Introducing VMware Validated Designs for Software-Defined Data Center

VMware Validated Design for Software-Defined Data Center 3.0

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About Introducing VMware Validated Design for Software-Defined Data Center

The *Introducing VMware Validated Design for Software-Defined Data Center* guide provides directions on using the content of VMware Validated Design™ for Software-Defined Data Center. The guide also contains a high-level overview of the Software-Defined Data Center (SDDC) design supported in this VMware Validated Design version.

Introducing VMware Validated Design for Software-Defined Data Center focuses on providing guidance about using the VMware Validated Design and includes the following information:

- Design objectives
- Document structure and purpose
- Supported VMware product versions
- SDDC design overview

Intended Audience

Introducing VMware Validated Design for Software-Defined Data Center is intended for cloud architects, infrastructure administrators, cloud administrators and cloud operators who want to get familiar with VMware Validated Design to deploy and manage an SDDC that meets the requirements for capacity, scalability, business continuity and disaster recovery.

VMware Technical Publications Glossary

VMware Technical Publications provides a glossary of terms that might be unfamiliar to you. For definitions of terms as they are used in VMware technical documentation, go to http://www.vmware.com/support/pubs.

Overview of VMware Validated Designs

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Use VMware Validated Designs to build a Software-Defined Data Center that is based on management components by VMware, and has a scalable and best-practice configuration.

VMware Validated Designs have the following advantages:

One path to SDDC

After you satisfy the deployment requirements, follow one consistent path to deploy an SDDC.

VMware Validated Designs offer an extensively tested solution path with specific information about product versions, networking architecture, capabilities, and limitations.

SDDC design for use in production

This VMware Validated Design supports an SDDC that has the following features:

- High-availability of management components
- Backup and restore of management components
- Monitoring and alerting
- Disaster recovery of management components
- Protection of management application by using NSX Distributed Firewall

Validated design and deployment

The prescriptive documentation of a VMware Validated Design is continuously validated by VMware.

Validation provides the following advantages to your organization:

- Validated product interoperability
- Validated SDDC features, such as custom workload churn, high availability of management components, operational continuity, efficient monitoring, and a design with dual-region support in mind
- Reduced risk of deployment and operational problems
- Reduced test effort

Fast SDDC standup

By downloading all SDDC products , and following detailed design and step-by-step instructions, you are able to implement a data center without engaging in design work and product research.

Support for latest product releases	Every version of a VMware Validated Design accommodates new product releases. If you have deployed an SDDC according to an earlier version of a VMware Validated Design, you can directly follow the validated design to upgrade your environment.
Foundation of SDDC deployment use cases	This VMware Validated Design provides the foundation for use cases that satisfy the requirements of individual organizations or industry segments, such as VMware Validated Design for Micro-Segmentation and VMware Validated Design for IT Automating IT.

Solution Overview and Design Objectives

2

This VMware Validated Design has a number of objectives to deliver prescriptive content about an SDDC that is fast to deploy and is suitable for use in production.

Table 2-1. Objectives of VMware Validated Designfor Software-Defined Data Center

VMware Validated Design Objective	Description
Main objective	SDDC capable of automated provisioning of workloads
Scope of deployment	Greenfield and brownfield deployment of the SDDC management components.
Cloud type	Private cloud
Number of regions and disaster recovery support	Dual-region SDDC that supports disaster recovery The documentation provides guidance for a deployment that supports two regions for failover in the following way: ■ The design documentation provides guidance for an SDDC whose management components are designed to operate in the event of planned migration or disaster recovery. This part also includes design of the components that support the failover. ■ The deployment documentation provides guidance for an SDDC that supports two regions for both management and tenant workloads. ■ The operational guidance contains detailed instructions about performing disaster recovery and planned migration.
Maximum number of virtual machines	■ 10,000 running virtual machines ■ Churn rate of 150 virtual machines per hour Churn rate is related to provisioning, power cycle operations, and decommissioning of one tenant virtual machine by using a blueprint in the cloud management platform. A churn rate of 100 means that 100 tenant workloads are provisioned, pass the power cycle operations, and are deleted.

Number of hardware pods	2-pod setup
	The validated design requires the following pods for SDDC deployment:
	■ Management pod. Runs the virtual machines of the management products.
	■ Shared edge and compute pod
	  ■ Runs the tenant workloads.
	  ■ Runs the required NSX services to enable north-south routing between the SDDC and the external network, and east-west routing inside the SDDC.

Table 2-1. Objectives of VMware Validated Designfor Software-Defined Data Center (Continued)

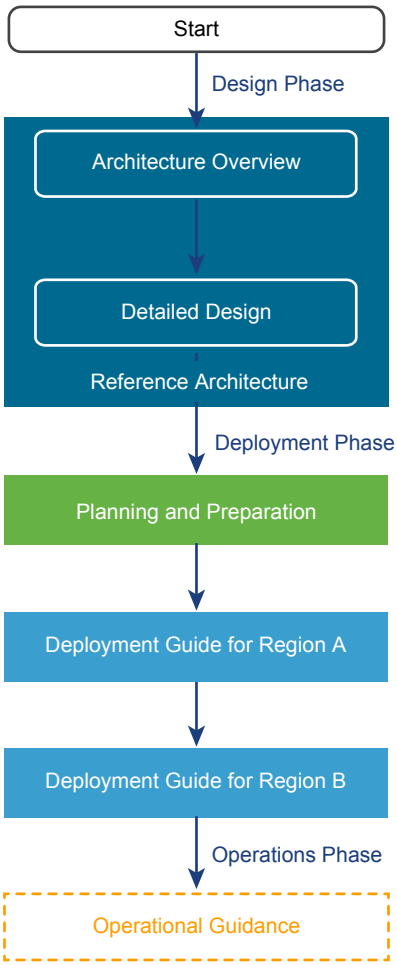
VMware Validated Design Objective	Description
Data center virtualization	■ Compute virtualization ■ Software-defined storage in the management pod ■ Network virtualization
Scope of guidance	■ Storage, compute and networking for the management pod. ■ Number of hosts, amount of storage and configuration. ■ Deployment and initial setup of management components at the levels of infrastructure, cloud management platform, and operations. ■ Basic tenant operations such as creating a tenant, assigning tenant capacity, configuring user access, and adding virtual machines to a service catalog from single-machine blueprints. ■ Operations on the management components of the SDDC such as monitoring and alerting, backup and restore, post-maintenance validation, disaster recovery and upgrade.
Overall availability	99% availability Planned downtime is expected for upgrades, patching, and on-going maintenance.
Authentication, authorization, and access control	■ Use of Microsoft Active Directory as a central user repository. ■ Use of service accounts with minimum required authentication and Access Control List configuration. ■ Use of basic tenant accounts.
Certificate signing	Certificates are signed by an external certificate authority (CA).
Hardening	Tenant workload traffic can be separated from the management traffic. The design uses a distributed firewall to protect all management applications. To secure the SDDC, only other management solutions and approved administration IP addresses can directly communicate with individual components.

