

MICROSOFT CLOUD REFERENCE ARCHITECTURE: MICROSOFT APPLICATIONS

Deploying applications using Microsoft Windows Azure Pack, Microsoft Exchange Server, Microsoft SQL Server, and Microsoft SharePoint Server

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Reference architecture overview

Document purpose EMC developed this reference architecture to help IT departments transform the way they offer business applications to their customers. This reference architecture will help your organization to reduce the risks associated with creating application deployment services while being agile enough to respond to the data needs of the business. The hybrid cloud model uses an agile infrastructure to scale up and down as necessary to meet the demand for your Microsoft business applications.

This guide provides a design architecture for a private cloud using a Microsoft System Center management platform for automation to deliver infrastructure as a service (IaaS) on a Microsoft virtualization platform.

In this reference architecture, Microsoft applications such as Microsoft Exchange, SQL Server, and SharePoint are provisioned and deployed using a self-service portal to streamline management. For more information, refer to the *Microsoft Cloud Reference Architecture: Foundation*.

Use this reference architecture to empower your organization to respond faster to business opportunities by incorporating a cloud architecture into your Microsoft application deployment designs. Moving your Microsoft applications to a highly available, secure cloud configuration will help you future-proof your business.

Scope

This reference architecture guide provides a technical overview of an EMC on-premises data center solution using EMC and Microsoft technologies for a private cloud infrastructure. The solution shows how IT organizations can deliver Microsoft server applications that are provisioned using a self-service portal.

Audience

This guide is intended for technical engineering staff, managers, cloud administrators, solution architects, and storage administrators responsible for analyzing, designing, and managing virtualized infrastructure solutions, cloud solutions, and application platforms.

Readers of this guide should be familiar with EMC products and with Microsoft technologies such as Microsoft Windows Azure Pack (WAP), System Center, Hyper-V, Windows Server 2012 R2, SQL Server, SharePoint, and Exchange.

The business challenge

Organizations are increasingly seeking to do more with less. One way to achieve this objective is by transforming to a fully virtualized cloud infrastructure, managed with automation, to deliver IT as a service with increased performance, agility, and flexibility.

Many customers are seeking to transform their existing Microsoft virtualization environment into a managed and orchestrated solution. Microsoft System Center with WAP provides a toolset to manage infrastructure and applications across private, hosted, and Microsoft Azure cloud solutions.

EMC can help with a data center solution infrastructure deployment that provides a robust Hyper-V-based platform to give your business applications the capacity to operate more efficiently and with greater agility.

To minimize overhead, Microsoft business applications such as SQL Server, SharePoint Server 2013, and Exchange Server must be easy to implement. Administrators can deploy Microsoft applications on an EMC storage platform to optimize performance needs.

The technology solution

To help tenant users to deploy applications such as SQL Server, Exchange, and SharePoint as a service with minimal system administrator intervention, this solution demonstrates how to integrate the following EMC and Microsoft technologies:

- Hyper-V for Windows Server 2012 R2
- Windows Server Failover Clustering (WSFC)
- Microsoft System Center 2012 R2
- Windows Azure Pack
- EMC storage and software

Reference architecture

Figure 1 shows how self-service is managed in this reference architecture.

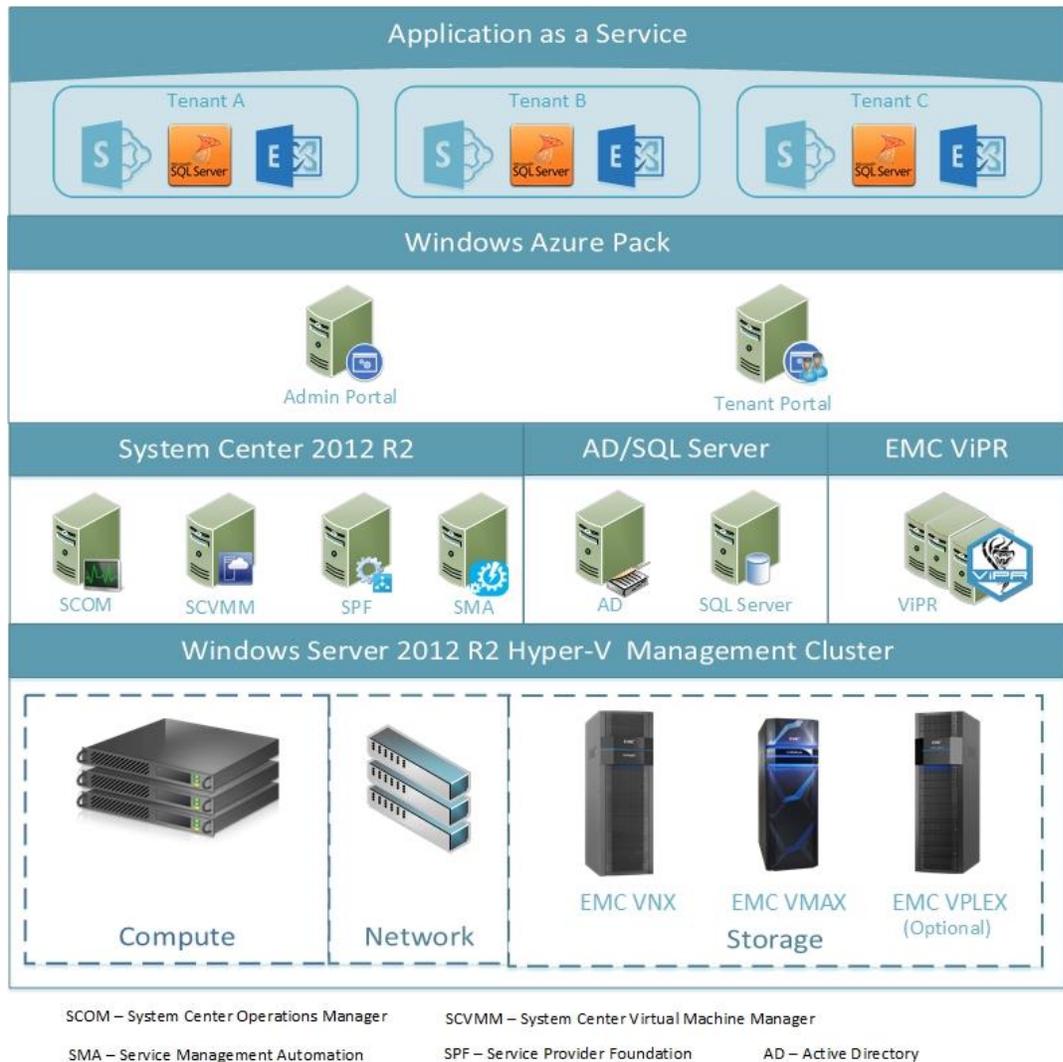


Figure 1. Solution architecture

For information about the management infrastructure of the Microsoft private cloud for applications, refer to the *Microsoft Cloud Reference Architecture: Foundation*.

