



Hewlett Packard
Enterprise

HPE Network Node Manager i Software Premium Edition

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

Support Matrix

Document Release Date: November 2016
Software Release Date: November 2016

Legal Notices

Warranty

The only warranties for Hewlett Packard Enterprise products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HPE shall not be liable for technical or editorial errors or omissions contained herein.

The information contained herein is subject to change without notice.

Restricted Rights Legend

Confidential computer software. Valid license from HPE required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Oracle Technology — Notice of Restricted Rights

Programs delivered subject to the DOD FAR Supplement are 'commercial computer software' and use, duplication, and disclosure of the programs, including documentation, shall be subject to the licensing restrictions set forth in the applicable Oracle license agreement. Otherwise, programs delivered subject to the Federal Acquisition Regulations are 'restricted computer software' and use, duplication, and disclosure of the programs, including documentation, shall be subject to the restrictions in FAR 52.227-19, Commercial Computer Software-Restricted Rights (June 1987). Oracle America, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

For the full Oracle license text, see the license-agreements directory on the NNMi product DVD.

Copyright Notice

© Copyright 2007 - 2016 Hewlett Packard Enterprise Development LP

Trademark Notices

Adobe® is a trademark of Adobe Systems Incorporated.

Apple is a trademark of Apple Computer, Inc., registered in the U.S. and other countries.

AMD is a trademark of Advanced Micro Devices, Inc.

Google™ is a registered trademark of Google Inc.

Intel®, Intel® Itanium®, Intel® Xeon®, and Itanium® are trademarks of Intel Corporation in the U.S. and other countries.

Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.

Internet Explorer, Lync, Microsoft, Windows, and Windows Server are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

Red Hat® Enterprise Linux Certified is a registered trademark of Red Hat, Inc. in the United States and other countries.

sFlow is a registered trademark of InMon Corp.

UNIX® is a registered trademark of The Open Group.

This product includes software developed by the Apache Software Foundation.
(<http://www.apache.org>).

This product includes software developed by the Visigoth Software Society (<http://www.visigoths.org/>).

Documentation Updates

The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
- Document Release Date, which changes each time the document is updated.
- Software Release Date, which indicates the release date of this version of the software.

To check for recent updates or to verify that you are using the most recent edition of a document, go to:
<https://softwaresupport.hpe.com/group/softwaresupport/search-result?keyword=>.

This site requires an HP Passport account. If you do not have one, click the **Create an account** button on the HP Passport Sign in page.

Support

Visit the HPE Software Support web site at: <https://softwaresupport.hpe.com>

This web site provides contact information and details about the products, services, and support that HPE Software offers.

HPE Software Support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued support customer, you can benefit by using the support web site to:

- Search for knowledge documents of interest
- Submit and track support cases and enhancement requests
- Download software patches
- Manage support contracts
- Look up HPE support contacts
- Review information about available services
- Enter into discussions with other software customers
- Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport ID, go to <https://softwaresupport.hpe.com> and click **Register**.

To find more information about access levels, go to:

<https://softwaresupport.hpe.com/web/softwaresupport/access-levels>

Contents

| | |
|--|-----------|
| About this Document | 6 |
| How to Use this Document | 6 |
| Part I: Requirements and Compatibility | 9 |
| Requirements | 9 |
| Installation Guide | 9 |
| Hardware | 9 |
| Virtualization Products | 10 |
| Operating Systems | 12 |
| Linux OS Prerequisites | 14 |
| Required Libraries | 14 |
| Red Hat Enterprise Linux 6 Prerequisites | 14 |
| Red Hat Enterprise Linux 7 Prerequisites | 14 |
| SUSE Prerequisites | 15 |
| Linux Kernel Tuning | 15 |
| Virtual Memory / Swap Space | 16 |
| High-Availability Products | 17 |
| Databases | 19 |
| Web Browsers and Plug-ins | 19 |
| General Web Browser Requirements | 19 |
| Supported Web Browsers on a Remote Client System (for operational use) | 20 |
| Adobe Flash Player Plug-in | 21 |
| Microsoft Visio (NNM iSPI NET only) | 21 |
| Compatibility | 22 |
| Languages | 22 |
| HPE Software Integrations | 22 |
| Integrations with NNMi | 22 |
| Integrations with iSPIs (10.20) | 24 |
| HPE Software Coexistence | 24 |
| Part II: Performance, Sizing, and Other Recommendations | 26 |
| Recommendations for NNMi | 26 |
| Sizing Recommendations | 26 |
| Hardware Requirements for Each Tier | 27 |
| Tuning the NNMi Memory Size | 31 |
| NNMi Disk Space Considerations | 32 |
| Maximum Limits for Correlation Rules and Causal Rules | 33 |
| Global Network Management Recommendations | 33 |
| Recommended Soft Limits for Trap Burst Throughput Rate | 33 |
| Other Recommended Limits | 34 |
| Recommendations for NNM iSPI Performance for Metrics | 35 |
| Hardware and Software Requirements | 35 |
| Hardware Sizing Assumptions | 36 |

