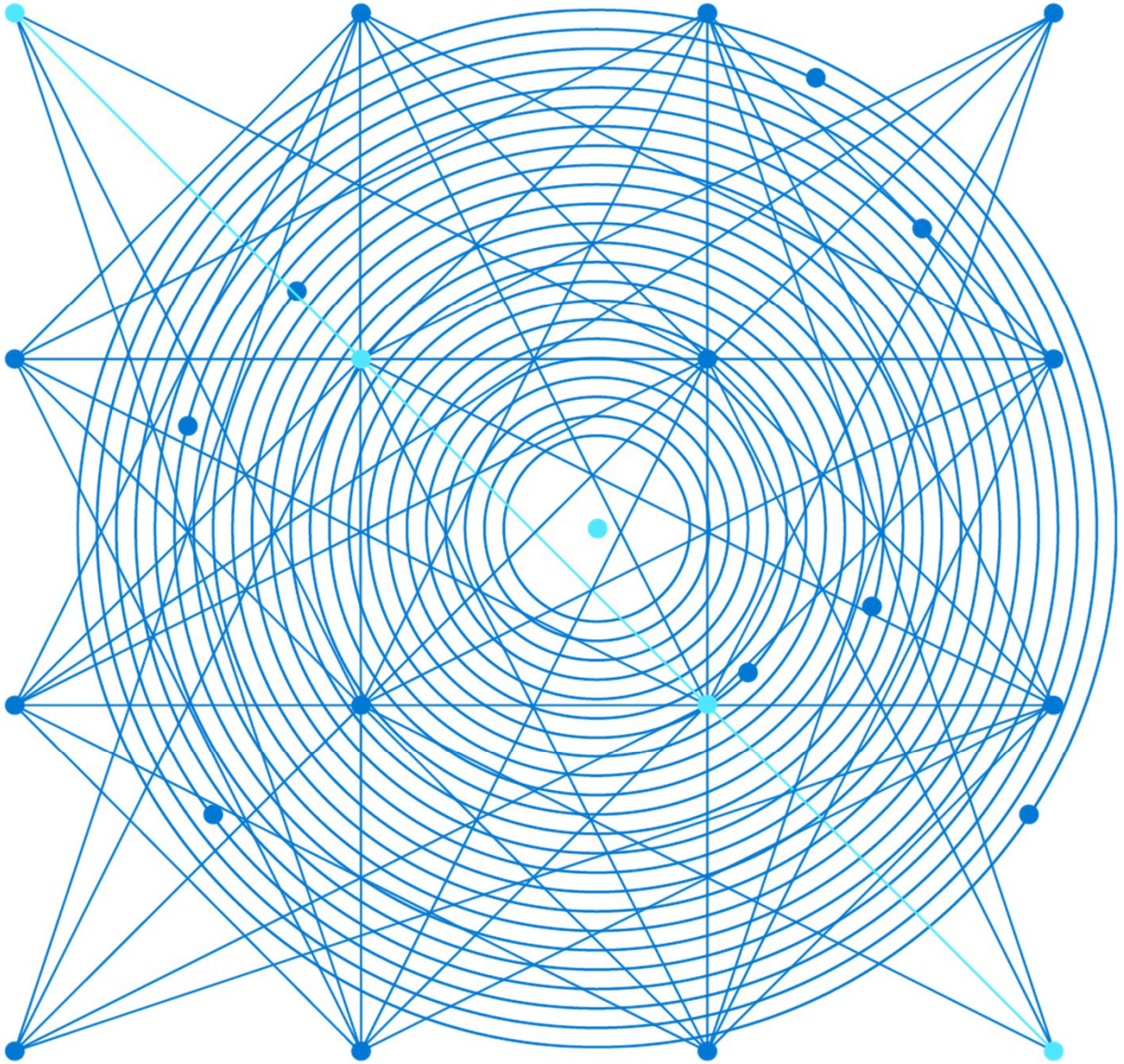
AZ-303: Microsoft Azure Architect Technologies



Module 4: Implement VMs for Windows and Linux

Azure Dedicated Hosts, Scale Sets, Disk Encryption, and High Availability

Learning Objectives

You will learn the following:

- Running Linux and Windows Virtual Machines on Azure
- Select Virtual Machine Size
- Configure High Availability
- Implement Azure Dedicated Hosts
- Deploy and Configure Scale Sets
- Configure Azure Disk Encryption

Overview: Running Linux and Windows Virtual Machines on Azure

Checklist for creating an Azure Virtual Machine

Required resources for IaaS Virtual Machines:

- Start with the network
- Name the VM
- Decide the location for the VM
- Determine the size of the VM
- Understanding the pricing model
- Storage for the VM
- Select an operating system

Start with the Network

Segregate the network

- Create one or more subnets

Secure the network

- Create and assign Network Security Groups (NSGs)

Plan each VM deployment

Naming the VM (1 of 2)

Naming convention considerations:

- The VM name is configured as part of the operating system.
- This name defines a manageable Azure resource—not trivial to change later.

Recommended naming conventions include the following:

Element	Example	Notes
Environment	dev, prod, QA	The environment for the resource
Location	uw (US West), ue (US East)	The Azure region
Instance	01, 02	Instance of a resource
Product or service	Service	Product, application, or service that resource supports
Role	sql, web, messaging	Role of the resource

Naming the VM (2 of 2)

A VM deployment includes several resources:

- The VM itself
- Storage account for the disks
- Virtual network (shared with other VMs and services)
- Network interface to communicate on the network
- Network Security Group(s) to secure network traffic
- Public internet address (optional)

Decide the Location of the VM

- Azure has datacenters all over the world
- Datacenters are grouped into geographic regions
- Select a region where you want the resources to be allocated

Determine the Size of the VM (1 of 2)

Azure provides different VM sizes that offer variations of

- Processing power
- Memory
- Storage capacity

Azure provides a wide range of VM size options

- General purpose
- Compute optimized
- Memory optimized
- Storage optimized
- GPU
- High performance compute
- Confidential computing

Determine the Size of the VM (2 of 2)

Option	Description
General purpose	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	High CPU-to-memory ratio. Suitable for medium traffic web servers, network appliances, batch processes, and application servers.
Memory optimized	High memory-to-CPU ratio. Great for relational database servers, medium to large caches, and in-memory analytics.
Storage optimized	High disk throughput and IO. Ideal for VMs running databases.
GPU	Heavy graphics rendering and video editing. These VMs are ideal options for model training and inferencing with deep learning.
High performance compute	The fastest and most powerful CPU with optional high-throughput network interfaces.
Confidential compute	Designed to protect the confidentiality and the integrity of data and code while it's processed in the cloud.

