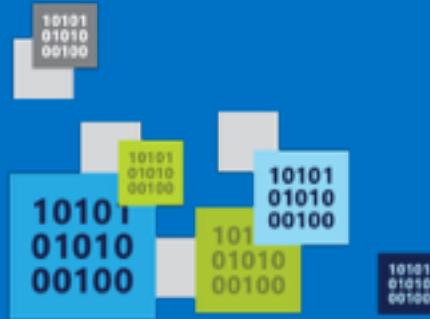
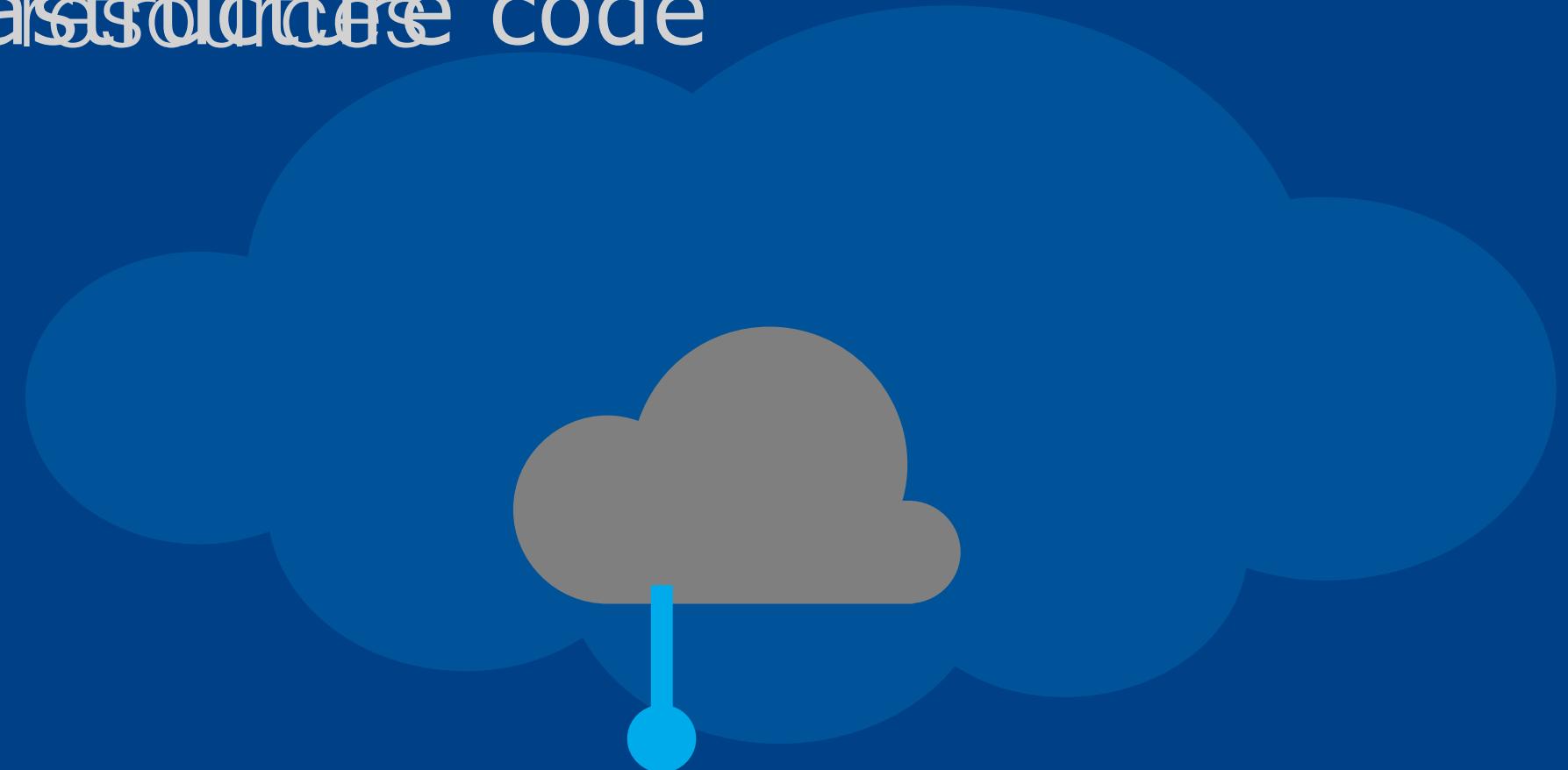


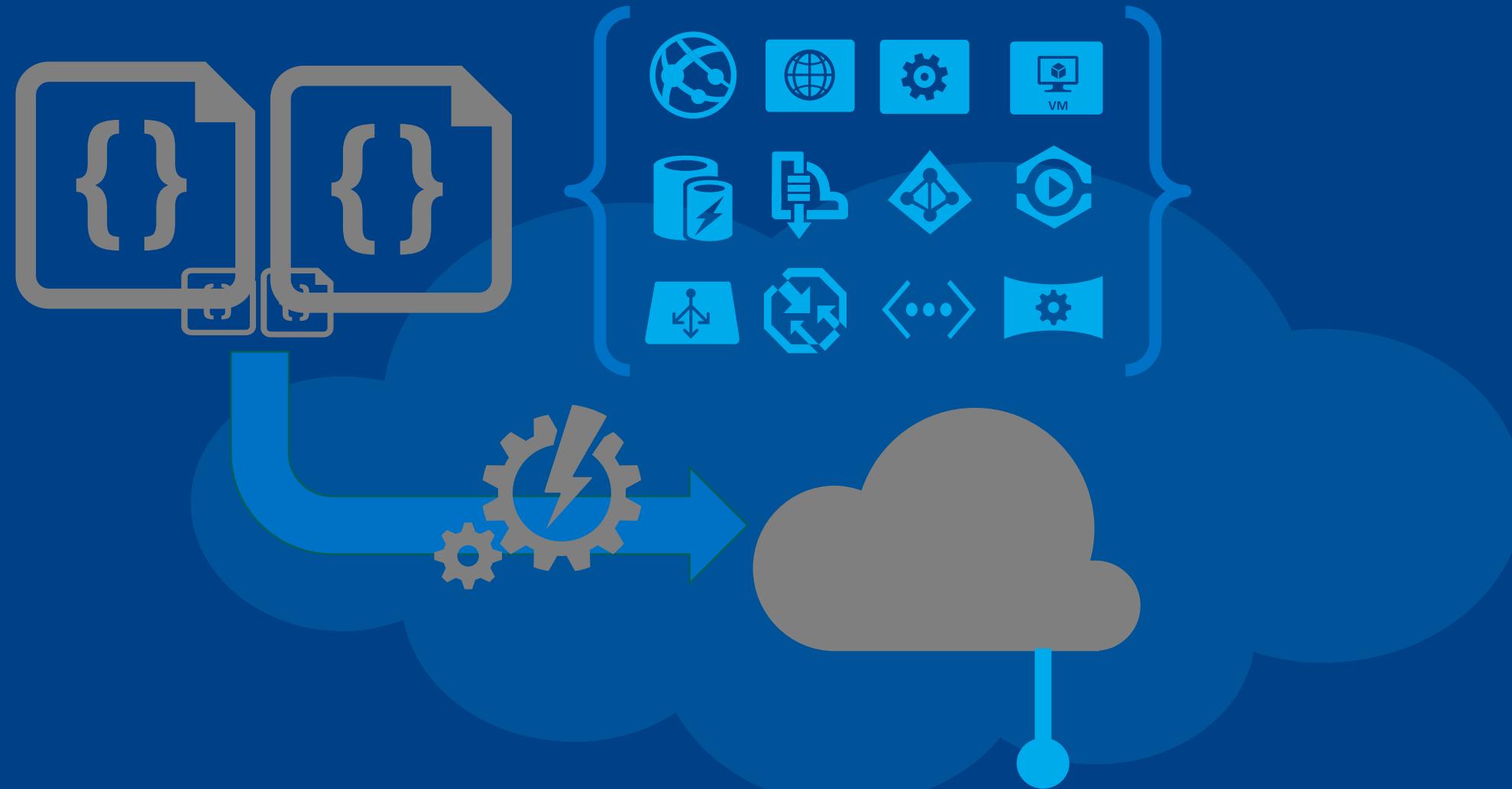
Azure IaaS



Your service

- Your application code
- Requirements for reuse code





You: Code (application, infrastructure)
Azure: Resources (IaaS, PaaS, SaaS)

Virtual Machines

Azure Virtual Machines



- à Launch Windows Server and Linux in minutes
- à Scale from 1 to 1000s of VM Instances
- à Save money with per-minute billing
- à Open and extensible

Announcing - redhat now on Azure



THE WAIT IS OVER

Use Red Hat products on Microsoft Azure

Security, consistency, reliability: These are why enterprises trust Red Hat® solutions. They're also why enterprises turn to a public cloud like Microsoft Azure. It's only natural that customers want to unite the 2.

Now you can. [Red Hat and Microsoft are teaming up](#) to offer open hybrid cloud solutions on Azure.

[READ THE PRESS RELEASE](#)

Microsoft Azure

“This partnership is a powerful win for enterprises, ISVs and developers. With this partnership, we are expanding our commitment to offering unmatched choice and flexibility in the cloud today, meeting customers where they are so they can do more with their hybrid cloud deployments – all while fulfilling the rigorous security and scalability requirements that enterprises demand.”

Provisioning VM

Getting Started



Management Portal



Scripting
(Windows, Linux and Mac)



REST API

Select Image and VM Size

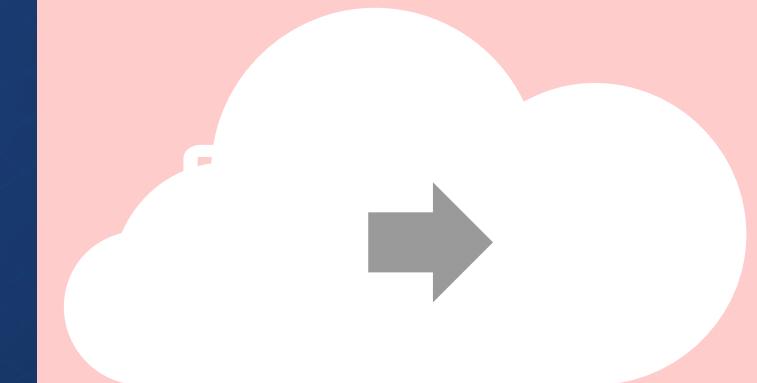


Windows Server
Linux

General Purpose
Basic
Standard
Optimized Compute
Performance
Optimized
Network Optimized

