HP Front Accessible NVMe Storage Technical White Paper



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Introduction

The HP Front NVMe solution provides users with secure, high- performance front removable M.2 storage. New on HP Z G6i workstations, is the Gen5 Front Removable storage. This solution elegantly combines hardware and software functionality to provide easy-to-use, hot-swappable drive management. HP software allows users to conveniently eject drives and monitor diagnostic information.



Z8 Fury G6i

Hardware Gen5 Front Removable Storage

Overview

The HP Front NVMe Gen5 solution, fits in the front 5.25" bay on supported HP workstations to offer the user high performance front removable NVMe storage. There are two versions of this module: Gen5 Front Removable 4-bay and Gen5 Front Removable 2-bay, Front Removable will be referenced as FAS in this document . The Gen5 FAS 4-bay/2-bay is a receiving frame installed in the front 5.25" bay of the system. This frame supports modules which hold the M.2 NVMe drives. A notable benefit of this solution is that it enables front removable storage for the user without using a PCIe slot.

Hardware Interconnect

The Gen5 FAS 4-bay/2-bay takes advantage of PCIe Gen5 to offer high IO performance to the removable drives. Each removable drive is connected to the main system board with a x4 PCIe Gen5 connection. Both the G6i Z4 and G6i Z8 have dedicated connectors on the mainboard for this front NVMe solution. The Gen5 FAS 4-bay/2-bay frame connects to dedicated MCIO connectors on the mainboard using high speed cables.

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HP Front Accessible Storage for G6i

Misc Hardware Features

The Gen5 FAS 4-bay/2-bay has two LEDs per drive to display status and diagnostic information to the user. The software section below details what all is reported on the front LEDS. There is also a central lock on the unit which allows the user to lock all drives in the frame with the provided Key.

Gen5 FAS 4-Bay vs Gen5 FAS 2-Bay

HP G6i workstations supporting front NVMe will support either the Gen5 FAS 4-Bay or the Gen5 FAS 2-Bay, not both. The only functional difference between the modules is the number of drives supported: 4-Bay supports four drives and the 2-Bay supports two drives. The system's support for either 4-Bay or 2-Bay is determined by the number of dedicated connectors on the system's mainboard .



Z4 G6i

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Hardware Gen4 QX448 and QX428

Overview

The HP Front NVMe Gen4 solution, developed with CRU, installs in the front 5.25" bay of compatible HP workstations to provide high-performance, removable NVMe storage. There are two versions of this module: QX448 and QX428. The QX448/428 is a receiving frame installed in the front 5.25" bay of the system. This frame supports the CRU SHIPS modules which hold the M.2 NVMe drives. A notable benefit of this solution is that it enables front removable storage for the user without using a PCIe slot.

Hardware Interconnect

The QX448/428 takes advantage of PCIe Gen4 to offer high IO performance to the removable drives. Each removable drive is connected to the main system board with a x4 PCIe Gen4 connection. System boards supporting QX448/428 will have dedicated connectors on the mainboard for this front NVMe solution. The QX448/428 frame connects to dedicated SlimSAS connectors on the mainboard using high speed SlimSAS cables.

Additional Hardware Features

The QX448/428[1] has two LEDs per drive to display status and diagnostic information to the user. The software section below details what all is reported on the front LEDS. There is also a central lock on the unit which allows the user to lock all drives in the frame with the provided key.

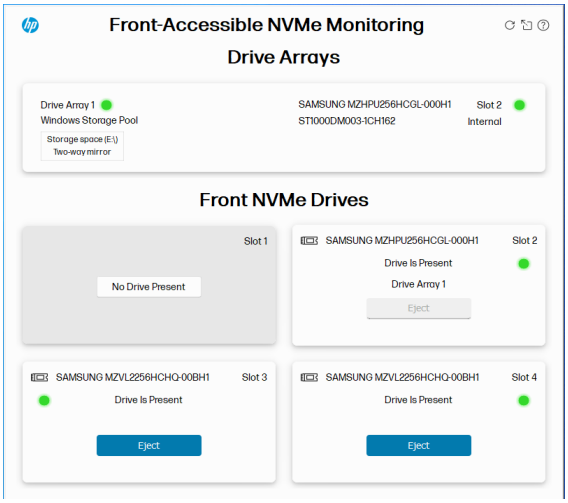
	Gen5 4 Bay	Gen5 2 Bay	QX448	QX428
Number of Drives Supported	4	2	4	2
PCIe Support	PCIe Gen 5.0	PCIe Gen 5.0	PCIe Gen 4.0	PCIe Gen 4.0
Front Lock with 2 Keys	Yes	Yes	Yes	Yes
Drive Power LED	Yes	Yes	Yes	Yes
Drive Status LED	Yes	Yes	Yes	Yes
Number of Data Cables	Two MCIO cables	One MCIO cable	Two 8i SlimSAS cables	One 8i SlimSAS cable

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Software Solution

Overview of FANS (Front-Accessible NVMe Storage)

The FANS software is a unique HP solution designed to operate alongside HP's Front Accessible NVMe Storage hardware. Primarily targeting Media & Entertainment, Government, and Law Enforcement, it's designed to facilitate the rapid ejection and general monitoring of drives. FANS software comes preinstalled on HP desktop workstations beginning with G5 systems and will also be available for customers to install themselves via softpaq download on HP's website.



