Hewlett Packard Enterprise

HPE Reference Architecture for VMware Cloud Foundation 5.2.1 on HPE ProLiant servers

HPE ProLiant DL325 Gen11 Server as Management Domain Hosts and
HPE ProLiant DL380 Gen11 Server as Workload Domain Hosts

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Executive summary

Businesses face challenges to turn ideas into services faster, respond quickly to new customer demands, and innovate better by building new services with technology to stay competitive. To meet these business demands, IT is increasingly adopting new cloud technologies, to replace expensive hardware with a software-defined model. Enterprises need an ideal Hybrid IT model that supports both traditional and cloud-native applications. Therefore, businesses are moving towards digital transformation and software-defined data center (SDDC) solutions to support this shift.

Hewlett Packard Enterprise and VMware by Broadcom collaborate to help customers accelerate the journey to the hybrid cloud and bring the promise of the software-defined data center to life. The combination of both HPE ProLiant DL servers Infrastructure and VMware SDDC solution improves business outcomes and overall value for our customers. HPE ProLiant DL servers combined with VMware Cloud Foundation™ (the solution) provides a software-defined infrastructure platform that delivers elastic, agile infrastructure to accelerate time to market, increases innovation and reduces TCO. Standardized cloud building blocks are leveraged to optimize efficiency, performance, and resilience for VM and container-based workloads. Extensible, full-stack architecture provides on-ramp to multi-cloud with a consistent cloud operating model. Solution simplifies enterprise operations through infrastructure automation and advanced life cycle management across geographic boundaries and accelerates cloud adoption and easily migrates workloads across multi-cloud deployments with complete management and visibility. In addition, it provides advanced protection against cyberattacks through distributed firewalling and VMware-managed context-aware security and enhances data protection and improves resilience through integration with Disaster Recovery as-a-Service.

For enterprise customers looking to accelerate their journey to hybrid cloud, HPE ProLiant DL servers with VMware Cloud Foundation are the right solution to support and run all your enterprise apps—both traditional and containerized—in a cloud environment.

This Reference Architecture provides typical use case guidance for deploying and managing VMware Cloud Foundation on HPE ProLiant DL servers and the deployment of the vSphere Lifecycle Manager (vLCM) based management domain and VI workload domain. VMware Validated Solutions (VVS) are technically validated implementations, serving as a blueprint for SDDC implementation. VVS can be used along with the VMware Cloud Foundation 5.2.1 documentation and HPE's Reference Architecture, to build VMware Cloud Foundation 5.2.1 as a private cloud on HPE ProLiant DL300 Servers. For more information on VMware Validated Solutions, refer VMware Validated Solutions for VCF 5.2.1.

Benefits include:

- Combines HPE ProLiant DL servers with VMware Cloud Foundation from a deployment and lifecycle perspective, in a cost-effective and simplified management model for faster time to value.
- A traditional virtual infrastructure (VI) traditional data center that is simple to operate in a VMware Cloud Foundation workload domain.
- Ability to begin with a small infrastructure footprint and expand on-demand to quickly meet changing business requirements.
- Remediate drivers and firmware upgrades in a single maintenance window along with ESXi™ update for a vLCM-based workload domain through the Hardware Support Manager (HSM) service integrated into HPE OneView for VMware vCenter® (OV4vC) plug-in.

Application Virtual Network (AVN) is a software-defined overlay network that provides many benefits in SDDC such as simplified data mobility, improved security, and disaster recovery procedures. The use of AVN in VMware Cloud Foundation 5.2.1. is optional however, it is required to set up and use the optional Aria suite of products. Aruba CX 8325 switches that support up to 100Gb per port, high-performance server connectivity, and the capability to handle virtual environments are used as top of rack switches (TORs) and Aruba 6300M switches are used as out of management switches in the solution.

Target audience: This document is intended for IT decision-makers as well as architects, system engineers, and system administrators who want to understand enterprise-ready private cloud solutions using the HPE ProLiant DL servers and VMware Cloud Foundation. The reader should have a solid understanding of and familiarity with VMware Cloud Foundation, Enterprise Networking, and HPE ProLiant DL servers.

Document purpose: The purpose of this document is to demonstrate a validated use case of an enterprise-ready private cloud solution by combining the value of VMware Cloud Foundation and HPE ProLiant DL servers Infrastructure that is general-purpose, flexible, and easy to deploy. Customers can follow the recommendations detailed in this document to deploy the private cloud in a green field environment. The intent of this document does not claim to define the only supported deployment scenario or cover every scenario and use case found in various customer environments.

This Reference Architecture describes solution testing performed in December 2024.

Solution overview

This Reference Architecture demonstrates a typical use case best practices for customers building a cloud solution in an enterprise data center and deploying business-critical applications in an automated manner. The solution design is based on VMware Cloud Foundation on HPE ProLiant DL servers. VMware Cloud Foundation provides a unified SDDC platform comprising VMware vSphere® Hypervisor, VMware Virtual SAN™ Storage (vSAN), and VMware NSX networking.

This Reference Architecture demonstrates the following components for VMware Cloud Foundation:

- **HPE ProLiant Servers** - HPE ProLiant DL325 Gen11 Servers as management and HPE ProLiant DL380 Gen11 Servers as workload domain hosts.
- **HPE OneView** - HPE OneView management appliance deploys and maintains infrastructure faster, simplifies IT operations, and increases productivity.
- **HPE OneView for VMware vCenter** – HPE OneView for VMware vCenter (OV4vC) facilitates remediation on the servers via vSphere Lifecycle Manager (vLCM) in addition to HPE hardware management and monitoring tasks.
- **vSphere Lifecycle Manager** - vLCM, a vCenter service, integrated with VMware Cloud Foundation helps to create and remediate cluster images for centralized and simplified lifecycle management of ESXi hosts including firmware.
- **VMware Cloud Foundation lifecycle management** – It is the process of performing patch updates or upgrades to the underlying management components of VMware Cloud Foundation instance through SDDC Manager.

Figure 1 shows the physical rack layout showcasing the solution components validated in this Reference Architecture.

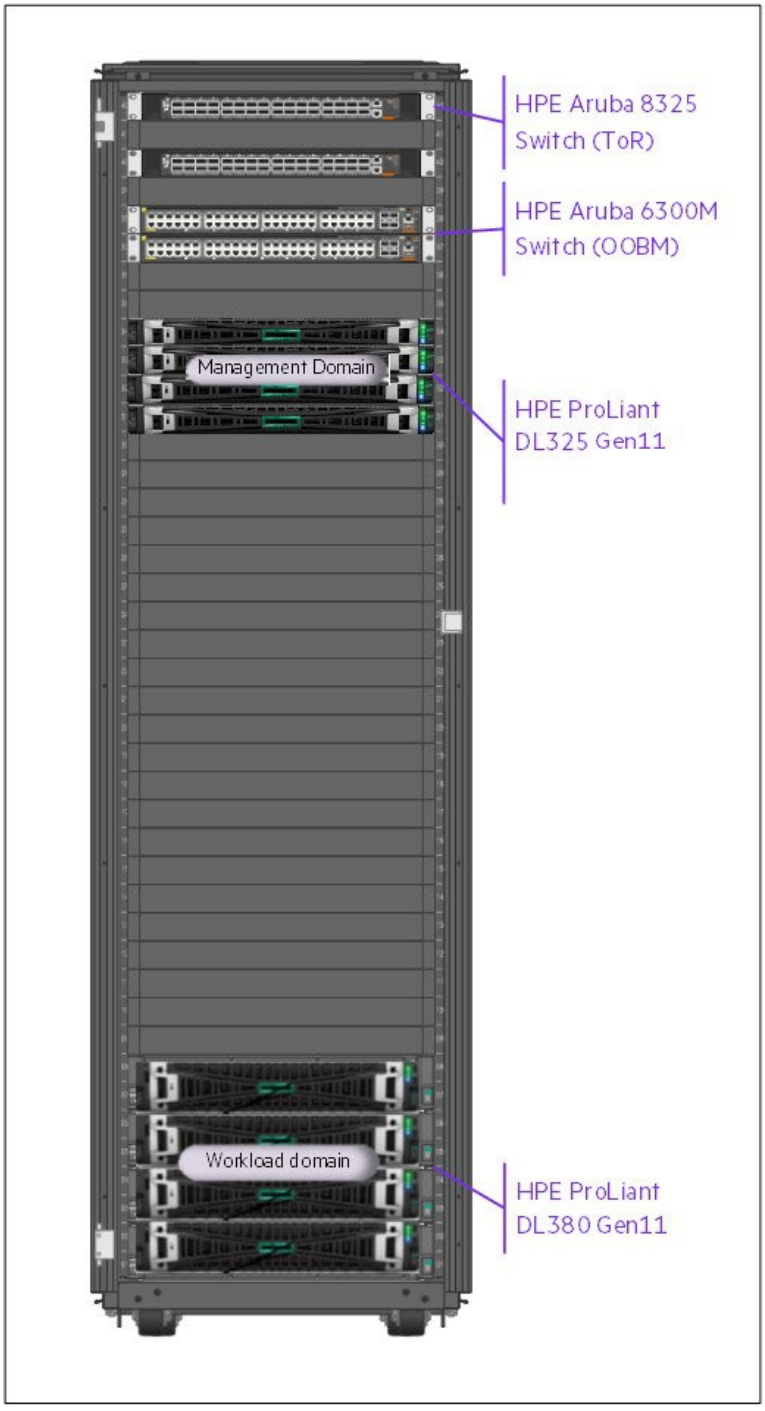

Figure 1. Physical rack layout showcasing the solution components.

Solution components

The VMware Cloud Foundation on the HPE ProLiant DL servers is validated with the following hardware and software components. For additional component details, refer to the VMware Cloud Foundation 5.2.1 Release notes at https://techdocs.broadcom.com/us/en/vmware-cis/vcf/vcf-5-2-and-earlier/5-2/vcf-release-notes/vmware-cloud-foundation-521-release-notes.html, and the VMware Cloud Foundation frequently asked questions at https://core.vmware.com/resource/vmware-cloud-foundation-frequently-asked-questions-faq. VMware Cloud Foundation is supported on vSphere-compatible server hardware which meets the minimum requirements for VMware Cloud Foundation and the desired workloads.

For more information on VMware Cloud Foundation 5.2.1 software and firmware used in this reference architecture, refer to HPE Firmware and Software Compatibility Matrix for VMware Cloud Foundation 5.2.1.

Hardware

Table 1 shows the hardware components used in this solution.

Table 1. HPE hardware components

Components	Quantity	Description
HPE ProLiant DL325 Gen11 server (Management domain node)	4	• 1 x AMD® EPYC® 9334P (2.7GHz/32-core/210W) • 6 x 64 GB RAM • 1 x HPE MR216i-o Gen11 x16 Lanes without Cache OCP SPDM Storage Controller • 2 x 1.6TB NVMe Gen4 High Performance Mixed Use SFF BC Self encrypting FIPS U.3 CM6 SSD as boot drives • 8 x HPE 1.6TB NVMe Gen4 High Performance Mixed Use SFF BC U.3 PM1735a SSD for vSAN • 1 x Mellanox MCX631102ASADAT Ethernet 10/25Gb 2-port SFP28 Adapter • 1 x Mellanox MCX631432ASADAI Ethernet 10/25Gb 2-port SFP28 OCP3 Adapter
HPE ProLiant DL380 Gen11 server (Workload domain node)	4	• 2 x Intel Xeon-Gold 6438Y+ 2.0GHz 32-core 205W Processor for HPE • 12 x 64 GB RAM • 1 x HPE MR216i-o Gen11 x16 Lanes without Cache OCP SPDM Storage Controller • 2 x HPE 960GB SATA 6G Mixed Use SFF BC Multi-Vendor SSD as boot drives • 8 x HPE 6.4TB NVMe Gen4 High Performance Mixed Use SFF BC U.3 PM1735a SSD for vSAN • 1 x Mellanox MCX631432AS-ADAI Ethernet 10/25Gb 2-port SFP28 OCP3 Adapter • 1 x Mellanox MCX631102AS-ADAT Ethernet 10/25Gb 2-port SFP28 Adapter
Aruba CX 8325 Switch	2	Aruba 8325-32C Power to Port Airflow 6 Fans 2 Power Supply Units
Aruba CX 6300M Switch	2	Aruba 6300M 48G Power to Port Airflow 2 Fans 1 Power Supply Unit

For additional details on vSAN Ready Nodes, refer to the Broadcom Compatibility Guide (BCG) for vSAN and VMware Cloud Foundation Planning and Preparation Guide.