Virtual Machine Sizes (Windows and Linux)

Type	Sizes	Description
General purpose	B, Dsv3, Dv3, Dasv4, Dav4, DSv2, Dv2, Av2, DC, DCv2, Dv4, Dsv4, Ddv4, Ddsv4	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	Fsv2	High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, batch processes, and application servers.
Memory optimized	Esv3, Ev3, Easv4, Eav4, Ev4, Esv4, Edv4, Edsv4, Mv2, M, DSv2, Dv2	High memory-to-CPU ratio. Great for relational database servers, medium to large caches, and in-memory analytics.
Storage optimized	Lsv2	High disk throughput and IO ideal for Big Data, SQL, NoSQL databases, data warehousing and large transactional databases.
GPU	NC, NCv2, NCv3, ND, NDv2 (Preview), NV, NVv3, NVv4	Specialized virtual machines targeted for heavy graphic rendering and video editing, as well as model training and inferencing (ND) with deep learning. Available with single or multiple GPUs.
High performance compute	HB, HBv2, HC, H	Our fastest and most powerful CPU virtual machines with optional high-throughput network interfaces (RDMA).
Confidential compute	DCsv2-Series	Supports a larger range of deployment capabilities, have 2x the Enclave Page Cache (EPC) and a larger selection of sizes compared to the DC-Series VMs.

Virtual Machine by series: https://azure.microsoft.com/en-us/pricing/details/virtual-machines/series/

The Pricing Model

There are two separate costs charged for every VM

- Compute costs
- Storage costs

There are two main payment options for compute costs

- Pay as you go
- Reserved Virtual Machine instances

Select an Operating System

Azure provides a variety of OS images you can install into the VM, including:

- All currently supported versions of Windows
- All major Linux distributions

- You can search Azure Marketplace for more install images
- You can create your own custom images to create Azure VMs

Storage for the VM

Each Azure VM has two or more disks:

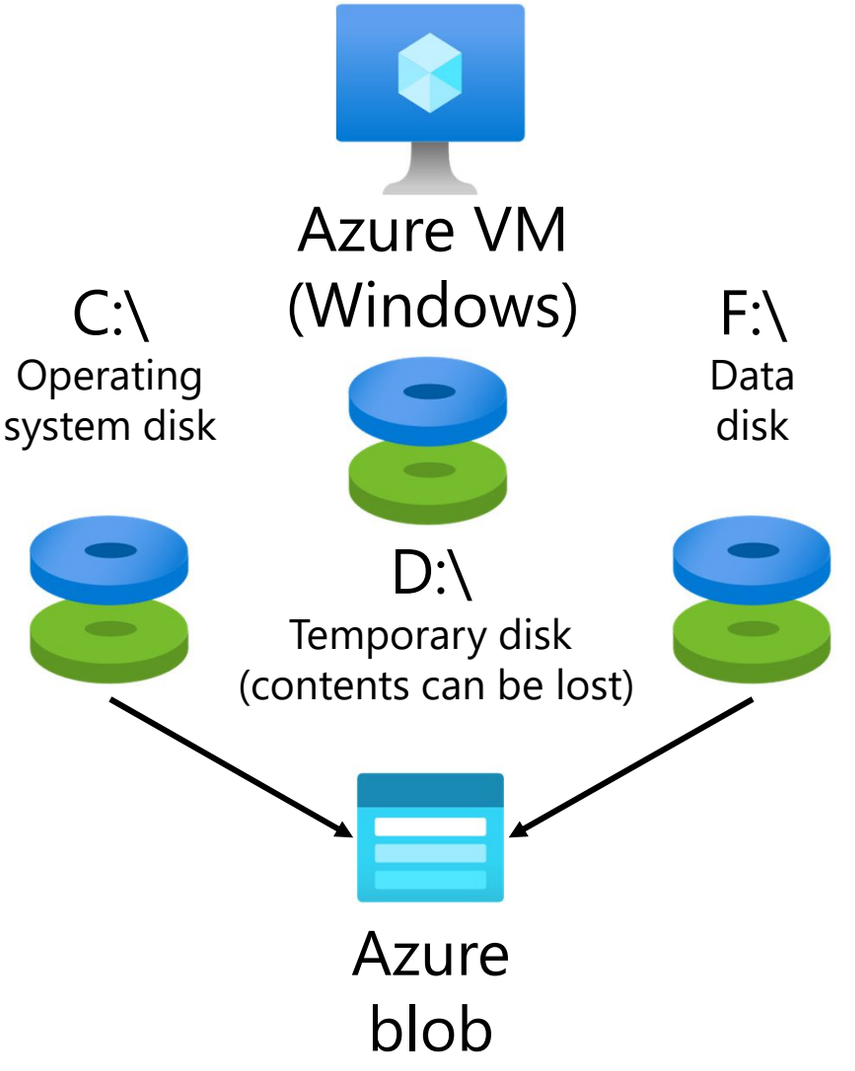
- OS disk
- Temporary disk
- Data disks (optional)

OS and data disks reside in Azure Storage accounts:

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

When creating an Azure VM, you can choose between:

- Managed disks (recommended)
- Unmanaged disks



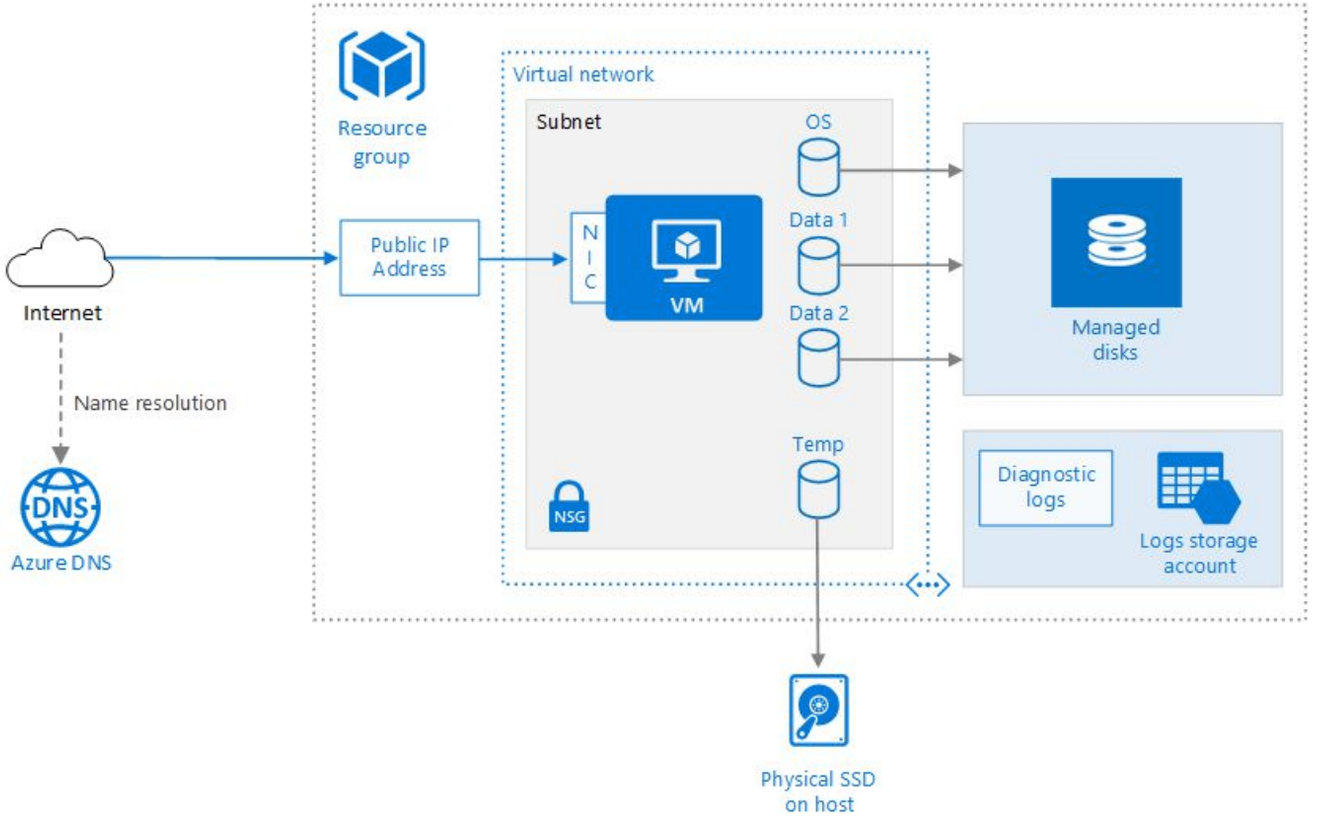
Running Linux and Windows Virtual Machines on Azure

