



# AZ – 203 Developer Training

Deploy & Manage Virtual Machine



# Agenda



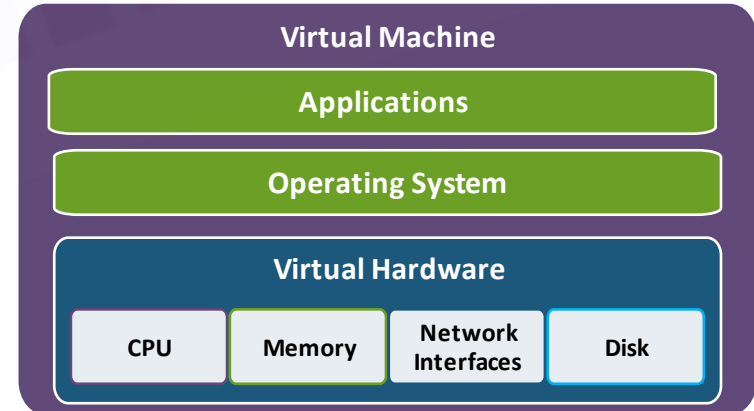
- ☐ What is Virtual Machine
- ☐ What is Azure Virtual Machine
- ☐ Classic and ARM
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- ☐ Disks
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- ☐ Disks Storage
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- ☐ Network Interfaces
- ☐ Network Security Groups
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- ☐ Convert Disks Storage
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- ☐ What is Azure PowerShell
- ☐ CloudShell

# Virtual Machine

# What is Virtual Machine?



- ❑ A virtual machine is a computer file, typically called an image, which behaves like an actual computer.
- ❑ In other words, creating a computer within a computer.
- ❑ It runs in a window/ Linux, much like any other program, giving the end user the same experience on a virtual machine as they would have on the host operating system itself.
- ❑ For servers, the multiple operating systems run side-by-side with a piece of software called a hypervisor to manage them.
- ❑ Each virtual machine provides its own virtual hardware, including CPUs, memory, hard drives, network interfaces and other devices.
- ❑ The virtual hardware is then mapped to the real hardware on the physical machine.



# What is Azure Virtual Machine?

□ Azure Virtual Machines (VM) is one of several types of on-demand, scalable computing resources that Azure offers.

When you run Azure VMs, you pay for the compute time on a per-minute basis.

The price for VMs is calculated based on their size, the operating system, and any licensed software installed.

Therefore, to avoid the corresponding charges whenever you are not using it, you should change its state to **Stopped (Deallocated)**.

# Azure VM: Classic and ARM



- ❑ The Azure classic deployment model was originally referred to as the Service Management model.
- ❑ This model served as the primary method of deploying and managing Azure services until the introduction of Azure Resource Manager (ARM).
- ❑ You can provision Azure VMs by using either the classic or the Azure Resource Manager deployment model.
- ❑ In comparison to the classic deployment model, the capabilities of Azure Resource Manager offer significant changes to the implementation and management of Azure VMs, including:

Support for up to three fault domains in an availability set. The classic deployment model supports two fault domains in an availability set.

Integration of the Azure Key Vault with Azure VMs to help secure secret information such as administrative passwords. Azure Key Vault also facilitates platform-based encryption of VM disks.

# Azure VM: Sizing



- ❑ In Azure, you select from a range of predefined configuration options that correspond to different VM sizes.
- ❑ The VM size determines characteristics such as the number and speed of its processors, amount of memory, maximum number of network adapters or data disks you can attach to it, and maximum size of a temporary disk.

## General purpose VM

- General purpose VM sizes provide balanced CPU-to-memory ratio.

## Compute optimized VM

- Compute optimized VM sizes have a high CPU-to-memory ratio.

## Memory optimized VM

- Memory optimized VM sizes offer a high memory-to-CPU ratio.

## Storage optimized VM

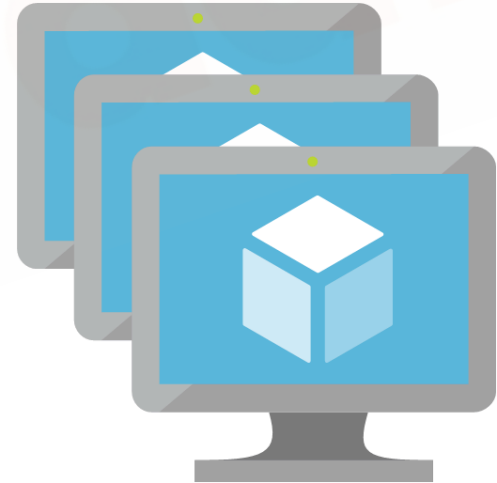
- Storage optimized VM sizes offer high disk throughput and IO.

