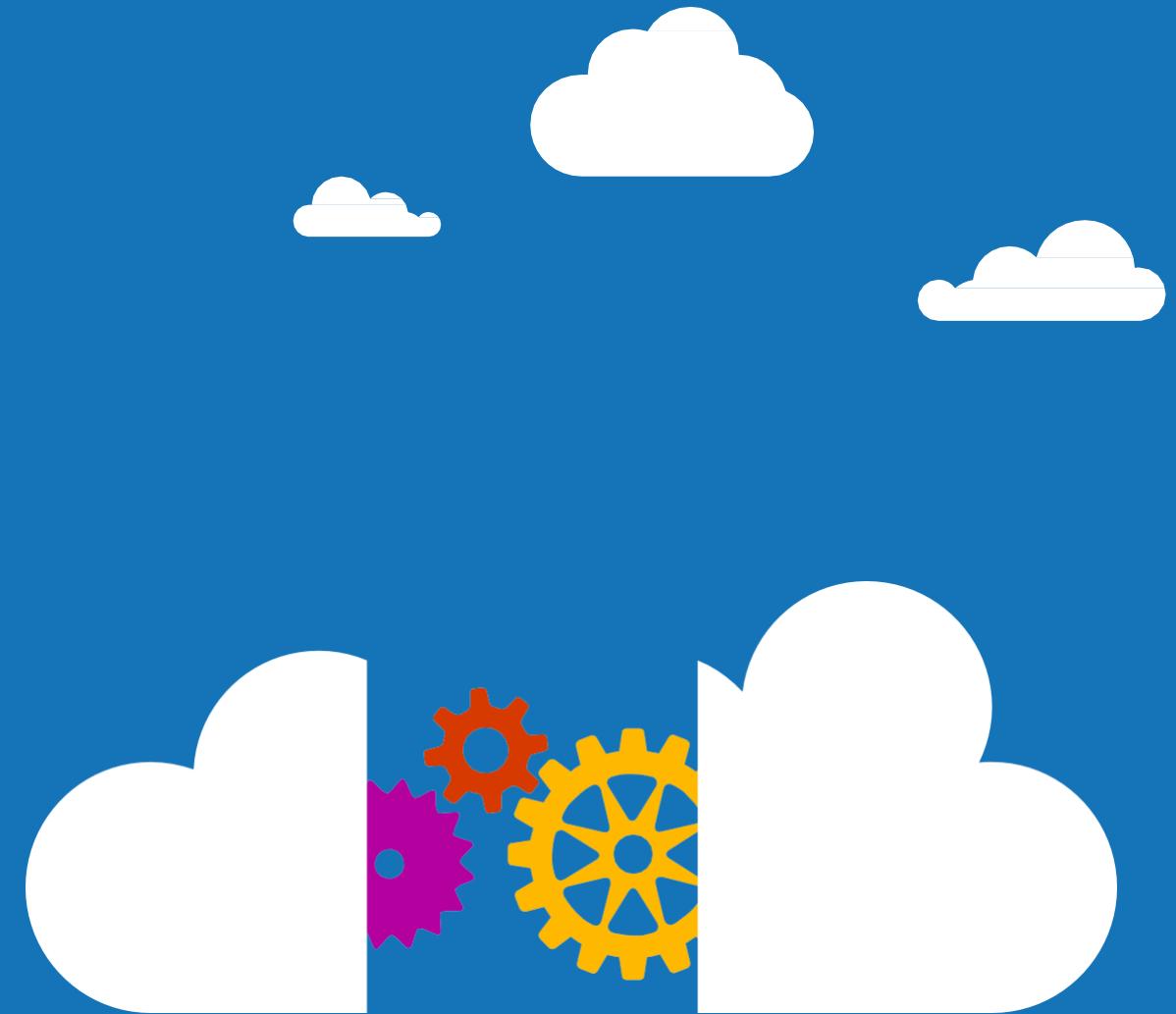


# Microsoft Azure

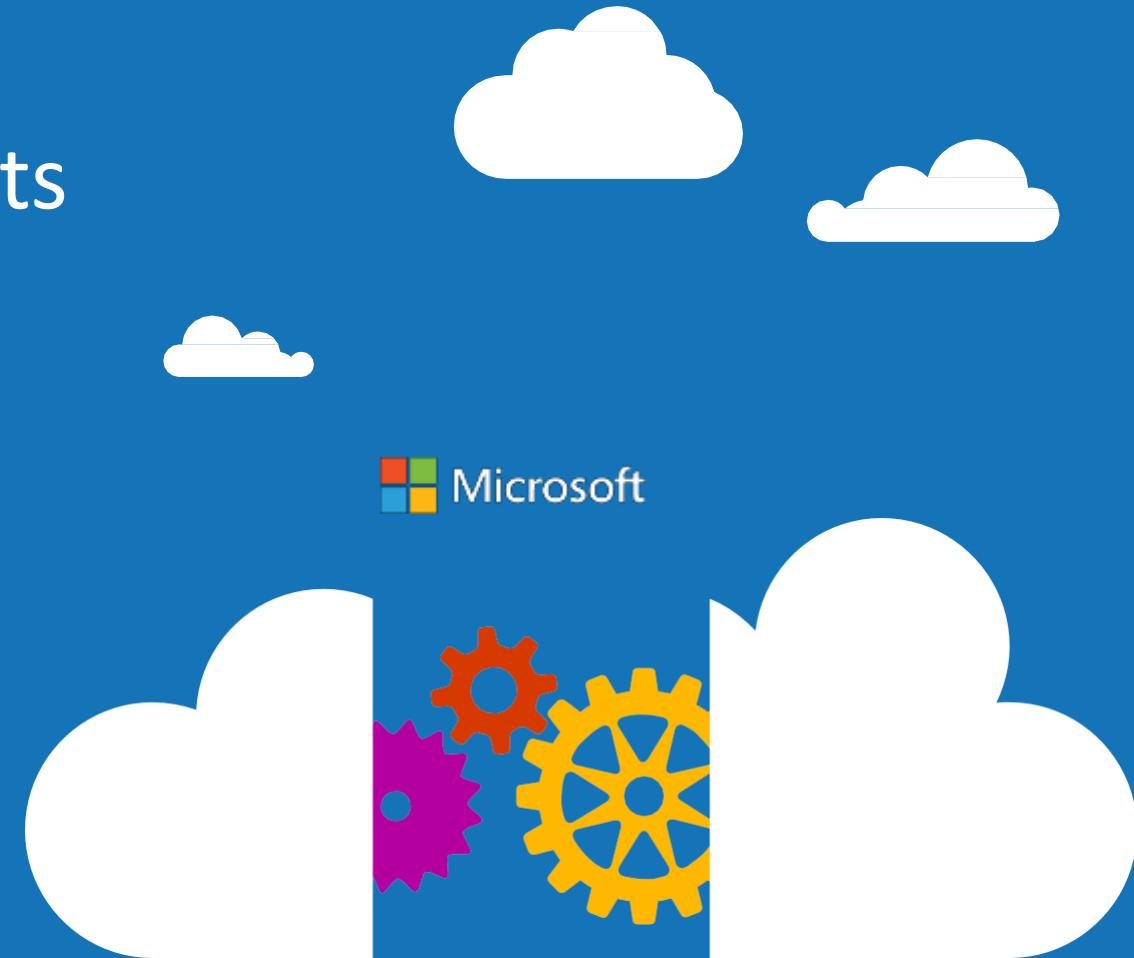
Supakit Prueksaaron, Ph.D



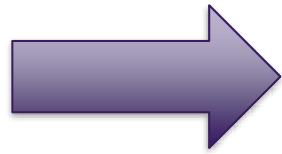
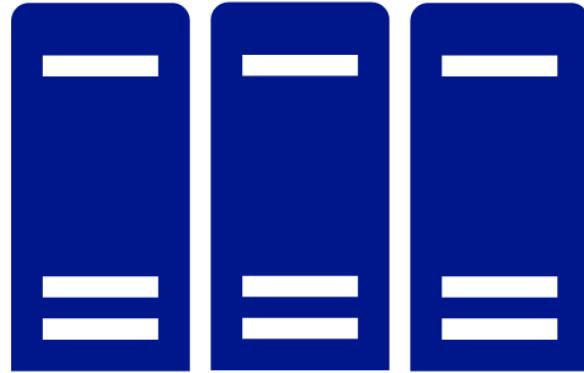
# Course Outline



- Microsoft Azure Cloud Computing
- Create VM, Storage and so on.
- Load Balance and Auto Scale sets
- Azure Web App
- Azure Storage account

