



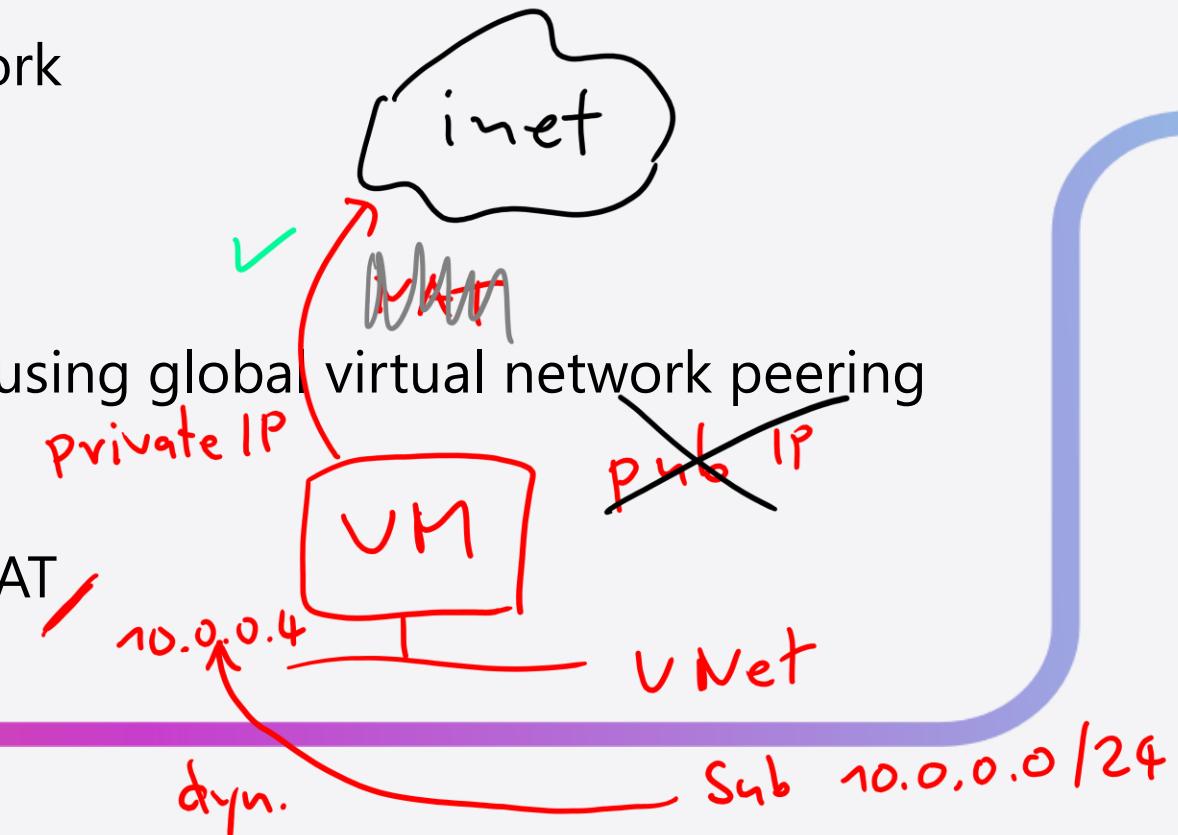
AZ-700

Introduction to Azure Virtual Networks



Module Overview

- Explore Azure Virtual Networks ~~/~~
- Configure Public IP addresses ~~/~~
- Exercise: Design and implement a Virtual Network in Azure
- Design name resolution for your Virtual Network
- Exercise: Configure DNS settings in Azure ~~/~~
- Enable Cross-VNet connectivity with peering ~~/~~
- Exercise: Connect two Azure Virtual Networks using global virtual network peering
- Implement virtual network traffic routing ~~/~~
- Configure internet access with Azure Virtual NAT



Explore Azure Virtual Networks



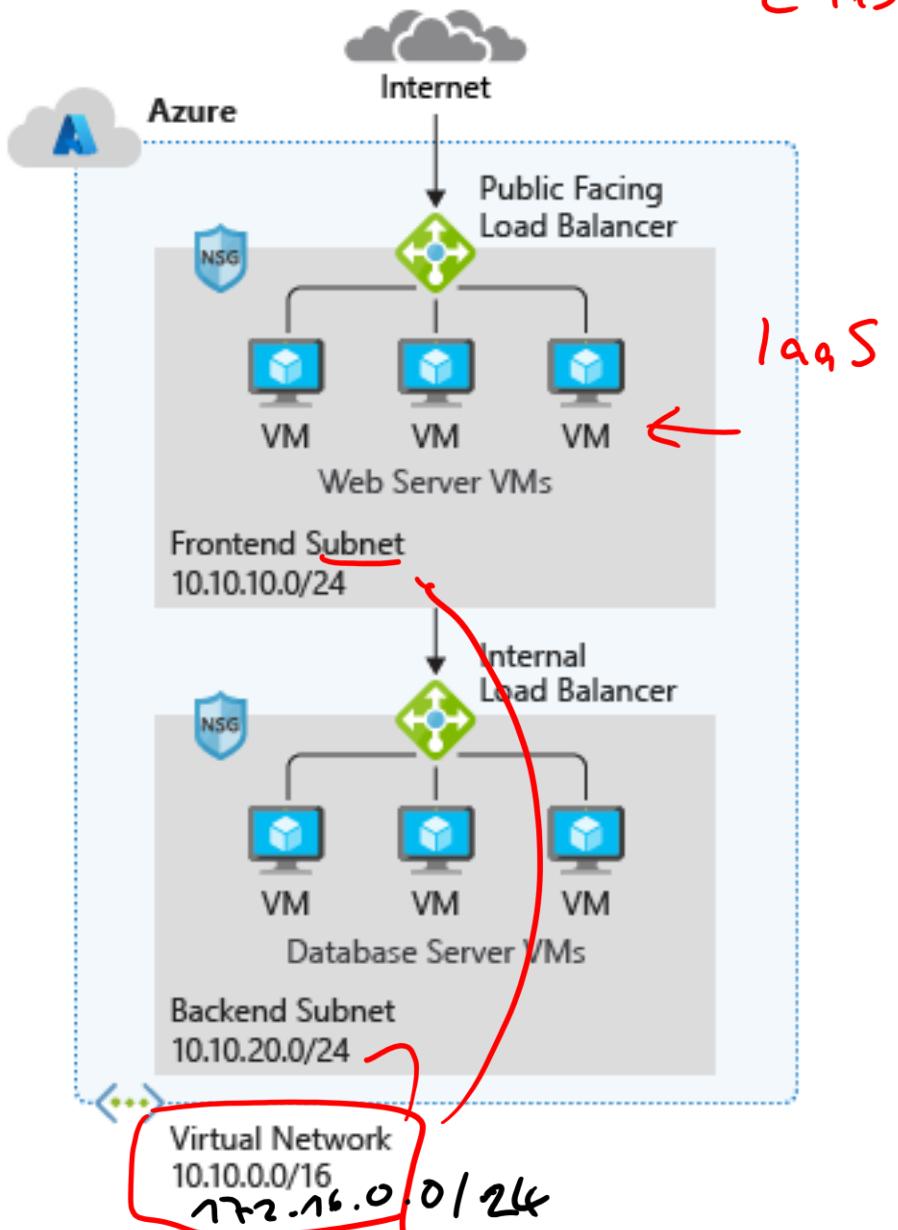
Learning Objectives - Azure Virtual Networks

- Capabilities of Azure Virtual Networks
- Virtual Network Address space
- Subnets
- Private IP Address allocation
- Understand Regions and Subscriptions
- Create a Virtual Network
- Demonstration – Creating Virtual Networks
- Learning Recap

SaaS
PaaS
CaaS

Capabilities of Azure Virtual Networks

- Communication with the Internet
- Communication between Azure resources
- Communication between on-premises resources
- Filtering network traffic
- Routing network traffic



Virtual Network address space

IPv4

IPv6

→ pub IP

RFC 1918

10.0.0.0 - 10.255.255.255 (10/8 prefix)

172.16.0.0 - 172.31.255.255 (172.16/12 prefix)

192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

Azure reserves 5 IP addresses

- x.x.x.0: Network address
- x.x.x.1: Reserved by Azure for the default gateway
- x.x.x.2 x.x.x.3: Reserved by Azure to map the Azure DNS IPs to the VNet space
- x.x.x.255: Network broadcast address

Unavailable address ranges:

- 224.0.0.0/4 (Multicast)
- 255.255.255.255/32 (Broadcast)
- 127.0.0.0/8 (Loopback)
- 169.254.0.0/16 (Link-local)
- 168.63.129.16/32 (Internal DNS)

Logical representation
of your own network

Create a dedicated
private cloud-only
virtual network

Securely extend
your datacenter with
virtual networks

Enable hybrid
cloud scenarios

Subnets

Subnets				
Name	IPv4	IPv6	Available IPs	Delegated to
subnet0	10.1.0.0/24	-	251	-
subnet1	10.1.1.0/24	-	251	-
subnet2	10.1.2.0/24	-	251	-
GatewaySubnet	10.1.255.0/27	-	availability dependent on dyn...	-

A virtual network can be segmented into one or more subnets

Subnets provide logical divisions within your network

Subnets can help improve security and make it easier to manage the network

Each subnet must have a unique address range – cannot overlap with other subnets in the virtual network in the subscription

Private IP Addresses allocation

10.
172.16 ...
32
192.168

Private IP Addresses	IP address association	Resource Type
Virtual Machine	NIC Microsoft.Network / NetworkInterfaces	
Internal Load Balancer	Front-end configuration	
Application Gateway	Front-end configuration	

Dynamic (default). Azure assigns the next available unassigned or unreserved IP address in the subnet's address range

Static. You select and assign any unassigned or unreserved IP address in the subnet's address range

Understand Regions and Subscriptions

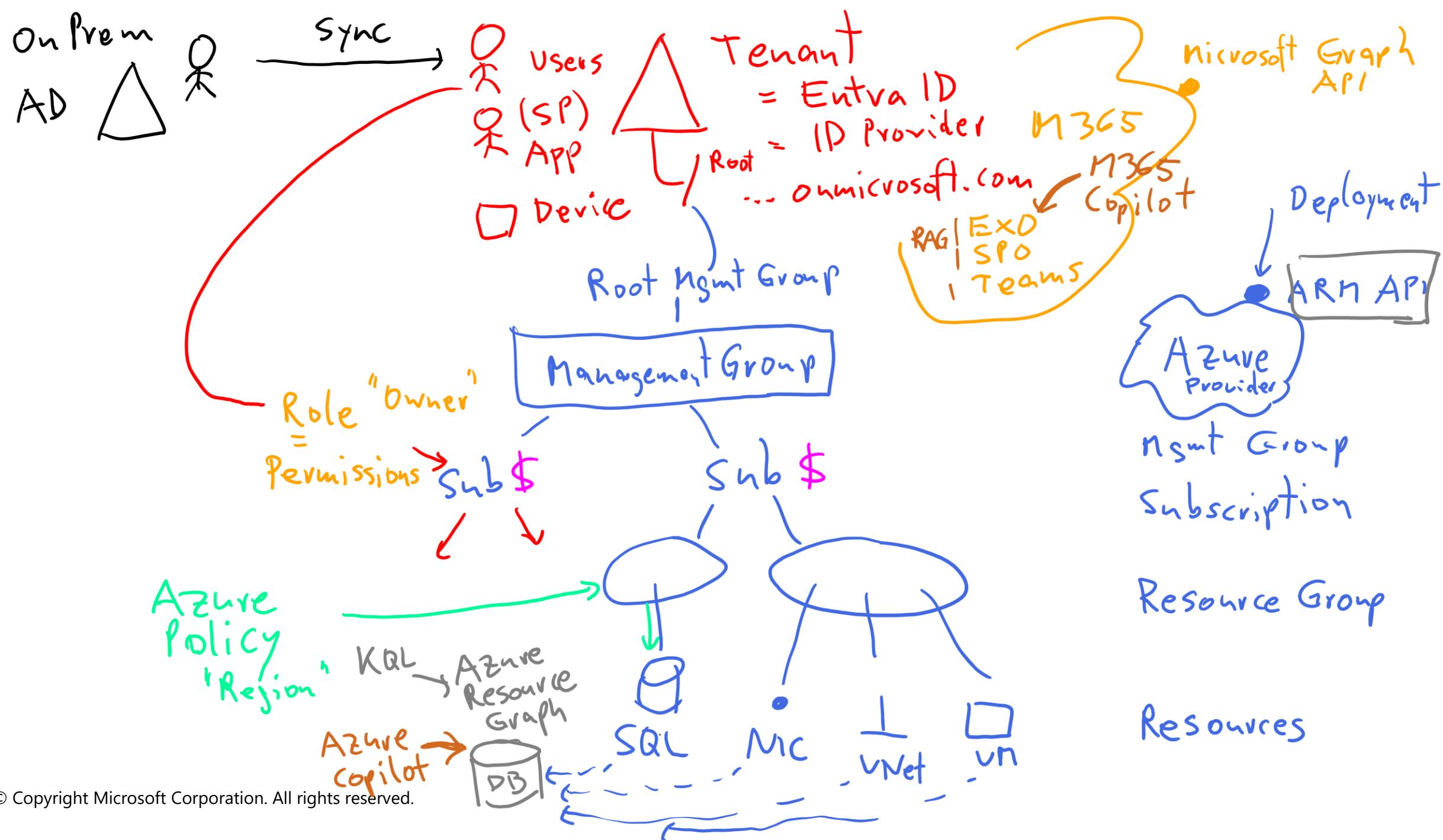
Region = 3 oder mehr DC
= Location



Avail Zone 1,2,3

Regions: VNet is scoped to a single region or location; however, multiple virtual networks from different regions can be connected using Virtual Network Peering.