## GPU optimized VM

- GPU optimized for heavy graphic rendering and video editing.

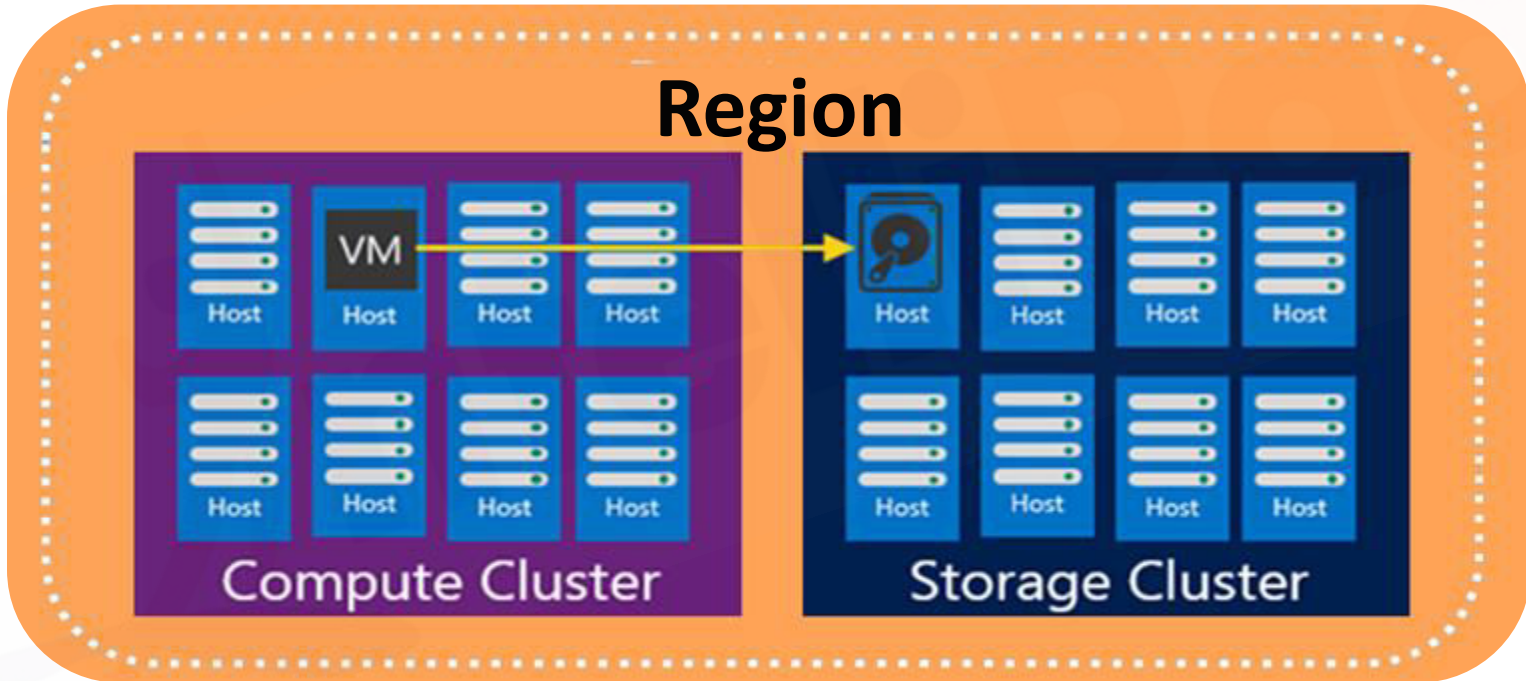
# Azure VM: ACU

- ❑ ACU stands for Azure Compute Unit.
- ❑ This is a measurement created by Microsoft to provide a way to more accurately compare the vCPU performance (or Virtual CPU Compute Performance) across Azure VM Instance Sizes.
- ❑ Using the Azure Compute Unit measurement, you will be able to identify which VM Size will fulfill your cloud compute performance requirements.
- ❑ It is based on the A0 (extra small) having a value of 50.
  - ❑ A VM with an ACU of 100 has twice the compute of a VM with an ACU of 50.
  - ❑ A VM with an ACU of 200 would be twice that of a VM with an ACU of 100 and so on.





