Technical white paper

Step-by-Step Guide to Deploying NNMi

Network Node Manager i Software 10.10

November 2015

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Purpose

This document describes deploying a new NNMi 10.10 installation on a small test network. The steps included are similar to those you would take to deploy NNMi in a production network.

Read this document, and then use the *HP Network Node Manager i Software Deployment Reference* as a resource. It contains many details that extend beyond the technical scope of this document.

Note: To find the latest *HP Network Node Manager i Software Deployment Reference*, see: h20230.www2.hp.com/selfsolve/manuals

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The Basic Steps: A Roadmap

This document assumes you have completed the following prerequisites:

- You have installed NNMi.
- Your server meets all the system prerequisites, including the patch requirements and kernel parameters shown in the *HP Network Node Manager i Software System and Device Support Matrix*, available at http://h20230.www2.hp.com/selfsolve/manuals.

Caution: The NNMi installation script does not check that your server meets the system prerequisites. Ignoring these requirements can cause issues after you complete your installation.

The examples in this document are of an NNMi installation on a Linux server. If you are using NNMi installed on a Windows server, convert any paths and commands.

Note: To find the latest *HP Network Node Manager i Software Deployment Reference*, see: h20230.www2.hp.com/selfsolve/manuals

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This document describes the following tasks:

1. Apply the License
2. Back up the Original Configuration
3. Sign in to NNMi and Create Users
4. Set up Communication Configuration
5. Configure Discovery
6. Configure Monitoring
7. Configure Incidents, Traps, and Automatic Actions
8. Configure the NNMi Console
9. Maintain NNMi
10. Check NNMi Health

It also includes Best Practices and Example Usage Scenarios.

See the *HP Network Node Manager i Software Deployment Reference*, available at http://h20230.www2.hp.com/selfsolve/manuals, for information about the following topics:

- Security Groups and Multi-tenancy
- Integration with other HP products such as HP Operations Manager (HP OM), HP Universal Configuration Management Database (HP UCMDB), and third-party products
- High Availability or Application Failover
- Using a remote Oracle database
- NNM iSPIs, such as NNM iSPI for Performance and NNM iSPI for MPLS

To install the NNMi iSPIs, see the following documents, available http://h20230.www2.hp.com/selfsolve/manuals:

- NNM iSPI Performance for Metrics Interactive Installation Guide
- NNM iSPI Performance for Traffic Interactive Installation Guide
- NNM iSPI Performance for QA Interactive Installation Guide
- NNM iSPI Performance for QA Intelligent Response Agent Interactive Installation Guide

To deploy the NNMi iSPIs, see the following documents, available http://h20230.www2.hp.com/selfsolve/manuals:

- NNM iSPI Performance for Metrics Deployment Reference
- NNM iSPI Performance for Traffic Deployment Reference
- NNM iSPI Performance for QA Deployment Reference

Apply the License

You can use the instant-on license or obtain a larger temporary license from HP.

Contact your HP Sales Representative or your Authorized Hewlett-Packard Reseller for information about the NNMi licensing structure, and to learn how to add license tiers for enterprise installations. To obtain additional license keys, go to the HP License Key Delivery Service: https://webware.hp.com/welcome.asp

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Note: The instant-on license is for NNMi Ultimate and enables NNMi for 250 nodes. If you install NNMi Premium at a later date, some functionality is lost. For information about NNMi Ultimate and NNMi Premium features, see the *HP Network Node Manager i Software Release Notes*, available at http://h20230.www2.hp.com/selfsolve/manuals.

You can install the license using the command line. The following command shows an example of installing the license using the **nnmlicense.ovpl** script:

```
nnmlicense.ovpl NNM -f ./mylicense.key
```

Back up the Original Configuration

Make a backup of the original NNMi configuration before making any changes. This way, you can revert back to the original configuration if needed.

To back up the original NNMi configuration, complete the following steps:

1. Create a directory on the NNMi management server where you want to keep the original configuration files. For this example, create a directory called **/var/tmp/origconfig**.

2. Run the **nnmconfigexport.ovpl** command using the **-c** and **-f** options. The **–c** option specifies all configurations and the **–f** option specifies the directory.

   The following command shows an example of running the nnmconfigexport.ovpl script:

   ```
   nnmconfigexport.ovpl -c all -f /var/tmp/origconfig/
   ```

   After you run the nnmconfigexport.ovpl script, NNMi displays output similar to the following:

   ```
   Successfully exported /var/tmp/origconfig/incident.xml.
   Successfully exported /var/tmp/origconfig/status.xml.
   …
   Successfully exported /var/tmp/origconfig/account.xml.
   Successfully exported /var/tmp/origconfig/securitymappings.xml.
   Successfully exported /var/tmp/origconfig/security.xml.
   ```

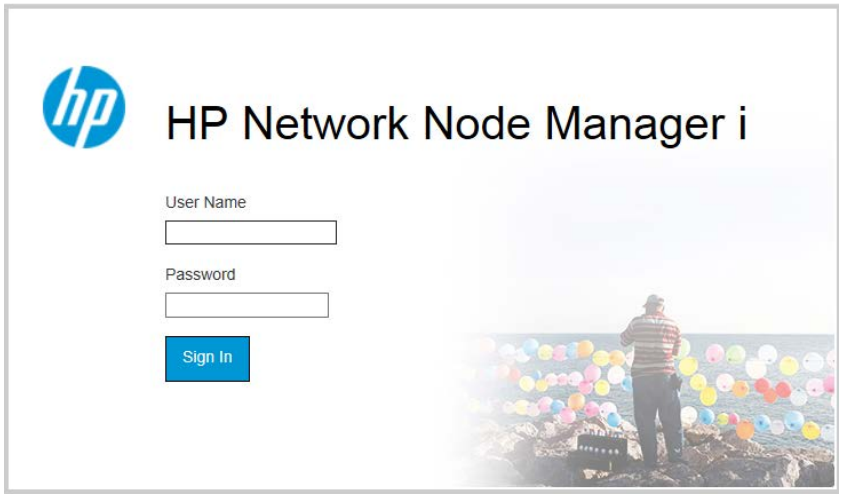
Sign in to NNMi and Create Users

Initial Sign In

Access NNMi using a browser such as Internet Explorer or Mozilla Firefox. Use a URL similar to the following, inserting your server name and the port you selected for communication during the installation process:

```
http://<serverName>:<port number>/nnm
```

Figure 1: NNMi Sign In Screen



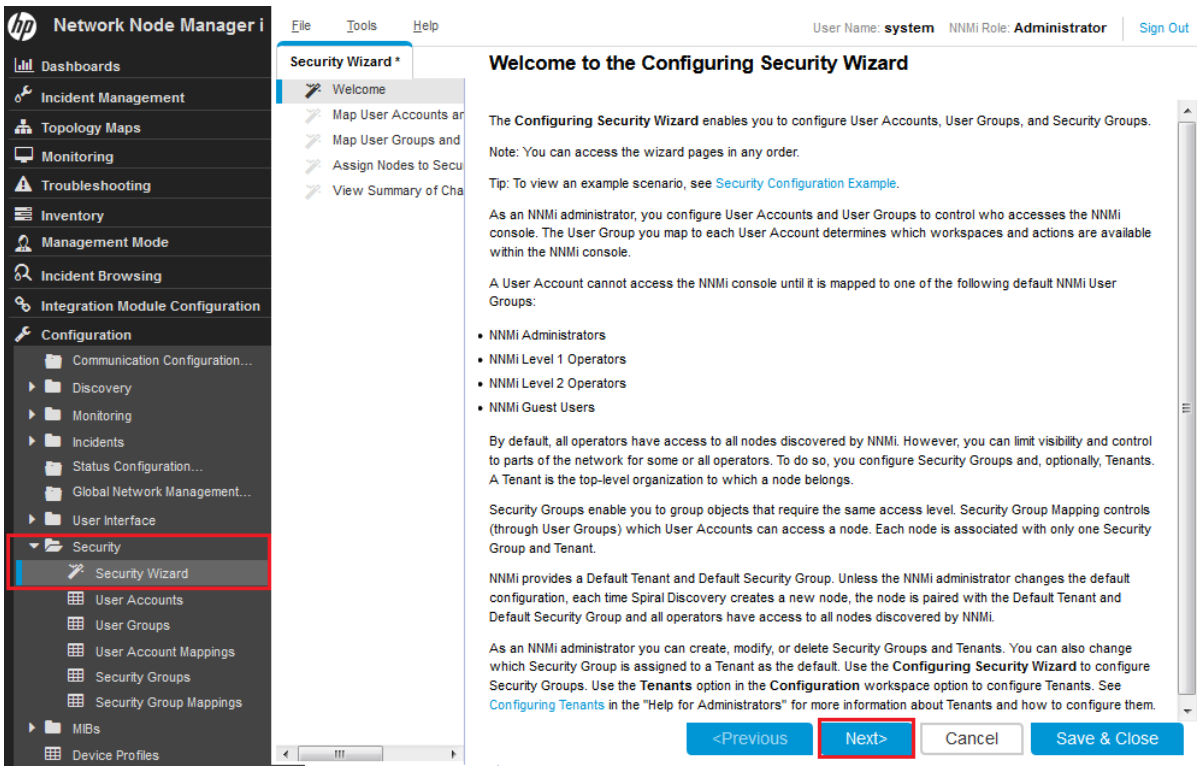
Create User Accounts and Roles

Do not use the system user name in most cases. Create and use an Administrator account for most of your work, following these instructions:

1. From the workspace navigation panel, select the **Configuration** workspace.
2. Expand the **Security** folder.
3. Click **Security Wizard**.

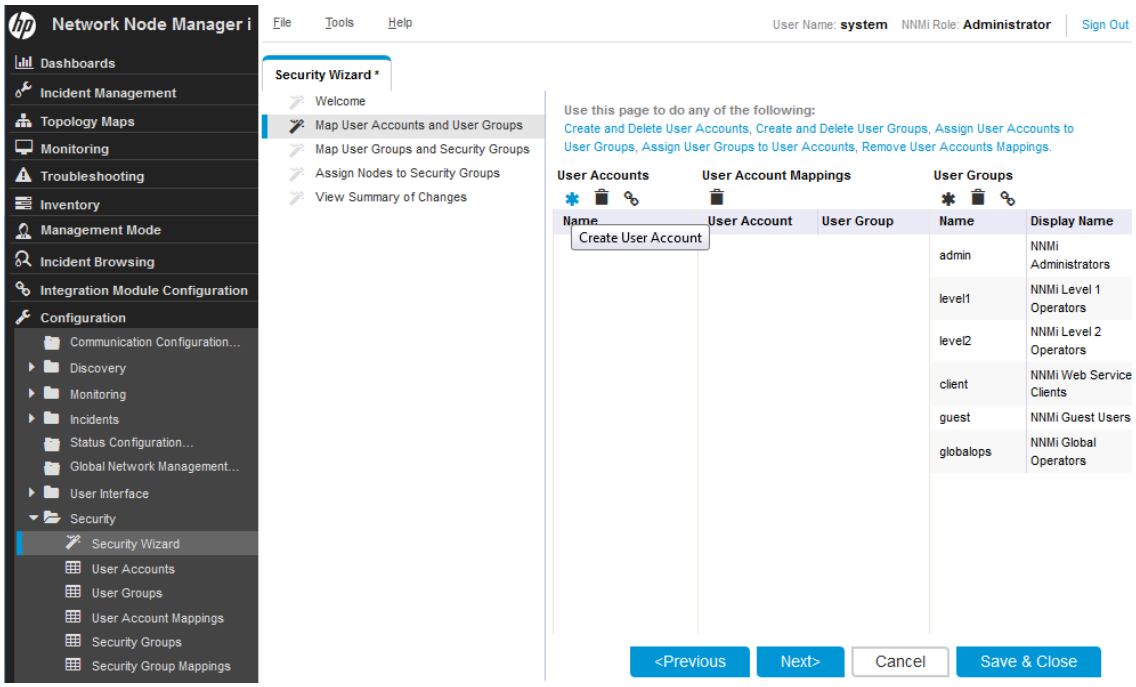
You should see the **Security Wizard** welcome page.

Figure 2: Security Wizard Welcome Page



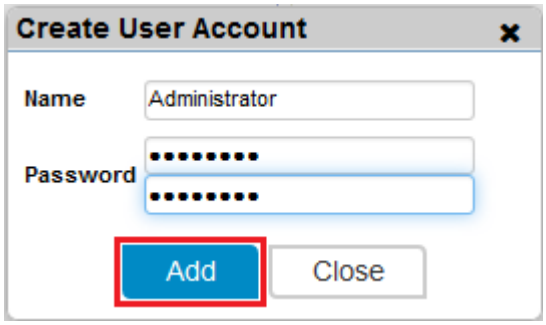
4. On the **Map User Accounts and User Groups** page, under **User Accounts**, click the ✱ icon.

Figure 3: Security Wizard: Create User Account



5. In the **Create User Account** dialog box, enter the account information, click **Add**, and then click **Close**.

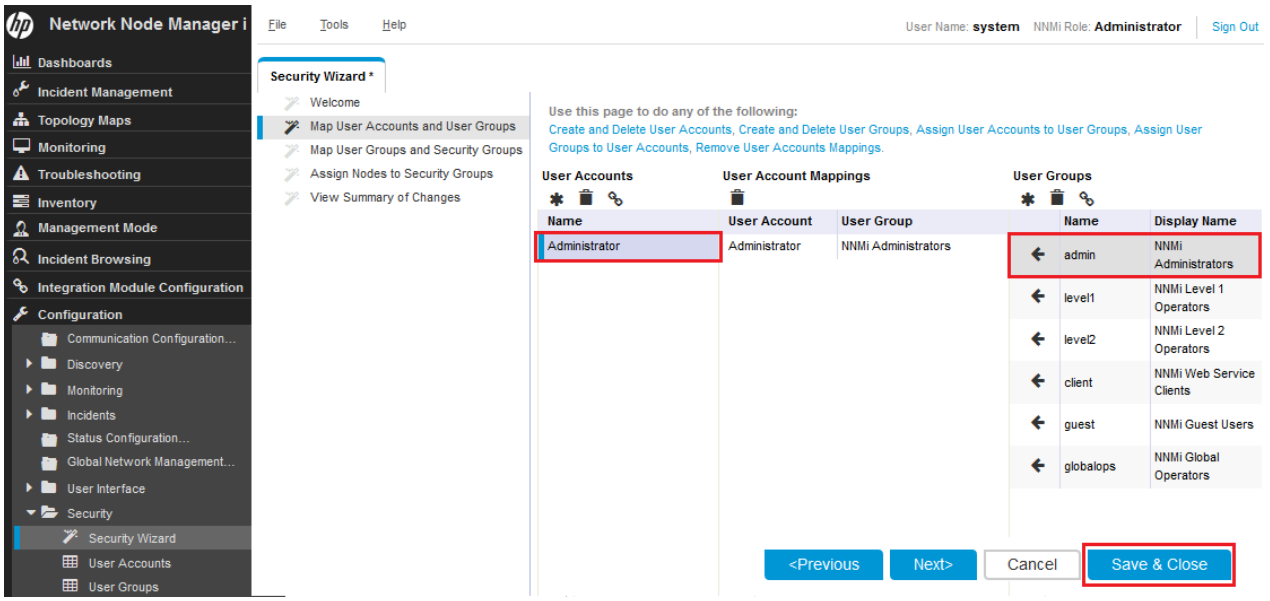
Figure 4: Security Wizard: Create User Account Dialog Box



6. Click the new account name in the **User Accounts** column, and then click the ← icon next to the appropriate User Group to create the **User Account Mapping**.
7. Click **Close**, and then click **OK** > **OK** to accept the changes. See **Figure 5**.

Tip: User Account Mappings replace the “Role” concept in previous versions of NNMi.

Figure 5: Security Wizard: Map User Group to User Account



8. Sign out of NNMi and sign in with the new User Account Name to make sure it works correctly.

Set up Communication Configuration

By default, NNMi performs SNMP community string discovery. This example describes how to use this default method.

By default, NNMi tries all possible community strings sequentially. NNMi selects the first community string that results in a response from a node as the SNMP community string for that node. In this example, configure only the default community strings. You can implement more complex solutions with this configuration, but in most cases, this is an adequate approach.

Tip: Configuring only default community strings works best when the number of community strings is low.

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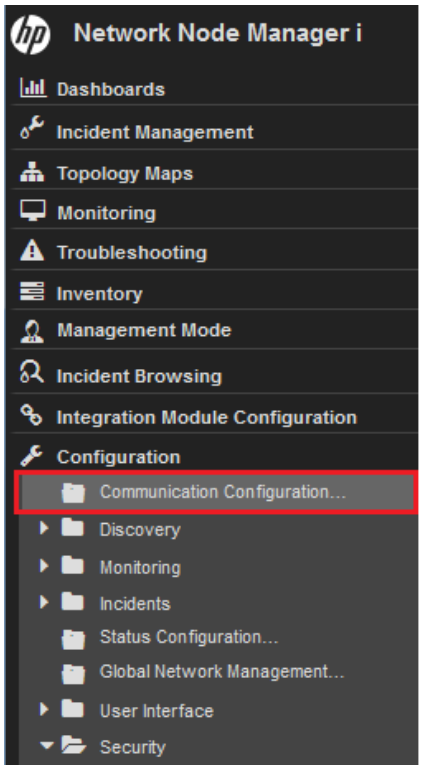
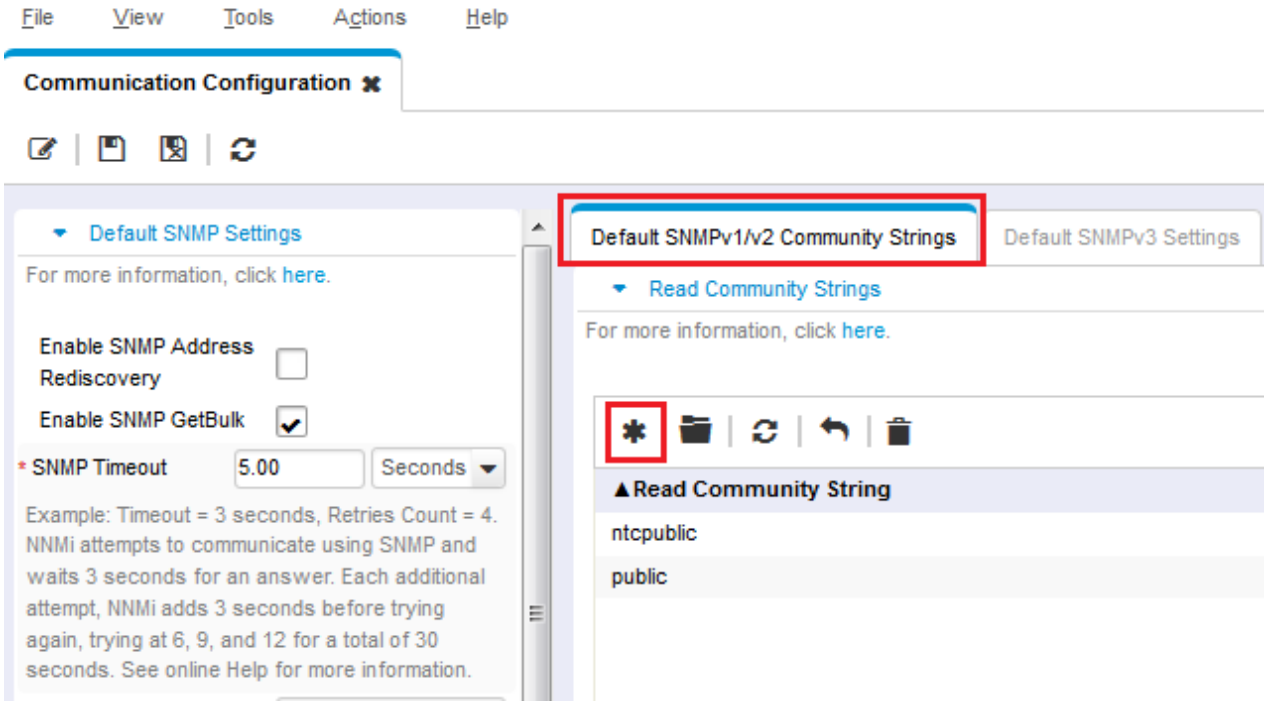
1. From the workspace navigation panel, select the **Configuration** workspace, and then click **Communication Configuration**.

Figure 6: Communication Configuration



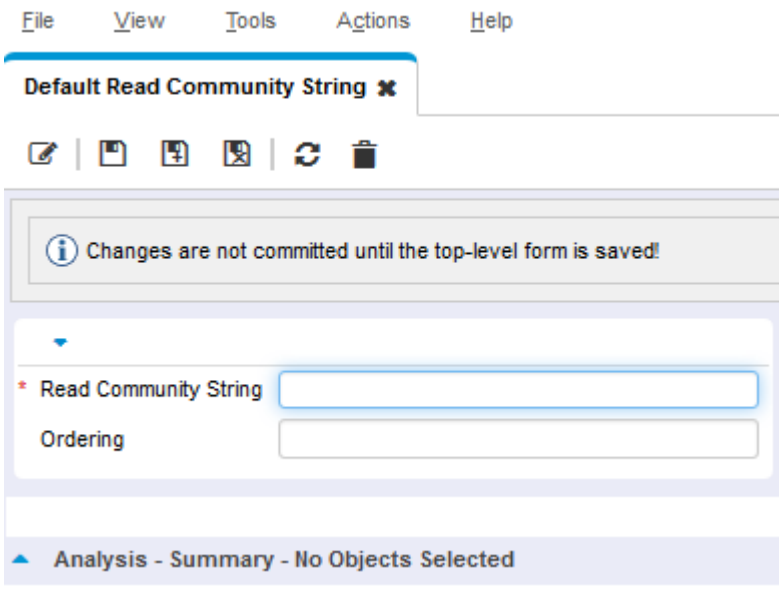
2. Click the **Default SNMPv1/v2 Community Strings** tab, and then click the ✱ icon to create a new community string.

Figure 7: Communication Configuration: Default SNMPv1/v2 Community Strings Tab



3. Enter your community string, and then click **Save and Close**.

Figure 8: Default Read Community String



4. Repeat the previous steps for all your community strings.

Tip: Explore the other **Communication** configuration options in case you want to make additional changes.

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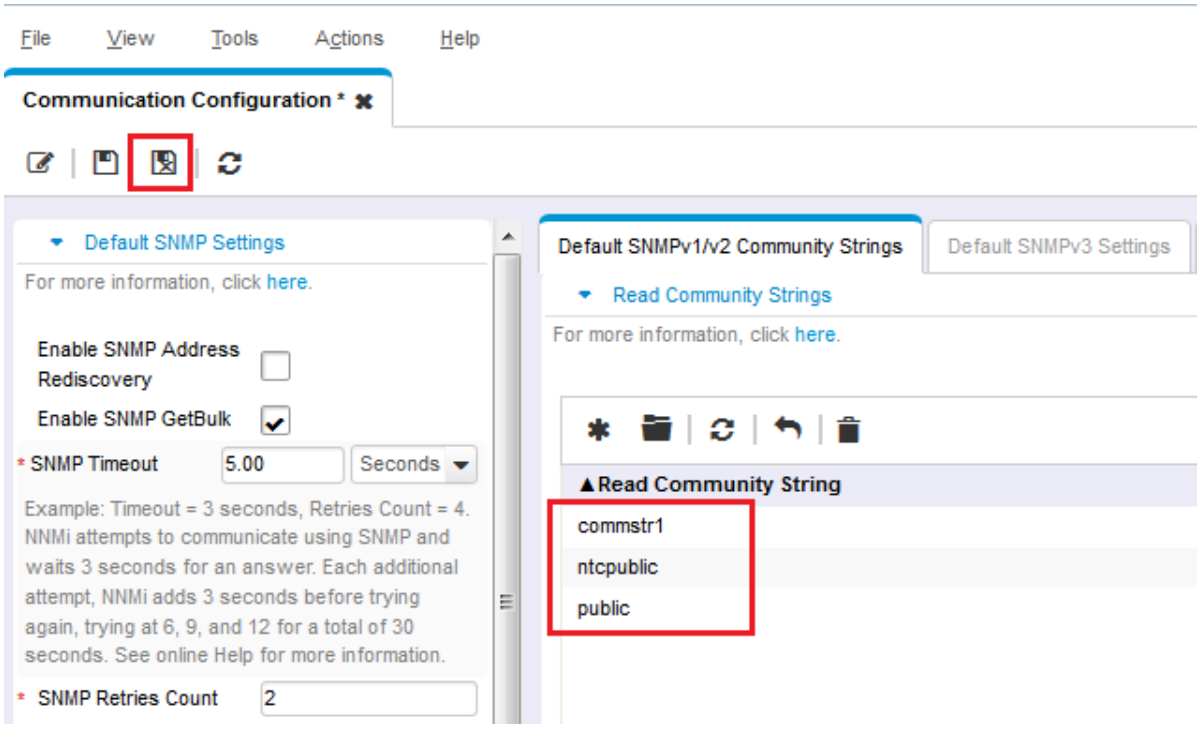
5. When you finish configuring your community strings, click **Save and Close** in the **Communication Configuration** form to save your changes.

   Your SNMP configuration is complete.

Figure 9: Communication Configuration: Save and Close



Configure Discovery

NNMi supports two methods of discovery: list-based and automatic. Each method offers advantages.

List-based discovery uses a list of node names or IP addresses as input and only discovers the nodes contained in that list. NNMi discovers no additional nodes or IP addresses beyond those contained in this list. This method gives you control over what is discovered and managed by NNMi. Each node in the list is known as a seed.

Note: NNMi loads each seed even if its IP address is outside of the Auto-Discovery range.

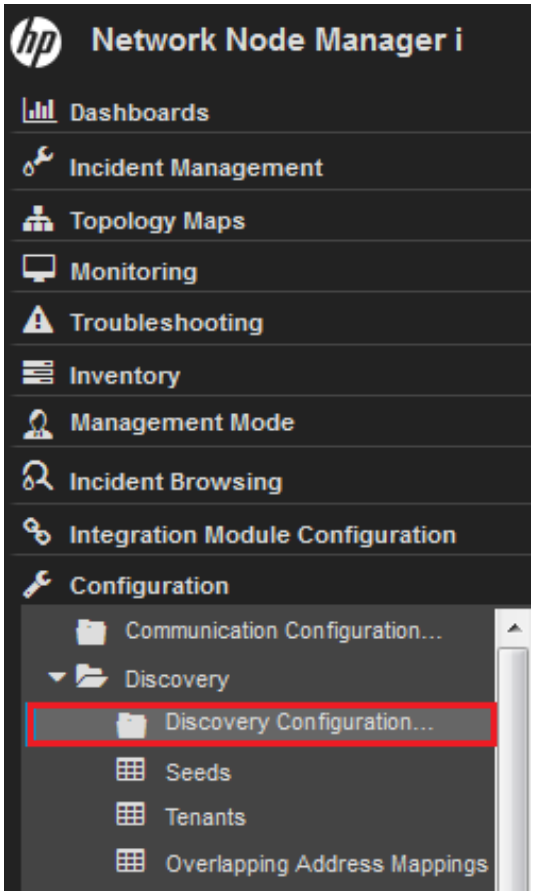
Tip: If you load a seed as an IP address for a device, it is a good practice to specify the preferred management address (usually the loopback address with Cisco gear) as the seed.

Automatic discovery finds nodes on the network based on user-specified criteria. You can configure NNMi to restrict discovered nodes based by address range, SNMP values (system object ID), device type, and other methods. You can configure automatic discovery with a single seed node; although even this node is not required if you enable the optional ping- sweep feature.

The following example describes an automatic discovery based on an address range. Additionally, this example shows you how to load a couple of seed nodes.

