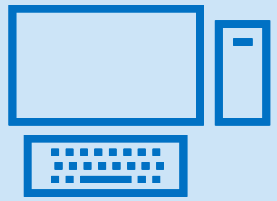
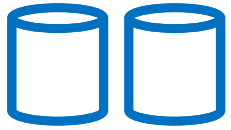
Compute

Core infrastructure



Compute

Virtual machines
Availability sets
VM scale sets
Controlled maintenance

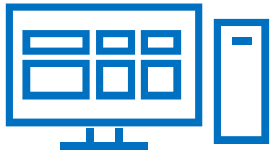


Storage

Disks
Blob storage
File sync
Hot and cold

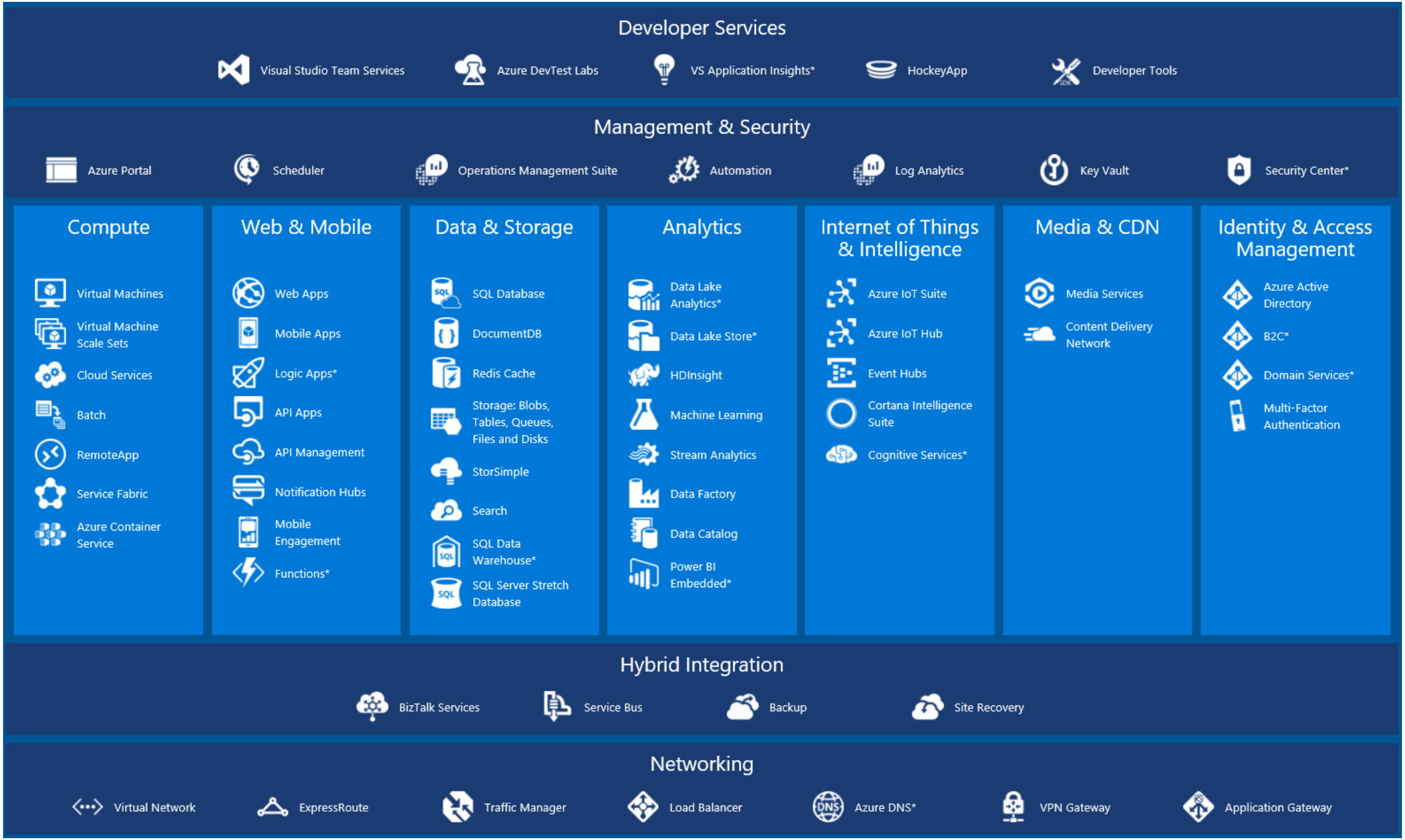
Networking

Virtual networks
VPN, ExpressRoute
Load balancer
DNS, Traffic Manager



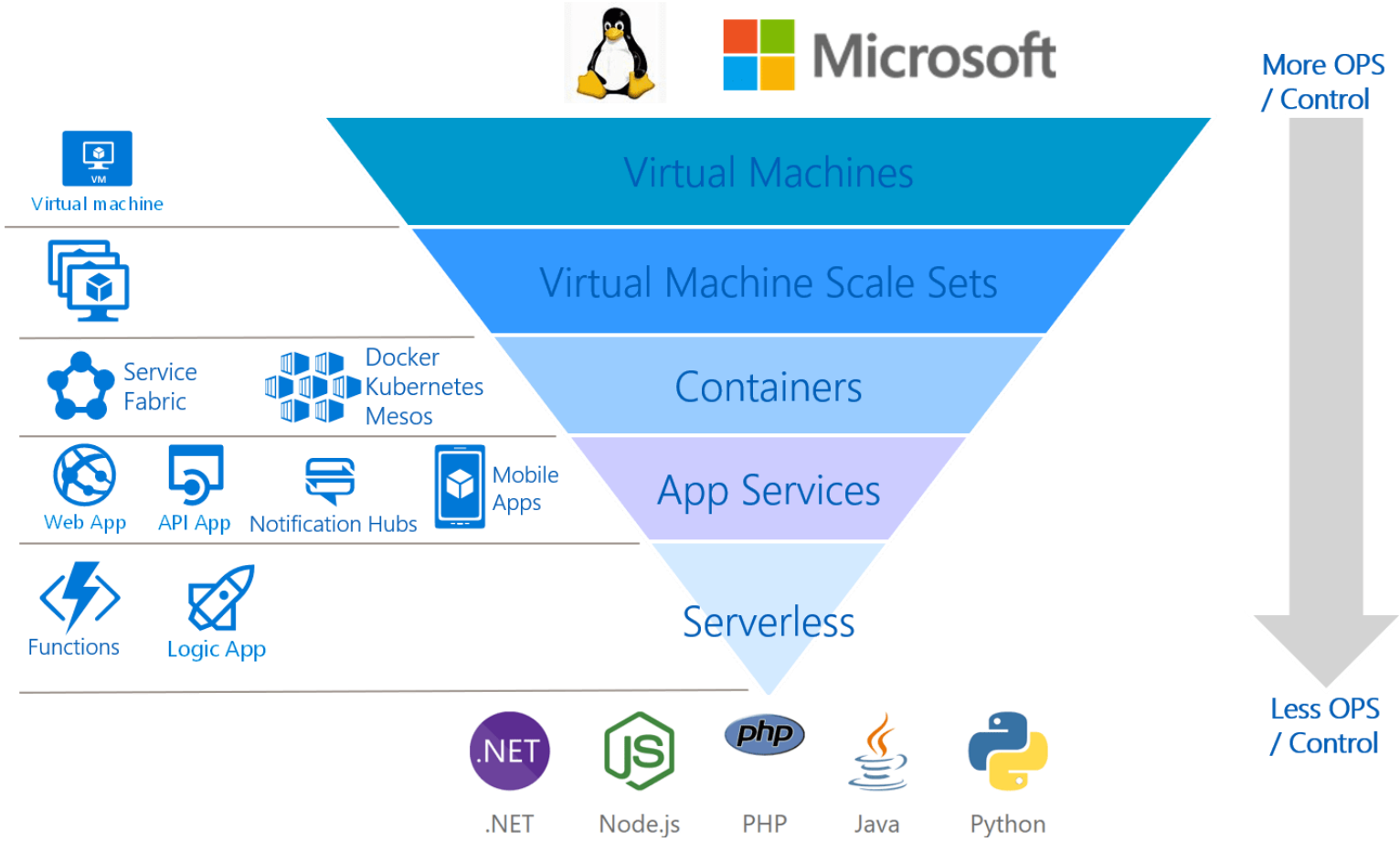
Management

Log Analytics
Cloud Shell
Site Recovery
Security Center

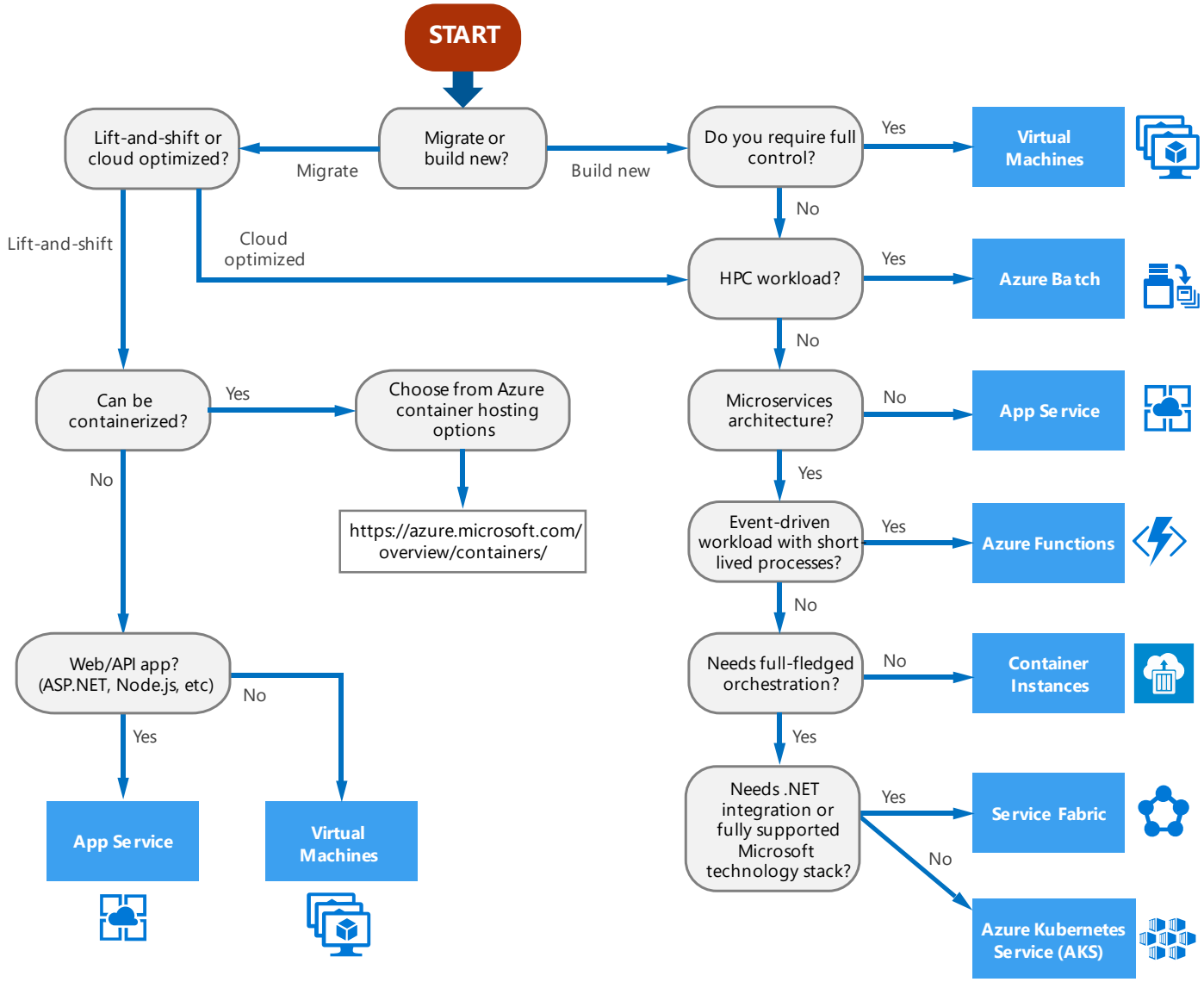

Developer Services
Visual Studio Team Services
Azure DevTest Labs
VS Application Insights*
HockeyApp
Developer Tools
Management & Security
Azure Portal
Scheduler
Operations Management Suite
Automation
Log Analytics
Key Vault
Security Center*
Compute
Virtual Machines
Virtual Machine Scale Sets
Cloud Services
Batch
RemoteApp
Service Fabric
Azure Container Service
Web & Mobile
Web Apps
Mobile Apps
Logic Apps*
API Apps
API Management
Notification Hubs
Mobile Engagement
Functions*
Data & Storage
SQL Database
DocumentDB
Redis Cache
Storage: Blobs, Tables, Queues, Files and Disks
StorSimple
Search
SQL Data Warehouse*
SQL Server Stretch Database
Analytics
Data Lake Analytics*
Data Lake Store*
HDInsight
Machine Learning
Stream Analytics
Data Factory
Data Catalog
Power BI Embedded*
Internet of Things & Intelligence
Azure IoT Suite
Azure IoT Hub
Event Hubs
Cortana Intelligence Suite
Cognitive Services*
Media & CDN
Media Services
Content Delivery Network
Identity & Access Management
Azure Active Directory
B2C*
Domain Services*
Multi-Factor Authentication
Hybrid Integration
BizTalk Services
Service Bus
Backup
Site Recovery
Networking
Virtual Network
ExpressRoute
Traffic Manager
Load Balancer
Azure DNS*
VPN Gateway
Application Gateway


Developer Services
Visual Studio Team Services
Azure DevTest Labs
VS Application Insights*
HockeyApp
Developer Tools
Management & Security
Azure Portal
Scheduler
Operations Management Suite
Automation
Log Analytics
Key Vault
Security Center*
Compute
Virtual Machines
Virtual Machine Scale Sets
Cloud Services
Batch
RemoteApp
Service Fabric
Azure Container Service
Web & Mobile
Web Apps
Mobile Apps
Logic Apps*
API Apps
API Management
Notification Hubs
Mobile Engagement
Functions*
Data & Storage
SQL Database
DocumentDB
Redis Cache
Storage: Blobs, Tables, Queues, Files and Disks
StorSimple
Search
SQL Data Warehouse*
SQL Server Stretch Database
Analytics
Data Lake Analytics*
Data Lake Store*
HDInsight
Machine Learning
Stream Analytics
Data Factory
Data Catalog
Power BI Embedded*
Internet of Things & Intelligence
Azure IoT Suite
Azure IoT Hub
Event Hubs
Cortana Intelligence Suite
Cognitive Services*
Media & CDN
Media Services
Content Delivery Network
Identity & Access Management
Azure Active Directory
B2C*
Domain Services*
Multi-Factor Authentication
Hybrid Integration
BizTalk Services
Service Bus
Backup
Site Recovery
Networking
Virtual Network
ExpressRoute
Traffic Manager
Load Balancer
Azure DNS*
VPN Gateway
Application Gateway

How much control/ops do you need/want?



