

HP Storage Operations Manager

Software Version: 10.00

Windows® and Linux® operating systems

Support Matrix

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Acknowledgements

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

This product includes software developed by the Indiana University Extreme! Lab.
(<http://www.extreme.indiana.edu>)

This product uses the j-Interop library to interoperate with COM servers.
(<http://www.j-interop.org>)

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Requirements for the SOM Management Server

This section provides information about the supported hardware and software that is required to successfully install and run Storage Operations Manager (SOM) 10.00 management server.

Physical Hardware

The Storage Operations Manager 10.00 management server is supported on the following hardware:

Windows and Linux

- Processor:
 - Intel® 64-bit (x86-64)

The following Intel® 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 tier
 - AMD 64-bit (AMD64)
- Minimum CPU size: 8 cores across 1 or more physical CPUs

Note:

- For information about required CPU, RAM, and disk space, see ["CPU, RAM, Swap Space, and Disk Space Recommendations" on page 23](#).
- If you are using an external database, for the database server hardware and operating system requirements, see the database documentation.

Operating System

The Storage Operations Manager 10.00 management server runs on the following operating systems:

- Windows

See ["Windows Installation Prerequisites"](#) below and ["Virtual Memory / Swap Space"](#) on page 12.

- Windows Server® 2008 R2 x64 Standard Edition, Enterprise Edition, or Datacenter Edition with SP1 (or later service pack)
- Windows Server 2012 R2 Standard Edition or Datacenter Edition with Update 1 (or later update)

- Linux

- Red Hat Enterprise Linux Server 6.4 or 6.5

See ["Red Hat Linux Installation Prerequisites"](#) on the next page, ["Linux Kernel Tuning"](#) on page 10, and ["Virtual Memory / Swap Space"](#) on page 12.

- SUSE Linux Enterprise Server 11 SP3

See ["SUSE Linux Installation Prerequisites"](#) on page 9, ["Linux Kernel Tuning"](#) on page 10, and ["Virtual Memory / Swap Space"](#) on page 12.

Windows Installation Prerequisites

The following considerations apply to installing SOM on a supported Windows operating system:

- Windows operating systems on the Intel® Itanium® Processor Family (IPF) are not supported.
- Windows 32-bit operating systems are not supported.
- The Windows SNMP Trap service (or any other service that takes UDP Port 162) must be disabled. For more information, see the SOM Interactive Installation Guide.
- Anti-virus and backup software can interfere with SOM operation if this software locks files while SOM is running. Any application that locks files should be configured to exclude the SOM data

directory. (On the Windows operating system, the default location is <Drive>:\ProgramData\HP\HP BTO Software.)

- The Windows operating system includes the concept of User Access Control (UAC). Users who are not part of the Local Administrator group might not have the full Administrator privileges that are required to successfully install SOM. All of the scripts and commands shipped with SOM detect and warn the user if the user does not have full Administrator privileges. For a successful SOM installation, install SOM as a user with full Local Administrator access or disable UAC.

Red Hat Linux Installation Prerequisites

SOM requires the following exact library versions. The RPM versions may vary depending on the minor release of RHEL. Both 64-bit and 32-bit compat-libstdc++ libraries are required before installing SOM.

Before installing SOM on a supported 64-bit RHEL server, verify that the following library files are installed:

- RPM: **compat-libstdc++-33-3.2.3-69.el6.x86_64**
 - /usr/lib64/libstdc++.so.5
 - /usr/lib64/libstdc++.so.5.0.7
- RPM: **compat-libstdc++-33-3.2.3-69.el6.i686**
 - /usr/lib/libstdc++.so.5
 - /usr/lib/libstdc++.so.5.0.7
- RPM: **glibc-2.12-1.47.el6_2.5.x86_64**
 - /lib64/libc-2.12.so
- RPM: **libaio-0.3.107-10.el6.x86_64**
 - /lib64/libaio.so.1
- RPM: **libXtst-1.0.99.2-3.el6.x86_64**
 - /usr/lib64/libXtst.so.6
- RPM: **libXext-1.1-3.el6.i686**
 - /usr/lib/libXext.so.6
- RPM: **libXi-1.3-3.el6.x86_64**
 - /usr/lib64/libXi.so.6

- RPM: **libXi-1.3-3.el6.i686**
 - /usr/lib/libXi.so.6

For example, to install the RHEL package `compat-libstdc++-33-3.2.3-69.el6.i686`, you can obtain and install the package in one of two ways:

- If you have subscribed to the RedHat repository or the CentOS repository, run the following command:

```
yum install compat-libstdc++-33-3.2.3-69.el6.i686
```

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 RHEL repository, download the package from the following URL:

<http://mirror.centos.org/centos/6/os/i386/Packages/compat-libstdc++-33-3.2.3-69.el6.i686.rpm>

Then run the following command on the Linux Console:

```
rpm -i compat-libstdc++-33-3.2.3-69.el6.i686.rpm
```

This command installs the package on the system.

