Abstract

This solution guide describes how to use Enterprise Hybrid Cloud 4.1.1 to provision and manage new and existing Microsoft Exchange Server, Microsoft SQL Server, and Microsoft SharePoint Server applications for on-premises or hosted cloud services.

H15771R

This document is not intended for audiences in China, Hong Kong, and Taiwan.
Copyright

The information in this publication is provided as is. Dell Inc. makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose.

Use, copying, and distribution of any software described in this publication requires an applicable software license.

Copyright © 2017 Dell Inc. or its subsidiaries. All Rights Reserved. Dell, EMC, and other trademarks are trademarks of Dell Inc. or its subsidiaries. Other trademarks may be the property of their respective owners. Published in the USA March 2017 Solution Guide H15771R.

Dell Inc. believes the information in this document is accurate as of its publication date. The information is subject to change without notice.
Chapter 1  Executive Summary ................................................................. 5
Business challenge .................................................................................. 6
Solution overview .................................................................................. 6
Key benefits ............................................................................................ 7
Document purpose .................................................................................. 7
Audience .................................................................................................. 7
Essential reading ..................................................................................... 8
Terminology ............................................................................................. 8
We value your feedback! .......................................................................... 9

Chapter 2  Solution Architecture ............................................................... 10
Overview ................................................................................................ 11
Key components ..................................................................................... 13
Software resources ................................................................................ 14

Chapter 3  Provisioning Microsoft Applications ...................................... 15
Overview ................................................................................................ 16
Preparing application deployment .......................................................... 17
Provisioning Exchange Server ................................................................ 17
Provisioning SQL Server ......................................................................... 20
Provisioning SharePoint Server ............................................................... 22

Chapter 4  Microsoft Applications Day 2 Operations ............................... 24
Overview ................................................................................................ 25
Exchange as a service ............................................................................ 25
SharePoint as a service .......................................................................... 26
Database as a service ............................................................................. 28

Chapter 5  Monitoring Microsoft Applications ......................................... 48
Overview ................................................................................................ 49
Storage capacity monitoring ................................................................. 49
vRealize Hyperic .................................................................................... 50
vRealize Operations Manager ................................................................. 52
Exchange Server monitoring ................................................................. 54
SQL Server monitoring .......................................................................... 57
SharePoint Server monitoring ............................................................... 59
Chapter 6  Conclusion  62
Summary ..................................................................................63
Benefits ..................................................................................63

Chapter 7  References  65
Dell EMC documentation ..........................................................66
VMware documentation ............................................................66
Microsoft documentation .........................................................66
Chapter 1: Executive Summary

This chapter presents the following topics:

- Business challenge
- Solution overview
- Key benefits
- Document purpose
- Audience
- Essential reading
- Terminology
- We value your feedback!
Business challenge

While many organizations have successfully introduced virtualization as a core technology within their data center, end users and business units within the organizations have not experienced many of the benefits of cloud computing, 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

To meet these challenges, public cloud providers 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. As a result, IT departments must create cost-effective alternatives to public cloud services—alternatives that do not compromise enterprise features such as data protection, disaster recovery, and guaranteed service levels.

Deciding where to deploy Microsoft applications such as Microsoft Exchange Server, Microsoft SQL Server, and Microsoft SharePoint Server can involve trade-offs. Traditional on-premises infrastructure gives IT teams more control, but provisioning can take weeks. Public clouds speed up provisioning, but they do not necessarily meet business requirements for data protection, disaster recovery, security, and guaranteed service levels. Enterprise Hybrid Cloud 4.1.1 provides on-premises or hosted cloud services to meet these business requirements.

Solution overview

Enterprise Hybrid Cloud integrates the best of Dell EMC and VMware products and services to deliver a fully integrated, enterprise-ready solution across all three data center pillars—compute, storage, and network. Enterprise Hybrid Cloud empowers IT organizations to accelerate the implementation and adoption of a hybrid cloud while still enabling customer choice for the compute and networking infrastructures within the data center. It caters to customers who want to preserve their investment and make better use of their existing infrastructure and to customers who want to build new infrastructures that are dedicated to a hybrid cloud.

Developed by Dell EMC and VMware product and services teams, Enterprise Hybrid Cloud takes advantage of the strong integration between Dell EMC technologies and the VMware vRealize Suite. Enterprise Hybrid Cloud includes Dell EMC scalable storage arrays and integrated Dell EMC and VMware monitoring and data protection to provide the foundation for cloud services within customer environments.

The Microsoft modular add-on to Enterprise Hybrid Cloud uses VMware vRealize Automation and VMware vRealize Orchestrator to enable automated deployment,
management, and protection of Exchange Server, SQL Server, and SharePoint Server applications, and to enable application monitoring with VMware vRealize Hyperic during the application lifecycle.

**Key benefits**

Enterprise Hybrid Cloud for Microsoft Applications provides a reference architecture that integrates all the key components and functionality necessary for deploying, managing, and protecting Microsoft applications in a hybrid cloud. It enables customers to use Enterprise Hybrid Cloud 4.1.1 for:

- On-demand, self-service provisioning of Microsoft enterprise applications such as Exchange Server, SQL Server, and SharePoint Server
- Complete management of the application service lifecycle
- Provisioning, monitoring, protection, and management of the infrastructure services by line-of-business end 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, and disaster recovery services as part of the cloud service provisioning process
- Database as a service (DBaaS), with rapid, on-demand, self-service provisioning of SQL Server instances and databases on SQL Server virtual machines, post deployment

**Document purpose**

This solution guide introduces the architecture, features, and functionality of the Enterprise Hybrid Cloud for Microsoft Applications solution and demonstrates the use cases that it enables. Data protection for Microsoft applications within Enterprise Hybrid Cloud is described in a separate solution guide.

**Audience**

This guide is intended for customers, partners, and Dell EMC personnel who plan to deploy Enterprise Hybrid Cloud for Microsoft Applications. Users should have the necessary training and background to install and configure Enterprise Hybrid Cloud, Exchange Server (2013 and 2016), SQL Server (2012, 2014, and 2016), SharePoint Server (2013 and 2016), and the associated infrastructure. Users should also be familiar with the infrastructure and security policies of the particular customer installation.
Essential reading

The following documents describe the architecture, components, features, and functionality of Enterprise Hybrid Cloud 4.1.1:

- Enterprise Hybrid Cloud 4.1.1 Reference Architecture Guide
- Enterprise Hybrid Cloud 4.1.1 Concepts and Architecture Guide
- Enterprise Hybrid Cloud 4.1.1 Infrastructure and Operations Guide
- Enterprise Hybrid Cloud 4.1.1 Administration Guide
- Enterprise Hybrid Cloud 4.1.1 Security Management Guide

This guide provides external references where applicable. It is recommended that users implementing Enterprise Hybrid Cloud be familiar with these documents. For details, refer to Chapter 7.

Terminology

Table 1 provides definitions for some of the terms that are used in this guide.

Table 1. Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always On Availability Groups</td>
<td>SQL Server feature that supports a failover environment for a discrete set of user databases that fail over as a unit. In Always On Availability Groups, an availability group consists of one primary replica and one or more corresponding secondary replicas.</td>
</tr>
<tr>
<td>Application blueprint</td>
<td>Logical topology of an application for deployment in a virtual cloud. An application blueprint captures the structure of an application with logical nodes, their corresponding services and operating systems, dependencies, default configurations, and network and storage topology requirements. The blueprint is published as a catalog item in the vRealize Automation service catalog.</td>
</tr>
<tr>
<td>Availability database</td>
<td>In Always On Availability Groups, a database that belongs to an availability group. For each availability database, the availability group maintains a single read/write copy (primary database) and one to eight read-only copies (secondary databases).</td>
</tr>
<tr>
<td>Availability group</td>
<td>In Always On Availability Groups, a container for a set of databases (availability databases) that fail over together.</td>
</tr>
<tr>
<td>Availability replica</td>
<td>In Always On Availability Groups, an instance of an availability group that is hosted by a specific SQL Server and contains a copy of each availability database in the availability group.</td>
</tr>
<tr>
<td>Business group</td>
<td>A managed object that associates users with a specific set of catalog services and infrastructure resources.</td>
</tr>
<tr>
<td>Database availability group (DAG)</td>
<td>A set of up to 16 highly available Exchange Server Mailbox servers that host a set of databases and provide automatic database-level recovery from failures that affect individual servers or databases.</td>
</tr>
</tbody>
</table>
## Chapter 1: Executive Summary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High availability (HA)</td>
<td>A mechanism that enables a system or infrastructure to continue providing services in the event of isolated component or resource failures.</td>
</tr>
<tr>
<td>Infrastructure as a service (IaaS)</td>
<td>A standard set of automated resources that include compute, storage, and networking capabilities provided through a hosting company or service provider.</td>
</tr>
<tr>
<td>IT as a service (ITaaS)</td>
<td>Enterprise IT that acts and operates as a competitive service provider for an organization that has many provider options for IT services, including outsourcing companies and public cloud providers.</td>
</tr>
<tr>
<td>Key performance indicator (KPI)</td>
<td>A quantifiable measure that compares performance criteria, including strategic and operational goals of an organization.</td>
</tr>
<tr>
<td>Pod</td>
<td>A collection of virtual machines that has a specific function within Enterprise Hybrid Cloud.</td>
</tr>
<tr>
<td>vRealize Automation software components</td>
<td>Software script block that can be used to install application on a virtual machine and reused in multiple applications.</td>
</tr>
<tr>
<td>Web front-end (WFE)</td>
<td>A web server that handles web page requests from users and provides a Web-based user interface for a back-end service such as a database. A SharePoint farm can use multiple web front-end servers (WFE) and a Network Load Balancer (NLB) to distribute requests for scalability and redundancy.</td>
</tr>
</tbody>
</table>

