Microsoft Hybrid Cloud for Enterprise Architects

What IT architects need to know about hybrid scenarios using Microsoft cloud services and platforms

This topic is 1 of 5 in a series 1 2 3 4 5

Hybrid cloud overview

Hybrid cloud uses compute or storage resources on your on-premises network and in the cloud. You can use hybrid cloud as a path to migrate your business and its IT needs to the cloud or integrate cloud platforms and services with your existing on-premises infrastructure as part of your overall IT strategy.

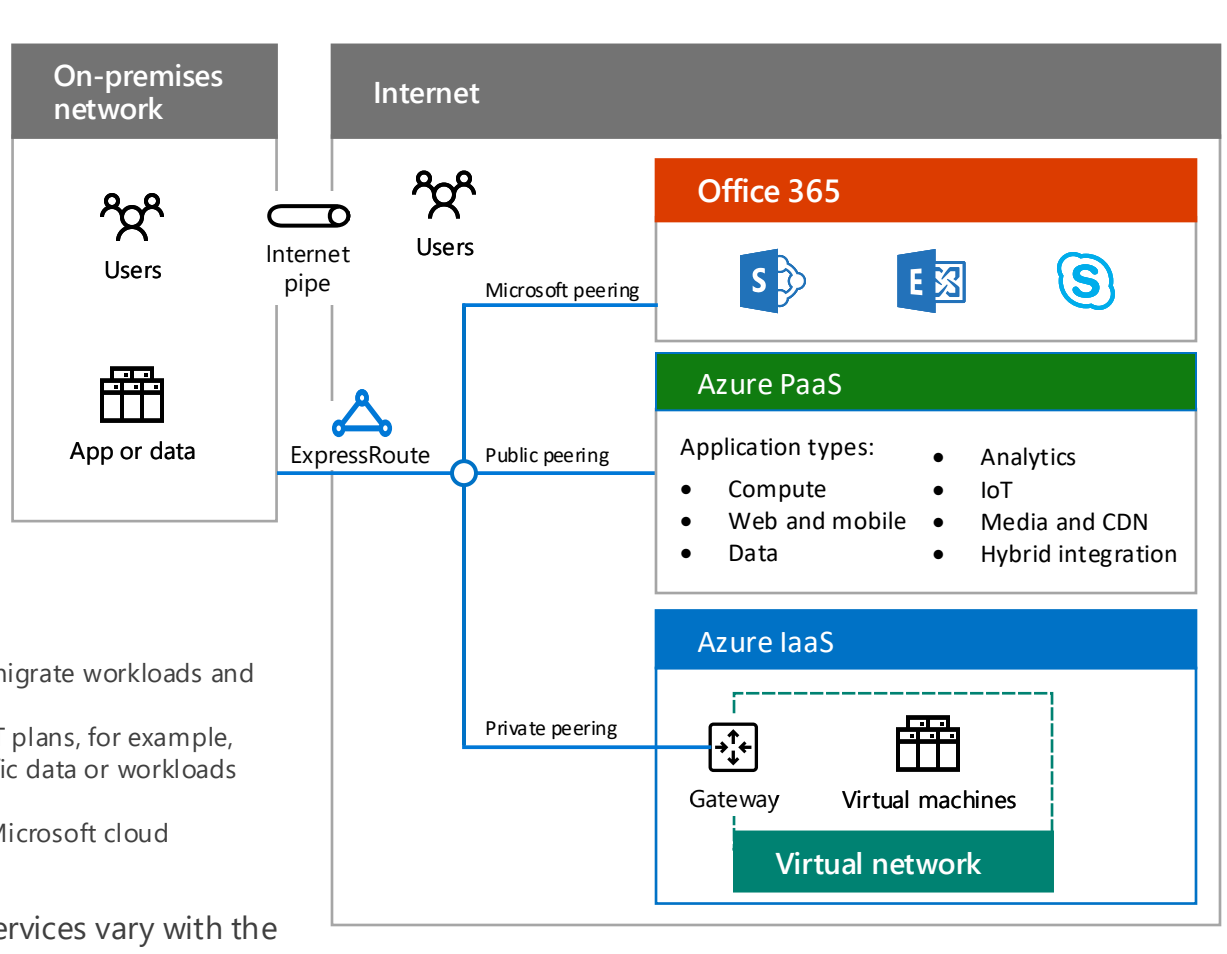
Microsoft hybrid cloud

Microsoft hybrid cloud is a set of business scenarios that combine a Microsoft cloud platform with an on-premises component, such as:

- Getting search results from content both in an on-premises SharePoint farm and in SharePoint Online in Office 365.
- A mobile app running in Azure that queries an on-premises data store.
- An intranet IT workload running on Azure virtual machines.

Because Microsoft has the most complete cloud solution in the marketplace—including Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)—you can:

- Leverage your existing on-premises investments as you migrate workloads and applications to the cloud.
- Incorporate hybrid cloud scenarios into your long-term IT plans, for example, when regulations or policies do not permit moving specific data or workloads to the cloud.
- Create additional hybrid scenarios that include multiple Microsoft cloud services and platforms.



Scenarios for hybrid cloud with Microsoft cloud services vary with the platform.

SaaS
Software as a Service

Microsoft SaaS services include Office 365, Microsoft Intune, and Microsoft Dynamics 365. Hybrid cloud scenarios with Microsoft SaaS combine these services with on-premises services or applications. For example, Exchange Online running in Office 365 can be integrated with Skype for Business 2019 that is deployed on-premises.

Azure PaaS
Platform as a Service

Microsoft Azure PaaS services allow you to create cloud-based applications. Hybrid cloud scenarios with Azure PaaS services combine an Azure PaaS app with on-premises resources or applications. For example, an Azure PaaS app could securely query an on-premises data store for information needed to display to mobile app users.