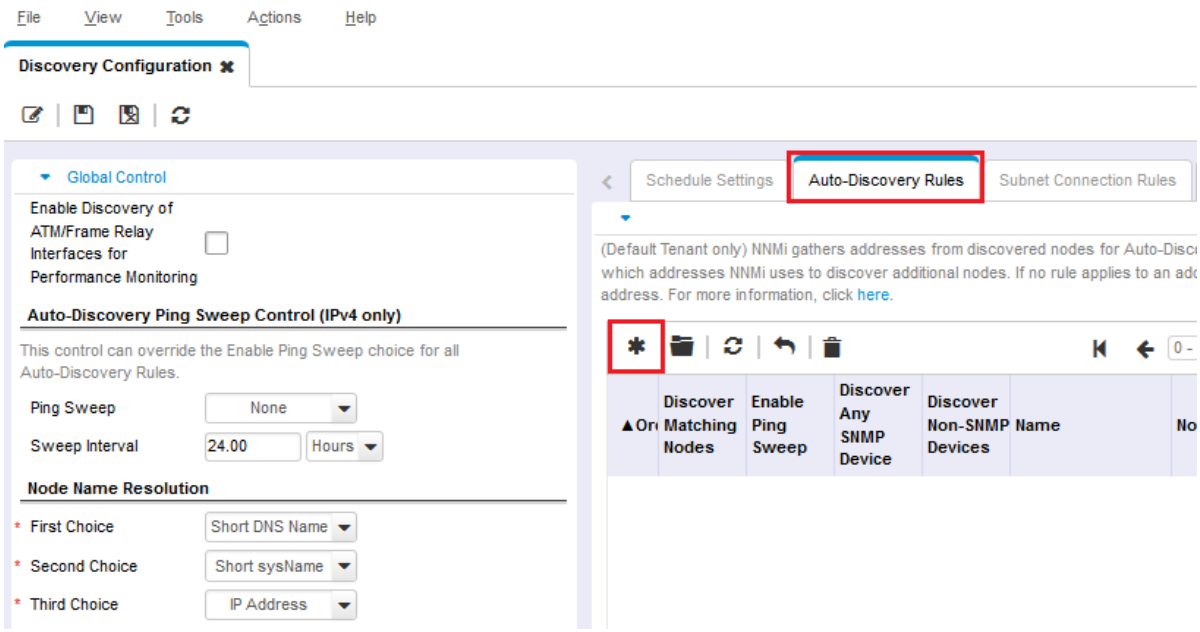
1. From the workspace navigation panel, select the **Configuration** workspace, expand the **Discovery** folder, and then click **Discovery Configuration**.

Figure 10: Discovery Configuration



2. Click the **Auto-Discovery Rules** tab, and then click the ✱ icon to create a new rule.

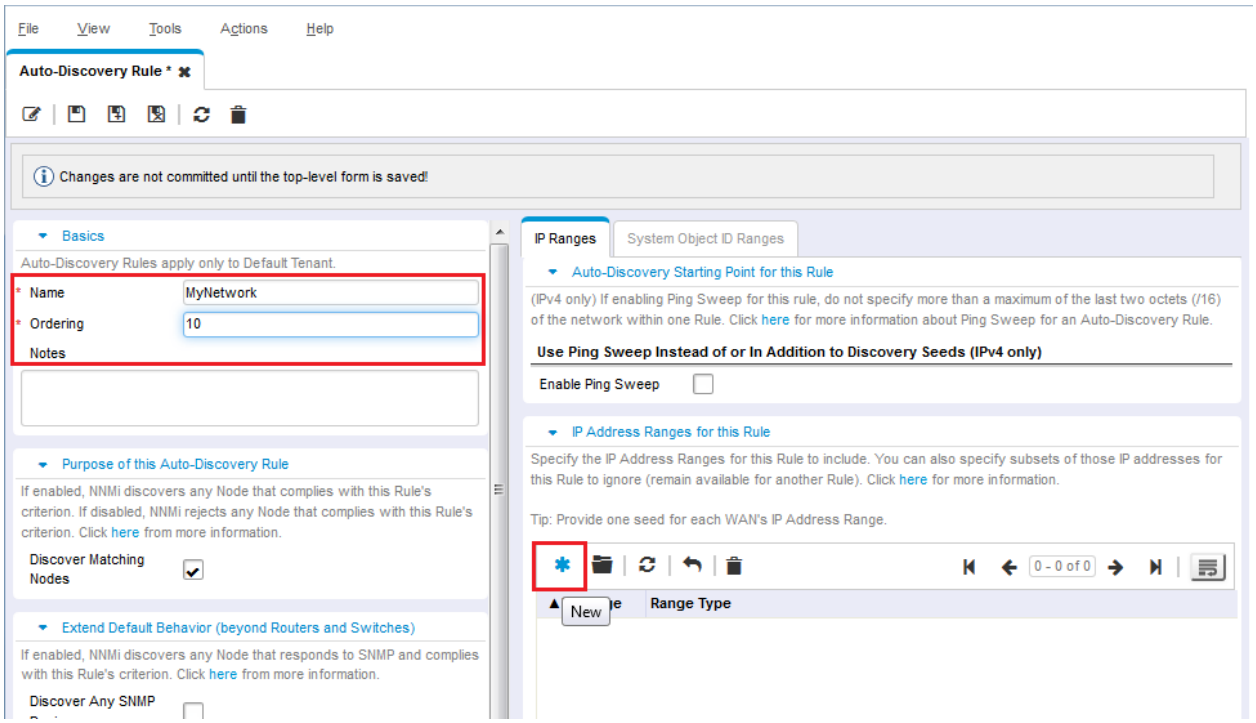
Figure 11: Discovery Configuration: Auto-Discovery Rules



3. Fill out the **Basics** section.

Tip: NNMi uses the **Ordering** attribute value to prioritize multiple Auto-Discovery Rules. This example uses only one Auto-Discovery Rule.

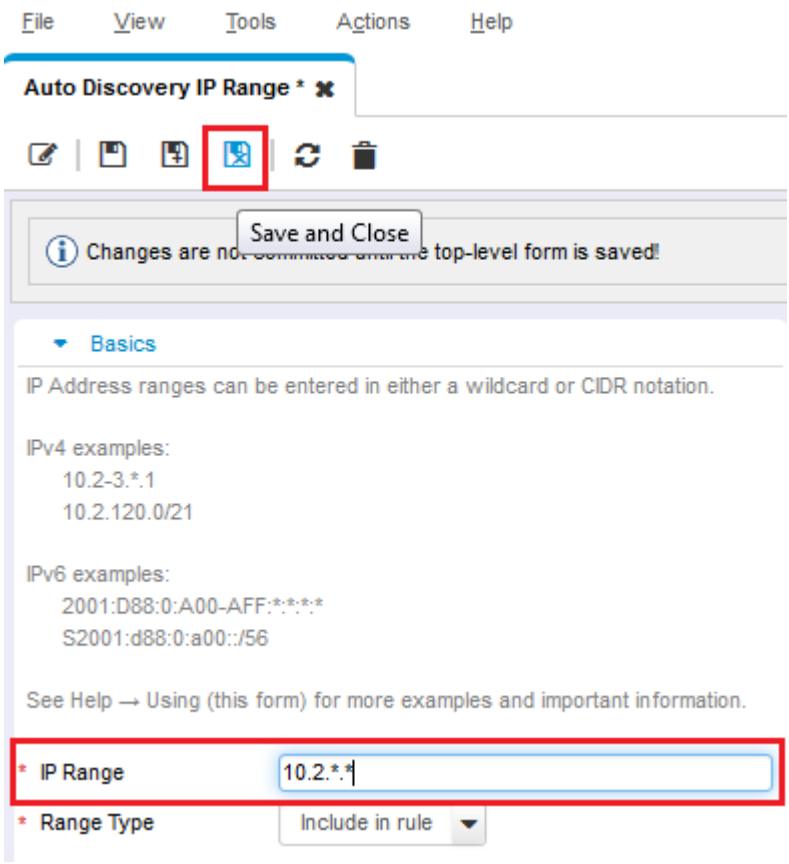
Figure 12: Auto-Discovery Rule: Ordering Attribute



4. Click the ✱ icon to open an entry screen for the IP Range in this rule.

5. In the **IP Range** text box, enter the IP range you want to discover. Notice that you can enter both inclusive rules (Include in rule) and exclusive rules (Ignored by rule). The exclusive rules take priority over the inclusive rules.

Figure 13: Auto-Discovery IP Range



6. Click **Save and Close** on this form as well as on the **Auto-Discovery Rule** form to save your changes.

This example does not use the ping-sweep feature.

Tip: If you choose to use the ping-sweep feature in your environment, NNMi sweeps across a maximum of a class B network (for example, 10.2.*.*) for each Auto-Discovery Rule.

Note the following:

- By default, NNMi discovers only routers and switches within the defined IP address range. To discover nodes beyond switches and routers, add system object ID ranges that include your other devices.
- If a node has multiple addresses, such as a router, then only one of the addresses must fall within the IP range. This address does not need to be the loopback address. NNMi might discover more nodes than you initially expect if you enter addresses other than the loopback addresses.

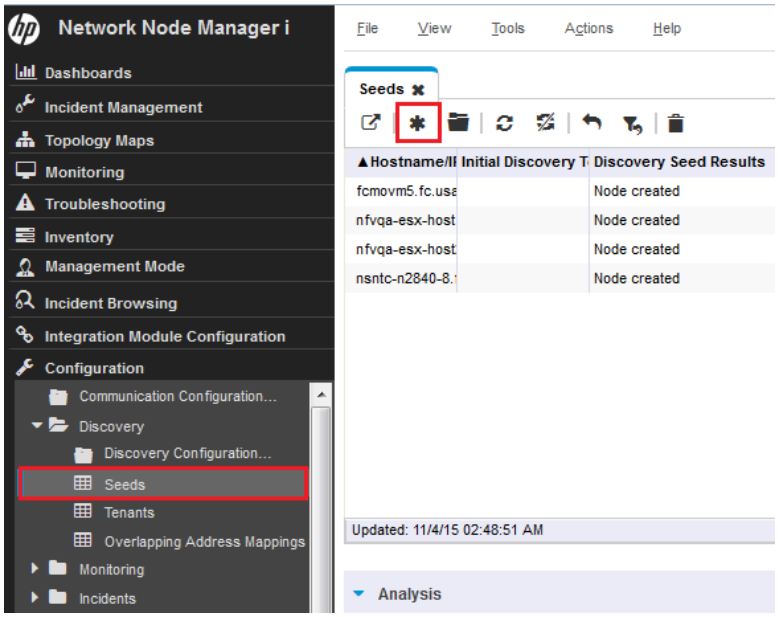
You now have one Auto-Discovery Rule defined. In most cases you only need one Auto-Discovery Rule since each rule can be quite complex.

Next, this example explains how to add a seed node.

Tip: It is better to add a router as a seed rather than a switch because routers provide a larger set of addresses for NNMi discovery.

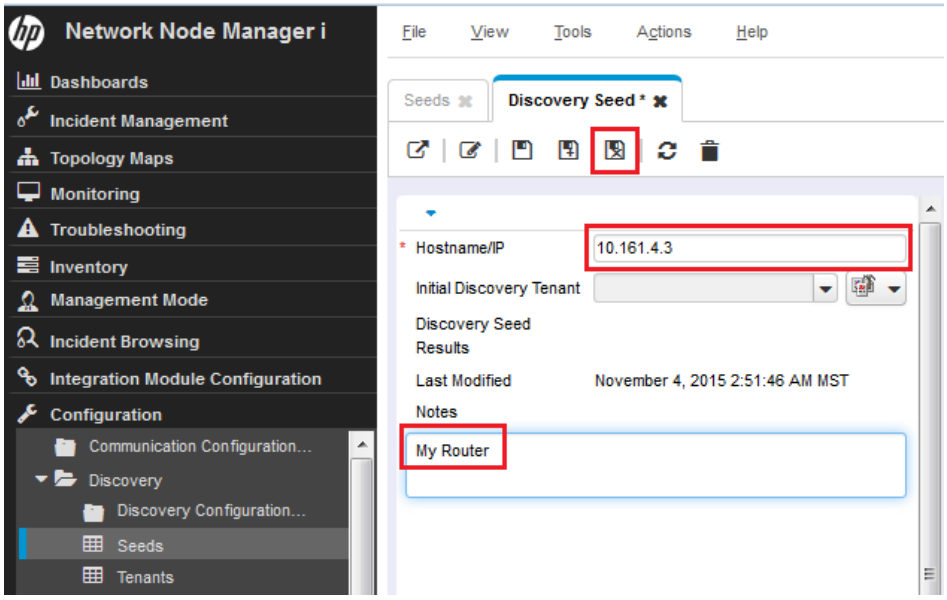
1. From the workspace navigation panel, select the **Configuration** workspace, expand the **Discovery** folder, and then click Seeds.
2. Click the ✱ icon to create a new seed.

Figure 14: Discovery: Seeds



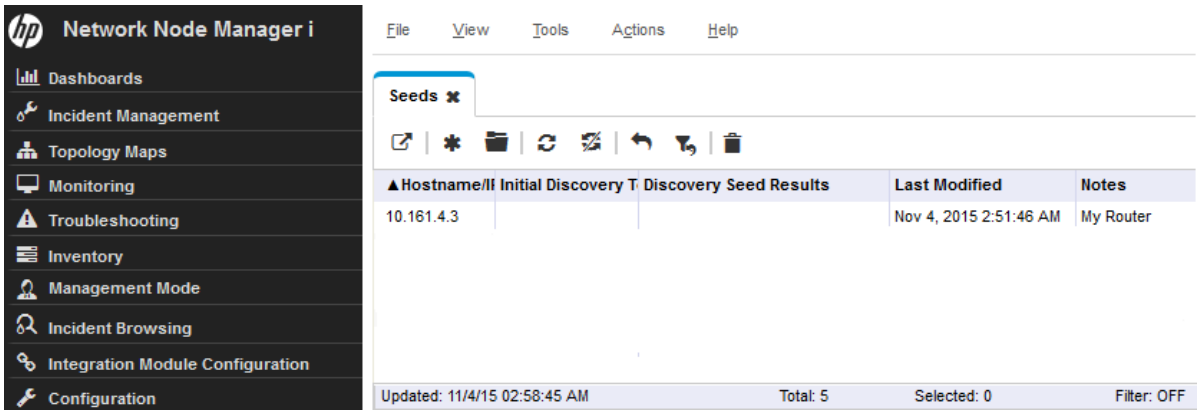
3. In the **Discovery Seed** form, enter the hostname or IP address and any **Notes**, as desired, and then click Save and Close.

Figure 15: Seeds: Discovery Seed



Tip: Examine the **Discovery Seed Results** column in the Seeds table to determine the discovery status of each seed. As NNMi begins discovering the node, NNMi displays the progress as **In progress**. When the discovery completes, the **Discovery Seed Results** entry changes to **Node Created**.

Figure 16: Seeds: Discovery Seed Results



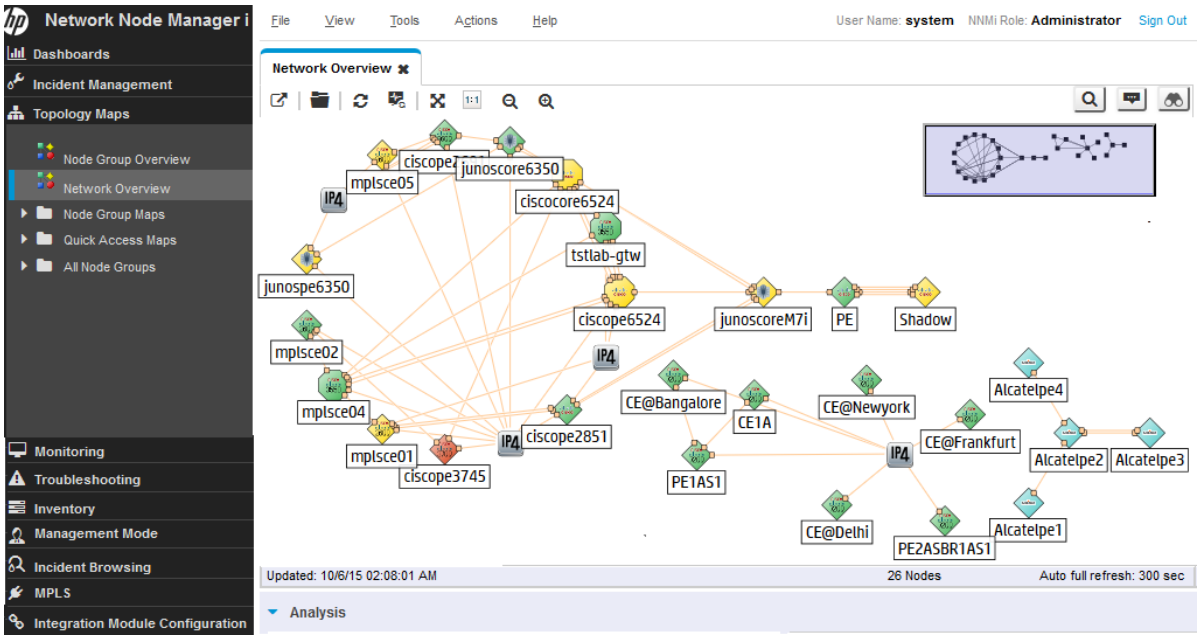
Tip: You can also load a list of seeds from a file using the **nnmloadseeds.ovpl** script. This script enables you to load a large number of seed nodes. If you use list-based discovery rather than Auto-Discovery Rules, you can load all of your nodes using the **nnmloadseeds.ovpl** script. See the **nnmloadseeds.ovpl** reference page or the Linux manpage for more information.

When you use the Auto-Discovery method, Auto Discovery begins finding other switches and routers that have addresses within the address range specified in your Auto-Discovery Rule. Initially NNMi shows nodes without displaying status. Eventually NNMi shows a status for each discovered node.

The **Network Overview** map is useful to display discovery progress in smaller environments because the **Network Overview** map displays a limited number of nodes and connections.

Tip: Click Refresh on the **Network Overview** map to display the initial nodes.

Figure 17: Topology Maps: Network Overview



Configure Discovery for Hypervisors and Virtual Machines

NNMi supports discovery of virtual machines (VMs) hosted on a hypervisor, along with the L2 connections among the VMs and the hypervisor.

The following example describes how to configure discovery for one hypervisor and the VMs hosted on that hypervisor.

Note: You need to obtain a copy of the SSL certificate from the hypervisor server. For information about retrieving this certificate, see the *HP Network Node Manager i Software Deployment Reference*.

Note: This example also assumes that you have set up the NNMi communication configuration as described in *Set up Communication Configuration* in this document.

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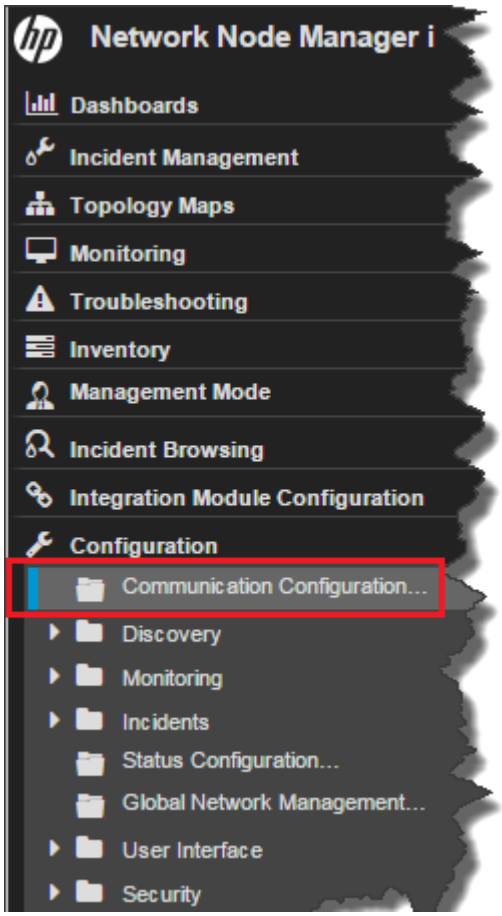
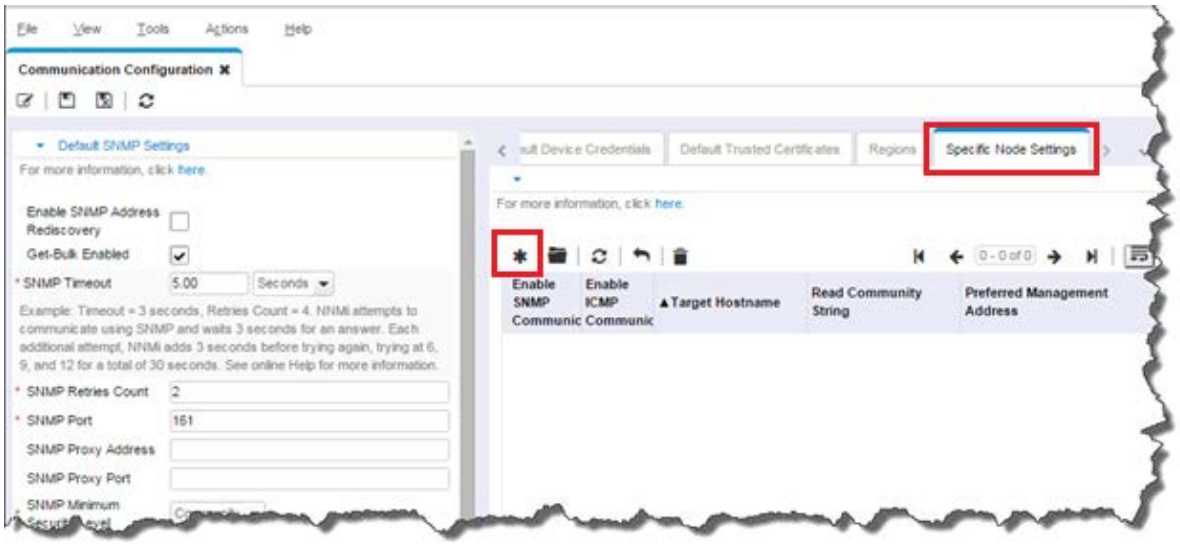
1. From the workspace navigation panel, select the **Configuration** workspace, and then click **Communication Configuration**.

Figure 18: Communication Configuration



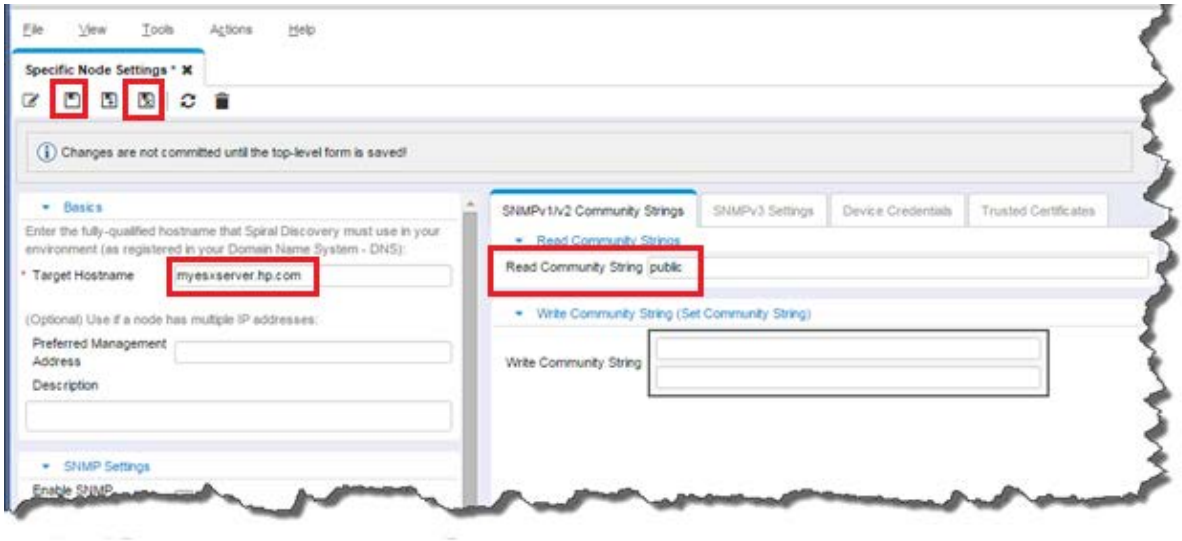
2. Click the **Specific Node Settings** tab, and then click the ✱ icon to create a new setting.

Figure 19: Communication Configuration: Specific Node Settings Tab



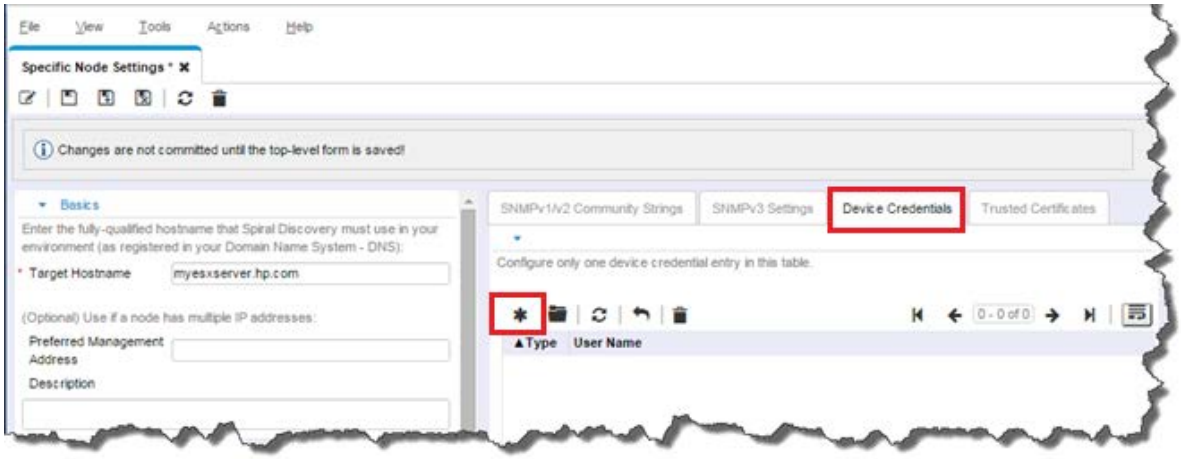
3. Enter the FQDN of the hypervisor in the **Target Hostname** field and the SNMP read community string of the hypervisor in the **Read Community String** field, and then click **Save** 💾. Leave everything else unset so that NNMi uses the default values.

Figure 20: Create a Specific Node Setting



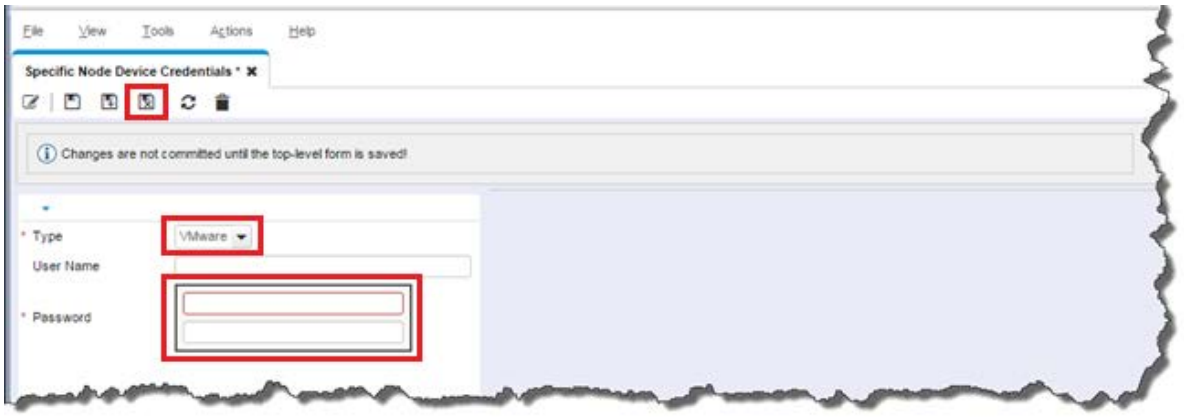
4. Click the **Device Credentials** tab, and then click the ✱ icon to create a new credential.

