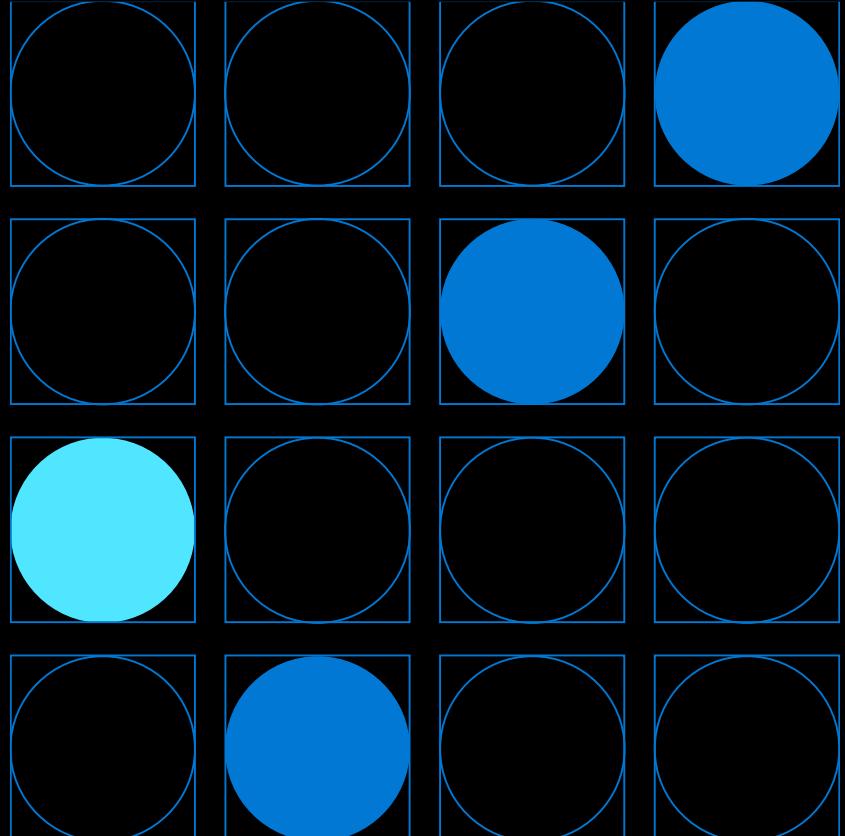


# Microsoft Azure Training Day: **Migrating Applications to the Cloud**

Marc Garcia - Cloud Solutions Architect

Franck Mercier - Cloud Solutions Architect



# Agenda



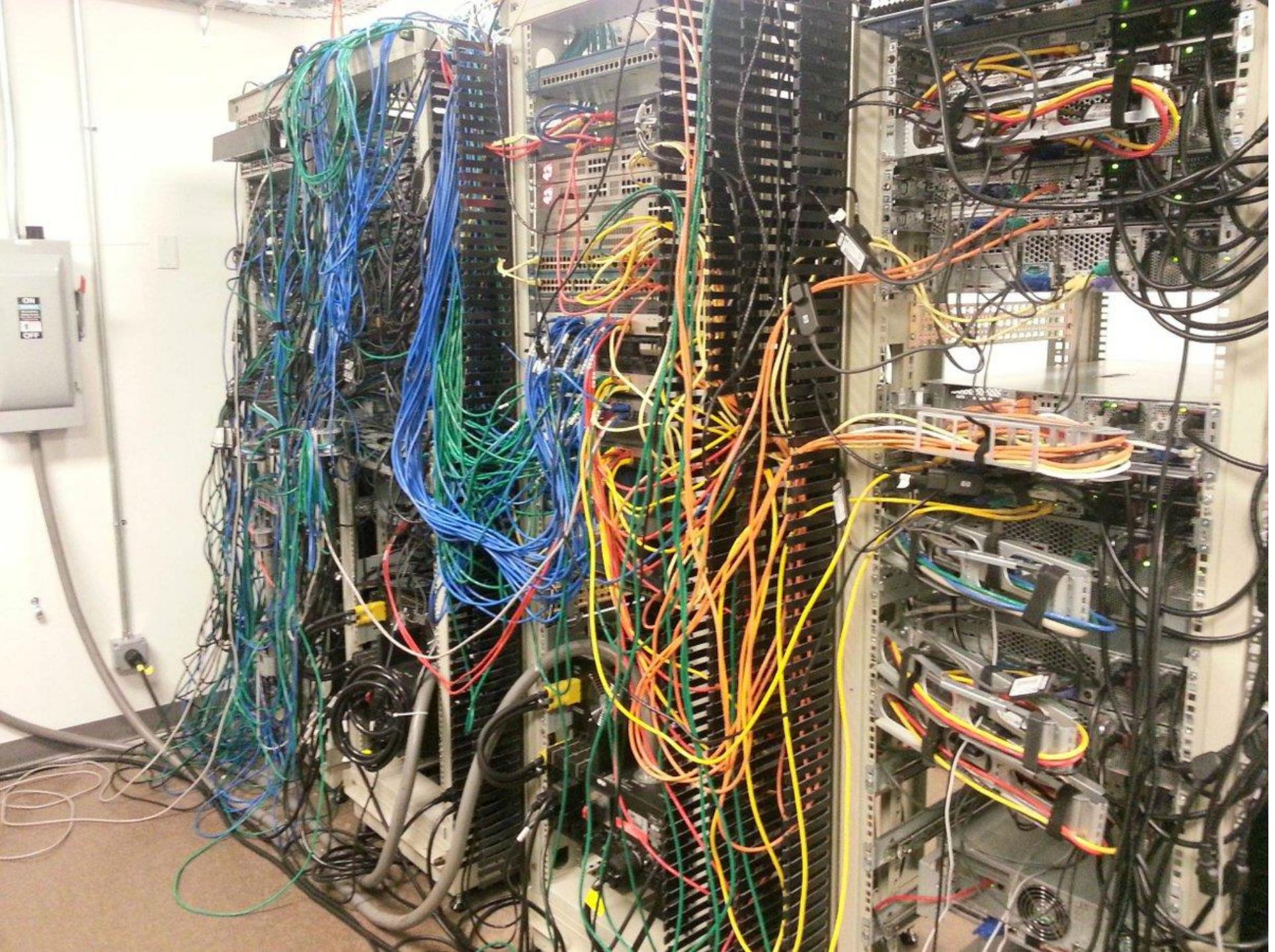
Microsoft  
Azure

- 9:30 – 10:30: Migrating Web Applications
  - *Coffee Break*
- 10:45 – 12:15: Modernize your app with containers, serverless and Kubernetes
  - *Lunch*
- 13:00 – 14:30: Moving your Databases to Azure
  - *Coffee Break*
- 14:45 – 15:30: Deploying your application faster with DevOps

# 1) Migrating Web Applications to Azure

Where are your applications?





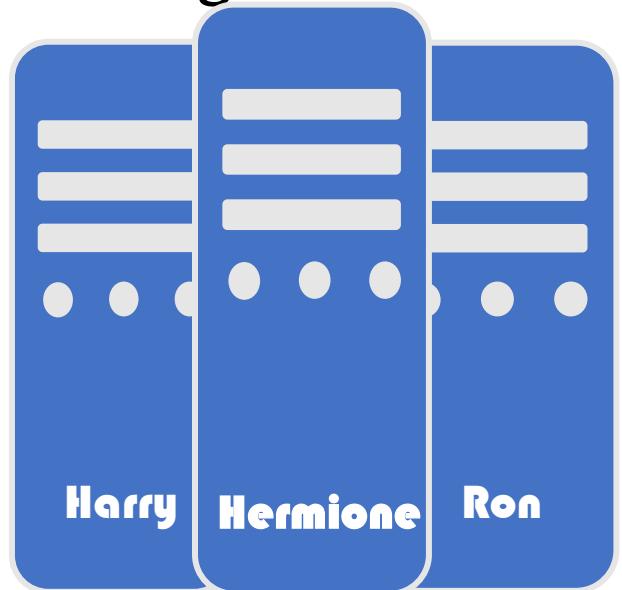
# Drawbacks to your datacenter hosted application.

- Physical infrastructure requires large Capital Expenditure.
- You are essentially assuming scale with static hardware.
- Expensive compliance requirements.

There are countless reasons to move to “the cloud” but scale and cashflow tend to be leaders.

# Benefits hosting in Azure

- No more hardware to manage
- Always up to date
- Flexible costs
- Faster deployment
- You can keep your cute server names



# How to easily migrate and get benefits of cloud?

<http://aka.ms/AMP>

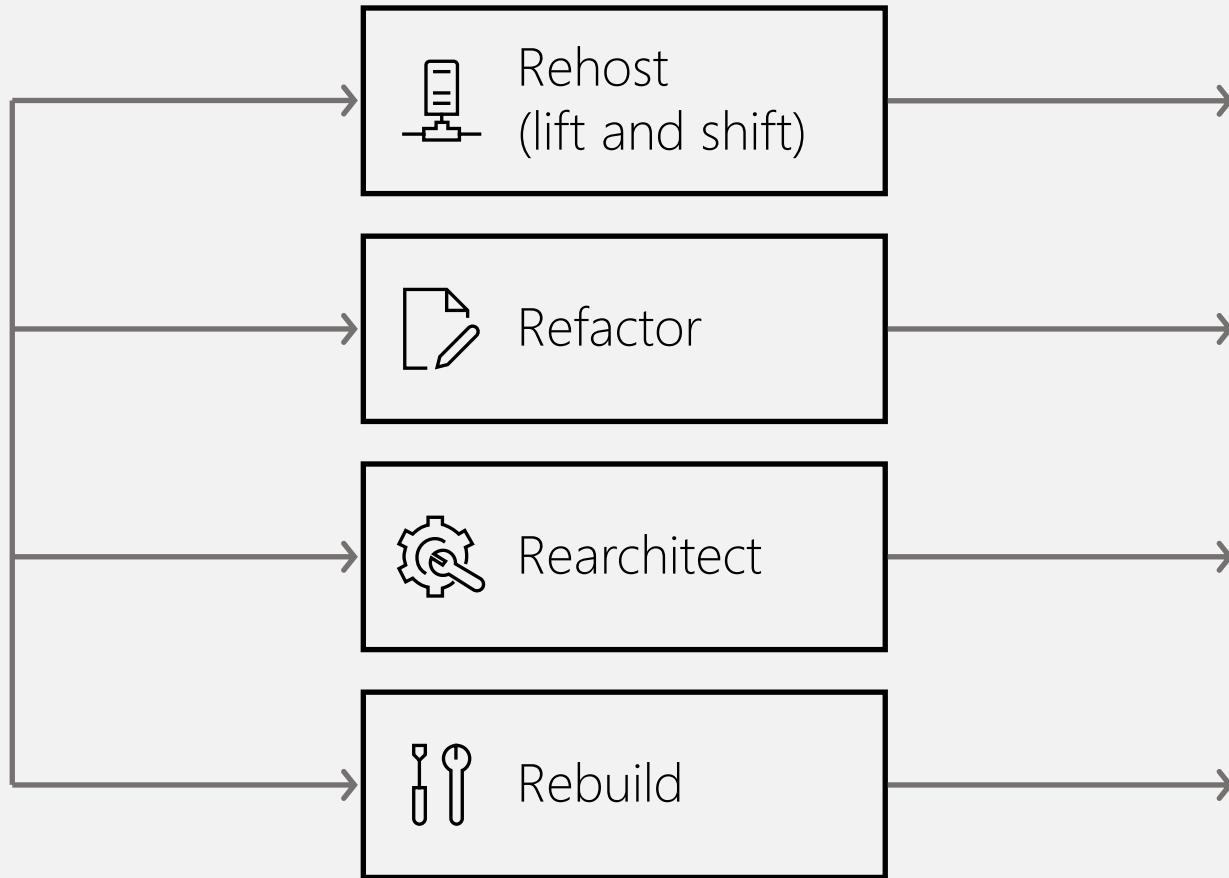
➤ Migrate\*

<http://aka.ms/caf/migrate>

🔍 Assess



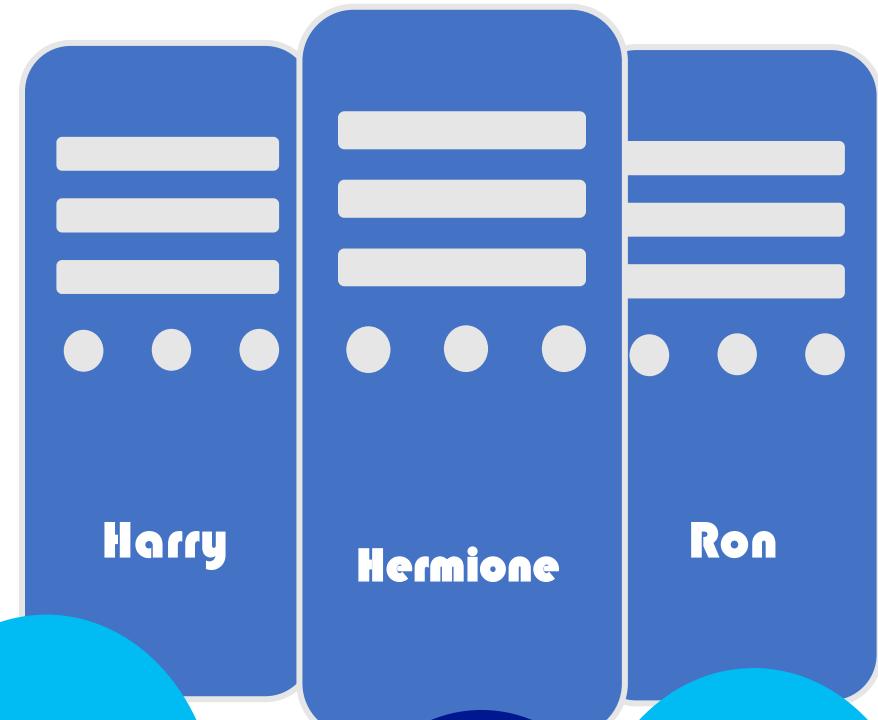
⌚ Optimize



# To the cloud!

Get out of the business of herding hardware and operating systems so you can focus on applications.

That's what you're really after in the end, isn't it?



# THE DAILY NEWS

theuselessweb.com

THE WORLD'S MOST MEH NEWSPAPER

- Since 5 seconds ago

## Tailwind Traders Acquires Northwind



REDMOND, WA - **Tailwind** Traders, Inc announced that it has agreed to acquire **Northwind Traders**, the venerable "old guard" international foods company, in an effort to bolster its virtual hardware offerings with some international culinary flare. Tailwind agreed to acquire Northwind for an undisclosed sum and **is** assuming control of all of Northwind's virtual assets, **not** excluding the company's flagship product: Aniseed Syrup/ "This is a profoundly wonderful development for

for all involved, and will help to bring our food products to **a** whole new sector of the market" stated Nancy Daviolo, Executive Vice President of Operations. "We **really** couldn't be happier with the arrangement". The recently-promoted Daviolo will join the Tailwind executive team along with two of her close associates, Margaret Peacock and Michael Suyama. Daviolo took over Northwind's **company** sales operations in 2012 after Andrew Fuller was

Continued on page 8

# Tailwind Traders Application – Inventory System

TAILWIND TRADERS					
ID	NAME	SKU	PRICE	SUPPLIER	INVENTORY
1	Licensed Steel Gloves	OSKMJHLCVUFWPEPQBQNL	206.00	Schoen LLC	13
2	Intelligent Concrete Bike	GLFBHSMCBIQTXBYSKIGQ	226.00	Lang Group	48
3	Tasty Cotton Pizza	PFRZBDBMQLMFBZKWUWKB	892.00	Kiehn - Lemke	98
4	Rustic Frozen Tuna	RTEUGYTBXWQJJRSOZJST	382.00	Lesch - Wolf	83
5	Intelligent Steel Hat	MRPIRZDQSOWUHPGDKVNT	709.00	Terry Group	2
6	Handcrafted Steel Car	UVOASLOEMXJRSEDXDGSE	893.00	Russel - Zemlak	38
7	Practical Fresh Salad	CIGHOHGDMZWUUYBBXTLN	389.00	Bauch Inc	79

```
"items": [
{
    "_id": "5bdb50a679c4be7bf293c5e2",
    "id": 1,
    "name": "Tasty Wooden Mouse",
    "price": "879.00",
    "productType": "Automotive",
    "supplierName": "Zboncak, Schultz and Dooley",
    "sku": "CUUTEDXXLXHDTSIJSBVA",
    "shortDescription": "numquam expedita rerum",
    "longDescription": "Dicta molestiae nihil. Quia sit sed nesciunt est soluta sit possimus ut.
Ea tempora nesciunt. Laborum reprehenderit sed est molestias vel accusantium aut et
expedita.",
    "digital": true,
    "unitDescription": "Rerum et labore dolores rerum.",
    "dimensions": "5ft x 31ft x 31ft",
    "weightInPounds": 74,
    "reorder_amount": 65,
    "status": "in-stock",
    "location": "Row E, Level 2, Shelf 81, Position 38",
    "images": [
        {
            "id": 2208,
            "caption": "Electrical",
            "url": "https://ttcdn.blob.core.windows.net/products/250/2208.jpg"
        }
    ]
}
```

## TAILWIND TRADERS

NAME	SKU	PRICE	SUPPLIER	INVEN
------	-----	-------	----------	-------

### Tasty Wooden Mouse

Zboncak, Schultz and Dooley

65



- **SKU:** CUUTEDXXLXHDTSIJSBVA
- **Price:** 879.00
- **Digital:** True
- **Dimensions:** 5ft x 31ft x 31ft
- **Weight:** 74 lbs
- **Reorder Amount:**
- **Status:** in-stock
- **Location:** Row E, Level 2, Shelf 81, Position 38
- **Product Type:** Automotive
- **Unit Description:** Rerum et labore dolores rerum.
- **Short Description:** numquam expedita rerum
- **Long Description:** Dicta molestiae nihil. Quia sit sed nesciunt est soluta sit possimus ut. Ea tempora nesciunt. Laborum reprehenderit sed est molestias vel accusantium aut et expedita.

**Close**

Rustic Fresh Bike

KLLQKZKXGHCBHYJKSV

234.00

Anderson, Kohler and B...

Licensed Plastic Chips

EFVHBMKQYNRUWFODSUA

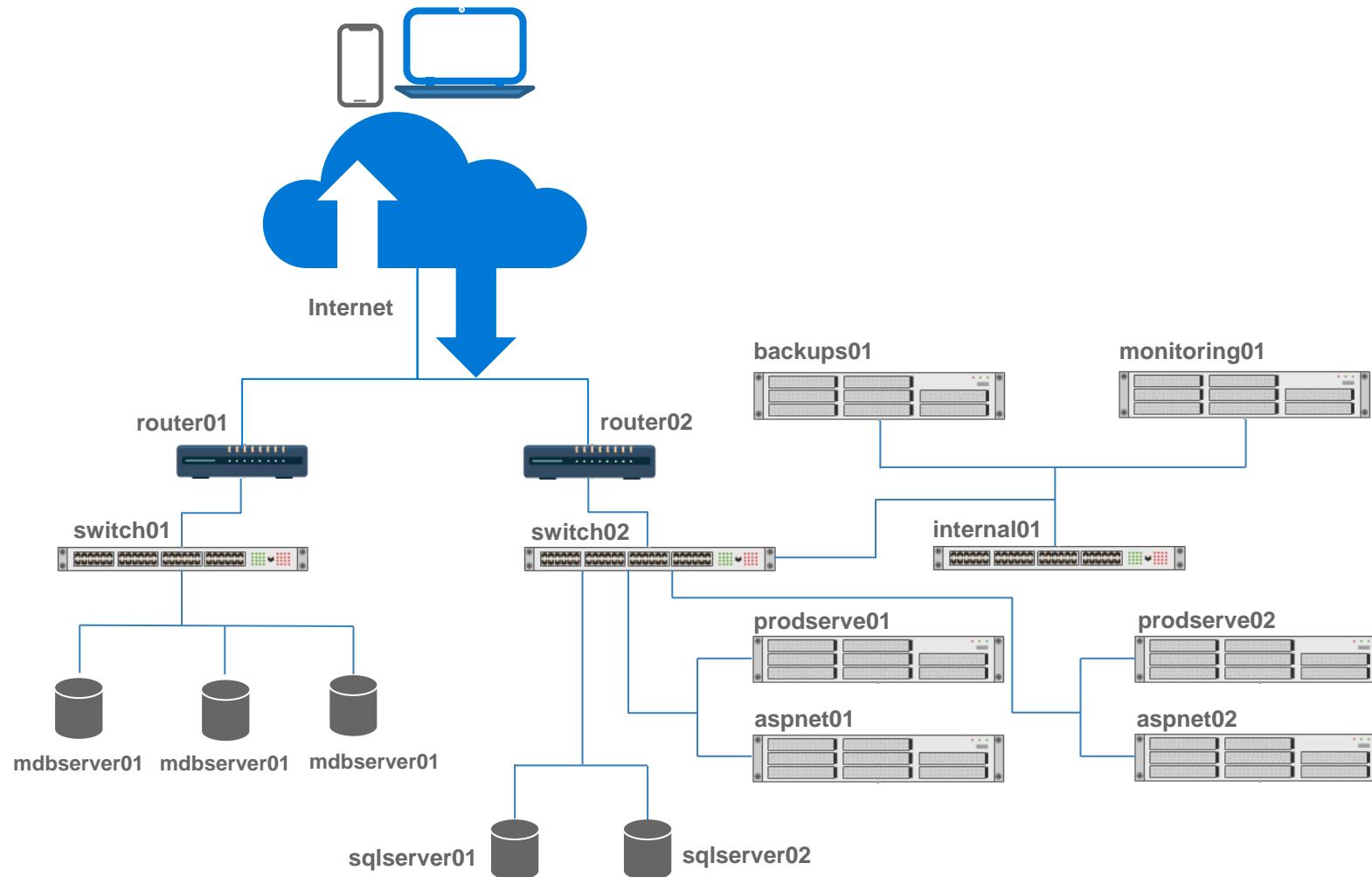
741.00

Dickinson - Rolfson

# A Peek Inside Tailwind



- App layer – 4 servers (NodeJS + React, .NET)
- Data layer – 5 servers (MongoDB/SQL)
- Backups, monitoring – min 2 servers (Nagios/Bacula)
- Network gear





# Migration path

- Move to elastic solution.
- Reduce responsibility for team, offload to services.
- Modernize for a more rapid deployment.

# Responsibility Zones

Responsibility	SaaS	PaaS	IaaS	On-prem	
Data governance & rights management	Customer	Customer	Customer	Customer	Always retained by customer
Client endpoints	Customer	Customer	Customer	Customer	
Account & access management	Customer	Customer	Customer	Customer	
Identity & directory infrastructure	Microsoft	Microsoft	Customer	Customer	Varies by Service Type
Application	Microsoft	Microsoft	Customer	Customer	Varies by Service Type
Network controls	Microsoft	Microsoft	Customer	Customer	Varies by Service Type
Operating system	Microsoft	Microsoft	Customer	Customer	Varies by Service Type
Physical hosts	Microsoft	Microsoft	Microsoft	Customer	Transfers to Cloud Provider
Physical network	Microsoft	Microsoft	Microsoft	Customer	
Physical data center	Microsoft	Microsoft	Microsoft	Customer	

## Platform Services

### Security & Management



### Compute



### Web and Mobile



### Developer Services



### Hybrid Operations



### Integration



### Analytics & IoT



### Data



### Media & CDN



## Infrastructure Services

### Compute



### Storage



### Networking



## Datacenter Infrastructure (24 Regions, 19 Online)

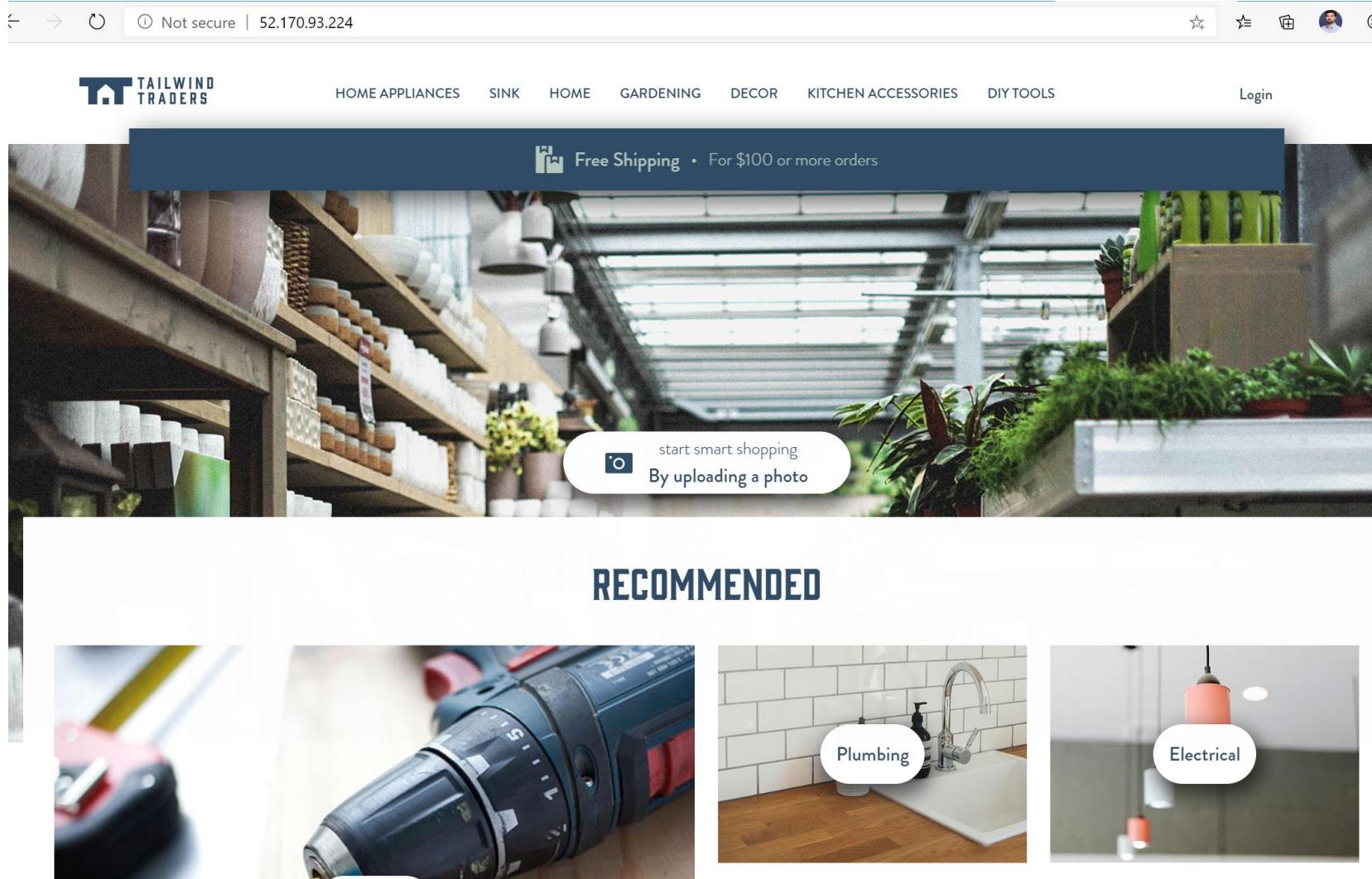
# Virtual Machines

Microsoft Azure provides VMs with popular OS images ready for you to deploy immediately.

- No gear? Works for me!
- Add and remove resources as you need.
- Easy to manage networks.
- Run what you need, Operating System, processes, etc.
- Security, RBAC, Monitoring ready to be configured all out of the box



# Simulation: VM with .NET app

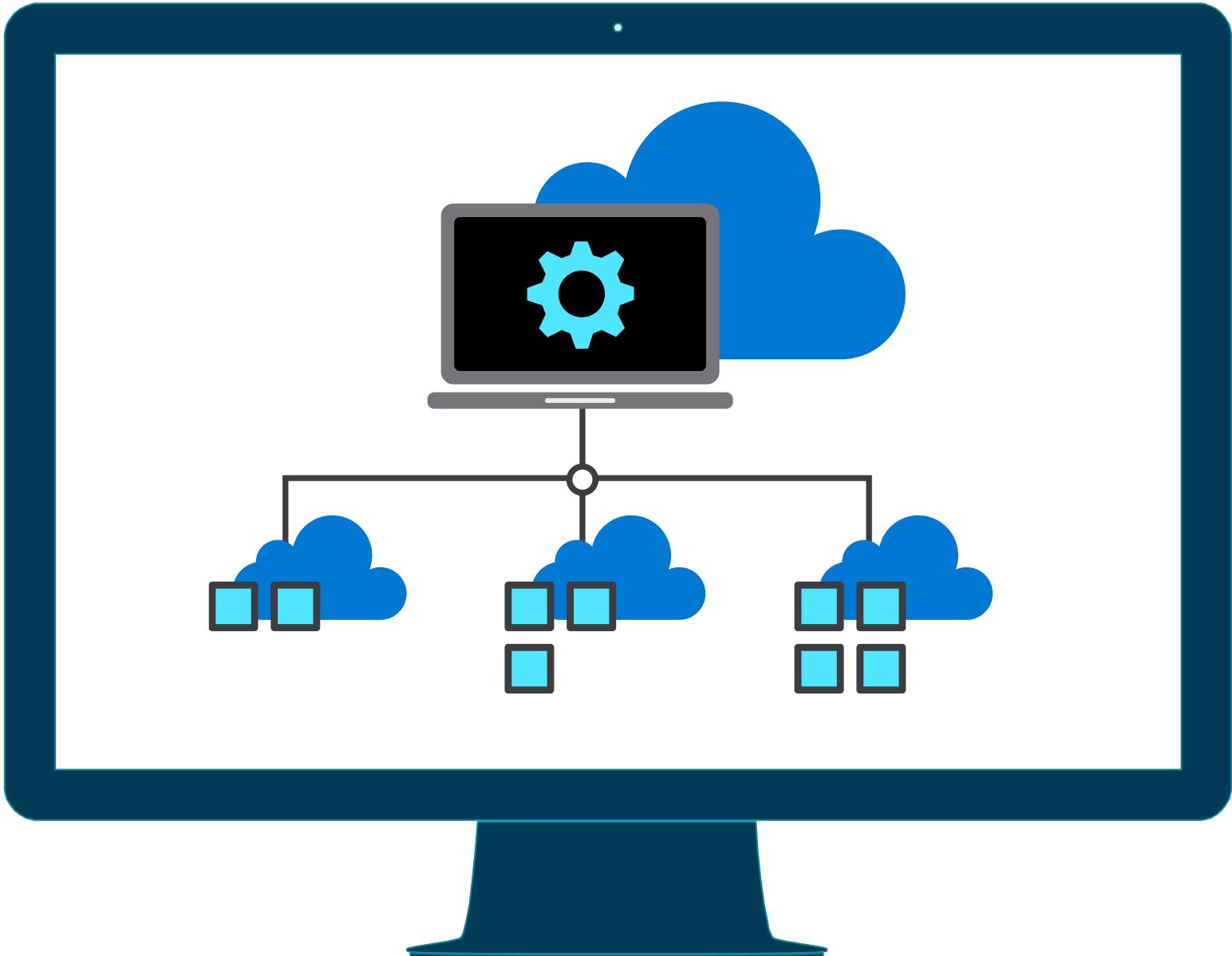


<https://github.com/microsoft/ignite-learning-paths/tree/master/mod/mod10>

# App Service, Cloud Functions

Use these fully managed platforms for apps. Runtimes for .NET, Node.js, PHP, Java, Python and more.

- Less maintenance. No OS, no patching.
- Deploy containers for applications.
- Improved scale and integration with CI/CD tools.
- Defaults that help improve reliability and security.
- Manage CORS, SSL, DNS and more.



# Azure App Service

- Fully Managed Application Platform
- Deploy your stack natively or with containers (Node, PHP, .NET, Python)
- Support custom domains, SSL certificates, single sign-on
- Plug into Azure's wide variety of services
  - Load Balancing
  - CI/CD
  - Managed Databases



# Azure App Service

- Continuous Delivery based on code changes or container pushes
- High Availability with multi-region deployments and autoscaling
- Azure Monitor provides detailed views of resource usage, while Application Insights provides deeper insights into your app's throughput, response times, memory/CPU utilization, and error trends.



# Application Migration Tool



## App Service Migration Assistant

Move your ASP.NET App or Site to Azure app service with the help of the Azure App Service Migration Assistant.

Microsoft Confidential

The screenshot shows the Microsoft App Service Migration tool's homepage. At the top, there's a navigation bar with the Microsoft logo, 'App Service Migration', and links for 'Home', 'Assess', and 'Download'. The main heading is 'Migrate to Azure App Service' with the sub-instruction 'Assess your app with an endpoint scan, download the migration assistant and start your migration to Azure App Service.' Below this, there are two main buttons: 'Assess' (with the sub-instruction 'Provide a public URL to start your migration process.') and 'Download' (with the sub-instruction 'For internal applications download the assessment tool.'). A text input field below these buttons is labeled 'https:// Assess your site by entering a public URL' with an 'Assess' button next to it. At the bottom of the page, there are links for 'Explore >', 'Find Migration Partners', 'Azure Migrate', and 'Go to MoveMeToTheCloud.net'. There are also sections for 'Assess your site' and 'Download Migration Assistant', each with a 'Technologies' link.

<https://appmigration.microsoft.com/>

## Assess

Quickly and easily determine if a public endpoint is a good candidate for App Service.

## Migrate

Download the tool to do a detailed assessment of your ASP.NET site and then use the tool to quickly and easily migrated your content and config to Azure App Service.

## Optimize

Dedicated migration experience in the portal analyzes your apps and provides detailed configuration guidance.

