

NFV 511-WBT vRouter Management & Logging

NFV 511-WBT AT&T Vyatta 5600 vRouter Management & Logging

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Welcome to the AT&T vRouter Dynamic Multipoint VPN course.

NFV 511-WBT vRouter Management & Logging

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NFV 511-WBT vRouter Management & Logging

Course Objectives

After completing this course, you will be able to:

- Configure vRouter to communicate with an SNMP server
- Access system logs
- Configure vRouter to communicate with an external SYSLOG server
- Use vRouter logs and monitoring to troubleshoot configuration and operational problems
- Discuss sFlow and configure vRouter as an sFlow agent
- Configure the vRouter as a NetFlow exporter

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After completing this course, you should be able to:

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- Access system logs
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- Discuss sFlow and configure vRouter as an sFlow agent
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We'll begin with an overview of 5600 vRouter SNMP support, as well as the steps for configuring SNMP.

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vRouter SNMP Support

vRouter supports SNMP versions 2c and 3

sysObjectID = 1.3.6.1.4.1.30803
sysDescr = AT&T_version_info


SNMP Manager

Uses standard SNMP messages (GET, SET, TRAP) to monitor devices

Management Information Base (MIB)

vRouter has no specific enterprise MIB

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Simple Network Management Protocol (SNMP), is a standard for managing and monitoring network devices, including vRouters. The vRouter supports both SNMP version 2c and 3. We will discuss configuration for version 2c first.

The vRouter is pre-configured with the sysObjectID and sysDescr string as shown on the screen.

This system information can be pulled into your SNMP management station using standard SNMP GET messages. GET messages can also gather device operational statistics. You can use SET commands to set event conditions and thresholds on the vRouter. When the event occurs, or when the vRouter reaches a threshold, it will send a TRAP to the management station.

The actual thresholds and events, as well as monitoring settings, are defined in a Management Information Base (MIB).

Unlike other vendors, vRouter does not have a customized MIB specific to a vRouter. Instead, we utilize industry-standard MIBs. The vRouter support team has provided a list of MIBs that they use in production and lab environments to monitor vRouters.

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Configuring SNMP v2

Define SNMP community

```
set service snmp community string  
edit service snmp community string
```

Set address of SNMP manager in community

```
set client ipaddress
```

Set privilege level for community

```
set authorization [rw | ro]
```

Specify address to listen for SNMP messages (optional)

```
set service snmp listen-address ipaddress [port]
```

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To enable SNMP on a vRouter, you need to define the SNMP community string. This is a string of characters that identifies a level of access to your vRouter. Your SNMP management station must have the same community string defined in order to communicate with the vRouter.

Because there are multiple parameters associated with the community string, we recommend using the edit command. This saves you some typing, and ensures all parameters are associated with the same string.

In edit mode, set the address of the SNMP management station associated with the community string. You can specify multiple client addresses.

Next, specify the privilege level for the community string – read/write, or read-only.

You can optionally set the address you want the vRouter to listen on for SNMP requests. If you do not configure this, the device will automatically listen on all active interfaces.

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Configuring SNMP v2 (cont.)

Set trap destination

```
set service snmp trap-target ip-address
```

Optional – set source for traps

```
set service snmp trap-source ip-address
```

Set device information

```
set service snmp contact string
```

```
set service snmp description string
```

```
set service snmp location string
```

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If you plan to have the vRouter send traps, you also need to specify the IP address of the SNMP manager receiving those traps. Optionally, you can specify the source address for the traps. If you do not specify, the vRouter will use the IP address of the outbound interface sending the trap message. You can set basic device information. When the SNMP management station first establishes communication with the vRouter, it will pull this information.

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SNMP v2 Scenario

Community information

String: *KeepOut*
Permissions: read/write

Traps go to management station

Device information

Contact: Joe Admin
Description: vRouter
Location: San Francisco

The diagram illustrates a network configuration. On the left, there is a circular icon representing a vRouter with the text "dp0p1p1" and "192.168.42.1/24" next to it. A blue line connects this vRouter to a server rack icon on the right, which is labeled "SNMP Mgmt" and "192.168.51.150".

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Let's look at a configuration example. In this scenario, our SNMP management station is at 192.168.51.150. We want messages to that station to originate from the address assigned to data plane interface 1 – 192.168.42.1.

The community string is *KeepOut*, with read-write permission.

All traps should be sent to the management station.


For the device information, the contact is *JoeAdmin*. The description is *Vyatta*, and the location is *San Francisco*.

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SNMP v2 Configuration

```
[edit]
vyatta@vyatta# edit service snmp community KeepOut
[edit service snmp community KeepOut]
vyatta@vyatta# set client 192.168.51.150
[edit service snmp community KeepOut]
vyatta@vyatta# set authorization rw
[edit service snmp community KeepOut]
vyatta@vyatta# up
[edit service snmp community]
vyatta@vyatta# up
[edit service snmp]
vyatta@vyatta# set trap-target 192.168.51.150
[edit service snmp]
vyatta@vyatta# set contact "Joe Admin"
[edit service snmp]
vyatta@vyatta# set description "vRouter"
[edit service snmp]
vyatta@vyatta# set location "San Francisco"
[edit service snmp]
vyatta@vyatta# commit
[edit service snmp]
vyatta@vyatta#
```

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We begin with the `edit` command shown. This command creates the community string *KeepOut*, and moves us within the configuration hierarchy to set parameters associated with the string.

