

Microsoft Azure: Infrastructure as a Service (IaaS)

Module 3: IaaS VMs

Microsoft Azure VMs

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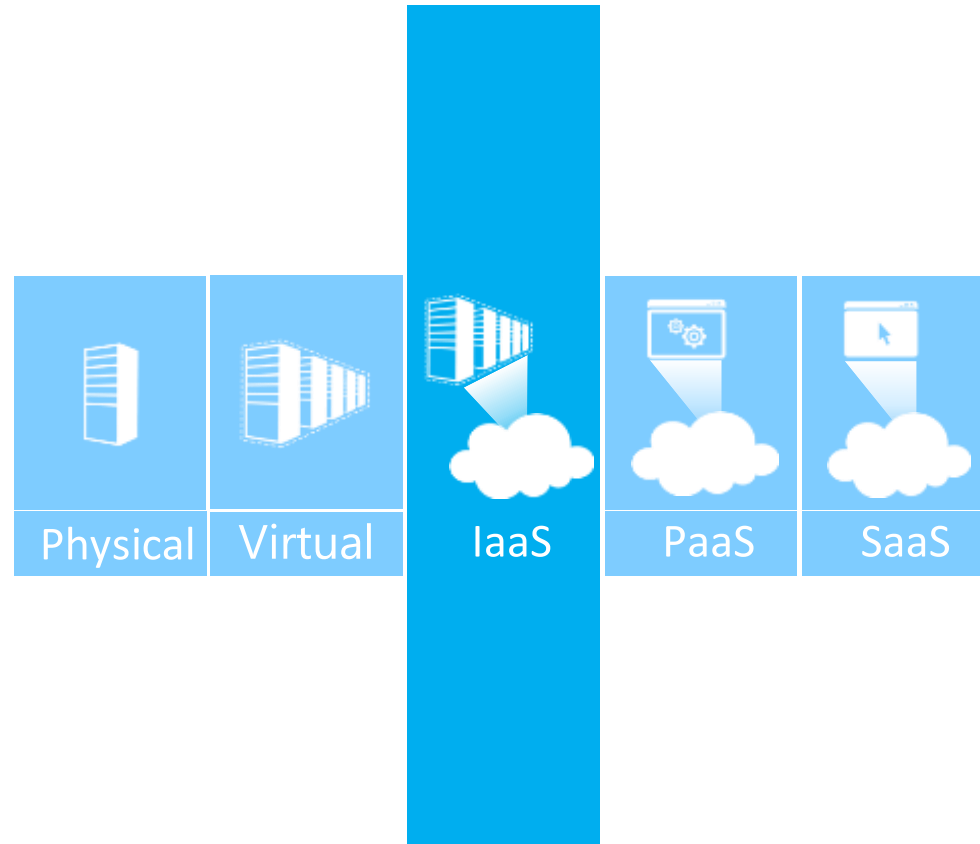
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A Continuous Offering from Private to Public Cloud



Overview



Support for key server applications



Easy storage manageability: Page blob



High availability features



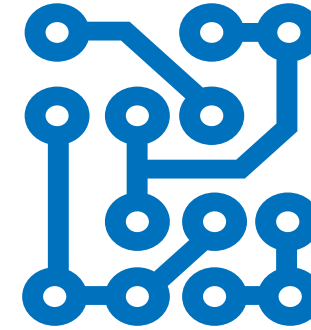
Advanced networking



Integration with compute Platform as a Service (PaaS)

IaaS Workloads: All About the App

- Line of Business (LoB) applications:
 - Custom applications
 - Customer Relationship Management (CRM)
 - Content Management Server (CMS)
 - Enterprise Resource Planning (ERP)
 - Business Intelligence (BI)
- Application Infrastructure:
 - File servers
 - Databases
 - Identity
 - Source control
- Developer, Testing and Staging environments:
 - Quickly provision and un-provision entire environments
- Hybrid applications:
 - Applications that span your data center and the cloud



Provisioning to the Cloud

Getting Started



Management Portal(s)



Scripting
(Windows, Linux and Mac)



Azure Resource Manager
(ARM)



REST API

Select Image and VM Size



Windows Server



Linux



A0 – A11



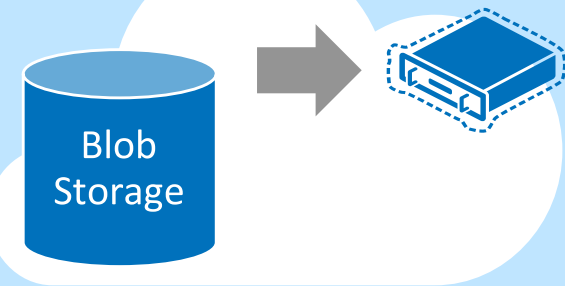
D1 – D4/D11 – D14



G1 – G5

New Disk Persisted in Storage

Boot VM from New Disk



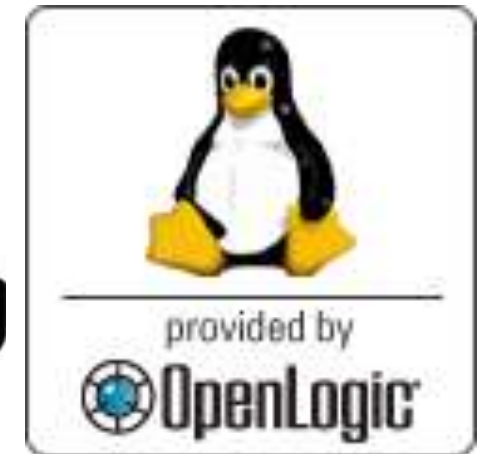
Cloud

Supported Windows Server Applications

- **Microsoft BizTalk Server** - Microsoft BizTalk Server 2013 and later versions
- **Microsoft Dynamics AX** - Microsoft Dynamics AX 2012 R3 and future updates
- **Microsoft Dynamics GP** - Microsoft Dynamics GP 2013 and later versions
- **Microsoft Dynamics NAV** - Microsoft Dynamics NAV 2013 and later versions
- **Microsoft Forefront Identity Manager** - Microsoft Forefront Identity Manager 2010 R2 SP1 and later versions
- **Microsoft HPC Pack** - Microsoft HPC Pack 2012 and later versions
- **Microsoft Project Server** - Microsoft Project Server 2013 and later versions
- **Microsoft SharePoint Server** - Microsoft SharePoint Server 2010 and later versions are supported on Windows Azure Virtual Machines.
- **Microsoft SQL Server** - 64-bit versions of Microsoft SQL Server 2008 and later versions
- **Microsoft System Center** - Microsoft System Center 2012 SP1 and later versions are supported for the following applications:
 - •App Controller
 - •Configuration Manager
 - •Endpoint Protection
 - •Operations Manager
 - •Orchestrator
 - •Server Application Virtualization
 - •Service Manager
- **Microsoft Team Foundation Server 2012** and later versions
- **Microsoft Exchange**
- For the most up to date list : <http://support.microsoft.com/kb/2721672>

Linux on Microsoft Azure

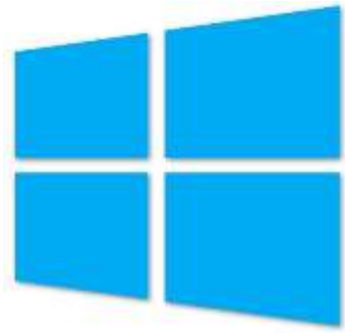
- Supported Versions:
 - SUSE SLES 11 Service Pack 3+ (SP3)
 - openSUSE 13.1+, 13.2
 - CentOS 6.5, 6.6, 7.0+ by OpenLogic*
 - Ubuntu Server 12.04.1+, 14.04, 14.10, 15.04, 15.10
 - Oracle Linux 6.4+, 7.0
 - Specific versions are endorsed:
 - Integration Components
 - Testing and validation by partners
 - Bring other variants at your own risk**
- *Image provided by OpenLogic based on CentOS 6.5 – 7.1
 - **Interoperation work will be Required



What about Red Hat?

- 11/4/2015 – new announcement on partnership between Red Hat and Microsoft.
<http://news.microsoft.com/2015/11/04/microsoft-and-red-hat-to-deliver-new-standard-for-enterprise-cloud-experiences/>
- Landing site <https://azure.microsoft.com/en-us/campaigns/redhat/>

Gallery Images Available



Microsoft

- Windows Server 2008 R2
- SQL Server 2012 - 2014
- Windows Server 2012
- BizTalk Server 2013
- SharePoint 2013 (trial)



Open Source

- OpenSUSE 13.1
- CentOS 6.5
- Ubuntu 12.04/ Ubuntu 14.04 LTS
- SUSE Linux Enterprise Server 11 SP2

ORACLE

Oracle

- Version 11g and 12c

Server Roles that are Not Supported

Server Role
Hyper-V
Windows Deployment Services
Remote Access (Direct Access, Routing)
Rights Management Services

<http://support.microsoft.com/kb/2721672>

Server Features that are not Supported

Server Feature
BitLocker Drive Encryption (C: Drive only)
Internet Storage Name Server
Multipath I/O
Network Load Balancing
Peer Name Resolution Protocol
SNMP Services
Storage Manager for SANs
Windows Internet Name Service
Wireless LAN Service

