HP Z8 G4 WORKSTATION

The HP Z8 G4 Workstation is the successor to the HP Z840 Workstation. Its architecture introduces several new functionalities and technologies. These include all new Intel® memory architecture, Intel®-integrated 10 GbE, I/O slot improvements and improved performance.

CHASSIS AND SYSTEM HIGHLIGHTS

The ultimate in dual socket processor computing - the HP Z8 G4 Workstation is redesigned to deliver superior performance and expandability. The innovative HP Z8 architecture supports the latest processor, memory, graphics, and storage technologies. For high-end hardware configurations there are two 90% efficient power supply options delivering up to 1450 or 1700W. Innovative cooling and ducting provide industry leading acoustics.

MOBILITY & FLEXIBILITY

With robust full grip front and rear aluminum carrying handles and slick feet, the system can be easily moved to a new location or to gain better access. The system can be used in desktop/deskside orientations or rack-mounted using HP's enterprise-class, fully extendable rails.

New with this generation of premium workstations, the Front IO-User Interface is now modular and configurable with two options to choose from. Both modules feature the power button/LED, HDD activity LED, audio jack, USB charging port, and optional SD card reader. The Entry module features 4 USB 3.1 Gen1 Type-A ports, while the Premium module provides 2 USB 3.1 Gen2 Type-C ports and 2 USB 3.1 Gen1 Type-A ports.

In this generation, the HP Z8 G4 Workstation capability has been greatly expanded, with only a slight increase in chassis size. The "split chassis" architecture facilitates dual processors, 24 DDR4 memory slots, rear access/direct connect PSU, and up to nine high-performance PCIe expansion slots. The main PCIe zone accommodates seven full length and full height cards. In addition, two internal slots located near the top of the chassis accommodate custom HP PCIe modules to provide extra flexibility and robust configurations. With four internal storage bays, dedicated slim-line optical bay, and two 5.25" external device bays, the HP Z8 G4 Workstation delivers high flexibility for storage and accessory options. The internal storage bays feature new tool-free drive carriers designed to minimize drive vibration, ensuring quiet operation. The drive carriers are compatible with industry standard 3.5" storage devices, and can easily accept the smaller 2.5" form-factor with an optional adapter. The industry standard external device bays expand storage capability, allow for additional I/O, or customer specific options.

For demanding configurations two power supply options are available:

• 1125W, 90% efficient

– 100V ~/12A	1125W
– 115 -127V~/12A	1275W, UPS recommended (See Site Prep Guide)
– 200-240V~/10A	1450W

• 1450W, 90% efficient

– 100V ~/16A	1450W	
– 115 -127V~/16A	1550W, UPS recommended (See Site Prep Guide)	
– 200-240V~/10A	1700W	

INTERIOR DESIGN & COOLING

The interior is very organized with a consistent user access strategy. All user-serviceable components are identified with blue touchpoints. The service label located on the left access panel provides users with system board and memory loading information and quick access to diagnostic information. Cables are hidden or efficiently routed, providing better component access and airflow management.

The chassis is designed to maximize fresh air inlet to the system, and direct cool air where it's needed. The CPU and memory ducting has an innovative design to maximize fresh air inlet to memory as well as both CPUs, and keeps the memory airflow separated from the CPU airflow. The memory ducting has a patent pending multi-channel design that directs cooler air from the inlet to both the front and rear DIMM banks, as well as to separate segments along the length of the DIMMs. The zone between the front and rear CPUs is divided by a baffle to direct fresh air to both CPUs and prevent preheated exhaust air from the front CPU cooler from entering the rear CPU cooler.

Go to the Thermal and Acoustic section to learn more about the HP Z8 G4's innovative cooling.

DESIGNING THE EXPERIENCE

HP Workstations have long represented industry leadership in designing for the best user experience, with groundbreaking innovations in tool-free design. Whether it is adding hard drives, expanding memory, or upgrading graphics capabilities - the HP Z8 G4 provides tool-free access to most internal components.

Due to the tool-free ease of use, HP understands system and component security may be a concern, therefore several security features have been incorporated. The left side access panel includes a key lock and the right side panel can be secured with the HP BPC Security Lock or Kensington security device. An optional system intrusion switch is also available. The rear access power supply is unlocked by default but can be easily secured by removing the PSU and enabling the locking mechanism on the side cover of the power supply.

ENVIRONMENTALLY FRIENDLY

HP is committed to environmental sustainability and energy efficiency. To reduce energy consumption, HP Workstations offer ENERGY STAR®[5,6] qualified configurations and the HP Z8 G4 features two 90% efficient power supplies. The HP Workstation design team has taken a proactive approach (beyond industry regulations) to recyclability and selecting materials that reduce the impact on the environment. HP Z8 G4 configurations are available with low-halogen materials.[1]

SYSTEM ARCHITECTURE

New Intel® Processor micro-architecture
The HP Z8 G4 Workstation uses the Intel® C622 chipset to support the latest Intel® Xeon® processor Scalable family[8], including processors of up to twenty-eight-cores and up to 205W. Intel® Xeon® Scalable processors feature a new micro-architecture with new Intel® AVX-512 (Intel® Advanced Vector Extensions for 512-bit) instructions, all new memory architecture, Intel® Ultra Path Interconnect (Intel® UPI), 48 PCIe Gen3 lanes and optional integrated 10 Gigabit Ethernet. The Intel® Xeon® Scalable family processors feature two integrated memory controllers each supporting three DDR4 channels that increase the memory capacity and bandwidth by 50%. The dual Intel® Ultra Path Interconnect (Intel® UPI) between the two processors supports data transfers up to 10.4 GT/s increasing peak data transfers and bandwidth over the HP Z840. Each processor supports 48 lanes of PCIe Gen3, a 20% increase over the previous generation.

Intel® Advanced Vector Extensions 512 (Intel® AVX-512)
The new Intel® AVX-512 instructions extend the Intel® Advanced Vector Extensions (Intel® AVX) instructions with 512-bit integer instructions. The 512-bit integer vectors benefit enterprise-class and High Performance computing workloads.

Next generation Intel® Active Management Technology
New features for Intel® AMT 11.0 and later include:
• USB-Redirect. With ME 11.x and later, USB-Redirect (USB-R; AKA Media Redirection) has replaced IDE-Redirection as the interface for directing a media image from a local system to a remote system. With USB-R, a USB drive image is created on the remote system to mount as a drive accessible to the local OS or BIOS. This feature can be used for file sharing, installing software, or reimaging a remote system.

Memory technology
The HP Z8 G4 Workstation introduces support for DDR4 2933 MHz Registered DIMMs.[3] The speed that the memory runs is determined by the processor and is limited to 2933 MHz for the Cascade Lake-SP processor generation. DDR4 LR DIMMs (load-reduced DIMMS) are also supported and enable a total system memory size up to 3 TB based on supported DIMM capacities*. NUMA and Non-NUMA modes are supported and dynamic power saving is enabled.
* May not be available at launch.

USB 3.1 Gen2 Type-C
The HP Z8 G4 configured with the Premium Front I/O module provides two USB 3.1 Gen2 (10 Gb/s) Type-C ports in addition to two USB 3.1 Gen1 (5 Gb/s) Type-A ports. The Type-C ports each deliver up to 15W of power (3A @ 5V) when the system is running. More information on USB Technology and Performance measurements can be found in the "Resources, contacts, or additional links" section below.

I/O AND STORAGE
Internal I/O
The HP Z8 G4 provides a total of seven high-performance Graphics and I/O slots.

In a single processor configuration the HP Z8 G4 provides two PCIe3 x16 and three PCIe3 x4 dedicated electrical slots. It also provides one PCIe3 x8 electrical slot for internal M.2 PCIe-attached storage.

In a dual processor configuration the HP Z8 G4 provides two additional PCIe3 x16 slots and an additional PCIe3 x8 electrical slot for internal M.2 PCIe-attached storage. In addition one of the PCIe3 x4 slots is automatically upgraded to a PCIe3 x8 slot when a 2nd processor is present.

The HP Z8 G4 provides an internal 1-port USB 3.0 header, an internal 2-port USB 2.0 header and an internal 1-port USB 2.0 header.

Storage
The Intel® C622 chipset supports 2 SATA (Serial ATA) controllers, SATA and sSATA (secondary SATA). The SATA controller supports eight 6 Gb/s ports and RAID modes 0, 1, 5, and 10. The sSATA controller supports two 6 Gb/s ports and RAID modes 0 and 1. Ports from both controllers can be routed to the rear panel with an eSATA bulkhead option. Note that it is not possible to RAID across the two SATA controllers.

External I/O
On the front I/O area, the HP Z8 G4 can be configured two ways.

• The Entry Front I/O option provides 4 USB 3.1 Gen1 (5 Gbs) Type-A ports (the left-most supports battery charging), headset/headphone, and the option for an SD card reader.

• The Premium Front I/O option provides 2 USB 3.1 Gen2 (10 Gbs) Type-C ports, 2 USB 3.1 Gen1 Type-A ports (the left-most supports battery charging) combo headset/microphone jack, and the option for an SD card reader.

In the rear I/O area, the HP Z8 G4 provides 6 USB 3.0 ports, 2 gigabit Ethernet LAN ports, two additional Ethernet ports via option module, audio line-in/mic-in, audio Line-Out, PS/2, and a serial port. Additional rear I/O ports can be added via PCIe add-in cards.

GRAPHICS

With the 1125 W/15A power supply, certain system configurations can support up to four 75 W cards, or up to three 180 W cards or up to two 250 W cards. With the optional 1450 W/20A supply, certain configurations can support up to four 75 W cards, or up to three 180 W cards or up to three 250 W cards.

OTHER FEATURES

• 1125 W/15A power supply, 90% efficient

• Optional 1450 W/20A power supply, 90% efficient

• Rear panel power on/off switch and LED for easier rack maintenance

• ENERGY STAR® qualified configurations, China's Energy Conservation Program (CECP) configurations, European Union's ErP LOT6 2013 power limit of 0.5W in off mode.

• Intel® vPro™ manageability with support both for DASH and Intel® AMT (Advanced Manageability Technology) on all the Xeon® processors. IT managers have increased flexibility in optimizing their Enterprise manageability strategy across HP's Commercial Laptops, Desktops and Workstations.