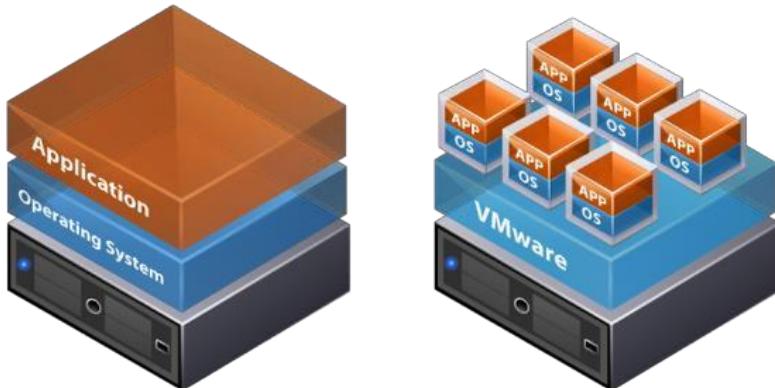


# Cloud Computing Overview

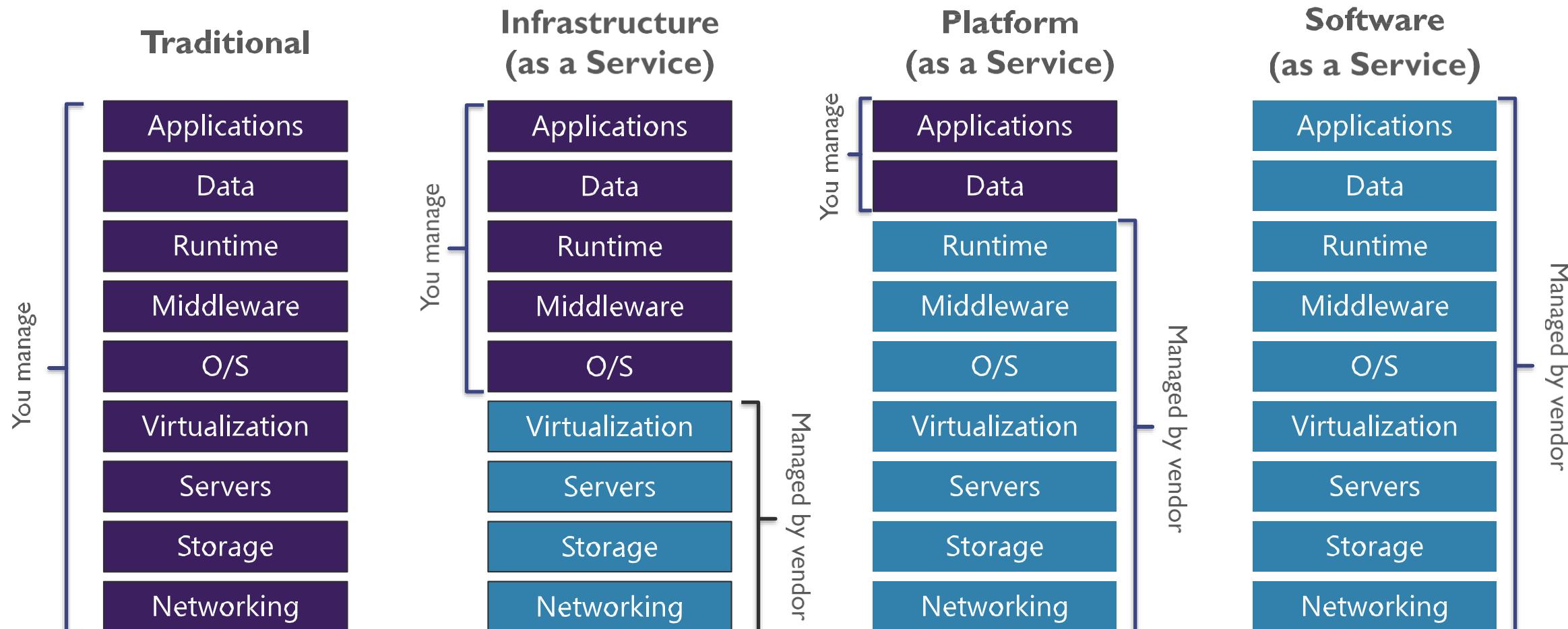


Azure

Traditional Datacenter

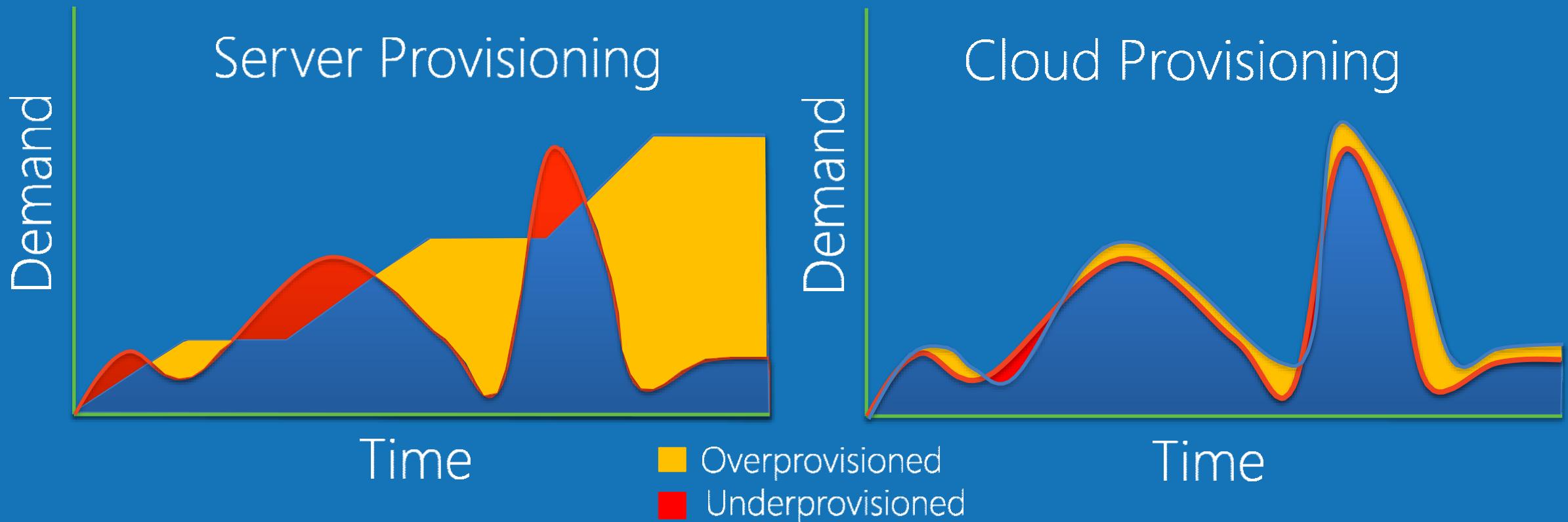


# Cloud Service Models

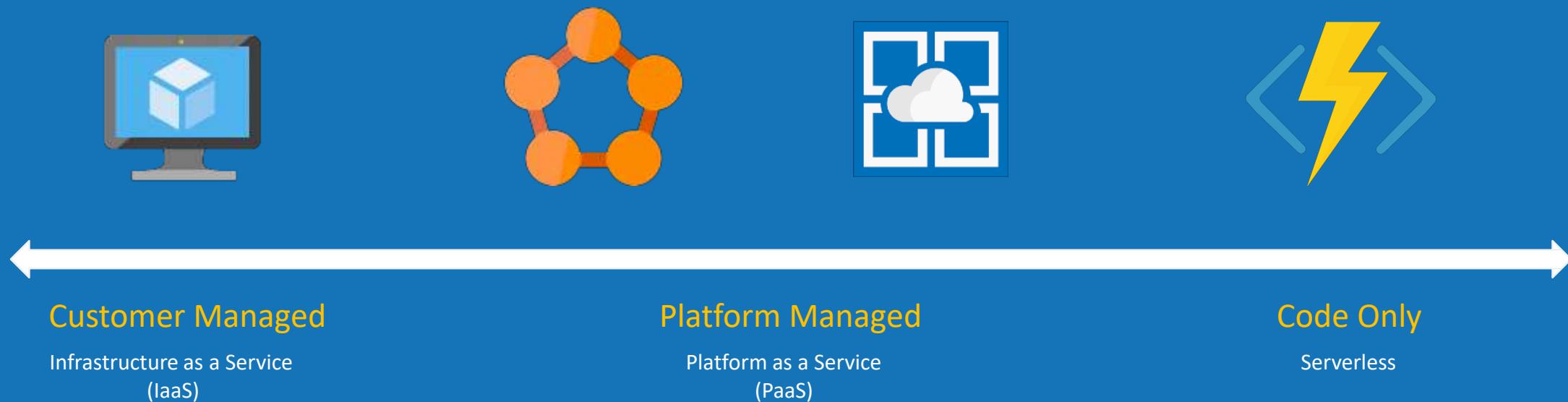


# What is a “Cloud”?

- Cloud: on demand, scalable, multi tenant, self service compute and storage resources



# Types of Azure Services



# Types of Azure Services

- **Infrastructure as a Service (IaaS)**

- **Customer managed**
- **Full control over the services**
- **You are responsible for managing/updating and maintaining**

- **Platform as a Service (PaaS)**

- **Platform Managed**
- **Little to No control over underlying infrastructure**
- **Azure is responsible for managing/up**

- **Serverless**

- **Fully managed by Azure**
- **Code Only – All you need to do is write code**

**54** regions  
worldwide

**140** available in  
140 countries



# ExpressRoute



Private, high b/w network connections up to 10Gbps)

Predictable performance







# Accessing Azure

[Microsoft Azure](https://portal.azure.com)

Search resources, services, and docs (G+/)

supakit\_pao@hotmail.c... DEFAULT DIRECTORY

Create a resource

Home

Dashboard

All services

Favorites

- All resources
- Resource groups
- App Services
- Function App
- SQL databases
- Azure Cosmos DB
- Virtual machines
- Load balancers
- Storage accounts
- Virtual networks
- Azure Active Directory
- Monitor
- Advisor

Azure services See all (100+) Create a resource >

Virtual machines App Services Storage accounts SQL databases Azure Database for PostgreSQL Azure Cosmos DB Function App

Microsoft Learn Learn Azure with free online training from Microsoft

Azure Monitor Monitor your apps and infrastructure

Security Center Secure your apps and infrastructure

Cost Management Analyze and optimize your cloud spend for free

Recent resources See all your recent resources > See all your resources >

NAME	TYPE	LAST VIEWED
window01-new	Virtual machine	23 h ago
window01-image-20191014	Image	1 d ago
SL-cloud1	Resource group	1 d ago
mysql1	Virtual machine	1 d ago
Cloud1	Resource group	1 d ago
Centos01	Virtual machine	1 d ago
cloudinaction1	Storage account	2 d ago

Useful links

Technical Documentation [Azure Services](#) Recent Azure Updates [Azure Migration Tools](#) Find an Azure expert

Azure mobile app

Download on the [App Store](#) GET IT ON [Google Play](#)



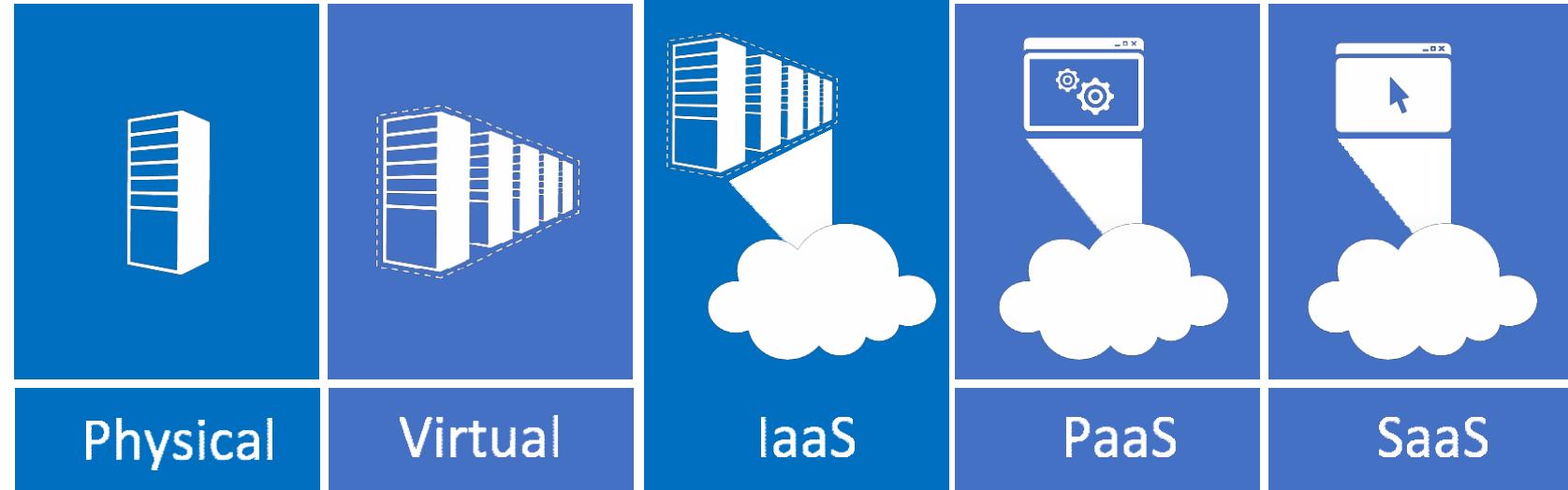
<http://portal.azure.com>

PowerShell and Azure CLI

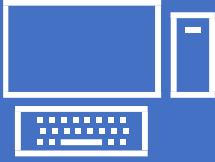
# Azure Account Hierarchy



# Infrastructure as a Service



# Core services of Azure IaaS



## Compute

Virtual machines

Availability sets

VM Scale Sets



## Storage

Disks  
(Standard, premium)

Blob storage  
(Hot, cool)

Files



## Networking

Virtual networks

VPN, ExpressRoute

Load Balancer

DNS, Traffic Manager



## Management

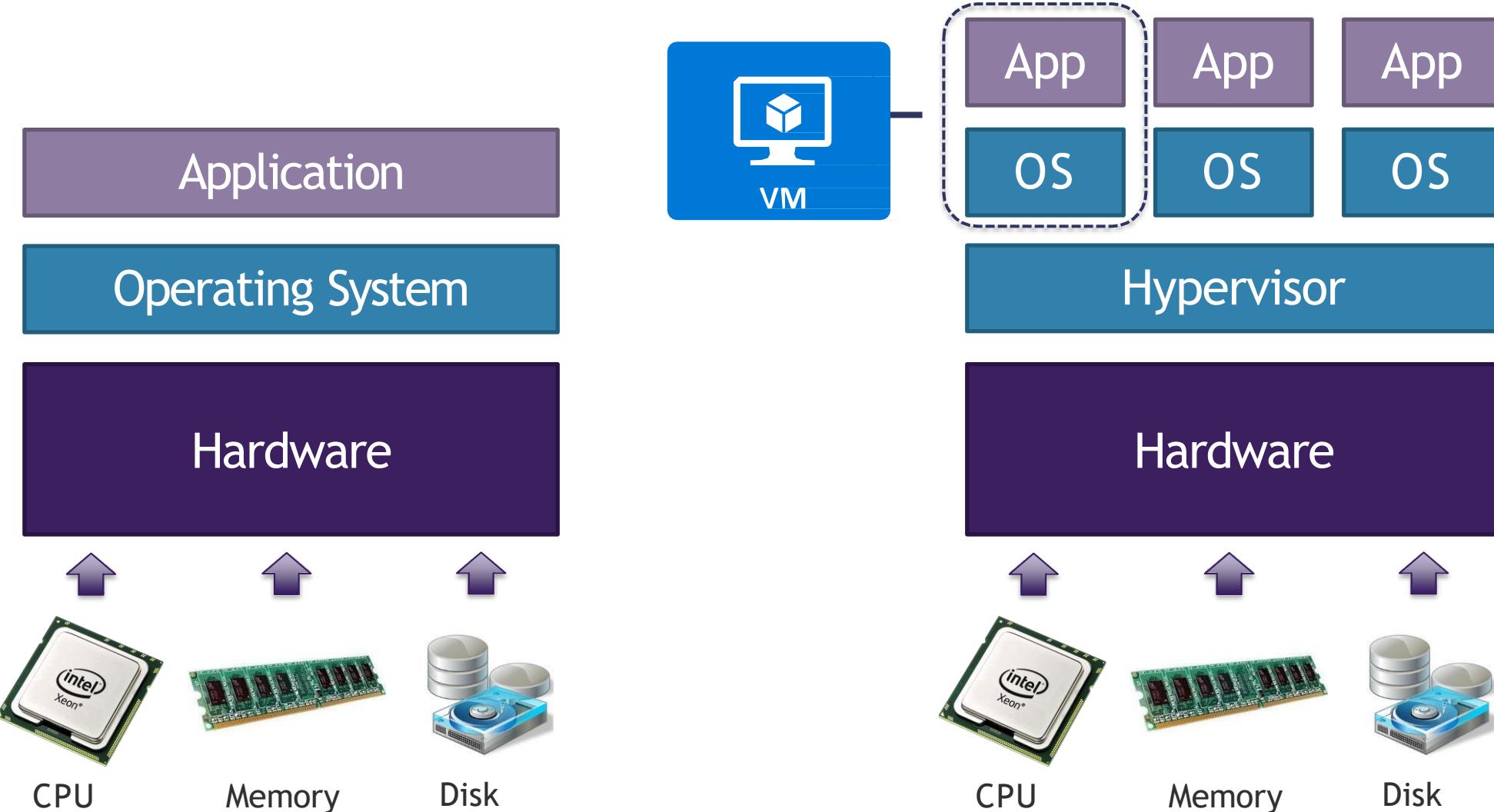
Azure Resource Manager (ARM)

Azure Active Directory

Portal

KeyVault

# Introduction to Virtual Machines



# VM Types



Type	Purpose
A - Basic	Basic version of the A series for testing and development.
A - Standard	General-purpose VMs.
B - Burstable	Burstable instances that can burst to the full capacity of the CPU when needed.
D - General Purpose	Built for enterprise applications. DS instances offer premium storage.
E - Memory Optimized	High memory-to-CPU core ratio. ES instances offer premium storage.
F - CPU Optimized	High CPU core-to-memory ratio. FS instances offer premium storage.
G - Godzilla	Very large instances ideal for large databases and big data use cases.