Key components

This section briefly describes the key components of this solution. For detailed information, refer to the *Microsoft Cloud Reference Architecture: Foundation*.

EMC technology

EMC ViPR

EMC ViPR® is a lightweight solution that transforms existing storage into a simple, extensible, and open platform. ViPR software extends current storage investments to meet new cloud-scale workloads, and enables simple data and application migration out of or into public clouds and back, under or out of the control of IT. ViPR software gives IT departments the ability to deliver on-premises, fully automated storage services at prices that are the same as, or lower than, those of public cloud providers.

Microsoft technology

This solution uses Microsoft private cloud technology with EMC storage platform and integration technologies to provide a self-service application-provisioning feature for cloud tenants. This reference architecture guide uses three Microsoft applications for illustration purposes: SQL Server, SharePoint, and Exchange.

Microsoft SQL Server 2012 or 2014

Microsoft SQL Server is Microsoft's database management and analysis system for e-commerce, line-of-business, and data-warehousing solutions. SQL Server is widely used to store, retrieve, and manage application data. SQL Server is used with a range of applications, each of which may have different requirements for performance, sizing, availability, recoverability, manageability, and so on. For this reason, it is important to fully understand these requirements and plan accordingly when deploying SQL Server.

Microsoft SharePoint 2013

Microsoft SharePoint Server 2013 provides a business-collaboration platform for enterprise and commercial organizations. SharePoint enables organizations to share content and information through websites, blogs, wikis, and document libraries, and to manage this content and information collectively from start to finish.

Microsoft Exchange 2013

Microsoft Exchange Server 2013 is an enterprise email and communication system that allows businesses and customers to collaborate and share information. EMC enhances Exchange Server 2013 with the industry's broadest choice of storage platforms, software, and services.

The [Solution features](#) section of this guide provides a high-level description of the self-service process for each application.

Resources

This section outlines the specific resources that we¹ used for this solution.

¹ In this guide, "we" refers to the EMC engineering team that tested the solution.

Hardware resources

Refer to the *Microsoft Cloud Reference Architecture: Foundation*.

Software resources

Refer to the *Microsoft Cloud Reference Architecture: Foundation*. Additional software resources used in this solution are listed in Table 1.

Table 1. Additional solution software

Software	Version
Microsoft SQL Server	2014 Service Pack 1 (SP1) or 2012 SP1
Microsoft SharePoint	2013 SP1
Microsoft Exchange	2013 SP1

Server and networking requirements

Refer to the *Microsoft Cloud Reference Architecture: Foundation*.

Solution features

Applications as a service

This solution demonstrates how you could deliver the following applications to your cloud customers:

- SQL Server as a service
- SharePoint as a service
- Exchange as a service

This section explains how to configure these services as a cloud administrator and how to subscribe to them as a tenant. Before considering each application in turn, this section introduces the concepts of virtual machine templates and user roles.

Virtual machine templates

A virtual machine template provides a set of property pages that enable administrators to preconfigure virtual machine provisioning such as hardware and operating system (OS) profiles. You can further edit the properties of virtual machine templates to meet specific tenant requirements. Additionally, you can create a new virtual machine template by modifying the property values of an existing virtual machine template.

Using these templates, tenants can easily deploy application servers without knowing how to install and configure them. Accessing the application service requires no more than 10 clicks in the WAP tenant portal.

Figure 2 shows an example of a virtual machine template in the System Center Virtual Machine Manager (SCVMM).

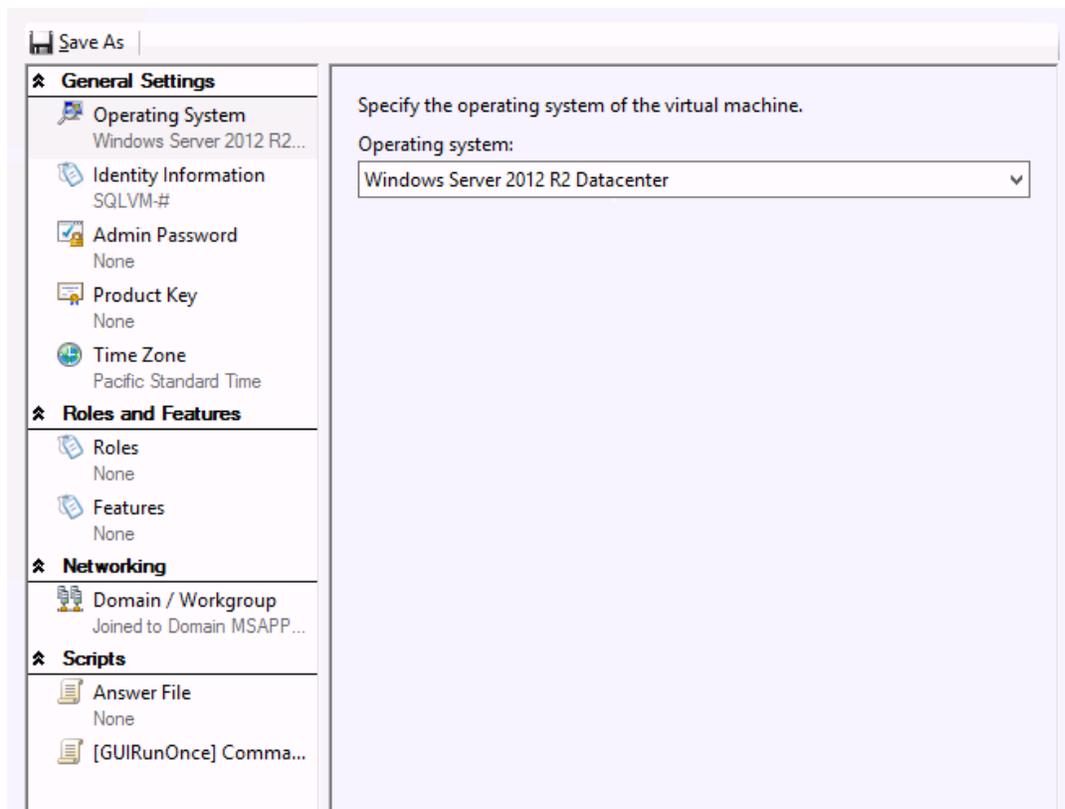


Figure 2. Example of a virtual machine template in SCVMM: OS configuration

User roles

Two types of persona interact with application-as-a-service functionality in the Microsoft cloud environment:

- **Cloud administrators** provide applications as a service by:
 - Automating the allocation of desired computing resources such as CPUs, memory, storage, and network
 - Creating virtual machines
 - Provisioning application services
- **Tenants** consume instances of the application as a service, typically by subscribing to virtual machines and application servers.