HP Z8 G4 VS. HP Z840 FEATURE COMPARISON

Table 1. HP Z8 G4 vs. HP Z840 feature comparison

	HP Z8 G4	HP Z840
Operating System	Windows 10 Professional 64-bit Windows 7 Professional 64-bit	Windows 8.1 Professional 64-bit Windows 7 Professional 64-bit
Processors	Intel® Xeon Scalable Processor	Intel® Xeon E5-2600v3
New instruction set	AVX-512 AES-NI	AVX2 AES-NI
Memory technology	DDR4: Registered and LR-DIMMs Up to 2666MHz[3]	DDR4: Registered and LR-DIMMs Up to 2400MHz
USB enhancement	Two USB 3.1 Gen2 Type-C ports (Premium Front I/O option)	USB charging port on top-most front port
USB 3.1 Gen1 ports	6 Rear, 4 Front (Entry Front I/O) or 2 Front (Premium Front I/O), 1 Internal	4 Rear, 4 Front, 1 Internal
USB charging ports	1 Front Type A port supports 1.5A@5V in S5, S4, S3, S0 states Premium Front I/O: Type-C ports support 3A @5V in S0 state, and Power Delivery 2.0	1 Front Type A port supports 1.5A@5V in S5, S4, S3, S0 states
Integrated Networking	Intel® I219 (AMT) and Intel® X722 Gigabit Ports; Optional Dual Intel® X722 10GbE Port Module (X722 ports support iWARP RDMA)	Intel® I218 (AMT) and Intel® I210 Gigabit Ports
Manageability	Intel® ME11.20/AMT11, Intel® vPro	Intel® ME9.1/AMT9.1, Intel® vPro

HP Z8 G4 SUPPORTED CPU LINE-UP

Name	Clock Speed (GHz)	Cores	Cache (MB)	Memory Speed (MHz)	Hyper Threading	Supports Intel® DCPMM™ Technology	Intel® Turbo Boost Technology[1]	TDP (W)
Intel® Xeon® 8280 processor	2.7	28	38.5	2933	YES	YES	3.3, 4.0	205
Intel® Xeon® 8260M processor	2.4	24	35.75	2933	YES	YES	3.1, 3.9	165
Intel® Xeon® 8260 processor	2.4	24	35.75	2933	YES	YES	3.1, 3.9	165
Intel® Xeon® 8180 processor	2.5	28	38.5	2666	YES	NO	3.23.8	205
Intel® Xeon® 8160M processor	2.1	24	33.00	2666	YES	NO	2.8, 3.7	150
Intel® Xeon® 8160 processor	2.1	24	33	2666	YES	NO	2.8, 3.7	150
Intel® Xeon® 6254 processor	3.1	18	24.75	2933	YES	YES	3.9, 4.0	200
Intel® Xeon® 6252 processor	2.1	24	35.75	2933	YES	YES	2.8, 3.7	150
Intel® Xeon® 6248 processor	2.5	20	27.5	2933	YES	YES	3.2, 3.9	150
Intel® Xeon® 6244 processor	3.6	8	24.75	2933	YES	YES	4.3, 4.4	150
Intel® Xeon® 6242 processor	2.6	16	22	2933	YES	YES	3.5, 3.9	150
Intel® Xeon® 6240Yprocessor	2.6	18	24.75	2933	YES	YES	3.3, 3.9	150
Intel® Xeon® 6240 processor	2.6	18	24.75	2933	YES	YES	3.3, 3.9	150
Intel® Xeon® 6230 processor	2.1	20	27.5	2933	YES	YES	2.8, 3.9	125
Intel® Xeon® 6152 processor	2.1	22	30.25	2666	YES	NO	2.8, 3.7	140
Intel® Xeon® 6154 processor	3	18	24.75	2666	YES	NO	3.7, 3.7	200
Intel® Xeon® 6148 processor	2.4	20	27.5	2666	YES	NO	3.1, 3.7	150
Intel® Xeon® 6146 processor	3.2	12	24.75	2666	YES	NO	3.9, 4.2	165
Intel® Xeon® 6144 processor	3.5	8	24.75	2666	YES	NO	4.1, 4.2	150
Intel® Xeon® 6142M processor	2.6	16	22	2666	YES	NO	3.3, 3.7	150
Intel® Xeon® 6142 processor	2.6	16	22	2666	YES	NO	3.3, 3.7	150
Intel® Xeon® 6140M processor	2.3	18	24.75	2666	YES	NO	3.0, 3.7	140
Intel® Xeon® 6140 processor	2.3	18	24.75	2666	YES	NO	3.0, 3.7	140
Intel® Xeon® 6138 processor	2.0	20	27.5	2666	YES	NO	2.7, 3.7	125
Intel® Xeon® 6136 processor	3	12	24.75	2666	YES	NO	3.6, 3.7	150
Intel® Xeon® 6134M processor	3.2	8	24.75	2666	YES	NO	3.7, 3.7	130
Intel® Xeon® 6134 processor	3.2	8	24.75	2666	YES	NO	3.7, 3.7	130
Intel® Xeon® 6132 processor	2.6	14	19.25	2666	YES	NO	3.3, 3.7	140
Intel® Xeon® 6130 processor	2.1	16	19.7522	2666	YES	NO	2.8, 3.7	125
Intel® Xeon® 6128 processor	3.4	6	19.25	2666	YES	NO	3.7, 3.7	115
Intel® Xeon® 5222 processor	3.8	4	16.5	2933	YES	YES	3.9, 3.9	105
Intel® Xeon® 5220 processor	2.2	18	24.75	2933	YES	YES	2.7, 3 .9	105
Intel® Xeon® 5218 processor	2.3	16	22	2933	YES	YES	2.8, 3.9	125
Intel® Xeon® 5215M processor	2.5	10	13.75	2933	YES	YES	3.0, 3.4	85
Intel® Xeon® 5215 processor	2.5	10	13.75	2933	YES	YES	3.0, 3.4	85
Intel® Xeon® 5120 processor	2.2	14	19.25	2400	YES	NO	2.6, 3.2	105
Intel® Xeon® 5118 processor	2.3	12	16.5	2400	YES	NO	2.7, 3.2	105
Intel® Xeon® 5115 processor	2.4	10	13.75	2400	YES	NO	2.8, 3.2	85
Intel® Xeon® 5122 processor	3.6	4	16.5	2666	YES	NO	3.7, 3.7	105
Intel® Xeon® 4216 processor	2.1	16	22	2933	YES	NO	2.7, 3.2	100
Intel® Xeon® 4215 processor	2.5	8	11	2933	YES	YES	3.0, 3.5	85
Intel® Xeon® 4214Yprocessor	2.2	12	16.5	2933	YES	NO	2.7, 3.2	105
Intel® Xeon® 4214 processor	2.2	12	16.5	2933	YES	NO	2.7, 3.2	85
Intel® Xeon® 4210 processor	2.2	10	13.75	2933	YES	NO	2.7, 3.2	85
Intel® Xeon® 4208 processor	2.1	8	11	2933	YES	NO	2.5, 3.2	85
Intel® Xeon® 4116 processor	2.1	12	16.5	2400	YES	NO	2.4, 3.0	85
Intel® Xeon® 4114 processor	2.2	10	13.75	2400	YES	NO	2.5, 3.0	85
Intel® Xeon® 4112 processor	2.6	4	8.25	2400	YES	NO	2.9, 3.0	85
Intel® Xeon® 4110 processor	2.1	8	11	2400	YES	NO	2.4, 3.0	85
Intel® Xeon® 4108 processor	1.8	8	11	2400	YES	NO	2.1, 3.0	85
Intel® Xeon® 3204 processor	1.9	6	8.25	2933	YES	NO	N/A	85
Intel® Xeon® 3106 processor	1.7	8	11	2133	NO	NO	N/A	85
Intel® Xeon® 3104 processor	1.7	6	8.25	2133	NO	NO	N/A	85

All HP Z8 G4 Intel® Xeon® CPUs Feature Intel® vPro™ Technology.

[1]Intel® Data Center Persistent Memory Modules available 2nd Half 2019.

[2]The specifications shown in this column represent the following: (all core maximum turbo steps, all core maximum turbo steps) Turbo boost

stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

I/O SLOT OPTIMIZATIONS

The HP Z8 G4 Workstation utilizes PCI-Express 3.0 technology with high performance over a variety of conditions. This paper provides guidance on optimizing the performance of your system when using PCI-Express cards.

Figure 1. HP Z8 Workstation Block Diagram
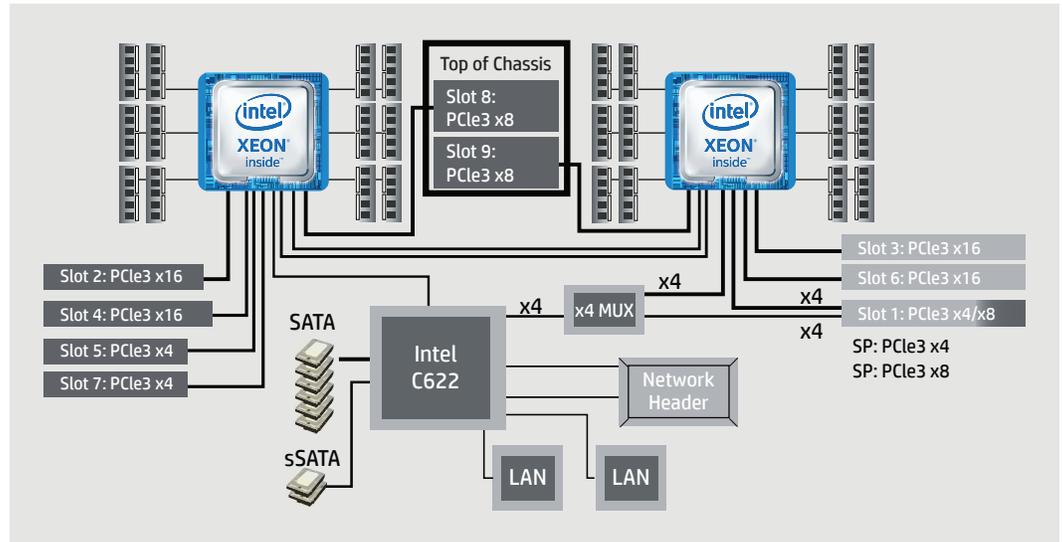
INTEGRATED PCI-EXPRESS 3.0

The HP Z8 G4 uses the Intel® Xeon® processor Scalable family, with integrated PCI-Express 3.0 controllers delivering a peak bandwidth of 16 Gb/s per direction for each x16 slot (1 GB/s per lane). PCI-Express 3.0 is backward compatible with 1.0 and 2.0, and slots will train to the highest common speed. PCI Express 3.0 slots will initialize at 1.0 and then transition to 3.0 through a training sequence that involves four adaptive training phases. It is recommended to carefully evaluate and validate PCI-Express 3.0 devices that are not available or supported from HP.

