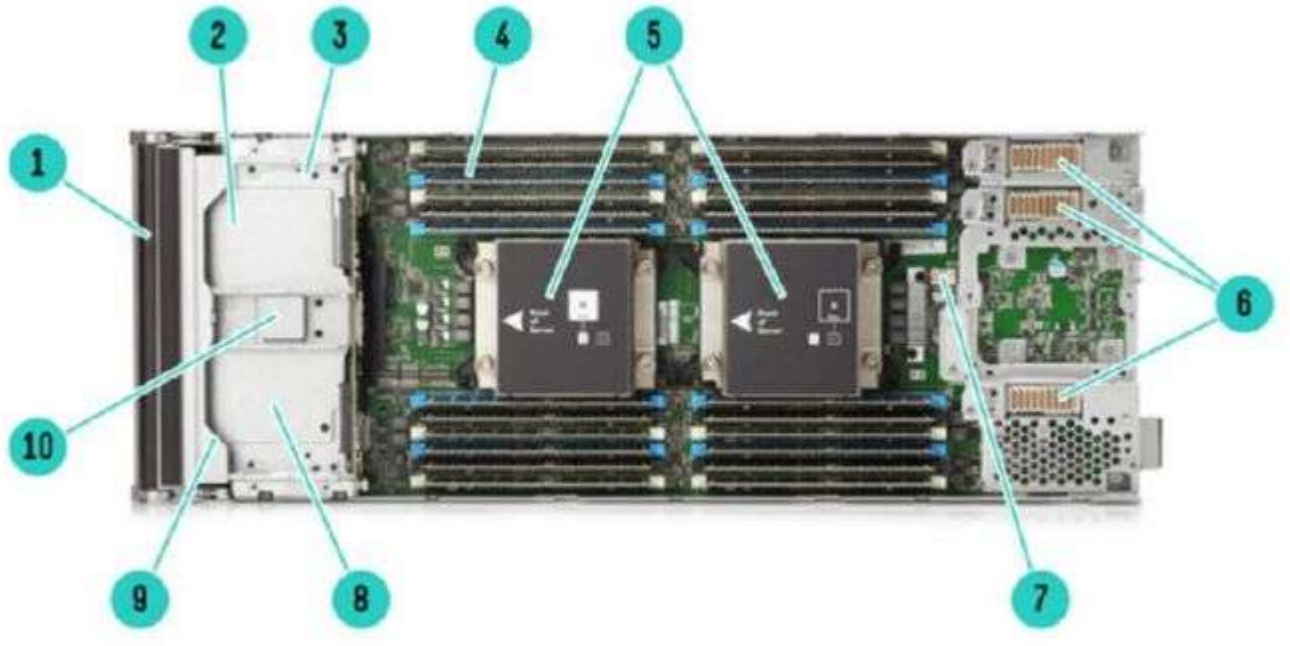
HPE Synergy 480 Gen9 Compute Module



HPE Synergy 480 Gen9 Compute Module - Internal View

1. Removable drive cage with two hot-plug drive bays
2. TPM connector (under drive cage)
3. USB 3.0 (under drive cage)
4. Twenty four (24) DDR4 DIMM memory slots (12 per processor)
5. Up to two (2) Intel Xeon E5-2600 v4 processors
6. Mezzanine connectors (x16 PCIe 3.0)
7. HPE Smart Storage Battery connector
8. iLO (under drive cage)
9. MicroSD Slot (under drive cage)
10. Storage controller connector (under drive cage)

HPE Synergy, the first platform built from the ground up for Composable Infrastructure, offers an experience that empowers IT to create and deliver new value instantly and continuously. It is a single infrastructure that reduces operational complexity for traditional workloads and increases operational velocity for the new breed of applications and services. Through a single interface, HPE Synergy composes physical and virtual compute, storage, and fabric pools into any configuration for any application. As an extensible platform, it easily enables a broad range of applications and operational models such as virtualization, hybrid cloud, and DevOps. With HPE Synergy, IT can become not just the internal service provider but the business partner to rapidly launch new applications that become the business.

HPE Synergy supports both two-socket and four-socket compute modules which provide the performance, scalability, density optimization, storage simplicity, and configuration flexibility to power a variety of workloads, including business processing, IT infrastructure, web infrastructure, collaborative, and high-performance computing.

The HPE Synergy 480 Gen9 Compute Module delivers superior capacity, efficiency, and flexibility in a two-socket, half-height form factor to support demanding workloads. Powered by Intel's® latest E5-2600 v4

Overview

processors, HPE DDR4 SmartMemory supporting up to 1.5 TB, flexible storage controller options, three I/O connectors, and designed to create a pool of flexible compute capacity within a composable infrastructure the HPE Synergy 480 Gen9 Compute Module is the ideal platform for general-purpose enterprise workload performance now and in the future.

HPE Synergy offers additional compute module options (that have individual QuickSpecs) including:

- HPE Synergy 620 Gen9 (2-socket, mission critical)
- HPE Synergy 660 Gen9 (2-4-socket, general purpose)
- HPE Synergy 680 Gen9 (4-socket, mission critical)

This QuickSpecs document focuses on the HPE Synergy 480 Gen9 Compute Module.

Standard Features

NOTE: This document covers the HPE Synergy 480 Gen9 Compute Module only. For information on HPE Synergy 12000 Frame and interconnects please see the HPE Synergy 12000 Frame QuickSpecs.
https://www.hpe.com/h20195/v2/GetDocument.aspx?docname=c04815113

NOTE: For the Standard Features shipped in the "Factory Integrated Models", please see the "Configuration Information - Factory Integrated Models" section.

Processor
Up to two of the following

HPE Synergy 480 Gen9 Intel Xeon E5-2699 v4 (2.2GHz/22-core/55MB/145W)
HPE Synergy 480 Gen9 Intel Xeon E5-2698 v4 (2.2GHz/20-core/50MB/135W)
HPE Synergy 480 Gen9 Intel Xeon E5-2697 v4 (2.3GHz/18-core/45MB/145W)
HPE Synergy 480 Gen9 Intel Xeon E5-2697A v4 (2.6GHz/16-core/40MB/145W)
HPE Synergy 480 Gen9 Intel Xeon E5-2695 v4 (2.1GHz/18-core/45MB/120W)
HPE Synergy 480 Gen9 Intel Xeon E5-2690 v4 (2.6GHz/14-core/35MB/135W)
HPE Synergy 480 Gen9 Intel Xeon E5-2683 v4 (2.1GHz/16-core/40MB/120W)
HPE Synergy 480 Gen9 Intel Xeon E5-2680 v4 (2.4GHz/14-core/35MB/120W)
HPE Synergy 480 Gen9 Intel Xeon E5-2667 v4 (3.2GHz/8-core/25MB/135W)
HPE Synergy 480 Gen9 Intel Xeon E5-2660 v4 (2.0GHz/14-core/35MB/105W)
HPE Synergy 480 Gen9 Intel Xeon E5-2650 v4 (2.2GHz/12-core/30MB/105W)
HPE Synergy 480 Gen9 Intel Xeon E5-2650L v4 (1.7GHz/14-core/35MB/65W)
HPE Synergy 480 Gen9 Intel Xeon E5-2643 v4 (3.4GHz/6-core/20MB/135W)
HPE Synergy 480 Gen9 Intel Xeon E5-2640 v4 (2.4GHz/10-core/25MB/90W)
HPE Synergy 480 Gen9 Intel Xeon E5-2637 v4 (3.5GHz/4-core/15MB/135W)
HPE Synergy 480 Gen9 Intel Xeon E5-2630 v4 (2.2GHz/10-core/25MB/85W)
HPE Synergy 480 Gen9 Intel Xeon E5-2630L v4 (1.8GHz/10-core/25MB/55W)
HPE Synergy 480 Gen9 Intel Xeon E5-2623 v4 (2.6GHz/4-core/10MB/85W)
HPE Synergy 480 Gen9 Intel Xeon E5-2620 v4 (2.1GHz/8-core/20MB/85W)
HPE Synergy 480 Gen9 Intel Xeon E5-2609 v4 (1.7GHz/8-core/20MB/85W)
HPE Synergy 480 Gen9 Intel Xeon E5-2603 v4 (1.7GHz/6-core/15MB/85W)

NOTE: All processors within the compute module must be identical.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.
NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.
NOTE: For the Intel® C610 Chipset E5-2600 v4 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a module, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: The HPE Synergy 480 Gen9 Compute Module includes three I/O mezzanine connectors. A processor must be installed in processor slot 1 for access to mezzanine connector one and three (mezzanine connectors 1 and 3). A processor must be installed in processor slot 2 for access to the mezzanine connector two (mezzanine connector 2).
NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the see the "Memory" section later in this document.

