Microsoft Azure

AZ-104

Administer Virtual Networking

About this course: Course Outline

01: Administer Identity

02: Administer Governance and Compliance

03: Administer Azure Resources

04: Administer Virtual Networking

05: Administer Intersite Connectivity

06: Administer Network Traffic Management

07: Administer Azure Storage

08: Administer Azure Virtual Machines

09: Administer PaaS Compute Options

10: Administer Data Protection

11: Administer Monitoring

Administer Virtual Networking Introduction

SDN

Configure Virtual Networks

TCP / IPv4
IPv6

Configure Network Security Groups

NSG FW

Configure Azure Firewall

WAF
AppGw
Front Door

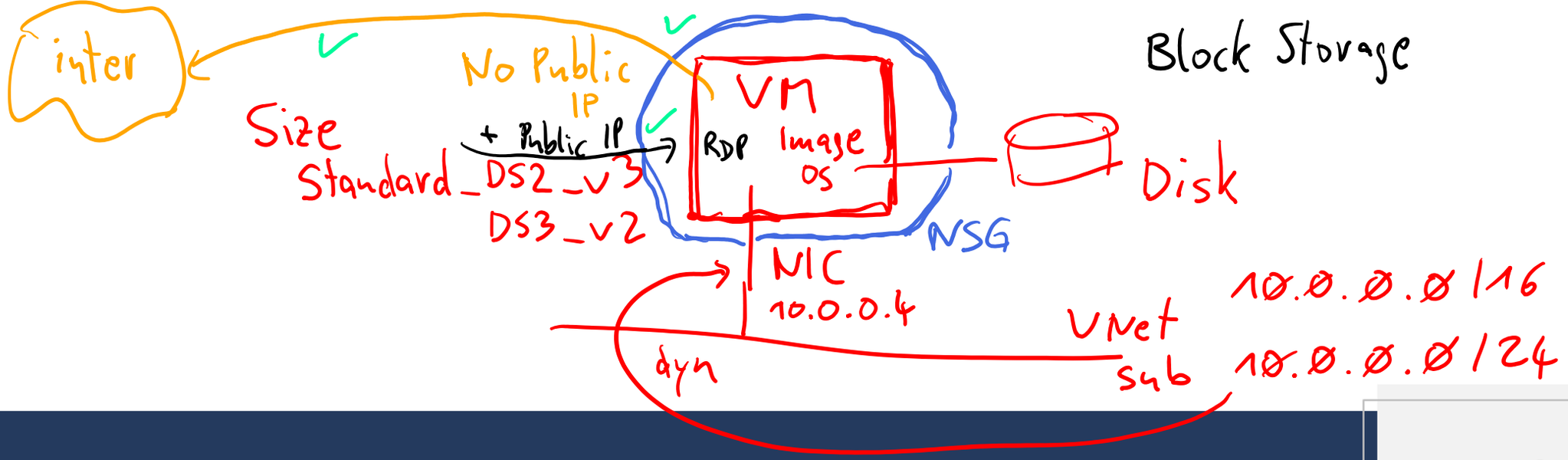
Configure Azure DNS

IANA

priv zone
contoso.com
pub zone

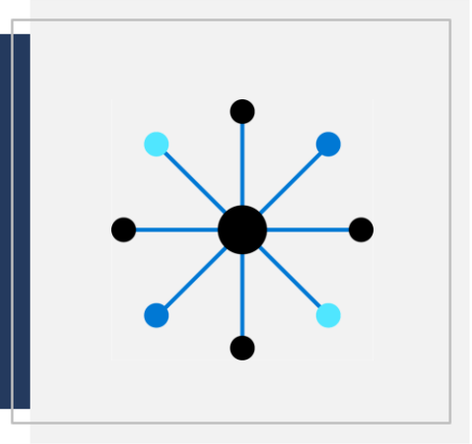
contoso.com
VNet

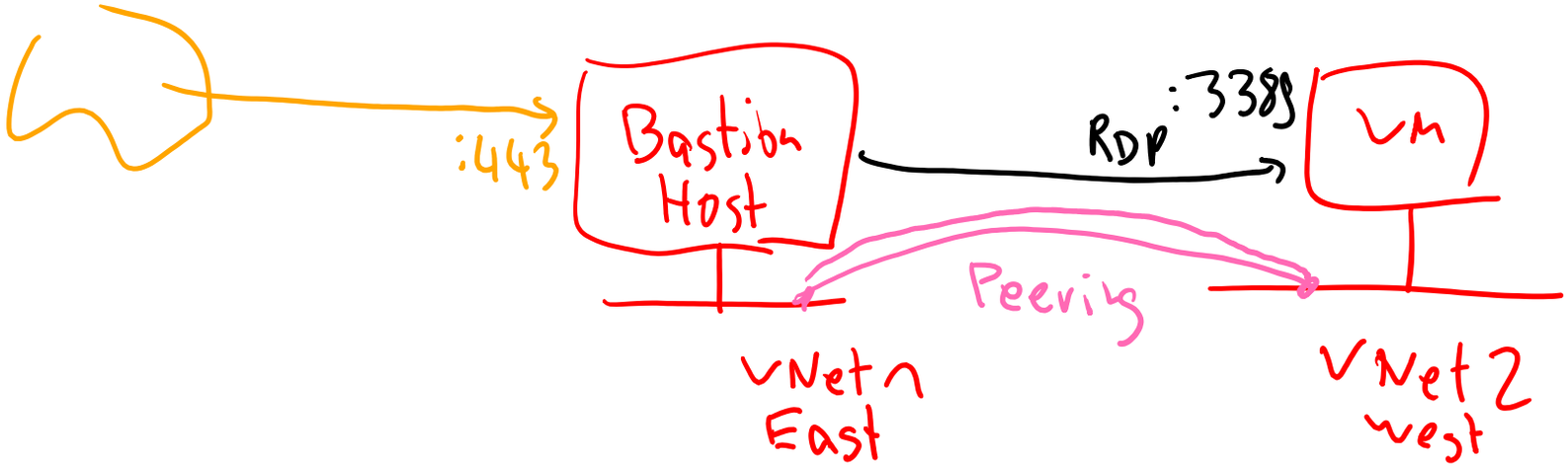