PCI-EXPRESS PERFORMANCE

The HP Z8 G4 integrates several features within the processor: Three PCIe 3.0 controllers, DMA caching, two 3-channel memory controllers per processor (2 DIMMs per channel), and a dual QPI processor interconnect at up to 10.4 GT/s. This produces excellent performance in I/O bandwidth, remote bandwidth, and latency.

Figure 2. x16 Peak Bandwith per Direction- GB/s
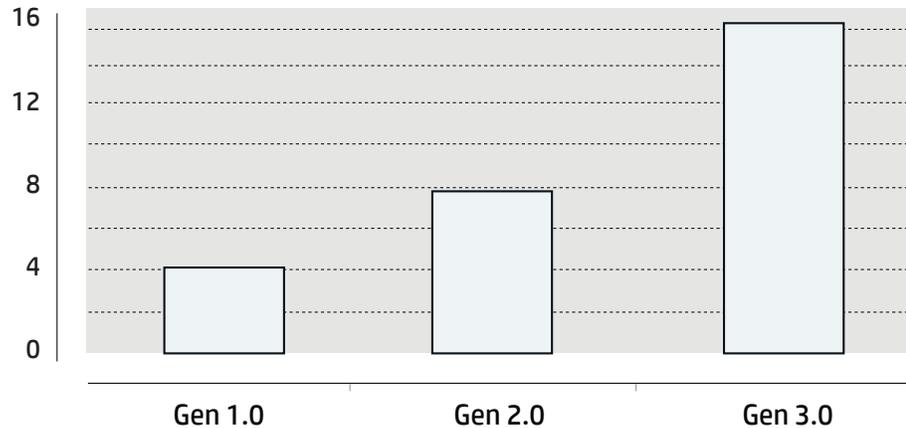
PCI-EXPRESS I/O SLOT OPTIONS

The HP Z8 G4 provides a total of seven high-performance Graphics and I/O slots in a dual processor configuration. Two additional internal slots (one per processor) are located at the top of the chassis and are optimized to support HP proprietary solutions such as the Multiplatform PCIe-Dual M.2 Adapter (864764-001). In a single processor configuration, slots 3, 6, and 9 are not available and slot 1 reduced to 4 lanes.

With the 1125 W/(15A@100V) power supply, certain system configurations can support up to four 75 W cards, or up to three 180 W cards or up to two 250 W cards. With the 1450 W/(20A@100V) supply, certain configurations can support up to four 75 W cards, or up to three 180 W cards or up to three 250 W cards.

Figure 3.

PCIe Single Processor slot layout

Slot #	
1	PCIe3 x4
2	PCIe3 x16
3	Not Available
4	PCIe3 x16
5	PCIe3 x4
6	Not Available
7	PCIe3 x4
8	PCIe3 x8 — Top of Chassis
9	Unavailable

PCIe Dual Processor slot layout

Slot #	
1	PCIe3 x8
2	PCIe3 x16
3	PCIe3 x16
4	PCIe3 x16
5	PCIe3 x 4
6	PCIe3 x16
7	PCIe3 x4
8	PCIe3 x8 — Top of Chassis
9	PCIe3 x8

Legend: PCH Connected — CPU0 Connected — CPU1 Connected
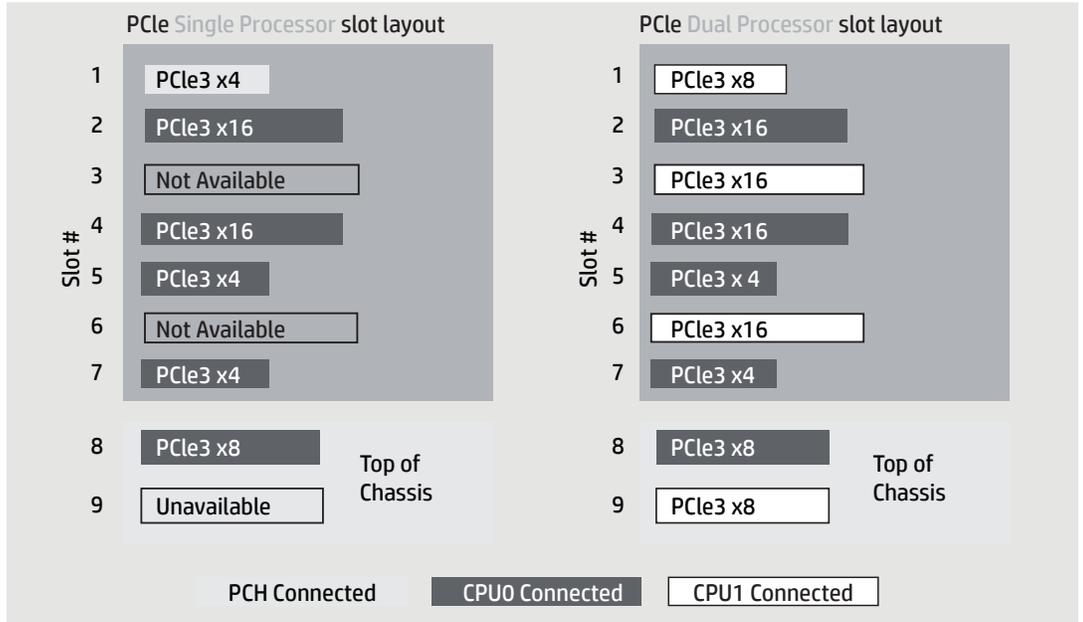
RECIPE FOR OPTIMIZING PCI-EXPRESS I/O PERFORMANCE

For high I/O bandwidth applications, the choice of slot loading, processor, and memory configuration can be optimized to ensure maximum bandwidth available. Applications and cards sensitive to I/O latency may benefit as well from some of the tips below.

RECOMMENDED CONFIGURATION STEPS

1. Place GPU and graphics cards first, following the slot order listed in Table 2.
2. Place I/O cards next, from highest bandwidth to lowest, following the slot order listed in Table 2. This is the optimal load order for most applications.
3. Additional I/O bandwidth refinements may be possible. If necessary, refer to the tips below.

Table 2. HP Z8 G4 I/O Slot Recommended Load Order

Load priority	Card description	Slot 1 x4/x8	Slot 2 x16	Slot 3 x 16	Slot 4 x16	Slot 5 x4	Slot 6 x16	Slot 7 x4	M2PM0-Slot 8 x8	M2PM1-Slot 9 x8
1	1st Graphics		Only							
2	Thunderbolt 3 (2-port)									
3	2nd Graphics				1		2			
4	3rd Graphics (requires 2nd Processor)			2			1			
5	4th Graphics (requires 2nd Processor)			Only						
6	Z Turbo Drive Dual Pro (2x M.2 w/Levers)								1	2
7	Z Turbo Drive Dual Pro (2x M.2 w/Bracket)	2 (if x8)		4	1		3			
8	Z Turbo Drive Quad Pro (4x M.2 card)			3	1		2			
9	Optane SSD					2		1		
10	SAS	4 (if x8)		3	1		2			
11	Network Interface Controller - ALL	3		6	1	2	5	1		
12	eSATA (2x port cable)	6		5	4	3	2	1		

* Slots 3 and 6 are only available with a second processor.

* Slot 1 is x4 with single processor; x8 with dual processor unless Thunderbolt 3 card installed.

ADDITIONAL TIPS
- For applications doing direct bus Peer-to-Peer transfers between cards, load the corresponding cards in slots located behind the same processor. For instance, load cards in slots 2, 4, 5, 7, and 8, or in slots 1, 3, 6, and 9.
- For very high bandwidth applications in dual processor systems, select processor models with the highest QPI frequency (10.4 GT/s).
- If possible, make sure all I/O cards are loaded in slots that have a PCI-Express Lane Width at least as wide as the card (see Table 2).
- For predictable latencies, try disabling NUMA (Non-Uniform Memory Access) mode (BIOS setup menu -> Advanced -> Performance Options -> Non-Uniform Memory Access (NUMA) = Disable).
- For cards that are latency sensitive, load these cards in processor slots.
- Ensure Idle Power Savings BIOS setting is set to Normal (BIOS setup menu -> Advanced -> Power Options -> Idle Power Savings = Normal).
- Use the latest system BIOS version available on hp.com.
- Check for updates in the latest performance optimization white papers (link below).

STORAGE CONFIGURATIONS AND RAID

The HP Z8 G4 Workstation includes two 6 Gb/s Intel® SATA RAID controllers. SATA is 8 ports and sSATA (secondary SATA) is 2 ports. Both controllers have identical electrical characteristics.

SATA STORAGE FEATURES
Controller interfaces and supported drive types
The controllers support the following drive types and max link speeds:
*Key management software used with SED drives requires that SATA emulation mode be set to AHCI.

Controller	Number of ports	Max link speed	Interface type	Drives supported*
SATA	8	6 Gb/s	SATA	SSD, SED, HDD, ODD, eSATA
sSATA	2	6 Gb/s	SATA	SSD, SED, HDD, ODD, eSATA

RAID Levels
The RAID levels supported are shown in the table below:

Controller	Number of ports	RAID levels	Max RAIDs
SATA	8	0, 1, 5, 10	2
sSATA	2	0, 1	1

Option ROM Launch Policy
In the Pre-OS environment, HP Workstations can use either Option ROM (OROM) or a Unified Extensible Firmware Interface (UEFI) driver for configuration and management of the RAID controllers. The default shipping configuration
is set to **All UEFI**. This can be changed in BIOS Setup under `Advanced > Option ROM Launch Policy`. Select the desired Option ROM Launch Policy from the pull down menu.

The OROM or UEFI driver is not available when the SATA or sSATA controller is set to AHCI.

When the Option ROM Launch Policy is set to All Legacy, the SATA and/or sSATA OROM will only display at power on if there are two or more RAID capable devices attached to the controller, or a single device is attached that contains RAID metadata. In the latter case, the OROM will show that the RAID is failed or degraded.

When the Option ROM Launch Policy is set to UEFI, the legacy OROM will not display and management of RAID can be performed in the UEFI Drivers tab in BIOS Setup.

Controller Enable/Disable
The SATA and sSATA controllers can be Disabled or Enabled from the BIOS menu under `Advanced > System Options`. Uncheck the box to disable or check the box to enable the desired controller. By default both the SATA and sSATA controllers are enabled.

Per port Enable/Disable of SATA and sSATA ports
Individual SATA and sSATA ports can be Disabled or Enabled individually from the BIOS menu under `Advanced > Port Options`. Use the pull down menu to select Enable, eSATA, or Disable. By default all of the SATA and sSATA ports are enabled.