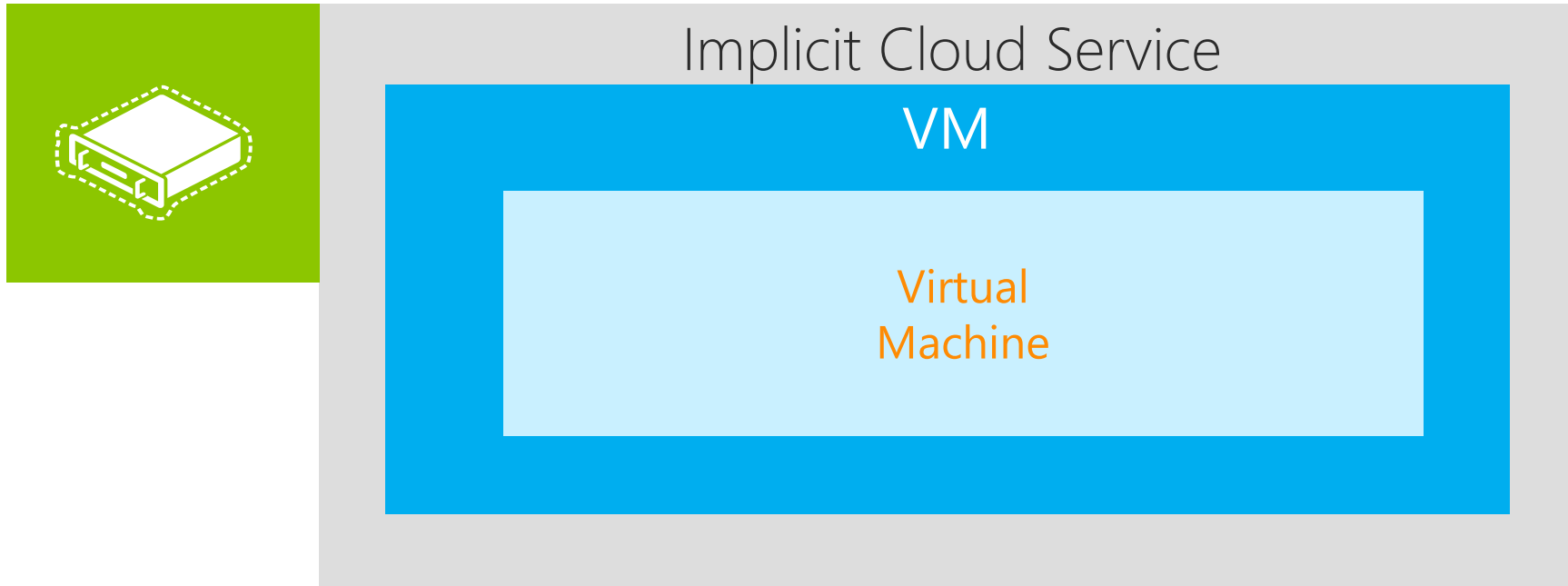
Demo: Getting Started with VMs

Module 3: IaaS VMs

VMs and Cloud Services (*Classic*)

