Hewlett Packard Enterprise

HPE Network Node Manager i Software Ultimate Edition

Software Version: 10.21
for the Windows® and Linux® operating systems

Support Matrix

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About this Document

> **Note:** For the latest copy of this document, click here:
>
> https://softwaresupport.hpe.com/km/KM02581675

This document provides an overview of the system requirements and supported devices for Network Node Manager i Software Ultimate Edition (NNMi Ultimate).

NNMi Ultimate includes the following add-in components (also known as iSPIs) along with the core NNMi software:

- Network Node Manager iSPI Network Engineering Toolset Software
- Network Node Manager iSPI Performance for Metrics Software
- Network Node Manager iSPI Performance for Quality Assurance Software
- Network Node Manager iSPI Performance for Traffic Software
- Network Node Manager iSPI for IP Multicast Software
- Network Node Manager iSPI for MPLS Software
- Network Node Manager iSPI for IP Telephony Software

> **Note:** Only NNMi and NNM iSPI Performance for Metrics are updated in the version 10.21 release.
>
> NNMi 10.21 is a patch.
>
> All iSPIs (10.20) work with NNMi 10.21.
>
> You can install the NNM iSPI Performance for Metrics 10.21 patch on the NPS system after NNMi 10.21 is successfully installed.

Part 1 of this document contains the system requirements of NNMi and all iSPIs available with NNMi Ultimate.

Part 2 of this document provides performance and sizing recommendation for NNMi and all iSPIs available with NNMi Ultimate.

Part 3 of this document provides a list of devices supported by NNMi and iSPIs.

How to Use this Document

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Part I: Requirements and Compatibility

This section of the document describes hardware and software prerequisites and compatibility information for Network Node Manager i Software Ultimate Edition.

The tables in this section provide information about NNMi10.21 and NNM iSPI Performance for Metrics10.21. All other iSPIs referenced in these tables are of version 10.20.

Requirements

This section provides information about the supported hardware and software that you must have to successfully install and run Network Node Manager i Software Ultimate Edition 10.21. These requirements apply to NNMi and all NNM iSPIs (unless otherwise specified).

Installation Guide

To obtain an electronic copy of the most current version of the Network Node Manager i Software Ultimate Edition 10.20 Installation Guide, go to https://softwaresupport.hpe.com/km/KM02208862.

Installation instructions for NNMi 10.21 available in the *readme* file of the NNMi 10.21 patch.

> **Note:** Installation requirements for Network Node Manager i Software Smart Plug-ins can be found in the respective installation guide bundled with the iSPI component.

Hardware

This section describes hardware component requirements for Network Node Manager i Software Ultimate Edition.

> **Note:** The information contained in this section also applies to NNM iSPIs unless otherwise specified.

NNMi 10.21 is supported on Intel 64-bit (x86-64) or AMD 64-bit (AMD64) processors.

For Intel 64-bit (x86-64), the following Xeon processor families are recommended:

- Penryn, Nehalem, Westmere, Sandy Bridge, Ivy Bridge, Haswell or later for up to Medium tier
- Sandy Bridge, Ivy Bridge, Haswell or later for Large or Very Large tier and GNM global manager

For information on hardware sizing, see "Performance, Sizing, and Other Recommendations" on page 27.

Virtualization Products

NNMi 10.21 can be used with the following virtualization products:

> **Note:** Virtual environments must meet the hardware requirements.
>
> Summary of the table below:
>
> - *Column 2nd*: details apply to NNMi, the NNM iSPI for IP Multicast, the NNM iSPI for MPLS, the NNM iSPI for IP Telephony, the NNM iSPI Performance for QA, and all other components that *can only* be installed on the NNMi management server—unless otherwise specified in the **Additional Information** column.
> - *Column 3rd*: details apply to NPS—a component of the NNM iSPI Performance for Metrics.
> - *Column 4th*: details apply to iRA, which is distributed with the NNM iSPI Performance for QA media.
> - *Column 5th*: details apply to the Master and Leaf Collectors of the NNM iSPI Performance for Traffic
> - *Column 6th*: details apply to the Diagnostic Server, which is distributed with the NNM iSPI NET media.
>
> The table in this section provides information about NNMi 10.21 and NNM iSPI Performance for Metrics 10.21. All other iSPIs referenced in the table are of version 10.20.

Table: Virtualization Support

Virtualization Product	NNMi Management Server	NPS System	iRA Node	NNM iSPI Performance for Traffic Collectors	NNM iSPI NET Diagnostic Server	Additional Information
VMware ESXi Server						
VMware ESXi Server 5.x	✓	✓	✓	✓	✓	- Bridged network environment required. NAT'ed network environments are not supported. - (For NNMi) VMware vmotion (for DRS and DPM) of the NNMi management server is supported. - Supported only up to the Medium Tier for the NNM iSPI Performance for Traffic.
VMware ESXi Server 6.x	✓	✓	✓	✓	✓	
Microsoft Hyper-V						

Table: Virtualization Support, continued

Virtualization Product	NNMi Management Server	NPS System	iRA Node	NNM iSPI Performance for Traffic Collectors	NNM iSPI NET Diagnostic Server	Additional Information
Microsoft Hyper-V 2012	✓	✓	✓	✓	✓	• Host OS: Windows Server 2012 or 2012 R2 (or later service pack)
Microsoft Hyper-V 2012 R2 (or later service pack)	✓	✓	✓	✓	✓	• Guest OS: Any of the Windows operating systems listed in "Operating Systems" on page 12.
Kernel-Based Virtual Machine (KVM)						
KVM	✓	✓	X	X	X	• Guest operating system must be included in "Operating Systems" on page 12. • Supported only up to the Medium Tier • Supported only for NNMi Premium.
Oracle VM						
Oracle VM 3.x (starting at 3.2)	✓	✓	X	X	X	• Guest operating system must be included in "Operating Systems" on page 12. • Supported only up to the Medium Tier • Supported only for NNMi Premium (however; iRA is not supported).

Operating Systems

NNMi 10.21 is a patch.

All iSPIs (10.20) work with NNMi 10.21.

You can install the NNM iSPI Performance for Metrics 10.21 patch on the NPS system after NNMi 10.21 is successfully installed.

Network Node Manager i Software Ultimate Edition 10.21 will run on the following operating systems:

> **Note:** Summary of the table below:
>
> - *Column 2nd*: details apply to NNMi, the NNM iSPI for IP Multicast, the NNM iSPI for MPLS, the NNM iSPI for IP Telephony, the NNM iSPI Performance for QA, and all other components that *can only* be installed on the NNMi management server—unless otherwise specified in the **Additional Information** column.
> - *Column 3rd*: details apply to NPS—a component of the NNM iSPI Performance for Metrics.
> - *Column 4th*: details apply to iRA, which is distributed with the NNM iSPI Performance for QA media.
> - *Column 5th*: details apply to the Master and Leaf Collectors of the NNM iSPI Performance for Traffic
> - *Column 6th*: details apply to the Diagnostic Server, which is distributed with the NNM iSPI NET media.
>
> The table in this section provides information about NNMi 10.21 and NNM iSPI Performance for Metrics 10.21. All other iSPIs referenced in the table are of version 10.20.

Table: Operating Systems

Operating System	NNMi Management Server	NPS System	Intelligent Response Agent (iRA)	NNM iSPI Performance for Traffic	NNM iSPI NET Diagnostic Server	Additional Information
Windows Server 2012						
Windows Server 2012 Datacenter Edition (or later service pack)	✓	X	✓	✓	✓	
Windows Server 2012 Standard Edition (or later service pack)	✓	X	✓	✓	✓	
Windows Server 2012 R2 Datacenter Edition (or later	✓	✓	✓	✓	✓	

Table: Operating Systems, continued

Operating System	NNMi Management Server	NPS System	Intelligent Response Agent (iRA)	NNM iSPI Performance for Traffic	NNM iSPI NET Diagnostic Server	Additional Information
service pack)						
Windows Server 2012 R2 Standard Edition (or later service pack)	✓	✓	✓	✓	✓	
Red Hat Enterprise Linux						
Red Hat Enterprise Linux Server 6.x (starting with 6.4)	✓	✓	✓	✓	✓	
Red Hat Enterprise Linux Server 7.x	✓	✓*	✓	✓	X	
Oracle Linux						NNMi and iSPIs running on Oracle Linux in an HA cluster is not supported.
Oracle Linux Red Hat Compatible Kernel 6.x (starting with 6.4)	✓	X	✓	✓	✓	For a list of dependent libraries for NNMi, see "Red Hat Enterprise Linux 6 Prerequisites " on page 15.
Oracle Linux Red Hat Compatible Kernel 7.x	✓	X	✓	✓	X	For a list of dependent libraries for NNMi, see "Red Hat Enterprise Linux 7 Prerequisites " on page 15.
SUSE Enterprise Linux						
SUSE Linux	✓	✓	✓	✓	X	For a list of

Table: Operating Systems, continued

Operating System	NNMi Management Server	NPS System	Intelligent Response Agent (iRA)	NNM iSPI Performance for Traffic	NNM iSPI NET Diagnostic Server	Additional Information
Enterprise Server 11 SP3 (or later service pack)						dependent libraries for NNMi, see "SUSE Prerequisites" on the next page.
SUSE Linux Enterprise Server 12 (or later service pack)	✓	X	✓	✓	X	

*You can install NPS 10.21 on Red Hat Enterprise Linux 7.x by following these steps:

1. Install NPS 10.20 on a Red Hat Enterprise Linux 7.x system. This installation requires some additional libraries. See the *NNM iSPI Performance for Metrics 10.20 Interactive Installation and Upgrade Guide* for more information.

   Note: Do not perform any operation on NPS after this installation as NPS 10.20 cannot successfully function on Red Hat Enterprise Linux 7.x.

2. Install the NPS 10.21 patch.

Note: On NPS 10.20 running on Red Hat Enterprise Linux 6.x, do not upgrade the operating system to Red Hat Enterprise Linux 7.x. Installation of NPS 10.21 on such a system may fail.

Linux OS Prerequisites

This section describes the prerequisites for installing Network Node Manager i Software Ultimate Edition on supported Linux operating systems.

For the prerequisites to install iSPIs, see the iSPI installation guides.

Required Libraries

NNMi requires the following library versions. The RPM versions may vary depending on the minor release of Red Hat Enterprise Linux. Before installing NNMi on a 64-bit Linux server, verify that the following library files are installed:

Make sure your system meets the following requirements for installing Network Node Manager i Software Ultimate Edition on Red Hat Enterprise Linux (as well as Oracle Linux).

Red Hat Enterprise Linux 6 Prerequisites

RPM Package	Library
glibc	/lib64/libc-2.12.so
libaio	/lib64/libaio.so.1
libXtst	/usr/lib64/libXtst.so.6
libXi	/usr/lib64/libXi.so.6

Red Hat Enterprise Linux 7 Prerequisites

RPM Package	Library
glibc	/lib64/libc-2.17.so
libaio	/lib64/libaio.so.1
libXtst	/usr/lib64/libXtst.so.6
libXi	/usr/lib64/libXi.so.6

For example, to install the Red Hat Enterprise Linux package libXtst, you can obtain and install the package in one of two ways:

- If you have subscribed to the Red Hat repository, run the command yum install libXtst. This command automatically locates the package in the repository, then downloads and installs the package on the system.
- If you do not have access to any Red Hat repository, contact your Linux administrator to download the package.

SUSE Prerequisites

Make sure your system meets the following requirements for installing Network Node Manager i Software Ultimate Edition on SUSE operating system.

- Required Libraries: NNMi requires the following exact library versions. The RPM versions may vary depending on the minor release of SUSE. Before installing NNMi on a 64-bit Linux server, verify that the following library files are installed:

SUSE Linux Enterprise Server 11

RPM Package	Library
glibc	/lib64/libc-2.11.3.so
libaio	/lib64/libaio.so.1
xorg-x11-libs	/usr/lib64/libXtst.so.6 /usr/lib64/libXi.so.6

SUSE Linux Enterprise Server 12

RPM Package	Library
glibc	/lib64/libc-2.19.so
libaio	/lib64/libaio.so.1
libXtst6	/usr/lib64/libXtst.so.6
libXi6	/usr/lib64/libXi.so.6

Linux Kernel Tuning

NNMi requires that the following kernel tunable options be changed from their default settings.

- SNMP utilizes UDP (User Datagram Protocol) for sending and receiving SNMP request and response Protocol Data Units (PDUs). The operating system utilizes UDP buffering to match the arrival rate of UDP packets with their consumption rate by NNMi. To minimize the chances for lost SNMP request or response packets, a sufficient amount of memory is required for UDP buffering. NNMi requests 8 MB for the UDP receive buffer (for incoming responses) and 2 MB for the UDP send buffer (for outgoing requests). Linux systems typically reserve only 128 KB for each of these buffers.
  To make this change permanent (after a reboot):

  a. Edit the /etc/sysctl.conf file and add the following entry:
  ```
  # NNMi settings for UDP receive and send buffer sizes

  net.core.rmem_max = 8388608

  net.core.wmem_max = 2097152
  ```

  b. Reboot the system. To immediately apply the changes without a reboot, you can also run the command /sbin/sysctl -p.

  If ovjboss is running, restart the process to benefit from these changes:
  ```
  ovstop ovjboss; ovstart ovjboss
  ```

- The default size of kernel.shmmax on an upgraded operating system might be too small for the embedded database to operate after a reboot (as reported by ovstatus -c nmsdbmgr). Configure this value before installing NNMi.
  To validate, run /sbin/sysctl -q kernel.shmmax.
  Make sure that the size of kernel.shmmax is at least 12 GB. In most cases, it is best to reset this value to 64 GB, which is the default value for new Red Hat installations.
  To make this change permanent (after a reboot)

  a. Edit the /etc/sysctl.conf file to add the following entry:
  ```
  # NNMi settings for embedded database

  kernel.shmmax = 68719476736
  ```

  b. Either reboot the system or run /sbin/sysctl -p to immediately apply the changes without requiring a reboot.

- The number of open files per process must be increased. To increase the number of files:

  a. Edit the /etc/security/limits.conf file to add (or update) if the existing value is less than 16384 the following lines.

```
# Increase the default max open files for NNMi
*     soft     nofile     16384
*     hard     nofile     16384
```

b. Save your changes.

c. Log off from the Linux system, and then log back on, as the change to the limits.conf file only applies to new shells.

d. When you start installing NNMi, the installer inherits the new file limits.

> **Note:** If you have already installed NNMi, do the following to restart NNMi so it inherits the new file limits:
> ```
> ovstop; ovstart
> ```

Virtual Memory / Swap Space

- Recommended size is at least one and a half times physical memory (i.e., 1.5 * RAM).
- Verify and adjust the virtual memory:
    - Windows: Use **System Properties**.

    - Linux: To verify, use the `cat /proc/meminfo | grep Swap` command. To adjust, use the parted and mkswap commands.

High-Availability Products

NNMi 10.21 is a patch.

All iSPIs (10.20) work with NNMi 10.21.

You can install the NNM iSPI Performance for Metrics 10.21 patch on the NPS system after NNMi 10.21 is successfully installed.

The table in this section provides information about NNMi 10.21 and NNM iSPI Performance for Metrics 10.21. All other iSPIs referenced in the table are of version 10.20.

Note: Use of the NNM iSPI NET diagnostics server on systems that are integrated in an NNMi cluster is not supported. The NNM iSPI NET diagnostics server must be installed on a system separate from the NNMi cluster systems.

The following products and components are not supported in HA clusters:

- iRA
- NNM iSPI Performance for Traffic Leaf Collector
- NNM iSPI NET Diagnostic Server

NNMi can run on certain high availability (HA) systems with additional configuration. See the *Deployment Reference* for information on how to install and configure NNMi with high availability systems. When you install and configure NNMi with high availability systems, it is important to carefully follow the steps documented in the *Deployment Reference* and *Interactive Installation and Upgrade Guide* to accurately configure NNMi for HA. Only HA configurations that follow these documented steps can be supported by HPE.

Note: All products listed here support only a 1+1 configuration model for high availability.

