Overview

PCIe Solid State Drives for HP Workstations

Introduction
Storage technology with NAND media is outgrowing the bandwidth limitations of the SATA bus. New high performance Storage solutions will connect directly to the PCIe bus for revolutionary performance improvements. These components will be available in a variety of form factors and performance levels, designed specifically for certain market segments, and ultimately the costs will continue to decline as the technology evolves.

Performance
HP Z Turbo Drive
The HP Z Turbo Drive features a PCIe connected SSD, and this enables performance levels greater than 1GB/s. This performance is available at a price that is at parity with today's comparable SATA SSDs. This will enable the highest price/performance ratio for client grade SSDs.

The HP Z Turbo Drive will be supported on desktop platforms of HP Z Workstations. It will support storage configurations as a Boot device and as a Data device. The performance gains are significant when connecting to the PCIe bus. The sequential read and write performance is roughly twice as fast as today's SATA SSD products.

HP Z Turbo Drive 256GB SSD
256GB SSD
NAND Type: MLC
Read Bandwidth (128KB): 1.08GB/s
Write Bandwidth (1MB): 800 MB/s
Random Read IOPS (4KB): 120K
Random Write IOPS (4KB): 60K
Endurance (Total Bytes Written): 146 TB
Weight: 1.8oz (51g)
Form Factor: Half-height, half-length*

Overview

HP Z Turbo Drive 512GB SSD
512GB SSD
NAND Type: MLC
Read Bandwidth (128KB): 1.17GB/s
Write Bandwidth (1MB): 930 MB/s
Random Read IOPS (4KB): 122K
Random Write IOPS (4KB): 72K
Endurance (Total Bytes Written): 292 TB
Weight: 1.8oz (51g)
Form Factor: Half-height, half-length*

The HP Z Turbo Drive is supported on all current desktop workstation platforms, including Z230, Z420, Z620, Z820, and Z440, Z640, Z840. It is supported as a boot device and a data device(s). It is also supported by our current offering of Operating Systems, including Linux, and does not require a separate driver. It does require a BIOS update for any system shipped prior to the Z Turbo Drive launch. It can be configured with additional hard drives, both SATA and SAS, and with multiple Z Turbo drives per system. All supported configurations are not available as factory options in all regions.

Support for OPAL hardware encryption: No
Support for Secure Erase: Yes
Supported in HP Performance Advisor: yes (includes wear gauge)
Approved PCIe slots :
Recommended slot order for Z820
1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z620 - Slot 4, Slot 5
Z420 - Slot 4, Slot 5
Z230 - Slot 4

Recommended slot order for Z840
1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z640 - Slot 4, Slot 5, Slot 3 (in order of preference)
Z440 – Slot 4, Slot 5, Slot 3 (in order of preference)

For RAID support, there are some specific differences and thus restrictions as compared to SATA/SAS HDDs or SSDs. Software RAID is used, as there is not a good solution today for hardware based RAID.

● Windows RAID with Boot Configuration: Limited support for RAID 1*, No support for RAID 0, 5, 10
● Windows RAID with Data Configuration: Support for RAID 0, 1; No support for RAID 5, 10
● Linux RAID with Boot Configuration: Functional for RAID 0, 1*; No support for RAID 5, 10
● Linux RAID with Data Configuration: Functional for RAID 0, 1, 5, 10**

* RAID 1 can be set up, yet will not provide complete, redundant protection as the boot partition is not replicated on both drives. An OS boot partition cannot be protected by software RAID 1.
** Limited testing has been done with Linux to confirm RAID support and performance characteristics

HP Z Turbo Drive G2
The new HP Z Turbo Drive G2 features the next generation PCIe SSD. This M.2 form factor device uses PCIe Gen3 x4 which enables performance levels greater than 2GB/s, which is roughly 4x greater than SATA SSDs. The Random Read performance is significantly improved also, due to the NVMe controller technology used on the device. This performance is available at a price that is comparable to commercial SATA SSDs.
The HP Z Turbo Drive G2 will be supported on desktop platforms of HP Z Workstations including Z240, Z440, Z640 and Z840. It will support storage configurations as a Boot device and as a Data device. It also can be configured with other storage components including SATA and SAS drives and controllers. Not all configurations are available from the factory.