Lab 04 – Implement Virtual Networks



Block Storage

Configure Virtual Networks



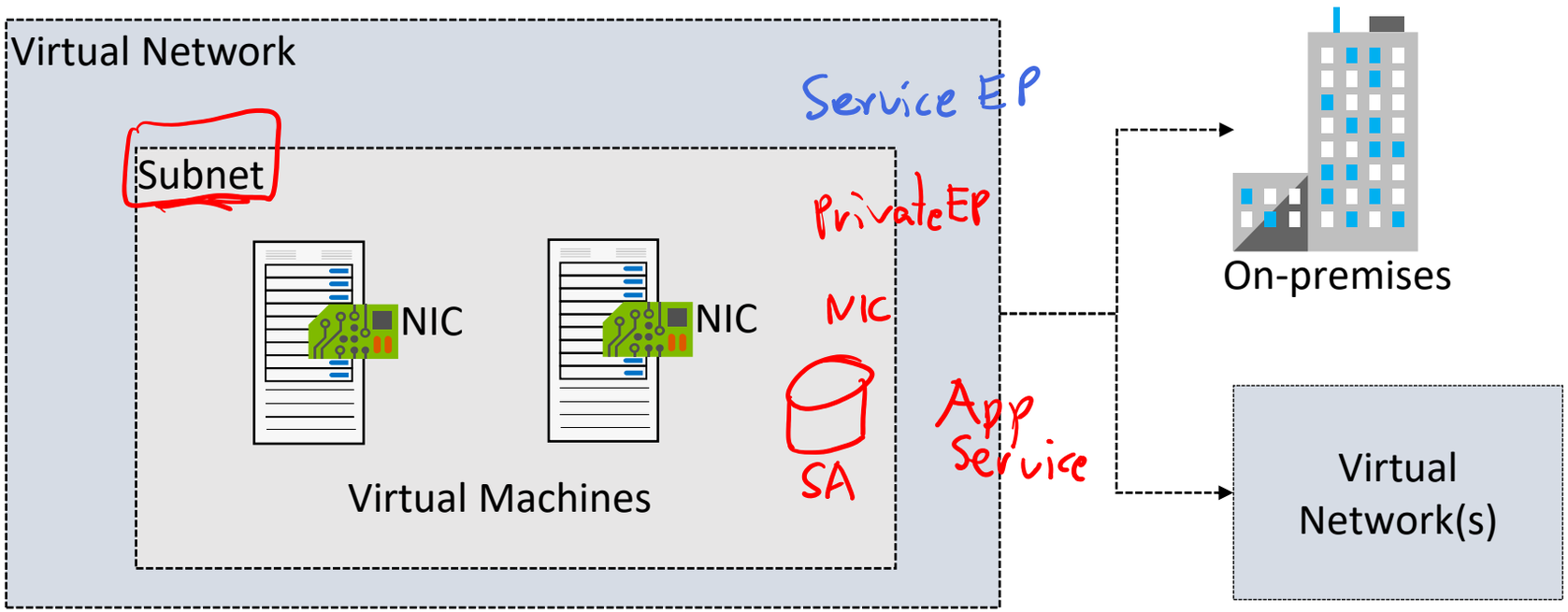


Blobs
Files
Table
Queue
Storage Account

Configure Virtual Networks Introduction

- Plan Virtual Networks
- Create Subnets
- Create Virtual Networks
- Plan IP Addressing
- Create Public IP Addresses
- Associate Public IP Addresses
- Associate Private IP Addresses
- Demonstration – Virtual Networks
- Summary and Resources

Plan Virtual Networks



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

Create Subnets

Scope 10.0.0.0/16
172.16.0.0/16

+ Subnet | + Gateway subnet | Refresh | Manage users | Delete

Name	IPv4	IPv6	Available IPs	Delegated
subnet0	10.0.0.0/24	-	250	-
subnet1	10.0.1.0/24	-	251	-
subnet2	10.0.2.0/24	-	251	-
AzureBastionSubnet	10.0.30.0/27	-	27	-
GatewaySubnet	10.0.3.0/27	-	availability dependent on dynamic use	-

