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Section: Introduction to Azure

Introduction to Microsoft Azure

- Microsoft's Cloud Platform
- Multiple ways to login
- Azure Resource Manager



How to Access the Azure Portal



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Logging into Azure



Azure Portal

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- portal.azure.com
- See all resources
- Billing and Security
- Customizable

Azure PowerShell

- Azure Modules
- Cross platform
- Leverages PowerShell Base knowledge

Azure CLI

- Bash like interface
- Cross Platform

Azure Mobile App

- iOS and Android
- Manager Resources
- Azure CloudShell

Azure REST API

- ARM is based on a REST API

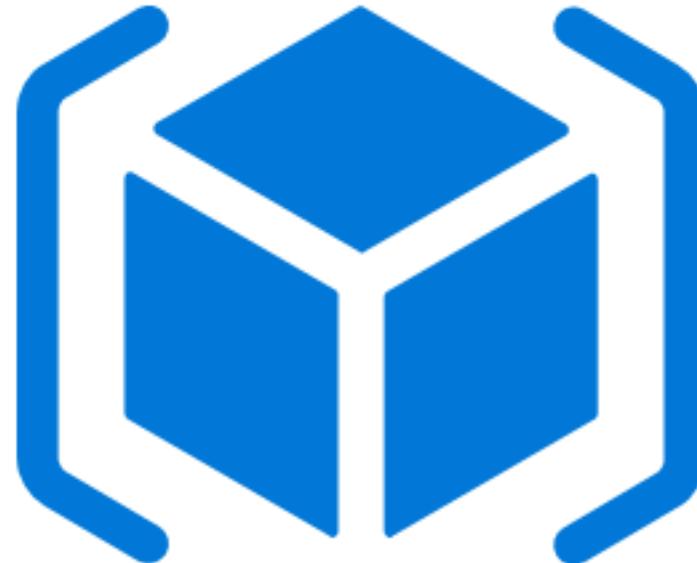
Resource Groups and Regions



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Resource Groups

- Logical container that is used to hold related solutions
- Ideally - lifecycle based
- Useful:
 - Resource Locks
 - Resource Tagging
 - RBAC
 - Exporting to templates



Regions

- Set of datacenters within a geographical area
- 60+ regions and 160 data centers
- Considerations
 - Compliance
 - Network latency
 - Fault tolerance



DEMO

Logging into Azure



Section:

Intro to Azure Infrastructure as a Service (IaaS)

Understanding Azure Virtual Machines (VMs) and their Components

Infrastructure as a Service (IaaS)

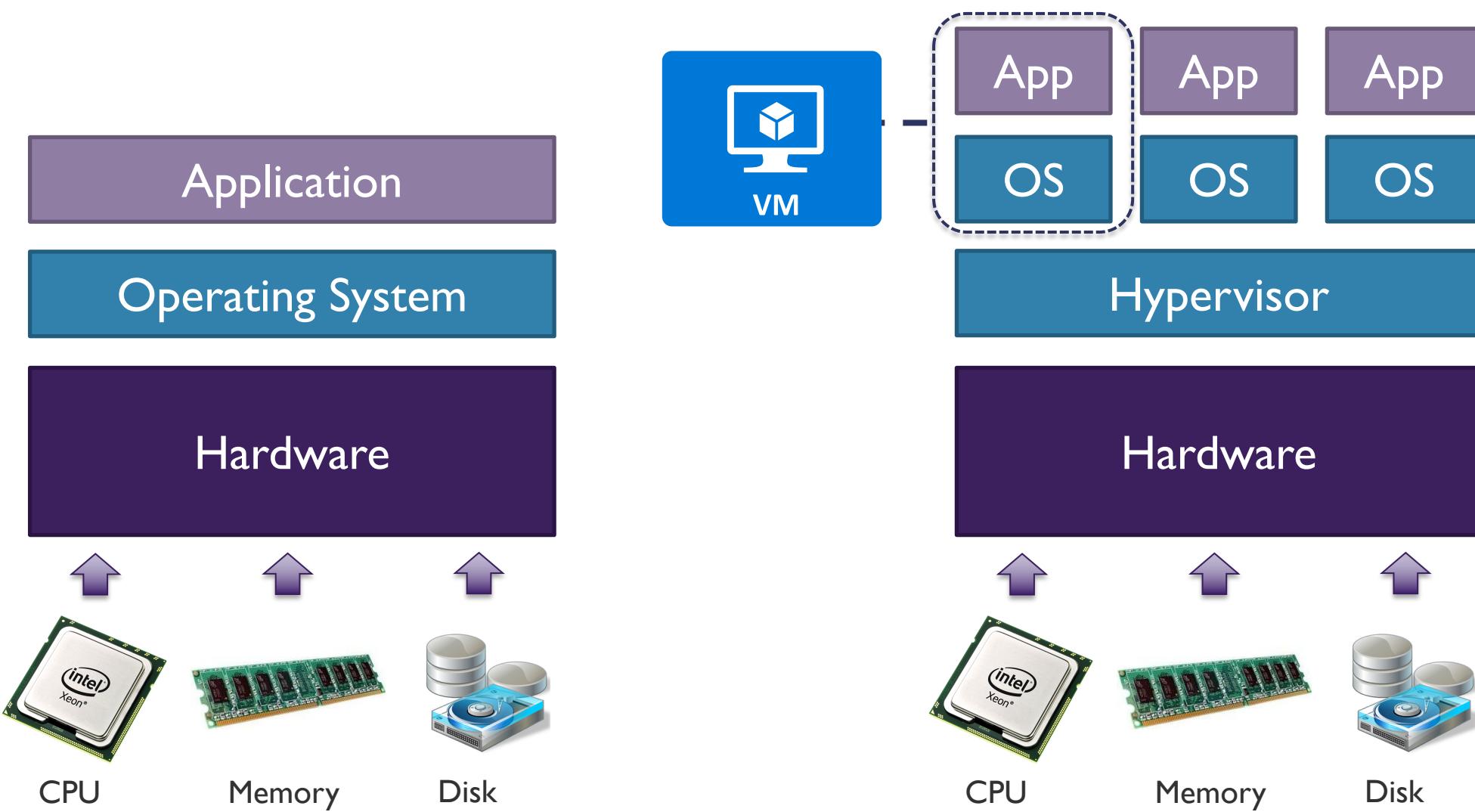
- Azure Virtual Machines
- Support Linux and Windows OS
- Multiple sizes and types to support a variety of workloads



Introduction to Virtual Machines



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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.

VM Specializations



S

Premium Storage
options available

Example: DSv2

M

Larger memory
configuration of
instance type

Example: Standard A2m_v2

R

Supports remote
direct memory
access (RDMA)

Example: H16mr

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

Supported OS Versions

Windows Server Support



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

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

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: GitHub
		CentOS 6.4+: In kernel	
CoreOS	494.4.0+	In kernel	Source code: GitHub
Debian	Debian 7.9+, 8.2+	In kernel	Package: In repo under "waagent" Source code: GitHub
Oracle Linux	6.4+, 7.0+	In kernel	Package: In repo under "WALinuxAgent" Source code: GitHub
Red Hat Enterprise Linux	RHEL 6.7+, 7.1+	In kernel	Package: In repo under "WALinuxAgent" Source code: GitHub
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: GitHub
openSUSE	openSUSE Leap 42.2+	In kernel	Package: In Cloud:Tools repo under "python-azure-agent" Source code: GitHub

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

Regional Limitations

Products	United States										Canada	
	NON-REGIONAL*	EAST US	EAST US 2	CENTRAL US	NORTH CENTRAL US	SOUTH CENTRAL US	WEST CENTRAL US	WEST US	WEST US 2	CANADA EAST	CANADA CENTRAL	
- Compute												
Virtual Machines		●	●	●	●	●	●	●	●	●	●	
A0 - A7		●	●	●	●	●	●	●	●	●	●	
Av2		●	●	●	●	●	●	●	●	●	●	
B-series	●								●			
A8 – A11 (Compute Intensive)	●				●	●		●				
D-series	●	●	●	●	●	●		●				
Dv2-series	●	●	●	●	●	●	●	●	●	●	●	
Dv3-series	●	●						●	●	●	●	
DS-series	●	●	●	●	●	●		●				
DSv2-series	●	●	●	●	●	●	●	●	●	●	●	
DSv3-Series	●	●							●			
Ev3-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

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Deploy VM from the Portal



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Managing Access to our VM



Introduction to ARM Templates

ARM Templates Overview



```
{  
  "$schema": "http://schema.management.azure.com/schemas/2015-01-01/deploymentTemplate.json#",  
  "contentVersion": "1.0.0.0",  
  "parameters": {},  
  "variables": {},  
  "resources": [  
    {  
      "name": "[concat('storage', uniqueString(resourceGroup().id))]",  
      "type": "Microsoft.Storage/storageAccounts",  
      "apiVersion": "2016-01-01",  
      "sku": {  
        "name": "Standard_LRS"  
      },  
      "kind": "Storage",  
      "location": "North Central US",  
      "tags": {},  
      "properties": {}  
    }  
  ],  
  "outputs": {}  
}
```



Resource
(E.g. Storage Account)

- Apply Infrastructure as Code
- Download templates from Azure Portal
- Author new templates
- Use Quickstart templates, provided by Microsoft

ARM File Types



ARM Template File

Describe the configuration
of your infrastructure via a
JSON file

ARM Template Parameter File

Separate your parameters
(optional)

Deployment Scripts

E.g. PowerShell for
Deployment

ARM Template Constructs



Parameters

Define the inputs you want to pass into the ARM template during deployment.

Variables

Values that you can use throughout your template. Used to simplify your template by creating reuse of values.

Resources

Define the resources you wish to deploy or update.

Outputs

Specify values that are returned after the ARM deployment is completed.

Creating a VNet using ARM templates



- Define a Vnet with the following properties
 - Name: ExampleVnet
 - Address Space: 10.10.0.0/16
 - One subnet named: ExampleSubnet01
 - Subnet Prefix: 10.10.0.0/24
- Two files
 - arm-vnet.json
 - arm-vnet.parameters.json

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Creating a VNet and Subnet using ARM Templates



Section:

Azure App Services

Understanding App Services and Web Apps

App Service Plan Overview

- PaaS that allows you to build and host a variety of web platforms
- Defines a set of computer resources available to the Web Apps
- Offers high availability and the ability to scale workloads
- Supports automated deployments from any Git repo

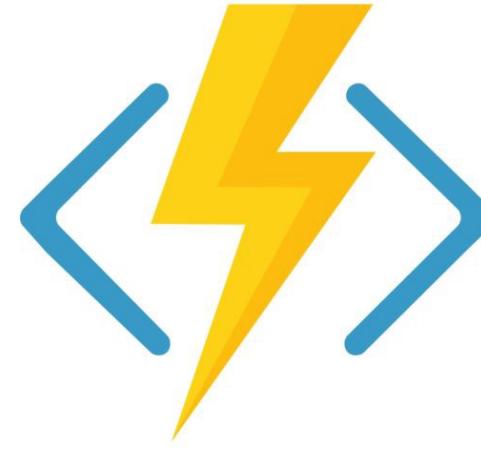


App Service Plan Features



- Multiple tiers to choose from to ensure you get the performance and features required
- CI/CD Support
- Supports Linux, Windows, and container-based workloads
- Wide variety of languages
- Can use Azure AD, Google, Facebook, Twitter or other MS accounts for authentication
- Fully isolated environment using App Service Environments

App Service Plan



Web Apps
(API Apps)

Mobile Apps

Azure Functions

Deploying Code to Web Apps

- Multiple ways to update code to a Web App
 - FTP
 - Run from a package
 - Git (Local or hosted)
 - Cloud Sync (OneDrive/Drop Box)
- Deployment Slots
 - Allows you to run multiple version of code at the same time
 - Allows you to “Swap” slots with no dropped requests.



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Setup App Service Plan



Web App Settings

Configuring Web Apps



Language Specific Settings

Settings specific to that Web App. Encrypted at rest

Connection Strings

Allows you to connect with a third party

SSL Settings

Has a default SSL cert created but you can purchase or use a third-party certificate

Custom Domain Names

Associate a custom domain name with the Web App

App Service Plan Metrics



Component	Description
CPU Percentage	The average CPU used across all instances of the plan.
Memory Percentage	The average memory used across all instances of the plan.
Data In	The average incoming bandwidth used across all instances of the plan.
Data Out	The average outgoing bandwidth used across all instances of the plan.
Disk Queue Length	The average number of both read and write requests that were queued on storage. A high disk queue length is an indication of an application that might be slowing down due to excessive disk I/O.
HTTP Queue Length	The average number of HTTP requests that had to sit on the queue before being fulfilled. A high or increasing HTTP Queue length is a symptom of a plan under heavy load.

Azure Web App Diagnostic Logs



I. Application

- Error
- Warning
- Information
- Verbose

2. Web Server

- Web Server Logging
- Detailed Error Message
- Failed Request Tracing

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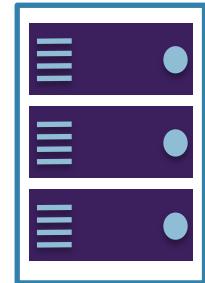
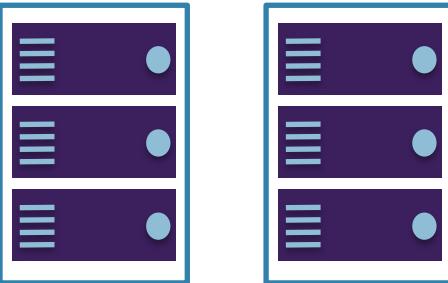
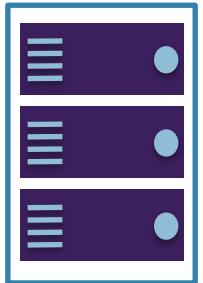
Configuring the App Service Plan



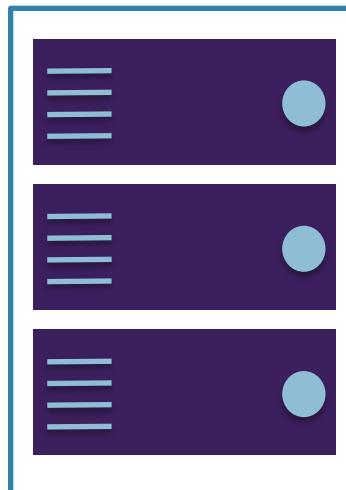
Scaling Apps



Scale Out



Scale Up



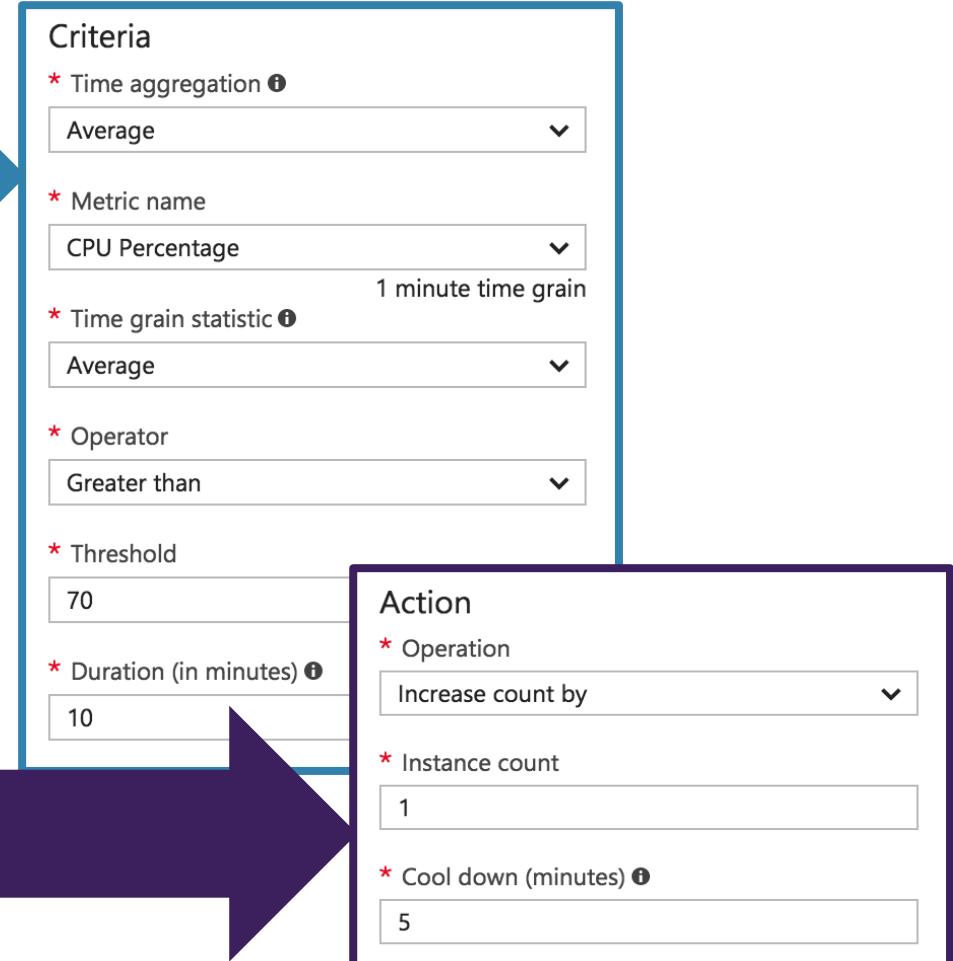
Scale Mode



Approach	Benefits
Scale based on an infrastructure metric (E.g. CPU usage)	Simple to configure.
Scale based on an application metric (E.g. Application Insights)	More accurate in determining the performance from a user perspective than pure CPU usage.
Scale to specific instance counts	If you know particular times when demand is high you can ensure the instances are already scaled out ahead of time.