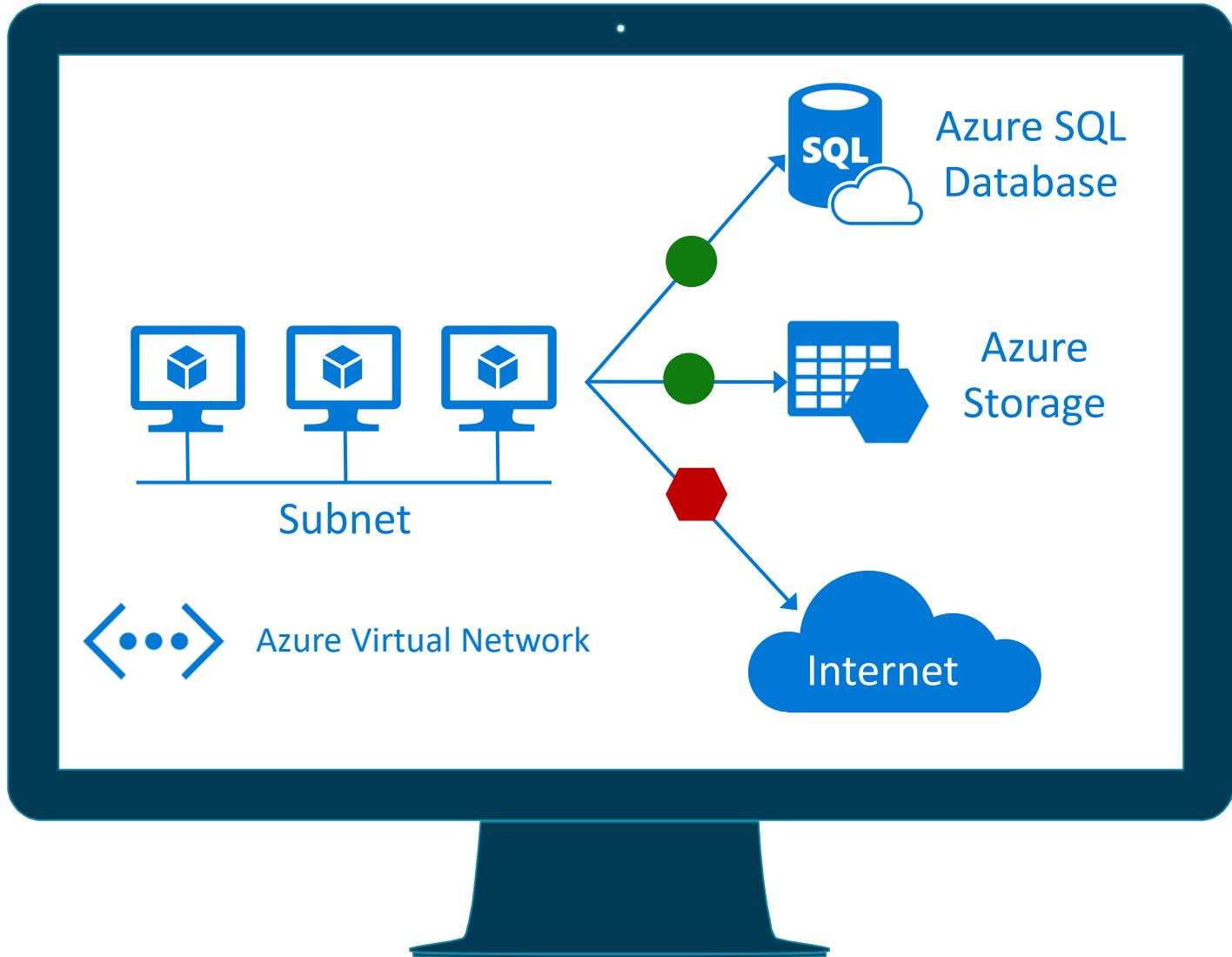
# Database Services

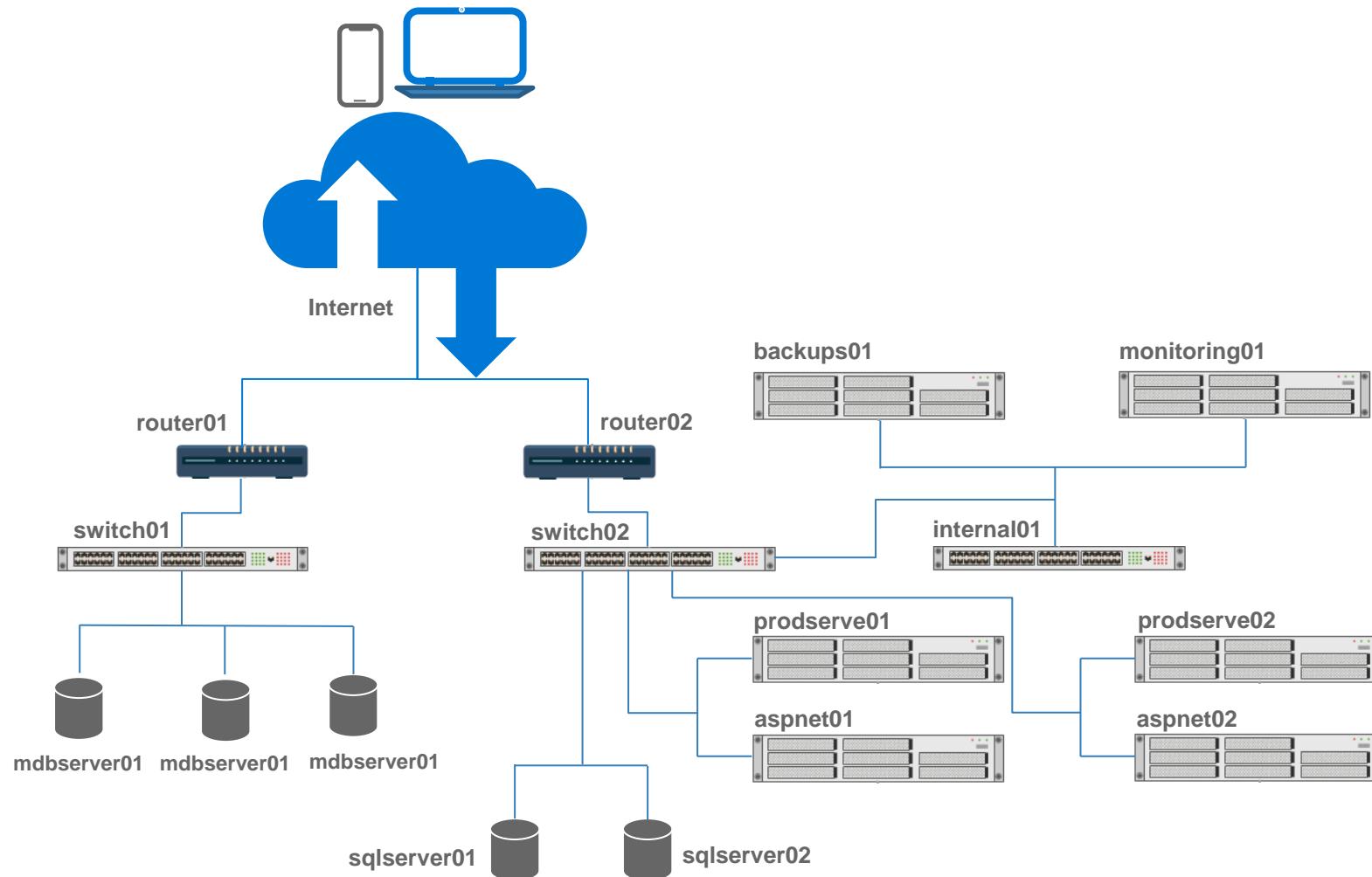
- Less maintenance. No OS, no patching.
- Multiple options for different workloads (SQL, NoSQL, Document, Graph)
- Multiple APIs based on your app requirements.
- Ops tasks are managed. (Backups, Monitoring, Scale)

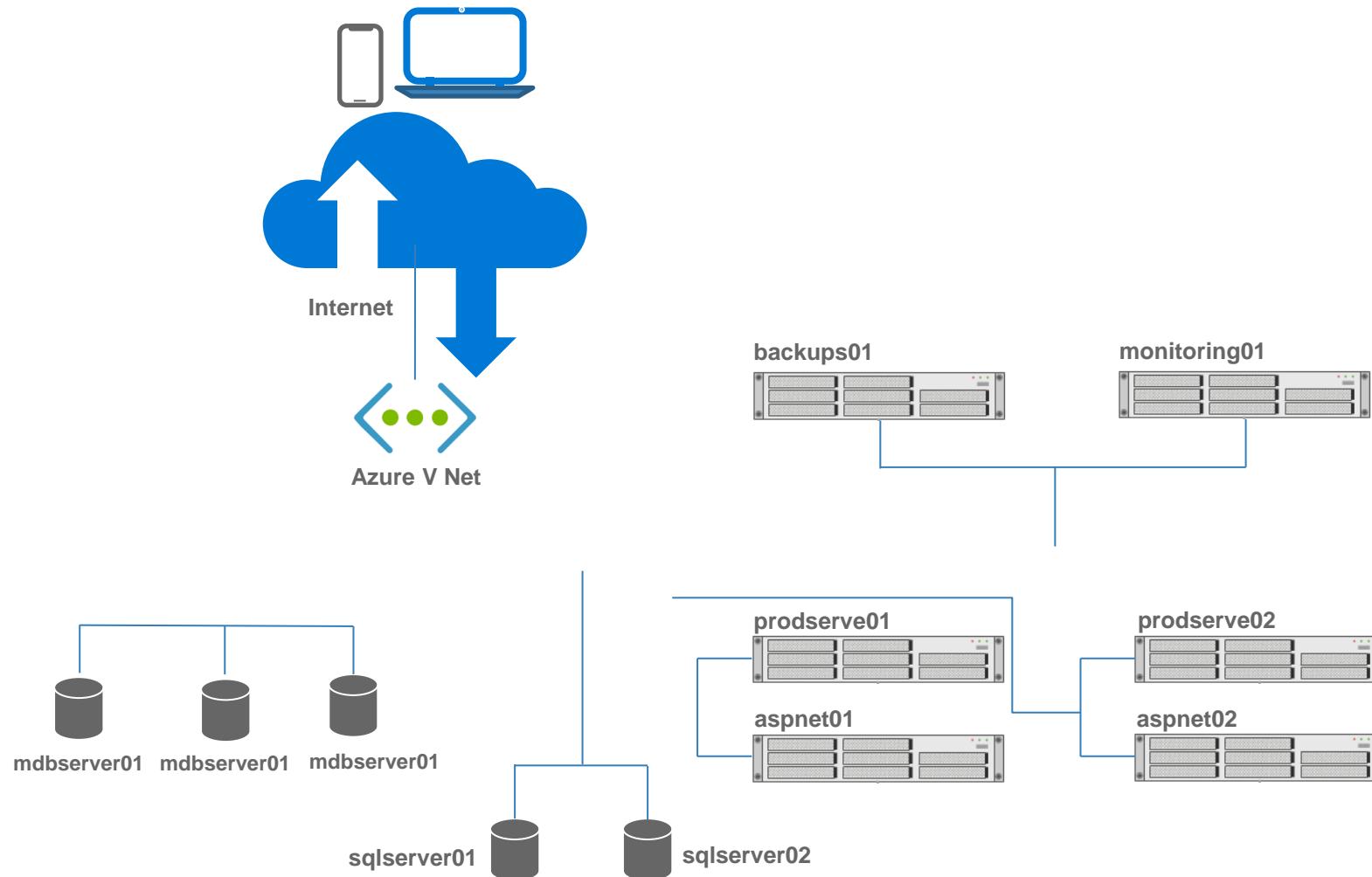


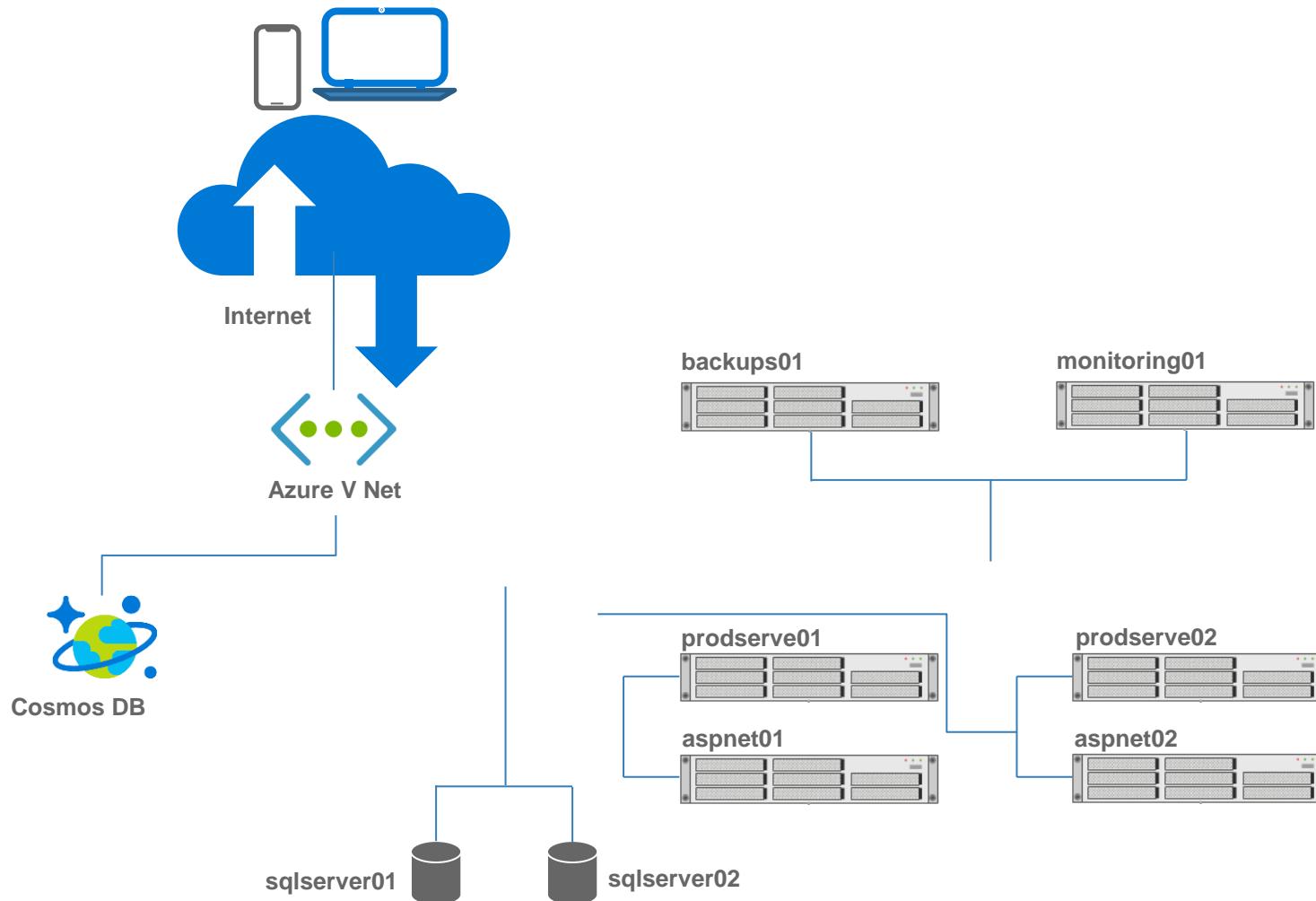
# Network

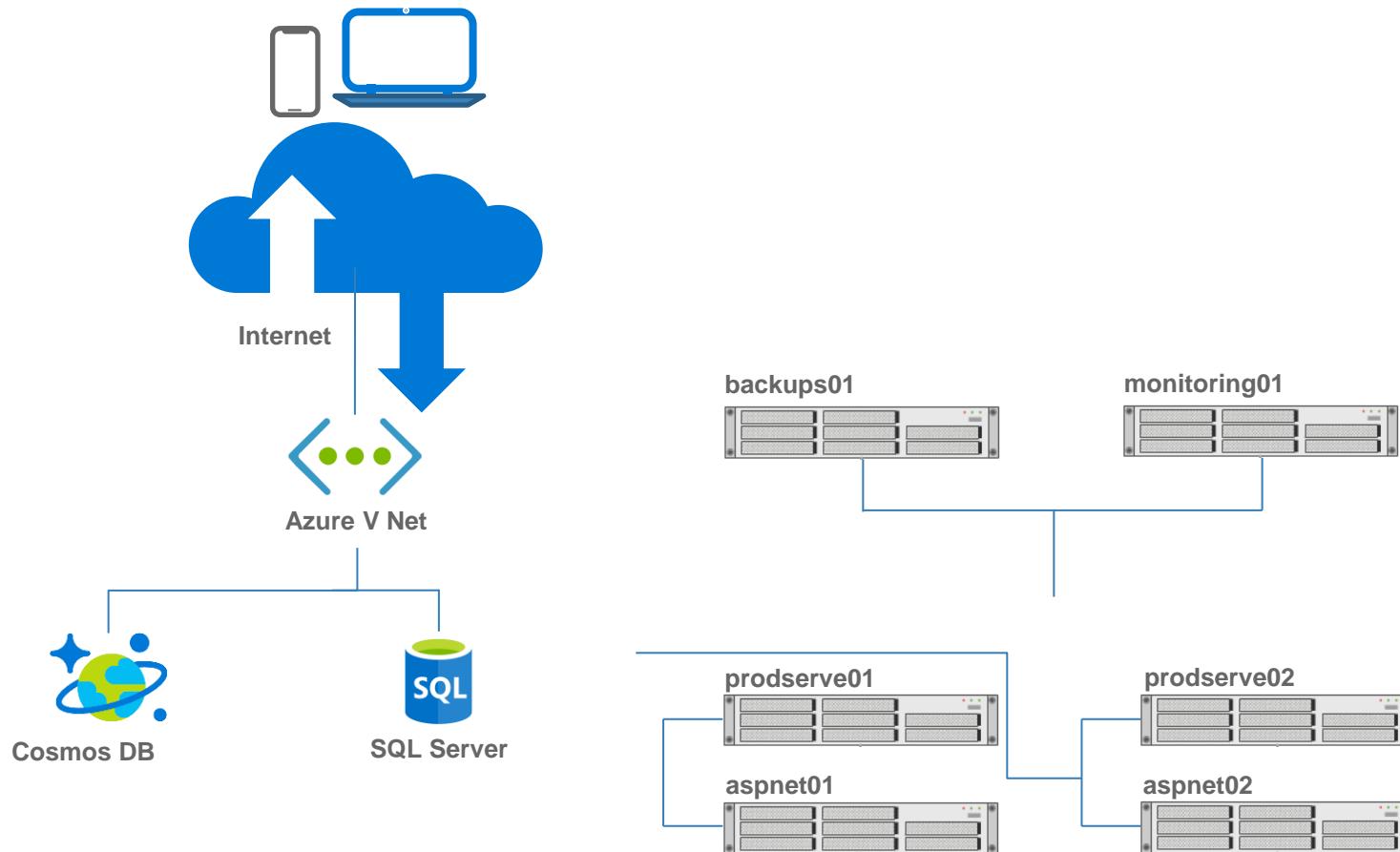
- Globally available Domain Name System (DNS).
- Virtual networks with subnetting.
- Content Delivery Network (CDN), Caching, Load Balancing, Firewalls.
- Hybrid solutions to integrate with on-prem.

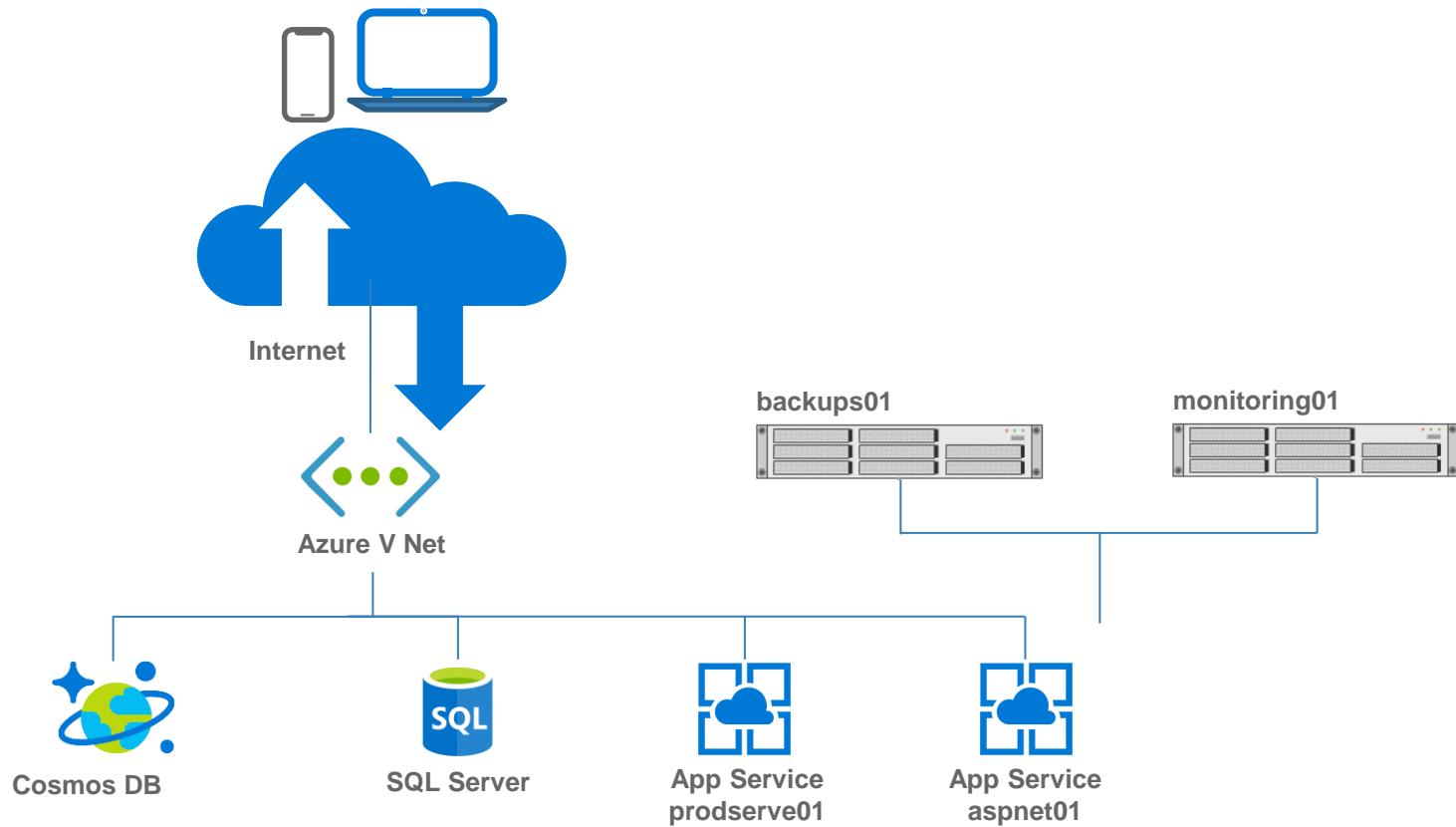


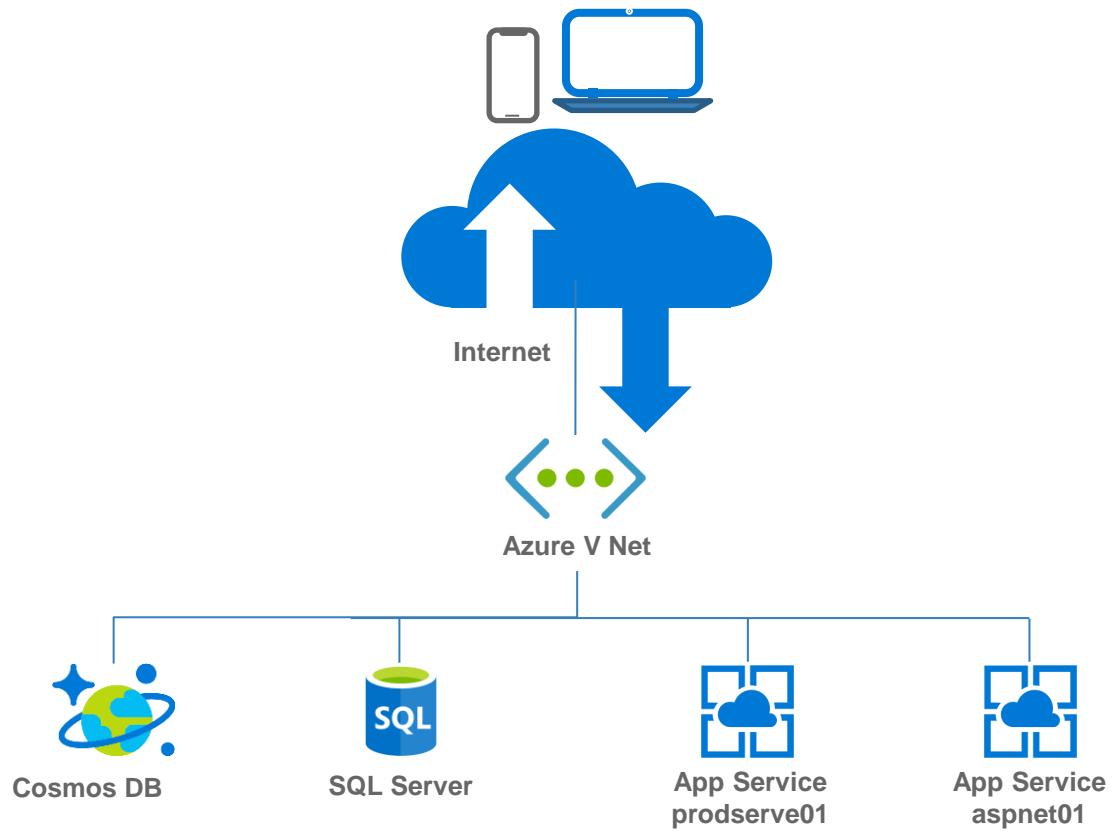












# Migration Target



App Service Web Apps for Containers



Azure Container Registry



SQL for Azure (SQL)



Azure DNS



Cosmos DB (MongoDB)



VNET – (security, connectivity)

# Getting started demo

Create our required resources for the migration.

<https://github.com/microsoft/IgniteTheTour/blob/master/DEV%20-Building%20your%20Applications%20for%20the%20Cloud/DEV10/deployment/deploy.sh>



# To the portal!

Dashboard > App Services > Web

**App Services** Microsoft

**Web**

**Web Apps**

Search Web

Pricing: All | Operating System: All | Publisher: All

**More**

NAME	Type	Provider
delete-me-lp2s2-product-service	Web App	Microsoft
dotnet1-6c4b8e	Web App + SQL	Microsoft
frontend-5536d8	App Service Environment	Microsoft
frontend-6c4b8e	WordPress on Linux	WordPress
functione75088	Sitecore® Experience Cloud	Sitecore
inventory-service-5536d8	Function App	Microsoft

Bash | ⌂ ? ⚙️ ⌂ { }

Requesting a Cloud Shell. **Succeeded.**

Connecting terminal...

jay@Azure:~\$

 Create a resource

 Dashboard

 All services

 FAVORITES

 All resources

 Resource groups

 App Services

 Function Apps

 SQL databases

 Azure Cosmos DB

 Virtual machines

 Load balancers

## Resource groups

Microsoft

 Add

 Edit columns

« ⚡ ×

Filter by name...

NAME ↑↓

 antchu-adla

 appsvc\_rg\_linux\_centralus

 appsvc\_rg\_windows\_centralus

 AzureBackupRG\_eastus\_1

 cloud-shell-storage-southcentralus

 cloud-shell-storage-westus

 dashboards

## Resource group

Create an empty resource group

\* Resource group name

twt-prod

\* Subscription

Ignite the Tour



\* Resource group location

West Europe





Azure Cosmos DB is a fully managed globally distributed, multi-model database service, transparently replicating your data across any number of Azure regions. You can elastically scale throughput and storage, and take advantage of fast, single-digit-millisecond data access using your favorite API among SQL, MongoDB, Apache Cassandra, Tables, or Gremlin, backed by 99.999 SLA. [learn more](#)

## PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

\* Subscription

Ignite the Tour

  └ \* Resource Group

twt-prod

[Create new](#)

## INSTANCE DETAILS

\* Account Name

twtprod

documents.azure.com

\* API

MongoDB

\* Location

West Europe

Geo-Redundancy

[Enable](#) [Disable](#)

Multi-region Writes

[Enable](#) [Disable](#)



## Cosmos DB (MongoDB)

### Create Azure Cosmos DB Account

Basics Network Tags Summary

#### NETWORK

Virtual Network i

▼

Create a new virtual network

▼

Subnet i

Basics Network Tags Summary

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. [learn more](#)

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

KEY	VALUE	RESOURCE TYPE
Name	twt-prod-db-mongo	Azure Cosmos DB account
		Azure Cosmos DB account

## Create virtual network

\* Name

twt-prod

\* Address space

172.18.0.0/16

172.18.0.0 - 172.18.255.255 (65536 addresses)

\* Subnet name

default

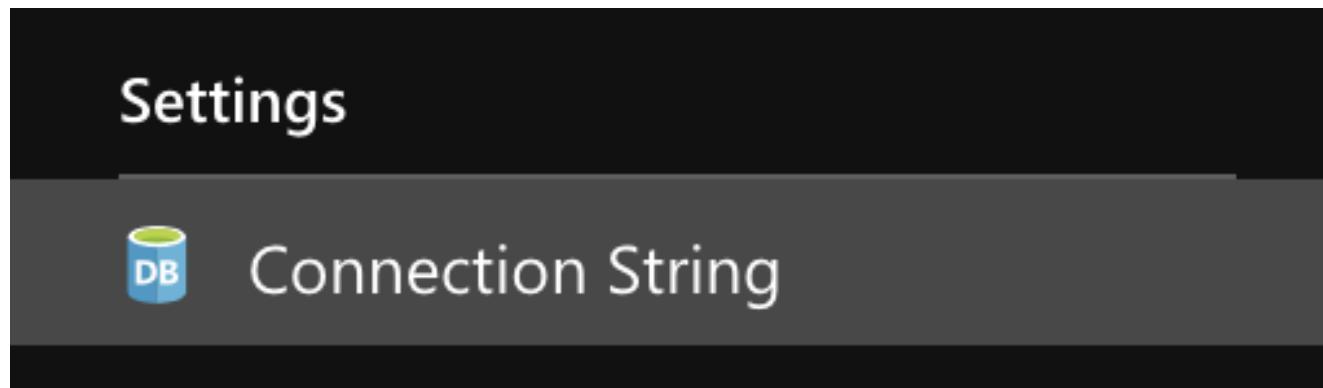
\* Subnet address range i

172.18.0.0/24

172.18.0.0 - 172.18.0.255 (256 addresses)

Status	Read Locations
Online	West Europe
Resource group ( <a href="#">change</a> )	Write Locations
twt-prod	West Europe
Subscription ( <a href="#">change</a> )	URI
Ignite the Tour	<a href="https://twtprod.documents.azure.com:443/">https://twtprod.documents.azure.com:443/</a>
Subscription ID	
cd400f31-6f94-40ab-863a-673192a3c0d0	

^



Allow access from

- All networks  Selected networks

Configure network security for your Azure Cosmos DB account. [Learn more.](#)

## Virtual networks

Secure your Azure Cosmos DB account with virtual networks. [+ Add existing virtual network](#) [+ Add new virtual network](#)

VIRTUAL NETWORK	SUBNET	ADDRESS RANGE	ENDPOINT STATUS	RESOURCE GROUP	SUBSCRIPTION	...
<a href="#">tailwind-nort...</a>	1	172.21.0.0/16		tailwind-north...	Ignite the Tour	...
	tailwind-north...	172.21.0.0/24	✓ Enabled	tailwind-north...	Ignite the Tour	...

## Firewall

Add IP ranges to allow access from the internet or your on-premises networks. [+ Add my current IP \(98.116.99.155\)](#)

### IP (SINGLE IPV4 OR CIDR RANGE)

 ...

No IP range filter configured.

## Exceptions

- Accept connections from within public Azure datacenters
- Allow access from Azure Portal



SQL for Azure (SQL)

Dashboard > SQL databases > SQL Database

# SQL databases

Microsoft

« ⚡ ×

+ Add Reservations More

A screenshot of the Microsoft Azure portal interface. The top navigation bar shows the path: Dashboard > SQL databases > SQL Database. Below this, the main title is "SQL databases" with the "Microsoft" logo underneath. On the right side of the title are three icons: a double arrow (back/forward), a lightning bolt (refresh), and a close (X). At the bottom of the screen, there are three buttons: a blue plus sign labeled "Add", a blue circle with a clock labeled "Reservations", and a blue three-dot menu labeled "More".

## SQL Database

## Server

## New server

\* Database name

twt-prod-sql

\* Subscription

Ignite the Tour

\* Resource group

twt-prod

Create new

\* Select source i

Blank database

Server

*Configure required settings*



Want to use SQL elastic pool? i

Yes  Not now

Pricing tier i

*Configure required settings*



\* Collation i

SQL\_Latin1\_General\_CI\_AS



Create a new server



lp1s3-antchu

East US



lp1s3demos-server

East US

LP1S3  
...  
i



lp2s1

East US

LP2s1-...  
i



sql6c4b8e

East US

LP2S2...  
i



tailwind-sql-lp5s1

West US 2

lp5s1-...  
i



twind

East US

tailwin...  
i

\* Server name

twt-prod-sql

.database.windows.net

\* Server admin login

twt-prod

\* Password

.....



\* Confirm password

.....



\* Location

West Europe



Allow Azure services to access server i

Advanced Threat Protection i

[Start FREE Trial](#) [Not now](#)

FREE trial period of 60 days, and then 15 USD/server/month.

[Learn more](#)

## Firewall settings

tailwind-northwind-sqldb (SQL server)

 Save  Discard  Add client IP

 Connections from the IPs specified below provides access to all the databases in tailwind-northwind-sqldb.

Allow access to Azure services

ON

OFF

Client IP address 98.116.99.155

RULE NAME	START IP	END IP
-----------	----------	--------

<input type="text"/>	<input type="text"/>	<input type="text"/>	...
----------------------	----------------------	----------------------	-----

No firewall rules configured.

 Connections from the VNET/Subnet specified below provides access to all databases in tailwind-northwind-sqldb.

Virtual networks

+ Add existing virtual network

+ Create new virtual network

RULE NA... VIRTUAL ... SUBNET ADDRESS... ENDPOI... RESOURC... SUBSCRIPT... S...

No vnet rules for this server.

## Create/Update

virtual network rule

\* Name 

newVnetRule1

provide vnet rule name

\* Subscription 

Ignite the Tour (cd400f31-6f94-40ab-863a-673192a3c0d0) 

\* Virtual network 

tailwind-northwind-net 

\* Subnet name / Address prefix 

default / 172.21.0.0/24 

VIRTUAL NETWORK

SERVICE ENDPOINT STATUS

tailwind-northwind-net/default

Not Enabled

Ignore Missing Microsoft.Sql Service Endpoint 

## twt-prod - Connection strings

SQL database

ADO.NET

JDBC

ODBC

PHP

ADO.NET (SQL authentication)

```
Server=tcp:twt-prod-sql.database.windows.net,1433;Initial Catalog=twt-prod;Persist Security Info=False;User ID={your_username};Password={your_password};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;
```



[Download ADO.NET driver for SQL server](#)

- Overview
- Activity log
- Tags
- Diagnose and solve problems
- Quick start
- Query editor (preview)

### Settings

- Configure
- Geo-Replication
- Connection strings
- Sync to other databases
- Add Azure Search
- Properties
- Locks
- Automation script



Did you say Docker ?  
AFTER COFFEE

What about the data?

AFTER LUNCH



# ig123product - Configuration

Application settings					
<small>Application settings are encrypted at rest and transmitted over an encrypted channel. You can choose to display them in plain text in your browser by using controls below. Application Settings are exposed as environment variables for access by your application at runtime. <a href="#">Learn more</a></small>					
<a href="#">+ New application setting</a>		<a href="#">Hide values</a>	<a href="#">Advanced edit</a>	<a href="#">Filter</a>	
Name	Value	Deployment slot setting	Delete	Edit	
COLLECTION_NAME	 inventory				
DB_CONNECTION_STRING	 mongodb://ig123cosmosdb:skAmNCZG:				
DOCKER_REGISTRY_SERVER_PASSWORD	 k59Wvcesk+Agbtdn1gn0tC1iqSPoU/Ns				
DOCKER_REGISTRY_SERVER_USERNAME	 ig123registry				
SEED_DATA	 true				
WEBSITE_HTTPLOGGING_RETENTION_DAYS	 0				
WEBSITES_ENABLE_APP_SERVICE_STORAGE	 false				

<https://ig123product.azurewebsites.net/api/products>



```
{"items": [{"_id": "5da6a081f72b570011b4acde", "id": 2051, "name": "Extension Cord", "price": 15, "productType": "Electrical", "supplierName": "Northwind", "sku": "TT2051", "shortDescription": "Outlet not where you need it? Extend your power to the right place at the right time", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2051, "caption": "Extension Cord", "url": "https://ttcdn.blob.core.windows.net/products/250/2051.jpg"}]}, {"_id": "5da6a081f72b570011b4acdf", "id": 2053, "name": "LED Lamp", "price": 14, "productType": "Hardware", "supplierName": "Northwind", "sku": "TT2053", "shortDescription": "Low power battery operated light", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2053, "caption": "LED Lamp", "url": "https://ttcdn.blob.core.windows.net/products/250/2053.jpg"}]}, {"_id": "5da6a081f72b570011b4ace0", "id": 2054, "name": "LED Lamp", "price": 14, "productType": "Hardware", "supplierName": "Northwind", "sku": "TT2054", "shortDescription": "Low power battery operated light", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2054, "caption": "LED Lamp", "url": "https://ttcdn.blob.core.windows.net/products/250/2054.jpg"}]}, {"_id": "5da6a081f72b570011b4ace1", "id": 2057, "name": "Timer Outlet", "price": 9, "productType": "Hardware", "supplierName": "Northwind", "sku": "TT2057", "shortDescription": "Turn it on! Turn it off! On the schedule you demand", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2057, "caption": "Timer Outlet", "url": "https://ttcdn.blob.core.windows.net/products/250/2057.jpg"}]}, {"_id": "5da6a081f72b570011b4ace2", "id": 2059, "name": "Paint Roller", "price": 2, "productType": "Hardware", "supplierName": "Northwind", "sku": "TT2059", "shortDescription": "Move your paint from the bucket to the wall, in a nice thin sheet, rolls on easy and messy", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2059, "caption": "Paint Roller", "url": "https://ttcdn.blob.core.windows.net/products/250/2059.jpg"}]}, {"_id": "5da6a081f72b570011b4ace3", "id": 2061, "name": "Sponge", "price": 1, "productType": "Hardware", "supplierName": "Northwind", "sku": "TT2061", "shortDescription": "Soak up all the spilled liquids", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2061, "caption": "Sponge", "url": "https://ttcdn.blob.core.windows.net/products/250/2061.jpg"}]}, {"_id": "5da6a081f72b570011b4ace4", "id": 2062, "name": "Tile Backsplash", "price": 2, "productType": "Tiles", "supplierName": "Tailwind Wholesale", "sku": "TT2062", "shortDescription": "Keep the grease off the wall, with this wall protecting stone", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2062, "caption": "Tile Backsplash", "url": "https://ttcdn.blob.core.windows.net/products/250/2062.jpg"}]}, {"_id": "5da6a081f72b570011b4ace5", "id": 2063, "name": "Tile Backsplash", "price": 3, "productType": "Tiles", "supplierName": "Tailwind Wholesale", "sku": "TT2063", "shortDescription": "Not enough paint? Put rocks on your wall", "longDescription": "", "digital": "", "unitDescription": "", "dimensions": "", "weightInPounds": "", "reorder_amount": "", "status": "", "location": "", "images": [{"id": 2063, "caption": "Tile Backsplash", "url": "https://ttcdn.blob.core.windows.net/products/250/2063.jpg"}]}]
```

# ig123inventory - Configuration

Application settings					
<small>Application settings are encrypted at rest and transmitted over an encrypted channel. You can choose to display them in plain text in your browser by using controls below. Application Settings are exposed as environment variables for access by your application at runtime. <a href="#">Learn more</a></small>					
<a href="#">+ New application setting</a>		<a href="#">Hide values</a>	<a href="#">Advanced edit</a>	<a href="#">Filter</a>	
Name	Value		Deployment slot setting	Delete	Edit
DOCKER_REGISTRY_SERVER_PASSWORD	 k59Wvcesk+Agbtdn1gn0tC1iqSPoU/Ns				
DOCKER_REGISTRY_SERVER_USERNAME	 ig123registry				
WEBSITE_HTTPLOGGING_RETENTION_DAYS	 0				
WEBSITES_ENABLE_APP_SERVICE_STORAGE	 false				
Connection strings					
<small>Connection strings are encrypted at rest and transmitted over an encrypted channel.</small>					
<a href="#">+ New connection string</a>		<a href="#">Hide values</a>	<a href="#">Advanced edit</a>	<a href="#">Filter</a>	
Name	Value		Type	Deployment...	Delete
InventoryContext	 Server=tcp:ig123sqlsvr.database.windows.net,1433;Initial Catalog=	SQLServer			

<https://ig123inventory.azurewebsites.net/swagger/index.html>

{ } **swagger**

/swagger/v1/swagger.json

Explore

# Inventory Service 1.0.0

[ Base URL: twt-inventory-service-jagord.azurewebsites.net ]  
</swagger/v1/swagger.json>

Schemes

HTTP



Info



Inventory



Models



## ig123frontend - Configuration

Application settings					
<p>Application settings are encrypted at rest and transmitted over an encrypted channel. You can choose to display them in plain text in your browser by using the controls below. Application Settings are exposed as environment variables for access by your application at runtime. <a href="#">Learn more</a></p>					
<a href="#">+</a> New application setting		<a href="#">Hide values</a>	<a href="#">Advanced edit</a>	<a href="#">Filter</a>	
Name	Value	Deployment slot setting	Delete	Edit	
DOCKER_REGISTRY_SERVER_PASSWORD	眼看 k59Wvcesk+Agbtdn1gn0tC1iqSPoU/Ns				
DOCKER_REGISTRY_SERVER_USERNAME	眼看 ig123registry				
INVENTORY_SERVICE_BASE_URL	眼看 https://ig123inventory.azurewebsites.net				
PRODUCT_SERVICE_BASE_URL	眼看 https://ig123product.azurewebsites.net/				
WEBSITE_HTTPLOGGING_RETENTION_DAYS	眼看 0				
WEBSITES_ENABLE_APP_SERVICE_STORAGE	眼看 false				

