

Introducing VMware Validated Designs for Software-Defined Data Center

19 MAR 2019

VMware Validated Design 5.0

VMware Validated Design for Software-Defined Data
Center 5.0

VMware Validated Design 5.0.1

VMware Validated Design for Software-Defined Data
Center 5.0.1



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Contents

About Introducing VMware Validated Design for Software-Defined Data Center	5
Updated Information	6
1 Features of VMware Validated Designs	7
2 SDDC Architectures	9
3 Design Objectives of VMware Validated Designs	12
4 Automated Deployment of VMware Validated Designs	16
5 Workload Domains in VMware Validated Design	18
6 Documentation Structure and Audience	22
7 Post-Deployment Documentation and Technical Notes	27
8 Overview of Standard SDDC	30
Physical Infrastructure Layer in Standard SDDC	31
Virtual Infrastructure Layer in Standard SDDC	33
Operations Management Layer in Standard SDDC	37
Cloud Management Layer in Standard SDDC	44
Business Continuity Layer in Standard SDDC	45
Multiple Availability Zones in Standard SDDC	47
9 Overview of Consolidated SDDC	51
Physical Infrastructure Layer in Consolidated SDDC	51
Virtual Infrastructure Layer in Consolidated SDDC	54
Operations Management Layer in Consolidated SDDC	57
Cloud Management Layer in Consolidated SDDC	62
Business Continuity Layer in Consolidated SDDC	64
10 Overview of ROBO SDDC	66
Physical Infrastructure Layer in ROBO SDDC	66
Virtual Infrastructure Layer in ROBO SDDC	69
Operations Management Layer in ROBO SDDC	73
Cloud Management Layer in ROBO SDDC	79

[Business Continuity Layer in ROBO SDDC](#) 80

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.

Required Software

Introducing VMware Validated Design for Software-Defined Data Center is compliant and validated with certain product versions. See *VMware Validated Design Release Notes* for more information about supported product versions

Updated Information

Introducing VMware Validated Designs is updated with each release of the product or when necessary.

This table provides the update history of *Introducing VMware Validated Designs*.

Revision	Description
19 MAR 2019	The overview of additional workload domains with NSX-T is extended with details on VMware Validated Design 5.0.1. See Chapter 5 Workload Domains in VMware Validated Design .
22 JAN 2019	Initial release.

Features of VMware Validated Designs



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 a tested solution path with information about product versions, networking architecture, capabilities, and limitations.

SDDC design for use in production

A 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
 - Churn rate of tenant workloads
 - High availability of management components
 - Operational continuity
 - Design with dual-region support in mind
- Reduced risk of deployment and operational problems

- Reduced test effort

Fast SDDC standup

You can implement a data center without engaging in design work and product research. After you download all SDDC products, follow the detailed design and step-by-step instructions.

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 scenarios for industry segments

This VMware Validated Design provides the foundation for implementing scenarios for individual organizations or industry segments, such as micro-segmentation, IT automating IT, and intelligent operations.

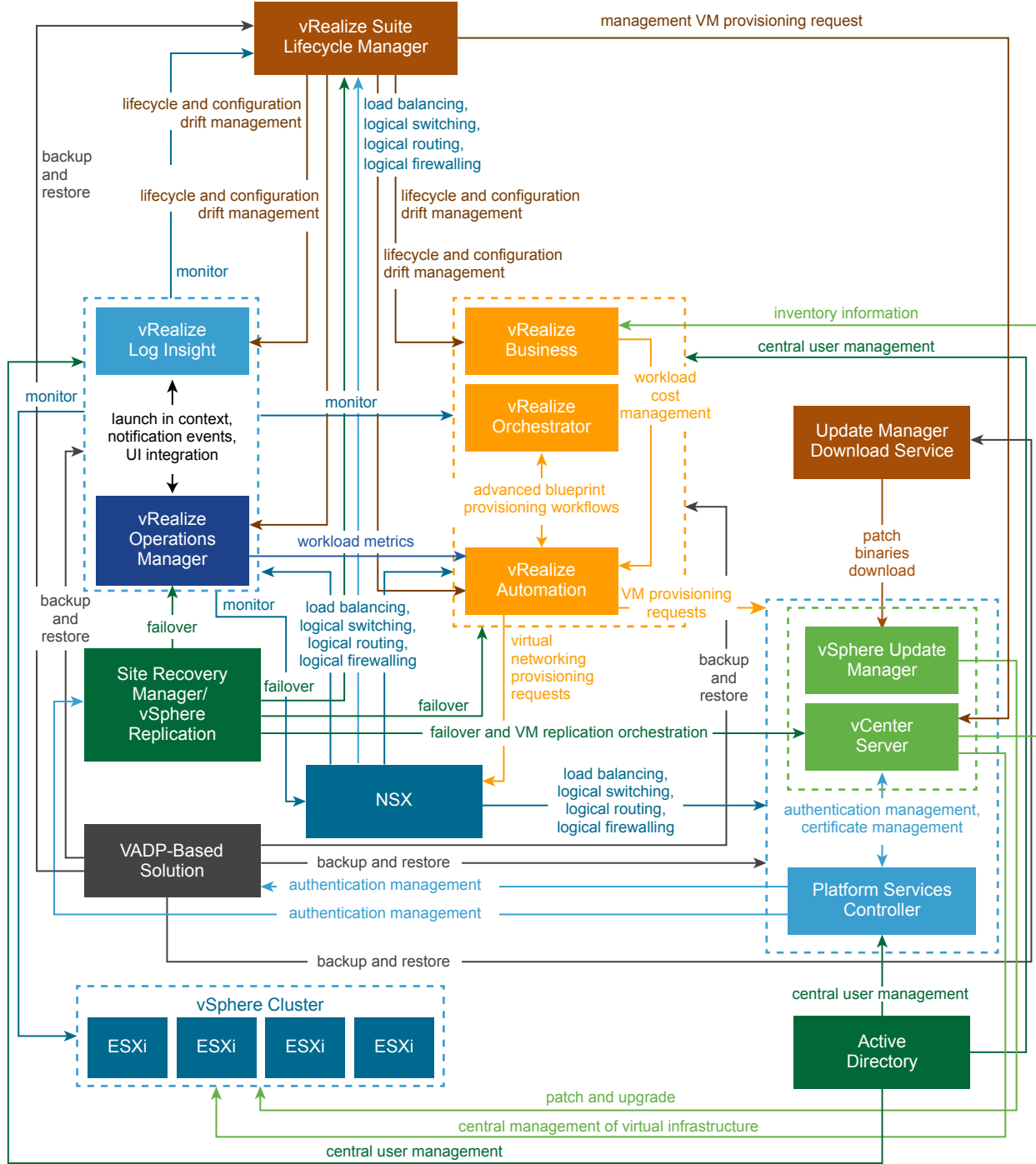
SDDC Architectures

VMware Validated Design supports several SDDC architectures according to the requirements of your organization and the resource capabilities of your environment. Implement a dual-region architecture for workload provisioning and disaster recovery according to production best practices, and extend it with multiple Remote Office and Branch Office (ROBO) sites. If you are working on an SDDC proof-of-concept, or plan to deploy a small-scale environment and extend it according to tenant adoption, implement a consolidated architecture in a single region.

High-Level Logical Design of the SDDC

The SDDC according to VMware Validated Design for Software-Defined Data Center contains the main services that are required to cover workload provisioning, operations management and business continuity.

Figure 2-1. Logical Design of the SDDC



SDDC Architectures

The VMware Validated Design for Software-Defined Data Center family provides the following SDDC implementations:

SDDC Architecture	Product Name	Description
Standard SDDC	VMware Validated Design for Software-Defined Data Center	Implements a production-ready SDDC that is dual-region, each region deployed on two workload domains - management and virtual infrastructure.
Consolidated SDDC	VMware Validated Design for Management and Workload Consolidation	Consolidates the resources that are used in the Standard SDDC to provide a single-region environment with a smaller hardware footprint and less strict availability. For example, you can use this design in a smaller environment with less virtual machines, or as a proof of concept or production pilot.
ROBO SDDC	VMware Validated Design for Remote Office and Branch Office	<p>Extends the Standard SDDC with support for remote offices that are located at a distance from the main office. The main office runs an instance of the Standard SDDC.</p> <p>The ROBO SDDC provides decentralized management, such as on-site vCenter Server and NSX Manager, but connects to an existing Standard SDDC over a WAN link. Monitoring and cloud management functions are centralized.</p>

Design Objectives of VMware Validated Designs

3

According to the SDDC implementation type, a 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 3-1. Objectives of VMware Validated Design for 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	<p>Dual-region SDDC that supports disaster recovery</p> <p>The documentation provides guidance for a deployment that supports two regions for failover in the following way:</p> <ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 10,000 running virtual machines ■ Churn rate of 150 virtual machines per hour <p>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.</p>
Number of workload cluster in a region	<p>2-cluster setup, with minimum 4 ESXi hosts in a domain</p> <p>The 2-cluster validated design requires the following workload domains for SDDC deployment:</p> <ul style="list-style-type: none"> ■ Management cluster. Runs the virtual machines of the management products. ■ Shared edge and compute cluster <ul style="list-style-type: none"> ■ 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 3-1. Objectives of VMware Validated Design for Software-Defined Data Center (Continued)

VMware Validated Design Objective	Description
Data center virtualization	<ul style="list-style-type: none"> ■ Compute virtualization ■ Software-defined storage in the management cluster ■ Network virtualization
Scope of guidance	<ul style="list-style-type: none"> ■ Storage, compute and networking for the management cluster. ■ 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	<p>99% availability</p> <p>Planned downtime is expected for upgrades, patching, and on-going maintenance.</p>
Authentication, authorization, and access control	<ul style="list-style-type: none"> ■ 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	<p>Certificates are signed by an external certificate authority (CA) that consists of a root and intermediate authority layers.</p>
Hardening	<p>Tenant workload traffic can be separated from the management traffic.</p> <p>The design uses a distributed firewall to protect all management applications.</p> <p>To secure the SDDC, only other management solutions and approved administration IP addresses can directly communicate with individual components.</p>

Table 3-2. Objectives of VMware Validated Design for Management and Workload Consolidation

VMware Validated Design Objective	Description
Main objective	SDDC capable of automated provisioning of workloads
Scope of deployment	Greenfield deployment of the SDDC management components
Cloud type	Private cloud
Number of regions and disaster recovery support	Single-region SDDC that you can scale out to dual-region.
Maximum number of virtual machines	<ul style="list-style-type: none"> ■ 1,500 running virtual machines ■ Churn rate of 50 virtual machines per hour
Number of clusters in a region	<p>1-cluster setup, with minimum 4 ESXi hosts in the cluster</p> <p>The 1-cluster validated design includes a consolidated virtual infrastructure layer for management, edge and compute components.</p>

Table 3-2. Objectives of VMware Validated Design for Management and Workload Consolidation (Continued)

VMware Validated Design Objective	Description
Data center virtualization	<ul style="list-style-type: none"> ■ Compute virtualization ■ Software-defined storage in the consolidated cluster ■ Network virtualization
Scope of guidance	<ul style="list-style-type: none"> ■ Storage, compute and networking for the consolidated cluster. ■ 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.
Overall availability	<p>95% availability</p> <p>Planned downtime is expected for upgrades, patching, and on-going maintenance.</p>
Authentication, authorization, and access control	<ul style="list-style-type: none"> ■ 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	<p>Certificates are signed by an external certificate authority (CA) that consists of a root and intermediate authority layers.</p>
Hardening	<p>Tenant workload traffic can be separated from the management traffic.</p> <p>The design uses a distributed firewall to protect all management applications.</p> <p>To secure the SDDC, only other management solutions and approved administration IP addresses can directly communicate with individual components.</p>

Table 3-3. Objectives of VMware Validated Design for Remote Office and Branch Office

VMware Validated Design Objective	Description
Main objective	SDDC capable of automated provisioning of workloads
Scope of deployment	Greenfield deployment of the SDDC management components
Cloud type	Private cloud
Maximum number of remote regions	10
Maximum number of virtual machines	<ul style="list-style-type: none"> ■ 100 virtual machines per remote region ■ 1,000 running virtual machines across all remote regions ■ Churn rate of 100 virtual machines per hour
Number of clusters in a remote region	<p>1-cluster, with minimum 4 hosts in the cluster</p> <p>The 1-cluster region includes a consolidated virtual infrastructure layer for management, edge and compute components.</p>
WAN capacity	10 Mbps, latency up to 100 ms
Data center virtualization	<ul style="list-style-type: none"> ■ Compute virtualization ■ Software-defined storage in the consolidated cluster ■ Network virtualization

Table 3-3. Objectives of VMware Validated Design for Remote Office and Branch Office (Continued)

VMware Validated Design Objective	Description
Scope of guidance	<ul style="list-style-type: none"> ■ Storage, compute and networking for the consolidated cluster. ■ 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.
Overall availability	<p>95% availability</p> <p>Planned downtime is expected for upgrades, patching, and on-going maintenance.</p>
Authentication, authorization, and access control	<ul style="list-style-type: none"> ■ Use of Microsoft Active Directory as a central user repository. ■ Use of service accounts with minimum required authentication and Access Control List configuration.
Certificate signing	<p>Certificates are signed by an external certificate authority (CA) that consists of a root and intermediate authority layers.</p>
Hardening	<p>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.</p>

Automated Deployment of VMware Validated Designs

4

In version 5.0 of VMware Validated Design, the deployment of the SDDC is automated. You use VMware Cloud Builder to deploy the SDDC management domain end-to-end and a virtual infrastructure workload domain for tenant workloads.

For each region, the workflow for automated SDDC deployment consists of the following stages:

1 Prepare the data center.

Configure the physical servers, network, and storage in the data center. Then, download the required software. See the *VMware Validated Design Planning and Preparation* documentation.

2 Prepare a deployment specification in Microsoft[®] Excel[®] spreadsheet format (XLS).

Work with the technology team of your organization to collect details about the environment in the region where you plan to deploy the SDDC. Write down the details in a Deployment Parameters XLS file. See the *VMware Validated Design Planning and Preparation* documentation.

3 Prepare the environment.

In each region, install ESXi on the physical servers. Deploy virtual machines as ready-to-use units or as templates for management components that are installed on a guest operating system, such as vRealize Automation, vSphere Update Manager Download Service, and Site Recovery Manager. See the *VMware Validated Design Deployment* documentation.

4 Prepare Cloud Builder.

Download and deploy the Cloud Builder virtual appliance in each region. Then, upload the software bundles that contain the product binaries in this version of VMware Validated Design and the certificates, signed by a certificate authority, for the management nodes. See the *VMware Validated Design Deployment* documentation.

5 Run the SDDC deployment.

Generate a JSON file for each cluster in the region from the Deployment Parameters XLS file, perform an audit of the JSON files and target environment, and bring up the SDDC. See the *VMware Validated Design Deployment* documentation.

6 Remove Cloud Builder.

Use Cloud Builder only for a deployment of the SDDC on a clean environment. Remove the virtual appliance after the deployment is complete for resource optimization.

For details on the latest available documentation, see [Documentation Map for VMware Validated Design](#).

Workload Domains in VMware Validated Design

5

In VMware Validated Design, a workload domain represents a logical unit that groups ESXi hosts managed by a vCenter Server instance with specific characteristics according to VMware SDDC best practices.

A workload domain exists in the boundaries of an SDDC region. A region can contain one or more domains. A workload domain cannot span multiple regions.

Each domain contains the following components:

- One vCenter Server instance connected to a pair of Platform Services Controller instances in the same or another workload domain.
- At least one vSphere cluster with vSphere HA and vSphere DRS enabled.
- One vSphere Distributed Switch for management traffic and NSX logical switching.
- NSX components that connect the workloads in the cluster for logical switching, logical dynamic routing, and load balancing.
- One or more shared storage allocations.

Management Workload Domain

Contains the SDDC management components.

The management workload domain has the following features:

Table 5-1. Features of the Management Workload Domain

Feature	Description
Types of workloads	Management workloads and networking components for them.
Cluster types	Management cluster
Virtual switch type	vSphere Distributed Switch
Software-defined networking	NSX for vSphere
Shared storage type	<ul style="list-style-type: none">■ vSAN for primary storage■ NFS for secondary storage
Time of deployment	First domain to deploy during initial SDDC implementation

Table 5-2. Management Workloads for the Management Workload Domain

Component	Cluster Location	Domain-Specific Instance
vCenter Server	Management cluster	X
Platform Services Controller pair	Management cluster	X
NSX Manager	Management cluster	X
NSX Controller cluster	Management cluster	X
NSX Edge devices for North-South routing and load balancing	Management cluster	X
NSX universal dynamic router	Management cluster	X

Initial Virtual Infrastructure Workload Domain

Contains tenant workloads that use NSX for vSphere for logical networking.

The initial virtual infrastructure (VI) workload domain has the following features:

Table 5-3. Features of the Initial VI Workload Domain

Feature	Description
Types of workloads	Tenant workloads and networking components for them.
Cluster types	<ul style="list-style-type: none"> ■ Shared edge and compute cluster ■ Additional compute clusters
Software-defined networking	NSX for vSphere
Shared storage type	FC/FCoE, iSCSI, NFS, or vSAN
Time of deployment	During initial SDDC implementation

Table 5-4. Management Workloads for the Initial VI Workload Domain

Component	Cluster Location	Domain-Specific Instance
vCenter Server	Management cluster	X
Platform Services Controller pair	Management cluster	
NSX Manager	Management cluster	X
NSX Controller cluster	Shared edge and compute cluster	X
NSX Edge devices for North-South routing and load balancing	Shared edge and compute cluster	X
NSX universal dynamic logical router	Shared edge and compute cluster	X
NSX dynamic logical router	Shared edge and compute cluster	X

Virtual Infrastructure Workload Domains with VMware NSX-T

Contain tenant workloads that use NSX-T for logical networking. According to the requirements of your organization, you can deploy multiple workload domains with NSX-T.

