



AZURE FUNDAMENTALS

Core Cloud Services – Introduction to Azure

-Microsoft Learning

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Introduction

You've heard buzzwords about the cloud — *scale, elasticity, microservices*. Perhaps you've seen other companies be successful with the cloud and wondered how it can help you meet your business challenges or even grow your career. Did you know that more than 90% of Fortune 500 companies run on the Microsoft Cloud?



The cloud helps power your everyday life, and it's often present in ways you don't even realize. In this new connected world, we believe technology creates opportunity. To keep up with today's ever-changing digital world, understanding cloud technology can help align your career to this exciting revolution.

In less than the time it takes to eat lunch, you'll create your first virtual machine on Azure and configure it to run a basic web site, a foundational building block of everything from digital transformation to the next big startup.

In this module, you will:

- Learn what Microsoft Azure is and how it relates to cloud computing
- Use Azure Cloud Shell to launch a Windows or Linux virtual machine
- Configure your virtual machine to run a basic web server
- Scale up your server to give you more compute power

What is Azure?

Azure is Microsoft's cloud computing platform. Azure is a continually expanding set of cloud services that help your organization meet your current and future business challenges. Azure gives you the freedom to build, manage, and deploy applications on a massive global network using your favorite tools and frameworks.

How does Azure work?

Before we go further, let's briefly define cloud computing.



What is cloud computing?

Cloud computing is the delivery of computing services over the Internet using a **pay-as-you-go** pricing model. Put another way, it's a way to rent compute power and storage from someone else's data center.

Instead of maintaining CPUs and storage in your data center, you rent them for the time that you need them. The cloud provider takes care of maintaining the underlying infrastructure for you.

You can treat cloud resources like you would your resources in your own data center. When you're done using them, you just give them back. You're billed only for what you use.

While this is all great, the real value of the cloud is that it enables you to quickly solve your toughest business challenges and bring cutting edge solutions to your users.

Why should I move to the cloud?



The cloud helps you move faster and innovate in ways that were once nearly impossible.

In our ever-changing digital world, two trends emerge:

- Teams are delivering new features to their users at record speeds.
- End users expect an increasingly rich and immersive experience with their devices and with software.

Software releases were once scheduled in terms of months or even years. Today, teams are releasing features in smaller batches. Releases are now often scheduled in terms of days or weeks. Some teams even deliver software updates continuously — sometimes with multiple releases within the same day.

Think of all the ways you interact with devices that you couldn't do just a few years ago. Many devices can recognize your face and respond to voice commands. Augmented reality changes the way you interact with the physical world. Household appliances are even beginning to act intelligently. These are just a few examples, many of which are powered by the cloud.

To power your services and deliver innovative and novel user experiences more quickly, the cloud provides on-demand access to:

- A nearly limitless pool of raw compute, storage, and networking components.
- Speech recognition and other cognitive services that help make your application stand out from the crowd.
- Analytics services that enable you to make sense of telemetry data coming back from your software and devices.

Let's see how Azure fits in with cloud computing.

What can I do on Azure?



Azure provides over 100 services that enable you to do everything from running your existing applications on virtual machines to exploring new software paradigms such as intelligent bots and mixed reality.

Many teams start exploring the cloud by moving their existing applications to virtual machines that run in Azure. While migrating your existing apps to virtual machines is a good start, the cloud is

more than just "a different place to run your virtual machines".

For example, Azure provides AI and machine-learning services that can naturally communicate with your users through vision, hearing, and speech. It also provides storage solutions that dynamically grow to accommodate massive amounts of data. Azure services enable solutions that are simply not feasible without the power of the cloud.