New Disk Persisted in Storage

Boot VM from New Disk



Cloud

VM Gallery

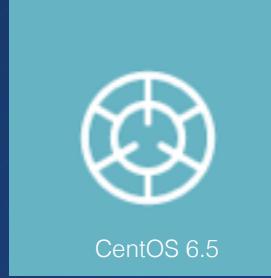
A COLLECTION OF PREBUILT IMAGES FOR VARIOUS WORKLOADS



Windows Server 2012 R2



Ubuntu Server 14.04 LTS



CentOS 6.5



SUSE Linux Enterprise Server



openSUSE 13.1



Oracle Linux 6.4.0.0.0



SQL Server 2014 Standard



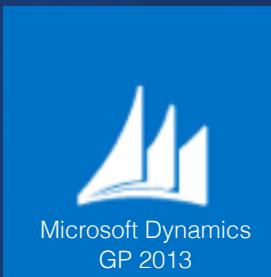
Oracle Database 11g R2



BizTalk Server 2013



SharePoint Server Farm



Microsoft Dynamics GP 2013



Zulu 8

SAP HANA
Developer Edition

Puppet Enterprise 3.2.3



Barracuda Web Application

Oracle WebLogic
Server 12.1.2

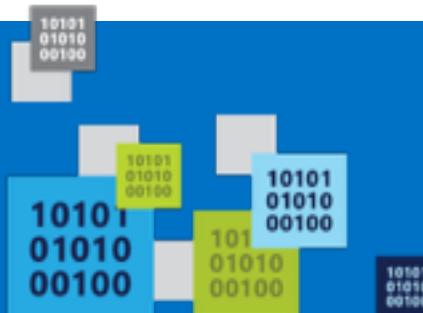
Visual Studio Ultimate 2013



Windows 8.1 Enterprise

Virtual Machine Sizes

- General Purpose compute: Basic
- General Purpose compute: Standard
- Optimized Compute
- Performance Optimized
- Network Optimized

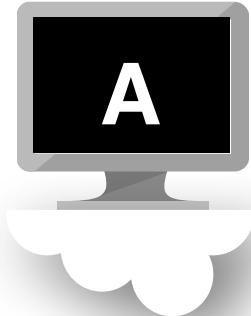


Scale-up options



Highest value

Largest scale-up



Highest value



35% faster than D
NVIDIA GPUs
Intel E5-2673 v3 CPUs



Most memory
fastest CPUs



NVIDIA GPUs
Remote visualization
Compute-intensive + RDMA



80000 IOPS
Petabytes storage

The G family

Optimized for data workloads

Up to 32 CPU cores, 448 GB
RAM

6.5 TB local SSD

Latest generation Intel
processor

Up to 64 attached disks!!

Dell PowerEdge R930 Rack Server

Starting Price \$66,621.00
Instant Savings \$20,229.13

Subtotal **\$46,391.87**

As low as **\$1,392.00 /month[^]**

 [Dell Business Credit | Apply](#)

 [Discount Details](#)

 **Ships in 11 - 15 Business Days**

 [Print Summary](#)

Additional Processor	No 3rd/4th Processors	edit
Processor Thermal Configuration	2 CPU	edit
PCIe Riser	None	edit
Cooling	None	edit
Memory DIMM Type and Speed	2133MT/s RDIMMs	edit
Memory Configuration Type	Performance Optimized	edit
Memory Capacity	16GB RDIMM, 2133MT/s, Dual Rank, x4 Data Width	edit
RAID Configuration	No RAID for H330/H730P (1-24 HDDs)	edit
RAID Controller	PERC H730P Adapter RAID Controller, 2Gb NV Cache	edit
Hard Drives	800GB Solid State Drive SAS Read Intensive MLC 12Gbps 2.5in Hot-plug Drive	edit
Network Daughter Card	Broadcom 5720 Quad Port 1Gb Network Daughter Card	edit
Additional Network Cards	None	edit

General Purpose Compute

Basic Tier

An economical option for development workloads, test servers, and other applications that don't require load balancing, auto-scaling, or memory-intensive virtual machines.

Instance	Cores	RAM	Disk sizes
A0	1	0.75 GB	20 GB
A1	1	1.75 GB	40 GB
A2	2	3.5 GB	60 GB
A3	4	7 GB	120 GB
A4	8	14 GB	240 GB

General Purpose Compute

Standard Tier

Offers the most flexibility. Supports all virtual machine configurations and features

Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Max. IOPS (500 per disk)
Standard_A0\ExtraSmall	1	768 MB	1	Temporary = 20 GB	1	1x500
Standard_A1\Small	1	1.75 GB	1	Temporary = 70 GB	2	2x500
Standard_A2\Medium	2	3.5 GB	1	Temporary = 135 GB	4	4x500
Standard_A3\Large	4	7 GB	2	Temporary = 285 GB	8	8x500
Standard_A4\ExtraLarge	8	14 GB	4	Temporary = 605 GB	16	16x500
Standard_A5	2	14 GB	1	Temporary = 135 GB	4	4X500
Standard_A6	4	28 GB	2	Temporary = 285 GB	8	8x500
Standard_A7	8	56 GB	4	Temporary = 605 GB	16	16x500

General Purpose Compute

Network optimized with Infiniband support

Adds a 40Gbit/s InfiniBand network with remote direct memory access (RDMA) technology.

Instance	Cores	RAM	Disk sizes
A8	8	56 GB	382 GB
A9	16	112 GB	382 GB

Adds a 40Gbit/s InfiniBand network with remote direct memory access (RDMA) technology. Ideal for Message Passing Interface (MPI) applications, high-performance clusters, modeling and simulations, video encoding, and other compute or network intensive scenarios.

Optimized Compute (D Tier)- 60% faster CPUs, more memory, and local SSD

Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Max. IOPS (500 per disk)
Standard_D1	1	3.5 GB	1	Temporary (SSD) =50 GB	2	2x500
Standard_D2	2	7 GB	2	Temporary (SSD) =100 GB	4	4x500
Standard_D3	4	14 GB	4	Temporary (SSD) =200 GB	8	8x500
Standard_D4	8	28 GB	8	Temporary (SSD) =400 GB	16	16x500
Standard_D11	2	14 GB	2	Temporary (SSD) =100 GB	4	4x500
Standard_D12	4	28 GB	4	Temporary (SSD) =200 GB	8	8x500
Standard_D13	8	56 GB	8	Temporary (SSD) =400 GB	16	16x500
Standard_D14	16	112 GB	8	Temporary (SSD) =800 GB	32	32x500

Dv2 Series- 35% faster than D series, 2.4 GHz Intel Xeon® E5-2673 v3 (Haswell)

Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Max. IOPS (500 per disk)
Standard_D1_v2	1	3.5 GB	1	Temporary (SSD) =50 GB	2	2x500
Standard_D2_v2	2	7 GB	2	Temporary (SSD) =100 GB	4	4x500
Standard_D3_v2	4	14 GB	4	Temporary (SSD) =200 GB	8	8x500
Standard_D4_v2	8	28 GB	8	Temporary (SSD) =400 GB	16	16x500
Standard_D5_v2	16	56 GB	8	Temporary (SSD) =800 GB	32	32x500
Standard_D11_v2	2	14 GB	2	Temporary (SSD) =100 GB	4	4x500
Standard_D12_v2	4	28 GB	4	Temporary (SSD) =200 GB	8	8x500
Standard_D13_v2	8	56 GB	8	Temporary (SSD) =400 GB	16	16x500
Standard_D14_v2	16	112 GB	8	Temporary (SSD) =800 GB	32	32x500

DS-series VMs can use Premium Storage- high-performance, low-latency storage.

Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Cache size (GB)	Max. disk IOPS & bandwidth
Standard_DS1	1	3.5	1	Local SSD disk = 7 GB	2	43	3,200 32 MB per second
Standard_DS2	2	7	2	Local SSD disk = 14 GB	4	86	6,400 64 MB per second
Standard_DS3	4	14	4	Local SSD disk = 28 GB	8	172	12,800 128 MB per second
Standard_DS4	8	28	8	Local SSD disk = 56 GB	16	344	25,600 256 MB per second
Standard_DS11	2	14	2	Local SSD disk = 28 GB	4	72	6,400 64 MB per second



G-series VMs offer the most memory and run on hosts that have Intel Xeon E5 V3 family processors.

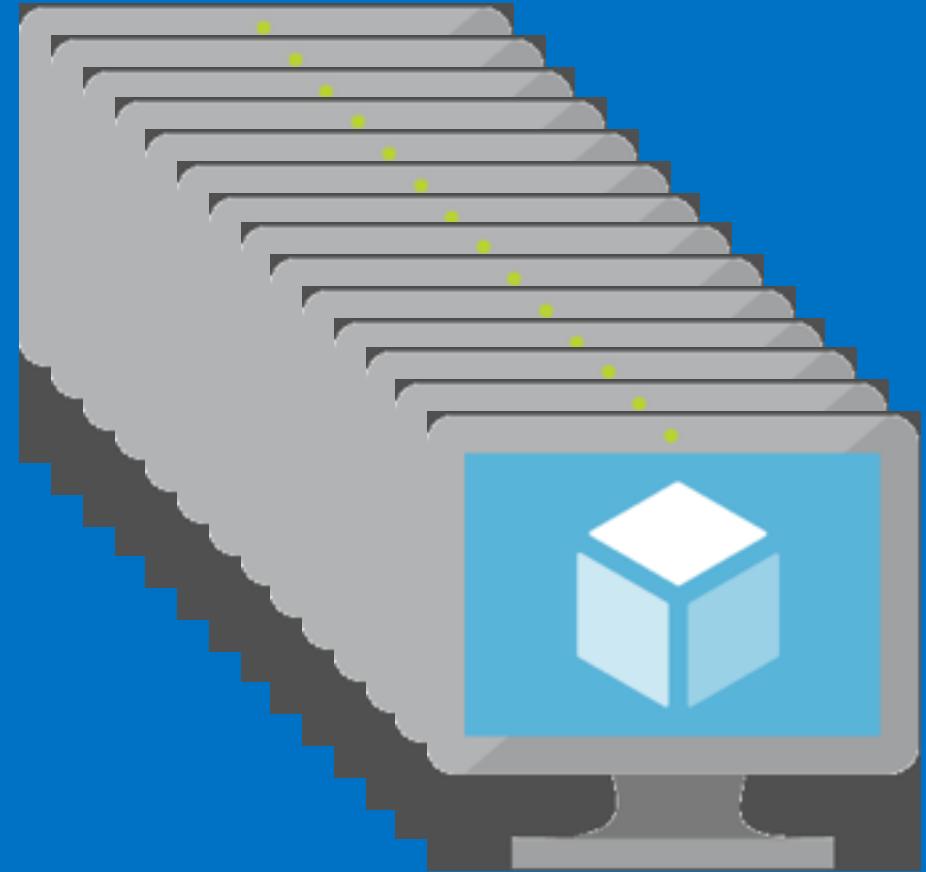
Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Max. IOPS (500 per disk)
Standard_G1	2	28 GB	1	Local SSD disk = 384 GB	4	4 x 500
Standard_G2	4	56 GB	2	Local SSD disk = 768 GB	8	8 x 500
Standard_G3	8	112 GB	4	Local SSD disk = 1,536 GB	16	16 x 500
Standard_G4	16	224 GB	8	Local SSD disk = 3,072 GB	32	32 x 500
Standard_G5	32	448 GB	8	Local SSD disk = 6,144 GB	64	64 x 500

GS-series VMs , Godzilla ++ (Premium Storage- high-performance, low-latency storage)

Size	CPU cores	Memory	NICs (Max)	Max. disk size	Max. data disks (1023 GB each)	Cache size (GB)	Max. disk IOPS & bandwidth
Standard_GS1	2	28	1	Local SSD disk = 56 GB	4	264	5,000 125 MB per second
Standard_GS2	4	56	2	Local SSD disk = 112 GB	8	528	10,000 250 MB per second
Standard_GS3	8	112	4	Local SSD disk = 224 GB	16	1056	20,000 500 MB per second
Standard_GS4	16	224	8	Local SSD disk = 448 GB	32	2112	40,000 1,000 MB per second
Standard_GS5	32	448	8	Local SSD disk = 896 GB	64	4224	80,000 2,000 MB per second

