Abstract

This guide describes the management and monitoring functions of Enterprise Hybrid Cloud 4.1.1. Enterprise Hybrid Cloud enables delivery of infrastructure, storage, backup, continuous availability, and disaster recovery as cloud services.

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Chapter 1: Executive Summary

Document purpose

This document describes the infrastructure and operations management components of Enterprise Hybrid Cloud 4.1.1.

Audience

This document is intended for executives, managers, architects, cloud administrators, and technical administrators of IT environments who want to implement or use Enterprise Hybrid Cloud. Readers should be familiar with VMware vRealize Suite, storage technologies, and general IT functions and requirements, and how a hybrid cloud infrastructure accommodates these technologies and requirements.

Essential reading

The following guides provide further information about various aspects of Enterprise Hybrid Cloud:

- *Enterprise Hybrid Cloud 4.1.1: Administration Guide*
- *Enterprise Hybrid Cloud 4.1.1: Concepts and Architecture Guide*
- *Enterprise Hybrid Cloud 4.1.1: Reference Architecture Guide*
- *Enterprise Hybrid Cloud 4.1.1: Security Management Guide*

Business challenge

While many organizations have successfully introduced virtualization as a core technology within their data centers, the benefits of virtualization have largely been restricted to the IT infrastructure owners. End users and business units (BUs) within customer organizations have not experienced many of the benefits of virtualization, such as increased agility, mobility, and control.

Transforming from the traditional IT model to a cloud-operating model includes overcoming the challenges of legacy infrastructure and processes, such as:

- Inefficiency and inflexibility
- Slow, reactive responses to customer requests
- Inadequate visibility into the cost of the requested infrastructure
- Limited choice of availability and protection services

The difficulty in overcoming these challenges has given rise to public cloud providers who have built technology and business models catering to the requirements of end-user agility and control. Many organizations are under pressure to provide these same service levels within the secure and compliant confines of the on-premises data center without sacrificing visibility and control. As a result, IT departments must create alternative cloud solutions that are cost-effective and that do not compromise enterprise requirements such as data protection, disaster recovery (DR), and guaranteed service levels.
Solution purpose

Enterprise Hybrid Cloud is a completely virtualized data center, fully automated by software. It starts with a foundation that delivers infrastructure as a service (IaaS). When Enterprise Hybrid Cloud is live, you can customize it with add-on modules, including database as a service (DBaaS), platform as a service (PaaS), and cloud brokering. You can also optionally implement high availability and data recovery, as well as backup and recovery services.

Enterprise Hybrid Cloud enables:

- Complete management of the infrastructure service lifecycle
- On-demand management of network bandwidth, servers, storage, and security
- Provisioning, monitoring, protection, and management of the infrastructure services by line-of-business users without IT administrator involvement
- Provisioning of application blueprints with associated infrastructure resources by line-of-business application owners without IT administrator involvement
- Provisioning of backup, continuous availability (CA), and DR services as part of the cloud service provisioning process
- Adding, modifying, or deleting services to an application or virtual machine during its complete lifecycle
- Maximum asset usage
- Increased scalability with centrally managed multisite platforms spanning IT services to all data centers

Technology solution

Enterprise Hybrid Cloud integrates automated workflows and application blueprints with converged and hyperconverged infrastructures along with Dell EMC, VMware, professional services, and single contact support into an easy-to-consume hybrid cloud converged platform.

Enterprise Hybrid Cloud integrates the best of Dell EMC and VMware products and services with converged and hyperconverged infrastructures. This integration empowers IT organizations to accelerate implementation and adoption of a hybrid cloud infrastructure, while still enabling customer choice for the compute and networking infrastructure within the data center. Enterprise Hybrid Cloud caters to customers who want to preserve their investment and make better use of their existing infrastructure and to those who want to build out new infrastructures dedicated to a hybrid cloud.

Enterprise Hybrid Cloud takes advantage of the strong integration between Dell EMC technologies and the VMware vRealize Suite. Developed by Dell EMC, Enterprise Hybrid Cloud includes Dell EMC scalable storage arrays, integrated Dell EMC and VMware monitoring, and data protection suites to provide the foundation for enabling cloud services within the customer environment.
Enterprise Hybrid Cloud offers several key benefits to customers:

- **Rapid implementation**—Enterprise Hybrid Cloud provides the foundation for IaaS and can be designed and implemented in a validated, tested, and repeatable way that is based on converged infrastructure. This increases the time-to-value for the customer while simultaneously reducing risk. Deliver IT as a service (ITaaS) with add-on modules for backup, DR, CA, virtual machine encryption, applications, application lifecycle automation for continuous delivery, ecosystem extensions, and more.

- **Defined upgrade path**—Customers implementing Enterprise Hybrid Cloud receive upgrade guidance based on the testing and validation completed by Dell EMC. This upgrade guidance enables customers, partners, and Dell EMC services teams to perform upgrades faster and with much less risk.

- **Validated and tested integration**—Build guides have been developed and there has been extensive integration testing across Enterprise Hybrid Cloud, making it simpler to use and manage, and more efficient to operate.

**We value your feedback**

Dell EMC and the authors of this document welcome your feedback on the solution and the solution documentation. Contact EMC.Solution.Feedback@emc.com with your comments.

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- vRealize Operations Manager .............................. 9
Overview

Infrastructure maintenance and operations teams need the end-to-end visibility and intelligence to make fast, informed operational decisions to ensure guaranteed service levels proactively in cloud environments. They need to identify the root cause of performance problems promptly, optimize capacity in real time, and maintain compliance in a dynamic environment of constant change.

Enterprise Hybrid Cloud provides the ability to monitor and manage resources and systems in the hybrid cloud environment intelligently using Dell EMC and VMware product integration and interoperability.

vRealize Operations Manager

The VMware vRealize Operations Manager dashboard provides a comprehensive view into the environment, as shown in Figure 1. The main dashboard is divided into three logical entities that provide high-level information about current overall health and issues of all managed resources, risk of future issues, and resource efficiency trends in the environment.