A virtual infrastructure workload domain with NSX-T has the following features:

Table 5-5. Features of a VI Workload Domain with NSX-T

Feature	Description
Types of workloads	Tenant workloads and networking components for them.
Cluster types	<ul style="list-style-type: none"> ■ Shared edge and compute cluster ■ Additional compute clusters
Virtual switch type	<ul style="list-style-type: none"> ■ vSphere Distributed Switch for traffic from the management workload domain ■ NSX-T Virtual Distributed Switch (N-VDS) for management traffic in the VI workload domain, tenant workload traffic and dynamic routing
Software-defined networking	NSX-T
Shared storage type	FC/FCoE, iSCSI, NFS, or vSAN
Time of deployment	After initial SDDC implementation

In VMware Validated Design 5.0, you deploy the management workloads for the VI workload domain with NSX-T:

Table 5-6. Management Workloads for a VI Workload Domain with NSX-T in VMware Validated Design 5.0

Component	Cluster Location	Domain-Specific Instance	Cross VI Workload Domain
vCenter Server	Management cluster	X	
Platform Services Controller pair	Management cluster		
NSX-T Manager	Management cluster	X	X Deployed with the first VI workload domain with NSX-T
NSX-T Controller cluster	Management cluster	X	X Deployed with the first VI workload domain with NSX-T
NSX Edge devices for North-South and East-West routing	Shared edge and compute cluster	X	X Deployed with the first VI workload domain with NSX-T

In VMware Validated Design 5.0.1, you deploy the management workloads for the VI workload domain with NSX-T:

Table 5-7. Management Workloads for a VI Workload Domain with NSX-T in VMware Validated Design 5.0.1

Component	Cluster Location	Domain-Specific Instance	Cross VI Workload Domain
vCenter Server	Management cluster	X	
Platform Services Controller pair	Management cluster		
NSX-T Manager cluster	Management cluster	X	X Deployed with the first VI workload domain with NSX-T
NSX Edge devices for North-South and East-West routing	Shared edge and compute cluster	X	X Deployed with the first VI workload domain with NSX-T

Operations and Workload Provisioning

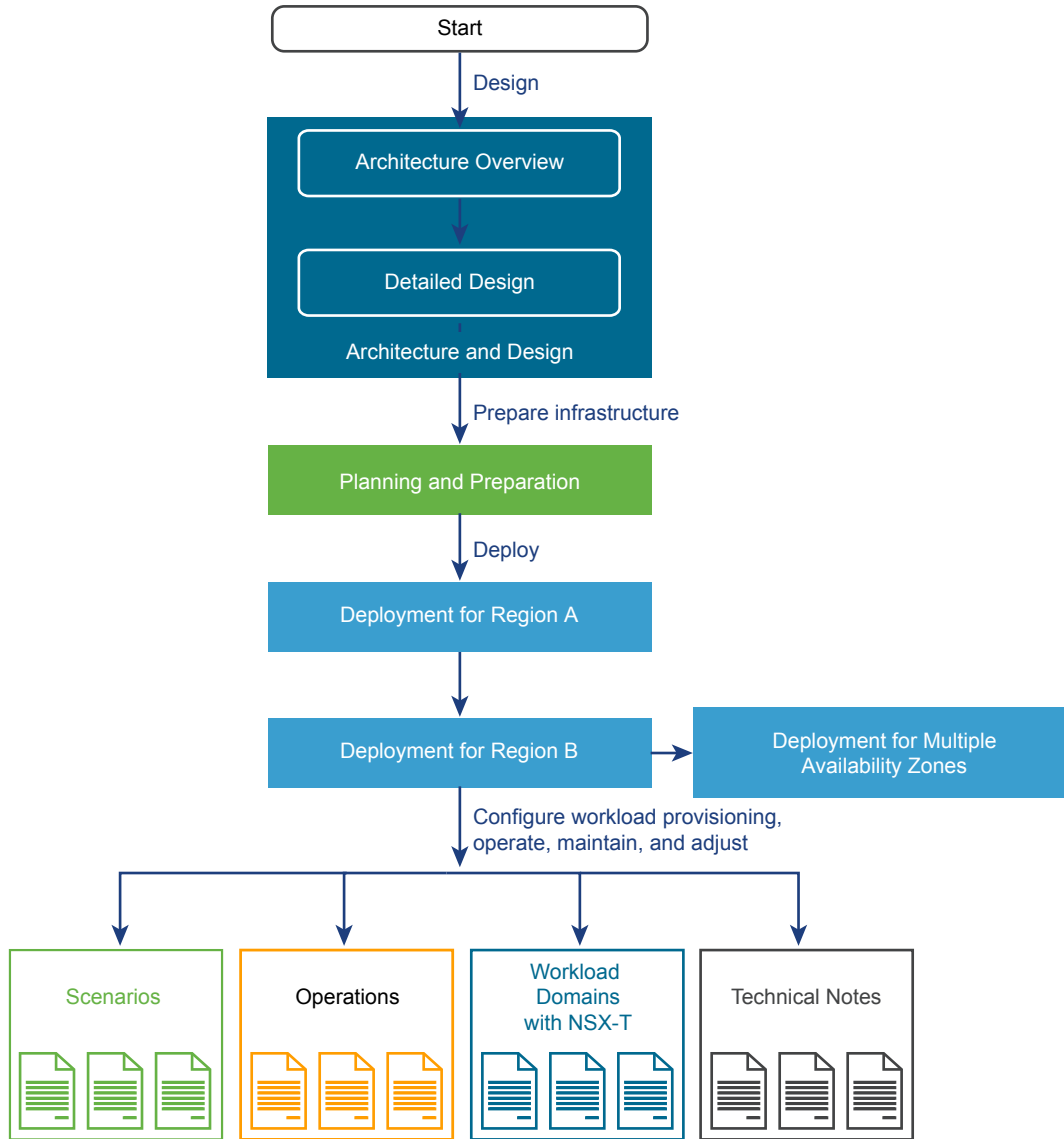
All management components for operations management and cloud management are in the management workload domain. When you deploy a VI workload domain, you connect these management components to the vCenter Server instances in the VI workload domains, to the monitoring agents of the virtual machines for the NSX instance for the domain, and to the NSX Manager for the domain.

Documentation Structure and Audience

6

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 6-1. VMware Validated Design Documentation Flow



For details on the latest available documentation, see [Documentation Map for VMware Validated Design](#).

Architecture Overview

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

Table 6-1. Architecture Overview Information

Section Attribute	Description
Guide	<i>Architecture and Design</i>
Purpose	<ul style="list-style-type: none"> ■ 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
SDDC Architecture	<ul style="list-style-type: none"> ■ Standard SDDC ■ Consolidated SDDC ■ ROBO SDDC

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 6-2. Detailed Design Information

Section Attribute	Description
Guide	<i>Architecture and Design</i>
Purpose	<ul style="list-style-type: none"> ■ 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
SDDC Architecture	<ul style="list-style-type: none"> ■ Standard SDDC ■ Consolidated SDDC ■ ROBO SDDC

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 6-3. Planning and Preparation Information

Section Attribute	Description
Guide	<i>Planning and Preparation</i>
Purpose	<p>Collect all requirements that your environment must meet so that you can follow a VMware Validated Design to create an SDDC. The <i>Planning and Preparation</i> section provides prerequisites about the following areas:</p> <ul style="list-style-type: none"> ■ 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
SDDC Architecture	<ul style="list-style-type: none"> ■ Standard SDDC ■ Consolidated SDDC ■ ROBO SDDC

Deployment of Region A

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

Table 6-4. Deployment Guide Information

Section Attribute	Description
Guide	<i>Deployment of Region A</i> for Standard SDDC <i>Deployment</i> for ROBO SDDC and Consolidated SDDC
Purpose	<ul style="list-style-type: none"> ■ Provide step-by-step instructions for each management component of the SDDC according to the selected design path in <i>Detailed Design</i>. ■ 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
SDDC Architecture	<ul style="list-style-type: none"> ■ Standard SDDC ■ Consolidated SDDC ■ ROBO SDDC

Deployment of Region B

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

Table 6-5. Deployment Guide Information

Section Attribute	Description
Guide	<i>Deployment of Region B</i>
Purpose	<ul style="list-style-type: none"> ■ Provide step-by-step instructions for each management component of the SDDC according to the selected design path in <i>Detailed Design</i>. ■ 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
SDDC Architecture	<ul style="list-style-type: none"> ■ Standard SDDC

Documentation on Workload Provisioning, Maintenance and Expansion of the SDDC

After you deploy the SDDC, follow the post-deployment documentation to operate and maintain the management workloads, or to modify or extend the SDDC. See [Chapter 7 Post-Deployment Documentation and Technical Notes](#).

Post-Deployment Documentation and Technical Notes



VMware Validated Design provides several types of documentation for operating, maintaining, extending, and modifying a deployed SDDC. This documentation is delivered as a set of add-on packages that could be asynchronously published.

For details on the latest available documentation, see [Documentation Map for VMware Validated Design](#).

Operational Guidance

The operational guidance in VMware Validated Design provides a prescriptive guidance on the common operations that you perform after the SDDC implementation is completed.

Documentation Feature	Description
Type of Guidance	According to the target operation type, each guide provides a set of step-by-step instructions organized by layer or solution. The guidance is based on the SDDC configuration in the design and deployment documentation.
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators
Supported SDDC Architecture	<ul style="list-style-type: none">Standard SDDC for all operations guidesStandard SDDC, Consolidated SDDC, and ROBO SDDC for the certificate replacement documentation.
Covered use cases	<ul style="list-style-type: none">SDDC monitoring by setting up dashboards and activating alerts for monitoring the SDDC, and lists of notifications that are most symptomatic.Upgrade of the SDDC management components.Backup and restore of the SDDC management components by using a VADP-based solution.Disaster recovery of the SDDC management componentsOperational verification of the SDDC management components after software maintenance such as installation, restore, upgrade, or failover.Replacement of the certificates of the SDDC management components if the certificates are expiring or if you are scaling out a component.

Scenarios

A scenario represents a sub- or super-set of VMware Validated Design for Software-Defined Data Center. A scenario guide provides an SDDC solution to achieve specific IT outcomes, such as application security, IT automation, and so on.

Documentation Feature	Description
Type of Guidance	According to the target outcome, each VMware Validated Design scenario guide supports a set of validated workflows. The workflows are related to the common operations that you perform in the covered case.
Audience	Cloud architects, infrastructure administrators, cloud administrators, and cloud operators.
Supported SDDC Architecture	Standard SDDC
Covered use cases	<ul style="list-style-type: none"> ■ IT Automating IT ■ Intelligent Operations ■ Micro-Segmentation

Technical Notes

A technical note in VMware Validated Design is a short document that describes a modification of or an extension to the prescribed SDDC implementation.

Documentation Feature	Description
Type of Guidance	According to the target outcome, each technical note discusses a specific configuration and nodes from the VMware Validated Design documentation.
Audience	Cloud architects, infrastructure administrators, and cloud administrators.
Supported SDDC Architecture	Standard SDDC
Covered use cases	<ul style="list-style-type: none"> ■ Dynamic routing configuration options ■ Designing an SDDC that consists of several regions ■ Integration with and migration to an SDDC that complies with VMware Validated Design

Workload Domain Guidance

In addition to the initial domain setup for tenant workloads, you can evaluate and deploy a workload domain where tenant workloads can use the features of add-on products such as VMware NSX-T.

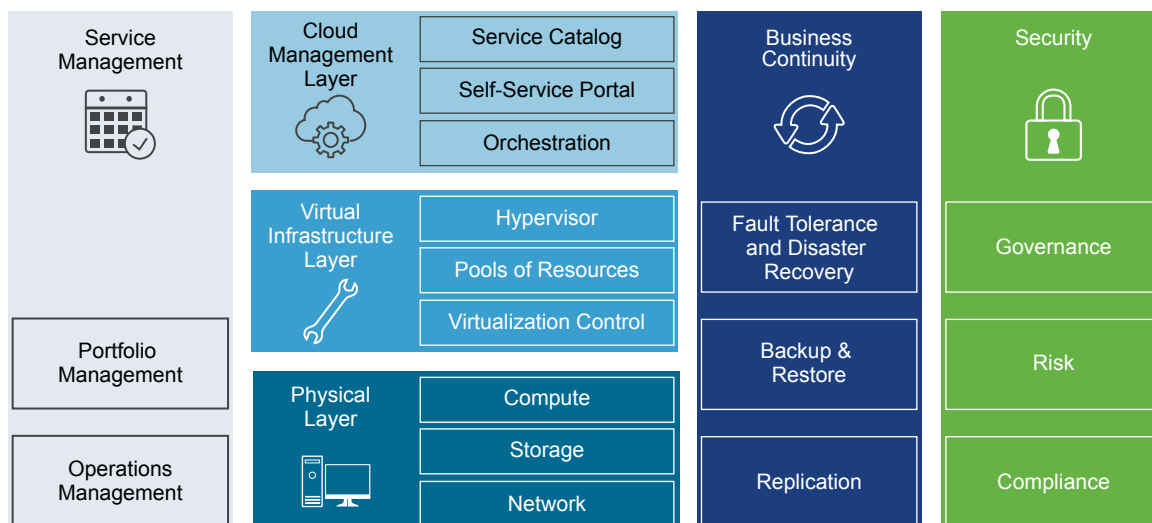
Documentation Feature	Description
Type of Guidance	VMware Validated Design provides design and deployment guidance to extend the SDDC with another workload domain that runs a solution in addition to the software for implementing the SDDC. A solution in this case consists of one or two products that are additional to the software for the main SDDC implementation.
Audience	Cloud architects, infrastructure administrators, and cloud administrators.
Supported SDDC Architecture	Standard SDDC
Covered use cases	<ul style="list-style-type: none"> ■ Additional workload domain with NSX-T

Overview of Standard SDDC

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 Architecture and Design*, *VMware Validated Design Deployment for Region A*, *VMware Validated Design Deployment for Region B* and *Deployment for Multiple Availability Zones*.

Figure 8-1. Components of a Software-Defined Data Center



- **Physical Infrastructure Layer in Standard SDDC**

The physical layer in Standard SDDC contains the compute, storage, and network resources in your data center.

- **Virtual Infrastructure Layer in Standard SDDC**

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

- **Operations Management Layer in Standard SDDC**

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

- **Cloud Management Layer in Standard SDDC**

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

- **Business Continuity Layer in Standard SDDC**

The business continuity layer includes solutions for data protection and disaster recovery of critical management components of the SDDC.

- **Multiple Availability Zones in Standard SDDC**

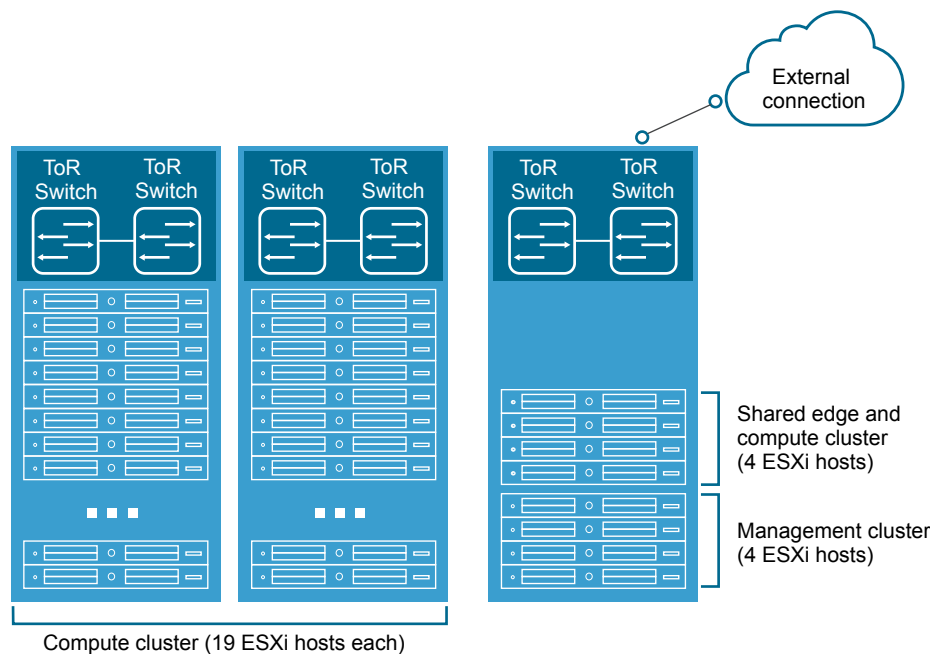
VMware Validated Design for Software-Defined Data Center provides alternative guidance for implementing an SDDC that contains two availability zones in the protected region. You use a vSAN stretched management and shared edge and compute clusters to create a second availability zone in Region A to increase their availability because maintenance or loss of one availability zone does not affect the overall operation of the clusters.

Physical Infrastructure Layer in Standard SDDC

The physical layer in Standard SDDC contains the compute, storage, and network resources in your data center.

The compute, storage and network resources are organized in workload domains. The physical layer also includes the physical network infrastructure, and storage setup.

Figure 8-2. Physical Configuration of the SDDC



Workload Domains

At the physical layer, workload domains can include different combinations of servers, and network equipment which can be set up with varying levels of hardware redundancy and varying quality of components. Workload domains are connected to a network core that distributes data between them. The workload domain is not defined by any hard physical properties. It is a standard unit of connected elements within the SDDC.

Workload domain is a logical boundary of functionality, managed by a single vCenter Server. While each workload domain usually spans one rack, it is possible to aggregate multiple workload domains into a single rack in smaller setups. For both small and large setups, homogeneity and easy replication are important.

Clusters

This VMware Validated Design uses the following types of clusters:

Management Cluster Resides in the management workload domain and runs the virtual machines of the components that manage the data center, such as vCenter Server, NSX Manager, NSX Controller, vRealize Operations Manager, vRealize Log Insight, vRealize Automation, and other management components.

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

Shared Edge and Compute Cluster Resides in the first cluster in the virtual infrastructure workload domain and 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 cluster also hosts the tenant virtual machines (sometimes referred to as workloads or payloads). As the environment grows, additional compute-only clusters can be added to support a mix of different types of workloads for different types of Service Level Agreements (SLAs).

Compute Cluster Resides in a virtual infrastructure workload domain and runs tenant virtual machines (sometimes referred to as workloads or payloads). You can mix different types of compute clusters and provide separate compute pools for different types of SLAs.

Network

This VMware Validated Design uses a Layer 3 network architecture.

- A Top of Rack (ToR) switch is typically located inside a rack and provides network access to the servers inside that rack.

- An inter-rack switch at the aggregation layer provides connectivity between racks. Links between inter-rack switches are typically not required. If a link failure between an inter-rack switch and a ToR switch occurs, the routing protocol ensures that no traffic is sent to the inter-rack 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 8-1. 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:

Primary Storage vSAN storage is the default storage type for the SDDC management components. All design, deployment and operational guidance are performed on vSAN.

The storage devices on vSAN ready servers provide the storage infrastructure. Because this VMware Validated Design uses vSAN in hybrid mode, each rack server must have minimum one SSD and two HDD devices that form a disk group with capacity.

Secondary Storage NFS storage is the secondary storage for the SDDC management components. It provides space for archiving log data and application templates.

