

Why public cloud, why CSA?

Agenda

- Why this class?
- High level plan
 - Day #1 – IaaS
 - Day #2 – PaaS
 - Day #3 – Data
- ~50 Key Concepts

Why Public Cloud?

Azure

Intelligent Cloud segment (ICS) revenue up 27% to \$12.28b

Growth from the Azure cloud 'slowed' to 59% - actual Azure revenue number not available in public

ICS consists of Azure, GitHub & Server products (incl. SQL Server & Windows Server)

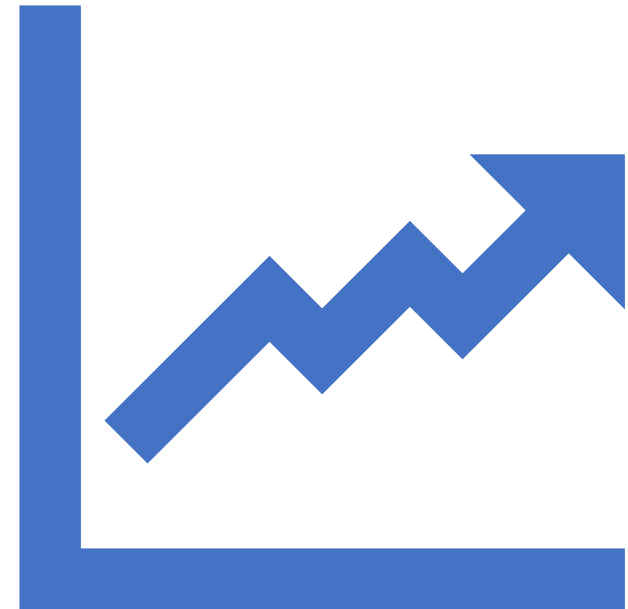
Potential for \$50b+ in CY 20 revenue – largest segment in MS

Amazon

AWS hits 10b\$ quarter for the 1st time ever

Potential for \$45-\$50 in CY 2020 revenue

However growth 'slowed' to 33%



Why Public Cloud?

Google

Cloud revenue grew 52% YoY to \$2.8b during the quarter

Cloud revenue consists of Google Cloud Platform (GCP) & GSuite (Google Office products)

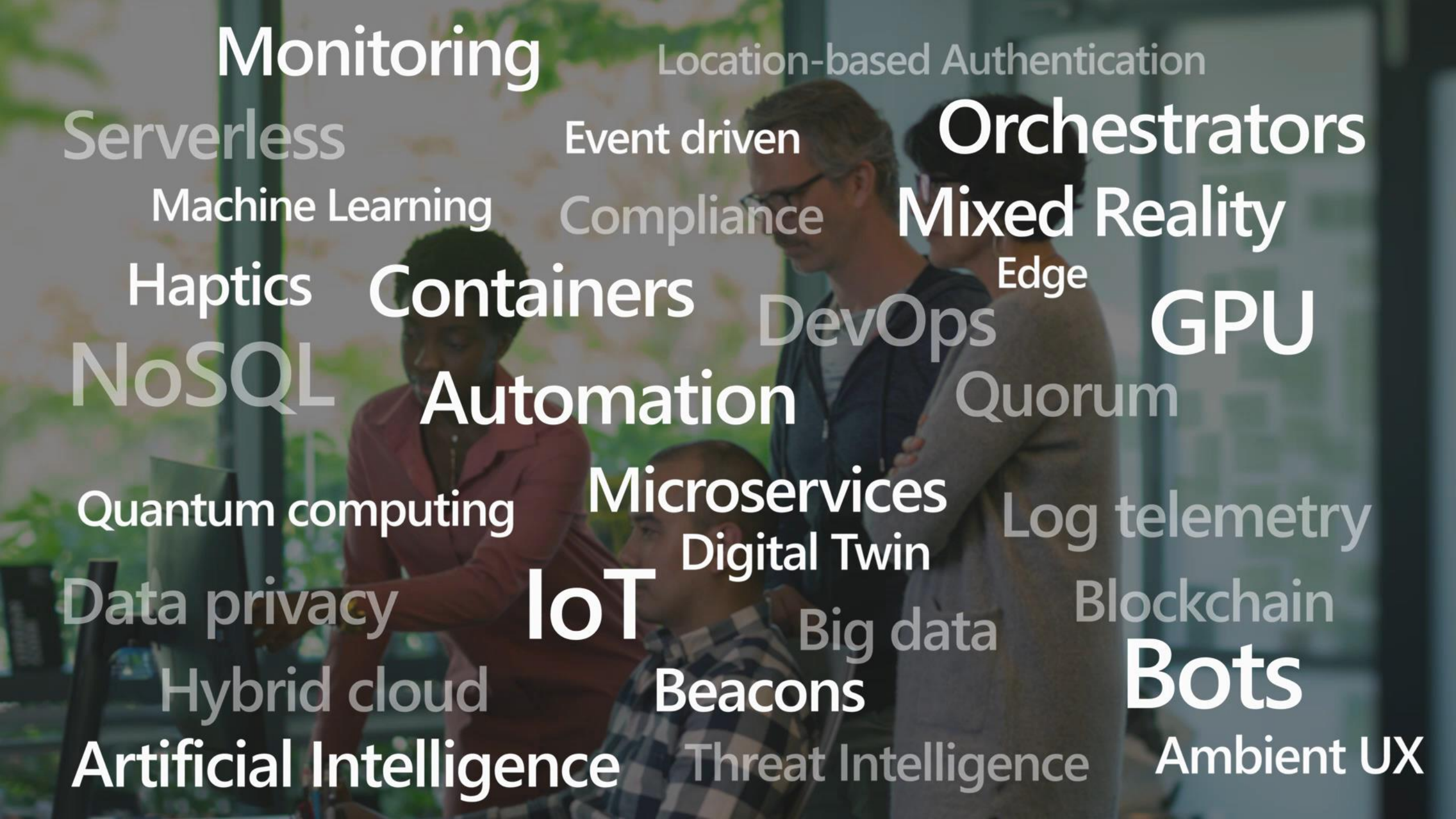
GCP growing faster than overall cloud revenue but breakdown not shared

Alibaba

Global adoption may be impacted if another China tariff cycle is on the way

Cloud computing revenue +62% YoY to \$1.54 billion (7% of total revenue)





Monitoring

Location-based Authentication

Serverless

Event driven

Orchestrators

Machine Learning

Compliance

Mixed Reality

Haptics

Containers

Edge

DevOps

GPU

NoSQL

Automation

Quorum

Quantum computing

Microservices

Log telemetry

Digital Twin

Data privacy

IoT

Big data

Blockchain

Hybrid cloud

Beacons

Bots

Artificial Intelligence

Threat Intelligence

Ambient UX



The business is betting on me.

Should I use IaaS or PaaS?

What is the right container approach?

Where do I use serverless?

Do I need to understand quantum?

How do I move to DevOps?

I don't want to get hacked.

Can I reuse my code?

Which tech do I use?

How do I manage my cloud apps?

How do I meet these expectations?

What is the best approach?

Can I trust the cloud?