Tour of Azure services

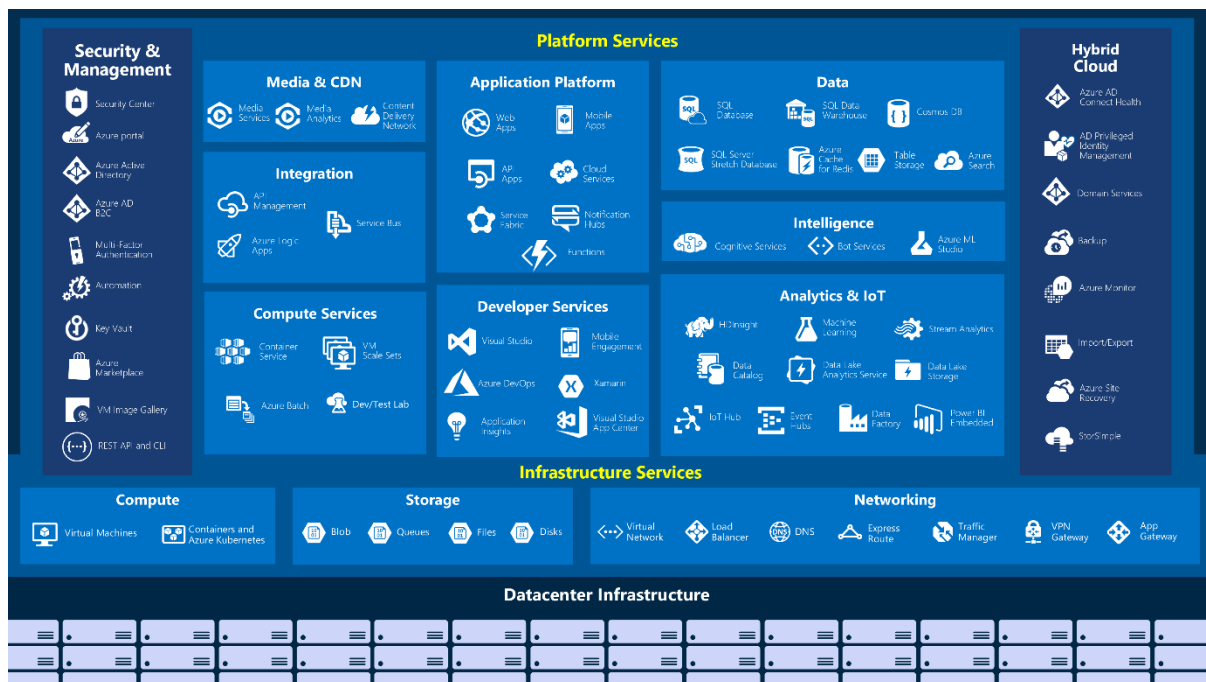
Azure can help you tackle tough business challenges. You bring your requirements, creativity, and favorite software development tools. Azure brings a massive global infrastructure that's always available for you to build your applications on.

Let's take a quick tour of the high-level services Azure offers.

Azure: the big picture

Azure services

Here's a big-picture view of the available services and features in Azure.



Let's take a closer look at the most commonly-used categories:

- Compute
- Networking
- Storage
- Mobile
- Databases
- Web
- Internet of Things
- Big Data
- Artificial Intelligence
- DevOps



Compute

Compute services are often one of the primary reasons why companies move to the Azure platform. Azure provides a range of options for hosting applications and services. Here are some examples of compute services in Azure:

Service name	Service function
Azure Virtual Machines	Windows or Linux virtual machines (VMs) hosted in Azure
Azure Virtual Machine Scale Sets	Scaling for Windows or Linux VMs hosted in Azure
Azure Kubernetes Service	Enables management of a cluster of VMs that run containerized services
Azure Service Fabric	Distributed systems platform. Runs in Azure or on-premises
Azure Batch	Managed service for parallel and high-performance computing applications
Azure Container Instances	Run containerized apps on Azure without provisioning servers or VMs
Azure Functions	An event-driven, serverless compute service

Networking

Linking compute resources and providing access to applications is the key function of Azure networking. Networking functionality in Azure includes a range of options to connect the outside world to services and features in the global Microsoft Azure datacenters.