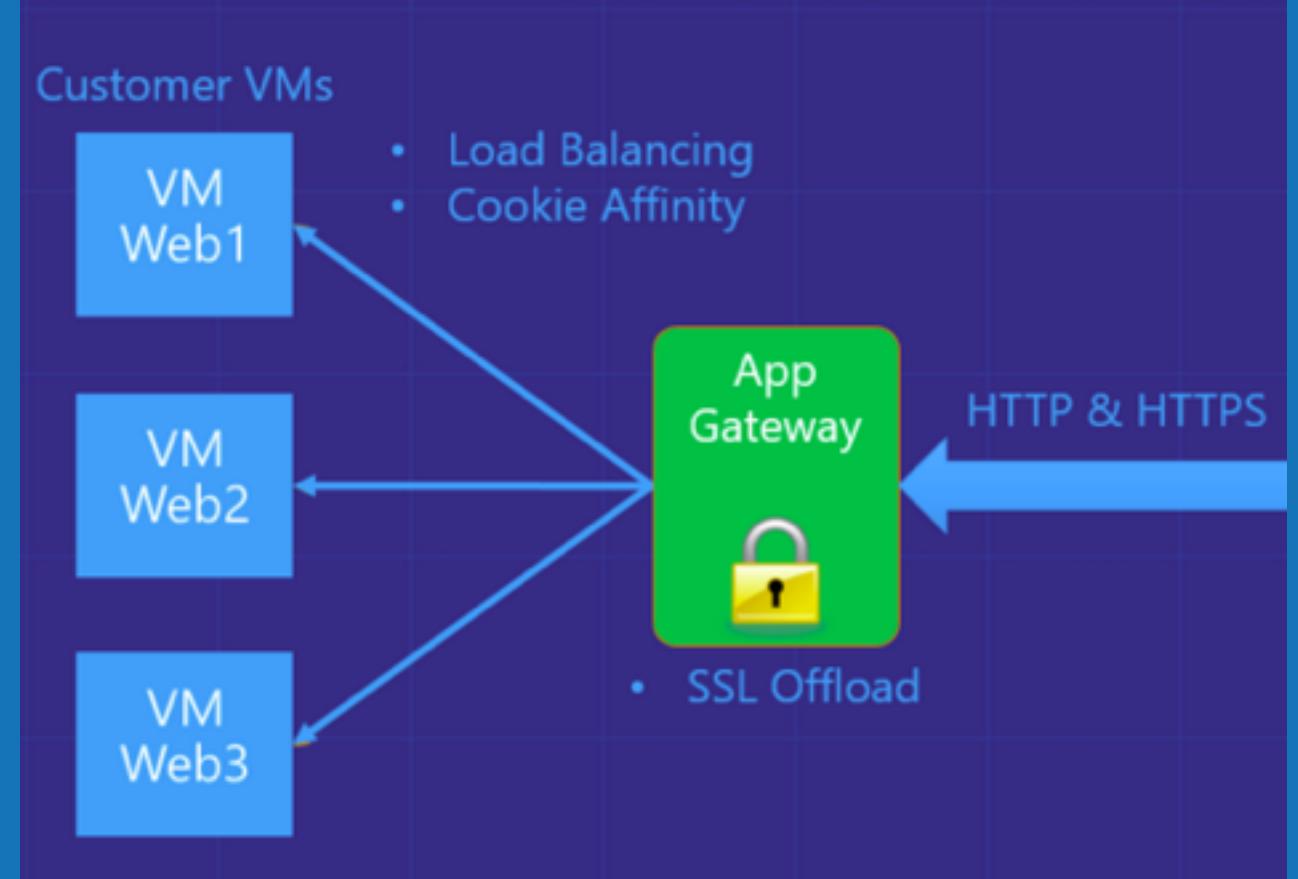
Key Improvements: Azure Virtual Machines (v2)

- Massive and parallel deployment of Virtual Machines
- 3 Fault Domains in Availability Sets
- Custom URLs for Custom Script VM Extensions for VMs



<https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-app-frameworks/>

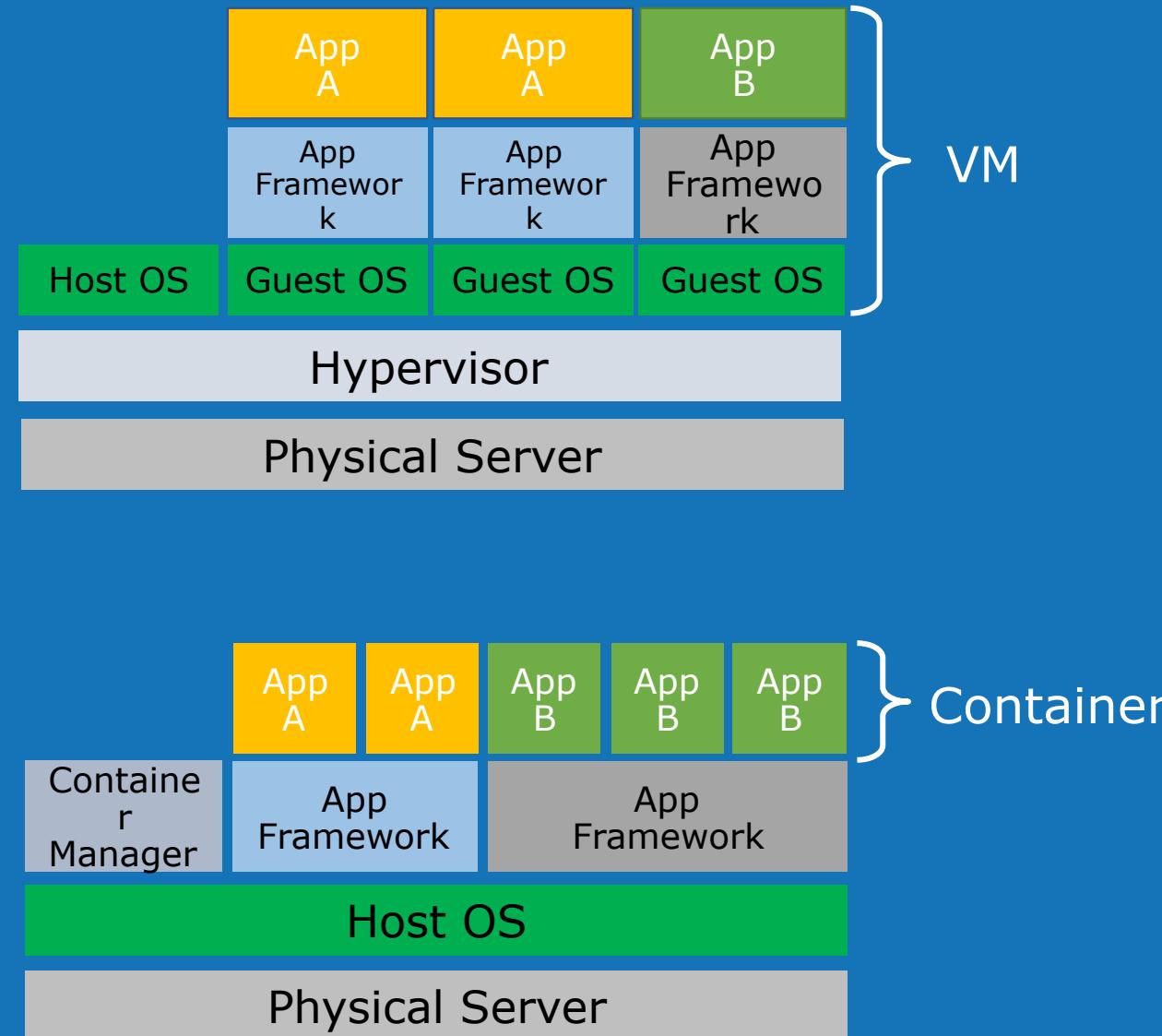
Virtual Machine Scale Sets



VMs + Containers

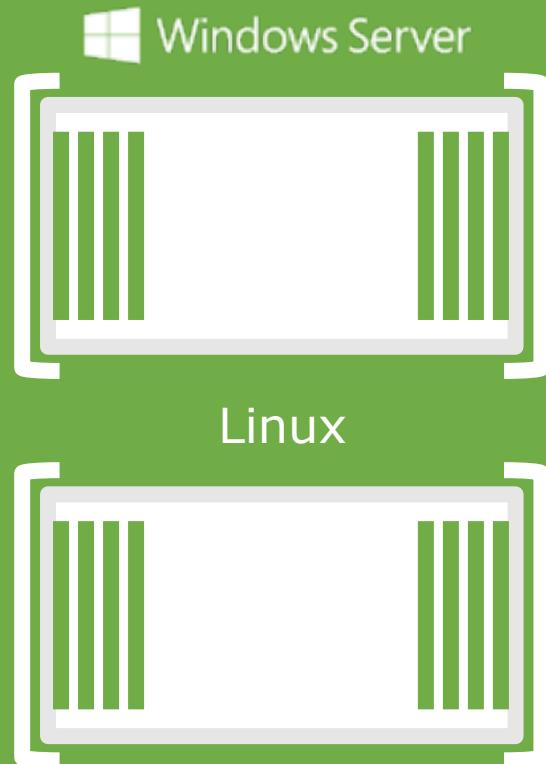
Containers

- What are they?
 - Unit of deployment
 - Isolated environment
 - Isolated collection of resources
- What are the benefits?
 - Instant startup
 - Repeatable and reliable execution
- Scenarios
 - Dev/Test
 - Great for micro-services



