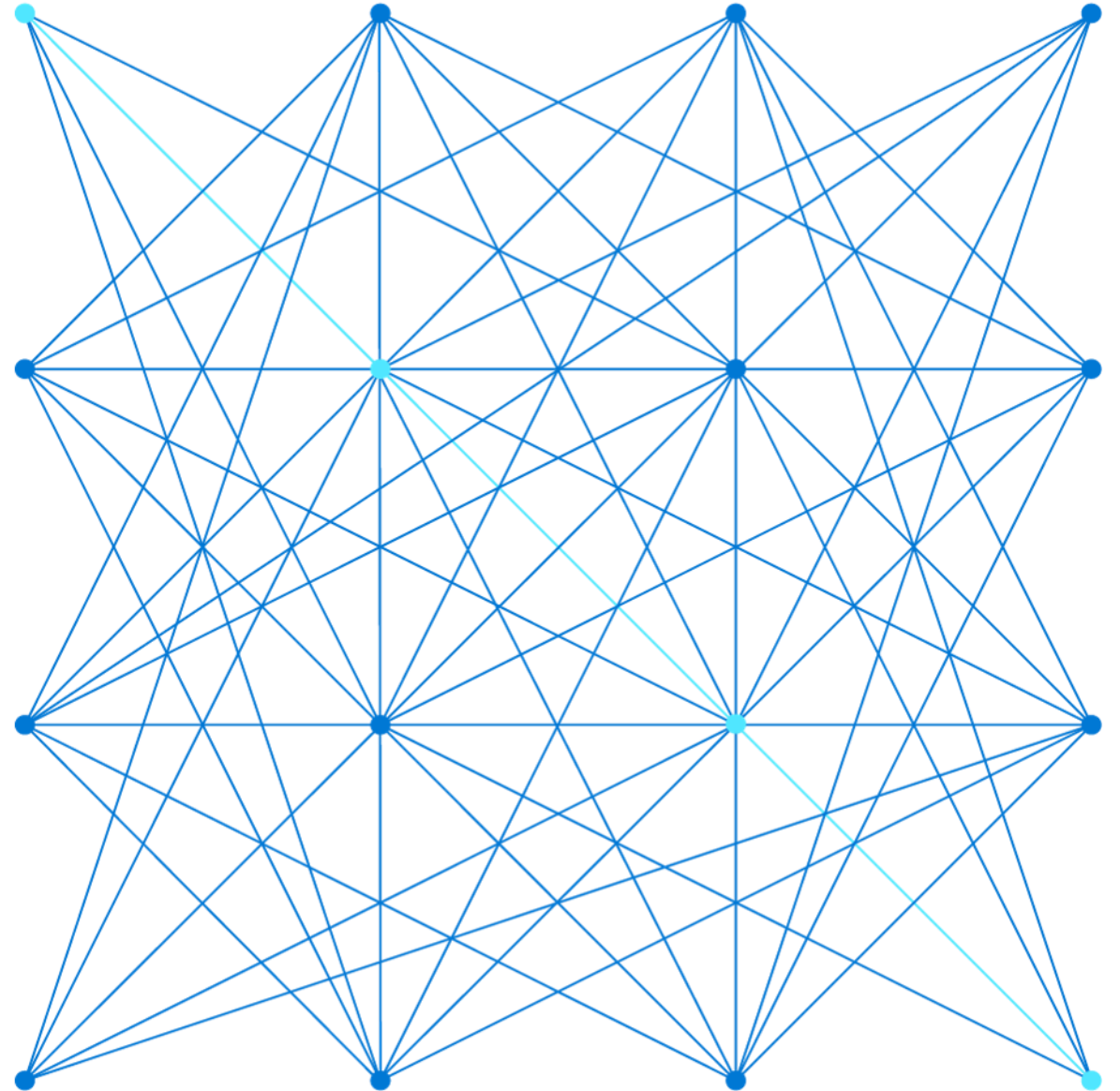


# AZ-104

## Administer Azure Virtual Machines

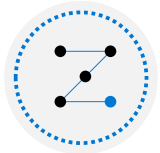


# About this course: Course Outline



01: Administer Identity

---



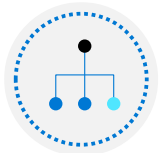
02: Administer Governance and Compliance

