

Automated Network Management Solution (ANM)

HP Network Node Manager i, iSPIs for Performance, NET iSPI, and
HP Network Automation

Solution Version: 9.0

Solution Concept Guide

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Welcome to This Guide

This guide provides general information about the Automated Network Management Solution (ANM)—what the solution can accomplish and for whom.

This chapter includes:

- How This Guide Is Organized on page 3
- Who Should Read This Guide on page 4
- Additional Online Resources on page 4

How This Guide Is Organized

This guide contains the following chapters:

Chapter 1 Introduction to ANM

Provides a brief description of the Automated Network Management (ANM) Solution and illustrates a typical deployment.

Chapter 2 ANM Customer Scenarios

Provides sample customer scenarios implementing the ANM Solution capabilities. This section demonstrates what you can achieve with this solution.

Who Should Read This Guide

This guide explains the motivation to install and use the ANM Solution. It describes what the solution implementation will achieve, which ITIL processes it will answer, and describes the workflow between the products comprising the solution.

This guide is intended for:

- ▶ Customers
- ▶ Presales and sales personnel
- ▶ PSO
- ▶ Anyone who wants to learn about the solution, its workflow, and its contribution

The information in this guide may duplicate information available in other ANM documentation, but is provided here for convenience.

Additional Online Resources

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Welcome to This Guide

1

Introduction to ANM

This chapter includes:

Concepts

- ▶ ANM – Overview on page 7
- ▶ Network Management Concepts on page 9
- ▶ ANM Solution Product Relationships on page 12
- ▶ Personas on page 21

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- ▶ Terms and Definitions on page 22

Note: If you have any feedback or comments about this document, please contact solutionpackagingandscp@hp.com.

Concepts

ANM – Overview

Automated Network Management (ANM) is a solution that integrates network fault detection, performance monitoring, configuration management and compliance, as well as incorporating the diagnostic and automation tools. It enables the ITILv3 best practices in the network domain—namely event, incident, and problem management; change configuration; and release and deploy management.

ANM enables the IT organization to:

- reduce the Mean Time to Repair (MTTR),
- increase the Mean Time Between Failure (MTBF),
- become policy compliant,
- reduce Mean Time to Change network configuration,
- and increase the SLA with faster ROI.

The ANM Solution is comprised of six individual, but integrated products that are brought together in the HP Network Management Center. The products that comprise the ANM Solution are:

- HP Network Node Manager i 9.0
- HP Network Automation 7.6
- HP Network Node Manager iSPI Performance for Metrics 9.0
- HP Network Node Manager iSPI Performance for Traffic 9.0
- HP Network Node Manager iSPI Performance for Quality Assurance 9.0
- HP Network Node Manager iSPI Network Engineering Toolset 9.0

In the following chapter, you will find examples that illustrate common scenarios for personas responsible for Network Operations / Engineering. These personas require the solution to provide the following capabilities for efficient management of their network:

- Network Change and Configuration Management,
- Network Performance Management,
- Network Fault Management,
- Network Run-Book Automation,
- and Network Diagnostics.

Using these capabilities, the following high level generic actions can be completed by the user:

- Network Diagnostics
- Automated Event Enrichment

- ▶ Network Performance and Metrics Management (including Traffic Management)
- ▶ Discovery, Inventory, and Topology Management
- ▶ Network Fault Management
- ▶ Compliance and Configuration Monitoring
- ▶ Network Change, Configuration, and Deployment Management
- ▶ Network Event and Incident Management
- ▶ Change Automation as a result of a Network Fault

Note: The Smart Plug-ins (SPIs) provide valuable insight into the current health and ongoing trends in your network, allowing you to increase availability and performance, while lowering associated support costs and improving capacity management and planning.

Network Management Concepts

As networks continue to expand, network topologies continue to increase in complexity. In addition, many networks must now comply with regulations and security best practices. This results in a complex infrastructure with multiple protocols, technologies, and vendors to support. Centrally managing the network infrastructure in a secure, automated, and centralized fashion becomes vital to the network's performance—in preventing additional security vulnerabilities to a complete outage—all of which can cause increased liability, lost revenues, and lost productivity.

In this complex situation, the Network Engineers need for managing and monitoring can be divided into three major fields:

- **Availability and Incident Management:** One of the basic needs of a Network Engineer is knowing if there is a network outage occurring on their network, along with the ability to recognize the root cause of the outage. Network Engineers need to know if the source of the root cause is hardware failure or any other environmental reason. They need this information as soon as possible.