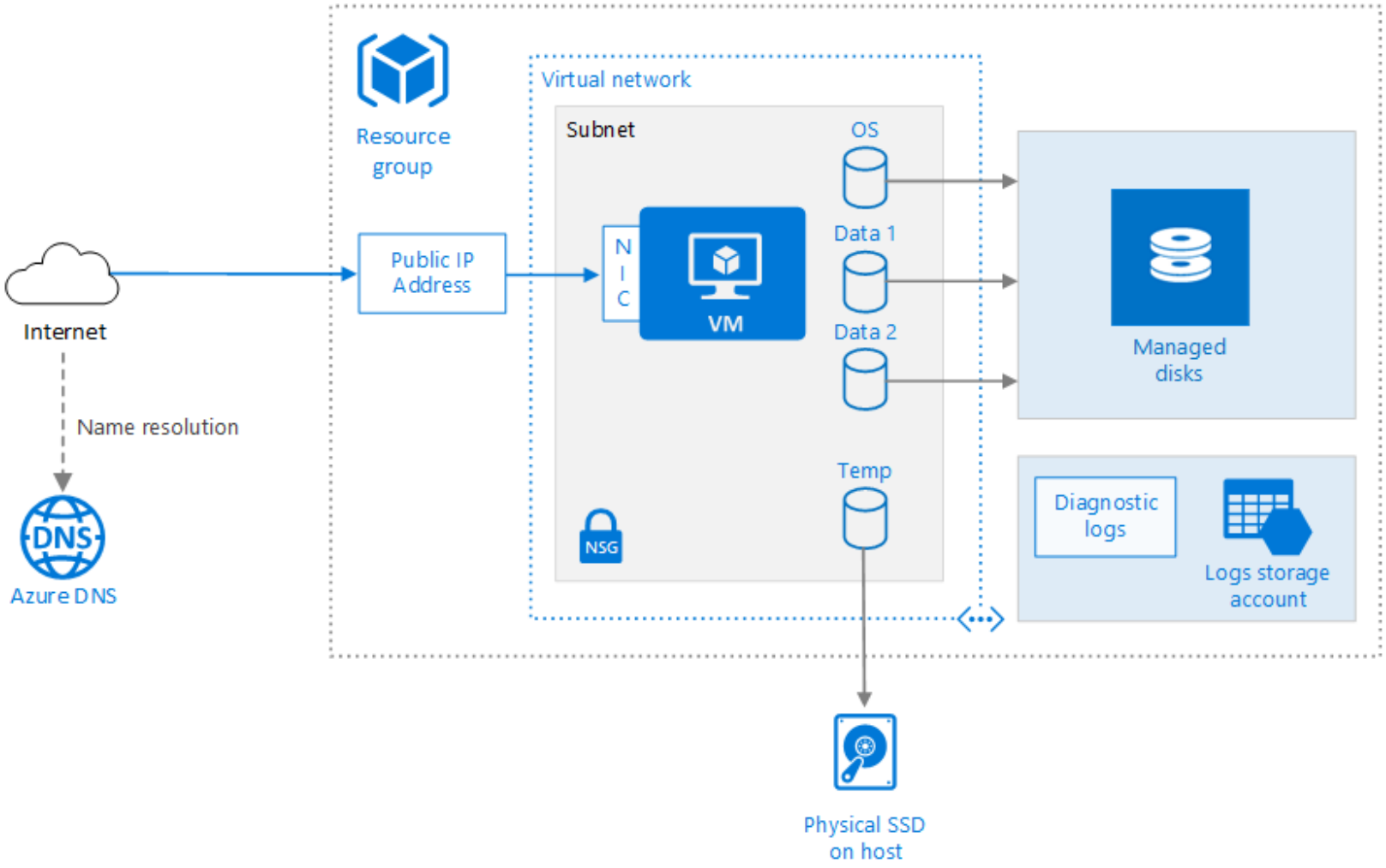
When to use what?



Azure Compute

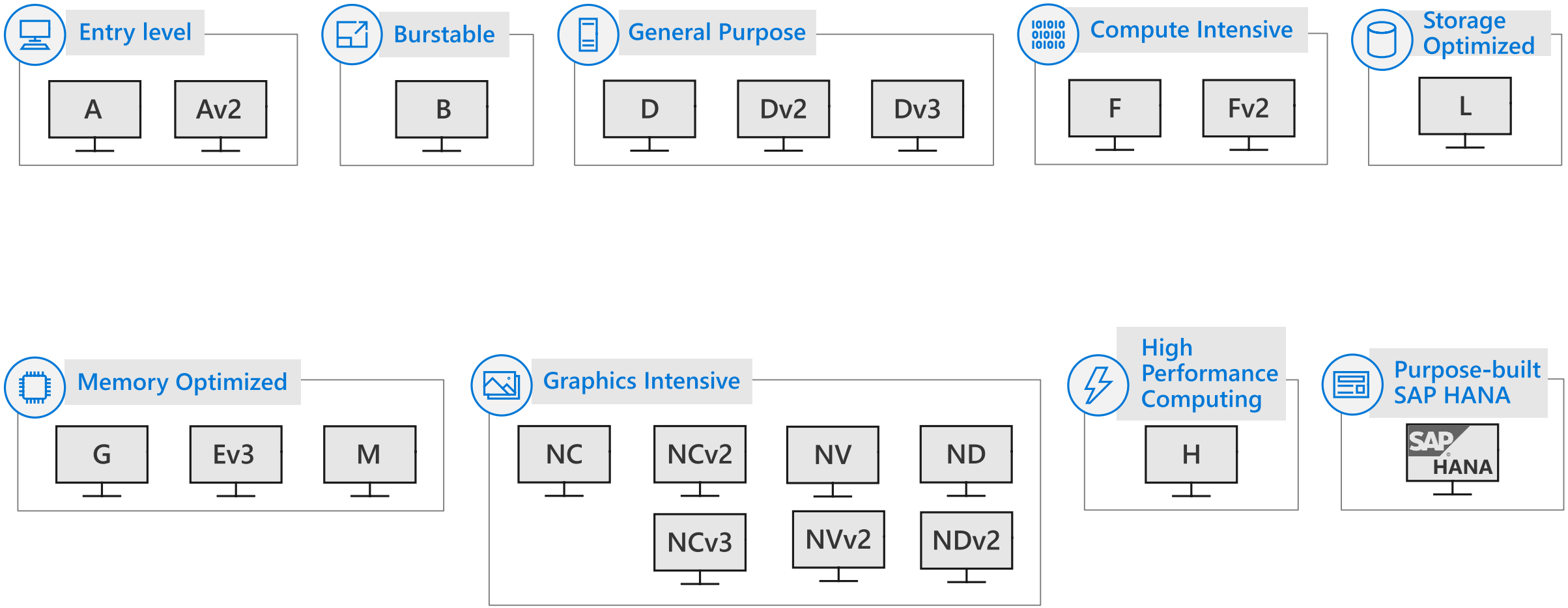
Virtual Machines

Azure VM anathomy

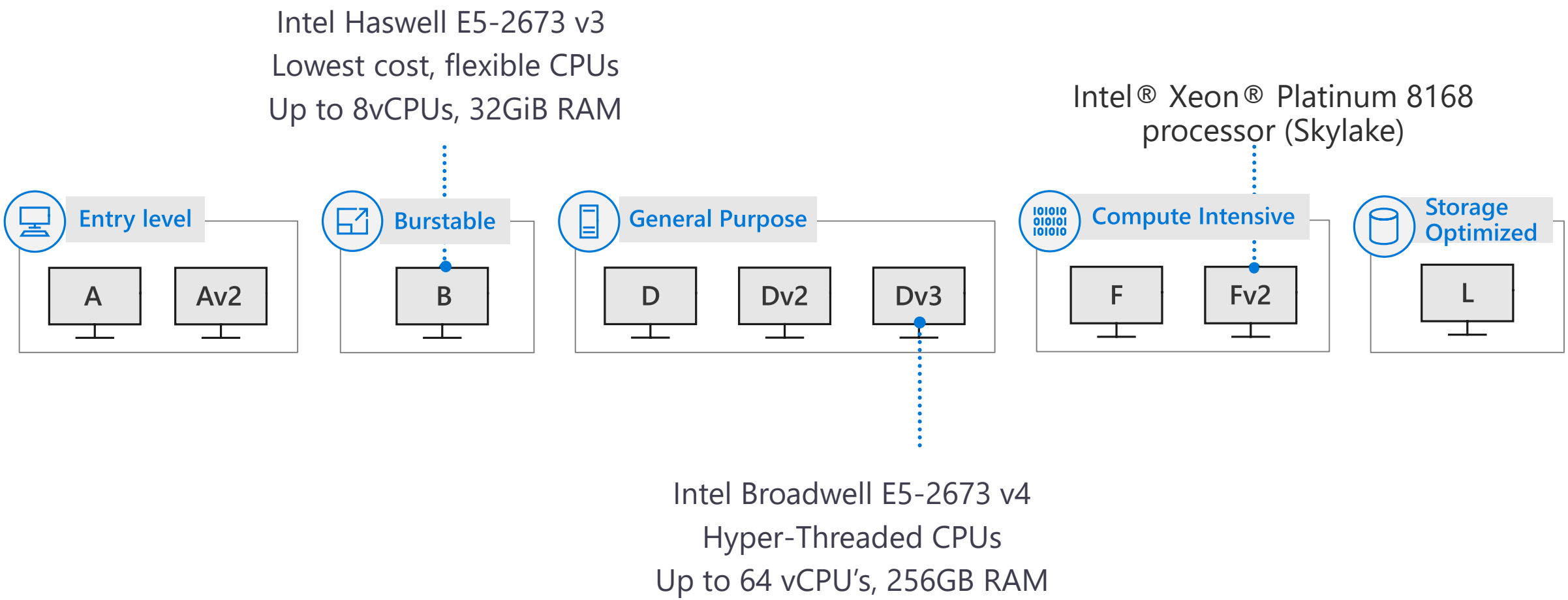


VM Gallery Images

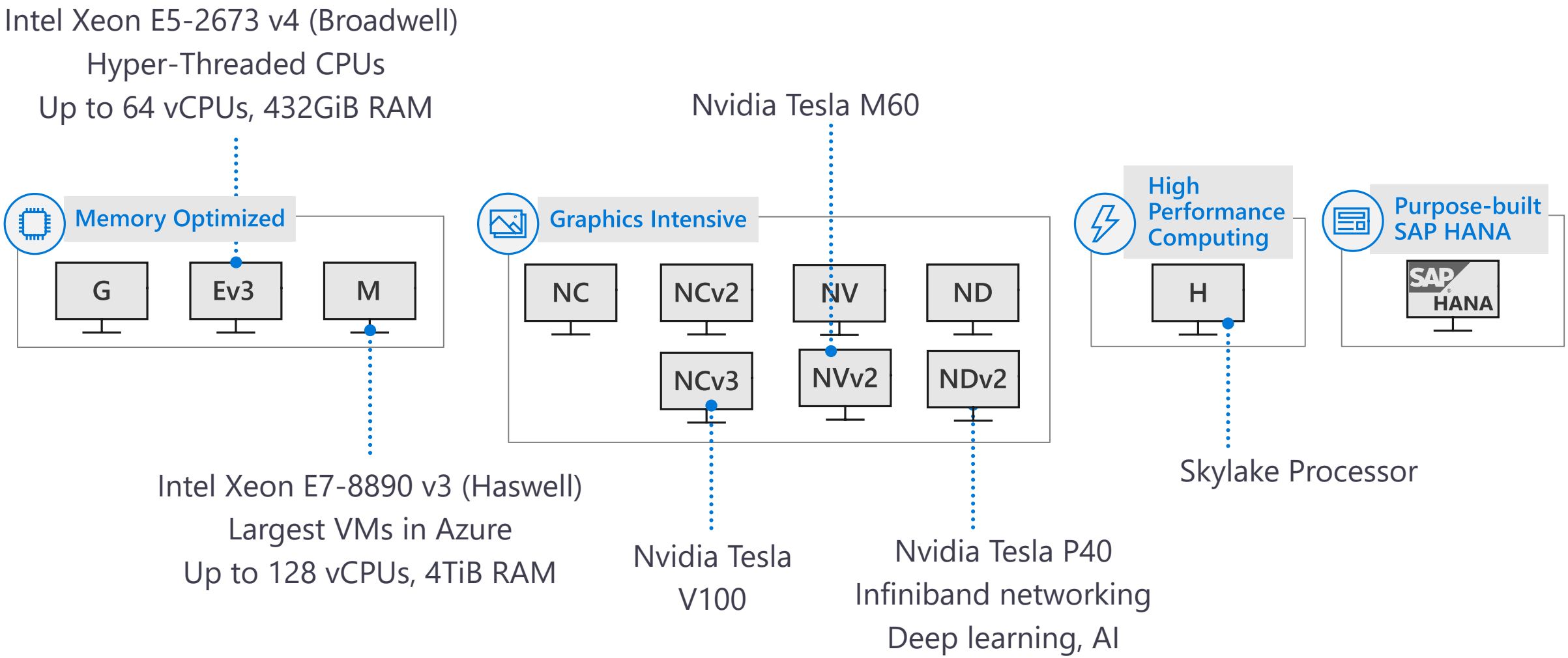
Compute options for all types of apps



.. From entry-level to storage optimized …



.. From memory optimized to HPC



Choosing a VM Size

General Purpose	Compute Optimized	Memory Optimized	GPU	High Performance Compute
A0 – A5 Basic	F1, F2, F4, F8, F16	D11 – D14	NV6, NV12, NV24	A8 – A11
A0 – A7 Standard		D11v2 – D15v2	NC6, NC12, NC24, NC24r	H8, H8m, H16, H16m, H16r, H16mr
D1 – D4		G1 – G5		
D1v2 – D5v2				

Disks vs Images

OS Images

- Microsoft
- Partner
- User

Base OS image for new Virtual Machines
Sys-Prepped/Generalized/Read Only
Created by uploading or by capture

Disks

- OS Disks
- Data Disks

Writable Disks for Virtual Machines
Created during VM creation or during upload of existing VHDs.