Azure VM deployments includes other resources

- Networking
- Storage

Place related resources in the same resource group to simplify

- Management
- Cost tracking
- deprovisioning

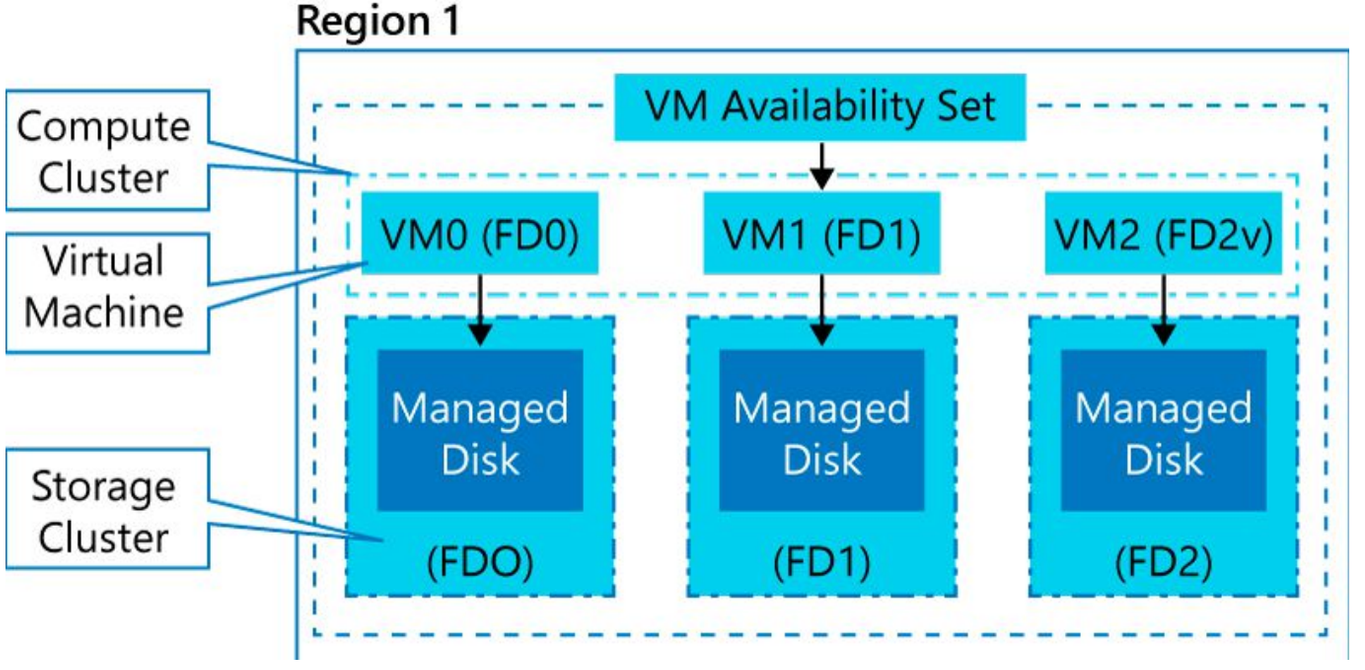


Configure High Availability

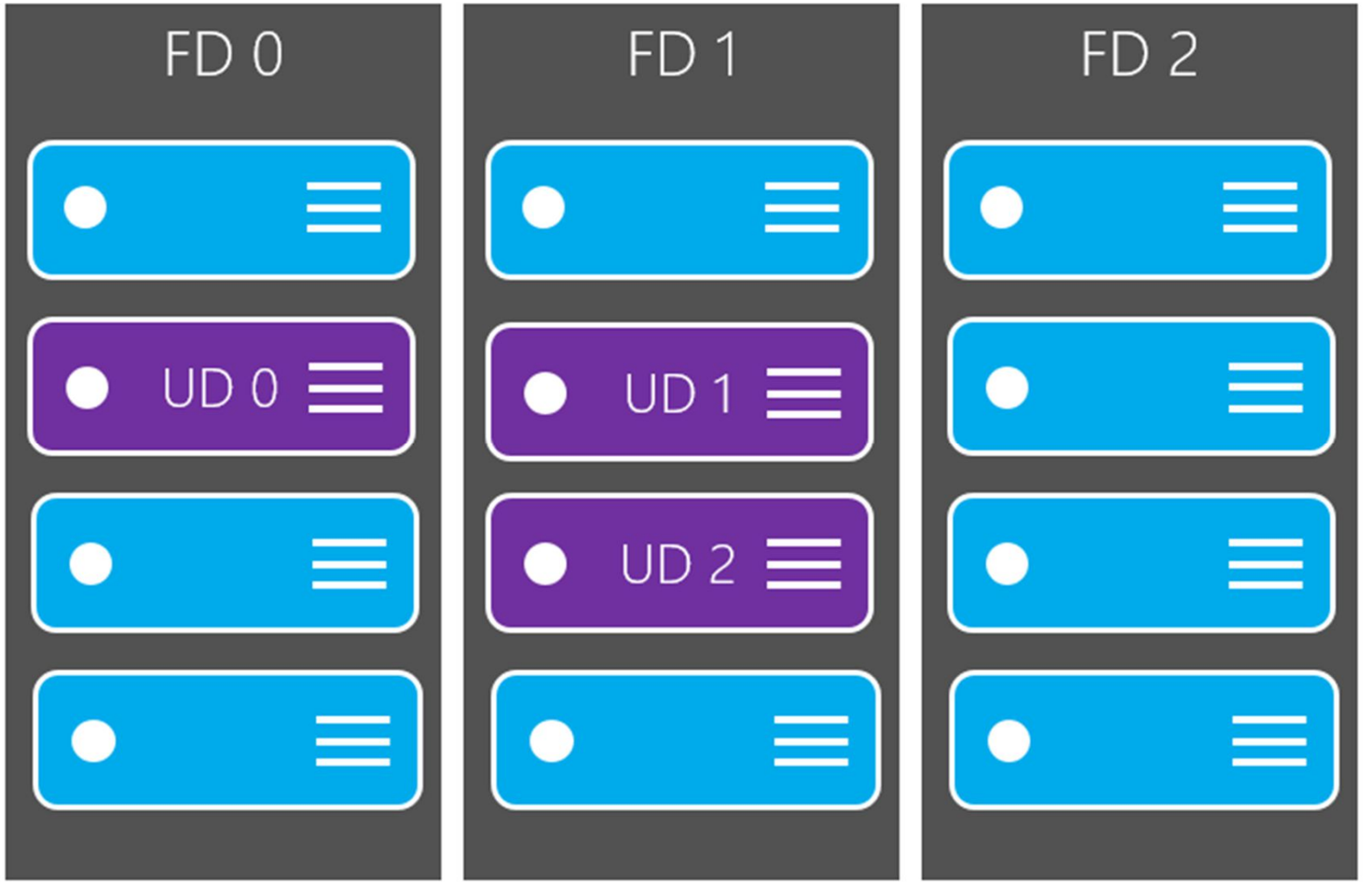
Availability Sets (1 of 2)

An availability set is a logical grouping of VMs within a datacenter:

- Automatically distributes VMs across fault and update domains on compute clusters
- With managed disks, it provides equivalent resiliency on storage clusters
- Provides 99.95% availability SLA (for 2 or more VMs)



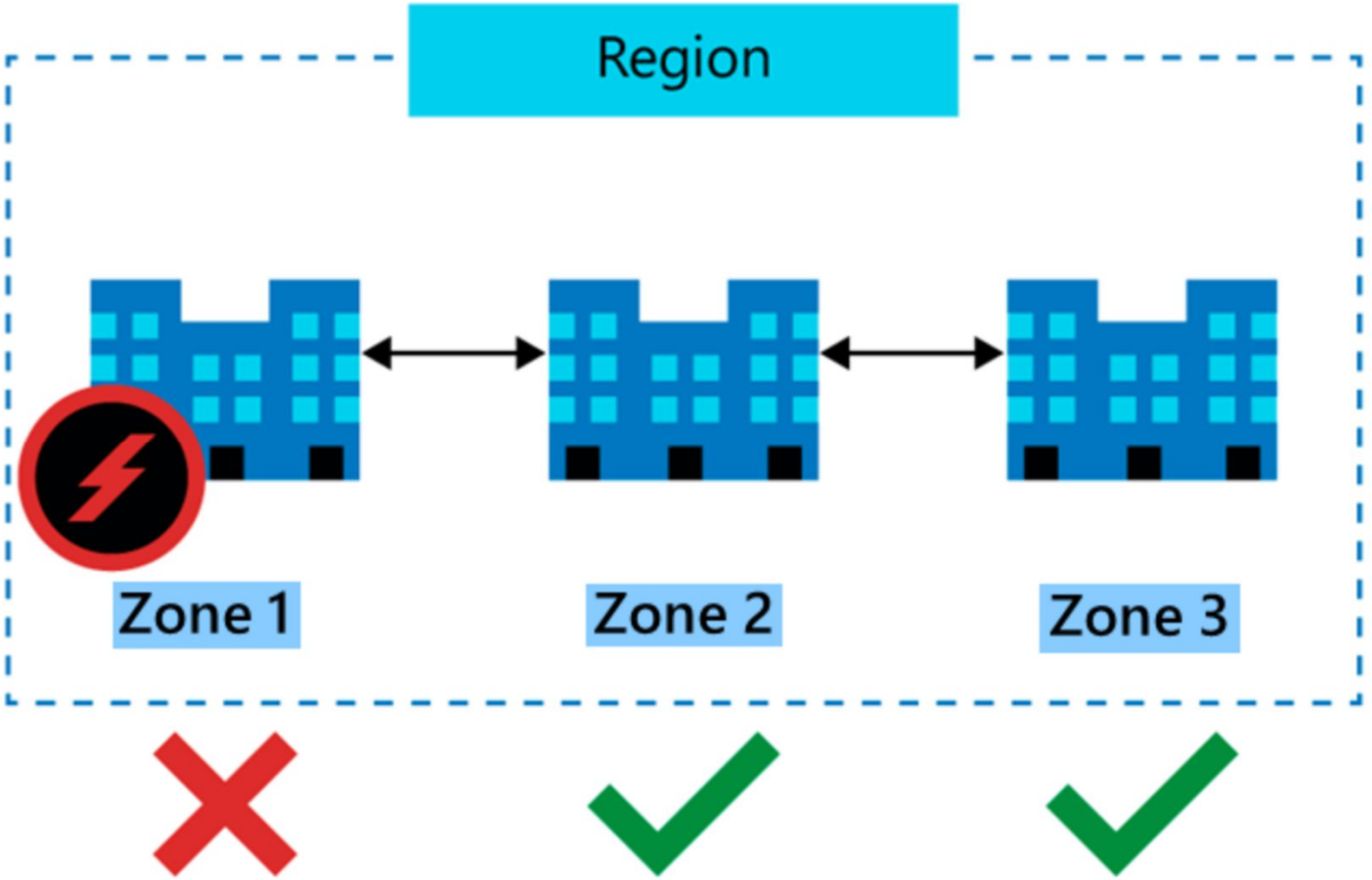
Availability Sets (2 of 2)



Availability Zones

Core concepts:

- Availability zones
- Fault domains
- Update domains



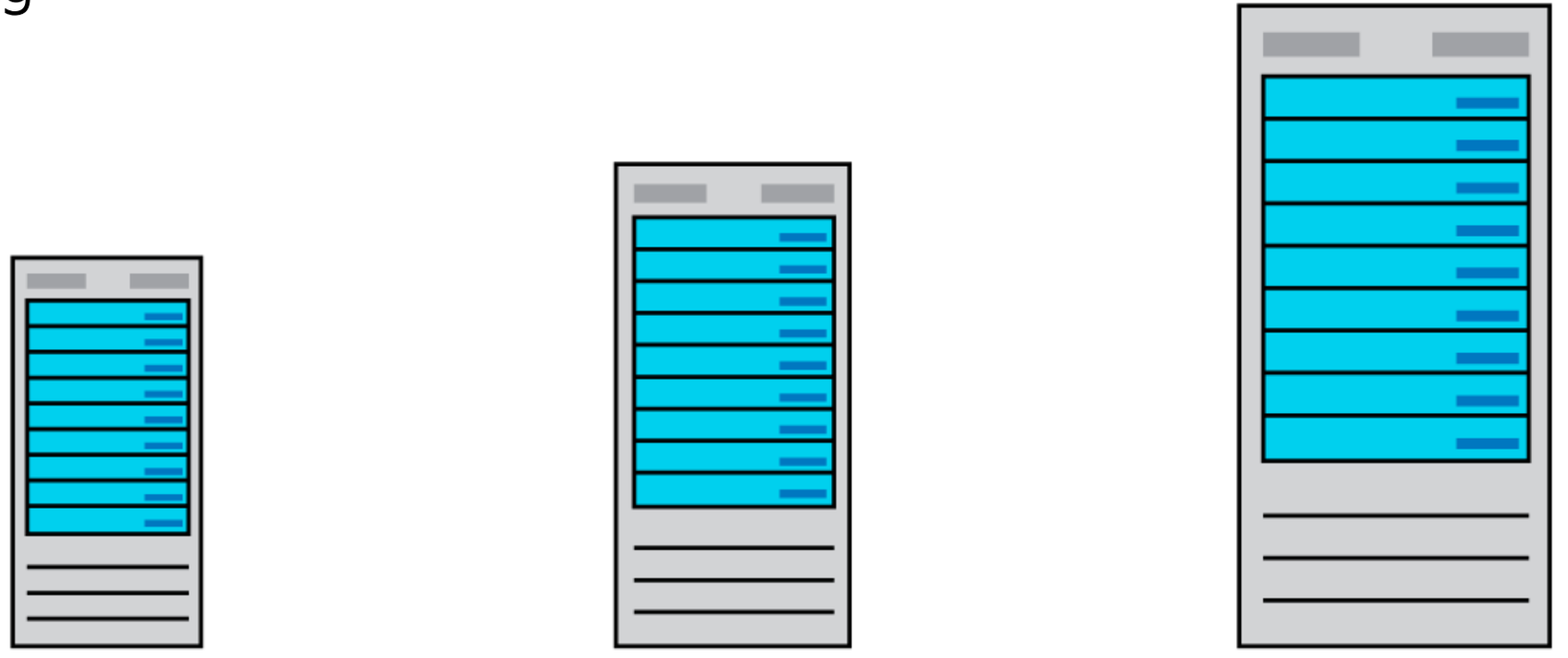
Virtual Machine Scale Sets

- Consist of identically configured, load balanced VMs
- Support manual, scheduled and automatic scaling
- Automatically distributes VMs across fault domains and update domains

Deploy and Configure Scale Sets

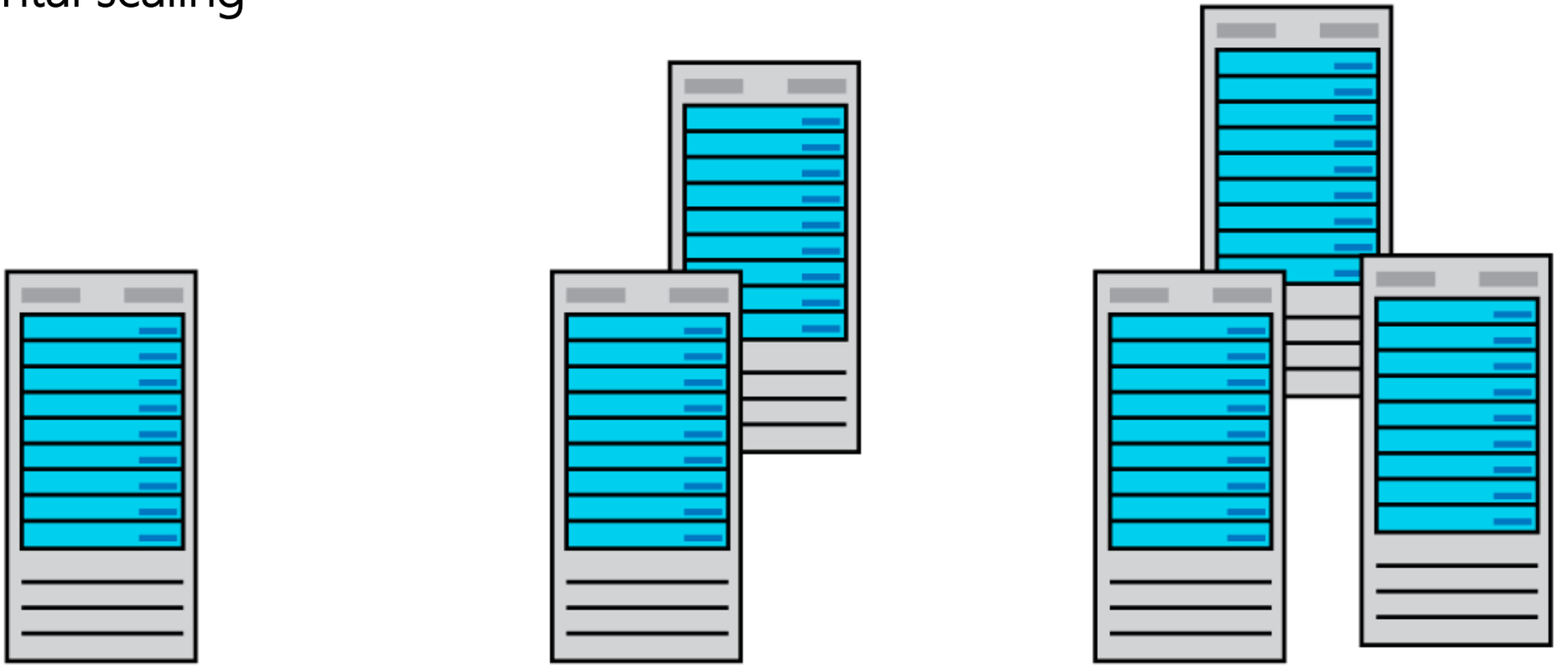
Scaling Concepts (1 of 2)