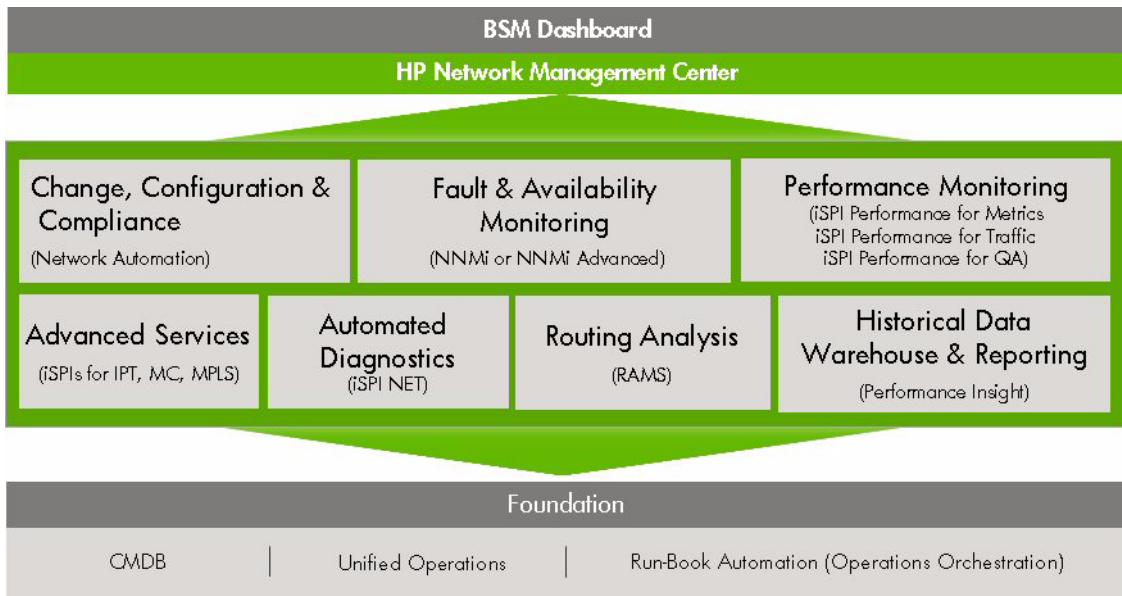
Network Engineers also like to have the ability to see their network diagram as it is in reality, who is connected to whom, and which devices exist on their network.

- **Performance Analysis:** Most of the problems that Network Engineers encounter are problems where no outage is occurring, but the customer still complains that the service level they receive from the network is poor—even affecting the business QoS. In this scenario, the Network Engineers will have more advanced needs for troubleshooting the incident. They will need to have a tool that will help them analyze what the root cause is of this behavior—a tool that will show them basic real-time and historical performance data (for comparison purposes), such as Utilization and Errors, and show them an IP traffic analysis examining if the source of the problem is an application that overloads the network. This tool needs to show them IPSLA information so they will be able to see if the QoS polices were configured correctly.
- **Change and Configuration Management and Compliance:** When managing a large network is your responsibility, such as the Network Engineer, everyday tasks that consume most of your time are tasks such as changing the configuration on devices as a result of problems or other infrastructure changes, adding a new device to the network, and so on. While performing these tasks on a large number of devices, you or your colleagues can make mistakes and perform changes incorrectly which can result, in a worst case scenario, in an outage.

Another need for the Network Engineer is to make sure that all configurations were made according to their instructions, and to have an archive of those configurations. These needs are very common for any Network Engineer who is responsible for many network devices.

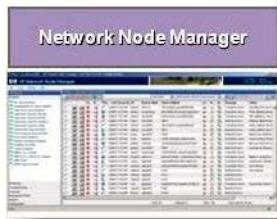
The following section will explain how the ANM Solution can provide Network Engineers with the ability to handle all of these needs with easy-to-use products that can make their day-to-day work easier and much more efficient.

The following diagram displays which HP Network Management Center products can fulfill the needs described in this chapter. The next chapter elaborates on how the ANM solution products that are part of this center fulfill those needs.



ANM Solution Product Relationships

HP Automated Network Management enables customers to reduce costs and increase agility by unifying automation across all network operations. Unlike point product approaches, HP offers an integrated solution portfolio that automates event, performance, change and configuration management, plus automated IT process automation.



Fault and availability monitoring
Improve network availability with a model based network management solution

Change, configuration & compliance
Comprehensive network automation spanning all tasks from provisioning and change management to compliance enforcement and reporting

Performance monitoring
Increase operator productivity and efficiency and reduced MTTR

Engineering Toolset
Automate common network engineering and network tool administrators tasks

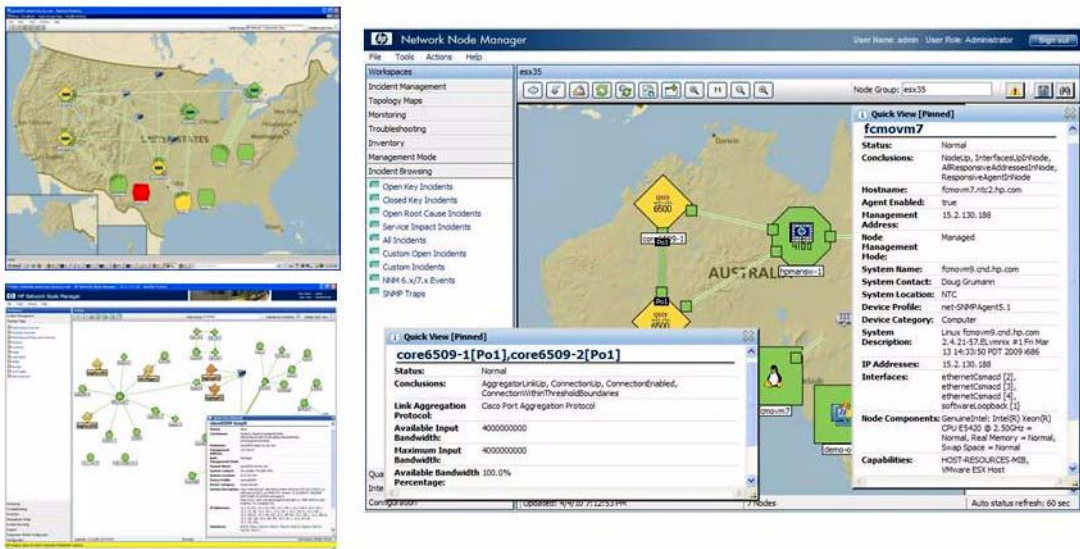
HP Network Node Manager i Software (NNMi)

HP Network Node Manager i Software (NNMi) contains a toolset to help you maintain a healthy network across your organization. NNMi provides smart network fault and availability monitoring using common network protocols like SNMP and ICMP. NNMi can discover network nodes (such as switches and routers) on an ongoing basis, providing an up-to-date representation of the network topology (Layers 2 and 3).