Productive



Hybrid



Open



Trusted

Productive

Infrastructure



"What your application runs on"

Data



"What your application works with"

Code

















"What your application does"



Migrate • Innovate

← Unified Management • Security • Governance • Tools • DevOps →

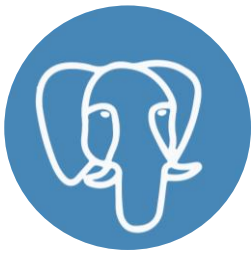
Infrastructure for all workloads

On-demand	Purpose-built	Linux, Open Source, and Red Hat	Best Choice for Microsoft workloads
 Compute		 +40% of Azure VMs are running Linux	 Cost savings
 Networking		 1.4x growth of Linux	 Easy migrations
 Storage	 	 Co-located support with Red Hat on-site team	 First-party support
			 Modernize apps beyond infrastructure

Azure Operational Data Services



SQL DB



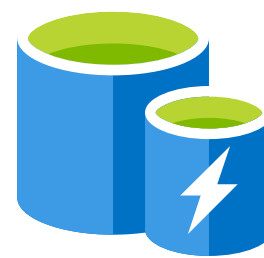
PostgreSQL



MySQL



MariaDB

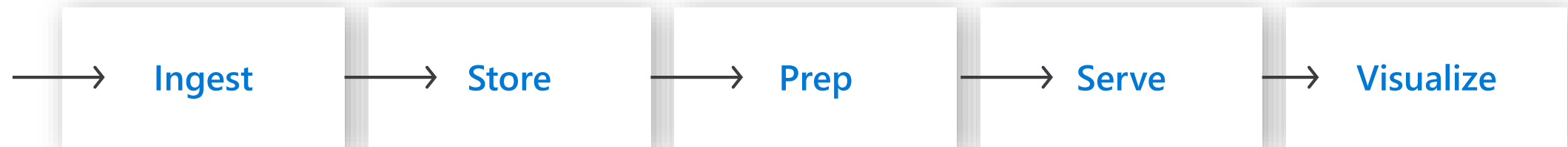


Redis Cache



Cosmos DB

Azure for Cloud Scale Analytics



Azure for Cloud Scale Analytics

Ingest

70+ Connectors



Azure
Data Factory

Store

Cost-effective

101010
010101
101010

Azure Data
Lake Storage

Prep

Best Spark



Azure
Databricks

Serve

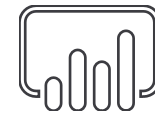
Fastest DW



Azure Synapse

Visualize

Modern BI



Power BI

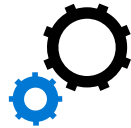
A serverless platform for Application Modernization



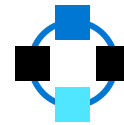
Web & Mobile
development



Containers



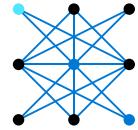
Microservices



Integration
services



Event-driven



AI



Dev Ops

AWS and Azure Comparison

<https://docs.microsoft.com/en-us/azure/architecture/aws-professional/services>

Azure and its competitors: The big picture - BRK2287

	Compute				Data		
	IaaS	CaaS	PaaS	FaaS	Object Storage	Relational	NoSQL
Microsoft Azure	Virtual Machines	Azure Container Service (ACS)	App Service, Service Fabric	Azure Functions	Blobs	SQL Database	Cosmos DB, ...
Amazon Web Services	Elastic Compute Cloud (EC2)	EC2 Container Service (ECS)	Elastic Beanstalk	Lambda	Simple Storage Service (S3)	Relational Database Service (RDS), ...	DynamoDB, ...
Google Cloud Platform	Compute Engine	Container Engine	App Engine	Cloud Functions	Cloud Storage	Cloud SQL, Cloud Spanner	Cloud Datastore
Salesforce Force.com			Force.com				Force.com Database

https://www.youtube.com/watch?v=uUskdZ_Gwt0



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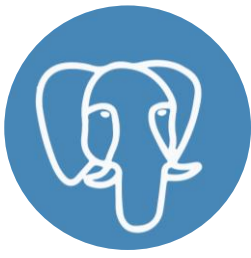
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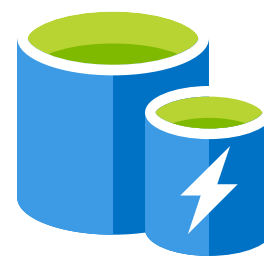
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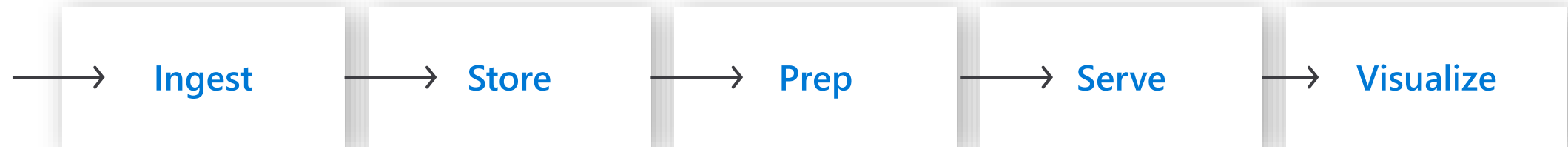


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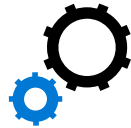
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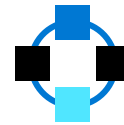
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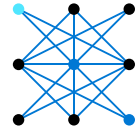
Microservices



Integration
services



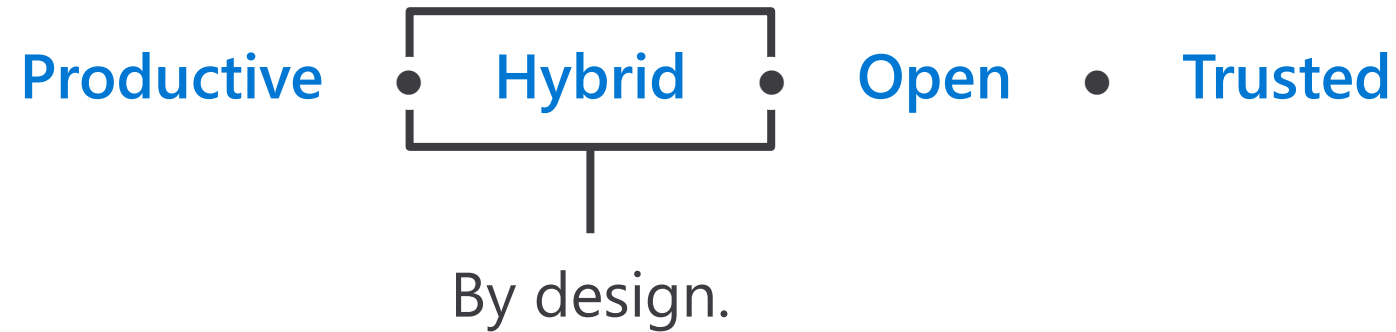
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AI

