

# AZ-305 Agenda

Module 01 Design a governance solution

Module 02 Design a compute solution

Module 03 Design a non-relational data storage solution

Module 04 Design a data storage solution for relational data

Module 05 Design a data integration solution

Module 06 Design an application architecture solution

Module 07 Design Authentication and Authorization Solutions

Module 08 Design a solution to log and monitor Azure resources

Module 09 Design a network infrastructure solution ←

Module 10 Design a business continuity solution

Module 11 Design a migration solution

# Design a network infrastructure solution



# Learning Objectives

- Recommend a network architecture solution based on workload requirements
- Design for Azure network connectivity services
- Design for on-premises connectivity to Azure virtual networks
- Design for application delivery services
- Design for application protection services
- Case study
- Learning recap

LB  
App GW

## AZ-305: Design Infrastructure Solutions (30-35%)

### Design network solutions

- Recommend a connectivity solution that connects Azure resources to the internet
- Recommend a connectivity solution that connects Azure resources to on-premises networks
- Recommend a solution to optimize network performance
- Recommend a solution to optimize network security
- Recommend a load-balancing and routing solution

Recommend a network  
architecture solution based  
on workload requirements



# Defense in Depth (activity)

Provide a layered approach and multiple levels of protection.



Layers

Compute

Perimeter

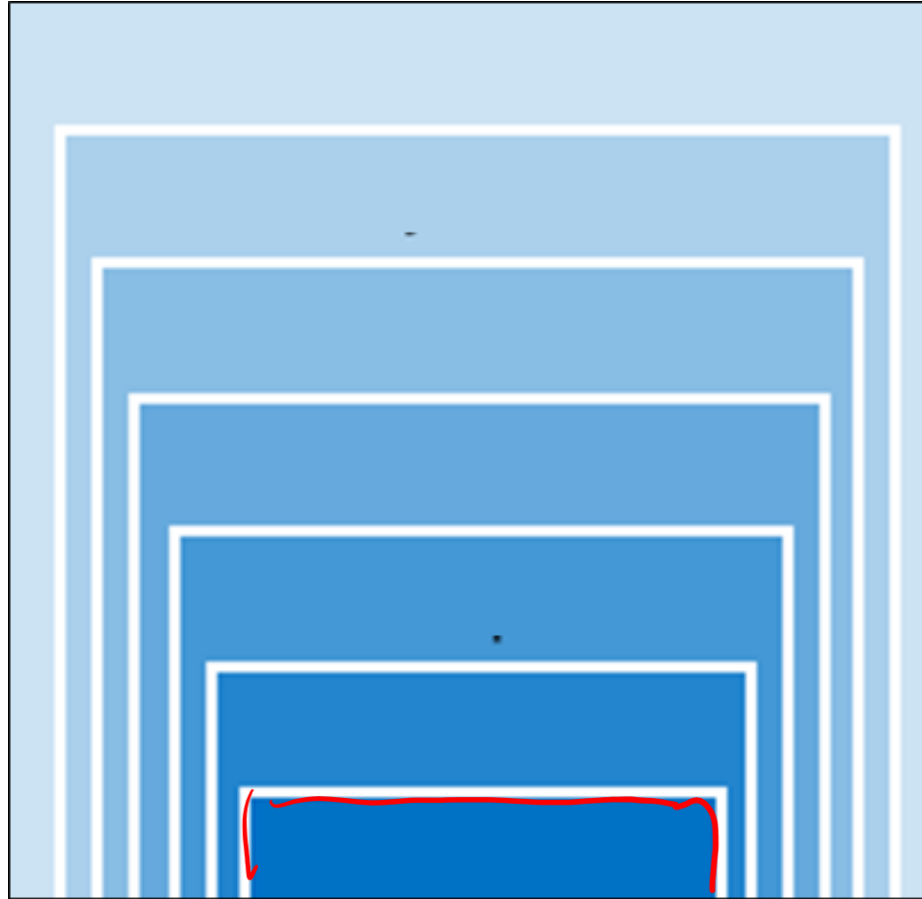
Identity & Access

Application

Data

Physical Security

Network



- Application Security Groups "Label"
- Azure Firewall ←
- Network Security Groups ← NSG
- Conditional Access
- Datacenter security
- Container security
- DDoS ←
- Azure Information Protection
- Defender for Cloud Storage
- Privileged Identity Management
- Azure Key Vault
- Host security

# Gather Network Requirements

## Plan Virtual Networks and subnets – design considerations

- Naming
- Regions
- Subscriptions
- Segmentation
- Security
- Connectivity
- Permissions
- Policy

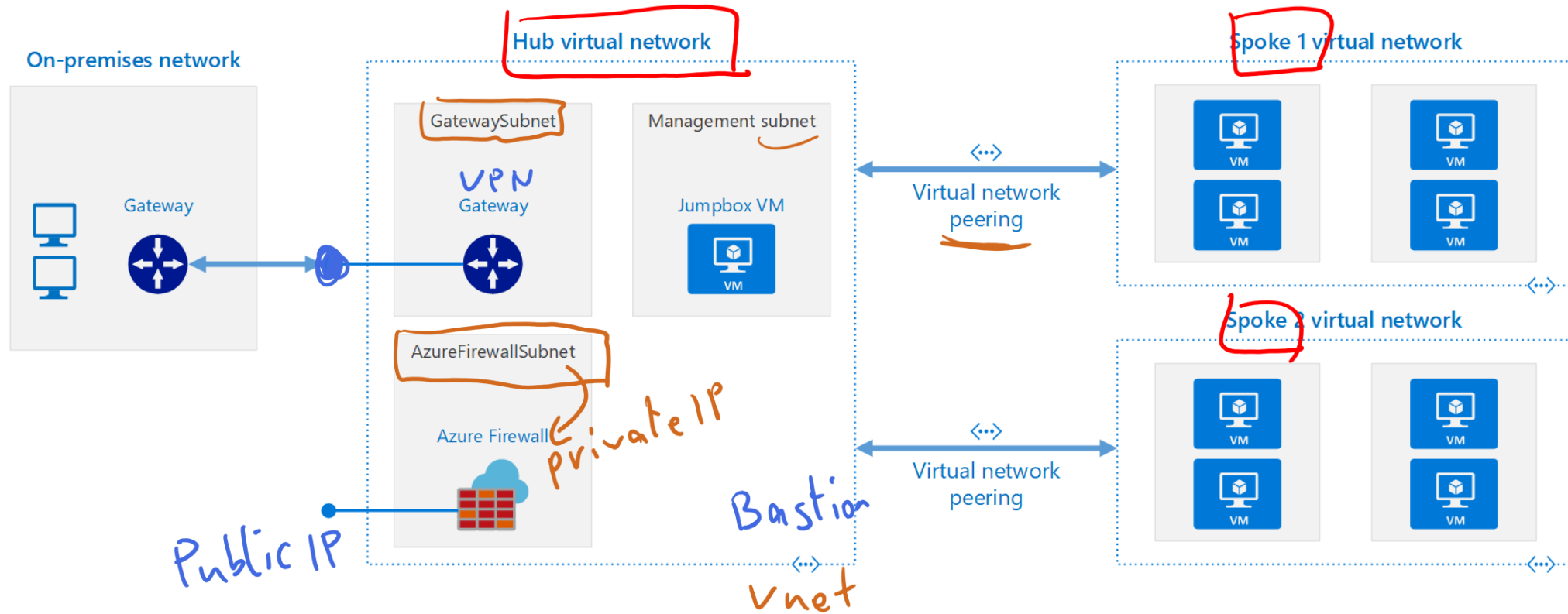


# Design for Azure network connectivity services



# Design Azure Virtual networks

Azure Virtual Network is the fundamental building block for your private network in Azure. A virtual network is a virtual, isolated portion of the Azure public network. Use VNets to communication between Azure resources, the internet and on-premises networks.





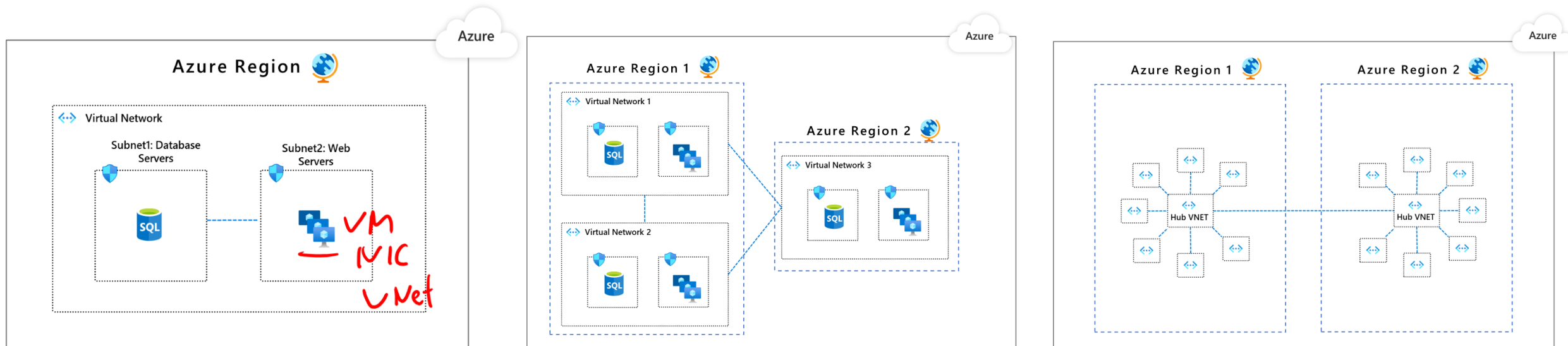
# Design network topology

Segmentation is a model in which you take your networking footprint and create software defined perimeters using tools available in Microsoft Azure.