# VM Types (continued)



Type	Purpose
H - High performance compute	High performance compute instances aimed at very high-end computational needs such as molecular modelling and other scientific applications.
L - Storage optimized	Storage optimized instances which offer a higher disk throughput and IO.
M - Large memory	Another large-scale memory option that allows for up to 3.5 TB of RAM.
N - GPU enabled	GPU-enabled instances.
SAP HANA on Azure Certified Instances	Specialized instances purposely built and certified for running SAP HANA.

# Azure VM Sizes



Lowest Price



SSD Storage  
Fast CPUs



New generation  
of D family VMs



High memory and  
Large SSDs



New A-Series



Compute Intensive



NVIDIA GPUs  
K80 Compute



NVIDIA GPUs  
M60 Visualization



Fastest CPU  
IB Connectivity



Large SSDs



SAP Large Instances

# VM Specializations



S

Premium Storage  
options available

Example: DSv2

M

Larger memory  
configuration of  
instance type

Example: StandardA2m\_v2

R

Supports remote  
direct memory  
access (RDMA)

Example: H16mr

# VM prices and size



OS/Software:  
Windows OS

Region:  
Southeast Asia

Display pricing by:  
Hour

Category: All General purpose Compute optimized Memory optimized Storage optimized GPU High performance compute

ADD TO ESTIMATE	INSTANCE	VCPU	RAM	TEMPORARY STORAGE	PAY AS YOU GO	ONE YEAR RESERVED (% SAVINGS)	THREE YEAR RESERVED (% SAVINGS)	3 YEAR RESERVED WITH AZURE HYBRID BENEFIT (% SAVINGS)
+ B1S	B1S	1	1 GiB	4 GiB	\$0.0172/hour	\$0.0118/hour (~32%)	\$0.0090/hour (~48%)	\$0.0050/hour (~71%)
+ B1MS	B1MS	1	2 GiB	4 GiB	\$0.0304/hour	\$0.0195/hour (~36%)	\$0.0140/hour (~54%)	\$0.0100/hour (~67%)
+ B2S	B2S	2	4 GiB	8 GiB	\$0.0608/hour	\$0.0389/hour (~36%)	\$0.0279/hour (~54%)	\$0.0199/hour (~67%)
+ B2MS	B2MS	2	8 GiB	16 GiB	\$0.114/hour	\$0.0698/hour (~39%)	\$0.0478/hour (~58%)	\$0.0398/hour (~65%)
+ B4MS	B4MS	4	16 GiB	32 GiB	\$0.227/hour	\$0.1397/hour (~38%)	\$0.0956/hour (~58%)	\$0.0796/hour (~65%)
+ B8MS	B8MS	8	32 GiB	64 GiB	\$0.454/hour	\$0.2792/hour (~39%)	\$0.1911/hour (~58%)	\$0.1591/hour (~65%)
+ B12MS	B12MS	12	48 GiB	96 GiB	\$0.682/hour	N/A	N/A	\$0.2386/hour (~65%)

Chat with Sales

Region:

Southeast Asia

Currency:

US Dollar (\$)

BIG DATA  
EXPERIENCE  
CENTER

## Pricing details

### Inbound data transfers

(i.e. data going into Azure data centers): **Free**

### Outbound data transfers

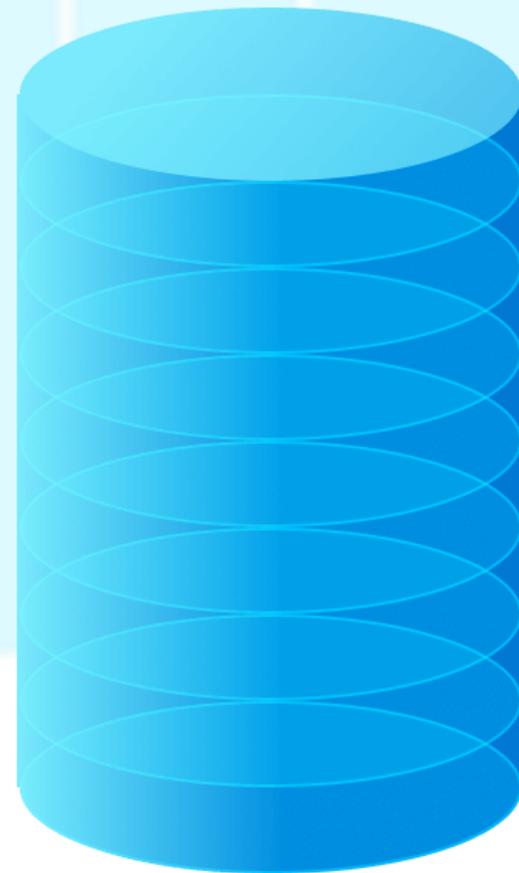
(i.e. data going out of Azure data centers; zones refer to source region):

OUTBOUND DATA TRANSFERS	ZONE 2*
First 5 GB /Month <sup>1</sup>	Free
5 GB - 10 TB <sup>2</sup> /Month	\$0.12 per GB
Next 40 TB (10 - 50 TB) /Month	\$0.085 per GB
Next 100 TB (50 - 150 TB) /Month	\$0.082 per GB
Next 350 TB (150 - 500 TB) /Month	\$0.08 per GB
Over 500 TB /Month	<a href="#">Contact us</a>



# Cost savings

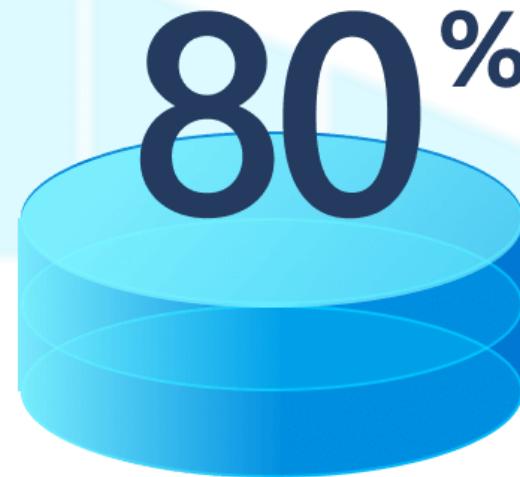
## vs. pay as-you-go



Pay as you go



Azure RIs



RIs + Azure Hybrid Benefits

# Azure Compute Units (ACUs)



Way to compare  
CPU performance  
between different  
types/sizes of VM

Microsoft-  
created  
performance  
benchmark

A VM with an ACU  
of 200 has twice the  
performance of a  
VM with an ACU of  
100

# Azure Compute Units (ACUs)

SKU Family

ACU \ vCPU

vCPU: Core

A0

50

1:1

A1 - A4

100

1:1

A5 - A7

100

1:1

A1\_v2 - A8\_v2

100

1:1

A2m\_v2 - A8m\_v2

100

1:1

A8 - A11

225\*

1:1

D1 - D14

160 - 250

1:1

D1\_v2 - D15\_v2

210 - 250\*

1:1

DS1 - DS14

160 - 250

1:1

DS1\_v2 - DS15\_v2

210 - 250\*

1:1

D\_v3

160 - 190\*

2:1\*\*\*

Ds\_v3

160 - 190\*

2:1\*\*\*

# Windows Server Support



OS	Key Points
Pre-Windows 2008 R2 (e.g. Windows Server 2003)	<ul style="list-style-type: none"><li>Windows 2003 and later are supported for deployment.</li><li>Must bring own image.</li><li>No marketplace support.</li><li>Need to have your own custom support agreement (CSA).</li></ul>
Windows Server 2008 R2	<ul style="list-style-type: none"><li>Supported.</li><li>Specific support matrix for server roles.</li><li>EOL Jan 14, 2020</li></ul>
Windows Server 2012	<ul style="list-style-type: none"><li>Supported - Datacenter version in marketplace.</li></ul>
Windows Server 2016	<ul style="list-style-type: none"><li>Supported - Datacenter and nano versions in marketplace.</li></ul>
Windows Server 2019	<ul style="list-style-type: none"><li>Supported- Datacenter version in marketplace</li></ul>
Desktop OS	<ul style="list-style-type: none"><li>Windows 10 Pro and Enterprise in marketplace.</li></ul>

<https://support.microsoft.com/en-us/help/2721672/microsoft-server-software-support-for-microsoft-azure-virtual-machines>





# Windows Server

[Save for later](#)

Microsoft

Select a software plan

[smalldisk] Windows Server 2008 R2 SP1 ▾

[Create](#)[Start with a pre-set configuration](#)

[smalldisk] Windows Server, version 1903 with Containers

Windows Server 2008 R2 SP1

Windows Server 2008 R2 SP1 (zh-cn)

Windows Server 2012 Datacenter

Windows Server 2012 Datacenter (zh-cn)

Windows Server 2012 R2 Datacenter

Windows Server 2012 R2 Datacenter (zh-cn)

Windows Server 2016 Datacenter

Windows Server 2016 Datacenter - Server Core

Windows Server 2016 Datacenter - with Containers

Windows Server 2016 Datacenter (zh-cn)

Windows Server 2019 Datacenter

Windows Server 2019 Datacenter (zh-cn)

Windows Server 2019 Datacenter Server Core

Windows Server 2019 Datacenter Server Core with Containers

Windows Server 2019 Datacenter with Containers

[Overview](#)[Plans](#)

Windows Server is the right choice for you if you're including:

- Unique hybrid scenarios
- Advanced management
- Faster innovation
- Unprecedented choice

## Available Images

Windows Server 2019 is the right choice for your application needs.

## Latest: Windows Server

- Server with Desktop Experience
- [Server Core](#) or Nano Server
- [Containers options](#) for Windows Server and Server Core containers pre-installed on servers with Desktop Experience, or Server Core

Windows Server Semi-Annual Channel releases deliver new operating system capabilities at a faster pace and are based on the Server Core architecture.