Note: The CentOS repository is a free public RHEL open source repository where you can obtain the required packages. SOM is not supported on CentOS for production use.

SUSE Linux Installation Prerequisites

SOM requires the following exact library versions. The RPM versions may vary depending on the minor release of SUSE. Both 64-bit and 32-bit `compat-libstdc++` libraries are required before installing SOM.

Before installing SOM on a supported 64-bit SUSE server, verify that the following library files are installed:

- RPM: **compat-libstdc++-33-3.3.3-11.9**
 - /usr/lib64/libstdc++.so.5
 - /usr/lib64/libstdc++.so.5.0.7

- RPM: **libstdc++33-32bit**-3.3.3-11.9
 - /usr/lib/libstdc++.so.5
 - /usr/lib/libstdc++.so.5.0.7
- RPM: **glibc**-2.11.1-0.17.4
 - /lib64/libc-2.11.1.so
- RPM: **libaio**-0.3.109-0.1.46
 - /lib64/libaio.so.1
- RPM: **xorg-x11-libs**-7.4-8.24.2
 - /usr/lib64/libXtst.so.6
- RPM: **xorg-x11-libXext-32bit**-7.4-1.16.21
 - /usr/lib/libXext.so.6
- RPM: **xorg-x11-libs**-7.4-8.24.2
 - /usr/lib64/libXi.so.6
- RPM: **xorg-x11-libs-32bit**-7.4-8.24.2
 - /usr/lib/libXi.so.6

Linux Kernel Tuning

SOM requires that some kernel tunable options be changed from their default settings.

kernel.shmmax

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 sedbmgr`). Configure this value before installing SOM.

To validate, run:

```
/sbin/sysctl -q kernel.shmmax
```

Depending on the memory tier for your installation, this value might need to be as large as 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:

```
# SOM settings for embedded database  
kernel.shmmax = 68719476736
```

Then either reboot the system or run `/sbin/sysctl -p` to immediately apply the changes without requiring a reboot.

UDP receive and send buffer sizes

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 SOM. To minimize the chances for lost SNMP request or response packets, a sufficient amount of memory is required for UDP buffering. SOM requests 8 MB for the UDP receive buffer (for incoming responses) and 8MB 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 to add the following entry:

```
# SOM settings for UDP receive and send buffer sizes
net.core.rmem_max = 8388608
net.core.wmem_max = 8388608
```

Then either reboot the system or run `/sbin/sysctl -p` to immediately apply the changes without requiring a reboot.

If somjboss is running, restart the process to benefit from these changes:

```
ovstop -c somjboss; ovstart -c somjboss
```

Open files limits

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

1. Edit the `/etc/security/limits.conf` file to add (or update if the existing value is less than 65536) the following lines:

```
# Increase the default max open files for SOM
*      soft      nofile      65536
*      hard      nofile      65536
```

2. Save your changes.
3. Log off from the Linux system, and then log back on, as the change to the `limits.conf` file only applies to new shells.
4. When you start installing SOM, the installer inherits the new file limits.

Note: If you have already installed SOM, do the following to restart SOM so that 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.

Databases

One of the following supported databases is required to run Storage Operations Manager 10.00:

- Embedded Postgres database on the SOM management server:
 - SOM automatically installs, initializes, and maintains the embedded database.
 - SOM provides tools for re-initializing, backing up while online, and restoring the embedded database.
 - The embedded database performs well for most deployments.
- Oracle 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 SOM management server and the database server be at least 1 GB/s.
 - The Oracle database user must be created with an appropriate tablespace before SOM installation (see the *SOM Interactive Installation Guide*).

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

Application Servers

Installing SOM installs the required application server for the SOM management server.

Web Servers

Installing SOM installs the required web server for the SOM management server.

Web Browsers and Plug-ins

The SOM console runs in a web browser. Ensure that each SOM console user's web browser meets the specifications described here.

Web Browser Versions

One of the following supported web browsers with the following plug-ins is required to run the SOM console:

- Microsoft Internet Explorer (32-bit and 64-bit) version 9, 10, or 11 (not running in Compatibility View mode)
- Mozilla Firefox 31.x ESR on the Windows or Linux operating system

The Firefox Extended Support Release (ESR) browser is available from:

<http://www.mozilla.org/en-US/firefox/organizations/all.html>

The Firefox browser works best if new windows are opened as separate windows, not tabs. For information, see "Mozilla Firefox Known Problems" in the *SOM Release Notes*.