Azure IaaS
Infrastructure as a Service

Azure IaaS services allow you to build and run server-based IT workloads in the cloud, rather than in your on-premises datacenter. Hybrid cloud scenarios with Azure IaaS services typically consist of an IT workload that runs on virtual machines that is transparently connected to your on-premises network. Your on-premises users will not notice the difference.

Elements of hybrid cloud

You must account for the following elements when planning and implementing hybrid cloud scenarios with Microsoft cloud platforms and services.

Networking

Networking for hybrid cloud scenarios includes the connectivity to Microsoft cloud platforms and services and enough bandwidth to be performant under peak loads.

Microsoft Cloud Networking for Enterprise Architects

Identity

Identity for SaaS and Azure PaaS hybrid scenarios can include Azure AD as a common identity provider, which can be synchronized with your on-premises Windows Server AD, or federated with Windows Server AD or other identity providers. You can also extend your on-premises Identity infrastructure to Azure IaaS.

Microsoft Cloud Identity for Enterprise Architects

Security

Security for hybrid cloud scenarios includes protection and management for your identities, data protection, administrative privilege management, threat awareness, and the implementation of governance and security policies.

Microsoft Cloud Security for Enterprise Architects

Management

Management for hybrid cloud scenarios includes the ability to maintain settings, data, accounts, policies, and permissions and to monitor the ongoing health of the elements of the scenario and its performance. You can also use the same tool set, such as Systems Management Server, for managing virtual machines in Azure IaaS.

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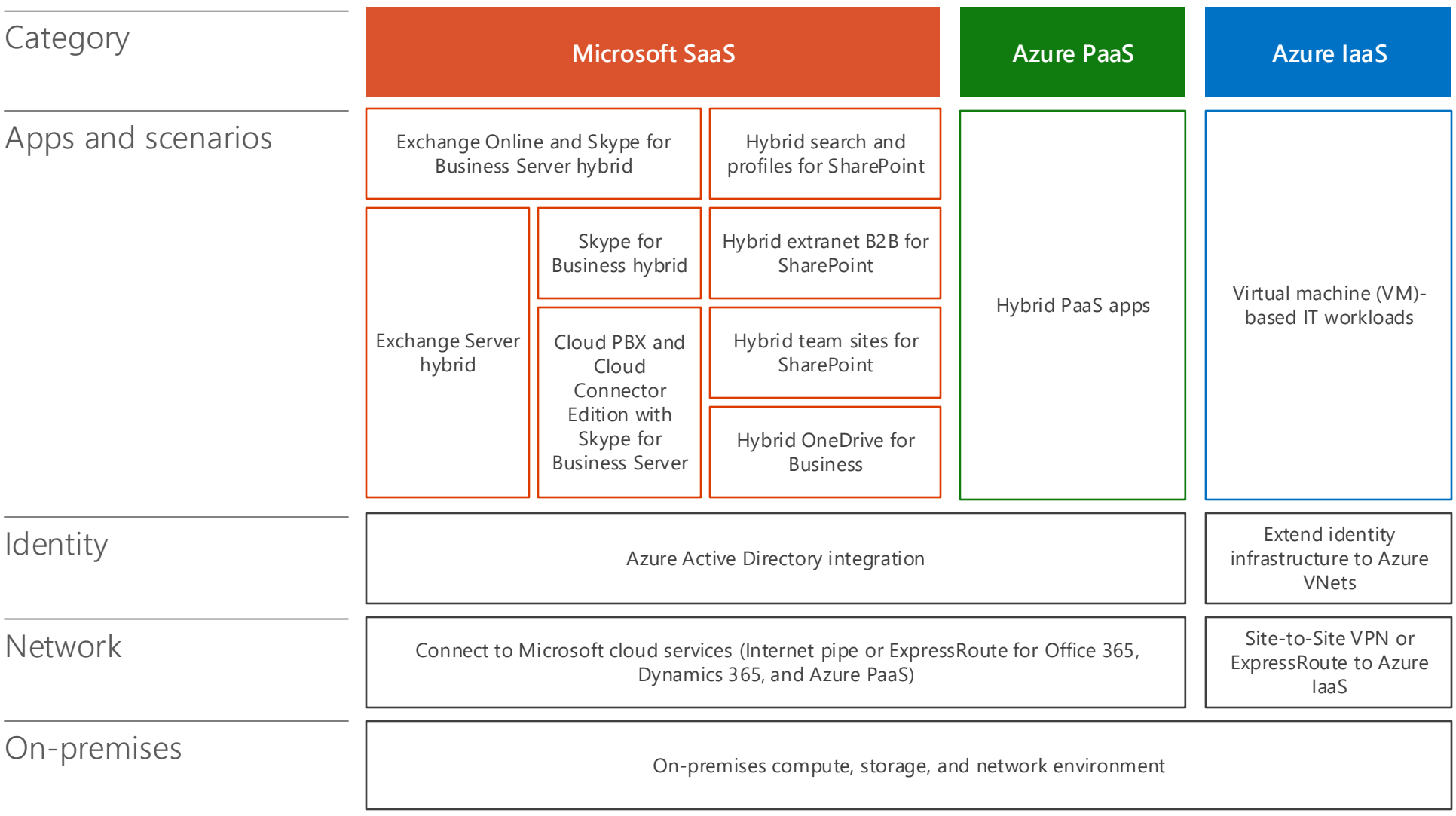
Architecture of Microsoft hybrid cloud scenarios

Use an architectural approach to plan and implement hybrid cloud scenarios with Microsoft cloud services and platforms.



The **Apps and scenarios** layer contains the specific hybrid cloud scenarios that are detailed in topics 3-5 of this model. The **Identity**, **Network**, and **On-premises** layers can be common to the categories of cloud service (SaaS, PaaS, or IaaS).