![vRealize Operations Manager dashboard high-level overview](image)

Figure 1. vRealize Operations Manager dashboard high-level overview

The primary logical entities in vRealize Operations Manager are:

- **Health**—Calculates health scores based on patented algorithms that dynamically observe behavioral trends of the cloud environment and display red, yellow, and green status of the virtual machines, datastores, and clusters.

- **Risk**—Enables insight into resource consumption, providing advance notification of critical resource capacities, and alerts to future issues.

- **Efficiency**—Proactively optimizes the environment and reclaims waste.

Features and functions of vRealize Operations Manager include:

- **Smart alerts**—Smart alerts combine multiple symptoms to generate a single alert that focuses on the underlying issue with clear recommendations. You can create customized alert definitions.

- **Automated problem remediation**—Integrated action and remediation capabilities provide the ability to apply actions according to the recommendation for the alerts.
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- **Reporting**—Several out-of-the-box reports provide the ability to generate fully customizable reports.
- **Capacity planning and project management capabilities**—Capacity planning and project management capabilities extend beyond VMware vSphere and across physical and application-level metrics. You can adjust flexible capacity models to meet different business needs.
- **Custom policies**—You can apply custom policies for specific workload types, applications, or clusters, enabling more advanced monitoring of performance, capacity, and configuration standards.
- **Unified storage visibility**—New storage visibility shows the correlation between the application group and the storage infrastructure supporting it, including host bus adapters, fabric, and arrays, along with the ability to trace operational issues.

vRealize Operations Manager uses management packs, as shown in the example in Figure 2, to provide deeper visibility into other components that may be present in the environment. VMware provides some management packs, while Dell EMC, Cisco, and Brocade provide others. Enterprise Hybrid Cloud uses these management packs to provide maximum visibility into the cloud platform.

![Figure 2. Selection of available vRealize Operations management packs](image)

The management packs that are currently available for Enterprise Hybrid Cloud are:

- VMware vRealize Automation
- VMware NSX
- VMware vSphere
- VMware vRealize Log Insight
- EMC™ Storage Analytics
- EMC ViPR™
- Brocade Fabric

You can create custom dashboards and cloud-specific dashboards for any environment using the objects and details provided by the various management packs.

**vRealize Automation Management Pack**

The management pack for vRealize Automation provides cloud administrators with tenant-aware operational visibility of the infrastructure supporting the hybrid cloud, as shown in the example in Figure 3. This management pack provides default dashboards that extend to vRealize Automation cloud constructs such as tenants, business groups, and
reservations, and correlates these constructs to vSphere objects such as virtual machines, clusters, and datastores.

vRealize Operations Manager health badges that are visible in vRealize Automation are an added integration point, as shown in Figure 4. While this feature is separate from the vRealize Automation Management Pack, configuring the vRealize Operations Manager health badges for virtual machines provides users with quick visibility into the health of their virtual machines.
Dell EMC provides integrated services that allow vRealize Operations to collect and report ViPR and Dell EMC storage array resource metrics. Using ViPR Analytics and EMC Storage Analytics (ESA), VMware and storage administrators monitor the software-defined storage environment, continuously available EMC VPLEX™ devices, and the individual storage platforms. Health and risk analytics can be used to assist with problem resolution. Storage metrics are presented directly to vRealize Operations through customizable dashboards, providing complete visibility into ViPR and storage array performance and capacity metrics.

You can install ViPR and ESA adapters on an existing instance of an enterprise-licensed vRealize Operation.

**ViPR Analytics**

The ViPR Analytics Pack provides enhanced capabilities for VMware vRealize Operations Management Suite by linking ViPR Analytics with vRealize Operations. This integration delivers custom analytics and visual representations of the resources within the Dell EMC software-defined infrastructure.

ViPR inventory, metering, and event data is imported into vRealize Operations and displayed through pre-configured dashboards that show collections of volume, storage port, storage system, and virtual pool data. vRealize Operations uses the data to compute key resource status scores. Resource details, individual metrics, and ViPR event alerts are also presented in dashboard views. The health scores of ViPR resources can be improved by using performance data from EMC Unity™, EMC VNX™, EMC VMAX™, EMC ScaleIO™, EMC XtremIO™, and VPLEX adapters.
The preconfigured dashboards provided by the ViPR Analytics Pack include capacity, performance, and higher-level at-a-glance information.

Note: The ViPR Analytics Pack integrates with Dell EMC VxBlock Systems™ and Dell EMC VxRack™ Systems. The Enterprise Hybrid Cloud platform on Dell EMC VxRail™ Appliances does not require this integration.

**ViPR Capacity dashboard**

You can use the ViPR Capacity dashboard to monitor virtual storage pool capacity and datastore disk usage, as shown in Figure 5.

![ViPR Capacity dashboard in vRealize Operations Manager](image)

Figure 5. ViPR Capacity dashboard in vRealize Operations Manager

The ViPR Capacity dashboard consists of the following components:

- **Virtual storage pool workload**—Displays the provisioned capacity consumed by the datastores
- **Virtual storage pool capacity remaining**—Displays the available storage pool capacity
- **Resource selector**—Enables you to search for a specific resource
- **Status boards**—Displays various status and relationship information for ViPR resources
- **Clusters in workload**—Displays the top clusters in disk capacity workload
- **Datastores in workload**—Displays the top datastores in disk capacity workload


**ViPR Performance dashboard**

You can use the ViPR Performance dashboard, as shown in Figure 6, to monitor storage network and datastore latency performance data.