Documentation Structure and Audience

3

The structure of the VMware Validated Design documentation reflects the best practices in designing and deploying a data center that is capable of automated workload provisioning. The documentation components of the validated design are organized according to the audience and deployment stage. You use the documents in a specific order.

Figure 3-1. VMware Validated Design Documentation Flow



Architecture Overview

The first part of a VMware Validated Design is *Architecture Overview* and it introduces the terms and components in the design.

Table 3-1. Architecture Overview Information

Section Attribute	Description
Guide	*VMware Validated Design Reference Architecture Guide*
Purpose	■ Introduce the fundamentals and components in the SDDC design. ■ Provide information about the layered structure of the SDDC. ■ Describe the building modules and basic behavior of each management component.
Audience	Cloud architects and cloud administrators

Detailed Design

After you learn about the basic modules in the SDDC design, you proceed with detailed design of the management components and the required infrastructure.

Table 3-2. Detailed Design Information

Section Attribute	Description
Guide	*VMware Validated Design Reference Architecture Guide*
Purpose	■ Provide complete details about the configuration of each layer and of the components that are a part of the layer. ■ Describe available design alternatives. ■ Provide design decisions to reflect the main design issues and the rationale behind a chosen solution path.
Audience	Cloud architects and cloud administrators

Planning and Preparation

After you understand the details of the design, you plan your environment according to the requirements of the design so that you can deploy the designed SDDC directly without additional testing and troubleshooting efforts.

Table 3-3. Planning and Preparation Information

Section Attribute	Description
Guide	*VMware Validated Design Planning and Preparation Guide*
Purpose	Collect all requirements that your environment must meet so that you can follow a VMware Validated Design to create an SDDC. The *Planning and Preparation* section provides prerequisites for the following areas: ■ Required software including VMware products, scripts, and third-party software ■ Networking configuration including VLANs, example IP addresses, and DNS names ■ Active Directory user configuration ■ Specifications of the virtual machines that you must provide in advance
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators

Deployment Guide for Region A

After you make sure that your environment has the required structure and configuration, follow the *Deployment Guide for Region A* to start the SDDC implementation in the first region.

Table 3-4. Deployment Guide Information

Section Attribute	Description
Guide	*VMware Validated Design Deployment Guide for Region A*
Purpose	■ Provide step-by-step instructions for each management component of the SDDC according to the selected design path in *Detailed Design*. ■ Cover the single-region setup of the SDDC. ■ Provide details about setting up the virtual infrastructure for both management and tenant workloads. ■ Provide procedures for integration of the products to form one functional system.
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators

Deployment Guide for Region B

After you make sure that your environment has the required structure and configuration, follow the *Deployment Guide for Region B* to start the SDDC implementation in the second region.

Table 3-5. Deployment Guide Information

Section Attribute	Description
Guide	*VMware Validated Design Deployment Guide for Region B*
Purpose	■ Provide step-by-step instructions for each management component of the SDDC according to the selected design path in *Detailed Design*. ■ Cover the dual-region setup of the SDDC. ■ Provide details about setting up the virtual infrastructure for both management and tenant workloads. ■ Provide procedures for integration of the products to form one functional system.
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators

Operational Guidance

After you deploy the SDDC, follow the *Operational Guidance* documentation to operate the environment and the management workloads .

Table 3-6. Operational Guidance Information

Section Attribute	Description
Guide	*VMware Validated Design Operational Guidance* that is delivered as a set of add-on packages that could be asynchronously delivered.
Purpose	For each management component, provide the following information: ■ Step-by-step instructions about backing and restoring the components of each management product. ■ Step-by-step instructions about setting up dashboards and activating alerts for monitoring the SDDC, and lists of notifications that are most symptomatic. ■ Step-by-step instructions about verifying the operation of the SDDC after software maintenance such as restore, upgrade or failover . ■ Step-by-step instructions about setting up and performing for disaster recovery or planned migration. ■ Step-by-step instructions about upgrading from earlier versions of a VMware Validated Design.
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators

Overview of the SDDC Structure

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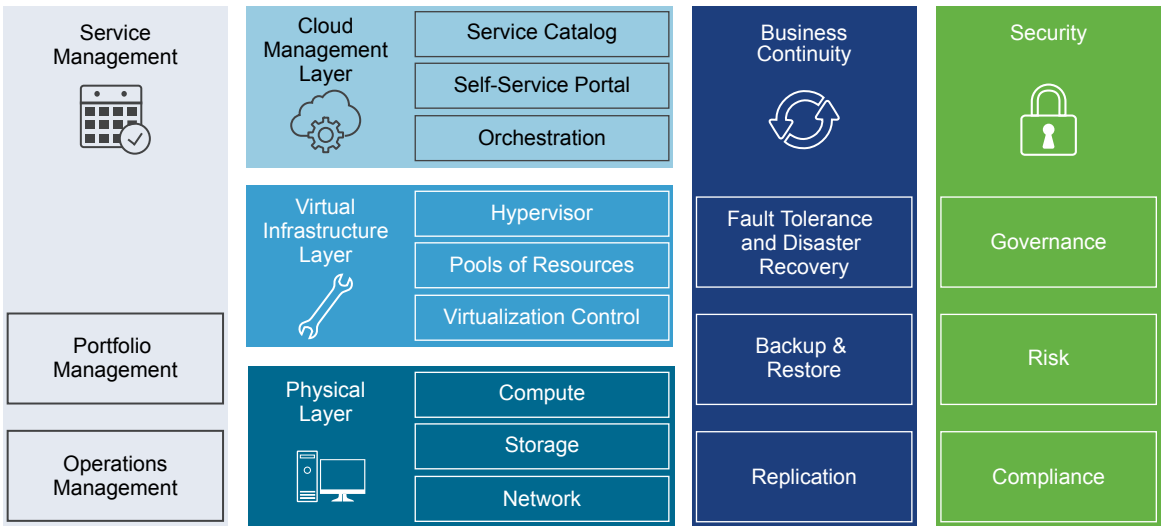
The SDDC architecture in this VMware Validated Design consists of layers. The layered structure enables you to create the SDDC in modules and to handle each set of components separately.

For information about the design and deployment of each layer, see *VMware Validated Design Reference Architecture Guide*, *VMware Validated Design Deployment Guide for Region A* and *VMware Validated Design Deployment Guide for Region B*.

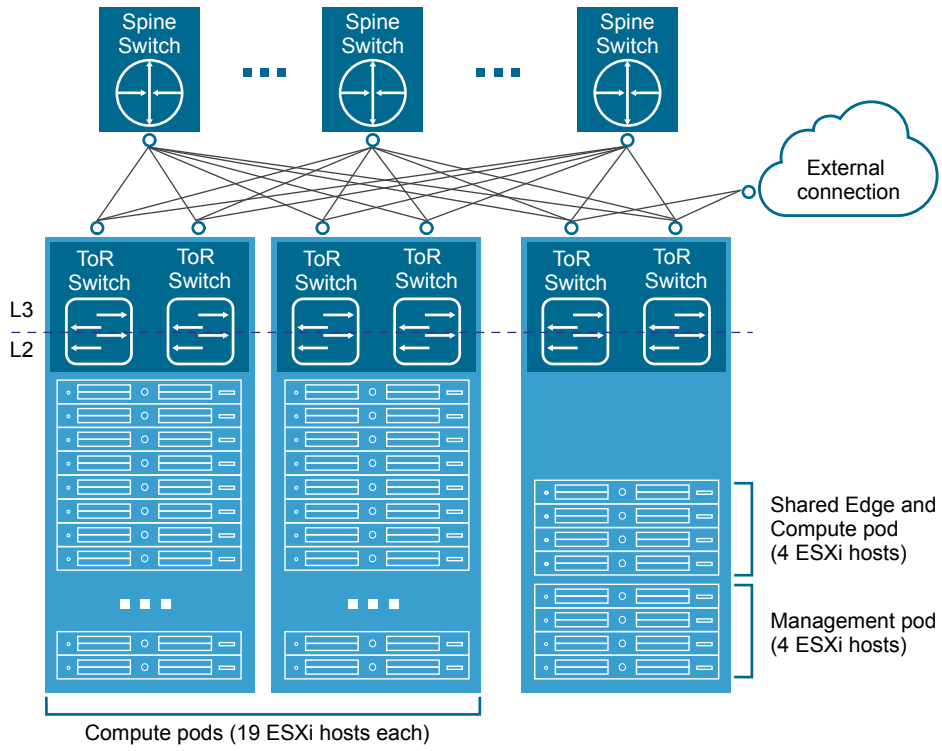
Figure 4-1. Components of a Software-Defined Data Center



Physical Infrastructure Layer

The physical layer contains the compute, storage, and network resources in your data center. These resources are organized in pods. The physical layer also includes the physical network infrastructure, and storage considerations.

Figure 4-2. Physical Configuration of the SDDC



Pods

At the physical layer, a pod is a logical grouping of hardware that supports a certain function and is easy to replicate. Pods can have different configurations of server, storage, and network equipment. In large environments, each pod spans one rack, but in smaller environments you can aggregate multiple pods into a single rack.

This VMware Validated Design uses the following types of pods:

Management Pod

Runs the virtual machines of the components that manage the data center, such as vCenter Server, NSX Manager, and NSX Controller.

This VMware Validated Design uses one management pods that occupies half a rack.

Shared Edge and Compute Pod

The shared edge and compute pod runs the required NSX services to enable north-south routing between the data center and the external network, and east-west routing inside the data center. This shared pod also hosts the tenant virtual machines (sometimes referred to as workloads or payloads). As the environment grows, additional compute-only pods can be added to support a mix of different types of workloads for different types of Service Level Agreements.

Compute Pod

Compute pods host the tenant virtual machines (sometimes referred to as workloads or payloads). You can mix different types of compute pods and provide separate compute pools for different types of SLAs.

Network

This VMware Validated Design uses a Layer 3 leaf-and-spine network architecture.

- A leaf switch is typically located inside a rack and provides network access to the servers inside that rack. Leaf switches are also called Top of Rack (ToR) switches.
- A spine switch is in the spine layer and provides connectivity between racks. Links between spine switches are typically not required. If a link failure between a spine switch and a leaf switch occurs, the routing protocol ensures that no traffic is sent to the spine switch that has lost connectivity.