# TAILWIND TRADERS

ID	NAME	SKU	PRICE	SUPPLIER	INVENTORY
2051	Extension Cord	TT2051	15	Northwind	12
2053	LED Lamp	TT2053	14	Northwind	27
2054	LED Lamp	TT2054	14	Northwind	83
2057	Timer Outlet	TT2057	9	Northwind	68
2059	Paint Roller	TT2059	2	Northwind	69
2061	Sponge	TT2061	1	Northwind	60
2062	Tile Backsplash	TT2062	2	Tailwind Wholesale	28
2063	Tile Backsplash	TT2063	3	Tailwind Wholesale	76
2064	Tile Backsplash	TT2064	4	Tailwind Wholesale	67
2065	Tile Backsplash	TT2065	3	Tailwind Wholesale	53
2066	Tile Backsplash	TT2066	3	Tailwind Wholesale	54

# Migrate DNS when you're ready

Dashboard > App Services > twt-fe-service-jagord - Custom domains

**App Services** Microsoft

+ Add Edit columns More

twt

NAME ↑↓

- twt-fe-service-jagord
- twt-inventory-service-jagord
- twt-product-service

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Deployment

- Quickstart
- Deployment slots
- Deployment options (Classic)
- Deployment Center

Settings

- Application settings
- Container settings
- Authentication / Authorization...
- Application Insights
- Managed service identity

Backups

Custom domains

SSL settings

Networking

**twt-fe-service-jagord - Custom domains** App Service

Search (Ctrl+/)

Refresh FAQs

Custom Hostnames

Configure and manage custom hostnames assigned to your application. [Learn more](#)

IP address: 168.61.217.214

HTTPS Only: Off On

Add hostname

HOSTNAMES ASSIGNED TO SITE	SSL BINDING
twt-fe-service-jagord.azurewebsites.net	

**App Service Domains**

Purchase and manage domains for your Azure services with a single interface. [Learn more](#)

Buy Domain

DOMAINS	EXPIRES
No data found	

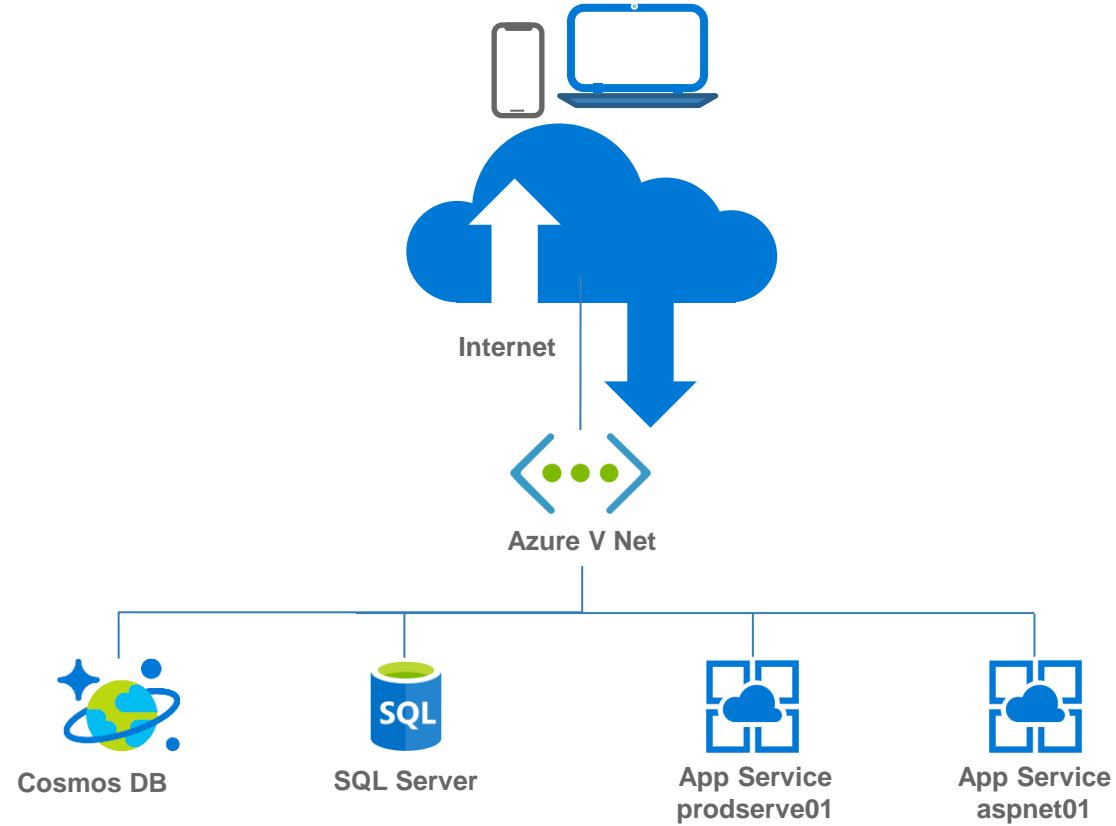
**Add hostname**

twt-fe-service-jagord

\* Hostname

store.twt.com

Validate



2a) Modernizing your application with  
containers and Serverless

# Introduction to Containers

# Containers

Shipping containers are efficiently moved using different modes of transport

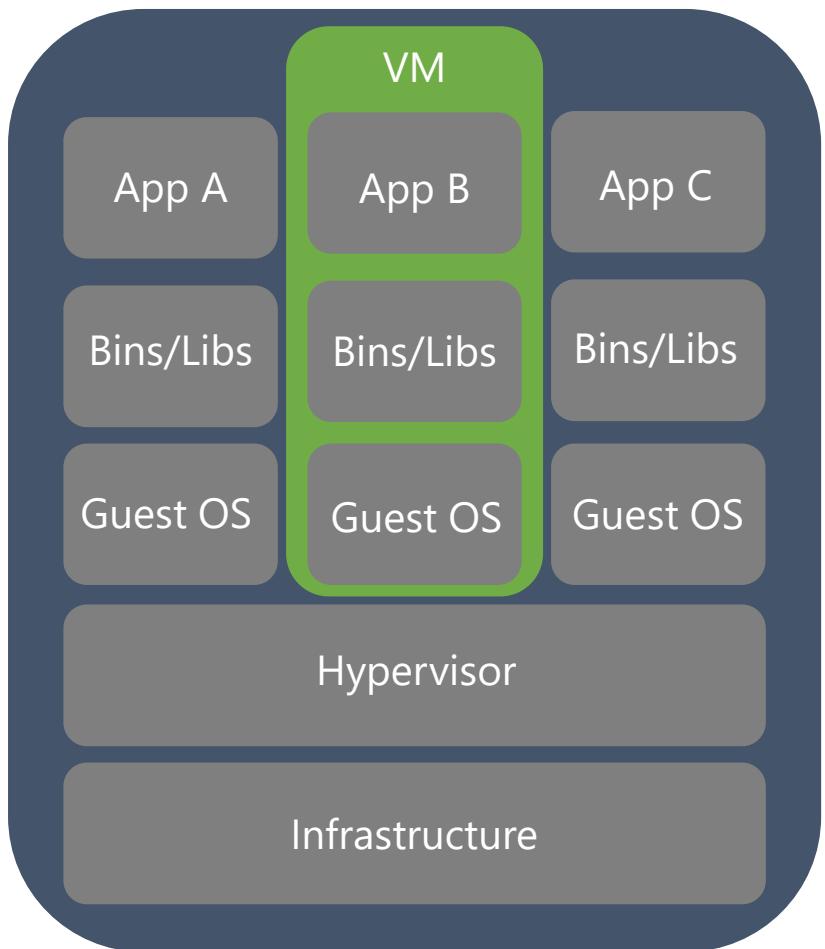
- Exact same dimensions & strength
- Initially being carried by a truck to a port
- Stacked alongside thousands of other containers on a huge container ship
- Ship carries them to the other side of the world
- At no time during the journey does the container need to opened, repacked or modified in any way to reach its destination



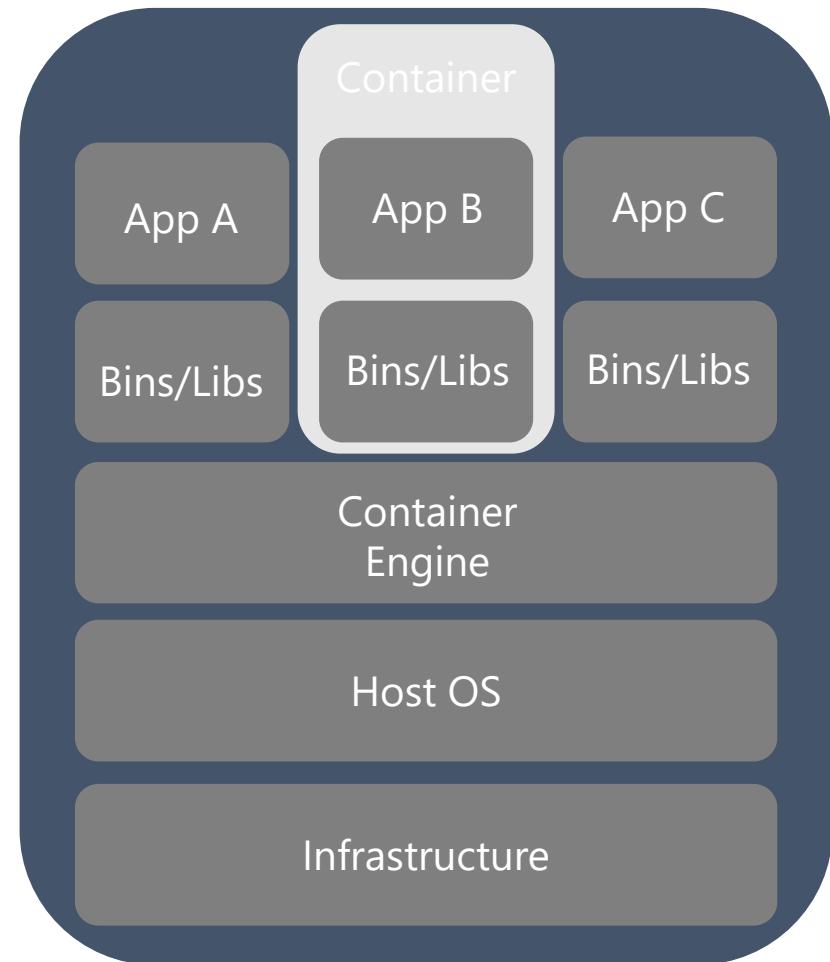
# A History of Containers

- 1979 – Unix V7
  - chroot: The beginning of process isolation. Worked by segregating file access for each process.
- 2000 – FreeBSD Jails
  - Partitions a FreeBSD computer system into several independent, smaller systems called “jails” with the ability to assign an IP address for each system
- 2001 – Linux VServer
  - A “jail” mechanism that can partition resources (file systems, network addresses, memory) on a computer system
- 2004 – Oracle Solaris Containers
  - Combines system resource controls and boundary separation provided by zones
- 2005 – Open VZ (Open Virtuzzo)
  - An operating system-level virtualization technology for Linux that uses a patched Linux kernel for virtualization, isolation, resource management and checkpointing
- 2006 – Process Containers
  - Launched by Google to limit, account for and isolate resource usage for a collection of processes. Later named Control Groups (cgroups)
- 2008 – LXC (LinuX Containers)
  - Most complete implementation of Linux container manager, using cgroups and Linux namespaces
- 2011 – Warden
  - CloudFoundry started Warden initially using LXC; later replaced with its own implementation. Works on any OS, running as a daemon and providing an API for container management
- 2013 – LMCTFY
  - Let Me Contain That For You (LMCTFY) began as an open-source version of Google’s container stack. Development in LMCTFY stopped in 2015 as efforts shifted toward libcontainer (part of the Open Container Foundation)
- 2013 – Docker
  - With the emergence of Docker, containers exploded in popularity. Docker offered an entire ecosystem for container management.

# Architecture



Virtual Machines



Containers

## What is a Container?

- All the required components to make a piece of software run is packaged into containers
- Containers are different than VMs since they don't have a full operating system
- Containers remove the overhead of VMs and they will always run the same, regardless of how or where they are deployed

# Why Containers?

- Encapsulate the application environment
- Generic API between management systems and applications
- Improved application deployment and introspection
- Manage applications instead of machines
- Relieve developers and operations from being concerned with the specific details of the machine and OS
- Ties system telemetry to the application (CPU, Memory, etc...)
- Allows infrastructure team flexibility in rolling out new hardware, OS, or system SKU's without impacting the applications
- Resonates with a microservices approach

# Container Runtime

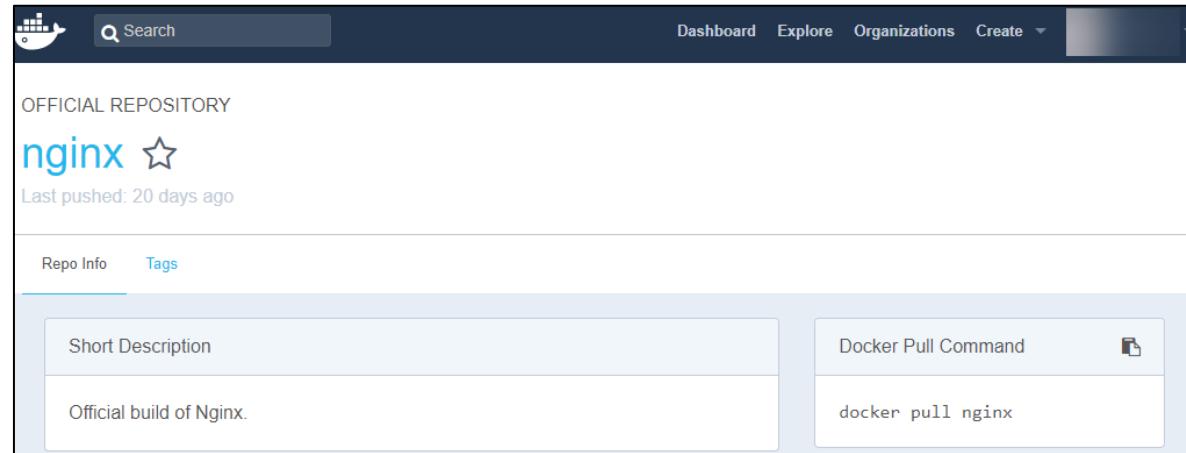
- Engine
  - Daemon runs on the host machine
  - Provides Sandboxing, Networking, Storage
- Client
  - CLI to interact with Engine
  - Local or Remote

# Containers

- Image
  - Application package with all dependencies
- Container
  - Instance of a Image
- Configuration File
  - Contains metadata necessary to implement standard operations against the container

# Containers Registries

- Docker Hub
  - Hosted registry service for managing images
  - Public and Private Image Repositories
  - Default Registry for Docker Operations
- Docker Trusted Registry
  - Private dedicated image registry, e.g. Azure Container Registry
- Other registries
  - Azure Container Registry

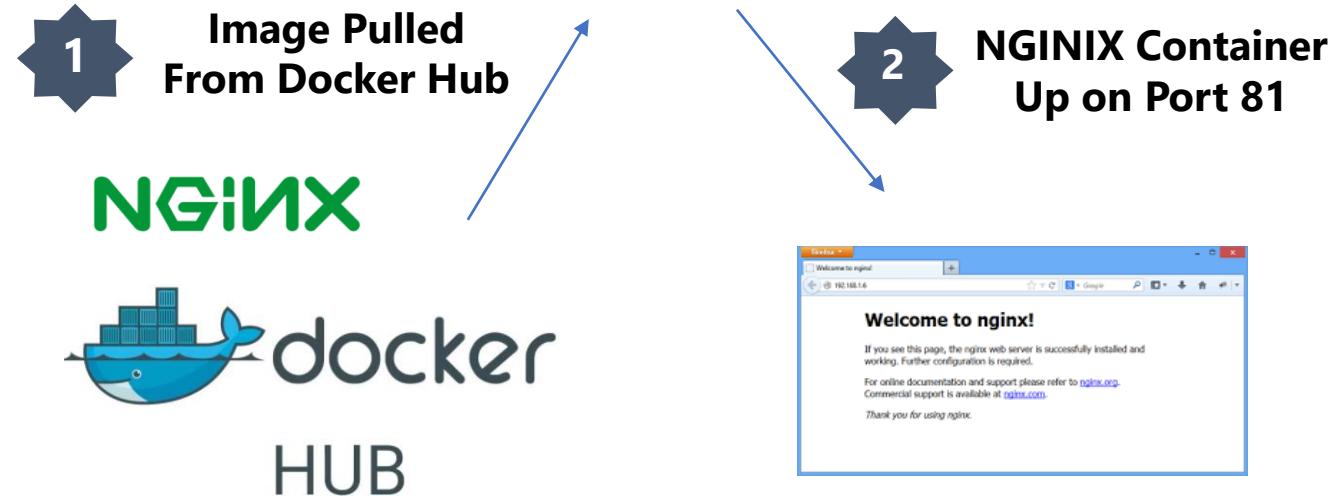


# Using Docker Images: Linux

- Image is “pulled” from the Registry
  - 1. docker pull nginx
- Container started using “Run”
- Software accessible once container is started
- TCP Ports mapped between Container and HOST
  - 2. docker run nginx –p 80:81

```
@dockervm: sudo docker pull nginx
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
94ed0c431eb5: Pull complete
9406c100a1c3: Pull complete
aa74daafdf50c: Pull complete

@dockervm: sudo docker run -p 80:81
```

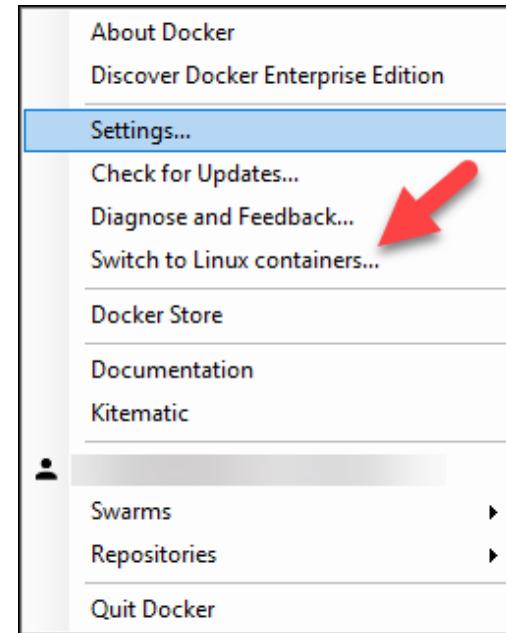


# Docker Containers on Windows

- Requires Hyper-V role and Containers feature & leverages PowerShell
- Switch between Linux and Windows Containers on Windows

```
PS C:\Users\ [ ] docker pull microsoft/mssql-server-windows-express
Using default tag: latest

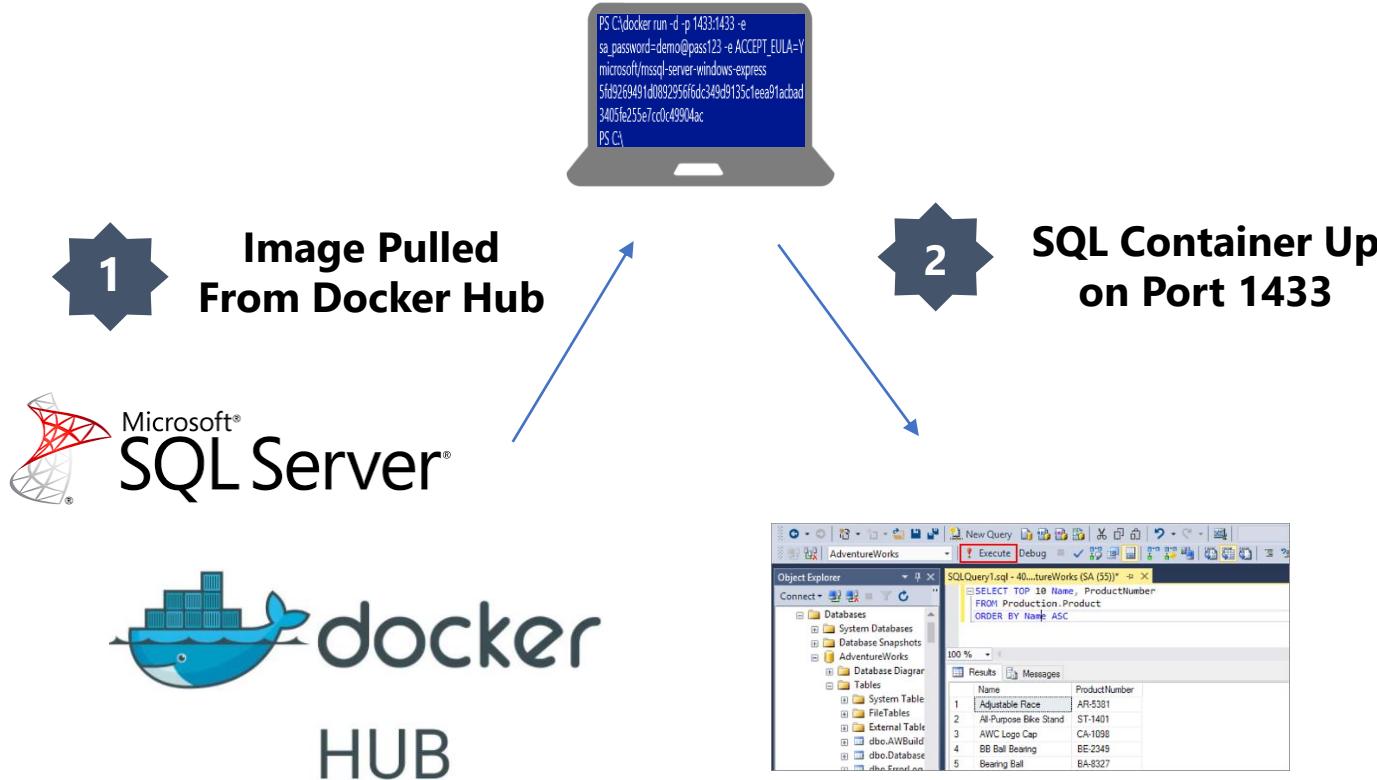
Please login prior to pull:
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID,
ub.docker.com to create one.
Username ( [ ] : [ ]
Password:
latest: Pulling from microsoft/mssql-server-windows-express
3889bb8d808b: Downloading [==>] 265.7MB/4.07GB
e29af68a947: Downloading [=====] 265.6MB/1.225GB
41be53e9dc04: Download complete
bcc51d185a7f: Download complete
978a493606df: Download complete
a930f7aefdf81: Download complete
8ad36c7092f8: Download complete
4cf45d7ce9ba: Download complete
1ad578c4d5d8: Download complete
f931387a33d6: Downloading [=====] 469.3MB/643.6MB
4477ad670f23: Waiting
90d8977a8378: Waiting
```



# Using Docker Images: Windows

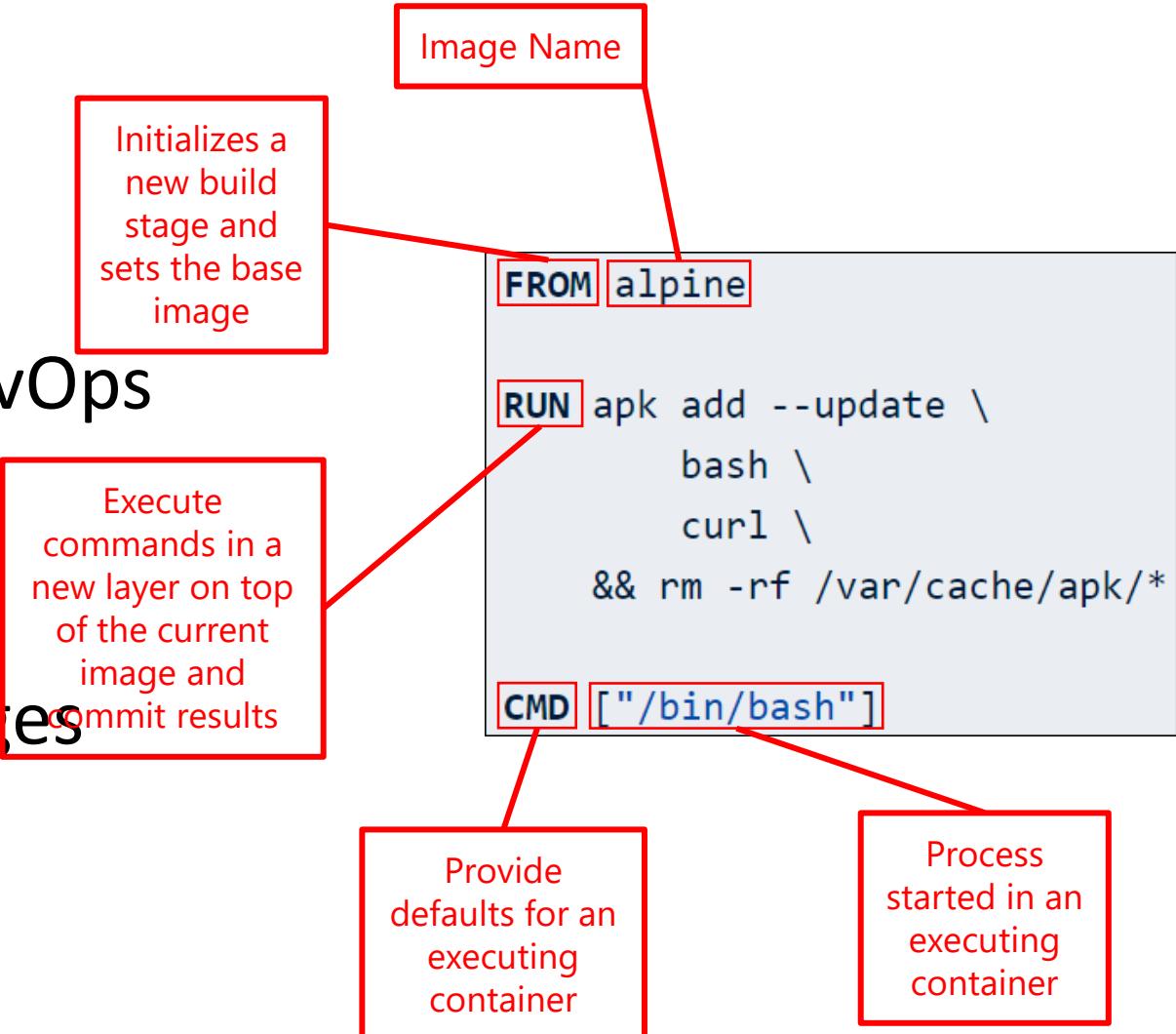
- Image is “pulled” from the Registry
  1. docker pull microsoft/ms-sql-server-windows-developer
- Container started using “Run”
- Software accessible once container is started
- TCP Ports mapped between Container and HOST
- Docker MSI --isolation=hyperv
  2. docker run -d -p 1433:1433 --env sa\_password=demo@pass123 -e ACCEPT\_EULA=Y --isolation=hyperv microsoft/mssql-server-windows-developer

```
PS C:\docker pull microsoft/mssql-server-windows-developer
latest: Pulling from microsoft/b08959e1175b: Pull complete
PS C:\docker run -d -p 1433:1433 --env
sa_password=demo@pass123 -e ACCEPT_EULA=Y
--isolation=hyperv microsoft/mssql-server-windows-developer
```



# Docker File

- Captures the Steps to build a container
- Is a version-able asset in your DevOps flows
  - Configuration As Code
- Re-use of Existing Container Images (Private or Public)

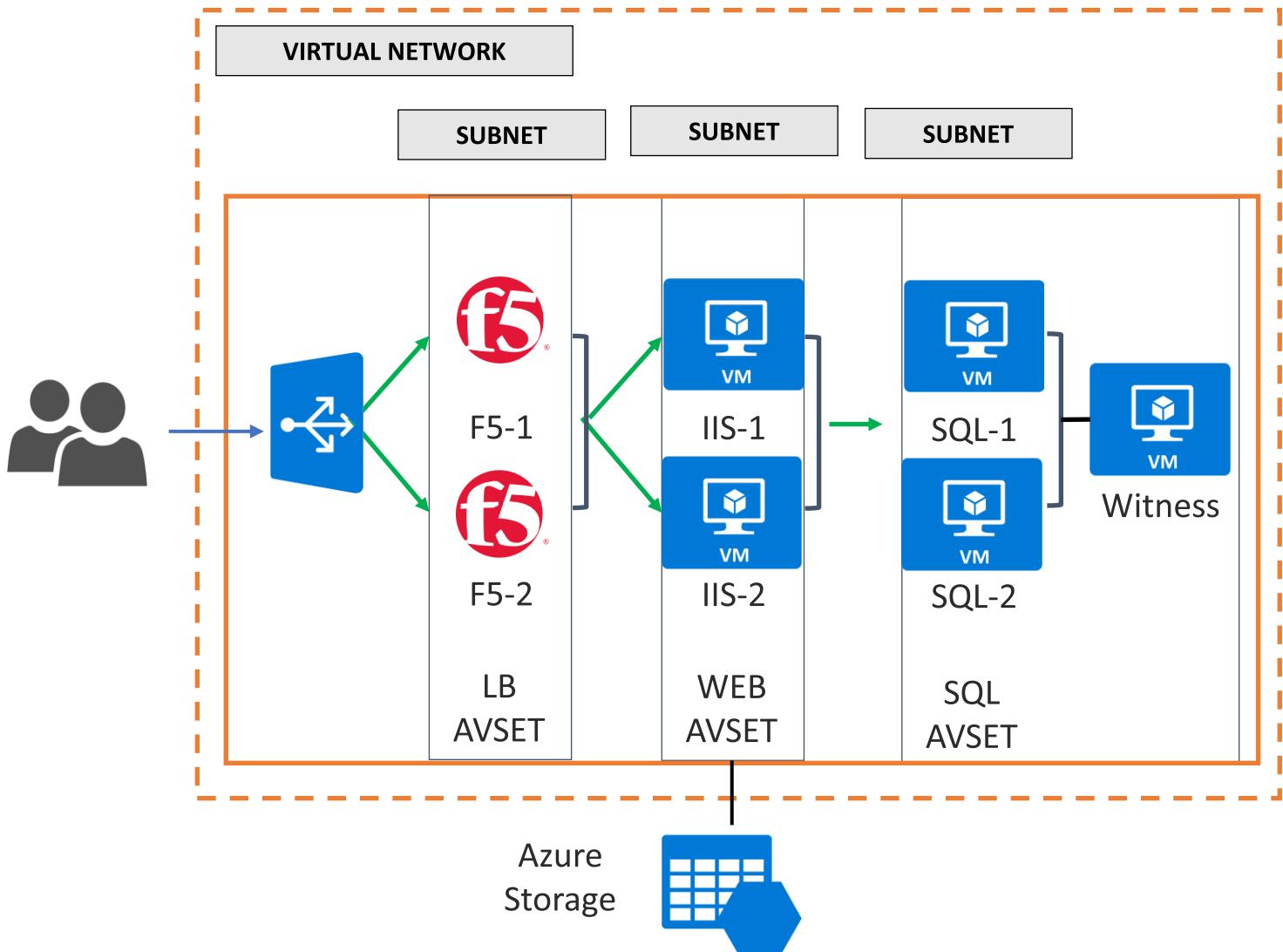


# Deploying and Scaling Containers

# Classic Web Deployment – Cloud IaaS

Azure VMs, Azure Load Balancer, Azure Storage

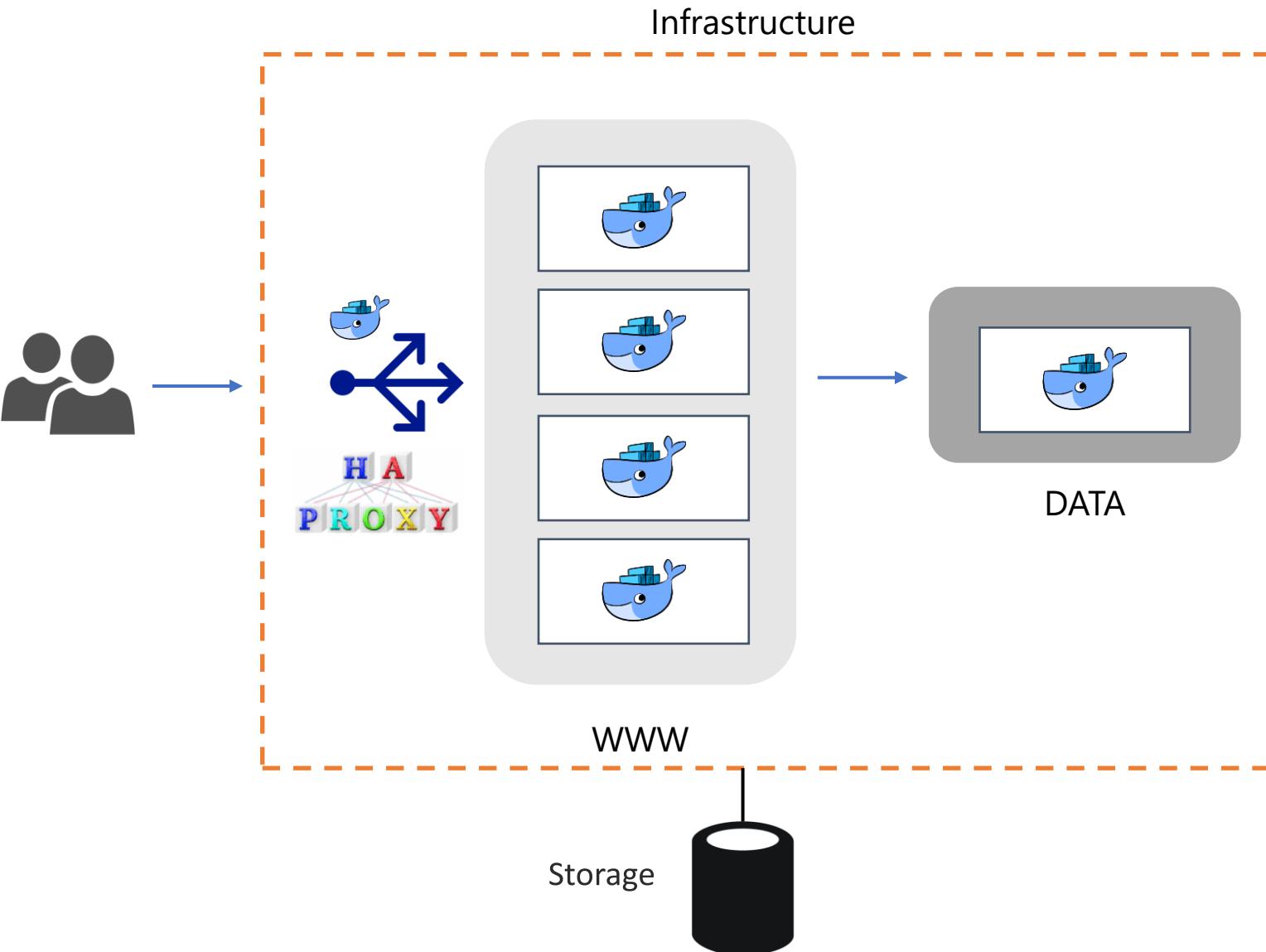
- 3 tiers, separate networks
- VMs running on Azure
- Load balancers in front of Web Tier



# Web Deployment – Manual Docker

Docker Containers on either Hardware or VMs

- Docker Containers implemented manually running on either Hardware or VMs
- HAProxy Load Balancer
- Storage Provided by Infrastructure of whatever type



# What is the Role of the Container Orchestrator?

- Manage
  - Container Deployments
  - Clusters
- Provide
  - High Availability
  - Scalability
  - Discoverability
  - Discovery
  - Networking

Why are they important?

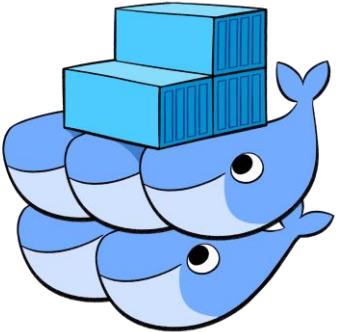
---

Orchestrators abstract an application & its architecture completely from the infrastructure...