Storage Disks

Standard Storage

- Cloud-scale reliable storage
- Maximum 500 IOPS, 60 MB per second throughput per disk
- Available in all VM Sizes

Premium Storage

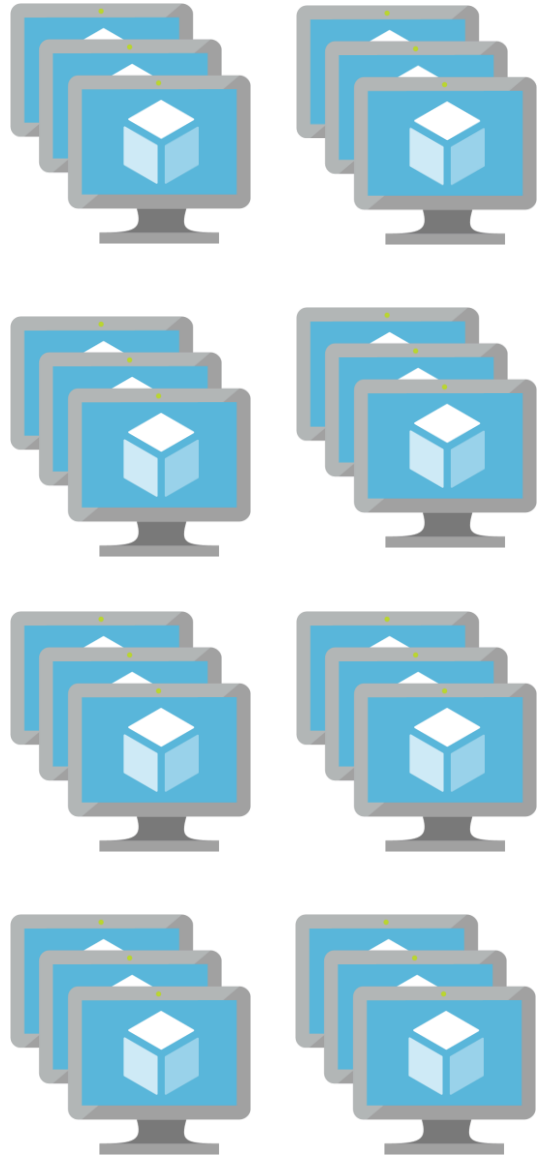
- High-performance, low-latency disk support, ideal for I/O intensive workloads
- Maximum 5000 IOPS, 200 MB per second throughput per disk
- Only supported in “S” series VMS (DS, DSv2, GS, FS)
- Locally redundant storage only

Azure File Storage

- Mount Azure Storage as network share volumes
- Can be accessed via SMB 3.0 or REST APIs
- Up to 1000 IOPS, up to 60 MB/second throughput per share
- Max share size = 5TB, Max file size = 1 TB.

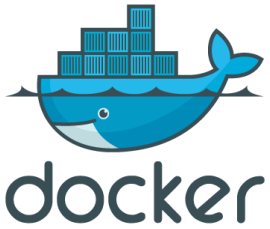
VM Scale Sets

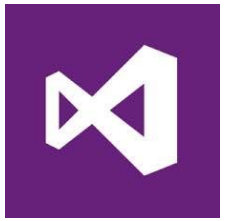
- Easily deploy a set of VMs based on the same image
- Implicitly balanced across Fault & Update Domains
- VM Scale sets are implicitly an Availability Set (3 FD, 5 UD)
- Manual or rule-based scaling for the Scale Set capacity
- Use a Load Balancer or Application Gateway to distribute requests across the available VM's in a Scale Set



VM Extensions

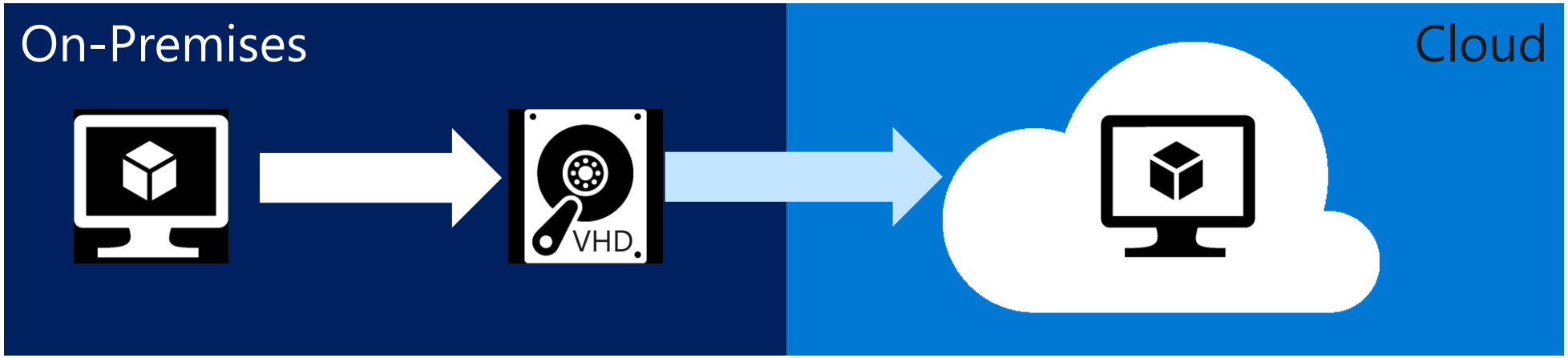
- Small applications that perform post-deployment configuration and automation tasks
- Extensions are published by Microsoft & trusted 3rd party publishers
- Can be added, updated, disabled, or removed at any time
- Managed via Azure Portal, PowerShell, and Management APIs



Custom Image Upload

- Prepare the VHD
- Optional – generalize the VHD by using SysPrep/waagent
- Upload the VHD to Azure Storage
- Prepare networking resources
- Create the VM from uploaded generalized or specialized image



Azure business continuity

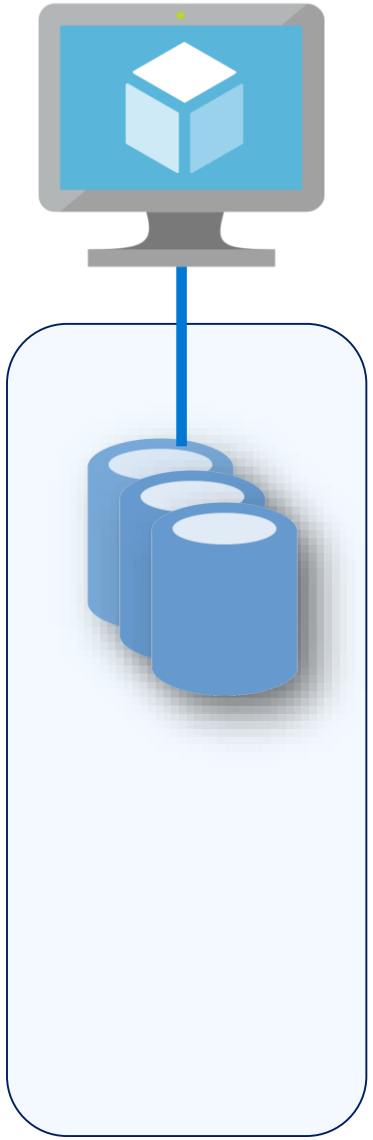
Knowing Your 9's

Availability (%)	Description	Downtime (Minutes)			Practical Meaning	FAA Rating
		Annual	Quarterly	Monthly		
90	Unmanaged	52,596.00	13,149.00	4,383.00	Down 5 weeks per year	
99	Managed	5,259.60	1,314,90	438.30	Down 4 days per year	ROUTINE
99.9	Well-Managed	525.96	131.49	43.83	Down 9 hours per year	ESSENTIAL
99.99	Fault-Tolerant	52.60	131.15	4.38	Down 1 hour per year	
99.999	High Availability	5.26	1.31	.44	Down 5 minutes per year	CRITICAL
99.9999	Very High Availability	0.53	0.13	0.04	Down 30 seconds per year	
99.99999	Ultra Availability	0.05	0.01	--	Down 3 seconds per year	SAFETY CRITICAL

From Generic Requirements for Operation Systems Platform Reliability, Telcordia Technologies System Documentation,GR-2841-CORE and Federation Aviation Administration Handbook: Reliability, Maintainability, and Availability (RMA) Handbook, FAA-HDBK-006A, Jan 7, 2008.

Single-Instance SLA – 99.9%

- No Availability Set required
- Virtual machine connectivity of at least 99.9%
- Application servers that cannot be clustered or load-balanced
- VM must use Premium (SSD-based) storage



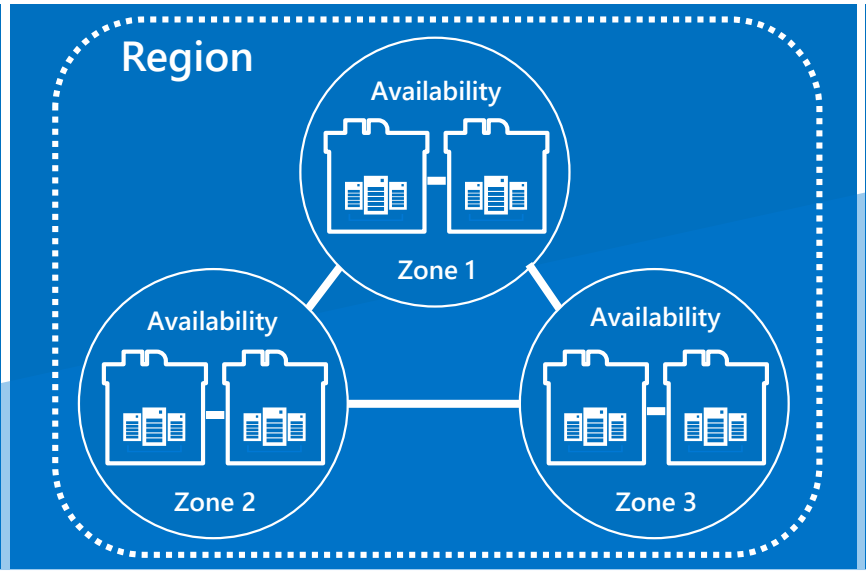
Azure VM Service Level Agreement

- 99.95% for multiple role instances in an Availability Set
- What's Included
  - Computer hardware failure (disk, CPU, memory)
  - Data Center failures – network, power
  - Hardware upgrades, software maintenance, Host OS Updates
- Not Included
  - VM Container crashes, Guest OS updates

Azure protection options for all scenarios

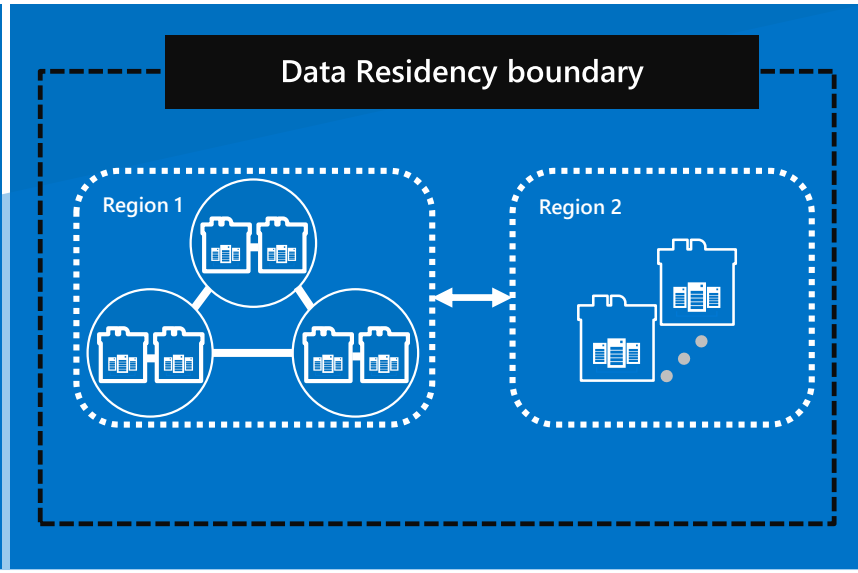
Availability Sets

High Availability protection from hardware failures in a datacenter.