HPE ProLiant DL325 Gen11 server

The HPE ProLiant DL325 Gen11 server is a low-cost 1 rack unit dual processor solution that delivers exceptional value balancing compute, memory and network bandwidth. Powered by 4th Generation AMD EPYC™ Processors with up to 128 cores, increased memory bandwidth (up to 3 TB), high-speed PCIe Gen5 I/O and EDSFF storage, and supporting up to two GPUs at the front, this server is a superb low-cost, 1U 1P, performance solution suitable for virtualized workloads. This solution leverages four (4) HPE ProLiant DL325 Gen11 servers to deploy VMware Cloud Foundation management domain.

Figure 2 shows the HPE ProLiant DL325 Gen11 server.

Figure 2. HPE ProLiant DL325 Gen11 server

HPE ProLiant DL380 Gen11 server

The secure 2P 2U HPE ProLiant DL380 Gen11 servers are adaptable for diverse workloads and environments and deliver world-class performance with the right balance of expandability and scalability. Designed for supreme versatility and resiliency while being backed by a comprehensive warranty makes it ideal for multiple environments from Containers to Cloud to Big Data. This solution leverages four (4) HPE ProLiant DL380 Gen11 servers to deploy VMware Cloud Foundation workload domain.

Figure 3. HPE ProLiant DL380 Gen11 server

Aruba CX 6300M Switch

The Aruba CX 6300M Switch Series is a modern, flexible and intelligent family of stackable switches ideal for enterprise network access, aggregation, core, and data center top of rack (ToR) deployments. Created for game-changing operational efficiency with built-in security and resiliency. The Aruba 6300M 48-port 1GbE and 4-port SFP56 (R9F63A) switch provide the foundation for high-performance networks supporting IoT, mobile, and cloud applications. Figure 3 shows the front view of the Aruba CX 6300M Switch.

Figure 4. Aruba CX 6300M Switch

Aruba CX 8325 Switch Series

The Aruba CX 8325 Switch Series offers a flexible and innovative approach to addressing the application, security, and scalability demands of the mobile, cloud, and IoT era. These switches serve the needs of the next-generation core and aggregation layer, as well as emerging data

center requirements at the Top of Rack (ToR) and End of Row (EoR). They provide over 6.4Tbps of capacity, with line-rate Gigabit Ethernet interfaces including 1Gbps, 10Gbps, 25Gbps, 40Gbps, and 100Gbps. The Aruba CX 8325 Switch series includes industry-leading line rate ports 1/10/25GbE (SFP/SFP+/SFP28) and 40/100GbE (QSFP+/QSFP28) with connectivity in a compact 1U form factor. These switches offer a fantastic investment for customers wanting to migrate from older 1GbE/10GbE to faster 25GbE, or 10GbE/40GbE to 100GbE ports.

Figure 5 shows the front view of the Aruba CX 8325 32Y8C Switch.

Figure 5. Aruba CX 8325 Switch

Software

Tables 2, 3, and 4 list the software components used in this solution.

Table 2. HPE software and firmware components

Component	Version
HPE ProLiant DL380 Gen11 server's Service Pack for ProLiant (SPP)	2024_0923.23 (P76088_001_gen11spp-2024.09.00.00-Gen11SPP2024090000.2024_0923.23.iso) Base Packages • Gen11 Service Pack for ProLiant 2024.09.00.00
HPE OEM image for vSphere 8.0 Update 3b	VMware-ESXi-8.0.3-24280767-HPE-803.0.0.11.8.0.6-Oct2024
HPE Add-On	HPE-803.0.0.11.8.0.6-Sep2024-Addon-depot.zip
Aruba CX 6300M Switch	10.13.1040
Aruba CX 8325 Switch (R9F67A)	10.13.1040
Aruba Fabric Composer	7.0.4
HPE G2 Metered and Switches PDUs	2.0.0.T

Table 3. VMware software components

Component	Version
Cloud Builder VM	5.2.1 (Build: 24307856)
SDDC Manager	5.2.1 (Build: 24307856)
VMware vCenter Server®	8.0 Update 3c (Build: 24305161)
VMware vSphere 8.0 ESXi	8.0 Update 3b (Build: 24280767)
VMware vSAN™	8.0 Update 3b (Build: 24280767)
VMware NSX	4.2.1 (Build: 24304122)
VMware Aria Suite Lifecycle	8.18 (Build: 24029603)

Table 4. HPE Solution Integration software for VMware

HPE Solution Component	Version
HPE OneView (Virtual Appliance)	9.10.01 (HPE_OneView_9.10.01_ESXi_Z7550-97837.ova)
HPE OneView for VMware vCenter (OV4VC) plug-in	11.6

For more information on VMware Cloud Foundation 5.2.1 software and firmware, refer to the HPE Firmware and Software Compatibility Matrix for VMware Cloud Foundation 5.2.1.

VMware Cloud Foundation

VMware Cloud Foundation is the industry's most advanced enterprise-ready hybrid cloud platform providing a complete set of software-defined services for compute, storage, networking, security, and cloud management to run enterprise apps whether it is traditional or containerized. VMware Cloud Foundation drastically simplifies data center operations by deploying standardized and validated architecture with built-in lifecycle automation of the cloud stack. VMware Cloud Foundation orchestrates, provisions, and deploys an SDDC platform by integrating VMware vSphere, vSAN, and NSX into a full-stack HCI solution that delivers enterprise-ready cloud infrastructure.

Figure 6 shows the overview of VMware Cloud Foundation components.

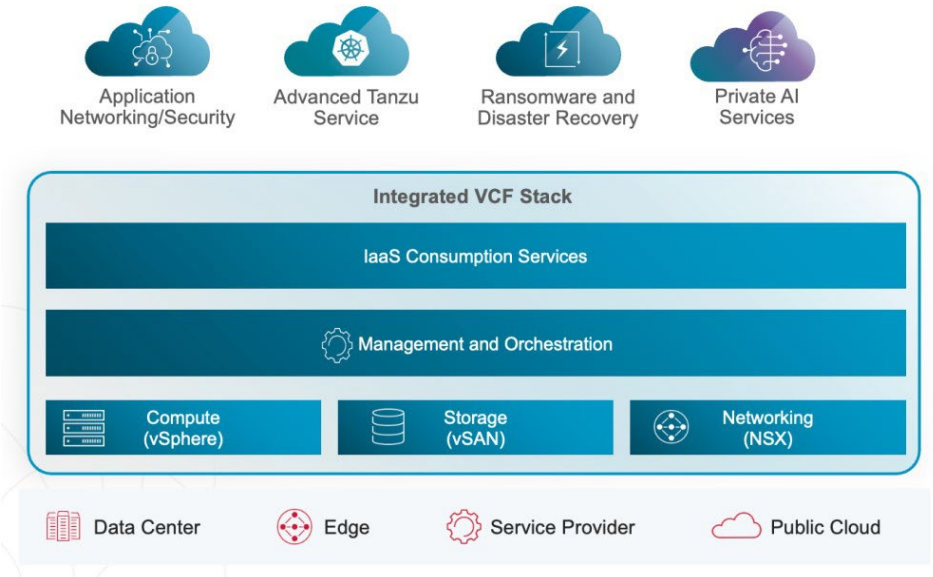

Figure 6. VMware Cloud Foundation components

VMware Cloud Foundation components

The core components of VMware Cloud Foundation are as follows:

For more information on VMware Cloud Foundation components and its use cases, refer to VMware Cloud Foundation datasheet.

Cloud Foundation Builder VM

The Cloud Foundation Builder VM is a one-time use VM during greenfield deployment that deploys and configures the management domain and transfers inventory and control to SDDC Manager. During the deployment process, the Cloud Foundation Builder VM validates network information provided in the deployment parameter spreadsheet such as DNS, network (VLANs IP Address, MTUs), and credentials. After the management domain is up and the SDDC Manager is running, the Cloud Foundation Builder VM must be powered off and archived.

Table 5 shows the Cloud Foundation Builder VM resource requirements.

Table 5. Cloud Foundation Builder VM resource requirements

Components	Requirements
CPU	4 vCPUs
Memory	4 GB
Storage	279 GB 25.1 GB (thin provisioned) 253.8 GB (thick provisioned)

SDDC Manager

SDDC Manager manages the implementation of the VMware Cloud Foundation system, creates and manages workload domains, and performs lifecycle management to ensure the software components remain up to date. SDDC Manager also monitors the logical and physical resources of VMware Cloud Foundation. It allows data center administrators to configure the additional hosts and racks into a logical pool of resources and thus multiple racks can be managed as a single VMware Cloud Foundation System. SDDC Manager controls these processes by using workflows. Each workflow comprises a series of tasks that are executed by the SDDC Manager.

VMware vCenter Server

VMware vCenter Server provides management of a VMware virtualized environment with one or more ESXi hosts. SDDC Manager deploys one VMware vCenter Server per workload domain. By default, all vCenter Servers are configured in enhanced linked mode.

VMware vSphere (ESXi)

ESXi is a type 1 hypervisor used to implement virtualization on bare-metal systems. ESXi provides compute virtualization within the software-defined data center, and it is a foundational building block for implementing a private cloud.

VMware vSAN

VMware vSAN aggregates local or direct-attached data storage devices to create a single storage pool shared across all hosts in the vSAN cluster. vSAN eliminates the need for external shared storage and simplifies storage configuration and virtual machine provisioning.

VMware NSX

VMware NSX is designed to address application frameworks and architecture that have heterogeneous endpoints and technology stacks. In addition to vSphere, this environment may include other hypervisors, containers, bare metal, and public clouds. NSX allows IT and development teams to choose the technologies best suited for their applications. NSX is also designed for management, operations, and consumption by development organizations besides being used by IT.

VMware vSphere Lifecycle Manager

VMware vSphere Lifecycle Manager is the next version of Update Manager that enables centralized, automated patch, and version management for VMware vSphere. VMware vSphere Lifecycle Manager provides the functionality to upgrade and patch ESXi. VMware vSphere Lifecycle Manager along with HPE OneView Hardware Support Manager (HSM) plug-in can also perform server firmware, drivers, and software updates in the same maintenance window as the ESXi server operating system updates.

HPE Software Solution Integration components

HPE OneView

HPE OneView is a management appliance used to deploy and maintain infrastructure faster, simplify IT operations, and increase productivity. It lets businesses simplify and automate today's complex hybrid IT infrastructure. Through software-defined intelligence, HPE OneView takes a template-driven approach for deploying, provisioning, updating, and integrating compute, storage, and networking infrastructure.

HPE OneView Hardware Support Manager (HSM)

The HPE Hardware Support Manager plug-in for VMware vSphere Lifecycle Manager allows users to update server's firmware in the same maintenance window as the ESXi server Operating System updates, with a single reboot if possible.

HPE OneView for VMware vCenter

HPE OneView for VMware vCenter is a VMware vCenter plugin that provides server hardware management capabilities, including comprehensive monitoring, firmware update, vSphere/ESXi image deployment, remote control, and power optimization for HPE servers in the VMware environment. HPE OneView HSM is integrated inside HPE OneView for VMware vCenter.

Design and configuration guidance

The following section describes an example of the high-level steps necessary for deploying VMware Cloud Foundation on HPE ProLiant DL servers. The sections are grouped into Infrastructure, management domain, and workload domain roles.

Infrastructure configuration

Aruba CX 6300M Switches configuration

Aruba CX 6300M switches are the out-of-band management switches in this solution. Both Aruba CX 6300M switches are configured for Virtual Switching Framework that virtualizes two physical devices into one Virtual Fabric to provide high availability and scalability. All the HPE ProLiant DL Server's iLO connects to the solution management network configured on Aruba CX 6300M switches. HPE Integrated Lights-Out enables the remote management of HPE ProLiant DL Servers securely from anywhere on this solution management network.

Aruba CX 8325 Switches configuration

Aruba CX 8325 Switches should be connected and configured for Virtual Switching Extension (VSX) that virtualizes the control plane of two aggregation switches to function as one device at layer 2 and as independent devices at layer 3. Aruba's VSX has been designed from the ground up to provide industry-leading performance and high availability (HA) with much-needed simplicity. This is accomplished through the resiliency of AOS-CX, a modern network operating system that performs continuous state synchronization.

All the VLANs required for VMware Cloud Foundation deployment should be created on the top-of-rack (ToR) switches. The Ethernet ports on the Aruba CX 8325 Switches should be trunk enabled allowing all VLANs required for the VMware Cloud Foundation stack.

