Hewlett Packard Enterprise

Family guide

HPE Server Options

High-performance, reliable and efficient components for accelerating HPE servers

PulseSupply
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Reimagine the server. Think compute.

Trusted servers built for today and tomorrow
Mobility, the cloud, Big Data, and data security trends are creating high expectations for businesses of all sizes. These modern IT demands are driving a major shift away from a "traditional" server-based approach to a new "compute" approach that accelerates IT service delivery, lowers costs, and fuels business growth.

Intelligent HPE servers give you the freedom to reimagine the server and start thinking in terms of compute for your business. No matter what your size, there is an HPE server that is just right to help you meet increasing user and customer demands—even when time, money, and technology resources are stretched thin.

Inside each HPE server are essential performance building blocks—think core DNA—such as DDR server memory, persistent memory, storage, and network adapters. We call these building blocks HPE Server Options. They are designed to deliver the highest performance for any workload, with secure reliability, and at economics that don't slow down your business.

HPE servers, configured with HPE Server Options, are the ideal solution for most application workloads and a wide range of IT environments—from the simplest small-to medium-sized business (SMB) site—to the largest enterprise data center.

HPE Server Options Portfolio

The HPE Server Options portfolio features user-inspired innovations that help improve HPE Server performance—reliably and securely—with a level of efficiency that leads to lower total cost of ownership (TCO).

The HPE Server Options portfolio spans several key technologies designed to improve server performance, reliability, and efficiency, including:

- **HPE Server Memory**—Includes HPE SmartMemory, for exceptional DDR4 server memory performance and reliability.
- **HPE Server Storage**—Includes HPE Smart Array controllers, HPE solid-state drives (SSDs), and HPE hard disk drives (HDDs). Hewlett Packard Enterprise offers the industry's broadest portfolio of server storage solutions, ideal for boosting HPE server performance and reliability.
- **HPE Persistent Memory**—HPE now offers the industry's first servers enabled with Persistent Memory, a new technology category that delivers the performance of memory with the persistence of storage.
- **HPE Server Networking**—Presents a wide variety of server-networking offerings including HPE FlexFabric adapters, which deliver the highest levels of performance and reliability for input/output (I/O)-intensive application workloads.
- **HPE Rack and Power Infrastructure**—Includes HPE rack enclosures and HPE power and cooling management offerings that provide the foundation for a secure and reliable hybrid cloud infrastructure.
- **HPE Power Supplies**—HPE Power Supplies offer high-efficiency power options available in multiple input and output options, allowing you to "right-size" a power supply for specific server/storage configurations and environments. This flexibility helps to minimize power waste, lower overall energy costs, and avoid trapped power capacity in the data center.

Why choose HPE Server Options?

One of Hewlett Packard Enterprise's core tenets for servers and Server Options is creating a customer experience that is second to none. Thus, HPE Server Options are backed by one of the most rigorous quality programs in the industry. Hewlett Packard Enterprise's relentless focus on quality and innovation is integrated into every phase of the product development lifecycle.

For example, our focus on quality can be found in each of the following areas:

- **Supplier selection and management**—We hold suppliers accountable, setting a new standard for quality expectations and requirements. From rigorous supplier selection, supplier quality, and component testing, no one works harder than HPE to ensure each supplier is equally committed to this 100 percent focus on quality.
- **Product design**—We design HPE Server Options to maximize system performance and reliability—avoiding downtime at any cost. This focus begins at the product design and testing stages with a laser focus on eradicating all product defects and critical errors before the Server Options leave our factory.
- **Customer focus**—HPE has decades of experience with customers around the world. We invite them to partner with our research and development (R&D) experts, sellers, and executives to ensure our products, solutions, and services are customer-inspired. This focus on innovation is why Hewlett Packard Enterprise is a leader in U.S. patent grant work in servers and Server Options.
- **Enhanced customer testing**—Before any HPE server or server option leaves our factory, it must stand up to the industry's most rigorous customer environment testing, seeking to mimic extreme customer environments. This level of testing ensures reliability, interoperability, error handling, and recovery.
- **Manufacturing processes**—Hewlett Packard Enterprise's world-class manufacturing facilities relentlessly focus on quality. For example, our focus on prevention and detection is critical to a quality manufacturing process. That includes tight coordination with R&D teams, as well as monitoring and detection systems to ensure quality issues are found and corrected quickly. In addition, HPE servers and Server Options go through rigorous run-in testing on each server prior to shipping, ensuring that a quality system arrives at your shipping dock.
- **Server management tools and firmware maintenance**—HPE servers and Server Options are integrated into HPE system management tools like the Integrated Lights-Out (iLO) technology for easy configuration, maintenance, and installation. This integration helps lower your operations costs when compared to non-HPE components. And the HPE Smart Update Manager (SUM) simplifies the complex task of firmware and software maintenance—streamlining your system administration efforts.
- **HPE ProLiant BIOS firmware and end-to-end integration**—Finally, HPE optimizes its BIOS firmware for its Server Options to maximize performance and reliability—often at levels higher than specified. And complete end-to-end integration of HPE servers and Server Options dramatically reduces the cost and time associated with on-premises integration testing.

HPE Server Options

High performance, reliable and efficient components for accelerating HPE Server

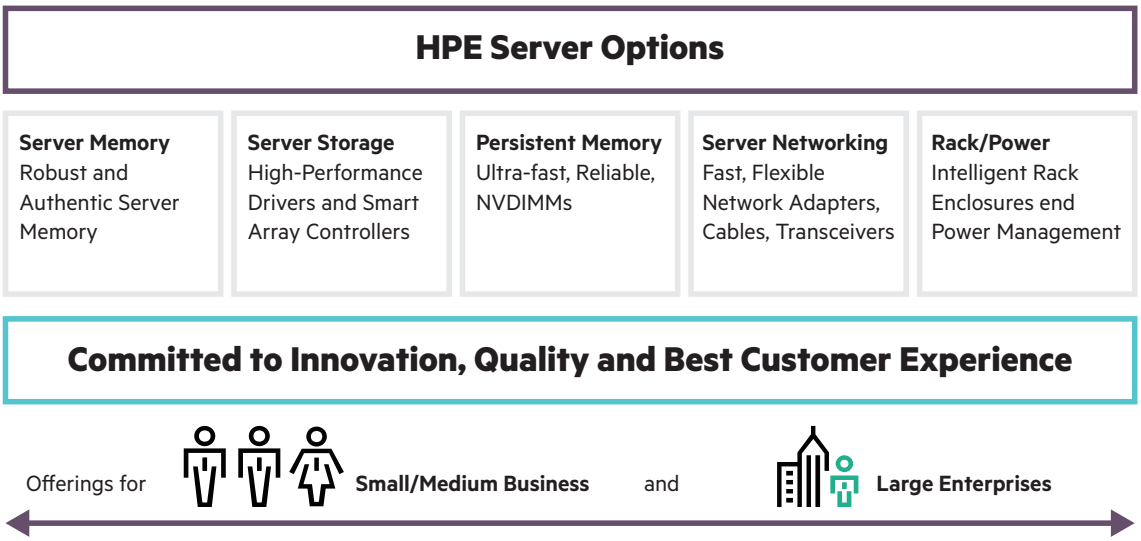

Figure 1: The HPE Server Options portfolio at-a-glance

HPE Server Memory

Expect the efficiency, performance, and reliability to productively manage your expanding workloads