External SATA (eSATA)
External SATA (eSATA) is supported with an optional eSATA bulkhead adapter.

Ports can be configured individually as eSATA in the BIOS under `Advanced > Port Options`. Use the pull down menu to select Enable, eSATA, or Disable. When a port is designated as eSATA, the port link speed may be limited to 3 Gb/s.

An option to eject the drive will be available from the `Windows Taskbar Safely Remove Hardware and Eject Media` applet. Disks included in a RAID array will not be visible in the Eject applet. The current OS disk may be visible in the Eject applet but cannot be ejected. External drives can be hot plugged if the drive is compatible with hot plugging.

Hot plug or Hot unplug and surprise removal/insertion of internal drives is not recommended.

SATA emulation modes
The SATA and sSATA controllers are capable of being set to RAID mode or AHCI mode. Controls for changing SATA Emulation Mode are in BIOS Setup (F10) under `Advanced > System Options`. Uncheck the Controller RAID Mode box to enable AHCI mode on the desired controller.

• RAID (Default; ACHI + RAID capability with greatest flexibility for most users)
• AHCI (Required when using SEDs)

AHCI and RAID technology
The default SATA emulation mode on HP Workstations is RAID (RAID + AHCI) unless SEDs are installed. If SEDs are installed, the SATA emulation mode will be set to AHCI. The SATA emulation mode can be changed in BIOS setup under `Advanced > System Options`, but changing the mode is not recommended and can result in boot failure or data loss if the SATA emulation mode is changed after the OS is installed or if a volume already contains data. Always back up your data before making any storage system changes.

RAID
RAID provides all of the benefits of AHCI with the added flexibility of RAID for configurations needing performance or data redundancy. Even if you don't use RAID today, setting the SATA mode to RAID makes your system RAID ready for the future. RAID is the preferred mode and default storage configuration SATA mode set in HP Workstation BIOS.

AHCI (Advanced Host Controller Interface)
AHCI is a technical standard developed by Intel® for the hardware mechanism that allows software to communicate with SATA (Serial ATA) devices. It is enumerated as a PCI device and transfers data between system memory and SATA devices.

AHCI provides many benefits over the legacy IDE (Integrated Drive Electronics) hard drive interface. Some of the benefits include:

• Elimination of master/slave handling
• Native Command Queuing (NCQ) that allows a SATA device to internally optimize the order of command execution for increased performance
• TRIM command support for SSDs which keeps track of files that have been deleted but not erased on the drive. This improves performance of the drive and helps extend the life of the SSD by preventing unnecessary writes

Supported RAID Levels
RAID provides a method of combining multiple disks into a single logical volume to increase performance or create data redundancy.

RAID 0 – Creates a single volume that has data striped across two or more drives on the same controller. The size of the volume is based on the size of the smallest capacity drive times the number of drives in the RAID 0 configuration. RAID 0 is typically used to improve performance or create a larger volume from smaller drives. There is no data redundancy or parity in a RAID 0 configuration.

RAID 1 – Creates a single volume that is a mirror image of identical data on two physical drives on the same controller. The size of the mirror is limited by the smallest drive used in the RAID 1 configuration. This configuration provides data redundancy protection against a single drive failure, does not use parity, and almost doubles performance. If a drive fails, the drive can be replaced by a drive of the same capacity or larger capacity to rebuild the RAID array.

RAID 5 – Creates a single volume from three or more physical drives on the same controller. RAID 5 uses striping with parity data in distributed blocks across all member disks. A RAID 5 volume is tolerant of a single disk failure. RAID 5 has performance attributes similar to a RAID 0. RAID 5 has two options for RWH (RAID Write Hole) Closure. Distributed RWH distributes partial parity logging across all members. Journaling RWH utilizes an additional drive for partial parit logging. The journaling drive can be smaller capacity than RAID members.

RAID 10 – Creates a mirror of pair of drives, and then stripes the data on the mirrored pairs. A RAID 10 must contain two or more drive pairs, with a four drive minimum. A RAID 10 is fault tolerant to one drive per mirrored pair.

CREATING RAID ARRAYS ON THE SATA CONTROLLER
NOTE: Intel® Rapid Storage Technology enterprise (Intel® RSTe) has been rebranded as Intel® Virtual RAID on CPU (Intel® VROC). You may encounter both of these nomenclatures in this document and in Intel® tools drivers and documentation.

RAID arrays can be created through Option ROM (OROM) at power on, UEFI drivers tab in the BIOS Setup menu, DOS utilities, EFI shell utilities, Windows command line utilities, or from a graphical user interface (GUI) within the Windows OS.

1. PRE-OS RAID CREATION THROUGH THE OPTION ROM (OROM)
In order to use the OROM for configuration of RAID arrays, the Option ROM Launch Policy in BIOS must be set to **All Legacy.** This is the default as shipped configuration and can be changed in BIOS Setup under `Advanced > Option ROM Launch Policy`.

To access the OROM, press Ctrl-I as soon as you see Intel® Rapid Storage Technology enterprise or Intel® Virtual RAID on CPU Option ROM.

The OROM will only display at power on if there are two or more RAID capable devices attached to the controller, or a single device is attached that contains RAID metadata. In the latter case, the OROM will show that the RAID is failed or degraded.

Once in the OROM, you can Create RAID Volumes, Delete RAID Volumes, Reset Disks to Non-RAID, or Exit. The keys available for use are listed at the bottom of the screen.

Example: RAID volume creation on the SATA controller through OROM.

a. Use the **Up/Down** arrows to navigate to "1. Create RAID Volume" if not already selected.
b. Enter the desired volume name and press **Tab** or **Enter**.
c. Use the **Up/Down** arrows to scroll through available RAID levels. A description of the level will appear in the "HELP" box. Select the desired RAID level and press **Tab** or **Enter**.
d. Press **Enter** to open the "SELECT DISKS" window.
e. Use the **Up/Down** arrows to highlight a desired disk and press **Space** to select the disk. Press **Enter** after you have selected all of the disks that you want to be included in the RAID.
f. If you are creating a RAID array that is striped, you can use the **Up/Down** arrows to change strip size if desired. Press **Enter** when done.
g. Capacity will be automatically calculated for you based on the RAID type. The capacity shown may be around 95% of the actual available capacity. In a mirrored array, the reserved space helps to ensure that a failed drive can be replaced with another drive of the same listed capacity even if the actual capacity is slightly less than the listed capacity. Press **Enter** to accept the default capacity.
h. Press **Enter** to create the volume.

Similarly a user can Delete RAID volumes or reset disks to Non-RAID status by following the on screen prompts and using the keys listed at the bottom of each screen.

2. RAID CREATION USING THE UEFI DRIVER IN BIOS SETUP
In order to create RAID arrays using the UEFI driver in BIOS, the **Option ROM Launch Policy** in BIOS must be set to **All UEFI** or **All UEFI Except Video**. This can be changed in BIOS Setup under `Advanced > Option ROM Launch Policy`.

The UEFI driver interface can be found in the BIOS Setup menu. Press F10 when powering up the system. Select the UEFI Drivers tab. Select the Intel(R) VROC SATA Controller or Intel(R) VROC sSATA Controller where the SATA drives are attached.

Example: RAID volume creation on SATA controller using the UEFI Driver interface.

a. Use the **Up/Down** arrows to select **Create RAID Volume** and press **Enter**.
b. Use the **Up/Down** arrows to select **Name** and press **Enter** to pop up a box for editing the volume name. Change the name if desired and press **Enter** to close the edit box.
c. Use the **Up/Down** arrows to select **RAID Level** and press **Enter** to show available RAID levels. Use the **Up/Down** arrows to select the desired RAID level and press **Enter** to accept.
d. Use the **Up/Down** arrows to navigate to "< >" behind the drives you want to include in the array. Press **Enter** to open a selection box and use **Up/Down** arrows to change from blank to "X". Press Enter to accept. Continue selecting drives until you have selected all of the drives that you want to include in the RAID array.
e. Arrays that use striping, will have an option to select strip size. You can accept the default by navigating past it or press **Enter** and make a selection.
f. Leave the capacity as default.
g. Use the **Up/Down** arrows to select **Create Volume** and press **Enter** to create the array. This will take you back to the main screen for the current controller where you can create an additional RAID array (up to 2 arrays) or view already created arrays.

3. RAID CREATION FROM A DOS OR EFI SHELL.

RAID arrays can be created in a DOS or EFI shell by using the shell specific Intel® RAID Utility for the controller. This is useful in a deployment environment where an organization wants to configure multiple systems identically. The utilities can also be run from a DOS or EFI bootable USB key.

The utilities are specific to a particular driver version and are available with the driver package downloadable from hp.com.

The utilities are:

DOS Shell

• RCfgSata.exe (For the sSATA controller use RCfgsSata.exe)

EFI Shell

• RCfgSata.efi (For the sSATA controller use RCfgsSata.exe)

For the latest commands use "/?" option when executing the command.

Example:
```
> RCfgSata.exe /? Press Enter
```

4. RAID creation from a Windows Administrator Command Prompt.

RAID arrays can be created by using the Intel® Virtual RAID on CPU (Intel® VROC) Command Line Interface (VROCCLI). The CLI is included in the Intel® VROC driver package for your system, downloadable from hp.com. The VROCCLI utility must be executed from an administrator command prompt. If you attempt to execute the VROCCLI utility from a non administrator command prompt, you will receive the following message: "Could not obtain system information to display middleware version."

See the **Intel® VROC Command Line Interface** documentation for specific usage instruction.

5. RAID creation from within the OS using the Intel® Virtual RAID on CPU GUI.

The RSTe GUI provides an easy method for creating RAID arrays. The RSTe GUI is pre-installed on systems shipped from the factory, and can also be installed from the latest driver package available on hp.com.

Launch Intel® Virtual RAID on CPU GUI by navigating to it from the start menu, or press the Windows key and then start typing "Intel®" in the Box that appears. A short list should appear that contains "Intel® Virtual RAID on CPU". Click this item with the mouse to launch the GUI.

Click the "Create Volume..." button to start the guided RAID array creation process. Additional help is available on each page of RAID creation process by clicking on "More help on this page" at the lower right corner of each page. A balloon with a question mark inside will be displayed if help or suggestions are available for a specific topic. Click on the balloon to display the help on the item in a new page.

Z TURBO DRIVE STORAGE FEATURES

The HP Z8 G4 Workstation can support up to 8 Z Turbo Drives.[7] All Z Turbo Drives qualified on HP Z8 G4 are NVMe storage devices.

