

Overview

HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement

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.

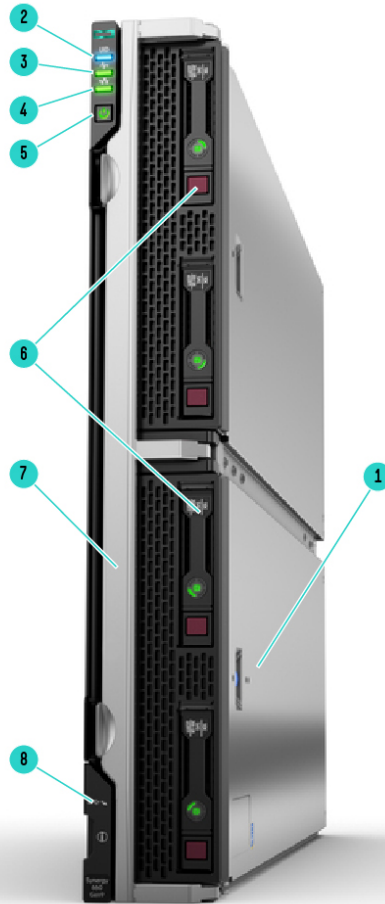
HPE Synergy supports both two-socket and four-socket compute modules which provide the performance, scalability, density optimization, storage simplicity, and configuration flexibility to power a variety of workloads, including business processing, IT infrastructure, web infrastructure, collaborative,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

The HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement delivers agility, control and security in a four-socket, full-height form factor to support demanding workloads and virtualization density. Powered by 2 or 4 Intel® Xeon® Scalable family processors, 48 slots for HPE DDR4 SmartMemory supporting up to 6TB, flexible storage controller options with up to four SFF drives (8 uFF drives) and/or up to 4 internal M.2 drives, and six (6) I/O mezzanine slots. This compute module is designed to create a pool of flexible compute capacity within a composable infrastructure. This makes the HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement the ideal platform for virtualization density, high availability, and scale-up enterprise workloads.

This QuickSpecs document focuses on the HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement. This document includes all the options that have been NEBS (GR-63 and GR-1089) and ETSI (EN 300 132-2 and EN 300 386) certified.

Notes: The HPE Synergy Gen10 compute modules installation involves a minimum upgrade requirement for component compatibility purposes. To ensure proper system functionality, you must update your system to Release Set Version 3.00.20170707 (or later) before installing and operating your compute module. Go to <http://www.hpe.com/downloads/synergy> and see the HPE Synergy Firmware Update Overview guide at <http://www.hpe.com/info/synergy-firmware-update-overview-en> for specific details on updating compute module components.

Overview

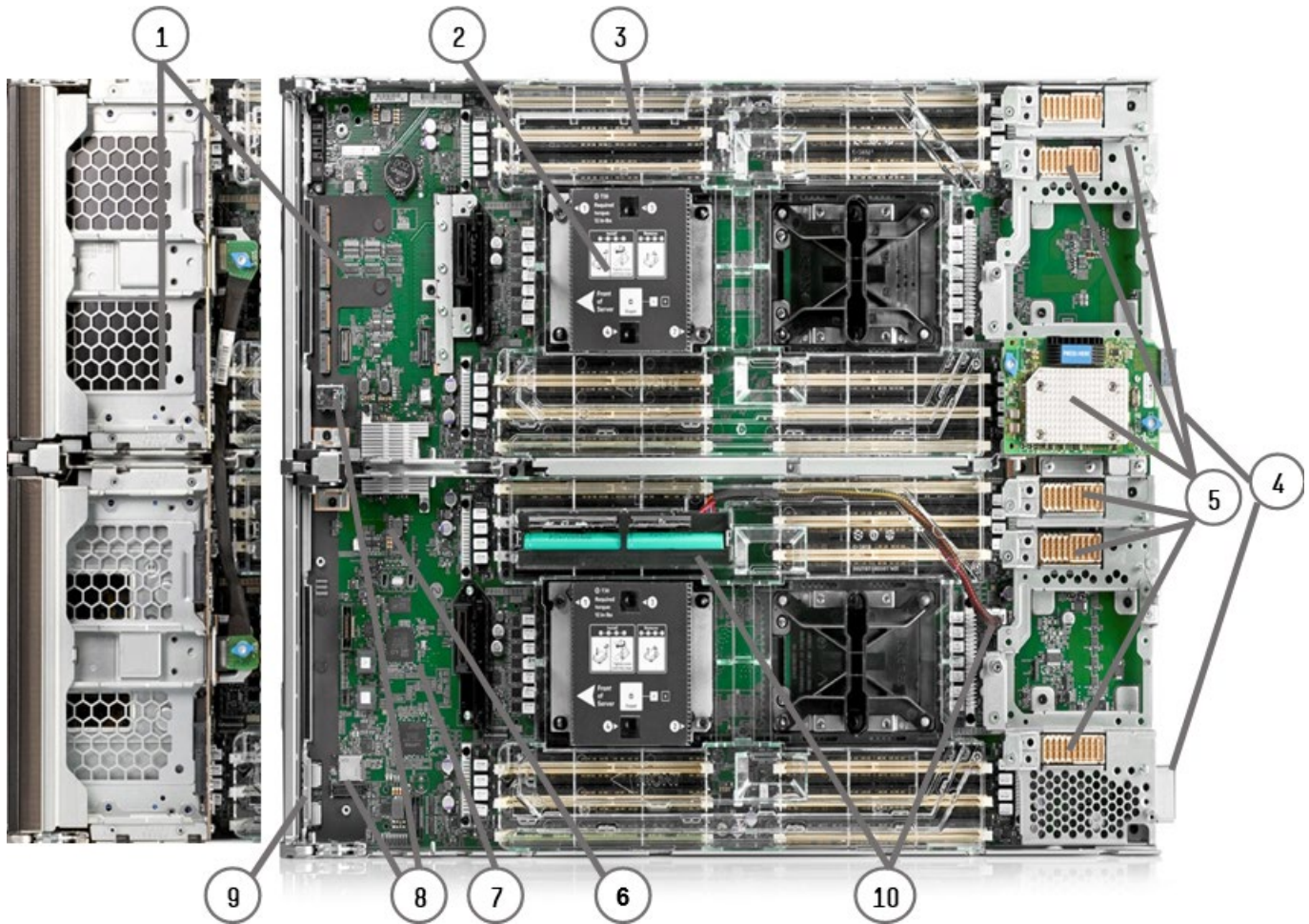


Front View – HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement

- | | |
|--|---|
| 1. Quick Access Panel | 2. UID LED |
| 3. Health Status LED | 4. Mezzanine NIC Status LED |
| 5. Power On / Stand By Button and System Power LED | 6. Zero (0) to Four (4) Hot-Plug Drive Bays (or up to 8 uFF with Smart Drive bay adapter) |
| 7. Compute Module Handle Release Latch | 8. External USB Connector and iLO USB (behind serial label pull tab) |



Overview



**Synergy 660 Gen10 Compute Module
(Drive Cage removed)**

- | | |
|--|--|
| 1. Removable drive cage with 4 hot-plug drive bays and 4 M.2 slots | 2. 2 or 4 x Intel® Xeon® Scalable processors |
| 3. 48 DDR4 DIMM memory slots (12 per processor) | 4. Power/management combo connector |
| 5. 6 x 16 PCIe 3.0 Mezzanine Slots | 6. TPM connector (under drive cage) |
| 7. iLO5 | 8. Internal MicroSD & USB 3.0 (boot port under drive cage) |
| 9. USB 3.0/iLO Connections | 10. Connector and JPE Smart Storage Battery |



Standard Features

Processors

Two or four of the following depending on model.