Virtual Infrastructure Layer in Standard SDDC

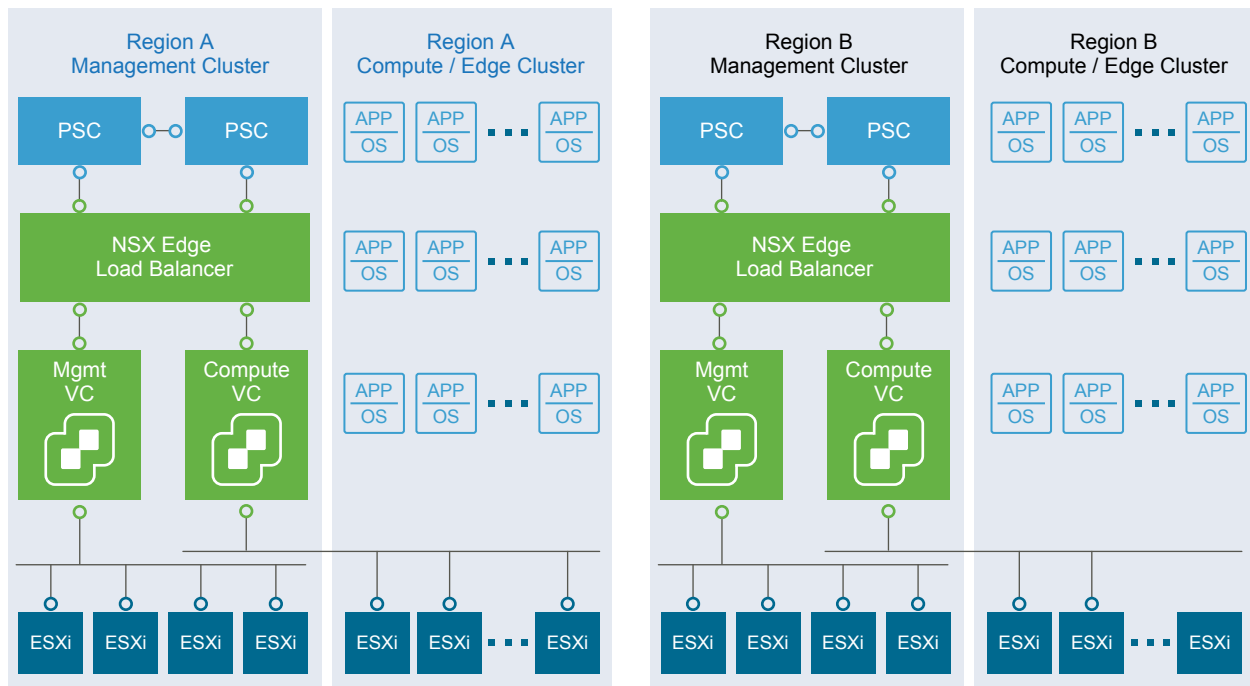
The virtual infrastructure layer of the Standard SDDC contains the components that provide compute, networking, and storage resources to the management and tenant workloads.

vCenter Server Design

Table 8-2. vCenter Server Design Details

Design Area	Description
vCenter Server instances	<p>You deploy two vCenter Server instances in the following way:</p> <ul style="list-style-type: none"> ■ One vCenter Server instance supporting the SDDC management components. ■ One vCenter Server instance supporting the edge components and tenant workloads. <p>Using this model provides the following benefits:</p> <ul style="list-style-type: none"> ■ Isolation of management and compute vCenter Server operations ■ Simplified capacity planning ■ Separated upgrade ■ Separated roles
Clusters	<p>You distribute hosts and workloads in the following clusters:</p> <ul style="list-style-type: none"> ■ 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	<p>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.</p>
Deployment model	<p>This VMware Validated Design uses two external Platform Services Controller instances and two vCenter Server instances.</p> <p>For redundancy, the design joins the two Platform Services Controller instances to the same vCenter Single Sign-On domain, and points the vCenter Server instances to a load balancer that distributes the requests between the two Platform Services Controller instances.</p>
Management host provisioning	<p>You use host profiles to apply the networking and authentication configuration on the ESXi hosts in the management cluster and in the shared edge and compute cluster.</p>

Figure 8-3. Layout of vCenter Server Clusters



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.

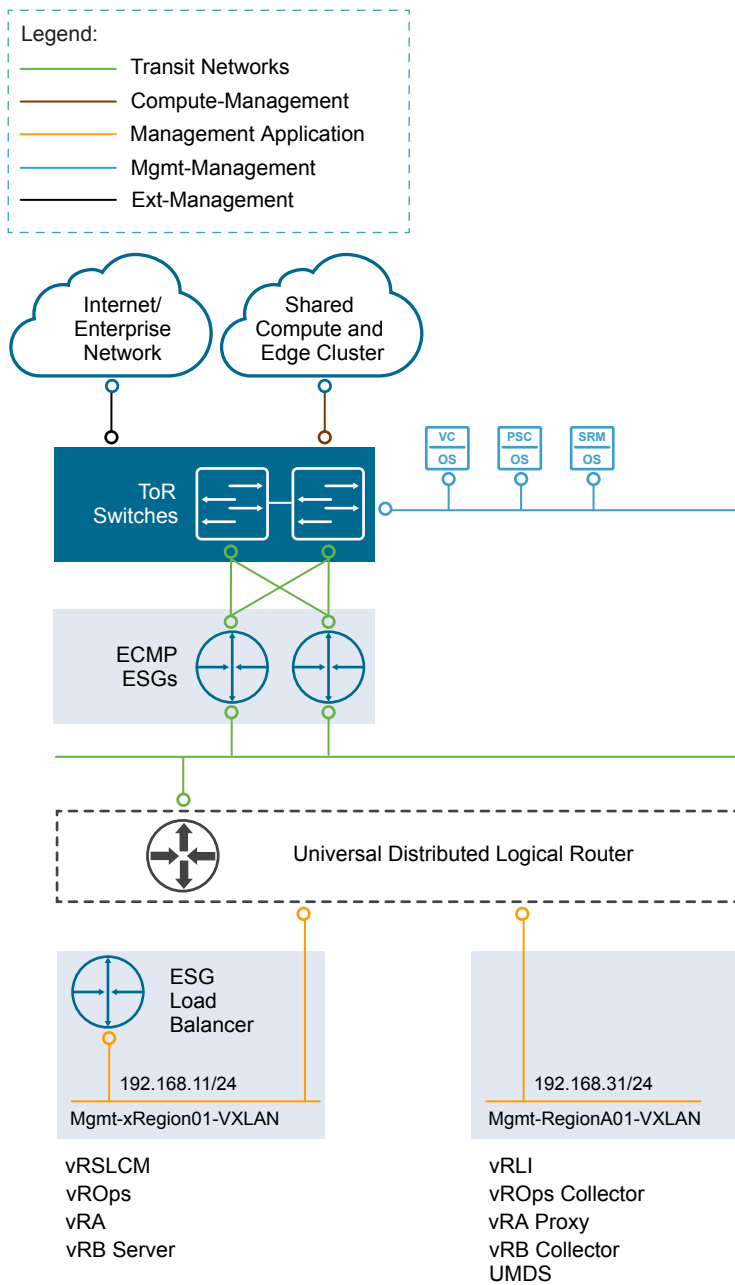
Dynamic routing support includes the following nodes:

- 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.
- Distributed logical router (DLR) for the shared edge and compute cluster and compute clusters to provide east/west routing for workloads that require on-demand network objects from vRealize Automation.

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

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

Figure 8-4. Virtual Application Network Design



Distributed Firewall

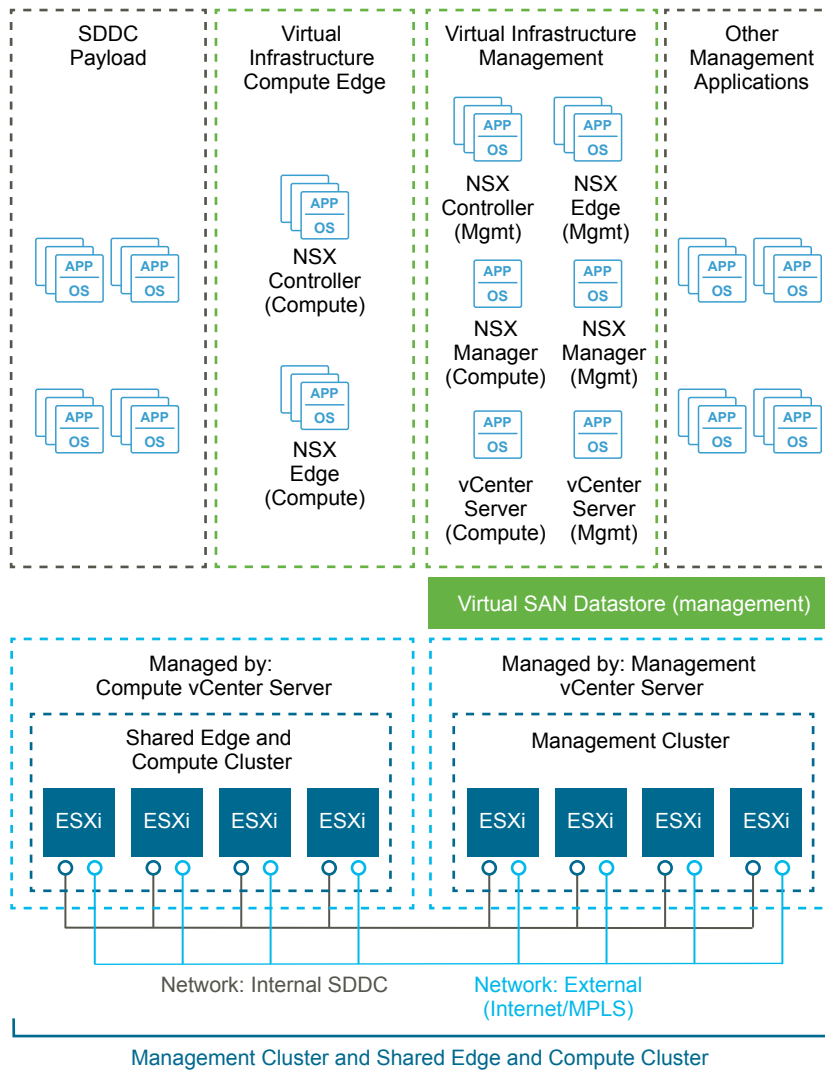
This VMware Validated Design uses the distributed firewall functionality that is available in NSX to protect all management applications attached to application virtual networks.

Software-Defined Storage Design for Management Products

In each region, workloads on the management cluster store their data on a vSAN datastore. The vSAN 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 vSAN.

Figure 8-5. vSAN Conceptual Design



vRealize Log Insight and vRealize Automation Content Library use NFS exports as secondary storage. In each region, you create a datastore in the shared edge and compute cluster for vRealize Automation.

Operations Management Layer in Standard SDDC

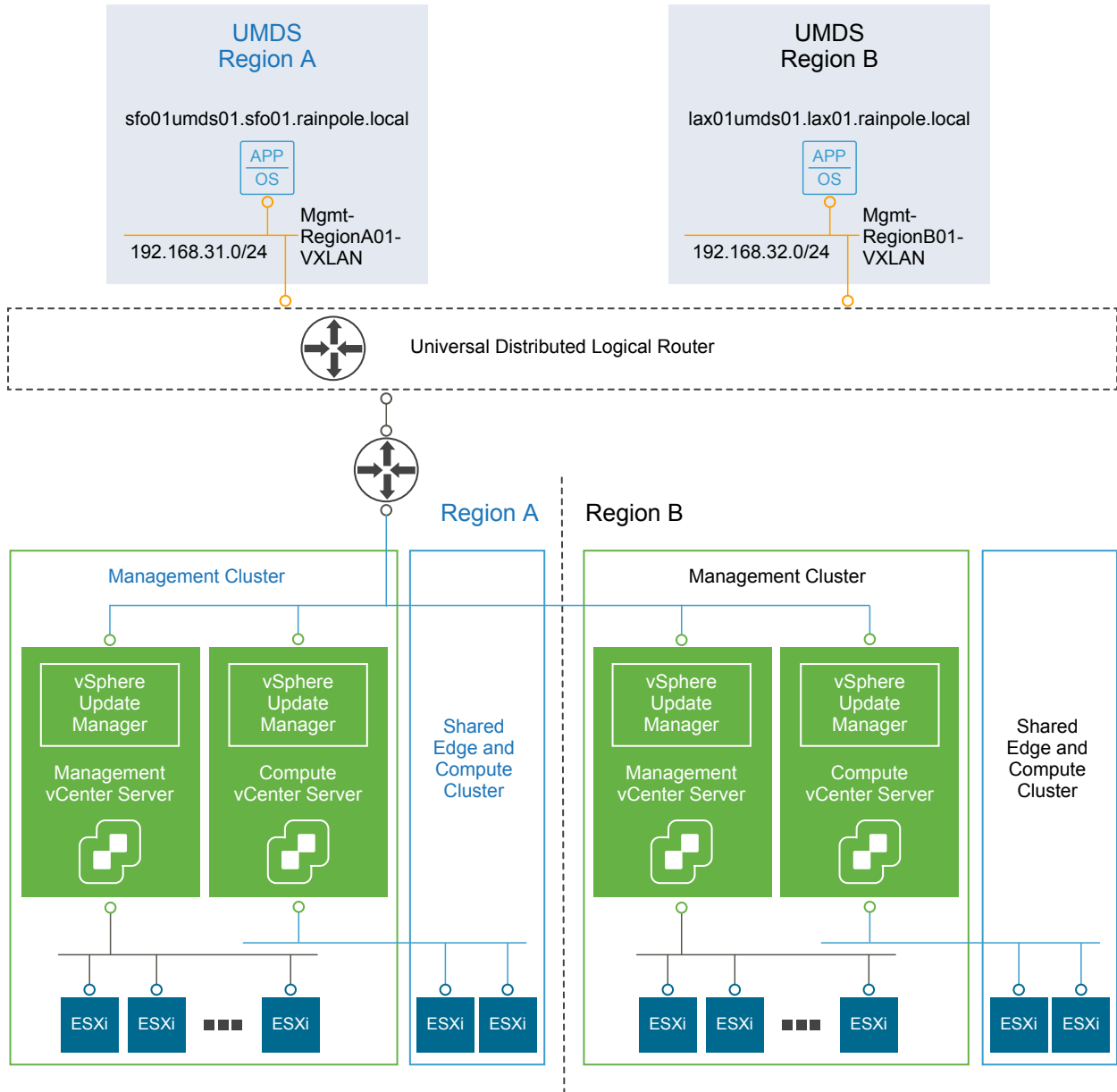
The operations layer of the SDDC provides capabilities for performance and capacity monitoring, and for backup and restore of the cloud management components.

vSphere Update Manager

This VMware Validated Design version uses vSphere Update Manager for upgrade of the ESXi hosts from previous VMware Validated Design versions.

vSphere Update Manager server and client components are a part of vCenter Server Appliance in vSphere 6.5 or later. This design also deploys an instance of vSphere Update Manager Download Service (UMDS) in each region. Using a region-specific UMDS instance restricts the direct access to the external network from multiple vSphere Update Manager and vCenter Server instances, and reduces storage requirements across vSphere Update Manager.

Figure 8-6. vSphere Update Manager Design



vRealize Suite Lifecycle Manager

vRealize Suite Lifecycle Manager provides lifecycle management capabilities for vRealize components including automated deployment, configuration, and upgrade. vRealize Suite Lifecycle Manager communicates with each Management vCenter Server in the SDDC to orchestrate the deployment, upgrade, and configuration drift analysis of vRealize Suite components in the SDDC.

Figure 8-7. Logical Design of vRealize Lifecycle Manager in a Multi-Region Deployment

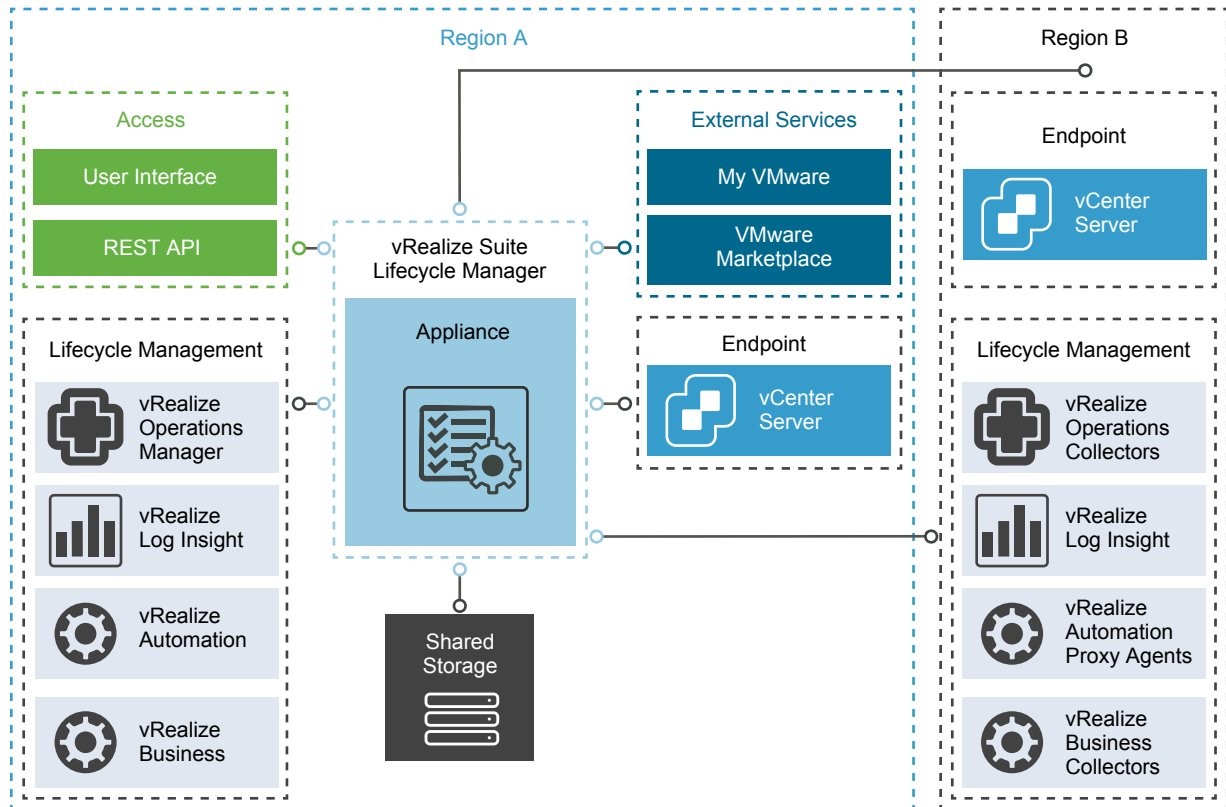


Table 8-3. vRealize Suite Lifecycle Manager Design Details

Design Attribute	Description
Deployment model	One virtual appliance that deploys and upgrades the vRealize components on a virtual infrastructure that is controlled by one or more vCenter Server instance
Supported components	<ul style="list-style-type: none"> vRealize Operations Manager vRealize Log Insight vRealize Automation (with embedded vRealize Orchestrator) vRealize Business for Cloud
Product installation setup	<ul style="list-style-type: none"> Direct integration with My VMware to access vRealize Suite entitlements Environments configuration that uses the product-based deployment path in the installation wizard

Table 8-4. Environment Layout in vRealize Suite Lifecycle Manager

Environment Name	Environment Type	Scope	Product Components
Cross-Region	Production	Cross-Region	<ul style="list-style-type: none"> ■ vRealize Operations Manager Analytics Cluster ■ vRealize Operations Manager Remote Collectors ■ vRealize Automation Appliances ■ vRealize Automation IaaS Managers ■ vRealize Automation IaaS Web Servers ■ vRealize Automation IaaS DEMs ■ vRealize Automation vSphere Proxy Agents ■ vRealize Business Server Appliances ■ vRealize Business Data Collectors
Region A	Production	Region A	vRealize Log Insight Cluster
Region B	Production	Region B	vRealize Log Insight Cluster

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 8-8. vRealize Operations Manager Logical Design