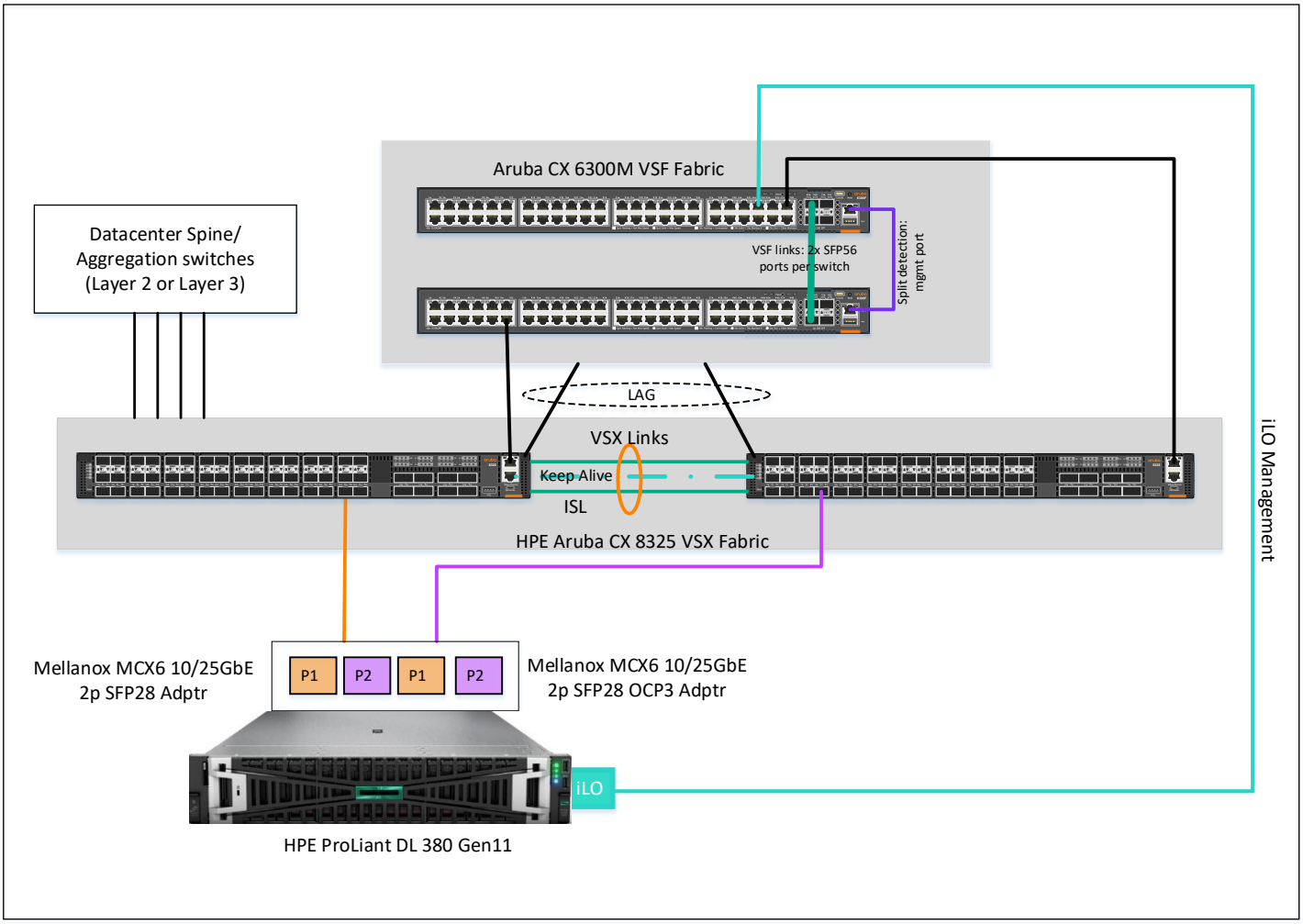

Figure 7. Network layout with Aruba Switches

Aruba Fabric Composer (AFC)

Aruba Fabric Composer is an intelligent, API-based, software-defined orchestration solution that simplifies and accelerates leaf-spine network provisioning and day-to-day operations across rack-scale compute and storage infrastructure. Aruba Fabric Composer orchestrates is a discrete set of switches as a single entity called a fabric which significantly simplifies operations and troubleshooting. Aruba's data center orchestration solution is fully infrastructure and application-aware providing automation of various configuration and lifecycle events. It also has key integrations with the VMware stack (SDDC Manager, vSphere/vCenter, NSX to help with automation, visibility, and troubleshooting across the virtual and physical networks.

To know more about Aruba Fabric Composer (AFC), refer to https://www.arubanetworks.com/en-in/products/switches/core-and-data-center/fabric-composer/.

In this solution, Aruba CX 6300 OOBM management switches and Aruba CX 8325 data switches are orchestrated from the single AFC user interface providing connectivity visualizations and automation of onsite deployments and day-to-day operations.

Aruba Fabric Composer available in OVA format is deployed as a virtual machine on a standalone ESXi server. This ESXi server has connectivity to the solution management network and is also used to host other infrastructure virtual machines such as NTP and DNS, which are necessary to deploy this cloud solution. To begin with, both Aruba CX 6300M switches and Aruba CX 8325 switches are configured with management IPs that belong to the solution management network. A pair of Aruba CX 6300 OOBM switches and Aruba CX 8325 switches are onboarded to AFC as part of the Aruba fabric before proceeding to configure VLANs needed support VMware Cloud Foundation deployment. AFC UI helps avoid command-line interface to perform all network configurations, providing increased visibility and control.

Figure 8 shows both OOBM and data switches onboarded to Aruba Fabric Composer.

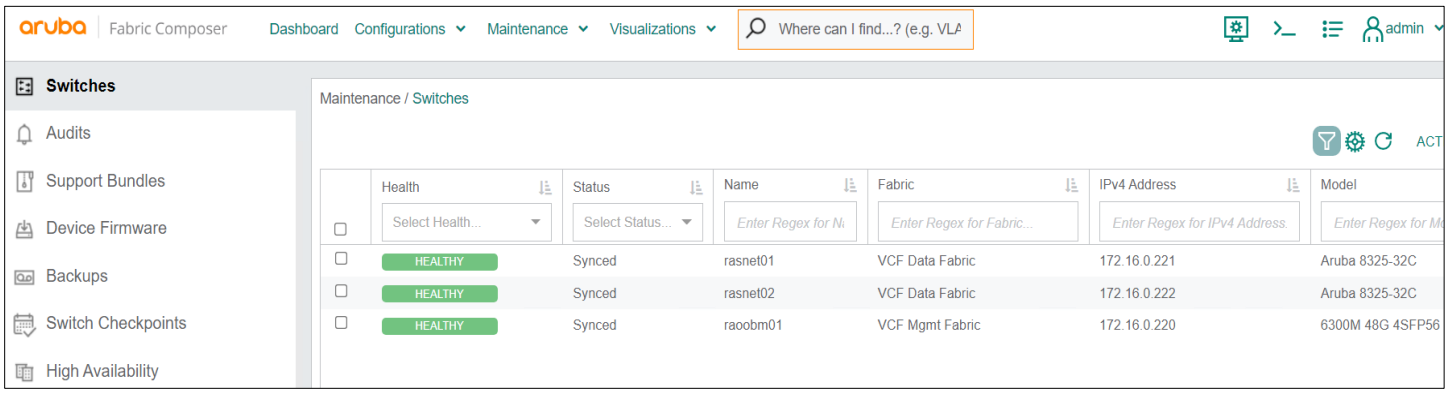

Figure 8. Aruba switches onboarded to Aruba Fabric Composer

Aruba VSX, if not already configured, can also be configured from the Aruba Fabric Composer. Multi-Chassis Link Aggregation Group between OOBM and data switches can also be configured through Aruba Fabric Composer.

Figure 9 shows MC-LAG and Aruba 8325 VSX Inter-Switch Link configured through AFC.

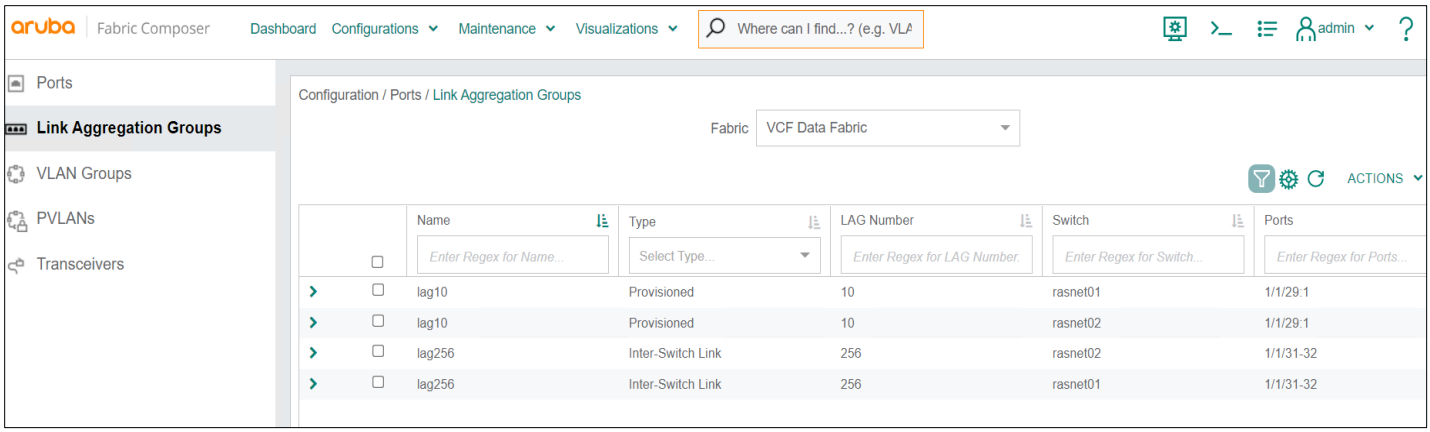

Figure 9. MC-LAG and ISL configured through Aruba Fabric Composer

VLANs required for VMware Cloud Foundation deployment should be configured on both Aruba CX 8325 switches. Since the control plane is separate for paired Aruba CX 8325 switches, each interface VLANs must be created on both the switches.

Figures 10 and 11 shows one of the switch virtual interface created on Aruba CX 8325 switch with an active gateway through the AFC.