Features

Drive Ejection: Each drive inserted in the carrier is represented by the FANS user interface. Each drive will appear in a card that mirrors the slot it is installed in on the front of the carrier, allowing the user to easily differentiate the drives. On each of these cards is an eject button. Clicking the eject button will trigger a Windows ejection event, meaning the drive will be safe to remove. These cards also display information on the drives themselves. There is a circle on each card that represents the Status LED on the front of the unit. Any status change will be reflected in both this circle and the Status LED.

RAID Monitoring: For any RAID setup that includes a front NVMe drive, the FANS software will display and monitor all drives (internal and front NVMe) included in the RAID array. The supported RAIDs for monitoring are on Windows (Storage Spaces and VROC) and Ubuntu (LVM RAID and MD RAID). The RAID array is represented in a visual card, similar to the drive cards. If internal drives are included in the RAID along with a front NVMe drive, the FANS interface will simply state that the device is internal instead of displaying the status of internal drives. Any RAID faults will

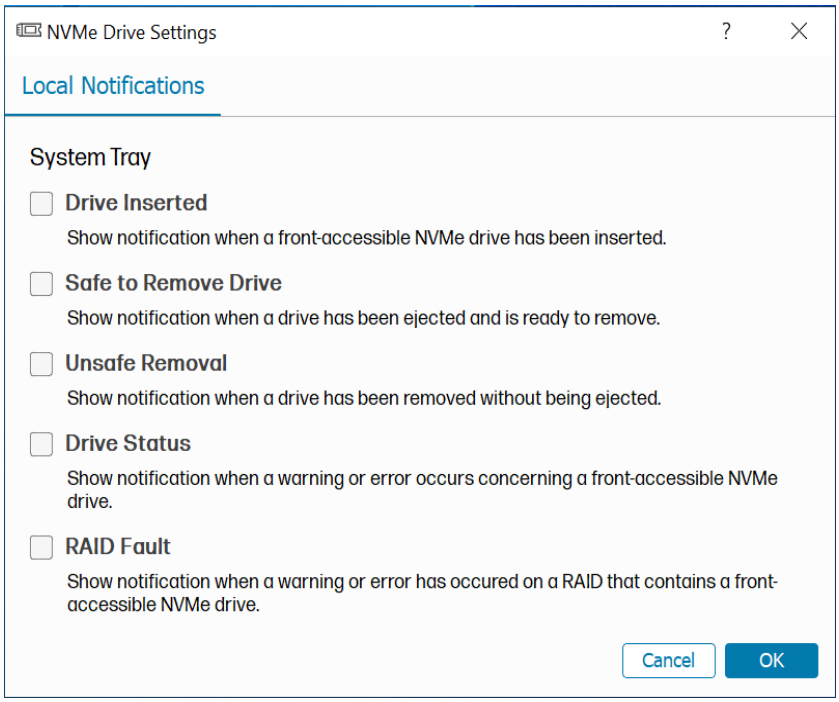
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trigger user notification and will display an error on the RAID card. The FANS software is purely observational and provides no RAID Management capabilities.

SMART Monitoring: FANS will also trigger an error notification if a SMART error is received. SMART errors are warnings that drives send out when they are about to fail. Any high-level SMART event will also be displayed on the drive card. The user can see this by hovering over the status LED.

Task Bar Notifications: FANS will alert the user via task bar notifications whenever a significant event is detected, as long as the user has not turned this off through the settings.

Settings Modification: Users will be able to customize the type of alerts they receive, and how they receive them. User can opt out of notifications from the FANS user interface.



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LED Behavior

The Front Accessible NVMe Storage hardware has two LEDs per drive: a Power LED and a Status LED. The Power LED will blink when the drive is being accessed by the system. The behavior of the Status LED can be seen below in Figure 3.

Figure 3: Front Accessible NVMe Storage LED Behavior

LED Name	Color	State	Description
Status LED	Green	Ready to Use	The drive/RAID is operating normally
Status LED	White	Ejected	The LED turns white when a drive has been ejected from Windows, but not removed.
Status LED	Red	Fault Detected	The drive/RAID has encountered a failure/fault. The user will need to address the issue.
Power LED	White	Drive Has Been Inserted	We have no control over the power LED, but it is always on when a drive has been inserted

Resources, contacts, or additional links

Visit **HP's White Paper site** to learn more about the innovation in HP Workstations and the latest technologies offered in the products.

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Disclaimers

1. Prior QX428/448 versions purchased before 02/05/2024 only support up to PCIe Gen 3. it is recommended to use “CRU certified” storage module that is fully tested and compliance with “QX” series.

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