

## Infrastructure as a Service (IaaS)

### Virtual Machines

#### Availability Set

- 2 fault domains for classic
- 3 fault domains for Resource Manager deployments
- 5 update domains

#### Scale Set

- Max 100 VMs
- Max 1000 VMs with placement groups (auto scale)
- Managed disks needed for large scale sets

#### VM Series

- A General purpose
- F Compute optimised
- D,E,G Memory optimised
- L Storage optimised
- N Graphic GPU optimised
- H High performance computing

### High Performance Compute

#### HPC Workload Series

- A General purpose
- N Graphic GPU optimised
- H High performance computing

#### HPC Pack

- Windows Server 2012, 2016, and Linux
- Create HPC clusters on-prem

#### Cloud-native HPC solution

- HPC head node and compute nodes
- Virtual Machine Scale Sets (VMSS)
- VMs using RDMA are placed in same VMSS
- Virtual Network
- Azure Blob Storage for node disks

#### Hybrid HPC solution

- + ExpressRoute to connect cloud with on-prem
- + VPN Gateway endpoint between cloud and on-prem

## Networking

### Virtual Network

#### VNets

- Max 50 VNets per subscription

#### Subnets

- Max 1000 subnets per VNet
- Max 10 VNet connections (peering) per subscription

#### Public Address

- Max 60 public dynamic addresses per subscription
- Max 20 public static addresses per subscription

#### Private Address

- Max 4096 private addresses per VNet

#### DNS

- DNS for multiple VNets requires own DNS server

### Application Gateway

#### Gateway

- DNS level
- Application level 7
- HTTP and HTTPS
- VNet: Any public or internal IP address
- Endpoint monitoring: Supported via probes

#### SSL

- SSL off loading to avoid costly decryption

#### Firewall

- Web Application Firewall (WAF)

### Network Security

#### DMZ

- Network Security Groups (NSG)
- User Defined Routes (UDR)
- Firewalls

#### Network Security Groups

- Inbound and outbound rules
- Checked between VMs, Vnets, and other services
- Applied to one or more subnets or network interfaces
- Low order numbers are higher priority

#### User Defined Rules

- Create UDRs & IP forwarding by creating a routing table

#### Virtual Network Service Tunneling

- Force external traffic through a site-to-site VPN tunnel

#### Web Application Firewall

- Part of Application Gateway and based on OWASP 3.0
- Can protect max 20 applications behind an App G/W
- Examples: SQL Injection, Cross-Site Scripting, Bots, ...

### Load Balancer

#### Load Balancing

- Transport Layer 4
- Any protocol
- Azure VMs and Cloud service endpoints
- VNet: Internet and internal facing
- Endpoint monitoring: Supported via probes

#### Types

- Basic
- Standard ... up to 1000 VMs, HA ports, and NSG.

### Traffic Manager

#### Traffic management

- DNS level
- Any protocol
- VMs, Cloud Service, Web Apps, and external endpoints
- VNet: Internet facing
- Endpoint monitoring: HTTP/HTTPS GET

#### Load balancing

- Use with load balancer for high-avail and high-per

### External Connectivity

#### Azure VPN

- Basic – max 10 site-site, 128 point-site, avg 100Mbps
- VpnGw1 – max 30 site-site, 128 point-site, avg 650Mbps
- VpnGw2 – max 30 site-site, 128 point-site, avg 1Gbps
- VpnGw3 – max 30 site-site, 128 point-site, avg 1.25Gbps

#### Site-to-site

- Requires Routing and Remote Access Service (RRAS)
- Internet Protocol Security (IPSec) connection
- Internet Key Exchange (IKE) management protocol

#### Point-to-site

- Connect IKE2 or Secure Socket Tunneling Protocol (SSTP)
- No RRAS device required

#### VNet-to-Vnet

- Max 10 VNet connections (peering) per subscription

#### ExpressRoute

- Any-to-Ant (IPVPN) – provider sets up secure connection
- Point-to-Point Ethernet –two provider connections
- Co-Located at Cloud Exchange – two cross connections

## Azure Web Apps

### App Service Plans

#### Free and Shared

##### Basic

- Up to 3 instances (manual)

##### Standard

- Up to 10 instances (auto scale)
- 5 Slots
- Daily backups
- Azure Traffic Manager