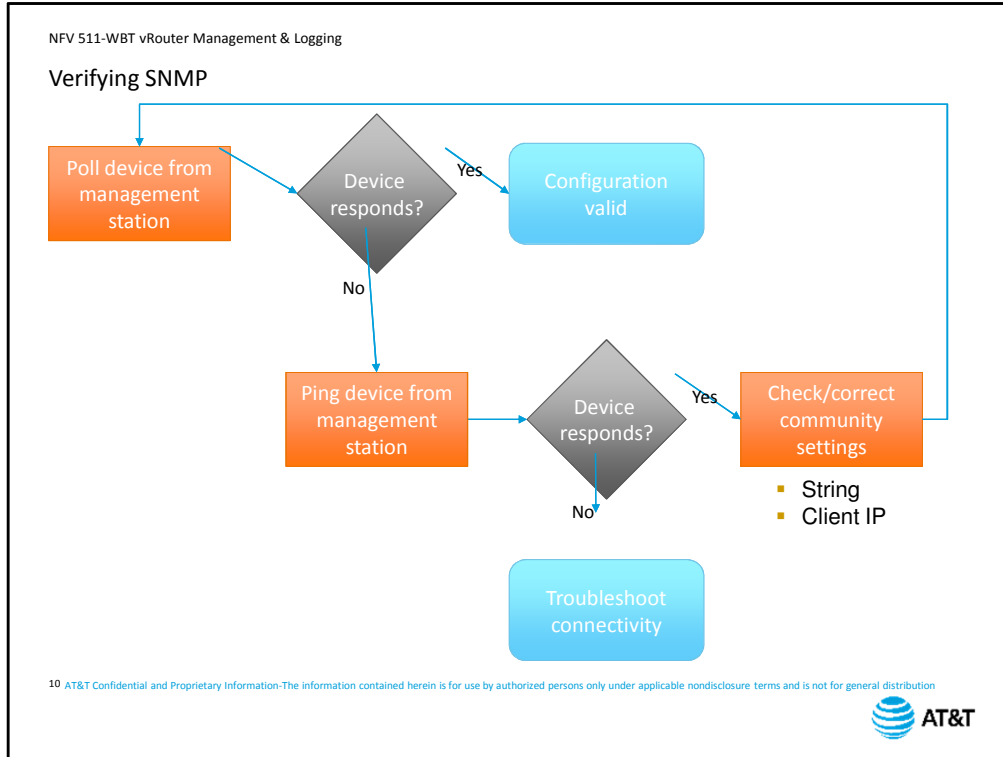
Next, we configure the address of the SNMP management station.

Next, we set the authorization to *read-write (rw)*.

We go up two levels to exit the community string, then set the trap target. We do not need to set the trap source, since data plane interface 1 is the interface that will be generating the trap messages.

Finally, we set the contact information, the description, and the location. Note that we used quotes around the text so that the space characters are preserved.

Finally, we commit our changes.



The best way to verify overall SNMP functionality is to poll your vRouter from your SNMP management station.

If the device responds to the poll, then your SNMP configuration is valid.

If it does not respond, then verify that basic IP connectivity exists by pinging the device from the management station.

If the device responds to the ping, then you need to verify the community settings on the vRouter.

Check the string for case sensitivity, and verify that the management station is configured as a client.

Retry the poll once you have corrected any misconfiguration. If the device does not respond to the ping, then you have an underlying IP connectivity issue. It could be a routing problem, or there could be a firewall blocking SNMP communications.



Now we will look at vRouter support for SNMP version 3.

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SNMP Version 3

User-Based Security Model (USM – RFC 3414)

Username-based authentication

Provides authentication, data encryption, and timeliness checks

Transport Security Model (TSM – RFC 5591)

PKI-based authentication (requires Certificate Authority)

Provides authentication, data encryption, and timeliness checks


View-Based Access Control Model (VACM – RFC 2275)

Views: list of MIB objects that can be accessed

Groups: list of views that can be accessed

Actions are read-only and read-write

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SNMP version 3 made significant improvements in security and manageability by introducing three major concepts.

The first is the User-Based Security Model or USM.

Instead of having generic “group” keys as with version 2, version 3 allows you to define individual username/password combinations for user authentication.

You can optionally enable encryption. The standard also defines timeliness checks. Since SNMP messages are often time-critical, making sure that messages are current is important for accuracy of information.

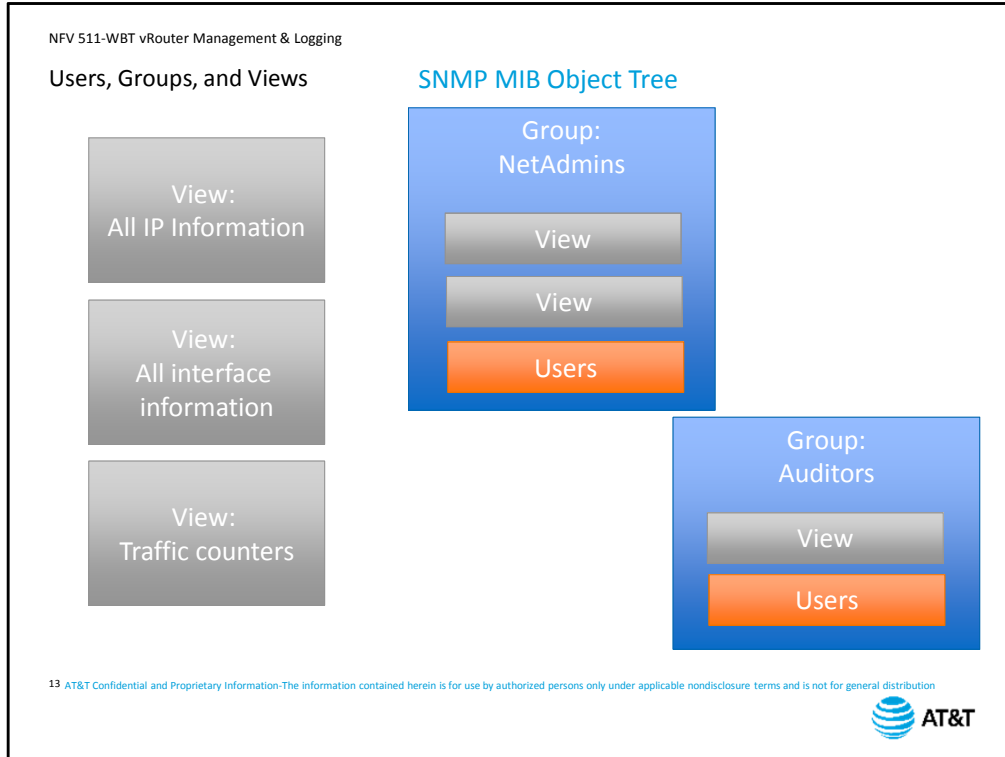
The second is the Transport Security Model or TSM which uses the Public Key Infrastructure for access authentication and encryption. PKI uses certificates to identify devices, and those certificates must be generated and managed by a Certificate Authority.

TSM provides the same benefits as USM, using certificates rather than username/password strings.

Finally, version 3 introduced the concept of View-Based Access Control

You, the administrator, can group specific MIB objects into views, then use Groups to define who can access a view or set of views.

For each group, you can specify an action of read-write or read-only.



Let's look at how users, groups, and views fit together.

A view is a list of SNMP Object Identifiers, or OIDs. You, the administrator, determine how you want to group these OIDs.

The OID structure is a tree, so if you include an object with sub-branches, those sub-branches will also be included in the view.