Virtual machine provisioning

When the provisioning is done from a template:

- The virtual machine is created with the computing resources specified by the template.
- Additional configuration parameters from the template are applied. The virtual machine joins the specified Active Directory domain. Tenants can consume the service over local or remote connections.

Configuring an application as a service

As a cloud administrator, you can build an application as a service by following these high-level steps:

1. Build Windows 2012 R2 virtual machines.
2. Install the application on the virtual machines.
3. Build virtual machine templates with these virtual machines in SCVMM.
4. Configure virtual machine templates to allow tenants to choose different hardware profiles (such as storage, CPU, memory) by selecting different templates.
5. Create a plan for the application in the WAP administrator portal.
6. Configure the plan in the WAP administrator portal by entering the target parameters and virtual machine templates.

Subscribing to an application as a service

As a tenant, you can subscribe to an application as a service through the WAP tenant portal by following these high-level steps:

1. Log in to the WAP tenant portal.
2. Subscribe to the desired plan provided by the cloud administrator.
3. Submit a request for the desired virtual machine. The virtual machine is provisioned in an automated manner.

SQL Server as a service

The SQL Server self-service features built on top of the Microsoft private cloud are collectively referred to as SQL Server as a service. SQL Server as a service offers flexible and cost-effective virtualized solutions for SQL Server provisioning to meet demanding performance and cost-saving objectives for enterprise businesses.

Database applications can consume the SQL Server via local or remote connections when SQL Server virtual machine provisioning is complete

Figure 3 shows some of the different SQL Server virtual machine templates that are available in SCVMM in this solution, along with their different storage service levels.

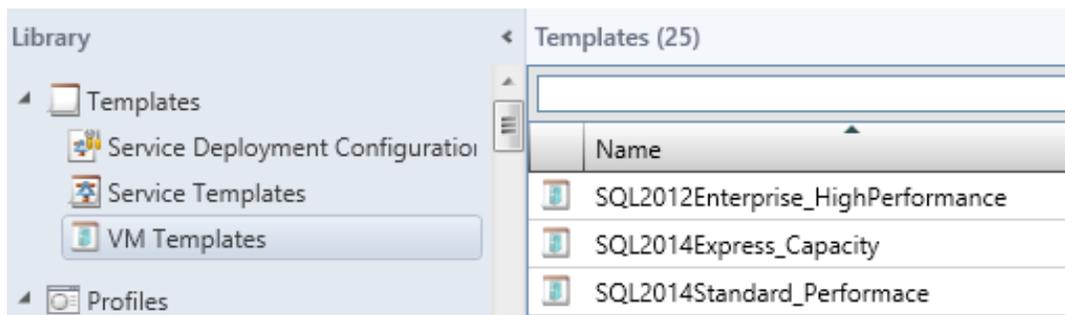


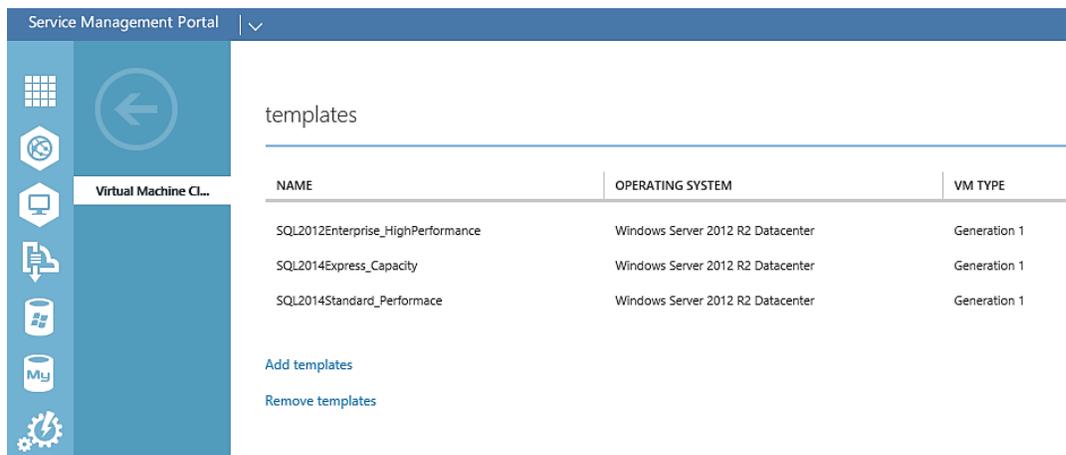
Figure 3. SQL Server templates with different storage service levels in SCVMM

Configuring SQL as a service

Follow the high-level steps in [Configuring an application as a service](#). In step 2, you must specify the required SQL Server versions (SQL 2012 or SQL 2014) and editions (Enterprise, Standard, or Express edition).

Note: Virtual machine templates allow SQL virtual machine provisioning to be implemented without any manual scripting.

Figure 4 shows the WAP plan SQL Server templates in the Service Management Portal.



The screenshot shows the Service Management Portal interface. On the left is a navigation sidebar with icons for various services, including a 'Virtual Machine CL...' section. The main content area is titled 'templates' and contains a table with three columns: NAME, OPERATING SYSTEM, and VM TYPE. Below the table are links for 'Add templates' and 'Remove templates'.