---

### 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](mailto:EMC.Solution.Feedback@emc.com) with your comments.

**Authors:** Wensheng Liu, Yunlong Zhang, Lieven Lin, Mark Qin Xu, Winfred Weng, Cheryl Tao, Dave Simmons, Fiona O’Neill
This chapter presents the following topics:

**Overview** .................................................................................................................. 11

**Key components** ........................................................................................................ 13

**Software resources** ..................................................................................................... 14
Overview

Enterprise Hybrid Cloud for Microsoft Applications provides the following application-specific functionality, in addition to the core Enterprise Hybrid Cloud functionality:

- Automated deployment of Microsoft applications
- Microsoft applications Day 2 operations
- Application monitoring during the application lifecycle

Figure 1 shows the full management stack of Enterprise Hybrid Cloud with key components outlined. Enterprise Hybrid Cloud for Microsoft Applications adds vRealize Hyperic, a component of vRealize Operations Manager, to monitor metrics that are specifically related to Exchange Server, SQL Server, and SharePoint Server.

![Enterprise Hybrid Cloud reference architecture](image)

The management, network, and tenant resources for the solution are divided into several pods, as shown in Figure 1, with each pod performing a specific function:

- **Core Pod**
  
The Core Pod hosts a core set of resources that must exist in the data center before the remainder of the cloud can be deployed. These core resources include VMware vCenter Server, Microsoft SQL Server 2012, and VMware NSX Manager.
Chapter 2: Solution Architecture

The Core Pod also contains Log Insight forwarders and vRealize Operations Manager collectors to localize and optimize the collection of logs and network usage.

- **Automation Pod**
  The Automation Pod hosts the virtual machines that automate and manage the cloud infrastructure that supports the workloads that the cloud tenants consume. The Automation Pod supports the components responsible for functions such as the user portal and automated provisioning, monitoring, metering, and reporting.

- **NEI Pod**
  The NEI Pod hosts the VMware NSX Edge appliances and VMware NSX Controller nodes and becomes the convergence point at which the physical and virtual networks connect.

- **Workload Pods**
  The Workload Pods are configured and assigned in vRealize Automation as shared resources, to host application virtual machines that are deployed by the different business groups in the hybrid cloud environment. These Workload Pods are deployed as VMware vSphere clusters in VMware vCenter endpoints.

Dell EMC provides various options for back-end storage in Enterprise Hybrid Cloud environments, including EMC™ VMAX™, EMC VNX™, EMC Isilon™, EMC XtremIO™ all-flash arrays, and EMC ScaleIO™ software-defined storage.

Dell EMC also provides various data protection options. For example, the EMC Avamar™ software and hardware solution provides fast, efficient backup and recovery. The EMC Data Domain™ system continues to revolutionize disk backup, archiving, and disaster recovery with high-speed, inline deduplication, and the EMC VPLEX™ system provides continuous availability and application mobility over distance.

**VMware vRealize Automation**

vRealize Automation automates application provisioning in Enterprise Hybrid Cloud, which includes deploying, configuring, and updating the software components and anything as a service (XaaS). vRealize Automation simplifies complex deployments of both custom and packaged applications and replaces vRealize Application Services from Enterprise Hybrid Cloud 4.1.

vRealize Automation enables you to construct application blueprints for rapid deployment of Microsoft applications on Enterprise Hybrid Cloud. vRealize Automation Blueprint Designer creates these application blueprints and publishes them to the vRealize Automation service catalog, from which users can request them for provisioning. The published blueprint contains virtual machine deployment information, as well as software components that include scripts for deploying application services to virtual machines.

Application blueprints with virtual machine templates can apply to single systems or multiple systems, covering both bare-metal server deployments and virtual machine deployments. With predefined blueprints, you can easily deploy multitier enterprise applications that require multiple application, database, and web components, and related services.
vRealize Hyperic is a component of the VMware vRealize Operations Management Suite. It monitors operating systems, applications, and services running in physical, virtual, and cloud environments. vRealize Hyperic offers the unique ability to automatically discover, inventory, and monitor servers, regardless of server type or location, and enables application operations teams to ensure that business-critical applications that are run without fail.

The integration of vRealize Hyperic with vRealize Operations Manager provides a single user interface (UI) for monitoring a wide range of metrics relating to the availability and use of Microsoft applications. The Management Pack for vRealize Hyperic provides metrics reports specific to Microsoft applications in vRealize Operations Manager.

Key components

Enterprise Hybrid Cloud for Microsoft Applications uses the following components:

**Note:** For an overview of these components, refer to the *Enterprise Hybrid Cloud 4.1.1 Reference Architecture Guide.*

- VMware vSphere ESXi and VMware vCenter Server
- VMware vRealize Suite including:
  - VMware vRealize Automation
  - VMware vRealize Orchestrator
  - VMware vRealize Operations Manager
  - VMware vRealize Business for Cloud
  - VMware vRealize Log Insight
- VMware NSX for vSphere
- VMware vCenter Site Recovery Manager
- EMC ViPR Controller software-defined storage
- EMC VNX, VMAX, ScaleIO, VPLEX, Isilon, and XtremIO storage platforms
- EMC RecoverPoint for Virtual Machines (DR customers only)
- EMC RecoverPoint (DR customers only)
- EMC Avamar and Data Domain data protection platforms
- EMC ViPR SRM and Data Protection Advisor

Data protection for Microsoft applications is discussed in a separate document.

Figure 2 shows the key components of Enterprise Hybrid Cloud for Microsoft Applications (Dell EMC products are shown in blue and VMware products are shown in green), with Exchange Server, SQL Server, and SharePoint Server deployed on the IT-as-a-service platform.
Software resources

Table 2 lists the application software components and supporting services specific to Enterprise Hybrid Cloud for Microsoft Applications. For a complete list of Enterprise Hybrid Cloud 4.1.1 software requirements, refer to the Enterprise Hybrid Cloud EMC E-Lab Simple Support Matrix.

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows Server</td>
<td>2012 and 2012 R2</td>
<td>Supported operating systems</td>
</tr>
<tr>
<td>Microsoft Exchange Server</td>
<td>2013 and 2016</td>
<td>Supported versions of Exchange Server</td>
</tr>
<tr>
<td>Microsoft SharePoint Server</td>
<td>2013 and 2016</td>
<td>Supported versions of SharePoint Server</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>2012, 2014, and 2016</td>
<td>Supported versions of SQL Server</td>
</tr>
<tr>
<td>VMware vRealize Hyperic</td>
<td>5.8.6</td>
<td>A component of vRealize Operations that is used in Enterprise Hybrid Cloud for Microsoft Applications</td>
</tr>
</tbody>
</table>
This chapter presents the following topics:

**Overview** .............................................................................................................................................. 16
**Preparing application deployment** ......................................................................................................... 17
**Provisioning Exchange Server** .............................................................................................................. 17
**Provisioning SQL Server** ....................................................................................................................... 20
**Provisioning SharePoint Server** ............................................................................................................. 22
Overview

Enterprise Hybrid Cloud provides a foundation for successful and consistent deployments of Microsoft applications. Enterprise Hybrid Cloud provides features for users to easily and efficiently deploy Microsoft applications. The following Microsoft applications provisioning services are delivered with fully automated installation and configuration:

- Exchange Server provisioning
- SQL Server provisioning
- SharePoint Server provisioning

Microsoft application service facilitates the automated deployment of SQL Server, SharePoint Server, and Exchange Server across any business group in an organization, whether the business group is a highly used production environment or a test and development unit.