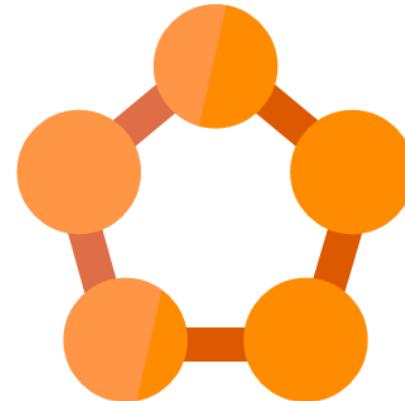
# Container Orchestrator Leaders



**kubernetes**



Docker Swarm



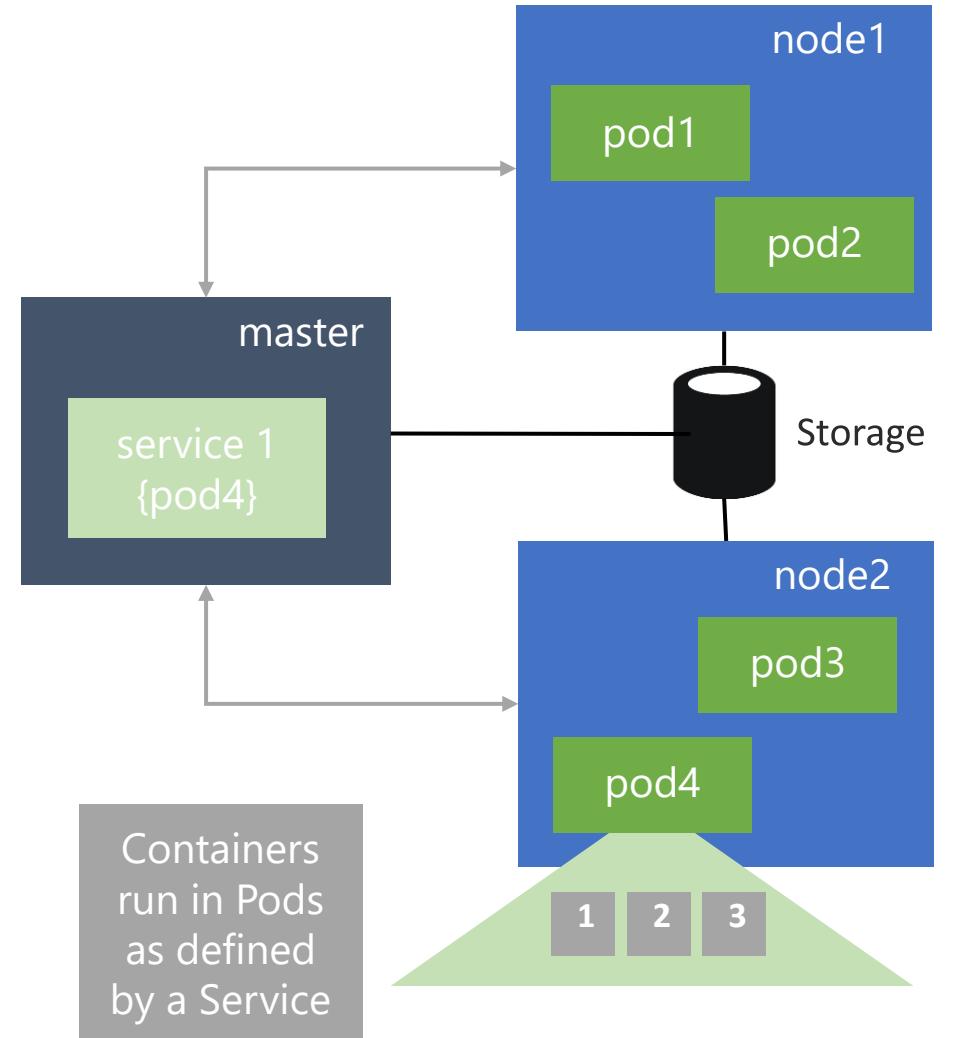
Azure Service Fabric

# Kubernetes

Open source based on project “Borg” at Google



- High Level Components
  - Master
    - Defines the Cluster and Managing the resources including the Storage, Scheduler & API Endpoint
    - Manages Registries of various pieces of the cluster (Nodes, Services, Pods)
  - Nodes
    - Provides the compute power
  - Pods run on Nodes
    - Collection of Containers that can run on a host
    - Logical Host with access to a shared volume
  - Service
    - Defines Set of Pods to be used for a Service
  - Container
    - Unit of Compute

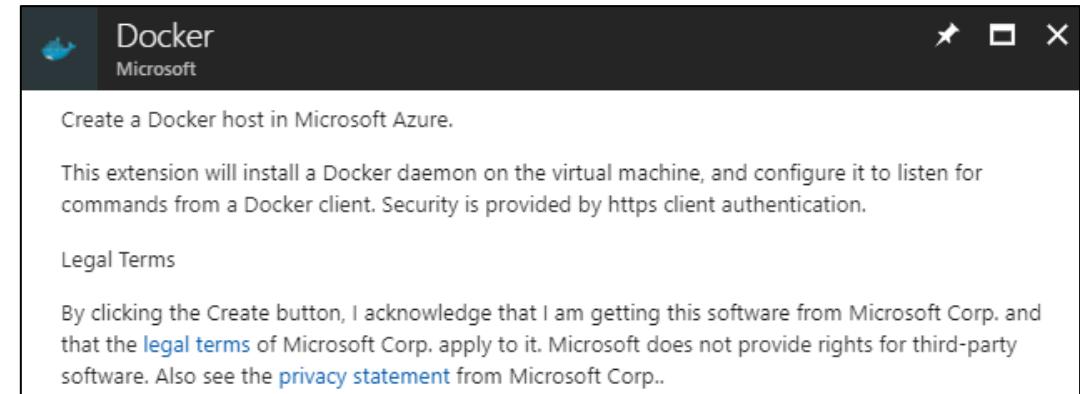


# Containers on Azure

# Running Docker on Azure VMs

## Support for Linux and Windows Containers

- Many options for running Docker on Azure
  - Marketplace VM Images with Docker installed
    - Docker on Ubuntu Server
    - RancherOS
    - CoreOS
    - Windows Datacenter 2016 with Containers
  - Docker VM Extension
    - Installs & configures the Docker daemon, Docker client, and Docker Compose
    - Can be installed via ARM Template
  - Manual Installation of Docker on VM
    - Docker can be run from any supported VM image

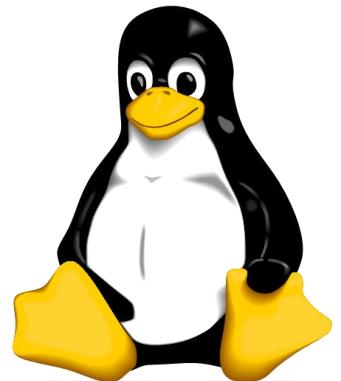
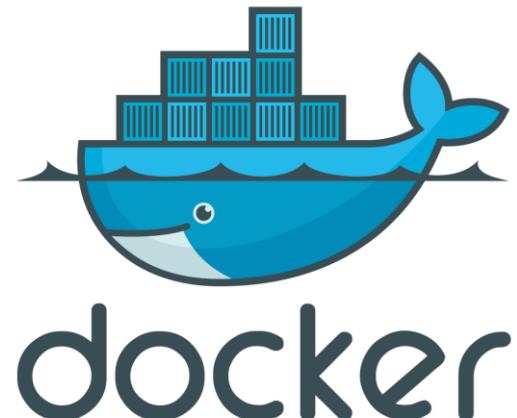


# Using Docker with Azure App Service

## Web App on Linux

- Built-in Containers
  - Node.js
  - PHP
  - .NET Core
- Any Docker Container
  - Docker Hub
  - Private Registry

The screenshot shows two side-by-side Azure portal windows. The left window is titled 'Web App On Linux (pre...)' and contains fields for 'App name' (LinuxWebApp2017), 'Subscription' (Super Awesome Cloud), 'Resource Group' (Create new selected, group name LinuxWebApp2017Group), and 'App Service plan/Location' (LinuxWebAppPlan(West Europe)). A blue callout box points to the 'Configure container' section, which says 'node 4.5.0'. The right window is titled 'Docker Container' and contains a 'docker' logo, a brief description of using Docker containers, and a 'Image source' section with tabs for 'Built-in' (selected), 'Docker Hub', and 'Private registry'. It also shows a 'Runtime Stack' dropdown set to 'Node.js 4.5.0'.



# Azure Kubernetes Service (AKS)

- Makes it simple to create, configure, and manage a preconfigured Kubernetes cluster to run containerized applications
- Control plane / Master is fully managed
- Worker nodes are regular VMs



# Azure Container Instances

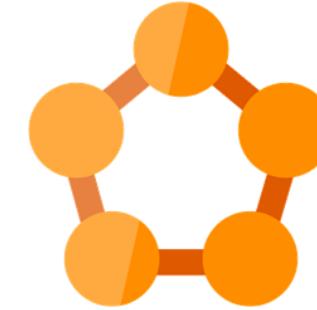
- Start a container in seconds with a single command without VMs
- Pull container images from Docker Hub or Azure Container Registry
- Containerize your application using Docker technology and execute immediately with one click
- Take advantage of per-second billing & container-based compute on demand



# Docker Containers on Service Fabric

Distributed Platform for running microservices on Azure

- Running an existing application in a Windows or Linux container on a Service Fabric cluster doesn't require any changes to your application



<https://docs.microsoft.com/en-us/azure/service-fabric/service-fabric-get-started-containers-linux>

# Finding the Right Azure Container Service

Use case	Azure Service
Scale and orchestrate containers using Kubernetes, DC/OS or Docker Swarm	AKS
Easily run containers on Azure with a single command	ACI
Store and manage container images across all types of Azure deployments	ACR
Develop microservices and orchestrate containers on Windows or Linux	Service Fabric
Deploy web applications on Linux using containers	App Service
Run repetitive compute jobs using containers	Batch

# Azure Container Registry

Docker Private Registry hosted in Azure

- Store and manage container images across all types of Azure deployments
- Keep container images near deployments to reduce latency and costs
- Maintain Windows and Linux container images in a single Docker registry
- Use familiar, open-source Docker command line interface (CLI) tools
- Simplify registry access management with Azure Active Directory

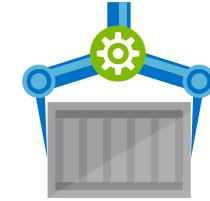
A screenshot of the Azure portal showing the 'myprivateregistry' Container registry blade. The left sidebar includes links for Overview, Activity log, Access control (IAM), Tags, Quick start, and SETTINGS (Access keys). The main pane displays essential details: Resource group (acr-rg), Status (Active), Location (West US), Subscription name (Visual Studio Ultimate with MSDN), and Subscription ID. It also shows the login server (myprivateregistry-on.azurecr.io) and creation date (Creation date).

Resource group	acr-rg
Status	Active
Location	West US
Subscription name	Visual Studio Ultimate with MSDN
Subscription ID	[REDACTED]
Login server	myprivateregistry-on.azurecr.io
Creation date	[REDACTED]
Storage account	myprivateregistry215527

```
C:\Container Class>docker push myprivateregistry-on.azurecr.io/module01/module01
The push refers to a repository [myprivateregistry-on.azurecr.io/module01/module01]
aa9058bb75a6: Pushed
4169ead5865f: Pushed
3ca93ff2177d: Pushed
e9ee7618a0f5: Pushed
8d1a0fd05aa3: Pushed
e99d2cad2762: Pushed
5d6cbe0dbcfc9: Pushed
1.0: digest: sha256:47dde4cf2d6e1e178c7f706fdd6fa52bf1db09477d7dadf89977f9491cbe1835 size: 1792
```

# Azure Container Registry

## ACR Tasks



- Native Container Build Service in the cloud
- Follows docker build semantics

```
docker build -t helloworld:v1 .
az acr build -t helloworld{{.Build.ID}} .
```

Trigger based builds (git commits, base image updates)

```
az acr build-task create
--image helloworld{{.Build.ID}}
--name myBuildTask
--registry jengademos
--context https://github.com/me/helloworld
--branch master
--git-access-token $PAT
```

# Demo

## Building and Pushing Images to Azure

<https://github.com/microsoft/IgniteTheTour/blob/master/DEV%20-%20Building%20your%20Applications%20for%20the%20Cloud/DEV10/deployment/deploy.sh>

# The Tailwind Traders App

- Ecommerce web app
- Three microservices:
  - Frontend (React)
  - Inventory service (C#)
  - Product service (Node.js)

# Create container registry

\* Registry name  
The registry name is required.  
.azurecr.io

\* Subscription  
▼

\* Resource group  
▼  
Create new

\* Location  
▼

\* Admin user ⓘ

\* SKU ⓘ  
▼



twtaacr

Container registry



Search (Ctrl+ /)

[Move](#) [Delete](#) [Update](#)[Overview](#)[Activity log](#)[Access control \(IAM\)](#)[Tags](#)[Quick start](#)[Events](#)[Settings](#)[Access keys](#)[Locks](#)[Automation script](#)[Services](#)[Repositories](#)[Webhooks](#)[Replications](#)

Essentials ^

Resource group

twt-prod-jagord

Location

West Europe

Subscription name

Ignite the Tour

Subscription ID

cd400f31-6f94-40ab-863a-673192a3c0d0

Login server

twtaacr.azurecr.io

Creation date

11/8/2018, 8:26 PM EST

SKU

Standard

Provisioning state

Succeeded

Registry quota usage

Used  
**0.8 GiB**Available in SKU  
**99.2 GiB**

ACR Tasks

Build, Run, Push and Patch containers in Azure with ACR Tasks. Tasks supports Windows, Linux and ARM with QEMU.

[Learn more](#)

Container security integrations



## twtnwacr - Access keys

Container registry

Search (Ctrl+ /)

Overview

Activity log

Access control (IAM)

Tags

Quick start

Events

### Settings

Access keys

Locks

Automation script

### Services

Repositories

Webhooks

#### Registry name

twtnwacr



#### Login server

twtnwacr.azurecr.io

#### Admin user

Enable

Disable

#### Username

twtnwacr



#### NAME      PASSWORD

password      jZ2FQMuK4=wby6t9d7DcTzG3I=zPb3JT



password2      jnNeYf1PXuSmK2sywLX/7l0sQaJ/bONX



# Build Docker image directly in ACR

```
-rwxr-xr-x  1 jaygordon  staff   122 Nov  8 22:00 start-docker.sh
bash-3.2$ az acr build -r twtacr --subscription "Ignite the Tour" -t twt-inventory-service-jagord-demo .
Packing source code into tar to upload...
Excluding '.gitignore' based on default ignore rules
Uploading archived source code from '/var/folders/33/jdycc_k567v7ns54whd4wrpw000
0gp/T/build_archive_b40a789d756c457eb1fa4711e80b39a0.tar.gz'...
Sending context (10.366 KiB) to registry: twtacr...
Queued a build with ID: cb8
Waiting for agent...
2018/11/12 15:07:13 Successfully logged in
2018/11/12 15:07:13 Executing step ID: build. Working directory: '', Network: ''
2018/11/12 15:07:13 Obtaining source code and scanning for dependencies...
2018/11/12 15:07:14 Successfully obtained source code and scanned for dependenci
es
Sending build context to Docker daemon  82.94kB
Step 1/5 : FROM microsoft/dotnet:2.2-sdk
2.2-sdk: Pulling from microsoft/dotnet
bc9ab73e5b14: Already exists
193a6306c92a: Already exists
e5c3f8c317dc: Already exists
a587a86c9dcb: Already exists
99b2440d111d: Pulling fs layer
0c3d3d854356: Pulling fs layer
f3c0d17b8c87: Pulling fs layer
```

```
2018/11/12 15:09:19 Successfully pushed image: twtacr.azurecr.io/twt-inventory-service-jagord-demo:latest
2018/11/12 15:09:19 Step ID: build marked as successful (elapsed time in seconds : 36.495270)
2018/11/12 15:09:19 Populating digests for step ID: build...
The following dependencies were found:
- image:
    registry: twtacr.azurecr.io
    repository: twt-inventory-service-jagord-demo
    tag: latest
    digest: sha256:81afb2e8ce50ab11f12d33e88ab4dd4232225d39064a46c4fa5604425ff94
e4d
    runtime-dependency:
        registry: registry.hub.docker.com
        repository: microsoft/dotnet
        tag: 2.2-sdk
        digest: sha256:453a72b74edd4c747dad0148743d1be0cf6c4c6cfbd8bd9badcf2c84370a4
4eb
    git: {}
```

```
bash-3.2$ docker image ls twtacr.azurecr.io/twt-product-service-jagord
REPOSITORY                      TAG      IMAGE ID      CREATED       SIZE
twtacr.azurecr.io/twt-product-service-jagord  20181112  9b5ed75edaf5  2 minutes ago  113MB
twtacr.azurecr.io/twt-product-service-jagord  latest   b52943e5ea26  3 days ago   113MB
bash-3.2$
```

# Three Different Ways To Build Containers

- docker build; docker push\*
- az acr build\*
- Azure Devops Pipeline

\*manual

# Deploying to Azure App Service

- Our images are in the registry
- **Azure App Service for Linux** runs our containers

```
az webapp create \
-g $RES_GROUP \
-n $WEB_APP_3 \
--plan $APP_SERVICE \
--deployment-container-image-name 'nginx'
```

## App Services

Microsoft



**+ Add** **Edit columns** **More**

Filter by name...

NAME ↑↓

- delete-me-lp2s2-product-service
- dotnet1-6c4b8e
- frontend-5536d8
- frontend-6c4b8e
- functione75088
- inventory-service-5536d8
- inventory-service-6c4b8e
- inventory-service-friday-zip
- jaydestro-blog

## Web



Web App for Containers X

Pricing

All

Operating System

All

Publisher

All

### Results

NAME	PUBLISHER	CATEGORY
Web App for Containers	Microsoft	Web Apps
Web App For Containers + MySQL	Microsoft	Web Apps

# Create App Service for Web Apps (Docker)

**Web App**

[Basics](#) [Docker](#) [Tags](#) [Review + create](#)

App Service Web Apps lets you quickly build, deploy, and scale enterprise-grade web, mobile, and API apps running on any platform. Meet rigorous performance, scalability, security and compliance requirements while using a fully managed platform to perform infrastructure maintenance. [Learn more](#)

**Project Details**

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ

Resource Group \* ⓘ  [Create new](#)

**Instance Details**

Name \*  [.azurewebsites.net](#)

Publish \*

Operating System \*

Region \*   ⓘ Can't find your App Service Plan, try a different region.

**App Service Plan**

App Service plan pricing tier determines the location, features, cost and compute resources associated with your app. [Learn more](#)

Linux Plan (West US 2) \* ⓘ

 **Single Container**

 **Docker Compose (Preview)**

**Image source**

[Quickstart](#) [Azure Container Registry](#) [Docker Hub](#) [Private Registry](#)

Registry

Image

Tag

Startup File

Secrets

Everybody has them

# The Problem

- We need database credentials in app
- Insecure: hard-code secrets into Dockerfile
- Insecure: hard-code secrets into scripts

How do we securely **store** and **inject** secrets?

# Azure KeyVault

- Secure storage for secret data
- Everything stored in Hardware Security Modules (HSMs)
- Integrated with many Azure Services
- Store Keys, Secrets, Certificates
- Strict control and auditing of Key Vault

# Create a Keyvault

```
az keyvault create \  
--resource-group $RES_GROUP \  
--name $AKV_NAME
```

# Store a Secret

```
az keyvault secret set \  
--vault-name $AKV_NAME \  
--name web3-mongo-connection \  
--value $DB_CONNECTION_STRING
```

# Read a Secret on the Command Line

```
az keyvault secret show \  
--vault-name $AKV_NAME \  
--name web3-mongo-connection \  
--query value \  
-o tsv
```

# Read Secrets from App Code

```
const KeyVault = require("azure-keyvault");  
...  
const secrets = await client.getSecrets(uri);
```

# Demo

Storing and Accessing Secrets in KeyVault

# Azure Functions

Serverless to the next level



# Focus on code, not plumbing



No infrastructure  
management



Auto-scale based  
on your workload



No wasted resources,  
pay only for what you use

# Language options

Generally available



Public preview



April 2019



More on the way!

# Common Architecture Patterns

- Event and Stream Processing
  - IoT event and data processing
  - Big data and machine learning pipelines
- Serverless APIs
  - Mobile / Web backends
- Integration and Enterprise Service Bus
  - Connecting line-of-business systems
  - Pub/Sub for business events
- Automation and Digital Transformation
  - Process automation

# Azure Functions Overview

- React to external **triggers**
- Azure defines supported languages
- "glue" services together
- Small applications, simple deployments

# Reports?

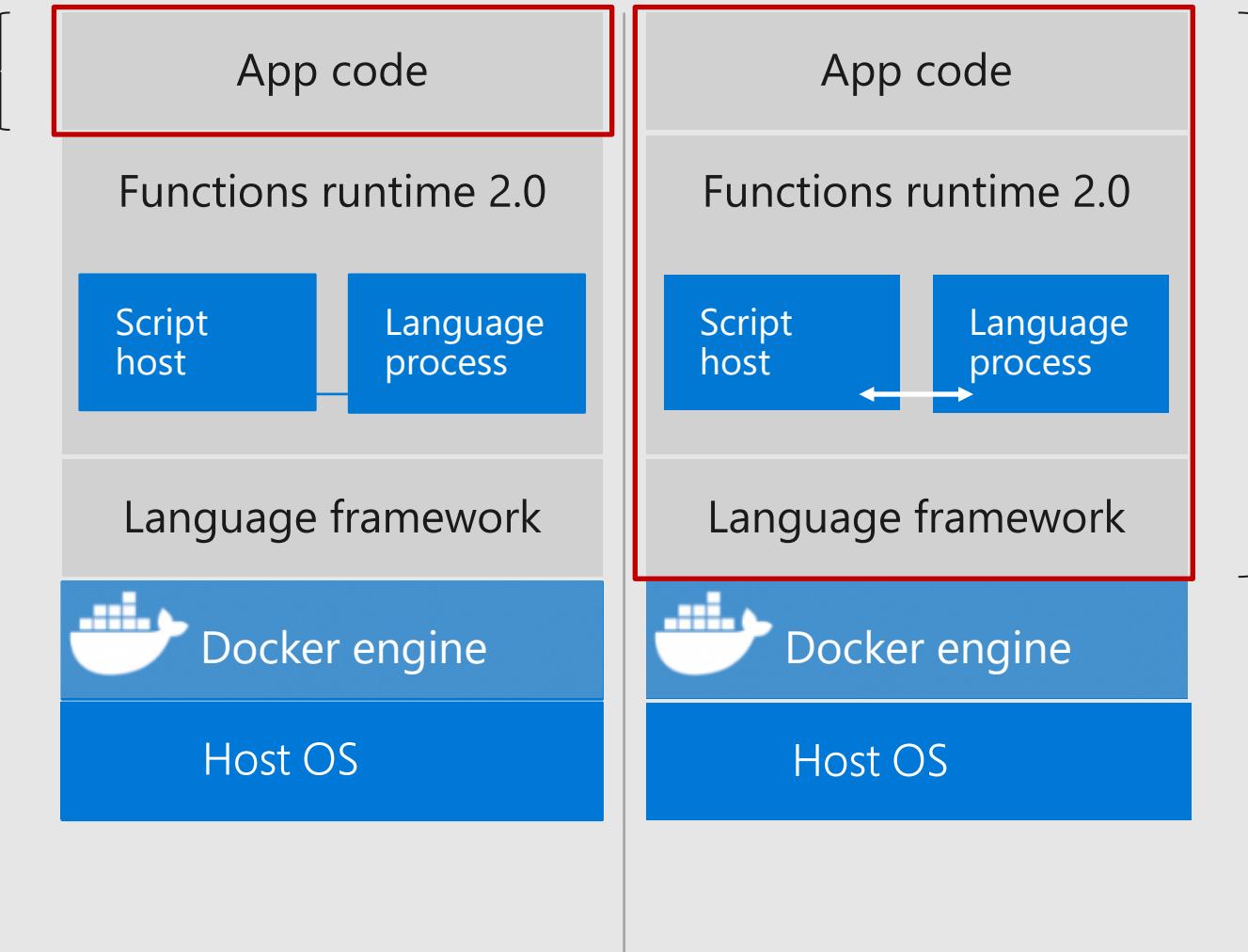
- Replace existing ‘cron’ jobs
- Nightly reports emailed to staff

# Timers

- Built-in Azure functions trigger
- Calls your code on an interval
- Replace cron jobs

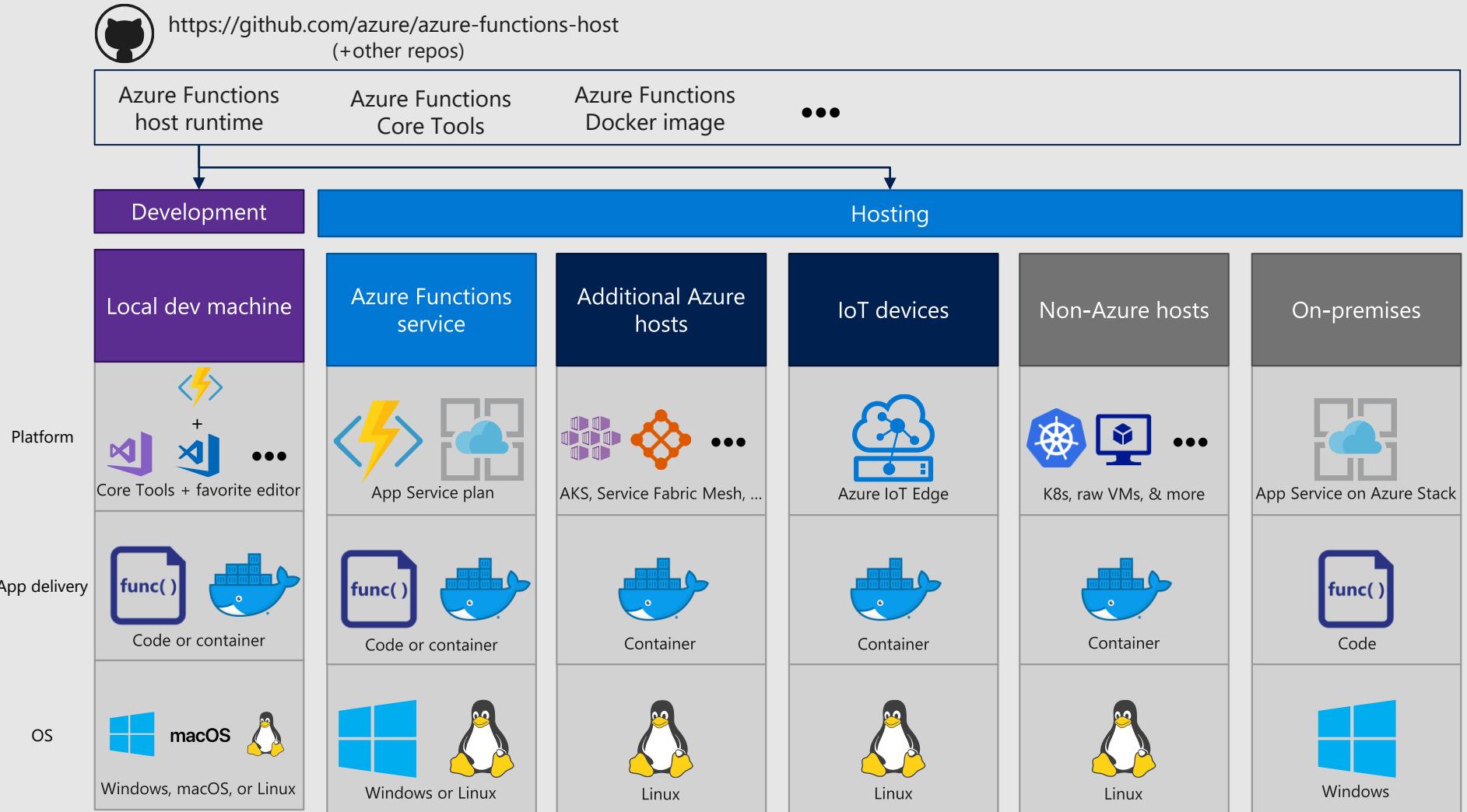
# Hosting Functions Containers

Bring business logic code only.  
Run on containers managed and abstracted by hosting platform.



Bring a custom container image encapsulating business logic + dependencies.

# Functions everywhere



# Demo

Calculating a Report Every X Minutes

# Summary

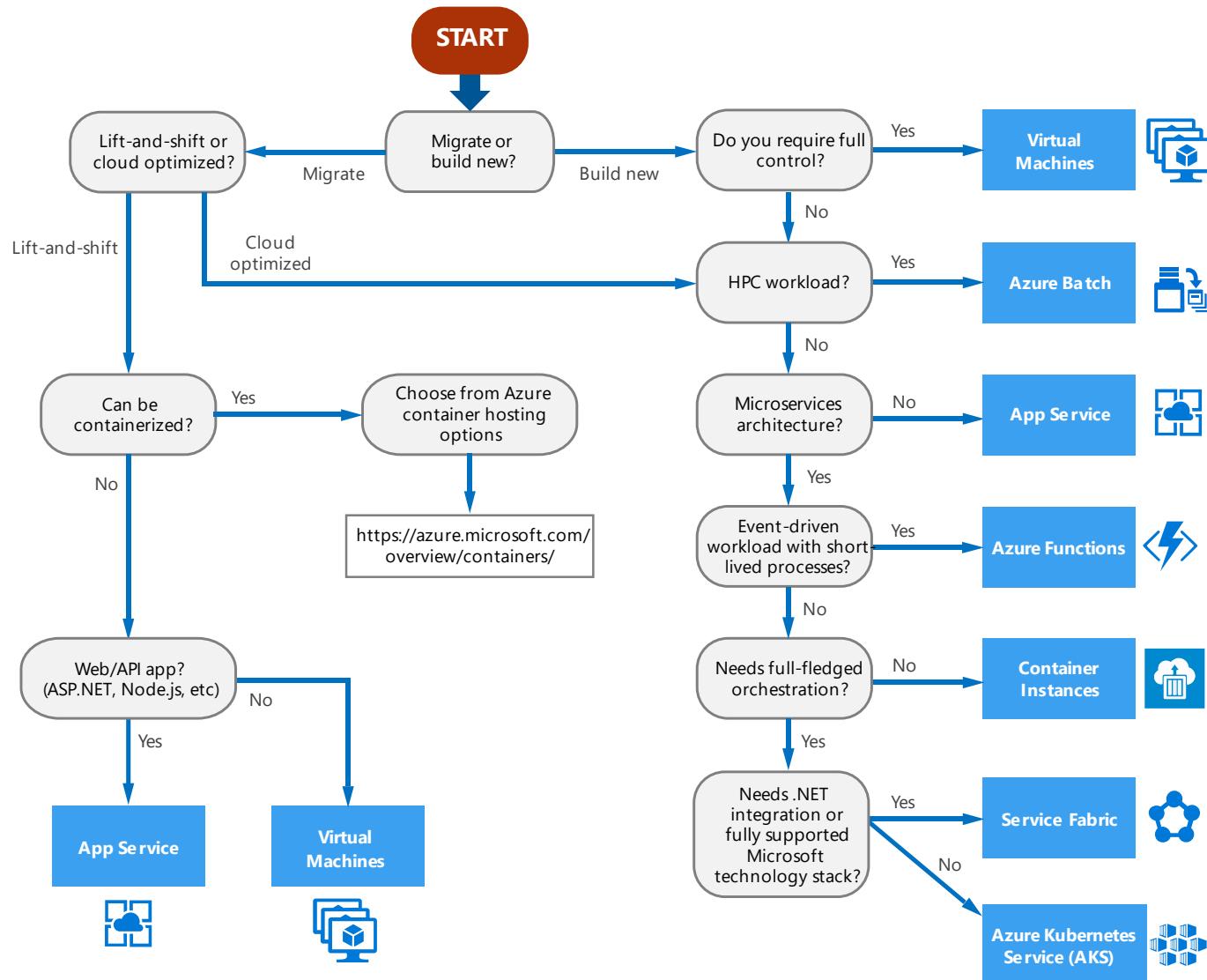
- Code -> **Docker Image**
- Image -> **Azure Container Registry (ACR)**
- ACR -> **Azure App Service for Linux**
- “Cron job” Trigger -> **Azure Functions**

## 2b) Consolidating infrastructure with Azure Kubernetes Service

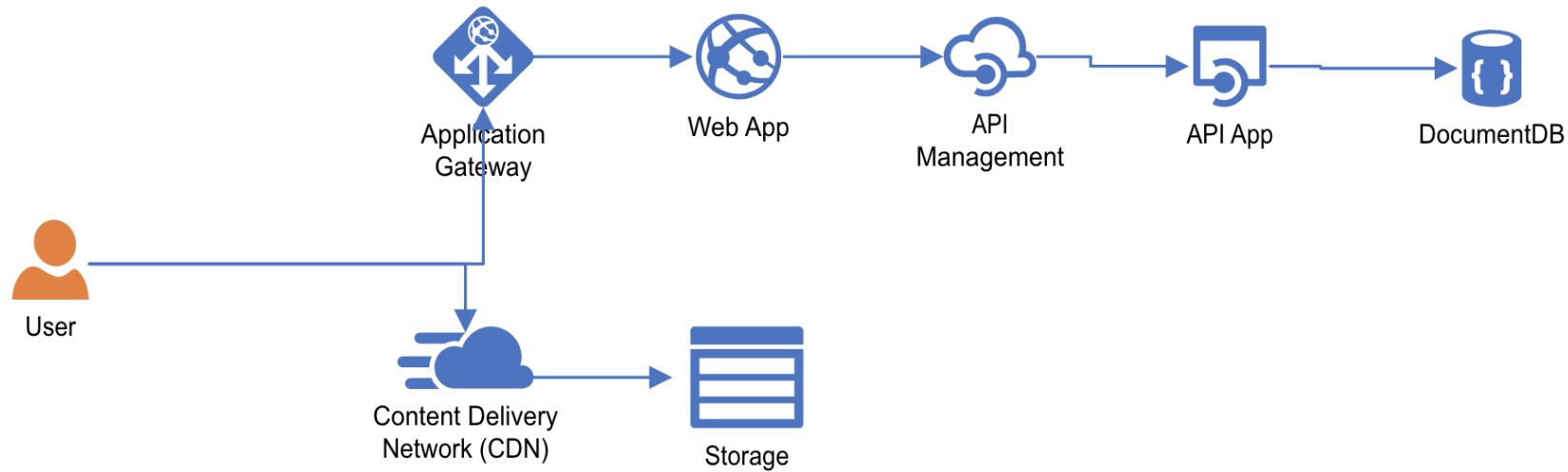
# Azure Kubernetes

Before starting with K8s with  
customers... stop and think!