A group is a list of views. You can have one or more views per group, and you can use the same view in multiple groups.


You then assign individual users to groups. A user can only be assigned to a single group.

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v3 Configuration Steps

- 1. Create Views**
Need to collect OIDs for MIB objects
- 2. Create Groups**
Assign views to groups
- 3. Define Users**
Name and authentication method
USM optional encryption
Assign to group
- 4. Enable traps**
Associate with username

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To configure a vRouter for operations with SNMP version 3, follow these steps. First, you need to create your views. You need to have a MIB browser or a list of OIDs available in order to configure the views. Next, create the groups and assign the views you want available to each group. Next, define the SNMP users. You can use both the User-based Security Model and the Transport Security Model. You'll need to define the authentication method, optionally enable encryption, and assign the user to a group. Finally, you can enable SNMP traps. Traps are also associated with usernames.


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Create Views

Include MIB object
`edit service snmp v3 view name`
`set oid oid-string`
Can be subtree or individual object

Exclude object
`set oid oid-string exclude`

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To create a view, use the command `set service snmp v3 view`. Specify the name of the view and the OID you want included in the view.

If you plan to include several OIDs in a view, it is easier to use the `edit` command to create the view and move within the configuration hierarchy, then use the `set` command to just specify the OIDs.

Remember, the OID can represent an individual MIB object, or can represent a sub-tree of objects.

If you include a tree, but do not want some of the objects within that tree, you can use the `exclude` parameter for those objects you do not want included.

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Create Groups and Assign Views

Configure groups and views

```
edit service snmp v3 group group-name
set view view-name
```


Configure access level

```
set mode [rw | ro]
```

Configure security level

```
set seclevel [auth | priv]
```

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The next step is to create the group and assign the views. If you have only one view for a group, you can do this in a single command. If you have multiple views, again it may be easier to use the `edit` command to create the group, then set each view within the group. Set the group for read-write or read-only access. You also need to specify the security requirements for the group. All users assigned to the group must have the same security level as you set here.

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USM Commands


Configure authentication per user
`set service snmp v3 user name auth plaintext-key string`

Configure encryption per user (optional)
`set service snmp v3 user name privacy plaintext-key string`

Note: Plaintext keys are automatically encrypted and cannot be recovered

Assign users to group
`set service snmp v3 user name group group-name`

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The next step is to define our users. If using User-based Security Model or USM, you create the username and set the password in a single command.

Optionally, you can configure an encryption key. Both the password and the encryption key must be identical on both the vRouter and the SNMP management station.

Although you configure these keys in plain text, they are encrypted automatically by the vRouter and stored in the configuration file in an encrypted format. You would have to decrypt the password to recover it.

Next assign the user to a group, using the group name you defined in the previous configuration step.

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TSM Commands

Before configuration

Generate certificates

Copy certificate fingerprints or files to `/etc/snmp/tls/certs`

Set pointer to user certificates

```
set service snmp v3 user name tsm-key filename
```

Set pointer to device SNMP certificate


```
set service snmp v3 tsm local-key filename
```

Assign user to group

```
set service snmp v3 user name group group-name
```

Note: Encryption is automatic via a secure TLS connection

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If using or TSM, you need to generate certificates for all users and for the vRouter. Copy the certificates to the `/etc/snmp/tls/certs` directory on the vRouter.

Within the configuration file, set the pointer to the appropriate certificate file for each username.

Next, set the pointer to the certificate for the vRouter itself.

Finally, assign the TLS user to the appropriate group.

You do not need to set any encryption keys; the PKI exchange establishes a secured TLS connection between the vRouter and the SNMP management station automatically.

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Enabling v3 Traps

Specify username for trap target

```
edit service snmp v3 trap-target ipaddress  
set user name
```

Specify authentication key for trap target

```
set auth plaintext-key string
```

Optionally, specify encryption key for trap target

```
set privacy plaintext-key string
```

By default, traps are acknowledged

```
set type trap
```

Enable unacknowledged traps

```
set engineid string
```

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Version 3 traps need to be associated with a specific username. This does not have to be a user you've already defined on the vRouter, but it does have to be defined on the SNMP management station. It is a best practice to have a separate user identity for traps.

You also need to specify the authentication key for traps.

If you want traps sent in encrypted format, set the encryption key. As with other keys, both authentication and encryption are configured in plain text, but stored in encrypted format.

Keys must be identical on the vRouter and the SNMP management station.

By default, traps are sent using UDP and are unacknowledged. If you want traps to be acknowledged, you need to configure `type trap`, then set the Engine ID for the device generating the trap responses.

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SNMP v3 Scenario

2 Administrative Roles

Network administrator

- Needs read-write access to IF-MIB (1.3.6.1.2.1.2.2) and IP-MIB (OID 1.3.6.1.2.1.4)
- Must have encryption for all users

Equipment auditing

- Needs read-only access to hardware-related OIDs (1.3.6.1.2.1.1.1.0, 1.3.6.1.2.1.1.2.0, 1.3.6.1.2.1.1.4.0)
- Authentication only


2 Users

NetAdmin

Auditor

[Traps to TrapReceiver at 172.24.42.99](#)

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In our sample scenario, we have two separate administrative roles. The Network Administrator needs read-write access to the complete IF-MIB and the IP-MIB. We have already looked up the OIDs. Users in this group must have encryption as well as authentication. The Equipment Auditor role needs read-only access to specific hardware-related OIDs. Users in this group only require authentication. We have two users on our SNMP management station, Netadmin and Auditor, that we will assign to our groups. Traps will go to the TrapReceiver user on the management station at 172.24.42.99.

```
NFV 511-WBT vRouter Management & Logging  SNMP v3 Configuration

[edit]
vyatta@vyatta# edit service snmp v3 view NetAdminView
[edit service snmp v3 view NetAdminView]
vyatta@vyatta# set oid 1.3.6.1.2.1.2.2
[edit service snmp v3 view NetAdminView]
vyatta@vyatta# set oid 1.3.6.1.2.1.4
[edit service snmp v3 view NetAdminView]
vyatta@vyatta# up
[edit service snmp v3 view]
vyatta@vyatta# up
[edit service snmp v3]
vyatta@vyatta# set group NetAdminGroup view NetAdminView
[edit service snmp v3]
vyatta@vyatta# set group NetAdminGroup mode rw
[edit service snmp v3]
vyatta@vyatta# set group NetAdminGroup seclevel priv
[edit service snmp v3]
vyatta@vyatta# edit user NetAdmin
[edit service snmp v3 user NetAdmin]
vyatta@vyatta# set auth plaintext-key LetMeIn!
[edit service snmp v3 user NetAdmin]
vyatta@vyatta# set privacy plaintext-key KeepOut!
[edit service snmp v3 user NetAdmin]
vyatta@vyatta# set group NetAdminGroup
[edit service snmp v3 user NetAdmin]
vyatta@vyatta#
```

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We configure the first set of view, groups, and users so you can see the syntax in action, then look at the complete configuration.