fix
fix
fix Azure Firewall Subnet

A virtual network can be segmented into one or more subnets

Subnets provide logical divisions within your network

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

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

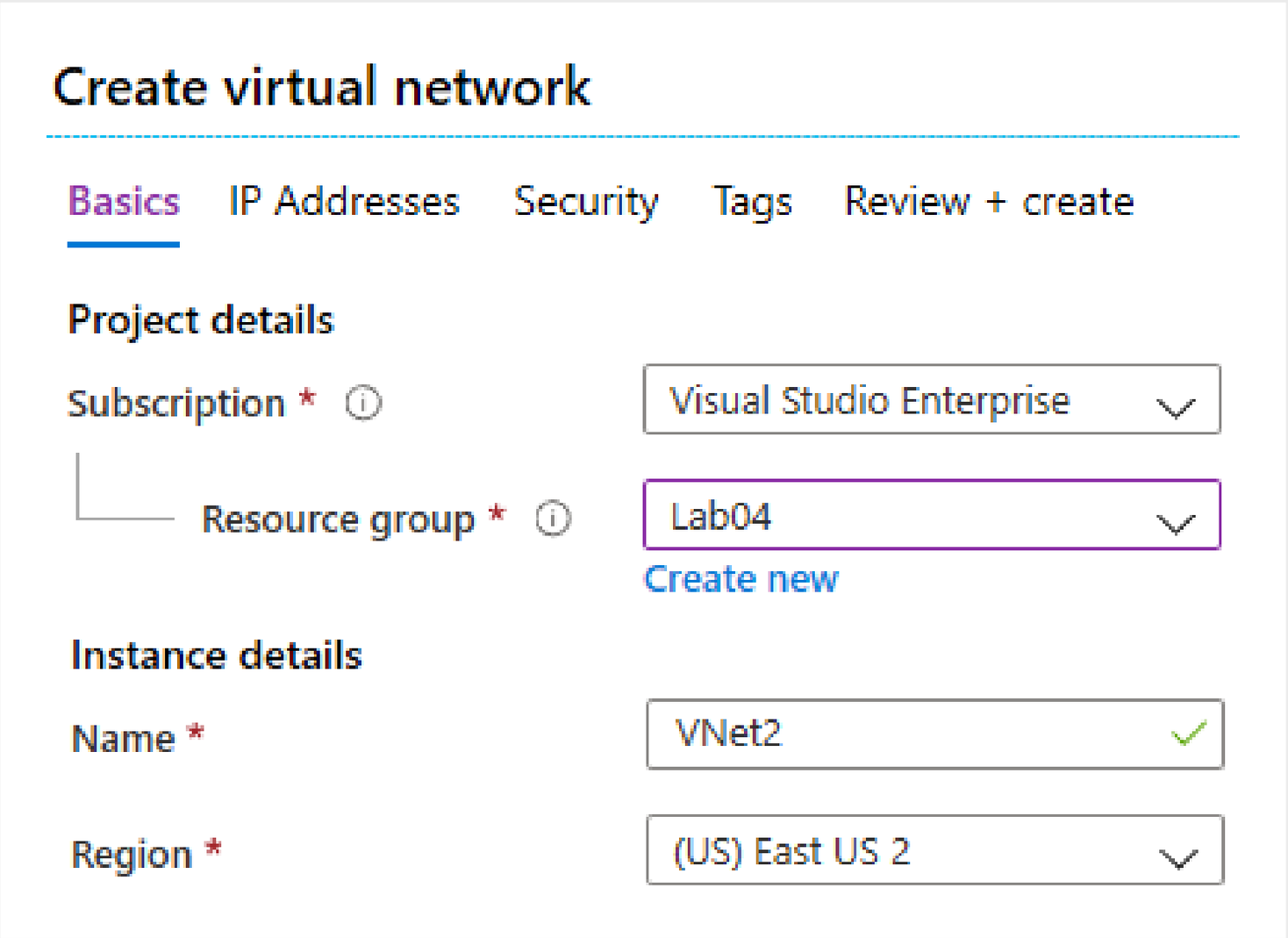
Create Virtual Networks

Create new virtual networks at any time

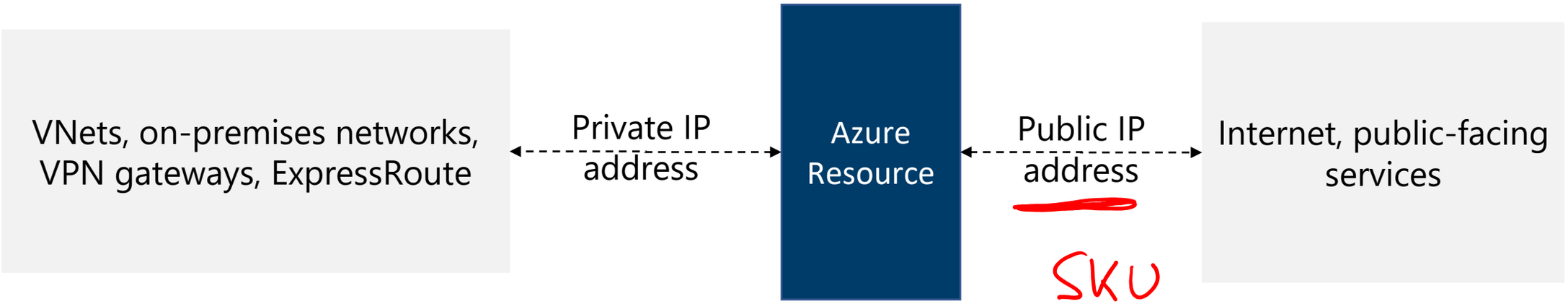
Add virtual networks when you create a virtual machine

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

Be careful with overlapping address spaces



Plan IP Addressing



Private IP addresses - used within an Azure virtual network (VNet), and your on-premises network, when you use a VPN gateway or ExpressRoute circuit to extend your network to Azure

Public IP addresses - used for communication with the Internet, including Azure public-facing services

New - NetNetIpAddress

Create Public IP Addresses

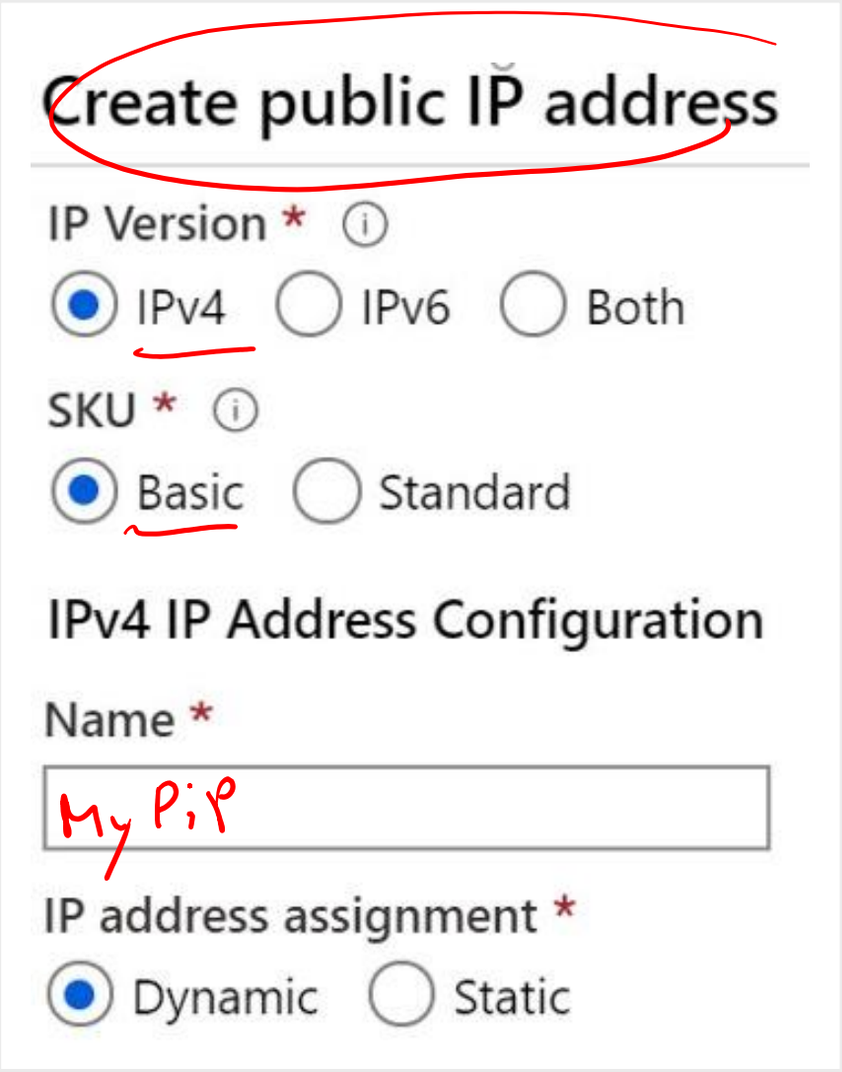
Available in IPv4 or IPv6 or both

Basic vs Standard SKU

Dynamic vs Static

Zone redundant (Standard SKU)

Range of contiguous addresses available as a prefix



Associate Public IP Addresses

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	Yes*
Application Gateway	Front-end configuration	Yes	Yes*

A public IP address resource can be associated with virtual machine network interfaces, internet-facing load balancers, VPN gateways, and application gateways

*Static IP addresses only available on certain SKUs.