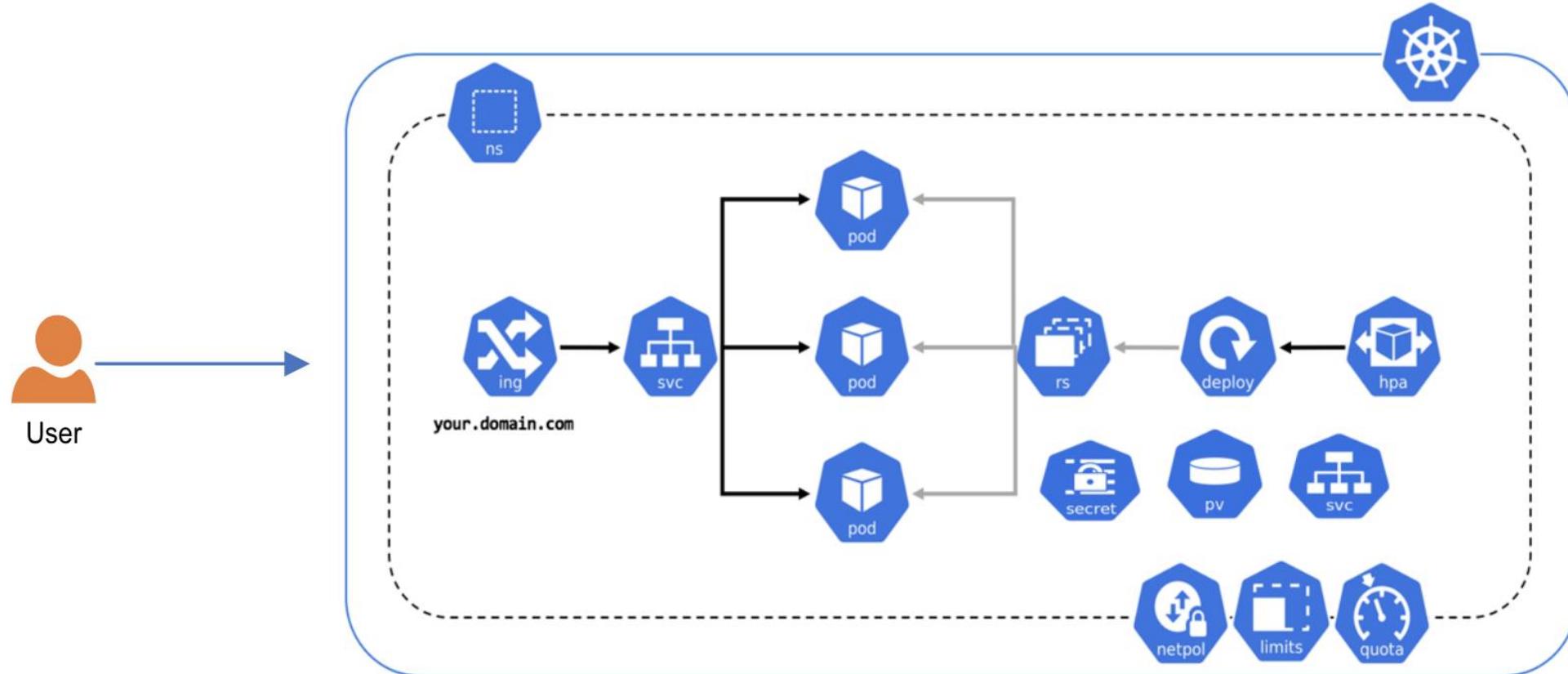
# Azure Decision Tree



# Solving this Challenge with our Azure Toolbox



# Solving this challenge with the Kubernetes Toolbox



<https://github.com/hjacobs/kubernetes-failure-stories>

# Azure App Services for Linux

- Fully managed PaaS for containers
- Support for many workflows
- Advanced features for webapps



# Azure Container Instances

- Containers on demand
- Per-second billing (!)
- Integrations with other Azure services
- No need to provision VM's or clusters
- Hypervisor level isolation
- Public IP
- Persistent Storage
- Supports both Linux and Windows containers

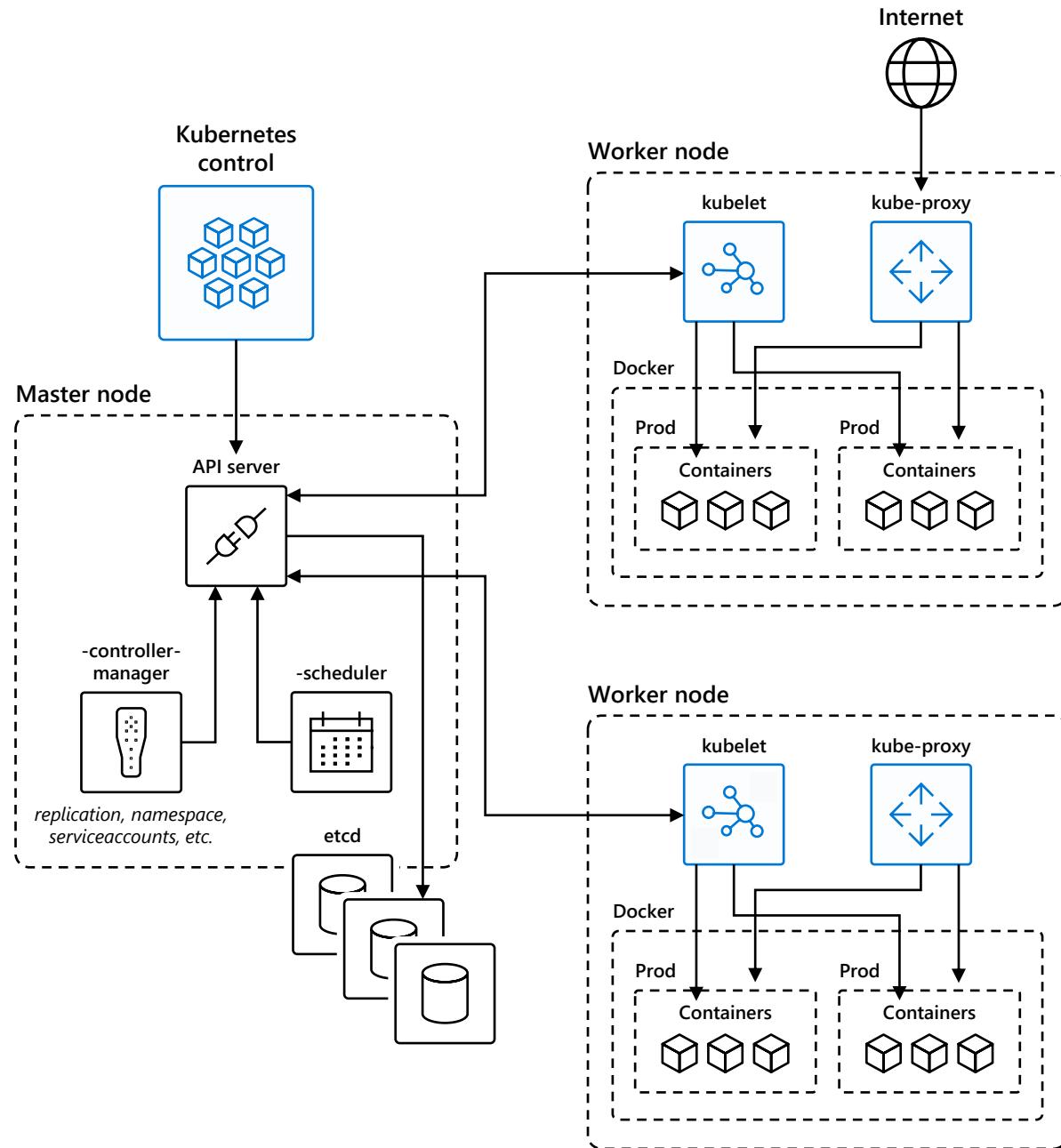


# Azure Container Instances

```
$ az container create  
  --resource-group myrg \  
  --name aci-helloworld \  
  --image microsoft/aci-helloworld \  
  --dns-name-label aci-demo \  
  --ports 80
```

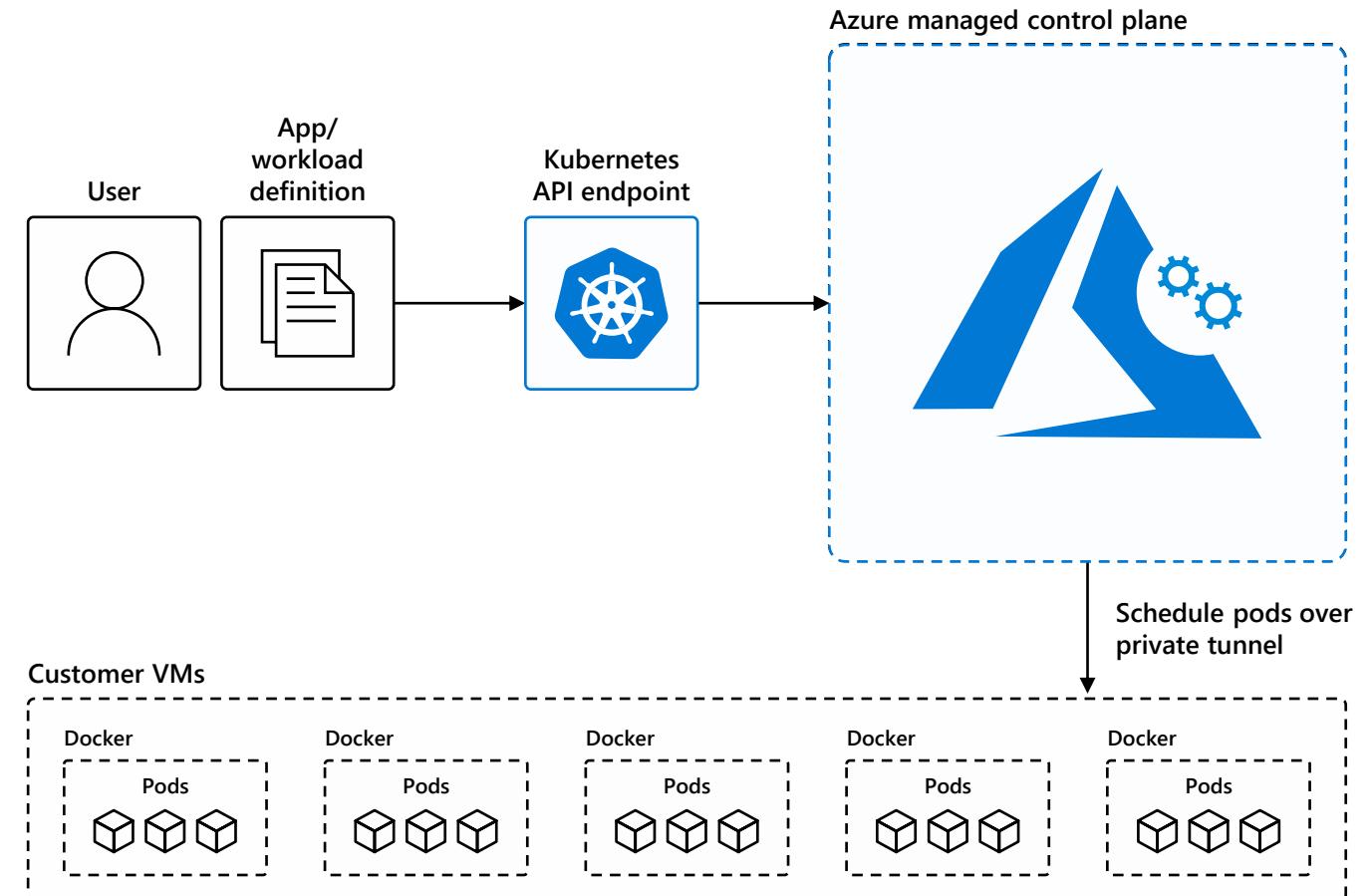
# Kubernetes 101

1. Kubernetes users communicate with API server and apply desired state
2. Master nodes actively enforce desired state on worker nodes
3. Worker nodes support communication between containers
4. Worker nodes support communication from the Internet



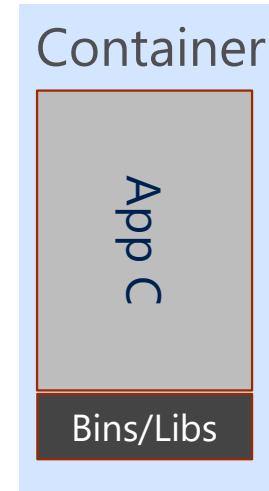
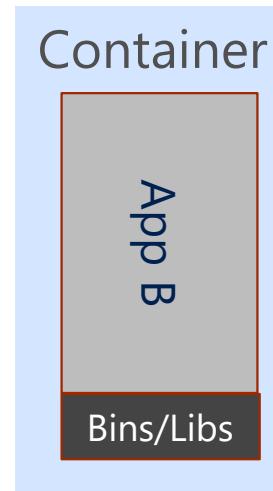
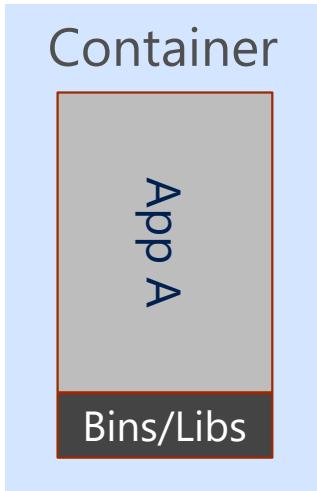
# How managed Kubernetes on Azure works

- Automated upgrades, patches
- High reliability, availability
- Easy, secure cluster scaling
- Self-healing
- API server monitoring
- At no charge



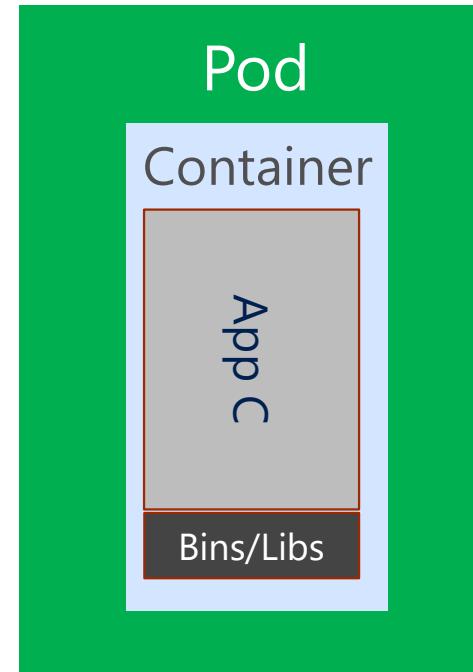
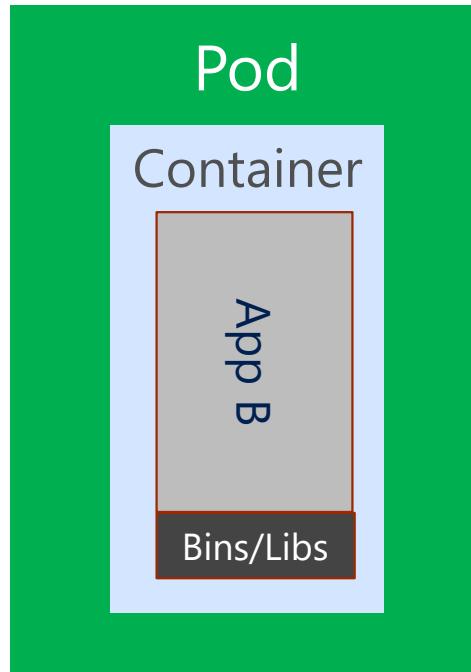
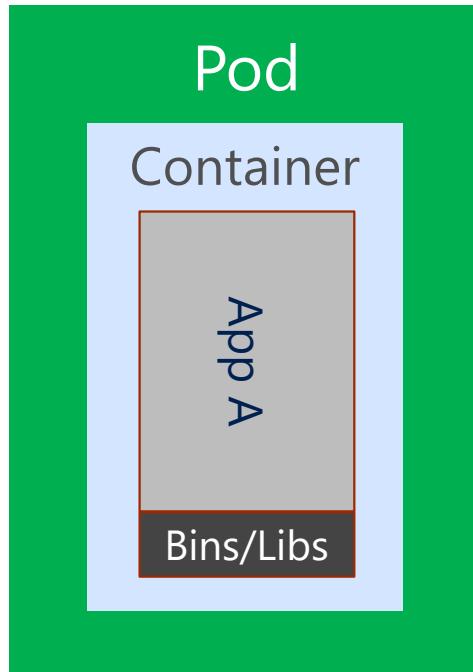
# Kubernetes Architecture Components

Where do the Containers go?



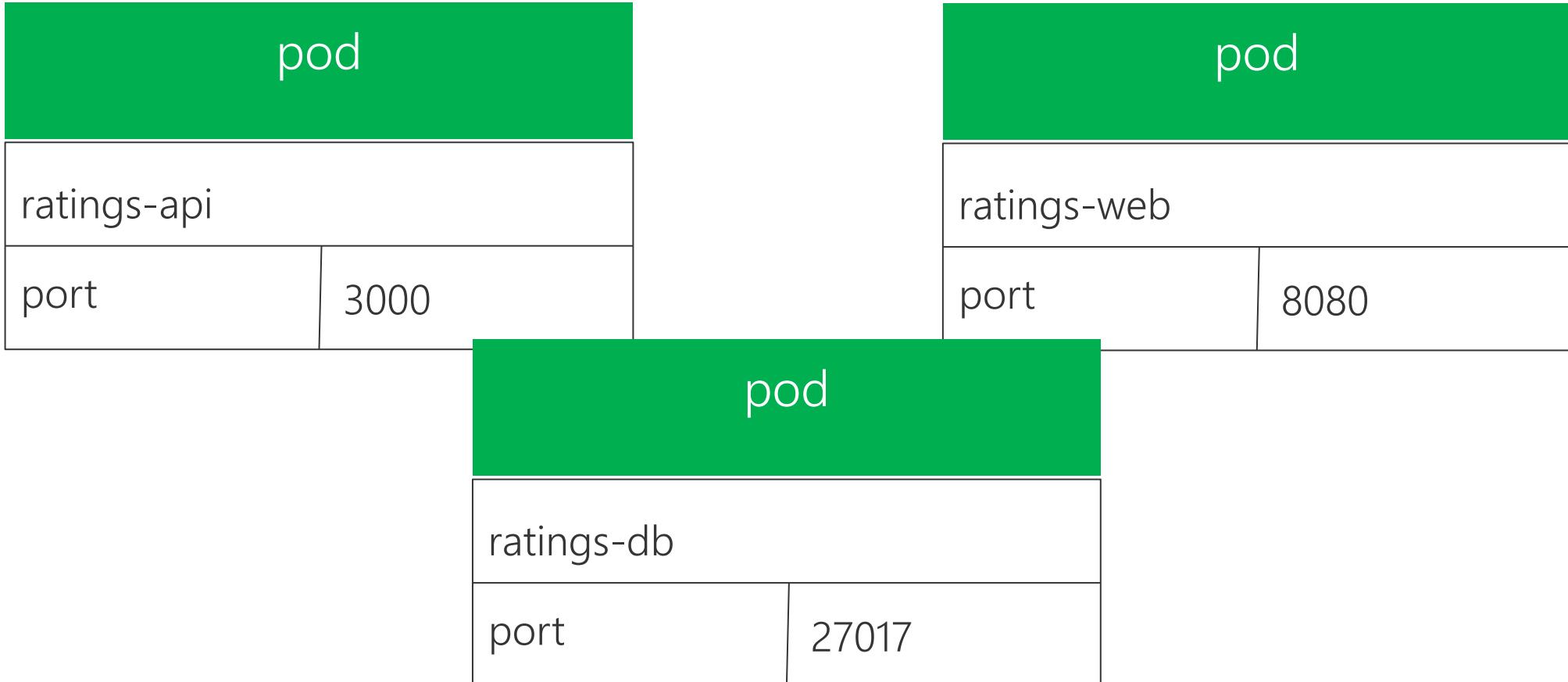
# Kubernetes Architecture Components

Introducing.... Pods!



Containers go inside Pods!

# Pods



## Deployment

label	app=ratings-web , tier=web
image	azurecr.io/ratings-web:v1

pod

ratings-web-1

port 8080

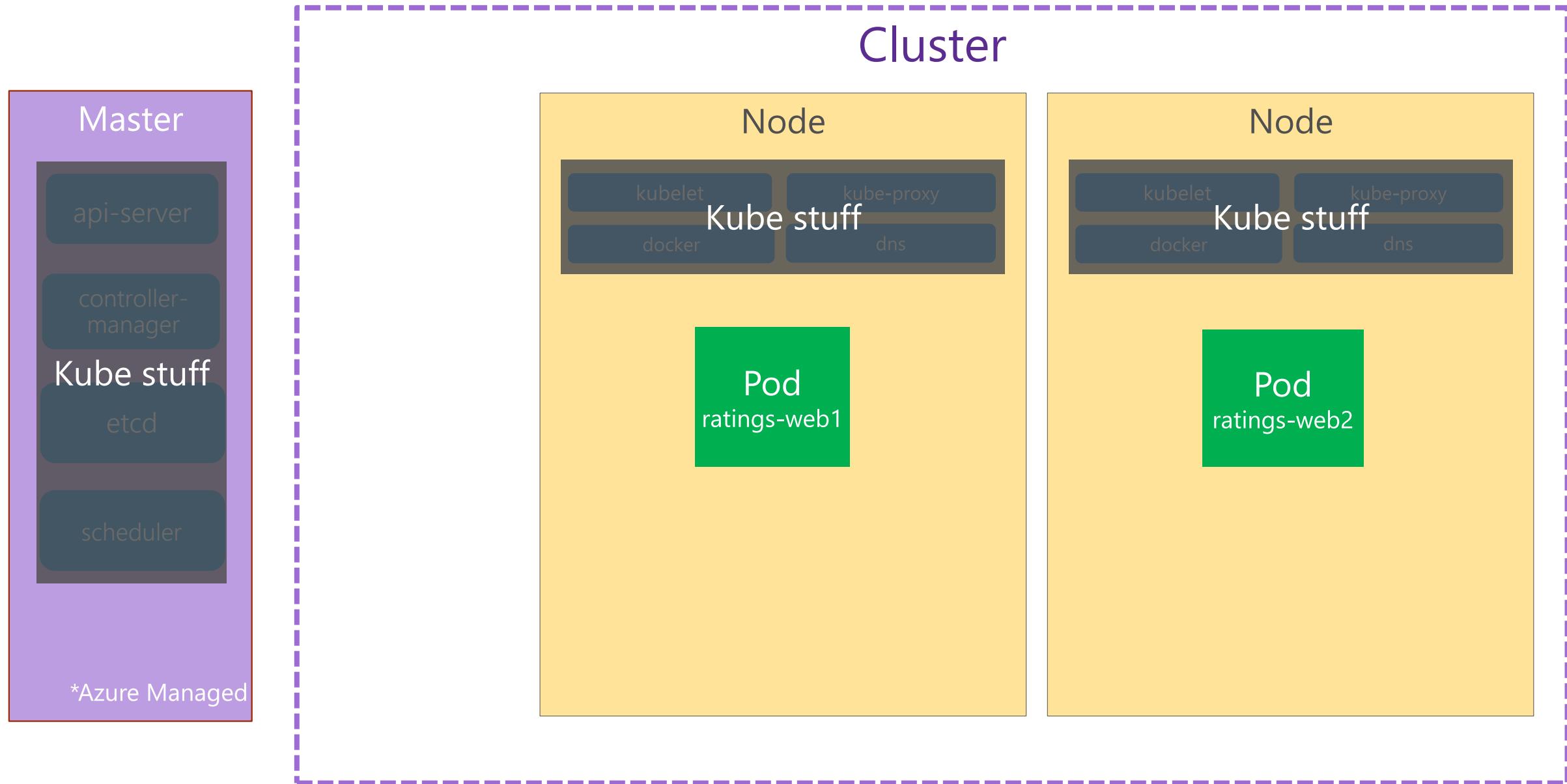
pod

ratings-web-2

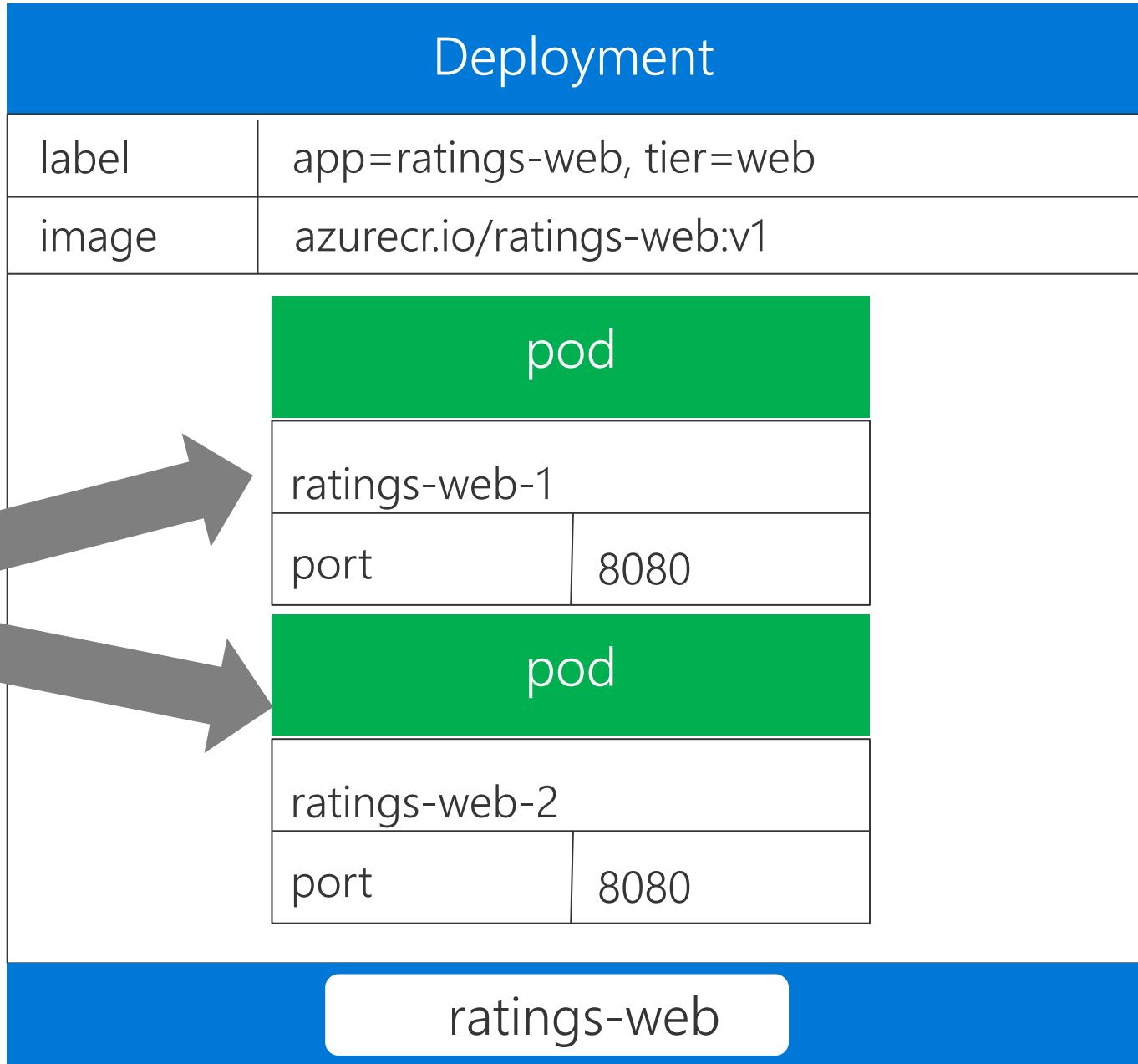
port 8080

ratings-web

# Kubernetes Architecture Components



Service	
ratings-web	
selector	app=ratings-web
port	8080:8080
IP	10.0.2.20

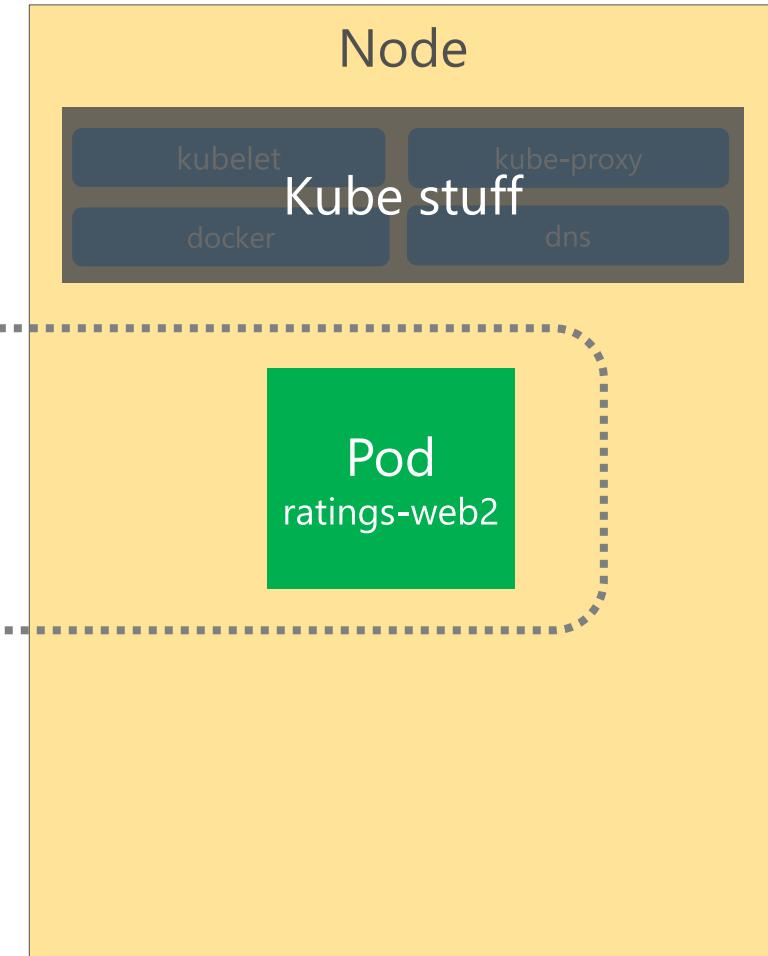
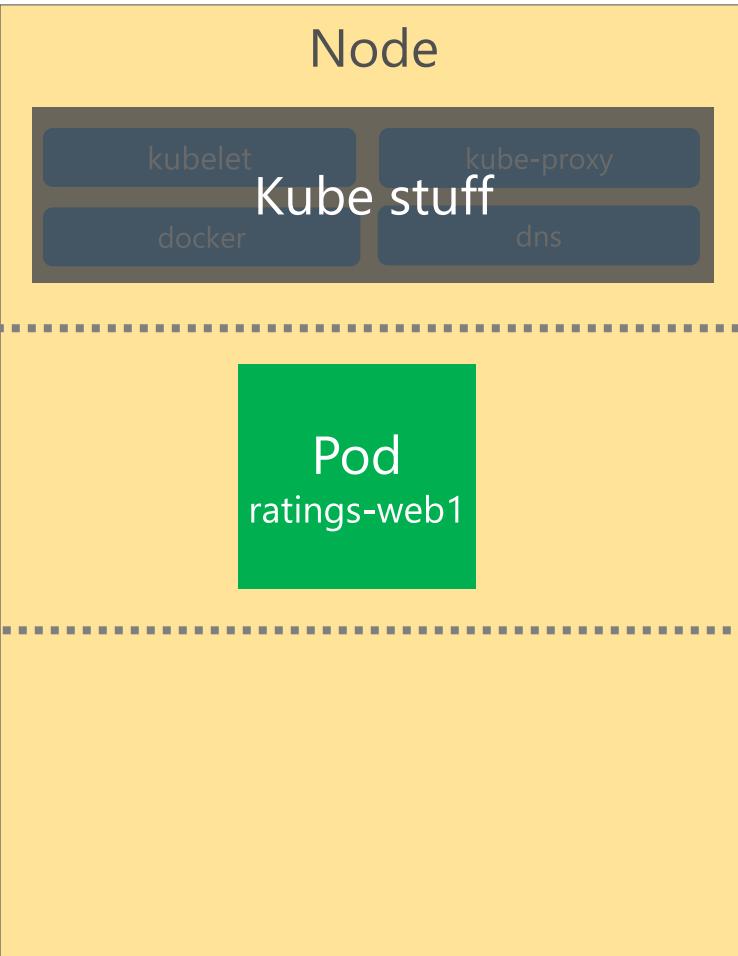


# Kubernetes Architecture Components

Pods



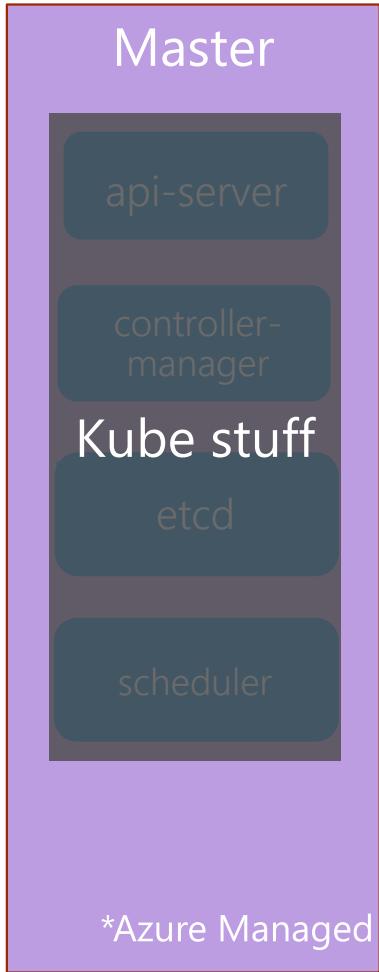
Cluster



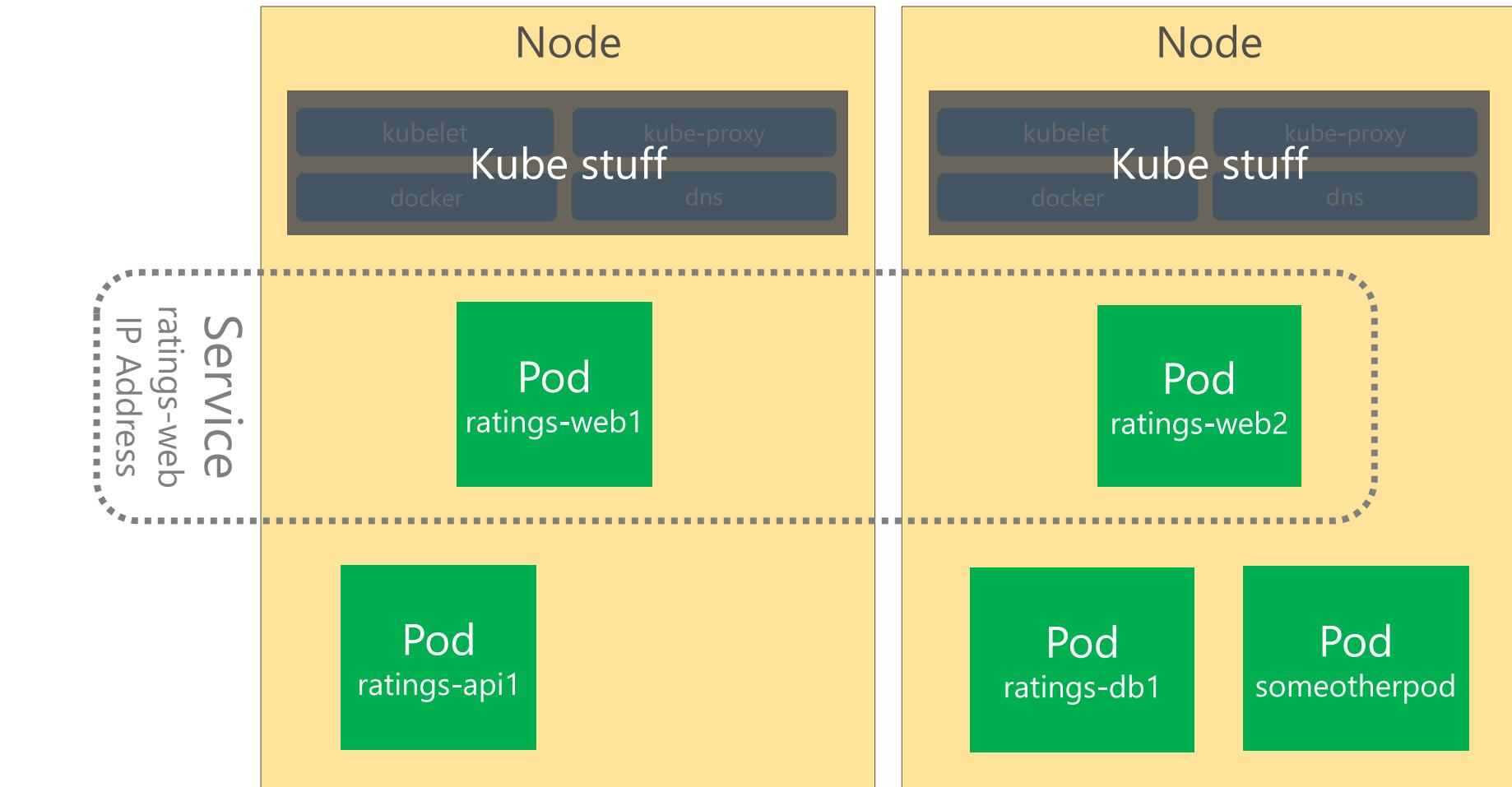
Service  
ratings-web  
IP Address

# Kubernetes Architecture Components

Pods



Cluster

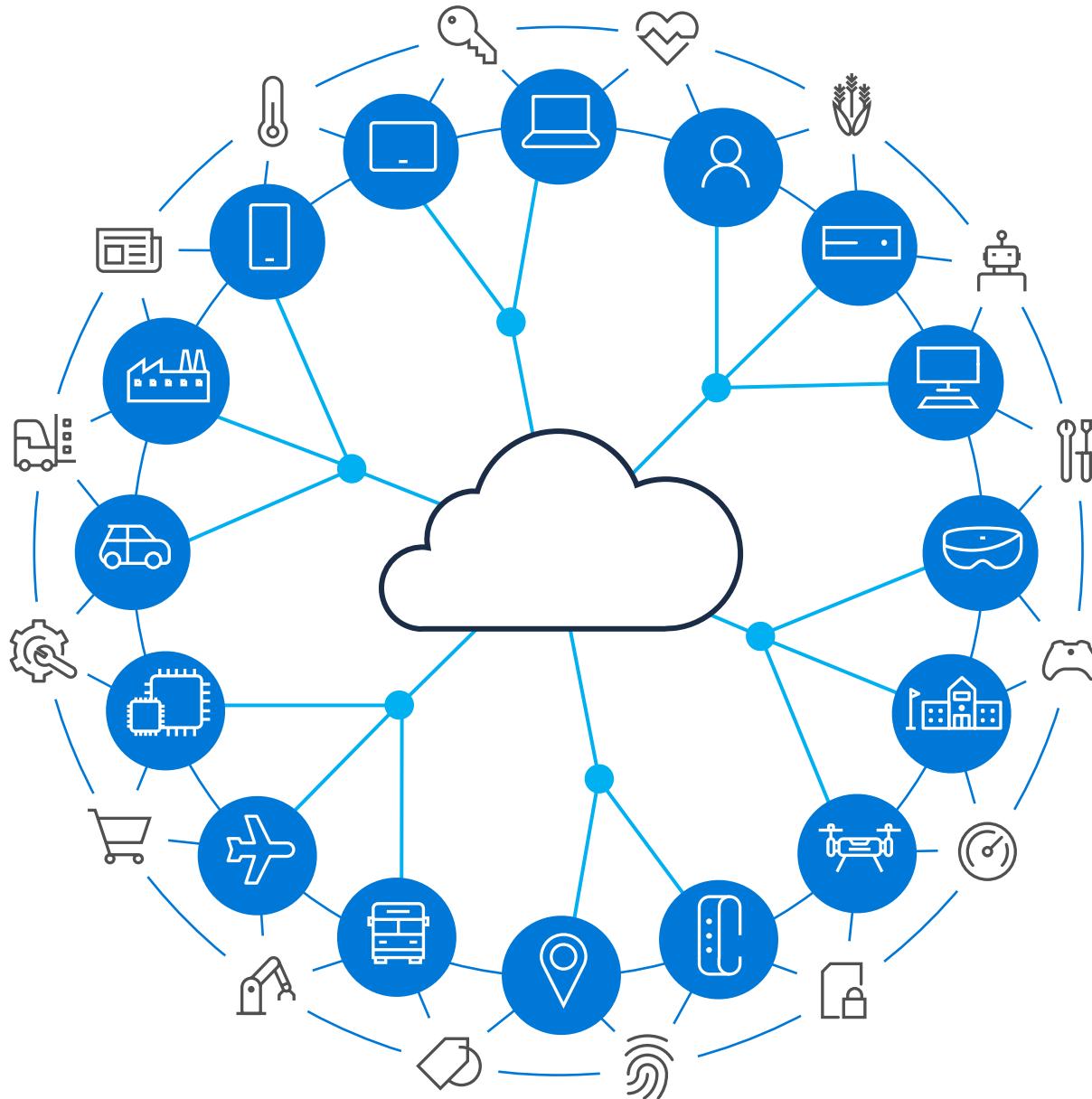


# Kubernetes Setup

```
az aks create \
--resource-group ignite \
--name myAKSCluster \
--node-count 3 \
--enable-addons monitoring,http_application_routing \
--generate-ssh-keys
```

# Front Door

## Geographical Load Balancing

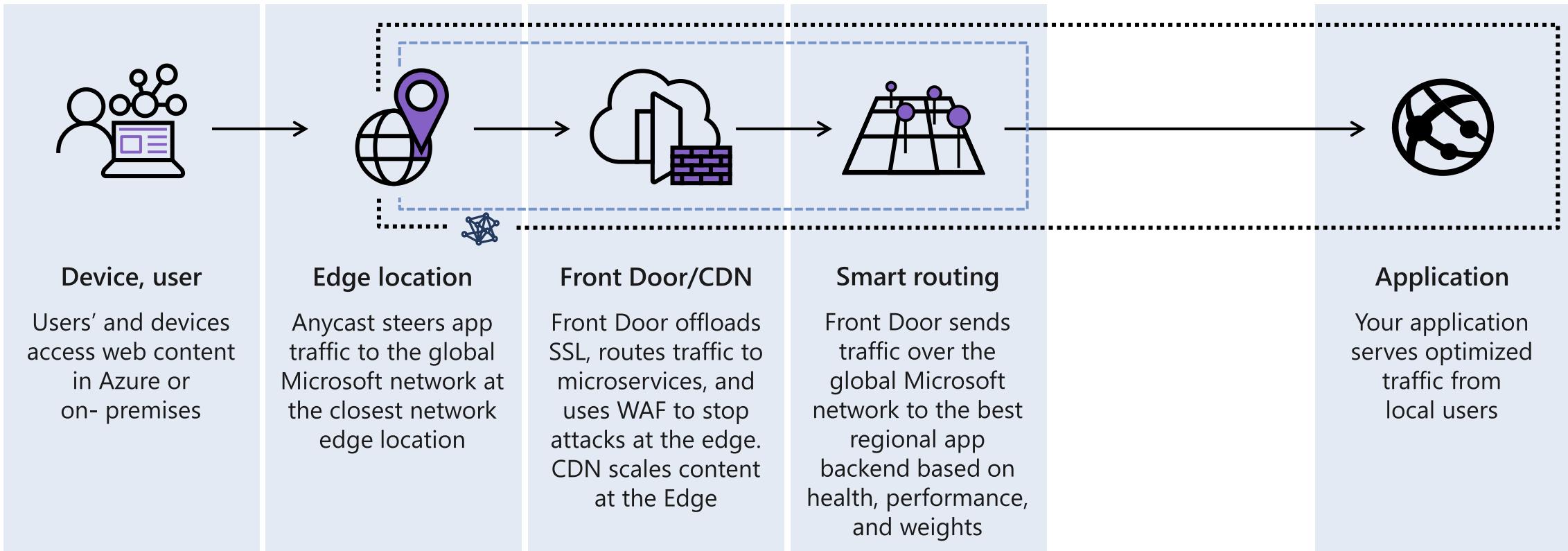


The cloud is changing the way we think about delivering content and applications over the internet.