Availability Zones

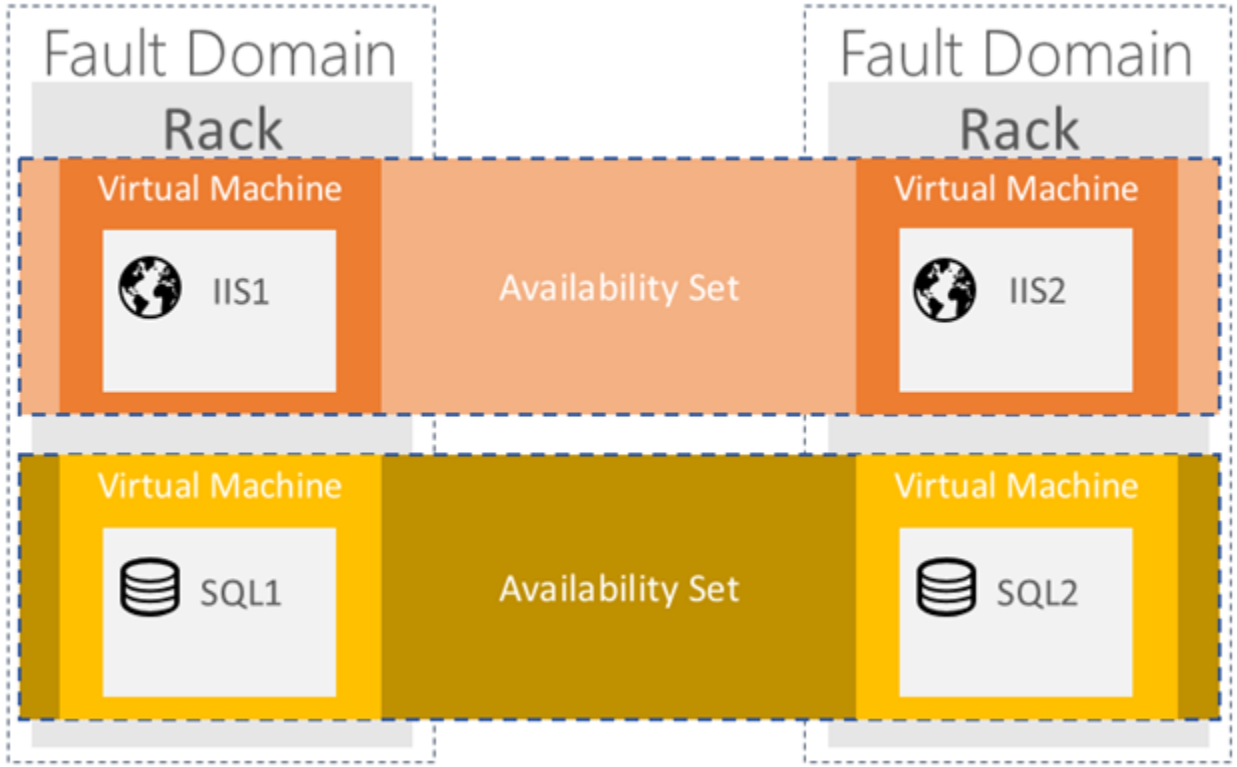
High Availability protection against loss of datacenters. Multiple datacenters per physically separated zone. Each zone features independent network, cooling, and power.



Region Pairs

Protection for your data and applications from the loss of an entire region with Geo-redundant storage (GRS) and Azure Site Recovery.

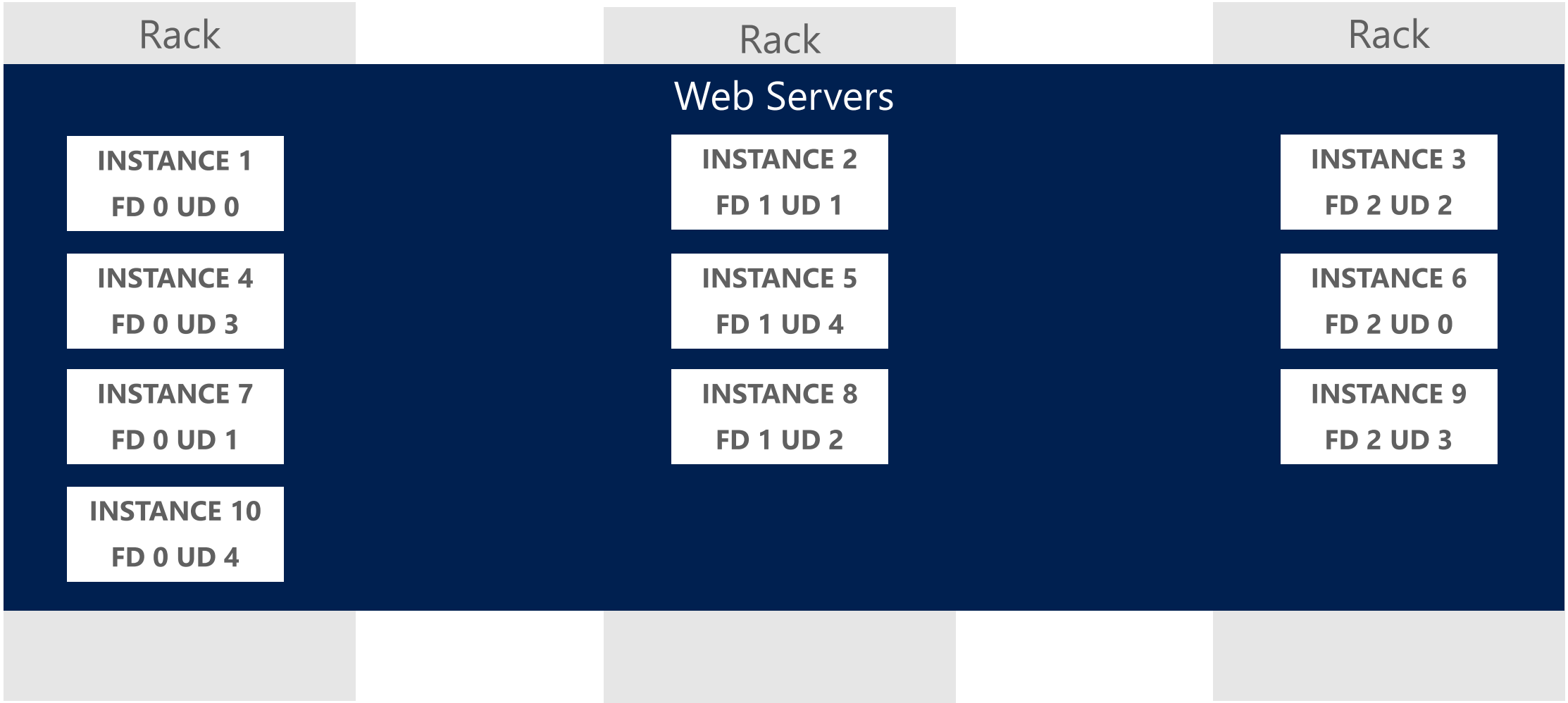
Azure Fault and Update Domains



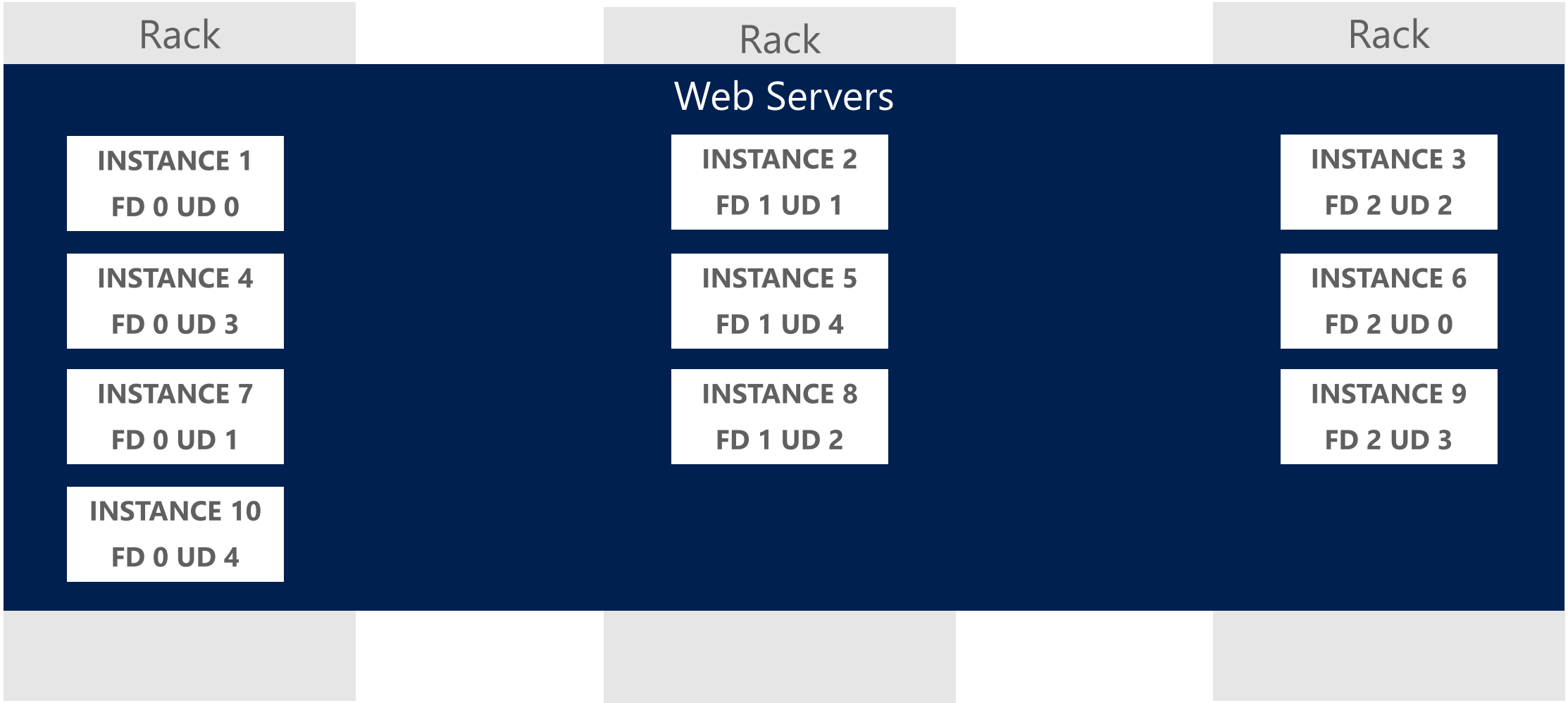
Azure Fault and Update Domains

- Fault domains are groupings of VMs that share the same physical hardware (server rack, power connection, network switch.)
- Update domains are groupings of VMs that can be rebooted at the same time.
- Deploying your VMs into an Availability Set distributes them across Fault & Update Domains in order to help ensure uptime for your system.