We begin with creating the NetAdmin view, then assigning the two OIDs to the view.

We go up two levels to exit the view level of the hierarchy.

Next, we create the group and assign the view in a single command.

Then configure the mode of the group to read-write, and set the security level to use encryption. We need to make sure that all users assigned to this group also have encryption configured.

Because we are setting a few parameters for the user, we use the `edit` command to create the username, set the authentication key,

Then set the encryption key. Note that the authentication and encryption keys must be at least 8 characters.


Finally, we assign the user to a group. We repeat the same steps for the second view, group, and user.

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SNMP v3 Configuration (cont.)

```
[edit service snmp v3]
vyatta@vyatta# set trap-target 172.24.42.99 user TrapReceiver
[edit service snmp v3]
vyatta@vyatta# set trap-target 172.24.42.99 auth plaintext-key WarnInG!
[edit service snmp v3]
vyatta@vyatta# commit
[edit service snmp v3]
vyatta@vyatta# save
[edit]
vyatta@vyatta#
```

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To finish our configuration, we start at the `service snmp v3` level of the hierarchy and set the trap target address and username.

Next assign the authentication key. Remember the key must be at least 8 characters. Note, we will not be encrypting or acknowledging trap messages.

We commit our configuration, then save it.

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Configuration – Views, Groups, Users

```

view AuditView {
  oid 1.3.6.1.2.1.1.1.0 {
  }
  oid 1.3.6.1.2.1.1.2.0 {
  }
  oid 1.3.6.1.2.1.1.4.0 {
  }
}

view NetAdminView {
  oid 1.3.6.1.2.1.2.2 {
  }
  oid 1.3.6.1.2.1.4 {
  }
}


group AuditGroup {
  mode ro
  seclvl auth
  view AuditView
}

group NetAdminGroup {
  mode rw
  seclvl priv
  view NetAdminView
}

user Auditor {
  auth {
    encrypted-key ""
    plaintext-key sk382ngy1
  }
  engineid ""
  group AuditGroup
  privacy {
    encrypted-key ""
    plaintext-key k48ci9892
  }
}

user NetAdmin {
  auth {
    encrypted-key ""
    plaintext-key LetMeIn!
  }
  engineid ""
  group NetAdminGroup
  privacy {
    encrypted-key ""
    plaintext-key KeepOut!
  }
}
    
```

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When we look at the both views, we see the list of OIDs assigned to each view. The views are then associated with the groups we created, along with the mode and security level

The users are associated with the groups. Because we have not yet established a connection with an SNMP management station, the key strings are still in plaintext. The engine ID field will be populated once a connection is established, and identifies the specific management station that authenticated the user.

Also note that, although the Audit group security level is set to authentication, the Audit user still has a privacy key configured. This works because the user is more secure than the group definition requires. If you try to assign a user with authentication-only security to a group that requires encryption, you will get a commit error.

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Verifying SNMP v3 Configuration

Use `show snmp v3` Operational mode commands to verify configuration

Verify operations from an SNMP Management station

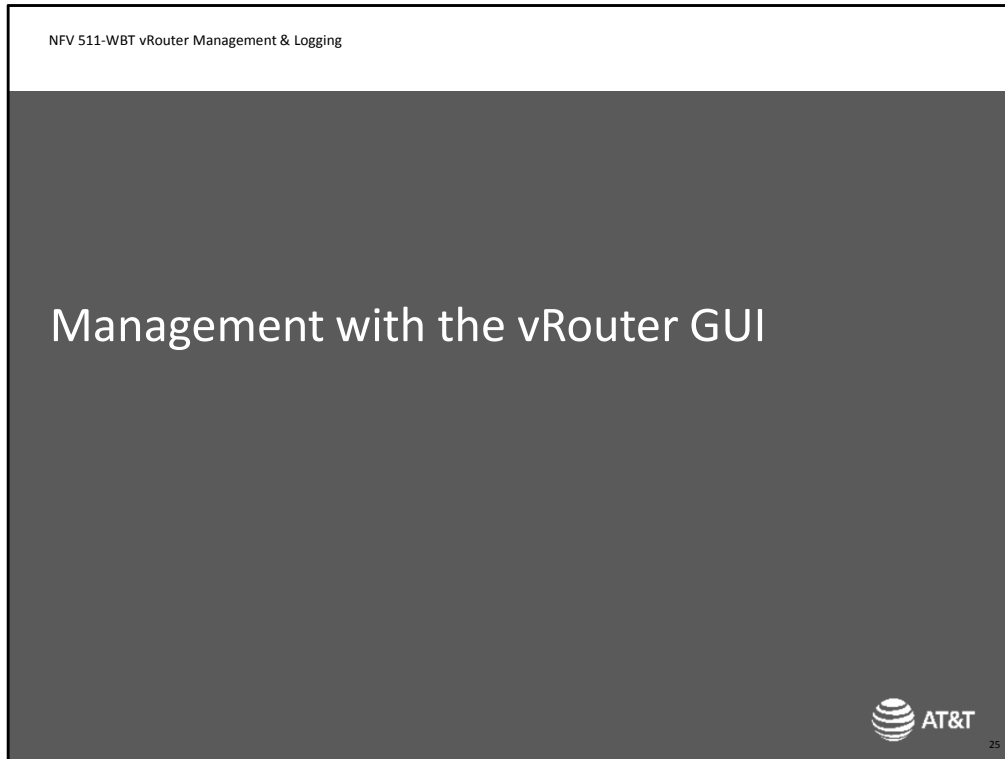
```
vyatta@VY1A1:~$ show snmp v3 ?
Possible completions:
<Enter>          Execute the current command
certificates     Show TSM certificates
group            Show the list of configured groups
trap-target      Show the list of configured targets
user             Show the list of configured users
view             Show the list of configured views
```