On-premises

On-premises infrastructure for hybrid scenarios can include servers for SharePoint, Exchange, Skype for Business, and line of business applications. It can also include data stores (databases, lists, files). Without ExpressRoute connections, access to the on-premises data stores must be allowed through a reverse proxy or by making the server or data accessible on your DMZ or extranet.

Network

There are two choices for connectivity to Microsoft cloud platforms and services: your existing Internet pipe and ExpressRoute. Use an ExpressRoute connection if predictable performance is important. You can use one ExpressRoute connection to connect directly to Microsoft SaaS services (Office 365 and Dynamics Online CRM), Azure PaaS services, and Azure IaaS services.

Identity

For cloud identity infrastructure, there are two ways to go, depending on the Microsoft cloud platform. For SaaS and Azure IaaS, integrate your on-premises identity infrastructure with Azure AD or federate with your on-premises identity infrastructure or third-party identity providers. For VMs running in Azure, you can extend your on-premises identity infrastructure, such as Windows Server AD, to the virtual networks (VNets) where your VMs reside.

Hybrid cloud scenarios for the three-phase cloud adoption process

Many enterprises, including Microsoft's, use a three-phase approach to adopting the cloud. Hybrid cloud scenarios can play a role in each phase.

1. **Move productivity workloads to SaaS**

   For productivity workloads that currently are or must stay on-premises, hybrid scenarios allow them to be integrated with their cloud counterparts.

2. **Develop new and modern applications in Azure PaaS**

   Azure PaaS hybrid applications can securely leverage on-premises server or storage resources.

3. **Move existing applications to Azure IaaS**

   For lift-and-shift and build-in-the-cloud scenarios, server-based applications running on Azure VMs provide easy provisioning and scaling.

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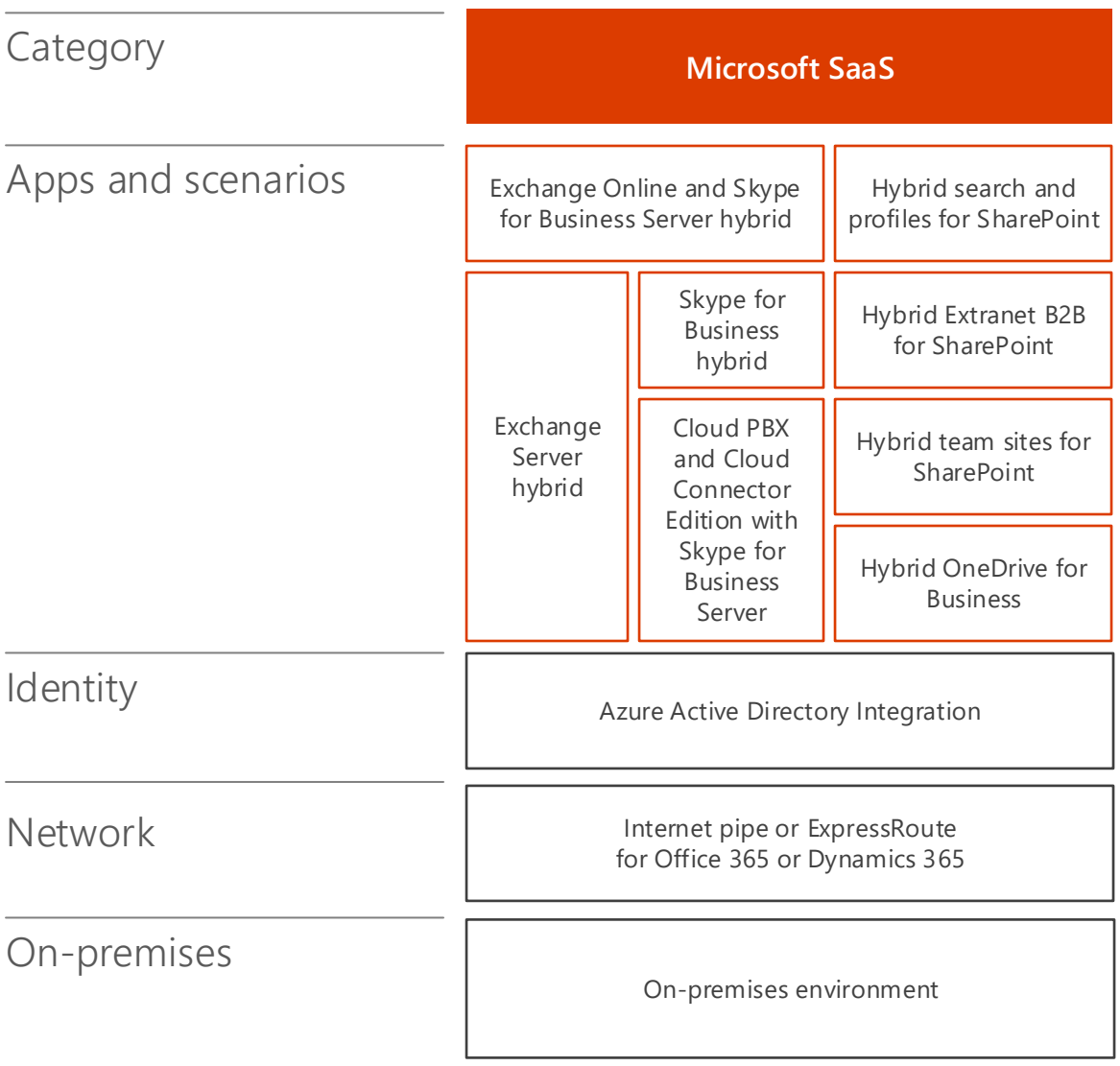
Hybrid cloud scenarios for Microsoft SaaS (Office 365)

Combine on-premises deployments of Exchange, SharePoint, or Skype for Business with their counterparts in Office 365 as part of a cloud migration or long-term integration strategy.