Figure 21: Specific Node Setting – Device Credentials Tab



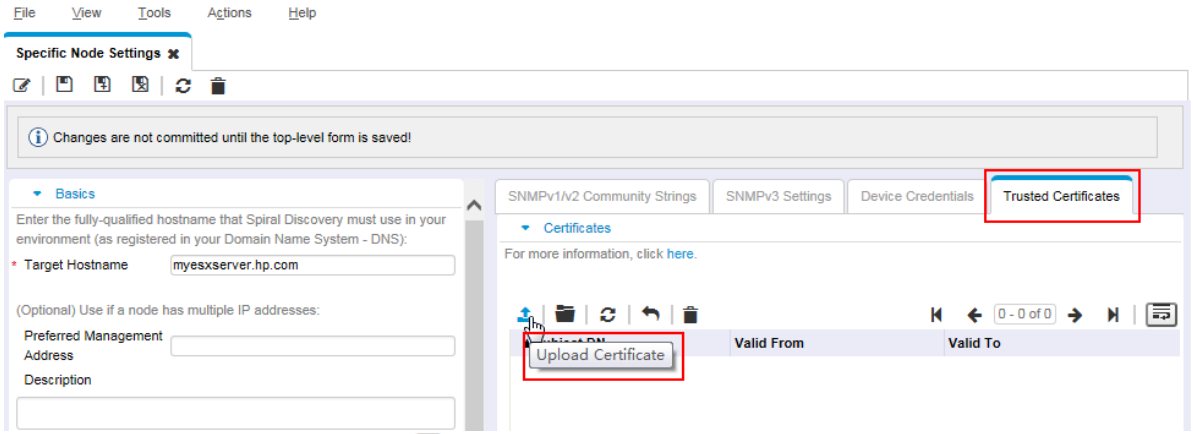
5. Select VMWare in the **Type** box, enter the credentials to the hypervisor, and then click the **Save and Close** icon .

Figure 22: Specific Node Setting – New Device Credentials



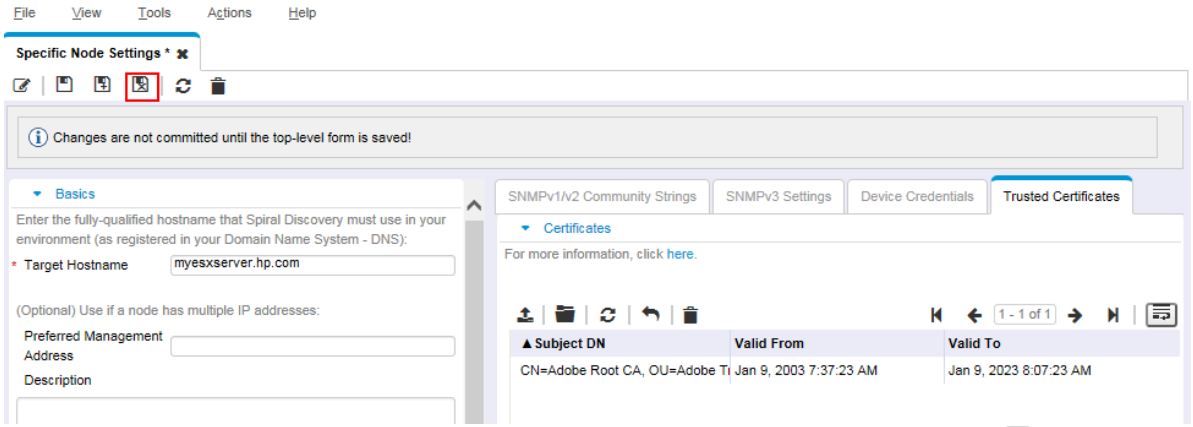
6. To import the hypervisor's SSL certificate, click the **Trusted Certificates** tab, then click **Upload Certificate**.

Figure 23: Specific Node Setting – Trusted Certificates Tab



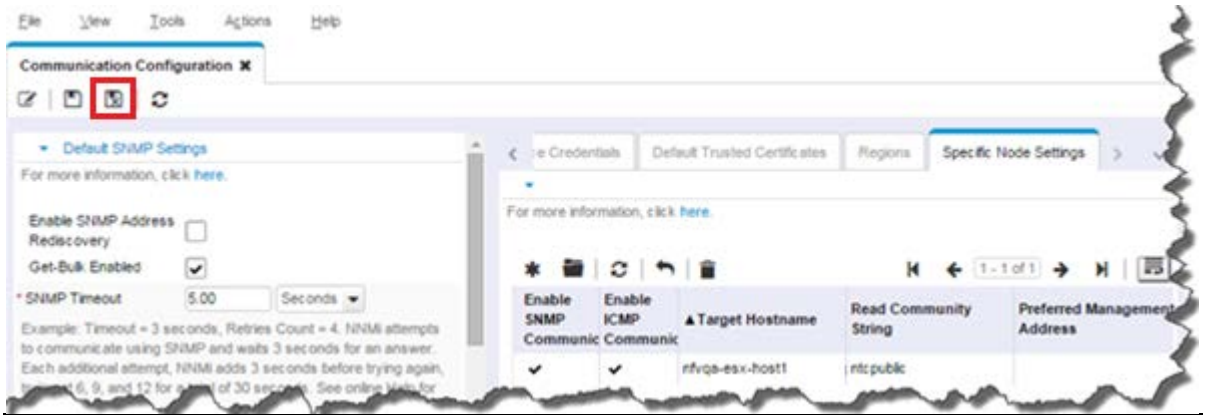
7. Click the **Save and Close** icon .

Figure 24: Specific Node Settings – Save the hypervisor's certificate



8. When you finish configuring the **Specific Node Settings**, click the **Save and Close** icon on the **Communication Configuration** form to save your changes. Your configuration for the hypervisor is complete. You can repeat the same procedure to add more hypervisors.

Figure 25: Communication Configuration: Save and Close



Tip: You can also use the **nnmcommunication.ovpl** script to configure the discovery for hypervisors and VMs. Run **the nnmcommunication.ovpl** command three times to complete the configuration:

nnmcommunication.ovpl -createNodeSettings -name <*FQDN*> -icmpEnabled true -snmpEnabled true -snmpGetBulk true -snmpCommunity <*read string*>

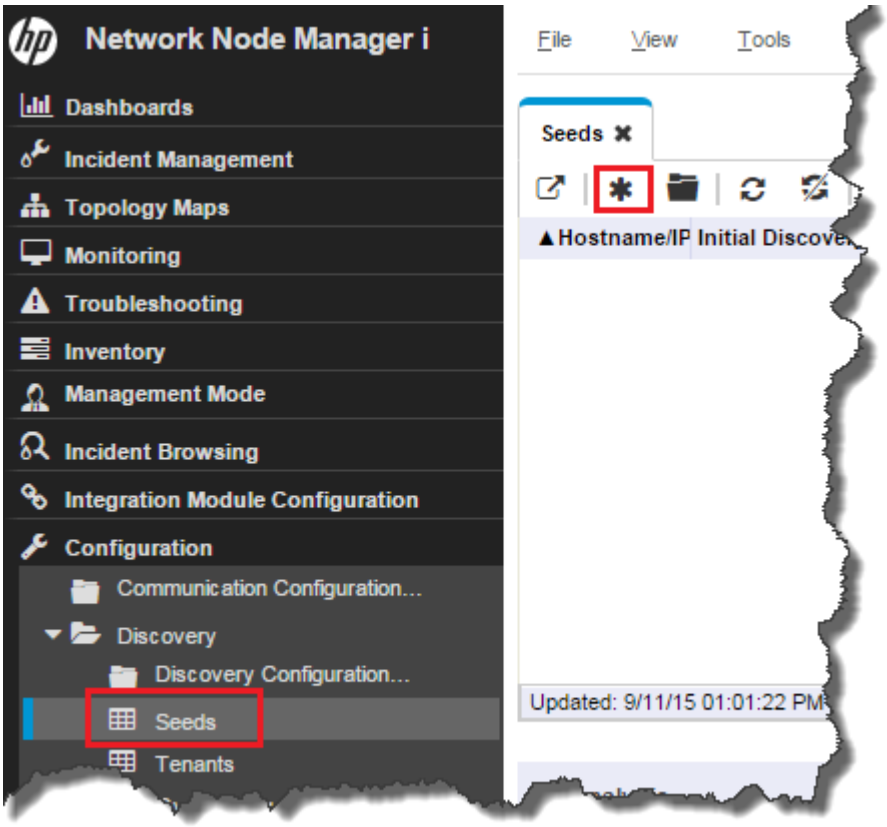
nnmcommunication.ovpl -addCredential -nodeSetting <*FQDN*> -type VMWARE -username <*user name*> -password <*password*>

nnmcommunication.ovpl -addCertificate -nodeSetting <*FQDN*> -cert <*certificate*>

---

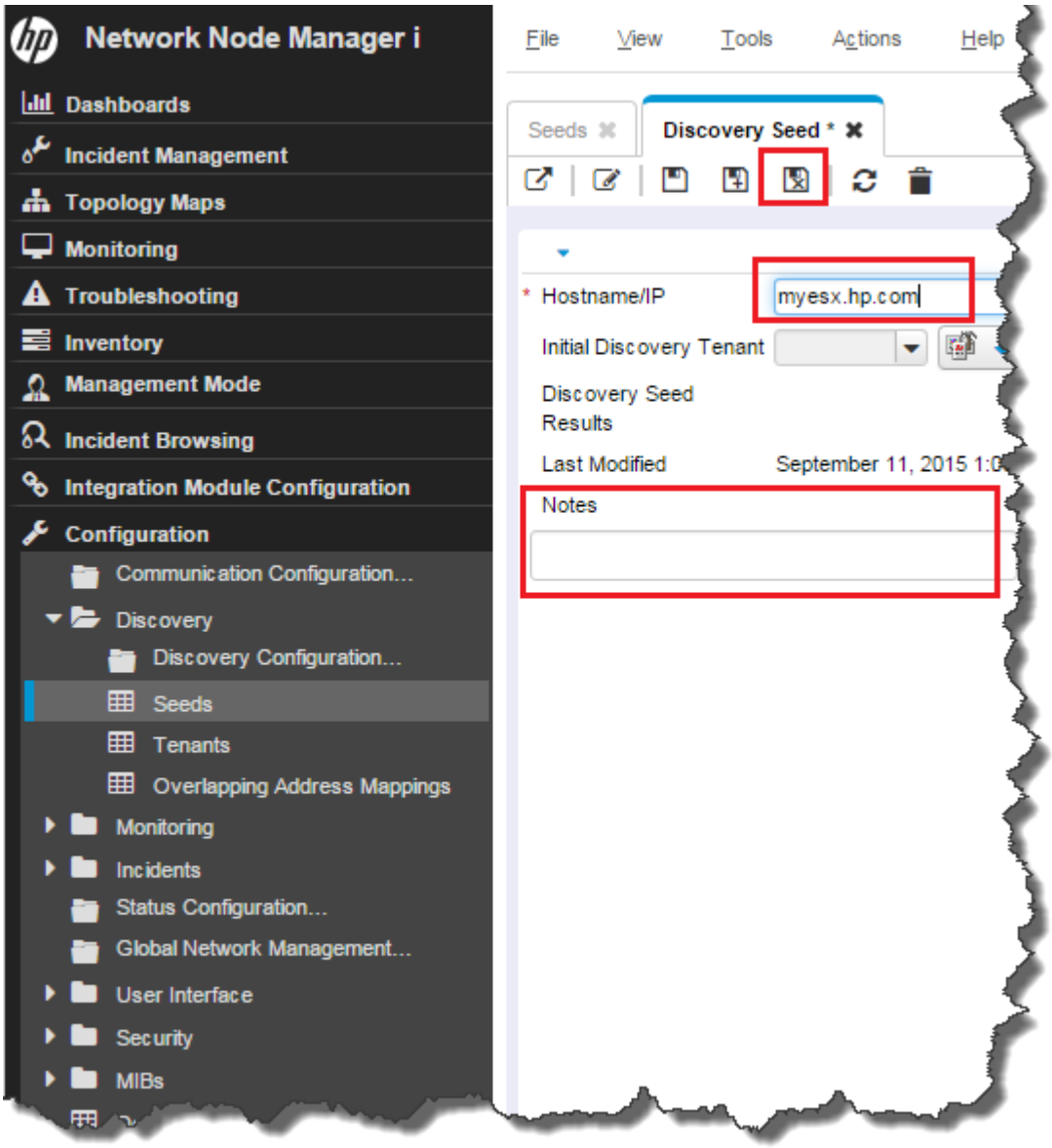
9. Load the hypervisor as a seed, and then let NNMi discover it. From the workspace navigation panel, select the **Configuration** workspace, expand the **Discovery** folder, and then click **Seeds**. Click the ✱ icon to create a new seed.

Figure 26: Discovery – Create a New Seed



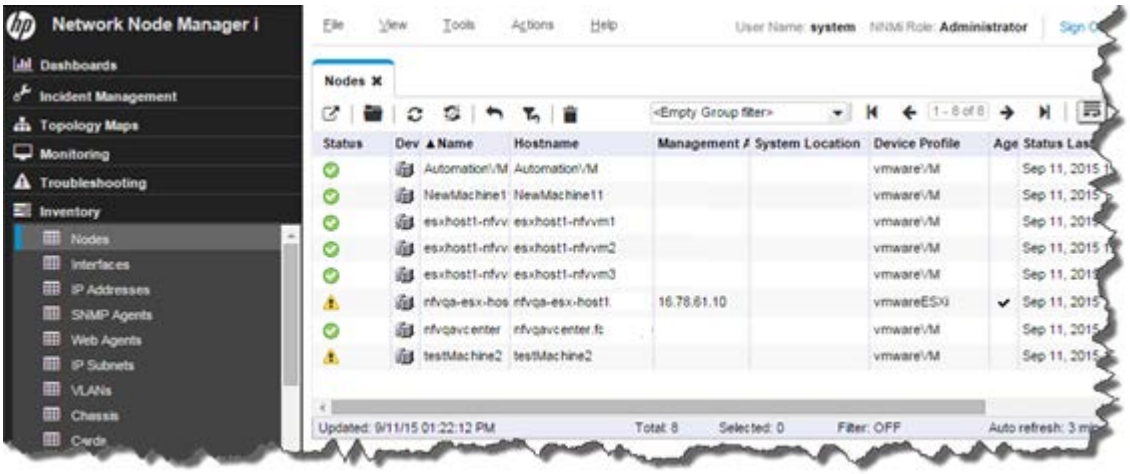
10. On the **Discovery Seed** form, enter the hostname or IP address of the hypervisor, and any notes as desired, and then click the **Save and Close** icon .

Figure 27: Discovery – Add the Hypervisor as a Seed



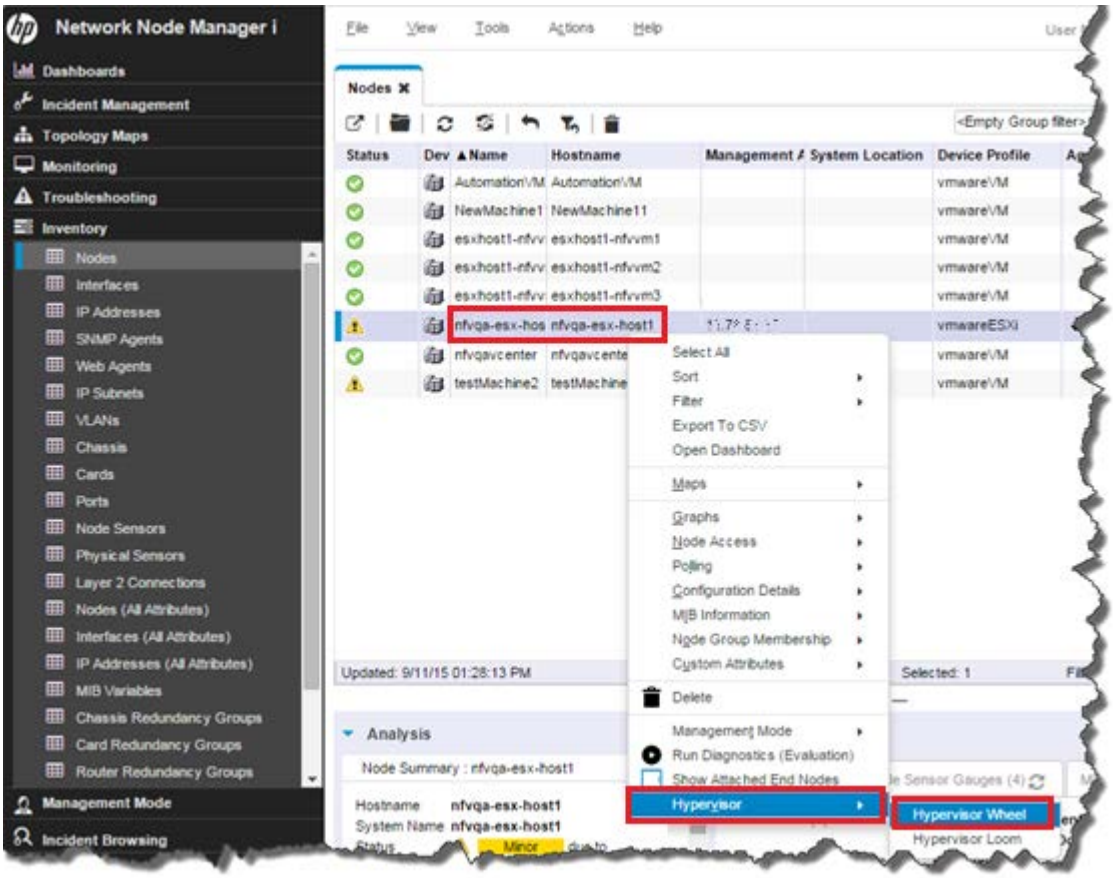
11. Verify the results. Wait for several minutes until NNMi finishes discovery. From the workspace navigation panel, select the **Inventory** workspace, and then select **Nodes**. The hypervisor and all VMs hosted on the server appear in the Nodes table view.

Figure 28: Node List Showing the Hypervisor and its VMs



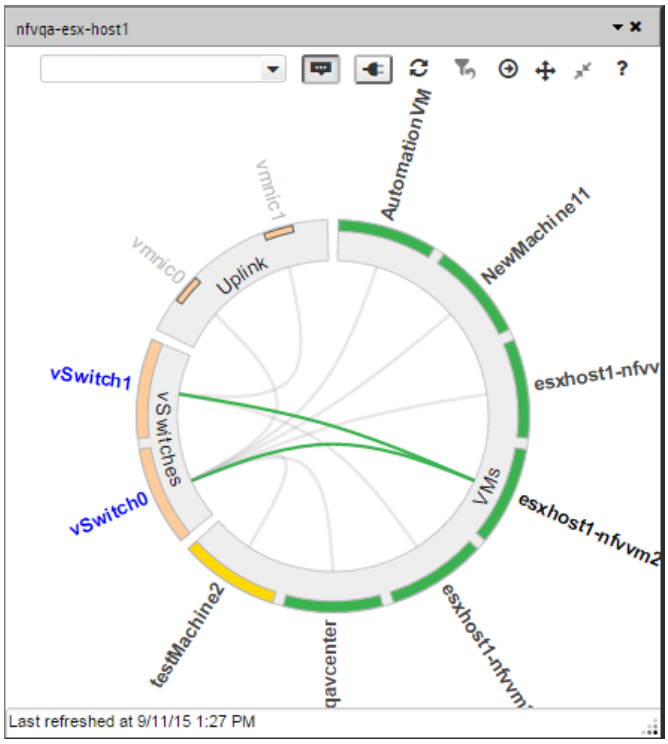
12. View the vSwitches, vNICs, and the L2 connections among the hypervisor and its VMs.
13. In the table view, right-click the hypervisor name, click **Hypervisor**, and then click **Hypervisor Wheel**.

Figure 29: Hypervisor Wheel Menu Item



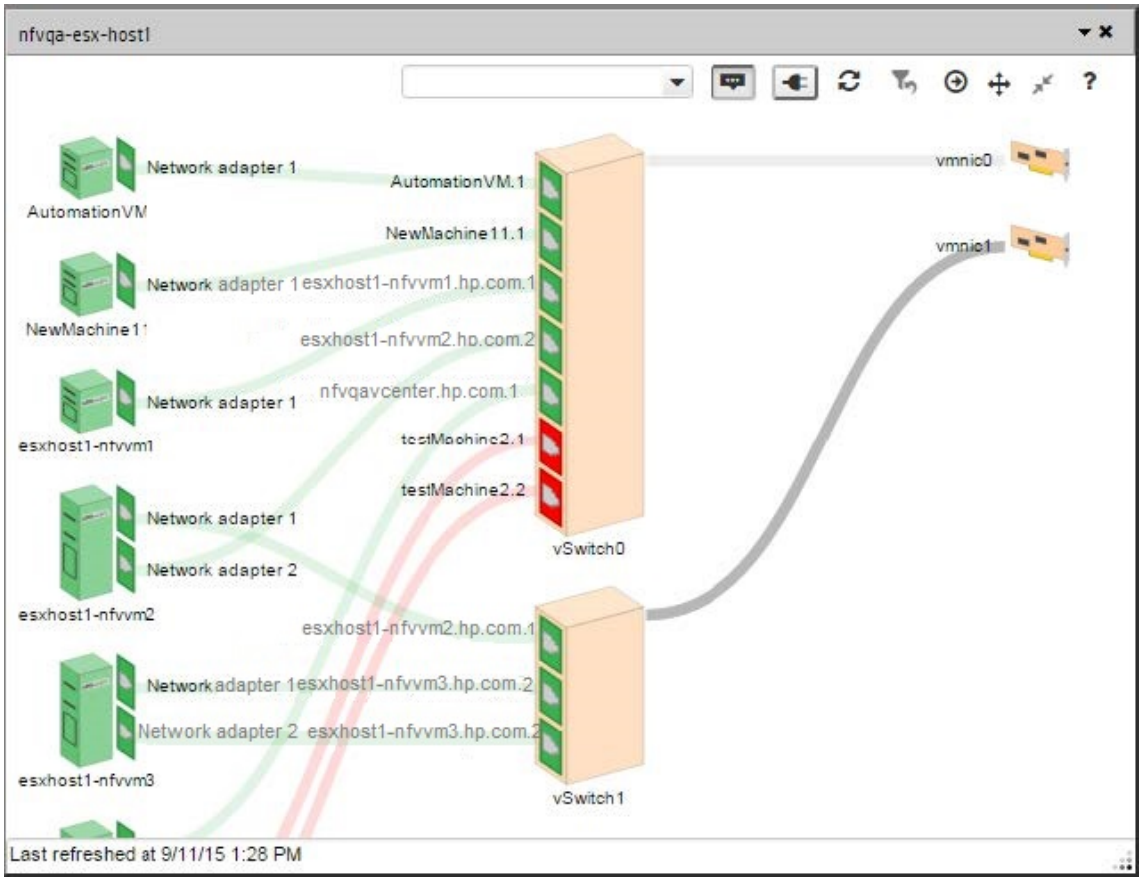
14. The hypervisor wheel diagram shows the virtual switches and L2 connections.

Figure 30: Hypervisor Wheel Diagram Showing virtual switches and L2 Connections



You can also choose the **Hypervisor Loom** menu item to display the hypervisor loom diagram.

Figure 31: Hypervisor Loom Diagram Showing virtual switches and L2 Connections



Configure Monitoring

Monitoring in NNMi is flexible and easy to configure. By default, NNMi uses SNMP polling rather than ICMP (ping) polling. The exception to this is non-SNMP nodes—NNMi polls these nodes using ICMP. You can enable ICMP polling more broadly if desired.

By default, NNMi polls connected interfaces. A connected interface in NNMi is an interface that is connected in the NNMi topology, which does not always include mapping to interfaces that have a wire connected.

Consider the following scenario:

- An access switch with 48 ports is connected to desktop computers and one uplink port.
- NNMi discovered the uplink node, but has not discovered any of the desktop computers.

In this case, only the uplink port will be considered connected to NNMi because it does not have a representation of the connection to the desktop computers. In most cases, this is the desired behavior. Usually, you will not want NNMi to notify you every time a computer is turned off for the evening.

In the following example, the c2900xl-1 switch is an access switch with one uplink (Fa0/2). As shown in **Figure 33: Node Form: List of Interfaces**, only one interface is monitored.

Figure 32: Map View: One Interface Monitored

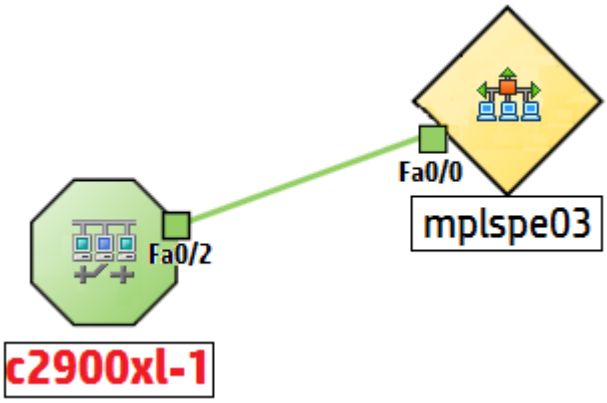
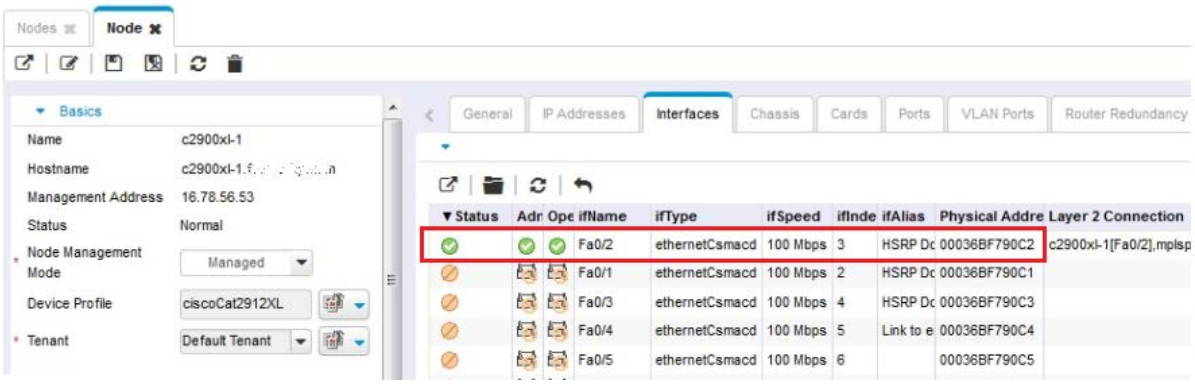


Figure 33: Node Form: List of Interfaces



The second default behavior applies to routers. For routers, NNMi monitors most interfaces that host IP addresses. NNMi assumes that if an administrator takes the time to configure an IP address on an interface, it is desirable to monitor that interface. In some cases, NNMi models these interfaces as being connected; however, in other cases, NNMi models these interfaces as being unconnected. An example of this is a router that has an interface that connects to a WAN cloud. NNMi might not discover and model the connection to the cloud, but NNMi monitors the router interface by default.

When modifying this default behavior, note the following:

- NNMi enables you to modify monitoring settings in high volume.

