



**Hewlett Packard**  
Enterprise

# **HPE ConvergedSystem 700**

Architected for Virtualization and Hybrid IT  
infrastructure

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## Executive summary

New workloads and business demands are forcing customers to reevaluate the way they purchase and manage infrastructure. Do-it-yourself and integrated systems assembled from components provided by multiple vendors often cause increases in cost, time, and effort as well as create complexity with interoperability challenges. HPE ConvergedSystem 700 addresses these new requirements with a tightly integrated, workload-optimized system architected to support on-demand IT infrastructure, private cloud, and mixed workloads. Preconfigured to meet a range of business needs, HPE ConvergedSystem 700 offerings can be deployed easily and rapidly to support a variety of virtualized application environments. Hewlett Packard Enterprise engineering has done all the testing and validation so that IT professionals can focus their time on critical activities. Specific technology has been included in the system that addresses critical business objectives such as lower costs, increased performance, and high availability.

Each system ships with factory-integrated compute, storage, networking, and management components, all preconfigured to address the most demanding workloads. Converged management and automation capabilities are built into the HPE ConvergedSystem 700 that allow customers to simplify everyday tasks through a single pane of glass. Compute and storage can be scaled independently so customers can easily adapt to new requirements and enable the solution to grow as business needs change. One-stop support from the HPE Center of Excellence (COE) provides a single point of accountability with faster problem resolution.

HPE ConvergedSystem 700 can be extended to support a variety of application workloads through reference architectures (RAs). For more information visit: [hpe.com/info/ra](http://hpe.com/info/ra). These RAs provide recommendations for workload-specific configurations for deploying applications such as Citrix® XenDesktop®, Microsoft® Exchange/SharePoint mixed workloads, and database consolidation with SQL Server or Oracle database.

HPE RAs allow customers to deploy applications with confidence by reducing risk and accelerating application deployment through a proven and tested methodology.

HPE ConvergedSystem 700 helps customers drive business agility with solutions that enable you to adapt to your market and customer needs quickly. It delivers a broad range of benefits, including:

- **Fast:** HPE ConvergedSystem 700 enables you to reduce the time to insight and action through automated deployment, provisioning, and predictive analytics. It allows you to provision infrastructure in a matter of minutes while being able to identify and respond to hot spots quickly.
- **Efficient:** HPE ConvergedSystem 700 features automated converged management that radically simplifies everyday tasks to reduce OPEX and improve operational agility. It features templates that eliminate many manual operations and device-focused processes enable you to refocus your investment on innovation, not operations, by lowering the TCO of your general purpose infrastructure. It provides true business transformation, via a solution lifecycle management, to increase IT operational efficiency and a reduction in administration time.
- **Simple:** Easily stand up and manage new services for your business partners. Fewer management tools are required through converged management. Software-defined templates make on-demand IT infrastructure services deployment faster and easier.

HPE ConvergedSystem 700 is available as the following offerings:

- **HPE ConvergedSystem 700 for VMware®**—This system provides customers with a complete VMware virtualization environment that is ready to use right after installation. It ships with all hardware, including compute, storage, and networking equipment, racked and cabled as well as a full software suite consisting of VMware and HPE management tools preinstalled and preconfigured.
- **HPE ConvergedSystem 700 for Foundation**—This system is offered as hardware only and provides the customer with maximum flexibility in terms of workload deployment. It ships with compute, storage, and networking equipment racked and cabled; and, ships without integrated software from the factory. This provides the customer with the freedom to layer on additional hypervisors of their choice, as well as Microsoft applications or cloud workloads.
- **HPE ConvergedSystem 700 for Microsoft Hyper-V**—This system provides customers with a complete Microsoft Hyper-V virtualization environment that is based on Windows Server 2012 R2 Datacenter Edition and Microsoft System Center 2012 R2 and is ready to use right after installation. It ships with all pre-integrated hardware, including compute, storage, and networking equipment, racked and cabled. Microsoft Hyper-V and System Center<sup>1</sup> will be deployed on-site by HPE TS Consulting (TSC) Deployment Accelerator Service included with the system purchase and adheres to the Microsoft Private Cloud Fast Track v4 program.

<sup>1</sup> Not all System Center components are deployed as part of the HPE TS Consulting (TSC) Deployment Accelerator Service.

Once the offering is chosen, the customer has a number of options to configure HPE ConvergedSystem 700 for a specific workload requirement. Choices include:

- Workload servers: Depending on the number of processor cores you need, you can configure 2–128 server blades to function as workload servers. The Intel® Xeon® v4 family processor options provide between 4–22 physical cores per processor<sup>2</sup>. In addition, you can configure each blade with 64 GB–1 TB of memory.<sup>3</sup> Server blades are housed in up to eight HPE BladeSystem c7000 enclosures.
- Storage: HPE ConvergedSystem 700 utilizes HPE 3PAR StoreServ 8000<sup>4</sup> storage, which can be configured to meet your particular needs for storage capacity and IOPS. Storage can be customized to include either two or four controller nodes and incorporate a variety of options including a mixture of SAS, NL, or SSD drives or it can be deployed as an all-flash array.
- Networking: HPE ConvergedSystem 700 provides redundant connectivity to all network components in the solution and has the option of deploying with either HPE or Cisco Top of Rack (ToR) switches.

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## Note

HPE ConvergedSystem 700 is offered as a single-rack system with one enclosure and one HPE 3PAR StoreServ storage array; or, as a multi-rack system where compute and storage are contained in separate racks. In the multi-rack system, compute can be scaled up to eight enclosures contained in three racks. For storage, HPE ConvergedSystem 700 multi-rack can accommodate two HPE 3PAR StoreServ storage arrays. Each array is contained in a base rack with an option to add expansion racks.

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Each solution also includes redundant management servers designed to provide holistic management of both physical and virtual environments. Management has been consolidated to a single pane of glass, with high levels of flexibility and scalability.

Configuration options for HPE ConvergedSystem 700 (CS700) are outlined in [Appendix A—Solution hardware configuration](#).

This technical system guide outlines the design objectives for HPE ConvergedSystem 700 and provides detailed information on solution components.

**Target audience:** Chief information officers (CIOs), chief technology officers (CTOs), IT directors, data center managers, and customers wishing to learn more about this complete solution package from Hewlett Packard Enterprise. This document assumes the reader has a basic understanding of several key data center technologies including, but not limited to: servers, storage, networking, power, solution management, virtualization, and hypervisors.

## HPE ConvergedSystem 2.0 addendum

March 2017

- HPE FlexFabric 5940 switch—Provides a higher density and a larger switching capacity for most demanding data centers.
- VMware vSphere 6.0—Provides various methods of deploying VMware vCenter and platform services controller.
- HPE OneView 3.0—Provides more features including a single sign-on and centralized reporting.
- HPE Recovery Manager Central (RMC) 3.0—Now offering more features including a standalone appliance VM and RMC for Oracle.
- HPE OneView for VMware vCenter 8.2—Now is an appliance with new dashboard and added support for VMware vCenter enhanced link mode.
- HPE Helion CloudSystem 10.0.2—HPE Helion CloudSystem 10 is a comprehensive hybrid IT solution for your enterprise.
- HPE 3PAR StoreServ—Industry leading HPE 3PAR StoreServ 8000 is now available with 3PAR all-inclusive licenses.
- Cisco N9K-C9396PX—A new option platform available as ToR switches.
- Cisco N2L-2348UPQ—A new platform used to expand port density for existing Nexus 56128P ToR switches.

<sup>2</sup> The Intel® Xeon® E5-2600 v3 processors are also available as an option.

<sup>3</sup> Depending on the particular HPE ConvergedSystem 700 solution and the processor selected.

<sup>4</sup> HPE 3PAR StoreServ 7000c series is available for expansion storage only.

- HPE Solid State M.2 120 GB Kit—Increased capacity of internal direct attached disks in workload servers.
- Microsoft Windows Server 2016 Licenses—Makes all Windows virtual machines in the VMware solution ready for Windows Server 2016 upgrade when available.

## Expansion options

CS700 2.0 now offers expansion options allowing customers to easily scale to meet their workload demands. Expansion options include:

- Add-on HPE ProLiant BL460c Gen9 server blade
- Add-on management servers
- Add-on enclosure
- Add-on rack (for both single-rack and multi-rack configurations)
- Add-on storage (single and multi-rack array restrictions apply)
- Add-on ToR network switches (multi-rack expansion)
- Add-on SAN switches (multi-rack expansion)

## Solution overview

While many data centers are using virtualization, decision-makers may still need to address a broad range of challenges, including:

- Time, resources, and effort required to deploy a complete solution
- Proliferation of management tools
- Security issues
- Difficulties scaling
- Difficulties extending to the cloud

HPE ConvergedSystem 700 is designed to address these challenges through a precision-tuned system that helps deliver the fastest path to agile, efficient virtualized application solutions.

Key benefits of HPE ConvergedSystem 700 include the following:

- Provides a pre-engineered and validated system that is optimized for today's most challenging workloads
- One infrastructure management platform to simplify everyday tasks and free up IT resources
- Pre-integrated and tested system to reduce on-site deployment activities and free up IT admin resources
- Reduces risk by preventing issues proactively and maintaining peak performance
- Cloud compatibility allows customers to upgrade easily to cloud with confidence

## Design objectives

This section outlines key design objectives for HPE ConvergedSystem 700.

### Leadership performance

Powered by a range of Intel® Xeon® processors, HPE ConvergedSystem 700 is designed to provide the performance required by the largest, most demanding data centers. Storage scalability and performance have been optimized through tight integration with HPE 3PAR StoreServ storage.

## Realistic sizing

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### Important

HPE ConvergedSystem 700 provides multiple core density options. This section assumes workload servers are utilizing ten-core processors with Intel Hyper-Threading Technology enabled.

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While the scalability of an HPE ConvergedSystem 700 solution depends on the particular workloads being virtualized, HPE considers the storage I/O load on each VM to be particularly significant. An estimation of the number of typical VMs that can be supported by a particular configuration should take into account these key considerations:

- Number of logical processor cores: The solution design assumes one VM per logical processor core equivalent on each workload server. With Intel Hyper-Threading Technology enabled, each default workload server has 40 logical processor core equivalents.
- I/O workload: Each VM is typically expected to sustain an average storage load of 30–50 host IOPS based on random, small-block I/Os with 70 percent reads/30 percent writes and a 20 ms response time.

Based on the default core density and sustained storage I/O performance delivered by HPE ConvergedSystem 700, each workload server can support 40 typical VMs; however, in practice, it is unlikely that a particular workload server would be consuming 100 percent of its storage resources at any one time. As a result, if 50 percent of storage resources were being consumed on average, each workload server would be able to support 80 VMs, assuming default processors are selected. In the case of utilizing an all-flash array, the number of IOPS drastically exceeds 50 host IOPS per VM with a response time of less than 1 ms.

To help size an appropriate HPE ConvergedSystem, the [Converged Infrastructure Solution Sizer Suite](#) can be used. The sizer should be used to propose an optimized HPE ConvergedSystem 700 solution based on workload characteristics you specify. HPE ConvergedSystem 700 2.0 currently supports up to 22 physical cores per socket in workload servers.

### High availability

Designed for high availability, HPE ConvergedSystem 700 minimizes single points of failure by including:

- Multiple workload servers
- Clustered management servers with shared SAN storage to support the solution-specific management software stack
- Dedicated networks to allow the migration of VMs without impacting users
- Redundant network switches, HPE Virtual Connect FlexFabric modules, and Onboard Administrator modules
- Redundant power design with redundant HPE Power Distribution Units
- Redundant SAN switches or Converged switches<sup>5</sup>; Dynamic Path Selection (DPS) capability dynamically routes Fibre Channel traffic across multiple links between HPE 3PAR StoreServ storage and hosts
- Automatic storage failover and failback; multiple RAID protection levels
- Multiple copies of data optimized within the storage array, eliminating any single point of failure in the SAN while providing very fast access; applications have continuous data availability in the event of a disk controller or storage node failure
- Redundant Virtual Services Routers, when this option is utilized.

### Converged management

At the heart of HPE ConvergedSystem 700 is HPE OneView, which provides converged management to eliminate the complexity of managing infrastructure through automation. HPE OneView's architecture delivers a unified and consistent management experience across the infrastructure in the system including the workload servers contained in HPE BladeSystem, HPE 3PAR StoreServ storage and HPE Networking. It uses a software-defined approach to system management enabling you to capture and standardize the best practices from your IT team. For example, it utilizes profiles to capture the entire configuration for a resource and stores them in a single place for easy management. HPE OneView's capabilities can be extended through integration into VMware vRealize Operations Manager. This provides administrators with

<sup>5</sup> HPE FlexFabric 5930 switch can be used as converged network and SAN in multi-rack.

increased visibility and control over performance and capabilities, while ensuring service levels and operational efficiency in dynamic virtualized environments, all through a single pane of glass.

### Pre-integration

HPE ConvergedSystem 700 is pre-integrated in the factory based on extensively tested configuration guidelines. All of the components prescribed are prebuilt, racked and cabled prior to being delivered at the customer site. This process ensures an integrated hardware solution, a consistent and repeatable initialization and a known end state when it arrives at the customer site.

- **ConvergedSystem 700 2.0 for VMware**—If the HPE ConvergedSystem 700 for VMware is being deployed, the system will be ready to deploy production virtual machines. Each virtualization host has VMware vSphere<sup>6</sup> preinstalled through automation capabilities, customized to a predefined network and storage infrastructure, and preregistered to the vCenter server that is installed on the management VM.
- **ConvergedSystem 700 2.0 for Foundation**—If the HPE ConvergedSystem 700 for Foundation is being deployed, it ships with compute, storage, and networking equipment racked and cabled; and, ships without software or applied configuration from the factory. This provides the customer with the freedom to layer on additional hypervisors of their choice, as well as Microsoft application or cloud workloads.

**ConvergedSystem 700 2.0 for Microsoft Hyper-V**—If the HPE ConvergedSystem 700 for Microsoft Hyper-V option is being deployed, the solution will ship with all prescribed hardware pre-integrated, including compute, storage, and networking equipment, racked and cabled. The HPE TS Consulting (TSC) Deployment Accelerator Service is included with the HPE CS700 purchase. This service will be used to perform on-site deployment of Hyper-V clusters to compute nodes (BL460c Gen9) and System Center configuration of all physical and virtual machines as part of the service, adhering to the Microsoft Private Cloud Fast Track v4 program.

### Solution support experience

HPE ConvergedSystem 700 provides customers with a solution support experience with a single point of accountability. HPE includes Proactive Care 24/7 4-hour response with the option for Proactive Select Credits to support the entire solution. When a support call is placed with HPE for this system, it is initially recognized as being related to a ConvergedSystem and routed to a Support Specialist who understands the interoperability complexities of the entire solution. This Support Specialist will also manage the issue until it is closed resulting in faster problem resolution. Your support experience includes:

- Global Support Team
- 24/7, 4-hour response coverage
- Support of the end-to-end solution stack
- End-to-end case/customer ownership
- Enhanced escalation capabilities
- On-site service by highly trained and skilled Solution Engineers when deemed necessary
- Active collaboration with other support parties (e.g., VMware, Microsoft)

### Accelerated path from virtualization to cloud

If you wish to accelerate the path from virtualization to cloud, HPE ConvergedSystem 700 has been architected to support the use of HPE CloudSystem functionality in a virtual environment. If you have standardized on the VMware platform for cloud automation, you can add VMware vCloud Suite. Similarly, if you have standardized on Microsoft Hyper-V you can add Windows Azure Pack (WAP) to extend the capabilities of HPE ConvergedSystem 700.

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### Note

Because management and virtualization layers are pre-integrated and optimized, the turnkey HPE ConvergedSystem 700 solution is ready to work with the specific virtualization technologies you use. For example, HPE OneView is tightly integrated with VMware vSphere and Microsoft System Center.

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<sup>6</sup> VMware vSphere versions 5.5 or 6.0 are available

A service automation platform such as HPE CloudSystem or VMware vCloud Suite, is designed to orchestrate infrastructure provisioning, including the loading of appropriate hypervisors.

## Components

Depending on the configuration chosen, HPE ConvergedSystem 700 can deliver the following key components:

- Hardware
  - HPE Intelligent Infrastructure for intelligent rack and power infrastructure management
  - HPE BladeSystem c7000 platinum enclosures
  - HPE Virtual Connect FlexFabric 20/40 F8 modules
  - HPE ProLiant BL460c Gen9 server blades with Intel® Xeon® E5-2600 v3 or v4 series processors (workload servers)
  - HPE ProLiant WS460c Gen9 graphics server blades with NVIDIA M6 graphic accelerator options
  - HPE ProLiant DL360 Gen9 servers with Intel® Xeon® E5-2680 v3 or v4 (management servers)
  - HPE 3PAR StoreServ 8200, 8400, 8440, 8450, storage<sup>7</sup>
  - HPE FlexFabric 5940, HPE FlexFabric 5930, or Cisco Nexus series switches
  - HPE SN6000B SAN switches for multi-rack solutions<sup>8</sup>
  - HPE Virtual Connect for 3PAR with Flat SAN technology for single-rack solutions
- Software
  - HPE OneView
  - HPE Insight Remote Support
  - HPE 3PAR StoreServ software: HPE ConvergedSystem 700 is now offered by default with the all-inclusive Single-system license. This Single-system license includes the following software by default<sup>9</sup>:
    - HPE 3PAR Operating System Software
    - HPE 3PAR Thin Provisioning
    - HPE 3PAR Thin Persistence
    - HPE 3PAR Thin Conversion
    - HPE 3PAR Virtual Copy Software
    - HPE 3PAR Dynamic Optimization
    - HPE 3PAR Adaptive Optimization
    - HPE 3PAR Priority Optimization
    - HPE 3PAR Virtual Domains
    - HPE 3PAR Virtual Lock
    - HPE 3PAR System Reporter
    - HPE 3PAR Online Import Software
    - HPE 3PAR Peer Motion 365
    - HPE File Persona Software

<sup>7</sup> HPE 3PAR StoreServ 7000c series is available for expansion storage only.

