

Overview

HPE Parallel File System Storage

Are you frustrated with the architectural and economical limitations of your current high performance file storage?

HPE Parallel File System Storage is cost-effective, parallel storage for your high-performance simulation, AI and data analytics environments running on HPE Apollo systems and HPE ProLiant DL servers with HPE InfiniBand HDR/Ethernet 100/200 Gb adapters.

It combines two iconic industry brands that do not need any introduction - the leading parallel enterprise file system (IBM Spectrum Scale - formerly known as GPFS) and the world's most secure industry-standard servers (rack-optimized HPE ProLiant DL servers) into a high performance, cost-effective software-defined storage solution that ships fully integrated as an HPE product from the HPE factory. With unified support from HPE Services services for the full storage solution.

HPE Parallel File System Storage provide multiples of performance and namespace scalability, as compared to standard scale-out NAS storage, to increase the utilization of your compute nodes by removing I/O bottlenecks while enable cost savings through storage island consolidation in a unified, high performance namespace.

It is ideal for all organizations that leverage clusters of HPE Apollo systems or HPE ProLiant DL servers for High Performance Computing (HPC), Artificial Intelligence (AI) and High Performance Data Analytics (HPDA) workloads and who are struggling with the performance, scalability, and economics of their current storage infrastructure for unstructured data.

Platform Information

HPE Parallel File System Storage provides the following three ways to build a file system

- All user data in the file system on fast NVMe SSD
- All user data in the file system on cost-effective HDD
- Fast NVMe storage pool and cost-effective HDD storage pool in the same file system/namespace with two models of storage nodes that are based on HPE ProLiant DL325 Gen10 Plus rack servers
- HPE Parallel File System 16 Flash Bays Server
- HPE Parallel File System 8 Disk Bays Server.
- HPE Parallel File System 12 Disk Bays Server
- HPE Parallel file System Base Protocol Server

The above servers run the iconic IBM Spectrum Scale® parallel file system in Erasure Code Edition (ECE). IBM Spectrum Scale ECE was designed to be deployed on standard rack servers like the HPE ProLiant DL325 Gen 10 Plus. ECE provides all the functionality, reliability, scalability, and performance of IBM Spectrum Scale with the added benefit of network-dispersed IBM Spectrum Scale RAID, which provides the ability build IBM Spectrum Scale-based storage systems from clusters of cost-effective, high volume rack servers like the HPE ProLiant DL brand.

The Parallel File System Protocol Server provides a pre-configured server to address the need to give access to PFSS file systems to NFS, SMB and Object (S3) clients. This allows the customer to serve shared data to all major access platforms.

For a detailed description of the functionalities of the IBM Spectrum Scale parallel file system please refer to the **IBM Redbook IBM Spectrum Scale (formerly GPFS)** as well as to the **IBM Redbook IBM Spectrum Scale Erasure Code Edition - Planning and Implementation Guide**. Both documents provide background information on the broad set of enterprise storage functionality of the embedded parallel file system but are not necessary to configure and order HPE Parallel File System storage.

The intent of HPE Parallel File System Storage is to take the complexity out of planning and implementing IBM Spectrum Scale on cost-effective, high volume rack servers by

- Pre-configuring the two models of storage servers described below.
Do not worry about component selection like processor type, core counts, memory configurations etc. The HPE team already has done this work for you for this high-performance storage use case.

Overview

- Pre-installing all the software required already in the HPE factory accelerating the deployment and simplifying the installation process. Even the install packages of the IBM Spectrum Scale clients for the compute nodes are also included on the two models for storage servers when they arrive in your location.
- Providing installation services through our global HPE Services organization

This is expected to be a major value proposition for customers who are using or planning to use clusters of compute nodes composed of HPE Apollo systems of HPE ProLiant DL rack servers that are interconnected with low latency 200 gigabit per second networks for simulation, artificial intelligence, or high-performance data analytics workloads as they now:

- Can have “one hand to shake” in the procurement process for the end-to-end (E2E) system – for both HPC/AI compute and HPC/AI storage
- Can have “on throat to choke” in the problem identification process for E2E issues – with HPE Services as the single point of accountability
- Have the option to consume the full E2E system with subscription-based, as-a-service models like HPE GreenLake

HPE Parallel File System 16 Flash Bays Server

This 1U rack mount storage node is the model that creates (very fast) NVMe-based performance and capacity in the file system/name space by combining a minimum of four of those servers in identical configuration in a RAID cluster.