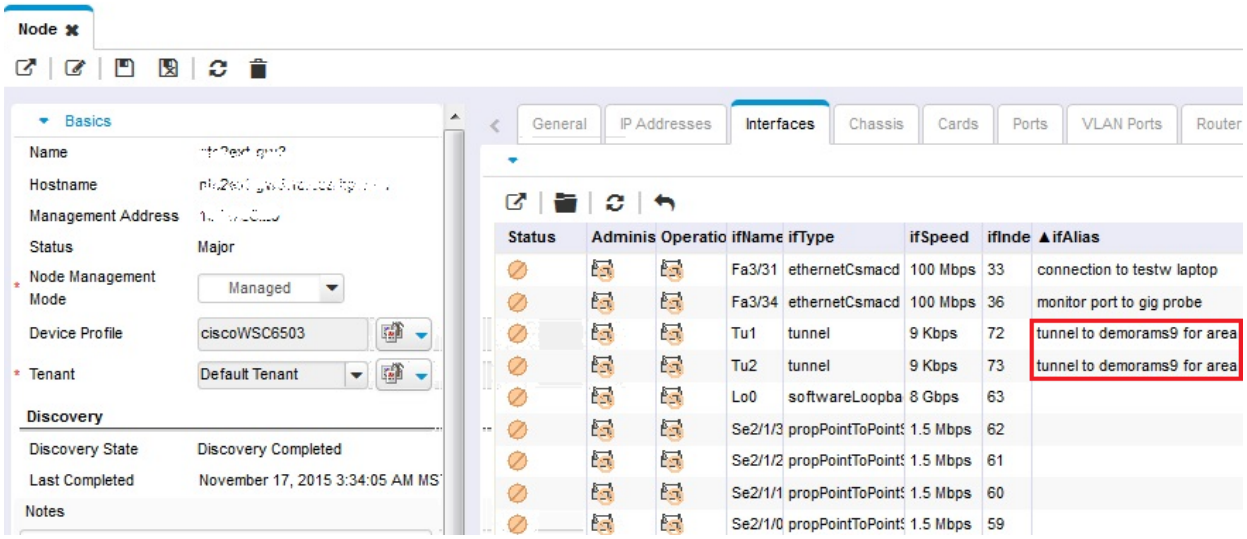
- NNMi does this by using filters to apply monitoring to individual nodes, interfaces, and addresses. These filters are the same filters available for the user interface.
- Although this document focuses on nodes and interfaces, NNMi monitors additional entities such as Fans, and HSRP groups.

Consider the following scenario:

- Interfaces on a subset of nodes have an IfAlias that begins with tunnel to.
- You determine that NNMi needs to monitor these interfaces if their speed is 9 Kbs.

Using NNMi you can create a filter to identify any interfaces that match these criteria. After creating this filter, you apply monitoring settings to these interfaces.

Figure 34: Node Form: Apply Monitoring Settings

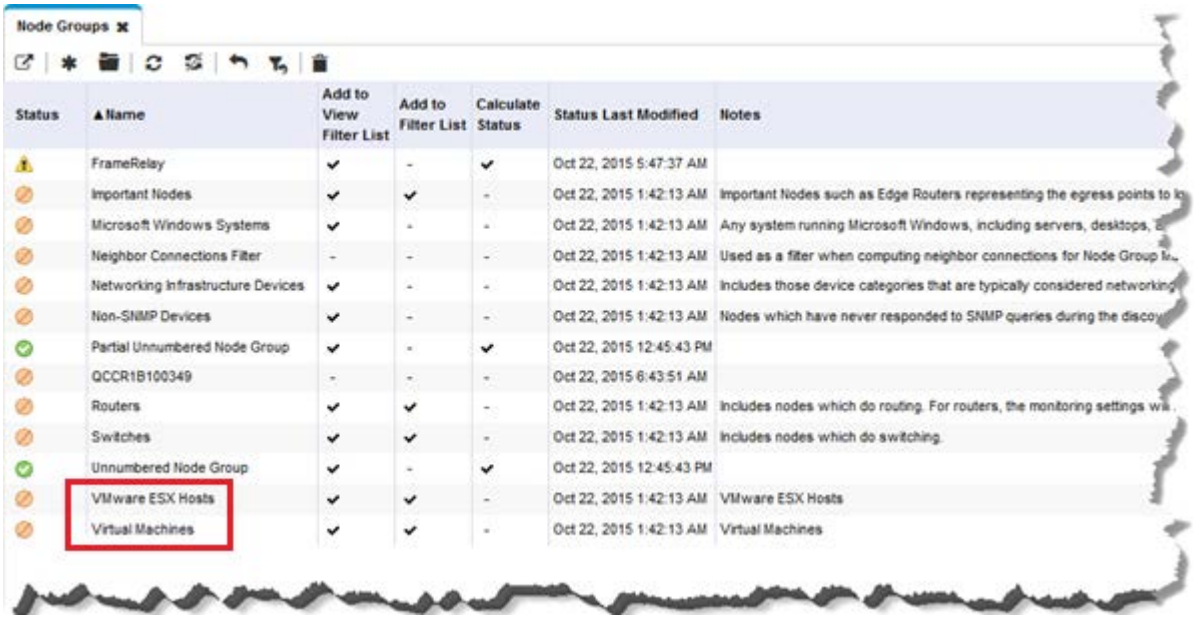


Configure Monitoring for ESXi Server and VMWare

For NNMi to monitor virtual machines (VMs) hosted on a hypervisor, additional monitoring configuration is required. The following example describes these steps.

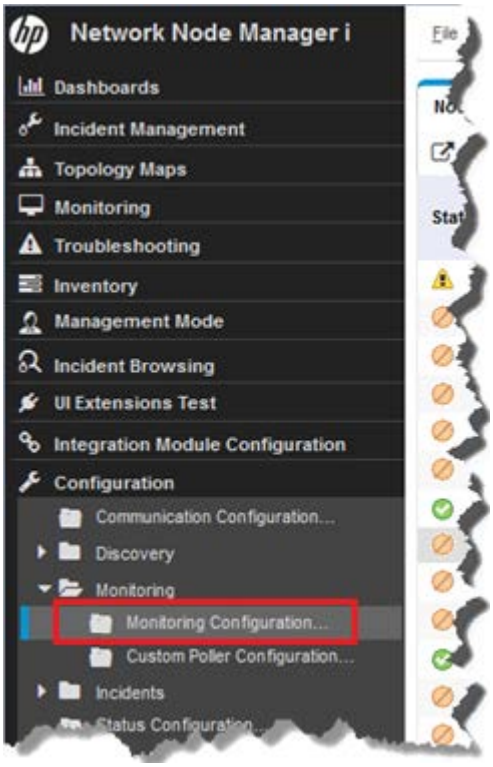
1. Create two node groups, one for all VMs (called Virtual Machines) and the other for all hypervisors (called VMware ESX Hosts).

Figure 35: Configuration: Node Groups



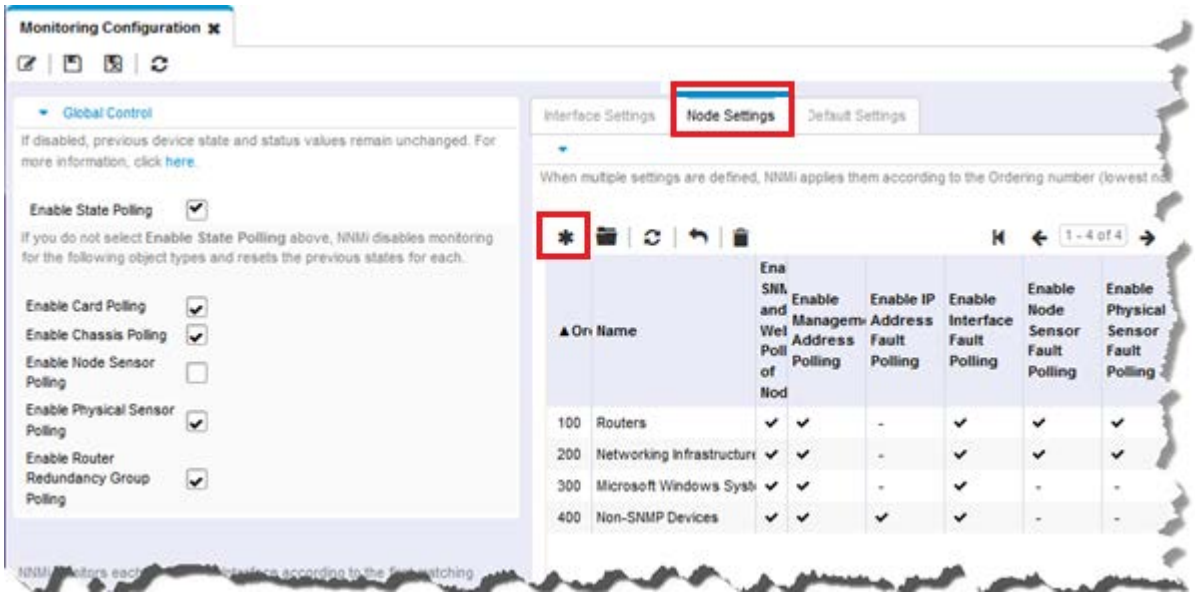
2. From the workspace navigation panel, select the **Configuration** workspace, and then click **Monitoring > Monitoring Configuration**.

Figure 36: Monitoring Configuration



3. Click the **Node Settings** tab, and then click the ✱ icon to create a new setting.

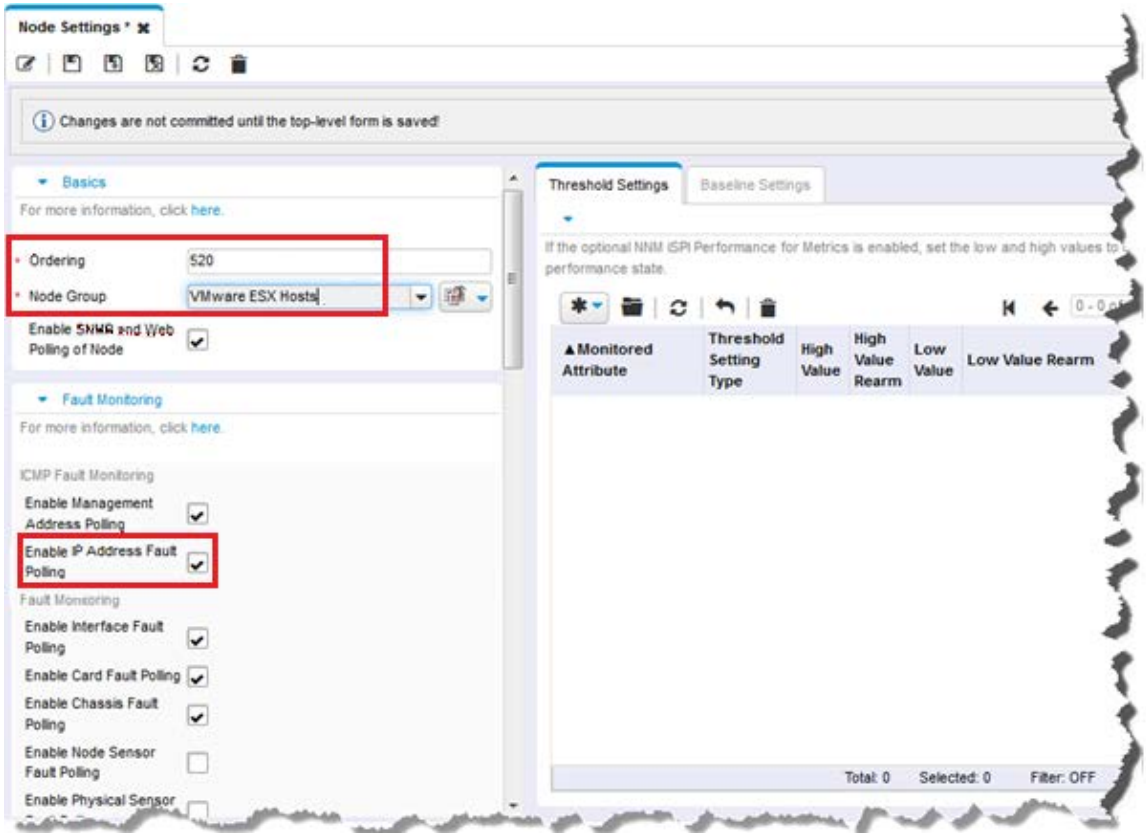
Figure 37: Monitoring Configuration



4. Keep the default settings, and add the following additional settings:

   - Set **Ordering** to value larger than 500, for example, 520.
   - For **Node Group**, choose the hypervisor group, for example, “VMWare ESX Hosts.”
   - Select the **Enable IP Address Fault Polling** check box.
   - Select the **Enable Interface Performance Polling** check box.
   - Select the **Poll Unconnected Interfaces** check box.
   - Select the **Poll Interfaces Hosting IP Addresses** check box.

Figure 38: Monitoring Configuration: Node Settings



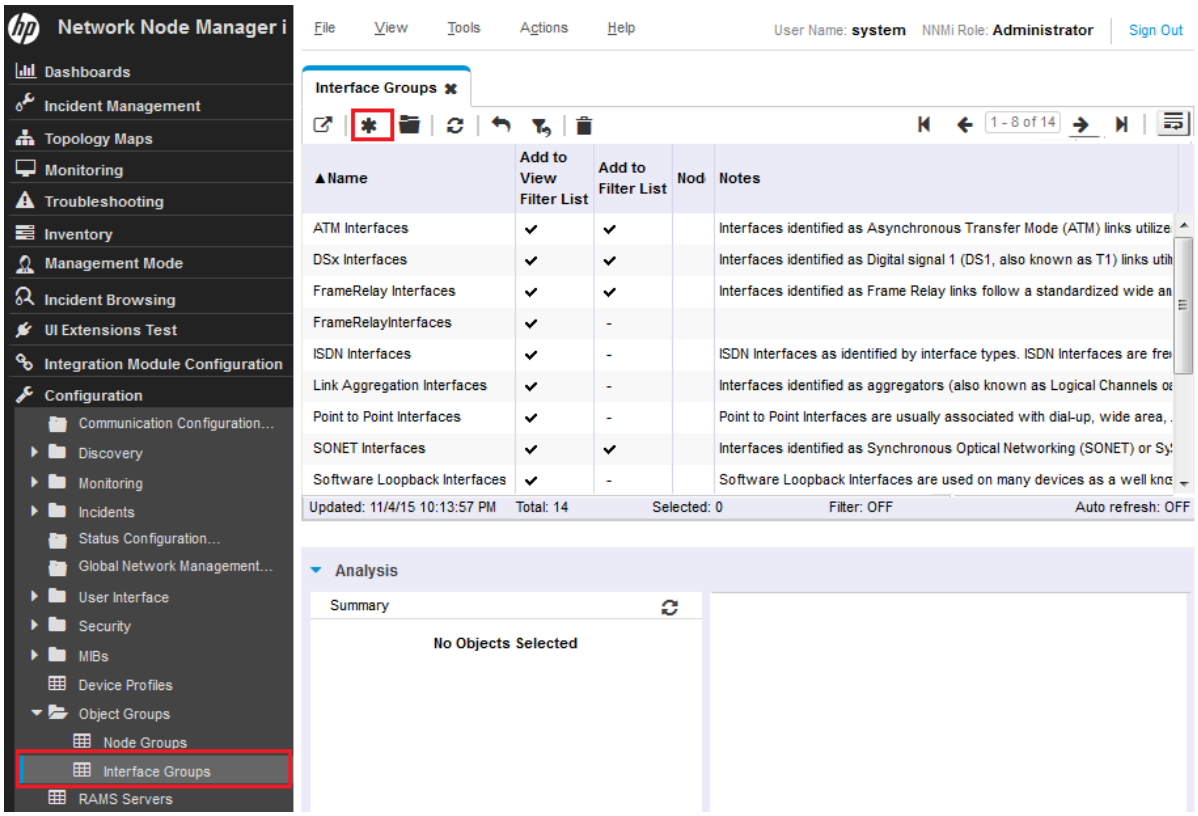
5. Click the **Save and Close** icon .
6. Repeat steps 2 – 5 for the Virtual Machines node group, specifying a different ordering number in step 4a.

Create an Interface Group for Monitoring

NNMi enables you to create groups of nodes and interfaces. To create an Interface Group, follow these steps:

1. From the workspace navigation panel, select the **Configuration** workspace, and then click Interface Groups.

Figure 39: Configuration: Interface Groups



2. Click the ✱ icon to create a new Interface Group.
3. Enter **Important 9kbs Tunnels**, or some other descriptive name, in the **Name** text box.

Tip: Do not restrict this Interface Group to a specific Node Group; although often, you will do so.

---

4. Click the **Additional Filters** tab to access the **Filter Editor** used to define the filter logic.

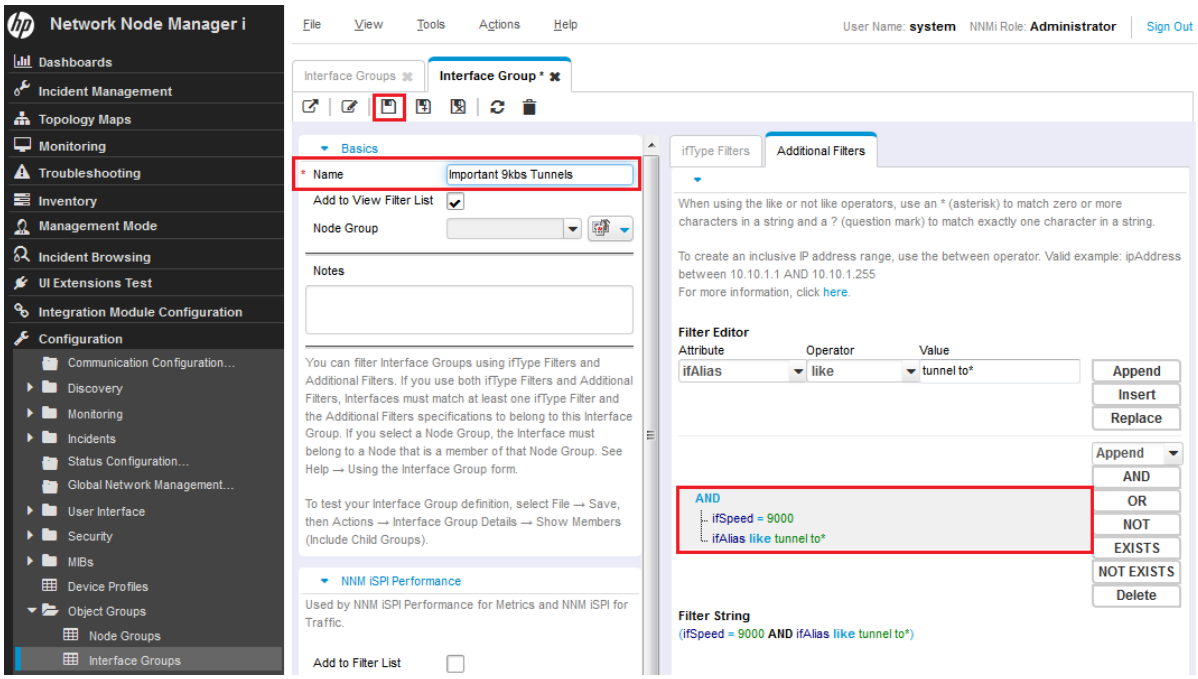
You define a filter expression by selecting an Attribute, an Operator and a value. You can use the like operator along with an asterisk for variable matching.

In this example, use an AND condition for the two attributes.

Tip: If you encounter problems when defining your logic, close the form without saving it to return to the last saved value. Then re-open the form and begin again.

Note: If you define an IfType filter (on the **IfType Filters** tab), then it is always logically AND'ed with the filters on the **Additional Filters** tab.

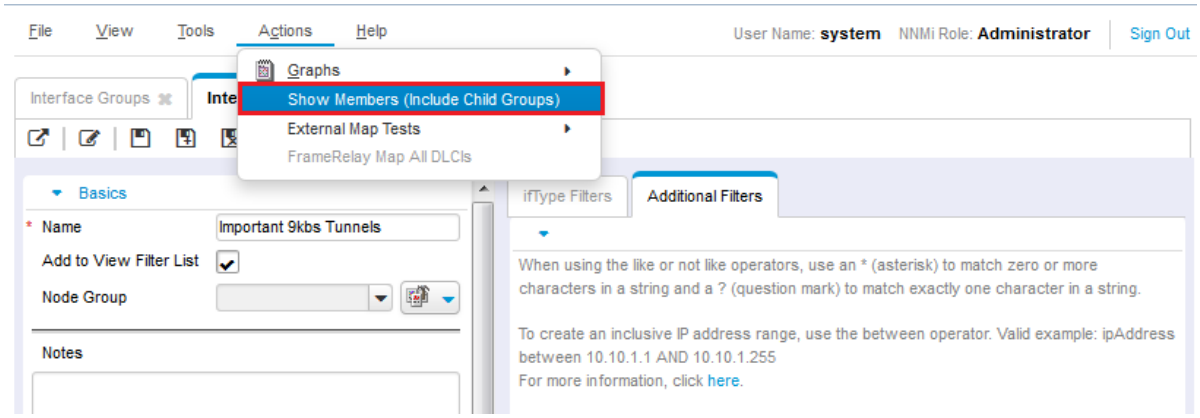
Figure 40: Interface Groups: Save



5. After you specify your filter, save the filter, but do not close it.
6. Verify that the filter works as expected using the **Actions > Show Members (include Child Groups)** menu item.

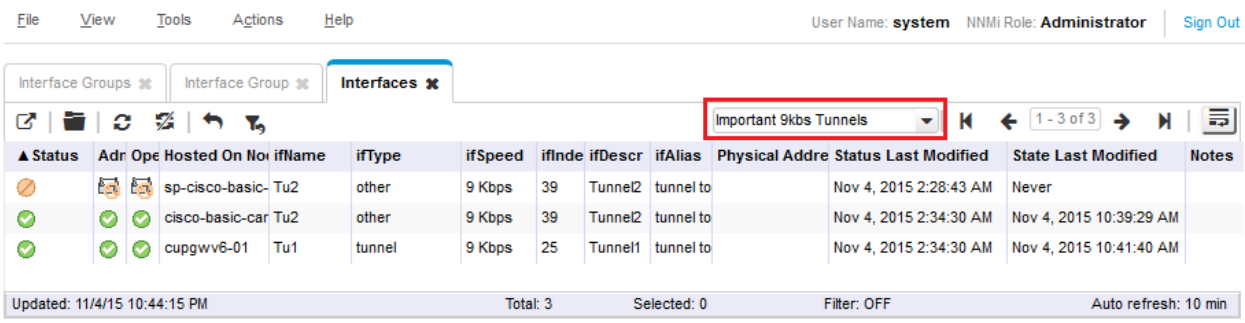
NNMi displays all items that pass the filter criteria.

Figure 41: Actions: Show Interface Group Members



7. Verify the results. In this example, you can see that the filter matched a number of interfaces in the network. NNMi is already monitoring some of them.

Figure 42: Interfaces: Interface Group Filter Results



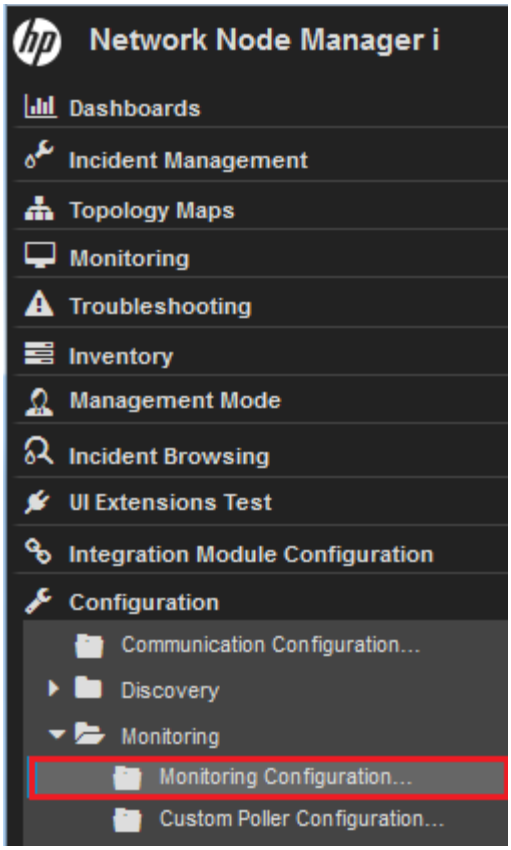
Apply Monitoring to an Interface Group

To monitor the interfaces defined by the filter just created, apply monitoring to this Interface Group. You can apply monitoring to both Node Groups and Interface Groups.

Note: NNMi considers an interface setting to be a higher priority than a node setting.

1. From the workspace navigation panel, select the **Configuration** workspace, and then click **Monitoring Configuration**.

Figure 43: Monitoring Configuration

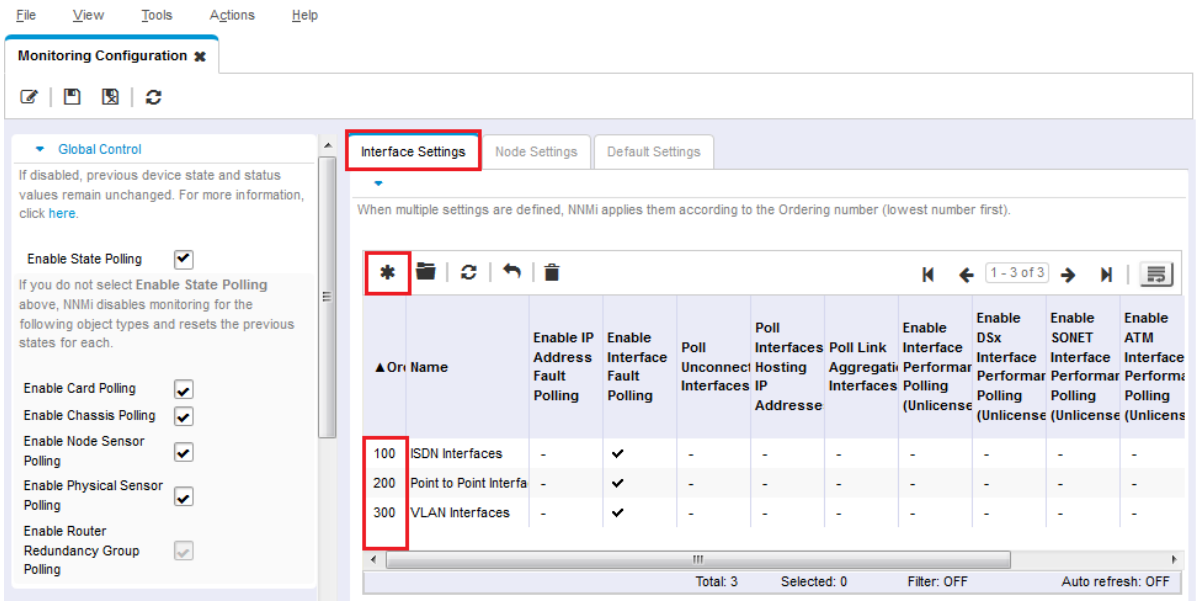


2. Click the **Interface Settings** tab.

Tip: Take note of the current Ordering values. These define priority if an interface belongs to multiple groups.