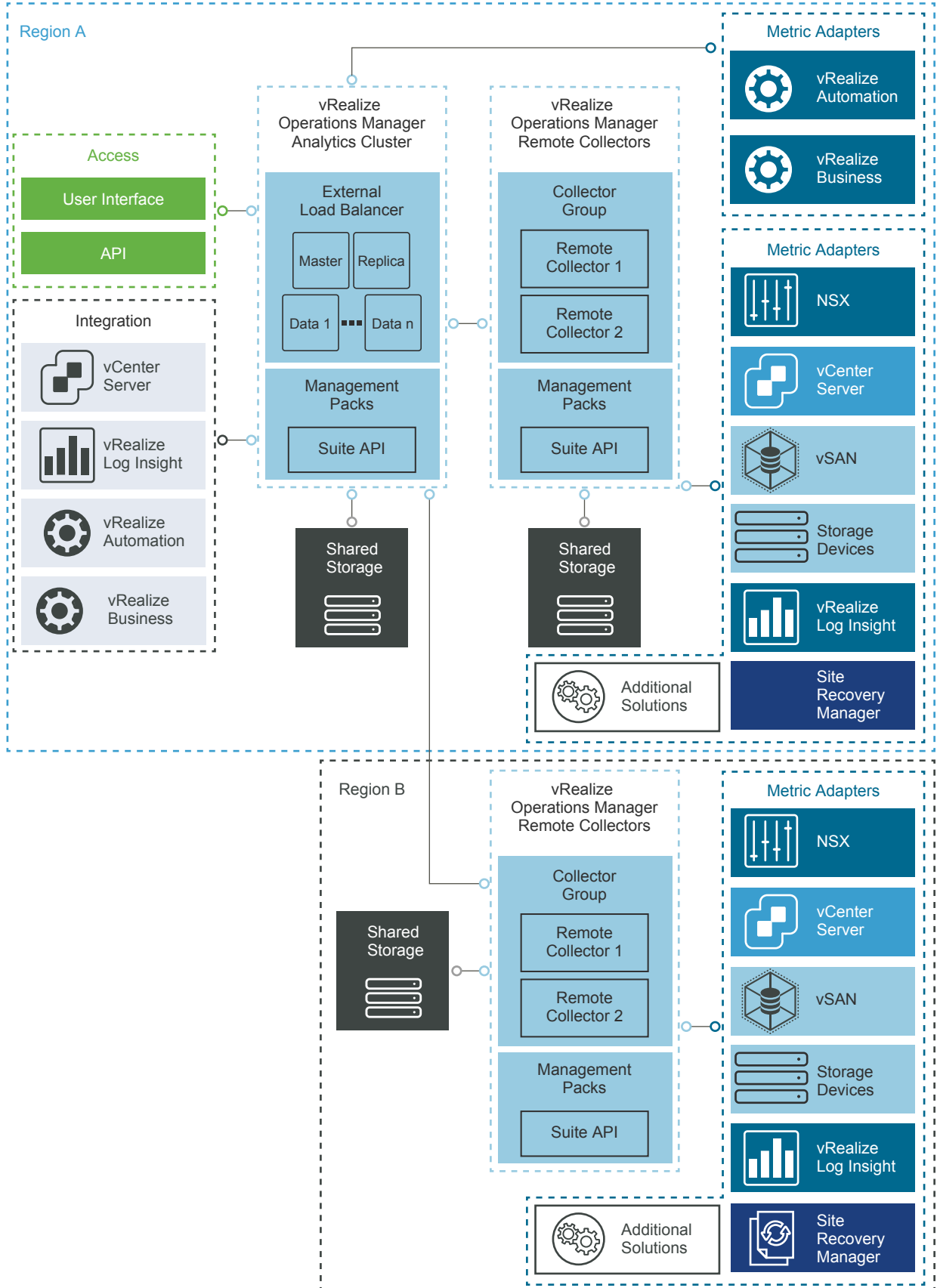


Table 8-5. vRealize Operations Manager Design Details

Design Attribute	Description
Deployment model	<ul style="list-style-type: none"> ■ Analytics cluster of three nodes: master, master replica and data node ■ Remote collector group that consists of two remote collectors that communicate with the region-specific components in the region
Monitored components	<ul style="list-style-type: none"> ■ vCenter Server and Platform Services Controller ■ ESXi hosts in the management cluster and the shared edge and compute cluster ■ 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 including Launch in Context ■ vRealize Business including integration in the vRealize Operations Manager operations interface ■ vSAN ■ vRealize Operations Manager (self-health monitoring) ■ Site Recovery Manager

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 8-9. vRealize Log Insight Logical Design

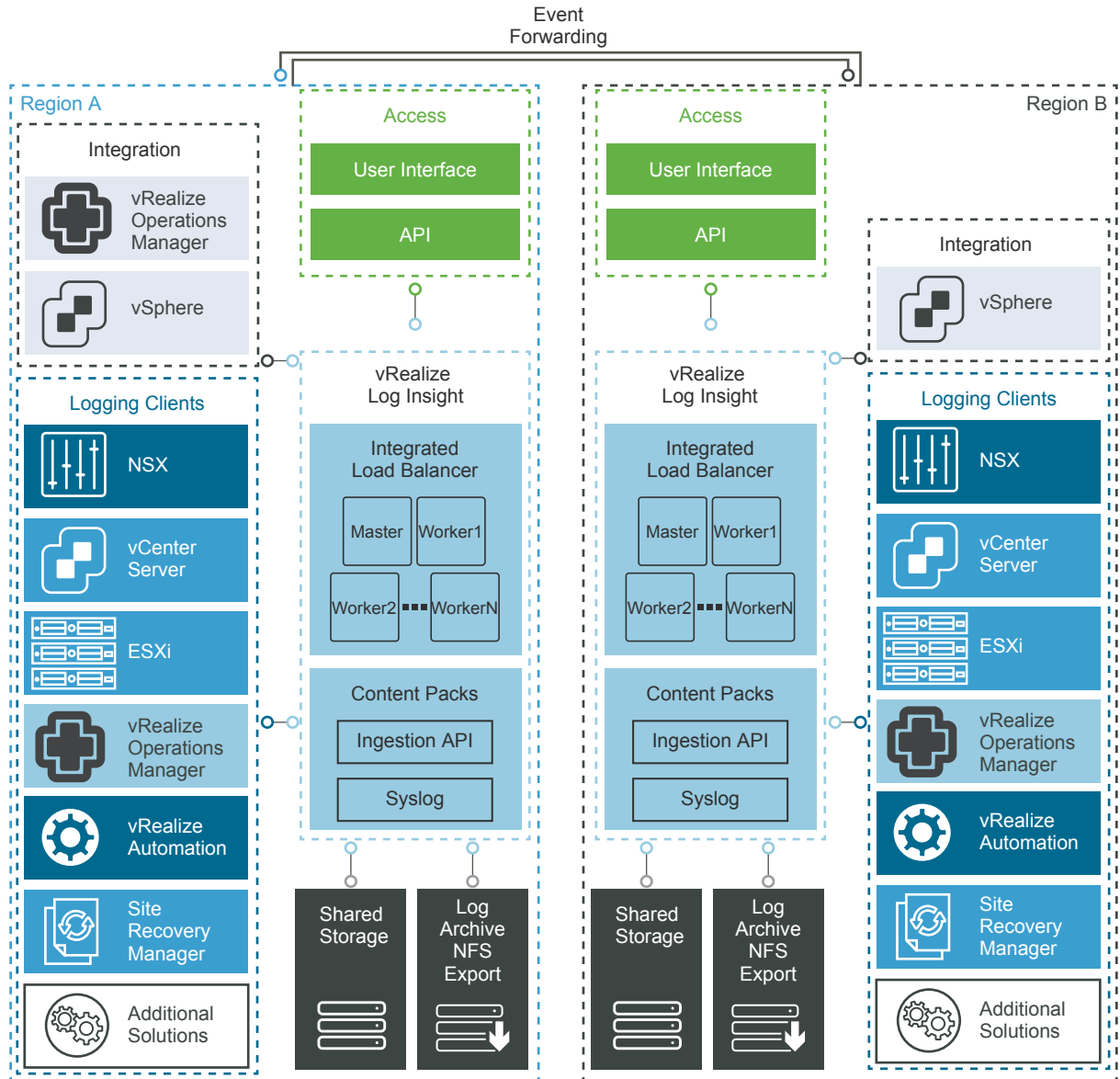


Table 8-6. vRealize Log Insight Design Details

Design Attribute	Description
Deployment model	Cluster of master node and two worker nodes.
Monitored components	<ul style="list-style-type: none"> ■ 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 ■ vRealize Business ■ Analytics cluster nodes of vRealize Operations Manager ■ Management virtual appliances ■ Site Recovery Manager
Archiving	Archiving location on an NFS export

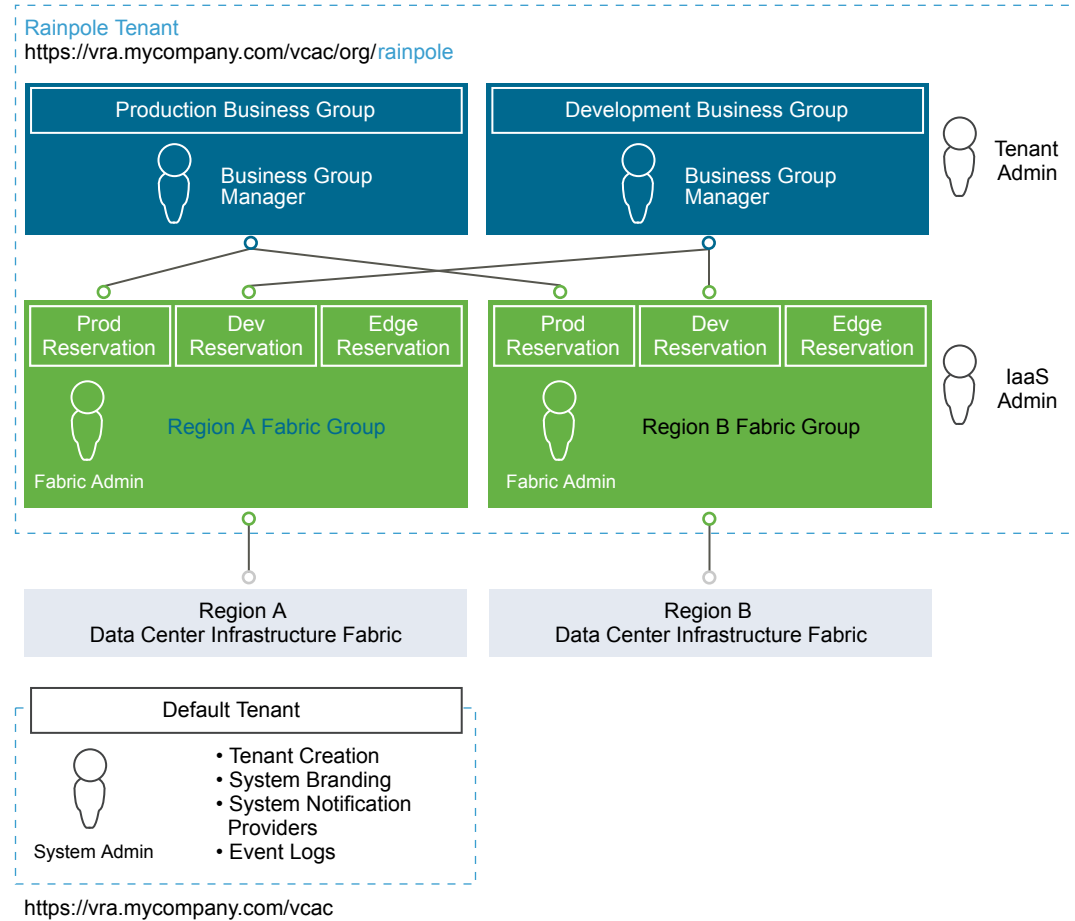
Cloud Management Layer in Standard SDDC

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

Table 8-7. Cloud Management Design Details

Design Attribute	Description
Software components	<ul style="list-style-type: none"> ■ vRealize Automation ■ Embedded vRealize Orchestrator ■ vRealize Business
Deployment model of vRealize Automation	<p>Distributed deployment with support for vSphere endpoints by using vSphere Proxy Agent virtual machines.</p> <p>You install the vRealize Automation components on multiple machines.</p>
High availability and load balancing	Supported for all nodes except the Microsoft SQL database server and vRealize Business.
Endpoints	<ul style="list-style-type: none"> ■ vCenter Server for the compute and edge clusters ■ NSX Manager 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	According to the internal structure and workload configuration of your organization. Allocate business groups for separate business units, for example, for development and production.

Figure 8-10. Example vRealize Automation Tenant Design



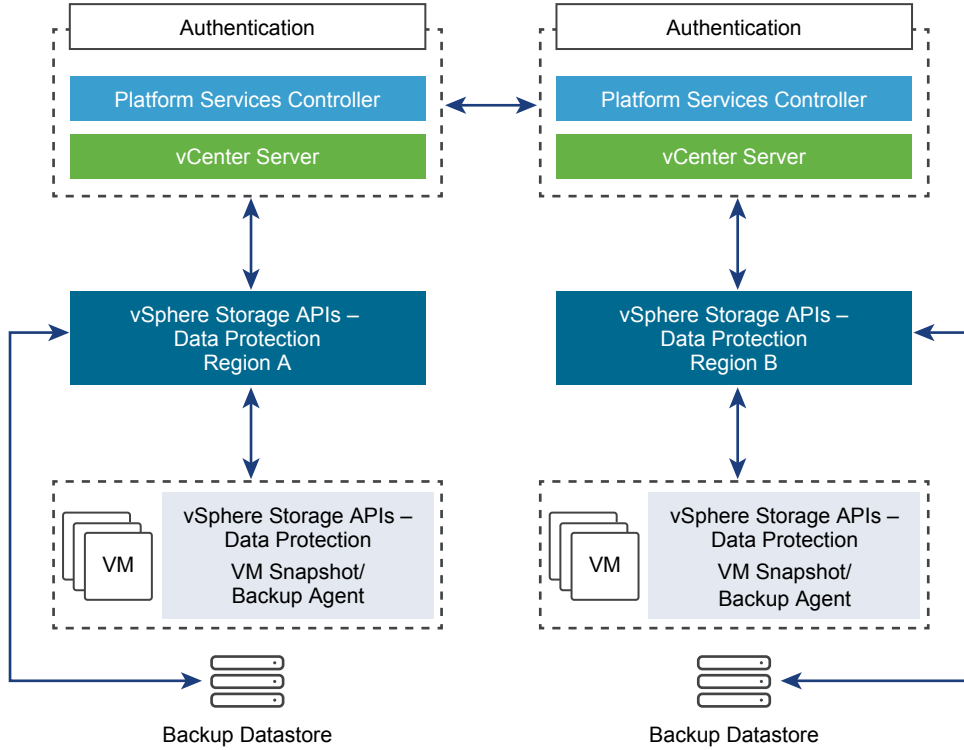
Business Continuity Layer in Standard SDDC

The business continuity layer includes solutions for data protection and disaster recovery of critical management components of the SDDC.

Data Protection

To back up the virtual machines of the SDDC management components, you deploy a solution that is compatible with vSphere Storage APIs for Data Protection (VADP). Place an instance of the backup solution in every region.

Figure 8-11. Data Protection Design

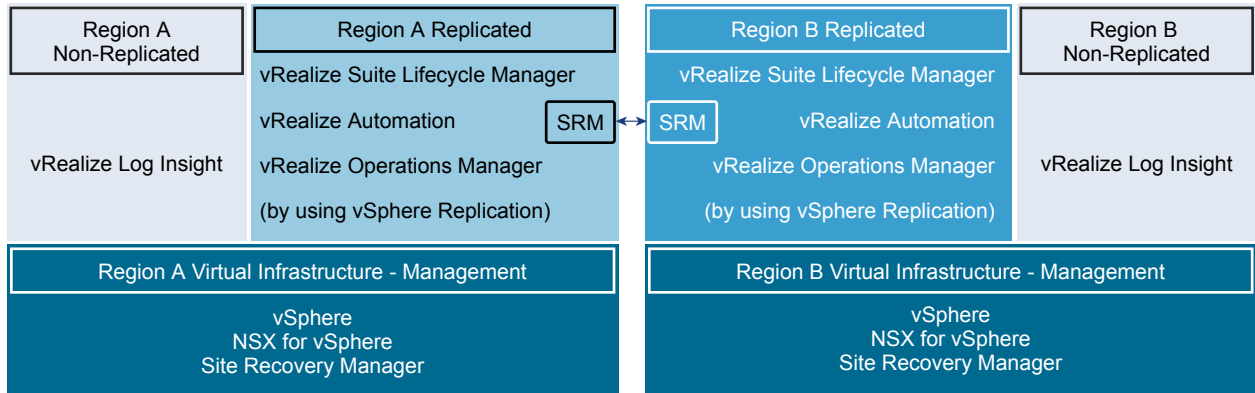


Disaster Recovery Design

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 8-12. Disaster Recovery Architecture



Multiple Availability Zones in Standard SDDC

VMware Validated Design for Software-Defined Data Center provides alternative guidance for implementing an SDDC that contains two availability zones in the protected region. You use a vSAN stretched management and shared edge and compute clusters to create a second availability zone in Region A to increase their availability because maintenance or loss of one availability zone does not affect the overall operation of the clusters.

In a stretched cluster configuration, both availability zone are active. If either availability zone fails, the virtual machines are restarted in the unaffected availability zone because virtual machine writes occur to both availability zones synchronously. As a result, no data is lost.

Overview of vSAN Stretched Cluster

Virtual machine write operations are performed synchronously across both availability zones. Each availability zones has a copy of the data and witness components are placed on the witness host in Region B. Because the distance between the two availability zones must be minimal, you usually deploy a multi-availability zone SDDC in metropolitan or campus environments.

Extending the management cluster to a vSAN stretched cluster provides the following advantages:

- Increased availability with minimal downtime and data loss
- Inter-site load balancing

Using a vSAN stretched cluster for the management components has the following disadvantages:

- Increased footprint
- Symmetrical host configuration in the two availability zones
- Limited distance between the availability zones
- Additional setup and more complex Day-2 operations
- License upgrade

Regions and Availability Zones

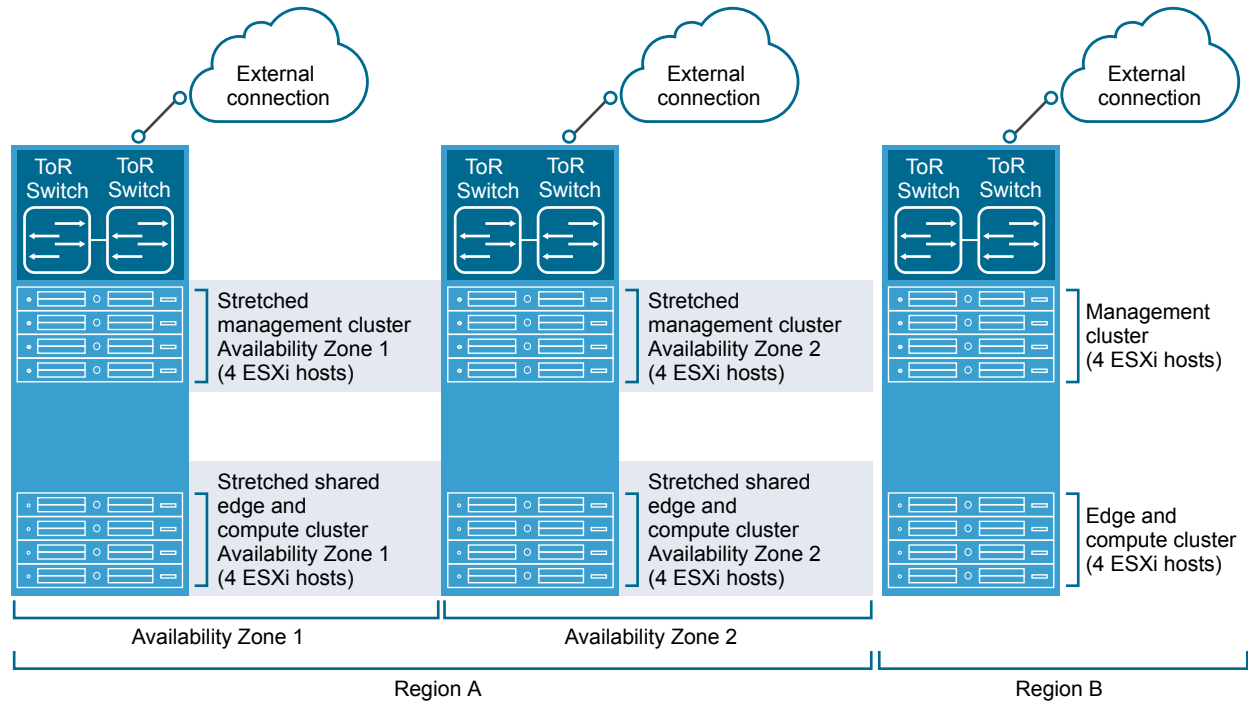
In the multi-availability zone version of the VMware Validated Design, you have two availability zones in Region A.