As shown in Figure 3, through the Enterprise Hybrid Cloud self-service portal, users can choose one of the Microsoft application catalogs and request a specific application service. Then the requested Microsoft application can be provisioned easily with a few mouse clicks.

![Microsoft application services in the vRealize Automation Service Catalog](image)
Preparing application deployment

Before deploying Microsoft applications from the Enterprise Hybrid Cloud self-service portal, the following prerequisites must be met:

- The Active Directory infrastructure with Domain Naming Services (DNS) must exist before Microsoft applications can be installed.
- The Active Directory account that is used to perform the Microsoft applications installation must be created and granted with necessary permissions. Refer to the Microsoft documentation for detailed information for each application.

Provisioning Exchange Server

The following features are available for provisioning Exchange Server in Enterprise Hybrid Cloud:

- A stand-alone Exchange Server virtual machine is deployed with preconfigured CPU, memory, and storage resources for a specified number of users.
- An Exchange Server is deployed in a high-availability configuration as part of an Exchange database availability group (DAG), with preconfigured CPU, memory, and storage resources for a specified number of users. This option deploys two servers in a DAG with two database copies.
- A new Exchange Server is deployed to an existing DAG, with preconfigured CPU, memory, and storage resources.

Enterprise Hybrid Cloud supports the following Exchange Server deployments:

- Exchange Server 2016 Standard and Enterprise Editions on Windows Server 2012 R2

Figure 4 shows an example of a vRealize Automation service catalog that includes various items for deploying Exchange Server.
Figure 4. Service Catalog window for Exchange

Figure 5 shows a New Request form that has been requested from the service catalog. In this example, the user has the option to modify the compute resources and the Exchange Server virtual machine hostname under the vSphere machine.

Figure 5. Standalone Exchange server request form
After the user submits the request, the deployment begins. The requester can view the detailed execution information status of the request by clicking the request number on the Requests tab in vRealize Automation.

The automated Exchange Server provisioning process includes the following steps (using Exchange DAG provisioning as an example):

1. Collect request inputs
   The service collects inputs from the user, including:
   - Virtual machine properties such as vCPUs, memory, hostname, and so on
   - Active Directory properties such as domain name, DNS IP address, and so on
   - Exchange properties such as Exchange organization name, DAG name, and IP address

2. Provision the virtual machine
   A virtual machine is cloned from the blueprint template and host information is customized according to user inputs.

3. Join the domain for the virtual machine
   Add the Windows virtual machine into the domain based on the preconfigured values of the DNS IP address and the domain.

4. Enable remote PowerShell for Windows Server
   Enable the remote PowerShell feature on the Windows virtual machine for Day 2 on-demand operations.

5. Install Exchange Server software
   Install Exchange Server on virtual machines based on the preconfigured values of the Exchange organization name and other information.

6. Set up Exchange DAG
   Set up Exchange DAG based on the preconfigured value of the DAG.
Provisioning SQL Server

The following features are available for provisioning SQL Server in Enterprise Hybrid Cloud:

- A stand-alone SQL Server instance is deployed, with preconfigured CPU, memory, and storage resources for a specified number of users.
- A SQL Server instance is deployed in a high-availability configuration as part of an Always On Availability Group, with preconfigured CPU, memory, and storage resources for a specified number of users.

This solution supports the following SQL Server deployments:

- SQL Server 2012 Enterprise, Standard, and Express Editions on Windows Server 2012 and 2012 R2
- SQL Server 2014 Enterprise, Standard, and Express Editions on Windows Server 2012 and 2012 R2
- SQL Server 2016 Enterprise, Standard, and Express Editions on Windows Server 2012 R2

Figure 6 shows an example of a vRealize Automation service catalog that includes various items for deploying SQL Server.

![Figure 6. Viewing service catalog items for SQL Server](image-url)
During SQL Server application provisioning, the following SQL Server feature options are available:

- Deploy the SQL Server database engine only
- Deploy the SQL Server database engine with SQL Server Reporting Services (SSRS)
- Deploy the SQL Server database engine with SQL Server Integration Services (SSIS)

Figure 7 shows the SQL Server feature options in the SQL Server deployment wizard in vRealize Automation.

![SQL Server features option](image)

**Figure 7. SQL Server features option**

The SQL Server provisioning process includes the following steps (using SQL Server Always On Availability Group provisioning as an example):

1. **Collect request inputs**
   The service collects inputs from the user, including:
   - Virtual machine properties such as vCPUs, memory, hostname, and so on
   - Active Directory properties such as domain name, DNS IP address, and so on
   - Windows cluster properties such as cluster name, cluster IP address, and so on
   - SQL Server properties such as instance name, database name, and so on

2. **Provision the virtual machine**
   Two virtual machines are cloned from the virtual machine template and host information is customized according to user inputs.
3. Join the domain for the virtual machine
   Add a Windows virtual machine into the domain based on the preconfigured values of the DNS IP address and the domain.

4. Enable remote PowerShell for Windows Server
   Enable the remote PowerShell feature on the Windows virtual machine for Day 2 on-demand operations.

5. Configure Windows Failover Cluster
   Create a Windows Failover Cluster with the name and IP address defined by users.

6. Install SQL Server software
   Install SQL Server software on the two virtual machines based on the preconfigured SQL Server property values.

7. Configure Always On Availability Group
   Create and configure the SQL Server Always On Availability Group, and then create and add a database to the Always On Availability Group.

Provisioning SharePoint Server

The following features are currently available for provisioning SharePoint Server in Enterprise Hybrid Cloud:

- A single server SharePoint 2013 farm is deployed, with preconfigured CPU, memory, and storage resources for a specified number of users.
- A SharePoint 2016 farm is deployed that consists of one Front-End (FE) server and one SQL Server instance, with preconfigured CPU, memory, and storage resources for a specified number of users.
- An additional SharePoint 2013 or 2016 Front-End server is deployed to an existing SharePoint 2013 or 2016 intranet farm that consists of multiple VMs.

Note: Adding a front-end to a single server farm is not supported in SharePoint 2013.

Enterprise Hybrid Cloud supports the following SharePoint deployments:

- SharePoint Server 2013 on Windows Server 2012 and 2012 R2
- SharePoint Server 2016 on Windows Server 2012 R2

Figure 8 shows an example of a vRealize Automation service catalog that includes various items for deploying SharePoint Server.
Chapter 3: Provisioning Microsoft Applications

Service Catalog

Browse the catalog for services you need.

Figure 8. Viewing service catalog items for SharePoint Server

The SharePoint Server provisioning process includes the following steps (using SharePoint 2016 normal farm provisioning as an example):

1. **Collect request inputs**
   The service collects inputs from the user, including:
   - Virtual machine properties such as vCPUs, memory, hostname, and so on
   - Active Directory properties such as domain name, DNS IP address, and so on
   - SharePoint properties such as farm credentials, web application name, site name, and so on

2. **Provision the virtual machine**
   Two virtual machines are cloned from a virtual machine template and host information is customized according to user inputs.

3. **Join the domain for the virtual machine**
   Add a Windows virtual machine into the domain based on the preconfigured values of the DNS IP address and domain.

4. **Enable remote PowerShell for Windows Server**
   Enable the remote PowerShell feature on the Windows virtual machine for Day 2 on-demand operations.

5. **Install SharePoint Server 2016 normal farm**
   Install SharePoint Server on one virtual machine as a backend, and then install a Front-End server.
This chapter presents the following topics:

- **Overview** .................................................................25
- **Exchange as a service** ..................................................25
- **SharePoint as a service** ...............................................26
- **Database as a service** ..................................................28
Overview

After the Microsoft applications service has been provisioned, users can perform on-demand requests to the virtual machine of the different applications, such as adding a new database for SQL Server, adding a new SharePoint site, and adding an Exchange mailbox database. These requests are called Day 2 operations.

vRealize Orchestrator provides Microsoft applications Day 2 operations as workflows. These Day 2 operations workflows can be categorized into two types:

- **Resource actions**—Extend the functionality of the standard machine actions to deliver complex automated processes against the deployed virtual machine.

