Microsoft Azure: Infrastructure as a Service (IaaS)

Module 3: IaaS VMs

Microsoft Azure VMs

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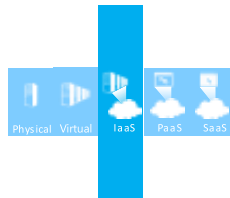## A Continuous Offering from Private to Public Cloud

Physical Virtual IaaS PaaS SaaS

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Overview

	Support for key server applications
	Easy storage manageability: Page blob
	High availability features
	Advanced networking
	Integration with compute Platform as a Service (PaaS)

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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:
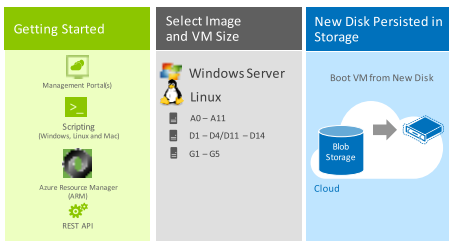 - Applications that span your data center and the cloud

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Provisioning to the Cloud

Getting Started	Select Image and VM Size	New Disk Persisted in Storage
Management Portal(s)	Windows Server	Boot VM from New Disk
Scripting (Windows, Linux and Mac)	Linux	
Azure Resource Manager (ARM)	A0 – A11	Blob Storage
REST API	D1 – D4/D11 – D14	
	G1 – G5	Cloud

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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**

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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

3

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
- Version 11g and 12c

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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

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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

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Demo: Getting Started with VMs

Module 3: IaaS VMs

VMs and
Cloud Services (*Classic*)

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IaaS Virtual Machines

- VMs are roles with exactly one instance

Implicit Cloud Service
VM
Virtual Machine
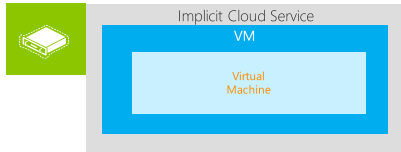
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Cloud Services with VMs

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

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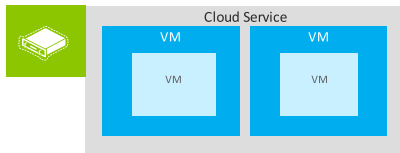
- Need to manage firewalls
- Current limit = 50 VMs per Cloud Service

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Multiple Cloud Services Configuration

LB

80/443
WEB
SQL
AD/DC/DNS
Cloud Service 2
AD 1

VPN Tunnel
Corp Users

Cloud Service 1
Microsoft Azure   On-premises
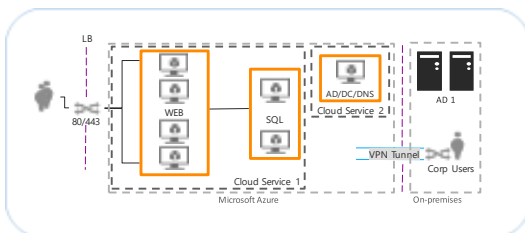
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Module 3: IaaS VMs

VM and
Resource Groups (V2)

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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
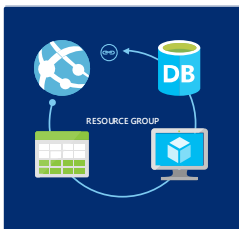- Access Control – Scope for RBAC permissions

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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
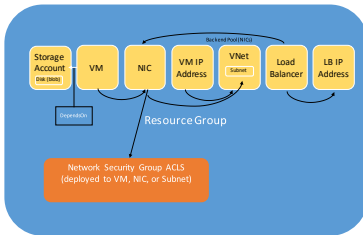

Portal View of Resource Group

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

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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
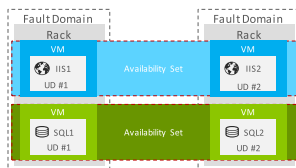
How Does this Relate to the SLA?
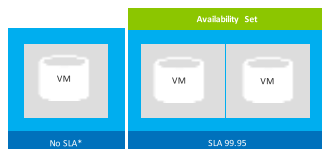
* No guaranteed SLA for single VM instance

End-to-End Highly Available Solution

- Redundancy at every level
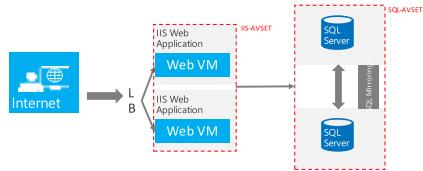
Module 3: IaaS VMs