Overview

HP Z Turbo Drive G2 128GB SSD
128GB SSD
PCIe Gen3 x4 architecture
NVMe Controller
NAND Type: MLC
Read Bandwidth (128KB): 2000 MB/s
Write Bandwidth (1MB): 650 MB/s
Random Read IOPS (4KB): 300K
Random Write IOPS (4KB): 83K
Endurance (Total Bytes Written): 73 TB
Weight: 3.9oz (111g)
Form Factor: Half-height, half-length*

HP Z Turbo Drive G2 256GB SSD
256GB SSD
PCIe Gen3 x4 architecture
NVMe Controller
NAND Type: MLC
Read Bandwidth (128KB): 2260 MB/s
Write Bandwidth (1MB): 1260 MB/s
Random Read IOPS (4KB): 300K
Random Write IOPS (4KB): 100K
Endurance (Total Bytes Written): 146 TB
Weight: 3.9oz (111g)
Form Factor: Half-height, half-length*

HP Z Turbo Drive G2 512GB SSD
512GB SSD
PCIe Gen3 x4 architecture
NVMe Controller
NAND Type: MLC
Read Bandwidth (128KB): 2260 MB/s
Write Bandwidth (1MB): 1550 MB/s
Random Read IOPS (4KB): 300K
Random Write IOPS (4KB): 100K
Endurance (Total Bytes Written): 292 TB
Weight: 4.0oz (113g)
Form Factor: Half-height, half-length*

HP Z Turbo Drive G2 1TB SSD
1TB SSD
PCIe Gen3 x4 architecture
NVMe Controller
NAND Type: MLC
Read Bandwidth (128KB): 2500 MB/s
Write Bandwidth (1MB): 1550 MB/s
Random Read IOPS (4KB): 210K
Random Write IOPS (4KB): 130K
Endurance (Total Bytes Written): 600 TB
Weight: 4.0oz (113g)
Form Factor: Half-height, half-length*

The HP Z Turbo Drive G2 is supported on the current desktop workstation platforms, including Z240, Z440, Z640, and Z840. It is supported as a boot device and a data device(s). It is also supported by our current offering of Operating Systems, including Linux, and may require a separate driver, depending on OS. It does require a BIOS update for any system shipped prior to the Z Turbo Drive G2 launch, minimum BIOS is 1.53. It can be configured with additional hard drives, both SATA and SAS, and with multiple Z Turbo drives per system. All supported configurations are not available as factory options in all

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regions.

NVMe devices require a driver for proper detection and operation. Microsoft Windows 8 and higher have an inbox NVMe driver. For Windows 7, HP recommends the Microsoft hotfix which provides an NVMe driver (listed below). In addition, the Samsung NVMe driver, version 1.4.7.6, can be used with specific Samsung M.2 devices. (available at http://www.hp.com). Also note that the new NVMe driver will not support the original HP Z Turbo Drive, which requires an AHCI driver.

KB2990941 (https://support.microsoft.com/en-us/kb/2990941)
KB3087873 (https://support.microsoft.com/en-us/kb/3087873)
Operating System Support
Microsoft Windows 7 64-bit, Microsoft Windows 8.1 64-bit, Microsoft Windows 10 64-bit, RHEL 6,7; SUSE 11,12; Ubuntu 14.04.
Note: Not supported for 32-bit Microsoft Windows Operating Systems.
Support for OPAL hardware encryption: No
Support for Secure Erase: Yes
Supported in HP Performance Advisor: yes (includes wear gauge)
Approved PCIe slots :
Recommended slot order for Z840
1. Slot 1
2. Slot 6
3. Slot 3 (Requires 2nd CPU)
4. Slot 4 (Requires 2nd CPU)

Z640 - Slot 4, Slot 5, Slot 3 (in order of preference)
Z440 - Slot 4, Slot 5, Slot 3 (in order of preference)
Z240 - Native Motherboard slot first, then available PCIe Gen3 slot (either #1 or #4)

RAID support details are similar to the data listed above for HP Z Turbo Drive.