- **XaaS blueprints**—Provide additional automated tasks between virtual machines.

Exchange as a service

The Exchange Day 2 operation includes the following resource action: Adding a mailbox database to an Exchange Server instance.

Users can add Exchange mailbox databases to an existing server through the self-service portal. If the server belongs to a DAG environment, the new database is added to all the server nodes in the DAG. If it is a stand-alone server, the database is added to that server only.

Adding a mailbox database to an Exchange Server instance involves following steps:

1. Creating a new mailbox database on the Exchange Server instance
2. If this is an Exchange DAG, adding the database to other nodes
3. Mounting the new mailbox database

The user types the Exchange administrator credentials and provides a new database name through the wizard, as shown in Figure 9.

Figure 9. Adding a new mailbox database to an Exchange Server instance
SharePoint as a service

The SharePoint Day 2 operation includes the following resource actions:

- Adding a content database
- Adding a site to an existing site collection

Adding content databases

Users can add a SharePoint content database into a previously provisioned SharePoint database server by selecting the server in the vRealize Automation portal and then selecting Add New SharePoint Content DB, as shown in Figure 10.

Figure 10. Adding a new SharePoint content database into an existing SharePoint server

After initiating the request, the requester is prompted for a description and a reason for the deployment and the SharePoint administrator credentials. The requester then selects an existing web application URL and specifies the name for the new database, as shown in Figure 11.

Figure 11. SharePoint content database properties
Adding a SharePoint site

Similar to adding a content database, users can also add a SharePoint site into a previously provisioned site collection by selecting the site collection in the vRealize Automation portal and then selecting the **Add New SharePoint Site** action, as shown in Figure 12.

![Figure 12. Adding a new SharePoint site into an existing site collection](image)

After initiating the request, the requester is prompted for a description and a reason for the deployment, and the SharePoint administrator credentials. The requester then selects the URL for the existing web application and specifies the name for the site, as shown in Figure 13.

![Figure 13. Specifying SharePoint site details](image)
Database as a service

Database as a service (DBaaS) for SQL Server enables rapid, on-demand provisioning of SQL Server instances and databases on virtual machines that are deployed on Enterprise Hybrid Cloud. Users perform these operations from the vRealize Automation portal, which provides a centralized location to manage instances and databases for individual business groups. Users can migrate databases into Enterprise Hybrid Cloud from other environments or between SQL Server virtual machines in Enterprise Hybrid Cloud environments, and can also upgrade SQL Server databases.

The DBaaS functionality also automates deployment of the SQL Server Always On Availability Groups feature, which is used for high availability and disaster recovery. Databases can be added to or removed from existing availability groups through the self-service portal.

Enterprise Hybrid Cloud platform supports the following features for DBaaS through the vRealize Automation portal:

- SQL Server patching
- SQL Server instance migration
- SQL Server instance upgrade (upgrading the existing instance to a newer version on another SQL Server virtual machine)

DBaaS offers automated provisioning and administration of SQL Server databases and instances. To protect against overprovisioning when multiple groups share a central pool of resources, approval policies can be associated with provisioning requests so that the requests do not progress until designated infrastructure administrators have approved them. In this way, infrastructure administrators retain control of the resources.

Figure 14 shows the relationship between virtual machines, SQL Server instances, and SQL Server user databases.

![Diagram showing SQL Server virtual machines, instances, and user databases](image)

Figure 14. SQL Server virtual machines, instances, and user databases

Users can perform the following DBaaS tasks on Enterprise Hybrid Cloud after a SQL Server virtual machine has been provisioned:

- Creating a SQL Server database or instance
- Deleting a SQL Server database or instance
Chapter 4: Microsoft Applications Day 2 Operations

- Adding a database to, or removing a database from, an Always On Availability Group
- Upgrading a SQL Server database or instance from one SQL Server virtual machine to another
- Installing a service pack or a cumulative update for a SQL Server virtual machine
- Migrating a database or instance from a SQL Server physical or virtual machine that Enterprise Hybrid Cloud does not manage

**Note:** Dell EMC recommends performing full tests for each DBaaS feature before applying it to the production environment.

Creating SQL Server user databases

Users can provision SQL Server user databases on the default SQL Server instance that was created during the initial deployment of a SQL Server virtual machine or on any instance that is created during the lifecycle of the virtual machine.

To create one or more SQL Server databases from vRealize Automation:

1. Under **Machines**, select a SQL Server virtual machine and then select **Create SQL Server Database** from the **Actions** menu.
2. Under **Request Information**, specify a description and a reason for the request.
3. Under **SQL Server Information**, specify a username and password. The user credentials must have login privileges on the SQL Server virtual machine.
4. Under **Create SQL Server Database**, from the **Instance Name** list, select the instance on which you want to create the new databases. The list includes all existing SQL Server instances to which the requester has login rights on the selected virtual machine, as shown in Figure 15.

![Figure 15. Selecting a SQL Server instance](image)

5. Type a name for the database and click the + (plus) icon, as shown in Figure 16.
Creating SQL Server instances

Users can provision new SQL Server instances on a virtual machine after the machine is deployed. They can also provision multiple instances with a single request. This functionality significantly accelerates the provisioning process.

**Note:** To create a SQL Server instance, the requester must know the location of the SQL Server installation binaries. This property is used to identify the SQL Server version of the new instance.

To create one or more SQL Server instances from vRealize Automation:

1. Under **Machines**, select a SQL Server virtual machine and then select **Create SQL Server Instance** from the **Actions** menu.
2. Under **Request Information**, specify a description and a reason for the request.
3. Under **SQL Server Information**, specify a username and password. The user credentials must have login privileges on the SQL Server virtual machine.
4. The **Instances** list on the **Create SQL Server Instance** tab lists all existing SQL Server instances to which the requester has login rights, and includes the name and SQL Server version of each instance. To create an instance:
   a. Type the name of the instance and click the + (Add) icon, as shown in Figure 17. Repeat this action to create additional new instances.
   b. Specify the location of the SQL Server binaries.

---

**Figure 17. Creating a SQL Server instance**

---

**Figure 16. Creating a SQL Server database**

6. Click **Submit** to complete the request.
5. Click **Submit** to complete the request.

**Deleting SQL Server user databases**

Users can delete SQL Server user databases that are deployed on Enterprise Hybrid Cloud by using the self-service portal. Make a full backup copy of a database before you delete it.

To delete a SQL Server database:

1. Under **Machines**, select the relevant SQL Server virtual machine and select **Delete SQL Server Database** from the **Actions** menu.
2. Under **Request Information**, specify a description and a reason for the request.
3. Under **SQL Server Information**, specify a username and password. The user credentials must have login privileges on the selected SQL Server virtual machine.
4. Under **Delete SQL Server Database**, from the **Instance Name** list, select the instance from which you want to delete the database. The list includes all existing SQL Server instances to which the requester has login rights on the selected virtual machine, as shown in Figure 18.

![Figure 18. Selecting a SQL Server instance to delete](image)

5. After you select an instance, the **Database** field lists all the existing user databases on the instance, as shown in Figure 19.

![Figure 19. Selecting a database for deletion](image)

6. Select the database that you want to delete.

7. Under **Summary**, review the details of the request to confirm that you are deleting the correct database, and then click **Submit**.
Deleting SQL Server instances

Users can delete SQL Server instances that are deployed on Enterprise Hybrid Cloud by using the self-service portal. It is recommended that, before deleting an instance, the user makes a full backup copy of any databases on the instance and creates scripts to capture any logins, jobs, or other important objects.

**Note:** To delete a SQL Server instance, the requester must know the location of the SQL Server installation binaries that correspond to the version of SQL Server that the instance is running—for example, SQL Server 2016 Enterprise Edition.

To delete a SQL Server instance:

1. Under **Machines**, select the relevant SQL Server virtual machine and then select **Delete SQL Server Instance** from the **Actions** menu.
2. Under **Request Information**, specify a description and a reason for the request.
3. Under **SQL Server Information**, specify a username and password.
   The user credentials must have login privileges on the selected SQL Server virtual machine.
4. Under **Delete SQL Server Database**, from the **Instance Name** list, select the instance that you want to delete, as shown in Figure 20. The list includes all existing SQL Server instances to which the requester has login rights on the selected virtual machine.
5. In the **Setup.exe** field, type the location of the SQL Server binary files, as shown in Figure 21. In this solution, the binary files are stored on a network share.
6. Under **Summary**, review the details of the request to confirm that you are deleting the correct instance, as shown in Figure 22, and then click **Submit**.
Managing SQL Server Always On Availability Groups

This solution supports the automated provisioning of Always On Availability Groups through the self-service portal. With the platform’s DBaaS functionality, users can add databases to and remove databases from Always On Availability Groups. This functionality greatly simplifies and accelerates these database operations, providing greater protection for SQL Server databases deployed within business groups.

