



Best practices configuring HP ProLiant DL580 Gen8 Servers With Microsoft Windows Server

Table of contents

Introduction.....	2
HP ProLiant DL580 Gen8 Server overview	2
HP ProLiant DL580 Gen8 Server architecture	2
HP ProLiant DL580 Gen8 Server UEFIROM	3
HP ProLiant DL580 Gen8 Server management	4
Aligning the server hardware configuration with your operating system	4
Operating system maximum configuration details	5
Hyper-V maximum configuration details.....	6
Pre-configuration tasks.....	6
Best practices for configuring the HP ProLiant DL580 Gen8 Server	7
Determining I/O adapter placement.....	7
Considerations based on boot mode selection.....	7
Configuring power management.....	7
Best practices for configuring Windows Server on the HP ProLiant DL580 Gen8 Server	9
Windows Server 2008 SP2	10
Windows Server 2008 R2 SP1, Windows Server 2012, and Windows Server 2012 R2	11
HP ProLiant DL580 Gen8 Server HP Memory Quarantine	15
HP Advanced error recovery with Windows Server 2012 and Windows Server 2012 R2	15
Best practices for configuring Hyper-V on the HP ProLiant DL580 Gen8 Server	15
Windows Server 2008 SP2 Hyper-V.....	15
Windows Server 2008 R2 SP1 Hyper-V	15
Windows Server 2012 Hyper-V and Windows Server 2012 R2 Hyper-V.....	16
HP ProLiant System Optimizer for Windows Server x64 Editions	18
Resources, contacts, or additional links.....	22
HP resources.....	22
Microsoft resources	22

Introduction

This paper provides recommendations and best practices for configuring an HP ProLiant DL580 Gen8 Server and Microsoft® Windows® Server operating system to optimize the scalability and resiliency of this solution.

The DL580 Gen8 server supports the following x64 versions of the Windows Server operating systems, including Hyper-V:

- Microsoft Windows Server 2008 with Service Pack 2 (SP2)
- Microsoft Windows Server 2008 R2 with Service Pack 1 (SP1)
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2

We provide recommendations for all supported Windows Server operating systems; however, to take full advantage of the DL580 Gen8 server technology, we recommend using Windows Server 2012 R2. We also recommend using HP ProLiant System Optimizer, a software utility (described later in this document) for implementing many of the best practices discussed in this document.

HP ProLiant DL580 Gen8 Server overview

The DL580 Gen8 server is a four-socket (4S) scale-up platform designed for performance, efficiency, and reliability. To meet the needs of your environment and to utilize the Windows Server operating system to its full potential, the DL580 Gen8 server offers many benefits.

Figure 1. HP ProLiant DL580 Gen8 Server



Featuring Intel® Xeon® E7-4800/8800 v2 processors, the DL580 Gen8 server delivers blazing fast results with enhanced processor performance, more memory slots, greater I/O bandwidth, and increased storage performance. It also offers security and data protection features for system resiliency that your business can depend on. With intelligent manageability through HP OneView, HP Integrated Lights-Out 4 (iLO 4) firmware, and user-inspired features, you can achieve faster, lower cost infrastructure management.

The DL580 Gen8 server is well suited for data-intensive workloads where performance and scalability are primary concerns. These environments include large online transaction processing and decision support databases; large-scale consolidation and virtualization; and resource-intensive applications, such as customer relationship management (CRM), capacity requirements planning (CRP), and enterprise resource planning (ERP).

For more information and technical specifications for this server, see the HP ProLiant DL580 Gen8 Server web page at hp.com/servers/dl580-gen8.

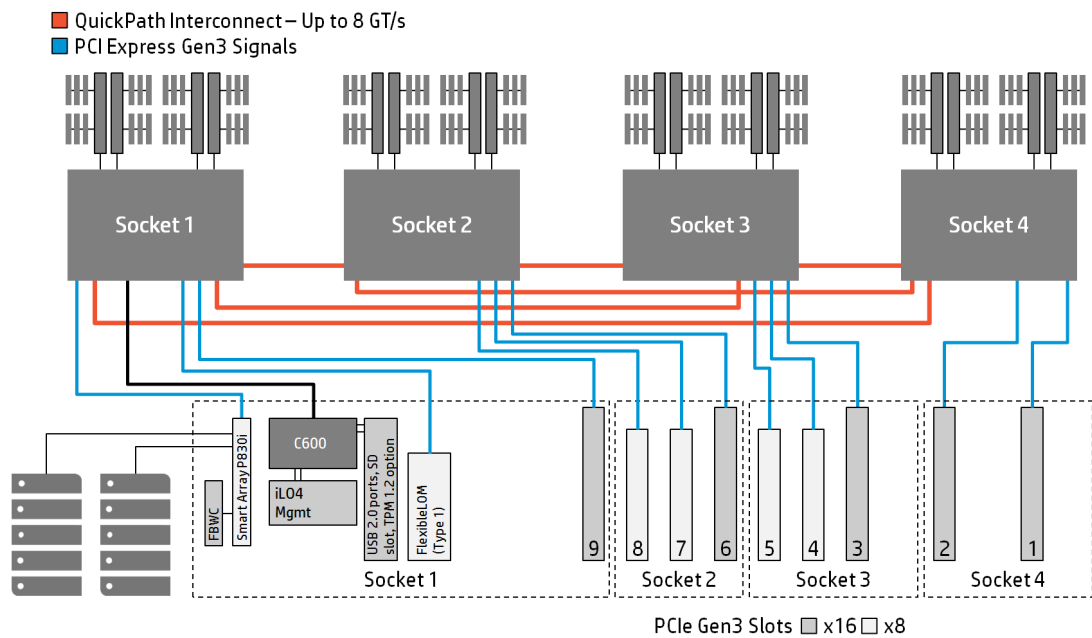
HP ProLiant DL580 Gen8 Server architecture

The DL580 Gen8 server architecture lets you configure your server to meet the needs of demanding, data-intensive workload environments. The basis for the DL580 Gen8 server architecture is the Intel Xeon E7-4800/8800 v2 processors that support Non Uniform Memory Architecture (NUMA). Each processor has its own set of memory that connects directly to a set of peripherals.

As illustrated in Figure 2, key features of the DL580 Gen8 server architecture include:

- Processors: With four processor sockets, you can achieve the performance that you need by configuring your server with up to four Intel Xeon E7-4800/8800 v2 processors. These processors can have up to 6, 8, 10, 12, or 15 cores.
- Memory: With 96 DDR3 DIMM slots, you can achieve the maximum memory configuration of 6 TB by populating all slots with 64-GB DDR3 DIMMS.
- I/O expansion: Nine PCIe slots give you the flexibility to add I/O adapters to meet your environment’s needs:
 - Five PCIe Gen3, x16 electrical full length/full height slots for adapters that require high bandwidth and wattage, such as HP IO Accelerators and General-Purpose Computation on Graphics Processing Units (GPGPUs)
 - Four PCIe Gen3, x8 electrical full length/full height slots

Figure 2. HP ProLiant DL580 Gen8 Server architecture



HP ProLiant DL580 Gen8 Server UEFIROM

The DL580 Gen8 server allows you to choose between two boot modes: Legacy mode or Unified Extensible Firmware Interface (UEFI) mode. You can select the boot mode in the “Boot Options” section of the BIOS/Platform Configuration (RBSU).

For more information about UEFI mode and the DL580 Gen8 server, see the HP UEFI home page at hp.com/go/uefi.

The Windows Server operating systems can utilize the benefits that UEFI mode offers. See the “Considerations based on boot mode” section of this paper for information about Windows Server support.

Figure 3. HP ProLiant DL580 Gen8 Server boot modes



HP ProLiant DL580 Gen8 Server management

The DL580 Gen8 server includes the complete set of embedded management features that support the lifecycle of ProLiant servers, from initial deployment, through ongoing management, to service alerting. These embedded management features include:

- HP OneView provides integrated management.
- HP Intelligent Provisioning reduces system deployment time.
- HP iLO Management Engine with HP Agentless Management provides embedded intelligence for managing your server.
- HP Smart Update solution reduces the time required for system maintenance and updates.

Aligning the server hardware configuration with your operating system

When determining the configuration of your DL580 Gen8 server, be aware of the maximum resources that your version of Windows Server can utilize. To avoid unused resources, align the server configuration to meet the operating system limitations. For example, the DL580 Gen8 server can have up to 6 TB of memory; however, some versions of the Windows Server operating systems may not support the full memory scalability of the server.