##### Premium

- Up to 20 instances (auto scale)
- 20 Slots
- Daily backups
- Azure Traffic Manager

##### Isolated

- App Service Environment (ASE) – scalable, secure
- Up to 100 instances/plan or 100 plans with one instance

### Redis Cache

#### Basic

- Ideal for development, testing, and non-critical work
- No SLA

#### Standard

- Ideal for production and cost effective
- Data replication between two nodes
- High availability SLA

#### Premium

- Redis persistence
- Create workloads > 53GB
- Ability to isolate

### Content Delivery Network (CDN)

#### Cache static content to multiple regions

### Traffic Manager

#### Routing methods

- Performance
- Weighted
- Priority
- Geographic

#### Handle load & locate closest geo region at DNS level

### Scalability

#### Up

- Select different (better) Service Plan

#### Out

- Scale out Web App manually or automatically

## Serverless and Microservices

### Functions

#### Serverless compute service

##### Event-driven actions and triggers

- HTTP-based API endpoints (HTTP triggers)
- Timer triggers

##### Programming Languages

- C#, F#, Node.js, Java, PHP, PowerShell, Batch, JavaScript, Python, Typescript

##### Plans

- Consumption App Service Plan (cost effective)
- Other App Service Plans

### Containers

#### Azure Container Instances (ACI)

- One ACI = one Docker container
- Role Based Access Control (RBAC)
- Short-running workloads

#### Azure Container Services (AKS)

- Load balancing
- Orchestration
- Long running workloads

### API Management

#### Service that exposes different apps as APIs

##### API Gateway

- Bridge between app and outside world
- Enhanced security, policies, authentication
- Caching, throttling

##### API Management Portal

- Define custom APIs
- Package APIs into open or protected products

##### Developer Portal

- Developers can access APIs and documentation

### Logic Apps

#### Workflow Driven

##### Integration with cloud and on-prem services

- BizTalk, ...

### Deployments vs Migrations

#### Cloud Infrastructure Ready

- Host on VMs as-is

#### Cloud DevOps Ready

- Use containers to develop and deploy
- Decouple application from infrastructure

#### Cloud Optimised

- Modernise mission critical applications



## Hybrid Applications



Storage Options	SQL Databases	MySQL	PostgreSQL	Cosmos DB	Blob	Table	Queue	File	Disk	Data Lake Store	SQL Data Warehouse
Relational data	X	X									
Object-relational data			X								
Unstructured data				X	X						
Semi-structured data						X					
Queue messages							X				
Files on disk								X			
High-performance files on disk									X		
Store large data					X			X	X	X	X
Store small data	X	X	X	X		X	X	X	X		
Geographic data replication	X			X							