Adding a database to an Always On Availability Group

To add a database to an Always On Availability Group:

1. Under Machines, select the primary node of the availability group and select Add Database to SQL Server Always On Availability Group from the Actions menu.
2. Under Request Information, specify a description and reason for the request.
3. Under SQL Server Information, specify a username and password.
   The user credentials must have login privileges on the SQL Server virtual machine.
4. Under Add Database to SQL Server Always On Availability Group, as shown in Figure 23:
   a. Specify the Backup Location for the SQL Server database. This location is a network share to which the database is backed up when it is added to the selected availability group.
   b. Specify the Restore Location for the availability group. This location is a local disk file location to which the database is restored to the secondary node when it is added to the selected availability group.
   c. From the Instance Name list, select the relevant SQL Server instance.
   d. From the Availability Group list, select the availability group to which you want to add the database. The list includes all the availability groups on the selected instance.
   e. From the Database list, select the database to add to the availability group. The list includes all existing databases to which the requester has login rights on the selected instance.

Figure 22. Summary for deleting a SQL Server instance
Figure 23. Adding an existing database to a SQL Server availability group

6. Click Submit.

Removing a database from an Always On Availability Group

To remove a database from an Always On Availability Group:

1. Under Machines, select the primary node of the availability group and select Remove Database from SQL Server Always On Availability Group from the Actions menu.

2. Specify a description and reason for the request and a username and password.

3. Under Remove Database from SQL Server Always On Availability Group, as shown in Figure 24:

   a. From the Instance Name list, select the relevant SQL Server instance. The list includes all existing SQL Server instances to which the requester has login rights on the selected virtual machine.

   b. From the Availability Group list, select the availability group from which you want to remove the database. The list includes all the availability groups to which the requester has login rights on the selected instance.

   c. From the Database list, select the database to remove from the availability group.

Figure 24. Removing a database from an availability group

4. On Summary, review the details of the request to confirm that you are removing the correct database. The details include the state of the secondary replicas when the request completes, as shown in Figure 25.
Figure 25. Summary for removing a database from an availability group

5. Click Submit.

Upgrading SQL Server

Enterprise Hybrid Cloud platform offers less complex options for upgrading SQL Server databases or instances on-premises compared to traditional methods. This functionality enables organizations to seamlessly:

- Upgrade databases on a SQL Server instance within an Enterprise Hybrid Cloud platform
- Upgrade the entire SQL Server instance on the virtual machine within an Enterprise Hybrid Cloud platform

These actions use vRealize Orchestration workflows. Before you run either action, Dell EMC recommends that you perform the required due diligence on the databases or instances being upgraded.

Upgrading SQL Server databases

The Upgrade SQL Server Database post-provisioning resource action enables administrators to upgrade SQL Server databases from a SQL Server instance with a previous version to another SQL Server instance with an equal or later version that is deployed in Enterprise Hybrid Cloud. For example, you can upgrade databases from a SQL Server 2014 virtual machine to another SQL Server 2016 virtual machine.

The upgrade operation backs up the source databases to a specified network share and restores them to a selected SQL Server instance on a selected virtual machine. The network share must have sufficient space for the database backups. The user account that performs the upgrade operation must have read and write access to the destination share.

To upgrade SQL Server databases:

1. Under Machines, select a SQL Server virtual machine and then select Upgrade SQL Server Database from the Actions menu.
2. Type a description and a reason for the request.
3. Complete the Source SQL Server form, as shown in Figure 26:
   a. Type the Username and Password for the source SQL Server virtual machine.
   b. Select the source SQL Server instance from the list of instances on the virtual machine.
   c. In the Backup Instance field, select Yes to upgrade all user databases on the source instance. To upgrade a single database only, select No and then select the database from the list of databases on the selected instance.
Chapter 4: Microsoft Applications Day 2 Operations

Selecting the source SQL Server databases

4. Complete the **Destination SQL Server** form, as shown in Figure 27:
   a. Select the **Destination Machine** from the list of SQL Server virtual machines that are deployed on Enterprise Hybrid Cloud.
   b. Select the **Destination SQL Server instance** from the list of instances on the selected virtual machine.

Selecting the destination SQL Server virtual machine

5. Under **Backup Location**, specify the backup location for the databases being upgraded, as shown in Figure 28.

Specifying the backup location for the user databases

6. Under **Summary**, as shown in Figure 29, review the details of the request, and then click **Submit** to start the workflow.
Figure 29. Summary for upgrading SQL Server databases

After the databases have been upgraded, the source and destination databases remain in a read-only state until they are manually changed to a writable state.

**Upgrading SQL Server instances**

The *Upgrade SQL Server Instance* post-provisioning resource action enables administrators to upgrade SQL Server instances from a previous SQL Server version to another SQL Server instance with an equal or later version that is deployed in Enterprise Hybrid Cloud. For example, you can upgrade a SQL Server 2014 instance to a virtual machine with SQL Server 2016 version.

During the instance upgrade operation, the SQL Server databases, logins and credentials, permissions, job servers, policies, server configuration, and so on are migrated to a SQL Server instance with an equal or later version in the Enterprise Hybrid Cloud platform.

Before you implement a SQL Server instance migration, install the *dbatools* free tool in the source SQL Server machine. For more details about and prerequisites for dbatools, refer to the *Use PowerShell to Migrate SQL Server Instances* Microsoft TechNet article.

To upgrade the SQL Server instance in the Enterprise Hybrid Cloud platform:

1. Under *Machines*, select a SQL Server virtual machine and then select *Upgrade SQL Server Instance* from the *Actions* menu.
2. Type a description and a reason for the request.
3. Under *Powershell Credential*, type the requested information, as shown in Figure 30.

Figure 30. Providing the PowerShell credential to upgrade SQL Server instance
4. Under **Source SQL Server Information**, as shown in Figure 31:
   a. Type the **Source SQL Server name** (Fully Qualified Domain Name (FQDN) is preferred).
   b. After you type the value, the dbatools status is automatically checked, and **dbatools detected successfully** is displayed. If an error message appears, review the prerequisites that are required for dbatools installation.
   c. Select the **Source SQL Server instance** from the list of instances on the specified server.
   d. Type the source SQL Server sysadmin details and password in the relevant fields.

![Figure 31. Example of Source SQL Server instance to be upgraded](image)

5. Under **Destination SQL Server Information**, as shown in Figure 32:
   a. Select the **Destination SQL Server name** from the list box.
   b. Select the **Destination SQL Server instance name** from the list of instances on the specified server.
   c. Type the destination SQL Server sysadmin account name and password in the relevant fields.

   In the example in Figure 32, the sa account can be used only if SQL Server and Windows authentication mode is enabled.

![Figure 32. Selecting the destination SQL Server instance](image)

6. Under **Backup Network Share Location**, type the backup location for the instance being migrated, as shown in Figure 33.
Figure 33. Specifying the backup location for upgrading the SQL Server instance

7. Under **Summary**, as shown in Figure 34, review the details of the request, and then click **Submit** to start the workflow.

Figure 34. Summary for upgrading SQL Server instance

Users can verify that the databases, logins and credentials, permissions, policies, jobs, and other components after the upgrade SQL Server instance request completes.

**Note:** Each component is upgraded separately in the Upgrade SQL Server workflow. If the workflow is partially successful, it does not roll back the successful component upgrades. Users can check the error message in the request pane and run the workflow again to complete the upgrade for previously failed components.

**Patching SQL Server**

Enterprise Hybrid Cloud offers a simplified option for patching SQL Server compared to traditional methods. This functionality enables organizations to:

- Locate all SQL Server patches including Service Packs, Cumulative Updates, and hotfixes on a remote shared folder without the need to copy each patch to each SQL Server machine’s local disk.
- Show the SQL Server instance detail version and build number before and after the patching.

These actions use vRealize Orchestrator workflows. To patch the SQL Server virtual machines that enabled SQL Server Always On Availability Group, install the patch on each node, one after another.

**Note:** Before running the patching action, Dell EMC recommends backing up the important user databases and fully testing the non-production environment.