NAME	OPERATING SYSTEM	VM TYPE
SQL2012Enterprise_HighPerformance	Windows Server 2012 R2 Datacenter	Generation 1
SQL2014Express_Capacity	Windows Server 2012 R2 Datacenter	Generation 1
SQL2014Standard_Performance	Windows Server 2012 R2 Datacenter	Generation 1

Figure 4. WAP plan SQL Server templates in the Service Management Portal

Subscribing to SQL as a service

Tenants can subscribe to SQL as a service through the WAP tenant portal. To do this, follow the high-level steps in [Subscribing to an application as a service](#).

Figure 5 shows examples of SQL Server templates in the WAP tenant portal.

Virtual Machine configuration

The screenshot displays the 'CREATE VIRTUAL MACHINE' interface. On the left, a sidebar contains 'ALL', 'TEMPLATES', and 'DISKS'. The 'TEMPLATES' section is active, showing a list of SQL templates under an 'A-Z' dropdown menu. The templates listed are 'SQL2012Enterprise_HighPerformance', 'SQL2014Express_Capacity', and 'SQL2014Standard_Performance'. The 'SQL2012Enterprise_HighPerformance' template is selected, and its details are shown on the right. The details include a description: 'This is a standalone installation of SQL Server 2012 Enterprise Edition for high performance deployment.' and a list of specifications: RELEASE DATE (7/28/2015 6:58:21 AM), OPERATING SYSTEM (Windows Server 2012 R2 Datacenter), MEMORY (8 GB), PROCESSORS (4), DISKS (0), NETWORK ADAPTERS (1), GENERATION (1), and SUBSCRIPTION (SQL Plan).

Property	Value
RELEASE DATE	7/28/2015 6:58:21 AM
OPERATING SYSTEM	Windows Server 2012 R2 Datacenter
MEMORY	8 GB
PROCESSORS	4
DISKS	0
NETWORK ADAPTERS	1
GENERATION	1
SUBSCRIPTION	SQL Plan

Figure 5. SQL template examples in the WAP tenant portal

Figure 6 shows the remote SQL connection through SQL Management Studio to the newly created SQL Servers.

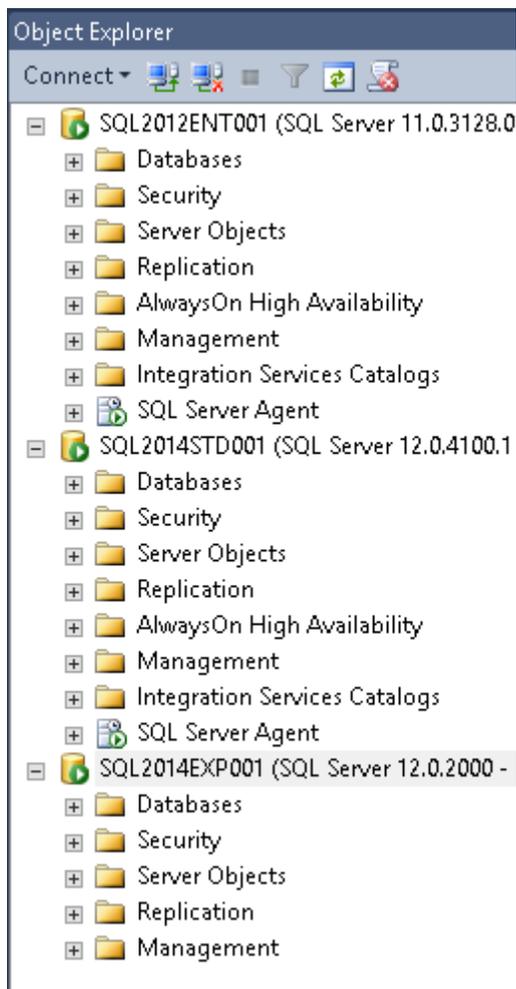


Figure 6. Remote connection to newly created SQL Servers

SharePoint as a service

This solution offers tenants several example SharePoint templates. These templates have standalone SharePoint features and different compute resources, each with different storage resources.

When SharePoint virtual machine provisioning is complete:

- Users can access a provisioned web application and site and a central location for collaboration.
- Tenants can browse the SharePoint website and upload or download documents.
- SharePoint administrators can log in to the central administration site to manage the SharePoint site.

Figure 7 shows an example of different SharePoint templates with different storage service levels.

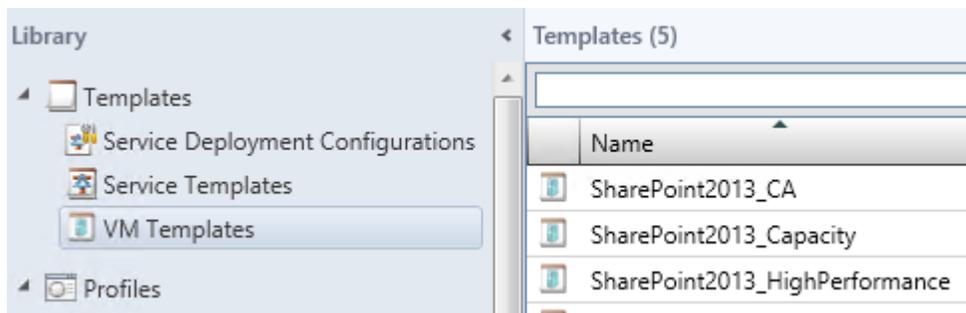


Figure 7. SharePoint template with different storage services in SCVMM

Note: The “CA” suffix in “SharePoint2013_CA” indicates that this template supports the continuous availability (CA) feature provided by EMC VPLEX®. Refer to the *Microsoft Cloud Reference Architecture: Foundation Guide* for more information.

Configuring SharePoint as a service

Follow the high-level steps in [Configuring an application as a service](#). In step 6, add SharePoint virtual machine templates to the plan.

Figure 8 shows SharePoint templates in a WAP plan.