The storage server provides up to 16 Small Form Factor (SFF) hot pluggable drives bays for NVMe SSD.



HPE Parallel File System 16 Flash Bays Server

HPE Parallel File System 8 Disk Bays Server

This 1U rack mount storage node is the model that creates HDD-based performance and (cost-effective) capacity in the file system/name space by combining a minimum of four of those servers in identical configuration in a RAID cluster.

The storage server provides up to 8 Large Form Factor (LFF) hot pluggable drive bays for SAS 7.2K RPM HDD. In addition to the configurable HDD capacity each of those servers contains a factory installed NVMe metadata store with default capacity of 1.6 or 3.2 terabyte to serve file system metadata and small files from fast NVMe Flash.



HPE Parallel File System 8 Disk Bays Server

Overview

HPE Parallel File System 12 Disk Bays Server

This 1U rack mount storage node is the model that creates HDD-based performance and (cost-effective) capacity in the file system/name space by combining a minimum of four of those servers in identical configuration in a RAID cluster.

The storage server provides up to 12 Large Form Factor (LFF) hot pluggable drive bays for SAS 7.2K RPM HDD. In addition to the configurable HDD capacity each of those servers contains a factory installed NVMe metadata store with default capacity of 1.6 or 3.2 terabyte to serve file system metadata and small files from fast NVMe Flash.



HPE Parallel File System 12 Disk Bays Server

HPE Parallel File System Base Protocol Server

This 1U rack mount storage node is the provides a supported platform for delivering non-native access to the PFSS file systems via protocols like NFS, SMB, S3. It allows the selection of 3 performance levels, a variety of networking interfaces (10,25,40, 100,200 Gb ethernet) as well adding additional NVME drives to enable the use of extended read caching on the node. (LROC)



HPE Parallel File System Base Protocol Server

Overview

Models

HPE Parallel File System 16 Flash Bays Server

Configuration options are:

- Number of NVMe SSD per server: 3, 4, 6, 8, 10, 12, 14 or 16
- Capacity point of NVMe SSD in terabyte (TB): 3.84, 7.68 or 15.36
- Choice of network adapter: 1 port or 2 port InfiniBand HDR/Ethernet 200 Gb QSFP56 adapter

In case the server is initially ordered in a configuration with less than 16 NVMe SSD from the HPE factory, the free drive slots can be populated at a later stage by ordering additional NVMe drives with the part numbers shown below.

Notes: Unlike other parallel storage systems HPE Parallel File System Storage does not require the configuration of a file system license SKU per terabyte capacity or per SSD.

Description	SKU
HPE Parallel File System 16Flash Bay Svr	R7R36A

Notes: The above CTO models have no drives pre-configured - three drives or more in even quantities of the same type and capacity must be ordered

HPE Parallel File System Base Protocol Server

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- Number of NVMe SSD per server: 3, 4, 6, 8, 10, 12, 14 or 16
- Capacity point of NVMe SSD in terabyte (TB): 3.84, 7.68 or 15.36
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Standard Features

Features and Benefits

The performance your HPC/AI clusters need

HPE Parallel File System Storage is built on industry standard server technology utilizing the AMD EPYC 7000 series processor family and HPE Smart Memory up to 3200 MT/s DDR4 memory.

Fast PCIe 4.0/ NVMe SSDs are the standard medium to deliver performance with the ability to add HDD storage pools in the same namespace to provide cost-effective storage capacity.

High speed, low latency networks like InfiniBand EDR/HDR or 100/200 Gigabit Ethernet deliver the data to the CPU or GPU compute nodes without input/output (IO) bottlenecks.