Summary of the table below:

- *Column 2nd*: details apply to NNMi, the NNM iSPI for IP Multicast, the NNM iSPI for MPLS, the NNM iSPI for IP Telephony, the NNM iSPI Performance for QA, and all other components that *can only* be installed on the NNMi management server—unless otherwise specified in the **Additional Information** column.
- *Column 3rd*: details apply to NPS, which is distributed with the NNM iSPI Performance for Metrics media.
- *Column 4th*: details apply to the Master Collector of the NNM iSPI Performance for Traffic

Table: HA Products

HA Cluster	NNMi Management Server	NPS System	NNM iSPI Performance for Traffic Master Collector	Additional Information
Windows Server 2012				
Microsoft Failover Clustering for Windows Server 2012	✓	X	✓	Before configuring HA on Windows Server, you must install the `FailoverCluster-CmdInterface` component using either Server Manager or Windows PowerShell cmdlets.
Microsoft Failover Clustering for Windows Server 2012 R2	✓	✓	✓	
Red Hat Enterprise Linux				
Red Hat Enterprise Linux 6.x with Veritas Cluster Server (VCS) version 6.x	✓	✓	✓	• Some disk types require the use of Veritas Storage Foundation (VSF) version 6.0.
Red Hat Enterprise Linux 7.x with Veritas Cluster Server (VCS) version 6.x with 6.2	✓	X	✓	• VCS 6.x and VSF 6.x might require operating system patches. For specific information, see the appropriate Veritas product documentation.
Red Hat Enterprise Linux 6.x with Red Hat Cluster Suite (RHCS) 6.x	✓	X	X	This combination is not supported by any iSPIs.
SUSE Enterprise Linux				
SUSE Linux Enterprise Server 11 SP3 with Veritas Cluster Server (VCS) version 6.x	✓	X	✓	This combination is not supported by any iSPIs.
SUSE Linux Enterprise Server 12 with Veritas Cluster Server (VCS) version 6.x	✓	X	✓	This combination is not supported by any iSPIs.

Databases

NNMi can store its data in an embedded PostgreSQL database or in an external Oracle database. You must choose the database type at installation time.

> **Note:** You cannot change the database type after NNMi installation.

Database Version	Notes
Embedded database on the NNMi management server	• NNMi automatically installs, initializes, and maintains the embedded database. • NNMi provides tools for re-initializing, backing up while online, and restoring the embedded database.
Oracle and Oracle Real Application Clusters (RAC) 11g Release 2 (11.2.0.x starting with 11.2.0.3) installed on a remote system	• It is recommended that the network connection between the NNMi management server and the database server be at least 1 Gbps. • The Oracle database user must be created with an appropriate table space before NNMi installation (see the *NNMi Interactive Installation and Upgrade Guide*).
Oracle and Oracle Real Application Clusters (RAC) 12c Release 1 (12.1.0.x) installed on a remote system	• The Enterprise Edition of Oracle database is supported for all tiers • The Standard Edition of Oracle database is supported up to the Medium tier.

Database Requirements for the NNM iSPI NET

> **Note:** If you plan to use an existing HPE OO Central Server, you can choose to use any database supported by HPE OO. This section is relevant if you want to use the HPE OO Studio that is embedded with the NNM iSPI NET installer.

NNM iSPI NET requires an external PostgreSQL database to store data. You must install the database before the NNM iSPI NET installation.

NNM iSPI NET 10.20 supports PostgreSQL 9.3.x.

Web Browsers and Plug-ins

This section contains web browser and Adobe Flash Player plug-in requirements to work with NNMi web console.

> **Note:** The information contained in this section also applies to NNM iSPIs unless otherwise specified.

General Web Browser Requirements

Make sure the web browser meets the following requirements to access NNMi using the supported web browser.

- Enable popups for the browser (see instructions on the NNMi console sign-in page or in the *NNMi Interactive Installation and Upgrade Guide*).

- Enable cookies for the browser (see instructions on the NNMi console sign-in page or in the *NNMi Interactive Installation and Upgrade Guide*).

- Enable JavaScript for the browser.

- Install Adobe Flash (for proper display of Real-Time Line Graphs).

- The resolution of the client display should be at least 1024x768.

> **Caution:** The following browsers are not supported:
>
> - Microsoft Internet Explorer version 11 when running in Compatibility View mode or in Enterprise mode. Be sure to disable Compatibility View in Internet Explorer using Tools → Compatibility View Settings (clear all check boxes).
> - Microsoft Internet Explorer prior to version 11
> - Apple Safari prior to version 9.x
> - Mozilla Firefox prior to version 45.x ESR
> - Mozilla Firefox non-ESR version
> - Opera (all versions)

Supported Web Browsers on a Remote Client System (for operational use)

The following web browsers are supported on a remote client system.

- Microsoft Internet Explorer (32-bit and 64-bit) version 11 (not running in Compatibility View mode).
- Mozilla Firefox version 45.x ESR on a Windows or Linux client.
  - The Firefox ESR (Extended Support Release) browser is available at http://www.mozilla.org/firefox/organizations/all.html.

  - The Firefox browser works best when you open links as new windows rather than tabs. For information, see "Mozilla Firefox Known Problems" in the Release Notes.

- Apple Safari version 9.x on an OS X client.
  - *Exception:* The NPS console and all other windows that are launched from the NPS console are not supported with Safari.

- Google Chrome^{TM}
  - *Exceptions:*
    - NPS Query Studio and BI Server Administration features are not supported with Chrome.

Compatibility Matrix of Different NPS Components with Supported Web Browsers

	Google Chrome	Apple Safari 9.x (Only on OS X)	Microsoft Internet Explorer 11	Mozilla Firefox 45.x ESR
Dashboards	✓	✓	✓	✓
Performance Troubleshooting	✓	✓	✓	✓
NPS console and reports	✓	X	✓	✓
Query Studio	X	X	✓	✓
BI Server Portal	✓	X	✓	✓
BI Server Administration	X	X	✓	✓

Adobe Flash Player Plug-in

The Real-time Line Graphs (Actions → Graphs) requires the Adobe Flash Player Plug-in version 11.2 or above on Linux and 21.0.0.242 or above in Windows. The Adobe Flash Player is available from www.adobe.com/go/getflash/.

Microsoft Visio (NNM iSPI NET only)

The NNM iSPI NET feature to export map views to Visio (Tools → Visio Export) requires Microsoft Visio 2010 or Microsoft Visio 2013.

Compatibility

This section provides information about software and configurations that are not required, but which are compatible with Network Node Manager i Software Ultimate Edition 10.21.

Languages

NNMi and iSPIs are localized (or translated) to the following languages:

Localization

Product	Locale						
	French	**German**	**Japanese**	**Korean**	**Russian**	**Simplified Chinese**	**Spanish**
NNMi	✓	✓	✓	✓	✓	✓	✓
NNM iSPI Performance for Metrics	✓	✓	✓	✓	✓	✓	✓
NNM iSPI Performance for QA	✓	✓	✓	✓	✓	✓	✓
NNM iSPI Performance for Traffic	✓	✓	✓	X	X	✓	X
NNM iSPI for MPLS	✓	✓	✓	X	X	✓	X
NNM iSPI for IP Multicast	✓	✓	✓	X	X	✓	X
NNM iSPI for IP Telephony	✓	✓	✓	X	X	✓	X
NNM iSPI NET	✓	✓	✓	X	X	✓	X

When those localized packages are installed, NNMi accepts non-English characters as input. With all other locales, English strings appear as output while NNMi accepts non-English characters as input.

On Windows systems, NNMi does not support installation using directory paths with localized characters; path names for `%NnmInstallDir%` and `%NnmDataDir%` can contain English characters only.

HPE Software Integrations

The following products have additional functionality available through an NNMi 10.21 integration.

The most current information about HPE software that integrates with NNMi 10.21 can be found at the HPE Support web site. See HPE Software Integrations Catalog.

For information on specific features, see the appropriate integration manual.

Integrations with NNMi

- HPE Advanced TeMIP NNM Integration (ATNI) version 6.0 with HPE TeMIP version 6.0, 6.2

  NNMi 10.21 on Red Hat Enterprise Linux integrated with ATNI 6.0 on Red Hat Enterprise Linux with patches TEMIPTNTLIN_00049 (runtime) and TEMIPTNTLIN_00050 (for Customization Toolkit) or any superseding patches. NNMi 10.21 on Windows integrated with remote ATNI 6.0 on HP-UX with patches PHSS_ 44066 on HP-UX and TEMIPTNTWIN_00006 on Windows or any superseding patches.

  See the TeMIP NNMi Advanced Integration Overview and other ATNI documentation for more details on the integration.

- HPE ArcSight Logger version 6.0, 6.1 and 6.2

  NNMi 10.21 supports all SmartConnectors supported by ArcSight Logger version 6.0, 6.1 and 6.2.

- HPE Asset Manager version 9.41 (with HPE Connect-It 9.53), 9.50 (with HPE Connect-It 9.60), and 9.60 (with HPE Connect-It 9.60)

- HPE Business Service Management (BSM) Real User Monitor (RUM), Run-time Service Model (RTSM), Operations Management (OMi), My BSM with BSM version 9.25, 9.26

  > **Note:** Integration with OMi for BSM 9.25 or 9.26 is supported only with BSM Connector 10.01. The BSM Connector must be installed on the NNMi management server.

- HPE Operations Manager i (OMi) 10.00, 10.01, 10.10, 10.11

  > **Note:** If you are using OMi 10.00 on Windows, apply the hotfix QCCR8D38153 on OMi. Contact HPE Support to obtain the hotfix.
  >
  > Integration with OMi 10.00, 10.01, or 10.10 is supported with BSM Connector 10.01. Integration with OMi 10.01, 10.10, or 10.11 is supported with HPE Operations Connector (Operations Connector) 10.11. The BSM Connector or Operations Connector must be installed on the NNMi management server.

- HPE Intelligent Management Center (IMC) version 7.1, 7.2
- HPE Network Automation (NA) version 10.21, 10.20, 10.11

  > **Note:** For NNMi and NA to run correctly on the same computer, you must install NNMi before installing NA. If you install NA before installing NNMi, the NNMi installation reports a port conflict with NA and does not complete.

- HPE Operations Analytics Premium and Ultimate 2.31
    - See the HPE Operations Analytics Configuration Guide for more details on the integration.

    > **Note:** HPE Operations Analytics Express is not supported.

- HPE Operations Manager (OM)

    - HPOM for Linux version 9.11, 9.20, 9.21

    - HPOM for UNIX version 9.11, 9.20, 9.21

    - HPOM for Windows version 9.00

    > **Note:** Integration with OM (agent implementation) is supported only with HPE Operations agent 12.00. The HPE Operations agent must be installed on the NNMi management server.

- HPE Operations Orchestration (HPE OO) version 10.x

    > **Note:** NNM iSPI NET provides a different integration with HPE OO. An embedded package of the required HPE OO version is included with the NNM iSPI NET media. For specific information, see the NNM iSPI NET requirements.

- HPE Route Analytics Management Software (RAMS) version 9.21 (requires a Premium, Ultimate or NNMi Advanced license)
- HPE SiteScope version 11.23, 11.30, 11.31, 11.32
- HPE Systems Insight Manager (SIM) version 7.4.x, 7.5.x
- HPE Universal CMDB (UCMDB) version 10.10, 10.11, 10.21, 10.22

    > **Note:** The HPE NNMi–HPE BSM/UCMDB Topology integration, as described in the NNMi—Business Service Management/Universal CMDB Topology Integration Guide, now supports integration with either HPE Business Service Management (BSM) Topology or HPE UCMDB. NNMi cannot simultaneously integrate directly with both HPE BSM Topology and HPE UCMDB. If you want NNMi information in both databases, configure the HPE NNMi–HPE BSM/UCMDB Topology integration with either HPE BSM Topology or HPE UCDMB and then configure integration between HPE BSM Topology and HPE UCMDB as described in the UCMDB Data Flow Management Guide, which is included on the UCMDB product media

- IBM Tivoli Netcool/OMNIbus version 8.1
- NetScout nGenius Performance Manager 5.2.1
- NNM iSPIs

    - NNM iSPI NET 10.20

    - NNM iSPI Performance for Metrics 10.20

    - NNM iSPI Performance for QA 10.20

    - NNM iSPI Performance for Traffic 10.20

- NNM iSPI for IP Multicast 10.20

- NNM iSPI for MPLS 10.20

- NNM iSPI for IP Telephony 10.20

Integrations with iSPIs (10.20)

- NNM iSPI Performance for Metrics with HPE Operations Bridge Reporter 10.00, 10.01
- NNM iSPI for IP Telephony with HPE SiteScope

  Supports integration with SiteScope 11.30

HPE Software Coexistence

The following products can coexist on the same system as NNMi 10.21:

- All Network NodeManager i Smart Plug-ins (NNM iSPIs) listed in the "About this Document" on page 7 except the NNM iSPI NET.

  Note: The NNM iSPI NET Diagnostic Server and NNMi cannot coexist on the same server. For instructions to install the NNM iSPI NET Diagnostic Server, see the *NNM iSPI NET Interactive Installation and Upgrade Guide*.

- HPE ArcSight Smart Connector: HPE Network NodeManager i SNMP version 7.1.6
- HPE Network Automation (NA) version 10.11, 10.20, 10.21
- HPE Business Service Management Connector version 10.01
- HPE Operations Connector version 10.11
- HPE Operations agent (64-bit only) version 12.00, 12.01

  Note: See the *NNMi Coexistence with HPE Operations Agent* section in the *Deployment Reference* for more information on the proper installation order when using HPE Operations agent.

  If you plan to install an HPE Operations agent on the NNMi management server (for communicating with OM), install NNMi before installing the HPE Operations agent.

  If you are also installing the Network Performance Server (NPS), you must install NPS after NNMi and before the HPE Operations agent.

- IBM Tivoli Netcool/OMNIbus SNMP Probe: The latest version that is compatible with IBM Tivoli Netcool/OMNIbus version 8.1

Part II: Performance, Sizing, and Other Recommendations

This section of the document describes hardware sizing, performance, and other recommendations for Network Node Manager i Software Ultimate Edition.

Note: The tables in this section provide information about NNMi10.21 and NNM iSPI Performance for Metrics10.21. All other iSPIs referenced in these tables are of version 10.20.

Recommendations for NNMi

This section describes performance, sizing, and other recommendations for NNMi software.

Sizing Recommendations

The recommendations listed in this section apply to NNMi running under the default settings.

NNM iSPIs might require additional hardware beyond what NNMi requires. If you intend to run any of the NNM iSPIs, review each NNM iSPIs support matrix before determining the total hardware requirements for your environment.

The following tables describe tiers of managed network environments and the hardware requirements for supporting these tiers. The values stated here are approximate and reflect levels tested by HPE. If you have a particularly complex environment, poll objects at a higher frequency, or poll more objects than stated in a given tier, you might need to increase the Java heap size, provision more powerful hardware as indicated by the next higher tier, or both. The number of discovered objects and polled object counts appear in the NNMi console Help → System Information window. All polled counts in the tables below reflect both performance and fault polling.

Note: Performance polling requires an Ultimate or Premium license.

Hardware Requirements for Each Tier

Managed environments larger than these tiers are not supported without additional HPE approval.

Tiers of Managed Network Environments

Managed environment tier[1]	Total number of discovered nodes	Number of Hypervisors[2]	Number of VMs[3]	Number of discovered interfaces	Number of polled addresses	Number of polled interfaces	Number of custom-polled objects[4]	Number of polled node and physical sensors	Number of concurrent users
Entry	Up to 250	5	100	15k	500	2500	1200	500	5
Small	250 - 3k	10	200	120k	5k	10k	30k	40k	10
Medium	3k – 8k	75	1500	400k	10k	50k	50k	60k	25
Large	8k – 18k	200	4000	900k	30k	70k	75k	80k	40
Very Large	18k - 30k	200	4000	1mil	60k	200k	200k	120k	40

- [1]To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.
- [2]The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.
- [3]The number of VMs managed through a Web Agent. This number is included in the total number of discovered nodes.
- [4] This applies to Custom Polled Instances for Custom Poller "Instance" collection. For Custom Poller "Bulk" collection limits, see "Other Recommended Limits" on page 35.