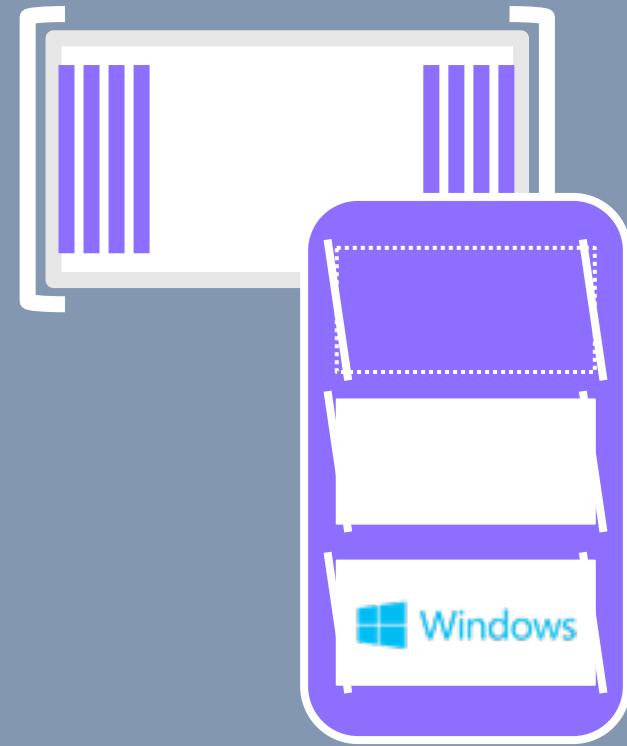
Container Ecosystem via Docker

Container Run-Time



Docker API / Client

Container Images



Docker images

Image Repository

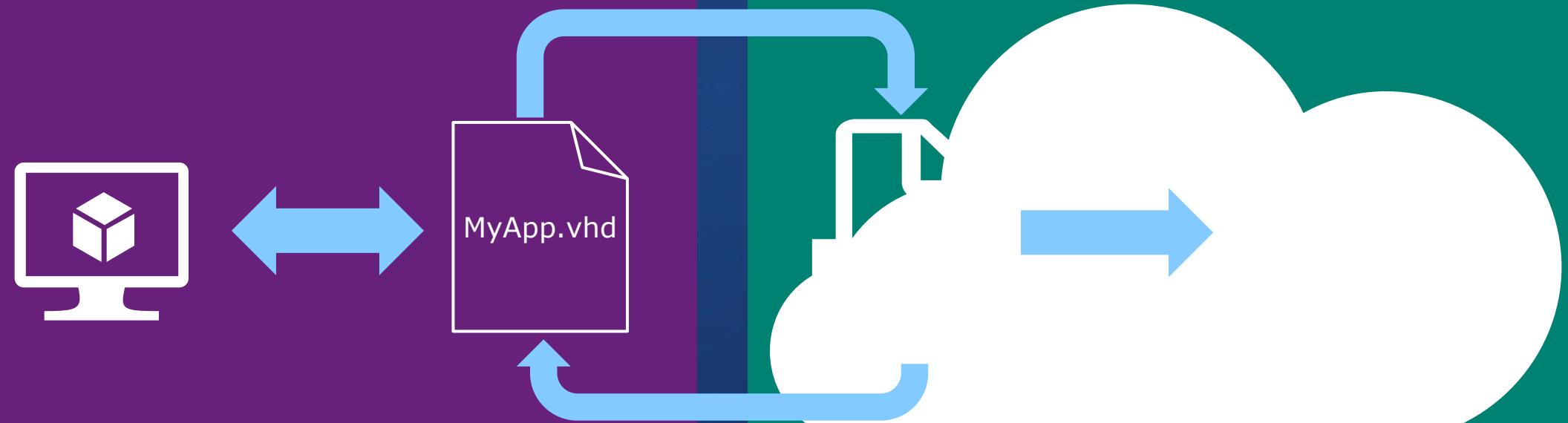


Docker Hub
(trusted
repositories)

Image Mobility

On-Premises

Cloud



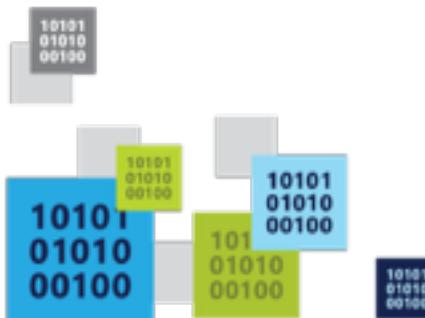
VM Extensions

- Installable components to customize VM instances
- Enable various DevOps scenarios
- Can be added, updated, disabled or removed at any time
- Managed via portal, PowerShell and Management APIs



Data Persistence

- à OS Disks
- à Data Disks



OS Images

- Microsoft
- Partner
- User



Base OS image for new Virtual Machines

Sys-Prepped/Generalized/Read Only
Created by uploading or by capture

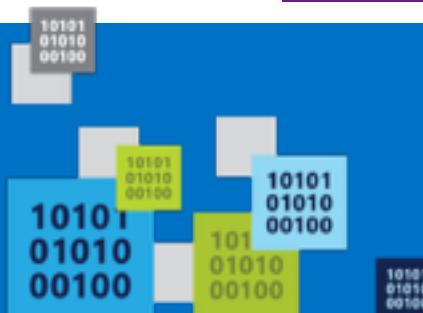
Disks

- OS Disks
- Data Disks



Writable Disks for Virtual Machines

Created during VM creation or during upload of existing VHDs.



VM disk layout

OS Disk

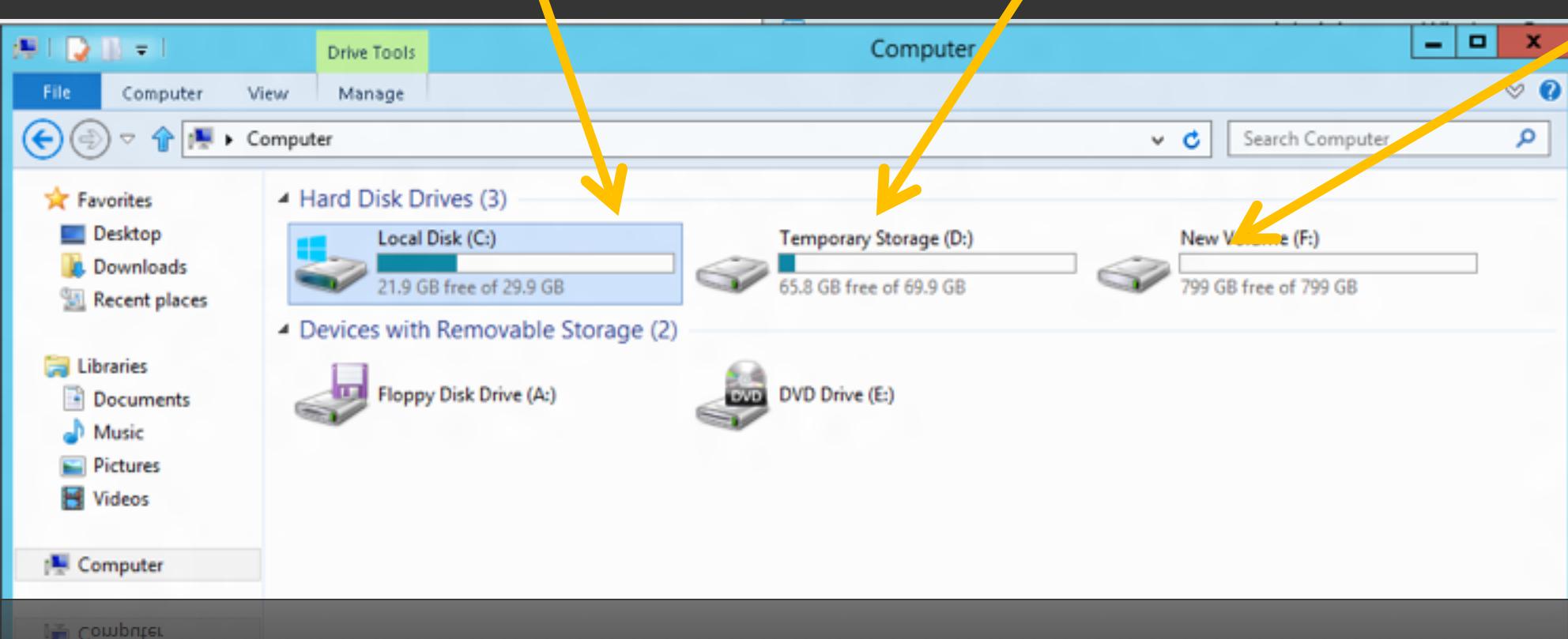
- Persistent
- SATA
- **Drive C:**

Temporary Storage Disk

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

Data Disk(s)

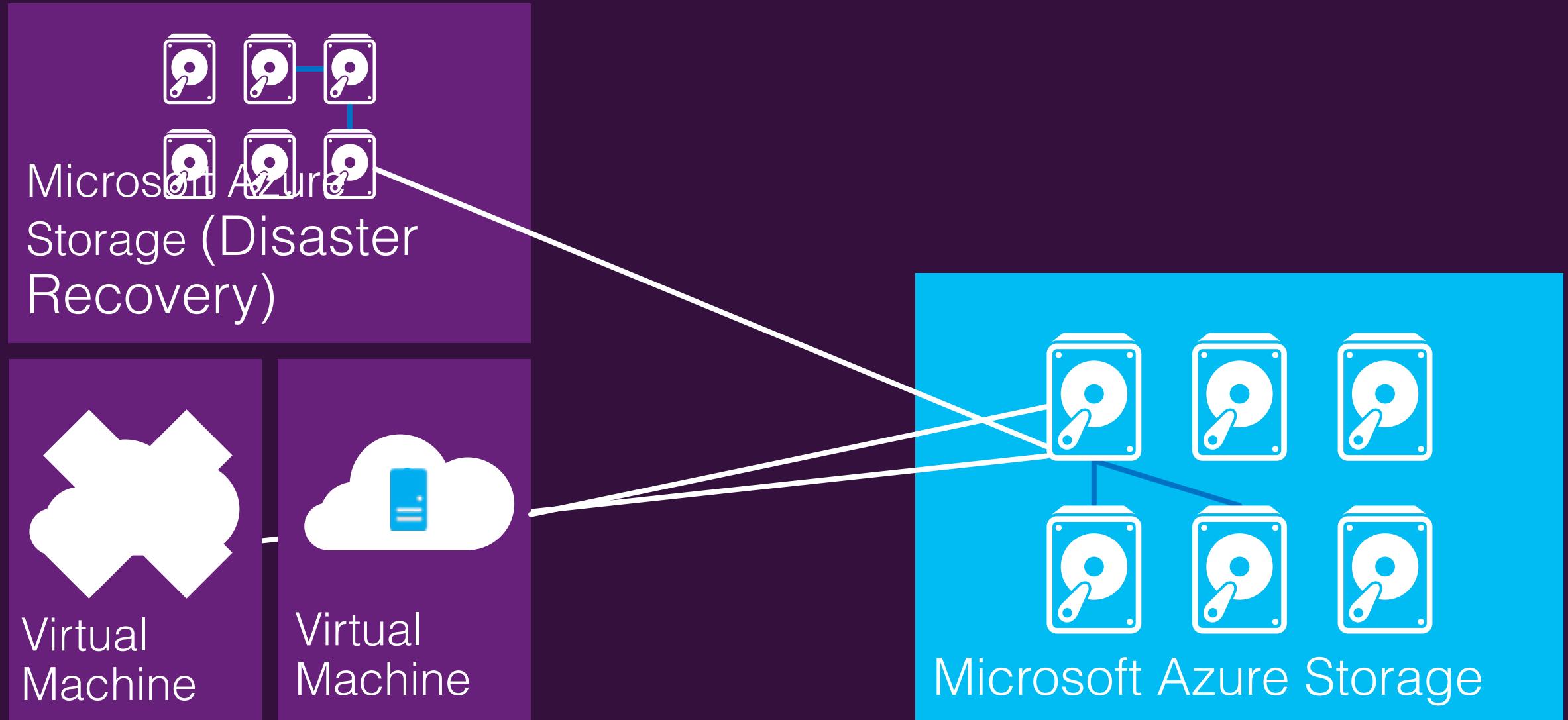
- Persistent
- SCSI
- **Customer Defined Letter**



Temporary Drive Guidance

- Never Place Critical Unreplicated Data on Temp Drive!!
- Use for SQL TempDB and Buffer Pool Extension on D-Series and G-Series VM Sizes Only (SSD Temp Disks)
 - Detailed instructions: <http://blogs.technet.com/b/dataplatforminsider/archive/2014/09/25/using-ssds-in-azure-vms-to-store-sql-server-tempdb-and-buffer-pool-extensions.aspx>
- Use Scheduled Tasks to Configure Temporary Disk
- Test Scheduled Tasks via Resize VM Operation