Regions and Availability Zones

Availability zone

Represent the fault domain of the SDDC. Multiple availability zones can provide continuous availability of an SDDC. This VMware Validated Design supports one availability zone per region.

Region

Each region is a separate SDDC instance. You use multiple regions for disaster recovery across individual SDDC instances.

In this VMware Validated Design, regions have similar physical and virtual infrastructure design but different naming.

Table 4-1. Regions in VMware Validated Design

Region	Disaster Recovery Role	Region-Specific Domain Name
Region A	Protected	sfo01.rainpole.local
Region B	Recovery	lax01.rainpole.local

Storage

This VMware Validated Design provides guidance for the storage of the management components. The design uses two storage technologies:

VMware Virtual SAN

Virtual SAN storage is the default storage type for the SDDC management components.

	The storage devices on Virtual SAN ready servers provide the storage infrastructure. Because this VMware Validated Design uses Virtual SAN in hybrid mode, each rack server must have one SSD and two HDD devices that form a disk group with capacity.
NFS	NFS storage is the secondary storage for the SDDC management components. It provides space for workload backup, archiving log data and application templates.

Virtual Infrastructure Layer

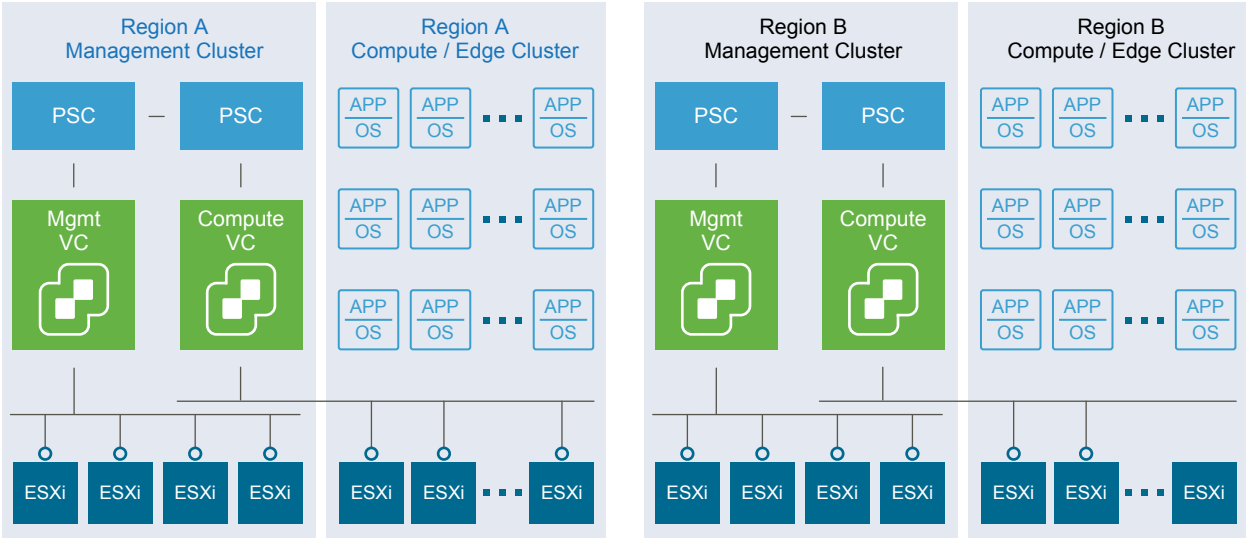
The virtual infrastructure layer contains the components that provide compute, networking, and storage resources to the management and tenant workloads.

vCenter Server Design

Table 4-2. vCenter Server Design Details

Design Area	Description
vCenter Server instances	You deploy two vCenter Server instances in the following way: ■ One vCenter Server instance supporting the SDDC management components. ■ One vCenter Server instance supporting the edge components and tenant workloads. Using this model provides the following benefits: ■ Isolation of management and compute vCenter Server operations ■ Simplified capacity planning ■ Separated upgrade ■ Separated roles
Clusters	You distribute hosts and workloads in the following clusters: ■ Management cluster that contains all management hosts and handles resources for the management workloads. ■ Shared edge and compute cluster that contains tenant workloads, NSX Controllers, and associated NSX Edge gateway devices used for the tenant workloads.
Resource pools for tenant workloads and dedicated NSX components	On the shared edge and compute cluster, you use resource pools to distribute compute and storage resources to the tenant workloads and the NSX components carrying their traffic.
Deployment model	This VMware Validated Design uses two Platform Services Controller instances and two vCenter Server instances. For redundancy, the design joins the two Platform Services Controller instances to the same vCenter Single Sign-On domain, and points each vCenter Server instance to one Platform Services Controller instance.

Figure 4-3. vCenter Server Cluster Layout



Dynamic Routing and Application Virtual Networks

This VMware Validated Design supports dynamic routing for both management and tenant workloads, and also introduces a model of isolated application networks for the management components.

