Module 4

Managing virtual machines

Module Overview

- Configuring virtual machines
- Configuring virtual machine disks
- Managing and monitoring Azure virtual machines
- Managing classic virtual machines

Lesson 1: Configuring virtual machines

- Demonstration: Preparing the Azure environment
- Configuring virtual machine availability
- Configuring virtual machine scalability
- Configuring virtual machine security
- Demonstration: Configuring Azure VM availability sets

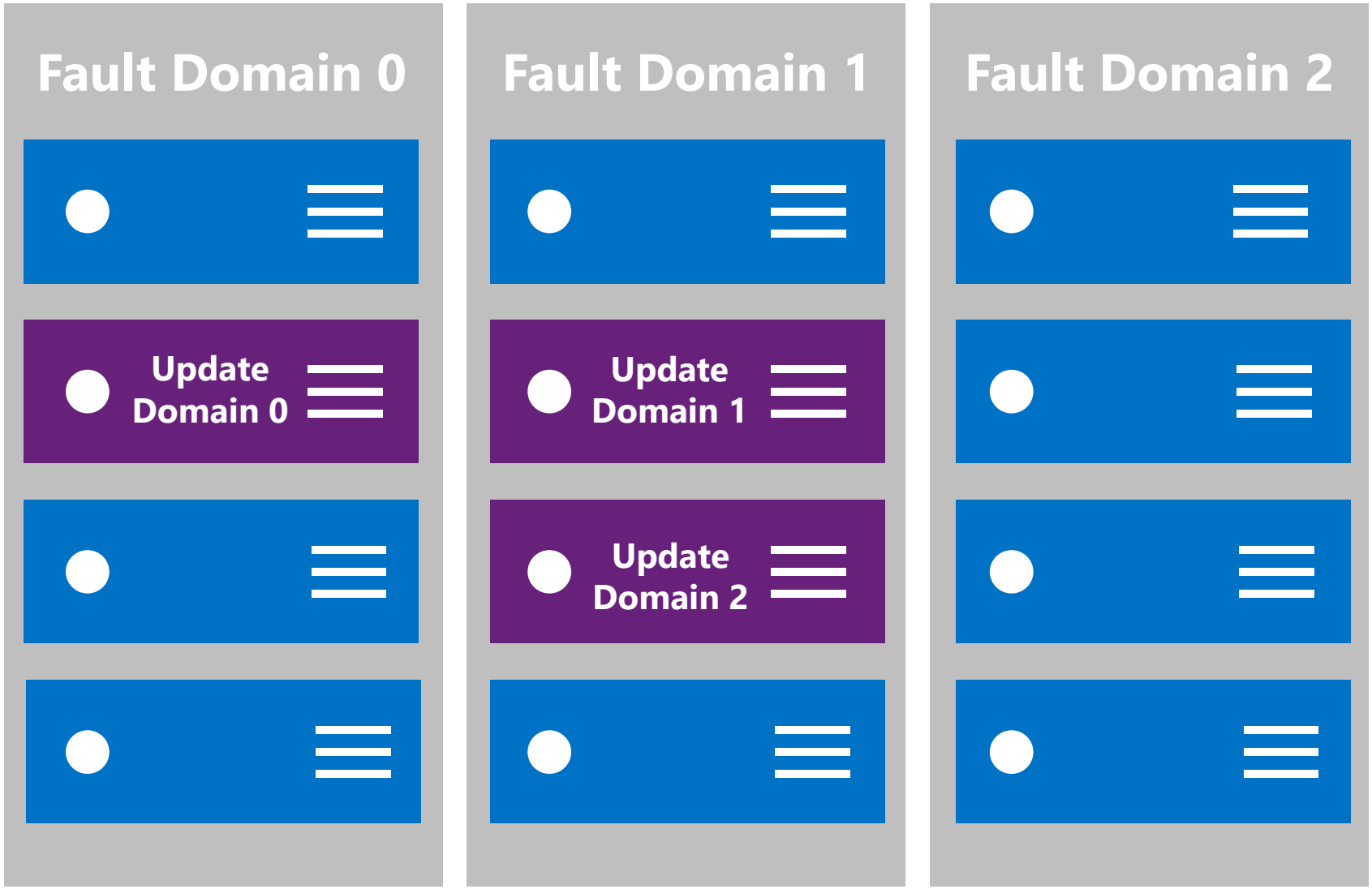
Demonstration: Preparing the Azure environment

In this demonstration, you will see how to prepare the Azure environment

Configuring virtual machine availability

- Availability set:
  - Logical grouping of two or more virtual machines
- Update domain:
  - Separate Azure infrastructure grouped by update cycle
- Fault domain:
  - Separate Azure infrastructure grouped by hardware resources
- Considerations:
  - Add multiple virtual machines to availability sets
  - Place application tiers in separate availability sets
  - Combine availability sets with load balancing

Configuring virtual machine availability



Virtual Machine Availability

- Meaning of 9's
- Fault domains, update domains and availability sets
- Load balancing

Meaning of 9's

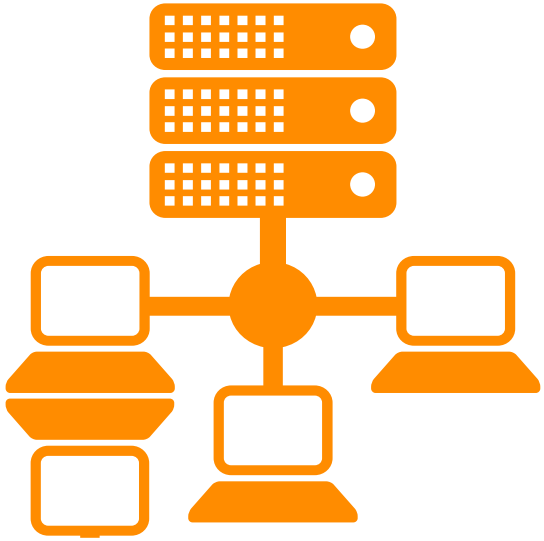
Service Availability (%)	System Type	Annualized Down Minutes	Quarterly Down Minutes	Monthly Down Minutes	Practical Meaning	FAA rating
90	Unmanaged	52,596.00	13,149.00	4,383.00	Down 5 weeks per year	
99	Managed	5,259.60	1,314.90	438.30	Down 4 days per year	ROUTINE
99.9	Well managed	525.96	131.49	43.83	Down 9 hours per year	ESSENTIAL
99.99	Fault tolerant	52.60	13.15	4.38	Down 1 hour per year	