**Installing the SQL Server patch**

To apply SQL Server patches:

1. Under **Machines**, select a SQL Server virtual machine and then select **Install SQL Server patch** from the **Actions** menu.
2. Under **Request Information**, specify a description and a reason for the request.
3. Under **SQL Server Information**, specify a username and password.
The user credentials must have login privileges on the SQL Server virtual machine. After entering the password, the version of current SQL Server instances is displayed, as shown in Figure 35.

**Figure 35. Show SQL Server instance version**

4. Under **Patch Information**, provide the information that is required, as shown in Figure 36:
   a. Type the network file share location of the patch.
   b. Type the exact binary file name of the patch.
   c. Type the username and password for the network file share.
   d. Specify if the database server must be rebooted immediately after patching.

**Note**: To determine if the reboot is required, refer to the patch release notes from the Microsoft website.

**Figure 36. Patch Information**

5. Click **Submit** to complete the request.

**Showing the SQL Server instances version**

To determine the SQL Server instances version after you install a patch, use the **Show SQL Server Instances Version** action:
1. Under **Machines**, select a SQL Server virtual machine and then select **Show SQL Server Instances Version** from the **Actions** menu.

2. Under **Request Information**, specify a description and a reason for the request.

3. Under **SQL Server Information**, specify a username and password.

   The user credentials must have login privileges on the SQL Server virtual machine. After entering the password, the SQL Server instances version after patching is displayed, as shown in Figure 37.

![Figure 37. Show SQL Server Instance Version](image)

4. Click **Submit** to complete the request.

**Migrating SQL Server**

Enterprise Hybrid Cloud platform allows database administrators to seamlessly migrate the existing off-premises SQL Server databases or instances into the Enterprise Hybrid Cloud platform. The platform supports:

- Migrating databases into an Enterprise Hybrid Cloud platform from SQL Server machines that are not currently managed by Enterprise Hybrid Cloud platform.
- Migrating the entire SQL Server instance into an Enterprise Hybrid Cloud platform from SQL Server machines that are not currently managed by Enterprise Hybrid Cloud platform.

The **Migrating SQL Server** feature is designed as XaaS blueprints in vRealize Automation. These blueprints use vRealize Orchestration workflows. Before you run either blueprint, Dell EMC recommends that you perform the required due diligence on the databases or instances being migrated.

**Migrating SQL Server databases**

The **Migrate SQL Server Database** XaaS blueprint enables users to move databases that reside on a SQL Server instance outside Enterprise Hybrid Cloud into an Enterprise Hybrid Cloud environment through the self-service portal, as shown in Figure 38. During the database migration operation, the databases are backed up to a specified network share and restored to a selected SQL Server instance within Enterprise Hybrid Cloud. The network share must have sufficient space for the database backups. The user account that performs the migration operation must have read and write access to the destination share.
To migrate SQL Server databases into Enterprise Hybrid Cloud:

1. Select the **Migrate SQL Server Database** XaaS blueprint in the vRealize Automation self-service portal.

2. Type a description and a reason for the request.

3. Complete the **Source SQL Server** form, as shown in Figure 39:
   a. Type the name of the source SQL Server host and its credentials.
   b. Select the source SQL Server instance from the list of instances on the specified server.
   c. In the **Backup Instance** field, select **Yes** to migrate all user databases on the source instance. To migrate a single database only, select **No** and then select the database from the list of user databases on the selected instance.

4. In the example in Figure 39, the source is a SQL Server 2008 R2 instance, and a single database is being migrated.
5. Under **Destination SQL Server**, as shown in Figure 40:
   a. Select the destination virtual machine and type its credentials.

   **Destination Machine** lists all SQL Server hosts that are deployed on Enterprise Hybrid Cloud workload pods in the destination environment.
   
   b. Select the destination SQL Server.

   **Destination SQL Server Instance** lists all existing SQL Server instances to which the requester has login rights on the selected virtual machine.

6. Under **Backup Location**, type the backup location for the database being migrated.

7. Under **Summary**, review the details of the request, and then click **Submit** to start the workflow.

After the database has been migrated, the source and destination databases remain in a read-only state until they are manually changed to a read/write state. Figure 41 shows an example of a database that is migrated into Enterprise Hybrid Cloud and is in a read-only state.
Migrating SQL Server instances

The **Migrate SQL Server Instance** XaaS blueprint enables users to move the entire SQL Server instance, which is outside the Enterprise Hybrid Cloud platform, into an Enterprise Hybrid Cloud platform through the self-service portal, as shown in Figure 42.

During the instance migration operation, the SQL Server databases, logins and credentials, permissions, job servers, policies, server configuration, and so on are all migrated to a SQL Server instance in Enterprise Hybrid Cloud platform.

Before you implement a SQL Server instance migration, install the **dbatools** free tool in the source SQL Server machine. For more details about and prerequisites for dbatools, refer to the **Use PowerShell to Migrate SQL Server Instances** Microsoft TechNet article.

To migrate a SQL Server instance into Enterprise Hybrid Cloud platform:

1. Select the **Migrate SQL Server Instance** XaaS blueprint in the vRealize Automation self-service portal.
2. Type a description and a reason for the request.
3. Under **Powershell Credential**, type the requested information.
4. Under **Source SQL Server Information**, as shown in Figure 43:
a. Type the **Source SQL Server name** (FQDN is preferred).

b. After you type the value, the dbatools status is automatically checked, and **dbatools detected successfully** is displayed. If an error message appears, review the prerequisites that are required for dbatools installation.

c. Select the **Source SQL Server instance** from the list of instances on the specified server.

d. Type the **Source SQL Server sysadmin** account name and password in the relevant field.

In the example in Figure 43, the source is a SQL Server 2008 R2 instance, and the sa sysadmin account on the source SQL Server is used for instance migration.

![Figure 43. Selecting the source SQL Server instance](image)

5. Under **Destination SQL Server Information**, as shown in Figure 44:
   - a. Select the **Destination SQL Server name** from the list box.
   - b. Select the **Destination SQL Server instance** from the list of instances on the specified server.
   - c. Type the **Destination SQL Server sysadmin** account name and password in the relevant field.

In the example in Figure 44, the destination is a SQL Server 2016 instance, and the sa sysadmin account on the destination SQL Server is used for instance migration.

![Figure 44. Selecting the destination SQL Server instance](image)

6. Under **Backup Location**, type the backup location for the instance being migrated.
7. Under **Summary**, review the details of the request, as shown in Figure 45, and then click **Submit** to start the workflow.

As shown in Figure 45, you can verify that the databases, logins and credentials, policies, jobs, and other components under the source SQL Server instances are successfully migrated to the destination SQL Server virtual machine in the Enterprise Hybrid Cloud platform.

**Note:** Each component is migrated separately in the Migrate SQL Server workflow. If the workflow is partially successful, it does not roll back the successful component upgrades. Users can check the error message in the request panel and run the workflow again to complete the migration for previously failed components.
Figure 45. SQL Server instance migrated into Enterprise Hybrid Cloud
This chapter presents the following topics:

Overview ........................................................................................................................................... 49
Storage capacity monitoring .................................................................................................................. 49
vRealize Hyperic .................................................................................................................................. 50
vRealize Operations Manager ............................................................................................................... 52
Exchange Server monitoring ................................................................................................................ 54
SQL Server monitoring ........................................................................................................................ 57
SharePoint Server monitoring ............................................................................................................ 59
Overview

Based on the requirements of specific business groups, you can configure monitoring of Microsoft applications on the Enterprise Hybrid Cloud platform by integrating vRealize Hyperic and vRealize Operations Manager. They provide a single UI for monitoring a wide range of metrics relating to the availability and use of Microsoft applications.

To ensure that Microsoft applications that are deployed in Enterprise Hybrid Cloud have monitoring capabilities, each application virtual machine requires a Hyperic agent to communicate with Hyperic Server, which is the Hyperic central monitoring server. The Hyperic agent is installed seamlessly during the automated provisioning of applications requested from the vRealize Automation service catalog.

Storage capacity monitoring

Administrators can monitor storage usage for Microsoft application virtual machines. For example, you can configure metrics to alert administrators when the total capacity of virtual machine disks has reached a certain threshold. In vRealize Operations Manager, administrators can create self-designed dashboards or edit existing dashboards, and then add the widgets necessary to monitor the virtual machines.

The dashboard example in Figure 46 shows capacity monitoring of a SharePoint Server 2013 virtual machine. **Capacity Remaining** shows the capacity utilization of the datastores that are associated with the application virtual machine. **Metric Chart** monitors the guest file system.