![ViPR Performance dashboard](image)

**Figure 6.** ViPR Performance dashboard in vRealize Operations Manager

The ViPR Performance dashboard consists of the following components:

- **Storage network workload**—Displays the collected I/O usage for all storage ports in a network
- **Storage port workload**—Displays the I/O workload for storage ports
- **Resource selector**—Used to search for a specific resource
- **Status boards**—Displays various status and relationship information for ViPR resources
- **Datastores with highest I/O workload**—Displays the top datastores with the highest I/O workload
- **Datastores with highest read latency**—Displays the top datastores with the highest read latency
- **Datastores with highest write latency**—Displays the top datastores with the highest write latency
ViPR at-a-glance dashboard

You can use the ViPR at-a-glance dashboard, as shown in Figure 7, to monitor performance and capacity data from a single dashboard.

![ViPR at-a-glance dashboard in vRealize Operations Manager](image)

The ViPR at-a-glance dashboard consists of the following components:

- **Capacity status monitoring**—Combines the Virtual Storage Pool Workload, Virtual Storage Pool Capacity Remaining, and Clusters in Workload components to create a single dashboard for monitoring capacity status
- **Performance status monitoring**—Combines the Storage Network Workload, Storage Port Workload, and Datastores with highest latency components to create a single dashboard for monitoring performance status

EMC Storage Analytics

The EMC Storage Analytics (ESA) management pack integrates the features and functionality of vRealize Operations Manager with Unity, VNX, VMAX, VPLEX, and XtremIO storage. It delivers custom analytics and visualizations that provide detailed visibility into the Dell EMC infrastructure, enhancing troubleshooting, and proactively identifying storage performance and capacity issues for remediation.
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Within the vRealize Operations Manager custom portal, ESA presents separate dashboards, some of which are universal and others that are specific to the storage arrays. Each dashboard is fully customizable and can be adjusted to display the required details and metrics or additional widgets.

**Note:** The ESA management pack integrates with VxBlock Systems only.

As shown in Figure 8, ESA enables the following default dashboards in the vRealize Operations Manager custom portal:

- **Storage Topology**—Displays resources and relationships between storage and virtual infrastructure objects
- **Storage Metrics**—Displays resources and metrics for all storage systems
- **Array-specific dashboards**—Displays resources and metrics for individual storage systems

![Image of vRealize Operations Manager custom portal showing dashboards](image)

**Figure 8.** Dashboards enabled by ESA management pack

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**Storage Topology dashboard**

The Storage Topology dashboard establishes mappings and correlations between storage system components and vCenter objects, as shown in Figure 9.

![Storage Topology and Health](image)

**Figure 9.** Storage Topology dashboard displaying the correlation between storage and vSphere objects

Topology mapping enables health scores and alerts for storage system components, such as storage processors and disks, to be shown in the context of vCenter objects, such as LUNs, datastores, and virtual machines.

You can see details for every object in every widget by selecting the object and clicking **Resource Detail** at the top of each widget. ESA displays all related VMware objects, which enable end-to-end navigation into the underlying storage array components, from vSphere datastore clusters and virtual machines to storage groups and ports.
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**Storage Metrics dashboard**
The Storage Metrics dashboard, as shown in Figure 10, displays a graph with each Dell EMC resource and the metrics associated with it. Navigation is from the top down. After choosing the storage system and a specific resource, you can select multiple metrics for display.

![Storage Metrics dashboard](image1)

**Array-specific dashboards**
XtremIO, Unity, VNX, VMAX, VPLEX, and ScaleIO systems have separate dashboards with details presented as heat maps, as shown in Figure 11. An array-specific dashboard displays the main storage system resource types, thin pools, storage groups, LUNs, front-end ports, storage processors, and EMC FAST™ Cache performance, and the metrics for each one.

![XtremIO overview dashboard](image2)
Depending on the objects being displayed, the heat map colors represent either usage or performance, or relative usage across a metric within an array. For any one of the objects displayed, you can view a full historical perspective on the Storage Metrics dashboard.

vRealize Operations Manager provides alerts for health, risk, and efficiency across the cloud environment, as shown in Figure 12. These alerts are both proactive and reactive. vRealize Operations Manager creates an alert based on either an existing event or on projected capacity usage and growth.

Figure 12. Health and risk alerts presented by vRealize Operations Manager

With proactive alerts, where vRealize Operations Manager reports risk for a specified object, the potential issue can be addressed before it occurs. With reactive alerts, where an event causing an issue has already occurred, vRealize Operations Manager provides troubleshooting advice in the context of the entire environment.
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Figure 13 shows the recommendations that are provided by vRealize Operations Manager in the context of a storage-related alert. The example indicates that a host has lost a storage path, which in turn creates a single point of failure.

![Figure 13. Intelligent recommendations for troubleshooting](image)

Remote collection

The vRealize Operations Manager remote collector node is an additional cluster node that allows vRealize Operations Manager to gather more objects into its inventory for monitoring. Unlike data nodes, remote collector nodes only perform the collector role of vRealize Operations Manager, without storing data or processing any analytics functions. In Enterprise Hybrid Cloud, remote collectors are placed in the Advanced Management Platform (AMP) and are deployed in the data center of remote vCenter instances.

During a DR failover of the automation pod, the remote collector node remains with the infrastructure that it is monitoring and continues to collect relevant events for vRealize Operations Manager.

A remote collector node is usually deployed to navigate firewalls, reduce bandwidth across data centers, connect to remote data sources, or reduce the load on the vRealize Operations Manager analytics cluster.
To deploy a remote collector, select the **Expand an Existing Installation** option, as shown in Figure 14.