From Generic Requirements for Operation Systems Platform Reliability, Telcordia Technologies System Documentation,GR-2841-CORE and Federation Aviation Administration Handbook: Reliability, Maintainability, and Availability (RMA) Handbook, FAA-HDBK-006A, Jan 7, 2008.

Meaning of 9's

Service Availability (%)	System Type	Annualized Down Minutes	Quarterly Down Minutes	Monthly Down Minutes	Practical Meaning	FAA rating
99.999	High availability	5.26	1.31	0.44	Down 5 minutes per year	CRITICAL
99.9999	Very high availability	0.53	0.13	0.04	Down 30 seconds per year	
99.99999	Ultra availability	0.05	0.01	-	Down 3 seconds per year	SAFETY CRITICAL

From Generic Requirements for Operation Systems Platform Reliability, Telcordia Technologies System Documentation,GR-2841-CORE and Federation Aviation Administration Handbook: Reliability, Maintainability, and Availability (RMA) Handbook, FAA-HDBK-006A, Jan 7, 2008.



99.95% for multiple role instances

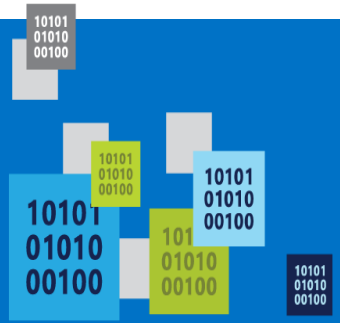
4.38 hours of downtime per year

What's included

Compute Hardware failure (disk, CPU, memory)
Datacenter failures - Network failure, power failure
Hardware upgrades, Software maintenance – Host OS Updates

