



Azure Fundamentals AZ-900

October 2019



Agenda - Timings

Time	October 15 th
9:00 – 9:15	Azure Fundamentals - Introduction
9:15	Azure Fundamentals – Module 1 Understanding cloud concepts
10:15	
10:15	Break – 30 minutes
10:45	
11:30	Azure Fundamentals – Module 2 Understanding core Azure services
11:30	
12:30	Lunch – 60 minutes
12:30	
13:00	Azure Fundamentals – Module 3 Understand security, privacy, compliance, and trust
13:00 - 14:00	Break – 30 minutes
14:00	
15:30	Azure Fundamentals – Module 4 Understand Azure pricing and support
15:30	
16:00	Wrap up / Feedback

Certification areas (AZ-900)

Study areas	Weights
Understanding cloud concepts	15-20%
Understanding core Azure services	30-35%
Understand security, privacy, compliance, and trust	30-35%
Understand Azure pricing and support	25-30%

- This course maps directly to the exam AZ-900 Microsoft Azure Fundamentals
- Percentages indicate the relative weight of each area on the exam.
- The higher the percentage, the more questions you are likely to see in that area.

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- Microsoft Certified Trainer (MCT)
- Microsoft Certified Solutions Associate (MCSA) - Web Application Development
- Microsoft Certified Azure Fundamentals
- Microsoft Certified Professional (MCP)



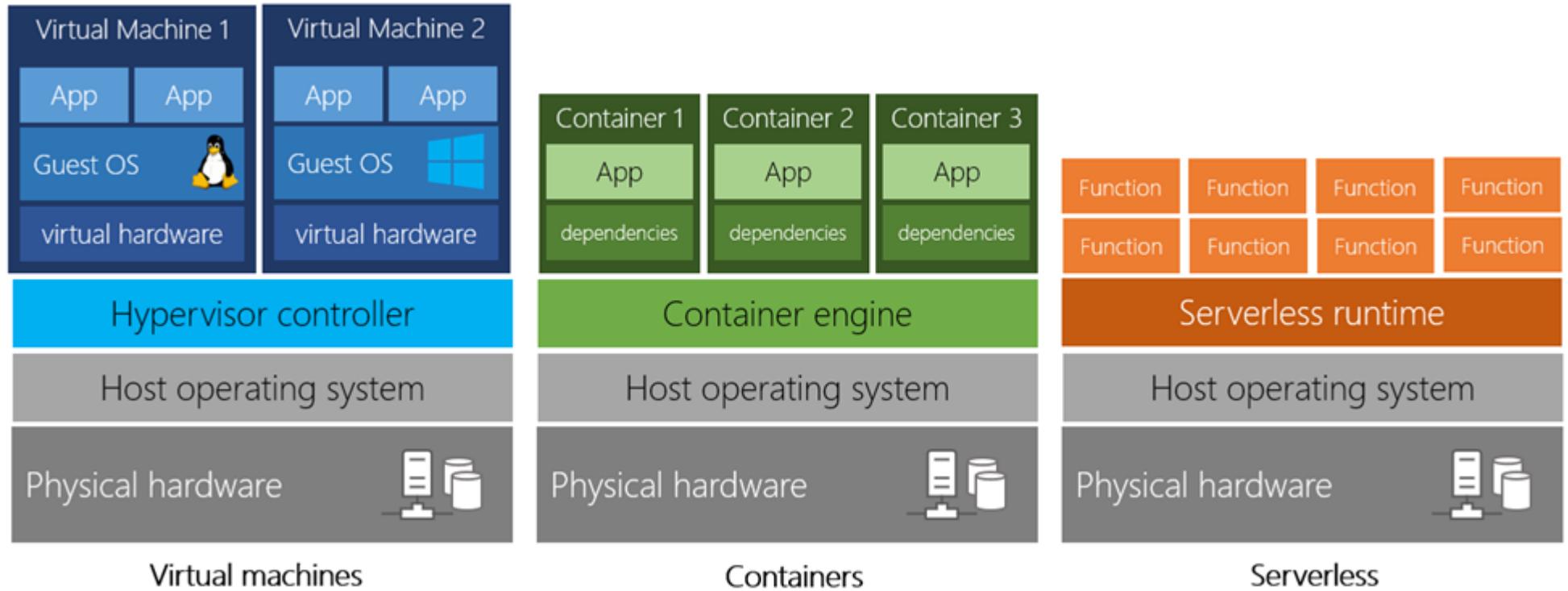


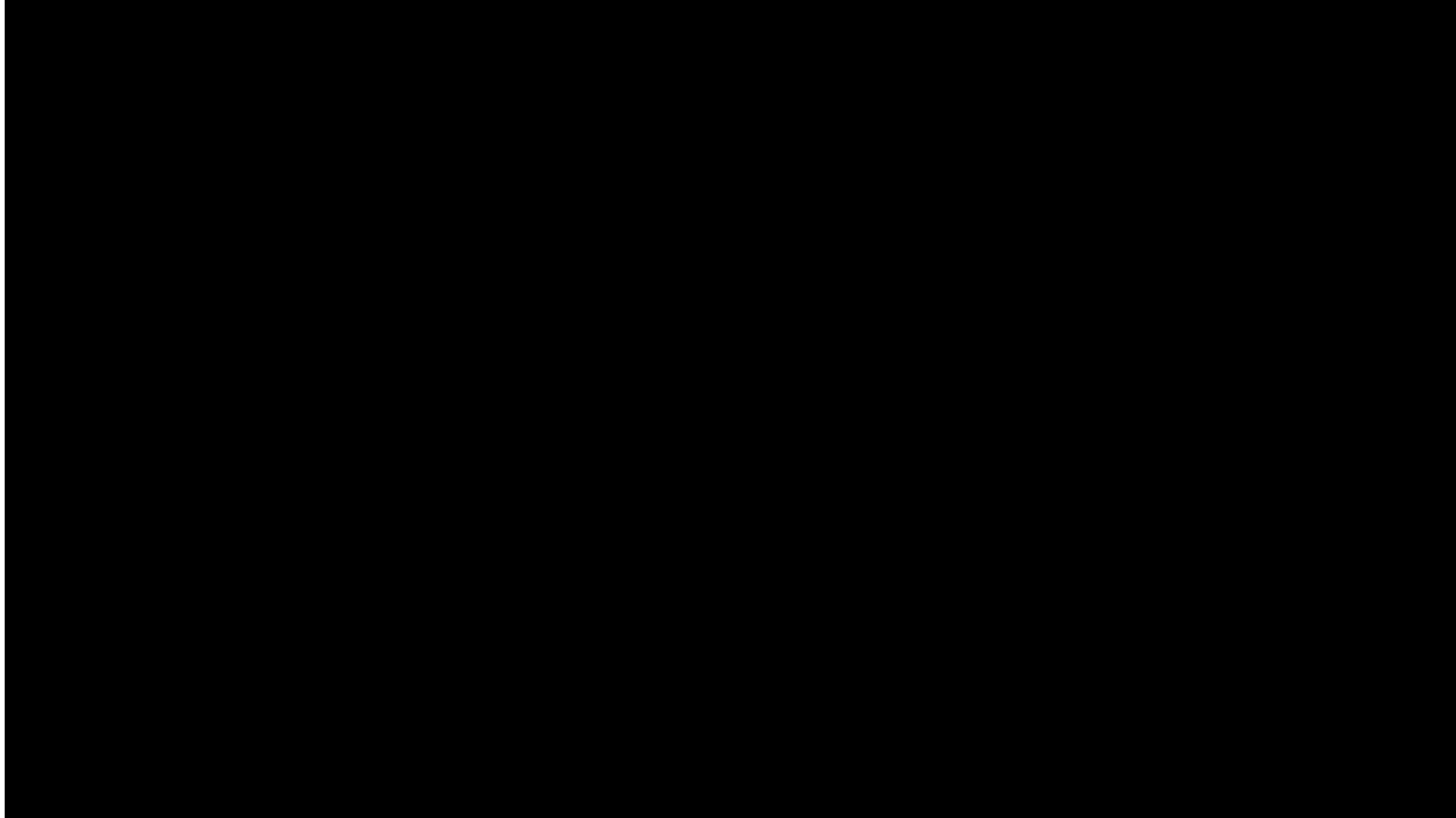
Module 1 – Cloud concepts

Why cloud services?

- Compute power (Virtual Machine + Virtual Network)
- Containers
- Serverless computing
- Storage

Virtual machines, Container, Serverless





Cloud computing characteristics

Ref: The NIST Definition of Cloud Computing

<https://csrc.nist.gov/publications/detail/sp/800-145/final>



On-demand
self-service



Ubiquitous
network
access



Location
transparent
resource
pooling



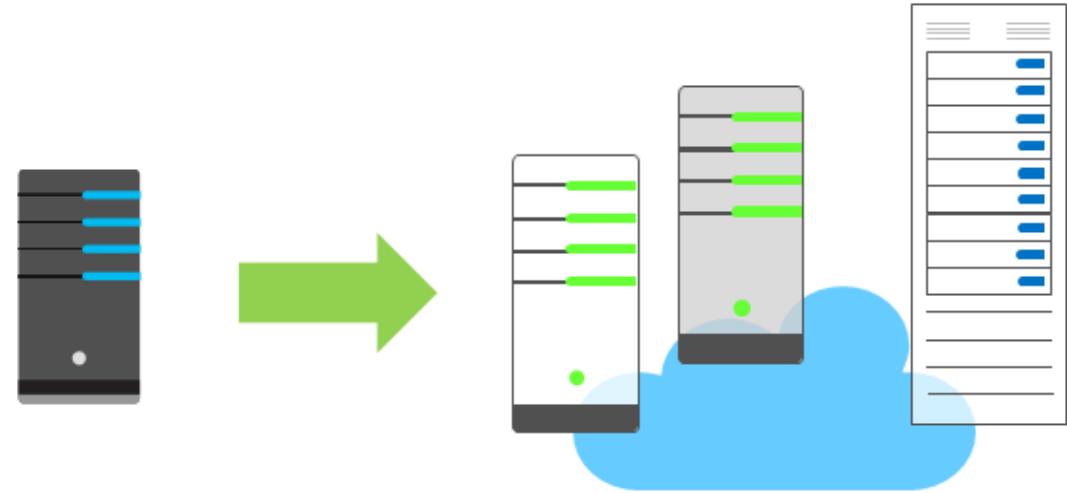
Rapid
elasticity



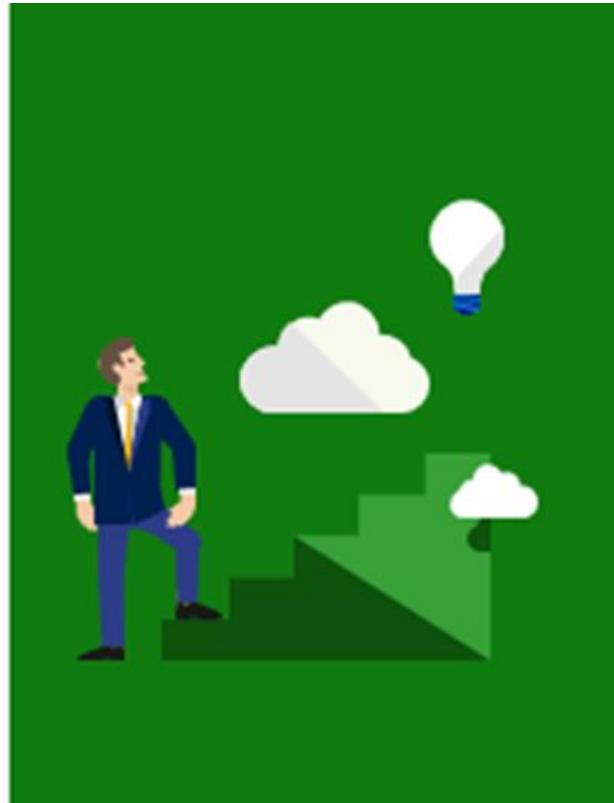
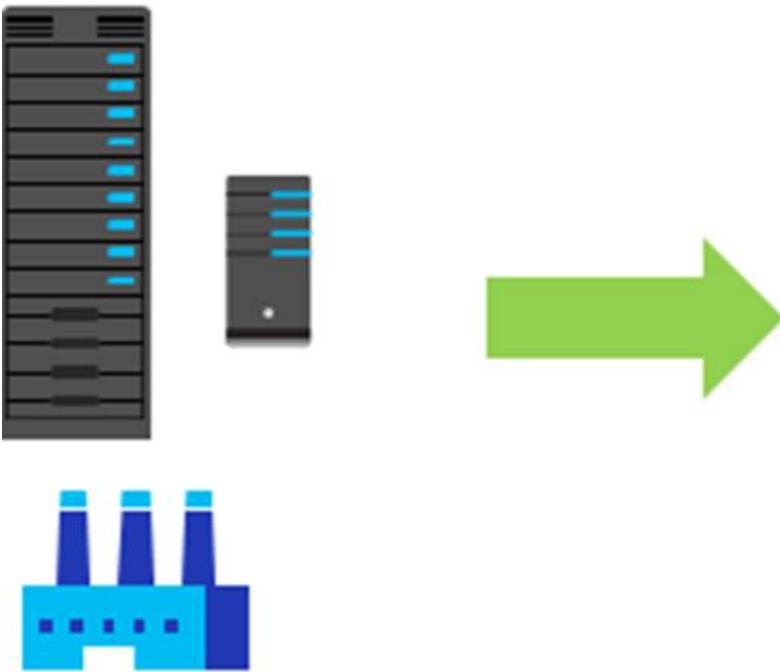
Measured
service:
Consumption
Based

Economies of scale

- Less expensive
- More efficient
- Pass benefits on



CapEx vs. OpEx



Cloud model comparison



Public Cloud

- No CapEx
- Agility
- Consumption-based



Private Cloud

- Control
- Security



Hybrid Cloud

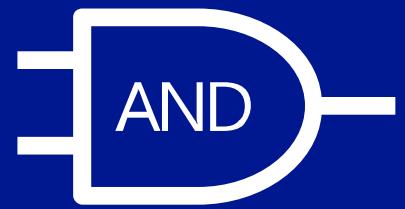
- Flexibility
- Compliance

Think AND not OR

Business needs



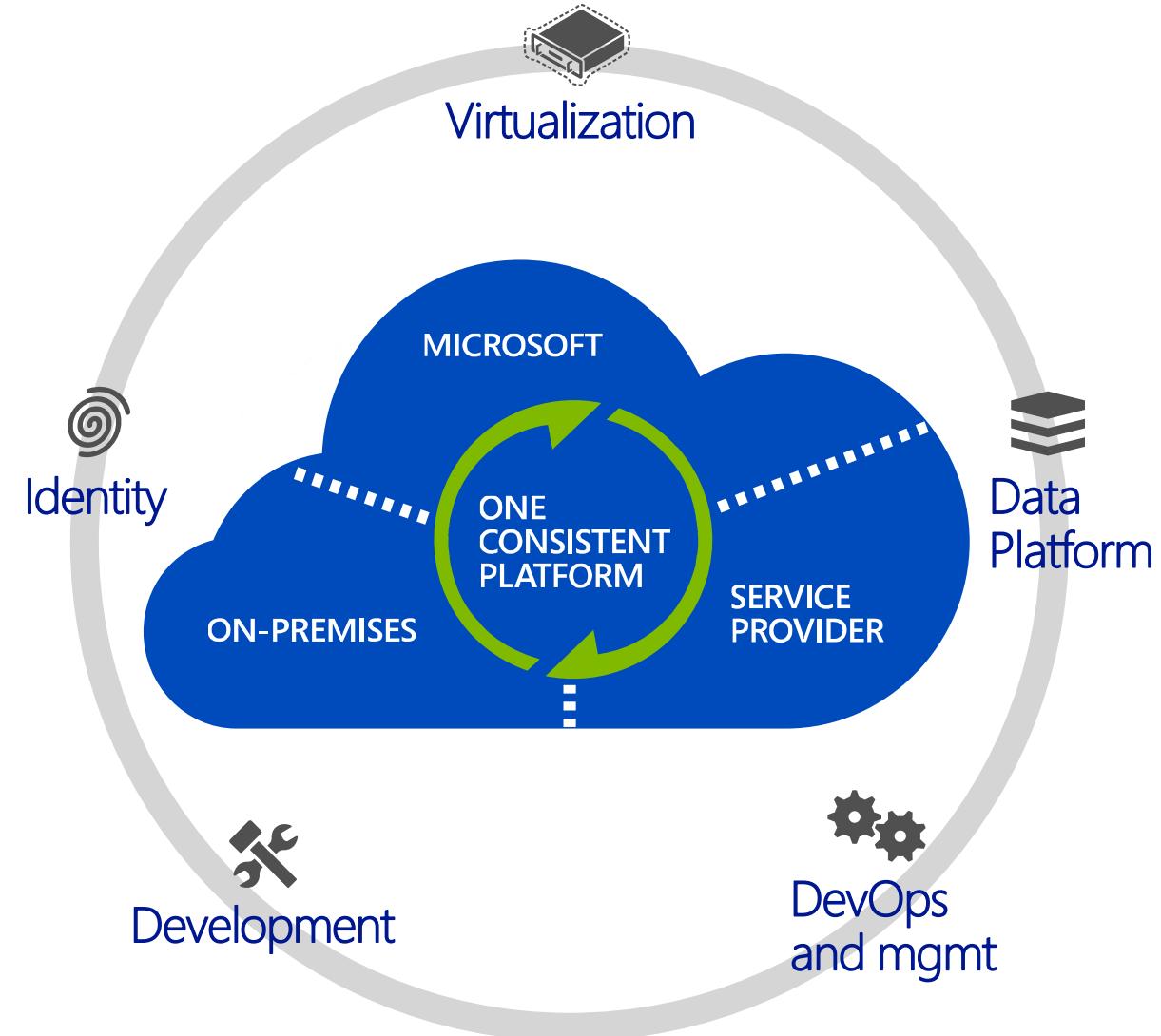
Integration



Microsoft Azure
fundamentals



On-premises
AND Cloud



Your World ...