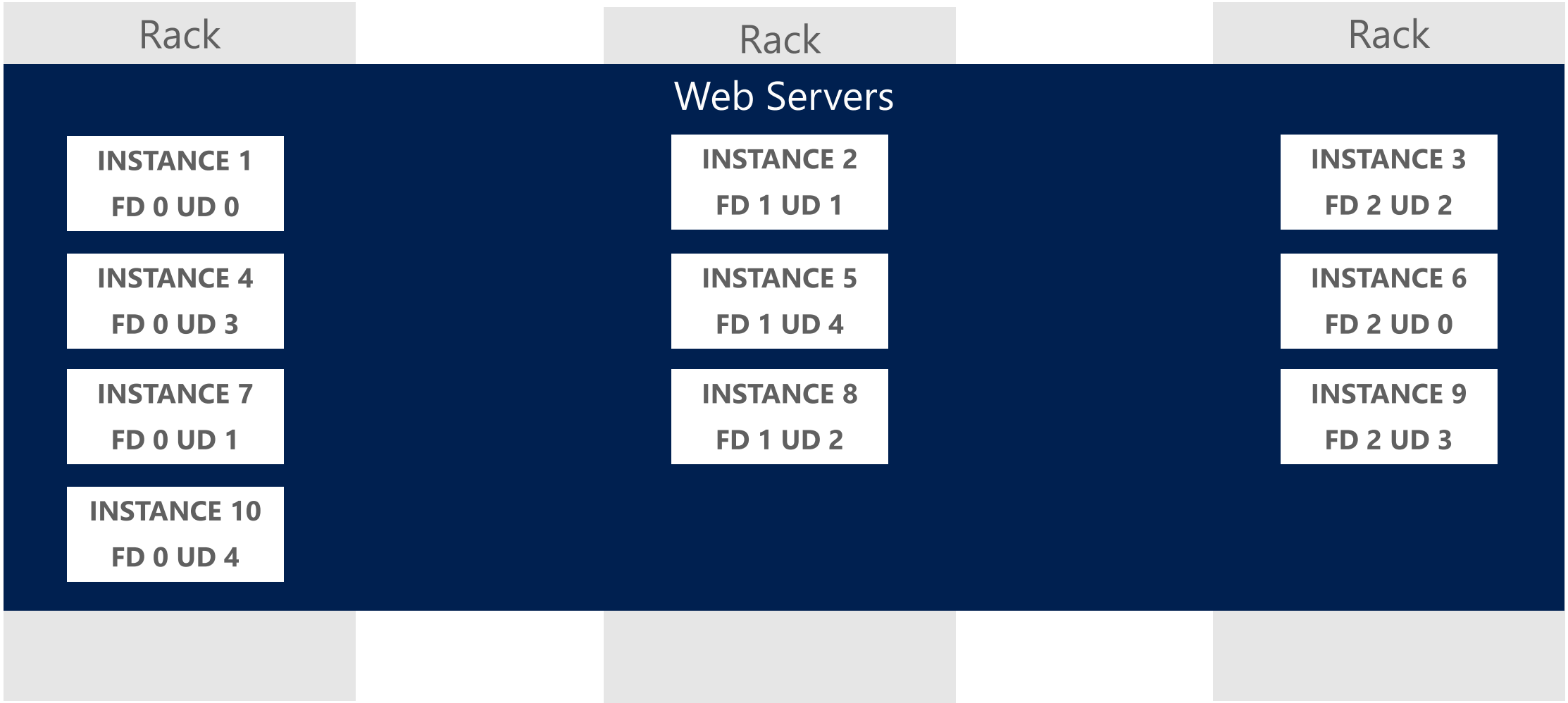
Availability Sets



Availability Sets – Rack Failure

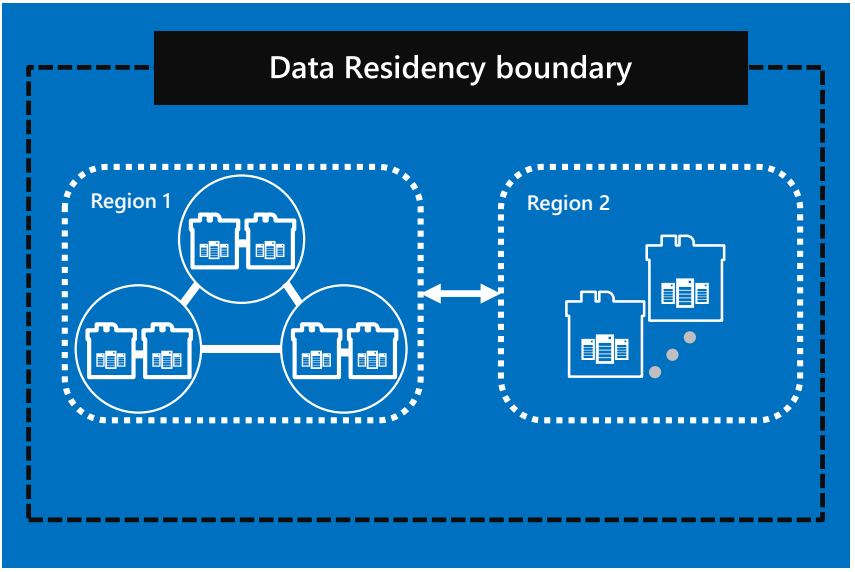


Availability Sets - Maintenance



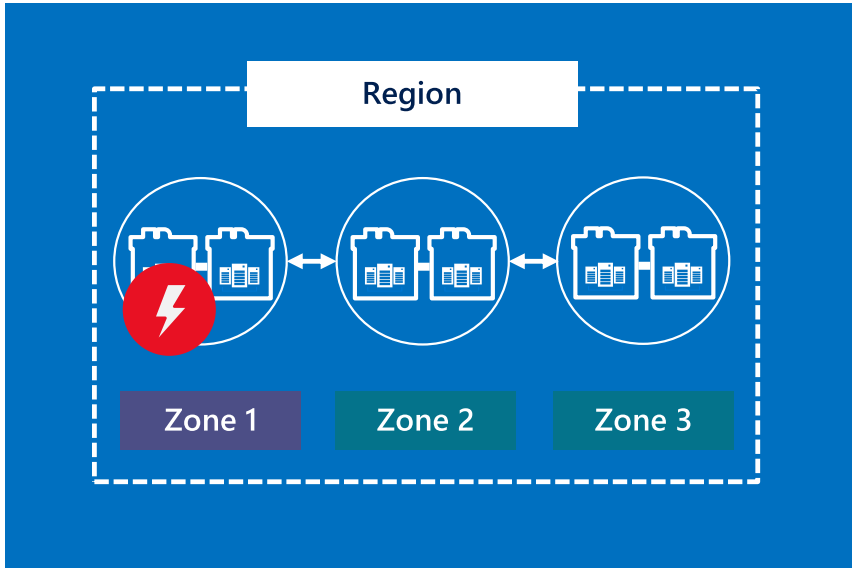
Availability Zones

Part of Azure's native HA/DR solutions, providing protection from datacenter failure



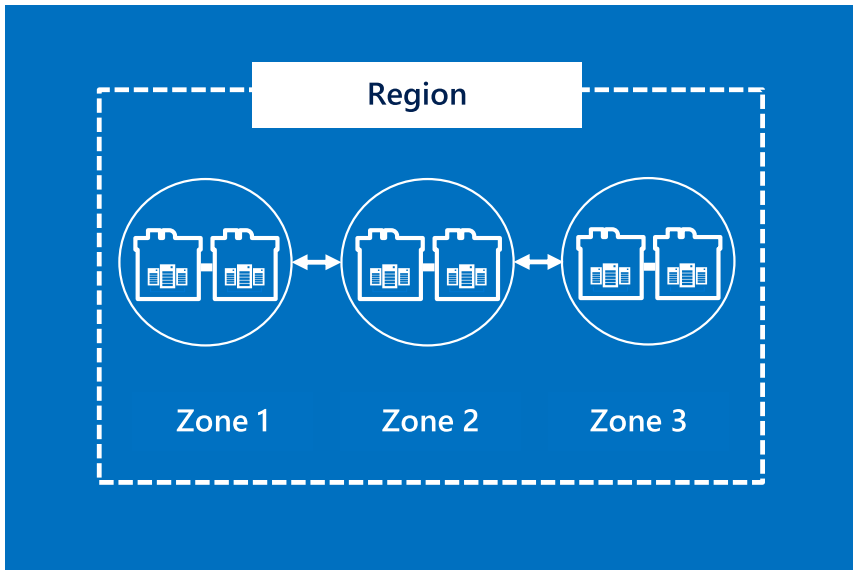
Comprehensive resiliency with Data Residency

Availability Zones and a paired region within the same data residency boundary provides high availability, disaster recovery, and backup.



Protect against entire datacenter loss

Each zone is physically separated and consists of one or more datacenters with independent power, network, and cooling. Applications and data are replicated through zone-redundant services.

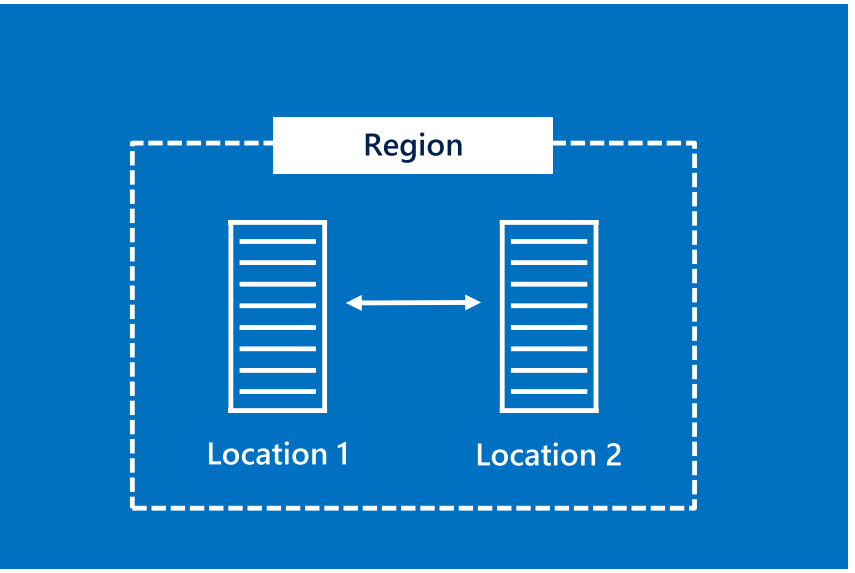


Run mission-critical applications with 99.99% SLA

High Availability supported with industry best SLA when two or more VMs are running in separate Availability Zones within a region.

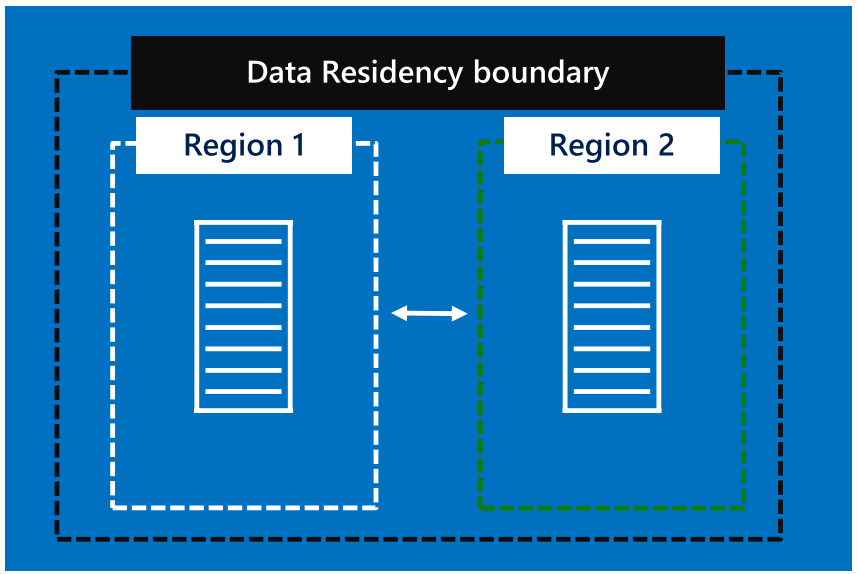
Azure business continuity

From mission critical applications to backup



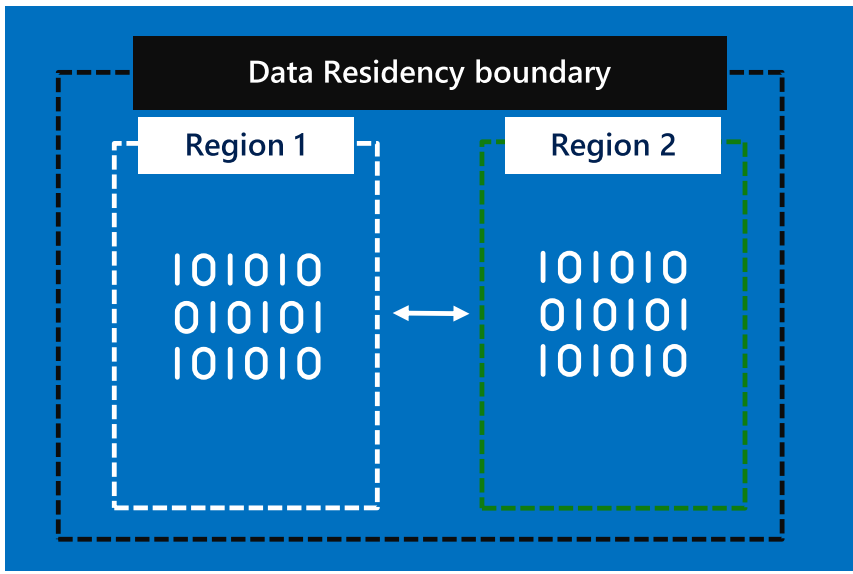
High Availability

Data is replicated to a minimum of one additional location at low latency so data and application uptime is preserved.



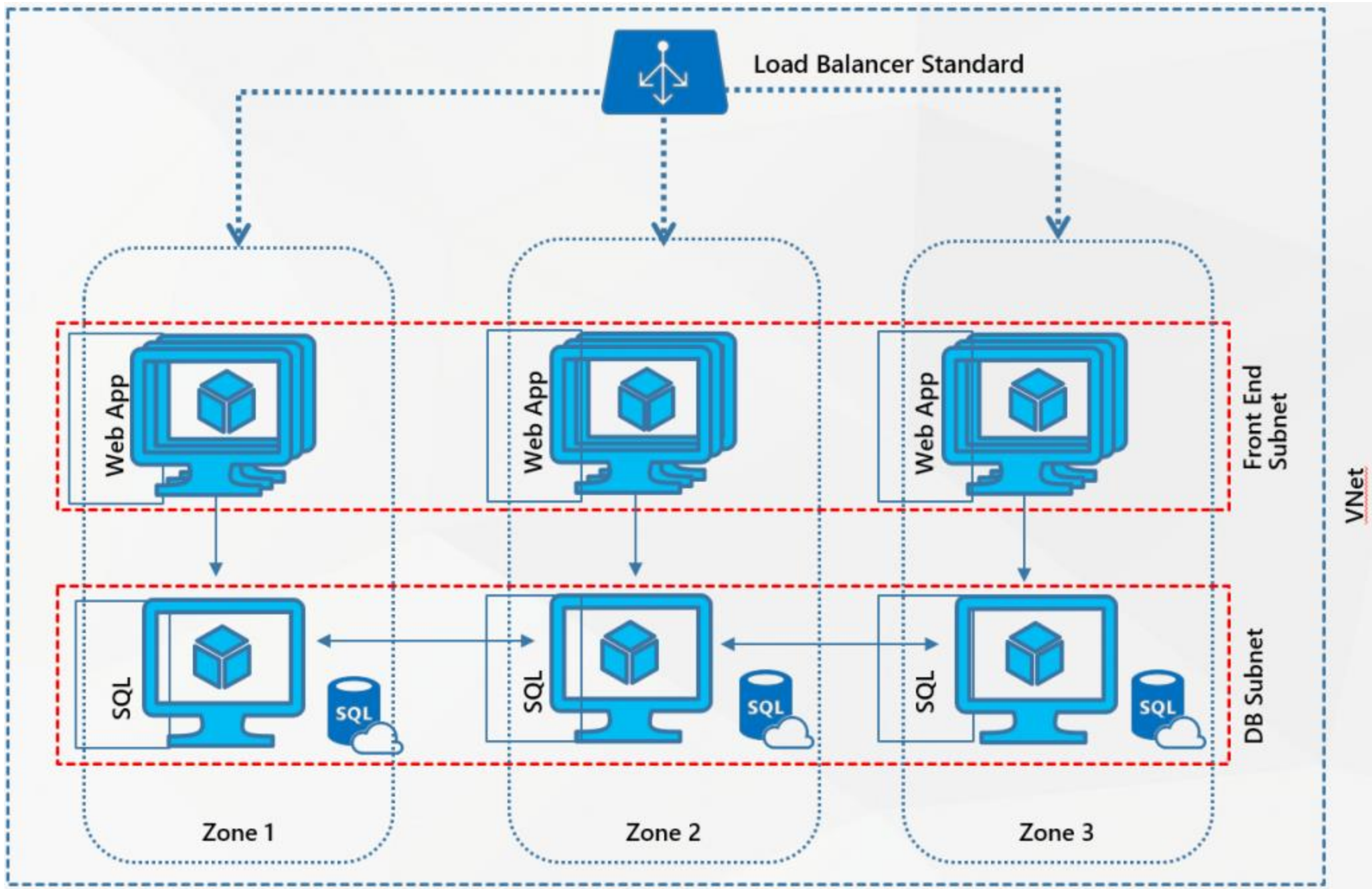
Disaster Recovery

Asynchronous replication from one region to another, with standby VMs in the other region. Azure offers protection between regions within data residency boundaries.



