

Introducing VMware Cloud Foundation

23 JUN 2020

VMware Cloud Foundation 4.0



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About Introducing Cloud Foundation

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The *Introducing VMware Cloud Foundation* document provides a high-level overview of the Cloud Foundation product.

Intended Audience

The *Introducing VMware Cloud Foundation* document is intended for data center cloud administrators. The information in this guide is written for experienced data center cloud administrators who are familiar with:

- Concepts of virtualization and software-defined data centers
- Networking and concepts such as uplinks, NICs, and IP networks
- Hardware components such as top-of-rack (ToR) switches, inter-rack switches, servers with direct attached storage, cables, and power supplies
- Methods for setting up physical racks in your data center
- Using the VMware vSphere[®] Web Client[™] to work with virtual machines

Related Publications

The *VMware Cloud Foundation Deployment Guide* is intended for data center cloud administrators who deploy a Cloud Foundation system in their organization's data center.

The *Planning and Preparation Workbook* provides detailed information about the software, tools, and external services that are required for Cloud Foundation.

The *VMware Cloud Foundation Operations and Administration Guide* contains detailed information about how to administer and operate a Cloud Foundation system in your data center.

The *VMware Cloud Foundation Lifecycle Management* document describes how to manage the lifecycle of a Cloud Foundation environment.

Your Cloud Foundation system includes various VMware software products and components. You can find the documentation for those VMware software products at docs.vmware.com.