For more information, visit
hpe.com/info/memory

Cloud computing, hybrid infrastructures, virtualization, and Big Data all increase server workloads, requiring additional resources to ensure your server is running as reliably and efficiently as possible. One such critical resource is server memory. Choosing a server memory module that provides the best combination of speed, bandwidth, and capacity will ensure your server is optimized to handle its anticipated workloads.

Hewett Packard Enterprise provides a large selection of server memory types and capacities at a variety of price points to support your current and future computing needs. All HPE Server Memory solutions are rigorously tested and authenticated to ensure the utmost compatibility with HPE servers.

HPE SmartMemory

Designed specifically for enterprise customers with a significant need for performance and capacity along with a desire to manage TCO, HPE SmartMemory offers the widest selection of types and capacities to leverage memory slots and optimize capacity to support server workloads while reducing power consumption. In fact, using HPE SmartMemory in your HPE ProLiant server can help it use significantly less energy in comparison to third-party server memory.

HPE SmartMemory also offers the fastest throughput in the industry, which reduces transaction response time, enables better leveraging of applications, and allows you to support more of your own customers. High-capacity HPE SmartMemory dual in-line memory modules (DIMMs) give an extra boost to performance, providing servers with the bandwidth to host memory-demanding applications.

In addition to performance and efficiency, HPE SmartMemory also offers significant reliability. HPE selects only the highest quality dynamic random access memory (DRAM) module from top suppliers. This increase in quality reduces issues that could affect signal integrity, increasing system reliability. Each DIMM is then put through rigorous firmware and integration testing to simulate extreme operating environments and conditions. Such rigorous testing and subsequent authentication unlocks performance and high-efficiency features—optimized for HPE servers—that enable HPE Server Memory to operate at higher speeds than industry-standard memory.

Hewlett Packard Enterprise continuously improves our memory testing processes, both at supplier manufacturing sites and in our own facilities. From new test algorithms to voltage, temperature, and frequency adjustments to exercise all memory operating modes, our goal is to guarantee that you are getting the most efficient, high-performing, and reliable memory available.

HPE SmartMemory:

- Operates at higher speeds than the industry standard when installed in HPE ProLiant servers
- Uses HPE's iLO technology to provide rapid insight into and resolutions for memory-related problems
- Ensures authentic HPE memory modules with the highest quality in the industry
- Consumes less power, reducing IT budgets
- Offers high-capacity registered DIMM (RDIMM) and load-reduced DIMM (LRDIMM) options

Need help choosing server memory?
HPE Server Memory Configurator

HPE Standard Memory

SMBs and remote or branch offices (ROBOs) often grapple with the need to grow the business while simultaneously controlling costs. Spending on technology and equipment is a large part of your capital and operating expenses, and to survive, you need to reduce costs and extend the life of your servers by adding low-cost memory. But this decision can leave your IT infrastructure at risk due to quality and compatibility issues. When workloads don't require high memory capacities, HPE Standard Memory is the best combination of quality and performance at the right price for your HPE ProLiant server.

As part of the Hewlett Packard Enterprise server memory portfolio, HPE Standard Memory is also sourced from the highest quality DRAM. It undergoes the same rigorous testing and authentication process as HPE SmartMemory to ensure it is completely compatible with HPE servers and will perform to industry-defined specifications. Although HPE Standard Memory still offers the performance and reliability you have come to expect from HPE, it is ideal as an affordable solution for SMB and ROBO customers.

HPE Standard Memory:

- Meets the needs of SMBs and ROBOs with the right memory at the right price without compromising quality
- Ensures memory is optimized on every HPE server platform
- Performs to industry-defined specifications
- Provides lower memory capacity solutions

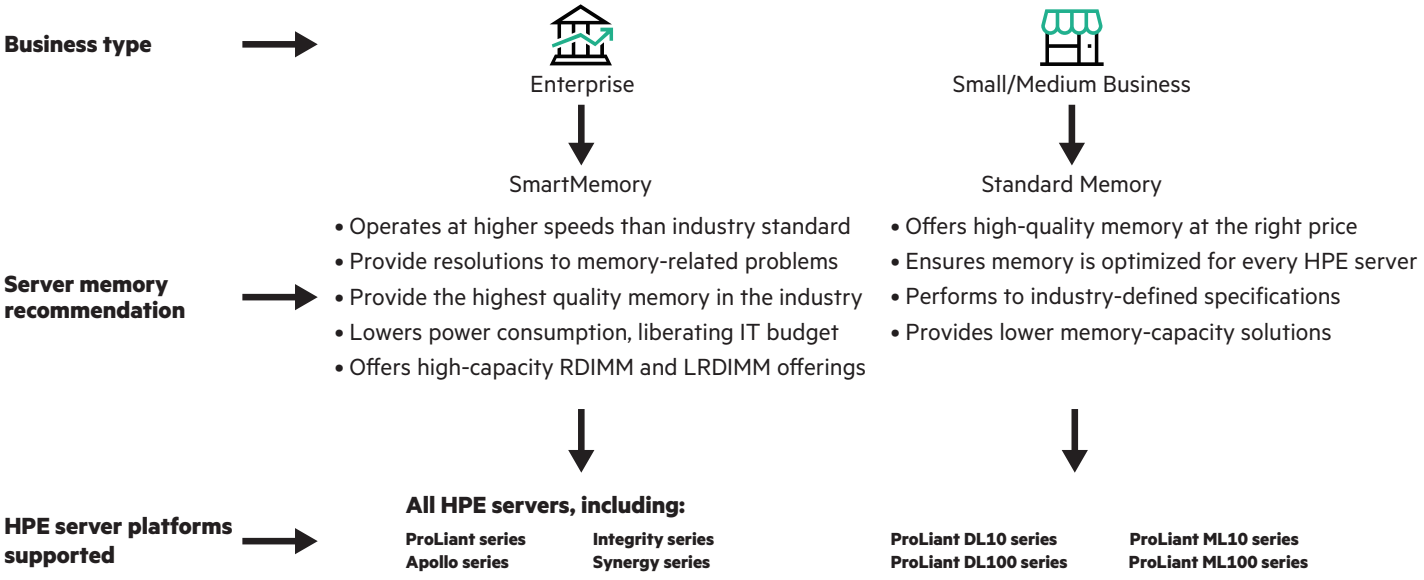

Figure 2: HPE Server Memory—Help me choose!