Notes: For more information regarding Intel Xeon processors, please see the following <http://www.intel.com/xeon>.

Model	CPU Frequency	Cores	L3 Cache	Power	UPI	DDR4	Memory per socket
Gold 6152 Processor	2.1 GHz	22	30.25 MB	140W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6140M Processor	2.3 GHz	18	24.75 MB	140W	3 @ 10.4 GT/s	2666 MT/s	1.5 TB
Gold 6140 Processor	2.3 GHz	18	24.75 MB	140W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6138 Processor	2.0 GHz	20	27.50 MB	125W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6134M Processor	3.2 GHz	8	24.75 MB	130W	3 @ 10.4 GT/s	2666 MT/s	1.5 TB
Gold 6134 Processor	3.2 GHz	8	24.75 MB	130W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6132 Processor	2.6 GHz	14	19.25 MB	140W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6130 Processor	2.1 GHz	16	22.00 MB	125W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6128 Processor	3.4 GHz	6	22.00 MB	115W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 6126 Processor	2.6 GHz	12	19.25 MB	125W	3 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 5122 Processor	3.6 GHz	4	16.50 MB	105W	2 @ 10.4 GT/s	2666 MT/s	768 GB
Gold 5120 Processor	2.2 GHz	14	19.25 MB	105W	2 @ 10.4 GT/s	2400 MT/s	768 GB
Gold 5118 Processor	2.3 GHz	12	16.50 MB	105W	2 @ 10.4 GT/s	2400 MT/s	768 GB
Gold 5115 Processor	2.4 GHz	10	13.75 MB	85W	2 @ 10.4 GT/s	2400 MT/s	768 GB

Notes:

- Platinum – 8100 Series – Supports 2 socket (Synergy 480 Gen10) or up to 4 socket (Synergy 660 Gen10) compute modules, 2 Socket supports 2UPI and 4 Socket supports 3UPI @ 10.4 GT/s, supports 6-Channel DDR4 @ 2666 MT/s providing up to 768GB memory capacity (1.5 TB on select processor skus). Intel Turbo Boost Technology, Intel Hyper-Threading Technology supported. Intel AVX-512 (2x 512-bit FMA), 48 lanes PCIe 3.0, advanced RAS.
- Gold – 5100, 6100 Series - Supports 2 socket (Synergy 480 Gen10) or up to 4 socket (Synergy 660 Gen10) compute modules, 2 Socket supports 2UPI and 4 Socket supports 3UPI @ 10.4 GT/s, supports 6-Channel DDR4 @ 2400 MHz (SKU 5122=supports 2666) providing up to 768GB memory capacity (1.5 TB on select skus). Intel Turbo Boost Technology, Intel Hyper-Threading Technology, Intel AVX-512(1x 512-bit FMA) (SKU 5122 supports 2x 512 bit FMA), 48 lanes PCIe 3.0, advanced RAS supported.
- The Intel Xeon Gold 6143 and Intel Xeon Platinum 8165 processors enable HPE Core Boosting technology. Please refer to the section on Intelligent System Tuning for more details.

<https://www.hpe.com/us/en/servers/management/tuning.html>

Chipset

Intel C621 Series Chipset

Notes: For more information regarding Intel® chipsets, please see the following URL:

<http://www.intel.com/products/server/chipsets/>

Synergy Management

HPE Composer powered by OneView

Notes: Read and learn more about [OneView](#).

On Compute Management Chipset

HPE iLO 5 ASIC

Notes: Read and learn more in the [iLO QuickSpecs](#).



Standard Features

Memory

HPE RDIMMS and LRDIMMs

Two to forty-eight (48) of the following depending on model

- HPE 8GB (1x8GB) Single Rank x8 DDR4-2666 CAS-19-19-19 Registered Memory Kit
- HPE 16GB (1x16GB) Single Rank x4 DDR4-2666 CAS-19-19-19 Registered Memory Kit
- HPE 16GB (1x16GB) Dual Rank x8 DDR4-2666 CAS-19-19-19 Registered Memory Kit
- HPE 32GB (1x32GB) Dual Rank x4 DDR4-2666 CAS-19-19-19 Registered Memory Kit

Type	HPE DDR4 SmartMemory, Registered (RDIMM), Load Reduced (LRDIMM)	
DIMM Slots Available	48	12 DIMM slots per processor, 6 channels per processor, 2 DIMMs per channel
Maximum capacity (LRDIMM)	6 TB	48 x 128 GB LRDIMM @ 2666 MT/s (check on availability of 128 GB DIMMs before ordering)
Maximum capacity (RDIMM)	1.5 TB	48 x 32 GB RDIMM @ 2666 MT/s
Maximum capacity (NVDIMM)	384 GB	24 x 16 GB NVDIMM @ 2666 MT/s

Notes:

- The 128 GB LRDIMM may not be mixed with other DIMM capacities/types.
- LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.
- HPE memory from previous generation servers (DDR3) is not compatible with this compute module. HPE DDR4 SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen10. Please see Memory Speed Tables for memory speed changes based on processors selected. For additional information, please see the HPE DDR4 SmartMemory QuickSpecs at: <https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04355083>

Memory Protection

Advanced ECC

Advanced ECC uses single device data correction to detect and correct single and all multibit error that occurs within a single DRAM chip.

Online Spare

Memory online spare mode detects a rank that is degrading and switches operation to the spare rank.

Online Mode

Memory Online Spare Mode (Rank Spare Mode)

Notes: For details on the HPE Server Memory Options RAS feature, visit: <http://www.hpe.com/docs/memory-ras-feature>.



Standard Features

Mezzanine Connectors

Six (6) I/O expansion mezzanine connectors:

- Mezzanine connector 1 is x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards) for fabric 1
Notes: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 1 and the other to bay 4.
- Mezzanine connector 2 is x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards) for fabric 2
Notes:
 - This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 2 and the other to bay 5.
 - The HPE Synergy 660 Gen10 supports 2 or 4 processors. Mezzanine 2 and 5 are only supported when 4 processors are installed.
- Mezzanine connector 3 is x16 PCIe 3.0 Type C (supports Type C mezzanine cards) for fabric 3.
Notes: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 3 and the other to bay 6.
- Mezzanine connector 4 is x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards) for fabric 1
Notes: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 1 and the other to bay 4.
- Mezzanine connector 5 is x16 PCIe 3.0 Type D (supports Type C and Type D mezzanine cards for fabric 2)
Notes:
 - This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 2 and the other to bay 5.
 - The HPE Synergy 660 Gen10 supports 2 or 4 processors. Mezzanine 2 and 5 are only supported when 4 processors are installed.
- Mezzanine connector 6 is x16 PCIe 3.0 Type C (supports Type C mezzanine cards) for fabric 3
Notes: This mezzanine connector supports dual-port mezzanine cards: one port is routed to interconnect module bay 3 and the other to bay 6.