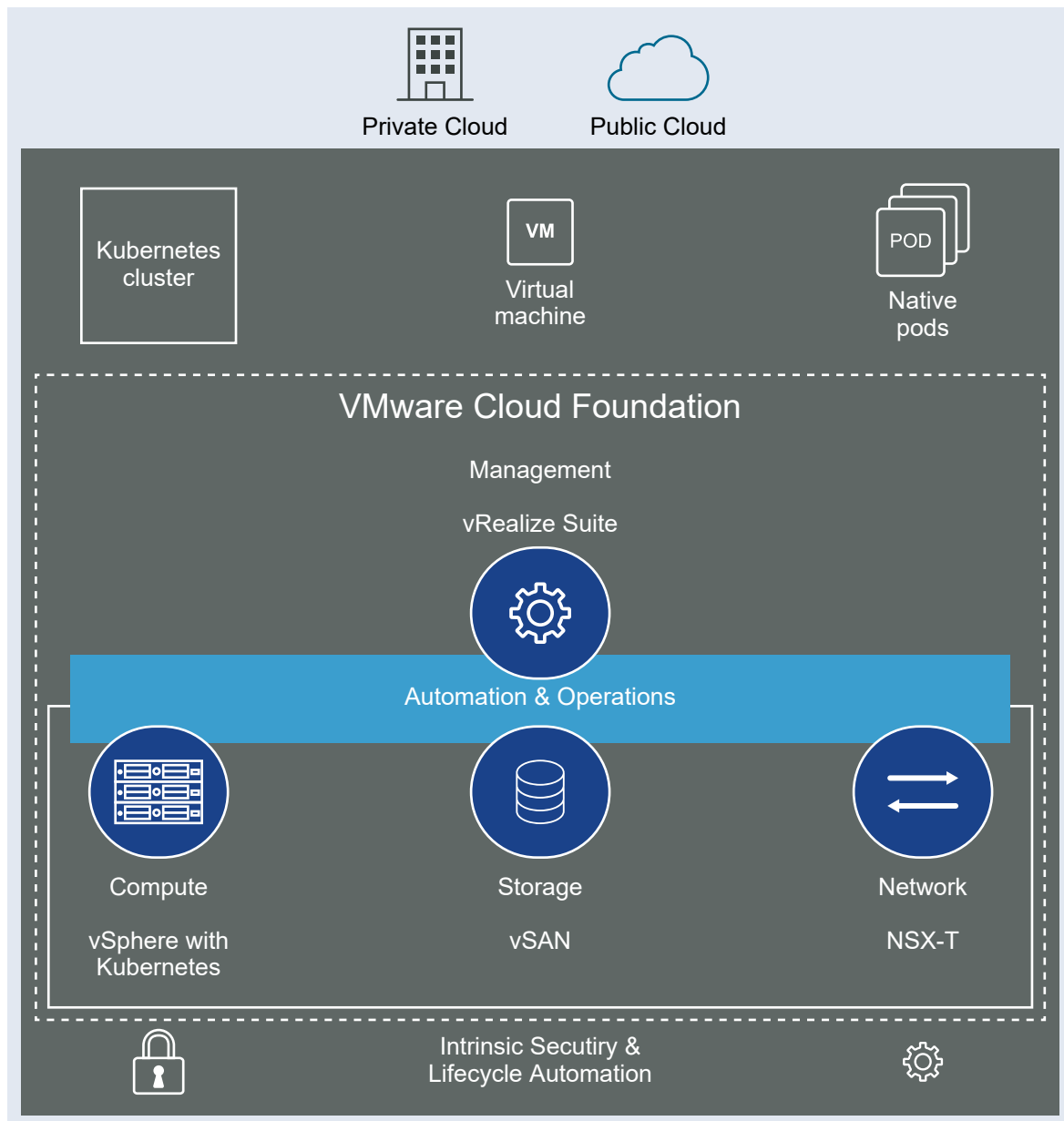
Cloud Foundation Glossary

The Cloud Foundation Glossary defines terms specific to Cloud Foundation.

About VMware Cloud Foundation

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VMware Cloud Foundation[®] provides a ubiquitous hybrid cloud platform for both traditional enterprise apps and modern apps. Based on a proven and comprehensive software-defined stack including VMware vSphere[®] with Kubernetes, VMware vSAN[®], VMware NSX-T[®] Data Center, and VMware vRealize[®] Suite, VMware Cloud Foundation provides a complete set of software-defined services for compute, storage, network security, Kubernetes management, and cloud management. The result is agile, reliable, efficient cloud infrastructure that offers consistent operations across private and public clouds.



This document focuses on the private cloud use case.

To manage the logical infrastructure in the private cloud, Cloud Foundation augments the VMware virtualization and management components with Cloud Builder and SDDC Manager. The Cloud Builder appliance automates the bring-up of the entire software-defined stack while SDDC Manager automates its configuration and provisioning. SDDC Manager also automates the lifecycle management of the stack, including the host firmware. From this interface, the IT administrator can provision new private cloud resources, monitor changes to the logical infrastructure, and manage life cycle and other operational activities.

Cloud Foundation enables data center cloud administrators to provision an application environment in a rapid, repeatable, automated way versus the traditional manual process.

This chapter includes the following topics:

- [Cloud Foundation Components](#)
- [Cloud Foundation Features](#)

Cloud Foundation Components

Cloud Foundation delivers a natively integrated software-defined data center stack that includes the core infrastructure virtualization, vSphere, vSAN, and NSX-T Data Center.

Cloud Builder

The VMware Cloud Builder appliance automates the deployment of the entire software-defined stack.

SDDC Manager

SDDC Manager automates the entire system lifecycle (from configuration and provisioning to upgrades and patching), and simplifies day-to-day management and operations.

VMware vSphere

VMware vSphere uses virtualization to transform individual data centers into aggregated computing infrastructures that include CPU, storage, and networking resources. VMware vSphere manages these infrastructures as a unified operating environment and provides you with the tools to administer the data centers that participate in that environment.

The two core components of vSphere are ESXi and vCenter Server. ESXi is the virtualization platform where you create and run virtual machines and virtual appliances. vCenter Server is the service through which you manage multiple hosts connected in a network and pool host resources.

With Kubernetes - Workload Management, you can deploy and operate the compute, networking, and storage infrastructure for vSphere with Kubernetes. vSphere with Kubernetes transforms vSphere to a platform for running Kubernetes workloads natively on the hypervisor layer. When enabled on a vSphere cluster, vSphere with Kubernetes provides the capability to run Kubernetes workloads directly on ESXi hosts and to create upstream Kubernetes clusters within dedicated resource pools.

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. Built in policies allow for flexibility in data availability.