Persistent Disks and Highly Durable



Linux on the Microsoft Cloud Platform

Virtual Machine Availability

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

Meaning of 9's

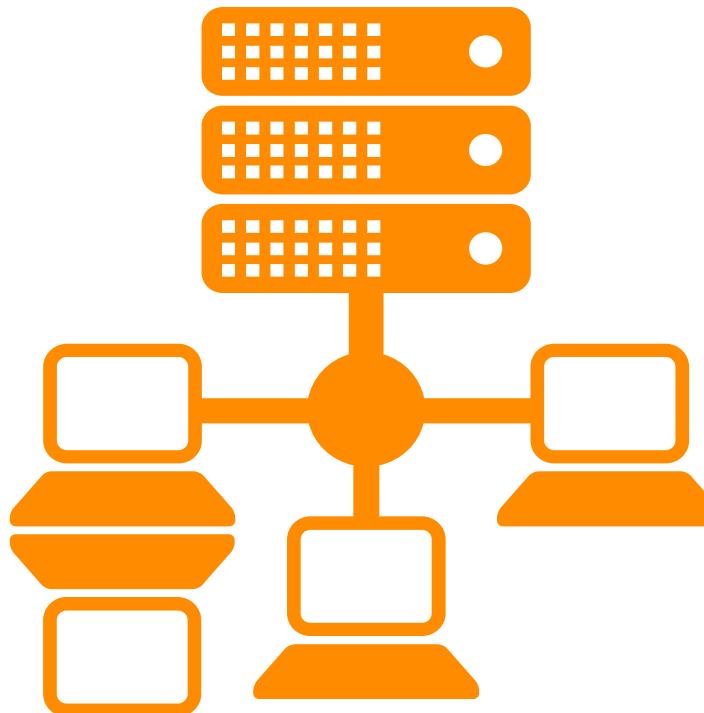
Service Availability(%)	System Type	Annualized Down Minutes	Quarterly Down Minutes	Monthly Down Minutes	Practical Meaning	FAA rating
90	Unmanaged	52,596.00	13,149.00	4,383.00	Down 5 weeks per year	
99	Managed	5,259.60	1,314.90	438.30	Down 4 days per year	ROUTINE
99.9	Well managed	525.96	131.49	43.83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

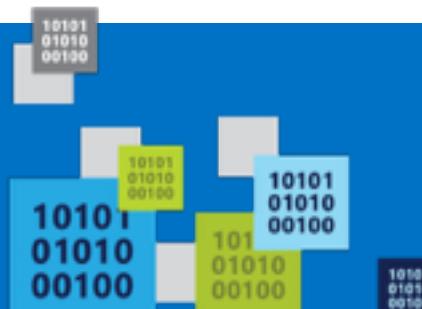
Compute Hardware failure (disk, CPU, memory)