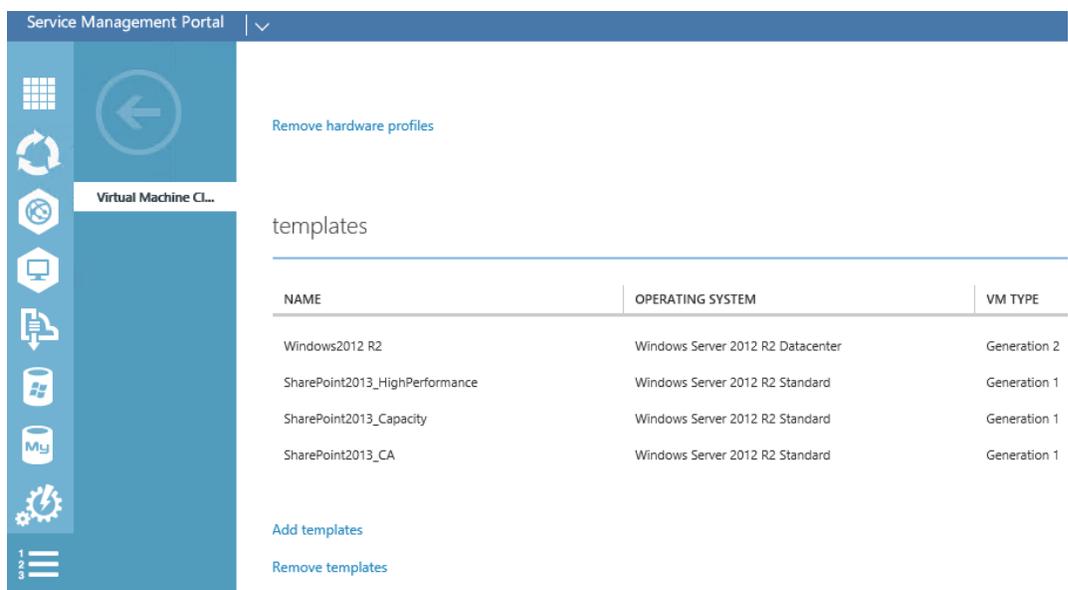


Figure 8. SharePoint templates in a WAP Service Management Portal

Subscribing to SharePoint as a service

After the cloud administrator has configured the service, the tenant can log in to the WAP tenant portal to subscribe. Follow the high-level steps in [Subscribing to an application as a service](#) to do this.

Figure 9 shows an example of a SharePoint template in the WAP tenant portal.

Virtual Machine configuration

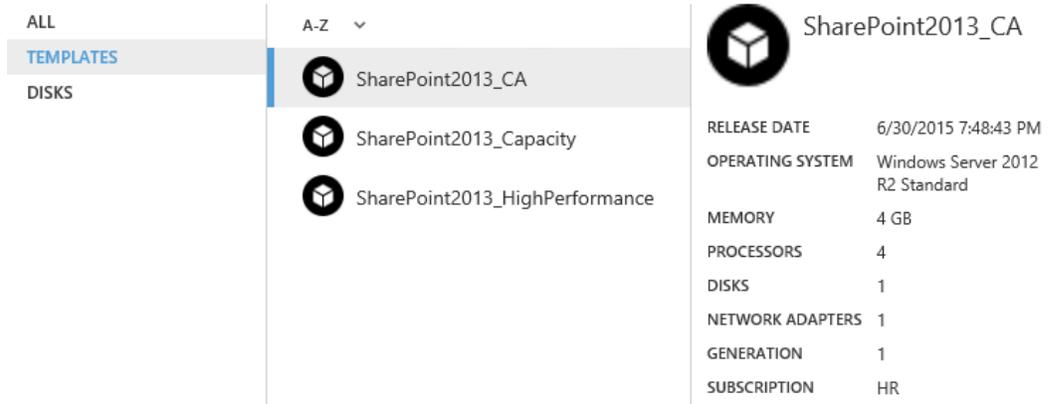


Figure 9. SharePoint template in WAP tenant portal

Figure 10 shows the Central Administration home page after a tenant user has logged in to the SharePoint server.

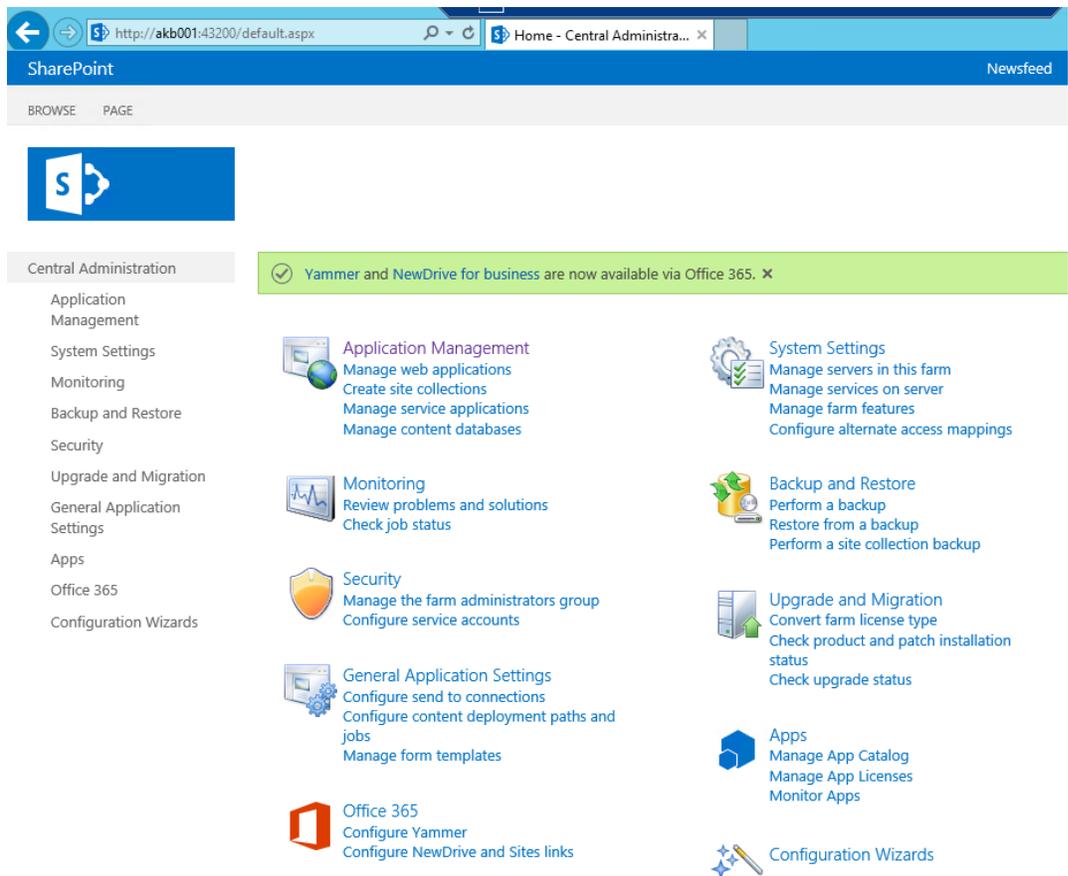


Figure 10. SharePoint Central Administration home page

Exchange as a service

This solution offers tenants several Exchange Server 2013 templates, each with different Exchange Server roles.