Operating system maximum configuration details

Use the information in Table 1 to help you align the DL580 Gen8 server configuration with the Windows Server operating system limits for the Windows Server operating system version that you are running.

Table 1. Operating system maximum configuration support matrix.

Operating system	Logical processors	Memory (RAM)	x2APIC support
Windows Server 2008 with SP2			
Enterprise Edition Datacenter Edition	64	1 TB	No
Standard Edition Embedded Edition Web Edition	64	32 GB	No
High Performance Computing (HPC) Edition	64	128 GB	No
Windows Server 2008 R2 with SP1			
Enterprise Edition Datacenter Edition	256	2 TB	Yes
Standard Edition Embedded Edition Web Edition	256	32 GB	Yes
High Performance Computing (HPC) Edition	256	128 GB	Yes
Windows Server 2012			
Standard Edition Datacenter Edition	640	4 TB	Yes
Windows Server 2012 R2			
Standard Edition Datacenter Edition	640	4 TB	Yes

Hyper-V maximum configuration details

Use the information in Table 2 to help you align the DL580 Gen8 server configuration with the Windows Server Hyper-V operating system limits for the Windows Server version that you are running.

Table 2. Hyper-V maximum configuration support matrix.

Operating system	Maximum allowed per host			Maximum number of virtual machines running guest operating systems*	Maximum allowed per guest	
	Logical processors	Virtual processors	Memory (RAM)		Virtual processors	Virtual memory (RAM)
Windows Server 2008 SP2 Hyper-V	24	192	1 TB	192	4	64 GB
Windows Server 2008 R2 SP1 Hyper-V	64	512	1 TB	384	4	64 GB
Windows Server 2012 Hyper-V	320	2048	4 TB	1024	64	1 TB
Windows Server 2012 R2 Hyper-V	320	2048	4 TB	1024	64	1 TB

* Each version of Microsoft Windows Server Hyper-V has its own limit for Virtual Machines running guest operating systems; there is also a limit of guest licenses per version or edition of the Windows Server operating system. For example, the “Standard Edition” of Windows Server 2012 and Windows Server 2012 R2 has a limit of 4 guests; whereas, the “Datacenter Edition” provides licensing for an unlimited number of guests. For licensing information and details, please refer to the Microsoft website at microsoft.com, or call your Microsoft representative.

Pre-configuration tasks

Before installing the Windows Server operating system on the DL580 Gen8 server, we recommend that you make sure that your server has the latest firmware, drivers, and HP software. For optimal performance and functionality, complete the following tasks:

- Review the HP ProLiant DL580 Gen8 Server User Guide.
The user guide provides information to help you configure the server for optimal performance, availability, and manageability. It also discusses software that can help you deploy, manage, and support the server. You can find the user guide on the HP ProLiant DL580 Gen8 Server web page at hp.com/servers/dl580-gen8.
- Download the HP Service Pack for ProLiant (HP SPP) to make sure that you have the latest firmware, drivers, and HP software installed on your server.
The HP SPP is a comprehensive system software and firmware solution delivered as a single ISO file. Using the HP Smart Update Manager (HP SUM) as the deployment tool, the HP SPP installs the latest HP firmware, drivers, and software.
The DL580 Gen8 server requires HP SPP Version 2014.02.0 (or later). You can download the HP SPP at hp.com/go/spp or obtain the HP SPP CD on the HP Support page at hp.com/support.
- Update the UEFIROM to the latest version. The DL580 Gen8 server should have UEFIROM version 01/14/2014(or later).
ROM updates for the DL580 Gen8 are available from the HP Support Center at hp.com/support/dl580gen8.

Determine which boot mode you will use: Legacy mode or UEFI mode. The DL580 Gen8 server ships with Legacy mode enabled by default. You can change or configure the boot mode in the “Boot Options” section of the BIOS/Platform Configuration (RBSU).For more information about UEFI mode and the DL580 Gen8 server, see the HP UEFI home page at hp.com/go/uefi. For more information factors that can affect your decision, see the “Considerations based on boot mode” section of this paper.

Best practices for configuring the HP ProLiant DL580 Gen8 Server

This section provides recommendations for DL580 Gen8 server hardware and ROM settings when running a Windows Server operating system. Before installing the Windows Server operating system, make sure that you have considered these recommendations, and implement them as necessary for your environment.

Determining I/O adapter placement

As illustrated in the DL580 Gen8 server architecture diagram (Figure 2 in the “HP ProLiant DL580 Gen8 Server architecture” section), the number of processors installed in the server determines the number of PCIe slots that are available for additional I/O adapters. For example, if the server has two processors, then I/O slots 6 through 9 are available for use.

To get the best I/O performance, add an I/O adapter to the I/O slot that matches its PCIe width (x8 or x16).

Considerations based on boot mode selection

The DL580 Gen8 server gives you a choice to configure the boot mode for either Legacy mode or UEFI mode. The server ships with Legacy mode enabled. You can change or configure the boot mode in the “Boot Options” section of the BIOS/Platform Configuration (RBSU).

Boot Mode Limitations for Windows Servers 2008 SP2 and Windows Server 2008 R2 SP1

The server ships with Legacy mode enabled. If you choose to enable UEFI mode and are running Windows Server 2008 SP2 or Windows Server 2008 R2 SP1, then you must *disable* “UEFI Optimized Boot” in the BIOS/Platform Configuration (RBSU). This option is enabled by default. This change is required to work around an issue in Windows 2008 SP2 and Windows Server 2008 R2 SP1 that requires legacy BIOS components for video operations in Windows Server.

Boot Device Considerations

Legacy mode and UEFI mode have different schemes for partitioning and booting the operating system. The Legacy mode necessitates a Master Boot Record (MBR) boot device, whereas UEFI mode requires a Globally Unique Identifier (GUID) Partition Table (GPT) boot device. UEFI mode offers a standard firmware interface that eases system configuration, troubleshooting, and support of large boot devices.

After configuring your server for either Legacy mode or UEFI mode, you must install the operating system to match the mode chosen for your server configuration. Windows Server detects the boot mode and creates partitions accordingly; however, the device is not bootable if you change the boot mode after installing the operating system.

For more information about UEFI settings, see the following documentation:

- HP UEFI System Utilities User Guide at hp.com/go/ProLiantUEFI/docs
- HP UEFI Shell User Guide at hp.com/go/ProLiantUEFI/docs

For more information about UEFI and the DL580 Gen8 server, see the HP UEFI home page at hp.com/go/uefi.

Configuring power management

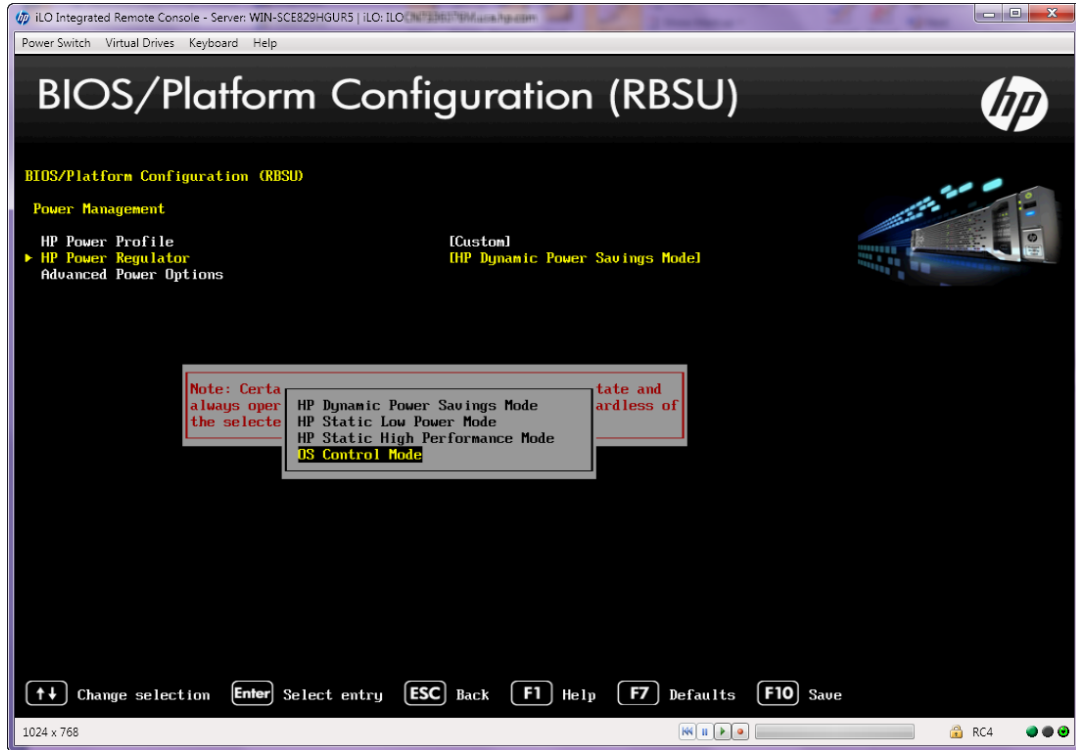
ProLiant servers are pre-configured to balance power and performance. Preset HP Power Profiles are also available to offer power configuration options depending on your priority: performance or power consumption.