Network Adapters or Mezzanine options include

- HPE Synergy 3820C 10/20GbE Converged Network Adapter
Notes: Supports full hardware offload of FCoE storage protocol processing for highest performance converged Ethernet data and storage networks
- HPE Synergy 2820C 10GbE Converged Network Adapter
Notes: Delivers flexibility to compose multiple network flows including Ethernet and FCoE or iSCSI within each connection.
- HPE Synergy 6810C 10/20/25/50Gb Ethernet Adapter
Notes: Refer to the Quickspecs for more details

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.



Standard Features

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.

Notes: For further information, please refer to the [RBSU and UEFI System Utilities User Guide](#)

Storage Controllers

Zero (0) to three (3) of the following depending on model:

Software RAID (embedded)

- HPE Smart Array S100i Software RAID Gen10 (HPE FIO Enable Smart Array SW RAID)

Notes:

HPE Smart Array S100i SR Gen10 SW RAID will operate in UEFI mode only. For legacy support an additional controller will be needed, and for CTO orders please also select the Legacy mode settings part, 758959-B22.

HPE Smart Array S100i SR Gen10 SW RAID is off by default and must be enabled. The enablement SKU is 784308-B21

Essential RAID Controllers

- HPE Smart Array E208i-c SR Gen10 12G SAS Modular Controller

Performance RAID Controllers

- HPE Smart Array P408i-c SR Gen10 12G SAS Modular Controller
- HPE Smart Array P416ie-m SR Gen10 12G SAS Mezzanine Controller (Mezzanine Hybrid Smart Array Controller for use with Synergy D3940 Storage Modules; up to 4 storage modules per frame with the HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplements)

Premium Backplane CTO Compute Module

Premium Backplane Compute Module option for use with up to 4 NVMe drives in front drive cage. Also, supports P416ie-m with specific SAS cable connections allowing P416ie-m to manage SATA/SAS drives in both front drive cage and HPE SY D3940 DAS Storage Module.

Maximum Internal Storage

	Capacity	Configuration
Hot Plug SFF SAS SSD	61.2 TB	4 x 15.3 TB
Hot Plug SFF SATA SSD	15.36 TB	4 x 3.84 TB
Hot Plug SFF SAS HDD	9.6 TB	4 x 2.4 TB
Hot Plug SFF SATA HDD	8.0 TB	4 x 2.0 TB
Hot Plug SFF NVMe SSD	16.0 TB	4 x 4.0 TB
Hot Plug uFF SATA SSD	2.72 TB	8 x 340 GB
Hot Plug internal M.2	7.68 TB	4 x 1.92 TB

Notes: The Synergy 660 Gen10 compute module includes 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 Synergy 660 Gen9 or Gen10 drive bays.



Standard Features

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
Notes: 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
iLO USB 2.0 port	One (1) external USB 2.0 connector for iLO 5

Operating Systems and Virtualization Software Support

- Microsoft Windows Server
- Microsoft Hyper-V Server
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server (includes XEN & KVM)
- VMware ESXi
- VMware vSphere

Notes: 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>

Form Factor

HPE Synergy 660 Gen10 is a 10U full-height, single-wide, compute module that plugs into the HPE Synergy Frame 12000.

Frames

HPE Synergy 12000 Frame, is the base for all Synergy products and supports full redundancy in a single Frame, while allowing for scalability and redundancy out to many Frames (up to 21 frames supported per single Composer/OneView)

- 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 six (6) HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplements

Industry Standard Compliance

- Microsoft® Logo certifications
- USB 3.0 Compliant; iLO USB is 2.0 compliant
- WOL enabled on specific adapters
- PXE support enabled
- TPM 2.0 Support (RBSU support of TPM 1.2)
- 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
- UEFI (Unified Extensible Firmware Interface Forum)



Standard Features

Graphics(I/O)

Integrated Matrox G200eH2 video standard with 16 MB of Video RAM

- 1280 x 1024 (32 bpp)
- 1920 x 1200 (16 bpp)

HPE iLO 5 on system management memory

- 32 MB Flash
- 512 MB with ECC (224 MB after ECC and video)

HPE Server UEFI/Legacy ROM

Unified Extensible Firmware Interface (UEFI) is an industry standard that provides better manageability and more secured configuration than the legacy ROM while interacting with your server at boot time. HPE Gen10 servers have a UEFI Class 2 implementation and support both UEFI Mode (default) and Legacy BIOS Mode.

Notes: The UEFI System Utilities tool is analogous to the HPE ROM-Based Setup Utility (RBSU) of legacy BIOS. For more information, please visit <http://www.hpe.com/servers/uefi>.

UEFI enables numerous new capabilities specific to HPE Synergy Compute Modules such as:

- Secure Boot and Secure Start enable for enhanced security
- Operating system specific functionality
- Support for > 2.2 TB (using GPT) boot drives
- USB 3.0 Stack
- Embedded UEFI Shell
- Mass Configuration Deployment Tool using iLO RESTful API that is Redfish API Conformant.
- PXE boot support for IPv6 networks
- Workload Profiles for simple performance optimization

UEFI Boot Mode only:

- TPM 2.0 Support
- NVMe Boot Support
- Platform Trust Technology (PTT) can be enabled.
- iSCSI Software Initiator Support.
- HTTP/HTTPs Boot support as a PXE alternative.
- Boot support for option cards that only support a UEFI option ROM

Notes:

- For UEFI Boot Mode, boot environment and OS image installations should be configured properly to support UEFI.
- UEFI FIO Setting (758959-B22) can be selected to configure the system in Legacy mode in the factory for your HPE Synergy Gen10 Server.



Standard Features

Embedded Management

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.

HPE Integrated Lights-Out (HPE iLO)

Monitor your servers for ongoing management, service alerting, reporting and remote management with HPE 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/servers/uefi>.

Intelligent Provisioning

Hassle free server and OS provisioning for 1 or more servers with Intelligent Provisioning. Learn more at <http://www.hpe.com/servers/intelligentprovisioning>.

iLO RESTful API

iLO RESTful API is Redfish API conformance and offers simplified server management automation such as configuration and maintenance tasks based on modern industry standards. Learn more at <http://www.hpe.com/info/restfulapi>.

Security Features

Newest forms of security based on iLO 5 features.

Secure Start with hardware root of trust.

- HPE hardware designed logic in iLO chip validates iLO firmware burned in chip
- iLO then validates system/compute ROM firmware for digital signature
- iLO completes the chain of trust.
- ROM validates option ROMs and OS Bootloader via UEFI Secure Boot

Standard security features

- 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).
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Standard Features

About Trusted Platform Module

Trusted Platform Module (TPM) is a separate processor that monitors the system state. TPM is a passive component needing to be updated and not able to lock down any component in the system except access to its own memory. It also provides some cryptographic operations - among them: creating RSA keypairs, and working with them.

The first verification of signatures happens by code on the CPU, which can be intercepted and replaced. Emulating a "properly" booted system is possible by sending the right values to the TPM.