# Azure VM: Disks



# Azure VM:

## Disks



- ❑ Disks that you attach to Azure virtual machines are stored as Virtual Hard Disk (VHD) files within an Azure storage account.
- ❑ Azure Disks are designed for 99.999% availability.
- ❑ You have three replicas of your data that enables high durability
- ❑ Azure Disks have consistently delivered enterprise-grade durability, with an industry-leading ZERO% Annualized Failure Rate.
- ❑ There are two performance tiers for storage that you can choose from when creating your:

- Standard Storage is backed by HDDs.

### Standard Storage

- Premium Storage is backed by SSDs, and delivers high-performance, low-latency disk support for VMs running I/O-intensive workloads.
- Premium offers at a higher pricing level.

### Premium Storage

# Azure VM:

## Standard vs Premium Disks



Category	Azure Premium Disk	Azure Standard Disk
Disk Type	Solid State Drives (SSD)	Hard Disk Drives (HDD)
Overview	SSD-based high-performance, low-latency disk support for VMs running IO-intensive workloads or hosting mission critical production environment	HDD-based cost effective disk support for Dev/Test VM scenarios
Scenario	Production and performance sensitive workloads	Dev/Test, non-critical, Infrequent access
Disk Type	Managed Disks only	Unmanaged & Managed Disks
Max Throughput per Disk	250 MB/s	60 MB/s
Max IOPS per Disk	7500 IOPS	500 IOPS

# Azure VM: Disks Storage



- ❑ Virtual machines in Azure use disks as a place to store an operating system, applications, and data.
- ❑ The operating system disk is created from an image, and both the operating system disk and the image are virtual hard disks (VHDs) stored in an Azure storage account.
- ❑ All Azure virtual machines have at least two disks:
  - Operating system disk
  - Temporary disk
- ❑ The temporary storage provided with each VM has no extra cost associated with it for storage space as well as for transactions.
- ❑ Data on temporary drive be lost, when you resize the VM, shutdown or restart your VM moved to a different host server.
- ❑ During a standard reboot of the VM, the data on the temporary drive should persist.

# Azure VM:

## Disks used by VMs

Azure VM supports three types of disks:

**Operating system disk**

- One per VM
- It is labeled as, C: drive for windows & /dev/sda for Linux by default
- This disk has a maximum capacity of 2048 gigabytes (GB)

**Temporary disk**

- One per VM
- The size varies depending on tier size used
- Provides temporary, non-persistent storage
- It is labeled as, D: drive for windows & /dev/sdb for Linux

**Data disk**

- Maximum number of disks is determined by the size of the VM
- Each data disk has a maximum capacity of 4095 GB
- Provides persistent storage for applications and data

Operating system and data disks are implemented as **blob storage in a storage account**.

The temporary disk is implemented as **local storage on the host where the VM is running**.

# Azure VM:

## Unmanaged vs Managed Disks

### Unmanaged Disks

- You must create Azure Storage accounts where Azure VM disks will reside
- The maximum number of Azure Storage accounts per region is limited to 200
- When using Standard storage with unmanaged disks, you pay only for the space you use

- Azure platform controls the placement of VM disk files
- The limit on the no. of Storage accounts no longer applies, there is a limit of 10,000 managed disks per region
- With managed disks, you pay for the full capacity of a disk, regardless of the disk space that is in use.

### Managed Disk

# Azure VM: Images



- ❑ You can use images to create Azure Virtual Machines.
- ❑ You can capture images from on-premises virtual machines, or you can use pre-built images from the Azure Marketplace.
- ❑ The Marketplace contains basic operating-system images and images that are built to provide a specific purpose.
- ❑ The Marketplace contains hundreds of images in the following categories:

Microsoft  
Windows  
Server

Linux  
Distributions

Database  
Servers

Application  
Servers

# Azure VM: Image Type

- ❑ VHD files in an Azure storage account represent one of two object types

Images

Disks

- ❑ Images serve as templates from which you create new disks during provisioning of new virtual machines.
- ❑ There are two types of images:

## Operating System Images

- Represents a single disk containing a generalized installation of the Windows or Linux operating system.

## VM Images

- Refers to an image that contains all disks attached to a VM during its capture.