**Pattern 1:** Single Virtual Network

**Pattern 2:** Multiple Virtual Networks with peering in between them

**Pattern 3:** Multiple Virtual Networks in a hub & spoke model



# Design Outbound Connectivity

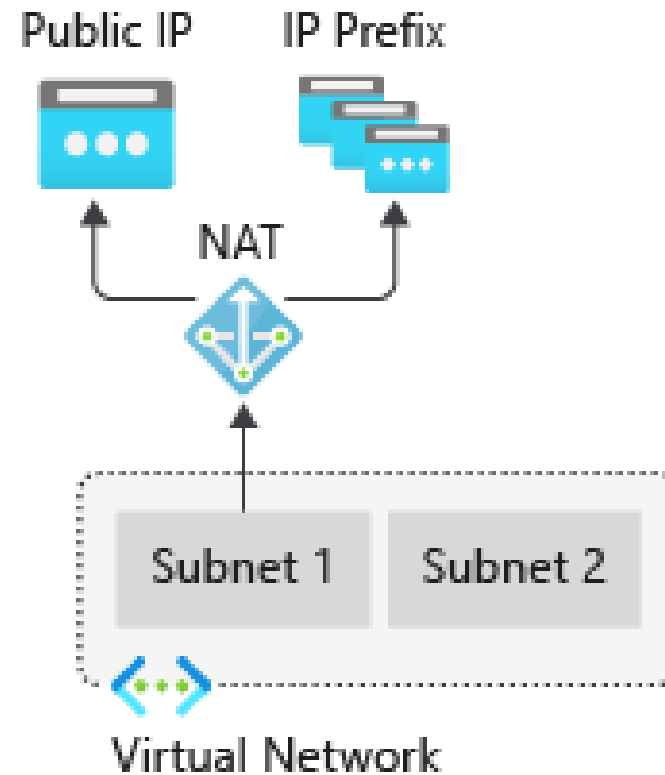
Virtual Network NAT (network address translation) simplifies outbound-only Internet connectivity for virtual networks. When configured on a subnet, all outbound connectivity uses your specified static public IP addresses. NAT is fully managed and highly resilient.

## Options include:

- Azure Firewall
- Load balancer
- Virtual Network NAT gateway

## Choose Virtual Network NAT gateway when:

- You need on-demand outbound to internet connectivity without pre-allocation
- You need one or more static public IP addresses for scale
- You need configurable idle timeout
- You need TCP reset for unrecognized connections



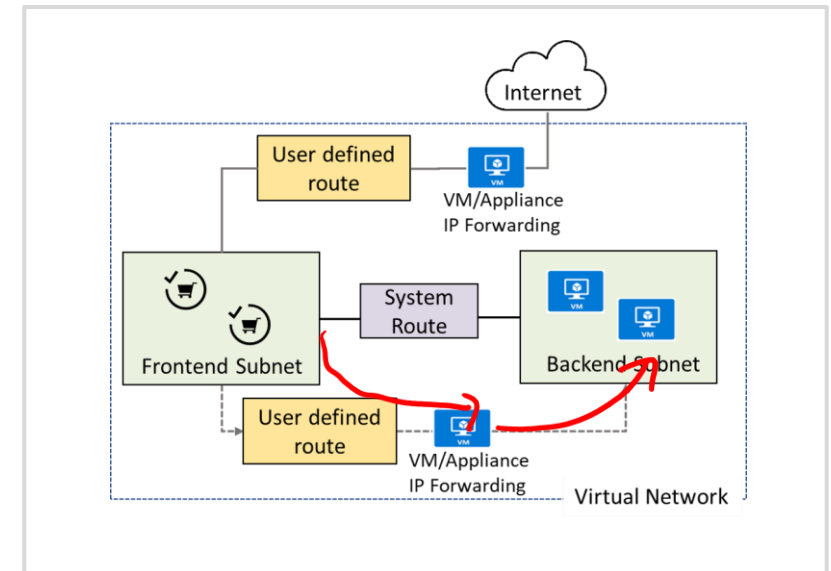
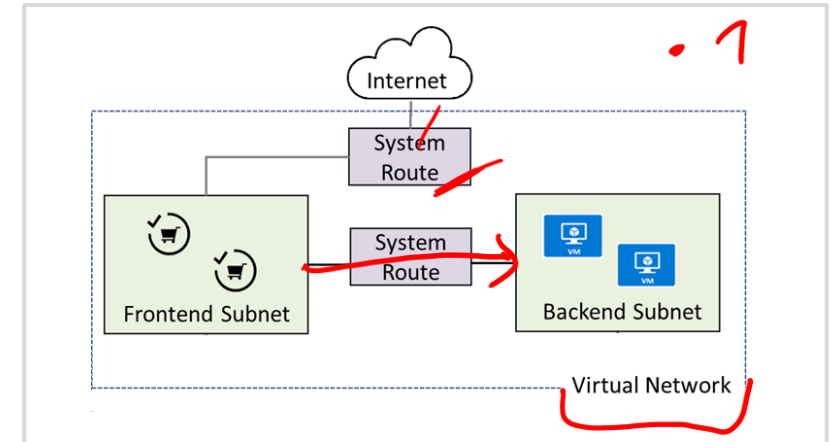
# Design Routing

- When you create a virtual network for the first time without defining any subnets, Azure creates routing entries in the routing table.
- When creating subnets inside a virtual network, Azure creates default entries in the routing table to enable communication between subnets within a virtual network.
- When creating a virtual network peering between two virtual networks, a route is added for each address range within the address space of each virtual network for which a peering is created.

## Types and priority of routes:

- User Defined Routes (UDR) ←
- BGP routes
- System routes

NVA



# Design for on-premises connectivity to Azure virtual networks



# VPN connection

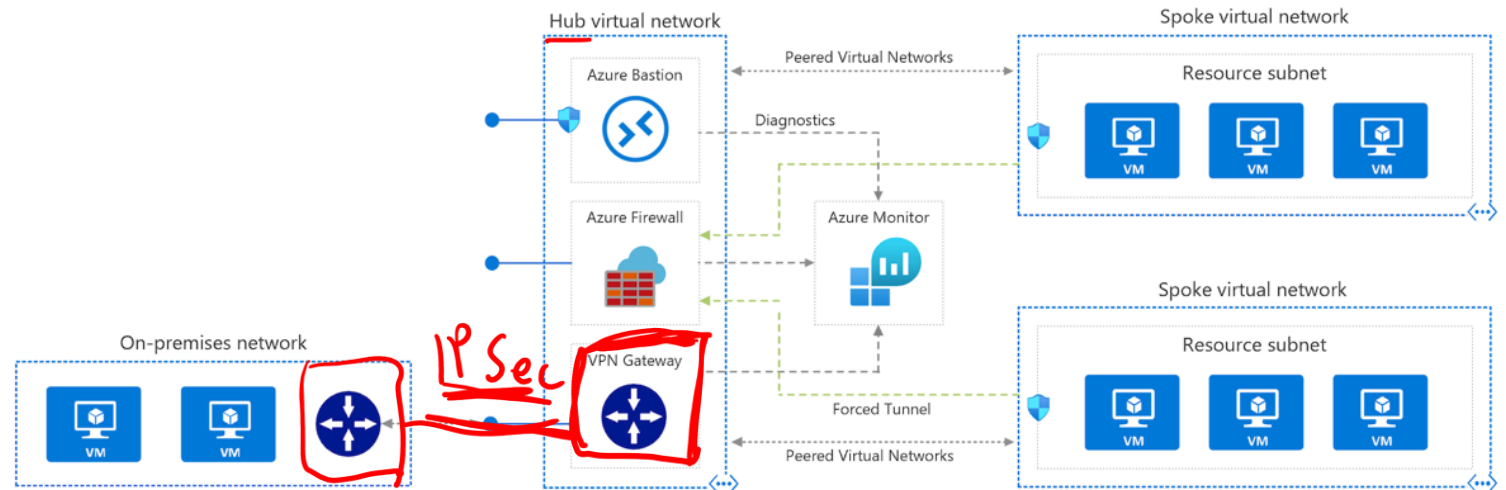
A VPN gateway is a type of virtual network gateway that sends encrypted traffic between an Azure virtual network and an on-premises location.

## Benefits

- Simple to configure
- Up to 10 Gbps depending on the VPN Gateway SKU

## Challenges

- Requires an on-premises VPN device
- The SLA only covers the VPN gateway, and not your network connection to the gateway or throughput



Site-to-site VPN  
Point-to-site  
HTTPS  
open VPN

# Azure ExpressRoute and ExpressRoute Direct connection

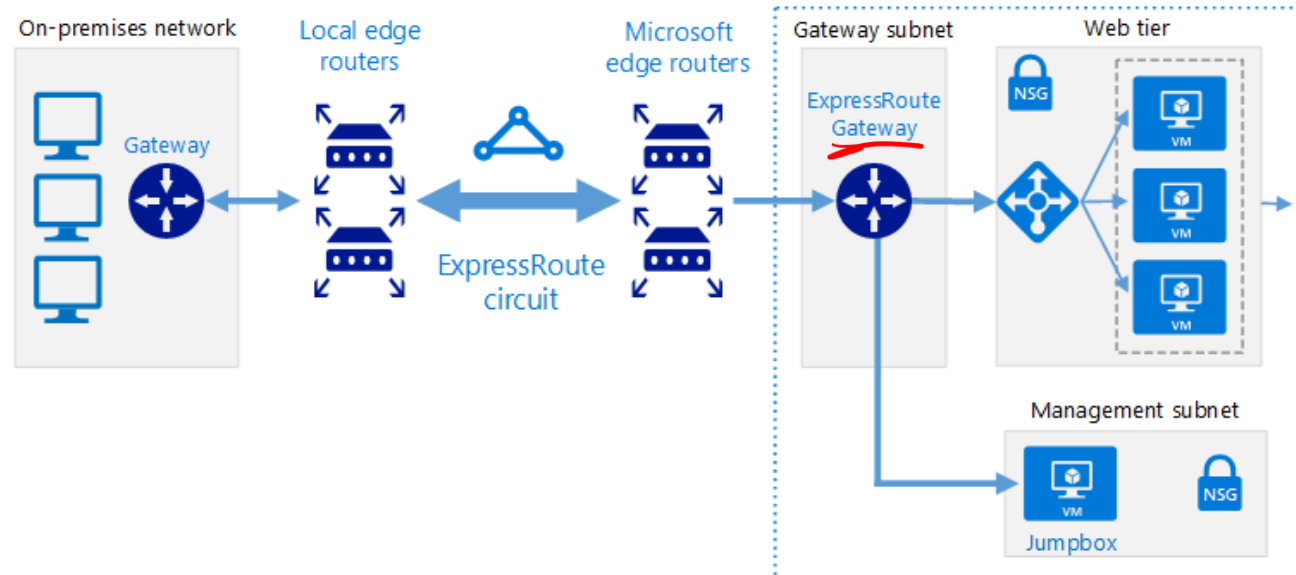
ExpressRoute connections use a private, dedicated connection through a third-party connectivity provider. **This connection is private.**

## Benefits

- Up to 100 Gbps bandwidth - supports dynamic scaling of bandwidth and direct access to national clouds
- Global reach - traffic over private connection
- Up to 99.95% availability SLA across the entire connection.