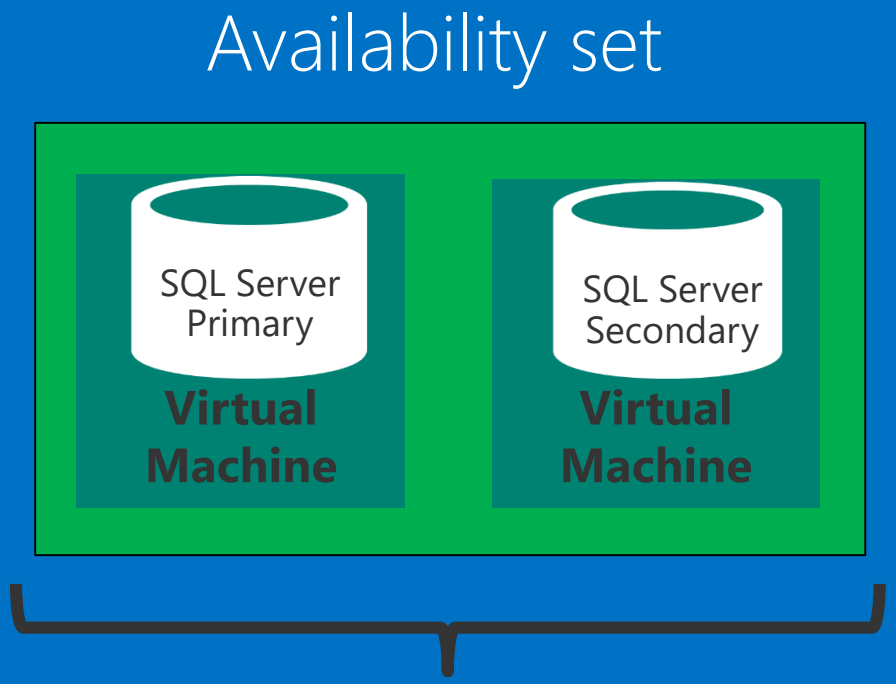
What is not included

VM Container crashes, Guest OS Updates



Service Level Agreements

Availability Sets



SLA High Availability

Hardware and Software

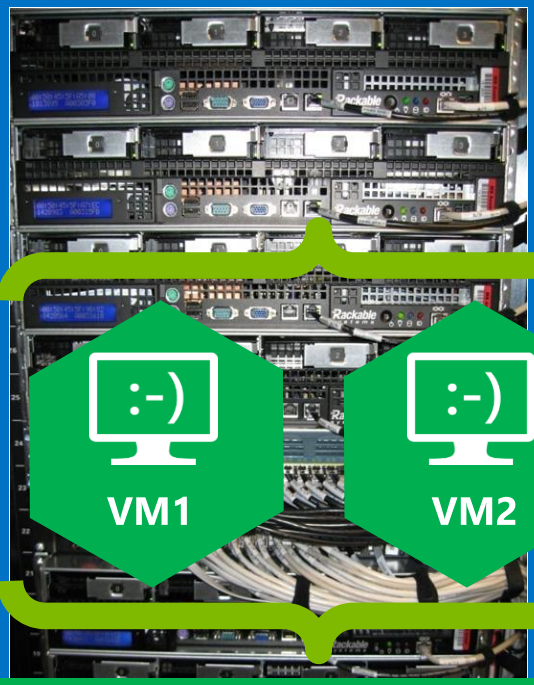
Windows and Linux

Availability Sets

Physical Machines

Power Unit
Rack Switch

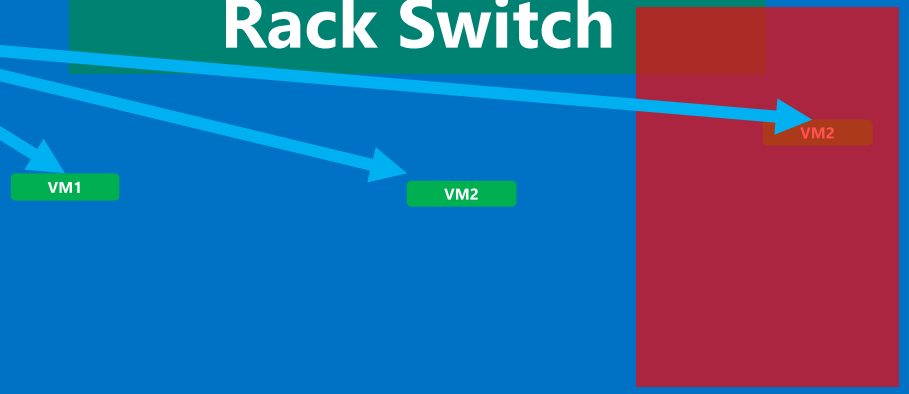
Availability Sets



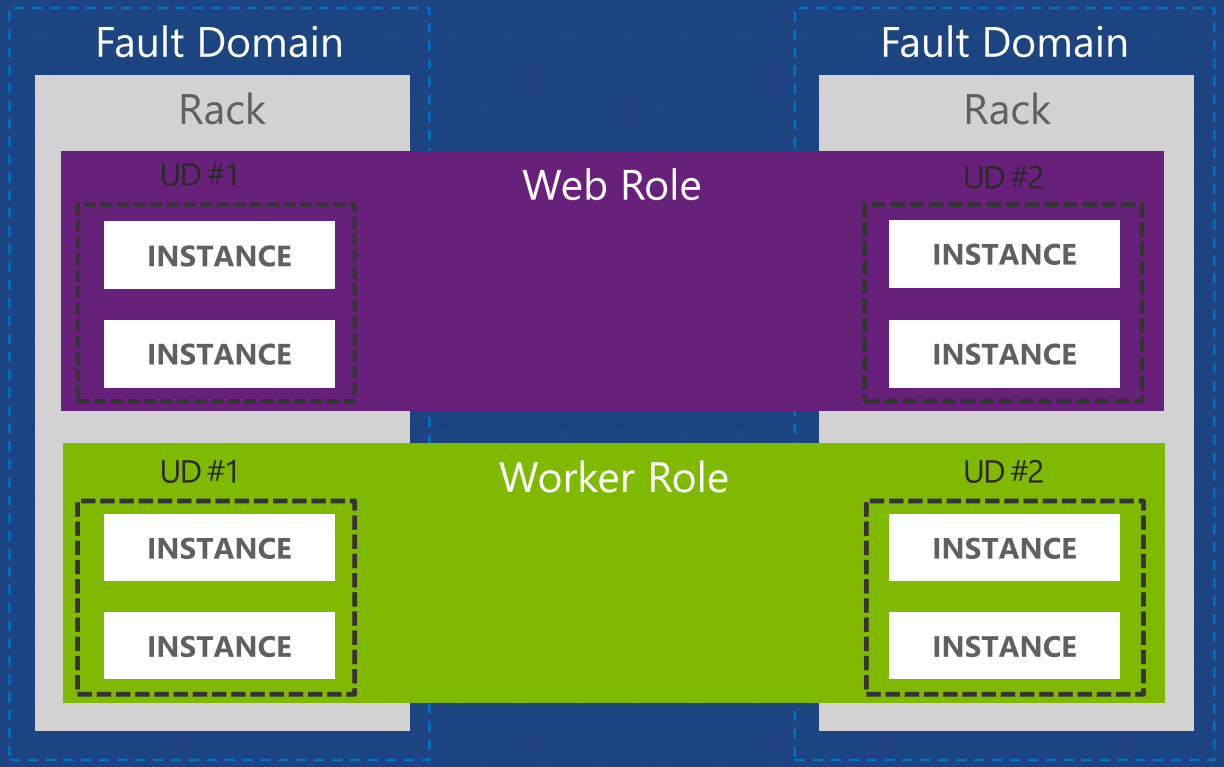
Availability Set

Physical Machines

Power Unit
Rack Switch

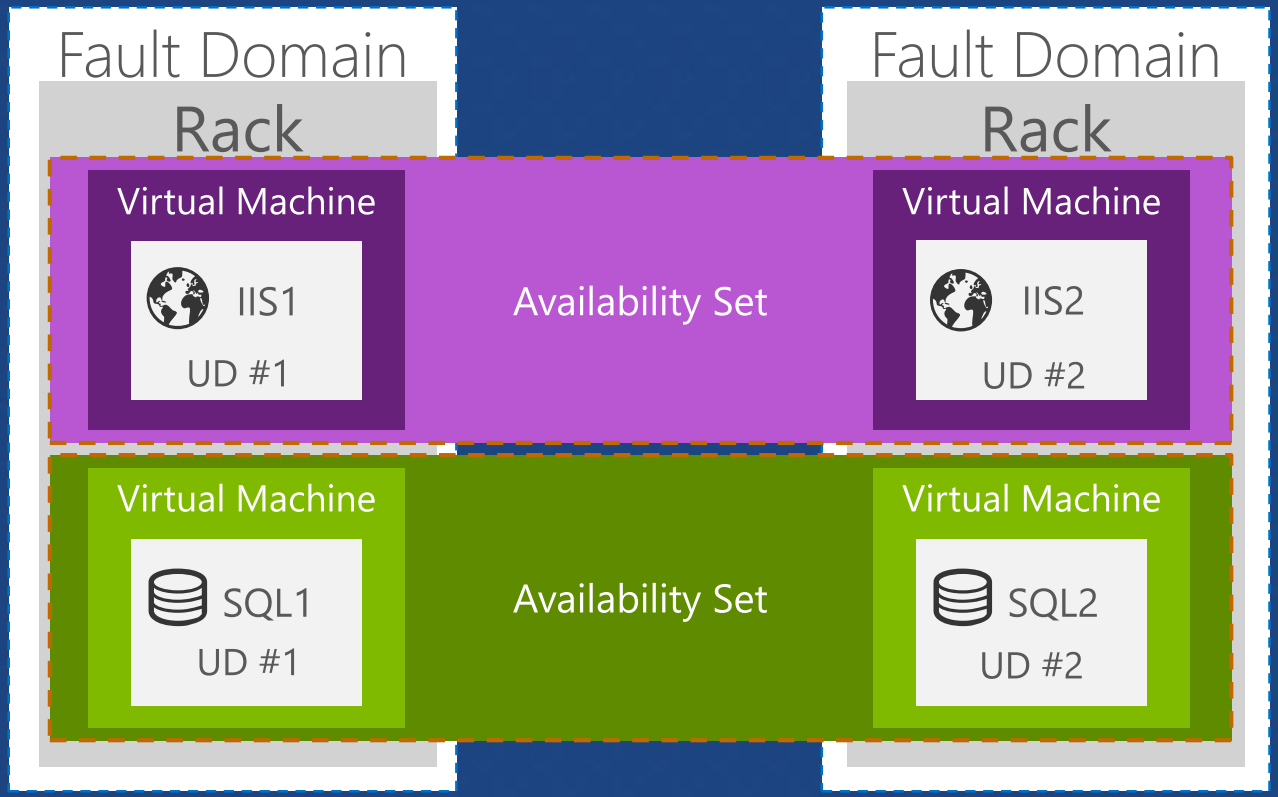


Fault and Update Domains



Virtual Machine Availability Sets