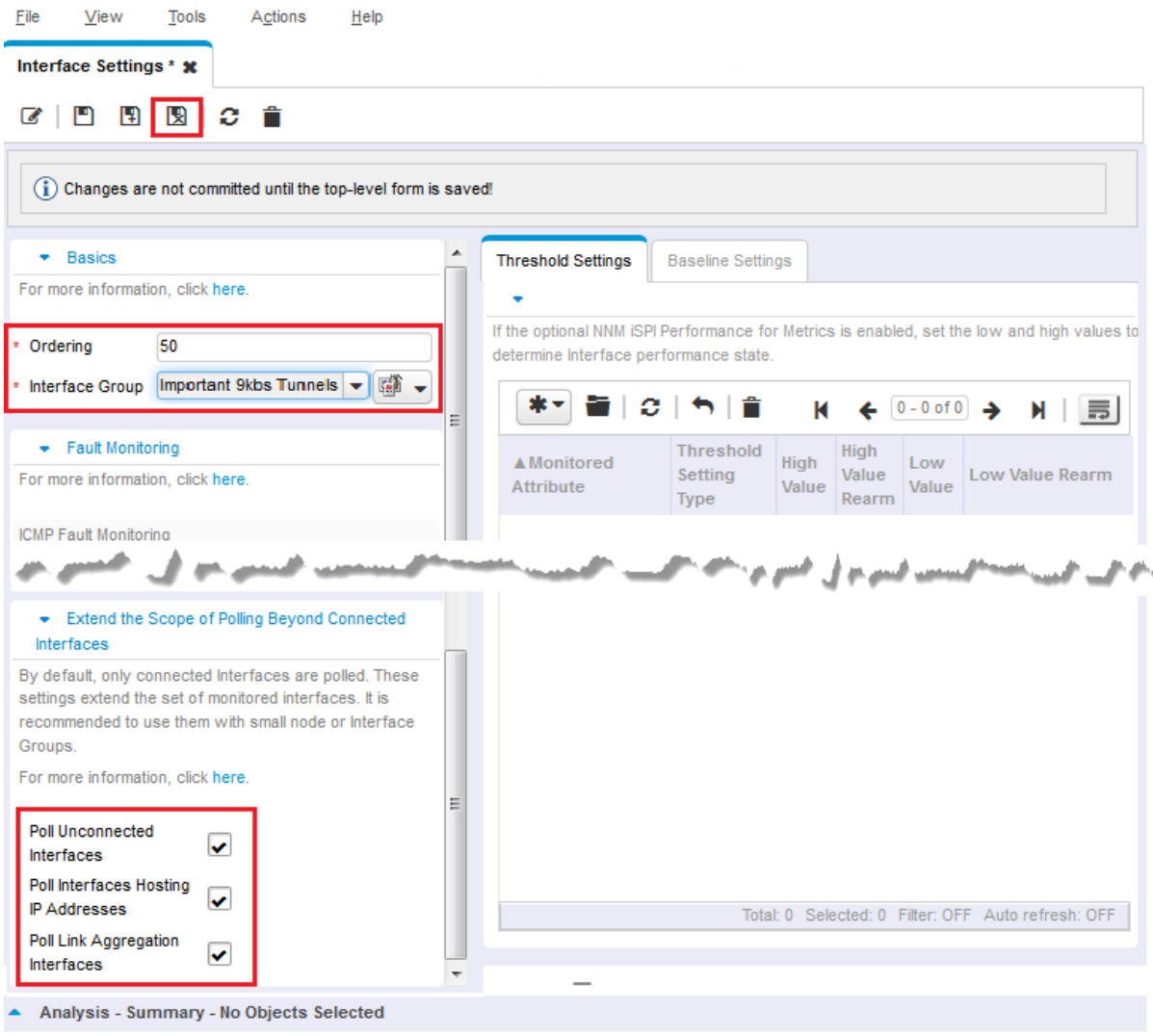
In this example, the highest priority is 100.

Figure 44: Monitoring Configuration: Interface Settings Tab



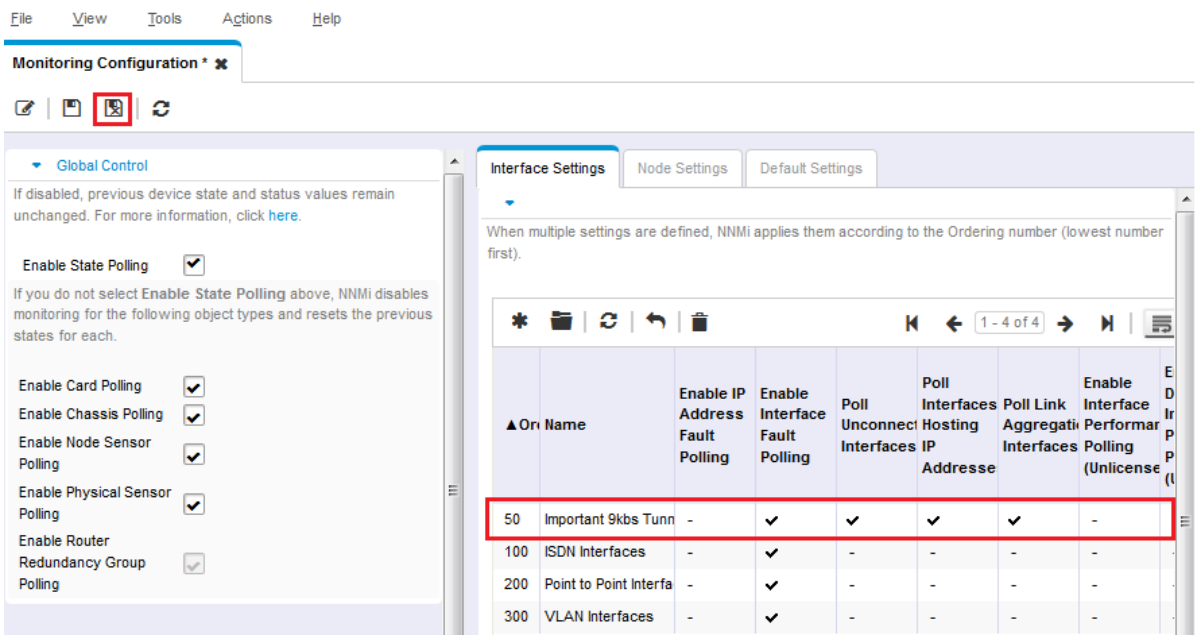
3. Click the ✱ icon.
4. Enter an **Ordering** value that configures this setting to have a higher priority than other settings. This ensures that these interfaces get polled. NNMi considers lower numbers to be higher priority. You also want to choose an **Ordering** value that takes into consideration future configurations. For example, if you set this number to 1, that sets the highest priority possible and limits your future entries. For this example, enter 50.
5. Extend the monitoring scope. To monitor these interfaces regardless of whether they are connected, click all the check boxes in the **Extend the Scope of Polling Beyond Connected Interfaces** area of the form.
6. Use the **Quick Find** feature to select your newly created Interface Group. Then click **Save and Close**.

Figure 45: Interface Settings: Save and Close



7. Click Save and Close at the top level **Monitoring Configuration** form to save your changes.

Figure 46: Monitoring Configuration: Save and Close



Now that you have a monitoring setting that applies to everything in this Interface Group, NNMi uses SNMP to monitor any interface that matches the **Important 9kbs Tunnels** filter.

Test the Monitoring Settings

You can test your new monitoring settings in many different ways. For this example, use the following steps:

1. From the workspace navigation panel, select the Inventory workspace, and then click Interfaces.
2. Use the drop-down menu to select the new Interface Group, Important 9kbs Tunnels.

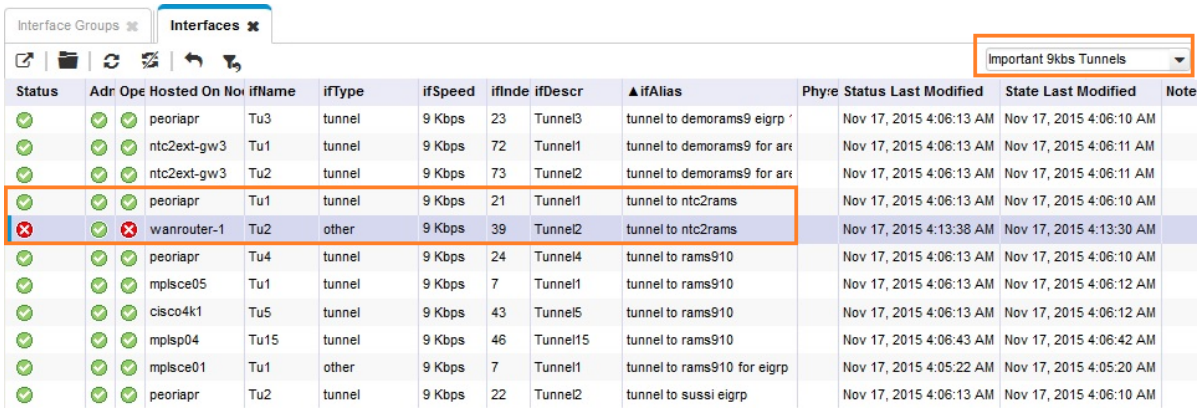
This filters the table to only show the interfaces in this Interface Group.

Tip: You might notice that some of the interfaces have an Administrative State of Not Polled. It can take a few minutes for your Monitoring configuration changes to take effect. To manually force the interfaces to be polled, perform a Status Poll command on one of the nodes hosting these interfaces. You should see them all begin to acquire status.

To perform a Status Poll on a node:

1. From the workspace navigation panel, select the **Inventory** workspace, and then click **Nodes**.
2. Select the node you want to poll, and then use the **Actions > Polling > Status Poll** command to start the Status Poll.

Figure 47: Interfaces: Important 9kbs Tunnels Filter

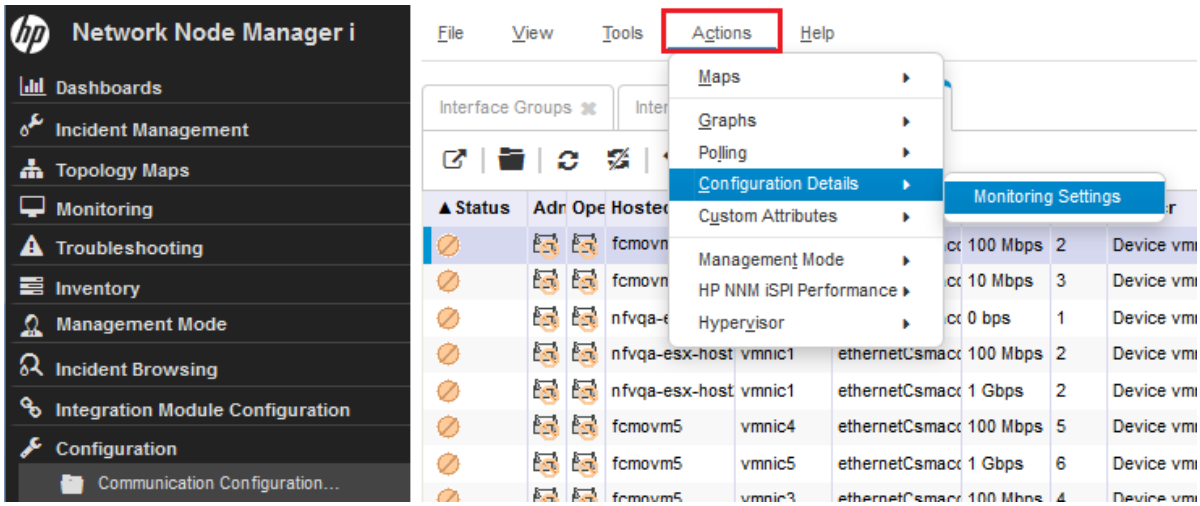


Open one of the interfaces highlighted in the previous figure and check the monitoring settings to confirm that your monitoring settings are working properly.

To check monitoring settings for an interface:

1. Double-click the interface.
2. Click **Actions > Configuration Details > Monitoring Settings** to view the monitoring configuration for the selected interface.

Figure 48: Actions: Monitoring Settings



This example report confirms that the monitoring settings are working properly:

First, you can see that NNMi applied the monitoring settings for the **Important 9kbs Tunnels** group to this interface. This shows you that the monitoring settings are properly associated with this interface.

Second, you can see that NNMi has Fault SNMP Polling Enabled set to true. This indicates that the new monitoring settings are successfully applied to the Important 9kbs Tunnels Interface Group.

Figure 49: Monitoring Settings Report: Interface

Monitoring Settings Report: Interface

NNMi Management Station: [redacted]
Object Name: Tu1
Hosted on Node: ntc2ext-gw2

Tip: NNMi administrators can monitor several aspects of each device (for example, Interface, Address, or Card). Check additional Monitoring Settings from other forms. For more information, click here.

SNMP Monitoring Summary	
Fault SNMP Polling Enabled	true
Fault Polling Interval	0 days 0 hours 5 minutes 0 seconds
Performance Polling Enabled	false
Performance Polling Interval	0 days 0 hours 5 minutes 0 seconds
Management Mode	Managed
Enable DSx Interface Performance Polling	false
Enable SONET Interface Performance Polling	false
Enable ATM Interface Performance Polling	false
Enable Frame Relay Interface Performance Polling	false

Monitoring Settings Applied	
Type	Interface Settings
Interface Group	Important 9kbs Tunnels
Node Group	None
Fault SNMP Interface Polling Enabled	true
Fault Polling Interval	0 days 0 hours 5 minutes 0 seconds
Performance SNMP Polling Enabled	false
Performance Polling Interval	0 days 0 hours 5 minutes 0 seconds
Enable DSx Interface Performance Polling	false
Enable SONET Interface Performance Polling	false
Enable ATM Interface Performance Polling	false
Enable Frame Relay Interface Performance Polling	false
Poll Unconnected Interfaces	true
Is this interface connected?	*no*

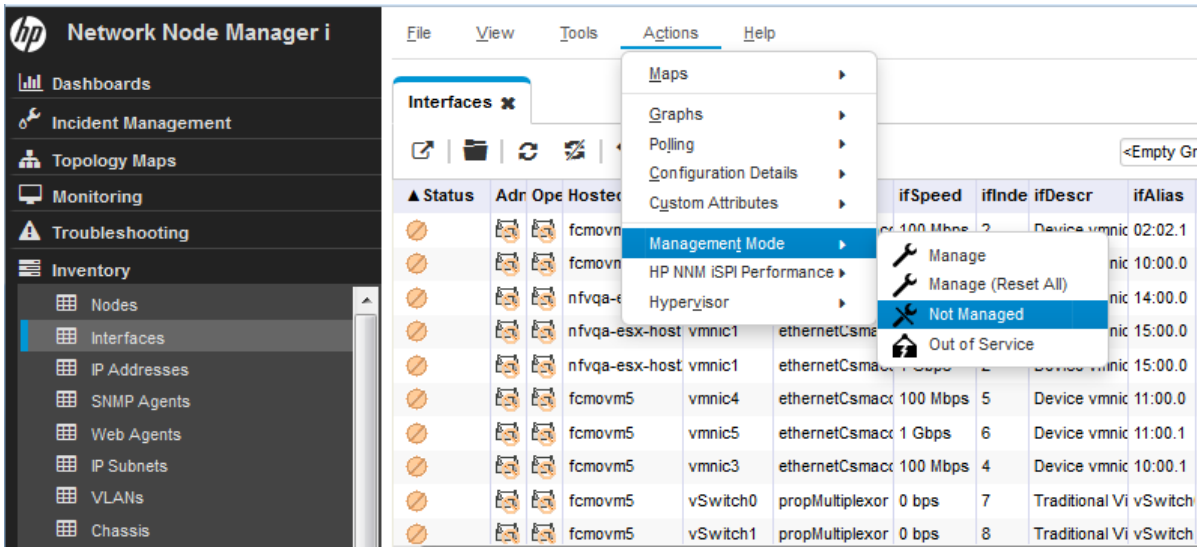
Monitoring Exceptions

You can manually force an interface or node to be unmonitored.

From the Interface form, click **Actions > Management Mode > Not Managed** to switch to unmanaging the interface.

NNMi no longer monitors this interface regardless of the monitoring settings.

Figure 50: Actions: Management Mode: Not Managed



NNMi does not presently have the same approach that NNM used to force an interface to be unmonitored. Currently, unmanaging an interface is only a negative override.

See *Forcing an Interface to be Polled*, available at softwaresupport.hp.com, to force NNMi to monitor an interface.

Configure Incidents, Traps, and Automatic Actions

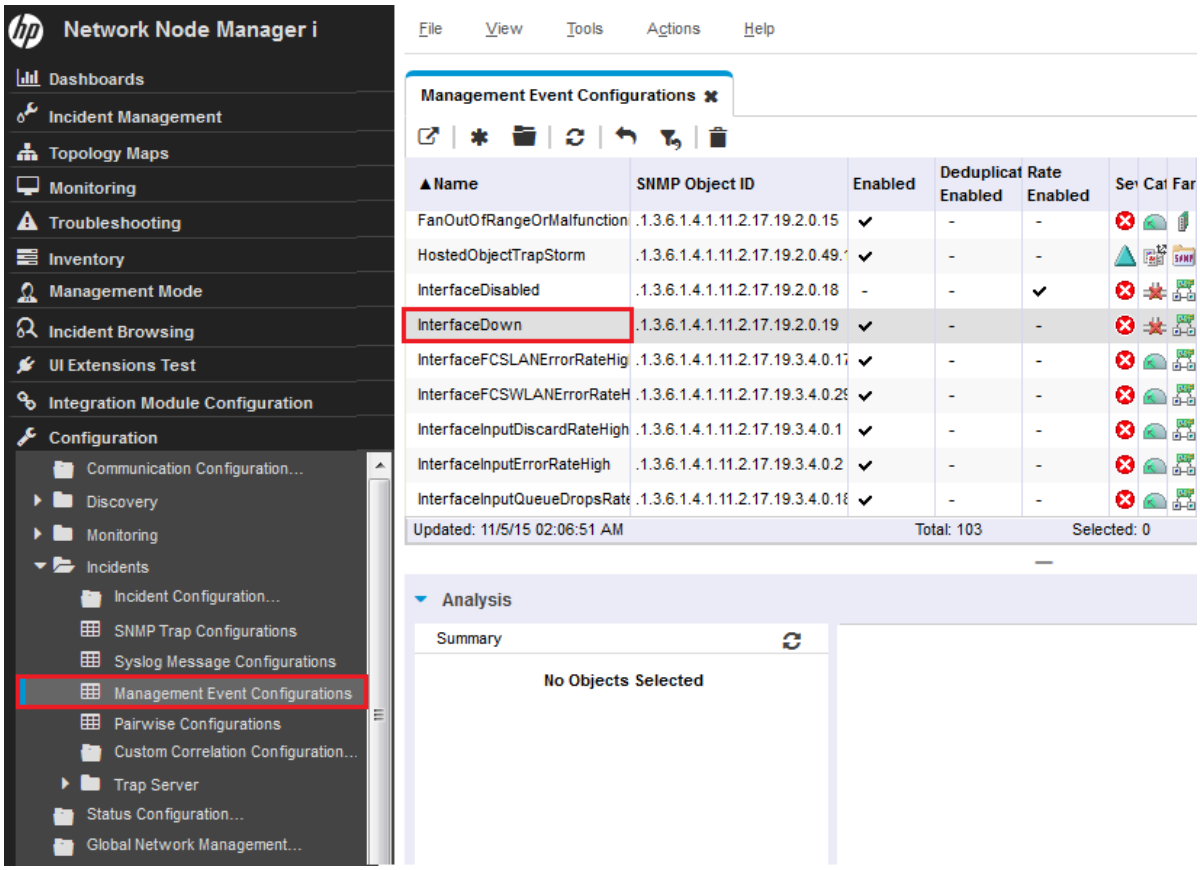
Configure Incidents

With NNMi, you can change certain aspects of an incident. Some examples include enabling an incident, formatting a message, enabling de-duplication, and enabling rate correlation.

This example describes how to enhance the InterfaceDown (Interface Down) incident to include the Interface Alias in the message.

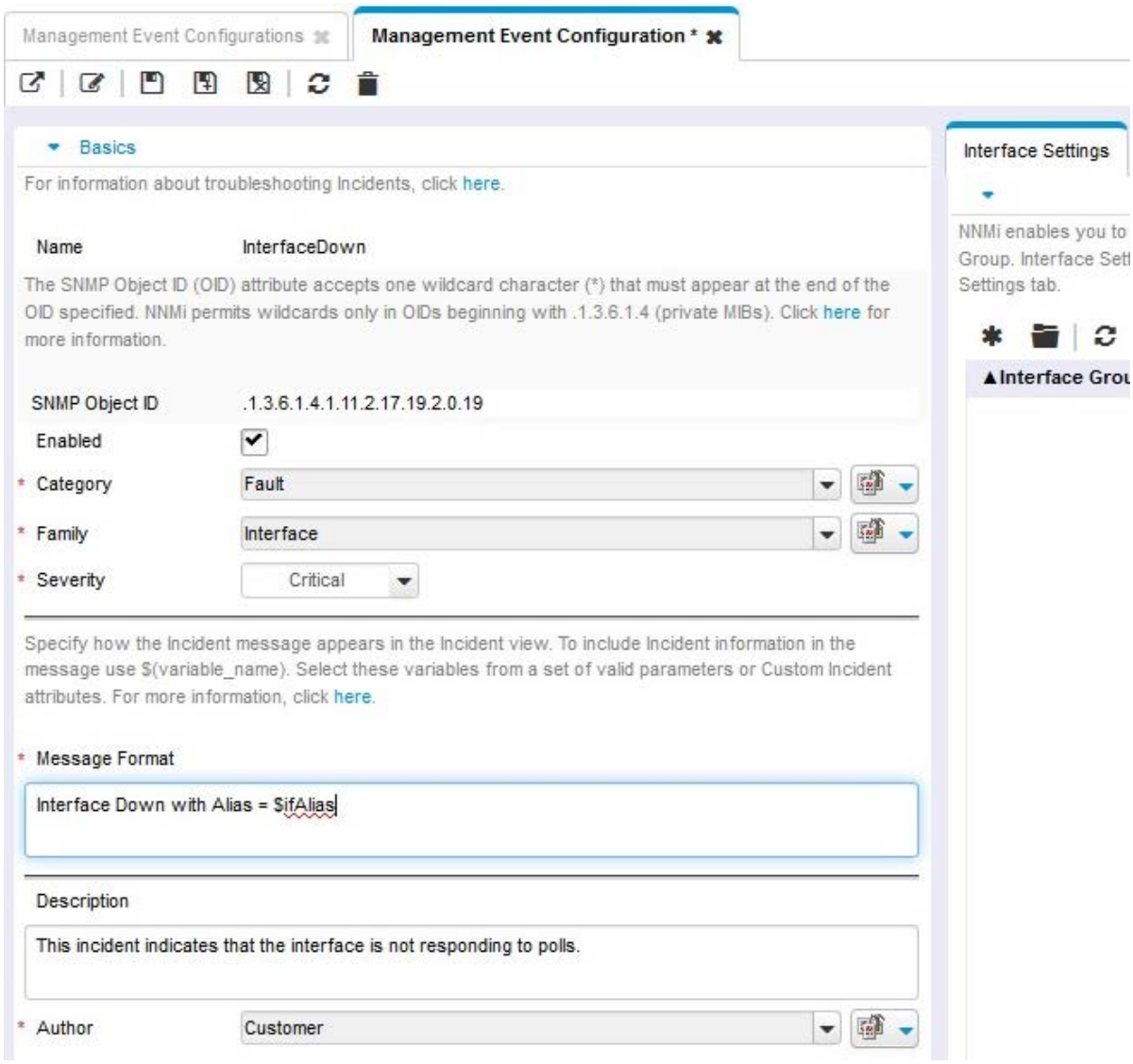
1. From the **Workspace** navigation panel, select the **Configuration** workspace, and then click **Incidents** > **Management Event Configurations**.
2. Double-click the **InterfaceDown** incident configuration.

Figure 51: Configuration: Management Event Configurations



3. Before continuing, see “Valid Parameters for Configuring Incident Messages” in the NNMi help to view the possible arguments that can be added to a message format. In this example, add the argument $ifAlias to the incident message as shown in the following example.

Figure 52: Management Event Configuration: Message Format

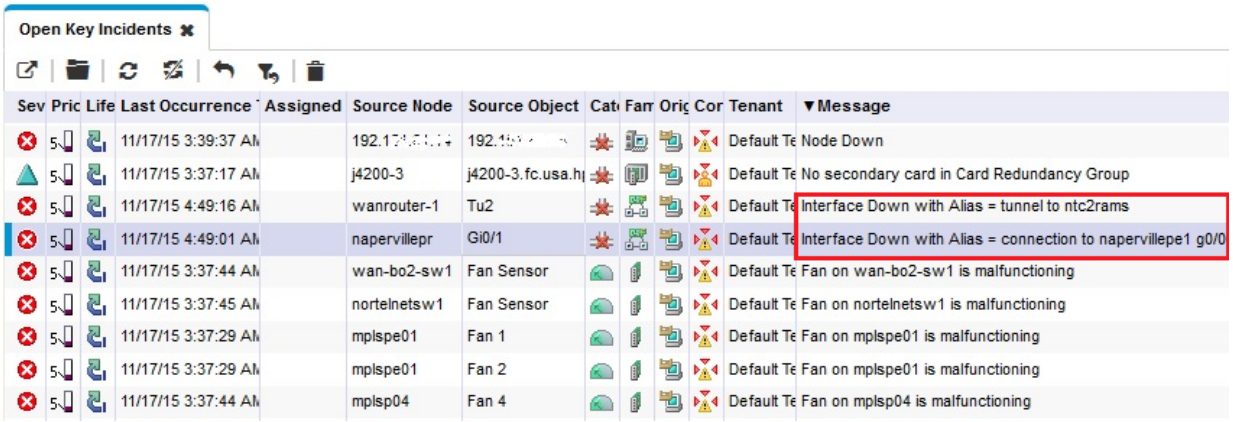


4. Change the **Author** to **Customer** using  **Quick Find**.
5. Finally, click **Save and Close** on this form and in the **Management Event Configuration** form.

As shown in the following **Open Key Incidents** view example, all InterfaceDown incidents show the $ifAlias parameter.

Note: If there is no alias on the interface, NNMi displays null for the alias.

Figure 53: Open Key Incidents



Configure Traps

Tip: See *Step- by-Step Guide to Incident Management*, available at softwaresupport.hp.com, for more details about working with traps in NNMi.

Note: To receive a trap into the NNMi Incident Browser, you must load the MIB that contains the trap definitions into NNMi.

For this example, you need to load three MIBs to satisfy the dependencies. You first load the ruggedcom.mib file, followed by the rcsysinfo.mib file. Then you can load the traps from the ruggedcomtraps.mib file. Use the nnmloadmib.ovpl command to load the MIBs into NNMi.

Note: You can also use the NNMi console to load MIBs.

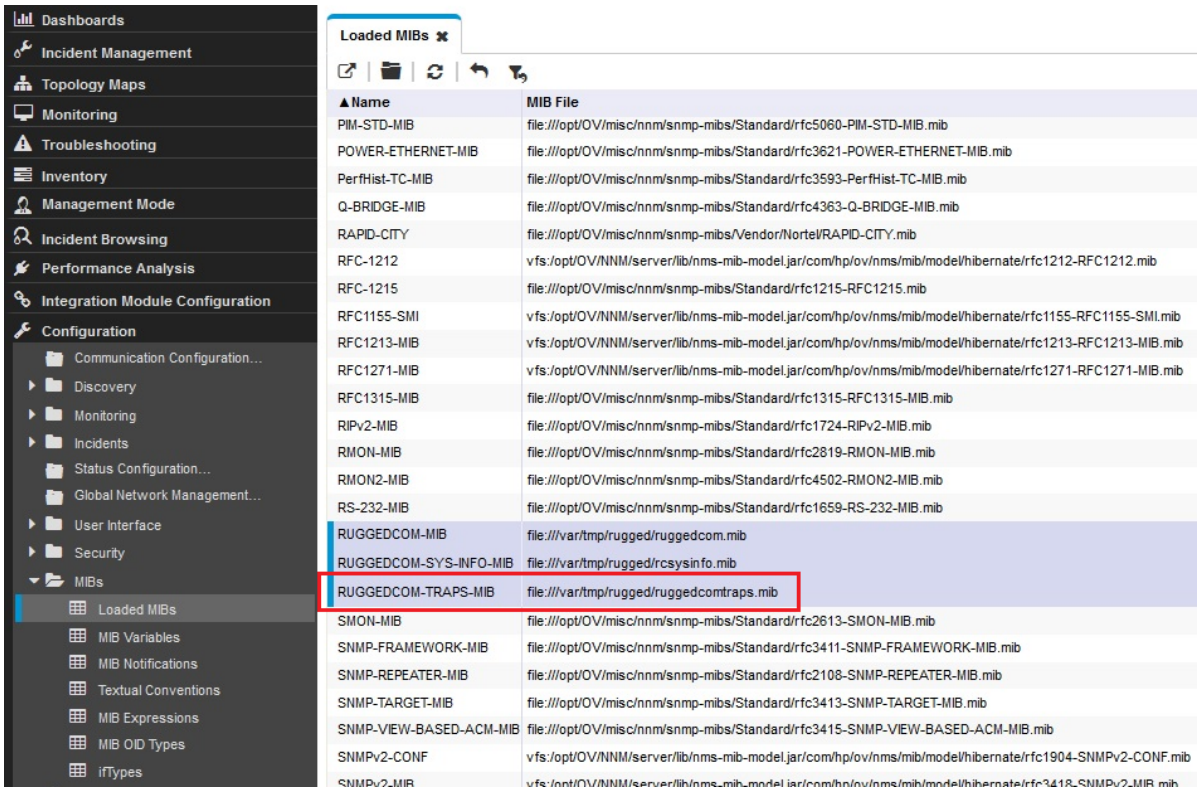
To load MIBs using the command line:

1. Run the nnmloadmib.ovpl -load ./ruggedcom.mib command. This loads the ruggedcom.mib definitions.
2. Run the nnmloadmib.ovpl -load ./rcsysinfo.mib command. This loads the **rcsysinfo.mib** definitions.
3. Run the nnmloadmib.ovpl -load ./ruggedcomtraps.mib command. This loads the ruggedcomtraps.mib file.

