

Lab 5 Task 1,

The module assessment is is unit 13.

## 1. Introduction

Unit 1 of 14

Ask Learn

# Introduction

1 minute

This module introduces you to the compute and networking services of Azure. You learn about three of the compute options (virtual machines, containers, and Azure functions). You also learn about some of the networking features, such as Azure virtual networks, Azure DNS, and Azure ExpressRoute.

## Learning objectives

After completing this module, you'll be able to:

- Compare compute types, including container instances, virtual machines, and functions.
- Describe virtual machine options, including virtual machines (VMs), virtual machine scale sets, virtual machine availability sets, and Azure Virtual Desktop.
- Describe resources required for virtual machines.
- Describe application hosting options, including Azure Web Apps, containers, and virtual machines.
- Describe virtual networking, including the purpose of Azure Virtual Networks, Azure virtual subnets, peering, Azure DNS, VPN Gateway, and ExpressRoute.
- Define public and private endpoints.

### Next unit: Describe Azure virtual machines

Next >

Having an issue? We can help!

- For issues related to this module, explore existing questions using the [#azure training tag](#) or ask a question on Microsoft Q&A. If you're asking a question, under Tags select *Azure* then *Azure Training*.
- For issues related to Certifications and Exams, post on [Certifications Support Forums](#) or visit our [Credentials Help](#).

## 2. Describe Azure virtual machines

Unit 2 of 14

Ask Learn

## Describe Azure virtual machines

6 minutes

100 XP

With Azure Virtual Machines (VMs), you can create and use VMs in the cloud. VMs provide infrastructure as a service (IaaS) in the form of a virtualized server and can be used in many ways. Just like a physical computer, you can customize all of the software running on your VM. VMs are an ideal choice when you need:

- Total control over the operating system (OS).
- The ability to run custom software.
- To use custom hosting configurations.

An Azure VM gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs the VM. However, as an IaaS offering, you still need to configure, update, and maintain the software that runs on the VM.

You can even create or use an already created image to rapidly provision VMs. You can create and provision a VM in minutes when you select a preconfigured VM image. An image is a template used to create a VM and may already include an OS and other software, like development tools or web hosting environments.

## Scale VMs in Azure

You can run single VMs for testing, development, or minor tasks. Or you can group VMs together to provide high availability, scalability, and redundancy. Azure can also manage the grouping of VMs for you with features such as scale sets and availability sets.

### Virtual machine scale sets

Virtual machine scale sets let you create and manage a group of identical, load-balanced VMs. If you simply created multiple VMs with the same purpose, you'd need to ensure they were all configured identically and then set up network routing parameters to ensure efficiency. You'd also have to monitor the utilization to determine if you need to increase or decrease the number of VMs.

Instead, with virtual machine scale sets, Azure automates most of that work. Scale sets allow you to centrally manage, configure, and update a large number of VMs in minutes. The number of VM instances can automatically increase or decrease in response to demand, or you can set it to scale based on a defined schedule. Virtual machine scale sets also automatically deploy a load balancer to make sure that your resources are being used efficiently. With virtual machine scale sets, you can build large-scale services for areas such as compute, big data, and container workloads.

### Virtual machine availability sets

### 3. Exercise - Create an Azure virtual machine

Unit 3 of 14

Ask Learn

## Exercise - Create an Azure virtual machine

10 minutes


100 XP

### Verify your account

Please solve this puzzle so we know you are a real person

Start Puzzle

388184215ee452ba3.7892202004

  
Audio

In this exercise, you create an Azure virtual machine (VM) and install Nginx, a popular web server.

You could use the Azure portal, the Azure CLI, Azure PowerShell, or an Azure Resource Manager (ARM) template.

In this instance, you're going to use the Azure CLI.

### Task 1: Create a Linux virtual machine and install Nginx

Use the following Azure CLI commands to create a Linux VM and install Nginx. After your VM is created, you'll use the Custom Script Extension to install Nginx. The Custom Script Extension is an easy way to download and run scripts on your Azure VMs. It's just one of the many ways you can configure the system after your VM is up and running.