Up to four M.2 modules may be installed via two HP Z8 M.2 Adapter Modules, and up to four additional M.2 modules may be added via a Z Turbo Drive Quad Pro carrier. The use of two HP Z8 M.2 Adapter Modules requires that two CPUs are installed in the workstation.

The Personality Module carriers can accommodate two M.2 modules up to the 22110 form factor. The Z Turbo Drive Quad Pro can accommodate four modules up the 22110 form factor.

TRIM support for HP Z Turbo Drives

TRIM keeps track of files that have been deleted but not erased on the drive to improve performance and help extend the life of the SSD. TRIM is not an acronym, but is a command specific to SSDs and is typically represented by TRIM in all upper case. TRIM is supported on NVMe devices using the DATASET MANAGEMENT command.

Configuring RAID with HP Z Turbo Drives using Intel® Virtual RAID on CPU

Intel® VROC software and drivers allow a user to create and manage bootable or data RAID on NVMe SSDs directly attached over PCIe to CPUs in supported Workstations. VROC does not recognize devices on PCIe slots connected to the PCH. VROC RAID is available when an optional VROC Upgrade Key module is installed on the motherboard. See whitepaper "Intel Virtual RAID on CPU" on hp.com (https://www.google.com/search?&q=Intel+virtual+raid+on+cpu+hp.com) for detailed VROC information and configuration.

Configuring RAID with HP Z Turbo Drives using Microsoft Windows

Once the HP Z Turbo Drives are installed in the system and the system has been rebooted, launch **Disk Management**.

- For Windows 7 systems, click **Start**, right-click on **Computer**, select **Manage**, select **Disk Management**.
- For Windows 8 and later systems, hit the **Windows+X** keys on the keyboard, select **Disk Management**.

If the HP Z Turbo Drives are new, you will be asked to initialize the drives.

- Choose either **Master Boot Record** (MBR) or **GUID Partition Table** (GPT).

  – You can use MBR or GPT for arrays smaller than 2.2 TB (e.g. the array size for two 512 GB drives in a RAID 0 is equal to 1 TB; the array size for two 512 GB drives in a RAID 1 is equal to 512 GB).

  – GPT must be used for arrays larger than 2.2 TB (e.g. the array size for four 1 TB drives in a RAID 0 is equal to 4 TB).

- Click **OK.**

Figure 4. Initialize disk
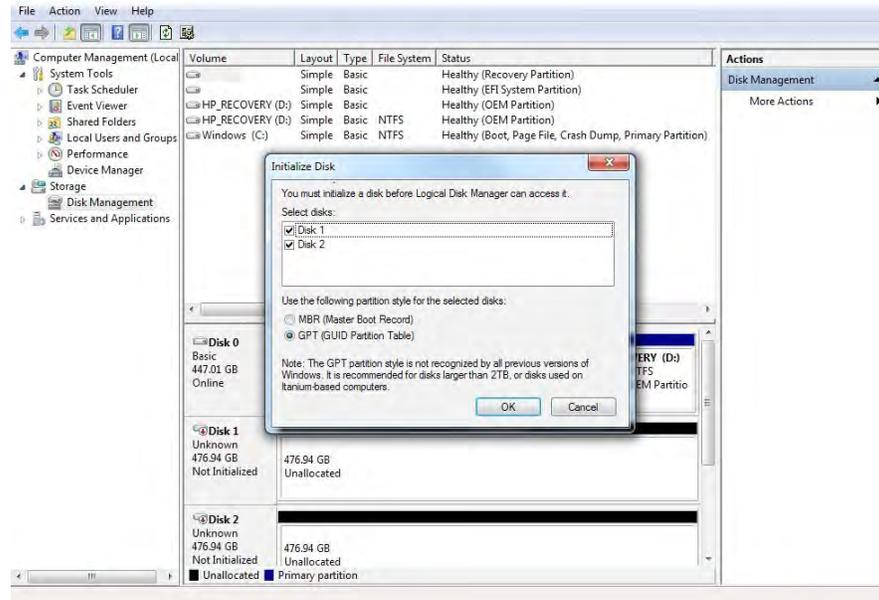
The drives are now initialized but unallocated.

Figure 5. Initialized but unallocated drives
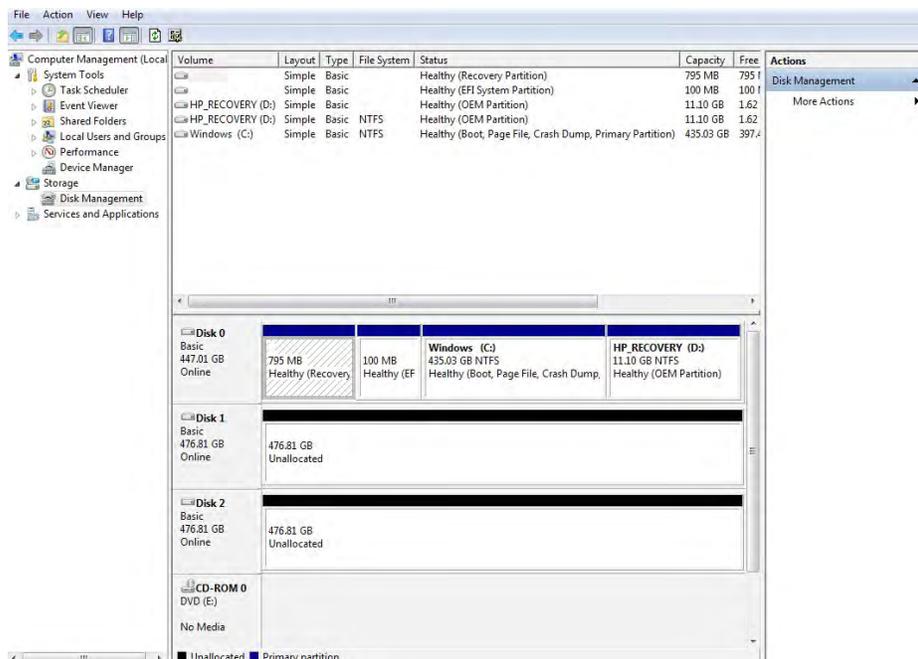
Mouse over one of the unallocated HP Z Turbo Drives and right-click. A menu will appear to configure a software RAID. The software RAID modes are defined as follows:

- **Simple volume:** No RAID, single drive.

- **Spanned volume:** A single partition that includes multiple drives. Files are not deliberately broken up among the drives. A spanned volume does not include any performance or redundancy advantages.

- **Striped volume (RAID 0):** Data and files are deliberately broken up across multiple disks in an attempt to improve read and write performance. The resulting RAID volume size is the sum of the individual drives included in the configuration.

- **Mirrored volume (RAID 1):** Data is replicated between drives, providing data redundancy but no performance advantage. The RAID volume size equals the size of the smallest drive in the array.

- **RAID 5 volume:** A RAID 5 does not replicate data between multiple drives and is more efficient at storing the redundancy information necessary to restore the RAID when a drive fails. Instead of replicating all data to a second drive, it creates a smaller parity partition to allow data recovery. RAID 5 is not available on Windows 7 or Windows 10.

Figure 6. Disk Management screen and menu choices
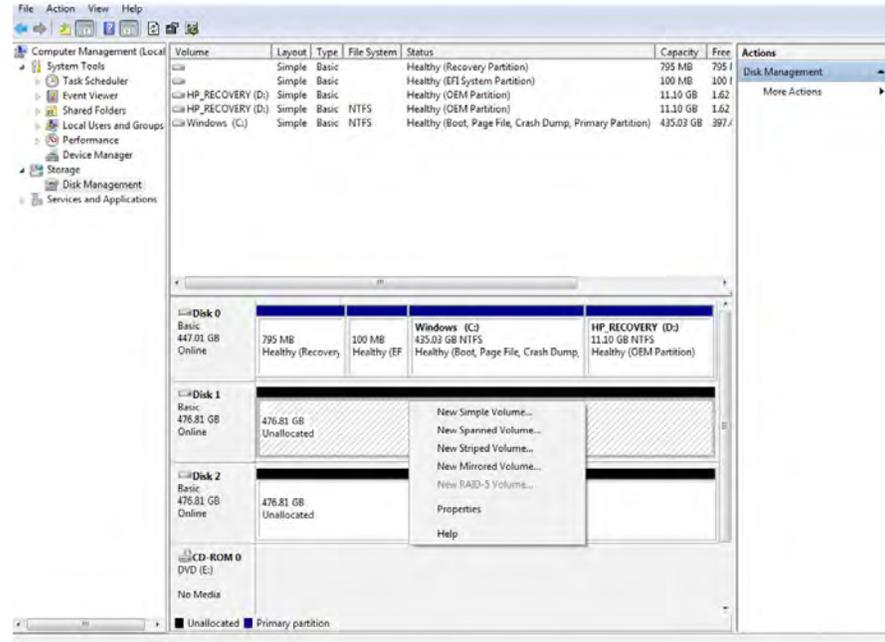
For this document, RAID 0 is selected using HP Z Turbo Drive G2s. Microsoft Windows provides a wizard to help complete the process.

Figure 7. Microsoft Windows RAID Configuration Wizard
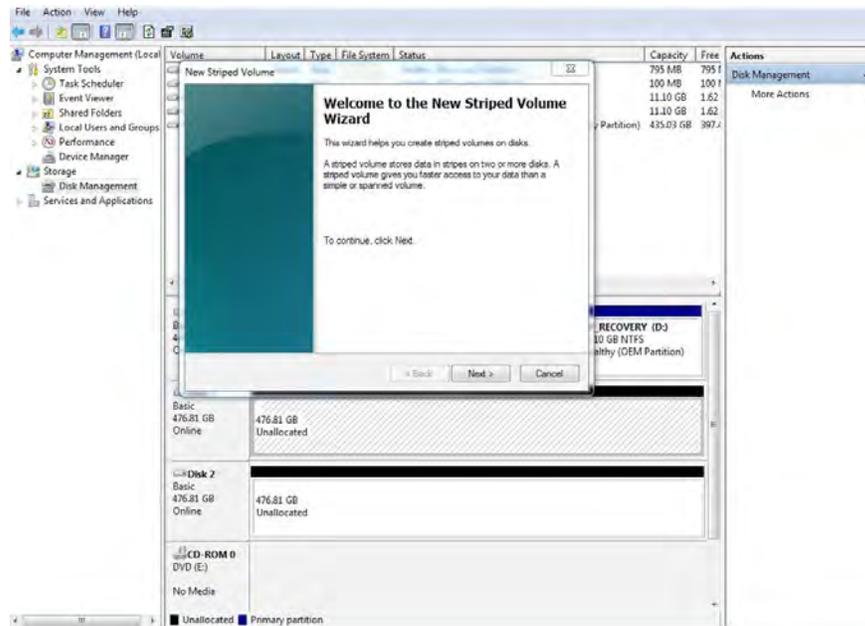
Click **Next.**

Choose the other drives to be included in the RAID array. For each drive to be added to the array:

• Select the drive.