<sup>8</sup> HPE FlexFabric 5930 switch can be used for SAN in multi-rack configurations.

<sup>9</sup> HPE ConvergedSystem 700 does not support all new software added by HPE 3PAR StoreServ Single-system license. Also, some suites do not apply, while others require additional configuration.



- HPE 3PAR Thin Copy Reclamation
- HPE 3PAR SmartStart
- HPE 3PAR Management Plug-in for VMware vCenter
- HPE 3PAR Recovery Manager for VMware vSphere
- HPE 3PAR Recovery Manager for Oracle
- HPE 3PAR Recovery Manager for SQL
- HPE 3PAR Recovery Manager for Microsoft Hyper-V
- HPE 3PAR Recovery Manager for Exchange
- HPE 3PAR VSS Provider for Microsoft Windows
- HPE 3PAR Recovery Manager Central
- HPE Recovery Manager Application Suite
- HPE 3PAR Thin Copy Reclamation
- HPE 3PAR Thin Deduplication
- HPE 3PAR Thin Clones
- HPE 3PAR Autonomic Rebalance
- HPE 3PAR System Tuner
- HPE 3PAR Host Explorer
- HPE 3PARInfo
- HPE 3PAR StoreServ Management Console (SSMC)
- HPE Policy Manager
- Additional HPE 3PAR software options that can be added to a CS700 configuration as part of the new all-inclusive Multi-Array license:
  - HPE 3PAR Remote Copy Software
  - HPE 3PAR Peer Motion
  - HPE 3PAR Cluster Extension
  - HPE 3PAR Peer Persistence
  - HPE 3PAR Storage Federation
- Additional HPE 3PAR software options that can be added to a CS700 configuration for Data Encryption:
  - HPE Data at Rest Encryption
- For HPE ConvergedSystem 700 for VMware, the following additional software components are included:
  - HPE OneView for VMware vCenter Server
    - HPE OneView for vCenter Server Module
    - HPE OneView for vCenter Storage Module
    - HPE Recovery Manager for VMware
  - HPE OneView for vRealize Operations Manager
  - HPE Insight Control Server Provisioning
  - Microsoft Windows Server® 2012 R2 Standard Edition

- HPE VSR1000 Virtual Services Router
- VMware vSphere with Operations Management (vSOM)
  - VMware vSphere Enterprise Plus
  - VMware vRealize Operations Standard
- VMware vCenter Server
- For HPE ConvergedSystem 700 for Microsoft Hyper-V, the following software components are included:
  - HPE OneView for Microsoft System Center
  - Microsoft Windows Server 2012 R2 Datacenter Edition<sup>10</sup>
  - Microsoft System Center 2012 R2 Datacenter Edition<sup>11</sup>
- Services
  - HPE Factory Express services
  - On-site installation and start-up service
  - Solution-level support services, including selectable HPE Care Pack services
  - Microsoft Hyper-V onsite TS Consulting Accelerator service is included with Microsoft Hyper-V variant
- Options
  - You can tailor certain solution components to meet your particular needs (see [Appendix A—Solution hardware configuration](#)).

## Solution hardware

HPE ConvergedSystem 700 is extremely agile, with a broad range of configurations available. Based on a common, scale-out architecture, it starts with as few as two workload servers and can scale up to 128 servers with multiple storage options. Compute and storage can be customized and scaled individually, providing the ability to deliver the right mix of performance for unique customer requirements.

This section provides more detail on the hardware components used in HPE ConvergedSystem 700 and presents views of a representative range of recommended HPE ConvergedSystem 700 solutions.

### Representative configurations

This section provides views of just some of the possible HPE ConvergedSystem 700 configurations:

- Minimum configuration
  - Multi-rack: with one HPE BladeSystem c7000 enclosure and 3PAR StoreServ storage (Figure 1)
  - Single-rack: Default racking with one HPE BladeSystem c7000 enclosure and 3PAR StoreServ storage (Figure 1a)
  - Single-rack: Alternate racking with one HPE BladeSystem c7000 enclosure and 3PAR StoreServ storage (Figure 1b)
  - Single-rack: Option available to include SAN switched storage (Figure 1c)

<sup>10</sup> Microsoft Windows Server 2012 R2 and System Center 2012 R2 are required, but not included with the system.

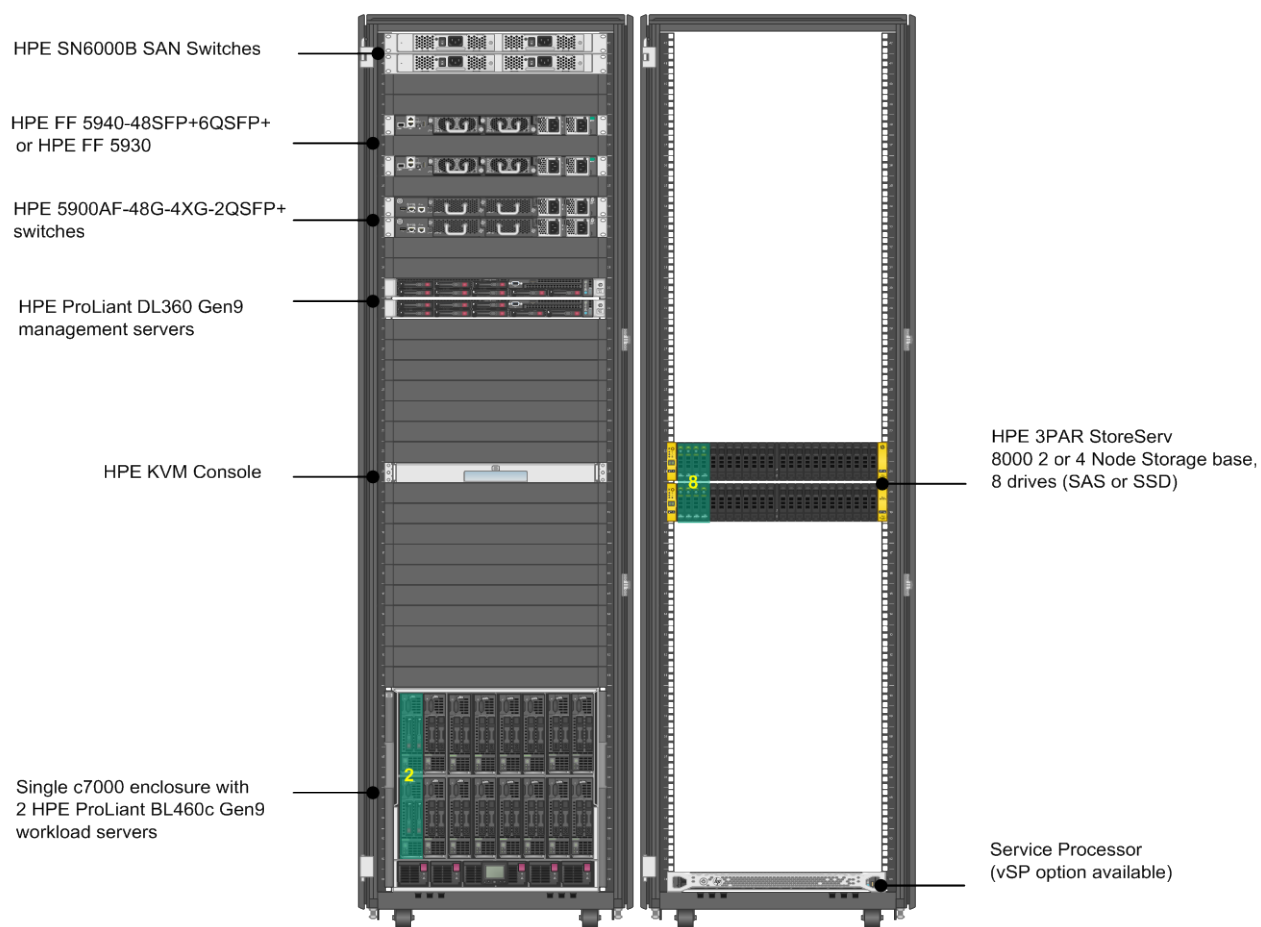
<sup>11</sup> Licenses for Windows Server and System Center 2012 R2 must be purchased or provided by the customer.

- Sample configuration
  - Compute rack with two HPE BladeSystem c7000 enclosures (Figure 2)
  - Storage rack with HPE 3PAR StoreServ 8400 4N storage (Figure 3)
- Maximum configuration
  - Three compute racks with eight HPE BladeSystem c7000 enclosures and four storage racks with 3PAR StoreServ 84xx (Figure 4)<sup>12</sup>

## Note

HPE 3PAR StoreServ component racking locations may vary due to customized configurations.

### Minimum configuration with one HPE BladeSystem c7000 enclosure and HPE 3PAR StoreServ storage

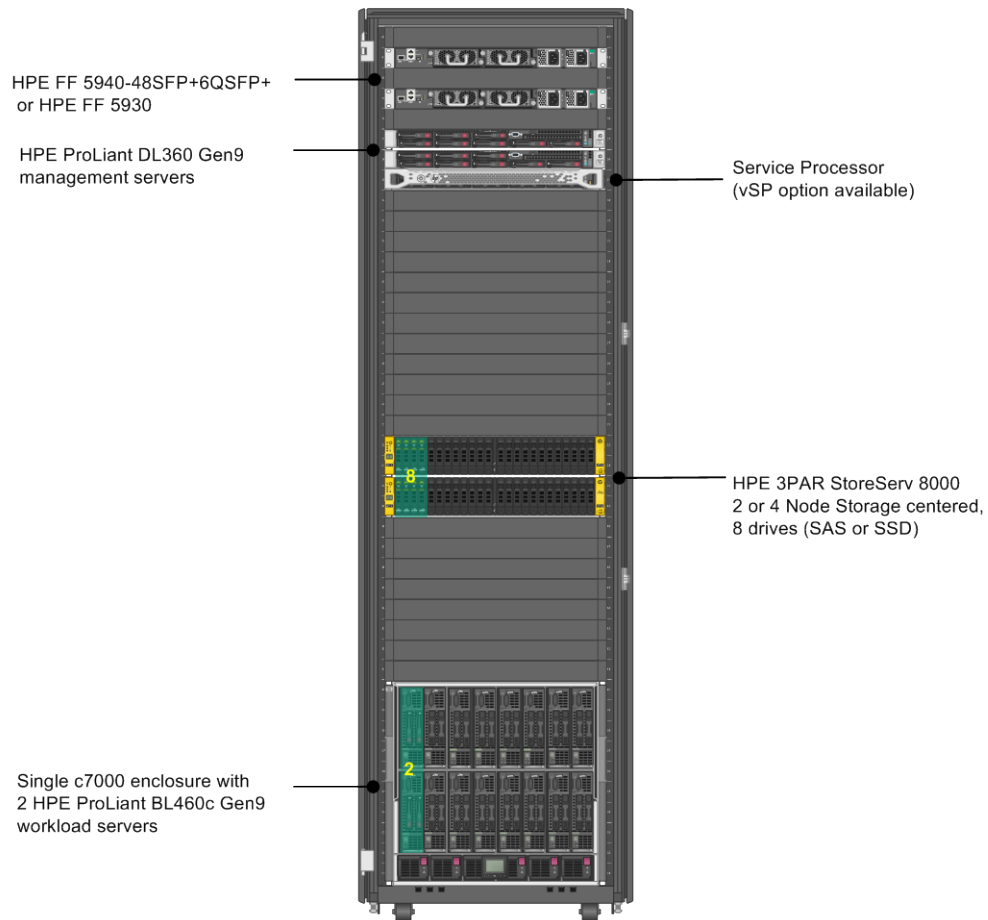


**Figure 1.** Front view of an HPE ConvergedSystem 700 solution featuring two workload servers and 3PAR StoreServ storage

## Note

The HPE 3PAR StoreServ storage configuration may vary depending on the customer order.

<sup>12</sup> Storage racks may vary depending on customer requirements.

**Sample configuration of CS700 single-rack solution with storage in default rack location**

**Figure 1a.** Front view of an HPE ConvergedSystem 700 single-rack solution featuring two workload servers and 3PAR StoreServ 2-node or 4-node array in the default racking location

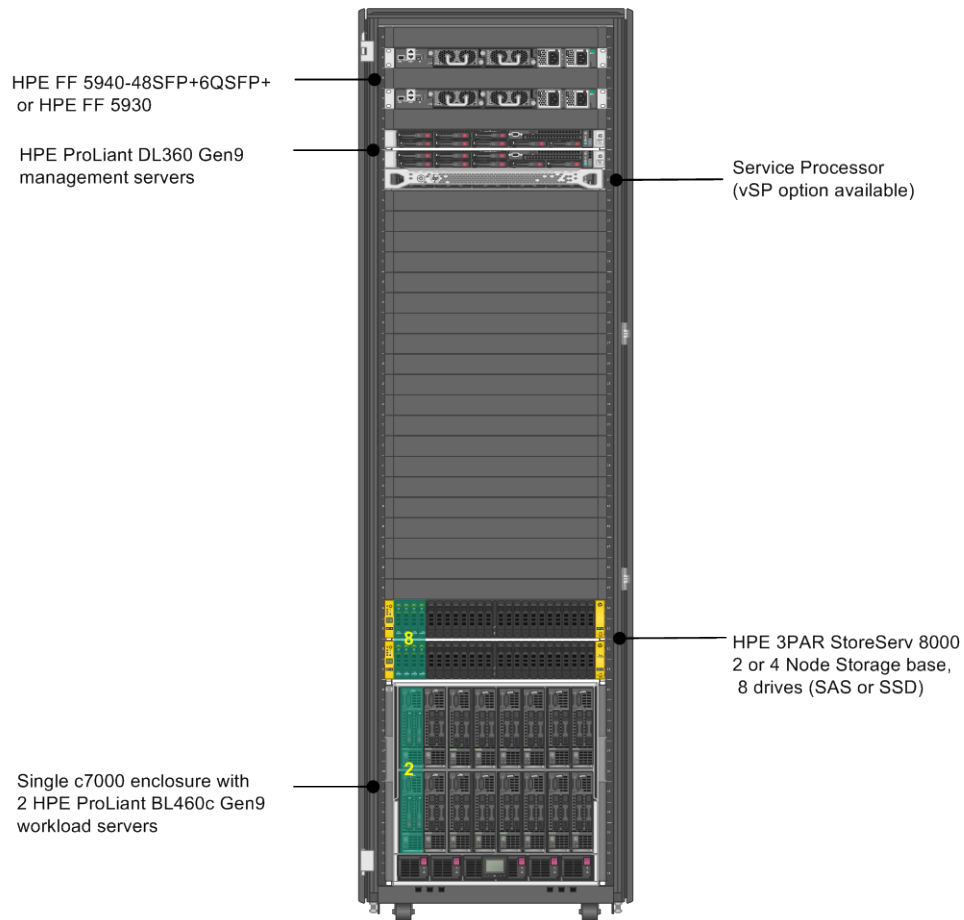
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**Note**

The HPE 3PAR StoreServ storage configuration may vary depending on the customer order.

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### Sample configuration of CS700 single-rack solution with storage in alternate rack location

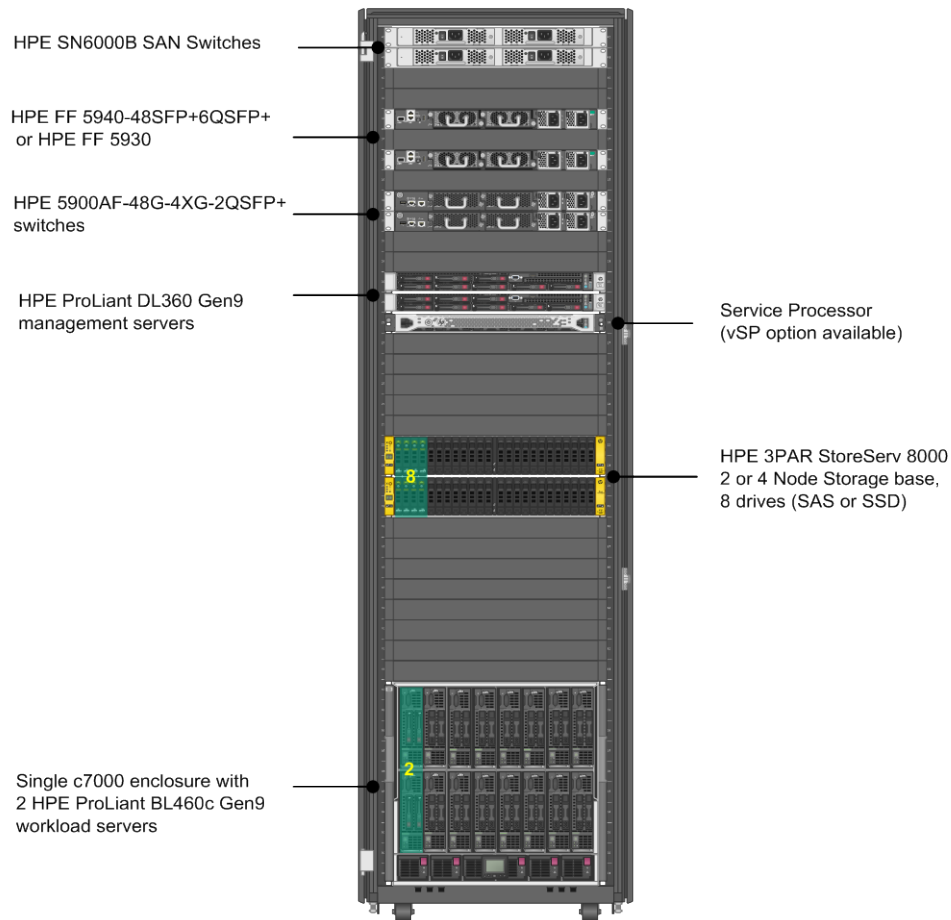


**Figure 1b.** Front view of an HPE ConvergedSystem 700 single-rack solution featuring two workload servers and 3PAR StoreServ 2-node storage array in alternate rack location

#### Note

The alternate positioning for the 2-node array should be selected when an infield upgrade of the array to 4 controller nodes is anticipated to allow for maximum storage flexibility.