Region	Availability Zone and Region Identifier	Region-Specific Domain Name	Region Description
Region A	SFO01	sfo01.rainpole.local	Availability Zone 1 in San Francisco, CA, USA based data center
Region A	SFO02	sfo01.rainpole.local	Availability Zone 2 in San Francisco, CA, USA based data center
Region B	LAX01	lax01.rainpole.local	Los Angeles, CA, USA based data center

Physical Infrastructure

In Availability Zone 2, you apply the same configuration as in Availability Zone 1. You double the hosts for the management cluster and shared edge and compute cluster in Region A, and you place them in the same rack.

Figure 8-13. Infrastructure Architecture for Two Availability Zones

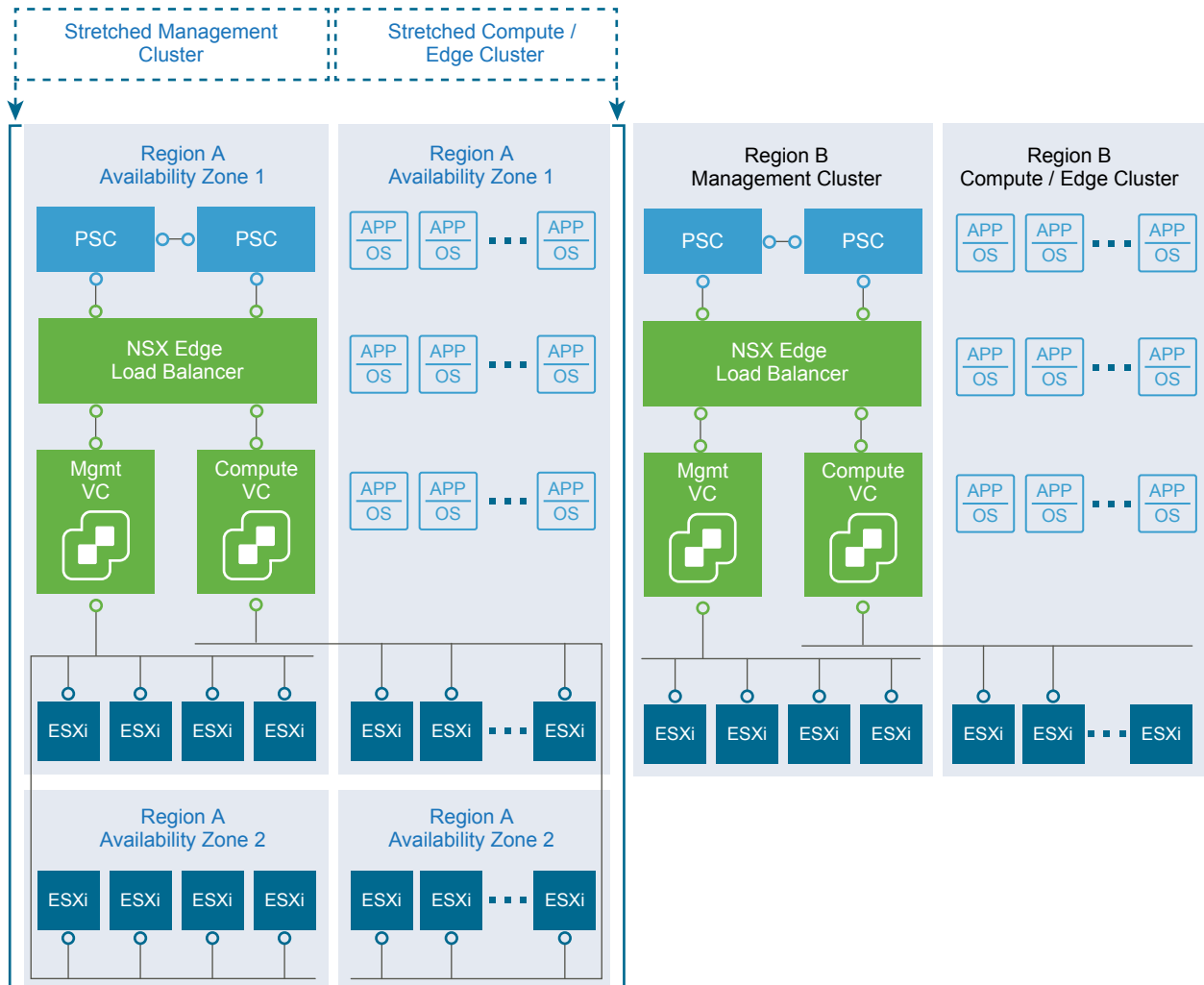


Component Layout with Two Availability Zones

The management components of the SDDC run in Availability Zone 1. They can be migrated to Availability Zone 2 when an outage or overload occurs in Availability Zone 2.

You can start deploying the SDDC in a single availability zone configuration, and then extend the environment with the second availability zone.

Figure 8-14. vSphere Logical Cluster Layout with Two Availability Zones

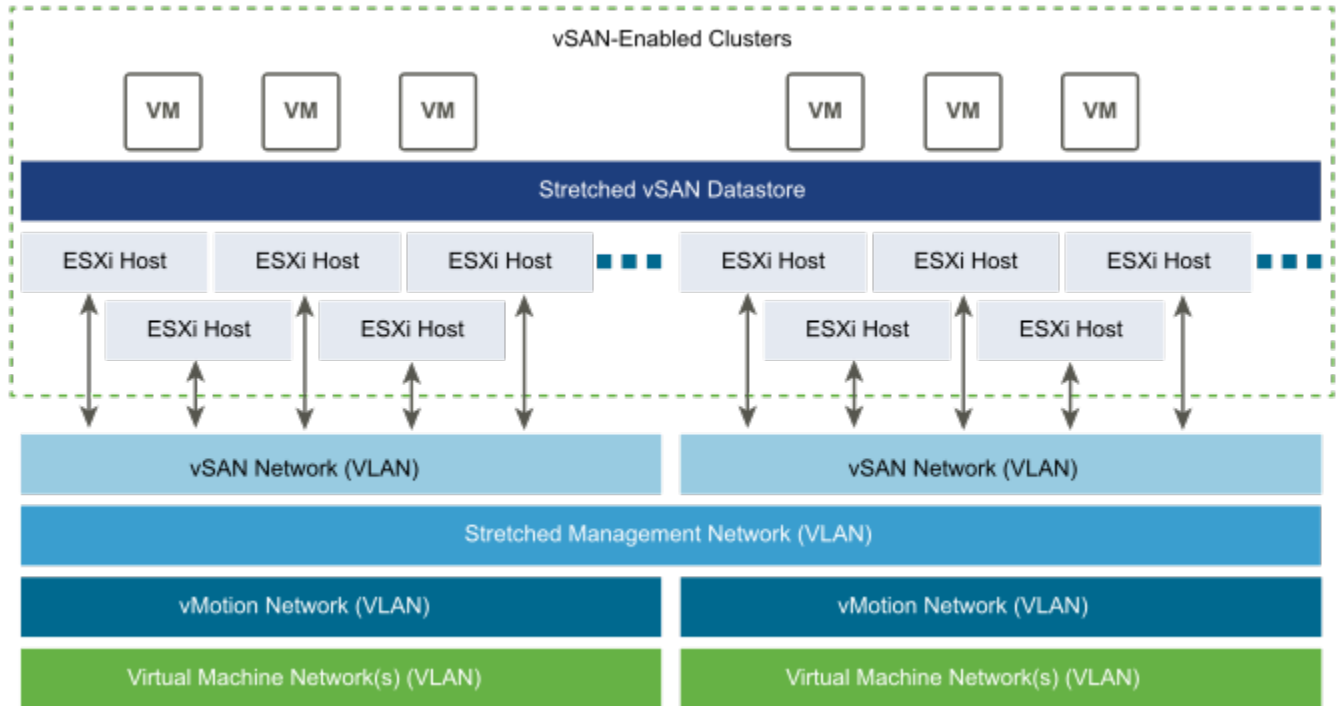


Network Configuration

When using two availability zones, the management VLAN that vCenter Server and other VLAN-backed management virtual machines use must be stretched across both availability zones.

The network between the availability zones must support jumbo frames with latency of less than 5 ms. Use a 10-GbE connection with vSAN for best and predictable performance (IOPS) of the environment.

Figure 8-15. VMware vSAN Conceptual Network with two Availability Zones

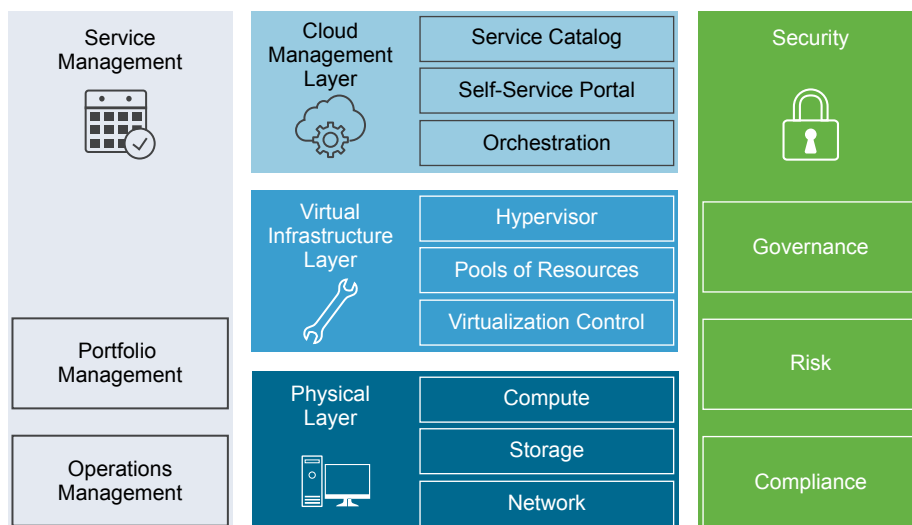


Overview of Consolidated SDDC

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 Architecture and Design* and *VMware Validated Design Deployment*.

Figure 9-1. Components of a Consolidated Software-Defined Data Center



This chapter includes the following topics:

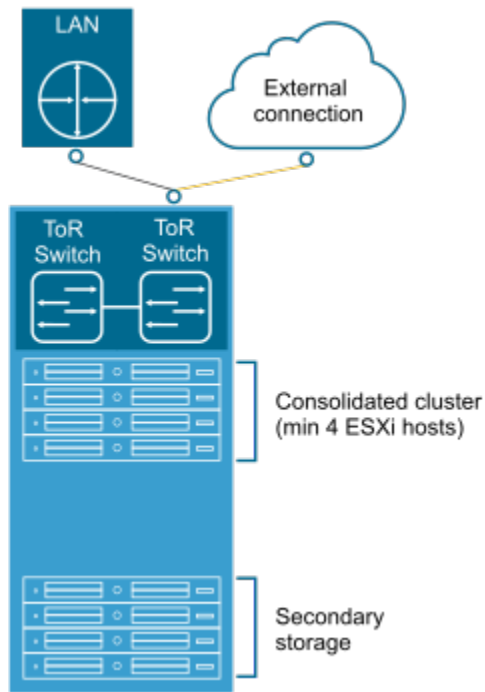
- [Physical Infrastructure Layer in Consolidated SDDC](#)
- [Virtual Infrastructure Layer in Consolidated SDDC](#)
- [Operations Management Layer in Consolidated SDDC](#)
- [Cloud Management Layer in Consolidated SDDC](#)
- [Business Continuity Layer in Consolidated SDDC](#)

Physical Infrastructure Layer in Consolidated SDDC

The physical layer in Consolidated SDDC contains the compute, storage, and network resources in your data center.

The compute, storage and network resources are organized in workload domains. The physical layer also includes the physical network infrastructure, and storage setup.

Figure 9-2. Physical Configuration of the Consolidated SDDC



Workload Domains

At the physical layer, workload domains can include different combinations of servers, and network equipment which can be set up with varying levels of hardware redundancy and varying quality of components. Workload domains are connected to a network core that distributes data between them. The workload domain is not defined by any hard physical properties. It is a standard unit of connected elements within the SDDC.

Workload domain is a logical boundary of functionality, managed by a single vCenter Server. While each workload domain usually spans one rack, it is possible to aggregate multiple workload domains into a single rack in smaller setups. For both small and large setups, homogeneity and easy replication are important.

Clusters

This VMware Validated Design uses the following types of clusters:

- Consolidated Cluster** The consolidated cluster resides in the management workload domain and runs the following services:
- Virtual machines to manage the SDDC such as vCenter Server, NSX Manager, vRealize Automation, vRealize Log Insight, vRealize Operations Manager and a backup solution on top of vSphere Storage APIs - Data Protection.
 - Required NSX services to enable north-south routing between the SDDC and the external network, and east-west routing inside the SDDC.
 - Virtual machines running business applications that support varying Service Level Agreements (SLAs).

Network

This VMware Validated Design uses a Layer 3 network architecture.

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

Regions and Availability Zones

Region Each region is a separate SDDC instance with one or more availability zones. You use multiple regions for disaster recovery across individual SDDC instances.

This VMware Validated Design uses a single region.

Table 9-1. Regions in Consolidated SDDC

Region	Region-Specific Domain Name
Region A	sfo01.rainpole.local

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.

Storage

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

- Primary Storage** vSAN storage is the default storage type for the SDDC management components. All design, deployment and operational guidance are performed on vSAN.
- The storage devices on vSAN ready servers provide the storage infrastructure. Because this VMware Validated Design uses vSAN in hybrid mode, each rack server must have minimum one SSD and two HDD devices that form a disk group with capacity.
- Secondary Storage** NFS storage is the secondary storage for the SDDC management components. It provides space for archiving log data and application templates.

Virtual Infrastructure Layer in Consolidated SDDC

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

vCenter Server Design

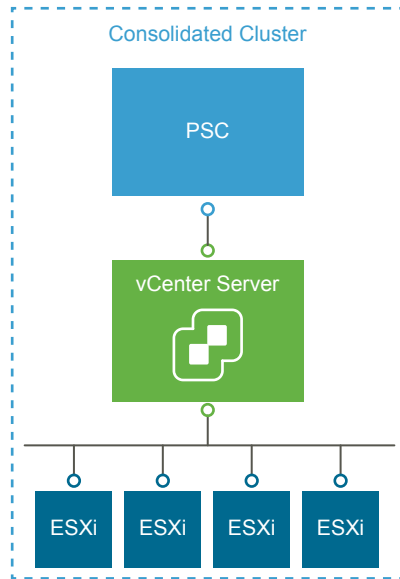
Table 9-2. vCenter Server Design Details in Consolidated SDDC

Design Area	Description
vCenter Server instances	You deploy a single vCenter Server instance that supports both the SDDC management components, and the tenant workloads and connecting edge components.
Clusters	You place hosts and workloads in a consolidated cluster. The cluster contains the management virtual machines, NSX controllers and edges, and tenant workloads.
Resource pools for management components, tenant workloads and dedicated NSX components	<p>On the consolidated cluster, you use resource pools to distribute compute and storage resources between the management components, and the tenant workloads and NSX components carrying their traffic.</p> <p>The Consolidated SDDC uses resource pools for the following components:</p> <ul style="list-style-type: none"> ■ Management virtual machines ■ NSX Edge devices for the management components ■ NSX Edge devices for the tenant workloads ■ Tenant workloads

Table 9-2. vCenter Server Design Details in Consolidated SDDC (Continued)

Design Area	Description
Deployment model	This VMware Validated Design uses a vCenter Server instance and a connected external Platform Services Controller instance .
Management host provisioning	You use a host profile to apply the networking and authentication configuration on the ESXi hosts in the consolidated cluster.

Figure 9-3. Layout of Consolidated Cluster in Consolidated SDDC



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.

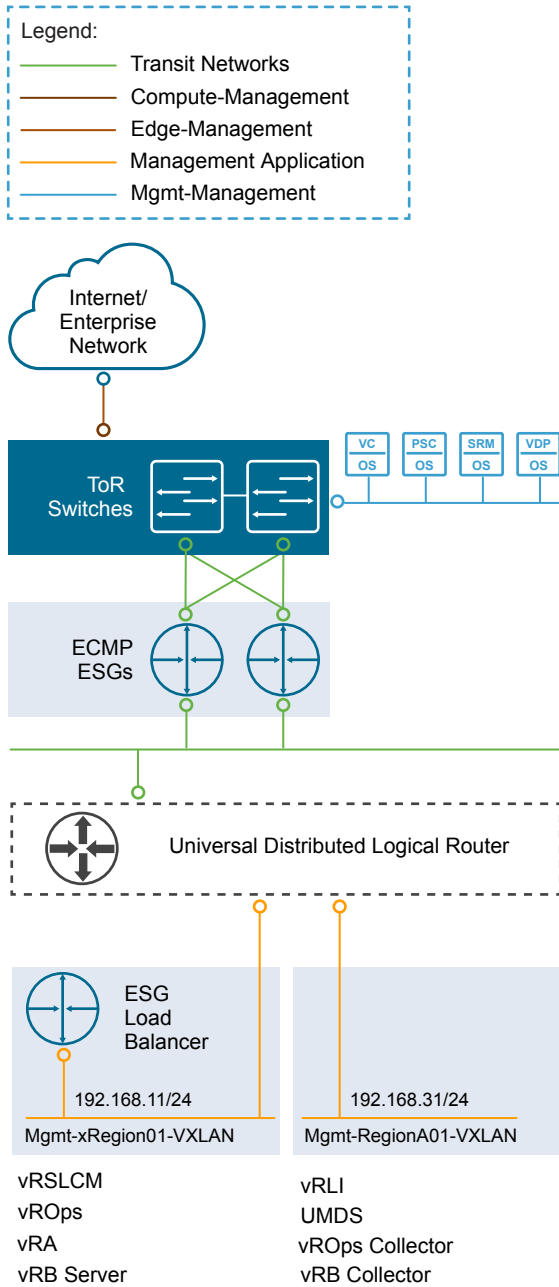
Dynamic routing support includes the following nodes:

- 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 between applications and to a potential second region.