Cloud



On-Premises

Hybrid Cloud requires consistency



Cloud

Common
Identity

Integrated
Management
and Security

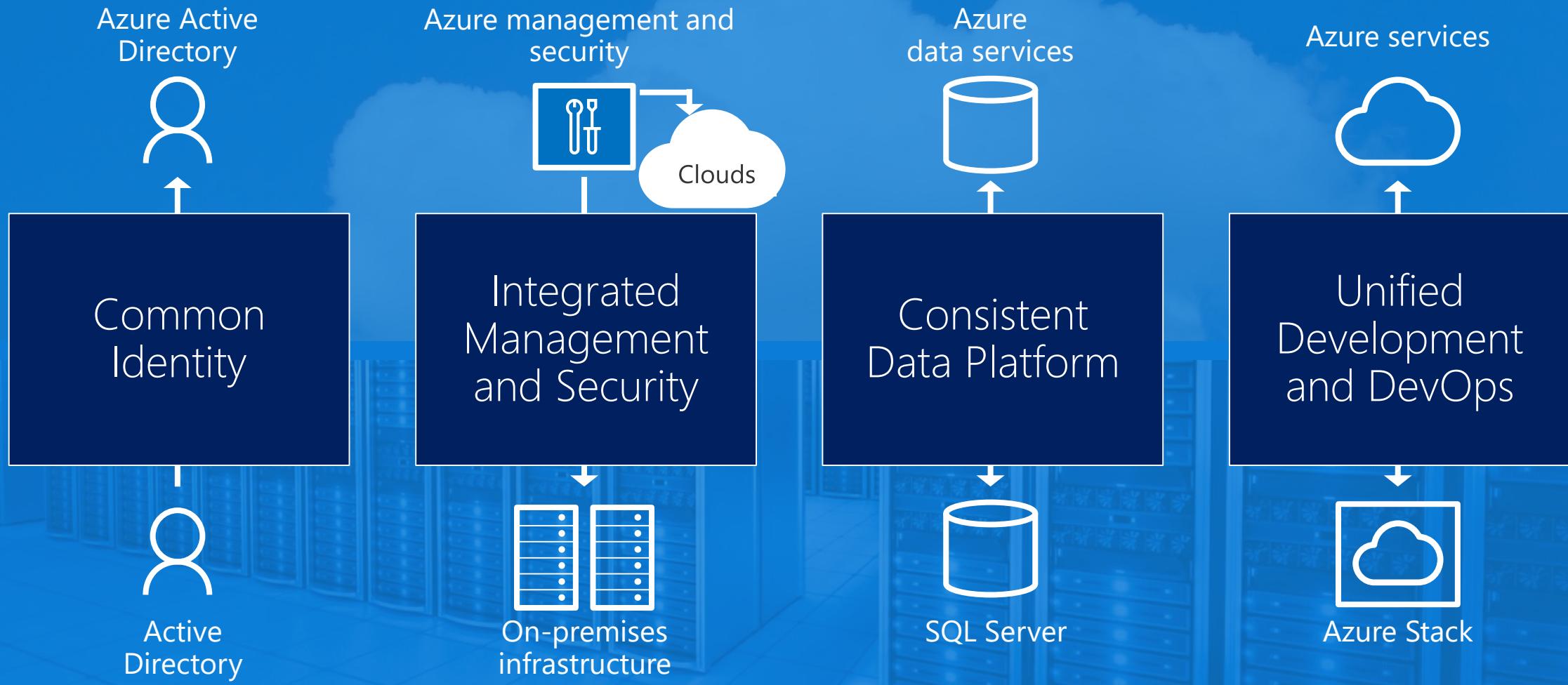
Consistent
Data Platform

Unified
Development
and DevOps



On-Premises

Microsoft Azure: Only consistent hybrid cloud



Types of cloud services

SaaS



Hosted applications/apps

Development tools, database management, business analytics



PaaS



Operating systems

Servers and storage

IaaS

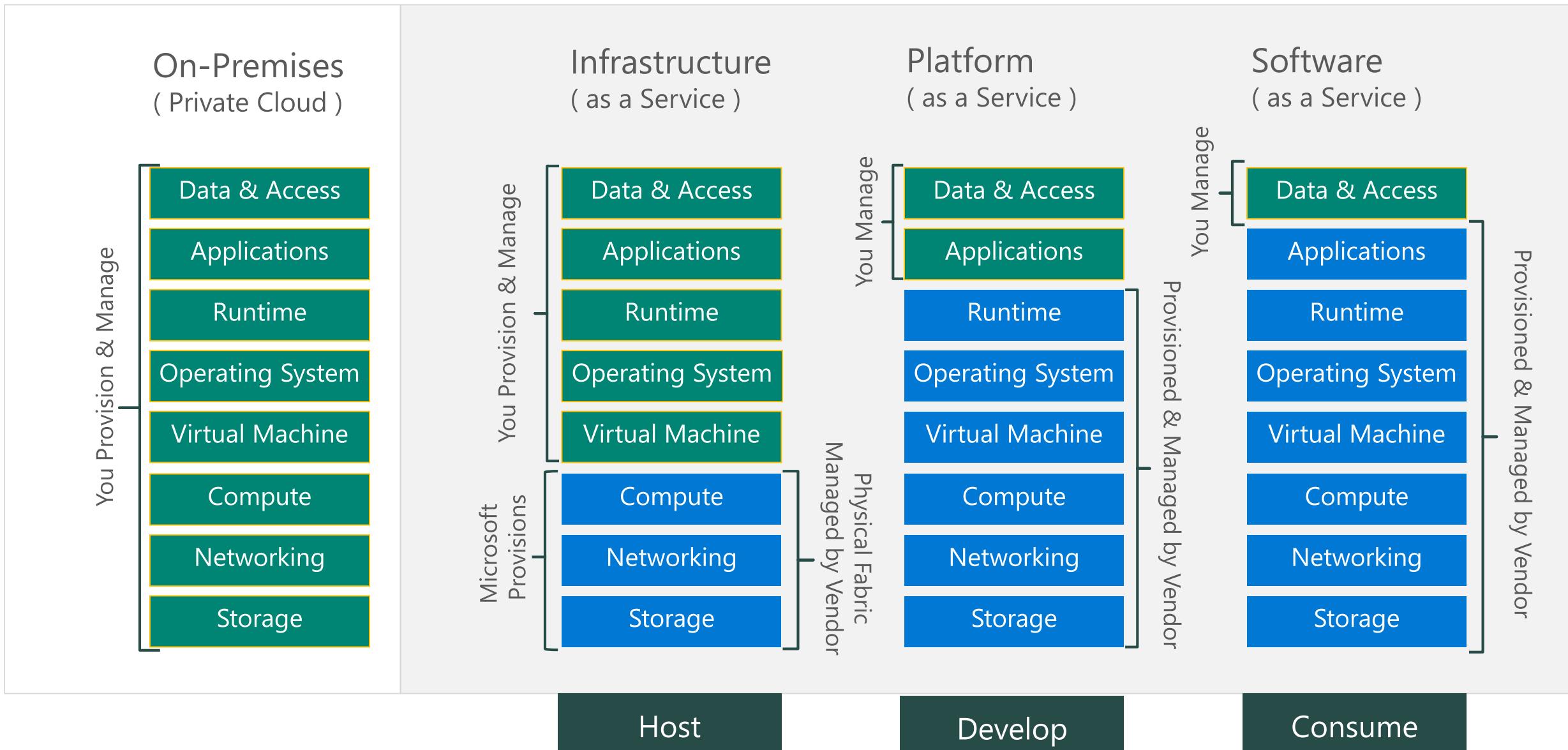


Networking firewalls/Security



Datacenter physical plant/building

Cloud computing models and responsibilities



Management responsibilities

On Premises	Infrastructure as a Service	Platform as a Service	Software as a Service
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

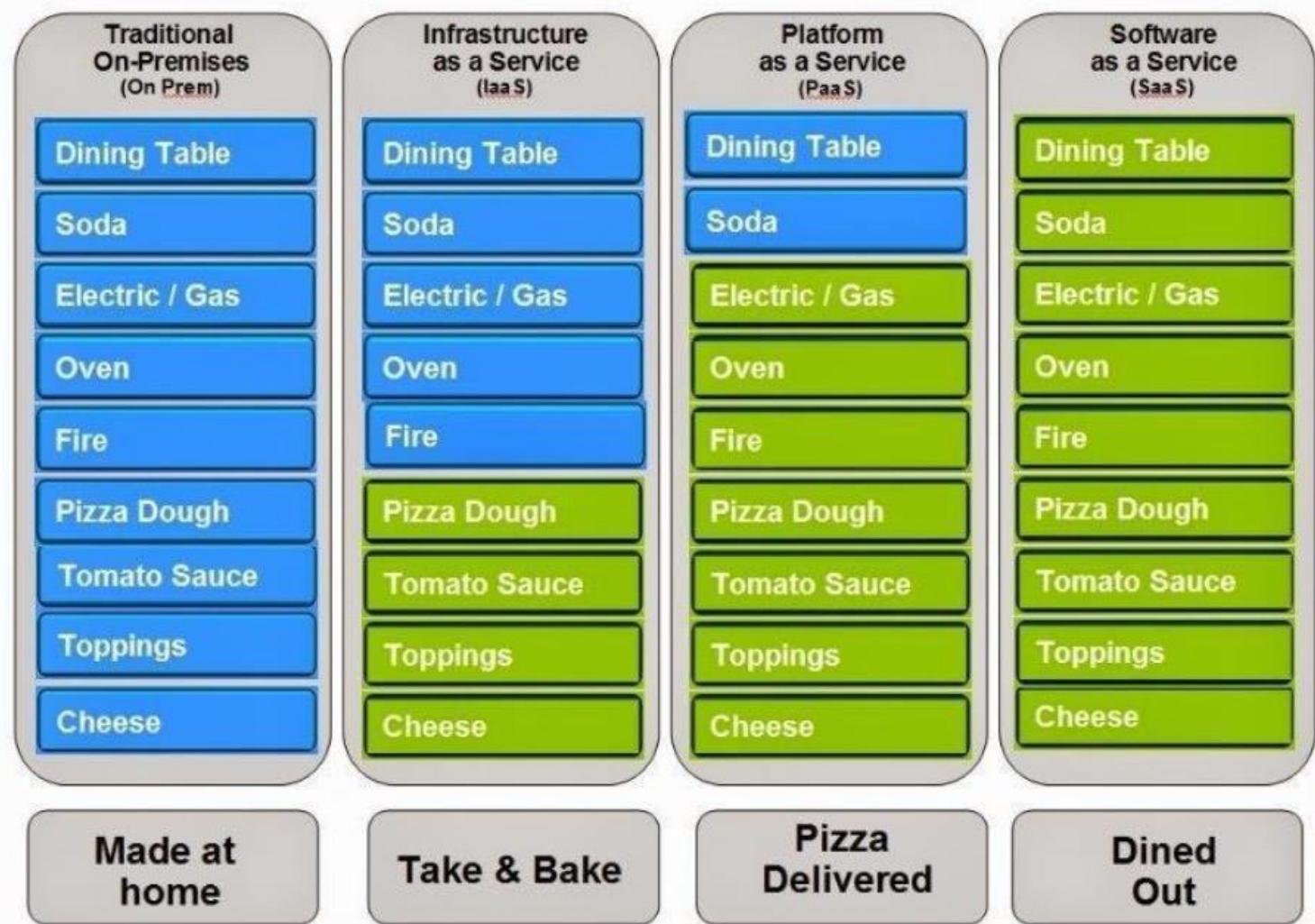


You manage



Provider manages

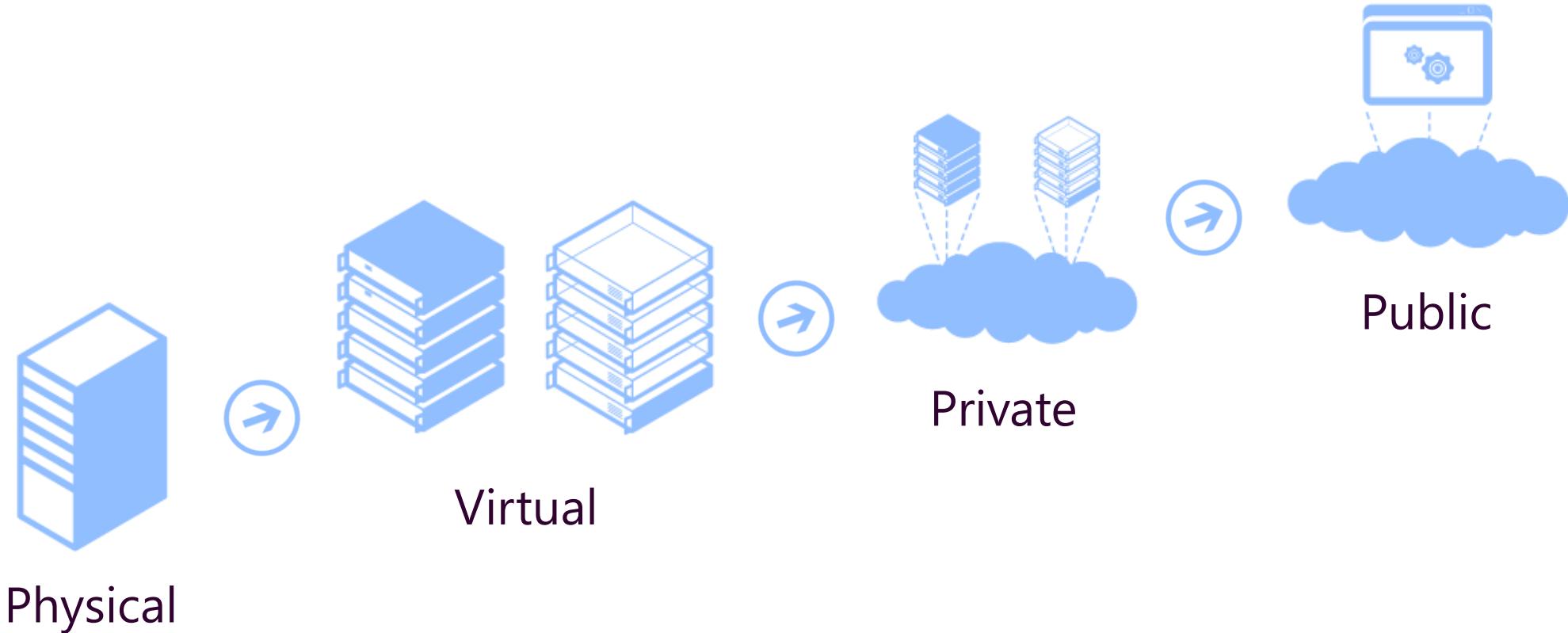
Think of it as “Pizza as a Service”



■ You Manage ■ Vendor Manages

Cloud on your Terms

Evolution toward highly virtual, and beyond to cloud



Review questions

Module 1 review questions

What would be viewed as benefits of using cloud services?

1. Elasticity
2. Agility
3. CapEx
4. All of the Above

Module 1 review questions

Which cloud model provides the greatest degree of flexibility?

1. Public
2. Private
3. Hybrid

Module 1 review questions

You need to run two types of applications—legacy applications that require specialized mainframe hardware and newer applications that can run on commodity hardware.

Which cloud deployment model would be best for you?

1. Public
2. Private
3. Hybrid



Module 2 – Core Azure services

Core Azure architectural components

54 regions
worldwide

140 available in
140 countries



54

Azure regions



Geographies

- Defined by geo-political boundaries or country borders
- Defines the data residency boundary for customer data
- Geographies:
 - Americas
 - Europe
 - Asia Pacific
 - Middle East
 - Africa