When Exchange virtual machine provisioning is complete:

- The tenant can start using the email service immediately
- The Exchange administrator can log in to the Exchange administration center to manage Exchange server

Figure 11 shows the different virtual machine templates, along with the available Exchange Server role options.

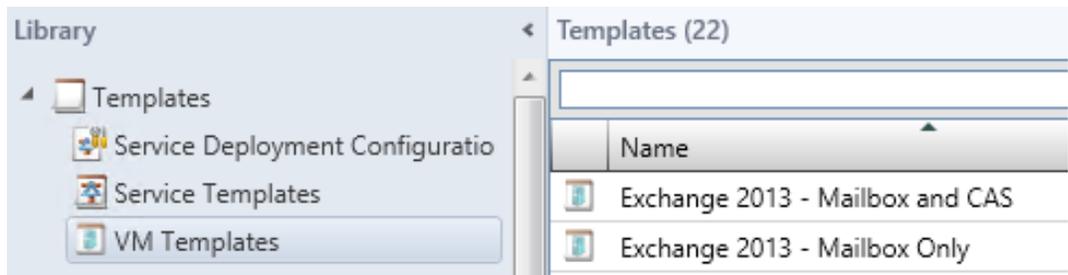


Figure 11. Exchange templates with Exchange Server roles in SCVMM

Configuring Exchange as a service

Follow the high-level steps in [Configuring an application as a service](#).

Figure 12 shows Exchange Server 2013 templates in the WAP plan.

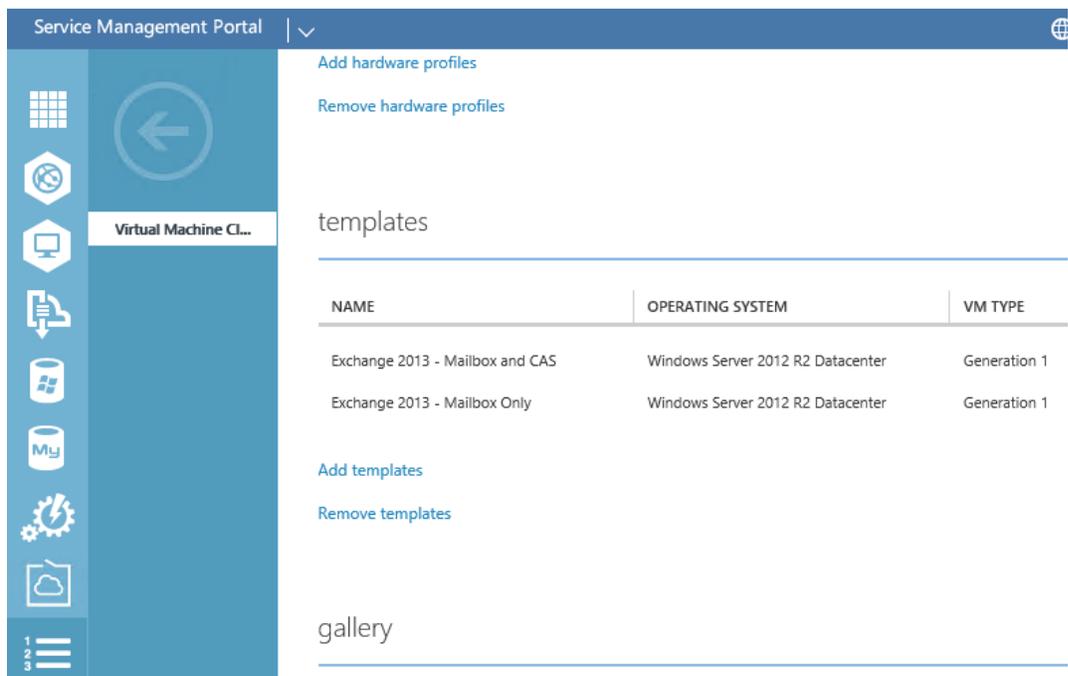


Figure 12. Exchange templates in the WAP plan

Subscribing to Exchange as a service

After the cloud administrator has configured the service, you can log in to the WAP tenant portal to subscribe. Follow the high-level steps in [Subscribing to an application as a service](#).

Figure 13 shows an example of an Exchange Server 2013 template in the WAP tenant portal.