Standard Features

Cache Memory One of the following depending on Model	55MB (1x55MB) L3 cache **NOTE:** For Twenty-two-core processors. 50MB (1x50MB) L3 cache **NOTE:** For Twenty-core processors. 45MB (1x45MB) L3 cache **NOTE:** For Eighteen-core processors. 40MB (1x40MB) L3 cache **NOTE:** For Sixteen-core processors. 35MB (1x35MB) L3 cache **NOTE:** For Fourteen-core processors. 30MB (1x30MB) L3 cache **NOTE:** For Twelve-core processors. 25MB (1x25MB) L3 cache **NOTE:** For Eight or Ten-core processors. 20MB (1x20MB) L3 cache **NOTE:** For Six, Eight, or Ten-core processors 15MB (1x15MB) L3 cache **NOTE:** For Quad or Six-core processors 10MB (1x10MB) L3 cache **NOTE:** For Quad-core processors	
Chipset	Intel® C610 Series Chipset **NOTE:** For more information regarding Intel chipsets, please see the following: **http://www.intel.com/products/server/chipsets/**.	
On System Management Chipset	HPE iLO (Firmware HPE iLO4 2.0), 4GB NAND with 1GB USB user space configurable via UEFI and accessible via iLO. Read and learn more in the **iLO QuickSpecs.** **NOTE:** For more information, visit: **http://www.hpe.com/info/ilo**	
Memory Protection	Advanced ECC Memory Mirroring Memory Online Spare Mode (Rank Spare Mode)	
Memory One of the following depending on Model	Type	HPE SmartMemory DDR4 Load Reduced (LRDIMM), or Registered (RDIMM)
	DIMM Slots Available	24 (12 DIMM slots per processor, 4 channels per processor, 3 DIMMs per channel)
	Maximum (LRDIMM)	1.5 Tb (24 x 64 Gb)

Standard Features

Maximum (RDIMM)	768 Gb (24 x 32 Gb)

NOTE: HPE memory from previous generation servers (DDR3) is not compatible with this compute module. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HPE SmartMemory QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111535
NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.

Network Controller

HPE Synergy 3820C 10/20 Gb Converged Network Adapter
NOTE: Supports full hardware offload of FCoE storage protocol processing for high performance converged Ethernet data and storage networks.

HPE Synergy 2820C 10/20 Gb Converged Network Adapter
NOTE: Delivers flexibility to compose multiple network flows including Ethernet and FCoE or iSCSI within each connection.

Standard iLO Network Controller:
One (1) 1 Gb/s port for the HPE iLO 4 to HPE Frame Link Module connection.

Mezzanine connectors

Three (3) I/O expansion mezzanine connectors:

- x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards) (mezzanine connector 1).
  NOTE: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 1 and the other to bay 4.
- x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards (mezzanine connector 2).
  NOTE: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 2 and the other to bay 5.
  NOTE: A second processor must be installed (in processor slot 2) to have access to mezzanine connector 2.
- x16 PCIe 3.0 Type C (supports Type C mezzanine cards) (mezzanine connector 3).
  NOTE: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 3 and the other to bay 6.

Mezzanine options include:

- Dual-port 10/20 Gb compute module mezzanine adapter options for additional network ports.
- Dual-port 16 Gb Fibre Channel HBA options for SAN connectivity.

HPE Compute Module ROM

HPE ROM (read only memory) is now digitally signed using the HPE Corporate Signing Service. This signature is verified before the flash process starts, reducing accidental programming and preventing malicious efforts to corrupt system ROM.

HPE ROM provides for essential initialization and validation of hardware components before control is passed to the customer-installed operating system. The ROM also provides the capability of booting from various fixed media (HDD, CD-ROM) and removable media (USB), to continue operation to the operating system.

HPE ROM performs very early configuration of the video controller, to allow monitoring of initialization progress via an attached monitor. If configuration or hardware errors are discovered during this early phase of hardware initialization, suitable messages are now displayed on the connected monitor. Additionally, these configuration or hardware errors are logged to the Integrated Management Log (IML) to assist in diagnosis.

HPE Synergy Compute ROM is used to configure the following:

- Processor and chipset status registers
- System memory, memory map, and memory initialization
- System hardware configuration (integrated PCI devices and optional PCIe cards).
- Customer-specific BIOS configuration using the UEFI System Utilities.

NOTE: For further information, please refer to the RBSU and UEFI System Utilities User Guide: **http://www.hpe.com/support/UEFIGen9_UG_en**
http://h20564.www2.hpe.com/hpsc/doc/public/display?docId=c04398276

Unified Extensible Firmware Interface (UEFI) or Legacy Model

HPE Synergy Compute Module System BIOS is an EDK2 UEFI solution, and adheres to the latest revisions of UEFI Class 2 specifications which supports both legacy boot and UEFI boot operation. The HPE Synergy 480 Gen9 defaults to UEFI boot operation and can be factory or field configured for Legacy boot operation.
NOTE: For UEFI boot operation, boot environment and OS image installations should be configured properly to support UEFI.
NOTE: For more information on Hewlett Packard Enterprise Synergy Compute Module System BIOS and UEFI, see the UEFI Information Library:
http://www.hpe.com/info/uefi/docs .
NOTE: HPE Legacy FIO Mode Setting (758959-B22) can be selected to configure the system in UEFI mode in the factory.

To modify the compute module configuration ROM default settings, press F9 in the HPE Synergy Compute Module POST screen to enter the UEFI System Utilities screen. By default, the System Utilities menus are in the English language.

UEFI enables numerous new capabilities, including both industry standard functionality and features specific to HPE Synergy Compute Modules. Following are some of the features that UEFI enables and that the HPE Synergy 480 Gen9 can support when configured for UEFI boot operation:

- Secure Boot - A new feature in which the system firmware, option card firmware, operating systems, and software collaborate to greatly enhance platform security.
- Operating system specific functionality - Microsoft Windows 2012 supports several features only when installed in UEFI mode.
- Support for > 2.2 TB (using GPT) boot drives - Such drives could previously only be used for boot drives when using RAID solutions such as HPE Smart Array.
- UEFI Shell - Provides a pre-boot environment for running scripts and tools. The HPE Synergy Compute Module UEFI Shell provides both standard capabilities as well as numerous enhancements.
- PXE boot support for IPv6 networks.
- PXE Multicast Boot allowing for faster PXE deployments for large numbers of servers.
- Boot support for option cards that only support a UEFI option ROM.

NOTE: When the server is configured for UEFI Boot Mode, PXE servers must be configured with a UEFI boot image.
NOTE: When the server boots in UEFI mode, it does not boot media with a legacy OS installation. This includes DOS targets and Windows or Linux systems installed in Legacy

Standard Features

mode. The reverse is also true for servers that boot in Legacy mode.

Storage Controller

Choice of:

- HPE Smart Array P240nr Controller with 1 Gb Flash-Backed Write Cache (FBWC) supporting RAID 0, 1, 10, 5, 6, and 1 ADM
- HPE Smart Array P542D Controller with 2 Gb Flash-Backed Write Cache (FBWC) supporting RAID 0, 1, 10, 5, 50, 6, 60, 1 ADM, and 10 ADM
- HPE H240nr Smart HBA supporting RAID 0, 1, 10, 5
- HPE B140i (chipset SATA)

Maximum Internal Storage

One of the following depending on Model

Hot Plug SFF SAS	4.0 Tb	2 x 2.0 Tb
Hot Plug SFF SATA	4.0 Tb	2 x 2.0 Tb
Hot Plug SFF SAS SSD	7.68 Tb	2 x 3.84 Tb
Hot Plug SFF SATA SSD	3.2 Tb	2 x 1.6 Tb
Hot Plug SFF NVMe SSD	4.0 Tb NVMe	2 x 2.0 Tb NVMe
Hot Plug uFF SATA SSD	1.36 Tb	4 x 340 Gb

NOTE: The HPE Synergy 480 Gen9 Compute Module supports the HPE hot plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HPE drives from previous generation servers (prior to Gen8) are not compatible with the HPE Synergy 480 Gen9 drive bays.

Interfaces

Micro SDHC Slot	One (1) internal Micro Secure Digital High Capacity (Micro SDHC) card slot
USB 3.0 Port	One (1) internal USB 3.0 connector for USB flash media drive keys

NOTE: The above options are intended for integrated hypervisor virtualization environments.

USB 3.0 Port	One (1) external USB 3.0 connector for USB flash media drive keys

Industry Standard Compliance

ACPI 2.0
Microsoft® Logo certifications
USB 3.0 Support
IPMI 2.0
Secure Digital 2.0
TPM 1.2 and 2.0 Support
IEEE (specific IEEE standards depending on Ethernet adapter card(s) installed)
Advanced Encryption Standard (AES)
Triple Data Encryption Standard (3DES)
SNMP
SSL 2.0
DMTF Systems Management Architecture for Server Hardware Command Line Protocol (SMASH CLP)
Active Directory v1.0
PCIe 3.0

Standard Features

ASHRAE A3

Operating Systems and Virtualization Software Support for HPE 480 Synergy Compute Module

- **Microsoft Windows Server**
- **Microsoft Hyper-V Server**
- **Red Hat Enterprise Linux (RHEL)**
- **SUSE Linux Enterprise Server (SLES)**
- **VMware ESXi**

https://www.hpe.com/h20195/v2/GetDocument.aspx?docname=c04815134

NOTE: For Operating Systems tested with the NVIDIA Tesla M6 GPU option, please see the Graphics Adapter section in Optional Features
NOTE: Operating System support may change. To get the most updated information, please go to the HPE OS Support Matrix at **http://www.hpe.com/info/ossupport**

Enclosures

HPE Synergy 12000 Frame, is the base for all Synergy products and supports:

- Up to 12 half-height, 6 full-height single-wide, or 3 full-height double-wide Compute Modules (mixing allowed)
- Up to 5 half-height double-wide HPE Synergy D3940 Storage Modules (mixing with compute modules in any to any ratio allowed)
- One HPE Synergy 12000 Frame will support up to twelve (12) HPE Synergy 480 Gen9 Compute Modules

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Graphics

Integrated Matrox G200eh video controller

- 1600 x 1200 (32 bpp)
- 1920 x 1200 (16 bpp)

HPE iLO Management On System Management Memory

- 16 Mb Flash Video Memory
- 256 Mb DDR 3 with ECC (112 MB after ECC and video)

NOTE: For GPU options, please see the Graphics Adapter section in Optional Features.

Form Factor

HPE Synergy 480 Gen9 is a half-height compute module that plugs into the HPE 12000 Frame.