## Challenges

- Can be complex to set up
- working with a third-party connectivity provider
- Requires high-bandwidth routers on-premises



# ExpressRoute with VPN failover

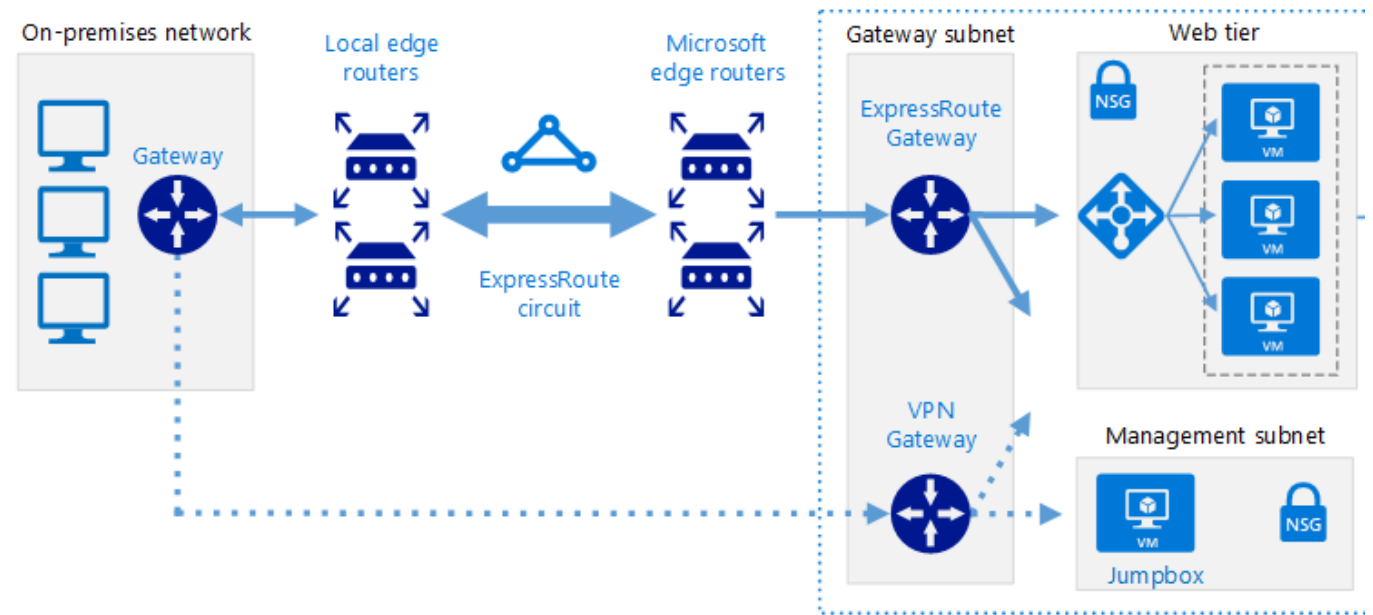
This options combines the previous two, using ExpressRoute in normal conditions, but failing over to a VPN connection if there is a loss of connectivity in the ExpressRoute circuit.

## Benefits

- High availability if the ExpressRoute circuit fails, although the fallback connection is on a lower bandwidth network.

## Challenges

- Complex to configure. You need to set up both a VPN connection and an ExpressRoute circuit.
- Requires redundant hardware (VPN appliances), and a redundant Azure VPN Gateway connection for which you pay charges.

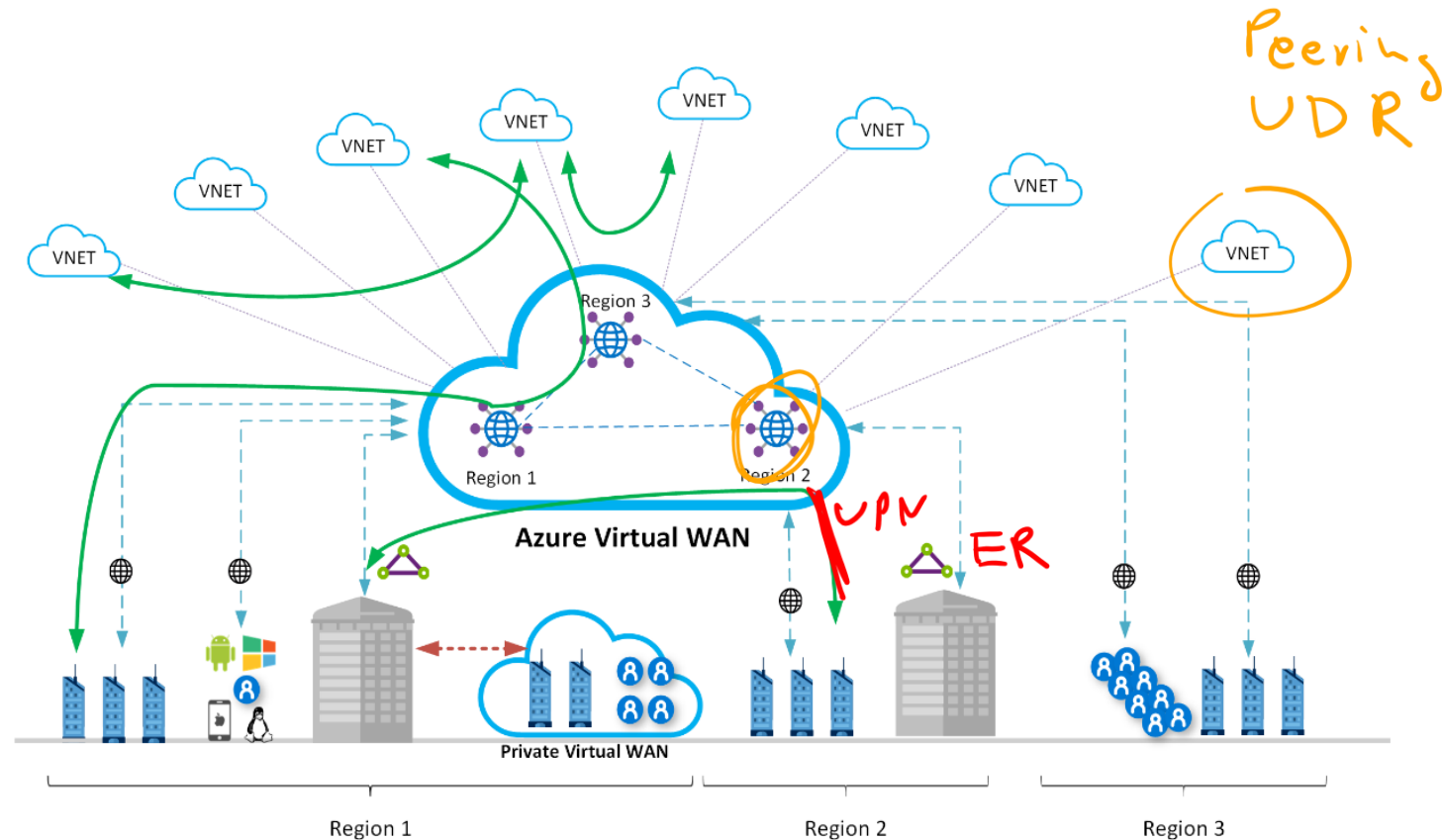




# Azure Virtual WAN

Azure Virtual WAN is a networking service that brings many networking, security, and routing functionalities together to provide a single operational interface

- Fully managed VWAN service.
- Cost savings by using a managed service and removing the necessity of network virtual appliance.
- Improved security by introducing centrally managed secured Hubs with Azure Firewall and VWAN
- Separation of concerns between central IT (SecOps, InfraOps) and workloads (DevOps).

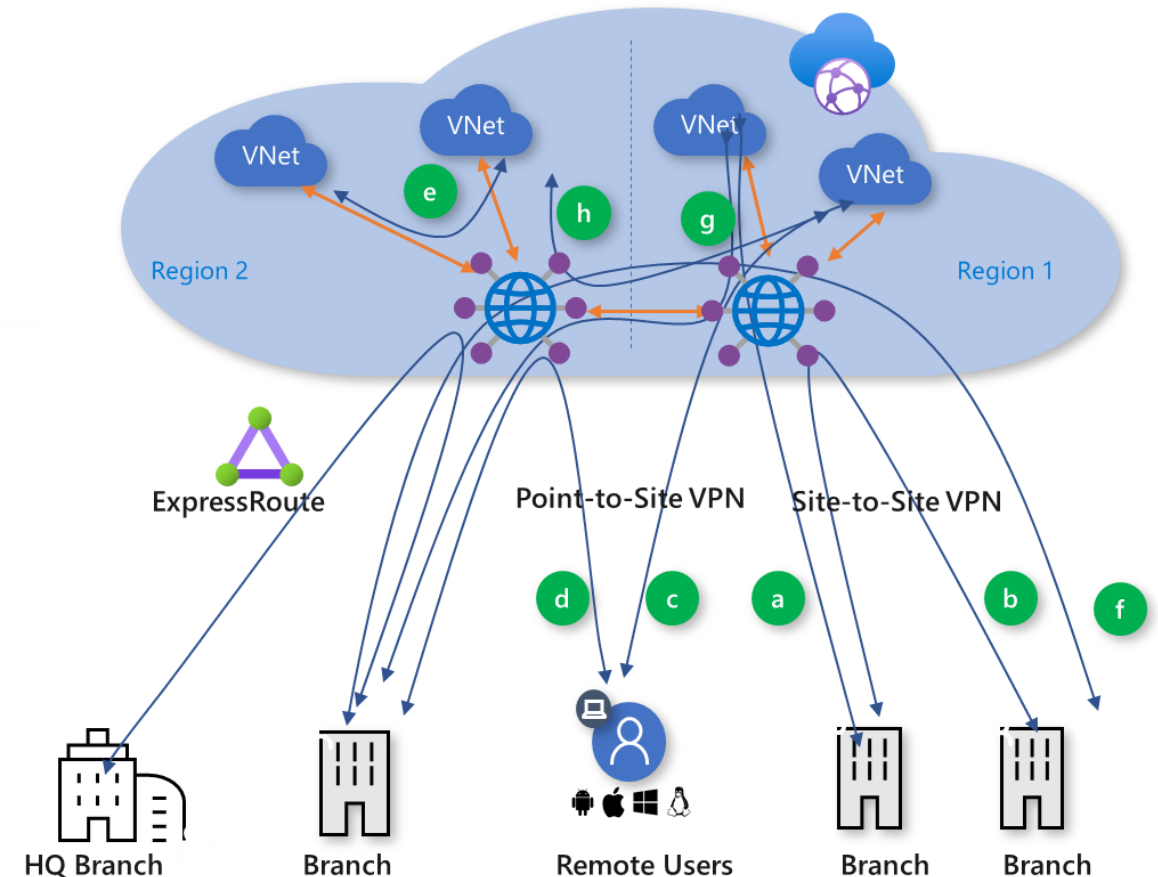


# Global transit network with Virtual WAN

Global transit network architecture is being adopted by enterprises to consolidate, connect, and control the cloud-centric modern, global enterprise IT footprint