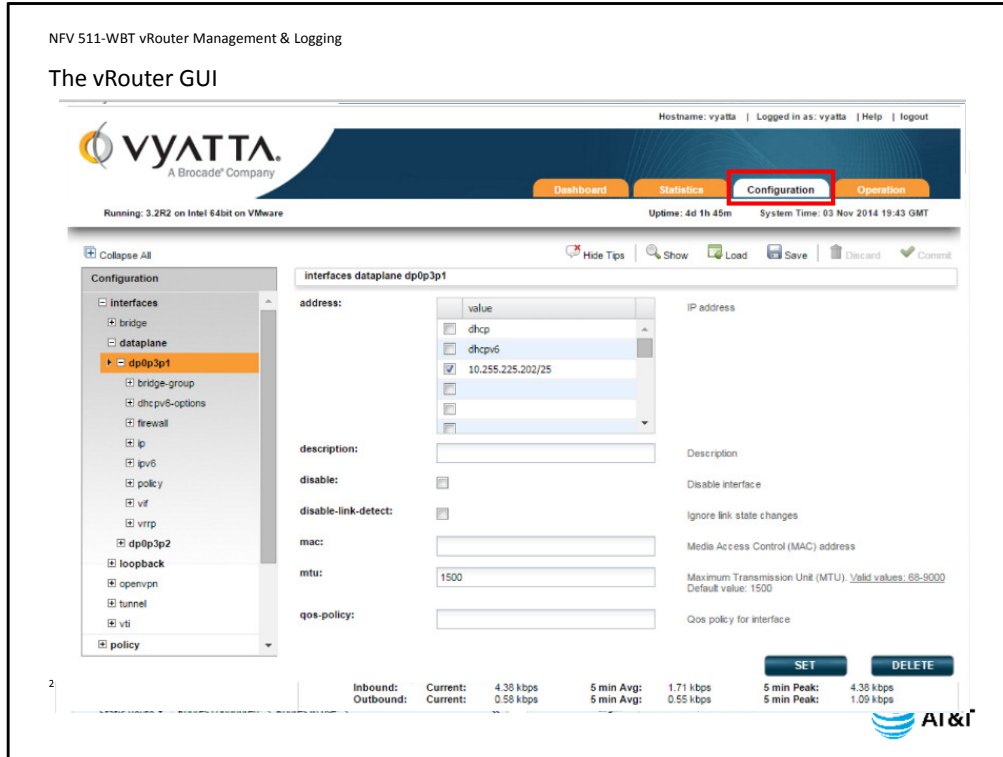
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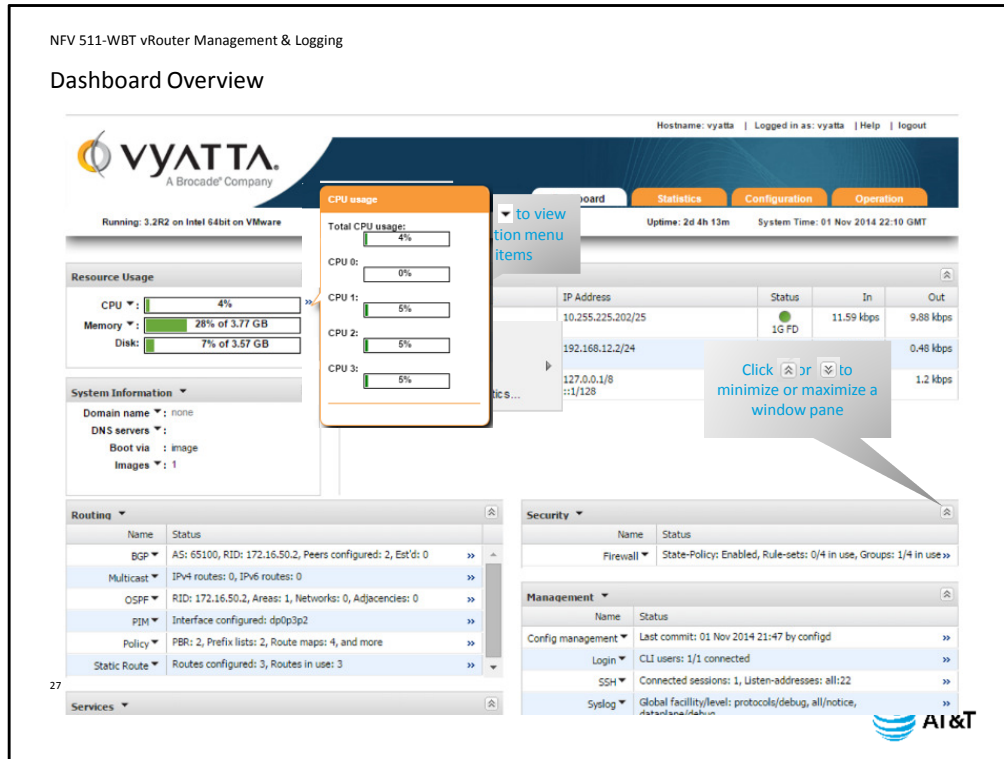
As with SNMP version 2, the vRouter can only verify your configuration data from the CLI. You can use `show` commands to display the list of known certificates, group configuration, trap target configuration, users, and view configuration.

To verify actual operations, you will need to use your management station to test the access to the vRouter.





The vRouter GUI provides you with an easy-to-use graphical view of your vRouter. The Dashboard tab gives you a single-screen overview of what is happening on your vRouter. We will go through the Dashboard windows in more detail on the next slide. The Statistics tab allows you to view interface and resource utilization graphs. The graph updates every 5 seconds, and displays a sliding 5 minute window. The Configuration tab provides you with a drop-down menu on the left to navigate the configuration hierarchy, then fields to enter configuration parameters. The Operation mode tab provides you with a drop-down menu on the left to navigate Operational mode commands, then displays the output on the right. Because this course is about managing your 5600 vRouter, we are going to focus on the Dashboard tab.



The vRouter GUI Dashboard provides you with one-stop monitoring for your vRouter. Information about key features and functionality are summarized on a single screen, making it easy to see the enabled features and overall device function in one place. Another feature of the Dashboard is the ability to view additional information about a particular object without having to open a new window. Blue double-right arrows next to a displayed item indicates that more details are available. Click on the arrows, and a pop-up window appears with the additional information – in this case, the summary of the CPU usage. Clicking anywhere on the main screen causes the pop-up to disappear. A black down-arrow indicates that there are jump-to options available. The actual options depend on the feature or function. *Edit* will jump you to the configuration tab, with the configuration menu hierarchy set to the appropriate level for the feature or device. In this case, clicking on *Edit* would take you to the “set interfaces data plane 1” level. *Run* will jump you to the Operation tab, with the selected command – in this case, either clear or show – selected and ready to run. *Statistics* will jump you to the Statistics tab and display the appropriate graph. You can customize your Dashboard view by minimizing or maximizing the specific window panes. For example, click the double up arrows next to *Security* and the pane will hide from your view.