HPE management solution

HPE Synergy Composer with HPE OneView

HPE Synergy integrates HPE OneView to deliver 'composable infrastructure' with a view of resources. This flexible and scalable solution provides IT managers with the architecture to implement their software-defined data center (SDDC) -- and to address the changing business needs and the challenges of today's enterprise data centers. **https://www.hpe.com/us/en/product-catalog/synergy/synergy-management/pip.hpe-synergy-composer.1008615209.html**

Standard Features

	HPE Integrated Lights Out	Monitor your servers for ongoing management, service alerting, reporting and remote management with iLO. Learn more at **http://www.hpe.com/info/ilo**
	UEFI	Configure and boot your servers securely with industry standard Unified Extensible Firmware Interface (UEFI). Learn more at **http://www.hpe.com/info/UEFI/docs**
	HPE RESTful API	RESTful API is an application programming interface. RESTful Web Service API served by iLO's web server. **http://www.hpe.com/info/restfulapi** .
	Intelligent Provisioning	Provision servers by discovering and deploying 1 to few servers with Intelligent Provisioning. Learn more at **http://www.hpe.com/servers/intelligentprovisioning**.
Server Utilities	**Smart Update**	Optimize firmware and driver updates with Smart Update solutions. Learn more at **http://www.hpe.com/info/smartupdate**.
	Scripting Tools	Provision one to many servers using your own scripts to discover and deploy them with Scripting Tool Kit for Windows and Linux or Scripting Tools for Windows PowerShell. Learn more at **http://www.hpe.com/servers/stk** and **http://www.hpe.com/servers/powershell**
	HPE iLO Mobile Application	Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: **http://www.hpe.com/info/ilo/mobileapp**.

Security

- Power-on password
- Administrator's password
- Keyboard password (QuickLock)
- HPE iLO Management On System Management Chipset with:
  - SSL encryption
  - Secure Shell version 2
  - Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser, CLP and XML scripting interface
  - AES and RC4 encryption of video
- External USB port enable/disable
- Network server mode
- Serial interface control
- TPM (Trusted Platform Module) 1.2 or 2.0 option
- Advanced Encryption Standard (AES)
- Intel® Advanced Encryption Standard-New Instructions (AES-NI)

Availability

Memory

- Advanced ECC uses single device data correction (SDDC) to detect and correct single and all multi-bit error that occurs within a single DRAM chip. Both x4 and x8 SDDC are supported (x8 requires lockstep mode).
- Memory online spare mode (also known as rank spare mode) detects a rank that is degrading and switches operation to the spare rank.
- Memory demand and patrol scrubbing to prevent accumulation of correctable errors and reducing the likelihood of unplanned downtime.
- Failed DIMM isolation improves the service time thus improving the overall system availability.
- Address parity protection available on RDIMMs and LRDIMMs detects address bit errors to improve service time and overall system availability.

Mezzanine options and I/O

- Multiple I/O mezzanine connectors that support a wide variety of mezzanine cards each supporting multiple data paths routed to redundant interconnect modules.
- Network Adapter Teaming (bonding) provides network fault tolerance, transmit load balancing, and switch-assisted load balancing.

Storage

- Two (2) Small Form Factor hot-plug SAS/SATA drive bays. Each can hold 2 uFF m.2 drives, for a total capacity of 4 uFF drives.
- Choice of the HPE Smart Array P240nr Controller with 1GB FBWC, HPE Smart Array P542D Controller with 2GB FBWC, HPE H240nr Smart HBA, or the HPE B140i (chipset SATA).
- RAID 0, 1, and 5 support for all storage controller offerings.
- Optional dual-port Fibre Channel mezzanine card(s) for redundant SAN connections.

Processor/Chipset

- Processor internal sensors & thermal control protection against over-temperature conditions.
- Cache parity/ECC protects cache data from accidental data corruption.
- Machine Check Architecture (MCA) detects and captures hardware errors such as system bus, memory ECC, parity, and cache, and improves service time.
- Intel® QPI Protocol Protection allows detection of data errors using a checksum of 8-bits.
- Core Disable for FRB (fault resilient boot) allows a system to power-on despite a failing core-pair. It uses BIST (built-in self-test) results to detect a failure and disables the target core-pair upon subsequent boot.

HPE Synergy 12000 Frame

- Up to 12 half-height, 6 full-height single-wide, or 3 full-height double-wide Compute Modules (mixing allowed)
- Half-height double-wide HPE Synergy D3940 Storage Modules (see Synergy Storage for mixing with compute modules and ratios allowed)
- Ten fans and single Frame Link Module included with every system
- Two appliance bays for redundant management appliances, embedded HPE OneView and other solutions to come via REST
- Up to six 2650 Watt Power Supplies of Titanium class efficiency providing 7950 Watts

Standard Features

of redundant power
- Up to 6 ICM module/switch bays for full redundancy of 3 fabrics.
- 2 slots for Frame Link Modules, offers links to multiple frames through a private air-gapped management network
- HPE Thermal Logic technology to maximize power and cooling efficiency
- HPE Intelligent Resources technology built-in to every option for HPE OneView Auto-Discovery of resources.

Warranty

This product is covered by a global limited warranty and supported by HPE Services and a worldwide network of Hewlett Packard Enterprise Authorized Channel Partners. Hardware diagnostic support and repair is available for three years from date of purchase. Support for software and initial setup is available for 90 days from date of purchase. Enhancements to warranty services are available through HPE Support Services or customized service agreements. Certain restrictions and exclusions apply. Drives have either a one year or three year warranty; refer to specific drive QuickSpecs for details.

NOTE: Compute module warranty includes 3-year Parts, 3-year Labor, 3-year on-site support. Warranty repairs may be accomplished through the use of Customer Self Repair (CSR) parts. These parts fall into two categories: 1) Mandatory CSR parts are designed for easy replacement. A travel and labor charge will result when customers decline to replace a Mandatory CSR part; 2) Optional CSR parts are also designed for easy replacement but may involve added complexity. Customers may choose to have Hewlett Packard Enterprise replace Optional CSR parts at no charge. Additional information regarding worldwide limited warranty and technical support is available at **https://h20565.www2.hpe.com/portal/site/hpsc/public?ac.admitted=1483642840383.125225703.1851288163**

Optional Features

Graphics Adapter

- NVIDIA Quadro M3000SE MXM server graphics
  - Workstation class performance for high-end professional 3D graphics
  - 4 GB GDDR5 memory
  - Supports bare metal and passthrough
  - Single Mezzanine adapter
  - Supports Environments (Refer to "Technical Specification"? section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System - Non Virtualized
      - Microsoft ® Windows 7® SP1, Windows 10®
      - RHEL 6.8+/7.2+
    - Server / Hypervisor
      - VMware® ESXi® version 6.0

- AMD FirePro S7100X MXM server graphics
  - Workstation class performance for high-end professional 3D graphics, or VDI acceleration delivering true PC graphics experience.
  - 8GB (GDDR5) memory
  - Supports up to six displays
  - Supports bare metal and pass-through
  - Supported environments (Refer to "Technical Specification"? section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System - Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
    - Server / Hypervisor
      - VMware ESXi version 6.0

- NVIDIA Tesla M6 MXM server graphics
  - Workstation class performance for ultra high end professional 3D graphics, or VDI acceleration delivering true PC graphics experience.
  - 8GB (GDDR5) memory
  - Supports shared graphics, pass-through and hardware GPU virtualization
  - Supported Environments (Refer to "Technical Specification"? section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System - Non Virtualized
      - Microsoft Windows 7 SP1, 10
    - Server / Hypervisor
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)

NOTE: Microsoft® Windows Server only supported in a Citrix or VMware virtualized environment

NOTE: GRID license for use with NVIDIA Tesla M6 must be purchased separately through an NVIDIA verified virtualization partner at **http://www.nvidia.com/buygrid**

NOTE: Not all operating systems supported by the HPE Synergy 480 have been tested with the NVIDIA Tesla M6. These include RHEL 6.7, SLES 11, Ubuntu, Debian, CentOS, Fedora, and OpenSUSE.

Fibre Channel Support	Up to two (2) optional Fibre Channel mezzanine HBAs are supported on the HPE Synergy 480 Gen9.
Compatible SAN	HPE Synergy 480 Gen9 Compute Modules are optimized for HPE MSA, EVA, 3PAR, XP, and LeftHand.
HPE Virtual Connect	HPE Synergy composable fabric delivers high performance and composability for the delivery of applications and services. The composable fabric is based on master/satellite architecture. The HPE Virtual Connect SE 40Gb F8 Module, master module, based on composable fabric is designed for Composable Infrastructure. Its disaggregated, rack-scale design uses a master/satellite architecture to consolidate data center network connections, reduce hardware and scales network bandwidth across multiple HPE Synergy Frames. The master module contains intelligent networking capabilities that extend connectivity to satellite frames through Interconnect Link Modules. This eliminates top of rack switch need and substantially reduces cost. The reduction in components also simplifies fabric management at scale while consuming fewer ports at the data center aggregation layer. The HPE VC SE 40 Gb F8 modules eliminate up to 95% of network sprawl at the compute module edge with one device that converges traffic inside frames and directly connects to external LANs. Each redundant pair of Virtual Connect modules provide eight adjustable downlink connections (six Ethernet and two Fibre Channel, or eight Ethernet) to dual-port 10 Gb and in case of 20 Gb Converged Network Adapters 16 adjustable downlinks connections 14 Ethernet and two Fibre Channel) on each compute module. Up to six uplinks using QSFP+ interfaces are available for connection to upstream Ethernet switches. Including splitter cables up to 24 uplinks are available for connection to upstream Ethernet and Fibre Channel. The HPE VC SE 40 Gb F8 modules avoid the confusion of traditional and other converged network solutions by eliminating the need for multiple Ethernet and Fibre Channel switches, extension modules, cables and software licenses. Also, Virtual Connect wire-once connection management is built-in enabling compute modules adds, moves and replacement in minutes instead of days or weeks. The Master/Satellite disaggregated architecture removes fixed of ratios of interconnects in every frame and allows extending networking resources pool for Virtual Connect to satellite frames. For more information on Virtual Connect and converged network options, see **http://www.hpe.com/info/virtualconnect**.
Storage Software	Whether you need to solve a specific data protection, archiving, or storage command and control challenge, or deliver on strategic consolidation, compliance, or continuity initiatives, look no further than HPE storage software. Our storage software helps you reduce costs, simplify storage infrastructure, protect vital assets and respond faster to business opportunities. Storage software that gets the job done:

Optional Features

- **Data Protection and Recovery Software**
  Whether you're a large enterprise or a smaller business, HPE data protection and recovery software will cost-effectively protect you against disaster and ensure business continuity.
- **Data Archive and Migration Software**
  The HPE storage software enables you to comply with data retention and retrieval requirements, improve application performance, and reduce costs by efficiently migrating infrequently accessed or less valuable data to lower cost storage.
- **Storage Resource Management Software (SRM)**
  The HPE storage resource management software reduces operational costs and provides the command and control foundation you need to efficiently manage and visualize your physical and virtual environments.
- **Data Replication Software**
  Hewlett Packard Enterprise offers array-based and host-based replication software for use in disaster recovery, testing, application development and reporting.
- **Storage Device Management Software**
  Maximize your investment in HPE storage and networking with software that enables hardware-specific configuration, performance tuning and connectivity management.
- **HPE StoreVirtual VSA**
  HPE StoreVirtual VSA allows you to create fully featured shared storage on a VMware vSphere or Microsoft Hyper-V virtualized server.

NOTE: For more information available Storage Software including QuickSpecs, please see:
https://www.hpe.com/us/en/storage/3par.html?jumpid=ps_cu2va3x4mi_AID-510190144&pp=false&gclid=CJnV9MnZq9ECFUYdfwodbdsLmQ&gclsrc=ds

Support Services

Service and Support

HPE Technology Services offers you a rich portfolio of consulting and support services designed to add value to our core products and solutions. We have the know-how and experience to put technology to work for you. We work closely with you, as your strategic partner, leveraging our full services portfolio to make sure that everything works to help optimize your enterprise.

Choose from services aligned to our product offerings and lifecycle. From proactive onsite services to innovative support when your products are connected to Hewlett Packard Enterprise Enterprsise, you choose the precise level of attention and support your business demands.

HPE Technology Services for HPE Synergy
HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.

Protect your business beyond warranty with HPE Support Services
HPE support services offer complete care and support expertise with committed response choices that are designed to meet your IT and business needs.

HPE Foundation Care services offer scalable reactive support-packages for HPE Synergy and software. You choose the type and level of service that is most suitable for your IT and business needs.

HPE Proactive Care keeps your system stable and reliable helping to prevent problems and reduce outages through proactive service management and enhanced technical response.

Advise, transform, integrate, support, automate, and flex

HPE Technology Services helps you get the most out of what you have today and transition to HPE Synergy, a composable infrastructure, at your pace and from wherever you are on the journey.

Start with the HPE Transformation Workshop to ensure that your business and IT organizations collaborate, define the topline strategy for composable, software-defined, cloud-ready infrastructure and kick-start your projects confidently. This workshop clarifies your business requirements and the issues that IT and operations teams must resolve in order to meet these requirements. A detailed executive briefing or high-level report summarizes the strategies, high-level plan and functional requirements.

HPE Modernization and Migration Services helps you choose the right platform for the right workload at the right cost and evolve your IT infrastructure, processes and organization taking advantage of "on-hybrid infrastructure"? innovations such as composable, converged, software-defined, technologies. Hewlett Packard Enterprise experts advise, transform, integrate and implement for platform refresh, datacenter consolidation virtualization, migration and automation projects.

HPE Flexible Capacity is a pay per use model for on premise infrastructure. This offers needed HPE Synergy capacity in the datacenter, plus a buffer of additional capacity. As HPE Synergy will be a dynamic environment, this provides enough room to grow your environment, but only pay for actual metered use. Technology transitions and refresh can be built in, infrastructure and services are billed monthly, enabling you to align costs to business use.

HPE Datacenter Care Infrastructure Automation: HPE Synergy with OneView embedded

helps enable infrastructure automation and is integrated with tools such as those from Chef, Puppet, and Docker, to enable rapid bare metal provisioning. With DC-IA, HPE service experts provide advice, support, best practices, for these tools that work with OneView to help create a fast, agile, and reliable automated IT environment. With this approach, customers can deploy faster. DC-IA delivers support to customers to enable infrastructure as code and agile processes as part of the service. Customers schedule quarterly reviews and reports with HPE Center of Expertise, as well as having access to these experts when needed, for automation development and code coaching.

Choose the right support to maximize uptime, free up your resources, and achieve improved value—as you get the most out of the existing IT assets while accelerating time-to-revenue.

Optimized Support

HPE Proactive Care Advanced - 24x7 coverage, three year Support Service
Builds and incorporates on Proactive Care and also gives customers personalized technical and operational advice from an assigned, local Account Support Manager for personalized technical collaboration, flexible access to specialist skills to help optimize business critical IT, and Critical Incident Management to help so the business is not affected if there is a system or device outage. This recommendation provides 24x7 coverage with four-hour response for hardware and Basic Software Support and Collaborative Call Management for selected non-HPE software that offers two-hour callback for supported software issues.
https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA5-3259ENW.pdf

Standard Support

HPE Proactive Care with 24x7 coverage, three year Support Service
Hardware and software support services designed specifically for your technology with rapid access to Advanced Solution Center specialists for start to finish case management plus proactive reports and recommendations for firmware and software management and best practice advice. This recommendation provides 24x7 coverage with four-hour response for hardware and Basic Software Support and Collaborative Call Management for selected non-HPE software that offers two-hour callback for supported software issues.
https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf

Deploy and integrate

HPE Factory Express Initial Frame Service for Synergy
Factory Express allows a customers' configurations to be pre-configured in the HPE Integration center with an implementation project manager to manage the deployment end to end. The project manager will act as a single point of contact to coordinate the build, delivery and onsite installation and commissioning of the solution. In addition to the configuration and deployment activities, your HPE Synergy configuration goes through comprehensive testing and a detailed documentation package on the configuration and settings of the delivered solution will be provided.
HPE Factory Express Synergy Additional Frame Service for Synergy
Add additional frames to your HPE Synergy Factory Express service or expand your existing HPE Synergy Infrastructure.
HPE Synergy First Frame Installation and Startup - Provides for hardware installation (HPE Synergy compute modules, Storage Modules, Virtual Connect modules, Interconnect Link Modules, Frame Link Modules, and HPE Synergy D3940 Storage Modules) and software startup for the first frame of your HPE Synergy deployment. Additional frames can be added using the HPE Synergy Additional Frame Installation and Startup Service.

HPE Synergy Additional Frame Installation and Startup Service - Add additional frames to your HPE Synergy First Frame Startup service or expand your existing HPE Synergy Infrastructure.

Support Services

HPE Education Services	Training your IT staff is critical to help drive the value of HPE Synergy with increased efficiencies and better business outcomes. Training is key to the transformation and management of HPE Synergy.
Parts and Materials	Hewlett Packard Enterprise 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 QuickSpecs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services. The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.
For more information	Additional Support Services can be found at HPE Support Services Central **https://ssc.hpe.com/portal/site/ssc/**

Configuration Information – Factory Integrated Models

NOTE: Not all models are available in all regions. Check with your local country Hewlett Packard Enterprise offices for availability
NOTE: This section lists some of the steps required to configure a Factory Integrated Model (configure-to-order or CTO compute module). To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an Hewlett Packard Enterprise approved configurator. Contact your local sales representative for information on CTO product offerings and requirements.
NOTE: Configure-to-order compute modules must start with a CTO Compute Module.
NOTE: FIO indicates that this option is only available as a factory installable option.
NOTE: All Factory Integrated Models will be populated with sufficient drive blanks based on the number of initial drives ordered with the server.
NOTE: The Factory integrated w/o drive bay model ships with a grill blank in place of the drive cage and drive backplane.