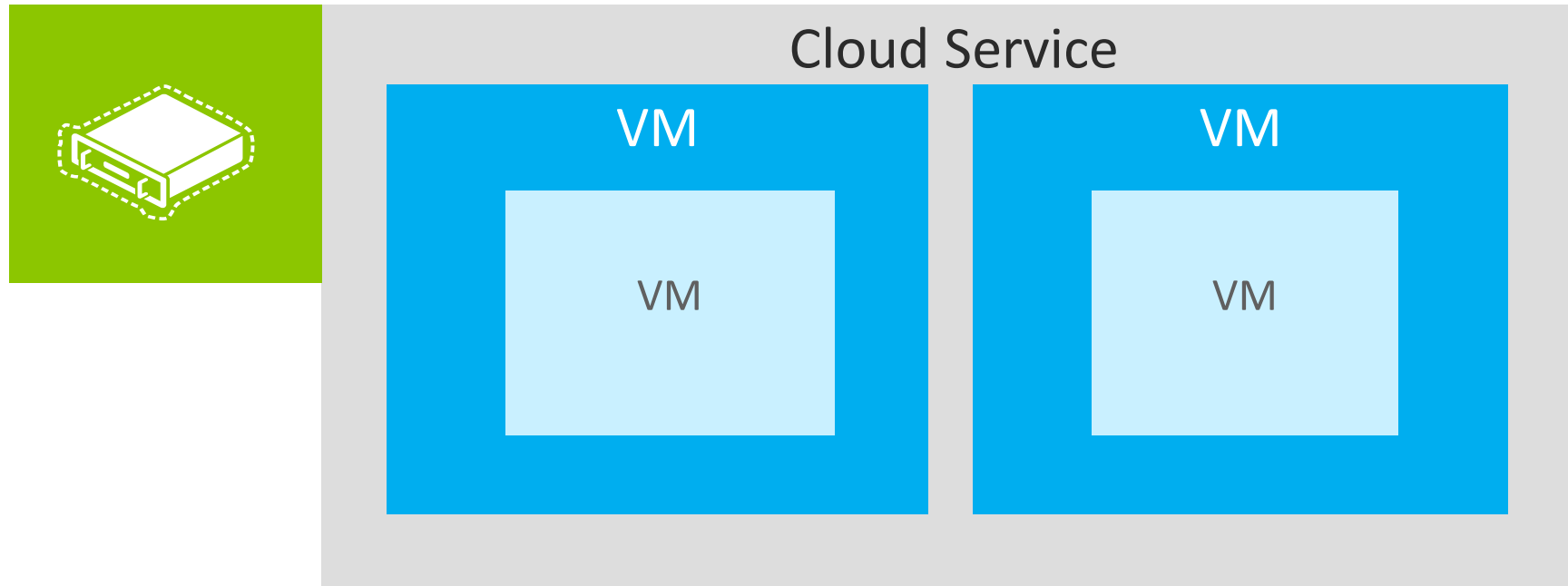
IaaS Virtual Machines

- VMs are roles with exactly one instance



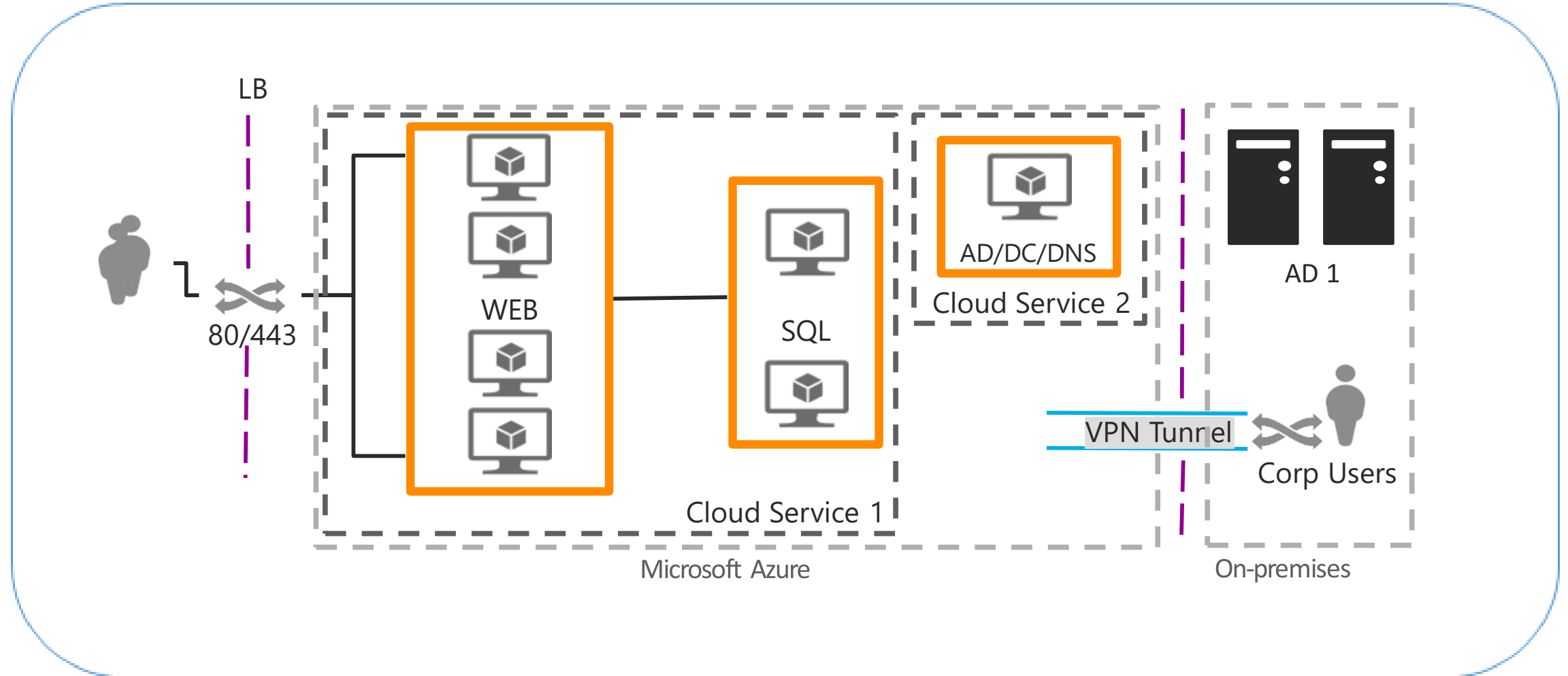
Cloud Services with VMs

- Multiple VMs can be hosted within the same cloud service*



- Need to manage firewalls
- Current limit = 50 VMs per Cloud Service

Multiple Cloud Services Configuration



Module 3: IaaS VMs

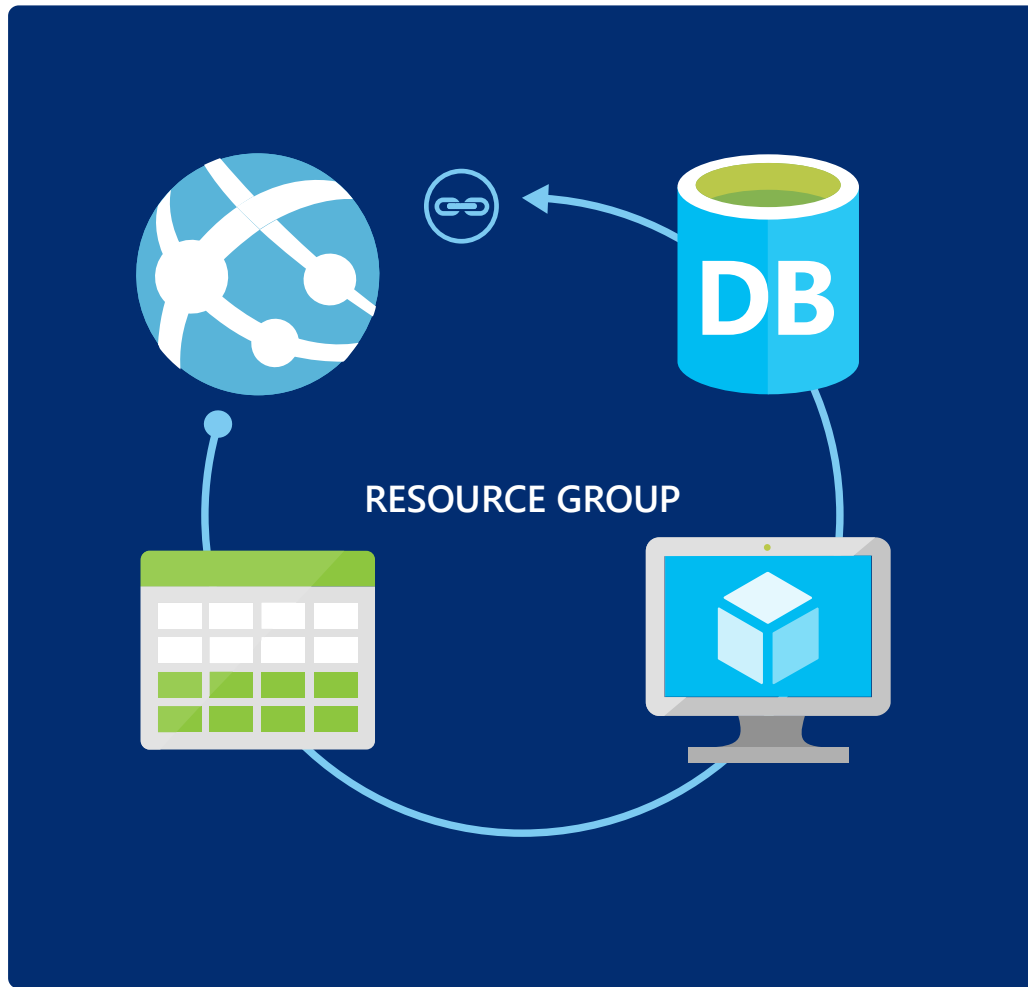
VM and Resource Groups (V2)

Reminder...Azure Resource Manager provides (IaaS V2)...

A Resource Group is a Unit of Management

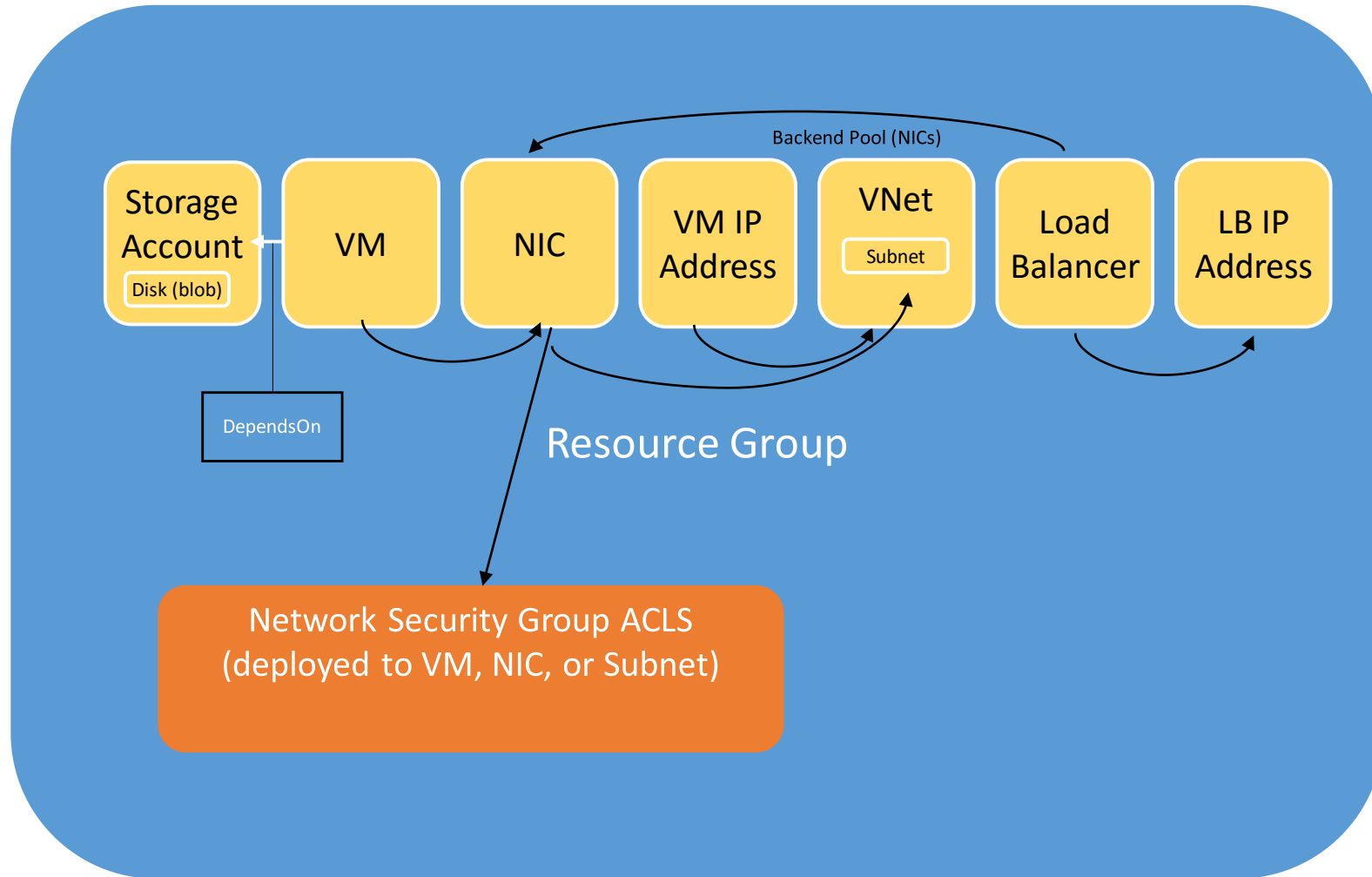
- Application Lifecycle Containment – Deployment, update, delete and status
- Declarative solution for Deployment – “Config as Code”
- Grouping – Metering, billing, quote: applied and rolled up to the group
- Consistent Management Layer
- Access Control – Scope for RBAC permissions

Azure Resource Groups

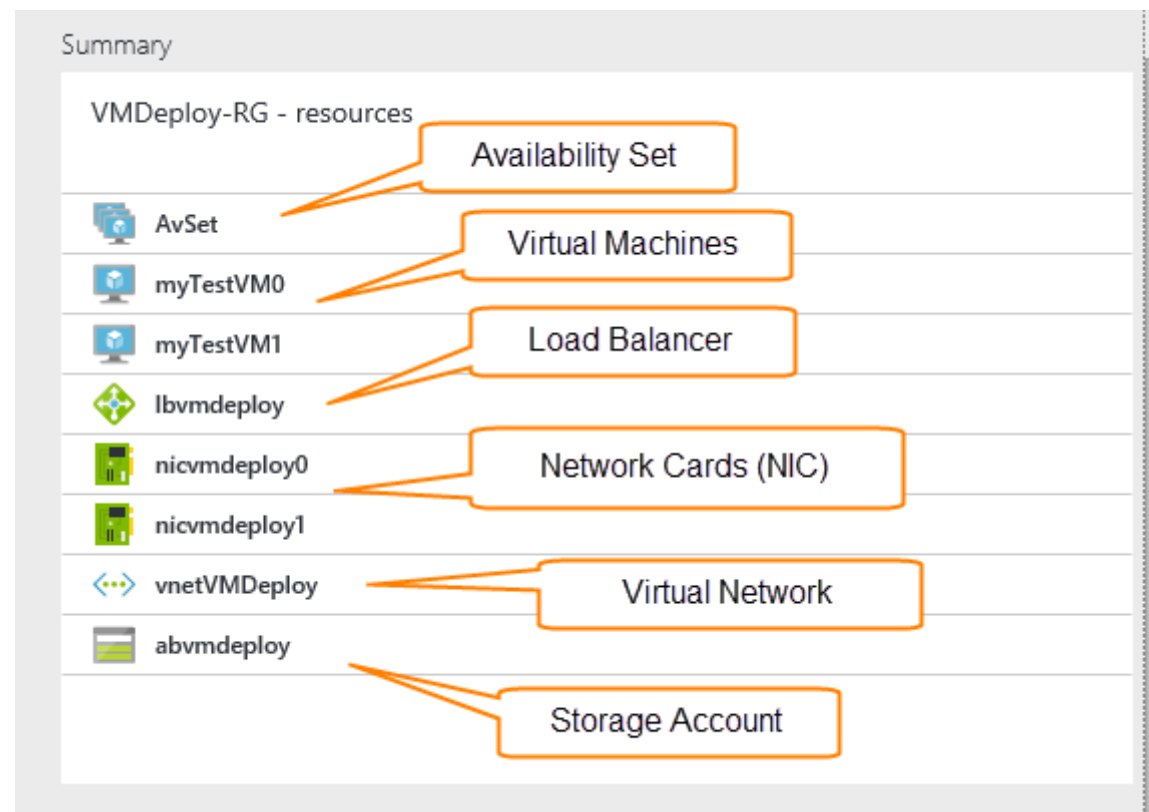


- Tightly coupled containers of multiple resources of similar or different types
- Resource groups can span regions
- Every resource **must** exist in one and only one resource group