To preserve the Firefox extended support release version, disable automatic updating of the browser:

- a. In Firefox, click **Firefox > Options**.
- b. In the **Options** dialog box, select the **Advanced** pane, and then select the **Update** tab.
- c. Under Firefox updates, select **Check for updates**.
- d. Click **OK**.

When accepting Firefox updates, do not update beyond the supported version.

Other Requirements

General web browser requirements:

- Disable all pop-up window blockers for the browser (see instructions on the SOM console sign-in page or in the *SOM Interactive Installation Guide*).
- Enable cookies for the browser (see instructions on the SOM console sign-in page or in the *SOM Interactive Installation Guide*).
- Enable JavaScript (active scripting) for the browser.
- The resolution of the client display should be at least 1024x768.

Requirements for the SOM Reporting Server

The SOM reporting engine is HP Service Health Reporter (SHR), which must be installed on a different computer from the SOM management server.

SHR must be version 9.40 with a required hotfix. Obtain the SOM-specific SHR hotfix from Support, and then follow the provided installation instructions.

If SHR is already running in your environment, you can configure that SHR instance to receive data from the SOM management server. See the *Storage Resource Management Reports Guide*. Ensure that the SHR server is large enough to handle the additional load from SOM as described in "[Performance and Sizing for the SOM Reporting Server](#)" on page 27.

To use the SHR included with SOM, read this section for the supported hardware and software that is required to successfully install and run SHR for SOM reporting. If you plan to run reporting for other products on this SHR instance, also see the *SHR Performance, Sizing, and Tuning Guide*.

Physical Hardware

The Storage Operations Manager 10.00 reporting server is supported on the following hardware:

Linux

- Processor:
 - For Intel 64-bit (x86-64), the following Intel Xeon processor families are recommended:
 - Penryn
 - Nehalem
 - Westmere
 - Sandy Bridge
 - For AMD 64-bit (AMD64), the following Opteron processor families are recommended:
 - Istanbul

- Lisbon
- Valencia
- Minimum CPU size: 4 cores
- Disk

Disk performance is important for high scale environments that are medium tier or higher. It is recommended to use RAID 1+0 (10) with battery-backed write cache on disks of 15,000 rpm or high performance SAN storage. Disk configurations that do not meet this level of performance are not adequate.

- VMware® ESXi 5.0 or a later minor version is recommended if SHR is to be deployed to a virtual machine. The virtual environment must meet the recommendation for an Intel 64-bit (x86-64) processor.

Operating System

The Storage Operations Manager 10.00 reporting server runs on the following operating systems:

- Linux
- Red Hat Enterprise Linux Server 5.5, 6.0, 6.2, 6.3, 6.4, or 6.5

The Linux kernel provides a system to limit the number of file descriptors and other resources on a per process basis. SHR uses sockets and file-system files extensively, so the SHR service start scripts sets this limit to 65,536.

You should configure virtual memory to at least twice the physical memory (that is, twice the size of the RAM).

Databases

Both of the following databases are required to run the Storage Operations Manager 10.00 reporting server. Installing SHR installs both databases on the SOM reporting server.

- Sybase IQ database for storing management data
- Embedded Postgres database for SHR self-management

Application Servers

Installing SHR installs the required application server for the SOM reporting server.

Web Servers

Installing SHR installs the required web server for the SOM reporting server.

Web Browsers and Plug-ins

The SHR Administration console runs in a web browser. Ensure that each SOM reporting server user's web browser meets the specifications described here.

Web Browser Versions

One of the following supported web browsers with the following plug-ins is required to run the SHR Administration console:

- Microsoft Internet Explorer version 8.x, 9.x, 10.x, or 11.x
- Mozilla Firefox 10.x ESR, 17.x ESR, 24.x ESR, or 31.x ESR

The Firefox Extended Support Release (ESR) browser is available from:

<http://www.mozilla.org/en-US/firefox/organizations/all.html>

Other Requirements

To view the SHR Administration Console in Internet Explorer or Firefox, you must enable the ActiveX and the JavaScript controls. Follow the Help menu of the web browser for assistance with enabling them.

The following Java version is required to access InfoView in SHR 9.40:

- Oracle Java 7, JVM 1.7.xx

Compatibility

This section provides information about software and configurations that are not required, but which are compatible with Storage Operations Manager 10.00.

Languages

Storage Operations Manager 10.00 runs on systems with any of the following languages:

- French
- German
- Japanese
- Russian
- Simplified Chinese

Storage Operations Manager 10.00 is localized in the following languages:

- Japanese
- Russian
- Simplified Chinese

Internationalization Variances

Storage Operations Manager 10.00 runs on all locales described in this document. There are no known variances.