NSX-T Data Center

The management domain and VI workload domains support the NSX-T Data Center platform.

NSX-T Data Center is focused on providing networking, security, automation, and operational simplicity for emerging application frameworks and architectures that have heterogeneous endpoint environments and technology stacks. NSX-T Data Center supports cloud-native applications, bare metal workloads, multi-hypervisor environments, public clouds, and multiple clouds.

vRealize Suite

Cloud Foundation supports automated deployment of vRealize Suite Lifecycle Manager. You can then deploy and manage the lifecycle of the vRealize Suite of products (vRealize Log Insight, vRealize Automation , and vRealize Operations Manager) through vRealize Suite Lifecycle Manager.

VMware vRealize Suite is a purpose-built management solution for the heterogeneous data center and the hybrid cloud. It is designed to deliver and manage infrastructure and applications to increase business agility while maintaining IT control. It provides the most comprehensive management stack for private and public clouds, multiple hypervisors, and physical infrastructure.

Cloud Foundation Features

This section describes the Cloud Foundation features.

Automated Software Bring-Up

You prepare your environment for Cloud Foundation by installing a baseline ESXi image on vSAN ReadyNodes. After the hosts are physically racked and cabled, Cloud Foundation uses the physical network details you provide (such as DNS, IP address pool, and so on) to automate the bring-up and configuration of the software stack. During bring-up, the management domain is created on the four hosts you specified. When the bring-up process completes, you have a functional management domain and can start provisioning VI workload domains.

Simplified Resource Provisioning with Workload Domains

In Cloud Foundation, a workload domains is a policy based resource construct with specific availability and performance attributes. It combines compute (vSphere), storage (vSAN), networking (NSX-T Data Center), and cloud management (vRealize Suite) into a single consumable entity. for creating logical pools across compute, storage, and networking. A workload domain consists of one or more vSphere clusters, provisioned automatically by SDDC Manager.

There are two types of workload domains - the management domain and VI workload domains.

The management domain is created during the bring-up process. It contains the Cloud Foundation management components. This includes an instance of vCenter Server and a three-node NSX Manager cluster for the management domain. The management domain uses vSAN storage.

You can create Virtual Infrastructure (VI) workload domains for user workloads. For each VI workload domain, you can choose the storage option (vSAN, NFS, or VMFS on FC). A VI workload domain can consist of one or more vSphere clusters. Each cluster starts with a minimum of three hosts and can scale up to the vSphere maximum of 64 hosts. SDDC Manager automates creation of the workload domain and the underlying vSphere cluster(s).

For the first VI workload domain in your environment, SDDC Manager deploys a vCenter Server and an NSX Manager cluster in the management domain. For each subsequent VI workload domain, SDDC Manager deploys an additional vCenter Server. New VI workload domains can share the same NSX Manager cluster as an existing VI workload domain, or deploy a new NSX Manager cluster. VI workload domains cannot share the management domain NSX Manager cluster.

Application Focused Management Brings Virtual Machines and Containers Onto the Same Platform

With Kubernetes - Workload Management, you can deploy and operate the compute, networking, and storage infrastructure for vSphere with Kubernetes workloads. A vSphere with Kubernetes workload is an application with containers running inside vSphere pods, regular VMs, or Tanzu Kubernetes clusters.

The Kubernetes concept of namespace is integrated into vSphere and becomes the unit of management. By grouping VMs and containers into logical applications via namespaces, Virtual Infrastructure (VI) admins who used to manage thousands of VMs can now manage just dozens of applications, a massive reduction in cognitive load.

Automated Lifecycle Management (LCM)

Cloud Foundation offers automated lifecycle management on a per-workload basis. Available updates for all components are tested for interoperability and bundled with the necessary logic for proper installation order. The update bundles are then scheduled for automatic installation on a per-workload domain basis. This allows administrators to target specific workloads or environments (development vs. production, for example) for updates independent from the rest of the environment.

vSphere Lifecycle Manager (vLCM), a vCenter service, is now integrated with Cloud Foundation. vLCM enables you to create cluster images for centralized and simplified lifecycle management of ESXi hosts including firmware. When a VI workload domain cluster is created with an image, you can update and upgrade the ESXi version on all hosts in the cluster collectively. You can also install and update vendor add-ons and components on all ESXi hosts in a cluster. The vLCM update manager is optional.