Azure networking facilities have the following features:

Service name	Service function
Azure Virtual Network	Connects VMs to incoming Virtual Private Network (VPN) connections
Azure Load Balancer	Balances inbound and outbound connections to applications or service endpoints
Azure Application Gateway	Optimizes app server farm delivery while increasing application security



Service name	Service function
Azure VPN Gateway	Accesses Azure Virtual Networks through high-performance VPN gateways
Azure DNS	Provides ultra-fast DNS responses and ultra-high domain availability
Azure Content Delivery Network	Delivers high-bandwidth content to customers globally
Azure DDoS Protection	Protects Azure-hosted applications from distributed denial of service (DDOS) attacks
Azure Traffic Manager	Distributes network traffic across Azure regions worldwide
Azure ExpressRoute	Connects to Azure over high-bandwidth dedicated secure connections
Azure Network Watcher	Monitors and diagnoses network issues using scenario-based analysis
Azure Firewall	Implements high-security, high-availability firewall with unlimited scalability
Azure Virtual WAN	Creates a unified wide area network (WAN), connecting local and remote sites

Storage

Azure provides four main types of storage services. These services are:

Service name	Service function
Azure Blob storage	Storage service for very large objects, such as video files or bitmaps
Azure File storage	File shares that you can access and manage like a file server
Azure Queue storage	A data store for queuing and reliably delivering messages between applications
Azure Table storage	A NoSQL store that hosts unstructured data independent of any schema

These services all share several common characteristics:

- **Durable** and highly available with redundancy and replication.

- **Secure** through automatic encryption and role-based access control.
- **Scalable** with virtually unlimited storage.
- **Managed**, handling maintenance and any critical problems for you.
- **Accessible** from anywhere in the world over HTTP or HTTPS.

Mobile

Azure enables developers to create mobile backend services for iOS, Android, and Windows apps quickly and easily. Features that used to take time and increase project risks, such as adding corporate sign-in and then connecting to on-premises resources such as SAP, Oracle, SQL Server, and SharePoint, are now simple to include.

Other features of this service include:

- Offline data synchronization.
- Connectivity to on-premises data.
- Broadcasting push notifications.
- Autoscaling to match business needs.

Databases

Azure provides multiple database services to store a wide variety of data types and volumes. And with global connectivity, this data is available to users instantly.

Service name	Service function
Azure Cosmos DB	Globally distributed database that supports NoSQL options
Azure SQL Database	Fully managed relational database with auto-scale, integral intelligence, and robust security
Azure Database for MySQL	Fully managed and scalable MySQL relational database with high availability and security
Azure Database for PostgreSQL	Fully managed and scalable PostgreSQL relational database with high availability and security
SQL Server on VMs	Host enterprise SQL Server apps in the cloud
Azure SQL Data Warehouse	Fully managed data warehouse with integral security at every level of scale at no extra cost
Azure Database Migration Service	Migrates your databases to the cloud with no application code changes



Service name	Service function
Azure Cache for Redis	Caches frequently used and static data to reduce data and application latency
Azure Database for MariaDB	Fully managed and scalable MariaDB relational database with high availability and security

Web

Having a great web experience is critical in today's business world. Azure includes first-class support to build and host web apps and HTTP-based web services. The Azure services focused on web hosting include:

Service Name	Description
Azure App Service	Quickly create powerful cloud web-based apps
Azure Notification Hubs	Send push notifications to any platform from any back end.
Azure API Management	Publish APIs to developers, partners, and employees securely and at scale.
Azure Search	Fully managed search as a service.
Web Apps feature of Azure App Service	Create and deploy mission-critical web apps at scale.
Azure SignalR Service	Add real-time web functionalities easily.

Internet of Things

People are able to access more information than ever before. It began with personal digital assistants (PDAs), then morphed into smartphones. Now there are smart watches, smart thermostats, even smart refrigerators. Personal computers used to be the norm. Now the internet allows any item that's online-capable to access valuable information. This ability for devices to garner and then relay information for data analysis is referred to as the Internet of Things (IoT).

There are a number of services that can assist and drive end-to-end solutions for IoT on Azure.