As NNMi maintains an accurate picture of the network, it also helps you handle problems through management by exception—the ability to pinpoint network problems by using event correlation and root cause analysis (RCA), and locating device-attached nodes. Unlike other network management software, NNMi applies sophisticated RCA algorithms to an accurate, ever-changing view of network topology to support dynamic fault management.

NNMi also allows you to monitor your device's health in terms of power and temperature (according to the support matrix) and view live performance graphs.

NNMi is the center of this solution from an operational point of view. From its GUI, you can access each of the other products in the solution.



HP Network Automation (NA)

HP Network Automation (NA) provides an enterprise class solution that tracks and regulates configuration and software changes across routers, switches, firewalls, load balancers, and wireless access points. NA provides visibility into network changes, enabling IT staff to identify and correct trends that could lead to problems, while mitigating compliance issues, security hazards, and disaster recovery risks. NA also captures full audit trail information about each device change.

NA supports more than 500 device types and models from the major vendors in the market; such as Cisco, Nortel, Juniper, HP and 3Com, F5, Alcatel-Lucent, Extreme, plus more.

NA lets Network Engineers know what changes have been made to network devices, who applied them, what the current configuration is, if the configuration complies with organizational standards, and also minimizes MTTR using configuration archiving and deployment.

The screenshot displays the HP Network Automation (NA) interface with several key components:

- Device Configuration (denver):** Shows configuration details for a device named 'denver'. A callout box states: "Discovering changes on devices as they occur".
- Image Analysis (Cisco-RSP4):** Shows details for a Cisco-RSP4 device, including a version list and image details for 'rsp-iss561-mz.121-27b.bin'. A callout box says: "Image analysis and recommendation for upgrade".
- Image Download:** A callout box indicates: "Download image directly into NA from Cisco.com".
- Policy Compliance:** A table showing compliance status for various rules. A callout box says: "Validate runtime and compliance state of the network".
- Compliance Status Charts:** Two pie charts showing the overall compliance status of the network.
- Dashboard Report:** A callout box at the bottom left says: "Dashboard report displaying general statistics on your network".

Select	Host-Name	Policy	Rule	Compliant?	Rule-Description
<input type="checkbox"/>	Cisco-RSP4	Network Health Check	HSRP Peer is Recognized	No	Tests that the HSRP Peer is Recognized so that the device properly fail over, should the c fail.
<input type="checkbox"/>	Cisco-RSP4	NSA Router Security Best Practices	Min 6 Character Password Length - Cisco IOS	No	Enforce a minimum password
<input type="checkbox"/>	Cisco-RSP4	Network Health Check	IP Routes are Correct	No	Tests that the IP routes are co the Routers
<input type="checkbox"/>	Cisco-1200	Network Health Check	HSRP Peer is Recognized	No	Tests that the HSRP Peer is Recognized so that the device properly fail over, should the c fail.
<input type="checkbox"/>	VTPLAB-C2950	PCI Regulation Compliance	PCI Rule 2.2.7 & 2.2.3.c & 2.2.4 - disable http server (disable all unnecessary and insecure services and protocols)	No	Disable http server.

HP Network Node Manager iSPI Performance for Quality Assurance (QA iSPI)

HP Network Node Manager iSPI Performance for Quality Assurance (QA iSPI) extends the capability of NNMi to monitor the quality of traffic flow in the network. QA iSPI collects data (using SNMP) from pre-configured QA probes on the selected network elements and gives the Network Engineers the ability to monitor these probes, display the service level data on site-to-site orientation, and also configure thresholds on the data collected by these probes. By connecting this iSPI to the Network Performance Server (part of the iSPI Performance for Metrics), Network Engineers can analyze the collected data through graphs and charts.

NNM iSPI Performance for QA, in conjunction with NNMi, performs the following tasks:

- ▶ Discover the pre-configured QA probes defined for various network elements
- ▶ Monitors the QA probes' status and their test results
- ▶ Display the QA probe results on the NNM iSPI Performance for QA views

Discovery and monitoring of IP SLA tests

Reporting alongside other iSPI data

Rank	Destination Site	Source Site	Destination Node	QA Test Name	Round Trip Time (msecs) (avg)
1	HC	Bangalore	15.2.122.113	Admin_UDPTest	226.17
2	HC	Bangalore	15.2.122.113	UDPEchoTest	220.73
3	HC	Bangalore	15.2.122.254	jittermeasure	318.42
4	HC	Bangalore	15.2.122.113	to-fc	300.54
5	Bangalore	Bangalore	ipb2.ind.hp.com	Data_jitter_test_to_ipb2	12.71
6	Bangalore	Bangalore	15.154.96.89	multitcpConnect	3.16
7	Bangalore	Bangalore	ciscope2851.ind.hp.com	ciscope524.ind.hp.com_ciscope2851.ind.hp.com_UDP_Echo	1.50
8	Bangalore	Bangalore	ciscope524.ind.hp.com	ciscope2851.ind.hp.com_ciscope524.ind.hp.com_TCP_Echo	1.24
9	Bangalore	Bangalore	15.154.96.89	multisys-test	1.07
10	Bangalore	Bangalore	ciscope2851.ind.hp.com	UDP_Test_To_L486Outer2851	1.02

Grouping by:

- Destination Site
- Source Site
- Destination Node
- QA Test Name

Confirm Selection

Details for Top 10 Destination Site

Combined Element Name

- Bangalore Bangalore 15.154.96.89 - multitcpConnect
- Bangalore Bangalore 15.154.96.89 - multisys-test
- Bangalore Bangalore ciscope2851.ind.hp.com - cisco
- Bangalore Bangalore ciscope2851.ind.hp.com - VoIP
- Bangalore Bangalore ciscope524.ind.hp.com - cisco
- Bangalore Bangalore ipb2.ind.hp.com - Data_jitter
- HC Bangalore 15.2.122.254 - jittermeasure
- HC Bangalore 15.2.122.113 - Admin_UDPTest
- HC Bangalore 15.2.122.113 - to-fc
- HC Bangalore 15.2.122.113 - UDPEchoTest

Quality Assurance Chart

Display Grain: 5 Minutes

HP Network Node Manager i Software Smart Plug-in Performance for Metrics (Metrics iSPI)

HP Network Node Manager i Software Smart Plug-in Performance for Metrics (Metrics iSPI) provides the core performance management capability to NNMi by gathering and monitoring the metric data polled by NNMi from different network elements. With the combination of NNMi and the iSPI Performance for Metrics, you can monitor the operational performance of the network infrastructure by collecting data on the main and common performance metrics; such as Error Rate, Interface Utilization, CPU, Memory Utilization, and more.

The main capabilities of the Metrics iSPI are:

- Historical graphs of performance data
- Performance threshold monitoring
- Performance review on a network path between two devices (E2E)



HP Network Node Manager iSPI Performance for Traffic (Traffic iSPI)

HP Network Node Manager iSPI Performance for Traffic (Traffic iSPI) extends the capability of NNMi to monitor the performance of the network. By collecting IP flow records that are exported by the routers, NNM iSPI for Traffic enriches the data available for the Network Engineers to analyze common network performance. For example, it enables you to understand why your network connection experiences high utilization.

NNM iSPI Performance for Traffic performs the following tasks:

- Aggregates the IP flow records
- Correlates the obtained IP flow records with NNMi for context-based analysis
- Generates performance reports by exporting data to the Network Performance Server (NPS)
- Generates maps to view the traffic flow information on your network.

Highly scalable distributed collection architecture—low overhead

Collection, analysis, and presentation of NetFlow and sFlow traffic information

Reports out-of-the-box or customizable, with flexible grouping

Configuration and tight integration with NNMi, including traffic maps launch

Collector Name	Status	IP	Collector Type	Collector Hostname	Listen Pt
leaf-collector	Running	13.136.111	sflow	leaf-collector	9992
leaf-collector	Running	13.136.111	netflow	leaf-collector	9991

Rank	Qualified Interface Name	Destination Host Name	Volume - Out Bytes (sum)	Percent of All
1	24-sa-ibmcom-ea1	172.16.1.12	308,865,708,830	56.21%
2	leaf-collector-leaf-collector-172.16.1.12	172.16.1.12	285,291,799,602	21.09%
3	leaf-collector-leaf-collector-172.16.1.12	leaf-collector-172.16.1.12	185,648,708,115	16.96%
4	24-sa-ibmcom-ea1	172.16.1.15	32,048,856,797	5.79%
5	leaf-collector-leaf-collector-172.16.1.12	leaf-collector-172.16.1.12	142,397,268	0.13%
6	leaf-collector-leaf-collector-172.16.1.12	leaf-collector-172.16.1.12	683,578,000	0.06%
7	leaf-collector-leaf-collector-172.16.1.12	leaf-collector-172.16.1.12	228,616,823	0.04%
8	leaf-collector-leaf-collector-172.16.1.12	172.16.1.10	220,428,880	0.04%
9	leaf-collector-leaf-collector-172.16.1.12	leaf-collector-172.16.1.12	220,646,156	0.02%
10	leaf-collector-leaf-collector-172.16.1.12	172.16.1.10	208,475,460	0.02%
	Other		789,794,617	0.29%

HP NNM iSPI Network Engineering Toolset (NET iSPI)

HP NNM iSPI Network Engineering Toolset (NET iSPI) extends the powerful network management capabilities of NNMi by providing additional troubleshooting and diagnostic tools for Network Engineers.

NNM NET iSPI provides the following functionality:

- ▶ SNMP trap analytics provide summary and detailed information about SNMP trap traffic in the network.
- ▶ Visio export functionality exports NNMi topology map data to Microsoft Visio files.
- ▶ Diagnostic flows provide automatic gathering and analysis of information from network devices, using commands running in the devices over SSH or Telnet. Running diagnostic flows when a network outage occurs is very helpful for troubleshooting—even investigating the root-cause afterwards.

The NNM NET iSPI diagnostic flows and diagnostics server, which must be installed separately from NNMi (on the NNMi management server or on a separate computer) provide the following:

- ▶ The diagnostic flows automatically gather diagnostic information when NNMi detects certain network incidents.
- ▶ The diagnostics server is an embedded packaging of HP Operations Orchestration (HP OO). If you already have the full HP OO product, you can install the NNM NET iSPI diagnostic flows on that server.

