Create and Manage Windows VMs with the Azure PowerShell module

Azure virtual machines provide a fully configurable and flexible computing environment. This tutorial covers basic Azure virtual machine deployment items such as selecting a VM size, selecting a VM image, and deploying a VM. You learn how to:1

* Create and connect to a VM
* Select and use VM images
* View and use specific VM sizes
* Resize a VM
* View and understand VM state

Launch Azure Cloud Shell

The Azure Cloud Shell is a free interactive shell that you can use to run the steps in this article. It has common Azure tools preinstalled and configured to use with your account. Just click the **Copy** to copy the code, paste it into the Cloud Shell, and then press enter to run it. There are two ways to launch the Cloud Shell:

|  |  |
| --- | --- |
| Click **Try It** in the upper right corner of a code block. | Cloud Shell in this article |
| Click the **Cloud Shell** button on the menu in the upper right of the Azure portal. | [Cloud Shell in the portal](https://portal.azure.com/) |
|  |  |

If you choose to install and use the PowerShell locally, this tutorial requires the Azure PowerShell module version 3.6 or later. Run Get-Module -ListAvailable AzureRM to find the version. If you need to upgrade, see [Install Azure PowerShell module](https://docs.microsoft.com/en-us/powershell/azure/install-azurerm-ps). If you are running PowerShell locally, you also need to run Login-AzureRmAccount to create a connection with Azure.

Create resource group

Create a resource group with the [New-AzureRmResourceGroup](https://docs.microsoft.com/en-us/powershell/module/azurerm.resources/new-azurermresourcegroup) command.

An Azure resource group is a logical container into which Azure resources are deployed and managed. A resource group must be created before a virtual machine. In this example, a resource group named *myResourceGroupVM* is created in the *EastUS* region.

Azure PowerShellCopyTry It

New-AzureRmResourceGroup -ResourceGroupName myResourceGroupVM -Location EastUS

The resource group is specified when creating or modifying a VM, which can be seen throughout this tutorial.

Create virtual machine

A virtual machine must be connected to a virtual network. You communicate with the virtual machine using a public IP address through a network interface card.

Create virtual network

Create a subnet with [New-AzureRmVirtualNetworkSubnetConfig](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/new-azurermvirtualnetworksubnetconfig):

Azure PowerShellCopyTry It

$subnetConfig = New-AzureRmVirtualNetworkSubnetConfig `

-Name mySubnet `

-AddressPrefix 192.168.1.0/24

Create a virtual network with [New-AzureRmVirtualNetwork](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/new-azurermvirtualnetwork):

Azure PowerShellCopyTry It

$vnet = New-AzureRmVirtualNetwork `

-ResourceGroupName myResourceGroupVM `

-Location EastUS `

-Name myVnet `

-AddressPrefix 192.168.0.0/16 `

-Subnet $subnetConfig

Create public IP address

Create a public IP address with [New-AzureRmPublicIpAddress](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/new-azurermpublicipaddress):

Azure PowerShellCopyTry It

$pip = New-AzureRmPublicIpAddress `

-ResourceGroupName myResourceGroupVM `

-Location EastUS `

-AllocationMethod Static `

-Name myPublicIPAddress

Create network interface card

Create a network interface card with [New-AzureRmNetworkInterface](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/new-azurermnetworkinterface):

Azure PowerShellCopyTry It

$nic = New-AzureRmNetworkInterface `

-ResourceGroupName myResourceGroupVM `

-Location EastUS `

-Name myNic `

-SubnetId $vnet.Subnets[0].Id `

-PublicIpAddressId $pip.Id

Create network security group

An Azure [network security group](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-nsg) (NSG) controls inbound and outbound traffic for one or many virtual machines. Network security group rules allow or deny network traffic on a specific port or port range. These rules can also include a source address prefix so that only traffic originating at a predefined source can communicate with a virtual machine. To access the IIS webserver that you are installing, you must add an inbound NSG rule.