1. From Cloud Shell, run the following `az vm create` command to create a Linux VM:

Azure Cloud Shell

This module requires a sandbox to complete. A [sandbox](#) gives you access to only be used to complete training on Microsoft Learn. Use for any other re sandbox.

Microsoft provides this lab experience and related content for educational solely for learning about the covered products and services in this Micros

#### 4. Describe Azure virtual desktop

Unit 4 of 14

Ask Learn

## Describe Azure virtual desktop

✓ 100 XP

5 minutes

Another type of virtual machine is the Azure Virtual Desktop. Azure Virtual Desktop is a desktop and application virtualization service that runs on the cloud. It enables you to use a cloud-hosted version of Windows from any location. Azure Virtual Desktop works across devices and operating systems, and works with apps that you can use to access remote desktops or most modern browsers.

The following video gives you an overview of Azure Virtual Desktop:



### Enhance security

Azure Virtual Desktop provides centralized security management for users' desktops with Microsoft Entra ID. You can enable multifactor authentication to secure user sign-ins. You can also secure access to data by assigning granular role-based access controls (RBACs) to users.

With Azure Virtual Desktop, the data and apps are separated from the local hardware. The actual desktop and apps are running in the cloud, meaning the risk of confidential data being left on a personal device is reduced. Additionally, user sessions are isolated in both single and multi-session environments.

### Multi-session Windows 10 or Windows 11 deployment

Azure Virtual Desktop lets you use Windows 10 or Windows 11 Enterprise multi-session, the only Windows client-based operating system that enables multiple concurrent users on a single VM. Azure Virtual Desktop also provides a more consistent experience with broader application support compared to Windows Server-based operating systems.

## 5. Describe Azure containers

Unit 5 of 14 ▾

Ask Learn

### Describe Azure containers

✓ 100 XP

6 minutes

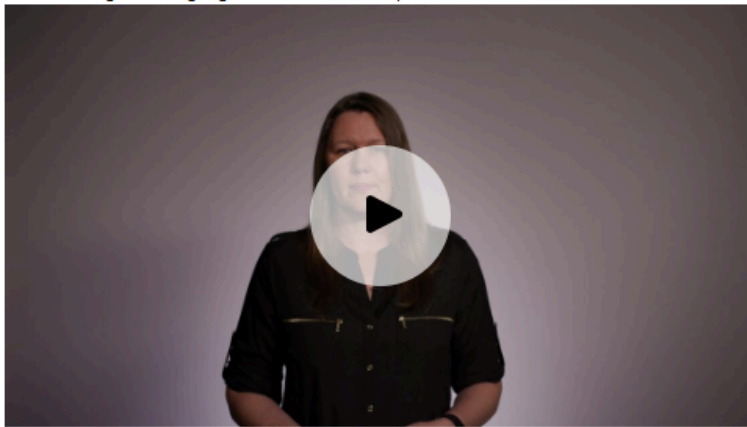
While virtual machines are an excellent way to reduce costs versus the investments that are necessary for physical hardware, they're still limited to a single operating system per virtual machine. If you want to run multiple instances of an application on a single host machine, containers are an excellent choice.

#### What are containers?

Containers are a virtualization environment. Much like running multiple virtual machines on a single physical host, you can run multiple containers on a single physical or virtual host. Unlike virtual machines, you don't manage the operating system for a container. Virtual machines appear to be an instance of an operating system that you can connect to and manage. Containers are lightweight and designed to be created, scaled out, and stopped dynamically. It's possible to create and deploy virtual machines as application demand increases, but containers are a lighter weight, more agile method. Containers are designed to allow you to respond to changes on demand. With containers, you can quickly restart if there's a crash or hardware interruption. One of the most popular container engines is Docker, and Azure supports Docker.

#### Compare virtual machines to containers

The following video highlights several of the important differences between virtual machines and containers:



#### Azure Container Instances

Azure Container Instances offer the fastest and simplest way to run a container in Azure; without having to manage any virtual machines or adopt any additional services. Azure Container Instances are a platform as a service (PaaS) offering. Azure Container Instances allow you to upload your containers and then the service runs the containers for you.