Recommended Hardware for Tiers

Managed environment tier	CPU (64-bit) x86-64 or AMD64[1]	RAM[2]	Recommended Java heap size (see "Tuning the NNMi Memory Size" on page 32)[3]	Disk space for application installation ($NnmInstallDir)[4]	Disk space for database and data during execution ($NnmDataDir)[5]
Entry	2 CPU cores	4 GB	2 GB	3 GB	10 GB
Small	4 CPU cores	8 GB	4 GB	3 GB	30 GB
Medium	6 CPU cores	16 GB	8 GB	3 GB	40 GB
Large	8 CPU cores	24 GB	12 GB	3 GB	60 GB
Very Large	12 CPU cores	48 GB	16 GB	3 GB	80 GB

- [1]See "Hardware" on page 9 for processor recommendations.

- [2]If you are running additional applications, increase resources appropriately. (For example, when the Network Performance Server (NPS) component of the NNM Performance iSPIs is installed on the same system as NNMi, the NPS uses half of the system RAM, and NNMi plus other products must fit into the other half, requiring at least double the amount of RAM stated here.) If you are planning to use any of the NNM iSPI Performance products (NNM iSPI Performance for Metrics, NNM iSPI Performance for Traffic, or NNM iSPI Performance for QA) and are managing at the Large tier or above, it is recommended that the NPS component of the NNM Performance iSPIs be installed on a separate server from NNMi. You can install spread NPS processes across multiple servers by creating a distributed deployment of NPS. See the *NNM iSPI Performance for Metrics Deployment Reference* for more information about the distributed deployment of NPS.

- [3]These recommendations are based on the environment size and polled object counts stated in this table. Polling fewer of a given object type might use less Java heap. Polling more of a given object type might require increased Java heap size as well as HPE approval.

- [4]`NnmInstallDir` is configured during installation on Windows (`C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/opt/OV/`.

- [5]`NnmDataDir` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/var/opt/OV/`. See "Hardware Requirements for Each Tier" on the previous page before proceeding.

The following tables describe hardware recommendations for global network management environment.

Global Network Management Environment[1]

Approximate managed environment	Number of regionally managed nodes[2]	Number of Hypervisors[3]	Number of VMs[4]	Number of regional managers	Number of Custom-Polled Objects via the Regional Manager as a Regional Proxy[5]	Number of concurrent users
Medium Global Manager	25k - 40k	500	10000	Up to 30	50k	20
Large Global Manager	40k - 80k	1000	20000	Up to 30	100k	40

- [1]See "Global Network Management Recommendations" on page 34.

- [2]To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.

- [3]The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.

- [4]The number of VMs managed through a Web Agent. This number is included in the total number of discovered nodes.

- [5]NNMi now enables you to configure Custom Pollers on the Global Manager in a Global Network Management environment and collect the custom-polled data via a Regional Manager. In this configuration, the Regional Manager acts as a regional proxy. For more information about this configuration, see the *Custom Pollers in a Global Network Management Environment* section in *Help for Administrators*.

Recommended Hardware for Global Network Management Environment

Approximate managed environment	CPU (64-bit)x86-64 or AMD64[1]	RAM	Recommended Java heap size (see "Tuning the NNMi Memory Size" on the next page)	Disk space for application installation ($NnmInstallDir)[2]	Disk space for database and data during execution ($NnmDataDir)[3]
Medium Global Manager[4]	8 CPU cores	24 GB	12 GB	3 GB	60 GB
Large Global Manager	12 CPU cores	48 GB	16 GB	3 GB	80 GB

- [1] See "Hardware" on page 9 for processor recommendations.

- [2] `NnmInstallDir` is configured during installation on Windows R2 (`C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/opt/OV/`

- [3] `NnmDataDir` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/var/opt/OV/` . See "Recommendations for NNMi" on page 27 before proceeding.

- [4] Most NNMi customers with fewer than 30k nodes to manage realize the lowest Total Cost of Ownership with a single server solution. If redundancy is required for a single server solution, a High Availability or NNMi Application Failover solution can be deployed with a clustered primary and standby server. Customers with fewer than 30k nodes who are considering a GNM solution should contact their HPE representative to discuss whether GNM is right for their environment.

Tuning the NNMi Memory Size

During installation, the recommended default maximum memory size of the NNMi application is configured in the `ovjboss.jvmargs` file. NNMi configures the `-Xmx` value by examining the amount of physical RAM and selecting the value for the closest tier. Review this memory size value after installation to make sure it is appropriate for the expected size of your environment. You may need to increase or decrease the memory size value to reflect the recommendations documented in *NNMi Performance, Sizing, and Other Recommendations*.

The current Maximum Attemptable Memory value (adjusted with –Xmx) and a memory region report are available in the NNMi console with **Help → System Information**. This -Xmx value must not exceed the amount of unused physical RAM. If the NNMi JVM's entire virtual memory space does not fit in physical memory, the operating system thrashes as NNMi randomly accesses its memory. NNMi supports a maximum –Xmx memory value of **24 GB**.

> **Note:** Setting the heap too large may cause long pauses which can affect the ability of NNMi to monitor the network. Large heap sizes require a fast CPU with high memory bandwidth.

You can approximate the amount of unused physical RAM available to NNMi as follows: From the amount of physical memory, subtract the following amounts:

- Memory for the operating system: 1 - 2 GB
- Memory for the `nmsdbmgr` process: 1 - 8 GB
- Memory for any other applications, including NNM iSPIs, that are running on the server

NNMi continues to monitor its memory regions during operation. If NNMi memory resources are getting low, a message appears on the NNMi console sign-on page, at the bottom of the NNMi console, and at the top of NNMi forms. When NNMi is running low on memory, it spends more time performing garbage collection, reducing overall system performance. Some of the possible memory region messages and suggested fixes include:

- `[Critical] The region 'PS Old Gen' is at 100.00% usage`

  This indicates the system is running low on heap memory. Check that the NNMi maximum heap setting is configured for the size of the monitored environment as specified under Sizing Recommendations.

  If the system is correctly configured and yet the warning persists, consider increasing the maximum NNMi heap size to the next tier, or by a small amount if at the maximum of 16 GB. Larger heap sizes are not always better as setting the heap too large may cause longer pauses if the hardware is not fast enough to handle the larger size.

  Setting the maximum heap to values over 16 GB should be done with caution as only high performance hardware is able to garbage collect such large heaps with acceptable pause times. Warnings about excessive pause times indicate the heap is too large for the system.

- `[Warning] The average garbage collection pause of 13.00 seconds for the 'PS MarkSweep' collector is above the recommended maximum of 10 seconds.`

  This warning indicates that the system is unable to garbage-collect the heap within a reasonable time leading to large pauses. This can indicate either a performance problem on the system, either swapping or insufficient CPU time if a VM, or it could indicate that the heap has been set too large for the performance of the system.

To change the NNMi Maximum Java Heap Size (–Xmx) or other Java Virtual Machine parameters:

1. Run the command ovstop -c ovjboss.

2. Edit the ovjboss.jvmargs file:
   Windows Server: C:\ProgramData\HP\HP BTO
   Software\shared\nnm\conf\props\ovjboss.jvmargs
   Linux: /var/opt/OV/shared/nnm/conf/props/ovjboss.jvmargs

3. Change the Maximum Java Heap Size to the required amount. For example, a snippet of the ovjboss.jvmargs file looks like this:
   # JVM Memory parameters

   # -Xms: Initial Java Heap Size

   # -Xmx: Maximum Java Heap Size

   # -Xss: Java stack size (default to OS-supplied value)

   #

   -Xms2048m

   -Xmx12g

   > **Note:** Changing values in this file should be done with care as it may have adverse impacts on the performance of NNMi. If in doubt, contact HPE Support.

4. Run the command ovstart -c ovjboss.

NNMi Disk Space Considerations

Before allocating disk space for NNMi, consider the following:

- The recommendations in the tables above are the recommended minimum disk space amounts based on HPE's average test environment. More complex environments might require more disk space.

- Disk performance is extremely important for high scale environments that are Medium tier or higher. HPE strongly recommends RAID 1+0 (10) with battery-backed write cache on discs of 15,000 rpm or better. Disk configurations that do not meet this level of performance are not adequate.

- Increasing log file size from the default settings uses more disk space. Before increasing log file size, validate that you have adequate disk space.

- During high scale testing, HPE has not seen tablespace sizes larger than 16 GB (Oracle or embedded PostgreSQL) - either single system or global manager in a Global Network Management environment. If using Oracle in a high scale environment, configure for incremental table space growth beyond this size.

- For Large and Very Large scale environments running NNMi application failover with PostgreSQL, the NNMi management server must have at least 40 GB more disk space than the recommended amount for application failover logs. For these scaled environments, it is recommended that you allocate disk space separate from $NnmDataDir for the application failover logs. The location of the failover logs can be configured in the nms-cluster.properties file.

- For Global Network Management environments, the global manager running NNMi application failover with PostgreSQL must have at least 140 GB more disk space than the recommended amount for application failover logs. For these scaled environments, it is recommended that you allocate disk space separate from $NnmDataDir for the application failover logs. The location of the failover logs can be configured in the nms-cluster.properties file.

- (Linux) if you partition your disk, you should ensure that the file systems containing the directories listed in the following table have at least the specified disk space available for NNMi. If you use all-in-root partitioning, you should ensure that the total required disk space is available. Also see "Virtual Memory / Swap Space" on page 17 for swap space requirements.

Disk Space Recommendations

Partition	Recommended Minimum Disk Space
/tmp	1 GB
/opt/OV/	See Recommended Hardware System Requirements for $NnmInstallDir for your managed environment tier in the above tables.
/var/opt/OV/	See Recommended Hardware System Requirements for $NnmDataDir for your managed environment tier in the above tables.

Maximum Limits for Correlation Rules and Causal Rules

To ensure adequate performance, NNMi supports the following maximums:

- 25 Correlation Rules
- 25 Causal Rules
- 5 Filter String entries for each of the following filters:
  - Child Incident

  - Parent Incident

  - Source Object

  - Source Node

Valid Filter String entries include logic operators (AND, OR) and comparison operations (Attribute, Operator, Expression). NNMi displays each entry on a separate line above the Filter String output.

Global Network Management Recommendations

Each Regional Manager can forward information to a supported limit of two Global Managers.

Recommended Soft Limits for Trap Burst Throughput Rate

NNMi has been tested with the following incoming SNMP trap rates. These rates assume a well-configured system and are supported independent of the hardware tier:

- 1,000 SNMP traps/second for up to 1 minute.
- 200 SNMP traps/second for up to 5 minutes.

- A sustained average of 50 SNMP traps/second.

- The database limit for storing traps is 95,000; when that limit is reached, new traps are no longer persisted in the NNMi database. See the *Archive and Delete Incidents* help topic in *Help for Administrators* for more information on the stored trap limit. See the NNMi Deployment Reference for enabling Auto-Trim for SNMP traps to avoid reaching the limit for stored traps. Traps can also be trimmed using the `nnmtrimincidents.ovpl` command. Even when new traps are not persisted in the NNMi database due to the database limit for storing traps, they are still stored in the binary trap store and can be viewed with the `nnmtrapdump.ovpl` command.

Other Recommended Limits

- NNMi supports a maximum of 1500 configured Users, 40 simultaneous users, 2000 User Groups, and 2000 Security Groups. Each user is limited to a maximum of 32 User Groups

- Node Groups
  - NNMi supports a maximum of 12,000 Node Groups

  - NNMi supports a hierarchy of 6 Node Groups deep

  - Use separate node groups for maps and monitoring settings

  - Best node group performance is obtained by using the following filtering styles:
    - Use "hostname like B038255*" style filtering

    - Avoid "hostname like *router" style filtering

    - Use "customAttributeName = tokyo1" style filtering

    - Avoid long filters that use `mgmtIPAddress = a.b.c.d` or `mgmtIPAddress = e.f.g.h` or `mgmtIPAddress = u.v.w.x` or `mgmtIPAddress = w.x.y.z` style filtering

- NNMi supports a maximum of 100 Interface Groups
- NNMi supports a maximum of 20 monitoring configuration groups
  - A monitoring configuration group can be either a Node Group or an Interface Group

  - Click the Interfaces Settings and Node Settings tabs of the Monitoring Configuration form to see the number of configured groups:
    - NNMi does not enforce any hard limits on the number of monitoring groups you configure

    - NNMi does not support configurations of more than 20 monitoring groups due to the risk of a degradation in NNMi performance

    - If the NNMi management server is nearing the limits of maximum performance, do not configure monitoring groups to use complex filters; doing so adds processing time and decreases NNMi performance

- NNMi supports a maximum of 20 million records daily for "Bulk" collection for Custom Poller for Very Large tier (where a record can contain values for multiple OIDs from a single SNMP table entry)

- Some commands support batching for updates. If the batch file is too large, transactions timeouts can occur. If that happens, decrease the size of the batch file and try again. The following limits may be useful guidelines:
  - 1000 lines in the batch file for the `nnmcommunication.ovpl` command

  - 100 lines in the batch file for the `nnmnodegroup.ovpl` command

Recommendations for NNM iSPI Performance for Metrics

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI Performance for Metrics Software.

Hardware and Software Requirements

You can install NPS on a dedicated system, separate from NNMi, or you can install it on the same system as NNMi. In addition, you can now split apart the roles within NPS and install them on independent hardware - allowing for better scalability and more predictable performance for your reporting solution. Before installing NPS and your iSPIs, make sure that your system meets the minimum requirements. Be aware of the following:

- The data directory (`NPSDataDir`) will contain the bulk of the collected and aggregated data and should be on the fastest and largest disk partition. On Linux, this will be `/var/opt/OV`. The Deployment Reference offers database sizing and tuning advice regarding file placement of the database files.

- By default, NPS stores daily aggregated data for 800 days, hourly aggregated data for 70 days, and very fine grain, as collected, data for 14 days. The retention periods for hourly and fine grain data can be increased to a maximum of 400 days. Most of the required disk space for the iSPI is consumed by this fine grain data storage. To change retention periods from the default, use the Configuration utility (`runConfigurationGUI.ovpl`). You can modify the settings for each of the storage areas independently, but fine grain data cannot be stored for longer than hourly data, which in turn cannot be stored for longer than daily data. Care should be taken to monitor the disk space usage on the NPS database system after a change to these parameters. The tables below quote disk space requirements for an out-of-the-box system, as well as for two further settings of retention.

- NPS supports a distributed architecture. The distributed deployment of NPS enables you to distribute the computing load across multiple systems and designate each system to perform a specific operation determined by the role assigned to the system. The three roles within NPS are:
  - Extract, Transform, and Load Server (ETL Server) role (1 or more required)

  - Database Server (DB Server) for storage and aggregation (1 or more required)

  - User Interface and Business Intelligence Server (UiBi Server) role to provide user interface for business intelligence reporting (1 required)

- A single hardware system can support any combination of roles, or each role can be split onto separate hardware platforms.

- There can be only one UiBi Server. However, the ETL Server role can be split across multiple individual servers - each supporting one or more Extension Pack. The Database Server role can be configured on multiple servers too.

- The decision to split NPS roles across multiple systems should ideally be made in advance of installation. Guidance on when it might be necessary and the options involved are provided in the *NNM iSPI Performance for Metrics Deployment Reference*.

- NPS does not support the Application Failover feature. However, you can use NPS with an NNMi management server that has been configured for Application Failover. If the NNMi management server is

configured for Application Failover, you must install NPS on a dedicated server (and not on the NNMi management server).

Hardware Sizing Assumptions

Each user environment is unique, as is the use of performance reporting at that environment. Some installations will have many operational users who frequently use the Performance Graphing feature and dashboards. Others will rarely use this functionality, but will have very high scheduled reporting loads. Some have high frequency collections against a small number of nodes, others have a wide range of custom collections running against a large number of nodes. In defining hardware levels, HPE is providing a guideline only, with many assumptions in place.