Virtualization Products

Storage Operations Manager 10.00 can be used with the following virtualization product:

- VMware ESXi 5.1 or 5.5
 - Virtual environment must meet the x86-64 or AMD64 hardware requirements listed above.
 - Bridged network environment required. NAT'ed network environments are not supported.

Virtual Server Configuration

When running the SOM management server on a virtual server, observe the following requirements:

- Reserve at least equal resources for memory and CPU as what is required for a physical SOM management server.
- The virtualized SOM management server NPIV configuration might impact the virtual machine performance.
- Configure the database to use multiple disk spindles in a virtualized environment.
- Other applications on virtual machines on the same physical ESX host server share memory and disk capacity for the virtual machine configuration. Another application competing for the same physical resources can reduce SOM performance.
- Moving the SOM virtual machine to another host server with a heavier configuration load might impact SOM performance. In a physical server environment with dedicated SAN disks the IO bandwidth is guaranteed.

The recommended ESX configuration for a virtual SOM management server is as follows:

- VMFS 5 file system
- At least 8 virtual CPUs
- 32 GB RAM with a memory reservation of 24-32 GB
- CPU GHz reservation is unlimited (adjusted)
- Virtual network bandwidth throughput is maximum, load balanced, and failover

- A dedicated data store, located on a fast SAN disk, for example EVA4400/3PAR
- It is recommended that databases use different spindles for a database running on a physical box. The VM RDM (SAN LUNs) can be configured in a similar way. If RDMs are not allowed per particular VMware administration policy, dedicated data stores can be used instead. Use one data store per virtual machine virtual disk. Note that using RDM with NPIV does not change the IO throughput.
- The SOM management server and the SOM reporting server use Para Virtual (PV) SCSI drivers.
- On a Windows operating system, virtual memory paging (**Windows Performance Properties > Advanced > Advanced**) should be static and maximized, with the initial and maximum values being equal. The Linux operating system uses dedicated swap partitions, so this concern does not apply.
- The SOM management server virtual machine must be configured for heavy duty application and networking and optimized for a high level of TCP/IP connections. This configuration grants the virtual machine a higher priority. SOM performance depends on what else runs on the same ESX host at the same time.

High-Availability Products

Storage Operations Manager 10.00 does not support any high-availability products.

HP Software Integrations

No integration information for Storage Operations Manager 10.00 is available.

HP Software Coexistence

The HP Operations agent must be installed on the SOM management server computer *after* installing SOM. This order avoids conflicts with ports and installation directories.

- If the HP Operations agent is needed, install SOM before installing the HP Operations agent.
- If the HP Operations agent is already installed, uninstall the HP Operations agent, install SOM, and then re-install the HP Operations agent.

Note: The HP Operations agent installation and data directories are the same as those for SOM. They are determined during SOM installation and cannot be changed during HP Operations agent installation.

For configuration information, see "Configuring Connections Between the SOM Management Server and the SOM Reporting Server with HPOM as the Certificate Authority" in the *Storage Resource Management Reports Guide*.

Other Software Coexistence

No coexistence information for Storage Operations Manager 10.00 with third-party products is available.

Performance and Sizing for the SOM Management Server

SOM 10.00 has been tested at scale for several SOM deployment tiers. For each tier, the SOM management server achieved excellent performance for the associated hardware environment described in "[CPU, RAM, Swap Space, and Disk Space Recommendations](#)" on page 23.

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

The following table describes the tested managed environment for each tier.

Single System Managed Environment Size for the SOM Management Server

Approximate Managed Tier	Number of Discovered Hosts	Number of Discovered Switches	Number of Discovered Storage Systems	Freshness Period
Entry	500 (150 hosts, 20 ESX, 300 VMs) 200 FC ports	20 500 FC ports	15 200 FC ports	24 hours
Small	1k (250 hosts, 50 ESX, 750 VMs) 500 FC ports	50 1200 FC ports	30 400 FC ports	24 hours
Medium	8k (4500 hosts, 300 ESX, 3200 VMs) 10k FC ports	150 3500 FC ports	50 1000 FC ports	24 hours
Large	16k (8200 hosts, 700 ESX, 7500 VMs) 17k FC ports	400 8k FC ports	100 2000 FC ports	72 hours

CPU, RAM, Swap Space, and Disk Space Recommendations

The following table describes the hardware requirements for supporting the managed storage environment tiers. The values stated here are approximate and reflect levels tested by HP. If you have a particularly complex environment, manage more devices 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.