Create a Virtual Network

Create new virtual networks at any time

Add virtual networks when you create a virtual machine

Need to define the address space, and at least one subnet

Ensure non-overlapping address spaces



Create virtual network

Basics IP Addresses Security Tags Review + create

Project details

Subscription * ⓘ

Visual Studio Enterprise

Resource group * ⓘ

Lab04

[Create new](#)

Instance details

Name *

VNet2

Region *

(US) East US 2

(Bicep) Template
vNet

1. mal → ARM
2. Mal X

~~VNet~~ — NIC- VM
VNet delete

idem potent
(Semper idem!)

Configure Public IP addresses

Learning Objectives - Configure Public IP addresses

- Public IP Addresses
- Choose the appropriate SKU for a public IP
- Creating Public IP Addresses
- Custom IP address prefix (Bring your own IP)
- Learning Recap

IP v4

IP v6

2001:cafe::/64

Public IP Addresses

DHCP

Public IP addresses	IP address association	Dynamic	Static
Virtual Machine	NIC	Yes	Yes
Load Balancer	Front-end configuration	Yes	Yes
VPN Gateway	Gateway IP configuration	Yes (non-AZ only)	Yes
Application Gateway	Front-end configuration	Yes (V1 only)	Yes (V2 only)
Azure Firewall	Front-end configuration	No	Yes
NAT gateway	Gateway IP configuration	No	Yes

A public IP address resource can be associated with resources such as virtual machine network interfaces, internet-facing load balancers, VPN gateways, and Application Gateways

Choose the appropriate SKU for a public IP

Basic SKU (retiring Sept 2025)

- Assigned with the static or dynamic allocation method
- Open by default. NSGs are recommended but optional
- Assigned to network interfaces, VPN gateway, public load balancers, or Application Gateways
- Do not support availability zone scenarios

Standard SKU

- Always use static allocation method
- Secure by default and closed to inbound traffic
- Allow inbound traffic with NSG
- Assigned to network interfaces, standard public load balancers, or Application Gateways
- Can be zone-redundant, zonal, or no-zone

Creating Public IP Addresses

Available in IPv4 or IPv6

Basic or Standard SKU

Regional or Global

Dynamic or Static

Routing preference

Configuration details

Name * myStandardPublicIP

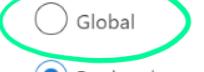
IP Version * IPv4 

IPv6

Basic

Standard 

Availability zone * No Zone

Global   Front Door

Regional 

Dynamic

Static

Microsoft network

Internet

Idle timeout (minutes) * 4

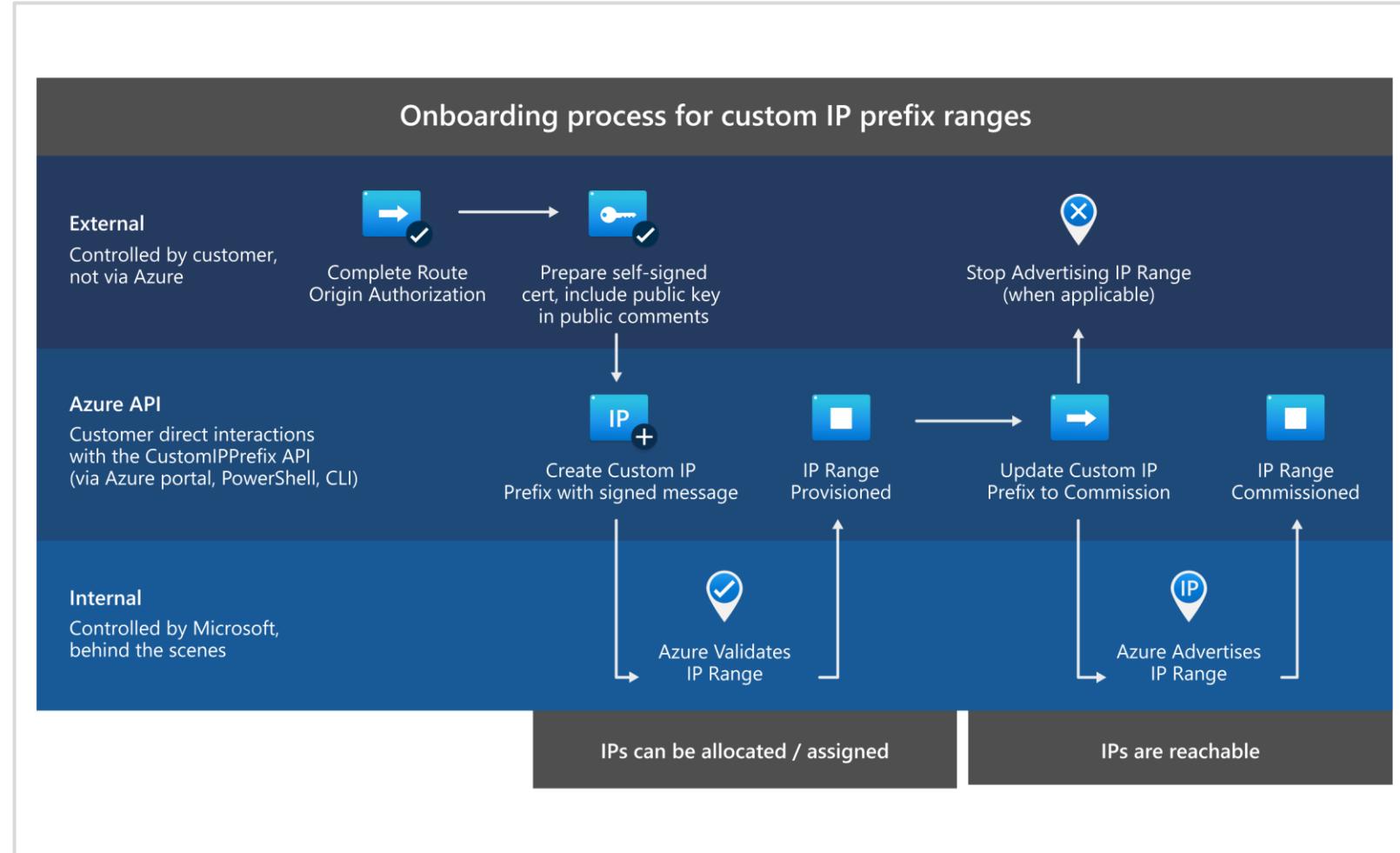
DNS name label

Custom IP address prefix (Bring your own IP)

Retain IP ranges (BYOIP) to maintain established reputation and continue to pass through externally controlled allowlists.

Three phase process to bring an IP prefix to Azure:

- Validation
- Provision
- Commission



Exercise: Design and implement a Virtual Network in Azure

Exercise - Design and Implement a Virtual Network in Azure



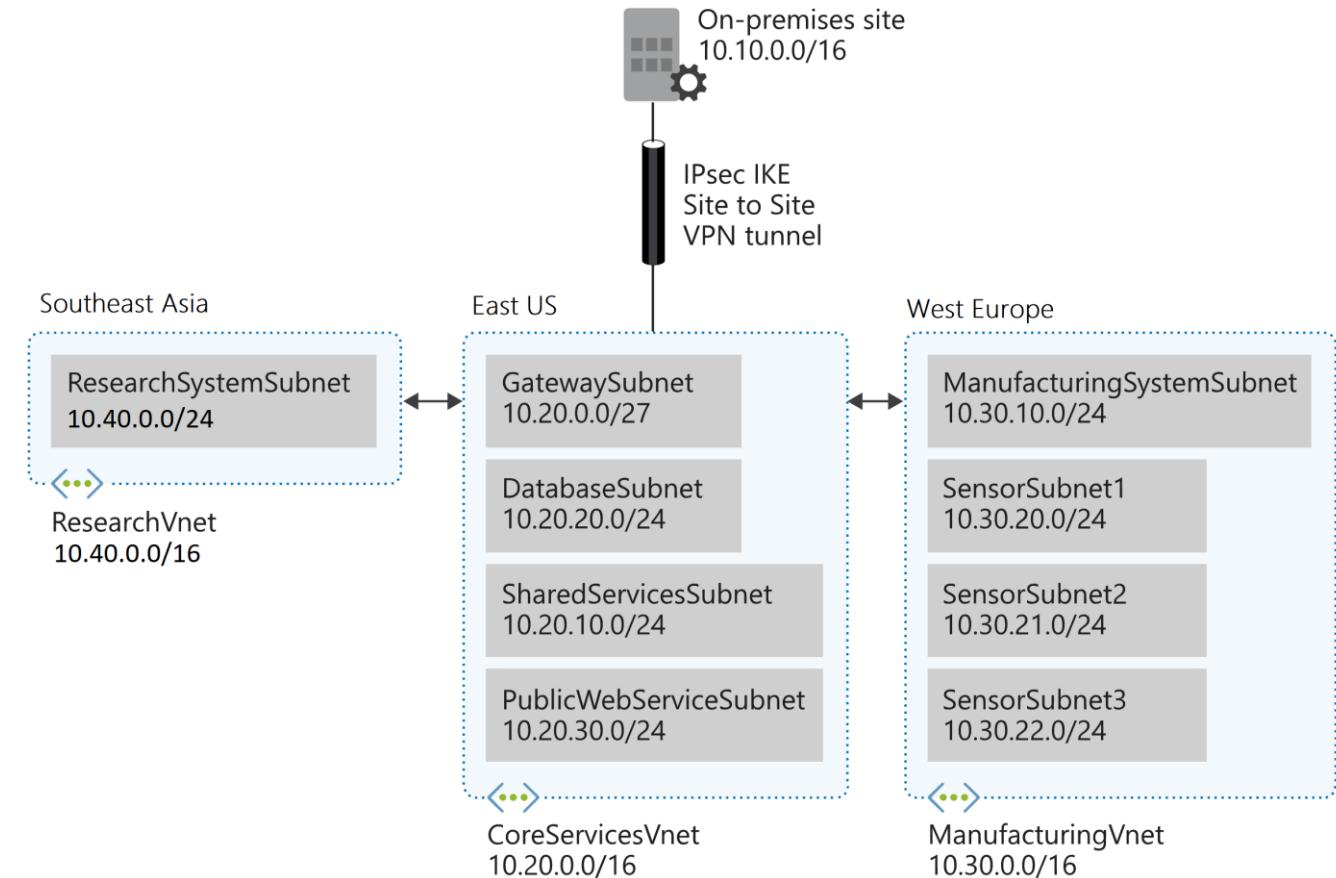
Task 1: Create the Contoso resource group