# Linux-Supported Distributions



Distribution	Version	Drivers	Agent
CentOS	CentOS 6.3+, 7.0+	CentOS 6.3: LIS download	Package: In repo under "WALinuxAgent" Source code: <a href="#">GitHub</a>
		CentOS 6.4+: In kernel	
CoreOS	494.4.0+	In kernel	Source code: <a href="#">GitHub</a>
Debian	Debian 7.9+, 8.2+	In kernel	Package: In repo under "waagent" Source code: <a href="#">GitHub</a>
Oracle Linux	6.4+, 7.0+	In kernel	Package: In repo under "WALinuxAgent" Source code: <a href="#">GitHub</a>
Red Hat Enterprise Linux	RHEL 6.7+, 7.1+	In kernel	Package: In repo under "WALinuxAgent" Source code: <a href="#">GitHub</a>
SUSE Linux Enterprise	SLES/SLES for SAP 11 SP4 12 SP1+	In kernel	Package: for 11 in Cloud:Tools repo for 12 included in "Public Cloud" Module under "python-azure-agent" Source code: <a href="#">GitHub</a>
openSUSE	openSUSE Leap 42.2+	In kernel	Package: In Cloud:Tools repo under "python-azure-agent" Source code: <a href="#">GitHub</a>

<https://docs.microsoft.com/en-us/azure/virtual-machines/linux/endorsed-distros>

# Regional Limitations



	ASIA PACIFIC		UNITED STATES							
Products	East Asia	Southeast Asia	Central US	East US	East US 2	North Central US	South Central US	West Central US	West US	West US 2
<b>Virtual Machines</b>	■	■	■	■	■	■	■	■	■	■
A0 - A7	■	■	■	■	■	■	■	■	■	■
Av2	■	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■	■
A8 – A11 (Compute Intensive)				■		■	■		■	
D-series	■	■	■	■	■	■	■		■	
DC-series		■			■				■	
Dv2-series	■	■	■	■	■	■	■	■	■	■
Dv3-series	■	■	■	■	■	■	■	■	■	■
DS-series	■	■	■	■	■		■		■	
DSv2-series	■	■	■	■	■	■	■	■	■	■
DSv3-Series	■	■	■	■	■	■	■	■	■	■
Ev3-series	■	■	■	■	■	■	■	■	■	■
ESv3-Series	■	■	■	■	■	■	■	■	■	■
F-series	■	■	■	■	■	■	■	■	■	■

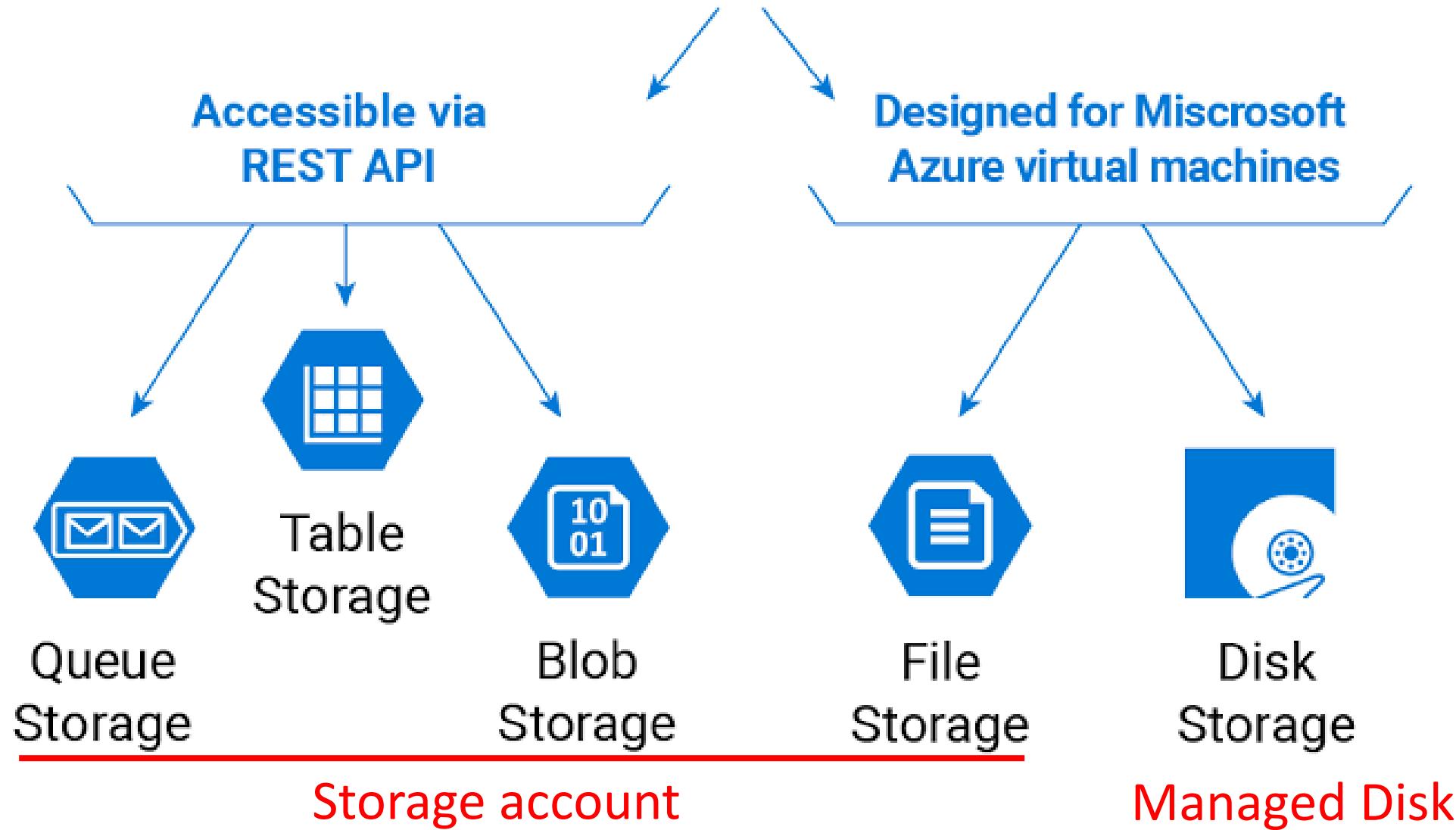
# Restricted Usernames



administrator	admin	user	user1
test	user2	test1	user3
admin1	1	123	a
actuser	adm	admin2	aspnet
backup	console	david	guest
john	owner	root	server
sql	support	support_388945a0	sys
test2	test3	user4	user5

You cannot use any of these names for your VM username when creating an Azure VM

# Microsoft Azure Storage



## Standard Storage

Backed by traditional  
HDD

Most cost effective

Max throughput -  
60MB/S per disk

Max IOPS -  
500 IOPS per disk

## Premium Storage

Backed by SSD drives

Higher performance

Max throughput -  
250MB/S per disk

Max IOPS -  
7500 IOPS per disk

# Managed Disk – Standard Storage Sizes



	S4	S6	S10	S20	S30	S40	S50
Disk size (GB)	32	64	128	512	1024	2048	4095



- Max IOPS for all sizes above is 300 IOPS/Disk
- Max throughput for all sizes is 60MB/s

# Managed Disk – Premium Storage Sizes



	P4	P6	P10	P15	P20	P30	P40	P50
Disk size (GB)	32	64	128	256	512	1024	2048	4095
Max IOPS	120	240	500	1100	2300	5000	7500	7500
Max through	25 MB/s	50 MB/s	100 MB/s	125 MB/s	150 MB/s	200 MB/s	250 MB/s	250 MB/s

# Managed vs. Unmanaged Disks

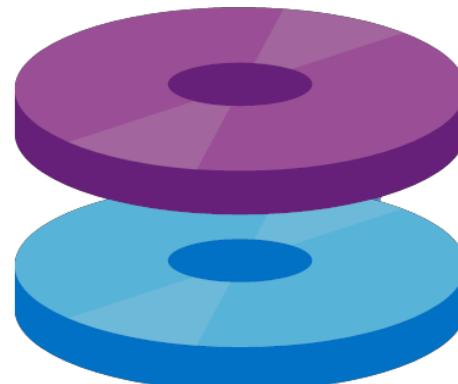


## Unmanaged Disks

DIY option

Management overhead  
(20000 IOPS per storage  
account limit)

Supports all replication  
modes  
(LRS, ZRS, GRS, RA-GRS)



## Managed Disks

Simplest option

Lower management  
overhead as Azure manages  
the storage accounts

Only LRS replication mode  
currently available

# Replication Options



## Logically Replicated Storage (LRS)

Replicated three times within a storage scale unit (collection of racks of storage nodes) hosted in a datacenter in the same region as your storage account was created.

## Zone Replicated Storage (ZRS)

Replicated three times across one or two datacenters in addition to storing three replicas similar to LRS. Data stored in ZRS is durable even in the event that the primary datacenter is unavailable or unrecoverable.

## Geographically Replicated Storage (GRS)

Replicates your data to a second region that is hundreds of miles away from the primary region. Your data is curable even in the event of a complete region outage.

## Read Only Geographically Replicated Storage (RA-GRS)

Same replication as per GRS but also provides read access to the data in the other region.

# LRS vs ZRS

- ZRS
- LRS



# Replication Strategies



Replication Strategy	LRS	ZRS	GRS	RA-GRS
Data is replicated across multiple datacenters?	No	Yes	Yes	Yes
Data can be read from a secondary location and the primary location?	No	No	No	Yes
Number of copies of data maintained on separate nodes:	3	3	6	6

Redundancy:  
LRSRegion:  
Southeast AsiaCurrency:  
US Dollar (\$)

you choose to store them on Premium SSD Managed Disk storage, you'll be charged at \$0.152/GB per month.

	DISK SIZE	PRICE PER MONTH	IOPS PER DISK	THROUGHPUT PER DISK
P4	32 GiB	\$5.28	120	25 MB/second
P6	64 GiB	\$10.21	240	50 MB/second
P10	128 GiB	\$19.71	500	100 MB/second
P15	256 GiB	\$38.02	1,100	125 MB/second
P20	512 GiB	\$73.22	2,300	150 MB/second
P30	1 TiB	\$135.17	5,000	200 MB/second
P40	2 TiB	\$259.05	7,500	250 MB/second
P50	4 TiB	\$495.57	7,500	
P60	8 TiB	\$946.08	16,000	
P70	16 TiB	\$1,802.06	18,000	
P80	32 TiB (32767 GiB)	\$3,604.11	20,000	

Redundancy:

LRS

Region:

Southeast Asia

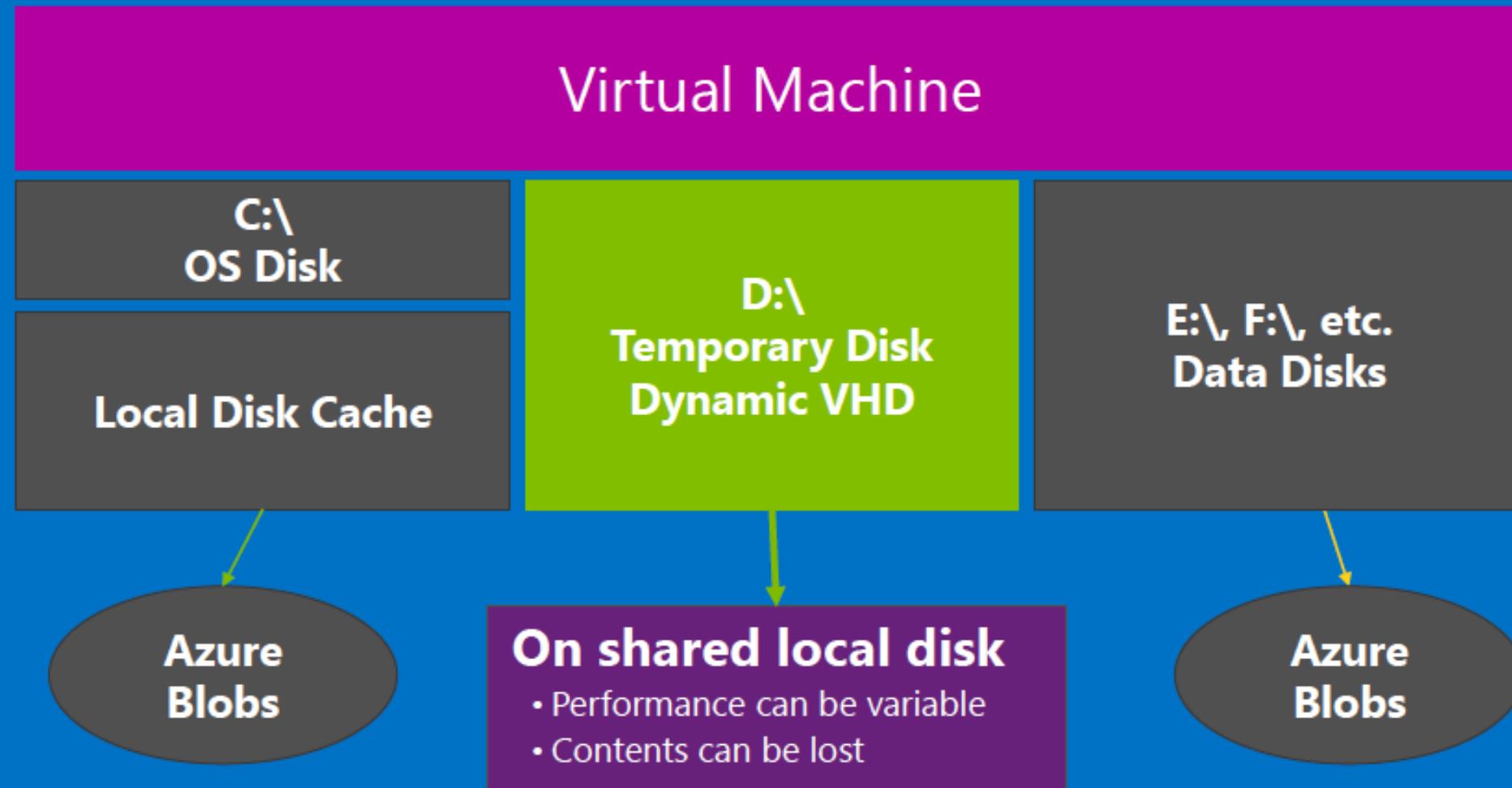
Currency:

US Dollar (\$)

# Managed disk price

	DISK SIZE	PRICE PER MONTH	IOPS PER DISK	THROUGHPUT PER DISK
E4	32 GiB	\$2.40	Up to 120	Up to 25 MB/second
E6	64 GiB	\$4.80	Up to 240	Up to 50 MB/second
E10	128 GiB	\$9.60	Up to 500	Up to 60 MB/second
E15	256 GiB	\$19.20	Up to 500	Up to 60 MB/second
E20	512 GiB	\$38.40	Up to 500	Up to 60 MB/second
E30	1 TiB	\$76.80	Up to 500	Up to 60 MB/second
E40	2 TiB	\$153.60	Up to 500	Up to 60 MB/second
E50	4 TiB	\$307.20	Up to 500	Up to 60 MB/second
E60	8 TiB	\$614.40	Up to 2,000	Up to 400 MB/second
E70	16 TiB	\$1,228.80	Up to 4,000	Up to 600 MB/second
E80	32 TiB (32767 GiB)	\$2,457.60	Up to 6,000	Up to 750 MB/second

# Virtual machine storage architecture



# Lab works



Welcome to Azure Marketplace. Discover, try, and deploy the cloud software you want.