To create an inbound NSG rule, use [Add-AzureRmNetworkSecurityRuleConfig](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/add-azurermnetworksecurityruleconfig). The following example creates an NSG rule named *myNSGRule* that opens port *3389* for the virtual machine:

Azure PowerShellCopyTry It

$nsgRule = New-AzureRmNetworkSecurityRuleConfig `

-Name myNSGRule `

-Protocol Tcp `

-Direction Inbound `

-Priority 1000 `

-SourceAddressPrefix \* `

-SourcePortRange \* `

-DestinationAddressPrefix \* `

-DestinationPortRange 3389 `

-Access Allow

Create the NSG using *myNSGRule* with [New-AzureRmNetworkSecurityGroup](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/new-azurermnetworksecuritygroup):

Azure PowerShellCopyTry It

$nsg = New-AzureRmNetworkSecurityGroup `

-ResourceGroupName myResourceGroupVM `

-Location EastUS `

-Name myNetworkSecurityGroup `

-SecurityRules $nsgRule

Add the NSG to the subnet in the virtual network with [Set-AzureRmVirtualNetworkSubnetConfig](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/set-azurermvirtualnetworksubnetconfig):

Azure PowerShellCopyTry It

Set-AzureRmVirtualNetworkSubnetConfig `

-Name mySubnet `

-VirtualNetwork $vnet `

-NetworkSecurityGroup $nsg `

-AddressPrefix 192.168.1.0/24

Update the virtual network with [Set-AzureRmVirtualNetwork](https://docs.microsoft.com/en-us/powershell/module/azurerm.network/set-azurermvirtualnetwork):

Azure PowerShellCopyTry It

Set-AzureRmVirtualNetwork -VirtualNetwork $vnet

Create virtual machine

When creating a virtual machine, several options are available such as operating system image, disk sizing, and administrative credentials. In this example, a virtual machine is created with a name of *myVM* running the latest version of Windows Server 2016 Datacenter.

Set the username and password needed for the administrator account on the virtual machine with [Get-Credential](https://msdn.microsoft.com/powershell/reference/5.1/microsoft.powershell.security/Get-Credential):

Azure PowerShellCopyTry It

$cred = Get-Credential

Create the initial configuration for the virtual machine with [New-AzureRmVMConfig](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/new-azurermvmconfig):

Azure PowerShellCopyTry It

$vm = New-AzureRmVMConfig -VMName myVM -VMSize Standard\_D1

Add the operating system information to the virtual machine configuration with [Set-AzureRmVMOperatingSystem](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/set-azurermvmoperatingsystem):

Azure PowerShellCopyTry It

$vm = Set-AzureRmVMOperatingSystem `

-VM $vm `

-Windows `

-ComputerName myVM `

-Credential $cred `

-ProvisionVMAgent -EnableAutoUpdate

Add the image information to the virtual machine configuration with [Set-AzureRmVMSourceImage](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/set-azurermvmsourceimage):

Azure PowerShellCopyTry It

$vm = Set-AzureRmVMSourceImage `

-VM $vm `

-PublisherName MicrosoftWindowsServer `

-Offer WindowsServer `

-Skus 2016-Datacenter `

-Version latest

Add the operating system disk settings to the virtual machine configuration with [Set-AzureRmVMOSDisk](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/set-azurermvmosdisk):

Azure PowerShellCopyTry It

$vm = Set-AzureRmVMOSDisk `

-VM $vm `

-Name myOsDisk `

-DiskSizeInGB 128 `

-CreateOption FromImage `

-Caching ReadWrite

Add the network interface card that you previously created to the virtual machine configuration with [Add-AzureRmVMNetworkInterface](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/add-azurermvmnetworkinterface):

Azure PowerShellCopyTry It

$vm = Add-AzureRmVMNetworkInterface -VM $vm -Id $nic.Id

Create the virtual machine with [New-AzureRmVM](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/new-azurermvm).

Azure PowerShellCopyTry It

New-AzureRmVM -ResourceGroupName myResourceGroupVM -Location EastUS -VM $vm

Connect to VM

After the deployment has completed, create a remote desktop connection with the virtual machine.