HPE Server Storage

Delivers the performance, reliability, and security required for your most demanding application workloads

For more information, visit
hpe.com/info/serverstorage

As data storage and accessibility requirements grow, you need solutions that can help overcome performance bottlenecks caused by demanding application workloads. Your storage solution should:

- Keep pace with data growth
- Enable fast access to data to keep you competitive
- Protect data integrity from outages and data loss
- Perform reliably to maximize uptime

HPE Server Storage for HPE servers offers a broad portfolio of workload-optimized solutions. The portfolio includes: HDDs, SSDs, PCIe workload accelerators, smart array controllers and Smart host bus adapters. Our server storage offerings provide enterprise customers with a combination of the latest technologies to enable hassle-free, high performance with outstanding reliability. Backed by more than 2.4 million hours[1] of the industry's most rigorous testing and qualification program, it delivers the quality you have come to expect from HPE.

[1] HP (now Hewlett Packard Enterprise) Internal Lab Testing. 2.4 million hours test quant is derived from a combination of drive qualification test plans, specifically HDDQ spec-supplier responsibility to perform, RDT-Reliability Demonstration test spec, CSI integration test spec, and Pilot test requirements. Test conducted July 2014.

Storage in HPE servers

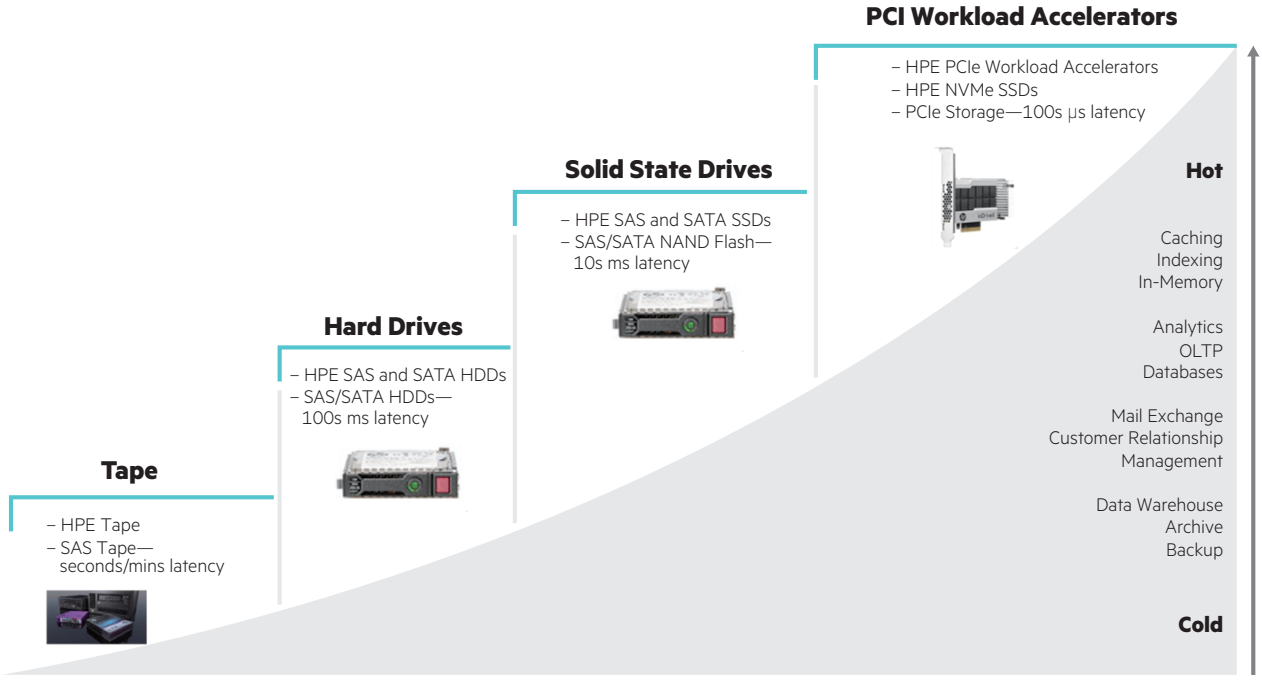

Figure 3: Storage technology spectrum today

HPE Hard Disk Drives

HPE HDDs deliver proven performance and reliable data integrity at the lowest cost per gigabyte. Most drives feature the HPE Smart Carrier with intuitive icons to report drive activity at-a-glance and a "do not remove" button that prevents data loss caused by human error. Each drive has HPE integrated firmware that provides best-in-class security, protecting your data from malicious attacks that could change or destroy it. Available in both serial attached small computer system interfaces (SAS) and serial advanced technology attachments (SATA) in capacities up to 8 TB and growing, there's a drive to fit any workload.

HDD with intuitive icons

Finding the right SSD for your HPE server has never been easier with the new, web-based HPE SSD Selector Tool. It reduces the time and eliminates the complexity of choosing just the right solution for your most demanding application workloads. To learn more, visit **hpe.com/info/serverstorage**

You can choose an HPE Storage drive with confidence, as all our drives are backed by the industry's most rigorous testing and qualification program.

HPE Solid State Drives

HPE SSDs remove performance bottlenecks, enabling faster access to data with consistently low latency—all while using less power. They are best suited for enterprise environments with highly random data under a variety of write-workload applications such as online transaction processing or Big Data analytics. HPE SSDs provide significantly better random read and write input/output operations per second (IOPS).

HPE NVMe PCIe 2.5-in. SSDs

HPE NVMe PCIe 2.5-in. SSDs talk directly to your applications via the peripheral component interconnect express (PCIe) bus. Hosting your entire database on one or more HPE NVMe PCIe 2.5-in. SSDs boost I/O, leverage in-memory access, reduce latency, and scale performance in-line with your processing requirements. These features, coupled with HPE Express Bay's front accessibility and serviceability, create a flexible and dependable solution to proactively address your storage needs.

HPE PCIe Workload Accelerators

HPE PCIe Workload Accelerators provide consistent, predictable, reliable, sustained high performance for all your business-critical applications. Integrated seamlessly with HPE servers via the PCIe bus, HPE PCIe workload accelerators increase per-server performance by eliminating I/O bottlenecks. By decreasing the need for external HDD storage arrays, together with their software layer, you simplify storage management and maintenance.