The bootblock, the part of the firmware that contains the first instructions executed by the CPU, comes first and anchors the root of trust. But if you can't trust the bootblock to send a truthful state into the TPM, this is a vulnerability.

About HPE Silicon Root of Trust

As soon as the server is powered on and the iLO firmware comes alive, it looks into the silicon for the immutable fingerprint that verifies all the firmware code is valid and uncompromised. Over a million lines of firmware code run before the operating system starts, making it vital to confirm that all server essential firmware is free from malware or compromised code.

During operation of the server, HPE has a new technology that conducts run-time firmware validation that checks the firmware stored in the server. At any point, if compromised code or malware is inserted in any of the critical firmware, an iLO audit log alert is created to notify the customer that a compromised has occurred. It is achieved by storing iLO 5 and UEFI firmware in non-volatile Flash memory which is thoroughly scanned at regular user determined intervals. The contents of the firmware stored in memory must be exactly right, down to the individual bit, or else it is flagged as compromised. See the iLO 5 QuickSpecs for recovery processes.

Warranty

This product is covered by a global limited warranty and supported by HPE Services and a worldwide network of HPE Authorized Channel Partners resellers. 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 Pointnext operational services or customized service agreements. Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

Notes: Server Warranty includes 3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response. 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**



Optional Features

Server Management

HPE OneView Advanced

HPE OneView brings a new level of automation to infrastructure management by taking a template driven approach to provisioning, updating, and integrating compute, storage, and networking infrastructure. It provides full-featured licenses which can be purchased for managing Gen8 Gen9 and Gen10 servers.

HPE iLO Advanced (standard with Synergy Compute)

HPE iLO Advanced licenses offer smart remote functionality without compromise. The license includes the full integrated remote console, virtual keyboard, video, and mouse (KVM), multi-user collaboration, console record and replay, and GUI-based and scripted virtual media and virtual folders. You can also activate the enhanced security and power management functionality

HPE iLO Advanced Premium Security Edition for iLO 5 includes iLO Advanced License plus high-end security modes, unique security capabilities, like Automatic FW recovery; Runtime FW verification, and Secure erase.

HPE iLO Scale-Out

HPE iLO Scale-Out is the preferred license built for web hosting, cloud service providers, and high performance computing data centers, managing massive scale out environments. This license offers sophisticated scripting tools that provide remote access through Text Console via SSH, Dynamic power capping, Email-based Alerting and proactive notifications.

HPE Insight Cluster Management Utility (CMU)

HPE Insight Cluster Management Utility is a HyperScale management framework that includes software for the centralized provisioning, management and monitoring of nodes and infrastructure.

HPE Insight Control

HPE Insight Control is recommended for current implementation on HPE Servers to deploy, migrate, monitor, remote control, and optimize your IT infrastructure through a single, simple management console.

Fibre Channel Support

Optional Fibre Channel mezzanine HBAs are supported on the HPE Synergy 660 Gen10.

Compatible SAN

HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplements 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 primary/satellite architecture.

The HPE Virtual Connect SE 40Gb F8 Module, primary module, based on composable fabric is designed for Composable Infrastructure. Its disaggregated, rack-scale design uses a primary/satellite architecture to consolidate data center network connections, reduce hardware and scales network bandwidth across multiple HPE Synergy Frames.

The primary 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 Primary/Satellite



Optional Features

disaggregated architecture removes fixed of ratios of interconnects in every frame and allows extending networking resources pool for Virtual Connect to satellite frames.

Notes: For more information on [Virtual Connect and converged network options](#)

One Config Simple (SCE)

SCE is a guided self-service tool to help sales and non-technical people provide customers with initial configurations in 3 to 5 minutes. You may then send the configuration on for configuration help, or use in your existing ordering processes. If you require "custom" rack configuration or configuration for products not available in SCE, please contact Hewlett Packard Enterprise Customer Business Center or an Authorized Partner for assistance.



Service and Support

Pointnext - Service and Support

Protect your business beyond warranty with HPE Support Services

HPE Pointnext provides a comprehensive portfolio including Advisory and Transformational, Professional, and Operational Services to help accelerate your digital transformation. From the onset of your transformation journey, Advisory and Transformational Services focus on designing the transformation and creating a solution roadmap. Professional Services specializes in creative configurations with flawless and on-time implementation, and on-budget execution. Finally, operational services provides innovative new approaches like Flexible Capacity and Datacenter Care, to keep your business at peak performance. HPE is ready to bring together all the pieces of the puzzle for you, with an eye on the future, and make the complex simple.

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Reduce down time and improve diagnostic accuracy with 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 about getting connected at <http://www.hpe.com/services/getconnected>

Other Related Services

HPE Server Hardware Installation

Provides for the **basic hardware installation** of HPE branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.

HPE Datacenter Care service

HPE Datacenter Care helps improve IT stability and security, increase the value of IT, and enable agility and innovation. It is a structured framework of repeatable, tested, and globally available services “building blocks.” You can deploy, operate, and evolve your datacenter wherever you are on your IT journey. With HPE Datacenter Care, you benefit from a personalized relationship with HPE via a single point of accountability for HPE and others’ products. <http://www.hpe.com/services/datacentercare>

HPE Flexibly Capacity

With Flexible Capacity, you get the speed, scalability, and economics of the public cloud in the privacy of your data center. Gain the advantages of the public cloud—consumption-based payment, rapid scalability without worrying about capacity constraints. Reduce the “heavy lifting” needed to operate a data center. And retain the advantages that IT provides the business (i.e., control, security). Deliver the right user experience, choose the right technology for the business, manage privacy and compliance, and manage the cost of IT. And, you have the option to use the public cloud when needed.

HPE Factory Express for Servers and Storage

HPE Factory Express offers configuration, customization, integration and deployment services for HPE servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed.

Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. HPE products supported through Factory Express include a wide array of servers and storage: HPE Integrity, HPE ProLiant, HPE Apollo, HPE ProLiant Server Blades, HPE BladeSystem, HPE Synergy, HPE 9000 servers as well as the MSA, 3PAR suite, XP, rackable tape libraries and configurable network switches.

HPE Technology Services Support Credits

HPE Technology Services Support Credits offer flexible services and technical skills to meet your changing IT demands. With a menu of service that is tailored to suit your needs, you get additional resources and specialist skills to help you maintain peak performance of your IT. Offered as annual credits, you can plan your budgets while proactively responding to your dynamic business.

HPE Education Services



Service and Support

Keep your IT staff trained making sure they have the right skills to deliver on your business outcomes. Book on a class today and learn how to get the most from your technology investment. <http://www.hpe.com/ww/learn>

HPE Support Center

The HPE Support Center is a personalized online support portal with access to information, tools and experts to support HPE business products. Submit support cases online, chat with HPE experts, access support resources or collaborate with peers. Learn more <http://www.hpe.com/support/hpesc>

HPE's Support Center Mobile App* allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime.

HPE Insight Remote Support and HPE Support Center are available at no additional cost with a HPE warranty, HPE Support Service or HPE contractual support agreement.

Notes: *HPE Support Center Mobile App is subject to local availability

For more information: <http://www.hpe.com/services>

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 quick-specs, 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.