NVIDIA Magnum IO support for accelerated input/output (IO) for NVIDIA GPUs which provides a path for data to bypass CPUs. Highly available write caching (HAWC) leverages non-volatile storage in the compute nodes for accelerated IO for write-intensive applications,

The scalability your HPC/AI clusters need

HPE Parallel File System Storage supports up to 128 storage servers in a single file system/name space - far beyond the limitations of NAS storage.

- Start with as little as four rack units to then go to wherever you need.
- Scale-out very granular in increments of one rack unit.
- Scale-out PCIe 4.0/ NVMe flash performance independently from cost effective HDD capacity in the same file system.

Notes: The current limitation to 128 storage servers is a testing limit in the current version and not an architectural limit.

The enterprise storage features you need

HPE Parallel File System Storage offers system availability features that provide enterprise-grade "Five nines" availability levels with automatic fail-over and intelligent fail-back for mission-critical use cases.

Comprehensive set of data protection features like snapshots, synchronous and asynchronous replication, file-level encryption (in-flight and at-rest) and asynchronous error diagnosis while affected input/output (I/O) operations continue.

Supports interfaces for file (POSIX, NFS, CIFS), object (S3, SWIFT) and Hadoop Distributed File System (HDFS) for a broad data accessibility across the organization.

The cost-effectiveness your HPC & AI budget needs

HPE Parallel File System Storage enables "storage islands" consolidation for your HPC, AI and HPDA environments. Its software-defined architecture combines the leading enterprise parallel file system with the leading rack-optimized industry standard servers as storage nodes.

The end-to-end customer support you need

HPE Parallel File Systems storage ends the era when you needed to buy different vendors for the compute and the storage portion of your HPC & AI cluster to get "best-of-breed" on every layer of the technology stack. No more!

Now you can get "best-of-breed" on every layer with HPE Services services as the Single Point of Accountability (SPOA) for your end-to-end infrastructure for HPC, AI and HPDA workloads running on HPE Apollo systems or HPE ProLiant DL rack servers.



Standard Features

Key Software Features

By leveraging the latest version IBM Spectrum Scale Erasure Code Edition the HPE Parallel File System Storage (HPE PFSS) systems deliver a rich set of enterprise and HPC functionality. This includes but is not limited to:

- Scale out performance and capacities in a single FS from
 - ~27TB to 21PB HDD Usable capacity
 - ~11TB to 34PB SSD Usable Capacity
- Performance up to TBs per/sec, 10s of Millions of IO/sec
- Snapshot
- Encryption
- Compression
- WORM down to the file level
- End to end Data integrity checking
- Policy driven data tiering and placement
 - Based on – name, size, type, age, File heat, Fullness of File system, etc.
 - Tier to: storage classes/pool, Object store (local and web)
- Remote copy (sync and async)
- Remote site cached access to central site
- Supports NFS/CIF/OBJECT (S3) Export with additional servers
- Kubernetes Container native access
- Hadoop integration (HDFS connector)
- File System event logging and audition with event notification
- QOS, by file set with a range of policies
- Attaches to NFS servers for file caching and native HPE PFSS access to NFS storage
 - Move data off NFS to HPE PFSS transparently while online
- Advanced web GUI
 - FS configuration, Performance monitor, Scalable history,

Erasure Code Edition Features

HPE Parallel File System Storage does not need external, highly available RAID controllers, because the RAID functions are handled by the embedded IBM Spectrum Scale ECE software.

IBM Spectrum Scale ECE supports two and three fault tolerant RAID codes. The two-fault tolerant codes include 8 data plus 2 parity, 4 data plus 2 parity, and 3-way replication. The three-fault tolerant codes include 8 data plus 3 parity, 4 data plus 3 parity, and 4-way replication. Figure 1-3 shows example RAID tracks consisting of data and parity strips.