Next, verify that the MIBs are loaded:

1. From the workspace navigation panel, select the Configuration workspace, and then click MIBs > Loaded MIBs.
2. Notice the newly loaded Rugged Com MIBs.
3. Take note of the traps module (RUGGEDCOM-TRAPS-MIB). You will need this for the next command.

Figure 54: Configuration: Loaded MIBs



4. Run the **nnmincidentcfg.ovpl -loadTraps RUGGEDCOM-TRAPS-MIB** command to load the traps from this module. You should see output similar to the following:

   SNMP trap(s) from mib module loaded: RUGGEDCOM-TRAPS-MIB.

   Number of traps: 5.

   The following traps were added to incident configuration:

   cfgChangeNoRevTrap - .1.3.6.1.4.1.15004.5.5

   cfgChangeTrap - .1.3.6.1.4.1.15004.5.4

   powerSupplyTrap - .1.3.6.1.4.1.15004.5.2

   swUpgradeTrap - .1.3.6.1.4.1.15004.5.3

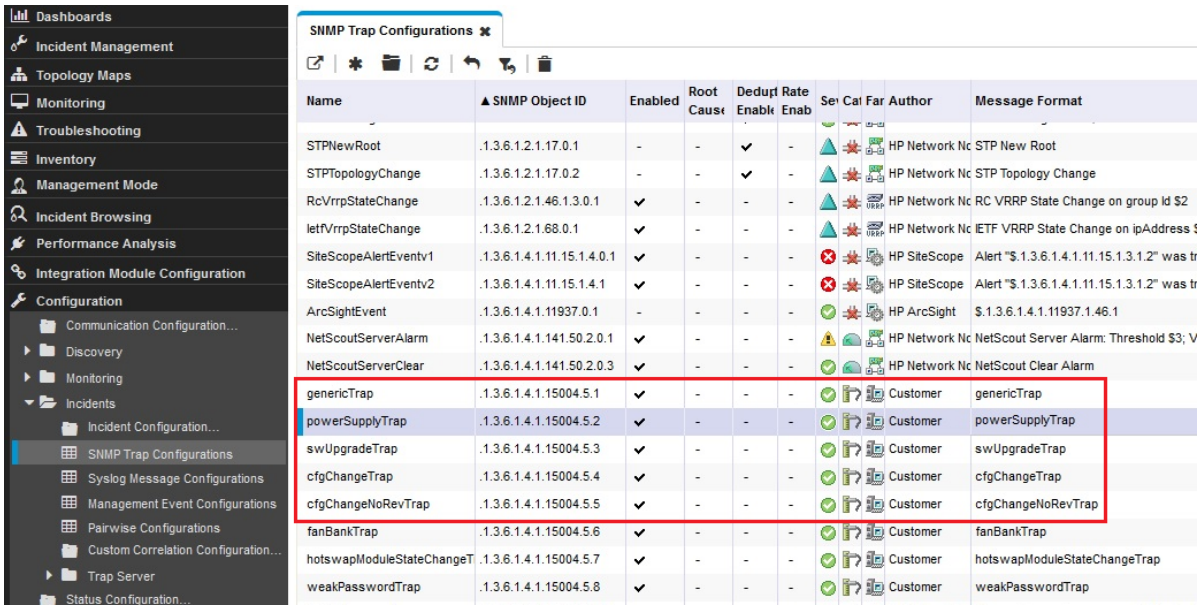
   genericTrap - .1.3.6.1.4.1.15004.5.1

You now have four new traps defined in NNMi. To view them:

1. From the workspace navigation panel, select the **Configuration** workspace, and then click **Incidents > SNMP Trap Configurations**.
2. Sort the traps by **SNMP Object ID**.

Notice that all of the traps are loaded as enabled. You may want to disable all but the ones you specifically want to receive. You may want to make configuration modifications at this time.

Figure 55: Configuration: SNMP Trap Configurations



Configure Automatic Actions

You can configure automatic actions for incidents. Usually you do this for only management events rather than for SNMP traps, because it is hard to predict the rate and volume of traps. NNMi automatic actions can be executable commands, command line scripts, or Python scripts. The Python scripts execute within NNMi's Java virtual machine (JVM) so they execute quickly. Since NNMi uses a Java interpreter for Python, NNMi refers to these scripts as Jython.

In NNMi, actions are based on Lifecycle Sate changes for incidents. You can configure NNMi to take one action when an interface goes down and another action when the interface comes back up again. To do this, configure both actions on the InterfaceDown incident, but associate one action with the Lifecycle State set to Registered and the other action with the Lifecycle State set to Closed. Usually NNMi does not generate an associated up incident.

Note: When NNMi generates an incident, it assigns the **Registered** state to the incident.

To configure NNMi to run a Perl script when it receives a Node Down incident, do the following:

1. Place your script in the actions directory.

Note: For security reasons, you must be root or administrator to access this directory.

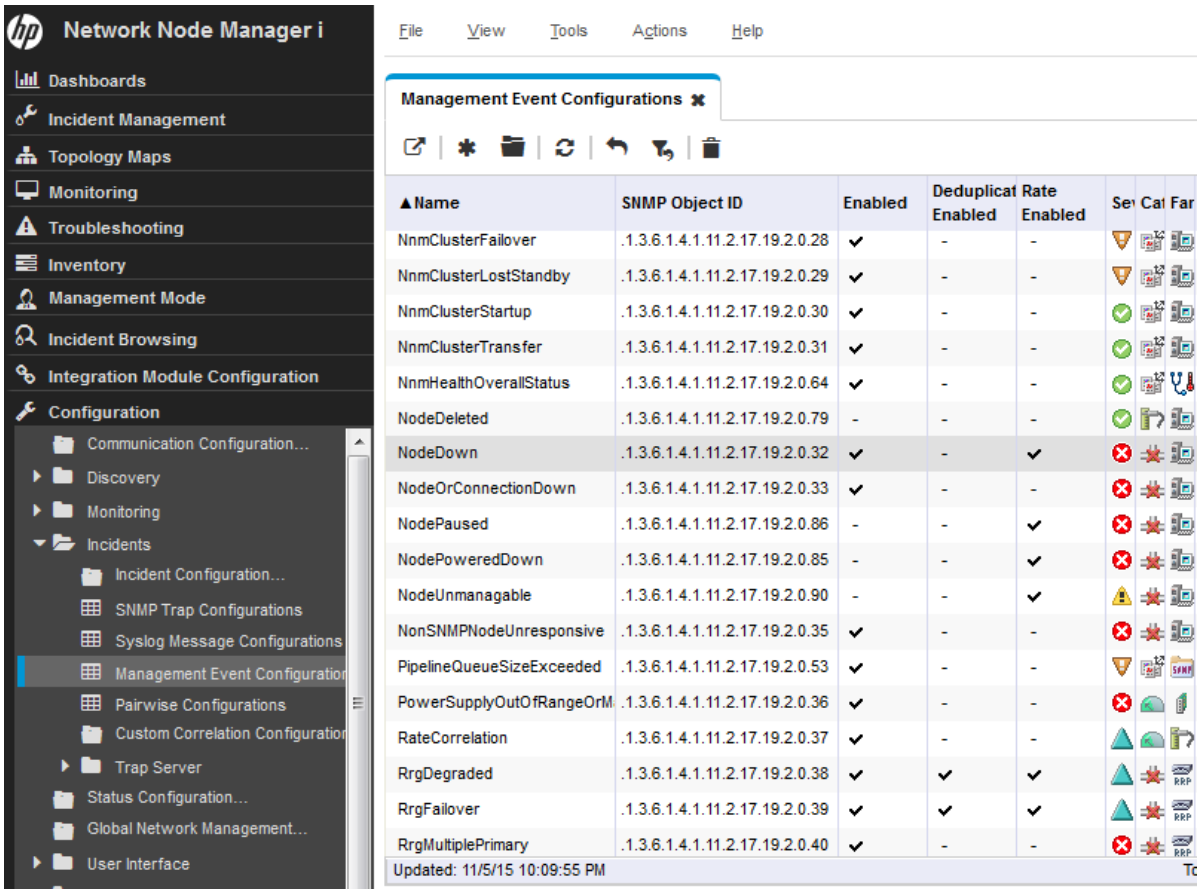
For this example, assume the actions directory appears in the following location:

- Windows: %NnmDataDir%\shared\nnm\actions
- Linux: $NnmDataDir/shared/nnm/actions

The actions directory can be in a different location depending on how you installed NNMi. For this example, the script is named writelog.ovpl. Copy this script into the actions directory. Make sure that your script is executable.

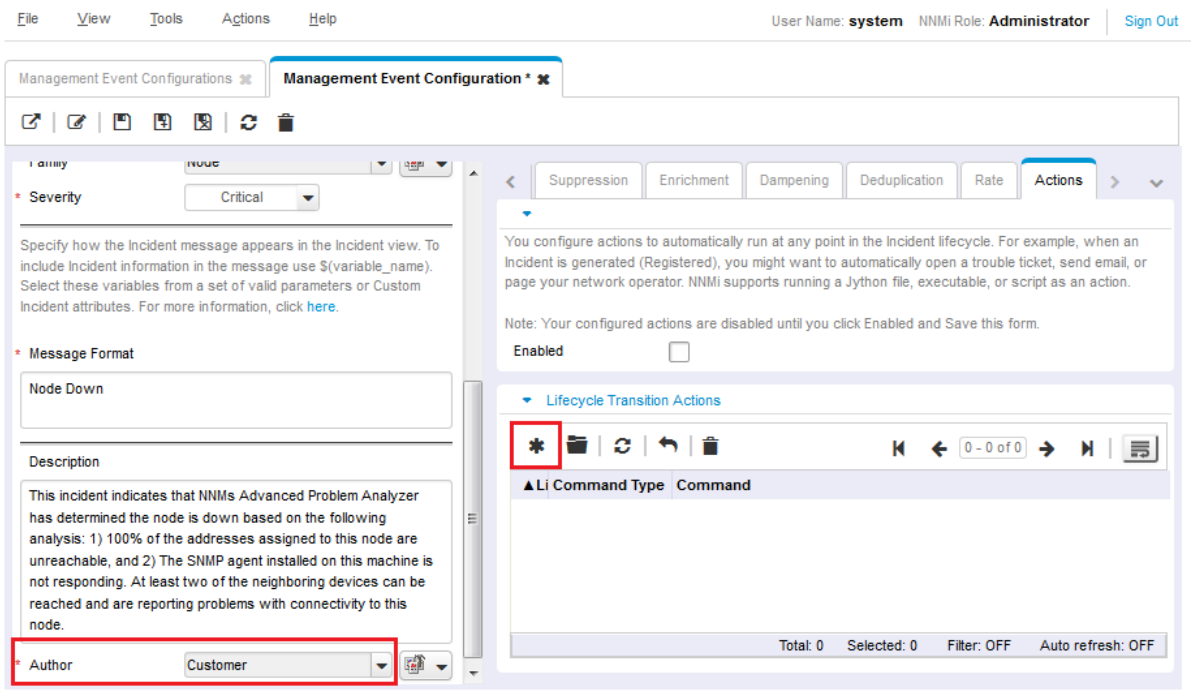
2. To associate this script with an action on this incident:
    a. From the workspace navigation panel, select the **Configuration** workspace.
    b. Click **Incidents > Management Event Configuration**.
    c. Double-click the **NodeDown** incident.

Figure 56: Management Event Configurations: NodeDown Incident



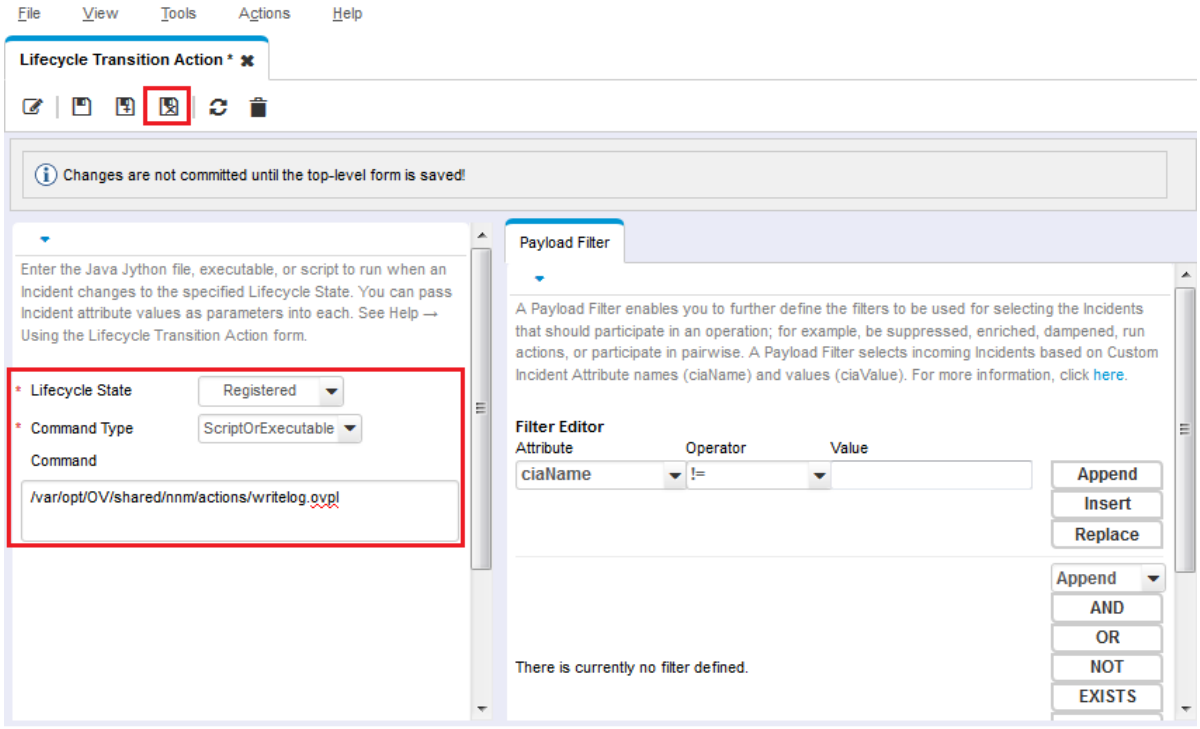
3. Change the **Author** to **Customer**, click the **Actions** tab, and click the ✱ icon.

Figure 57: Management Event Configuration: Actions Tab



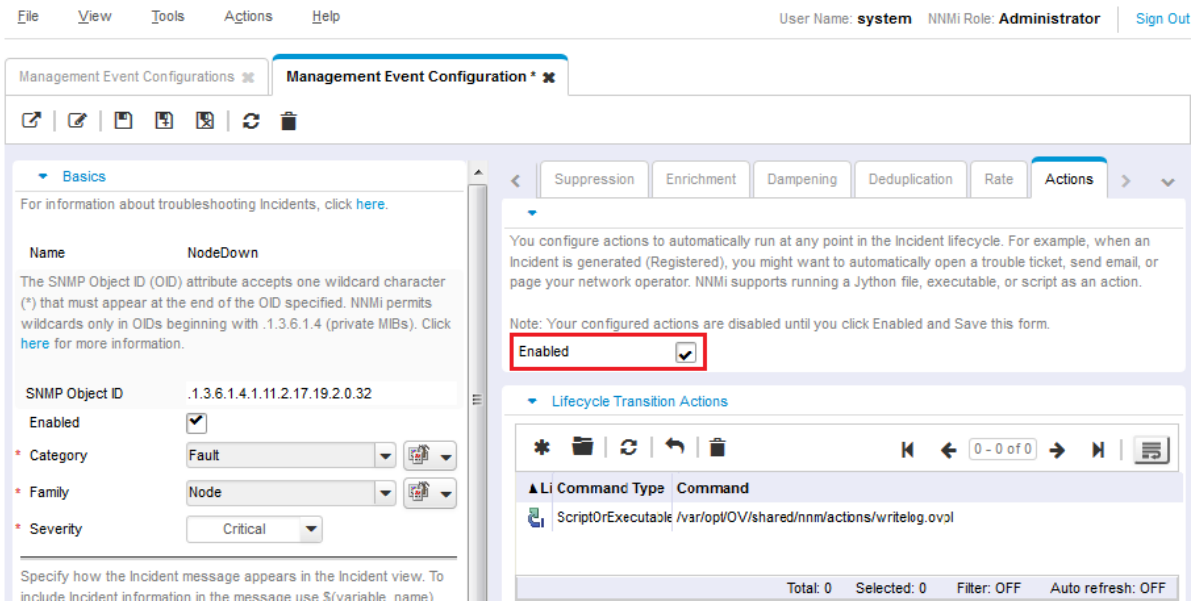
4. Select the appropriate **Lifecycle State** (**Registered** in this example).
5. Set the **Command Type** to **ScriptOrExecutable**.
6. Enter the name of the command, including the complete path to the executable, and then click **Save and Close**.

Figure 58: Lifecycle Transition Action



6. Click the **Enabled** check box to enable the action.

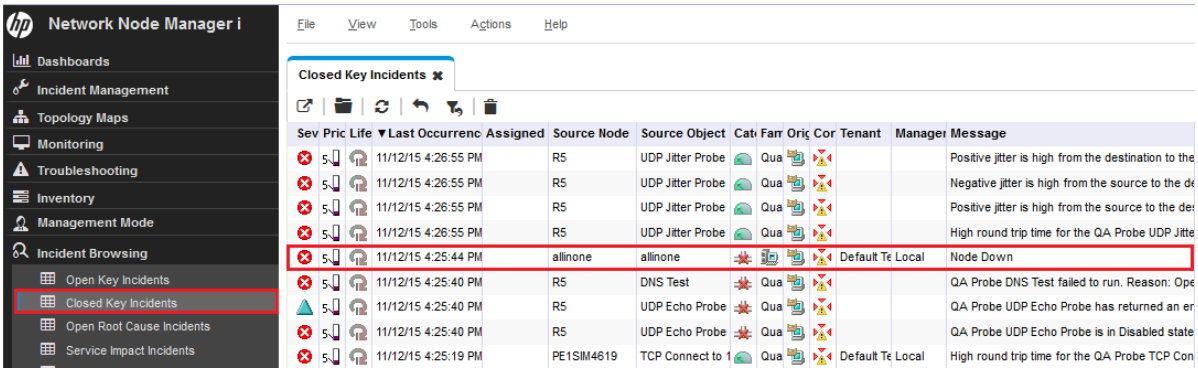
Figure 59: Management Event Configuration: Actions Tab: Enable Action



Next, you need to test the action. The easiest way to do this is to look for a previous occurrence of the NodeDown incident:

1. From the workspace navigation panel, select the **Incident Browsing** workspace, and then click **Closed Key Incidents**.

Figure 60: Incident Browsing: Closed Key Incidents View



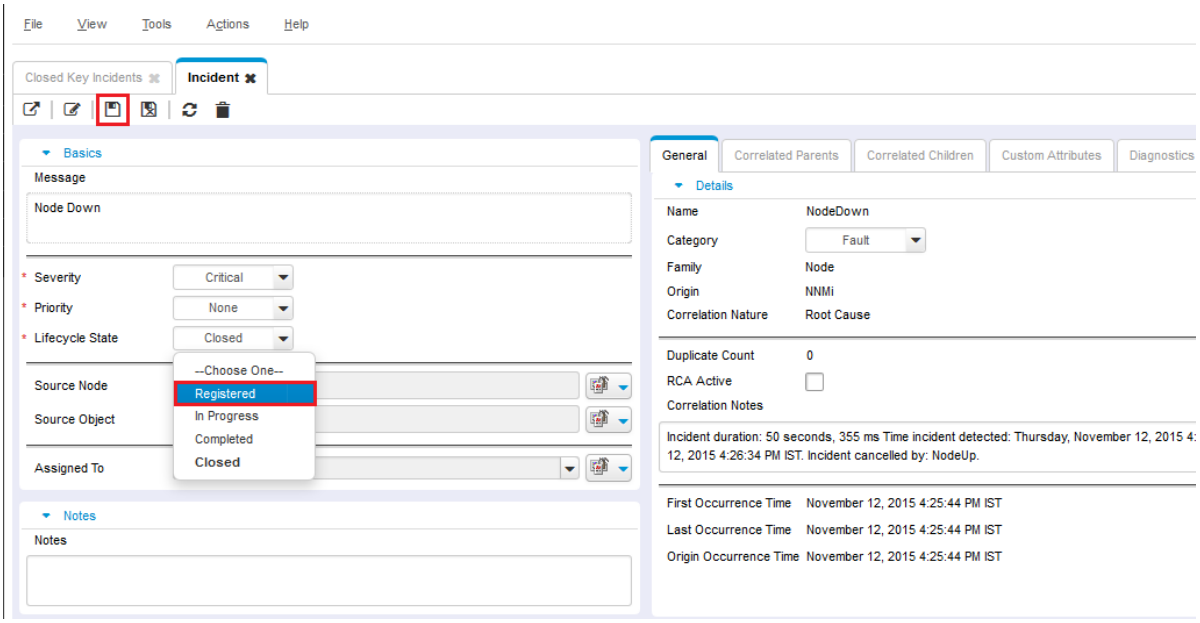
2. Double-click to open the form for a NodeDown incident that NNMi closed.

   In this example Closed means that the interface is back up. NNMi automatically closes an incident when a fault is cleared. (You can re-open the incident by setting the **Lifecycle State** to Registered. After you take this action, NNMi behaves as if the incident is opened for the first time when executing actions.)

3. Set the **Lifecycle State** to **Registered**.

   This causes your action to execute after you save this form (saving the Lifecycle State change). If you change the Lifecycle State without saving the change, NNMi takes no action.

Figure 61: Incident Form: Registered Lifecycle State



4. Click **Save** after each Lifecycle State change.

After saving your change, verify your action's results. In this case, look at the log file associated with this script. After you finish testing, set the **Lifecycle State** back to Closed, and then save the incident to return it to its original state.

Configure the NNMi Console

Overview

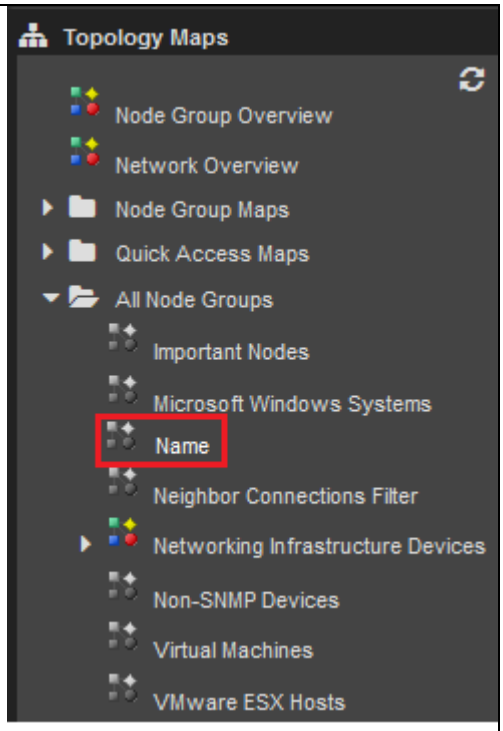
NNMi administrators define Node Groups to establish logical groups of devices. These Node Groups are used in a variety of ways. This section explains how they are used to create maps.

When NNMi Administrators create a Node Group:

- The link to that Node Group's map automatically shows up under the Topology Maps > All Node Groups folder in alphabetical order.

  The All Node Groups folder is visible only to NNMi Administrators.

- The Node Group Map icon is  grey.

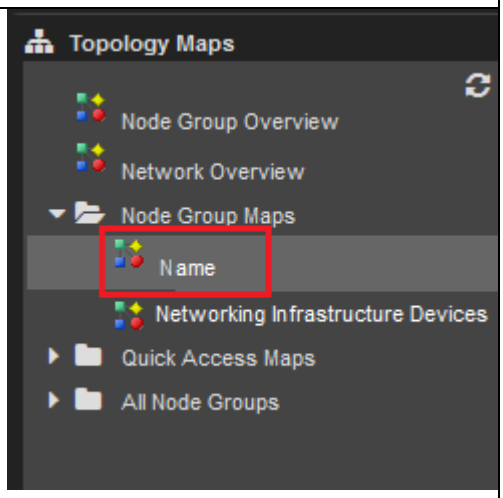


When the NNMi Administrator opens the Node Group Map and clicks the Save Map icon:

- The link to that Node Group's map automatically shows up under the Topology Maps > Node Group Maps folder in alphabetical order.

  The Node Group Maps folder is visible to all NNMi users.

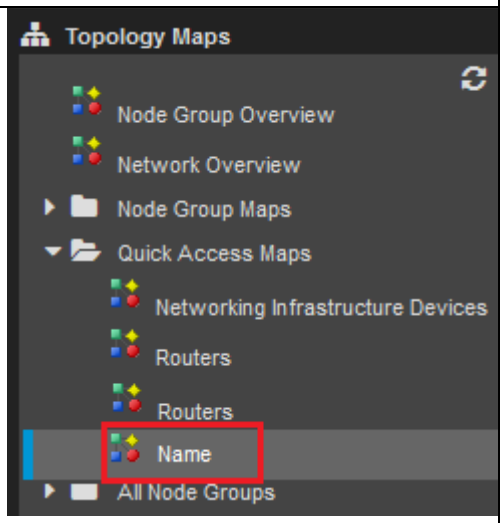
- The Node Group Map's icon changes to  multiple colors.



When the NNMi Administrator assigns a Topology Maps Ordering number to the Node Group's map (Configuration > User Interface > Node Group Map Settings):

- The link to that Node Group's map automatically shows up under the Topology Maps > Quick Access Maps folder in the assigned order.

  The Quick Access Maps folder is visible to all NNMi users.



If the the NNMi Administrator wants the new Node Group map to be displayed every time an NNMi user opens NNMi, use the Configuration > User Interface > User Interface Configuration: Initial View settings.

Configure Node Groups

To enhance diagnostics, create Node Group maps, which show the nodes contained in a Node Group.

See “Using Node Groups” in the *HP Network Node Manager i Software Deployment Reference*, available at softwaresupport.hp.com, for more information about configuring Node Groups.