**Sample configuration of CS700 single-rack solution with SAN switched storage<sup>13</sup>**



**Figure 1c.** Front view of an HPE ConvergedSystem 700 single-rack with SAN switched storage

<sup>13</sup> HPE FlexFabric 5930 switch can be used as pure Ethernet switch only. The HPE FlexFabric 5930 switch for converged configuration is not supported in a single rack.

Sample configuration with two HPE BladeSystem c7000 enclosures in compute rack

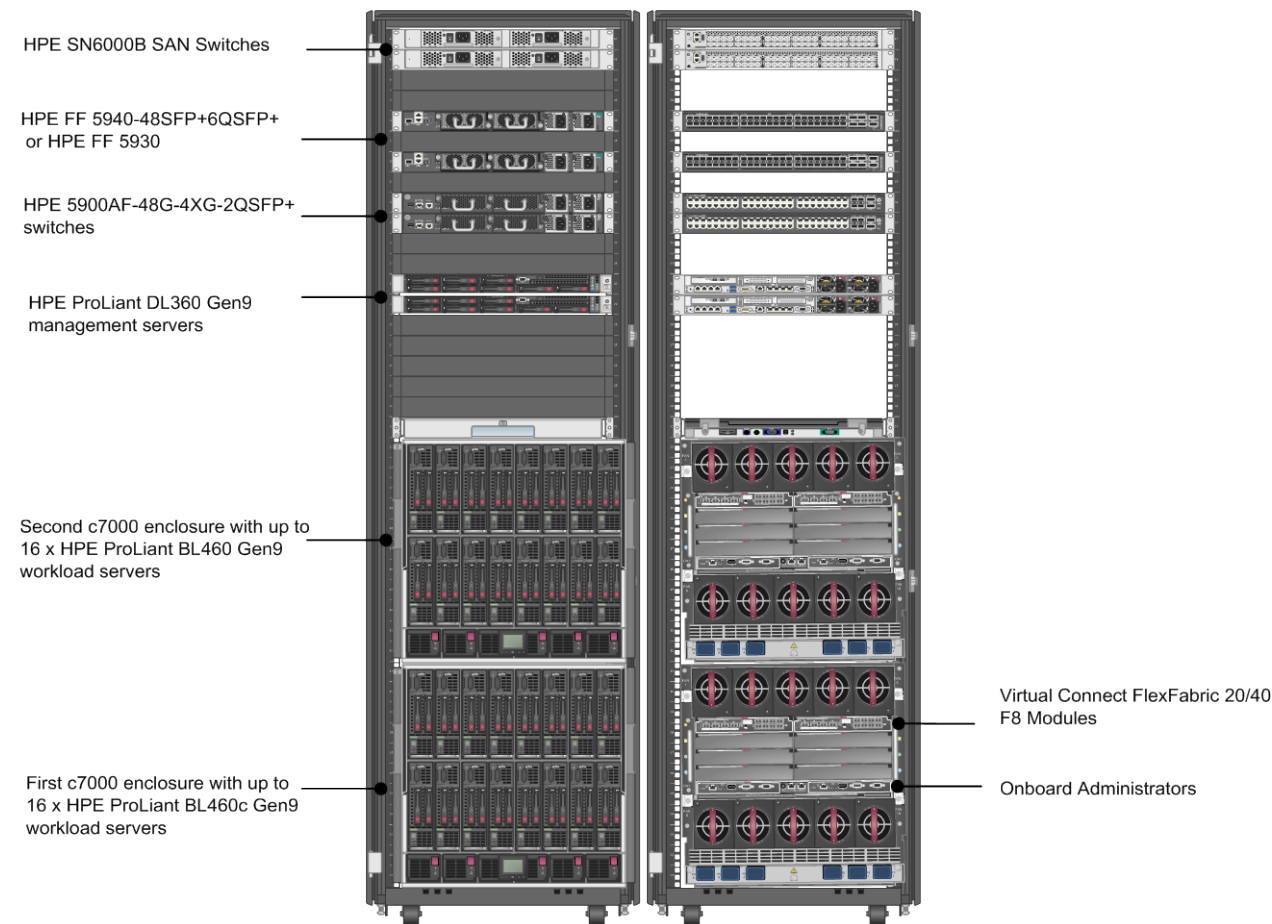


Figure 2. Front and rear views of the compute resources for HPE ConvergedSystem 700 solution featuring two HPE BladeSystem c7000 enclosures

Sample storage configuration of a CS700 solution

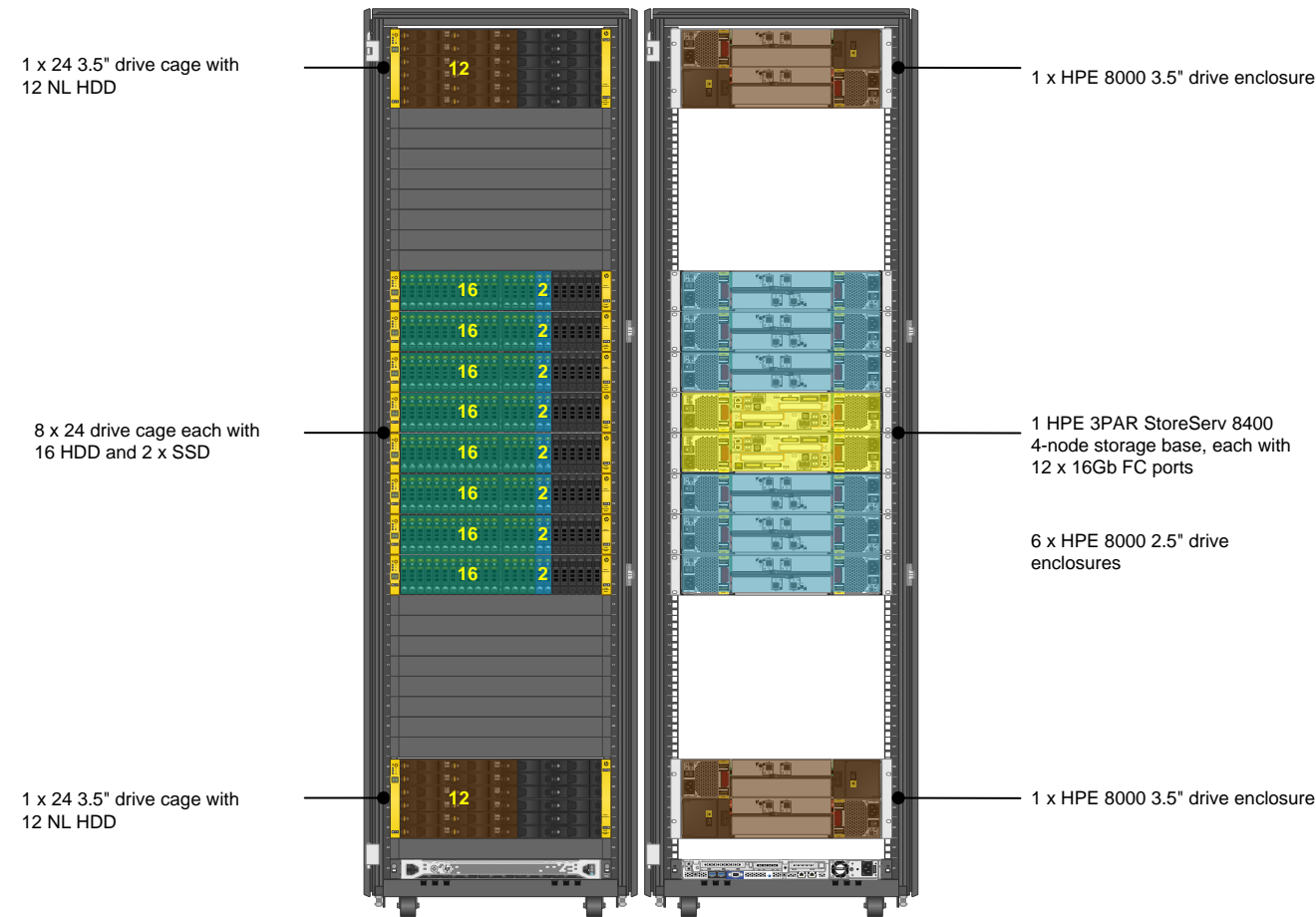
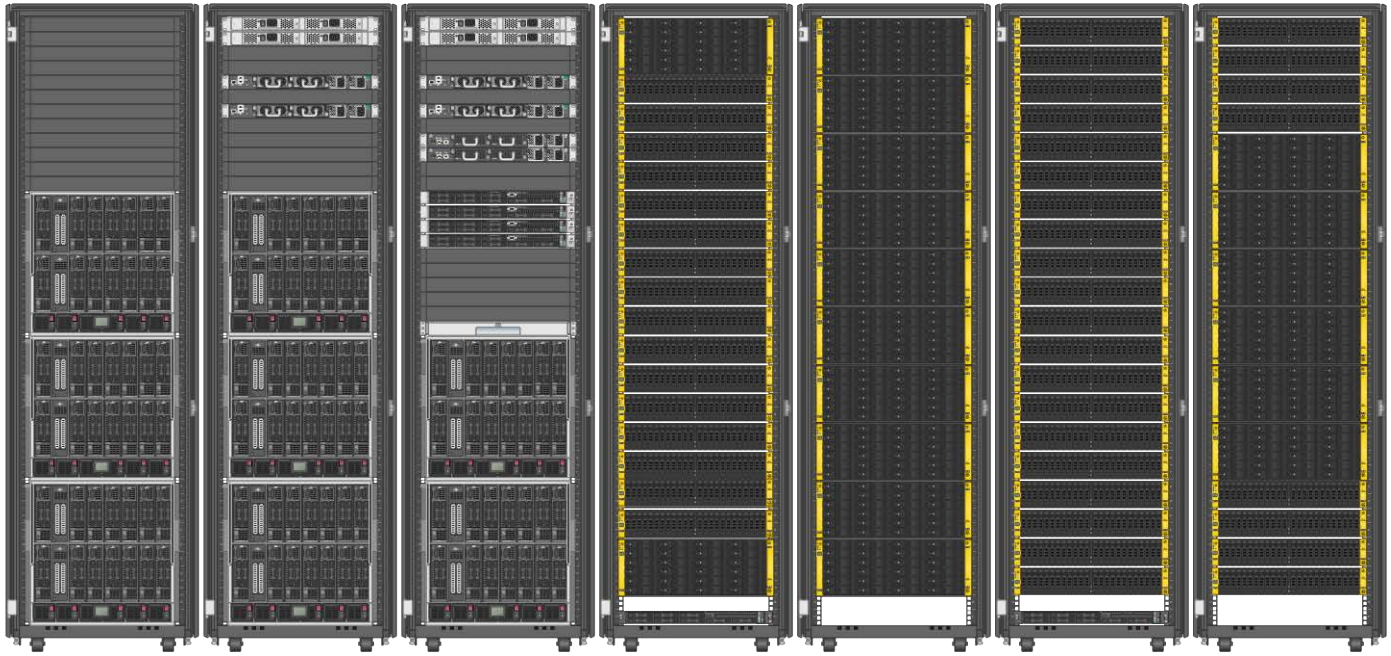


Figure 3. Front and rear views of the storage resources for HPE ConvergedSystem 700 solution featuring HPE 3PAR StoreServ 8400 4N storage



**Example maximum configuration with eight HPE BladeSystem c7000 enclosures and two HPE 3PAR StoreServ storage arrays**

**Figure 4.** Front view of an HPE ConvergedSystem 700 solution featuring 128 workload servers and HPE 3PAR StoreServ storage

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**Note**

HPE 3PAR StoreServ storage configuration may vary depending on customer order. Each 3PAR StoreServ array may include expansion racks (not pictured in Figure 4) as an option.

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For more information on solution configuration, refer to [Appendix A—Solution hardware configuration](#).

Key hardware components are outlined as follows.

## HPE rack and power infrastructure



Workload and management servers for HPE ConvergedSystem 700 are housed within HPE Rack and Power Infrastructure, which provides intelligent rack and power infrastructure management. For example, the [HPE Intelligent Series Rack](#) family offers next-generation, enterprise-class racks that are designed to meet both the current and future requirements of the demanding data center.

These racks offer innovative features such as:

- Unparalleled structural integrity, providing optimal support<sup>14</sup> for the HPE ConvergedSystem 700 solution—in shipment and at your site
  - Cooling and cable management advances
  - Wide choice of power and switching options
- Innovative HPE Metered and Switched PDUs bring state-of-the-art management and control to rack mount solutions, helping eliminate the overprovision of power in the data center. These Metered and Switched PDUs<sup>15</sup> deliver the following features:
    - Accurate measurement of power, data collection, alerts and links to HPE OneView management
    - Remote monitoring and control using a standard web browser
    - Intelligent discovery and power monitoring via communications with HPE Common Slot Platinum Power Supplies
    - Identification and automatic mapping of redundant power supplies to reduce the risk of human error

For full redundancy, power distribution in the HPE Intelligent Series Racks used in HPE ConvergedSystem 700 is split into two separate power buses. You can specify 24 A or 40 A single-phase Metered and Switched PDUs, or 24 A, 40 A, or 60 A three-phase Metered and Switched PDUs.

HPE Thermal Logic technology can lower your facility power and cooling costs. Features include:

- Power Regulator auto-throttles processors to reduce energy
- Dynamic Power Saver manages the power supply pool
- Sea of Sensors actively measures and adjusts cooling
- Active Cool Fans offer best-in-class efficiency and acoustics
- Platinum Power Supplies provide industry-leading efficiency
- Group Dynamic Power Capping adjusts to changes in the workload dynamically

### HPE BladeSystem c7000 platinum enclosure

The [HPE BladeSystem c7000 platinum enclosure](#) consolidates the essential elements of a data center—power, cooling, management, connectivity, redundancy, and security—into a modular, flexible, scalable, converged infrastructure with built-in intelligence and support for future technologies.

Key functionality introduced in the platinum enclosure includes:

- More efficient 2,400 W power supply that can reduce the enclosure's total cost of ownership (TCO)
- Location-discovery services that can optimize workload placement on servers with self-identification and inventory capabilities—HPE iLO collects and passes the appropriate data to HPE OneView, which can then auto-populate a server location screen

<sup>14</sup> Because the racks are being shipped with equipment installed, HPE Shock Intelligent Racks are used to provide additional support.

<sup>15</sup> The number of Metered and Switched PDUs deployed in HPE ConvergedSystem 700 depends on the particular configuration.

Figure 5 shows an HPE BladeSystem c7000 platinum enclosure that is fully populated.



**Figure 5.** HPE BladeSystem c7000 platinum enclosure, fully populated with HPE ProLiant BL460c Gen9 server blades

### **HPE Onboard Administrator**

HPE Onboard Administrator centralizes c-Class infrastructure management. Together with the enclosure's HPE Insight Display, the Onboard Administrator has been designed for both local and remote administration of HPE BladeSystem c-Class components and provides the following capabilities:

- Wizards for simple, fast setup and configuration
- Highly available and secure access to the HPE BladeSystem infrastructure
- Security roles for server, network and storage administrators
- Automated power and cooling of the HPE BladeSystem infrastructure
- Agentless device health and status
- Thermal Logic power and cooling information and control

Each HPE BladeSystem c7000 enclosure featured in a ConvergedSystem 700 solution includes redundant Onboard Administrator modules. Each enclosure supports up to 16 workload servers; solutions may be equipped with between one and eight enclosures, depending on the requirements of the workload.

### **HPE Virtual Connect technology**

HPE Virtual Connect technology provides wire-once, change-ready connectivity that is simple, flexible, and secure. This technology is a key element of HPE Converged Infrastructure, providing a better way to connect your virtualized environment to the network core. Rather than binding profiles to specific server blades, you create a profile for each of the bays in the HPE BladeSystem c7000 enclosure. Virtual Connect maps physical LAN or SAN connections to these profiles, allowing you to manage connectivity without involving LAN or SAN administrators. In addition, if a server blade were to fail, you could move its associated profile to a bay containing a spare blade, restoring availability without needing to wait for assistance.