UPDATE DOMAINS ARE HONORED BY HOST OS UPDATES



Availability Set Guidance

- VMs in Availability Set Must Be in Same Resource Group
- Availability Set: 5 Update Domains, 3 Fault Domains
  - Update Domain – Host Maintenance
  - Fault Domain – Isolation from component failure in rack unit
- Maximum of 100 VMs in a Availability Set
- Avoid Availability Sets with Single VM
  - This eliminates notification for host maintenance operations

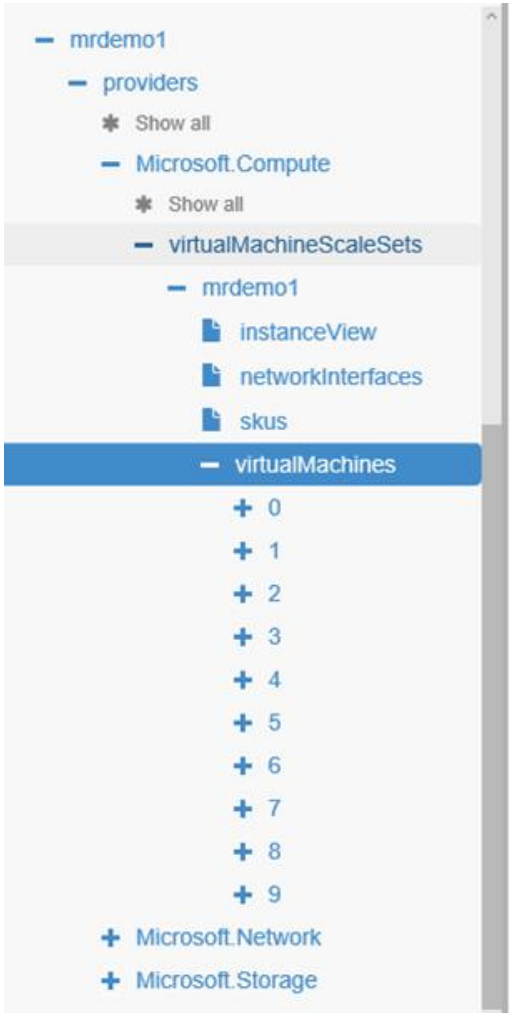
https://azure.microsoft.com/en-us/documentation/articles/azure-subscription-service-limits/