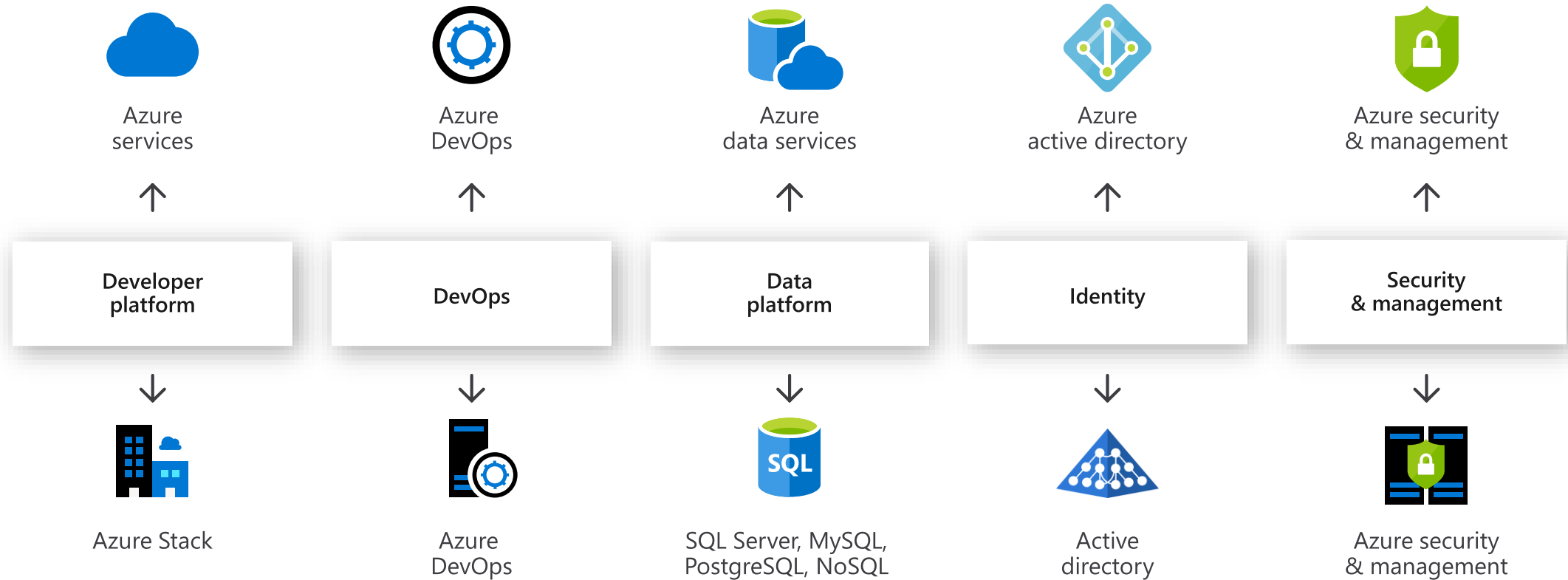


Dev Ops

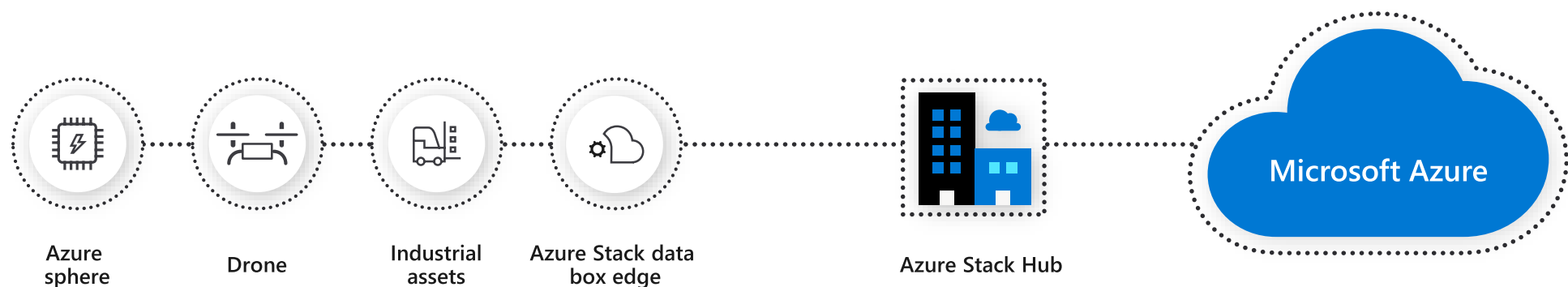




the only consistent, comprehensive hybrid cloud



Consistency across the cloud and the edge



← **Azure IoT Edge** → ← **Azure services** →

← **Consistent security, identity, management, and AI** →



Productive • Hybrid • **Open** • Trusted

GitHub contributions

2014

Satya "Microsoft loves Linux"
.NET foundation created

2015

VSCode released
HDInsight (Hadoop/Ubuntu) announced
Microsoft jointly forms Node.js foundation

2016

.NET Core 1.0
PowerShell Core
SQL on Linux announced
Windows Subsystem for Linux in Windows 10
Microsoft joins Linux foundation

2017

Microsoft Azure Kubernetes Service launched
Draft, Brigade, Kashti projects submitted to Kubernetes community
Microsoft joins Cloud Native Computing & Cloud Foundry Foundations
Azure Database for Postgres & MySQL announced
Azure Databricks (Apache Spark) announced

2018

VSCode ranked #1 developer tool (Stack Overflow, 2018 language survey)
Service Fabric Open Sourced
Azure Sphere with Linux kernel
GitHub intent to acquire announced
~5,000 Microsoft employees committing to open source projects on Github
Azure trending to 50% Linux