![vRealize Operations Manager initial setup](image1)

**Figure 14.** vRealize Operations Manager initial setup

The setup wizard to create a remote collector node enables you to set the following parameters as shown in Figure 15:

- Node name
- Node type
- Master node or IP address or fully qualified domain name (FQDN)
- Master node username and a password or passphrase

![Remote collector node setup](image2)

**Figure 15.** Remote collector node setup
This chapter presents the following topic:

vRealize Log Insight ................................................................. 23
vRealize Log Insight

VMware vRealize Log Insight delivers automated log management with system analytics, aggregation, and search. Enterprise Hybrid Cloud deploys vRealize Log Insight in a multi-node configuration to ensure uptime and reliability. vRealize Log Insight can analyze log events from any vCloud Suite component that supports syslog forwarding, including all components of the management cluster and infrastructure. In Enterprise Hybrid Cloud, the log-forwarding configuration is enhanced with VMware and Dell EMC content packs.

Content packs are immutable, or read-only, plug-ins to vRealize Log Insight that provide predefined knowledge about specific types of events, such as log messages. Content packs provide specific event knowledge in a format easily understandable by administrators, engineers, monitoring teams, and executives. Each content pack is delivered as a file, and can be imported into any instance of vRealize Log Insight.

Widgets provided by a content pack can be cloned and added to a customized dashboard with views required by the user. Figure 16, as an example, provides a view of interactions between Enterprise Hybrid Cloud components, showing which components are accessing the Cloud vCenter server and how often, and which mode of communication is being used. The vSphere Content Pack includes the widget that enables this view.

![Figure 16. vSphere Security dashboard displaying users and authentication type accessing the Enterprise Hybrid Cloud vCenter Server](image)

Dashboards and widgets can be created manually for components for which content packs do not exist. In large environments with numerous log messages, vRealize Log Insight provides runtime field extraction to enable you to locate instantly the most important data fields. Any field from the data can be extracted using regular expressions.

vRealize Log Insight ships with the vSphere content pack, which provides detailed insight into vSphere logs and events. Content packs are also available for vRealize Operations Manager, vRealize Automation, and NSX.

These content packs provide important information across the broader environment, providing many dashboards containing a comprehensive list of events and event types.

The content pack for vRealize Operations Manager presents log data in a meaningful way and analyses all the logs that are redirected from a vRealize Operations Manager
instance. The queries and dashboards provided by the content pack can be used to monitor and troubleshoot issues in the vRealize Operations Manager environment.

In addition to the content pack, you can integrate vRealize Operations Manager in the following independent ways:

- vRealize Log Insight can send notification events to vRealize Operations Manager.
- The Launch in context menu of vRealize Operations Manager can display actions related to vRealize Log Insight.

The Enable launch in context functionality enables users in vRealize Operations Manager to view events that are related to a specific object by launching vRealize Log Insight directly in the context of that object. Using this option in the Actions menu in vRealize Operations Manager triggers a search of all relevant vRealize Log Insight information on the selected item.

The launch-in-context action filters the logs using a constraint, for example hostname starts with <hostname prefix>, which results in only events that match that criteria being displayed, as highlighted in Figure 17.

Figure 17. vRealize Log Insight filtering logs for the management cluster components
Chapter 3: Centralized Log Management

The vRealize Automation content pack for Log Insight provides important information across all components of the vRealize Automation environment. The vRealize Automation and NSX components also must be configured to forward their respective logs to vRealize Log Insight.

When configured, the vRealize Automation content pack for Log Insight provides a centralized interface for monitoring the vRealize Automation environment. The content pack consists of the following dashboards that enable users to visualize multiple functioning components of vRealize Automation:

- **General – Overview**—Displays a general overview of vRealize Automation events over time and by status
- **General – Problems**—Compiles vRealize Automation environment errors and warnings that allow the user to focus on affected components and troubleshoot issues
- **vRA – Appliance**—Shows events by tenant, and counts of component errors and warnings, as well as events by message type
- **vRA – App Authoring**—Displays data for started and completed software installation events
- **vRA – Catalog**—Provides historical information for catalog requests
- **vRA – Designer**—Shows logs reported by the composition service, which is responsible for recursing blueprint objects and breaking them down into their various components for processing throughout the provisioning process
- **vRA – Extensibility**—Shows historical event broker events, as well as topic registration, errors, and logs by priority
- **vRA – Authentication**—Provides details about the VMware Identity Manager for authentication and authorization
- **vRA – IaaS**—Displays data for IaaS components running on one or several Windows hosts in a vRealize Automation and IaaS environment
- **vRA – NSX**—Provides information about data collection and errors that have occurred in the NSX environment
- **vRA – Telemetry**—Displays specific metrics over time about active business groups, entitlements, and approval policies
Chapter 3: Centralized Log Management

Figure 18 is an example of the vRealize Automation General – Overview dashboard, with details for events over time and status.

![vRealize Automation General – Overview dashboard](image1)

**Figure 18.** vRealize Automation General – Overview dashboard

Figure 19 shows an example of the vRealize Automation vRA – IaaS dashboard, with details for workflow, data collection, and model manager issues.

![vRealize Automation vRA – IaaS dashboard](image2)

**Figure 19.** vRealize Automation vRA – IaaS dashboard

For hybrid cloud components based on Microsoft Windows, such as those hosting the SMI-S server or SQL Server databases, vRealize Log Insight can collect data from
Windows systems with an easy-to-deploy vRealize Log Insight monitoring agent for Windows.

Additionally, agent-specific content packs are available for Windows and Linux operating systems. These agents are preconfigured for ease of use and can collect targeted data for Log Insight ingestion. As shown in Figure 20, the SQL Server agent is preconfigured to collect SQL events.

```
 fie\[log\]|MSsql
 ; IMPORTANT: Change the directory as per the environment
directory=c:\Program Files\Microsoft SQL Server\MSSQL\MSSQLSERVER\MSSQL\Log
tags="[ms_product":"mssql"]
charset=utf-16le
exclude=*.trc,*.log,*.mdmp
```

Figure 20. Microsoft – SQL Server agent

The agent is configured with certain defaults, which you can alter by using the "liagent" configuration file.

