Hewlett Packard
Enterprise

HPE Network Node Manager i Software

Software Version: 10.30
for the Windows® and Linux® operating systems

Support Matrix

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

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About this Document

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

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

Part 1 of this document contains the system requirements of NNMi .

Part 2 of this document provides performance and sizing recommendation for NNMi .

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

How to Use this Document

To See	Go Here
Hardware and software requirements for installing NNMi.	"Requirements" on page 6
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Performance and sizing recommendation for NNMi.	"Recommendations for NNMi" on page 23
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Requirements and Compatibility

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

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 10.30.

Installation Guide

To obtain an electronic copy of the most current version of the Network Node Manager i Software 10.30 Installation Guide, go to https://softwaresupport.hpe.com/km/KM02795805.

Hardware

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

NNMi 10.30 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, Very Large, or Extra Large tier and GNM global manager

For information on hardware sizing, see "Performance, Sizing, and Other Recommendations" on page 23.

Virtualization Products

NNMi 10.30 can be used with the following virtualization products:

Note: Virtual environments must meet the hardware requirements.

Summary of the table below:

Table: Virtualization Support

Virtualization Product	NNMi Management Server	Additional Information
VMware ESXi Server		
VMware ESXi Server 5.x	✓	• Bridged network environment required. NAT'ed network environments are not supported. • (For NNMi) VMware vmotion (for DRS and DPM) of the NNMi management server is supported.
VMware ESXi Server 6.x	✓	
Microsoft Hyper-V		
Microsoft Hyper-V 2012	✓	• 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 8.
Microsoft Hyper-V 2012 R2 (or later service pack)	✓	
Kernel-Based Virtual Machine (KVM)		
KVM	✓	• Guest operating system must be included in "Operating Systems" on page 8. • Supported only up to the Medium Tier • Supported only for NNMi Premium.
Oracle VM		
Oracle VM 3.x (starting at 3.2)	✓	• Guest operating system must be included in "Operating Systems" on page 8. • Supported only up to the Medium Tier • Supported only for NNMi Premium (however; iRA is not supported).

Operating Systems

Network Node Manager i Software 10.30 will run on the following operating systems:

Table: Operating Systems

Operating System	NNMi Management Server	Additional Information
Windows Server 2012		
Windows Server 2012 Datacenter Edition (or later service pack)	✓	
Windows Server 2012 Standard Edition (or later service pack)	✓	
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 (starting with 6.4)	✓	
Red Hat Enterprise Linux Server 7.x	✓	
Oracle Linux		NNMi running on Oracle Linux in an HA cluster is not supported.
Oracle Linux Red Hat Compatible Kernel 6.x (starting with 6.4)	✓	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	✓	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 10.
SUSE Linux Enterprise Server 12 (or later service pack)	✓	

Linux OS Prerequisites

This section describes the prerequisites for installing Network Node Manager i Software 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 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 on SUSE operating system.

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

SUSE Linux Enterprise Server 11

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

SUSE Linux Enterprise Server 12

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

Linux Kernel Tuning

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

- SNMP utilizes UDP (User Datagram Protocol) for sending and receiving SNMP request and response Protocol Data Units (PDUs). The operating system utilizes UDP buffering to match the arrival rate of UDP packets with their consumption rate by NNMi. To minimize the chances for lost SNMP request or response packets, a sufficient amount of memory is required for UDP buffering. NNMi requests 8 MB for the UDP receive buffer (for incoming responses) and 2 MB for the UDP send buffer (for outgoing requests). Linux systems typically reserve only 128 KB for each of these buffers.
  To make this change permanent (after a reboot):
  a. Edit the `/etc/sysctl.conf` file and add the following entry:
  ```
  # NNMi settings for UDP receive and send buffer sizes
  net.core.rmem_max = 8388608
  net.core.wmem_max = 2097152
  ```
  b. Reboot the system. To immediately apply the changes without a reboot, you can also run the command `/sbin/sysctl -p`.
  If `ovjboss` is running, restart the process to benefit from these changes:
  ```
  ovstop ovjboss; ovstart ovjboss
  ```