## 6. Describe Azure functions

Unit 6 of 14

Ask Learn


# Describe Azure functions

4 minutes

100 XP

Azure Functions is an event-driven, serverless compute option that doesn't require maintaining virtual machines or containers. If you build an app using VMs or containers, those resources have to be "running" in order for your app to function. With Azure Functions, an event wakes the function, alleviating the need to keep resources provisioned when there are no events.

## Serverless computing in Azure



## Benefits of Azure Functions

Using Azure Functions is ideal when you're only concerned about the code running your service and not about the underlying platform or infrastructure. Functions are commonly used when you need to perform work in response to an event (often via a REST request), timer, or message from another Azure service, and when that work can be completed quickly, within seconds or less.

Functions scale automatically based on demand, so they may be a good choice when demand is variable.

Azure Functions runs your code when it triggers and automatically deallocates resources when the function is finished. In this model, Azure only charges you for the CPU time used while your function runs.

Functions can be either stateless or stateful. When they're stateless (the default), they behave as if they restart every time they respond to an event. When they're stateful (called Durable Functions), a context is passed through the function to track prior activity.

Functions are a key component of serverless computing. They're also a general compute platform for running any type of code. If the needs of the developer's app change, you can deploy the project in an environment that isn't serverless. This flexibility allows you to manage scaling, run on virtual networks, and even completely isolate the functions.

## 7. Describe application hosting options

# Describe application hosting options

✓ 100 XP

3 minutes

If you need to host your application on Azure, you might initially turn to a virtual machine (VM) or containers. Both VMs and containers provide excellent hosting solutions. VMs give you maximum control of the hosting environment and allow you to configure it exactly how you want. VMs also may be the most familiar hosting method if you're new to the cloud. Containers, with the ability to isolate and individually manage different aspects of the hosting solution, can also be a robust and compelling option.

There are other hosting options that you can use with Azure, including Azure App Service.

## Azure App Service

App Service enables you to build and host web apps, background jobs, mobile back-ends, and RESTful APIs in the programming language of your choice without managing infrastructure. It offers automatic scaling and high availability. App Service supports Windows and Linux. It enables automated deployments from GitHub, Azure DevOps, or any Git repo to support a continuous deployment model.

Azure App Service is a robust hosting option that you can use to host your apps in Azure. Azure App Service lets you focus on building and maintaining your app, and Azure focuses on keeping the environment up and running.

Azure App Service is an HTTP-based service for hosting web applications, REST APIs, and mobile back ends. It supports multiple languages, including .NET, .NET Core, Java, Ruby, Node.js, PHP, or Python. It also supports both Windows and Linux environments.

## Types of app services

With App Service, you can host most common app service styles like:

- Web apps
- API apps
- WebJobs
- Mobile apps

App Service handles most of the infrastructure decisions you deal with in hosting web-accessible apps:

- Deployment and management are integrated into the platform.
- Endpoints can be secured.
- Sites can be scaled quickly to handle high traffic loads.
- The built-in load balancing and traffic manager provide high availability.

All of these app styles are hosted in the same infrastructure and share these benefits. This flexibility makes App Service the ideal choice to host web-oriented applications.

## Web apps

### 8. Describe Azure virtual networking

## Describe Azure virtual networking

100 XP

5 minutes

Azure virtual networks and virtual subnets enable Azure resources, such as VMs, web apps, and databases, to communicate with each other, with users on the internet, and with your on-premises client computers. You can think of an Azure network as an extension of your on-premises network with resources that link other Azure resources.

Azure virtual networks provide the following key networking capabilities:

- Isolation and segmentation
- Internet communications
- Communicate between Azure resources
- Communicate with on-premises resources
- Route network traffic
- Filter network traffic
- Connect virtual networks

Azure virtual networking supports both public and private endpoints to enable communication between external or internal resources with other internal resources.

- Public endpoints have a public IP address and can be accessed from anywhere in the world.
- Private endpoints exist within a virtual network and have a private IP address from within the address space of that virtual network.