Configuration Information

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.

Notes:

- Not all models are available in all regions. Check with your local country Hewlett Packard Enterprise offices for availability.
- Configure-to-order compute modules must start with a CTO Compute Module.
- FIO indicates that this option is only available as a factory installable option.
- All Factory Integrated Models will be populated with sufficient drive blanks based on the number of initial drives ordered with the server.
- The Factory integrated w/o drive bay model ships with a grill blank in place of the drive cage and drive backplane.

Step 1: Customizable Configuration (choose one of the following configurable models)

CTO Model Name	HPE Synergy 660 Gen10 Configure-to-order Compute Module	HPE Synergy 660 Gen10 Configure-to-order without Drive Bays Compute Module	HPE Synergy 660 Gen10 Configure-to-order Premium Backplane Compute Module
SKU Number	871929-B21	871930-B21	871931-B21
¹ TAA SKU	871929-B22	871930-B22	871931-B22
Processor	2 or 4 selectable		
DIMM Slots	48 total DIMM slots		
Backplane	Standard Backplane 4 Hot-plug SFF Bays	No Backplane No Drive Carriage system (optional 4x M.2)	Premium Backplane 4 Hot-plug SFF Bays NVMe SSD and DAS Ready, depending upon controller choice
Storage Controller	Optional <ul style="list-style-type: none"> • HPE Smart Array S100i SR Gen10 Controller (HPE FIO Enable Smart Array SW RAID) • HPE Smart Array E208i-c SR Gen10 Controller • HPE Smart Array P408i-c SR Gen10 Controller • HPE Smart Array P416ie-m SR Gen10 Controller • HPE SAS Cable for P416ie-m SR G10 Controller 		
Network Mezzanine Adapters	Optional <ul style="list-style-type: none"> • HPE Synergy 2820C 10Gb CNA • HPE Synergy 3820C 10/20Gb CNA • HPE Synergy 6810C 10/20/25/50Gb Ethernet Adapter 		
I/O slots	6 x16 PCIe 3.0		
Drives supported	Optional 0 to 4 SFF SAS/SATA/NVMe SSDs OR up to 8 uFF Flash AND/OR up to 4 internal M.2 drives		
Security	TPM 2.0 optional; iLO5		
USB and MicroSD	1 internal USB, 1 internal uSD, 1 external USB, 1 external USB iLO port		
Management	HPE OneView and iLO 5 Advanced included with all Synergy solutions		

Notes:

- CTO SKUs are designed for specific use case fits.
- This information applies to factory CTO configurations, Field upgrades may differ depending field configurations.
- BackPlane in the chassis description refers to the type of controller backplane in the Drive Cage modules.
- Standard BackPlane CTO chassis is designed for flexible use of the Compute Module for most workloads. This SKU may use the SATA Board Option, or SmartArray options. This SKU may also use the Mezzanine P416ie-m for connection to the HPE D3940 Storage Module, but no links to local front drive.



Configuration Information

- The Drive-Less CTO option is intended for stateless on SAN/NAS boot use cases and still supports mezzanine Smart Array for Synergy D3940 Storage Modules. Additionally, this model supports adding the M.2 Adapter for dual M.2 drive options. This SKU may also use the Mezzanine P416ie-m for connection to the HPE D3940 Storage Module, but no links to local front drive.
- The Premium BackPlane CTO option supports NVMe drives directly in the Front Drive cage. SATA/SAS drives may optionally be supported in the Front Drive Cage in combination with the D3940 Storage Module with a mezzanine Smart Array P416ie-m and addition SAS Cables that connect the mezzanine card directly to the Premium Backplane on the Local Drive Cage.
- ¹HPE offers multiple Trade Agreement Act (TAA) compliant configurations to meet the needs of US Federal Government customers. These products are either manufactured or substantially transformed in a designated country.

Step 2a: Choose Required Options

Step 2a: Processors (made – only L21 SKUs appear here)

Intel Xeon-Gold Processors

Intel Xeon-Gold 6152 (2.1GHz/22-core/140W) FIO Processor Kit for HPE Synergy 480/660 Gen10	872133-L21
Intel Xeon-Gold 6140M (2.3GHz/18-core/140W) FIO Processor Kit for HPE Synergy 480/660 Gen10	872116-L21
Intel Xeon-Gold 6140 (2.3GHz/18-core/140W) FIO Processor Kit for HPE Synergy 480/660 Gen10	872139-L21
Intel Xeon-Gold 6138 (2.0GHz/20-core/125W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873376-L21
Intel Xeon-Gold 6134 (3.2GHz/8-core/130W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873379-L21
Intel Xeon-Gold 6132 (2.6GHz/14-core/140W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873380-L21
HPE Synergy 480/660 Gen10 Intel Xeon-Gold 6130 (2.1GHz/16-core/125W) FIO Processor Kit	873381-L21
Intel Xeon-Gold 6128 (3.4GHz/6-core/115W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873383-L21
Intel Xeon-Gold 6126 (2.6GHz/12-core/125W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873384-L21
Intel Xeon-Gold 5122 (3.6GHz/4-core/105W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873386-L21
Intel Xeon-Gold 5120 (2.2GHz/14-core/105W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873388-L21
Intel Xeon-Gold 5118 (2.3GHz/12-core/105W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873387-L21
Intel Xeon-Gold 5115 (2.4GHz/10-core/85W) FIO Processor Kit for HPE Synergy 480/660 Gen10	873390-L21

Notes:

- All processors within any single compute module must be identical.
- HT indicates that the processor model supports Intel® Hyper-Threading Technology.
- 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.
- DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
- Supports 2 or 4 processors. Mixing different processor models is not supported.
- For the Intel® C621 Chipset Scalable Family Processors come with model numbers to indicate SKU level, processor generation, SKU model, integrations-optimizations or memory capacity. (ie. HPE Synergy 480/660 Gen10 Intel Xeon-Gold 6134M; 6 is the SKU Level, 1 is the processor generation, 34 is the SKU model, m indicates memory sku)
- 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.
- Gold – 5100, 6100 Series - 2 and 4 socket capable, 2S - 2UPI, 4S - 3UPI @ 10.4 GT/s, 6-Channel DDR4 @ 2400 MHz (SKU 5122=supports 2666), 768 GB memory capacity (1.5 TB on select skus), Intel Turbo Boost Technology, Intel Hyper-Threading Technology, Intel AVX-512(1x 512-bit FMA) (SKU 5122 supports 2x 512 bit FMA), 48 lanes PCIe 3.0, advanced RAS.

Configuration Information

- The Intel Xeon Gold 6143 and Intel Xeon Platinum 8165 processors enable HPE Core Boosting technology. Please refer to the section on Intelligent System Tuning for more details. <https://www.hpe.com/us/en/servers/management/tuning.html>

Step 2b: Choose Memory Options

HPE 8GB (1x8GB) Single Rank x8 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815097-B21
HPE 16GB (1x16GB) Single Rank x4 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815098-B21
HPE 16GB (1x16GB) Dual Rank x8 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	835955-B21
HPE 32GB (1x32GB) Dual Rank x4 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815100-B21

Notes:

- 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 Gen10. For additional information, please see the [HPE SmartMemory QuickSpecs](#).
- LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.
- For the latest information on [Memory Speed](#).
- If you want to know more about the memory, reference the [RAS feature whitepaper](#)
- HPE NVDIMM Memory cannot be mixed with standard DDR4 memory and is best suited for single channel operations i.e. 6 dimms per socket – channel 1.