2018/19

Microsoft acquires GitHub



2014

2015

2016

2017

2018

2018

Azure supports the open source ecosystem

Management



Databases & middleware



Applications



Infrastructure



App frameworks





Productive



Hybrid



Open

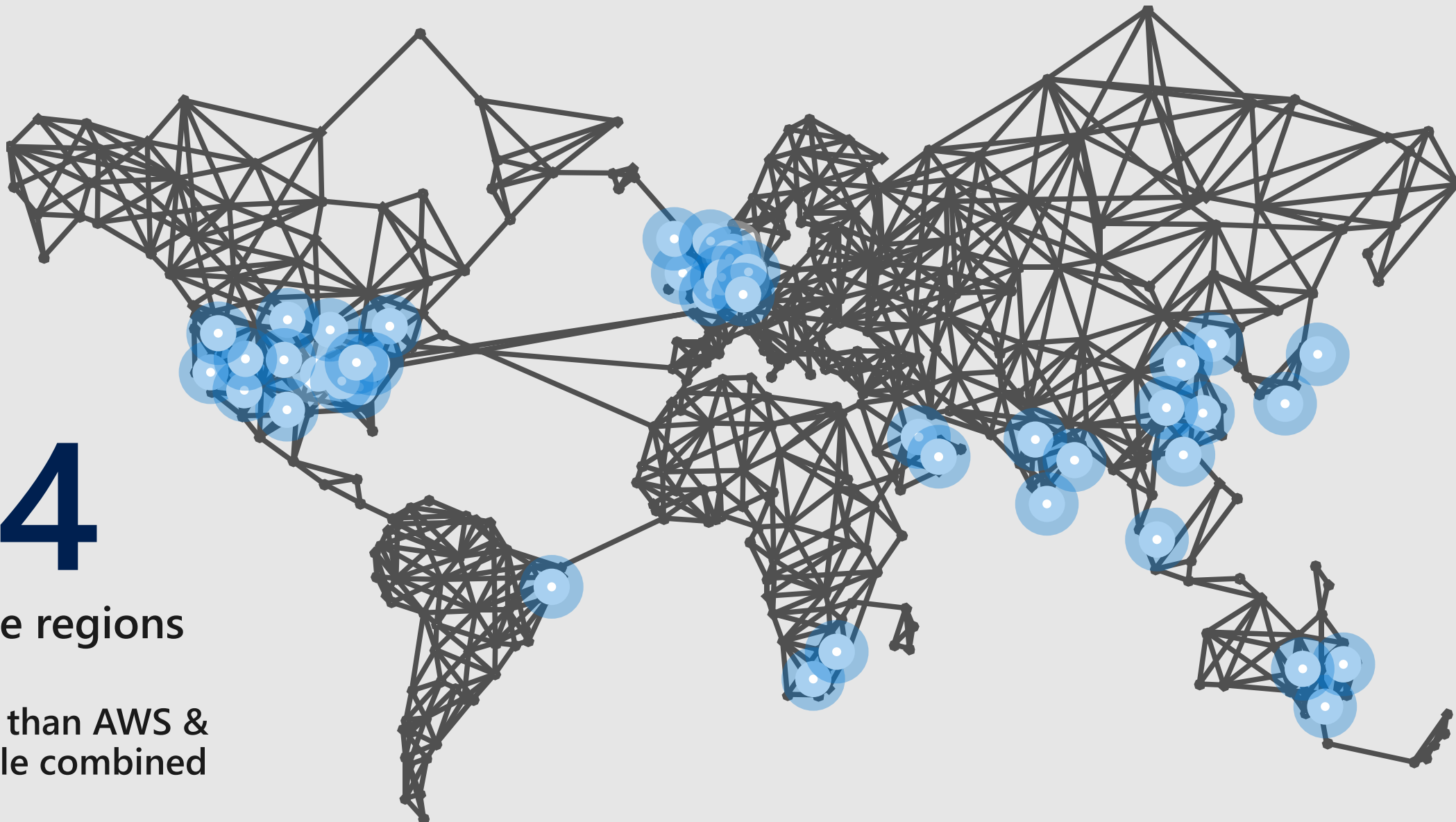


Trusted

54

Azure regions

More than AWS &
Google combined



Azure Compliance

Azure has the largest compliance portfolio in the industry

Industry



ISO
27001



SOC 1
Type 2



SOC 2
Type 2



SOC 3



PCI DSS
Level 1



ISO
27018



Content Delivery and
Security Association



Cloud Controls
Matrix v3.0.1



MPAA



Shared
Assessments

United States



FedRAMP
JAB
P-ATO



HIPAA /
HITECH



FIPS
140-2



21 CFR
Part 11



FERPA



DISA
Level 2
(DIACAP)



CJIS



IRS
1075



ITAR
-ready



Section
508
VPATs



FISMA



NIST
800-171



MARS-E



GxP



DIACAP

Regional



Argentine Data
Protection Act 25.326



European Union
Model Clauses



United Kingdom
G-Cloud



Canadian
Privacy Laws



China GB
18030



China
TRUCS



Singapore
MTCS Level 3



Australian Signals
Directorate



New Zealand
GCIO



Japan
Financial Services



ENISA
IAF



Cloud Security
Mark Gold



Spain
ENS



FACT



EU-US
Privacy Shield



NZCC
Framework



China Multi Layer
Protection Scheme



Japan My
Number Act



ISA/IEC
27017

Learn about cloud architect
responsibilities

More than technical skills

Technical Skills:

- Application Architecture
- Automation and Orchestration
- High Availability
- Governance
- Infrastructure and Operations
- Networking
- ITSM/ITOM
- Security

Nontechnical Skills:

- Change Management
- Communication and Collaboration
- Company/Vertical Experience
- Delegation
- Finance and Legal
- Self-starting

Cloud Architect Responsibilities

Culture

Collaboration

Adoption
Framework

Cloud
Architecture

More than technical skills...

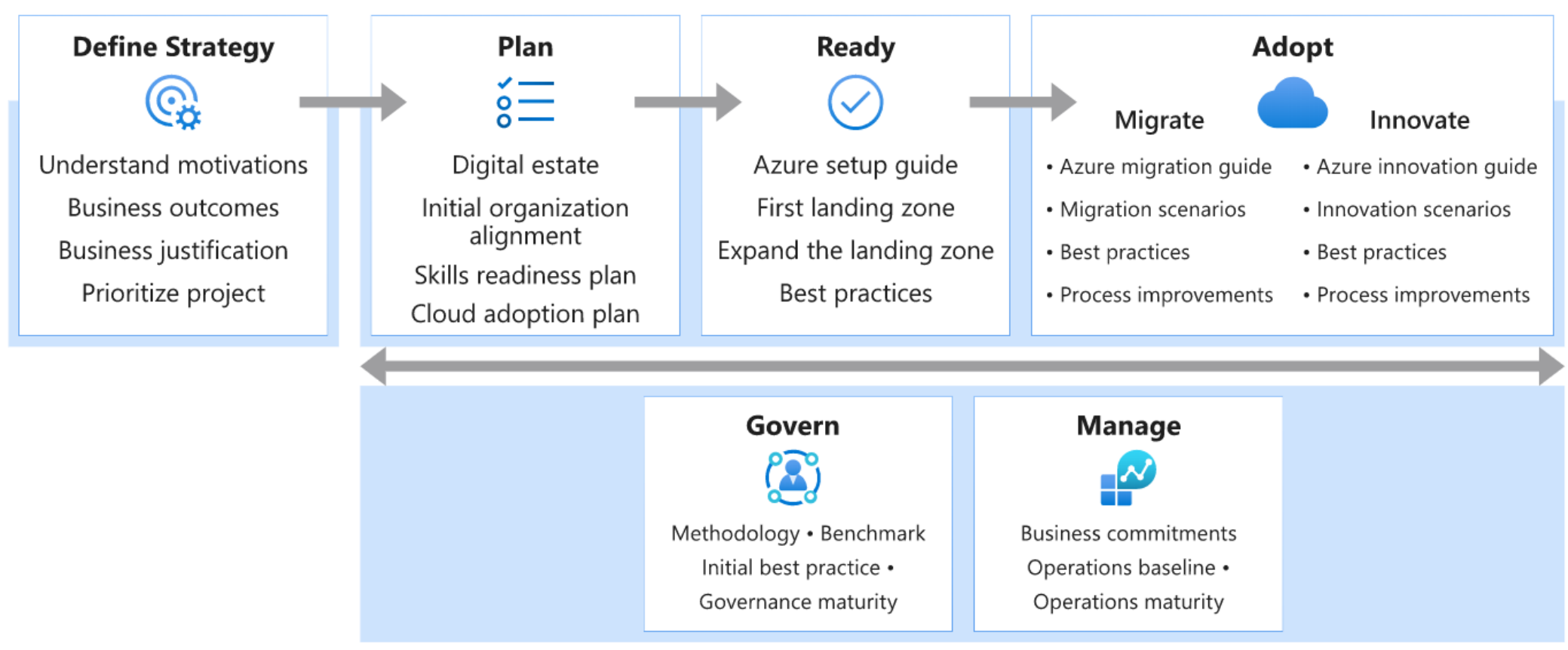
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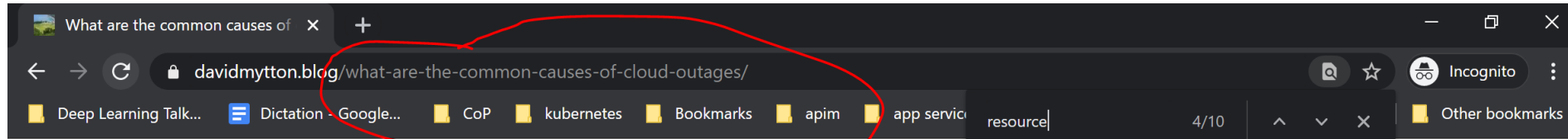
Cloud Adoption Framework for Azure



Learn about cloud design
patterns

Resilience Patterns

- Include retry logic
- Test your retry logic
- Break the circuit!
- Watch for uninitialized state (during recycle events)
- Plan for resilience



Root cause: misconfiguration.

- 2017-02-28 – [Amazon S3 Service Disruption in the Northern Virginia \(US-EAST-1\) Region](#)
Root Cause: human error.
- 2016-06-04 – [AWS Service Event in the Sydney Region](#)
Root cause: unexpected type of power outage.

Azure Outages

Azure only provide [90 days of incident history](#) and do not offer unique links to each root cause analysis.