Azure Virtual WAN supports the following global transit connectivity paths:

- Branch-to-VNet (a)
- Branch-to-branch (b)
  - ExpressRoute Global Reach and Virtual WAN
- Remote User-to-VNet (c)
- Remote User-to-branch (d)
- VNet-to-VNet (e)
- Branch-to-hub-hub-to-Branch (f)
- Branch-to-hub-hub-to-VNet (g)
- VNet-to-hub-hub-to-VNet (h)



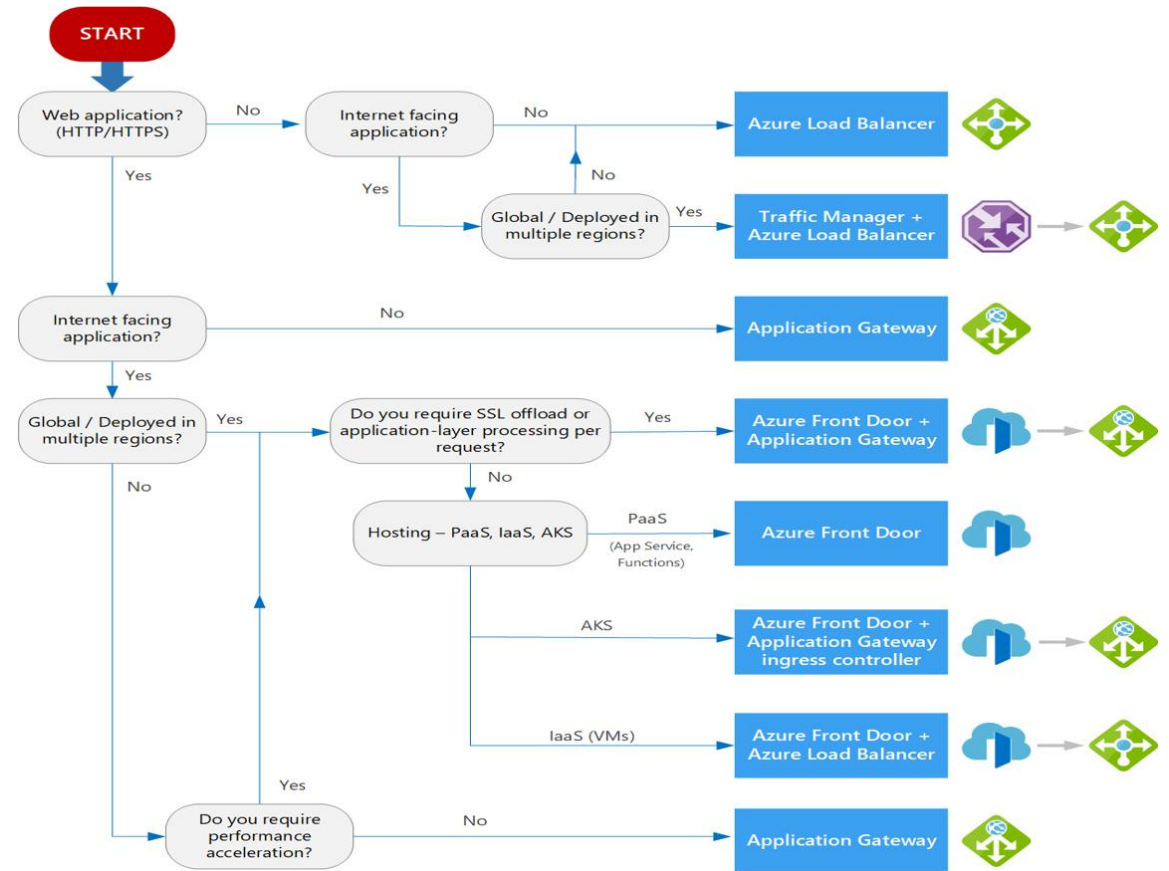
# Design for application delivery services



# Choosing a load balancer solution

Load balancing services to distribute your workloads across multiple computing resources – Azure Front Door, Traffic Manager, Load Balancer, and Application Gateway.

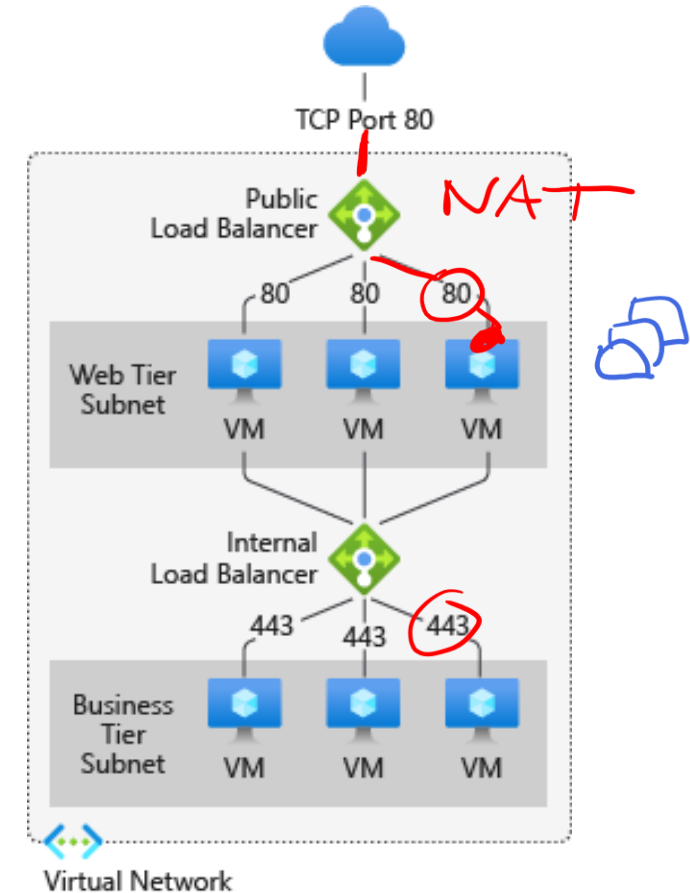
- Traffic type
- Global versus regional
- Availability
- Cost
- Features and limits
- Treat this flowchart as a starting point



# ~~Basic~~ Standard Load Balancer

High-performance, low-latency load-balancing for all UDP and TCP protocols

- Layer 4 load-balancing for all UDP and TCP protocols
- Manages inbound and outbound connections
- Provides public and internal load-balanced endpoints
- Uses rules to map inbound connections to backend destinations
- Health probes manage service availability

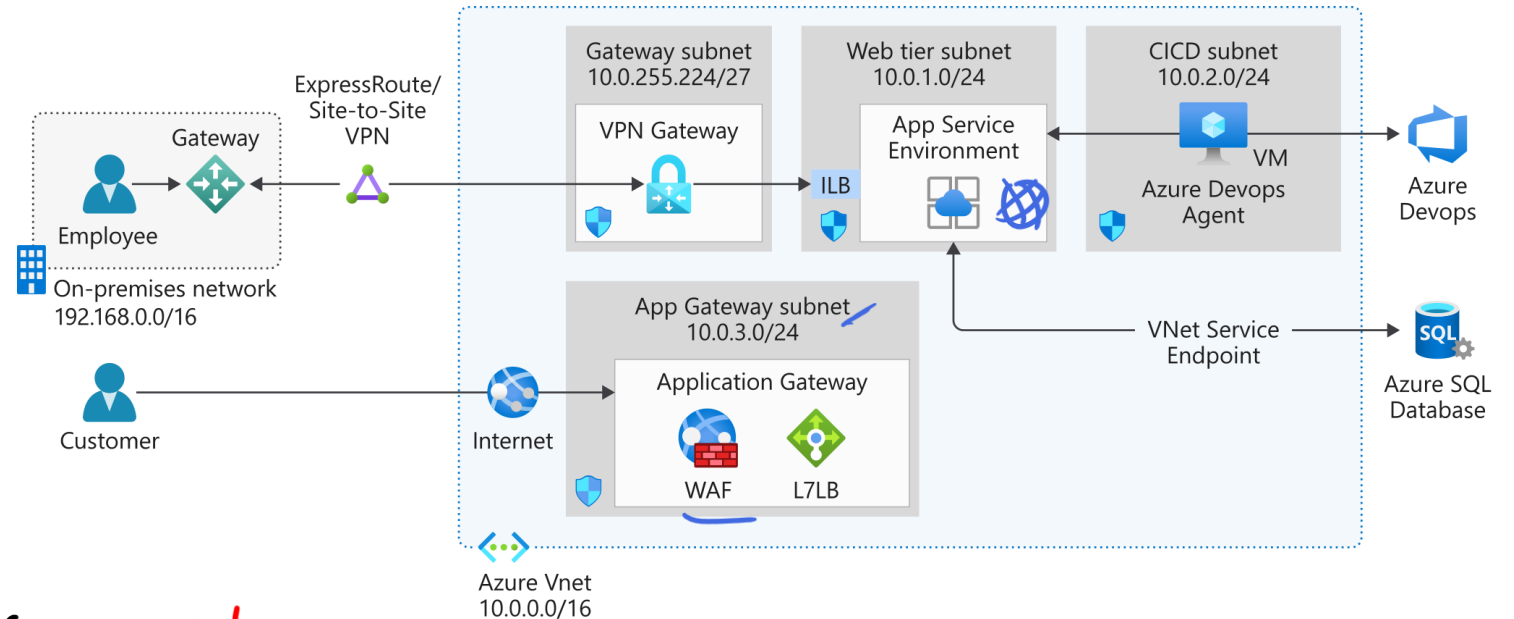


# Application Gateway

Azure Application Gateway is a web traffic load balancer that enables you to manage traffic to your web applications. It is an Application Delivery Controller (ADC) as a service, offering various layer 7 load-balancing capabilities for your applications.