Service Name	Description
IoT Central	Fully-managed global IoT software as a service (SaaS) solution that makes it easy to connect, monitor, and manage your IoT assets at scale
Azure IoT Hub	Messaging hub that provides secure communications and monitoring between millions of IoT devices
IoT Edge	Push your data analysis onto your IoT devices instead of in the cloud allowing them to react more quickly to state changes.

Big Data

Data comes in all formats and sizes. When we talk about Big Data, we're referring to *large* volumes of data. Data from weather systems, communications systems, genomic research, imaging platforms, and many other scenarios generate hundreds of gigabytes of data. This amount of data makes it hard to analyze and make decisions around. It's often so large that traditional forms of processing and analysis are no longer appropriate.

Open source cluster technologies have been developed to deal with these large data sets. Microsoft Azure supports a broad range of technologies and services to provide big data and analytic solutions.

Service Name	Description
Azure SQL Data Warehouse	Run analytics at a massive scale using a cloud-based Enterprise Data Warehouse (EDW) that leverages massive parallel processing (MPP) to run complex queries quickly across petabytes of data
Azure HDInsight	Process massive amounts of data with managed clusters of Hadoop clusters in the cloud
Azure Databricks (preview)	Collaborative Apache Spark-based analytics service that can be integrated with other Big Data services in Azure.

Artificial Intelligence

Artificial Intelligence, in the context of cloud computing, is based around a broad range of services, the core of which is Machine Learning. Machine Learning is a data science technique that allows computers to use existing data to forecast future behaviors, outcomes, and trends. Using machine learning, computers learn without being explicitly programmed.



Forecasts or predictions from machine learning can make apps and devices smarter. For example, when you shop online, machine learning helps recommend other products you might like based on what you've purchased. Or when your credit card is swiped, machine learning compares the transaction to a database of transactions and helps detect fraud. And when your robot vacuum cleaner vacuums a room, machine learning helps it decide whether the job is done.

Some of the most common Artificial Intelligence and Machine Learning service types in Azure are:

Service Name	Description
Azure Machine Learning Service	Cloud-based environment you can use to develop, train, test, deploy, manage, and track machine learning models. It can auto-generate a model and auto-tune it for you. It will let you start training on your local machine, and then scale out to the cloud
Azure Machine Learning Studio	Collaborative, drag-and-drop visual workspace where you can build, test, and deploy machine learning solutions using pre-built machine learning algorithms and data-handling modules

A closely related set of products are the *cognitive services*. These are pre-built APIs you can leverage in your applications to solve complex problems.

Service Name	Description
Vision	Image-processing algorithms to smartly identify, caption, index, and moderate your pictures and videos.
Speech	Convert spoken audio into text, use voice for verification, or add speaker recognition to your app.
Knowledge mapping	Map complex information and data in order to solve tasks such as intelligent recommendations and semantic search.
Bing Search	Add Bing Search APIs to your apps and harness the ability to comb billions of webpages, images, videos, and news with a single API call.
Natural Language processing	Allow your apps to process natural language with pre-built scripts, evaluate sentiment and learn how to recognize what users want.



DevOps

DevOps (Development and Operations) brings together people, processes, and technology, automating software delivery to provide continuous value to your users. Azure DevOps Services allows you to create *build* and *release* pipelines that provide continuous integration, delivery, and deployment for your applications. You can integrate repositories and application tests, perform application monitoring, and work with build artifacts. You can also work with and backlog items for tracking, automate infrastructure deployment and integrate a range of third-party tools and services such as Jenkins and Chef. All of these functions and many more are closely integrated with Azure to allow for consistent, repeatable deployments for your applications to provide streamlined build and release processes.

Some of the main DevOps services available with Azure are Azure DevOps Services and Azure DevTest Labs.

Service Name	Description
Azure DevOps	Azure DevOps Services (formerly known as Visual Studio Team Services, or VSTS), provides development collaboration tools including high-performance pipelines, free private Git repositories, configurable Kanban boards, and extensive automated and cloud-based load testing
Azure DevTest Labs	Quickly create on-demand Windows and Linux environments you can use to test or demo your applications directly from your deployment pipelines



VM's in Azure

As a technology professional, you likely have expertise in a specific area. Perhaps you're a storage admin or virtualization expert, or maybe you focus on the latest security practices. If you're a student, you may still be exploring what interests you most.