HPE Virtual Connect FlexFabric technology supports the convergence of traffic based on different network protocols, allowing you to split a 20 Gb network connection into four variable partitions. The benefits of FlexFabric technology include the ability to replace multiple low bandwidth physical NIC ports with a single port, lower management burden, fewer NICs and interconnect modules, and lower power and operational costs.

Each HPE BladeSystem c7000 enclosure featured in ConvergedSystem 700 includes redundant Virtual Connect FlexFabric 20/40 F8 modules that converge network traffic to workload servers<sup>16</sup> over high speed 20 Gb connections. As a result, a single device can eliminate up to 95 percent of network sprawl at the server edge by connecting directly to LANs and converging traffic inside the enclosure.

<sup>16</sup> Each workload server features a dual-port HPE FlexFabric adapter.

## HPE ProLiant BL460c/WS460c and DL360 Gen9 servers

The HPE ProLiant [BL460c Gen9](#) and [WS460c Gen9](#) workload servers used in HPE ConvergedSystem 700 have been engineered to deliver industry-leading performance—up to a 40 percent increase over previous generations. Embedded management enhancements include Integrated Lifecycle Automation capabilities enabled by innovations such as Intelligent Provisioning for easy system setup, Active Health for agentless hardware monitoring and alerting, and Smart Update for automated firmware and system software maintenance. The HPE ProLiant BL460c/WS460c Gen9 server blades also utilize HPE OneView to automate key management processes, including the system's physical development, configuration and problem management.

We've engineered the HPE ProLiant BL460c/WS460c Gen9 server blades to get the most out of the latest advances in processors, memory, networking technology and management solutions through these features:

- Intel-based blades: sockets for two Intel® Xeon® E5-2600 v3/v4 processors available
- 16 DDR4 DIMM sockets for up to 2 TB of HPE SmartMemory and a maximum memory speed up to 2400 MHz
- Connectors for up to two PCIe mezzanine cards (two x 16)
- Onboard storage with flexible HPE Smart Array controller options
- HPE FlexibleLOM technology with 20 Gb adapters
- Internal USB 3.0 port
- HPE Power Regulator for ProLiant
- Unified Extensible Firmware Interface (UEFI) for full configuration and management flexibility (with legacy BIOS mode still supported)

The Intel® Xeon® E5-2600 v4 processors and the DDR4 memory offer a performance increase of up to 21 percent over previous server blades.<sup>17</sup> The HPE ProLiant BL460c Gen9 server blade comes with iLO 4, the latest iLO firmware for the iLO management engine.

HPE ConvergedSystem 700 provides the flexibility to configure each BladeSystem c7000 enclosure with 2–16 ProLiant BL460c Gen9 server blades that are equipped with Intel® Xeon® E5-2600 v3/v4 series processors.

Additional flexibility is provided in the HPE ConvergedSystem 700 to configure the ProLiant BL460c Gen9<sup>18</sup> server blades to boot from:

- Local hard drives including Solid State Disk options
- Storage Area Network (SAN)<sup>19</sup>
- MicroSD boot options
- USB boot options
- M.2 SSD boot options

Redundant HPE ProLiant DL360 Gen9 servers are used as management servers in HPE ConvergedSystem 700, delivering exemplary performance and efficiency in a compact 1U size. Ideal for any cloud environment, this server is designed for high-performance workloads, with the adaptability you need to satisfy future requirements.

HPE ProLiant DL360 Gen9 servers include significant innovations that accelerate performance dramatically and address IT complexity, efficiency, and management concerns with:

- Modular, flexible designs that adapt to application needs easily
- Increased I/O density on 1U form factor for more expansion capabilities
- 2-socket architecture accommodating two Intel® Xeon® E5-2600 v4 processors
- HPE DDR4 SmartMemory running at 2400 MHz

<sup>17</sup> Intel performance testing, [intel.com/performance](http://intel.com/performance), comparing measurements on platform with two E5-2600 v3 versus E5-2600 v4. November 2015

<sup>18</sup> Boot from SAN not supported on HPE ProLiant DL360 Gen9 servers.

<sup>19</sup> OS must support boot from SAN.

- Improved component layout and airflow; systems are compliant with ASHRAE expanded operating ranges allowing more energy efficient cooling strategies
- HPE On System, On Premises, and On Cloud management technologies for accelerating IT service delivery

For more information on the server configurations used in HPE ConvergedSystem 700, refer to [Appendix A—Solution hardware configuration](#).

### Enhancing performance, efficiency, and security with Intel Xeon processors

Powering HPE ConvergedSystem 700 is the Intel® Xeon® E5-2600 v3/v4 series processor in the HPE ProLiant BL460c Gen9 or WS460c Gen9 server blade. The E5-2600 v4 processor has from four to 22 cores (in increments of two), and features an integrated Northbridge and a quad-channel DDR4 memory controller that works with registered DIMMs (RDIMMs) and load-reduced DIMMs (LR-DIMMs). The Intel E5-2600 v4 processor offers a maximum QPI speed of 9.6 GT/s and includes a last-level cache (LLC) of up to 55 MB (for the E5-2699 v4).

HPE ProLiant Gen9 server blades feature these Intel® Xeon® processor capabilities:

- Processor Internal Sensors and Thermal Control—Protection against over-temperature conditions.
- Cache parity/ECC—Protects cache data from accidental data corruption due to particle hits, etc.
- Legacy Error Mode—Corrupt data is contained before it is consumed to ensure data corruption does not occur.
- QPI Protocol Protection via Cycle Redundancy Check (CRC)—Automatically detects data errors using a checksum of either 8 bits or 16 bits.
- QPI Link Level Retry—Retransmits when a transient error is detected on the QPI link.
- PCIe Advanced Error Reporting—Enhanced PCIe reporting features such as finer granularity in defining the error type, ability to specify the severity of each uncorrectable error, error logging, ability to identify the source of an error, and more.
- Direct Media Interface link (DMI)—A x4 bidirectional chip-to-chip interconnect between the processor and chipset. The DMI link provides 2.0 GB/s of bandwidth in each direction (upstream and downstream).
- Internal processor sensors and thermal control—Protection against over-temperature conditions.

### Storage<sup>20</sup>

HPE ConvergedSystem 700 employs industry-leading HPE 3PAR StoreServ storage, which offers the performance and flexibility necessary to accelerate new application deployments as well as support mixed workload environments, on-demand IT infrastructure and cloud deployments.

Depending on the particular solution (see Table 1), HPE ConvergedSystem 700 offers the following storage choices:

- HPE 3PAR StoreServ 8200 (2 node)
- HPE 3PAR StoreServ 8400 (2 or 4 node)
- HPE 3PAR StoreServ 8440 (2 or 4 node)
- HPE 3PAR StoreServ 8450 (2 or 4 node) all-flash array

HPE 3PAR StoreServ storage has been designed to meet today's most challenging workloads and includes features that satisfy critical business requirements. This includes:

- High availability

High availability is a critical requirement that is built into the HPE 3PAR StoreServ Architecture providing full hardware redundancy. Controller node pairs are connected to dual-ported drive enclosures owned by that pair. Unlike other approaches, the system offers both hardware and software fault tolerance by running separate instances of the HPE 3PAR Operating System on each controller node, thus facilitating the availability of customer data. With this design, software and firmware failures—a significant cause of unplanned downtime—are greatly reduced.

<sup>20</sup> HPE 3PAR StoreServ 7000c series is available for expansion storage only

- Multi-tenancy

With HPE 3PAR StoreServ storage, you can securely partition resources within a shared infrastructure in order to pool physical storage resources for lower storage costs without compromising security or performance. HPE 3PAR StoreServ storage was built from the ground up to deliver multi-tenant resiliency that supports massive consolidation with ultra-high performance. The multi-controller scalability and extreme flexibility makes deploying and maintaining separate storage siloes to deliver different QoS levels a thing of the past. One-click autonomic rebalancing enables you to enhance QoS levels without service disruption, preplanning, or the need to purchase separate arrays to support different service levels.

- High and predictable performance

The ability of HPE 3PAR StoreServ storage to maintain high and predictable performance in multi-tenant environments is made possible through architectural innovations that eliminate resource contention, support mixed workloads, and enhance caching algorithms to accelerate performance and reduce latency. Specific features to enhance performance include:

- Load balancing—symmetrical load balancing and utilization of all controllers with seamless performance scalability
- Mixed workload support—allows different workloads to run on the same storage resource without contention
- Storage quality of service—delivers predictable tiered service levels
- Adaptive flash cache—reduces application response times for read intensive workloads
- Express Writes—introduces optimizations aimed at improving host write latency

- Data Compaction

Reducing capacity requirements by mitigating overprovisioning and using enterprise class data compaction technologies enable fast, simple, automated space reclamation essential to the efficiency of HPE 3PAR StoreServ storage. Compaction technologies included with HPE ConvergedSystem 700, such as thin provisioning, thin deduplication, and thin reclamation, offer efficiency benefits for storage that can significantly reduce both capital and operational costs with spinning media and SSDs.

- Autonomic storage management

The OS within HPE 3PAR StoreServ storage helps simplify, automate, and expedite storage management by handling provisioning, tiering, and change management automatically and intelligently. This happens at a subsystem level, without administrator intervention.

The system's user interfaces have been developed to offer autonomic administration. This means that the interfaces allow an administrator to create and manage physical and logical resources without requiring any overt action. Provisioning does not require any preplanning, yet the system constructs volumes intelligently based on available resources, unlike manual provisioning approaches that require planning and the manual addition of capacity to intermediary pools.

- All-inclusive Licenses

HPE 3PAR StoreServ arrays offer a simplified software licensing model: a Base operating system license, a multi array license, and a data encryption license. Under this new model of licensing, customers get all the software features and software applications available to meet a wider number of data center applications.

**Table 1.** Storage feature comparison, with maximum values provided

Ideal environment	7200c	8200	7400c	8400	7440c	8440	7450c	8450
<b>User environment</b>	Small to mid-size production environments or any size test and development environments		Mid-range storage customers who have previously compromised infrastructure scalability and availability to meet tight IT budgets		All-flash performance with flexibility of spinning media to satisfy diverse workloads		Targeted at critical applications that require increased performance in order to meet individual application service levels	
<b>Drive description</b>	SAS/SSD/NL	SAS/SSD/NL	SAS/SSD/NL	SAS/SSD/NL	SAS/SSD/NL	SAS/SSD/NL	SSD	SSD
<b>Capacity</b>	500 TiB	750 TiB	1,600 TiB	2,400 TiB	2,000 TiB	3,000 TiB	921 TiB	1843 TiB
<b>On-Node Cache</b>	40 GiB	64 GiB	48 GiB	128 GiB	96 GiB	384 GiB	192 GiB	384 GiB
<b>Availability</b>	<ul style="list-style-type: none"> <li>• Redundant power supplies and fans</li> <li>• Redundant batteries</li> <li>• Minimum of dual redundant controllers</li> <li>• RAID 1, RAID 5, and RAID MP for data protection</li> <li>• High availability cage</li> </ul>		<ul style="list-style-type: none"> <li>• Redundant power supplies and fans</li> <li>• Redundant batteries</li> <li>• Minimum of dual redundant controllers</li> <li>• RAID 1, RAID 5, and RAID MP for data protection</li> <li>• High availability cage</li> </ul>		<ul style="list-style-type: none"> <li>• Redundant power supplies and fans</li> <li>• Redundant batteries</li> <li>• Minimum of dual redundant controllers</li> <li>• RAID 1, RAID 5, and RAID MP for data protection</li> <li>• High availability cage</li> </ul>		<ul style="list-style-type: none"> <li>• Redundant power supplies and fans</li> <li>• Redundant batteries</li> <li>• Minimum of dual redundant controllers</li> <li>• RAID 1, RAID 5, and RAID MP for data protection</li> <li>• High availability cage</li> </ul>	
<b>Controller Nodes</b>	2	2	2 or 4	2 or 4	2 or 4	2 or 4	2 or 4	2 or 4
<b>HPE 3PAR ASICs</b>	Gen 4 2	Gen 5 2	Gen 4 2 or 4	Gen 5 2 or 4	Gen 4 2 or 4	Gen 5 2 or 4	Gen 4 2 or 4	Gen 5 2 or 4
<b>Processors</b>	2 x 6-core 1.8 GHz	2 x 6-core 2.2 GHz	2-4 x 6-core 1.8 GHz	2-4 x 6-core 2.2 GHz	2-4 x 8-core 2.3 GHz	2-4 x 10-core 2.4 GHz	2-4 x 8-core 2.3 GHz	2-4 x 10-core 2.4 GHz
<b>Host interface</b>	12 x 8 Gb Fibre Channel ports	12 x 16 Gb Fibre Channel ports	24 x 8 Gb Fibre Channel ports	24 x 16 Gb Fibre Channel ports	24 x 8 Gb Fibre Channel ports	24 x 16 Gb Fibre Channel ports	24 x 8 Gb Fibre Channel ports	24 x 16 Gb Fibre Channel ports
<b>Drive enclosure</b>	10 x 24-drive chassis	10 x 24-drive chassis	24 x 24-drive chassis	24 x 24-drive chassis	40 x 24-drive chassis	40 x 24-drive chassis	20 x 24-drive chassis	20 x 24-drive chassis

## Networking

HPE ConvergedSystem 700 utilizes HPE OneView to manage the solution. HPE ConvergedSystem 700 solution network traffic is contained within the solution's HPE FlexFabric 5940, HPE FlexFabric 5930, or Cisco Nexus switch infrastructure, providing high speed, low latency connections.

Network connectivity is achieved using the following components:

- Workload servers
  - HPE FlexFabric 20Gb 2-port 650FLB FIO Adapter
- Management servers
  - HPE Embedded 1Gb Ethernet 4-port 331i Adapter
  - HPE FlexFabric 10Gb 2-port 556FLR-SFP+ Adapter
- HPE BladeSystem c7000 enclosures
  - Redundant HPE Virtual Connect FlexFabric 20/40 F8 modules
- Network switches
  - Redundant HPE FlexFabric 5900AF-48G-4XG-2QSFP+, HPE FlexFabric 5940 48SFP+ 6QSFP+ or HPE FlexFabric 5930 switches
  - Redundant Cisco Nexus C9396PX switches or Cisco Nexus 56128P and 3048TP switches. Nexus 2348PQ switches are leveraged for solutions with five to eight enclosures

- Networking software
  - HPE VSR1000 Virtual Services Router<sup>21</sup>

**Networks in HPE ConvergedSystem 700 for VMware**

The following networks have been implemented in HPE ConvergedSystem 700 for VMware.

- Workload servers:
  - Solution Management Network—Isolates network traffic for management and provides access to management VMs
  - Production Network—Isolates network traffic for production VMs and provides a link to your data center
  - Datacenter Management Network—Enables management access, if desired, to the infrastructure components in the solution
  - Compute Migration Network—Allows production VMs to be migrated between vSphere hosts using the vMotion feature
  - Solution Compute High Availability Network—Helps ensure the failover of production VMs following a failure in one of the workload servers
- Management servers:
  - Solution Management Network—Isolates the network traffic required to manage the solution
  - Datacenter Management Network—Enables desired management access to the infrastructure components in the solution
  - Management Migration Network—Allows management VMs to migrate between management servers using the vMotion feature
  - Management High Availability Network—Helps ensure the failover of management VMs following a failure in one of the management servers

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**Note**

As part of the traffic isolation scheme, HPE uses VLANs based on VMware's best practices.

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**Note**

The Datacenter Management Network is provided to enable desired management access via the HPE VSR1000 Virtual Services Router (VSR1000). The VSR1000 uses network address translation (NAT) technology to convert the IP addresses on the Solution Management Network to the IP addresses of the Customer Datacenter Management Network. It also allows for access to the VMware vSphere hosts and VMware vRealize Operations Manager (vROps) software, HPE OneView and Insight Control Server Provisioning and Solution Management VMs from outside of the HPE ConvergedSystem 700 for VMware. This network provides additional connectivity for external management needs or to troubleshoot and resolve issues.