The screenshot displays the Network Node Manager (NNMi) interface. The top window shows a network topology with various nodes and connections. A blue callout box on the left states: "Export NNMi discovered topology to Visio for offline use". To the right, a window titled "Total Traps Received (by SNMP OID) at 6:22" shows a table of incident data. A blue callout box next to it says: "Trap analytics enable tuning of SNMP trap sources and incident generation". Below the topology, a "Network Overview Mar 10, 2010 10:37:41 AM" window shows a detailed view of the network. To the right of this, a "Predefined Operations Orchestration flows capture diagnostic detail on-demand or in response to incidents" window shows a flowchart with steps like "Check for invalid input", "Check Links Down", "Check Input Errors", "Check CRC Errors", "Check Frame", and "Check Overrun Errors". A blue callout box at the bottom right states: "Save engineering effort logging into individual devices for information and diagnosis".

Count	Graph	Incident Configuration	First Trap Time	Last Trap Time	Trap OID (Hex)	Trap OID (Text)
34			3/8/10 10:41 PM	3/8/10 10:42 PM	1.3.6.1.4.1.11.2.2.7.11.76.0.2	oid.org.dell.internet.private enterprises for net...
17			3/8/10 10:30 PM	3/8/10 10:42 PM	1.3.6.1.4.1.8.4.40.2.0.1	oid.org.dell.internet.private enterprises class...
10			3/8/10 10:30 PM	3/8/10 10:42 PM	1.3.6.1.4.1.11.2.2.7.11.118.0.2	oid.org.dell.internet.private enterprises for net...
8			3/8/10 10:30 PM	3/8/10 10:42 PM	1.3.6.1.4.1.8.4.1	oid.org.dell.internet.private enterprises class.0.1

 **Personas**

ANM Solution outcomes and uses are designed to feed the needs of the following personas in the organization:

- **Operator:** Responsible for monitoring the operation of the network infrastructure. This persona triages and troubleshoots incidents related to the network infrastructure, along with other infrastructure incidents.
- **Network Engineer:** Responsible for designing and managing the network of the organization, and also providing for second level support of network problems. This persona is usually the highest authority for deciding about large network changes.
- **Network Technician:** Responsible for the first level of support for network problems, plus implementing approved network changes.

Reference

Terms and Definitions

NA

HP Network Automation

NNMi

HP Network Node Manager i

NNMi Advanced

HP Network Node Manager i Advanced

RAMS

HP Route Analytics Management System

iSPI NET

Smart Plug-In Network Engineering Tool

iSPI Perf

Smart Plug-In for Performance

OO

HP Operations Orchestration

ITIL

Information Technology Infrastructure Library: A collection of volumes intended to assist and promote effective and efficient IT Service Management practices in organizations.

SM

HP Service Manager

2

ANM Customer Scenarios

The scenarios described in this chapter are an illustration of what you can accomplish with the Automated Network Management (ANM) Solution.

These scenarios also demonstrate how the solution products help you implement two ITILv3 service life cycles —Service Transition and Service Operation— which can result in higher SLA and faster ROI.

Concepts

- ANM Use Case Overview on page 23

Tasks

- ANM Use Cases on page 24

Concepts

ANM Use Case Overview

The ANM Solution provides for all the needs of network management using the network management products of HP Software. This is accomplished in an automated fashion wherever possible, thus minimizing the Network Manager's time spent on network maintenance.

In the following sections, specific customer scenarios, or key examples of common actions, are provided in order to show the effectiveness of ANM through its ability to provide automated end-to-end management capability for networks.

Tasks

ANM Use Cases

This chapter describes the following customer scenarios:

- ▶ "Automatic device inventory synchronization between monitoring and configuration management systems" on page 24
- ▶ "Automatic remediation of an out-of-compliance device configuration change" on page 27
- ▶ "Run-Book automation to remediate a network fault or performance incident" on page 30
- ▶ "Troubleshooting application performance problems from a network context" on page 32

The use cases are presented in the following format:

- ▶ **CORE Story:** Presents the scenario without ANM, which is commonly done manually by one or more personas using more than one system.
- ▶ **Using ANM:** Presents the scenario with ANM. This section also presents the benefits of using ANM in this scenario.

Automatic device inventory synchronization between monitoring and configuration management systems

CORE Story

- 1** Operator manually prepares the list of devices to be added.
- 2** Operator adds devices to device configuration management system.
- 3** The same devices are added to the monitoring system.
- 4** Both systems pull the devices' information.
- 5** Verify the devices are added to both systems and are synchronized.
- 6** Manage the configuration and monitor the status of the devices.

