traffic. Redundant gateways use NSRP to determine the tunnel status.

**Protecting Data in the VPN**

To protect traffic as it passes over the Internet, you can create a secure tunnel between devices using a tunneling protocol. Each device in the VPN uses the tunneling protocol to establish a secure data path, enabling traffic between the devices to flow securely from source to destination. NSM provides two tunneling protocols, IPSec and L2TP, as detailed in the following sections.
Using IPSec

IPSec is a suite of related protocols that tunnel data between devices and cryptographically secure communications at the network layer. Each device in the VPN has the same IPSec configuration, enabling traffic between the devices to flow securely from source to destination.

Because IPSec functions at the network layer, it protects all data generated by any application or protocol that uses IP. Network layer encryption protects data generated by all protocols at the upper layers of the protocol stack. It also protects all data throughout the entire journey of the packet. Data is encrypted at the source and remains encrypted until reaching its destination. Intermediate systems that transmit the packet (like routers and switches on the Internet) do not need to decrypt the packet to route it, and do not need to support IPSec.

When you create your VPN in NSM, you can use one or more IPSec services to establish the tunnel and protect your data. Typically, VPNs use encryption and authentication services to enable basic security between devices; however, for critical data paths, using certificates can greatly enhance the security of the VPN. NSM supports the following IPSec data protection services for VPNs.

Using Authentication

To authenticate the data in the VPN tunnel, you can use the AH protocol, pre-shared secrets, or certificates:

- **Authentication Header (AH)**—AH authenticates the integrity and authenticity of data in the VPN. You can authenticate packets using Message Digest version 5 (MD5), Secure Hash Algorithm-1 (SHA-1), or Hash-based Message Authentication Code (HMAC).

- **Preshared Secret**—NSM generates an ephemeral secret, distributes the secret to each VPN node, then authenticates the VPN data using MD5 or SHA hash algorithms against the secret.

- **Certificates**—IKE uses a trusted authority on the client as the certificate server.

Authentication only authenticates the data; it does not encrypt the data in the VPN. To ensure privacy, you must encrypt the data using ESP.

Using Encapsulating Security Payload (ESP)

ESP encrypts the data in the VPN with DES, Triple DES, or AES symmetric encryption. When the encrypted data arrives at the destination, the receiving device uses a key to decrypt the data. For additional security, you can encrypt the keys that decrypt the data using Diffie-Hellman asymmetric encryption. ESP can also authenticate data in the VPN using MD5 and SHA-1 algorithms. You can use ESP to encrypt, authenticate, or encrypt and authenticate data depending on your security requirements.

**NOTE:** We strongly recommend that you do not use null AH with ESP.
Because ESP uses keys to encrypt and decrypt data, each VPN node must have the correct key to send and receive VPN data through the VPN tunnel.

You can manually configure a key for each VPN node, or use a key exchange protocol to automate key generation and distribution:

- **Manual Key IKE**—In a manual key VPN, you specify the encryption algorithm, authentication algorithm, and the Security Parameter Index (SPI) for each VPN node. Because all security parameters are static and consistent, VPN nodes can send and receive data automatically, without negotiation.

- **Autokey IKE**—In an AutoKey IKE VPN, you can use the Internet Key Exchange (IKE) protocol to generate and distribute encryption keys and authentication algorithms to all VPN nodes. IKE automatically generates new encryption keys for the traffic on the network, and automatically replaces those keys when they expire. Because IKE generates keys automatically, you can give each key a short life span, making it expire before it can be broken. By also exchanging authentication algorithms, IKE can confirm that the communication in the VPN tunnel is secure.

Because all security parameters are dynamically assigned, VPN nodes must negotiate the exact set of security parameters that will be used to send and receive data to other VPN nodes. To enable negotiations, each VPN node contains a list of proposals; each proposal is a set of encryption keys and authentication algorithms. When a VPN node attempts to send data through the VPN tunnel, IKE compares the proposals from each VPN node and selects a proposal that is common to both nodes. If IKE cannot find a proposal that exists on both nodes, the connection is not established.

IKE negotiations include two phases:

- In Phase 1, two members establish a secure and authenticated communication channel.

- In Phase 2, two members negotiate Security Associations for services (such as IPsec) that require key material and/or parameters.

VPN nodes must use the same authentication and encryption algorithms to establish communication.

- **Replay protection**—In a replay attack, an attacker intercepts a series of legitimate packets and uses them to create a denial-of-service (DoS) against the packet destination or to gain entry to trusted networks. Replay protection enables your security devices to inspect every IPSec packet to see if the packet has been received before—if packets arrive outside a specified sequence range, the security device rejects them.

### Using L2TP

Layer 2 Tunneling Protocol (L2TP) is another tunneling protocol used to transmit data securely across the Internet. Because L2TP can transport Point to Point Protocol (PPP) frames over IP, it is often used to:

- Establish PPP connections (Ex. authenticate ADSL services using PPP for users with an ISP at the opposite side of a Telco IP/ATM network)
Transmit non-IP protocols (Ex. bridge Novell and other network protocols)

PPP can send IP datagrams over a serial link, and is often used to enable dial-up users to connect to their ISP and to the Internet. PPP authenticates username and password, and assigns parameters such as IP address, IP gateway, and DNS. PPP can also tunnel non-IP traffic across a serial link, such as Novell IPX or Appletalk.

PPP is also useful because it can carry non-IP traffic and authenticate connections to RADIUS servers. However, because PPP is not an IP protocol, Internet routers and switches cannot route PPP packets. To route PPP packets, you use L2TP, which encapsulates PPP packet inside an Internet routeable, UDP packet. L2TP VPNs supports remote access service users using Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP) authentication.

Using L2TP Over AutoKey IKE

L2TP only transmits packets; for encryption, authentication, or other data protection services, you must further encapsulate the L2TP packet using AutoKey IKE.

Choosing a VPN Tunnel Type

You can configure three types of VPN tunnels with NSM:

- Policy-based VPNs—The VPN tunnel is created and maintained only during the transfer of network traffic that matches a VPN rule, and is torn down when the connection ends. Use policy-based VPNs when you want to encrypt and authenticate certain types of traffic between two VPN members.

- Route-based VPNs—The VPN tunnel is created when the route is defined and is maintained continuously. Use route-based VPNs when you want to encrypt and authenticate all traffic between two VPN members. You cannot add RAS users in a routing-mode VPN.

- Mixed-mode VPNs—Connects policy-based VPNs to route-based VPNs in a mixed-mode VPN. You cannot add RAS users in a mixed-mode VPN.

The following sections detail Policy-based and Route-based VPN types.

About Policy-Based VPNs

A policy-based VPN tunnels traffic between two security devices or between one security device and a remote user. Each time a security device detects traffic that matches the from zone, source, to zone, destination, and service in the VPN rule, it creates the VPN tunnel to encrypt, authenticate, and send the data to the specified destination. When no traffic matches the VPN rule, the firewall tears down the VPN tunnel.

To create a policy-based VPN, use NSM to configure a policy based on the network components you want to protect, including protected resources, then push the configuration to the security device(s). The security device(s) use the configuration to create the VPN tunnel. A protected resource is a combination of a network component and a service; protected resources in a VPN can communicate with other
protected resources using the specified services. In a VPN rule, you add protected resources as the source and destination IP addresses.

Policy-based VPNs can use any of the supported data protection methods. Use policy-based VPNs when you want to enable Remote Access Services (RAS). You can add users to the VPN just as you add devices, enabling user access to all resources within the VPN.

About Route-Based VPNs

Like a policy-based VPN, a route-based VPN tunnels traffic between two security devices or between one security device and a remote user. However, a route-based VPN automatically tunnels all traffic between two termination points, without regard for the type of traffic. Because the tunnel is an always-on connection between two network points, the security device views the tunnel as a static network resource through which to route traffic.

To create the termination points of the tunnel, you designate an interface on the security device as a tunnel interface, then define a static route or use a dynamic routing protocol (BGP, OSPF) between all tunnel interfaces in the VPN. The tunnel interface, just like a physical interface, maintains state to enable dynamic routing protocols to make route decisions. When using VPN Manager to create your route-based VPNs, the tunnel interfaces are automatically created for you.

VPN Checklist

After you have carefully considered your VPN requirements, create a VPN checklist to help you determine the VPN components you need to create. You might also want to create a network diagram of your topology that includes protected resources, VPN members, their IP addresses and gateways, and the type of tunnel between them.

Define Members and Topology

What do you want to connect?
- Devices
- Network Components/Protected Resources
- Remote Access Service (RAS) Users
- Extranet Devices

How do you want to connect the VPN members?
- Site to Site
- Hub and Spoke
- Full Mesh

You might want to create a network diagram to map out your VPN visually, with IP addresses, to help you configure your topology.
Define VPN Type: Policy-Based, Route-Based, or Mixed-Mode

What type of traffic do you want to protect?

- Use a policy-based VPN to encrypt and authenticate certain types of traffic between two network nodes.
- Use a route-based VPNs to encrypt and authenticate all traffic between two network nodes.
- Use a mixed-mode VPN to encrypt and authenticate traffic between policy-based and route-based VPNs nodes.

Define Security Protocol (Encryption and Authentication)

How do you want to protect the VPN traffic?

- Autokey IKE
- L2TP
- L2TP over AutoKey IKE
- Manual Key (you cannot use VPN Manager to create a Manual Key VPN)

You must also decide if you want to use certificates to authenticate communication between the VPN members.

Define Method: VPN Manager or Device-Level?

How do you want to create the tunnel? Using VPN Manager or configuring each device?

Using VPN Manager

When adding a VPN using the VPN Manager, you enter the VPN members, gateways, IKE properties, and VPN topology, then autogenerate the VPN rules that create the VPN. You can inspect the VPN rules and override any VPN property before sending the VPN configuration to your devices.

Choose the VPN type that best matches your VPN requirements:

- Autokey IKE VPN—Use to authenticate and encrypt traffic between devices and/or protected resources. An Autokey IKE VPN supports:
  - Mixed-mode VPNs (policy-based members and route-based members)
  - Policy-based VPNs
  - Route-based VPNs
  - ESP and AH Authentication
  - ESP AutoKey IKE Encryption
IP traffic

Tunnels between devices (routing-based) and protected resources (policy-based)

- Autokey IKE RAS VPN—Use to authenticate and encrypt traffic between remote users and protected resources. An Autokey IKE RAS VPN supports:
  - Policy-based VPNs
  - ESP and AH Authentication
  - ESP AutoKey IKE Encryption
  - IP traffic
  - Remote access users

- L2TP RAS VPN—Use to authenticate (but not encrypt) PPP or other non-IP traffic between RAS users and protected resources. An L2TP RAS VPN supports:
  - Policy-based VPNs
  - AH Authentication
  - PPP or other non-IP traffic
  - Remote access users

- L2TP over Autokey IKE RAS VPN—Use to authenticate and encrypt PPP traffic between remote users and protected resources. An L2TP over Autokey IKE RAS VPN supports:
  - Policy-based VPNs
  - ESP and AH Authentication
  - ESP AutoKey IKE Encryption
  - PPP or other non-IP traffic
  - Remote access users

**Creating Device-Level VPNs**

You can create the following VPN types:

- AutoKey IKE VPN
- Manual Key IKE VPN
- L2TP VPN
- Redundant Site-Site VPN
Preparing VPN Components

After you have determine how you want to configure your VPN, you can begin preparing the VPN components necessary to create the VPN. A VPN combines device-level components (such as devices, zones, and routes) with network-level components (authentication, users, and NAT) to create a secure system of communication. Before you can create a VPN, you must first configure the components that comprise the VPN.

Each VPN type has basic, required, and optional components:

- “Preparing Basic VPN Components” on page 172
- “Preparing Required Policy-Based VPN Components” on page 172
- “Configuring Required Routing-Based VPN Components” on page 175
- “Configuring Optional VPN Components” on page 177

For mixed-mode VPNs, you must configure all basic and required policy- and route-based components.

NOTE: For step-by-step instructions on creating VPNs, see the Network and Security Manager Online Help topic “VPNs”.

Preparing Basic VPN Components

To create any type of VPN, ensure that all security devices you want to use in the VPN are managed by NSM and configured correctly.

- Devices—Add the security devices you want to include in the VPN to NSM, ensuring that all devices are in the same domain. If you need to add a device to a VPN in a different domain, you must add the device as an extranet device in the domain that contains the VPN, then add the extranet device to the VPN. For details on adding devices, importing devices, or using extranet devices in VPNs, see “Domain selection is critical when using VPNs. You can create VPNs only between devices within the same domain. If you need to add a device to a VPN in a different domain, add the device as an extranet device in the domain that contains the VPN, then add the extranet device to the VPN.

- Zones—Configure each security device with at least two zones (trust and untrust); each zone must contain at least one interface (physical or virtual). For details on creating and configuring zones and interfaces, see “Configuring Zones” on page 34.

Preparing Required Policy-Based VPN Components

A policy-based VPN requires several components:

- Address Objects
- Protected Resources
The following sections detail how to configure each component; after you have created a component, you can use it to create your VPN.

**Configuring Address Objects**

You must create address objects to represent your network components in the UI. For details on creating and configuring address objects, see the [Network and Security Manager Administration Guide](#).

**Configuring Protected Resources**

You should determine your protected resources first to help you identify the devices you need to include in the VPN. After you know what you want to protect, you can use VPN Manager or manually configure your security devices to create the VPN. A protected resource object represents the network components (address objects) and services (service objects) you want to protect and the security device that protects them.

The address specifies secured destination, the service specifies the type of traffic to be tunneled, and the device specifies where the VPN terminates (typically an outgoing interface in untrust zone). In a VPN rule, protected resources are the source and destination IP addresses.

When creating protected resources:

- To protect multiple network components that are accessible by the same security device, add the address objects that represent those network components to the protected resource object.
- To protect a single network component that is accessible by multiple security devices, add multiple devices to the protected resource object. You must configure each device to be a part of the VPN.
- To manage different services for the same network component, create multiple protected resource objects that use the same address object and security device but specify a different service object.
- If you change the security device that protects a resource, NSM removes the previous security device from all affected VPNs and adds the new security device. However, NSM does not configure the VPN topology for the new security device—you must reconfigure the topology to include the new device manually.

For more details on creating protected resources, see the [Network and Security Manager Administration Guide](#).

**Configuring Shared NAT Objects**

For VPNs that support policy-based NAT, you must create one or more shared NAT objects. A shared NAT object contains references to device-specific NAT objects, enabling multiple devices to share a single object.
First, create a device-specific NAT object by editing the device configuration of each security device member. Then, create a global NAT object that includes the device-specific NAT objects. In the Object Manager, create a single shared NAT object to represent similar device-specific NAT objects (for example, a global DIP represents multiple device-specific DIPs). Use the global NAT object in your VPN; when you install the VPN on a device, that device automatically replaces the shared NAT object with its device-specific NAT object.

For details on shared NAT objects, see the *Network and Security Manager Administration Guide*.

### Configuring Remote Access Service (RAS) Users

For VPNs that support RAS users, you must create a User Object to represent each user. NSM supports two types of users:

- **Local Users**—A local user has an account on the security device that guards the protected resources in the VPN. When a local user attempts to connect to a protected resource, the security device authenticates the user.

- **External Users**—An external user has an account on RADIUS or SecureID Authentication Server. When an external user attempts to connect to a protected resource, the security device forwards the request to the authentication server for authentication.

### Authenticating RAS Users

You can authenticate/encrypt a RAS user using one or more of the following protocols:

- **XAuth**—Uses IPSec ESP and a username and password for authentication. XAuth RAS users must authenticate with a username and password when they connect to the VPN tunnel.

- **AutoKey IKE**—Uses IPSec ESP and AH for encryption and authentication. AutoKey IKE users have a unique IKE ID that NSM uses to identify and authenticate the user during IKE Phase I negotiations. To simplify RAS management for large numbers of AutoKey IKE users, you can also create AutoKey IKE groups that use a shared Group IKE ID.

- **L2TP**—Uses Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP) for authentication (password sent in the clear).

- **Manual Key IKE**—Uses IPSec ESP and AH for encryption and authentication. Because manual key users are device-specific, you create them in the security device configuration, not in the Object Manager. For details on creating manual key users, see “Configuring L2TP and XAuth Local Users” on page 200.

We strongly recommend that you do not use null AH with ESP.

NSM allows certificate with DC in certificate DN to be used for dialup user IKE ID selection.

When you use certificate DN as dialup user IKE ID, the following takes place:

- On the device sever, a partial or whole DN is associated with a VPN configuration.
On the client side, the certificate DN is sent as IKE ID for the server to match the VPN configuration based on the content of DN.

The server DN configuration can contain a container part and a wildcard part as follows:

- The container part contains a continuous section of the DN; for example, “OU=a,O=b”. Any DN containing all specified elements in correct order are accepted.
- Up to seven wildcards can be specified, one for each of the following element: CN, OU, O, L, ST, C, Email.

NSM needs to support DC container type when using ASN1-DN to create IKE ID or a group of IKE ID that enables multiple, concurrent connections to the same VPN tunnel. During Phase 1 negotiations, IKE first attempts to make an exact match between the RAS IKE ID and peer gateway IKE ID.

If no match is found, IKE then attempts to make a partial match between the RAS IKE ID and Group IKE ID. When selecting this type, you must enter a container identity or a wildcard ID (CN, OU, O, L, ST, C, Email).

NSM devices authenticate a RAS IKE user's ID if the values in the RAS IKE user's ASN1-DN identity fields exactly match the values in the group IKE user's ASN1-DN identity fields. The container ID type supports multiple entries for each identity field (for example, "ou=eng,ou=sw,ou=screenos"). The ordering of the values in the identity fields of the two ASN1-DN strings must be identical. In this IKE ID matching part, we need to allow DC element to be matched.

NSM also supports DC in wildcard when using ASN1-DN to create IKE ID or a group of Wildcard ID. NSM devices authenticate a RAS IKE user's ID if the values in the RAS IKE user's ASN1-DN identity fields match those in the group IKE user's ASN1-DN identity fields. The wildcard ID supports only one value per identity field (for example, "ou=eng" or "ou=sw", but not "ou=eng, ou=sw"). The ordering of the identity fields in the two ASN1-DN strings are inconsequential. In this IKE ID matching part, we need to support DC as a wildcard element.

**Configuring Group IKE IDS**

If your VPN includes multiple remote users, it can be impractical to create an IKE ID and VPN rule for each. Instead, you can use a Group IKE ID to authenticate multiple users in a single VPN rule. In the security device configuration VPN settings, create a VPN Group and specify the maximum number of concurrent connections that the group supports (cannot exceed the maximum number of allowed Phase 1 SAs or the maximum number of VPN tunnels allowed on the Juniper Networks security device platform).

For details on group IKE IDs, see the ScreenOS 5.x Concepts and Examples Guide.

**Configuring Required Routing-Based VPN Components**

A route-based VPNs requires two components:
The following sections detail how to configure each required component.

For VPNs created with VPN Manager, you create the VPN first to autogenerate the tunnel interfaces, then create the routes on the device itself using those tunnel interfaces. For VPNs created at the device level, you can create the tunnel interfaces and routes before or after configuring the VPN.

**Configuring Tunnel Interfaces and Tunnel Zones**

A VPN requires a physical or virtual interface on the security device, and each security device supports a specific number of physical and virtual interfaces. To support multiple VPNs on a device, you might want to create tunnel interfaces and tunnel zones to increase the number of available interfaces on the device.

*NOTE:* VPN Manager automatically creates the necessary tunnel interfaces for route-based VPNs. For device-level VPNs, you can create the tunnel interfaces before or after creating the VPN.

If you do not need to do address translation (NAT), use unnumbered.

- **Tunnel Interfaces**—A tunnel interface handles VPN traffic between the VPN tunnel and the protected resources. You can create numbered tunnel interfaces that use unique IP addresses and netmasks, or unnumbered tunnel interfaces that do not have their own IP address and netmask (unnumbered tunnel interface borrows the IP address of the default interface of the security zone).

- **Tunnel Zones**—A tunnel zone is a logical construction that includes one or more numbered tunnel interfaces. You must bind the VPN tunnel to the tunnel zone (not the numbered tunnel interfaces); the VPN tunnel uses the default interface for the tunnel zone. In a policy-based VPN, you can link:
  - A single VPN tunnel to multiple tunnel interfaces
  - Multiple VPN tunnels to a single tunnel interface

For details on tunnel interfaces and tunnel zones, see “Configuring Tunnel Interfaces and Tunnel Zones” on page 176.

**Configuring Static and Dynamic Routes**

A security device must know the path, or route, between each protected resource or security device in the VPN before it can forward packets from the source network to the destination network on the other side of the tunnel. To specify the route, you can use static routes, which define a specific, unchanging path between two VPN nodes, or dynamic routes, which define an algorithm that dynamically determines the best path between two VPN nodes.
NOTE: If you are using VPN Manager to create the route-based VPNs, you create the
routes after autogenerating the VPN. If you are creating a device-level VPN, you can
create the routes after configuring the tunnel interfaces.

To create a static route, you must manually create a route for each tunnel on each
device. For VPNs with more than just a few devices, Juniper Networks highly
recommends using a dynamic routing protocol to automatically determine the best
route for VPN traffic:

To route between different networks over the Internet, use Border Gateway Protocol
(BGP); to route within the same network, use Open Shortest Path First (OSPF). For
details on creating routes, see “Configuring Virtual Routers for Root and
Vsys” on page 203.

Configuring Optional VPN Components

In any type of VPN, you can also use three optional components:

- Authentication Server
- Certificate and Certificate Revocation List Objects
- PKI Defaults

The following sections detail how to configure each optional component; after you
have created the component, you can use it to create your VPN.

Creating Authentication Servers

To externally authenticate VPN traffic for XAuth and L2TP, you must create an
authentication server object to use in your VPN. For details on authentication servers,
see “Configuring Authentication Servers” on page 122.

Creating Certificate Objects

To authenticate external devices, use a Group IKE ID to authenticate multiple RAS
users, or provide additional authentication for the security devices in your VPN, you
must obtain and install a digital certificate on each VPN member. A digital certificate
is an electronic means for verifying identity through the word of a trusted third party,
known as a Certificate Authority (CA). The CA is a trusted partner of the VPN member
using the digital certificate as well as the member receiving it.

The CA also issues certificates, often with a set time limit. If you do not renew the
certificate before the time limit is reached, the CA considers the certificate inactive.
A VPN member attempting to use an expired certificate is immediately detected (and
rejected) by the CA.

To use certificates in your VPN, you must configure:

- Local Certificate—Use a local certificate for each security device that is a VPN
  member.
Certificate Authority (CA) Object—Use a CA object to obtain a local and CA certificate.

Certificate Revocation List (CRL) Object—Use a CRL object to ensure that expired certificates are not accepted; a CRL is optional.

**Configuring Local Certificates**

A local certificate validates the identity of the security device in a VPN tunnel connection. To get a local certificate for a device, you must prompt the device to generate a certificate request (includes public/private key pair request) using the Generate Certificate Request directive. In response, the device provides certificate request that includes the encrypted public key for the device. Using this encrypted public key, you can contact an independent CA (or use your own internal CA, if available) to obtain a local device certificate file (.cer file).

You must install this local certificate file on the managed device using NSM before you can use certificates to validate that device in your VPN. Because the local certificate is device-specific, you must use a unique local certificate for each device.

You can also use SCEP to configure the device to automatically obtain local certificate (and a CA certificate) from the CA directly. For details on local certificates, see “Configuring A Local Certificate” on page 216.

**Configuring CA Objects**

A CA certificate validates the identity of the CA that issued the local device certificate. You can obtain a CA certificate file (.cer) from the CA that issued the local certification, then use this file to create a Certificate Authority object.

You must install this CA certificate on the managed device using NSM before you can use certificate to validate that device in your VPN. Because the CA certificate is an object, however, you can use the same CA for multiple devices, as long as those devices use local certificates that were issued by that CA.

You can also use SCEP to configure the device to automatically obtain a CA certificate at the same time it receives the local certificate. For details on configuring a certificate authority object, see the *Network and Security Manager Administration Guide*.

**Configuring CRL Objects**

A Certificate Revocation List (CRL) identifies invalid certificates. You can obtain a CRL file (.crl) from the CA that issued the local certification and CA certificate for the device, then use this file to create a Certificate Revocation object.

You must install the CRL on the managed device using NSM before you can use a CRL to check for revoked certificates in your VPN. Because the CRL is an object, however, you can use the same CRL for multiple devices, as long as those devices use local and CA certificates that were issued by that CA.

After you have received a CRL list, you can use the CRL object in your VPN. For details on configuring a certificate revocation list object, see the *Network and Security Manager Administration Guide*. 

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Creating PKI Defaults

You can configure default PKI settings for each security device that define how that device handles certificates. When configuring a VPN that includes the device, you can use these default settings. For details on PKI defaults, see the Network and Security Manager Administration Guide.

Creating Device-Level VPNs

You can create four types of device-level VPNs:

- Use an **AutoKey IKE VPN** to connect devices and/or protected resources. An AutoKey IKE VPN supports mixed-mode, policy-based, and routing-based VPNs, but does not support RAS users. For details on each step, see “Creating AutoKey IKE VPNs” on page 179.
- Use a **Manual Key IKE VPNs** to authenticate devices, protected resources, and RAS users in the VPN with manual keys. For details on each step, see “Creating Manual Key VPNs” on page 187.
- Use an **L2TP RAS VPN** to connect L2TP RAS users and protected resources with authentication but without encryption. For details on each step, see “Creating L2TP VPNs” on page 190.
- Use an **L2TP-over-AutoKey IKE RAS VPN** to connect L2TP RAS users and protected resources. An L2TP-over-AutoKey IKE RAS VPN supports policy-based VPNs and L2TP RAS users, but does not support routing-based VPNs. For details on each step, see “Creating L2TP Over Autokey IKE VPNs” on page 191.

Supported Configurations

IKE VPNs support tunnel mode, and can be policy-based or route-based; however, route-based VPNs do not support RAS users.

L2TP VPNs support transport mode, and can be policy-based.

Creating AutoKey IKE VPNs

Creating device-level AutoKey IKE VPNs is a four stage process:

- Configure Gateway
- Configure Routes (Route-based only)
- Configure VPN on the Device
- Add VPN rules to Security Policy

Configuring Gateways

A gateway is an interface on your security device that sends and receives traffic; a remote gateway is an interface on another device that handles traffic for that device. Each security device member has a remote gateway that it sends and receives VPN traffic to and from. To configure a gateway for a VPN member, you need to define
the local gateway (the interface on the VPN member that handles VPN traffic) and
the remote gateway (the interface on the other VPN member that handles VPN traffic).
The interface can be physical or virtual.

- For remote gateways that use static IP addresses, specify the IP address or host
  name of the remote device.
- For remote gateways that use dynamic IP addresses, configure an IKE ID for the
  remote device.
- For remote gateways that are RAS users, specify a Local User object as a remote
  gateway to enable RAS user access.

To add a gateway to a security device, open the device configuration, select VPN
Settings, and click the Add icon to display the New Gateway Dialog box. Configure
the gateway as detailed in the following sections.

**Properties**

Enter a name for the new gateway, then specify the following gateway values:

- **Mode**—The mode determines how Phase 1 negotiations occur.
  - In **Main** mode, the IKE identity of each node is protected. Each node sends
    three two-way messages (six messages total); the first two messages negotiate
    encryption and authentication algorithms that protect subsequent messages,
    including the IKE identity exchange between the nodes. Depending on the
    speed of your network connection and the encryption and authentication
    algorithms you use, main mode negotiations can take a long time to
    complete. Use Main mode when security is more important.
  - In **Aggressive** mode, the IKE identity of each node is not protected. The
    initiating node sends two messages and the receiving node sends one (three
    messages total); all messages are sent in the clear, including the IKE identity
    exchange between the nodes. Because Aggressive mode is typically faster
    but less secure than Main mode, use Aggressive mode when speed is more
    important than security. However, you **must** use Aggressive mode for VPNs
    that include RAS users.

- **Remote Gateway**—The remote gateway is the VPN gateway on the receiving
  VPN node, and can be an interface with a static or dynamic IP address, or local
  or external user object.
  - **Static IP Address**. For remote gateways that use a static IP address, enter
    the IP address and mask.
  - **RAS User/Group**. For remote gateways that are users, select the User object
    or User Group object that represents the RAS user.
  - **Dynamic IP Address**. For remote gateways that use a dynamic IP address,
    select dynamic IP address.

- **Outgoing Interface**—The outgoing interface (also known as the termination
  interface) is the interface on the security device that sends and receives VPN
  traffic. Typically, the outgoing interface is in the untrust zone.

- **Heartbeats**—Use heartbeats to enable redundant gateways. You can use the
  default or set your own thresholds:
■ Hello. Enter the number of seconds the security device waits between sending hello pulses.
■ Reconnect. Enter the maximum number of seconds the security device waits for a reply to the hello pulse.
■ Threshold. Enter the number of seconds that the security device waits before attempting to reconnect.

■ NAT Traversal—Because NAT obscures the IP address in some IPSec packet headers, a VPN node cannot receive VPN traffic that passes through an external NAT device. To enable VPN traffic to traverse a NAT device, you can use NAT Traversal (NAT-T) to encapsulate the VPN packets in UDP. If a VPN node with NAT-T enabled detects an external NAT device, it checks every VPN packet to determine if NAT-T is necessary. Because checking every packet impacts VPN performance, you should only use NAT Traversal for remote users that must connect to the VPN over an external NAT device.

You do not need to enable NAT-T for your internal security device nodes that use NAT; each VPN node knows the correct address translations for VPN traffic and does not need to encapsulate the traffic.

To use NAT-T, enable NAT-Traversal and specify:
■ UDP Checksum. A 2-byte value (calculated from the UDP header, footer, and other UDP message fields) that verifies packet integrity. You must enable this option for NAT devices that require UDP checksum verification; however, most NAT devices (including security devices) do not require it.
■ Keep alive Frequency. The number of seconds a VPN node waits between sending empty UDP packets through the NAT device. A NAT device keeps translated IP addresses active only during traffic flow, and invalidates unused IP addresses. To ensure that the VPN tunnel remains open, you can configure the VPN node to send empty “keep alive” packets through the NAT device.

**IKE IDs/XAuth**

Every VPN member has a unique identification number, known as an IKE ID. During Phase 1 negotiations, the IKE protocol uses the ID to authenticate the VPN member. You must select and configure an ID type for the VPN members at each end of the tunnel. However, the ID type can be different for each member:

■ ASN1-DN—Abstract Syntax Notation, version 1 is a data representation format that is non-platform specific; Distinguished Name is the name of the computer. Use ASN1-DN to create a Group ID that enables multiple RAS users to connect to the VPN tunnel concurrently.
■ At the peer ID, specify values for the Container Match and Wildcard Match.
■ At the local ID, specify the value.

Using a Group ID can make configuring and maintaining your VPN quicker and easier. For details on how Group IKE IDs work, see “Configuring Group IKE IDS” on page 175. For details on determining the ASN1-DN container
and wildcard values for Group IKE IDs, see Juniper Networks ScreenOS 5.x Concepts and Examples Guide.

- **FQDN**—Use a Fully Qualified Domain Name when the VPN member uses a dynamic IP address. FQDN is a name that identifies (qualifies) a computer to the DNS protocol using the computer name and the domain name; ex. server1.colorado.mycompany.com.

- **IP Address**—Use an IP address when the VPN member uses a static IP address.

- **U-FQDN**—Use a User Fully Qualified Domain Name when the VPN member uses a dynamic IP address (such as a RAS user). A U-FQDN is an email address, such as user1@mycompany.com.

Use the XAuth protocol to authenticate RAS users with an authentication token (such as SecureID) and to make TCP/IP settings (IP address, DNS server, and WINS server) for the peer gateway.

- **Default Server**—Use the default server to use the default XAuthentication server for the device. To change or assign a default XAuthentication server, edit the VPN settings > Defaults > Xauth settings.

- **XAuth Server**—Use to specify the authentication server that assigns TCP/IP settings to the remote gateway.
  - **XAuth Server Name.** Select a pre-configured authentication server object. For details on creating authentication server objects, see “Configuring Authentication Servers” on page 122.
  - **Allowed Authentication Type.** Select generic or Challenge Handshake Authentication Protocol (CHAP) (password is sent in the clear) to authenticate the remote gateway.
  - **Query Remote Setting.** Enable this option to query the remote settings object for DNS and WINS information.
  - **Users and Groups.** To authenticate XAuth RAS users using the authentication server, enable User or User Group and select a preconfigured user object.

- **XAuth Client**—Use when the remote gateway is a RAS user that you want to authenticate.
  - **Allowed Authentication Type.** Select Any or Challenge Handshake Authentication Protocol (CHAP) for authentication (password is sent in the clear).
  - **User Name and Password.** Enter the user name and password that the RAS user must provide for authentication.

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**NOTE:** All passwords handled by NSM are case-sensitive.

- **Bypass Authentication**—Use to permit VPN traffic from this VPN member to pass unauthenticated by the Auth server.
Security

Select the authentication method you want to use in the VPN:

- **Preshared Key**—Use if your VPN includes security devices and/or RAS users. VPN nodes use the preshared key during Phase 1 negotiations to authenticate each other; because each node knows the key in advance, negotiations use fewer messages and are quicker.
  - To generate a random key, enter a value for the seed, then click Generate Key. NSM uses the seed value to generate a random key, which is used to authenticate VPN members.

  **NOTE:** Using a random key can generate a value in excess of 255 characters, which exceeds ScreenOS limits and might not be accepted by the security device during update. To reduce the key size, shorten the autogenerated key value by deleting characters.

- To use a predefined value for the key, enter a value for the Preshared Key.

- **PKI**—Use if your VPN includes extranet devices or you require the additional security provided by certificates (PKI uses certificates for VPN member authentication).

For Phase 1 negotiations, select a proposal or proposal set. You can select from predefined or user-defined proposals:

- To use a predefined proposal set, select one of the following:
  - Basic (**nopfs-esp-des-sha**, **nopfs-esp-des-md5**)
  - Standard (**gs-esp-3des-sha**, **gs-esp-aes128-sha**)

  **NOTE:** You cannot use a predefined proposal set with certificates—you must select a user-defined proposal or change the authentication method to Preshared Key.

- To use a user-defined proposal, select a single proposal from the list of predefined and custom IKE Phase 1 Proposals. For details on custom IKE proposals, see “Configuring IKE Proposals” in the Network and Security Manager Administration Guide.

If your VPN includes only security devices, you can specify one predefined or custom proposal that NSM propagates to all nodes in the VPN. If your VPN includes extranet devices, you should use multiple proposals to increase security and ensure compatibility.
Configuring Routes (Route-based only)

For a routing-based VPN member, you must configure:

- Tunnel zone or tunnel interfaces on the member.
- Static or dynamic routes from the member to other VPN members.

VPN traffic flows through the tunnel zones or tunnel interfaces on the security device, and uses static or dynamic routes to reach other VPN members. You must create the tunnel zones and interfaces before configuring routes.

For details on configuring tunnel zones, tunnel interfaces, static routes, or dynamic routes, see “Configuring Virtual Routers” on page 237.

After you have configured the tunnel zone or interface on the security device, you must bind the VPN to that zone or interface to make the VPN functional, as described in the following section.

Configuring the VPN

When you configure the VPN, you are defining the gateway the security device uses to connect to the VPN, the IKE Phase 2 proposals used by that gateway, and how you want NSM to monitor the VPN tunnel.

For route-based VPNs, you are also binding the VPN to the tunnel interface or zone that sends and receives VPN traffic to and from the device.