Microsoft SaaS hybrid scenario architecture



There are a variety of SaaS-based hybrid scenarios, aligning around Office server products and their Office 365 counterparts:

- Exchange Server combined with Exchange Online (Exchange Server hybrid)
- Skype for Business Server combined with Skype for Business Online and the new Cloud PBX and Cloud Connector Edition scenarios
- SharePoint Server 2016 or SharePoint Server 2013 combined with SharePoint Online (multiple scenarios)

There is also Exchange Online with Skype for Business Server on-premises, a cross-product hybrid scenario.

Can include directory synchronization with your on-premises Windows Server AD. Alternately, you can configure Azure AD to federate with a third-party identity provider.

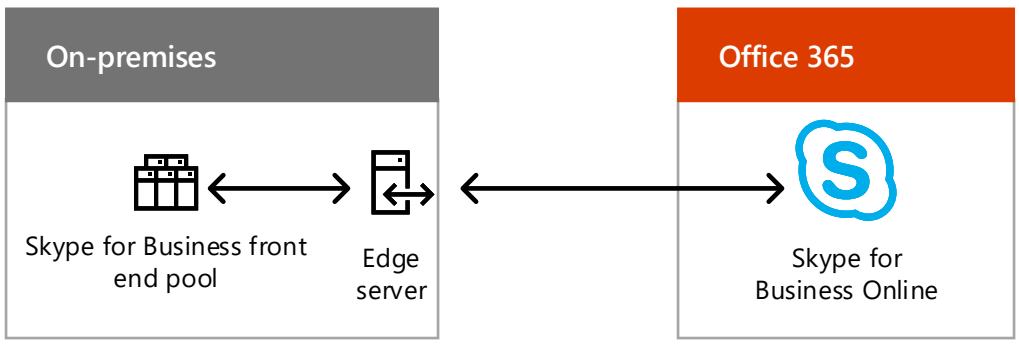
Consists of either your existing Internet pipe or an ExpressRoute connection with Microsoft peering for Office 365 or Dynamics 365.

Can consist of existing servers for Exchange, SharePoint, and Skype for Business, which should be updated to their latest versions. You can then combine them with their Office 365 counterparts for hybrid scenarios.

The subsequent sections of this topic show the key SaaS-based hybrid cloud scenarios.

Office 365 Test Lab Guides

Skype for Business Hybrid



Skype for Business Hybrid allows you to combine an existing on-premises deployment with Skype for Business Online.

Some users are homed on-premises and some users are homed online, but the users share the same Session Initiation Protocol (SIP) domain, such as contoso.com.

You can use this hybrid configuration to migrate from on-premises to Office 365 over time, on your schedule.

Skype for Business can also be integrated with Exchange Online.

Plan hybrid connectivity between Skype for Business Server and Skype for Business Online

Integration with Exchange and SharePoint

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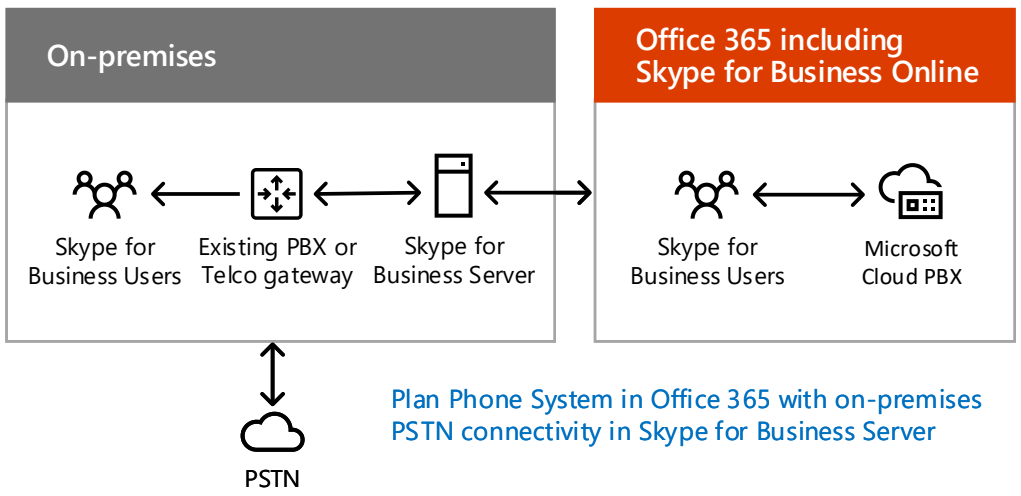
Cloud PBX with Skype for Business Server



Plan Phone System in Office 365 with on-premises PSTN connectivity in Skype for Business Server

Cloud PBX with Skype for Business Server allows you to transition an existing Skype for Business Server on-premises deployment to a topology with on-premises Public Switched Telephone Network (PSTN) connectivity.

Users in the organization who are homed in the cloud can receive private branch exchange (PBX) services from the Microsoft cloud that include signaling and voicemail, but PSTN connectivity (dial tone) is provided through Enterprise Voice from your on-premises Skype for Business Server deployment.

This is a great example of a hybrid configuration that allows you to gradually migrate to a cloud-based service. You can retain your users' voice capabilities as you begin to move them to Skype for Business Online. You can move your users at your own pace, knowing that their voice features will continue no matter where they are homed.

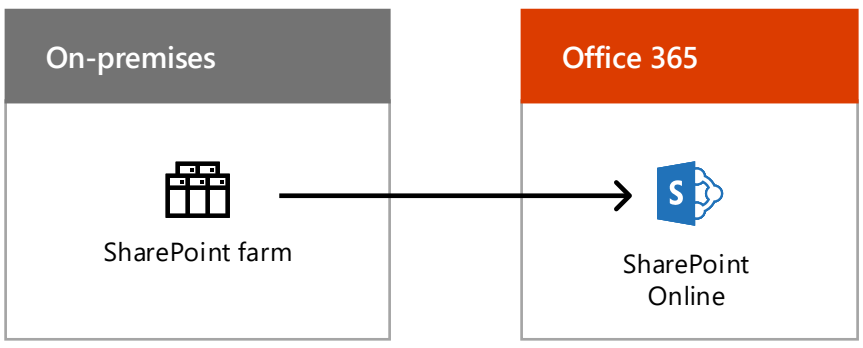
Skype for Business Cloud Connector Edition

If you do not already have an existing Lync Server or Skype for Business Server deployment, you can use Skype for Business Cloud Connector Edition, a set of packaged virtual machines (VMs) that implement on-premises PSTN connectivity with Cloud PBX.