Using ANM

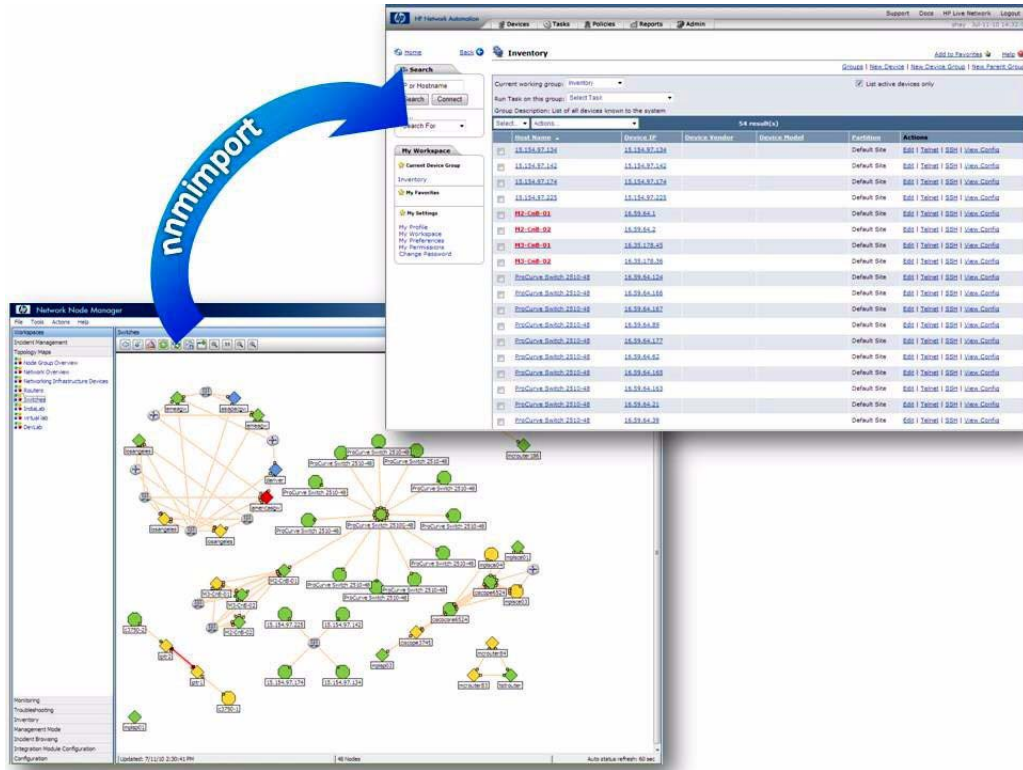
Process

- 1** User prepares an NNMi loadseed file that defines the set of devices to enter into monitoring, and loads it.
- 2** NNMi discovers the seeded devices, adds the new devices to the NNMi topology, and begins monitoring the devices for fault and performance conditions.
- 3** User executes a **nnmimport.bat** or **nnmimport.sh** script. This adds the NNMi devices to NA's device list, including a reference to a UUID—the unique ID of the device within NNMi's topology database.

Note: Steps 1-3 can be fully automated by configuring Auto-Discovery in NNMi and by scheduling the **nnmimport** script to be run every few hours or days (using **Windows Scheduler** in a Windows server or **crontab** in a Linux/Unix server.)

- 4** NA discovers the drivers specific to the newly-added devices, takes snapshots of the devices, and runs diagnostics on the devices.
- 5** NNMi adds the devices to NNM iSPI for Performance and provides SNMP performance metrics to be utilized in NNM iSPI Performance for Metrics.

- The products within the ANM Solution now share a common understanding of network inventory and network topology that are utilized in all other operations of the solution.



Note: The following requirements must be met for ANM to provide these capabilities:

- ▶ NA–NNMi integration is installed and configured properly.
 - ▶ SNMP community strings used in SNMP communication with the end devices are configured in NNMi such that they can be utilized in the discovery of devices.
 - ▶ Device credentials used to communicate with the end devices are configured as password rules in Network Automation.
 - ▶ Within Network Automation, a rule is configured to run discover driver when a device is added.
-

Benefits

- 1 Greatly reduced device and credential management time
- 2 Up-to-date and compliant asset management information
- 3 Rapid device enter-to-management process, thus service deployment to production
- 4 Single view of device inventory between the two systems

Automatic remediation of an out-of-compliance device configuration change

CORE Story

- 1 Unauthorized device configuration change occurred.
- 2 If configured, Operator is notified about the change in the monitoring system.
- 3 Network Engineer examines the change in the configuration management system.
- 4 Network Engineer determines that the configuration change is out of compliance.

- 5 Network Engineer or Network Technician restores the correct configuration to the device if it was previously backed up.
- 6 Network Engineer verifies the device is restored and the incident is closed.

Using ANM

Process

- 1 Device configuration is changed out-of-band.
- 2 NA receives a SYSLOG, automatically submitting a **Take Snapshot** task to verify if the configuration was changed, and then runs a compliance check on the new configuration.
- 3 New configuration is out of compliance. NA sends a trap to NNMi reflecting this in the NNMi console.
- 4 The Operator alarms the Network Engineer about the NNMi incident and cross launches **View HP NA Configuration Diff**.
- 5 Network Engineer views the change and decides to roll back the change. On the previous configuration saved in NA, Network Engineer runs the **Deploy to Running Config** step within NA.
- 6 NA restores and verifies the correct configuration to the device.

7 NNMi incident is closed manually by the Operator.

Change detected and examined against policies

Deploy the old configuration back

Event Date	Policy Name	Summary	Importance
Jun-28-10 15:00:42	No Delay on Interfaces	Policy Non-Compliance	Medium
Jun-28-10 15:00:42	Ensure Passwords	Policy Non-Compliance	Medium
Jun-28-10 15:00:42	NSA Router Security Best Practices	Policy Non-Compliance	Medium
Jun-28-10 15:00:35	No Delay on Interfaces	Policy Non-Compliance	Medium
Jun-28-10 15:00:35	Ensure Passwords	Policy Non-Compliance	Medium
Jun-28-10 15:00:34	No Delay on Interfaces	Policy Non-Compliance	Medium
Jun-28-10 15:00:45	No Delay on Interfaces	Policy Non-Compliance	Medium
Jun-28-10 15:00:45	NSA Router Security Best Practices	Policy Non-Compliance	Medium
Jun-28-10 15:00:41	Ensure Passwords	Policy Non-Compliance	Medium
Jun-22-10 15:00:38	No Delay on Interfaces	Policy Non-Compliance	Medium
Jun-22-10 15:00:38	Ensure Passwords	Policy Non-Compliance	Medium
Jun-22-10 15:00:38	NSA Router Security Best Practices	Policy Non-Compliance	Medium

Note: For the described use case to be fulfilled:

- customer-specific NA policies are configured, along with event rules.
- NNMi-NA integration is installed and configured properly.