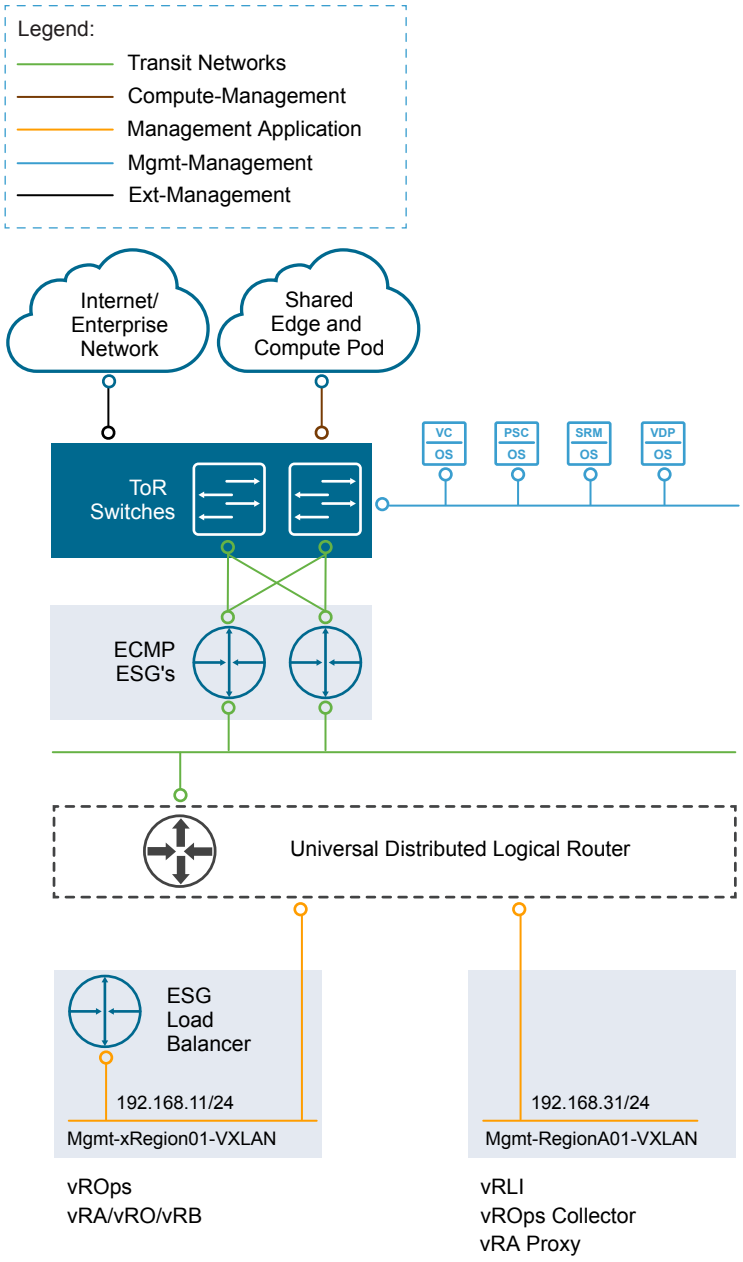
Dynamic routing support includes the following nodes:

- Pair of NSX Edge service gateways (ESGs) with ECMP enabled for north/south routing across all regions.
- Universal distributed logical router (UDLR) for east/west routing across all regions.

Application virtual networks provide support for limited access to the nodes of the applications through published access points. Three application virtual networks exist:

- Common application virtual network that connects the components that are designed to fail over to a recovery region.
- Application virtual network in Region A for components that are not designed to fail over.
- Application virtual network in Region B for components that are not design to fail over.

Figure 4-4. Virtual Application Network Components and Design



Distributed Firewall

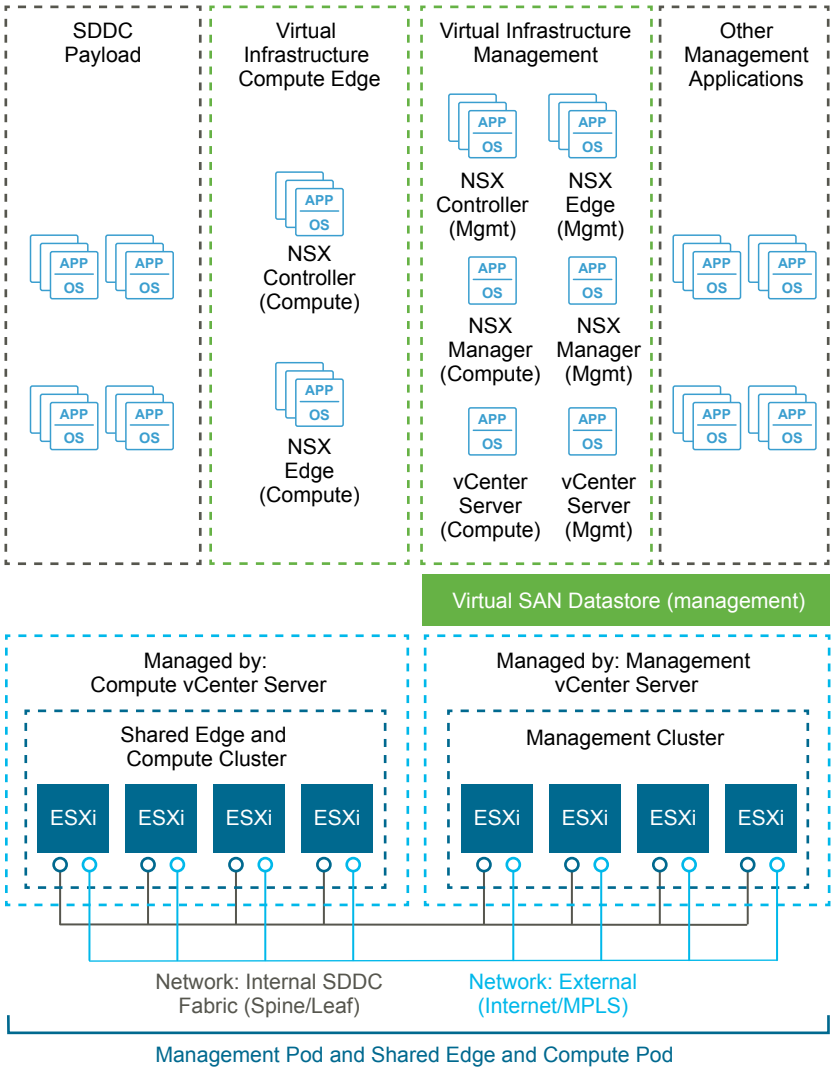
This VMware Validated Design uses the distributed firewall functionality that is available in NSX to protect all management applications attached to application virtual networks.