Category	Assumptions/Guidelines
Discovered vs Performance Polled	NNMi has the ability to discover topology elements such as nodes and interfaces, but not all discovered elements will have performance data collected and stored for reporting. The figures quoted below relate only to performance-polled elements.
Polling Frequency	• The figures in the tables below quote hardware requirements for an NPS running with a 5-minute polling frequency. • The number of polled interfaces and components is stated for each scale. Example: 130k/130k means 130,000 interfaces and 130,000 component sensors simultaneously. • Higher polling frequencies will result in more data being stored. So 400k interfaces at 5 minutes results in the same number of collected data points as 80k interfaces at 1-minute polling frequency.
Factors Affecting Performance	• These hardware recommendations are based on the use of the NNM iSPI Performance for Metrics package. They do not take account of additional factors that may affect the sizing of your application, such as the installation of other iSPI products. • Adding other iSPIs to your platform, such as NNM iSPI Performance for QA, NNM iSPI for IP Telephony, or NNM iSPI for MPLS, will result in additional storage and processing requirements for NPS. Be sure to carefully examine the iSPI-specific sections in this document to take account of additional NPS requirements from those installations. • Custom, user-defined collections will also result in additional storage and processing requirements for NPS. It is assumed that most customers will configure a small number of custom collections with report generation enabled. The load from these collections is typically too small to consider when sizing hardware for a full NNMi iSPI Performance installation. However, if the total number of managed elements being collected from is greater than approximately 10% of the total interface count managed by the system then the load should be considered when sizing the system. As a rule, consider that one custom collection running at a 5 minute interval which retrieves 10 OIDs is equivalent to one interface in the Interface Health package, or one Sensor in the Component Health package.
Post Installation and Maintenance	• HPE recommends that administrators monitor the disk usage, memory consumption and processing performance of the system on a daily basis after installation or when introducing a new custom collection or iSPI. • The installer should consult the NNM iSPI Performance for Metrics Deployment

Category	Assumptions/Guidelines
	Reference for pre-install and post install tuning tips.

Storage Capacity	• The size of the disk required to store collected data will vary dramatically depending upon the required retention periods for each type of data.
	
	• NPS records collected data in three granularities:
	  • As polled
	  • 1 Hour grain
	  • 1 Day grain
	
	• The tables below provide data for three different levels of retention:
	  • 14 days of as polled, 70 days of hourly grain, 800 days of daily grain (R14/H70/D800)
	  • 70 days of as polled, 70 days of hourly grain, 800 days of daily grain (R70/H70/D800)
	  • 70 days of as polled, 400 days of hourly grain, 800 days of daily grain (R70/H400/D800)
	
	• While overall disk size guidance is provided in this document, specifics regarding disk speeds and file layouts are covered in the Deployment Reference. Critical to the performance of the NPS server is the need for fast IO in support of the database loading and queries.

Disk Space and Storage Considerations

NPS requires high speed disk access. This is particularly relevant in a Large scale, Very Large scale, and distributed environments. You can use a benchmarking tool such as bonnie++ (only on Linux) to assess the performance of the proposed storage system. Read the Installation Guide and the Deployment Reference for disk and database file layout suggestions as well as post-install tuning guidelines.

NPS 10.21 is tested with the following file systems:

- For Windows: NTFS
- For Linux: ext4

Management Tiers of NPS

This section helps you determine the management tier of NPS. Resource requirements of the NPS system depend on the management tier. Follow the table below to determine the management tier of NPS.

Management Tier of NPS	Management Tier of NNMi	Management Tier of the NNM iSPI Performance for QA	NNM iSPI Performance for Traffic
Small	Entry	None	None

, continued

Management Tier of NPS	Management Tier of NNMi	Management Tier of the NNM iSPI Performance for QA	NNM iSPI Performance for Traffic
Small	Entry	Small	None
Medium	Entry	None	Entry
Medium	Entry	None	Entry
Medium	Entry	Small	Entry
Medium	Entry	Small	Small
Medium	Entry	Medium	None
Medium	Entry	Medium	Entry
Medium	Entry	Medium	Small
Medium	Small	None	None
Medium	Small	None	Entry
Medium	Small	None	Small
Medium	Small	None	Medium
Medium	Small	Small	None
Medium	Small	Small	Entry
Medium	Small	Small	Small
Medium	Small	Small	Medium
Medium	Small	Medium	None
Medium	Small	Medium	Entry
Medium	Small	Medium	Small
Medium	Medium	None	None
Medium	Medium	None	Entry
Medium	Medium	Small	None
Large	Entry	None	Medium
Large	Entry	Small	Medium
Large	Entry	Medium	Medium
Large	Medium	None	Small

, continued

Management Tier of NPS	Management Tier of NNMi	Management Tier of the NNM iSPI Performance for QA	NNM iSPI Performance for Traffic
Large	Medium	Small	Entry
Large	Medium	Small	Small
Large	Medium	Medium	None
Large	Medium	Medium	Entry
Large	Medium	Medium	Small
Large	Large	None	None
Large	Large	None	Entry
Large	Large	None	Small
Large	Large	Small	None
Large	Large	Small	Entry
Large	Large	Small	Small
Large	Large	Medium	None
Large	Large	Medium	Entry
Large	Large	Medium	Small
Very Large	Small	Large	None
Very Large	Small	Large	Entry
Very Large	Small	Large	Small
Very Large	Small	Large	Medium
Very Large	Small	Medium	Medium
Very Large	Small	Large	None
Very Large	Small	Large	Entry
Very Large	Small	Large	Small
Very Large	Small	Large	Medium
Very Large	Small	None	Medium
Very Large	Medium	Small	Medium
Very Large	Medium	Medium	Medium

, continued

Management Tier of NPS	Management Tier of NNMi	Management Tier of the NNM iSPI Performance for QA	NNM iSPI Performance for Traffic
Very Large	Medium	Large	None
Very Large	Medium	Large	Entry
Very Large	Medium	Large	Small
Very Large	Medium	Large	Medium
Very Large	Large	None	Medium
Very Large	Large	Small	Medium
Very Large	Large	Medium	Medium
Very Large	Large	Large	None
Very Large	Large	Large	Entry
Very Large	Large	Large	Small
Very Large	Large	Large	Medium
Very Large	Very Large	None	None
Very Large	Very Large	None	Entry
Very Large	Very Large	None	Small
Very Large	Very Large	None	Medium
Very Large	Very Large	Small	None
Very Large	Very Large	Small	Entry
Very Large	Very Large	Small	Small
Very Large	Very Large	Small	Medium
Very Large	Very Large	Small	Large
Very Large	Very Large	Medium	None
Very Large	Very Large	Medium	Entry
Very Large	Very Large	Medium	Small
Very Large	Very Large	Medium	Medium
Very Large	Very Large	Large	None
Very Large	Very Large	Large	Entry

, continued

Management Tier of NPS	Management Tier of NNMi	Management Tier of the NNM iSPI Performance for QA	NNM iSPI Performance for Traffic
Extra Large	Entry	None	Large
Extra Large	Entry	Small	Large
Extra Large	Entry	Medium	Large
Extra Large	Small	Large	Large
Extra Large	Small	None	Large
Extra Large	Small	Small	Large
Extra Large	Small	Medium	Large
Extra Large	Small	Large	Large
Extra Large	Medium	None	Large
Extra Large	Small	Small	Large
Extra Large	Medium	Medium	Large
Extra Large	Medium	Large	Large
Extra Large	Large	None	Large
Extra Large	Large	Small	Large
Extra Large	Large	Medium	Large
Extra Large	Large	Large	Large
Extra Large	Very Large	None	Large
Extra Large	Very Large	Small	Large
Extra Large	Very Large	Medium	Large
Extra Large	Very Large	Large	Small
Extra Large	Very Large	Large	Medium
Extra Large	Very Large	Large	Large

Note: For the Extra Large tier, use a distributed deployment of NPS.

Same Server Installation (NNMi and NPS on the Same System)

The following table outlines the requirements for CPU, RAM and disk space when NNMi and NPS (all roles) are on the same system. The CPU, RAM, and Disk figures represent the total requirements for the system and include the combined capacity required for NNMi and NPS. You must make sure that this host also meets any additional criteria defined in "Recommendations for NNMi" on page 27.

Be aware of the following:

- When NPS is installed on a system that hosts NNMi, half of the system RAM will be consumed by NPS. The figures below for RAM resources take account of the combined needs of NNMi and NPS, and are especially important when running NPS with several iSPIs providing data.

- These figures do not take account of additional requirements as a result of other iSPI products or custom, user-defined, collections.

- Although it is a supported option to have NNMi and NPS on the same system for "Large" scale environments, HPE recommends that NPS be installed on a separate, standalone system.

- HPE does not support NPS installed on the same server as NNMi for "Very Large" scale environments.

> **Tip:** Determine the tier of NPS with the help of the table in "Management Tiers of NPS" on page 38.

NNMi + iSPI Minimum Server Requirements for Same Server Installations

Tier	Number of CPUs (cores)[a]	RAM	Disk Space	Disk Hardware	Additional Disk Space Retention = R14/H70/D800	Additional Disk Space Retention = R70/H70/D800	Additional Disk Space Retention = R70/H400/D800
Entry	8 CPU	16 GB	15 GB	1 SCSI or SATA disk drive	200 GB	300 GB	300 GB
Small	8 CPU	24 GB	15 GB	1 SCSI or SATA disk drive	300 GB	400 GB	1 TB
Medium	12 CPU	48 GB	15 GB	RAID 1+0 or 5/6 with write cache recommended	800 GB	1.5 TB	4 TB
Large	24 CPU	96 GB	15 GB	High performance SAN storage	2 TB	3 TB	10 TB

[a] Recommended clock speed for each CPU: 2.5 GHz.

Dedicated Server Installation

If you plan on installing NPS on a separate machine from NNMi, make sure that the following criteria are met. Note that NPS sizing requirements are driven by the amount of data generated by the custom collections and iSPIs that will supply it. The references provided in this document for sizing and scalability are a guideline only and are based on the iSPI Performance for Metrics using the number of interfaces and node components that NNMi is polling for performance data. The total number of interfaces or components discovered by NNMi is not relevant for this system.

- These figures do not take account of additional requirements as a result of other iSPI products or custom, user-defined, collections
- Once NPS is installed, you can use the Managed Inventory report to see the variety of collected elements for each iSPI. For example, looking at the count of distinct Qualified Interface Names in the Interface Health Managed Inventory report will tell you how many unique interfaces have had performance data collected within the selected time period.

All the requirements listed in this table apply to the NPS system in a Global Network Management (GNM) environment as well.

> **Tip:** Determine the tier of NPS with the help of the table in "Management Tiers of NPS" on page 38.

NPS Minimum System Requirements

Management Environment Size	Minimum System Requirements							
Tier	Number of concurrent users	Number of CPUs (cores)[a]	RAM (in GB)	Disk space in NPS installation directory (in GB)	Disk hardware for the NPS data directory	Additional disk space Retention = R14/H70/D800	Additional disk space Retention = R70/H70/D800	Additional disk space Retention = R70/H400/D800
Small	10	8	16	10	1 SCSI or SATA disk drive	300 GB	400 GB	1 TB
Medium	25	8	32	10	RAID 1+0 or 5/6 with write cache recommended	800 GB	1.5 TB	4 TB
Large	40	16	64	10	RAID 1+0 or 5/6 with	2 TB	3 TB	10 TB

NPS Minimum System Requirements, continued

Management Environment Size	Minimum System Requirements							
Tier	Number of concurrent users	Number of CPUs (cores)[a]	RAM (in GB)	Disk space in NPS installation directory (in GB)	Disk hardware for the NPS data directory	Additional disk space Retention = R14/H70/D800	Additional disk space Retention = R70/H70/D800	Additional disk space Retention = R70/H400/D800
					write cache recommended			
Very large	40	32	160	10	High performance SAN storage	4 TB	8 TB	20 TB

[a] Recommended clock speed for each CPU: 2.5 GHz.

System Requirements in a Distributed Deployment of NPS

Follow this table to use a distributed deployment of NPS. In a distributed deployment of NPS, all NPS instances should be of the same version. You cannot install different versions of NPS for different server roles.

Use the distributed environment for the Extra Large tier of NPS (see "Management Tiers of NPS" on page 38.)

NPS Distributed Deployment System Requirement

Server Role	Requirements						
	Number of CPUs (cores)	RAM (in GB)	Disk space in NPS installation directory (in GB)	Disk hardware for the NPS data directory	Additional disk space Retention = R14/H70/D800	Additional disk space Retention = R70/H70/D800	Additional disk space Retention = R70/H400/D800
DB Server	32	64	10	High performance SAN storage	4 TB	8 TB	20 TB
UiBi Server	16	32	10	1 SCSI or SATA disk drive	Not Applicable		
ETL Server	32	48	10	1 SCSI or SATA disk drive			

Networking Configuration of the NPS Server

- Pure IPv6 is not supported, but dual stack IPv6 and IPv4 combined is supported.
- NPS systems must be served by Gigabit Ethernet LAN interfaces.

NNMi and NPS OS Combinations

This table illustrates the combinations of operating systems that are supported with NPS in a distributed installation environment. Note that NPS 10.21 should always be used with NNMi 10.21.

	NPS	
NNMi[1]	Windows	Linux
Windows	Supported	Not Supported
Linux	Supported	Supported

Recommendations for NNM iSPI Performance for QA

This section describes the performance, sizing, and other recommendations for the NNM iSPI Performance for QA.

CPU, RAM, and Disk Space Considerations

This section describes the hardware sizing recommendations for single system management environment, Global Network Management environment, and NPS.

Single System Managed Environment Size

The following table shows the requirements for the single system managed environment size. These requirements are in addition to the requirements for NNMi server.

Single System Managed Environment Size

Managed environment tier	Max number of probes	Max number of QoS interfaces	Max number of iRA probes	Max number of ping latency pairs	Max number of combined probes, iRA probes, and QoS interfaces
Small	5,000	2,000	1,500	1,000	5,000
Medium	30,000	12,000	10,000	3,000	30,000
Large	50,000	20,000	40,000	5,000	50,000

Recommended Hardware Requirements for Single System Managed Environment Size[1]

Managed environment tier	CPU (64-bit) x86-64 AMD64[2]	RAM	Recommended Java heap size ("Tuning the NNM iSPI Performance for QA Memory Size" on page 55)[3]	Disk space for application installation ($NnmInstallDir)[4]	Disk space for operational database (data during execution) ($NnmDataDir)[5]
Small	2 CPU Cores	4 GB	3 GB	2 GB	20 GB
Medium	4 CPU Cores	8 GB	6 GB	2 GB	60 GB
Large	4 CPU Cores	12 GB	8 GB	2 GB	80 GB

- [1]Apart from the hardware system requirements of NNMi, this table specifies the additional hardware system requirements for the NNM iSPI Performance for QA product to be installed on NNMi management server.

- [2]Minimum of 2.5GHz for x64.

- [3]These recommendations are based on the environment size and object counts stated in this table. Polling fewer of a given object type might use less Java heap. Polling more of a given object type might require increased Java heap size as well as HPE approval. For more details, see Tuning the iSPI Memory Size section.

- [4]`$NnmInstallDir` is configured during installation on Windows (`C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux (`/opt/OV/`).

- [5]`$NnmDataDir` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux (c).

> **Caution:** Running the NNM iSPI Performance for QA in an environment with probes or QoS interfaces or iRA probes far exceeding the supported maximum limit mentioned in the table above can lead to a database deadlock. If you intend to run the NNM iSPI Performance for QA in such an environment, you must configure discovery filters before the first discovery by NNM iSPI Performance for QA to bring down the number of discovered probes or QoS interfaces or iRA probes to the supported limit.

Global Network Management Environment Size

The following table shows the requirements for the Global Network Management environment size. These requirements are in addition to the requirements for NNMi server.

Global Network Management Environment Size

Managed environment tier	Number of Regional Services	Max number of probes	Max number of QoS interfaces	Max number of ping latency pairs	Max number of combined probes, iRA probes, and QoS interfaces
Medium	4	120,000	50,000	10,000	120,000
Large	9	250,000	100,000	20,000	250,000

Recommended Hardware Requirements for Global Network Management Environment Size[1]

Managed environment tier	CPU (64-bit) x86-64 AMD64[2]	RAM	Recommended Java heap size ("Tuning the NNM iSPI Performance for QA Memory Size" on page 55)[3]	Disk space for application installation ($NnmInstallDir)[4]	Disk space for operational database (data during execution) ($NnmDataDir)[5]
Medium	4 CPU Cores	16 GB	12 GB	2 GB	80 GB

Recommended Hardware Requirements for Global Network Management Environment Size1, continued

Managed environment tier	CPU (64-bit) x86-64 AMD64[2]	RAM	Recommended Java heap size ("Tuning the NNM iSPI Performance for QA Memory Size" on page 55)[3]	Disk space for application installation ($NnmInstallDir)[4]	Disk space for operational database (data during execution) ($NnmDataDir)[5]
Large	8 CPU Cores	24 GB	20 GB	2 GB	100 GB

- [1]Apart from the hardware system requirements of NNMi, this table specifies the additional hardware system requirements for the NNM iSPI Performance for QA product to be installed on NNMi management server.