**With private global cloud connectivity from Azure, we can focus on:**

- ➔ simplifying network ownership
- ➔ optimized end-to-end scenarios
- ➔ best practice architectures
- ➔ developer-centric experiences

# Building global web applications



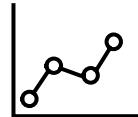
# Azure CDN

## Global multi-CDN native content delivery

Native cloud management experience

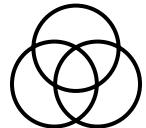
Best-of-breed networks (Verizon, Akamai, MS)

- B2C, media, gaming, commerce
- B2B, API, Telco, device management, IoT
- Static websites



### Content performance

Improve content performance, cost, and availability by caching content at the Edge, close to users



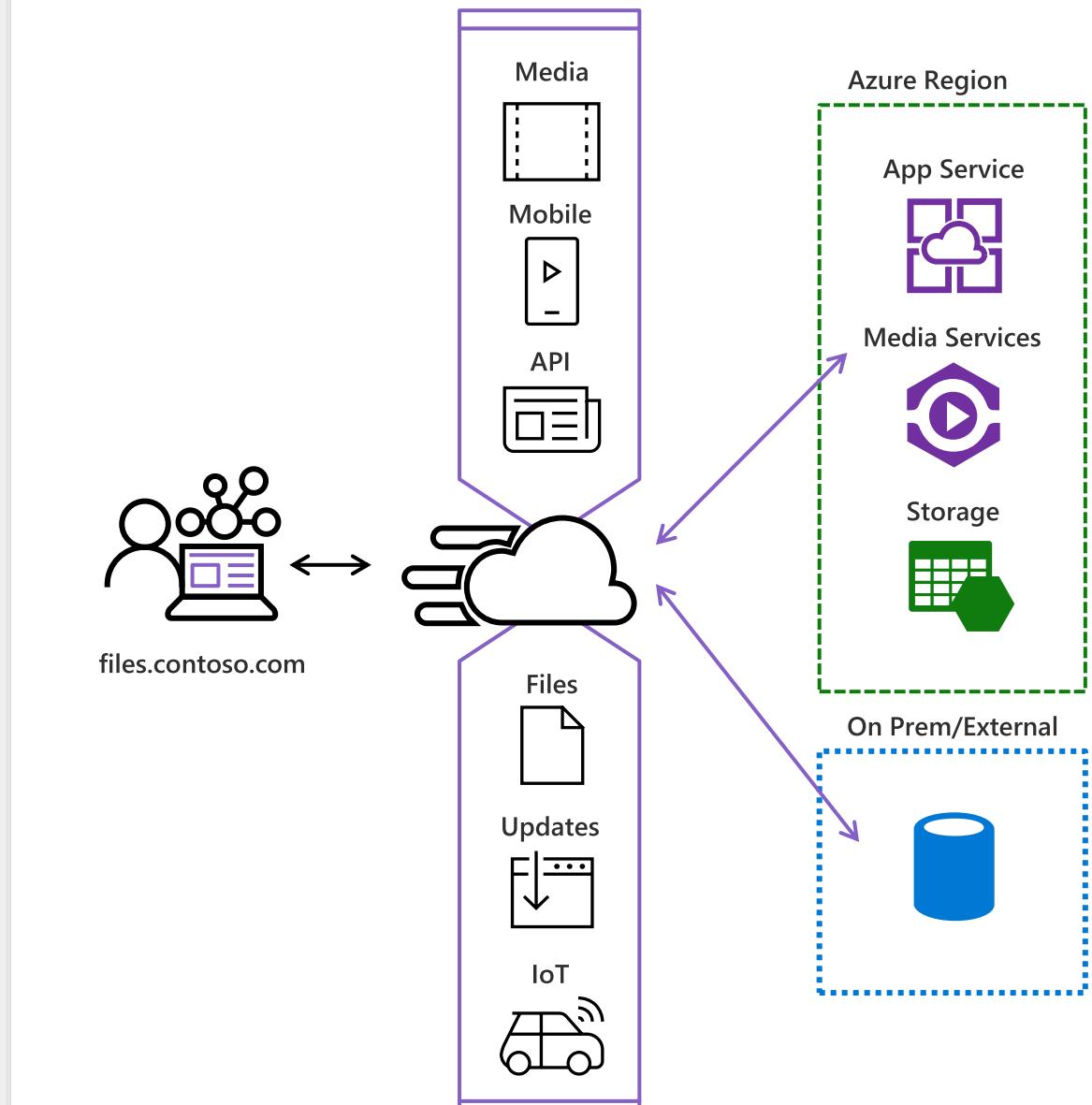
### Choice and power

Solve regional and global scale needs by choosing CDN provider(s) with best-of-breed capabilities



### Cloud migration

All S400/T100 customers need content delivery. CDN is easy to onboard and enable customer evaluation of Azure

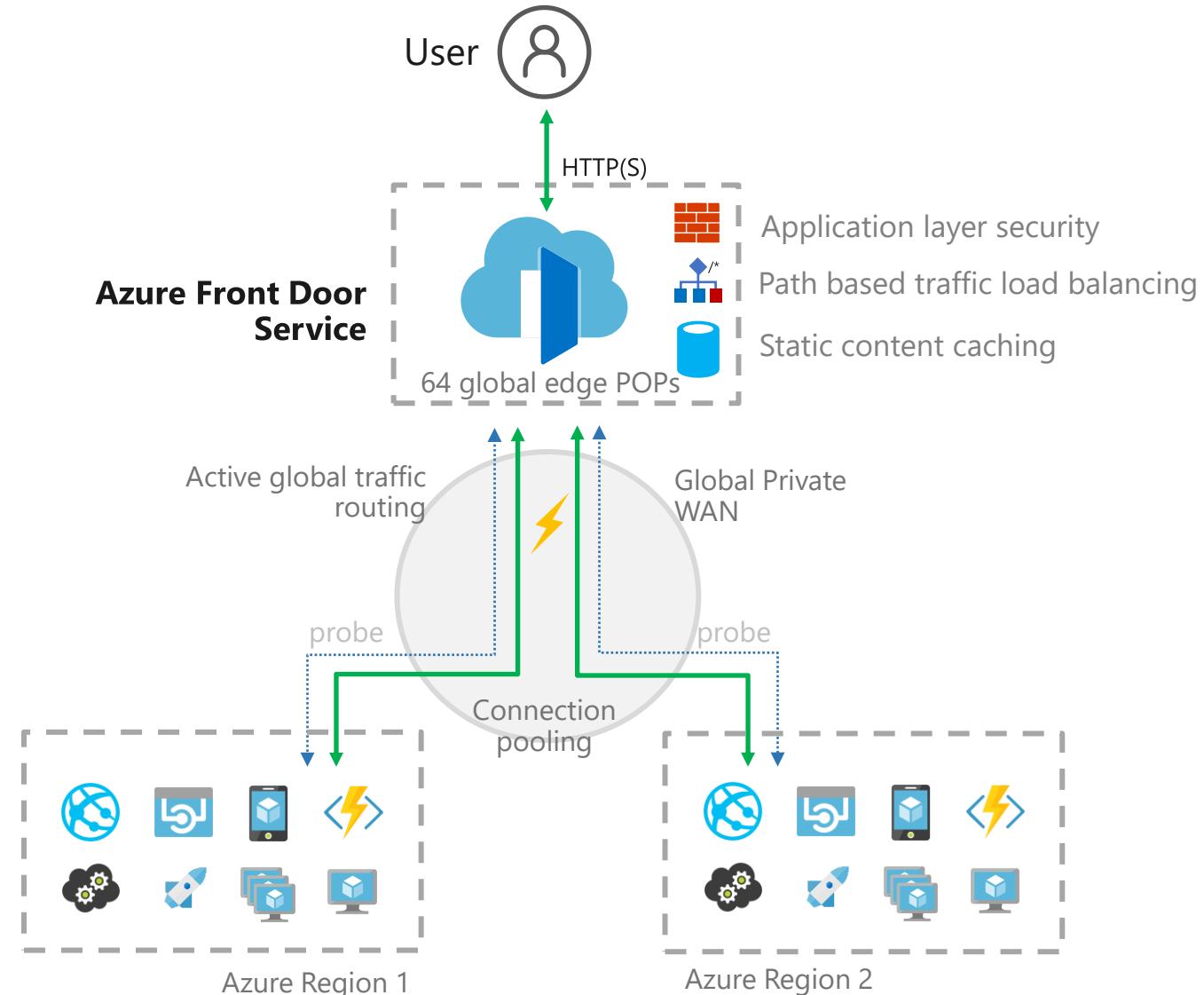




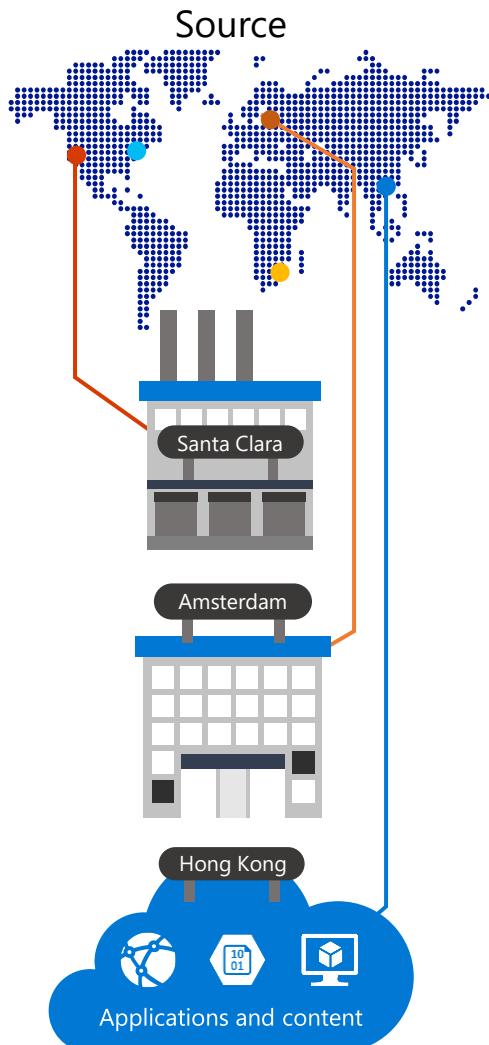
# Azure Front Door Service

Your secure entry point for delivering globally performant hyperscale apps.

- ✓ Application acceleration at Microsoft's edge
- ✓ Integration with App Services
- ✓ Global HTTP load balancing with instant failover
- ✓ Application layer security (WAF rules @ Edge)
- ✓ Massive SSL offload
- ✓ Integrated static content caching
- ✓ Central application traffic dashboard



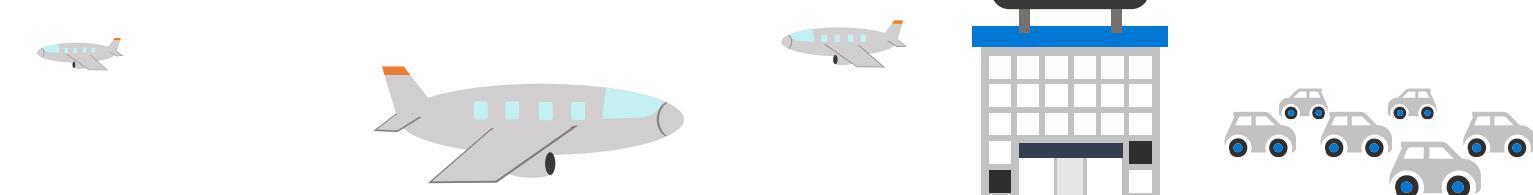
# The value of Azure Front Door Service for app delivery



## Connecting to the Cloud **without** Application Delivery Network (ADN)

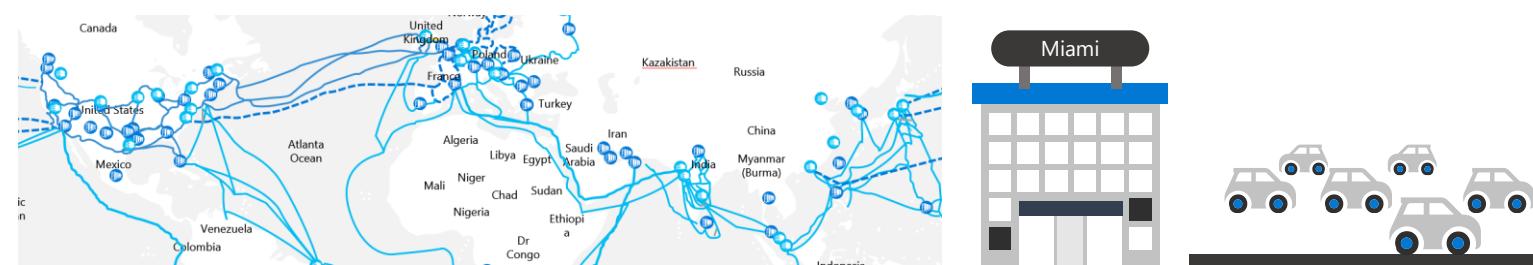


## Connecting to the Cloud **with** ADN



ADN serves as **distribution, routing, and logistics** to enable delivery and cost by **optimizing local and global connections separately**

## Connecting to the Cloud **with** Azure Front Door Service

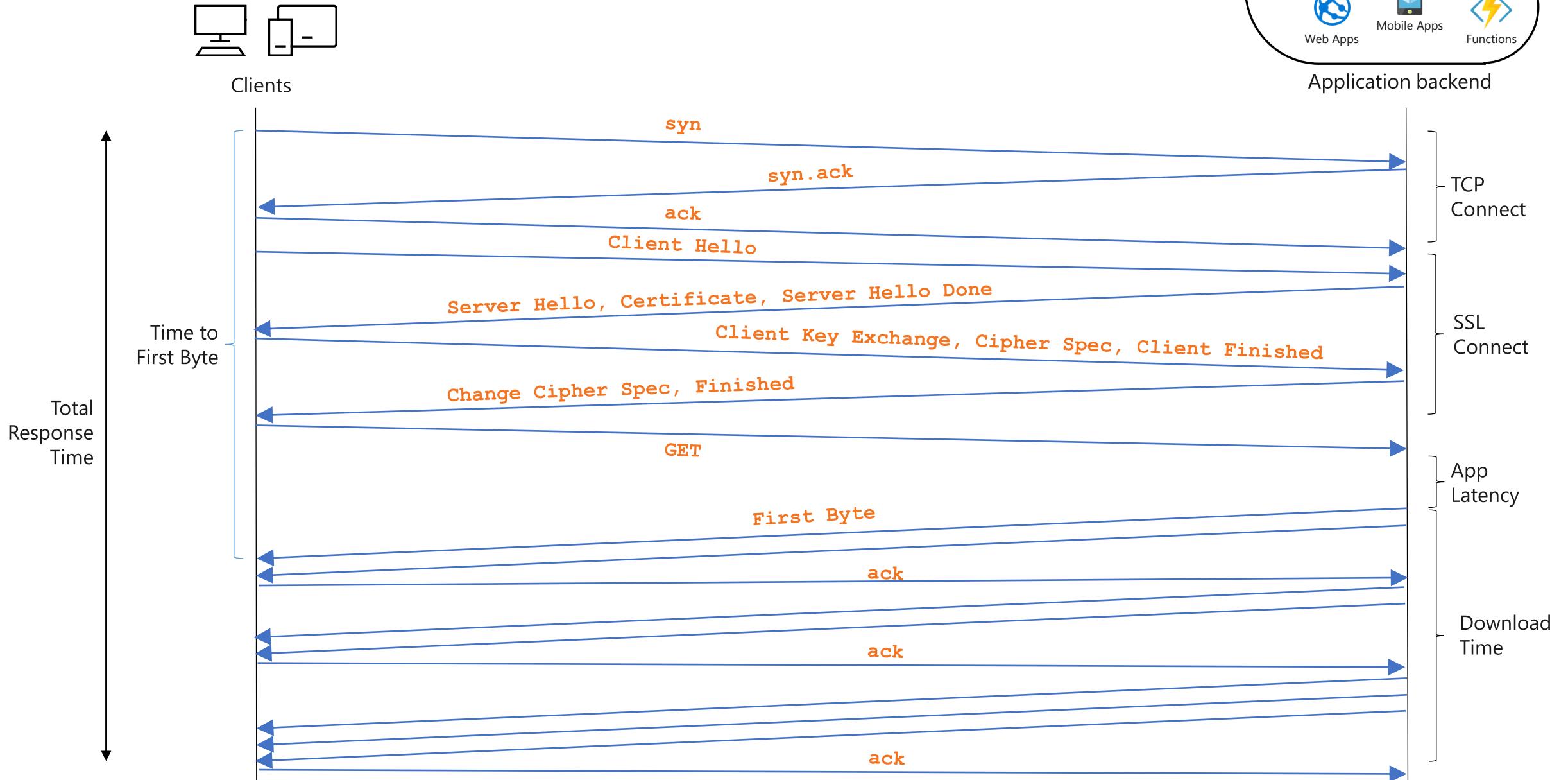


Front Door further enhances global connectivity for applications by using **Anycast** protocol and Microsoft's Global network thereby **guaranteeing higher availability and reliability while maintaining performance**

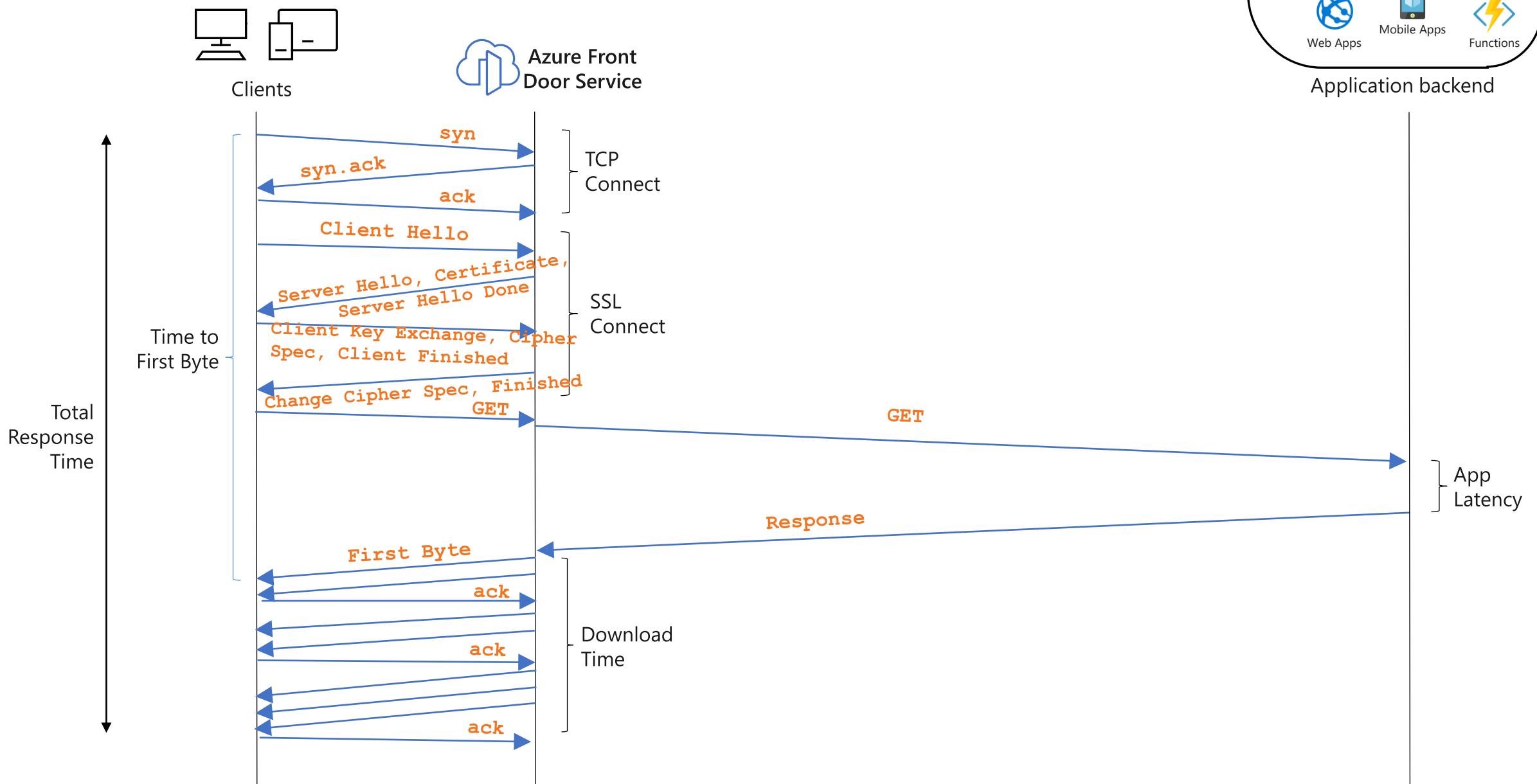
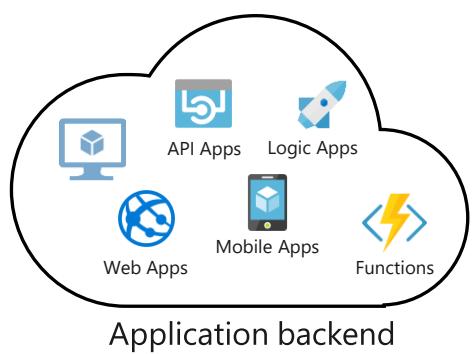
Destination



# Connection establishment and response



# Make your apps faster, reduce backend load!





# Azure Front Door Service

**Build on the “battle-tested” platform used to power reliable and fast global services at Microsoft**



*“Azure DevOps has onboarded all of its microservices to the Azure Front Door Service over the past year. It provides us with significant benefits in terms of both performance and reliability.”*



*Front Door enables Bing to operate at scale with competitive performance while also scaling agile development across many independent microservices.*

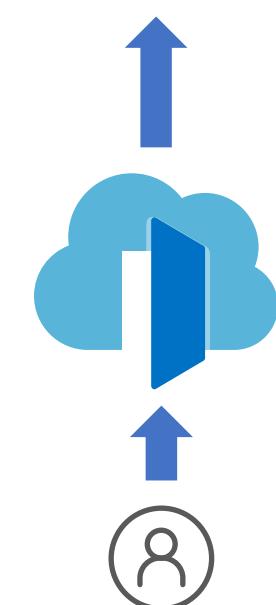
Copenhagen  
M I S T

*Azure Frontdoor is the perfect addition to our acclaimed Blueprint for Sitecore service, accelerating large scale, secure delivery of dynamic web content across the globe.*

*What otherwise requires carefully orchestrating a number of services to achieve, is now available in a one-stop service with global reach and a wide featureset.*

*- Jesper Ravnsgaard, Principal Strategist*

Office 365 Azure Skype Bing  
Azure DevOps MSN OneDrive  
Xbox Cortana Windows Teams



<https://azure.com/frontdoor>



## Azure CDN

Static file / web site caching

OTT video delivery

Live video delivery

Simple applications



## Azure Front Door

Application acceleration

Global load balancing

Web application protection

Microservice apps / path based LB

# Front Door with AKS

- AKS *ingress* creates a public IP, routes inside the cluster
- No SSL, caching, etc... out of the box
- Layer Front Door on top

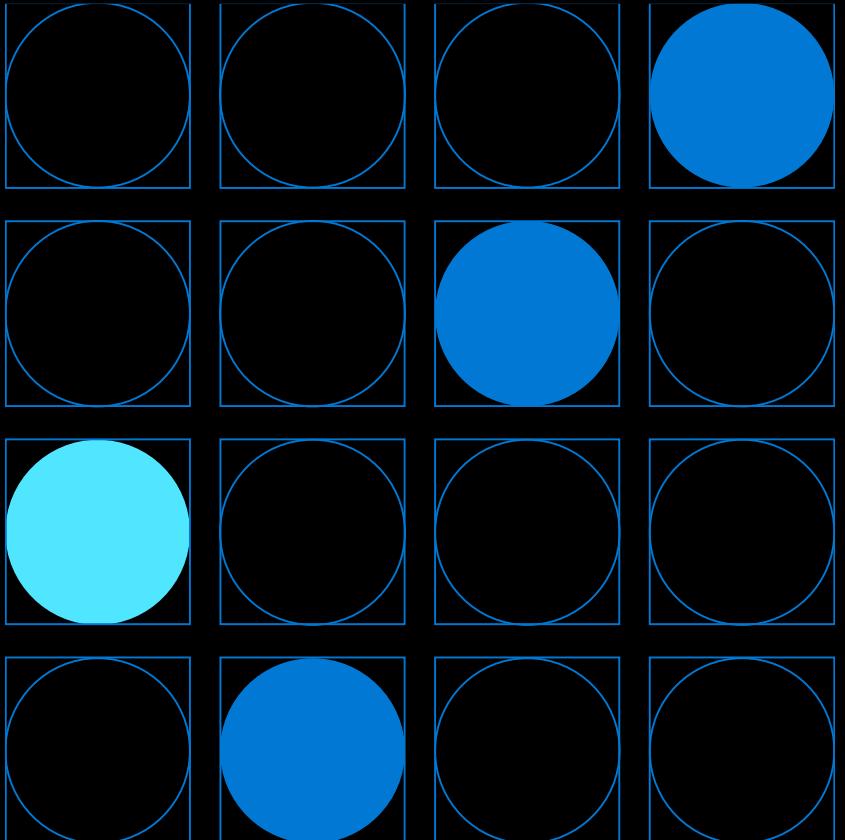
# Multi-Region Redundancy

- **An entire region is offline, what do you do?**
  - Identical AKS clusters in different regions
  - Deploy to each with a strategy
  - One Front Door for everything

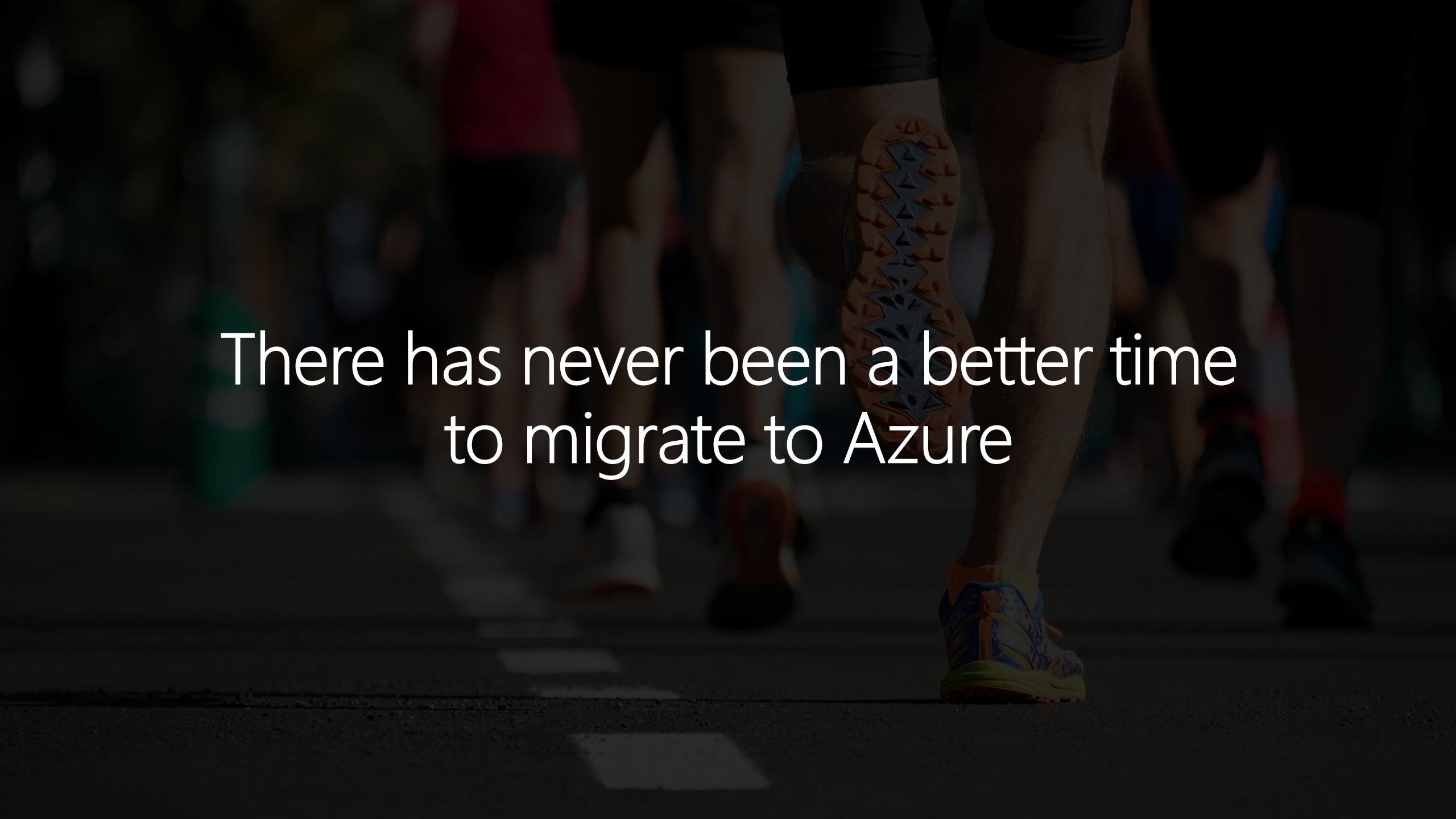
# What About the Data?

- Multi-region compute needs data replication
- Cosmos DB is already global
- SQL databases have replication

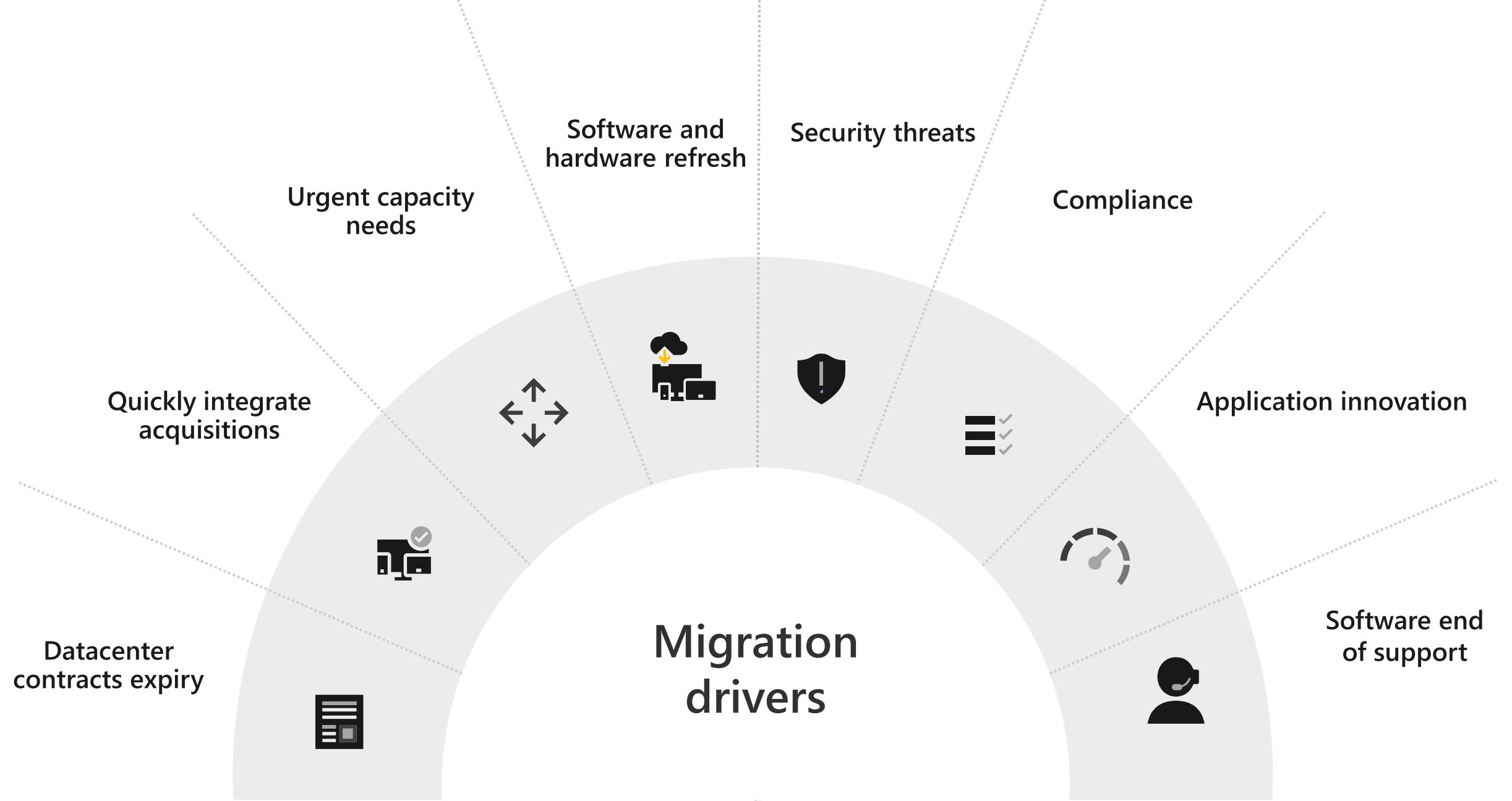
# Lunch Break



# 3) Moving your database to Azure

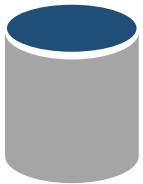
A dark, low-angle photograph showing the backs of several runners in a race. They are wearing various athletic shoes and clothing. In the center, a runner's leg is prominent, wearing a blue and yellow patterned sock and a shoe with a red, blue, and yellow design. The background is blurred.