Software-Defined Storage Design for Management Products

In each region, workloads on the management cluster store their data on a Virtual SAN datastore. The Virtual SAN datastore spans all 4 ESXi hosts of the management cluster. Each host adds one disk group to the datastore.

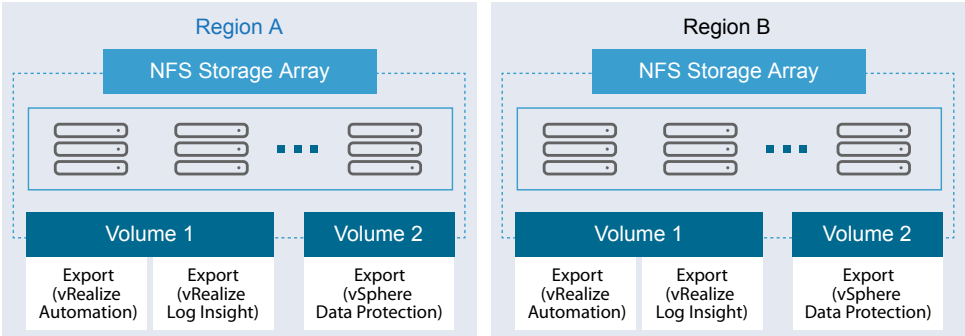
Applications store their data according to the default storage policy for Virtual SAN.

Figure 4-5. Virtual SAN Conceptual Design



vSphere Data Protection, vRealize Log Insight and vRealize Automation Content Library use NFS exports. You create two datastores: one in the management cluster for vSphere Data Protection and one in the shared edge and compute cluster for vRealize Automation.

Figure 4-6. NFS Storage Exports



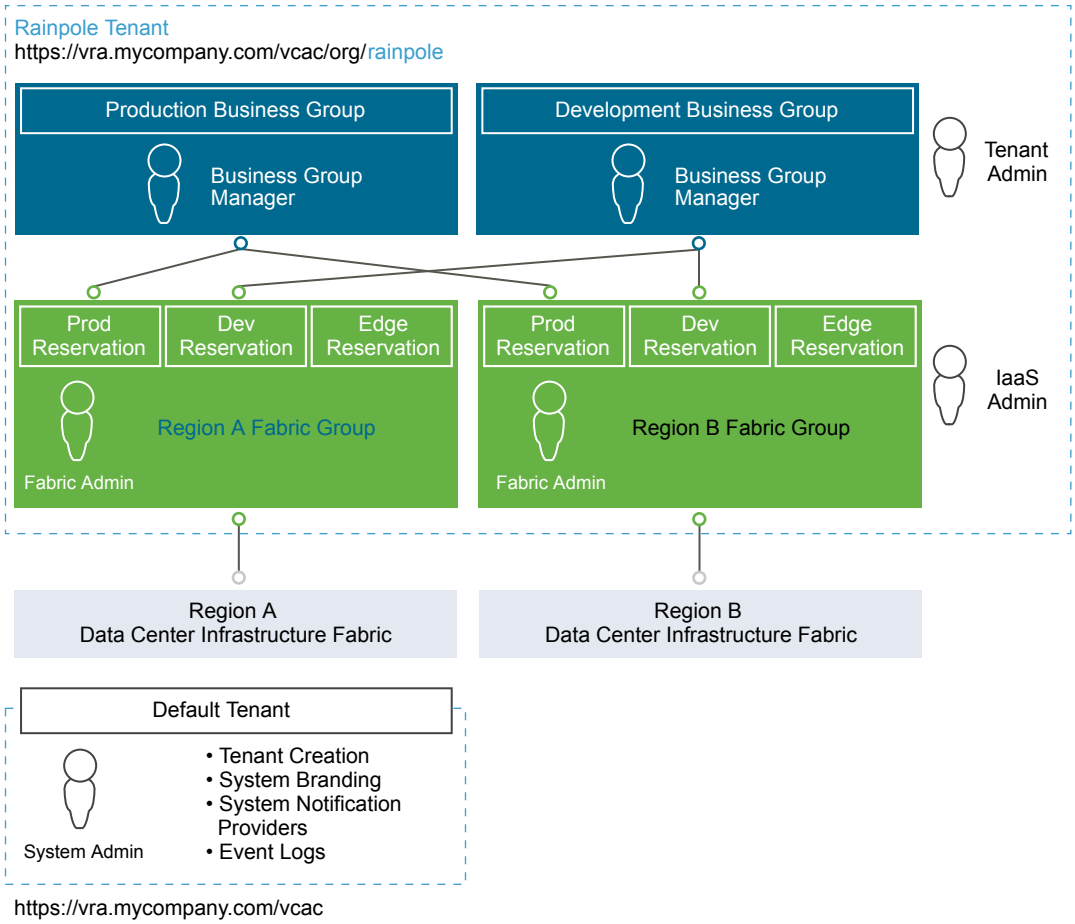
Cloud Management Layer

The cloud management layer enables you to deliver tenants with automated workload provisioning by using a self-service portal.

Table 4-3. Cloud Management Design Details

Design Attribute	Description
Software components	■ vRealize Automation ■ vRealize Orchestrator ■ vRealize Business
Deployment model of vRealize Automation	Distributed deployment with support for vSphere endpoints by using vSphere Proxy Agent virtual machines. You install the vRealize Automation components on multiple machines.
High availability and load balancing	Supported for all nodes except the Microsoft SQL database server and vRealize Business.
Endpoints	■ vCenter Server for the management cluster ■ vCenter Server for the compute and edge clusters
Blueprint configuration	Single-machine blueprints
Tenants	A single tenant company called Rainpole.
Fabric groups	One fabric group in a region with all resources in the compute and edge cluster assigned.
Business groups	Two business groups, one for production and one for development.