- The default size of `kernel.shmmax` on an upgraded operating system might be too small for the embedded database to operate after a reboot (as reported by `ovstatus -c nmsdbmgr`). Configure this value before installing NNMi.
  To validate, run `/sbin/sysctl -q kernel.shmmax`.
  Make sure that the size of `kernel.shmmax` is at least 12 GB. In most cases, it is best to reset this value to 64 GB, which is the default value for new Red Hat installations.
  To make this change permanent (after a reboot)
  a. Edit the `/etc/sysctl.conf` file to add the following entry:
  ```
  # NNMi settings for embedded database
  kernel.shmmax = 68719476736
  ```
  b. Either reboot the system or `run /sbin/sysctl -p` to immediately apply the changes without requiring a reboot.
- The number of open files per process must be increased. To increase the number of files:
  a. Edit the `/etc/security/limits.conf` file to add (or update) if the existing value is less than 16384 the following lines.
  ```
  # Increase the default max open files for NNMi
  *     soft    nofile    16384
  *     hard    nofile    16384
  ```
  b. Save your changes.
  c. Log off from the Linux system, and then log back on, as the change to the limits.conf file only applies to new shells.
  d. When you start installing NNMi, the installer inherits the new file limits.

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

Virtual Memory / Swap Space

- Recommended size is at least one and a half times physical memory (i.e., 1.5 * RAM).
- Verify and adjust the virtual memory:
  - Windows: Use **System Properties**.
  - Linux: To verify, use the `cat /proc/meminfo | grep Swap` command. To adjust, use the parted and mkswap commands.

High-Availability Products

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.

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: NNMi supports only a 1+1 configuration model for high availability.

Summary of the table below:

Table: HA Products

HA Cluster	NNMi Management Server	Additional Information
Windows Server 2012		
Microsoft Failover Clustering for Windows Server 2012	✓	Before configuring HA on Windows Server, you must install the `FailoverCluster-CmdInterface` component using either Server Manager or Windows PowerShell cmdlets.
Microsoft Failover Clustering for Windows Server 2012 R2	✓	
Red Hat Enterprise Linux		
Red Hat Enterprise Linux 6.x with Veritas Cluster Server (VCS) version 6.x	✓	• Some disk types require the use of Veritas Storage Foundation (VSF) version 6.0. • 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	✓	
Red Hat Enterprise Linux 6.x with Red Hat Cluster Suite (RHCS) 6.x	✓	This combination is not supported by any iSPIs.
SUSE Enterprise Linux		
SUSE Linux Enterprise Server 11 SP3 with Veritas Cluster Server (VCS) version	✓	This combination is not supported by any iSPIs.

Table: HA Products, continued

HA Cluster	NNMi Management Server	Additional Information
6.x		
SUSE Linux Enterprise Server 12 with Veritas Cluster Server (VCS) version 6.x	✓	This combination is not supported by any iSPIs.

Databases

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

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

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

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 10.x
- Mozilla Firefox prior to version 52.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 52.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 10.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 10.x (Only on OS X)	Microsoft Internet Explorer 11	Mozilla Firefox 52.x ESR
Dashboards	✓	✓	✓	✓
Performance Troubleshooting	✓	✓	✓	✓
NPS console and reports	✓	X	✓	✓
Query Studio	X	X	✓	✓
BI Server Portal	✓	X	✓	✓

	Google Chrome	Apple Safari 10.x (Only on OS X)	Microsoft Internet Explorer 11	Mozilla Firefox 52.x ESR
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 10.30.

Note: NNMi, NPS, and iSPIs contain open source and third-party software components that are listed in the *NNMi Open Source and Third Party Software License Agreements* document. Do not independently apply any patches or updates released by these open source communities and third parties. HPE does not support environments where such components are updated by patches that are not released and certified by HPE.

Languages

NNMi is localized (or translated) to the following languages:

- French
- German
- Japanese
- Spanish

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 10.30 integration.

The most current information about HPE software that integrates with NNMi 10.30 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 10.30 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 10.30 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, 6.2 , and 6.4

  NNMi 10.30 supports all SmartConnectors supported by ArcSight Logger version 6.0, 6.1, 6.2 , and 6.4.
- 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, and 10.61

  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 is supported with HPE Operations Connector (Operations Connector) 10.01, 10.11.
- HPE Intelligent Management Center (IMC) version 7.1, 7.2
- HPE Network Automation (NA) version 10.30, 10.21, 10.20

  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 12.03. 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, 11.33
- 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, 10.31

  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 10.30
  - NNM iSPI Performance for Metrics 10.30
  - NNM iSPI Performance for QA 10.30
  - NNM iSPI Performance for Traffic 10.30

- NNM iSPI for IP Multicast 10.30
- NNM iSPI for MPLS 10.30
- NNM iSPI for IP Telephony 10.30

Integrations with iSPIs (10.30)

- 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 10.30:

- 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, 12.03

  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

Java Development Kit

NNMi 10.30 requires Java Development Kit (JDK) 1.8.x. The NNMi installer is now shipped with Open JDK 1.8 (azul/zulu-openjdk).