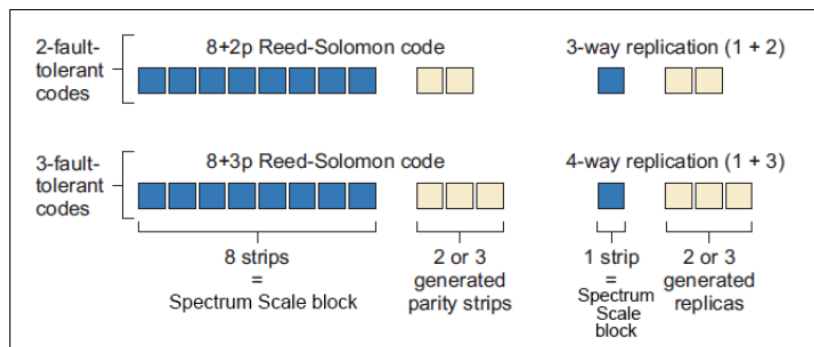


Figure 1-3: RAID tracks

Standard Features

IBM Spectrum Scale RAID

Distributes data and parity information across node failure domains to tolerate unavailability or failure of all storage drives in a node. It also distributes spare capacity across nodes to maximize parallelism in rebuild operations. IBM Spectrum Scale RAID implements end-to-end checksums and data versions to detect and correct the data integrity problems of traditional RAID.

Erasure Code Edition (ECE) takes this to the next level by distributing the data across a set of share nothing nodes allowing for granular scale out with simplified node configurations (no more need for complicated and expensive dual node servers with shared disks/flash). Leverage the bidirectional nature of modern high-speed networks to minimize impact on the network performance.

ECE keeps data integrity and version information with the data from the time the data leaves the client node to the time it is stored on disk. This enables higher data integrity checking than can be achieved by T10Dif alone.

Due to the overhead for data protection (RAID Level) the usable capacity of HPE Parallel File System storage is less than the raw capacity (capacity of all configured storage drives combined).

Hardware Features

The HPE FPSS leverage the outstanding capabilities of the HPE ProLiant server line to deliver high value in granular scalable configurations. By taking advantage of the AMD Epyc line of processors and their high IO capabilities HPE delivers high performance without the high price tag.

All nodes are configured with AMD epic processors with 8 to 48 cores depending on the configuration and 64GB to 128GB of 3200MTs. This enables all the performance of the installed HDDs/SSDs to be exposed to the client systems. It also allows for plenty of head room for delivering advanced functions with virtually no impact to performance.

In order to get the most out of the storage high speed dual protocol NICs are used that can support both InfiniBand and Ethernet at either 100Gb or 200Gb speeds. 1 or 2 NICs can be configured to support a range of connectivity and availability requirements.

A range of HDD and SSD choices are available to ensure capacity and performance requirements can be met precisely. No need to over provision capacity to meet performance requirements or visa versa.



Service and Support

HPE Services

No matter where you are in your digital transformation journey, you can count on HPE Services to deliver the expertise you need when, where and how you need it. From planning to deployment, ongoing operations and beyond, our experts can help you realize your digital ambitions.

<https://www.hpe.com/services>

Consulting Services

No matter where you are in your journey to hybrid cloud, experts can help you map out your next steps. From determining what workloads should live where, to handling governance and compliance, to managing costs, our experts can help you optimize your operations.

<https://www.hpe.com/services/consulting>

HPE Managed Services

HPE runs your IT operations, providing services that monitor, operate, and optimize your infrastructure and applications, delivered consistently and globally to give you unified control and let you focus on innovation.

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Operational services

Optimize your entire IT environment and drive innovation. Manage day-to-day IT operational tasks while freeing up valuable time and resources. Meet service-level targets and business objectives with features designed to drive better business outcomes.

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HPE Complete Care Service

HPE Complete Care Service is a modular, edge-to-cloud IT environment service designed to help optimize your entire IT environment and achieve agreed upon IT outcomes and business goals through a personalized experience. All delivered by an assigned team of HPE Services experts. HPE Complete Care Service provides:

- A complete coverage approach -- edge to cloud
- An assigned HPE team
- Modular and fully personalized engagement
- Enhanced Incident Management experience with priority access
- Digitally enabled and AI driven customer experience

<https://www.hpe.com/services/completecure>

HPE Tech Care Service

HPE Tech Care Service is the operational support service experience for HPE products. The service goes beyond traditional support by providing access to product specific experts, an AI driven digital experience, and general technical guidance to not only reduce risk but constantly search for ways to do things better. HPE Tech Care Service delivers a customer-centric, AI driven, and digitally enabled customer experience to move your business forward. HPE Tech Care Service is available in three response levels. Basic, which provides 9x5 business hour availability and a 2-hour response time. Essential which provides a 15-minute response time 24x7 for most enterprise level customers, and Critical which includes a 6-hour repair commitment where available and outage management response for severity 1 incidents.