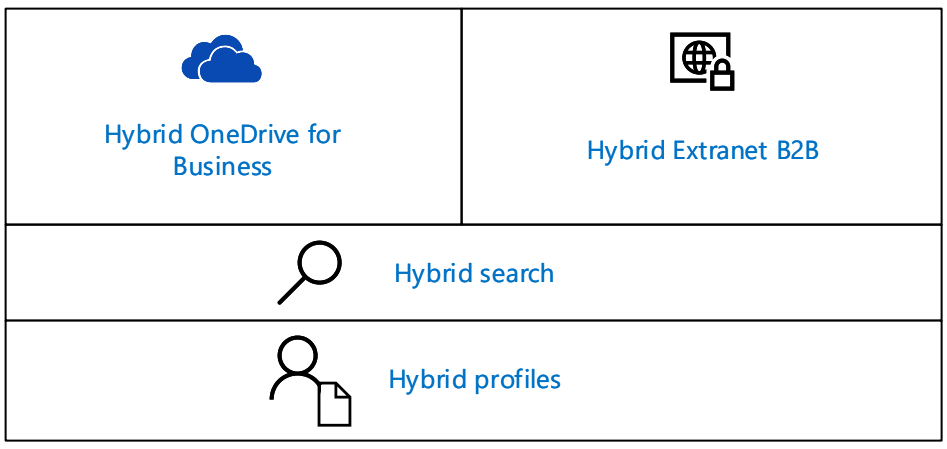
Plan for Skype for Business Cloud Connector Edition

SharePoint Hybrid

SharePoint hybrid combines SharePoint Online in Office 365 with your on-premises SharePoint farm for a best of both worlds, connected experience.



SharePoint hybrid scenarios

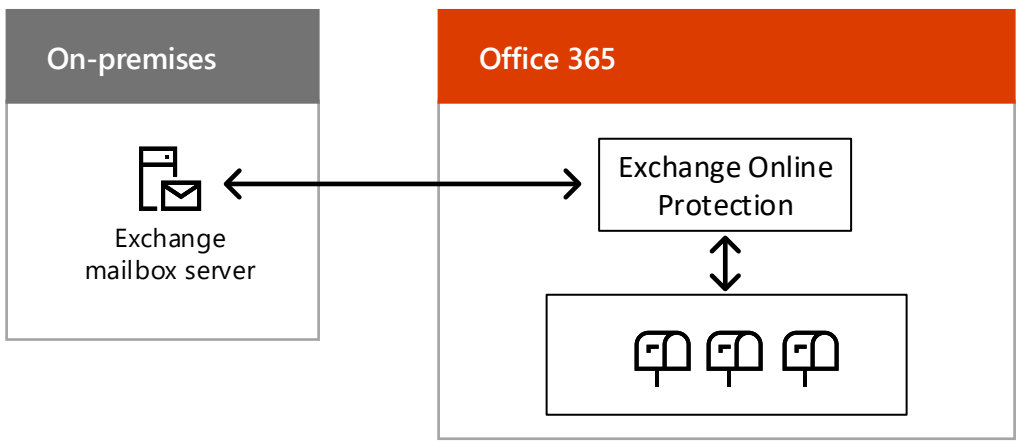


Additional SharePoint hybrid scenarios

Hybrid Picker	Extensible hybrid app launcher
It is easy to enable hybrid scenarios using the wizards that automate hybrid configuration, available from the SharePoint Online admin center in Office 365.	Allows users to view and use Office 365 video and Delve apps and experiences within the pages of their on-premises SharePoint farm.

All of these SharePoint hybrid scenarios, except the Extensible hybrid app launcher, are available for both SharePoint 2016 and SharePoint 2013 users.

Exchange Server 2016 Hybrid



Exchange Server Hybrid Deployments

With Exchange Server 2016 Hybrid, you can realize the benefits of Exchange Online in Office 365 for online users while on-premises users continue to use existing Exchange Server infrastructure.

Some users have an on-premises email server and some users use Exchange Online, but all users share the same e-mail address space.

This hybrid configuration:

- Leverages your existing Exchange Server infrastructure while you migrate to Exchange Online over time, on your schedule.
- Allows you to support remote sites without investing in branch office infrastructure.
- Allows you to route incoming Internet email through Exchange Online Protection in Office 365.
- Serves the needs of multinational organizations with subsidiaries that require data to reside on-premises.

You can also integrate this hybrid configuration with other Microsoft Office 365 applications, including Skype for Business Online and SharePoint Online.

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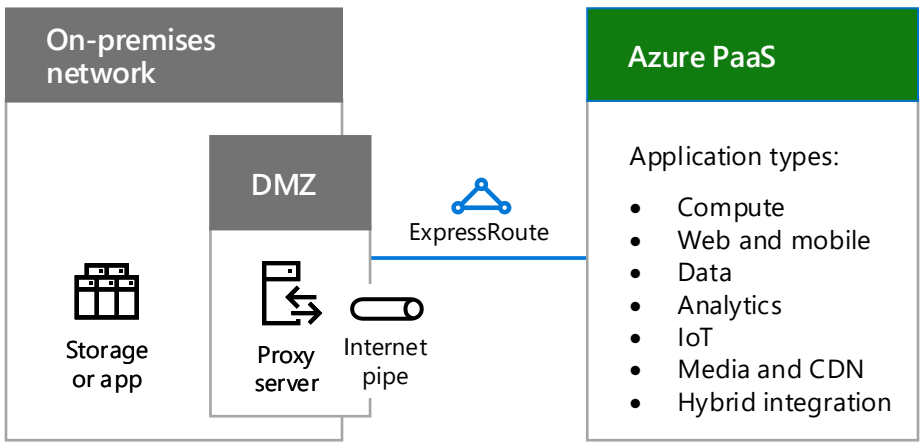
Hybrid cloud scenarios for Azure PaaS

Combine on-premises data or computing resources with new or converted applications running in Azure PaaS, which can take advantage of cloud performance, reliability, and scale and provide better support for mobile users.