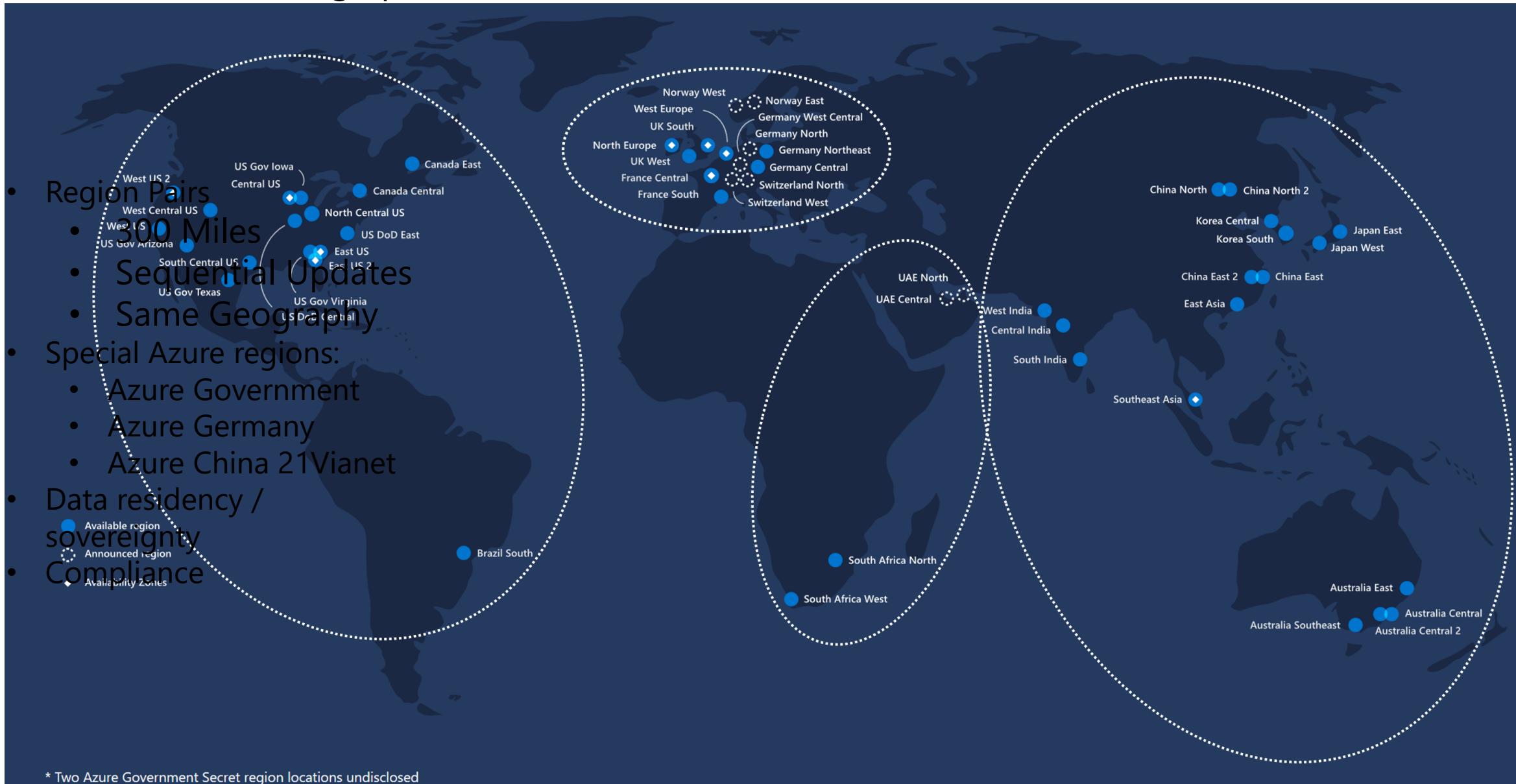
Microsoft Azure Regions

Microsoft Azure Geographies



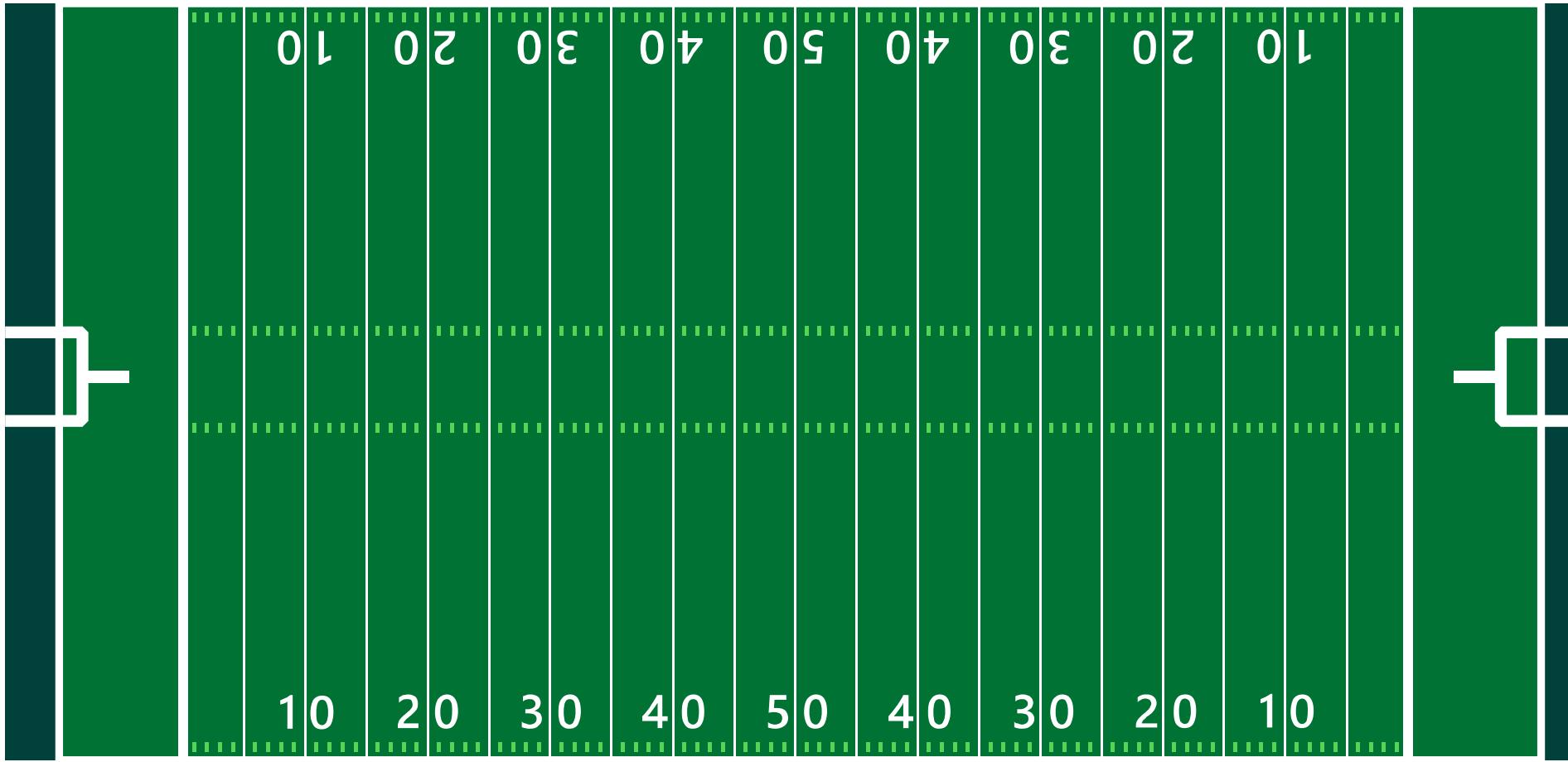
Microsoft Azure Regions

Microsoft Azure Geographies

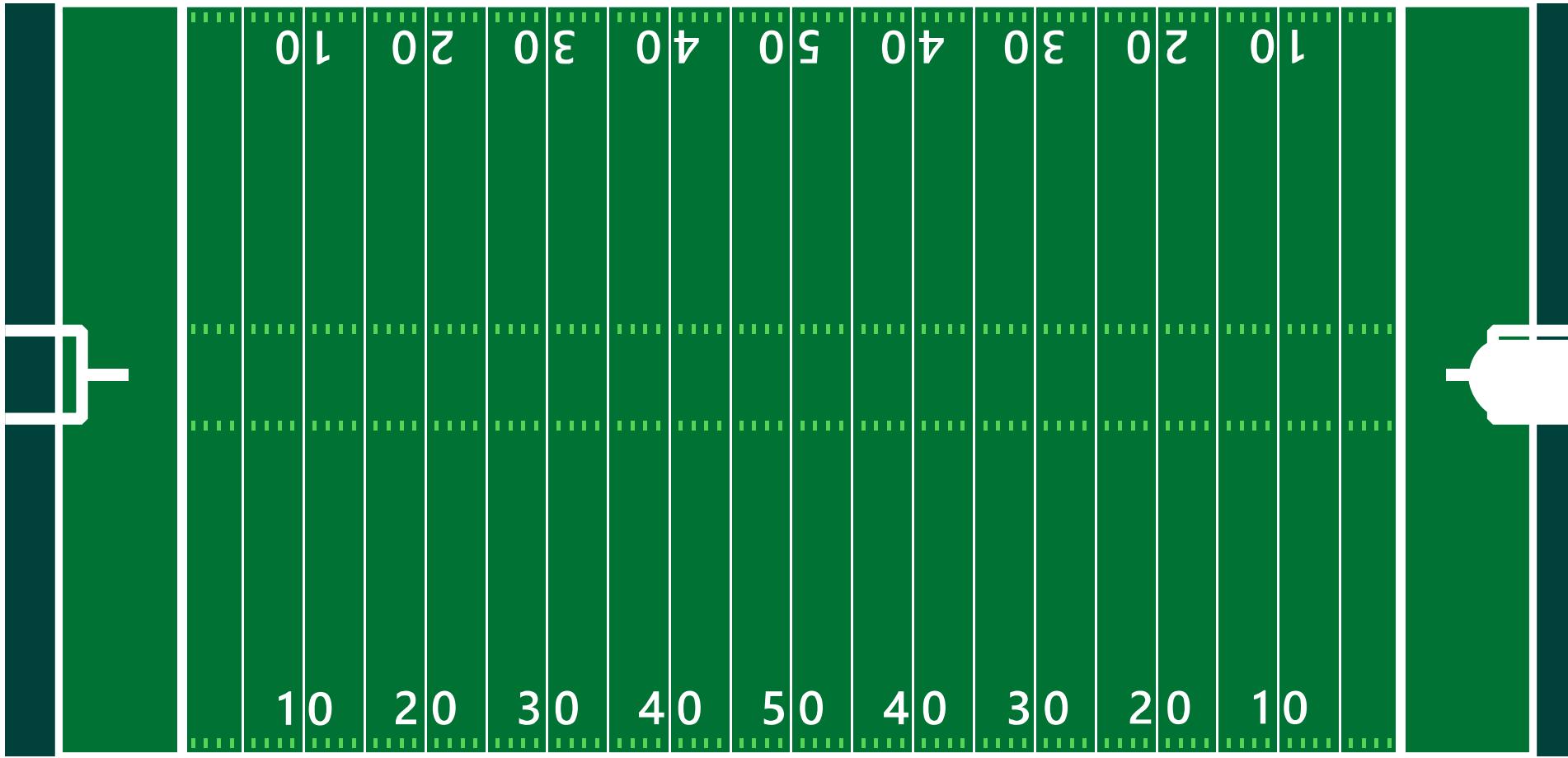


Dublin, Ireland

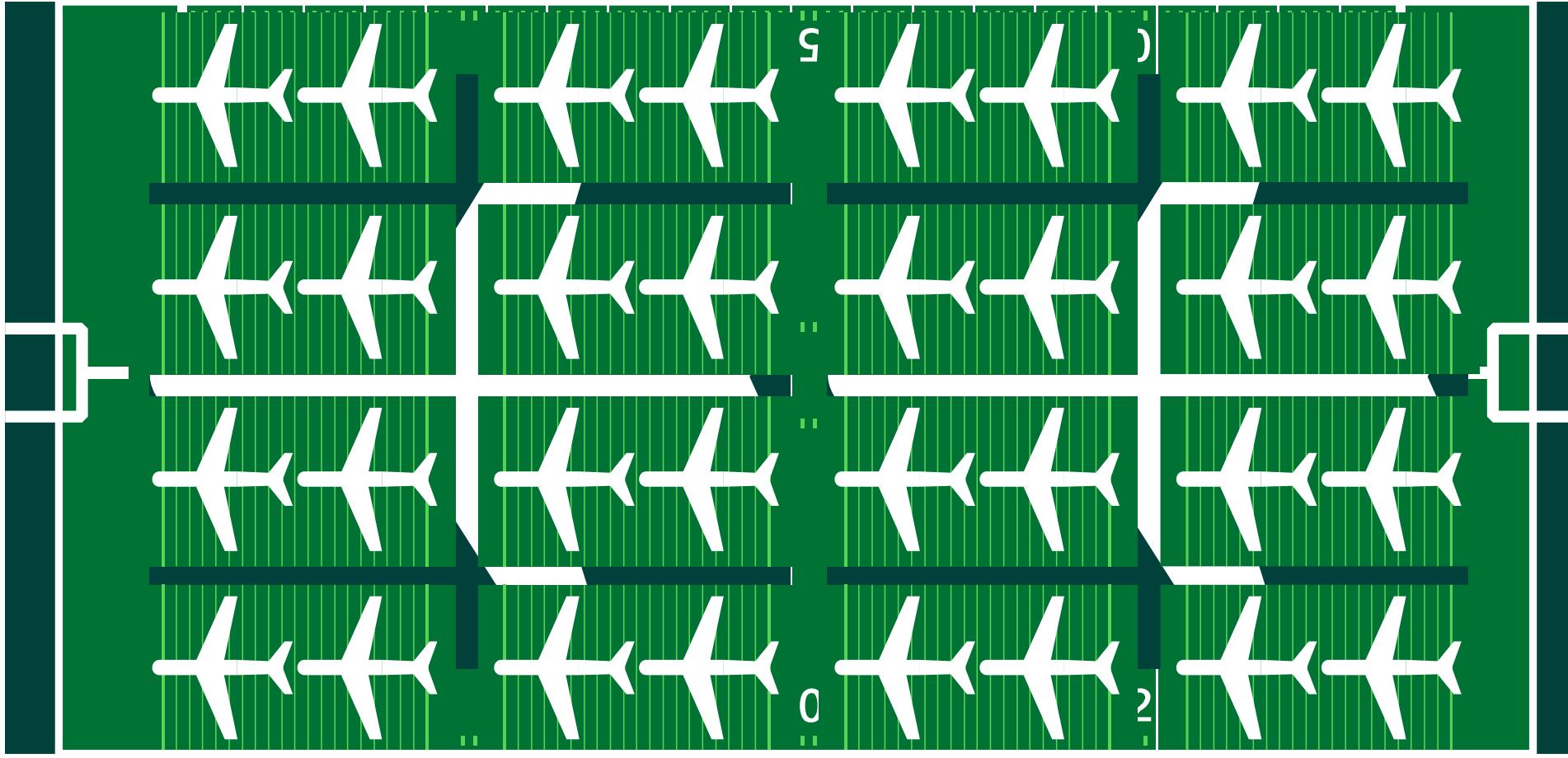




Datacenter buildings are about one football field in size



...large enough to hold
two jumbo jets

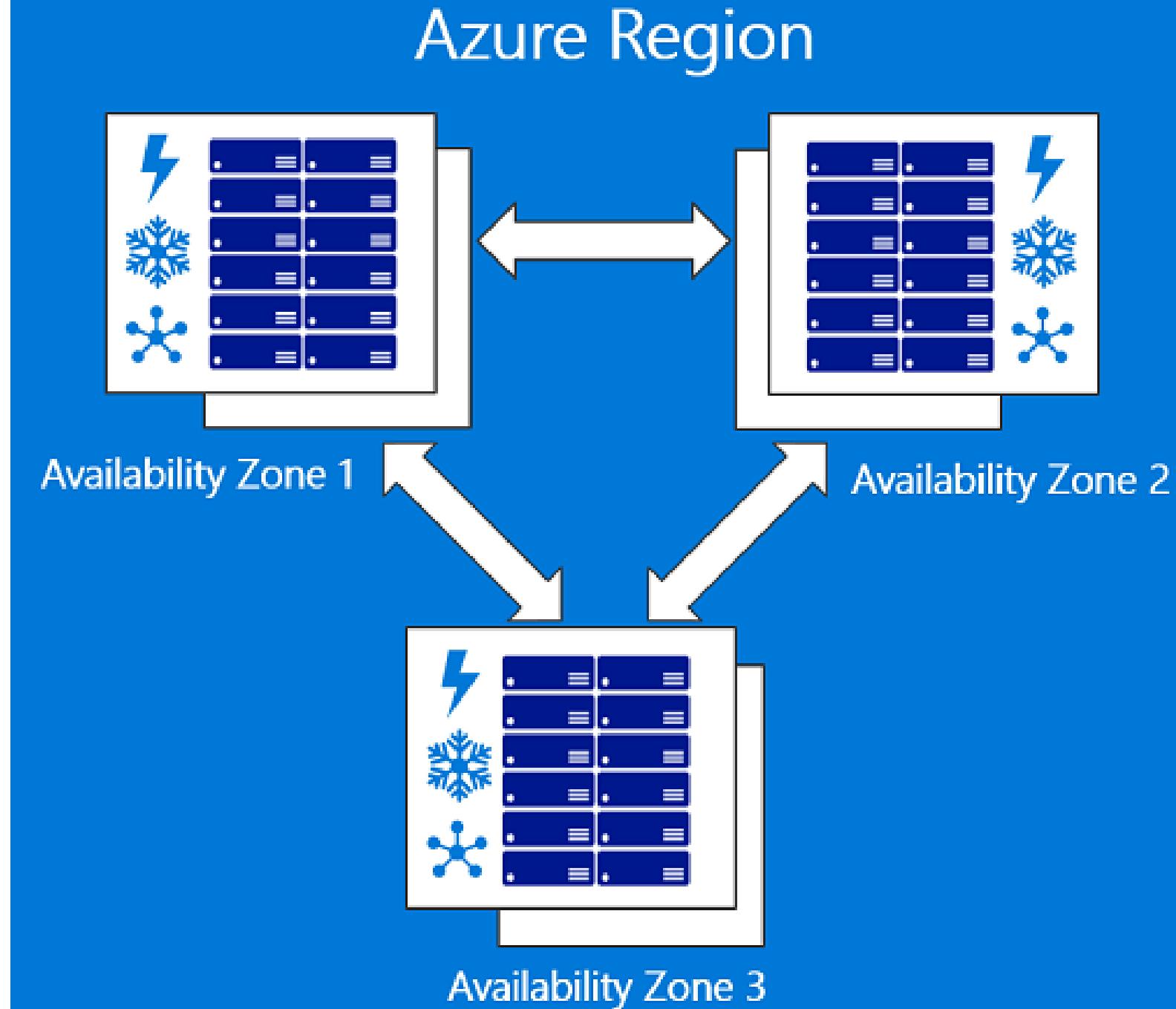


That's up to 600,000 servers in
each Azure region.

And there are 16 building per region...