We configured similar dashboards for SQL Server and Exchange Server. Monitoring capacity usage of application virtual machines ensures that administrators can take remedial action before any problems arise.

![Figure 46. Storage capacity dashboard for Microsoft applications](image-url)
Chapter 5: Monitoring Microsoft Applications

vRealize Hyperic

vRealize Hyperic is a core component in monitoring Microsoft applications on the Enterprise Hybrid Cloud platform. It collects application metrics and makes them available in vRealize Operations Manager for monitoring. Hyperic is integrated with vRealize Operations Manager through a management pack. You can download the Management Pack for vRealize Hyperic from the VMware Solution Exchange Marketplace.

A wide range of Microsoft application metrics are enabled by default in Hyperic. Administrators can enable and view additional metrics in vRealize Operations Manager. Custom plug-ins are also available, as shown in Figure 47. You can download plug-ins from the VMware Solutions Exchange Marketplace.

The vRealize Hyperic agent is required to enable communications between Microsoft application virtual machines and the vRealize Hyperic Server. In this Enterprise Hybrid Cloud platform, we enabled automated installation of the agent by creating a Hyperic service for Windows on vRealize Application Services and adding this service to the various application blueprints published to vRealize Automation, as shown in Figure 48. In this way, all application deployments install the Hyperic agent by default.
After a deployment is complete, Hyperic automatically discovers application and server resources. To enable vRealize Operations Manager to monitor application-specific counters, the application resources must be added to the Hyperic inventory. Use the Add to Inventory option on the Auto-Discovery dashboard in Hyperic, as shown in Figure 49.

Resources added to the Hyperic inventory appear on the Resources tab, from which the resources can be added to a group, if required. Groups enable Microsoft assets on Enterprise Hybrid Cloud to be added as a collection of inventory resources within Hyperic.
Chapter 5: Monitoring Microsoft Applications

vRealize Operations Manager

Although vRealize Hyperic is required to monitor Microsoft applications running on Enterprise Hybrid Cloud, vRealize Operations Manager provides the portal for monitoring and providing insight into the availability, use, and overall health of Exchange Server, SQL Server, and SharePoint Server deployments.

In vRealize Operations Manager, you can create custom dashboards for each of the Microsoft applications to ensure that the correct metrics are being monitored for the applications, as shown in Figure 50. The metrics that are enabled on vRealize Operations Manager can be selected to best suit the monitoring requirements of the organization or specific business groups. In vRealize Operations Manager, you can also enable alerts based on the specific threshold requirements for each application and you can set up notifications to send email to the relevant application teams when alerts are generated.

![Figure 50. Example of a custom dashboard in vRealize Operations Manager](image)

Integrating Hyperic with vRealize Operations Manager

To enable metrics to populate from vRealize Hyperic to vRealize Operations Manager, install and set up the Management Pack for vRealize Hyperic as follows:

1. Download the Management Pack from the VMware Solutions Exchange Marketplace.
2. In vRealize Operations Manager Administration, select Environment > Solutions and then click the + (plus) icon, as shown in Figure 51.
Figure 51. Installing and configuring the Hyperic Management Pack

3. Browse to and select the Management Pack. Then click **Upload**, as shown in Figure 52.

Figure 52. Uploading the Management Pack for Hyperic

4. To complete the installation, follow the Add Solution wizard.

5. Under **Solutions**, click **Configure** to edit the adapter settings, as shown in Figure 53.

Figure 53. Configuring the Management Pack for Hyperic

6. Specify the required Hyperic and vRealize Operations Manager server settings and click **Test Connection**, as shown in Figure 54.
Chapter 5: Monitoring Microsoft Applications

7. After the test finishes, click **Save Settings**.

**Exchange Server monitoring**

From Hyperic Server 5.8.6, the **exchange-plugin.jar** plug-in for Exchange is installed by default, which enables Exchange Server metrics monitoring and reporting. When a user requests Exchange Server from the service catalog, the Hyperic agent is installed as part of the deployment. To enable Hyperic to discover and monitor Exchange Server, the Hyperic agent on Windows must be run as a domain user with an Exchange Organization Management Role.

**Exchange Server metrics**

Administrators can enable a wide range of Exchange Server metrics in Hyperic to monitor specific Exchange Server deployments across business groups in Enterprise Hybrid Cloud. Administrators can monitor individual Exchange Server components, such as databases, database instances, and mailbox counters, for availability, use, and performance, as shown in Figure 55. After the metrics are enabled in Hyperic, the counters are visible in vRealize Operations Manager. You can then add the counters to custom dashboards.
In vRealize Operations Manager, administrators can configure Exchange Server counters as key performance indicators (KPIs) and can configure thresholds to ensure that Exchange administrators are notified if thresholds are exceeded. The ability to monitor Exchange-specific counters, such as failed or pending deliveries, ensures that administrators can resolve potential problems quickly.

Administrators configure thresholds by creating symptom definitions and assigning these to alert definitions. KPIs can then be modified in a monitoring policy, which is a set of rules that vRealize Operations Manager uses to analyze and display information about objects. Figure 56 shows the **Override Attributes** page in a monitoring policy where some KPIs have been set for Exchange Server deployments.

![Figure 56. Examples of Exchange Server attributes in a policy](image)
These are examples of Exchange Server metrics that you can monitor in vRealize Operations Manager:

- I/O Database Reads/Sec
- I/O Database Writes/Sec
- Client RPC Failed
- Failed Deliveries Per Second
- Pending Deliveries
- Database Page Fault Stalls per Minute
- I/O Database Reads Average Latency
- I/O Database Writes Average Latency
- RPC Averaged Latency

**Note:** For information about the full range of Exchange Server metrics that are supported by vRealize Hyperic, refer to *VMware vRealize Hyperic Resource Configuration and Metrics*.

**Exchange Server dashboards**

Email is a mission-critical application. It is vital that any delays in delivery or degraded performance are identified early and the cause of the slowdown that is determined quickly. Custom at-a-glance dashboards for Exchange Server environments enable application teams to view the overall health and performance of Exchange Server servers, services, and mail traffic running on Enterprise Hybrid Cloud. This functionality enables potential problems to be identified before end users experience any decline in the email service.

Figure 57 shows a custom dashboard that we created to monitor Exchange Server deployments. The dashboard shows the availability of Exchange Server environments as well as Exchange Server alerts and anomalies. You can create dashboards like this to suit the specific monitoring requirements of an organization.
SQL Server monitoring

From Hyperic Server 5.8.6, the sqlquery-plugin.jar plug-in for SQL Server is installed by default, which enables SQL Server metrics monitoring and reporting.

vRealize Hyperic supports a wide range of SQL Server metrics, enabling SQL Server administrators to ensure that instances and databases are performing within the expected thresholds of a business group on Enterprise Hybrid Cloud. Some metrics are enabled by default on Hyperic. Administrators can enable additional metrics depending on the monitoring needs within an organization. This solution enables monitoring of valuable SQL Server availability, use, and performance metrics so that administrators can prevent potential performance- or capacity-related problems before they arise.

In vRealize Operations Manager, you can configure SQL Server metrics as KPIs, and you can configure thresholds to ensure that the relevant SQL Server administrators are notified if thresholds are exceeded.

Configure thresholds by creating symptom definitions and assigning them to alert definitions. KPIs are then modified in a monitoring policy, which is a set of rules that vRealize Operations Manager uses to analyze and display information about objects. Figure 58 shows the Override Attributes page in a monitoring policy where some KPIs have been set for SQL Server metrics.

![Figure 58: Example of SQL Server attributes within a monitoring policy](image)

These are examples of SQL Server metrics that you can monitor in vRealize Operations Manager:

- SQL Server Availability
- User Connections
- Transactions
- SQL Server Cache memory
- Database free percent
- Log Growth
- Page Growth
- Batch Requests/sec
Chapter 5: Monitoring Microsoft Applications

- Compilations/sec
- Re-compilations/sec

**Note:** For information about the full range of SQL Server metrics that are supported by vRealize Hyperic, refer to *VMware vRealize Hyperic Resource Configuration and Metrics Guide*.

### SQL Server dashboards

Custom at-a-glance dashboards for SQL Server enable application teams to monitor SQL Server instance and database metrics and trending, and to easily identify and quickly correct potential problems. Administrators can add a wide range of widgets to SQL Server dashboards, each with specific metrics. Figure 59 shows the **New Dashboard** wizard, which is used to create and customize dashboards to provide unique views of SQL Server objects.