Associate Private IP Addresses

Private IP Addresses	IP address association	Dynamic	Static
Virtual Machine	NIC	Yes	Yes
Internal Load Balancer	Front-end configuration	Yes	Yes
Application Gateway	Front-end configuration	Yes	Yes

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

Demonstration – Virtual Networks

Create a virtual network in the portal

Create a virtual network with PowerShell

Summary and Resources – Configure Virtual Networks

Knowledge Check	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Design an IP addressing schema for your Azure deployment (Sandbox) Implement Windows Server IaaS VM IP addressing and routing

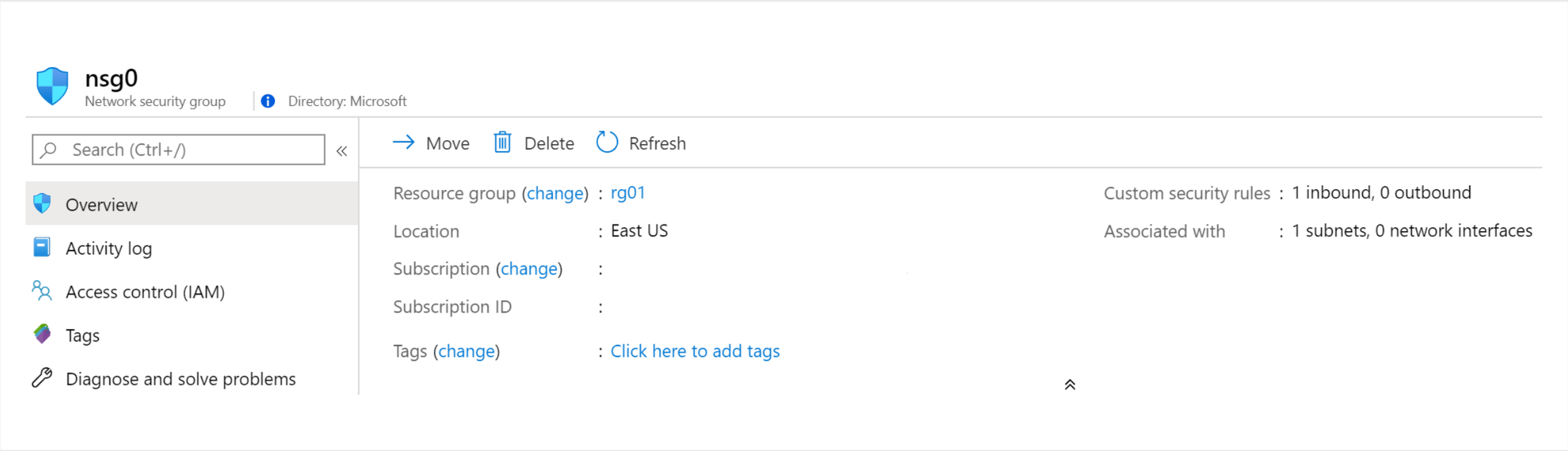
A *sandbox* indicates a hands-on exercise.

Configure Network Security Groups

Configure Network Security Groups Introduction

- Implement Network Security Groups (NSGs)
- Determine NSG Rules
- Determine NSG Effective Rules
- Create NSG Rules
- Implement Application Security Groups (ASGs)
- Demonstration – NSGs
- Summary and Resources

Implement Network Security Groups (NSGs)



Limits network traffic to resources in a virtual network

Lists the security rules that allow or deny inbound or outbound network traffic

Associated to a subnet or a network interface

Can be associated multiple times

Determine NSG Rules

Inbound security rules

Priority	Name	Port	Protocol	Source	Destination	Action
100	RDP_Inbound	3389	Any	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Outbound security rules

Priority	Name	Port	Protocol	Source	Destination	Action
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
65500	DenyAllOutBound	Any	Any	Any	Any	Deny

Security rules in NSGs enable you to filter network traffic that can flow in and out of virtual network subnets and network interfaces