• Click **Add.**

Figure 8. Drive selection
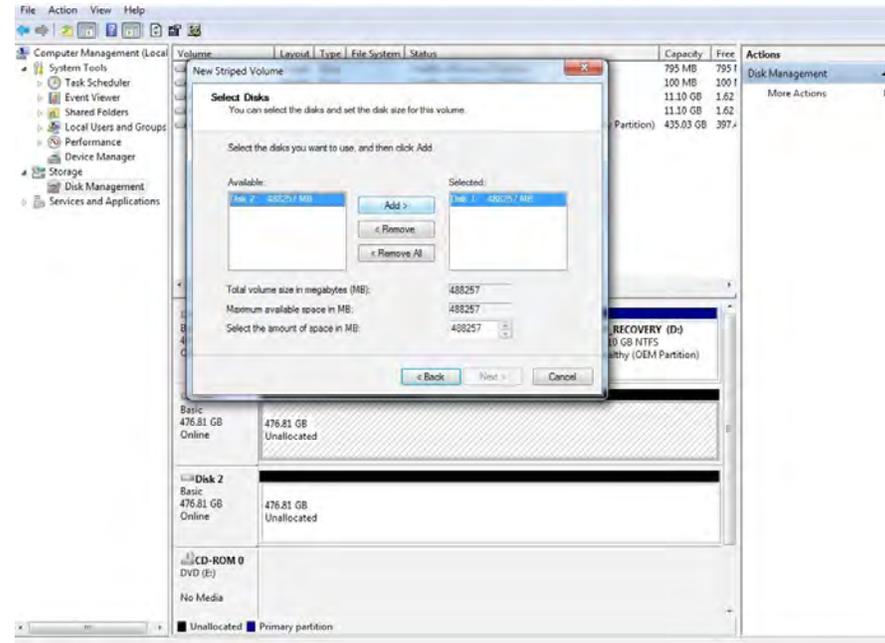
Once all drives have been added, click **Next.**

Figure 9. Drive selection
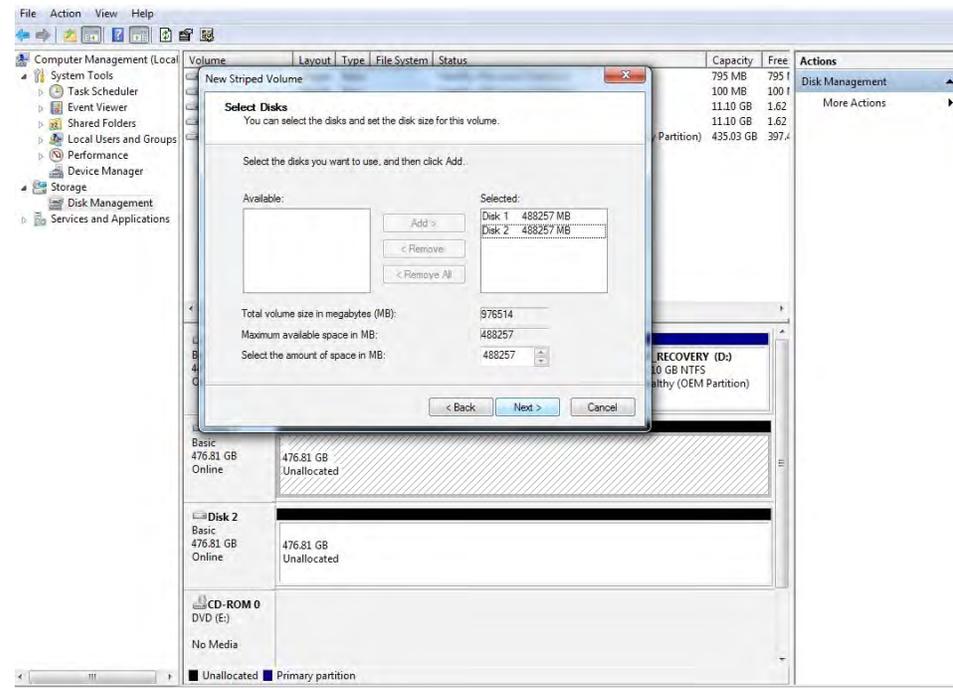
Assign a drive letter for the resulting RAID volume. Notice that the RAID can be assigned to an empty NTFS folder. Choose the appropriate option, then click **Next.**

Figure 10. Assigning a drive letter
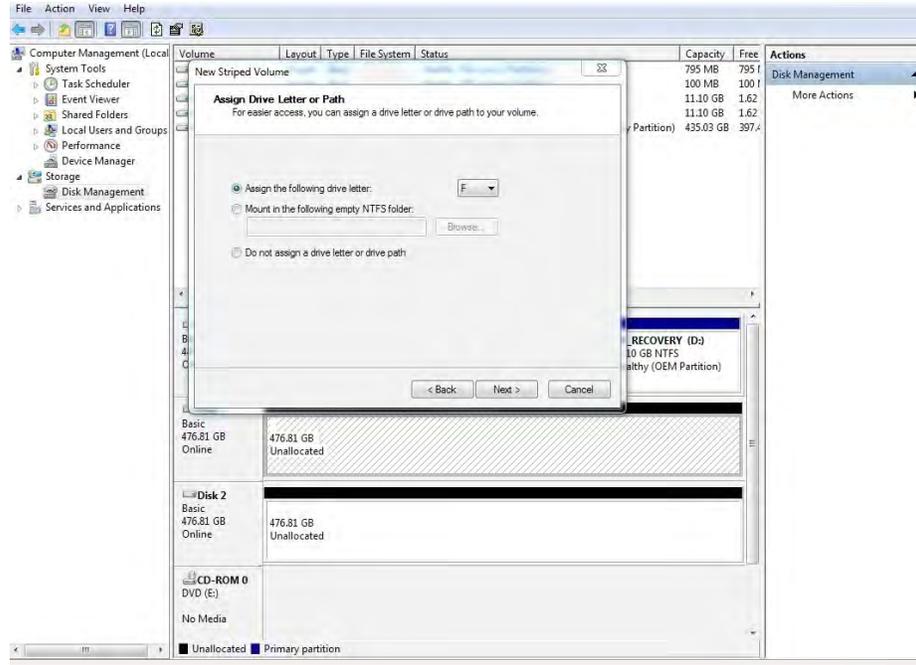
The OS will now format the RAID volume. Select either the default stripe size, or choose an alternative size. Click **Next** to continue.

Figure 11. Stripe size
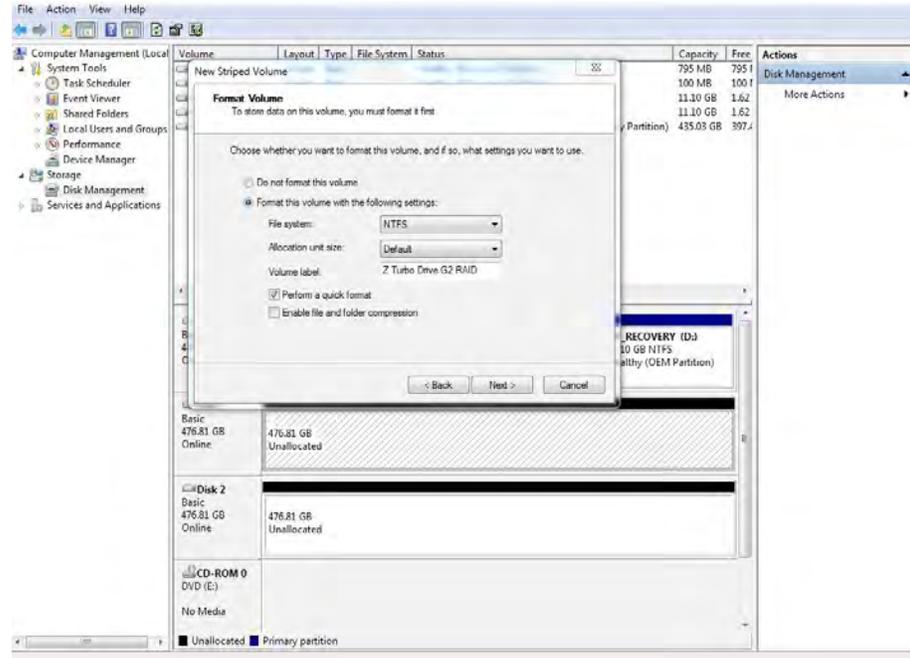
When the RAID configuration has completed, click **Finish**.

Figure 12. RAID configuration completion message
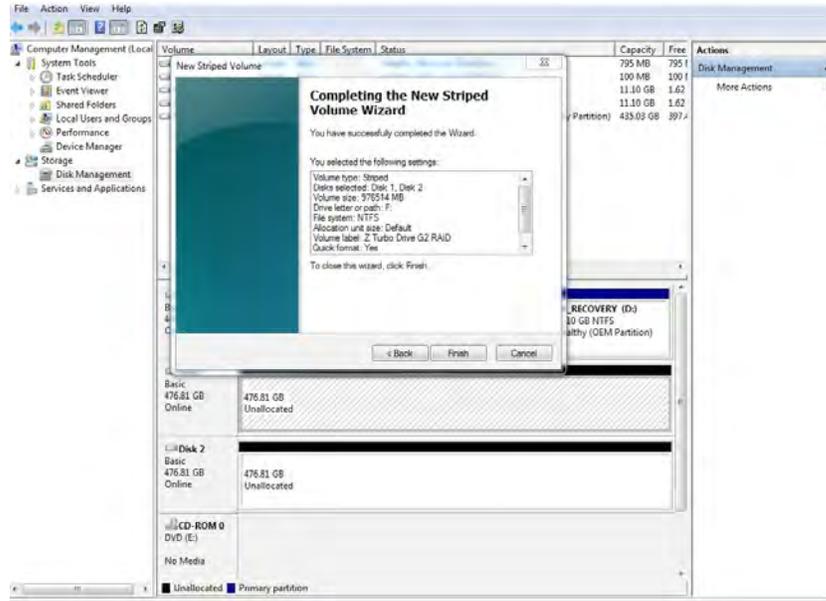
Click **Yes** to continue with the RAID configuration, or **No** to abort.