---



03: Administer Azure Resources

---



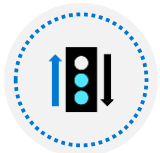
04: Administer Virtual Networking

---

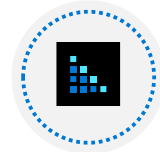


05: Administer Intersite Connectivity

---

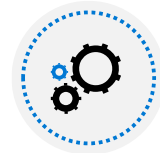


06: Administer Network Traffic Management



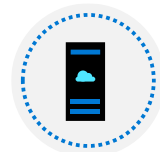
07: Administer Azure Storage

---



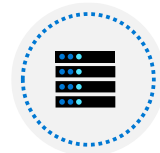
08: Administer Azure Virtual Machines

---



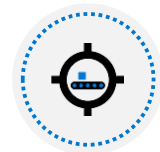
09: Administer PaaS Compute Options

---



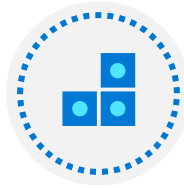
10: Administer Data Protection

---

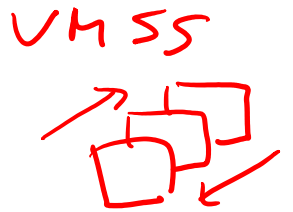


11: Administer Monitoring

# Administer Azure Virtual Machines Overview

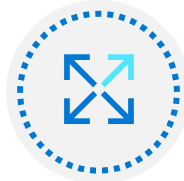


Configure Virtual Machines



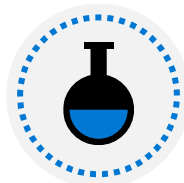
Configure Virtual Machine Availability

LB  
Traffic Manager  
• • •



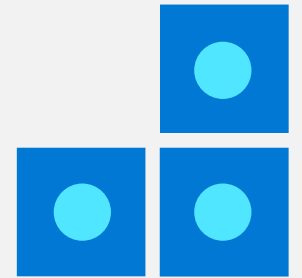
Configure Virtual Machine Extensions

Script  
DSC  
Azure AD



Lab 08 – Manage Virtual Machines

# Configure Virtual Machines



# Configure Virtual Machines Introduction



Review Cloud Services Responsibilities



Plan Virtual Machines



Determine Virtual Machine Sizing



Determine Virtual Machine Storage



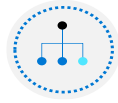
Demonstration - Creating a VM in the Portal



Connect to Virtual Machines



Connect to Windows Virtual Machines



Connect to Linux Virtual Machines



Demonstration – Connect to Linux VMs (optional)



Summary and Resources

# Review Cloud Services Responsibilities



Test and development, website hosting, storage, backup, recovery, high-performance computing, big data analysis, and extended data center

# Plan Virtual Machines

Start with the network

Name the virtual machine

region =  
Choose a location 

- Each region has different hardware and service capabilities
- Locate Virtual Machines as close as possible to your users and to ensure compliance and legal obligations

Consider pricing



60+ Azure regions  
Available in 140 countries

## Determine Virtual Machine Sizing

Type	Description
General purpose	Balanced CPU-to-memory ratio.
Compute optimized	High CPU-to-memory ratio.
Memory optimized	High memory-to-CPU ratio.
Storage optimized	High disk throughput and I/O.
GPU	Specialized virtual machines targeted for heavy graphic rendering and video editing..
High performance compute	Our fastest and most powerful CPU virtual machines

✓ [Share VM images in a compute gallery](#)



# Determine Virtual Machine Storage

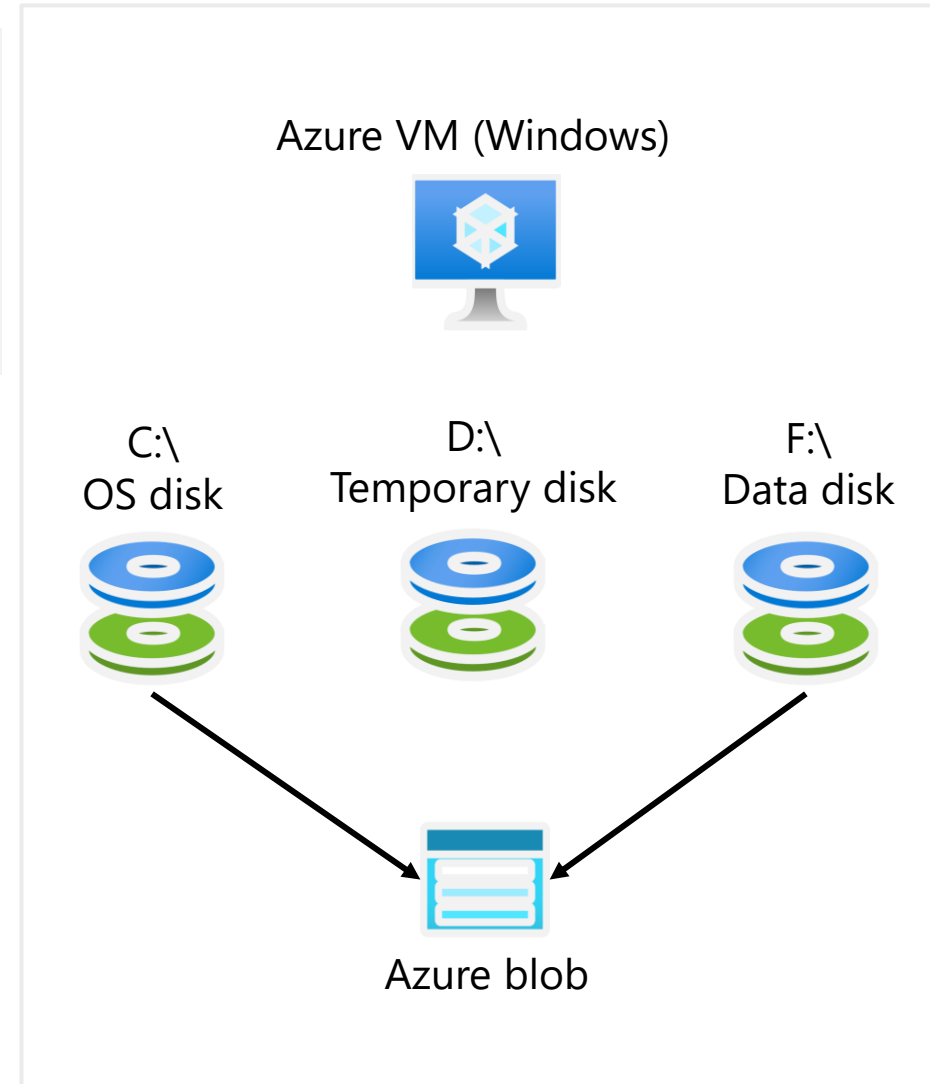
Each Azure VM has two or more disks:

- OS disk
- Temporary disk (not all SKUs have one, content can be lost)
- Data disks (optional)

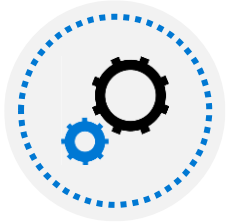
OS and data disks reside in Azure Storage accounts:

- Azure-based storage service
- Standard (HDD, SSD) or Premium (SSD), or Ultra (SSD)