Understanding Disks

VM Disk Layout – Windows OS

OS Disk
- Persistent
- SATA
- **Drive C:**

* Max. size of C:\ drive – 1,023GB

VM Disk Layout – Windows OS (continued)

Temporary Storage Disk
- Local (Not Persistent)
- SATA
- **Drive D:**

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VM Disk Layout – Windows OS(continued)
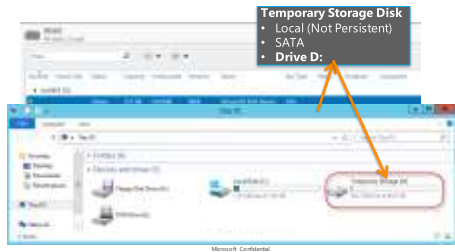
Data Disk(s)
- Persistent
- SCSI
- **Customer-defined Letter**
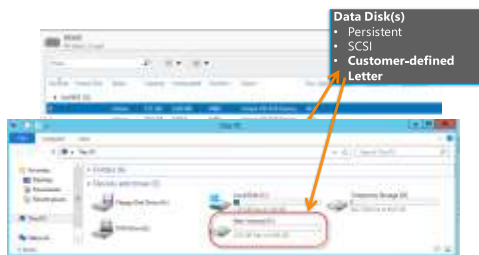
Persistent Disk Management – Windows OS

- *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

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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

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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

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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**

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VM Sizes – D Series Standard Tier

- Compute processers 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

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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	Name	vCores	Memory (GB)	Max. Disk IOPS IOPS/MB sec
Standard_DS1	1	3.5	3200/32	Standard_DS11	2	14	6400/64
Standard_DS2	2	7	6400/64	Standard_DS12	4	28	12800/128
Standard_DS3	4	14	12800/128	Standard_DS13	8	56	25600/256
Standard_DS4	8	28	25600/256	Standard_DS14	16	112	50000/512

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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

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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

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Persistent Disks and Azure Storage High Durability

Microsoft Azure Storage (Disaster Recovery)

VM   VM

Microsoft Azure Storage
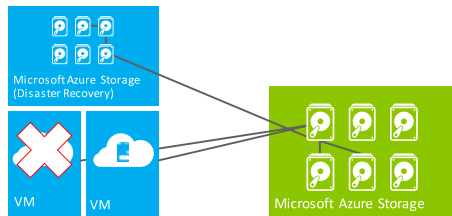
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Azure Premium Storage

- 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
• Disk capacity: 32 TB • Snapshot capacity: 10 TB	Up to 50 gigabits per second for Inbound + Outbound

Creating a Premium Storage account

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

On-premises
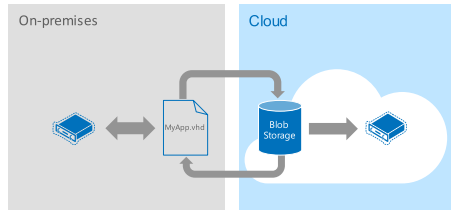
Cloud

MyApp.vhd

Blob Storage

Bring Your Own Server/VHD

On-premises

On-premises
Virtual Server

MyApp.vhd

Cloud

Upload VHD

Blob storage

Create disk or image

Provision VM from an image or a disk using a portal, a script or an API

Use Case
- Forklift Migration of VMs
- Sysprepped Images
- Use Add-AzureVHD to upload

VHD must be fixed disk

* Disk must be converted before upload
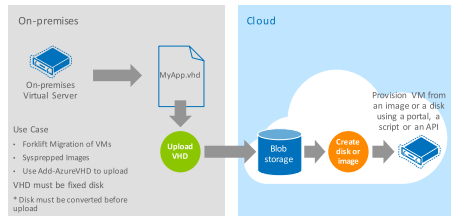
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Imaging VMs in the Cloud

Cloud

Blob storage

Base.VHD

Boot VM

Customize VHD

Generalize VHD

Capture VM

Identical or similar deployment instances use a common OS image as a starting point

Blob storage

Capture VM saves the customized image to your image library
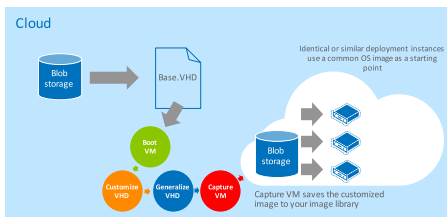
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Tips on Bring Your Own (BYO) Generalized Images

- 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

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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

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