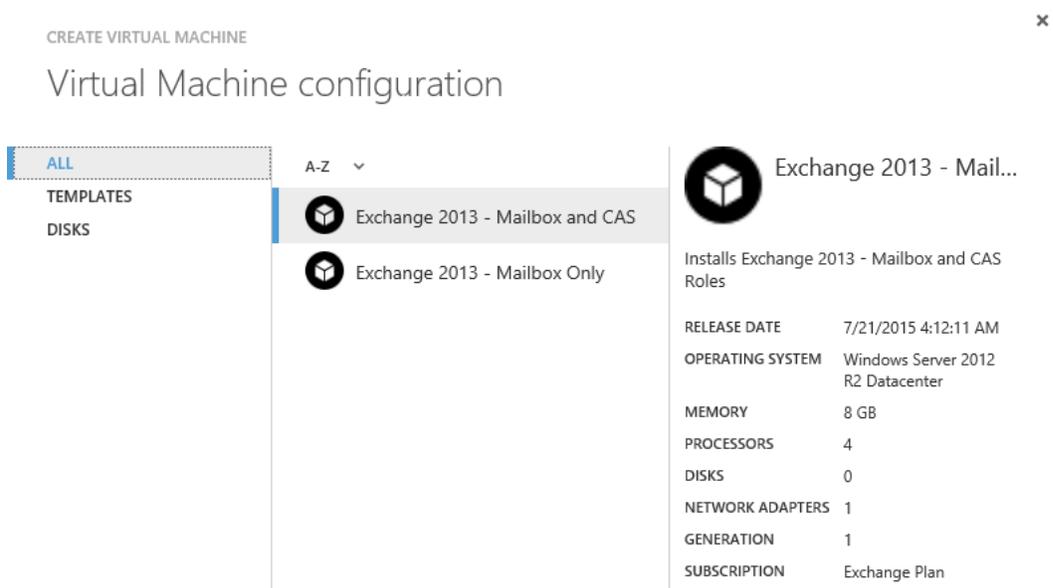
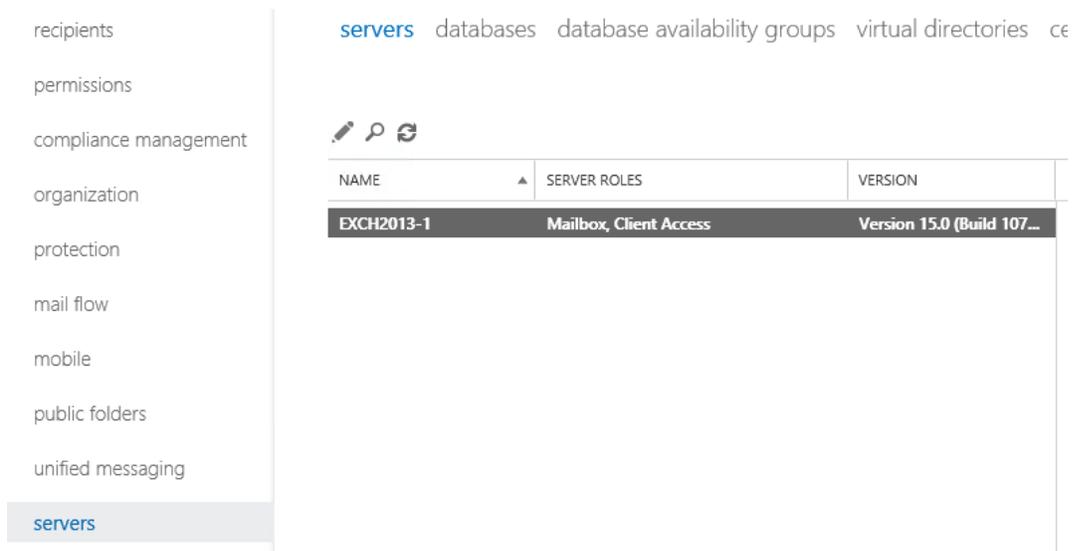


Figure 13. Exchange template examples in the WAP tenant portal

After the virtual machine is successfully deployed, the Exchange administrator can log in remotely to verify that the Exchange application is operational.

Figure 14 shows an Exchange administrator logged in to the Exchange Server 2013 admin center. The server appears in the Exchange servers list.

Exchange admin center



NAME	SERVER ROLES	VERSION
EXCH2013-1	Mailbox, Client Access	Version 15.0 (Build 107...

Figure 14. Exchange admin center showing a new Exchange Server

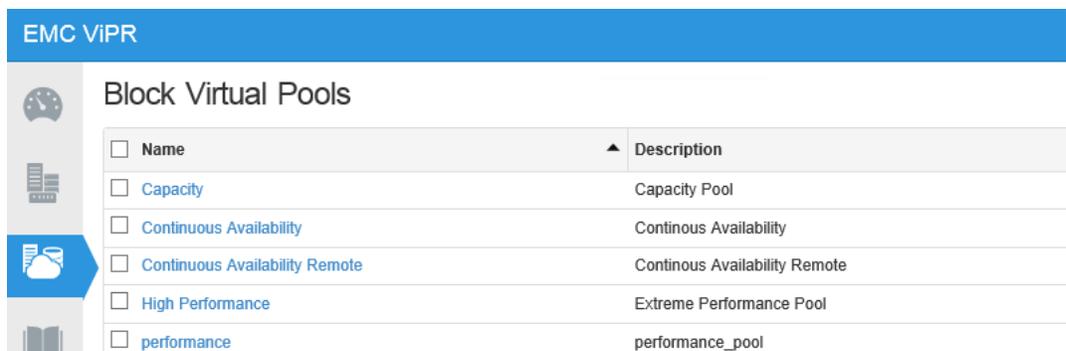
Storage service levels for applications

With ViPR and SCVMM, this solution enables tenants to choose different storage service levels for their applications. We created several storage service levels from ViPR and bound these levels with the SCVMM storage classification. Cloud administrators can use this method to create different templates with different storage service levels, and tenants can choose templates based on business requirements.

Storage service levels in ViPR

To provide storage service for applications, we first defined different storage service levels in ViPR. We then linked the storage service levels to block virtual pools in ViPR in a one-to-one mapping relationship. For example, we created a block virtual pool in ViPR with all solid-state drives (SSDs) in the back end and named it a “High Performance” pool.

Figure 15 shows storage service levels defined in ViPR.



Name	Description
Capacity	Capacity Pool
Continuous Availability	Continuous Availability
Continuous Availability Remote	Continuous Availability Remote
High Performance	Extreme Performance Pool
performance	performance_pool

Figure 15. Storage service levels in ViPR

Creating storage classifications in SCVMM

To choose different storage service levels for your templates, you must create the storage classifications in SCVMM under Fabric Management, as shown in Figure 16.

To align with the storage service in ViPR, we recommend giving the classifications the same names as virtual pools in ViPR.

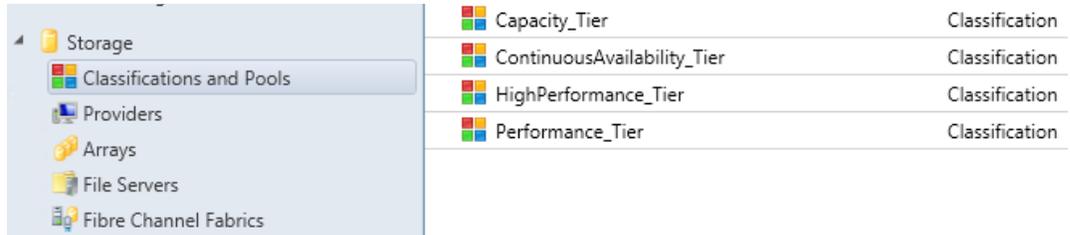


Figure 16. Storage classifications in SCVMM

Binding the ViPR virtual pool with the SCVMM storage classification

After the configuration on both ViPR and SCVMM storage classifications is complete, the final step is to bind the two together. By selecting the classification in storage under the Hyper-V cluster node's properties, you can bind the cluster volume to the SCVMM classification.