Dell EMC provides vRealize Log Insight content packs for VNX, VMAX, and XtremIO systems to present the logging details in a meaningful way. Customized dashboards and user-defined fields for VNX, VMAX, and XtremIO enable root cause analysis on the arrays or backup infrastructure.

The VNX content pack provides the following dashboards:

- Overview
- Alerts/Faults
- Commands
- System Notifications
- Background Processes
Each dashboard contains multiple widgets that are specific to their parent dashboard. Figure 21 displays the widgets available in the **Overview** dashboard for VNX.

![Example of an overview dashboard: VNX content pack](image)

**Figure 21. Example of an overview dashboard: VNX content pack**

Dell EMC provides a custom content pack for VMAX log information and provides several dashboards that contain widgets:

- **Overview**—Information about all VMAX data in the vRealize Log Insight instance
- **Local & remote replication**—Information that is specific to log messages generated by EMC SRDF™ or EMC TimeFinder™ replication software

**Note:** SRDF is supported with Log Insight, but not with Enterprise Hybrid Cloud.

- **Virtual provisioning overview**—Information about thin pool and device events
- **Director events**—Information about any front-end or back-end director events on the VMAX system
- **Auditing**—All audit log information
Figure 22 shows an example of a dashboard that is included with the VMAX content pack.

![Example of a VMAX content pack dashboard](image)

**Figure 22. Example of a VMAX content pack dashboard**

For detailed information about the VMAX content pack, refer to *Using the EMC VMAX Content Pack for VMware vRealize Log Insight White Paper*.

Dell EMC provides a custom content pack for the XtremIO array to visualize log information and provide insight into Dell EMC’s dynamic flash storage array. The content pack consists of these dashboards that contain widgets:

- **XtremIO Overview**—Displays information about all XtremIO data in the vRealize Log Insight instance
- **XtremIO Errors**—Displays error information that the XtremIO array sends to Log Insight through the syslog protocol
- **XtremIO Management Server (XMS)**—Displays XtremIO Management Server events
Figure 23 shows an example of a dashboard that is included with the XtremIO content pack.

Content packs are also available for Enterprise Hybrid Cloud integrated components from vendors such as Puppet, Cisco, and Brocade as well as for applications such as Oracle, SQL Server, SharePoint, and Exchange.

**Event forwarding**

To ensure non-disruptive event gathering, even in a disaster, Enterprise Hybrid Cloud uses event forwarding functionality within vRealize Log Insight. The event forwarder is a stand-alone node with the sole purpose to aggregate and forward logs to the main Log Insight instance.

Event forwarders are placed in the AMP, as well as in remote vCenter data centers. They send all data to the main vRealize Log Insight instance and ensure continued gathering of log data in case of a DR failover.

The event forwarder is an independent instance of vRealize Log Insight. To configure event forwarding, click the configuration drop-down list icon, select Administration, and then select Event Forwarding. Figure 24 shows the Event Forwarding configuration pane.
To access the configuration window and set the options, as shown in Figure 25, click **New Destination**.

![New Destination configuration window](image)

**Figure 25. New Destination configuration window**

The New Destination configuration options include:

- **Name**—A unique name for the destination
- **Host**—The IP address or the FQDN of the destination
- **Protocol**—The preferred method of event transfer
  - If the remote destination is a Log Insight instance, Ingestion API (default) is used. The event’s original source is preserved in the source field.
  - **Note**: If you use Ingestion API, SSL is the preferred method. The remote server’s trust root is validated. By default, Event Forwarding with SSL does not work with self-signed certificates that are installed on destination servers.
  - If the destination is another type of log server, Syslog is used. When events are forwarded using syslog, the event’s original source is lost and the receiver may record the message’s source as the vRealize Log Insight forwarder’s IP address or hostname.
- **Tags (optional)**—Enables you to add fields with predefined values to events for easier querying. You can add multiple comma-separated tags.
- **Filters (optional)**—Controls which events to forward. If you do not set a filter, all events are forwarded. For more information, see the Searching and Filtering Log Events topic in the *VMware vRealize Log Insight User’s Guide*.
- **Port**—The port on the remote destination to which events are sent.
• **Disk Cache**—The amount of reserved local disk space to buffer events that you configure to be forwarded. Buffering is used when the remote destination is unavailable or unable to process the events being sent to it.

• **Worker Count**—The number of simultaneous outgoing connections to use. The default value is 2.
This chapter presents the following topic:

**Storage resource management**...34
Storage resource management

Enterprise Hybrid Cloud uses the comprehensive resource management and reporting functionality available with ViPR Storage Resource Management (SRM) and vRealize Operations Manager.

Cloud administrators can use ViPR SRM through real-time dashboards or reports to understand and manage capacity and consumption of ViPR software-defined storage and to monitor SLA compliance.

vRealize Operations Manager provides powerful virtual resource consumption and capacity planning functionality to help predict behavior and understand the potential impact of future growth on the resources supporting the hybrid cloud environment.

The EMC SRM Suite provides comprehensive monitoring, reporting, and analysis for heterogeneous block, file, and virtualized storage environments. As shown in Figure 26, it enables you to visualize application storage dependencies, analyze configurations, monitor capacity growth, and optimize the environment to improve return on investment.

ViPR SRM identifies how much raw storage is in the hybrid cloud environment, how much of the total raw storage is configured for use, how much remains unconfigured, and how much of that unconfigured storage is available on specific arrays.

Multiple storage dashboards and views are available to enable instant analysis of overall storage capacity and consumption in the environment.

Identifying and viewing ViPR storage capacity

The ViPR virtual array consists of multiple virtual pools supported by one or more storage arrays. ViPR SRM provides the ability to analyze the virtual array and virtual pool down to the physical storage pools residing on different storage arrays.
A high-level report beginning with the ViPR virtual array, as shown in Figure 27, provides details of available and provisioned storage capacity and the virtual pools that are configured in the virtual array.

**Note:** The report provides more details about file systems, block volumes, and storage ports, but the details are not shown in Figure 27.