<https://www.hpe.com/services/techcare>



Service and Support

HPE Lifecycle Services

HPE Lifecycle Services provide a variety of options to help maintain your HPE systems and solutions at all stages of the product lifecycle. A few popular examples include:

- Lifecycle Install and Startup Services: Various levels for physical installation and power on, remote access setup, installation and startup, and enhanced installation services with the operating system.
- HPE Firmware Update Analysis Service: Recommendations for firmware revision levels for selected HPE products, taking into account the relevant revision dependencies within your IT environment.
- HPE Firmware Update Implementation Service: Implementation of firmware updates for selected HPE server, storage, and solution products, taking into account the relevant revision dependencies within your IT environment.
- Implementation assistance services: Highly trained technical service specialists to assist you with a variety of activities, ranging from design, implementation, and platform deployment to consolidation, migration, project management, and onsite technical forums.
- HPE Service Credits: Access to prepaid services for flexibility to choose from a variety of specialized service activities, including assessments, performance maintenance reviews, firmware management, professional services, and operational best practices.

Notes: To review the list of Lifecycle Services available for your product go to:

<https://www.hpe.com/services/lifecycle>

For a list of the most frequently purchased services using service credits, see the [HPE Service Credits Menu](#)

Other Related Services from HPE Services:

HPE Education Services

Training and certification designed for IT and business professionals across all industries. Broad catalogue of course offerings to expand skills and proficiencies in topics ranging from cloud and cybersecurity to AI and DevOps. Create learning paths to expand proficiency in a specific subject. Schedule training in a way that works best for your business with flexible continuous learning options.

<https://www.hpe.com/services/training>

Defective Media Retention

An option available with HPE Complete Care Service and HPE Tech Care Service and applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction.

Consult your HPE Sales Representative or Authorized Channel Partner of choice for any additional questions and services options.

Parts and Materials

HPE will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

How to Purchase Services

Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from HPE or an enterprise reseller are quoted using HPE order configuration tools.
- Customers purchasing from a commercial reseller can find services at <https://ssc.hpe.com/portal/site/ssc/>



Service and Support

AI Powered and Digitally Enabled Support Experience

Achieve faster time to resolution with access to product-specific resources and expertise through a digital and data driven customer experience

Sign into the HPE Support Center experience, featuring streamlined self-serve case creation and management capabilities with inline knowledge recommendations. You will also find personalized task alerts and powerful troubleshooting support through an intelligent virtual agent with seamless transition when needed to a live support agent.

<https://support.hpe.com/hpesc/public/home/signin>

Consume IT On Your Terms

HPE GreenLake edge-to-cloud platform brings the cloud experience directly to your apps and data wherever they are—the edge, colocations, or your data center. It delivers cloud services for on-premises IT infrastructure specifically tailored to your most demanding workloads. With a pay-per-use, scalable, point-and-click self-service experience that is managed for you, HPE GreenLake edge-to-cloud platform accelerates digital transformation in a distributed, edge-to-cloud world.