Resource Group logical view



Portal View of Resource Group



Resource Group Key Points

- A resource can only be IN one resource group
- You CAN share resources in a resource group with other resource groups, ie, such as a storage account
- Virtual machines in a resource group MUST be in a virtual network and MUST be in a subnet which by default has a network security group (NSG)
- V2 virtual machines can only be placed in V2 storage accounts
- Load balancers must be created either via ARM or PowerShell, it cannot be done in the portal

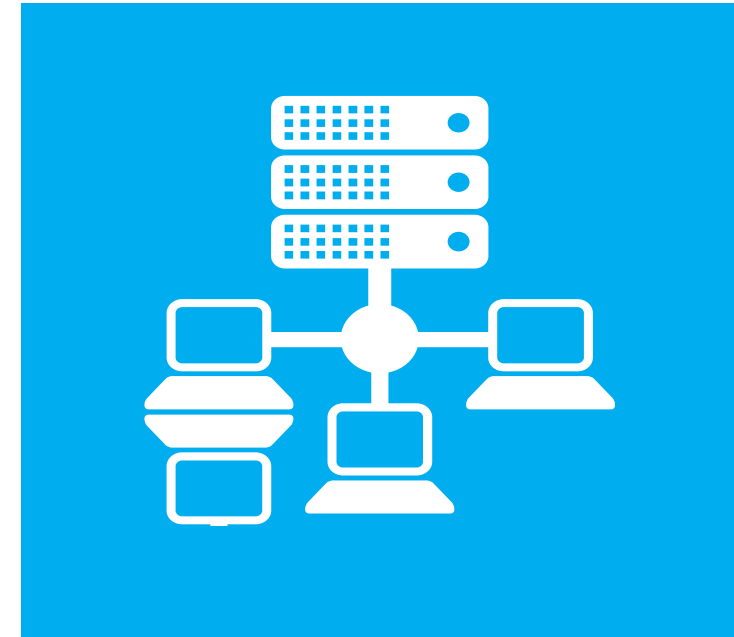
Demo: Resource Groups

Module 3: IaaS VMs

VM Availability

Service Level Agreements (SLA)

- For Cloud Services, we guarantee that when you deploy two or more role instances in different fault and upgrade domains, your Internet facing roles will have external connectivity at least 99.95% of the time.
- For all Internet facing Virtual Machines that have two or more instances deployed in the same Availability Set, we guarantee you will have external connectivity at least 99.95% of the time.
- For Virtual Network, we guarantee a 99.9% Virtual Network Gateway availability.
- "NO SLA" under the single instance



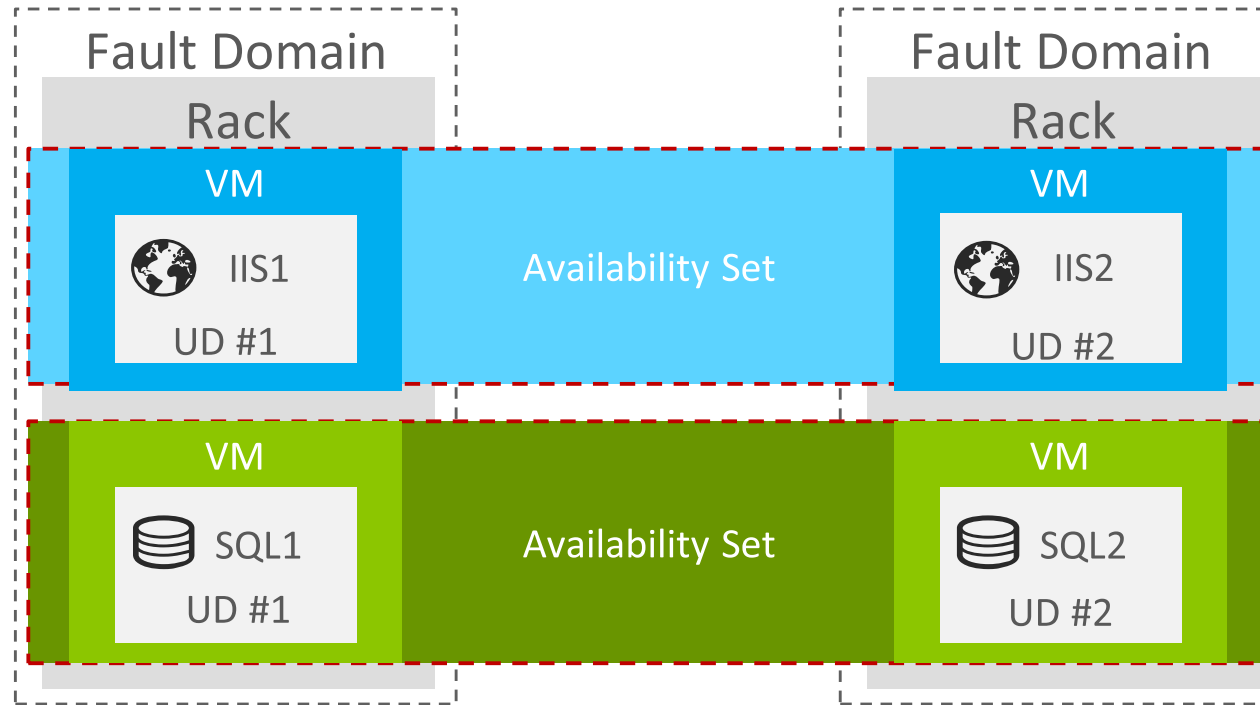
Fault and Update Domains

- Fault domains:
 - Represent groups of resources anticipated to fail together, i.e. same rack, same server
 - Fabric spreads instances across fault at least two fault domains
 - The number of fault domains is controlled by the Azure Fabric
 - Anticipated to fail together: share power source and network switch
 - IaaS V2 – 3 fault domains by default
- Update domains:
 - Represents groups of resources that will be updated together
 - Host OS updates honor service update domains
 - Specified in service definition
 - Default of five (up to 5)
 - IaaS V2 – more than 5 update domains
- Fabric spreads role instances across update domains and fault domains