When running a DL580 Gen8 server with a large number of processors, memory, and I/O in a demanding workload environment such as Microsoft SQL Server; there is a custom option for setting the Power Regulator to “OS Control Mode” that may be beneficial. In this type of environment, our testing shows that the “OS Control Mode” settings improve performance while still controlling power consumption. However, all environments are different and we recommend trying these settings with your workload and evaluating your results.

To see if the OS Control Mode settings provide a benefit for your environment, complete the following steps:

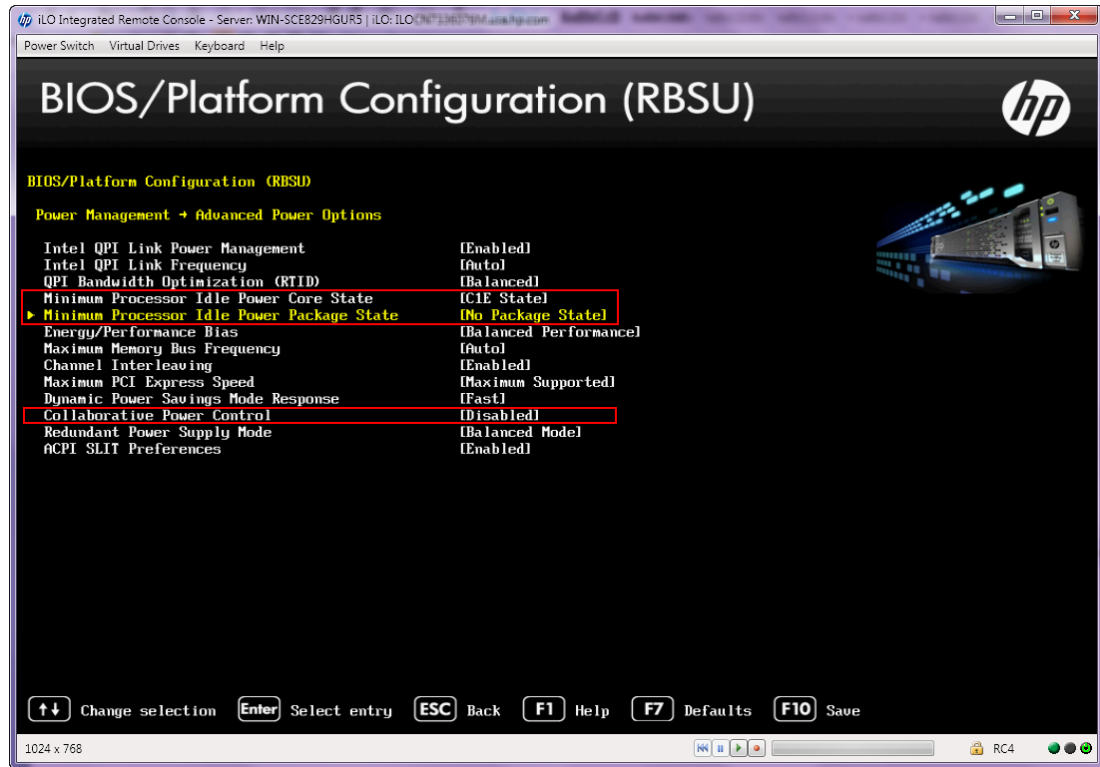
1. During the server boot process, press **F9** to start the UEFI System Utility.
2. Select **System Configuration**, and then press **Enter**.
3. Select **BIOS/Platform Configuration (RBSU)**, and then press **Enter**.
4. Select **Power Management Options**, and then press **Enter**.
5. Select **HP Power Profile**, and press **Enter**.
6. Select **Custom**, and then press **Enter**.
7. Select **HP Power Regulator**, and press **Enter**.
8. Select **OS Control Mode**, and then press **Enter**.

Figure 4. Configuring OS Control Mode



9. Select **Advanced Power Management Options**, and then press **Enter**.
10. Select **Minimum Processor Idle Power Package State**, and then press **Enter**.
11. Select **No Package State**, and then press **Enter**
12. Select **Minimum Processor Idle Power Core State**, and press **Enter**.
13. Select **C1E**, and then press **Enter**.
14. Select **Collaborative Power Control**, and press **Enter**.
15. Select **Disabled**, and then press **Enter**.

Figure 5. Configuring Advanced Power Options



16. Press **Esc** to exit the menu, and then press **F10** key to confirm your changes and reboot the server.

Note

Changing the OS Control Mode settings does not affect the Windows Server operating system power profiles and settings. For information on the Windows Server operating system power profiles and settings and Microsoft power tuning guidelines, see the links available in the “Resources, contacts, or additional links” section of this paper.

Best practices for configuring Windows Server on the HP ProLiant DL580 Gen8 Server

This section provides recommendations and best practices for running Windows Server on the DL580 Gen8 server. Refer to the appropriate section for your operating system version. Review these recommendations before installing the Windows Server operating system.

For all Windows Server operating systems, we recommend the following practices:

- Install the latest Microsoft hotfixes for the version of Windows Server operating system running on your server.
- Install the HP ProLiant System Optimizer for Windows Server x64 Editions
- Read the relevant Windows Server configuration whitepapers that we reference in the “Resources, contacts, or additional links” section of this paper.

Note

We provide recommendations for all supported Windows Server operating systems; however, to take full advantage of the DL580 Gen8 server technology, we recommend using Windows Server 2012 R2.

Windows Server 2008 SP2

The following sections provide best practices for configuring Windows Server 2008 SP2 on the DL580 Gen8 server.

Hyper-threading overview

Hyper-threading (HT) is an Intel proprietary technology for increasing parallel computational power (processor multi-tasking) by allowing the operating system to see and address each physical processor core as if it were two threads (logical processors). With hyper-threading, each processor core appears as two threads, and the Windows Server operating system sees each thread as a logical processor.

To improve performance, hyper-threading enables the operating system and applications to share work between each core's two logical processors, thereby making use of resources that would otherwise be idle. Hyper-threading is enabled by default on the DL580 Gen8 server.

Because the Windows Server 2008 SP2 operating system cannot recognize more than 64 logical processors, any additional logical processors beyond the maximum of 64 will sit idle. For this reason, when running Windows Server 2008 SP2 on a DL580 Gen8 server, we recommend disabling hyper-threading if you have more than 32 cores.

As an example, a DL580 Gen8 server with 4 processors and 10 cores per processor has 40 total cores. Since each core creates two threads, the total thread count for this configuration is 80 threads (or 80 total logical processors).

$40 \text{ total cores} \times 2 \text{ threads per core} = 80 \text{ total threads (logical processors)}$

The Windows Server operating system sees each thread as a logical processor; therefore, this server configuration has 80 total logical processors, which exceeds the maximum logical processor count (64) that Windows Server 2008 SP2 supports. As a result, in this situation we recommend disabling hyper-threading.