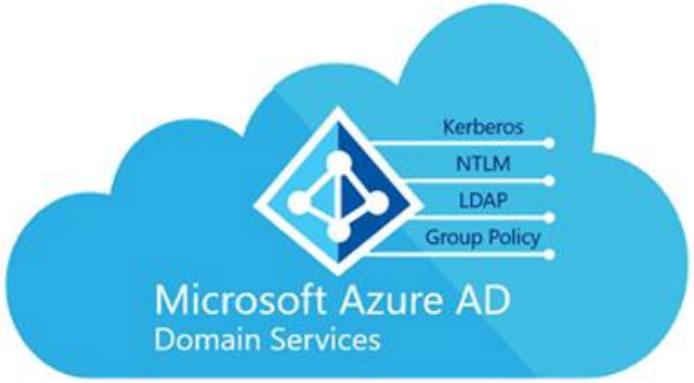
Backup

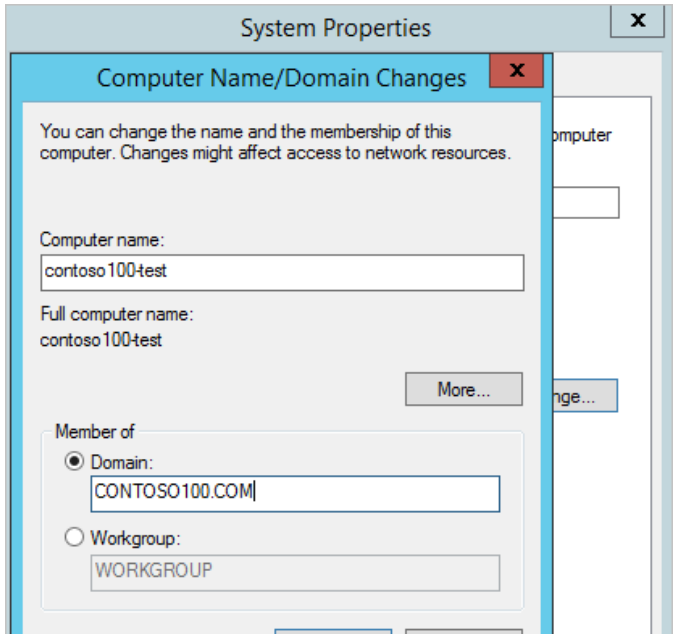
Data is asynchronously replicated and stored for redundancy purposes with data residency options.

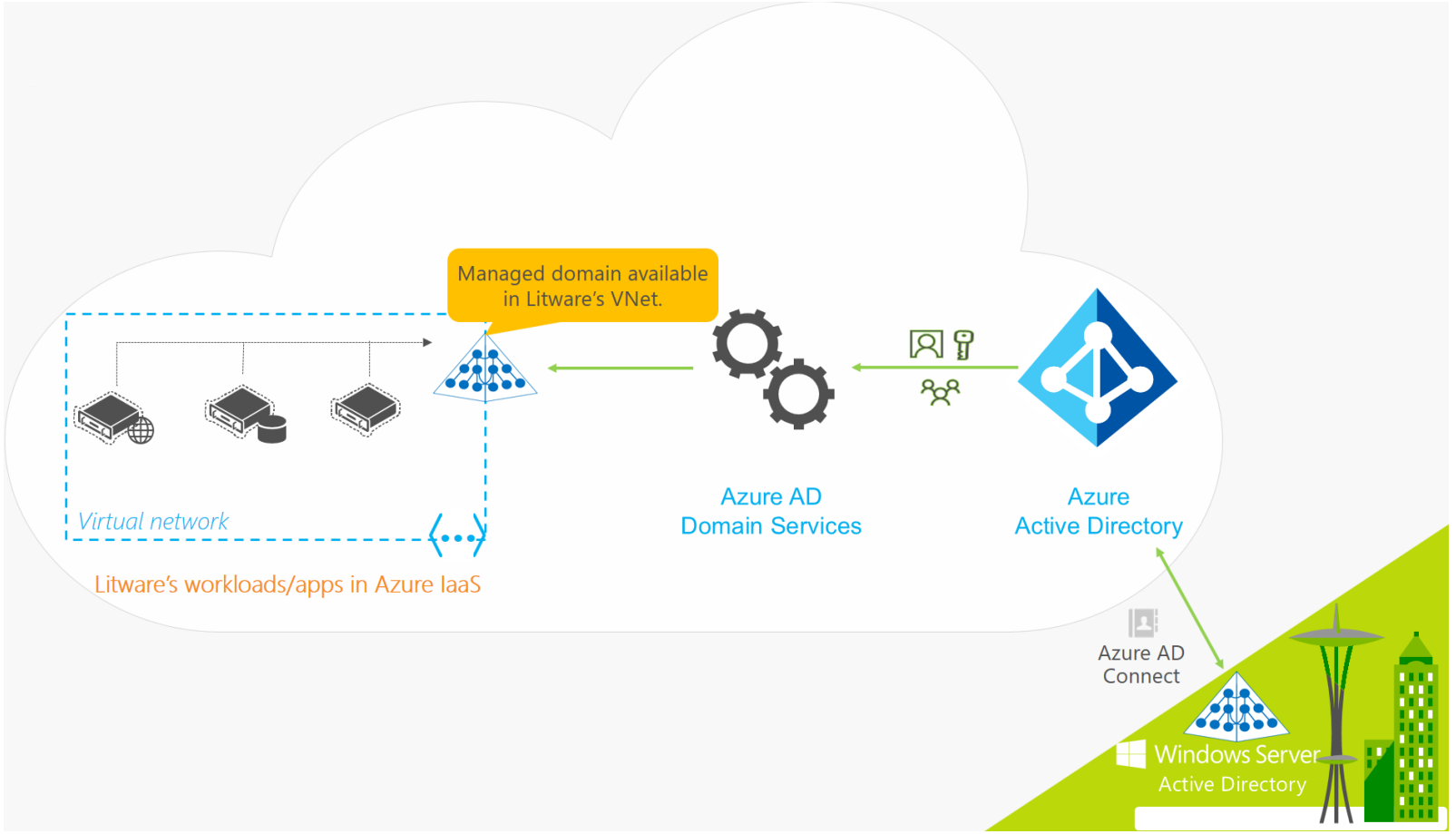

Load Balancer Standard
Web App
Web App
Web App
Front End Subnet
SQL
SQL
SQL
SQL
SQL
SQL
DB Subnet
Zone 1
Zone 2
Zone 3
VNet

Additional Concepts

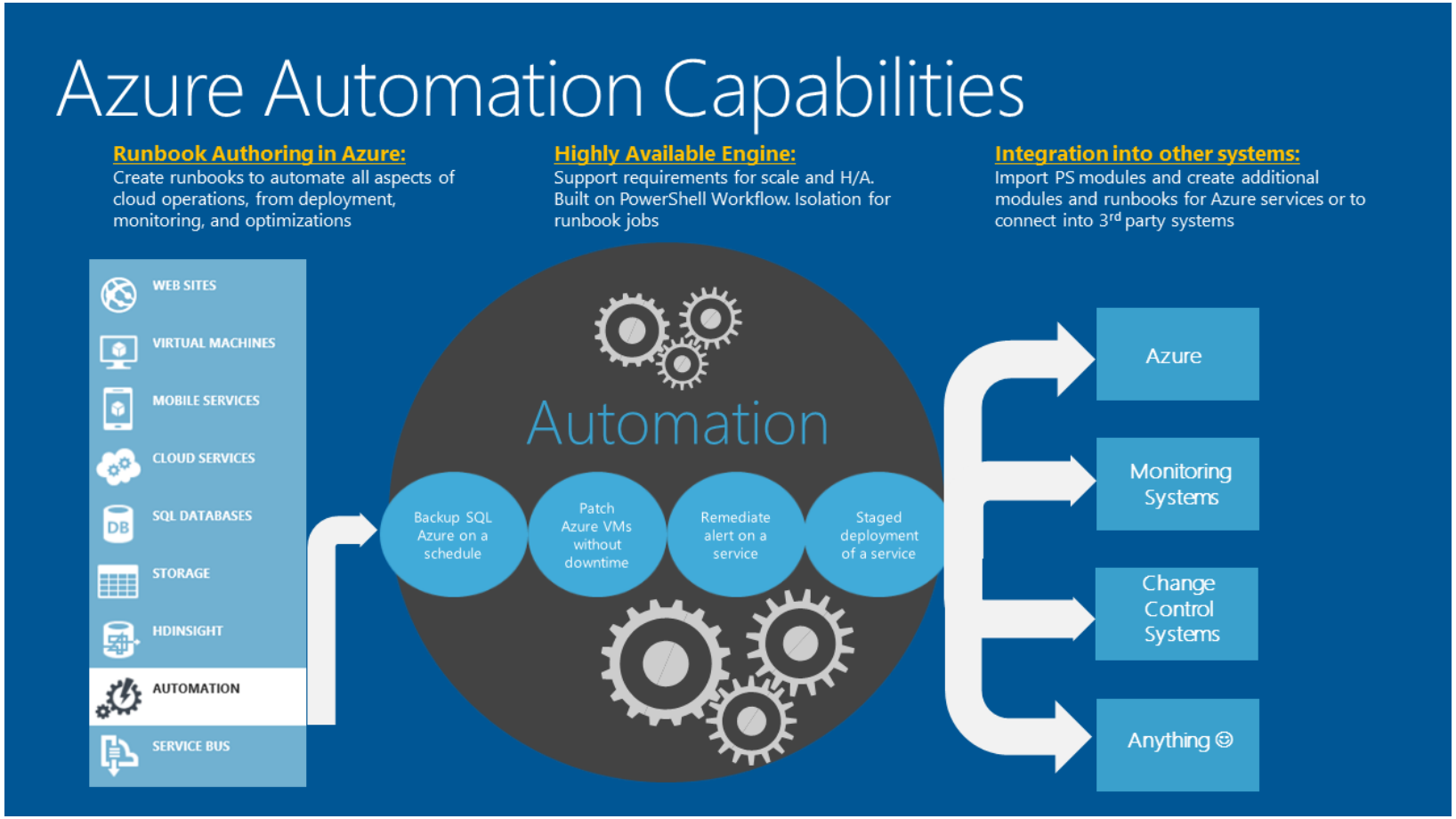
Joining a domain







Azure automation



Azure automation

Process Automation

Orchestrate processes using graphical, PowerShell, and Python runbooks

Configuration Management

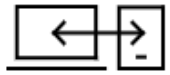
Collect inventory
Track changes
Configure desired state