[Browse all apps >](#)

[Check out the latest announcements](#)

## Featured apps



**Barracuda WAF-as-a-Service**  
By Barracuda Networks, Inc.

★★★★★ (1)  
Software plans start at \$424.00/month

[Free trial](#)



**F5 BIG-IP Virtual Edition - BEST (PAYG)**  
By F5 Networks

Software plans start at \$1.33/hour

[Free software trial](#)



**CloudGuard IaaS - Firewall & Threat Prevention**  
By Check Point

★★★★★ (1)  
Price varies

[Test Drive](#)



**MongoDB Atlas on Azure**  
By MongoDB, Inc.

Software plans start at \$24,000.00/year

[Get it now](#)



**SUSE Linux Enterprise Server (SLES) for SAP**  
By SUSE

Software plans start at \$0.17/hour

[Get it now](#)

## Featured Consulting services

# VM Images

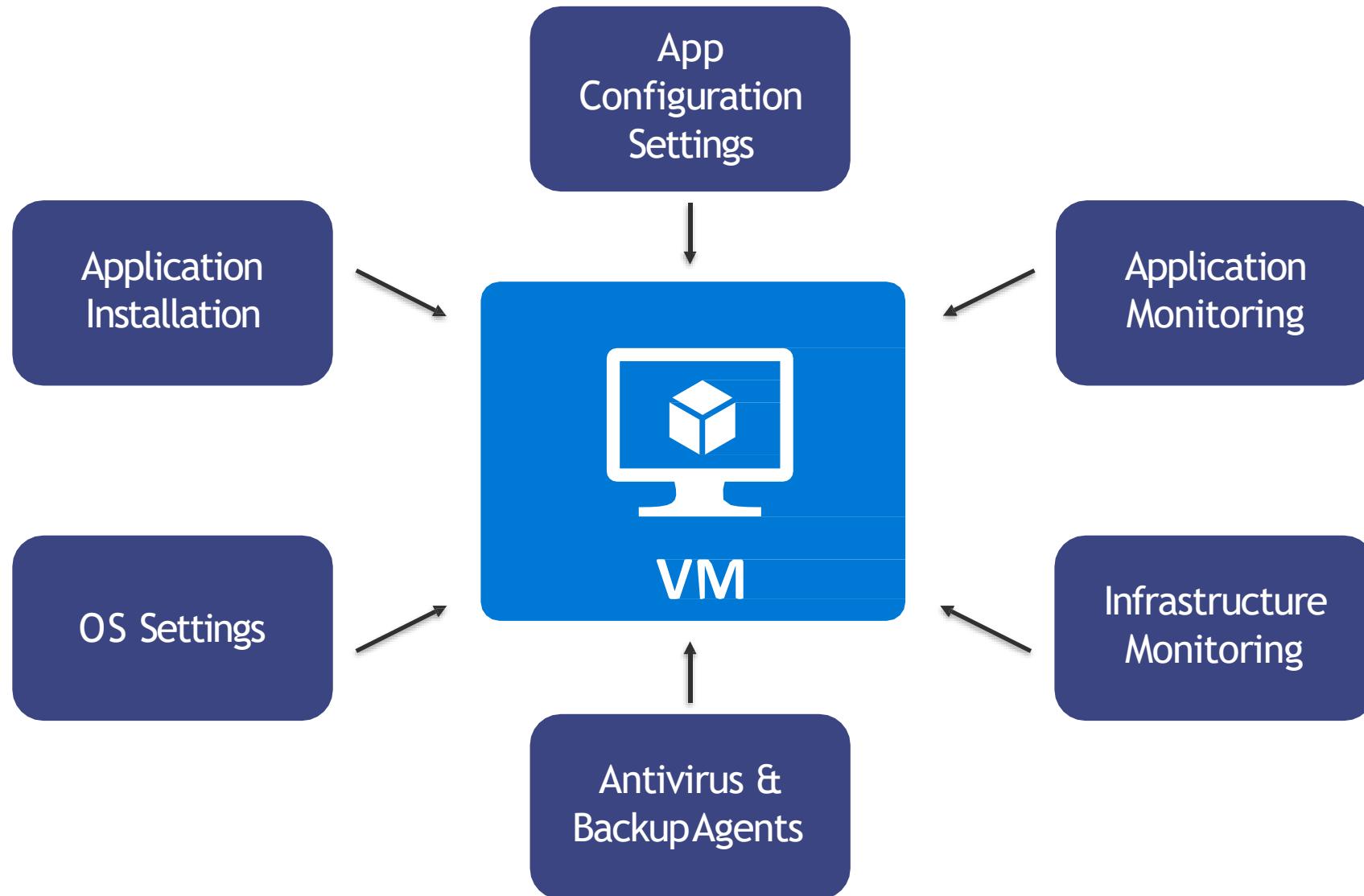
## Custom Images

- Do-it-yourself image
- Windows - Sysprep
- Linux - sudo waagent  
-deprovision+user
- Generalize in Azure
- Create image

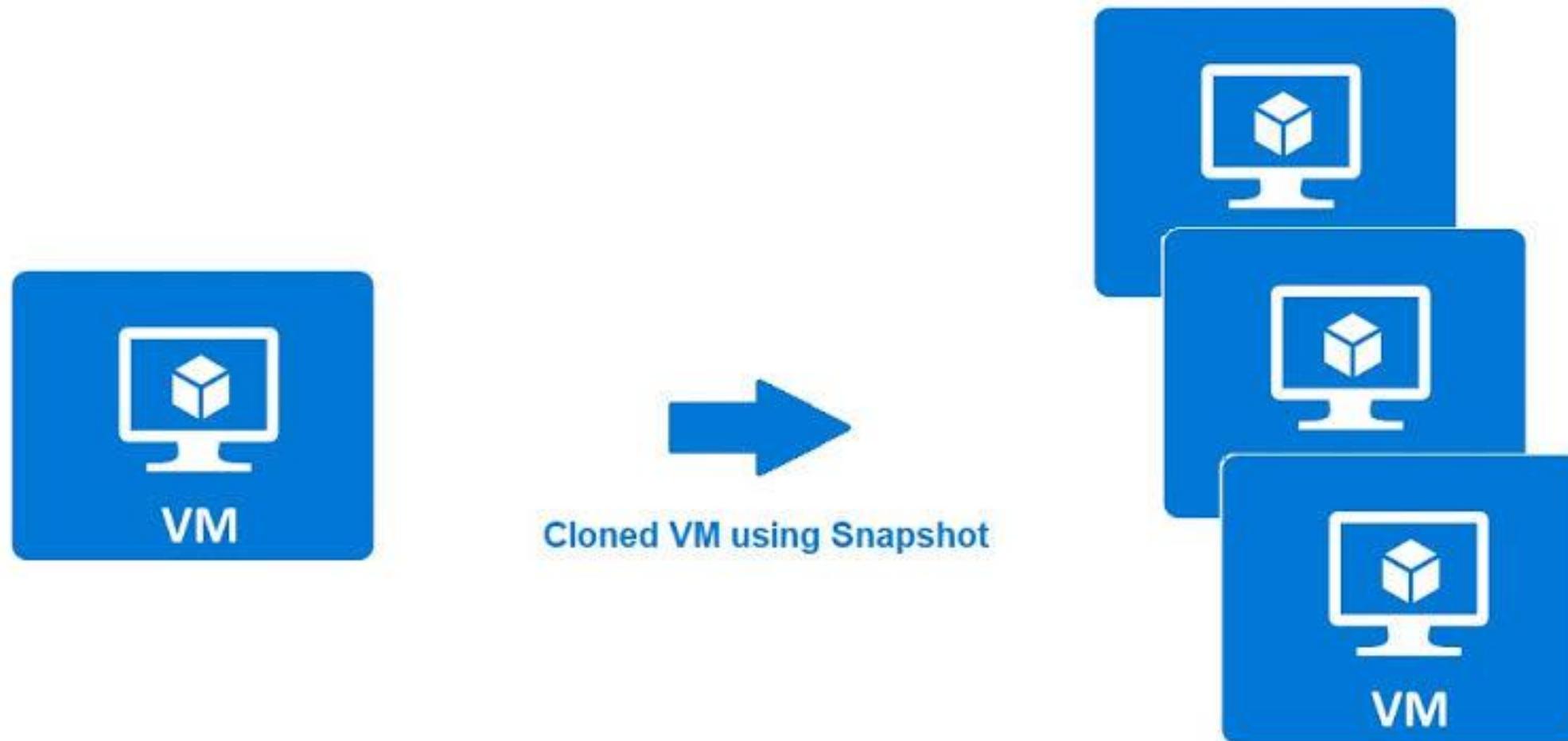
## Marketplace Images

- Provided for you in the Azure Marketplace
- Properties:
  - Publisher
  - Offer
  - SKU

# Configuration Management



# Cloned VM using Snapshot



## Potential for VM Impact

- Planned maintenance
- Unplanned hardware maintenance
- Unexpected downtime

## Availability Sets

- Group two or more machines in a set
- Separated based on Fault Domains and Update Domains

# Azure availability set

## Fault Domains

Represent groups of resources anticipated to fail together i.e. Same rack, same server

Fabric spreads instances across min 2 fault domains

## Update Domains

Groups of resources that will be updated together

Host OS updates honour service update domains

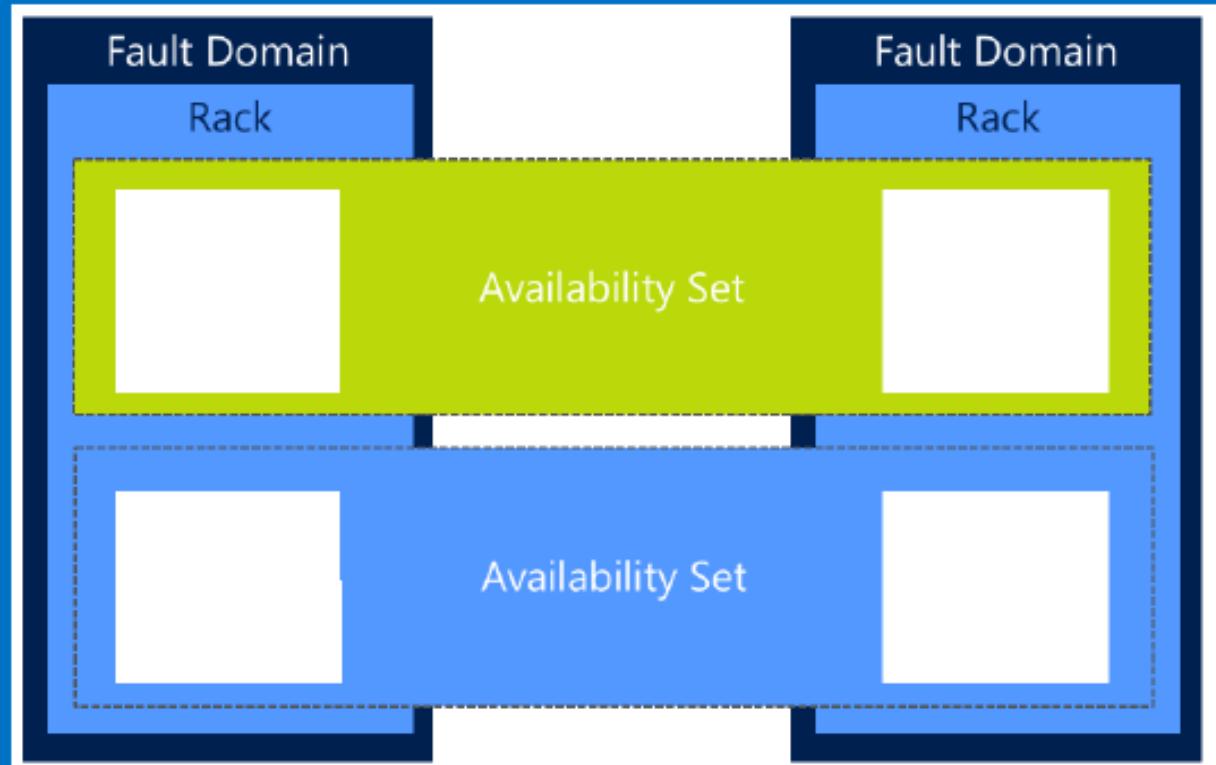
Specified in service definition

Default of 5 (up to 20)