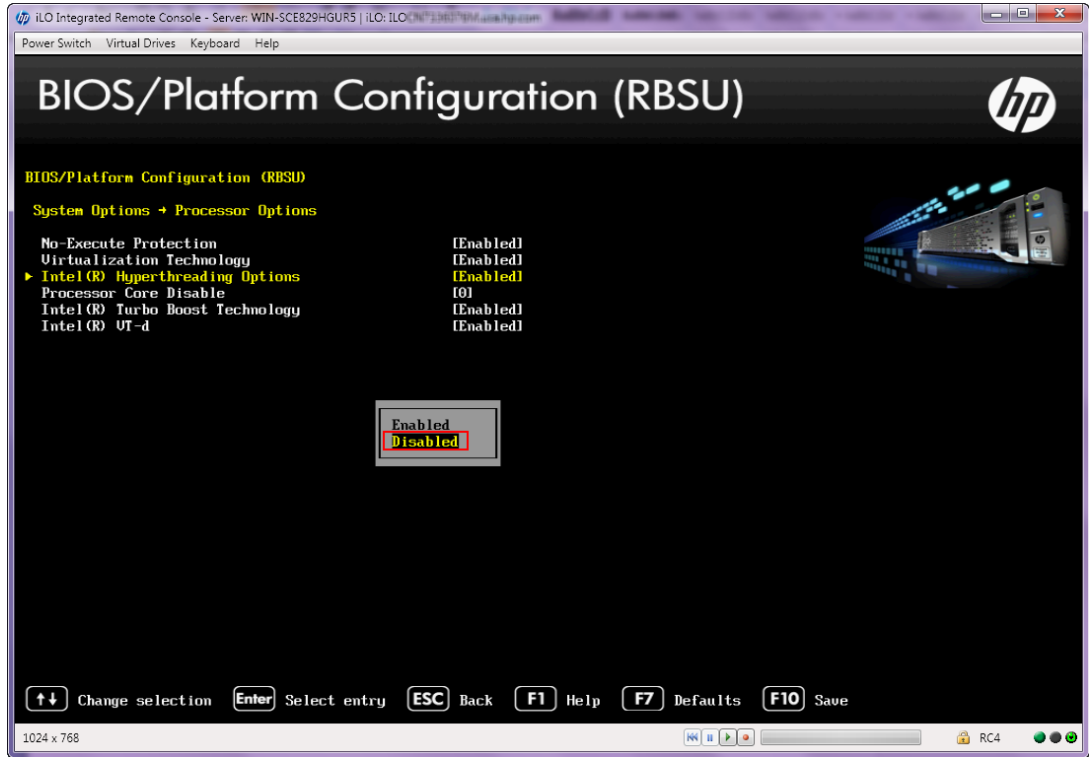
Disabling hyper-threading

Disable hyper-threading to keep logical processor count at or below the logical processor limitation of 64 logical processors.

Hyper-threading is controlled by the UEFI ROM. To disable hyper-threading, complete the following steps:

1. During the server boot process, press **F9** to start the UEFI System Utility.
2. Select **System Configuration**, and then press **Enter**.
3. Select **BIOS/Platform Configuration (RBSU)**, and then press **Enter**.
4. Select **System Options**, and then press **Enter**.
5. Select **Processor Options**, and then press **Enter**.
6. Select **Intel Hyper threading Options**, and then press **Enter**.
7. Select **Disabled** to turn hyper-threading OFF, and then press **Enter**.

Figure 6. Disabling hyper-threading



8. Press **Esc** to exit the menu, and then press **F10** to confirm your changes and reboot the system.

Windows Server 2008 R2 SP1, Windows Server 2012, and Windows Server 2012 R2

The maximum processors and memory limits for the Windows Server 2008 R2 SP1, Windows Server 2012, or Windows Server 2012 R2 operating systems can take full advantage of the DL580 Gen8 server resources. The following sections provide best practices for configuring these Windows Server operating systems on the DL580 Gen8 server.

Determining whether to use hyper-threading for your application

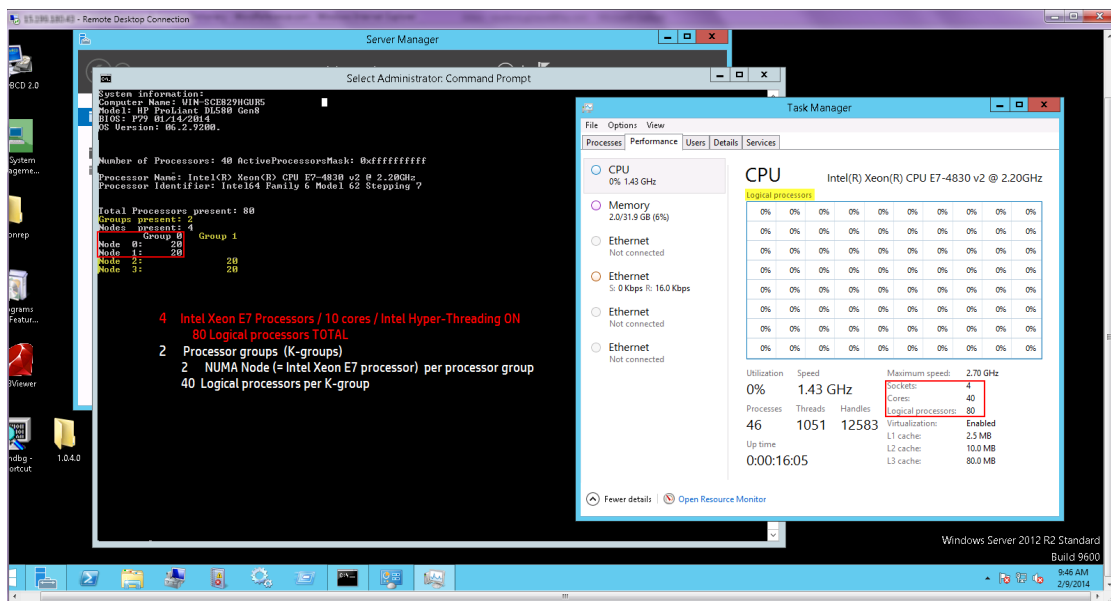
Processor groups

The concept of a processor group (also known as a k-group) was introduced in Windows Server 2008 R2 when the operating system increased its scalability to support more than 64 logical processors. A processor group is a static set of up to 64 logical processors. Processor groups are numbered starting with zero. If you have fewer than 64 logical processors, then there will be a single processor group: Group 0.

For optimal performance, the Windows Server operating system adjusts the size of processor groups (up to 64 logical processors) depending on the total core count.

As an example, a DL580 Gen8 server with 4 processors, 10 cores per processor, and hyper-threading enabled has 80 total logical processors. In this case, each processor group encompasses 2 sockets, or 40 logical processors.

Figure 7. Determining logical processors



For more information about processor groups, see the “Processor Group” topic on the Microsoft Developer Network website at msdn.microsoft.com/en-us/library/dd405503%28VS.85%29.aspx.

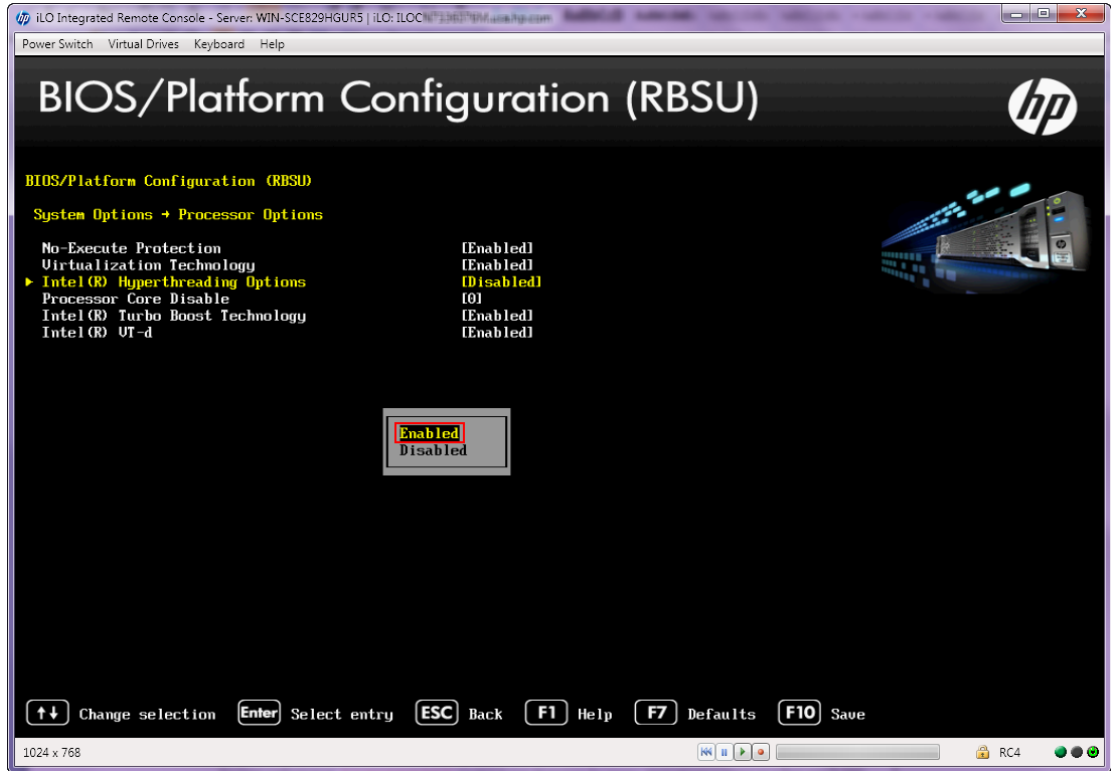
Applications that are aware of processor groups

New applications and many modified legacy applications have been written to run correctly with multiple processor groups. These applications are able to extend their operations across multiple processor groups. For these applications, it is beneficial to enable hyper-threading so that your application can take full advantage of the larger number of logical processors available in a DL580 Gen8 server configuration.