Properties

Enter the following values:

- VPN name—Enter a name for the VPN.
- Remote Gateway—Select the gateway for the VPN.
- Idle Time to Disable SA—Configure the number of minutes before a session that has no traffic automatically disables the SA.
- Replay Protection—In a replay attack, an attacker intercepts a series of legitimate packets and uses them to create a denial-of-service (DoS) against the packet destination or to gain entry to trusted networks. If replay protection is enabled, your security devices inspect every IPSec packet to see if the packet has been received before—if packets arrive outside a specified sequence range, the security device rejects them.
- IPSec Mode—Configure the mode:
  - Use tunnel mode for IPSec. Before an IP packet enters the VPN tunnel, NSM encapsulates the packet in the payload of another IP packet and attaches a new IP header. This new IP packet can be authenticated, encrypted, or both.
  - Use transport mode for L2TP-over-IPSec. NSM does not encapsulate the IP packet, meaning that the original IP header must remain in plaintext.
However, the original IP packet can be authenticated, and the payload can be encrypted.

- Do not set Fragment Bit in the Outer Header—The Fragment Bit controls how the IP packet is fragmented when traveling across networks.
  - Clear. Use this option to enable IP packets to be fragmented.
  - Set. Use this option to ensure that IP packets are not fragmented.
  - Copy. Select to use the same option as specified in the internal IP header of the original packet.

**Security**

For Phase 2 negotiations, select a proposal or proposal set. You can select from predefined or user-defined proposals:

- To use a predefined proposal set, select one of the following:
  - Basic (nopfs-esp-des-sha, nopfs-esp-des-md5)
  - Compatible (nopfs-esp-3des-sha, nopfs-esp-3des-md5, nopfs-esp-des-sha, nopfs-esp-des-md5)
  - Standard (gs-esp-3des-sha, gs-esp-aes128-sha)

- To use a user-defined proposal, select a single proposal from the list of predefined and custom IKE Phase 2 Proposals. For details on custom IKE proposals, see “Configuring IKE Proposals” in the Network and Security Manager Administration Guide.

If your VPN includes only security devices, you can specify one predefined or custom proposal that NSM propagates to all nodes in the VPN. If your VPN includes extranet devices, you should use multiple proposals to increase security and ensure compatibility.

**Binding/ProxyID**

You can bind the VPN tunnel to a tunnel interface or tunnel zone to increase the number of available interfaces in the security device. To use a tunnel interface and/or tunnel zone in your VPN, you must first create the tunnel interface or zone on the device; for details, see “Configuring Tunnel Interfaces and Tunnel Zones” on page 176 and “Configuring a Tunnel Interface” on page 73.

- None—Select none when you do not want to bind the VPN tunnel to a tunnel interface or zone.
- Tunnel Interface—Select a pre-configured tunnel interface on the security device to bind the VPN tunnel to the tunnel interface. The security device routes all VPN traffic through the tunnel interface to the protected resources.
- Tunnel Zone—Select a pre-configured tunnel zone on the security device to bind the VPN tunnel directly to the tunnel zone. The tunnel zone must include one or more numbered tunnel interfaces; when the security device routes VPN traffic
to the tunnel zone, the traffic uses one or more of the tunnel interfaces to reach
the protected resources.

You can also enable proxy and configure the proxy parameters.

**Monitor**

You can enable VPN Monitor and configure the monitoring parameters for the device.
Monitoring is off by default. To enable the VPN Monitor in Realtime Monitor to display
statistics for the VPN tunnel, configure the following:

- **VPN Monitor**—When enabled, the device sends ICMP echo requests (pings)
  through the tunnel at specified intervals (configurable in seconds) to monitor
  network connectivity (the device uses the IP address of the local outgoing interface
  as the source address and the IP address of the remote gateway as the destination
  address). If the ping activity indicates that the VPN monitoring status has changed,
  the device triggers an SNMP trap; VPN Monitor (in RealTime Monitor) tracks
  these SNMP statistics for VPN traffic in the tunnel and displays the tunnel status.

- **Rekey**—When enabled, the device regenerates the IKE key after a failed VPN
tunnel attempts to re-establish itself. When disabled, the device monitors the
tunnel only when the VPN passes user-generated traffic (instead of using
device-generated ICMP echo requests). Use the rekey option to:
  - Keep the VPN tunnel up even when traffic is not passing through
  - Monitor devices at the remote site.
  - Enable dynamic routing protocols to learn routes at a remote site and
    transmit messages through the tunnel.
  - Automatically populate the next-hop tunnel binding table (NHTB table) and
    the route table when multiple VPN tunnels are bound to a single tunnel
    interface.

- **Optimized**—(This option appears only for devices running ScreenOS 5.x.) When
  enabled, the device optimizes its VPN monitoring behavior as follows:
  - Considers incoming traffic in the VPN tunnel as ICMP echo replies. This
    reduces false alarms that might occur when traffic through the tunnel is
    heavy and the echo replies cannot get through.
  - Suppresses VPN monitoring pings when the tunnel passes both incoming
    and outgoing traffic. This can help reduce network traffic.

- **Source Interface and Destination IP**—Configure these options to use VPN
  Monitoring when the other end of the VPN tunnel is not a security device. Specify
  the source and destination IP addresses.

**Adding a VPN Rule**

After you have configured the VPN on each device you want to include in the VPN,
you can add a VPN rule to a Security Policy:

- For policy-based VPNs, you must add a VPN rule to create the VPN tunnel.
For route-based VPNs, the VPN tunnel is already in place. However, you might want to add a VPN rule to control traffic through the tunnel.

For details on adding and configuring a VPN rule in a Security Policy, see “Adding VPN Rules” on page 192.

**Creating Manual Key VPNs**

Creating a device-level Manual Key VPN is a four stage process:

1. Configure XAuth Users
2. Configure Routes (Route-based only)
3. Configure VPN on Device
4. Add VPN rules to Security Policy

**Adding XAuth Users**

For VPNs that use IPSec manual key to provide remote access services, you must add an XAuth User to the security device. An XAuth User has an account on the security device that guards the protected resources in the VPN; when the user attempts to connect to a protected resource, the security device authenticates the user.

To add a XAuth User for a security device, in the security device configuration L2TP/XAuth/Local User, click the Add icon. Enter a name for the user, then specify:

- **User**—Select a preconfigured Local User object that is configured for XAuth.
- **Remote Setting**—Select a preconfigured Remote Settings object.
- **IP Pool**—Select a preconfigured IP Pool object.
- **Static IP**—Enter the static IP address of the Local User.

**Configuring Routes (Route-based only)**

For a routing-based VPN member, you must configure:

- **Tunnel zone or tunnel interfaces on the member.**
- **Static or dynamic routes from the member to other VPN members.**

VPN traffic flows through the tunnel zones or tunnel interfaces on the security device, and uses static or dynamic routes to reach other VPN members. You must create the tunnel zones and interfaces before configuring routes. For details on configuring tunnel zones, tunnel interfaces, and static or dynamic routes, see “Configuring Virtual Routers” on page 237.

After you have configured the tunnel zone or interface on the security device, you must bind the VPN to that zone or interface to make the VPN functional, as described in the following section.
Configuring the VPN

The following sections detail how to configure the VPN.

Properties

Enter the following values:

- **VPN name**—Enter a name for the VPN.
- **Gateway**—Enter a gateway for the VPN.
- **Local SPI**—The local Security Parameter Index.
- **Remote SPI**—The remote Security Parameter Index.
- **Outgoing Interface**—The outgoing interface is the interface on the security device that sends and receives VPN traffic. Typically, the outgoing interface is in the untrust zone.
- **Do not set Fragment Bit in the Outer Header**—The Fragment Bit controls how the IP packet is fragmented when traveling across networks.
  - **Clear**. Use this option to enable IP packets to be fragmented.
  - **Set**. Use this option to ensure that IP packets are not fragmented.
  - **Copy**. Select to use the same option as specified in the internal IP header of the original packet.
- **IPSec Protocol**—Specify the IPSec protocol and algorithm you want to use for data authentication and/or encryption. Because this information is static for each VPN member, they do not need to negotiate for communication.
  - **AH**. Use Authentication Header to authenticate the VPN traffic, but not encrypt the traffic. If you select AH, you must also specify the key or password that AH uses in the authentication algorithm.
  - **ESP**. Use Encapsulating Security Payload to authenticate and encrypt the VPN traffic. If you select ESP, because ESP uses keys to encrypt and decrypt data, you must also specify the key or password that the VPN node uses to send and receive VPN data through the VPN tunnel.

**NOTE:** All passwords handled by NSM are case-sensitive.

- **ESP**. Use Encapsulating Security Payload to authenticate and encrypt the VPN traffic. If you select ESP, because ESP uses keys to encrypt and decrypt data, you must also specify the key or password that the VPN node uses to send and receive VPN data through the VPN tunnel.

Binding

You can bind the VPN tunnel to a tunnel interface or tunnel zone to increase the number of available interfaces in the security device. To use a tunnel interface and/or tunnel zone in your VPN, you must first create the tunnel interface or zone on the device; for details, see “Configuring Tunnel Interfaces and Tunnel Zones” on page 176 and “Configuring a Tunnel Interface” on page 73.

- **None**—Select none when you do not want to bind the VPN tunnel to a tunnel interface or zone.
Tunnel Interface—Select a pre-configured tunnel interface on the security device to bind the VPN tunnel to the tunnel interface. The security device routes all VPN traffic through the tunnel interface to the protected resources.

Tunnel Zone—Select a pre-configured tunnel zone on the security device to bind the VPN tunnel directly to the tunnel zone. The tunnel zone must include one or more numbered tunnel interfaces; when the security device routes VPN traffic to the tunnel zone, the traffic uses one or more of the tunnel interfaces to reach the protected resources.

**Monitor**

You can enable VPN Monitor and configure the monitoring parameters for the device. Monitoring is off by default. To enable the VPN Monitor in Realtime Monitor to display statistics for the VPN tunnel, configure the following:

- **VPN Monitor**—When enabled, the device sends ICMP echo requests (pings) through the tunnel at specified intervals (configurable in seconds) to monitor network connectivity (the device uses the IP address of the local outgoing interface as the source address and the IP address of the remote gateway as the destination address). If the ping activity indicates that the VPN monitoring status has changed, the device triggers an SNMP trap; VPN Monitor (in RealTime Monitor) tracks these SNMP statistics for VPN traffic in the tunnel and displays the tunnel status.

- **Rekey**—When enabled, the device regenerates the IKE key after a failed VPN tunnel attempts to re-establish itself. When disabled, the device monitors the tunnel only when the VPN passes user-generated traffic (instead of using device-generated ICMP echo requests). Use the rekey option to:
  - Keep the VPN tunnel up even when traffic is not passing through.
  - Monitor devices at the remote site.
  - Enable dynamic routing protocols to learn routes at a remote site and transmit messages through the tunnel.
  - Automatically populate the next-hop tunnel binding table (NHTB table) and the route table when multiple VPN tunnels are bound to a single tunnel interface.

- **Optimized**—(This option appears only for devices running ScreenOS 5.x.) When enabled, the device optimizes its VPN monitoring behavior as follows:
  - Considers incoming traffic in the VPN tunnel as ICMP echo replies. This reduces false alarms that might occur when traffic through the tunnel is heavy and the echo replies cannot get through.
  - Suppresses VPN monitoring pings when the tunnel passes both incoming and outgoing traffic. This can help reduce network traffic.

- **Source Interface and Destination IP**—Configure these options to use VPN Monitoring when the other end of the VPN tunnel is not a security device. Specify the source and destination IP addresses.
Adding a VPN Rule

After you have configured the VPN on each device you want to include in the VPN, you can add a VPN rule to a Security Policy:

- For policy-based VPNs, you must add a VPN rule to create the VPN tunnel.
- For route-based VPNs, the VPN tunnel is already in place. However, you might want to add a VPN rule to control traffic through the tunnel.

For details on adding and configuring a VPN rule in a Security Policy, see "Adding VPN Rules" on page 192.

Creating L2TP VPNs

Creating device-level L2TP VPN is a three stage process:

1. Add L2TP Users
2. Configure L2TP Settings
3. Add VPN rules to Security Policy

Adding L2TP Users

For VPNs that use L2TP to provide remote access services, you must add an L2TP User to the security device. An L2TP User has an account on the security device that guards the protected resources in the VPN; when the user attempts to connect to a protected resource, the security device authenticates the user.

To add a L2TP User for a security device, in the security device configuration L2TP/XAuth/Local User, click the Add icon. Enter a name for the user, then specify:

- User—Select a preconfigured Local User object that is configured for L2TP.
- Remote Setting—Select a preconfigured Remote Settings object.
- IP Pool—Select a preconfigured IP Pool object.
- Static IP—Enter the static IP address of the Local User.

Configuring L2TP

To connect to an L2TP VPN tunnel, the L2TP RAS user uses the IP address and WINS/DNS information assigned by the user’s ISP. However, when the L2TP RAS user sends VPN traffic through the tunnel, the security device assigns a new IP address and WINS/DNS information that enables the traffic to reach the destination network.

Enter a name for the L2TP VPN, then specify the following information:

- Host Name—Enter the name of the L2TP host.
- Outgoing Interface—The outgoing interface is the interface on the security device that sends and receives VPN traffic. Typically, the outgoing interface is in the untrust zone.
Keep Alive—The number of seconds a VPN member waits between sending hello packets to an L2TP RAS user.

Peer IP—Enter the IP address of the L2TP peer.

Secret—Enter the shared secret that authenticates communication in the L2TP tunnel.

Remote Settings—Select the preconfigured remote settings object that represents the DNS and WINS servers assigned to L2TP RAS users after they have connected to the tunnel.

IP Pool Name—Select the preconfigured IP pool object that represents the available IP addresses that can be assigned to L2TP RAS users after they have connected to the tunnel.

Auth Server

- Use the default settings to use the default authentication server for the domain. To change or assign a domain authentication server, edit the domain settings; for details, see the Network and Security Manager Administration Guide.
- Use custom settings to specify a preconfigured authentication server object to assign TCP/IP settings to the gateway and authenticate specific L2TP User or User Groups.

Adding a VPN Rule

After you have configured the VPN on each device you want to include in the VPN, you can add a VPN rule to a Security Policy:

- For policy-based VPNs, you must add a VPN rule to create the VPN tunnel.
- For route-based VPNs, the VPN tunnel is already in place. However, you might want to add a VPN rule to control traffic through the tunnel.

For details on adding VPN rules to a Security Policy, see “Adding VPN Rules” on page 192.

Creating L2TP Over Autokey IKE VPNs

Creating a device-level L2TP-over-Autokey IKE VPN is a multi-stage process:

1. Add L2TP Users (see “Adding L2TP Users” on page 190)
2. Configure L2TP Settings (see “Configuring L2TP” on page 190)
3. Configure Peer Gateway (see “Configuring Gateways” on page 179)
4. Configure Routes (Route-based only) (see “Configuring Routes (Route-based only)” on page 184)
5. Add VPN to Device (see “Configuring the VPN” on page 184)
6. Add VPN rules to Security Policy (see “Adding a VPN Rule” on page 191)
Adding VPN Rules

To create a policy-based VPN or to add access policies to a route-based VPNs, you must add a VPN rule to a Security Policy for each device in the VPN.

Adding a VPN Rule is a three stage process:

1. Configuring the VPN rule
2. Configure Security Policy
3. Installing the Security Policy

Configuring the VPN

In Security Policies, select a predefined Security Policy (or create a new policy), and add a VPN rule. right-click in the Source Address, Destination Address, Action, or Install On column and select Configure VPN to display the Configure VPN dialog box.

- Select the source security device that contains the termination interface for the VPN tunnel.
- Select a VPN Type:
  - For IKE VPNs, select the VPN that you configured on the device.
  - For L2TP VPNs, you must also select the L2TP tunnel that you configured on the device.
- Select the Protected Resources for the VPN:
  - If both VPN termination points are security devices, choose the protected resources that represent the network components you want to protect. You can also select a predefined Global MIP or VIP for the device.
  - If the source VPN termination point is a RAS user, select Source is Dialup and choose the Protected Resources behind the destination VPN termination point that represent the network components you want to protect on the remote network.
  - If the destination VPN termination point is a RAS user, select Destination is Dialup and choose the Protected Resources behind the source VPN termination point that represent the network components you want to protect on the local network.

Configuring the Security Policy

To configure the remaining columns for the VPN rule:

- From Zone—Select the zone on the source VPN member that contains the termination interface for the VPN tunnel.
- To Zone—Select the zone on the destination VPN member that contains the termination interface for the VPN tunnel.
- Service column—Select the services you want to permit in the VPN tunnel.
You do not need to configure the action—NSM automatically defines the action as tunnel. You can also configure traffic shaping, options, authentication, antivirus, or attack protection for the VPN Rule. For details on configuring these rule options, see the *Network and Security Manager Administration Guide*.

To deny a host, use a deny rule before the VPN rule.

**Assign and Install the Security Policy**

You must assign the Security Policy to the each VPN member and install the Security Policy on those devices before the VPN is active.

### Device-Level VPN Examples

This section provides examples of the two device-level VPN types with step-by-step instructions on creating each type of device-level VPN.

**NOTE:** For examples on creating other VPN types using VPN Manager, see the *Network and Security Manager Administration Guide*.

In this example, a Manual Key tunnel provides a secure communication channel between offices in Tokyo and Paris. The Trust zones at each site are in NAT mode. The Trust and Untrust security zones are in the trust-vr routing domain, and the Untrust zone interface (ethernet3) serves as the outgoing interface for the VPN tunnel.

To set up the tunnel, you must configure the security devices at both ends of the tunnel. First, you create the VPN components that you use to build the VPN, such as the security devices and the shared Address Objects. Next, you create the tunnel interfaces for each device and configure the VPN tunnel. You must also add the necessary static routes on each device to create the VPN tunnel. Finally, you create firewall rules in a Security Policy to control VPN traffic between the two sites.

1. Add the Tokyo and Paris security devices (for details on adding devices, see “Adding Devices” in the *Network and Security Manager Administration Guide*).
   Begin by configuring the Tokyo device with the following interfaces:
   - Ethernet1 is the Trust IP (10.1.1.1/24) in the Trust zone.
   - Ethernet3 is the Untrust IP (1.1.1.1/24) in the Untrust zone.

2. Configure the Paris device with the following interfaces:
   - Ethernet1 is the Trust IP (10.2.2.1/24) in the Trust zone.
   - Ethernet3 is the Untrust IP (2.2.2.2/24) in the Untrust zone.

3. Create the Address Objects that you use in the VPN rule in the firewall rulebase (for details on creating VPN rules, see “Adding VPN Rules” on page 192).

4. Add the Tokyo Trust LAN (10.1.1.0/24) as an network Address Object. In Address Objects, click the **Add** icon and select **Network**. Configure the following, then click **OK**.
5. Add the Paris Trust LAN (10.2.2.0/24) as a network Address Object. In Address Objects, click the Add icon and select Network. Configure the following, then click OK:
   - For Name, enter Paris Trust LAN.
   - For IP Address/Netmask, enter 10.2.2.0/24.
   - For Color, select magenta.
   - For Comment, enter Paris Trust Zone.

6. Configure the Tokyo tunnel interface:
   - In the navigation tree, select Device Manager > Devices, then double-click the Tokyo device to open the device configuration.
   - In the device navigation tree, select Network > Interface. Click the Add icon and select Tunnel Interface. The General Properties screen for tunnel.1 appears.

7. Configure the following, then click OK:
   - For Zone, select untrust.
   - For IP Options, select Unnumbered.
   - For Source Interface, select ethernet3.
   - Create the Tokyo VPN:

8. In the device navigation tree, select VPN Settings > AutoKey IKE/Manual VPN.
9. Select the Manual tab, then click the Add icon. The Properties screen appears. Configure the Properties tab as shown below:
   - For Name, enter Tokyo_Paris.
   - For Gateway, enter 2.2.2.2.
   - For Local SP, enter 3020.
   - For Remote SPI, enter 3030.
   - For Outgoing Interface, select ethernet3.
   - For ESP/AH, select ESP CBC.
   - For Encryption Algorithm, select 3DES-CBC.
   - Select Generate Key by Password, then enter the password asdk24234.
   - For Authentication Algorithm, select SHA-1.
- Select **Generate Key by Password**, then enter the password **PNas134a**.
- Select the Binding tab. Enable Tunnel Interface, then select **tunnel.1**.

10. Click **OK** to save the new VPN.

11. Create Tokyo Routes:
- In the device navigation tree, select **Network > Virtual Router** to display the list of virtual routers on the device. Double-click the trust-vr route to open the vr for editing.
- In the virtual router dialog box, click **Routing Table**, then click the **Add** icon under destination-based Routing Table to add a new static route.

**NOTE:** ScreenOS 5.0.x devices display destination-based and source-based routing tables; ScreenOS 5.1 and higher devices display destination-based, source-based, and source interface-based routing tables.

12. Configure a route from the untrust interface to the gateway, then click **OK**.
13. Configure route from the trust zone to the tunnel interface, then click **OK**.
14. Click **OK** to save your changes to the virtual router, then click **OK** to save your changes to the Tokyo device.
15. Configure the Paris Tunnel Interface:
- In Device Manager, double-click the device icon for Paris to open the device configuration.
- In the device navigation tree, select **Network > Interface**. Click the **Add** icon and select **Tunnel Interface**. The General Properties screen appears.

16. Configure the following, then click **OK**:
- For Zone, select **untrust**.
- For IP Options, select **Unnumbered**.
- For Source Interface, select **ethernet3**.

17. Create the Paris VPN:
- In the device navigation tree, select **VPN Settings > AutoKey IKE/Manual VPN**.
- Select the **Manual** tab, then click the **Add** icon. The Properties screen appears.

18. Configure the following:
- For Name, enter **Paris_Tokyo**.
- For Gateway, enter **2.2.2.2**.
- For Local SP, enter **3020**.
- For Remote SPI, enter **3030**.
- For Outgoing Interface, select **ethernet3**.
For ESP/AH, select ESP CBC.

For Encryption Algorithm, select 3DES-CBC, then select Generate Key by Password and enter the password asdk24234.

For Authentication Algorithm, select SHA-1, then select Generate Key by Password and enter the password PNas134a.

19. Select the Binding tab. Enable Tunnel Interface, then select tunnel.1.

20. In the device navigation tree, select Network > Virtual Router to display the list of virtual routers on the device.

21. Click OK to save the new VPN.


23. Double-click the trust-vr route to open the vr for editing.

24. In the virtual router dialog box, click Routing Table, then click the Add icon under destination-based Routing Table to add a new static route.

**NOTE:** ScreenOS 5.0.x or higher devices display both destination-based and source-based routing tables; ScreenOS 5.1 and higher devices display destination-based, source-based, and source interface-based routing tables.

25. Configure a route from the untrust interface to the gateway, then click OK.

26. Configure route from the trust zone to the tunnel interface, then click OK.

27. Click OK to save your changes to the virtual router, then click OK to save your changes to the Paris device.

28. Create the Security Policy:
   - In the main navigation tree, select Security Policies. Click the Add icon to display the New Security Policy dialog box.

29. Configure the following, then click OK:
   - For Security Policy Name, enter Corporate Route-based VPNs.
   - Add comments, if desired.

30. In the main navigation tree, select Security Policies > Corporate Route-based VPNs. The security policy appears in the main display area. Configure the rules:

In this example, a Manual Key tunnel provides a secure communication channel between offices in Tokyo and Paris, using ESP with 3DES encryption and SHA-1 authentication. The Trust zones at each site are in NAT mode. The Trust and Untrust security zones and the Untrust-Tun tunnel zones are in the trust-vr routing domain. The Untrust zone interface (ethernet3) serves as the outgoing interface for the VPN tunnel.

To set up the tunnel, you must configure the security devices at both ends of the tunnel. First, you create the VPN components that you use to build the VPN, such as the security devices and the shared Address Objects. Next, you configure the VPN
tunnel and add the necessary static routes on each device. Finally, you create VPN rules in a Security Policy to create the VPN tunnel between the two sites.

1. Create VPN Components:
   ■ Security Devices.
   ■ Address Objects.

2. Create the Tokyo VPN:
   ■ In the device navigation tree, select **VPN Settings > AutoKey IKE/Manual VPN**.
   ■ Select the **Manual** tab, then click the **Add** icon. The Properties screen appears.

3. Configure the following:
   ■ For Name, enter **Tokyo_Paris**.
   ■ For Gateway, enter **2.2.2.2**.
   ■ For Local SP, enter **3020**.
   ■ For Remote SPI, enter **3030**.
   ■ For Outgoing Interface, select **ethernet3**.
   ■ For ESP/AH, select **ESP CBC**.
   ■ For Encryption Algorithm, select **3DES-CBC**.
   ■ For Authentication Algorithm, select **SHA-1**.

4. Select **Generate Key by Password**, then enter the password **PNas134a**.
5. Select the **Binding** tab. Enable Tunnel Zone and select **untrust-tun**.
6. Click **OK** to save the new VPN.
7. Create Tokyo Routes.

8. Create the Paris VPN:
   ■ In the device navigation tree, select **VPN Settings > AutoKey IKE/Manual VPN**.
   ■ Select the **Manual** tab, then click the **Add** icon. The Properties screen appears.

9. Configure the following:
   ■ For Name, enter **Paris_Tokyo**.
   ■ For Gateway, enter **2.2.2.2**.
   ■ For Local SP, enter **3020**.
   ■ For Remote SPI, enter **3030**.
   ■ For Outgoing Interface, select **ethernet3**.
   ■ For ESP/AH, select **ESP CBC**.
For Encryption Algorithm, select 3DES-CBC, then select Generate Key by Password and enter the password asdk24234.

For Authentication Algorithm, select SHA-1, then select Generate Key by Password and enter the password Pnas134a.

10. Select the Binding tab. Enable Tunnel Zone and select untrust-tun.
11. Click OK to save the new VPN.
13. Create the Security Policy:
   - In the main navigation tree, select Security Policies. Click the Add icon to display the new Security Policy dialog box.
14. Configure the following, then click OK:
   - For Security Policy Name, enter Corporate Policy-Based VPN.
   - Enter comments, if desired.
15. In the main navigation tree, select Security Policies > Corporate Policy-Based VPN. The security policy appears in the main display area. Configure two VPN rules as shown below:
   - Rule 1 creates the VPN tunnel from the Tokyo device to the Paris device.
   - Rule 2 creates the VPN tunnel from the Paris device to the Tokyo device.

In this example, you create a RAS user group called Field Sales and configure an L2TP tunnel called Sales_Corp, using ethernet3 (Untrust zone) as the outgoing interface for the L2TP tunnel. The security device applies the default L2TP tunnel settings to the RAS user group.

NOTE: An L2TP-only configuration is insecure and is recommended only for debugging.

The remote L2TP clients are on Windows 2000 operating systems. For information on how to configure L2TP on the remote clients, refer to Windows 2000 documentation. Only the configuration for the security device end of the L2TP tunnel is provided below.

1. Configure the L2TP user objects. First, configure an L2TP user object for Adam, then click OK:
   - For Name, enter Adam.
   - Select Enable, then select L2TP.
   - Select Password, then enter and confirm the password: AJbioJ15.
2. Configure an L2TP user object for Betty, then click OK:
Device-Level VPN Examples

For Name, enter Betty.
- Select **Enable**, then select **L2TP**.
- Select **Password**, then enter and confirm the password: **BviPsoJ1**.

3. Configure an L2TP user object for Carol, then click **OK**:
- For Name, enter Carol.
- Select **Enable**, then select **L2TP**.
- Select **Password**, then enter and confirm the password: **Cs10kdD3**.

4. Create a local user group called Field Sales that includes the Adam, Betty, and Carol local user objects.

5. Configure the Remote Settings object. Configure the following, then click **OK**:
- For Name, enter **RM_L2TP**.
- For Color, select **green**.
- For Dns1, enter **1.1.1.2**.
- For Dns2, enter **1.1.1.3**.
- For Wins1, enter **0.0.0.0**.
- For Wins2, enter **0.0.0.0**.

   For details on creating Remote Settings objects, see the *Network and Security Manager Administration Guide*.

6. Configure the IP Pool object. Configure the following, then click **OK**:
- For IP Pool Name, enter **Global**.
- For Color, select **magenta**.
- For Start IP, enter **10.10.2.100**.
- For End IP, enter **10.10.2.180**.

   For details on creating IP Pool objects, see “Configuring IP Pools” in the *Network and Security Manager Administration Guide*.

7. Configure the L2TP tunnel:
- In Device Manager, double-click the device icon for the device on which you want to configure the L2TP tunnel.
- In the device navigation tree, select **VPN Settings > L2TP**. In the main display area, click the **Add** icon. The null-L2TP tunnel dialog box appears.

8. Configure the following, then click **OK**:
- For Name, enter **Sales_Corp**.
- For Outgoing Interface, select **ethernet3**.
- For Keep Alive, enter **60**.
- For Peer IP, enter 0.0.0.0 (because the peer’s ISP dynamically assigns it an IP address, enter 0.0.0.0 here).
- Select Use Custom Settings, and leave the default authentication server as Local.
- For User/Group, select Dialup Group, then select Field Sales.

9. Click OK to save your changes to the device.
10. Configure a rule in the Zone Rulebase of a Security Policy.

**Configuring L2TP and XAuth Local Users**

Use the L2TP/XAuth/Local User option to enable the security device to authenticate local users and/or assign specific IP pools and remote settings. Because user objects are shared objects, you can configure the same user on multiple devices, but assign different remote settings and IP pool for each device.

You must configure a L2TP or XAuth local user on a security device when:
- You want the device to authenticate the user. Typically, you want to authenticate a user who is connecting to the device using a VPN tunnel.
- You want the device to assign specific IP, DNS server, and WINS server addresses to a user who is connecting to the device using a VPN tunnel. The remote settings and IP pool you assign at the device level override the remote settings and IP pool assigned to the VPN.

**Configuring L2TP Local Users**

The Layer 2 Tunneling Protocol (L2TP) enables a security device to authenticate users using the local database or an external auth server, and assign specific remote settings and IP pools.

L2TP enables the security device to authenticate users; to encrypt an L2TP VPN tunnel, you must apply an encryption scheme, such as IPSec, to the L2TP tunnel. When configuring an L2TP-over-IPSec VPN, you are actually setting up an L2TP tunnel and an IPSec tunnel with the same endpoints, then linking the two tunnels together in a Security Policy rule. VPN Manager automatically generates the required rules; if you are creating the L2TP-over-IPSec VPN at the device-level, you must configure the rules manually. For more information about L2TP VPNs, see “Creating L2TP VPNs” on page 190.

You can also use the device to assign specific IP, DNS server, and WINS server addresses from the local database or a RADIUS server. When you assign the L2TP user or user group a remote setting and IP pool at the device level, the settings override the remote settings and IP pool assigned to the VPN. You can even use different auth servers, one for each aspect of L2TP. For example, you might use a SecurID server to authenticate an L2TP user but make the address assignments from the local database.
1. In the main navigation tree, select **Object Manager > User Objects > Local Users**. In the main display area, click the **Add** icon. Configure the following settings, then click **OK**:
   - For Name, enter **Adam**.
   - For Color, select **orange**.
   - Select Enable, then select **L2TP**.
   - Select Password, then enter and confirm the password: **AJbioJ15**.

   For information about how to create user objects, see the *Network and Security Manager Administration Guide*.

2. In the main navigation tree, select **Object Manager > Remote Settings**. In the main display area, click the **Add** icon. Configure the following settings, then click **OK**:
   - For Name, enter **RM_L2TP**.
   - For Color, select **green**.
   - Enter comments, if desired.
   - For Dns1, enter **1.1.1.2**.
   - For Dns2, enter **1.1.1.3**.
   - For Wins1, enter **0.0.0.0**.
   - For Wins2, enter **0.0.0.0**.

   For information about how to create Remote Settings objects, see the *Network and Security Manager Administration Guide*.

   - In the main navigation tree, select **Object Manager > IP Pools**. Configure the new IP Pool:

3. In the main display area, click the **Add** icon. The New IP Pool dialog box appears. Configure the following settings:
   - For IP Pool Name, enter **Global**.
   - For Color, select **magenta**.
   - Enter comments, if desired.

4. Click the Add icon. Configure the following settings and click **OK**:
   - For Start IP, enter **10.10.2.100**.
   - For End IP, enter **10.10.2.180**.

5. Click **OK** to save the new IP Pool object. For information about how to create IP Pool objects, see “Configuring IP Pools” in the *Network and Security Manager Administration Guide*.

6. Configure the L2TP local user:
In the main navigation tree, select **Device Manager > Devices**, then double-click the device on which you want to configure the L2TP local user. The device configuration appears.

In the device navigation tree, select **L2TP/XAuth/Local User**, then click the **Add icon**. The new L2TP/XAuth User Settings dialog box appears. Configure the following settings, then click **OK**:

- For **User**, select **Adam**.
- For **Remote Settings**, select **RM_L2TP**.
- For **IP Pool**, select **Global**.

7. Click **OK** to save your changes to the device configuration.

### About XAuth Users

The XAuth protocol enables the device to authenticate XAuth users and/or assign IP pools and remote settings.

An XAuth user (or user group) is a RAS user who authenticates when connecting to the security device using an AutoKey IKE VPN tunnel. Although both IKE and XAuth users can authenticate through an AutoKey IKE VPN tunnel, the authentication of IKE users is actually the authentication of VPN gateways or clients, while the authentication of XAuth users is the authentication of the individuals themselves. XAuth users must enter information that only they are supposed to know—their user name and password.

You can also assign an XAuth user IP, WINS, and DNS addresses from the device. When you assign the XAuth user or user group a remote setting and IP pool at the device level, the settings override the remote settings and IP pool assigned to the VPN.

For more information about configuring authentication users on security devices, refer to the “Fundamentals” volume in the *Concepts & Examples ScreenOS Reference Guide*.

### Configuring vsys

A vsys is a virtual system that exists within a physical security device. By logically partitioning a single, physical security device into multiple virtual systems (each in its own domain), you can provide secure multi-tenant services. The physical device (known as the “root” device) shares some settings across all vsys, but each vsys also has its own unique settings. To enable the physical device to correctly route traffic to the appropriate vsys device, you must use VLAN tags at the vsys level or IP classification at the root level.

To add a vsys to the NSM system, you must first add a physical device that can contain vsys devices (Netscreen-500, 5000 series, ISG 1000, and ISG 2000 security devices support vsys), then add each vsys to the physical device. An NSM administrator with full device configuration permissions can see both the root and vsys devices in a domain, but an administrator with only vsys permissions can see
only the vsys devices in a domain. To create a secure, multi-tenant system, place
the root device in the global domain and each vsys device in its own domain, then
assign Vsys administrations to manage each domain. For details on adding a vsys,
see “Adding Vsys Devices” in the Network and Security Manager Administration Guide.

After you have added or modeled a new root device and vsys to the NSM system,
you must configure the vsys interfaces and subinterfaces, and any shared virtual
routers and shared security zones on the root device. When importing an existing
root device and vsys, NSM automatically imports the existing root and vsys settings
from each device (physical and virtual).

The NetScreen-5000 series security devices running ScreenOS 5.0 L2V also support
vsys transparent mode, also known as layer 2 vsys, or L2V vsys. To create an L2V
vsys, when modeling the root device into NSM, ensure that the mode is set to
Transparent (for imported devices, you must enable transparent mode on the physical
device using the Web UI or CLI).

For more information about vsys, refer to the “Virtual Systems” volume in the
Concepts & Examples ScreenOS Reference Guide. For more information about how to
configure transparent vsys, refer to the Juniper Networks New Features Guide
for ScreenOS 5.0-L2V software.