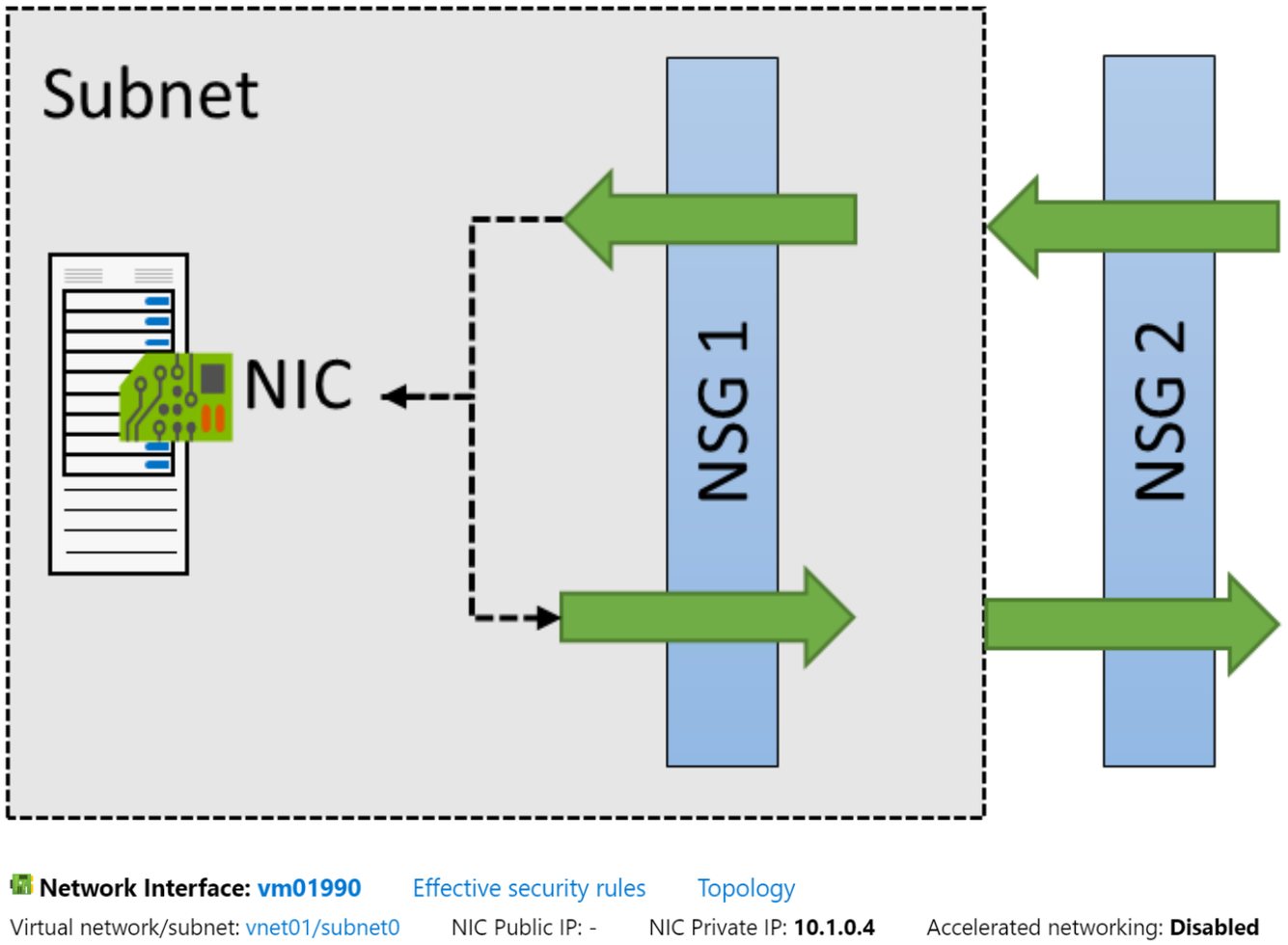
There are default security rules. You cannot delete the default rules, but you can add other rules with a higher priority

Determine NSG Effective Rules

NSGs are evaluated independently for the subnet and NIC

An “allow” rule must exist at both levels for traffic to be admitted

Use the Effective Rules link if you are not sure which security rules are being applied



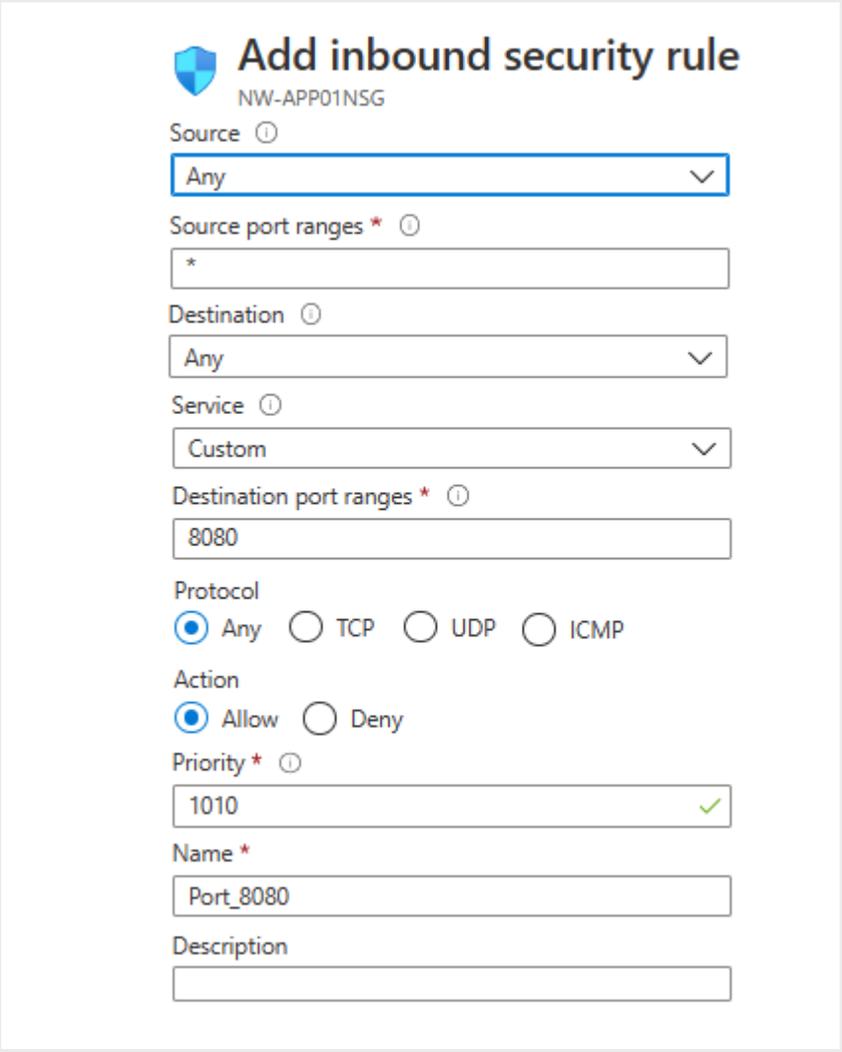
Create NSG rules

Source (Any, IP addresses, service tags, application security group)

Destination (Any, IP addresses, virtual network, application security group)

Service (HTTPS, SSH, RDP, DNS, POP3, custom, ...)