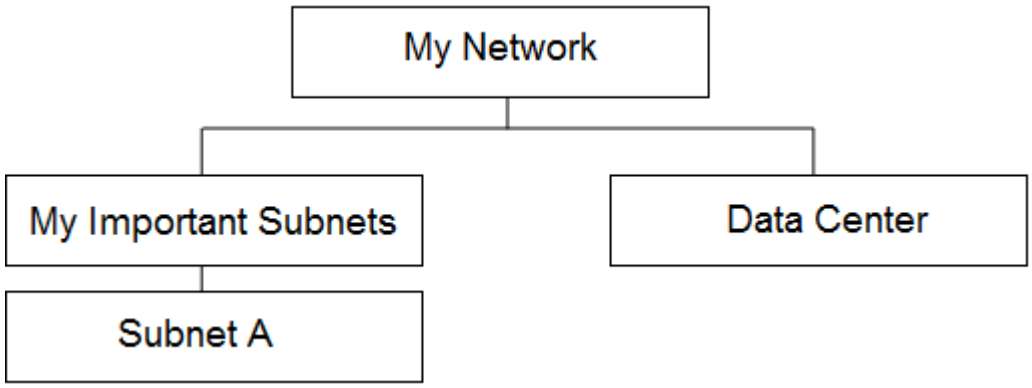
This example creates Node Groups for a few different subnets.

Tip: You want these Node Groups to refer to management addresses rather than addresses on the node. You also want these Node Groups to contain nodes based on names.

Note: The same node can be in multiple Node Groups.

The following diagram describes an example hierarchy of Node Groups:

Figure 62: Hierarchy of Groups



Subnet A = Management Address of 192.125.*.*

Data Center = Nodes that have a system name beginning with “data_center”

Note the following:

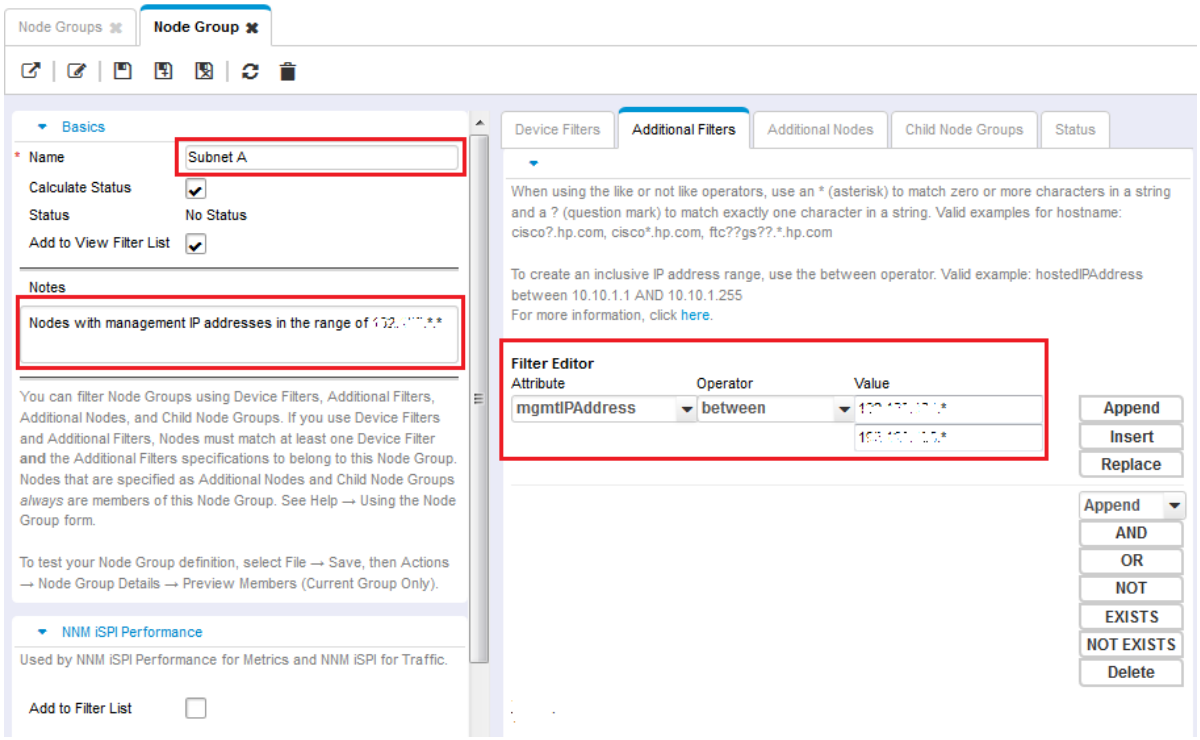
- Only the Subnet A Node Group and Data Center Node Group are populated with nodes. The My Important Subnets Node Group shows structure in the hierarchy and is populated only with a Child Node Group.
- It is easiest to work your way up the hierarchy.

1. Click the **Configuration** workspace > **Object Groups** > **Node Groups**.
   On the **Node Groups** form, click the ✱ icon.

   Create the Subnet A Node Group as shown in the following example:

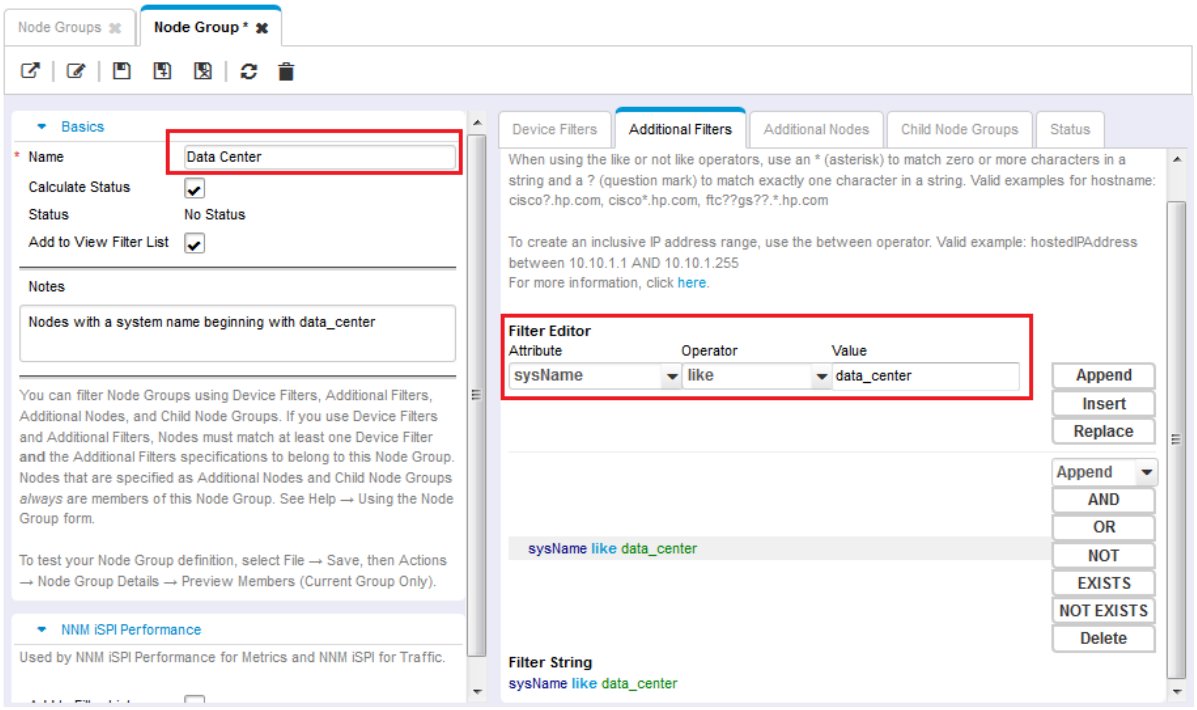
Tip: Notice the unique expression for IP address ranges.

Figure 63: Node Group: Basics



2. Next, create the Data Center Node Group.

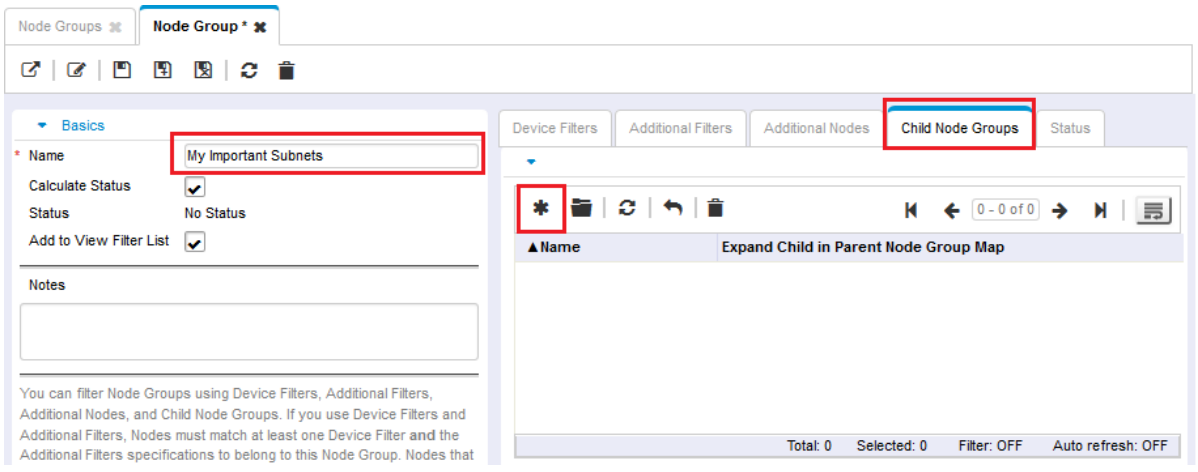
Figure 64: Node Group: Additional Filters Tab



3. Next, create the Node Group called My Important Subnets:

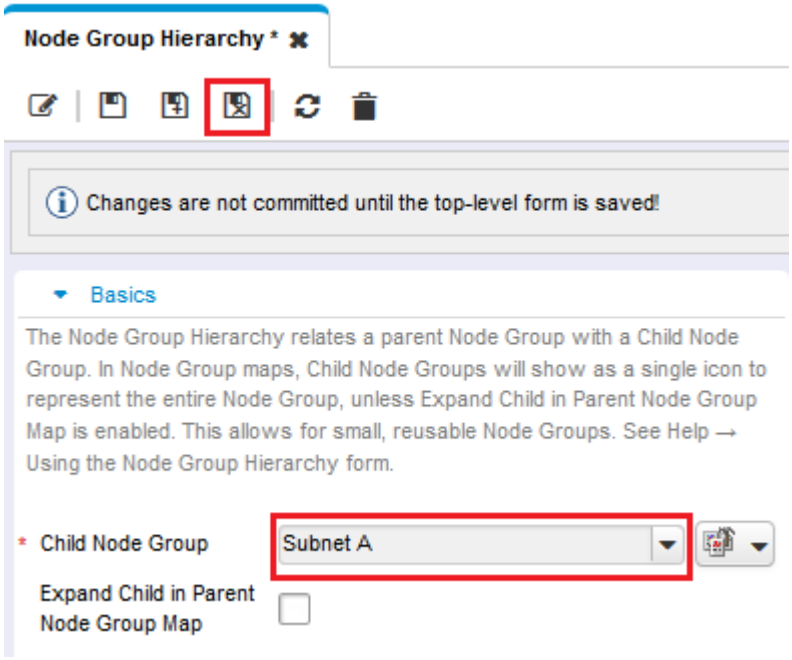
    1. On the **Node Groups** form, click the ✱ icon.
    2. Enter **My Important Subnets** in the **Name** text box.
    3. Click the **Child Node Groups** tab, and then click the ✱ icon.

Figure 65: Node Group: Child Node Group Tab



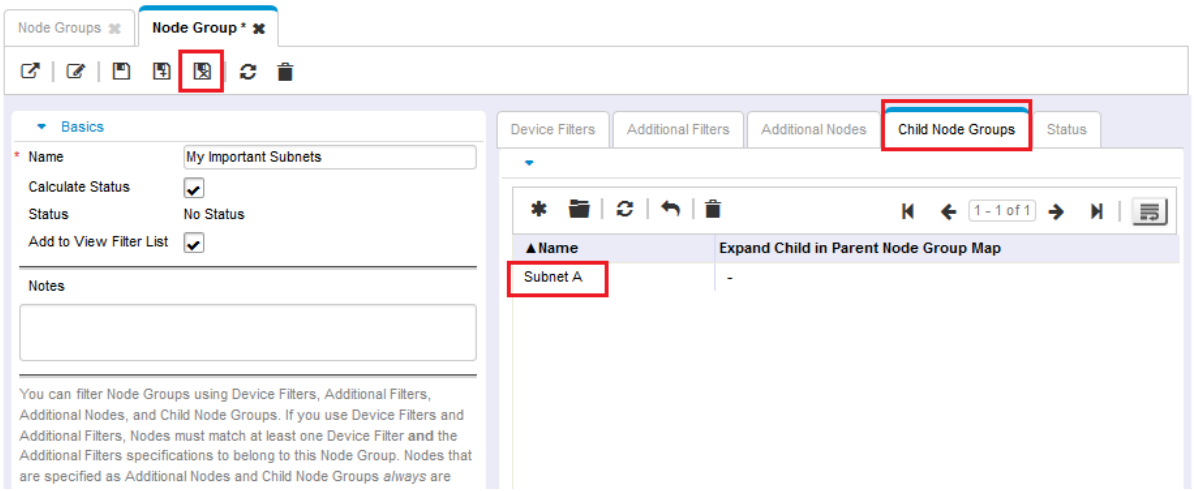
4. Click  , and then click **Quick Find**. Click the **Subnet A Child Node Group**, and then click **OK**.

Figure 66: Node Group Hierarchy: Assign Child Node Group Name



5. Click  **Save and Close**. You just created a Child Node Group, Subnet A, for the My Important Subnets Node Group.

Figure 67: Child Node Groups Tab: Save and Close



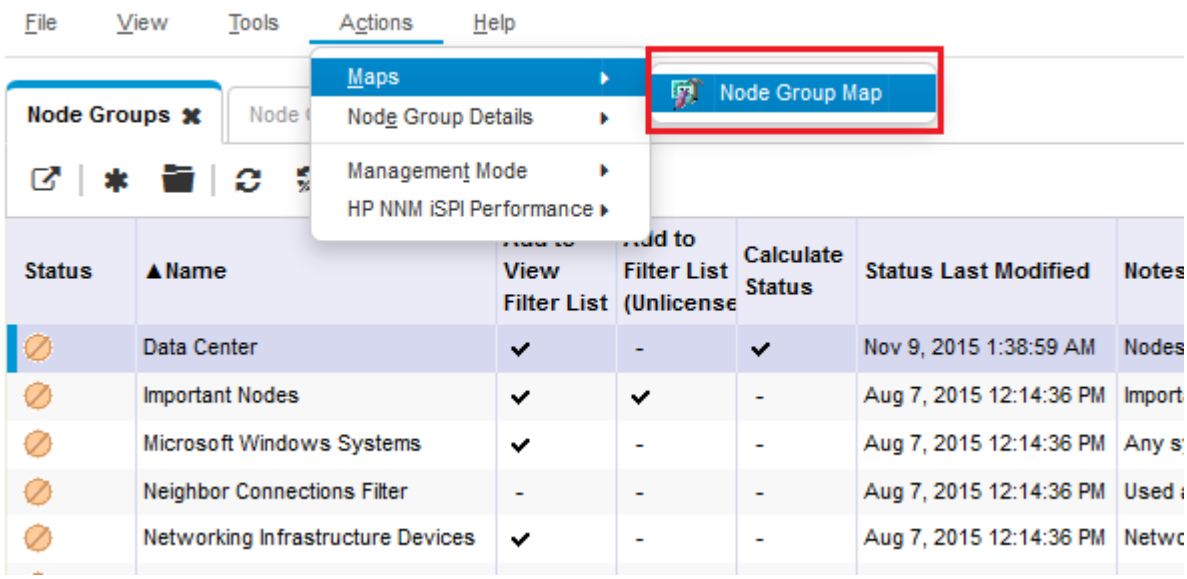
Finally, create the Node Group called My Network that includes the following Child Node Groups: Data Center and My Important Subnets.

Tip: Remember to test the membership after you save each Node Group by clicking **Actions > Node Group Details > Preview Members (Current Group Only)**.

After you test the population of the Node Groups, create an initial instance of a map for each Node Group:

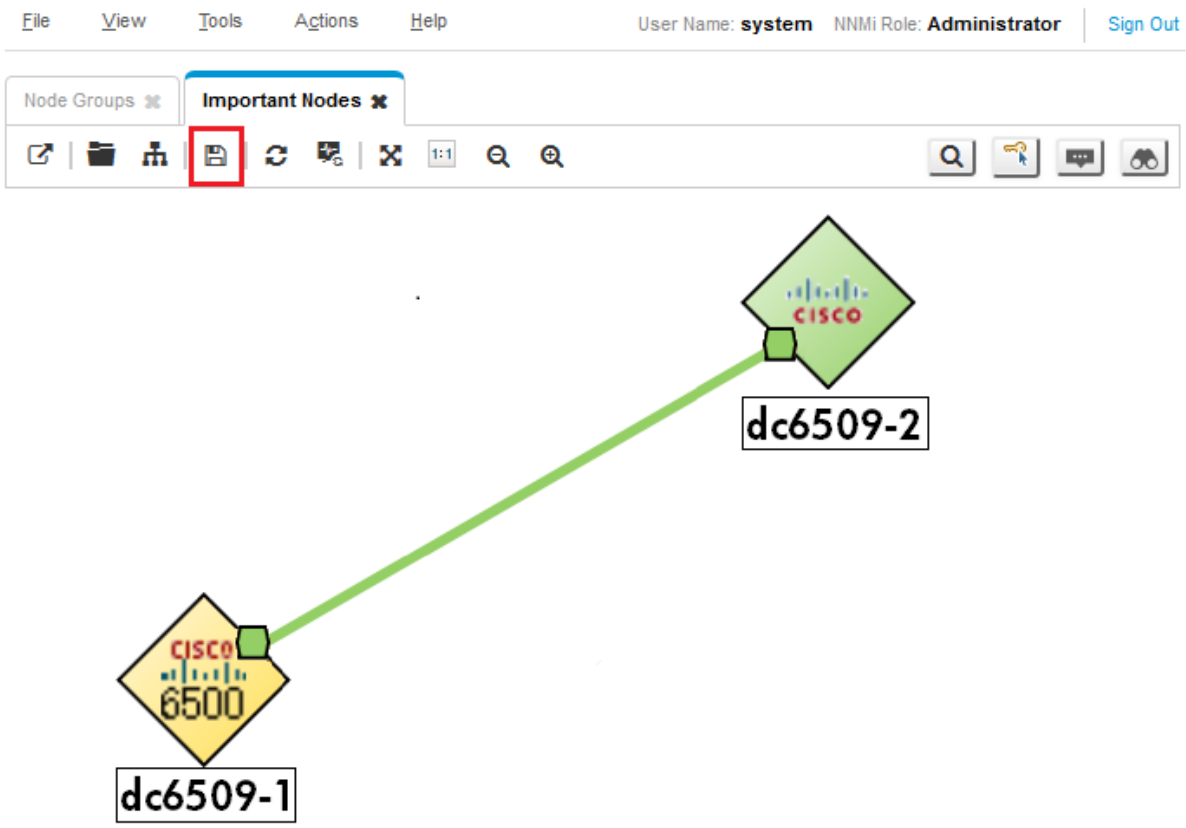
1. Click **Actions > Maps > Node Group Map** to open the map.

Figure 68: Actions: Map: Select Node Group Map



2. Optional: You can move the icons around and click Save Map (this changes everyone's copy of the map).

Figure 69: Topology Maps > All Node Groups > Node Group Map: Save Map



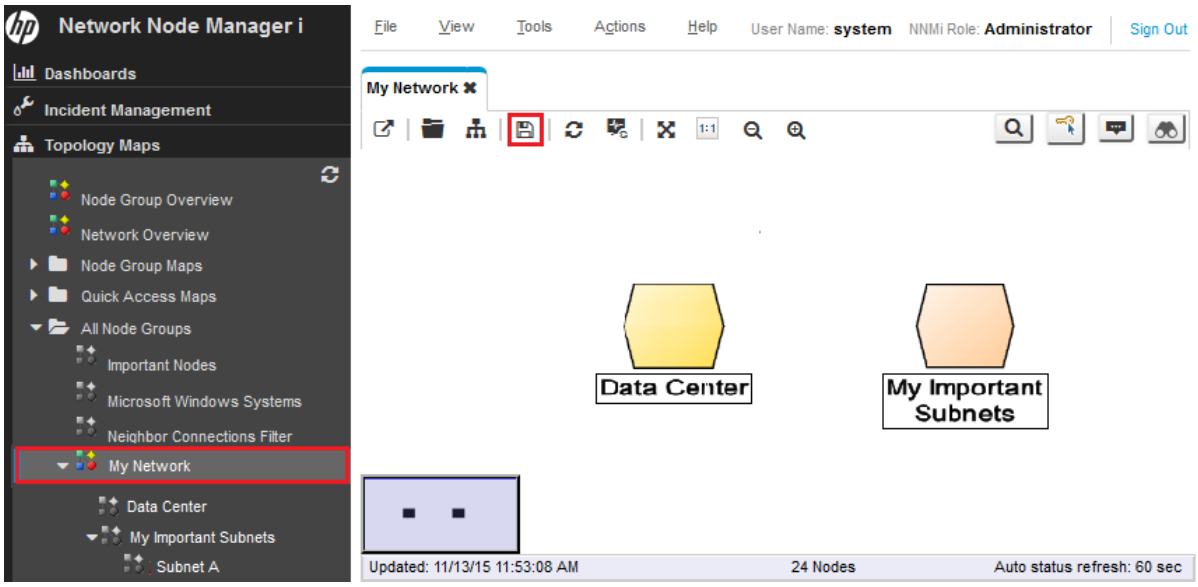
After you save the change, NNMi displays a message informing you that it created a Node Group map.

Repeat this same process for the entire hierarchy. It may take time for status to fully propagate to the Node Groups.

Configure the Node Group Maps

You now have a map hierarchy that you can navigate within. From the workspace navigation panel, select the **Topology Maps** workspace. If you do not see the newly created Node Group Maps, try refreshing the browser or signing out and back into NNMi.

Figure 70: My Network Topology Map



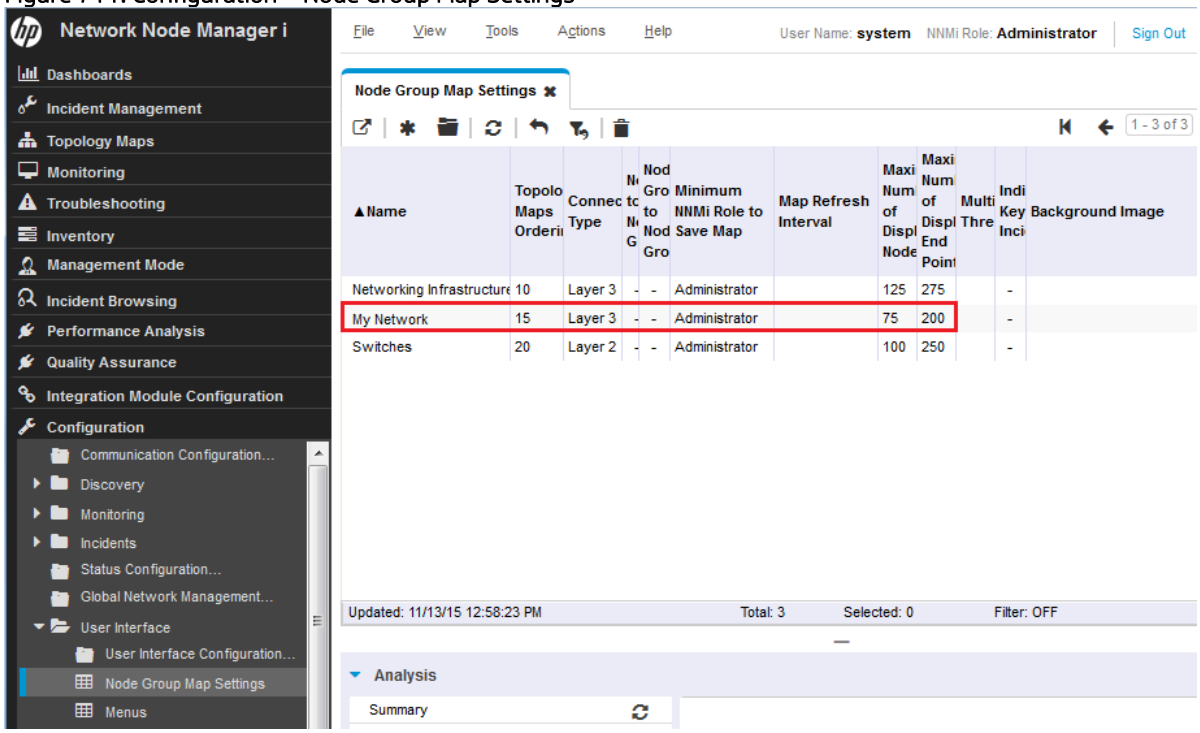
The Node Group Map Settings configuration option enables you to position Node Groups, add background graphics, and change connectivity options.

To place a background graphic on the map:

1. From the workspace navigation panel, select the **Topology Maps** workspace, expand the **All Node Groups** folder, and then click **My Network** to display the map. Click **Save Map** (this adds the map to the Node Group Maps Settings).
2. From the workspace navigation panel, select the **Configuration** workspace, expand the **User Interface** folder, and then click **Node Group Map Settings**.

Note the current **Topology Map Ordering** values. The lowest number currently used is 10.

Figure 711: Configuration > Node Group Map Settings



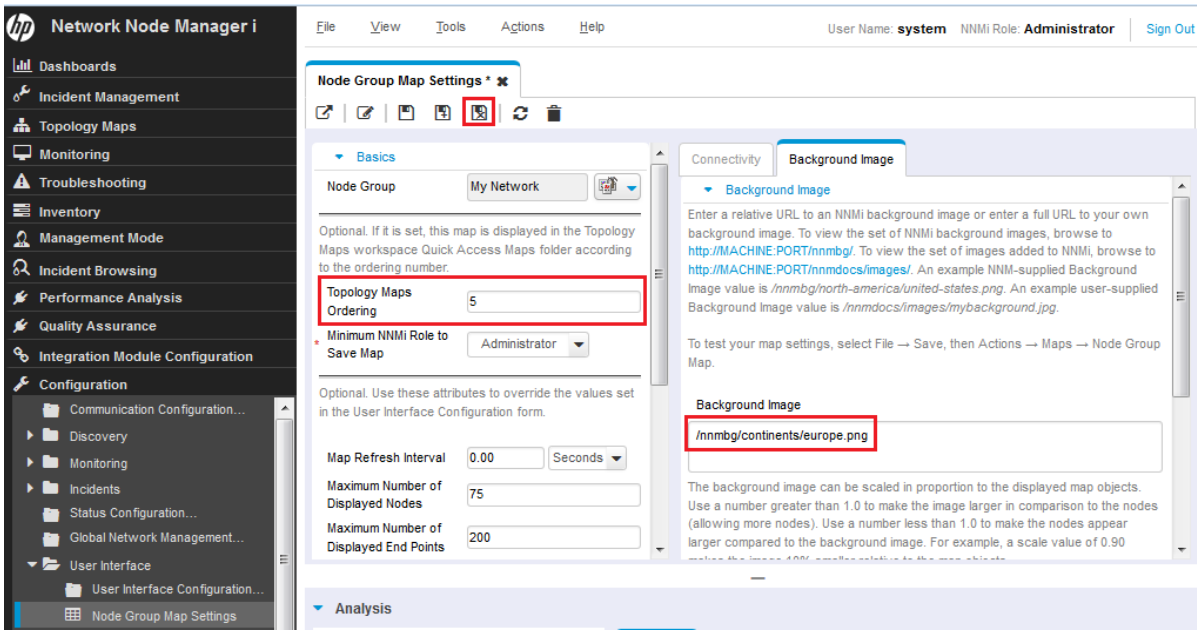
3. Double-click **My Network**.
4. Add a background image.

Tip: Use the local path, such as /nnmbg/continents/europe.png, rather than including http://<machine name> in front of the path. This enables the Application Failover feature to function properly.

---

5. Change the **Topology Maps Ordering** value to **5** so that this value is lower than the lowest value used in the previous example.
6. Click **Save and Close**.