Configuring Rule Sets

Configure rule criteria



The screenshot shows a configuration interface for rule sets. It is divided into two main sections: 'Criteria' and 'Action'.

Criteria:

- * Time aggregation: Average
- * Metric name: CPU Percentage
- 1 minute time grain
- * Time grain statistic: Average
- * Operator: Greater than
- * Threshold: 70
- * Duration (in minutes): 10

Action:

- * Operation: Increase count by
- * Instance count: 1
- * Cool down (minutes): 5

Decide on an action

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App Service Plan Auto Scale



Section:

Azure Functions

Introduction to Azure Functions

Azure Functions

- Lets you run code without worrying about the infrastructure
- Serverless
- Variety of languages supported
- Initiated by “Triggers”
- Bindings allow you to pass data to and from
- Multiple pricing models



Supported Languages



Language	1.x	2.x	3.x
C#	GA (.NET Framework 4.7)	GA (.NET Core 2.2)	GA (.NET Core 3.1)
JavaScript	GA (Node 6)	GA (Node 10 & 8)	GA (Node 12 & 11)
F#	GA (.NET Framework 4.7)	GA (.NET Core 2.2)	GA (.NET Core 3.1)
Java	N/A	GA (Java 8)	GA (Java 11 ¹ & 8)
PowerShell	N/A	GA (PowerShell Core 6)	GA (PowerShell 7 & Core 6)
Python	N/A	GA (Python 3.7 & 3.6)	GA (Python 3.8, 3.7, & 3.6)
TypeScript	N/A	GA ²	GA ²

Triggers

- Kicks off a function
- Only one trigger per function
- Different trigger types can provide unique data to the function
- functions.json

```
JSON
Copy

{
  "dataType": "binary",
  "type": "httpTrigger",
  "name": "req",
  "direction": "in"
}
```

Trigger Types



HTTP

Timer

Service Bus
(Topic & Queue)

Event Hub

Cosmos DB

Storage
(Blob and Queue)

Bindings

- Provides a way to accept data and return a result
- Each binding has a direction "In" or "Out"

JSON

Copy

```
{  
  "bindings": [  
    {  
      "type": "queueTrigger",  
      "direction": "in",  
      "name": "order",  
      "queueName": "myqueue-items",  
      "connection": "MY_STORAGE_ACCT_APP_SETTING"  
    },  
    {  
      "type": "table",  
      "direction": "out",  
      "name": "$return",  
      "tableName": "outTable",  
      "connection": "MY_TABLE_STORAGE_ACCT_APP_SETTING"  
    }  
  ]  
}
```

Function Consumption Plans



Consumption

Premium

Dedicated
(App Service)

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Creating our First Function



Durable Functions



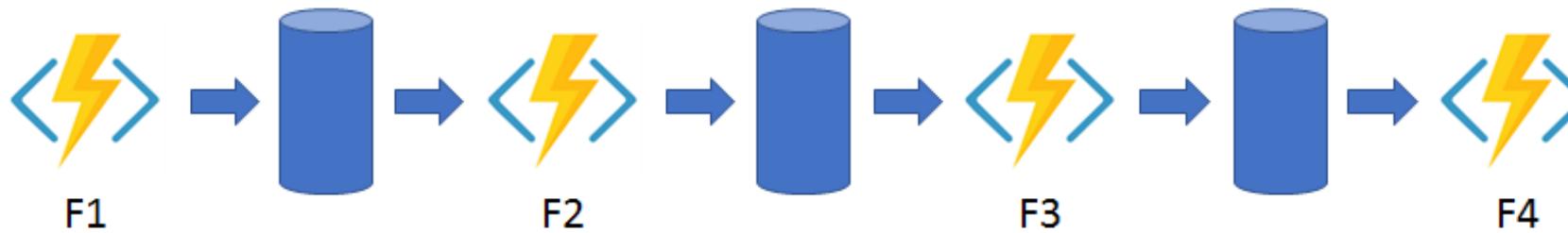
S K Y L I N E S
A C A D E M Y

Azure Durable Functions

- Function becomes stateful
- Orchestrator functions
 - Controls the order that actions are executed
- Activity functions
 - These execute the individual tasks
- Entity functions
 - Read and update state throughout the process

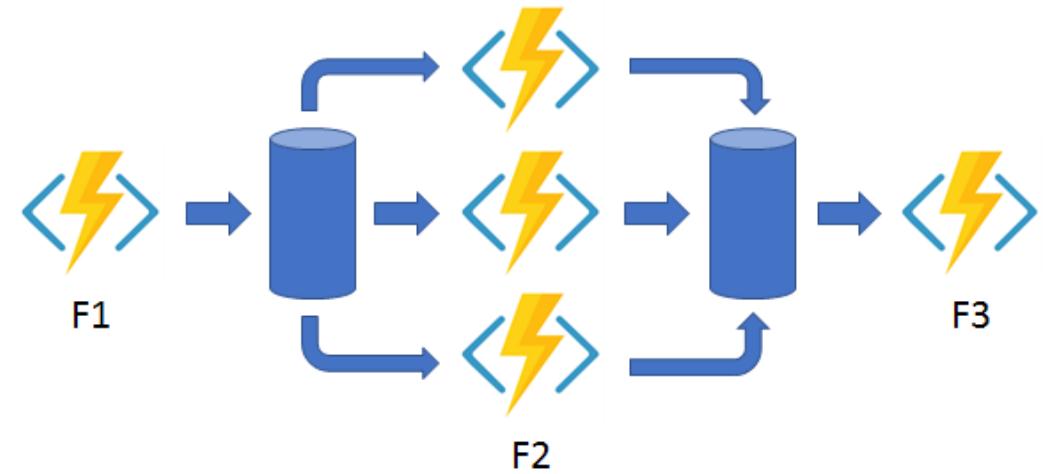
Azure Durable Functions

Multiple patterns



Chaining

Fan In/Out



Section:

Cosmos DB

Intro to Cosmos DB



What is Cosmos DB?

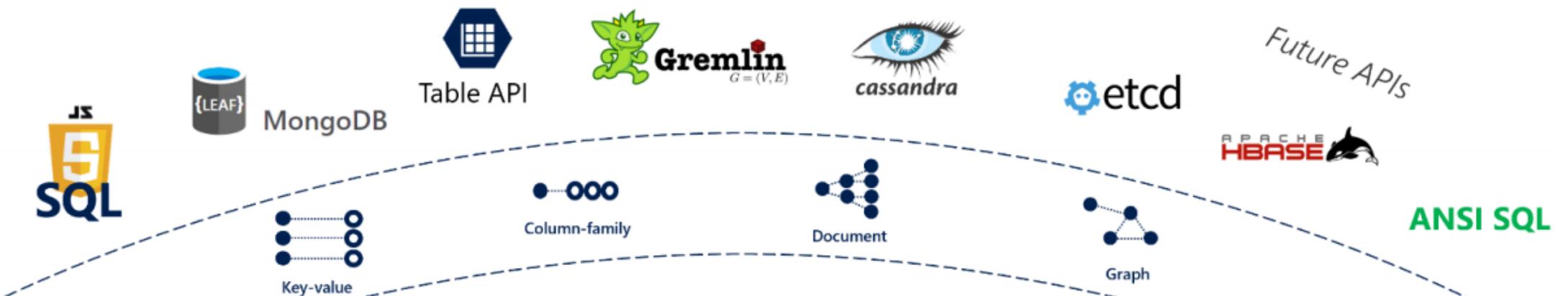
- Microsoft's NoSQL/non-relationship solution
- Supports multiple APIs/Data models
- Elastically scale for throughput and storage
- Globally distributed
- Variable consistency options



Data Models/APIs

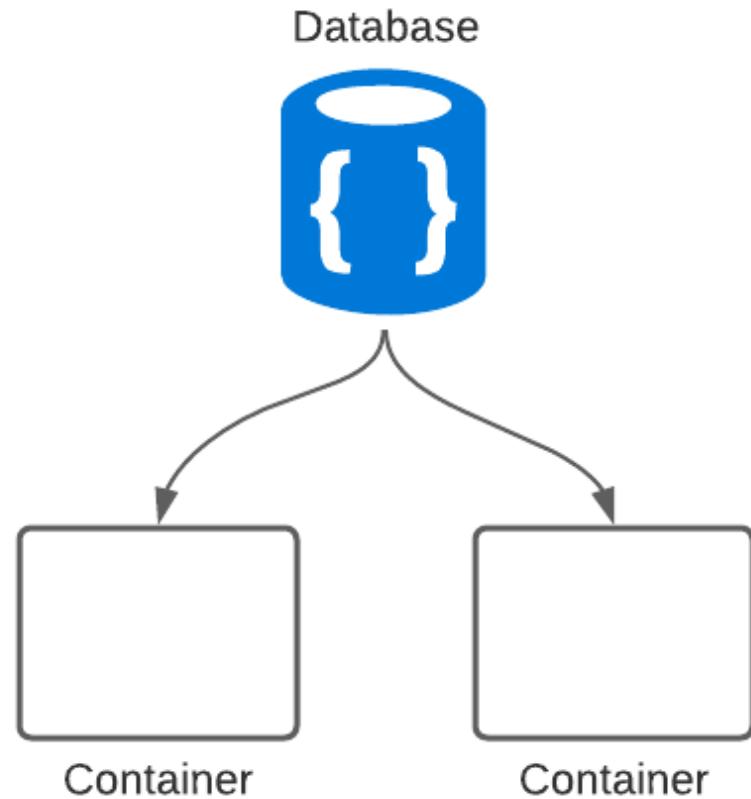
- Choose the data Model/API type:
 - DocumentDB
 - MongoDB
 - Cassandra
 - Gremlin
 - Table
 - etcd

Image Source: Techcrunch.com



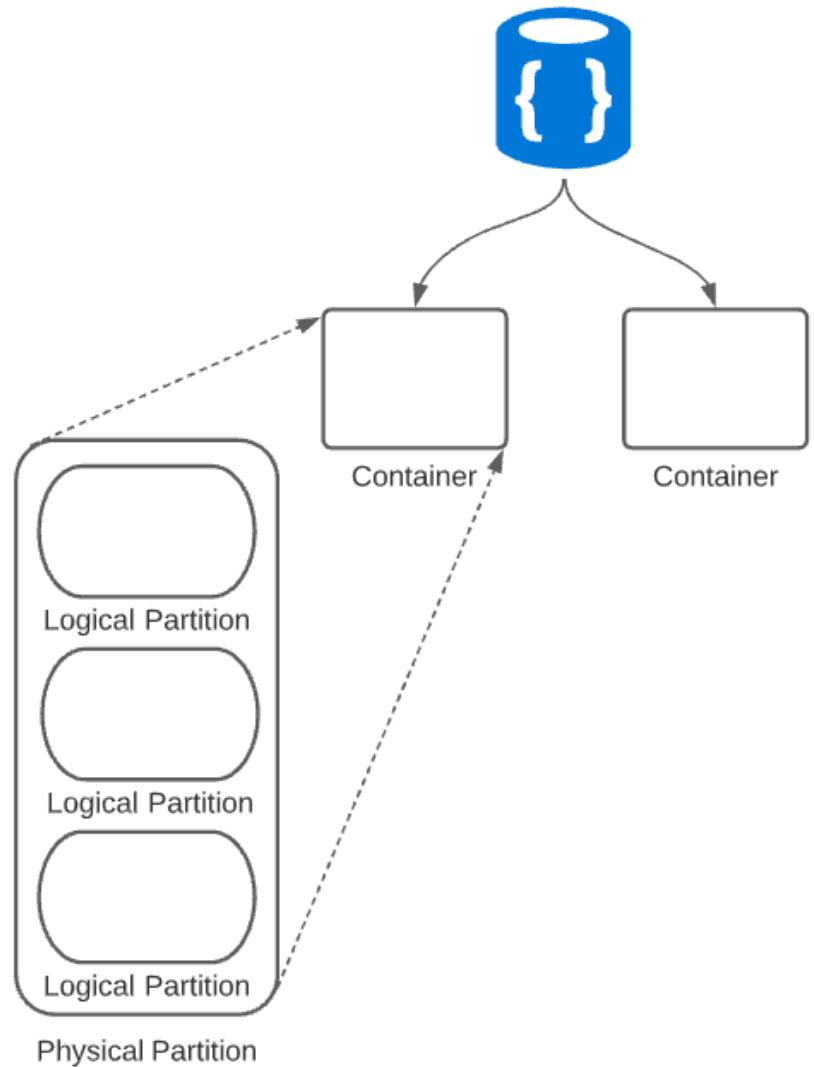
Cosmos DB Structure

- **Databases**
 - Defines the API you will be using
- **Containers**
 - Manage the throughput (performance)
 - Contains one or more physical partitions



Cosmos DB Structure (continued)

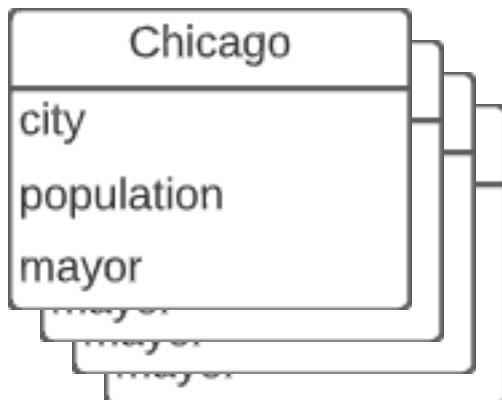
- **Physical Partitions**
 - Consists of one or more logical partitions
 - Managed by CosmosDB
 - Provide 10k request units/second
- **Logical Partitions**
 - Documents grouped by Partition Key
 - Max size of 20 GB
 - No limit of in number of logical partitions



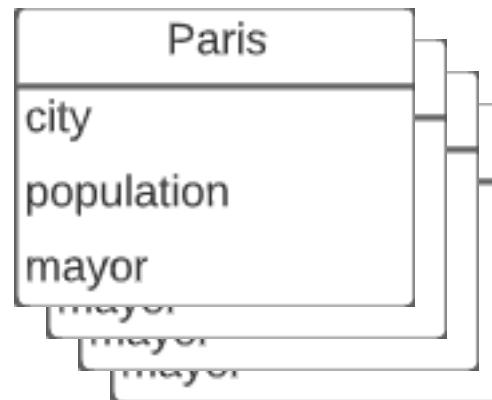
How Data is Stored

Document

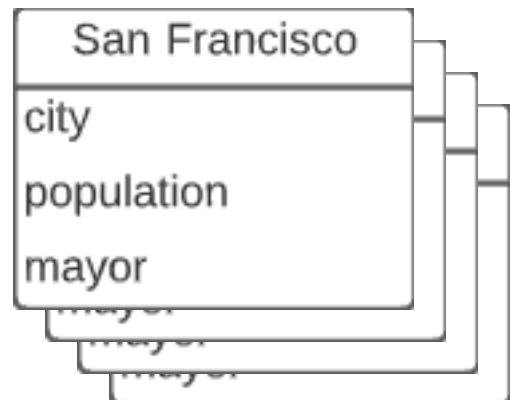
```
1 {  
2   "city": "Chicago",  
3   "date": "1/1/2020",  
4   "population": "lots",  
5   "mayor": "that one person",  
6   "highTemp": "warmer",  
7   "lowTemp": "colder",  
8   "numberOfAccidents": "too many"  
9 }
```