Models

HP Z Turbo Drive 256GB SSD	G3G88AA
HP Z Turbo Drive 512GB SSD	G3G89AA
HP Z Turbo Drive G2 128GB SSD	Note 1
HP Z Turbo Drive G2 256GB SSD	M1F73AA
HP Z Turbo Drive G2 512GB SSD	M1F74AA
HP Z Turbo Drive G2 1TB SSD	T9H98AA
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	N2M98AA
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	N2M99AA
HP Z Turbo Drv G2 256GB PCIe SSD (Z240 MB)	T6U42AA
HP Z Turbo Drv G2 512GB PCIe SSD (Z240 MB)	T6U43AA
HP Z Turbo Drv G2 1TB PCIe SSD (Z240 MB)	W6C19AA
HP Z Turbo Drive G2 256GB PCIe SSD (Z1 G3)	W5A06AA
HP Z Turbo Drive G2 512GB PCIe SSD (Z1 G3)	W5A07AA
HP Z Turbo Drive G2 1TB PCIe SSD (Z1 G3)	T0K72AA
HP Z Turbo Drive Thermal Solution (Z1 G3)	W0T85AA

NOTE 1: not available today as After Market Option

Technical Specifications

Storage / Hard Drives	HP Z Turbo Drive 256GB SSD	Capacity	256GB
		Interface	PCI Express 2.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive 512GB SSD	Capacity	512GB
		Interface	PCI Express 2.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive G2 128GB SSD	Capacity	128GB
		Interface	PCI Express 3.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive G2 256GB SSD	Capacity	256GB
		Interface	PCI Express 3.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive G2 512GB SSD	Capacity	512GB
		Interface	PCI Express 3.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive G2 1TB SSD	Capacity	1TB
		Interface	PCI Express 3.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)
	HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Interface	PCI Express Gen3 x16
	HP Z Turbo Drv G2 256GB PCIe SSD (Z240 MB)	Capacity	256GB (one M.2 PCIe NVMe module)
	HP Z Turbo Drv G2 512GB PCIe SSD (Z240 MB)	Capacity	512GB (one M.2 PCIe NVMe module)
	HP Z Turbo Drv G2 1TB PCIe SSD (Z240 MB)	Capacity	1TB
		Interface	PCI Express 3.0 x4 electrical x4 physical
		Operating Temperature	32° to 158° F (0° to 70° C)

Technical Specifications

HP Z Turbo Drv G2 1TB PCIe SSD (Z240 MB)		
	Capacity	1TB
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)

HP Z Turbo Drive G2 256GB PCIe SSD (Z1 G3)		
	Capacity	256GB
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)

HP Z Turbo Drive G2 512GB PCIe SSD (Z1 G3)		
	Capacity	512GB
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)

HP Z Turbo Drive G2 1TB PCIe SSD (Z1 G3)		
	Capacity	1TB
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)

HP Z Turbo Drive Thermal Solution (Z1 G3)		
	Capacity	Heatsink accommodates 2 PCIe SSD modules

Summary of Changes

Date of change:	Version History:		Description of change:
	From v1 to v2		
June 11, 2014	From v3 to v4	Removed	Removed the Z Turbo Drives.
September 2. 2014	From v4 to v5	Added	Add slot recommendations for Z840, Z640, Z440, details for Boot, note for support of Secure erase, and Linux support
December 1, 2014	From v5 to v6	Changed	HP Z Turbo Drive compatibility
February 1, 2015	From v6 to v7	Added	Support for Z440, 640 and 840 Workstations
		Removed	third party tools support for Secure Erase
April 1, 2015	From v7 to v8	Added	Z Turbo Drives G2 256 and 512GB
		Removed	Fusion ioFX
June 1, 2015	From v8 to v9	Added	RAID Compatibility
		Changed	Messaging and Compatibility
February 1, 2016	From v9 to v10	Added	HP Z240 Workstations compatibility
		Changed	Z Turbo Drives and Z Turbo Drive Quad Pro Specs
March 1, 2016	From v10 to v11	Changed	Z Turbo G2 NVMe devices comments and driver links
April 1, 2015	From v11 to v12	Added	HP Z Turbo Drive G2 1TB for all current platforms, 256,512GB and 1TB; Support Z240 and Z1 G3, HP Z Turbo Drive Thermal Solution (Z1 G3)

title