Step 1: Base Compute Module Configuration (Select a configurable Compute Module)

Models	HPE Synergy 480 Gen9 Configure-to-order Compute Module	HPE Synergy 480 Gen9 Configure-to-order w/o Drive Bays Compute Module	HPE Synergy 480 Gen9 Configure-to-order Expanded Storage Compute Module
SKU Number	732350-B21	732351-B21	732352-B21
Processors	1 or 2 E5-2600 v4 processors.		
DIMM Slots	24 DIMM slots for DDR4 RDIMM or LRDIMM Memory		
Storage Controllers Supported	• HPE Dynamic Smart Array B140i or one of the following controller options: • HPE H240nr Smart Host Bus Adapter • HPE Smart Array P240nr/1GB FBWC	• HPE Smart Array P542D/2GB FBWC	• HPE Smart Array P542D/2GB FBWC
Graphics Adapter (optional)	NVIDIA® Tesla® M6 Mezzanine GPU FIO Adapter with NVIDA® Grid™ vGPU 2.0 and later technology (1536 CUDA Cores)		
PCIe Expansion	Three (3) x16 PCIe I/O mezzanine connectors		
Drives Supported	Two (2) HPE small form factor (SFF) hot-plug SAS/SATA drive bays with support for two (2) SFF drives or up to four (4) uFF drives	No support for local SFF or uFF drives External drive support enabled with the P542D and HPE Synergy D3940 Storage Module	Two (2) HPE small form factor (SFF) hot-plug SAS/SATA/PCIe NVMe drive bays with support for two (2) SFF drives or up to four (4) uFF drives
Security	One (1) TPM connector		
USB and MicroSD	One (1) front USB 3.0 port, One (1) internal USB 3.0 port, One (1) MicroSD		
Management	HPE Synergy Composer powered by HPE OneView, iLO		

Factory BTO and CTO Models

Pre-Configured BTO Models

Configuration Information – Factory Integrated Models

Model	Entry	Base 1	Base 2	Performance 1	Performance
Part Number	826954-B21	826953-B21	826952-B21	826951-B21	826950-B21
Processor	1x E5-2609 v4	1x E5-2630 v4	1x E5-2650 v4	2x E5-2660 v4	2x E5-2680 v4
Memory	16GB (2x 8GB 2400MHz RDIMMs)	32GB (2x 16GB 2400MHz RDIMMs)	64GB (4x 16GB 2400MHz RDIMMs)	64GB (4x 16GB 2400MHz RDIMMs)	128GB (4x 32GB 2400MHz LRDIMMs)
Local Storage Bays	2 Hot-plug SFF	2 Hot-plug SFF	2 Hot-plug SFF	2 Hot-plug SFF	2 Hot-plug SFF
Drives	Optional (SAS/SATA/SSD)	Optional (SAS/SATA/SSD)	Optional (SAS/SATA/SSD)	Optional (SAS/SATA/SSD)	Optional (SAS/SATA/SS
Storage Controller	HPE H240nr Smart Host Bus Adapter	HPE Smart Array P240nr/1GB FBWC with Smart Storage battery	HPE Smart Array P240nr/1GB FBWC with Smart Storage battery	HPE Smart Array P240nr/1GB FBWC with Smart Storage battery	HPE Smart Ar P240nr/1GB FBWC with Smart Storage battery
Network Adapter	1x HPE Synergy 3820C 10/20G Converged Network Adapter	1x HPE Synergy 3820C 10/20G Converged Network Adapter	1x HPE Synergy 3820C 10/20G Converged Network Adapter	1x HPE Synergy 3820C 10/20G Converged Network Adapter	1x HPE Synerg 3820C 10/20G Converged Network Adapt
I/O Expansion Slots	3 x16 PCIe 3.0	3 x16 PCIe 3.0	3 x16 PCIe 3.0	3 x16 PCIe 3.0	3 x16 PCIe 3.0

Step 2: Choose Required Options (one of the following from each list unless otherwise noted)

HPE Processors

NOTE: All FIO processor kits (i.e. xxxxxx-L21) contain one (1) processor.
NOTE: If two processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 4.

E5-2600 v4 series Processors

HPE Synergy 480 Gen9 Intel® Xeon® E5-2699 v4 (2.2GHz/22-core/55MB/145W) FIO Processor Kit	827187
HPE Synergy 480 Gen9 Intel® Xeon® E5-2697 v4 (2.3GHz/18-core/45MB/145W) FIO Processor Kit	827185
HPE Synergy 480 Gen9 Intel® Xeon® E5-2667 v4 (3.2GHz/8-core/25MB/135W) FIO Processor Kit	826999
HPE Synergy 480 Gen9 Intel® Xeon® E5-2650L v4 (1.7GHz/14-core/35MB/65W) FIO Processor Kit	826998
HPE Synergy 480 Gen9 Intel® Xeon® E5-2698 v4 (2.2GHz/20-core/50MB/135W) FIO Processor Kit	826997
HPE Synergy 480 Gen9 Intel® Xeon® E5-2695 v4 (2.1GHz/18-core/45MB/120W) FIO Processor Kit	826996
HPE Synergy 480 Gen9 Intel® Xeon® E5-2690 v4 (2.6GHz/14-core/35MB/135W) FIO Processor Kit	826995

Configuration Information – Factory Integrated Models

HPE Synergy 480 Gen9 Intel® Xeon® E5-2683 v4 (2.1GHz/16-core/40MB/120W) FIO Processor Kit	826994
HPE Synergy 480 Gen9 Intel® Xeon® E5-2680 v4 (2.4GHz/14-core/35MB/120W) FIO Processor Kit	826993
HPE Synergy 480 Gen9 Intel® Xeon® E5-2643 v4 (3.4GHz/6-core/20MB/135W) FIO Processor Kit	826992
HPE Synergy 480 Gen9 Intel® Xeon® E5-2640 v4 (2.4GHz/10-core/25MB/90W) FIO Processor Kit	826991
HPE Synergy 480 Gen9 Intel® Xeon® E5-2637 v4 (3.5GHz/4-core/15MB/135W) FIO Processor Kit	826990
HPE Synergy 480 Gen9 Intel® Xeon® E5-2630L v4 (1.8GHz/10-core/25MB/55W) FIO Processor Kit	826989
HPE Synergy 480 Gen9 Intel® Xeon® E5-2623 v4 (2.6GHz/4-core/10MB/85W) FIO Processor Kit	826988
HPE Synergy 480 Gen9 Intel® Xeon® E5-2620 v4 (2.1GHz/8-core/20MB/85W) FIO Processor Kit	826987
HPE Synergy 480 Gen9 Intel® Xeon® E5-2603 v4 (1.7GHz/6-core/15MB/85W) FIO Processor Kit	826986
HPE Synergy 480 Gen9 Intel® Xeon® E5-2697A v4 (2.6GHz/16-core/40MB/145W) FIO Processor Kit	826985
HPE Synergy 480 Gen9 Intel® Xeon® E5-2660 v4 (2.0GHz/14-core/35MB/105W) FIO Processor Kit	826984
HPE Synergy 480 Gen9 Intel® Xeon® E5-2650 v4 (2.2GHz/12-core/30MB/105W) FIO Processor Kit	826983
HPE Synergy 480 Gen9 Intel® Xeon® E5-2630 v4 (2.2GHz/8-core/25MB/85W) FIO Processor Kit	826982
HPE Synergy 480 Gen9 Intel® Xeon® E5-2609 v4 (1.7GHz/8-core/20MB/85W) FIO Processor Kit	826980

NOTE: All processors within the compute module must be identical.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.
NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.
NOTE: For the Intel® C610 Chipset E5-2600 v4 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a module, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: The HPE Synergy 480 Gen9 Compute Module includes three I/O mezzanine connectors. A processor must be installed in processor slot 1 for access to mezzanine connector one and three (mezzanine connectors 1 and 3). A processor must be installed in processor slot 2 for access to the mezzanine connector two (mezzanine connector 2).
NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the see the "Memory"

section later in this document.

HPE Memory	**HPE SmartMemory**	
	HP 8GB (1x8GB) Single Rank x8 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805347·
	HP 16GB (1x16GB) Single Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805349·
	HPE 16GB (1x16GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	836220·
	HP 32GB (1x32GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805351·
	HPE 32GB (1x32GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Load Reduced Memory Kit	805353·
	HPE 64GB (1x64GB) Quad Rank x4 DDR4-2400 CAS-17-17-17 Load Reduced Memory Kit	805358·
	HPE 128GB (1x128GB) Octal Rank x4 DDR4-2400 CAS-20-18-18 Load Reduced Memory Kit	809208·
	NOTE: HPE memory from previous generation servers (DDR3) is not compatible with this compute module. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HPE SmartMemory QuickSpecs at: **https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111535**	
	NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.	
HPE Networking	**10/20Gb Mezzanine Adapters**	
	NOTE: The compute module requires a minimum of one (1) mezzanine network adapter.	
	NOTE: Mezzanine network adapters can be installed in any mezzanine connector. Hewlett Packard Enterprise best practice is to install the first network adapter in mezzanine connector 3 to facilitate installation of Type C and D mezzanines in mezzanine connectors 1 or 2	
	HPE Synergy 6810C 25/50Gb Ethernet Adptr	867322·
	HPE Synergy 3820C 10/20Gb Converged Network Adapter	777430·
	HPE Synergy 2820C 10Gb Converged Network Adapter	794538·

Step 3: Choose Additional Factory Integration Options

HPE Storage Controllers	HPE Smart Array P240nr/1GB FBWC 12Gb 1-port Internal SAS Controller	758801·
	HPE Smart Array P542D/2GB FBWC 12Gb Mezzanine SAS Controller	759557·
	HPE Compute Module Smart Array P542D SAS Cable	815173·
	HPE Smart Storage Battery with 260mm Cable Kit	782958·
	HPE H240nr 12Gb 1-port Int FIO Smart Host Bus Adapter	814069·
	HP FIO Enable Smart Array B140i Setting	784308·
	NOTE: If the HPE Smart Array P240nr or the HPE H240nr Smart Host Bus	

Adapter are not selected, the B140i controller (chipset SATA) will be enabled to support SATA devices for the internal drive bays. If RAID is required when using the B140i controller, please choose HPE FIO B140i RAID Enable Kit - BIOS Setting' (784308-B21).
NOTE: The HPE Smart Array P542D is required for connection to storage resources in the HPE Synergy D3940 Storage Module.
NOTE: To support local drive bay and D3940 Storage Module connectivity on the same controller the HPE Smart Array P542D (759557-B21) and P542D SAS cable are required with the HPE Synergy 480 Gen9 Configure-to-order Expanded Storage Compute Module (732352-B21).
NOTE: The HPE Smart Storage Battery (782958-B21) is included with the HPE Smart Array P240nr Controller. If the Smart Array P542D Controller is selected the Smart Storage Battery is required to support battery-backed FBWC.