## When to use Application Gateway

- Layer 7 - HTTP(s) only
- Supports WAF -stateful inspection
- Traffic routing
- SSL/TLS termination
- Supports PaaS and IaaS
- Regional service



Front Door  
Global  
CDN  
WAF

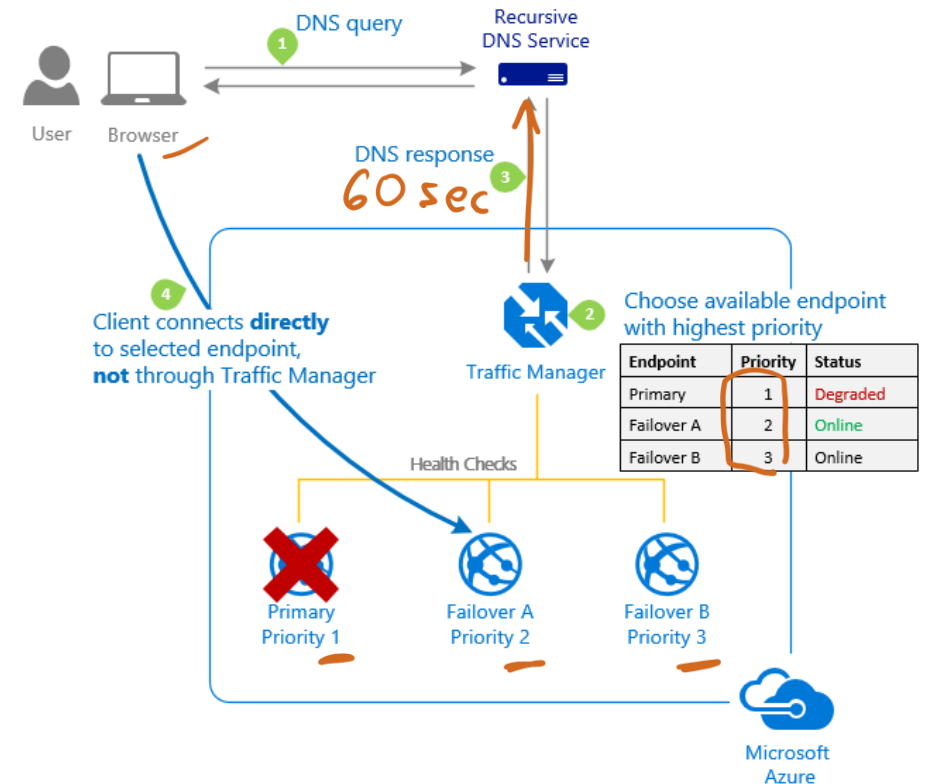
Route 53 AWS

# Traffic Manager

Azure Traffic Manager is a DNS-based traffic load balancer that enables you to distribute traffic optimally to services across global Azure regions. Traffic Manager provides a range of traffic-routing methods to distribute traffic such as priority, weighted, performance, geographic, multi-value, or subnet.

## Choose Traffic Manager when you need:

- To increase application availability
- Improve application performance
- Combine hybrid applications
- Distribute traffic for complex deployments



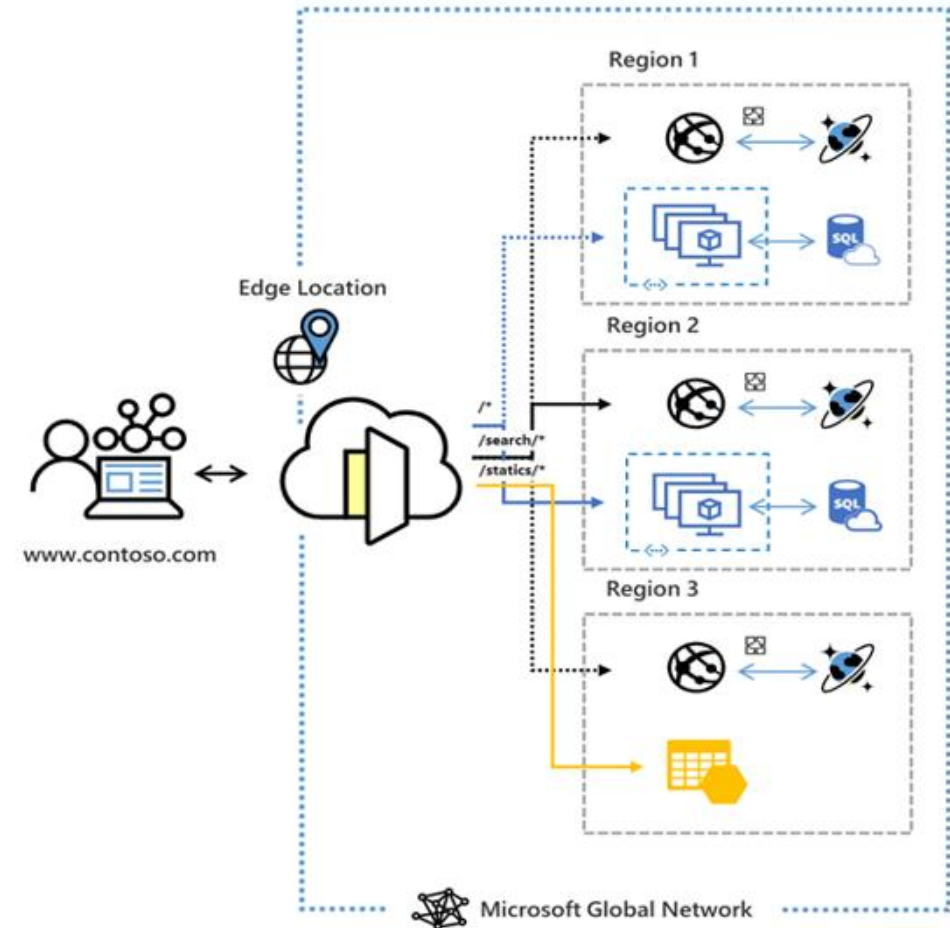


# Azure Front Door Service

Azure Front Door Service enables you to define, manage, and monitor the global routing for your web traffic by optimizing for best performance and instant global failover for high availability.

## Choose Front Door when:

- You need to ensure that requests are sent to the lowest latency backends (low latency)
- You have primary and secondary backends (priority)
- You want to distribute traffic using weight coefficients (weighted)
- You want to ensure requests from the same end user gets sent to the same backend (affinity)
- Your traffic is HTTP(s) based and you need WAF and/or CDN integration

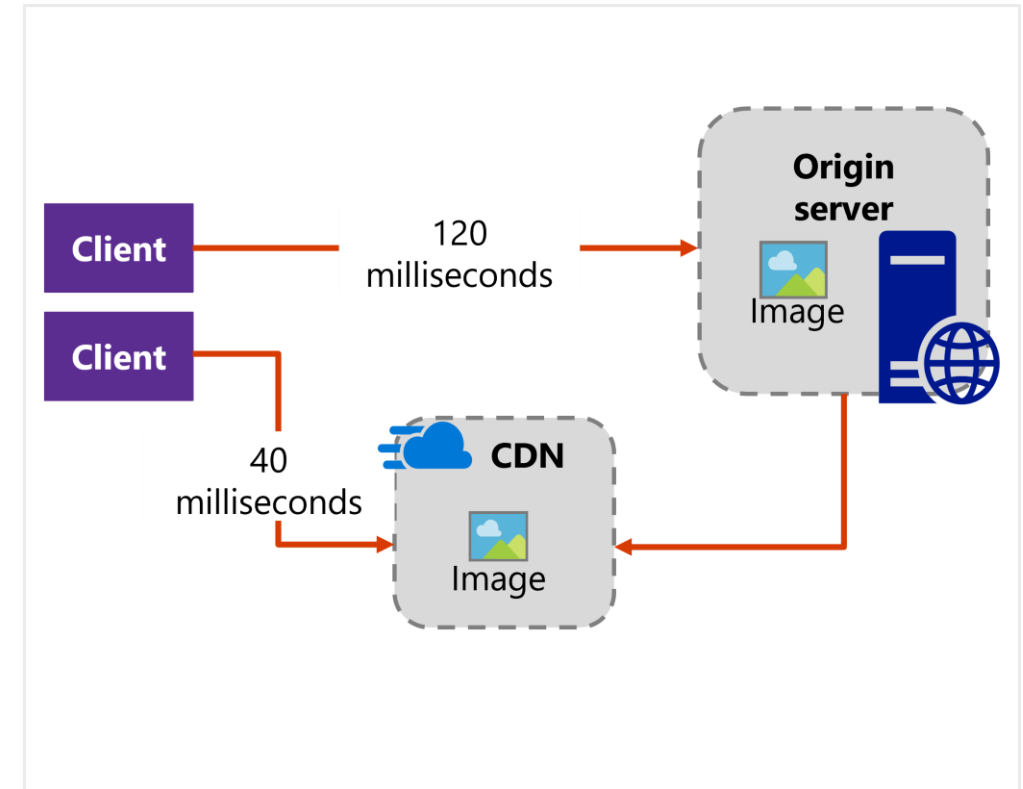


# Content Delivery Network (CDN)

Azure CDN offers developers a global solution for rapidly delivering high-bandwidth content to users by caching their content at strategically placed physical nodes across the world.

## When to leverage a CDN:

- You want point-of-presence locations that are close to large clusters of users.
- You want to reduce latency - both the transmission delay and the number of router hops.
- You want custom domains, file compression, caching, and geo-filtering.