Viewing Root and Vsys Configurations

To view a root system configuration, in the main navigation tree, select Device
Manager > Devices, then double-click the root device. To view the vsys devices
associated with the root system, in the device navigation tree, select VSYS.

To view a vsys configuration, in the main navigation tree, select Device Manager >
Devices, then double-click the vsys. A virtual system configuration is similar to a
device configuration, but a vsys configuration displays fewer settings because the
root device controls some settings.

Configuring Virtual Routers for Root and Vsys

At the root level, you can configure a virtual router as shareable, enabling that VR to
be used by all vsys. By default, the untrust-vr is shared. To unshare a VR, you must
remove all assigned vsys from a shared VR.

At the vsys level, you can configure the following virtual routers:

- Shared root-level virtual routers—By default, the root and vsys share the
  untrust-vr. However, you can configure a vsys to use any VR that is shared at
  the root-level.

- Non-sharable vsys-level virtual router—This is a vsys-specific virtual router that,
  by default, maintains the routing table for the Trust-vsysname zone. By default,
  a vsys-level virtual router is named vsysname-vr (you can also customize the
  name to make it more meaningful). All vsys-level virtual routers are non-sharable.
Configuring Zones for Root and Vsxs

At the root-level, you can configure a zone as shareable, enabling that zone to be used by all vsxs. To share a zone, the zone must be in a shared virtual router; however, a shared virtual router can contain both shared and unshared zones.

**NOTE:** For details on configuring zones in L2V mode, see “Configuring L2V Zones” on page 211.

At the vsxs level, the following zones are automatically created or inherited:

- All shared zones—These zones are inherited from the root device.
- Shared Null zone—This zone is inherited from the root device.
- Trust-vsys_name zone—This zone is created by default when you create the vsys.
- Untrust-Tun-vsys_name zone—This zone is created by default when you create the vsys.
- Global-vsys_name zone—This zone is created by default when you create the vsys.

Each vsxs also supports user-defined security zones; you can bind these zones to any shared virtual routers defined at the root level or to the virtual router dedicated to that vsxs.

Configuring Interfaces for Root and Vsxs

Interfaces can be dedicated, shared, imported, and exported between root and vsxs.

**NOTE:** When the root system is in L2V, you cannot import or export interfaces. For more information, see “Configuring Layer 2 Vsxs (L2V)” on page 209.

At the root level, shared interfaces that are bound to a shared zone. However, any physical, subinterface, redundant interface, or aggregate interface in the root system that is bound to a non-shareable zone is dedicated to the root system, and cannot be shared. To import an interface to a vsxs, the interface must be in the Null zone at the root level; to export an interface from a vsxs, the interface must be in the Null zone at the vsxs level.

At the vsxs level, you can configure the following interfaces:

- Shared Interface—A shared interface is an interface that can be shared with the root system. To share a root interface, the interface must be shared at the root level and bound to a shared zone in a shared virtual router. By default, the untrust-vr and Untrust zone are shared, enabling you to configure a vsxs to share any root-level physical interface, subinterface, redundant interface, or aggregate interface that is bound to the Untrust zone.

- Dedicated Subinterface—A dedicated subinterface uses VLAN tagging, which enables the device to determine the vsxs to which inbound or outbound traffic
through that interface belongs. When you configure a subinterface in a vsys, the interface is dedicated to that vsys.

- **Imported Physical/Aggregate**—A physical or aggregate interface in the null zone is imported from the root system, then bound to a shared zone or the Trust-vsys_name zone. When you import a physical or aggregate interface from the root system, the vsys has exclusive use of that interface. You can also export interfaces in the null zone to the root system. When you export an interface to the root system, the root system has exclusive use of that interface.

### Using the VLAN Management Interface

To manage a vsys independent of the root system, you can create a management interface bound to the VLAN zone (automatically created when you create a vsys). Using the VLAN management interface, a vsys admin can manage the vsys using a unique IP address and VLAN ID.

You can bind more than one interface to the management zone.

#### Routing Traffic to Vsys

To enable the physical device to correctly route traffic to the appropriate vsys device, you must use VLAN IDs (VIDs) at the vsys level or IP classification at the root level.

#### Using VLAN IDs

When using VIDs for routing traffic to vsys, you create dedicated vsys subinterfaces with a VID; all traffic handled by a subinterface includes the subinterface’s VID in the frame header. The root system uses the VID to correctly route traffic to and from the subinterface.

**NOTE:** A VLAN identifier is also known as a VLAN tag.

A subinterface stems from a physical interface, which acts as a trunk port. A trunk port enables a Layer 2 network device to bundle traffic from several VLANs through a single physical port, sorting the various packets by the VID in their frame headers. VLAN trunking enables one physical interface to support multiple logical subinterfaces, each of which must be identified by a unique VID. The VID on an incoming Ethernet frame indicates the destination subinterface and system. When you associate a VLAN with an interface or subinterface, the device automatically defines the physical port as a trunk port.

#### Using VLANs in Transparent Mode

When the root device is in Transparent mode, you cannot use VLAN tagging at the vsys level (except when using L2V; for details, see “Configuring Layer 2 Vsyls (L2V)” on page 209). However, you can configure subinterfaces and VLAN tagging at the root level by define all physical ports as trunk ports. To do so, in the device navigation tree, select **Network > Interfaces**, then double-click the VLAN-1 interface. In the General Properties interface screen, select **Vlan Trunk**.
NOTE: The NetScreen-5000 series security devices running ScreenOS 5.0 L2V supports vsys transparent mode, also known as layer 2 vsys, or L2V vsys.

In this example, you define 3 subinterfaces (10.1.1.1/24, 10.2.2.1/24, and 1.3.3.1/24) with VLAN tags on ethernet 2.3 for the three virtual systems vsys1, vsys2, and vsys3. The first two subinterfaces are for two private virtual systems operating in NAT mode, and the third subinterface is for a public virtual system operating in Route mode. All virtual systems share the Untrust zone and its interface with the root system. The Untrust zone is in the untrust-vr routing domain. For vsys1 and vsys2, you use the default virtual router. For vsys3, you choose the sharable root-level untrust-vr.

1. Add a NetScreen-5000 security device in running ScreenOS 5.2 as the root system, then configure the network module:
   - Double-click the device to open the device configuration. In the device navigation tree, select Network > Slot.
   - Double-click slot 2 to display the slot configuration dialog box. For Card Type, select 5000-8G SPM.
   - Click OK to save the slot configuration.

2. Add three vsys devices:
   - Vsys1 and Vsys 2 use the default virtual router.
   - Vsys3 uses the existing untrust-vr virtual router.
   - Create a subinterface for vsys1

3. In the main navigation tree, select Device Manager > Devices, then doubleclick vsys1.

4. In the device navigation tree, select Network > Interfaces. Click the Add icon and select Sub Interface.

5. In the subinterface general properties, configure the following then click OK:
   - For Interface, select ethernet2/3.1.
   - For Sub Interface Type, select tag.
   - For VLAN tag, select 1.
   - For Zone, select trust-vsyst1.
   - For IP Address and Netmask, enter 10.1.1.1/24.

6. Create subinterface for vsys2:
   - In the main navigation tree, select Device Manager > Devices, then doubleclick vsys2.
   - In the device navigation tree, select Network > Interfaces. Click the Add icon and select Sub Interface.

7. In the subinterface general properties, configure the following then click OK:
For Interface, select ethernet2/3.2.
For Sub Interface Type, select tag.
For VLAN tag, select 2.
For Zone, select trust-vsyst.
For IP Address and Netmask, enter 10.2.1.24.

8. Create subinterface for vsyst:
   - In the main navigation tree, select Device Manager > Devices, then doubleclick vsyst.
   - In the device navigation tree, select Network > Interfaces. Click the Add icon and select Sub Interface.
   - In the subinterface general properties, configure the following then click OK:
     - For Interface, select ethernet2/3.3
     - For Sub Interface Type, select tag.
     - For VLAN tag, select 3.
     - For Zone, select trust-vsyst.
     - For IP Address and Netmask, enter 1.3.3.1/24.
     - For Mode, select Route.

Using IP Classification

When using IP-based classification, you associate a subnet or range of IP addresses with the root or a specific vsyst. The root system checks the source and destination IP addresses in IP packet headers to identify the device (root or vsyst) to which traffic belongs.

You configure IP classification at the root level, on the Untrust interface, which is shared by default with all vsyst. In the device navigation tree of the root system, select Network > Interfaces, then doubleclick the Untrust interface. In the interface navigation tree, select IP Classification, then select Enabled. Right-click and select New to display the New IP Classification List, then configure a subnet or IP address range for the root and/or each vsyst.

In this example, you configure IP-based traffic classification for three virtual systems (vsyst1, vsyst3, and vsyst3). You define the trust-vr as sharable, then create a new, shared zone called internal that is bound to the trust-vr (both internal and Untrust zones are in the shared trust-vr routing domain). Within the internal zone, configure a subnet for each vsyst (10.1.0.0/24 for vsyst1, 10.1.2.0/24 for vsyst2, and 10.1.3.0/24 for vsyst3).

Next, bind the interfaces. Configure ethernet1/1 in the shared internal zone, assign IP address 10.1.0.1/16, and select NAT mode. Configure ethernet1/2 in the shared
Untrust zone and assign it IP address 210.1.1.1/24. Finally, configure the default gateway in the Untrust zone as 210.1.1.250.

1. Add an ISG 2000 security device running ScreenOS 5.2 as the root system, then configure the network module:
   - Double-click the device to open the device configuration. In the device navigation tree, select Network > Slot.
   - Double-click slot 1 to display the slot configuration dialog box. For Card Type, select 8 Interfaces (10/100).

2. Click OK to save the slot configuration.

3. Add the following vsys devices (all use default virtual router):
   - vsys1
   - vsys2
   - vsys3

   In the device navigation tree, select Network > Virtual Routers, then double-click trust-vr. Ensure that Shared Virtual Router is selected, then click OK.

4. In the device navigation tree, select Network > Zones. Click the Add icon and select New Security Zone. In the Zone General Properties, configure the following:
   - For Name, enter internal.
   - For Virtual Router, select trust-vr.

   Select Shared. When selected, the option IP Classification appears in the zone navigation tree.

   In the zone navigation tree, select IP Classification, then configure the following:

   Select Enabled.

5. Right click in the IP Classification screen and select New. The New IP Classification list appears. Configure the following, then click OK:
   - For Vsys, select vsys1.
   - Select Subnet.

   For IP Address and Netmask, enter 10.1.0.0/24.

   Right click in the IP Classification screen and select New. The New IP Classification list appears. Configure the following, then click OK:

   For Vsys, select vsys2.
   - Select Subnet.

   For IP Address and Netmask, enter 10.1.0.0/24.

6. Right click in the IP Classification screen and select New. The New IP Classification list appears. Configure the following, then click OK:
- For Vsys, select vsys3.
- Select Subnet.
- For IP Address and Netmask, enter 10.1.3.0/24.
- In the device navigation tree, select Network > Interfaces:

7. Doubleclick ethernet 1/1. In the Interface General Properties, configure the following, then click OK:
   - For Zone, select internal.
   - For IP Address and Netmask, enter 10.1.0.1/16.

8. Doubleclick ethernet 1/2. In the Interface General Properties, configure the following, then click OK:
   - For Zone, select Untrust.
   - For IP Address and Netmask, enter 210.1.1.1/24.
   - In the device navigation tree, select Network > Virtual Routers, then doubleclick trust-vr.
   - In the virtual router navigation tree, select Routing Table.

9. In the Destination-based Routing Table area, click the Add icon. Configure the following route, then click OK:
   - For IP Address and Netmask, enter 0.0.0.0/0.
   - For Next Hope, select Gateway.
   - For Interface, select ethernet1/2.
   - For Gateway IP Address, enter 210.1.1.250.

**Configuring Layer 2 Vsys (L2V)**

A NetScreen-5000 series security device running ScreenOS 5.0-L2V supports virtual systems in transparent mode (the device functions similar to a Layer-2 switch or bridge). The device groups packets to or from a unique vsys based on the VLAN tag in the packet header, applies the Security Policy for the vsys to the packets, then sends permitted packets through the device without packet modification.

When you first add a NetScreen-5000 series security device running ScreenOS 5.0-L2V to NSM, the device is in neutral mode, meaning that neither L2V or VLAN trunk mode is configured on the device. To confirm that the device is neutral mode, ensure that the root system does not contain a VLAN group, no VLAN IDS have been exported to a vsys device, vlan1 exists in the root system only, and that the VLAN trunk mode is disabled.

To enable L2V on a neutral root system, you must:
1. Import VLAN IDs from the root system to vsys.
2. Create a VLAN group (in the root system or vsys) and assign that group to a physical port and zone.

When L2V is enabled, you cannot configure VLAN trunk mode (option is disabled). For information about how to change an L2V root system to VLAN trunk mode, see “Converting L2V to VLAN Trunking” on page 213.

Assigning L2V VLAN IDs

You must use VLAN tags for vsys devices in transparent mode. The device classifies traffic to or from the vsys based on the VLAN tag. A root device running ScreenOS 5.0-L2V supports a maximum of 4094 VLANs. You can assign each vsys 2 to 4094 VLANs, however, after a VLAN is assigned to one vsys it cannot be used in another. The root system reserves vlan 1, vlan0, and vlan4095.

By default, all VLAN IDS belong to the root system. To configure VLAN IDs for each vsys, you must import the VLAN IDs from the root system to a vsys:

1. In the main navigation tree, select Device Manager > Security Devices, then doubleclick a vsys device.
2. In the vsys device navigation tree, select Network > Vlan > Import.
3. Click the Add icon to display the New Vlan Import Entry dialog box, then enter the range of VLAN IDs you want to import from the root system to the vsys.
4. Click OK. NSM imports the VLAN IDs within the specified range from the root system; these IDS are now reserved and cannot be used by the root system or other vsys.

To export VLAN IDs to the root system, you must delete the VLAN IDs from the vsys (select the VLAN import entry then click the Delete icon). When you delete an ID range, NSM no longer reserves those IDs, enabling you to import the IDs to another vsys.

After you have imported VLAN IDs to a vsys, you can group those IDs and assign them to a physical port and zone.

Creating L2V VLAN Groups

A VLAN group contains VLAN IDs and specifies the port and zone on the physical device that handles those IDS. You can create a VLAN group that includes a single ID range, or add multiple ID ranges to group multiple VLAN ranges.

For each group, you must configure:

- The VLAN IDS ranges you want to include in the group. To include a ID range within a group, you must have previously imported the IDs to the vsys (the IDs must be reserved by the vsys). To view the VLAN IDs imported to the vsys, select the option Show Vlan IDs Imported (option is located at the bottom of the VLAN Group screen). To clear the VLAN ID information from the group screen, clear (unselect) the option.
The Port and Zone that handle traffic with the specified IDs. You can select any physical interface or aggregate interface and any L2 zone. Interfaces included within an aggregate interface are not displayed and cannot be selected.

If you select the Null zone for a VLAN interface, NSM automatically sets the zone as v1-null.

You can create VLAN groups at the root level and at the vsys level. When configuring a root VLAN group, however, any VLAN ID ranges you include in the group are automatically reserved for the root system and cannot be imported by a vsys.

You cannot delete VLAN IDs that are included in a VLAN group.

**Configuring L2V Zones**

You can configure any predefined zone in a shared virtual router as shareable. In the NSM UI, the following predefined L2 zones appear with regular zone names:

- **v1-trust** appears as trust
- **v1-untrust** appears as untrust
- **v1-dmz** appears as dmz

The exception is v1-null, which appears as v1-null; the regular null zone is unchanged, and appears as null. By default, the predefined VLAN zone is also sharable when using L2V. The VLAN zone contains all vsys management interfaces.

You can also create custom L2V zones in the root system or vsys, although you cannot configure a custom L2V zone as sharable. When you define a new L2 zone, NSM prepends the prefix “L2-” to the name during a device update. However, the L2 prefix does not appear in the NSM UI. For example, if you create an L2 zone named “music”, the UI displays the zone name as “music”, but the Web UI and CLI displays the zone name as “L2-music”.

**NOTE:** When configuring a custom L2V zone, the name must include only lower-case letters.

**Configuring L2V Interfaces**

In the root system, you can bind any interface to an L2 zone. If the zone is shared with vsys, the interface also becomes shared with vsys. You cannot import or export interfaces between root and vsys, and you cannot assign an IP address to an interface (except the VLAN management interfaces).

In the root system, you can create VLAN management interfaces and aggregate interfaces. At the vsys level, you can only create VLAN management interfaces.
Configuring L2V VLAN Management Interfaces

The root system contains a predefined VLAN management interface (vlan1) that is bound to the VLAN zone. You can configure this interface as you would a normal security interface, for example, assign the interface an IP address, configure DHCP, or configure monitoring.

For each vsys that you want to manage, you must create the VLAN management interface on the vsys, then bind the interface to the VLAN zone. Because each VLAN interface uses a VLAN ID, you must have previously imported VLAN IDs from a root system before creating the VLAN interface on a vsys device. For example, before you create vlan.3 management interface on a vsys, you must import the VLAN ID 3 from the root system.

For both root and vsys, the VLAN interface name is the VLAN ID for the interface. To add multiple management interfaces, bind each interface to the VLAN zone and assign each interface a unique vlan name (vlan1, vlan2, vlan3, and so on; acceptable range is 2-4094). When assigning IP address to each interface, ensure that the IP subnets for all interfaces do not overlap.

Configuring L2V Aggregate Interfaces

You can create aggregate interfaces in the root system to increase available bandwidth. An aggregate interface must be bound to an L2 zone (cannot be bound to the VLAN zone) and can be shared with vsys. Although you can manage this interface, you cannot assign an IP address. Additionally, if you bind a regular interface to an L2 aggregate interface, you cannot select the zone for the regular interface.

You cannot create aggregate interfaces at the vsys level.

The 8G Secure Port Module (SPM) supports two ASICs; ports ethernet2/1 through ethernet2/4 use one ASIC, and ports ethernet2/5 through ethernet2/8 use the other. You must configure aggregate interfaces in pairs, starting with port ethernet2/1.

| aggregate1    | ethernet2/1 and ethernet2/2 |
| aggregate2    | ethernet2/3 and ethernet2/4 |
| aggregate3    | ethernet2/5 and ethernet2/6 |
| aggregate4    | ethernet2/7 and ethernet2/8 |

The 8G2 Secure Port Module (SPM) supports a maximum of two 4-port aggregate interfaces, four trusted and four untrusted. Assigning the VLANs to an aggregate interface provides a traffic bandwidth of 2Gbps in each direction, with a maximum of 4Gbps for bi-directional traffic per Application-Specific Integrated Circuit (ASIC). You must configure aggregate interfaces in pairs, starting with port ethernet2/1, as shown in Table 19 on page 213.
### Converting L2V to VLAN Trunking

When the VLAN interface is set to Trunk mode, the root system operates in VLAN trunk mode and L2V is disabled for the device. While in VLAN trunk mode, all L2V functionality is unsupported: You cannot import VLAN IDs to vsys devices or VLAN groups to root or vsys.

To change a neutral root system to VLAN Trunk mode, in the device navigation tree, select **Network > Interfaces**, then doubleclick the vlan1 interface. In the General Properties interface screen, select **Vlan Trunk**. To disable VLAN trunk mode, clear the Vlan Trunk option (the device returns to neutral).

To change an L2V root device to VLAN Trunk mode, you must first delete VLAN IDS that were imported to vsys devices and VLAN groups in the root and vsys devices.

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**NOTE:** To confirm that the device is neutral mode, ensure that the root system does not contain a VLAN group, no VLAN IDS have been exported to a vsys device, vlan1 exists in the root system only, and that the VLAN trunk mode is disabled.

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In this example, you configure a NetScreen-5200 security device in L2V mode and the vsys “music”. The music vsys shares the music-untrust zone with the root system. You must import the VLANs to a vsys before they can be tagged.

1. Add a NetScreen-5000 security device in transparent mode running ScreenOS 5.0 L2V as the root system, then configure the network module:
   - Double-click the device to open the device configuration. In the device navigation tree, select **Network > Slot**.
   - Double-click slot 2 to display the slot configuration dialog box. For Card Type, select **5000-8G SPM**.
   - Click **OK** to save the slot configuration.
   - Create the vsys music. In the Device Manager, select **Security Devices**, then doubleclick the vsys music to open the vsys configuration.

2. Create two custom layer-2 zones on the vsys music:
   - In the vsys configuration tree, select **Network > Zones**. Click the Add icon and select **Security Zone**. Configure the zone name as music-trust, then click **OK**.
   - In the vsys configuration tree, select **Network > Zones**. Click the Add icon and select **Security Zone**. Configure the zone name as music-untrust, then click **OK**.
3. Import VLAN IDs from the root system to the vsys music:
   - In the vsys navigation tree, select **Network > Vlan > Import**.
   - Click the Add icon to display the New VLAN Import Entry. Configure the following, then click **OK**:
     - For Vlan ID Begin, enter **100**.
     - For Vlan ID End, enter **199**.
     - For Comments, enter **music vlans**.
   - Create a VLAN group on the vsys music. In the vsys navigation tree, select **Network > Vlan > Group**, then click the Add icon to display the New VLAN Group Entry. Configure the following:
     - For Vlan Group Name, enter **it_music**.

4. In the Setting Vlan Group area, click the Add icon to display the New Vlan Group Range. Configure the following, then click **OK**:
   - For Start Vlan ID, enter **100**.
   - For End Vlan ID, enter **199**.

5. In the Binding Vlan Group to Port and Zone area, click the Add icon to display the New Vlan Group Port Settings. Configure the following, then click **OK**:
   - For Interface, select **ethernet2/5**.
   - For Zone, select **music-trust**.

6. In the Binding Vlan Group to Port and Zone area, click the Add icon to display the New Vlan Group Port Settings. Configure the following, then click **OK**:
   - For Interface, select **ethernet2/1**.
   - For Zone, select **music-untrust**.
   - Create management interface for vsys music:
     - In the vsys navigation tree, select **Network > Interfaces**, then click the Add icon and select VLAN Interface.

7. Configure the following General Properties:
   - For Name, enter **199** (name appears as vlan199).
   - For Zone, select **vlan**.
   - For IP Address/Netmask, enter **1.0.1.199/24**.
   - Clear Manageable (deselect the checkbox).
   - In the interface navigation tree, select **Service Options**. Select the Telnet, Ping, and Web, then click **OK**.

8. Configure zone firewall rules in a Security Policy for vsys music. First, create a rule that permits HTTP traffic from music-untrust to music trust:
Configuring Certificates

Every security device supports the use of certificates to authenticate itself to outside parties. A digital certificate is an electronic means for verifying identity through a trusted third party, known as a Certificate Authority (CA). The CA is a trusted partner of the identity sending the digital certificate as well as the identity receiving it. To
authenticate identity, the CA issues certificates, often with a set time limit. If you do not renew the certificate before the time limit is reached, the CA considers the certificate inactive. For example, a VPN member attempting to use an expired certificate is immediately detected (and rejected) by the CA.

You can use certificates to authenticate a VPN member (external device or security device), RAS users for a Group IKE ID, or SSL management of a security device. You must obtain and install the following certificates on the managed device before you can use certificates to authenticate the device:

- “Configuring A Local Certificate” on page 216—A local certificate authenticates the identity of the device on which it is installed.
- “Configuring CA Certificates” on page 220—A CA certificate authenticates a third party.
- “Configuring CRLs” on page 222 (Optional)—A Certificate Revokation List (CRL) ensures that expired certificates are not accepted.

**NOTE:** A CRL is optional; you do not need to obtain and install a CRL on the security device to use certificates.

When you import a security device that already has a local certificate, CA, and CRL installed, these certificates and lists are automatically imported as part of the device configuration when you add that device to the NSM system. However, to reuse the CA and CRL in other security devices, you must load the CA and CRL file directly into the management system (you cannot reuse a local certificate on another device). For information, see “Using Imported Certificates” on page 222.

**Using Self-Signed Certificates (ScreenOS 5.1 and higher only)**

For devices running ScreenOS 5.1 and higher, a self-signed certificate is automatically created each time the device powers on; you can use this self-signed certificate to authenticate the device for SSL management. Because this self-signed certificate is not authenticated by an external, third-party Certificate Authority, you cannot use it to authenticate a VPN member in an IKE VPN. A device running ScreenOS 5.1 and higher automatically creates the self-signed certificate upon reboot, so you do not need to configure a Generate Certificate Request to obtain it. However, if you delete the self-signed certificate for a device and do not want to reboot the device to obtain a new certificate, you can use the Generate Certificate Request procedure to prompt the device to regenerate the certificate. For steps to obtaining a self-signed certificate, see “Generating the Certificate Request” on page 217.

A self-signed certificate that was automatically generated by the device at startup has a certificate status of **system**. If you use the Generate Certificate Request to obtain a new self-signed certificate, the self-signed certificate has a certificate status of **active**.

**Configuring A Local Certificate**

A local certificate validates the identity of the security device. Each security device that performs authentication (in a VPN, for SSL management, for device
administrators) must have a local certificate installed on the device. To view the available local certificates on a device, in the device navigation tree, select **VPN Settings > Local Certificates**.

To get a local certificate for a device, you must prompt the device to generate a certificate request (includes public/private key pair request) using the Generate Certificate Request directive. Depending on how you want to use the local certificate and the version of ScreenOS the device is running, you can configure a CA-signed local certificate or a self-signed local certificate:

- **Obtain a local certificate signed by a CA**—Use for devices running ScreenOS 5.0 or higher, and for devices running ScreenOS 5.1 and higher that need to use a local certificate for authentication in an IKE VPN. When the device receives the prompt for a certificate request, it processes the request and returns the encrypted public key for the device. Using this encrypted public key, you can contact an independent CA (or use your own internal CA, if available) to obtain a local device certificate file (a .cer file). You must install this local certificate file on the managed device using NSM before you can use certificates to validate that device. Because the local certificate is device-specific, you must use a unique local certificate for each device.

- **Use the self-signed certificate**—Use for devices running ScreenOS 5.1 and higher that do not need to use the certificate for authentication in an IKE VPN. When configuring the request, select **Create Self-Signed Certificate**. When the device receives the certificate request, it processes the request and automatically adds the certificate to the device. Because this certificate is both a local and CA certificate, you do not need to contact a CA.

For CA-signed local certificates, you can also use SCEP to configure the device to automatically obtain a local certificate (and a CA certificate) from the CA directly.

**Generating the Certificate Request**

To send a certificate request prompt to the managed device, right-click the device and select **Certificates > Generate Certificate Request**. Enter the following information:

- **Name**—Enter the name of the certificate requestor; typically, this is the person who administrators the security device.
- **Phone**—Enter the telephone number of the certificate requestor.
- **Domain Component**—Enter one or more domain components for the certificate requestor. Multiple entries must be separated by commas.
- **Unit/Department**—Enter the unit or department of the certificate requestor.
- **Organization**—Enter the organization of the certificate requestor.
- **County/Locality**—Enter the county or locality of the certificate requestor.
- **State**—Enter the state of the certificate requestor.
- **Country**—Enter the country of the certificate requestor.
- **E-mail**—Enter the email address of the certificate requestor.
- **IP Address**—Enter the IP address of the certificate requestor.
■ **FQDN**—Enter the fully-qualified domain name of the security device.

■ **Key Pair Type**—Select RSA or DSA encryption.

■ **Key Pair Length**—Select the key length: 512, 786, 1024, or 2048. Ensure that your Certificate Authority can support the key length you select. Key lengths greater than 1024 might require generation times longer than 10 minutes.

■ **Create Self-Signed Certificate (ScreenOS 5.1 and higher only)**—Select this option to use the self-signed certificate on a device running ScreenOS 5.1 and higher. Because the self-signed certificate is both the local certificate and the CA certificate, when this option is enabled the SCEP options are automatically disabled.

■ **Automatically Enroll**—Select this option to use SCEP. The device automatically requests, receives, and installs the local certificate and the CA certificate locally. To use SCEP, configure the following defaults:
  ■ **Certificate Authority.** Select a preconfigured CA or use the default CA settings for the device.
  ■ **E-mail request to.** Provide the email address that receives the PKCS#10 file, which defines the syntax for certification requests.

Click **OK** to send the request prompt to the device. A Job Manager window appears to display job information and job progress. When the job is complete, the device public key appears in the Job window.

If you are obtaining the local certificate manually, you need the device public key to give to the CA. Copy and paste the information from the job window to a text file, or leave the job window open while you contact the CA.

If you are using SCEP to obtain a local certificate and a CA certificate, the device automatically sends its public key to the CA directly. When SCEP obtains both the local and CA certificate, the job completes. Close the Job Manager window, then check the status of certificates: open the device configuration and select **VPN Settings > Local Certificates**. The certificate status appears as **active**, indicating that the certificate file has been successfully installed on both the physical device and the management system (you might need to use the Refresh directive to prompt the UI to update the certificate status).

If you are using the self-signed certificate on a device running ScreenOS 5.1 and higher, the device automatically creates the certificate. A Job Manager window appears to display job information and job progress. When the job is complete, close the Job Manager window. To view the certificate, open the device configuration and select **VPN Settings > Local Certificates**. The certificate status appears as **active**, indicating that the self-signed certificate file has been successfully created and installed on both the physical device and the management system.

**Obtaining and Installing the Local Certificate (CA or SCEP Only)**

For CA-signed local certificates, after you prompt the device to generate the certificate request, the device creates the public/private key pair that is used to create the local certificate and returns the public key to the management system (the private key
never leaves the device). During this time, the certificate status is key pair, meaning that a key pair exists but no certificate has been loaded.

After you obtain the local certificate, you must load the certificate into the management system using the NSM UI, then install the certificate on the managed device:

- For devices running ScreenOS 5.x, you must install a TFTP server on the NSM Device Server. The Device Server automatically uses TFTP to load the certificate onto your managed devices. For more information about creating a TFTP server on the Device Server, see the Network and Security Manager Installation Guide.

- For devices running ScreenOS 5.1 and higher, the Device Server automatically uses Secure Server Protocol (SSP) to load firmware onto your managed devices. SSP is the protocol used for the management connection between the physical device and the NSM Device Server.

After the certificate is installed on the device, the certificate is known as active. To view the current status of your certificate requests, open the device configuration and select VPN Settings > Local Certificates:

- Before the certificate is fulfilled, the certificate status appears as key pair, indicating a public/private key pair exists but the certificate file does not yet exist on both the physical device and the management system.

- After the certificate is fulfilled, the certificate status appears as active, indicating that the certificate file has been successfully installed on both the physical device and the management system.

NOTE: Any time you need to move information from the physical device to the management system, you are using a Refresh directive; when you need to move information from the management system to the physical device, you are using an Update directive.

---

### Installing the Local Certificate Using SCEP

If you used SCEP for automatic enrollment, the device contacts the specified CA and obtains a local and CA certificate. After the device has installed the certificate, refresh the NSM device configuration for that device to view the new certificate information:

1. Right-click the device and select Certificates > Refresh Local Certificates. This directive uses the information about the physical device to refresh the information on the management system.

2. Open the device configuration to view the local certificates in VPN Settings > Local Certificates. The certificate status appears as active, indicating that the certificate file has been successfully installed on both the physical device and the management system.
Installing the Local Certificate Manually

If you did not use SCEP, you must manually contact your CA and use the device public key to create a local device certificate. After you have obtained the local certificate (.cer) file from your CA, install that certificate on the device:

1. Right-click the device and select **Certificates > Update Fulfilled Certificate**. This directive uses the information in the management system to update the information about the physical system.

2. Load the certificate file and click **OK** to install the local certificate on the device.

**NOTE:** For devices running ScreenOS 5.x, you must install a TFTP server on the NSM Device Server. The Device Server automatically uses TFTP to load the local certificate onto your managed devices. For more information about creating a TFTP server on the Device Server, see the *Network and Security Manager Installation Guide*.

A Job Manager window appears to display job information and job progress. When the job is complete, close the Job Manager window.

3. To view the local certificate, open the device configuration and select **VPN Settings > Local Certificates**. The certificate status appears as **active**, indicating that the certificate file has been successfully installed on both the physical device and the management system.

For devices running ScreenOS 5.1 and higher, the Device Server automatically uses Secure Server Protocol (SSP) (the protocol used for the management connection) to load the local certificate.

**Configuring CA Certificates**

A CA certificate validates the identity of the third party CA that issued the local device certificate. To view the available CA certificates on a device, in the device navigation tree, select **VPN Settings > CA Certificates**.

**NOTE:** If you are using a self-signed certificate, you do not need to contact a CA. The self-signed certificate on the device is issued and signed by the same entity (the device), so the issuer and the subject of the certificate are the same. However, because this self-signed certificate is not authenticated by an external, third-party Certificate Authority, you cannot use it to authenticate a VPN member in an IKE VPN.

To obtain a CA certificate file (.cer), contact the CA that issued the local certificate, then use this file to create a Certificate Authority object. You must install this CA certificate on the managed device using NSM before you can use certificate to validate that device in your VPN. Because the CA certificate is an object, however, you can use the same CA for multiple devices, as long as those devices use local certificates that were issued by that CA.

You can also use SCEP to configure the device to automatically obtain a CA certificate at the same time it receives the local certificate. For details on configuring a certificate.
authority object, see “Configuring Certificate Authorities” in the Network and Security Manager Administration Guide.

The following sections explain how to add a CA certificate to a device using SCEP or manually.

**Obtaining and Installing a CA Certificate Using SCEP**

If you used SCEP to obtain a local certificate for the device, the CA certificate was automatically downloaded and installed on the device at the same time as the local certificate. However, because the management system does not know about the CA certificate, you must refresh the CA information:

1. Right-click the device and select **Certificates > Refresh CA Certificates**. This directive uses the information about the physical device to refresh the information on the management system.

2. Open the device configuration to view the CA certificates in **VPN Settings > CA Certificates**.

**Obtaining and Installing a CA Certificate Manually**

If you did not use SCEP, you must manually contact your CA, obtain a CA certificate, and create a Certificate Authority Object. Then, add the CA certificate to the device and install it on the device:

1. Open the device configuration and select **VPN Settings > CA Certificates**. Click the Add icon and add the Certificate Authority object. Close the device configuration.

2. Right-click the device and select **Certificates > Update CA Certificate**. This directive uses the information in the management system to update the information on the physical system. A Job Manager window appears to display job information and job progress.

**NOTE:** For devices running ScreenOS 5.x, you must install a TFTP server on the NSM Device Server. The Device Server automatically uses TFTP to load the CA certificate onto your managed devices. For more information about creating a TFTP server on the Device Server, see the Network and Security Manager Installation Guide.

3. When the job is complete, close the Job Manager window.

For devices running ScreenOS 5.1 and higher, the Device Server automatically uses Secure Server Protocol (SSP) (the protocol used for the management connection) to load the CA certificate.

To view CA certificate, open the device configuration and select **VPN Settings > CA Certificates**.
Configuring CRLs

A Certificate Revocation List (CRL) identifies invalid certificates. To view the available CRLs on a device, in the device navigation tree, select **VPN Settings > CRLs**. To obtain a CRL file (.crl), contact the CA that issued the local certification and CA certificate for the device, then use this file to create a Certificate Revocation List object.

You must install the CRL on the managed device using NSM before you can use a CRL to check for revoked certificates in your VPN. Because the CRL is an object, however, you can use the same CRL for multiple devices, as long as those devices use local and CA certificates that were issued by that CA. After you have received a CRL, you can use the CRL object in your VPN. For details on configuring a certificate revocation list object, see “Configuring CRL Objects” on page 178.