Step 4: Choose Additional Options for Factory Integration

NOTE: For additional options please see the Core Options and Additional sections below; or the following:

- HPE Synergy 12000 Frame QuickSpecs
  https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04815113
- HPE Synergy Interconnect and Mezzanine Components QuickSpecs
  https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04815110
  https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04815110
- HPE Synergy D3940 Storage Module QuickSpecs
  https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04815141

Additional Options

HPE Graphics Adapters	HPE Synergy 480 NVIDIA Tesla M6 FIO Mezzanine Card **NOTE:** Must be installed in Mezz 1. Due to heatsink size, no other card may be installed in Mezz 2 and the HPE Smart Array P542D/2GB FBWC 12Gb Mezzanine SAS Controller, which provides connectivity to direct attach storage, cannot be in the same server due to size restraints. **NOTE:** NVIDIA Tesla M6 requires NVIDIA Grid 2.0 or later to enable vGPU features. vGPU not enabled by default on the card alone. For more information, go to NVIDIA: **http://www.nvidia.com/grid** **NOTE:** GRID license for use with NVIDIA Tesla M6 must be purchased separately through an NVIDIA verified virtualization partner at **http://www.nvidia.com/buygrid**.	826042-B21
HPE Networking	**10/20Gb Mezzanine Adapters**	
	HPE Synergy 6810C 25/50Gb Ethernet Adptr	867322-B21
	HPE Synergy 3820C 10/20Gb Converged Network Adapter	777430-B21
	HPE Synergy 2820C 10Gb Converged Network Adapter	794538-B21
HPE Fibre Channel	HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter	777452-B21
	HPE Synergy 3530C 16Gb Fibre Channel Host Bus Adapter	777454-B21
HPE Processors	**E5-2600 v4 series Processors**	
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2699 v4 (2.2GHz/22-core/55MB/145W) Processor Kit	827187-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2697 v4 (2.3GHz/18-core/45MB/145W) Processor Kit	827185-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2667 v4 (3.2GHz/8-core/25MB/135W) Processor Kit	826999-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2650L v4 (1.7GHz/14-core/35MB/65W) Processor Kit	826998-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2698 v4 (2.2GHz/20-core/50MB/135W) Processor Kit	826997-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2695 v4 (2.1GHz/18-core/45MB/120W) Processor Kit	826996-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2690 v4 (2.6GHz/14-core/35MB/135W) Processor Kit	826995-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2683 v4 (2.1GHz/16-core/40MB/120W) Processor Kit	826994-B21
	HPE Synergy 480 Gen9 Intel® Xeon® E5-2680 v4 (2.4GHz/14-core/35MB/120W) Processor Kit	826993-B21

Additional Options

HPE Synergy 480 Gen9 Intel® Xeon® E5-2643 v4 (3.4GHz/6-core/20MB/135W) Processor Kit	826992-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2640 v4 (2.4GHz/10-core/25MB/90W) Processor Kit	826991-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2637 v4 (3.5GHz/4-core/15MB/135W) Processor Kit	826990-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2630L v4 (1.8GHz/10-core/25MB/55W) Processor Kit	826989-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2623 v4 (2.6GHz/4-core/10MB/85W) Processor Kit	826988-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2620 v4 (2.1GHz/8-core/20MB/85W) Processor Kit	826987-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2603 v4 (1.7GHz/6-core/15MB/85W) Processor Kit	826986-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2697A v4 (2.6GHz/16-core/40MB/145W) Processor Kit	826985-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2660 v4 (2.0GHz/14-core/35MB/105W) Processor Kit	826984-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2650 v4 (2.2GHz/12-core/30MB/105W) Processor Kit	826983-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2630 v4 (2.2GHz/8-core/25MB/85W) Processor Kit	826982-B21
HPE Synergy 480 Gen9 Intel® Xeon® E5-2609 v4 (1.7GHz/8-core/20MB/85W) Processor Kit	826980-B21

NOTE: All processors within the compute module must be identical.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.
NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.
NOTE: For the Intel® C610 Chipset E5-2600 v4 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a module, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: The HPE Synergy 480 Gen9 Compute Module includes three I/O mezzanine connectors. A processor must be installed in processor slot 1 for access to mezzanine connector one and three (mezzanine connectors 1 and 3). A processor must be installed in processor slot 2 for access to the mezzanine connector two (mezzanine connector 2).
NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the see the "Memory" section later in this document.

HPE Memory HPE SmartMemory

Additional Options

HP 8GB (1x8GB) Single Rank x8 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805347-B21
HP 16GB (1x16GB) Single Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805349-B21
HPE 16GB (1x16GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	836220-B21
HP 32GB (1x32GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Registered Memory Kit	805351-B21
HPE 32GB (1x32GB) Dual Rank x4 DDR4-2400 CAS-17-17-17 Load Reduced Memory Kit	805353-B21
HPE 64GB (1x64GB) Quad Rank x4 DDR4-2400 CAS-17-17-17 Load Reduced Memory Kit	805358-B21
HPE 128GB (1x128GB) Octal Rank x4 DDR4-2400 CAS-20-18-18 Load Reduced Memory Kit	809208-B21

NOTE: HPE memory from previous generation servers (DDR3) is not compatible with this compute module. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HPE SmartMemory QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111535
NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.

HPE Drives

NOTE: The HPE Synergy 480 Gen9 Compute Module supports the HPE hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HPE drives from generation G7 servers and before are not compatible with the HPE Synergy 480 Gen9 drive bays.
NOTE: The mixing of standard SAS drives with SAS SSD is supported within the compute module, but limits the RAID configuration to two separate RAID 0 volumes. Mixing of other drives types is not supported.
NOTE: HPE drives have either a one year or three year warranty; refer to the specific drive QuickSpecs for details.
https://www.hpe.com/h20195/v2/GetPDF.aspx%2Fc04111744.pdf and
https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04154378
NOTE: The drive options are not required when configuring a drive-less model.

HPE Synergy 480 Gen9 Compute Module support all small form factor (SFF) SAS and SATA HDDs and SSDs currently certified in HPE Smart Carriers. Any exceptions to this qualification will be listed on this page by drive description and part number.

Drive Qualification Exceptions:

At this time there are no exceptions to list.

HPE Security	HPE Trusted Platform Module Option	488069-B21

Additional Options

	HPE Trusted Platform Module 2.0 Kit	745823-B21

NOTE: The TPM (Trusted Platform Module) is a microcontroller chip that can securely store artifacts used to authenticate the server platform. These artifacts can include passwords, certificates and encryption keys. Windows® BitLocker™ Drive Encryption (BitLocker) is a data protection feature available in Windows Server® 2012. BitLocker leverages the enhanced security capabilities of a Trusted Platform Module (TPM) version 1.2. The TPM works with BitLocker to help protect user data and to ensure that a server running Windows Server 2012 has not been tampered with while the system was offline.
NOTE: For more information about TPM, including a white paper, go to **https://www.hpe.com/h20195/v2/GetDocument.aspx?docname=c04939549**
NOTE: HPE Synergy OS pre-installed units will come with the partition required for TPM deployment.
NOTE: The TPM key is unique to every TPM deployed server and must be retained. Misplacing or losing the key could result in data loss.

HPE Storage Controllers	HPE Smart Array P240nr/1GB FBWC 12Gb 1-port Internal SAS Controller	758801-B21
	HPE Smart Array P542D/2GB FBWC 12Gb Mezzanine SAS Controller	759557-B21
	HPE H240nr 12Gb 1-port Internal Smart Host Bus Adapter	759553-B21
	HPE Compute Module Smart Array P542D SAS Cable	815173-B21
	HPE Smart Storage Battery with 260mm Cable Kit	782958-B21

NOTE: If the HPE Smart Array P240nr or the HPE H240nr Smart Host Bus Adapter are not selected, the B140i controller (chipset SATA) will be enabled to support SATA devices for the internal drive bays. If RAID is required when using the B140i controller, please choose HPE FIO B140i RAID Enable Kit - BIOS Setting (784308-B21).
NOTE: The HPE Smart Array P542D is required for connection to storage resources in the HPE Synergy D3940 Storage Module.
NOTE: To support local drive bay and D3940 Storage Module connectivity on the same controller the HPE Smart Array P542D (759557-B21) and P542D SAS cable are required with the HPE Synergy 480 Gen9 Configure-to-order Expanded Storage Compute Module (732352-B21).
NOTE: The HPE Smart Storage Battery (782958-B21) is included with the HPE Smart Array P240nr Controller. If the Smart Array P542D Controller is selected the Smart Storage Battery is required to support battery-backed FBWC.

HPE Flash Media Kits	**HPE Enterprise Mainstream Flash Media Kits for Memory Cards**	
	HPE 8GB microSD Enterprise Mainstream Flash Media Kit	726116-B21
	HPE 8GB microSD Enterprise Mainstream Flash Media Kit	737959-B21

Additional Options

HPE 32GB microSD Mainstream Flash Media Kit	700139-B21
HP Dual 8GB microSD Enterprise Midline USB Kit	741279-B21

NOTE: Please see the QuickSpecs for Technical Specifications and additional information: **https://www.hpe.com/h20195/v2/GetDocument.aspx?docname=c04123175**

HPE Synergy Services

NOTE: See HPE Support Services Central for additional services at **http://ssc.hpe.com/portal/site/ssc/**

HPE Synergy Proactive Care Services

HPE 3 Year Proactive Care 24x7 Synergy 480 Service	H0UT1E
HPE 3 Year Proactive Care 24x7 with DMR Synergy 480 Service	H0UT2E
HPE 3 Year Proactive Care Advanced 24x7 Synergy 480 Service	H0UT4E
HPE 3 Year Proactive Care Advanced 24x7 with DMR Synergy 480 Service	H0UT5E

Deployment/Installation & Start-up Services

HPE Factory Express Synergy Initial Frame Package 4 Service	HA454A1-300
HPE Factory Express Synergy Add-on Frame Package 4 Service	HA454A1-301
HPE Synergy First Frame Startup Service	U8JM3E
HPE Synergy Additional Frame Startup Service	U8JM4E

Memory

Memory Subsystem Architecture
Each processor socket contains four memory channels that support three DIMMs each for a total of 12 (12) DIMM per installed processor or a grand total of twenty four (24) DIMMs for the compute module.