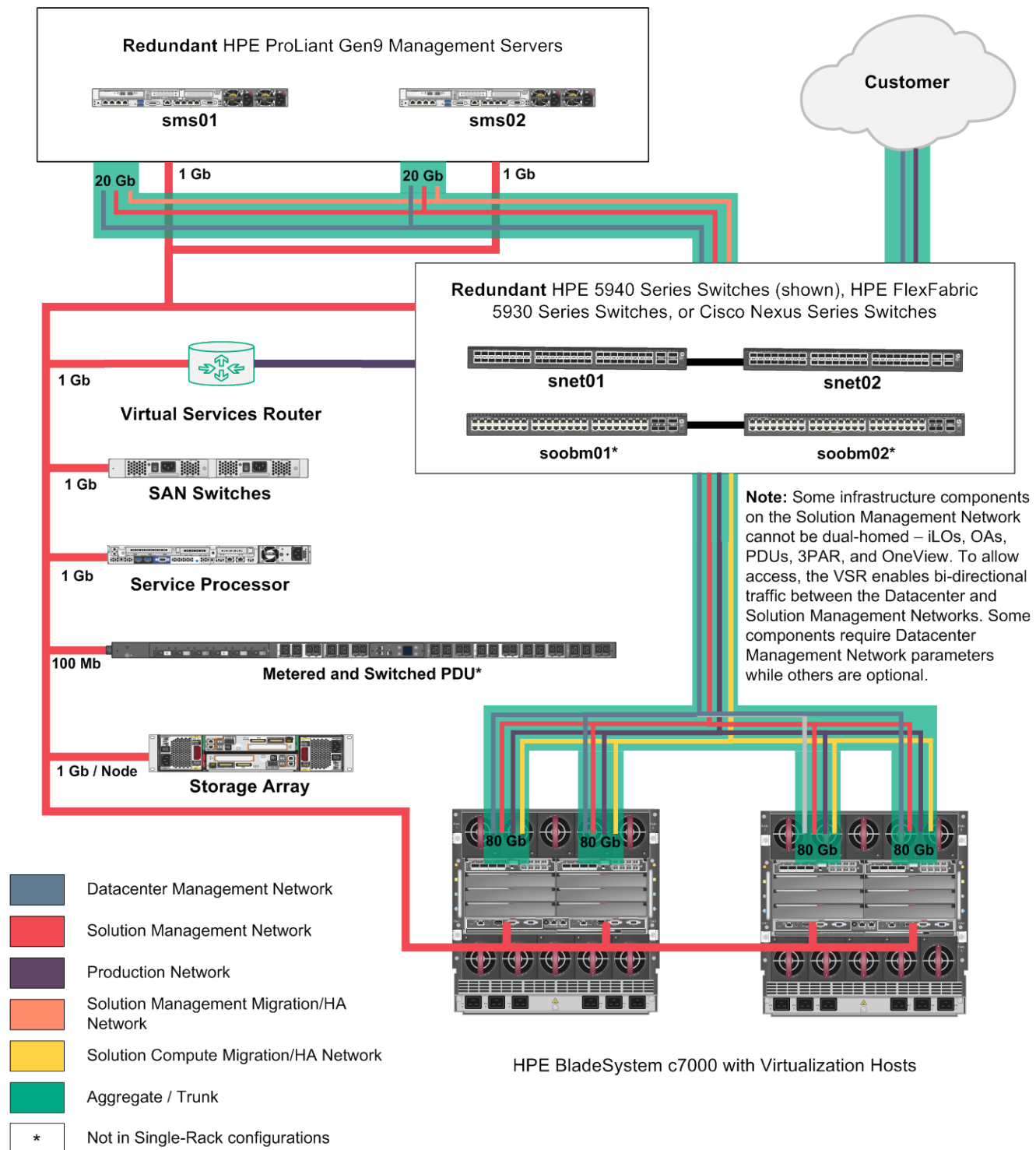
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<sup>21</sup> VSR option does not apply to Microsoft Hyper-V solution



Figure 6 presents a simplified overview of the Ethernet network configuration for an HPE ConvergedSystem 700 for VMware with two BladeSystem c7000 enclosures (with no storage shown).

### HPE ConvergedSystem 700 simplified network for VMware solution



**Figure 6.** Ethernet network configuration for an HPE ConvergedSystem 700 for VMware solution

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**Note**

Figure 6 shows the logical separation of network functions in the HPE ConvergedSystem 700 for VMware solution using HPE FlexFabric 5940 switches. These switches can be replaced with HPE FlexFabric 5930 or Cisco Nexus switches if your solution requires it.

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**Note**

Figure 6 shows an HPE SN6000B SAN switch. The HPE ConvergedSystem 700 2.0 single rack can be configured as Flat SAN or with SAN switches.

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**Networks in HPE ConvergedSystem 700 for Microsoft Hyper-V**

The following networks have been implemented in HPE ConvergedSystem 700 for Hyper-V.

- Workload servers:
  - Solution Management Network— Isolates network traffic for management and provides access to management VMs
  - Production Network—Isolates network traffic for production VMs and provides a link to your data center
  - Compute Migration Network—Also referred to as the Live Migration Network, allows production VMs to be migrated between Hyper-V hosts using the Live Migration feature
  - Solution Compute High Availability Network—Also referred to as the Cluster Network, helps ensure the failover of production VMs and maintain Cluster Shared Volume storage connectivity following a failure in one of the workload servers
- Management servers:
  - Solution Management Network— Isolates the network traffic required to manage the solution
  - Management Migration Network—Also referred to as the Live Migration Network, allows management VMs to be migrated between Hyper-V hosts using the Live Migration feature
  - Management High Availability Network—Also referred to as the Cluster Network, helps ensure the failover of management VMs and maintain Cluster Shared Volume storage connectivity following a failure in one of the workload servers

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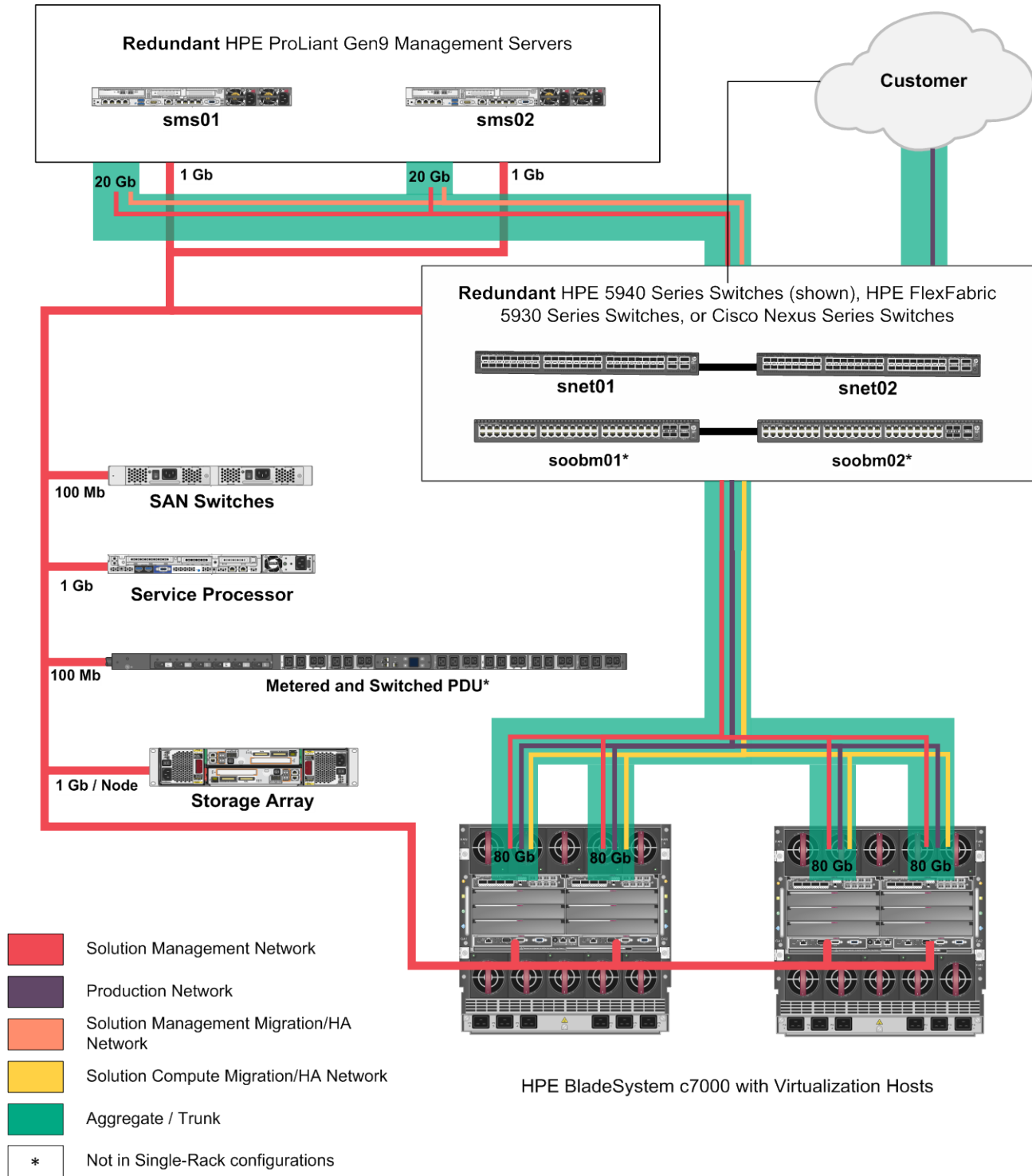
**Note**

For Microsoft Hyper-V, for the networks that are common to both Workload and Management servers, customers can opt to use unique VLANs and subnets for each network.

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Figure 7 presents a simplified overview of the Ethernet network configuration for an HPE ConvergedSystem 700 for Hyper-V with two BladeSystem c7000 enclosures (with no storage shown).

### HPE ConvergedSystem 700 simplified network for Microsoft Hyper-V solution



**Figure 7.** Ethernet network configuration for an HPE ConvergedSystem 700 for Hyper-V solution

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**Note**

Figure 7 shows the logical separation of network functions in the HPE ConvergedSystem 700 for Hyper-V solution using HPE FlexFabric 5940 switches. These switches can be replaced with HPE FlexFabric 5930 or Cisco Nexus switches if your solution requires it.

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**Note**

Figure 7 shows an HPE SN6000B SAN switch. The HPE ConvergedSystem 700 2.0 single rack can be configured as Flat SAN or with SAN switches.

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More information on individual switches is provided in the next section.

**Networks in HPE ConvergedSystem 700 for Foundation**

The networks defined in Figure 6 (for VMware) illustrate a potential implementation supported by the HPE ConvergedSystem 700 for Foundation solution. No native networks come preconfigured with the HPE ConvergedSystem 700 for Foundation solution. You have the flexibility to implement the network according to your own specifications.

**Network switches****HPE FlexFabric 5940 and 5930<sup>22</sup> switches**

HPE FlexFabric 5940 switch



HPE FlexFabric 5930 4-Slot switch

The [HPE FlexFabric 5940](#) and [HPE FlexFabric 5930](#) switch series provide high density, ultra-low latency, top-of-rack (ToR) switches. Designed for HPE FlexNetwork architecture,<sup>23</sup> these switches are ideally suited for deployments at the server access layer of large enterprise data centers and are powerful enough for deployments at the data center core layer of medium sized enterprises.

With the increase in virtualized applications and server-to-server traffic, customers now require ToR switch innovations that can meet their needs for higher performance server connectivity, convergence of Ethernet and storage traffic, the capability to handle virtual environments and low-latency in a single device.

Key features include:

- Cut through with ultra-low latency and wire speed
- [HPE Intelligent Resilient Fabric](#) (IRF) for virtualization and two-tier architecture
- High 1GbE/10GbE ToR port density with 40GbE uplinks
- IPv6 support in ToR with full L2/L3 features
- Convergence ready with DCB, FCoE, and TRILL

To accommodate production network traffic, HPE ConvergedSystem 700 features redundant HPE FlexFabric 5900AF-48G-4XG-2QSFP+ and HPE FlexFabric 5940 48SFP+ 6QSFP+, or HPE FlexFabric 5930 2-slot or 4-slot switches, all which are linked via IRF technology and appear to the solution's HPE Virtual Connect FlexFabric 20/40 F8 modules as a single logical network device. In addition, these switches, in conjunction with the Virtual Connect modules, create a fully redundant active-active network design that can maximize throughput while isolating traffic.

<sup>22</sup> HPE FlexFabric 5930 switch is available in 2-slot and 4-slot modules

<sup>23</sup> HPE FlexNetwork architecture segments network infrastructure in order to meet the unique requirements of the particular area (data center, corporate campus, or branch office). As part of the FlexFabric building block, HPE FlexFabric 5940 and 5930 switches help converge and secure the data center network, servers, and storage.

These switches support Link Aggregation Control Protocol (LACP), which allows multiple physical ports to be bundled together to form a single logical channel. With LACP, multiple devices can communicate simultaneously at full single port speed, without permitting any one device to monopolize traffic. In conjunction with IRF, aggregation groups can be connected to both switches in active-active mode without the use of protocols, such as spanning tree.

Table 2 compares the key features of the switches used in HPE ConvergedSystem 700.

**Table 2.** Example switch feature comparison

	HPE FF 5940 48SFP+ 6QSFP+	HPE FF 5900AF-48G-4XG-2QSFP+ <sup>24</sup>	HPE FlexFabric 5930 4-slot
<b>I/O ports and slots</b>	48 fixed 1000/10000 SFP+ ports 6 QSFP+ 40GbE ports	48 autosensing 10/100/1000 ports 4 fixed 1000/10000 SFP+ ports 2 QSFP+ 40GbE ports	4 module slots; Up to 96 Ports of 10 GbE and Eight 40G QSFP+
<b>10 Gb/s Latency</b>	< 1 microseconds (64-byte packets)	< 1.5 microseconds (64-byte packets)	< 1 microsecond (64-byte packets)
<b>Throughput</b>	1071 million packets per second	250 million packets per second	1429 million packets per second
<b>Routing/Switching capacity</b>	1440 Gb/s	336 Gb/s	2560 Gb/s
<b>Routing table size</b>	120,000 entries (IPv4), 60,000 entries (IPv6)	16,000 entries (IPv4), 8,000 entries (IPv6)	128,000 entries (IPv4), 64,000 entries (IPv6)
<b>Mac address table size</b>	288,000 entries	128,000 entries	288,000 entries

## Networking software

### HPE VSR1000 Virtual Services Router (only deployed with HPE ConvergedSystem 700 for VMware)

The HPE VSR1000 Virtual Services Router (VSR1000) is a virtualized application that provides functionality similar to a physical router. The VSR1000 series enables significant operational savings as a result of its agility and ease of deployment. Like other virtual applications, the routers run in a virtual machine on an industry standard x86 server. Resources on the VSR1000 series can be dynamically allocated and upgraded on demand as performance requirements grow. The VSR1000 series is available in one, four, and eight virtual CPU versions that have no expiration date. Robust routing is provided between networked devices using a number of popular routing protocols. In addition, the series provides critical network services associated with today's enterprise routers such as VPN gateway, firewall and other security and traffic management functions. A variety of deployment models are supported, including enterprise branch CPE routing and cloud offloading for small- to medium-sized workloads.

- Virtualized enterprise class x86 routing software
- Firewall, IPSec, and MPLS VPN security
- Agile deployments across the branch office, data center, and cloud
- Easy to deploy and manage remotely
- VMware and KVM hypervisor support

<sup>24</sup> Although the 5900AF ToR switches have been replaced with HPE FF 5940 48SFP+ 6QSFP+, the HPE FF 5900AF-48G-4XG-2QSFP+ are used as out-of-band switches.

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**Note**

The VSR1000 in HPE ConvergedSystem 700 for VMware provides NAT between the data center management network and the solution management network. This allows the customer to access management components from the data center IP space. It also allows multiple solution racks to have identical IP address schemes within the rack but use NAT addresses to communicate to enable replication, high availability, and metro cluster via the data center network.

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**HPE StoreFabric SAN switches<sup>25</sup>**

HPE ConvergedSystem 700 multi-rack solution utilizes redundant HPE SN6000B Fibre Channel switches or HPE FlexFabric 5930 4-slot switches in a converged network and SAN configuration. Both SAN switch arrangements provide sufficient host ports to meet design objectives for IOPS capacity. Two variants of the HPE SN6000B Fibre Channel switches are offered in the solution:

- HPE SN6000B 16Gb 48/24 Fibre Channel switch (with an optional upgrade to activate 24 additional ports)
- HPE SN6000B 16Gb 48/48 Fibre Channel switch

HPE FlexFabric 5930 4-slot switches can only be used as converged network and SAN switches in a multi-rack configuration.

**HPE SN6000B 16Gb 48-port Active Fibre Channel switch**

The [HPE SN6000B switch](#) meets the needs of hyper-scale, private cloud storage environments by delivering market-leading 16 Gb technology and capabilities optimized for highly virtualized environments.

The HPE SN6000B switch scales from 24 to 48 ports and supports 4, 8, 10, or 16 Gb speeds in an efficiently designed 1U package.

High speed 16 Gb optimized ISLs deliver twice the performance compared to previous generation FC switches, resulting in fewer links, cables, and ports, as well as less power for the same performance.

Exchange-based Dynamic Path Selection (DPS) optimizes fabric-wide performance and load balancing by routing data to the most efficient available path automatically.

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**Note**

Changes to the storage configuration can be achieved via the SAN switch web interface and HPE 3PAR Management Console. Alternately, you can use the SAN switch CLI and HPE 3PAR CLI.

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**Management software**

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**Note**

HPE ConvergedSystem 700 for Foundation is a hardware only stack and does not come with any virtualization software preinstalled. It is a platform that gives the customer the flexibility to layer on their hypervisor, application or cloud workload of choice. It ships with a subset of software items including HPE OneView 3.0 (Advanced LTU only), Insight Remote Support, and the HPE 3PAR Management Software.

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<sup>25</sup> HPE FlexFabric 5930 switch can be used as converged network and SAN switch in multi-rack configuration only.

Management software in HPE ConvergedSystem 700 for VMware

The default configuration of the HPE ConvergedSystem 700 for VMware includes two preconfigured HPE ProLiant DL360 Gen9 servers running VMware vSphere 6.0<sup>26</sup>, deployed with the appropriate management VMs listed in Table 3 depending on configuration. These VMs provide all the management connectivity needed to administer the solution.

Figure 8 depicts the logical view of the VMs on the management servers used to administer the HPE ConvergedSystem 700 solution. This figure illustrates the two preconfigured HPE ProLiant DL360 Gen9 management servers in the VMware solution with the general management VMs.