# Design for application protection services

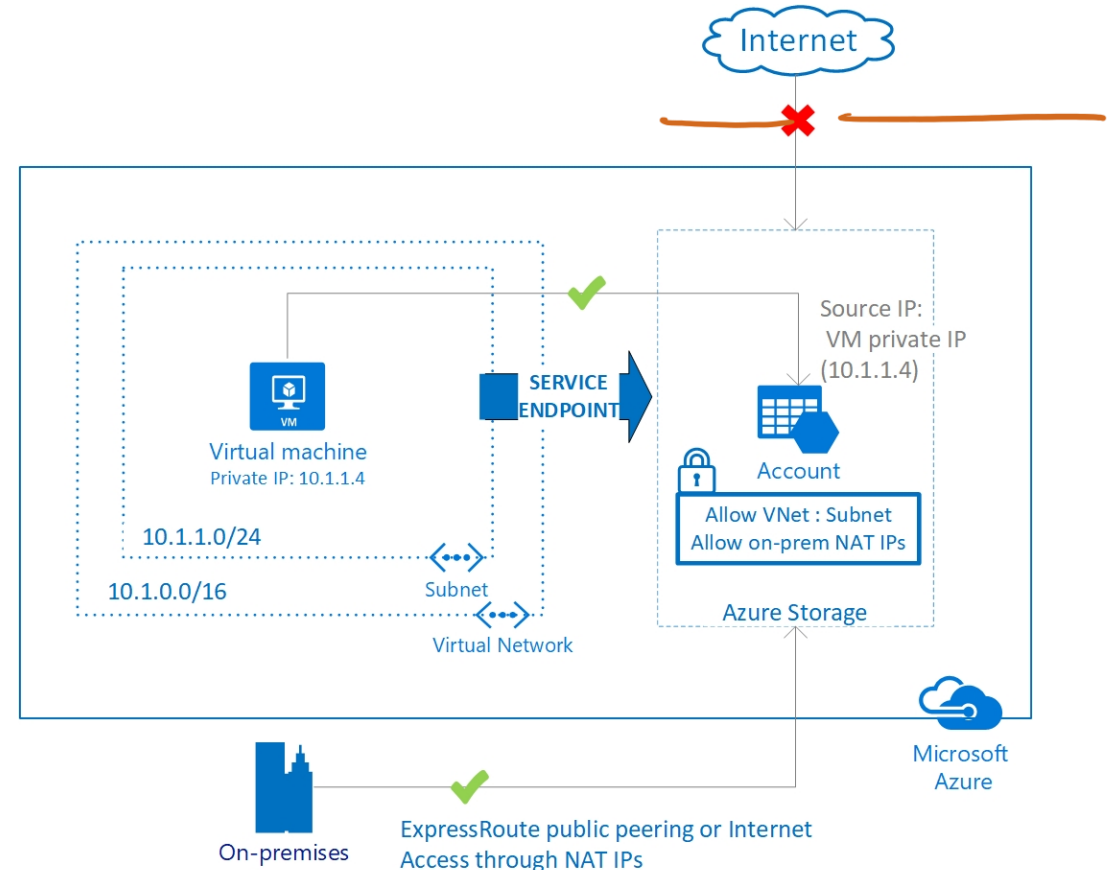


# Service endpoints = Routing

Virtual Network (VNet) service endpoint provides secure and direct connectivity to Azure services over an optimized route over the Azure backbone network

## Key Benefits:

- Improved security for your Azure service resources
- Optimal routing for Azure service traffic from your virtual network
- Simple to set up with less management overhead



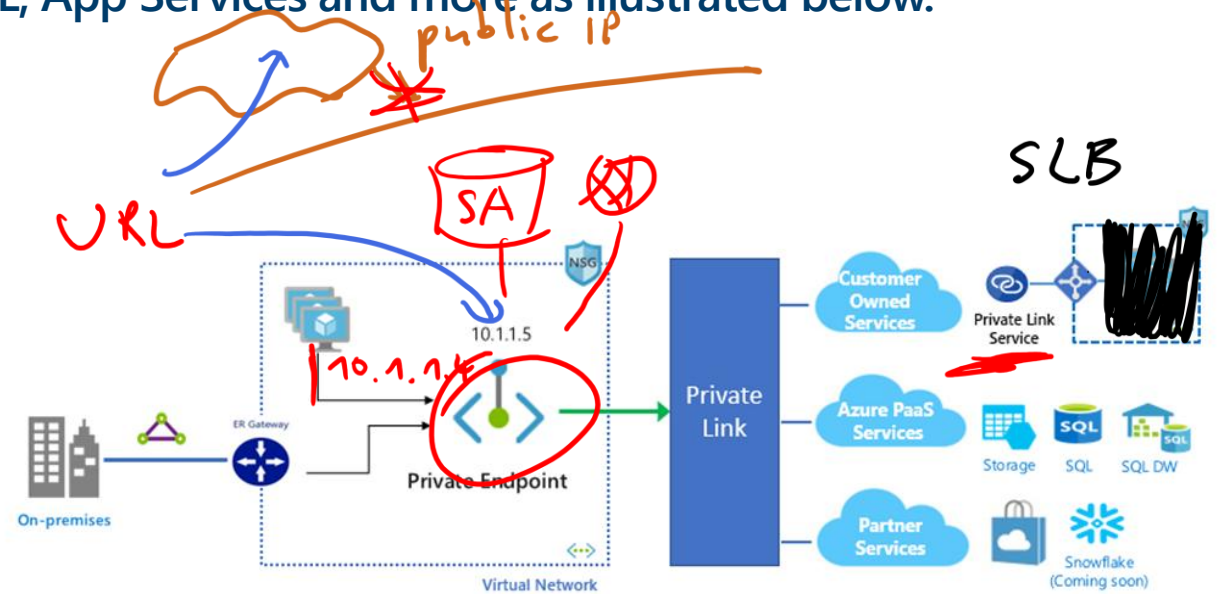
# Azure Private Link

Private EP = NIC

Azure Private Link enables you to access Azure PaaS Services (for example, Azure Storage and SQL Database) and Azure hosted customer-owned/partner services over a private endpoint in your virtual network. Private link is used to access PaaS services such as Azure Storage, Azure SQL, App Services and more as illustrated below.

Recommend private link or private endpoints when:

- You need private connectivity to services on Azure
- You need integration with on-premises and peered networks
- You need traffic to remain on Microsoft network, with no public internet access



Azure Private Link – Connecting Azure Services privately to your Network

# Network security groups



You can filter network traffic to and from Azure resources in an Azure virtual network with a network security group.



A network security group (NSG) contains a list of Access Control List (ACL) rules that allow or deny network traffic to subnets, NICs, or both.



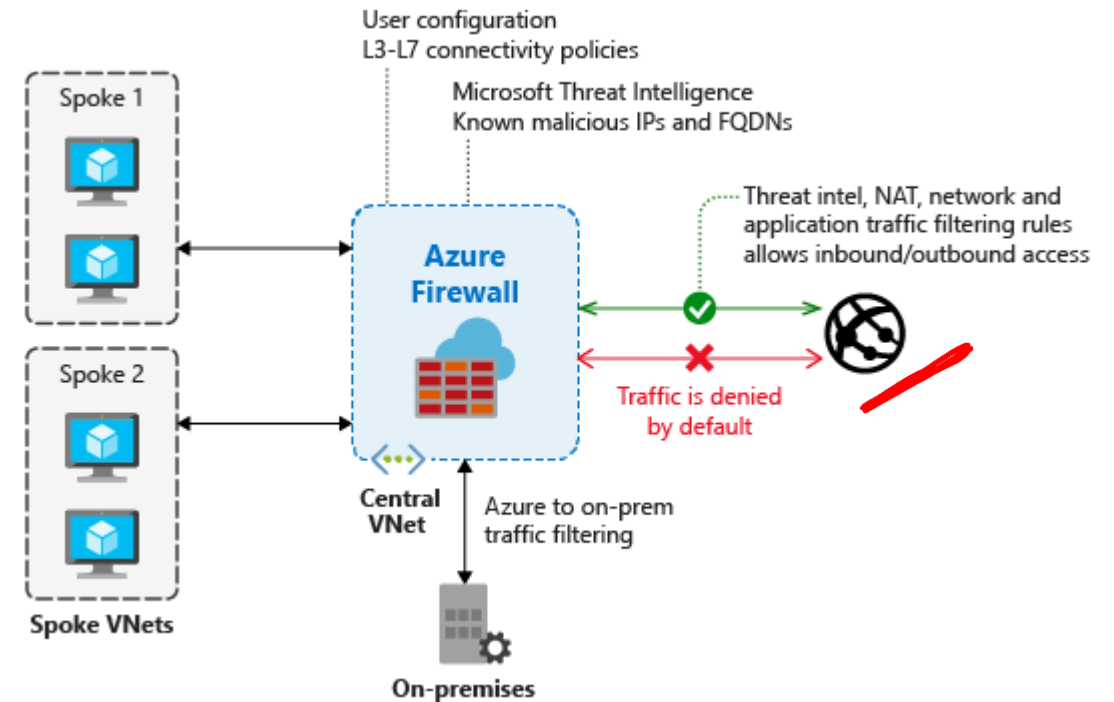
NSGs contain two sets of rules: inbound and outbound. The priority for a rule must be unique within each set.

# Azure Firewall

Azure firewall is a cloud-native network security service offering high-availability and scalability. Azure Firewall provides inbound protection for non-HTTP/S protocols (for example, RDP, SSH, FTP), outbound network-level protection for all ports and protocols, and application-level protection for outbound HTTP/S.

## Use Azure Firewall to:

- Protect your network against infiltration.
- Implement hierarchical firewall policies.
- Configure spoke-to-spoke connectivity.
- Monitor incoming and outgoing traffic.
- If you require multiple firewalls.