Memory Population Rules and Guidelines:

- A minimum of one DIMM is required per processor.
- Install DIMMs only if the corresponding processor is installed.
- If only one processor is installed in a two processor system, only half of the DIMM slots are available.
- DIMM sizes can be mixed in channel. To maximize performance, it is recommended to balance the total memory capacity between all installed processors and to load the channels similarly whenever possible.
- LRDIMM and RDIMMs are all distinct memory technologies and cannot be mixed within a compute module.
- DIMMs of different speeds may be mixed in any order; the compute module will select a common optimal speed.
- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the memory type and number of installed processors.
- HPE memory from previous generation servers is not compatible with the HPE Synergy 480 Gen9 Compute Module.
- To realize the performance memory capabilities listed in this document, HPE SmartMemory is required. For additional information, please see the HPE SmartMemory QuickSpecs at: **https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111535**

Synergy 480 Compute Module

Memory Speed Table

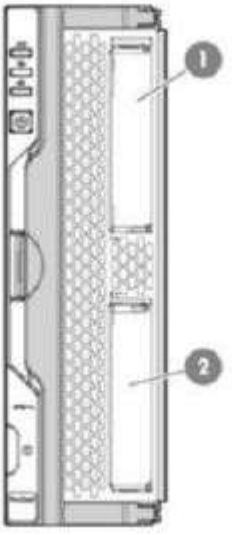
Synergy 3DPC EP Platform	**Synergy 480 Gen9**			
DIMM Type	**Register DIMM (RDIMM)**			
HPE SKU P/N	805347-B21	805349-B21	836220-B21	805351-B21
SKU Description	HPE 8GB 1Rx8 PC4-2400T-R Kit	HPE 16GB 1Rx4 PC4-2400T-R Kit	HPE 16GB 2Rx4 PC4-2400T-R Kit	HPE 32GB 2Rx4 PC4-2400T-R Kit
DIMM Rank	Single Rank (1R)	Single Rank (1R)	Dual Rank (2R)	Dual Rank (2R)
DIMM Capacity	**8GB**	**16GB**	**16GB**	**32GB**
Voltage	1.2V	1.2V	1.2V	1.2V
DRAM depth [bit]	1G	2G	1G	2G
DRAM Width [bit]	x8	x4	x4	x4
DRAM Density	8Gb	8Gb	4Gb	8Gb
CAS Latency	17-17-17	17-17-17	17-17-17	17-17-17
DIMM Native Speed (MT/s)	2400	2400	2400	2400
HPE Server Memory Speed (MT/s)				
1 DIMM Per Channel	2400	2400	2400	2400

Memory

2 DIMM Per Channel	2133	2133	2400	2400
3 DIMM Per Channel	1866	1866	1600	1600

DIMM Type	**Load Reduced (LRDIMM)**		
HPE SKU P/N	805353-B21	805358-B21	809208-B21
SKU Description	HPE 32GB 2Rx4 PC4-2400T-L Kit	HPE 64GB 4Rx4 PC4-2400T-L Kit	HPE 128GB 8Rx4 PC4-2400U-L Kit
DIMM Rank	Dual Rank (2R)	Quad Rank (4R)	Octal Rank (8R)
DIMM Capacity	**32GB**	**64GB**	**128GB**
Voltage	1.2V	1.2V	1.2V
DRAM depth [bit]	2G	2G	2G
DRAM Width [bit]	x4	x4	x4
DRAM Density	8Gb	8Gb	8Gb
CAS Latency	17-17-17	17-17-17	20-18-18
DIMM Native Speed (MT/s)	2400	2400	2400

HPE Server Memory Speed (MT/s)			
1 DIMM Per Channel	2400	2400	2400
2 DIMM Per Channel	2400	2400	2400
3 DIMM Per Channel	2133	2133	2133



1-2 2 x SFF hot-plug drive bays for SAS, SATA, SAS SDD, SATA SSD, NVMe PCIe

Technical Specifications

System Unit	**Dimensions** (H x W x D) (with bezel)	2.5 x 8.43 x 23.62 in. (63.5 x 214 x 600 mm)	
	Weight (approximate)	Maximum: all processors, 24 DIMMs, drives, mezzanine cards, and one flash cache battery installed)	18 lbs. (8.16 kg)
		Minimum: one processor and 1 DIMM installed	14.5 lbs. (6.57 kg)
	Power Specifications	For power specifications including input requirements, BTU rating, and power supply output, please see the HPE Synergy Frame QuickSpecs. To review typical system power ratings use the HPE Power Advisor which is available via the online tool located at **http://www.hpe.com/info/hpepoweradvisor**.	
	System Inlet Temperature	Operating	10°C to 35°C (50°F to 95°F) The upper limit may be limited by the type and number of options installed. System performance may be reduced if operating with a fan fault.
		Non-operating	-30C to 60C (-22F to 140F).
	Extended Ambient Operating Support	Qualifications for extended ambient configurations are detailed at: **https://www.hpe.com/servers/ASHRAE**	
	Relative Humidity (non-condensing)	Operating	10% to 90% @ 28C (82.4F)
		Non-operating	5% to 95% @ 38.7C (101.7F)
	Acoustic Noise	For acoustic noise specifications, please see the HPE Synergy 12000 Frame QuickSpecs.	

HPE Smart Array P542D Controller	**Storage Interface**	12 Gb/s SAS (Serial Attached SCSI) 6 Gb/s SATA (Serial Advanced Technology Attachment)
	SAS Connectors	Two (2) external ports supporting x4 SAS links each and two (2) internal ports supporting x4 SAS links each
	SAS Speed	x16 12 Gb/s per physical link
	PCIe Link Rate	PCIe 3.0 x8 links
	Memory Bus Speed	DDR3-1866 MHz, 72-bit wide bus at 14.92 GB/s (2 Gb cache module)
	Logical Drives Supported	64 logical drives
	Max Drives Supported	Up to 256 drives (Up to 128 drives per logical drive)

	RAID Support	RAID 6, 60 (Advanced Data Guarding) RAID 5, 50 (Distributed Data Guarding) RAID 1, 10 (Drive Mirroring) RAID 1 ADM, 10 ADM (Advanced Data Mirroring) RAID 0 (Striping)
	Upgradeable Firmware	Flashable ROM with redundant firmware images

HPE Smart Array P240nr/1GB Controller	**Disk Drive Interface**	12 Gb/s SAS (Serial Attached SCSI) 6 Gb/s SATA (Serial ATA)
	Server Interface	x8 5G PCIe 3.0 provides 8 Gb/s maximum bandwidth
	Cache Memory	1 Gb flash backed write cache (FBWC) cache standard
	Logical Drives Supported	64 (with included 1Gb cache)
	Host Memory Addressing	64-bit, supporting servers memory space greater than 4 Gb
	RAID Support	RAID 1 (mirroring), RAID 0 (striping), RAID 5, RAID 10
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives)

HPE H240nr Smart HBA	**Disk Drive Interface**	12 Gb/s SAS (Serial Attached SCSI) 6 Gb/s SATA (Serial ATA)
	Compute module Interface	x8 5G PCIe 3.0 provides 8 Gb/s maximum bandwidth
	Cache Memory	None
	Logical Drives Supported	64
	Host Memory Addressing	64-bit, supporting compute modules memory space greater than 4 Gb
	RAID Support	RAID 1 (mirroring) and RAID 0 (striping), RAID 5, RAID 10
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives)

HPE Dynamic Smart Array B140i Controller	**Disk Drive Interface**	6 Gb/s SATA (Serial ATA)
	Compute module Interface	Embedded x4 PCIe 2.0
	SAS Connectors	2 internal SATA ports
	Cache Memory	None

Technical Specifications

	SAS Speed	6 Gb/s SATA links
	Logical Drives Supported	Up to 10 logical volumes (4 physical drives)
	Host Memory Addressing	64-bit, supporting greater than 4Gb compute module memory space
	Hot Plug Support	Yes
	RAID Support	RAID 1 (Mirroring), RAID 0 (Striping), RAID 5
	Other	Upgradeable firmware with recovery ROM
HPE Synergy 2820C 10Gb Converged Network Adapter	**Type**	Dual-port 10 Gb mezzanine
	Network Processor	QLogic 57840S with integrated MAC/PHY
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 20Gbps full duplex; 40 Gb/s aggregate full duplex theoretical bandwidth
	IEEE Compliance	802.3, 802.3ab, 802.3u, 802.3x, 802.3ad, 802.3p, 802.1q, 802.3ae, 802.3ap
	Standard Features	Delivers flexibility to compose multiple network flows including Ethernet and FCoE or iSCSI within each connection. Full hardware offload of FCoE and iSCSI storage protocol processing for highest performance converged Ethernet data and storage networks. Flex-10 Technology allows you to fine tune bandwidth for up to four partitioned FlexNIC's and FlexHBA's to optimize connectivity for different application needs. From 100 Mb/s to 10 Gb/s on up to four "Physical Function" NICs per port, in increments of 100 Mb/s for NIC. The combined bandwidth of NICs cannot exceed port bandwidth i.e. 10 Gb. A single Type C mezzanine form factor provides flexible network and storage I/O for any HPE Synergy Compute Module. Provides up to 40 Gb/s of converged bi-directional Ethernet bandwidth. Industry-leading throughput and latency performance. Supports Tunnel Offload with NVGRE and VXLAN. Hardware acceleration and offloads for stateless TCP/IP, TCP Offload Engine (TOE). Orchestrates reliable adapter firmware updates with an entire HPE Synergy infrastructure from a single tool, HPE Synergy Composer. Integrated PHY and MAC. Support for Preboot eXecution Environment (PXE). Support for SR-IOV (Windows, Linux, VMware). Support for Network Partitioning (NPAR) when using Pass-thru modules.
HPE	**Type**	Dual-port 10/20 Gb mezzanine