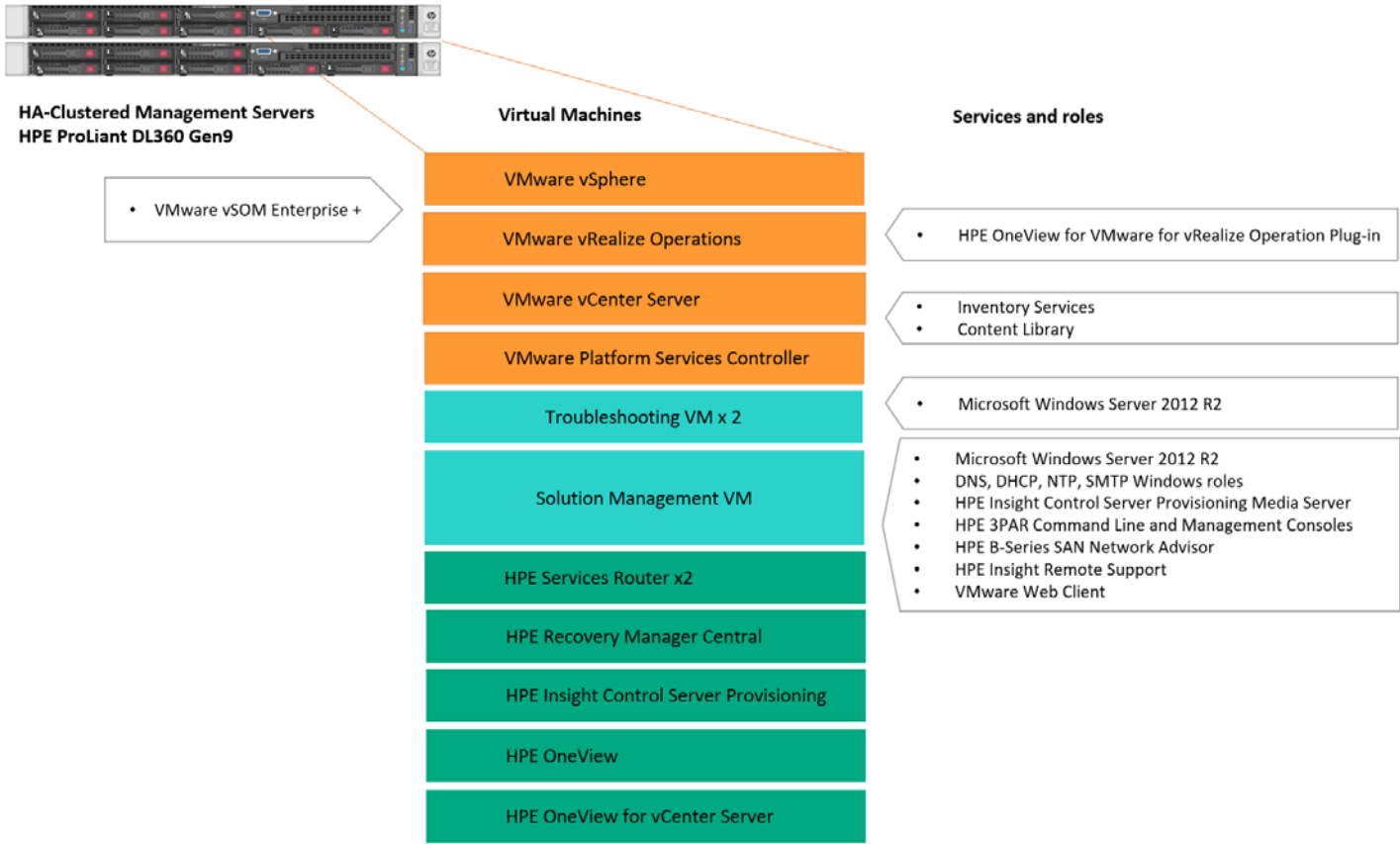


Figure 8. Virtualized management stack in HPE ConvergedSystem 700 for VMware

<sup>26</sup> HPE ConvergedSystem CS700 2.0 will ship with VMware vSphere 6.0 as default. VMware vSphere 5.5 will also be available as an option.

Each of the management VMs has a required VMware hardware compatibility level as well as predefined resource allocation as shown in Table 3.

**Table 3.** Management VMs in HPE ConvergedSystem 700 for VMware

VM name	Applications	vCPUs	vRAM	Storage <sup>27</sup>	Management Server Host
smgmt01	ICSP Media Server, DNS, DHCP, IIS, SMTP, NTP	6	32 GB	330 GB	sms02
tsvm01	3PAR CLI, 3PAR MC, 3PAR SSMC, vSphere .NET client	2	8 GB	80 GB (local)	sms01
tsvm02	3PAR CLI, 3PAR MC, 3PAR SSMC, vSphere .NET client	2	8 GB	80 GB (local)	sms02
svsr01	Virtual Services Router	1	1 GB	8 GB (local)	sms01
svsr02	Virtual Services Router	1	1 GB	8 GB (local)	sms02
oneview	OneView	2	10 GB	160 GB	sms01
icsp	Insight Control Server Provisioning	4	16 GB	200 GB	sms01
vROps	vRealize Operations Manager	4	16 GB	266 GB	sms01
vCSA	VMware vCenter Server 6.0	4*	16 GB*	150 GB* (embedded PSC) 108 GB* (external PSC)	sms02
PSC	Platform Services Controller	2*	2 GB*	30 GB*	sms01
RMC	Recovery Manager Central	2	8 GB	2 GB (Thin Provision) 100 GB (Thick Provision)	sms02

\* For small environments (up to 100 hosts, 1,000 virtual machines)

More information is provided below on individual management stack components, as well as the storage management capabilities provided by HPE 3PAR software running on the 3PAR StoreServ storage. The HPE 3PAR System Reporter runs on the HPE 3PAR StoreServ controller nodes and records all information about the HPE 3PAR StoreServ configurations through the HPE 3PAR tab in vCenter.

The management VMs smgmt01, ICsp, HPE OneView, vROps, vCSA, PSC, and RMC are preinstalled on shared LUNs from the HPE 3PAR array. The following VMs (tsvm01, tsvm02, svsr01, svsr02) are saved on the local storage of the management servers. The six management VMs on the shared LUNs are managed by a Common Provisioning Group (CPG) named CPG\_Mgt, which has four HPE 3PAR storage thin provisioned virtual volumes named as follows:

- Quorum1
- Quorum2
- MgtTPVV01
- MgtTPVV02

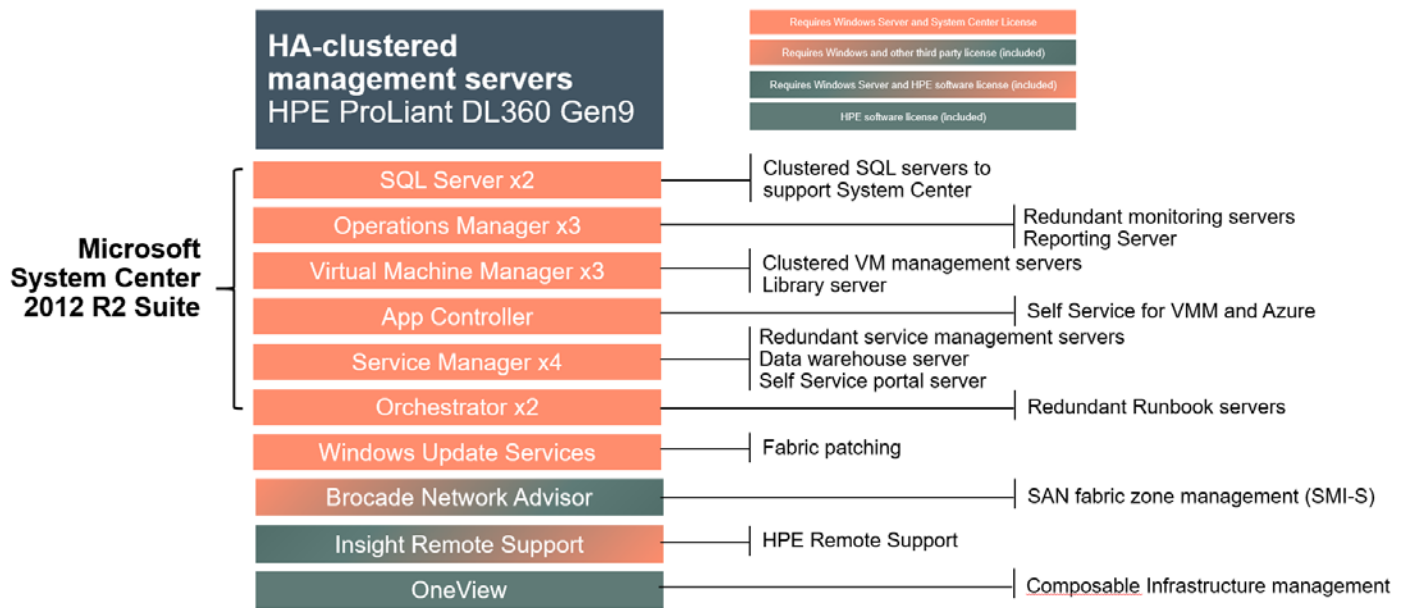
<sup>27</sup> Thin provisioned.



## Management software in HPE ConvergedSystem 700 for Microsoft Hyper-V

The default configuration of the HPE ConvergedSystem 700 for Hyper-V includes two preconfigured HPE ProLiant DL360 Gen9 servers running Microsoft System Center 2012 R2 deployed with the appropriate management VMs. These VMs provide all the management connectivity needed to administer the Hyper-V solution.

Figure 9 depicts the logical view of the VMs on the management servers used to administer the HPE ConvergedSystem 700 solution. This figure illustrates the two preconfigured HPE ProLiant DL360 Gen9 management servers in the Hyper-V solution with the general management VMs.



**Figure 9.** Virtualized management stack in HPE ConvergedSystem 700 for Hyper-V

## Components

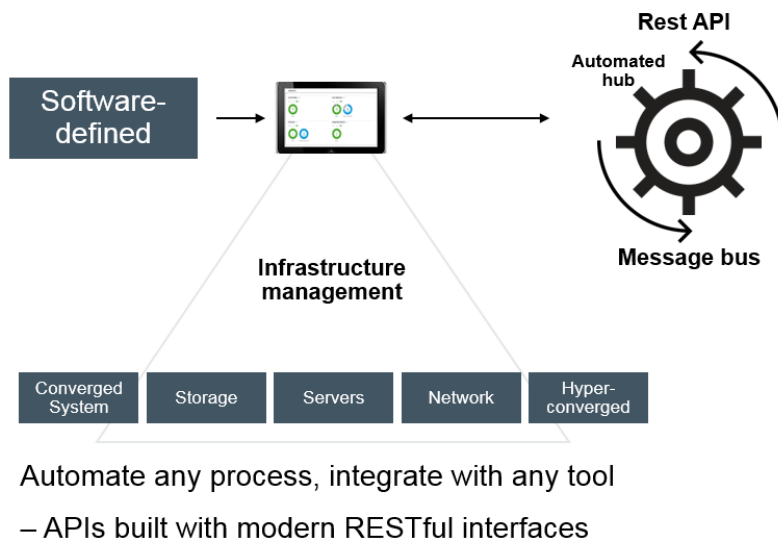
### HPE OneView

HPE ConvergedSystem 700 utilizes HPE OneView, a comprehensive, single platform designed from the ground up for converged infrastructure management. An integrated platform increases the productivity of every member of the internal IT team, across servers, storage, and networking. By streamlining processes, incorporating best practices, and creating a new, holistic way to work, HPE OneView provides organizations with a more efficient way to work. It is designed for open integration with existing tools and processes to extend these efficiencies.

HPE OneView comes preinstalled with the HPE ConvergedSystem 700, making it easy to deploy. It manages servers, storage, networking, and power and cooling resources through their full lifecycle. It collapses infrastructure management tools into a single resource-oriented architecture that provides direct access to all logical and physical resources of HPE ConvergedSystem 700. Logical resources include server profiles and server profile templates, storage volumes and storage volume templates, enclosures and enclosure groups, logical interconnects and logical interconnect groups, and network connections and storage volume attachments that can be provisioned as a service. Physical resources include server hardware blades and rack servers, networking interconnects, storage systems, disks and compute resources.

The HPE OneView converged infrastructure platform offers a uniform way of interacting with resources by providing a RESTful API foundation. This integrated resource model removes the need for you to enter and maintain the same configuration data more than once and struggle to keep all versions up-to-date. It encapsulates and abstracts many underlying tools behind the integrated resource model, so you can operate with new levels of simplicity, speed, and agility to provision, monitor, and maintain the HPE ConvergedSystem 700. The integrated resource model is critical for diagnosing problems or determining the risk of making a change by seeing affected resources and how they are interconnected before making the change.

HPE OneView also streamlines the process of bringing the enclosures, interconnects and server hardware under management. When you add a device, HPE OneView automatically detects all the hardware and prepares it for monitoring and management. We have taken the approach in HPE OneView that server hardware either has a server profile and is allocated and fully configured, or it has no server profile and is available as raw hardware in a pool awaiting a new configuration. This supports the most dynamic reconfiguration of hardware possible, while preserving the simplicity of provisioning a new server profile just like the last one. It guarantees the server profile will deploy successfully to the allocated hardware, based on deep knowledge of the server hardware type and enclosure group.



### Existing integrations



Figure 10. HPE OneView architecture

### Designed for automation

A substantial portion of the work of operations teams consists of routine tasks related to infrastructure lifecycle management, including designing, provisioning, monitoring, and updating. HPE OneView is designed to automate day-to-day responsibilities by simplifying time-consuming tasks leading to increased productivity and reduced operational costs. It is an automated infrastructure provider under any environment including VMware, Microsoft, Red Hat®, and OpenStack®, that supports traditional, virtualized, and cloud workloads.

### Enhanced user experience

The HPE OneView UI approach is designed to enhance the interaction between IT staff and match your work practices in the data center. It is designed to be simple, efficient, and consistent. It features new capabilities inspired by web technology commonly used in our consumer lives, and rethinks them for the data center. You also have the choice of the programmatic interfaces based on RESTful APIs.

The HPE OneView UI design builds functionality around administrators work practices and puts resources in the menu while fully embracing the web experience. Right-click to open in a new tab, copy and paste, browser bookmarks, easily e-mail links to colleagues, and print diagrams and data. There are search capabilities, newsfeeds, and other functions that work as you've come to expect in a web experience. The HPE OneView UI also works on desktops, tablets, and mobile devices.

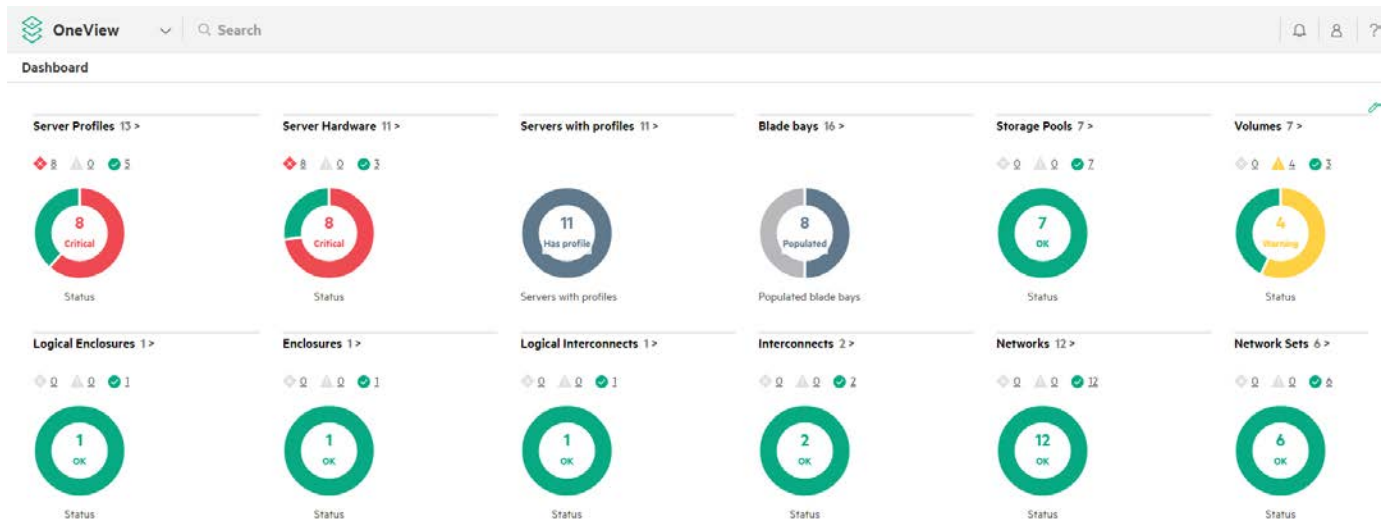


Figure 11. HPE OneView User Interface

### Software-defined resources

HPE OneView provides software-defined resources including templates, profiles, and groups that provide an innovative way to manage your entire data center. These logical constructs let you specify the desired configuration of your environment and allows HPE OneView to automate the process of making it so. Groups and templates enable you to define configurations that are specific to the environment you want to build, such as VMware vSphere virtual hosts. They provide flexibility to simplify changes across your data center and controlled change management. HPE OneView provides several software-defined resources, such as groups and server profiles. These reusable logical constructs mean that you can capture the best practices of your experts across a wide variety of disciplines, including networking, storage, hardware configuration, and operating system build and configuration. HPE OneView keeps your best practice approaches intact as you grow, but it still allows for customization so that you maintain ultimate control. This facilitates faster provisioning, greater consistency, and fewer errors.