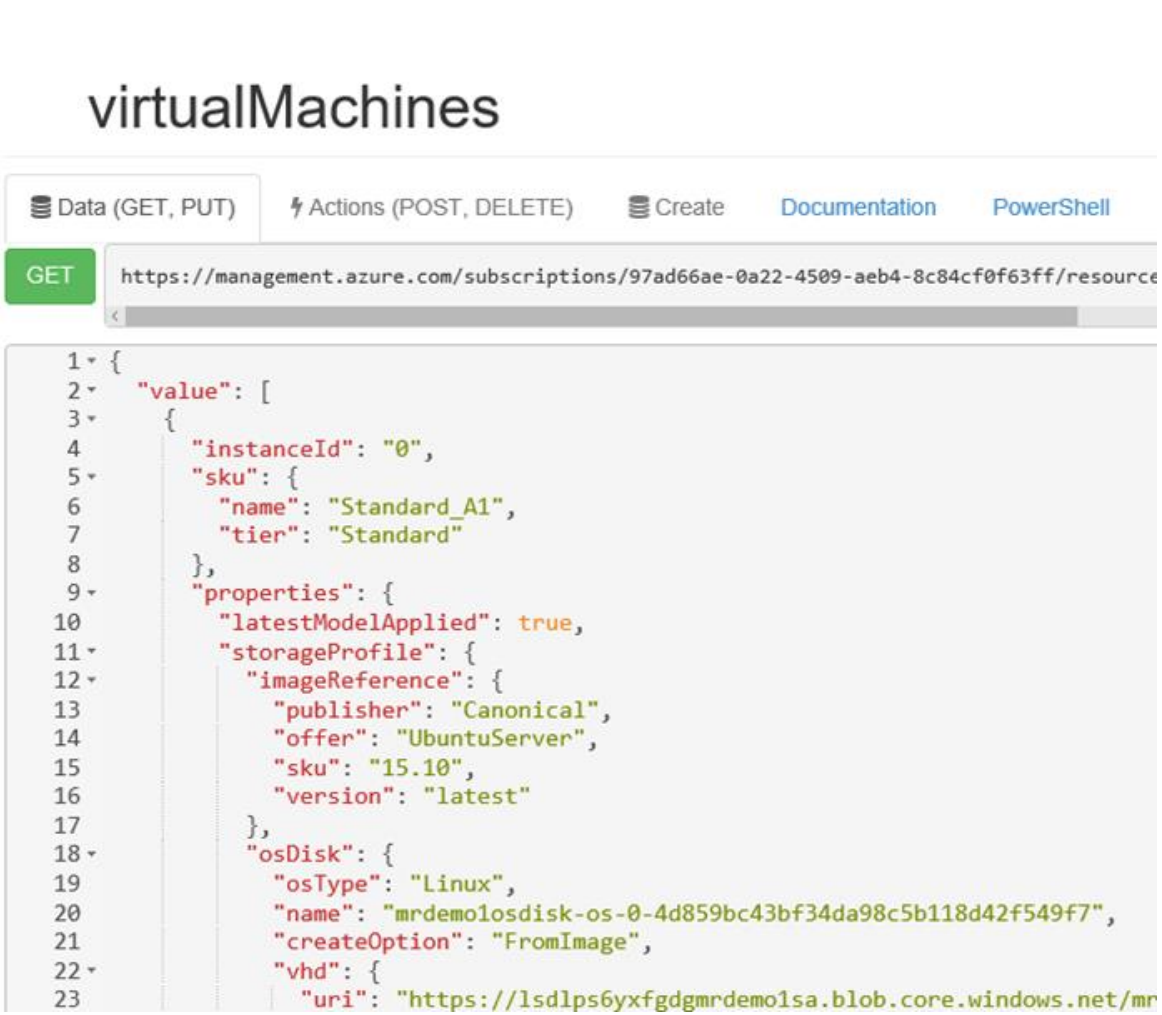
Configuring virtual machine scalability

- VM Scale Sets provide VM auto-scaling:
  - With managed disks:
    - Up to 1000 VMs when using VM Marketplace image
    - Up to 100 VMs when using custom images
  - With unmanaged disks:
    - Up to 100 VMs when using VM Marketplace image
    - Up to 40 VMs when using custom images (overprovision = $true)
    - Up to 20 VMs when using custom images (overprovision = $false)
  - 5 fault domains and 5 update domains
  - Stateless workloads
- Implement by using:
  - Microsoft.Compute resource provider
  - Microsoft.Insights resource provider