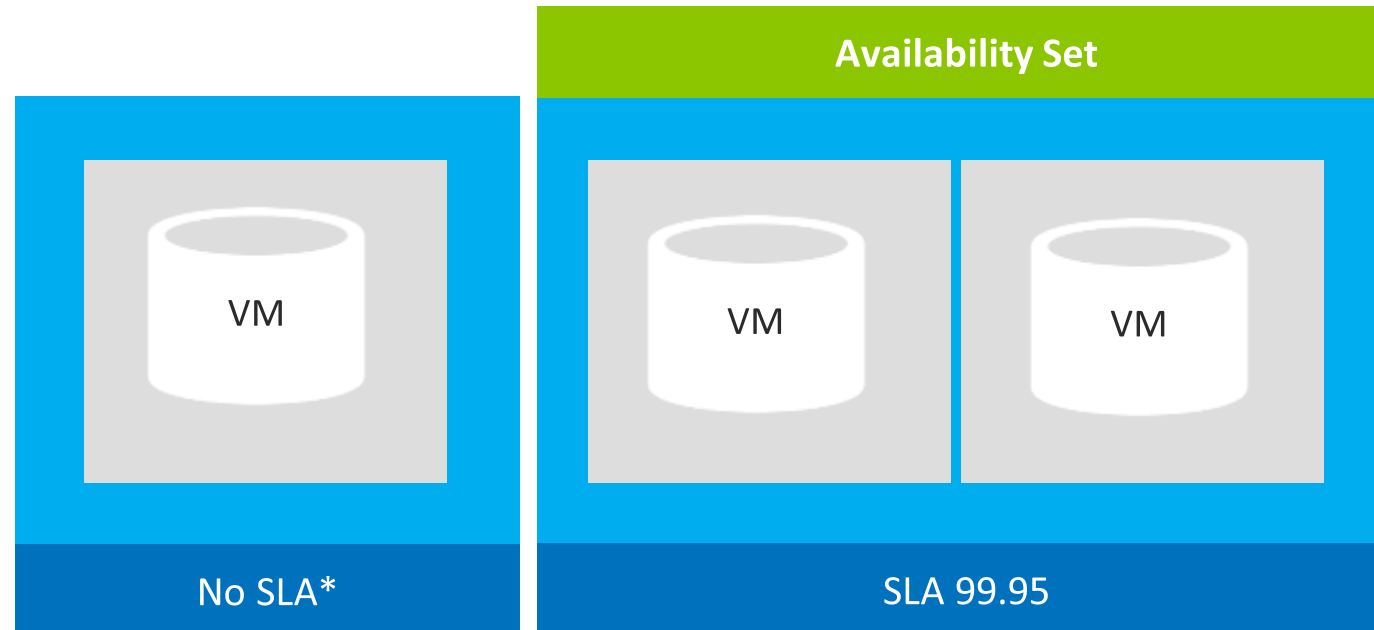


VM Availability Sets

- Update domains are honored by host OS updates



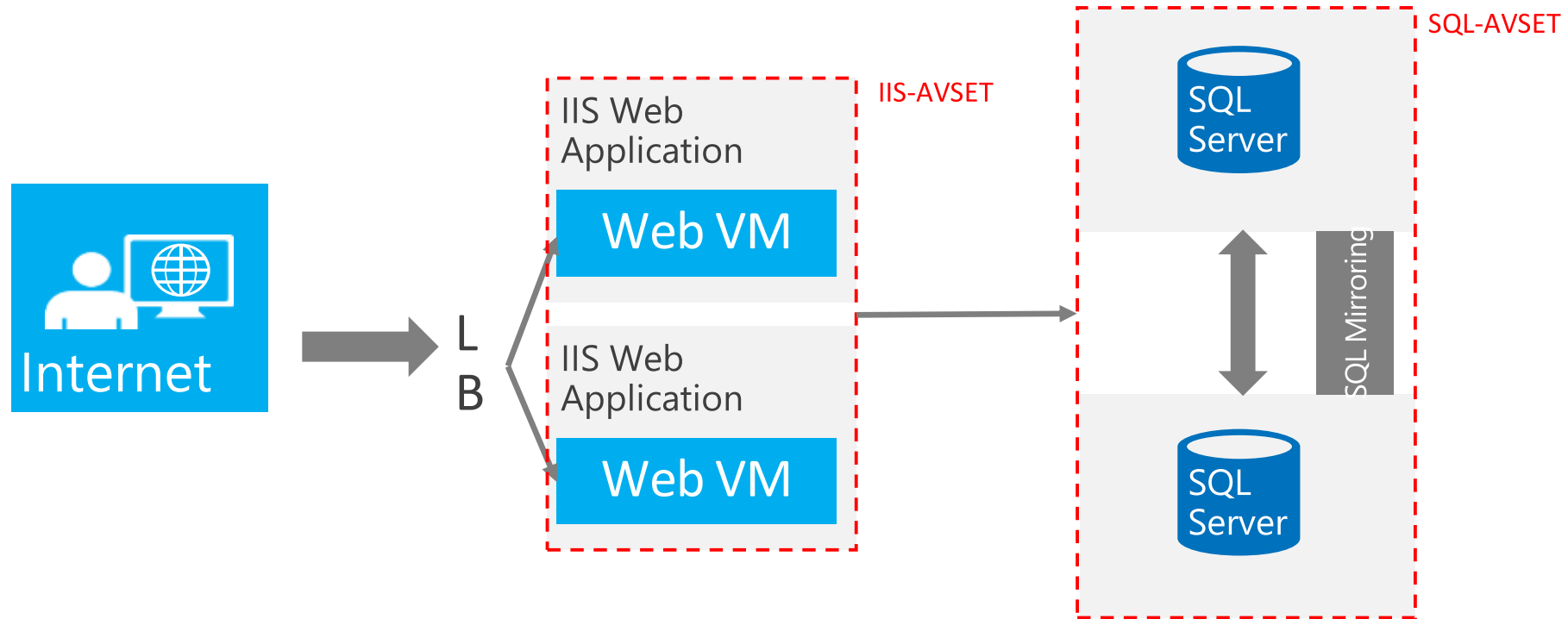
How Does this Relate to the SLA?



* No guaranteed SLA for single VM instance

End-to-End Highly Available Solution

- Redundancy at every level



Module 3: IaaS VMs

Understanding Disks

VM Disk Layout – Windows OS

The image displays two windows illustrating the disk layout for a Windows OS VM.

Hyper-V Disk Manager (DISKS): Shows three disks for 'IwVM1 (3)'. Disk 0 is the OS disk, highlighted in blue. It is a 127 GB Virtual Hard ATA Device (ATA) in an Online state. Disk 1 is a 70.0 GB Virtual Hard ATA Device (ATA) in an Online state. Disk 2 is a 5.00 GB Microsoft Virtual Disk (SAS) in an Online state.

Windows File Explorer (This PC): Shows the 'Devices and drives (5)' section. It includes a Floppy Disk Drive (A:), a DVD Drive (E:), a Local Disk (C:) with 118 GB free of 126 GB, and Temporary Storage (D:) with 68.7 GB free of 69.9 GB.

OS Disk Details: A callout box highlights the OS Disk with the following properties:

- Persistent
- SATA
- **Drive C:**

Orange arrows indicate the mapping from the OS Disk (Disk 0) in the Hyper-V Disk Manager to the Local Disk (C:) in the Windows File Explorer.

* Max. size of C:\ drive – 1,023GB

VM Disk Layout – Windows OS (continued)

DISKS
All disks | 3 total

Filter

Number	Virtual Disk	Status	Capacity	Unallocated	Partition	Name	Bus Type	Read...	Clustered	Subsystem
IwVM1 (3)										
0		Online	127 GB	2.00 MB	MBR	Virtual HD ATA Device	ATA			

Temporary Storage Disk

- Local (Not Persistent)
- SATA
- **Drive D:**

This PC

File Computer View

Search This PC

Folders (6)

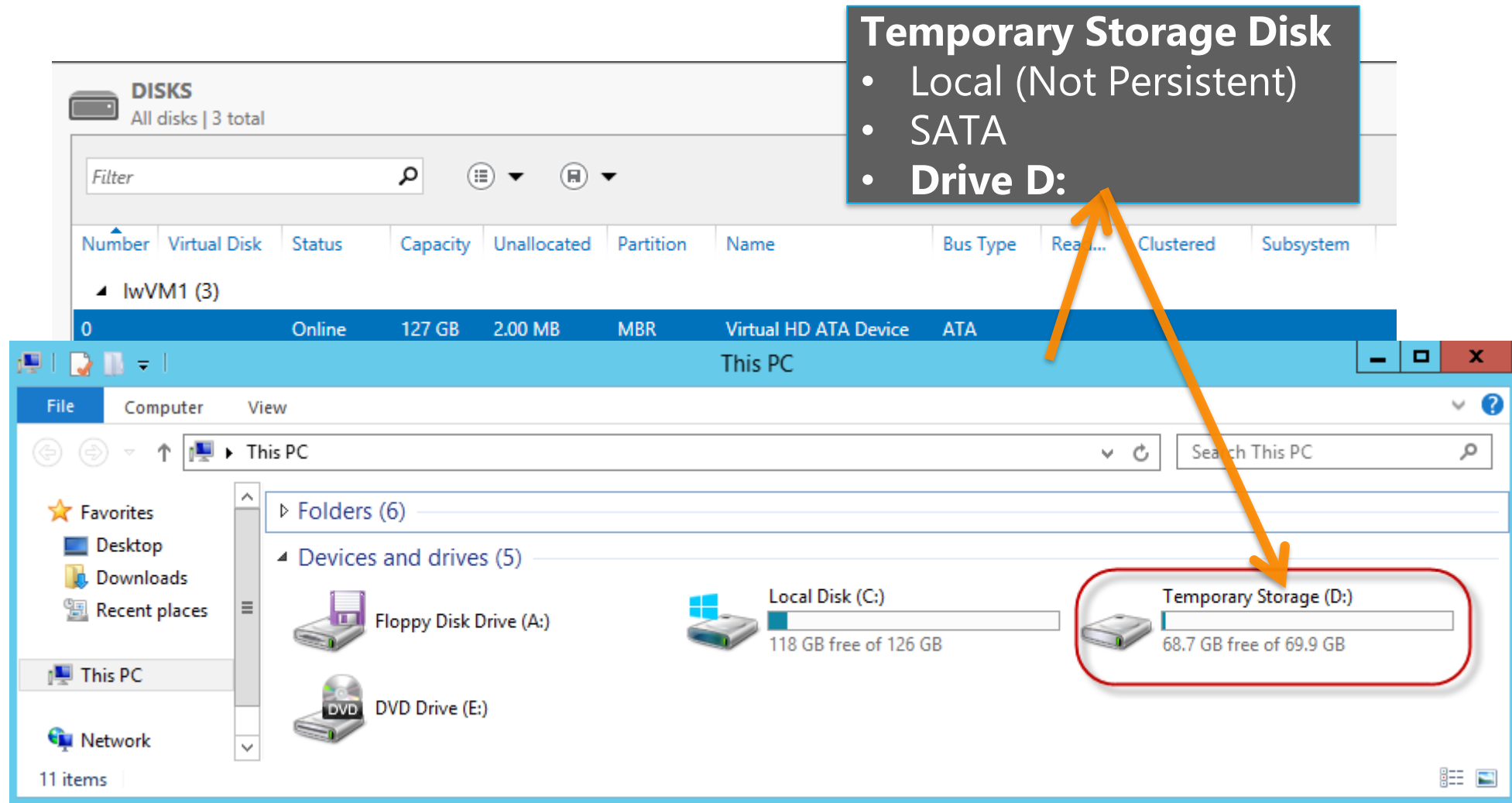
Devices and drives (5)

Floppy Disk Drive (A:)

DVD Drive (E:)

Local Disk (C:)
118 GB free of 126 GB

Temporary Storage (D:)
68.7 GB free of 69.9 GB



VM Disk Layout – Windows OS(continued)

The image displays two windows illustrating the disk layout of a Windows OS running in a VM.