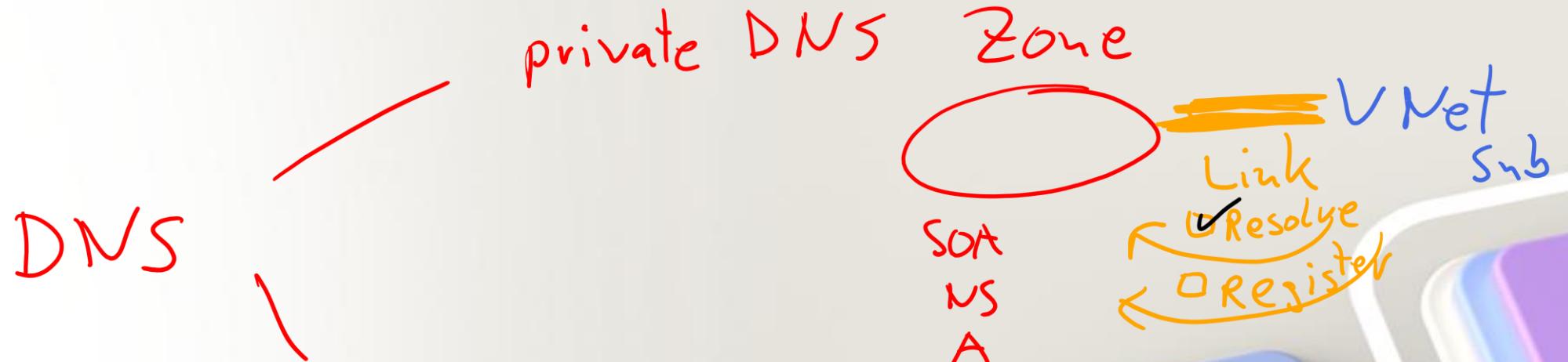
Task 2: Create the CoreServicesVnet virtual network and subnets

Task 3: Create the ManufacturingVnet virtual network and subnets

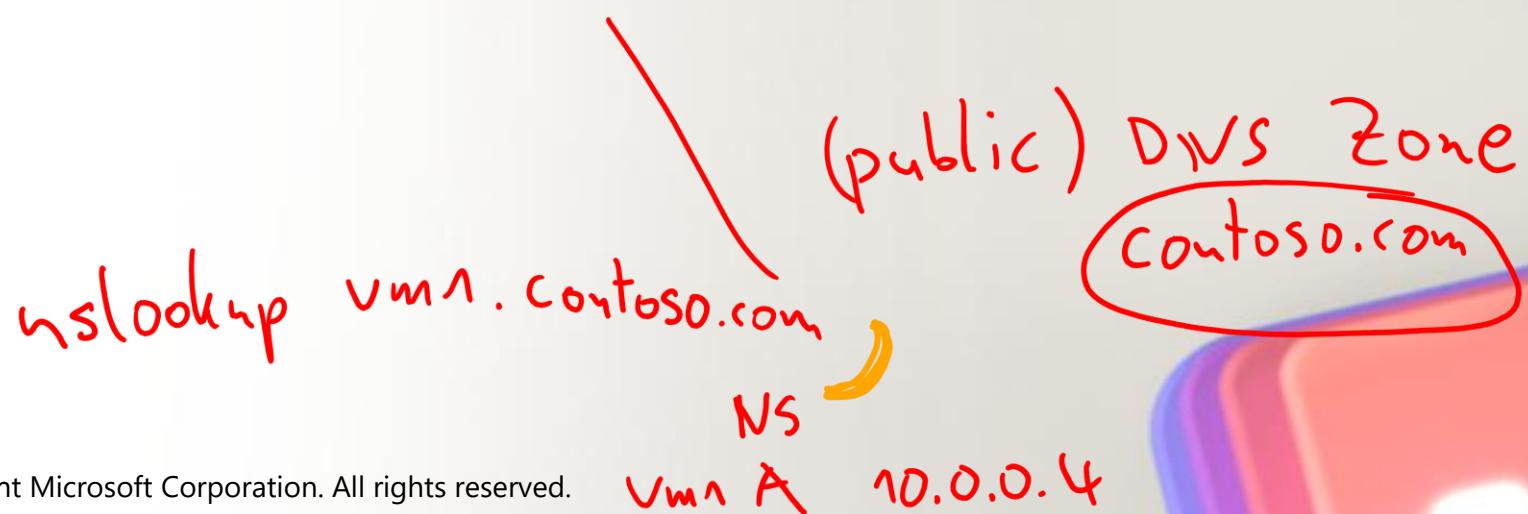
Task 4: Create the ResearchVnet virtual network and subnets

Task 5: Verify the creation of VNets and Subnets





Design Name Resolution for Azure Virtual Network



Learning Objectives - Design Name Resolution

- Public DNS
- Azure DNS Zones
- DNS Delegation
- DNS Record Sets
- DNS for Private Domains
- Private Zones Scenarios
- Significance of IP address 168.63.129.16
- Configure DNS settings inside a VNet
- Demonstration & Learning Recap

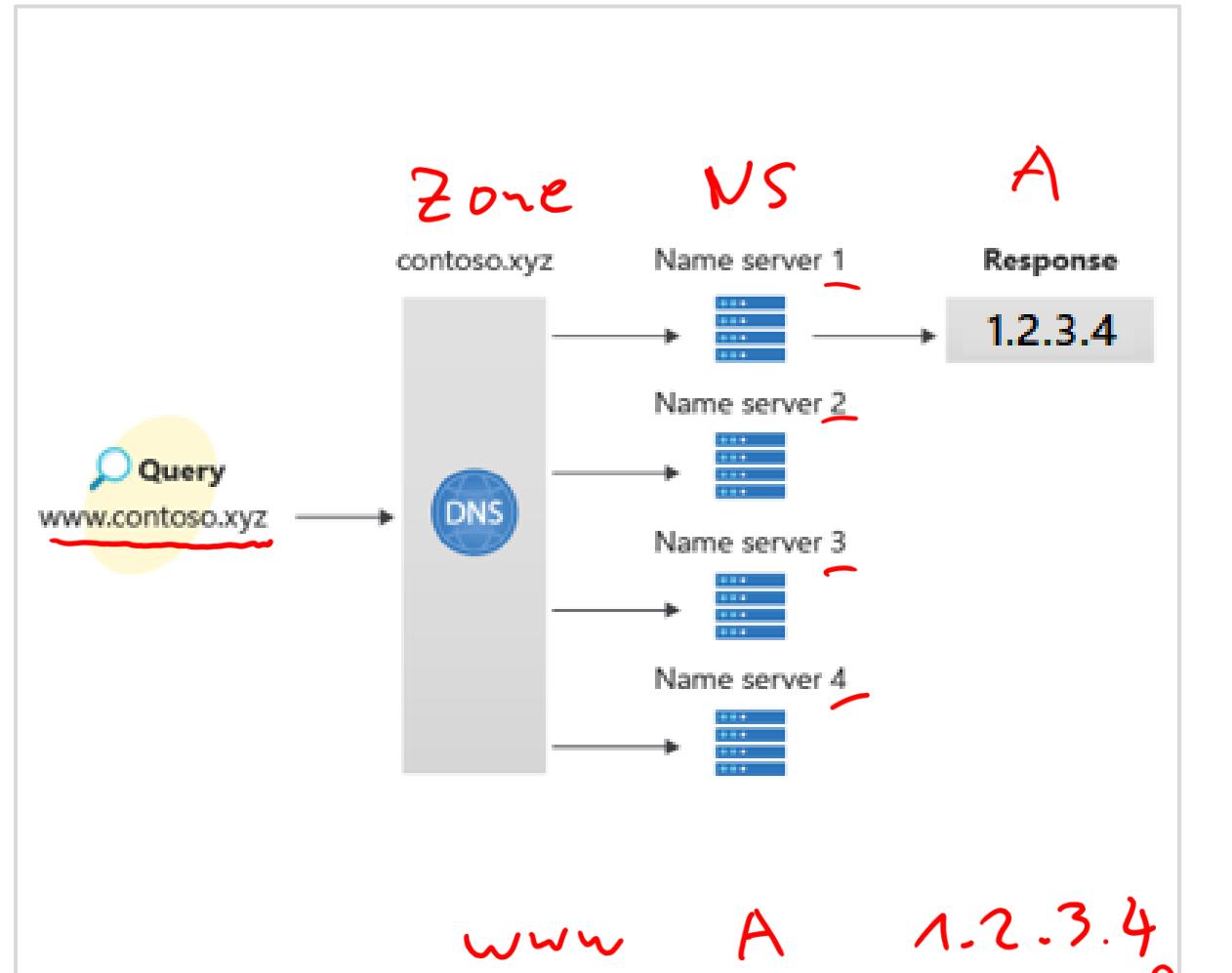
Standard DNS Resolver

Public DNS

Public DNS services resolve names and IP addresses for resources and services accessible over the internet such as web servers. Azure DNS is a hosting service for DNS domain that provides name resolution by using Microsoft Azure infrastructure

In Azure DNS, you can create address records manually within relevant zones. The records most frequently used will be:

- Host records: A/AAAA (IPv4/IPv6)
- Alias records: CNAME



Azure DNS Zones

A DNS zone hosts the DNS records for a domain

The same zone name can be reused in a different resource group or a different Azure subscription

Where multiple zones share the same name, each instance is assigned different name server addresses

Root/Parent domain is registered at the registrar and pointed to Azure Name Servers

Create DNS zone X

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

A DNS zone is used to host the DNS records for a particular domain. For example, the domain 'contoso.com' may contain a number of DNS records such as 'mail.contoso.com' (for a mail server) and 'www.contoso.com' (for a web site). Azure DNS allows you to host your DNS zone and manage your DNS records, and provides name servers that will respond to DNS queries from end users with the DNS records that you create. [Learn more.](#)

Project details

Subscription * MSDN Platforms Subscription

Resource group * rg-dns [Create new](#)

Instance details

Name * azureadmininc.org

Resource group location East US

[Review + create](#) [Previous](#) [Next : Tags >](#) [Download a template for automation](#)

DNS Delegation

When delegating a domain to Azure DNS, you must use the name server names provided by Azure DNS – use all four

Once the DNS zone is created, update the parent registrar

For child zones, register the NS records in the parent domain

The screenshot shows the Azure portal interface for managing a DNS zone. At the top, there's a header with the domain name 'azureadmininc.org' and a 'DNS zone' label. Below the header are several actions: 'Record set' (with a plus icon), 'Move' (with an arrow icon), 'Delete zone' (with a trash bin icon), and 'Refresh' (with a circular arrow icon). A dashed-line box encloses the following settings:

- Resource group ([change](#))
rg-dns
- Subscription ([change](#))
MSDN Platforms Subscription
- Subscription ID
- Tags ([change](#))
[Click here to add tags](#)

On the right side of the screen, there is a list of four name servers, each preceded by a small blue circular icon:

- Name server 1
ns1-02.azure-dns.com.
- Name server 2
ns2-02.azure-dns.net.
- Name server 3
ns3-02.azure-dns.org.
- Name server 4
ns4-02.azure-dns.info.