Benefits

- 1 Around-the-clock detection and enforcement of network changes
- 2 Automation of the governance process through the use of NA Event Rules functionality

- 3 Reduced network downtime by avoiding unknown problematic changes in devices by using the compliance checks
- 4 Reduced network downtime achieved more quickly, thus increasing service availability and gaining a higher ROI

Run-Book automation to remediate a network fault or performance incident

CORE Story

- 1 Device fault and performance incident occurs.
- 2 Operator categorizes the incident.
- 3 Operator runs a diagnostic—troubleshoots and identifies the incident.
- 4 Operator or Network Engineer resolve the issue.
- 5 Operator verifies the issue has been fixed.
- 6 Operator closes the incident.

Using ANM

Process

- 1 Device fault and performance incident occurs due to excessive line CRC errors on the interface. (It is assumed that thresholds and actions are configured.)
- 2 NNMi triggers an automatic diagnostic when it receives the **InterfaceInputErrorsHigh** incident.
- 3 NNM iSPI NET automatically runs the diagnostic and enriches the incident with a link to the diagnostic report.
- 4 Operator views the incident and diagnostic data, and observes that CRCs are high on this interface.
- 5 Network Engineer launches additional diagnostics against the router. (These diagnostics show that the OSPF adjacency running across this interface is unstable.)
- 6 Network Engineer selects the node in the map and cross launches into NA in the context of this router.

- 7 Network Engineer discovers that the cause of the CRC errors is a duplex mismatch configuration. Using NA, the Operator configures the problem port to match the other side of the connection and the errors stop. OSPF is no longer flapping.
- 8 NNMi incident is either closed manually by the Operator at this time or, when the root cause of the CRC errors is remedied and the configuration is brought back to normal, automatically closed by NNMi.

Performance problem recognized

Launching Diagnostics flow using NET ISPI

Device current configuration shows the interface is configured in Half duplex

Parameters for Reporting Level: One Flow Run

Step	Response	Message
Determine IOS/CATOS	✓	Diagnostic Cisco Switch Spawning? not baseline executed on node 86.58.63.262
String Comparator	✓	Flow startup success M IOS/CATOS version determined.
IOS Spawning Tree Info:	✓	Spawning Tree Brief
Resolved: success	✓	1: Invalid input detected at "''" marker. detectnet
		Return step - Cisco Switch SpawningTree Baseline

```

07
078 interface Ethernet2/0
079 ip address 16.59.63.252 255.255.252.0
080 duplex half
081 /
082 interface Ethernet2/1
083 no ip address
084 shutdown
    
```

Step Name	Step #	User ID	Parent Flow	Start Time	End Time	Execution Time (Secs)	Response	Recorded Bound Inputs	RCI Value
Cisco Switch SpawningTree Baseline	0	admin		06/07/10 15:57:01	06/07/10 15:57:05	4.790	success (info style="color=white; background-color=gray") Diagnostic-Cisco Switch SpawningTree Baseline executed on node 26.99.63.252 (R2): Flow startup success, IOS/CATOS version determined.		0.0
Determine IOS/CATOS	1	admin	Cisco Switch SpawningTree Baseline	06/07/10 15:57:01	06/07/10 15:57:03	2.224	success (info style="color=white; background-color=gray") Diagnostic-Cisco Switch SpawningTree Baseline executed on node 26.99.63.252 (R2): Flow startup success, IOS/CATOS version determined.		0.0
String Comparator	2	admin	Cisco Switch SpawningTree Baseline	06/07/10 15:57:03	06/07/10 15:57:03	0.06	success		0.0

Benefits

- 1 Minimized network downtime and performance issues
- 2 Increased service availability, thus higher ROI, by providing the Network Engineer with the necessary tools and data for faster real-time troubleshooting

Troubleshooting application performance problems from a network context

CORE Story

- 1 Network Engineer receives a phone call or trouble ticket that network performance is negatively affecting application performance.
- 2 Operator determines which server-to-server communications are involved in the application by using traceroute and communications involved in the application, and uses traceroute to determine the routed infrastructure utilized to transit traffic on behalf of the application.
- 3 From the individual routers, the routing table is checked to understand the individual interfaces associated with the application path.
- 4 Performance metrics from each device on the device itself are gathered, as well as the individual interfaces involved in the network path.
- 5 Traffic metrics via sniffer/probe tools deployed within the network path are gathered to determine which abnormal or unauthorized traffic is interfering with target application traffic across over-utilized routers.
- 6 Network devices are logged on to to block unauthorized traffic, or reroute target application traffic through alternate, less utilized routes.

Using ANM

Process

- 1 NNMi receives a notification that interface utilization is beyond acceptable boundaries for an important network interface.
- 2 NNM iSPI Performance for Traffic is launched to understand the application traffic transiting the interface. Inspection reveals a critical application is part of the network traffic over the interface, and the available bandwidth is potentially below what is necessary for proper operation of the application.

Additionally, using the NNM iSPI Performance for QA, an IPSLA test between the routers in the network path of the application indicates packet loss between the routers.