## Availability Sets

VMs in separate Fault Domains

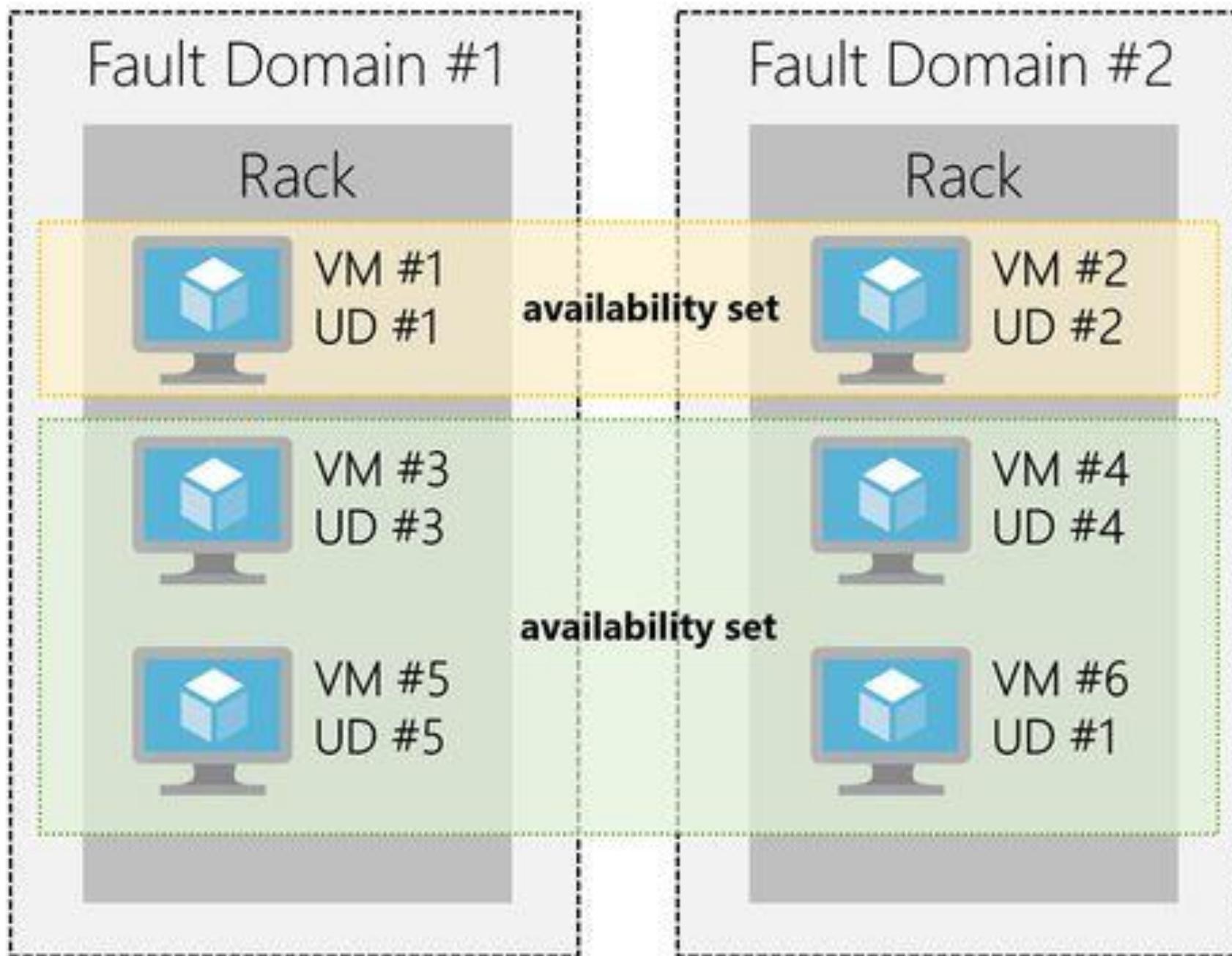
SLA 99.95 | HW SW | Windows & Linux



### IMPORTANT

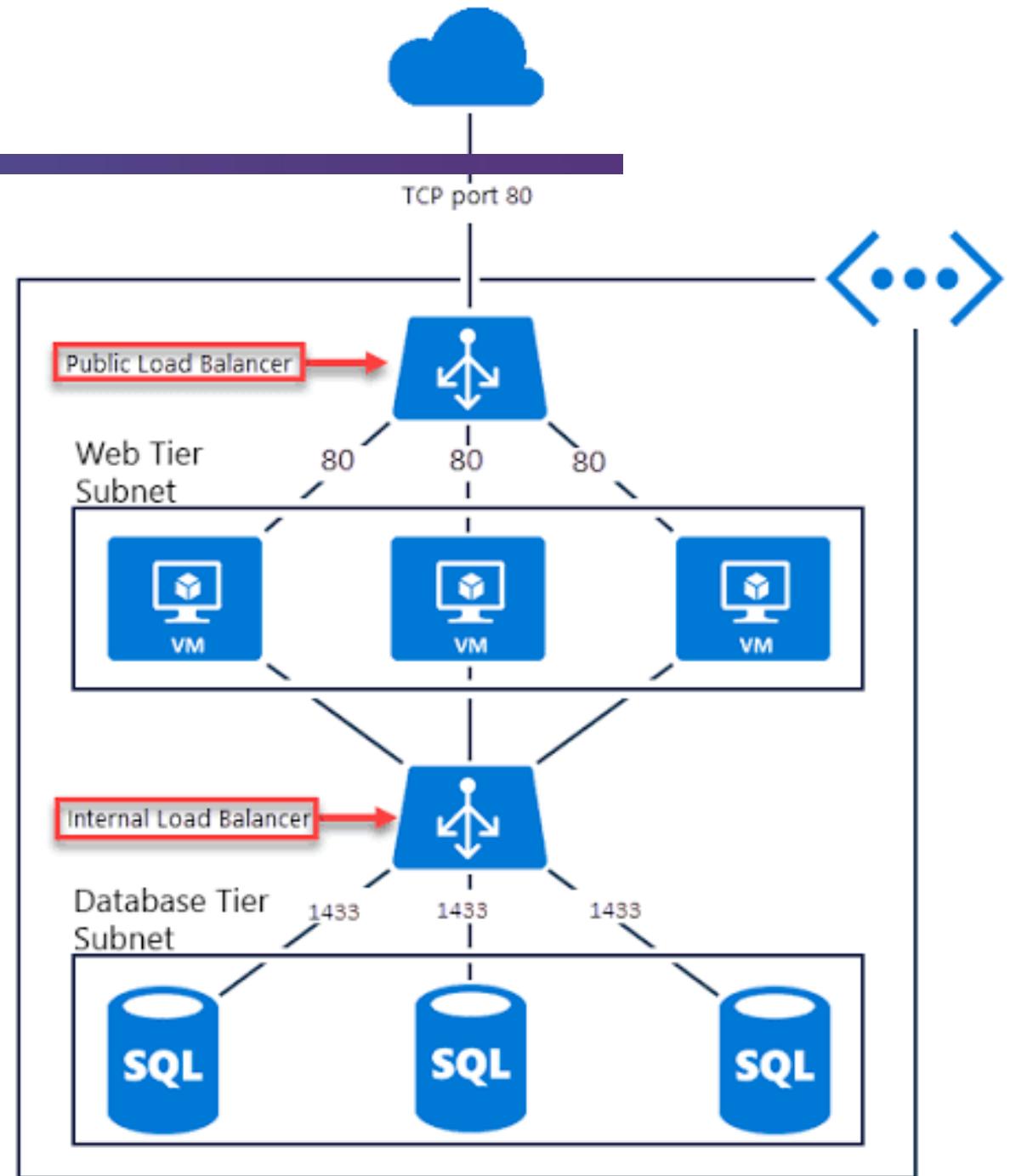
The availability set for this virtual machine has only one running instance, which affects the service-level agreement (SLA). The SLA requires at least two running virtual machine instances. [Learn more](#)

# Fault Domain & Update Domain

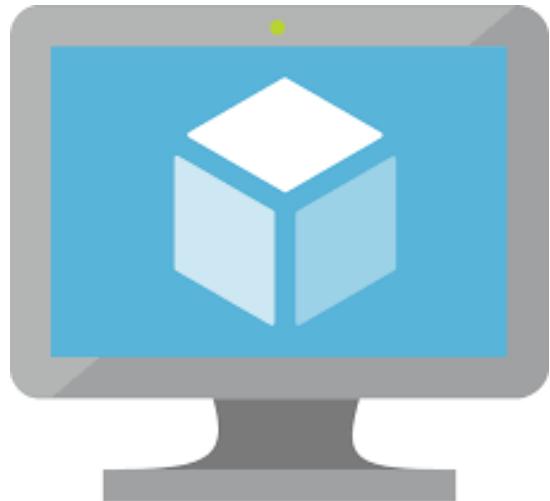


# Azure load balance

- Frontend pool
  - Public IP
- Backend pool
  - VMs member
- Health probe
  - Service port timeout
- Load Balance rules
  - Main configuration

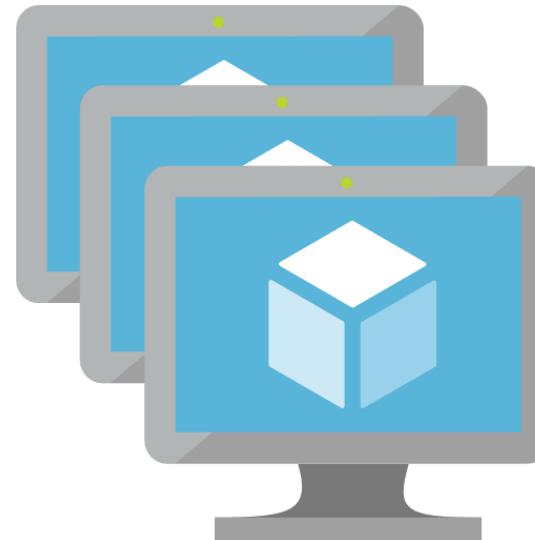


# Scale Sets



VS

.



# Define Virtual Machine Scale Set (VMSS)



- Use Portal, PowerShell or API
- Number of instances you wish to run, instance size, etc.
- Determine if you want to auto-scale

INSTANCES AND LOAD BALANCER

\* Instance count

\* Instance size ([View full pricing details](#))

Enable scaling beyond 100 instances  No  Yes

Use managed disks  No  Yes

\* Public IP address name

Public IP allocation method  Dynamic  Static

\* Domain name label

AUTOSCALE

Autoscale  Disabled  Enabled

# Configure Autoscale Rules

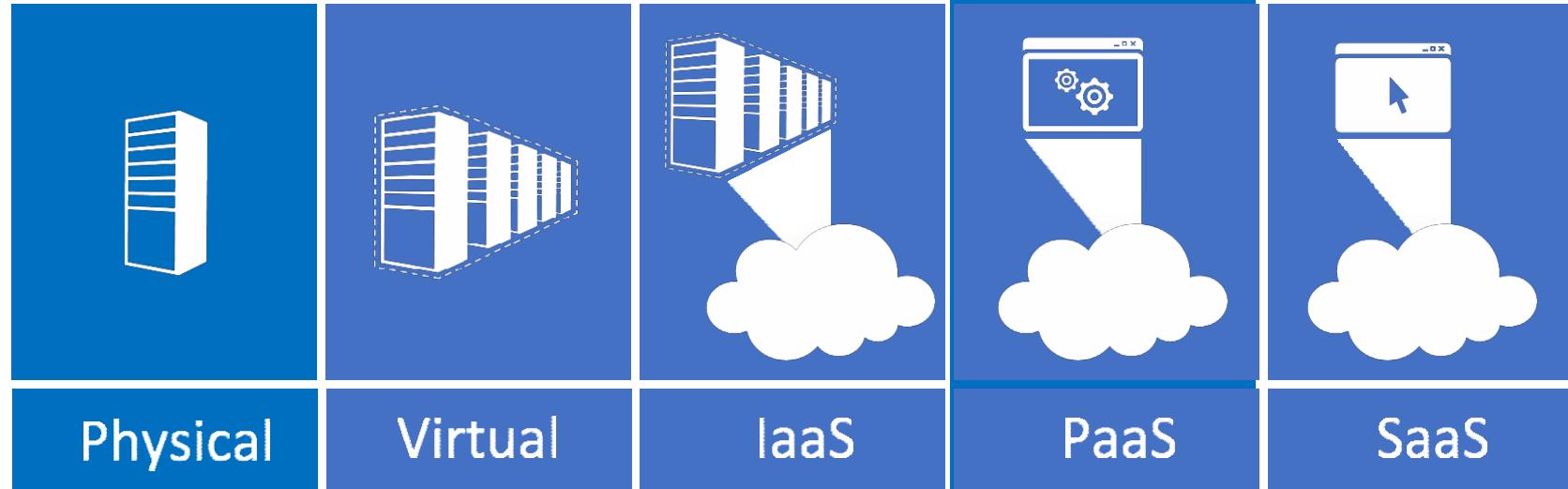


- Set minimum and maximum instance counts
- Scale out based on a variety of metrics - infrastructure or application
- Scale out based on a schedule
- Remember to account for sessions when scaling in on web servers