Priority – The lower the number, the higher the priority



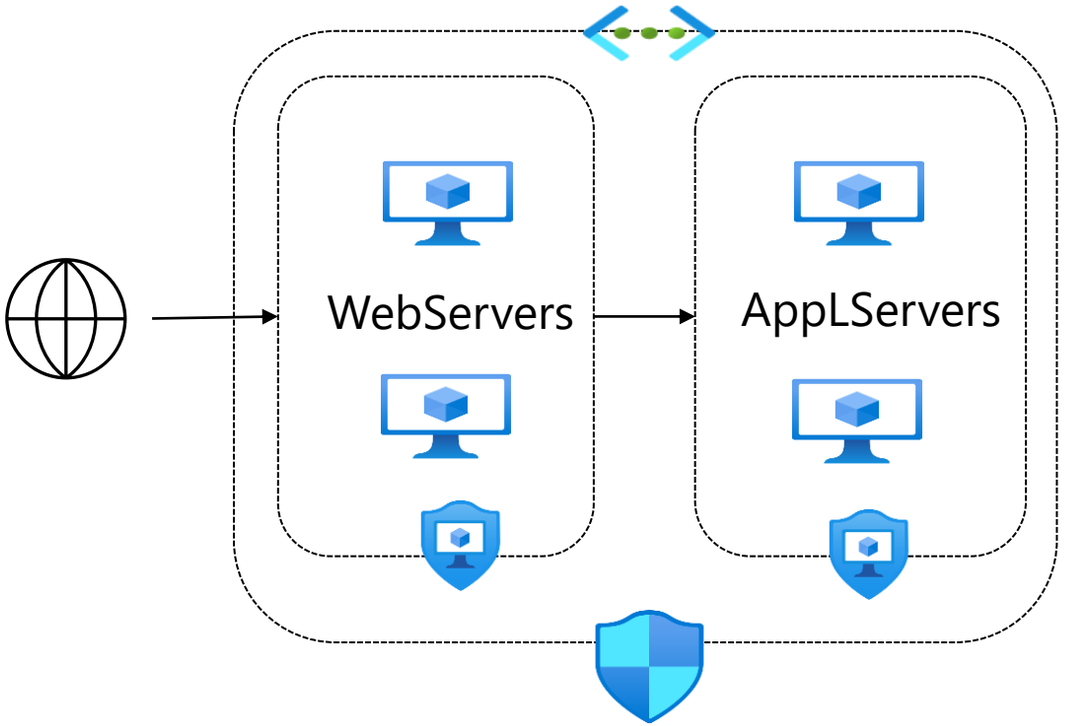
Implement Application Security Groups

Extends your application's structure

ASGs logically group virtual machines – web servers, application servers

Define rules to control the traffic flow

Wrap the ASG with an NSG for added security



Source	Destination	Port
Internet	WebServers	80, 443
WebServers	SQLServers	1533

Demonstration – Network Security Groups

Access the NSGs blade

Add a new NSG

Explore inbound and outbound rules

Summary and Resources – Configure Network Security Groups

Knowledge Check	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Secure and isolate access to Azure resources by using network security groups and service endpoints (Sandbox)

A *sandbox* indicates a hands-on exercise.

ARM

AzureAD

Connector

Microsoft Sentinel SIEM

Azure FW

Log Analytics Work Space (Blob)

Lesson 03: Configure Azure Firewall

Azure Firewall Subnet

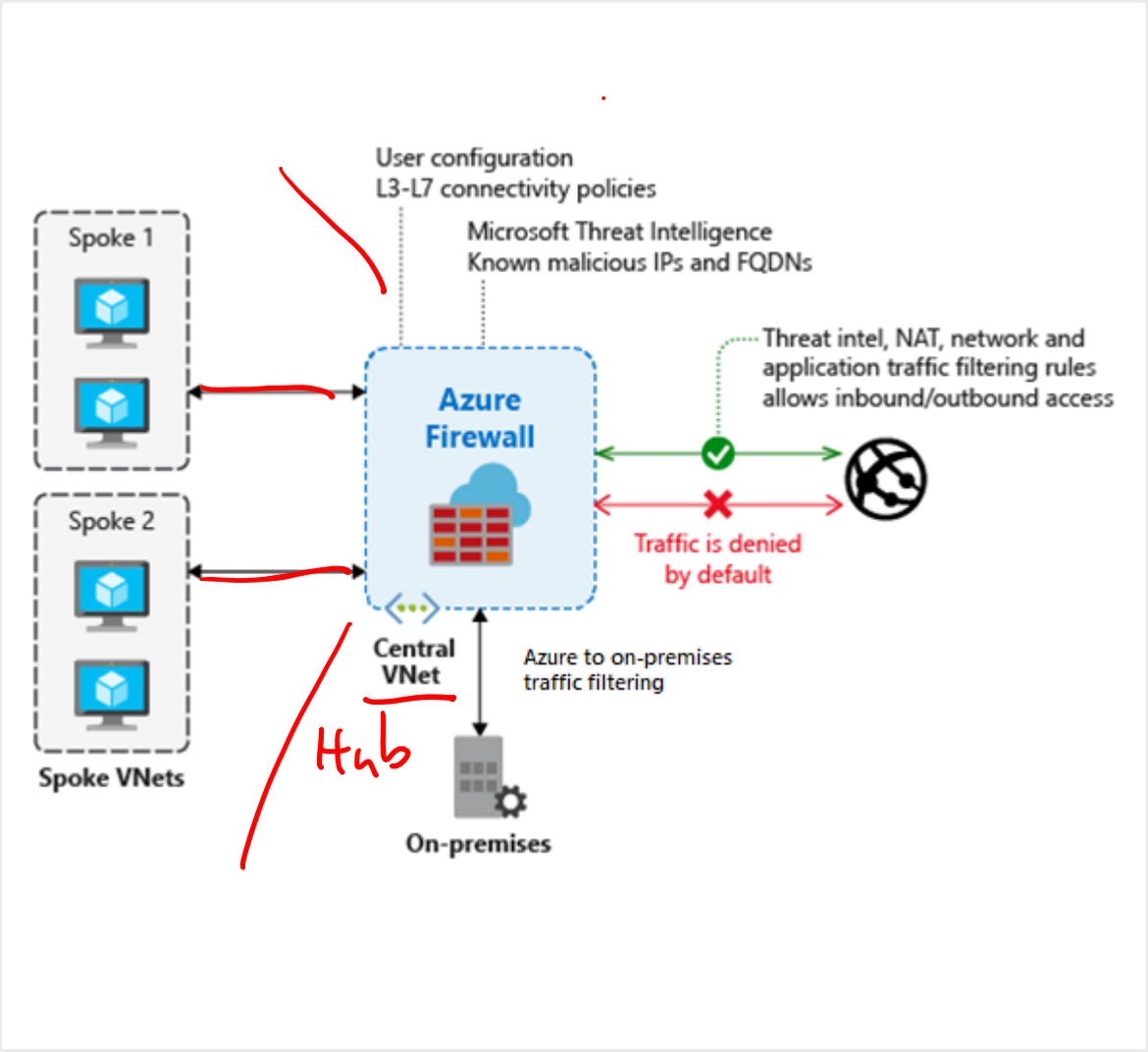
Configure Azure Firewall Introduction

- Determine Azure Firewall Uses
- Create Azure Firewalls
- Create Azure Firewall Rules
- Summary and Resources