- [2]Minimum of 2.5GHz for x64.

- [3]These recommendations are based on the environment size and object counts stated in this table. Polling fewer of a given object type might use less Java heap. Polling more of a given object type might require increased Java heap size as well as HPE approval. For more details, see "Tuning the NNM iSPI Performance for QA Memory Size" on page 55.

- [4]NnmInstallDir is configured during installation on Windows (`C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux (`/opt/OV/`).

- [5]NnmDataDir is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux (`/var/opt/OV/`).

These recommendations only apply to the NNM iSPI Performance for QA running under the default settings. If you intend to run any of the other NNM iSPIs, you must review each iSPI support matrix before determining the hardware you need.

The following are the recommendations for the QA Probes/QoS entities:

- Not more than 5% probes (of the maximum number of probes that can be configured for that managed environment tier) have a polling frequency less than or equal to 1 minute. You can associate a maximum of 500 probes to a source site and 500 probes to a destination site.

- To implement QoS management, we recommend the following average object count ratio per QoS interfaces to QoS policies, classes, and actions: **1:5**.

Network Performance Server (NPS)

The following table shows the requirements for the Network Performance Server (NPS) for different managed environment sizes. These requirements are in addition to the requirements for the NPS for the NNM iSPI Performance for QA or any other iSPI that is installed. This is significantly affected by the changes in the configured retention period for the data queried by different extension packs.

Managed Environment Size	Network Performance Server Minimum Hardware System Requirements [1]				
Approximate managed environment tier	Max number of combined probes, iRA probes, and QoS interfaces	CPU (64-bit) x86-64 AMD64	RAM	Disk space for storing the NNM iSPI Performance for QA data in the Sybase DB (the NPS database) (<DataDir on the NPS system>)[2]	Disk space required for archiving the processed data for 2 weeks (<DataDir on the NPS system >)[3]
Entry - Single Station	5,000	2 CPU Cores	12 GB	500 GB	30 GB
Medium - Single Station	30,000	4 CPU Cores	16 GB	700 GB	60 GB
Large - Single Station	50,000	8 CPU Cores	32 GB	1 TB	160 GB
Medium - GNM	120,000	16 CPU Cores	64 GB	2.5 TB	600 GB
Large - GNM	250,000	32 CPU Cores	96 GB	4 TB	1 TB

The disk space specifications in the table is meant to retain the data for a maximum period of 400 days. For higher retention period, we recommend you to allot more disk space for <NPS_Data_Dir>. See the NNM iSPI Performance for QA Deployment Reference to calculate the disk space required for <NPS_Data_Dir> by NPS.

- [1]Apart from the hardware system requirements of NPS, this table specifies the additional hardware system requirements for the NPS system to build the NNM iSPI Performance for QA reports.
- [2]Allocate raw disk partition for better performance.
- [3]If the default data archiving period is more than 2 weeks, provision additional disk space proportionately.

Note: In large scale tier, it is recommended to use Linux operating system for NPS at GNM as ETL process is observed to be slow on Windows.

Intelligent Response Agent (iRA)

You can configure up to 2500 iRA probes for each iRA instance. The number of HTTP/HTTPS probes must not exceed 10% of the maximum supported iRA probes. You can see iRA-based probes in the Probes inventory in the Quality Assurance workspace.

The following table shows the requirements for the Intelligent Response Agent (iRA) only when it is hosted on an independent server:

Intelligent Response Agent Minimum Hardware System Requirements[1]	
CPU (64-bit) x86-64 AMD64	RAM
2 CPU Cores	500 MB

[1]There is no additional hardware requirement for the iRA when it is hosted on a server along with NNMi, the NNM iSPI Performance for QA, and any other iSPI.

To install iRA, see the *Intelligent Response Agent Interactive Installation Guide* (available on the NNM iSPI Performance for QA product media or manuals web site).

Metrics Collected by Probes from Different Devices

Probe Type	Device Type			
	Cisco	Juniper	H3C	iRA Node
ICMP Echo	Round Trip Time (RTT)	• RTT • Packet Loss (%) • Two-way Packet Loss	RTT	RTT

ICMP Jitter	Not Supported	• RTT
		• Jitter[1]
		  • Positive Jitter Destination-to-Source
		  • Positive Jitter Source-to-Destination
		  • Negative Jitter Destination-to-Source
		  • Negative Jitter Source-to-Destination
		  • Two-way Jitter
		• Packet Loss (%)
		  • Two-way Packet Loss
			Not Supported	Not Supported

UDP Echo	RTT	• RTT • Packet Loss (%)	RTT	RTT

Probe Type	Device Type			
	Cisco	**Juniper**	**H3C**	**iRA Node**
		• Two-way Packet Loss		
TCP Connect	RTT	• RTT • Packet Loss (%) • Two-way Packet Loss	RTT	RTT

UDP	• RTT
	• Jitter
	  • Positive Jitter Destination-to-Source
	
	  • Positive Jitter Source-to-Destination
	
	  • Negative Jitter Destination-to-Source
	
	  • Negative Jitter Source-to-Destination
	
	  • Two-way Jitter
	• Packet Loss
	  • Packet Loss Source-to-Destination
	
	  • Packet Loss Destination-to-Source
	
	  • Two-way Packet Loss
		• RTT
		• Jitter[1]
		  • Positive Jitter Destination-to-Source
		
		  • Positive Jitter Source-to-Destination
		
		  • Negative Jitter Destination-to-Source
		
		  • Negative Jitter Source-to-Destination
		
		  • Two-way Jitter
		• Packet Loss
		  • Packet Loss Source-to-Destination
			Not Supported	• RTT
				• Jitter[2]
				  • Two-way Jitter
				
				• Packet Loss[2]
				  • Packet Loss Source-to-Destination
				
				  • Packet Loss Destination-to-Source
				
				  • Two-way Packet Loss

VoIP	• RTT
	• Jitter
	  • Positive Jitter Destination-to-Source
	
	  • Positive Jitter
		Not Supported	Not Supported	Not Supported

Probe Type	Device Type			
	Cisco	Juniper	H3C	iRA Node

	Source-to-Destination
	
	• Negative Jitter Destination-to-Source
	
	• Negative Jitter Source-to-Destination
	
	• Two-way Jitter
	• Packet Loss
	  • Packet Loss Source-to-Destination
	
	  • Packet Loss Destination-to-Source
	
	  • Two-way Packet Loss
	
	  • Mean Opinion Score (MOS)			

Oracle	Not Supported	Not Supported	Not Supported	RTT
HTTP	• RTT • RTT DNS • RTT Connection • RTT Operation	• RTT • Packet Loss (%) • Two-way Packet Loss	Not Supported	• RTT • RTT DNS • RTT Connection • RTT Operation
HTTPS	Not Supported	Not Supported	Not Supported	• RTT • RTT DNS • RTT Connection • RTT Operation
DNS	RTT	Not Supported	Not Supported	RTT
DHCP	RTT	Not Supported	Not Supported	Not Supported

- [1]The following metrics are collected only if one way hardware time stamp is enabled for a probe:
  - Positive Jitter Destination-to-Source

  - Positive Jitter Source-to-Destination

  - Negative Jitter Destination-to-Source

  - Negative Jitter Source-to-Destination

- [2]The destination iRA must be configured as a UDP responder. Other UDP responders are not supported.

Tuning the NNM iSPI Performance for QA Memory Size

During installation, the recommended default maximum memory size of the iSPI application server is configured in the `nms-qa.jvm.properties` file to 2GB. For improved performance in larger environments, it is recommended that you increase this value as documented in "CPU, RAM, and Disk Space Considerations" on page 48.

The current Maximum Attemptable Memory value (adjusted with $-Xmx$) is available in the NNMi console with Help → System Information for NNM iSPI Performance for QA. It is recommended that this $-Xmx$ value not exceed the amount of unused physical RAM. If the iSPI JVM's entire virtual memory space does not fit in physical memory, the operating system thrashes as iSPI randomly accesses its memory.

You can approximate the amount of unused physical RAM available to iSPI as follows. From the amount of physical memory, subtract the following amounts:

- Memory for the operating system: 1 - 2 GB
- Memory for the `nmsdbmgr` process: 1 - 8 GB
- Memory for any other applications, including NNMi and other iSPIs, that are running on the server

To change the Maximum Java Heap Size ($-Xmx$) or other Java Virtual Machine parameters:

1. `ovstop -c qajboss`
2. Edit the `nms-qa-jvm.properties` file:
   - Windows Server 2008: `%NnmDataDir%\shared\qa\conf\nms-qa.jvm.properties`

   - Linux: `$NnmDataDir/shared/qa/conf/nms-qa.jvm.properties`

3. Change the Maximum Java Heap Size to the required amount. For example, a snippet of the ms-qa.jvm.properties file looks like this:

   ```
   #
   # JVM Memory parameters
   # –Xms: Initial Java Heap Size
   # –Xmx: Maximum Java Heap Size
   # –Xss: Java stack size (default to OS-supplied value)
   #
   ```

–Xmx2048m

–Xms1024m

> **Note:** For Linux servers, if the Java heap size is greater than 4 GB, enable the -d64 flag. (To enable -d64 flag, uncomment #-64 flag in the nms-qa.jvm.properties file.)

4. `ovstart -c qajboss`

Recommendations for NNM iSPI Performance for Traffic

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI Performance for Traffic Software.

CPU, RAM, and Disk Space Considerations

Below are the different tiers of managed network environments and the hardware required by the NNM iSPI Performance for Traffic for supporting these environments. Managed environments bigger than the Large tier are not supported without additional HPE approval. You can also refer to "Recommendations for NNMi" on page 27.

The tables below list the hardware resource requirements for the NNM iSPI Performance for Traffic Master Collector component. Resource requirements published in this section are valid for the NNM iSPI Performance for Traffic deployed on physical servers. The resource requirements for deploying the NNM iSPI Performance for Traffic on a virtual machines, see "Deploying the NNM iSPI Performance for Traffic in a Virtual Environment" on page 61.

Key factors considered while determining these requirements are:

- Total number of flow records per minute in the entire managed environment (that is, the sum of the traffic flow records per minute)
- Total number of interfaces that are being used by all the routers in the environment to export flows

> **Note:**
>
> - If the NNM iSPI Performance for Traffic components are installed on (or share the disk space with) a system where NNMi or the NNM iSPI Performance for Metrics is installed, the system requirements provided in this support matrix is in addition to the specified system requirements in Recommendations for NNMi and Recommendations for NNM iSPI Performance for Metrics.
> - Interface Traffic data is supported for up to 480k unique flow records per minute at the Master Collector. Disable the data generation for the Interface Traffic reports in medium and large tiers for optimum performance. For steps to disable the data generation for the Interface Traffic report, refer to *Disabling Data Generation for the Interface Traffic Reports* section in the *NNM iSPI Performance for Traffic Deployment Reference*.
> - Each CPU for the Master or Leaf Collector should have a minimum clock speed of 2.5 GHz.

Size of the Master Collector System

Managed Environment				Master Collector Minimum Hardware System Requirements						NPS Requirements		
Environment Tier	Flow Records per Minute (max)	Active Flow-Exporting Interfaces (max)	Recommended Number of Leaf Collector Systems	CPU (64-bit) x86-64/AMD64	RAM	Xmx	Installation Directory Space (<Traffic InstallDir>)[3]	Data Directory Space(<Traffic DataDir>) [4]	Queue Size[5]	CPU (64-bit) x86-64/AMD64	RAM	Disk Space in the NPS Database
Entry[1]	60K	50	Master and Leaf Collectors are colocated on the same system	4 CPU cores	6 GB	Leaf: 1.5 GB Master: 3 GB	1.5 GB	8 GB	Not Applicable	4 CPU cores	16 GB	1 TB
Small	250K	200	1	4 CPU cores	8 GB	6 GB	1.5 GB	8 GB	600000	8 CPU cores	32 GB	2 TB
Medium[2]	6mil	1000	4	4 CPU cores	16 GB	12 GB	1.5 GB	32 GB	3000000	16 CPU cores	48 GB	5 TB
Large	20mil	4000	8	8 CPU cores	24 GB	16 GB	1.5 GB	64 GB	5000000	24 CPU cores	64 GB	12 TB

- [1]The entry tier specifications assume that the Master and Leaf Collectors are colocated on a single system. The total number of CPUs (4) and memory requirements (6 GB) are the cumulative resource requirements for one Master and one Leaf Collector on the system.

- [2]When the raw data collection is enabled, the maximum flow rate for the Medium tier is 600K flow records per minute.

- [3]`<TrafficInstallDir>` is configured during installation of the NNM iSPI Performance for Traffic (Master Collector or Leaf Collector) on Windows (`C:\Program Files (x86)\HP\HP BTO Software` by default). You can refer to the NNM iSPI Performance for Traffic Interactive Installation Guide to configure these parameters.

- [4]`<TrafficDataDir>` is configured during installation of the NNM iSPI Performance for Traffic (Master Collector or Leaf Collector) on Windows (`C:\ProgramData\HP\HP BTO Software` by default).

- [5]Queue size is the value of the `nms.traffic-master.maxflowrecord.inqueue` property in the nms-traffic-master.address.properties file on Master Collector. After installing the NNM iSPI Performance for Traffic, set the Queue size to the value recommended in the above table. To modify the default Queue size by updating the `nms.traffic-master.maxflowrecord.inqueue` property, see the NNM iSPI Performance for Traffic Deployment Reference.

The following table lists the resource requirements for a single Leaf Collector. The key factor considered for sizing is the total number of flow records per minute being processed by the individual Leaf Collector instance. All the data presented in this table was derived from testing done on systems with Intel 64-bit (x86-64) processors.

Size of the Leaf Collector System

Leaf Collector Types Based on Sizing	Flow Records per Minute to the Leaf Collector (Maximum)	Number of Flow-Exporting Interfaces (Maximum)	CPU	RAM	Xmx	Installation Directory Space(<Traffic InstallDir>)	Data Directory Space (<Traffic DataDir>)	Flow Record Pool Size[1]	TopN Flow Record Pool Size[2]
Type 1: Use at least one Leaf Collector of this size for the Small tier.	250K	200	4 CPU cores	4 GB (1066 MHz or higher)	3 GB	1.5 GB	8 GB	600000	2000000
Type 2: Use at least four Leaf Collectors of this size for the Medium tier.	1.5mil	500	4 CPU cores	16 GB (1066 MHz or higher)	12 GB	1.5 GB	32 GB	3000000	5000000
Type 3: Use at least eight Leaf Collectors of this size for the Large tier.	2.5mil	800	8 CPU cores	24 GB (1066 MHz or higher)	20 GB	1.5 GB	64 GB	5000000	8000000

- [1]FlowRecord Pool Size is the value of the `flowrecord.pool.size` property in the `nms-traffic-leaf.address.properties` file on each Leaf Collector.

- [2]TopN Flow Record Pool Size is the value of the `topn.flowrecord.pool.size` property in the `nms-traffic-leaf.address.properties` file on each Leaf Collector.

See the *NNM iSPI Performance for Traffic Deployment Reference* for details about how to configure these parameters. Increasing FlowRecord pool size and TopN FlowRecord pool size requires additional memory. For every 100K increase in pool sizes, you must provide additional 100 MB memory. For example, if you increase FlowRecord pool size by 200K and TopN FlowRecord pool size by 500K, you must add additional 700 MB to the Xmx value for Leaf Collector.

Note:

- Make sure that the -Xms value is 3/4th of the value considered for Xmx.

- The total number of Leaf Collectors in a deployment is dependent on the total number of flow records per minute in the environment, total number of flow exporting interfaces, and the processing capability of each Leaf Collector system.

- HPE recommends that you do not configure multiple Leaf Collector instances on a single Leaf Collector system.
- If the incoming flow rate is more than the supported flow rate of the managed environment tier, the Leaf Collector may drop flow records, which may lead to data loss.
- NetFlow records from some routers contain interface index for interfaces, although NetFlow is not configured for these interfaces. With NetFlow v5 exports, the interface index causes additional data processing on the NNM iSPI Performance for Traffic. Therefore, HPE recommends that you use the NetFlow v9 or Flexible NetFlow that includes the flow direction field.