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

- Cross-region application virtual network that connects the components that are designed to fail over to a recovery region if the SDDC is scaled out to a dual-region configuration.
- Region-specific application virtual network in Region A for components that are not designed to fail over.

Figure 9-4. Virtual Application Network Components and Design in Consolidated SDDC



Distributed Firewall

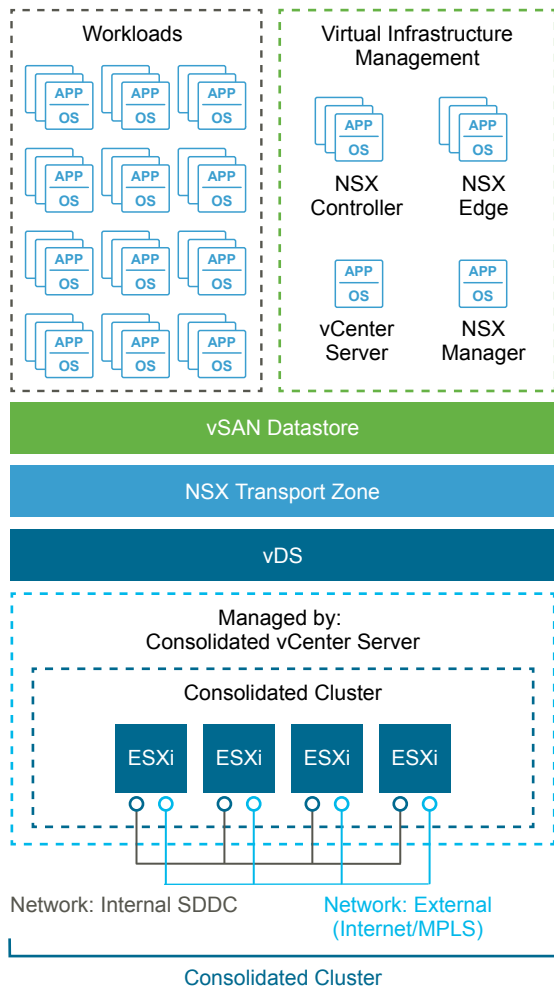
This VMware Validated Design uses the distributed firewall functionality that is available in NSX to protect all management applications attached to application virtual networks.

Software-Defined Storage Design for Management Products

Workloads store their data on a vSAN datastore. The vSAN datastore spans all 4 ESXi hosts of the consolidated cluster. Each host adds one disk group to the datastore.

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

Figure 9-5. vSAN Conceptual Design in Consolidated SDDC



vRealize Log Insight uses NFS exports as secondary storage.

Operations Management Layer in Consolidated SDDC

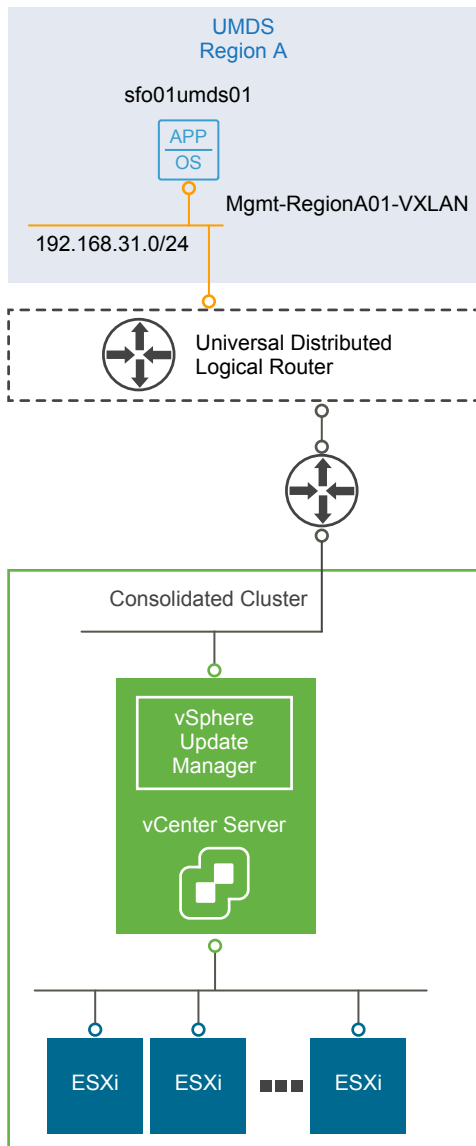
The operations layer of the Consolidated SDDC provides capabilities for performance and capacity monitoring, and for backup and restore of the cloud management components.

vSphere Update Manager

This VMware Validated Design version uses vSphere Update Manager for upgrade of the ESXi hosts from previous VMware Validated Design versions.

vSphere Update Manager server and client components are a part of vCenter Server Appliance in vSphere 6.5 or later. This design also deploys an instance of vSphere Update Manager Download Service (UMDS). Using a region-specific UMDS instance restricts the direct access to the external network from multiple vSphere Update Manager and vCenter Server instances, and reduces storage requirements across vSphere Update Manager.

Figure 9-6. vSphere Update Manager Design in Consolidated SDDC



vRealize Suite Lifecycle Manager

vRealize Suite Lifecycle Manager provides lifecycle management capabilities for vRealize components including automated deployment, configuration, and upgrade. vRealize Suite Lifecycle Manager communicates with the Consolidated vCenter Server to orchestrate the deployment, upgrade, and configuration drift analysis of vRealize Suite components in the SDDC.

Figure 9-7. Logical Design of vRealize Lifecycle Manager in Consolidated SDDC

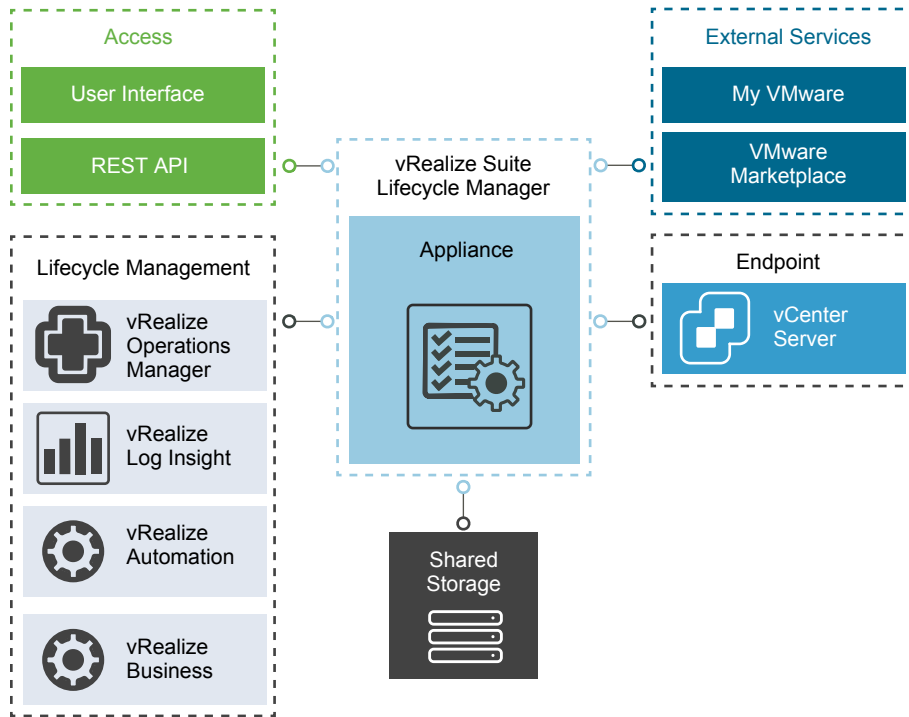


Table 9-3. vRealize Suite Lifecycle Manager Design Details

Design Attribute	Description
Deployment model	One virtual appliance that deploys and upgrades the vRealize components on the virtual infrastructure that is controlled by the Consolidated vCenter Server.
Supported components	<ul style="list-style-type: none"> ■ vRealize Operations Manager ■ vRealize Log Insight ■ vRealize Automation (with embedded vRealize Orchestrator) ■ vRealize Business for Cloud
Product installation setup	<ul style="list-style-type: none"> ■ Direct integration with My VMware to access vRealize Suite entitlements ■ Environments configuration that uses the product-based deployment path in the installation wizard

Table 9-4. Environment Layout in vRealize Suite Lifecycle Manager

Environment Name	Environment Type	Scope	Product Components
Cross-Region	Production	Cross-Region	<ul style="list-style-type: none"> ■ vRealize Operations Manager Analytics Cluster ■ vRealize Operations Manager Remote Collectors ■ vRealize Automation Appliances ■ vRealize Automation IaaS Managers ■ vRealize Automation IaaS Web Servers ■ vRealize Automation IaaS DEMs ■ vRealize Automation vSphere Proxy Agents ■ vRealize Business Server Appliances ■ vRealize Business Data Collectors
Region A	Production	Region A	vRealize Log Insight Cluster

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 9-8. vRealize Operations Manager Logical Design in Consolidated SDDC

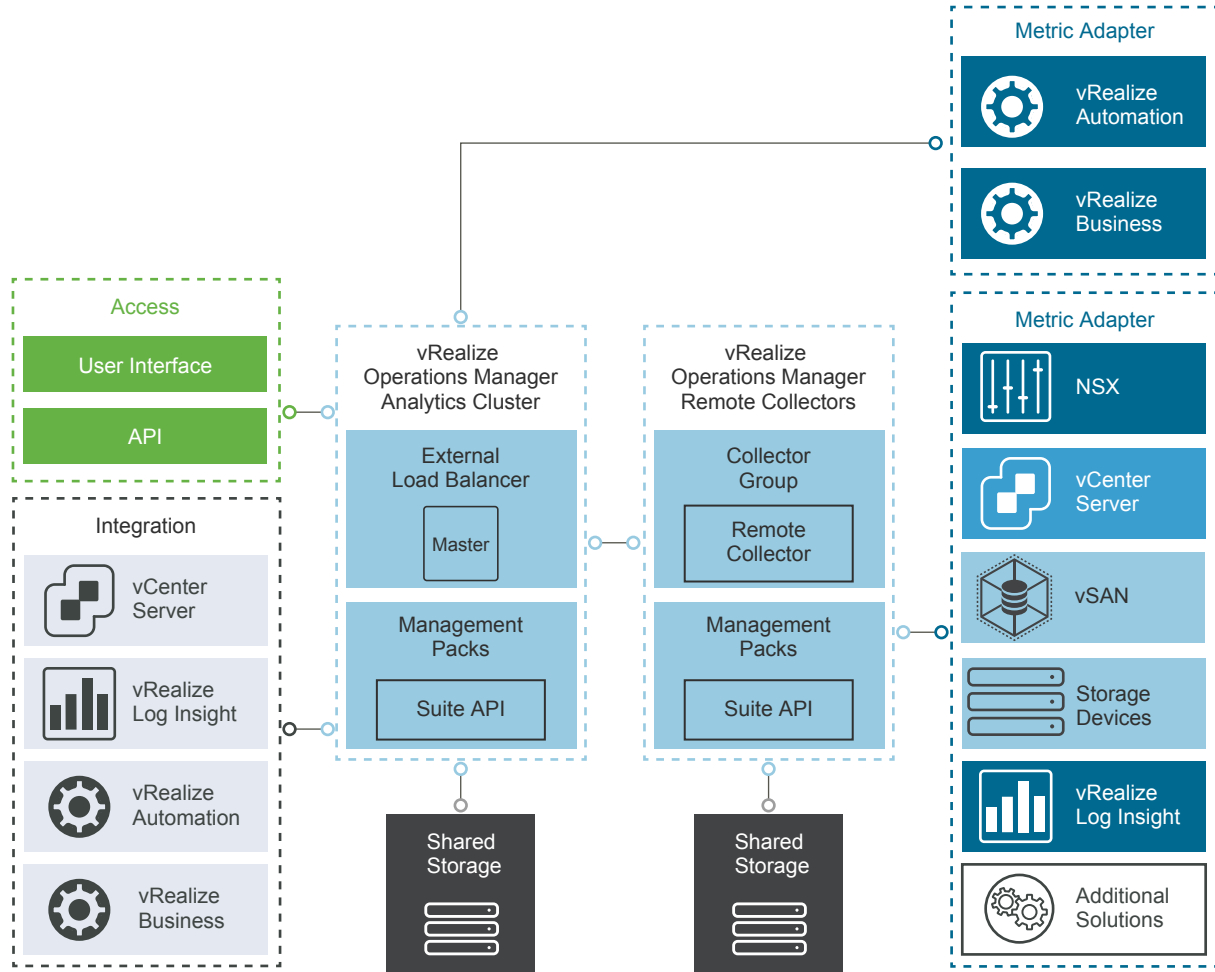


Table 9-5. vRealize Operations Manager Design Details in Consolidated SDDC

Design Attribute	Description
Deployment model	<ul style="list-style-type: none"> Analytics cluster of one node: master Remote collector group that consists of one remote collector that communicates with the management components in the single region
Monitored components	<ul style="list-style-type: none"> vCenter Server and Platform Services Controller ESXi hosts in the consolidated cluster All components of NSX for vSphere for the consolidated cluster vRealize Automation and vRealize Orchestrator vRealize Log Insight including Launch in Context vRealize Business including integration in the vRealize Operations Manager operations interface vSAN 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 9-9. vRealize Log Insight Logical Design in Consolidated SDDC

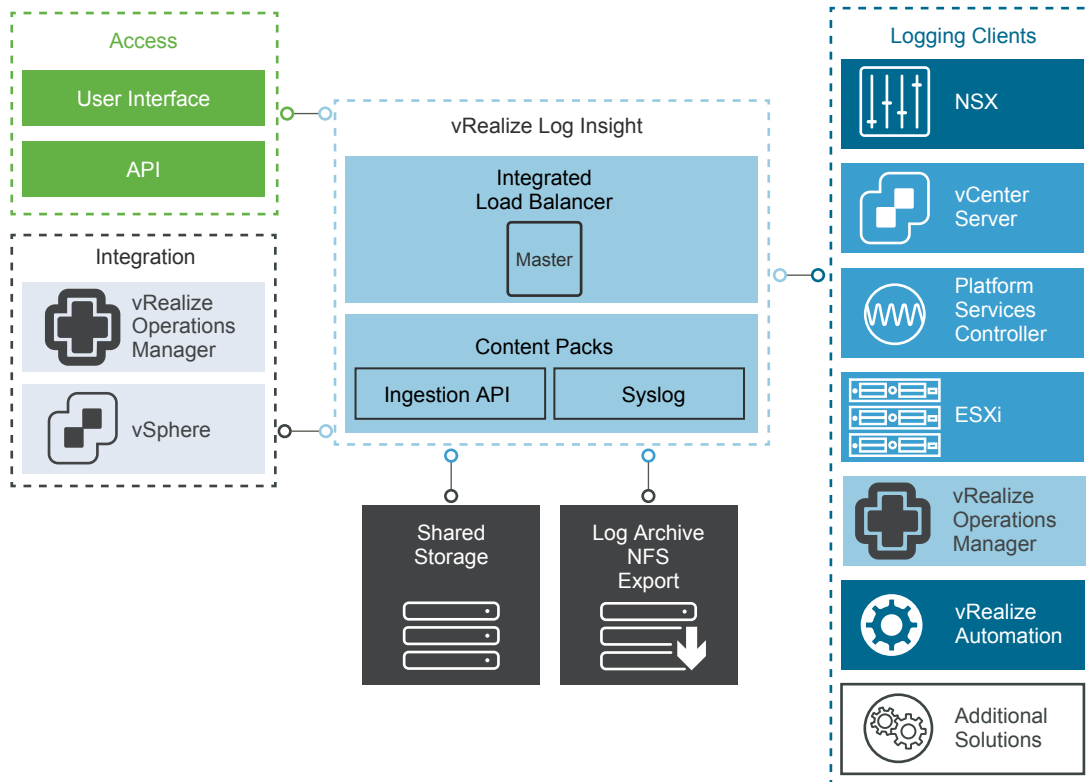


Table 9-6. vRealize Log Insight Design Details in Consolidated SDDC

Design Attribute	Description
Deployment model	Cluster of a master node.
Monitored components	<ul style="list-style-type: none"> ■ vCenter Server and Platform Services Controller ■ ESXi hosts in the consolidated cluster ■ All components of NSX for vSphere for the consolidated cluster ■ vRealize Automation and vRealize Orchestrator ■ vRealize Business ■ Analytics cluster nodes of vRealize Operations Manager ■ Management virtual appliances
Archiving	Archiving location on an NFS export

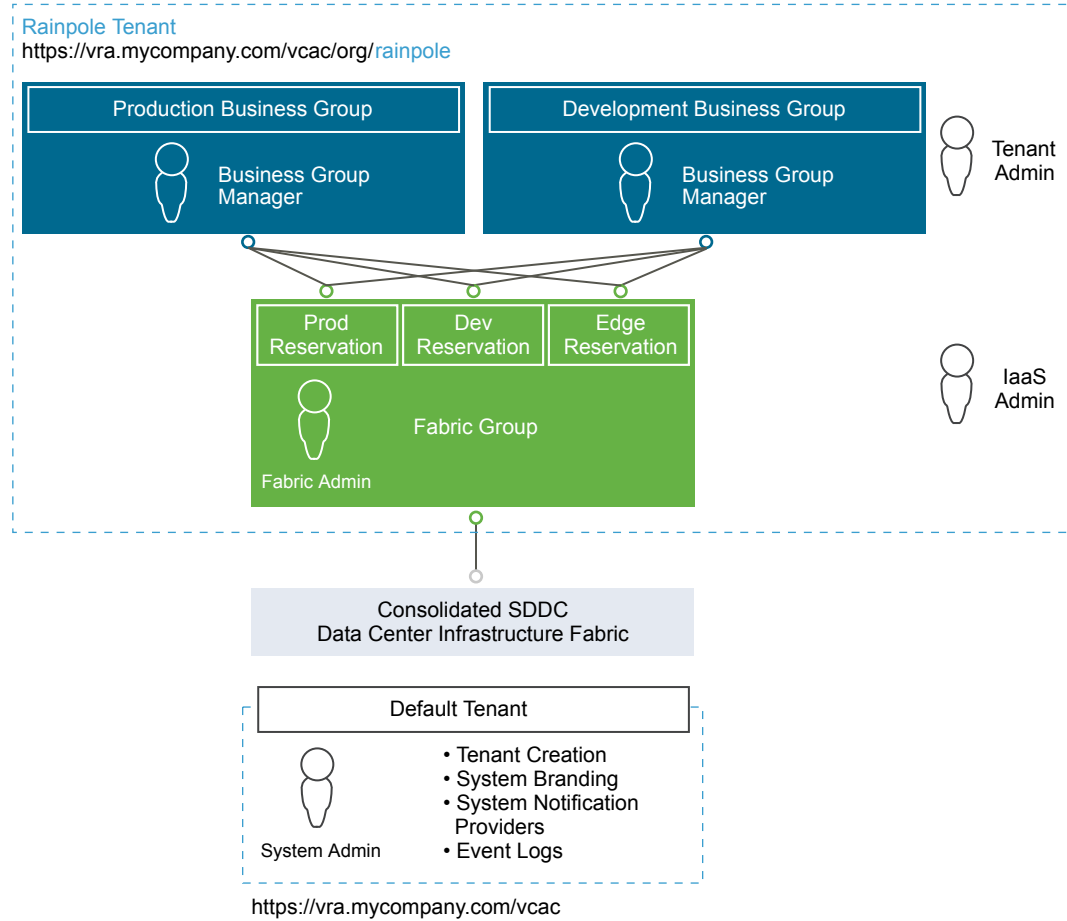
Cloud Management Layer in Consolidated SDDC

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

Table 9-7. Cloud Management Design Details in Consolidated SDDC

Design Attribute	Description
Software components	<ul style="list-style-type: none"> ■ vRealize Automation ■ Embedded vRealize Orchestrator ■ vRealize Business
Deployment model of vRealize Automation	<p>Distributed deployment with support for vSphere endpoints by using vSphere Proxy Agent virtual machines.</p> <p>You install the vRealize Automation components on multiple machines.</p>
High availability and load balancing	Disabled
Endpoints	<ul style="list-style-type: none"> ■ vCenter Server for the consolidated cluster ■ NSX Manager for the consolidated cluster
Blueprint configuration	Single-machine blueprints
Tenants	A single tenant company called Rainpole
Fabric groups	One fabric group with all resources in the consolidated cluster assigned
Business groups	According to the internal structure and workload configuration of your organization. Allocate business groups for separate business units, for example, for development and production.