Step 2c: Choose Networking Adapters

HPE Synergy 3820C 10/20Gb Converged Network Adapter	777430-B21
HPE Synergy 6810C 25/50Gb Ethernet Adapter	867322-B21

Notes:

- Networking adapters must have matched Interconnect Modules or Interconnect Links matched in the corresponding ICM slot on the rear of the Synergy 12000 Frame. See Specifications Section below for Mezzanine to ICM Best Practices and matching requirements.
- Networking adapters must have matched Interconnect Modules or Interconnect Links matched in the corresponding ICM slot on the rear of the Synergy 12000 Frame. See Specifications Section below for Mezzanine to ICM Best Practices and matching requirements.

Step 3: Choose Additional Factory Integratable Options

HPE Storage Controllers

HPE FIO Enable Smart Array SW RAID	784308-B21
HPE Synergy Compute Chipset SATA FIO Board Kit	872955-B21
HPE Smart Array E208i-c SR Gen10 (8 Internal Lanes/No Cache) 12G SAS Modular Controller	823852-B21

Notes: HPE Smart Array E208i-c SR Gen10 Controller (823852-B21) or HPE Smart Array P480i-c SR Gen10 Controller (832856-B21) is required with HPE Synergy 660 Gen10 Configure-to-order Compute Module (871929-B21/B22).

HPE Smart Array P408i-c SR Gen10 (8 Internal Lanes/2GB Cache) 12G SAS Modular Controller	823856-B21
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Notes: HPE Smart Array E208i-c SR Gen10 Controller (823852-B21) or HPE Smart Array P480i-c SR Gen10 Controller (832856-B21) is required with HPE Synergy 660 Gen10 Configure-to-order Compute Module (871929-B21/B22).

HPE 96W Smart Storage Lithium-ion Battery with 260mm Cable Kit	P01367-B21
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Notes: Available beginning December 2017.

HPE Smart Array P416ie-m SR Gen10 (8 Int 8 Ext Lanes/2GB Cache) 12G SAS Mezzanine Controller	804428-B21
HPE Smart Array P416ie-m SR Gen10 SAS Cable Kit	871573-B21

Notes: For use with premium compute modules/front local drives



Configuration Information

HPE I/O Expansion Options

HPE Synergy 6810C 25/50Gb Ethernet Adapter	867322-B21
HPE Synergy 3820C 10/20Gb Converged Network Adapter	777430-B21

Notes: See Specifications sections below for Best Practices and requirements for options placement in correct mezzanine slots that match with Interconnect model slotting for correct operations.

Step 4: Choose Additional Options For Factory Integration

From Additional Options 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> and
 - <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>

Step 5: Choose HPE Synergy Services

HPE Synergy Proactive Care Services

HPE 3 Year Proactive Care 24x7 Synergy SY660 Gen10 Service	H7ML8E
HPE 3 Year Proactive Care 24x7 with DMR Synergy SY660 Gen10 Service	H7ML9E
HPE 3 Year Proactive Care 24x7 with DMR Synergy SY660 Gen10 Service	H7ML9E
HPE 3 Year Proactive Care Advanced 24x7 with DMR Synergy SY660 Gen10 Service	H7MM2E



Additional Options

Notes: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an HPE approved configurator. Contact your local sales representative for additional information.

HPE Processors (2 or 4 total are required)

Intel Xeon-Gold Processors

Intel Xeon-Gold 6152 (2.1GHz/22-core/140W) Processor Kit for HPE Synergy 480/660 Gen10	872133-B21
Intel Xeon-Gold 6140M (2.3GHz/18-core/140W) Processor Kit for HPE Synergy 480/660 Gen10	872116-B21
Intel Xeon-Gold 6140 (2.3GHz/18-core/140W) Processor Kit for HPE Synergy 480/660 Gen10	872139-B21
Intel Xeon-Gold 6138 (2.0GHz/20-core/125W) Processor Kit for HPE Synergy 480/660 Gen10	873376-B21
Intel Xeon-Gold 6134 (3.2GHz/8-core/130W) Processor Kit for HPE Synergy 480/660 Gen10	873379-B21
Intel Xeon-Gold 6132 (2.6GHz/14-core/140W) Processor Kit for HPE Synergy 480/660 Gen10	873380-B21
HPE Synergy 480/660 Gen10 Intel Xeon-Gold 6130 (2.1GHz/16-core/125W) Processor Kit	873381-B21
Intel Xeon-Gold 6128 (3.4GHz/6-core/115W) Processor Kit for HPE Synergy 480/660 Gen10	873383-B21
Intel Xeon-Gold 6126 (2.6GHz/12-core/125W) Processor Kit for HPE Synergy 480/660 Gen10	873384-B21
Intel Xeon-Gold 5122 (3.6GHz/4-core/105W) Processor Kit for HPE Synergy 480/660 Gen10	873386-B21
Intel Xeon-Gold 5120 (2.2GHz/14-core/105W) Processor Kit for HPE Synergy 480/660 Gen10	873388-B21
Intel Xeon-Gold 5118 (2.3GHz/12-core/105W) Processor Kit for HPE Synergy 480/660 Gen10	873387-B21
Intel Xeon-Gold 5115 (2.4GHz/10-core/85W) Processor Kit for HPE Synergy 480/660 Gen10	873390-B21

Notes:

- All processors within the compute module must be identical.
- HT indicates that the processor model supports Intel® Hyper-Threading Technology.
- 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.
- DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
- Supports 2 or 4 processors. Mixing different processor models is not supported.
- For the Intel® C621 Chipset Scalable Family Processors come with model numbers to indicate SKU level, processor generation, SKU model, integrations-optimizations or memory capacity. (ie. HPE Synergy 480/660 Gen10 Intel Xeon-Gold 6134M; 6 is the SKU Level, 1 is the processor generation, 34 is the SKU model, m indicates memory sku)
- The HPE Synergy 660 Gen9 Compute Module includes six I/O mezzanine connectors.
- 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.
- Gold – 5100, 6100 Series - 2 and 4 socket capable, 2S - 2UPI, 4S - 3UPI @ 10.4 GT/s, 6-Channel DDR4 @ 2400 MHz (SKU 5122=supports 2666), 768 GB memory capacity (1.5 TB on select skus), Intel Turbo Boost Technology, Intel Hyper-Threading Technology, Intel AVX-512(1x 512-bit FMA) (SKU 5122 supports 2x 512 bit FMA), 48 lanes PCIe 3.0, advanced RAS.
- The Intel Xeon Gold 6143 and Intel Xeon Platinum 8165 processors enable HPE Core Boosting technology. Please refer to the section on Intelligent System Tuning for more details.