# Azure VM: Custom Image

- ❑ You can reuse Azure Virtual Machines that you configure to deploy images as new Azure Virtual Machines.
- ❑ This process saves time when you are configuring new virtual machines by reusing a configuration that exists already within an Azure Virtual Machine.
- ❑ To create an image of a virtual machine, you need to:
  - Generalize the Windows VM using Sysprep
    - Sysprep removes all your personal account information, among other things, and prepares the machine to be used as an image.



# Azure VM: Resource Group



- ❑ All the resources in your group should share the same lifecycle. You deploy, update, and delete them together.
- ❑ Each resource can only exist in one resource group.
- ❑ You can add or remove a resource to a resource group at any time.
- ❑ You can move a resource from one resource group to another group.
- ❑ A resource group can contain resources that reside in different regions.

❑ A resource group can be used to scope access control for administrative actions.

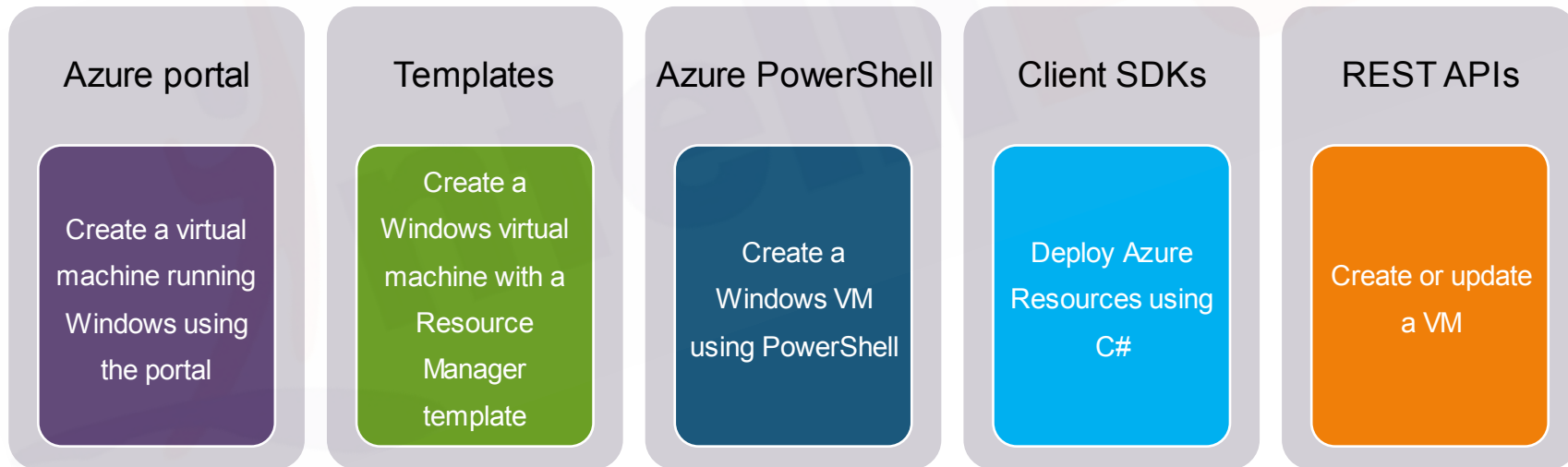
A resource can interact with resources in other resource groups.

When creating a resource group, you need to provide a location for that resource group

# Azure VM:

## How do I create my first VM?

- ❑ You have several choices for creating your VM.
- ❑ The choice that you make depends on the environment you are in.



# Azure VM: Network Interfaces

- ❑ A network interface (NIC) is the interconnection between a VM and a virtual network (VNet).
- ❑ A VM must have at least one NIC, but can have more than one, depending on the size of the VM you create.
- ❑ Each NIC attached to a VM must exist in the same location and subscription as the VM.
- ❑ You can change the subnet a VM is connected to after it's created, but you cannot change the VNet.
- ❑ You can assign these types of IP addresses to a NIC in Azure:

**Public IP addresses**

**Private IP  
addresses**

# Azure VM:

## Network Security Groups

- ❑ A network security group (NSG) contains a list of Access Control List (ACL) rules that allow or deny network traffic to subnets, NICs, or both.
- ❑ NSGs can be associated with either subnets or individual NICs connected to a subnet.
- ❑ When an NSG is associated with a subnet, the ACL rules apply to all the VMs in that subnet.
- ❑ In addition, traffic to an individual NIC can be restricted by associating an NSG directly to a NIC.
- ❑ NSGs contain two sets of rules: inbound and outbound.
- ❑ The priority for a rule must be unique within each set.
- ❑ Each rule has properties of protocol, source and destination port ranges, address prefixes, direction of traffic, priority, and access type.