Logical Partition



Logical Partition



Logical Partition

Partitions



Cosmos DB

Container 1

Partition Key: City

Chicago
city
population
mayor
Paris
city
population
mayor
San Francisco
city
population
mayor

Dallas
city
population
mayor
Sydney
city
population
mayor

Physical Partition

Container 2

Partition Key: UserId

jf123456
userid
location
dob
nc654321
userid
location
dob
bb345612
userid
location
dob

gs321654
userid
location
dob
ml456123
userid
location
dob
rh435612
userid
location
dob

Physical Partition

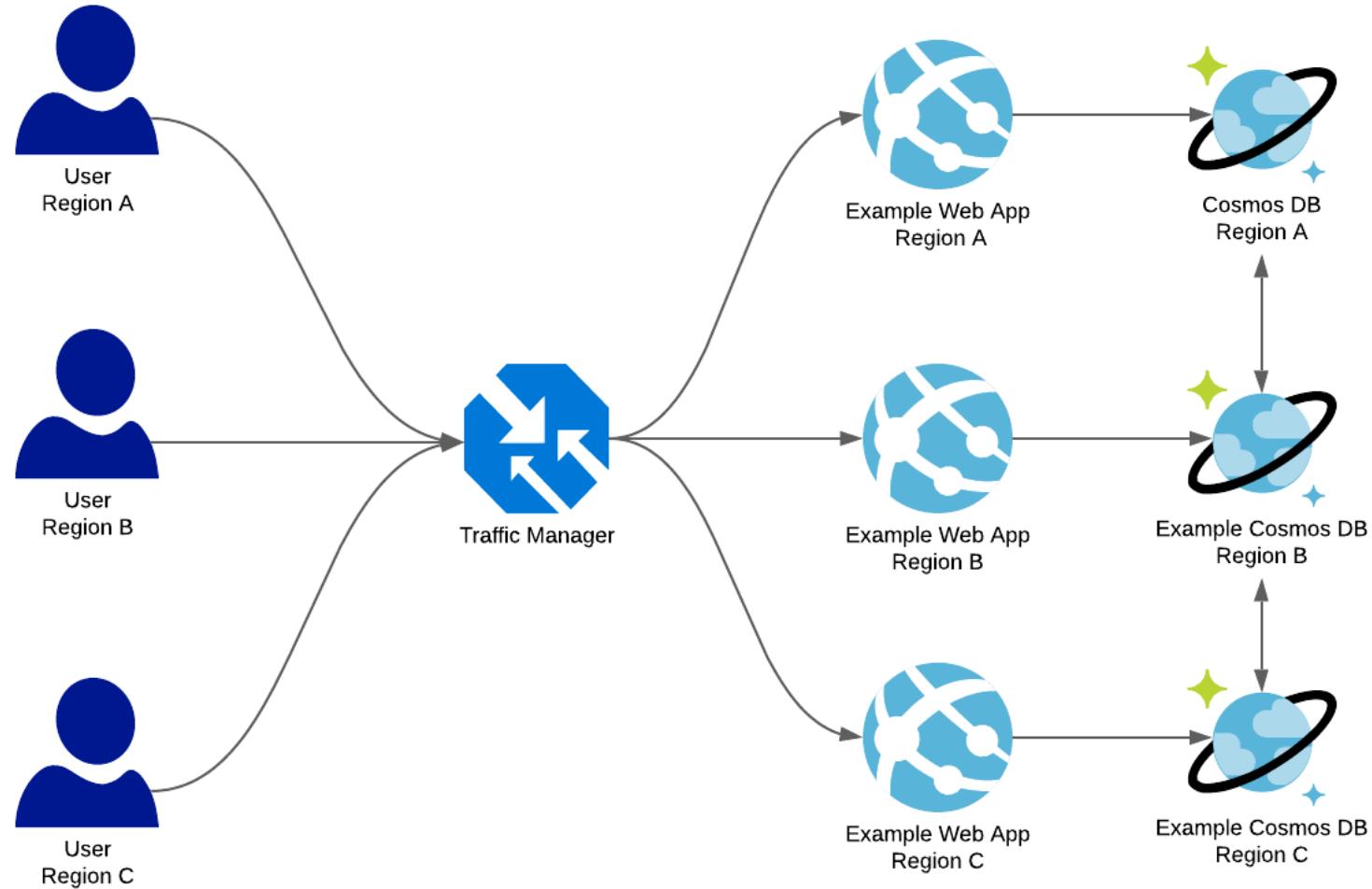
Consistency Levels



S K Y L I N E S
A C A D E M Y

Global Distribution

- Multi-master approach



Overview Consistency Levels



Strong

Bounded
Staleness

Session

W - A, B, C
R - A, B, C

W - A, B,C
R - A, B, C

W – A, B, C
R – C, A, B

Cosmos DB Consistency Levels



	Strong	Bounded Staleness	Session	Consistent Prefix	Eventual
Same Region – Single-Master	Strong	Strong	Consistent Prefix	Consistent Prefix	Eventual
Same Region – Multi-Master	Strong	Consistent Prefix	Consistent Prefix	Consistent Prefix	Eventual
Different Region – Single-Master	Strong	Consistent Prefix	Consistent Prefix	Consistent Prefix	Eventual
Different Region – Multi-Master	Strong	Eventual*	Eventual	Eventual	Eventual

Choosing the Consistency Level for SQL API



- Session is the default consistency level
- App requires strong consistency = Bounded Staleness
- App can use eventual consistency = Consistent Prefix
- Highest Availability and lowest latency = Eventual

Consistency levels for other APIs



- Cassandra
 - The write level is set the default of Cosmos DB account
 - The read level uses what is set in the Cassandra client driver
- Mongo DB
 - The Write replica is the same as what is configured on the Cosmos DB Account
 - Azure will map the read consistency level to what is configured dynamically by the Mongo DB Client on the read request

<https://docs.microsoft.com/en-us/azure/cosmos-db/consistency-levels-across-apis>

DEMO

Creating a Cosmos DB

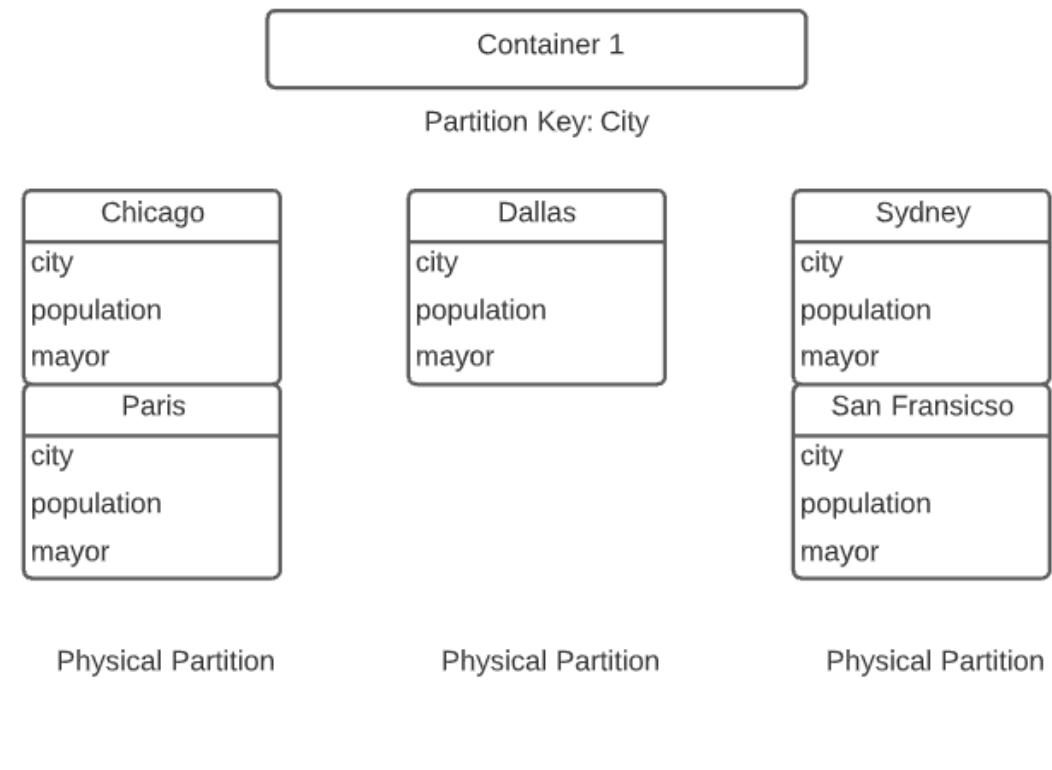
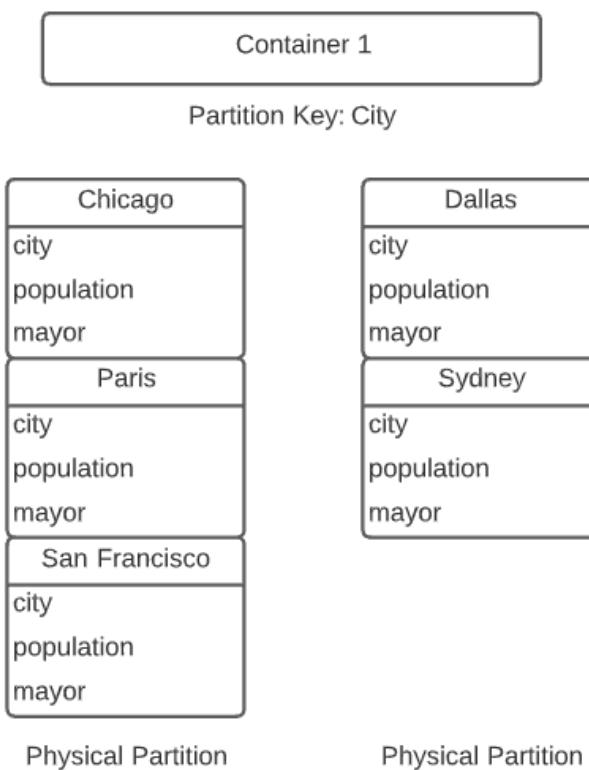


Managing Cosmos DB



Horizontal Scaling

- When your RU exceeds a physical partition Azure will automatically add another physical partition and re-allocate your logical partitions.



Server-side Programming



- **Stored Procedures**
 - Application Logic that runs against a collection in a single transaction
- **Triggers**
 - Application logic that runs before or after a CRUD operation
- **Change Feed**
 - Provide an ordered list of documents modified in a container

Section:

Azure Blob Storage

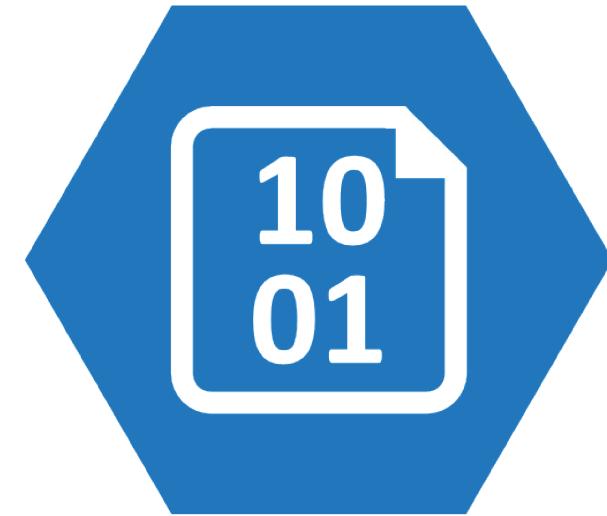
Understanding Blob Storage



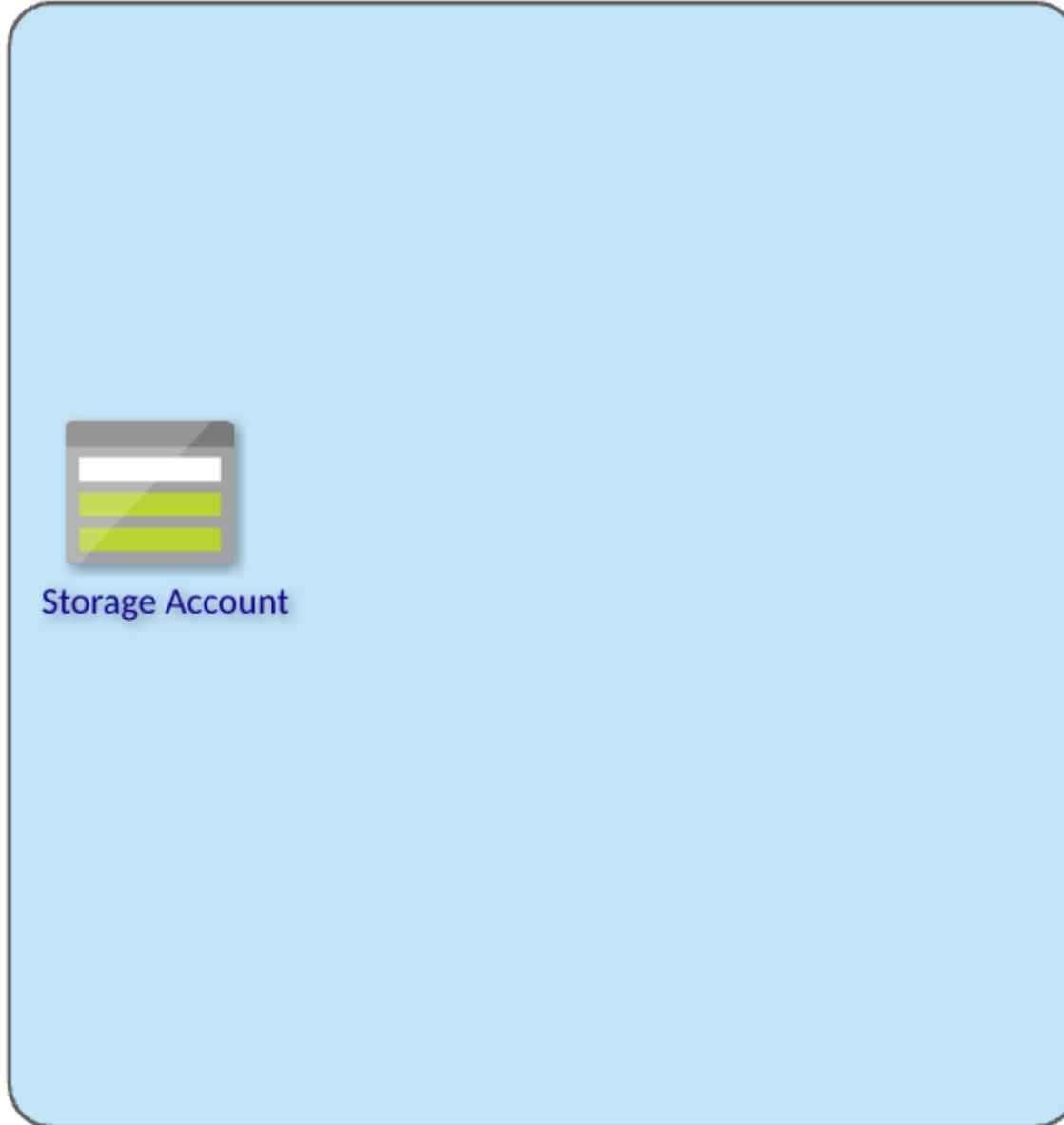
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Azure Blob Storage