<https://www.hpe.com/us/en/servers/management/tuning.html>



Additional Options

HPE Memory

HPE 8GB (1x8GB) Single Rank x8 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815097-B21
HPE 16GB (1x16GB) Single Rank x4 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815098-B21
HPE 16GB (1x16GB) Dual Rank x8 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	835955-B21
HPE 32GB (1x32GB) Dual Rank x4 DDR4-2666 CAS-19-19-19 Registered Smart Memory Kit	815100-B21

Notes:

- 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 Gen10. For additional information, please see the [HPE DDR4 SmartMemory QuickSpecs](#)
- LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a compute module.
- HPE NVDIMM Memory cannot be mixed with standard DDR4 memory and is best suited for single channel operations i.e. 6 dimms per socket – channel 1.

HPE Drives

Enterprise - 12G SAS - SFF Drives

HPE 300GB SAS 12G Enterprise 15K SFF (2.5in) SC 3yr Wty Digitally Signed Firmware HDD	870753-B21
HPE 1.8TB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty 512e Digitally Signed Firmware HDD	872481-B21

Midline - 12G SAS - SFF Drives

HPE 2TB SAS 12G Midline 7.2K SFF (2.5in) SC 1yr Wty 512e HDD	765466-B21
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Notes:

- The HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement 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 660 Gen10 drive bays.
- 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.
- HPE drives have either a one year or three year warranty; refer to the specific drive QuickSpecs for details. [HPE Hard Disk Drives](#) or [HPE Solid State Drives](#)
- The drive options are not required when configuring a drive-less model.

Drive Qualification Exceptions

At this time there are no exceptions to list.

HPE Security

HPE Trusted Platform Module 2.0 Kit	745823-B21
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Notes:

- 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.
- For more information about [Trusted Platform Module](#)
- HPE Synergy OS pre-installed units will come with the partition required for TPM deployment.



Additional Options

- 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 Networking

Ethernet Mezzanine Adapters

HPE Synergy 3820C 10/20Gb Converged Network Adapter	777430-B21
HPE Synergy 6810C 25/50Gb Ethernet Adapter	867322-B21

HPE Storage Controllers

HPE FIO Enable Smart Array SW RAID	784308-B21
HPE Synergy Compute Chipset SATA FIO Board Kit	872955-B21

Notes: Two (2) are required only when HPE Smart Array S100i is enabled

HPE Smart Array E208i-c SR Gen10 (8 Internal Lanes/No Cache) 12G SAS Modular Controller	823852-B21
HPE Smart Array P408i-c SR Gen10 (8 Internal Lanes/2GB Cache) 12G SAS Modular Controller	823856-B21
HPE Smart Array P416ie-m SR Gen10 (8 Int 8 Ext Lanes/2GB Cache) 12G SAS Mezzanine Controller	804428-B21
HPE Smart Array P416ie-m SR Gen10 SAS Cable Kit	871573-B21

HPE Flash Media Kits

HPE 8GB microSD Flash Memory Card	726116-B21
HPE 8GB microSD Enterprise Mainstream Flash Media Kit	737959-B21
HPE 32GB microSD Flash Memory Card	700139-B21
HPE 8GB Dual microSD Flash USB Drive	741279-B21

Notes: Please see the QuickSpecs for Technical Specifications and additional information:

<https://www.hpe.com/h20195/v2/GetDocument.aspx?docname=c04123175>

HPE Synergy Services

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
HPE 3 Year Proactive Care 24x7 Synergy SY480 Gen10 Service	H7MC1E
HPE 3 Year Proactive Care 24x7 with DMR Synergy SY480 Gen10 Service	H7MC2E
HPE 3 Year Proactive Care Advanced 24x7 Synergy SY480 Gen10 Service	H7MC4E
HPE 3 Year Proactive Care Advanced 24x7 with DMR Synergy SY480 Gen10 Service	H7MC5E

Notes: DMR – Defective Media Retention

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

Notes: See HPE Support Services Central for additional services at <http://ssc.hpe.com/portal/site/ssc/>



Memory

Memory Subsystem Architecture

Notes: Each processor socket contains six memory channels that support two DIMMs each for a total of 12 (twelve) DIMMs per installed processor or up to forty-eight (48) 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 Gen10 Compute Module.

To realize the performance memory capabilities listed in this document, HPE SmartMemory is required. For additional information, please see the [HPE DDR4 SmartMemory QuickSpecs](#)

Synergy 660 Gen10 Compute Module Memory Speed Table

DIMM Type	Register DIMM (RDIMM)			
HPE SKU P/N	815097-B21	815098-B21	835955-B21	815100-B21
SKU Description	HPE 8 GB 1Rx8 PC4-2666V-R	HPE 16 GB 1Rx4 PC4-2666V-R	HPE 16 GB 2Rx8 PC4-2666V-R	HPE 32 GB 2Rx4 PC4-2666V-R
DIMM Rank	Single Rank (1R)	Single Rank (1R)	Dual Rank (2R)	Dual Rank (2R)
DIMM Capacity	8 GB	16 GB	16 GB	32 GB
Voltage	1.2V	1.2V	1.2V	1.2V
DRAM depth [bit]	1G	2G	1G	2G
DRAM Width [bit]	x8	x4	x8	x4
DRAM Density	8 Gb	8 Gb	8 Gb	8 Gb
CAS Latency	19-19-19	19-19-19	19-19-19	19-19-19
DIMM Native Speed (MT/s)	2666	2666	2666	2666
HPE Server Memory Speed (MT/s) with Intel Xeon 8100 Series Scalable Family Processors (Platinum); also supported 5122				
1 DIMM Per Channel	2666 MT/s	2666 MT/s	2666 MT/s	2666 MT/s
2 DIMMs Per Channel	2666 MT/s	2666 MT/s	2666 MT/s	2666 MT/s
HPE Server Memory Speed (MT/s) with Intel Xeon 6100 & 5100 Series Scalable Family Processors (Gold); except for 5122 processor above				
1 DIMM Per Channel	2400 MT/s	2400 MT/s	2400 MT/s	2400 MT/s
2 DIMMs Per Channel	2400 MT/s	2400 MT/s	2400 MT/s	2400 MT/s



Memory

DIMM Type	Load Reduced (LRDIMM)	
HPE SKU P/N	815101-B21	815102-B21
SKU Description	HPE 64GB 4Rx4 PC4-2400V-L	HPE 128GB 8Rx4 PC4-2666V-L
DIMM Rank	Quad Rank (4R)	Octal Rank (8R)
DIMM Capacity	64GB	128GB
Voltage	1.2V	1.2V
DRAM depth [bit]	2G	2G
DRAM Width [bit]	x4	X4
DRAM Density	8 Gb	8Gb
CAS Latency	19-19-19	22-19-19
DIMM Native Speed (MT/s)	2666	2666

HPE Server Memory Speed (MT/s) with Intel Xeon 8100 Series Scalable Family Processors (Platinum)(also supported 5122)

1 DIMM Per Channel	2666 MT/s	2666 MT/s
2 DIMMs Per Channel	2666 MT/s	2666 MT/s

HPE Server Memory Speed (MT/s) with Intel Xeon 6100 & 5100 Series Scalable Family Processors (Gold)(except for 5122 processor above)