Configuring virtual machine scalability

Exploring your VM Scale Sets

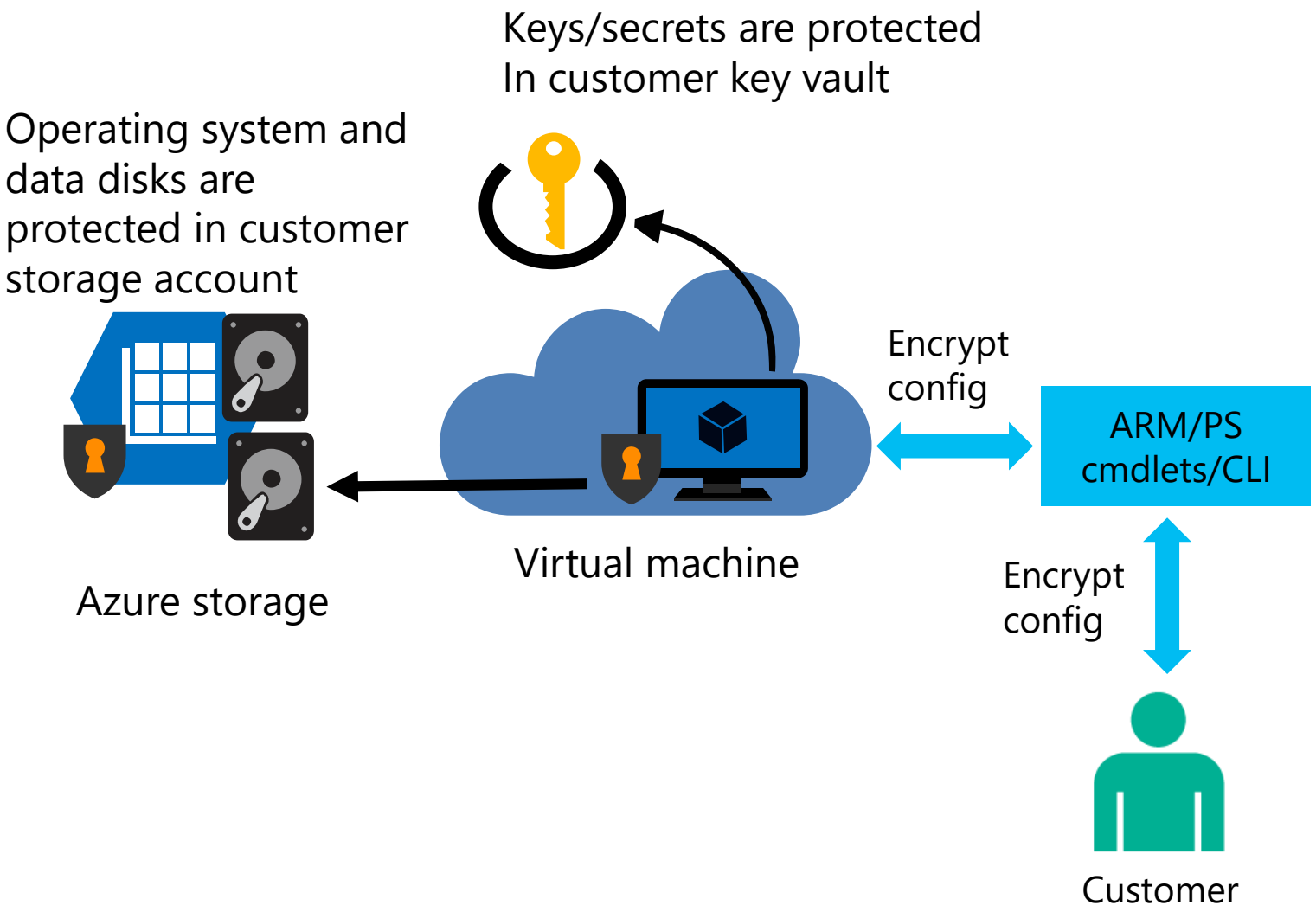




Configuring virtual machine security

- Azure uses industry standard encryption for data sent to, received from, and travelling within Azure datacenters
- Azure Key Vault
  - Store secret data and keys
  - Use secret data and keys in Azure management and config
- Azure Drive Encryption
  - Full volume encryption for Windows and Linux VMs
  - Integrates with Azure Key Vault

Configuring virtual machine security



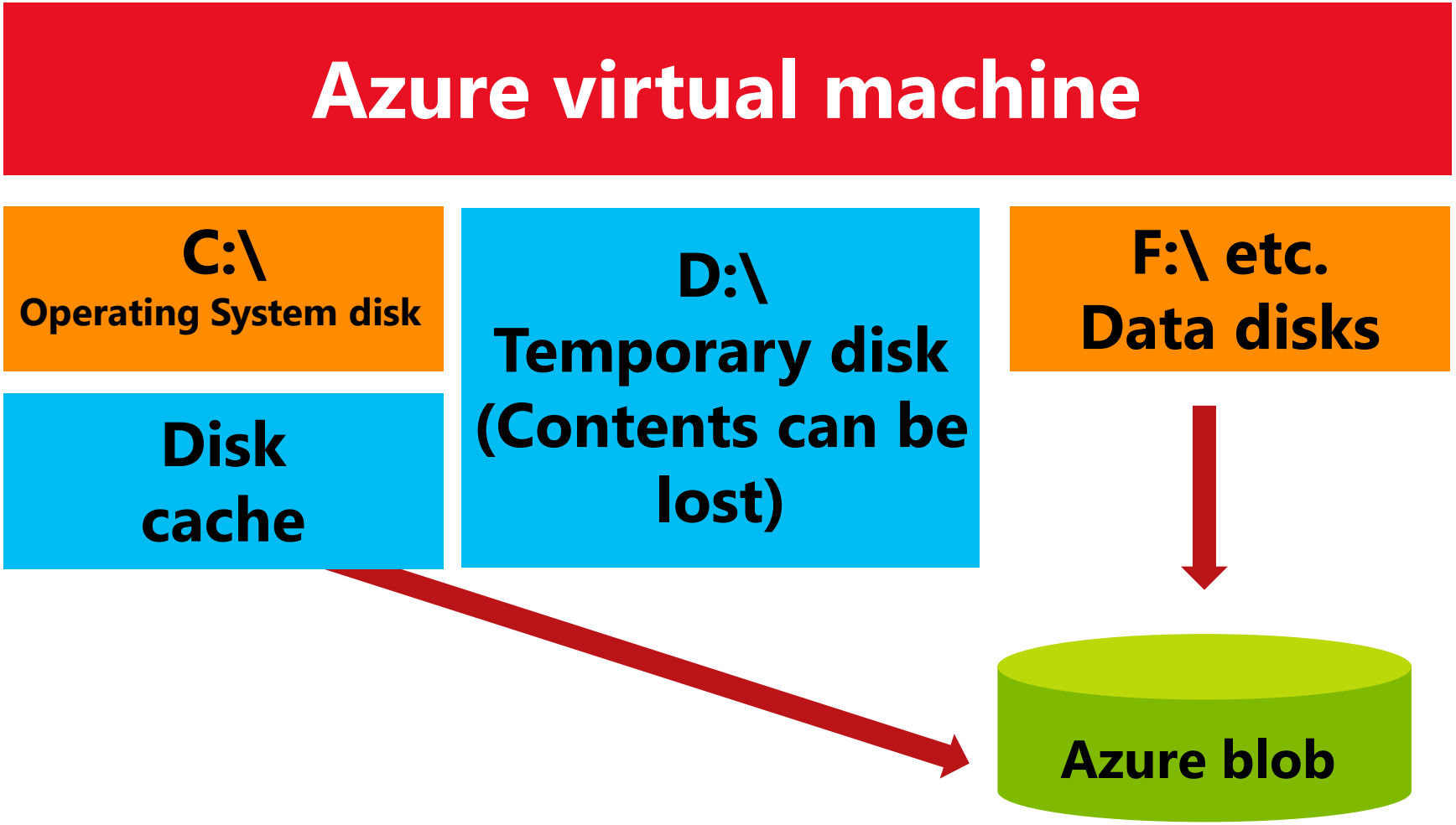
Demonstration: Configuring Azure VM availability sets

In this demonstration, you will see how to create virtual machines in an availability set

Lesson 2: Configuring virtual machine disks

- Overview of virtual machine disks
- Managing virtual machine disks
- Migrating virtual machine disks and images