| | |
|---|-----------|
| Disk Space and Storage Considerations | 37 |
| Management Tiers of NPS | 37 |
| Same Server Installation (NNMi and NPS on the Same System) | 39 |
| Dedicated Server Installation | 40 |
| System Requirements in a Distributed Deployment of NPS | 42 |
| Networking Configuration of the NPS Server | 42 |
| NNMi and NPS OS Combinations | 43 |
| Recommendations for NNM iSPI Performance for QA | 44 |
| CPU, RAM, and Disk Space Considerations | 44 |
| Single System Managed Environment Size | 44 |
| Global Network Management Environment Size | 45 |
| Network Performance Server (NPS) | 46 |
| Intelligent Response Agent (iRA) | 47 |
| Metrics Collected by Probes from Different Devices | 48 |
| Tuning the NNM iSPI Performance for QA Memory Size | 51 |
| Part III: Device Support for NNMi and iSPIs | 53 |
| Supported Network Devices for NNMi | 53 |
| Supported Network Devices for the NNM iSPI Performance for QA | 54 |
| Supported Network Devices for the NNM iSPI NET | 55 |
| Send Documentation Feedback | 58 |

About this Document

Note: For the latest copy of this document, click here:

<https://softwaresupport.hpe.com/km/KM02581660>

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

NNMi Premium 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

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 Premium.

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

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

How to Use this Document

| To See | Go Here |
|---|---|
| Hardware and software requirements for installing NNMi and iSPIs. | "Requirements" on page 9 |
| Compatibility of NNMi and iSPIs with other HPE Software products. | "Compatibility" on page 22 |
| Performance and sizing recommendation for NNMi. | "Recommendations for NNMi" on page 26 |
| Performance and sizing recommendation for the NNM iSPI NET. | Recommendations for NNM iSPI NET |

| To See | Go Here |
|--|---|
| Performance and sizing recommendation for the NNM iSPI Performance for Metrics | "Recommendations for NNM iSPI Performance for Metrics" on page 35 |
| Performance and sizing recommendation for the NNM iSPI Performance for QA. | "Recommendations for NNM iSPI Performance for QA" on page 44 |
| Device support for NNMi and iSPIs. | "Device Support for NNMi and iSPIs" on page 53 |

Part I: Requirements and Compatibility

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

The tables in this section provide information about NNMi 10.21 and NNM iSPI Performance for Metrics 10.21. 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 Premium 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 Premium 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 Premium 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 26.

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.

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 | Additional Information |
|---|------------------------|------------|----------|--|
| VMware ESXi Server | | | | |
| VMware ESXi Server 5.x | ✓ | ✓ | ✓ | |
| VMware ESXi Server 6.x | ✓ | ✓ | ✓ | |
| Microsoft Hyper-V | | | | |
| Microsoft Hyper-V 2012 | ✓ | ✓ | ✓ | <ul style="list-style-type: none">• Host OS: Windows Server 2012 or 2012 R2 (or later service pack)• Guest OS: Any of the Windows operating systems listed in "Operating Systems" on page 12. |
| Microsoft Hyper-V 2012 R2 (or later service pack) | ✓ | ✓ | ✓ | |
| Kernel-Based Virtual Machine (KVM) | | | | |
| KVM | ✓ | ✓ | X | <ul style="list-style-type: none">• 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 | | | | |

Table: Virtualization Support, continued

| Virtualization Product | NNMi Management Server | NPS System | iRA Node | Additional Information |
|---------------------------------|------------------------|------------|----------|--|
| Oracle VM 3.x (starting at 3.2) | ✓ | ✓ | X | <ul style="list-style-type: none"> • 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 Premium 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.