Update Management

Assess compliance
Schedule update installation

Shared capabilities

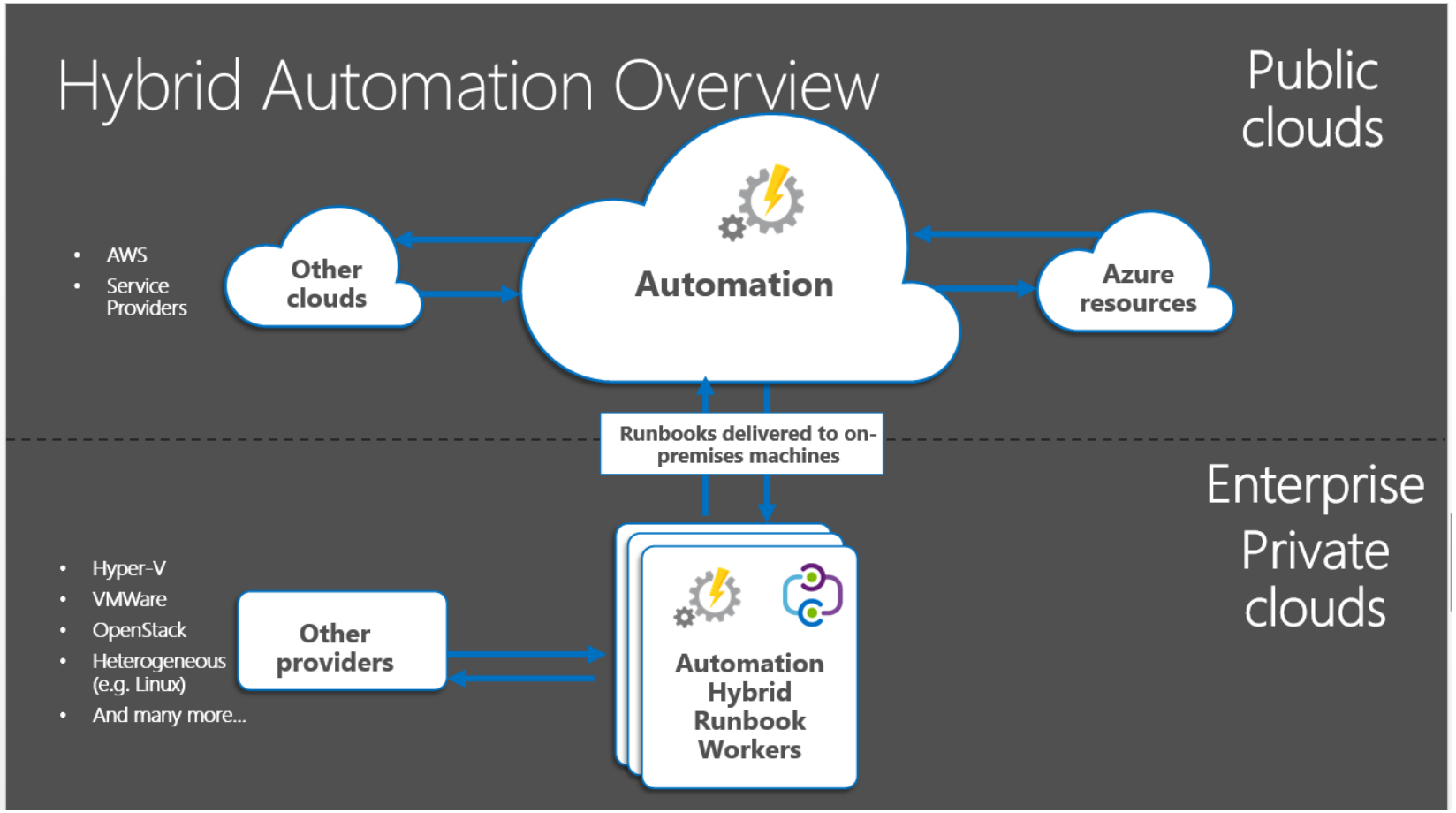
Role based access control
Secure, global store for variables, credentials, certificates, connections
Flexible scheduling
Shared modules
Source control support
Auditing
Tags



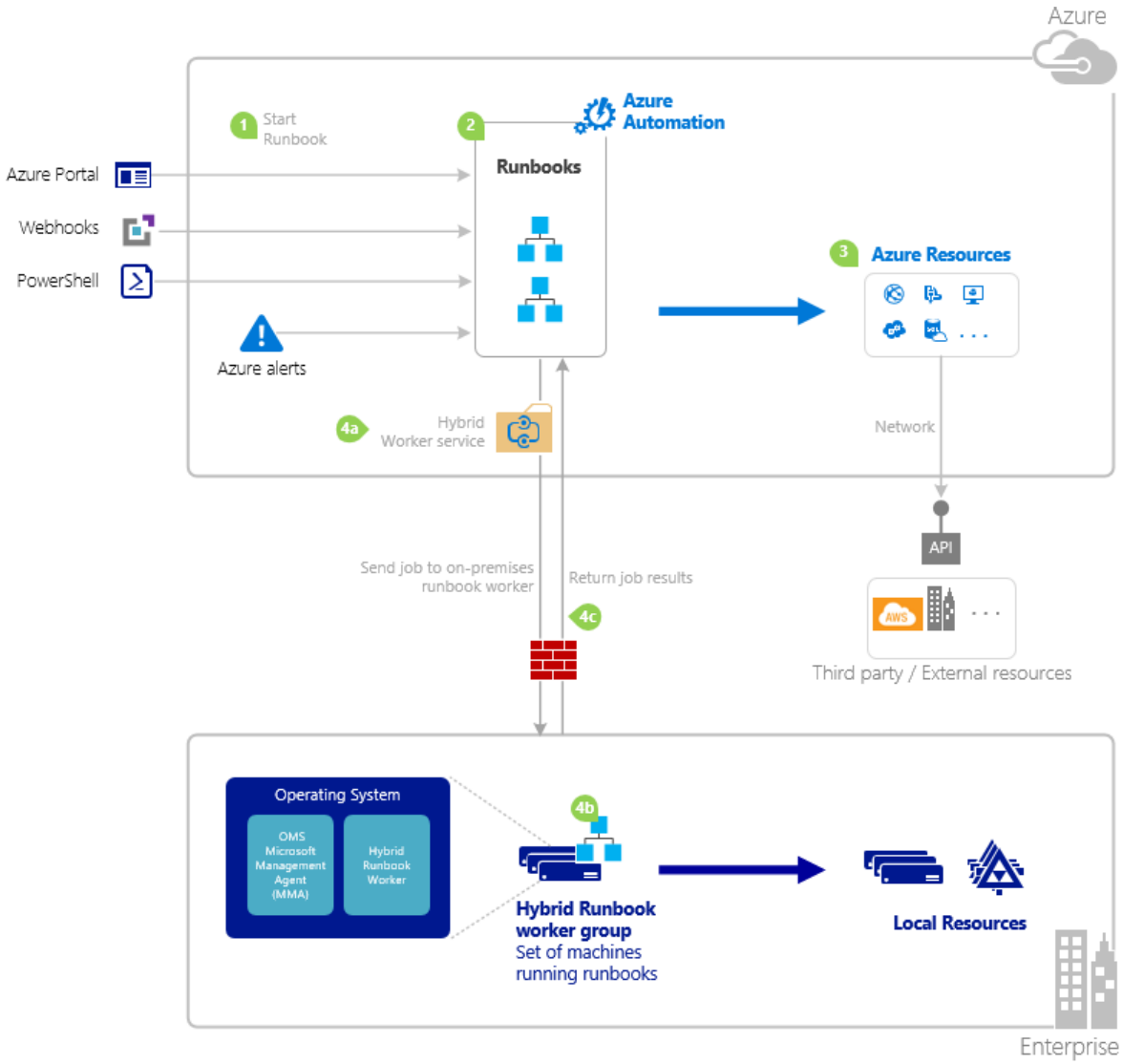
Heterogenous

Windows & Linux
Azure and on-premises

Automation overview



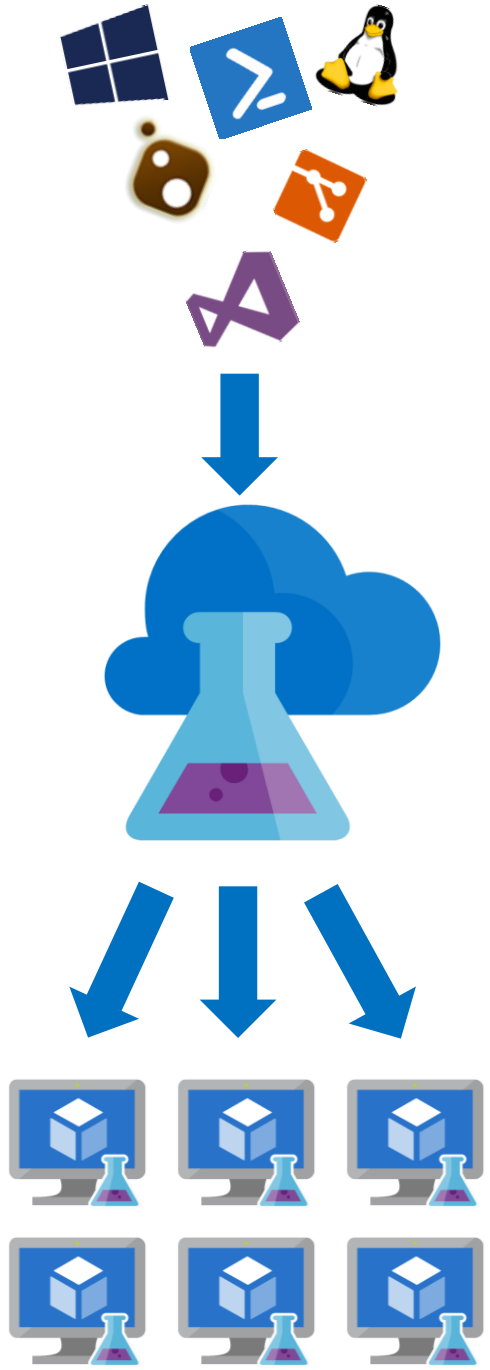
Example flow



1. An actor starts a runbook
2. Azure automation notes that a runbook should be started
3. Cloud resources - Runbook acts on local Azure resources or other external resources reachable via the network
4a. On-premises – Hybrid runbook group sends the runbook to an on-premises machine to run
4b. Runbook acts on its local networked resources
4c. Job results are returned

Azure DevTest Labs

- Manage a set of VM's or provide worry-free self-service for dev-test lab environments.
- Use "Formulas" to create reusable VM configurations
- Use "Artifacts" to create reusable VM configuration elements
- Configure policies for auto-shutdown, auto-start
- Role-based access for Owners, Contributors, Lab Users



Provisioning a VM

Hands on lab

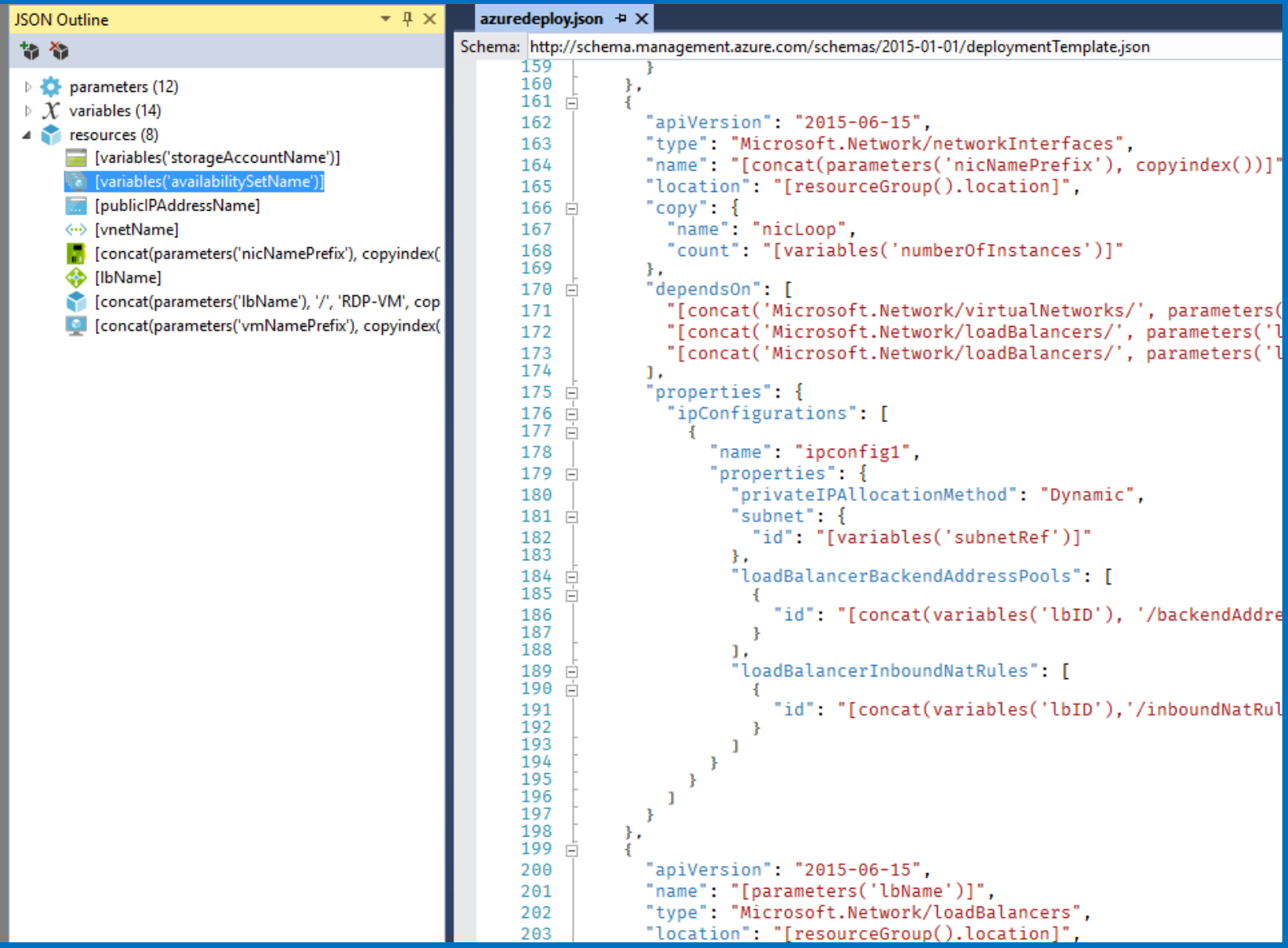
Provisioning Steps

Image	Scale	Boot
• Select an image from the VM Gallery • Upload your own Custom-Prepped Image • Use a Custom ARM Template	• General Purpose • Compute Optimized • Memory Optimized • GPU • High Performance Compute	• Create new disk in Storage • Boot the machine