Azure VMs use managed disks



# Demonstration – Creating a VM in the Portal



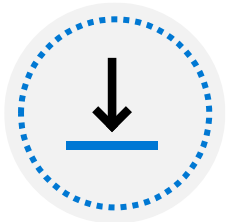
Create the virtual machine

---



Connect to the virtual machine

---



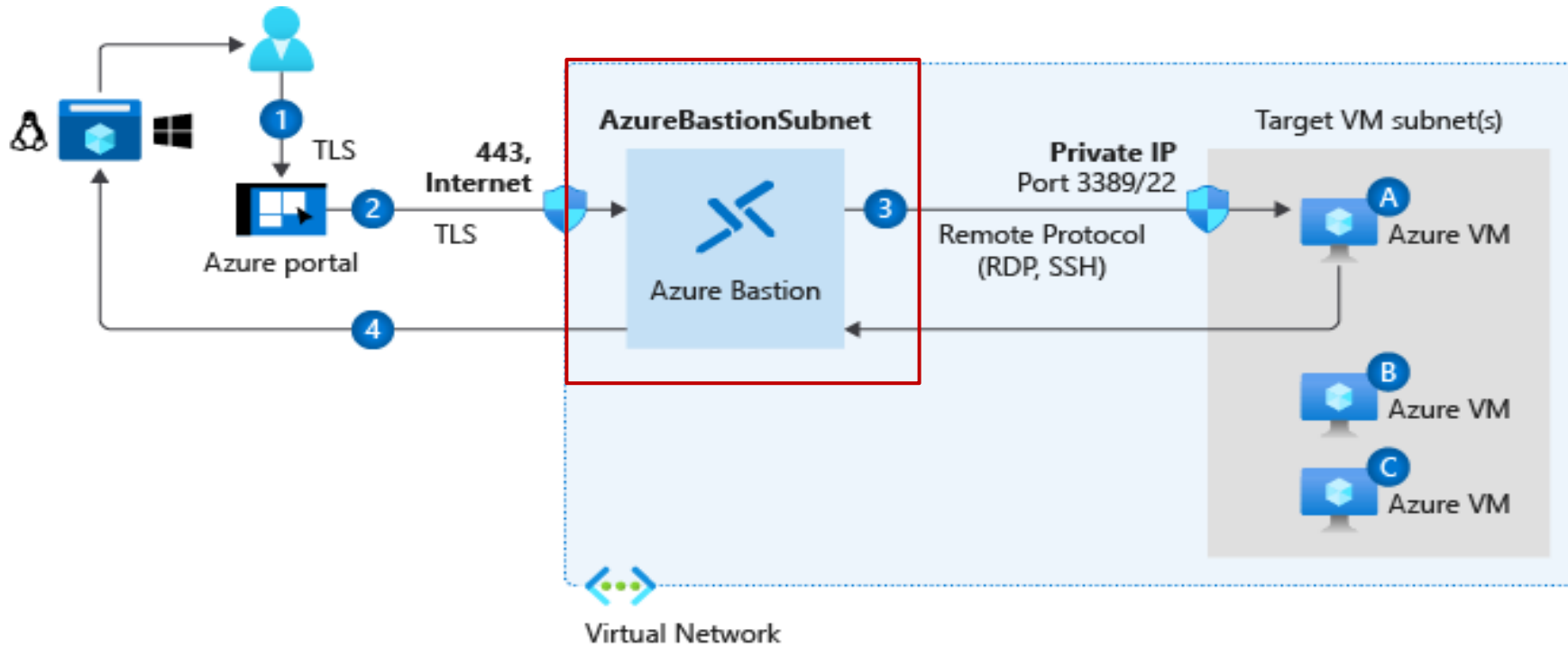
Install the Web Server role

---



View the IIS welcome page

# Connect to Virtual Machines



Bastion Subnet for RDP/SSH through the Portal over SSL

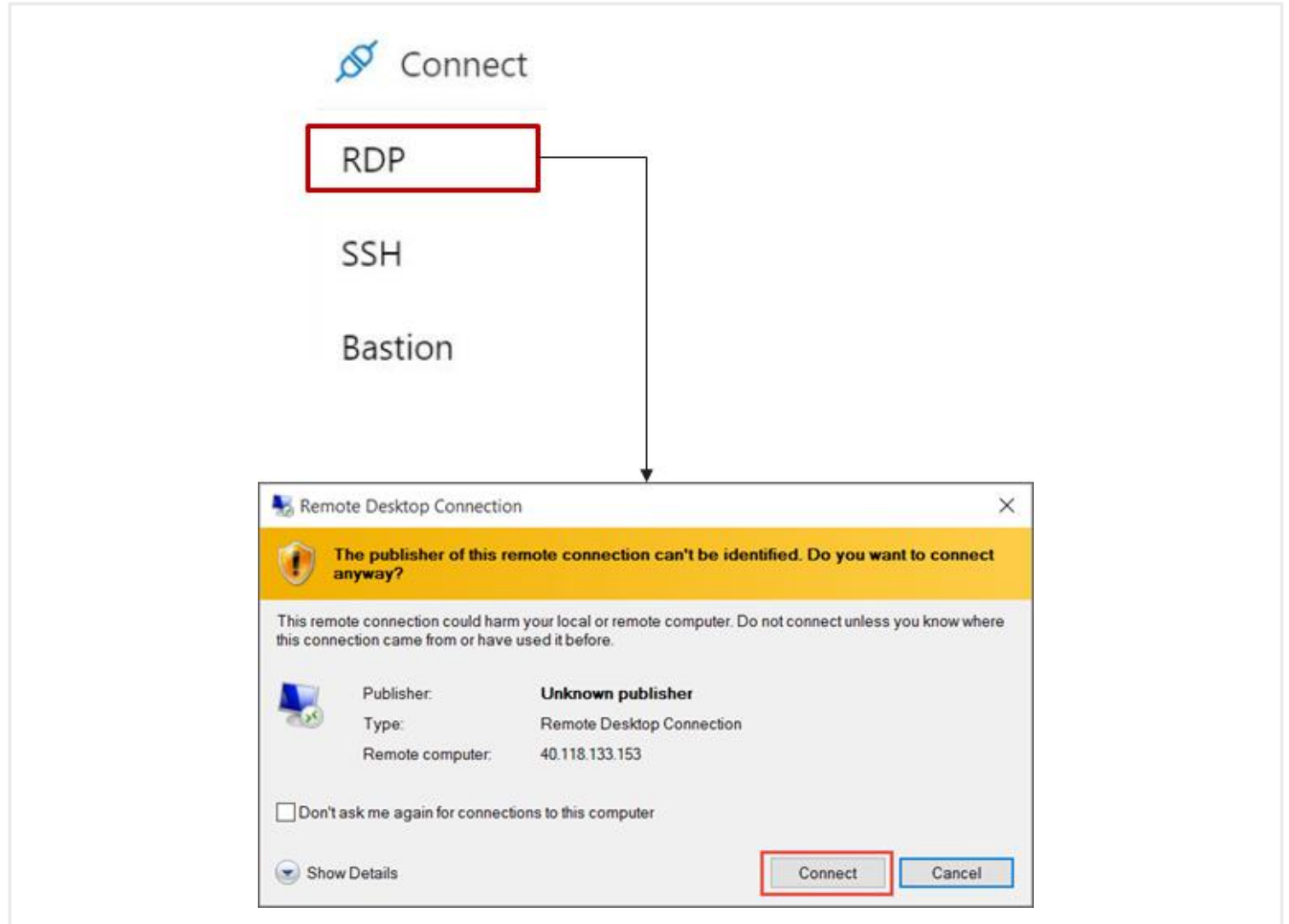
Remote Desktop Protocol for Windows-based Virtual Machines

Secure Shell Protocol for Linux based Virtual Machines

# Connect to Windows Virtual Machines

Remote Desktop Protocol (RDP) creates a GUI session and accepts inbound traffic on TCP port 3389

WinRM creates a command-line session so you can run scripts



# Connect to Linux Virtual Machines

Administrator account

Authentication type

Username \* ⓘ

SSH public key \* ⓘ

Provide an RSA public key in the single-line format (starting with "ssh-rsa") or the multi-line PEM format. You can generate SSH keys using ssh-keygen on Linux and OS X, or PuTTYGen on Windows.



[Learn more about creating and using SSH keys in Azure](#)

Authenticate with a SSH public key or password

SSH is an encrypted connection protocol that allows secure logins over unsecured connections

There are public and private keys

# Demonstration – Connect to Linux VMs (optional)



Create the SSH keys

---



Create the Linux machine and assign the public SSH key

---



Access the server using SSH

# Summary and Resources - Configure Virtual Machines

## Knowledge Check Questions



## Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