Server profiles and enclosure groups make it easier to prepare a bare-metal server for operating system deployment, preparing the system with firmware, BIOS settings, local storage configurations, SAN storage, network connectivity, and defining the complete desired configuration. Template server profiles can be used to capture your best practices once, and then roll them out multiple times in an efficient and error-free way.

HPE OneView includes the following features:

- Automated Storage Provisioning

HPE OneView provides automated, policy driven storage provisioning of storage resources. It is fully integrated with server profiles so that you can manage the storage infrastructure of the HPE ConvergedSystem 700. It enables you to view and manage your storage system and pools, create new volumes, create volume templates to provision multiple volumes and automate the zoning of storage and attach storage to server profiles.

- Network management for HPE Virtual Connect

HPE OneView simplifies the deployment of HPE Virtual Connect for HPE ConvergedSystem 700. The software-defined nature of HPE OneView extends HPE Virtual Connect features using Profiles, Logical Interconnect Groups and Network sets to simplify management and capture best practices.

- System Health

Efficient data views and effective control enable you to respond to issues for managing the health of HPE ConvergedSystem 700 with simplified monitoring through a streamlined, modern alert management architecture. When managed resources are added, they are automatically set up for monitoring, including the automatic registration of SNMP traps and scheduling of health data collection.

- Firmware updates and Configuration change management

HPE OneView leverages and extends the HPE Smart Update portfolio of [HPE Service Pack for ProLiant \(SPP\)](#) and [HPE Smart Update Manager \(HPE SUM\)](#) for breakthrough system maintenance at the scale of your data center. HPE SPP and HPE SUM provide capabilities to update HPE ProLiant servers and blade infrastructure systematically with one-click simplicity. HPE OneView extends these capabilities with software-defined approaches and with firmware baselines for efficient, reliable, non-disruptive, and simple firmware management.

- Reports

A predefined list of reports is available with HPE OneView from the user interface or through the RESTful API. These reports can be exported to CSV or Microsoft Excel files or printed as PDF files. Predefined reports include:

- Alerts Report
- Users Report
- Server Inventory
- Server Firmware Inventory
- Server Profiles Inventory
- Enclosure Bay Inventory
- Enclosure Inventory
- Interconnect Inventory

Reports are based on HPE OneView inventory, configuration, and health status information. Additional data and information can be obtained for customer reporting by querying the RESTful API.

- Server Provisioning

HPE OneView provides a complete provisioning solution for the HPE servers deployed with HPE ConvergedSystem 700. It can be used to install and configure HPE ProLiant servers using resources such as OS Build Plans and scripts to run deployment jobs. It allows you to install operating systems such as Windows®, Linux®, and vSphere on the servers, deploy OSs to virtual machines, update drivers/utilities/firmware, and configure server system hardware (such as iLOs, BIOS, HPE Smart Array, and Fibre Channel HBA).

- Remote management (HPE iLO Advanced)

HPE OneView licenses iLO Advanced, HPE's comprehensive lights-out remote management solution for HPE ProLiant servers. Features provided include remote access, graphical remote control, shared console and console replay, and remote system logs.

- Power monitoring and energy management

HPE OneView integrates resources to provide you with a power monitoring and energy solution designed to scale to the level of your data center. Centralized monitoring of data center power consumption and thermal output is complemented with energy instrumentation connected into HPE iLO capabilities, allowing compatibility with any operating system residing on the managed server.

### **HPE OneView with hypervisor management**

To extend the capabilities of VMware vCenter and Microsoft System Center to the physical environment, HPE ConvergedSystem 700 includes the following integration packs:

- [HPE OneView for VMware vCenter](#)
- [HPE OneView for Microsoft System Center](#)

These products integrate the manageability features of HPE ProLiant, BladeSystem, Virtual Connect and Storage into vCenter Server and System Center management respectively, to create a holistic, single pane of glass management experience. They allow you to gain deeper control of your virtualized environment, reducing the time it takes to make important changes, increase capacity or manage planned and unplanned downtime. When used with the automation power of HPE OneView, best practices for HPE ConvergedSystem 700 can be defined once and reused many times to provision an entire cluster with compute and storage fully configured easily. These integration packs also deliver powerful analytics and deeper troubleshooting tools to your virtualization administrators.

### **HPE Insight Control Server Provisioning**

Insight Control Server Provisioning is designed to streamline server provisioning administrative tasks and serves as the common multi-server provisioning capability for HPE ConvergedSystem 700 for virtualization. It simplifies the process for deploying OSs on HPE ProLiant bare-metal servers and is preinstalled on a virtual machine (VM) optimized to run the HPE Insight Control Server Provisioning application.

HPE Insight Control Server Provisioning allows you to:

- Install Microsoft Windows, Linux, VMware vSphere, and Microsoft Hyper-V on HPE ProLiant servers
- Update drivers, utilities, and firmware on HPE ProLiant servers using the HPE Service Packs for ProLiant (SPPs)
- Configure HPE ProLiant system hardware, iLOs, BIOS, and Smart Array controllers
- Deploy to target servers with, or without, PXE
- Run deployment jobs on multiple servers simultaneously
- Customize your HPE ProLiant deployments with an easy-to-use, browser-based interface

### **VMware vRealize Operations Manager**

vRealize Operations Manager on HPE Converged Infrastructure combines the leading software and hardware virtualization platform with robust management capabilities. This solution enables users to gain operational insight into a vSphere environment while optimizing capacity. By providing detailed analysis of the virtual environment, it enables users to reclaim unused capacity, right size virtual machines, improve utilization and help increase consolidation ratios. vRealize Operations Manager on HPE Converged Infrastructure works to:

- Improve application performance and business continuity

vRealize Operations Manager supports even the most resource-intensive applications to guarantee SLAs and availability. It reduces the cost and complexity of managing business continuity and disaster recovery with Always-On IT capabilities and layered protection against service outages and data loss.

- Simplify IT operations at a lower cost

vRealize Operations Manager lowers operational overhead and simplifies the management of development, quality assurance and production IT environments that are large and geographically distributed.

- Gain operational insight

vRealize Operations Manager enables IT to respond to performance trends proactively. It collects and analyzes performance data, correlates abnormalities, and identifies the root cause of building performance issues.

- Optimize capacity

vRealize Operations Manager makes it easier to manage and optimize capacity planning. Unused virtual machines can be reclaimed, and under provisioned virtual machines can be right sized, to help make the most efficient use of resources.

### **HPE 3PAR software**

HPE 3PAR Operating System Software is used to drive HPE 3PAR StoreServ storage, utilizing advanced internal virtualization capabilities, as well as features and tools designed to enhance the efficiency of storage management, capacity utilization, and performance in enterprise and cloud data centers.

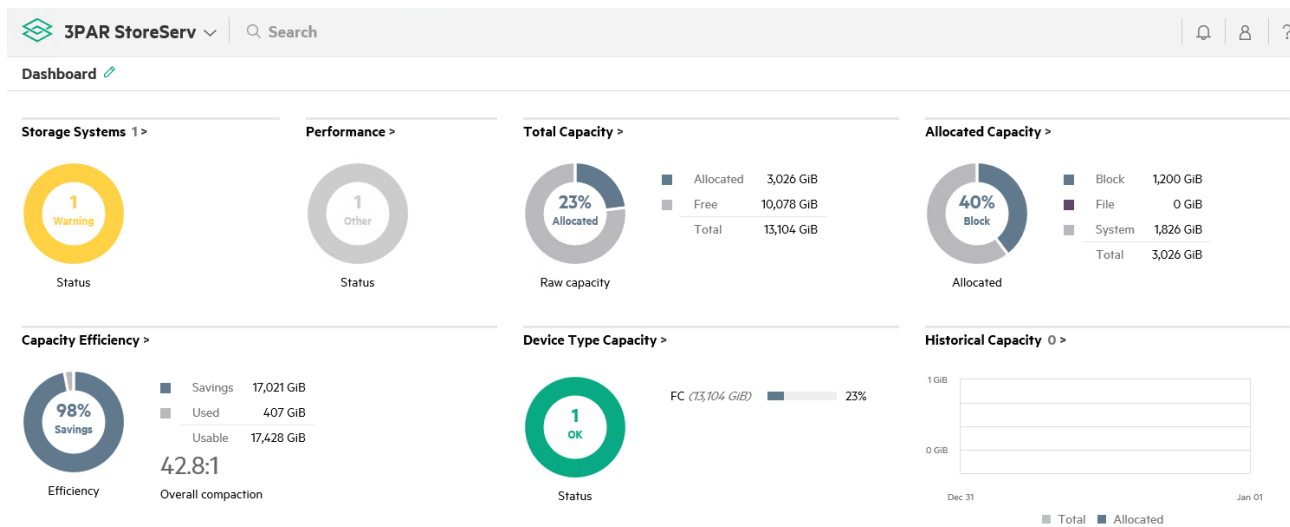
HPE ConvergedSystem 700 is preconfigured with a broad range of HPE 3PAR software, as outlined in the next section. Additional information on HPE 3PAR software is available at [hpe.com/storage/3par](http://hpe.com/storage/3par).

## HPE 3PAR StoreServ Management Console

The [HPE 3PAR Management Console](#) delivers simplicity, usability, and visibility for storage management, allowing you to administer all your HPE 3PAR StoreServ storage from a single window, including remote systems used for replication. As shown in Figure 10, you receive a dashboard view of all connected systems, including important data such as the remote replication configuration. The Management Console is integrated with signature HPE 3PAR applications such as Thin Provisioning and Virtual Copy; everything you need to optimize your storage environment is right at your fingertips. This unified manager provides capabilities such as autonomic disaster recovery—disaster recovery that automatically and intelligently configures itself.<sup>28</sup>

The configuration and management of peer motion between storage arrays can be orchestrated through the Management Console.

You can also use the powerful, scriptable HPE 3PAR CLI for storage management.



**Figure 12.** Single window storage management with the HPE 3PAR StoreServ Management Console (SSMC)

## HPE 3PAR Virtual Copy Software

Flexible [HPE 3PAR Virtual Copy Software](#) (Virtual Copy) allows you to create instant, point-in-time copies so you can share and protect your data. Many traditional copying solutions lack flexibility and require too great an investment in online capacity to be considered economical; however, Virtual Copy is a reservation-less, nonduplicative, copy-on-write solution that consumes capacity only for changed data, in fine grained increments, without ever duplicating changed data within a snapshot tree.

Using Virtual Copy to generate and manage snapshots frees up CPU cycles on the management servers for processing application requests rather than storage requests.

## HPE 3PAR System Reporter Software

[HPE 3PAR System Reporter Software](#) (System Reporter) delivers web-based historical performance and capacity management information on your HPE 3PAR StoreServ storage.

The HPE 3PAR StoreServ storage preconfigured on your ConvergedSystem 700 solution is intended to provide a starting point. You can use System Reporter to determine if the storage meets your needs or if it should be tailored to satisfy your workload.<sup>29</sup>

<sup>28</sup> Requires a secondary disaster recovery site.

<sup>29</sup> If you need assistance with storage scaling, consult your HPE account team.

**HPE 3PAR Thin Provisioning Software**

HPE 3PAR Thin Provisioning Software (Thin Provisioning) allows capacity to be dedicated and configured autonomically, just in-time and without active management, enhancing capacity utilization and breaking the traditional linkage between allocated and purchased capacity. Now, you only purchase the disk capacity you actually need.

**HPE 3PAR Thin Conversion Software**

HPE 3PAR Thin Conversion Software (Thin Conversion) drives the conversion of inefficient, fat volumes on legacy arrays to more efficient thin volumes. For example, conversion from a fully provisioned volume to a thin provisioned volume, and vice versa, can be performed online, avoiding the need for applications to go through offline transitions from old to new volumes.

**HPE 3PAR Thin Persistence Software**

HPE 3PAR Thin Persistence Software (Thin Persistence) reclaims the unused space associated with deleted data to keep volumes thin.

**HPE 3PAR Thin Deduplication and Thin Clones Software**

HPE 3PAR Thin Deduplication Software features inline deduplication built into the HPE 3PAR ASICs at the heart of each controller node. This unique implementation relies on built-in hardware capability to assign a unique hash to any incoming write request and leverages the HPE 3PAR Thin Provisioning metadata lookup table for fast hash comparisons. This inline deduplication process carries multiple benefits, including increasing capacity efficiency, protecting flash performance, and extending flash media lifespan.

An extension of HPE 3PAR Thin Deduplication for server and desktop virtualization environments, HPE 3PAR Thin Clones Software enables the creation of nonduplicative VM clones with VMware ESXi and Microsoft Hyper-V. These VM clones are created instantly by leveraging copy offload for VMware vStorage APIs for Array Integration (VAAI) and Microsoft Offloaded Transfer (ODX) without increasing capacity consumption on the HPE 3PAR StoreServ array. HPE 3PAR Thin Clones Software leverages Thin Deduplication to update the metadata table without copying data, relying on inline deduplication to reduce capacity footprint as new write requests arrive.

**HPE 3PAR Host Explorer Software**

HPE 3PAR Host Explorer Software (Host Explorer) drives autonomic<sup>30</sup> storage management by establishing secure communication channels between storage and hosts. It also supports automatic host discovery and the collection of detailed host configuration information.

**HPE 3PAR Dynamic Optimization Software**

HPE 3PAR Dynamic Optimization Software (DO) is an autonomic, volume-level tiering tool that can react quickly and nondisruptively to changing application and infrastructure requirements. DO allows you to alter service levels associated with a storage volume (RAID level, subsystem failure protection level, drive type, stripe width, and/or radial placement) or rebalance storage volumes, each with a single click.

The capabilities of DO include:

- Converting a volume from one service level to another. For example, moving a LUN from a RAID 1 common provisioning group (CPG) to RAID 5 nearline storage in another CPG.
- Redistributing a volume among all available drives. For example, after adding a new drive.
- Redistributing data among physical LUNs dynamically to optimize performance.

**HPE 3PAR Adaptive Optimization Software**

HPE 3PAR Adaptive Optimization Software (AO) is an autonomic sub-volume level tiering tool that takes a fine grained, highly automated approach to service level optimization, providing highly reliable, nondisruptive, cost-optimized storage tiering and delivering the right QoS to the right data at the right time.

Since AO is policy driven, it can be customized by SAN administrators. Its capabilities include:

- Analyzing performance based on hot regions<sup>31</sup> in chunklet distribution
- Using HPE 3PAR Operating System Software to move chunklets to the fastest storage tier

Management and configuration of AO can be performed via the HPE 3PAR Management Console or CLI.

<sup>30</sup> Where “autonomic” implies self-managed, distributed computing resources that can adapt to change and abstract complexity from users.

<sup>31</sup> Based on I/O rates

**HPE 3PAR Priority Optimization Software**

HPE 3PAR Priority Optimization Software enables service levels for applications, virtual domains, and workloads as business requirements dictate. It enables the customer to provision storage performance as they can provision storage capacity. This allows them to create SLAs to protect mission-critical applications in enterprise environments by assigning a minimum goal for I/O per second, bandwidth and latency so performance for that specific tenant or application is assured. In addition, performance max limits on workloads with lower service level requirements can be assigned, as well as providing high priority applications with all the resources they need to meet specific service levels.

**HPE 3PAR Remote Copy Software**

HPE 3PAR Remote Copy is a unique replication technology that allows you to protect and share data from any application more simply, efficiently, and affordably. Remote Copy reduces the cost of remote data replication and DR dramatically by leveraging HPE 3PAR's unique thin copy technologies. This enables the use of both mid-range and high-end arrays and eliminates the need for professional services. In addition, HPE 3PAR offers autonomic DR configuration that enables you to set up and test your entire DR deployment in just minutes from a single window. This includes multisite replication, using both mid-range and high-end arrays.

**HPE 3PAR Peer Persistence Software**

HPE 3PAR Peer Persistence Software allows companies to federate their HPE 3PAR StoreServ storage systems across geographically separated data centers. This intersite federation of storage allows customers to use their data centers more effectively by allowing them to move applications from one site to another without application downtime. Peer Persistence leverages the high availability solutions on HPE 3PAR StoreServ systems, and extends it even further by enabling a peer relationship between two HPE 3PAR StoreServ storage systems located at geographically separated sites. Peer Persistence also enables failover/failback between two sites/data centers to be transparent to hosts and without any disruption to applications running on them. Peer Persistence is deployed with Remote Copy without the need for any additional hardware or appliance.

**HPE 3PAR Virtual Domains Software**

HPE 3PAR Virtual Domains is virtual machine software that delivers secure access and robust storage services for different applications and user groups. It is also known as virtual private arrays. By providing secure, administrative segregation of users and hosts within a consolidated, massively parallel HPE 3PAR StoreServ, Virtual Domains allows individual user groups and applications to achieve greater storage service levels in performance, availability, and functionality. HPE 3PAR Virtual Domains is ideal for enterprises or service providers looking to leverage the benefits of consolidation and deploy a purpose-built infrastructure for their private or public cloud.

**HPE 3PAR Virtual Lock Software**

HPE 3PAR Virtual Lock prevents deletion of virtual volumes (including thin volumes created with HPE 3PAR Thin Provisioning Software) and volume copies (such as those created with HPE 3PAR Virtual Copy) for a specified period of time. Applying a user-configurable retention period, Virtual Lock secures volumes and copies so they cannot be deleted, even by an HPE 3PAR StoreServ user with the highest level privileges.