Availability zones

- Separate locations
- Independent
 - Power
 - Cooling
 - Networking
- Isolation Boundary



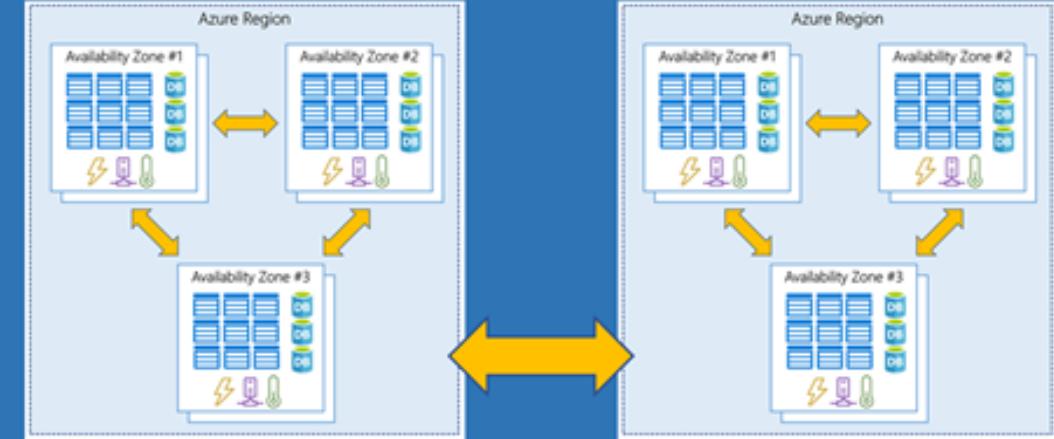
Region Pairs in Azure

Geography

Region Pair



Region Pair



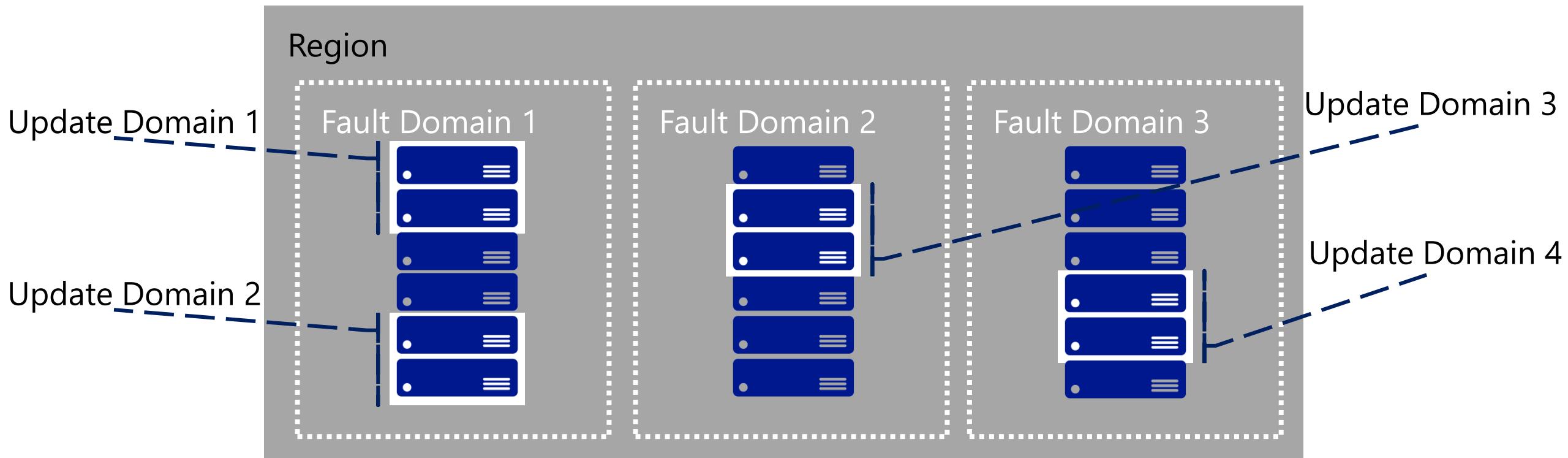
Availability sets

Fault Domains

- Segments clusters within a region (Up to 3)

Update Domains

- Segments updates and patches to clusters (Up to 20)





Resource groups

A collection of Azure Resources

Let's take a look:
Core Azure Services

Core Azure Services and Products

Azure Services

Compute

- VMs, Availability Sets & Zones, Scale sets, App services, Azure Functions, Containers

Networking

- vNets, Load Balancers, Application Gateways, VPN Gateways, CDN, ExpressRoute

Databases

- CosmosDB, Azure SQL, Azure Migration service

Big Data & Analytics

- Azure SQL Data Warehouse, HDInsight, Data Lake Analytics

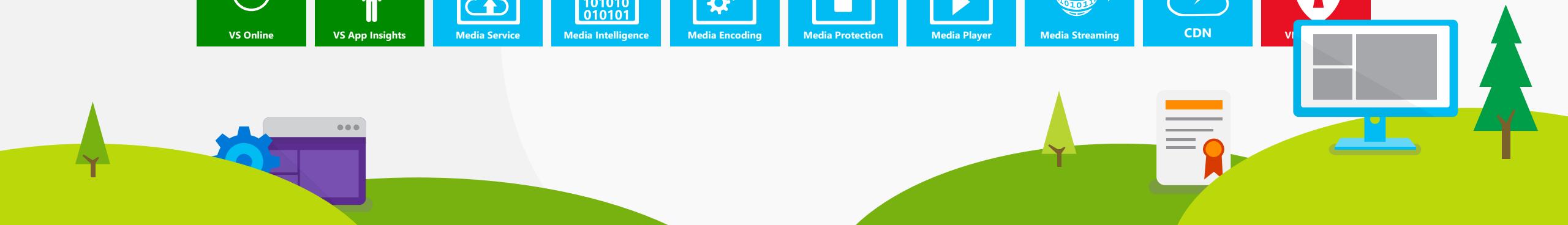
AI & IoT

- IoT Central & Hub, Azure Machine Learning

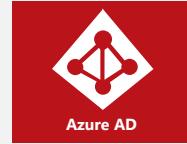


Azure Infrastructure Breadth

100's of services, continuous evolution



Windows Server & Azure



Identity



Storage



Networking



Compute

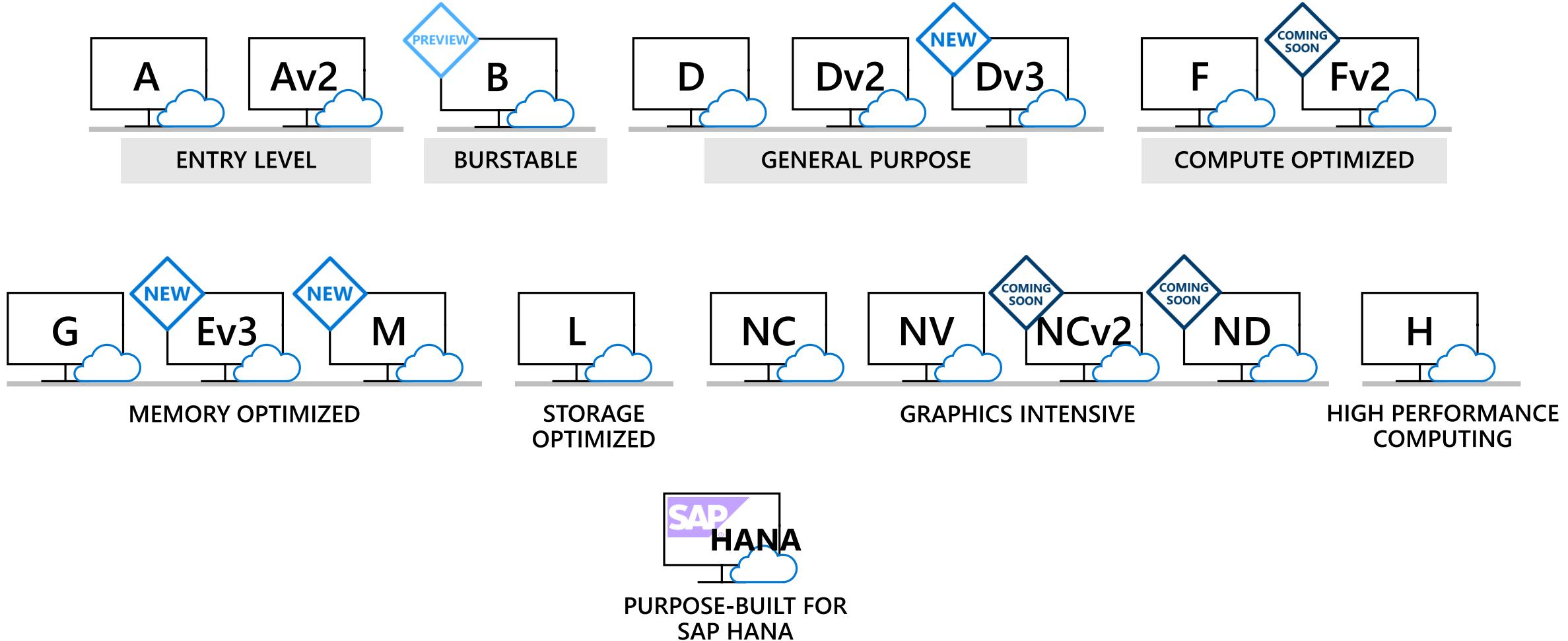


Hosted Web Services



Databases

Compute options for all types of apps





Azure Storage



Azure storage services – Azure services

Azure Storage is a service that you can use to store files, messages, tables, and other types of information.



- **Blob storage:** No restrictions on the kinds of data it can hold.
Blobs are highly scalable
- **Disk storage:** Provides disks for virtual machines, applications, and other services
- **File storage:** Azure Files offers fully-managed file shares in the cloud

Storage types

Structured data

- Adheres to a schema

Semi-structured data

- Non-relational (NoSQL) data

Unstructured data

- No restrictions, flat files
- Holds PDFs, JPGs, JSON files, etc.



Azure Storage Account

IaaS



Storage



Virtual
machines



Networking

Disks

Persistent disks for Azure IaaS VMs

Premium Storage Disks option: SSD based, high IOPS, low latency

Files

Fully Managed File Shares in the Cloud

SMB and REST access
“Lift and shift” legacy apps

Synch with on-premises (New!)

Blobs

Highly scalable, REST based cloud object store

Block Blobs: Sequential file I/O
Cool Tier Available
Page Blobs: Random-write pattern data
Append Blobs

Tables

Massive auto-scaling NoSQL store

Dynamic scaling based on load
Scale to PBs of table data
Fast key/value lookups

Queues

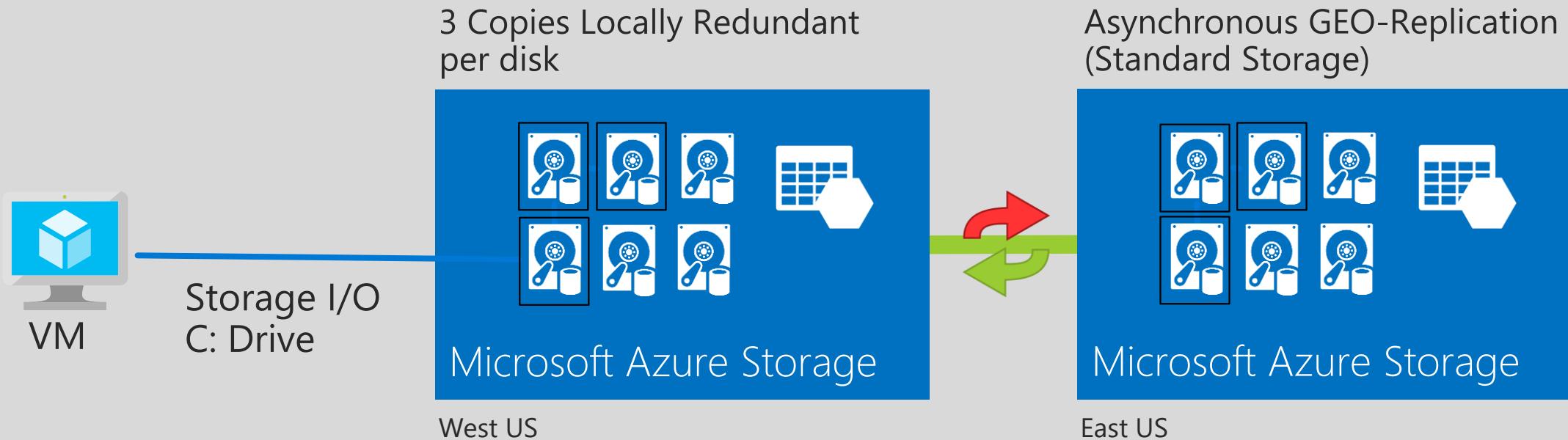
Reliable queues at scale for cloud services

Decouple and scale components
Message visibility
timeout and update message to protect against unreliable dequeuers

Built on a unified Distributed Storage System

Durability, Encryption at Rest, Strongly Consistent Replication, Fault Tolerance, Auto Load-Balancing

VM Storage Basics



Virtual Machine Storage Basics



Premium disks

SSD based, high IOPS,
low latency

Up to 64 TB, 80000 IOPs

Appropriate for data base, file servers, and interactive applications that have a dependency on high IOPs and low latency storage.



Standard disks

Magnetic disks, HDD based.
Up to 500 IOPs/disk

Appropriate for web and application servers that do not have a dependency on high IOPs or low latency storage.



Files

"SMB File Share"

SMB 3.0

Shared storage (read/write multiple virtual machines), replace file servers, support legacy applications and support lift and shift style workloads



Compute services



Azure compute services - virtual machine services

VMs are software emulations of physical computers. Examples of Azure services for virtual machines include:



- Azure VMs: Infrastructure as a service (IaaS) to create and use VMs in the cloud



- VM scale sets: Designed for automatic scaling of identical VMs



- App services: Platform as a service (PaaS) offering to build, deploy, and scale enterprise-grade web, mobile, and API apps



- Functions: Creates infrastructure based on an event

Azure compute services – container services

Containers are a virtualization environment. However, unlike virtual machines, they do not include an operating system. Containers are meant to be lightweight, and are designed to be created, scaled out, and stopped dynamically. Examples of Azure services for containers include:



- Azure Container Instances: A PaaS offering that allows you to upload your containers, which it then will run for you
- Azure Kubernetes Service: A container orchestrator service for managing large numbers of containers



Demo: Create an Azure virtual machine

Walkthrough-Create a Virtual machine using Azure Portal

- In this walkthrough task we will create a virtual machine in Azure via the Azure Portal, configure it as a web server and connect to the web server over the internet.
- You can complete this walkthrough task by completing the steps outlined below, or you can simply read through them, depending on your available time



Azure Networking



Azure network services

Networking on Azure allows you to connect cloud and on-premises infrastructure and services.



- Azure Virtual Network: An IaaS service to create and use VMs in the cloud



- Azure Load Balancer: Designed for automatic scaling of identical VMs



- VPN Gateway: A PaaS offering to build, deploy, and scale enterprise-grade web, mobile, and API apps



- Azure Application Gateway: Creates infrastructure based on an event



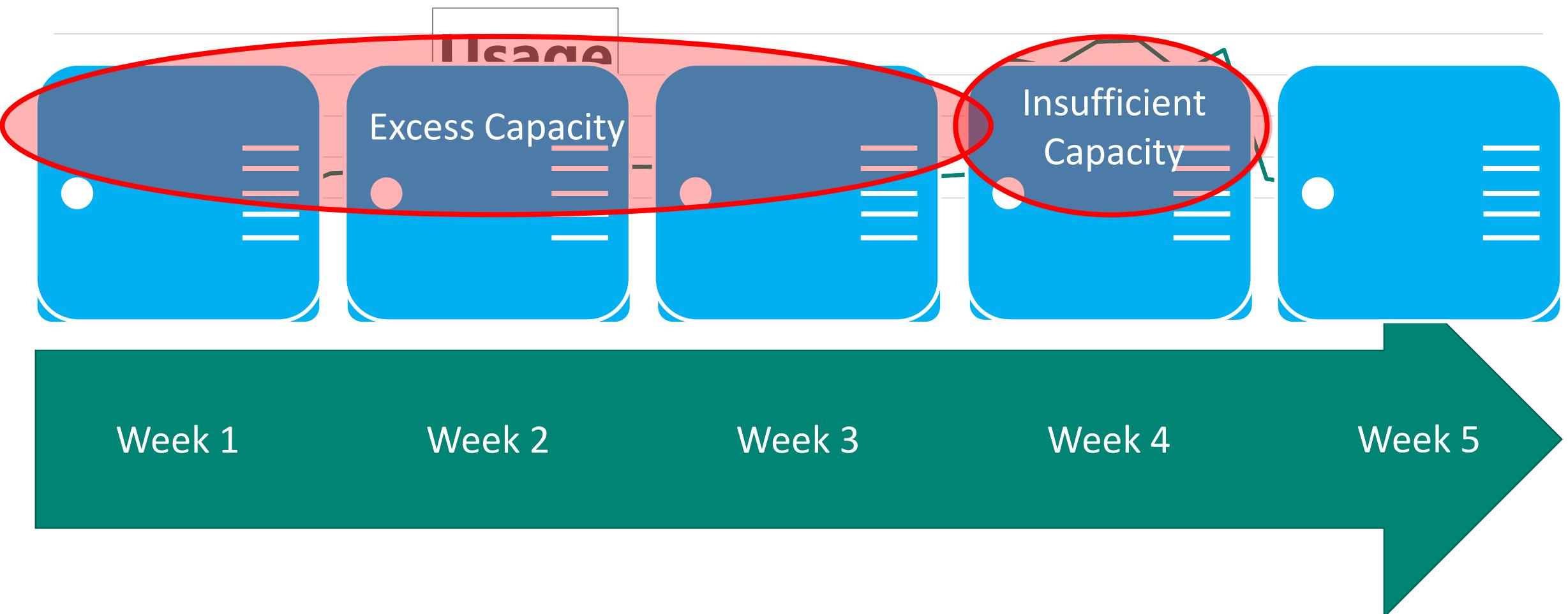
- Content Delivery Network: Creates infrastructure based on an event

Demo: Create an Azure virtual networks

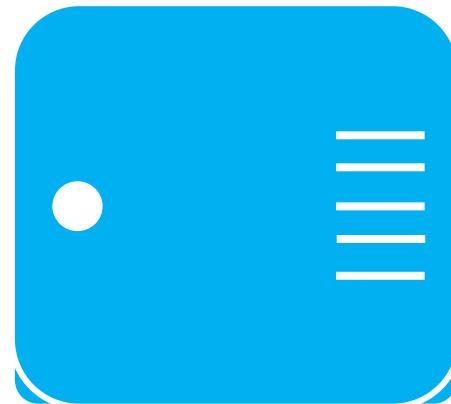
Walkthrough-Create a virtual network via the Azure Portal

- In this walkthrough task we will create a virtual network, deploy two virtual machines onto that virtual network and then configure them to allow one virtual machine to ping the other over that virtual network.
- You can complete this walkthrough task by completing the steps outlined below, or you can simply read through them, depending on your available time