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Enabling the Web GUI

Enable the Web GUI

```
set service https
```

Secure – encrypted login and command activity

Listens on TCP ports 80 (http) and 443 (https)

http auto-redirects to https

Disabled by default for security

When enabled, enabled on a system-wide basis (all interfaces)

Use firewall to block unwanted access

– Please refer to the *AT&T Vyatta 5600 vRouter Software Documentation* for more details

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To enable the Web GUI, use the command `set service https`.

The GUI provides encrypted transport of both login and command activity.

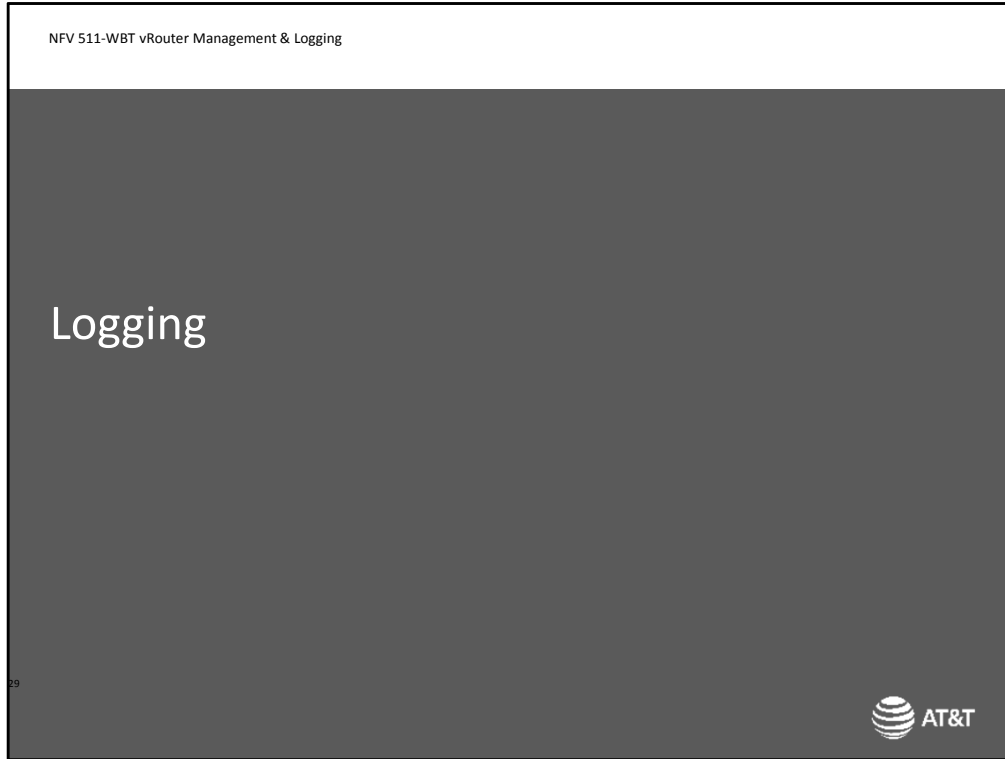
The Web GUI listens on TCP port 80 (for HTTP) and port 443 (for HTTPS).

Any HTTP open request is automatically redirected to the HTTPS port to open a secured connection.

As with other network-based access, the Web GUI is disabled by default for security.

When you enable it, it is enabled system-wide basis. That is, it is available through all network interfaces.

You need to configure the vRouter firewall feature to block unwanted access. For more details on firewall configuration, please refer to the *AT&T Vyatta 5600 vRouter Software Documentation*.



Next we'll look at the logging capabilities of the 5600 vRouter.

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vRouter Logging Capabilities

- Extensive local logging on local hard drive
- Uses standard *syslogd* process
- Messages stored in */var/log/messages*


Writes up to 500KB per file, then opens new file

- Old file is renamed *messages.0*, then *messages.1*...

Separate logs for

- Boot messages
- PPP connection setup
- IPsec setup

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One of the advantages of vRouter software is its extensive local logging capabilities. Unlike traditional networking devices, vRouter supports an integrated hard drive, providing capacity for storing local messages without the requirement of an external server. vRouter software uses the Linux standard *syslogd* process to store logs.

Log messages are stored in the file */var/log/messages*.

When this file reaches 500KB in size, the vRouter renames the file to *messages.0* and opens a new messages file. This continues up to the file *messages.9*, for a total of 5 gigabytes of log messages.

In addition, the vRouter system maintains separate logs for bootup messages, PPP connection setup, IPsec connection setup, and other features.


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Generating Log Entries

emerg	General system failure, system unusable
alert	Immediate action is required to prevent system from becoming unusable
crit	Critical condition, such as resource exhaustion
err	Error condition, system still functioning
warning	Event has occurred that may cause error
notice	Normal but significant event has occurred
info	Normal event of interest
debug	Trace-level information

- Enable debug-level logging selectively
 - For security features, enable on per-rule basis
`set feature rule num log enable`
 - For routing protocols, enable via Operational mode using
`monitor protocol name options`

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Syslog has 8 pre-defined levels for log messages.

The default logging level is notice, which means that by default, the system log records messages with a level of notice or higher.

In some cases, particularly if you are troubleshooting, you may want to capture trace-level information – that is, packet-level captures of protocol exchanges or security features. To do this, you enable debug-level logging selectively on the feature you want to examine more closely.

For security features such as NAT and firewall, you can enable debug-level logging on a per-rule basis.

For routing protocols, you enable debug-level logging from Operational mode using the `monitor` command. We will examine examples of both.

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Viewing Log Entries

`show log` displays the contents of the active log file

`show log | match string`


`show log | more`

```
vyatta@vyatta:~$ show log ?
Possible completions:
<Enter>          Execute the current command
all              Show contents of all master log files
authorization    Show listing of authorization attempts
dhcp            Show log for Dynamic Host Control Protocol (DHCP)
directory        Show listing of user-defined log files
dns             Show log for Domain Name Service (DNS)
file            Show contents of user-defined log file
firewall         Show log for Firewall
https           Show log for Https
image           Show logs from an image
<Truncated Output>
```

`show log all` displays all *messages.n* files

`show log tail` displays most recent log messages

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To view the active log file, use the Operational mode command `show log`.