Summary

- Misconfiguration: 3
- **Resource** exhaustion: 1
- Inconsistent data replication: 1
- Software bugs: 2

The sample size is small due to the public incident history limit. According to the paper "[What bugs cause production cloud incidents?](#)", 40% of all incidents over a 6 month period were caused by software bugs:

In this work, we systematically studied all the high- severity production-run incidents during a recent span of 6 months in Microsoft Azure services, which cover a wide range of services including computation, storage, data management, data analytics, IoT, media services, etc., and identified software bugs as the most common cause of cloud incidents (close to 40%). We then did an in-depth study of all the 112 high-severity production incidents that are caused by software bugs.

Resilience Modeling and Analysis (RMA)

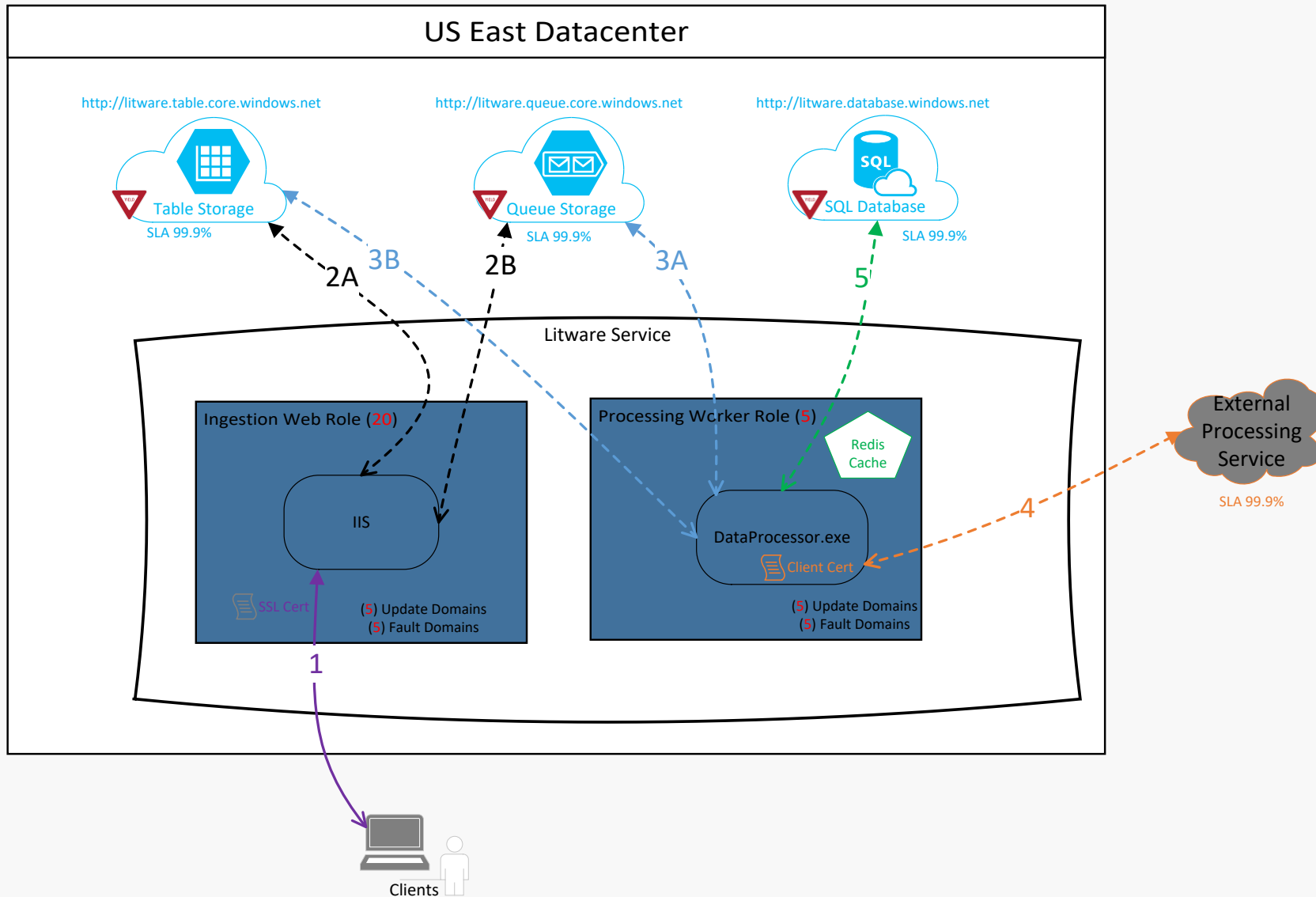
Address reliability issues early in the design

Prioritize reliability related work efforts

Provide tangible output for other reliability efforts

<https://www.microsoft.com/en-us/download/details.aspx?id=38823>

Component Interaction Diagram





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> Design Patterns

Overview

> Categories

Ambassador

Anti-corruption Layer

Asynchronous Request-Reply

Backend for Frontend

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Cloud Design Patterns

03/01/2018 • 7 minutes to read • +5

In this article

[Challenges in cloud development](#)

[Catalog of patterns](#)

These design patterns are useful for building reliable, scalable, secure applications in the cloud.

Each pattern describes the problem that the pattern addresses, considerations for applying the pattern, and an example based on Microsoft Azure. Most of the patterns include code samples or snippets that show how to implement the pattern on Azure. However, most of the patterns are relevant to any distributed system, whether hosted on Azure or on other cloud platforms.

Challenges in cloud development

Learn of Azure building
blocks

Application Architecture	VMs - Azure Virtual Machines	ACI - Azure Container Instances	Azure App Service (w-w/o containers)	AKS - Azure Kubernetes Services	Azure Functions	Azure Batch
Web apps (Monolithic)	✓	✓	✓	✓		
N-Tier apps (Services)	✓	✓	✓	✓	✓	
Cloud-Native (Microservices)		✓		✓ (Linux containers)	✓ (Event-driven)	
Batch/Jobs (Background tasks)	✓	✓	✓	✓	✓ (Background tasks)	✓ (Large-scale)

Legend



Choosing Azure compute platforms

Azure SQL Database

- Active geo-replication
- Automatic Asynchronous Replication
- Multiple readable secondaries
- Planned failover& Unplanned failover
- User-controlled failover and failback

The screenshot displays the Azure portal interface for an Azure SQL Database named 'dimadhus_d111'. The top navigation bar includes tabs for Settings, Tools, Copy, Restore, Export, and Delete. The main content area is divided into several sections:

- Essentials:** Provides key information about the database, including the resource group (Group-67), status (Online), location (North Central US), and server name (auditing-server.database.windows.net).
- Operations:** Contains a section for the Index Advisor, which currently shows 0 new index recommendations, and a Query Performance Insight tile.
- Geo-Replication:** This section is highlighted with a blue border. It features a world map showing the primary database location in North Central US and a secondary database location in South Central US. Below the map, a table lists the replication details.