HPE Flash Media Devices

If you require boot-from-flash for integrated hypervisors and Tier 1 operating systems, trust Hewlett Packard Enterprise high-performance enterprise flash media kits to meet those needs. With high data retention and read/write cycles, HPE flash media devices are available in secure digital (SD) and microSD form factors.

HPE Optical Drives

Available as both DVD-ROM and DVD-RW solutions, HPE optical drives are available in half-height, slim, and super-slim models to fit any HPE system in your data center. Available on select HPE ProLiant Gen9 servers, the HPE Universal Media Bay provides functional flexibility to add an optical disk drive bay, USB, and/or VGA ports to the server while providing two drive bays for small form factor drives.

HPE Smart Array Controllers

Designed to enhance server uptime and maintain flexibility for future growth, HPE Smart Array controllers blend the reliability of small computer system interfaces with the performance advantages of serial architecture. With HPE Smart Array Controllers and Smart Host Bus Adapters (HBAs), you have the flexibility to choose the 12 Gb per second controller most suited to your environment. Providing industry-leading performance with unmatched data protection, this is the solution for companies with direct-attached SAS storage. Adding HPE Secure Encryption support to the HPE Smart Array controller helps you deal with data privacy challenges.

HPE Smart Host Bus Adapters

Perfect for environments that require fast access, HPE Smart HBAs provide cost-effective, reliable, high-performance SAS connectivity to direct attached storage, shared storage, and tape drives. Optimized for HPE ProLiant servers running Hadoop, Database Availability Group, VMware® Virtual SAN™, and Microsoft® Storage Spaces applications, HPE Smart HBAs are a perfect conduit for deploying software-defined storage as a means to manage the IT storage pool. For greater flexibility, HPE Smart HBAs are also capable of running in simple RAID mode.

HPE Secure Encryption
HPE Secure Encryption is an HPE Smart Array controller-based data encryption solution for protecting sensitive, mission-critical data. This is an enterprise-class encryption solution for data at rest, on any bulk storage (with the exception of tape or external arrays such as HPE P2000 and HPE MSA 2040) attached to the supported HPE Smart Array Px4x family of controllers. The solution is available for both local and remote deployments.

HPE SmartCache
HPE SmartCache is an HPE Smart Array controller-based read and write caching solution for HPE ProLiant servers in a direct attached storage environment. It caches the most frequently accessed "hot" data onto lower latency SSDs to dynamically accelerate application workloads. HPE SmartCache operates transparently to host applications, which means you do not have to change the application, but can still realize better performance with a minimal number of SSDs in your configuration.

HPE Server Storage can help you manage your growing data needs. Whether you need large capacity or fast access, we have a solution to empower any workload.

HPE Persistent Memory

Increase the performance of your database and analytics applications

For more information, visit
hpe.com/info/persistentmemory

HPE Persistent Memory is the technology of the future for data-intensive workload computing, delivering the performance of memory with the persistence of traditional storage. If you're looking for offerings that give you faster access to your data so you can reach faster business decisions, look no further. Faster access to data means you get the answer you need more quickly, to gain an advantage against competitors and even increase revenue potential—all at a lower TCO.

Hewlett Packard Enterprise is first in the market with the practical implementation of persistent memory server technology and is the partner you can trust now and in the future.

HPE delivers industry first Persistent Memory-enabled servers

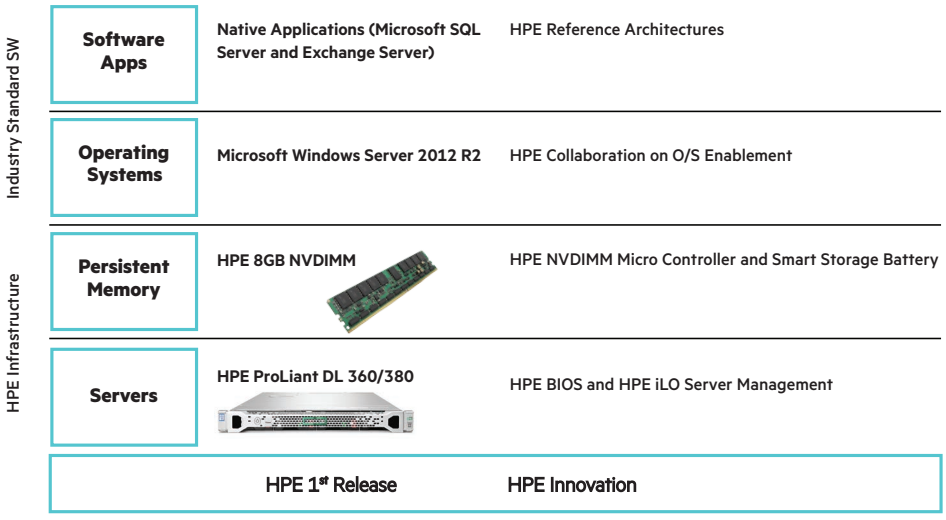

Figure 4: HPE Persistent Memory hardware and software ecosystem

HPE 8 GB NVDIMM

The HPE 8 GB NVDIMM is the first product in the HPE Persistent Memory portfolio. It is designed for HPE ProLiant Gen9 servers featuring Intel® Xeon® E5-2600 v4 processors. The first two servers supporting HPE NVDIMMs are the HPE ProLiant DL360 and DL380 Gen9 servers.

HPE NVDIMMs are ideal for accelerating databases and analytics workloads. With up to 128 GB capacity in a single server, HPE NVDIMMs improve application performance by reducing traditional storage hardware bottlenecks like write latency.

HPE NVDIMMs complement existing storage technology, such as SSDs and PCIe workload accelerators, by becoming one of the fastest tiers of storage on HPE ProLiant Gen9 servers. HPE NVDIMMs can also benefit other workloads and applications where traditional storage bottlenecks would benefit from the lower latency storage tier of HPE Persistent Memory.

Additionally, HPE NVDIMMs have the resiliency you have come to expect from storage technology by utilizing higher endurance DRAM and components that help verify data is moved to non-volatile technology in the event of a power loss. You have the added assurance that data will be preserved and is recoverable after an outage. HPE NVDIMMs include a flash component plus an HPE Smart Storage Battery that provides you with a persistent storage capability at memory speeds without the data volatility of memory.[2]

HPE NVDIMM hardware is only half of the puzzle—with the other half being the software ecosystem enablement we are driving in the industry. Hewlett Packard Enterprise is working directly with software application and operating system partners to develop the software ecosystem for HPE Persistent Memory to verify that you can take full advantage of the performance potential of this exciting new technology.