3 NNM iSPI Performance for Traffic reveals competing traffic from an unauthorized traffic source.

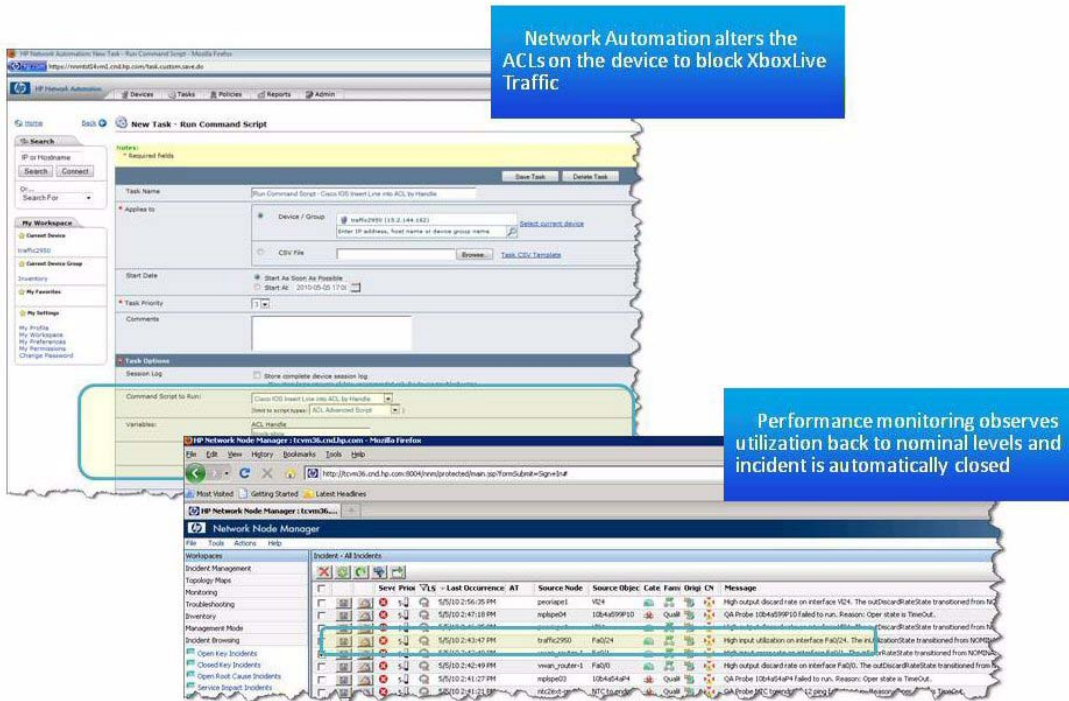
The image displays two screenshots from HP Network Node Manager. The top screenshot shows the 'Incident - All Incidents' browser with a table of incidents. A blue callout box points to the first incident with the message: 'Incident browser shows interface utilization exception'. The table includes columns for Severity, Priority, Last Occurrence, AT, Source Node, Source Object, Category, Family, Origin, and Message. The bottom screenshot shows the 'Top N - Cognos Viewer - Mozilla Firefox' displaying 'Interface Traffic: Top N' for May 5, 2010. A blue callout box points to the 'XboxLive' entry in the traffic analysis table with the message: 'Traffic analysis shows XboxLive traffic competing for bandwidth'. Another blue callout box points to the 'NetBIOSNameService' entry with the message: 'Quality Assurance tests show high loss on the link'.

Severity	Priority	Last Occurrence	AT	Source Node	Source Object	Category	Family	Origin	Message
High	High	5/5/10 2:43:47 PM		traffic2950	Fa0/24				High input utilization on interface Fa0/24. The utilizationState transitioned from NOMINAS...
High	High	5/5/10 2:42:49 PM		vsmb_router1	Fa0/0				High input error rate on interface Fa0/0. The inputErrorRateState transitioned from NOMINAS...
High	High	5/5/10 2:42:49 PM		vsmb_router-1	Fa0/0				High output discard rate on interface Fa0/0. The outDiscardRateState transitioned from NOMINAS...
High	High	5/5/10 2:41:27 PM		mplse03	10b454d4	Qualif			QA Probe 10b454d4 failed to run. Reason: Oper state is TimeOut.
High	High	5/5/10 2:37:59 PM		rtc2ent-gw2	ntc-to-endhoc9	Qualif			QA Probe ntc-to-endhoc9 ping failed to run. Reason: Oper state is TimeOut.
High	High	5/5/10 2:37:59 PM		rtc2ent-gw2	udp-jitter test t	Qualif			QA Probe udp-jitter test to 15.6.96.52 failed to run. Reason: Oper state is NotConnected.
High	High	5/5/10 2:36:35 PM		peerogw1	V24				High output discard rate on interface V24. The outDiscardRateState transitioned from NOMINAS...
High	High	5/5/10 2:35:59 PM		rtc2ent-gw2	udp-jitter test t	Qualif			QA Probe udp-jitter test to 15.6.96.52 has returned an error. Reason: Oper state is Sequen...
High	High	5/5/10 2:35:28 PM		mplse03	10b454d4	Qualif			QA Probe 10b454d4 failed to run. Reason: Oper state is TimeOut.

Rank	Application Name	Volume - In Bytes (sum)	Percent of All
1	vsmb_router	1,280,245,512	77.00%
2	XboxLive	1,280,245,512	22.74%
3	NetBIOS	102,260	0.00%
4	NetBIOSNameService	102,260	0.00%

4 NA user (Network Engineer) runs a **Batch Insert ACL Line** to modify multiple ACLs to multiple devices to block unauthorized traffic. As part of initial setup, the **ACL handles** need to be configured—grouping of similar functionality ACLs.

5 Interface utilization exception automatically clears in NNMi as a result of traffic returning to normal, and the incident closes in NNMi.



Benefits

- 1** Increased service levels as a result of proactive management of network utilization issues before it becomes a problem for mission critical applications
- 2** Faster Mean Time to Repair (MTTR), with tools to triage the cause of network utilization issues
- 3** Efficient network configuration, including remediation of network configuration issues that affect critical services across the entire network

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