# Azure VM: Resize



- ❑ One of the great benefits of Azure VMs is the ability to change the size of your VM based on resources.
- ❑ Consider the following, when planning to resize virtual machines:
  - ❑ The region in which your VM is deployed. Different VM sizes require different physical hardware.
  - ❑ In some instances, an Azure region may not contain the hardware required to support the desired VM size.
- ❑ If the VM size you desire to use is not available in your current region, then your options are to either wait for the size to become available in the region or to move the VM, and possibly other services, to a new region.

# Azure VM: Snapshots



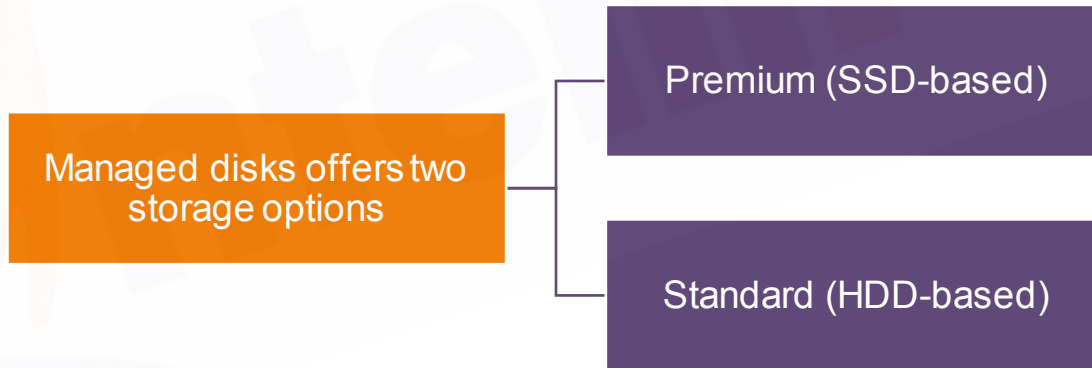
- ❑ A Managed Snapshot is a read-only full copy of a managed disk which is stored as a standard managed disk.
- ❑ With snapshots, you can back up your managed disks at any point in time.
- ❑ These snapshots exist independent of the source disk and can be used to create new Managed Disks.
- ❑ They are billed based on the used size.

Example, if you create a snapshot of a managed disk with provisioned capacity of 64 GB and actual used data size of 10 GB, snapshot will be billed only for the used data size of 10 GB.

# Azure VM:

## Convert Disks Storage

- ❑ It allows you to easily switch between the two options with minimal downtime based on your performance needs.
- ❑ This capability is not available for unmanaged disks.





# Automate Deployment of VMs

# Automate Deployment of VMs



- ❑ For updating the resource in an Azure Resource manager template, you can use the following **github** link:

<https://github.com/mspnp/template-examples>

## Create a Windows VM from a specialized disk by using PowerShell

Before you begin

- ❑ To use PowerShell, make sure that you have the latest version of the AzureRM.Compute PowerShell module.

```
PowerShell Copy  
  
Install-Module AzureRM -RequiredVersion 6.0.0
```

### Option 1:

- Use an existing disk

### Option 2:

- Upload a specialized VHD, then Upload the VHD to your storage account and Create a managed disk from the VHD

### Option 3:

- Copy an existing Azure VM and Create a new disk from the snapshot, then **create** the new VM with the subnet and virtual network, security group and Public IP Address etc. Next step is to select the name, size, OS and you're good to go.

# Automate Deployment of VMs



## Create a Windows virtual machine from a Resource Manager template

### Launch the Azure Cloud Shell

Create a resource group, all resources must be deployed in a resource group.

Get a list of available locations where resources can be created.

Create the resource group in the location that you select. This example shows the creation of a resource group named **myResourceGroup** in the **West US** location

### Create the files

In this step, you create a template file that deploys the resources and a parameters file that supplies parameter values to the template. You also create an authorization file that is used to perform Azure Resource Manager operations.

Create a file named *CreateVMTemplate.json* and add your JSON code to it. Replace the value of *domainNameLabel* with your own unique name.

Create a file named *Parameters.json* and add this JSON code to it

Create a new storage account and container

Upload the files to the storage account

Then simply create the resource by deploying the template

# Automate Deployment of VMs: Download the template for a VM



## Download the template using the portal

Log in to the Azure portal.

On the left menu, select **Virtual Machines**.