Azure PaaS hybrid scenario architecture

	Azure PaaS	
Apps and scenarios	Hybrid PaaS apps	A hybrid PaaS application runs in Azure and uses on-premises compute or storage resources.
Identity	Azure Active Directory integration	Consists of either directory synchronization or federation with a third-party identity provider.
Network	Internet pipe or ExpressRoute to Azure PaaS	Consists of either your existing Internet pipe or an ExpressRoute connection with public peering to Azure PaaS. You must include a way for the Azure PaaS application to access the on-premises compute or storage resource.
On-premises	On-premises environment	Consists of identity and security infrastructure and existing line of business (LOB) applications or database servers, which an Azure PaaS application can securely access.

Azure PaaS hybrid application



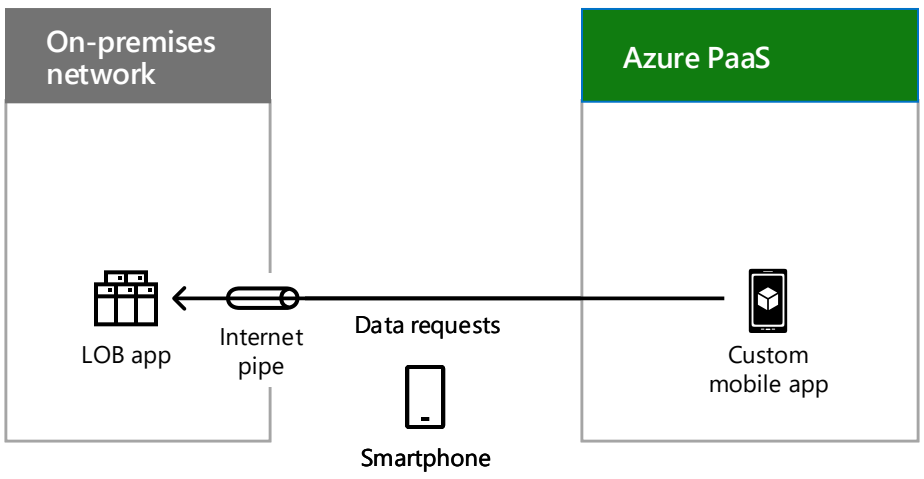
An organization can make its compute or storage resources available to the Azure PaaS hybrid application by:

- Hosting the resource on servers in the DMZ.
- Hosting a reverse proxy server in the DMZ, which allows authenticated, inbound, HTTPS-based requests to the resource that is located on-premises.

The Azure app can use credentials from:

- Azure AD, which can be synchronized with your on-premises identity provider, such as Windows Server AD.
- A third-party identity provider.

Example Azure PaaS hybrid application



This example Azure PaaS hybrid application is a custom mobile app that provides up-to-date contact information on employees. The end-to-end hybrid scenario consists of:

- A smartphone app that requires validated, on-premises credentials to run.
- A custom mobile app running in Azure PaaS, which requests information about specific employees based on queries from a user's smartphone app.
- A reverse proxy server in the DMZ that validates the custom mobile app and forwards the request.
- An LOB application server farm that services the contact request, subject to the permissions of the user's account.

Because the on-premises identity provider has been synchronized with Azure AD, both the custom mobile app and the LOB app can validate the requesting user's account name.

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Hybrid cloud scenarios for Azure IaaS

Extend your on-premises computing and identity infrastructure into the cloud by hosting IT workloads running in cross-premises Azure virtual networks (VNets).

Azure IaaS hybrid scenario architecture

	Azure IaaS	
Apps and scenarios	VM-based IT workloads	An IT workload is typically a multi-tier, highly-available application composed of Azure virtual machines (VMs).
Identity	Extend your identity infrastructure to Azure VNets	Add identity servers, such as Windows Server AD domain controllers, to the set of servers running in Azure VNets for local authentication.
Network	Site-to-Site VPN or ExpressRoute to Azure IaaS	Use either a site-to-site VPN connection over the Internet or an ExpressRoute connection with private peering to Azure IaaS.
On-premises	On-premises environment	Contains identity servers that are synchronized with the identity servers running in Azure. Can also contain resources that VMs running in Azure can access, such as storage and systems management infrastructure.

Directory Synchronization server for Office 365

A directory synchronization server for Office 365 synchronizes the list of accounts in Windows Server AD with the Azure AD tenant of an Office 365 subscription.