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) | 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 service pack) | ✓ | ✓ | ✓ | |
| Windows Server 2012 R2 Standard Edition (or later service pack) | ✓ | ✓ | ✓ | |
| Red Hat Enterprise Linux | | | | |
| Red Hat Enterprise Linux Server 6.x | ✓ | ✓ | ✓ | |

Table: Operating Systems, continued

| Operating System | NNMi Management Server | NPS System | Intelligent Response Agent (iRA) | Additional Information |
|--|------------------------|------------|----------------------------------|---|
| (starting with 6.4) | | | | |
| Red Hat Enterprise Linux Server 7.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 the next page. |
| Oracle Linux Red Hat Compatible Kernel 7.x | ✓ | X | ✓ | For a list of dependent libraries for NNMi, see "Red Hat Enterprise Linux 7 Prerequisites " on the next page. |
| SUSE Enterprise Linux | | | | |
| SUSE Linux Enterprise Server 11 SP3 (or later service pack) | ✓ | ✓ | ✓ | For a list of dependent libraries for NNMi, see "SUSE Prerequisites" on page 15. |
| SUSE Linux Enterprise Server 12 (or later service pack) | ✓ | 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 Premium 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 Premium 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 Premium 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):

- 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
```
- 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)

- Edit the `/etc/sysctl.conf` file to add the following entry:

```
# NNMi settings for embedded database
kernel.shmmax = 68719476736
```
 - 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:
 - 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
```
 - Save your changes.
 - Log off from the Linux system, and then log back on, as the change to the `limits.conf` file only applies to new shells.
 - 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., $1.5 * \text{RAM}$).
- 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

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.

Table: HA Products

| HA Cluster | NNMi Management Server | NPS System | 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 | ✓ | ✓ | |

Table: HA Products, continued

| HA Cluster | NNMi Management Server | NPS System | Additional Information |
|---|------------------------|------------|--|
| Clustering for Windows Server 2012 R2 | | | |
| Red Hat Enterprise Linux | | | |
| Red Hat Enterprise Linux 6.x with Veritas Cluster Server (VCS) version 6.x | ✓ | ✓ | <ul style="list-style-type: none"> Some disk types require the use of Veritas Storage Foundation (VSF) version 6.0. 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 7.x with Veritas Cluster Server (VCS) version 6.x with 6.2 | ✓ | X | |
| Red Hat Enterprise Linux 6.x with Red Hat Cluster Suite (RHCS) 6.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 | <ul style="list-style-type: none">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 | <ul style="list-style-type: none">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 <i>NNMi Interactive Installation and Upgrade Guide</i>).The Enterprise Edition of Oracle database is supported for all tiersThe Standard Edition of Oracle database is supported up to the Medium tier. |
| Oracle and Oracle Real Application Clusters (RAC) 12c Release 1 (12.1.0.x) installed on a remote system | |

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™
 - *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 | ✓ | ✓ |

| | Google Chrome | Apple Safari 9.x (Only on OS X) | Microsoft Internet Explorer 11 | Mozilla Firefox 45.x ESR |
|--------------------------|---------------|---------------------------------|--------------------------------|--------------------------|
| 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 Premium 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 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

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 6](#) 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 Premium 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 |

- ¹To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.
- ²The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.
- ³The 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 34](#).

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 31) 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 |

- ¹See ["Hardware" on page 9](#) for processor recommendations.
- ²If 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.
- ³These 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.
- ⁴NnmInstallDir 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/.
- ⁵NnmDataDir 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 Environment¹

| 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 |

- ¹See ["Global Network Management Recommendations" on page 33](#).
- ²To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.
- ³The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.
- ⁴The number of VMs managed through a Web Agent. This number is included in the total number of discovered nodes.
- ⁵NNMi 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.
- ²NnmInstallDir 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/
- ³NnmDataDir 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 26](#) 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 16](#) 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-pollled elements. |
| Polling Frequency | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> As polled 1 Hour grain 1 Day grain The tables below provide data for three different levels of retention: <ul style="list-style-type: none"> 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 |
|------------------------|-------------------------|--|
| Small | Entry | None |
| Small | Entry | Small |