Figure 9-10. Example vRealize Automation Tenant Design



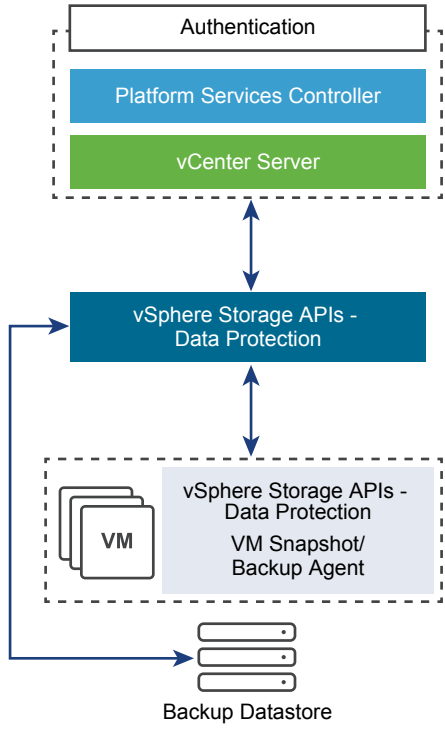
Business Continuity Layer in Consolidated SDDC

The business continuity layer includes solutions for data protection of critical management components of the Consolidated SDDC.

Data Protection

To back up the virtual machines of the SDDC management components, you deploy a solution that is compatible with vSphere Storage APIs for Data Protection (VADP).

Figure 9-11. vSphere Data Protection Design in Consolidated SDDC

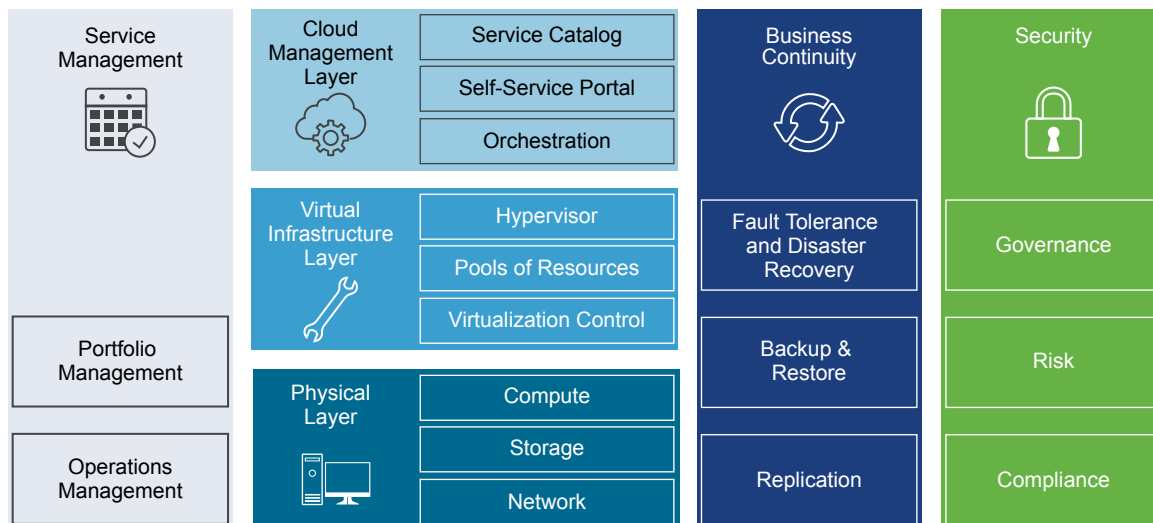


Overview of ROBO SDDC

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 Architecture and Design* and *VMware Validated Design Deployment*.

Figure 10-1. Components of a ROBO SDDC



This chapter includes the following topics:

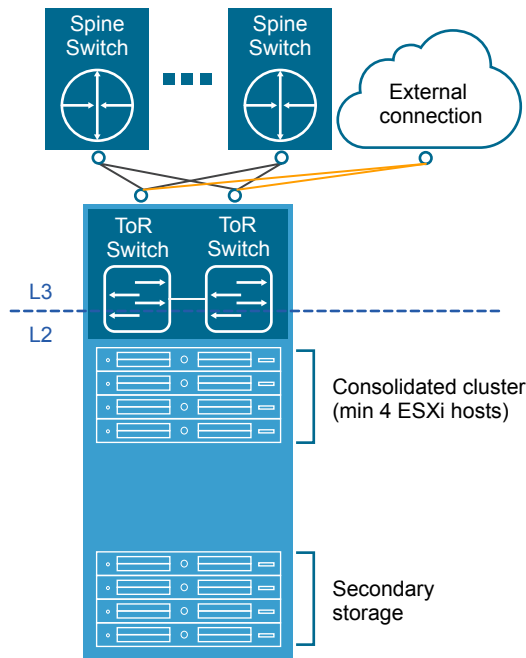
- [Physical Infrastructure Layer in ROBO SDDC](#)
- [Virtual Infrastructure Layer in ROBO SDDC](#)
- [Operations Management Layer in ROBO SDDC](#)
- [Cloud Management Layer in ROBO SDDC](#)
- [Business Continuity Layer in ROBO SDDC](#)

Physical Infrastructure Layer in ROBO SDDC

The physical layer in ROBO SDDC contains the compute, storage, and network resources in your data center.

The compute, storage and network resources are organized in workload domains. The physical layer also includes the physical network infrastructure, and storage setup.

Figure 10-2. Physical Configuration of the ROBO SDDC



Workload Domains

At the physical layer, workload domains can include different combinations of servers, and network equipment which can be set up with varying levels of hardware redundancy and varying quality of components. Workload domains are connected to a network core that distributes data between them. The workload domain is not defined by any hard physical properties. It is a standard unit of connected elements within the SDDC.

Workload domain is a logical boundary of functionality, managed by a single vCenter Server. While each workload domain usually spans one rack, it is possible to aggregate multiple workload domains into a single rack in smaller setups. For both small and large setups, homogeneity and easy replication are important.

Clusters

This VMware Validated Design uses the following types of clusters:

Consolidated Cluster

The consolidated cluster resides in the management workload domain and runs the following services:

- Virtual machines to manage the SDDC such as vCenter Server, NSX Manager, vRealize Automation, vRealize Log Insight and vRealize Operations Manager.

- Required NSX services to enable north-south routing between the SDDC and the external network, and East-West routing inside the SDDC.
- Virtual machines running business applications that support varying Service Level Agreements (SLAs).

Network

This VMware Validated Design uses a Layer 3 network architecture.

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

Regions, Hubs and ROBO Sites

Hub

A hub is the centralized provisioning and monitoring components of the SDDC. A hub can be dedicated to ROBO sites according to the number of remote office connections required or be a part of the VMware Validated Design for Software-Defined Data Center. In either case, the hub has the capability for failover between regions in the event of a disaster.

Region

Each region is a separate SDDC instance and can contain one or more availability zones. This VMware Validated Design uses two example regions in the hub: one in San Francisco (SFO) and the other in Los Angeles (LAX).

Table 10-1. Regions in VMware Validated Design for Remote Office and Branch Office

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

Availability Zone

Represent the fault domain of the SDDC. Multiple availability zones can provide continuous availability of an SDDC. By default, this VMware Validated Design supports one availability zone in each region in the hub. Alternatively, you can implement an SDDC that has two availability zones in Region A. See [Multiple Availability Zones in Standard SDDC](#).

ROBO site

A ROBO site is a location that you use to support specific services such as manufacturing, hospitals, or call centers. These locations require minimal workload deployment and have hardware located in space constrained rooms.

Table 10-2. Sites in VMware Validated Design for Remote Office and Branch Office

Site Identifier	Description
NYC01	New York City, NY, USA based Remote Office and Branch Office

Storage

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

Primary Storage

vSAN storage is the default storage type for the SDDC management components. All design, deployment and operational guidance are performed on vSAN.

The storage devices on vSAN ready servers provide the storage infrastructure. Because this VMware Validated Design uses vSAN in hybrid mode, each rack server must have minimum one SSD and two HDD devices that form a disk group with capacity.

Secondary Storage

NFS storage is the secondary storage for the SDDC management components. It provides space for archiving log data and application templates.

Virtual Infrastructure Layer in ROBO SDDC

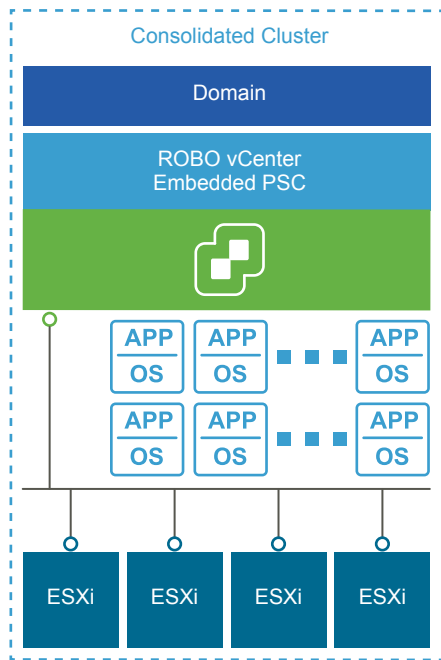
The virtual infrastructure layer of the ROBO SDDC contains the components that provide compute, networking, and storage resources to the management and tenant workloads in the remote office.

vCenter Server Design

Table 10-3. vCenter Server Design Details in ROBO SDDC

Design Area	Description
vCenter Server instances	You deploy a single vCenter Server that supports both the SDDC management components.
Clusters	You place hosts and workloads in a consolidated cluster. The cluster contains the management virtual machines, NSX controllers and edges, and tenant workloads.
Resource pools for tenant workloads and dedicated NSX components	<p>On the consolidated cluster, you use resource pools to distribute compute and storage resources between the management components, and the tenant workloads and NSX components carrying their traffic.</p> <p>The Consolidated SDDC uses resource pools for the following components:</p> <ul style="list-style-type: none"> Management virtual machines NSX Edge devices for the management components NSX Edge devices for the tenant workloads Tenant workloads
Deployment model	This VMware Validated Design uses a vCenter Server instance with an embedded Platform Services Controller instance.
Management host provisioning	You use a host profile to apply the networking and authentication configuration on the ESXi hosts in the consolidated cluster.

Figure 10-3. Layout of vCenter Server Consolidated Cluster in ROBO SDDC



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.

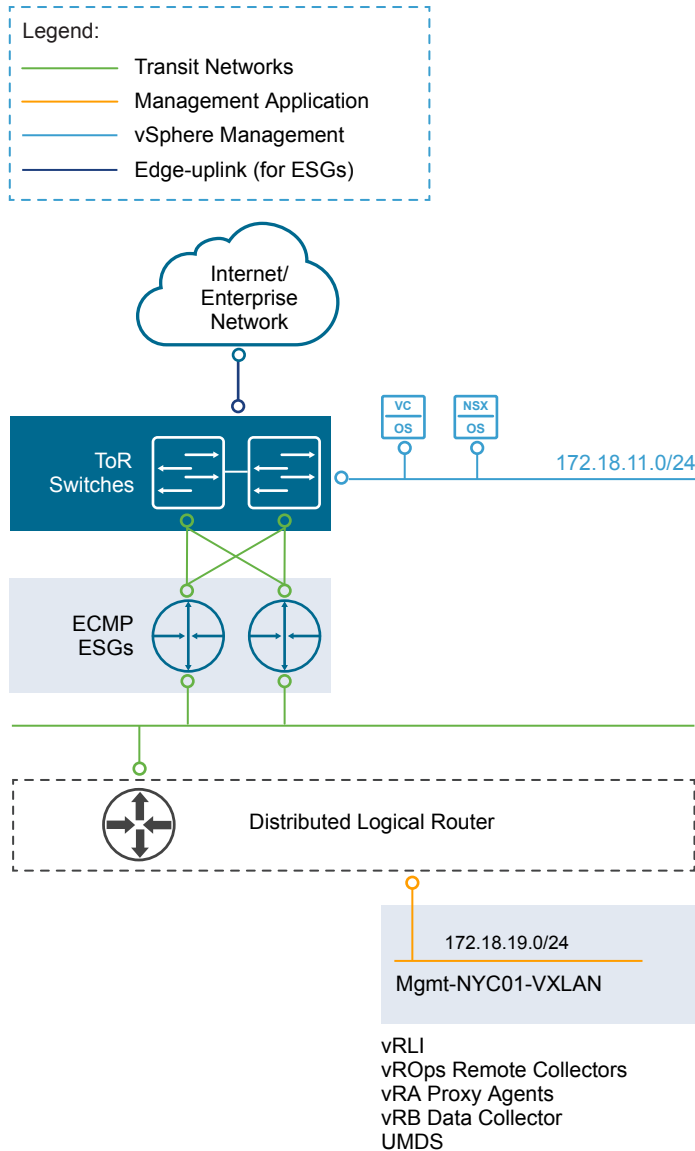
Dynamic routing support includes the following nodes:

- Pair of NSX Edge service gateways (ESGs) with ECMP enabled for north/south routing across all regions.
- Distributed logical router (DLR) for tenant internal network.

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

- Application virtual network in each site for components that are not designed to fail over.

Figure 10-4. Virtual Application Network Components and Design in ROBO SDDC



Distributed Firewall

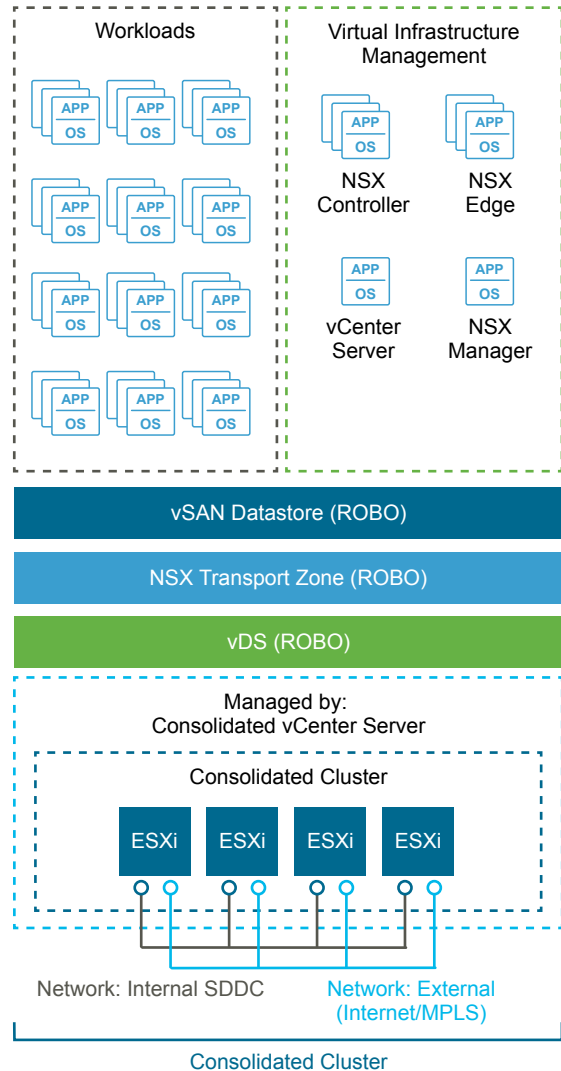
This VMware Validated Design uses the distributed firewall functionality that is available in NSX to protect all management applications attached to application virtual networks.

Software-Defined Storage Design for Management Products

Workloads store their data on a vSAN datastore. The vSAN datastore spans all 4 ESXi hosts of the consolidated cluster. Each host adds one disk group to the datastore.

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

Figure 10-5. vSAN Conceptual Design in ROBO SDDC



vRealize Log Insight use NFS exports as secondary storage.

Operations Management Layer in ROBO SDDC

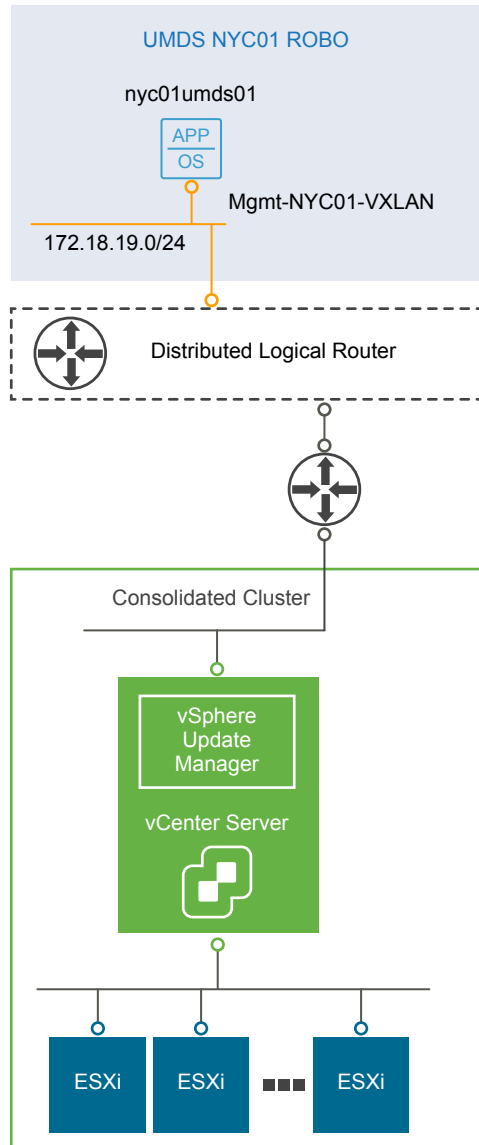
The operations layer of the ROBO SDDC provides capabilities for performance and capacity monitoring.

vSphere Update Manager

This VMware Validated Design version uses vSphere Update Manager for upgrade of the ESXi hosts from previous VMware Validated Design versions.

vSphere Update Manager server and client components are a part of vCenter Server Appliance in vSphere 6.5 or later. This design also deploys an instance of vSphere Update Manager Download Service (UMDS). Using a region-specific UMDS instance restricts the direct access to the external network from multiple vSphere Update Manager and vCenter Server instances, and reduces storage requirements across vSphere Update Manager.