No matter your role, most people get started with the cloud by creating a virtual machine. Here you'll deploy a virtual machine running Windows Server 2016.

There are many ways to create a virtual machine on Azure. Here, you'll create a Windows or Linux virtual machine using an interactive terminal called Cloud Shell. If you work from the terminal on a daily basis, you know this is often the fastest way to get the job done.

Tip

Prefer Linux or want to try something new? Select **Linux** from the top of this page to run a Linux virtual machine.

Let's review some basic terms and get your first virtual machine up and running.

What is a virtual machine?

A virtual machine, or VM, is a software emulation of a physical computer. Because VMs exist as software, dozens, hundreds, or even thousands of Azure VMs can be generated in minutes, then deleted when you don't need them. With low-cost, per-minute billing, you pay only for the compute resources you use, for as long as you are using them. Plus, there are many ways to configure the VMs to fit your needs.

A snapshot of a running VM is called an *image*. Azure provides images for Windows and several flavors of Linux. You can also create your own preconfigured images to make deployments go faster. Here you'll bring up a Windows Server 2016 VM, provided by Microsoft.

What defines a virtual machine on Azure?

A virtual machine is defined by a number of factors, including its size and location. Before you bring up your VM, let's briefly cover what's involved.

Size



A VM's size defines its processor speed, amount of memory, initial amount of storage, and expected network bandwidth. Some sizes even include specialized hardware such as GPUs for heavy graphics rendering and video editing.

Region

Azure is made up of data centers distributed throughout the world. A *region* is a set of Azure data centers in a named geographic location. Every Azure resource, including virtual machines, is assigned a region. East US and North Europe are examples of regions.

Network

A *virtual network* is a logically isolated network on Azure. Each virtual machine on Azure is associated with a virtual network. Azure provides cloud-level firewalls for your virtual networks called *network security groups*.

Resource groups

Virtual machines and other cloud resources are grouped into logical containers called *resource groups*. Groups are typically used to organize sets of resources that are deployed together as part of an application or service. You refer to a resource group by its name.

What is Azure Cloud Shell?

Azure Cloud Shell is a browser-based command-line experience for managing and developing Azure resources. Think of Cloud Shell as an interactive console that you run in the cloud.

Cloud Shell provides two experiences to choose from: Bash and PowerShell. Both include access to the Azure CLI, the command-line interface for Azure.

You can use any Azure management interface, including the Azure portal, Azure CLI, and Azure PowerShell, to manage any kind of VM. For learning purposes, here you'll use the Azure CLI to create and manage either a Windows or Linux VM.

Quickstart: Create a Windows virtual machine in the Azure portal

Azure virtual machines (VMs) can be created through the Azure portal. This method provides a browser-based user interface to create VMs and their associated resources. This quickstart shows you how to use the Azure portal to deploy a virtual machine (VM) in Azure that runs Windows Server 2016. To see your VM in action, you then RDP to the VM and install the IIS web server.