SERVER/DATABASE		STATUS
PRIMARY		
North Central US	auditing-server/dimadhus_d111	Online
SECONDARIES		
South Central US	sqlloctest/dimadhus_d111	Read

Below the table, there is a 'TARGET REGIONS' section with a list of available regions for replication, each accompanied by a green checkmark icon:


- West US
- Central US
- South Central US
- North Central US
- East US
- East US 2
- Brazil South
- North Europe

Azure Cosmos DB

- Geo Replication
- Automatic Regional Failures
- Multi-Master Support

Home > New > Create Azure Cosmos DB Account

Create Azure Cosmos DB Account

 Try Cosmos DB for free, up to 20K RU/s, for 30 days with unlimited renewals. →

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

Azure Cosmos DB is a globally distributed, multi-model, fully managed database service. [Try it for free](#), for 30 da unlimited renewals. Go to production starting at <price>/month per database, multiple containers included. [Lea](#)

Project Details

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

* Subscription

* Resource Group [Create new](#)

Instance Details

* Account Name

* API ⓘ

Apache Spark ⓘ You're on the waitlist for Azure Cosmos with support for Apache Spark pre

* Location

Geo-Redundancy ⓘ

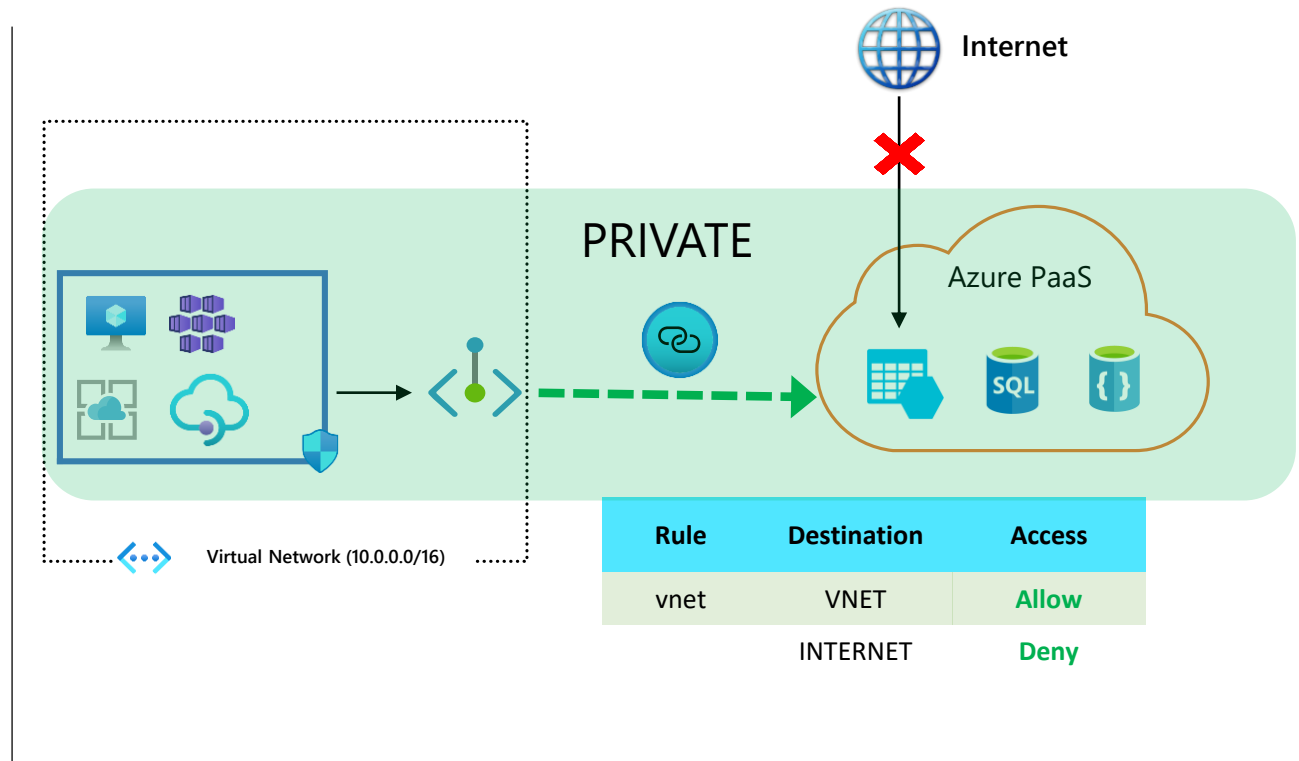
Multi-region Writes ⓘ

Availability Zones ⓘ

[Review + create](#) [Previous](#) [Next: Network](#)

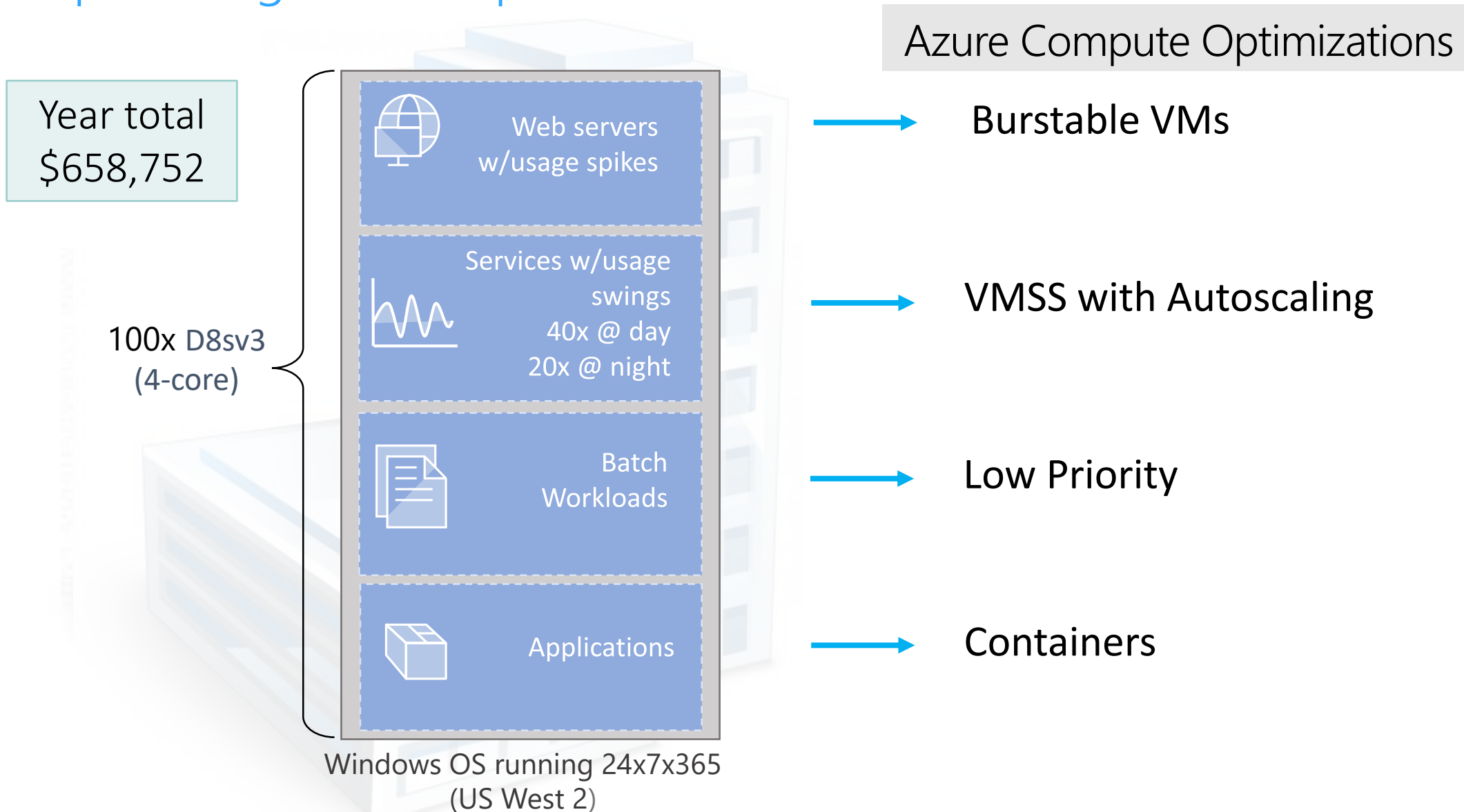
PaaS meets VNET

- VNet PaaS via the Microsoft backbone
- PaaS resource mapped to Private IP Address.
- In-built data exfiltration protection