Datacenter failures - Network failure, power failure

Hardware upgrades, Software maintenance – Host OS Updates

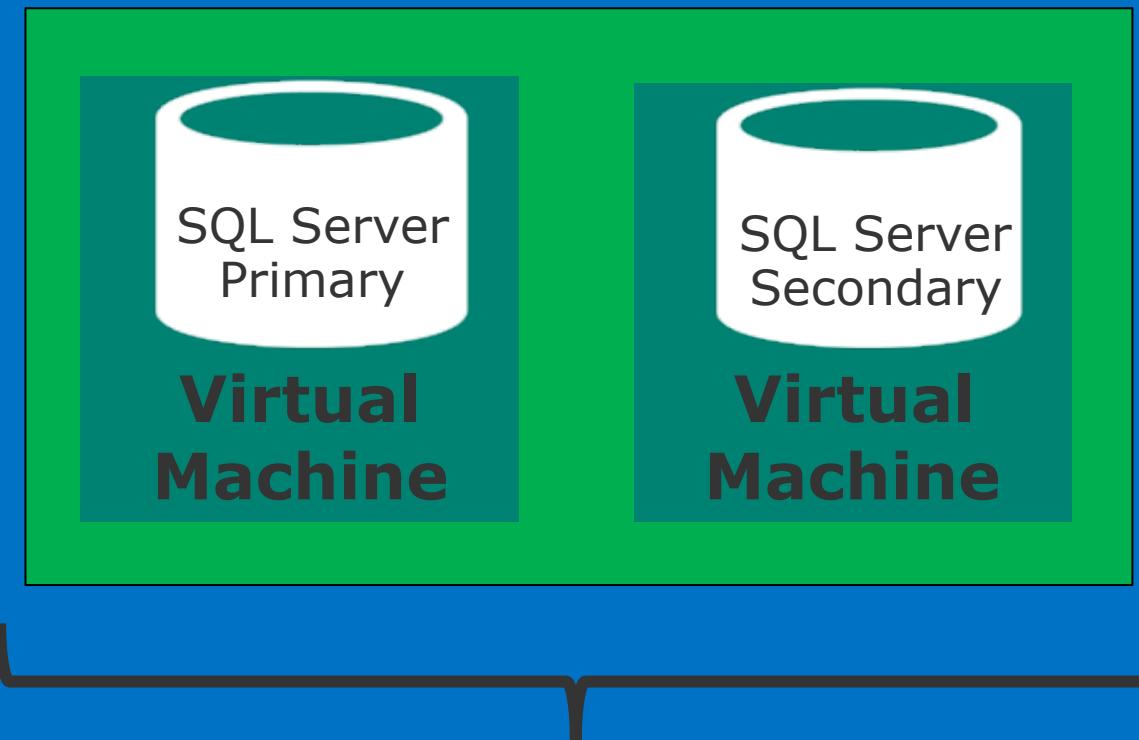
What is not included

VM Container crashes, Guest OS Updates



Availability Sets

Availability set



SLA High Availability
Hardware and Software
Windows and Linux

SLA 99.95

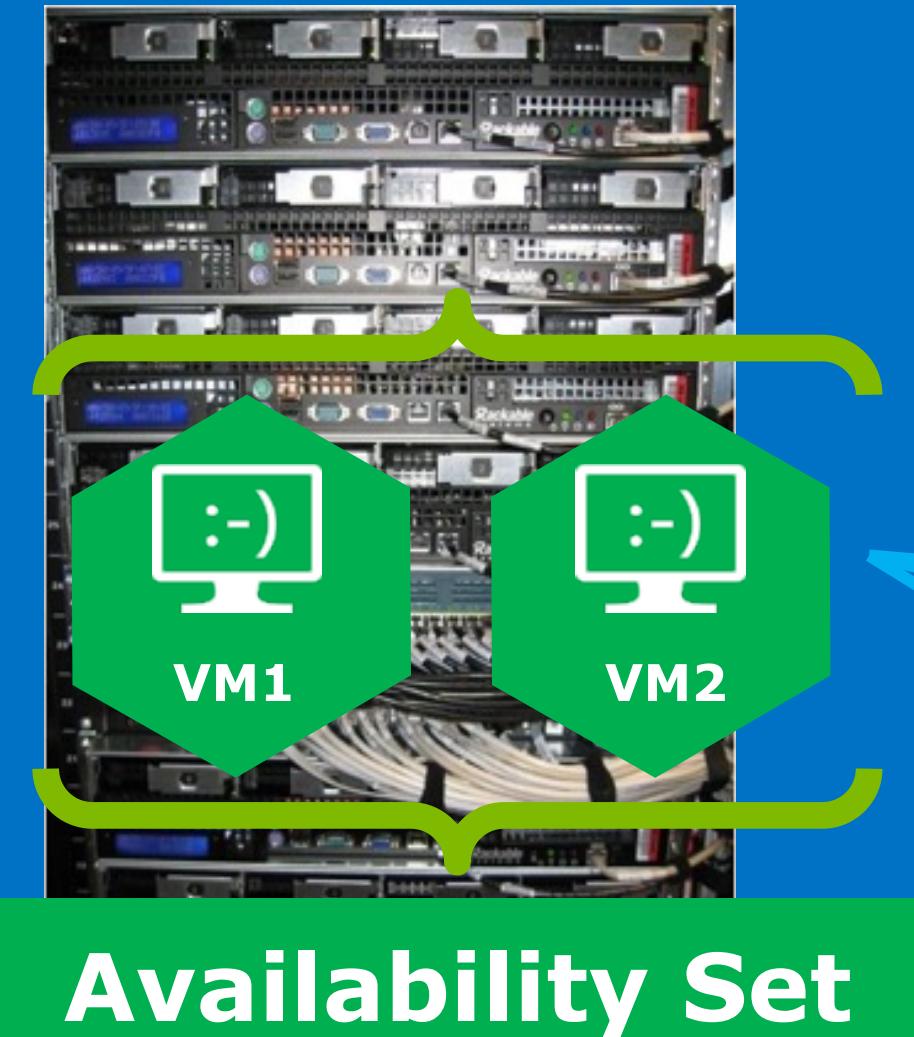
Availability Sets



**Physical
Machines**

**Power Unit
Rack Switch**

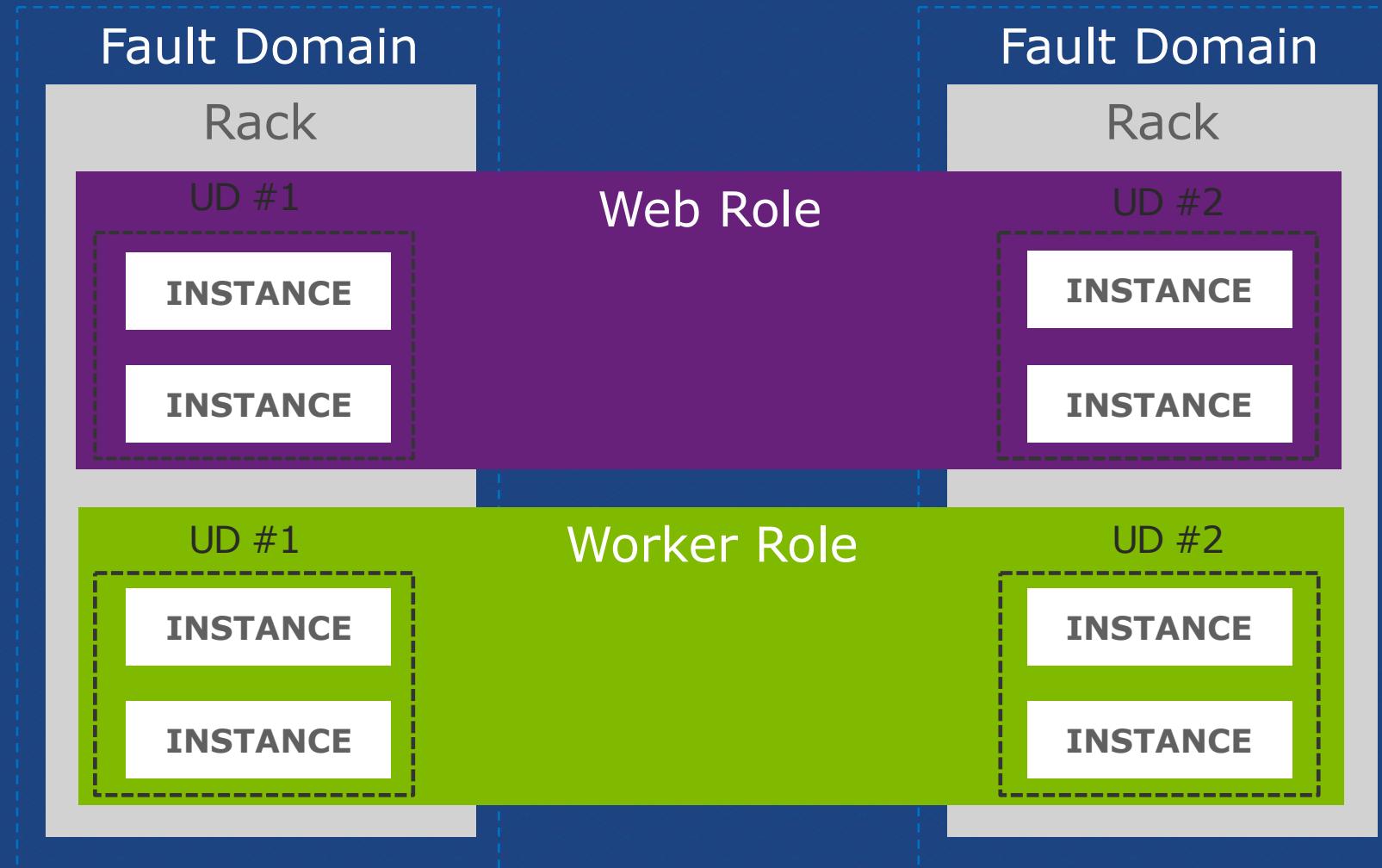
Availability Sets



Physical
Machines

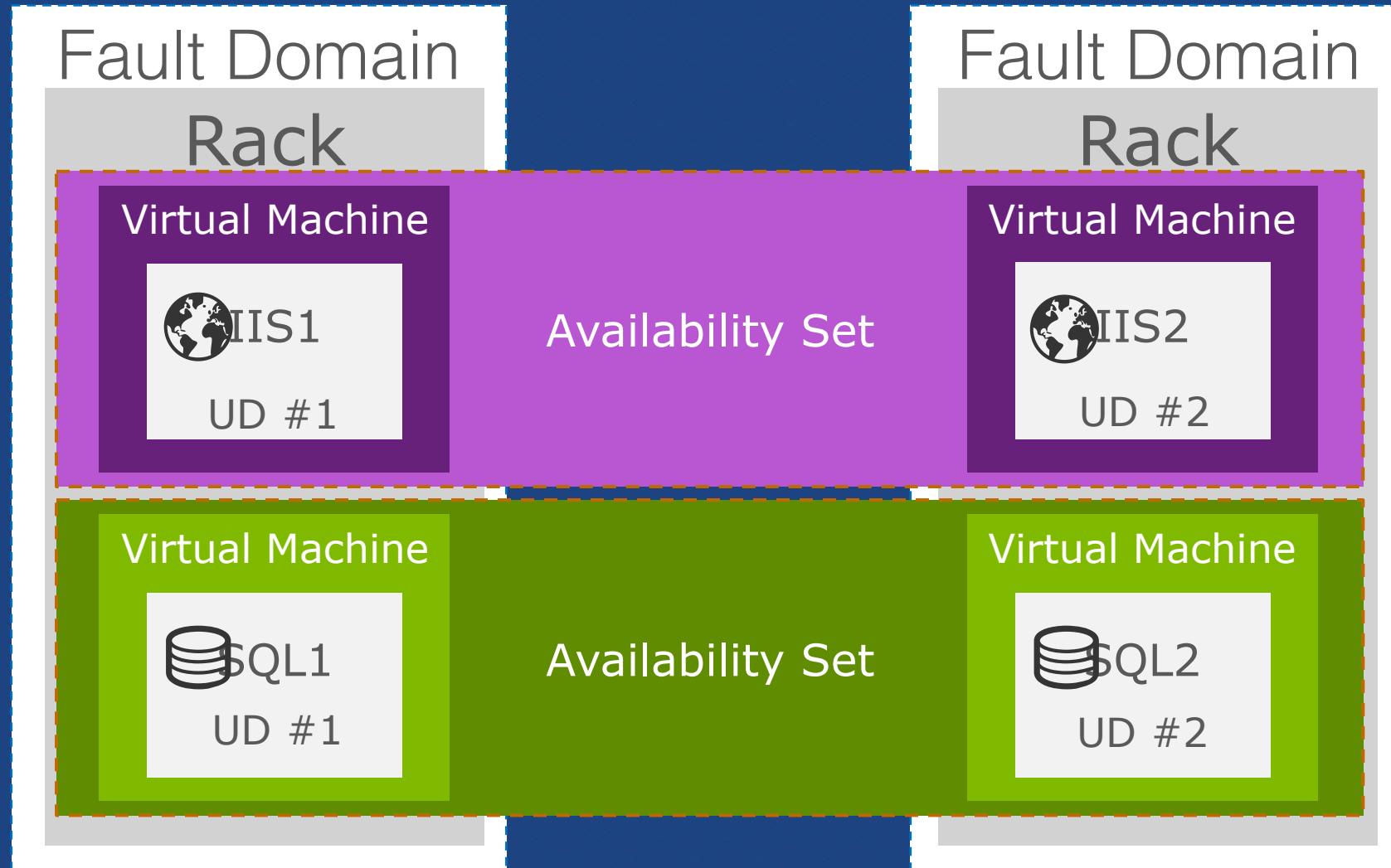
Power Unit
Rack Switch

Fault and Update Domains



Virtual Machine Availability Sets

UPDATE DOMAINS ARE HONORED BY HOST OS UPDATES

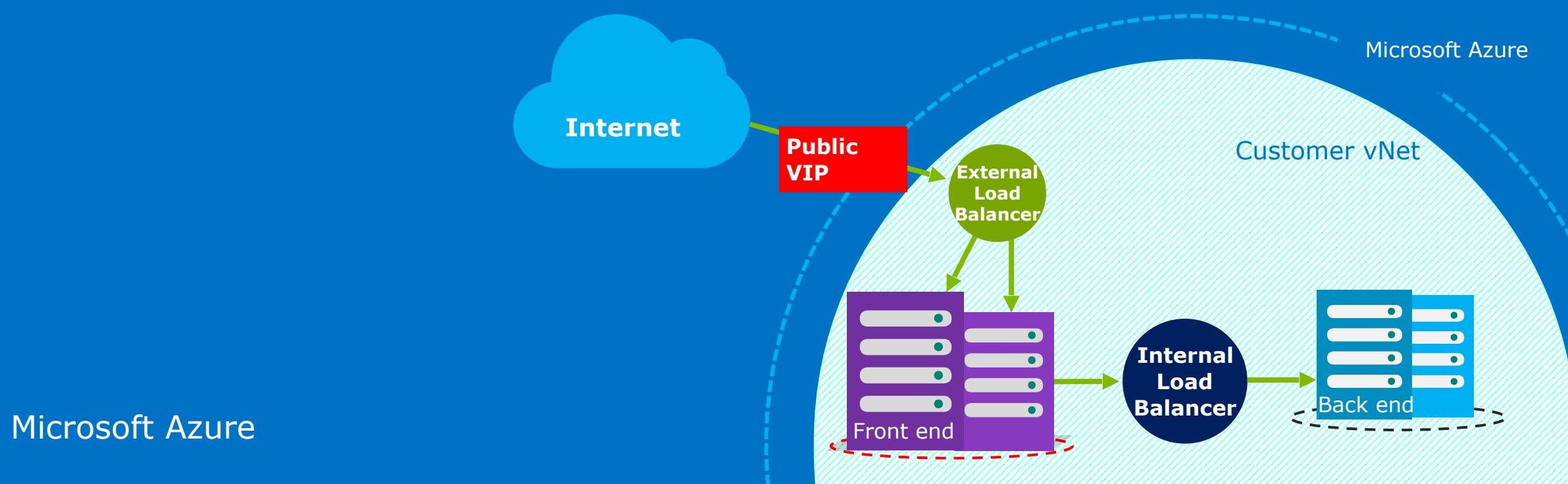


Availability Set Guidance

- 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

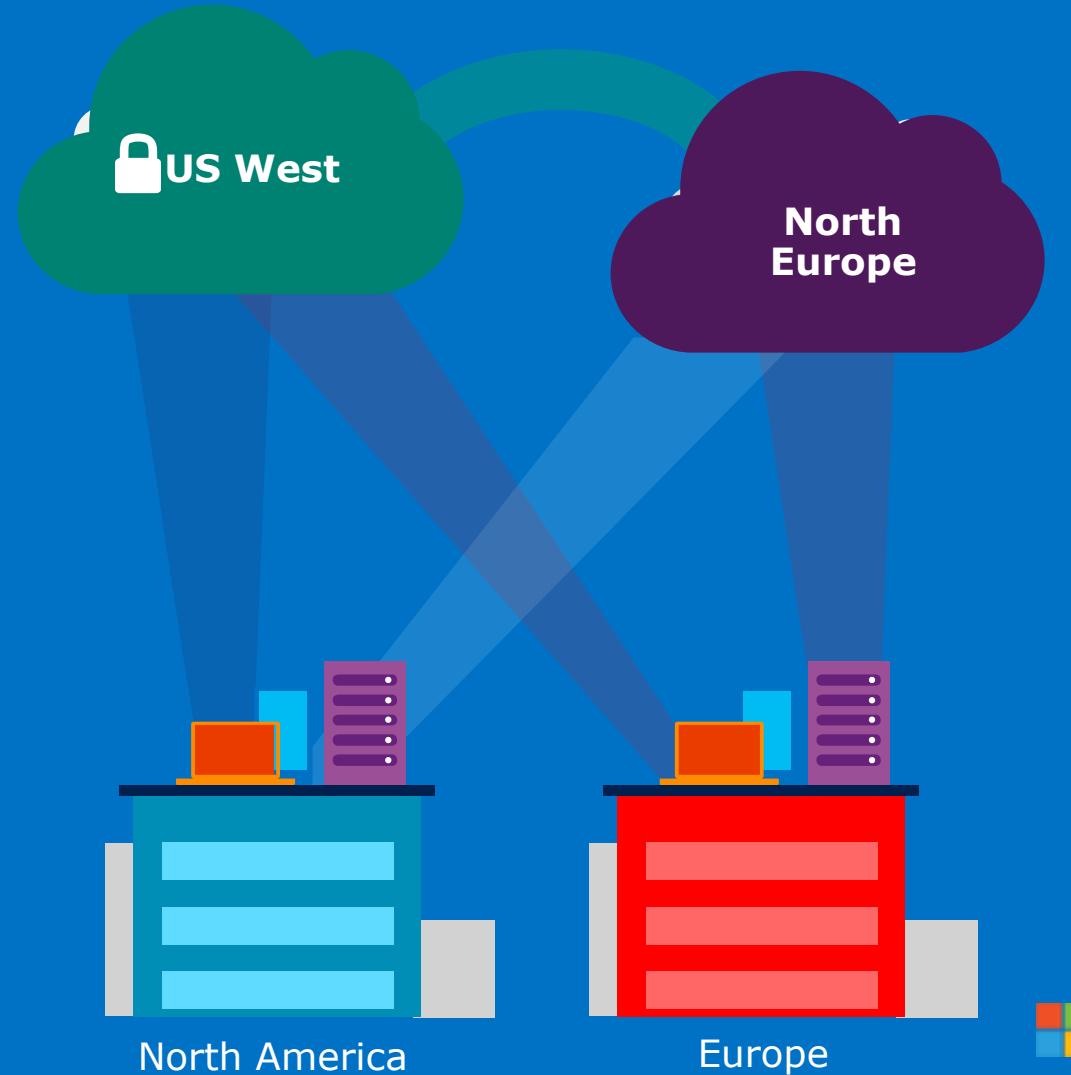
Load balancing

- Load balancing
Multiple VMs share the workload via public facing endpoints
- Internal Load balancing
Load balancing between VMs that don't have public facing endpoints