Hyper-threading is controlled by the UEFI ROM. It is enabled by default on the DL580 Gen8 server. Although enabled by default, if necessary, you can verify or change the hyper-threading setting by completing the following steps:

1. During system boot, press **F9** to run the UEFI System Utility.
2. Select **System Configuration**, and then press **Enter**.
3. Select **BIOS/Platform Configuration (RBSU)**, and then press **Enter**.
4. Select **System Options**, and then press **Enter**.
5. Select **Processor Options**, and then press **Enter**.
6. Select **Intel Hyperthreading Options** and then press **Enter**.
7. Select **Enabled** to turn hyper-threading ON, and then press **Enter**.

Figure 8. Enabling hyper-threading



8. Press **Esc** to exit the menu, and then press **F10** to confirm your changes and reboot the system.

Legacy applications that are not aware of processor groups

Legacy applications that are not aware of processor groups, such as Microsoft SQL Server 2008, 2005, or earlier, can still operate on the Windows Server operating system without modification. These legacy applications are assigned to the first processor group (Group0) and run by default on that group. This gives them access to a maximum of 64 logical processors for scheduling threads.

For best performance, it is recommended to disable hyper-threading for legacy applications running on a DL580 Gen8 server with more than 64 logical processors. Since the application will only have access to a maximum of 64 logical processors, it is better to utilize the 64 logical processors as cores instead of threads. For instructions on how to disable hyper-threading, see the “Disabling hyper-threading” section of this paper.

Process allocation for legacy applications that are not aware of processor groups

If you must run multiple legacy applications that are not aware of processor group on the same server, we recommend spreading the application load across multiple processor groups.

To review the process allocation, run the Microsoft Windows Task Manager Utility, and then complete the following steps:

1. Navigate to the **Processes** tab.
2. Right-click on the process name.
3. Select the **Set Affinity** option. If the Windows Server operating system has configured multiple k-groups, a drop-down box appears with the list of Processor Group names, starting with zero.

For information on assigning processor groups manually, see the Microsoft document *How to manually configure K-Group assignment on multiprocessor machines* at support.microsoft.com/kb/2506384.

CAUTION

The *How to manually configure K-Group assignment on multiprocessor machines* document contains information about modifying the Windows Registry. Use the Registry Editor at your own risk. Just as it is advisable to perform a system backup prior to any modification, you should backup the Registry before modifying it. If the Registry Editor is used incorrectly, serious issues could occur that may require a reinstallation of the operating system.

x2APIC

The Intel x2APIC interrupt architecture addresses the need for interrupt address scaling above 256 logical processors. When x2APIC is not enabled, the system works in the previous xAPIC mode. The x2APIC mode provides better performance in the delivery and handling of interrupts, both in hardware and software.

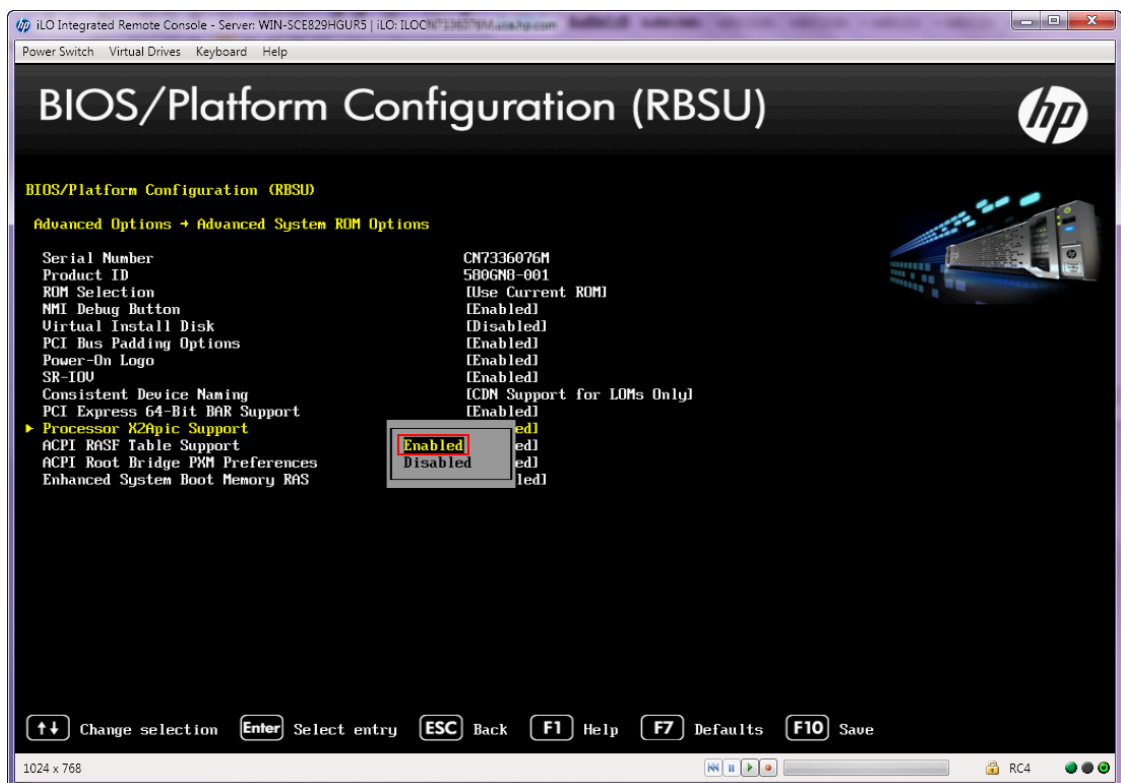
Our testing with Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 indicates that the x2APIC resolves some of the high contention issues in kernel data structures, when compared with xAPIC support. For this reason, we recommend enabling the x2APIC mode.

Enabling x2APIC mode

To enable the x2APIC mode in the UEFI ROM, complete the following steps:

1. During system boot, press **F9** to run the UEFI System Utility.
2. Select **System Configuration**, and then press **Enter**.
3. Select **BIOS/Platform Configuration (RBSU)**, and then press **Enter**.
4. Select **Advanced Options**, and then press **Enter**.
5. Select **Advanced System ROM Options**, and then press **Enter**.
6. Select **Processor x2APIC Support**, and then press **Enter**.
7. Select **Enabled** to enable x2APIC Mode, and then press **Enter**.

Figure 9. Enabling x2APIC support



8. Press **F10** to save.

HP ProLiant DL580 Gen8 Server HP Memory Quarantine

HP Memory Quarantine is an important feature on large memory footprint systems such as the DL580 Gen8 server. It limits the impact of uncorrectable memory errors by consistently inspecting the memory for errors. If it finds an error, it attempts to correct it, and eventually tags the address as bad if it is impossible to correct. When running Windows Server 2008 R2 SP1, Windows Server 2012, or Windows Server 2012 R2, the operating system receives a notification, and will not use the bad memory location (until the error is repaired) thus preventing a system crash.

HP Advanced error recovery with Windows Server 2012 and Windows Server 2012 R2

HP Advanced Error Recovery for the DL580 Gen8 server enables applications to recover from uncorrectable errors found in the processor, cache, or memory during execution. With this feature, if an error occurs, the server can continue to run, limiting the impact of the error to a killed or re-started thread, process, or virtual machine.

Both Windows Server 2012 and Windows Server 2012 R2 support this feature; however, Windows Server 2012 requires Microsoft hotfix 2901012, which is available at support.microsoft.com/kb/2901012/EN-US.