![ViPR SRM: Overview of ViPR virtual array](image)

**Figure 27.** ViPR SRM: Overview of ViPR virtual array

As shown in Figure 28, in addition to the high-level ViPR virtual pool details, ViPR SRM provides lower-level details on a particular ViPR pool, including type and protocol, the provisioning and assignment types, and the capacity and usage figures.

The virtual pool details include the physical storage array to which the virtual pool belongs. In the example in Figure 28, the virtual pool named VNX File contains a storage pool named File Pool and belongs to the VNX file storage system.

![ViPR SRM: ViPR virtual pool details](image)

**Figure 28.** ViPR SRM: ViPR virtual pool details
Administrators can run reports and generate views to display details on the physical storage pools supporting the ViPR virtual pools, as shown in Figure 29. The storage pool details in Figure 29 map directly to the physical storage arrays that ViPR manages.

![Figure 29. ViPR SRM: Storage pools supporting ViPR virtual pools](image)

Details on the various storage systems that are configured with ViPR are available in the storage system report, as shown in Figure 30.

![Figure 30. ViPR SRM: Physical storage systems](image)

All these reports and views are available in the ViPR SRM Report Library under EMC ViPR.

The EMC SRM Suite provides visibility into the physical and virtual relationships in this hybrid cloud infrastructure to ensure consistent service levels.

The Storage Compliance SolutionPack for the SRM Suite automates the process of validating the storage infrastructure configuration against Dell EMC proven best practices, providing the following functionality:

- Monitors compliance with best practices and the EMC Support Matrix
- Identifies configuration issues proactively
- Ensures that hosts, SAN, and networking are configured to meet service levels

The workflow of storage resource compliance management starts with SRM policy management. Through the SRM Administration Portal, an administrator can use a default
user-defined SRM policy to detect configuration changes to the hybrid cloud environment that result in a breach of compliance.

**Creating a storage compliance policy**

An administrator can create a storage compliance policy as follows:

1. Log in to the SRM Administration Portal and create a policy under Operations > Compliance > Storage Compliance > Manage Rules & Policies > Create Policy.
2. Select a template from the list box, as shown in Figure 31.

![Figure 31. Creating a storage compliance policy: Description](image)

3. Type a policy name and description and set the state of the policy to Enabled.
4. Under Scope, create a user-defined scope with the scope name and criteria, as shown in Figure 32.

![Figure 32. Creating a storage compliance policy: Scope](image)

The scope can be as broad or as specific as required.
5. Under **Rules**, create the rules and the severity set, as shown in Figure 33.

![Create Policy](image)

**Figure 33. Creating a storage compliance policy: Rules**

6. Under **Schedule**, apply a schedule and then save the policy.

The new storage compliance policy can now be enabled and is ready to run.

The Storage Compliance SolutionPack downloads the EMC Support Matrix and validates your SAN’s compliance with EMC Support Matrix recommendations to ensure that the configuration has been thoroughly evaluated against Dell EMC E-Lab standards.

If compliance breaches exist, ViPR SRM creates a breach report to enable administrators to analyze the issues. A policy breach occurs when an object in the data center violates a user-defined policy.

Figure 34 shows an example of all active breaches in the data center by severity and policy.

![Storage Compliance / Breach Report](image)

**Figure 34. Breach Report: Active breaches by severity and policy**
Figure 35 shows an active breach report for SAN zoning. The report comprises the following sections:

- **Breaches**—Provides information on each breach severity, device name, device type, policy, rules, and breach timeline
- **Breach details**—Shows the cause of the breach and a recommendation that complies with customer and Dell EMC best practices
- **Drill-down into device**—Provides a device summary that assists in further investigation of the compliance issues

![Breaches Table]

![Breach details Diagram]

![Drill-down into device Diagram]

**Figure 35. Report of all active breaches**

As with all reports in ViPR SRM, you can automatically send the breach reports to the relevant management team and administrators.

vRealize Operations Manager facilitates capacity planning for virtual machines that are based on past and current consumption, enabling cloud administrators to calculate and plan more efficiently for current and future virtual machine deployments. In addition, vRealize Operations Manager easily identifies and manages both overutilization and underutilization of virtual machine resources, enabling administrators to remediate or resize virtual machines as appropriate.

**Virtual machine capacity planning**

The capacity planning component of vRealize Operations Manager provides statistics on the current utilization. It can also provide predictive what-if scenarios where infrastructure in the environment might be influenced by an increase or decrease in the number of ESX hosts, storage, or virtual machines on existing or new consumption profiles. When a what-if scenario is implemented, vRealize Operations Manager models can predict the impact and plan for future requirements.
To plan the capacity requirements based on future growth, you can create a what-if scenario that contains a virtual machine profile that based on an existing virtual machine or based on a new one, as shown in Figure 36.

![Figure 36. Specifying a reference virtual machine configuration for capacity planning](image)

As shown in Figure 36, you can tailor the virtual machine profile to specify the allocation of resources in addition to their actual usage and consumption. Adding 50 new virtual machines to the profile, for example, produces revised values for remaining capacity or over-subscription, as shown in Figure 37.

![Figure 37. What-if scenario: Adding new virtual machines](image)

**Virtual machine resource optimization**

In situations where resources are limited, vRealize Operations Manager can identify reclaimable, underutilized resources in idle or oversized virtual machines.

The definitions of underutilized and over utilized virtual machines are based on policy and are customizable to suit specific business requirements. You can create and apply multiple policies as needed.
The **Virtual Machine Reclaimable Capacity** list, as shown in Figure 38, displays information about the compute resources that can be reclaimed from running virtual machines for use by other virtual machines.

![Virtual Machine Reclaimable Capacity list](image)

**Figure 38. Virtual Machine Reclaimable Capacity list**

For system-side warnings and risks that might not have alerts that are configured for them, the **Symptoms** list provides information about active symptoms for a selected object in the vSphere inventory, such as the Enterprise Hybrid Cloud Tenant Workload Pod, as shown in Figure 39.