Multi-Instance Management

Multiple Cloud Foundation instances can be managed together by grouping them into a federation, such that each member can view information about the entire federation and the individual instances within it. Federation members can view inventory across the Cloud Foundation instances in the federation as well as the available and used aggregate capacity (CPU, memory, and storage). This allows you to maintain control over the different sites and ensure that they are operating with the right degree of freedom and meeting compliance regulations for your industry. It also simplifies patch management by showing the number of patches available across sites in the global view.

Cloud Foundation Architecture

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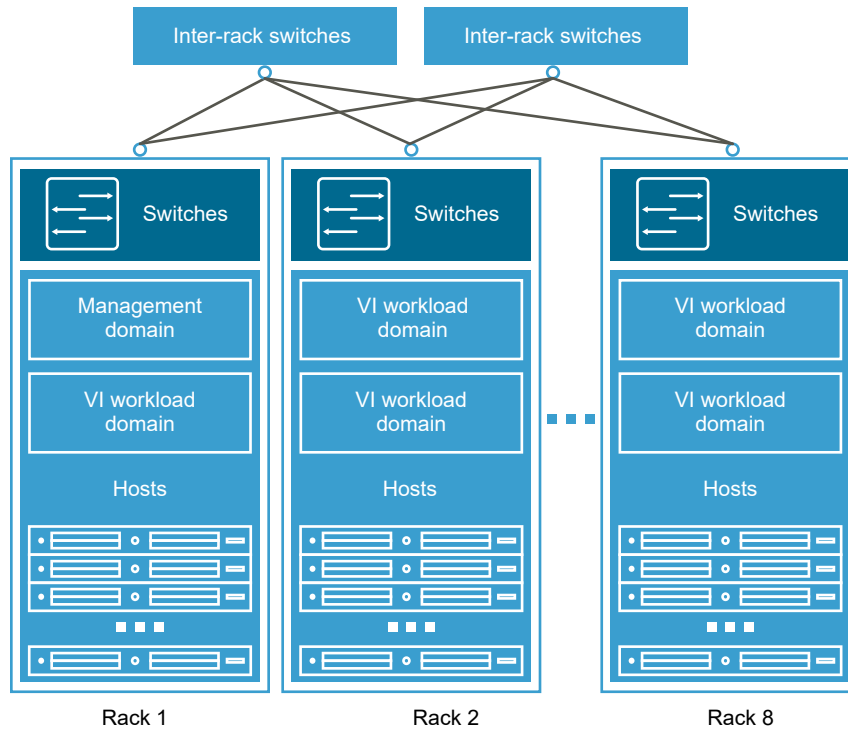
Cloud Foundation supports two architecture models - standard and consolidated.

This chapter includes the following topics:

- [Standard Architecture Model](#)
- [Consolidated Architecture Model](#)

Standard Architecture Model

With the standard architecture model, management workloads run on a dedicated management domain and user workloads are deployed in separate virtual infrastructure (VI) workload domains. Each workload domain is managed by a separate vCenter Server instance which provides for scalability and allows for autonomous licensing and lifecycle management.

Figure 3-1. Sample Standard Architecture

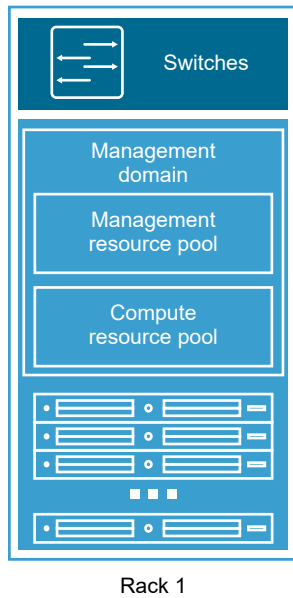
Standard architecture is the recommended model as it aligns with the VMware best practice of separating management workloads from customer workloads. It provides better long term flexibility and expansion options.