Best practices for configuring Hyper-V on the HP ProLiant DL580 Gen8 Server

Hyper-V is a Microsoft technology that enables the partitioning of a single physical machine into multiple virtual machines. Based on the hypervisor architecture, Hyper-V allows the creation and management of virtual machines, each one isolated from the others, running the same or different operating systems.

This section provides recommendations and best practices for running Hyper-V on the DL580 Gen8 server. Refer to the appropriate section for your Hyper-V version.

Note

We provide recommendations for all supported Windows Server operating system Hyper-V versions; however, to take full advantage of the DL580 Gen8 server technology, we recommend using Windows Server 2012 R2 Hyper-V.

Windows Server 2008 SP2 Hyper-V

Windows Server 2008 SP2 Hyper-V supports a maximum of 24 logical processors. It can only use the first 24 logical processors. If you are running Windows Server 2008 SP2 Hyper-V on a DL580 Gen8 server that has more than 24 logical processors, we recommend that you disable hyper-threading. For instructions on how to disable hyper-threading, see the “Disabling hyper-threading” section of this paper.

Windows Server 2008 R2 SP1 Hyper-V

Windows Server 2008 R2 SP1 Hyper-V supports a maximum of 64 logical processors. It can only use the first 64 logical processors. If you are running Windows Server 2008 R2 SP1 Hyper-V on a DL580 Gen8 server that has more than 64 logical processors, we recommend that you disable hyper-threading. For instructions on how to disable hyper-threading, see the “Disabling hyper-threading” section of this paper.

Windows Server 2012 Hyper-V and Windows Server 2012 R2 Hyper-V

This section provides best practices for running Windows Server 2012 Hyper-V or Windows Server 2012 R2 Hyper-V on the DL580 Gen8 server.

With Windows Server 2012 and Windows Server 2012 R2, Hyper-V provided some new features and enhancements, including the following:

- Concurrent live migrations
- Storage live migrations
- New Virtual Hard Disk VHDX format with up to 16 TB and support for 4 Kb sectors
- Hyper-V replicas for asynchronous replications of virtual machines, which allows for disaster recovery
- SR-IOV support for networking, which reduces processor usage for network traffic, reduces latency, and increases network efficiency
- Virtual switch enhancements to improve manageability, security, isolation, visibility, and scalability
- Native network interface card teaming support through Microsoft load balancing/failover (LBFO)

Hyper-V and NUMA

The DL580 Gen8 server can have a maximum of 120 logical processors: 4 processors of 15 cores with hyper-threading. This configuration will have multiple Hyper-V partitions (parent and children), each with its own set of virtualized hardware resources (processors, memory, and I/O adapters).

If the server has more than 64 logical processors, the parent partition is assigned 64 logical processors automatically. The Windows Server operating system distributes the logical processors evenly across the physical sockets (or NUMA nodes). For example, if there are 4 sockets with 15 cores and hyper-threading is enabled, the Windows Server operating system assigns 16 logical processors to each of the 4 sockets (or NUMA nodes), equaling the 64 logical processor maximum.

Hyper-V is NUMA-aware and implements virtual NUMA; the Guest operating system learns the underlying hardware topology. The virtual NUMA feature enables optimal performance and workload scalability in large virtual machine configurations by allowing NUMA-aware Guest operating systems and applications (like Microsoft SQL Server) to leverage inherent NUMA performance optimizations. The default virtual NUMA topology projected into a Hyper-V virtual machine is optimized to match the host's NUMA topology.

Virtual machines can span NUMA nodes, depending on their sizes and the processor configuration of the particular DL580 Gen8 server. Windows Server 2012 Hyper-V and Windows Server 2012 R2 Hyper-V automatically pick the resources in the most optimal way. However, if the virtual machine is configured to use Dynamic Memory, only one virtual NUMA node (that is, a flat NUMA topology) will be projected into the Guest, which effectively disables virtual NUMA support.

Virtual machine licensing

Microsoft offers two products that support unlimited virtual machine licenses:

- Windows Server 2012 and Windows Server 2012 R2 Datacenter Edition provide unlimited virtual instances.
- Windows Server 2012 Hyper-V and Windows Server 2012 R2 Hyper-V provide unlimited licenses as a free download, but requires additional operating system licensing.

For details about licensing, see the following websites or contact your Microsoft representative:

- Windows Server 2012: microsoft.com/en-us/server-cloud/windows-server/default.aspx
- Windows Server 2012 R2: microsoft.com/en-us/server-cloud/windows-server/windows-server-2012-r2.aspx
- Hyper-V: microsoft.com/en-us/server-cloud/hyper-v-server/default.aspx

SR-IOV

Single Root I/O Virtualization (SR-IOV) is a PCI-SIG specification for partitioning PCIe adapter bandwidth. Currently, Windows Server 2012 and Windows Server 2012 R2 support SR-IOV with network adapters. Partitioning port bandwidth enables virtual machines to share a single PCIe adapter. The virtual machines talk directly to the networking hardware. On scale-up systems like DL580 Gen8 server, this communication improves the throughput, latency, and processor utilization of the I/O traffic processing. For a list of network adapters that support SR-IOV, see the DL580 Gen8 server QuickSpecs at hp.com/servers/dl580-gen8. Note that the Guest operating systems must also be capable of utilizing SR-IOV.

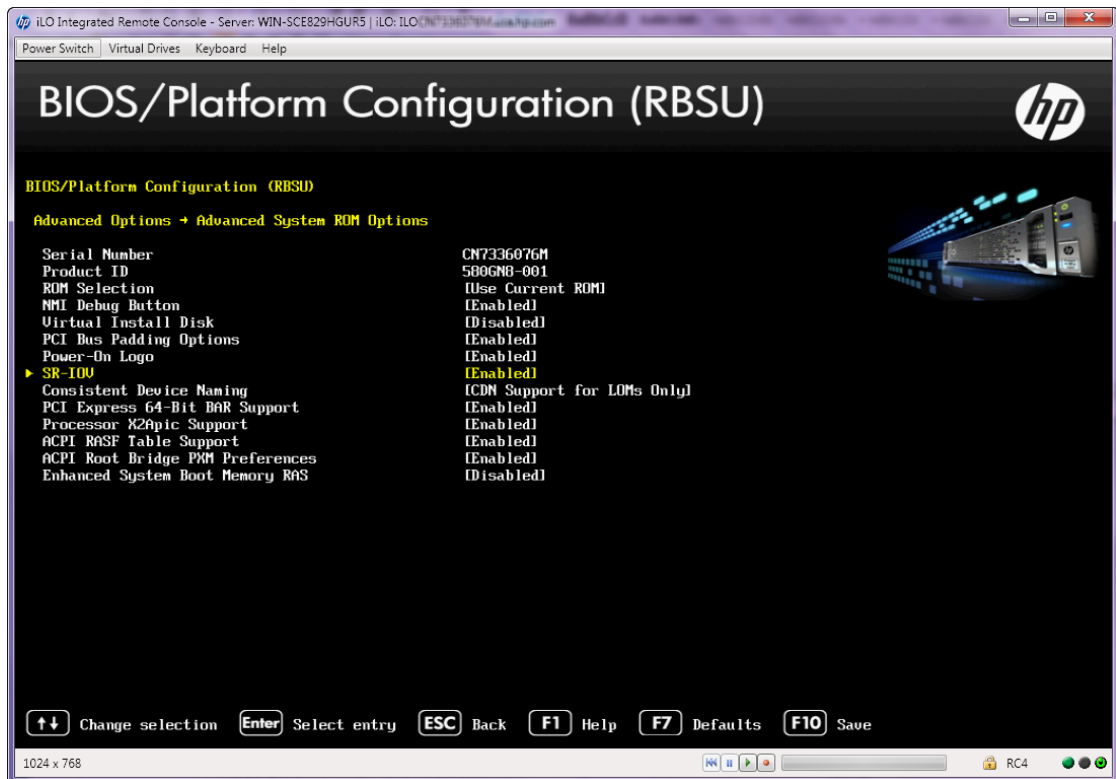
Important

Enable SR-IOV before installing the Hyper-V role. If you fail to enable SR-IOV prior to installing the Hyper-V role, “phantom devices” may display in Device Manager. These are caused by the re-enumeration of the PCI devices. If this occurs, remove the phantom devices by using the **Show hidden devices** option in the **Device Manager** view.