![Symptoms list](image)

**Figure 39. Symptoms list**

**Running vRealize Operations Manager reports**

Reports in vRealize Operations Manager provide a more formal display of the information contained in the various available views and summaries. Reports are run from a report template within which multiple reports can be included, after which they can be scheduled or run in the context of the object selected in the vSphere inventory.
Chapter 4: Resource Management

When a report runs successfully, you can download it in either PDF or CSV format, along with previously run instances of the same report.

The scope of reporting with vRealize Operations Manager in Enterprise Hybrid Cloud includes the cloud management platform and the cloud resources used by vRealize Automation.
Chapter 5 Metering and Chargeback

This chapter presents the following topic:

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Metering

The hybrid cloud environment requires flexible metering and costing models that can track the use of all resources within the environment. VMware vRealize Business for Cloud is a business management tool in VMware’s cloud management portfolio that provides a simplified management solution for focused cloud infrastructure costing. vRealize Business for Cloud shows the costs of virtual machines and the utilization of shared resources, helping customers to better manage demand and budget for the future.

Figure 40 shows the vRealize Business for Cloud dashboard. The integration with vRealize Automation provides business management and cost transparency capabilities in a virtual infrastructure.

Figure 40. vRealize Business for Cloud overview

vRealize Business for Cloud enables the cloud administrator to:

- Determine the pricing of vRealize Automation blueprints by using the current cost and utilization levels of virtual machines as a reference
- Make decisions related to the placement of workloads based on the cost and services that are available in the hybrid cloud environment
- Provide chargeback costs of virtual machines and blueprints based on the BU and application group in the hybrid cloud environment
- Manage costs based on capital and operating expenditures
- Get an accurate cost of virtual machines
The dashboard shown in Figure 40 supports the unified cloud business management data model. The simplified dashboard includes these main sections:

- **Expenses**—Displays the total projected expense on your private and public cloud accounts for the current month
- **Operations**—Displays the estimated total number of virtual machines from private and public cloud accounts for the current month
- **Consumption**—Displays the projected charge value for the current month

Cloud administrators can obtain more detailed information for each topic as they navigate vRealize Business for Cloud. More detailed reports with breakdowns of machine quota, memory, and storage usage, as well as cost details of vCenter Server and vRealize Automation, are available under **Reports**.

vRealize Business for Cloud is integrated as part of vRealize Automation and is displayed as a tab in the vRealize Automation self-service portal. Enterprise Hybrid Cloud uses VMware vCenter Server as its endpoint, so vRealize Business for Cloud is configured to ingest data from vCenter Servers.

After an administrator enters the credentials for vCenter Server and establishes a connection, vRealize Business for Cloud can monitor the vCenter inventory.

Because vRealize Business for Cloud is integrated with vCenter Server, it can import existing resource hierarchies, folder structures, and vRealize tags to organize hybrid cloud resource usage with BUs, departments, and projects.

vRealize Business for Cloud facilitates both infrastructure operational analysis and consumption analysis.

**Operational analysis**

vRealize Business for Cloud enables the cloud administrator to analyze the costs of the underlying service resources of the hybrid cloud. These resources include CPU, RAM, storage, and operating system (OS) (license and labor).

The operational analysis module of vRealize Business for Cloud accepts the total monthly operating cost in the cloud infrastructure, as modeled by using the cost driver component as input. The module then calculates the base rate for CPU and RAM, expressed in dollars per gigahertz and dollars per gigabytes of CPU and RAM respectively. The derived base rates for CPU, memory, and storage that are configured in the cost driver are used to calculate the total monthly operating cost. Certain costs are directly attributed to the virtual machines, for example, desktop operating system licenses and labor costs are classified under the heading of OS (license and labor).
As shown in Figure 41, this Resources dashboard provides a view of information in terms of the current month cost, trend, and total percentage value of CPU, RAM, storage, OS, and virtual machines running on different generations of servers.

![Figure 41. vRealize Business for Cloud operational analysis of the hybrid cloud environment](image)

This information enables the cloud administrator to optimize workload placements that are based on the generation of hardware (for example, the virtual machines on older servers might cost more than the virtual machines on new servers) and see how costs for CPU and RAM are trending over time.

The cloud administrator can adjust how the cost allocation occurs in the virtual infrastructure. The total loaded cloud cost includes hardware, operating systems, maintenance, network, labor, and facility costs, which are allocated on the virtual infrastructure. To compute the loaded unit cost of CPU and RAM, the administrator can specify the expected CPU value and memory utilization, as shown in Figure 42.

![Figure 42. vRealize Business for Cloud: Specifying expected utilization of CPU and RAM](image)

The utilization levels of clustered and stand-alone hosts are derived from the average monthly usage data from vCenter, enabling the cloud administrator to understand the loaded costs by cluster and to manage unallocated costs that are based on utilization levels.

**Consumption costs analysis**

vRealize Business for Cloud enables you to identify cloud resource consumers easily, the purpose for which resources are being consumed, and the costs associated with running those resources.
Figure 43 shows the Charge dashboard that details costs and use of CPU, RAM, and storage of virtual machines for the current month, categorized based on the application, and the BU (consumer). The data is displayed at the beginning of the month, based on the previous month's averages. It is updated throughout the month as utilization varies. For new virtual machines and vRealize Automation 7.x, vRealize Automation communicates with vRealize Business for Cloud to obtain the upfront price of the machines based on the pricing policies defined in vRealize Business for Cloud.

![vRealize Business for Cloud consumption charges overview for hybrid cloud](image)

Figure 43. vRealize Business for Cloud consumption charges overview for hybrid cloud

vRealize Business for Cloud provides intuitive navigation to detailed information. By clicking Business Units List, as shown in Figure 44, the cloud administrator can view a breakdown of applications and the total cost of virtual machines for each of the applications. This view also provides a visual display of cost and usage of CPU, RAM, and storage for virtual machines, categorized based on the application in that BU.