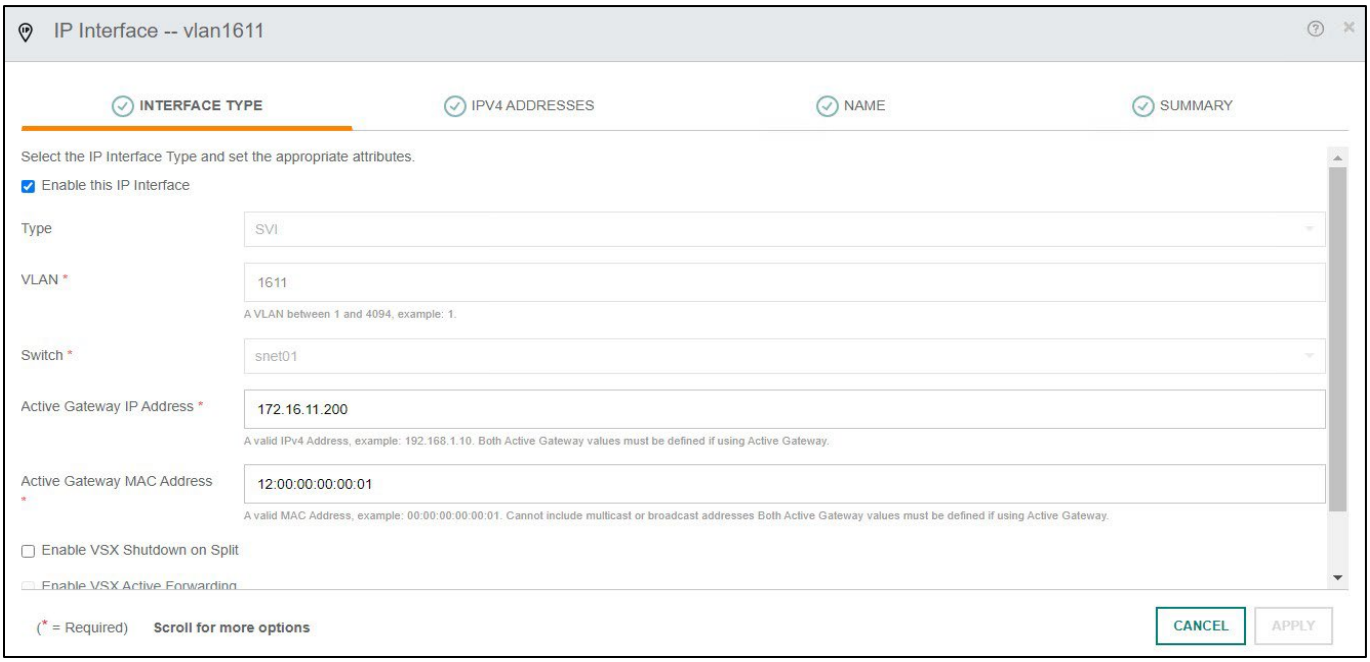

Figure 10. Interface VLAN created through Aruba Fabric Composer

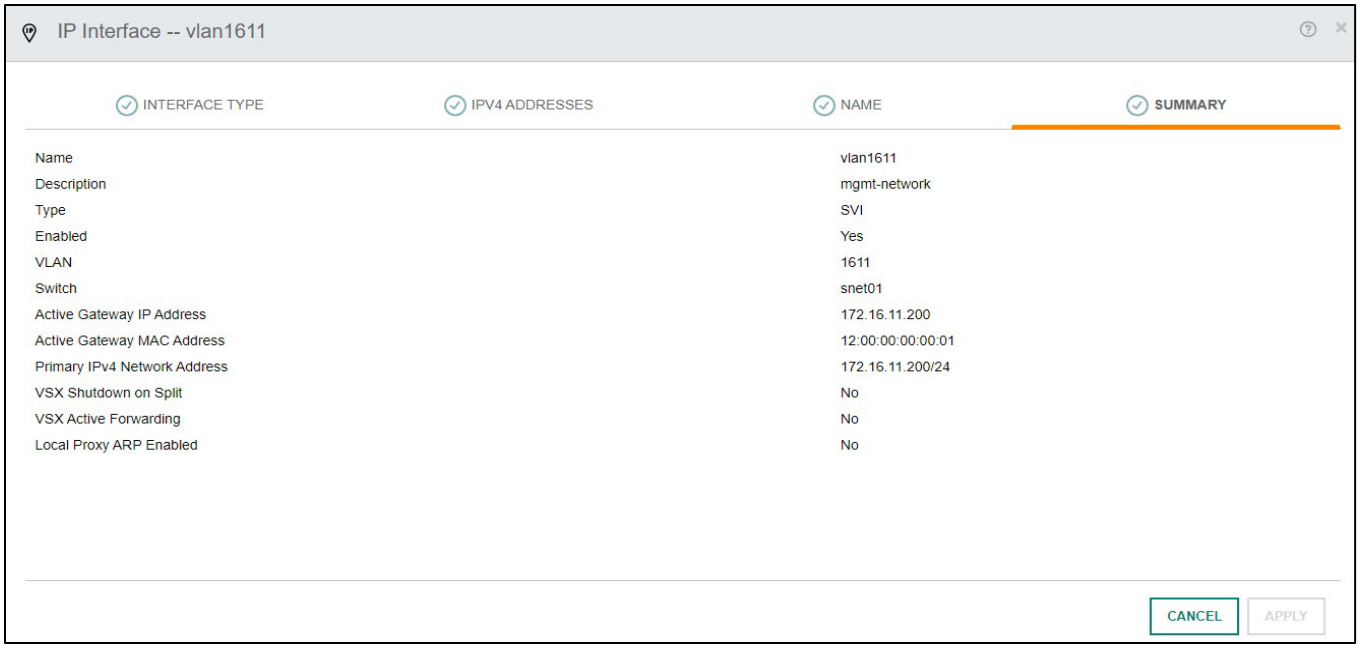

Figure 11. Summary of Interface VLAN created through Aruba Fabric Composer

All the interface VLANs required for VMware Cloud Foundation management domain deployment, workload domain deployment, and edge cluster deployment are configured through Aruba Fabric Composer. Figure 12 shows the solution VLANs configured through the Aruba Fabric Composer.

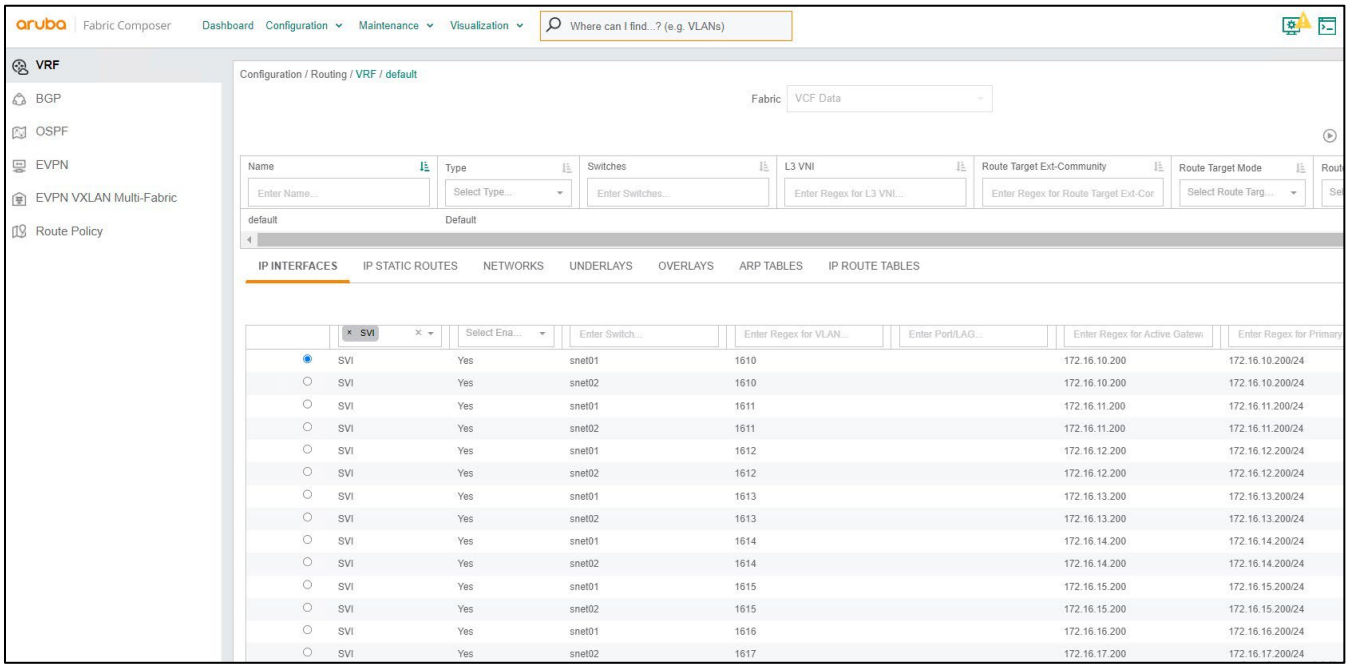

Figure 12. Solution VLANs created through Aruba Fabric Composer

HPE ProLiant DL Gen11 Server configuration

1. Deploy ESXi on all management and workload domain servers.
2. Configure VLAN ID, IP Address, DNS server IP, and FQDN for all the ESXi nodes through ESXi DCUI.
3. Configure Network Time Protocol (NTP) on an ESXi host using the vSphere Client.
4. Start SSH and NTP services on an ESXi host using the vSphere Client.
5. Update the VLAN ID of the VM Network to 'VM Management VLAN'
6. Regenerate certificates on all ESXi hosts to ensure correct common name based on newly added host FQDN.
7. Disable the SSH service on an ESXi host.

Management domain bring-up

1. Download the VMware Cloud Foundation parameter sheet from VMware downloads.
2. Deploy Cloud Builder Virtual Machine (CBVM) on one of the HPE ProLiant DL servers chosen for the management domain.
3. Fill in the parameter sheet and upload the VMware Cloud Foundation parameter sheet in the CBVM for the VMware Cloud Foundation management domain that deploys the SDDC Manager, vCenter Server, NSX, and vSAN.
4. After the SDDC Manager bring-up is successful, verify vCenter and SDDC Manager have no errors to be resolved.
5. Power off and delete the CBVM.
6. Enable vSAN performance service.

Cloud-builder parameter sheet

After cloud-builder VM is deployed, a parameter sheet filled with deployment details is uploaded to the cloud-builder to bring up the SDDC. The DNS server mentioned in the parameter sheet should have the DNS records for all the VMware Cloud Foundation software components contained in the parameter sheet.

Figure 13 highlights the VLANs, Static IP Pool support for NSX host overlay, and support for vDS profiles in the Hosts and Networks tab of the parameter sheet. VMware Cloud Foundation 5.2.1 supports a separate network for the management VMs that allows for traffic isolation between management VMs and ESXi host management VM kernel Interfaces.

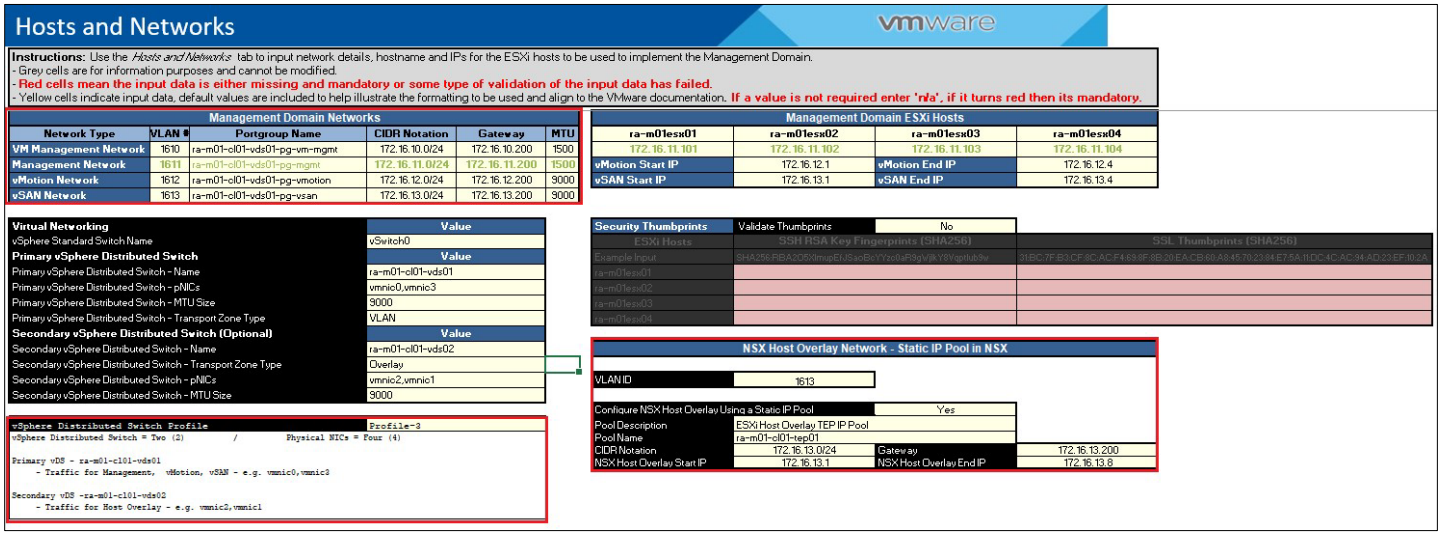

Figure 13. Hosts and Networks details in the VMware Cloud Foundation deployment parameter sheet

vSphere Distributed Switch Profile as shown in the above VMware Cloud Foundation parameter sheet allows deploying an SDDC with a custom VDS design. VMware Cloud Foundation 5.2.1 provides three (3) vSphere Distributed Switch profiles that perform host bring-up with two or four pNICs and create up to two vSphere Distributed Switches to isolate the VMkernel traffic. vSphere Distributed Switch section includes a

parameter for Transport Zone Type with allowed values Overlay, VLAN, Overlay/VLAN or N/A. Profile-3 is being recommended and validated for this solution. The vSphere Distributed Profile is chosen as Profile-3 out of the supported two vDS profile types as shown in Figure 13.

Figure 14 highlights the FIPS security mode, enable vLCM Cluster Image and enable vSAN-ESA feature of VMware Cloud Foundation 5.2.1. FIPS is disabled by default on the parameter sheet and enabling FIPS in the parameter sheet enforces FIPS onto all the SDDC components. Enabling vLCM Cluster Image allows the user to deploy management domain with vSphere Lifecycle Manager (vLCM) images. Beginning with VMware Cloud Foundation 5.x new deployments, the management domain nodes may utilize vSAN/ESA architecture instead of vSAN/OSA. If the Management domain servers have vSAN/ESA compatible hardware, change the default setting for "Enable vSAN ESA".

Note
For this reference architecture, vSAN Express Storage Architecture is validated for workload domain as part of the create workload domain workflow in SDDC Manager.