The NNM iSPI Performance for Traffic is tested to work optimally with the numbers of sites, TOS groups, and thresholds listed in the table below.

Maximum Sites, TOS Groups, and Thresholds

Management Environment Tier	Maximum Number of Sites	Maximum Number of TOS Groups	Maximum Number of Thresholds
Entry	10	5	5
Small	20	5	5
Medium	30	10	10
Large	40	20	20

The test environment used to derive the above numbers had only the following non-default features enabled: sites, TOS groups, and thresholds.

The NNM iSPI Performance for Traffic is tested with:

- Five sites for each Leaf Collector in a Large tier
- 15 sites for each Leaf Collector in a Medium tier
- 20 sites for each Leaf Collector in a Small tier

  Note: You may experience data processing issues if the ratio of sites to Leaf Collectors exceeds this value.

- The NNM iSPI Performance for Traffic is tested in an environment where flow records do not contain VLAN IDs.

Deploying the NNM iSPI Performance for Traffic in a Virtual Environment

You can install the NNM iSPI Performance for Traffic on virtual machines. The hardware resource requirement for installing the NNM iSPI Performance for Traffic on a virtual machine is different from the requirements published in the previous section (in the *CPU, RAM, and Disk Space Requirements / Maximum Supported Managed Environment* section). This section details the prerequisite hardware resources like CPU, RAM, and disk space to install the NNM iSPI Performance for Traffic.

Size of the Master Collector System

Table below lists the hardware resource requirements for the Master Collector component.

Key factors considered while determining these requirements are:

- Total number of flow records per minute in the entire managed environment (that is, the sum of the traffic flow records per minute)
- Total number of interfaces that are being used by all the routers in the environment to export flows

These requirements are valid for all guest operating systems supported by the NNM iSPI Performance for Traffic.

Table: Master Collector

Managed Environment Size				Master Collector Minimum Hardware System Requirements						
Tier	Total Flow Records per Minute (Maximum)	Total Active Flow-Exporting Interfaces (Maximum)	Recommended Number of Leaf Collector Systems	CPU	RAM	-Xmx	Disk space for application installation (<Traffic InstallDir>)	Disk space for data during execution (<TrafficDataDir>)	Queue Size
Entry	60K	50	Master and Leaf Collectors are co-located on the same system	4 CPU cores	6 GB	Leaf: 1.5 GB Master: 3 GB	1.5 GB	8 GB	Not Applicable
Small	250K	200	1	4 CPU cores	8 GB	6 GB	1.5 GB	8 GB	600000
Medium	5M	1000	4	8	16	12 GB	1.5 GB	42 GB	3000000

Table: Master Collector, continued

Managed Environment Size				Master Collector Minimum Hardware System Requirements						
Tier	Total Flow Records per Minute (Maximum)	Total Active Flow-Exporting Interfaces (Maximum)	Recommended Number of Leaf Collector Systems	CPU	RAM	-Xmx	Disk space for application installation (<Traffic InstallDir>)	Disk space for data during execution (<TrafficDataDir>)		Queue Size
				CPU core	GB					

Note: The entry tier specifications assume that the Master and Leaf Collectors are co-located on a single system. The hardware requirements are the cumulative resource requirements for one Master and one Leaf Collector on the system.

Note: When the data collection for the Interface Traffic reports is enabled, the maximum flow rate for the medium tier is 600K flow records per minute.

Size of the Leaf Collector System

Table below lists the resource requirements for a single Leaf Collector. The key factor considered for sizing is the total number of flow records per minute being processed by the individual Leaf Collector instance. These requirements are valid for all guest operating systems supported by the NNM iSPI Performance for Traffic.

Table: Leaf Collector

Leaf Collector Types Based on Sizing	Flow Records per Minute to the Leaf Collector (Maximum)	Number of Flow-Exporting Interfaces (Maximum)	NNM iSPI Performance for Traffic Leaf Collector Minimum Hardware System Requirements					FlowRecord Pool Size	TopN Flow Record Pool Size
			CPU	RAM	-Xmx	Disk space for application installation (<Traffic InstallDir>)	Disk space for data during execution (<Traffic DataDir>)		
Type 1 - use at least one	250k	200	4	4 GB	3 GB	1.5 GB	8 GB	600000	2000000

Table: Leaf Collector, continued

Leaf Collector Types Based on Sizing	Flow Records per Minute to the Leaf Collector (Maximum)	Number of Flow-Exporting Interfaces (Maximum)	NNM iSPI Performance for Traffic Leaf Collector Minimum Hardware System Requirements						FlowRecord Pool Size	TopN Flow Record Pool Size
			CPU	RAM	-Xmx	Disk space for application installation (<Traffic InstallDir>)	Disk space for data during execution (<Traffic DataDir>)			
Leaf Collector of this size for the small tier.			CPU cores	(1066 MHz or higher)						
Type 2 - use four Leaf Collectors of this size for the medium tier.	1.25M	500	4 CPU cores	16 GB (1066 MHz or higher)	12 GB	1.5 GB	32 GB		3000000	5000000

Retention Period

See the NNM iSPI Performance for Traffic Deployment Reference for the details of the retention periods of the NNM iSPI Performance for Traffic data for each Extension Pack.

Linux Kernel Tuning

Flow exporting protocols utilize User Datagram Protocol (UDP) for sending FlowRecord Protocol Data Units (PDUs). The operating system utilizes UDP buffering to match the arrival rate of UDP packets with their consumption rate by the NNM iSPI Performance for Traffic Leaf Collector. To minimize the chances for lost packets, a sufficient amount of memory is required for UDP buffering. The NNM iSPI Performance for Traffic requests 24 MB for the UDP receive buffer (for incoming responses). Linux systems typically reserve only 128 KB for this buffer.

To make this change permanent (after a reboot):

1. Edit the `/etc/sysctl.conf` file and add the following entry:
   ```
   # NNM iSPI Performance for Traffic settings for UDP receive buffer size
   net.core.rmem_max = 25165824
   ```
2. Either reboot the system or `run /sbin/sysctl -p` to immediately apply the changes without requiring a reboot. If the Leaf Collector processes are running, restart the processes to benefit from these changes.

NNMi and Master/Leaf Combinations

This table illustrates the supported combinations of operating systems for the NNMi management server and Master/Leaf Collector system:

	Master/Leaf Collectors	
NNMi[1]	**Windows**	**Linux**
Windows	Supported	Not Supported
Linux	Supported	Supported

[1]The HPE NNMi Extension for iSPI Performance for Traffic must always be installed on the NNMi management server.

Other Recommendations

Web Browser Configuration

HPE recommends that you do not configure your web browser to use a proxy server. If you configure the web browser to use a proxy server, you may not be able to launch the NNM iSPI Performance for Traffic Configuration form (by clicking the Configuration workspace), release notes (by clicking the Help menu), and the Reference Pages (by clicking the Help menu) from the NNMi console.

High Availability

The Leaf Collectors do not support running in high availability (HA) environments. The NNM iSPI Performance for Traffic can operate in an environment where NNMi is running in an HA cluster, as well as where both NNMi and the NNM iSPI Performance for Metrics are running in HA clusters. You can also install the Master Collector in an HA cluster when NNMi is not installed in an HA cluster.

Recommendations for NNM iSPI for MPLS

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI for MPLS Software.

CPU, RAM, and Disk Space Requirements/Maximum Supported Management Environment

Below are the three tiers of managed network environments and the hardware required by the NNM iSPI for MPLS for supporting these environments. Managed environment bigger than the large tier is not supported without additional hardware resources and HPE approval. To tune Java heap size, see "Tuning the NNM iSPI for MPLS Memory" on page 68.

If you intend to run any of the other NNM iSPIs, please review each NNM iSPIs support matrix before determining the hardware you need. Each of the NNM iSPIss may require additional hardware beyond what NNMi and NNM iSPI for MPLS require. If you are running additional applications, please increase resources appropriately.

Single System Managed Environment Size

Single System Managed Environment Size (NNM iSPI for MPLS)

Managed environment tier	Number of discovered VRFs	Number of discovered TE Tunnels	Number of discovered PseudoWire VCs	Number of Monitored LSPs	Preferred NNMi Scale [1]
Small	Up to 2K	Up to 500	Up to 500	Up to 50	Low
Medium	Up to 8K	500-1000	500-1000	Up to 100	Low or Medium
Large	8K-23K	Up to 2K	Up to 2K	Up to 200	Large

[1]For more information about NNMi Scale, see "Requirements and Compatibility" on page 9.

> **Note:** Physical RAM should be twice that of the combined Xmx values of NNMi and the available NNM iSPIs on the management server.

Recommended Hardware System Requirements for Single System Management Environment Size

Management environment tier	Additional CPUs	Additional RAM	Recommended Java heap size (see **"Tuning the NNM iSPI for MPLS Memory" on the next page**)	Additional Disk space for database and data during execution (`<NnmDataDir>`)[1]
Small	1 CPU core	4GB	Default value	10 GB
Medium	1 CPU core	8 GB	4 GB	20 GB
Large	2 CPU cores	16 GB	8 GB	20 GB

[1]Windows (`C:\ProgramData\HP\HP BTO Software\ by default`), or on Linux `/var/opt/OV/`).

To calculate the disk space information for MPLS reports, check the number of VRFs. Consider this count of VRFs as the polled objects. Use the number of polled objects sizing information from "Recommendations for NNM iSPI Performance for Metrics" on page 36. Allocate the same disk space information for the number of MPLS objects (VRF) according to the disk space required for the number of polled objects. For more information about NPS and NNM iSPI Performance for Metrics, see "Recommendations for NNM iSPI Performance for Metrics" on page 36.

Global Network Management Recommendations

NNM iSPI for MPLS Global Network Management Environment Size

Managed environment tier	Number of discovered VRFs[1]	Number of discovered TE Tunnels	Number of PseudoWires VCs	Number of Monitored LSPs	Number of regional managers
Medium Global Manager	Up to 36K	Up to 3K	Up to 3600	Up to 600	Up to 3
Large Global Manager	Up to 96K	Up to 6K	Up to 7200	Up to 1200	Up to 6

[1]Total number of discovered VRFs in the GNM topology. The count of discovered VRFs include the number of VRFs from all the Regional Managers.

Recommended Hardware System Requirements for Global Systems

Approximate managed environment tier	Additional CPUs	Additional RAM	Recommended Java heap size (see "Tuning the NNM iSPI for MPLS Memory" below)	Additional Disk space for database and data during execution (<NnmDataDir>)
Medium Global Manager	4 cores	12 GB	6 GB	30 GB
Large Global Manager	8 cores	24 GB or more	8 GB	40 GB

Tuning the NNM iSPI for MPLS Memory

To change the iSPI's Maximum Java Heap Size (-Xmx) or other Java Virtual Machine parameters, follow these steps:

1. Stop the NNM iSPI for MPLS process by the following command: `ovstop –c mplsjboss`

2. Edit the `nms-mpls.jvm.properties` file:

   - Windows: `C:\ProgramData\All Users\Application Data\HP\HP BTO Software\shared\mpls\conf\nms-mpls.jvm.properties`

   - Linux: `/var/opt/OV/shared/mpls/conf/nms-mpls.jvm.properties`

3. Update the Maximum Java Heap Size to the required value. For example, a snippet of the `nms-mpls.jvm.properties` file appears as:

   ```
   # JVM Memory parameters

   #   -Xms: Initial Java Heap Size

   #   -Xmx: Maximum Java Heap Size

   #

   -Xmx2048m

   -Xms1024m
   ```

4. Start the NNM iSPI for MPLS processes by the following command: `ovstart –c mplsjboss`.
   For more information, see NNMi "Requirements and Compatibility" on page 9.

Recommendations for NNM iSPI for IP Multicast

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI for IP Multicast Software.

CPU, RAM, and Disk Space Requirements/Maximum Supported Managed Environment

Below are the two tiers of managed network environments and the hardware required for the NNM iSPI for IP Multicast. Managed environment with size bigger than the large tier is not supported without additional hardware resources and HPE approval.

The NNM iSPI for IP Multicast hardware requirements mentioned in the following table are in addition with NNMi hardware requirements mentioned in "Recommendations for NNMi" on page 27.

Before installing the NNM iSPI for IP Multicast, make sure that the physical RAM must be twice that of the combined Max Java Heap size (Xmx) value for the NNM iSPI for IP Multicast and NNMi.

Medium-Large Management Environments

IP Multicast Managed Environment Size

Managed environment tier	Number of discovered IP Multicast nodes	Number of discovered IP Multicast interfaces	Number of active flows[1]
Medium	Up to 500	Up to 4K	Up to 100
Large	Up to 2000	Up to 16K	Up to 200

[1] Active Flows - Number of unique multicast groups across all the Multicast-enabled nodes in the network.

Recommended Hardware System Requirements for IP Multicast Managed Environment Size

Managed environment tier	CPU (64-bit) x86-64/ AMD64	RAM	Recommended Java heap size (see "Tuning the NNM iSPI for IP Multicast Memory" on the next page)	Disk space for application installation (<NnmInstallDir>)[1]	Disk space for database and data during execution (<NnmDataDir>)[2]	Disk space for the IP Multicast report data during execution[3] (<NnmDataDir>)
Medium	2 CPU	4 GB	2 GB (-Xmx2g)	1 GB	10 GB	30 GB
Large	4 CPU	8 GB	4 GB (-Xmx4g)	1 GB	20 GB	200 GB

- [1]`<NnmInstallDir>` is configured during installation. On Windows it is set to (`C:\Program Files (x86)`
  `\HP\HP BTO Software\ by default`), and on Linux it is (`/opt/OV/`).

- [2]`<NnmDataDir>` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\`
  `by default`), or on Linux `/var/opt/OV/`).

- [3]This is the additional disk space required for the NNM iSPI for IP Multicast reports. For more information
  about NPS and NNM iSPI Performance for Metrics, see "Recommendations for NNM iSPI Performance
  for Metrics" on page 36.

Global Network Management Recommendations

The NNM iSPI for IP Multicast hardware requirements mentioned in the following table are in addition to the
NNMi hardware requirements mentioned in "Recommendations for NNMi" on page 27. Make sure that the
physical RAM must be twice that of the combined Max Java Heap size (Xmx) value for the NNM iSPI for IP
Multicast and NNMi.

Global Network Management Recommendations

Network Management Environment Size			Recommended Hardware System Requirements					
Approximate managed environment tier	Number of managed nodes	Number of regional managers	CPU (64-bit) x86-64 AMD 64	RAM	Recommended Java heap size (see Tuning the iSPI Memory Size)	Disk space for application installation (`<NnmInstallDir>`)	Disk space for database and data during execution (`<NnmDataDir>`)	Disk space for the IP Multicast report data during execution[1] (`<NnmDataDir>`)
Global Manager	3K	Up to 4	4 CPU cores	12 GB	6 GB (-Xmx6g)	1 GB	30 GB	360 GB

[1]This is the additional disk space required for the IP Multicast reports. For more information about NPS and
iSPI Performance for Metrics, "Recommendations for NNM iSPI Performance for Metrics" on page 36.

Tuning the NNM iSPI for IP Multicast Memory

To change the iSPI's Maximum Java Heap Size (-Xmx) or other Java Virtual Machine parameters, follow
these steps:

1. Stop the IP Multicast process by using the following command: `ovstop -c mcastjboss`

2. Edit the `nms-multicast.jvm.properties` file available in the following directory:
   - Windows: `%NnmDataDir%\shared\multicast\conf\nms-multicast.jvm.properties`

   - Linux: `$NnmDataDir/shared/multicast/conf/nms-multicast.jvm.properties`

3. Update the Maximum Java Heap Size to the required value. For example, a snippet of the nms-

multicast.jvm.properties file appears as:

```
#
# JVM Memory parameters
#    -Xms: Initial Java Heap Size
#    -Xmx: Maximum Java Heap Size
#
-Xms1024m
-Xmx2048m
```

4. Start the IP Multicast process by using the following command: `ovstart -c mcastjboss`.

Recommendations for NNM iSPI for IP Telephony

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI for IP Telephony Software.