Overview of virtual machine disks



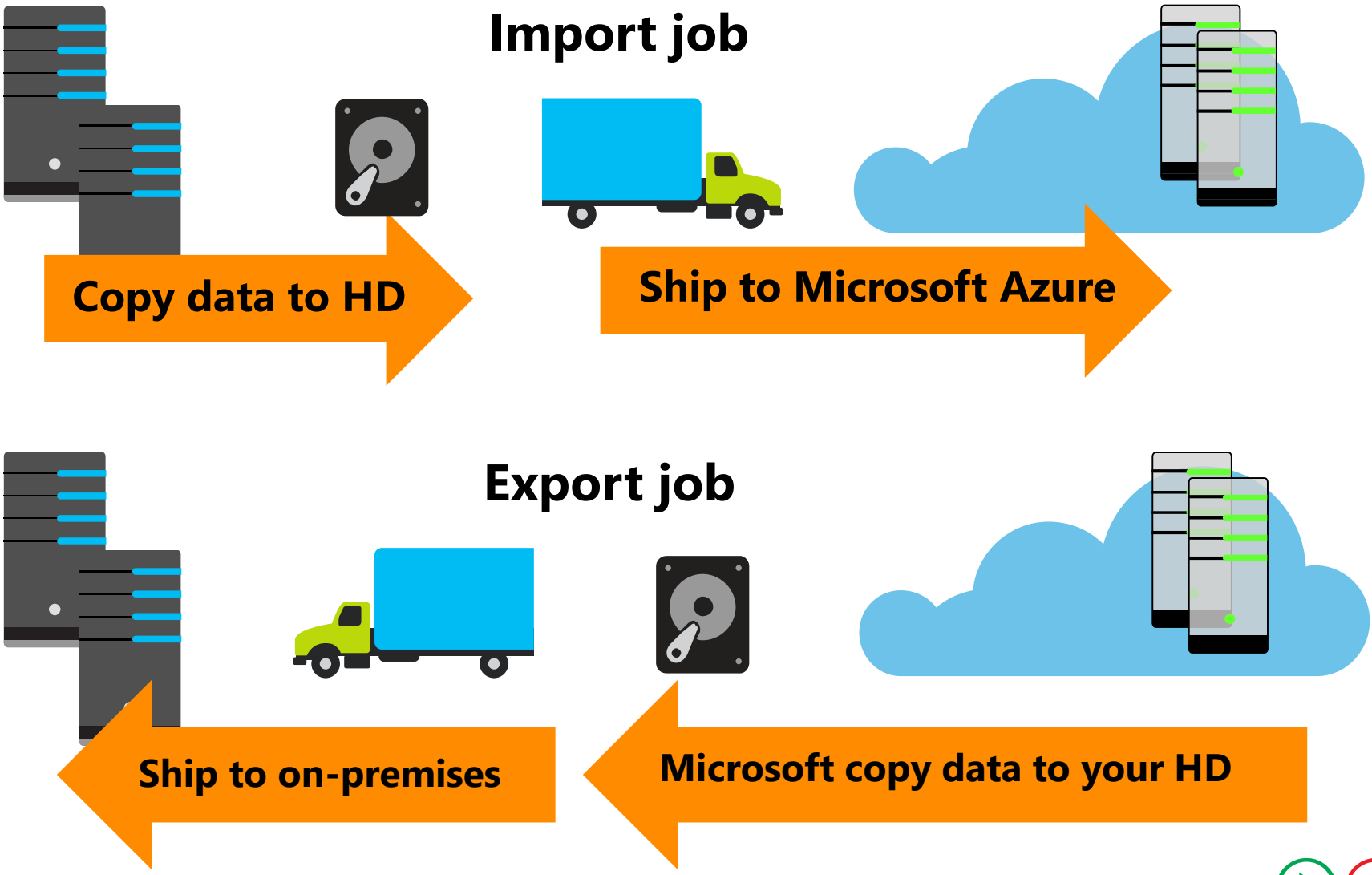
Managing virtual machine disks

- Manage Azure VM disks:
  - Attach an operating system or data disk
  - Remove a data disk
  - Modify disk settings:
    - Change caching behavior
    - Increase size
- Use Storage Spaces in Windows Azure VMs:
  - Increase I/O throughput of a volume
  - Create a volume larger than 1 TB

Migrating virtual machine disks and images

- Use Azure PowerShell cmdlets:
  - **Add-AzureVHD** to upload VHD files
  - **Save-AzureVHD** to upload VHD files
- Advantages:
  - **Add-AzureVHD** automatically converts dynamic disks to fixed format
  - **Add-AzureVHD** and **Save-AzureVHD** inspects the .VHD file format, and reads/writes actual disk content and skips empty bytes, providing a more efficient data transfer
  - Both cmdlets support multithreading for increased throughput

Migrating virtual machine disks and images



Lesson 3: Managing and monitoring Azure virtual machines

- Configuration management options
- What is the VM Agent Custom Script extension?
- What is the VM Agent Desired State Configuration extension?
- Monitoring Azure virtual machines
- Demonstration: Configuring Azure Resource Manager Windows virtual machines with DSC

Configuration management options

- Cross-Platform Management Options:
  - VM Agent and VM Agent Extensions
  - Azure CLI
  - Azure PowerShell
- Windows Management Options:
  - RDP
- Linux Management Options:
  - SSH

What is the VM Agent Custom Script extension?

- Custom Script VM Agent extension:
  - Automate by running Windows PowerShell or Linux scripts locally on Azure VMs
  - Upload scripts to an Azure storage account of GitHub for use across Azure VMs
  - Use Azure PowerShell, Azure CLI, or Azure Resource Manager templates to deploy Custom Script VM Agent extension

What is the VM Agent Desired State Configuration extension?