Vertical scaling



Scaling Concepts (2 of 2)

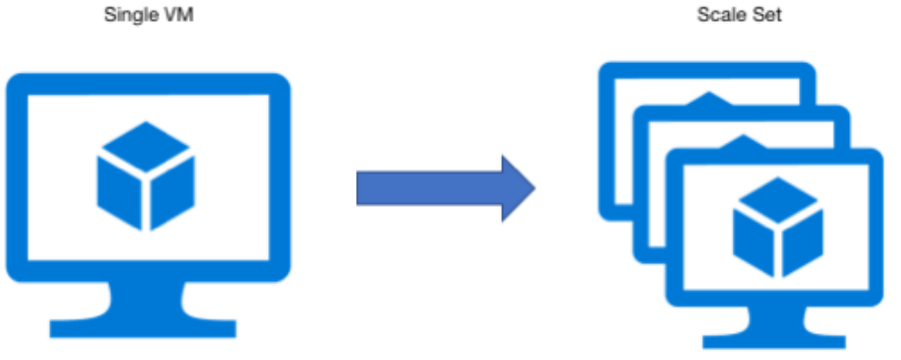
Horizontal scaling



Scale Sets

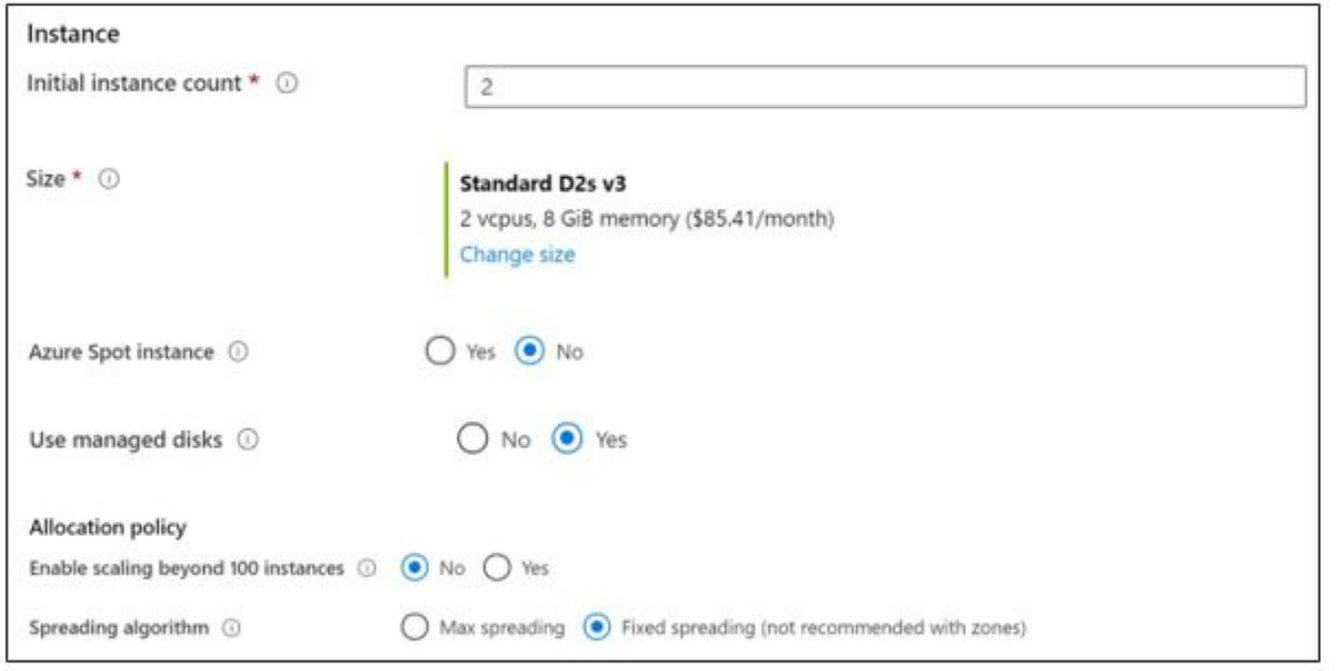
Scale set benefits

- Simplicity: All VM instances are created using the same based OS
- Load balancer support: layer 4 and layer 7
- High availability: multiple instances of the same workload
- Autoscaling: the number of instances adjusts dynamically based on demand
- Scalability: up to 1,000 VM instances (600 when using custom images)



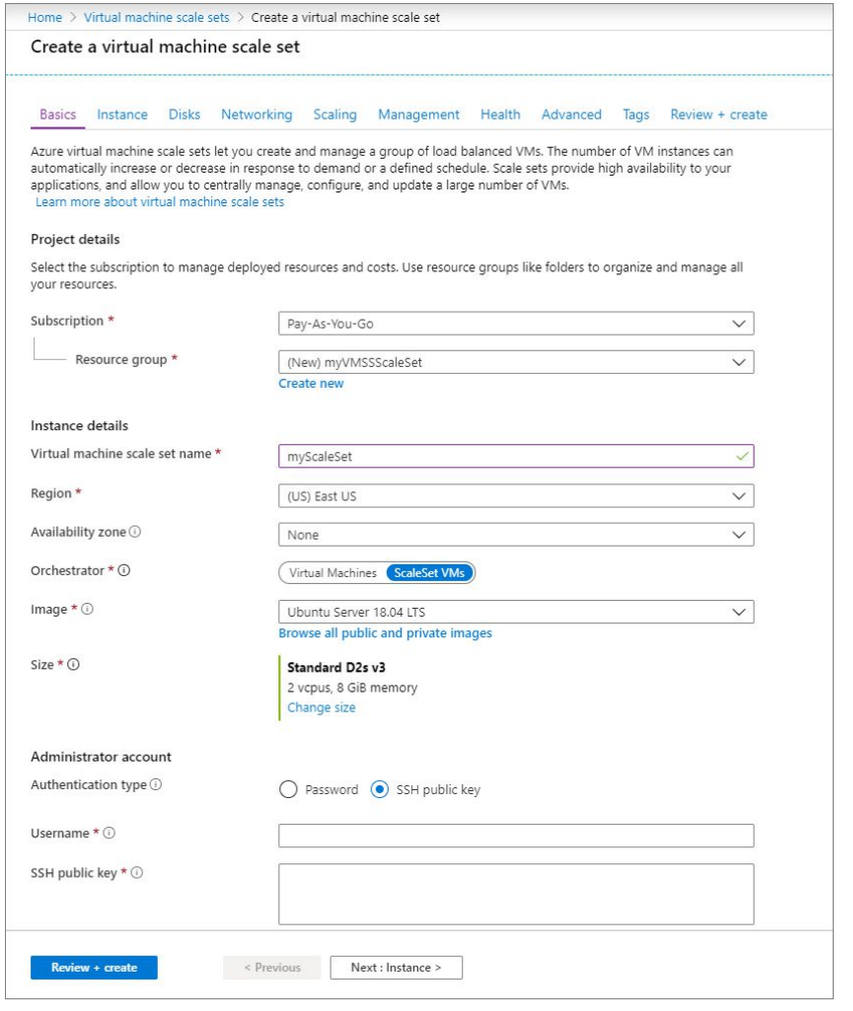
Implementing Scale Sets

- Initial instance count
- Instance size
- Azure spot instance
- Use managed disks
- Enable scaling beyond 100 instances
- Spreading algorithm