Figure 10-6. vSphere Update Manager Design in ROBO SDDC



vRealize Suite Lifecycle Manager

vRealize Suite Lifecycle Manager provides lifecycle management capabilities for vRealize components including automated deployment, configuration, and upgrade. vRealize Suite Lifecycle Manager communicates with the Consolidated vCenter Server in the ROBO site to orchestrate the deployment, upgrade, and configuration drift analysis of vRealize Suite components in the SDDC.

vRealize Suite Lifecycle Manager controls separately the lifecycle of the hub components and of the components that are specific to the ROBO.

Figure 10-7. Logical Design of vRealize Lifecycle Manager in ROBO SDDC

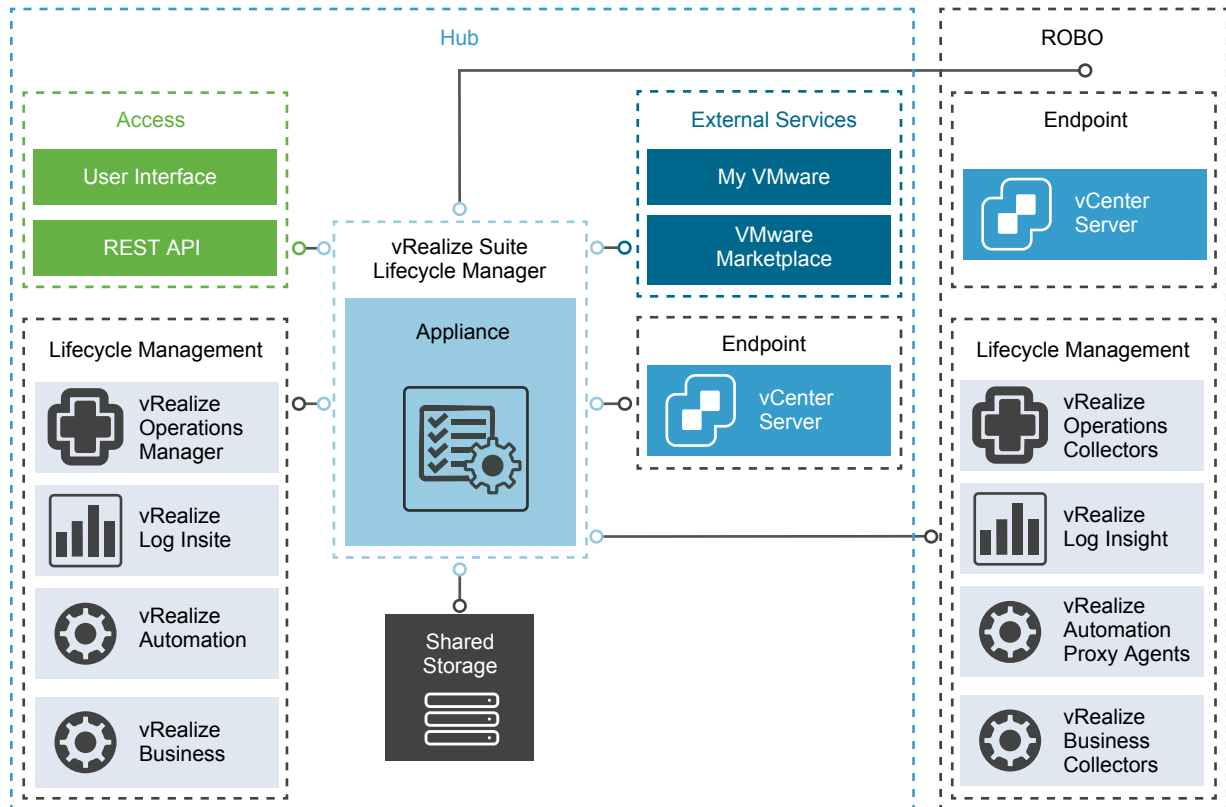


Table 10-4. vRealize Suite Lifecycle Manager Design Details

Design Attribute	Description
Deployment model	One virtual appliance in the hub that deploys and upgrades the vRealize components on the virtual infrastructure that is controlled by the vCenter Server instance in each ROBO
Supported components in the ROBO site	<ul style="list-style-type: none"> vRealize Operations Manager remote controllers vRealize Log Insight cluster vSphere Proxy Agents in vRealize Automation vRealize Business data collector
Product installation setup	<ul style="list-style-type: none"> Direct integration with My VMware to access vRealize Suite entitlements Environments configuration that uses the product-based deployment path in the installation wizard

Table 10-5. Environment Layout in vRealize Suite Lifecycle Manager

Location	Environment Name	Environment Type	Scope	Product Components
Hub	Cross-Region	Production	Cross-Region	<ul style="list-style-type: none"> ■ vRealize Operations Manager Analytics Cluster ■ vRealize Operations Manager Remote Collectors ■ vRealize Automation Appliances ■ vRealize Automation IaaS Managers ■ vRealize Automation IaaS Web Servers ■ vRealize Automation IaaS DEMs ■ vRealize Automation vSphere Proxy Agents ■ vRealize Business Server Appliances ■ vRealize Business Data Collectors
	Region A	Production	Region A	vRealize Log Insight Cluster
	Region B	Production	Region B	vRealize Log Insight Cluster
ROBO site	ROBO A	Production	ROBO A	vRealize Log Insight Cluster

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 10-8. vRealize Operations Manager Logical Design in ROBO SDDC

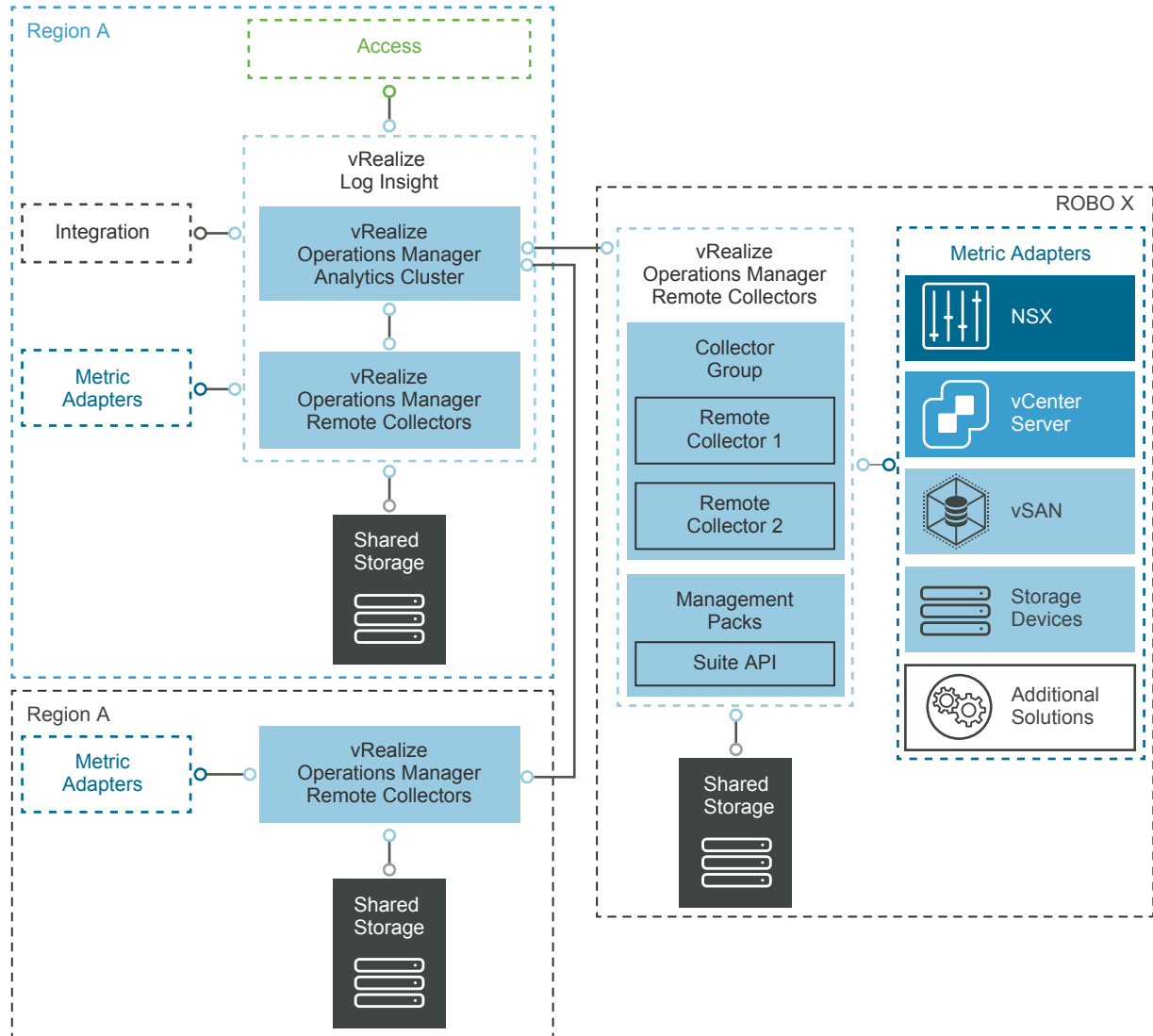


Table 10-6. vRealize Operations Manager Design Details in ROBO SDDC

Design Attribute	Description
Deployment model	<ul style="list-style-type: none"> Analytics cluster of 3 nodes in the hub: master, master replica and data nodes Remote collector group that consists of two remote collectors in each ROBO site
Monitored components from the ROBO site	<ul style="list-style-type: none"> vCenter Server and Platform Services Controller ESXi hosts in the consolidated cluster All components of NSX for vSphere for the consolidated cluster vSphere Proxy Agents in vRealize Automation vRealize Log Insight including Launch in Context

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 10-9. vRealize Log Insight Logical Design in ROBO SDDC

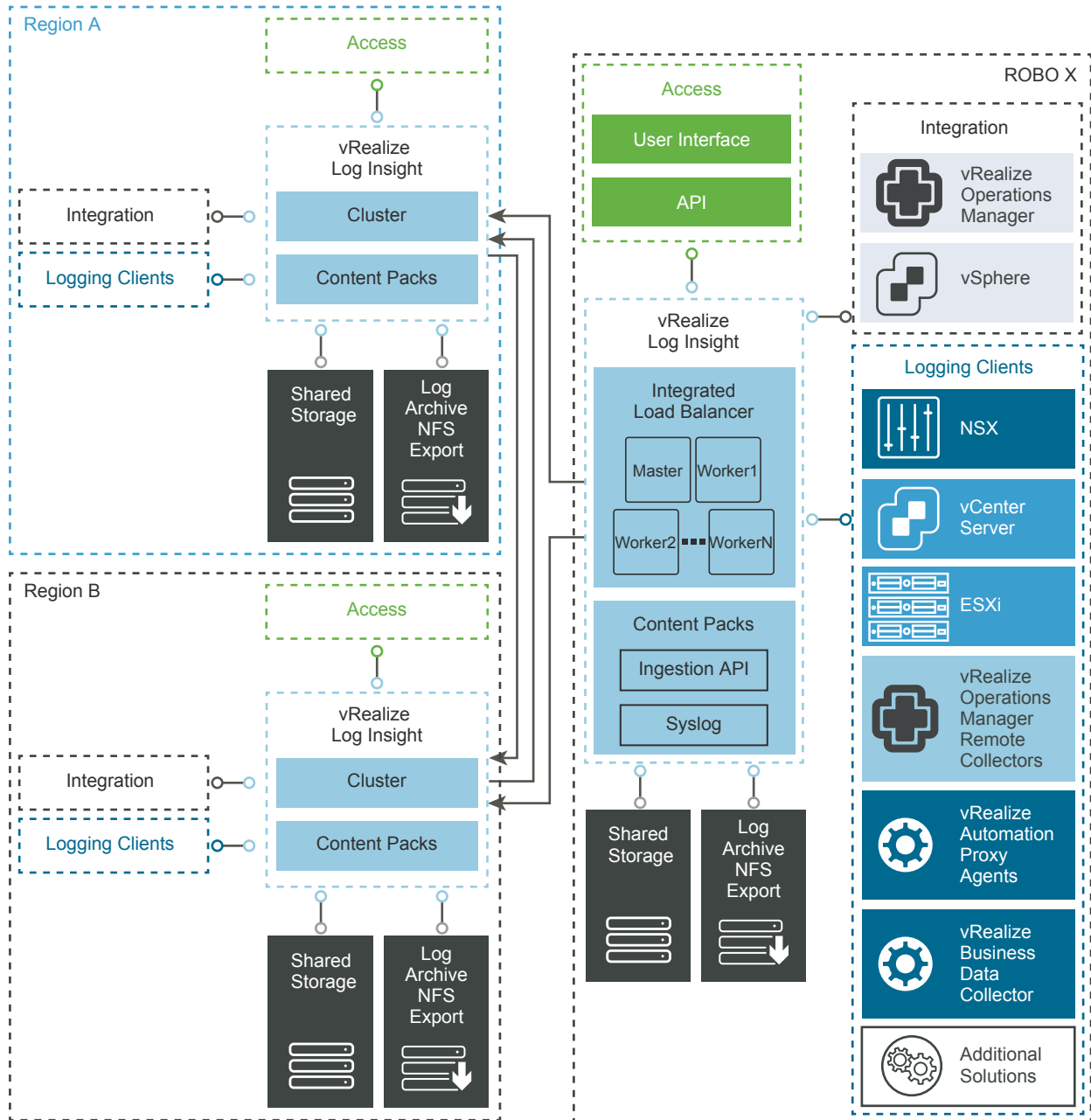


Table 10-7. vRealize Log Insight Design Details in ROBO SDDC

Design Attribute	Description
Deployment model	Cluster of 3 node: one master and two worker nodes.
Monitored components from the ROBO site	<ul style="list-style-type: none"> ■ vCenter Server and Platform Services Controller ■ ESXi hosts in the consolidated cluster ■ All components of NSX for vSphere for the consolidated cluster ■ vSphere Proxy Agents in vRealize Automation ■ Remote collectors in vRealize Operations Manager
Archiving	Archiving location on an NFS export

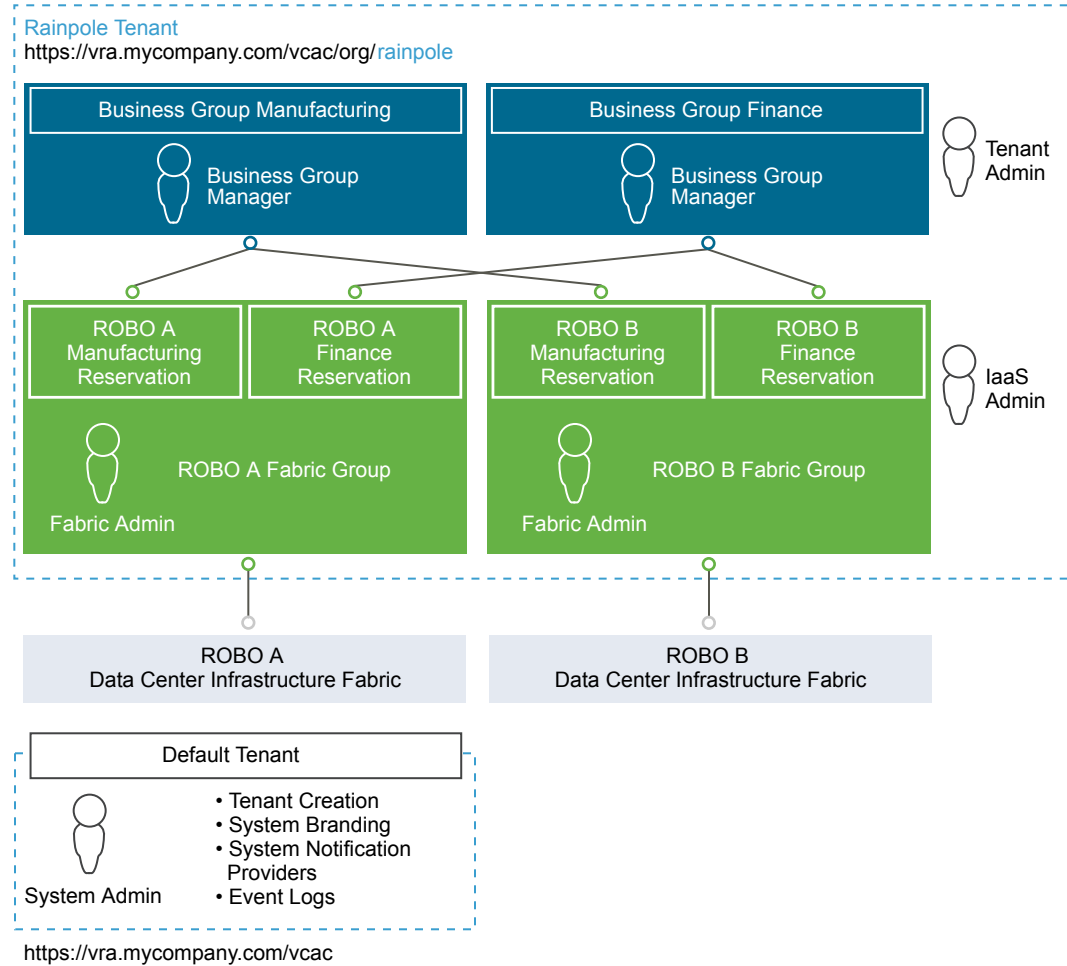
Cloud Management Layer in ROBO SDDC

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

Table 10-8. Cloud Management Design Details in ROBO SDDC

Design Attribute	Description
Software components in the hub	<ul style="list-style-type: none"> ■ vRealize Automation ■ vRealize Orchestrator ■ vRealize Business
Deployment model of vRealize Automation and vRealize Business in the ROBO site	<p>Distributed deployment with support for vSphere endpoints by using vSphere Proxy Agent virtual machines in the ROBO sites.</p> <p>You install the vRealize Automation components on multiple machines.</p> <p>The site contains a vRealize Business data collector. The data collector sends cost data back to the vRealize Business server in the hub.</p>
High availability and load balancing	The vSphere Proxy Agents in each site are highly-available.
Endpoints	<ul style="list-style-type: none"> ■ vCenter Server for the consolidated cluster in the site ■ NSX Manager for the consolidated cluster in the site
Blueprint configuration	Single-machine blueprints
Tenants	A single tenant company called Rainpole
Fabric groups	One fabric group with all resources in the consolidated cluster assigned
Business groups	According to the internal structure and workload configuration of your organization. Allocate business groups for separate business units, for example, for development and production.

Figure 10-10. Example vRealize Automation Tenant Design in ROBO SDDC



Business Continuity Layer in ROBO SDDC

The business continuity layer includes solutions for data protection critical management components of the ROBO SDDC.

Data Protection

To back up the virtual machines of the SDDC management components, you deploy a solution that is compatible with vSphere Storage APIs for Data Protection (VADP).

Figure 10-11. vSphere Data Protection Design in ROBO SDDC