Because this can be up to 500kilobytes of messages, we have pre-defined some filters for you. By adding the appropriate option, you will only see messages relating to the specified feature or protocol.

You can also use the Linux-style pipe (|) and specify a specific text string to search for. The device will display all lines in the log that contain the string.

If the output is more than one screen, use pipe (|) and `more` to display one screen of data at a time.

To view the entire set of log files in sequential order, use the command `show log all`.

Again, you can use the match tool to search the output.

If you just want to see what happened most recently on your device, you can use the `show log tail` command. This displays the last 10 log entries.


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Searching Active Log

Use Linux pipe (`|`), `match` and `more` to search the log

```
vyatta@training:~$ show log | match ERROR | more
May 16 13:30:50 training pluto[5686]: ERROR: "peer-76.74.103.7-tunnel-1" #995: s
endto on pppoe1 to 76.74.103.7:500 failed in ISAKMP notify. Errno 22: Invalid argument
May 16 13:31:20 training pluto[5686]: ERROR: "peer-76.74.103.7-tunnel-1" #995: s
endto on pppoe1 to 76.74.103.7:500 failed in ISAKMP notify. Errno 22: Invalid argument
May 18 00:10:55 training pluto[5686]: ERROR: "peer-76.74.103.7-tunnel-1" #1043:
sendto on pppoe1 to 76.74.103.7:500 failed in ISAKMP notify. Errno 22: Invalid argument
May 18 14:42:39 training pluto[5686]: ERROR: "peer-76.74.103.7-tunnel-1" #1064:
sendto on pppoe1 to 76.74.103.7:500 failed in ISAKMP notify. Errno 22: Invalid argument
:
```

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Here is an example of using Linux pipes (`|`), with the `match` and the `more` commands. In this case, we are searching for all log messages that contain the string *ERROR*, and limiting the display to one screen at a time.

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Troubleshooting Example 1

Viewing IPsec negotiations

```
vyatta@training:~$ show log vpn ipsec
<Truncated Output>
Apr  5 18:26:09 vRouter pluto[4128]: "peer-76.74.103.7-tunnel-1" #235: sent
QI2, IPsec SA established {ESP=>0x1b44d2bc <0xc26aaa0c}
Apr  5 18:39:03 vRouter pluto[4128]: "peer-76.74.103.7-tunnel-1" #232:
received Delete SA(0x433b6564) payload: deleting IPSEC State #234
Apr  5 19:13:41 vRouter pluto[4128]: "peer-76.74.103.7-tunnel-1" #236:
initiating Quick Mode PUBKEY+ENCRYPT+TUNNEL+PFS+UP to replace #235 {using
isakmp#232}
Apr  5 19:13:42 vRouter pluto[4128]: "peer-76.74.103.7-tunnel-1" #236: Dead
Peer Detection (RFC 3706) enabled
Apr  5 19:13:42 vRouter pluto[4128]: "peer-76.74.103.7-tunnel-1" #236: sent
QI2, IPsec SA established {ESP=>0x6719ac18 <0xf53aa049}
vyatta@training:~$
```

You need to know how the protocol works to find the problem

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Here is an example of the VPN logs. The output displays the last few messages of a successful IPsec tunnel negotiation.

If the text on the screen does not make any sense to you, then it is illustrating an important point of using log output. You need to know how the protocol you are trying to troubleshoot is supposed to work in order to understand the log messages.

In this case, if you do not know that IPsec negotiations end when an SA is established, you do not know that the last message indicates a successful tunnel negotiation.

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Troubleshooting Example 2

Logging NAT packets

```
[edit]
vyatta@vyatta# set service nat source rule 30 log enable
[edit]
vyatta@vyatta# commit
[edit]
vyatta@vyatta# run show log nat
Apr  5 18:17:01 vRouter kernel: [595980.330716] [NAT-SRC-30-MASQ] IN= OUT=pppoe1
SRC=192.168.2.104 DST=173.12.167.194 LEN=56 TOS=0x00 PREC=0x00 TTL=62 ID=52504 P
ROTO=UDP SPT=7172 DPT=64544 LEN=36
Apr  5 18:17:01 vRouter kernel: [595980.341042] [NAT-SRC-30-MASQ] IN= OUT=pppoe1
SRC=192.168.2.104 DST=173.12.167.194 LEN=56 TOS=0x00 PREC=0x00 TTL=62 ID=16918 P
ROTO=UDP SPT=7172 DPT=64545 LEN=36
<Truncated Output>
[edit]
vyatta@vyatta# delete service nat source rule 30 log enable
[edit]
vyatta@vyatta# commit
[edit]
vyatta@vyatta#
```

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In this example, we are enabling logging of a specific NAT rule. We enable logging on `nat source rule 30`, then commit the change to make it active. Now we wait a bit for log entries to be generated as traffic passes through the vRouter and matches the rule.

Now we can look at the log to see if any traffic has matched our logged rule. Since we are in Configuration mode, we have to add the `run` parameter to the `show log` command. This lets us see the log data without having to exit Configuration mode. In this case, logging captures the headers from the packets that match the rule.

When we are done, we have to remember to delete logging from the rule, or the vRouter will continue to log packet headers that match the rule.

We have to commit the deletion in order for it to take effect.

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Troubleshooting Example 3

Logging OSPF packets

```
vyatta@vyatta:~$ monitor protocol ospf enable packet hello
vyatta@vyatta:~$ show log tail
Apr  5 20:30:51 vRouter ospfd[1949]: Hello received from [172.24.42.53]
via [dp0p1p2:192.168.13.1]
Apr  5 20:30:51 vRouter ospfd[1949]: src [192.168.13.3],
Apr  5 20:30:51 vRouter ospfd[1949]: dst [224.0.0.5]
Apr  5 20:30:51 vRouter ospfd[1949]: Packet 172.24.42.53 [Hello:RECV]:
Options *| - | - | - | - | E | *
Apr  5 20:30:51 vRouter ospfd[1949]: make_hello: options: 2, int:
dp0p1p1:192.168.12.1
Apr  5 20:30:51 vRouter ospfd[1949]: make_hello: options: 2, int:
dp0p1p2:192.168.13.1
Apr  5 20:30:51 vRouter ospfd[1949]: Hello sent to [224.0.0.5] via
[dp0p1p1:192.168.12.1].
Apr  5 20:30:51 vRouter ospfd[1949]: make_hello: options: 2, int:
dp0p1p3:192.168.101.1
Apr  5 20:30:51 vRouter ospfd[1949]: Hello sent to [224.0.0.5] via
[dp0p1p2:192.168.13.1].
Apr  5 20:30:51 vRouter ospfd[1949]: Hello sent to [224.0.0.5] via
[dp0p1p3:192.168.101.1].
```

Can also use match strings – remember they are case-sensitive!