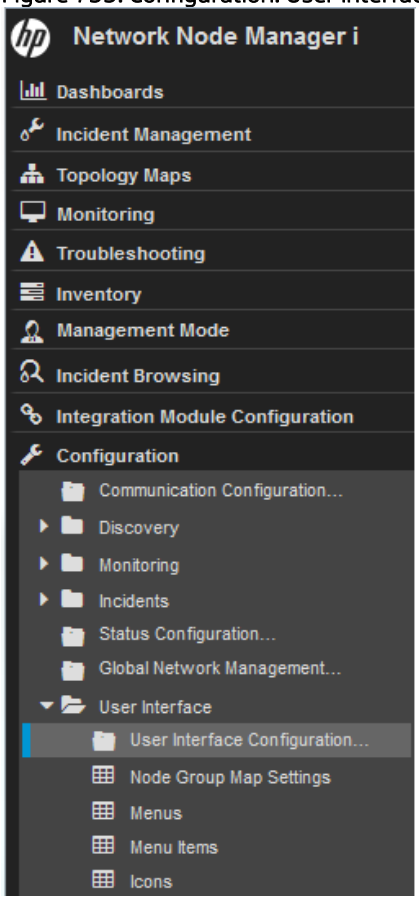
Figure 722: Save Node Group Map Settings



To specify the **My Network** map as the initial view:

1. Click **User Interface Configuration**.

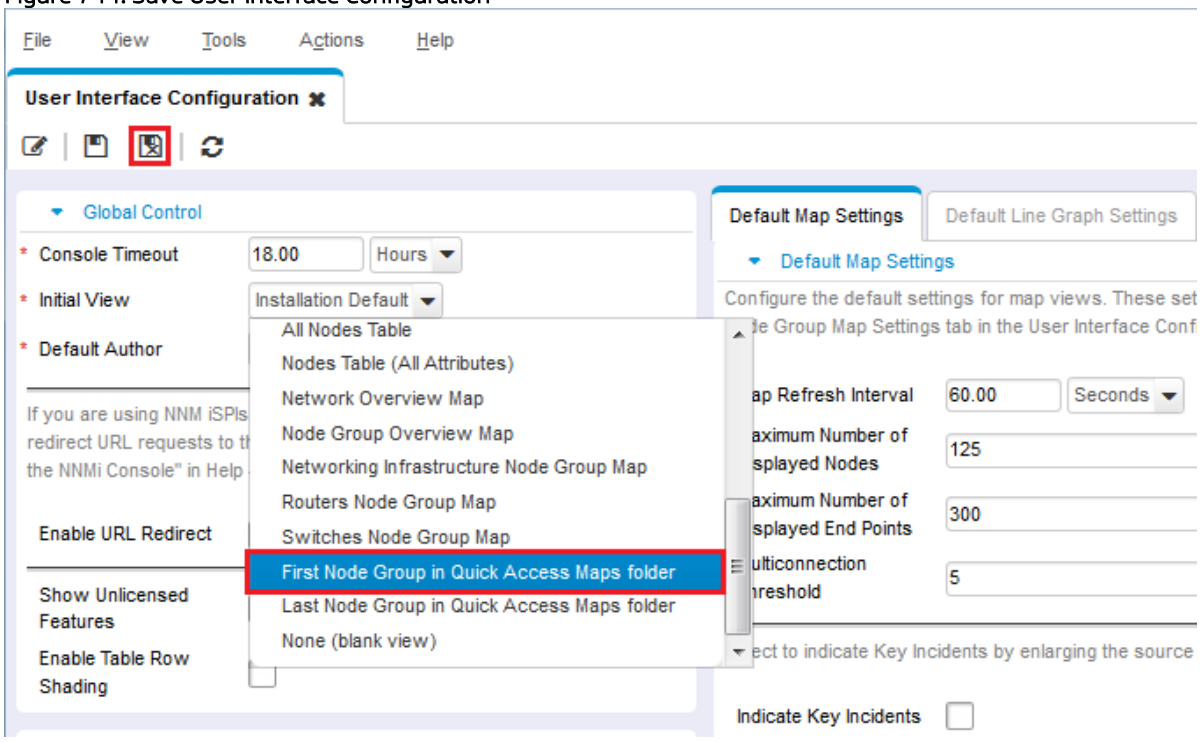
Figure 733: Configuration: User Interface Configuration



2. Change the **Initial View** selection to the **First Node Group in Quick Access Maps folder**. This is the My Network map because we set the **Topology Maps Ordering** attribute value to 5.

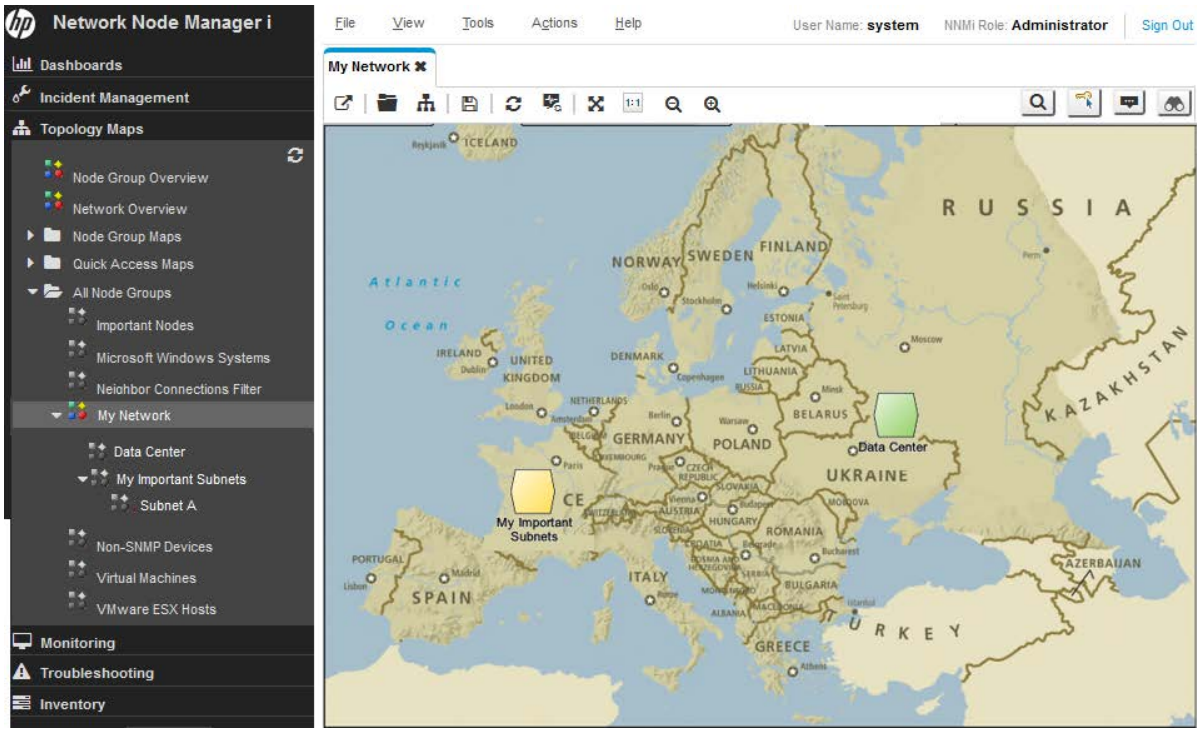
   Click **Save and Close**.

Figure 744: Save User Interface Configuration



9. After you sign out, and then back into NNMi, the initial view is the My Network map.

Figure 755: My Network Map



Maintain NNMi

Back up and Restore NNMi Data

NNMi provides backup and restore scripts to help protect your data.

The backup script is nnmbackup.ovpl. Use this script either online or offline. The online option enables you to run the script without stopping NNMi. Running this script generates a backup with a date and time stamp in the file name so you can specify the same target directory each time. This backup contains everything needed to restore your NNMi environment.

The following command shows an example of using the backup script:

nnmbackup.ovpl -type online -scope all -force -archive -target /var/tmp/mybackups

The previous command creates a file with a name similar to nnm-bak-20110504145143.tar.

The associated restore script is nnmrestore.ovpl. This command requires the backup file or directory created from the nnmbackup.ovpl script. To run this script, you must stop NNMi using the ovstop -c command.

An example nnmrestore.ovpl script usage is:

nnmrestore.ovpl -force -source /var/tmp/mybackups/nnm-bak-20110504145143.tar

The source directory should contain all of the files from the backup or the single tar file. If the source is a tar file, the script extracts the tar file to a temporary folder in the current working directory. The script removes the temporary folder after it completes the restore.

Caution: Never restore a backup across NNMi patch versions or restore a backup from a previous patch level of NNMi.

For example, in the following scenario, you should not restore the backup from the NNMi management running patch 4 onto the patch 5 code. This will cause fatal errors for NNMi:

- Patch 4 is running on your NNMi management server.
- After you run a backup, you upgrade to patch 5.

Tip: Track the version of the patch you are running in the backups by using a naming convention for the directories. For example, name the backup directory patch4.

Export and Import NNMi Configurations

Configuring NNMi is one of the most important tasks you do. Although your configuration is backed up as part of the nnmbackup.ovpl and nnmbackupembdb.ovpl scripts, consider using the nnmconfigexport.ovpl and nnmconfigexport.ovpl scripts included in NNMi. These scripts provide flexibility when it comes to restoring NNMi configuration. Using these scripts, you can:

- Take a snapshot of the present NNMi configuration
- Divide the configuration into small pieces
- Restore just one piece of NNMi configuration if you need to revert back to a recent snapshot

For example, to create several Node Groups, use the export script to take a snapshot of the configuration at strategic points along the way so you can revert back if you make a significant mistake.

The export script is nnmconfigexport.ovpl. Use the nnmconfigexport.ovpl script to specify a configuration area, such as discovery, Node Groups, incidents, and many others. NNMi also provides an all option to export all of the configuration information.

See the nnmconfigexport.ovpl reference page or the Linux manpage for details.

An example nnmconfigexport.ovpl script usage is listed below:

nnmconfigexport.ovpl -c nodegroup -f /tmp

In this example, NNMi displays the following message:

Successfully exported /tmp/nodegroup.xml.

Each exported configuration corresponds to one configuration area in the NNMi console.

Note: The **nnmconfigexport.ovpl** script does not generate a date and time stamp on the files. If you want to automate this command, put the date and time stamp in the directory name.

To restore the configuration, use the **nnmconfigimport.ovpl** script.

Tip: You do not need to specify a configuration area because this is implied by the file contents.

An example nnmconfigexport.ovpl script usage is listed below:

nnmconfigimport.ovpl -f /tmp/nodegroup.xml

As with the **nnmbackup.ovpl** and **nnmbackupembdb.ovpl** scripts, do not use these scripts across patch versions. NNMi validates the configuration file and rejects it during the import if it is invalid for the current version of NNMi.

Caution: The **nnmconfigimport.ovpl** script overrides the current configuration if the format is correct.

Note: NNMi does not support importing configurations from other NNMi management servers. Therefore, you cannot create a configuration export on one NNMi management server and import it on another server. Only a full backup (nnmbackup.ovpl) can be transferred between servers.

Trim Traps from the Database

Traps that pass all of the NNMi filters are eventually stored in the NNMi database. Traps can come in high volume and affect NNMi performance.

Tip: Regularly trim traps from your NNMi database using the nnmtrimincidents.ovpl script. You can archive these traps if necessary.

An example nnmtrimincidents.ovpl script usage is listed below:

nnmtrimincidents.ovpl -age 1 -incr weeks -origin SnmpTrap -trimOnly -quiet

This example usage trims any traps older than one week. This usage does not archive the traps. See the nnmtrimincidents.ovpl reference page or the Linux manpage for more options.

Tip: Use **nnmtrimincidents.ovpl** in a cron job to clear out old unnecessary trap incidents on a regular basis.

Note: NNMi eventually forces you to trim traps from the NNMi database by stopping storage of traps after it reaches a limit of 100,000 traps in the NNMi database.

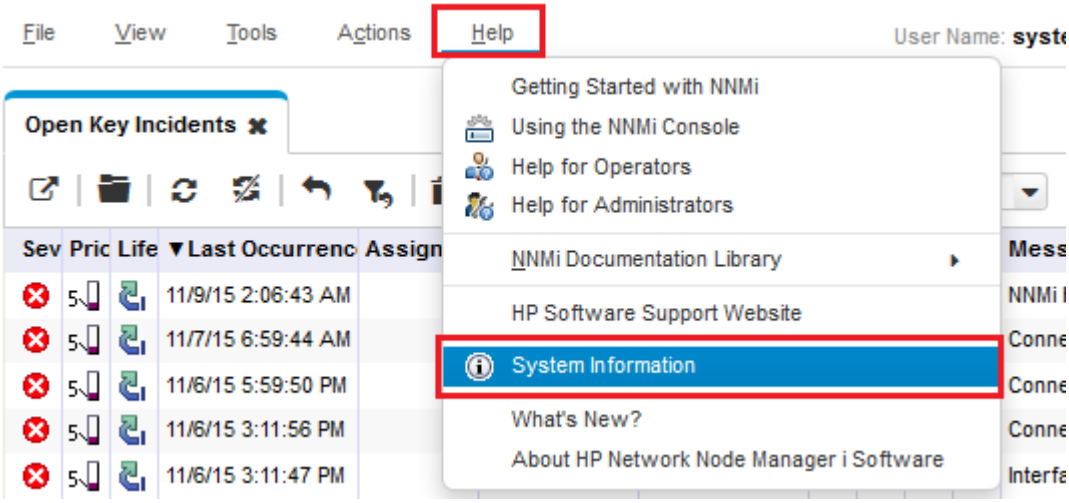
This reference to the NNMi database is not the same as the trap datastore. See the *Step- by-Step Guide to Incident Management*, available at softwaresupport.hp.com, for more information.

Check NNMi Health

You can check the general health of NNMi with a few different tools.

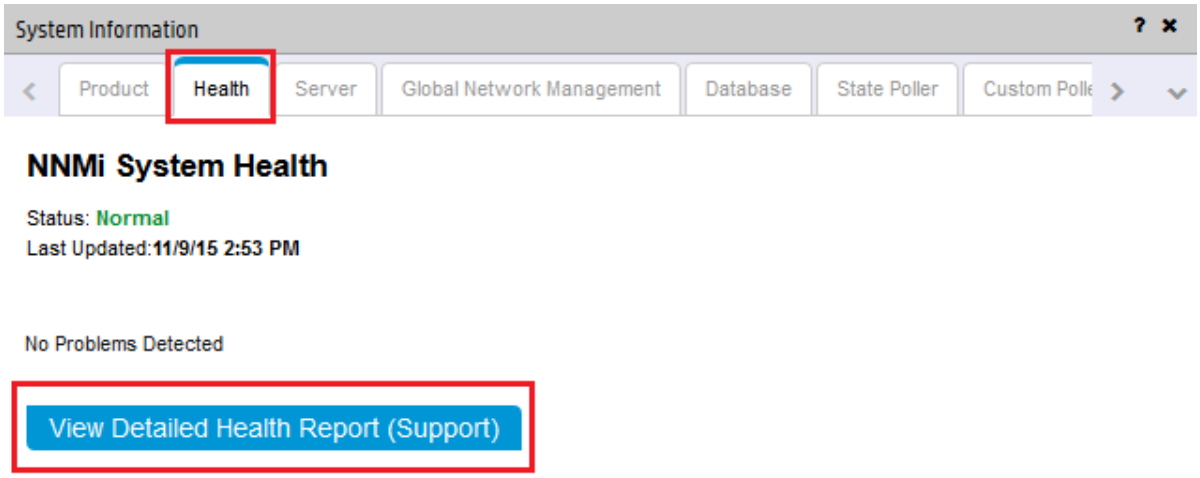
From the NNMi console, click **Help > System Information** for a listing of some important information.

Figure 766: Help: System Information



The best place to view the health of NNMi is in the **Health** tab. If NNMi identifies a health issue, it changes status and presents the reasons for the status in this report.

Figure 777: System Information: Health Tab



Best Practices

Some additional recommendations that you might want to consider:

- **NNMi Embedded Database**. Use NNMi's embedded database, even for large scale. Tests show that Postgres is highly scalable. You do not need to consider Oracle just because you have a large network. Postgres is highly reliable and is the preferred database for NNMi. Postgres is embedded into NNMi and NNMi provides any required tools you need.
- **SNMP Timeout Configuration**. Use caution when adjusting the SNMP timeout configuration. Timeout values increment with each timeout and can grow quickly beyond your original intention.
- **Node Status**. From the NNMi console, click one of the topology map selections. After you see the resulting display, double-click one of the nodes to open a node form. Click the Conclusions tab and review the data to better understand why the current status is set for the node.
- **Node Group Map Settings**. Reduce the number of connections between Node Groups using the End Points Filter in the Node Group Map Settings form. Highly connected maps display slowly and NNMi drops connections, if necessary, on the map.

- **SNMP Community Strings**. Do not use an @ symbol in your SNMP community strings. This is a reserved character for Cisco devices and causes unpredictable NNMi behavior.

Example Usage Scenarios

This section presents three usage scenarios. These scenarios assume that you have only NNMi available.

Tip: NNMi can forward Key Incidents to other products, such as HP Operations Manager (HP OM).

Management by Exception

NNMi identifies root cause problems associated with a network fault as Key Incidents.

To view all of the Open Key Incidents:

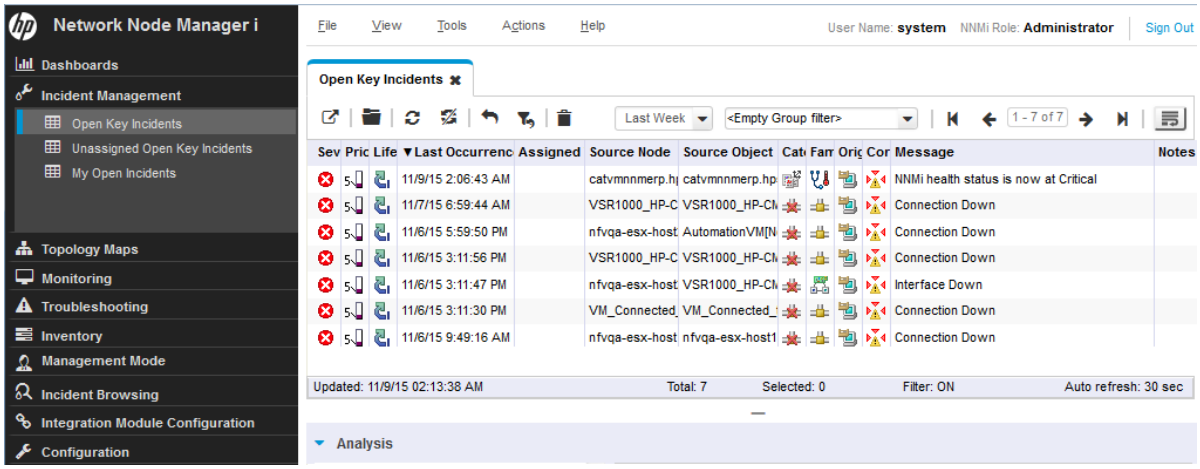
1. From the workspace navigation panel, select the **Incident Management** workspace.
2. Click **Open Key** Incidents.

NNMi displays all of the outstanding key incidents in your network and updates this list every 30 seconds. See "Help for Operators" in the NNMi help for more information about key incidents.

Tip: NNMi filters the Open Key Incidents view by time. Use the drop-down menu to select an appropriate time value.

The following example displays all of the open key incidents that occurred in the last day. Using this example, you can see that one node went down in the last 24 hours.

Figure 788: Open Key Incidents



By monitoring the Open Key Incidents view, you can pinpoint the exact cause of a network problem and begin working toward a solution. This is management by exception because the incident view shows these exceptions (or outages).

The *management by exception* approach includes the following advantages:

- You can quickly see the root cause of the problem.
- You can easily identify the source of the problem as the source object, such as an interface, address, node, or other possible sources.

Note the following when using the management by exception approach:

- A Node Down incident shows only the root cause; however, the node being down could affect connectivity to many other nodes. Check the **Topology Maps** views to assist you in recognizing the scope of an outage. (See the following section, Map-Based Management, for more information.)
- Not all Node Down incidents are of equal importance. You will want additional tools, such as the **Topology Maps** view and Node Group names, to assist you in prioritizing these incidents. (See the following section, Map-Based Management, for more information.)

Map-Based Management

Another method of network management is to create maps to monitor node status changes. These maps can be arranged in many ways, including geography or building.

All of the maps available from the **Topology Maps** workspace are arranged by Node Groups. Note the following about Node Group maps:

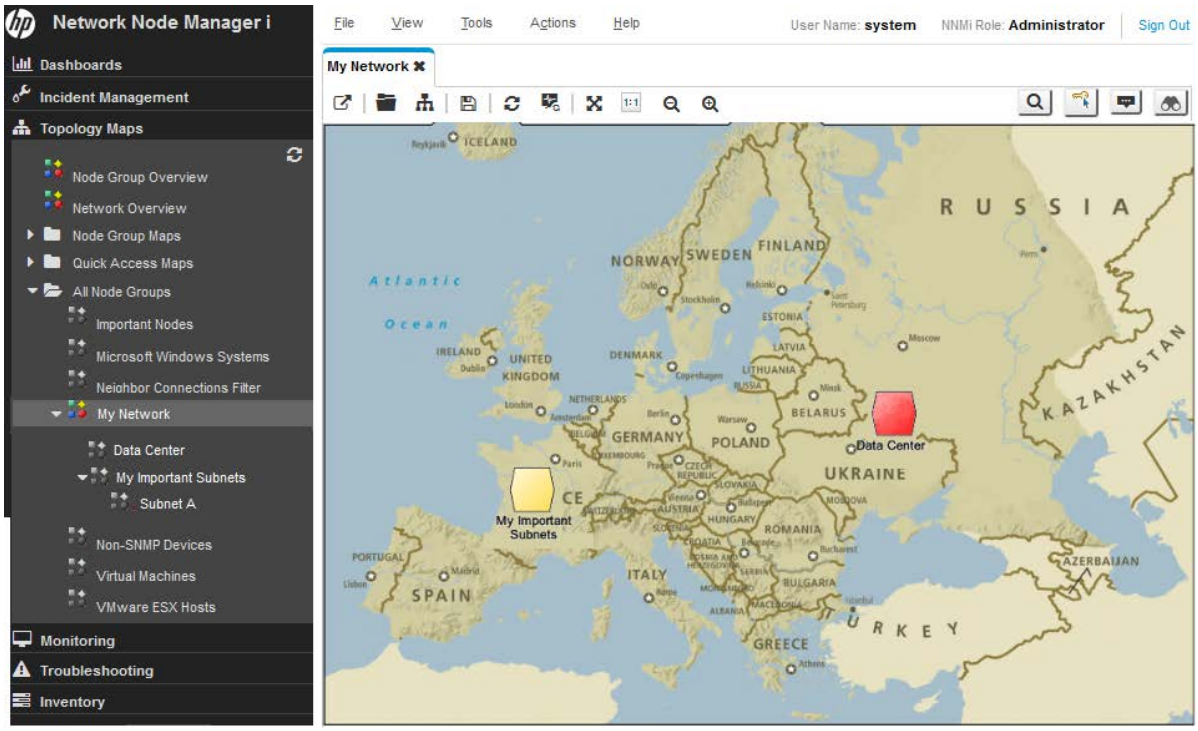
- The status is propagated from the Child Node Group nodes up to the parent Node Group maps.
- By default, NNMi propagates the most critical node status in the Node Group up the hierarchy. This enables you to monitor node status from a high level.
- When a top-level Node Group map changes color from green to red, yellow, or orange, you can navigate into the Node Group maps until you find the problem node. After you reach the problem node, you can take actions similar to those described in the previous section to troubleshoot the problem.
- Similar to incidents, nodes and interfaces can be annotated with notes if you want to keep a log of information about the troubleshooting progress.

The following screen capture shows an example of the My Network map with a problem that you need to correct. In this example, double-click the Node Group icon to find the faulting node.

Tip: The NNMi administrator can specify the default map that NNMi displays after initial sign in.

To navigate to a Node Group map from the NNMi console, click **Topology Maps**, and then select the map name of interest.

Figure 79: My Network Topology Map



The *map-based management* approach includes the following advantages:

- You can easily scope the outage. It becomes obvious quickly if other nodes are affected based on the status of neighboring nodes.
- You can easily identify the affected location. This approach helps you decide what to work on first.

When using the map-based management approach note the following:

- To find the source of the problem, open the node and go to the Conclusions tab to determine the problem.
- If one node is already down in a Node Group, NNMi does not indicate that one or more additional nodes have gone down in the same Node Group.

List-Based Management

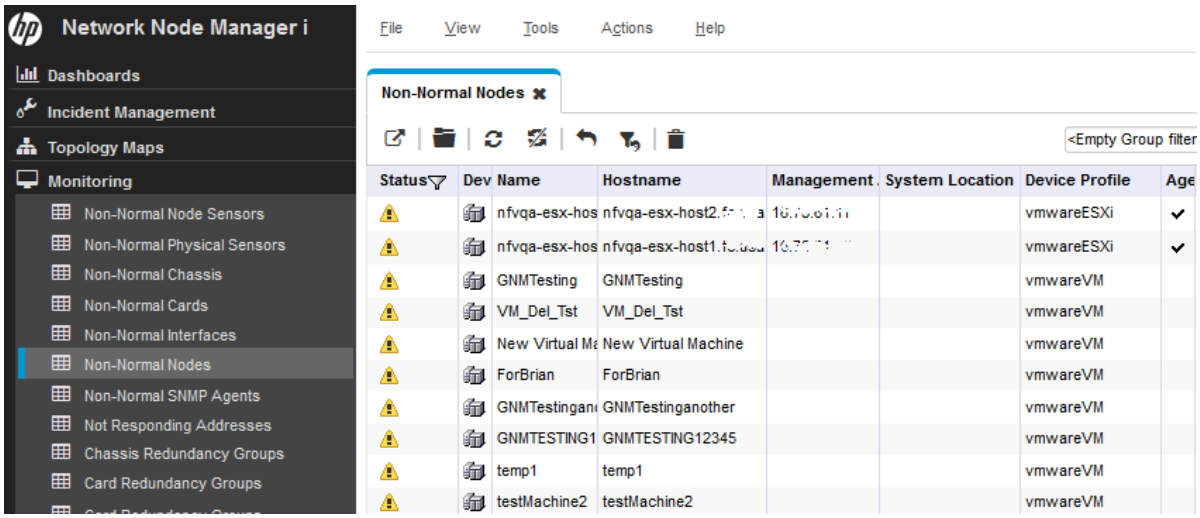
NNMi also enables you to manage your network from a dynamic list. NNMi provides dynamically updated tables that show nodes or interfaces experiencing problems. NNMi usually updates this list every 15 seconds. From this list, you can use tools, as described in the previous sections, to diagnose and fix problems. Because this list is dynamic, NNMi removes the nodes or interfaces from this list as the nodes or interfaces return to a Normal status.

For example, to display all the nodes having a non-normal status:

1. From the workspace navigation panel, select the Monitoring workspace.
2. Click **Non-Normal Nodes.**

As shown in the following example, NNMi displays all nodes that have a status other than Normal.

Figure 790: Non-Normal Nodes



The *list-based management* approach includes the following advantages:

- You know how many nodes or interfaces you need to investigate.
- You do not need to navigate into NNMi maps to troubleshoot your network.

When using list-based management, note the following:

- NNMi includes up to five entries in the status history.
- NNMi does not assign a Critical status to nodes that are “in the shadow” of a node that is down. See “Help for Operators” in the NNMi help for more information.
- The list-based view does not indicate where the node is physically located.

Conclusion

This document described an NNMi deployment on a small test network. It included information about installing a license, creating users, configuring communication, discovery, incidents, traps, actions, and the NNMi console. This document also explained maintenance tasks for NNMi and how to monitor NNMi health. It also provided some best practices and explained some possible usage scenarios for NNMi.

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