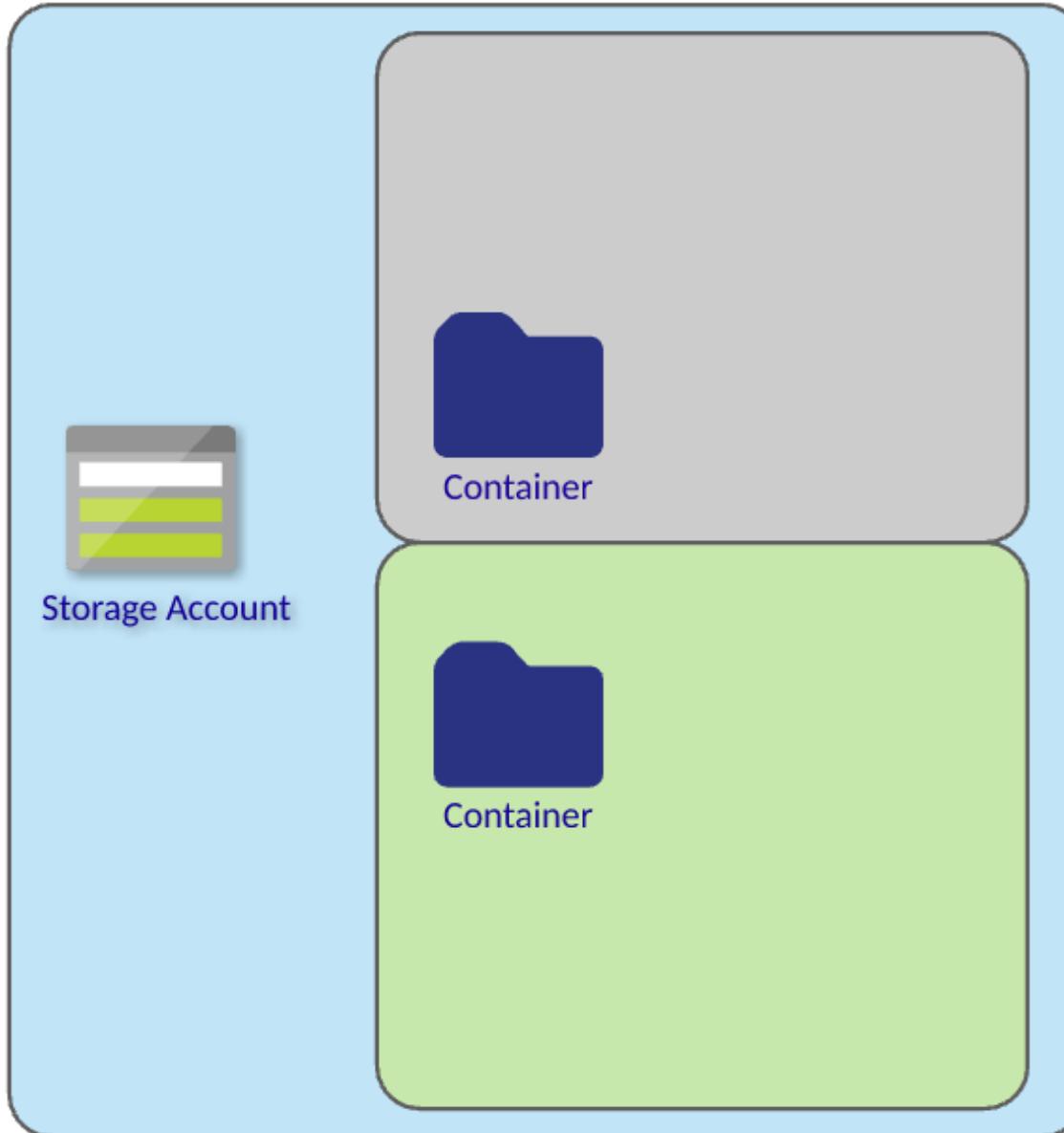
- Provides unstructured data storage
- Accessed via HTTP/HTTPS, Azure REST API, PowerShell or Azure CLI
- Tiered access levels
- Disaster recovery capabilities



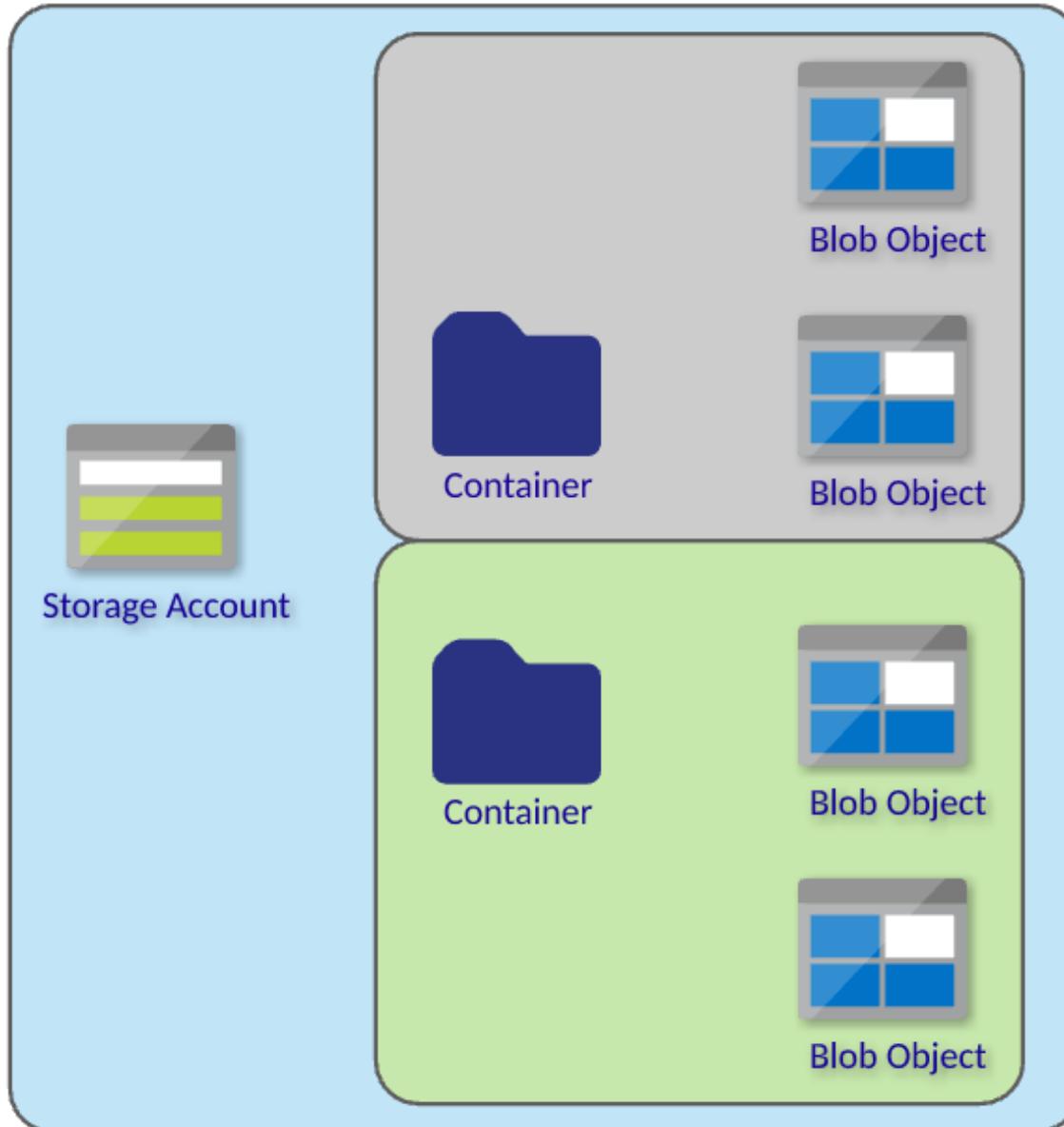
Blob Storage Structure



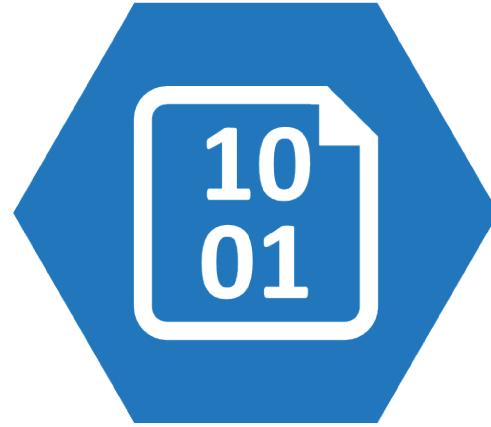
Blob Storage Structure



Blob Storage Structure



Storage Tiers



Hot

Cold

Archive

DEMO

Create Azure Blob Storage



Shared Access Signatures

Managing Access: SAS Overview



Shared Access Signature (SAS)

- It is a query string that we add on to the URL of a storage resource.
- The string informs Azure what access should be granted.

Account SAS Tokens

- Granted at the account level to grant permissions to services within the account.

Service SAS Tokens

- Grants access to a specific service within a Storage Account.

User Delegated SAS

- Uses Azure AD permissions instead of a token
- Can only be associated with Blob Storage

SAS Breakdown



Storage Resource URI

`https://slsasdemo.blob.core.windows.net/images/image.jpg`

SAS Token

`?sv=2017-07-29&ss=bfqt&srt=sco&sp=rwdlacup&se=2020-05-24T01:21:26Z&st=2020-05-18T17:21:26Z&spr=https&sig=dctAWsi39LncBNCIZRn%2FQMjMMA5CPByLzagfsF7MVYc%3D`

SAS Breakdown

(continued)



- sv=2017-07-29
- ss=bfqt
- srt=sco
- sp=rwdlacup
- se=2020-05-24T01:21:26Z&st=2020-05-18T17:21:26Z
- spr=https
- sig=dctAWsi39LncBNCIZRn%2FQMjMMA5CPByLzagfsF7MVYc%3D

Storage Service Version

Signed Services

Signed Resource Types

Signed Permission

Signed Expiry & Start

Signed Protocol

Signature

DEMO

Shared Access Signatures



Working with Azure Storage Blobs



Moving Data in Blob objects



Storage Explorer

AzCopy

Azure PowerShell
Azure CLI

Immutable Storage



WORM

Time-Based
Retention

Legal Hold

Metadata



“Set of data that describes and give information about other data”

System
Properties

User-Defined
Metadata

.NET
Azure CLI
Portal

DEMO

Working with Azure Storage Blobs



Section:

Implementing Azure Security

Azure AD Security



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- Azure Virtual Machines
- Support Linux and Windows OS
- Multiple sizes and types to support a variety of workloads



Azure AD as an Identity Provider



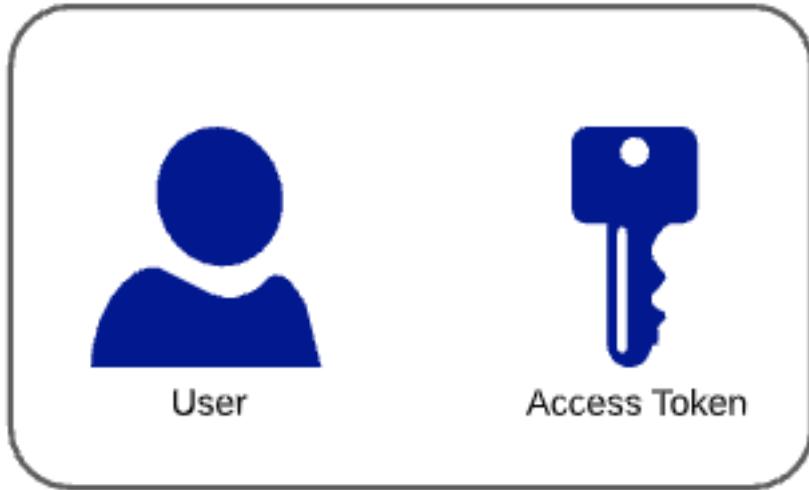
Enterprise
Identity Solution

Oauth 2.0 and
OpenID Connect

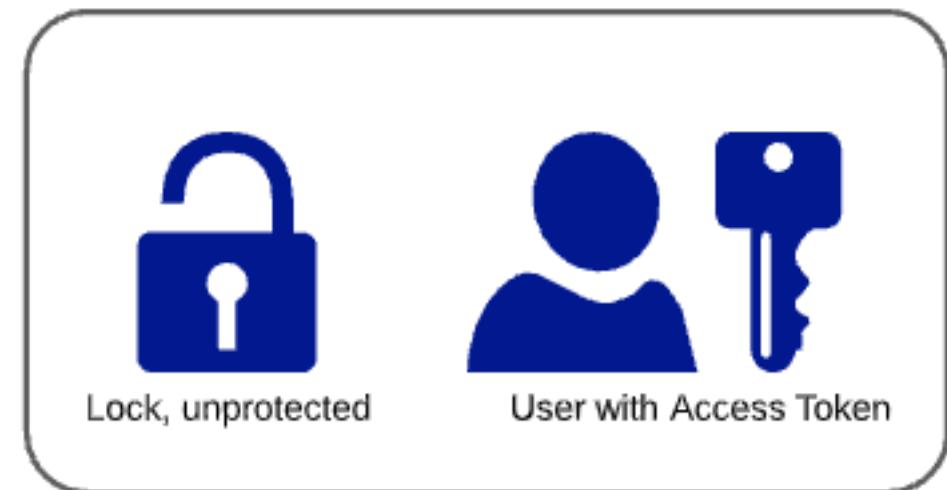
MSAL

Conditional
Access

AuthN vs AuthZ

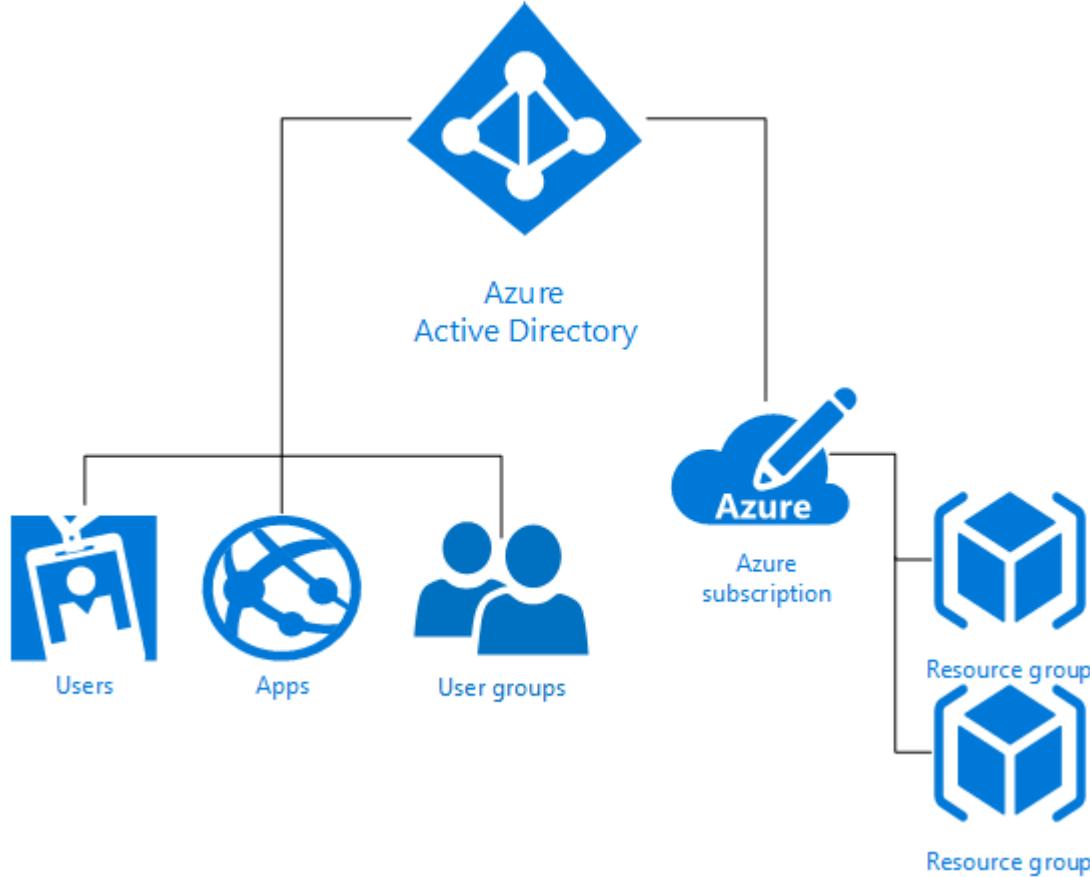


Authentication (AuthN)



Authorization (AuthZ)

RBAC Overview



- Create Users, Apps, Groups
- Assign them to objects in Azure with a specific Role

Azure RBAC Built-in Roles

(continued)



- Roles include various actions
- Action defines what type of operations you can perform on a given resource type
 - Write enables you to perform PUT, POST, PATCH, and DELETE operations
 - Read enables you to perform GET operations
- Use PowerShell to get latest roles