The NNMi installer can install this embedded JDK. You can choose to use an already installed version of JDK 1.8.x.

During upgrade, the installer removes the JDK installed by the previous version of NNMi and allows you to install either the embedded version of JDK or an already installed version of JDK 1.8.x.

Note the following requirements:

- In an Application Failover cluster, you must install the same version of JDK on the active and standby nodes.
- In an HA cluster, you must install the same version of JDK on all nodes.
- On Linux, it is recommended that you use the JDK 1.8.x provided by your operating system vendor (Red

Hat or SUSE).

- On Windows, it is recommended that you install the Oracle JDK 1.8.x.

Performance, Sizing, and Other Recommendations

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

Recommendations for NNMi

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

Sizing Recommendations

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

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

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

Note: Performance polling requires an Ultimate or Premium license.

Hardware Requirements for Each Tier

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

Tiers of Managed Network Environments

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

- [1]To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.
- [2]The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.
- [3]The number of VMs managed through a Web Agent. This number is included in the total number of discovered nodes.
- [4] This applies to Custom Polled Instances for Custom Poller "Instance" collection. For Custom Poller "Bulk" collection limits, see "Other Recommended Limits" on page 31.

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 28)[3]	Disk space for application installation ($NnmInstallDir)[4]	Disk space for database and data during execution ($NnmDataDir)[5]
Entry	2 CPU cores	4 GB	2 GB	3 GB	10 GB
Small	4 CPU cores	8 GB	4 GB	3 GB	30 GB
Medium	6 CPU cores	16 GB	8 GB	3 GB	40 GB
Large	8 CPU cores	24 GB	12 GB	3 GB	60 GB
Very Large	12 CPU cores	48 GB	16 GB	3 GB	80 GB

- [1]See "Hardware" on page 6 for processor recommendations.
- [2]If you are running additional applications, increase resources appropriately. (For example, when the Network Performance Server (NPS) component of the NNM Performance iSPIs is installed on the same system as NNMi, the NPS uses half of the system RAM, and NNMi plus other products must fit into the other half, requiring at least double the amount of RAM stated here.) If you are planning to use any of the NNM iSPI Performance products (NNM iSPI Performance for Metrics, NNM iSPI Performance for Traffic, or NNM iSPI Performance for QA) and are managing at the Large tier or above, it is recommended that the NPS component of the NNM Performance iSPIs be installed on a separate server from NNMi. You can install spread NPS processes across multiple servers by creating a distributed deployment of NPS. See the *NNM iSPI Performance for Metrics Deployment Reference* for more information about the distributed deployment of NPS.
- [3]These recommendations are based on the environment size and polled object counts stated in this table. Polling fewer of a given object type might use less Java heap. Polling more of a given object type might require increased Java heap size as well as HPE approval.
- [4]`NnmInstallDir` is configured during installation on Windows (`C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/opt/OV/`.
- [5]`NnmDataDir` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/var/opt/OV/` . See "Hardware Requirements for Each Tier" on the previous page before proceeding.

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

Global Network Management Environment[1]

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

- [1]See "Global Network Management Recommendations" on page 30.
- [2]To view discovered object counts and polled object counts, see the Database, State Poller, and Custom Poller tabs in the Help → System Information window.
- [3]The number of hypervisors (for example, VMware ESXi hosts) managed through a Web Agent. This number is included in the total number of discovered nodes.
- [4]The number of VMs managed through a Web Agent. This number is included in the total number of discovered nodes.
- [5]NNMi now enables you to configure Custom Pollers on the Global Manager in a Global Network Management environment and collect the custom-polled data via a Regional Manager. In this configuration, the Regional Manager acts as a regional proxy. For more information about this configuration, see the *Custom Pollers in a Global Network Management Environment* section in *Help for Administrators*.

Recommended Hardware for Global Network Management Environment

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

- [1] See "Hardware" on page 6 for processor recommendations.
- [2] `NnmInstallDir` is configured during installation on Windows `R2 ( C:\Program Files (x86)\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/opt/OV/`
- [3] `NnmDataDir` is configured during installation on Windows (`C:\ProgramData\HP\HP BTO Software\` by default), or on Linux by creating a symlink to `/var/opt/OV/` . See "Recommendations for NNMi" on page 23 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 11 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

Device Support for NNMi

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

Supported Network Devices for NNMi

For the list of supported network devices, see the *NNMi Device Support Matrix* at https://softwaresupport.hpe.com/km/KM02795785.

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.

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Feedback on Support Matrix (Network Node Manager i Software 10.30)

Just add your feedback to the email and click send.

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We appreciate your feedback!