[Introduction to Azure virtual machines \(Sandbox\)](#)

[Choose the right disk storage for your virtual machine workload](#)

[Create a Linux virtual machine in Azure \(Sandbox\)](#)

[Create a Windows virtual machine in Azure \(Sandbox\)](#)

[Connect to virtual machines through the Azure portal by using Azure Bastion](#)

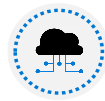
*A sandbox indicates a hands-on exercise.*

# Configure Virtual Machine Availability





# Configure Azure Virtual Machine Availability Introduction



Plan for Maintenance and Downtime



Setup Availability Sets



Review Update and Fault Domains



Review Availability Zones



Compare Vertical to Horizontal Scaling



Create Scale Sets (2 student topics)



Configure Autoscale (2 student topics)



Demonstration – Virtual Machine Scaling



Summary and Resources

# Plan for Maintenance and Downtime

## Unplanned Hardware Maintenance

When the platform predicts a failure, it will issue an **unplanned hardware maintenance** event

**Action:** Live migration

## Unexpected Downtime

**Unexpected Downtime** is when a virtual machine fails unexpectedly

**Action:** Automatically migrate (heal)

## Planned Maintenance

**Planned Maintenance** events are periodic updates made to the Azure platform

**Action:** No action

# Setup Availability Sets

Hyper-V

Avail

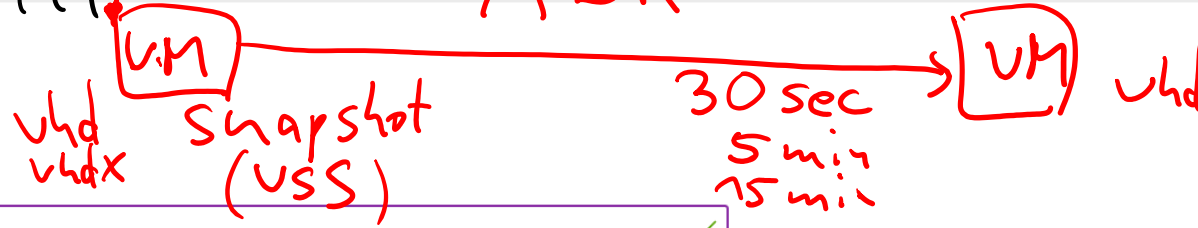
Zone



Geo



ASR



## Instance details

Name \* ⓘ

avset01

Region \* ⓘ

(US) East US

Fault domains ⓘ

2

Update domains ⓘ

5

Use managed disks ⓘ

No (Classic)

Yes (Aligned)