- Leverages Windows DSC and DSC for Linux:
  - WMF-based (Windows)
  - OMI-based (Linux)
- Implemented as VM Agent extensions:
  - DSC Extension for Windows Azure VMs
  - Azure DSCForLinux Extension for Linux Azure VMs
- Deployment support:
  - ARM templates
  - Windows PowerShell
  - Azure CLI

Monitoring Azure virtual machines

- Available for VMs running the Windows and Linux operating systems:
  - Implemented as Agent VM extension
  - Include boot diagnostics
- Metrics, diagnostics and log data is:
  - Displayed in Azure portal (metrics and boot diagnostics)
  - Configurable via Azure portal and programmatically
  - Stored in Azure storage (tables and blobs)
- Alerts:
  - Metric, condition, threshold, and period-based
  - Email notifications and Webhook support

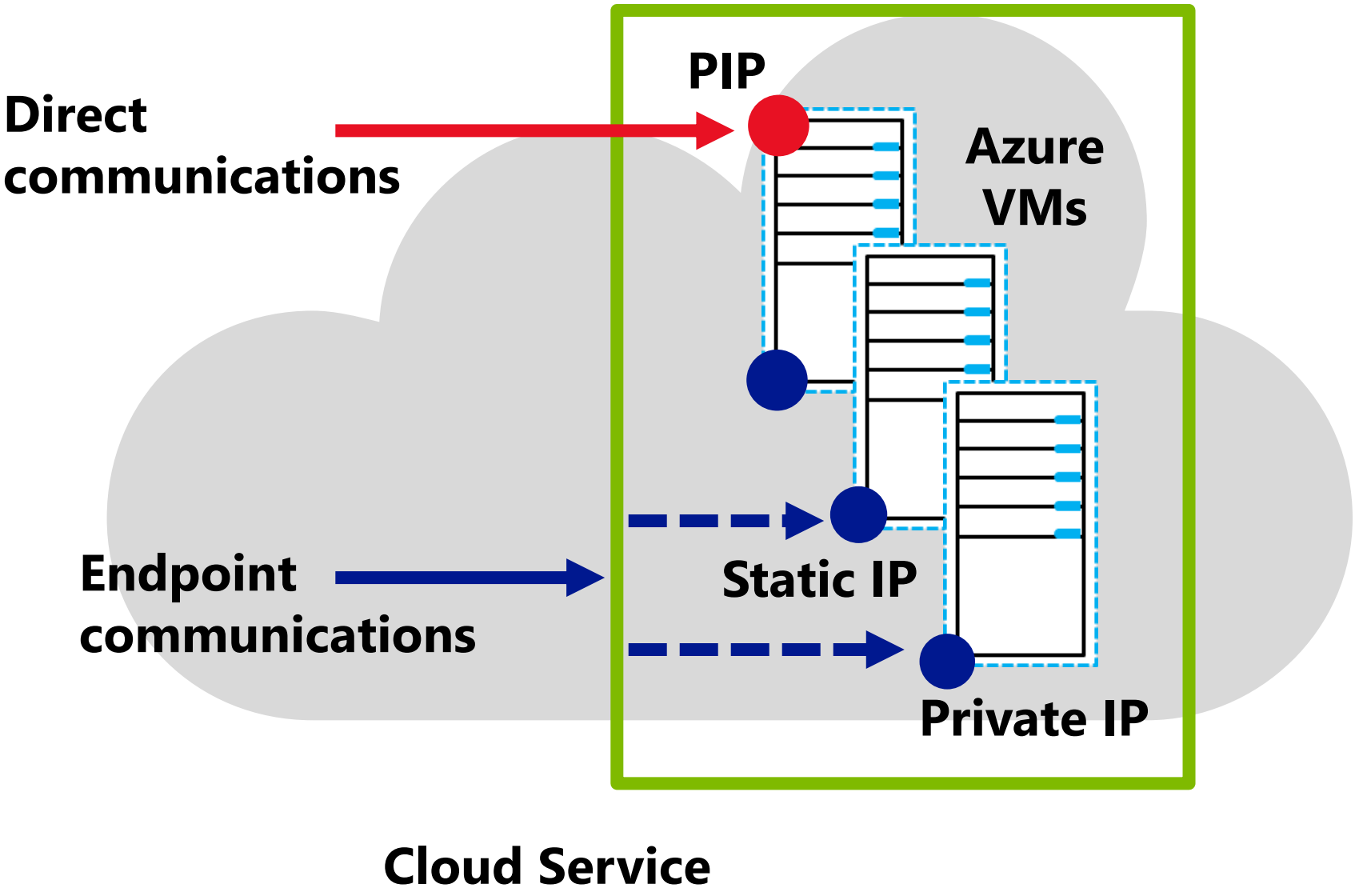
Demonstration: Configuring Azure Resource Manager Windows virtual machines with DSC

In this demonstration, you will see how to apply DSC to an Azure virtual machine running the Windows operating system

Lesson 4: Managing classic virtual machines

- Configuring classic virtual machines
- Managing and configuring classic VM storage
- Monitoring and managing classic VMs

Configuring classic virtual machines



Managing and configuring classic VM storage

- Disks and images must reside in an Azure classic storage account
- Reference images by using the full name of the VHD file

Monitoring and managing classic VMs

Monitoring:

- Available for Windows and Linux classic VMs
- No support for boot diagnostics

- Management and Operating System Configuration:
  - Available for Windows and Linux classic VMs
  - Support for Desired State Configuration extension
  - Support for Custom Script extension

Lab: Managing Azure virtual machines

- Exercise 1: Configuring availability
- Exercise 2: Implementing DSC
- Exercise 3: Implementing Storage Space–based volumes

Estimated Time: 60 minutes

Lab Scenario

Now that you identified basic deployment options of Azure Resource Manager VMs, you need to start testing more advanced configuration features. As part of these tests, you need to place the two web servers, which will host the A. Datum ResDev application, in a load-balanced availability set. You will also install IIS on these virtual machines by using the VM Agent DSC extension. In addition, to enhance Azure VM storage, you will set up Storage Spaces–based volumes.

Lab Review

- Why would you use Storage Spaces in an Azure VM considering that Azure already provides highly available storage built into a storage account?

Module Review and Takeaways

- Review Question