You must manually contact your CA, obtain a CRL, and create a Certificate Revocation List Object. Then, add the CRL to the device and install it on the device:

1. Open the device configuration and select **VPN Settings > CRLs**. Click the Add icon and add the Certificate Revocation List object. Close the device configuration.
2. Right-click the device and select **Certificates > Update CRL**. This directive uses the information in the management system to update the information on the physical system. A Job Manager window appears to display job information and job progress.

**NOTE:** For devices running ScreenOS 5.x, you must install a TFTP server on the NSM Device Server. The Device Server automatically uses TFTP to load the CRL onto your managed devices. For more information about creating a TFTP server on the Device Server, see the Network and Security Manager Installation Guide.

3. When the job is complete, close the Job Manager window.

For devices running ScreenOS 5.1 and higher, the Device Server automatically uses Secure Server Protocol (SSP) (the protocol used for the management connection) to load CRLs.

To view CRL, open the device configuration and select **VPN Settings > CRL**.

Using Imported Certificates

If you imported a security device that already has a local certificate, CA, and CRL, these objects are automatically imported when you add that device to the NSM system. Imported objects use the default name of `<CN>_<timestamp>`.

However, to reuse the CA and CRL objects in other security devices, you must load the CA and CRL file directly into the management system:

- To load a CA file (.cer) into the management system, open the imported CA object in Object Manager and use the Load Certificate option. After loading the CA, verify the status of the certificate appears as Loaded.
To load a CRL file (.crl) into the management system, open the imported CRL object in Object Manager and use the Load CRL option. After loading the CRL, verify the status of the CRL appears as Loaded.

After the CA certificate and CRL files have been loaded, you can use those CA and CRL objects in other devices.

**Configuring PKI Defaults**

You can configure default PKI settings for each security device that define how that device handles certificates. When configuring a VPN that includes the device, you can use these default settings.

In device configuration tree, select VPN Settings > Defaults > PKI Settings to display the default PKI settings. First, configure the source interface for PKI Traffic. The source interface is the interface on the device that sends the certificate request to the CA.

**Configuring X509 Certificates**

Configure the following X509 certificate settings:

- Email Destination for the PKCS#10 File—Provide the email address that receives the PKCS#10, which defines the syntax for certification requests.
- Select raw common name—Select this option to use only one CN field in the certificate CN in SCEP certificate request. Some certificate authorities support a single CN field in the certificate DN, when responding to a SCEP request. When enabled, the CN field contains the value of certificate name when you set DN.

**Configuring Revocation**

Revocation settings define how and when certificates are revoked. You might want to revoke a certificate that you suspect has been compromised or when a certificate holder leaves a company. You can revoke the certificate manually, or use Certificate Revokation List (CRL) or Online Certificate Status Protocol (OCSP) to automatically check for revoked certificates.

- X.509 Certificate Path Validation Level. X.509 contains a specification for a certificate which binds an entity’s distinguished name to its public key through the use of a digital signature.
  - Full. Use full validation to validate the certificate path back to the root.
  - Partial. Use partial validation to validate the certificate path only part of the way to the root.
- Revocation Check. Select or clear revocation checking for certificates:
  - Check for revocation. Select this option to enable revocation checking.
  - Do not check for revocation. Select this option to disable revocation checking.
Revocation Checking Method—If you enabled revocation checking, you can select the checking method to use. If you did not enable revocation checking, these fields are unavailable.

- CRL. Enables you to keep a local copy of the revoked certificates on the managed device. This method enables you to check for revoked certificates quickly.

- OCSP. Enables the device to access a remote OCSP server to check for revoked certificates. Because the OCSP server dynamically updated their list of revoked certificates, this method provides the most up-to-date information.

Best Effort—Select this option to check for revocation and accept the certificate if no revocation information is found.

CRL Settings—Configure the default setting for the Certificate Revocation List.

- URL address. Provide the URL address of your internal LDAP server that provides the CRL.

- LDAP server. Provide the IP address of the external LDAP server that manages the CRL.

- Refresh Frequency. Select the frequency that the device contacts the CA to obtain a new CRL list: Daily, Weekly, or Monthly.

OCSP—Enable to dynamically check for revoked certificates.

- Certificate Verification. Select the CA certificate used to verify the signature on the OCSP response.

- No revoke status check for CA delegated signing cert. Select this option if you do not want the original CA certificate to verify the validity of the CA delegated OCSP signing certificate. When enabled, the validity of the OCSP signing certificate is verified by original CA certificate.

- URL of OCSP Responder. Provide the URL address of the OCSP server.

Configuring Simple Certificate Enrollment Protocol

Alternatively, you can use Simple Certificate Enrollment Protocol (SCEP) to get a local certificate automatically. To enable SCEP for a managed device, configure the default PKI settings for SCEP:

- CA CGI—Enter the URL address of the Certificate Authority Certificate Generation Information.

- RA CGI—Enter the URL address of the Registration Authority Certificate Generation Information that the security device contacts to request a CA certificate.

- CA IDENT—Enter the name of the certificate authority to confirm certificate ownership.

- Challenge—Enter the challenge word(s) sent to you by the CA that confirm the security device identity to the CA.

- CA Certificate Authentication—Configure the default method for obtaining CA certificates:
- Auto. Select this option for CA certificates retrieved through SCEP.
- Manual. Select this option for CA certificates retrieved manually.

- Polling Interval. NSM searches the list of the pending certificates based on this setting and records the time due for the first pending certificate. This process repeats 48 times; after that time, pending certificates can be polled only manually. When polling succeeds, NSM removes the pending certificate from the pending certificate list and schedules no new polling.
- Poll. When enabled, you can configure the number of minutes between polls.
- Do not poll. Use this option to disable automatic polling.

- Certificate Renewal—Define the number of times a certificate can be renewed.
This chapter presents an overview of the Skinny Client Control Protocol (SCCP) Application Layer Gateway (ALG) and lists the firewall security features of the implementation.

This chapter contains the following sections:

- Support the Cisco Skinny Protocol on page 227
- Session Initiation Protocol Application Layer Gateway on page 228

### Support the Cisco Skinny Protocol

Skinny Client Control Protocol (SCCP) is supported on security devices in Route, Transparent, and Network Address Translation (NAT) modes. SCCP is a binary-based Application-Layer protocol used for Voice-over-Internet Protocol (VoIP) call setup and control. In the SCCP architecture, a Cisco H.323 proxy, known as the Call Manager, does most of the processing. IP phones, also called End Stations, run the Skinny client and connect to a primary (and, if available, a secondary) Call Manager over TCP on port 2000 and register with the primary Call Manager. This connection is then used to establish calls coming to or from the client.

The SCCP ALG supports the following:

- Call flow from a Skinny client, through the Call Manager, to another Skinny client.
- Seamless failover—switches over all calls in process to the standby firewall during failure of the primary.
- VoIP signaling payload inspection—fully inspects the payload of incoming VoIP signaling packets based on related RFCs and proprietary standards. Any malformed packet attack is blocked by the ALG.
- SCCP signaling payload inspection—fully inspects the payload of incoming SCCP signaling packets in accordance with RFC 3435. Any malformed-packet attack is blocked by the ALG.
- Stateful processing—invokes the corresponding VoIP-based state machines to process the parsed information. Any out-of-state or out-of-transaction packet is identified and properly handled.
- Network Address Translation (NAT)—translates any embedded IP address and port information in the payload, based on the existing routing information and network topology, with the translated IP address and port number, if necessary.
- Pinhole creation and management for VoIP traffic—identifies IP address and port information used for media or signaling and dynamically opens (and closes) pinholes to securely stream the media.

1. In the main navigation tree, select Device Manager > Security Devices.
2. In the main display area, select a security device and then double-click the device on which you want to modify the ALG section. The device configuration appears.
3. In the main navigation tree, select Advanced > ALGs.
4. In the main display area, select Enable SCCP ALG.
5. Click the Show button to expand the SIP settings.
6. Use the up/down arrows to specify Inactive Media Timeout. The default setting is 120 seconds.
7. Select the Enable Call Flood Protection to Call Manager. The feature is not enabled as a default.
8. When the Enable Call Flood Protection to Call Manager feature is enabled, Maximum number of calls per minute threshold value is set to 20 calls per minute as a default.

**NOTE:** The threshold value is per client to protect the Call Manager from being flooded with new calls either by an already compromised connected client or a faulty device.

9. Select Pass unidentified Skinny message in Route mode.
10. Select Pass unidentified Skinny message in NAT mode.

**NOTE:** When you select the “pass unidentified message” in either the route of NAT mode, the message that had an error in decoding (because of unidentified message ID or parameter) is forwarded as-is without any processing.

11. Click OK to apply your settings.

The threshold value is per client to protect the Call Manager from being flooded with new calls either by an already compromised connected client or a faulty device.

When you select the “pass unidentified message” in either the route or Nat mode, the message that had an error in decoding (because of unidentified message ID or parameter) is forwarded as-is without any processing.

### Session Initiation Protocol Application Layer Gateway

Session Initiation Protocol (SIP) is an Internet Engineering Task Force (IETF)-standard protocol for initiating, modifying, and terminating multimedia sessions over the
Internet. Such sessions might include conferencing, telephony, or multimedia, with features such as instant messaging and application-level mobility in network environments.

Juniper Networks security devices support SIP as a service and can screen SIP traffic, allowing and denying it based on a policy that you configure. SIP is a predefined service in ScreenOS and uses port 5060 as the destination port.

SIP’s primary function is to distribute session-description information and, during the session, to negotiate and modify the parameters of the session. SIP is also used to terminate a multimedia session.

Session-description information is included in INVITE and ACK messages and indicates the multimedia type of the session, for example, voice or video. Although SIP can use different description protocols to describe the session, the Juniper Networks SIP ALG supports only Session Description Protocol (SDP).

SDP provides information that a system can use to join a multimedia session. SDP might include information such as IP addresses, port numbers, times, and dates. Note that the IP address and port number in the SDP header (the “c=” and “m=” fields, respectively) are the address and port where the client wants to receive the media streams and not the IP address and port number from which the SIP request originates (although they can be the same). See “SDP” on page 233 for more information.

SIP messages consist of requests from a client to a server and responses to the requests from a server to a client with the purpose of establishing a session (or a call). A User Agent (UA) is an application that runs at the endpoints of the call and consists of two parts: the User Agent Client (UAC), which sends SIP requests on behalf of the user; and a User Agent Server (UAS), which listens to the responses and notifies the user when they arrive. Examples of UAs are SIP proxy servers and phones.

**SIP Request Methods**

The SIP transaction model includes a number of request and response messages, each of which contains a method field that denotes the purpose of the message. ScreenOS supports the following method types and response codes:

- **INVITE**—A user sends an INVITE request to invite another user to participate in a session. The body of an INVITE request may contain the description of the session. In NAT mode, the IP addresses in the Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **ACK**—The user from whom the INVITE originated sends an ACK request to confirm reception of the final response to the INVITE request. If the original INVITE request did not contain the session description, the ACK request must include it. In NAT mode, the IP addresses in the Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **OPTIONS**—Used by the User Agent (UA) to obtain information about the capabilities of the SIP proxy. A server responds with information about what methods, session description protocols, and message encoding it supports. In NAT mode, when the OPTIONS request is sent from a UA outside NAT to a proxy inside NAT, the SIP ALG translates the address in the Request-URI and the IP address in the To: field to the appropriate IP address of the internal client. When
the UA is inside NAT and the proxy is outside NAT, the SIP ALG translates the From:, Via:, and Call-ID: fields.

- **BYE**—A user sends a BYE request to abandon a session. A BYE request from either user automatically terminates the session. In NAT mode, the IP addresses in the Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **CANCEL**—A user can send a CANCEL request to cancel a pending INVITE request. A CANCEL request has no effect if the SIP server processing the INVITE had sent a final response for the INVITE before it received the CANCEL. In NAT mode, the IP addresses in the Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **REGISTER**—A user sends a REGISTER request to a SIP registrar server to inform it of the current location of the user. A SIP registrar server records all the information it receives in REGISTER requests and makes this information available to any SIP server attempting to locate a user. In NAT mode, REGISTER requests are handled as follows:
  - REGISTER requests from an external client to an internal registrar—When the SIP ALG receives the incoming REGISTER request it translates the IP address, if any, in the Request-URI. Incoming REGISTER messages are allowed only to a MIP or VIP address. No translation is needed for the outgoing response.
  - REGISTER requests from an internal client to an external registrar—When the SIP ALG receives the outgoing REGISTER request it translates the IP addresses in the To:, From:, Via:, Call-ID:, and Contact: header fields. A backward translation is performed for the incoming response.

- **Info**—Used to communicate mid-session signaling information along the signaling path for the call. In NAT mode, the IP addresses in the Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **Subscribe**—Used to request current state and state updates from a remote node. In NAT mode, the address in the Request-URI is changed to a private IP address if the messages is coming from the external network into the internal network. The IP addresses in Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **Notify**—Sent to inform subscribers of changes in state to which the subscriber has a subscription. In NAT mode, the IP address in the Request-URI: header field is changed to a private IP address if the message is coming from the external network into the internal network. The IP addresses in Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

- **Refer**—Used to refer the recipient (identified by the Request-URI) to a third party by the contact information provided in the request. In NAT mode, the IP address in the Request-URI is changed to a private IP address if the message is coming from the external network into the internal network. The IP addresses in Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.

For example, if user A in a private network refers user B, in a public network, to user C, who is also in the private network, the SIP ALG allocates a new IP address and port number for user C so that user C can be contacted by user B.
If user C is registered with a registrar, however, its port mapping is stored in the ALG NAT table and is reused to perform the translation.

- **Update**—Used to open pinhole for new or updated SDP information. The Via:, From:, To:, Call-ID:, Contact:, Route:, and Record-Route: header fields are modified.
- **1xx, 202, 2xx, 3xx, 4xx, 5xx, 6xx Response Codes**—Used to indicate the status of a transaction.

### Classes of SIP Responses

SIP responses provide status information about SIP transactions and include a response code and a reason phrase. SIP responses are grouped into the following classes:

- **Informational (100 to 199)**—Request received, continuing to process the request.
- **Success (200 to 299)**—Action successfully received, understood, and accepted.
- **Redirection (300 to 399)**—Further action required to complete the request.
- **Client Error (400 to 499)**—Request contains bad syntax or cannot be fulfilled at this server.
- **Server Error (500 to 599)**—Server failed to fulfill an apparently valid request.
- **Global Failure (600 to 699)**—Request cannot be fulfilled at any server.

Table 20 on page 231 provides a complete list of current SIP responses, all of which are supported on Juniper Networks security devices.

<table>
<thead>
<tr>
<th>Classes</th>
<th>Response Code</th>
<th>Reason Phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational</td>
<td>100 Trying</td>
<td>180 Ringing</td>
</tr>
<tr>
<td></td>
<td>182 Queued</td>
<td>183 Session progress</td>
</tr>
<tr>
<td>Success</td>
<td>200 OK</td>
<td>202 Accepted</td>
</tr>
<tr>
<td>Redirection</td>
<td>300 Multiple choices</td>
<td>301 Moved permanently</td>
</tr>
<tr>
<td></td>
<td>305 Use proxy</td>
<td>380 Alternative service</td>
</tr>
</tbody>
</table>
### Table 20: SIP Responses (continued)

<table>
<thead>
<tr>
<th>Client Error</th>
<th>400 Bad request</th>
<th>401 Unauthorized</th>
<th>402 Payment required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>403 Forbidden</td>
<td>404 Not found</td>
<td>405 Method not allowed</td>
</tr>
<tr>
<td>406 Not acceptable</td>
<td>407 Proxy authentication required</td>
<td>408 Request time-out</td>
<td></td>
</tr>
<tr>
<td></td>
<td>409 Conflict</td>
<td>410 Gone</td>
<td>411 Length required</td>
</tr>
<tr>
<td>413 Request entity too large</td>
<td>414 Request-URL too large</td>
<td>415 Unsupported media type</td>
<td></td>
</tr>
<tr>
<td>420 Bad extension</td>
<td>480 Temporarily not available</td>
<td>481 Call leg/transaction does not exist</td>
<td></td>
</tr>
<tr>
<td>482 Loop detected</td>
<td>483 Too many hops</td>
<td>484 Address incomplete</td>
<td></td>
</tr>
<tr>
<td>485 Ambiguous</td>
<td>486 Busy here</td>
<td>487 Request canceled</td>
<td></td>
</tr>
<tr>
<td>488 Not acceptable here</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Server Error</td>
<td>500 Server internal error</td>
<td>501 Not implemented</td>
<td>502 Bad gateway</td>
</tr>
<tr>
<td>502 Service unavailable</td>
<td>504 Gateway time-out</td>
<td>505 SIP version not supported</td>
<td></td>
</tr>
<tr>
<td>Global Failure</td>
<td>600 Busy everywhere</td>
<td>603 Decline</td>
<td>604 Does not exist anywhere</td>
</tr>
<tr>
<td></td>
<td>606 Not acceptable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ALG—Application-Layer Gateway**

There are two types of SIP traffic, the signaling and the media stream. SIP signaling traffic consists of request and response messages between client and server and uses transport protocols such as User Datagram Protocol (UDP) or Transmission Control Protocol (TCP). The media stream carries the data (audio data, for example) and uses Application Layer protocols such as Real Time Protocol (RTP) over UDP.

Juniper Networks security devices support SIP signaling messages on port 5060. You can simply create a policy that permits SIP service, and the security device filters SIP signaling traffic like any other type of traffic, permitting or denying it. The media stream, however, uses dynamically assigned port numbers that can change several times during the course of a call. Without fixed ports, it is impossible to create a static policy to control media traffic. In this case, the security device invokes the SIP ALG. The SIP ALG reads SIP messages and their SDP content and extracts the port-number information it needs to dynamically open pinholes and let the media stream traverse the security device.

NOTE: We refer to a pinhole as the limited opening of a port to allow exclusive traffic.

The SIP ALG monitors SIP transactions and dynamically creates and manages pinholes based on the information it extracts from these transactions. The Juniper Networks SIP ALG supports all SIP methods and responses (see “SIP Request Methods” on page 232.)
229 and “Classes of SIP Responses” on page 231). You can allow SIP transactions to traverse the Juniper Networks firewall by creating a static policy that permits SIP service. This policy enables the security device to intercept SIP traffic and do one of the following actions: permit or deny the traffic or enable the SIP ALG to open pinholes to pass the media stream. The SIP ALG needs to open pinholes only for the SIP requests and responses that contain media information (SDP). For SIP messages that do not contain SDP, the security device simply lets them through.

The SIP ALG intercepts SIP messages that contain SDP and, using a parser, extracts the information it requires to create pinholes. The SIP ALG examines the SDP portion of the packet, and a parser extracts information such as IP addresses and port numbers, which the SIP ALG records in a pinhole table. The SIP ALG uses the IP addresses and port numbers recorded in the pinhole table to open pinholes and allow media streams to traverse the security device.

**NOTE:** Juniper Networks security devices do not support encrypted SDP. If a security device receives a SIP message in which SDP is encrypted, the SIP ALG permits it through the firewall but generates a log message informing the user that it cannot process the packet. If SDP is encrypted, the SIP ALG cannot extract the information it needs from SDP to open pinholes. As a result, the media content that SDP describes cannot traverse the security device.

1. In the main navigation tree, select **Device Manager > Security Devices**.
2. In the main display area, select a security device and then double-click the device on which you want to modify the ALG section. The device configuration appears.
3. In the main navigation tree, select **Advanced > ALGs**.
4. In the main display area, select **Enable SIP ALG**.
5. Click the **Show** button to expand the SIP settings.
6. Use the up/down arrows to configure the following:
   - **Signalling Inactivity Timeout.** The default setting is 43200 seconds (12 hours).
   - **Media Inactivity Timeout.** The default is 120 seconds.
   - **Maximum duration a message will remain in network.** The default setting is 5 seconds.
   - **Round Trip Time Estimate.** The default setting is 500 milliseconds.
   - **Invite Transaction Timeout.** The default setting is 3 minutes.
   - **Select IP Attack Protection and specify Timeout if you want IP attack protection to be enabled.**
7. Click **OK** to apply your settings.

**SDP**

An SDP session description is text-based and consists of a set of lines. It can contain session-level and media-level information. The session-level information applies to
the whole session, while the media-level information applies to a particular media
stream. An SDP session description always contains session-level information, which
appears at the beginning of the description, and might contain media-level
information, which comes after.

**NOTE:** In the SDP session description, the media-level information begins with the
m = field.

Of the many fields in the SDP description, two are particularly useful to the SIP ALG
because they contain Transport Layer information. The two fields are the following:

- **c =** for connection information

  This field can appear at the session or media level. It displays in this format:

  - c = <network type> <address type> <connection address>

  Currently, the security device supports only “IN” (for Internet) as the network
type, “IP4” as the address type, and a unicast IP address or domain name as the
destination (connection) IP address.

**NOTE:** Generally, the destination IP address can also be a multicast IP address, but
ScreenOS does not currently support multicast with SIP.

If the destination IP address is a unicast IP address, the SIP ALG creates pinholes
using the IP address and port numbers specified in the media description field
m = .

- **m =** for media announcement

  This field appears at the media level and contains the description of the media.
  It displays in this format:

  - m = <media> <port> <transport> <fmt list>

  Currently, the security device supports only “audio” as the media and “RTP” as
the Application Layer transport protocol. The port number indicates the
destination (not the origin) of the media stream. The format list (fmt list) provides
information on the Application Layer protocol that the media uses.

  In this release of ScreenOS, the security device opens ports only for RTP and
RTCP. Every RTP session has a corresponding Real Time Control Protocol (RTCP)
session. Therefore, whenever a media stream uses RTP, the SIP ALG must reserve
ports (create pinholes) for both RTP and RTCP traffic. By default, the port number
for RTCP is one higher than the RTP port number.

  With this configuration, the following happens:

  - Any connections into eth4 from any IP address except the database server
    IP address are logged with an alert.
Any connections into eth2 from any IP address except the web server are logged. In addition, if the database server IP address appears in eth2, the sensor logs that event.

**Pinhole Creation**

Both pinholes for the RTP and RTCP traffic share the same destination IP address. The IP address comes from the c= field in the SDP session description. Because the c= field can appear in either the session-level or media-level portion of the SDP session description, the parser determines the IP address based on the following rules (in accordance with SDP conventions):

- First, the SIP ALG parser verifies if there is a c= field containing an IP address in the media level. If there is one, the parser extracts that IP address, and the SIP ALG uses it to create a pinhole for the media.
- If there is no c= field in the media level, the SIP ALG parser extracts the IP address from the c= field in the session level, and the SIP ALG uses it to create a pinhole for the media. If the session description does not contain a c= field in either level, this indicates an error in the protocol stack, and the security device drops the packet and logs the event.

The following lists the information the SIP ALG needs to create a pinhole. This information comes from the SDP session description and parameters on the security device:

- Protocol: UDP.
- Source IP: Unknown.
- Source port: Unknown.
- Destination IP: The parser extracts the destination IP address from the c= field in the media or session level.
- Destination port: The parser extracts the destination port number for RTP from the m= field in the media level and calculates the destination port number for RTCP using the following formula:
  \[
  \text{RTP port number} + \text{one}
  \]
- Lifetime: This value indicates the length of time (in seconds) during which a pinhole is open to allow a packet through. A packet must go through the pinhole before the lifetime expires. When the lifetime expires, the SIP ALG removes the pinhole.

When a packet goes through the pinhole within the lifetime period, immediately afterwards the SIP ALG removes the pinhole for the direction from which the packet came.

**Session Inactivity Timeout**

Typically a call ends when one of the clients sends a BYE or CANCEL request. The SIP ALG intercepts the BYE or CANCEL request and removes all media sessions for that call. There could be reasons or problems preventing clients in a call from sending
BYE or CANCEL requests, for example, a power failure. In this case, the call might go on indefinitely, consuming resources on the security device. The inactivity-timeout feature helps the security device to monitor the liveliness of the call and terminate it if there is no activity for a specific period of time.

A call can have one or more voice channels. Each voice channel has two sessions (or two media streams), one for RTP and one for RTCP. When managing the sessions, the security device considers the sessions in each voice channel as one group. Settings such as the inactivity timeout apply to a group as opposed to each session.

- **Signaling-inactivity timeout**: This parameter indicates the maximum length of time (in seconds) a call can remain active without any SIP-signaling traffic. Each time a SIP-signaling message occurs within a call, this timeout resets. The default setting is 43200 seconds (12 hours).

- **Media-inactivity timeout**: This parameter indicates the maximum length of time (in seconds) a call can remain active without any media (RTP or RTCP) traffic within a group. Each time an RTP or RTCP packet occurs within a call, this timeout resets. The default setting is 120 seconds.

If either of these timeouts expires, the security device removes all sessions for this call from its table, thus terminating the call.
Chapter 8  
Routing

This chapter provides information on using the Virtual Router screens to configure routing on security devices. Routing is the process of forwarding packets from one network to another toward a final destination, and a router is a point where one network meets another network. Security devices contain integrated routing functionality that enables them to effectively forward protected traffic to its destination.

This chapter contains the following sections:

- Configuring Virtual Routers on page 237
- Configuring Dynamic Routing on page 250
- Configuring Multicast Routing on page 265
- IRDP on ns5GT Support on page 273
- Configuring ICMP Router Discovery Protocol on page 274
- Disabling IRDP on page 275
- Policy-Based Routing on page 275

Configuring Virtual Routers

To configure a virtual router, double-click the virtual router in the Virtual Router configuration screen (or, either select the virtual router and then click the Edit icon, or right-click the virtual router and select Edit). You can configure the following parameters for a virtual router:

- “Configuring Virtual Router General Properties” on page 239
- “Configuring Access Lists” on page 240
- “Configuring Route Maps” on page 241
- “Configuring Export and Import Rules” on page 242
- “Configuring Routing Table Entries” on page 245
- “Configuring Route Preferences” on page 250

For details on configuring dynamic routing protocols (BGP, RIP, OSPF) in the virtual router and on the interfaces, see “Configuring Dynamic Routing” on page 250. For details on configuring multicast routing protocols (PIM-SIM, IGMP, IGMP-Proxy) and multicast route entries, see “Configuring Multicast Routing” on page 265.
For more detailed explanations about virtual routers and dynamic routing protocols on security devices, see the “Dynamic Routing” volume in the Concepts & Examples ScreenOS Reference Guide.

About Routes

You can configure three types of routing on a security device:

- Static—Static routes are mappings of IP network addresses to next-hop destinations that you define on a layer 3 forwarding device, such as a router. These mappings do not change unless you alter them. For networks that have few connections to other networks or where inter-network connections are relatively unchanging, it is usually more efficient to define static routes than to set up dynamic routing. The device retains static routes until you explicitly remove them. However, you can override static routes with dynamic routing information if necessary.

- Dynamic—Dynamic routing involves routers exchanging information about the reachability of networks and subnetworks and adjusting routing tables by analyzing incoming routing update messages. These messages populate the network, directing routers to recalculate routes and change their routing tables accordingly.

- Multicast—Multicast protocols enable routers to forward traffic from one source to multiple receivers simultaneously.

All routes are contained within a virtual router, as detailed below.

About Virtual Routers

A security device can divide its routing component into two or more virtual routers. A virtual router supports static routing, dynamic routing protocols, and multicast protocols, which you can enable simultaneously in one virtual router. A security device can contain the following types of Virtual Routers (VRs):

- Predefined Virtual Routers—Each security device contains two predefined virtual routers:
  
  - trust-vr. By default, contains all predefined security zones and any user-defined zones.
  
  - untrust-vr. By default, does not contain any security zones.

  You cannot delete the trust-vr or untrust-vr predefined virtual routers.

- Custom Virtual Routers—On some security devices, you can create and configure additional custom virtual routers.

You can define multiple VRs, but trust-vr is the default VR. All predefined and custom security zones (and all interfaces bound to those security zones) are bound to the trust-vr virtual router. To bind a security zone to the untrust-vr or to a custom VR, you must first unbind all interfaces from the zone. For a vsys, you can select a virtual router to be the default router for the vsys.
Configuring Virtual Router General Properties

You can configure the following general properties for a virtual router:

- **Virtual Router ID**—A unique identifier used to communicate with other routing devices. The identifier can be in the form of a dotted decimal notation, like an IP address, or an integer value. If you do not configure a specific virtual router ID before enabling a dynamic routing protocol, the device automatically selects the highest IP address of the active interfaces in the VR for the router identifier.

- **Maximum Number of Routes**—The maximum number of routing table entries that can be allocated for a specific virtual router. The maximum number of route entries available depends upon the security device and the number of virtual routers configured on the device. Setting the maximum number of route entries in a VR helps prevent one virtual router from using up all the entries in the system.

- **Maximum Equal Cost Routes Supported (ScreenOS 5.1 and higher only)**—The maximum Equal Cost Multi-Path (ECMP) routes used by the virtual router. You might want to use ECMP when load balancing to enable the route lookup to select a different route each time the route is invoked. This setting controls how many ECMP routes the route lookup can use; you can configure one to four ECMP routes for each virtual router. For example, when this setting is three and the number of available ECMP routes is five, the route lookup uses only the first three ECMP entries in the routing table (in round robin fashion) for the virtual router.

- **Route Lookup Preference (ScreenOS 5.1 and higher only)**—Configure the order in which route lookup occurs. By default, route lookup uses the following sequence: SIBR routes (preferred value 3), Source-Based routes (preferred value 2), Destination-Based routes (preferred value 1). To change this sequence, configure the values for each preference from 1 to 255; the higher the value, the more preferred the route.

- **Shared VR**—You can make the VR accessible from any virtual system (vsys) on the device. By default, only the untrust-vr is a shared VR that is accessible by any vsys. You can configure other root-level VRs to be sharable.

- **Route Exporting**—(For the trust-vr only) You can enable or disable automatic route exporting to the untrust-vr for interfaces configured in Route mode.

- **Consider Active Routes**—You can direct the virtual router to consider active routes on inactive interfaces for redistribution or export. By default, only active routes defined on active interfaces can be redistributed to other protocols or exported to other virtual routers.

- **SNMP Private Traps**—You can specify the use of SNMP private traps for managing virtual router objects, including objects in the dynamic routing MIB. This option is only available for the default root-level virtual router.

- **Ignore Overlapping Subnets**—You can direct the virtual router to ignore overlapping subnet addresses for interfaces in the virtual router. By default, you cannot configure overlapping subnet IP addresses on interfaces in the same virtual router.

- **Next Hop**—(For the trust-vr only) You can direct the virtual router to use the untrust-vr as the next hop for the default route.
For instructions for configuring virtual router general properties, see the Network and Security Manager Online Help.

**Configuring Access Lists**

An access list is a sequential list of statements against which a route is compared. Each entry in the list specifies the IP address/netmask of a network prefix and the forwarding status (whether to permit or deny the route).

For example, an entry in an access list can permit routes for the 1.1.1.0/24 subnetwork, while another entry in the same access list can deny routes for the 2.2.2.0/24 subnetwork. If a route matches an entry in the access list, the specified forwarding status is applied. If the two entries are in an access list, a route to the host at 1.1.1.10 is permitted, while the route to the host at 2.2.2.10 is denied.

You can also use access lists to control the flow of multicast control traffic. You can create an access list to restrict the multicast groups that hosts can join or the sources from which multicast traffic is received. After you create an access list, you can include it in a multicast rule.

The sequence of entries in an access list is important. A route is first compared to the entry in the access list with the lowest sequence number and then to other entries in ascending sequence number until there is a match. If there is a match, all subsequent entries in the access list are ignored. Therefore, you should sequence the more specific entries before less specific entries. For example, place the entry that denies routes for the 1.1.1.1/30 subnetwork before the entry that permits routes for the 1.1.1.0/24 subnetwork.

For instructions for configuring virtual router access lists, see the Network and Security Manager Online Help.

In this example, you create an access list on the trust-vr:

1. In Device Manager, double-click a device icon to open the device configuration. In the device navigation tree, select Network > Virtual Routers.
2. Double-click the trust-vr virtual router. The General Properties screen appears.
3. In the virtual router navigation tree, select Access List, then click the Add icon in the main display area. The Access List Entries/New dialog box appears.
4. For Access List Number, enter 2. This number uniquely identifies the access list.
5. In the Access List Entries area, click the Add icon. The New Access List Entry dialog box appears. Configure the following:
   - For Sequence Number, enter 10. This number positions this statement relative to other statements in the access list.
   - For Action, select Permit.
   - For Prefix, select Prefix to Filter and enter the IP address/netmask 1.1.1.1/24.
6. Click OK to save the new access list.

7. Click OK to save your changes to the virtual router, then click OK again to save your changes to the device configuration.

**Configuring Route Maps**

A route map is a set of statements that the device applies in sequential order to a route. Each statement in the route map defines a condition that is compared to the route. A route is compared to each statement in a specified route map in order of increasing sequence number until there is a match, then the action specified by the statement is applied. If the route matches the condition in the route map statement, the route is either permitted or rejected.

A route map statement can also modify certain attributes of a matching route. There is an implicit deny at the end of every route map; that is, if a route does not match any entry in the route map, the route is rejected.

For each match condition, you specify whether a route that matches the condition is accepted (permitted) or rejected (denied). If a route matches a condition and is permitted, you can optionally set attribute values for the route. You can configure additional entries for the same route map, specifying a different sequence number for each entry.

**Configuring Route Map Match Conditions**

You can configure the following match conditions for a route map:

- **AS Path (BGP)**—Select the AS path Access List a route must match. For details, see “Configuring Access Lists” on page 240.
- **Community (BGP)**—Select the Community a route must match. For details, see “Configuring Access Lists” on page 240.
- **Metric**—Select the route metric a route must match.
- **Interface**—Select the interfaces a route must match.
- **Access List**—Select the access list a route must match. For details, see “Configuring Access Lists” on page 240.
- **Next-Hop**—Matches a specified Access List. For details, see “Configuring Access Lists” on page 240.
- **Route Type (OSPF)**—Select the route types (OSPF internal, external type 1, or external type 2) that a route must match.
- **Tag**—Select the route tag value a route must match.

**Configuring Permitted Route Attributes**

You can configure the following attributes for matching permitted routes:
AS Path (BGP)—Prepends a specified AS path access list to the path list attribute of the matching route.

Community (BGP)—Sets the community attribute of the matching route to the specified community list.

Next-Hop—Sets the next-hop of the matching route to the specified IP address.

Tag—Sets the tag of the matching route to the specified tag value or IP address.

Weight—Sets the weight of the matching route.

Metric Type (OSPF)—Sets the OSPF metric type of the matching route to either external type 1 or external type 2.

Local Preference (BGP)—Sets the local-pref attribute of the matching route to the specified value.

Preserve preference (ScreenOS 5.1 and higher only)—Preserves the preference value of the matching route that is exported into another virtual router.

Metric—Select one of the following to configure how the virtual router assigns a metric to permitted routes:

- Use Metric Specified By User as Imported/Exported Route Metric. When enabled, the VR assigns the specified metric value to all matching routes.
- Use the Source Route Metric as the Imported/Exported Route Metric. When enabled, the VR preserves the metric of a matching route that is imported or exported into another virtual router.
- Offset Metric (ScreenOS 5.1 and higher only)—When enabled, the VR increments the metric of the matching route by the specified number. Use this option to increase the metric on a less desirable path. For RIP routes, you can apply the increment to either routes advertised (route-map out) or routes learned (route-map in). For other routes, you can apply the increment to routes that are exported into another virtual router.

For instructions on configuring virtual router route maps, see the Network and Security Manager Online Help.

**Configuring Export and Import Rules**

When the security device has multiple virtual routers, you can enable one VR to learn specified routes in the another VR.

- Use an export rule on the source VR to export specific routes to the destination VR. When exporting routes, a virtual router permits other VRs to learn about its network.