CPU, RAM, and Disk Space Requirements / Maximum Supported Managed Environment

Listed here are the three tiers of managed network environments and the hardware required by the NNM iSPI for IP Telephony for supporting these environments. Managed environments bigger than the Large tier are not supported without additional HPE approval. Make sure to check the HPE Network Node Manager i Software Ultimate Edition Device Support Matrix 10.21.

The NNM iSPI for IP Telephony hardware requirements mentioned in the following tables are in addition to NNMi hardware requirements mentioned in the HPE Network Node Manager i Software Ultimate Edition (NNMi) Device Support Matrix 10.21.

Before installing the NNM iSPI for IP Telephony, make sure that your system meets the following minimum requirements:

- The RAM Requirement mentioned in the tables below is an approximate number to help you get started with the sizing of the system. However, if you are planning to install the NNM iSPI Performance for Metrics on the same system, you must ensure that the physical RAM is greater than two times that of the combined Xmx values of NNMi, the NNM iSPI for IP Telephony, other content iSPI s (if installed on the system), the NNM iSPI Performance for Traffic Master Collector (if installed on the system), the NNM iSPI Performance for Traffic Leaf Collector (if installed on the system), and the NNM iSPI Performance for QA (if installed on the system). You must also consider the consumption of memory in segments apart from the memory consumption by various heap segments. In addition, you must also consider consumption of memory by the operating system, applications from HPE that are not listed in this document, and applications from other vendors.

- If you are planning to install the NNM iSPI Performance for Metrics on a separate system, you must ensure that the physical RAM is greater than that of the combined Xmx values of NNMi, the NNM iSPI for IP Telephony, other content iSPI s (if installed on the system), the NNM iSPI Performance for Traffic Master Collector (if installed on the system), the NNM iSPI Performance for Traffic Leaf Collector (if installed on the system) and the NNM iSPI Performance for QA (if installed on the system). You must also consider the consumption of memory in segments instead of considering various heap segments. In addition, you must also consider consumption of memory by the operating system, applications from HPE that are not listed in this document, and applications from other vendors.

- It is recommended that you provision 4 GB or more of RAM for the operating system and the other applications on the system.

Standalone Instance of NNM iSPI for IP Telephony

The following tables contains environment sizes and minimum hardware requirements for Monitoring the Cisco, Avaya, or Nortel IP Telephony, or the Acme Session Border Controller.

Standalone Instance for Monitoring Cisco, Avaya, Nortel IP Telephony, or the Acme Session Border Controller

Management Environment Tier-Cisco, Avaya, Nortel, or Acme

Managed environment tier	Number of Directory Numbers (DNs)	Number of Sessions (Through Session Border Controllers)[2]	Number of discovered NNMi nodes that are not hosting IP Phones
Entry	Up to 500	Up to 500	Up to 100
Small	Up to 3K	Up to 3K	Up to 500
Medium[1]	Up to 10K	Up to 10K	Up to 1.5K
Large[1]	Up to 30K	Up to 30K	Up to 3K
Very Large[1]	Up to 50K	Up to 50K	Up to 4K

- [1]Also assumes up to 30 K, 75K, and 100K CDRs per hour collected and processed by the NNM iSPI for IP Telephony for the medium tier, large tier, and very large tier respectively.

- [2]Indicates the concurrent SIP sessions through an Acme Session Director.

IP Telephony Minimum Hardware System Requirements for Standalone Instance Environment Tier

Managed environment tier	CPU (64-bit) x86-64 AMD64	RAM	Java heap size the NNM iSPI for IP Telephony [2]	Java heap size for NNMi	Disk space for NNM iSPI for IP Telephony Installation with an Incremental Demand on (`<NnmInstallDir>`)	Total Disk Space for Database and Data During Execution (`<NnmDataDir>`)[3]
Entry	2 CPU Cores	9 GB	3 GB (-Xmx3g)	3 GB (-Xmx3g)	1 GB	20 GB
Small	4 CPU Cores	10 GB	4 GB (-Xmx4g)	4 GB (-Xmx4g)	1 GB	40 GB
Medium[1]	4 CPU Cores	18 GB	8 GB (-Xmx8g)	8 GB (-Xmx8g)	1 GB	80 GB
Large[1]	8 CPU Cores	28 GB	12 GB (-Xmx12g)	12 GB (-Xmx12g)	1 GB	120 GB
Very Large[1]	8 CPU Cores	40 GB	16 GB (-Xmx16g)	16 GB (-Xmx16g)	1 GB	160 GB

- [1]Also assumes up to 30K, 75K, and 100K CDRs per hour collected and processed by the NNM iSPI for IP Telephony for the medium tier, large tier, and very large tier respectively.

- [2]To tune Java heap size, see the Tuning the iSPI Memory for the NNM iSPI for IP Telephony.
- [3]This does not include the disk space to retain the data for reporting.

Standalone Instance for IP Telephony for Monitoring the Microsoft IP Telephony or the Acme Session Border Controller

Management Environment Tier-Microsoft or Acme

Managed environment tier	Number of discovered Lync End Users	Number of Sessions (Through Session Border Controllers)[2]	Number of discovered Gateways	Number of discovered Lync Servers	Number of discovered Lync Sites
Entry	Up to 200	Up to 200	1	10	1 Central Site
Small	Up to 1K	Up to 1K	Up to 11	Up to 50	1 Central Site and 10 Branches
Medium[1]	Up to 5K	Up to 5K	Up to 110	Up to 500	1 Central Site and 100 Branches
Large[1]	Up to 10K	Up to 10K	Up to 550	Up to 1K	5 Central Sites and 500 Branches
Very Large[1]	Up to 50K	Up to 50K	Up to 1100	Up to 3K	10 Central Sites and 1000 Branches

- [1]Also assumes up to 30K, 75K, and 100K CDRs per hour collected and processed by the NNM iSPI for IP Telephony for the medium tier, large tier, and very large tier respectively.
- [2]Indicates the concurrent SIP sessions through an Acme Session Director.

IP Telephony Minimum Hardware System Requirements for Standalone Instance Environment Tier

Approximate Managed Environment Size	CPU (64-bit) x86-64 AMD64	RAM	Java heap size for IP Telephony [2]	Java heap size for NNMi	Disk space for NNM iSPI for IP Telephony Installation with an Incremental Demand on (`<NnmInstallDir>`)	Total Disk Space for Database and Data During Execution (`<NnmDataDir>`)[3]
Entry	2 CPU Cores	8 GB	2 GB (-Xmx2g)	2 GB (-Xmx2g)	1 GB	20 GB
Small	4 CPU cores	12 GB	3 GB (-Xmx3g)	4 GB (-Xmx4g)	1 GB	40 GB

IP Telephony Minimum Hardware System Requirements for Standalone Instance Environment Tier, continued

Approximate Managed Environment Size	CPU (64-bit) x86-64 AMD64	RAM	Java heap size for IP Telephony [2]	Java heap size for NNMi	Disk space for NNM iSPI for IP Telephony Installation with an Incremental Demand on (<NnmInstallDir>)	Total Disk Space for Database and Data During Execution (<NnmDataDir>)[3]
Medium[1]	4 CPU cores	16 GB	4 GB (-Xmx4g)	6 GB (-Xmx6g)	1 GB	80 GB
Large[1]	8 CPU cores	24 GB	6 GB (-Xmx6g)	8 GB (-Xmx8g)	1 GB	120 GB
Very Large[1]	8 CPU cores	32 GB	8 GB (-Xmx8g)	10 GB (-Xmx10g)	1 GB	160 GB

- [1]Also assumes up to 30 K, 75K, and 100K CDRs per hour collected and processed by the NNM iSPI for IP Telephony for the medium tier, large tier, and very large tier respectively.
- [2]To tune Java heap size, see the Tuning the iSPI Memory for the NNM iSPI for IP Telephony.
- [3]This does not include the disk space to retain the data for reporting.

> **Note:** If the deployment comprises Microsoft and Cisco/Avaya/Nortel IP telephony environments, use the sizing requirements that are listed in the table .

Global Network Management

Global Manager Instance of the NNM iSPI for IP Telephony for Monitoring the Cisco, Avaya, or Nortel IP Telephony, or the Acme Session Border Controller

Managed Environment Size-Cisco, Avaya, Nortel, or Acme

Approximate managed environment tier	Number of regionally managed Directory Numbers (DNs)	Number of Sessions (Through Session Border Controllers)[2]	Number of regionally managed nodes that are not hosting IP Phones	Number of regional managers	Number of concurrent NNMi users
Medium[1]	Up to 150K	Up to 150K	Up to 15K	Up to 30	20
Large[1]	Up to 250K	Up to 250K	Up to 20K	Up to 30	40

- [1]Also assumes a total of 375K and 500K CDRs per hour collected across regional manager instances of the NNM iSPI for IP Telephony and forwarded to a single global manager instance of the NNM iSPI for IP Telephony for the medium tier and large tier respectively.
- [2]Indicates the concurrent SIP sessions through an Acme Session Director.

IP Telephony Minimum Hardware System Requirements for the Managed Environment Size

Approximate Managed Environment	CPU (64-bit) x86-64/AMD64	RAM	Java heap size for the NNM iSPI for IP Telephony [2]	Java heap size for NNMi	Disk space for NNM iSPI for IP Telephony Installation with an Incremental Demand on (`<NnmInstallDir>`)	Total Disk Space for Database and Data During Execution (`<NnmDataDir>`)[3]
Medium[1]	4 CPU cores	32 GB	16 GB (-Xmx16g)	12 GB (-Xmx12g)	1 GB	160 GB
Large[1]	8 CPU cores	48 GB	24 GB (-Xmx24g)	16 GB (-Xmx16g)	1 GB	320 GB

- [1]Also assumes a total of 375K and 500K CDRs per hour collected across regional manager instances of the NNM iSPI for IP Telephony and forwarded to a single global manager instance of the NNM iSPI for IP Telephony for the medium tier and large tier respectively.

- [2]To tune Java heap size, see the Tuning the iSPI Memory for the NNM iSPI for IP Telephony.

- [3]This does not include the disk space to retain the data for reporting.

Global Manager Instance of the NNM iSPI for IP Telephony for Monitoring the Microsoft IP Telephony or the Acme Session Border Controller

Managed Environment Size-Microsoft and Acme

Managed environment tier	Number of regionally managed Lync End Users	Number of Sessions (Through Session Border Controllers)[2]	Number of regionally managed Servers and Gateways	Number of regional managers	Number of concurrent NNMi users
Medium[1]	Up to 150K	Up to 150K	Up to 3K	Up to 30	20
Large[2]	Up to 250K	Up to 250K	Up to 5K	Up to 30	40

- [1]Also assumes a total of 375K and 500K CDRs per hour collected across regional manager instances of the NNM iSPI for IP Telephony and forwarded to a single global manager instance of the NNM iSPI for IP Telephony for the medium tier and large tier respectively.

- [2]Indicates the concurrent SIP sessions through an Acme Session Director.

IP Telephony Minimum Hardware System Requirements for the Managed Environment Size

Approximate managed environment tier	CPU (64-bit) x86-64/AMD64	RAM	Java heap size for the NNM iSPI for IP Telephony [2]	Java heap size for NNMi	Disk space for NNM iSPI for IP Telephony Installation with an Incremental Demand on (`<NnmInstallDir>`)	Total Disk Space for Database and Data During Execution (`<NnmDataDir>`)[3]
Medium[1]	8 CPU cores	24 GB	12 GB (-Xmx12g)	8 GB (-Xmx8g)	1 GB	160 GB
Large[1]	8 CPU cores	32 GB	16 GB (-Xmx16g)	12 GB (-Xmx12g)	1 GB	320 GB

- [1]Also assumes a total of 375K and 500K CDRs per hour collected across regional manager instances of the NNM iSPI for IP Telephony and forwarded to a single global manager instance of the NNM iSPI for IP Telephony for the medium tier and large tier respectively.

- [2]To tune Java heap size, see the Tuning the iSPI Memory for the NNM iSPI for IP Telephony.

- [3]This does not include the disk space to retain the data for reporting.

Note: If the deployment comprises Microsoft and Cisco/Avaya/Nortel IP telephony environments, use the sizing requirements that are listed "Global Manager Instance of the NNM iSPI for IP Telephony for Monitoring the Cisco, Avaya, or Nortel IP Telephony, or the Acme Session Border Controller" on page 75.

Memory, CPU Requirements on the NNM iSPI Performance for Metrics/NPS System for Processing of the Reporting Data Generated by the NNM iSPI for IP Telephony

If you decide to enable various reporting options for the NNM iSPI for IP Telephony, you must provision for incremental memory and CPU usage on the system for the NNM iSPI Performance for Metrics/NPS, which is supplied with the reporting data created by the NNM iSPI for IP Telephony. You must make such a provision for the following scenarios:

- The NNM iSPI Performance for Metrics/NPS is installed on the same machine where NNMi and the NNM iSPI for IP Telephony are installed

- The NNM iSPI Performance for Metrics/NPS is installed on a separate system

See the NNM iSPI Performance for Metrics/NPS Support Matrix document for more information on minimum system requirements (including those for the CPU and memory) for appropriately evaluating the CPU and memory requirements and taking adequate measures before deploying the NNM iSPI Performance for Metrics/NPS.

- As a general rule, for colocated installations (where the NPS and NNMi are installed on the same system), the physical RAM size of the system must be at least twice as much as the total Heap Size requirements from the NNM iSPI for IP Telephony, NNMi, other iSPI product (or product components), and other

applications installed on the system (leaving aside around 4 GB for the operating system).

- For the other type of installation (where the NPS is not installed on the NNMi management server), the physical RAM size of the NPS system must be at least twice as much as the total Heap Size requirements from the other iSPI products or product components and other applications installed on the system (leaving aside around 4 GB for the operating system).

- For large and very large tier deployments of the standalone instance of the NNM iSPI for IP Telephony, and for medium and large tier deployments of all global manager instances of the NNM iSPI for IP Telephony, install the NPS on system other than the NNMi management server.

Also, make sure that the various parameters related to the NPS database and BI server are appropriately tuned for your scale. Default settings created by the NPS installation for these parameters might not be appropriate for the scale of your deployment.

- Some of the important parameters for the NPS database server are the in-memory caches used by the database engine. These parameters must have correct settings configured to avoid performance problems in report execution.

- Similarly, parameters for the NPS BI server must be tuned appropriately by directly interacting with the NPS.

If you want to disable the IP Telephony reporting packages for a specific IP Telephony vendor (Avaya, Cisco, Microsoft, or Acme), you can accomplish this by uninstalling the NPS report extension pack containing the specific reporting packages from NNM iSPI for IP Telephony. See the NNM iSPI for IP Telephony and NPS documentation for instructions on uninstalling a specific extension pack.

For information about the disk I/O recommendations, see "Recommendations for NNM iSPI Performance for Metrics" on page 36.

Tuning the NNM iSPI for IP Telephony Memory

To change the iSPI's Maximum Java Heap Size (`-Xmx`) or other Java Virtual Machine parameters, follow these steps:

1. Stop the NNM iSPI for IP Telephony process by the following command: `ovstop -c iptjboss`

2. Edit the `nms-ipt.jvm.properties` file available in the following directory:
   - Windows: `%nnmdatadir%\shared\ipt\conf`

   - Linux: `/var/opt/OV/shared/ipt/conf`

3. Update the Maximum Java Heap Size to the required value. For example, a snippet of the `nms-ipt.jvm.properties` file appears as:

   ```
   #
   # JVM Memory parameters
   #    -Xms: Initial Java Heap Size
   #    -Xmx: Maximum Java Heap Size
   #
   -Xms1024m
   -Xmx2048m
   ```

4. Start the NNM iSPI for IP Telephony process by the following command: `ovstart -c iptjboss`

For more information about NNMi values, see "Recommendations for NNM iSPI Performance for Metrics" on page 36.

Additional Recommendations

- Specifically for the USER space in the NPS database, periodic checks on the disk utilization are extremely important. This will help you proactively plan and execute database and disk sizing tasks in a way to prevent the loss of your valuable reporting data or to prevent permanent instability of the system. You can again perform these periodic checks by using various database sizing utilities provided by the NPS. See the NPS Support Matrix document and other NPS documents for database sizing.