Understand your workload

Optimizing VM composition



Burstable VMs

Efficiently handle workload spikes



Purchase VM with baseline performance, build credits to handle workload spikes

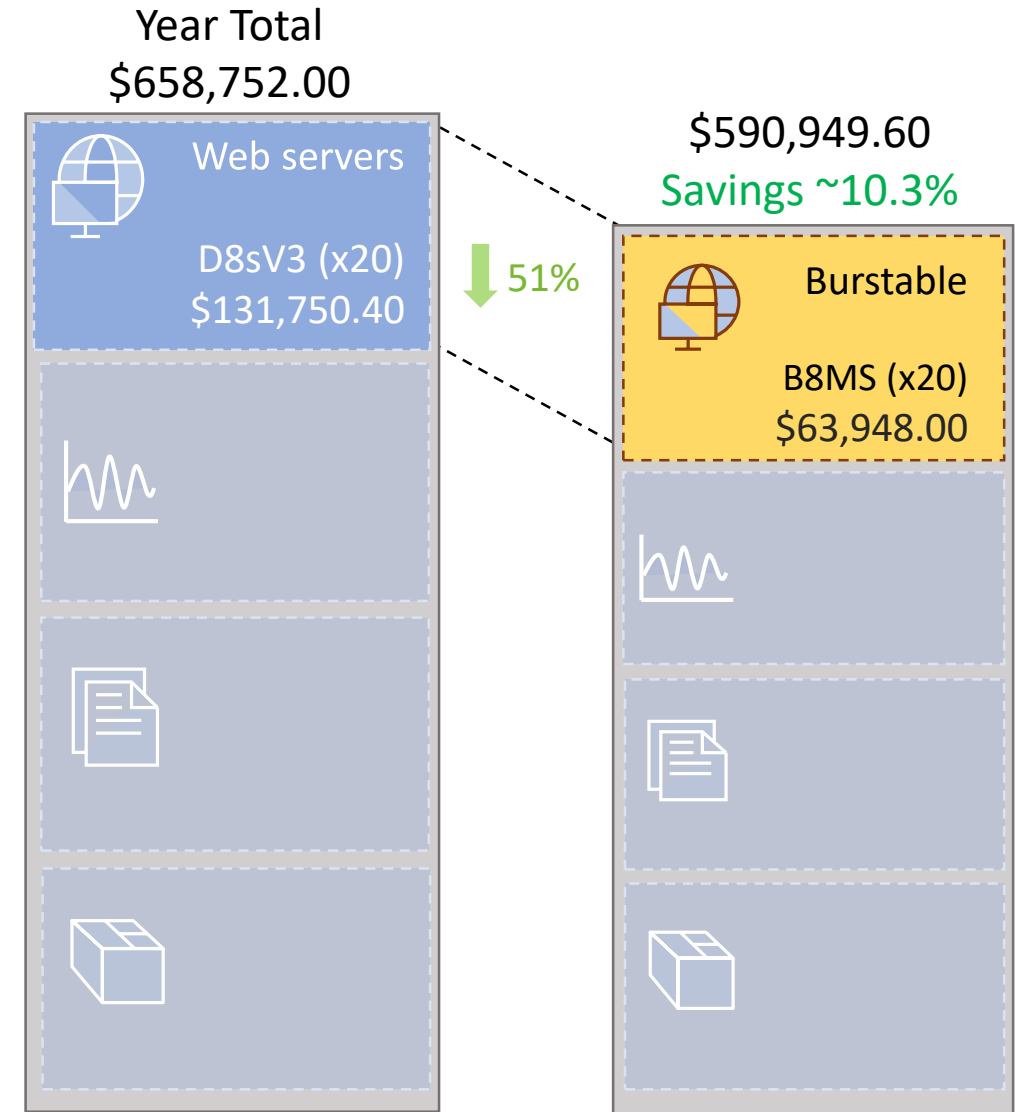


Burst up to 100% of the vCPU when the application requires higher CPU perf
Support sizes from 1 vcpu to 20 vcpu
Memory from 0.5G to 80G



Ideal for workloads that do not need full CPU perf continuously

- Web servers, Proof of concept, dev build env

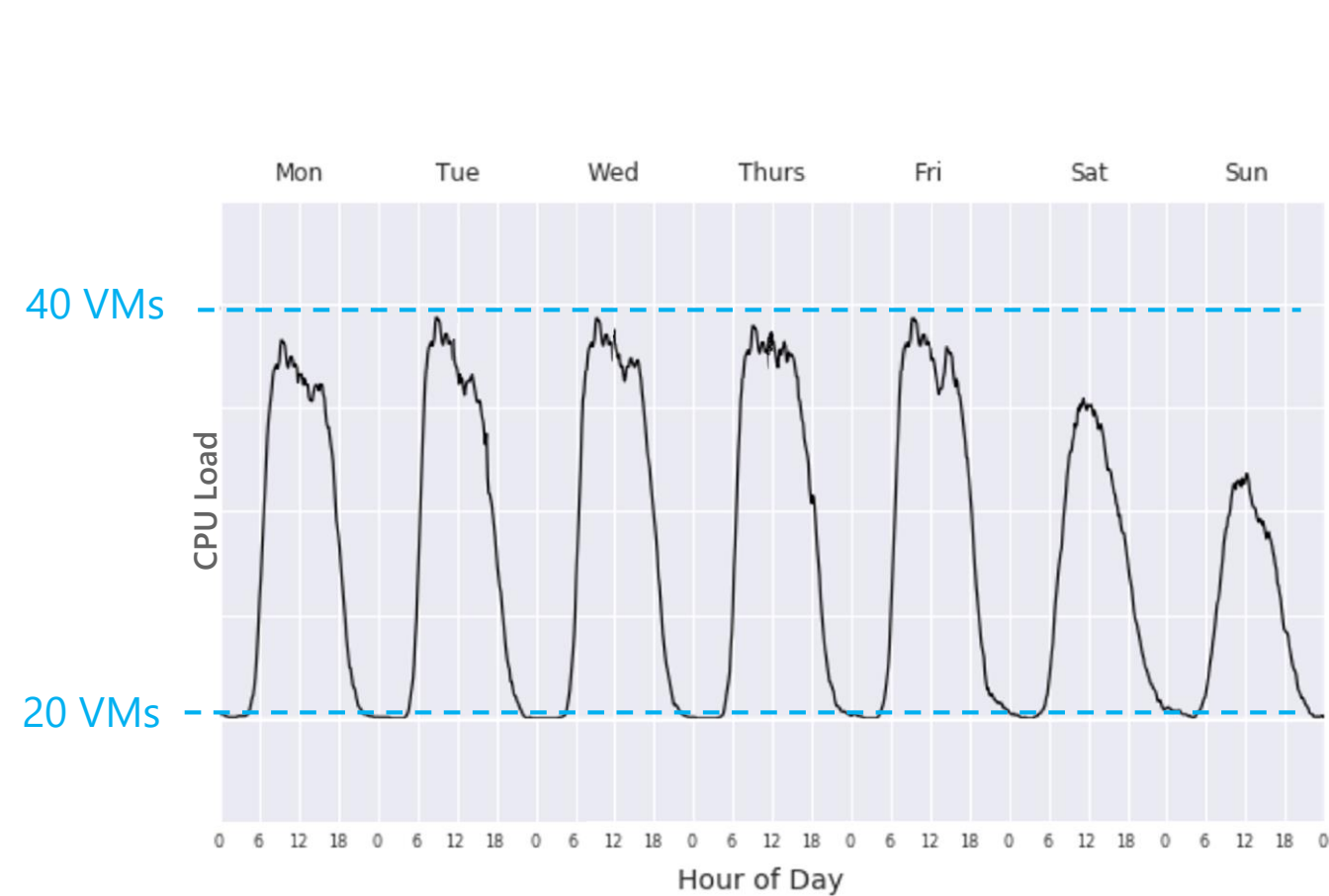


Windows OS running 24x7x365 (US West 2)