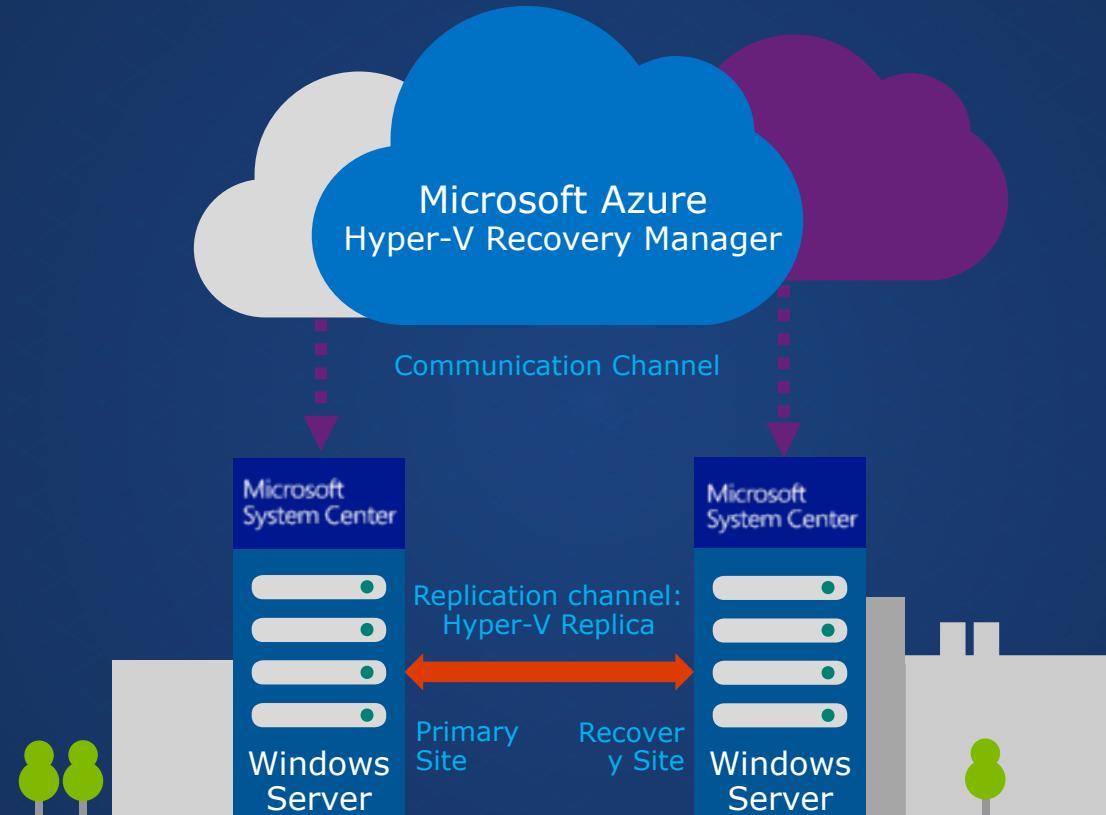
Traffic Manager

- Load balancing
- Failover



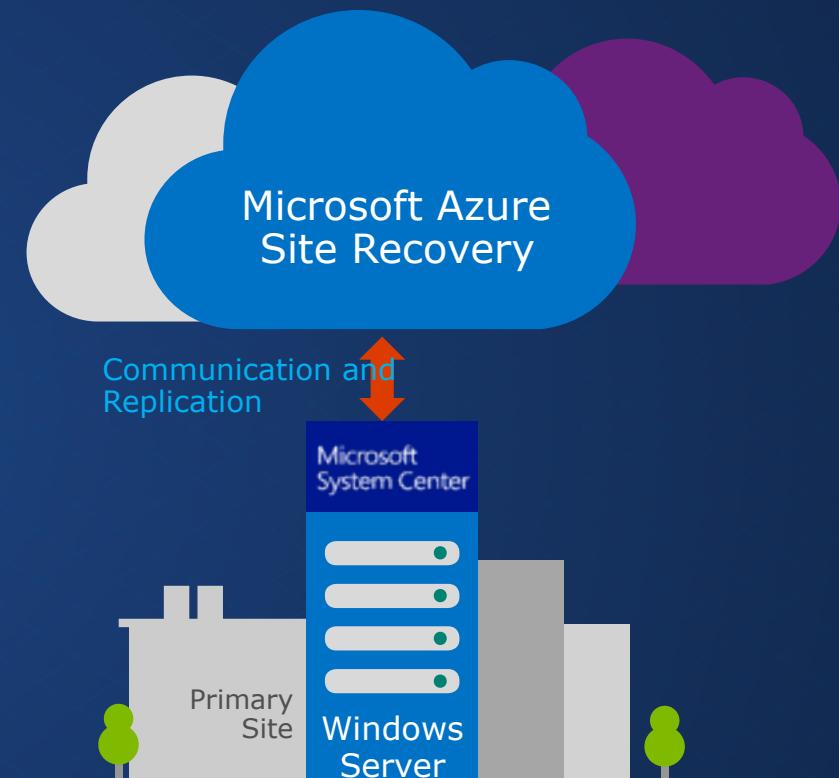
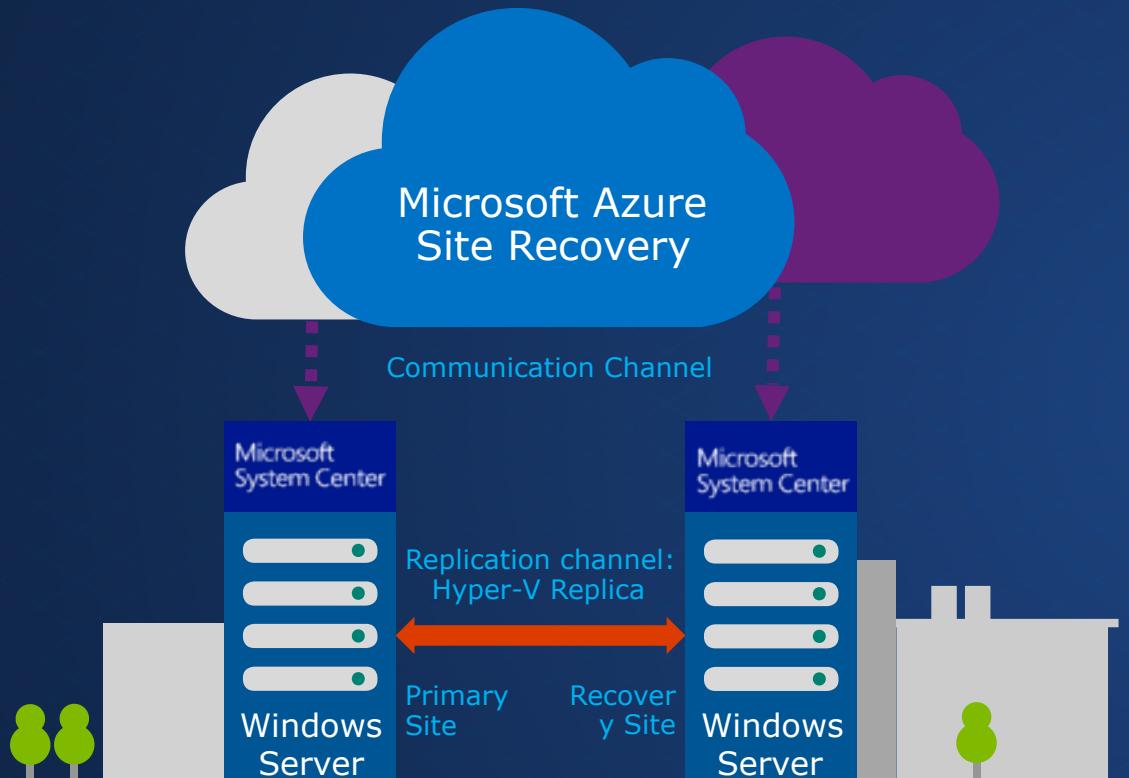
Transform the datacenter

Orchestrated disaster recovery to a second site



Transform the datacenter

Orchestrated disaster recovery to a second site or to Azure



Key features include:

- Automated VM protection and replication
- Remote health monitoring
- Customizable recovery plans

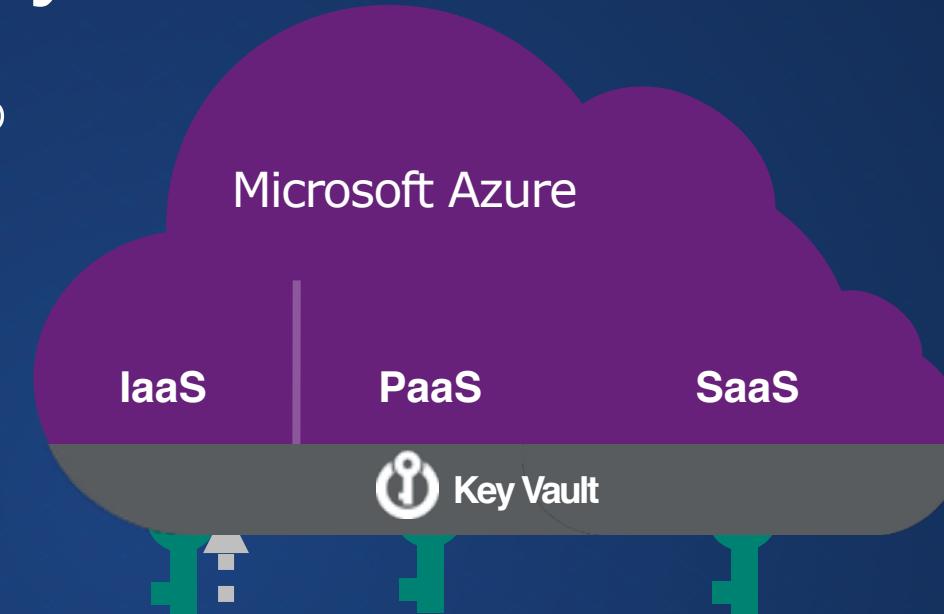
- No-impact recovery plan testing
- Orchestrated recovery when needed

Microsoft Azure Key Vault

Key Vault offers an easy, cost-effective way to safeguard keys and other secrets used by cloud apps and services using HSMs.