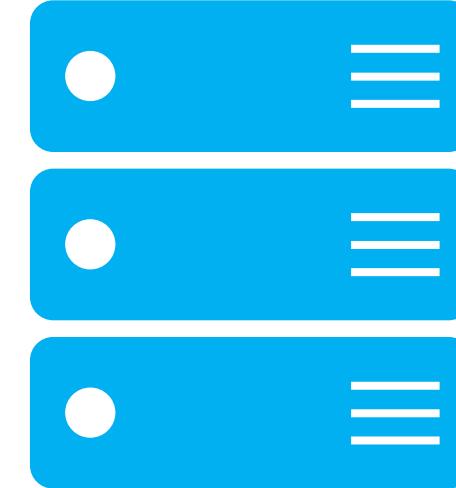
Design for Scale



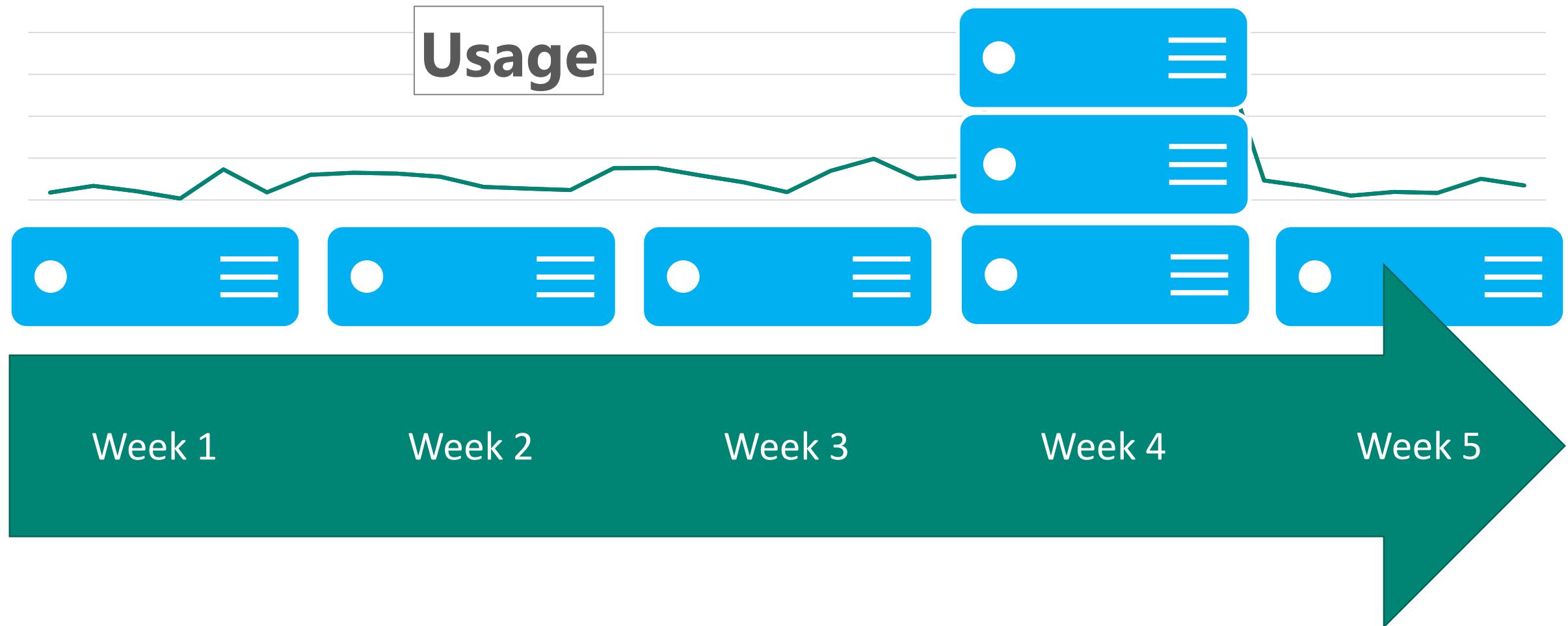
Scale Up vs. Scale Out



Scale Up vs. Scale Out



Scale vs. Time





Azure Database Service



Azure database services

Azure database services are fully-managed PaaS database services that free up valuable time you'd otherwise spend managing your database



- Azure Cosmos DB: A globally-distributed database service that enables you to elastically and independently scale throughput and storage
- Azure SQL Database: A relational database as a service (DaaS) based on the latest stable version of the Microsoft SQL Server database engine
- Azure Database Migration: A fully-managed service designed to enable seamless migrations from multiple database sources to Azure data platforms with minimal downtime



Demo: Create a SQL database

Walkthrough-Create a SQL database

- In this walkthrough task we will create a SQL database in Azure and then query the data in that database.
- You can complete this walkthrough task by completing the steps outlined below, or you can simply read through them, depending on your available time



Azure Big Data



Big data and analytics

Big data refers to large volumes of data that become increasingly hard to make sense of, or consequently make decisions about. Some big data and analytic services in Azure include:



- Azure SQL Data Warehouse: A cloud-based Enterprise Data Warehouse that leverages massively parallel processing (mpp) to run complex queries quickly across petabytes of data
- Azure HDInsight: A fully-managed, open-source analytics service for enterprises. It is a cloud service that makes it easier, faster, and more cost-effective to process massive amounts of data
- Azure Data Lake Analytics: An on-demand analytics job service that simplifies big data. Instead of deploying and tuning hardware, you write queries to transform your data and extract valuable insights.





Azure
AI



Artificial Intelligence

Artificial Intelligence (AI), in the context of cloud computing, is based around a broad range of applications, including Machine Learning, which use existing data to forecast future behaviors, outcomes, and trends. Using machine learning, computers learn without being explicitly programmed. Some AI services in Azure include:



- Azure Machine Learning service: Provides a cloud-based environment used to develop, train, test, deploy, manage, and track machine learning models
- Azure Machine Learning Studio: A collaborative, drag-and-drop visual workspace where you can build, test, and deploy machine learning solutions without needing to write code

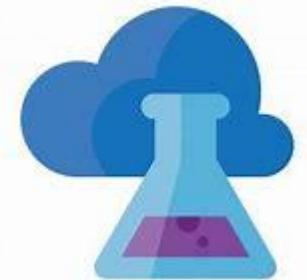


Azure DevOps



DevOps

DevOps allows you to create build and release pipelines that provide continuous integration, delivery, and deployment for applications.



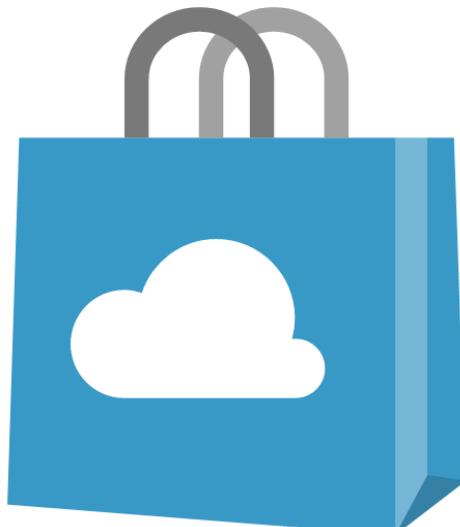
- Azure DevOps services: Provides development collaboration tools including pipelines, Git repositories, Kanban boards, and extensive automated and cloud-based load testing.
- Azure DevTest Labs: Allows you to quickly create environments in Azure while minimizing waste and controlling cost

Azure Marketplace

Connects end users with Microsoft partners, Independent Software Vendors (ISVs), and start-ups that offer solutions and services for Azure.

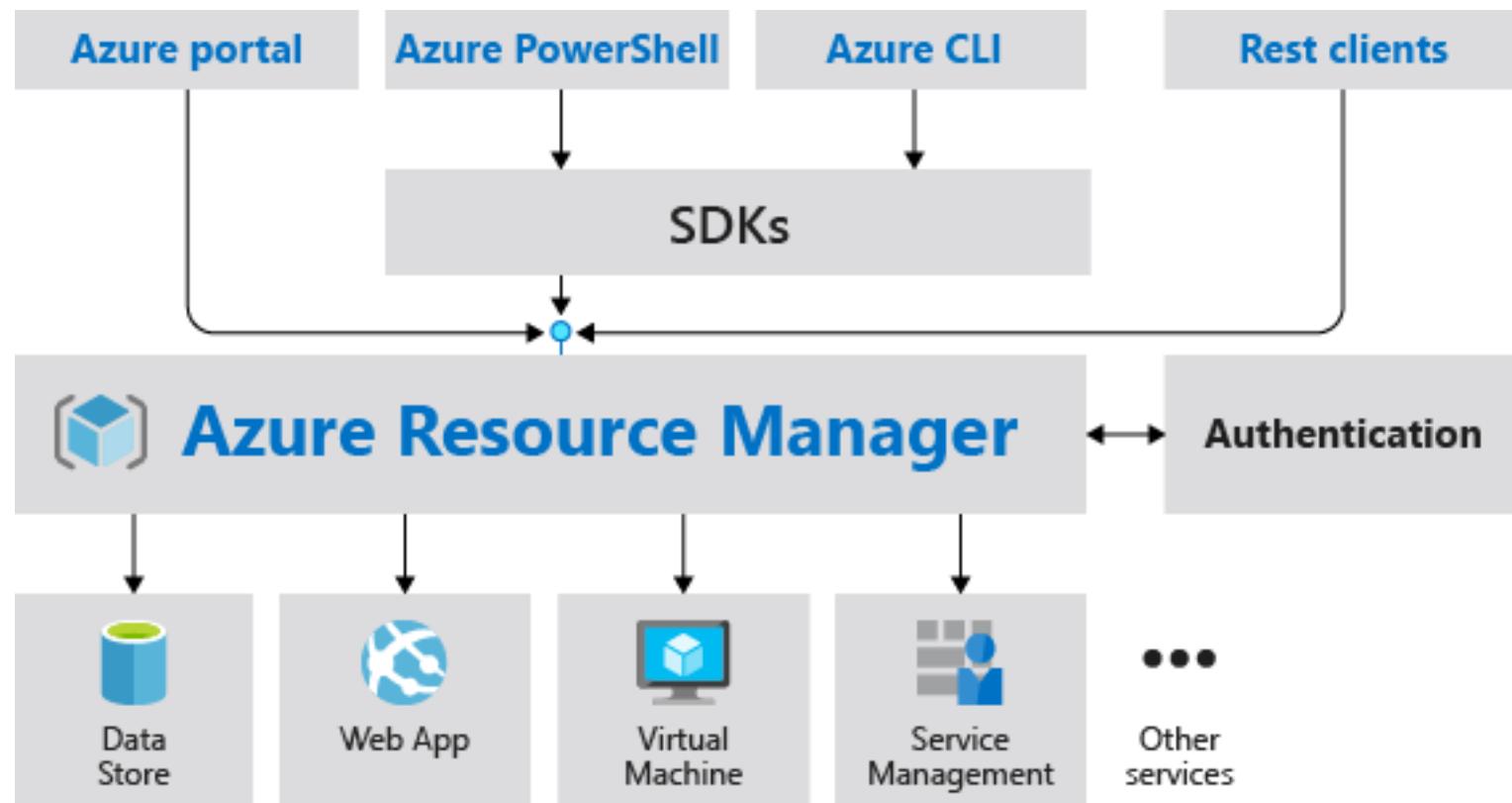
Azure customers, IT professionals and cloud developers can find, try, purchase, and provision Azure applications and services from certified service providers.

Includes close to 10,000 product listings.



Azure Management Solutions

Azure management tools



Azure Portal

- Web portal

Azure PowerShell

- Client-based shell based on Windows (.NET), Linux, or MacOS (.NET Core)

Azure CLI

- CLI for Windows, Linux, and MacOS
- Bash on Windows Subsystem for Linux

Azure Cloud Shell

- Browser-based environment for PowerShell & Bash CLI

Review questions

Module 2 review questions

What are the core architectural components of Azure?

Module 2 review questions

Every resource created in Azure must exist in one and only one what?

Module 2 review questions

You need to deploy a legacy application in Azure that has some customizations necessary to ensure that it runs successfully.

The application will run on a VM running the Windows operating system.

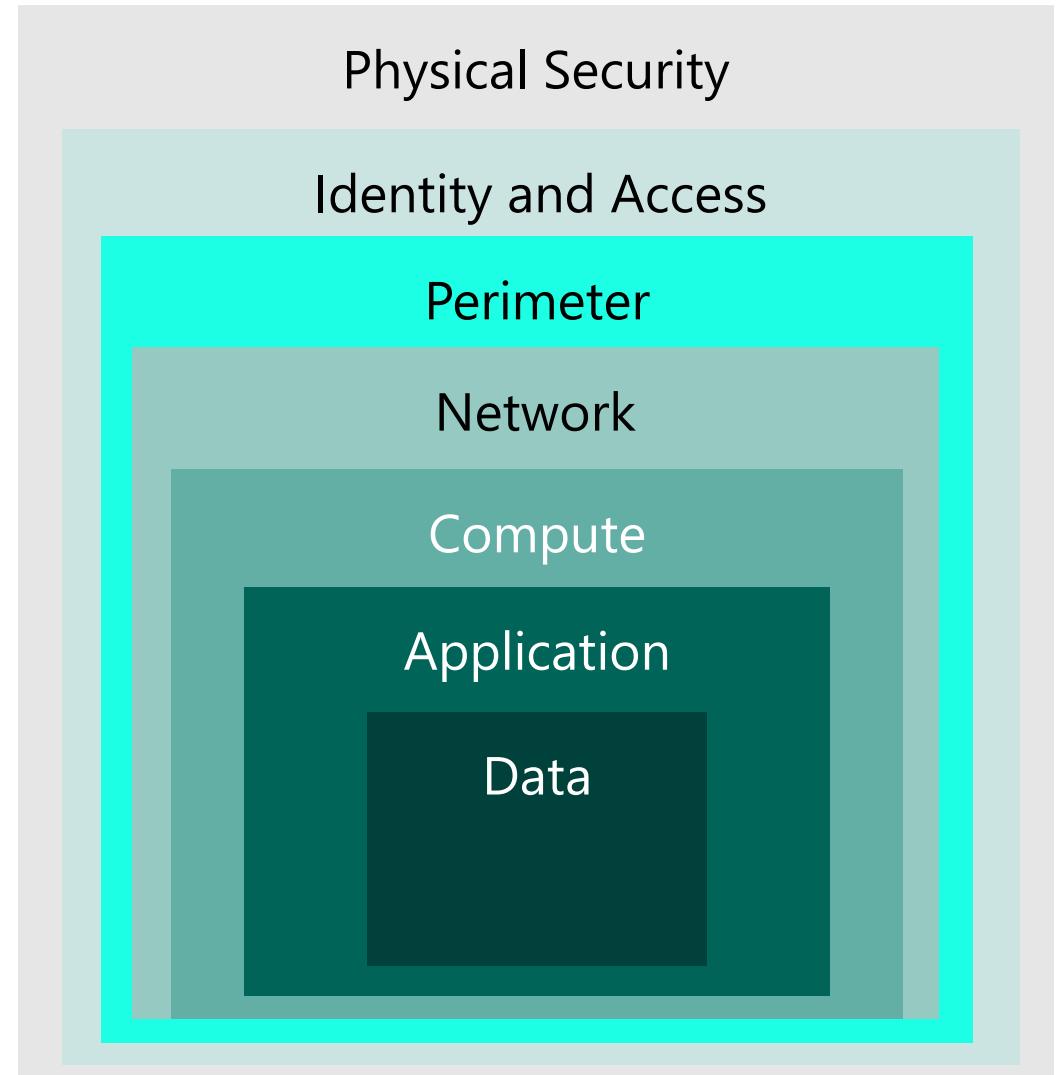
Which Azure service would you recommend to run the virtual machine in?

Module 3 – Security, privacy, compliance, and trust

Defense in depth

A layered approach to securing computer systems.

- Provides multiple levels of protection.
- Attacks against one layer are isolated from subsequent layers.



Azure Security Services

Azure Firewall

- Managed cloud service
- Grants or denies access to network resources
- Built-in high availability, scalability, filtering rules, and Azure Monitor logging

Azure DDoS Protection

- Protects against DDoS attacks
- Monitors network traffic at Azure edge, protecting services

Network Security Groups

- Fine-grained network traffic filtering
- Packet filter, not a firewall



Authentication vs Authorization

Authentication

- Establishes an identity
- Challenges access for credentials

Authorization

- Assumes successful **authentication**
- Establishes appropriate level of access



Directory Differences

Azure Active Directory

- Cloud
- Designed for HTTP and HTTPS
- Queried via Rest API's
- Uses SAML, WS-Federation, or OpenID for authentication
- Uses OAuth for authorization
- Includes federation services
- Flat Structure

Active Directory

- On-Prem
- Query via LDAP
- Uses Kerberos for Authentication
- No Federation Services
- Organizational Units (OU's)
- Group Policy (GPO's)

Azure Active Directory

Azure AD

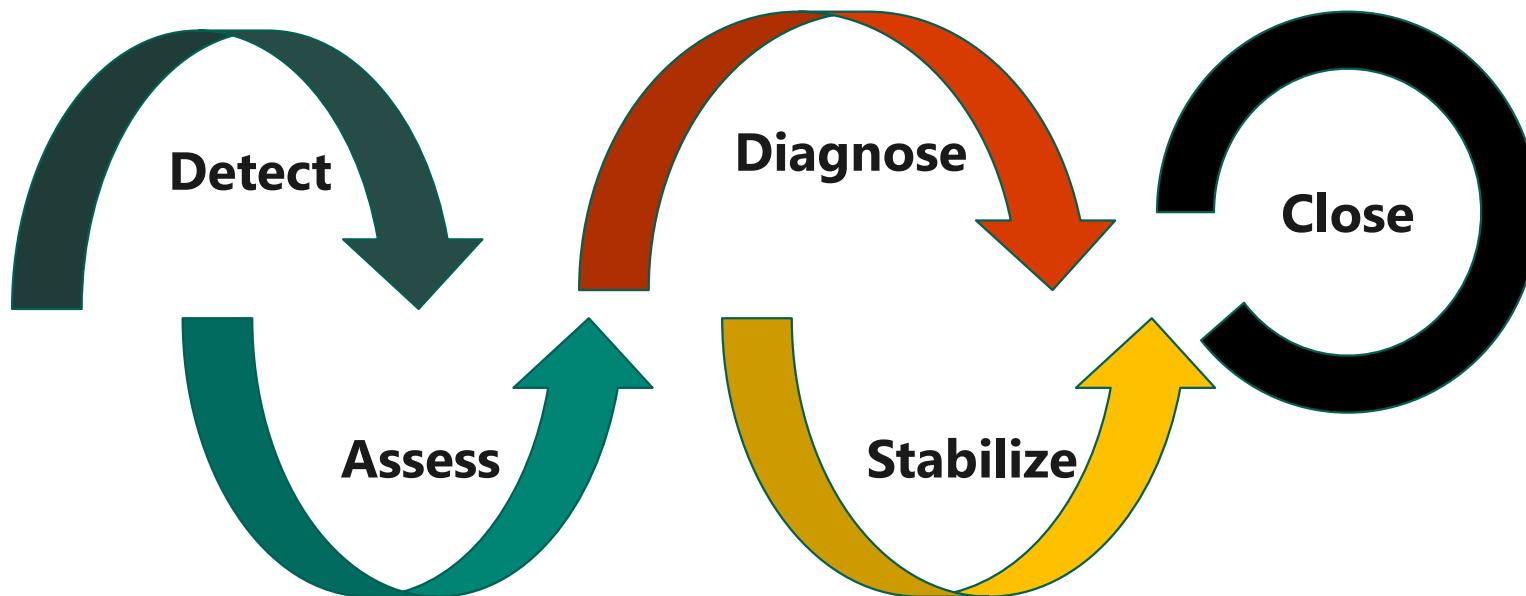
- Cloud-based identity
- SSO (Single Sign-On)
- B2B (Federation)
- B2C (Consumer)

Multi-factor authentication

- Something you know
- Something you have
- Something you are



Azure Security Center



Azure Security Center

techgenix.com

Security Center - Overview

Showing 2 subscriptions

Search (Ctrl+)

GENERAL

- Overview
- Getting started
- Events
- Search

POLICY & COMPLIANCE

- Coverage
- Secure score
- Security policy
- Regulatory Compliance (Prev...)