Select the virtual machine from the list.

Select **Automation script**.

Select **Download** from the menu at the top and save the .zip file to your local computer.

Open the .zip file and extract the files to a folder. The .zip file contains:

- `deploy.ps1`
- `deploy.sh`
- `deployer.rb`
- `DeploymentHelper.cs`
- `parameters.json`
- `template.json`

The `template.json` file is the template.

# Automate Deployment of VMs:

## Download the template for a VM

### Download the template using PowerShell

You can also download the .json template file using the `Export-AzureRMResourceGroup` cmdlet. You can use the `-path` parameter to provide the filename and path for the .json file.

```
Export-AzureRmResourceGroup -ResourceGroupName "myResourceGroup" -Path "C:\users\public\downloads"
```

# Automate Deployment of VMs: Windows VM using Azure Portal



## Create Virtual Machine

1. Choose **Create** a resource in the upper left-hand corner of the Azure portal.

In the search box above the list of Azure Marketplace resources, search for and select Windows Server 2016 Datacenter, then choose **Create**.

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.

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

Under **Administrator account**, provide a username, such as *azureuser* and a password. The password must be at least 12 characters long.

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

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

**Connect to virtual machine then Install the web server and view the IIS welcome page.  
-> After this, clean up the resources.**

# Automate Deployment of VMs: Linux VM using Azure Portal

## Create SSH key pair

Open a bash shell and use `ssh-keygen` to create an SSH key pair. If you don't have a bash shell on your local computer, you can use the Azure Cloud Shell.

```
ssh-keygen -t rsa -b 2048
```

The above command generates public and private keys with the default name of `id_rsa` in the `~/.ssh` directory. The command returns the full path to the public key. Use the path to the public key to display its contents with `cat`.

```
cat ~/.ssh/id_rsa.pub
```

Save the output of this command. You will need it when configuring your administrator account to log in to your VM.

For more detailed information on how to create SSH key pairs, including the use of PuTTY, If you create your SSH key pair using the Cloud Shell, it will be stored in an Azure File Share that is automatically mounted by the Cloud Shell. Don't delete this file share or storage account until after you have retrieved your keys or you will lose access to the VM.

After this, simply Sign Into Azure portal and Create the VM like in previous steps and connect to VM by creating SSH Connection and Install the web server and view the web server in action.

Then clean up the resources.

# Azure VM: Pricing

## Pay as you go

Pay for compute capacity by the second.

Increase or decrease compute capacity on demand.

Start or stop at any time and only pay for what you use.

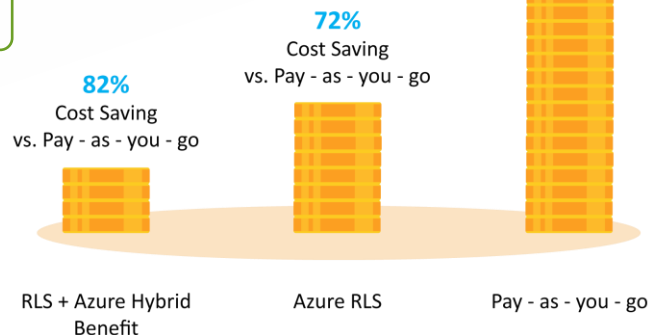
## Reserved Virtual Machine Instances

Advanced purchase for one or three years in a specified region.

You get up to 72% price savings compared to pay as you go pricing.

## Azure Hybrid

Use your on-premises Windows Server licences to save big on Azure, while you just pay for base compute costs.





# Hands-On

# Hands-On

- ☐ Create a virtual machine
  - ☐ Connect virtual machine
  - ☐ Install web server
- ☐ Create customize OS image
  - ☐ Launch new VM using customize Image
- ☐ Convert dynamic to static IP address
- ☐ Create additional NIC
  - ☐ Assign 2nd NIC to VM
- ☐ Create & manage vm disks
- ☐ Create Snapshot of disk
- ☐ Resize a virtual machine
- ☐ Delete resource group