- Use an import rule on the destination VR to import specific routes from the source VR. Import rules control which routes can be imported; if the destination VR does not contain any import rules, the destination VR accepts all exported routes, however, if you create an import rule, the destination VR accepts only the routes specified in the import rule.
Configuring an export or import rule is similar to configuring a redistribution rule. You configure a route map to specify which routes are to be exported/imported and the attributes of the routes.

You can also configure the trust-vr to automatically export all its route table entries to the untrust-vr, or configure a user-defined virtual router to automatically export routes to other virtual routers. However, this does not necessarily mean that the untrust-vr imports all the routes exported by the trust-vr. If you define import rules for the untrust-vr, only routes that match the import rules are imported.

For instructions on configuring virtual router export and import rules, see the Network and Security Manager Online Help.

In this example, you export OSPF routes for the 1.1.1.1/24 network in the trust-vr virtual router to the untrust-vr routing domain. You first create an access list for the network prefix 1.1.1.1/24, which is then used in the route map “rtmap1” to filter for matches of routes for the 1.1.1.1/24 network. You then create a route export rule to export matching OSPF routes from the trust-vr to the untrust-vr virtual router.

1. In Device Manager, double-click a device icon to open the device configuration. In the device navigation tree, select Network > Virtual Routers.
2. Double-click the trust-vr virtual router. The General Properties screen appears.
3. Configure the Access List:
   ■ In the virtual router navigation tree, select Access List, then click the Add icon in the main display area. The Access List Entries/New dialog box appears.
   ■ For Access List Number, enter 2.
4. In the Access List Entries area, click the Add icon. The New Access List Entry dialog box appears. Configure the following, then click OK:
   ■ For Sequence Number, enter 10.
   ■ For Action, select Permit.
   ■ For Prefix, select Prefix to Filter and enter the IP address/netmask 1.1.1.1/24.
5. Configure the Route Map:
   ■ In the virtual router navigation tree, select Route Map, then click the Add icon in the main display area. The New Route Map dialog box appears.
   ■ For Name, enter rtmap1.
   ■ In the Route Map Entry area, click the Add icon. The New Route-Map Entry dialog box appears.
6. Configure the following way:
   ■ For Sequence Number, enter 10.
   ■ For Action, select permit.
   ■ In the Match Properties area, in the Access List table, select 2.
   ■ Leave all other defaults and click OK to save the new route map entry.
7. Configure the Export Rule:
   ■ In the virtual router navigation tree, select Export Rules, then click the Add icon in the main display area. The New Export Rule dialog box appears.
   ■ Configure the following:
     ■ For Export to Virtual Router, select untrust-vr.
     ■ For Route Map, select rtmap1.
     ■ For Protocol, select OSPF.

8. Click OK to save the new export rule.
9. Click OK to save your changes to the virtual router, then click OK again to save your changes to the device configuration.

In this example, you configure the trust-vr to automatically export all routes to the untrust-vr. You also configure a route map on the untrust-vr to permit only internal OSPF routes.

1. In Device Manager, double-click a device icon to open the device configuration. In the device navigation tree, select Network > Virtual Routers.
2. Configure the export rule for the trust-vr:
   ■ Double-click the trust-vr virtual router. The General Properties screen appears.
   ■ In the main display area, select Auto-export route to untrust-vr.
   ■ Click OK to save your changes to the trust-vr.
3. Configure the route map for the untrust-vr.
   ■ Double-click the trust-vr virtual router. The General Properties screen appears.
   ■ In the virtual router navigation tree, select Route Map, then click the Add icon in the main display area.
   ■ For Name, enter from-ospf-trust.
4. In the Route Map Entry area, click the Add icon. The New Route-Map Entry dialog box appears. Configure as shown in [Unresolved xref].
   ■ For Sequence Number, enter 10.
   ■ For Action, select permit.
   ■ In the Match Properties area, in the Route Type table, select Internal OSPF.
5. Click OK to save the new route map entry, then click OK again to save the route map.
6. Click OK to save your changes to the virtual router, then click OK again to save your changes to the device configuration.
Configuring Routing Table Entries

Typically, routers are attached to multiple networks and are responsible for directing traffic across these networks. Each router maintains a routing table, which is a list of known networks and directions on how to reach them. While processing an incoming packet on a security device, the router performs a routing table lookup to find the appropriate interface that leads to the destination address.

Each entry in a routing table—called a route entry or route—is identified by the destination network to which traffic can be forwarded. The destination network, in the form of an IP address and netmask, can be an IP network, subnetwork, supernet, or a host. Routing table entries can originate from the following sources:

- Directly-connected networks (the destination network is the IP address that you assign to an interface in Route mode)
- Dynamic routing protocols, such as OSPF, BGP, or RIP
- Routes that are imported from other routers or virtual routers
- Statically-configured routes

You can configure three types of Static Routes: Destination-Based, Source-Based, and Source-Interface-Based routing. For each type of static route, you configure the following information:

**NOTE:** Source-interface-based routing is supported in ScreenOS 5.1 and higher.

- The interface on the security device on which traffic for the destination network is forwarded.
- The next-hop, which can be either another virtual router on the security device or a gateway IP address (usually a router address).
- The protocol from which the route is derived.
- Preference (ScreenOS 5.1 and higher only)—Controls the route to use when multiple routes to the same destination network exist. The lower the preference value of a route, the more likely the route is to be selected as the active route. By default, the preference value is automatically determined by the protocol or the origin of the route. You can modify a preference value from 1 to 255 for each protocol or route origin on a per-virtual router basis.
- Metric (ScreenOS 5.1 and higher only)—Controls the route used when multiple routes for the same destination network with the same preference value exist. The metric value for connected routes is always 0. The default metric value for static routes is 1, but you can specify a different value from 1 to 255 when defining a static route.
- Keep route active when interface is down (ScreenOS 5.1 and higher only)—Select this option to ensure that the route remains active even when the interface link status is down or the interface IP address is removed. By default, this option is disabled for all route entries. To enable this option for a Destination-Based route entry, you must configure the Next-Hop as a Gateway (not a Virtual Router).
- The virtual system (vsys) to which this route belongs.
NOTE: In the routing table, you must configure a default route (network address 0.0.0.0/0) for the security device. You should also configure a route from the device to the IP address of the Network and Security Manager Device Server.

For instructions for configuring virtual router static route entries, see the Network and Security Manager Online Help.

The following sections detail each static route type.

**Configuring Destination-Based Routes**

When a security device contains multiple virtual routers, the device does not automatically forward traffic between zones that reside in different VRs, even if the Security Policy permits that traffic. To enable traffic to pass from one virtual router to another, you can configure a static route in one virtual router that defines another VR as the next hop for the route. This route can even be the default route for the virtual router. For example, you can configure a default route for the trust-vr with the untrust-vr as the next hop. If the destination in an outbound packet does not match any other entries in the trust-vr routing table, it is forwarded to the untrust-vr.

To create a static route for a network destination, you must enter the IP address and netmask for the destination network, then select either Virtual Router or Gateway as the Next Hop:

- If the Next Hop is a Virtual Router, you must also select the VR that is to be the next hop for the route.
- If the Next Hop is a Gateway, you must also enter the interface through which the next hop router is accessed, the IP address of the next hop router, and the metric and tag for the route.

For devices running ScreenOS 5.2, you can also configure Gateway Tracking to manage the route. When enabled, Gateway Tracking deactivates a route when the gateway becomes unreachable. When the gateway become reachable again, Gateway Tracking reactivates the route. Gateway Tracking is supported only for destination-based route table entries.

For instructions for configuring virtual router destination-based route entries, see the Network and Security Manager Online Help.

**Configuring Source-Based Routing**

Some security devices also enable you to configure a route entry based on the source IP address of the data packet.
To create a static route for a network destination, you must enter the IP address and netmask for the destination network, then select the interface through which the next hop router is accessed. You must also enter the IP address of the next hop router and configure a metric for the route.

For instructions for configuring virtual router source-based route entries, see the Network and Security Manager Online Help.

In the following example, you want to forward traffic from the 10.1.1.0/24 subnetwork to ISP 1, and forward traffic from the 10.1.2.0/24 subnetwork to ISP 2. You must configure two entries in the default trust-vr virtual router routing table and enable source-based routing. The subnetwork 10.1.1.0/24, with ethernet1 as the forwarding interface, uses the ISP 1 router (1.1.1.1) as the next-hop; subnetwork 10.1.2.0/24, with ethernet2 as the forwarding interface, uses the ISP 2 router (2.2.2.2) as the next-hop.

1. Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Virtual Routers. Double-click the trust-vr virtual router. The General Properties screen appears.

2. In the router navigation tree, select Routing Table.

3. Select Enable Source-Based Routing.

4. Add the first routing entry:
   - In the Source-Based Routing Table area, click the Add icon. The New Source Routing Table dialog box appears.

5. Configure the following:
   - For IP Address, enter 10.1.1.0.
   - For Network Mask, enter 24.
   - For Interface, select ethernet1
   - For Gateway, enter the IP address 1.1.1.1
   - Click OK to save the new routing entry.

6. Add the second routing entry:
   - In the Source-Based Routing Table area, click the Add icon. The New Source Routing Table dialog box appears.

7. Configure the following:
   - For IP Address, enter 10.1.2.0.
   - For Network Mask, enter 24.
   - For Interface, select ethernet2
   - For Gateway, enter the IP address 2.2.2.2
   - Click OK to save the new routing entry.

8. Confirm that your routing table is similar to the one shown in Figure 5 on page 248.

9. Click OK to save your changes to the device.
Configuring Source-Interface-Based Routing

Some security devices also enable you to configure a route entry based on the source interface (the interface on which a data packet arrives). You can use source-based-interface routing (SIBR) to enable traffic from users on a specific subnet to be forwarded on one path while traffic from users on a different subnet is forwarded on another path.

NOTE: Source-interface-based routing is supported in ScreenOS 5.1 and higher.

SIBR can be used in conjunction with the source-based routing feature, which enables traffic to be forwarded based on the source IP address of a data packet. When a security device performs route lookup, the source-interface-based routing table is checked first. If the route is not found in the source-interface-based routing table and if source-based routing is enabled, the source-based routing table is checked. If the route is not found in the source-based routing table, the destination-based routing table is checked.

You define source-interface-based routes as static routes on a specific virtual router and source interface. Source-interface-based routes only apply to the virtual router in which you configure them. For example, you cannot specify another virtual router as the next-hop for a source-interface-based route. You also cannot redistribute source-interface-based routes into another virtual router or into a routing protocol.

When configuring SIBR, you must specify the name of the interface in the virtual router on which the packet arrives, then set the interface on which the packet is to be forwarded. This interface can belong to a zone in another virtual router, if that virtual router is sharable. (Sharable virtual routers are VRs that are accessible by any vsys on the device. The untrust-vr is, by default, a sharable virtual router, but you can configure other root-level VRs to be sharable). Next, enter the IP address of the next hop router in Gateway. If you have already specified a default gateway for the interface, you do not need to specify this parameter; the interface’s default gateway is used for the source-interface-based route.

You can also configure a metric for the route, if desired. By default, the metric for all SIBR entries is 1. If there are multiple source-interface-based routes with the same prefix, only the route with the best (lowest) metric is used for route lookup and other routes with the same prefix are marked as “inactive”.

For instructions for configuring virtual router source interface-based route entries, see the Network and Security Manager Online Help.

In the following example, you want to forward traffic from the 10.1.1.0/24 subnetwork to ISP 1, and forward traffic from the 10.1.2.0/24 subnetwork to ISP 2. You must configure two entries in the default trust-vr virtual router routing table and enable source-based routing. The subnetwork 10.1.1.0/24, with ethernet2/1 as the source interface and ethernet2/3 as the forwarding interface, uses the ISP 1 router (1.1.1.1) as the next-hop; subnetwork 10.1.2.0/24, with ethernet2/2 as the source interface and ethernet2/4 as the forwarding interface, uses the ISP 2 router (2.2.2.2) as the next-hop.
1. Add a NetScreen-5400 device running ScreenOS 5.x, then configure the network module:
   - Double-click the device icon to open the device configuration. In the device navigation tree, select Network > Slot.
   - Double-click slot 2 to display the slot configuration dialog box. For Card Type, select 5000-8G SPM.
   - Click OK to save the slot configuration, then click Apply to apply the new interfaces to the device.

2. Configure the ethernet 2/1 and ethernet 2/3 interfaces:
   - In the device navigation tree, select Network > Interface.

3. Double-click the ethernet2/1 interface. The General Properties screen appears. Configure as follows:
   - For Zone, select Trust.
   - For IP address and Netmask, enter 10.1.1.0/24.
   - Click OK to save your changes to the interface.

4. Double-click the ethernet2/3 interface. The General Properties screen appears. Configure as follows:
   - For Zone, select Trust.
   - For IP address and Netmask, enter 10.1.2.0/24.
   - Click OK to save your changes to the interface.

5. In the device navigation tree, select Network > Virtual Routers. Double-click the trust-vr virtual router. The General Properties screen appears. In the router navigation tree, select Routing Table.

6. Select Enable Source-Based Routing.

7. Configure the first entry:
   - In the Source-Interface-Based Routing Table area, click the Add icon.

8. Configure the following:
   - For Incoming Interface, select ethernet2/1.
   - For IP Address and Netmask, enter 10.1.1.0/24
   - For Interface, enter ethernet2/3.
   - For Gateway IP Address, enter 1.1.1.1
   - Click OK to save the SIBR entry.

9. Configure the second entry:
   - In the Source-Interface-Based Routing Table area, click the Add icon.

10. Configure the following:
- For Incoming Interface, select ethernet2/3.
- For IP Address and Netmask, enter 10.1.2.0/24
- For Interface, enter ethernet2/4.
- For Gateway IP Address, enter 2.2.2.2
- Click OK to save the SIBR entry.

11. Click OK to save your changes to the virtual router, then click OK to save your changes to the device.

**Configuring Route Preferences**

A route preference is a weight added to the route that influences the determination of the best path for traffic to reach its destination. When importing or adding a route to the routing table, the virtual router adds a preference value—determined by the protocol by which the route is learned—to the route. A low preference value (a number closer to 0) is preferable to a high preference value (a number further from 0). In a virtual router, you can set the preference value for routes according to protocol.

To change the preference value for a protocol, enter a new value for the protocol in the Route Preferences configuration screen.

**Configuring Dynamic Routing**

This section describes the basic steps in configuring the following dynamic routing protocols:

- “Configuring Open Shortest Path First (OSPF)” on page 250
- “Configuring Routing Information Protocol (RIP)” on page 257
- “Configuring Border Gateway Protocol (BGP)” on page 262

**Configuring Open Shortest Path First (OSPF)**

The Open Shortest Path First (OSPF) routing protocol operates within a single Autonomous System (AS). A router running OSPF distributes its state information (such as usable interfaces and neighbor reachability) by periodically flooding link-state advertisements (LSAs) throughout the AS.

Each OSPF router uses LSAs from neighboring routers to maintain a link-state database, a listing of topology and state information for the surrounding networks. The constant distribution of LSAs throughout the routing domain enables all routers in an AS to maintain identical link-state databases. OSPF uses the link-state database to determine the best path to any network within the AS by generating a shortest-path tree (a graphical representation of the shortest path to any network within the AS). While all routers have the same link state database, they all have unique shortest-path trees because a router always generates the tree with itself at the top of the tree.
To enable OSPF on a security device, you must first enable OSPF on a virtual router, then enable OSPF on individual interfaces. You can also configure optional OSPF settings, such as the following:

- Global settings, such as virtual links, that are set at the VR level for the OSPF protocol.
- Interface settings, such as authentication, that are set on a per-interface basis for the OSPF protocol. When you configure an OSPF parameter at the interface level, the parameter setting affects the OSPF operation only on the specific interface.

Additionally, you can set security-related OSPF settings at either the VR level or on a per-interface basis. The following sections detail how to enable OSPF and configure all optional parameters.

**Enabling OSPF**

To enable OSPF on a security device, you must first create an OSPF instance on a virtual router, then enable OSPF on individual interfaces.

To create an OSPF instance in a virtual router:

1. In the device navigation tree, select **Network > Virtual Router** and double-click the virtual router for which you want to configure OSPF.
2. In the router navigation tree, select **Dynamic Routing Protocol**, then select **Configured OSPF Instance**. The OSPF settings appear in the router navigation tree.
3. Select **OSPF > Parameters**, then select **Enable OSPF**. If desired, configure additional global and security settings, as detailed in “Configuring Global OSPF Settings” on page 251.
4. Click **OK** to save your changes to the virtual router.

To enable OSPF on an interface:

1. In the device navigation tree, select **Network > Interface** and double-click the interface for which you want to configure OSPF.
2. In the interface navigation tree, select **Protocol** and select the OSPF tab.
3. Select **Enable OSPF**. If desired, configure additional interface and security settings, as detailed in “Configuring OSPF Interface Parameters” on page 254.
4. Click **OK** to save your changes to the interface.

**Configuring Global OSPF Settings**

A global OSPF setting affects operations on all OSPF-enabled interfaces. You configure global settings in the virtual router.

For instructions on configuring OSPF settings on the virtual router and on the interface, see the *Network and Security Manager Online Help*. 
Configuring OSPF Parameters

You can configure the following parameters for an OSPF instance:

- Automatically Generate Virtual Links—Select this option to direct the VR to automatically create a virtual link for instances when it cannot reach the network backbone. By default, this option is disabled.

- Reject Default Route—Select this option to prevent Route Detour Attacks, in which a router injects a default route (0.0.0.0/0) into the routing domain in order to detour packets to itself. During a router detour, a compromised router can then either drop the packets, causing service disruption, or it can obtain sensitive information in the packets before forwarding them. By default, this option is disabled, meaning OSPF accepts any default routes that are learned in OSPF and adds the default route to the routing table.

- RFC 1583 Compatible—Select this option to make the OSPF routing instance compatible with RFC 1583, an earlier version of OSPF. By default, security devices support OSPF version 2, as defined by RFC 2328.

- Prevent Hello Packet Flooding Attack—Configure the Maximum Hello Packets threshold accepted by the VR. By default, the OSPF hello packet threshold is 10 packets per hello interval. You might want to use this setting to prevent a malfunctioning or compromised router from flooding its neighbors with OSPF hello packets.

- Prevent LSA Flooding Attack—Configure the number of LSAs accepted by the VR. By default, the VR accepts all LSAs. You might want to use this setting to prevent a malfunctioning or compromised router from flooding its neighbors with OSPF LSA packets. During an LSA flood attack, a router generates an excessive number of LSAs in a short period of time, thus keeping other OSPF routers in the network busy running the SPF algorithm.

- Advertising Default Route—Select this option to direct the VR to advertise an active default route (0.0.0.0/0) in the VR route table to all OSPF areas.

Configuring OSPF Areas

By default, all routers are grouped into a single “backbone” area called area 0 (usually denoted as area 0.0.0.0). However, you might want to segment large geographically dispersed networks into multiple areas for better scalability.

Using multiple areas reduces the amount of routing information passed throughout the network because a router only maintains a link-state database for the area in which it resides. The VR maintains link-state information for all connected areas, and does not maintain link-state information for networks or routers outside the area.

AS external advertisements describe routes to destinations in other autonomous systems and are flooded throughout an AS. To prevent AS external advertisements from flooding an AS, configure the OSPF area as a stub area:

- Stub area—An area that receives route summaries from the backbone area but does not receive link-state advertisements from other areas for routes learned through non-OSPF sources (BGP, for example). A stub area can be considered a totally stubby area if no summary routes are allowed in the stub area.
Not So Stubby Area (NSSA)—Like a normal stub area, NSSAs cannot receive routes from non-OSPF sources outside the current area. However, external routes learned within the area can be learned and passed to other areas.

All areas must connect to area 0, which is defined by default on the virtual router when you enable the OSPF routing instance on the virtual router. For areas that cannot be physically connected to the backbone area, you must configure a virtual link to provide the remote area with a logical path to the backbone through another area. For details on virtual links, see “Configuring OSPF Virtual Links” on page 253.

**Configuring OSPF Summary Import**

In large internetworks where hundreds or even thousands of network addresses can exist, routers can become overly congested with route information. After you have redistributed a series of routes from an external protocol to the current OSPF routing instance, you can bundle the routes into one generalized or summarized network route. By summarizing multiple addresses, you enable a series of routes to be recognized as one route, simplifying the process.

Using route summarization in a large, complex network can isolate topology changes from other routers. An intermittently failing link in a domain does not affect the summary route, so no router external to the domain needs to modify its routing table due to the link failure. Route summarization also prevents LSAs from propagating to other areas when a summarized network goes down or comes up.

You can summarize inter-area routes or external routes.

**Configuring OSPF Redistribution Rules**

Use route redistribution to exchange of route information between routing protocols. You can redistribute the following types of routes into the OSPF routing instance in the same VR:

- Routes learned from BGP
- Directly connected routes
- Imported routes
- Statically configured routes

When you configure route redistribution, you must first specify a route map to filter the routes that are redistributed.

**Configuring OSPF Virtual Links**

All areas must connect to area 0, which is the backbone. Area 0 is defined by default on the virtual router when you enable the OSPF routing instance on the virtual router. For areas that cannot be physically connected to the backbone area, you must configure a virtual link to provide the remote area with a logical path to the backbone through another area.

To enable a virtual link, the virtual link must exist on routers at both ends of the link. Specifically, you must configure:
- **Area ID**—The ID of the OSPF area through which the virtual link passes. You cannot create a virtual link that passes through the backbone area or a stub area.
- **Router ID**—The ID of the router at the other end of the virtual link.

### Configuring OSPF Interface Parameters

By default, OSPF is disabled on all interfaces in the VR. You must enable OSPF on an interface before OSPF can use that interface to transmit receive packets. When you disable OSPF on an interface, OSPF does not transmit or receive packets on the specified interface, but interface configuration parameters are preserved.

For instructions for configuring OSPF settings on the virtual router and on the interface, see the *Network and Security Manager Online Help*.

You can enable OSPF on ethernet and tunnel interfaces. When configuring OSPF on a tunnel interface, you can configure additional parameters to keep OSPF tunnel traffic to a minimum.

You can configure the following OSPF interface parameters:

- **Bind to Area**—Select a previously-created area to bind the interface to that area. By default, all interfaces are bound to area 0, the backbone area.
- **Cost**—Configure the metric for the interface. The cost associated with an interface depends upon the bandwidth of the link to which the interface is connected. The higher the bandwidth, the lower (more desirable) the cost value.
- **Hello Interval**—Configure the number of seconds that the interface sends out OSPF hello packets to the network. By default, the interface sends 10 hello packets per second.
- **OSPF Priority**—Configure the priority level of the VR elected by the interface. The router (Designated Router or Backup Designated Router) with the larger priority value has the best chance (although not guaranteed) chance of being elected.
- **Retransmit Interval**—Configure the number of seconds that elapse before the interface resends an LSA to a neighbor that did not respond to the original LSA. By default, the interface resends an unacknowledged LSA every 5 seconds.
- **Transmit Delay**—Configure the number of seconds between transmissions of link-state update packets sent on the interface. By default, the interface sends link-state updates every second.
- **Configuring Interface Link Type**—Configure how the interface forms adjacencies with other routers:
  - **A Point-to-Point interface for OSPF forms an adjacency with only one OSPF router in the area. If the local tunnel interface is to be bound to multiple tunnels, you must configure the local tunnel interface as a point-to-multipoint interface.**
  - **A Regular Multicast Interface for OSPF acts as a broadcast interface, and forms adjacencies with all routers in the area.**
Enable Reduction in LSA Flooding (ScreenOS 5.1 and higher only)—Select to suppress LSA packets. When this option is enabled, the device sends LSA packets only when the LSA content has changed. By default, this option is disabled.

Configure to Ignore MTU Mismatch in DB Exchange (ScreenOS 5.1 and higher only)—Select to ignore any mismatches in maximum transmission unit (MTU) values between the local and remote interfaces that are found during OSPF database negotiations. Use this option only when the MTU on the local interface is lower than the MTU on the remote interface.

Interface OSPF Passive Mode—Select to prevent the interface from transmitting or receiving packets. The IP address of the interface is still advertised on the OSPF domain as an OSPF route and not as an external route. You might want to select this option when BGP is also enabled on the interface.

You can configure the following additional OSPF parameter for tunnel interfaces:

Configuring Demand Circuit (ScreenOS 5.1 and higher Tunnel Interfaces only)—Configure the tunnel interface as an OSPF demand circuit (a network segment on which connect time or usage affects the cost of using such connection). When traversing a demand circuit, the security device limits routing protocol traffic to changes in network topology, and suppresses sending OSPF hello packets and periodic refreshment of LSA flooding. To configure an interface as a demand circuit:

- The Interface Link Type must be point-to-point or serial; you cannot configure a point-to-multipoint interface as a demand circuit.
- You must configure both ends of the tunnel as demand circuits.

**Configuring OSPF Neighbors**

Two routers with interfaces on the same subnet are considered neighbors. Routers use the hello protocol to establish and maintain these neighbor relationships. When two routers establish bidirectional communication, they are said to have established an adjacency. If two routers do not establish an adjacency, they cannot exchange routing information. By default, the OSPF routing instance on the virtual router forms adjacencies with all OSPF neighbors communicating on an OSPF-enabled interface.

You can configure the following settings for Neighbors on the interface:

- Neighbor Dead Interface—Enter the number of seconds that elapses with no response from an OSPF neighbor before OSPF determines the neighbor is not running. By default, OSPF determines a neighbor is “dead” after 40 seconds.
- Add/Edit/Delete Neighbor (Ethernet Interface Only)—To limit the devices on an interface that can form adjacencies with the OSPF routing instance, define the subnets that contain eligible OSPF neighbors. Only hosts or routers that reside in the specified subnets can form adjacencies with the OSPF routing instance.

**NOTE:** All OSPF routers in an area must use the same hello, dead, and retransmit interval values before they can form adjacencies.
**Configuring OSPF Authentication**

Because LSAs are unencrypted, most protocol analyzers can decapsulate OSPF packets. Authenticating OSPF neighbors using MD5 authentication or simple password is the best way to fend off these types of attacks.

When authentication is enabled, the device discards all unauthenticated OSPF packets received on the interface. By default, authentication is disabled.

To enable authentication, select one of the following authentication methods:

- **Clear Text Authentication**—To use a simple password for authentication, select this option and enter the password.

  **NOTE:** All passwords handled by NSM are case-sensitive.

- **Multiple MD5 Authentication**—To use MD5 keys for authentication, select this option, then configure the active MD5 key.
  - To use an existing MD5 key, select the key ID as the Active MD5 Key ID.
  - To add a new MD5 key, click the Add icon and configure a Key ID for the new MD5 key.

  **NOTE:** You must use the same MD5 key for the sending and receiving OSPF routers.

To configure OSPF:

1. In the navigation tree, select **Device Manager > Devices**. Double-click the device object to open the device configuration.

2. In the device navigation tree, select **Network > Virtual Router** to display the list of configured virtual routers. Double-click the virtual router in which you are configuring an OSPF routing instance. The Virtual Router configuration screen appears.

3. In the virtual router navigation tree, select **Dynamic Routing Protocol** and enable **Configured OSPF Instance**. OSPF configuration options now appear in the virtual router navigation tree under Dynamic Routing Protocol.

4. In the virtual router navigation tree, select **OSPF > Parameters** to display the Parameters screen. Select **OSPF**, then click **OK** to close the Parameters screen.

5. To define a new non-backbone OSPF area, select **OSPF > Area**. The Area configuration screen appears. In this screen, do the following:

6. Click the Add icon.
7. Enter the Area ID.
8. Select the interfaces that are to be included in this OSPF area.
9. Select the Type.
10. Click **OK** to close the Area configuration screen.
11. In the device navigation tree, select **Interface** to display the list of interfaces. Double-click the interface that is connected to OSPF peers to open the interface screen.

12. In the interface navigation tree, select **Protocol** to display the Protocol screen, then click the OSPF tab and configure the following:

13. Select the ID of the OSPF area to which the interface is bound.

14. Select **OSPF**.

15. Click **OK**.

**Configuring Routing Information Protocol (RIP)**

Routing Information Protocol (RIP) is a distance vector protocol used in moderate-sized autonomous systems (AS). Security devices support RIPv1 and RIPv2 (as defined by RFC 2453) and additional MD5 authentication extensions (as defined by RFC 2082).

Use RIP for dynamic routing on moderate-sized networks and to manage route information within a small, homogeneous, network such as a corporate LAN. The longest path allowed in a RIP network is 15 hops; a metric value of 16 indicates an invalid or unreachable destination. RIP supports both point-to-point networks (used with VPNs) and broadcast/multicast Ethernet networks. RIP does not support point-to-multipoint interfaces.

RIP maintains its own database of routes, including RIP protocol routes and redistributed routes. This database contains one entry for every destination that is reachable through the RIP routing instance. RIP adds the best routes to the VR routing table based on the virtual router’s ECMP limit (configured in the General Properties area of the virtual router) and the Alternate Route limit (configured in the virtual router’s RIP parameters). RIP sends out messages that contain the complete routing table to every neighboring router every 30 seconds. These messages are normally sent as multicasts to address 224.0.0.9 from the RIP port.

To enable RIP on a security device, you must first enable RIP on a virtual router, then enable RIP on individual interfaces. You can also configure optional RIP settings, such as the following:

- Global settings, such as timers and trusted RIP neighbors, that are set at the VR level for the RIP protocol.
- Interface settings, such as authentication, that are set on a per-interface basis for the RIP protocol. When you configure a RIP parameter at the interface level, the parameter setting affects the RIP operation only on the specific interface.

Additionally, you can set security-related RIP settings at either the VR level or on a per-interface basis. The following sections detail how to enable RIP and configure all optional parameters.

**Enabling RIP**

To enable RIP on a security device, you must first create a RIP instance on a virtual router, then enable RIP on individual interfaces.
To create a RIP instance on a virtual router:

1. In the device navigation tree, select **Network > Virtual Router** and double-click the virtual router for which you want to configure RIP.
2. In the router navigation tree, select **Dynamic Routing Protocol** and enable **Configured RIP Instance**. The RIP settings appear in the router navigation tree.
3. Select RIP > Parameters, then select **Enable RIP**. If desired, configure additional global and security settings, as detailed in “Configuring Global RIP Settings” on page 258.
4. Click **OK** to save your changes to the virtual router.

To enable RIP on an interface:

1. In the device navigation tree, select **Network > Interface** and double-click the interface for which you want to configure RIP.
2. In the interface navigation tree, select **Protocol** and select the RIP tab.
3. Select **Enable RIP**. If desired, configure additional interface and security settings, as detailed in “Configuring RIP Interface Parameters” on page 260.
4. Click **OK** to save your changes to the interface.

**Configuring Global RIP Settings**

A global RIP setting affects operations on all RIP-enabled interfaces. You configure global settings in the virtual router.

For instructions for configuring RIP settings on the virtual router and on the interface, see the *Network and Security Manager Online Help*.

**Configuring RIP Parameters**

You can configure the following parameters for an RIP instance:

- **RIP Version (ScreenOS 5.1 and higher only)**—Select the version of RIP you want to use for this virtual router. When you configure RIP on the individual interfaces, you can override this setting.

- **Reject Default Route**—Select this option to prevent Route Detour Attacks, in which a router injects a default route (0.0.0.0/0) into the routing domain to detour packets to itself. During a route detour attack, a compromised router can drop the packets, causing service disruption, or can obtain sensitive information in the packets before forwarding them. By default, this option is disabled, meaning RIP accepts any default routes that are learned in RIP and adds the default route to the routing table.

- **Ignore Same Subnet Checking**—Select this option to allow RIP neighbors on different subnets.

- **Advertising Default Route**—Select this option to direct the VR to advertise an active default route (0.0.0.0/0) in the VR route table to all RIP areas.
Default Metric—Configure the default metric for routes that RIP imports from other protocols, such as OSPF and BGP. By default, RIP assigns a metric of 10 to all imported routes.

Number of Alternate Routes for Prefix Allowed (ScreenOS 5.1 and higher only)—Configure the maximum number of RIP routes for the same prefix that RIP can add to the RIP route database. By default, RIP does not allow alternate routes.

Hold Down Time for Routes (ScreenOS 5.1 and higher only)—Configure the number of seconds that RIP waits before updating the routing table. Use this option to prevent route flapping when handling high metric routes. By default, RIP waits 120 seconds between routing table updates. When configuring this option:

- Ensure that the value is at least three times the value of the Update Timer.
- Ensure that the value does not exceed the sum of the Update Timer value plus the Flush Timer value.

For example, if the Update Timer is 60 and the Flush Timer is 180, you can set the hold down time value between 181 and 239.

Retransmit Interval for Demand Circuits (ScreenOS 5.1 and higher only)—Configure the number of seconds that elapse before RIP resends the RIP routing table to a demand circuit neighbor that did not respond. You can also configure the number of times RIP attempts to retransmit the routing table. By default, RIP resends every 5 seconds.

Poll Interval for Demand Circuits (ScreenOS 5.1 and higher only)—Configure the number of seconds between demand circuit checks. By default, RIP sends a request through the demand circuit every three minutes to verify that the tunnel interface is up. You can also configure the number of times a demand circuit must fail to respond before RIP considers the circuit down. By default, RIP never considers an unresponsive circuit down (Number of Retries is 0).

Timers—Configure the following timers:

- Update Timer. Configure the number of seconds that the virtual router sends RIP route database updates to neighbors.
- Invalid Timer. Configure the number of seconds after a neighbor stops advertising a route that RIP considers the route invalid. By default, RIP considers a route invalid 180 seconds after a neighbor stops advertising it.
- Flush Timer. Configure the number of seconds an invalid route remains in the RIP route database. By default, RIP removes a route that has been invalid for 120 seconds.

Maximum Route Update Packets—Configure the maximum number of packets that the VR can receive per RIP update.

Maximum Neighbors Allowed on One Interface—Configure the maximum number of RIP neighbors allowed on a single interface. By default, RIP allows up to 16 neighbors for the same interface.
■ Access List for Filtering Trusted Neighbors—Configure the Access List that defines trusted RIP neighbors. If you do not select an access list, RIP uses multicasting or broadcasting to detect neighbors on a RIP-enabled interface.

■ Route Maps—To control which routes RIP learns and advertises, configure the following:
  ■ The Inbound Route Map defines the routes that RIP learns.
  ■ The Outbound Route Map defined the routes that RIP advertises.

**Configuring RIP Redistribution Rules**

Use route redistribution to exchange of route information between routing protocols. You can redistribute the following types of routes into the RIP routing instance in the same VR:

■ Routes learned from BGP
■ Routes learned from OSPF
■ Directly connected routes
■ Imported routes
■ Statically configured routes

When you configure route redistribution, you must first specify a route map to filter the routes that are redistributed.

**Configuring RIP Summary Import (ScreenOS 5.1 and higher only)**

In large internetworks where hundreds or even thousands of network addresses can exist, routers can become overly congested with route information. After you have redistributed a series of routes from an external protocol to the current RIP routing instance, you can bundle the routes into one generalized or summarized network route. By summarizing multiple addresses, you enable a series of routes to be recognized as one route, simplifying the process.

Using route summarization in a large, complex network can isolate topology changes from other routers. An intermittently failing link in a domain does not affect the summary route, so no router external to the domain needs to modify its routing table due to the link failure.

You can summarize inter-area routes or external routes.

**Configuring RIP Interface Parameters**

By default, RIP is disabled on all interfaces in the VR. You must enable RIP on an interface before RIP can use that interface to transmit or receive packets. When you disable RIP on an interface, RIP does not transmit or receive packets on the specified interface, but interface configuration parameters are preserved.