RESOURCE SECURITY HYGIENE

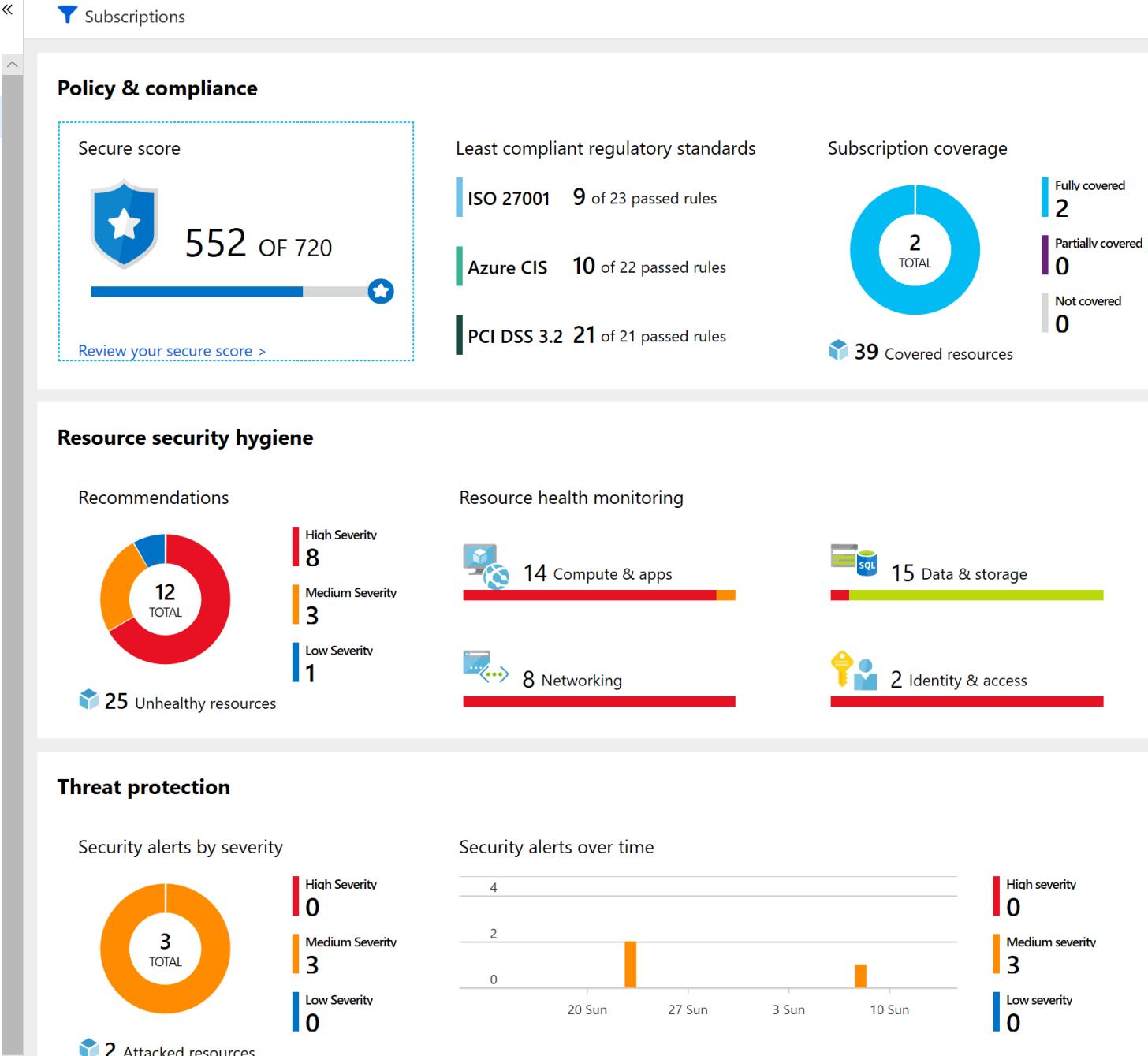
- Recommendations
- Compute & apps
- Networking
- Data & storage
- Identity & access (Preview)
- Security solutions

ADVANCED CLOUD DEFENSE

- Adaptive application controls
- Just in time VM access
- File Integrity Monitoring

THREAT PROTECTION

- Security alerts



Azure Key Vault

Stores keys

- Application secrets
- Certificates
- Key management

Secure access

Permission controls

Access logging

Encrypted with HSM*



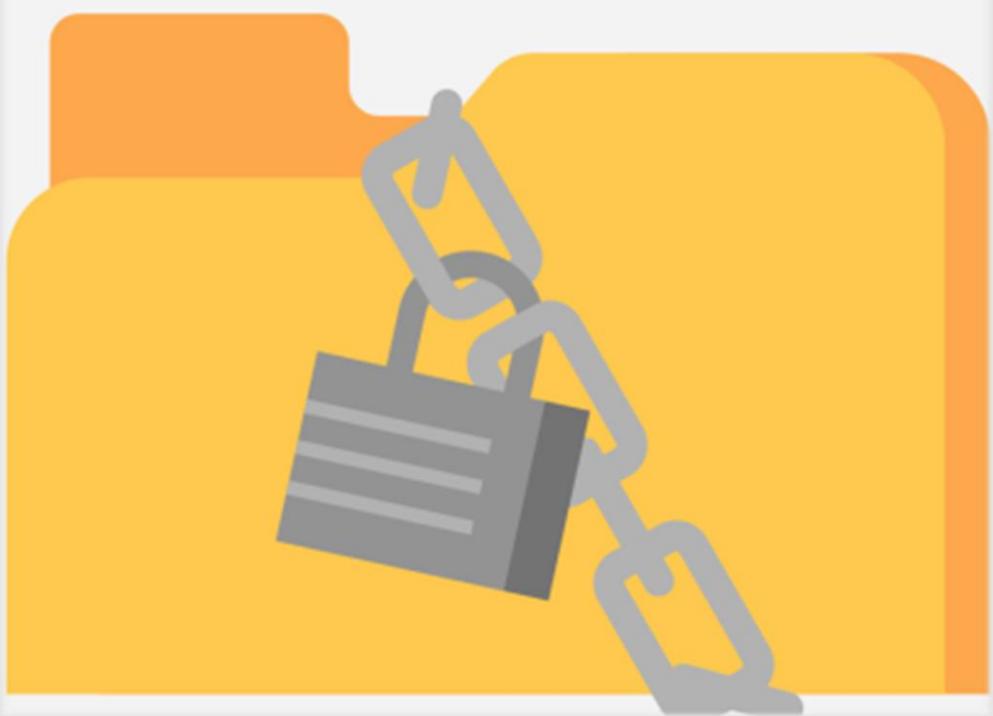
**Hardware security modules: The gold standard
for encryption key security**

www.secureidnews.com



HSM = Hardware Security Modules

Azure Information Protection



Classify and protect documents and emails

Uses labels to apply classification

Automatically based on rules and conditions

Manually by users

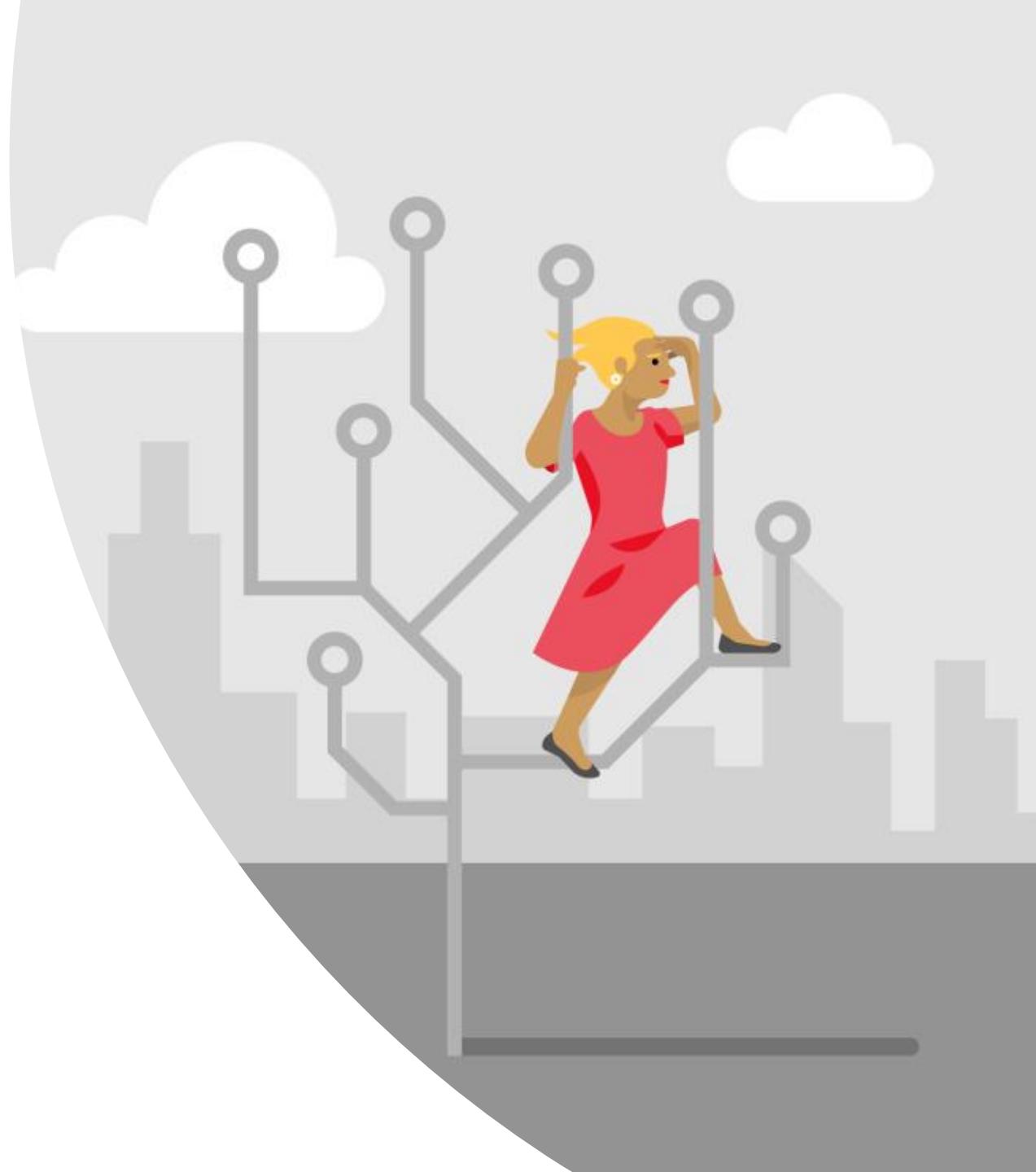
Azure Advanced Threat Protection (Azure ATP)

Identify, detect, and investigate threats against users

Azure ATP portal

Azure ATP sensor (Domain Controllers)

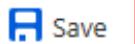
Azure ATP cloud service





mydemoserver - Advanced Threat Protection (Preview)

Azure Database for MySQL server

 Search (Ctrl+ /)

Save



Feedback

Overview

Activity log

Tags

Settings

Connection security

Connection strings

Server parameters

Pricing tier

Properties

Locks

Automation script

Security

Advanced Threat Protection (Pr...)

Monitoring

Alerts

Metrics

Server logs

Advanced Threat Protection

ON

OFF

Send alerts to

 Email addresses Email service and co-administrators

Advanced Threat Protection

ON

OFF

Send alerts to

 Email addresses Email service and co-administrators

Advanced Threat Protection

ON

OFF

Send alerts to

 Email addresses Email service and co-administrators

Security alerts

mbolt-threat-detection-mysql

[Filter](#) [Security Center](#)

5

4

3

2

1

0



High severity

Medium severity

4**4**

1 Sun

1 Wed

1 Sat

		DESCRIPTION	COUNT	DETECTED BY	ENVIRONMENT	DATE	STATE	CONFIDENCE	SEVERITY	
NEW	!	Potential SQL Brute Force attempt	3	Microsoft	Azure	09/19/18	Active	—	High	...
NEW	!	Attempted logon by a potentially harmful application	3	Microsoft	Azure	09/19/18	Active	—	High	...
NEW	!	Attempted logon by a potentially harmful application	1	Microsoft	Azure	09/18/18	Active	—	High	...
NEW	!	Potential SQL Brute Force attempt	1	Microsoft	Azure	09/18/18	Active	—	High	...
NEW	!	Logon by an unfamiliar principal	3	Microsoft	Azure	09/19/18	Active	—	Medium	...
NEW	!	Logon from an unusual location	3	Microsoft	Azure	09/19/18	Active	—	Medium	...
NEW	!	Logon by an unfamiliar principal	1	Microsoft	Azure	09/18/18	Active	—	Medium	...
NEW	!	Logon from an unusual location	1	Microsoft	Azure	09/18/18	Active	—	Medium	...

Azure Monitoring

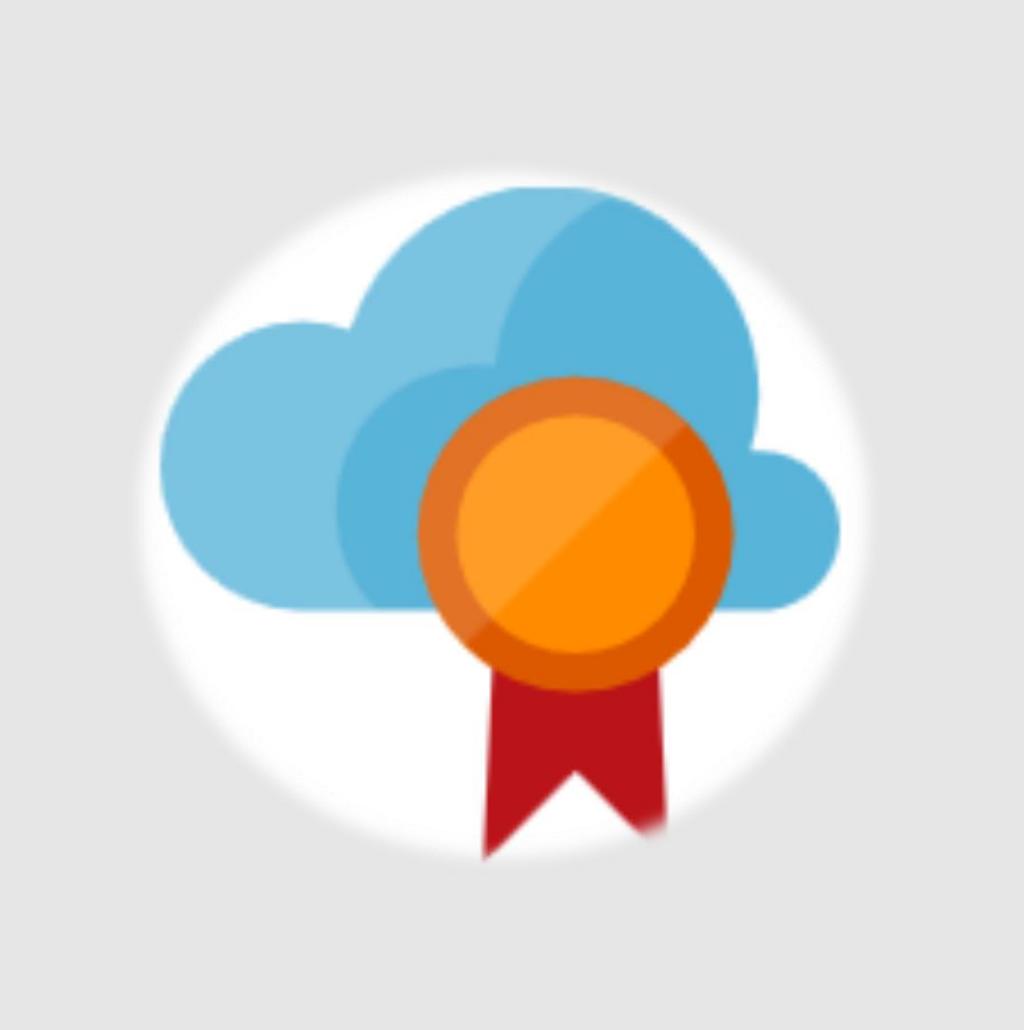
Azure Monitor

- Collects and analyzes telemetry from cloud and on-prem resources
- Enable 'Diagnostics' on resources to enhance collection

Azure Service Health

- Azure Status
- Service Health
- Azure Resource Health





Azure Advisor

Free Service

Get best practices recommendations

Help Improve:

- Performance
- Security
- High Availability
- Azure costs

Get recommendations with proposed actions inline

Advisor recommendations

Download as CSV Download as PDF Configure

Subscriptions: 2 of 24 selected – Don't see a subscription? Switch directories

2 subscriptions

All types

Active

No grouping

Overview

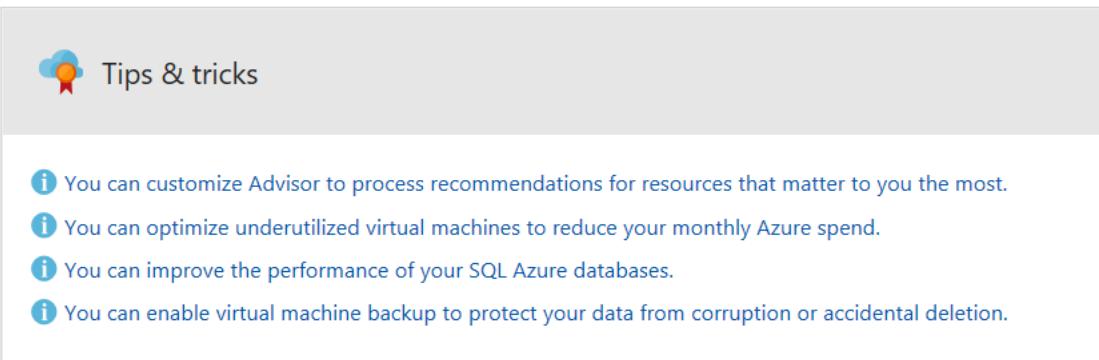
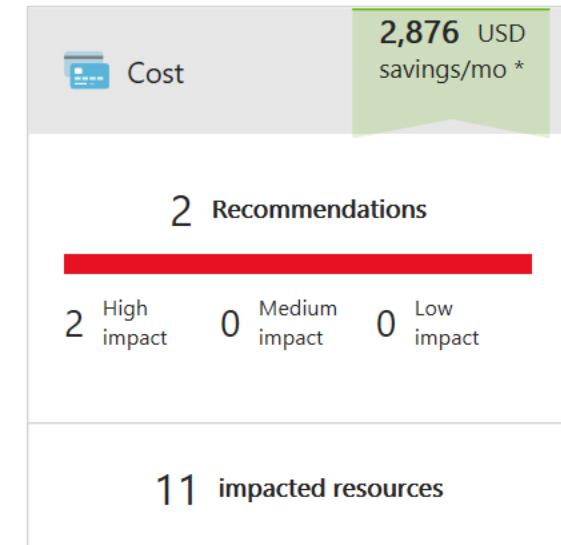
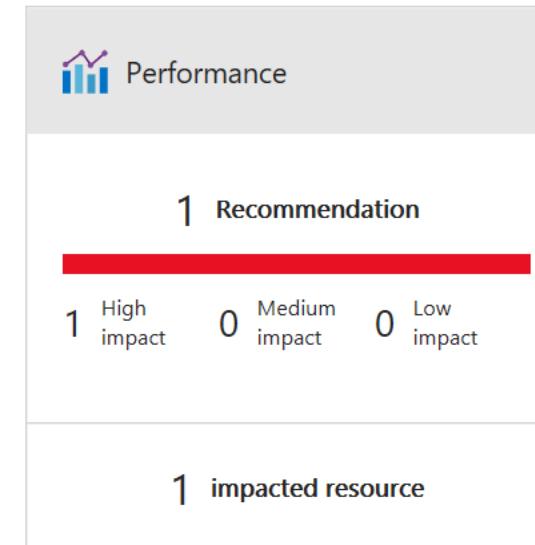
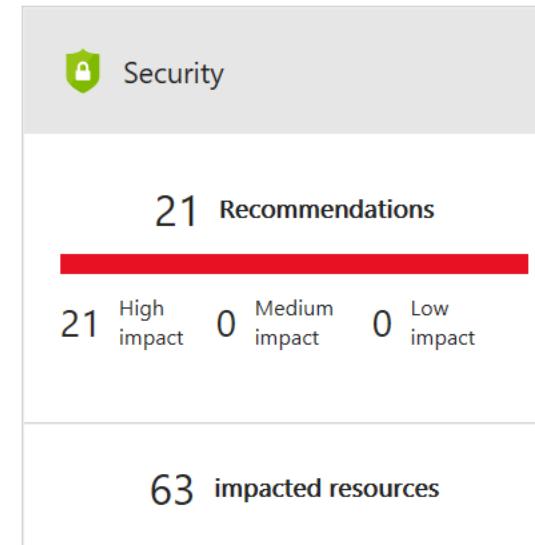
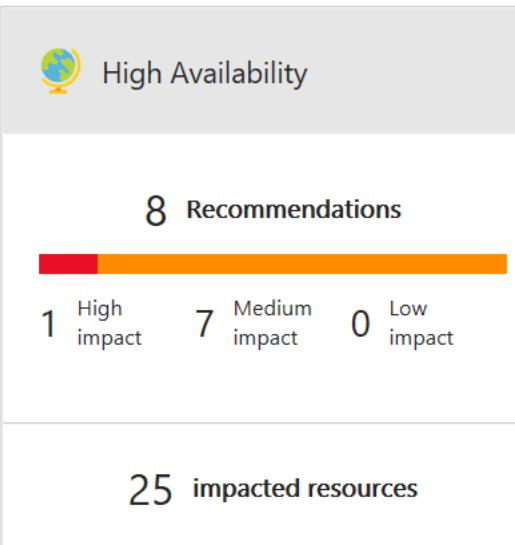
High Availability (8)

Security (21)

Performance (1)

Cost (2)

All (32)



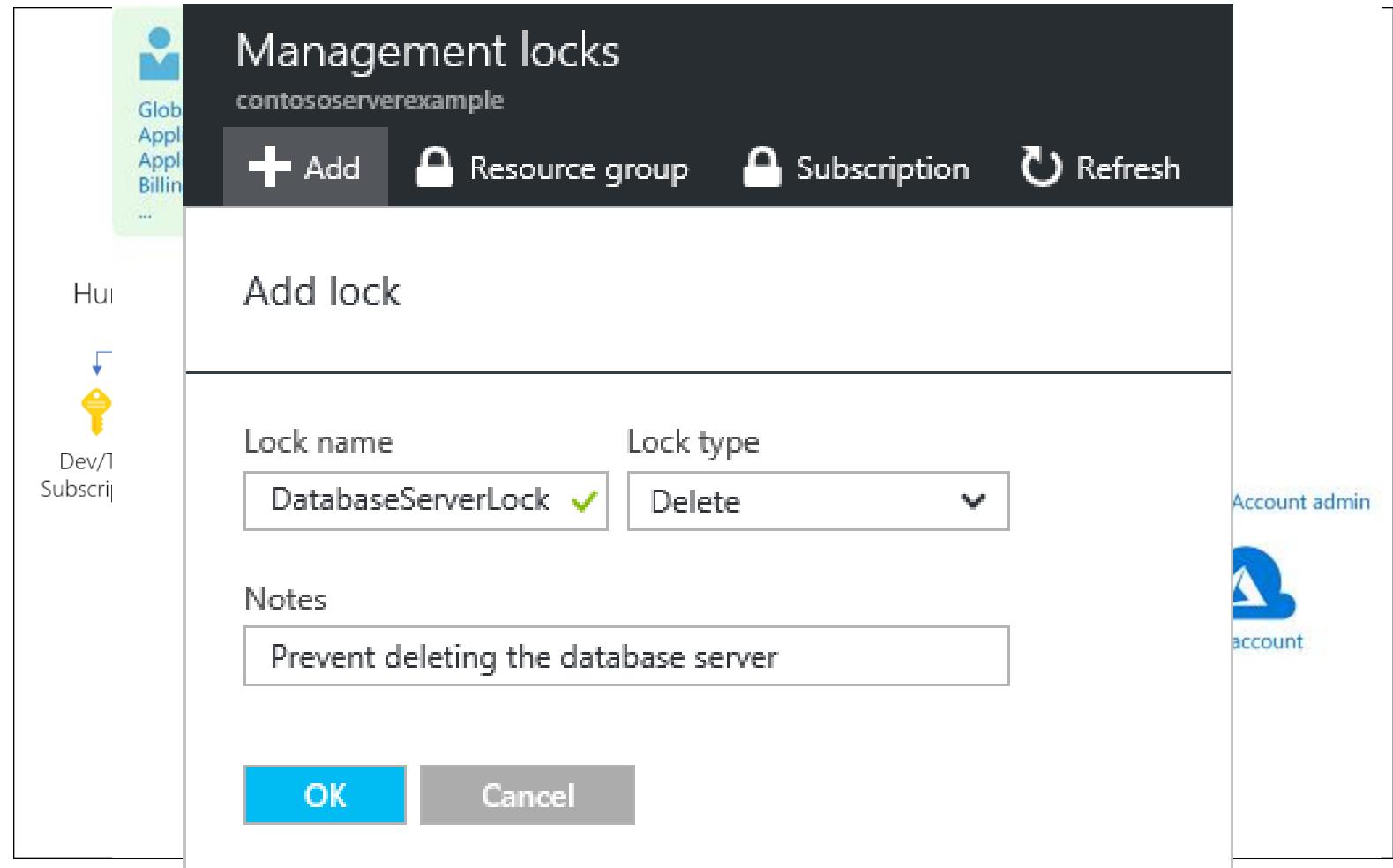
Download recommendations as PDF

Download recommendations as CSV

Governance

Management Groups

- Resource Graph
- Azure Policy
- Azure Blueprints
- RBAC
- Resource locks



Privacy & Compliance

Privacy statement

Personal data, interactions with data, data transparency

Trust Center

One-stop shop for security, privacy, and compliance documents

Compliance terms

GDPR, HIPAA, ISO

Compliance manager

Assess your compliance

Service Trust Portal

Audit reports, compliance guides, and trust reports

Community cloud

Azure Government

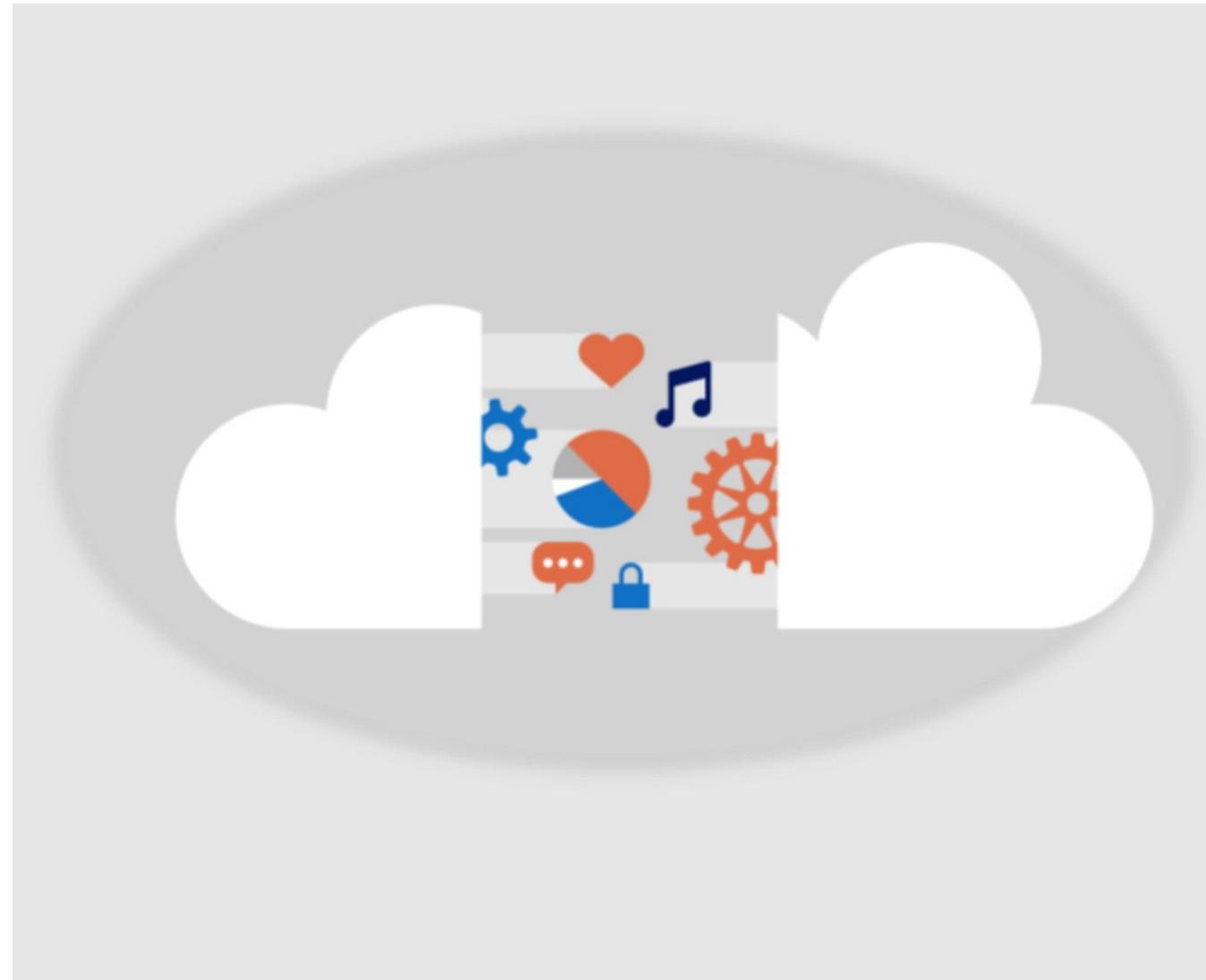
- Separate instance of global Azure services
- Physical isolation by region

Azure Germany

- Data residency and data at rest within Germany
- Uses a data trustee model to handle all aspects of data

Azure China

- Separate instance of global services
- Operated by Chinese partner, 21Vianet
- Compliant with Chinese regulations



**Let's take a look:
Azure Trust Center**

Review questions

Question 3.1

There has been an attack on your public-facing website.

The application's resources have been overwhelmed and exhausted and are now unavailable to users.

What service should you use to prevent this type of attack?

Question 3.2

Azure AD is capable of providing which services?

Question 3.3

Where can you obtain details about the personal data Microsoft processes, how Microsoft processes it, and for what purposes?



Module 4 – Azure pricing and support

Azure Subscriptions

Multiple subscriptions per account

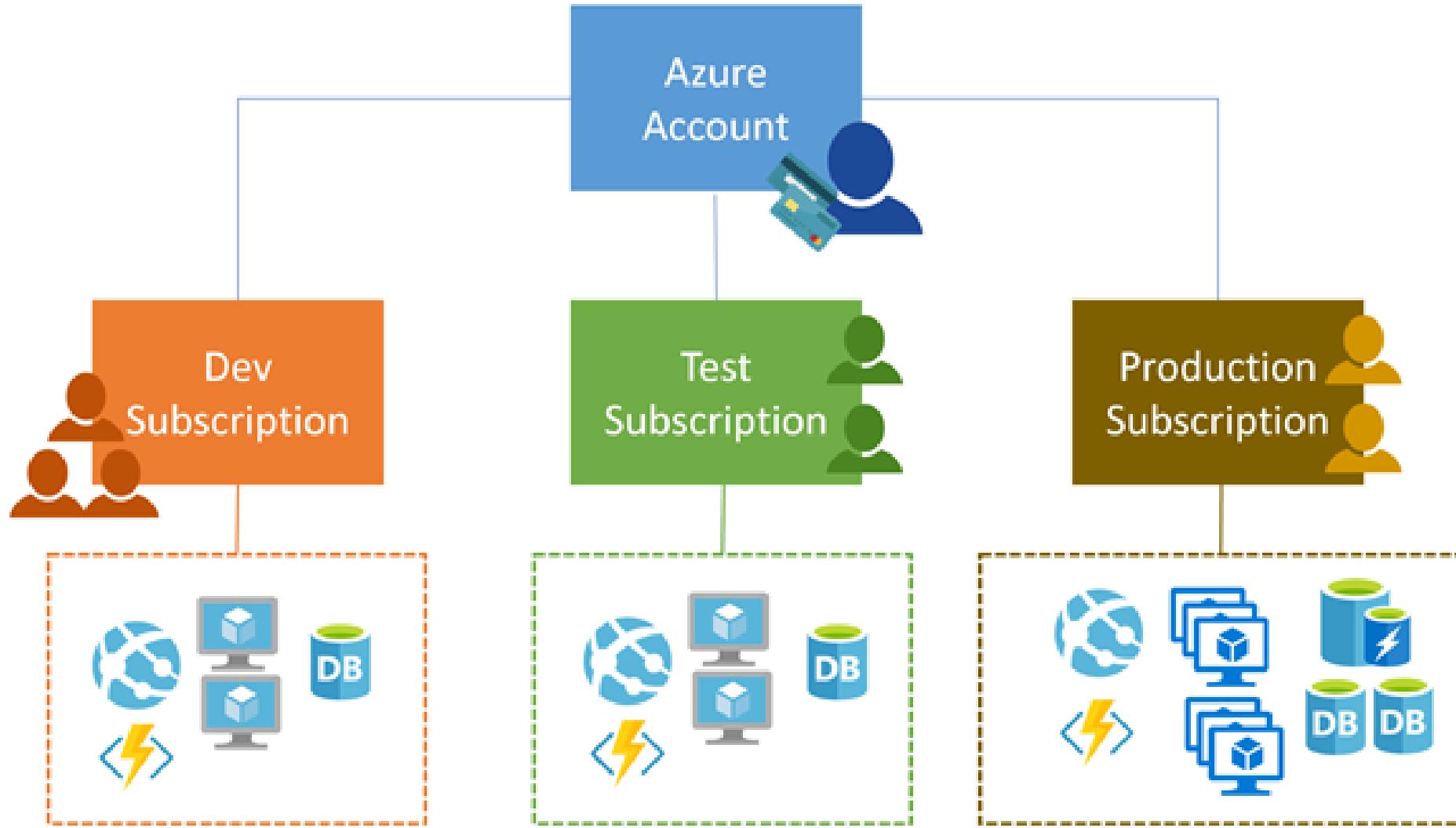
Provides access and boundaries between products and services

- Billing boundaries
- Access control boundaries with Azure Policy

Various subscription types

- Free
- Pay-as-you-go
- Enterprise Agreement

Create management hierarchy with Management Groups



 Search (Ctrl+ /)

Overview

Access control (IAM)

Diagnose and solve problems

BILLING

Invoices

Cost analysis

External services

Payment methods

Partner information

SETTINGS

Programmatic deployment

Resource groups

Resources

Usage + quotas

Policies

→ Costs by service



There is a delay between the time when a resource is used and the time when the usage reaches the billing system. Due to this, costs reported here may be delayed. Amounts displayed are estimates, and may not reflect some recent usage. Taxes are not included.

Subscription	Resource type	Resource group
Pay-As-You-Go [f515...]	All resource types	All resource groups

Timespan Tag

Custom All tags

Start date End date

2017-04-27 2017-05-26

Apply **Download**

Total cost

1685.61 USD Search to filter items...

NAME	TYPE	RESOURCE ...	COST (USD)	TAGS	...
abcd	Batch account	abcdef	1,178.80	AccountName:...	...
hctest	Scheduler Job ...	hctest	13.54	--	...
bextweb001	App Service	bextresourcegr...	9.36	--	...
bextsa001	Storage account	bextresourcegr...	0.07	--	...