DNS Record Sets

A record set is a collection of records in a zone that have the same name and are the same type

Azure DNS supports all common DNS record types: A, AAAA, CAA, CNAME, MX, NS, PTR, SOA, SRV, and TXT

A record set cannot contain two identical records

Changing the drop-down Type, changes the information required

Add record set X

dnszone.com

Name

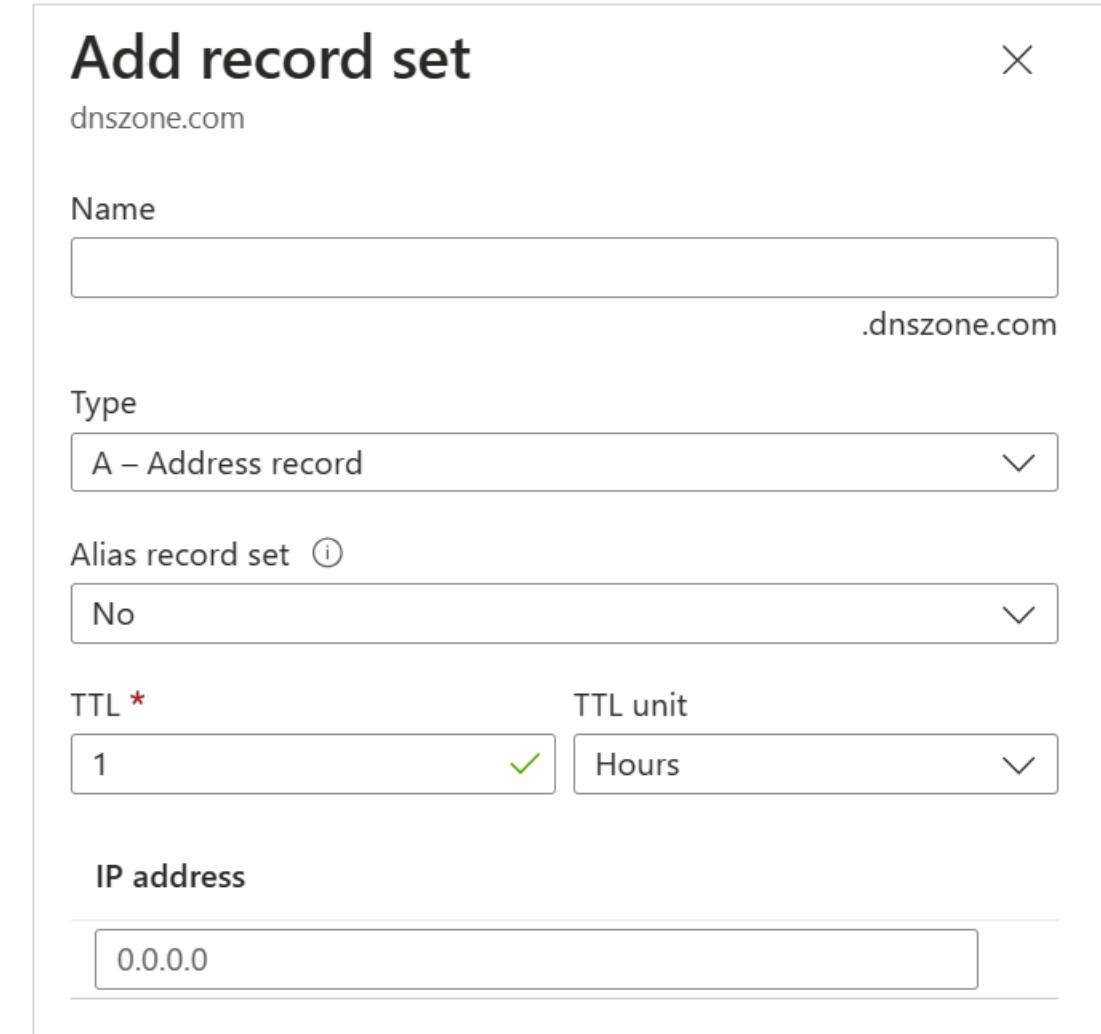
.dnszone.com

Type

Alias record set (i)

TTL * TTL unit

IP address



DNS for Private Domains

Use your own custom domain names

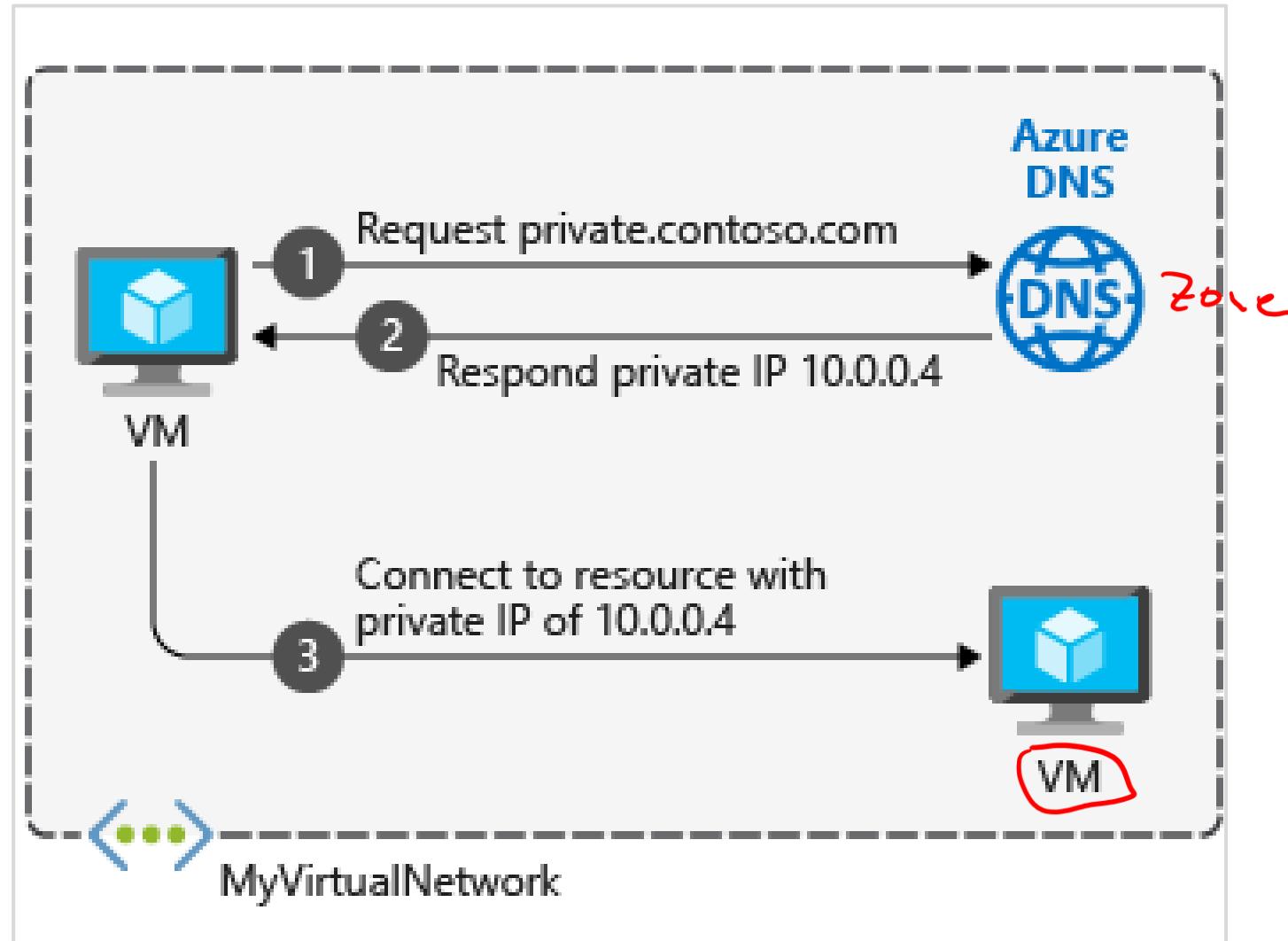
Provides name resolution for VMs within a VNet and between VNets

Automatic hostname record management

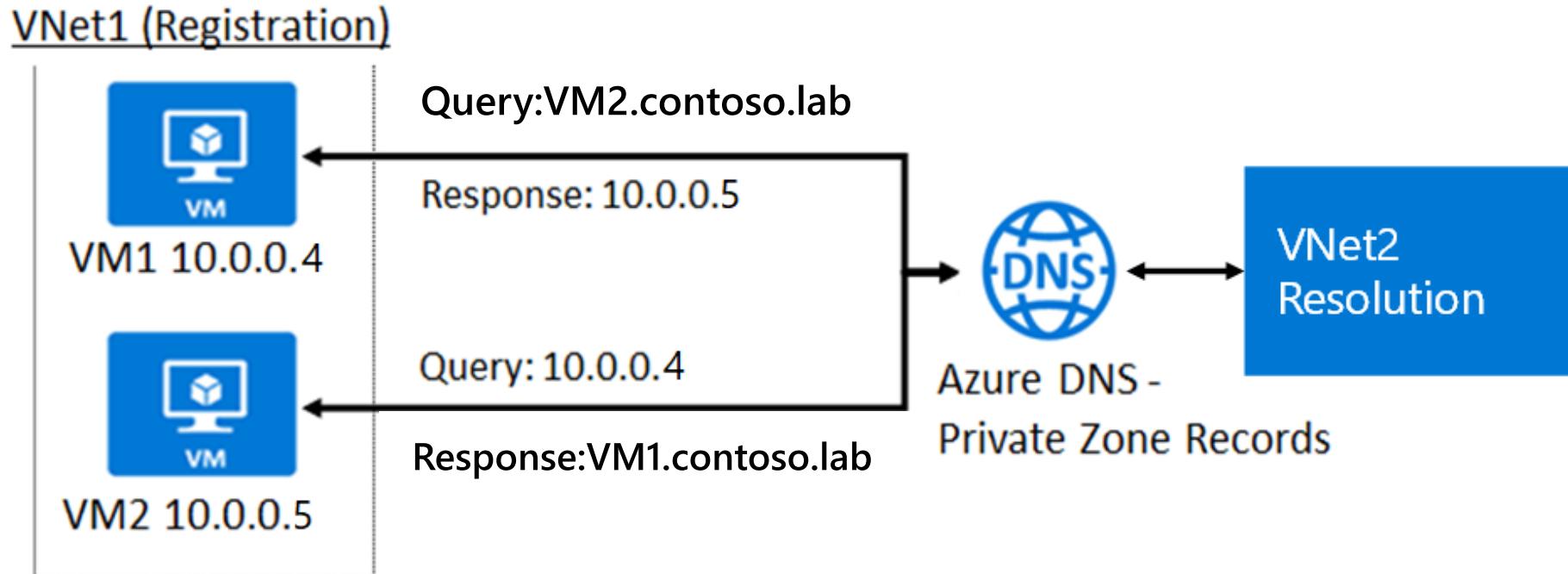
Removes the need for custom DNS solutions

Use all common DNS records types

Available in all Azure regions



Private Zone Scenarios



DNS queries across the linked virtual networks are resolved

DNS resolution in VNet1 is private and not accessible from the Internet

Magic

Significance of IP address 168.63.129.16

Enables the VM Agent to communicate with the Azure platform to signal that it is in a "Ready" state

Enables communication with the DNS virtual server to provide filtered name resolution to the resources (such as VM) that do not have a custom DNS server.

Enables health probes from Azure load balancer to determine the health state of VMs