For instructions for configuring RIP settings on the virtual router and on the interface, see the *Network and Security Manager Online Help*. 

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260  Configuring Dynamic Routing
You can enable RIP on ethernet and tunnel interfaces. When configuring RIP on a tunnel interface, you can configure additional parameters to keep RIP tunnel traffic to a minimum.

You can configure the following RIP interface parameters:

- **Bind Interface to RIP**—Select to bind this interface to RIP.
- **Run Demand Circuit** (ScreenOS 5.1 and higher tunnel interface only)—Configure the tunnel interface as a RIP demand circuit (a network segment on which connect time or usage affects the cost of using such connection). When traversing a demand circuit, the security device limits routing protocol traffic to changes in network topology, and suppresses sending RIP packets. To complete the demand circuit, you must configure both ends of the tunnel as demand circuits.
- **Enable Summarization** (ScreenOS 5.1 and higher only)—Select to enable route summarization on this interface. By default, the interface does not allow route summarization.
- **Add/Edit/Delete RIP Neighbor** (ScreenOS 5.1 and higher only)—You can define the static RIP neighbors for the interface.
- **RIP Versions** (ScreenOS 5.1 and higher only)—Select the version of RIP you want this interface to use for sending and receiving RIP information. By default, the interface uses the RIP version configured for the virtual router (Vrouter RIP Instance Version); if you select a different version, it overrides the virtual router setting.
- **Metric**—Configure the metric used for RIP routes from this interface.
- **Passive Mode**—Select to prevent the interface from transmitting packets (the interface can still receive packets). RIP advertises the IP address of the interface as a RIP route and not as an external route. By default, passive mode is disabled; however, you might want to select this option when BGP is also enabled on the interface.
- **Route Maps**—To control which routes RIP learns and advertises, select a previously-created Route Map for each of the following:
  - The Incoming Route Map Filter defines the routes that RIP learns.
  - The Outgoing Route Map Filter defines the routes that RIP advertises.
  These settings override the route maps configured on the virtual router.
- **Split Horizon**—Select Split-Horizon to prevent the interface from advertising learned routes in RIP updates sent to the same interface. When enabled, you can also select the Poison Reverse option, which instructs the interface to advertise learned routes with a metric of 16 when sending updates to the same interface. By default, split horizon is disabled.

**Configuring RIP Authentication**

Because RIP packets are unencrypted, most protocol analyzers can decapsulate them. Authenticating RIP neighbors using MD5 authentication or simple password is the best way to fend off these types of attacks. When authentication is enabled, the device discards all unauthenticated RIP packets received on the interface. By default, authentication is disabled.
To enable authentication, select one of the following authentication methods:

- **Clear Text Authentication**—To use a simple password for authentication, select this option and enter the password.

  **NOTE:** All passwords handled by NSM are case-sensitive.

- **Multiple MD5 Authentication**—To use MD5 keys for authentication, select this option, then configure the active MD5 key.
  - To use an existing MD5 key, select the key ID as the Active MD5 Key ID.
  - To add a new MD5 key, click the Add icon and configure a Key ID for the new MD5 key.

  **NOTE:** You must use the same MD5 key for the sending and receiving RIP routers.

### Configuring Border Gateway Protocol (BGP)

Border Gateway Protocol (BGP) is a path-vector protocol that is used to carry routing information between autonomous systems (ASs). To configure BGP, you must create and enable the BGP routing instance in a virtual router by assigning an autonomous system number to the BGP instance, then enabling the instance. After you enable and configure the BGP peer, you can then enable BGP on the interface that is connected to the peer.

Before two BGP devices can communicate and exchange routes, they need to identify each other so they can start a BGP session. You need to specify the IP addresses of the BGP peers and, optionally, configure parameters for establishing and maintaining the session. Peers can be either internal (IBGP) or external (EBGP) peers. For an EBGP peer, you need to specify the autonomous system in which the peer resides.

All BGP sessions are authenticated by checking the BGP peer identifier and the AS number advertised by the peers. A successful connection with a peer is logged. If anything goes wrong with the peer connection, a BGP notification message is sent to or received from the peer, which causes the connection to fail or close.

For instructions for configuring BGP settings on the virtual router and on the interface, see the *Network and Security Manager Online Help*.

### Route-Refresh Capability

NSM supports BGP route-refresh. This feature provides a soft reset mechanism that allows the dynamic exchange of route refresh requests and routing information between BGP peers and the subsequent re-advertisement of the outbound or inbound routing table.

Routing policies for a BGP peer using route-maps might impact inbound or outbound routing table updates because whenever a route policy change occurs, the new policy
A soft reset allows the application of a new or changed policy without clearing an active BGP session. The route-refresh feature allows a soft reset to occur on a per-neighbor basis and does not require preconfiguration or extra memory.

A dynamic inbound soft reset is used to generate inbound updates from a neighbor. An outbound soft reset is used to send a new set of updates to a neighbor. Outbound resets don’t require preconfiguration or routing table update storage.

The route refresh feature requires that both BGP peers advertise route-refresh feature support in the OPEN message. If the route-refresh method is successfully negotiated, either BGP peer can use the route-refresh feature to request full routing information from the other end.

For more detailed information about zones on security devices, see the “Routing” volume in the Concepts & Examples ScreenOS Reference Guide.

Configuring BGP Networks

Use the BGP Network settings to change the route attributes generated by BGP. For each route you want to change, create a new Network entry that contains the IP address and netmask for the network reachable from the BGP routing instance. Next, configure the new route attributes for that network:

- **Check Route Availability**—Configure how BGP determines route availability for this route:
  - **Turn Off Reachability Check.** When enabled, the BGP routing instance does not test whether it can reach the specified network.
  - **Check for Same Route.** When enabled, the BGP routing instance checks the prefix entered after the network for reachability; if reachable, the BGP routing instance adds the network.
  - **Check Route Reachability.** Select to direct the BGP routing instance to perform a test to determine whether it can reach the network you identified.

- **Configure Route Attributes (ScreenOS 5.1 and higher only)**—Configure how BGP determines the route attributes for the specified route:
  - **Weight.** Select **Weight** to assign a local preference value to the route that is not advertised to peers. If BGP uses more than one route to a destination, the route with the highest weight value is preferred.
  - **Route Map.** Select a previously-created route map to apply attributes for this route. BGP advertises the route with the route attributes specified in the selected route map.
Configuring Aggregate Addresses

As the number of BGP router addresses grows, each route in the AS requires more memory and CPU time to process addresses from the routing table. Using aggregation, BGP can reduce the size of a routing table by summarizing a range of addresses into a single route entry. Each address range included in the aggregate address is considered a contributing route within the aggregate address.

For each aggregate address you want to use, create a new Aggregate Address entry that contains the aggregate address IP and netmask. Next, configure the route attributes for the address:

- **AS Set**—When enabled, BGP generates AS set-path information for the aggregated route and all contributing routes.
- **Summary Only**—When enabled, BGP advertises the aggregate route in place of individual addresses for more specific contributing routes. If you select this option, you cannot configure a Suppress Route Map entry for this aggregate route.
- **Route Maps (ScreenOS 5.1 and higher only)**—Configure a previously-created route map for each of the following:
  - **Advertise Route Map**—Select the previously-created route map that defines the path attributes for the aggregate route.
  - **Attribute Route Map**—Select the previously-created route map that defines the route attributes for the aggregate route.
  - **Suppress Route Map**—Select the previously-created route map that you want BGP to suppress for the aggregate route. If you select this option, you cannot enable Summary Only for this aggregate route.

Configuring Neighbors and Peer Groups

Use the Neighbor settings to configure individual peer addresses, called neighbors. You can also assign neighbors to a peer-group to configure parameters for the peer-group as a whole (you cannot assign IBGP and EBGP peers to the same peer-group).

Configuring a BGP Routing Instance

To configure BGP:

1. In the navigation tree, select Device Manager > Devices. Double-click the device object to open the device configuration.
2. In the device navigation tree, select Network > Virtual Router to display the list of configured virtual routers. Double-click the virtual router in which you are configuring a BGP routing instance. The Virtual Router configuration screen appears.
4. In the virtual router navigation tree, select BGP > Parameters to display the Parameters screen. Configure the following:
   ■ Select BGP.
   ■ Enter an AS Number.
5. In the virtual router navigation tree, select BGP > Neighbors to display the Neighbors screen. Click the Add icon to display the New Neighbor screen. Configure the following:
   ■ Select Peer Enabled.
   ■ Enter the BGP peer information.
6. Click OK to save the new neighbor.
7. Click OK to save your changes to the virtual router.
8. In the device navigation tree, select Interface to display the list of interfaces. Double-click the interface that is connected to the BGP peer to open the interface screen.
9. In the interface navigation tree, select Protocol to display the Protocol screen, then click the BGP tab and enable BGP.
10. Click OK.

**Configuring Multicast Routing**

Multicast routing environments require the following items:

■ A mechanism between hosts and routers to communicate group membership information. Security devices support the Internet Group Management Protocol (IGMP) versions 1, 2, and 3.
■ A multicast routing protocol to populate the multicast route table and forward multicast traffic to hosts throughout the network. Security devices support the Protocol Independent Multicast-Sparse-Mode (PIM-SM) protocol. Alternatively, you can use IGMP Proxy to transmit multicast information between routers without the CPU overhead of a multicast routing protocol.

**NOTE:** Multicast routing is only supported in ScreenOS 5.1 and higher.

This section describes the basic steps to configure the following multicast protocols:

■ “Configuring IGMP” on page 266
■ “Configuring IGMP Proxy” on page 267
■ “Configuring PIM-SM” on page 267
NOTE: The NSM UI displays the multicast parameters and multicast static routes that you configure. It does not display dynamic information about multicast protocols at the device level. (For example, whether or not an interface is a querier in IGMP.) For this information, you must issue the appropriate CLI “get” commands from the device.

Configuring IGMP

On security devices, you must explicitly enable IGMP in router mode on the interfaces that are connected to hosts. Security devices support the following Internet Group Management Protocol (IGMP) versions:

- IGMPv1, as defined in RFC 1112, Host Extensions for IP Multicasting, defines the basic operations for multicast group memberships.
- IGMPv2, as defined in RFC 2236, Internet Group Management Protocol, Version 2, expands on the functionality of IGMPv1.
- IGMPv3, as defined in RFC 3376, Internet Group Management Protocol, Version 3, adds support for source filtering. Hosts running IGMPv3 indicate which multicast groups they want to join and the sources from which they expect to receive multicast traffic. IGMPv3 is required when you run Protocol Independent Multicast in Source-Specific Multicast (PIM-SSM) mode.

To enable IGMP in router mode:
1. In the device navigation tree, select Network > Interface.
2. Double-click the interface on which you are enabling IGMP. The General Properties screen appears.
3. In the interface navigation tree, select Protocol.
4. Select the IGMP tab and configure the following:
   - In the Type box, select Router.
   - Select Enable.
   - Click OK to save your changes to the interface.
5. Click OK to save your changes to the device.

You can optionally change the default parameters for each interface on which IGMP is enabled. You can also use access lists to control traffic to and from an IGMP interface. First, create access lists that identify the following items:

- Multicast groups that the hosts on a specified interface can join
- Hosts from which an IGMP router interface can receive IGMP messages
- Routers that are eligible for querier selection

Then, enter the access list IDs in the IGMP configuration screen of the IGMP interface(s). The security device then filters IGMP traffic based on the access lists.
Configuring IGMP Proxy

IGMP proxy enables a security device to extend the scope of a multicast domain by one hop without running a multicast routing protocol. When you enable IGMP proxy on a device, the interface connected to the hosts (downstream interface) functions as a multicast router, and the interface connected to the upstream router functions as an IGMP host. You must first enable IGMP in host mode on upstream interfaces, then enable IGMP in router mode on downstream interfaces, and finally enable IGMP proxy on router interfaces.

To configure an IGMP proxy in the NSM UI:
1. In the device navigation tree, select Network > Interface.
2. Double-click the interface on which you are enabling IGMP. The General Properties screen appears.
3. In the interface navigation tree, select Protocol.
4. Select IGMP.
   - If you are enabling IGMP on an upstream interface:
     - In the Type box, select Host.
     - Select Enable.
   - If you are enabling IGMP on a downstream interface:
     - In the Type box, select Router.
     - Select Enable.
     - Select Proxy.
   - Click OK to save your changes to the routing entry.
   - Click OK to save your changes to the device.

After you configure the interfaces, configure a multicast rule to permit IGMP messages to pass between zones. For information about multicast rules, see the Network and Security Manager Administration Guide.

Configuring PIM-SM

To configure PIM-SM in a virtual router on a security device:
1. Configure either a static route or a dynamic routing protocol, such as OSPF. (For information about configuring static routes, see “Configuring Routing Table Entries” on page 245. For information about dynamic routing protocols, see “Configuring Dynamic Routing” on page 250.)
2. Create a Security Policy to pass unicast and multicast data traffic between zones. (For details on Security Policies, see the Network and Security Manager Administration Guide.
3. Create and enable the PIM-SM routing instance in a virtual router.
4. Select PIM-SM on interfaces that transmit multicast traffic.
5. Configure a multicast rule to permit PIM-SM messages between zones. (For details on multicast rules, see the Network and Security Manager Administration Guide.

After you enable the PIM-SM routing instance in the virtual router and enable it on all applicable interfaces, you can optionally configure PIM-SM features such as the following:

- Use access lists to restrict the rendezvous points (RPs) and sources from which a multicast group can receive traffic. You can also use access lists to restrict the multicast groups for which the virtual router forwards PIM join-prune messages. First, create the access lists, then enter the access list IDs in the PIM-SM configuration screen of the virtual router. The security device then uses the access lists to filter the PIM-SM traffic.
- Change the default parameters for each interface on which PIM-SM is enabled. When you set parameters at this level, the parameters affect the specific interface only.
- Configure a static RP for a particular zone, or use dynamic RP mappings and configure a virtual router as a candidate rendezvous point (C-RP).
- You can configure a virtual router to function as a proxy RP.

To configure PIM-SM in the NSM UI, perform the following steps:

1. In the navigation tree, select Device Manager > Devices. Double-click the device icon to open the device configuration.
2. Configure the virtual router for PIM-SM:
   - In the device navigation tree, select Network > Virtual Router.
   - Double-click the virtual router in which you are configuring a PIM-SM instance. The General Properties screen appears.
   - In the virtual router navigation tree, select Dynamic Routing Protocol.
   - In the main display area, select Configure PIM-SM. PIM-SM configuration options now appear in the virtual router navigation tree under Dynamic Routing Protocol.
   - In the virtual router navigation tree, select Dynamic Routing Protocol > PIM-SM > Parameters. The Parameters configuration screen appears.
     - Select Enable in the main display area,
     - Click OK to save your changes to the virtual router.
3. Configure the interface for PIM-SM:
   - In the device navigation tree, select Network > Interface.
   - Double-click the interface that transmits multicast traffic. The General Properties screen appears.
   - In the interface navigation tree, select Protocol, then select the PIM-SM tab in the main display area.
- Select Configure PIM-SM on Interface.
- Select Enable PIM-SM.
- Click OK to save your changes to the interface. Repeat step 3 to enable PIM-SM on additional interfaces.

4. Click OK to save your changes to the device configuration.

**Configuring RP to Group Mappings**

You can configure a static rendezvous point (RP) for a particular zone and/or configure a virtual router as a Candidate RP (C-RP). Before you configure a static RP and a C-RP, you must first create access lists that identify the multicast groups mapped to each one.

To configure an RP, perform the following steps:

1. In the navigation tree, select Device Manager > Devices. Double-click the device icon to open the device configuration.

2. Configure the virtual router for PIM-SM:
   - In the device navigation tree, select Network > Virtual Router.
   - Double-click the virtual router in which you are configuring a PIM-SM instance. The General Properties screen appears.
   - In the virtual router navigation tree, select Dynamic Routing Protocol.
   - In the main display area, select Configure PIM-SM. PIM-SM configuration options now appear in the virtual router navigation tree under Dynamic Routing Protocol.
   - In the virtual router navigation tree, select Dynamic Routing Protocol > PIM-SM > Rendezvous Points.
   - In the main display area, click the Add icon. The new Zone dialog box appears. For Zone, select the zone that contains the RP.

3. To configure a C-RP:
   - Select the interface that is advertised as the C-RP.
   - Specify the access list that identifies the multicast group(s) for which the interface is the RP candidate.
   - Select the advertised C-RP priority.
   - Select the holdtime advertised to the bootstrap router.

4. To configure a Static Rendezvous Point, click the Add icon in the Static RP Addresses area. The Static RP Addresses dialog box appears. Configure as follows:
   - Enter the IP address of the RP.
   - Specify the access list that identifies the multicast group(s) mapped to the RP.
If you want to always use the same RP for the specified multicast group(s) select the **Always used as RP** check box. Use this option to override dynamic group-RP mappings.

5. Click **OK** to save your changes to the virtual router, then click **OK** to save your changes to the device configuration.

### Configuring Acceptable Groups

You can create access lists to identify the acceptable sources, multicast groups and RPs, then configure the virtual router to accept PIM messages only from those specified in the access lists. To configure acceptable groups on the virtual router:

1. In the navigation tree, select **Device Manager > Devices**. Double-click the device icon to open the device configuration.

2. Configure the virtual router for PIM-SM:
   - In the device navigation tree, select **Network > Virtual Router**.
   - Double-click the virtual router in which you are configuring a PIM-SM instance. The General Properties screen appears.
   - In the virtual router navigation tree, select **Dynamic Routing Protocol**.
   - In the main display area, select **Configure PIM-SM**. PIM-SM configuration options now appear in the virtual router navigation tree under Dynamic Routing Protocol.
   - In the virtual router navigation tree, select **Dynamic Routing Protocol > PIM-SM > Acceptable Groups**.
   - In the main display area, select the access list that identifies the permitted multicast group(s).
   - In the Group Specific Access Policies area, click the Add icon to map a multicast group to access lists. The Multicast Group IP dialog box appears.
   - Enter the IP address of the multicast group for which you created access lists for permitted RPs and permitted sources.
   - Select the ID of the access list that identifies the permitted RP(s). The device drops traffic for the multicast group if the traffic is from an RP that is not on the access list.
   - Select the ID of the access list that identifies the permitted source(s). This prevents unauthorized sources from sending data into your network. When you use this feature, the device drops multicast data from sources not in the list.

3. Click **OK** to save the new Multicast Group IP.

4. Click **OK** to save your changes to the virtual router, then click **OK** again to save your changes to the device configuration.
Configuring Proxy RP

You can configure a virtual router to function as a proxy Rendezvous Point (RP). A proxy RP acts as the RP for groups learned from other zones. To configure a virtual router as a proxy RP, select Proxy when configuring the RP for PIM-SM.

In this example, the hosts in the Trust zone are to receive the multicast stream for the multicast group 224.4.4.1/32. You configure RIP as the unicast routing protocol and create a firewall rule to pass data traffic between the Trust and Untrust zones. You create a PIM instance on the trust-vr and enable PIM on ethernet1 in the Trust zone, and on ethernet2 in the Untrust zone. ethernet1 is connected to the potential receivers; so, you also configure IGMP in router mode on this interface. You then create a multicast rule that permits PIM-SM BSR and join-prune messages between the zones.

1. Configure zones and interfaces.
   - Configure ethernet1 and bind it to the Trust zone.
   - Select IGMP in router mode on ethernet1.
   - Configure ethernet2 and bind it to the Untrust zone.

2. Configure the following address objects:
   - Multicast group IP address.
   - Source IP address.
   - Configure the access list that permits traffic from multicast group 224.4.4.

3. Configure RIP.
   - Create a RIP instance on the trust-vr.
   - Select RIP on ethernet1 and on ethernet3.

4. Configure PIM-SM.
   - Create a PIM-SM instance on the trust-vr.
   - Select Enable in the Parameters screen.
   - Select PIM-SM on ethernet1 and on ethernet3.

5. Configure a firewall rule that permits unicast and multicast data traffic to pass between zones.

6. Configure a multicast rule permitting PIM-SM messages to pass between zones.

Configuring Multicast Route Table Entries

Use static multicast routes to forward multicast data from hosts on interfaces in IGMP router proxy mode to routers upstream on the interfaces in IGMP host mode. (For information about IGMP proxy, see “Configuring IGMP Proxy” on page 267.)
Configuring Multicast Routing Table Preferences

You can configure the following settings for the multicast routing table:

- **Enable Multiple Incoming Interfaces**—Select this option to permit multiple routes with different incoming interfaces for the same source and multicast group.
- **Maximum Entries**—Enter the maximum number of route entries you want the multicast routing table to hold. By default, this option is set to 4096.
- **Negative Mroute Cache**—Select this option to store unroutable multicast packets in a cache until a multicast route can be established for the packet. For example, the security device might be unable to immediately route a multicast packet when:
  - The IGMP proxy receives a data packet for which it has no interested member. The device creates a negative mroute entry for the packet and stores the packet in the negative mroute cache. When the IGMP proxy receives a group join for the source (or source and group), the device automatically forwards the cached packet.
  - The device receives a data packet from a locally connected PIM-SM but does not have a group RP mapping for that group. The device creates a negative mroute entry for the packet and stores the packet in the negative mroute cache. When the device learns the RP mapping, it automatically registers and forwards the packet.
  - In an Active-Active NSRP configuration, the device that is not responsible for forwarding packets receives a multicast data packet. The device creates a negative mroute entry for the packet and stores the packet in the negative mroute cache. When the device that is responsible for forwarding packets learns of the group interest for the data packet, it forwards the packet.

When you enable Negative Mroute Cache, you can also configure a Timer that controls how the device ages unroutable packets in the cache. By default, the Timer is set to 90 seconds, meaning that the device deletes a route entry in the cache after 90 seconds. The acceptable range is 10 to 180 seconds.

Configuring a Multicast Static Route

For each static entry in the multicast routing table, you must configure the following information:

- **Multicast Group IP**—Enter the IP address of the group that receives multicast traffic.
- **Source IP**—Enter the IP address of the source of the multicast traffic.
- **Incoming Interface**—Select the interface on the device that receives multicast traffic.
- **Outgoing Information**—Enter the information that defines the interface and IP address the device uses to forward multicast traffic.
- **Outgoing Interface**. Select the interface on the device that forwards multicast traffic.
Outgoing Group. Security devices can translate the original multicast group address to a different multicast group address on the outgoing interface. Use this option to specify the translated multicast group address for the outgoing interface (you configure the original group address in the Multicast Group IP setting).

You can configure multiple Outgoing Information settings for a single static multicast route.

In this example, you configure a static multicast route from a source with IP address 20.20.20.200 to the multicast group 238.1.1.1. You configure the security device to translate the multicast group from 238.1.1.1 to 238.2.2.1 on the outgoing interface.

1. In the navigation tree, select Device Manager > Devices. Double-click the device object to open the device configuration.

2. In the device navigation tree, select Network > Virtual Router to display the list of configured virtual routers. Double-click the virtual router in which you are configuring a static multicast routing entry. The Virtual Router configuration screen appears.

3. In the virtual router navigation tree, select Multicast Routing Table. Configure the multicast routing preferences:
   - Select Enable Multiple Incoming Interfaces.
   - Select the Negative Mroute Cache. Leave the default Timer setting of 4096.

4. In the Multicast Static Routes area, click the Add icon. The New Mgroup dialog box appears. Configure the new routing entry:
   - For Multicast Group IP, enter 238.1.1.1.
   - For Source IP, enter 20.20.20.200.
   - For Incoming Interface, select ethernet1.

5. Configure an Outgoing Information setting:
   - Click the Add icon. The New Outgoing Information dialog box appears.
   - For outgoing interface, select ethernet3.
   - For Outgoing Group, enter the IP address 238.2.2.1.

6. Click OK to add the Outgoing Information setting to the static route settings. Repeat step 5 to add more Outgoing Information settings.

7. Click OK to save your changes to the virtual router, then click OK again to save your changes to the device.

IRDP on ns5GT Support

ICMP Router Discovery Protocol (IRDP) is an ICMP message exchange between a host and a router. The security device is the router and advertises the IP address of a specified interface periodically or on-demand. If the host is configured to listen, you can configure the security device to send periodic advertisements. If the host...
explicitly sends router solicitations, you can configure the security device to respond on demand.

Before a host can send IP datagrams beyond its directly connected subnet, it must discover the address of at least one operational router on that subnet. IRDP is a router discovery method that uses a pair of ICMP messages for use on multicast links. The messages are called Router Advertisements (RA) and Router Solicitations (RS). Each router periodically multicasts an RA from each of its multicast interfaces, announcing the IP address(es) of that interface. Hosts discover routers simply by listening for advertisements. The host may send out router solicitation messages seeking immediate advertisements at startup, rather than wait for periodic updates.

**Configuring ICMP Router Discovery Protocol**

You can enable and disable IRDP and configure or view IRDP settings using NSM. When you enable IRDP on an interface, NSM initiates an immediate IRDP advertisement to the network. For information about configuring an interface, see the Network and Security Manager Administration Guide.

In the following example, you configure IRDP for the Trust interface.

1. In the main navigation tree, select Device Manager > Security Devices.
2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.
3. In the main navigation tree, select Network > Interface.
4. Select a trust interface, and click Edit.
5. In the main navigation tree, select Protocol and select the IRDP tab.
6. Select the Enable IRDP checkbox.
7. Click OK to apply the settings.

Table 21 on page 274 lists the IRDP parameters, default values, and available settings.

**Table 21: IRDP Protocol Settings**

<table>
<thead>
<tr>
<th>IPv4 address</th>
<th>Primary and secondary IP addresses-advertised</th>
<th>Advertise—you can add a preference value (-1 through 2147483647)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management and webauth IP addresses-not advertised</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Broadcast Advertisement</th>
<th>Disabled</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Init Advertise Interval after Enable</td>
<td>16 seconds</td>
<td>1 through 32 seconds</td>
</tr>
<tr>
<td>Init Advertise Packet Count</td>
<td>5</td>
<td>1 through 5</td>
</tr>
</tbody>
</table>
### Table 21: IRDP Protocol Settings (continued)

<table>
<thead>
<tr>
<th>Lifetime</th>
<th>three times the Max Advertise Interval value</th>
<th>Max Advertise Interval value through 9000 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Advertise Interval</td>
<td>600 seconds</td>
<td>4 through 1800 seconds</td>
</tr>
<tr>
<td>Min Advertise Interval</td>
<td>75% of the Max Advertise Interval value</td>
<td>3 through Max Advertise Interval value</td>
</tr>
<tr>
<td>Response Delay</td>
<td>2 seconds</td>
<td>0 through 4 seconds</td>
</tr>
</tbody>
</table>

### Disabling IRDP

You can disable an interface from running IRDP; however, when you do so, ScreenOS deletes all related memory from the original configuration.

To disable the Trust interface from running IRDP, enter the following command:

```
unset interface trust protocol irdp enable
```

**NOTE:** For details on viewing IRDP information from the Web UI or the CLI, see the *Concepts & Examples ScreenOS Reference Guide*.

### Policy-Based Routing

Policy-Based Routing (PBR) provides a flexible mechanism for forwarding data packets based on policies configured by a network administrator. PBR enables you to implement policies that selectively cause packets to take different paths. PBR provides a routing mechanism for networks that rely on Application Layer support, such as antivirus (AV), deep inspection (DI), or anti-spam, web filtering, and/or that require an automatic way to specific applications.

When a packet enters the security device, ScreenOS checks for PBR as the first part of the route-lookup process, and the PBR check is transparent to all non-PBR traffic. PBR is enabled at the interface level and configured within a virtual router context; but you can choose to bind PBR policies to an interface, a zone, a virtual router (VR), or a combination of interface, zone, or VRs.

You use the following three building blocks to create a PBR policy:

- **Extended access lists**—Extended access-lists list the match criteria you define for PBR policies.
- **Match groups**—Match groups provide a way to organize (by group, name and priority) extended access lists.
- **Action groups**—Action groups specify the route that you want a packet to take. You specify the “action” for the route by defining the next interface, the next-hop, or both.
1. In the main navigation tree, select **Device Manager > Security Devices**.
2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.
3. In the main navigation tree, select **Network > Virtual Router**.
4. Click New to view the configuration page.
5. In the navigation tree, select Access List and the following to create access list 10 entries:
   - Extended ACL ID: 10
   - Sequence Number: 1
   - Source IP Address/Netmask: 172.18.1.10/32
   - Destination Port: 80-80
   - Protocol: TCP
   - Click OK to return to the list of Access Lists.
6. Click New to configure a second entry for access list 10 and configure the following:
   - Extended ACL ID: 10
   - Sequence Number: 2
   - Source IP Address/Netmask: 172.18.2.10/32
   - Destination Port: 443-443
   - Protocol: TCP
7. In the navigation tree, select Policy-based, and click New in the Match Group tab to configure the match group:
   - Match Group Name: left_router
   - Sequence Number: 1
   - Extended ACL: Select 10 from the dropdown list.
8. In the navigation tree, select Policy-based, and click New in the Action Group tab to view the configuration page.
9. In the navigation tree, select Policy-based, and click New in the Policy tab to view the configuration page. Each PBR policy needs to have a unique name.
10. Use the policy binding tabs in the configuration page to bind policies.
Chapter 9
Virtual Systems

You can logically partition a single Juniper Networks security system into multiple virtual systems to provide multi-tenant services. Each virtual system (vsys) is a unique security domain and can have its own administrators (called virtual system administrators or vsys admins) who can individualize their security domain by setting their own address books, user lists, custom services, VPNs, and policies. Only a root-level administrator, however, can set firewall security options, create virtual system administrators, and define interfaces and subinterfaces.

**NOTE:** Refer to the Juniper Networks marketing literature to see which platforms support this feature.

Juniper Networks virtual systems support two kinds of traffic classifications: VLAN-based and IP-based, both of which can function exclusively or concurrently. To get detailed information on creating, viewing, Vsys profiles and other resource information, see the Concepts & Examples ScreenOS Reference Guide.

This chapter contains the following sections:

- Vsys DHCP Enhancement on page 317
- Vsys Limitations on page 278

**Vsys DHCP Enhancement**

Dynamic Host Configuration Protocol (DHCP) was designed to reduce the demands on network administrators by automatically assigning the TCP/IP settings for the hosts on a network. Instead of requiring administrators to assign, configure, track, and change (when necessary) all the TCP/IP settings for every machine on a network, DHCP does it all automatically. Furthermore, DHCP ensures that duplicate addresses are not used, reassigns unused addresses, and automatically assigns IP addresses appropriate for the subnet on which a host is connected.

NSM allows you to configure Dynamic Host Configuration Protocol (DHCP) message relay from one or multiple DHCP servers to clients within a virtual system (vsys). You can configure DHCP message relay on an interface that is available to a virtual system.

If you have two DHCP servers, server 1 and server 2, a security device, sitting between the DHCP servers and a client, individually passes DHCP requests to each DHCP server on different outgoing interfaces. As each DHCP reply is received, the security
device passes them to the root vsys and then forwards them to the appropriate DHCP client within a vsys.

To configure DHCP with vsys:
1. Create a virtual system.
2. Enable DHCP for that vsys.
3. Configure a static route to allow the DHCP server in the root system to access the vsys.
4. Set security policies in the virtual system.

For more details on DHCP server configuration and settings, see the Concepts & Examples ScreenOS Reference Guide.

**Vsys Limitations**

The global maximum value for any vsys resource is dependent on the security device. If you do not explicitly set maximum and reserved limits, the default values for the device are used.

When setting maximum and reserved limits for resources, keep the following in mind:
- You cannot set the maximum value higher than the device-dependent global maximum value.
- For all resources except sessions, you cannot set the maximum value lower than the resources currently being used (actual-use value).
- You cannot set the reserved value higher than the configured maximum value.
- The total allocated usage, which is the sum of reserved values or actual-use values (whichever is higher) for all virtual systems, cannot exceed the global maximum value.

**NOTE:** For more information on setting Vsys limitations, see the Concepts & Examples ScreenOS Reference Guide.

**Example: Setting VSYS Resource Limits**

1. Select Object Manager > Vsys Profile.
2. Select New and configure the following:
   - For Name, enter Gold
   - For CPU Weight, enter 30 (default is 50)
   - For DIPs, Maximum: 25, Reserved: 5
   - For MIPs, Maximum: 25
   - For Mpolicy, Maximum: 5
3. Click OK to apply the settings.

**Per Vsys Session Limit**

To set session limits, you need to configure one or more of the following parameters:

- **session max**
  
  The session maximum is a number between 100 and the maximum session number for the overall security system. The default value is the maximum session number for the overall security system (as if no session limitation is in force).

- **reserve**
  
  In case of over-subscription, the reserve number is the number of sessions you reserve or guarantee for the specified vsys. The reserve value is a number between zero (0) and the maximum number of sessions you allocate for the specified vsys.

- **alarm**
  
  The alarm threshold is a percentage of the maximum limit that triggers the alarm. The default value is 100% of the session limit for a configured vsys.

1. Select Object Manager > Vsys Profile.
2. Select Vsys Profile Gold (from previous example) and click Edit.
3. Configure as follows:
   - For Session Limitation, Maximum: 2500, Reserved: 2000
   - For Alarm: 90 (indicates the alarm triggers when 90% of the session maximum is achieved).
   - Click OK to apply the settings.

**Per Vsys CPU Limit**

By default, virtual systems within a single security system share the same CPU resources. It is possible for one virtual system (vsys) to consume excess CPU resources at the expense of other virtual systems.

For example, if one virtual system, within a security system that houses 20 virtual systems, experiences a DOS attack that consumes all of the CPU resources, the CPU is unable to process traffic for any of the other 19 virtual systems. In essence, all 20 virtual systems experience the DOS attack. CPU overutilization protection, also known as the CPU limit feature, is intended to protect against this.

Overutilization protection allows you to configure the security device for “fair use,” or fair mode, as opposed to “shared use,” or shared mode. To enable a more fair
distribution of processing resources, you can assign a flow CPU utilization threshold to trigger a transition to fair mode, and you can choose a method for transition back to shared mode. By default, the security device operates in shared mode.

To enforce fair use, you assign a CPU weight to each vsys that you configure. ScreenOS uses these weights, relative to the weights of all virtual systems in the security device to assign time quotas proportional to those weights. ScreenOS then enforces the time quotas over one second intervals. This means that as long as a vsys does not exceed its time quota over that one second period and the firewall is not too heavily loaded, no packets for that vsys should be dropped.

**NOTE:** The CPU overutilization protection feature is independent of the session limits imposed by a vsys profile.

As system administrator, you determine how much traffic passes through a given vsys in fair mode by setting its CPU weight in relation to that of other virtual systems.

You must identify any anticipated burstiness while the security system is in fair mode, and then choose the CPU weight for each vsys appropriately so that bursts pass through the security system. We recommend verifying that adverse packet dropping does not occur with the chosen weights prior to deployment. With this feature, you can also ensure a fixed CPU weight for the Root vsys.

For more information on setting and viewing CPU limits, see *Concepts & Examples ScreenOS Reference Guide*.

**Example: Configuring CPU Weight**

1. Select Object Manager > Vsys Profile.
2. Select the corp-profile vsys profile, and click Edit.
3. For CPU Weight, enter 40.
4. Click OK to apply the setting.
Chapter 10
User Authentication

This chapter explains the options available for using Extensible Authentication Protocol (EAP) to provide authentication for Ethernet and wireless interfaces. It contains the following sections:

- IEEE802.1x Support on page 317
- Supported EAP Types on page 281

IEEE802.1x Support

EAP is an authentication framework that supports multiple authentication methods. EAP typically runs directly over data link layers, such as Point-to-Point Protocol (PPP) or IEEE 802, without requiring Layer 3 addressing.