Technical Specifications

Synergy 3820C 10/20Gb Converged Network Adapter	**Network Processor**	QLogic 57840S with integrated MAC/PHY
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 40 Gb/s full duplex; 80Gbps aggregate full duplex theoretical bandwidth
	IEEE Compliance	802.3, 802.3ab, 802.3u, 802.3x, 802.3ad, 802.3p, 802.1q, 802.3ae, 802.3ap
	Standard Features	Delivers flexibility to compose multiple network flows including Ethernet and FCoE or iSCSI within each connection. Full hardware offload of FCoE and iSCSI storage protocol processing for highest performance converged Ethernet data and storage networks. Flex-20 Technology allows you to fine tune bandwidth for up to four partitioned FlexNIC's and FlexHBA's to optimize connectivity for different application needs. From 100 Mb/s to 20 Gb/s on up to four "Physical Function" NICs per port, in increments of 100 Mb/s for NIC. The combined bandwidth of NICs cannot exceed port bandwidth i.e. 20 Gb. A single Type C mezzanine form factor provides flexible network and storage I/O for any HPE Synergy Compute Module. Provides up to 80 Gb/s of converged bi-directional Ethernet bandwidth. Industry-leading throughput and latency performance. Supports Tunnel Offload with NVGRE and VXLAN. Hardware acceleration and offloads for stateless TCP/IP, TCP Offload Engine (TOE). Orchestrates reliable adapter firmware updates with an entire HPE Synergy infrastructure from a single tool, HPE Synergy Composer. Integrated PHY and MAC. Support for Preboot eXecution Environment (PXE). Support for SR-IOV (Windows, Linux, VMware). Support for Network Partitioning (NPAR) when using Pass-thru modules.

HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter	**Type**	Dual-port 16Gb mezzanine
	Network Processor	QLogic 8324
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 16 Gb/s, each direction; 64 Gb/s aggregate full duplex theoretical bandwidth
	IEEE Compliance	802.3ae, 802.1Q, 802.3x, 802.1p, 802.3ad/LACP, 802.1AB(LLDP), 802.1Qbg, 802.1Qbb, 802.1Qaz, 802.3ap
	Standard Features	Flexible Configuration and Connection of Pools of Compute Resources. • Provides flexible connectivity to HPE Synergy Virtual Connect FC Modules and Brocade FC Switch Modules. Performance Optimized:

- Capable of delivering twice the data throughput (MB/s) compared to 8 Gb FC HBAs.
- High link speed combined with larger data block sizes results in improved application performance.
- Dynamic Port Utilization architecture delivers up to 600 K Input Output Operations per second (IOPS) on each port or up to 1.2 million IOPS with single port operation.

Virtualization Optimized:

- Ideal for high density server virtualization environments.
- Enables more applications and Virtual Machines to run on a single HPE Synergy Compute Module and Fibre Channel port, resulting in reduced cabling and a higher return on IT investment.

Supports QLogic StorFusion(TM) technology designed to enhance diagnostic and troubleshooting capabilities, quicken SAN deployment, and improve QoS when connected to Brocade 16 Gb FC fabrics.

- Accelerate SAN deployment (FA-PWWN, F-BLD).
- Improve network resiliency and Quality of Service (FEC, CS_CTL).
- Eenhance diagnostics and troubleshooting (Clearlink®, LCB, RDP, FDMI, FC Ping, FC Traceroute).

Power Optimized:

- Latest generation technology saves power.
- Reduced number of components on each FC HBA reduces overall power consumption.

RAS Optimized:

- Highest Data Integrity; Overlapping Protection Domains (OPD) extended for control and data paths.

Security Optimized:

- SAN-level authentication (FC-SP), fabric-level isolation (NPIV and end-to-end data integrity (T10).

Management Optimized:

- Provisions and updates all adapters quickly and consistently using the HPE Synergy template-driven server profiles.
- Orchestrates reliable adapter firmware updates with an entire HPE Synergy infrastructure from a single too, HPE Synergy Composer.

Fault tolerant HBA Architecture.
Two 16 Gb/s Fibre Channel ports.
Multi-Path support for redundant HBAs and paths including Linux driver failover.
RoHS compliance.
QLogic Converge Console management utility for centralized.
management and remote control of distributed HBAs.

NVIDIA® Tesla® M6 GPU Mezzanine Card	**Memory size**	8 Gb
	Memory type	GDDR-5
	Memory interface	256-bit
	Card type	MXM-v3.1
	I/O interface	PCIe (x16) Gen3
	Max Power consumption	100W
	API	DirectX 12, Shader Model 5.0; OpenGL4.5, CUDA, DirectCompute, OpenCL
	Operating Systems	Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere 5.5 or later (vDGA) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions **NOTE:** Microsoft® Windows Server only supported in a Citrix or VMware virtualized environment **NOTE:** Bare metal not supported at this time.

Environment-friendly Products and Approach	**End-of-life Management and Recycling**	Hewlett Packard Enterprise offers end-of-life Hewlett Packard Enterprise product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: **http://www.hpe.com/info/recycle**. To recycle your product, please go to: **http://www.hpe.com/info/recycle** or contact your nearest Hewlett Packard Enterprise sales office. Products returned to Hewlett Packard Enterprise will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard Enterprise web site at: **http://www.hpe.com/info/recycle** These instructions may be used by recyclers and other WEEE treatment facilities as well as Hewlett Packard Enterprise OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

Summary of Changes

Date	Version History	Action	Description of Change
17-Jul-2017	From Version 10 to 11	Changed	Configuration Information-Factory Integrated Models and Related Options sections were updated.
		Added	SKU added in Configuration Information-Factory Integrated Models and Related Options sections: 867322-B21
08-May-2017	From Version 9 to 10	Changed	Additional Options and Memory sections were updated.
		Added	SKUs added in Additional Options: 836220-B21, 809208-B21, 836220-B21, 809208-B21.
27-Mar-2017	From Version 8 to 9	Changed	Overview, Optional Features, and Configuration Information - Factory Integrated Models sections were updated.
		Removed	Obsolete SKUs were deleted: 854845-B21, 652749-B21.
13-Jan-2017	From Version 7 to 8	Changed	Standard Features, Optional Features, Support Services, Configuration Information - Factory Integrated, Additional Options, and Memory sections were updated.
28-Nov-2016	From Version 6 to 7	Changed	Standard Features, Services and Support, and Configuration Information - Factory Integrated Models sections were updated.
19-Aug-2016	From Version 5 to 6	Changed	Format edited in document.
29-Jul-2016	From Version 4 to 5	Changed	QuickSpecs updated.
		Added	SKUs added: 854845-B21, 777454-B21.
		Removed	SKU deleted: 777434-B21
08-Apr-2016	From Version 3 to 4	Changed	Configuration Information - Factory Integrated Models, and Additional Options sections were updated.
		Added	SKUs were added/replaced in Configuration Information - Factory Integrated Models and Additional Options sections: 827187-B21, 827185-B21, 826999-B21, 826998-B21, 826997-B21, 826996-B21, 826995-B21, 826994-B21, 826993-B21, 826992-B21, 826991-B21, 826990-B21, 826989-B21, 826988-B21, 826987-B21, 826986-B21, 826985-B21, 826984-B21, 826983-B21, 826982-B21, 826980-B21.
		Removed	Obsolete SKUs were deleted: D8S85AAE, D8S84A.
31-Mar-2016	From Version 2 to 3	Changed	Sections in QuickSpecs were updated.
		Added	SKUs added: 732371-L21, 732372-L21, 732373-L21, 732374-L21, 732375-L21, 732376-L21, 732377-L21, 732386-L21, 732369-L21, 732368-L21, 805347-B21, 805349-B21, 805351-B21, 805353-B21, 805358-B21, 777430-B21, 777434-B21, 794538-B21, 758801-B21, 759557-B21, 815173-B21, 782958-B21, 814069-B21, 784308-B21, 826042-B21, 777452-B21, 732371-B21, 732372-B21, 732373-B21, 732374-B21, 732375-B21, 732376-B21, 732377-B21, 732386-B21, 732369-B21, 732368-B21, 488069-B21, 745823-B21, 759553-B21, D8S85AAE, D8S84A, 726116-B21, 737959-B21, 700139-B21,

Summary of Changes

			741279-B21, H0UT1E, H0UT2E, H0UT4E, H0UT5E, HA454A1-300, HA454A1-301, U8JM3E, U8JM4E.
17-Dec-2015	From Version 1 to 2	Changed	Overview, Standard Features, Configuration Information-Factory, Integrated Models, Additional Options, Memory, Storage, Technical Specifications sections were updated.
1-Dec-2015	Version 1	Created	New QuickSpecs

Sign up for updates

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

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