To enable SR-IOV in the UEFI ROM, complete the following steps:

1. During system boot, press **F9** to run the System Utility.
2. Select **System Configuration**, and then press **Enter**.
3. Select **BIOS/Platform Configuration (RBSU)**, and then press **Enter**.
4. Select **Advanced Options**, and then press **Enter**.
5. Select **Advanced System ROM Options**, and then press **Enter**.
6. Select **SR-IOV**, and then press **Enter**.
7. Select **Enable**, and then press **Enter**.

Figure 10. Enabling SR-IOV



8. Press **F10** to save.

For details about implementing SR-IOV, see the white paper “Implementing Windows Server 2012 SR-IOV on ProLiant Servers” at hp.com/portal/site/hpsc/template.BINARYPORTLET/public/kb/docDisplay/resource.process/?spf_p.tpst=kbDocDisplay_ws_BI&spf_p.rid_kbDocDisplay=docDisplayResURL&javax.portlet.beginCacheTok=com.vignette.cachetoken&spf_p.rst_kbDocDisplay=wsrp-resourceState%3DdocId%253Demr_na-c03514877%257CdocLocale%253Den&javax.portlet.endCacheTok=com.vignette.cachetoken.

Hyper-V role

When the Hyper-V role is installed as part of Windows Server, the host operating system becomes the “Parent Partition,” also known as the “management operating system.” The hypervisor partition is placed between the parent partition and the hardware. Because of this, Microsoft recommends installing additional non-Hyper-V or Virtual Desktop Infrastructure (VDI)-related applications on the server.

Alternatively, download Windows Server 2012 Hyper-V or Windows Server 2012 R2 Hyper-V that will create a dedicated Hyper-V server from the Microsoft website microsoft.com.

Running the Hyper-V server without the GUI

When running a Hyper-V server, we recommend using the Windows GUI (Server Core for Windows Server 2012 and Windows Server 2012 R2). Server Core for Windows Server 2012 and Windows Server 2012 R2 installs fewer components and requires fewer patches, which reduces administrative service and maintenance time. In addition, it requires less disk space and decreases the potential surface attack.

Administration can be done remotely or through Windows PowerShell. For information about the extensive set of commands available, see the Hyper-V Cmdlets in Windows PowerShell webpage at technet.microsoft.com/library/hh848559.aspx.

HP ProLiant System Optimizer for Windows Server x64 Editions

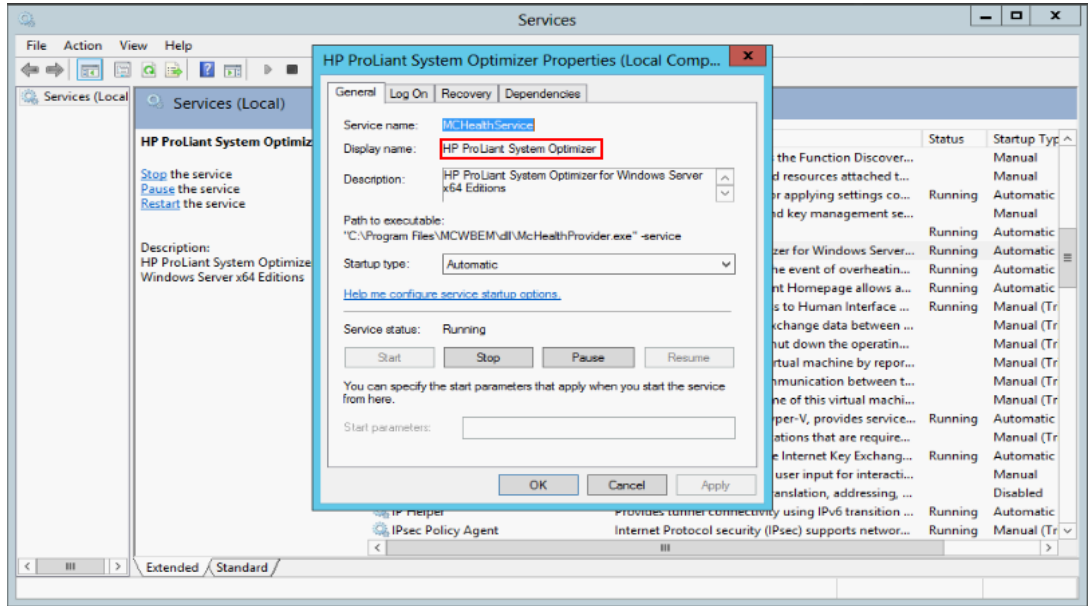
The HP ProLiant System Optimizer for Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 is the tool best suited for implementing most of the recommendations found in this white paper. This software optimizes the Windows operating environment by determining what OS is running, whether Hyper-V is installed, and checking the BIOS or UEFI parameters and Windows Server settings.

HP ProLiant System Optimizer will suggest optimal settings in the following areas:

- Server: X2APIC, power management, processor cores, Hyper-Threading, and SR-IOV mode.
- Operating System: Processor groups, pagefile location and size, memory dump types and location, status of HP software, drivers, and firmware updates.

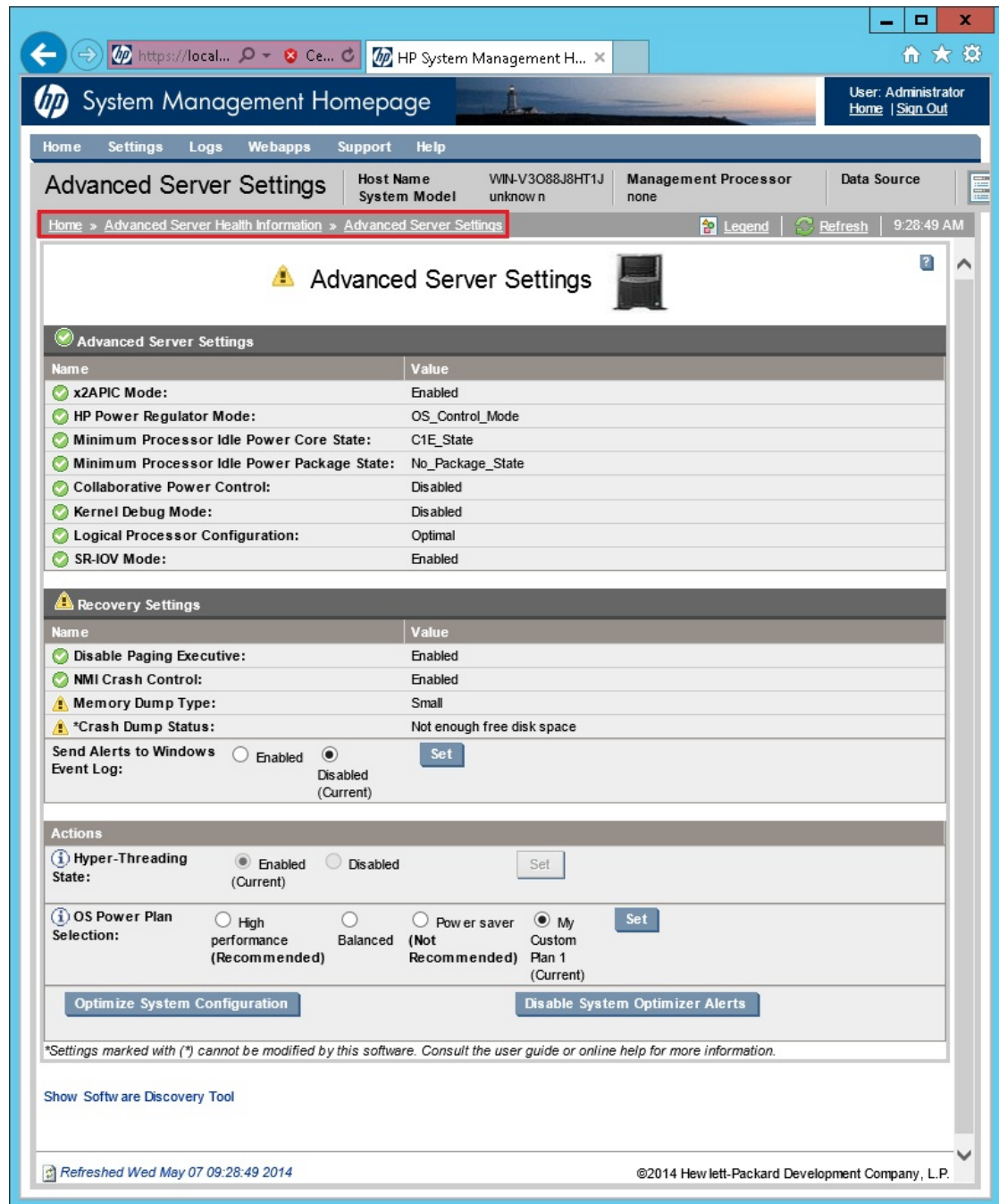
HP ProLiant System Optimizer is downloadable from the DL580 Gen8 server support page at hp.com/support/dl580gen8 and is provided as an HP Smart Component. HP ProLiant System Optimizer installs in the `\Program Files\McWBEM` directory and creates a HP ProLiant System Optimizer service.