Recommended Hardware System Requirements for the SOM Management Server

Approximate Managed Tier	CPU (64-bit) x86-64 AMD64	RAM	Recommended Java Heap Size (See "Tuning the jboss Memory Size" on the next page)	Disk space for Application Installation	Disk Space for Database and Data During Execution
Entry	8	12 GB	8 GB (-Xmx=8g)	3 GB	10 GB
Small	12	24 GB	12 GB (-Xmx=12g)	3 GB	20 GB
Medium	12	24 GB	16 GB (-Xms = -Xmx = 16G)	3 GB	40 GB
Large	16	32 GB	24 GB (-Xms = -Xmx = 24G)	3 GB	60 GB

Disk Space Considerations

Before allocating disk space for SOM, consider the following:

- The recommendations in the tables above are the recommended minimum disk space amounts based on HP'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. HP 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, HP has not seen tablespace sizes larger than 16 GB (Oracle or embedded Postgres). If using Oracle in a high scale environment, configure for incremental table space growth beyond this size.
- (*Linux only*) If you partition your disk, ensure that the file systems containing the directories listed in the following table have at least the specified disk space available for SOM. If you use all-in-root partitioning, ensure that the total required disk space is available.

Partition	Recommended Minimum Disk Space
/tmp	1 GB
/opt/OV/	See Recommended Hardware System Requirements for your managed environment tier in the above tables.
/var/opt/OV/	See Recommended Hardware System Requirements for your managed environment tier in the above tables.
Swap	1.5 times physical memory (RAM) size. To verify, use the <code>cat '/proc/meminfo grep -i swap'</code> command. To adjust, use the <code>parted</code> and <code>mkswap</code> commands.

Tuning the jboss Memory Size

During installation, the recommended default maximum memory size of the jboss application server is configured in the `ovjboss.jvmargs` file. SOM 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 verify that 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 the table "[Recommended Hardware System Requirements for the SOM Management Server](#)" on the [previous page](#).

The current Maximum Attemptable Memory value (adjusted with `-Xmx`) and a memory region report are available in the SOM console with **Help > System Information**. It is recommended that this `-Xmx` value not exceed the amount of unused physical RAM. If the jboss JVM's entire virtual memory space does not fit in physical memory, the operating system thrashes as jboss randomly accesses its memory. SOM supports a maximum `-Xmx` memory value of 24 GB.

You can approximate the amount of unused physical RAM available to jboss. From the amount of physical memory available on the server, subtract the following amounts:

- Memory for the operating system: 1 - 2 GB
- Memory for the somdbmgr process: 2 - 8 GB

If jboss memory resources are getting low, a message appears on the SOM console sign-on page, at the bottom of the SOM console, and at the top of SOM forms. When jboss 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

Fix by increasing the `-Xmx` value in `ovjboss.jvmargs`.

- [Critical] The region 'Tenured Gen' is at 100.00% usage

Fix by increasing the `-Xmx` value in `ovjboss.jvmargs`.

- [Major] The region 'PS Perm Gen' is at 92.66% usage

- [Critical] The region 'Perm Gen' is at 96.32% usage

The Perm Gen memory area is the area used for on-demand loading of Java classes. PS Perm Gen is the name of the memory area used with multiple CPU systems. Fix by restarting somjboss. If the problem continues, fix by increasing the `-XX:MaxPermSize` such as changing `-XX:MaxPermSize=128m` to `-XX:MaxPermSize=256m`.

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

1. `ovstop -c somjboss`
2. Edit the `ovjboss.jvmargs` file:
 - **Windows:** `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)
#
-Xms16g
-Xmx24g
#-Xss128m
```
4. `ovstart -c`

Tuning jboss Server Properties

These are the default parameters configured out of the box:

```
# Primary work manager thread pool configuration
-Dnmsas.server.workManagerPool.threads.min=200
-Dnmsas.server.workManagerPool.threads.max=250
-Dnmsas.server.workManagerPool.queue.limit=10000

# Discovery architecture - job dispatcher thread pool
configuration
-Dda.dispatcherTotalCapacity=100
-Dda.bulkDiscoveryQueueSize=100
-Dda.bulkDiscoveryIntervalInSeconds=20

-Dda.maxConcurrentHostStoragePostProcessors=5
-Dda.maxConcurrentSwitchFabricPostProcessors=5
-Dda.percentDataCollectionJobs=50
```

For Medium environments, the settings should be changed to:

```
# Primary work manager thread pool configuration
-Dnmsas.server.workManagerPool.threads.min=400
-Dnmsas.server.workManagerPool.threads.max=500
-Dnmsas.server.workManagerPool.queue.limit=10000

# Discovery architecture - job dispatcher thread pool
configuration
-Dda.dispatcherTotalCapacity=200
-Dda.bulkDiscoveryQueueSize=100
-Dda.bulkDiscoveryIntervalInSeconds=1200