Enables the VM to obtain a dynamic IP address from the DHCP service in Azure

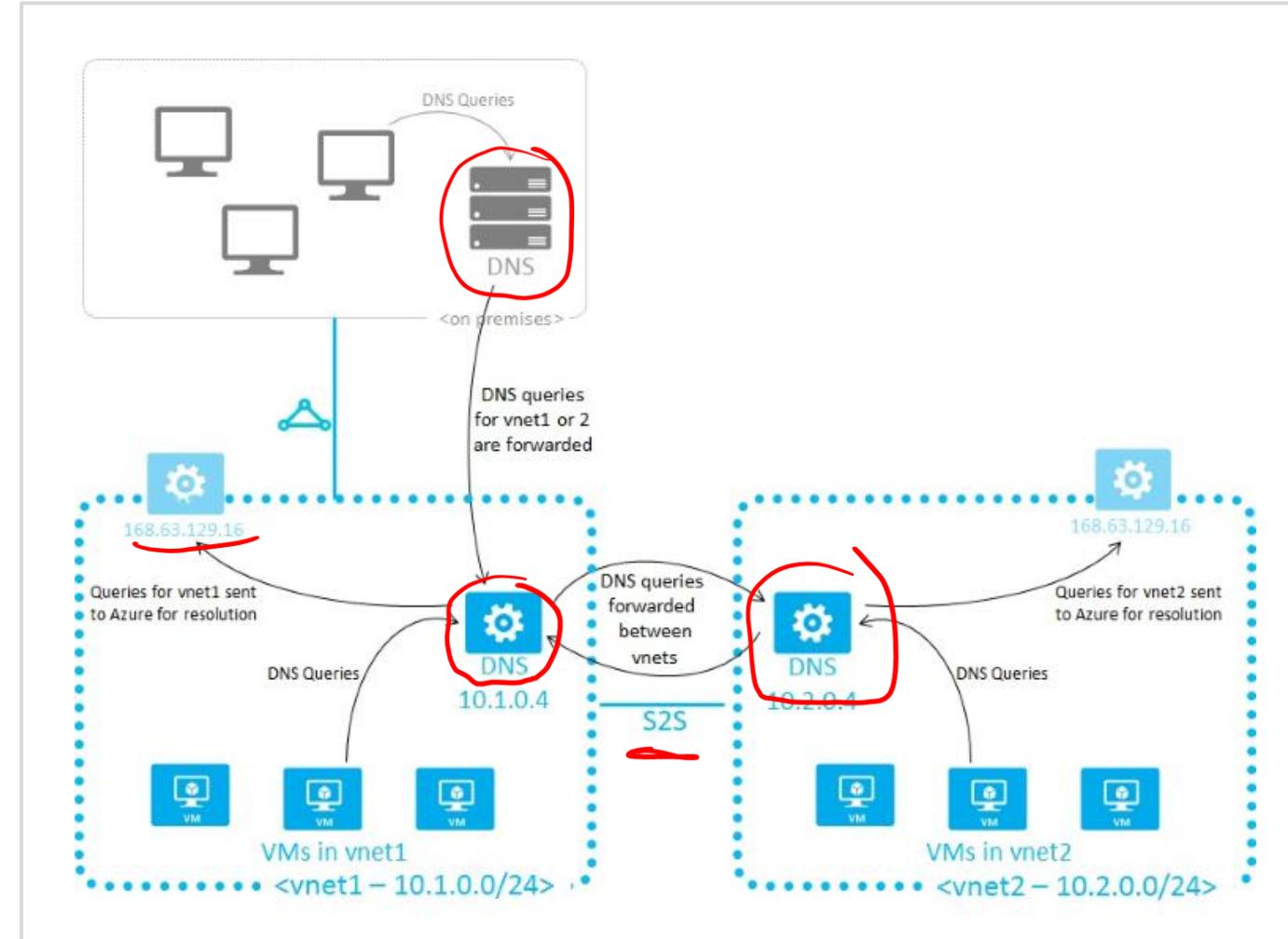
Enables Guest Agent heartbeat messages for the PaaS role

ipconfig
IP 10.0.0.4
DNS 168...
DHCP 168...

Configure DNS settings inside a VNet

Provide your own DNS solution:

- Provide appropriate host name resolution.
- Provide appropriate recursive resolution to allow resolution of external domain names.
- Be accessible (TCP and UDP on port 53) - NSG rules must allow access to your DNS listeners endpoint.
- Be secured against access from the internet, to mitigate threats posed by external agents.



Demonstration – DNS Name Resolution



- Create a DNS zone
- Add a DNS record set
- Use PowerShell to view DNS information
- View your name servers
- Test the resolution
- Explore DNS metrics

Learning Recap – Design Name Resolution



Check your knowledge questions and additional study

[Host your domain on Azure DNS – Training](#)

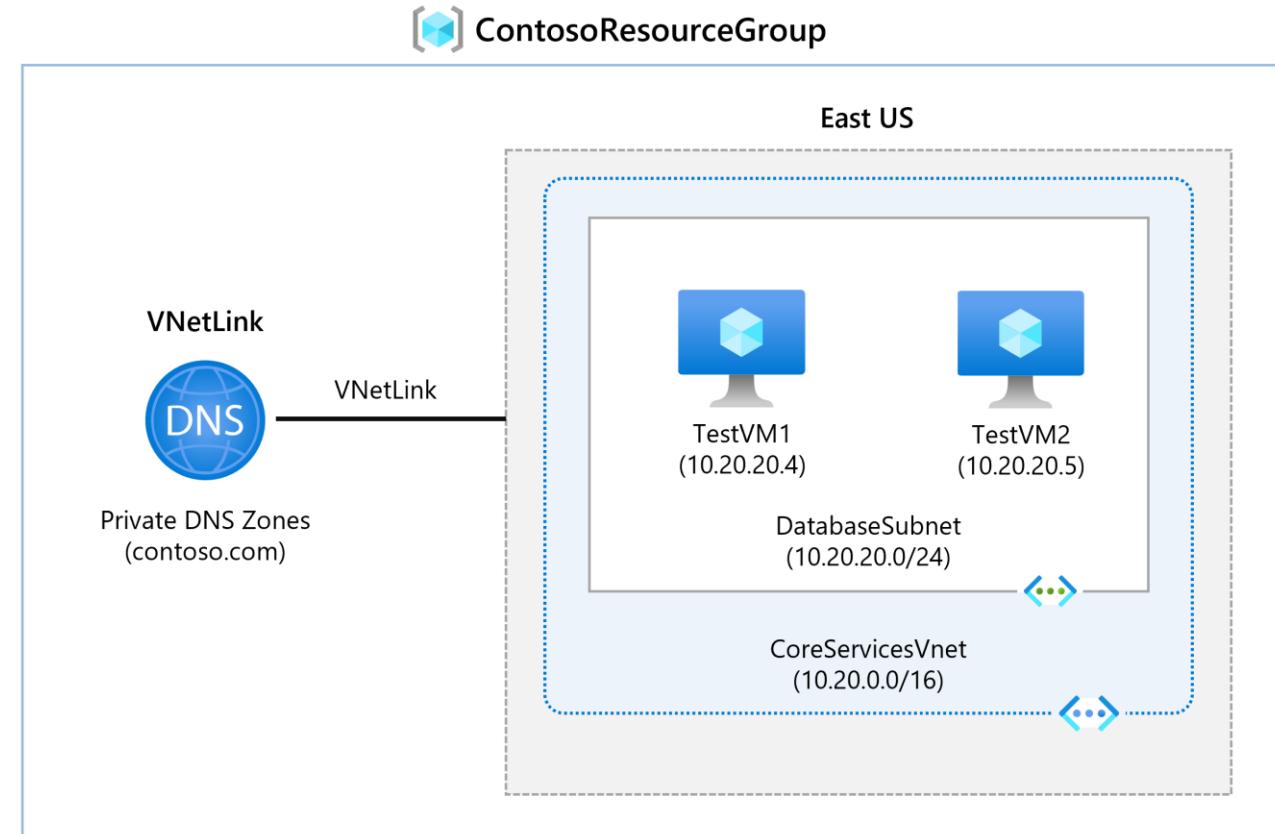
[Implement DNS for Windows Server IaaS VMs – Training](#)

[Secure Windows Server DNS – Training](#)

Exercise: Configure DNS settings in Azure

Exercise – Configure DNS Settings in Azure

- Create a private DNS Zone
- Link subnet for auto registration
- Create Virtual Machines to test the configuration
- Verify records are present in the DNS zone



Enable Cross-VNet Connectivity with Peering

Learning Objectives - Enable Cross-VNet Connectivity with Peering

- VNet Peering
- Gateway Transit and Connectivity
- Service Chaining
- Configure VNet Peering
- Demonstration
- Learning Recap

VNet Peering

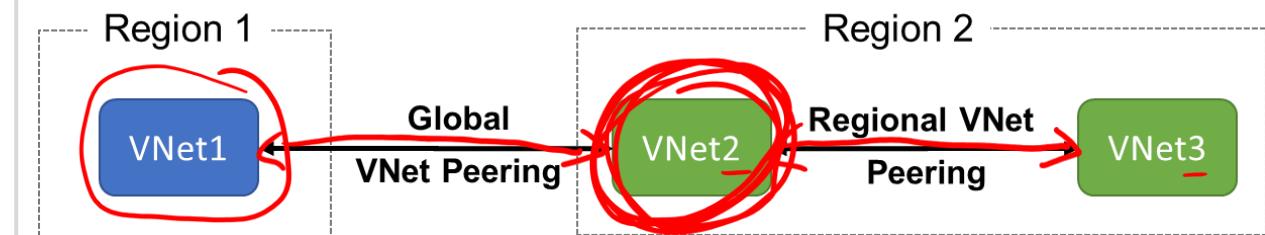
VNet peering connects two Azure virtual networks

Two types of peering: Regional and Global

Peered networks use the Azure backbone for privacy and isolation

You can peer across subscriptions and tenants

VNet peering is not transitive 



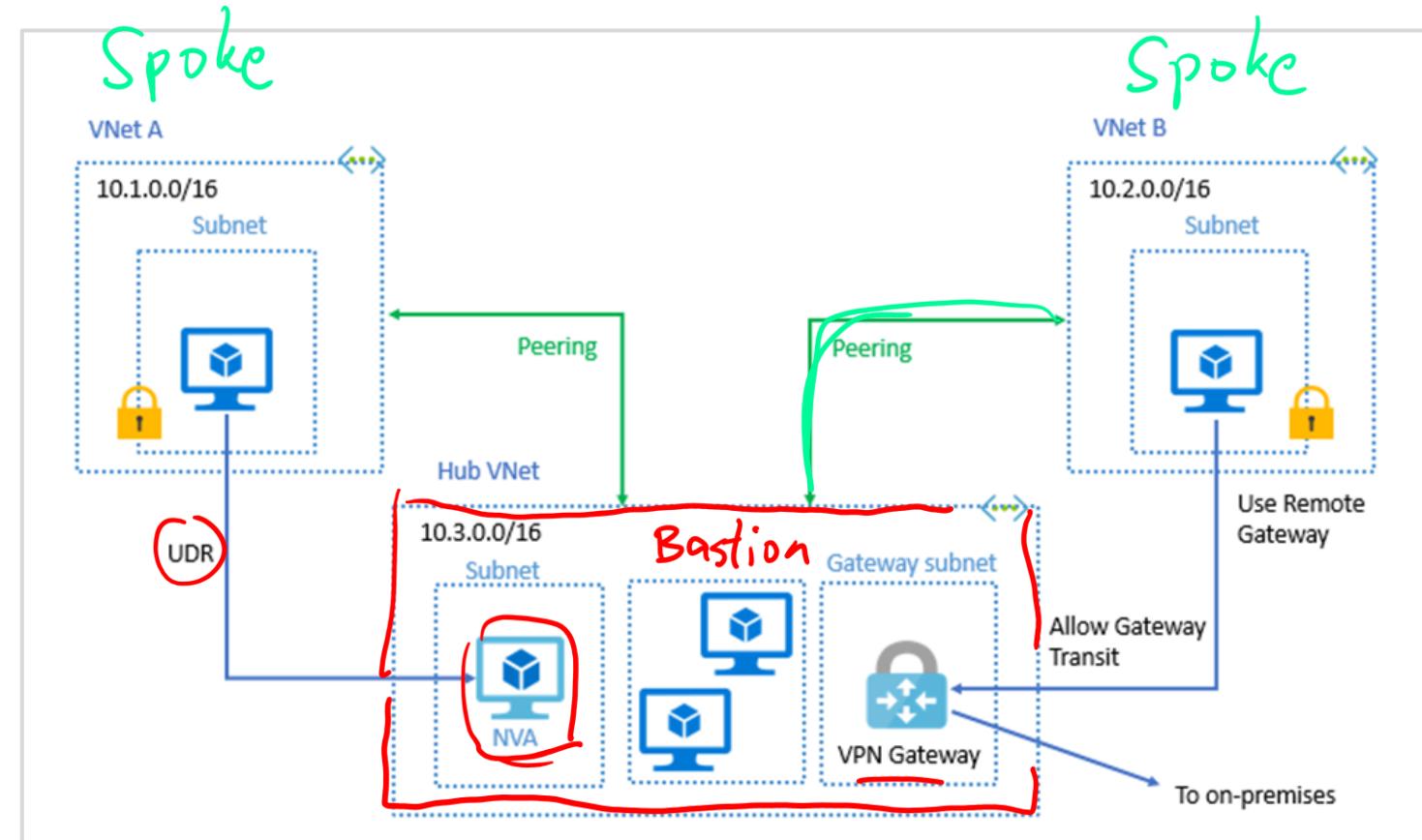
Implementing VNet Peering

NVA Network Virtual Appliance
UDR User Defined Routing

Gateway transit allows peered virtual networks to share the gateway and get access to resources