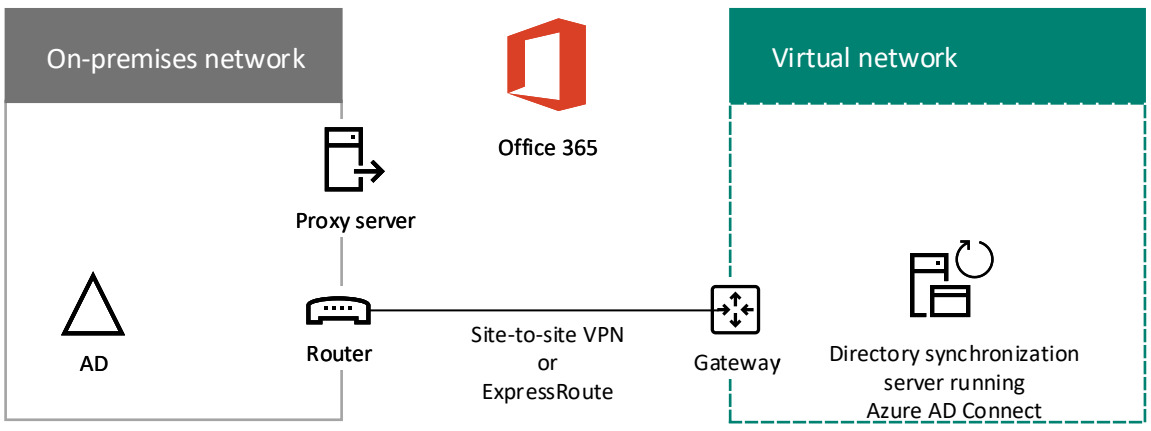
A directory synchronization server is a Windows-based server that runs Azure AD Connect. For faster provisioning or to reduce the number of on-premises servers in your organization, deploy your directory synchronization in a virtual network (VNet) in Azure IaaS.

You connect your organization network to the Azure VNet with a site-to-site (S2S) VPN or ExpressRoute connection.

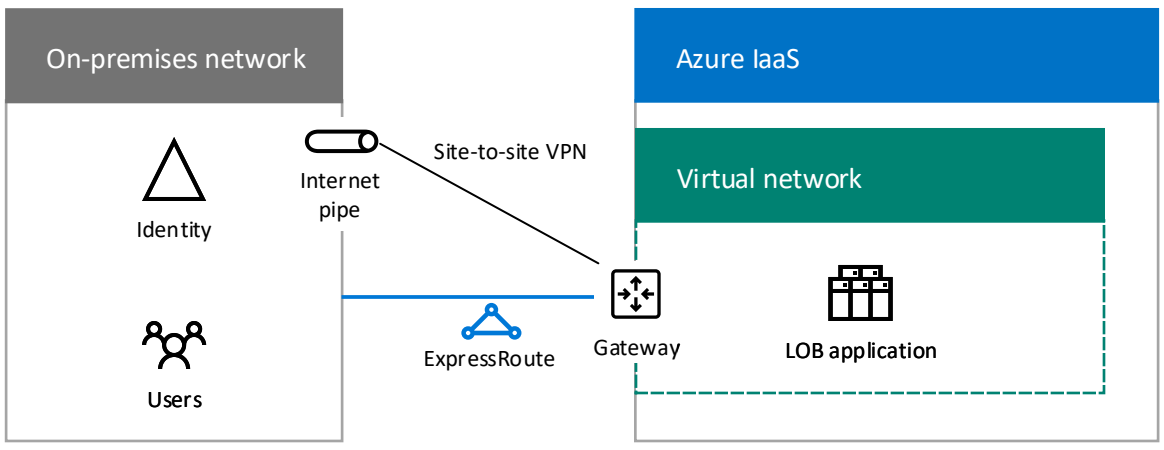
The directory synchronization server polls Windows Server AD for changes and then synchronizes them with the Office 365 subscription.

Deploy Office 365 Directory Synchronization in Azure

Running your directory synchronization server from an Azure VNet is an example of extending your computing and identity infrastructure to the cloud.



Line of business (LOB) application



You can create LOB applications running on Azure VMs, which reside on subnets of an Azure VNet in an Azure datacenter (also known as a location).

Because you are essentially extending your on-premises infrastructure to Azure, you must assign unique private address space to your VNets and update your on-premises routing tables to ensure reachability to each VNet.

Once connected, these VMs can be managed with remote desktop connections or with your systems management software, just like your on-premises servers.

By configuring publicly-exposed ports, these VMs can also be accessed from the Internet by mobile or remote users.

Simulated cross-premises virtual network in Azure

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Attributes of LOB applications hosted on Azure VMs

Multiple tiers

Typical LOB applications use a tiered approach. Sets of servers provide identity, database processing, application and logic processing, and front-end web servers for employee or customer access.

High availability

Typical LOB applications provide high availability by using multiple servers in each tier. Azure IaaS provides a 99.9% uptime SLA for servers in Azure availability sets.

Load distribution

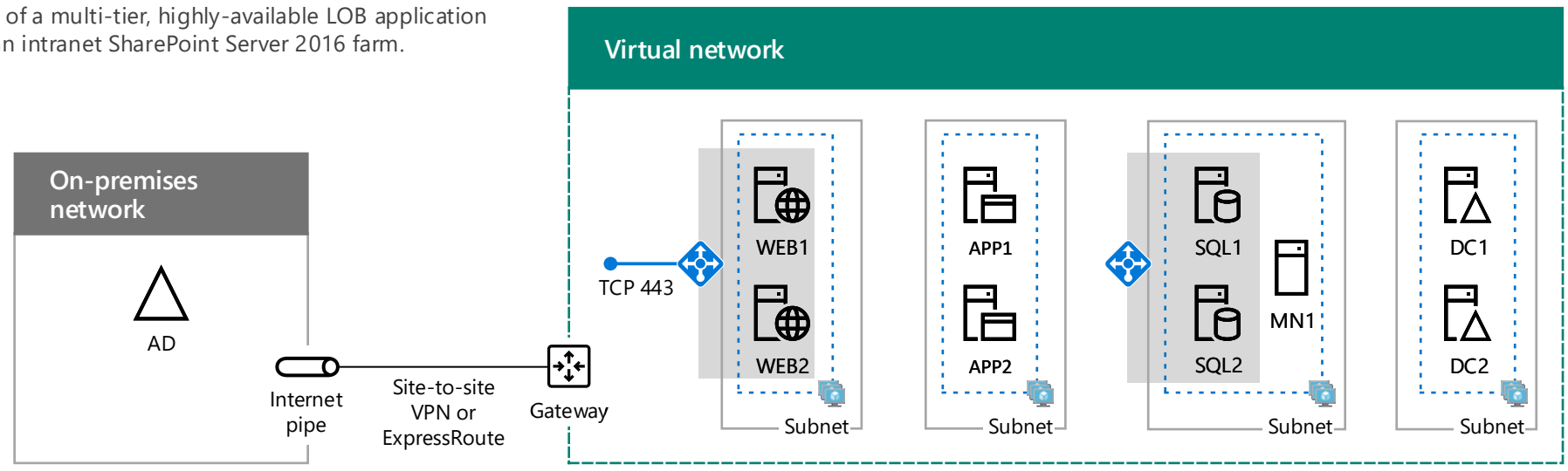
To distribute the load of network traffic among multiple servers in a tier, you can use an Internet-facing or internal Azure load balancer. Or, you can use a dedicated load balancer appliance available from the Azure marketplace.