Two or more instances in  
Availability Sets = 99.95% SLA

Configure multiple  
Virtual Machines in  
an Availability Set

Configure each  
application tier  
into separate  
Availability Sets

Combine a Load  
Balancer with  
Availability Sets

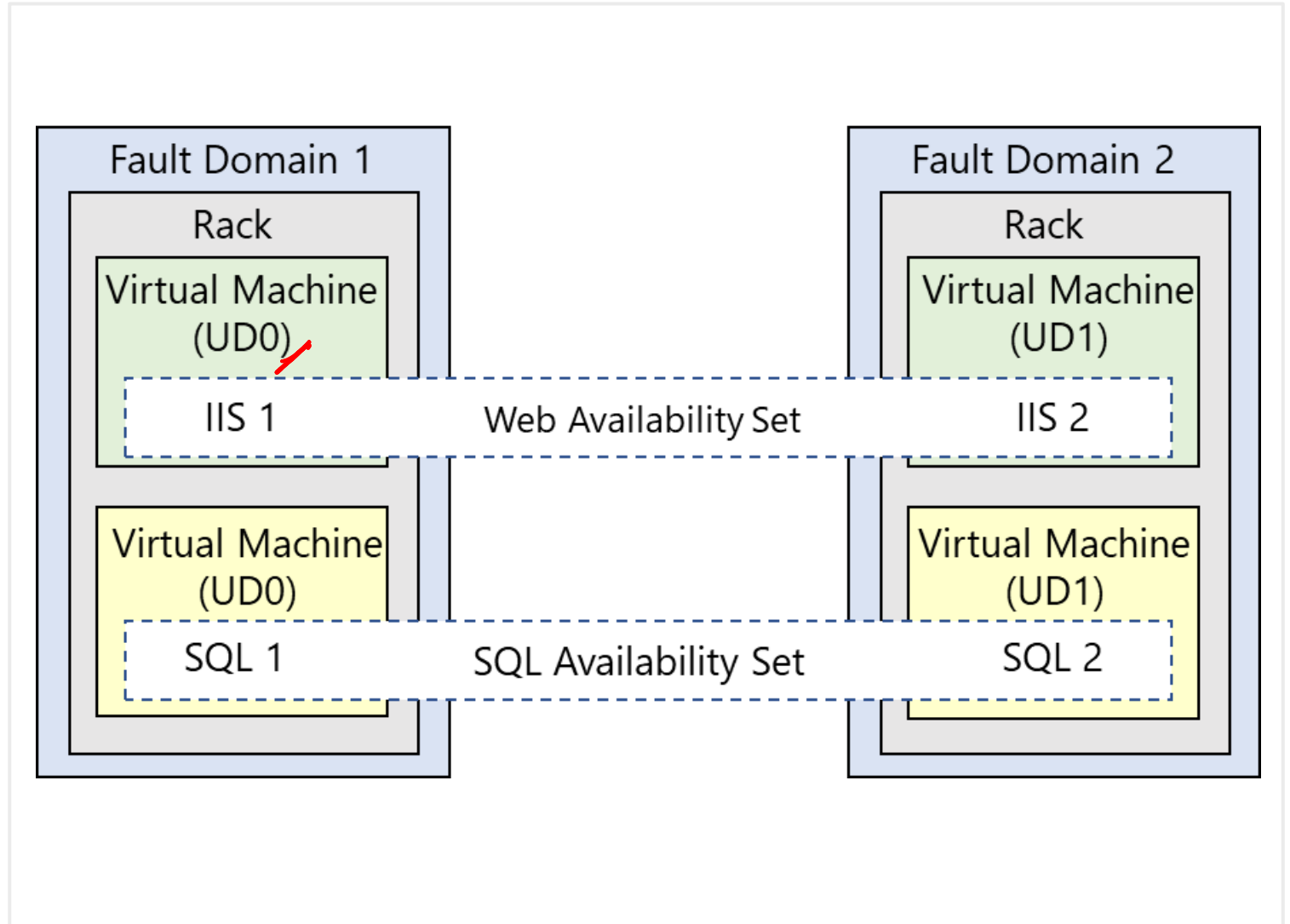
Use managed disks  
with the Virtual  
Machines

VMware Solutions

# Review Update and Fault Domains

**Update domains** allows Azure to perform incremental or rolling upgrades across a deployment. During planned maintenance, only one update domain is rebooted at a time

**Fault Domains** are a group of Virtual Machines that share a common set of hardware, switches, that share a single point of failure. VMs in an availability set are placed in at least two fault domains