Figure 13. RAID configuration confirmation
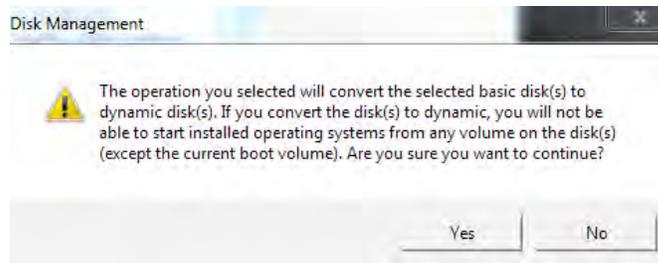
When completed, Disk Management will show all the disks configured using RAID, based on the name of the volume and the assigned drive letter. Note that in Disk Management, the volumes shown in the top pane relates to the overall size of the RAID while the disks listed at the bottom display the size of the individual drives.

Figure 14. Disk Management with HP Z Turbo Drives in a RAID 0 configuration
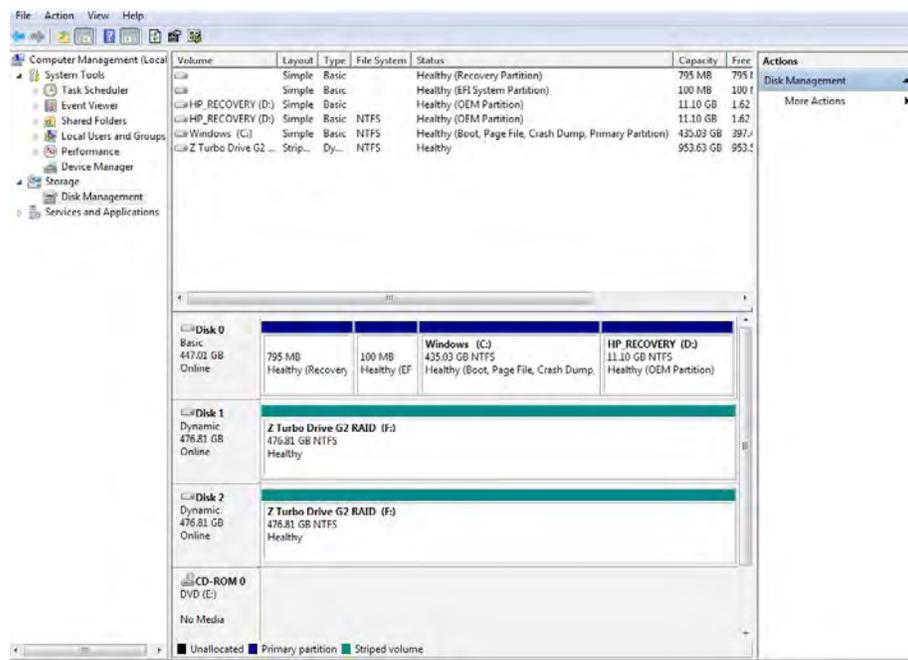
Note: On completion the OS will see a new drive and may generate an AutoPlay dialog. Either select **Open folder to view files** or close the dialog box.

Figure 15. AutoPlay dialog box

PERFORMANCE CONSIDERATIONS

POWER SETTINGS

The default "Balanced" and "Power Saver" plans in Windows Power Options may result in power management settings that may adversely affect performance of your applications. If the workstation is being used for a high demand application, consider choosing the "High performance" power plan or choose custom settings that better fit your use model.

SSDS USED IN RAID CONFIGURATIONS AND TRIM SUPPORT

TRIM keeps track of files that have been deleted but not erased on the drive to improve performance and help extend the life of the SSD. As the SSD is used, the controller within the SSD distributes data across the available FLASH on the SSD until all FLASH is used. After the FLASH has been used up, a block erase is required before subsequent writes can occur. The TRIM command normally frees up memory prior to being needed for the next write. If the TRIM commands are not sent to the drive and no unerased FLASH is available for writing, the SSD controller must erase a block of memory prior to writing. This can slow performance in applications that perform a lot of file write and file delete operations. One example is in compiling code where the compiler generates many intermediate files that then get deleted.

The table below shows which RAID arrays support TRIM:

Controller	TRIM supported	TRIM not supported
SATA	0, 1, 10	5
sSATA	0, 1	No RAID Support
NVMe	0, 1, 10	

Storage caching options

HP Workstations ship with default storage cache settings that balance performance with data protection. The balance of performance and protection can be adjusted by changing one or more of these settings.

Create a backup of your data before attempting to change any storage related settings.

Windows Write-caching policy (Disk Properties in Disk Manager)

Write caching on the device:

DEFAULT: Enabled

Improves performance by enabling write caching on the disk; however, a loss of power may result in loss of data that has not been committed to the storage media.

Windows write-cache buffer flushing:

DEFAULT: Enabled

When enabled, Windows will periodically instruct the storage device to commit data in the devices cache to the non-volatile storage media. These periodic commands result in decreased overall system performance.

Note: If Windows write-cache buffer flushing is enabled, Intel® VROC write-back cache is disabled. To enable write-back cache on volumes, you must disable Windows write-cache buffer flushing

A user can choose to disable Windows write-cache buffer flushing to restore system performance, allowing the Intel® VROC driver to handle all write-cache buffer flushing.

Intel® VROC write-back cache [for RAID volumes] (Intel® VROC GUI, Volume Properties)

DEFAULT: Disabled

When enabled the read and write performance of a RAID or recovery volume is improved. In write-back cache mode, the RAID controller acknowledges write I/O requests immediately after the data loads into the controller cache. The application can continue working without waiting for the data to be physically written to the hard drives.

Enabling Intel® VROC write-back cache will enable Write caching on the device if not already enabled and will disable Windows write-cache buffer flushing.

MEMORY CONFIGURATIONS AND OPTIMIZATION

The purpose of this section is to provide an overview of the memory configurations for the HP Z8 G4 Workstation and to provide recommendations to optimize performance.

SUPPORTED MEMORY MODULES

Types of memory supported on an HP Z8 G4 Workstation are:

Intel® Xeon® SP: Platinum 8100, Gold 6100, Gold 5100, Silver 4100 and Bronze 3100 Family:

• 8 GB, 16 GB, and 32 GB PC4-2666-R 2666 MHz DDR4 Registered DIMMs[4]

• 64 GB PC4-2666-L 2666 MHz DDR4 LR DIMMs[4]

• 128 GB PC4-2666-L 3DS 2666 MHz DDR4 3DS LR DIMMs[4]

  – Sleep (S3 state) support:

  – Sleep (S3 state) may not be supported with non-HP validated 64 GB LR DIMMs

  – Sleep (S3 state) not supported with 128 GB LR DIMMs

• Single and dual rank DIMMs based on 4Gb and 8Gb DRAMs are supported

• Quad and octal rank LR DIMMs based on 8Gb DRAMs are supported

Intel® Xeon® SP: Platinum 8200, Gold 6200, Gold 5200, Silver 4200 and Bronze 3200 Family:

• 8 GB, 16 GB, 32 GB and 64 GB PC4-2933-R 2933 MHz DDR4 Registered DIMMs[4]

• 128 GB PC4-2666-L 3DS 2666 MHz DDR4 3DS LR DIMMs[4]

  – Sleep (S3 state) support:

  – Sleep (S3 state) not supported with 128 GB LR DIMMs

• Single and dual rank DIMMs based on 8 Gb and 16 GB DRAMs are supported

• Quad and octal rank LR DIMMs are supported

Types of memory NOT supported on an HP Z8 G4 Workstation are:

• Unbuffered DIMMs

• Non-ECC DIMMs

• DDR, DDR2, or DDR3 DIMMs

See Memory Technology White Paper for more memory module technical information.

PLATFORM CAPABILITIES

Maximum capacity

• Single processor: 1.5 GB
• Dual processors: 3 TB

CPU Memory limits

• Intel® has limited the maximum memory supported per CPU

   − Intel® Xeon® SP Processors: Platinum 8100, Gold 6100, Gold 5100, Silver 4100 and Bronze 3100 Family:

• Base Memory CPUs support up to 768 GB per CPU, 1.5 TB per system
• Large Memory Optimized CPUs support up to 1.5 TB per CPU, 3 TB per system

   − Intel® Xeon® SP Processors: Platinum 8200, Gold 6200, Gold 5200, Silver 4200 and Bronze 3200 Family:

• Base Memory CPUs support up to 1 TB per CPU, 2 TB per system
• Large Memory Optimized CPUs support up to 2 TB per CPU, 4 TB per system

Total of 24 memory sockets

• 12 memory sockets available per CPU
• 6 channels per processor and 2 sockets per channel

Speed

• 2933 MHz, 2666 MHz, 2400 MHz, and 2133 MHz memory speeds are supported in this platform
• Memory will operate at the speed of the slowest rated installed processor or DIMM

Registered, LR DIMMs and 3DS LR DIMMs cannot be mixed in a system Dynamic power saving is enabled NUMA, Sub-NUMA and Non-NUMA modes are supported and user configurable.

MEMORY FEATURES

ECC is supported on all of our supported DIMMs

• Single-bit errors are automatically corrected.
• Multi-bit errors are detected and will cause the system to immediately reboot and halt with an F1 prompt error message.
• By way of comparison, non-ECC memory (not supported on this platform) does not detect or correct single-bit or multi-bit errors which can cause instability, or corruption of data, in the platform.
  See Memory Technology White Paper for more information.

Command and Address parity is supported

• Command and Address errors are detected and will cause the system to immediately reboot and halt with an F1 prompt error message.

OPTIMIZE PERFORMANCE

System performance is largely based on the applications being used. Generally, to obtain the best performance, it is advised that you follow the following guidelines:

• For best performance, it is recommended to load memory into all channels. Since these platforms have 6 channels per CPU, install memory in sets of 6 for single CPU configurations or 12 for dual CPU configurations.
• Proper individual DIMM capacity selection is essential to maximizing performance. Evenly distributing total desired memory across all operational channels and CPUs will deliver the best performance.
• To increase overall performance, install multiple ranks in each channel. This can be accomplished by installing 2 single ranked DIMMs in the same channel.
• It is not recommended to only use three DIMMs, but to get better performance out of a three DIMM configuration, it is recommended that you install all three DIMMs on one side of the CPU.