# Azure PowerShell

# What is Azure PowerShell?

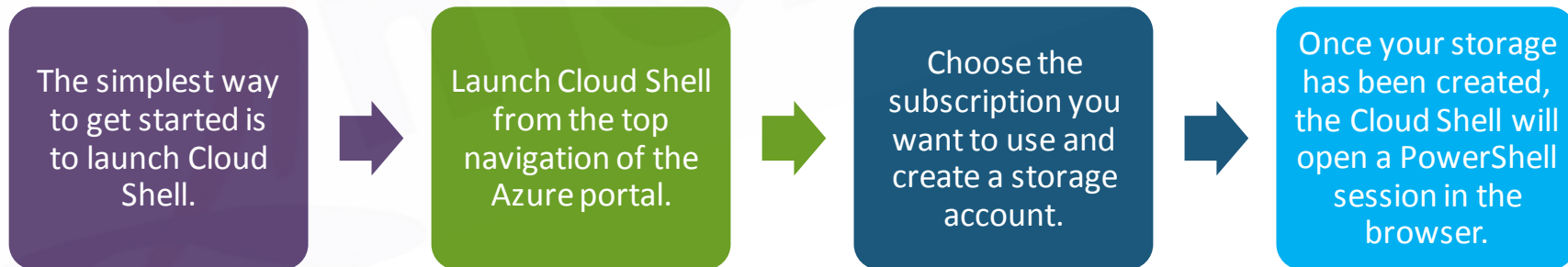
- ❑ Azure PowerShell provides a set of cmdlets that use the Azure Resource Manager model for managing your Azure resources.
- ❑ You can use it in your browser with Azure Cloud Shell, or you can install it on your local machine and use it in any PowerShell session.
- ❑ Use the Cloud Shell to run the Azure PowerShell in your browser, or install it on own computer.



# Azure PowerShell: CloudShell



- ❑ Azure PowerShell is designed for managing and administering Azure resources from the command line, and for building automation scripts that work against the Azure Resource Manager.
- ❑ You can use it in your browser with Azure Cloud Shell, or you can install it on your local machine and use it in any PowerShell session.
- ❑ **Connect**



# Hands-On

# Azure PowerShell: Create a Resource Group

- ❑ Create a resource group named "MyResourceGroup" in the "eastus" region of Azure.
- ❑ To do so type the following command:
  - ❑ `New-AzureRmResourceGroup -Name 'myResourceGroup' -Location 'eastus'`

PowerShell

```
New-AzureRmResourceGroup -Name 'myResourceGroup' -Location 'westeurope'
```

Output

```
ResourceGroupName : myResourceGroup
Location           : westeurope
ProvisioningState  : Succeeded
Tags               :
ResourceId         : /subscriptions/XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX/resourceGroups/myResourceGroup
```

# Azure PowerShell: Create Network Resources



First we need to create a subnet configuration to be used with the virtual network creation process.



We also create a public IP address so that we can connect to this VM.



We create a network security group to secure access to the public address.



Finally we create the virtual NIC using all of the previous resources.

PowerShell

```
# Variables for common values
$resourceGroup = "myResourceGroup"
$location = "westeurope"
$vmName = "myWindowsVM"

# Create a subnet configuration
$subnetConfig = New-AzureRmVirtualNetworkSubnetConfig -Name mySubnet1 -AddressPrefix 192.168.1.0/24

# Create a virtual network
$vnnet = New-AzureRmVirtualNetwork -ResourceGroupName $resourceGroup -Location $location `
-Name MYvNET1 -AddressPrefix 192.168.0.0/16 -Subnet $subnetConfig

# Create a public IP address and specify a DNS name
$publicIp = New-AzureRmPublicIpAddress -ResourceGroupName $resourceGroup -Location $location `
-Name "mypublicdns$(Get-Random)" -AllocationMethod Static -IdleTimeoutInMinutes 4
$publicIp | Select-Object Name,IpAddress

# Create an inbound network security group rule for port 3389
$nsgRuleRDP = New-AzureRmNetworkSecurityRuleConfig -Name myNetworkSecurityGroupRuleRDP -Protocol Tcp `
-Direction Inbound -Priority 1000 -SourceAddressPrefix * -SourcePortRange * -DestinationAddressPrefix *
-DestinationPortRange 3389 -Access Allow

# Create a network security group
$nsg = New-AzureRmNetworkSecurityGroup -ResourceGroupName $resourceGroup -Location $location `
-Name myNetworkSecurityGroup1 -SecurityRules $nsgRuleRDP

# Create a virtual network card and associate with public IP address and NSG
$nic = New-AzureRmNetworkInterface -Name myNic1 -ResourceGroupName $resourceGroup -Location $location `
-SubnetId $vnnet.Subnets[0].Id -PublicIpAddressId $publicIp.Id -NetworkSecurityGroupId $nsg.Id
```