Hyper-V Disk Manager (DISKS): Shows the configuration for 'lwVM1 (3)' with 3 total disks. The table below lists the disks:

Number	Virtual Disk	Status	Capacity	Unallocated	Partition	Name	Bus Type
0		Online	127 GB	2.00 MB	MBR	Virtual HD ATA Device	ATA
1		Online	70.0 GB	0.00 B	MBR	Virtual HD ATA Device	ATA

Windows File Explorer (This PC): Shows the internal disk layout. The 'Devices and drives (5)' section includes:

- Floppy Disk Drive (A:)
- DVD Drive (E:)
- Local Disk (C:): 118 GB free of 126 GB
- Temporary Storage (D:): 68.7 GB free of 69.9 GB
- New Volume (F:): 4.93 GB free of 4.99 GB

An orange arrow points from the 'Data Disk(s)' callout to the 'New Volume (F:)' drive in the File Explorer. A red circle highlights the 'New Volume (F:)' drive.

Data Disk(s)

- Persistent
- SCSI
- **Customer-defined Letter**

Persistent Disk Management – Windows OS

- C:\ = OS Disk
- D:\ = Non-Persistent Cache Disk
- E:\, F:\, G:\ and all subsequent Data Disks—you will need to attach and format them

Capability	OS Disk	Data Disk
Host Cache Default	ReadWrite	None
Max Capacity	1023 GB	1 TB
Imaging Capable	Yes	No
Hot Update	Cache Setting requires a reboot	Change Cache without reboot, Add/Remove without reboot

Disk Caching – Windows OS

- Modify using the **Set-AzureOSDisk** or the **Set-AzureDataDisk** cmdlets

Supported Cache Modes:

Disk Type	Read Only	Read Write	None
OS Disk	Supported	Default	Not Supported
Data Disks	Supported	Supported	Default
Temporary Disk	Not stored in Microsoft Azure Storage Blob Service		

VM Sizes – Basic and Standard Tier

- Each persistent data disk can be up to 1 terabyte (TB)
- Typically, two data disks per available core
- Tiers
 - Basic – no load balancing, auto-scaling or memory intensive models – best for dev/test scenarios – A0 – A4
 - Standard – full capabilities vs. Basic tier – A0 – A11

VM Size	CPU Cores	Memory	# of Data Disks
A0	Shared	768 MB	1
A1	1	1.75 GB	2
A2	2	3.5 GB	4
A3	4	7 GB	8
A4	8	14 GB	16
A5	2	14 GB	4
A6	4	14 GB	16
A7	8	56GB	16
A8	8	56GB	16
A9	16	112GB	16
A10	8	56GB	16
A11	16	112GB	16

Compute Intensive – A Series VMs

- Hardware designed and optimized for compute and network intensive apps like HPC
- Supported for Windows and Linux
- A8 – A9 Ideal for MPI applications
- A10 – A11 – Ideal for HPC parametric or embarrassingly parallel applications

VM Size	CPU	CPU Cores	Memory	# of Data Disks	# Network Adapters
A8	Intel® Xeon® E5-2670 8 cores @ 2.6 GHz	8	56GB	16	2
A9	Intel® Xeon® E5-2670 16 cores @ 2.6 GHz	16	112GB	16	2
A10	Intel® Xeon® E5-2670 8 cores @ 2.6 GHz	8	56GB	16	1
A11	Intel® Xeon® E5-2670 16 cores @ 2.6 GHz	16	112GB	16	1

Use cases for D-Series VMs

- Workloads that replicate across multiple instances – ex. MongoDB
- High I/O local and temporary cache
- SQL Server 2014 Buffer Pool Extensions
- The CPU cores are 60% faster in D series than A series, so for CPU bound workloads this could result in needing fewer cores to do the same work, and thus reduce cost
- Data intensive type applications – Big Data and BI
- **Remember: The temporary, or D:\ drive on the VMs can lose the data if the physical disk failure occurs. This SSD drive replaces the previously know scratch D:\ drive**

VM Sizes – D Series Standard Tier

- Compute processors approx. 60% faster than A-Series Standard
- Up to 800GB of local SSD Drive space
- Local Drive is a temporary Drive!!

General Purpose

Name	vCores	Memory (GB)	Local SSD (GB)
D1	1	3.5	50
D2	2	7	100
D3	4	14	200
D4	8	28	400

High Memory

Name	vCores	Memory (GB)	Local SSD (GB)
D11	2	14	100
D12	4	28	200
D13	8	56	400
D14	16	112	800

VM Sizes – DS Series Standard Tier

- DS-series and GS-series VMs can use Premium Storage
- These VMs use solid-state drives (SSDs) to host a virtual machine's disks and also provide a local SSD disk cache
- Premium Storage is available in certain regions

Name	vCores	Memory (GB)	Max. Disk IOPS IOPS/MB sec
Standard_DS1	1	3.5	3200/32
Standard_DS2	2	7	6400/64
Standard_DS3	4	14	12800/128
Standard_DS4	8	28	25600/256

Name	vCores	Memory (GB)	Max. Disk IOPS IOPS/MB sec
Standard_DS11	2	14	6400/64
Standard_DS12	4	28	12800/128
Standard_DS13	8	56	25600/256
Standard_DS14	16	112	50000/512

VM Sizes – G Series

- More memory and Solid State Drive (SSD) drives
- Intel Xeon processor E5 v3 processor - Up to 800GB of local SSD Drive space
- Used for applications and parallel processing that require increased computing power

General Purpose

Name	vCores	Memory (GB)	Local SSD (GB)	Persistent Data Disks Max
Standard_G1	2	28	412	4
Standard_G2	4	56	824	8
Standard_G3	8	112	1,649	16
Standard_G4	16	224	3,298	32
Standard_G5	32	448	6,596	64

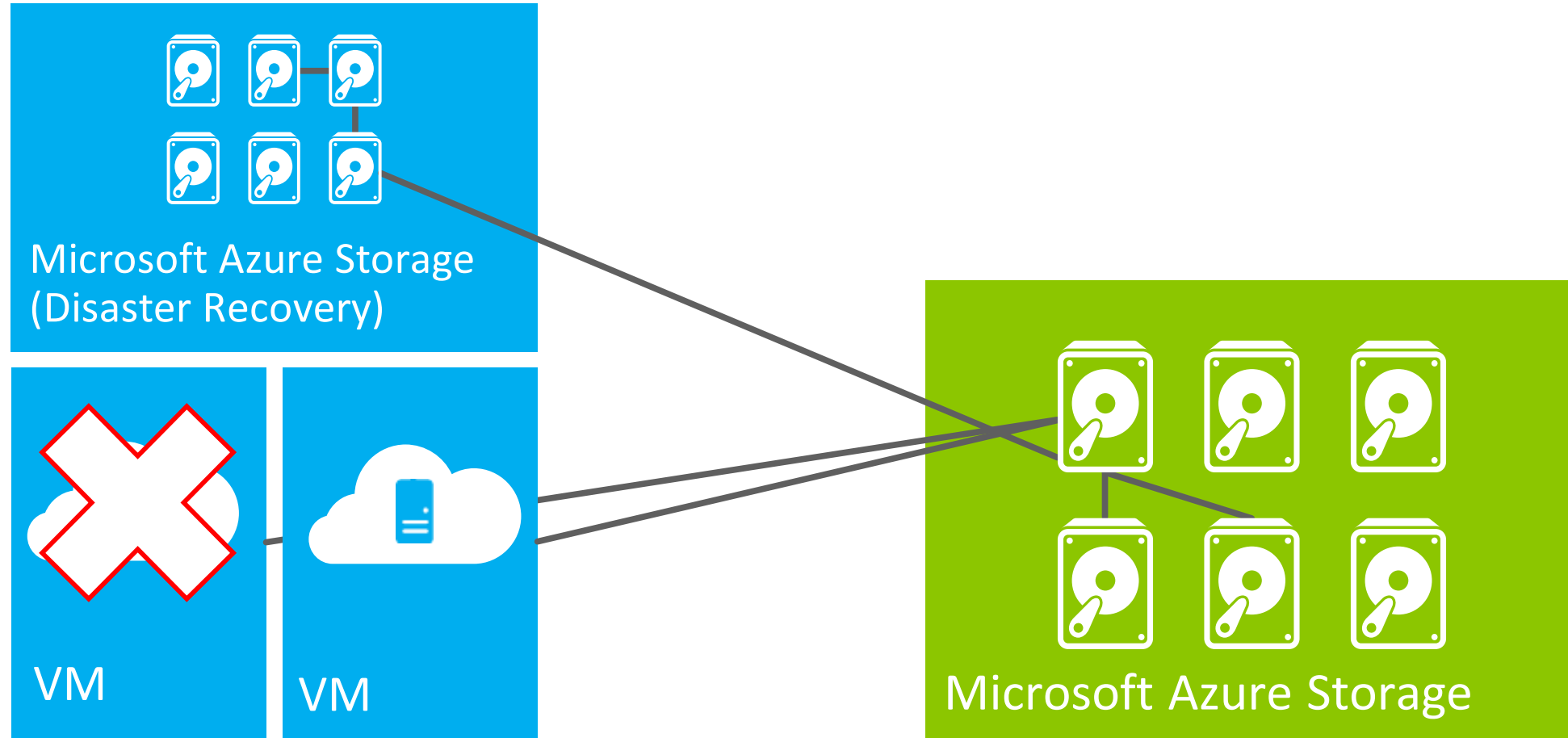
VM Sizes – GS Series

- GS-series VMs can use Premium Storage
- These VMs use solid-state drives (SSDs) to host a virtual machine's disks and also provide a local SSD disk cache
- Premium Storage is available in certain regions