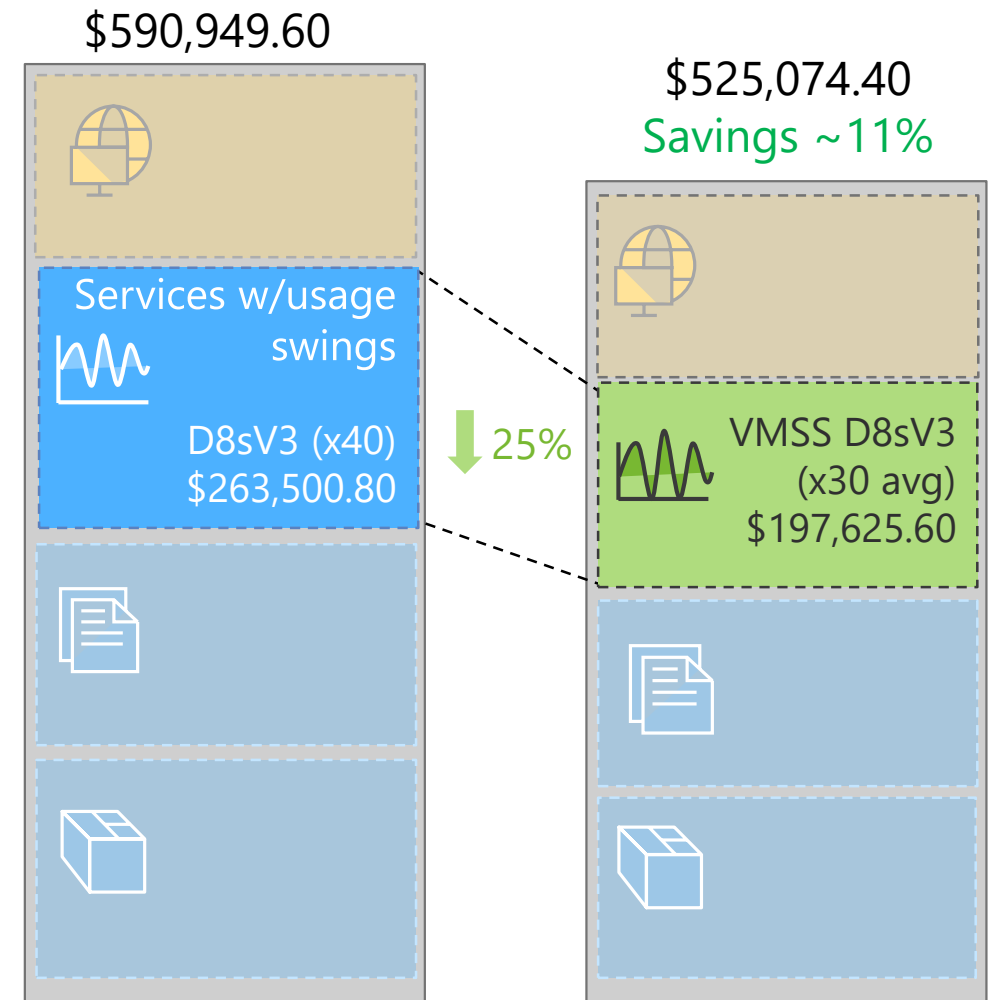
VMSS Autoscale

Optimize availability and savings

Starting total
\$658,752



Autoscale based on CPU threshold

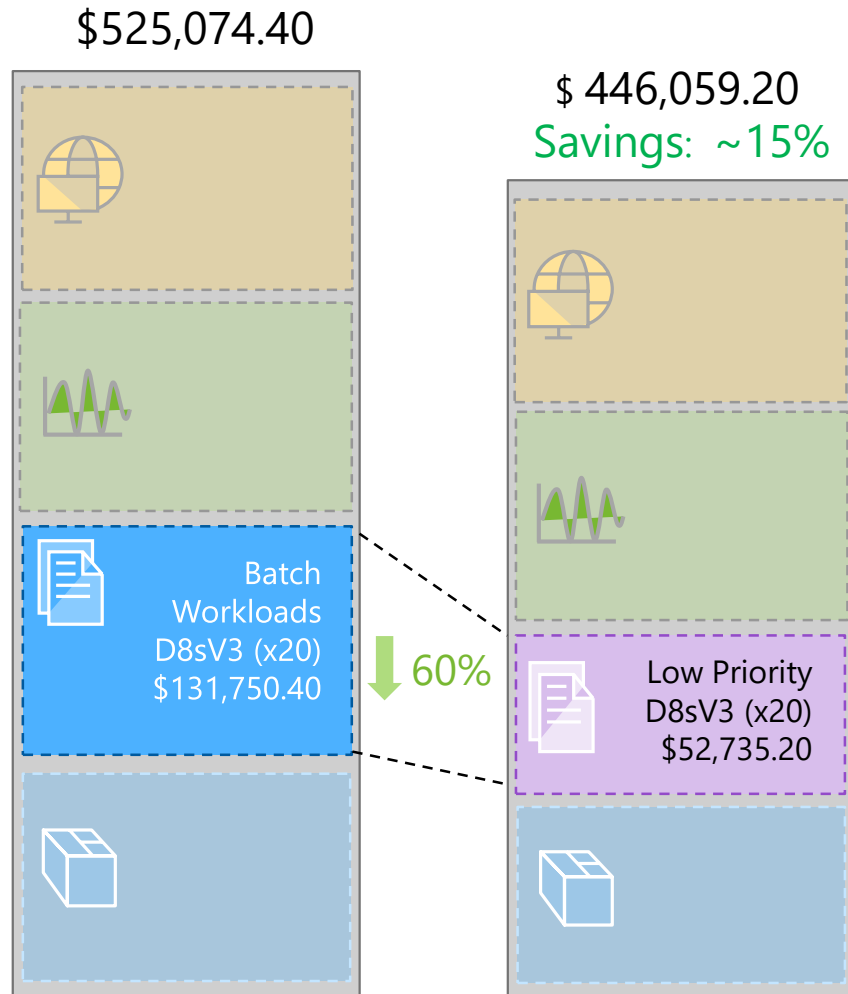


Windows OS running 24x7x365 (US West 2)

Low Priority

Leverage Azure's spare capacity

Starting total
\$658,752



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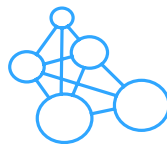


Take advantage of Azure's unutilized capacity at a steep fixed discounted price.

~60% - 80% depending on VM type/region



At any point when Azure needs the capacity back, VMs will be evicted with 30 seconds notice.



Great for batch workloads where job completion time is flexible and the work distributed across many VMs.

Containers

Reducing VM overhead

Starting total
\$658,752