1 DIMM Per Channel	2400 MT/s	2400 MT/s
2 DIMMs Per Channel	2400 MT/s	2400 MT/s

DIMM Type	NVDIMM(Persistent Memory)	
HPE SKU P/N	845264-B21	
SKU Description	HPE 16GB 1Rx4 PC4-2666 NVDIMM	
DIMM Rank	Single Rank (1R)	
DIMM Capacity	16 GB	
Voltage	1.2V	
DRAM depth [bit]		
DRAM Width [bit]		
DRAM Density		
CAS Latency		
DIMM Native Speed (MT/s)	2666	
1 DIMM Per Channel	2666 MT/s	
2 DIMM Per Channel		



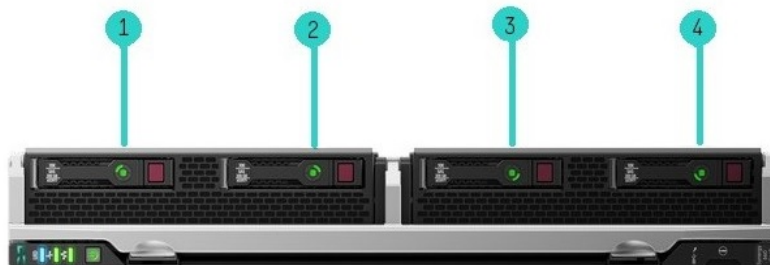
Memory

Memory Population Rules and Guidelines

Synergy Gen10 DIMM Population Guidelines per Socket (6 Channels/Socket, 2 DIMMs/channel)												
DIMM Slot	1	2	3	4	5	6	7	8	9	10	11	12
Number of DIMMs installed												
1 DIMM								■				
2 DIMMs								■		■		
3 DIMMs								■		■		■
4 DIMMs			■		■			■		■		
5 DIMMs			■		■			■		■		■
6 DIMMs	■		■		■			■		■		■
7 DIMMs	■		■		■		■	■		■		■
8 DIMMs			■	■	■	■	■	■	■	■		
9 DIMMs	■		■		■		■	■	■	■	■	■
10 DIMMs	■		■	■	■	■	■	■	■	■		■
11 DIMMs	■		■	■	■	■	■	■	■	■	■	■
12 DIMMs	■	■	■	■	■	■	■	■	■	■	■	■

Notes: For more information or additional DIMM configurations go to: <http://www.hpe.com/docs/memory-population-rules>

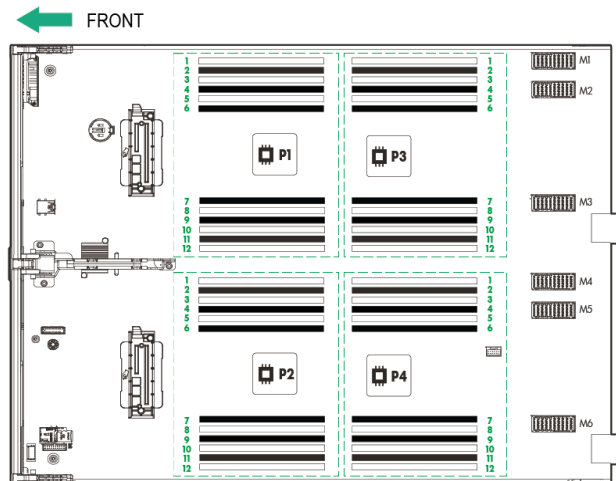
Front Local Storage



0-4 4 x SFF hot-plug drive bays for SAS, SATA, SAS SDD, SATA SSD, NVMe PCIe SSD, or up to 8 uFF with Smart Drive Carrier adapter Not shown: 4 internal M.2 drives, USB or uSD drives



Memory



General Memory Population Rules and Guidelines

- A minimum of one DIMM is required per processor. There is a minimum of 2 processors required.
- Install DIMMs only if the corresponding processor is installed.
- If only two processors are installed in a four processor system, only half of the DIMM slots are available (24).
- Most 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 660 Gen10 Compute Module – Carrier Grade Supplement.

To realize the performance memory capabilities listed in this document, HPE SmartMemory is required. For additional information, please see the [HPE DDR4 SmartMemory QuickSpecs](#).

Notes:

- For details on the HPE Server memory speed, visit: <http://www.hpe.com/docs/memory-speed-table>
- For details on the HPE Server Memory Options Population Rules, visit: <http://www.hpe.com/docs/memory-population-rules>

Technical Specifications

HPE Synergy 660 Gen10 Compute Module – Carrier Grade Supplement – Fabric Routing

Dimensions (H x W x D) (with bezel)	6.35 x 43.03 x 59.92 cm 2.50 x 16.94 x 23.59 in	
Weight (approximate)	13.75 kg 30.31 lbs	Minimum: two processor and 1 DIMM / processor installed
	17.41 kg 38.38 lbs	Maximum: all processors, 48 DIMMs, drives, mezzanine cards, and one flash cache battery installed)
Power Specifications	For power specifications including input requirements, BTU rating, and power supply output, please see the HPE Synergy Frame TechSpecs. 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/hppoweradvisor	
System Inlet Temperature	Operating	10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 20°C/hr (36°F/hr). The upper limit and rate of change may be limited by the type and number of options installed. System performance during standard operating support may be reduced if operating with a fan fault or above 30°C (86°F).
	Non-operating	-30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).
Extended Ambient Operating Support	For approved hardware configurations, the supported system inlet range is extended to be: 5° to 10°C (41° to 50°F) and 35° to 40°C (95° to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft). Notes: Qualifications for extended ambient configurations are detailed at: https://www.hpe.com/servers/ASHRAE	
Relative Humidity (non-condensing)	Operating	Minimum to be the higher (more moisture) of -12°C (10.4°F) dew point or 8% relative humidity. Maximum to be the lower (less moisture) of 24°C (75.2°F) dew point or 90% relative humidity.
	Non-operating	5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
Altitude	Operating	3050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
	Non-operating	9144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
Acoustic Noise	For acoustic noise specifications, please see the HPE Synergy 12000 Frame Specifications .	



Technical Specifications

- For information on the HPE Synergy 3820C 10/20Gb CNA please refer to their [QuickSpecs](#).
- For information on the HPE Synergy 6810C 25/50 Gb Ethernet adapter please refer to their [QuickSpecs](#).
- For information on the HPE Synergy 2820C 10Gb CNA please refer to their [QuickSpecs](#).
- For information on the HPE Smart Array S100i SR Gen10 Controller please refer to their [QuickSpecs](#).
- For information on the HPE Smart Array E208i-c SR Gen10 Controller please refer to their [QuickSpecs](#).
- For information on the HPE Smart Array P204i-c SR Gen10 Controller please refer to their [QuickSpecs](#).
- For information on the HPE Smart Array P416ie-m SR Gen10 Controller please refer to their [QuickSpecs](#).

Environment-friendly Products and Approach - End-of-life Management and Recycling

Hewlett Packard Enterprise offers [End-of-life product return, Trade-in, and Recycling programs](#), in many geographic areas, for our products. 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. 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
18-Jan-2021	Version 2	Changed	Standard Features section was updated. Obsolete SKUs were deleted in Configuration Information and Additional Options sections.
07-May-2018	Version 1	Created	New QuickSpecs



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