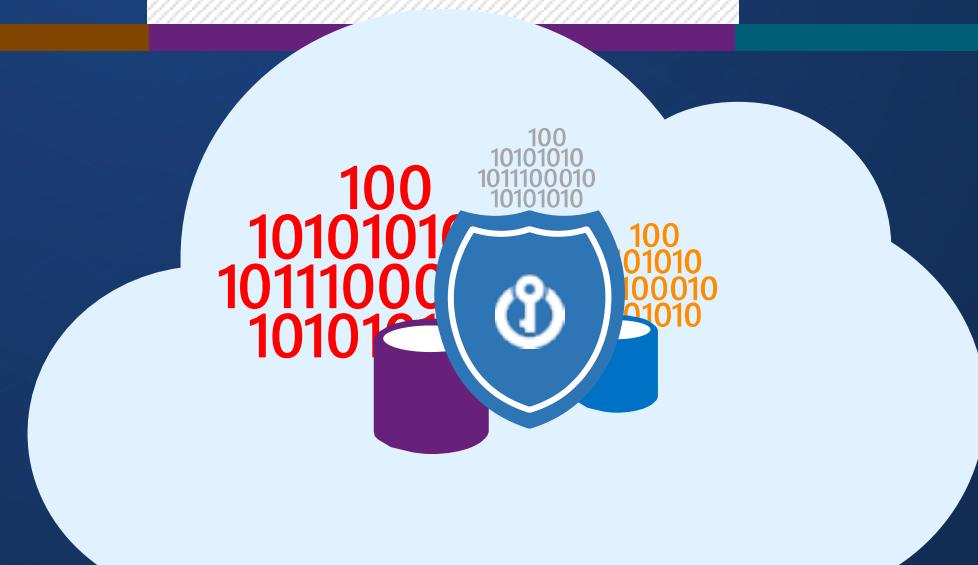
You manage your keys and secrets

Applications get high performance access to your keys and secrets... on your terms



Enhance data protection and compliance

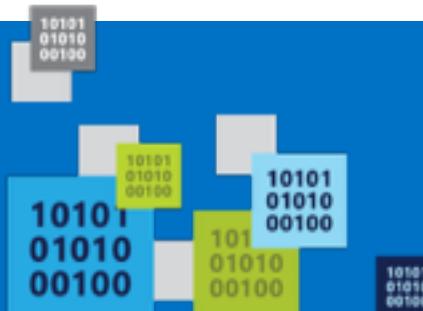
Increased security	HSM protected keys	Compliance	Monitoring
Encrypt keys and small secrets like passwords using keys protected by tightly controlled and monitored Hardware Security Modules (HSMs)	Import or generate your keys in HSMs for added assurance – so that keys stay within the HSM boundary	Comply with regulatory standards for secure key management, including the US Government FIPS 140-2 Level 2 and Common Criteria EAL 4+	Monitor and audit key use through Azure logging – pipe logs into HDInsight or your SIEM for additional analysis (coming soon)



Virtual Networks

Azure Virtual Networks

- à A protected private virtual network in cloud
- à Extend enterprise networks into Azure
- à Cross-premises connectivity



Virtual Network Scenarios

- Hybrid Public/Private Cloud
Enterprise app in Microsoft Azure requiring connectivity to on-premise resources
- Enterprise Identity and Access Control
Manage identity and access control with on-premise resources (on-premises Active Directory)
- Monitoring and Management
Remote monitoring and trouble-shooting of resources running in Azure
- Advanced Connectivity Requirements
Cloud deployments requiring IP addresses and direct connectivity across services

Cross-premises Connectivity

- Site-to-site

Create a secure connection between your on-premises site and your virtual network

- Point-to-site

Create a secure connection via VPN to your virtual network

- ExpressRoute™

Create a private connection between Azure data centers and infrastructures on your premises or in a co-location environment.

- Connect at an ExpressRoute location (Exchange Provider facility)

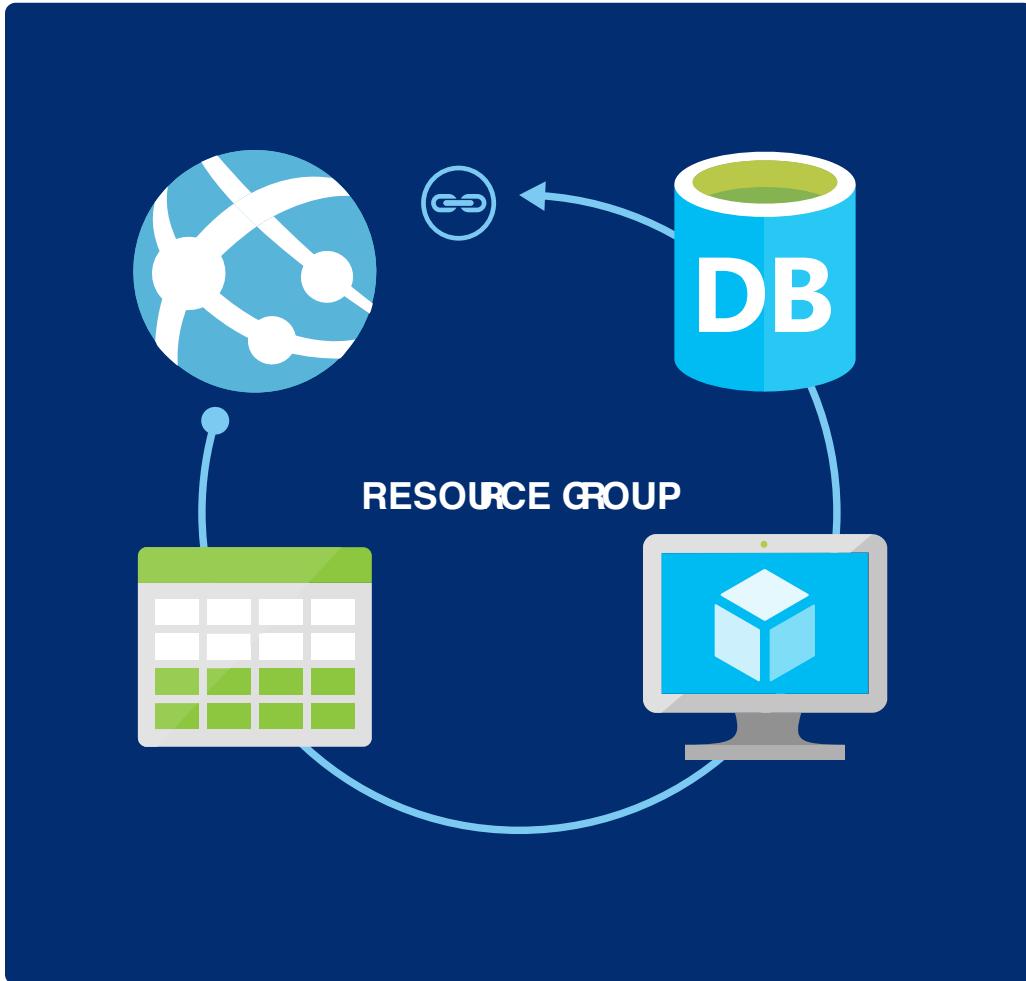
- Direct connect via a Network Service Provider

Microsoft Azure



Azure Resource Manager

Azure Resource Manager & Resource Groups



- Manage resources as a single unit
- Role based access and control (RBAC) on groups or resources
- Billing integrated tagging on groups or resources

Azure Resource Manager (ARM)

Consistent
management
layer

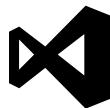
Tools



Microsoft Azure



Command line



Visual Studio

Curated
extensions



Provider
rest points



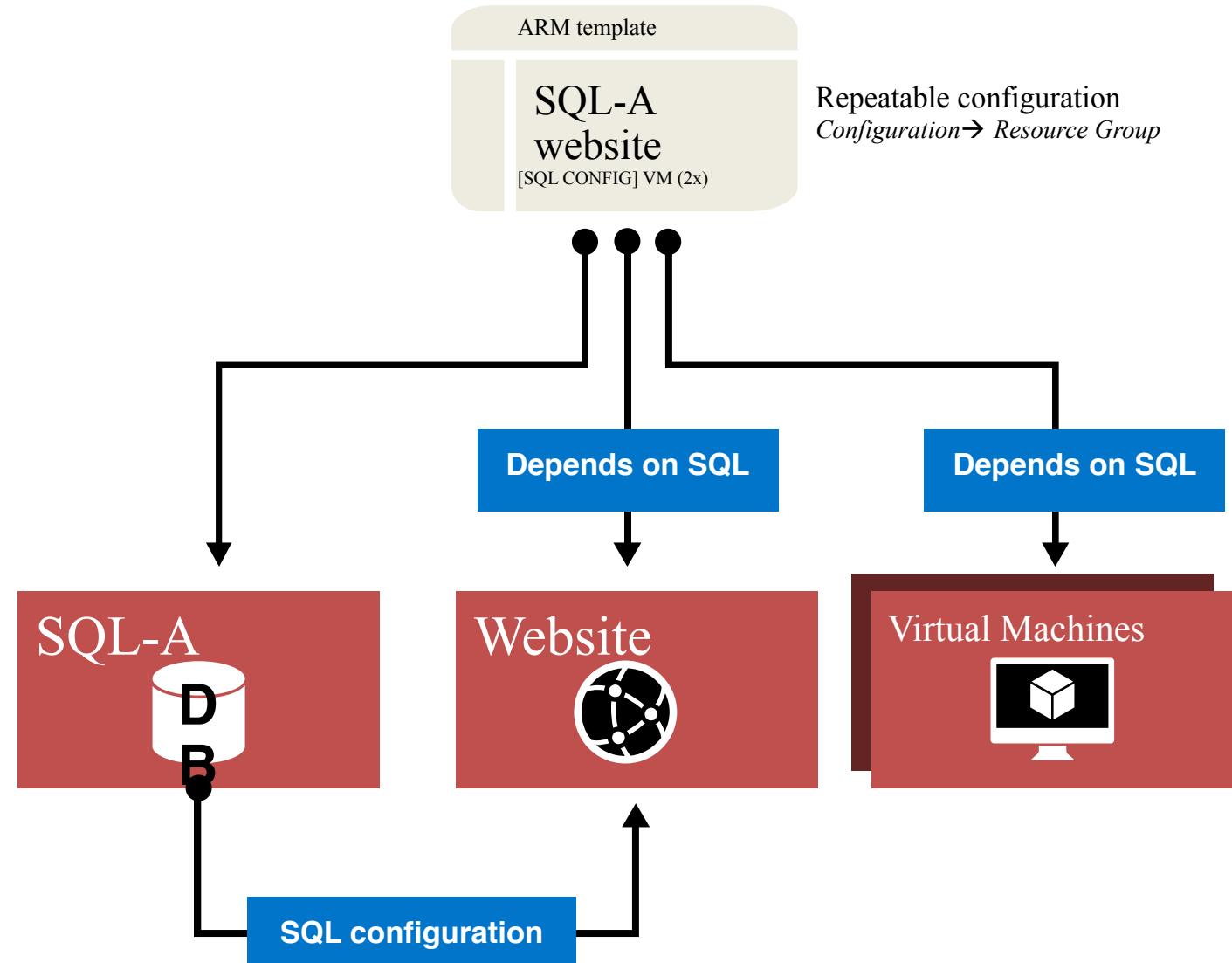
Azure Resource Manager templates

ARM templates can:

- Simplify deployment
- Simplify roll-back
- Provide cross-resource configuration and update support
- Be used as a learning tool to build to suit

Azure templates are:

- Source file, checked-in
- Specifies resources and dependencies (VMs, websites, DBs) and connections (configuration, LB sets)
- Configurable parameters for input/output



JSON files—simpler than they look

Schema, content version, parameters, variables, resources, and outputs

The screenshot shows a JSON editor interface with a large JSON document on the left and a preview pane on the right.

Left Panel (JSON Editor):

```
Branch: main
"resources": [
  {
    "type": "Microsoft.Storage/storageAccounts",
    "name": "[parameters('newStorageAccountName')]",
    "apiVersion": "2015-05-01-preview",
    "location": "[variables('location')]",
    "properties": {
      "accountType": "[variables('storageAccountType')]"
    }
  },
  {
    "apiVersion": "2015-05-01-preview",
    "type": "Microsoft.Network/publicIPAddresses",
    "name": "[variables('publicIPAddressName')]",
    "location": "[variables('location')]",
    "properties": {
      "publicIPAllocationMethod": "[variables('publicIPAddressType')]",
      "dnsSettings": {
        "domainNameLabel": "[parameters('dnsNameForPublicIP')]"
      }
    }
  }
],
```

Right Panel (Preview):

A preview of the JSON structure is shown in the right panel, displaying the following output:

```
placed."
```

The entire JSON document is annotated with black boxes and arrows, indicating specific parts of the schema and content.