"As the biggest communications service provider in Turkey, Turkcell needs agility in order to quickly provide rich services to our customers, so we are focused on modernizing our data center to gain a competitive edge. With HPE ProLiant DL380 Gen9 servers, powered by the new Intel Xeon E5-2600 v4 processors and game-changing HPE Persistent Memory, our compute journey has taken a critical leap forward, resulting in reduced deployment time for new business services as well as increased database transactions by up to 2x faster."

– Murat Akkaya, Infrastructure Resource Planning Expert, Turkcell

TURKCELL

[2] Based on the NVDIMM utilizing NAND Flash as a persistent store and the HPE Smart Storage Battery providing the backup power source to move data from DRAM to NAND Flash.

HPE Server Networking

Choose your bandwidth, simplify your infrastructure, and network with confidence

Network adapters, transceivers, and cables are the data and storage fabric that hold the server infrastructure together. For any given workload, the right mix of performance and cost with reliability and security are paramount. Whether purchasing a new HPE ProLiant server platform or upgrading your existing infrastructure with the latest server configuration, HPE Server Networking has your network covered.

- **Choose your bandwidth**—From 1 Gbps to 100 Gbps and beyond, HPE adapters are available for every SMB, cloud, Oracle enterprise manager, Telco, or enterprise server workload
- **Simplify your infrastructure**—HPE innovations like 25/100 Gb, FlexFabric, FCoE, and converged network adapters make the hybrid converged architecture a reality—today
- **Network with confidence**—HPE ProLiant Server Networking options have end-to-end reliability and compatibility; all are tested and qualified to rigid HPE quality standards and guaranteed to work seamlessly with trusted HPE ProLiant servers

HPE Networking and HPE servers deliver:

- **Performance**—Engineered to improve networking bandwidth and lower latency with HPE's broad Ethernet-enhanced network adapters portfolio
- **Reliability**—Rigorous qualification and testing to eliminate downtime and work seamlessly with HPE servers—health and monitoring with HPE iLO and critical software updates with HPE's Service Pack for ProLiant and SUM
- **Efficiency**—Workload-optimized with HPE features—from virtualization to network partitioning—software-defined with HPE OneView for your application needs

Performance, efficiency, and reliability are designed into HPE Server Networking products for an end-to-end experience.

How HPE Networking Solutions work together

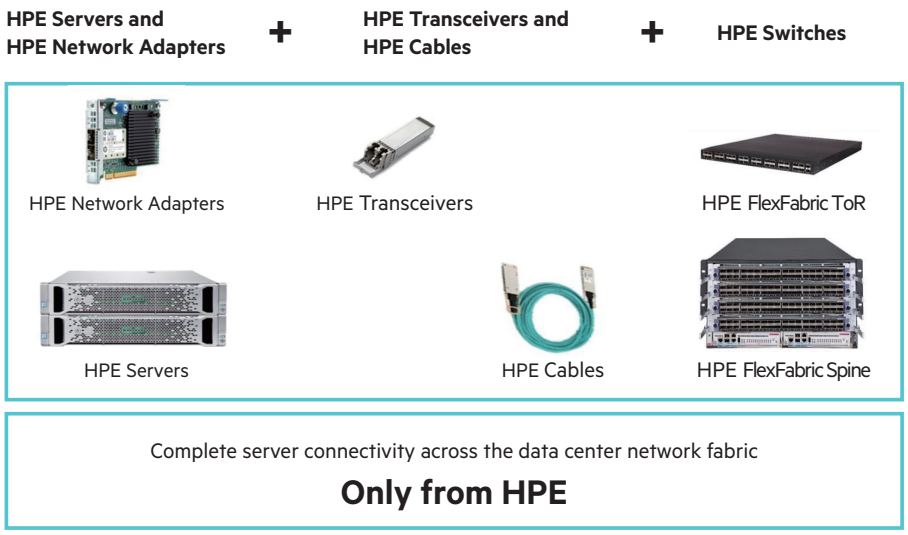

Figure 5: From the switch to the adapter inside your Server, HPE offers end-to-end branded Networking Solutions

HPE Network Adapters

Standard Series HPE Network Adapters
Enable a cost-effective Ethernet solution for your current HPE ProLiant server workload needs. The economic scalability of these adapters contains functionality like Single Root I/O virtualization (SR-IOV) for increased performance via direct access to hardware from a virtual environment. Other benefits include:

- **Efficiency**—Meets price/performance goals for 1 GbE and 10 GbE core enterprise workloads
- **Trusted quality**—Reliable and integrated into HPE ProLiant platform infrastructure
- **Virtualization**—The SR-IOV feature enables basic virtualization for expanding network fabric
- **NPAR**—Network partitioning allows you to "right size" data paths for better efficiency
- **Ethernet**—All our HPE adapters meet the IEEE 802.3 standard for local area networks

Advanced Series HPE Network Adapters
Simplify your network and storage topology to build the new hybrid server infrastructure using converged network adapters. HPE FlexFabric architecture leads the industry with the configurable flexibility needed from basic Ethernet NIC functionality to advanced features like Fibre Channel over Ethernet (FCoE).

- **FlexFabric**—Cost-effective software- and hardware-enhanced solutions and features in keeping with the newest performance I/O speed, including storage offloads, leverage an onboard chip vs. the motherboard CPU
- **FCoE**—Reduces the number of network interface cards required to connect to disparate storage and IP networks, the number of cables and switches, and power and cooling costs
- **Advanced series**—Simplify your Ethernet network and storage topology to build the new hybrid server infrastructure

Performance Series HPE Network Adapters
The Performance series delivers even higher bandwidth at a lower latency, with several choices for boosting I/O bandwidth for your most demanding application workloads. These expressly fast adapters can maximize packet throughput and workload performance with the Data Plane Development Kit (DPDK) support. The new 25 GbE adapters are tuned to work with the latest 10/25/50/100 Ethernet standards and with HPE-Networking Top-of-the-Rack switches. These new 25 GbE adapters maximize performance while auto negotiating down to 10 Gbps or up to 25 Gbps. In addition, using a 25 GbE enabled server can reduce TCO up to 27 percent over a 10 GbE server infrastructure while increasing bandwidth by 56 percent.