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In this example, we enable logging for OSPF hello packets. Unlike the security features, routing protocol debug-level logging is enabled in Operational mode. The `monitor protocol options` provide several choices for each routing protocol. We are interested in OSPF hello packets, just for the purposes of demonstration. To view messages, we use `show log tail`. We know OSPF hellos arrive every 10 seconds, so at least some of the last logged messages should be OSPF hellos. We could also use a pipe (`|`) and `match` command to search for a specific text string, but remember that those searches are case-sensitive. If we searched for *hello*, all lower-case, only those lines with the highlighted match would be displayed in our output. We would miss all the other hello-related messages.

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Creating Custom Logs

Direct the System Log output to another destination

```
set system syslog destination facility facility level level
```

Destinations


Local file: file *filename*

External syslog device: host [*hostname | ip-address*]

System console: console

User terminal session: user *user-id*

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In addition to the default system log, you can direct the system's log output to other destinations using the `set system log` command.

Options for `destination` include:

`file` - a local file which you can then read using the `show log` command. This file is in addition to the default local log already created by the vRouter.

`host` - sends messages to an external server running the syslogd utility.

`Console` - directs log output to the system console.

`User` - directs log output to a the terminal of a specified user session.

You can also use `set system syslog global` to direct output to the system standard location.

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Logging Facilities and Levels

Standard Linux syslog facilities


```
[edit]
vyatta@vyatta# set system syslog console facility ?
all      daemon    local2    local6    mark      syslog
auth     kern      local3    local7    news      user
authpriv local0    local4    lpr       dataplane protocols
uucp     cron      local1    local5    mail      security
[edit]
vyatta@vyatta#
```

Levels

emerg	General system failure, system unusable
alert	Immediate action is required to prevent system from becoming unusable
crit	Critical condition, such as resource exhaustion
err	Error condition, system still functioning
warning	Event has occurred that may cause error
notice	Normal but significant event has occurred
info	Normal event of interest
debug	Trace-level information

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You can limit the contents of your custom log by specifying a particular syslog facility to capture. Note that these are syslog facilities, not specific network protocols or vRouter features.

We mentioned the logging levels earlier. Setting a level includes all higher levels, So if you set the log to *notice* messages, the log will capture messages from *emergency* through *notice*.

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Custom Log Scenario


Send error messages to external syslog server, facility 0



The diagram illustrates a network configuration. On the left, a vRouter icon is labeled 'dp0p1p1' with the IP address '192.168.42.1/24'. A blue line connects it to a server icon on the right labeled 'syslog' with the IP address '192.168.51.150'.

```
[edit]
vyatta@vyatta# set system syslog host 192.168.51.150 facility local0 level err
[edit]
vyatta@vyatta#
```

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The most common application of custom logging is to send messages to an external syslog server (host). An external server may be collecting log information from multiple network devices, making it easier to correlate events.

In this scenario, we want to send *facility0* error level messages and above to the external syslog server at 192.168.51.150.

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Monitoring Log Entries in Real Time

`show log` – log entries displayed are static


`Monitor` – log entries are displayed in real-time

Exit monitor mode using `CTRL+C`

```
vyatta@vyatta:~$ monitor ?
cluster          https            snmp
command          interfaces       stop-all
conntrack-sync   lldp             traceroute
content-inspection log              vpn
dhcp             nat              vrrp
dns              openvpn          webproxy
firewall         protocol

vyatta@vyatta:~$ monitor protocol ospf enable packet hello
vyatta@vyatta:~$ monitor protocol ospf
Apr  5 20:30:51 vRouter ospfd[1949]: Hello received from [172.24.42.53]
via [eth2:192.168.13.1]
Apr  5 20:30:51 vRouter ospfd[1949]: src [192.168.13.3],
Apr  5 20:30:51 vRouter ospfd[1949]: dst [224.0.0.5]
Apr  5 20:30:51 vRouter ospfd[1949]: Packet 172.24.42.53 [Hello:RECV]:
Options *| - | - | - | - | E | *
```

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All the `log` commands we have shown you are “static” – that is, they access the log at the time you enter the command, but do not update your screen if new log entries occur. If you want to view log entries in real time, you can use the `monitor` commands. Monitor puts your screen into a “wait and see” mode, and new log messages are displayed as they are generated.

Note that this is the same `monitor` command we used to enable debug-level logging for OSPF. If we want to view OSPF packets in real time, first enable the logging of the packets you want to view, then enable monitoring for the protocol in general.

To exit this mode and return to the Operational prompt, enter `CTRL+C`.


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Reminder: Debug-level Logging Process

Steps

- Enable logging for your protocol or feature
 - Be as specific as possible
- Enable monitoring if you want to view real-time output
- Run tests, etc.
- View system log
- Disable logging

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To review, the process for capturing debug-level messages is as follows.

First, enable logging for the appropriate protocol or feature. Remember to be as specific as possible – choose a particular rule for security, or a particular message or packet type for protocols.

Next, if you want to view the output in real time, enable monitoring for the protocol or feature.

Next, run your test traffic, or trigger a protocol update, or whatever you need to do to generate traffic relevant to your troubleshooting.

If you are not viewing it in real time, you can view it now in the system log using the show commands we discussed earlier.

When you are done, remember to go back and disable the logging.

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Summary

You should now be able to

- Configure vRouter to communicate with an SNMP server
- Access system logs
- Configure vRouter to communicate with an external SYSLOG server
- Use vRouter logs and monitoring to troubleshoot configuration and operational problems
- Discuss sFlow and configure vRouter as an sFlow agent
- Configure the vRouter as a NetFlow exporter

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This concludes the AT&T Vyatta 5600 vRouter Management and Logging course.

You should now be able to:

- Configure the vRouter to communicate with a SNMP server
- Access system logs
- Configure the vRouter to communicate with an external SYSLOG server
- Use vRouter logs and monitoring to troubleshoot configuration and operational problems
- Discuss sFlow and configure vRouter as an sFlow agent
- Configure the vRouter as a NetFlow exporter

We hope that this information has been useful, and that you will take additional AT&T University course in the future.

Thank you.

End of Course – vRouter Management & Logging

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