AUTOSCALE

Autoscale <small>?</small>	<input type="radio"/> Disabled <input checked="" type="radio"/> Enabled
* Minimum number of VMs <small>?</small>	1
* Maximum number of VMs <small>?</small>	10
Scale out	
* CPU threshold (%) <small>?</small>	75
* Number of VMs to increase by <small>?</small>	1
Scale in	
* CPU threshold (%) <small>?</small>	25
* Number of VMs to decrease by <small>?</small>	1

# Platform as a Service

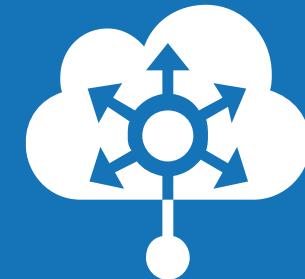




Azure  
Websites



Mobile  
Services



BizTalk  
Services

# Key app services in Azure today

# Introducing Azure App Service



Key app services in Azure today

- Unique integrated offering
- Mobile Services & Intelligent apps
- Build rich, engaging BizTalk Services
- Scale as your business grows





= One price

## Full capability set available including:

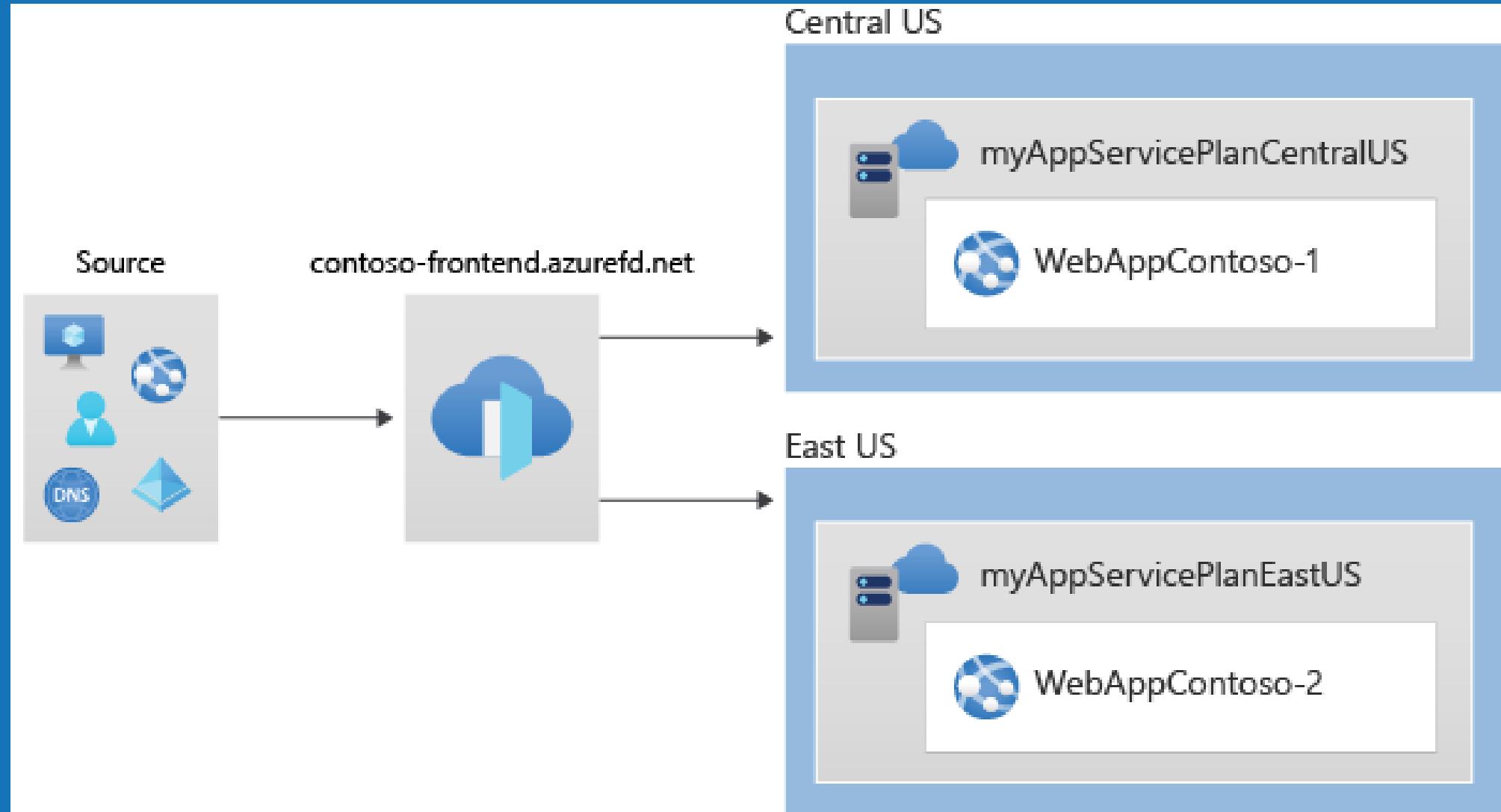
- .NET, Node.js, Java, PHP, and Python
- WebJobs for long running tasks
- Integrated VS publish, remote debug...
- CI with GitHub, BitBucket, VSO
- Auto-load balance, Autoscale, Geo DR
- Virtual networking and hybrid connections
- Site slots for staged deployments



### WEB APPS

Web apps run as-is  
no changes required

# Azure Front door



# Azure

- Web App
- Code
- Docker
- Docker register
- Example
- Wordpress App

# Lab 13: App Service

# Windows Azure Storage

## Storage in the Cloud

Scalable, durable, and available

Anywhere at anytime access

Only pay for what the service uses

## Exposed via RESTful Web Services

Use from Windows Azure Compute

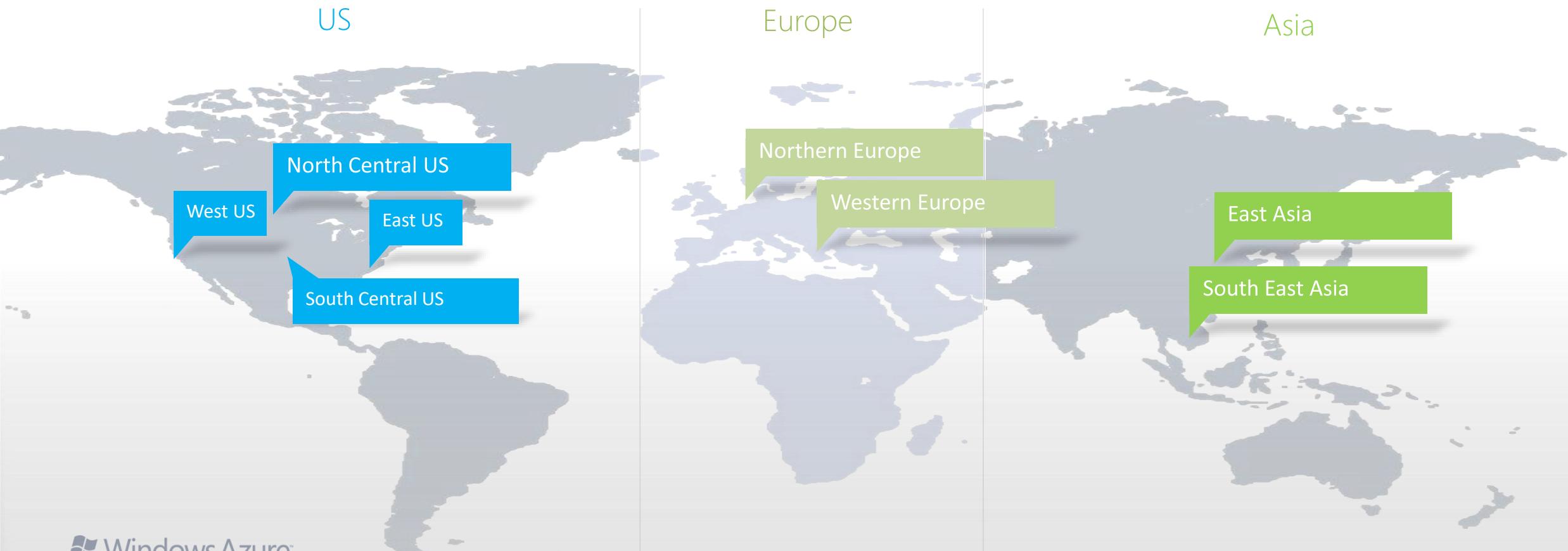
Use from anywhere on the internet



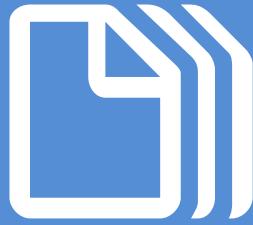
# Windows Azure Storage Account

User specified globally unique account name

Can choose geo-location to host storage account:



# Windows Azure Storage Abstractions



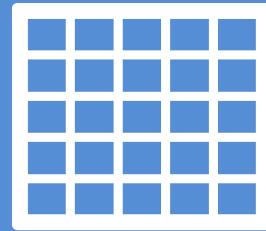
## Blobs

Simple named files along with metadata for the file.



## Drives

Durable NTFS volumes for Windows Azure applications to use.  
Based on Blobs.



## Tables

Structured storage. A table is a set of entities; an entity is a set of properties.

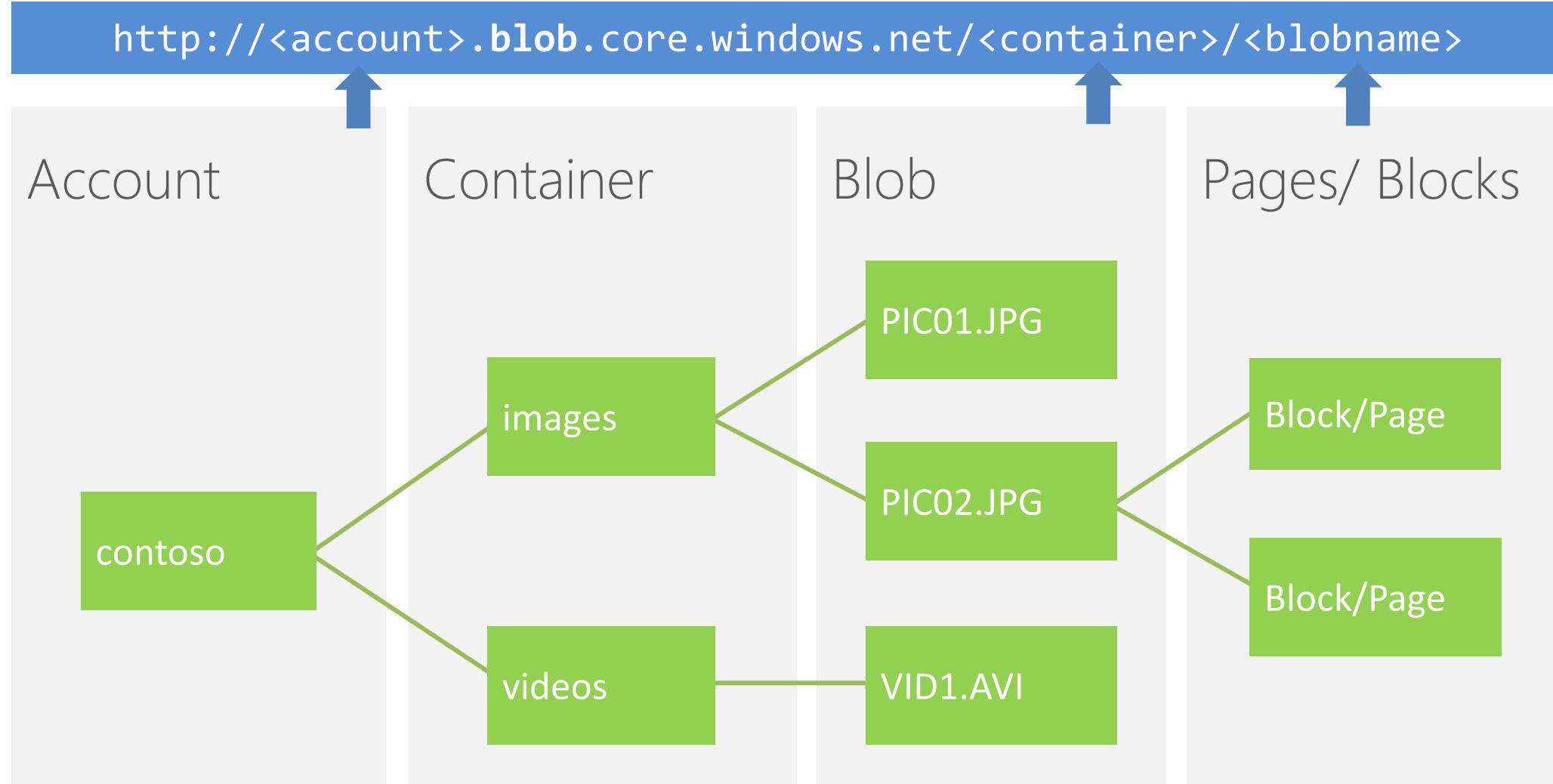


## Queues

Reliable storage and delivery of messages for an application.