IEEE 802.1X works for port-based access control, and IKEv2 uses it as an option for authentication. EAP functions in a security device configured in Transparent or Route (with or without Network Address Translation enabled) mode. Network and Security Manager (NSM) Redundancy Protocol (NSRP) supports EAP in networks with high availability. Log messages and SNMP support are also available.

802.1X support is available for all platforms.

EAP functions as the authentication portion of PPP, which operates at Layer 2. EAP authenticates a supplicant, or client, after the supplicant sends proper credentials and the authentication server, usually a RADIUS server, defines the user-level permissions. When you use EAP, all authentication information passes through the security device (known as a pass-through method of EAP authentication). All user information is stored on the authentication server.

If you use a RADIUS server for authentication that supports vendor-specific attributes (VSAs), you can use the zone-verification feature to verify the zones in which a client is a member.

Supported EAP Types

The following EAP types are supported:
- **EAP-TLS (Transport Layer Security):** The most common EAP derivative and is supported by most RADIUS servers. EAP-TLS uses certificates for user and server authentication and for dynamic session key generation.

- **EAP-TTLS (Tunneled Transport Layer Security):** Requires only a server-side certificate and a valid username and password for authentication. Steel-Belted RADIUS supports TTLS.

- **EAP-PEAP (Protected EAP):** Designed to compensate for the lack of features in EAP-TLS and reduce management complexity. It requires only server-side certificates and a valid username and password. It provides support for key exchange, session resumption, fragmentation, and reassembly. Steel-Belted RADIUS and Microsoft IAS support Protected EAP.

- **EAP-MD5 (Message Digest Algorithm 5):** Algorithm that uses a challenge and response process to verify MD5 hashes.
Chapter 11
High Availability

High availability provides a way to minimize the potential for device failure within a network. Because all of your network traffic passes through a Juniper Networks security device, you need to remove as many points of failure as possible from your network by ensuring that the device has a backup in case it fails.

Setting up your security devices in HA pairs removes one potential point of failure from your network design. You can remove other potential points of failure by setting up redundant switches on either side of the HA pair of security devices. This chapter explains how to configure NSM Redundancy Protocol (NSRP) clusters and describes how to use NSRP to support high availability (HA).

For detailed information on NSRP and HA, see the Concepts & Examples ScreenOS Reference Guide.

This chapter contains the following sections:

- Configuring NSRP Clusters on page 283
- Configuring Anti-Spoof Settings on page 294
- Configuring Profiler Settings on page 295
- Exporting and Importing Device Configurations on page 296

Configuring NSRP Clusters

An NSRP cluster consists of a two security devices that enforce the same Security Policy and share the same configuration settings. When you assign a security device to an NSRP cluster, any changes you make to the configuration on one member of the cluster propagate to the other. Members of the same NSRP cluster maintain identical settings for policies and policy objects (such as addresses, services, VPNs, users, and schedules) and system parameters (such as settings for authentication servers, DNS, SNMP, syslog, and so on).

The following sections explain these NSRP configuration topics:

- “About NSRP Clusters” on page 284
- “Creating an NSRP Cluster” on page 285
- “Active/Passive Configurations” on page 285
- “Active/Active Configurations” on page 288
- “Synchronizing Configurations” on page 289
About NSRP Clusters

Before two security devices can provide redundant network connectivity, you must group them in the same NSRP cluster. In an NSRP cluster, one device acts as a primary and the other as a backup:

- **In active/passive** configurations, the primary device handles all firewall and VPN activities while the backup waits to take over when the primary fails. You can configure the cluster in active/passive operation when the interfaces are in transparent, NAT, or route mode:
  - **Transparent Mode.** When interfaces are in Transparent mode, security zone interfaces do not have IP addresses, and the security device forwards traffic like a Layer 2 switch. To manage a backup device, you use the manage IP address that you set on the VLAN1 interface.
  - **NAT or Route Mode.** When interfaces are in NAT or Route mode, the security zone interfaces have IP addresses, and the device forwards traffic like a Layer 3 router. To manage a backup device, you must use the manage IP address that you set per security zone interface; you cannot set a manage IP address on a VSI for any VSD group except VSD group 0.

- **In active/active** configurations, you create two virtual security devices (VSD) groups for the cluster: One device acts as the primary device of one VSD group, while the other device acts as the backup for the same group. In the other VSD group, the device roles are reversed: Each device is the primary device of one VSD group and the backup in the other VSD group. You can configure the cluster in active/active operation when the interfaces are in NAT or route mode. The security zone interfaces have IP addresses, and the device forwards traffic like a Layer 3 router. To manage a backup device, you must use the manage IP address that you set per security zone interface; you cannot set a manage IP address on a VSI for any VSD group except VSD group 0.

Because of the sensitive nature of NSRP communications, you can secure all NSRP traffic through encryption and authentication. For encryption and authentication, NSRP supports the DES and MD5 algorithms respectively. However, if the HA cables run directly from one security device to another (that is, not through a switch forwarding other kinds of network traffic), it is unnecessary to use encryption and authentication.

In addition to NSRP clusters, which propagate configurations among group members and advertise each members’ current VSD group states, you can configure the devices as members in an RTO mirror group, which maintains the synchronicity of run-time objects (RTOs) between a pair of devices. When the primary device fails, the backup becomes the primary device with minimal service downtime by maintaining all current sessions.
NOTE: We recommend that you do not change the settings of VSD0 after importing the NSRP to NSM. Doing so will result in a loss of most attributes, especially the interface attributes. If you must change VSD0 settings, do not use NSM to delete or add VSD0. The safe way is to use the CLI or the Web UI to make the change to the device cluster first, and then re-import the cluster to NSM.

For more information about NSRP, see the “NSRP” volume in the Concepts & Examples ScreenOS Reference Guide for ScreenOS 5.x or the “High Availability” volume in the Concepts & Examples ScreenOS Reference Guide.

Creating an NSRP Cluster

To create an NSRP cluster, either by importing or modeling, first add the cluster to Network and Security Manager (NSM). In the Device Manager, click the Add icon and select Cluster. Follow the directions in the Add Device wizard to add the cluster. When you select the device model and ScreenOS version, remember that all devices in a cluster must be the same device model and run the same ScreenOS version.

Next, add devices to the cluster: Right-click the cluster and select New > Cluster Member. Follow the directions in the Add Device wizard to import or model the cluster member.

NOTE: When importing cluster device members, ensure that their device configurations are in sync (errors can occur in the import process if you attempt to import out-of-sync configurations).

Finally, configure the cluster and the cluster members (you must configure cluster members from within the cluster itself). To configure a cluster member, open the Cluster device configuration and select Members in the Cluster navigation tree. Double-click the cluster member you want to configure to open its device configuration, then make your changes.

Most settings entered on one device in a cluster propagate to the other device, however, some configurations, such as setting NSRP authentication and encryption passwords, do not propagate. If you are using NSRP authentication and encryption passwords in the cluster, you need to configure the same information on all devices in the cluster.

For instructions for adding member devices to a cluster, see the Network and Security Manager Online Help topic “Configuring NSRP Clusters”.

For more information about configurations that do not propagate, see the “NSRP” volume in the Concepts & Examples ScreenOS Reference Guide for ScreenOS 5.x or the “High Availability” volume in the Concepts & Examples ScreenOS Reference Guide.

Active/Passive Configurations

In an active/passive configuration, the primary device propagates all its network and configuration settings and the current session information to the backup device. If
By default, the two cluster members are configured as active/passive after you add them to the cluster object. NSM automatically creates VSD group 0 and transforms physical interfaces into Virtual Security Interfaces (VSIs) for VSD group 0.

To configure an active/passive cluster, you must:

1. Cable two security devices together.
2. Select automatic **RTO synchronization**.
3. Select the ports that you want the devices to monitor, so that if they detect a loss of network connectivity from one of the monitored ports, the primary device fails over.

In this example, you want to configure two NetScreen-208 security devices, Corporate A and Corporate B, in an NSRP cluster. Both devices are running ScreenOS 5.x. Using a cable, connect the ethernet7 interfaces of both devices, then use another cable to connect the ethernet8 interfaces. Next, add the cluster and cluster member to NSMr. When the devices become members of the NSRP cluster, the IP addresses of their physical interfaces automatically become the IP addresses of the Virtual Security Interfaces (VSIs) for VSD group ID 0. Each VSD member has a default priority of 100, the device with the higher unit ID becomes the VSD group primary.

Finally, configure the cluster:

- Bind ethernet7 and ethernet8 to the HA zone. By default, ethernet8 is bound to the HA zone, so you only need to bind it to the HA zone if you have previously bound it to a different zone.
- Set manage IP addresses for the Trust zone interfaces on both devices.
- Configure monitoring on ethernet1 and ethernet3, so that loss of network connectivity on either of those ports triggers a device failover.
- Select automatic synchronization of RTOs.

1. Create the Cluster. First, in the navigation tree, select **Device Manager > Devices**. Click the Add icon and select **Cluster**. Configure the following, then click **OK**:
   - For Cluster Name, enter **Corporate**.
   - For Color, select **cyan**.
   - For Physical Choice, select **ns208**.
   - For OS Version, select **5.0**.
- Ensure that Transparent Mode is not enabled (unchecked).
- For License Model, select Advanced.

2. Add the following two cluster members to the cluster: Corporate A, Corporate B. Choose Model when adding each device.

3. Configure the HA interfaces for the cluster.


5. For Zone, select HA, then click OK to save your changes.


7. Ensure that the zone name HA, then click OK to save your changes.

8. Configure the Untrust interface for the cluster:
   - In the cluster navigation tree, select Network > Interface. Double-click ethernet7. The General Properties screen appears.
   - For Zone, select Untrust.
   - For IP address and netmask, enter 210.1.1.1/24.
   - Click OK to save your changes.

9. Configure the Trust interface for the cluster:
   - In the cluster navigation tree, select Network > Interface. Double-click ethernet3. The General Properties screen appears.
   - For Zone, select Trust.
   - For IP address and netmask, enter 10.1.1.1/24.
   - Ensure that the interface mode is NAT, then click OK to save your changes.

10. Click Apply to apply all previous changes to the cluster members.

11. Configure the Manage IP and Monitoring for Corporate A:
    - In the device navigation tree, select Members. Double-click Corporate A to open its device configuration.
    - In the device navigation tree, select Network > Interface and double-click ethernet3. The General Properties screen appears.
    - For Manage IP, enter 10.1.1.20, then click OK to save your changes.

12. In the device navigation tree, select Monitoring > Whole Box Monitoring, then select the Monitor Interface tab.

13. Click the Add icon to display the new monitor interface dialog box. Select ethernet1, leave the default weight of 255, and click OK to save your changes.

14. Click the Add icon to display the new monitor interface dialog box. Select ethernet3, leave the default weight of 255, and click OK to save your changes.

15. Click OK to close the device configuration for Corporate A.

16. Configure the Manage IP for Corporate B:
In the cluster navigation tree, select Members. Double-click Corporate B to open its device configuration.

In the device navigation tree, select Network > Interface and double-click ethernet 3. The General Properties screen appears.

For Manage IP, enter 10.1.1.21, then click OK to save your changes.

In the device navigation tree, select Monitoring > Whole Box Monitoring, then select the Monitor Interface tab.

Click the Add icon to display the new monitor interface dialog box. Select ethernet1, leave the default weight of 255, and click OK to save your changes.

Click the Add icon to display the new monitor interface dialog box. Select ethernet3, leave the default weight of 255, and click OK to save your changes.

Click OK to close the device configuration for Corporate B.

17. Configure the NSRP settings:

In the cluster navigation tree, select NSRP.

Select RTO Sync.

18. Click OK to save your changes to the cluster and cluster members.

**Active/Active Configurations**

On a security device in Route or NAT mode, you can configure both devices in a redundant cluster to be active, sharing the traffic distributed between them by routers with load-balancing capabilities running a protocol such as the Virtual Router Redundancy Protocol (VRRP).

Using NSRP, you create two virtual security devices (VSD) groups, each with its own virtual security interfaces (VSI). For example, Device A acts as the primary of VSD group 1 and as the backup of VSD group 2. Device B acts as the primary of VSD group 2 and as the backup of VSD group 1. Devices A and B each receive 50% of the network and VPN traffic. Should device A fail, device B becomes the primary of VSD group 1, as well as continuing to be the primary of VSD group 2, and handles all of the traffic.

Although the total number of sessions divided between the two devices in an active/active configuration cannot exceed the capacity of a single security device (otherwise, in the case of a failover, the excess sessions might be lost), the addition of a second device doubles the available bandwidth potential. A second active device also guarantees that both devices have functioning network connections.

To configure an active/active cluster, you must configure a second VSD group:
1. Double-click the cluster to open the cluster configuration. In the cluster navigation tree, select Members.

2. In the VSD definitions area, click the Add icon to display the Add VSD dialog box.

3. Select a value other than 0, then click OK to save the new VSD. The VSD you added appears in the VSD Definitions list.

4. Click OK to save your changes to the cluster.

The VSD group member with the priority number closest to 0 becomes the primary. (The default is 100.) If two devices have the same priority value, the device with the lowest MAC address becomes primary.

Synchronizing Configurations

After you add new members to an NSRP cluster, you must synchronize the configuration and files from one device to another.

To synchronize configurations:

1. In the Device Manager, double-click the cluster to open the cluster configuration.

2. In the cluster navigation tree, select NSRP Directives > Flash Sync.

3. Select the device that will be used to synchronize the other device and click Perform Sync. The device that has been synchronized is automatically rebooted to activate the new configuration.

4. Click OK to save your changes to the cluster.

Synchronizing the Virtual Router

You can configure the virtual router information for the cluster or cluster members. For devices running 5.0, you must configure the virtual router settings at the system level (the cluster).

For devices running ScreenOS 5.1 and higher, you can configure the virtual router setting at the system level (the cluster) or at the local level (cluster member). By default, cluster members automatically use the virtual router settings of the cluster. To use different vrouter settings for each cluster member, you must disable NSRP configuration synchronization for the vrouter at the system level:

1. In the main navigation tree, select Device Manager > Devices, then double-click the cluster to open the cluster configuration.

2. In the cluster navigation tree, select Network > Virtual Router. Double-click the trust-vr virtual router. The General Properties screen appears.

3. Disable Enable NSRP Configuration Sync for Vrouter (clear the checkbox), then click Apply to save your changes to the cluster.

4. In the cluster navigation tree, select Members and double-click a cluster member device to open the device configuration. Edit the virtual router settings as desired.
NOTE: The Enable NSRP Configuration Sync setting does not affect the Vrouter ID. The Vrouter ID setting is always configured at the local level (cluster member).

5. Click OK to save your changes to the cluster member, then click OK to save your changes to the cluster.

Synchronizing Run-Time Objects (RTOs)

After synchronizing the configurations and files, you can then synchronize the run-time objects (RTOs). RTOs are code objects created dynamically in memory during normal operation. Some examples of RTOs are session table entries, ARP cache entries, DHCP leases, and IPSec security associations (SAs). In the event of a failover, the new primary device must maintain the current RTOs to avoid service interruption.

To ensure session backup, the members of an NSRP cluster backup the RTOs using an RTP mirror group. An RTO mirror group is two security devices that pass RTOs unidirectionally from a sender to a receiver. You can also create a second mirror group (with a different group ID from the first group) for the same devices but reverse the roles of sender and receiver. Working together, each member backs up the RTOs from the other, which permits RTOs to be maintained if the primary device of either VSD group in an active/active HA scheme fails.

After you add the cluster members, you can configure RTO synchronization to enable each member to send and receive RTOs. However, by default, NSRP cluster members do not synchronize their configurations before synchronizing RTOs; before enabling RTO synchronization, you must first synchronize the configurations between the cluster members. Unless the configurations on both members in the cluster are identical, RTO synchronization might fail.

Forcing VSD Group Member State

If necessary, for troubleshooting or maintenance, you can force a device to assume a new mode (master, backup, or ineligible) in a specified VSD group. To do this:

1. In the Device Manager, double-click the cluster to open the cluster configuration.

2. In the cluster navigation tree, select NSRP Directives > Exec Mode.

3. Select the device that will assume a new role, then click Exec Mode. The Mode Selection dialog box appears.

4. Select the mode that the device is to assume:
- **Master**—The VSD group member (primary device) processes traffic sent to the VSI.

- **Backup**—The VSD group member that will become the primary device if the current primary device fails. The election process uses device priorities to determine which member to promote. When electing a new primary, an RTO peer has precedence over any other VSD group member, even if that member has a better priority rating.

- **Ineligible**—The VSD group member cannot participate in the election process. The preempt option must be enabled on the master device for this option to appear.

- Click **OK** to save your changes.

**Example: Changing VSD Group Member State**

In this example, you change the VSD group member states.

1. In the cluster navigation tree, select **NSRP Directives > Exec Mode**.
2. Select **Office A**, then click **Exec Mode**. Configure as master (primary) of VSD group 0.
3. Select **Office B**, then click **Exec Mode**. Configure as master (primary) of VSD group 1.
   
   Both configurations are shown in Figure 8 on page 291.

4. Click **OK** to save your changes to the cluster.

**Configuring Monitoring (For Failover)**

You can configure NSRP to detect interface and zone failures on a device or VSD group. When one or more monitored objects on a device or VSD group fail, the primary device in the cluster or VSD group can fail over to the backup device or VSD group.

To control when the device or VSD group fails over, you configure the device to monitor specific objects.

**NOTE:** Each Vsys cluster device can see all VSDs in the cluster, even VSDs that the Vsys cluster device does not use. This means that you could configure a Vsys cluster device to monitor a VSD group that the device does not use. If this monitored VSD group failed, the Vsys cluster device that does use that VSD group would failover—not the Vsys cluster device that was configured to monitor the VSD group.

For each device or VSD group, you can monitor:

- Specific target IP addresses—the device sends ping or ARP requests to up to 16 specified IP addresses at specified intervals and then monitors responses from
the targets. All the IP addresses configured on the device or for a specified VSD group constitute a single monitored object.

- **Physical interfaces**—The device uses NSRP to check that the physical ports are active and connected to other devices.
- **Zones**—The device uses NSRP to check that all physical ports in a zone are active.

For each monitored object, you must configure a threshold, which is the total weight of failed monitored objects required to cause the device or VSD group to step down as master. If the cumulative weight of the failures of all monitored objects exceeds the monitored object failure threshold and the monitor threshold, then the device or VSD group fails over to the backup device or VSD group. You can set the monitored object failover threshold to a value from 1 to 255. The default threshold is 255.

You must also configure a failure weight, which is the weight that the failure of the monitored object contributes towards the device or VSD group failover threshold, which is known as the monitor threshold. You can set the object failure weight at a value from 1 to 255. The default failure weight for monitored objects is 255. If you want to monitor an object but do not want the failure of the object to affect failover of the device or VSD group, set the failure weight of the object to 0 (all failures are logged, even if the failure weight of the object is 0).

### Configuring Track IPs

For tracked IP addresses, you specify individual IP addresses, how they are to be monitored, what constitutes the failure of each tracked IP address (the threshold), and the weight that each failed address carries. When IP tracking is enabled, the device sends a request on the selected interface to target IP addresses at specified intervals, then monitors the targets for responses. If the device does not receive a response from a target for a specified number of times, the device considers that IP address to be unreachable. You configure the threshold (the number of acceptable consecutive response failures) for each IP address within the IP Option dialog box. The default threshold for each IP address is 3; acceptable values are from 1 to 200.

If the device does not receive a response from a specified number of targets, the device can deactivate routes associated with the selected interface. This threshold, known as the failure threshold, is the sum of the weights of all failed tracked IP addresses required for the tracked IP object to be considered failed. You configure the interface threshold (the total weight of the cumulative failed attempts) in the Track IP tab. The default is 1; acceptable values are from 1 to 255. A failure to reach any configured tracked IP address causes routes associated with the interface to be deactivated.

For each interface, you can configure up to four IP addresses to track. The tracked IP addresses do not have to be in the same subnetwork as the interface.

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**NOTE:** A single device can track 64 IP addresses. This total includes all track IP addresses for interface-based IP tracking and for NSRP-based IP tracking at the root level and vsys level.
**Configuring Interface Monitoring**

The device uses NSRP to check that the physical ports are active and connected to other network devices. When the port is inactive, the device considers the interface failed.

The process for adding an interface to monitor, is as follows:

- Edit the cluster by selecting and editing its members.
- Select Monitoring > Whole Box Monitoring.
- Use the Monitor Interface tab to select all the interfaces that need to be monitored and assign a weight to each interface in the device or VSD group to indicate the importance of that interface. The higher the weight, the faster the failover threshold is met. For example, if the untrust interface is more important than the management interface, assign the untrust interface a higher weight than the management interface.

For example, when using two VSD groups (VSD 1 and VSD 2) configured on two devices (device A and device B), if a port on a master device in a VSD group fails, you can configure VSD 1 to failover from the primary VSD group on device A to the backup VSD group on device B. VSD 2 remains active on device A.

**Configuring Zone Monitoring**

The device uses NSRP to check that all physical ports in a zone are active and connected to other network devices. When all ports within the zone are inactive, the device considers the zone failed.

You can assign a weight to each zone in the device or VSD group to indicate the importance of that zone. The higher the weight, the faster the failover threshold is met. For example, if the DMZ zone is more important than the trust zone, assign the DMZ zone a higher weight than the trust zone.

All interfaces bound to the monitored zone must fail before the device considers the zone down. Specifically:

- If a monitored zone has multiple interfaces, but only one interface in the zone is active, the device considers the zone active.
- If a monitored zone has a single interface bound to it and that interface is failed, the device considered the zone as failed.
- If a monitored zone has no interfaces bound to it, the zone cannot fail.
- If you unbind a downed interface from a zone that contains only that interface, the device no longer considers the zone failed. Similarly, if you unbind an active interface from a monitored zone where the remaining interfaces are down, the device considers the zone failed.

**Configuring Monitor Threshold**

The monitor threshold is the failure threshold for the device or VSD group. All failure weights for all monitored objects in the device or VSD group contribute to the monitor threshold.
threshold when a failure occurs; if the total sum of these failure weights meets or exceeds the monitor threshold, the device or VSD group fails over.

Alternatively, even if all IP addresses, interfaces, and zone fail in the device or VSD group, if the sum of their failure weights does not meet or exceed the monitor threshold, the device or VSD group does not fail over to the backup VSD group. To ensure that the device or VSD group fails over at the appropriate time, configure the failure weights of each monitored object in relation to the monitor threshold.

**Configuring Vsys Clusters**

A vsys cluster is a vsys device that has a cluster as its root device.

To enable failover from one virtual system to another, you must create a virtual system interface (VSI) for each virtual system. A logical entity at layer 3 that is linked to multiple layer 2 physical interfaces in a VSD group. The VSI binds to the physical interface of the device acting as primary of the VSD group. The VSI shifts to the physical interface of another device in the VSD group if there is a failover and it becomes the new primary.

- Trust zone VSIs—each vsys has its own trust zone vsi by default. All Trust zone virtual system VSIs must be in different subnets.
- Untrust zone VSIs—you can configure each vsys to use its own Untrust zone VSI or share the Untrust zone VSI from the root device. When virtual systems have their own Untrust zone VSIs, the VSIs must be in different subnets from each other and from the Untrust zone VSI at the root level.

After creating VSI, you must also create VSD groups to contain these VSIs.

**Configuring Anti-Spoof Settings**

These settings are valid for stand-alone IDP sensors only.

You can assign address objects to specific interfaces on your sensor. You can tell the sensor to log or drop any connections that do not match the permitted address objects for that interface.

In addition, you can tell the sensor to check incoming IP addresses against the permitted address objects for other interfaces. If the sensor detects an IP address coming in the wrong interface, it can log or drop that connection.

**Example: Applying Anti-Spoof to a Web Server and Database Server**

1. Add your web server and database server to the list of address objects.
2. Connect the web server to the Sensor via eth2. Connect the database server to the Sensor via eth4.
3. Open the Sensor in Device Manager.
4. Click **Anti-Spoof Settings**.
5. Click the + button to add a new entry to the anti-spoof table. In the window that opens, configure the following:
a. Select **eth4** as the forwarding interface to configure for the database server.
b. Your database server is important, so check both the Logging and Alert checkboxes.
c. Select Action as **None**.
d. Select your database server from the list of address objects.
e. Click **OK**.
f. Click the + button again to add your web server.
g. Select **eth2** as the interface.
h. Check **Logging**.
i. Check the **Check other interfaces** checkbox.
   If this checkbox is checked, the sensor compares each IP address to the list of addresses known to be assigned to other interfaces. In other words, if the database server’s IP address appears at this interface, you want the Sensor to let you know.
j. Select an Action of **None**. You just want to log this event.
k. Select the web server as the address object assigned to this interface.

### Configuring Profiler Settings

These settings are valid for stand-alone IDP sensors only. For more information, see the *Network and Security Manager Online Help*.

To configure the Profiler on a given IDP sensor, open that sensor’s Device window and select **Profiler Settings**. The following tabs are displayed:

**General**

In this tab, indicate whether Application Profiling is enabled and whether Probe and Attempt and Non-tracked IP Profiles will be included in profiling. Also indicate the size of the Profiler database and whether OS fingerprinting will be enabled.

**Tracked Hosts**

In this tab, select the known hosts that you want track. Use **Object Manager** > **Address Objects** to add entries to the hosts list.

**Exclude Hosts**

In this tab, select the known hosts that you want to exclude from profiling. Use **Object Manager** > **Address Objects** to add entries to the hosts list.

**Context to Profile**

In this tab, select the contexts you want to profile.
Alert

In this tab, indicate which Profiler events you want to generate alerts for.

Exporting and Importing Device Configurations

Use the Export Device Config To File directive to export an existing configuration on a security device(s) to a file.

To export a device configuration to file:
1. From the Device Manager, select a security device.
2. From the Device menu, select Device > Configuration > Export Device Config To File.
3. Select a security device(s). Click OK. A Job Information window appears displaying the status of the export process.
4. In the Job Information window, click on the device(s) whose configuration(s) you want to save, and then click Save Selected.

After the export has completed, you can then use the Import Device Config From File function to import that configuration to a security device.

To Import a Device Config From File
1. From the Device Manager, select a security device.
2. From the Device menu, select Device > Configuration > Import Device Config From File. A Select Target Directory window appears.
3. Select the configuration file. Pay careful attention to select a configuration file that was exported from the same type of security device running the same version of ScreenOS.
4. Click Import. A Job Information window appears displaying the status of the import process.
Chapter 12
WAN, ADSL, Dial, and Wireless

Juniper Networks wireless devices and systems provide wireless local area network (WLAN) connections with integrated Internet Protocol Security Virtual Private Network (IPSec VPN) and firewall services for wireless clients, such as telecommuters, branch offices, or retail outlets.

This chapter contains the following sections:

■ Configuring Wireless Settings on page 317
■ Configuring the Network Module on page 310
■ WPA2, Extended Range and SuperG Support on ns5GT Wireless on page 313
■ Configuring Super G on page 315
■ Configuring Atheros XR (Extended Range) on page 315

Configuring Wireless Settings

The wireless settings specify how a wireless-capable security device connects multiple wireless networks or a wireless network to a wired network. You can configure wireless settings only on a Juniper Networks NetScreen-5GT Wireless security device running ScreenOS 5.0.0-WLAN or ScreenOS 5.0.0-DSLW; these devices can act as a wireless access point (WAP).

When you deploy a NetScreen-5GT Wireless as a WAP, the security device manages a distribution system of one to eight basic service sets (BSSs). Each BSS uses a unique name identifier, called a service set identifier (SSID). Each host within a BSS must have the same SSID as that configured for that BSS on the security device. When configuring the SSID, you bind each BSS to its own interface (and zone); segmenting BSSs enables you to enforce different levels of device authentication and encryption for each zone, and to create rules that control wireless traffic across zones.

NOTE: When security zones contain wireless and wired networks, they must use separate subnets and connect to the device through different interfaces with logically separate IP addresses.

The NetScreen-5GT Wireless security device supports up to 60 wireless clients concurrently.
Configuring General Wireless Settings

NetScreen-5GT Wireless security device contains a radio transmitter/receiver with a frequency range of 2.4GHz to 2.4835GHz, and supports the IEEE 802.11b and 802.11g standards. When you first deploy the NetScreen-5GT Wireless device on your network, the radio transmitter/receiver is configured with default settings designed to work in most networking environments.

You can edit the default values for the following radio settings:

- Antenna settings
- Channel settings
- Operation Mode settings
- Transmission Power and Rate settings

The following sections detail each radio setting.

Configuring Antennas

You can use one antenna or a pair of antennas on the NetScreen-5GT Wireless security device. Select the antenna option that meets your network needs and that corresponds to the actual physical antenna configuration on the device.

To configure the antenna, in the device navigation tree, select Wireless Settings then select one of the antenna configurations:

- Diversity antennas — Select this option when the security device is using a pair of diversity antennas that provide 2dBi omnidirectional coverage (signal radiates 360 degrees horizontally). These antennas provide a fairly uniform level of signal strength within the area of coverage and are suitable for most installations (diversity antennas ship with the NetScreen-5GT Wireless device). This is the default option.

- Antenna A or Antenna B — Select one of these options when using a single antenna for 2dBi omnidirectional coverage (signal radiates 360 degrees horizontally). Unlike diversity antennas, which function as a pair, the external antenna operates singly to eliminate an echo effect that can sometimes occur from slight delay characteristics in signal reception when two antennas are in use.

NOTE: On the NetScreen-5GT Wireless security device, antenna A is nearest the power connector port.

When importing wireless settings from a security device, Network and Security Manager (NSM) automatically displays the antenna settings configured on the physical device. Before activating a modeled wireless security device, however, you must ensure that the antenna setting you select in the NSM UI matches the actual antenna configuration on the physical device. For example, if you model the device using antenna A as a single antenna providing 2dBi omnidirectional coverage, you or the device administrator must have connected an antenna to antenna port A on the physical device before you activate that device.
Configuring Channels

The wireless security device uses channels to send and receive wireless traffic. The device uses the same channel for all basic service sets (BSSs), which share the same overall bandwidth, and distinguishes traffic from different BSSs by the SSID number.

By default, the wireless security device automatically selects the appropriate channel based on the country code. To select a specific channel, in the device navigation tree, select Wireless Settings and change the Channel for Wireless AP Radio setting to Channel Number, then enter the channel number you want the device to use. To enable the device to use additional channels that might be available in your country, select Extended Channel Mode.

The regulatory domain for channel assignments is not configurable, and is preset as one of the following:

- **FCC (USA)**—This regulatory domain automatically sets the country code to USA. Because you cannot change this setting, it does not appear in the UI.
- **TELEC (Japan)**—This regulatory domain automatically sets the country code to Japan; you cannot change this setting. Because you cannot change this setting, it does not appear in the UI.
- **WORLD (all countries)**. This regulatory domain requires you to select from a list of countries (can select USA or Japan). If the device is preset to use FCC or TELEC, this setting does not appear in the UI.

**NOTE:** Although you can select the Extended Channel Mode option when the regulatory domain is WORLD and the selected country code is USA, there are no extended channels in the USA.

Configuring Operation Mode Settings

The NetScreen-5GT Wireless supports both 802.11b and 802.11g operation modes, either simultaneously (default setting) or exclusively. To configure the operation mode, in the device navigation tree, select Wireless Settings then select one of the following modes:

- To enable both 802.11b and 802.11g wireless clients to connect to the wireless security device, select 802.11b/g.
- To enable only 802.11b wireless clients to connect to the wireless security device, select 802.11b.
- To enable only 802.11g wireless clients to connect to the wireless security device, select 802.11b/g, then select the checkbox for 802.11g Only.

**NOTE:** We recommend you enable CTS protection (see “Configuring Control Frame Protection” on page 301) to avoid collisions when supporting 802.11b and 802.11g operation modes.
Configuring Transmission Settings

Use the transmission settings to control the power and rate used by the wireless interfaces. To configure the transmission settings, in the device navigation tree, select Wireless Settings, then edit the default values for the following settings:

- **Transmit Power**—This setting controls the power transmission and radio range. By default, the power level is set to full; available settings include an eighth, half, minimum, or quarter. You might need to edit this setting when using more than one wireless interface in the same location and frequency.
- **Data Rate for AP**—This setting controls the wireless interface data transmission rate for sending frames. By default, the rate is set to best rate (the wireless interface uses the best rate first, and then automatically falls back to the next rate if transmission fails).
- For 11b transmissions, available rates are 1, 2, 5.5, and 11mbps.
- For 11g transmissions, available rates are 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps.

Configuring Advanced Wireless Settings

Use the advanced wireless settings to control low-level wireless networking settings, such as aging values and collision protection. When you first deploy the NetScreen-5GT Wireless device on your network, the network settings are already configured with default settings designed to work in most networking environments. However, you might want to edit these settings to meet your specific wireless networking needs.

You can edit the default values for the following wireless networking settings.

Configuring Aging

The aging interval is the amount of time (in seconds) that a wireless client or bridge remembers an access point after communication with the WAP is lost. To configure the aging setting, in the device navigation tree, select **Wireless Settings > Advanced**, then edit the default aging value.

The default is 300 seconds; acceptable range is 60 to 1,000,000 seconds. To disable aging, set the value to 0 (zero).

Configuring Beacons

A WAP broadcasts beacon packets to keep the wireless network synchronized and to inform wireless clients of waiting data. A beacon packet includes data such as the wireless LAN service area, the WAP address, and Delivery Traffic Indicator Maps (DTIMs).

To configure the beacon settings, in the device navigation tree, select **Wireless Settings > Advanced**, then edit the default values for the following settings:

- **Beacon Interval**—The beacon interval is the amount of time between beacons sent by the NetScreen-5GT Wireless to wireless clients. A beacon transmission
includes the beacon interval; the interval informs receiving devices how long they can wait in low-power mode before waking up to handle beacons. Increasing the beacon interval lessens the number of beacon responses required by a wireless client, enabling clients to reduce battery power. The default value is 100 time units; acceptable range is 20 to 1,000 time units (1 time unit equals 1024 µs).

- Beacon Interval Between DTIMs—This interval is the amount of beacon intervals between Delivery Traffic Indicator Map (DTIM) messages, which inform wireless clients of waiting data. A lower value enables wireless clients to download waiting data more often; a higher value enables wireless clients to wait in low-power mode longer between DTIMs. When using a high DTIM value however, the client must stay active longer to collect waiting data, and clients might miss broadcast and multicast traffic messages. The default value is 1 beacon interval; acceptable range is 1 to 255.

Configuring Burst and Fragment Size

Use the burst and fragment setting to configure how the device transmits wireless packets over the network. To configure the burst and fragment settings, in the device navigation tree, select Wireless Settings > Advanced, then edit the default values for the following settings:

- Maximum Number of Frames in a Burst—The burst threshold defines the average maximum number of frames a WAP can use to handle wireless traffic before the device begins sending traffic in bursts. When wireless traffic exceeds the specified threshold, the device sends wireless packets in bursts to clients, who can switch to a low-power sleep state between bursts. The default value is 3 frames; acceptable range is 2 to 255 frames.

- Fragmentation Threshold—The fragmentation threshold defines the maximum size of a packet that can be transmitted without fragmentation. If the packet size exceeds the specified threshold, the sender (client or WAP) must fragment the packet before transmitting.

Using a high fragmentation threshold reduces the number of fragments on the wireless network, which can increase efficiency. However, large, unfragmented packets can be corrupted during transmission, requiring resend attempts that can decrease efficiency. The default value is 2346; acceptable range is even numbers between 256 and 2346.