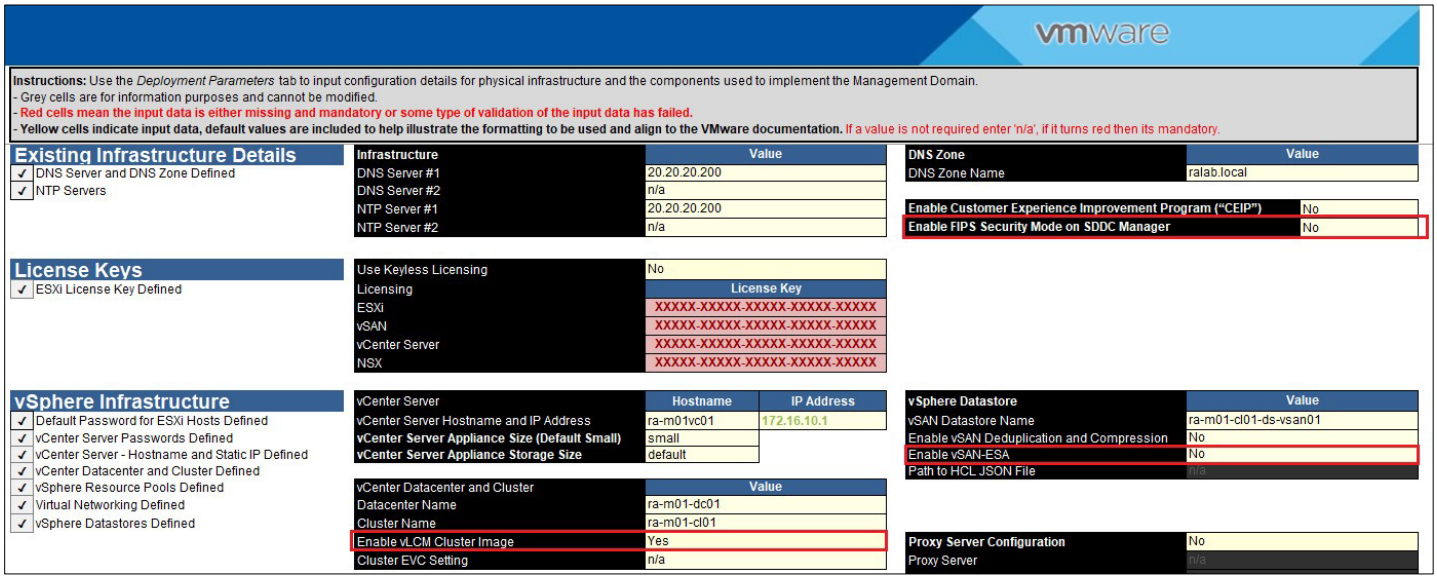

Figure 14. FIPS, vLCM Cluster Image and vSAN-ESA feature highlighted under the Deploy Parameters tab in the parameter sheet

Note
Selecting keyless licensing in the parameter sheet deploys VMware Cloud Foundation in an evaluation mode.

Figure 15 shows the VMware Cloud Foundation architecture type that can be deployed using the parameter sheet. VMware Cloud Foundation architecture can either be chosen as Standard or Consolidated.

Standard architecture

This model is recommended for workload provisioning and mobility across VMware Cloud Foundation instances. It separates management workloads from customer workloads, which aligns with VMware best practices. This model offers more flexibility for licensing and scalability, and it allows for life-cycle management to be applied to individual VI workload domains.

Consolidated architecture

This model is recommended for small-scale environments, SDDC proof-of-concepts, and special use cases. In this model, the management and user workload domains run together on a shared management domain. This model has less flexibility for scalability than the standard architecture.

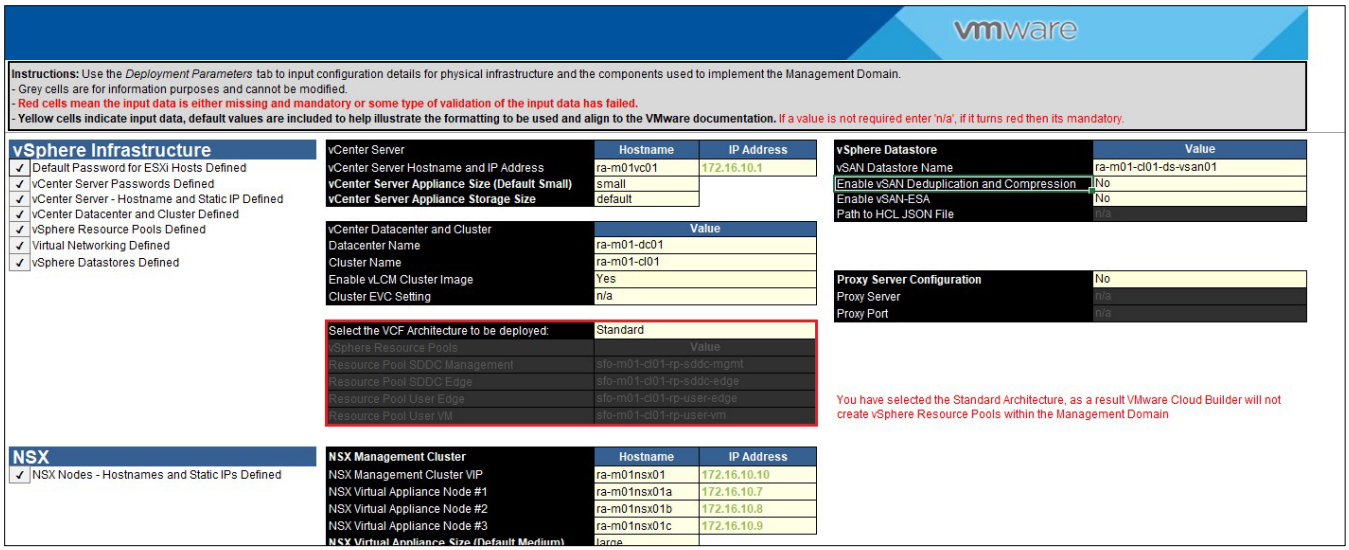

Figure 15. VMware Cloud Foundation architecture support highlighted in the parameter sheet

NSX Edge cluster deployment

Edge cluster can be deployed after the VMware Cloud Foundation management domain is up and running. BGP configuration is necessary on the top of rack network switches to deploy edge cluster. Edge cluster is one of the pre-requisites to deploy Application Virtual Networks(AVNs) on management domain.

Three additional VLANs need to be configured for NSX edge cluster deployment. One VLAN is for Edge Tunnel Endpoint (TEP) connectivity, and the other two VLANs are configured as 'Uplinks' for VMware NSX edge nodes in the VMware Cloud Foundation management domain. These uplinks will represent the NSX Edge VM uplinks to the physical ToR switch for North-South communication. Also, with VMware Cloud Foundation 5.2.1, a static IP pool is supported for NSX Host Overlay Network along with DHCP. Users can opt for either dynamic or static allocation of IP for the NSX host overlay network.

This deployment of VMware Cloud Foundation shows the collapsed cluster model where compute and edge clusters are deployed within a single cluster. In this model, the edge cluster consists of two edge VMs deployed as part of the compute cluster itself. However, if the scale of the VMware Cloud Foundation deployment is large which requires highly consistent bandwidth and latency, there is an option to deploy the edge cluster on dedicated server hardware.

Figure 16 shows the BGP peering between VMware Cloud Foundation edge VMs and Aruba top of rack switches. Diagram represents the edge VM to Aruba ToR peering with vSphere Distributed Switch profile 3.

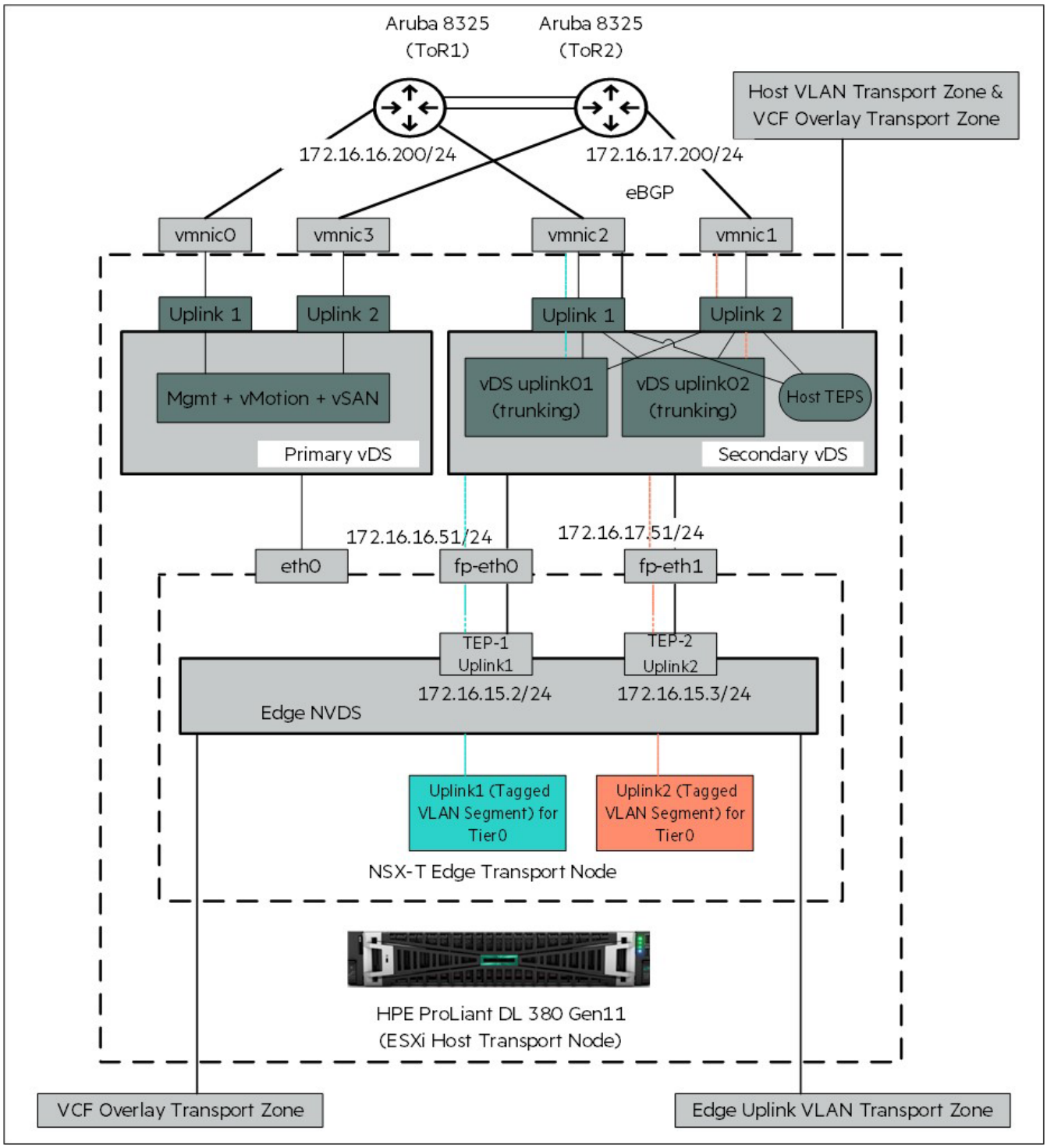

Figure 16. BGP peering between VMware Cloud Foundation edge VMs and Aruba top of rack switches.

VLANs configured as Edge uplinks do not have an active gateway configured since BGP Peering is not supported on Aruba active gateway interfaces. Instead, switch virtual interface IP is used for BGP peering in case of edge uplink VLANs.

The Autonomous System ID of the BGP instance on the Aruba switch is mentioned as 65001. The edge cluster deployed as part of NSX deployment in the VMware Cloud Foundation workload domain has the BGP Autonomous System ID as 65010. Both these BGP Autonomous Systems need to establish peering for North-South communication.

Aruba Fabric Composer configures the NSX Edge uplinks as BGP neighbors on the ToRs with Autonomous System ID 65001. Figure 17 shows the BGP configuration for VMware Cloud Foundation management domain NSX edge cluster peering on 2 ToR Aruba CX 8325 Switches. Once the edge cluster is successfully deployed, the connectivity status of peers on Aruba CX 8325 TORs and NSX edge virtual machines will show as established.