- Get faster time to market
- Save on TCO, align costs to business
- Scale quickly, meet unpredictable demand
- Simplify IT operations across your data centers and clouds

To learn more about HPE Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Contact information for a representative in your area can be found at "Contact HPE"

<https://www.hpe.com/us/en/contact-hpe.html>

For more information

<http://www.hpe.com/services>



Configuration Information

HPE Parallel File System 16 Flash Bay Server Options

NVMe Gen4 Hot Plug SFF (2.5-inch) SSDs

HPE Parallel File System 1.92TB NVMe Gen4 High Performance Read Intensive SFF SC PM1733 SSD	R8F23A
HPE Parallel File System 7.68TB NVMe Gen4 High Performance Read Intensive SFF SC U.3 PM1733 SSD	R7R39A
HPE Parallel File System 15.36TB NVMe Gen4 High Performance Read Intensive SFF SC U.3 PM1733 SSD	R7R40A

High Speed Network Adapter

Notes: A minimum of 1 and max of 2. Any combination is supported. Recommended configurations: for the R7R36A (NVMe SSD) use 2 of R7R46A

HPE Parallel File System 8 and 12 Drive Bay Server Options

SAS Hot Plug LFF (3.5-inch) Drives

HPE Parallel File System 4TB SAS 12G Business Critical 7.2K LFF LP 1-year Warranty HDD	R7R41A
HPE Parallel File System 8TB SAS 12G Business Critical 7.2K LFF LP 1-year Warranty HDD	R7R42A
HPE Parallel File System 12TB SAS 12G Business Critical 7.2K LFF LP 1-year Warranty HDD	R7R43A
HPE Parallel File System 18TB SAS 12G Business Critical 7.2K LFF LP 1-year Warranty HDD	R8G59A

Notes: All drives need to be the same size in a node and in a RAID Set. Minimum of 3 is required. With counts for 8 drive server of 3, 4, 6, 8, and for 12 drive server of 3, 4, 6, 8, 10, 12.

High Speed Network Adapter

Notes: A minimum of 1 and max of 2. Any combination is supported. Recommended configurations: for the R7R35A (HDD server) use 1 of R7R45A,

HPE Parallel File System Base Protoco Server Options

Performance Kits

HPE Parallel File System 1.92TB NVMe Gen4 High Performance Read Intensive SFF SC PM1733 SSD	R8F23A
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High Speed Network Adapter

Notes: A minimum of 1 and max of 2.



Technical Specifications

HPE Parallel File System 8 Drive Bay Server

- Spectrum Scale 5.1.0-2
- RHEL 8.3
- Hardware Platform
 - DL325 Gen 10 Plus
 - CPU/Memory balanced configuration
 - 8 LFF HDD Options
 - 3 to 8 drive (3,4,6,8)
 - 4,8,12,16 TB SAS HDDs
 - Meta Data Flash Options (1 required)
 - 1.6 TB Flash Metadata Store
 - 3.2 TB Flash Metadata Store
 - High Speed network Options
 - Upto 2 HS Network Interface Cards
 - 100 and 200 Gb IB/Etn
 - Management Network Ports
 - 4 GE and 1 iLO port
- Maximum usable capacity per unit
 - 8 x 16TB = ~102TB

Specifications for HPE Parallel File System 8 Disk Bay Server and HPE Parallel File System 12 Disk Bays Server

Processor	AMD Rome
Memory	64GB
Storage Controller	12Gb 8 Port SAS Controller
Internal Drive Support	Up to 8 or 12 3.5" (Large Form Factor) hot-plug drive bays in front and Mid access OS boot Redundant Flash drive
Network Port(s)	4 Gb Ethernet for management
Expansion Slots	3 Gen 4 PCIe, 2 for High-speed network, 1 for Flash Metadata Store
Power	2 x 800 W Platinum Hot plug
Form Factor	1 U Rack mount
Operating Systems	Linux
Licenses	Three-year HPE iLO Advanced support license Single Server License Notes: For more information, visit: https://www.hpe.com/us/en/servers/integrated-lights-out-ilo.html

Specifications for HPE Parallel File System 16 Flash Bays Server

Processor	AMD Rome
Memory	128GB
Storage Controller	CPU integrated NVMe, 12Gb SAS Controller (for boot disk)
Internal Drive Support	Up to 16 2.5" (Small Form Factor) hot-plug drive bays in front and Mid access 1 300GB SFF SAS Boot drive
Network Port(s)	4 1 Gb Ethernet for management
Expansion Slots	2 x PCIe Gen 4 x 16 slots for High-speed network cards.
Power	2 x 800W Platinum Hot plug
Form Factor	1 U Rack mount
Operating Systems	Linux
Licenses	Three-year HPE iLO Advanced support license Single Server License Notes: For more information, visit: https://www.hpe.com/us/en/servers/integrated-lights-out-ilo.html