Get latest roles

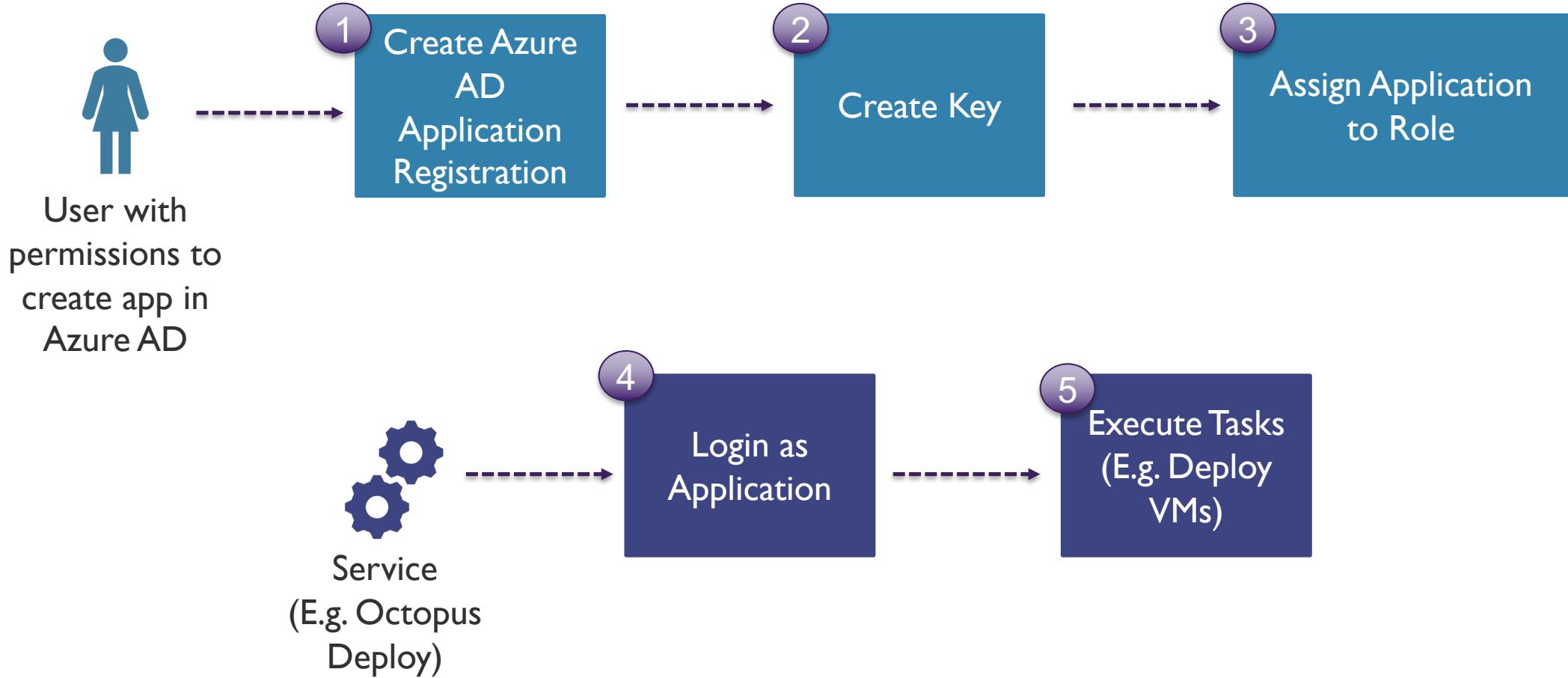
Get-AzRoleDefinition

Application Registrations/Service Principals



- Service Principal
 - Application account in the local Azure AD tenant
- Application Registrations
 - Global representation of an application for use in multiple tenants
- For each tenant, an Application Registration is created, there will be a local Service Principal to represent the application

Process for Creating a Service Principal



DEMO

Creating App Registrations



Managed Identities

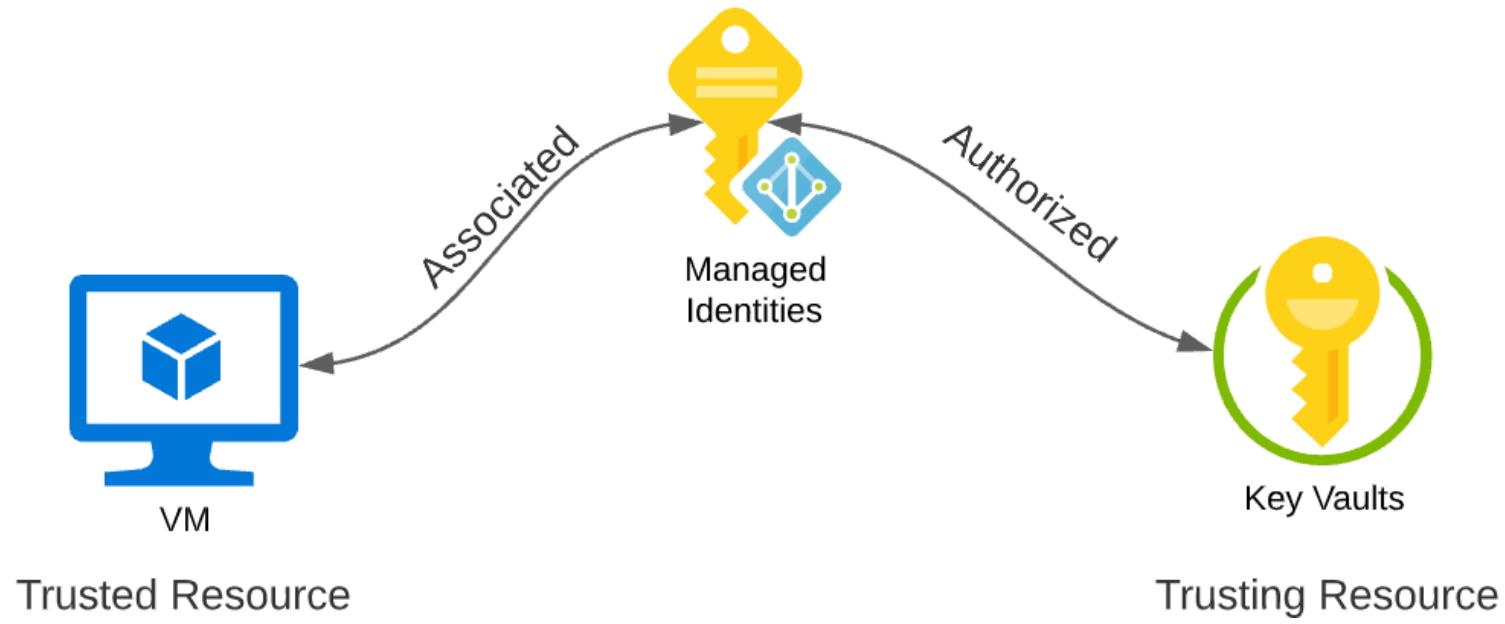
Azure Managed Identities

- Allow resources to authenticate to each other
 - Associate a managed identity with a resource
 - Assign permissions to the managed identity on another resource
- No credentials to manage
- System-assigned
- User-assigned



What is a managed identity

- Only used for authenticating between Azure resources
- Authorization is still separate



Systems vs User Assigned identities



System Assigned

- Created as part of the resource
- Shared Life Cycle
- Can not be shared

User Assigned

- Manually created and assigned to resource
- No defined lifecycle
- Can be associated with multiple resources

DEMO

Creating Managed Identities



Azure Key Vault



S K Y L I N E S
A C A D E M Y

Azure Key Vault

- Provides a secure way to store secrets, certificates, and keys
- Can be accessed via a REST API
- Integrated with Azure Services
- Can leverage Hardware Security Module
- Provides versioning



Securing your Key Vault



RBAC

Access Policies

Networking

Multiple Key
Vaults

DEMO

Setting up Azure Key Vault



Leveraging Key Vault



S K Y L I N E S
A C A D E M Y

Azure Key Vault

- Replace secrets with pointers



DEMO

Utilizing Azure Key Vault



Azure Key Vault



S K Y L I N E S
A C A D E M Y

Azure Key Vault

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S K Y L I N E S
A C A D E M Y

Azure Key Vault

- Replace secrets with pointers



DEMO

Utilizing Azure Key Vault



Delivering Content



S K Y L I N E S
A C A D E M Y

Content Delivery



Content
Delivery
Network

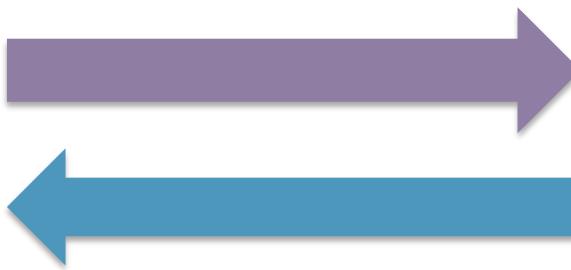
Front Door

Redis Cache

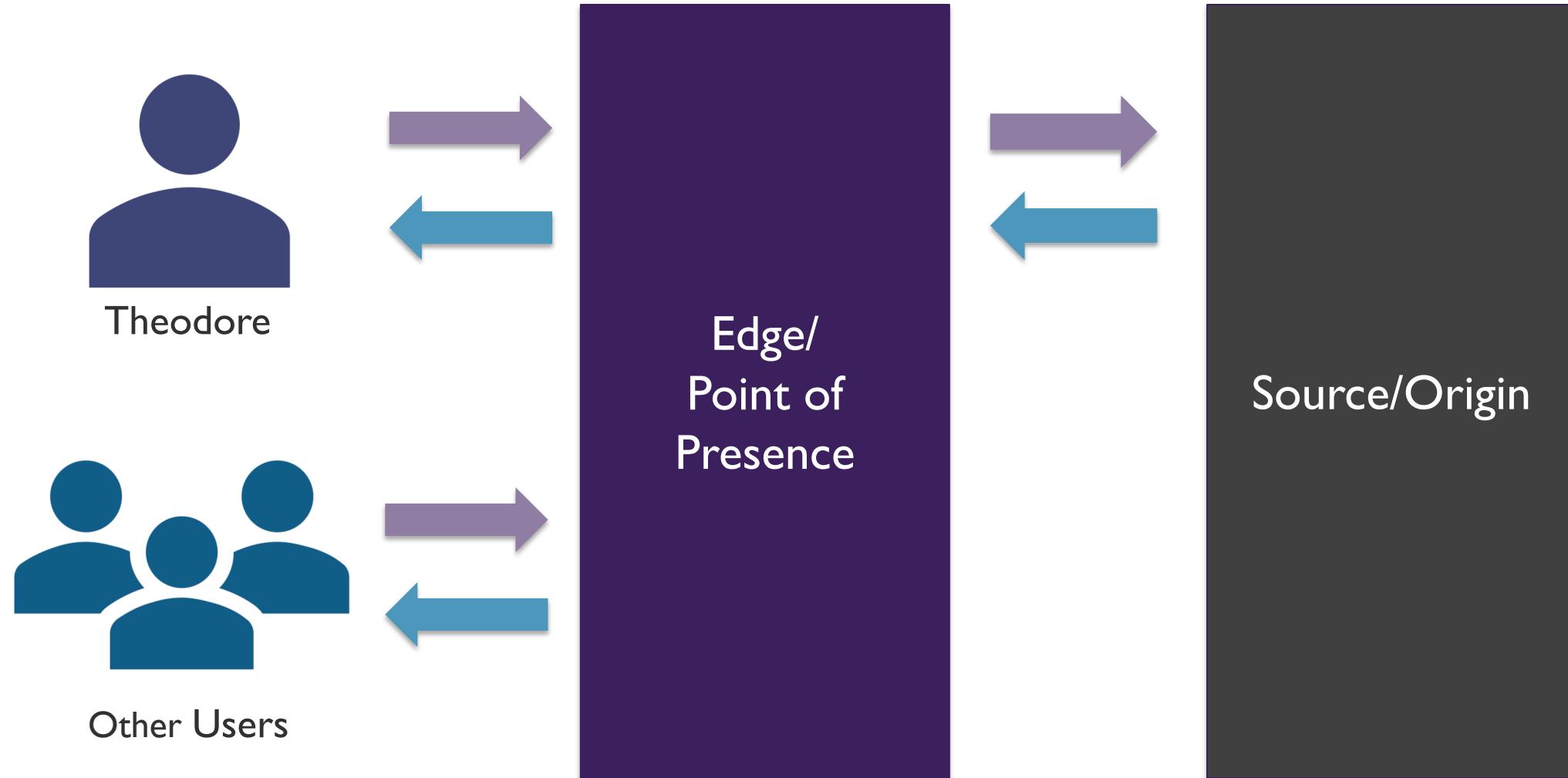
Traditional Delivery



Theodore



Delivery with CDN



Global Scale



Global Scale



Azure CDN Offerings

S3 Standard Microsoft	S1 Standard Verizon	S2 Standard Akamai	P1 Premium Verizon
 Custom domain SSL	 Custom domain SSL	 Custom domain SSL	 All standard features
 Content Purge	 Content Purge/Load	 Content Purge	 Token authentication
 Compression	 Compression	 Compression	 Performance analyti...
 Geo-filtering	 Geo-filtering	 Geo-filtering	 Realtime analytics
 Realtime analytics	 Core analytics	 Media optimization	 Mobile device rules
 Rules engine	 Dynamic delivery	 Core analytics	 Custom rules engine
 Web Application Fir...		 Dynamic delivery	 Cache/Header setti...
 HTTP Raw Logs			 URL redirect/rewrite