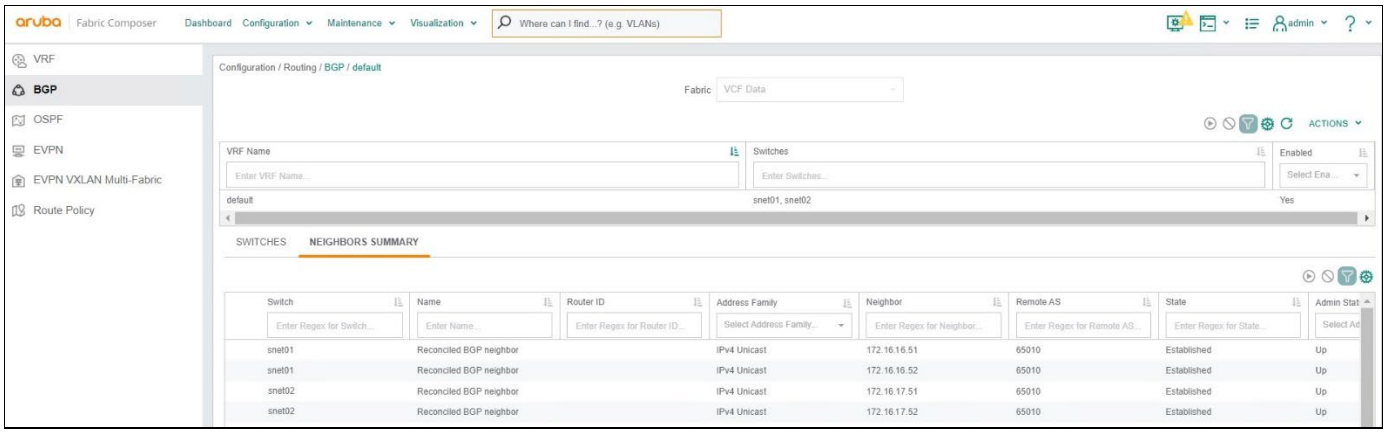

Figure 17. BGP peering configured between VMware Cloud Foundation workload domain edge VMs and Aruba top of rack switches through Aruba Fabric Composer

Deploy vSphere Lifecycle Manager images workload domain on HPE ProLiant DL servers

This section illustrates the deployment of the vSphere Lifecycle Manager Images workload domain on the HPE ProLiant DL380 Gen11 server. A network pool with vMotion and vSAN IP range must be created on SDDC Manager and the ESXi hosts configured for workload domain deployment must be commissioned through SDDC Manager to leverage for the workload domain deployment.

With VMware Cloud Foundation 5.2.1, each workload domain can either choose to join the management domain's vCenter Single Sign-On domain or a new vCenter Single Sign-On domain that is not used by any other workload domain making it isolated from the rest of the clusters. As part of the solution, isolated Single-Sign on domain for workload vCenter is validated.

Express Storage Architecture (ESA) in vSAN is designed to provide new all-levels of efficiency, performance, and scalability. It is an alternative to Original Storage Architecture used in previous editions of vSAN. It is a single-tier architecture designed for NVMe-based platforms that provides high performance and space efficiency. To enable vSAN ESA, it is required to use vLCM images to manage the clusters in the workload domains. Figure 18 shows enabling vSAN ESA for workload domain.

Note

Switching between vSAN ESA and vSAN OSA (Original Storage Architecture) is not dynamic. The datastore must be recreated with appropriate hardware configuration.

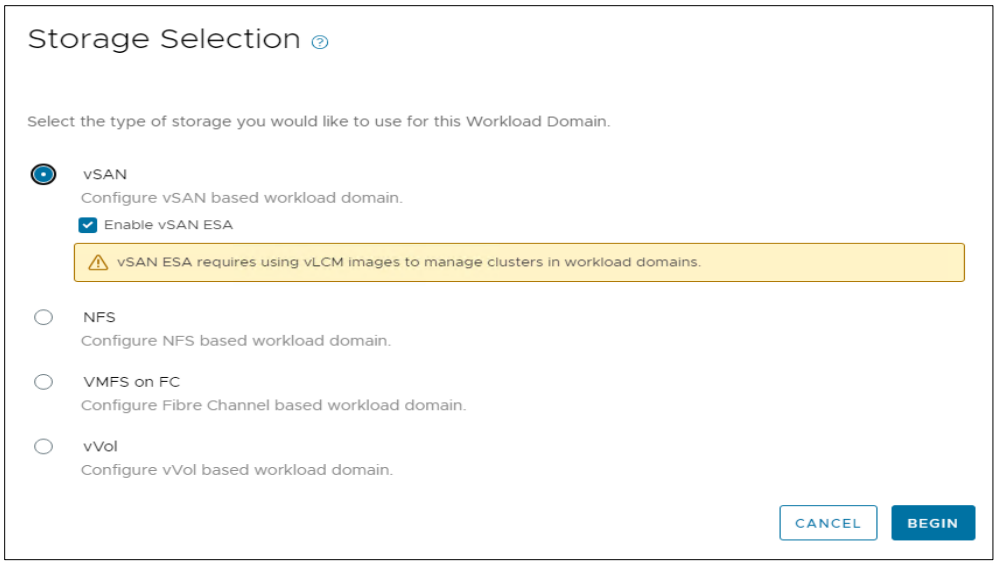

Figure 18. Enable vSAN ESA for vSAN based workload domain

When vLCM is enabled for management domain bring up, cluster image named Management Domain ESXi Personality will be imported into SDDC Manager automatically and will be available under image management section of SDDC Manager. During the deployment of the VMware Cloud Foundation workload domain, Management Domain ESXi Personality cluster image is selected to support the deployment of the vSphere Lifecycle Manager Images-based workload domain. During the deployment, virtual distributed switch profile and vSAN storage options are selected as per requirements.

Figure 19 shows the selection of image for vLCM-based workload domain deployment.

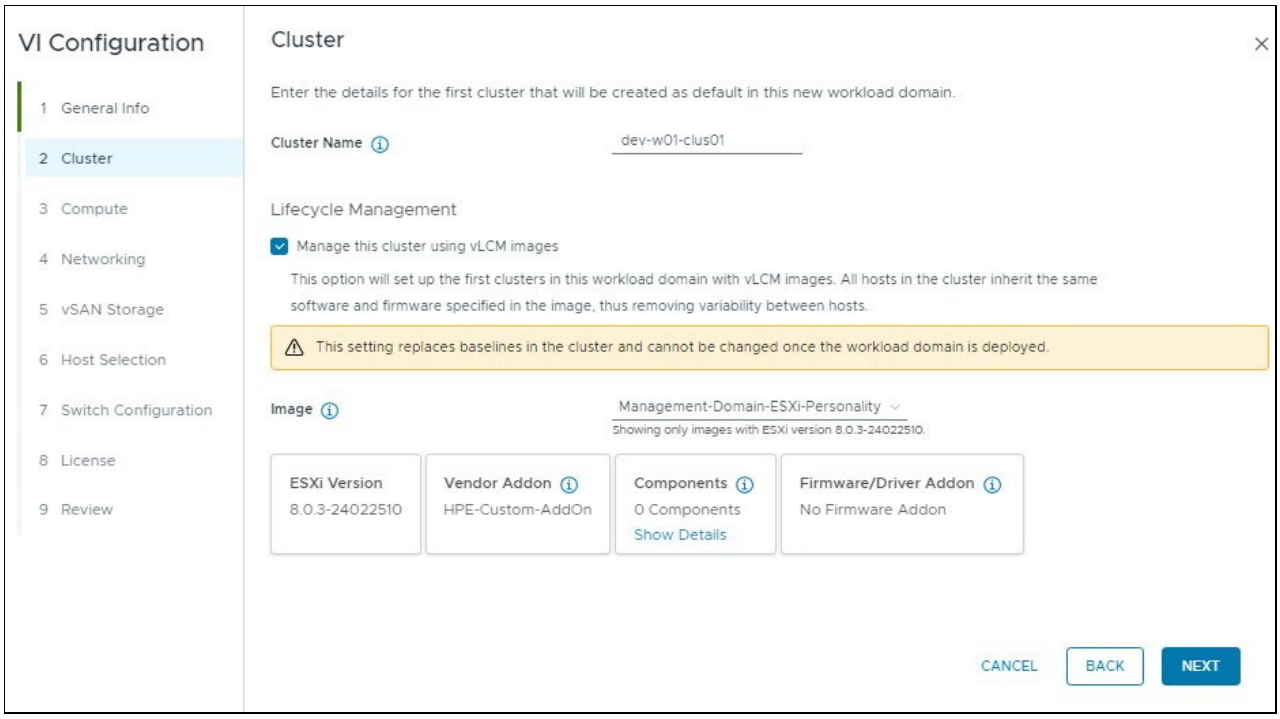

Figure 19. vLCM based workload domain image selection during VMware Cloud Foundation workload domain deployment

Firmware update of vLCM based workload domain using HPE OneView for VMware vCenter

With vLCM-based workload domain, firmware and driver updates are done using HPE OneView for VMware vCenter and VMware vSphere Lifecycle Manager. VMware vSphere Lifecycle Manager provides the functionality to upgrade and patch ESXi. VMware vSphere Lifecycle Manager along with HPE OneView Hardware Support Manager (HSM) plug-in can also perform server firmware and software updates in the same maintenance window as the ESXi server Operating System updates. HPE OneView HSM is integrated inside HPE OneView for VMware vCenter.

Deploy and configure OneView

HPE OneView is deployed on the VMware Cloud Foundation management domain as a virtual machine. After the networking configuration is setup on HPE OneView VM, import HPE ProLiant DL Servers of VMware Cloud Foundation management and workload domain to the HPE OneView using the server iLO IP address and credentials.

Deploying HPE OneView for VMware vCenter

HPE OneView for VMware vCenter provides server hardware management capabilities, including comprehensive monitoring, firmware update, vSphere/ESXi image deployment, remote control, end-to-end monitoring for Virtual Connect, and power optimization for HPE servers in the VMware environment.

HPE OneView for VMware vCenter version 11.6 with VMware vSphere 8.0 version onwards support staging. The staging process downloads the components from vSphere Lifecycle Manager to the ESXi hosts without immediately applying the software and firmware. This process reduces the time that ESXi hosts spend in maintenance mode.

VMware vLCM remediation requires a Hardware Support Manager (HSM) service to facilitate firmware updates on the servers. For HPE servers, the HSM service is bundled with HPE OneView for VMware vCenter (OV4vC) which leverages the firmware repository hosted on HPE OneView. The combination of these software components facilitates the firmware upgrade on all the hosts in the cluster.

The following steps outline the deployment of HPE OneView for vCenter 11.6 on VMware Cloud Foundation Management Domain:

1. HPE OneView for vCenter 11.6 appliance ova can be downloaded from https://myenterpriselicense.hpe.com/cwp-ui/product-download-info/Z7500-63235/-/sw_free?&. (Sign-in credentials using HPE Passport account is required).
2. Select HPE_OneView_for_VMware_vCenter_11.6_April_2024_Z7550-03663 from the list of possible downloadable files and download it.
3. Extract the zip file to the folder as HPE_OneView_for_VMware_vCenter_11.6_April_2024_Z7550-03663.
4. Log in to vCenter Server in the VMware Cloud Foundation management domain and right-click the cluster and select Deploy OVF template to start the deployment wizard for deploying the appliance.

   Table 6 shows the details of each screen and performs the required action.

Table 6. Deployment wizard actions for each screen

Installation	Action Needed
Select an OVF template	Select “local files” and point to folder “HPE_OneView_for_VMware_vCenter_11.6_April_2024_Z7550-03663” extracted. Select the “OV4VC-11.6” within the folder to deploy
Select a name and folder	Provide the HPE OneView for vCenter Virtual Machine name
Select a compute resource	Select the VMware Cloud Foundation Management Domain cluster as a destination compute resource for this virtual machine
Review details	Check details of the appliance
License agreement	Accept the license agreement
Select Storage	Select VM storage policy as “vSAN default Storage policy”. Select VMware Cloud Foundation Management Domain vSAN storage in the list of storage
Select network	HPE OneView for VMware vCenter allows you to configure up to three networks. At least one network needs to be configured during deployment. Configure “Network 1” to the VMware Cloud Foundation management network during deployment. You may configure additional networks for redundancy or if the storage network is on a private network and vCenter on a public network. Configure additional networks from the Administrator Console post-deployment as needed. Refer to the Figure 20 for the networking configuration
Customize template	Provide IP Address, Subnet Mask, Default gateway, DNS server, and Fully Qualified Domain Name for the “Network Settings”

Installation	Action Needed
Ready to Complete	Review the details for the installation and click **Finish to start** the installation

Figure 20 shows the network configuration for HPE OneView for the VMware vCenter appliance.