Pricing and purchasing

It depends.

- Enterprise
- CSP (Cloud Solution Provider)
- Web direct

Pricing factors

- Resource type
- Service
- Region



Billing zones



Pricing tools

Pricing calculator

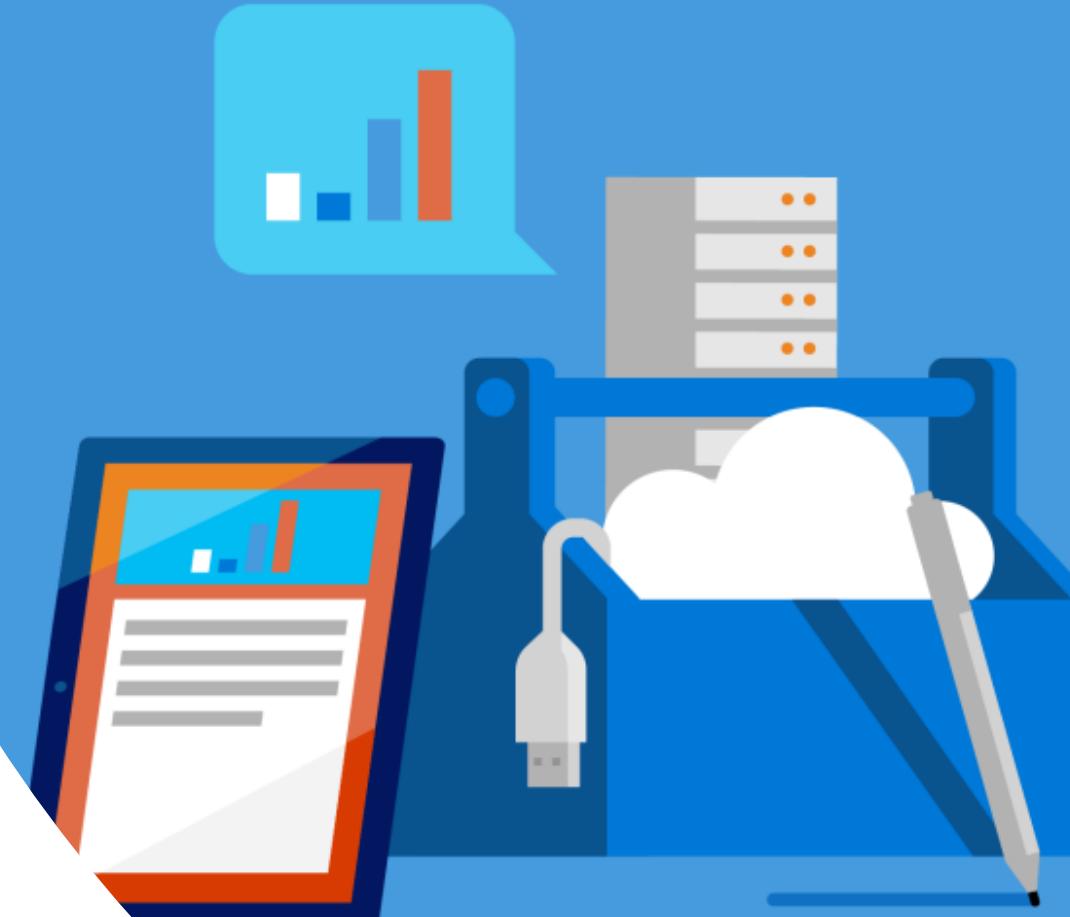
- Detailed cost estimate of services
- Only includes PayGo pricing
 - EA discounts and credits not included

Total cost of ownership calculator

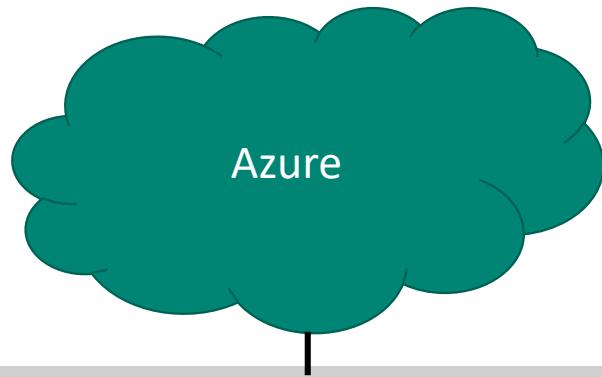
- Estimate savings migrating on-premises to Azure

Minimize costs

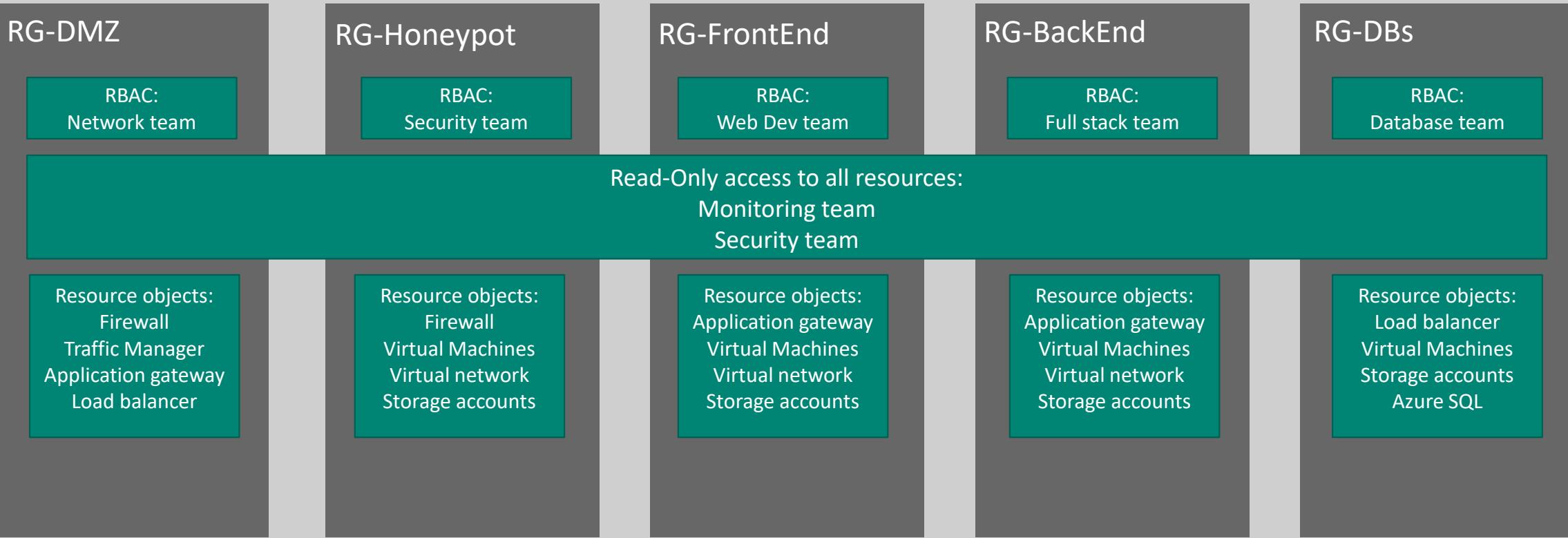
- Azure Reservations
- Spending limits
- Cost analysis
- Azure Cost Management tool



Goal



Subscription

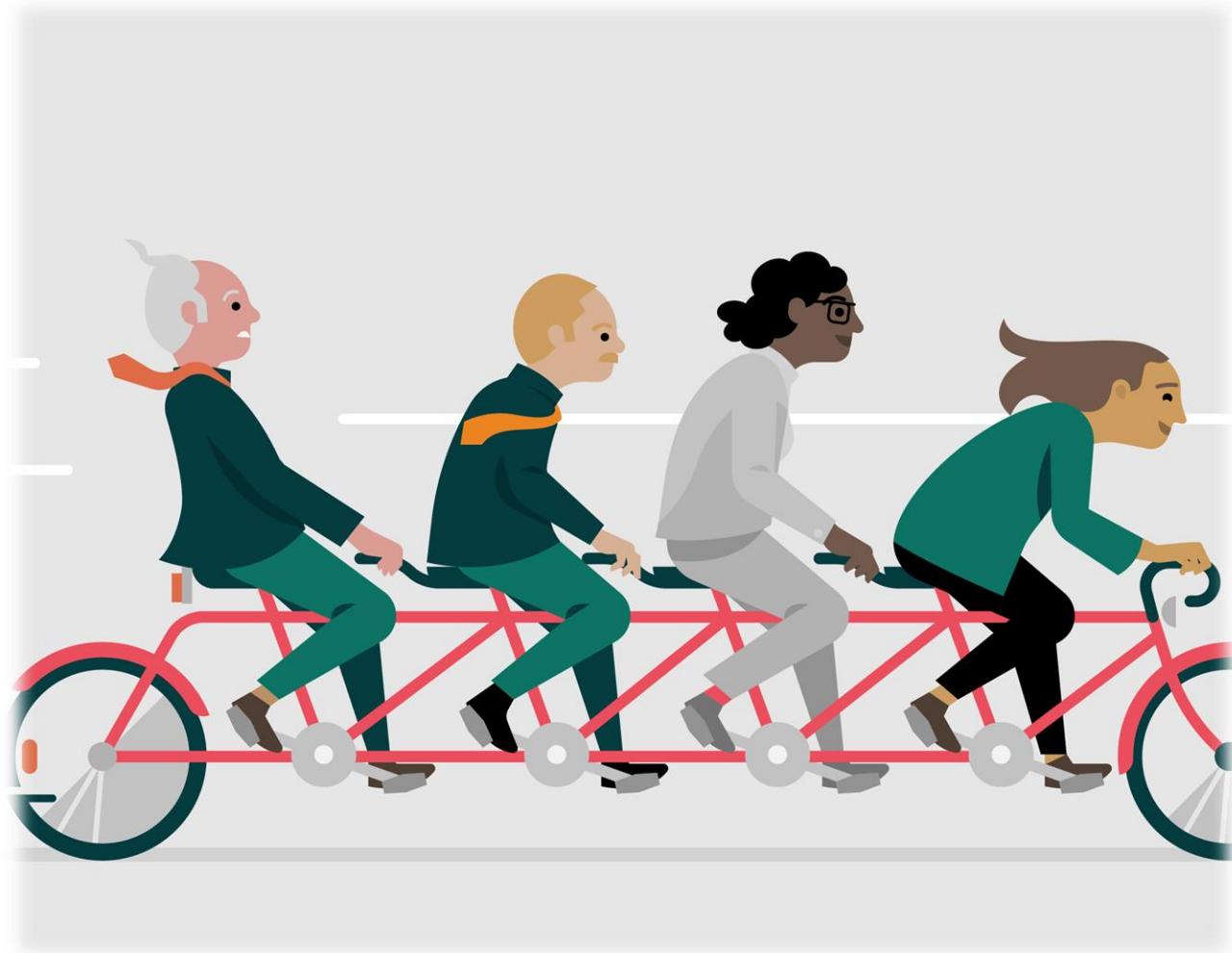


Azure Support Plans

Free
Developer
Standard
Professional Direct
Premier

Open a support ticket from **Help + Support**

- For best results, perform directly from impacted resource





Azure SLAs

Defines the Microsoft commitment

- Separate SLAs for each product and service

Three characteristics:

- Uptime or connectivity guarantees
- Performance target ranges (99.9% to 99.99%)
- Service credits

Composite SLAs

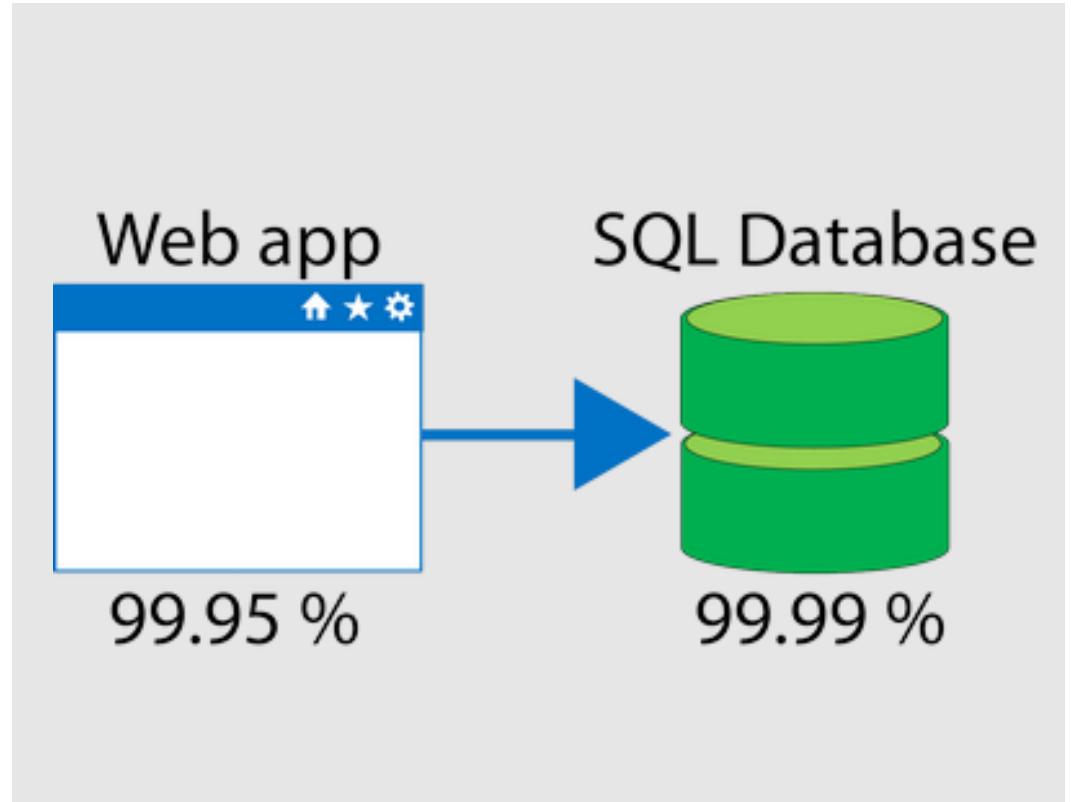
At the time of this writing, an App Service web app that writes to Azure SQL Database has the following SLAs:

- App Service Web Apps is 99.95 percent
- SQL Database is 99.99 percent

Question: What is the maximum downtime you would expect for this application?

Answer: The composite SLA for this application is $99.95\% \times 99.99\% = 99.94\%$.

This is lower than the individual SLAs. However, you can construct SLAs to improve overall application SLA.

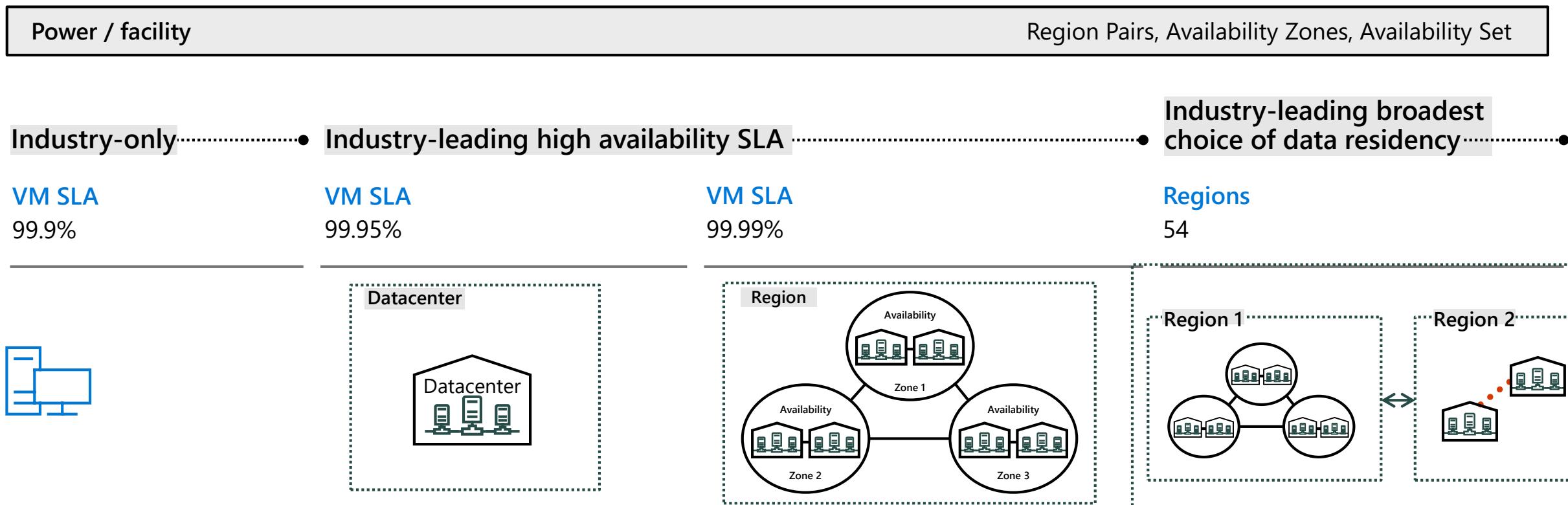


SLA times

SLA	Downtime per week	Downtime per month	Downtime per year
99%	1.68 hours	7.2 hours	3.65 days
99.9%	10.1 minutes	43.2 minutes	8.76 hours
99.95%	5 minutes	21.6 minutes	4.38 hours
99.99%	1.01 minutes	4.32 minutes	52.56 minutes
99.999%	6 seconds	25.9 seconds	5.26 minutes

Making sense of it all

- Industry-leading high availability SLA



Availability zones

Protection from entire datacenter failures

Region pairs

Protection from disaster with Data Residency compliance

Review questions

Question 4.1

1. How can you create a hierarchy of Azure subscriptions?
 - A. Pricing calculator
 - B. Management groups
 - C. Azure Active Directory
 - D. Azure Policy

Question 4.2

2. Which blade of the portal lets you open a service request ticket?
 - A. Help + Support
 - B. Cost management
 - C. Subscriptions
 - D. Resource groups

Question 4.3

3. What is the highest SLA that Microsoft defines for a service?
 - A. 99%
 - B. 99.9%
 - C. 99.99%
 - D. 99.999%



Thank you