BLOB: Binary Large Objects

# Blob Storage Concepts



# Two Types of Blobs Under the Hood

## Block Blob

Targeted at streaming workloads

Each blob consists of a sequence of blocks

Each block is identified by a Block ID

Size limit 200GB per blob

Optimistic Concurrency via Etags

## Page Blob

Targeted at random read/write workloads

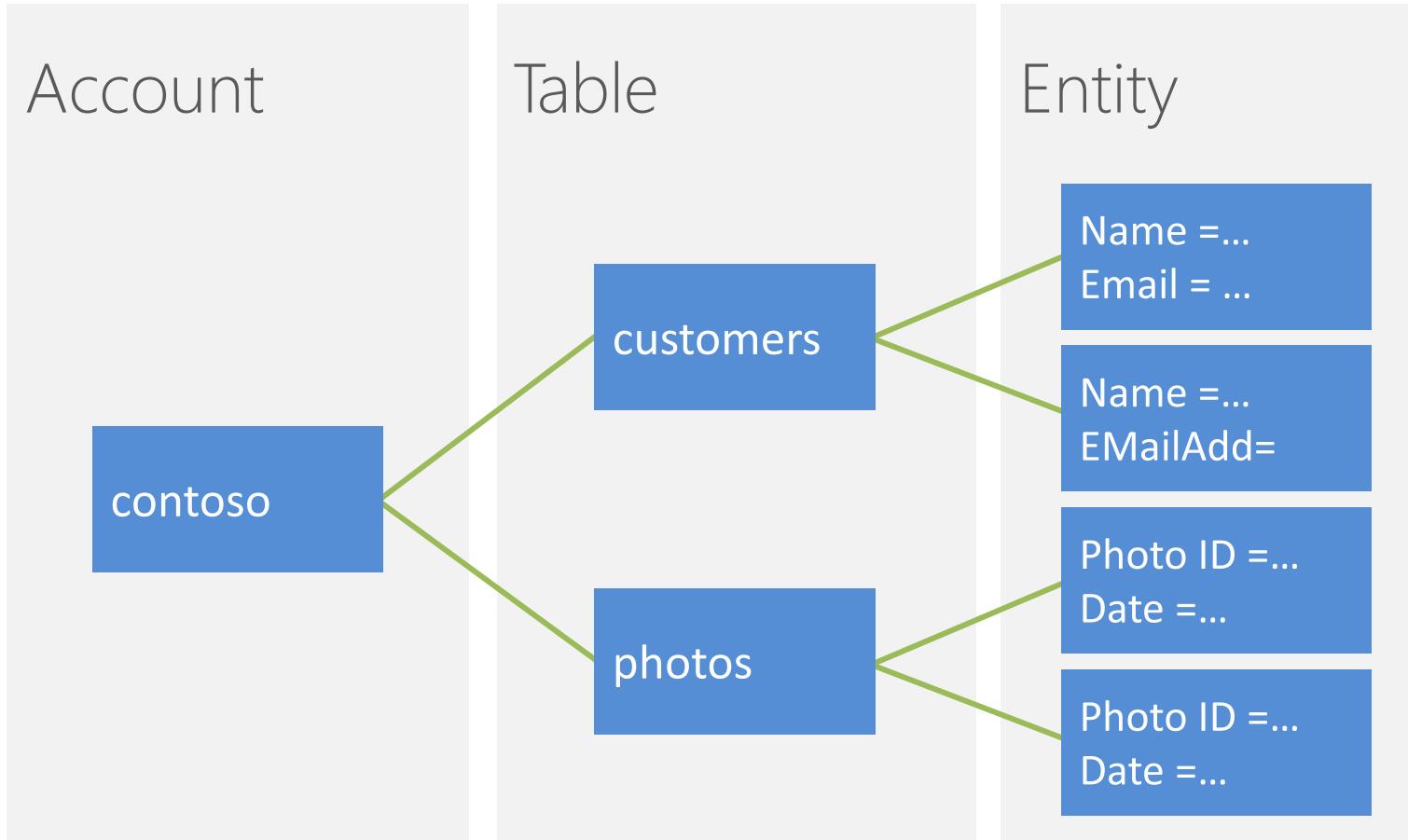
Each blob consists of an array of pages

Each page is identified by its offset from the start of the blob

Size limit 1TB per blob

Optimistic or Pessimistic (locking) concurrency via leases

# Table Storage Concepts (CosmosDB or NoSQL)



# Storage Tiers



## Premium

- Highest storage costs
- Lowest latency
- High speed IOPS
- Only on LRS

## Hot

- Higher storage costs
- Lower access costs

## Cold

- Lower storage costs
- Higher access costs
- Intended for data that will remain cool for 30 days or more

## Archive

- Lowest storage costs
- Highest retrieval costs
- When a blob is in archive storage it is offline and cannot be read

# Manage Access: Container Permissions



Private  
(No Anonymous Access)

Blob  
(Anonymous read access for blobs only)

Container  
(Anonymous read access for containers and blobs)

Access policy

images

Save

Public access level ?

- Private (no anonymous access) ^
- Private (no anonymous access)
- Blob (anonymous read access for blobs only)
- Container (anonymous read access for containers and blobs)

No results

+ Add policy

A screenshot of the Microsoft Azure portal interface. At the top, it says 'Access policy' and 'images'. Below that is a 'Save' button. The main area shows a list of public access levels. The first item, 'Private (no anonymous access)', is highlighted with a blue border and has an upward-pointing arrow icon to its right. Below it are three other options: 'Private (no anonymous access)', 'Blob (anonymous read access for blobs only)', and 'Container (anonymous read access for containers and blobs)'. At the bottom of the list, there is a message 'No results'. At the very bottom, there is a '+ Add policy' button.

# Windows Azure Drives

Durable NTFS volume for Windows Azure Instances

Use existing NTFS APIs to access a network attached durable drive

Use System.IO from .NET

## Benefits

Move existing apps using NTFS more easily to the cloud

Durability and survival of data on instance recycle

Drives can be up to 1TB

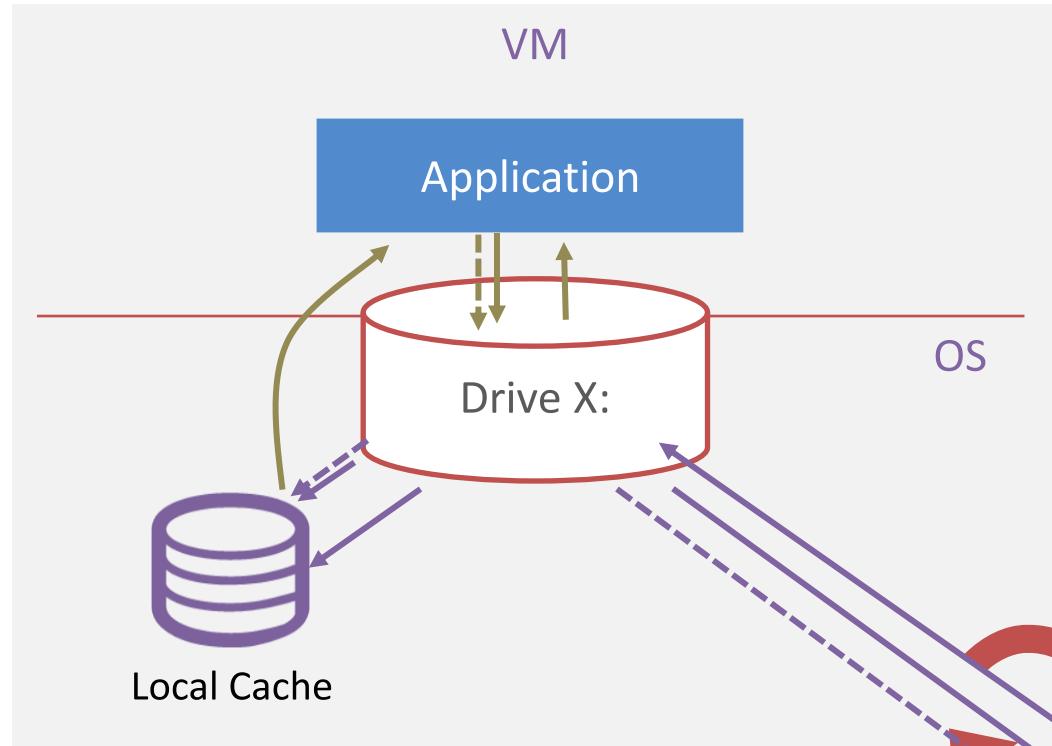
A Windows Azure Drive is an NTFS VHD Page Blob

Mounts Page Blob over the network as an NTFS drive

Local cache on instance for read operations

All flushed and unbuffered writes to drive are made durable to the Page Blob

# How Windows Fileshare work



Drive is a formatted page blob stored in blob service

Mount obtains a blob lease

Mount specifies amount of local storage for cache

NTFS flushed/unbuffered writes commit to blob store before returning to app

NTFS reads can be served from local cache or from blob store (cache miss)

Windows Azure  
Blob Service

## Explore storage options

Explore Azure block blob storage options, including account types and redundancy. Learn more about [storage account types and redundancy](#).

Redundancy:

LRS

Region:

Southeast Asia

Currency:

US Dollar (\$)

Pricing offers: [Recommended](#) [Blob only](#) [Other](#)



# Storage Account pricing

## Standard (GPv2) storage

Our recommended pricing offers for block blobs and append blobs provide access to the latest Azure Storage features. The Hot tier is applicable for most workloads. The Cool and Archive tiers are for cool or cold data with pricing optimized for lowest GB storage prices.

## Premium storage

Premium blob storage provides access to block blobs and append blobs with low and consistent latency, with pricing optimized for high transaction rates. Currently, premium blob storage is only available for Locally Redundant Storage (LRS).

It is not currently possible to tier to/from Premium tier

Currently, Premium Blob storage is only available for locally redundant storage (LRS). Similar to other block blobs offers, pricing for Premium Blob storage includes storage used (in GBs) and operations.

Premium Blob storage is now Generally Available. Preview pricing discounts will continue until April 30, 2019. Starting May 1, 2019 GA pricing will be in effect.

Geo Zone Redundant Storage (GZRS) is the new replication option designed to provide at least 16 9's durability of objects over a given year by replicating your data synchronously across three zones in the primary region (like ZRS today) and asynchronously to another region within the same geo across a single zone (like LRS today). When using GZRS, your data is durable in the case of a data center failure, zone failure, complete regional outage or a disaster in which the primary region isn't recoverable. For more details please refer to [the announcement blogpost](#) or [the supporting documentation](#).

GZRS prices are discounted preview prices and will change at the time of general availability.

## Data storage prices

All prices are per GB, per month.

	PREMIUM	HOT	COOL	ARCHIVE
First 50 terabyte (TB) / month	\$0.195 per GB	\$0.02 per GB	\$0.016 per GB	\$0.002 per GB
Next 450 TB / Month	\$0.195 per GB	\$0.0192 per GB	\$0.016 per GB	\$0.002 per GB
Over 500 TB / Month	\$0.195 per GB	\$0.0184 per GB	\$0.016 per GB	\$0.002 per GB

# Storage Account pricing

## Operations and data transfer prices

	PREMIUM	HOT	COOL	ARCHIVE
Write operations (per 10,000) <sup>1</sup>	\$0.0228	\$0.05	\$0.10	\$0.12
List and Create Container Operations (per 10,000) <sup>2</sup>	\$0.065	\$0.05	\$0.05	\$0.05
Read operations (per 10,000) <sup>3</sup>	\$0.0019	\$0.004	\$0.01	\$6
Archive High Priority Read (per 10,000) <sup>5</sup>				\$32.50
All other Operations (per 10,000), except Delete, which is free	\$0.0019	\$0.004	\$0.004	\$0.004
Data Retrieval (per GB) <sup>4</sup>	Free	Free	\$0.01	\$0.024
Archive High Priority Retrieval (per GB) <sup>5</sup>				\$0.065
Data Write (per GB) <sup>4</sup>	Free	Free	Free	Free



# Microsoft Azure

Global • Trusted • Hybrid