### Isolation and segmentation

Azure virtual network allows you to create multiple isolated virtual networks. When you set up a virtual network, you define a private IP address space by using either public or private IP address ranges. The IP range only exists within the virtual network and isn't internet routable. You can divide that IP address space into subnets and allocate part of the defined address space to each named subnet.

For name resolution, you can use the name resolution service built into Azure. You also can configure the virtual network to use either an internal or an external DNS server.

### Internet communications

You can enable incoming connections from the internet by assigning a public IP address to an Azure resource, or putting the resource behind a public load balancer.

### Communicate between Azure resources

## 9. Exercise - Configure network access

Unit 9 of 14

Ask Learn

100 XP

### Exercise - Configure network access

10 minutes

#### Verify your account

Please solve this puzzle so we know you are a real person

Start Puzzle

9d279d76223294c2261110804



In this exercise, you configure the access to the virtual machine (VM) you created earlier in this module.

#### Important

The Microsoft Learn sandbox should still be running. If the sandbox timed out, you'll need to redo the previous exercise (Exercise - Create an Azure virtual machine).


To verify the VM you created previously is still running, use the following command:


Azure CLI

Copy

This module requires a sandbox to complete. A [sandbox](#) gives you access to Azure resources. Your Azure subscription will not be charged. The sandbox may only be used to complete training on Microsoft Learn. Use for any other reason is prohibited, and may result in permanent loss of access to the sandbox. Microsoft provides this lab experience and related content for educational purposes. All presented information is owned by Microsoft and intended solely for learning about the covered products and services in this Microsoft Learn module.

## 10. Describe Azure virtual private networks

Unit 10 of 14 

Ask Learn 

# Describe Azure virtual private networks

5 minutes

A virtual private network (VPN) uses an encrypted tunnel within another network. VPNs are typically deployed to connect two or more trusted private networks to one another over an untrusted network (typically the public internet). Traffic is encrypted while traveling over the untrusted network to prevent eavesdropping or other attacks. VPNs can enable networks to safely and securely share sensitive information.

## VPN gateways

A VPN gateway is a type of virtual network gateway. Azure VPN Gateway instances are deployed in a dedicated subnet of the virtual network and enable the following connectivity:

- Connect on-premises datacenters to virtual networks through a site-to-site connection.
- Connect individual devices to virtual networks through a point-to-site connection.
- Connect virtual networks to other virtual networks through a network-to-network connection.

All data transfer is encrypted inside a private tunnel as it crosses the internet. You can deploy only one VPN gateway in each virtual network. However, you can use one gateway to connect to multiple locations, which includes other virtual networks or on-premises datacenters.

When setting up a VPN gateway, you must specify the type of VPN - either policy-based or route-based. The primary distinction between these two types is how they determine which traffic needs encryption. In Azure, regardless of the VPN type, the method of authentication employed is a preshared key.

- Policy-based VPN gateways specify statically the IP address of packets that should be encrypted through each tunnel. This type of device evaluates every data packet against those sets of IP addresses to choose the tunnel where that packet is going to be sent through.
- In Route-based gateways, IPSec tunnels are modeled as a network interface or virtual tunnel interface. IP routing (either static routes or dynamic routing protocols) decides which one of these tunnel interfaces to use when sending each packet. Route-based VPNs are the preferred connection method for on-premises devices. They're more resilient to topology changes such as the creation of new subnets.

Use a route-based VPN gateway if you need any of the following types of connectivity:

- Connections between virtual networks
- Point-to-site connections
- Multisite connections
- Coexistence with an Azure ExpressRoute gateway

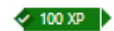
## High-availability scenarios

If you're configuring a VPN to keep your information safe, you also want to be sure that it's a highly available and fault

## 11. Describe Azure ExpressRoute



# Describe Azure ExpressRoute

 100 XP

4 minutes

Azure ExpressRoute lets you extend your on-premises networks into the Microsoft cloud over a private connection, with the help of a connectivity provider. This connection is called an ExpressRoute Circuit. With ExpressRoute, you can establish connections to Microsoft cloud services, such as Microsoft Azure and Microsoft 365. This feature allows you to connect offices, datacenters, or other facilities to the Microsoft cloud. Each location would have its own ExpressRoute circuit.