- You might like to disable the performance polling of a large number of NNMi interfaces and component objects in your environment if you are not interested in reports on interface and component health. Alternatively, you might like to tune the retention of aggregated interface and component health metrics in reporting packages to a value that is smaller than the default 400 (days). You can also apply both the measures at the same time to use your disk space optimally. Refer to the NNM iSPI Performance for Metrics/NPS documentation for reference information on how to accomplish these tasks.

Recommendations for NNM iSPI NET Diagnostic Server

This section describes the performance, sizing, and other recommendations for the Network Node Manager iSPI Network Engineering Toolset Software.

Database Requirements

See the database requirements for the NNM iSPI NET in "Databases" on page 20.

Hardware and Software Requirements for Standalone HPE OO

If a prior version of HPE Operations Orchestration (HPE OO) already exists on the system, the NNM iSPI NET diagnostics server installer does not install another version of HPE OO. Instead, the installer installs the NNM iSPI NET diagnostic flows into the existing HPE OO server.

For standalone HPE OO, NNM iSPI NET supports HPE OO version 10.22 and OO content version 10.1.70. See the *HPE Network Node Manager iSPI Network Engineering Toolset Software Interactive Installation and Upgrade Guide* for information on the use of an existing HPE OO.

Part III: Device Support for NNMi and iSPIs

This section of the document provides a list of devices supported by NNMi and iSPIs.

> **Note:** The tables in this section provide information about NNMi10.21 and NNM iSPI Performance for Metrics10.21. All other iSPIs referenced in these tables are of version 10.20.

Supported Network Devices for NNMi

For the list of supported network devices, see the *NNMi Device Support Matrix* at https://softwaresupport.hpe.com/km/KM02581677.

This device support information is based on the latest information available to HPE at the time of publication. Note that device vendors can at any time alter a device's MIB usage (for example, in newer IOS or system software versions) and invalidate NNM's interpretation of that device's MIB data.

For additional device support, see the NNMi Device Content page on HPE Live Network.

Supported Network Devices for the NNM iSPI Performance for QA

NNM iSPI Performance for QA supports the NNMi supported devices that match the following MIB specifications:

Supported Network Devices

Vendor	Feature	MIBs Supported	Recommended image version
Cisco	IPSLA probes	CISCO-RTTMON-MIB	12.x or higher
Cisco	QoS	CISCO-CLASS-BASED-QOS-MIB	12.x or higher
Juniper	RPM probes without jitter metrics	• DISMAN-PING-MIB • JNX-RPM-MIB • JNX-PING-MIB	9.x to 13.x
Juniper	RPM probes with jitter metrics[1]	• DISMAN-PING-MIB • JNX-RPM-MIB • JNX-PING-MIB	10.x to 13.x
H3C	NQA probes	DISMAN-PING-MIB	
iRA	Probes	QA-PROBE-MIB (shipped with the iRA installation)	
Cisco	Ping Latency Pairs	CISCO-PING-MIB	

[1]Jitter metrics for RPM Probes are supported only for selected models of MX and SRX device series.

Caution: This device support information is based on the latest information available to HPE at the time of publication. Note that device vendors can at any time alter a device's MIB usage (for example, in newer IOS or system software versions) and invalidate the NNM iSPI Performance for QA's interpretation of that device's MIB data.

Supported IP Flow Export Formats for the NNM iSPI Performance for Traffic

NNM iSPI Performance for Traffic supports the following IP Flow export formats:

- NetFlow

  - NetFlow v5

  - NetFlow v9

  - Flexible NetFlow with v9 export format configured with normal cache. The Flexible NetFlow record must contain the Input Interface Index field.

  - NetFlow from Adaptive Security Appliances (ASA) devices with ASA version 8.2(x).

  - Random Sampled NetFlow

- JFlow
- sFlow (R) v5
- Internet Protocol Flow Information eXport (IPFIX)

Supported Network Devices for the NNM iSPI for MPLS

The NNM iSPI for MPLS supports the following:

- Cisco routers running IOS Version 12.2(33) or above
- Cisco XR 12000 series routers running IOS XR Version 3.4 or above
- Cisco CRS-1 series routers running IOS XR Version 3.4 or above
- Juniper (M/T/J/MX/EX) series routers running JUNOS Version 8.3 or above
- Redback SmartEdge series routers running SEOS 6.5 or above
- Alcatel 7750 and 7710 series routers
- Huawei NE5000E, NE40E, NE20E/20 series routers

The following table illustrates the supported combinations of devices for the NNM iSPI for MPLS objects and services:

MPLS Objects and Services

Vendor/Device	L2VPNs	L3VPNs	MVPNs	TE Tunnels	PseudoWires	LSPs	SDPs
Alcatel	Yes	Yes	No	Yes	Yes	No	Yes
Cisco	Yes	Yes	Yes	Yes	Yes	Yes	Not Applicable
Huawei	Yes	Yes	No	Yes	Yes	No	Not Applicable
Juniper	Yes	Yes	No	Yes	Yes	Yes	Not Applicable
Redback	No	Yes	No	Yes	No	No	Not Applicable

Supported Network Devices for the NNM iSPI for IP Multicast

The NNM iSPI for IP Multicast supports the following routers:

- Cisco routers running IOS Version 12.x or above with the following MIBs:
  - IPMROUTE-STD-MIB - (RFC 2932)

  - PIM-MIB - (RFC 2934)

  - IGMPStdMIB (RFC2236) or IGMPExpMIB (RFC2236)

- Cisco routers running IOS-XR Version 3.4.1 and above with the following MIBs:
  - CISCO-IETF-IPMROUTE-MIB

  - CISCO-IETF-PIM-EXT-MIB

  - CISCO-IETF-PIM-MIB

  - MGMD-DRAFT-IETF-MIB

- Juniper routers running JunOS 7.x and above with the following MIBs:
  - IPMROUTE-STD-MIB - (RFC 2932) or IPMROUTE-MIB - (RFC 2932)

  - PIM-MIB - (RFC 2934)

  - IGMPStdMIB (RFC2236) or IGMPExpMIB (RFC2236)

- Alcatel-Lucent Service Router 7X50 with the following MIBs:
  - TIMETRA-GLOBAL-MIB.mib

  - TIMETRA-PIM-MIB.mib

  - TIMETRA-VRTR-MIB.mib

  - TIMETRA-IGMP-MIB.mib

  - TIMETRA-TC-MIB.mib

- Brocade NetIron MLX (System Mode: MLX), IronWare Version V5.2.0T163 with the following MIBs:
  - IPMROUTE-STD-MIB - (RFC 2932)

  - IGMP MIB (RFC 2933)

  - PIM MIB - (RFC2934)

Supported Devices for the NNM iSPI for IP Telephony

The following tables list the IP telephony devices supported by this version of the NNM iSPI for IP Telephony:

Cisco IP telephony

Devices/Entities	Version/Model/Type/Supported Protocol
Cisco Unified Communications Manager	5.x,6.x,7.x, 8.x, 9.x, and 10.x
Voice Gateway	All Cisco IOS-based gateways, Cisco VG224 Analog Gateways, and Cisco VG 248 Analog Gateways (supports Cisco Voice Gateways running MGCP and H.323 protocols; supports T1/E1 PRI, T1/E1 CAS, FXS, FXO, E&M voice interfaces).
IP Phone	Supports IP phones running on the SIP and SCCP (or Skinny) protocols. Supports Cisco IP Communicator Soft Phones. Also supports all other models of Cisco Unified IP Phone appliances.
Gatekeeper	All Cisco IOS routers that can run the Cisco H.323 Gatekeeper service. CISCO-GATEKEEPER-MIB must be accessible on the Cisco IOS-based device that runs the Cisco Gatekeeper Service.
Unity	- Cisco Unity 5.x, 7.x, 8.x - Cisco Unity Connection 7.x, 8.x, and 10.x SNMP MIB CISCO-UNITY-MIB must be accessible on the Unity and Unity Connection systems.
Cisco Call Manager Express (CCME)	All Cisco IOS routers that can run the CCME service.
Survivable Remote Site Telephony (SRST)	All Cisco IOS routers that can run the SRST service.

Avaya IP Telephony

Devices/Entities	Version/Model/Type/Supported Protocol
Communication Manager	Supports Communication Manager software/Firmware version 4.x/ 5.x/6.x on the following servers : - s88xx - s87xx

Avaya IP Telephony, continued

Devices/Entities	Version/Model/Type/Supported Protocol
	• s85xx • s84xx • s83xx **Note:** • If you are using version 5.x of the Avaya Communication Manager, you must install service pack 6 (Patch 18576) or later versions of the service packs on the Avaya Communication Manager. • If you are using version 6.x of the Avaya Communication Manager, you must install service pack 2 (Patch 18567) or later versions of the service packs on the Avaya Communication Manager.
Local Survivable Processor	Supports Communication Manager software/Firmware version 4.x/5.x/6.x on the following servers : • s8500 • s8300
H.248 Media Gateways	Supports Communication Manager software/Firmware version 4.x/5.x/6.x on the following media gateways: • G250 • G350 • G430 • G450 • G700
Port Network Media Gateway	Supports Communication Manager software/Firmware version 4.x/5.x/6.x on the following port network media gateway: • G650
IP Phones	Communication Manager software/Firmware 4.x/5.x/6.x compliant IP phones. The supported protocols include SIP and H.323. On the Avaya ONE –X soft phones, at the least, Avaya one-X Communicator Release 5.2 with Service Pack 4 (Product Version 5.2.0.23) or its equivalent Service Pack for Avaya one-X Communicator Release 6.x must be installed. The Service Pack level must include the fix for the issue with malformed CNAME in RTCP packets or the enhancement titled "Updated the CNAME in the RTCP packet for more accurate monitoring traceability."

Nortel IP Telephony

Devices/Entities	Version/Model/Type/Supported Protocol
Call Server	Models running the software version 5.x
Signaling Server	Models running the software version 5.x
Media Gateway	Media Gateway Controller Card (MGC) with DSP daughter boards, Media Card (MC), Voice Gateway Media Card (VGMC); MC 32 and MC 32S cards are supported in the MC or VGMC category.
IP Phone	The following Nortel IP phone models are supported: • NORTEL IP PHONE 2001 • NORTEL IP PHONE 2002 • NORTEL IP PHONE 2004 • NORTEL IP PHONE 2007 • NORTEL IP PHONE 2033 • NORTEL IP PHONE 1110 • NORTEL IP PHONE 1140E • NORTEL IP SOFTPHONE 2050 • MULTIMEDIA CLIENT

Microsoft IP Telephony

Devices/Entities	Version/Model/Type/Supported Protocol
Microsoft Lync Server 2010 Gateway	• NET UX 1.3 • HP Survivable Branch Module (HP SBM) 1.1.19.0

Acme IP Telephony

Devices/Entities	Version/Model/Type/Supported Protocol
Acme Packet Enterprise Session Border Controller	• 3820 • 4500

Supported Microsoft Lync Server Versions

The following Microsoft Lync versions are supported:

- Microsoft Lync 2010
- Microsoft Lync 2013

Supported Network Devices for the NNM iSPI NET

This device support information is based on the latest information available to HPE at the time of publication. Note that device vendors can, at any time, alter a device's command syntax and displayed information (for example, in newer IOS or system software versions) and invalidate NNM iSPI NET diagnostics usage of that device. In general software versions listed indicate minimal versions for proper operation of the diagnostic flow.

Devices are only supported if the device is running in the English locale.

Cisco IOS Version 12.3 offers the best support for executing diagnostics flows on Cisco devices. Earlier versions may work as noted below but some command syntax may indicate a failure when reviewing the diagnostics flow report.

Nortel switch devices, such as the 5510, due to their form-based logon conventions are required to support SSH as a transport mechanism.

Network Devices supported by NNM iSPI NET

Vendor	Family	Model	Agent's SNMP sysObjectID	Software Version	Notes
Cisco	2600 Series Multiservice Platform	2621	1.3.6.1.4.1.9.1.209	IOS Version 12.3(19)	All commands except for show spanning tree brief should function.
Cisco	2600 Series Multiservice Platform	2691	1.3.6.1.4.1.9.1.413	IOS Version 12.4(1)	
Cisco	2600 Series Multiservice Platform	2651	1.3.6.1.4.1.9.1.320	IOS Version 12.2(19a)	Versions earlier than 12.2 (19a) may have problems invoking show VLAN commands.
Cisco	Cisco 2800 Integrated Services Router	2821	1.3.6.1.4.1.9.1.577	IOS Version 12.4(12)	
Cisco	Cisco 2800 Integrated Services Router	2851	1.3.6.1.4.1.9.1.578	IOS Version 12.4(5a)	
Cisco	3600 Series Multiservice Platform	3620	1.3.6.1.4.1.9.1.122	IOS 12.2 (15)T13	
Cisco	3600 Series Multiservice Platform	3640	1.3.6.1.4.1.9.1.110	IOS Version 12.3(19)	All commands except for show spanning tree brief should function.

Network Devices supported by NNM iSPI NET, continued

Vendor	Family	Model	Agent's SNMP sysObjectID	Software Version	Notes
Cisco	Cisco 3700 Multiservice Access Routers	3725	1.3.6.1.4.1.9.1.414	IOS Version 12.3(9a)	
Cisco	3700 Series Multiservice Platform	3745	1.3.6.1.4.1.9.1.436	IOS Version 12.2(13) T12	All commands except for show spanning tree brief should function.
Cisco	4000M Series Routers	4500	1.3.6.1.4.1.9.1.14	IOS Version 12.2(23)	
Cisco	Catalyst 2900 Series XL Switches	2912XL	1.3.6.1.4.1.9.1.219	IOS Version 12.0(5)	All commands except for show interface, show protocols, show VLAN should function.
Cisco	Catalyst 2950 Series Switches	2950T-24	1.3.6.1.4.1.9.1.359	IOS Version 12.1(14) EA1a	All commands except for show interface, show protocols, show VLAN should function.
Cisco	Catalyst 3500 Series XL Switches	3508G-XL	1.3.6.1.4.1.9.1.246	IOS 12.0 (5)WC11	All commands except for show interface, show protocols, show VLAN should function.
Cisco	Catalyst 3500 Series XL Switches	3524XL	1.3.6.1.4.1.9.1.248	IOS 12.0 (5)	All commands except for show interface, show protocols, show VLAN should function.
Cisco	Catalyst 3560 Series Switches	3560-24PS	1.3.6.1.4.1.9.1.563	IOS Version 12.2(25) SEB4	All commands except for show VLAN and show spanning tree brief.
Cisco	Catalyst 3750 Series	3750	1.3.6.1.4.1.9.1.516	IOS Version 12.2(25) SEB4	All commands except for show VLAN and show spanning tree brief.
Cisco	Catalyst 5000 Series Switches	5000	1.3.6.1.4.1.9.5.7	Version 3.2(8)	Only Cisco Switch Spanning Tree Baseline diagnostic supported.
Cisco	Catalyst 5000 Series Switches	WS-X5302	1.3.6.1.4.1.9.1.168	IOS Version	Only Cisco Switch Baseline supported with some

Network Devices supported by NNM iSPI NET, continued

Vendor	Family	Model	Agent's SNMP sysObjectID	Software Version	Notes
	(RSM)			11.2 (12a.P1) P1	command failures.
Cisco	Catalyst 6500 Series Switch	6503	1.3.6.1.4.1.9.1.449	IOS Version 12.2(18) SXD7	
Cisco	Catalyst 6500 Series Switch	6506	1.3.6.1.4.1.9.1.282	IOS Version 12.2(18) SXF6	
Cisco	Catalyst 6500 Series Switch	6509	1.3.6.1.4.1.9.1.283	IOS 12.2 (18)SXD7	
Cisco	Cisco 7100 Series VPN Router	7140	1.3.6.1.4.1.9.1.277	IOS Version 12.2(15) T13	
Cisco	Catalyst 8500 Series Multiservice Switch Routers	8510	1.3.6.1.4.1.9.1.190	IOS 12.0 (1a)W5(6f)	All commands except for show interface summary and show spanning tree brief should function.
Cisco	Catalyst 8500 Series Multiservice Switch Routers	8540	1.3.6.1.4.1.9.1.203	IOS Version 12.1(6) EY1	All commands except for show interface summary and show spanning tree brief should function.
Nortel	BayStack	Baystack 5510	1.3.6.1.4.1.45.3.53.1	v5.1.1.017	Must configure SSH to use diagnostic flows.

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