# Review Availability Zones

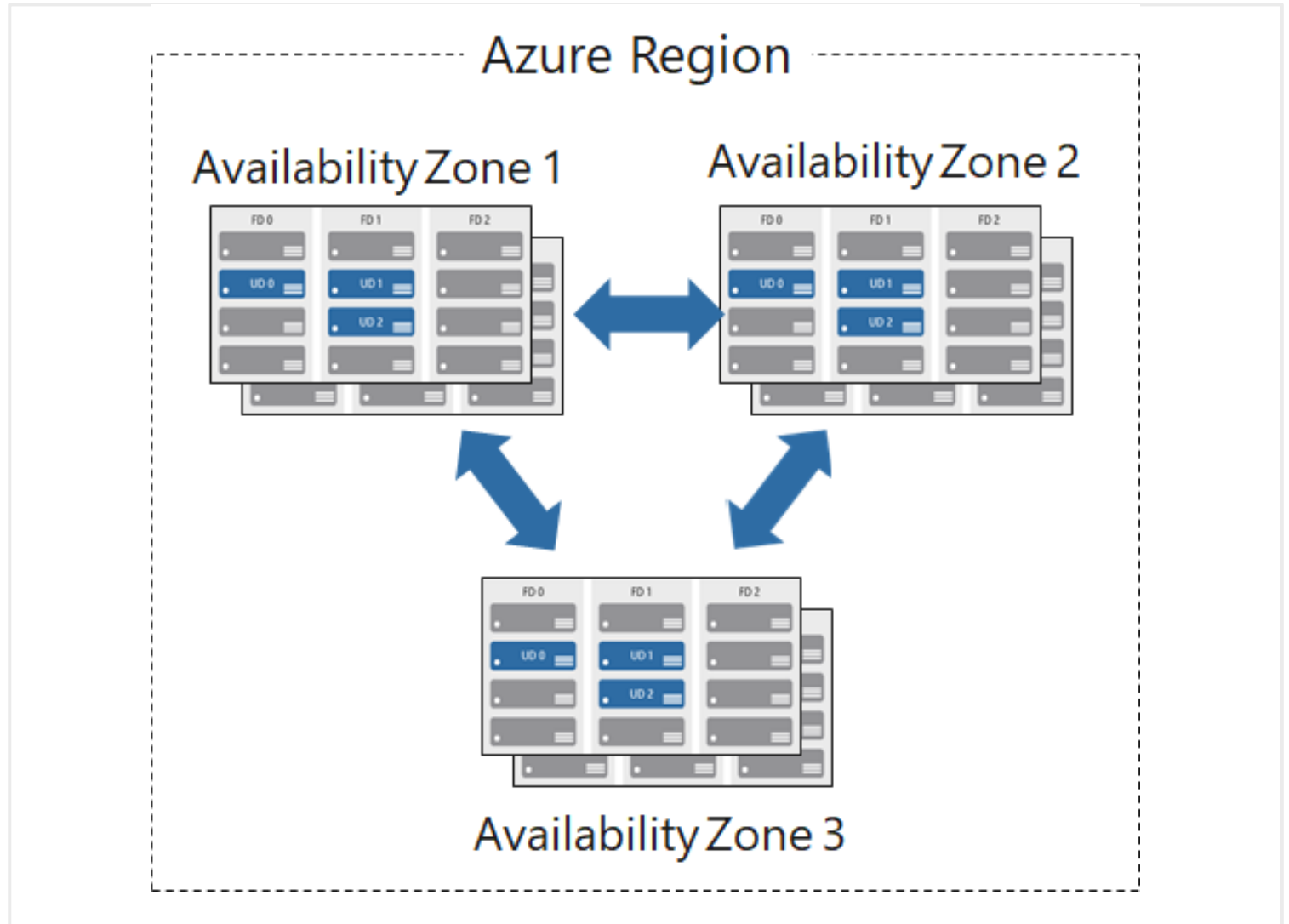
Unique physical locations in a region

Includes datacenters with independent power, cooling, and networking

Protects from datacenter failures

Combines update and fault domains

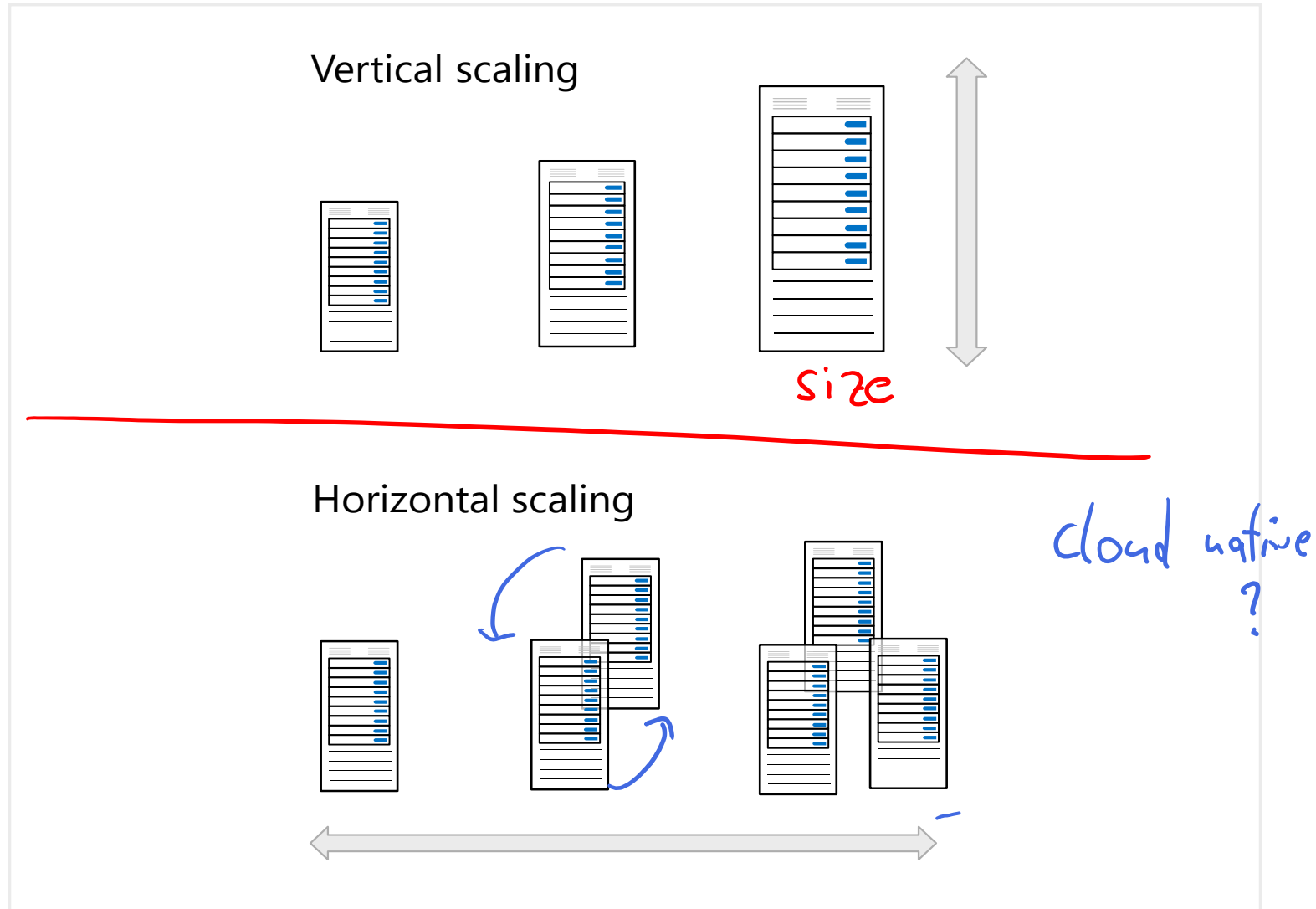
Provides 99.99% SLA



# Compare Vertical to Horizontal Scaling

**Vertical scaling** (scale up and scale down) is the process of increasing or decreasing power to a single instance of a workload; usually manual

**Horizontal scaling** (scale out and scale in) is the process of increasing or decreasing the number of instances of a workload; frequently automated



# Create Scale Sets

**Instance count.** Number of VMs in the scale set (0 to 1000)

**Instance size.** The size of each virtual machine in the scale set

**Azure Spot Instance.** Unused capacity at a discounted rate

**Use managed disks**

**Enable scaling beyond 100 instances**

ARM64

ARM  
Windows 11  
Windows PS5.1

Reserved Instance

1 Jahr  
3

+ EA

Instance

Initial instance count \* ⓘ

Size \* ⓘ **Standard D2s v3**  
2 vcpus, 8 GiB memory (\$85.41/month)  
[Change size](#)

Azure Spot instance ⓘ ☐ Yes ☒ No

Use managed disks ⓘ ☐ No ☒ Yes

Allocation policy

Enable scaling beyond 100 instances ⓘ ☒ No ☐ Yes

Spreading algorithm ⓘ ☐ Max spreading ☒ Fixed spreading (not recommended with zones)

+ Disk

# Configure Autoscale

Define a minimum, maximum, and default number of VM instances