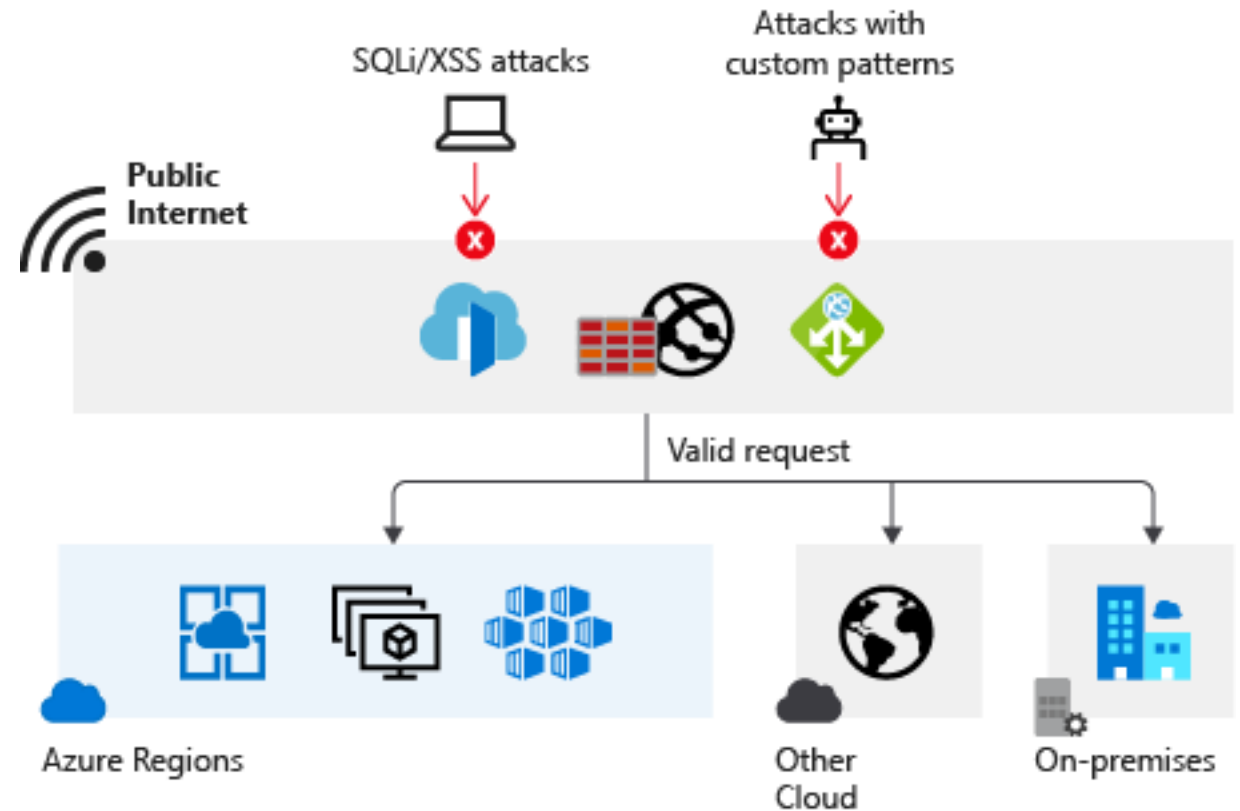


# Web Application Firewall

Azure Web Application Firewall (WAF) provides centralized protection to your web applications from common web exploits and vulnerabilities such as SQL injection, and cross site scripting. Azure WAF provides out of box protection from OWASP top 10 vulnerabilities via managed rules.

## When to use Web Application firewall:

- To prevent attacks in application code
- Centrally manage security for applications
- Deploy WAF with Azure Application Gateway, Azure Front Door and Azure Content Delivery Network (CDN)



# DDoS Protection

Azure DDoS Protection provides countermeasures against the most sophisticated DDoS threats. The service provides enhanced DDoS mitigation capabilities for your application and resources deployed in your virtual networks.

Feature	DDoS IP Protection	DDoS Network Protection
Active traffic monitoring & always on detection	●	●
Automatic attack mitigation	●	●
Metrics & alerts	●	●
Mitigation reports	●	●
Mitigation flow logs	●	●
Mitigation policies tuned to customers application	●	●
Integration with Firewall Manager	●	●
Microsoft Sentinel data connector and workbook	●	●
Protection of resources across subscriptions in a tenant	●	●
Public IP Standard SKU protection	●	●
Public IP Basic SKU protection		●
DDoS rapid response support		●
Cost protection		●
WAF discount		●
Price	Per protected IP	Per 100 protected IP addresses

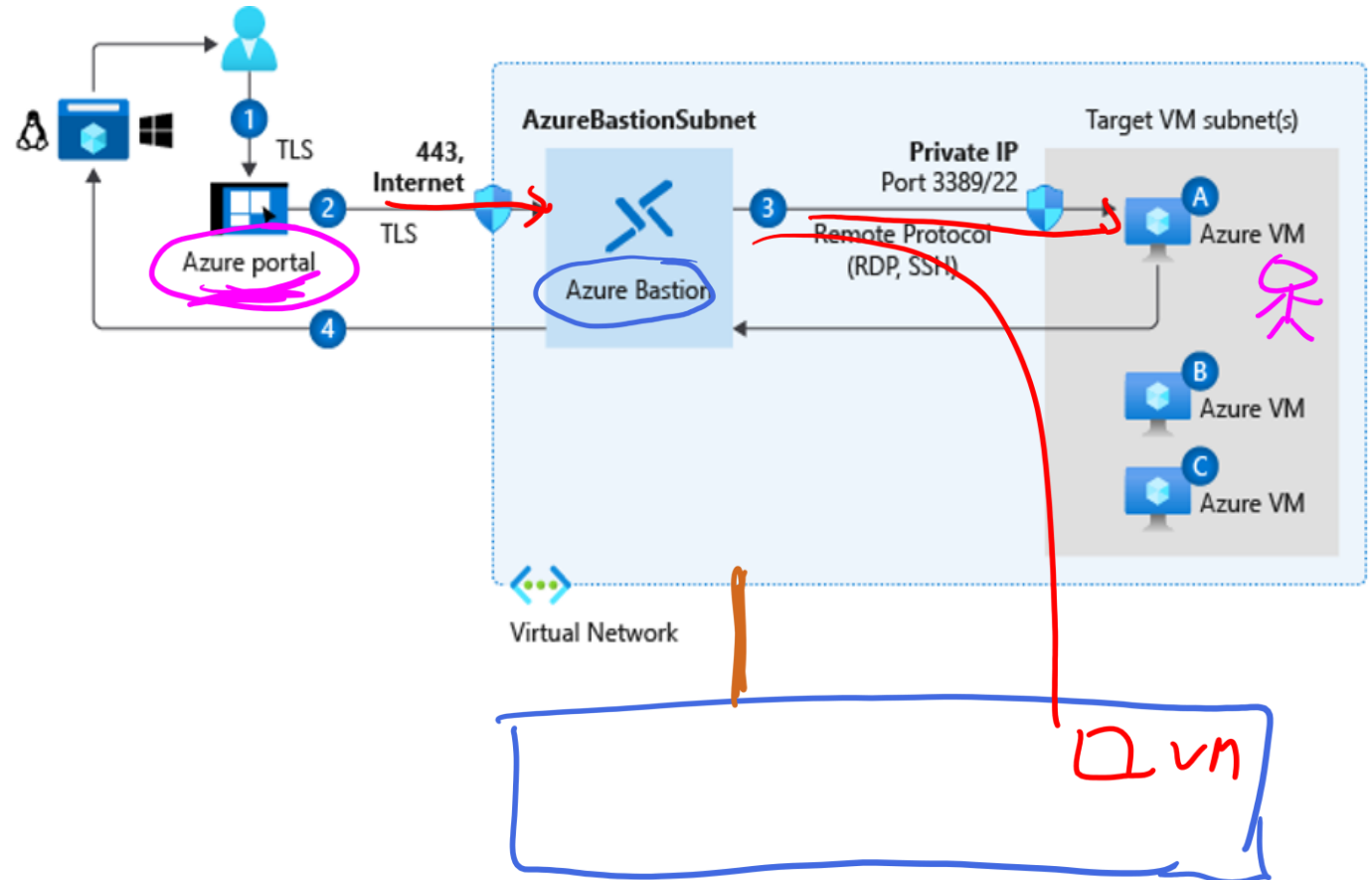
# Azure Bastion

The Azure Bastion service is a fully platform-managed PaaS service which provides secure and seamless RDP/SSH connectivity to your virtual machines directly in the Azure portal over TLS.

Sharable Links

Recommend Azure Bastion when you need to:

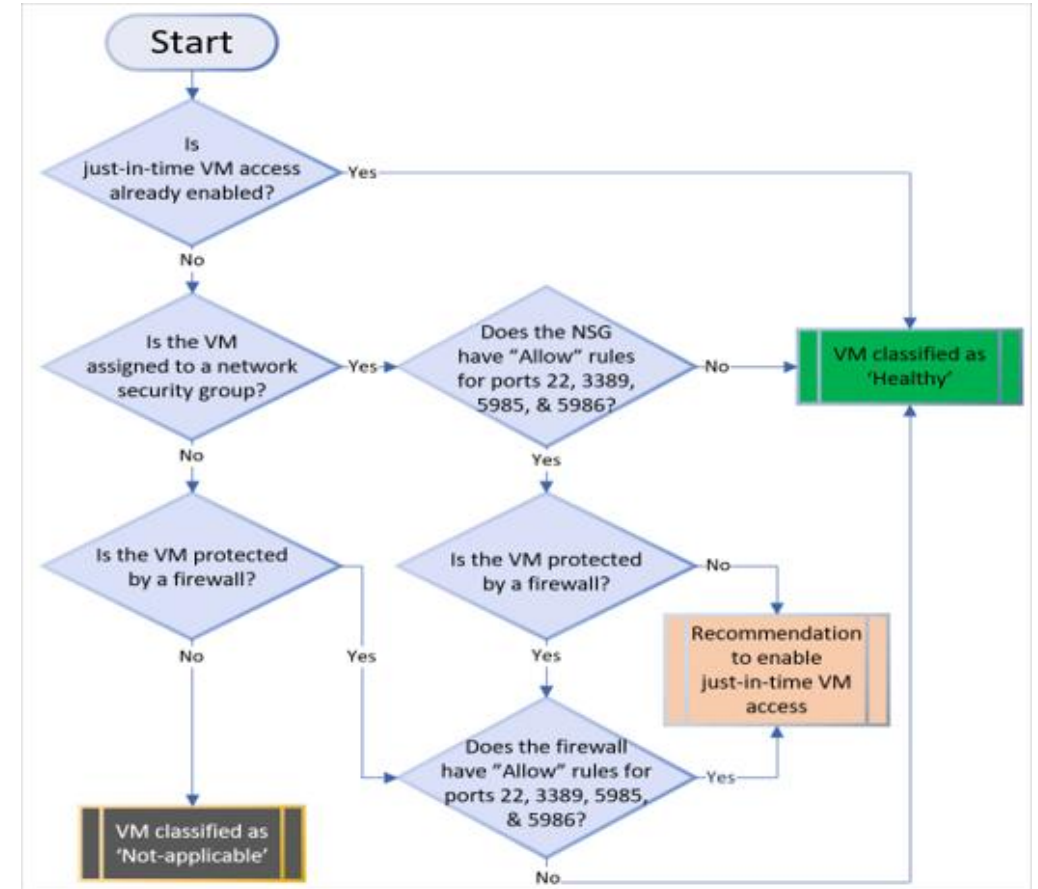
- Secure remote connections from the Azure portal to Azure VMs
- Eliminate exposing RDP and SSH public IP addresses of your Azure VMs
- Access VMs across multiple, peered networks



# Just in Time (JIT) Network Access

With JIT, you can lock down the inbound traffic to your VMs, reducing exposure to attacks while providing easy access to connect to VMs when needed.