Connectivity can be from an any-to-any (IP VPN) network, a point-to-point Ethernet network, or a virtual cross-connection through a connectivity provider at a colocation facility. ExpressRoute connections don't go over the public Internet. This setup allows ExpressRoute connections to offer more reliability, faster speeds, consistent latencies, and higher security than typical connections over the Internet.

## Features and benefits of ExpressRoute

There are several benefits to using ExpressRoute as the connection service between Azure and on-premises networks.

- Connectivity to Microsoft cloud services across all regions in the geopolitical region.
- Global connectivity to Microsoft services across all regions with the ExpressRoute Global Reach.
- Dynamic routing between your network and Microsoft via Border Gateway Protocol (BGP).
- Built-in redundancy in every peering location for higher reliability.

## Connectivity to Microsoft cloud services

ExpressRoute enables direct access to the following services in all regions:

- Microsoft Office 365
- Microsoft Dynamics 365
- Azure compute services, such as Azure Virtual Machines
- Azure cloud services, such as Azure Cosmos DB and Azure Storage

## Global connectivity

You can enable ExpressRoute Global Reach to exchange data across your on-premises sites by connecting your ExpressRoute circuits. For example, say you had an office in Asia and a datacenter in Europe, both with ExpressRoute circuits connecting them to the Microsoft network. You could use ExpressRoute Global Reach to connect those two facilities, allowing them to communicate without transferring data over the public internet.

## Dynamic routing

ExpressRoute uses the BGP. BGP is used to exchange routes between on-premises networks and resources running in Azure. This protocol enables dynamic routing between your on-premises network and services running in the Microsoft cloud.

## 12. Describe Azure DNS


## 13. Module assessment

Unit 13 of 14

Ask Learn

### Module assessment

4 minutes



Module assessment passed

Great job! You passed the module assessment.

Score: 100%

Choose the best response for each question.

### Check your knowledge

1. Which Azure Virtual Machine feature staggers updates across VMs based on their update domain and fault domain?

☒ Availability sets

☐ Scale sets

☐ Update sets

2. Which Azure service allows users to use a cloud hosted version of Windows from any location and connect from most modern browsers?

☒ Azure Virtual Desktop

☐ Azure Virtual Machines

☐ Azure Container Instances

3. If you need connections between virtual networks, point-to-site connections, multisite connections, or coexistence with an Azure ExpressRoute gateway, which type of VPN gateway should you use?

☒ Route-based VPN gateway

☐ Policy-based VPN gateway

☐ Point-based VPN gateway

Next unit: Summary

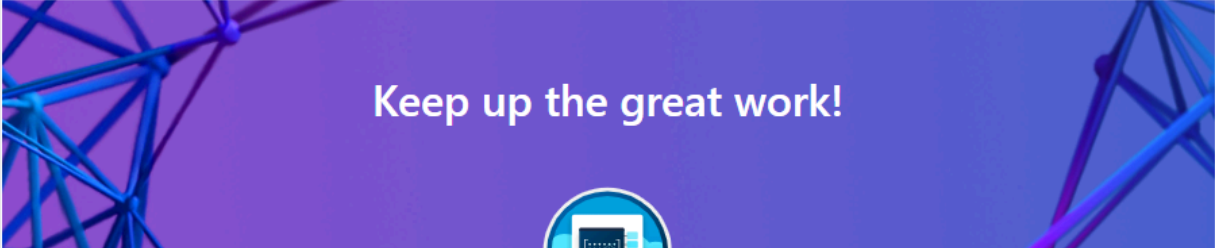
< Previous

Next >


## 14. Summary

Achievements

Ask Learn



# Keep up the great work!



Describe Azure compute and networking services

Module assessment passed






## You have earned an achievement!

Congratulations, but what should you do next?

---

### First, let's share your achievement

You put in the time to learn something new, let your network share in your victory!



---

### Don't lose your momentum, keep learning

Below you will find recommended content to help you along your path!

Next module in this learning path