<https://docs.microsoft.com/en-us/azure/cdn/cdn-features>

CDN Caching

- **Caching Rules**
 - Global
 - Custom

- **Caching Behavior**
 - Bypass
 - Override
 - Set if missing



DEMO

Create Azure CDN



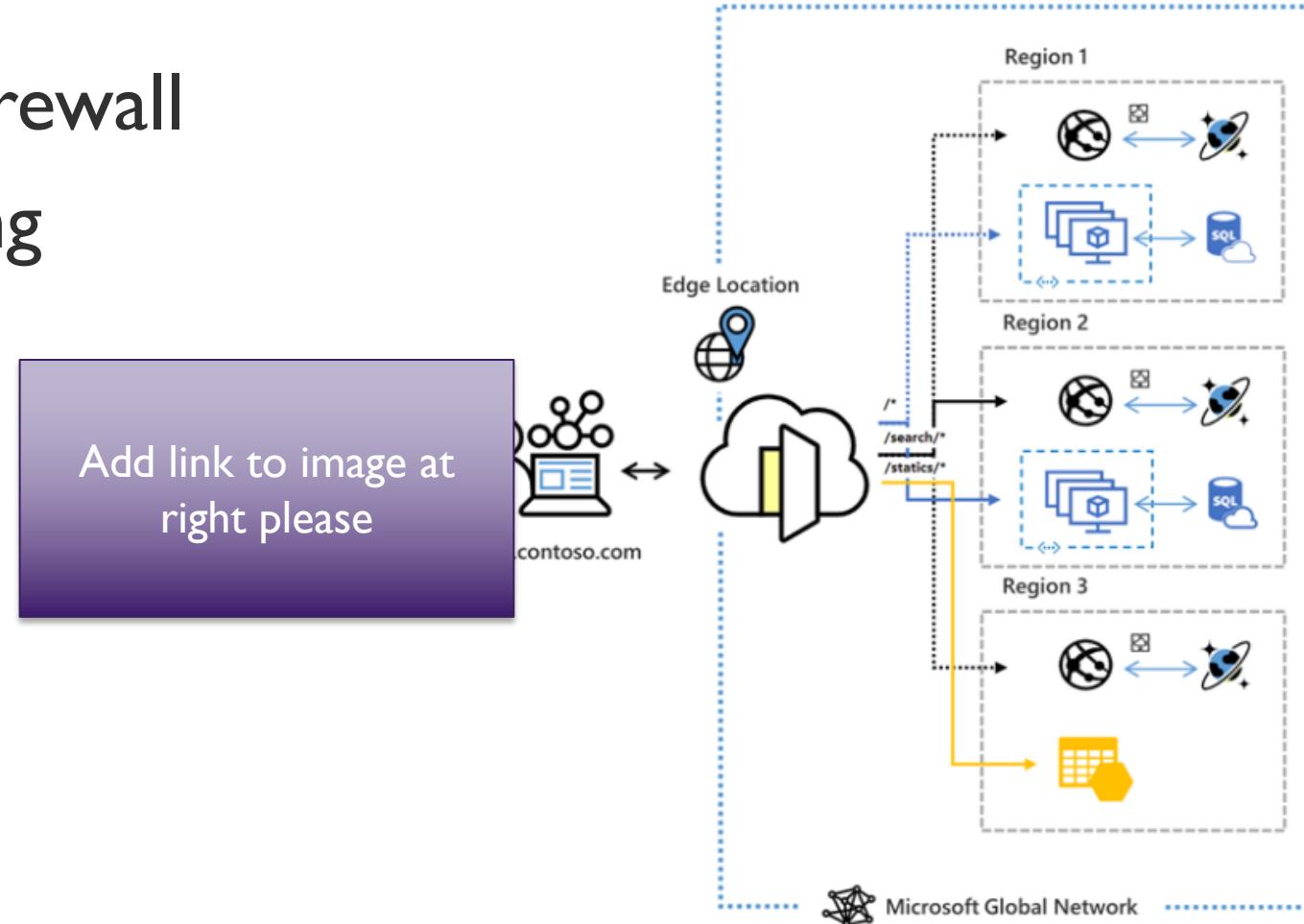
Azure Front Door



SKYLINES
ACADEMY

Azure Front Door

- Global Layer 7 Firewall
- Path based routing
- Load balancing
- SSL Offloading



Front Door Caching



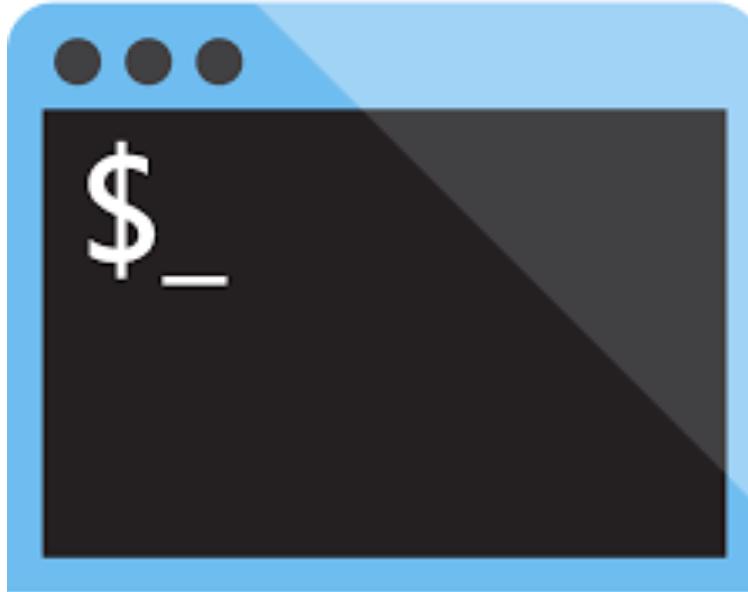
Object
Chunking

File
Compression

Query String

Request
Headers*

Front Door Cache Purging



- Cache Purge
- Cache-Control Headers
- Cache Duration

Azure Cache for Redis

Azure Cache for Redis

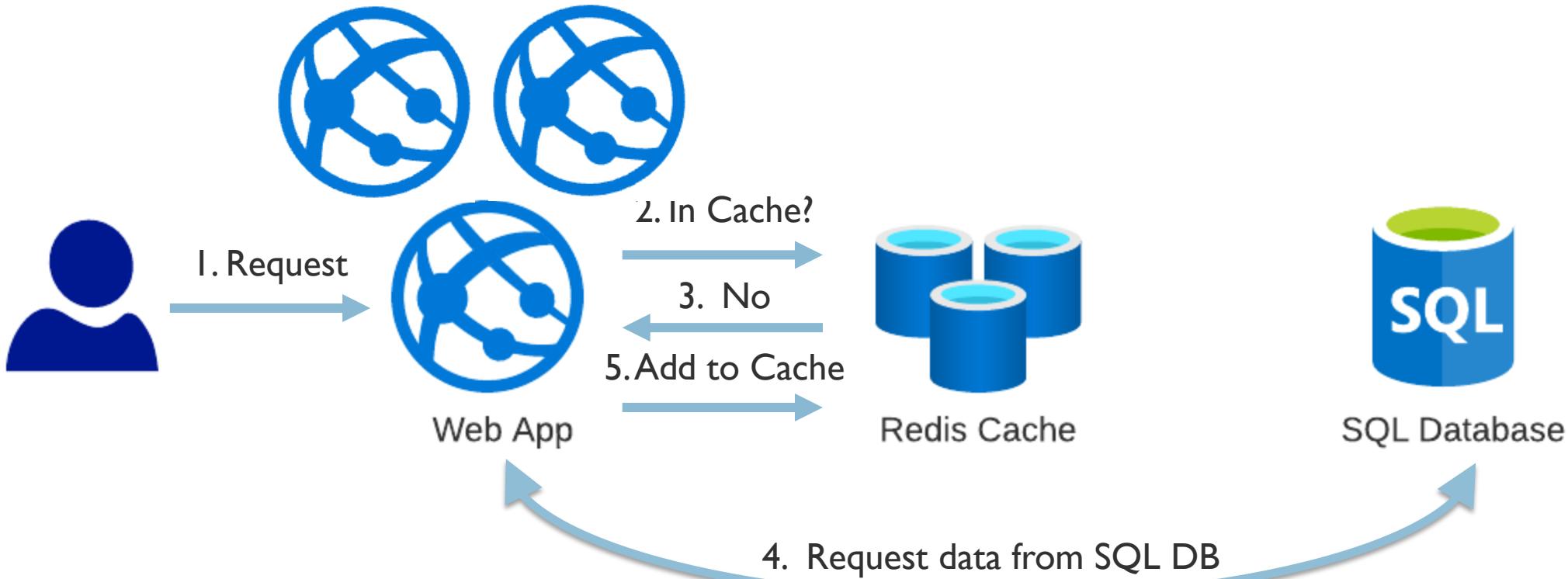


Distributed
Caching Engine

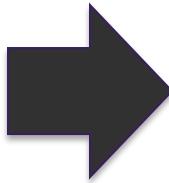
Full API
support

Azure or
External

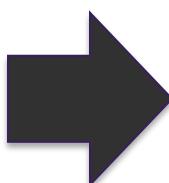
How Redis Cache works



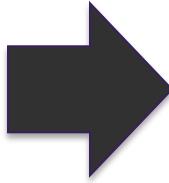
Redis Cache SKUs



- Single node cache
- Multi Memory Sizes – 250MB through 53 GB
- No SLA.



- Two node Cache
- Primary/Replica
- SLA



- Update 1.2 TB
- Geo Replication
- Data Persistence
- Import and Export data

Architecture Patterns



Data Cache

Content Cache

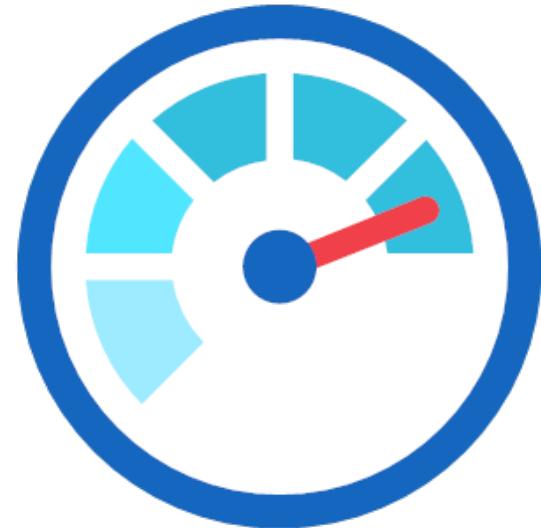
Session Store

Job and Message
Queuing

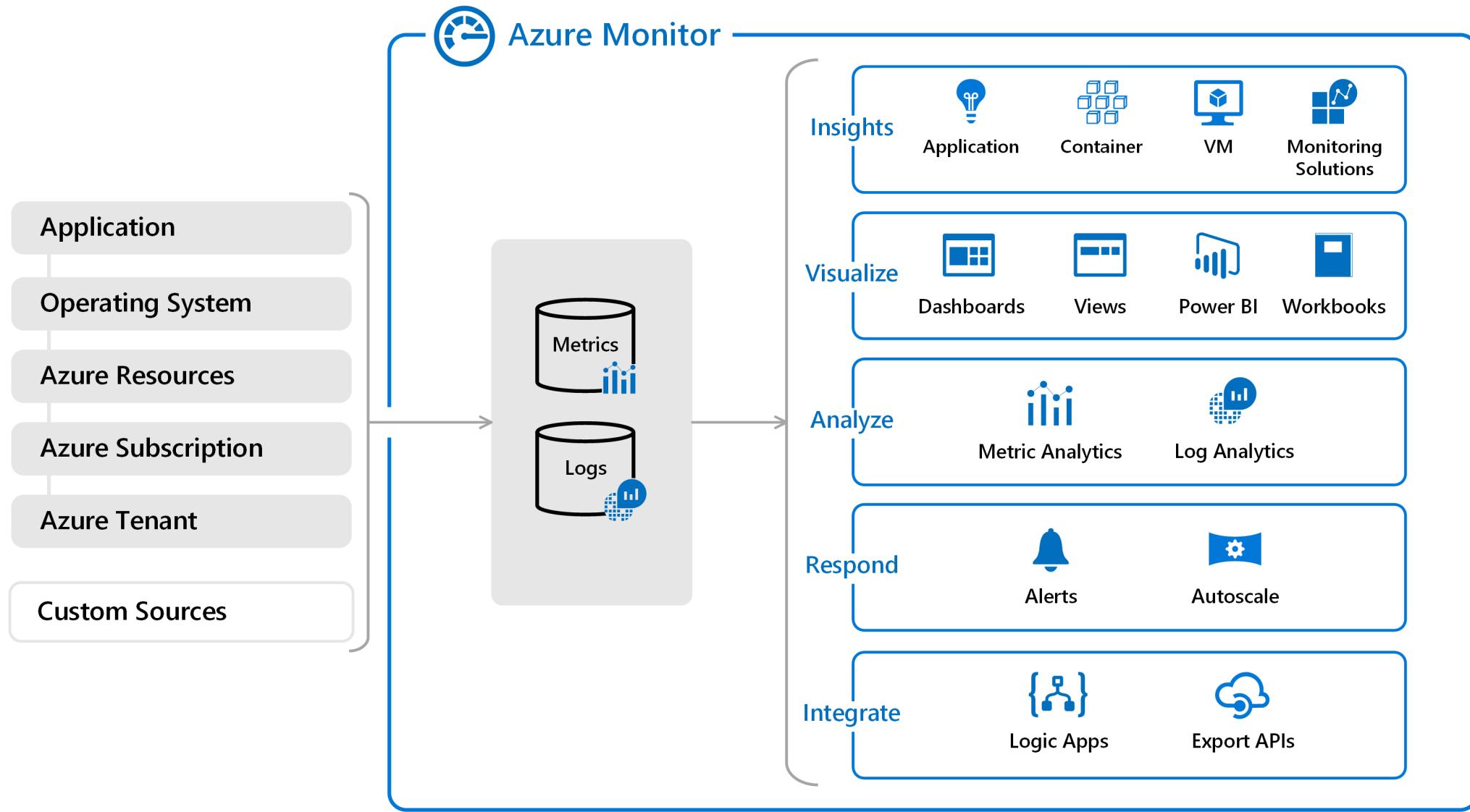
Application Insights

Azure Monitor

- Central location to monitor all resources
- Monitor within Azure
- Identify issues
- Create Alerts and auto remediation



Azure Monitor



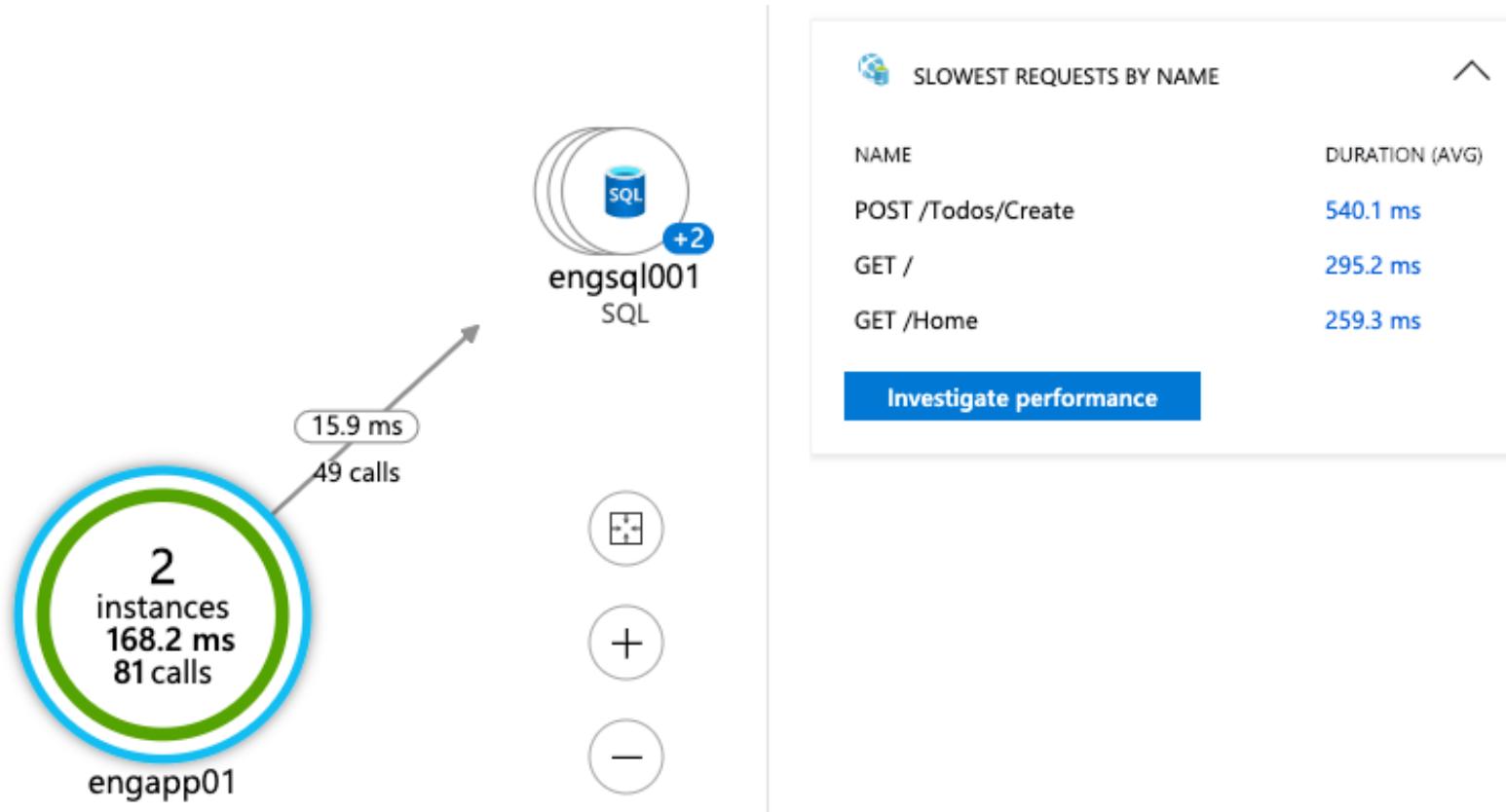
Application Insights

- Monitor details within your application
- Codeless and Code-based deployments
- Leverages Log Analytics for the backend



Application Map

- Details about each of the component to help paint the big picture
- Analytics specific requests



Monitoring Web Traffic



Funnel

User Flows

Impact

Retention

Cohorts

Deploying Application Insights



- Codeless monitoring
 - Push button
- Code-based Monitoring
 - Existing Application Insights
 - Application Insights Package

```
{  
  "ApplicationInsights": {  
    "InstrumentationKey": "putinstrumentationkeyhere"  
  },  
  "Logging": {  
    "LogLevel": {  
      "Default": "Warning"  
    }  
  }  
}
```

DEMO

Leveraging Application Insights



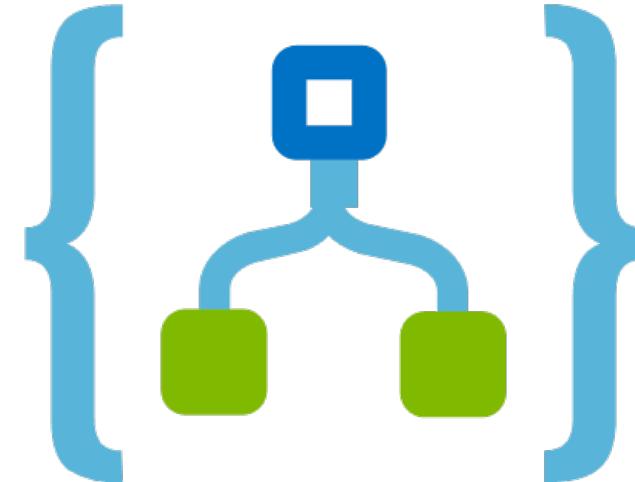
Logic Apps



S K Y L I N E S
A C A D E M Y

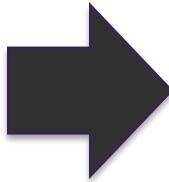
Logic Apps

- Orchestrator to automate workflows
- Integration with many applications
- Helps glue the old with the new
- “Serverless”