Create more advanced scale sets with scale out and scale in parameters

<b>Instance</b>	
Initial instance count * ⓘ	<input type="text" value="2"/>
<b>Scaling</b>	
Scaling policy ⓘ	<input type="radio"/> Manual <input checked="" type="radio"/> Custom
Minimum number of VMs * ⓘ	<input type="text" value="1"/>
Maximum number of VMs * ⓘ	<input type="text" value="10"/>
<b>Scale out</b>	
CPU threshold (%) * ⓘ	<input type="text" value="75"/>
Duration in minutes * ⓘ	<input type="text" value="10"/>
Number of VMs to increase by * ⓘ	<input type="text" value="1"/>
<b>Scale in</b>	
CPU threshold (%) * ⓘ	<input type="text" value="25"/>
Number of VMs to decrease by * ⓘ	<input type="text" value="1"/>



# Demonstration – Virtual Machine Scaling



Create a scale out rule

---



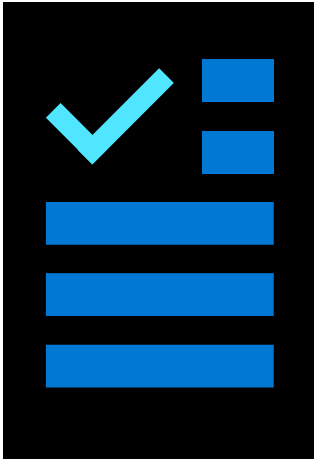
Create a scale in rule

---

# Summary and Resources – Configure Virtual Machine Availability

Knowledge Check Questions

Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))



[Build a scalable application with virtual machine scale sets](#)

---

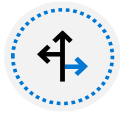
[Implement scale and high availability with Windows Server VM](#)

---

# Configure Virtual Machine Extensions



# Configure Virtual Machine Extensions Introduction



Implement Virtual Machine Extensions



Implement Custom Script Extensions



Implement Desired State Configuration



Demonstration – Custom Script Extension (optional)