Technical Specifications

Specifications for HPE Parallel File System Base Protocol Server

Performance	Entry	Mid range	High
Processor	AMD Rome 16core 3Ghz	AMD Rome 32core 2.5Ghz	AMD Rome 64core 2.0Ghz
Memory	128GB	256GB	512GB
Storage Controller	CPU integrated NVMe, 12Gb SAS Controller (for boot disk)		
Internal Drive Support	Up to 8 2.5" (Small Form Factor) hot-plug drive bays in front and Mid access 1 300GB SFF SAS Boot drive		
Network Port(s)	Default : 4 1 Gb Ethernet for management		
Expansion Slots	2 x PCIe Gen 4 x 16 slots for High-speed network cards.		
Power	2 x 800W Platinum Hot plug		
Form Factor	1 U Rack mount		
Operating Systems	Linux		
Licenses	Three-year HPE iLO Advanced support license Single Server License Notes: For more information, visit: https://www.hpe.com/us/en/servers/integrated-lights-out-ilo.html		

Common specs

Dimensions (H x W x D)	4.28 X 43.46 X 82.62 cm (1.69 X 17.11 X 32.52 In)		
Weight(approximate)	Maximum: 8 HDD 12 HDD 16 SSD	45.7 lb (20.8kg) 57.09 lb (25.9kg) 48.07 lb (21.8kg)	
Input Requirements(per power supply)			
Rated Line Voltage	100 to 120 VAC	200 to 240 VAC	
BTU Rating Maximum	For 800W Power Supply: 3207 BTU/hr (at 100 VAC), 3071 BTU/hr (at 200 VAC)	For 500W Power Supply: 1979 BTU/hr (at 100 VAC), 1911 BTU/hr (at 200 VAC)	
Power Supply Output (per power supply) 2 Power supplies install	Rated Steady-State Power - For 800W Power Supply: 800W (at 100 VAC), 800W (at 240 VAC)	Maximum Peak Power - For 800W Power Supply: 800W (at 100 to 127 VAC), 800W (at 200 to 240 1VAC),	

System Inlet Temperature

- Standard Operating Temperature**

10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 20°C/hr (36°F/hr). The upper limit and rate of change may be limited by the type and number of options installed. System performance during standard operating support may be reduced if operating with a fan fault or above 30°C (86°F).

- Extended Ambient Operating Temperature**

For approved hardware configurations, the supported system inlet range is extended to be: 5° to 10°C (41° to 50°F) and 35° to 40°C (95° to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft). The approved hardware configurations for this system are listed at the URL: <http://www.hpe.com/servers/ashrae>

For approved hardware configurations, the supported system inlet range is extended to be: 40° to 45°C (104° to 113°F) at sea level with an altitude derating of 1.0°C per every 125 m (1.8°F per every 410 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft). The approved hardware configurations for this system are listed at the URL:

<http://www.hpe.com/servers/ashrae>

System performance may be reduced if operating in the extended ambient operating range or with a fan fault.

- Non-operating**

-30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).



Technical Specifications

Relative Humidity^(non-condensing)

- **Operating**
 - 8% to 90% - Relative humidity (Rh), 28°C maximum wet bulb temperature, non-condensing.
 - **Non-operating**
 - 5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
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Summary of Changes

Date	Version History	Action	Description of Change
18-Mar-2024	Version 6	Changed	Overview section was updated. Obsolete SKUs were removed
18-Dec-2023	Version 5	Changed	HPE Services Rebranding Obsolete SKUs were removed
01-Nov-2021	Version 4	Changed	Overview and Service and Support sections were updated.
02-Aug-2021	Version 3	Changed	Overview section was updated.
06-Jul-2021	Version 2	Changed	Overview, Standard Features and Technical Specifications sections were updated. Added new Server and feature SKUs
06-Apr-2021	Version 1	New	New QuickSpecs



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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.

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