Figure 4-7. vRealize Automation Tenant Design



Operations Layer

The operations layer of the SDDC provides capabilities for performance and capacity monitoring, and for backup and restore of the cloud management components.

vRealize Operations Manager

You use vRealize Operations Manager to monitor the management components of the SDDC including vSphere, NSX for vSphere and vRealize Automation.

vRealize Operations Manager is also sized to accommodate the number of tenant workloads per the design objectives.

Figure 4-8. vRealize Operations Manager Logical Design

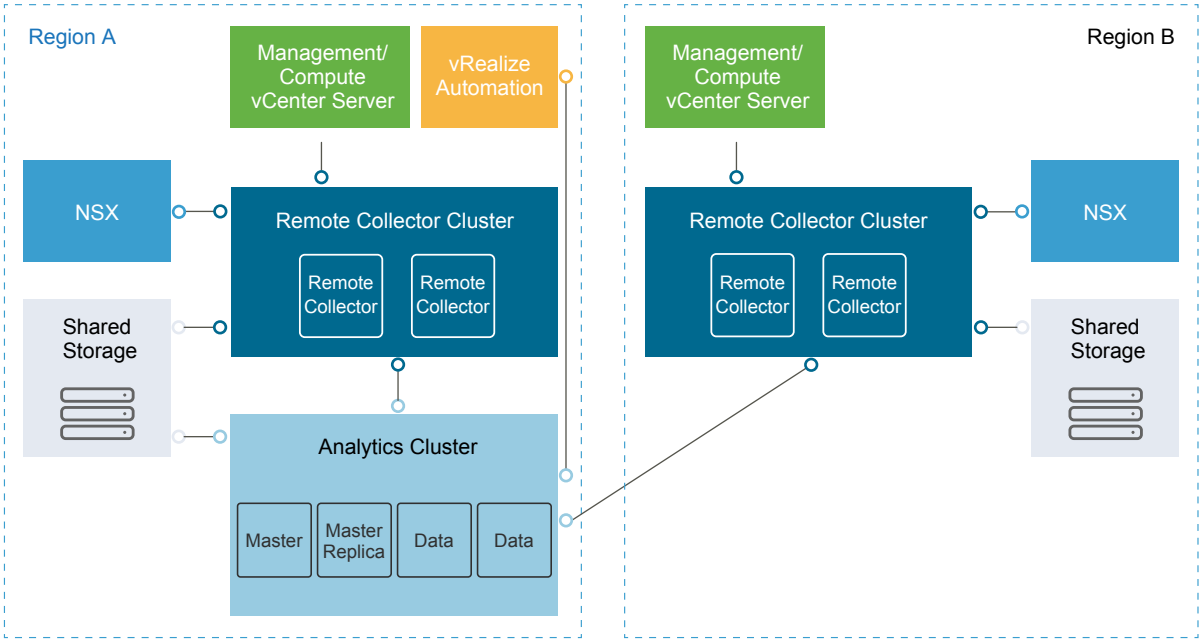


Table 4-4. vRealize Operations Manager Design Details

Design Attribute	Description
Deployment model	■ Analytics cluster of four nodes: master, master replica and two data nodes ■ Remote collector cluster that consists of two remote collectors that communicate with two vCenter Server instances in the region
Monitored components	■ vCenter Server and Platform Services Controller ■ Management, shared edge and compute ESXi hosts ■ All components of NSX for vSphere for the management cluster and the shared edge and compute cluster ■ vRealize Automation and vRealize Orchestrator ■ vRealize Log Insight ■ vRealize Operations Manager (self-health monitoring)

vRealize Log Insight

You use vRealize Log Insight to access the logs of the SDDC management components from a central place and view this information in visual dashboards.