Hub - Spoke - Topo

Determine Azure Firewall Uses

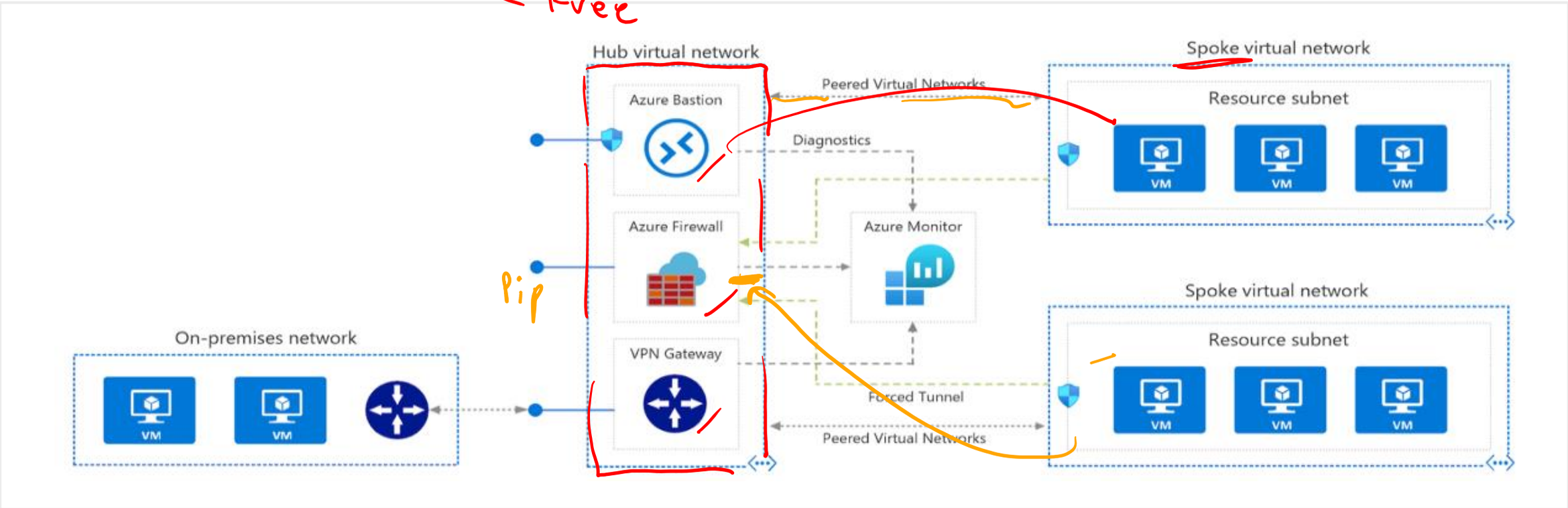
- Stateful firewall as a service
- Built-in high availability with unrestricted cloud scalability
- Create, enforce, and log application and network connectivity policies
- Threat intelligence-based filtering
- Fully integrated with Azure Monitor for logging and analytics
- Support for hybrid connectivity through deployment behind VPN and ExpressRoute Gateways



Create Azure Firewalls

Standard
Basic
Free

NVA Network Virtual Appliance
UDR User Defined Route



A Hub-Spoke network topology is recommended

Shared services are placed in the hub virtual network

Each environment is deployed to a spoke to maintain isolation

Create Azure Firewall Rules

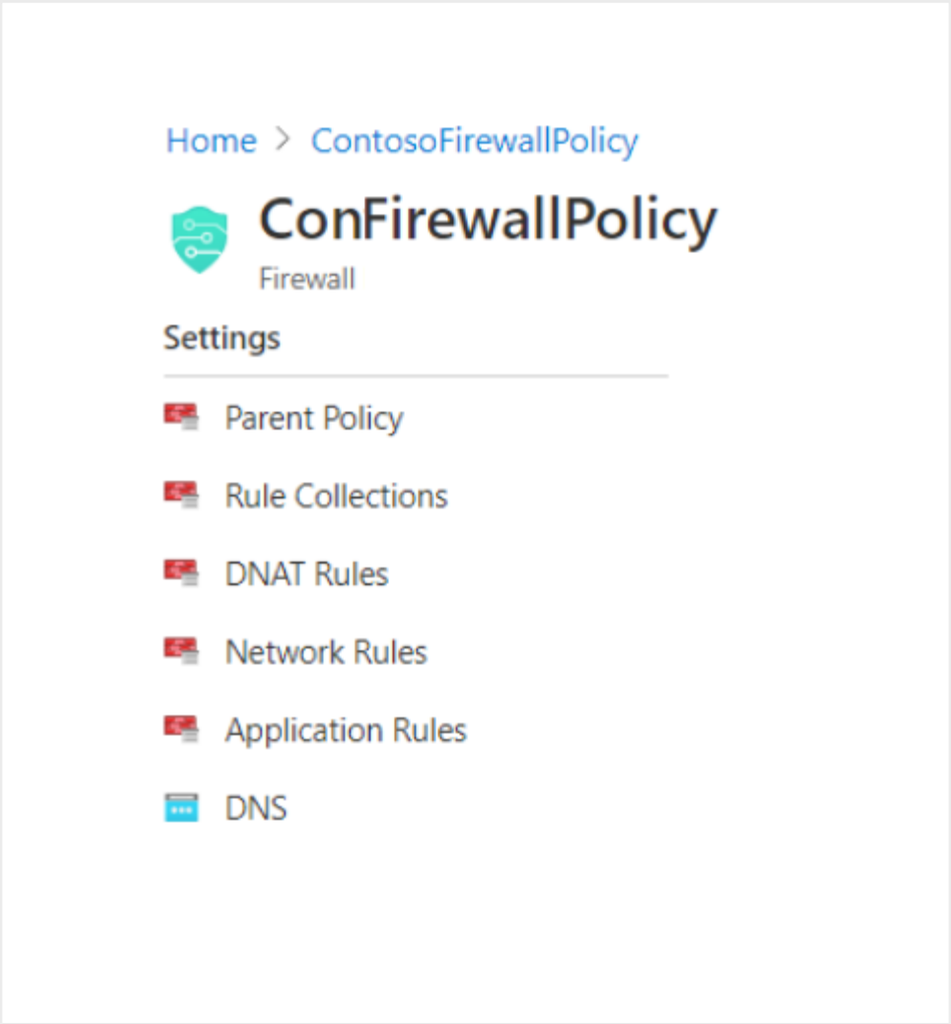
Azure Firewall Manager centralizes firewall management