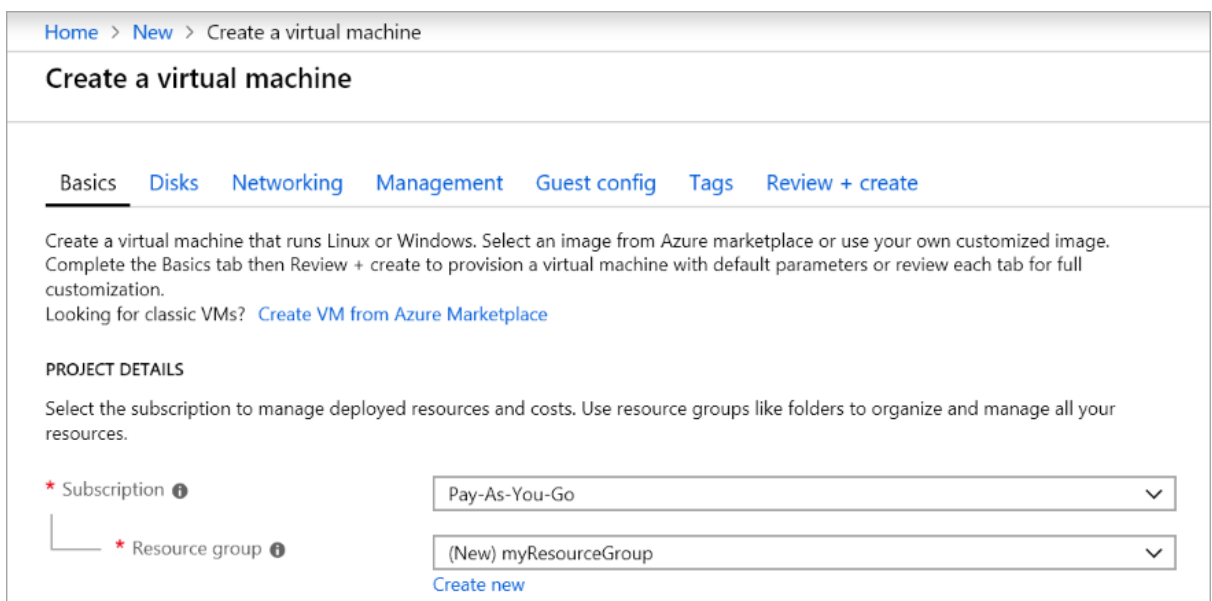
If you don't have an Azure subscription, create a [free account](#) before you begin.

Sign in to Azure

Sign in to the Azure portal at <https://portal.azure.com>.

Create virtual machine

1. Choose **Create a resource** in the upper left-hand corner of the Azure portal.
2. In the **New** page, under **Popular**, select **Windows Server 2016 Datacenter**.
3. In the **Basics** tab, under **Project details**, make sure the correct subscription is selected and then choose to **Create new** resource group. Type *myResourceGroup* for the name.



The screenshot shows the 'Create a virtual machine' page in the Azure portal. The breadcrumb navigation at the top reads 'Home > New > Create a virtual machine'. The page title is 'Create a virtual machine'. Below the title are tabs for 'Basics', 'Disks', 'Networking', 'Management', 'Guest config', 'Tags', and 'Review + create'. The 'Basics' tab is selected. The main content area contains instructions: 'Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization. Looking for classic VMs? [Create VM from Azure Marketplace](#)'. Below this is the 'PROJECT DETAILS' section with the instruction: 'Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.' There are two dropdown menus: 'Subscription' with 'Pay-As-You-Go' selected, and 'Resource group' with '(New) myResourceGroup' selected. A 'Create new' link is visible below the resource group dropdown.

4. Under **Instance details**, type *myVM* for the **Virtual machine name** and choose *East US* for your **Location**. Leave the other defaults.



INSTANCE DETAILS

* Virtual machine name ⓘ ✓

* Region ⓘ ▼

Availability options ▼

* Image ⓘ ▼
[Browse all images and disks](#)

* Size ⓘ **Standard DS1 v2**
1 vcpu, 3.5 GB memory
[Change size](#)

5. Under **Administrator account**, provide a username, such as *azureuser* and a password. The password must be at least 12 characters long and meet the [defined complexity requirements](#).

ADMINISTRATOR ACCOUNT

* Username ⓘ ✓

* Password ⓘ ✓

* Confirm password ⓘ ✓

✓ Password and confirm password must match.

6. Under **Inbound port rules**, choose **Allow selected ports** and then select **RDP (3389)** and **HTTP** from the drop-down.

INBOUND PORT RULES

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

* Public inbound ports ⓘ ☐ None ☒ Allow selected ports

* ▼

⚠ These ports will be exposed to the internet. Use the Advanced controls to limit inbound traffic to known IP addresses. You can also update inbound traffic rules later.