There has never been a better time  
to migrate to Azure





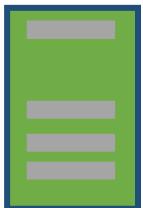
# 2008 | R2



## Windows Server



**Ends January 14, 2020**



## SQL Server



**Ends July 9, 2019**

**Free**

Extended security updates

Free security updates, only on IaaS Azure  
3 years of security updates after support ends  
75% of the license cost to buy standalone

# Azure capabilities across apps, data, and infrastructure



Azure  
Migrate



Java and Tomcat  
support in Azure  
app service



Azure Database for  
PostgreSQL, MySQL



Azure Site  
Recovery



kubernetes

Kubernetes on  
app service



Azure SQL database  
managed instance



Azure Database  
Migration Service



Red Hat Enterprise  
Linux support



Cassandra/MongoDB  
on Azure Cosmos DB

# Azure migration tools adoption over the last year

**450K+**  
**VMs**

---

Discovered by  
Azure Migrate

**325K+**  
**VMs**

---

Assessed by  
Azure Migrate

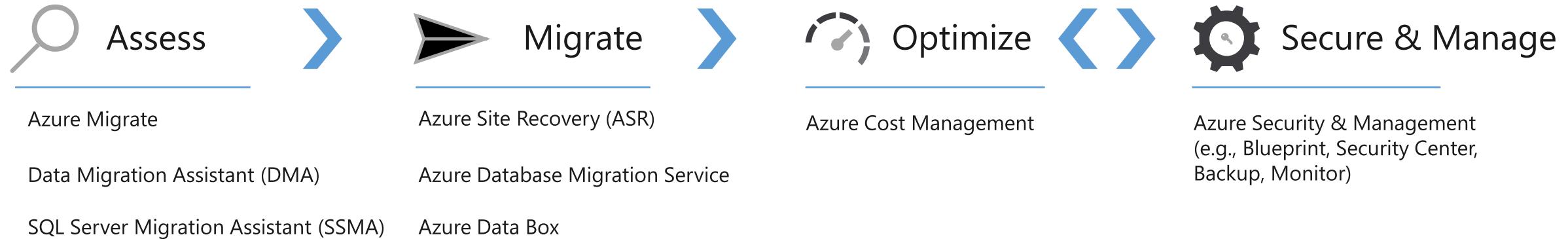
**41K+**  
**databases**

---

Migrated by Azure  
Database Migration Service

# Choice of tools for every stage and every requirement

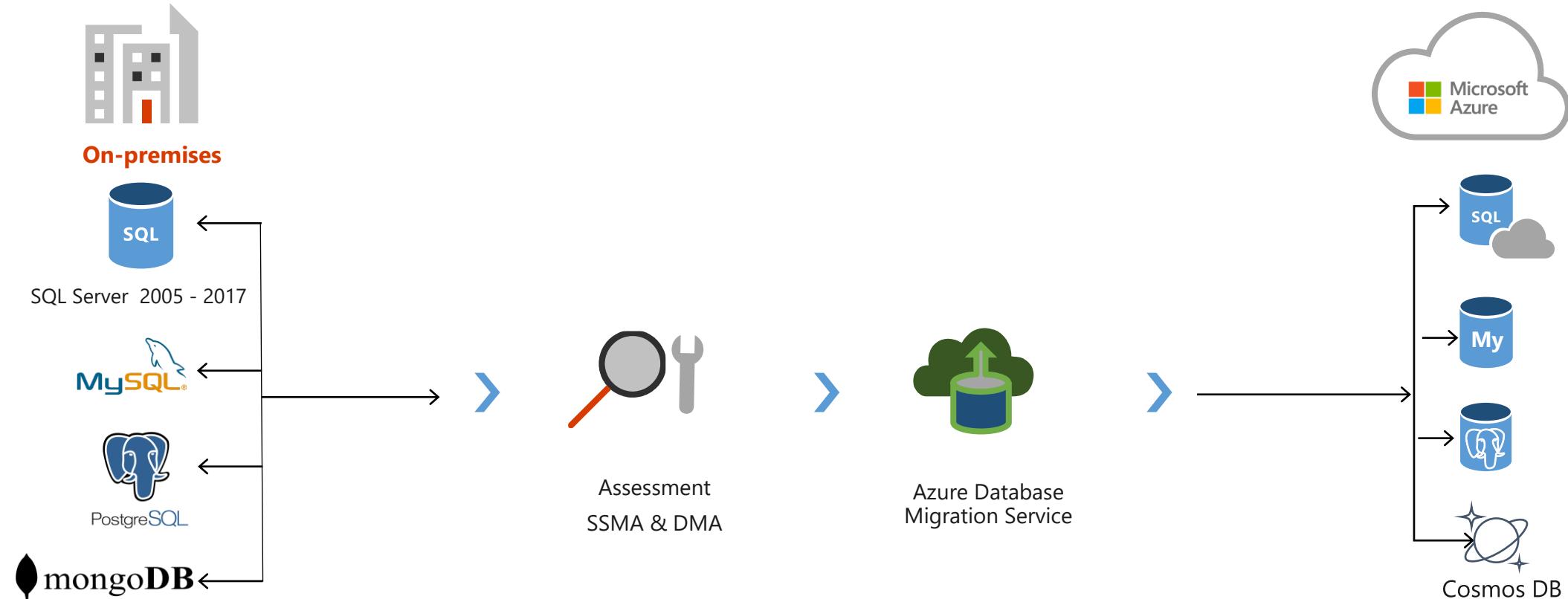
**Goal is successful Azure migration: Pick the right tool for the job**



We embrace ISV solutions



# Migrate databases using Azure Database Migration Service



Seamless, end to end solution | Near-zero downtime | Migrate at-scale from multiple sources



Assess



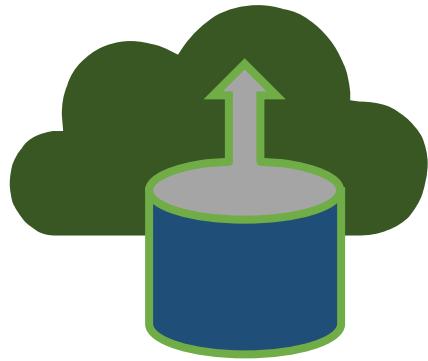
Migrate



Optimize



Secure and manage



Source	Target	Milestone
SQL Server	Azure SQL Database Managed Instance	Generally Available
MySQL	Azure Database for MySQL	Preview
PostgreSQL	Azure Database for PostgreSQL	Preview
MongoDB	Cosmos DB	Limited preview

# ANNOUNCING

# Azure Database Migration Service: New migration scenarios



Assess



Migrate



Optimize



Secure and manage

# ANNOUNCING

Azure SQL Database Managed Instance – GA  
(General Purpose)

Migrate SQL Server to fully managed SQL in Azure  
Fully compatible with SQL Server  
Built-in HA, Failover, Geo-DR, Intelligence

## NEW: Azure SQL Database Hyperscale – Preview

New, highly scalable service tier with built in intelligence  
Migrate multi-TB databases to Azure  
Auto-scale up to 100 TB per database



# ANNOUNCING

**Gateway**



**100 TB**



**Heavy (1 PB)**



Azure Data Box family provides additional data migration options

Migrate large amounts of data quickly and securely

[Gateway](#)

[100 TB](#)

[Heavy \(1PB\)](#)

Preview

General Availability

Preview

# Tailwind Traders acquires Northwind



**REDMOND, WA December 06, 2018** Tailwind Traders, Inc announced that it has agreed to acquire Northwind Traders, the venerable "old guard" international foods company, in an effort to bolster its virtual hardware offerings with some international culinary flare. Tailwind agreed to acquire Northwind for an undisclosed sum and will assume control of all of Northwind's virtual assets, including the company's flagship product: *Aniseed Syrup*

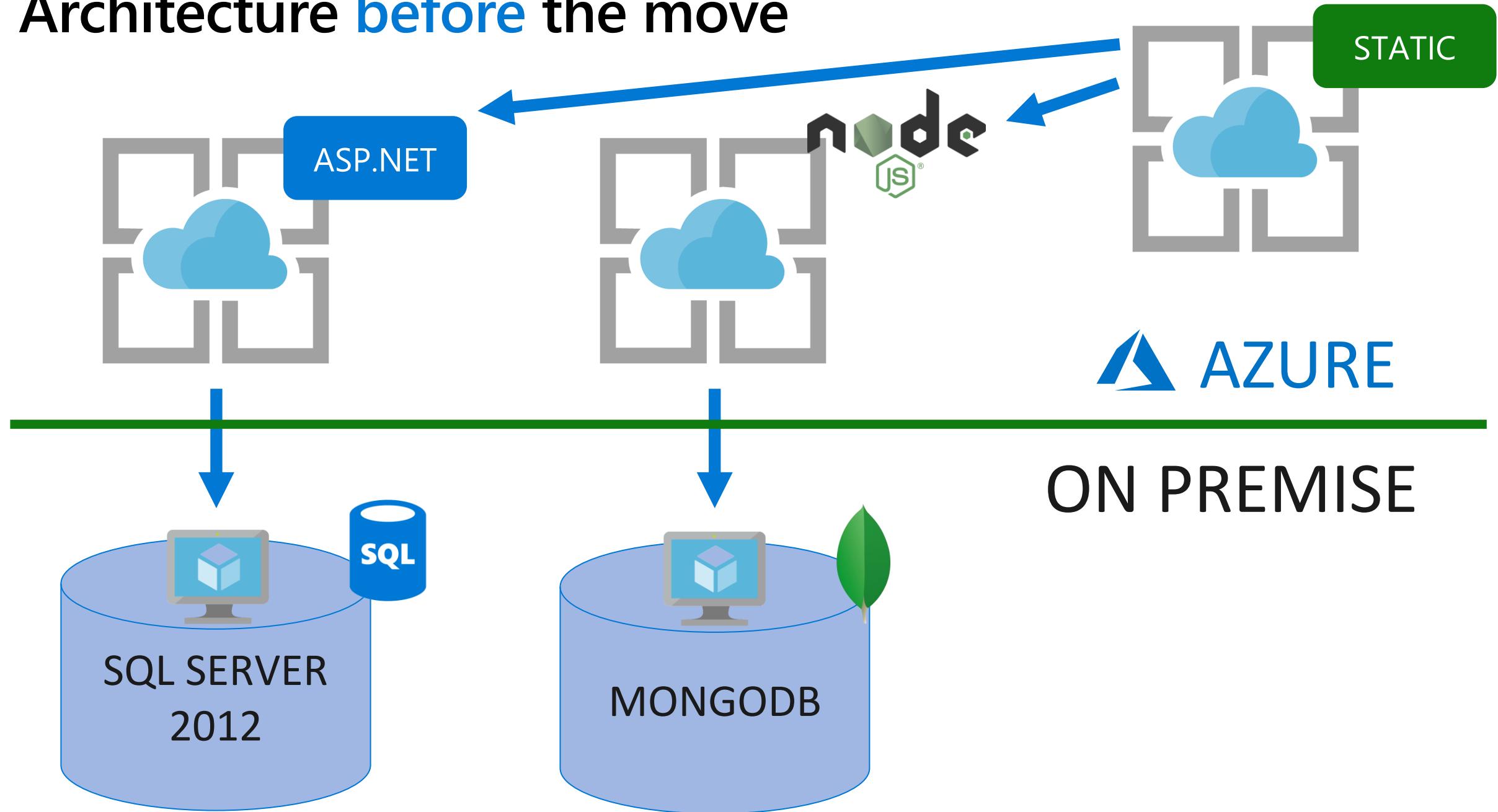
"This is a profoundly wonderful development for all involved, and will help to bring our food products to a whole new sector of the market" stated Nancy Daviolo, Executive Vice President of Operations. "We couldn't be happier with the arrangement". The recently-promoted Daviolo will join the Tailwind executive team along with two of her close associates, Margaret Peacock and Michael Suyama. Daviolo took over Northwind's sales operations in 2012 after Andrew Fuller was forced out of the company as a result of charges of fraud and embezzlement of more than 5,000 cases of Grandma's Boysenberry Spread.

# A rich catalog...

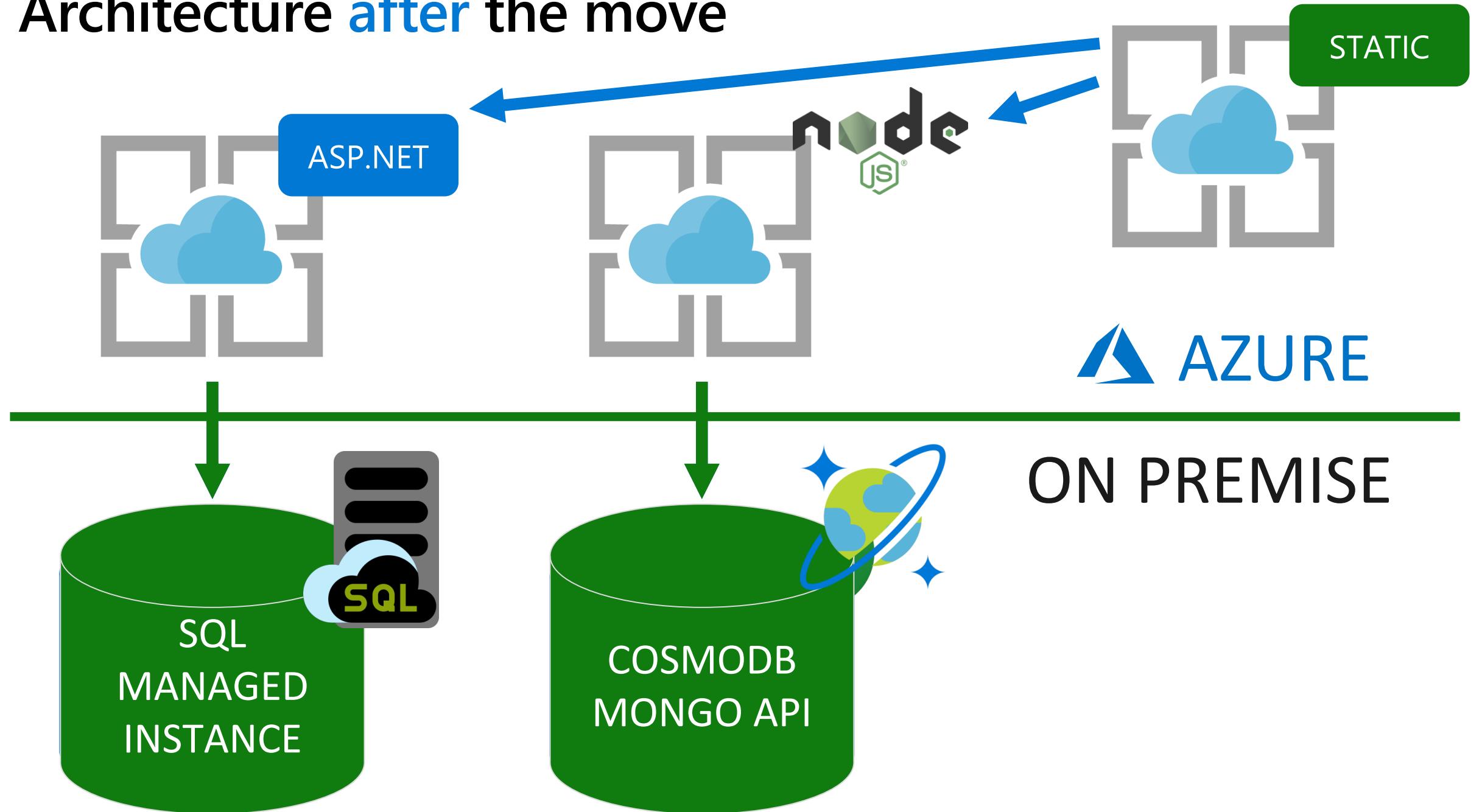


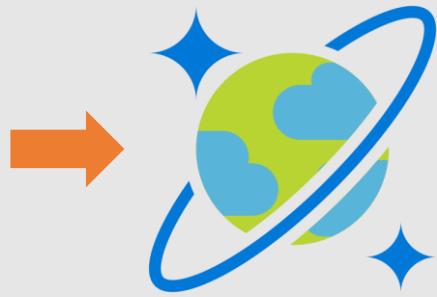
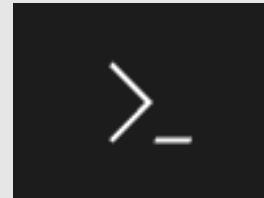
11	Unbranded Concrete Hat	VCIKWGXGDFXHNVQADJFZG	580.00	Mosciski - Cummings
12	Sleek Metal Shoes	AMSLVDYUBMBNOIXCEGVT	946.00	Hayes - Casper
13	Handcrafted Concrete Soap	WOPYRIESGMNIMVOKULSA	150.00	Connelly Inc
1	Incredible Frozen Chair	FTDQAYKRHMLQOEYTLXKO	291.00	Gibson - Bode
3	Ergonomic Plastic Tuna	BAAHUNJXFDDDBUAMQYQ	553.00	Pollich - Legros
14	Sleek Granite Car	KROAHUVSOTFDWFLKXYVF	374.00	Hickle, Heidenreich and...
51	Rustic Granite Car	UVHDNMOCRMIECGAGXCXU	131.00	Konopelski, Lesch and S...

# Architecture before the move



# Architecture **after** the move





# Demo

Creating the CosmosDB instance with CloudShell

# Azure Cosmos DB

Globally distributed database service



# Azure Cosmos DB APIs



MongoDB

SQL

Table storage

Gremlin Graph

Spark

Now GA

Cassandra





# Azure Cosmos DB



more coming soon

Key-Value



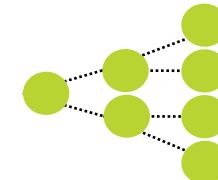
Global distribution

Column-family



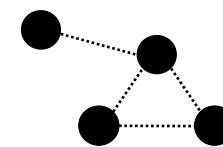
Elastic scale out

Documents



Guaranteed low latency

Graph



Five consistency models

Comprehensive SLAs

A globally-distributed, multi-model database service



## Work with NoSQL data in Azure Cosmos DB

2 hr 27 min remaining - Learning Path - 4 Modules



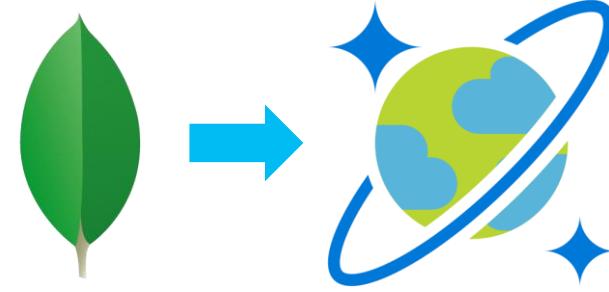
# /Learn alert

Expository text about the learning path goes here. This text box wraps.

<http://gslb.ch/247s-MSIgniteTheTour>

The screenshot shows the Microsoft Learn homepage. At the top, there's a navigation bar with the Microsoft logo, 'Learn', 'Azure', 'Business Applications', 'About', 'Browse All', and 'Certifications'. To the right are links for 'All Microsoft', a search bar, and 'Sign in'. Below the navigation is a banner with the text 'WELCOME TO Microsoft Learn' and 'Introducing a new approach to learning'. It highlights that skills can be learned through hands-on learning, earning points, levels, and achievements. A call-to-action button says 'Start learning for free >'. There are three main tabs at the bottom: 'Learning paths', 'Hands-on learning', and 'Learn for free'. The 'Learning paths' tab is selected. Below it, there's a section titled 'Start a learning path' with a dropdown menu labeled 'Select your role'. To the right, there's a diagram showing a network of interconnected icons representing different learning paths. At the bottom, there's a section titled 'Learn Azure' with the subtext 'Explore more advanced Azure topics with online courses.'

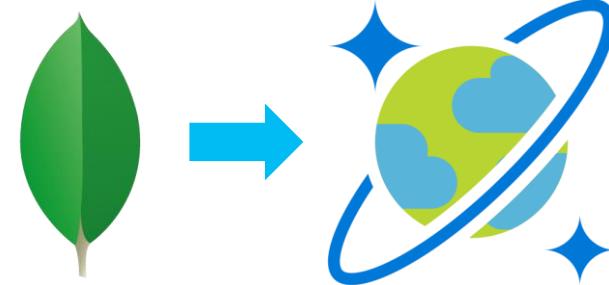
# Mongo APIs: Dump



```
ssh '[USER]@[IPADDRESS]
```

```
mongodump  
  --collection [COLLECTION]  
  --db [DATABASE]
```

# Mongo APIs: Dump



```
azureuser@mongodb1: ~
```

```
lbugnion@SurfaceLaurent:~$ ssh ' [REDACTED] @ [REDACTED]  
Enter passphrase for key '/home/lbugnion/.ssh/id_rsa':  
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.15.0-1028-azure x86_64)
```

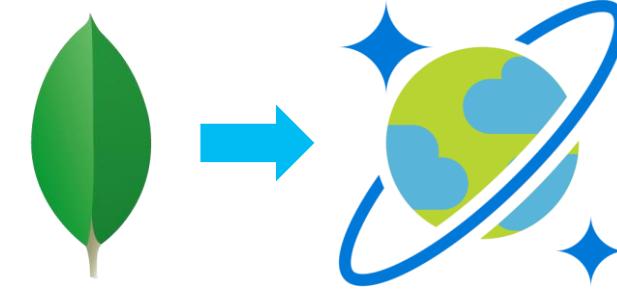
```
* Documentation: https://help.ubuntu.com  
* Management: https://landscape.canonical.com  
* Support: https://ubuntu.com/advantage
```

```
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud
```

```
16 packages can be updated.  
0 updates are security updates.
```

```
Last login: Fri Nov  2 21:58:21 2018 from [REDACTED]  
@mongodb1:~$ mongodump --collection [REDACTED] --db [REDACTED]  
2018-11-04T10:34:31.812+0000      writing [REDACTED] to [REDACTED]  
2018-11-04T10:34:31.817+0000      done dumping [REDACTED] (500 documents)  
@mongodb1:~$
```

# Mongo APIs: Restore

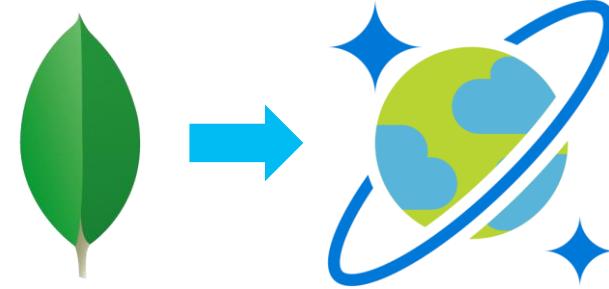


```
cd dump
```

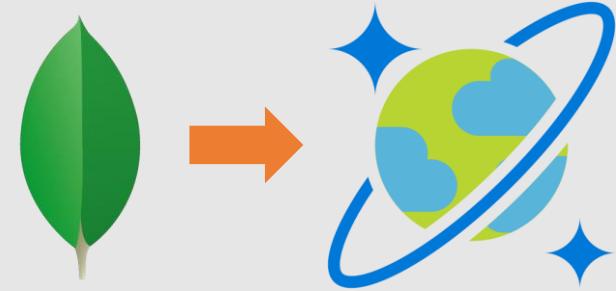
```
cd [DATABASENAME]
```

```
mongorestore --host [HOSTNAME]:10255  
  -u [USER] -p [PASSWORD]  
  --ssl --sslAllowInvalidCertificates  
  [BSONFILE].bson  
  --numInsertionWorkersPerCollection 4 --batchSize 24  
  --db [DATABASENAME] --collection [COLLECTIONNAME]
```

# Mongo APIs: Restore

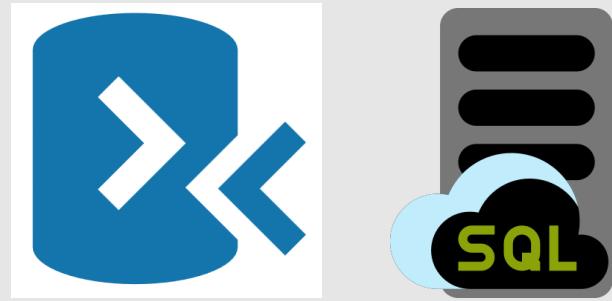


```
@mongodb1: ~/dump/  
@mongodb1:~$ cd dump  
@mongodb1:~/dump$ cd [REDACTED]  
@mongodb1:~/dump/ $ mongorestore --host [REDACTED]:10255 -u [REDACTED] -p [REDACTED]  
--ssl --sslAllowInvalidCertificate  
es [REDACTED].bson --numInsertionWorkersPerCollection 4 --batchSize 24 --db [REDACTED] --collection [REDACTED]  
2018-11-04T13:16:11.128+0000      checking for collection data in [REDACTED].bson  
2018-11-04T13:16:11.131+0000      reading metadata for [REDACTED] from [REDACTED].metadata.json  
2018-11-04T13:16:11.131+0000      restoring [REDACTED] from [REDACTED].bson
```



# Demo

Migrating the MongoDB to CosmosDB

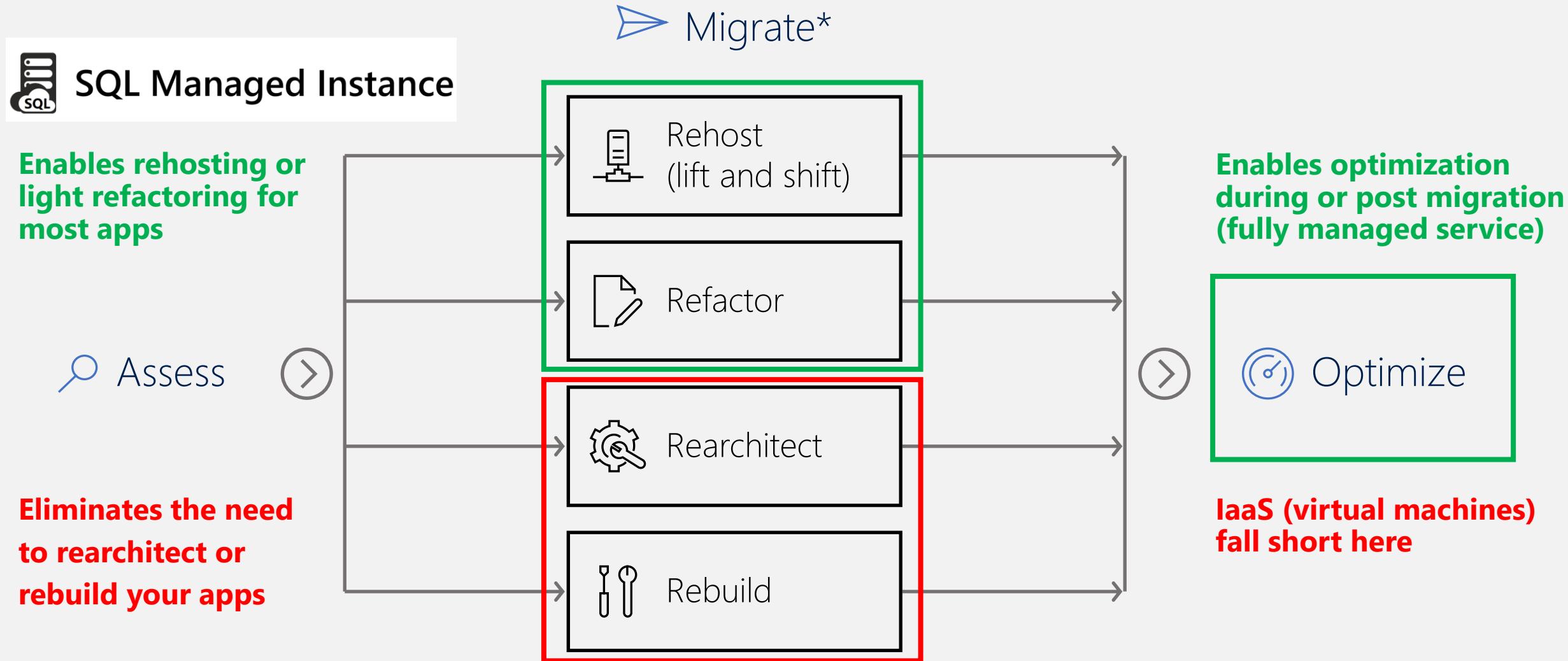


# Demo

Assessing the Database before migration  
with the Microsoft Data Migration Assistant

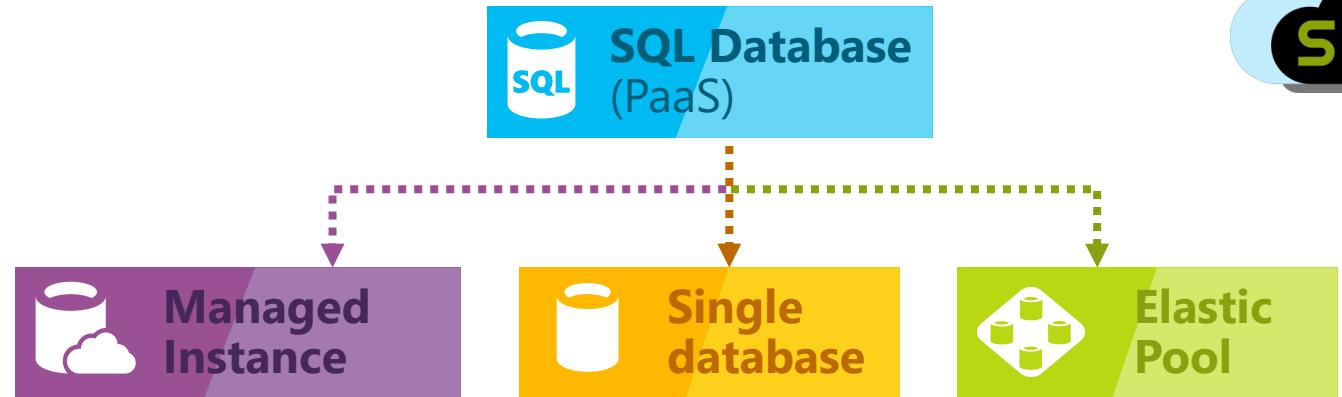
Migrating SQL Server to SQL Database  
(Part 1)

# How to easily migrate and get benefits of cloud?



# What is SQL Database Managed Instance?

New deployment option enabling  
friction-free migration of  
SQL Server workloads to  
a fully-managed service



## Fully-managed service

- Built on the same infrastructure as SQL Database
- Provides the same benefits (PaaS)

## SQL Server compatibility

- Fully-fledged SQL instance with nearly 100% compat with on-premise

## Full isolation and security

- Contained within your VNet
- Private IP addresses
- Express Route / VPN connectivity

## New purchasing options

- Transparent
- Frictionless
- Competitive

# Put your DBs on autopilot and focus on your business...

Tired of managing hardware, software & business continuity?

You can stop doing it, Managed Instance has it built-in

	Compute & storage provisioned on demand Fast & online scaling Full stack updates and patches
	Backups with health checks Point-in-time restore (configurable retention *)
	99.99% availability with automatic failover Disaster recovery with single geo secondary (multiple*)

\* - features coming soon

# Put your DBs on autopilot and focus on your business...

Is it hard to secure data and ensure standards compliance?

Is it hard to monitor and tune all your workloads?

## It's much easier with the Managed Instance

	Compliance with all major industry standards Threat detection with automatic alerting
	Intelligent query processing Automatic performance tuning*
	Monitoring at scale with Intelligent Insights Data discovery and classification* Vulnerability assessment

\* - features coming soon

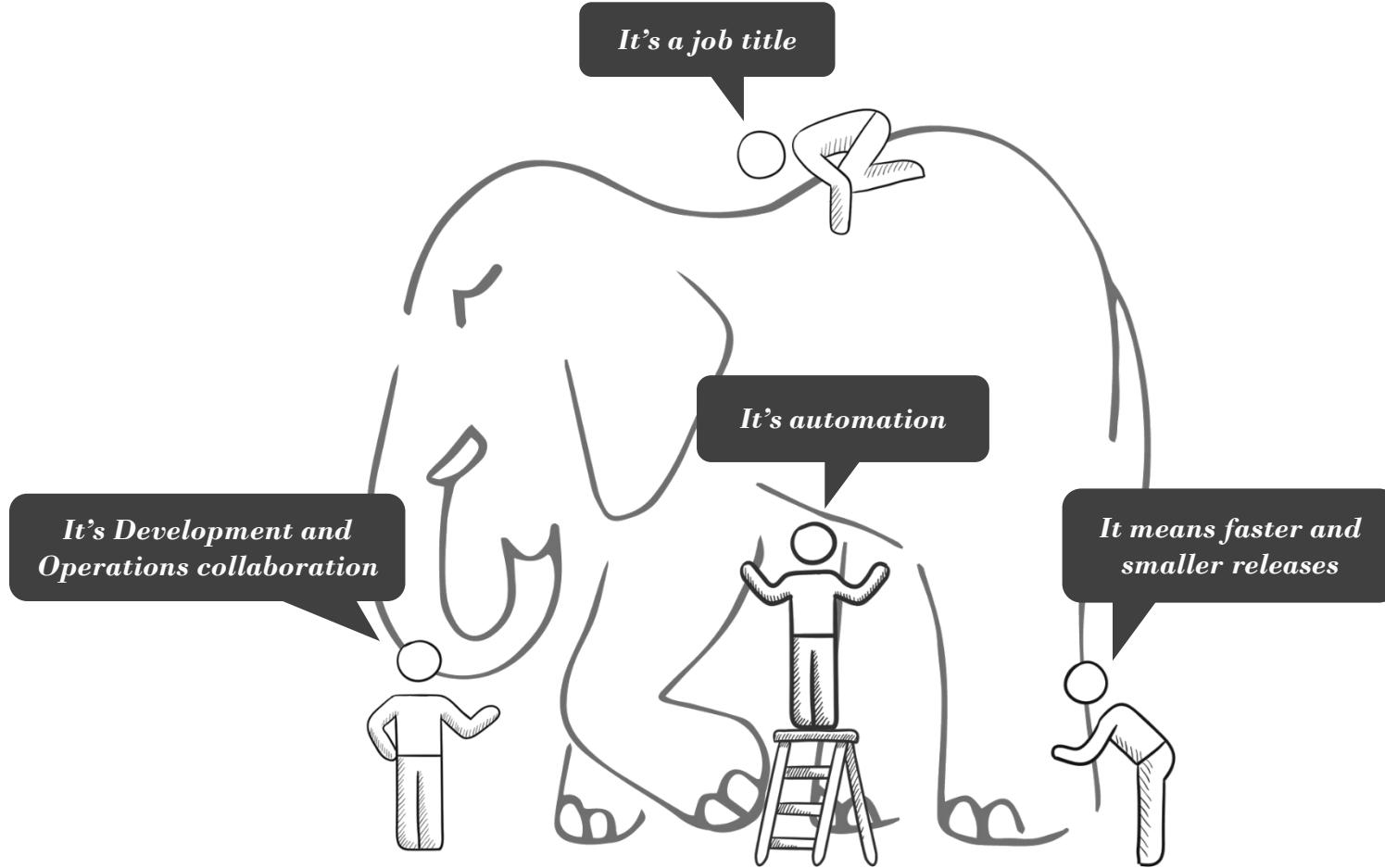


# Demo

Migrating SQL Server to SQL Database  
(Part 2)

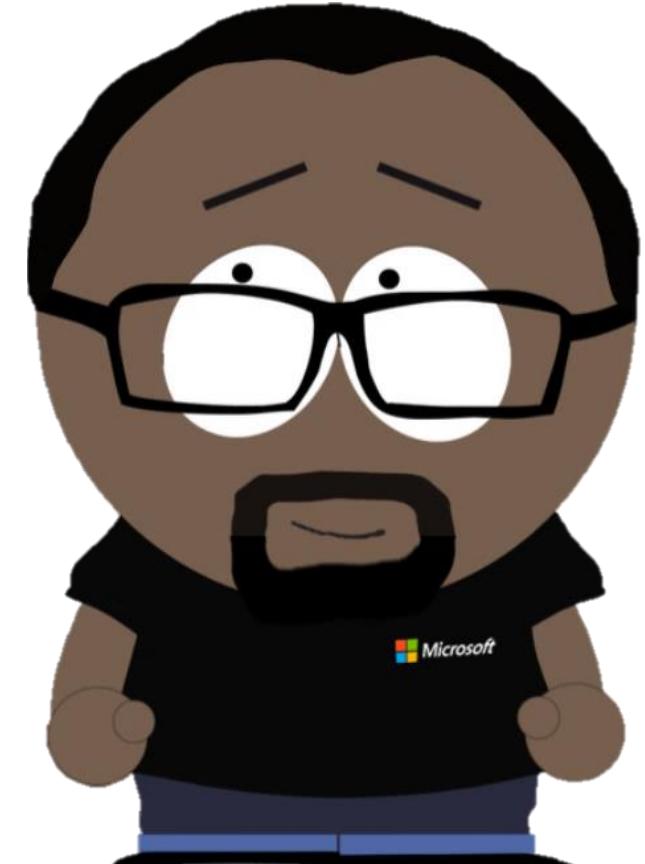
# 4) Deploying your Application Faster and Safer

# What is DevOps?



DevOps is the union of people, process, and products to enable continuous delivery of value to our end users.