Security

To protect servers from unsolicited incoming traffic from the Internet, you can use Azure network security groups. You can define allowed or denied traffic for a subnet or the network interface of an individual virtual machine.

SharePoint Server 2016 farm in Azure

An example of a multi-tier, highly-available LOB application in Azure is an intranet SharePoint Server 2016 farm.



Tiers: Servers running different roles within the farm create the tiers and each tier has its own subnet.

High-availability: Achieved by using more than one server in each tier and placing all the servers of a tier in the same availability set.

Load distribution: Internal Azure load balancers distribute the incoming client web traffic to the front-end servers (WEB1 and WEB2) and to the SQL Server cluster (SQL1 and SQL2).

Security: Network security groups for each subnet let you to configure allowed inbound and outbound traffic.

1 **Evaluate and experiment**

Understand the benefits of running SharePoint Server 2016 in Azure and build a simulated dev/test environment.

SharePoint Server 2016 in Microsoft Azure

Intranet SharePoint Server 2016 in Azure dev/test environment

2 **Design**

Step through a process to determine the set of Azure IaaS networking, compute, and storage elements to host your farm and their settings.

Designing a SharePoint Server 2016 farm in Azure

3 **Deploy**

Step through the end-to-end configuration of the high-availability farm in five phases.

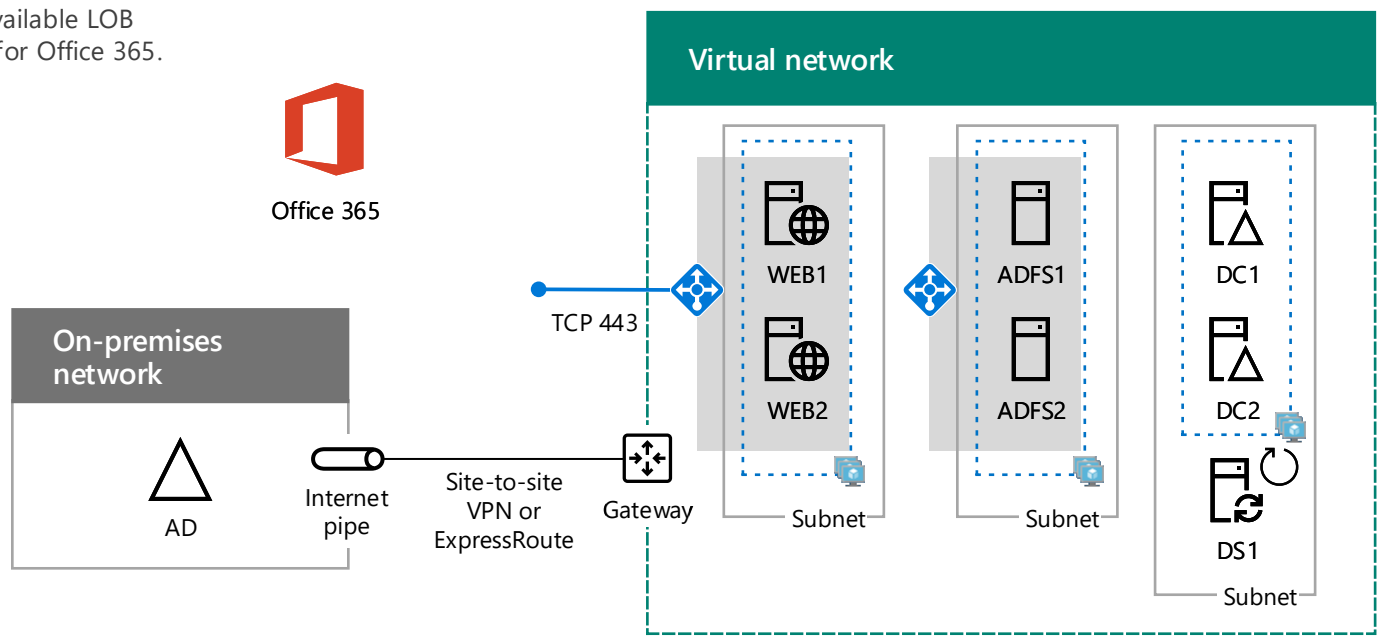
Deploying SharePoint Server 2016 with SQL Server AlwaysOn Availability Groups in Azure

Federated identity for Office 365 in Azure

Another example of a multi-tier, highly-available LOB application in Azure is federated identity for Office 365.

Tiers: There are tiers for web proxy servers, Active Directory Federation Services (AD FS) servers, and Windows Server AD domain controllers.

Load distribution: An external Azure load balancer distributes the incoming client authentication requests to the web proxies and an internal Azure load balancer distributes authentication requests to the AD FS servers.



1 **Evaluate and experiment**

Build a simulated dev/test environment for federated authentication with Office 365.

Federated identity for your Office 365 dev/test environment

2 **Deploy**

Step through the end-to-end configuration of the high availability AD FS infrastructure in five phases.

Deploy high availability federated authentication for Office 365 in Azure