No VPN gateway is required in the peered virtual network

Default VNet peering provides full connectivity



IP address spaces of connected networks can't overlap

Configure VNet Peering

Allow virtual network access settings

Configure forwarded traffic settings

Home > Virtual networks > abell-test-vn | Peerings >

Add peering ...

myVnet01

This virtual network

Peering link name *

Allow 'myVnet01' to access the peered virtual network ⓘ

Allow 'myVnet01' to receive forwarded traffic from the peered virtual network ⓘ

Allow gateway or route server in 'myVnet01' to forward traffic to the peered virtual network ⓘ

Enable 'myVnet01' to use the peered virtual networks' remote gateway or route server ⓘ

Remote virtual network

Peering link name *

Virtual network deployment model ⓘ

Resource manager

Classic

I know my resource ID ⓘ

Subscription * ⓘ

Azure Subscription

Virtual network *

Allow the peered virtual network to access 'myVnet01' ⓘ

Allow the peered virtual network to receive forwarded traffic from 'myVnet01' ⓘ

Allow gateway or route server in the peered virtual network to forward traffic to 'myVnet01' ⓘ

Enable the peered virtual network to use 'myVnet01's' remote gateway or route server ⓘ

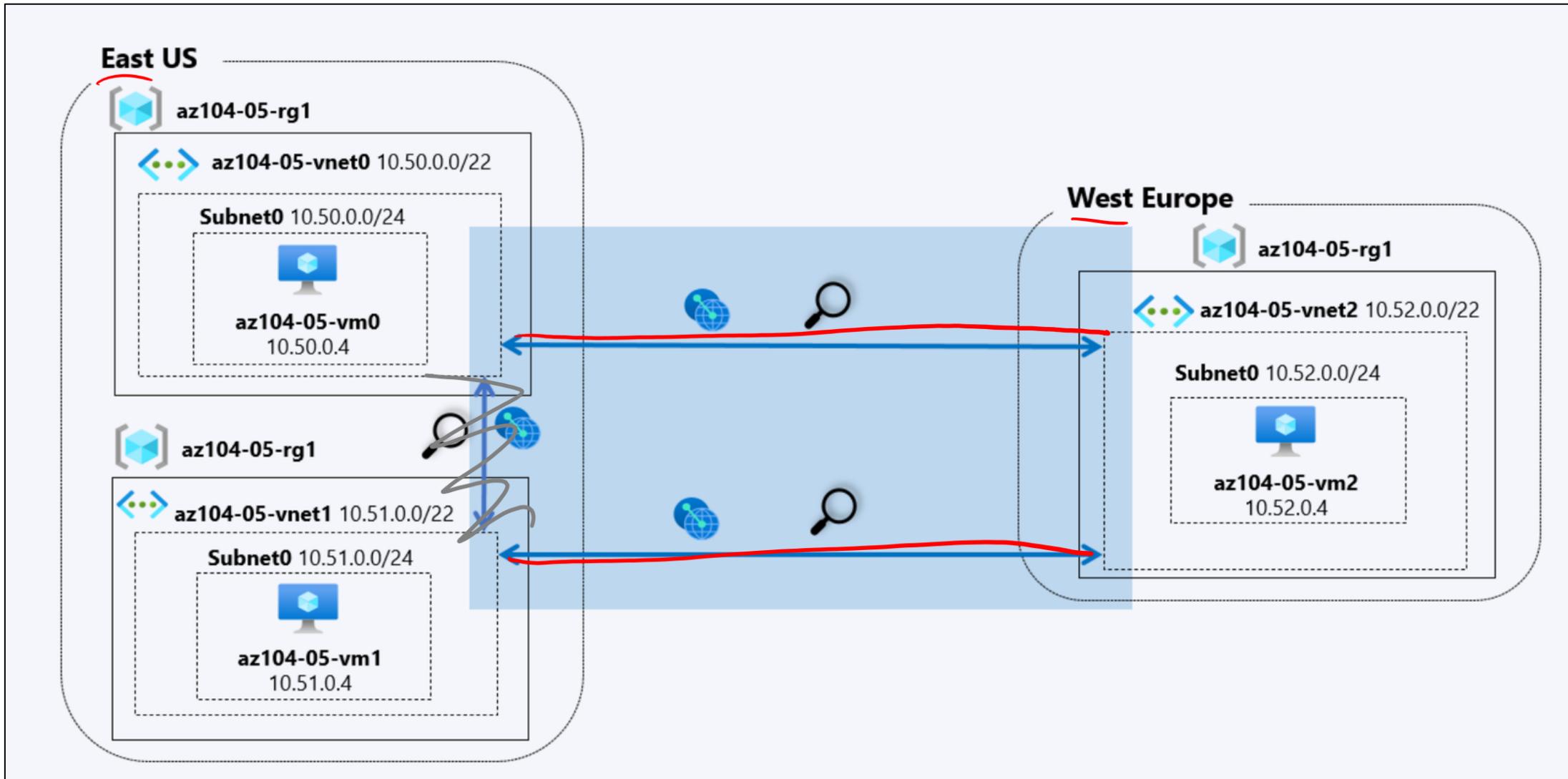
Add

Demonstration – VNet Peering



- Configure VNet peering on the first virtual network
- Configure a VPN gateway
- Allow gateway transit
- Confirm VNet peering on the second virtual network

Identify the type of peering



Learning Recap – VNet Peering Review



[Distribute your services across Azure virtual networks and integrate them by using virtual network peering – Training](#)

Check your knowledge questions and additional study

Exercise: Connect two Azure virtual networks using global VNet peering

Exercise - Connect Two Azure Virtual Networks Using Global VNet Peering

Task 1: Create a Virtual Machine to test the configuration

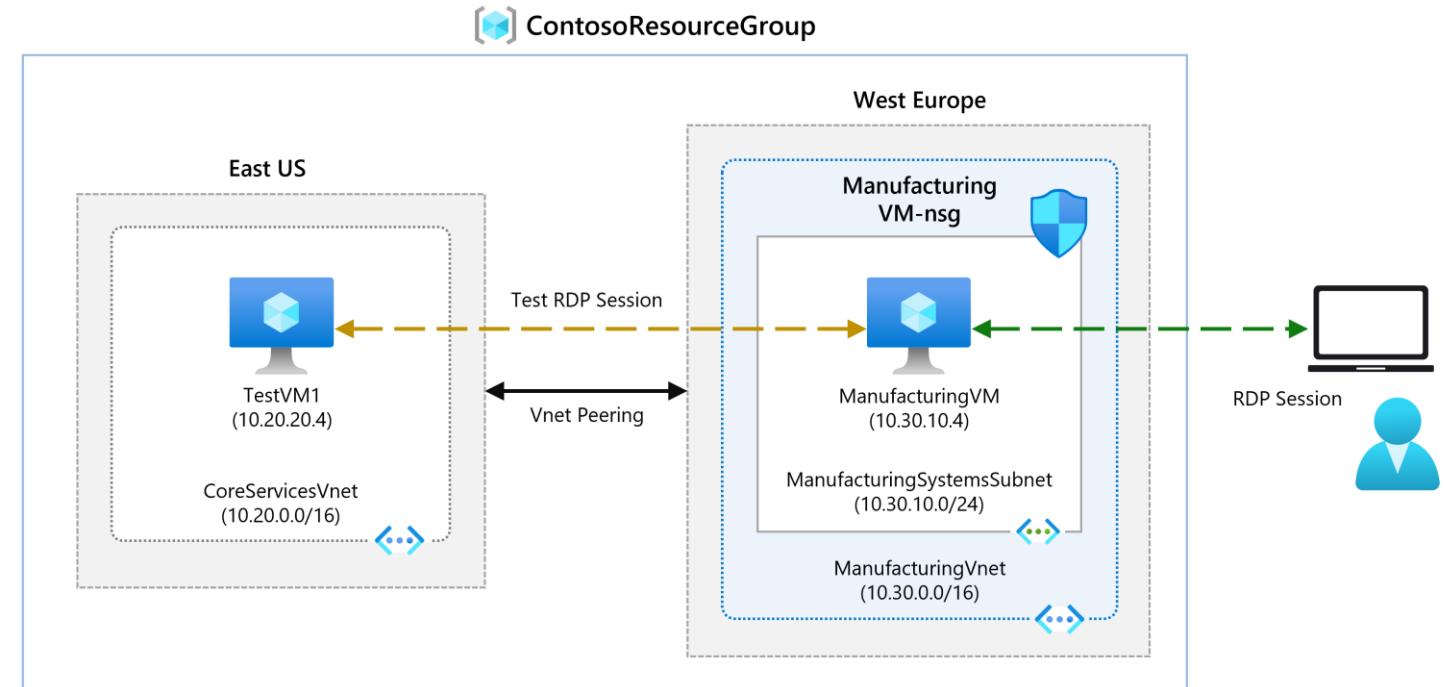


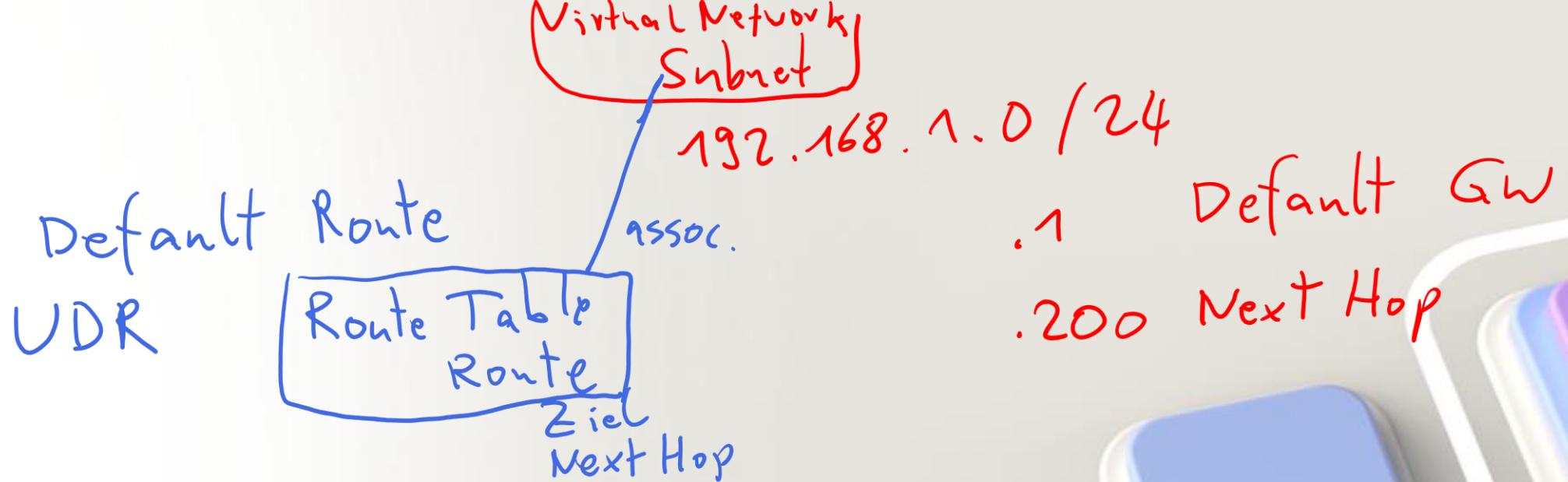
Task 2: Connect to the Test VMs using RDP

Task 3: Test the connection between the VMs

Task 4: Create VNet peerings between CoreServicesVnet and ManufacturingVnet

Task 5: Test the connection between the VMs





Implement virtual network traffic routing

Learning Objectives - Implement Virtual Network Traffic Routing

- Virtual network traffic routing
- Configure User-defined routes (UDRs)
- Configure forced tunneling
- Configure Azure Route Server
- Diagnose a routing problem
- Demonstration
- Learning Recap

Virtual network traffic routing

System routes

Default routes

Custom routes

myVMNic1 - Effective routes

Network interface

Search (Ctrl+ /) Download Refresh

Showing only top 200 records, click Download above to see all.