Run the following commands to return the public IP address of the virtual machine. Take note of this IP Address so you can connect to it with your browser to test web connectivity in a future step.

Azure PowerShellCopyTry It

Get-AzureRmPublicIpAddress -ResourceGroupName myResourceGroupVM | Select IpAddress

Use the following command, on your local machine, to create a remote desktop session with the virtual machine. Replace the IP address with the *publicIPAddress* of your virtual machine. When prompted, enter the credentials used when creating the virtual machine.

PowerShellCopy

mstsc /v:<publicIpAddress>

Understand VM images

The Azure marketplace includes many virtual machine images that can be used to create a new virtual machine. In the previous steps, a virtual machine was created using the Windows Server 2016-Datacenter image. In this step, the PowerShell module is used to search the marketplace for other Windows images, which can also as a base for new VMs. This process consists of finding the publisher, offer, and the image name (Sku).

Use the [Get-AzureRmVMImagePublisher](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvmimagepublisher) command to return a list of image publishers.

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Get-AzureRmVMImagePublisher -Location "EastUS"

Use the [Get-AzureRmVMImageOffer](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvmimageoffer) to return a list of image offers. With this command, the returned list is filtered on the specified publisher.

Azure PowerShellCopyTry It

Get-AzureRmVMImageOffer -Location "EastUS" -PublisherName "MicrosoftWindowsServer"

Azure PowerShellCopyTry It

Offer PublisherName Location

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Windows-HUB MicrosoftWindowsServer EastUS

WindowsServer MicrosoftWindowsServer EastUS

WindowsServer-HUB MicrosoftWindowsServer EastUS

The [Get-AzureRmVMImageSku](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvmimagesku) command will then filter on the publisher and offer name to return a list of image names.

Azure PowerShellCopyTry It

Get-AzureRmVMImageSku -Location "EastUS" -PublisherName "MicrosoftWindowsServer" -Offer "WindowsServer"

Azure PowerShellCopyTry It

Skus Offer PublisherName Location

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2008-R2-SP1 WindowsServer MicrosoftWindowsServer EastUS

2008-R2-SP1-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2012-Datacenter WindowsServer MicrosoftWindowsServer EastUS

2012-Datacenter-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2012-R2-Datacenter WindowsServer MicrosoftWindowsServer EastUS

2012-R2-Datacenter-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-Server-Core WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-Server-Core-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-with-Containers WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-with-Containers-smalldisk WindowsServer MicrosoftWindowsServer EastUS

2016-Datacenter-with-RDSH WindowsServer MicrosoftWindowsServer EastUS

2016-Nano-Server WindowsServer MicrosoftWindowsServer EastUS

This information can be used to deploy a VM with a specific image. This example sets the image name on the VM object. Refer to the previous examples in this tutorial for complete deployment steps.

Azure PowerShellCopyTry It

$vm = Set-AzureRmVMSourceImage `

-VM $vm `

-PublisherName MicrosoftWindowsServer `

-Offer WindowsServer `

-Skus 2016-Datacenter-with-Containers `

-Version latest

Understand VM sizes

A virtual machine size determines the amount of compute resources such as CPU, GPU, and memory that are made available to the virtual machine. Virtual machines need to be created with a size appropriate for the expect work load. If workload increases, an existing virtual machine can be resized.

VM Sizes

The following table categorizes sizes into use cases.

| Type | Sizes | Description |
| --- | --- | --- |
| General purpose | DSv2, Dv2, DS, D, Av2, A0-7 | Balanced CPU-to-memory. Ideal for dev / test and small to medium applications and data solutions. |
| Compute optimized | Fs, F | High CPU-to-memory. Good for medium traffic applications, network appliances, and batch processes. |
| Memory optimized | GS, G, DSv2, DS, Dv2, D | High memory-to-CPU. Great for relational databases, medium to large caches, and in-memory analytics. |
| Storage optimized | Ls | High disk throughput and IO. Ideal for Big Data, SQL, and NoSQL databases. |
| GPU | NV, NC | Specialized VMs targeted for heavy graphic rendering and video editing. |
| High performance | H, A8-11 | Our most powerful CPU VMs with optional high-throughput network interfaces (RDMA). |

Find available VM sizes

To see a list of VM sizes available in a particular region, use the [Get-AzureRmVMSize](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvmsize) command.