Figure 4-9. vRealize Log Insight Logical Design

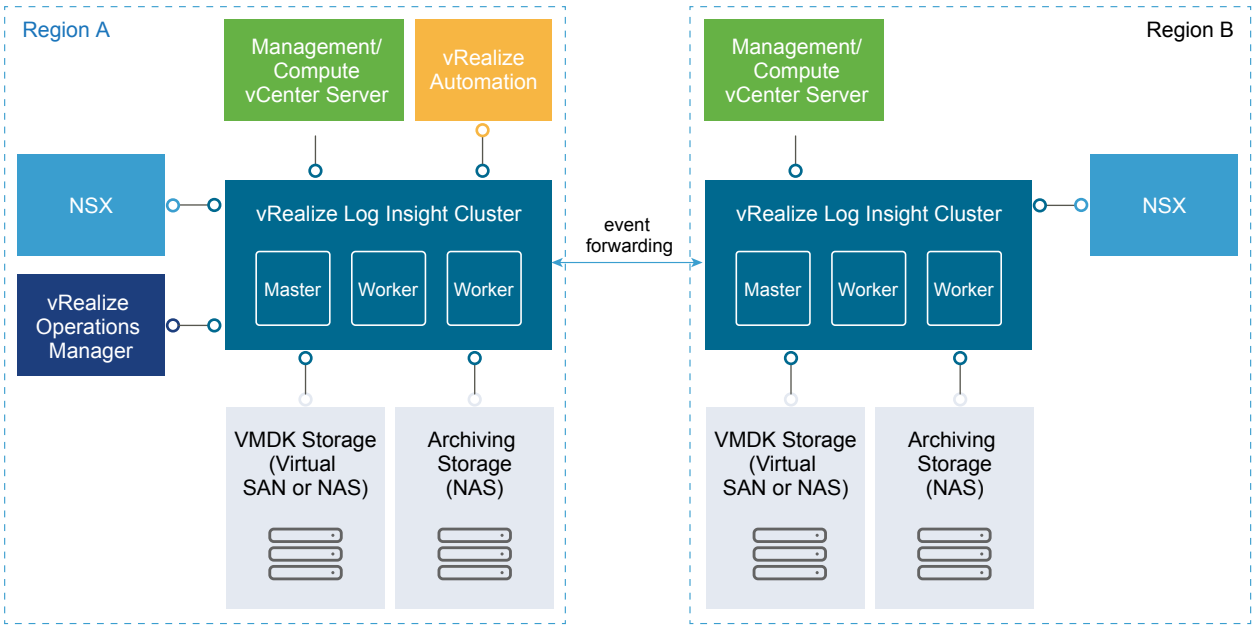


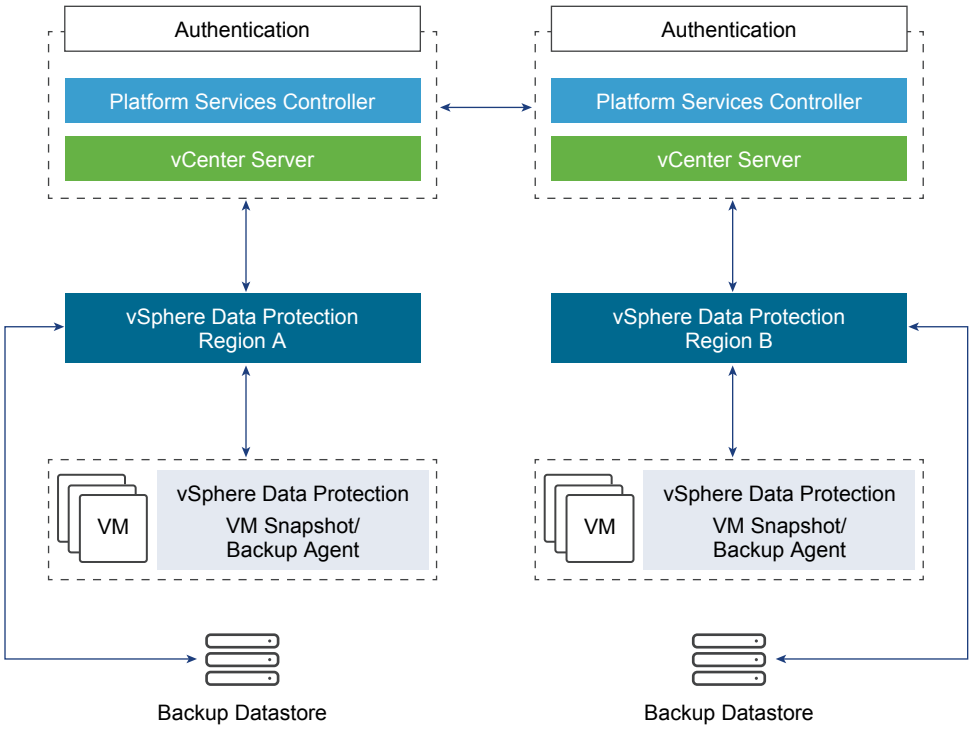
Table 4-5. vRealize Log Insight Design Details

Design Attribute	Description
Deployment model	Cluster of master node and two worker nodes.
Monitored components	■ vCenter Server and Platform Services Controller ■ Management, shared edge and compute ESXi hosts ■ All components of NSX for vSphere for the management cluster and the shared edge and compute clusters ■ vRealize Automation and vRealize Orchestrator ■ Analytics cluster nodes of vRealize Operations Manager
Archiving	Archiving location on an NFS export

vSphere Data Protection

You deploy vSphere Data Protection to back up the virtual machines of the SDDC management components. vSphere Data Protection stores its data and the backup copies of virtual machines on the NFS datastore in the management cluster.

Figure 4-10. vSphere Data Protection Design

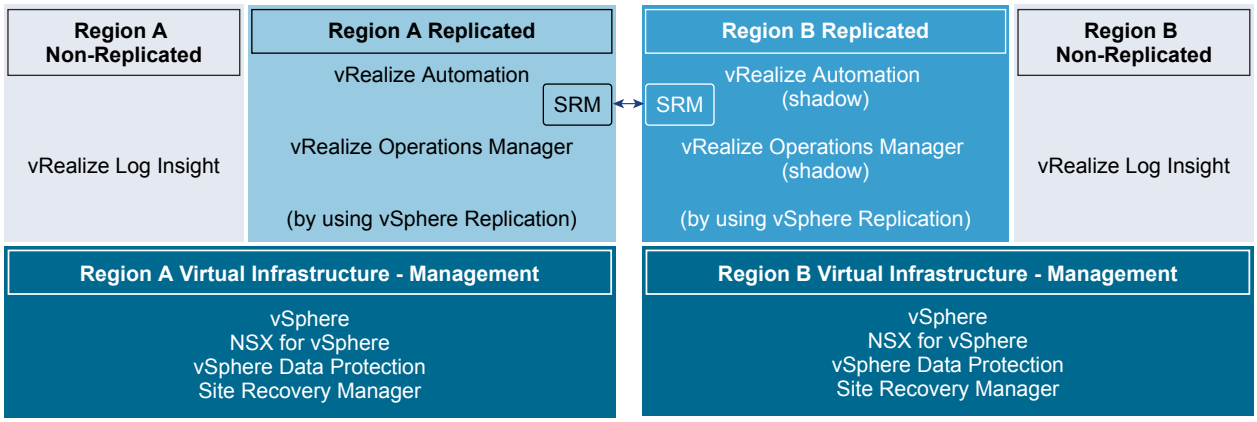


Disaster Recovery Design

This VMware Validated Design implements a disaster recovery configuration that uses Site Recovery Manager and vSphere Replication to replicate the management applications and to mirror them on the second recovery region.

- The following management applications are a subject of disaster recovery protection:
  - vRealize Automation together with vRealize Orchestrator and vRealize Business
  - Analytics cluster of vRealize Operations Manager
- The virtual infrastructure components that are not in the scope of the disaster recovery protection, such as vRealize Log Insight, are available as separate instances in each region.

Figure 4-11. Disaster Recovery Architecture



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