- Donovan Brown



# Why is DevOps important?

Your competition is already doing this

Increase velocity

Reduce downtime

Reduce human error

# High Performance DevOps Companies Achieve...

46x Deployment Frequency

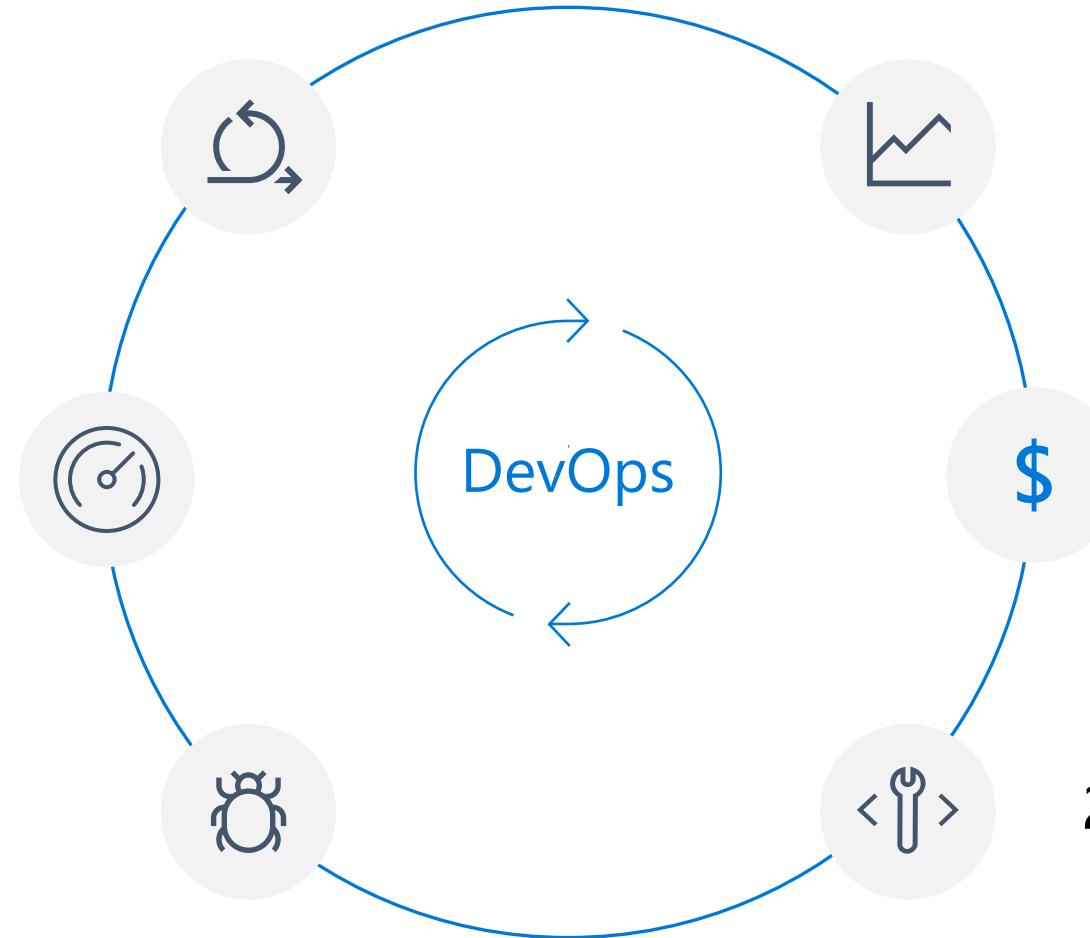
Faster Time to Market

7x Lower Change Failure Rate

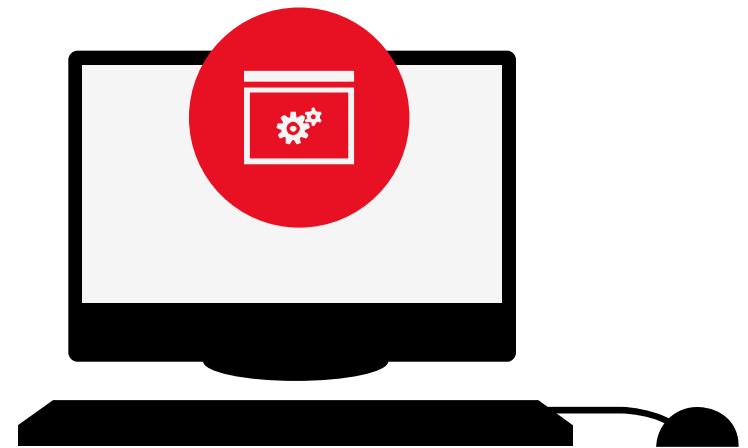
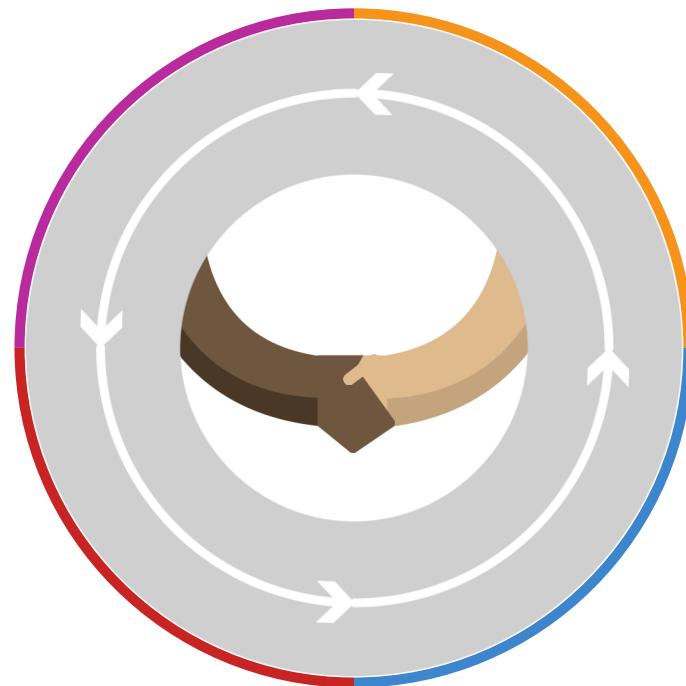
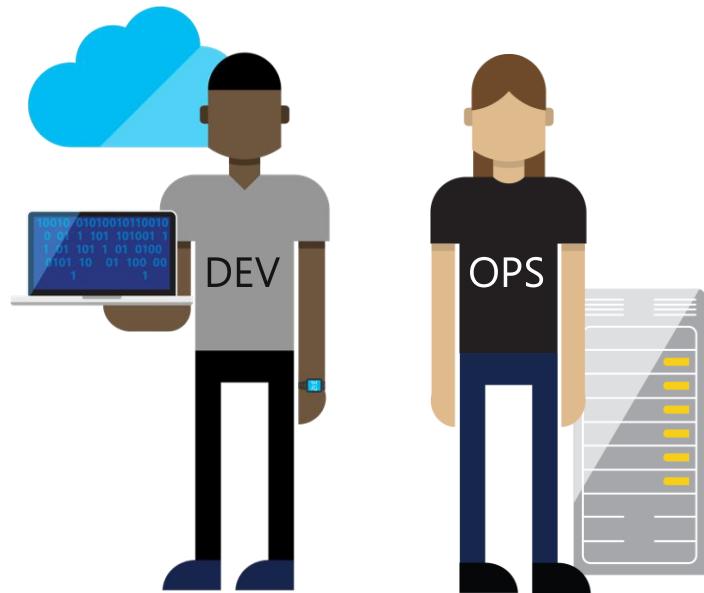
2,555x Faster Lead Time For Changes

Increased Revenue

2,604x Faster Mean Time to Recover



# DevOps: the three stage conversation

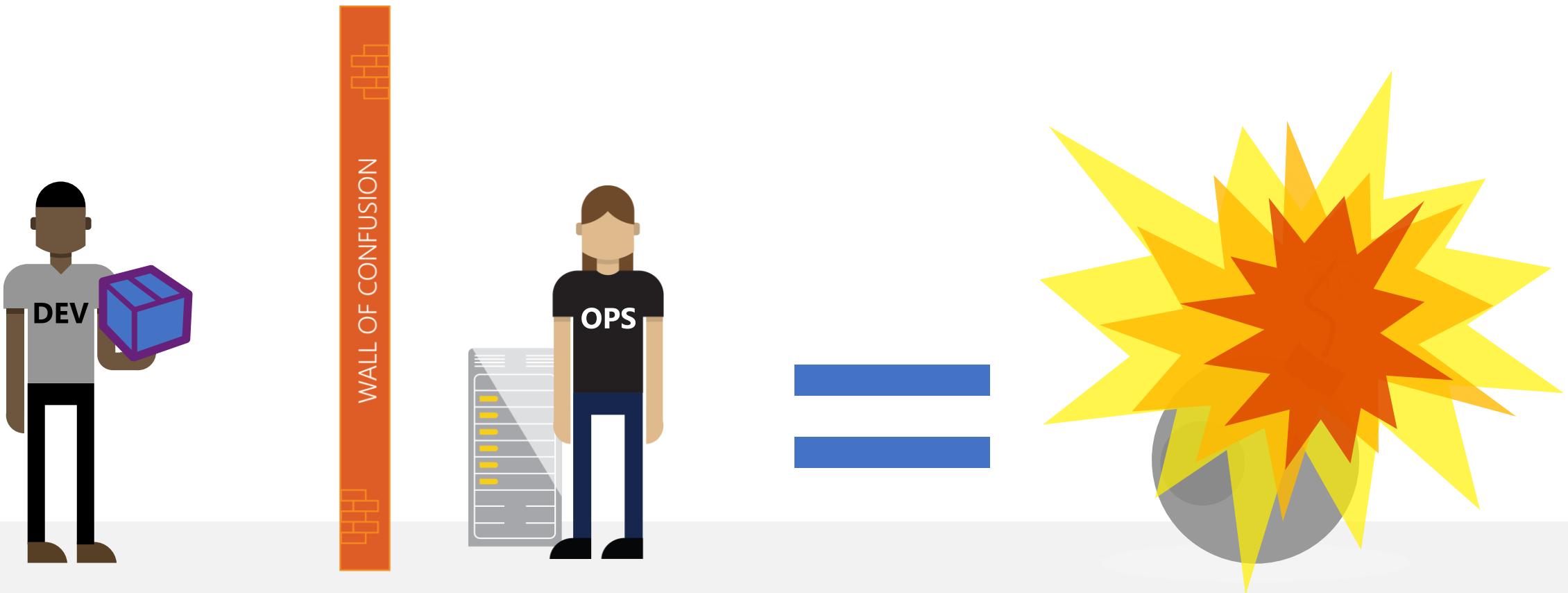


1 | People

2 | Process

3 | Products

# People



# Process

1 Plan

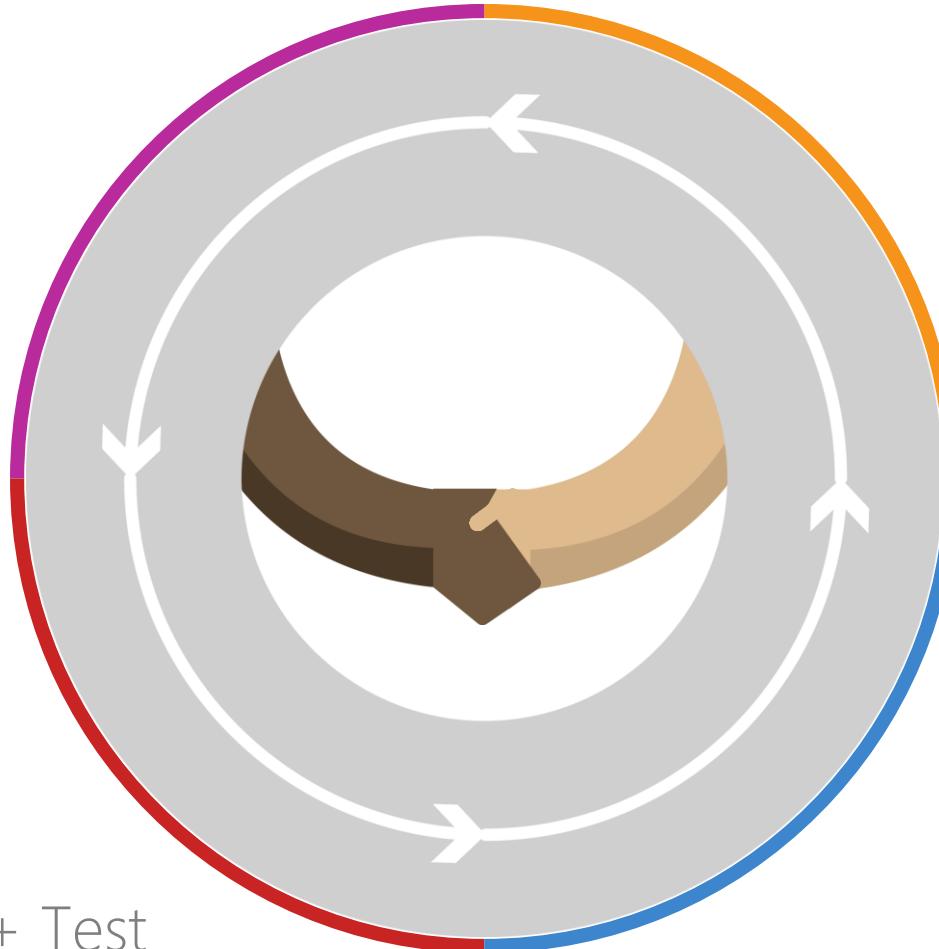
4 Monitor + Learn

Development

Production

2 Develop + Test

3 Release



# Introducing Azure DevOps



## Azure Boards

Deliver value to your users faster using proven agile tools to plan, track, and discuss work across your teams.



## Azure Pipelines

Build, test, and deploy with CI/CD that works with any language, platform, and cloud. Connect to GitHub or any other Git provider and deploy continuously.



## Azure Repos

Get unlimited, cloud-hosted private Git repos and collaborate to build better code with pull requests and advanced file management.



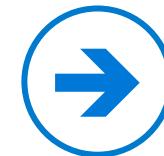
## Azure Test Plans

Test and ship with confidence using manual and exploratory testing tools.



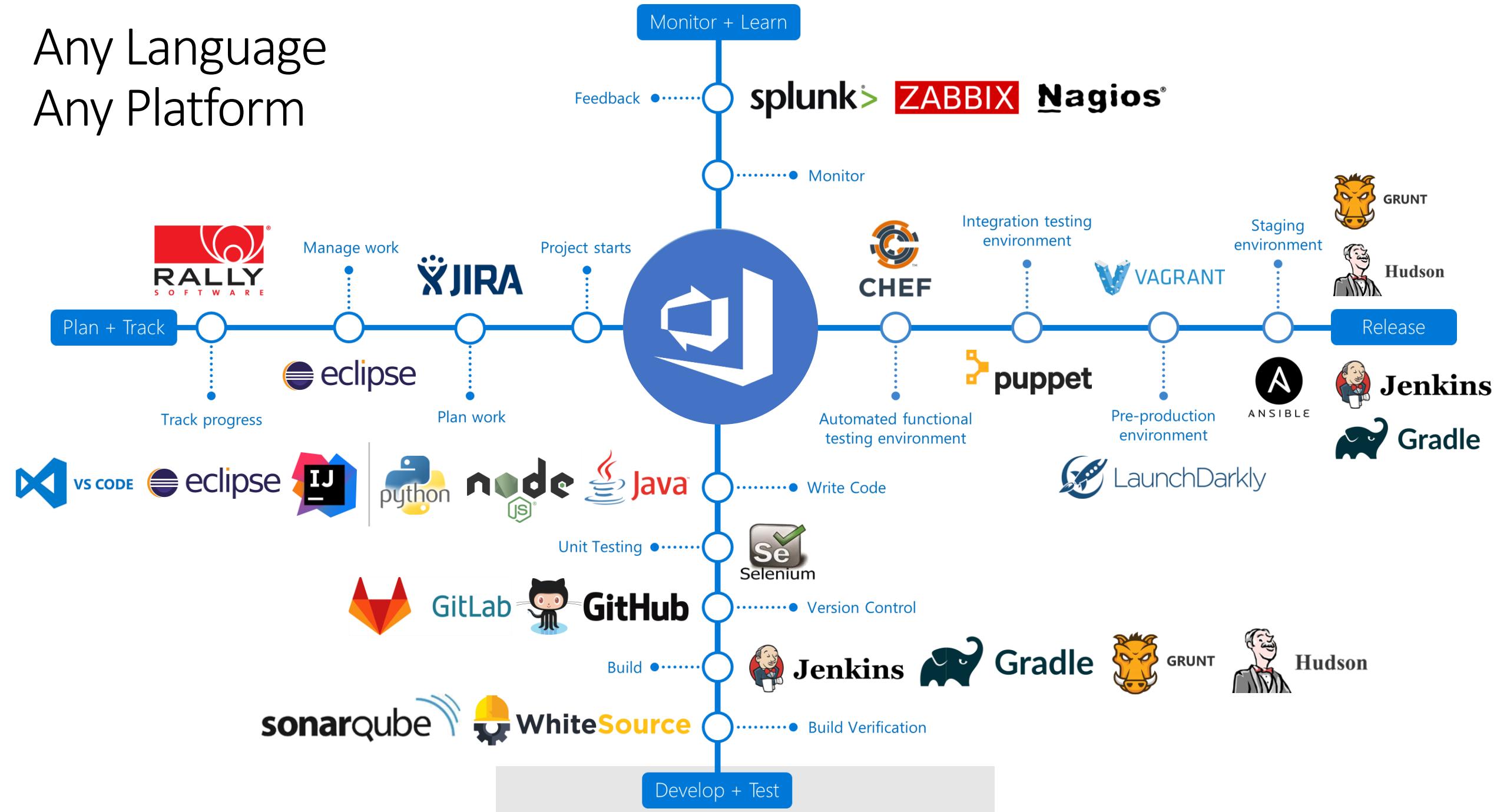
## Azure Artifacts

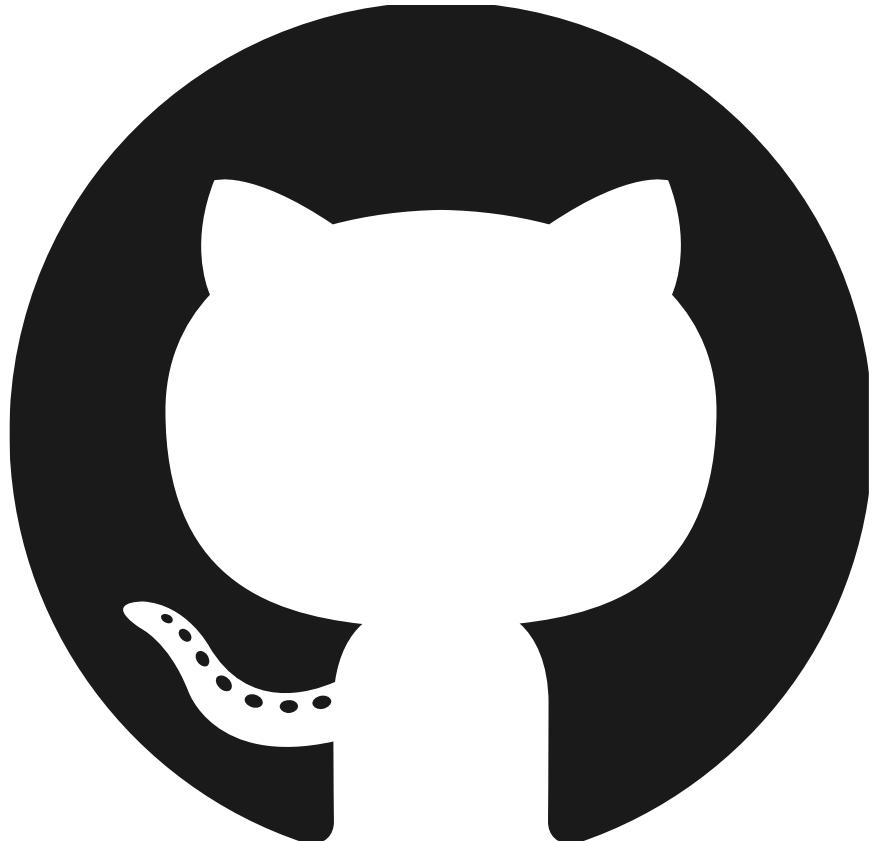
Create, host, and share packages with your team, and add artifacts to your CI/CD pipelines with a single click.



<https://azure.com/devops>

# Any Language Any Platform





# GitHub

The #1 developer platform  
on the planet

**33M+** Developers on GitHub

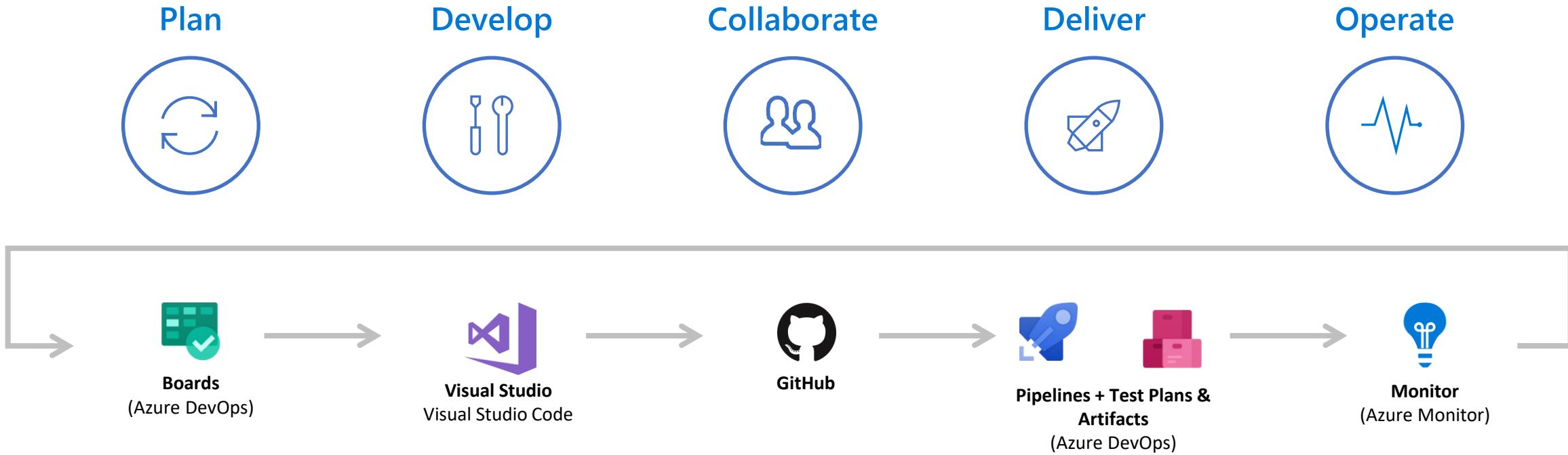
**100M** Private and public repositories

**1B+** Contributions per year

**2M** Organizations and growing

# Use the best of breed DevOps tools

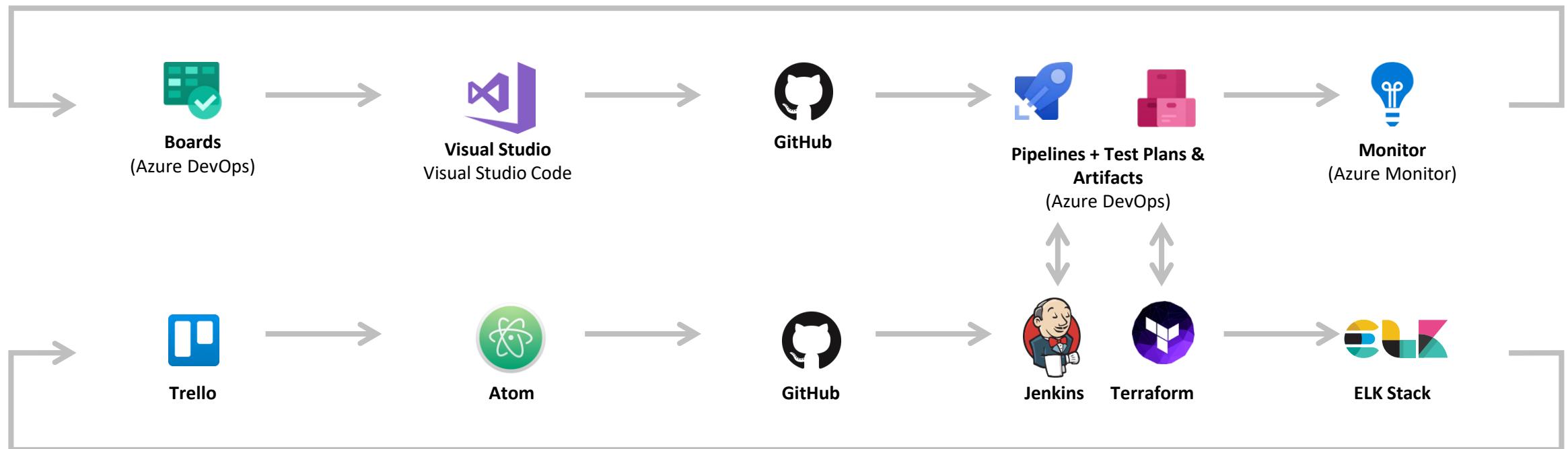
Use the best of breed DevOps tools with Azure DevOps and collaborate on GitHub



**Faster delivery to production = More business value**

# Use the tools you know and love

Integrate with your existing tools and workflows



# Fully integrated to maximize developer velocity



Connect to your GitHub repositories in Visual Studio



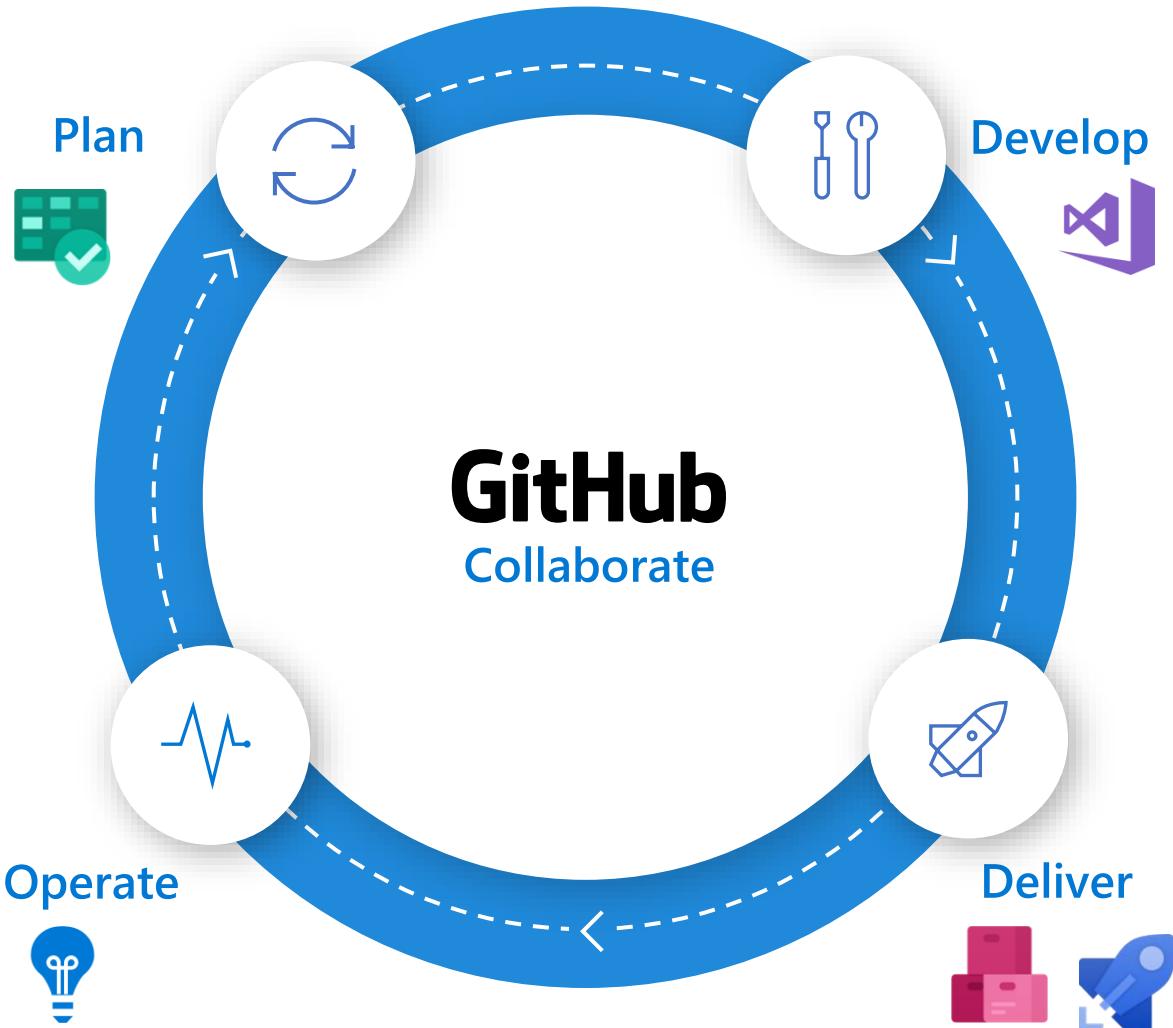
Link your GitHub commits with Azure Boards



Continuously build, test, deploy to any platform or cloud with Azure Pipelines

A screenshot of the Azure Pipelines marketplace page. At the top, there's a navigation bar with 'Search or jump to...', 'Pull requests', 'Issues', 'Marketplace' (which is active), and 'Explore'. Below the navigation is a header with the Azure Pipelines logo and the text 'Marketplace / Azure Pipelines'. There are two buttons: 'Set up a new plan' (green) and 'Edit your plan ▾' (grey). To the right of these buttons is the text 'Azure Pipelines' and a subtext 'Continuously build, test, and deploy to any platform and cloud'. Below this, it says 'Azure Pipelines offers cloud-hosted pipelines for Linux, macOS, and Windows with 10 free parallel jobs and unlimited minutes for open source projects.' There's also a 'Read more...' link. On the left side of the main content area, there's a sidebar with sections for 'Categories' (Continuous integration, Deployment), 'Supported languages' (Dockerfile, Go, Java, and 7 other languages supported), and 'Developer links' (Support, Status, Documentation, Privacy Policy). The main content area features a large blue box with the heading 'Linux, macOS, and Windows agents' and subtext 'Simplify managing hardware and VMs by using Microsoft cloud-hosted agents. Get full CI/CD pipeline support for every major platform and tool.' It shows four status cards: 'Test 27 succeeded', 'Build Linux 6 succeeded', 'Build Windows 2 succeeded', and 'Build macOS 64% in progress...'. A 'Distribute' button is also visible.

# Access the full breadth of the Azure Platform



## Microsoft Azure

### Core Infrastructure

Compute

Security

Storage

Management

Networking

### Advanced Workloads

Web + Mobile

Internet of Things

Microservices

Containers

Serverless

Identity

Data + Analytics

Artificial Intelligence

Cognitive Services

High Performance Computing

### Azure Stack + Hybrid



# /Docs alert

Azure DevOps documentation has quickstarts and all the reference material you could need

<https://aka.ms/AzureDevOpsDocs>

Microsoft | Azure DevOps Services Pricing News Support Subscriber Access Try for free

## Azure DevOps Documentation

Azure DevOps Services provides development collaboration tools including high-performance pipelines, free private Git repositories, configurable Kanban boards, and extensive automated and cloud-based load testing. For the on-premises platform (TFS), see [Visual Studio Team Foundation Server Documentation](#).

*Visual Studio Team Services is now Azure DevOps Services*

### Start using Azure DevOps



**Build GitHub projects using Azure Pipelines**  
Set up continuous integration and continuous delivery (CI/CD) for your GitHub repository.



**Start using Azure DevOps**  
Sign up and get started using Azure DevOps Services.



**What's new**  
Learn about new features under development and recently released.



**Web portal navigation**  
Learn how to work effectively within the web portal.



**Azure Pipelines**  
Manage CI/CD to deploy your code with high-performance pipelines that work with any language, platform, and cloud.



**Azure Repos**  
Use Git repositories, pull requests, and then integrate with CI/CD to build and deploy your apps.



**Azure Boards**  
Plan and track your work using interactive, highly-customizable backlogs and boards.



**Azure Artifacts**  
Share code with others across your teams or company, and support CI/CD of your apps.



**Azure Test Plans**  
Improve the overall code quality of your apps by using manual, exploratory, or load-based testing services.



**Settings**  
Configure resources and settings for users, teams, projects, and organizations.

**Create pipelines to build and deploy applications to any platform, cloud, or app store.**



# /Docs alert

The DevOps Resource Center is a great starting point for everything DevOps at Microsoft

<https://aka.ms/DevOpsResourceCenter>

The screenshot shows the Microsoft DevOps Resource Center. At the top, there's a navigation bar with links for Microsoft, Azure, DevOps, Services, Pricing, News, Support, and Subscriber Access, along with a "Try for free" button and a search icon. Below the navigation is a breadcrumb trail: Azure DevOps & TFS / DevOps Resource Center. A "Share" button and a "Dark" mode switch are also present. The main content area has a heading "DevOps Resource Center" and a subtext explaining its purpose: "This center combines our resources on learning DevOps practices, Git version control, Agile methods, how we work with DevOps at Microsoft, and how you can assess your own DevOps progression. Alternatively, you can jump to documentation on [getting started with DevOps on Azure](#), or to dive in, [start your own Azure DevOps project](#). If you're interested in practices, read on." On the left, a sidebar lists categories: "DevOps Resource Center" (selected), "DevOps at Microsoft", "Learn DevOps", "Learn Git", "Learn Agile", and "Events and Talks". The main content is organized into six cards:

- Learn DevOps**: DevOps is the union of people, process, and products to enable continuous delivery of value to our end users.
- Learn Git**: Git is a distributed version control system to track changes you make in your code over time.
- Learn Agile**: Agile approaches to software development emphasize incremental delivery, team collaboration, continual planning, and continual learning.
- DevOps at Microsoft**: This center will keep you current on how we adopt DevOps at Microsoft. We've selected the best videos and articles from both public conferences and internal training sessions.
- DevOps Events and Talks**: Take a look at some of our recent conference talks on youtube at the channel DevOps at Microsoft.
- DevOps Self-Assessment**: Get tailored recommendations on how to improve your organization's ability to develop and deliver value to customers, pivot when necessary, and beat competitors to market.

# Resources

# Azure.com/Migration

All things migration

## Guidance

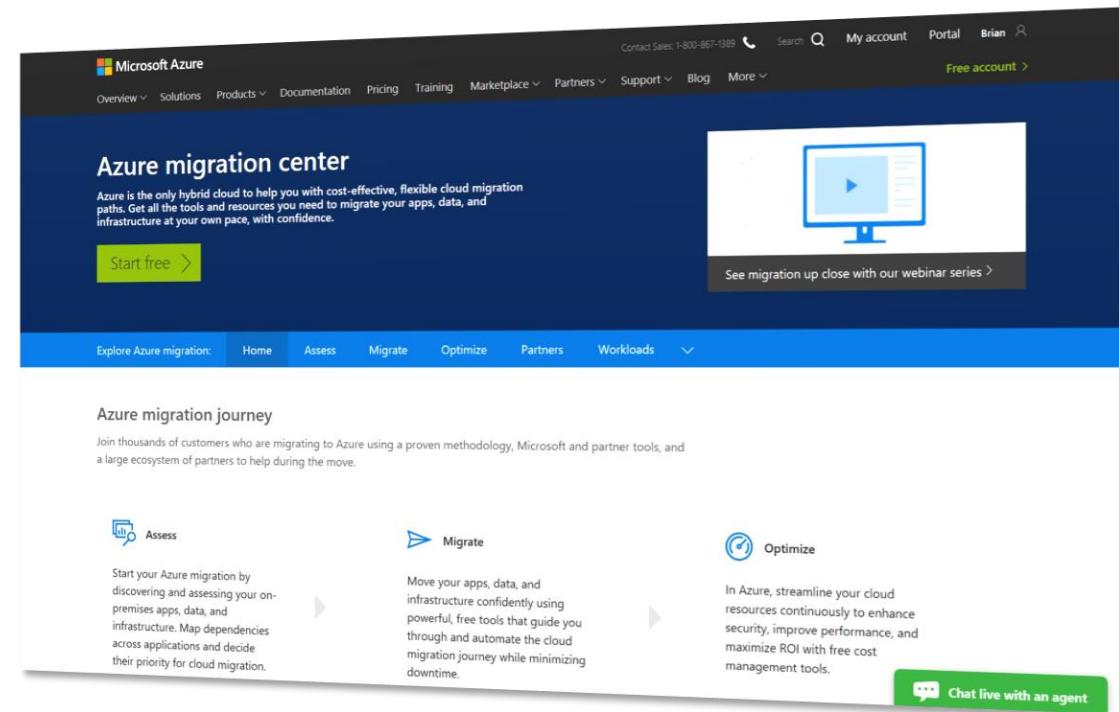
Migration journey  
and strategies

## Tools

Right tools for the job

## Partners

Migration experts



# Keep up to date on your Azure skills as you migrate



## Microsoft.com/Learn

Build skills quickly

Measure Azure skill proficiency

Role based certification & training

**Announcing** free migration course  
Assessing and Planning Azure Migration

The screenshot shows the Microsoft Learn homepage. At the top right, there's a banner for the "Assessing and Planning Azure Migration" course, which is described as free. Below the banner, the main navigation bar includes "Learn", "Azure", "Business Applications", "About", "Browse All", and "Certifications". On the left, there's a sidebar with a "Welcome to Microsoft Learn" message and a "Start Learning for Free" button. The main content area features several sections: "Start a learning path" (with a "Select your role" dropdown), "Learn Azure" (with three cards: "Cloud Foundations", "Administer infrastructure resources in Azure", and "Deploy a website with Azure App Service"), and "Additional Azure Training" (with three cards: "Administer containers in Azure", "Work with NoSQL data in Azure Cosmos DB", and "Architect great solutions in Azure"). Each card includes a thumbnail, a title, a duration, and a "Beginner", "Administrator", and "Expert" level indicator.

# Build your case: Azure TCO calculator

[Azure.com/tco](https://Azure.com/tco)

Total Cost of Ownership (TCO) Calculator  
Estimate the cost savings you can realize by migrating your workloads to Azure

Welcome to the preview of the new TCO Calculator. Please [leave feedback.](#) X

1 Define your workloads    2 Adjust assumptions    3 View report

---

**Define your workloads**  
Enter the details of your on-premises workloads. This information will be used to understand your current TCO and recommended services in Azure.

**Servers**  
Enter the details of your on-premises server infrastructure. After adding a workload, select the workload type and enter the remaining details.

[+ Add server workload](#)

---

**Databases**  
Enter the details of your on-premises database infrastructure. After adding a database, enter the details of your on-premises database infrastructure in the Source section. In the Destination section, select the Azure service you would like to use.

[+ Add database](#)

---

**Storage**  
Enter the details of your on-premises storage infrastructure. After adding storage, select the storage type and enter the remaining details.

[+ Add storage](#)

---

**Networking**  
Enter the amount of network bandwidth you currently consume in your on-premises environment.

Outbound bandwidth 1  
GB 1  
(1 - 2000)

[Next](#)

# Get help: FastTrack for Azure can help you migrate quickly and confidently

## Benefits

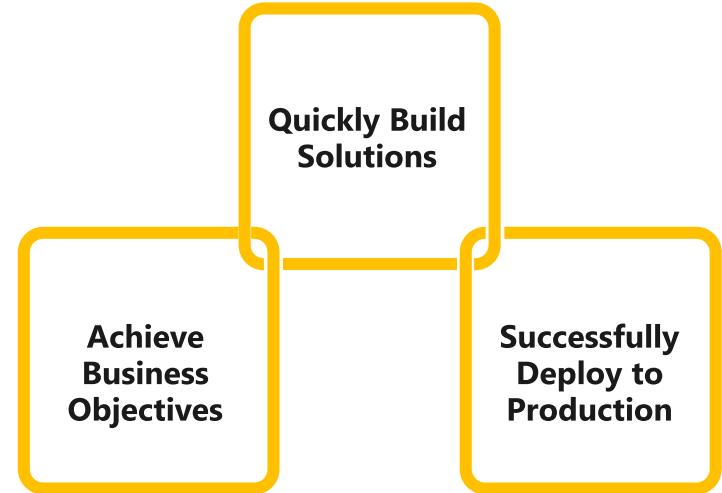
- **Direct assistance** from Azure engineers and program managers
- Use **proven practices** and tools from real customer experiences
- **Accelerated** deployment to full production of Azure solutions



## Engagement phases

- **Discovery:** Validate project scope, vision, requirements and assess architectural needs
- **Solution Enablement:** Guidance on solution architecture design using proven practices and design principles
- **Deployment:** Support in-house customer and/or partner led deployment of Azure solution
- **Continuous Partnership:** Provide periodic check-ins and address additional workloads and deployment needs

## FastTrack for Azure



Please visit [Azure.com/FastTrack](https://Azure.com/FastTrack) for more information

# Get help: skilled migration partners



TATA  
CONSULTANCY  
SERVICES



Infosys®  
Navigate your next



cloud  
BESPIN GLOBAL  
•



claranet



Crayon  
The Software Experts

DATA COM



hanu™  
100% CLOUD CLEAR



enso



MIRABEAU |\*  
A Cognizant Digital Business



NORDCLOUD



Progressive™  
Experience Outcomes  
Cloud | Digital | Operations



NEW SIGNATURE



[Click here to search for an Azure expert MSP in your region](#)

# Get started today

1

**Assess migration  
cost savings**

[Azure.com/TCO](https://Azure.com/TCO)

2

**Learn more, find a  
migration partner**

[Azure.com/Migration](https://Azure.com/Migration)  
[Aka.ms/AzureExpertMSP](https://Aka.ms/AzureExpertMSP)

3

**Start your migration  
project**

[Azure.com/MigrateNow](https://Azure.com/MigrateNow)



Learn more about Azure for free

<https://www.pluralsight.com/partners/microsoft/azure>

<https://docs.microsoft.com/en-us/learn/>

Github resources to run the demos

<https://github.com/microsoft/IgniteTheTour/tree/master/MIG%20-%20Migrating%20Applications%20to%20the%20Cloud>

<https://github.com/microsoft/ignite-learning-paths/tree/master/mod>