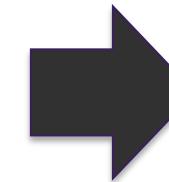
Components of Logic App

Trigger



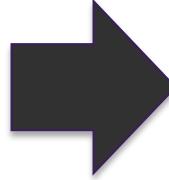
- Defines what will initiate the Logic App
- Can run on a schedule or be initiated by another action
- Polling and Push triggers

Connection



- Provides integration with other resources
- Built in ones work with Azure Resources
- Standard and Enterprise work with third parties

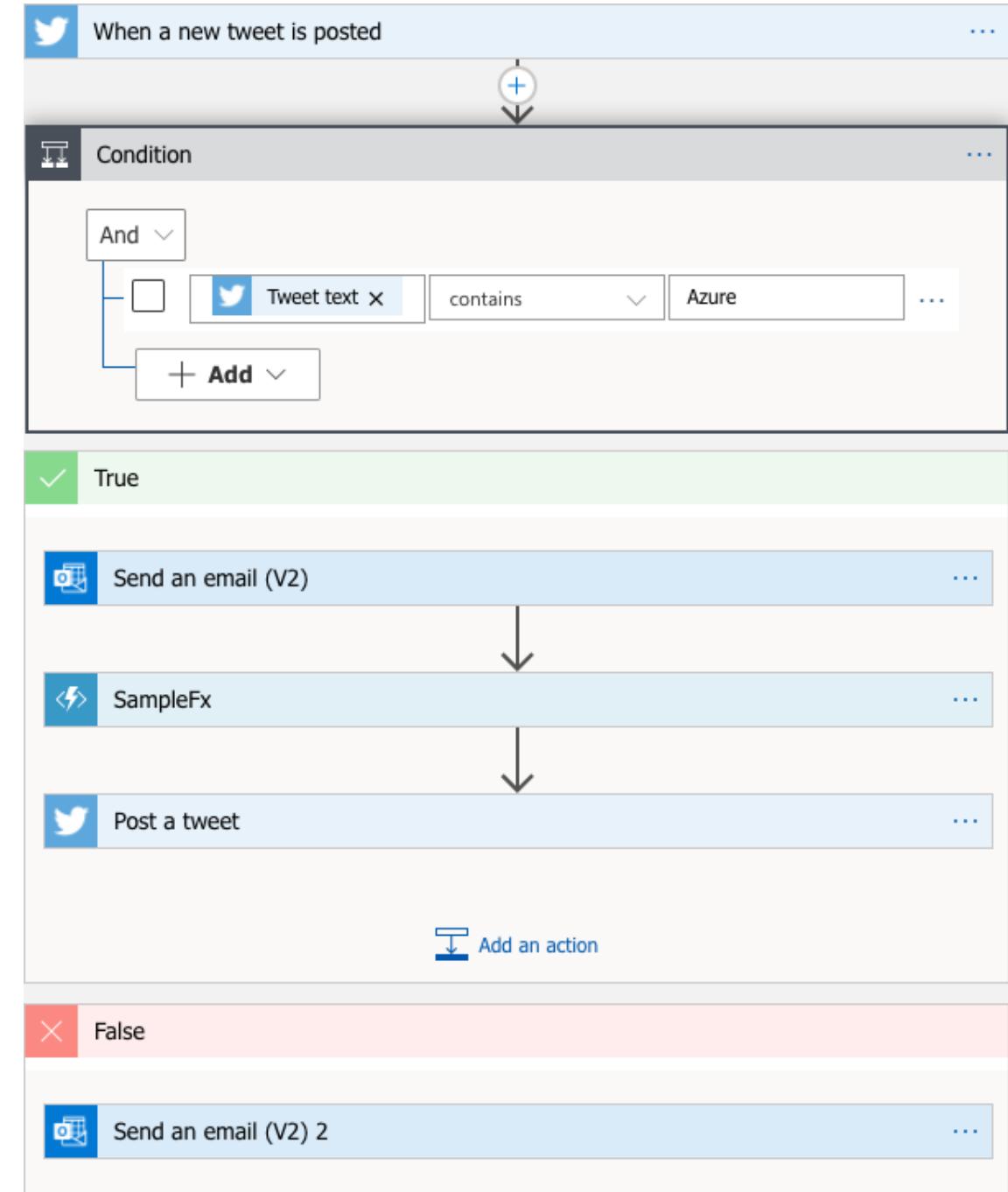
Action



- Defines what tasks the Logic App will complete
- Can be defined using Designer or via JSON

Logic App Designer

- Graphical interface for creating your workflow
- Easily add connectors and see options available
- Can easily see the JSON code within the designer.



Logic App Pricing



Consumption Based	Integrated Service Environment (ISE)
Only pay for when the amount of times.	Fixed Price
Depends on the connectors used. Standard and Enterprise connectors have a higher cost than Built-in connectors	You are limited by capacity of the SKU. The Premium ISE model allows you to scale. The Developer ISE tier is fixed.
Does not allow Vnet Integration	Vnet Integration available

DEMO

Create a Logic App



Logic App Templates



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Custom Templates

- Logic App and all parameters
- ARM Template
- Created using Visual Studio or PowerShell

```
$parameters = @{
    Token = (az account get-access-token | ConvertFrom-Json).accessToken
    LogicApp = 'SkylinesLogicApp'
    ResourceGroup = 'Skylines'
    SubscriptionId = (Get-AzContext).Subscription.Id
    Verbose = $true
}

Get-LogicAppTemplate @parameters | Out-File ./SkylinesLogicApp.json
```

Deploying Logic App



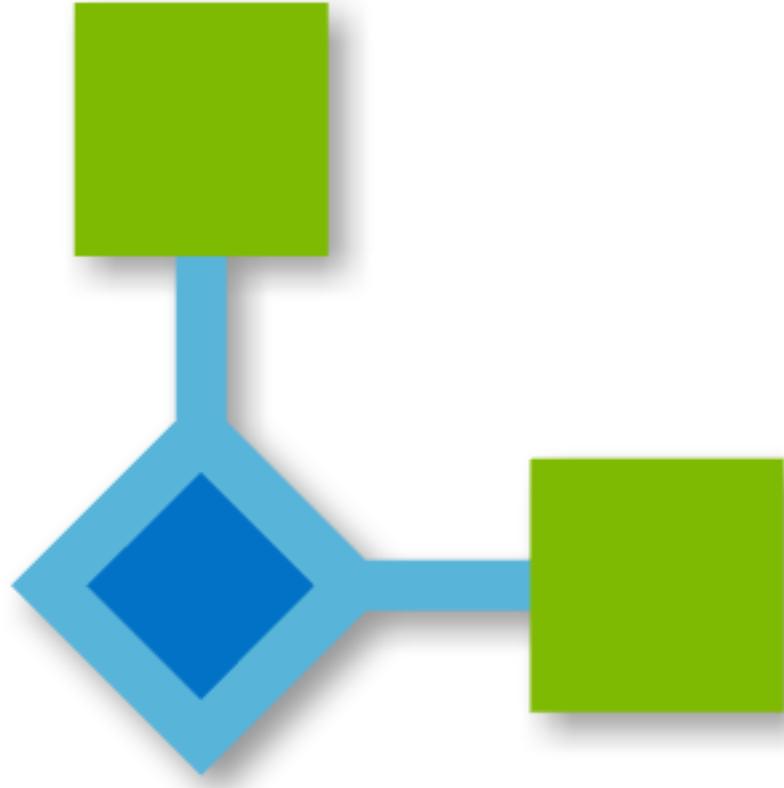
- Deployed using any other tool that supports ARM deployments

```
az group deployment create \
--resource-group Skylines \
--template-uri ./SkylinesLogicApp.json
```

Custom Connectors

Logic Apps Custom Connector

- Wrapper around REST or SOAP API
- Can be Public or Private
- Securing your API
- Defining the connector
 - OpenAPI
 - Postman Collection
 - Start from Scratch



DEMO

Creating a Logic App Custom Connector



API Management



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Azure API Management

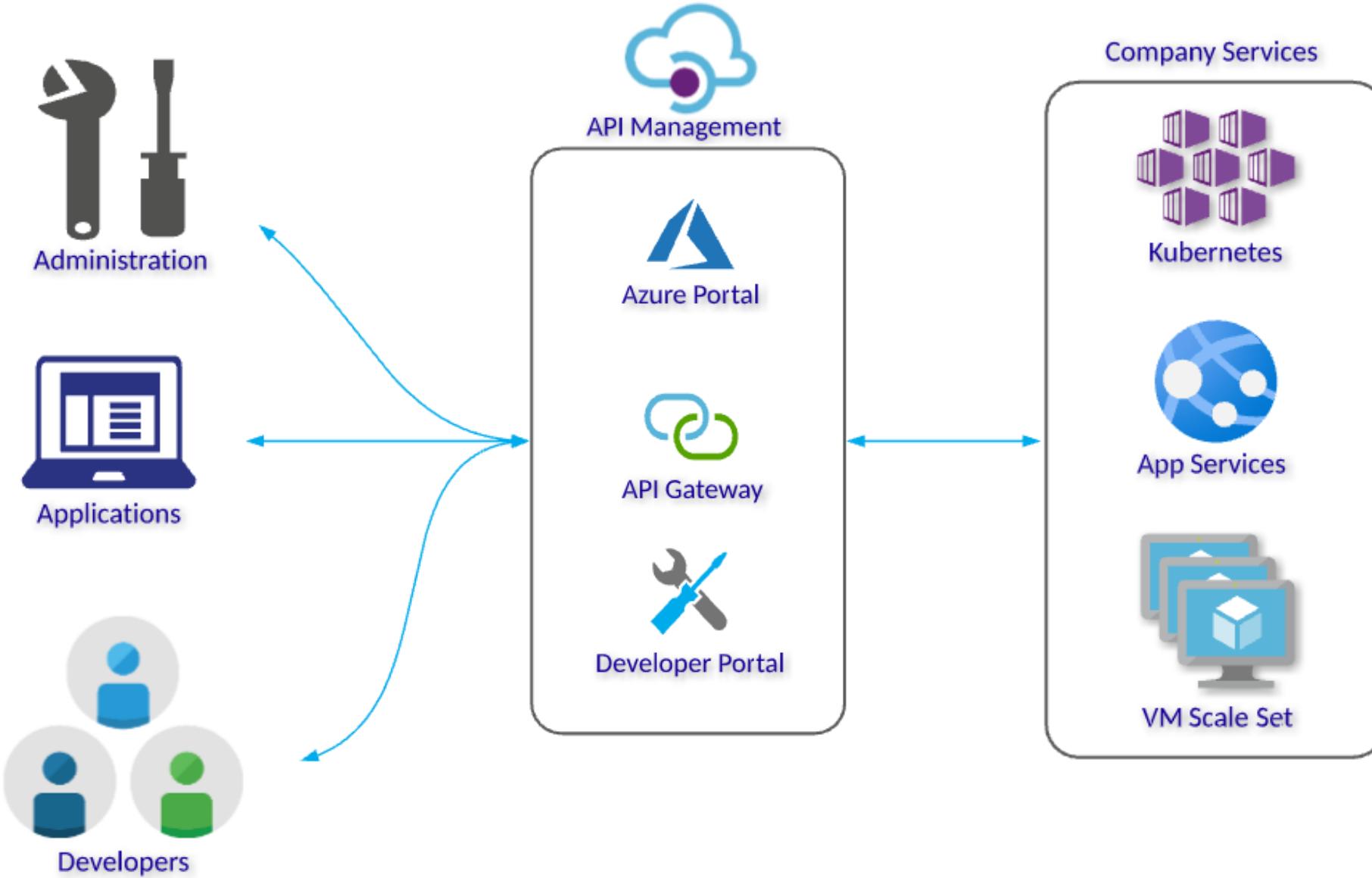
Layer of protection

Policies

Versions and revisions



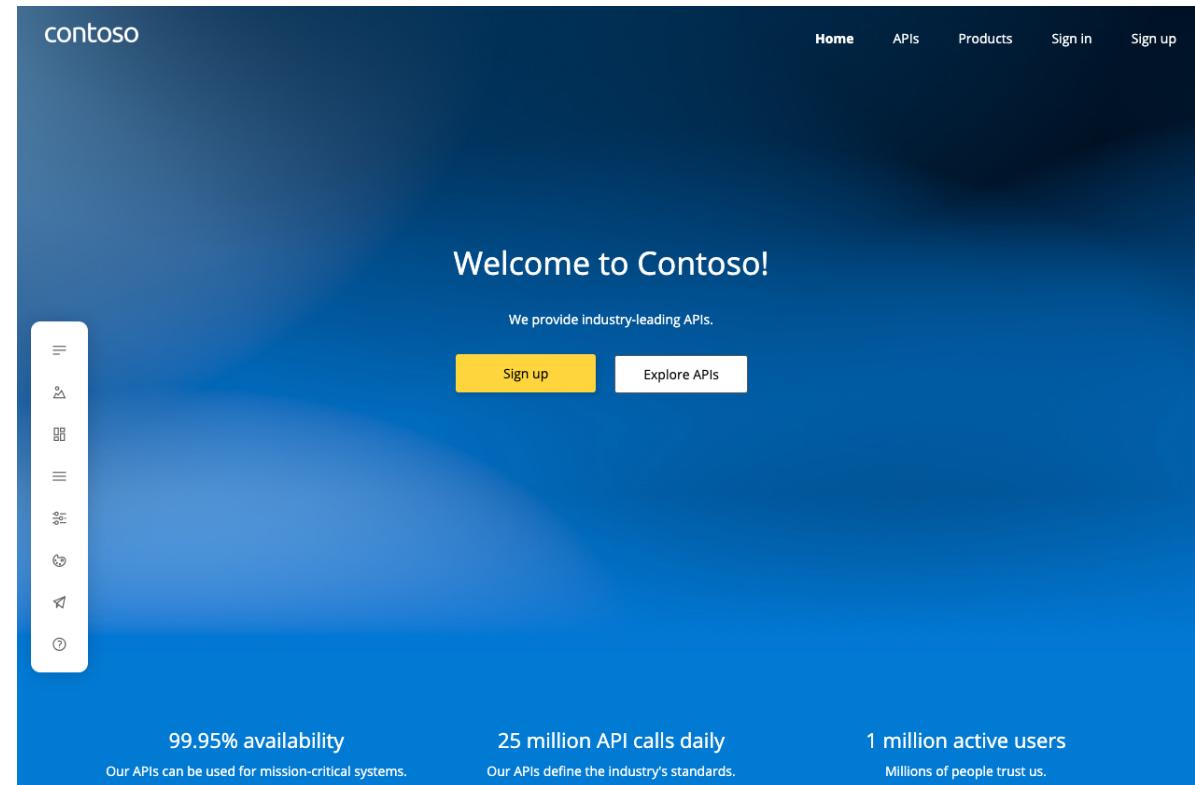
Azure API Management



Developer Portal



- Provide documentation for the APIs hosted
- Customizable
- Highly extensible
- Managed vs self hosted
 - More the one developer portal
 - Customer developer portal



Subscriptions



DEVELOPER



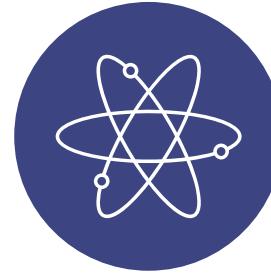
SUBSCRIPTION A



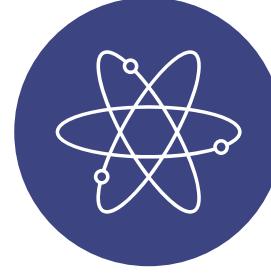
SUBSCRIPTION B



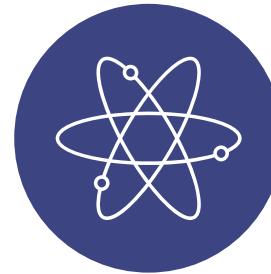
SUBSCRIPTION C



PRODUCT 1



PRODUCT 2



PRODUCT 3

Authentication



Developer Portal	API Gateway
Anonymous	Anonymous
Locally-managed Credentials	Subscription Based
Identity Provider	Client Certificate

Tiers



Consumption

Developer

Basic

Standard

Premium

DEMO

Create an API Management



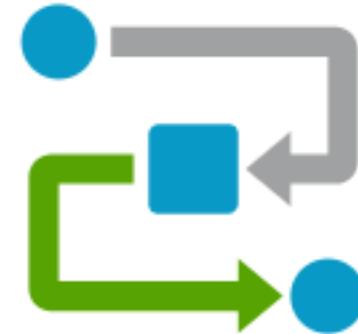
API Management Policies



SKYLINES
ACADEMY

Policies

- Modify incoming requests and outgoing responses
- Can be defined
 - Global
 - Product
 - API
 - Operation
- Evaluated in the same order



Policy Examples

- XML Based
- Examples
 - IP Filters
 - Rate Limiting
 - URI Rewrites
 - Validate JWT Tokens
 - Authenticate to backend services

```
<policies>
  <inbound>
    <base />
    <ip-filter action="allow">
      <address-range from="10.0.0.0" to="10.0.0.255" />
    </ip-filter>
  </inbound>
  <backend>
    <base />
  </backend>
  <outbound>
    <base />
    <set-header name="Content-Type" exists-action="append">
      <value>application/json</value>
    </set-header>
  </outbound>
  <on-error>
    <base />
  </on-error>
</policies>
```

DEMO

Configuring API Management Policies



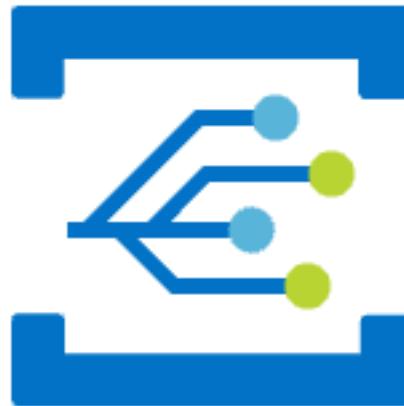
Event Based Solutions



SKYLINES
ACADEMY

Events

An event is the smallest amount of information that fully describes something that happened in the system.