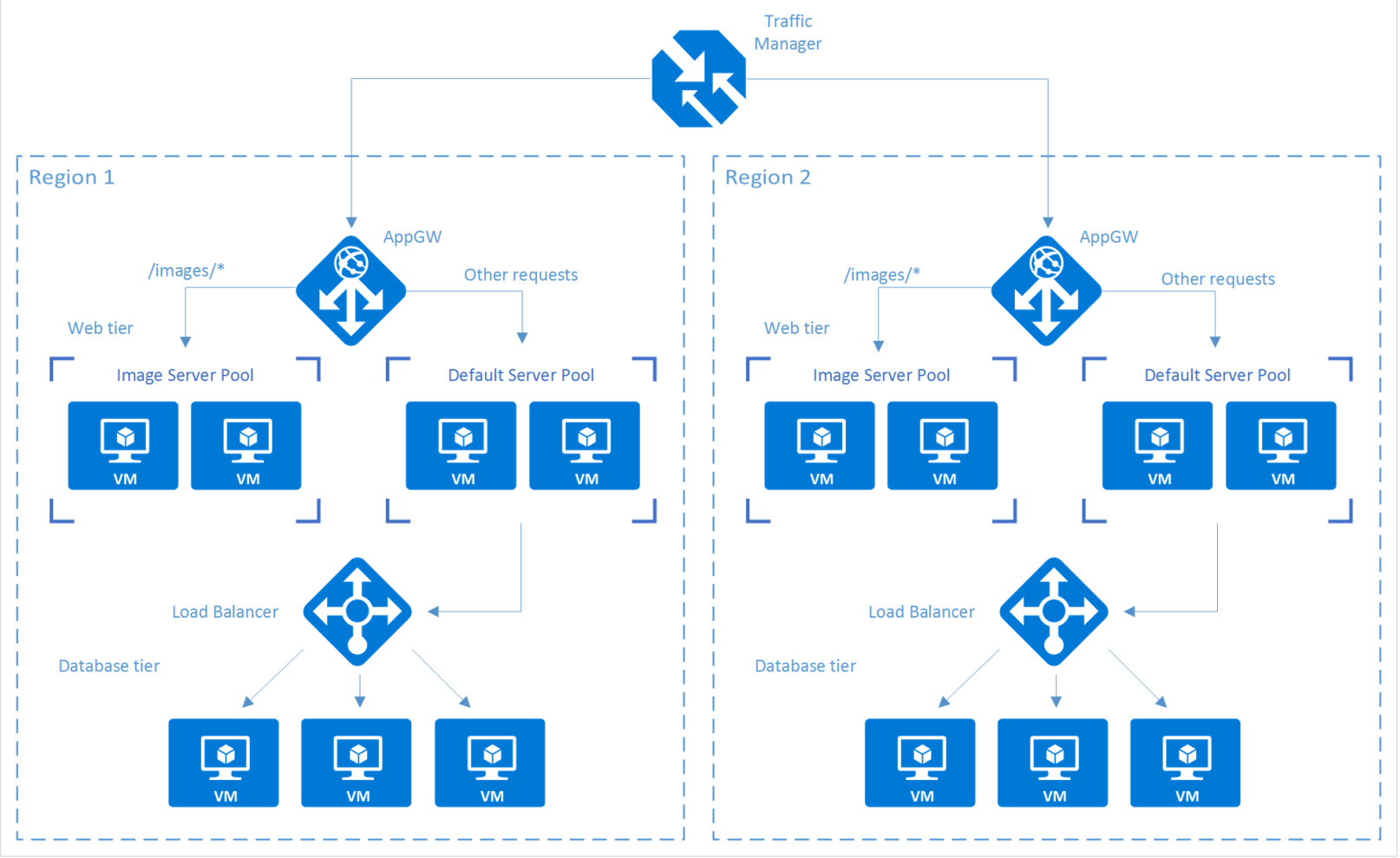


Azure Service Bus Queues	Azure Storage Queues
Message lifetime < 7 days	Message lifetime > 7days
Guaranteed (first in–first out) ordered	Queue size >80 GB
Duplicate detection	Transaction logs
Message size ≤1 MB	Message size ≤64 KB



Service for Msg/Events	Event Grid	Event Hubs	IoT Hub	Topics	Service Bus Queues	Storage Queues
Event ingestion	X	X	X			
Device management			X			
Messaging	X	X	X	X	X	X
Multiple consumers	X	X	X	X		
Multiple senders	X	X	X	X	X	X
Use for decoupling		X	X	X	X	X
Use for publish/subscribe	X					
Max message size	64 KB	256 KB	256 KB	1 MB	1 MB	64 KB

Containerisation	Azure Container Services	Azure Container Instances	Azure Service Fabric
For production deployments of complex systems (with a container orchestrator)	X		
For running simple configurations (possibly without orchestrator)		X	
For long-running workloads on containers	X		
For short-running workloads on containers		X	
For orchestrating a system based on containers	X		X
Orchestrating with open-source orchestrators ( <a href="#">DC/OS</a> , <a href="#">Docker Swarm</a> , <a href="#">Kubernetes</a> )	X		
Orchestrating with built-in orchestrator			X



Service	Azure Load Balancer	Application Gateway	Traffic Manager
Technology	Transport level (Layer 4)	Application level (Layer 7)	DNS level
Application protocols supported	Any	HTTP and HTTPS	Any (An HTTP endpoint is required for endpoint monitoring)
Endpoints	Azure VMs and Cloud Services role instances	Any Azure Internal IP address or public internet IP address	Azure VMs, Cloud Services, Azure Web Apps, and external endpoints
Vnet support	Can be used for both Internet facing and internal (Vnet) applications	Can be used for both Internet facing and internal (Vnet) applications	Only supports Internet-facing applications
Endpoint Monitoring	Supported via probes	Supported via probes	Supported via HTTP/HTTPS GET