LOADING RULES

- Load the memory modules in order of size, starting with the largest module and finishing with the smallest module.
- Each channel includes two DIMM sockets; black and white connector pairs represent a channel. For a single processor configuration, the DIMMs should be loaded first in the black sockets and then in the white sockets. The DIMMs should be loaded starting with the DIMM furthest from the CPU, with the first DIMM loaded in the top most socket and alternating sides of the CPU.
- For 3 DIMM per CPU configurations: load DIMMs in CPUx-DIMM1, CPUx-DIMM3 and CPUx-DIMM5.
- For a dual processor configuration, follow the loading order above, but alternate between the 2 processors.
- See the figure below for loading order.

Figure 16. Loading order for single and dual CPU configurations.
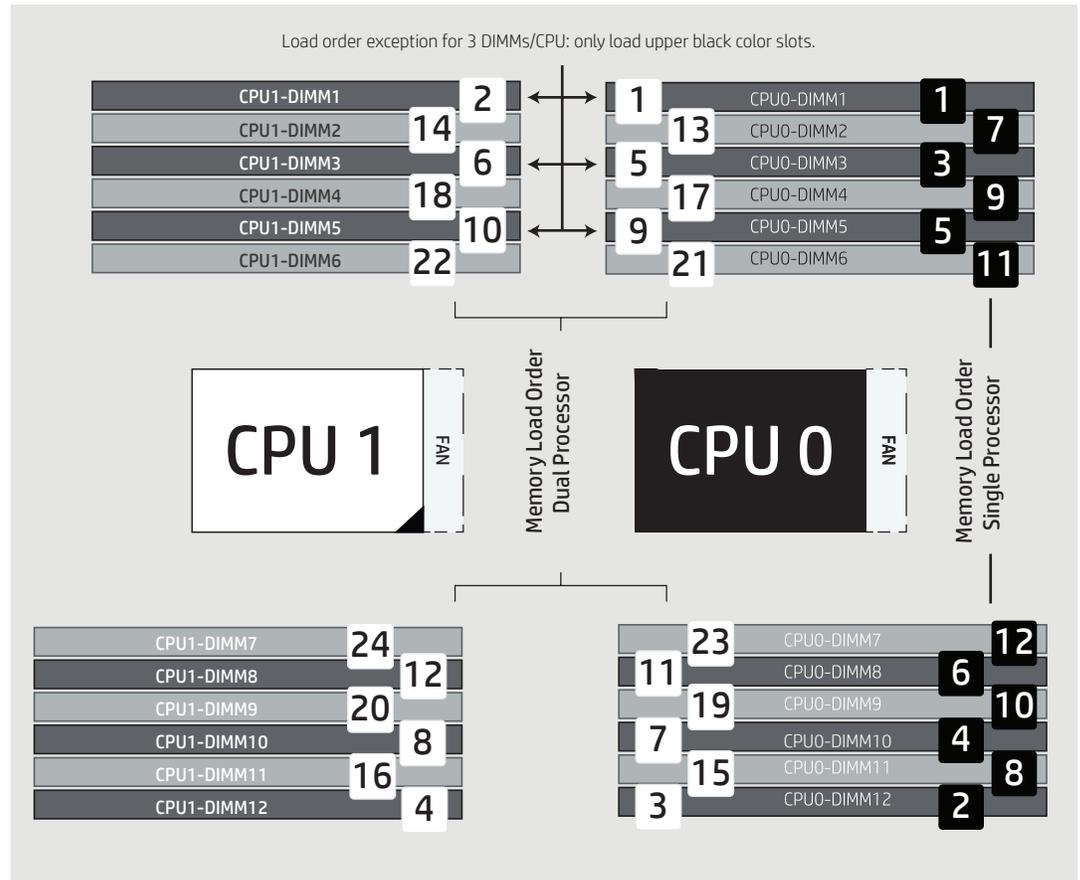
THERMALS AND ACOUSTICS

Performance, reliability, and low noise are critical to demanding workstation customers. Maintaining component temperatures is vital to both performance and reliability. Low noise is essential because a noisy environment increases user fatigue and reduces productivity.

With the increase in power and capabilities of the HP Z8 G4 Workstation, one might expect the system to be loud. However, through innovative engineering, the HP Z8 G4 maintains the excellent low noise levels already achieved by the quiet HP Z840. HP has taken a comprehensive approach to managing thermal and acoustic performance. By combining hard drive vibration damping, multi-channel airflow ducting, efficient CPU coolers, an array of temperature sensors, and advanced fan control algorithms, the HP Z8 G4 delivers users industry-leading acoustics and uncompromising reliability and performance.

MULTIPLE AIR VENTS

This incredible performance begins with a chassis design that emphasizes getting cool air in and hot air out of the system. In addition to the main vents on the front there are also vents at the bottom of the front bezel and the bottom of the chassis, vents behind the front handle, and vents in the sides of the front and top bezels. A sizeable 120x38 mm rear fan rapidly exhausts the heated air while minimizing noise levels. And the split chassis architecture provides the power supply with its own airflow without impacting the rest of the system.

Figure 17. – HP Z8 G4 System Airflow
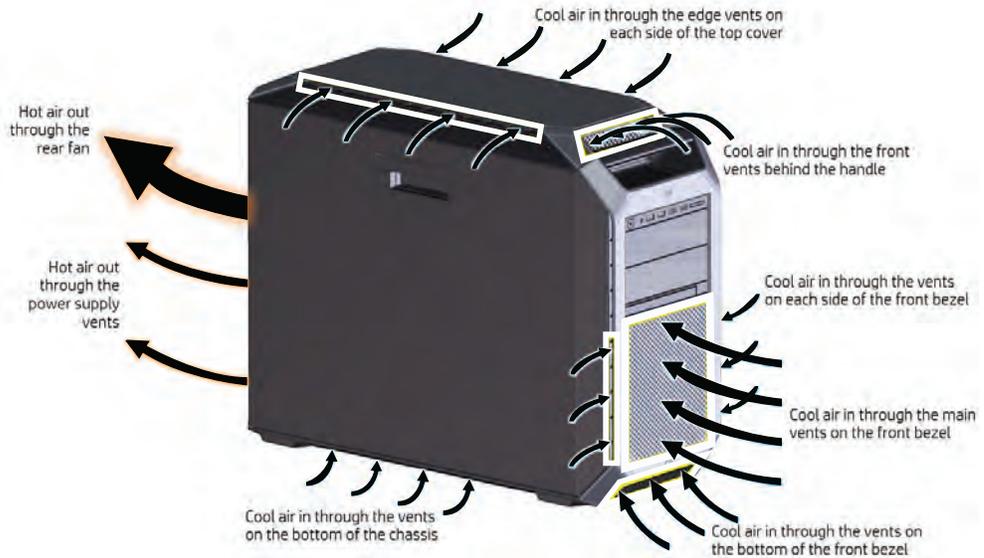
AIRFLOW MANAGEMENT

Within the chassis, the carefully crafted interior divides the system into separate zones for processors, memory, expansion cards, and hard disks. When combined with strategically placed fans, the ducting guides cool air to the location where it is needed and efficiently removes the heated air. The memory ducting has a patent pending multi-channel design that directs cooler air from the inlet to both the front and rear DIMM banks, as well as to separate segments along the length of the DIMMs. This innovative system design enables the HP Z8 G4 Workstation to provide comparable cooling to the HP Z840 using four fewer fans, reducing noise as well as potential points of failure.

Furthermore the CPU coolers have been designed to exacting specifications that exceed the Intel® requirements. And the air zone between the CPUs is divided by a baffle to direct fresh air to both CPUs and prevent preheated exhaust air from the front CPU cooler from entering the rear CPU cooler.

Figure 18 – HP Z8 G4 Memory and CPU Duct Airflow
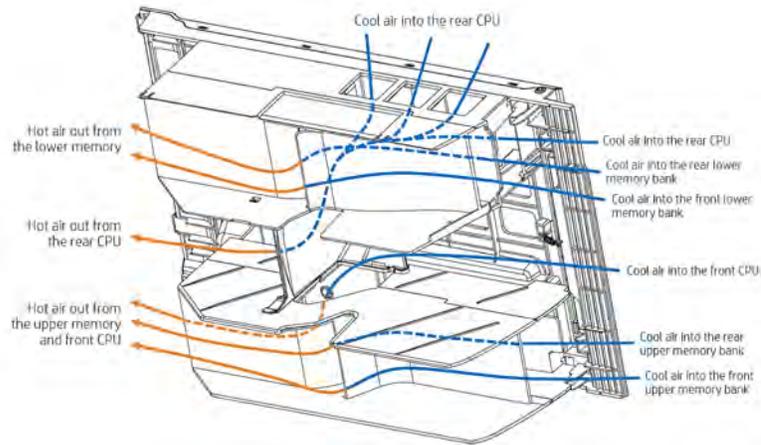
ADAPTIVE FAN CONTROL

The fourth generation health management controller on the HP Z8 G4 uses an array of up to 20 sensors to continuously monitor the system. The controller adapts to the system configuration, operating environment, and workload to perfectly tune the fan speeds, allowing the workstation to deliver optimal performance at the lowest possible noise levels. And while the system might feel warm it has all been designed and tested to ensure component safety, reliability, and operational lifetime.

RESOURCES, CONTACTS, OR ADDITIONAL LINKS

hp.com/go/whitepapers
This site includes white papers on USB 3.0 Technology, Battery Charging technology, ThunderboltTM 2 Technology, etc.

hp.com/support/HP Z8 G4_manuals
Learn more at

hp.com/go/workstations

Sources and legal disclaimers

* Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com

[1] In Intel® Xeon® SP Processors: Platinum 8100, Gold 6100, Gold 5100, Silver 4100, & Bronze 3100 Family support Microsoft Windows 7 Professional 64-bit.

[2] Intel® Turbo Boost technology requires a PC with a processor with Intel® Turbo Boost capability. Intel® Turbo Boost performance varies depending on hardware, software, and overall system configuration. See intel.com/technology/turboboost for more information.

[3] Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1 DIMM must be inserted into each channel. To get full 8 channel support, 2 processors MUST be installed. Actual memory speeds dependent on processor capability.

[4] For hard drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB for Windows 10 of system disk is reserved for system recovery software.

[5] EPEAT® registered where applicable. EPEAT® registration varies by country. See www.epeat.net for registration status by country. Search keyword generator on HP's 3rd party option store for solar generator accessories at www.hp.com/go/options

[6] External power supplies, power cords, cables and peripherals are not low halogen. Service parts obtained after purchase may not be low halogen.

[7] Optional or add-on feature.

[8] Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding, and/or naming is not a measurement of higher performance.

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