Scope Network interface (myVMNic1)

Associated route table: ⓘ

Effective routes

Source	↑↓	State	↑↓	Address Prefixes	↑↓	Next Hop Type	↑↓	Next Hop Type IP Address	↑↓	User Defined Route Name
Default		Active		10.1.1.0/24		Virtual network		-		-
Default		Active		0.0.0.0/0		Internet		-		-
Default		Active		10.0.0.0/8		None		-		-
Default		Active		100.64.0.0/10		None		-		-
Default		Active		192.168.0.0/16		None		-		-

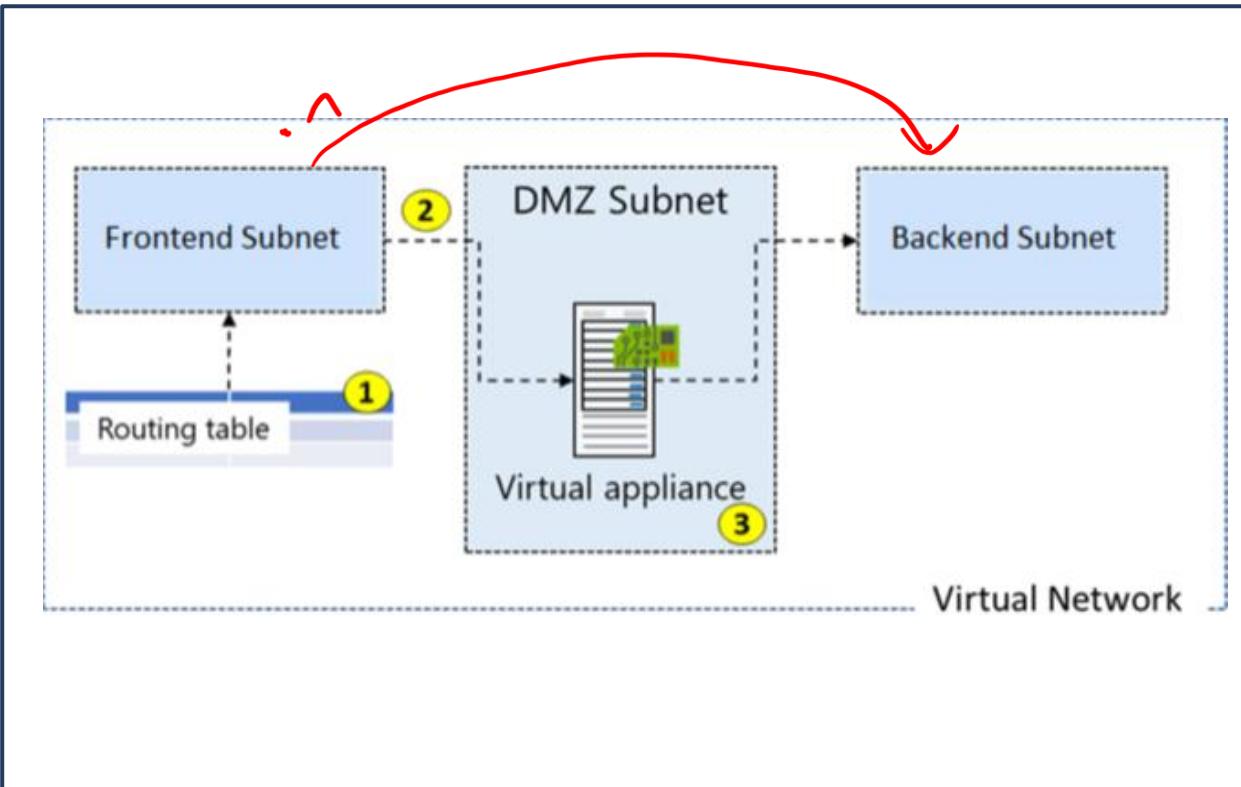
Effective security rules

Effective routes

New support request

Dynamisches Routing:
BGP
AS Nr.

Configure User-defined routes



Create Route table

Basics Tags Review + create

Project details

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

Subscription * RG1

Resource group * RG1

Instance details

Region * East US

Name * myRouteTablePublic

Propagate gateway routes * Yes No

Create a Custom Route and associate route table to subnet

Add route

myRouteTablePublic

A user defined route (UDR) is a static route that overrides Azure's default system routes, or adds a route to a subnet's route table. [Learn more ↗](#)

Route name * ✓

Destination type * ✓

Destination IP addresses/CIDR ranges * ✓

Next hop type * Virtual appliance

Next hop address * ✓

i Ensure you have IP forwarding enabled on your virtual appliance. You can enable this by navigating to the respective network interface's IP address settings.

Associate subnet

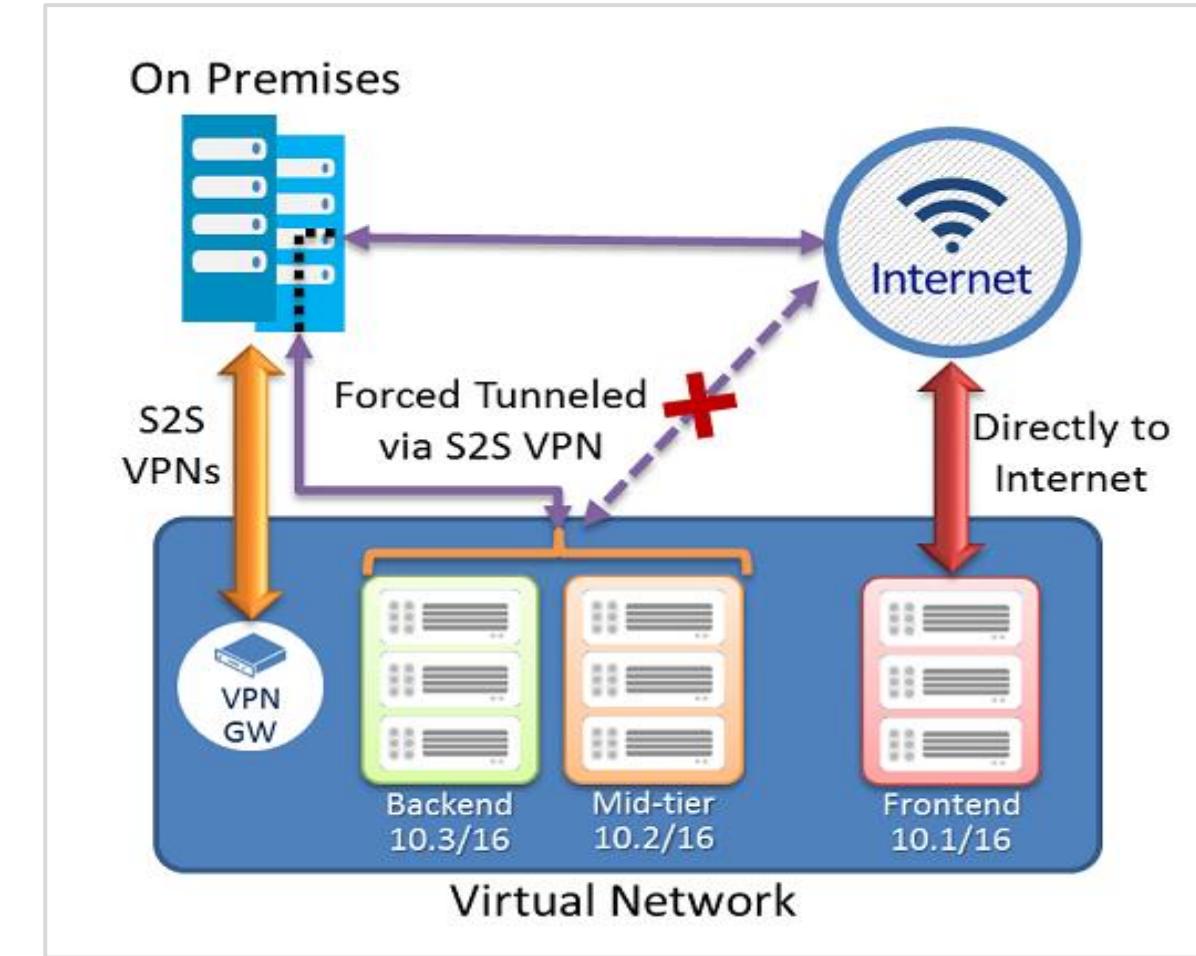
myRouteTablePublic

Virtual network (i)
 ✓

Subnet * (i)
 ✓

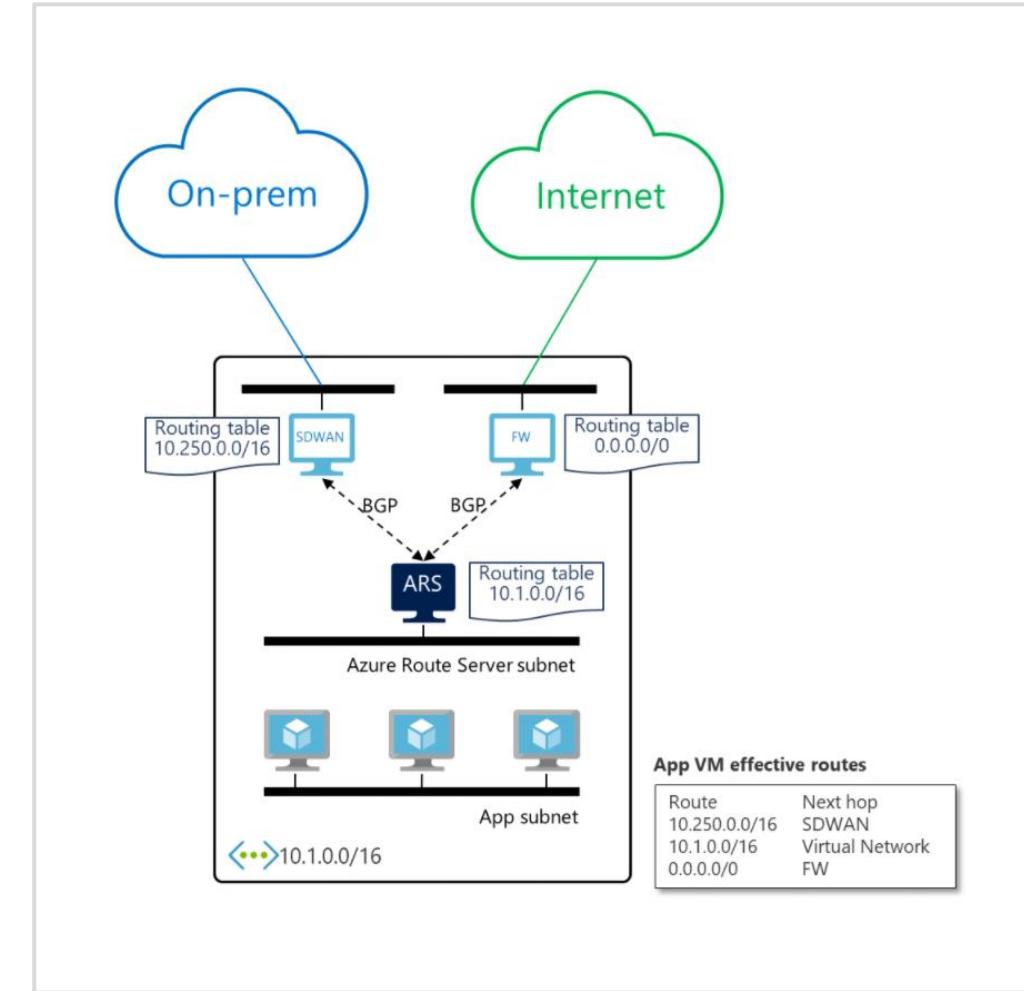
Configure forced tunneling

- Create a routing table.
- Add a user-defined default route to the VPN Gateway.
- Associate the routing table to the appropriate VNet subnet(s).
- Forced tunneling must be associated with a VNet that has a route-based VPN gateway.
- You must set a default site connection among the cross-premises local sites connected to the virtual network.
- The on-premises VPN device must be configured using 0.0.0.0/0 as traffic selectors.



Configure Azure Route Server

- Fully managed service that simplifies dynamic routing between NVA and the VNet
- NVA needs to support BGP
- You no longer need to manually update the routing table on your NVA whenever your virtual network addresses are updated.
- You no longer need to update User-Defined Routes manually whenever your NVA announces new routes or withdraw old ones.
- Needs a RouteServerSubnet



Diagnose a routing problem

View effective routes in the Azure portal, PowerShell or CLI

Use Azure Network Watcher to troubleshoot

ping
tracert
nslookup

NSG eff

Resolve Issues:

- Add a custom route to override a default route.
- Change or remove a custom route that causes traffic to be routed to an undesired location.
- Ensure that the route table is associated to the correct subnet (the one that contains the network interface).
- Ensure that devices such as Azure VPN gateway or network virtual appliances you've deployed are operating as intended.