Consolidated Architecture Model

The consolidated architecture design targets smaller Cloud Foundation deployments and special use cases. In this design, the management and user workload domains run together on a shared management domain. The environment is managed from a single vCenter Server and vSphere resource pools provide isolation between management and user workloads. In a consolidated architecture model, care must be taken to ensure that resource pools are properly configured as the domain is shared by the management and compute workloads.

As you add additional hosts to a Cloud Foundation system deployed on a consolidated architecture, you can convert to the standard architecture by creating a VI workload domain and moving the user workload domain VMs from the compute resource pool to the newly created VI workload domain. After moving these VMs, you may need to update shares and reservations on the compute resource pool in the management domain.

Figure 3-2. Sample Consolidated Architecture



Cloud Foundation Glossary

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Term	Description
availability zone	Collection of infrastructure components. Each availability zone is isolated from other availability zones to prevent the propagation of failure or outage across the data center.
Application virtual networks (AVNs)	Virtual networks backed by overlay segments using the encapsulation protocol of NSX-T. Virtual Networks use a single IP network address space, to span across data centers.
bring-up	Initial configuration of a newly deployed Cloud Foundation system. During the bring-up process, the management domain is created and the Cloud Foundation software stack is deployed on the management domain.
cluster image	Precise description of the software, components, vendor add-ons, and firmware to run on a host. With this new functionality, you set up a single image and apply it to all hosts in a cluster, thus ensuring cluster-wide host image homogeneity.
commission host	Adding a host to Cloud Foundation inventory. The host remains in the free pool until it is assigned to a workload domain.
composability	Ability to dynamically configure servers to meet the needs of your workloads without physically moving any hardware components. You bind disaggregated hardware components (compute, network, storage, and offload components) together to create a logical system based on the needs of your applications.
dirty host	A host that has been removed from a cluster in a workload domain. A dirty host cannot be assigned to another workload domain until it is cleaned up.
decommission host	Remove an unassigned host from the Cloud Foundation inventory. SDDC Manager does not manage decommissioned hosts.
Edge cluster	A logical grouping of Edge nodes. These nodes run on a vSphere cluster, and provide north-south routing and network services for the management and VI workload domains.
free pool	Hosts in the Cloud Foundation inventory that are not assigned to a workload domain
host	An imaged server.
inventory	Logical and physical entities managed by Cloud Foundation.
Kubernetes - Workload Management	With Kubernetes - Workload Management, you can deploy and operate the compute, networking, and storage infrastructure for vSphere with Kubernetes workloads. A vSphere with Kubernetes workload is an application with containers running inside vSphere pods, regular VMs, or Tanzu Kubernetes clusters.
Lifecycle Manager (LCM)	Automates patching and upgrading of the software stack.
management domain	Cluster of physical hosts that contains the management component VMs

Term	Description
network pool	Automatically assigns static IP addresses to vSAN and vMotion vmkernel ports so that you don't need to enter IP addresses manually when creating a VI workload domain or adding a host or cluster to a workload domain.
patch update bundle	Contains bits to update the appropriate Cloud Foundation software components in your management or VI workload domain.
region	A Cloud Foundation instance.
SDDC Manager	Software component that provisions, manages, and monitors the logical and physical resources of a Cloud Foundation system.
SDDC Manager VM	Virtual machine (VM) that contains the SDDC Manager services and a shell from which command line tools can be run. This VM exposes the SDDC Manager UI.
server	Bare metal server in a physical rack. After imaging, it is referred to as a host.
unassigned host	Host in the free pool that does not belong to a workload domain.
vSphere Lifecycle Manager (vLCM)	A vCenter service, which is now integrated with Cloud Foundation, that enables centralized and simplified lifecycle management of ESXi hosts.
workload domain	A policy based resource container with specific availability and performance attributes that combines vSphere, storage (vSAN, NFS, or VMFS on FC) and networking (NSX-T) into a single consumable entity. A workload domain can be created, expanded, and deleted as part of the SDDC lifecycle operations. It can contain cluster(s) of physical hosts with a corresponding vCenter to manage them. The vCenter for a workload domain physically lives in the management domain.