![vRealize Business for Cloud: Business Units List](image)

Figure 44. vRealize Business for Cloud: Business Units List
By clicking the BU, the administrator can see a detailed breakdown of cost and usage data for each cloud resource of a particular BU, as shown in Figure 45. This display provides a list of virtual machines and usage by CPU, RAM, storage, and costs for each component.

![Figure 45. vRealize Business for Cloud demand analysis: Virtual machine costs](image)

By clicking Business Units Map, as seen in Figure 46, the administrator can view a heat map, which enables the administrator to identify easily whether the BUs are over or under budget or over or under recovery. A number of blocks represent the BU and a tooltip on each block displays the values.

![Figure 46. vRealize Business for Cloud: Business Units Map](image)
Consumption showback analysis

Figure 47 shows the showback statement, which provides administrators with information about BUs and services, the projected monthly charge, and budget values for the environment. The showback statement is also available to tenant controllers.

![Figure 47. vRealize Business for Cloud showback statement](image)

The dashboard displays BUs that have charges. The administrator can click each BU to view charge values that are related to the particular BU. The dashboard also displays monthly budgets, month to date charges, projected monthly charges, charge and budget projections, as well as top business services.

**Reporting**

vRealize Business for Cloud has a powerful reporting engine that provides information about various system objects, such as servers, datastores, and virtual machines, which can be exported in CSV format for further analysis.

vRealize Business for Cloud provides the following reports that contain detailed information for the selected topics:

- **Servers**—Provides details about all servers that run the hybrid cloud and can be expanded to provide details for each cost driver
- **Datastores**—Provides details about each of the datastores seen by each vCenter Server instance that vRealize Business for Cloud is monitoring
- **VMs**—Provides details about all virtual machines running in the environment
- **Clusters**—Provides details about the servers within the clusters of the virtual environment
Chapter 5: Metering and Chargeback

The Servers report, as shown in Figure 48, provides details for all servers hosted in the hybrid cloud, including model name, CPU, and RAM, among other details. The administrator can add more server information by selecting cost drivers such as server hardware, OS licensing, maintenance, physical server labor, network, facilities, and other costs. vRealize Business for Cloud also displays the total loaded costs of servers.

Figure 48. vRealize Business for Cloud Servers report

The VMs report includes details for all virtual machines running in the hybrid cloud. The report can be viewed in a grid or in a vCenter Server folder structure. This report contains all the virtual machine specifications, usage details, and utilization details that contribute to the total price.

The report displays the various cost drivers such as storage cost, compute cost, OS labor, OS licensing, OS maintenance, and direct cost. A total monthly cost is displayed at the end of each row, as shown in Figure 49.

Figure 49. vRealize Business for Cloud VMs report with total monthly cost

The report can be sorted based on consumers, applications, and vCenter tags. As with the other reports, you can export the report into a CSV format to use with other applications.

Cost drivers

The Expenses view enables you to see all the factors that affect the cost of the environment.

Cost drivers are the costs incurred in managing a data center. The vRealize Business for Cloud administrator can manually input the cost drivers. If cost drivers are not input, the values are obtained from the reference database included with vRealize Business for Cloud.
As shown in Figure 50, vRealize Business for Cloud categorizes the cost drivers into the following groups: Hardware, Storage On Demand, Licensing, Maintenance, Labor, Network, Facilities, and Additional Costs. Except for the hardware cost, the cost driver data is the monthly cost.

![Figure 50. vRealize Business for Cloud cloud cost overview](image)

The configuration that is used for cost drivers determines how vRealize Business for Cloud calculates and displays the cost. You can manually edit the monthly cost of all the cost drivers, as indicated in Figure 51, from the current month onward.

![Figure 51. vRealize Business for Cloud cost: Editing monthly costs of server hardware](image)
Chapter 5: Metering and Chargeback

Cost profiles

vRealize Business for Cloud uses the reference database, which is preloaded with vendor-specific data and data that is based on industry standards to generate the default base price for CPU, RAM, and storage. vRealize Automation automatically uses these default prices, eliminating the need to configure cost profiles manually in vRealize Automation and to assign them to compute resources.

Through its integration with vCenter and vRealize Automation, vRealize Business for Cloud enables the cloud administrator to automatically monitor the utilization of storage resources provided by ViPR. You can create storage policies and tags in vCenter Server, based on the storage capabilities of each type of storage presented.

vRealize Business for Cloud discovers these storage categories and tags that were created in vCenter, and can display datastores that are based on those categories. You can also edit the Monthly Cost per GB, as shown in Figure 52. The vRealize Business for Cloud administrator can then group tiered datastores that are provisioned with ViPR and set the monthly cost per gigabyte as needed.

![Figure 52. vRealize Business for Cloud chargeback based on storage category and datastore tag](image)

If the predefined price points are not appropriate, the vRealize Business for Cloud administrator can:

- Select **Set Default prices**, where price is the cost for CPU, RAM, and storage.
- Manually set the prices for each of the clusters and stand-alone hosts.
- Manually set the price for each of the datastores.
This chapter presents the following topic:

Summary ........................................................................................................... 54
Summary

Enterprise Hybrid Cloud is the bridge between the applications of today (Platform 2) and the social, mobile, analytics, and cloud applications of the future (Platform 3). It empowers IT to be a broker of cloud services, providing the control and visibility that IT organizations need and the on-demand self-service that developers and application users expect.

Enterprise Hybrid Cloud users can easily provision standardized services directly from an application marketplace portal, with upfront pricing. Delivery of these resources from private and public clouds, whatever the workload calls for, is built on policies set by IT, which ensures application workloads are placed in the right cloud, with the right cost, security, and performance.