# Azure PowerShell: Create Virtual Machine



- ❑ First we need a set of credentials for the OS

```
PowerShell

# Create user object
$cred = Get-Credential -Message "Enter a username and password for the virtual machine."
```

- ❑ Now that we have the required resources we can create the VM.
- ❑ For this step, we create a VM configuration object, then we use the configuration to create the VM.

```
PowerShell

# Create a virtual machine configuration
$vmConfig = New-AzureRmVMConfig -VMName $vmName -VMSize Standard_D1 |
    Set-AzureRmVMOperatingSystem -Windows -ComputerName $vmName -Credential $cred |
    Set-AzureRmVMSourceImage -PublisherName MicrosoftWindowsServer -Offer WindowsServer -Skus 2016-Datacenter -Vers
    Add-AzureRmVMNetworkInterface -Id $nic.Id

# Create a virtual machine
New-AzureRmVM -ResourceGroupName $resourceGroup -Location $location -VM $vmConfig
```

# Azure PowerShell: Samples



Azure Virtual Machine PowerShell samples

<https://docs.microsoft.com/en-us/azure/virtual-machines/windows/powershell-samples?toc=%2Fpowershell%2Fazure%25%2Ftoc.json>

# Azure PowerShell: Tutorial



<https://docs.microsoft.com/en-us/azure/virtual-machines/windows/tutorial-manage-vm>

# QUIZ

# Quiz 1

Which service in Azure is used to manage resources in Azure?

- A Application Insights
- B Azure Resource Manager
- C Azure Portal
- D Log Analytics



# Answer 1

Which service in Azure is used to manage resources in Azure?

- A Application Insights
- B Azure Resource Manager
- C Azure Portal
- D Log Analytics



# Quiz 2

What are Virtual Machine scale sets in Azure?

**A**

Azure compute resource that can be used to deploy and manage a set of identical VMs.

**B**

Azure compute resource that can be used for deploying and manage the new VMs created

**C**

Azure compute resource that can be used for deploying and manage the already existing VMs

**D**

Azure compute resource which is used for scaling up and down the instances based on the requirements



# Answer 2

What are Virtual Machine scale sets in Azure?

**A**

Azure compute resource that can be used to deploy and manage a set of identical VMs.

**B**

Azure compute resource that can be used for deploying and manage the new VMs created

**C**

Azure compute resource that can be used for deploying and manage the already existing VMs

**D**

Azure compute resource which is used for scaling up and down the instances based on the requirements





# Quiz 3

Can we add the existing VM to an Availability Set?

A

Yes

B

No



# Answer 3

Can we add the existing VM to an Availability Set?

A

Yes

B

No



# Quiz 4

How much storage can you use with a Virtual Machine?

**A** 10GB

**B** 1GB

**C** 100MB

**D** 1TB



# Answer 4

How much storage can you use with a Virtual Machine?

**A** 10GB

**B** 1GB

**C** 100MB

**D** 1TB



# Quiz 5

Which is the right command to create a VM in Azure CLI?

**A**

```
az vm create --resource-group myResourceGroup --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```

**B**

```
az create vm --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```

**C**

```
az vm --resource-group myResourceGroup --name myVM --image win2016datacenter
```

**D**

```
vm create --resource-group myResourceGroup --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```



# Answer 5

Which is the right command to create a VM in Azure CLI?

**A**

```
az vm create --resource-group myResourceGroup --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```

**B**

```
az create vm --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```

**C**

```
az vm --resource-group myResourceGroup --name myVM --image win2016datacenter
```

**D**

```
vm create --resource-group myResourceGroup --name myVM --image win2016datacenter --admin-username azureuser --admin-password myPassword12
```



# Quiz 6

What do we use in order to Automate the deployment of VM?

- A** Azure VM
- B** Azure Blob Storage
- C** Azure PowerShell
- D** Azure CloudShell



# Answer 6

What do we use in order to Automate the deployment of VM?

- A** Azure VM
- B** Azure Blob Storage
- C** Azure PowerShell
- D** Azure CloudShell





# Quiz 7

Which template we used to create a Windows Virtual Machine?

- A Azure Powershell Template
- B Azure Content delivery Template
- C Azure Site Recovery Template
- D Azure Resource Manager Template



# Answer 7

Which template we used to create a Windows Virtual Machine?

- A Azure Powershell Template
- B Azure Content delivery Template
- C Azure Site Recovery Template
- D Azure Resource Manager Template





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