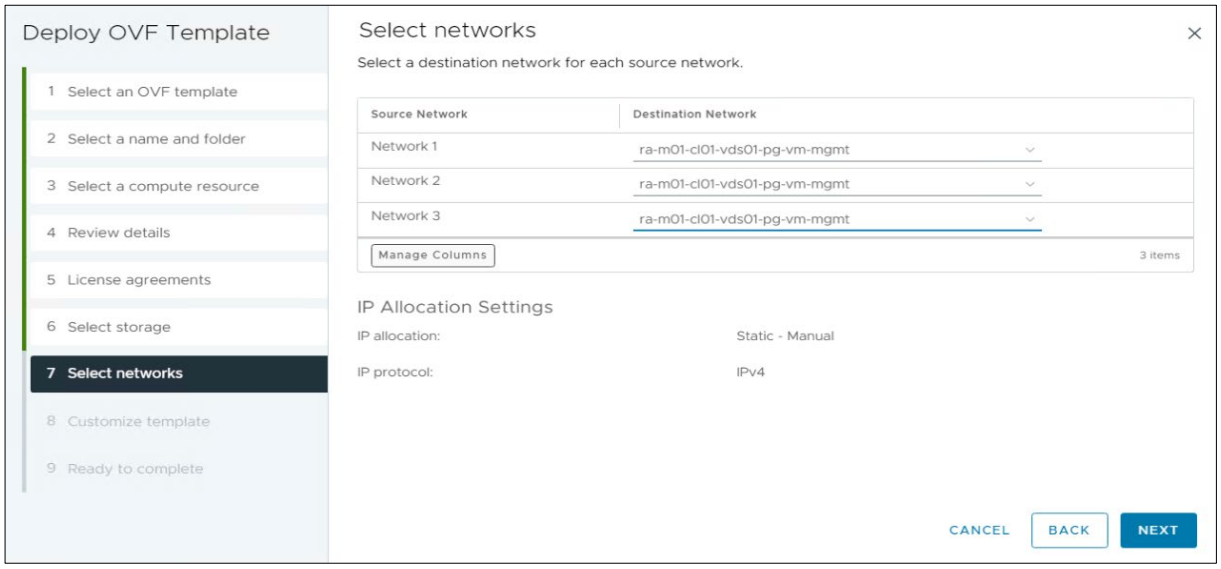

Figure 20. Network configuration for HPE OneView for VMware vCenter appliance

5. After the HPE OneView for vCenter appliance is deployed, power on the appliance and connect to the Administrator console using the appliance's fully qualified domain name (FQDN) or IP as https://<<ApplianceHostname/Ipaddress>>.
6. Click **Setup**. Enter a New Password and Confirm password and click **OK**.
7. Add management domain vCenter to HPE OneView for vCenter.
8. Add the HPE OneView for VMware vCenter certificate to VMware Cloud Foundation management domain vCenter, **vSphere Client > HPE OneView for VMware vCenter > HPE OneView Service Pack Management > Add Certificate**.
9. Configure the management domain vCenter certificate in the HPE OneView.
10. Validate iSUT and AMS settings for all the servers in the cluster via vCenter UI, **Cluster > Configure > HPE OneView for VMware vCenter**.
11. Register HPE OneView IP and Credentials within HPE OneView for the vCenter plug-in on the management domain vCenter.

vLCM Cluster image

A vLCM desired image definition is a specification of the software, components, vendor add-on, and firmware to be applied on all hosts in vSphere clusters in VMware Cloud Foundation Workload Domains.

vLCM Cluster image components for HPE ProLiant DL server-based workload domain as shown in Figure 21 consists of the following files as mentioned in Table 7. It is important to note the versions detailed are relevant to VMware Cloud Foundation 5.2.1 and will change depending upon the VMware Cloud Foundation build versions. For detailed software and firmware versions, refer to the software and firmware matrix documentation at https://www.hpe.com/psnow/doc/a50012007enw

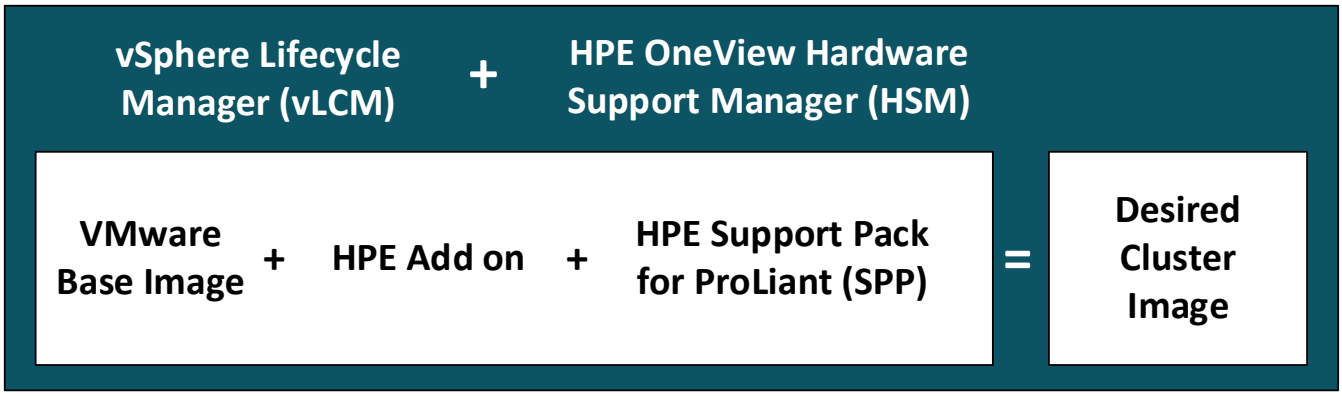

Figure 18. vLCM Cluster Image components

Table 7. vLCM image components

Name	Image file
VMware Base Image	VMware-ESXi-8.0U3b-24280767-depot.zip
HPE Add-On	HPE-803.0.0.11.8.0.6-Sep2024-Addon-depot.zip
HPE Service Pack for ProLiant (SPP)	2024_0923.23 (P76088_001_gen11spp-2024.09.00.00-Gen11SPP2024090000.2024_0923.23.iso)

Note
Initial imaging of HPE ProLiant DL servers should be completed using the HPE ProLiant DL380 Gen11 server Custom ISO image for ESXi VMware-ESXi-8.0.3-24280767-HPE-803.0.0.11.8.0.6-Oct2024.iso to ensure HPE value add software, and drivers are properly installed during ESXi installation.

Workflow for remediating the cluster

Updating all the hosts in the cluster using a single desired state specification of a vLCM cluster image and firmware maintains a homogeneous cluster environment and updates occur to software and firmware in a single remediation workflow and thus reducing downtime.

Figure 22 shows the approach for remediating the VMware Cloud Foundation cluster with the vLCM desired cluster image.

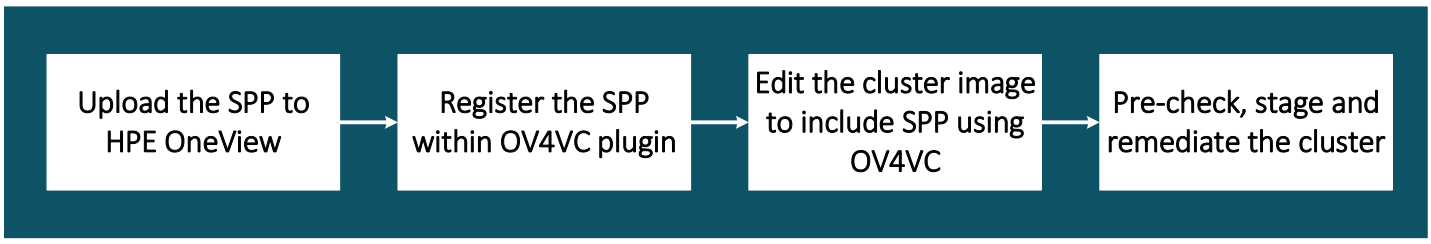

Figure 19. Flow diagram for vLCM based VMware Cloud Foundation workload domain remediation

Following are the overview steps to remediate the cluster with the desired cluster image. The same steps can be followed for both management and workload domain clusters:

1. Upload the Support Pack for ProLiant(SPP) package to HPE OneView.
2. Register the Uploaded package using HPE OneView for VMware vCenter plug-in in vCenter and wait for the “Sync Updates” task to complete.

3. Update the cluster image with desired components for ESXi version, Vendor Addon and Firmware and Drivers Addon. Validate and save the image.

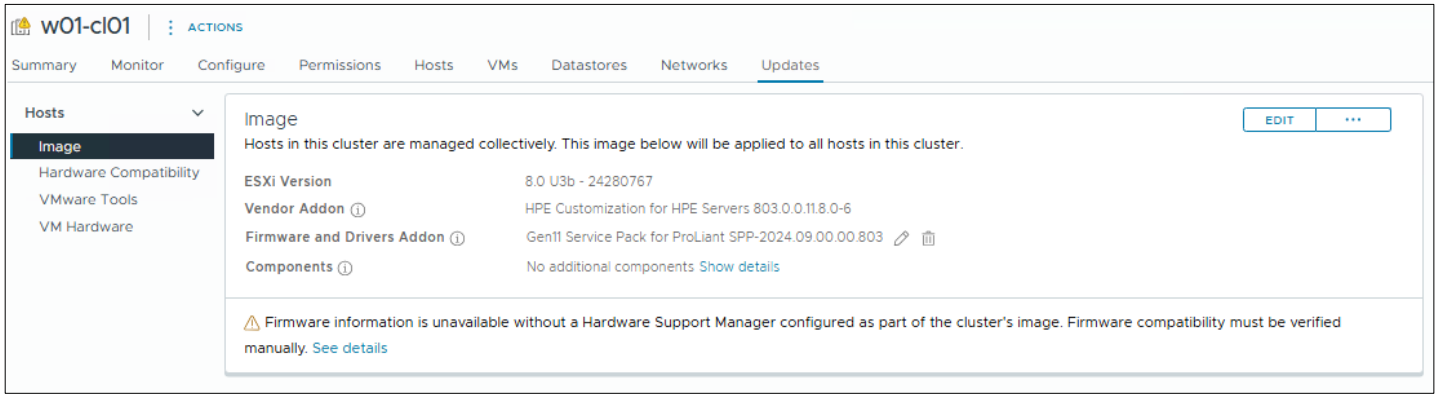

Figure 20. vLCM Cluster Image components chosen in vCenter when remediating cluster

4. Pre-check, stage and remediate the VMware Cloud Foundation cluster with the new image created after adding the HPE Support Pack for ProLiant.

Known issues

- Cloud-Builder login will fail unless the password configured during deployment matches the new password requirements of VMware Cloud Foundation 5.2.1. Ensure the password is 15-20 characters in length, not a dictionary word, does not contain three same consecutive chars, does not contain more than four monotonic char sequence, and has at least one upper case letter, at least one lower case letter, at least one digit, and at least one special character.
- Host commissioning will fail with self-signed certificates. Refer to Regenerate the Self-Signed Certificate on All Hosts document and regenerate self-signed certificates for ESXi hosts.

Patch and upgrade of VMware Cloud Foundation

SDDC Manager provides automated lifecycle management for core VMware Cloud Foundation components which includes vCenter Server, VMware ESXi™, and VMware NSX. If the SDDC Manager VM has internet access, it can be configured to connect to Broadcom depot to download the updates. The SDDC Manager's Lifecycle Manager organizes the upgrade workflow to ensure components are upgraded in the proper sequence as defined by VMware.

VMware Aria Suite Lifecycle Manager™ manages the lifecycle of the components that it deploys such as VMware Aria Operations, VMware Aria Automation, and VMware Aria Operations for Logs etc.

The high-level update workflow is as follows:

1. Receive notification for update availability.
2. Download the update bundle.
3. Select **update targets** and schedule the update.

Offline VMware Cloud Foundation update

When the SDDC Manager does not have access to internet, update bundles can be downloaded to an internal web server using 'Offline Bundle Transfer Utility' and SDDC Manager can be configured to pull the downloaded patches directly from internal web server to perform the updates. For more information about setting up the offline depot for SDDC Manager, refer the Offline Bundle Download for VMware Cloud Foundation.

Note
VMware Cloud Foundation update needs to be performed only after verifying if the underlying HPE Infrastructure including drivers and firmware is compatible with the version that is going to be installed. For more information, refer to the HPE ProLiant DL Server firmware and software compatibility matrix for the VMware Cloud Foundation 5.2.1 at https://www.hpe.com/psnow/doc/a50012007enw for guidance on whether VMware Cloud Foundation version is listed as compatible along with the drivers and firmware.

ESXi cluster-level and parallel upgrades
Enables customers to update the ESXi software on multiple clusters in a workload domain in parallel. Parallel upgrades reduce the overall time required to upgrade the VMware Cloud Foundation environment.