General Purpose

Name	vCores	Memory (GB)	Max Disks	Max. Disk IOPS IOPS/MB sec
Standard_GS1	2	28	4	5000/125
Standard_GS2	4	56	8	10000/250
Standard_GS3	8	112	16	20000/500
Standard_GS4	16	224	32	40000/1000
Standard_GS5	32	448	64	80000/2000

Persistent Disks and Azure Storage High Durability



Azure Premium Storage

- Premium storage account can be created via the Azure Portal <https://portal.azure.com> , Azure PowerShell or the Service Management REST API
- Available in Regions West US, East US 2 and West Europe, East China, Southeast Asia, West Japan, East Japan
- Supports on Azure Page Blobs that are used to hold persistent disks
- Only support Locally Redundant Storage (LRS)
- Must use DS-Series or GS-Series disks for VMs
- Cannot be mapped to a custom domain
- Storage analytics not currently supported

Azure Premium Storage Scalability

- Three types of Premium Storage disks

Premium Storage Disk Type	P10	P20	P30
Disk size	128 GB	512 GB	1024 GB (1 TB)
IOPS per disk	500	2300	5000
Throughput per disk	100 MB per second	150 MB per second	200 MB per second

- Scalability Targets

Total Account Capacity	Total Bandwidth for a Locally Redundant Storage Account
<ul style="list-style-type: none">• Disk capacity: 32 TB• Snapshot capacity: 10 TB	Up to 50 gigabits per second for Inbound + Outbound

Creating a Premium Storage account

Choose your pricing tier
Browse the available plans and their features

★ Recommended | View all

P Premium Locally Redundant ★	L Locally Redundant ★	G Geo-Redundant ★
3 Local replicas	3 Local replicas	3 Local replicas
		3 Geo-distributed replicas
Page blob	Block and page blobs	Block and page blobs
5000 Max IOPS per disk	Table	Table
99.9% SLA	Queue	Queue
	500 Max IOPS per disk	500 Max IOPS per disk
	99.9% SLA	99.9% SLA
19.71 STARTING COST PER 128GB DISK (USD)	2.40 STARTING COST PER 100GB (USD)	4.80 STARTING COST PER 100GB (USD)
R Read-Access Geo-Redundant ★	Z Zone Redundant	
3 Local replicas	3 Replicas across multiple availability zones	
3 Geo-distributed replicas		
Block and page blobs	Block blob	
Table	99.9% SLA	
Queue		
500 Max IOPS per disk		
99.9% SLA		
Read access to secondary location		
6.10 STARTING COST PER 100GB (USD)	3.00 STARTING COST PER 100GB (USD)	

Module 2: IaaS VMs

Disks and Images

Introduction to Disks and Images

OS Images

- Microsoft
- Partner
- User



- Base OS image for new VMs
- Sysprepped/Generalized/Read-only
- Created by uploading or by capture