Figure 17 shows the location of storage settings in SCVMM.

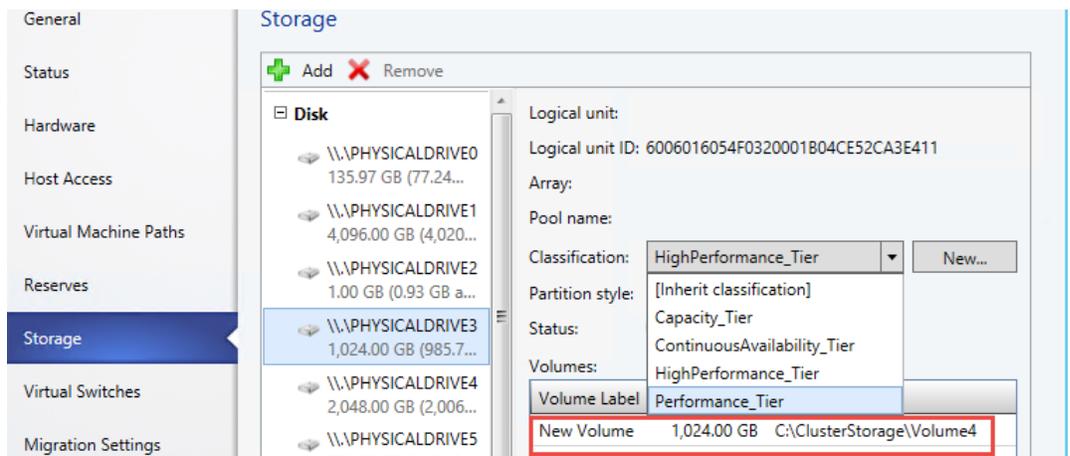


Figure 17. Storage settings in SCVMM

Failover Cluster Manager creates the cluster volume, where we bound ViPR with the cluster storage. Each cluster shared volume represents a virtual pool in ViPR.

Figure 18 shows the cluster storage in Failover Cluster Manager.

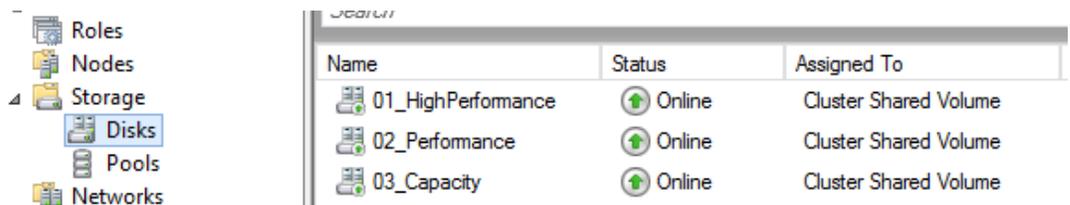


Figure 18. Cluster shared volume with storage service in Failover Cluster Manager

You can now select a storage service level in the virtual machine template, as shown in Figure 19.

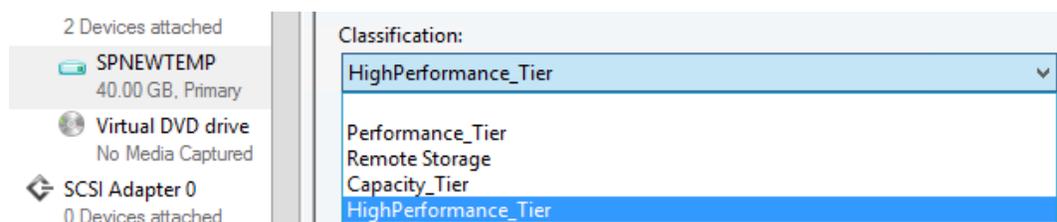


Figure 19. Selecting storage classification in the virtual machine template

Conclusion

This reference architecture enables customers to build an enterprise-class application-as-a-service platform for complete infrastructure service lifecycle management. This Microsoft-centric private cloud solution provides the following key benefits:

- **Self-service:** Tenants can use the self-service portal to provision the Microsoft application server by deploying selected virtual machine templates. Self-service provisioning encompasses all necessary compute resources including CPUs, memory, storage, network, and other preconfigured application components such as different versions and editions in an automated manner.
- **Flexible storage tier:** Tenants can choose different storage tiers associated with virtual machine templates. The storage tiers might include the high performance tier, performance tier, capacity tier, and continuous availability tier.
- **Reusability:** IT departments can create reusable application virtual machine templates that tenants can subscribe to over and over again. The reusable virtual machine templates reduce the cost and burden for IT departments of supporting application provisioning.
- **Customizability:** Application virtual machine templates are highly customizable in terms of allocating computing resources such as the number of CPUs, memory size, storage tier, network, and OS configuration. Additionally, the virtual machine templates enable administrators to add customized scripts that make this solution much more effective and flexible in meeting the needs of tenants.
- **Consistent user experience:** Microsoft private cloud provides the capabilities and required integration points for a consistent user experience when provisioning Microsoft SQL, Exchange, and SharePoint servers.

This solution uses the best of EMC and Microsoft products and services to enable customers to accelerate the implementation of Microsoft applications over the Microsoft private cloud, while providing customer choice for the compute, storage, and networking infrastructure within the data center.

References

EMC documentation

The following documentation on [EMC.com](#) or [EMC Online Support](#) provides additional relevant information about the reference architecture. Access depends on your login credentials. If you do not have access to a document, contact your EMC representative.

- *Microsoft Cloud Reference Architecture: Foundation*

Microsoft documentation

Documentation on the [Microsoft Technet](#) website provides additional relevant information.

Appendix

This section provides examples of configuration scripts used for SharePoint and Exchange applications after they are configured as a service.

- **SharePoint:** This is a post-configuration script for the SharePoint standalone server. Once the script starts to run, it will perform ten post-configuration steps to prepare the server.

```
cd "C:\Program Files\Common Files\microsoft shared\Web  
Server Extensions\15\BIN"  
psconfig -cmd standaloneconfig
```

- **Exchange:** This is an unattended installation script that performs a combined Mailbox/Client access role in Exchange server installation with certain organization names.

```
C:\ExchangeSetup\setup.exe mode:install  
/role:Mailbox,ClientAccess  
/IAcceptExchangeServerLicenseTerms /OrganizationName:orgname
```