Demonstration – Creating Custom Routes

- Create a route table
- Add a route
- Associate a route table to a subnet
- Use PowerShell to view your routing information



Learning Recap – Implement Virtual Network Traffic Routing



[Azure virtual network traffic routing | Microsoft Docs](#)

Check your
knowledge
questions and
additional
study

Configure internet access with Azure Virtual NAT

Learning Objectives - Azure Virtual NAT

- Azure Virtual Network NAT
- Choose when to use a Virtual Network NAT
- Coexistence of inbound and outbound
- How to deploy NAT
- Demonstration
- Learning Recap

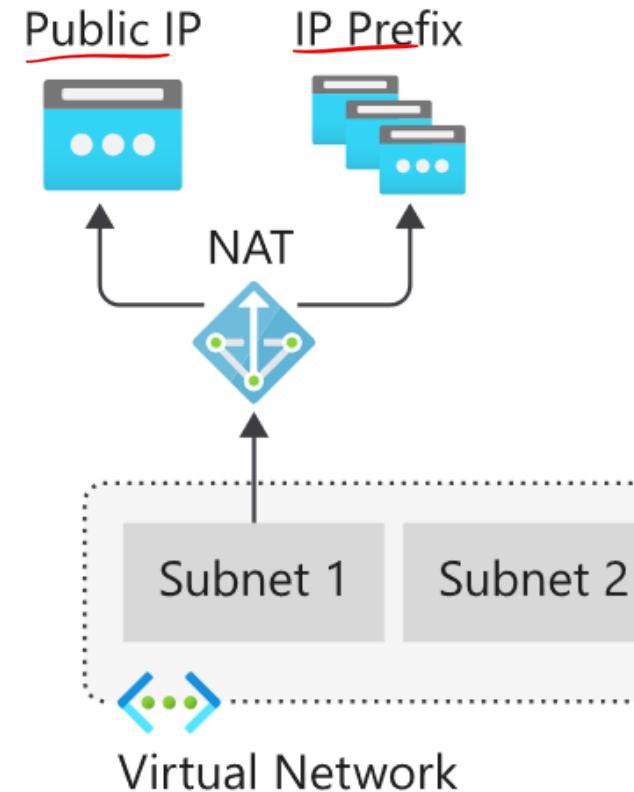
Azure NAT Gateway

Azure NAT Gateway (network address translation) simplifies outbound-only Internet connectivity for virtual networks

Is a fully managed and highly resilient service that supports dynamic workloads by scaling NAT

When configured on a subnet, all outbound connectivity uses your specified static public IP addresses

Outbound connectivity is possible without a load balancer or public IP addresses directly attached to virtual machines

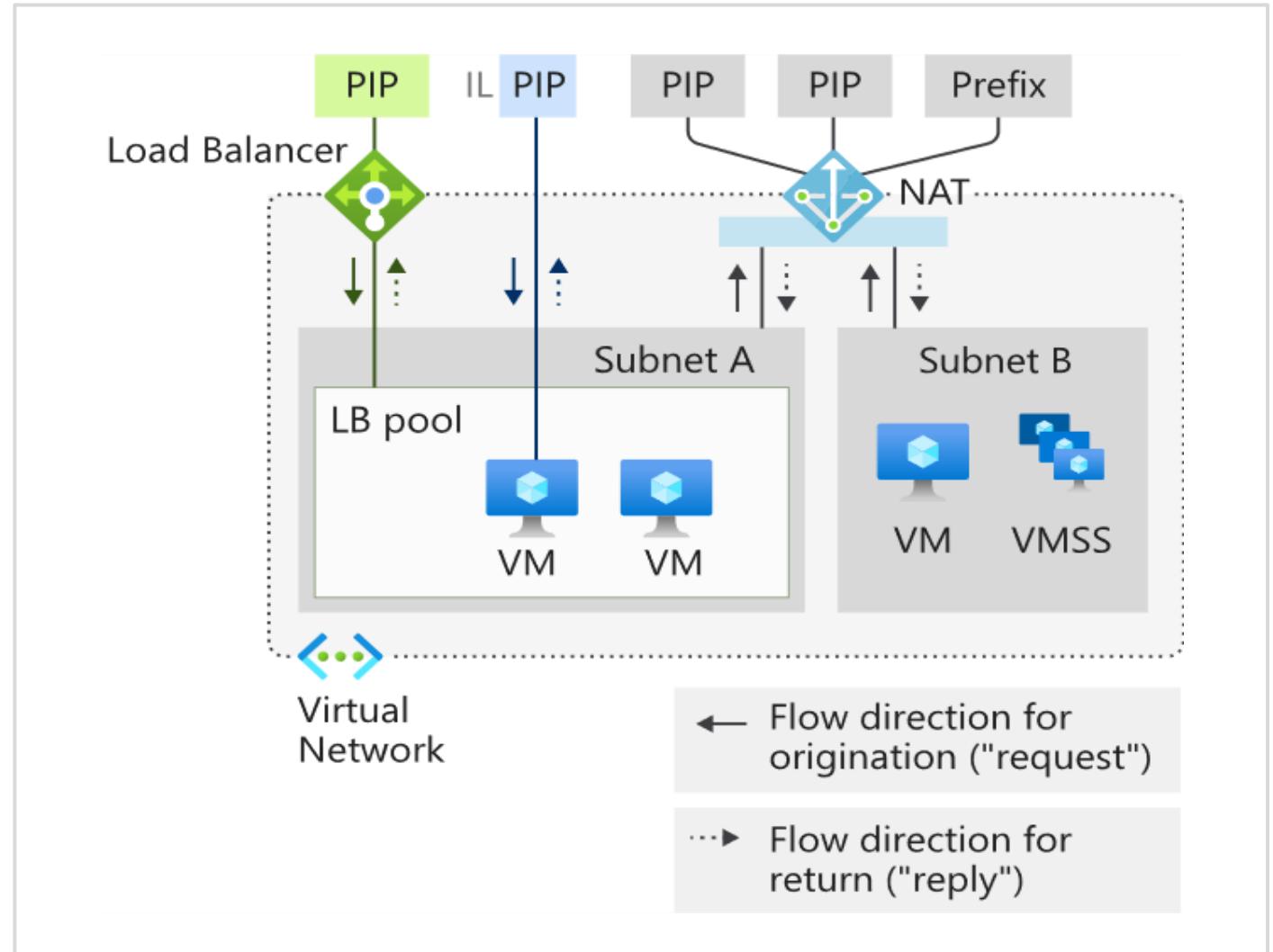


Coexistence of inbound and outbound

NAT and compatible Standard SKU features are aware of the direction the flow was started.

Inbound and outbound scenarios can coexist. **DNat** **SNat**

These scenarios will receive the correct network address translations because these features are aware of the flow direction.



How to deploy NAT

NAT gateway resource:

1. Create regional or zonal (zone-isolated) NAT gateway resource
2. Assign IP addresses
3. If necessary, modify TCP idle timeout

Virtual network:

- Configure virtual network subnet to use a NAT gateway.
- User-defined routes are not necessary.

Basics Outbound IP Subnet Tags Review + create

Azure NAT gateway can be used to translate outbound flows from a virtual network to the public internet. [Learn more about NAT gateways.](#)

Project details

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

Subscription * Contoso Hotels

Resource group * Create new

Instance details

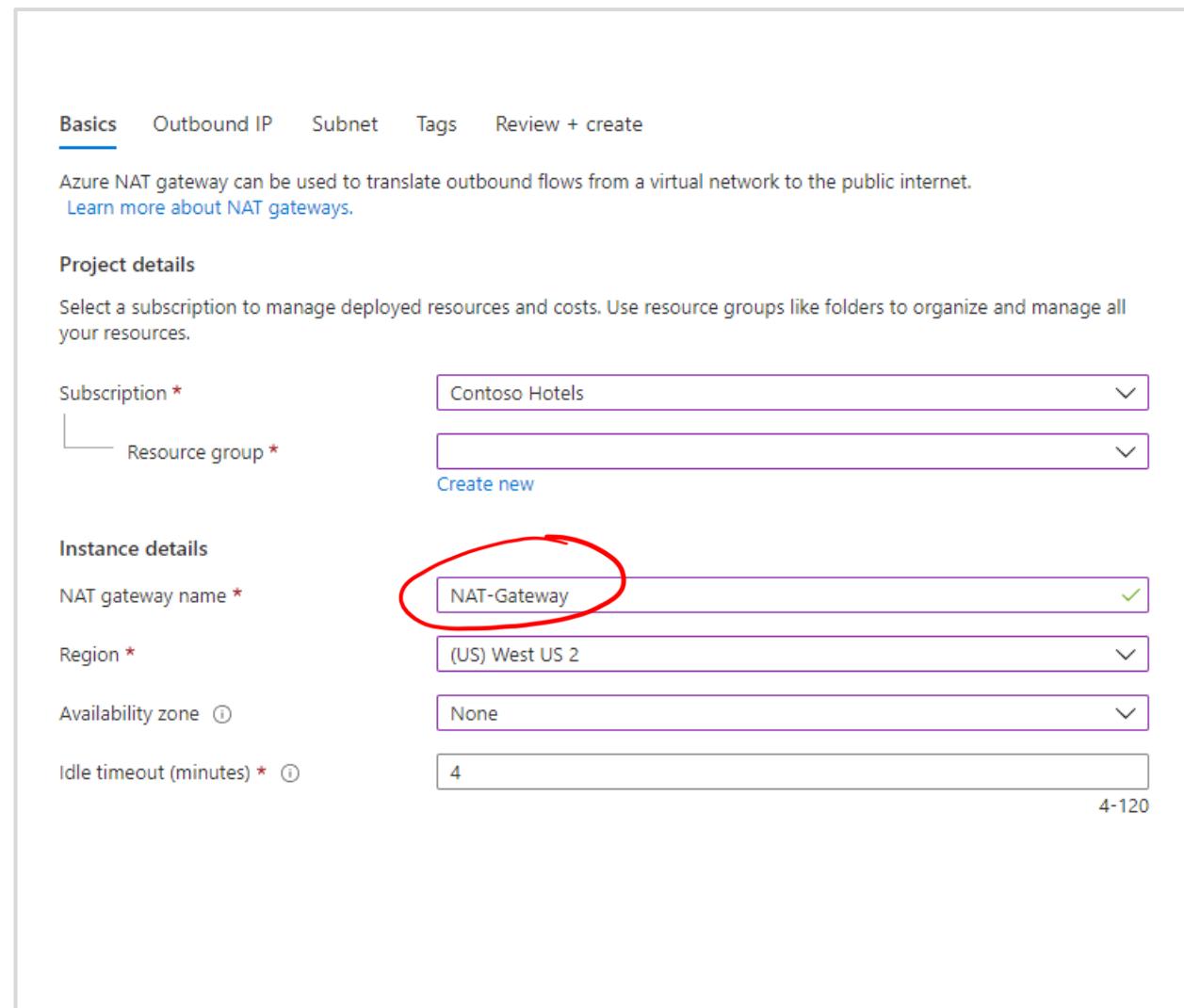
NAT gateway name * NAT-Gateway

Region * (US) West US 2

Availability zone ⓘ None

Idle timeout (minutes) * ⓘ 4

4-120

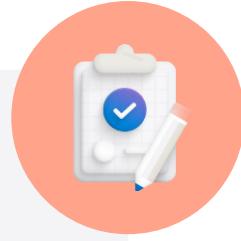


Demonstration – NAT Gateway



- Create a virtual network
- Create a virtual machine
- Create a NAT gateway and associate with the virtual network
- Connect to virtual machine and verify NAT IP address

Learning Recap – Azure virtual Network NAT



Check your knowledge questions and additional study

[What is Azure Virtual Network NAT?](#)

[Designing Virtual networks with NAT gateway resources – Azure Virtual Network NAT](#)

End of presentation