Azure PowerShellCopyTry It

Get-AzureRmVMSize -Location EastUS

Resize a VM

After a VM has been deployed, it can be resized to increase or decrease resource allocation.

Before resizing a VM, check if the desired size is available on the current VM cluster. The [Get-AzureRmVMSize](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvmsize) command returns a list of sizes.

Azure PowerShellCopyTry It

Get-AzureRmVMSize -ResourceGroupName myResourceGroupVM -VMName myVM

If the desired size is available, the VM can be resized from a powered-on state, however it is rebooted during the operation.

Azure PowerShellCopyTry It

$vm = Get-AzureRmVM -ResourceGroupName myResourceGroupVM -VMName myVM

$vm.HardwareProfile.VmSize = "Standard\_D4"

Update-AzureRmVM -VM $vm -ResourceGroupName myResourceGroupVM

If the desired size is not on the current cluster, the VM needs to be deallocated before the resize operation can occur. Note, when the VM is powered back on, any data on the temp disk are removed, and the public IP address change unless a static IP address is being used.

Azure PowerShellCopyTry It

Stop-AzureRmVM -ResourceGroupName myResourceGroupVM -Name "myVM" -Force

$vm = Get-AzureRmVM -ResourceGroupName myResourceGroupVM -VMName myVM

$vm.HardwareProfile.VmSize = "Standard\_F4s"

Update-AzureRmVM -VM $vm -ResourceGroupName myResourceGroupVM

Start-AzureRmVM -ResourceGroupName myResourceGroupVM -Name $vm.name

VM power states

An Azure VM can have one of many power states. This state represents the current state of the VM from the standpoint of the hypervisor.

Power states

| Power State | Description |
| --- | --- |
| Starting | Indicates the virtual machine is being started. |
| Running | Indicates that the virtual machine is running. |
| Stopping | Indicates that the virtual machine is being stopped. |
| Stopped | Indicates that the virtual machine is stopped. Note that virtual machines in the stopped state still incur compute charges. |
| Deallocating | Indicates that the virtual machine is being deallocated. |
| Deallocated | Indicates that the virtual machine is completely removed from the hypervisor but still available in the control plane. Virtual machines in the Deallocated state do not incur compute charges. |
| - | Indicates that the power state of the virtual machine is unknown. |

Find power state

To retrieve the state of a particular VM, use the [Get-AzureRmVM](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/get-azurermvm) command. Be sure to specify a valid name for a virtual machine and resource group.

Azure PowerShellCopyTry It

Get-AzureRmVM `

-ResourceGroupName myResourceGroupVM `

-Name myVM `

-Status | Select @{n="Status"; e={$\_.Statuses[1].Code}}

Output:

Azure PowerShellCopyTry It

Status

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PowerState/running

Management tasks

During the lifecycle of a virtual machine, you may want to run management tasks such as starting, stopping, or deleting a virtual machine. Additionally, you may want to create scripts to automate repetitive or complex tasks. Using Azure PowerShell, many common management tasks can be run from the command line or in scripts.

Stop virtual machine

Stop and deallocate a virtual machine with [Stop-AzureRmVM](https://docs.microsoft.com/en-us/powershell/module/azurerm.compute/stop-azurermvm):

Azure PowerShellCopyTry It

Stop-AzureRmVM -ResourceGroupName myResourceGroupVM -Name "myVM" -Force

If you want to keep the virtual machine in a provisioned state, use the -StayProvisioned parameter.

Start virtual machine

Azure PowerShellCopyTry It

Start-AzureRmVM -ResourceGroupName myResourceGroupVM -Name myVM

Delete resource group

Deleting a resource group also deletes all resources contained within.

Azure PowerShellCopyTry It

Remove-AzureRmResourceGroup -Name myResourceGroupVM -Force