- **Multi-speed**—10/25/50/100 Gbps: The latest adapter cards are the 25 GbE adapters that enable optimal PCIe slots usage to reduce the total number required to build a 25/50/100 infrastructure with future support also to include speeds beyond 100 Gbs using 8 lanes for 400 Gbs
- **RDMA over Converged Ethernet (RoCE)**—Network-intensive applications like networked storage or cluster computing need a network infrastructure with a high bandwidth and low latency. The advantages of RoCE over other strategies a e lower latency, lower CPU load and higher bandwidth
- **DPDK**—The DPDK allows software-based customization and optimization of network performance by using polling instead of traditional interrupt-driven network processing

Network adapters product portfolio

Networking flexibility at the speed of compute

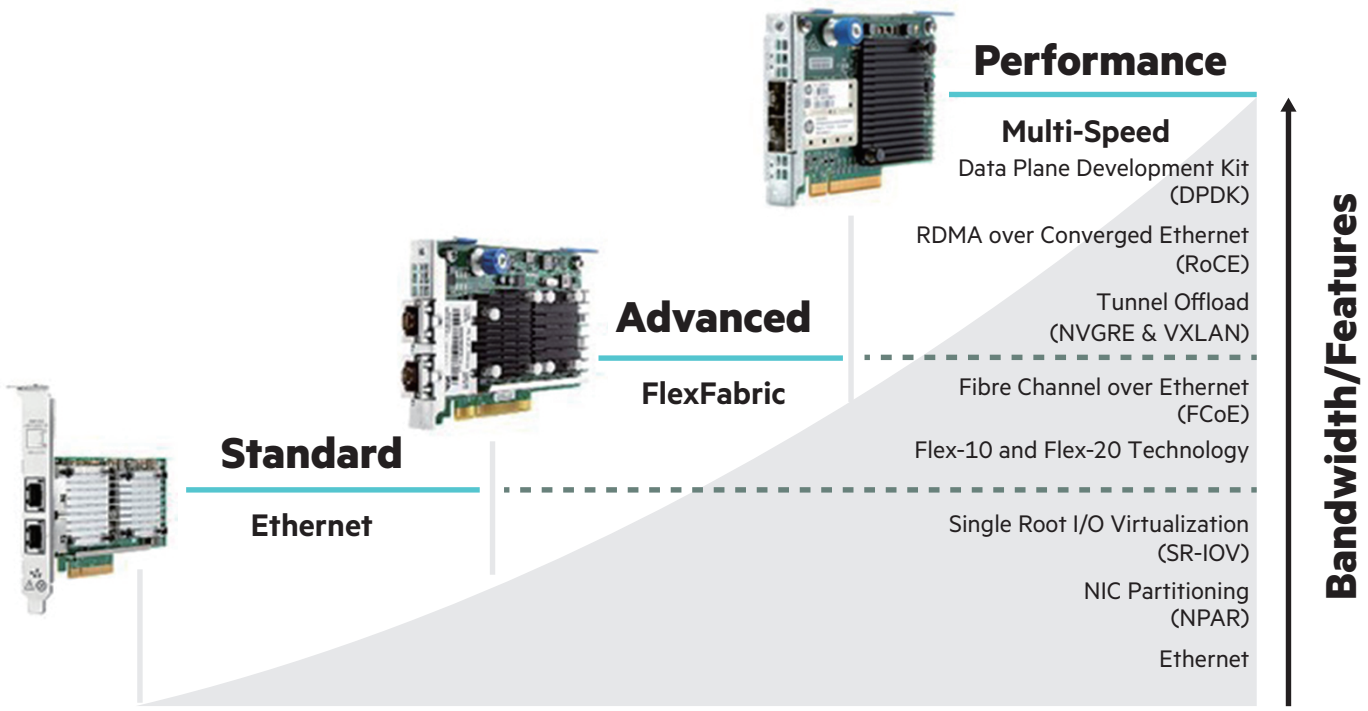

Figure 6: Network Adapter Cards by Bandwidth and Feature Set

HPE Transceivers and Cables

Transceivers and cables play an important role in data center infrastructure management. They support Ethernet connection for SMB, traditional enterprise, telco, and cloud customers, providing cost-effective transceiver/cable solutions with various speed, form factors, connection distances, and signal transduction media. HPE Server Options also include the copper and optical cabling needed to connect your networking. As with all HPE Server Options, cables and transceivers are also tested with network adapters to ensure 100 percent compatibility with the chosen server platform.

Table 1: Cables and Transceivers for your Networking Connectivity

	Small Form-Factor Pluggable (SFP)	Enhanced Small Form-Factor Pluggable (SFP+)	Enhanced Quad Small Form-Factor Pluggable (QSFP+)	SFP and Quad Small Form-Factor Pluggable (SFP/QSFP)
	Support 1 G Ethernet	Support 10 G Ethernet	Support 40 Gb Ethernet	Support 25/100 Gb Ethernet
Transceivers	RJ-45 SX	SFP+: • SR • LR • LRM • 10GBASE-T	QSFP+: • MPO SR4 100 m • MPO SR4 300 m • LC LR4	SFP28: • SR 100 m QSFP28: • SR4 100 m
Cables		DAC: • 1 0 Gb to 10 Gb: 0.35 m, 1 m, 3 m, 5 m, 7 m	DAC: • 40 Gb to 40 Gb: 0.35 m, 1 m, 3 m, 5 m, 7 m • 40 Gb to 4 x 10 Gb breakout: 3 m, 5 m AOC: • 40 Gb to 40 Gb: 7 m, 10 m, 15 m • 40 Gb to 4 x 10 Gb breakout: 7 m, 10 m, 15 m	DAC: • Gb SFP28 to SFP28 DAC: 0.5 m, 1 m, 3 m, 5 m • 100 Gb QSFP28 to 4 x 25 Gb SFP28 DAC 3 m, 5 m • 100 Gb QSFP28 to QSFP28 DAC 0.5 m, 251 m, 3 m, 5 m

HPE Rack and Power Infrastructure

For more information, please visit
hpe.com/info/rackandpower

World-class infrastructure is the foundation of a world-class data center

Your data center's job is to provide the foundational agility and compute power to support your business and enable your customers. HPE Rack and Power Infrastructure provides configurable, state-of-the-art infrastructure solutions, out of the box, that are able to meet the needs of businesses of all sizes, now and in the future.

HPE understands that more compute power equals more revenue, so the entire HPE Rack and Power Infrastructure portfolio is purpose-built to maximize the efficiency and output of your HPE servers and minimize headaches for your IT staff. Whether your needs are in server management, power management, or both, HPE products all have one thing in common—they're designed to boost agility and configurability in your data center, putting you in the driver's seat and giving you the foundation and leverage you need to drive your business and deliver results for your customers.

HPE Racks

Protect today's investment and enable tomorrow's growth with HPE Rack products. The HPE Rack family of products is optimized for your infrastructure requirements now and in the future. With our Standard, Advanced, and Enterprise series of rack enclosures, our portfolio is as flexible as it is sturdy—and provides an out-of-the-box infrastructure solution for data centers of all sizes.