![Dashboard Creation Wizard](image)

**Figure 59. Creating a custom SQL Server dashboard**

Figure 60 shows a custom dashboard that we created to monitor alerts relating to KPIs for SQL Server-specific metrics.
In this example, if SQL Server cache memory is underutilized for a specific period, an alert is triggered and appears on the dashboard. An email notification is also sent to the administrators responsible for the SQL Server resource that logged the alert. We included metric charts in the dashboard to monitor counters such as lock-wait times and total queries. We included object relationships to ensure that the underlying virtual environments on which SQL Server instances are deployed are also being monitored. You can create dashboards like this to help plan for future workloads on SQL Server databases.

SharePoint Server monitoring

To monitor SharePoint Server from vRealize Operations Manager, a custom plug-in is required for Hyperic. This plug-in is available from the VMware Solutions Exchange Marketplace and is installed using the Hyperic Plugin Manager. After the plug-in has been installed, Hyperic can monitor and report SharePoint metrics. When the required metrics have been enabled on Hyperic, they can be viewed in vRealize Operations Manager and added to custom dashboards.

From Hyperic Server 5.8.6, the *sharepoint-plugin.jar* plug-in for SharePoint is installed by default, which enables SharePoint Server metrics monitoring and reporting.

Administrators can enable a wide range of SharePoint Server metrics and counters in Hyperic to monitor core SharePoint Server components, such as Windows services, web server services, and cache publishing services. These metrics can be enabled for the specific requirements of an organization. Some metrics are enabled by default on Hyperic. Administrators can enable additional metrics to support custom dashboards for individual SharePoint Server instances or SharePoint farms.
Chapter 5: Monitoring Microsoft Applications

In vRealize Operations Manager, you can configure metrics as KPIs, and you can configure thresholds to ensure that the relevant SharePoint administrators are notified if thresholds are exceeded.

You configure thresholds by creating symptom definitions and assigning these to alert definitions. KPIs can then be modified in a monitoring policy, which is a set of rules that vRealize Operations Manager uses to analyze and display information about objects. Figure 61 shows the Override Attributes page in a monitoring policy where some KPIs have been set for SharePoint 2013 metrics.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Collection</th>
<th>KPI</th>
<th>Object Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTILIZATION Executing SQL Queries</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
<tr>
<td>UTILIZATION Executed Page Requests</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
<tr>
<td>AVAILABILITY Availability</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
<tr>
<td>ComponentCount Critical</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
<tr>
<td>ComponentCount Critical with combined</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
<tr>
<td>ComponentCount Immediate</td>
<td>Metric</td>
<td>Hyperic Adapter</td>
<td>SharePoint 2013</td>
</tr>
</tbody>
</table>

Figure 61. Example of SharePoint Server attributes within a monitoring policy

These are examples of SharePoint Server metrics that you can monitor in vRealize Operations Manager:

- Incoming Page Request Rate
- Executing SQL Queries
- Reject Page Request Rate
- Responded Page Request Rate
- Executing Time/Page Request
- Response Time

**Note:** For information about the full range of SharePoint Server metrics that are supported by vRealize Hyperic, refer to VMware vRealize Hyperic Resource Configuration and Metrics.

SharePoint Server dashboards

Custom dashboards provide an at-a-glance view of key metrics that are associated with SharePoint Server, enabling SharePoint administrators to easily identify any anomalies that occur and to quickly take remedial action.

Figure 62 shows a custom dashboard that we created to monitor a number of SharePoint stand-alone servers. The dashboard includes four widgets for monitoring SharePoint services such as web services and page requests. The Container Overview widget shows the overall health and availability of SharePoint components such as the Windows SharePoint Service content database (WSS_Content) and SQL Server resources. The metric charts assist in identifying any anomalies that occur. The Alert List view ensures that SharePoint alerts can be identified quickly. Notification of these alerts can also be sent to the SharePoint administrators responsible for the resources. You can create similar dashboards to monitor SharePoint farms.
Figure 62. Custom SharePoint Server dashboard
This chapter presents the following topics:

Summary .................................................................63
Benefits ........................................................................63
Summary

This Enterprise Hybrid Cloud for Microsoft Applications solution guide describes the main operations for on-demand provisioning and management of Microsoft applications, including Exchange Server, SQL Server, and SharePoint Server, from a self-service portal. vRealize Automation Services Design is used to configure pre-built application blueprints that contain the necessary scripts to install and customize the application deployments. These scripts can be modified to suit the needs of the application and the business.

Application administrators can deploy applications on virtual server and storage resources that optimize the performance needs of the application. They can also use the solution’s monitoring capabilities to ensure consistent service levels for the applications and their underlying virtual infrastructure. Alerts and email notification enable administrators to easily identify over- and under-utilized resources and to quickly scale application resources up or down when specific thresholds are breached. This offers a truly elastic solution for the cloud.

The solution includes SQL Server DBaaS, Exchange as a service, and SharePoint as a service and enables rapid, on-demand Microsoft applications services.

Benefits

The Enterprise Hybrid Cloud for Microsoft Applications solution enables Microsoft applications to be deployed across any business group running on Enterprise Hybrid Cloud. The following are key findings:

- **Accelerated and automated provisioning**—The solution’s self-service portal enables users to provision Microsoft applications on selectable infrastructure resources, on demand.

- **High availability**—vSphere HA clusters and vSphere DRS, in combination with Exchange DAG and SQL Server Always On Availability Groups, protect Microsoft applications running on Enterprise Hybrid Cloud.

- **Monitoring**—vRealize Hyperic, in combination with vRealize Operations Manager, enables administrators to monitor the real time health, performance, and usage of Microsoft applications through custom dashboards.

- **Notifications**—Automatic email notification ensures that application administrators are alerted when resource or performance thresholds are breached so that potential problems can be quickly resolved.

- **Elasticity**—Users can add resources on demand to meet the requirements of an application, including adding a DAG copy to an Exchange Server virtual machine and a front-end server to a SharePoint farm. These operations are fully automated. When no longer needed application resources can be retired and freed up for use by other cloud services.

- **Exchange as a service**—Users can add a new mailbox database to an existing Exchange server.

- **SharePoint as a service**—Users can add a new site or a new content database for an existing SharePoint farm.
Chapter 6: Conclusion

- **Database as a service**—The solution’s SQL Server DBaaS functionality enables database administrators directly from the self-service portal to:
  - Rapidly create and delete SQL Server instances and databases on demand.
  - Add databases to, or remove databases from, existing Always On Availability Groups.
  - Migrate SQL Server databases or instances from a SQL Server machine to another one in Enterprise Hybrid Cloud environment.
  - Install SQL Server patches including Service Packs, Cumulative Updates, and hotfixes.
  - Upgrade SQL Server instances and databases to another SQL Server virtual machine in a newer version.
This chapter presents the following topics:

Dell EMC documentation ................................................................. 66
VMware documentation .................................................................. 66
Microsoft documentation ............................................................... 66
Chapter 7: References

Dell EMC documentation

The following documentation on EMC.com provides additional and relevant information. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell EMC representative.

- Enterprise Hybrid Cloud 4.1.1 Reference Architecture Guide
- Enterprise Hybrid Cloud 4.1.1 Concepts and Architecture Guide
- Enterprise Hybrid Cloud 4.1.1 Infrastructure and Operations Guide
- Enterprise Hybrid Cloud 4.1.1 Administration Guide
- Enterprise Hybrid Cloud 4.1.1 Security Management Guide
- Microsoft Exchange Server Best Practices and Design Guidelines for EMC Storage
- Microsoft SQL Server Best Practices and Design Guidelines for EMC Storage
- Microsoft SharePoint Server: Best Practices and Design Guidelines for EMC Storage

VMware documentation

The following documentation on the VMware website provides additional and relevant information:

- VMware vRealize Automation Information
- VMware vRealize Operations Manager Information
- VMware vRealize Hyperic Documentation
- VMware vCenter Hyperic Resource Configuration and Metrics (PDF)
- Architecting Microsoft SQL Server on VMware vSphere Best Practices Guide (PDF)
- Microsoft Exchange 2013 on VMware Best Practices Guide (PDF)

Microsoft documentation

The following documentation on the Microsoft website provides additional and relevant information:

- Best Practices for Virtualizing and Managing SharePoint 2013
- Download SQL Server Management Studio (SSMS)
- Microsoft Windows Server documentation
- Microsoft SQL Server documentation
- Microsoft Exchange Server documentation
- Microsoft SharePoint documentation