7. Leave the remaining defaults and then select the **Review + create** button at the bottom of the page.

SAVE MONEY

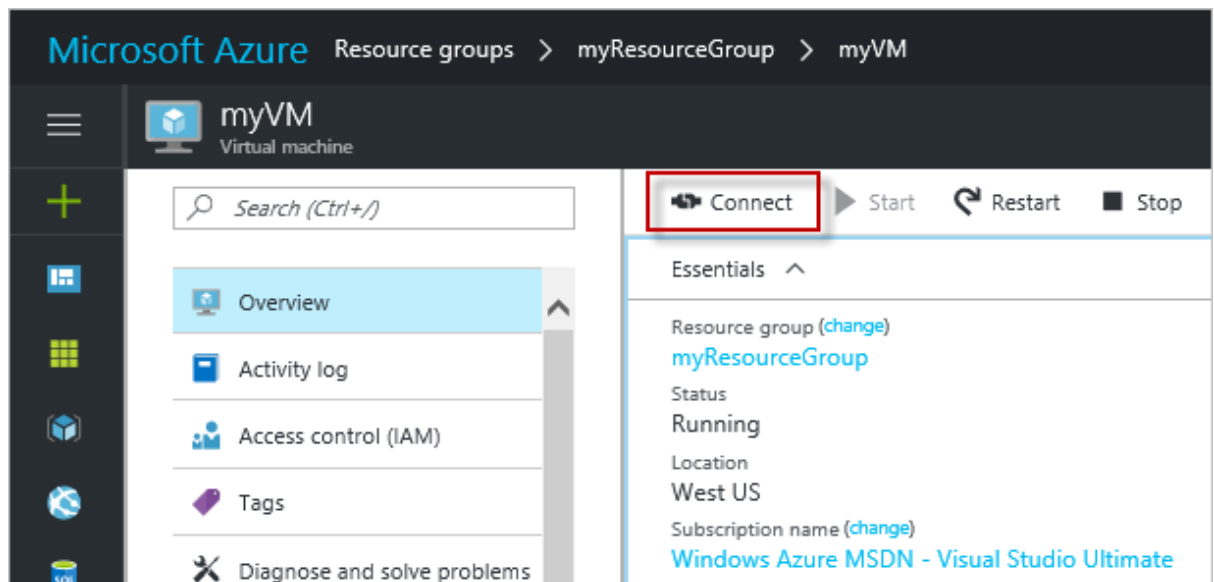
Save up to 49% with a license you already own using Azure Hybrid Benefit for Windows Server. [Learn more](#)

* Already have a Windows license? ⓘ ☐ Yes ☒ No

Connect to virtual machine

Create a remote desktop connection to the virtual machine. These directions tell you how to connect to your VM from a Windows computer. On a Mac, you need an RDP client such as this [Remote Desktop Client](#) from the Mac App Store.

1. Click the **Connect** button on the virtual machine properties page.



2. In the **Connect to virtual machine** page, keep the default options to connect by DNS name over port 3389 and click **Download RDP file**.
3. Open the downloaded RDP file and click **Connect** when prompted.
4. In the **Windows Security** window, select **More choices** and then **Use a different account**. Type the username as **localhost\username**, enter password you created for the virtual machine, and then click **OK**.
5. You may receive a certificate warning during the sign-in process. Click **Yes** or **Continue** to create the connection.

Install web server

To see your VM in action, install the IIS web server. Open a PowerShell prompt on the VM and run the following command:

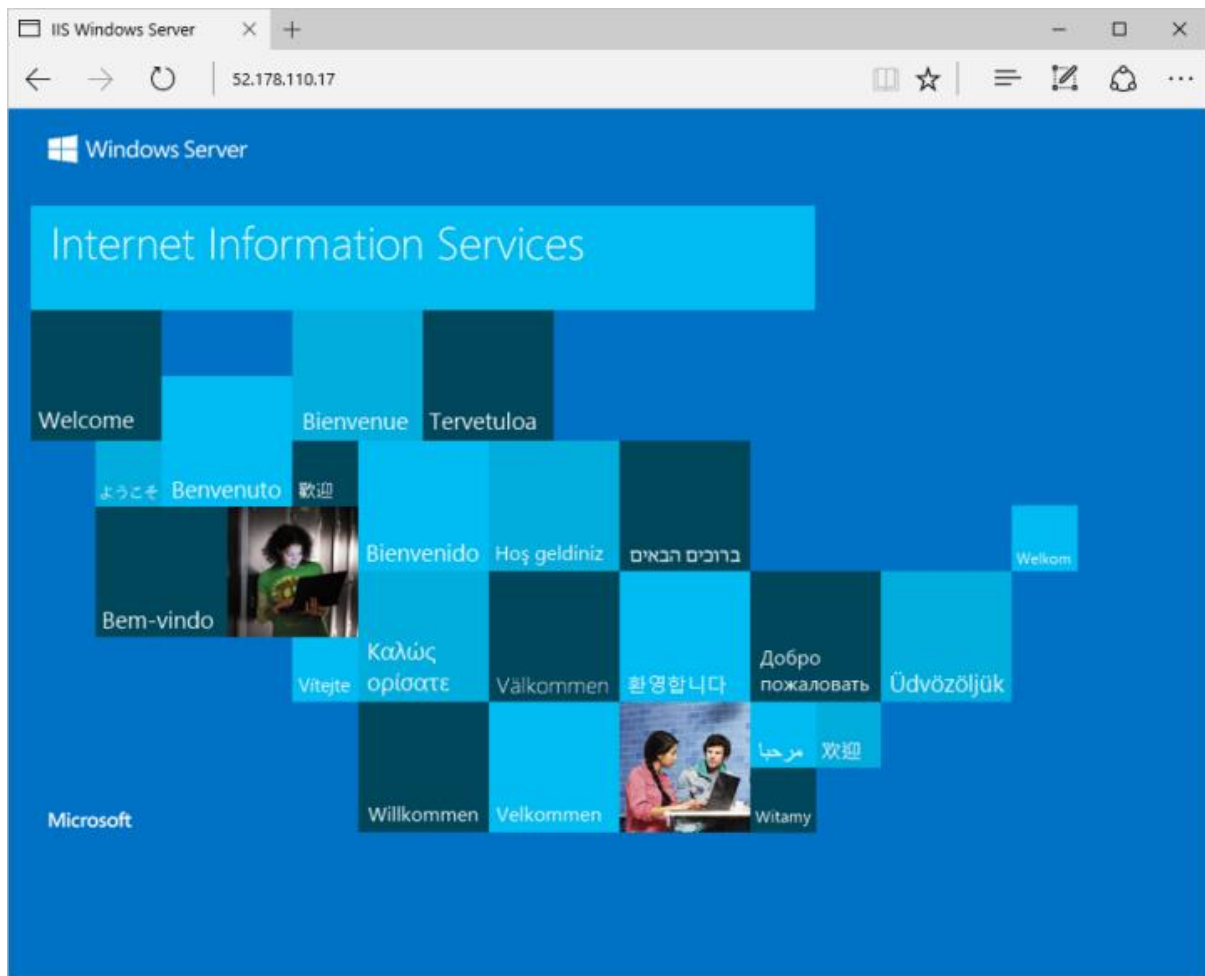
PowerShell

```
Install-WindowsFeature -name Web-Server -IncludeManagementTools
```

When done, close the RDP connection to the VM.

View the IIS welcome page

In the portal, select the VM and in the overview of the VM, use the **Click to copy** button to the right of the IP address to copy it and paste it into a browser tab. The default IIS welcome page will open, and should look like this:



Clean up resources

When no longer needed, you can delete the resource group, virtual machine, and all related resources. Select the resource group for the virtual machine, then select **Delete**. Confirm the name of the resource group to finish deleting the resources.

Please refer <https://docs.microsoft.com/en-us/azure/virtual-machines/windows/> for more in-depth information and how-to.