Bundle types
Upgrade bundle
An upgrade bundle contains bits to update the appropriate Cloud Foundation software components in your management domain or VI workload domain. In most cases, an upgrade bundle must be applied to the management domain before it can be applied to the workload domain.

Some upgrade bundles are cumulative. With a cumulative upgrade bundle, you can directly upgrade the appropriate software in your workload domain to the version contained in the cumulative bundle rather than applying sequential upgrades to reach the target version. Cumulative bundles are available only for the vCenter Server and ESXi.

Note
You can apply a cumulative bundle to a workload domain only if the target release in the bundle is lower than or at the same version as the management domain. If the cumulative bundle is available for both the management domain and VI workload domain, you must apply it to the management domain before applying it to the VI workload domain.

Install bundle
VMware Cloud Foundation includes the following install bundles:

- VI workload domain install bundle is used to deploy a new installation of the software components instead of the versions in your original Cloud Foundation installation. It includes software bits for vCenter Server and NSX for vSphere.
- VMware Aria Suite Lifecycle install bundle is used for deploying Aria Suite Lifecycle Manager. For other products of Aria Suite, the installation binaries can be downloaded from Broadcom support portal and uploaded to Aria Suite Lifecycle Manager for installation.

Async Patch bundle
An async patch bundle allows to apply critical patches to certain VMware Cloud Foundation components (NSX Manager, vCenter Server, and ESXi) when an update or upgrade bundle is not available.

Async Patching
Starting from VMware Cloud Foundation 5.2, async patching capability is available through SDDC Manager UI that allows application of critical patches to VMware Cloud Foundation components outside of VMware Cloud Foundation official upgrade. The tool supports both offline and online mode to apply an async patch depending on whether the SDDC Manager appliance has internet access or not.

The Async Patching supplements the information provided by the HPE ProLiant DL server firmware and software compatibility matrix for VMware Cloud Foundation to address patches compatible with the VMware Cloud Foundation version.

For more information on patching VMware Cloud Foundation, refer to Patching VMware Cloud Foundation.

Summary

Hewlett Packard Enterprise and VMware deliver the highly scalable VMware Cloud Foundation software-defined solution on HPE ProLiant DL servers. The VMware Cloud Foundation solution can be effectively and rapidly deployed on HPE ProLiant DL servers. This Reference Architecture demonstrates a secured and scalable private cloud solution built using VMware Cloud Foundation on HPE ProLiant DL servers. It showcases the ability to:

- Simplify deployment of vLCM VI workload domain and operations on VMware Cloud Foundation.

- Build a VMware Cloud Foundation workload domain with vSAN Storage as SDDC managed principal storage.
- Simplify firmware updates using HPE OneView for VMware vCenter with HSM service enabled.

Appendix A: Bill of Materials

Table A1 lists the hardware utilized for testing and developing Reference Architecture.

Note
Part numbers are at the time of publication and subject to change. The bill of materials does not include complete support options or complete rack and power requirements. For questions regarding ordering, consult with your Hewlett Packard Enterprise Reseller or Hewlett Packard Enterprise Sales Representative for more details. http://www.hpe.com/us/en/services/consulting.html

Table A1. Bill of materials

Product	Quantity	Product description
		Rack and Power
P9K40A	1	HPE 42U 600mmx1200mm G2 Enterprise Shock Rack
P9K40A001	1	HPE Factory Express Base Racking Service
120672-B21	1	HPE Rack Ballast Kit
BW930A	1	HPE Air Flow Optimization Kit
Q9V01A	1	HPE Universal G2 Rack Tie Down Kit
P9L11A	1	HPE G2 Rack Grounding Kit
P9L12A	1	HPE G2 Rack Baying Kit
P9L16A	1	HPE G2 Rack 42U 1200mm Side Panel Kit
P59411-B21	4	Enlogic by nVent G3 Metered 3-phase 8.6kVA/Outlets (30) C13 (6) Combo C13/C19 PDU for HPE
		Aruba Switches
R9F63A	2	Aruba 6300M 48G Power to Port Airflow 2 Fans 1 Power Supply Unit Bundle for HPE
R9F63A B2B	2	Aruba 6300M 48G Power to Port Airflow 2 Fans 1 Power Supply Unit Bundle for HPE PDU
R9G06A	2	Aruba 50G SFP56 to SFP56 0.65m Direct Attach Copper Cable for HPE
R9F61A	2	Aruba 6300M 12VDC 250W 100-240VAC Power to Port Airflow Power Supply Unit for HPE
R9F61A B2B	2	Aruba 6300M 12VDC 250W 100-240VAC Power to Port Airflow Power Supply Unit for HPE PDU
R9F57A	2	Aruba 1U Universal 4-post Rack Mount Kit for HPE
R9F59A	2	Aruba 4-post Rack Kit for HPE
R9F67A	1	Aruba 8325-32C Power to Port Airflow 6 Fans 2 Power Supply Units Bundle for HPE
R9F67A B2B	1	Aruba 8325-32C Power to Port Airflow 6 Fans 2 Power Supply Units Bundle for HPE PDU
R9F77A	3	Aruba 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable for HPE
R9F67A	1	Aruba 8325-32C Power to Port Airflow 6 Fans 2 Power Supply Units Bundle for HPE
R9F67A B2B	1	Aruba 8325-32C Power to Port Airflow 6 Fans 2 Power Supply Units Bundle for HPE PDU
845416-B21	8	HPE 100Gb QSFP28 to 4x25Gb SFP28 3m Direct Attach Copper Cable
C7533A	5	HPE 1.2m/4ft CAT5 RJ45 M/M Ethernet Cable
C7535A	6	HPE RJ45 to RJ45 Cat5e Black M/M 7.6ft 1-pack Data Cable
C7536A	4	HPE 4.3m/14ft CAT5 RJ45 M/M Ethernet Cable
		HPE ProLiant DL325 Gen11 Servers for management domain
P54199- B21	4	HPE ProLiant DL325 Gen11 8FF CTO Server
P53712- B21	4	AMD EPYC 9334 2.7GHz 32-core 210W Processor for HPE

Product	Quantity	Product description
P63871-B21	2	HPE 1.6TB SAS Mixed Use SFF BC Self-encrypting FIPS 140-2 PM7 SSD
P50312- B21	24	HPE 64GB (1x64GB) Dual Rank x4 DDR5-4800 CAS-40-39-39 EC8 Registered Smart Memory Kit
P50227-B21	8	HPE 1.6TB NVMe Gen4 High Performance Mixed Use SFF BC U.3 PM1735a SSD
P59620-B21	4	HPE ProLiant DL325 Gen11 2SFF x4 OCP2 Tri-Mode Cable Kit
P56652-B21	4	HPE ProLiant DL325 Gen11 2SFF x4 Tri-Mode U.3 BC Backplane Kit
P55000-B21	4	HPE ProLiant DL325 Gen11 8SFF x4 Tri-Mode U.3 BC Backplane Kit
P47789-B21	4	HPE MR216i-o Gen11 x16 Lanes without Cache OCP SPDM Storage Controller
P42044- B21	4	Mellanox MCX631102ASADAT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
P42041- B21	4	Mellanox MCX631432ASADAI Ethernet 10/25Gb 2-port SFP28 OCP3 Adapter for HPE
P59668-B21	4	HPE ProLiant DL325 Gen11 Liquid Cooling Fan Kit
P38997-B21	8	HPE 1600W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit
P48922-B21	4	HPE ProLiant DL3XX Gen11 Intrusion Cable Kit
P52351-B21	4	HPE DL3XX Gen11 Easy Install Rail 2 Kit
		HPE ProLiant DL380 Gen11 servers for workload domain
P52534-B21	4	HPE ProLiant DL380 Gen11 8SFF NC Configure-to-order Server
P52534-B21 ABA	4	HPE DL380 Gen11 8SFF NC CTO Server
P49615-B21	8	Intel Xeon-Gold 6438Y+ 2.0GHz 32-core 205W Processor for HPE
P43331-B21	48	HPE 64GB (1x64GB) Dual Rank x4 DDR5-4800 CAS-40-39-39 EC8 Registered Smart Memory Kit
P48813-B21	4	HPE DL380 Gen11 2U 8SFF x1 TM Kit
P28622-B21	2	HPE 1.2TB SAS 12G Mission Critical 10K SFF BC 3-year Warranty Self-encrypting FIPS HDD
P48814-B21	8	HPE DL380 Gen11 8SFF U.3 Prem Kit
P50230-B21	8	HPE 3.2TB NVMe Gen4 High Performance Mixed Use SFF BC U.3 PM1735a SSD
P42044-B21	4	Mellanox MCX631102AS-ADAT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
P47789-B21	4	HPE MR216i-o Gen11 x16 Lanes without Cache OCP SPDM Storage Controller
P42041-B21	4	Mellanox MCX631432AS-ADAI Ethernet 10/25Gb 2-port SFP28 OCP3 Adapter for HPE
P38995-B21	4	HPE 800W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit
P48825-B21	4	HPE ProLiant DL380 Gen11 8SFF CPU1/2 NVMe Cable Kit
P48828-B21	4	HPE ProLiant DL3XX Gen11 OCP2 x16 Enablement Kit
P48820-B21	4	HPE DL380/DL560 G11 2U High Perf Fan Kit
P35876-B21	4	HPE CE Mark Removal FIO Enablement Kit
P48818-B21	8	HPE DL380/DL560 G11 High Perf 2U HS Kit
P52341-B21	4	HPE ProLiant DL3XX Gen11 Easy Install Rail 3 Kit
P53634-B21	4	HPE ProLiant DL380 Gen11 16NVMe Balanced FIO Bundle Kit
C7536A	4	HPE 4.3m/14ft CAT5 RJ45 M/M Ethernet Cable
845416-B21	4	HPE 100Gb QSFP28 to 4x25Gb SFP28 3m Direct Attach Copper Cable

Note
The above BOM contains US localization (ABA is for the US); Customers must choose localization options based on the deployment location.

URLs for firmware, software, and documentation

Rack and power links

HPE Rack and Power Infrastructure, https://www.hpe.com/us/en/integrated-systems/rack-power-cooling.html

Network links

- Networking documentation page,

  https://asp.arubanetworks.com

- Aruba CX 6300 Switch documentation page,

  https://support.hpe.com/hpesc/public/docDisplay?docLocale=en_US&docId=a00092150en_us

- Aruba CX 8325 Switch documentation page,

  https://www.hpe.com/psnow/product-documentation?oid=1011156780&cc=ww&lc=en&jumpid=in_pdp-psnow-docs

Server links

- HPE ProLiant DL servers,

  https://www.hpe.com/us/en/servers/proliant-dl-servers.html

- SPP Documentation,

  http://www.hpe.com/info/spp/documentation

Software links

- HPE Storage Documentation,

  http://www.hpe.com/info/storage/docs

- HPE OneView
  - Software, https://myenterpriselicense.hpe.com/cwp-ui/product-download-info/Z7550-63180/-/sw360_hpe_internal?&
  - Documentation, https://support.hpe.com/hpesc/public/docDisplay?docId=sd00004891en_us&docLocale=en_US
- HPE OneView Partner Integrations,

  https://myenterpriselicense.hpe.com/cwp-ui/product-details/Z7500-63235/-/sw_free

- HPE VMware OEM Software Delivery Repository,

  http://vibsdepot.hpe.com

- HPE OEM customized VMware image downloads,

  https://www.hpe.com/us/en/servers/hpe-esxi.html

VMware links

- VMware Cloud Foundation 5.2.1 release notes,

  https://techdocs.broadcom.com/us/en/vmware-cis/vcf/vcf-5-2-and-earlier/5-2/vcf-release-notes/vmware-cloud-foundation-521-release-notes.html

- VMware Cloud Foundation Planning and Preparation Guide,

  https://techdocs.broadcom.com/us/en/vmware-cis/vcf/vcf-5-2-and-earlier/5-2/planning-and-preparation-workbook-5-2.html

Resources and additional links

HPE Reference Architectures, https://www.hpe.com/docs/reference-architecture

HPE Servers, hpe.com/servers

HPE Storage, hpe.com/storage

HPE Networking, hpe.com/networking

Aruba Fabric Composer (AFC), https://www.arubanetworks.com/en-in/products/switches/core-and-data-center/fabric-composer/

HPE GreenLake Advisory and Professional Services, hpe.com/us/en/services/consulting.html

HPE and VMware, hpe.com/partners/vmware

HPE Enterprise Support Center, https://support.hpe.com/hpesc/public/home

HPE OneView for VMware vCenter Release Notes, https://support.hpe.com/hpesc/public/docDisplay?docLocale=en_US&docId=sd00003083en_us

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