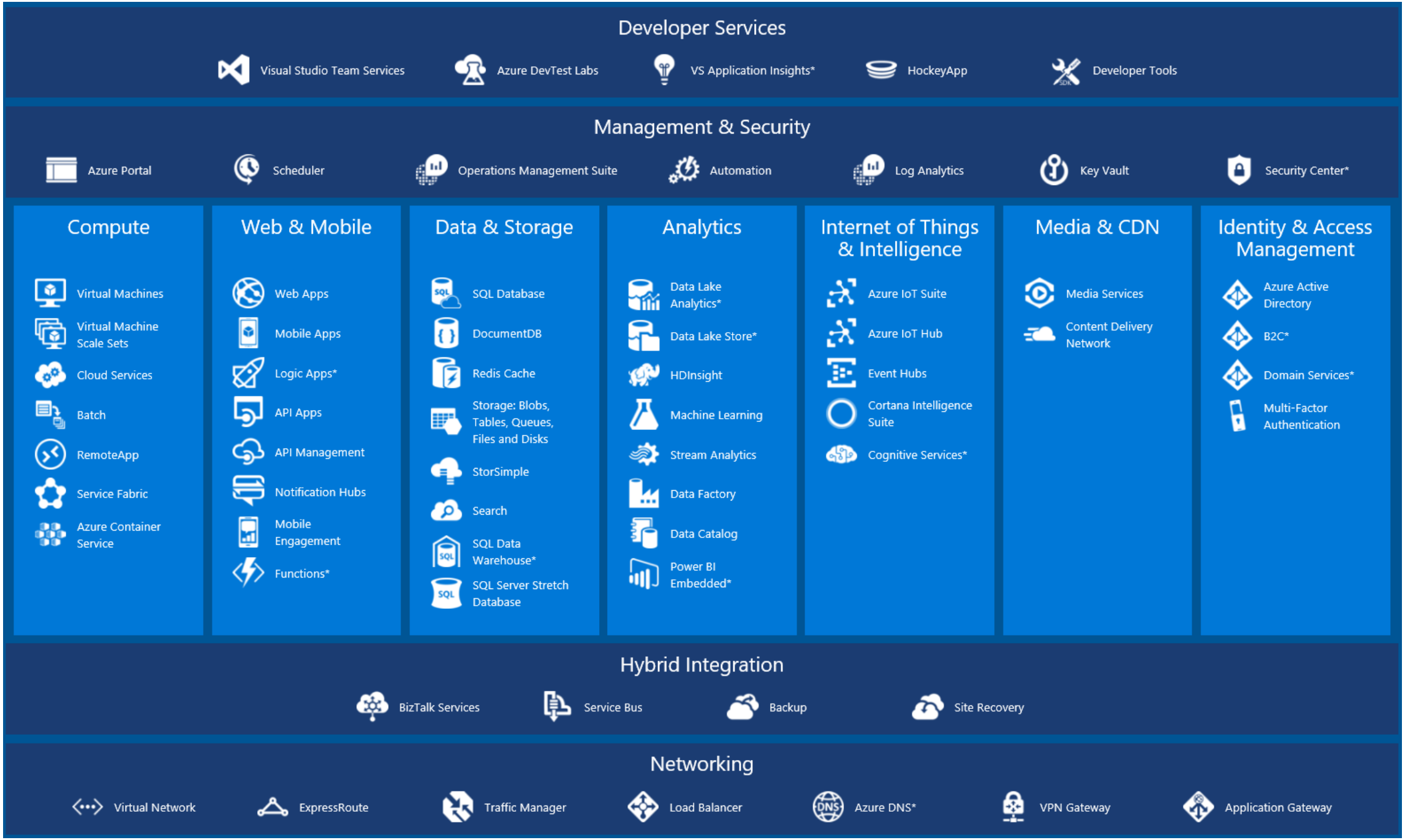
Easy as 1-2-3!

Deployment with ARM Templates

- Declarative deployment
- Maintain resources with the same lifecycle within a resource group
- Configure parameters for input/output
- Specify resources & dependencies
- Leverage Quickstart Templates or export existing resources



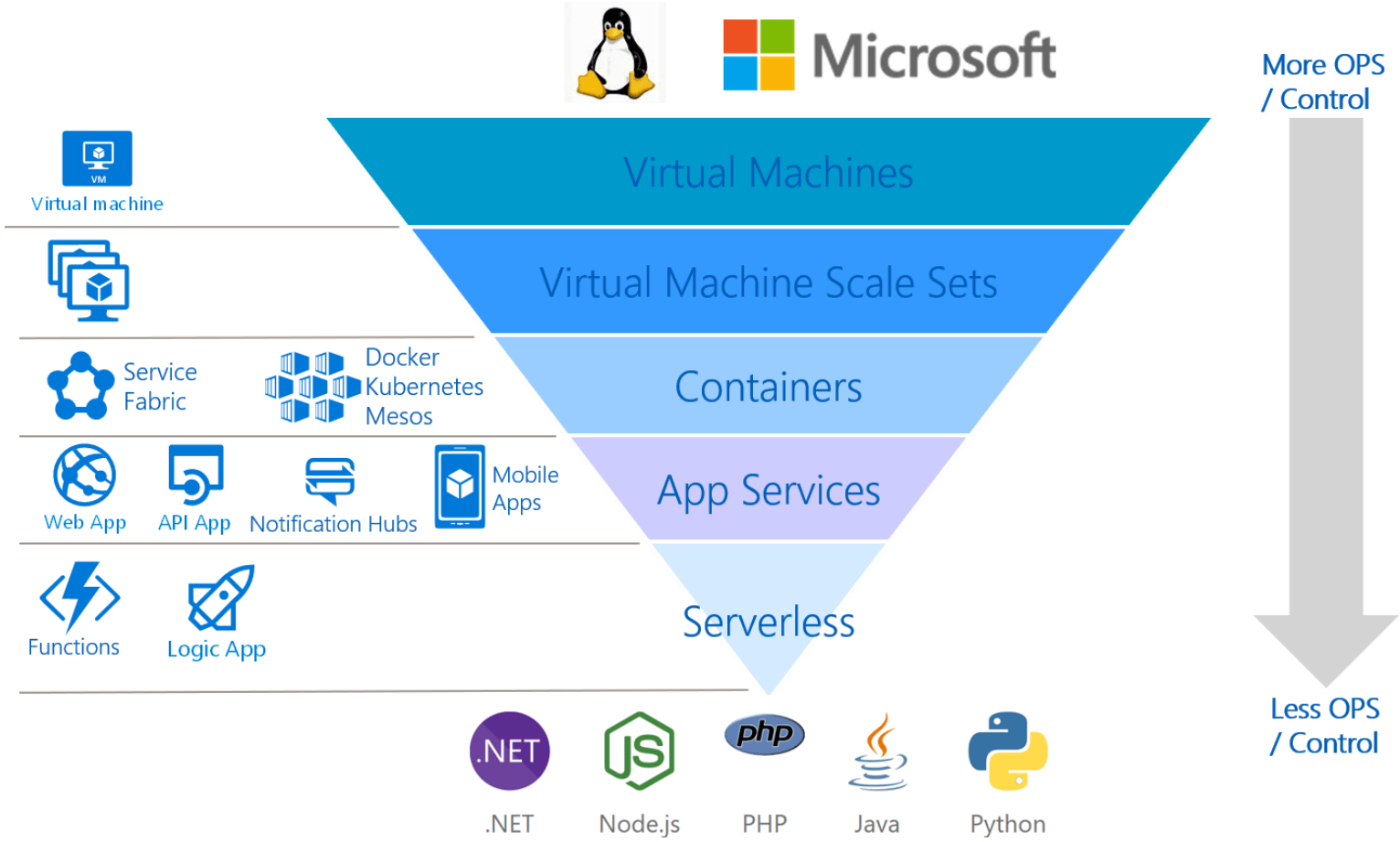
Recap


Developer Services
Visual Studio Team Services
Azure DevTest Labs
VS Application Insights*
HockeyApp
Developer Tools
Management & Security
Azure Portal
Scheduler
Operations Management Suite
Automation
Log Analytics
Key Vault
Security Center*
Compute
Virtual Machines
Virtual Machine Scale Sets
Cloud Services
Batch
RemoteApp
Service Fabric
Azure Container Service
Web & Mobile
Web Apps
Mobile Apps
Logic Apps*
API Apps
API Management
Notification Hubs
Mobile Engagement
Functions*
Data & Storage
SQL Database
DocumentDB
Redis Cache
Storage: Blobs, Tables, Queues, Files and Disks
StorSimple
Search
SQL Data Warehouse*
SQL Server Stretch Database
Analytics
Data Lake Analytics*
Data Lake Store*
HDInsight
Machine Learning
Stream Analytics
Data Factory
Data Catalog
Power BI Embedded*
Internet of Things & Intelligence
Azure IoT Suite
Azure IoT Hub
Event Hubs
Cortana Intelligence Suite
Cognitive Services*
Media & CDN
Media Services
Content Delivery Network
Identity & Access Management
Azure Active Directory
B2C*
Domain Services*
Multi-Factor Authentication
Hybrid Integration
BizTalk Services
Service Bus
Backup
Site Recovery
Networking
Virtual Network
ExpressRoute
Traffic Manager
Load Balancer
Azure DNS*
VPN Gateway
Application Gateway

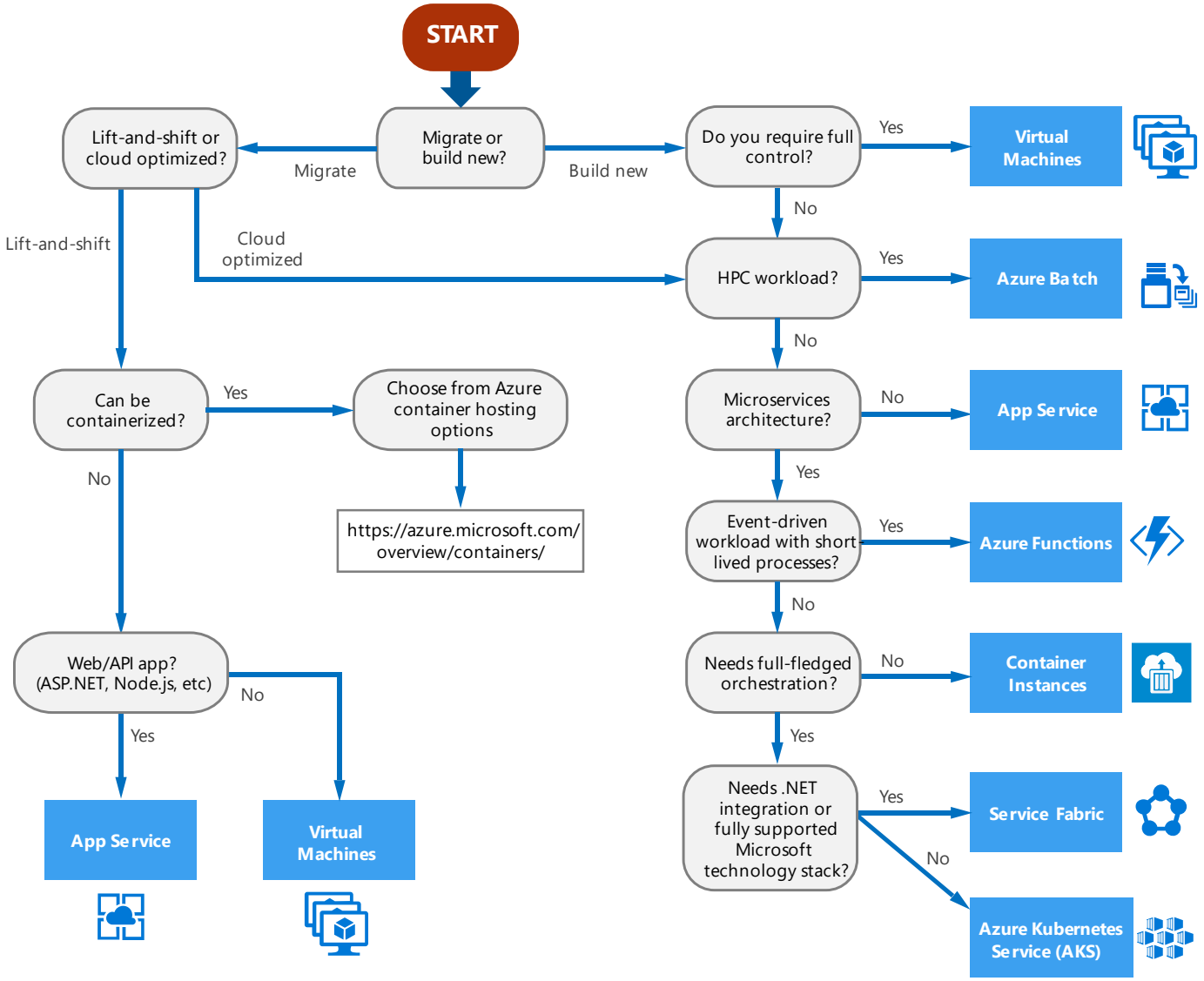
Azure Virtual Machine Benefits

- Choice
  - Choose from thousands of pre-configured VM images or configure, capture, and upload your own custom images
  - Leverage VM Extensions to do custom post-deployment configuration
- Scalability & Reliability
  - Select system profiles to best match your workload
  - Configure drives for size and performance
  - Leverage VM Scale Sets to scale from one to thousands of VM instances
- Access & Security
  - Configure Azure networking to the topology you require
  - Extend your on-premises infrastructure into the Cloud

How much control/ops do you need/want?



When to use what?



Lunch Break