**HPE 3PAR Peer Motion Software**

HPE 3PAR Peer Motion Software is a nondisruptive data migration tool for enterprise Storage Area Networks. With Peer Motion, customers can load balance I/O workloads across systems at will, perform technology refresh seamlessly, cost-optimize asset lifecycle management, and lower technology refresh capital expenditure. Peer Motion enables customers to migrate storage volumes between any HPE 3PAR StoreServ storage system online, nondisruptively, and without complex planning or dependency on extra tools.

**HPE 3PAR Online Import Software**

HPE 3PAR Online Import Software is a do-it-yourself data migration tool for enterprise Storage Area Networks. Online Import software enables customers to migrate storage volumes from either HPE EVA storage, EMC CX4 or EMC VNX storage to HPE 3PAR StoreServ storage systems online and without complex planning or dependency on extra tools.

**HPE 3PAR Replication Software Suite**

HPE 3PAR Replication Software Suite protects your applications, data, and your business from the unpredictable by delivering simple, fast, and economical application data protection, transparent failover, and disaster recovery solutions. This software suite bundles HPE 3PAR Virtual Copy, HPE 3PAR Remote Copy, HPE 3PAR Peer Persistence and HPE 3PAR Cluster Extension Software to help you protect, share, and freely move data across data centers without impacting your business applications.



## Considerations for data center integration

### Network data center uplinks

The network switches for the HPE ConvergedSystem 700 do not ship with any SFP+ transceivers to be used for the data center network connection. In addition to the purchase of HPE ConvergedSystem 700, the transceivers need to be purchased by customers if a network connection between the ConvergedSystem 700 and the customer data center is desired.

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#### Note

For the Microsoft Hyper-V solution, integration into the customer's data center is the only network connection option and appropriate SFP+ transceivers are required.

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You can order a variety of uplink transceivers for these ports at the time you order the rest of the solution.

For HPE switches, the most common transceivers include:

- HPE X120 1G SFP RJ45 T Transceiver (JD089B)
- HPE X120 1G SFP LC SX Transceiver (JD118B)
- HPE X130 10G SFP+ LC SR Transceiver (JD092B)

For a complete list of all available uplink transceivers, refer to the following QuickSpecs at:

HPE FlexFabric 5940 switch series: <http://h20195.www2.hpe.com/V2/GetDocument.aspx?docname=c05158726>

HPE FlexFabric 5930 switch series: <http://h20195.www2.hpe.com/V2/GetDocument.aspx?docname=c04111326>

For Cisco switches, the most common transceivers include:

- Cisco 1000BASE-T SFP (GLC-T)
- Cisco 1000BASE-SX SFP transceiver module (GLC-SX-MMD)
- Cisco 10GBASE-SR SFP+ module for MMF (SFP-10G-SR)

For a complete list of all available uplink transceivers, see the Transceiver Support Matrix on the Cisco website:

Cisco Nexus 5600: [cisco.com/c/en/us/products/collateral/switches/nexus-5000-series-switches/datasheet-c78-730760.html](http://cisco.com/c/en/us/products/collateral/switches/nexus-5000-series-switches/datasheet-c78-730760.html)

Cisco Nexus 9300: [cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/datasheet-c78-736967.html](http://cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/datasheet-c78-736967.html)

### Data center management integration for VMware solution

HPE ConvergedSystem 700 for VMware includes two different options for integrating management into a customer's environment:

- Island Management—In this scenario, the management servers for the HPE ConvergedSystem 700 are configured as the only management console. This will present the system with a self-contained management framework.
- Data Center-Wide Management—In this scenario, the management servers for the HPE ConvergedSystem 700 are configured as “jump stations.” This will enable local (if desired), as well as data center-wide, management through integration into an existing vCenter environment.

### Data center management integration for Microsoft Hyper-V solution

HPE ConvergedSystem 700 for Hyper-V solution requires integration into the customer's data center environment:

- Data Center-Wide Management—The TSC Deployment Accelerator service includes integrating the Hyper-V solution into the customer's data center environment. There is no VSR option for the Hyper-V solution. TS Consultants will work with the customer to collect key data points such as Active Directory Groups, VLANs, gateway, subnet, and DNS server IP addresses to complete the integration.

## Services

HPE provides one-stop support for the HPE ConvergedSystem 700 solution, including factory integration, installation, support, and consulting. This section outlines services that are available for ConvergedSystem 700.

### Factory Express

Factory Express services are utilized by all HPE ConvergedSystem 700 solutions. Benefits include:

- Business agility
  - Broad portfolio
  - Faster technology transactions
  - Smoother solution deployment
  - Faster return on IT investment
- Managing costs
  - Save time, money, and resources
  - Collaborate with HPE experts
  - One-touch efficiency
- Mitigating risk
  - Predictable, hassle-free experience
  - Efficiency and quality
- Increase performance and quality
  - Innovation based on standards
  - Our factory is your factory

### Support services

Support offerings for HPE ConvergedSystem 700 include:

- HPE Proactive Care 24/7 4-hour response

In converged, virtualized industry standard IT environments, there are many components that need to work together effectively. HPE Proactive Care Service 24/7 4-hour response supports these complex solutions, bringing together an enhanced call experience with end-to-end call management, advanced technical expertise for problem prevention, and rapid problem awareness and notification with expedited resolution<sup>32</sup>. Integrating both proactive and reactive elements, customers get superior value out of their IT investments. Proactive Care helps customers prevent problems and stabilize IT so they can focus on business innovation, growth, and staying competitive. It is cost-effective support covering servers, operating systems, hypervisors, storage, storage area networks (SANs), and networks. Proactive Care includes onsite hardware repair if it is required to resolve the issue. You can choose from a range of hardware reactive support levels to meet your business and operational needs. Hardware reactive support choices:

- HPE Proactive Care 24/7 4-hour response
- HPE 6-hour Call-to-Repair Proactive Care Service

The Proactive Care portfolio also offers the same service levels with the inclusion of hardware defective media retention (DMR) and comprehensive deflection material retention (CDMR) as additional core features.

<sup>32</sup> Elements of Proactive Care require customer action including subscription to HPE Support Center.

- HPE Proactive Care Advanced

HPE Proactive Care Advanced is designed for customers who want assigned resources for personalized technical assistance to help meet IT and business goals. Proactive Care Advanced builds on Proactive Care and gives customers an assigned, local account support manager to share best practices, flexible access to specialist skills, and critical event management if there is a complex incident or system outage.

- HPE Datacenter Care

HPE Datacenter Care is a personalized, flexible, and cost-effective, relationship-based approach to data center support and operations. HPE Datacenter Care provides you with the resources and care you need to make the most of your IT environment and evolve to hybrid IT—a service tailored to meet your business needs.

- HPE Flex Capacity

Customers can enjoy the ability to expand or shrink costs based on actual metered usage for their on premises IT, paying only for what they use above the minimum, with no capital needed up front. HPE Flex Capacity helps drive operational efficiency, so customers can spend more time on innovation and less time keeping the lights on.

- HPE Insight Remote Support<sup>33</sup>

HPE Insight Remote Support software is a portfolio of infrastructure remote support software. It automatically provides secure remote support for your IT environment for HPE servers, storage, and networking devices 24x7, so you can spend less time solving problems and more time focused on your business. You can have your systems remotely monitoring for hardware failure using industry secure technology to help avoid problems before they occur, with little intervention.

The software provides:

- Remote monitoring so you can gain control all of the time
- Automated notification every time so you can do more with less
- Automatic resolution in less time so your business stays up and running
- Proactive advisories to keep your environment running more reliably

For more information on these support offerings, refer to your HPE Account Manager or Reseller.

## Additional considerations

### Licensing considerations for HPE ConvergedSystem 700 for VMware

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#### Important

If you elect not to purchase VMware licenses through HPE, you must provide your own Enterprise License Agreement (ELA) licenses when your HPE ConvergedSystem 700 for VMware solution is being installed.

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#### VMware licenses

If you include VMware licenses with your HPE ConvergedSystem 700 for VMware solution, HPE will provide one VMware vSphere<sup>34</sup> Enterprise Plus license per physical processor.

<sup>33</sup> To fully realize all the benefits of your HPE Proactive Care experience, the customer must allow HPE to install and configure all HPE Insight Remote Support functionality.

<sup>34</sup> VMware versions 5.5 and 6.0 are available for CS700.

## Important

Purchasing your VMware software licenses from HPE ensures a single point of contact for all elements of HPE ConvergedSystem 700 for VMware. Many of our customers already have a VMware ELA, making this purchase redundant. In situations when VMware licenses are not purchased along with HPE ConvergedSystem 700 for VMware, and the initial call comes to HPE for VMware support assistance, HPE will continue to act as the focal point for the system. If the issue is VMware related, HPE will either engage VMware on the customer's behalf or advise the customer to call VMware directly. HPE will continue to be engaged until the issue is resolved to insure the integrity of the HPE ConvergedSystem 700. In situations when VMware is purchased along with HPE ConvergedSystem 700 for VMware, HPE will handle all VMware support issues, from beginning to end, without engaging VMware.

For more information on vSphere licensing, refer to [VMware vSphere: Licensing, Pricing and Packaging](#).

## Microsoft licenses for management servers

The management server infrastructure in HPE ConvergedSystem 700 for VMware utilizes VMs based on Windows Server 2016 R2 Standard. As a result,<sup>35</sup> the solution includes the Microsoft licenses required to support two VMs per management server.

## Licensing considerations for HPE ConvergedSystem 700 for Hyper-V

Hyper-V is an integrated component of Windows Server 2012 R2. Each management and workload server managed in the Hyper-V solution requires Windows Server 2012 R2 and System Center 2012 R2 Datacenter Edition licenses. HPE ConvergedSystem 700 2.0 does not include the Windows Server 2012 R2 Datacenter or System Center 2012 R2 Datacenter required licenses and they must be purchased separately or provided by the customer.

## Support considerations for Cisco switches

If Cisco switches are included as part of the HPE ConvergedSystem 700, and the customer has an issue, the first call should be to HPE where the best course of action will be determined. If the issue is found to be with the Cisco switch, the customer will be directed to contact Cisco directly.

HPE does not provide hardware replacement, operating system software updates, or technical support for Cisco switches other than basic troubleshooting for connectivity to solution components. It is highly recommended that the customer purchase Cisco SMARTnet Service for each Cisco Nexus switch included in the HPE ConvergedSystem 700. You may purchase Cisco SMARTnet Service through Cisco's global network of qualified Cisco Partners or contact your Cisco client service manager. To locate a partner near you, use the [Cisco Partner Locator](#).

## Appendix A—Solution hardware configuration

Table 4 outlines the hardware configurations deployed in HPE ConvergedSystem 700 based on the number of workload servers and the particular storage solution selected.

**Table 4.** Hardware and software configurations

Component	Quantity	Description
Workload server	2–16 per HPE BladeSystem c7000 enclosure	HPE ProLiant BL460c Gen9 or HPE ProLiant WS460c Gen9 single wide server blade each with: <ul style="list-style-type: none"> <li>• 2 x Intel® Xeon® processor: E5-2600 v3/v4 series</li> <li>• 64 GB–1 TB RAM</li> <li>• HPE Smart Array P244br controller and 1G FBWC</li> <li>• Optional 2 x SAS hard drives (300 GB/15,000 rpm, 450 GB/10,000 rpm, or 600 GB/10,000 rpm)</li> <li>• 1 x HPE FlexFabric 20Gb 2-port 650FLB FIO Adapter</li> </ul>
	2–16 per HPE BladeSystem c7000 enclosure	HPE ProLiant WS460c Gen9 graphics server blade <ul style="list-style-type: none"> <li>• NVIDIA M6 Graphic accelerator card (up to 4x M6 cards with WS460c multi GPU carrier)</li> <li>• Mixed blade environment supported</li> </ul>

**Note:** 2–16 HPE ProLiant BL460c Gen9 or HPE ProLiant WS460c Gen9 single wide blade per HPE BladeSystem c7000 enclosure.

2–8 HPE ProLiant BL460c Gen9 or HPE ProLiant WS460c Gen9 double wide with GPU carrier per HPE BladeSystem c7000 enclosure

<sup>35</sup> Unless you opt to omit the Microsoft licenses.

Component	Quantity	Description
Management server	2 to 4 (See Note) <b>Note:</b> Single rack supports up to three management servers max. CloudSystem SW option will require an additional 10Gb NIC for each DL360 Gen9 management server on the order.	HPE ProLiant DL360 Gen9 server, each with: <ul style="list-style-type: none"> <li>• 2 x Intel® Xeon® Processor E5-2680 v3/v4 series</li> <li>• 256 GB RAM</li> <li>• HPE Smart Array P440ar controller with 2 GB FBWC</li> <li>• 8 x SAS hard drives (600 GB/10,000 rpm)</li> <li>• HPE FlexFabric 10Gb 2-port 556FLR-SFP+ Adapter</li> <li>• HPE 82Q 8Gb Dual Port PCIe Fibre Channel Host Bus Adapter</li> <li>• Optional PCI Card: HPE StoreFabric CN1200E 10Gb CNA</li> <li>• SATA DVD-RW optical drive</li> </ul>
HPE 3PAR StoreServ storage	8200 2N	HPE 3PAR StoreServ 8200 storage in a 42U HPE i-Series rack
	8400 2N or 4N	HPE 3PAR StoreServ 8400 storage in a 42U HPE i-Series rack
	8440 2N or 4N	HPE 3PAR StoreServ 8440 storage in a 42U HPE i-Series rack
	8450 2N or 4N	HPE 3PAR StoreServ 8450 storage in a 42U HPE i-Series rack
		Note: For more information on storage support in particular HPE ConvergedSystem 700 solutions, refer to Table 1.
Network switches (HPE option)	2 (4 when greater than 4 enclosures) 2	HPE FlexFabric 5940 48SFP+ 6QSFP+ switches HPE FlexFabric 5900AF-48G-4XG-2QSFP+ switches (multi-rack only)
HPE 5930 switch segregated option:	2	Multi-rack segregated configuration: HPE FlexFabric 5930 switch; 2-slot or 4-slot Can be used as pure Ethernet switch in place of 2 x HPE FlexFabric 5940 48SFP+ 6QSFP+ switches Single-rack configuration: HPE FlexFabric 5930 switch; 2-slot Can be used as pure Ethernet switch in place of 2 x HPE FlexFabric 5940 48SFP+ 6QSFP+ switches
Network switches (Cisco option)	2	Cisco Nexus 56128P
	2	Cisco Nexus 3048TP
	2 when greater than 4 enclosures	Cisco Nexus 2348PQ
	2 (4 when greater than 4 enclosures) 2	Cisco Nexus C9396PX Cisco Nexus 3048TP
SAN switches	2 (4 when greater than 4 enclosures)	HPE SN6000B 16Gb 48/24 Fibre Channel switches (with an optional upgrade to activate 24 additional ports) or HPE SN6000B 16Gb 48/48 Fibre Channel switches (multi-rack and single rack with SAN switch option)
HPE 5930 switch converged option:	2	Multi-rack converged configuration only: HPE FlexFabric 5930 switch can be used as converged SAN and Ethernet switch
	Flat SAN	Single-rack only
Infrastructure	1–8	HPE BladeSystem c7000 platinum enclosure, each with: <ul style="list-style-type: none"> <li>• 2 x HPE Virtual Connect FlexFabric 20/40 F8 modules</li> <li>• 2 x HPE Onboard Administrator for the HPE BladeSystem c7000 enclosure</li> </ul>
	1 (1 or 2 c7000 enclosures) or 2 (3, 4, or 5 c7000 enclosures) or 3 (6, 7, or 8 c7000 enclosures)	HPE i-Series rack—42U compute rack
	1–2 (Array 1 rack + Optional Array 1 extension rack) 3–4 (Optional Array 2 Rack + Array 2 extension rack)	HPE i-Series rack—42U storage rack

## Resources and additional links

Contact Hewlett Packard Enterprise [hpe.com/contact](http://hpe.com/contact)

HPE ConvergedSystem 700 Firmware and Software Compatibility Matrix <http://h20564.www2.hpe.com/hpsc/doc/public/display?docId=c04822043>

HPE Pointnext Services [hpe.com/info/services](http://hpe.com/info/services)

HPE ConvergedSystem 700 [hpe.com/info/cs700](http://hpe.com/info/cs700)

HPE and VMware [hpe.com/partners/vmware](http://hpe.com/partners/vmware)

HPE Helion CloudSystem [hpe.com/info/cloudsystem](http://hpe.com/info/cloudsystem)

HPE OneView [hpe.com/info/hpeov](http://hpe.com/info/hpeov)

HPE Factory Express [hpe.com/info/factoryexpress](http://hpe.com/info/factoryexpress)

HPE Networking [hpe.com/networking](http://hpe.com/networking)

HPE Storage [hpe.com/storage](http://hpe.com/storage)

HPE Servers [hpe.com/servers](http://hpe.com/servers)

HPE ConvergedSystem 700 QuickSpecs <http://h20195.www2.hpe.com/V2/GetDocument.aspx?docname=c04505387>

HPE Reference Architectures, [hpe.com/info/ra](http://hpe.com/info/ra)

To help us improve our documents, please provide feedback at [hpe.com/contact/feedback](http://hpe.com/contact/feedback).



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