Event Grid

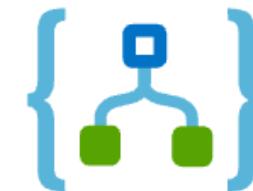
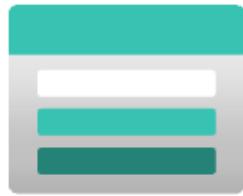


Event Hub



Notification Hub

Applications with event-based Architecture



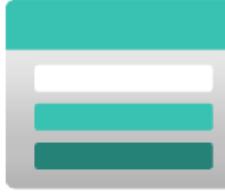
Event Grid Terminology



Event

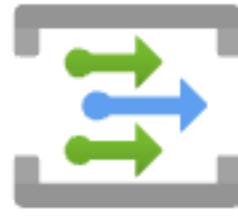


Publisher



Event Sources

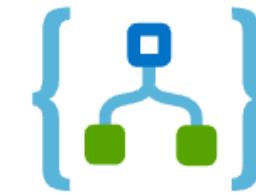
Event Grid Terminology – Part Duex



Topic



Subscriptions



Event Handlers

DEMO

Creating an Event Grid

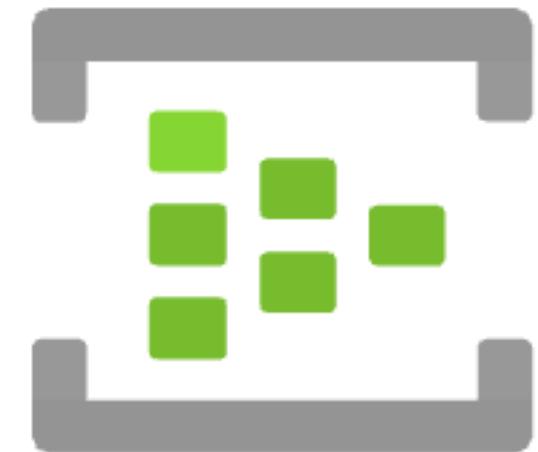


Event Hub

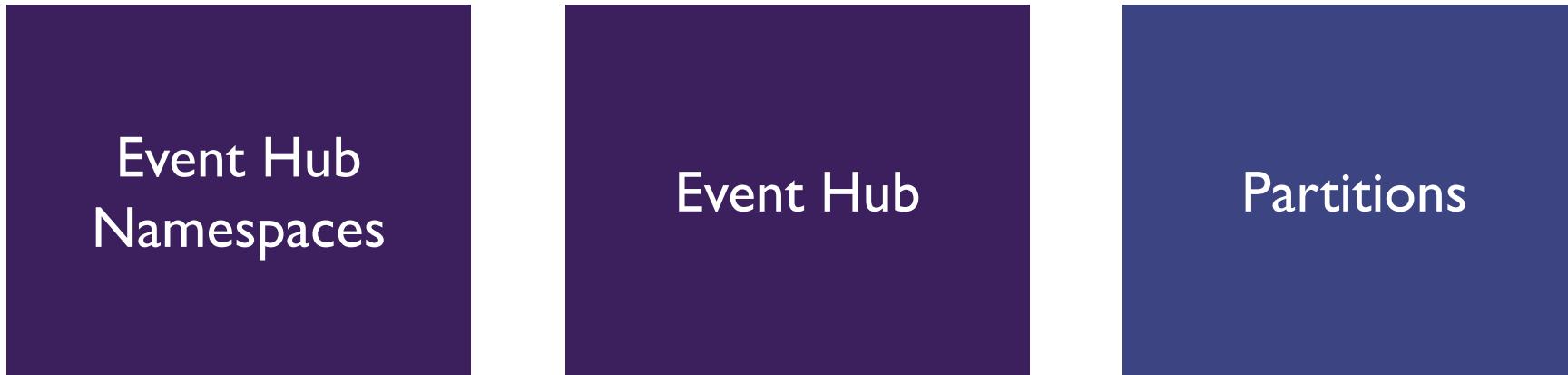


S K Y L I N E S
A C A D E M Y

- Event Hub is a data streaming and event ingestion platform
- Real time and batch processing
- Store events for archiving
- Stream events to third parties



Architecture



App Service Plan Metrics



Component	Description
Event Publisher	Resources that sends data to Event Hub
Throughput Unit	Capacity measurement for Event Hub
Consumer Group	Application(s) that read data from Event Hub
Event Receiver	The application that is part of the consumer group that reads the data

Terminology



Event Publishers

Consumer
Groups

Throughput Units

Event Receivers

Event Hub Options



- **Apache Kafka**
 - Lets existing Apache Kafka clients send data to Event Hub
 - Fully managed PaaS Offering
 - Only available on Standard and Dedicated tiers
- **Capture**
 - Save incoming event to Azure Blob Storage or Azure Data Lake
 - Time and Size Windows for how frequently data will write to storage

Tiers



Basic	Standard	Dedicated
1 Consumer Group	20 Consumer Groups	Up to 1000 Per Event Hub
Capture not available	Capture available	Capture included
Kafka not available	Kafka Built In	Kafka Built in
1 day of message retention	Up to 7 days of message retention	Up to 90 Days

DEMO

Event Hub



Notification Hub

Notification Hub



- Push engine that allows you to send push notifications:
 - Breaking news or sports notifications
 - Location based coupons for targeted users
 - Newly assigned tasks or work items
 - MFA prompts
- Works with iOS, Android, and Windows

Push Notifications



App Backend



Platform Notificaion
Service (PNS)

1. Mobile app checks for notifications
2. PNS Responds with temporary handle
3. Mobile app sends request to application backend
4. App Backend stores handle and sends notifications when ready
5. PNS Sends notification to mobile app

Push Notifications with Notification Hub



App Backend



Platform Notificaiton
Service (PNS)



Notification Hub

1. Mobile app checks for notifications
2. PNS Responds with temporary handle
3. Mobile app sends request to application backend
4. App Backend sends notification to Notification Hub
5. Notification Hub sends notification to PNS
6. PNS Sends notification to mobile app

Components



- **Notification Hub**
 - This holds the push information for a single application
- **Notification Namespace**
 - This holds a collection of Notification hubs for a single region

Deploying a Notification Hub



- Creating the notification namespace

```
az notification-hub namespace create \
--resource-group Skylines \
--name skylinessapp-nhub-ns \
--location centralus \
--sku Basic
```

- Creating the notification hub

```
az notification-hub create \
--resource-group Skylines \
--location centralus \
--namespace-name skylinessapp-nhub-ns \
--name skylinessapp-nhub-prod
```

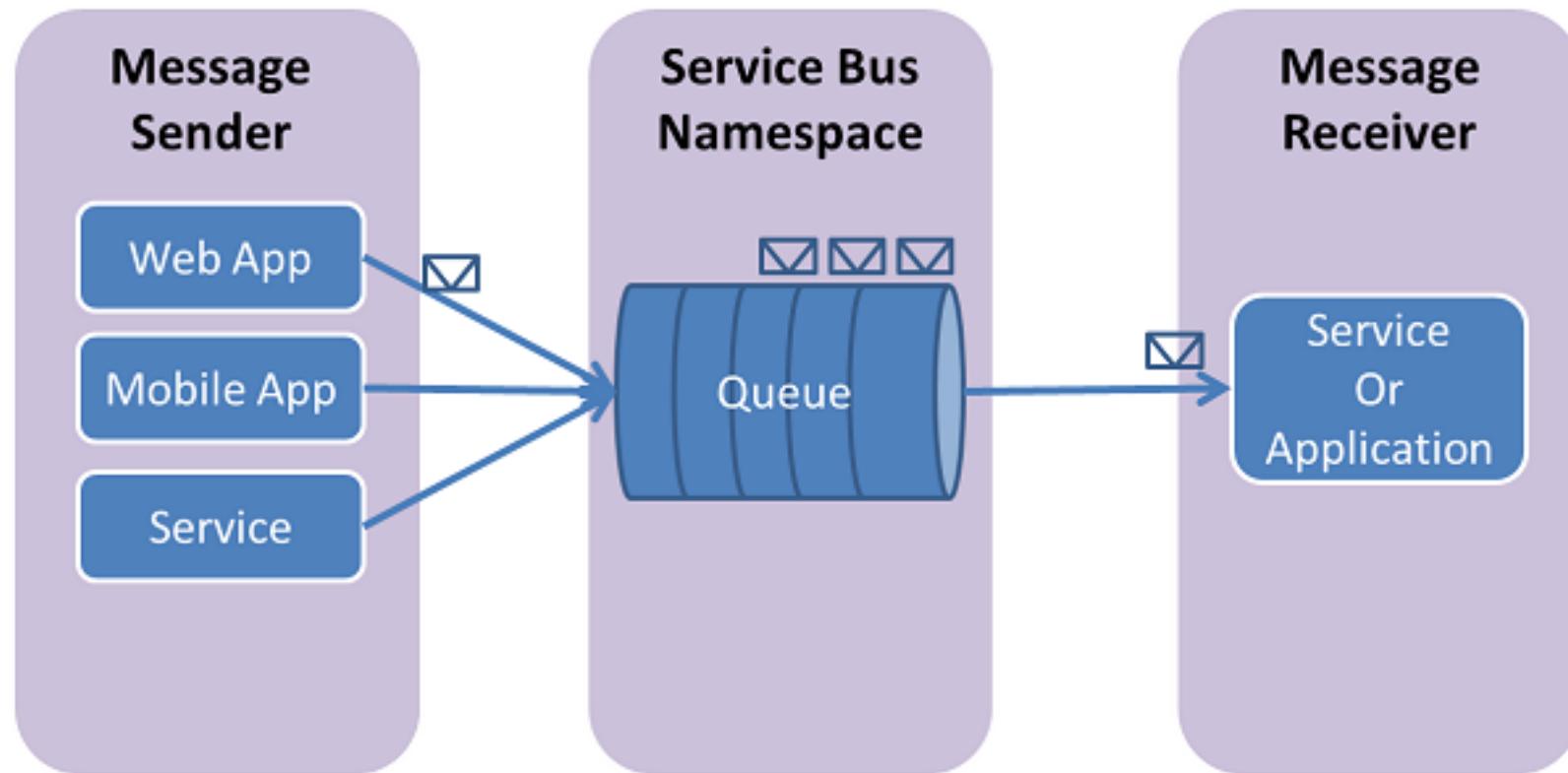
Message-based Solutions



S K Y L I N E S
A C A D E M Y

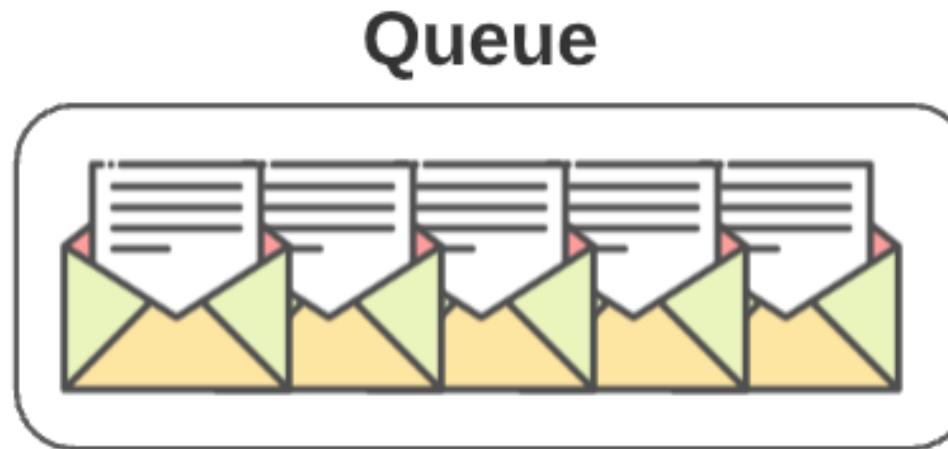
Azure Service Bus

“A message is in binary format and contain JSON, XML, or just text.”



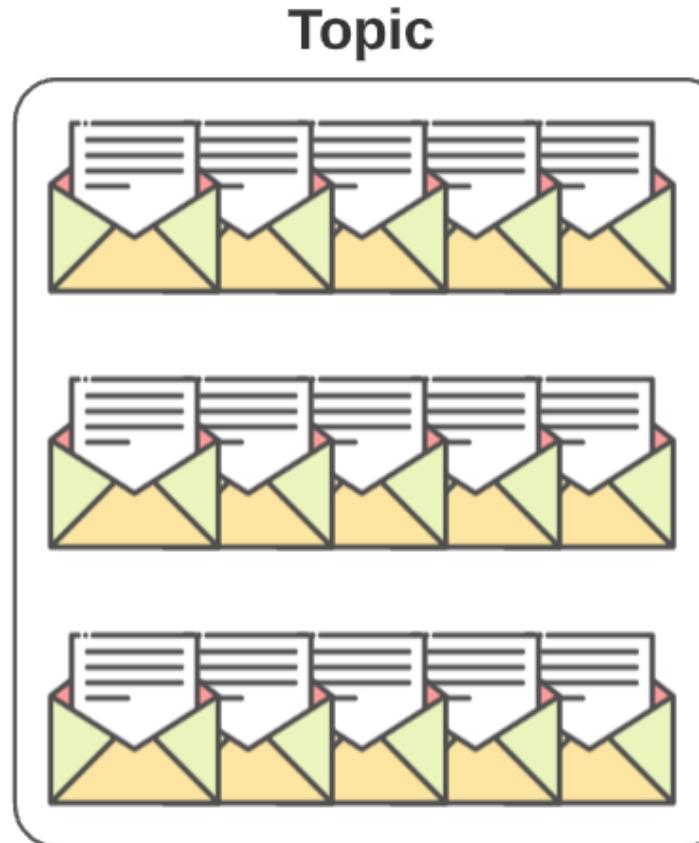
Queues

- Queues provide single space where messages are sent
- One : One relationship between sender and receiver



Topics

- Provide One : Many relationship between sender and receivers
- Each Receiver pulls from their own subscription.



Receiver



Receiver



Receiver

- Protect the Service Bus Queues and Topics using Shared Access Signatures
- Permission levels
 - Send
 - Listen
 - Manage
- Root SAS created by default on the Namespace
- Can create custom SAS on the Topic, Queue or Namespace

Tiers

- **Basic**
 - Queues Only
- **Standard**
 - Queues and Topics
- **Premium**
 - Isolated Instance
 - Higher Message Size limits
 - Availability Zones

DEMO

Azure Service Bus



Storage Queue

Storage Queue

- Built on top of Storage Accounts
- Same concept as Service Bus without the structure
 - Message order is not guaranteed
 - Unable to batch send messages
- Some advantages of Storage Queues
 - Higher Storage Limits
 - Lower Cost

Accessing Storage Queues



- URL based access
 - `https://storageacctname.queue.core.windows.net/queue-name/message`
- Security
 - Shared Key
 - Shared Access Signature
 - Azure AD
 - Firewall based

DEMO

Azure Storage Queue





SKYLINES

ACADEMY