Configuring Control Frame Protection

Control frame protection is designed to help avoid collisions on the wireless network. Transmission collision usually occurs when two wireless devices are within range of the same WAP, but are not within range of each other (they are hidden nodes). If two wireless transmissions collide at the WAP, the data in each transmission is lost.

To avoid collisions, you can require wireless clients to first request permission to send data (clients must send a request-for-send (RTS) frame) and/or receive approval of that request (client must receive a clear-to-send (CTS) frame) before transmitting data.
Because 802.11b stations can’t hear 802.11g stations using Orthogonal Frequency Division Multiplexing (OFDM), a method for wireless transmission that divides a signal and transmits the pieces at different frequencies simultaneously, traffic from these stations can collide on the network, reducing network efficiency. We recommend you enable protection to avoid collisions when supporting 802.11b and 802.11g operation modes.

NOTE: CTS protection is not supported when using 802.11b only.

To configure the control frame protection settings, in the device navigation tree, select Wireless Settings > Advanced, then edit the default values for the following settings:

- **Threshold for RTS to Transmit**—The request-to-send (RTS) threshold defines the maximum size of a packet that a wireless client can send without obtaining permission from the WAP. If a packet exceeds this threshold, the client must send an RTS message to the WAP requesting permission to send the packet. You might want to adjust this setting to control traffic flow through an access point that services a large number of clients. The default is 2346; accepted range is 256 to 2346.

- **CTS Protection Mode**—Enables Clear to Send (CTS) control frame protection, which requires wireless client to first receive a CTS frame from the WAP before sending data. Select one of the following protection modes:
  - **On**—When selected, wireless clients must first receive a CTS frame from the device before sending data.
  - **Off**—When selected, wireless clients do not send CTS control frames.
  - **Auto**—When selected, the device automatically detects the CTS mode used by the wireless client. This is the default setting.

- **CTS Protection Type**—The protection type defines the level of control frame protection enforced by the device. Select one of the following protection types:
  - **CTS Only**—When selected, wireless clients must first receive a single, self-directed CTS frame from the device before sending data. This is the default setting.
  - **CTS-RTS**—When selected, wireless clients must first send an RTS frame and receive a CTS frame from the device before sending data (a two-frame exchange occurs prior to the actual network transmission).

- **CTS Rate**—The CTS rate defines the data rate (in Mbps) at which CTS frames are sent. The default rate is 11 Mbps, acceptable values are 1, 2, 5.5, and 11.

### Configuring Short Slots

Short slots, an 802.11g-only feature, can increase efficiency and throughput for wireless traffic. By default, the device supports 802.11g traffic that uses short slots. However, because 802.11b does not support short slots, you might want to disable short slots for all protocols when your wireless network is handling 802.11b traffic.
To disable short slot for 802.11g packets, in the device navigation tree, select Wireless Settings > Advanced, then select Set Slot Time to Long.

**Configuring Preambles**

A preamble is the sequence of bits within a transmission that, when recognized and received by a wireless client, enables the client to locate the remaining packets in the transmission. The preamble length is defined in the Synchronization field of a wireless packet, and can be long or short:

- A long preamble (128 bits) provides the wireless client more time to process the preamble, which can provide greater interoperability with older wireless protocols and non-short-preamble equipment. All 802.11 devices support a long preamble.
- A short preamble (56 bits) can improve efficiency because the client does not spend time processing the preamble. However, older wireless protocols do not support short preambles.

By default, the device does not support long preambles. To enable long preambles for 802.11b packets only, in the device navigation tree, select Wireless Settings > Advanced, then select Long Transmit Preamble.

**Configuring Wireless MAC Access Lists**

The access control list (ACL) controls the wireless clients that can connect to the wireless network. The ACL identifies clients by their MAC addresses and directs the device to permit or deny access for each address. The ACL settings apply globally to all basic service sets (BSSs).

**Configuring MAC Access Mode**

You can configure the ACL to operate in one of the following modes:

- Disabled—When enabled, the security device does not filter MAC addresses. This is the default mode.
- Enabled—When enabled, the security device permits access to all hosts except those marked with a Deny control status. Use this option when you want to deny specific hosts, but allow unknown hosts to connect.
- Strict—When enabled, the security device denies access to all hosts except those marked with an Allow control status. Use this option when you want to restrict network access to specific hosts.

To configure the ACL mode, in the device navigation tree, select Wireless Settings > MAC Access List, then select the MAC Access Mode.

**Configuring MAC Addresses**

You can specify a maximum of 128 MAC addresses. To add an address, in the device navigation tree, select Wireless Settings > MAC Access List, then click the Add icon to display the New MAC address dialog box. Configure the following:

- MAC Address—Defines the MAC address of the client.
Control Status—The control status defines the action the device takes when a client with the specified MAC address is detected.

For example:
- If the control status is set to Deny and the MAC access mode is set to Strict, the device denies the client.
- If the control status is set to Allow and the MAC access mode is Deny or Strict, the device allows the client to connect.

**NOTE:** NSM does not support the learned MAC address list.

### Configuring Wireless SSIDs

To enable wireless clients to connect to the NetScreen-5GT Wireless security device, you must configure at least one basic service set (BSS) that defines and controls how the device handles traffic through a wireless interface.

You can create up to eight basic service sets, but the device can only use a maximum of only four at one time. You might want to configure extra service sets when your network uses site-specific or time-specific BSSs—to enable different BSSs, bind or unbind their corresponding SSIDs to interfaces.

### Configuring General SSID Settings

A new SSID does not contain default general settings; you must at least configure a name and select wireless interface for the SSID before the device can handle wireless traffic for that BSS.

- **Name**—The name uniquely identifies the BSS. The device uses the SSID name to distinguish the interface to route wireless traffic to. For enhanced security, do not assign the SSID a meaningful name that an attacker might be able to determine through reconnaissance, such as the department or location of the WAP. You can also make the name difficult to guess by using a mix of upper- and lowercase letters, numbers, and symbols. When the SSID name contains one or more spaces, enclose the name within quotation marks.

- **Suppressing Transmission of SSID Information**—When enabled, the device does not display the SSID name in broadcasts. Because the name is not broadcast, attackers must work harder to obtain the SSID name.

- **Isolation of Clients on the Same SSID**—When enabled, prevents wireless clients on the same subnetwork (SSID) from communicating directly with each other and bypassing the security device.

- **Wireless Interface**—Select the wireless interface (wireless 1 or wireless 2) that handles traffic for the SSID. The device routes all wireless traffic with the specified SSID name through this interface.
Configuring SSID Authentication and Encryption

Each SSID can use specific authentication and encryption settings, enabling you to configure differing levels of security for different resources. By default, the authentication/encryption is set to none; we strongly recommend that you select one of the supported authentication/encryption methods. The NetScreen-5GT Wireless device supports WEP and WPA authentication and encryption methods; to ensure the highest level of security we recommend that you select WPA as your authentication/encryption method.

The Wired Equivalent Privacy (WEP) uses the Rivest Cipher 4 (RC4) stream cipher algorithm to encrypt and decrypt data as it travels over the wireless link. You can store WEP keys locally on the security device or externally on an external authentication server. Wireless network users store one or more of the same keys on their systems and identify them with the same ID numbers. For details on configuring WEP, see “Configuring Wired Equivalent Privacy (WEP)” on page 305.

The Wi-Fi Protected Access (WPA) method patches many of the security vulnerabilities found in WEP, greatly enhancing payload integrity checks and the key exchange process. You can use WPA in one of the following modes:

- **WPA Mode**—In this mode, also known as Enterprise Mode, the device uses the Extensible Authentication Protocol (EAP) for authentication through a 802.1X-compliant RADIUS server (such as the Funk Odyssey RADIUS server and the Microsoft IAS RADIUS server). When handling wireless traffic, the device forwards authentication requests and replies between the wireless clients and the RADIUS server; after successfully authenticating a client, the RADIUS server sends an encryption key to both the client and to the device. The device itself manages the encryption process using Temporal Key Integrity Protocol (TKIP) or Advanced Encryption Standard (AES).

- **WPA-PSK**—In this mode, also known as Personal Mode, the device uses preshared keys (Preshared Key = PSK) or passphrase for authentication and encryption. Keys are stored on the device and on all wireless clients; you do not need to configure a separate authentication server.

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**NOTE:** For details about TKIP, see the IEEE standard 802.11. For details about AES, see RFC 3268, “Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS).”

For details on configuring WPA, see “Using Wi-Fi Protected Access (WPA)” on page 308.

### Configuring Wired Equivalent Privacy (WEP)

Although you can configure WEP for all the basic service sets (BSSs), the NetScreen-5GT Wireless (ADSL) device intentionally restricts its use to only one BSS at a time.

- **Auto**—When selected, the device automatically negotiates with wireless clients whether or not the client authenticates itself with a WEP shared key (device accepts both open encryption or shared-key authentication). Use this option to
improve compatibility between the WAP and wireless devices using various operating systems that support different implementations of WEP.

- **Open**—When selected, a wireless client must provide the SSID to the device before the device authenticates the client. For encryption, select one of the following:
  - **None**—When selected, no encryption is performed.
  - **WEP**—When enabled, an authenticated wireless client must provide a WEP key to the device before the client can encrypt and decrypt communication over the WLAN. Because the Open option is insecure (especially if the device is configured to broadcast the SSID), we recommend that you also enable WEP encryption.

When using WEP encryption, you must also select a key source, which specifies the location of the WEP key:

- **None or Local**—The key is stored on the security device. This is the default key-source when None is selected. When enabled, you must configure a default WEP key on the security device.
- **Server**—The key is stored on a RADIUS authentication server. When enabled, you must configure a RADIUS authentication server to handle WEP key requests (you do not need to configure or use a WEP key on the security device).
- **Both**—The key is stored on the security device and on the RADIUS authentication server. When enabled, you must configure a RADIUS authentication server to handle WEP key requests and configure a default WEP key on the security device.

- **Shared Key**—When selected, both the device and the wireless clients use the same key for authentication and encryption/decryption. You must configure a default WEP key on the security device.

During a shared key exchange:

a. The wireless client contacts the device.

b. The device responds to the client with a clear-text challenge text string that the client must then encrypt with the correct WEP key and return to the device.

c. The device receives the encrypted string from the client, decrypts it, and compares it with the original. If the strings match, authentication is successful; if the strings do not match or the client does not respond, authentication fails.

Although this method uses WEP keys for encryption, an attacker might be able to intercept both the clear-text challenge and the same challenge encrypted with a WEP key, and potentially decipher the WEP key.

**Configuring WEP Keys**

You can define WEP keys on the security device for BSS use. The security device, acting as a wireless access point (WAP), uses WEP keys for authenticating wireless
clients in that BSS, and for encrypting and decrypting traffic sent between itself and the clients.

You can define one to four WEP keys for each BSS on the security device. Using multiple keys enables you to adjust the level of security for different wireless clients within the same BSS; you can use longer keys to provide greater security for some traffic and smaller keys to reduce processing overhead for other, less critical traffic.

When you define only one WEP key on the security device, that key is the default key and handles all encryption, authentication, and decryption. When you define multiple keys on the security device, you can designate non-default keys to handle authentication and decryption (the default key always handles encryption). If you do not specify a default key, the first key you define automatically becomes the default key.

Wireless clients can use a static WEP key stored on the device, or a dynamic key on an external RADIUS server.

- When clients use a unique, dynamic WEP key from an external RADIUS server, the security device also uses this unique key—which it also receives from the RADIUS server—for bidirectional communication.
- When clients use static WEP keys stored locally on the security device, the device uses the default key to encrypt all transmitted wireless traffic. Clients must also have the default key loaded to decrypt traffic from the device.

The Key ID enables WEP key configuration and sets the WEP identification value. When all WEP keys are stored on the security device, you can assign the default key ID as 1, 2, 3, or 4.

However:

- When using WEP keys stored on the security device and dynamic WEP keys created by an external RADIUS server (RADIUS dynamically creates and distributes a different key per session for each wireless client), the ID for the default WEP key on the security device cannot be 1 because the RADIUS server uses 1 as the ID for all its keys. The security device can use a default WEP key with key ID 2, 3, or 4 for encryption, and a different WEP key with ID 1, 2, 3, or 4 for authentication and decryption.
- When all WEP keys are on an external RADIUS server, the server uses a key ID of 1 for all its keys (RADIUS dynamically creates and distributes a different key per session for each wireless client).

An encryption key length specifies the length of the key in bits. Juniper Networks supports two WEP key lengths: 40 and 104 bits. Because the keys are concatenated with a 24-bit initialization vector (IV), the resulting lengths are 64 and 128 bits.

Longer keys are more secure than shorter keys, but longer keys take longer to process and can reduce throughput speeds. Select the key length that is appropriate to the importance of the wireless traffic you want to protect:

- 40-bit—A 40-bit encryption length enables you to enter 10 hexadecimal digits or 5 ASCII characters.
104-bit—A 104-bit encryption length enables you to enter 26 hexadecimal digits or 13 ASCII characters.

The encryption method defines the string type (ASCII or Hexadecimal) for the WEP key:

- **ASCII**—Plain text string.
  - When using 40-bit length and ASCII method, enter 5 ASCII characters.
  - When using a 104-bit length and ASCII method, enter 13 ASCII characters.

- **Hexadecimal (default)**—A hexadecimal string uses only A-F and characters and 0-9 numbers. For example, 662ADC918DDD662ADC918DDD66 is a valid hexadecimal string but CADETS01234567890123456789 is not; the T and S are outside the valid hexadecimal range. The number of hexadecimal characters you enter depends on the specified key length:
  - When using 40-bit length and hexadecimal method, enter 10 hexadecimal characters.
  - When using a 104-bit length and hexadecimal method, enter 26 hexadecimal characters.

When using a single key on the security device for encryption, decryption, and authentication, you must define the default WEP key.

You can specify a static, non-default WEP key that the security device uses for authenticating and decrypting traffic received from wireless clients. However, each client must also load the WEP key (and ID) before they can authenticate themselves and send encrypted traffic to the security device. If a client does not supply a key ID, the security device attempts to use the default WEP key to authenticate the client and decrypt its traffic.

**Using Wi-Fi Protected Access (WPA)**

You can configure the SSID to use WPA enterprise mode or WPA personal mode:

- **WPA (Enterprise Mode)**—authentication uses an external RADIUS auth server for authentication. When using WPA, you must also configure the rekey interface and encryption method:
  - Encryption—The encryption setting specifies the encryption method used between the security device and wireless clients in the subnetwork. Select one of the following:
    - **AES**—The American Encryption Standard (AES) is used by WPA 2 devices. AES uses the Robust Security Network (RSN) cipher for encryption. This complex encryption mechanism is a block cipher (operates on 128 bit data blocks).
    - **TKIP**—The temporal key integrity protocol (TKIP) is used by WPA 1 devices. TKIP is a key management protocol that handles key generation and key synchronization; TKIP uses the RC4 algorithm for encryption.
    - **Auto**—When enabled, the device uses the encryption method (AES or TKIP) used by the client.
- **rekey-interval**—The rekey interval defines the number of seconds between group key updates. To enable key updates, select Value; the default interval is 1800 seconds and the acceptable range is 30-42949672 seconds. To disable key updates, select Disabled.

- **WPA-PSK (Personal Mode)** authentication uses a passphrase or pre-shared key on the security device to permit access to the SSID. When using WPA, you must also configure the WPA-PSK authentication and encryption method:
  
  - **Authentication (WSA-PSK)**—Specifies the authentication options for wireless clients attempting to access the SSID:
    - **Passphrase**—When enabled, you must configure a passphrase (8-63 ASCII characters) that permits access to the SSID.
    - **PSK**—When enabled, you must enter a pre-shared key (256 bit/64 characters hexadecimal) that permits access to the SSID.
  
  - **Encryption**—The encryption setting specifies the encryption method used between the security device and wireless clients in the subnetwork. Select one of the following:
    - **AES**—The American Encryption Standard (AES) is used by WPA 2 devices. AES uses the Robust Security Network (RSN) cipher for encryption. This complex encryption mechanism is a block cipher (operates on 128 bit data blocks).
    - **TKIP**—The temporal key integrity protocol (TKIP) is used by WPA 1 devices. TKIP is a key management protocol that handles key generation and key synchronization; TKIP uses the RC4 algorithm for encryption.
    - **Auto**—When enabled, the device uses the encryption method (AES or TKIP) used by the client.

### Reactivating Wireless Connections

When you make changes to the wireless settings on the security device, you must update the device with your changes before the new settings take effect.

---

**NOTE:** When using an authentication server for wireless authentication, if you enable 802.1X support on that server, you must also reactive the WLAN subsystem before the change can take effect.

Additionally, the device must reactivate its WLAN subsystem to use the new settings. NSM automatically reactivates the WLAN subsystem within the NetScreen-5GT Wireless security device during the device update process.

The reactivation process takes several seconds (approximately 10 seconds) to complete. During reactivation of the WLAN subsystem, the device severs all wireless connections and clears all wireless sessions from the session table. Previously connected wireless clients must reconnect to reestablish their disrupted sessions.
Conducting a Site Survey

When setting up the NetScreen-5GT Wireless (ADSL) device as a wireless access point (WAP), you can scan the broadcast vicinity to see if there are any other WAPs broadcasting nearby. A site survey detects any WAPs emitting a beacon in its area and records the following details about each detected WAP:

- Service set identifier (SSID)
- MAC address
- Received signal strength indicator (RSSI) The RSSI numbers are in decibels (dBs) that indicate the signal-to-noise ratio (SNR). The SNR is the signal level divided by the noise level, which results in a value representing signal strength.
- Broadcast channel

In addition to performing an initial site survey, you might want to perform occasional surveys to ensure that no rogue WAPs are operating in the area.

A site survey takes about 5-10 seconds to complete.

Configuring the Network Module

Some security device systems, such as the NetScreen 500, NetScreen-5000 series and ISG series, contain physical slots in which you can install optional modules.

Viewing Slot Information

- Physical Interface Modules—the Secure Services Gateway (SSG) 520 and 550 security devices use wide area network (WAN) data links to transmit and receive traffic across geographically dispersed networks. You define the properties of the data link by configuring the WAN interface that corresponds to a port on an SSG Physical Interface Module (PIM).
- Copper and Fiber Interface Modules—these modules provide additional ethernet ports.
- Management Modules—these modules provide management functionality for the ISG 2000 and 1000 series devices. The NetScreen-5000 series network modules are known as Security Port Modules (SPMs); SPMs handle general packet processing at Gigabit speeds, enabled by ASIC support.

**NOTE:** On SSG 520 and 550 security devices only, slot 0 is reserved for the device motherboard. The Card Type is referred to as “4 Ethernet interfaces (10/100/1000) fixed”.

The Chassis screens provide additional information about network modules installed in the available chassis slots of an ISG 2000 or ISG 1000 security device. The information displayed in the Chassis screens, including the version and serial number of the card, is obtained from the card installed in the physical device and is read-only.
You must configure the network module before physical interfaces appear in the NSM UI (even for imported devices).

**Physical Interface Module**

The SSG 520 and 550 devices support PIMs for the following WAN interface types:
- Serial
- T1
- E1
- T3 (also known as DS3)

**Serial**

Serial PIMs on SSG devices have two serial ports per PIM, which support full-duplex, synchronous data transmission. These ports can transmit packets at speeds up to 8 Megabits per second (Mbps). You cannot use these serial ports to connect a console or modem.

**T1**

T1 PIMs on SSG devices contain two T1 ports with integrated Channel Service Unit/Data Service Unit (CSU/DSU). These ports provide physical connections to T1 or fractional T1 network media types.

**E1**

E1 PIMs on SSG devices have two E1 ports with integrated Channel Service Unit/Data Service Unit (CSU/DSU). These ports provide physical connections to E1 or fractional E1 network media types.

**T3 (also known as DS3)**

Digital Signal level 3 (DS3) PIMs on SSG devices contain one physical DS3 port with integrated Data Service Unit (DSU). This port provides physical connection to T3 network media types at a bit rate of 44.736 megabits per second (Mbps).

**Interface Modules (Copper)**

A single security device can support a 10/100 Base-T and GBIC card simultaneously; however, the cards are not hot-swappable.

**10/100**

The 10/100Mbps interface module is typically used to support a 10 Base-T or 100 Base-T LAN. The card can support 2, 4, or 8 copper interfaces, and uses RJ45 connectors with twisted pair.
**NOTE:** The ISG 2000 supports a maximum port count of 28. When using 8-port 10/100 modules in each I/O slot, ports five through eight in slot 4 are automatically disabled. You cannot configure these ports for firewall or HA functionality.

## 10/100/1000

The tri-mode card, available for ISG security devices, is a 2 ethernet port 10/100/1000Mbps IO card. The card supports 2 copper interfaces, uses RJ45 connectors and twisted pair, and contains the following IO port configurations:

- 10Mbps Full/Half Duplex
- 100Mbps Full/Half Duplex
- 1000Mbps Full Duplex
- Auto (auto-negotiate link speed/duplex)

### Interface Modules (Fiber)

Fiber interface module provide connectivity for fiber-based, gigabit ethernet LANs.

- **GB**
  - 1 interface (mini-GBIC). This card supports 1 fiber interface and uses an optical cable with SX or LX connectors.
  - 2 interfaces (GBIC). This card supports 2 fiber interfaces and uses an optical cable with SX or LX connectors.
  - GB LX/SX (2 interfaces). This card supports 2 fiber interfaces and uses an optical cable with SX and LX connectors.

### Secure Port Modules (SPM)

Secure Port Modules (SPMs) provide general packet processing and device connection tasks for the NetScreen-5000 series. These modules are based on either the GigaScreen-II or Jupiter-II ASIC.

SPMs handle packets as they enter and exit the system, providing packet parsing, classification, and flow-level processing. SPMs also provide encryption, decryption, Network Address Translation (NAT), and session lookup features. When packets require additional processing, the device forwards the packets to the management module.

NSM supports the following SPMs for the NetScreen-5000 series security devices:
5000-8G SPM—This SPM provides eight 1-Gigabit Ethernet mini-Gigabit Interface Converter (GBIC) ports using hot-swappable transceivers. The 5000-8G delivers up to 4 Gigabits-per-second (Gbps) of firewall and up to 2 Gbps of Virtual Private Network (VPN) capacity. This module is also capable of supporting a total of four aggregate interfaces. The 5000-8G provides port Link and Activity LEDs in addition to Power and Status LEDs.

The 5000-8G2 SPM—This SPM provides eight 1-Gigabit Ethernet mini-Gigabit Interface Converter (GBIC) ports using hot-swappable transceivers. The 5000-8G2 SPM delivers up to 8 Gigabits-per-second (Gbps) of firewall and up to 4 Gbps of Virtual Private Network (VPN) capacity. This module is also capable of supporting a total of four aggregate interfaces, with up to four ports for each aggregate interface. The 5000-8G2 SPM provides port Link and Activity LEDs in addition to Power and Status LEDs.

5000-2G24FE SPM—This SPM provides two 1-Gigabit Ethernet ports and 24 FE ports with up to 2 Gbps of firewall and up to 1 Gbps of VPN process capacity. This module is capable of supporting a total of six aggregate interfaces. This total consists of one aggregate interface for the two 1-Gigabit ports, and five aggregate interfaces for the 24 10/100 Ethernet ports. Only similar ports can be aggregated together. You cannot aggregate a Gigabit port to a 10/100 FE port. The 5000-2G24FE provides port Link and Activity LEDs, in addition to Power and Status LEDs. Mini-GBIC transceivers are hot-swappable.

5000-2XGE SPM—This SPM provides two 10-Gigabit Ethernet ports using hot-swappable 10-Gigabit Small Form Factor Pluggable Module for PHY transceiver. The 5000-2XGE SPM delivers up to 10 Gigabits-per-second (Gbps) of firewall and up to 5 Gbps of Virtual Private Network (VPN) capacity. This module provides port Link and Activity LEDs in addition to Power and Status LEDs.

Viewing Chassis Information

For ISG security devices, you can view read-only information about the modules installed in the chassis of the device.

By default, the chassis includes a management module.

For ISG security devices running ScreenOS 5.0.0-IDP1, or ScreenOS 5.4 or later, the chassis also includes the IDP security module.

WPA2, Extended Range and SuperG Support on ns5GT Wireless

WPA2 is the second generation of WPA security. WPA2 is based on the final IEEE 802.11i amendment to the 802.11 standard. One of the primary improvements in WPA2 is stronger encryption.

Extended Range improves WLAN infrastructure in coverage that is required for connectivity at long ranges and in all corners of the home, office, enterprise, or hot spot.

Super G dramatically increases throughput needed for bandwidth intensive application and growing volume of users. By bonding two 54 Mbps channels, it delivers
significantly higher throughput (up to 108mbps) versus .11b, .11g, and .11a technologies.

**Configuring Wi-Fi Protected Access**

Wi-Fi Protected Access (WPA) is a more secure solution for WLAN authentication and encryption and was designed in response to many of the weaknesses in WEP. NSM supports WPA and WPA2.

WPA and WPA2 support 802.1X authentication, which use an Extensible Authentication Protocol (EAP) method for authentication through a RADIUS server. EAP is an encapsulation protocol used for authentication and operates at the Data Link Layer (Layer 2). For more information, refer to RFC 2284, PPP Extensible Authentication Protocol (EAP).

When using WPA or WPA2 with a RADIUS server, the security device forwards authentication requests and replies between the wireless clients and the RADIUS server. After successfully authenticating a client, the RADIUS server sends an encryption key to the client and the security device. From that point, the security device manages the encryption process, including the encryption type—Temporal Key Integrity Protocol (TKIP) or Advanced Encryption Standard (AES)—and the rekey interval. For information about TKIP, see the IEEE Standard 802.11. For information about AES, see RFC 3268, Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS).

You can also use WPA or WPA2 with a preshared key, which is a static key that is configured on the security device and the client’s device. Both devices use the key to generate a unique key (group key) for the session. You can specify the preshared key by using an ASCII passphrase (password) or in hexadecimal format. You also use the same encryption types as with 802.1X authentication: TKIP or AES.

1. In the main navigation tree, select **Device Manager > Security Devices**.
2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.
3. In the main navigation tree, select **Wireless**.
4. Configure the following:
   - For Select Specific Antenna, select **Antenna diversity**
   - For Channel for wireless AP radio, select **Auto**.
   - For Operation mode for AP, select **802.11b/g**.
   - For Transmit Power, select **Full**.
   - For Data Rate for AP, select the best rate.
   - In the main navigation tree, select **Wireless > SSID**.
5. Select **New** and configure as follows:
   - For Name, enter **my-ssid**.
   - For Wireless Interface, select **wireless 2**.
- For Authentication/Encryption, select WPA2.
- For Select Encryption Method, select Auto.
- For auth-server-name, select rd_1_1_1.
- For Rekey Interval, select None. Rekey interval is the time that elapses before the group key for clients is updated.

6. To configure WPA2-PSK settings, do the following:
   - For Authentication/Encryption, select WPA2-PSK.
   - For WPA2-PSK, select Passphrase. When enabled, you must configure a passphrase (8-63 ASCII characters) that permits access to the SSID.
   - For Passphrase, set a password.
   - For Encryption Method, select TKIP.
   - For Rekey Interval, select Value.
   - For Value, select a value. 1800 is the default value selected.
   - Click OK to apply the settings.

### Configuring Super G

In wireless devices that have an Atheros Communications chipset with Super G® feature, you can enable Super G, which can increase user data throughput rate up to 4 Mbps for 802.11a and 802.11g clients by using the following methods:

- **Bursting**: Allows the device to transmit multiple frames in a burst rather than pausing after each frame.
- **Fast frames**: Allows for more information per frame to be transmitted by allowing a larger-than-standard frame size.
- **Compression**: Link-level hardware compression is performed by a built-in data compression engine.

By default, this feature is disabled.

If wireless clients do not support Super G and the security device has Super G enabled, they can still connect to the wireless network, but the Super G feature is not available.

**NOTE:** You can read more about Atheros Communications Super G chipset at www.atheros.com.

### Configuring Atheros XR (Extended Range)

You can enable Atheros Communications eXtended Range (XR) technology. XR processes 802.11 signals, defined by IEEE 802.11a and 802.11g standards, so that
wireless networks to have fewer “dead spots” and greater range than usual. XR processes weaker signals more effectively and allows greater coverage. XR provides increased coverage at a lower data transmission rate.

Only the first active SSID per radio can support XR. When XR is enabled, the first active SSID per radio uses the XR feature.

1. In the main navigation tree, select **Device Manager > Security Devices**.
2. In the main display area, select a security device and then double-click the device on which you want to define forced timeout. The device configuration appears.
3. In the main navigation tree, select **Wireless**.
4. Configure the following:
   - For Select Specific Antenna, select **Antenna Diversity**.
   - For Channel for wireless AP radio, select **Auto**.
   - For Operation mode for AP, select **802.11b/g**.
   - For Transmit Power, select **Full**.
   - For Data Rate for AP, select the best rate.
   - Select **Enable SuperG** feature. If the security device has more than one radio, make the selection for the radio you want.
   - Select **XR Support**. If the security device has more than one radio, make the selection for the radio you want.
   - Click **OK** to apply the settings.
5. In the main navigation tree, select **Wireless > SSID**.
6. Select New and configure as follows:
   - For Name, enter **my-ssid**.
   - For Wireless Interface, select **wireless 2**.
   - For Authentication/Encryption, select **None**.
   - Click **OK** to apply the settings.

For detailed information on these WLAN features, see the *Concepts & Examples ScreenOS Reference Guide*.
Chapter 13

General Packet Radio Service

General Packet Radio Service (GPRS) networks connect to several external networks including those of roaming partners, corporate customers, GPRS Roaming Exchange (GRX) providers, and the public Internet. GPRS network operators face the challenge of protecting their network while providing and controlling access to and from these external networks. Juniper Networks provides solutions to many of the security problems plaguing GPRS network operators.

In the GPRS architecture, the fundamental cause of security threats to an operator’s inherent lack of security in GPRS Tunneling Protocol (GTP). GTP is the protocol used between GPRS Support Nodes (GSNs). Communication between different GPRS networks is not secure because GTP does not provide any authentication, data integrity, or confidentiality protection. Implementing Internet Protocol Security (IPSec) for connections between roaming partners, setting traffic rate limits, and using stateful inspection can eliminate a majority of the GTP’s security risks. Juniper Networks security devices mitigate a wide variety of attacks on the Gp, Gn, and Gi interfaces.

NOTE: Only ISG 2000 devices support GTP functionality. For more information on GPRS, see Concepts and Examples ScreenOS Reference Guide.

This chapter contains the following sections:

- 3GPP R6 IE Support on page 317
- DHCP Relay on page 319

3GPP R6 IE Support

Information Elements (IEs) are included in all GTP control message packets. IEs provide information about GTP tunnels, such as creation, modification, deletion, and status. NSM supports IEs consistent with 3GPP Release 6. If you are running an earlier release, or have contractual agreements with operators running earlier releases of 3GPP, you can reduce network overhead by restricting control messages containing unsupported IEs.

In 3GPP R6, the following new IEs have been added:

- Radio Access Technology (RAT)
- Routing Area Identity (RAI)
Radio Access Technology

The Radio Access Technology (RAT) information element provides ways to stimulate Wideband Code Division Multiple Access (WCDMA), and to perform reporting via billing information systems.

Routing Area Identity and User Location Information

Some countries restrict subscriber access to certain types of network content. To comply with these regulatory demands, network operators need to be able to police subscriber’s requested content before allowing a content download. NSM gives network operators the ability to screen content based on the Routing Area Identity (RAI) and User Location Information (ULI) IEs.

APN Restriction

Multiple concurrent primary Packet Data Protocol (PDP) contexts, and an MS/UE capable of routing between these two access points, can put IP security at risk for corporate users who have both private and a public APN. The APN Restriction IE, added to the GTP create PDP context response message, ensures the mutual exclusivity of a PDP context if requested by a GGSN (or rejected if this condition cannot be met), and thus avoids the security threat.

1. In the main navigation tree, select Object Manager > GTP Objects.
2. In the main display area, select an object and click Edit.
3. In the navigation tree, select IMSI Prefix and APN Filtering.
4. Click New and specify the following:
   - For APN, enter an access point name mobiphone.com.mnc123.mcc456.gprs.
   - For Selection Mode, select Network.
   - Click OK to apply the settings.

IMSI Prefix Filtering

A GPRS Support Node (GSN) identifies a mobile station (MS) by its International Mobile Station Identity (IMSI). An IMSI comprises three elements: the Mobile Country Code (MCC), the Mobile Network Code (MNC), and the Mobile Subscriber Identification Number (MSIN). The MCC and MNC combined constitute the IMSI prefix and identify the mobile subscriber’s home network, or Public Land Mobile Network (PLMN). By setting IMSI prefixes, you can configure the security device to deny GTP traffic coming from nonroaming partners. By default, a security device does not perform IMSI prefix filtering on GTP packets. By setting IMSI prefixes, you configure the security device to filter create pdp request messages and only permit GTP packets with IMSI prefixes.
that match the ones you set. For more information on IMSI prefix filtering, see Concepts & Examples ScreenOS Reference Guide.

1. In the main navigation tree, select **Object Manager > GTP Objects**.
2. In the main display area, select an object and click **Edit**.
3. In the navigation tree, select **IMSI Prefix and APN Filtering**.
4. Click **New** and specify the following:
   - For APN, enter an access point name `mobiphone.com.mnc123.mcc456.gprs`.
   - For Selection Mode, select **Mobile Station, Network, Verified**.
   - For MCC-MNC (Mobile Country-Network Code), select **MCC-MNC** and enter `246565`.
   - Click **OK** to apply the settings.

---

**IMEI-SV**

The International Mobile Equipment Identity-Software Version (IMEI-SV) IE provides ways to adapt content to the terminal type and client application whenever a proxy server for this purpose is not present. This IE is also useful in reports generated from the GGSN, AAA and/or Wireless Application Protocol Gateway (WAP GW). The GTP-aware security device supports the RAT, RAI, ULI, APN Restriction and IMEI-SV in GTP attributes to avoid treatment or categorization as unambiguous traffic, which can be harmful to GPRS traffic or GPRS roaming traffic. These attributes are included in the set of useful filter attributes used to block specific GPRS traffic and or GPRS roaming traffic. When you set an IMEI-SV IE, you must also specify an APN.

---

**DHCP Relay**

Dynamic Host Configuration Protocol (DHCP) was designed to reduce the demands on network administrators by automatically assigning the TCP/IP settings for the hosts on a network. Some security devices can also act as DHCP relay agents, receiving DHCP information from a DHCP server and relaying that information to hosts on any physical or VLAN interface in any zone.

When acting as a DHCP relay agent, the security device forwards DHCP requests and assignments between DHCP clients directly attached to one interface and one or more DHCP servers accessible through another interface. The clients and servers may be in the same security zone or in separate security zones.

You can configure a DHCP relay agent on one or more physical or VLAN interfaces on a security device, but you cannot configure a DHCP relay agent and DHCP server or client functions on the same interface.

When the security device functions as a DHCP relay agent, its interfaces must be in either Route mode or function as a Layer 3 device. For interfaces in Layer 3 mode (that is have IP addresses assigned to the interfaces), you must configure a security policy (from zone to zone or intrازone) to permit the predefined service DHCP-Relay before forwarding occurs.
You can configure up to three DHCP servers for each DHCP relay agent. The relay agent unicasts an address request from a DHCP client to all configured DHCP servers. The relay agent forwards to the client all DHCP packets received from all servers. For more information on DHCP configuration, see the Concepts & Examples ScreenOS Reference Guide.

**NOTE:** When a security device acts as a DHCP relay agent, the device does not generate DHCP allocation status reports because the remote DHCP server controls all the IP address allocations.
Part 2
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