Summary and Resources

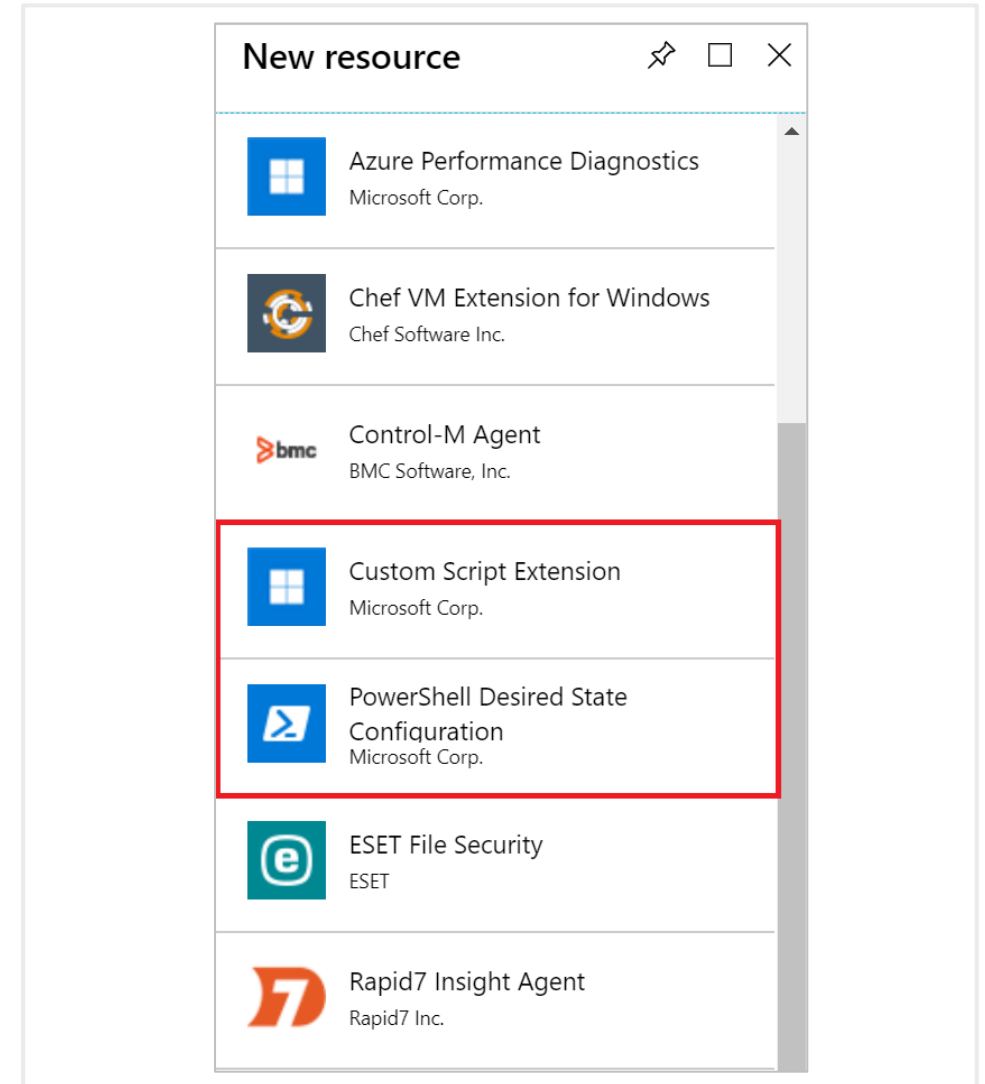
# Implement Virtual Machine Extensions

Extensions are small applications that provide post-deployment VM configuration and automation tasks

Managed with Azure CLI, PowerShell, Azure Resource Manager templates, and the Azure portal

Bundled with a new VM deployment or run against any existing system

Different for Windows and Linux machines



# Implement Custom Script Extensions

Extension scripts can be simple or complex

Extensions have 90 minutes to run

Double check dependencies to ensure availability

Account for any errors that might occur

Protect/encrypt sensitive information



The screenshot shows a dialog box titled "Install extension" with a close button (X) in the top right corner. Inside the dialog, there are two main sections. The first section is labeled "Script file (Required) \*" with an information icon (i) to its right. Below this label is a text input field containing the placeholder text "Select a file". To the right of this input field is a blue button labeled "Browse". The second section is labeled "Arguments (Optional)" with an information icon (i) to its right. Below this label is a large, empty text input field.

# Implement Desired State Configuration

- Functions  
max 8min
- Drivable Functions

Configuration block(s) have a name

Node blocks define the computers or VMs that you are configuring

Resource block(s) configure the resource and its properties

There are many built-in configuration resources

```
configuration IISInstall
```

```
{  
  Node "localhost"  
  {  
    WindowsFeature IIS  
    {  
      Ensure = "Present"  
      Name = "Web-Server"  
    }  
  }  
}
```

Automation Account

NOF

Node

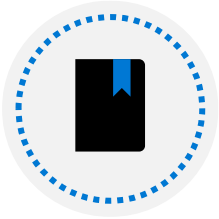
Linux  
OMI

# Demonstration – Custom Script Extension



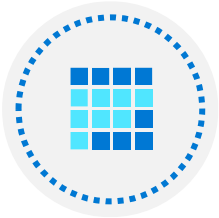
Verify the Web Server feature is available on a virtual machine

---



Create a PowerShell script file to install the Web Server

---



Configure an Extension in the Portal to run the script

---



Verify the Web Server feature was installed



# Summary and Resources - Configure Virtual Machine Extensions

Knowledge Check Questions



Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

[Automate the configuration of Windows Server IaaS Virtual Machines](#)

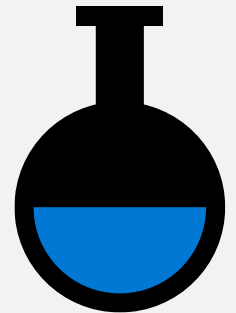
---

[Protect your virtual machine settings with Azure Automation State Configuration \(Sandbox\)](#)

---

A *sandbox* indicates a hands-on exercise.

# Lab – Manage Virtual Machines



# Lab 08 – Manage Virtual Machines

## Lab scenario

You are tasked with identifying different options for deploying and configuring Azure Virtual Machines

## Objectives

### Task 1:

Deploy zone-resilient Virtual Machines in the Azure portal and with templates

### Task 2:

Configure Azure Virtual Machines by using virtual machine extensions

### Task 3:

Scale compute and storage for Azure Virtual Machines

### Task 4:

Deploy zone-resilient scale sets by using the Azure portal

### Task 5:

Configure Azure virtual machine scale sets by using extensions


### Task 6:

Scale compute and storage for Azure virtual machine scale sets

Next slide for an architecture diagram 

# Lab 08 – Architecture diagram

## Task 1

 az104-08-rg01

 az104-06-vnet01 10.80.0.0/20

Subnet0 10.80.0.0/24



az104-08-vm0  
10.80.0.4

Zone1



az104-08-vm1  
10.80.0.5

Zone2

## Task 2



az10408rg01diag938



scripts



az104-08-install\_IIS.ps1

## Task 3, Task 4, Task 5, Task 6, Task 7

 az104-08-rg02

 az104-08-rg02-vnet 10.82.0.0/20

Subnet0 10.82.0.0/24



az10408vmss0



az10408vmss0-lb



az10408vmss0-nsg



az10408vmss0-ip

# End of presentation