HPE Advanced and Enterprise rack models offer the option to ship pre-configured racks directly to your data center, enabling fast and easy deployment of your IT equipment. Industry-standard design ensures compatibility regardless of the equipment currently in your data center.

HPE Rack and Power Infrastructure portfolio

Flexible | Powerful | Trusted

Infrastructure management | **Power management**

Racks and rack accessories	Keyboard, video, mouse (KVM) switch/consoles	Power distribution units (PDU)	Uninterruptable power supplies (UPS)
Wide range of choices, from SMB to enterprise	Manage all of your IT equipment seamlessly	Providing power to your IT, flexible and controllable	Preventing loss of data and business

Figure 7: HPE Rack and Power Infrastructure portfolio Visit the online **HPE Power Advisor**

HPE Keyboard/Video/Mouse

Running data centers is a 24x7 operation. HPE Keyboard/Video/Mouse (KVM) switches allow you to check in on your IT operations whenever and from wherever. Analog switches allow for local, direct access to equipment in your data center while our IP-based switches add remote configurability at the rack, row, and data center level.

Should your needs change, many of our analog switches are easily upgraded to IP-based capabilities through the addition of a USB remote access key. Arguably the most important piece of hardware in the server management process, there's an HPE KVM switch to fit your application with a wide variety of port quantities available.

To provide easy access to your KVM switch, HPE KVM consoles plug into your switches and serve as a dashboard for your entire rack—or even your entire data center. Easily accessible, comprehensive status data for each individual server, storage, and networking device enables you to pinpoint problems quickly and accurately, saving you time and minimizing unit downtime.

Of course, this efficiency carries over to the console itself. It will go to sleep whenever you're not using it, saving power for what matters—your data center and business. A display port comes standard with all HPE KVM consoles, facilitating easy sharing of the data and a cut above industry-standard VGA ports you'll find elsewhere. And the best part? Our 1U switches and consoles are form factor optimized, leaving more room for servers, compute power for your data center, and growth for your business.

HPE Power Distribution Units

No matter what pieces of equipment you add to your rack, they all have one thing in common—they need power. HPE Power Distribution Unit (PDU) options are available in both single-phase and three-phase configurations. Our PDUs can be mounted vertically or horizontally with minimal time and effort required for installation. HPE metered PDUs monitor the power consumption of each individual server to ensure balanced loads and operation within power thresholds, while optional environmental sensors ensure you'll be the first to know if something is amiss. If you require the ability to remotely power cycle IT equipment in your racks, try our HPE metered, switched, and intelligent PDUs—all you'll need to control power usage in your data center, down to the individual outlet level, is an Internet connection. Guarantee quality power distribution and empower control with HPE PDUs.

HPE Uninterruptable Power Supplies

So you've invested in a new data center and infrastructure. What happens when you experience your first power outage? Data center outages can be taxing on your IT resources and catastrophic for your business. Take worry out of the equation with HPE Uninterruptable Power Supplies (UPS). Available in both tower and rack configurations, as well as density-optimized configurations to fit most any setup, our UPS systems are as reliable as they are scalable. Optional Extended Runtime Modules can be added to increase your backup time by a factor of 10, ensuring you're covered until the power comes back on. When available power supply fluctuates outside of acceptable limits, your UPS activates in anticipation of a total outage, ensuring a seamless transition and no downtime. Protect your investments by protecting your data center with HPE UPS.

Visit the online **HPE Power Advisor**

HPE Power Advisor

As IT evolves and system density increases, systems housed in a single rack can now consume the amount of power once required for several racks. Effective sizing of a compute infrastructure while managing IT costs requires realistic estimates of current and future power and cooling requirements. Accurately estimating the power consumption of a server can define power distribution requirements at the rack level and can be the starting point for estimating the total power consumption and cooling needs for a data center. The HPE Power Advisor is an easy-to-use tool that estimates data center power requirements for server and storage configurations. HPE Power Advisor allows you to configure each individual server or node. You can then duplicate the server configuration as often as necessary to populate an enclosure, and then duplicate it to populate a rack. The result is you can build a complete data center quickly. Version 7.x includes the new HPE ProLiant Gen9 servers and options.

Features of the HPE Power Advisor:

- Accurately estimate power consumption of your HPE server and storage products
- Select the appropriate power supplies and other system components
- Configure and plan power usage at a system, rack, and multi-rack level
- Access useful tools including a cost-of-ownership calculator, power report, and bill of materials
- Both a downloadable and online Microsoft Windows® application is available. The Power Advisor online tool supports Google™ Chrome and Mozilla Firefox.

HPE Power Supplies

For more information, visit **hpe.com/info/powersupplies**

Efficiency drives productivity. HPE Power Supplies help your servers—and your business—go further

HPE Power Supplies offer high-efficiency power options available in multiple input and output options, allowing you to “right-size” a power supply for specific server/storage configurations and environments. This flexibility helps to minimize power waste, lower overall energy costs, and avoid trapped power capacity in the data center.

HPE Common Slot Power Supplies

HPE Common Slot Power Supplies share a common electrical and physical design that allows for hot-swap, tool-less installation into HPE server and storage solutions. High-efficiency options rated for up to 94 percent (Platinum/Platinum Plus) are available for many ProLiant Gen8 and ProLiant Gen9 DL500 series servers. Most options also support HPE Power Discovery Services via embedded power line communication technology. This feature enables each server to communicate identification, location, and power-related data to the HPE Intelligent PDU in the rack, which can then be shared with HPE Insight Control to manage power usage and efficiency in the data center.

HPE Flexible Slot Power Supplies

HPE Flexible Slot Power Supplies provide up to 96 percent power efficiency with 80 Plus Titanium-certified power supplies that lower server power requirements and reduce power waste in your data center. Flexible Slot Power Supplies have a form factor that is 25 percent smaller than previous generation common slot power supplies, providing more space to add additional Server Options and improve the performance of your servers. Flexible Slot Power Supplies provide fast, tool-less, hot-plug access to server power supplies for greater serviceability and are supported across the entire HPE ProLiant 300 Gen9 server family, simplifying your spares strategy and further reducing data center costs. Support for Power Discovery Services can be added to all HPE ProLiant DL/ML300 Gen9 servers with the HPE 800W Flex Slot Titanium Hot Plug Power Supply and HPE 1400W Flex Slot Platinum Plus Hot Plug Power Supply option.