Create a VM Scale Set in the Azure Portal

- Create a public load balancer
- Create virtual machine scale set

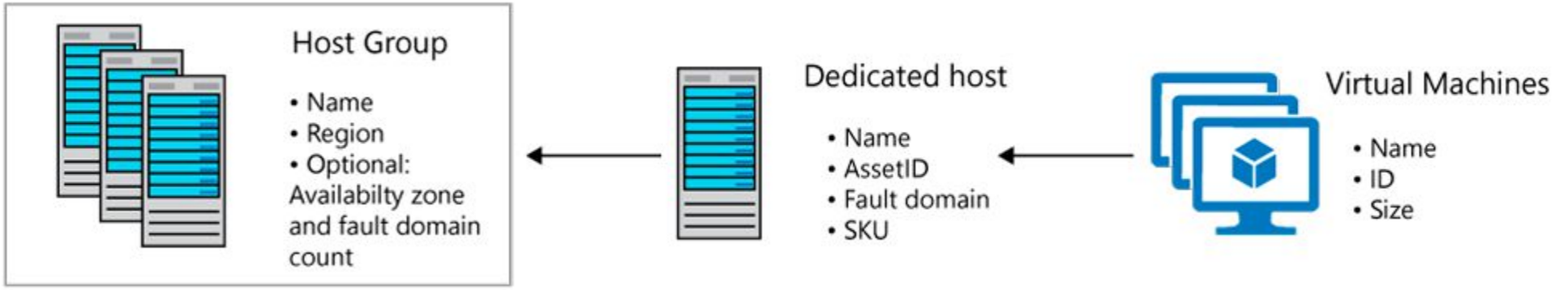


Implement Azure VM Dedicated Hosts

Azure Dedicated Hosts

Benefits:

- Implement hardware isolation at the physical server level
- Control impact of maintenance events initiated by the Azure platform



High Availability Considerations

Use Availability Zones for fault isolation

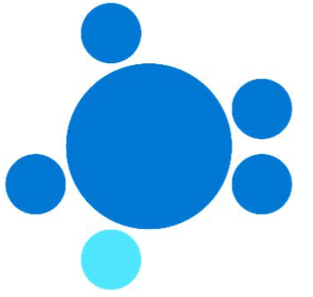
- Create one host group per zone

Use Fault Domains for fault isolation

- Assign a fault domain for each host in the same host group

Use Availability Zones and Fault Domains

- Create one host group per zone
- Assign a fault domain for each host in the same host group



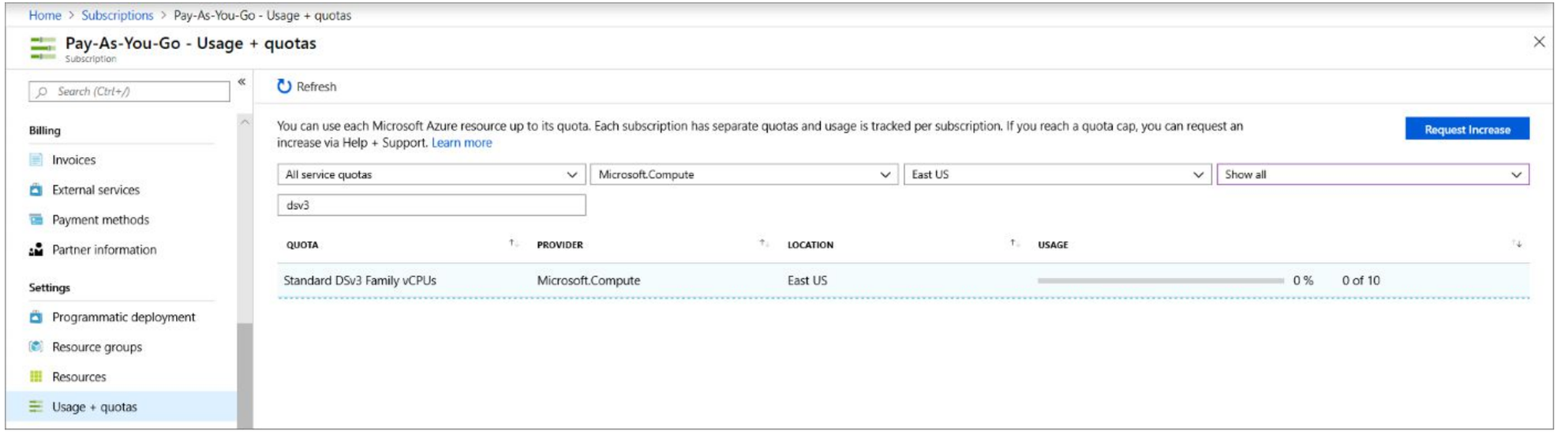
Azure Dedicated Hosts Capacity

Quotas

- Limit vCPUs for dedicated hosts per region
- Support quota increase

Pricing

- Per dedicated host (regardless of the number of deployed VMs)
- Based on VM family, type, and region



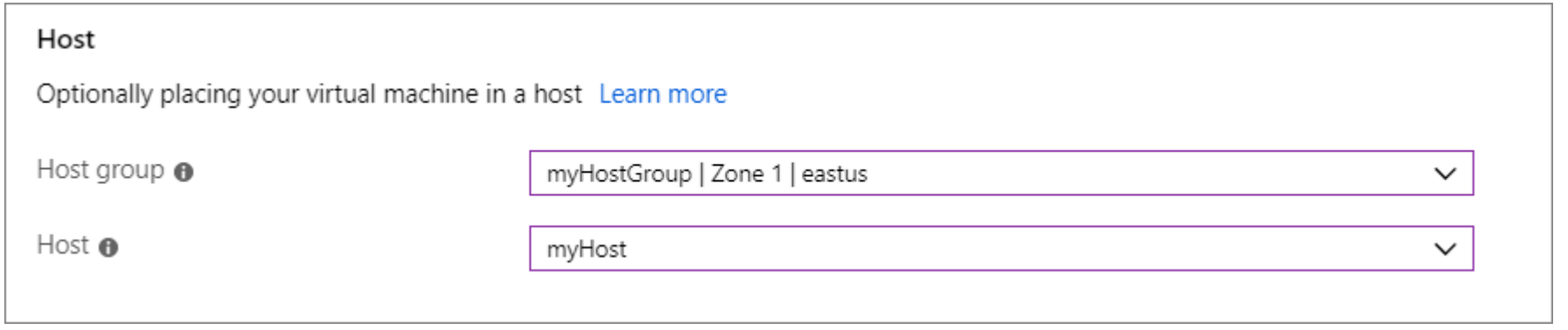
Deploy VMs to Dedicated Hosts

Limitations:

- Virtual machine scale sets are supported on dedicated hosts
- The sizes and hardware types available for dedicated hosts vary by region

To deploy highly available VMs to dedicated hosts:

- Create one or more host groups
- Create one or more hosts in each group
- Create a VM on each host



Configure Azure Disk Encryption

Azure Encryption Technologies

Two main encryption-based disk protection methods Azure VMs

- Storage Service Encryption (SSE)
- Azure Disk Encryption (ADE)

Storage Service Encryption (SSE)

- enabled for all new and existing storage accounts
- cannot be disabled

Azure Disk Encryption (ADE)

- managed by the VM owner
- uses **BitLocker** on Windows VMs and **DM-Crypt** on Linux VMs
- stores encryption keys in Azure Key Vault

Deciding When to use Encryption

- Disk encryption methods are complementary
  - Storage Service Encryption (SSE) is part of Azure (mandatory)
  - Azure Disk Encryption (ADE) makes use of OS tools (optional)
- Using both provides a defense-in-depth protection

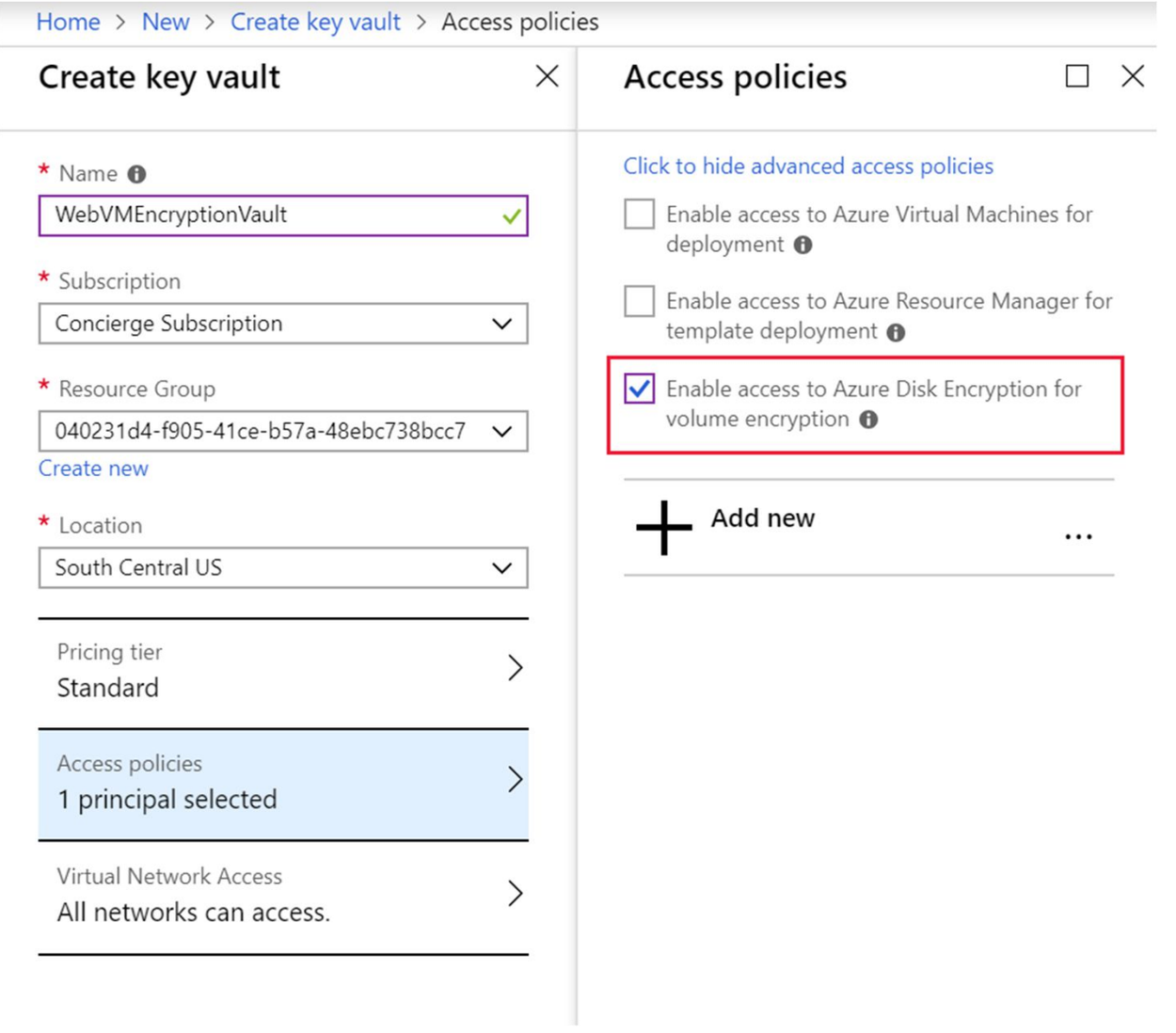
Encrypt an Existing VM Disk

Azure Disk Encryption prerequisites:

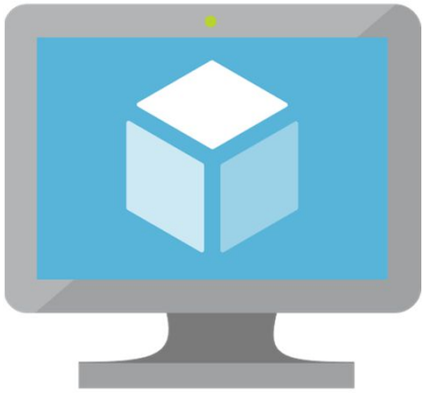
- An Azure key vault
- A key vault access policy that enables
  support for disk encryption
- ADE encryption keys stored in the key vault

To encrypt an existing VM disk, use:

- Azure PowerShell
- Azure CLI



Module Review Questions



Microsoft Azure

Online Role-based training resources:

Microsoft Learn

https://docs.microsoft.com/en-us/learn/

Microsoft Azure

Thank you.