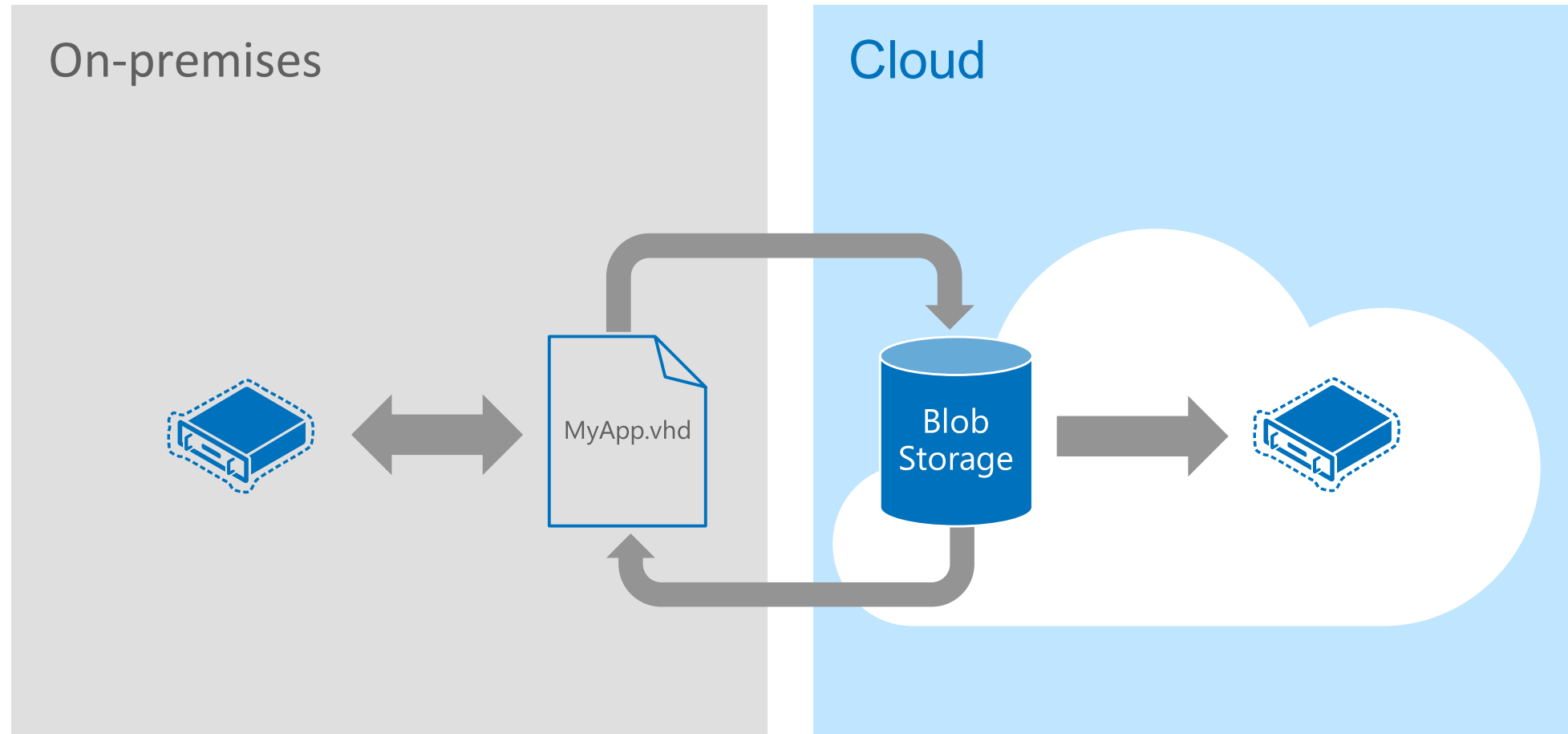
Disks

- OS Disks
- Data Disks

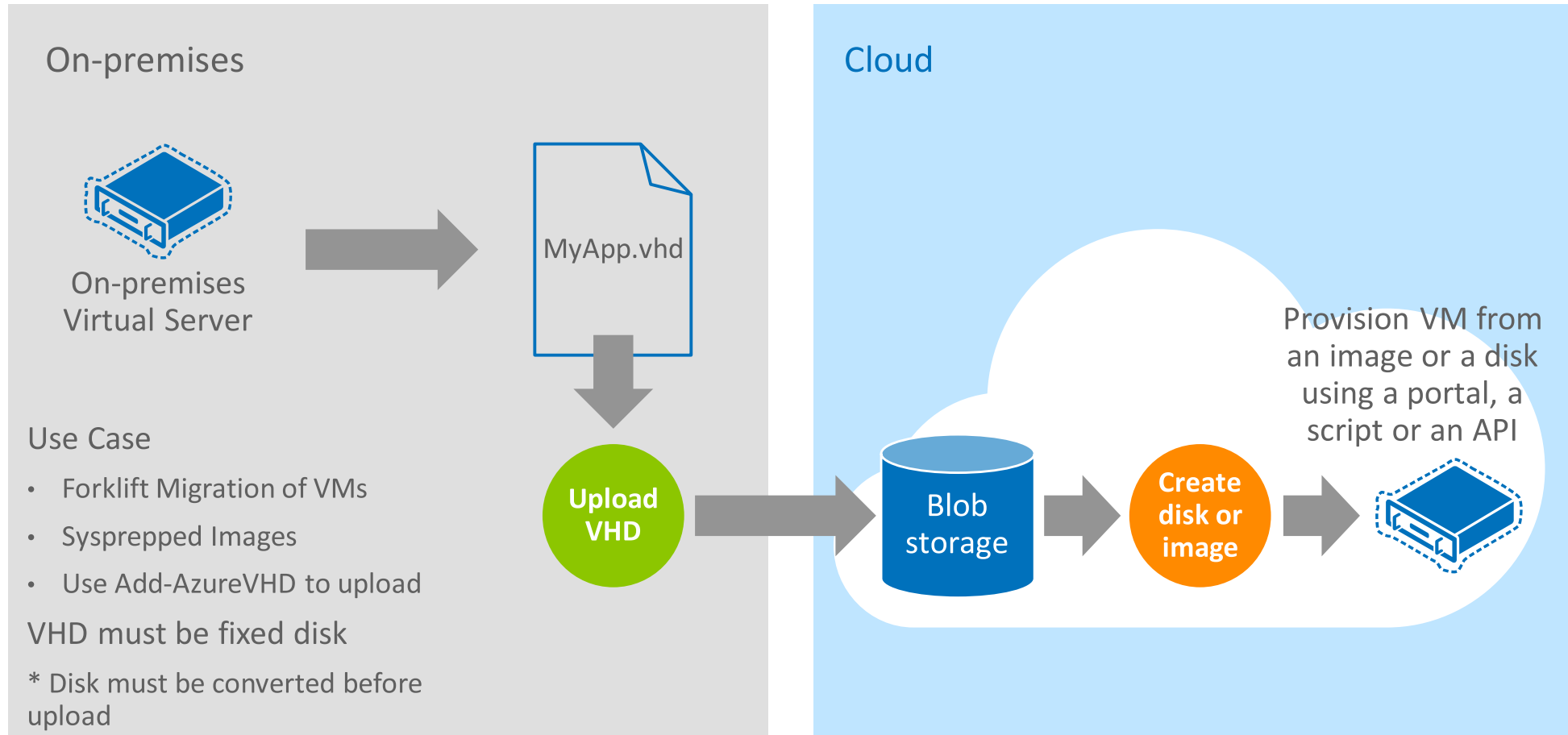


- Writable disks for VMs
- Created during VM creation or during upload of existing Virtual Hard Disks (VHDs)

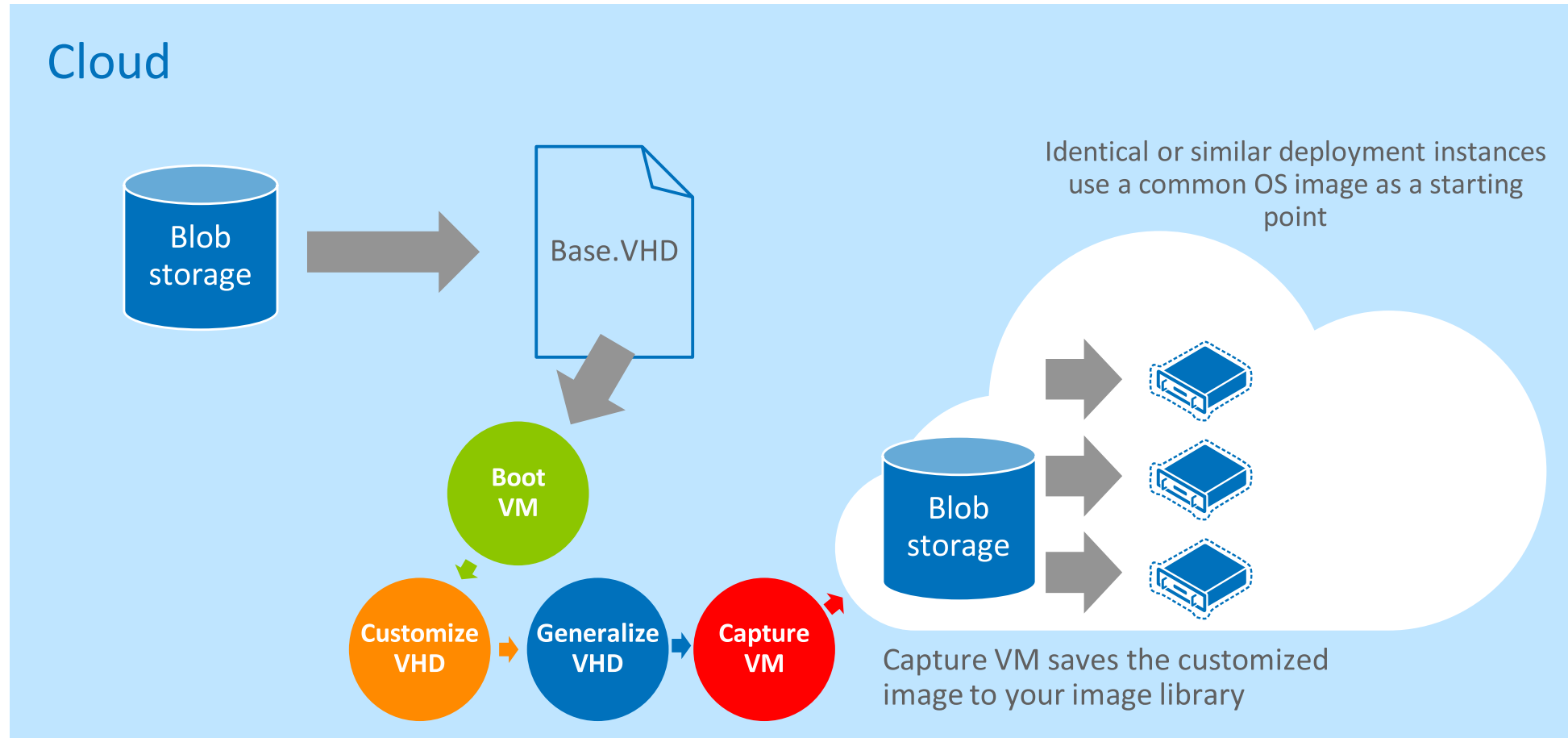
Image Mobility



Bring Your Own Server/VHD

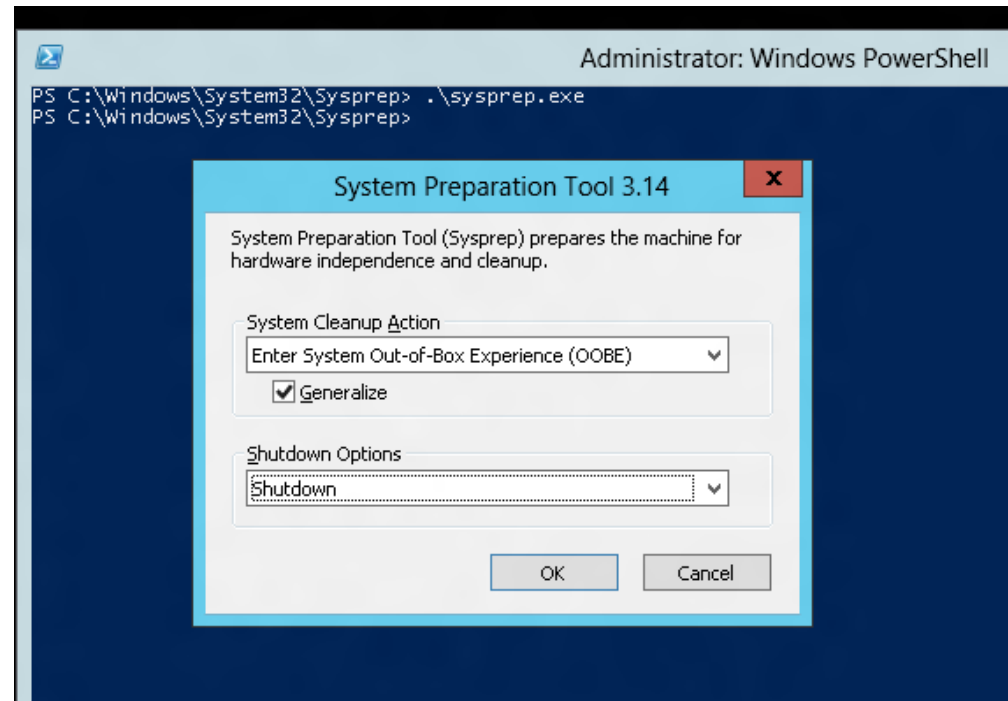


Imaging VMs in the Cloud



Tips on Bring Your Own (BYO) Generalized Images

- Sysprep and *Generalize* is expected
- Do not put **unattend.xml** on the disk
- Do not install the Microsoft Azure Integration Components
- No Microsoft Azure agent



Module 2: IaaS VMs

Managing VMs

Azure VM Agent and Extensions

- VM Agent is used to install, configure, manage and run Azure VM Extensions
 - Installs, configures, and removes VM extensions on instances of Azure VMs
 - Enable via Portal or PowerShell
 - Available for Windows and Linux
- VM Extensions provide dynamic features that Microsoft and other third parties provide
 - Modify security and identity features, such as resetting account values and using antimalware
 - Start, stop, or configure monitoring and diagnostics
 - Reset or install connectivity features, such as RDP and SSH
 - Diagnose, monitor, and manage your VMs

Virtual Machine Shutdown (classic portal view)

- Shutdown from Windows Azure Portal or Stop-AzureVM
 - Billing stops for the VM
 - All resources are released (including network adapters)
- Shutdown within the VM or Stop-AzureVM –StayProvisioned:
 - Billing continues for the VM
 - Keeps resources reserved (including IP address)

■ Stopped (Deallocated)

■ Stopped



Module 2: IaaS VMs

Preview Features

Module Summary



Support for key server applications



Easy storage manageability



High availability features



Advanced networking



Integration with compute PaaS