HPE Entry-level Power Supplies

HPE Entry-level Power Supplies offer an optimized set of features for most HPE ProLiant DL/ML10/100 Gen9 series servers, with options for both redundant and non-redundant power configurations. The HPE 550W FIO Power Supply offers Silver-certified 80 Plus power efficiency (up to 89 percent) with an optimized set of features for non-redundant power configurations. The HPE 900W AC 240VDC Power Input Module with Power Backplane can be configured to support power redundancy in HPE ProLiant servers that offer only a single power supply bay, providing additional protection against power loss. With an 80 Plus Gold power efficiency rating (up to 92 percent), this power option helps reduce operating expenses while protecting against trapped power capacity in the data center. Hot-plug AC 240VDC power input modules enable better serviceability with fast and easy deployment and replacement.

HPE High-Output Power Supplies for HPE BladeSystem c7000

HPE High-Output Power Supplies provide highly efficient and flexible power options that are specifically designed for the HPE BladeSystem c7000 enclosure. The c7000 enclosure can support up to six Gold (92 percent) or Platinum (94 percent) 80 Plus-certified power supply options, providing high-efficiency power solutions that lower your power requirements and decrease data center operating costs. HPE High-Output Power Supply options provide you with the ultimate flexibility of operating in different data center power infrastructure environments with multiple options for AC and DC power input voltages. Each power option supports hot-plug installation and removal, providing fast, tool-less access to your c7000 enclosure power supplies. Support for HPE Power Discovery Services is added by selecting a Platinum power option, allowing you to automatically map the power topology inside your rack, speeding implementation time, and greatly reducing the risk of human errors that can cause power outages.

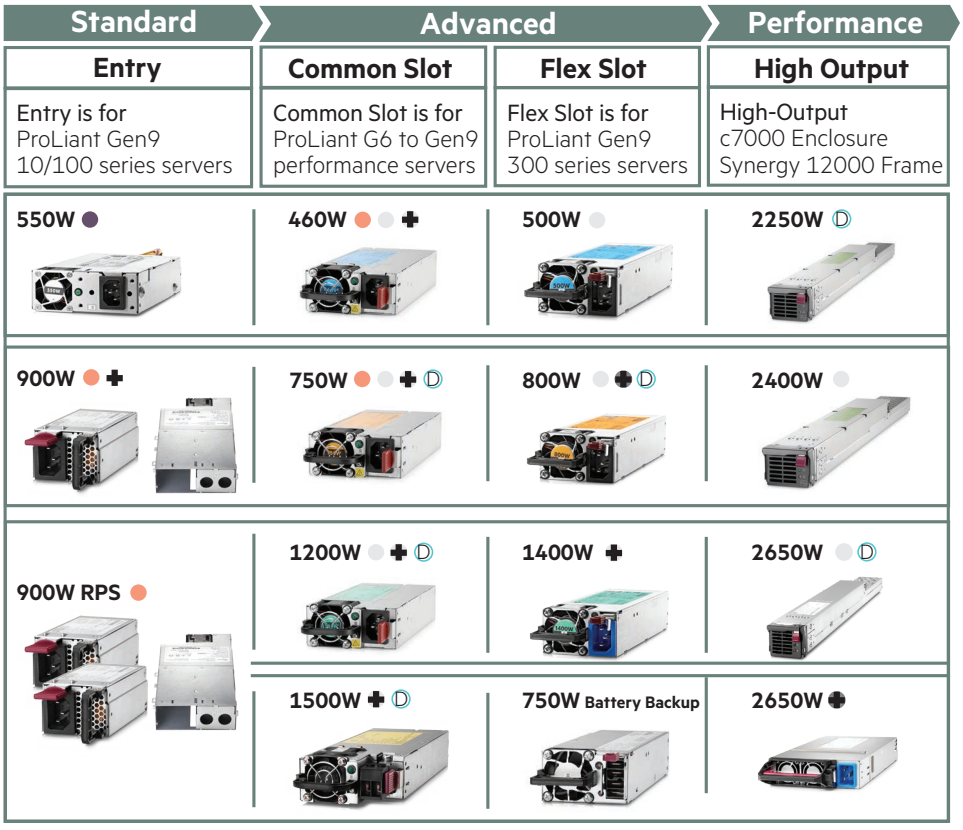

Figure 8: HPE Power Supplies portfolio

HPE High-Output Power Supplies for Synergy 12000 Frame
HPE High-Output Power Supplies provide highly efficient and flexible power options that are specifically designed for the HPE Synergy 12000 frame. The Synergy 12000 frame can support up to six Titanium (96 percent) 80 Plus-certified power supply options, providing high-efficiency power solutions that lower your power requirements and decrease data center operating costs. Each power option supports hot-plug installation and removal, providing fast, tool-less access to your Synergy 12000 frame power supplies. Support for HPE Power Discovery Services allows you to automatically map the power topology inside your rack, speeding implementation time and greatly reducing the risk of human errors that can cause power outages.

HPE Service and Support

For more information, visit
hpe.com/services/getconnected

Unlock the benefits of your investment and protect it beyond warranty

Warranty and Support Services will extend to include HPE Server Options configured with your server or storage device. The price of support service is not impacted by configuration details. HPE sourced options that are compatible with your product will be covered under your server support at the same level of coverage, enabling you to upgrade freely. Installation for HPE Server Options is available as needed. To keep support costs low, some high value options will require additional support. Additional support is only required on select high-value HPE Workload Accelerators, fiber switches, InfiniBand, and UPS batteries over 12kVA. See the specific high value options that require additional support on the **HPE Care Pack Services coverage for HPE Options Guide**.

Protect your business beyond warranty with HPE Support Services

HPE Technology Services delivers confidence, reduces risk, and helps you realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. HPE Support Services enable you to choose the right service level, length of coverage, and response time as you purchase your new server, giving you full entitlement to the support you need for your IT and business.

- HPE Foundation Care provides ongoing hardware and software support for your server and industry-leading third-party software.
- We recommend HPE Proactive Care Services to proactively address issues before they become problems, improve first-time fix rates, and reduce unplanned downtime.
- To cover your entire data center, HPE recommends HPE Datacenter Care Services, which provide flexible, proactive services and hardware and software support. We can tailor the service to your needs with building blocks of additional features such as spare parts management, multivendor support, and the innovative capacity management of HPE Flexible Capacity Service.

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Achieve up to 77 percent[3] reduction in down time, near 100 percent[3] diagnostic accuracy, and a single consolidated view of your environment. By connecting, you will receive 24x7 monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HPE support.

Learn more at
hpe.com/info/serveroptions

Contact Pulse Supply to purchase Dell Servers -
Tel: 410-583-1701 or Email at: sales@pulsesupply.com

[3] White paper "**The Business Value of Connected Support from HP** (now Hewlett Packard Enterprise)," IDC, 2015 Document #254594

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