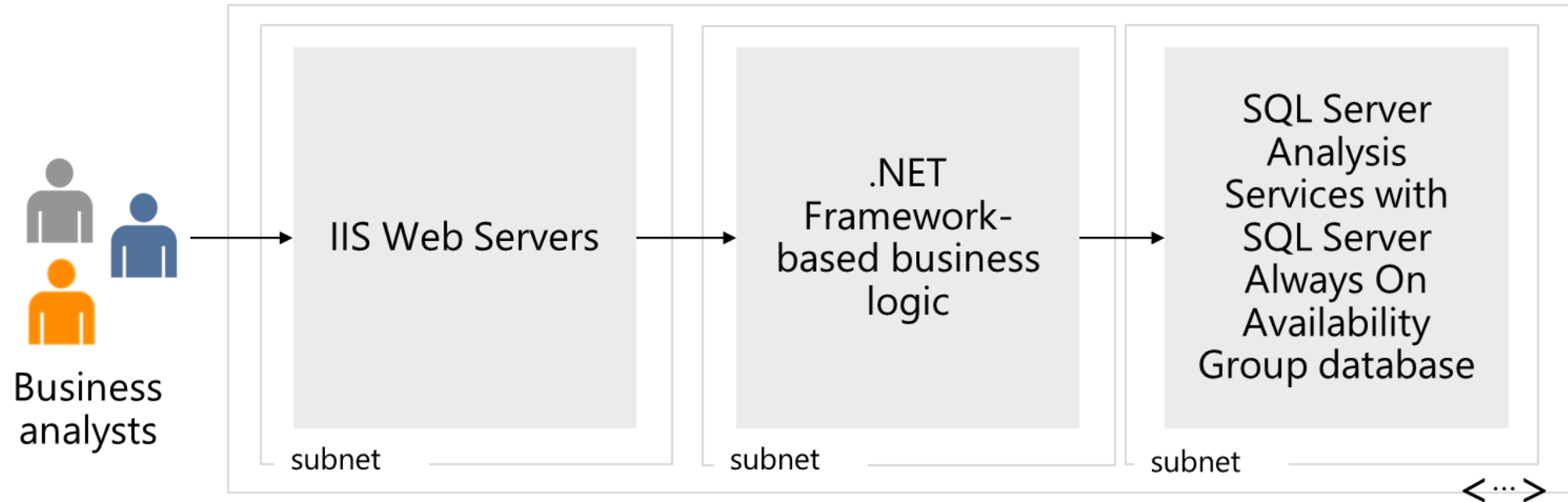
- Supports ports other than 3389 and 22
- Ports are blocked when not in use
- Integrates with NSGs and Azure Firewall



# Case study and review



# Case Study – BI enterprise application

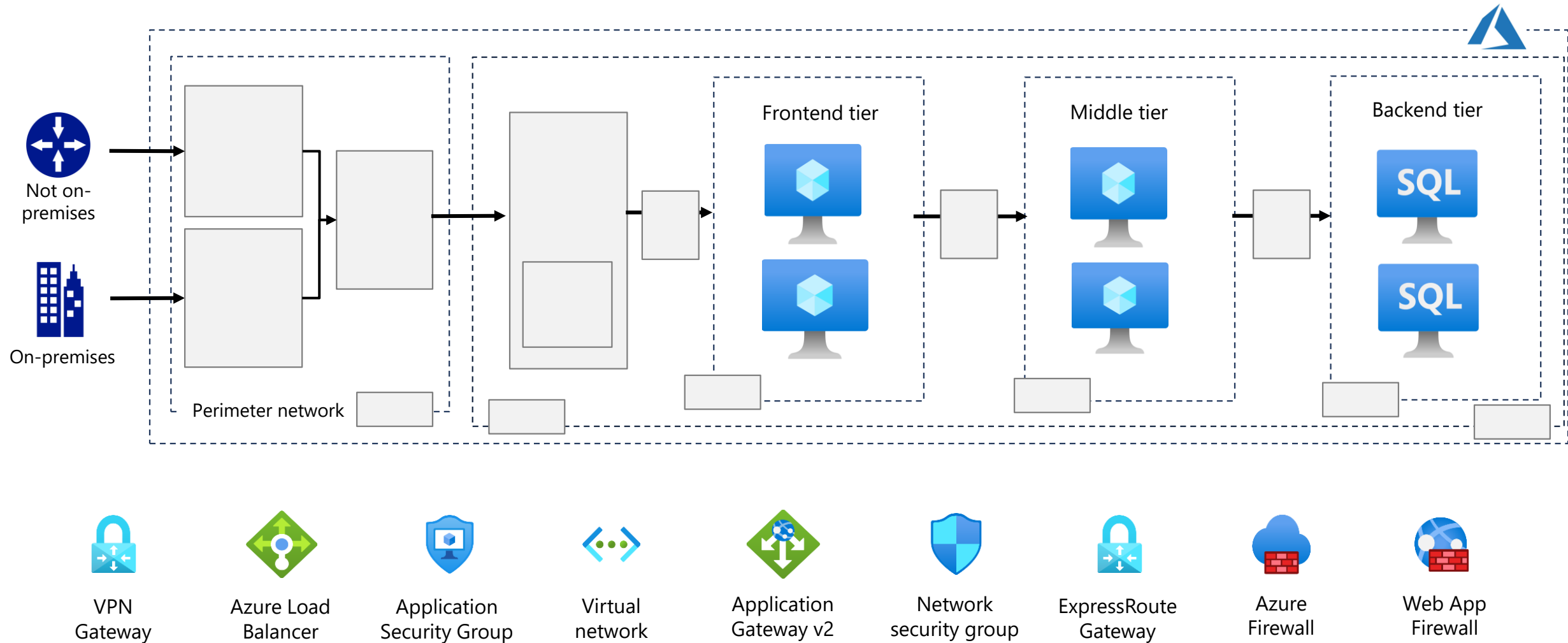


- Heavy demand.
- Servers reach their performance limits during the day.
- Servers sit idle during off hours.

- Rest API call from the front-end tier
- Request demand changes from day to day

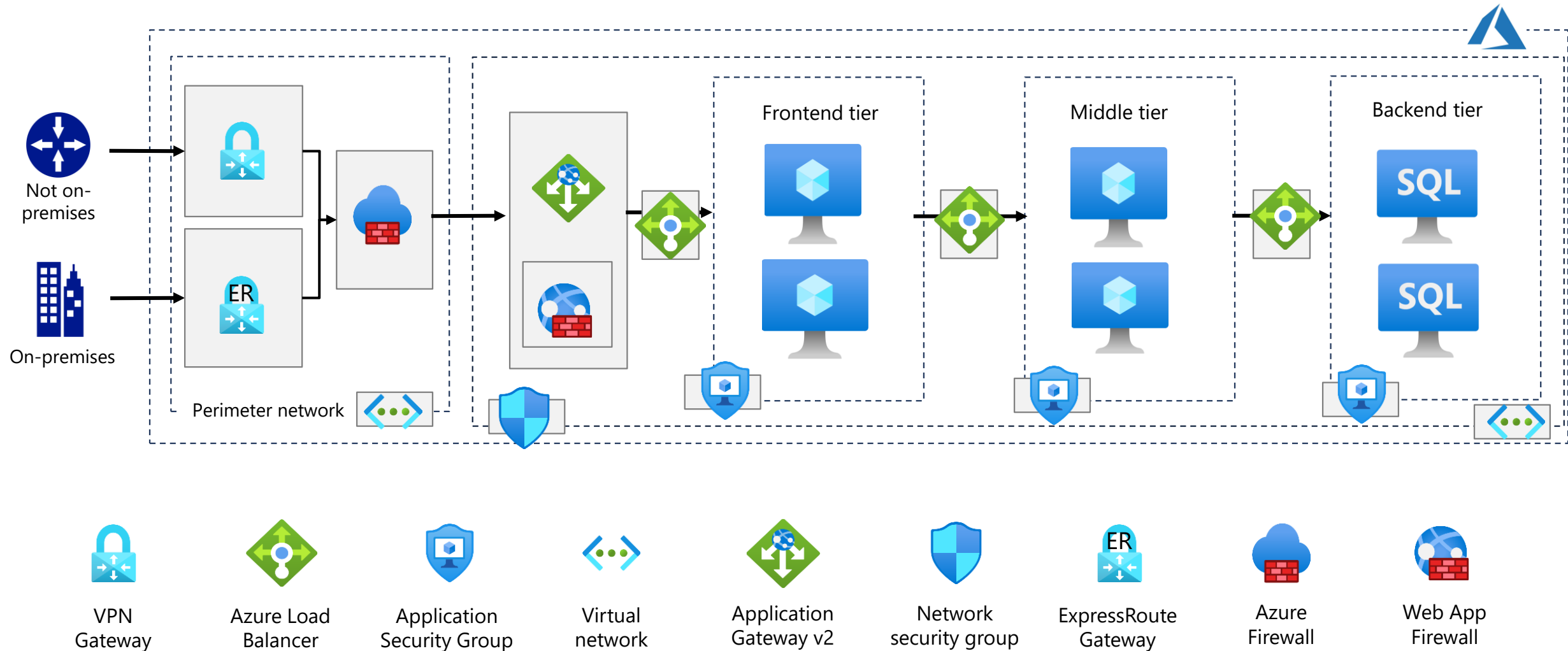
- Uses all-flash enterprise SAN storage

# Instructor solution - BI enterprise application

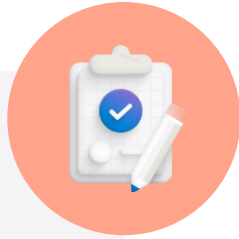




# Completed instructor solution - BI enterprise application



# Learning Recap – Network infrastructure solutions



Check your  
knowledge  
questions and  
review

## Reference modules

- [AZ-700 Designing and Implementing Microsoft Azure Networking Solutions](#)
- [Architect network infrastructure in Azure](#)

## Optional exercises

- [Distribute your services across Azure virtual networks](#)
- [Secure and isolate access using network security groups](#)

# Instructor resources (hidden)



# End of presentation