-Dda.maxConcurrentHostStoragePostProcessors=10
-Dda.maxConcurrentSwitchFabricPostProcessors=10
-Dda.percentDataCollectionJobs=80
```

For Large environments, the settings should be changed to:

```
# Primary work manager thread pool configuration
-Dnmsas.server.workManagerPool.threads.min=500
-Dnmsas.server.workManagerPool.threads.max=600
-Dnmsas.server.workManagerPool.queue.limit=10000

# Discovery architecture - job dispatcher thread pool
configuration
-Dda.dispatcherTotalCapacity=200
-Dda.bulkDiscoveryQueueSize=100
-Dda.bulkDiscoveryIntervalInSeconds=1200

-Dda.maxConcurrentHostStoragePostProcessors=10
-Dda.maxConcurrentSwitchFabricPostProcessors=10
-Dda.percentDataCollectionJobs=80
```

Performance and Sizing for the SOM Reporting Server

This section describes the process of sizing of the hardware needed to deploy the SOM content packs in your environment and how to modify various applications, databases, and operating system

parameters to achieve optimal performance.

The objective of sizing is to estimate the system resource required to ensure the deployed system meets the performance objectives.

The following factors affect SOM reporting server hardware sizing:

- The content you will deploy and the load for each of the content pack
- The retention period for each of the content

Calculating Content Load

This section provides the guidelines to calculate the load for the standard SOM content packs. The load is computed based on certain assumptions and approximations. While choosing hardware, include enough headroom to handle the actual load and anticipated growth. The load calculations are based on the statistics and metrics data collected per hour.

HP Storage Operations Management Content Pack for Switches

The size of the environment for the HP Storage Operations Management Content Pack for Switches content is determined by the total number of SAN switch ports for which statistics collection is configured. The default stats collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for Switches content is calculated as:

$$T (\text{Switch CP}) = \text{Number of switch ports} * 4$$

For example, with the following environment:

Total switch ports discovered and configured for stats collection are : 5000

The HP Storage Operations Management Content Pack for Switches throughput is:

$$5000 * 4 = 20000 \text{ records / hour}$$

HP Storage Operations Management Content Pack for Hosts

The size of the environment for the HP Storage Operations Management Content Pack for Hosts content is determined by the total number of ESX hosts discovered and configured for CPU and memory statistics collection and the total number of host disks configured for DiskIO statistics collection. The CPU and memory statistics are collected only for ESX servers. The DiskIO statistics are collected for all managed hosts. The default statistics collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for Hosts content is calculated as:

$$T (\text{Host CP}) = (2 * \text{ESX hosts} + \text{total number of disks}) * 4$$

For example, with the following environment:

- Total ESX hosts discovered and configured for CPU and memory statistics collection: 200
- Total number of host disk drives configured for DiskIO statistics collection:
Total hosts configured for DiskIO statistics collection * Average number of disks per host
= 2000 hosts * 10 disks per host
= 20000 disks

The HP Storage Operations Management Content Pack for Hosts throughput is:

$$(2 * 200 + 20000) * 4 = 81600 \text{ records / hour}$$

HP Storage Operations Management Content Pack for Storage Systems

The size of the environment for the HP Storage Operations Management Content Pack for Storage Systems content is determined by the total number of arrays, storage pools, storage volumes, NAS filers, snapshots, NAS extents, and quotas discovered. The default capacity metrics collection interval is 24 hours.

The throughput of the HP Storage Operations Management Content Pack for Storage Systems content is calculated as:

$$T (\text{Storage System CP}) = [(\# \text{ Arrays} + \# \text{ Pools} + \# \text{ Volumes}) + (\# \text{ Filers} + \# \text{ Snapshots} + \# \text{ Extents} + \# \text{ Quotas})] / 24$$

For example, with the following environment:

- SAN Arrays Discovered : 30
- NAS Filers Discovered : 20
- # Pools : 30 * 20 = 600 (20 is the average number pools per array)
- # Volumes : 30 * 2500 = 75000 (2500 is the average number of volumes per array)
- # Snapshots : 20 * 10000 = 200000 (10000 is the average number of snapshots per filer)
- # Extents : 20 * 100 = 2000 (100 is the average number of extents per filer)
- # Quotas : 20 * 1000 = 20000 (1000 is the average number of quotas per filer)

The HP Storage Operations Management Content Pack for Storage Systems throughput is:

$$[(30 + 600 + 75000) + (20 + 200000 + 2000 + 20000)]/24 = \sim 12402 \text{ records / hour}$$

HP Storage Operations Management Content Pack for HP 3PAR Performance Statistics

The size of the environment for the HP Storage Operations Management Content Pack for HP 3PAR Performance Statistics content is determined by the total number of HP 3PAR arrays discovered and configured for various statistics collection. The default statistics collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for HP 3PAR Performance Statistics content is calculated as:

$$T \text{ (HP 3PAR Perf CP)} = (\# \text{ 3PAR Arrays} + \# \text{ Volumes} + \# \text{ Controllers} + \# \text{ Pools} + \# \text{ FCPorts} + \# \text{ DiskDrives}) * 4$$

HP Storage Operations Management Content Pack for HP EVA Performance Statistics

The size of the environment for the HP Storage Operations Management Content Pack for HP EVA Performance Statistics content is determined by the total number of HP EVA arrays discovered and configured for various statistics collection. The default statistics collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for HP EVA Performance Statistics content is calculated as:

$$T \text{ (HP EVA Perf CP)} = (\# \text{ HP EVA Arrays} + \# \text{ Volumes} + \# \text{ Controllers} + \# \text{ Pools} + \# \text{ FCPorts} + \# \text{ DiskDrives}) * 4$$

Note: The HP Storage Operations Management Common Content Pack and HP Storage Operations Management Content Pack for End-to-End Connectivity do not contribute to the throughput calculation as they include only inventory reports and not reports on statistics or metrics.

HP Storage Operations Management Content Pack for EMC CLARiiON and VNX Performance Statistics

The size of the environment for the HP Storage Operations Management Content Pack for EMC CLARiiON and VNX Performance Statistics content is determined by the total number of EMC CLARiiON/VNX arrays discovered and configured for various statistics collection. The default statistics collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for EMC CLARiiON and VNX Performance Statistics content is calculated as:

$$T \text{ (EMC CLAR_VNX Perf CP) } = (\# \text{ CLAR/VNX Arrays} + \# \text{ Volumes} + \# \text{ Controllers} + \# \text{ FCPorts} + \# \text{ DiskDrives}) * 4$$

For example, with the following environment:

- EMC CLARiiON/VNX Arrays Discovered : 10
- # Volumes : $10 * 750 = 7500$ (750 is the average number of volumes per array)
- # Controllers : $10 * 2 = 20$ (2 is the average number of controllers per array)
- # FCPorts : $10 * 16 = 160$ (16 is the average number of FC Ports per array)
- # DiskDrives : $10 * 100 = 1000$ (100 is the average number of disks per array)

The HP Storage Operations Management Content Pack for EMC CLARiiON and VNX Performance Statistics throughput is:

$$(10 + 7500 + 20 + 160 + 1000) * 4 = 34760 \text{ records/hour}$$

HP Storage Operations Management Content Pack for EMC DMX Performance Statistics

The size of the environment for the HP Storage Operations Management Content Pack for EMC DMX Performance Statistics content is determined by the total number of EMC DMX arrays discovered and configured for various statistics collection. The default statistics collection interval is 15 minutes.

The throughput of the HP Storage Operations Management Content Pack for EMC DMX Performance Statistics content is calculated as:

$$T \text{ (EMC DMX Perf CP) } = (\# \text{ DMX Arrays} + \# \text{ Volumes} + \# \text{ Contrls} + \# \text{ FCPorts}) * 4$$

Retention Period

The following table shows the default retention periods for SOM data. If you increase the retention period, plan for more disk space.

Table Type	Default Retention Period (Days)
Raw	90
Hourly	365
Daily	1825

Deployment Size

For the SOM reporting server, the SHR deployment size is categorized as small or medium based on the number of elements data collected from SOM data sources. The following table shows the reporting throughput values and the recommended SHR deployment sizes for the SOM reporting server. For the definition of the SOM management server tiers, see ["Performance and Sizing for the SOM Management Server"](#) on page 21.

SOM Management Server Tier	Approximate Throughput (records/hour)	Recommended SHR Deployment Size
Entry	~175K	Small
Small	~320K	Small
Medium	~600K	Medium
Large	~950K	Medium

Hardware and Software Configuration

You must provision these minimum hardware and software requirements for HP Service Health Reporter. For optimal SHR performance, supply more hardware resources (CPU, RAM, and disk space) than the minimum requirements.

SHR Environment Size	System Configuration				Sybase IQ Configuration (all measures in GB)				
	Deployment Type	CPU (64 bit)	RAM	Disk Space for DB	Disk Space for S/W	iqmc	iqtc	iqml	main dbspace
Small with all SOM content packs	4 CPU cores	8 GB	400 GB	100 GB	1.1	1.1	1.1	49	49
Medium with all SOM content packs	8 CPU cores	16 GB	800 GB	200 GB	3.7	3.7	3.7	98	98

Sybase IQ Database

Traditional OLTP databases store data row-wise fashion which is the preferred mechanism for transaction processing. Sybase IQ stores data by column which is suitable for queries that extract few fields from a table. Sybase IQ performance is generally limited by the CPU, memory, and storage available to Sybase IQ process. An increase in CPU drives more memory and disk usage, so all aspects of the system should be taken into account while scaling up for Sybase IQ.

The following Sybase IQ startup parameters, located in the `$PMDB_HOME/config/pmdbconfig.cfg` file, can be configured for better performance. If you make any changes to the following parameters, you must restart the Sybase IQ database:

- **iqgovern:** Sybase IQ calculates the value for this parameter based on the system configuration. Do not modify this parameter except when Sybase IQ is deployed on a lower configuration system. If Sybase IQ is deployed on 4 CPU, 8 GB RAM system, add the entry `iqgovern=50` in the `$PMDB_HOME/config/pmdbconfig.cfg` file.
- **gm:** This parameter limits the total number of concurrent user connections to the Sybase IQ server. By default, SHR sets this parameter to 150. If you have installed only one or two SOM content packs, you can set this parameter to a lower value for better performance.

Note: Sybase IQ allocates memory for both active and idle connections and a lower value of `gm` prevents overheads.

- **iqmc, iqtc and iqlm:** Sybase IQ uses main, temporary, and large buffer caches for database operations. For recommended cache memory in different deployment environments, see ["Hardware and Software Configuration" on the previous page](#). You can increase the value of the buffer cache for better database performance depending on the physical memory available on the system.
- **main dbspace:** SHR creates main dbspace and temporary dbspace files in the same directory (disk). The SHR Internal Monitoring (IM) Service extends the `pmdb_user_main` database size automatically by adding new files when the database space usage crosses certain threshold value. The threshold value is configured using the `dbspace.max.percentage` parameter in the `config.prp` file. The default value of this parameter is 85 percent. It is recommended that an initial file size of higher volume be set instead of depending on SHR IM Service to add the file. Multiple smaller sets of data files will degrade the performance. Sybase IQ performs best with one large file compared to multiple smaller files.
- **temp dbspace:** The SHR IM Service does not extend the temporary dbspace. For better Sybase IQ performance, consider adding more data files to the dbspace manually, preferably from a

different disk, after the post-install configuration phase. This will increase the I/O rate and evenly distribute data in the database files, which will improve the overall database performance.

To improve performance, it is recommended to relocate the following Sybase IQ database files to different physical drives prior to the start of data collection:

- Catalog Store (for example, `pmdb.db`) - After the database is created, this file cannot be moved.
- IQ Store or IQ_SYSTEM_MAIN (for example, `pmdb.iq`) - After the database is created, this file cannot be moved.
- IQ Temporary store or IQ_SYSTEM_TEMP (for example, `pmdb.iqtmp`) - After the database is created, this file can be relocated.
- IQ message log or IQ_SYSTEM_MSG (for example, `pmdb.iqmsg`) - After the database is created, this file can be relocated.
- Catalog Store transaction log (for example, `pmdb.log`) - After the database is created, this file cannot be moved.
- User main or PMDB_USER_MAIN (for example, `pmdb_user_main(x).iq`) - During the creation of the database, you can specify a different location.

Sybase IQ performs better if you increase CPU and memory resource on the system.

SAP Business Objects

SHR reports are web intelligence documents. The Web Intelligence (WebI) Report Server in SAP Business Objects is responsible for generating Web Intelligence documents. The maximum memory available to the WebI server is only 2 GB as it is a 32-bit process. To overcome this limitation, estimate the load on the server and deploy the required number of WebI servers.

The load on the WebI Server depends on the number of simultaneous connections to the server and the complexity and size of the report documents accessed. If the server is not configured correctly, while accessing reports you may get errors like “Web Intelligence Server is busy” and “Server reached maximum number of simultaneous connections.”

Following are some of the steps you can do to avoid these errors:

- While accessing reports, default values for prompts can result in several thousands of records being loaded to the Web Intelligence server. You should specify appropriate values for prompts to avoid high load on the server.

- The default value for the maximum number of connections is 50. If the load on the server per request is high, then you may see the Server Busy error message. Consider reducing this parameter and instead add one more Web Intelligence Server to support additional connection requests. While adding additional servers, always add one Web Intelligence Processing Server per CPU core per machine.

To summarize, the objective is to arrive at the number of WebI servers and maximum connections per server so that the server allows all users to connect and open report documents without reaching the 2 GB limit.

Obsolescence Plans

As of March 2015, there are no plans to end support for any currently supported version of Storage Operations Manager.

We appreciate your 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, March 2015 (Storage Operations Manager 10.00)

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 storage-management-doc-feedback@hp.com.