, continued

| Management Tier of NPS | Management Tier of NNMi | Management Tier of the NNM iSPI Performance for QA |
|------------------------|-------------------------|--|
| Medium | Entry | Medium |
| Medium | Small | None |
| Medium | Small | None |
| Medium | Small | Small |
| Medium | Small | Medium |
| Medium | Medium | None |
| Medium | Medium | Small |
| Large | Medium | Medium |
| Large | Large | None |
| Large | Large | Small |
| Large | Large | Medium |
| Very Large | Small | Large |
| Very Large | Small | Large |
| Very Large | Medium | Large |
| Very Large | Large | Large |
| Very Large | Very Large | None |
| Very Large | Very Large | Small |
| Very Large | Very Large | Medium |
| Very Large | Very 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 26](#).

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 37](#).

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 |

^aRecommended 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 37](#).

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 |

^aRecommended 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 37.](#))

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 Size¹

| 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 51) 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 |

- ¹Apart 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.
- ²Minimum of 2.5GHz for x64.
- ³These 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 Size¹

| 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 51) 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 51) 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 |

- ¹Apart 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.
- ²Minimum of 2.5GHz for x64.
- ³These 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 51](#).
- 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.

- ¹Apart 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.
- ²Allocate raw disk partition for better performance.
- ³If 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 |

¹There 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) | <ul style="list-style-type: none"> RTT Packet Loss (%) <ul style="list-style-type: none"> Two-way Packet Loss | RTT | RTT |
| ICMP Jitter | Not Supported | <ul style="list-style-type: none"> RTT Jitter¹ <ul style="list-style-type: none"> 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 (%) <ul style="list-style-type: none"> Two-way Packet Loss | Not Supported | Not Supported |
| UDP Echo | RTT | <ul style="list-style-type: none"> RTT Packet Loss (%) | RTT | RTT |

| Probe Type | Device Type | | | |
|--------------------|---|---|---------------|---|
| | Cisco | Juniper | H3C | iRA Node |
| | | <ul style="list-style-type: none"> Two-way Packet Loss | | |
| TCP Connect | RTT | <ul style="list-style-type: none"> RTT Packet Loss (%) <ul style="list-style-type: none"> Two-way Packet Loss | RTT | RTT |
| UDP | <ul style="list-style-type: none"> RTT Jitter <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Packet Loss Source-to-Destination Packet Loss Destination-to-Source Two-way Packet Loss | <ul style="list-style-type: none"> RTT Jitter¹ <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Packet Loss Source-to-Destination | Not Supported | <ul style="list-style-type: none"> RTT Jitter² <ul style="list-style-type: none"> Two-way Jitter Packet Loss² <ul style="list-style-type: none"> Packet Loss Source-to-Destination Packet Loss Destination-to-Source Two-way Packet Loss |
| VoIP | <ul style="list-style-type: none"> RTT Jitter <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Negative Jitter Destination-to-Source Negative Jitter Source-to-Destination Two-way Jitter <ul style="list-style-type: none"> Packet Loss <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> RTT RTT DNS RTT Connection RTT Operation | <ul style="list-style-type: none"> RTT Packet Loss (%) <ul style="list-style-type: none"> Two-way Packet Loss | Not Supported | <ul style="list-style-type: none"> RTT RTT DNS RTT Connection RTT Operation |
| HTTPS | Not Supported | Not Supported | Not Supported | <ul style="list-style-type: none"> RTT RTT DNS RTT Connection RTT Operation |
| DNS | RTT | Not Supported | Not Supported | RTT |
| DHCP | RTT | Not Supported | Not Supported | Not Supported |

- ¹The 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
- ²The 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 44](#).

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`

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 | <ul style="list-style-type: none">• DISMAN-PING-MIB• JNX-RPM-MIB• JNX-PING-MIB | 9.x to 13.x |
| Juniper | RPM probes with jitter metrics ¹ | <ul style="list-style-type: none">• 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 | |

¹Jitter 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 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. |

Send Documentation Feedback

If you have comments about this document, you can [contact the documentation team](#) by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on Support Matrix (Network Node Manager i Software Premium Edition 10.21)

Just add your feedback to the email and click send.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to network-management-doc-feedback@hpe.com.

We appreciate your feedback!