Figure 11. HP ProLiant System Optimizer Properties menu



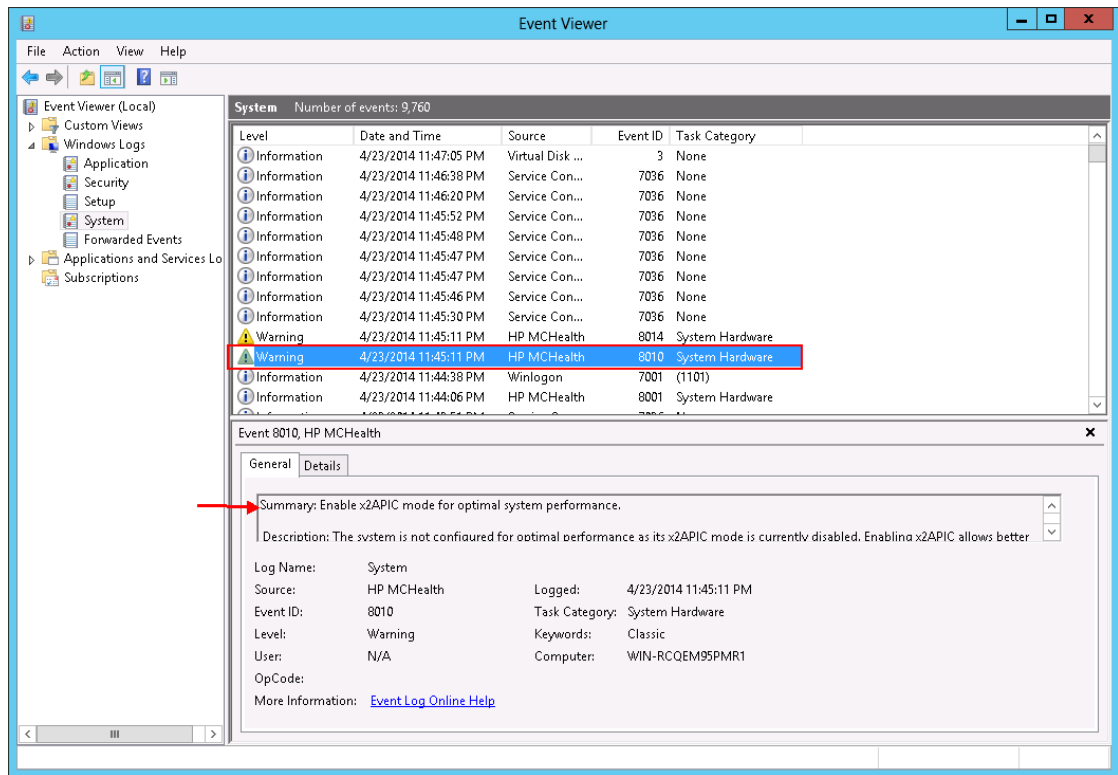
HP ProLiant System Optimizer integrates with in HP System Management Homepage (HP SMH), providing Advanced Server Health information.

Figure 12. HP ProLiant System Optimizer Advanced Server Settings



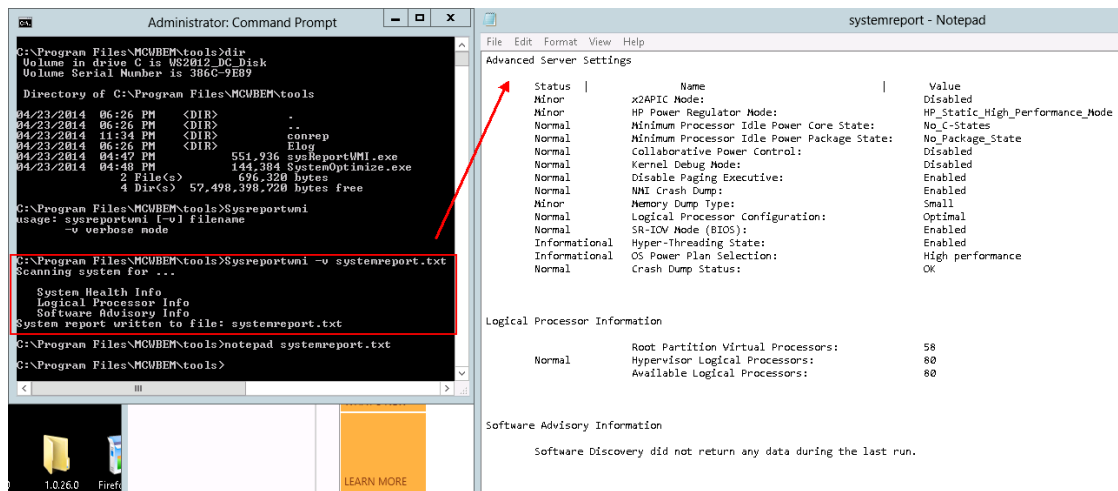
HP ProLiant System Optimizer can automate changes both at the hardware and OS level through a single **Optimize System Configuration** button under **Advanced Server Health information > Advanced Server Settings** in HP SMH or through a command line. HP ProLiant System Optimizer reports alerts in the Windows System event log as Web Based Enterprise Management (WBEM) indications and as status icons in HP SMH if parameters are not optimal.

Figure 13. Alerts reported by HP ProLiant System Optimizer to Event Viewer



HP ProLiant System Optimizer also generates a system report text file with advanced server settings.

Figure 14. Advanced server settings reported by HP ProLiant System Optimizer to Event Viewer



For more information, refer to the HP ProLiant System Optimizer User Guide available at hp.com/go/dl580gen8/docs under the "User Guide" section.

Resources, contacts, or additional links

HP resources

HP ProLiant servers

hp.com/go/proliant_servers-docs

HP Support Center

hp.com/go/hpsc

HP Intelligent Provisioning User Guide

hp.com/support/IP_UG_en

HP UEFI System Utilities User Guide

hp.com/go/ProLiantUEFI/docs

HP UEFI Shell User Guide

hp.com/go/ProLiantUEFI/docs

HP ProLiant servers and Windows Server 2012

hp.com/go/ws2012

HP ProLiant servers and Windows Server 2012 R2

hp.com/go/ws2012r2

Implementing Microsoft Windows Server 2012 on HP ProLiant Servers

hp.com/bc/docs/support/SupportManual/c03305495/c03305495.pdf

Implementing Microsoft Windows Server 2012 R2 on HP ProLiant Servers

hp.com/V2/GetDocument.aspx?docname=4AA4-7658ENW

Implementing Windows Server 2012 SR-IOV on HP ProLiant Servers and HP ProLiant server blades

hp.com/bc/docs/support/SupportManual/c03514877/c03514877.pdf

Microsoft resources

Microsoft Windows Server 2012

microsoft.com/en-us/server-cloud/windows-server/default.aspx

Windows Server 2012 Hyper-V

technet.microsoft.com/en-us/library/hh831531.aspx

Performance Tuning Guidelines for Windows Server 2012

msdn.microsoft.com/en-us/library/windows/hardware/ij248719.aspx

Performance Tuning Guidelines for Windows Server 2012 R2

msdn.microsoft.com/en-us/library/windows/hardware/dn529133

Microsoft Windows Server 2012 R2

microsoft.com/en-us/server-cloud/windows-server/windows-server-2012-r2.aspx

Microsoft TechNet (resources for IT professionals)

microsoft.com/technet

MSDN (resources for developers)

microsoft.com/msdn

Sign up for updates

hp.com/go/getupdated



Share with colleagues



Rate this document

© Copyright 2014 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice. The only warranties for HP 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. HP shall not be liable for technical or editorial errors or omissions contained herein.

Intel and Xeon are trademarks of Intel Corporation in the U.S. and other countries. Microsoft and Windows are U.S. registered trademarks of the Microsoft group of companies.