Firewall policies container rules and settings to control access

NAT rules allow incoming connections

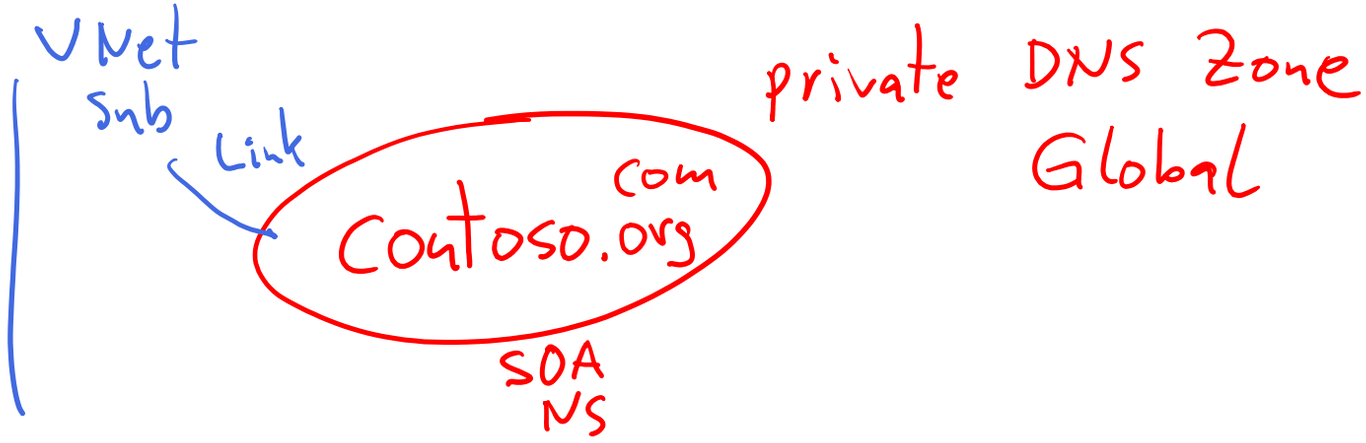
1.) **Network rules** contain source and destination addresses, protocols, and destination ports

2.) **Application rules provide** qualified domain names (FQDNs) that can be accessed from a subnet



Summary and Resources - Azure Firewall

Knowledge Check	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Introduction to Azure Firewall Introduction to Azure Firewall Manager



Configure Azure DNS

Configure Azure DNS Introduction

- Identify Domains and Custom Domains
- Verify Custom Domain Names (optional)
- Create Azure DNS Zones
- Delegate DNS Domains
- Add DNS Record Sets
- Plan for Private DNS Zones
- Determine Private Zone Scenarios
- Demonstration – DNS Name Resolution
- Summary and Resources

On Prem

contoso.com

Tenant

... onmicrosoft.com

contoso.com

Identity Domains and Custom Domains

contoso.com

SOA

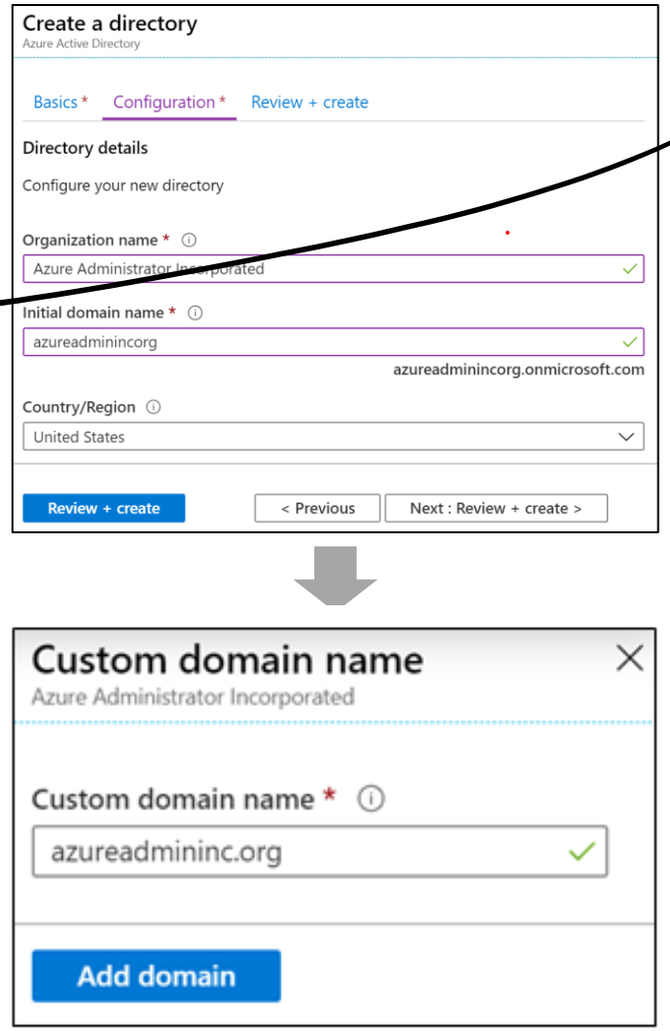
TXT

When you create an Azure subscription an Azure AD domain is created for you

The domain has initial domain name in the form *domainname.onmicrosoft.com*

You can customize/change the name

After the custom name is added it must be verified – this demonstrates ownership of the domain



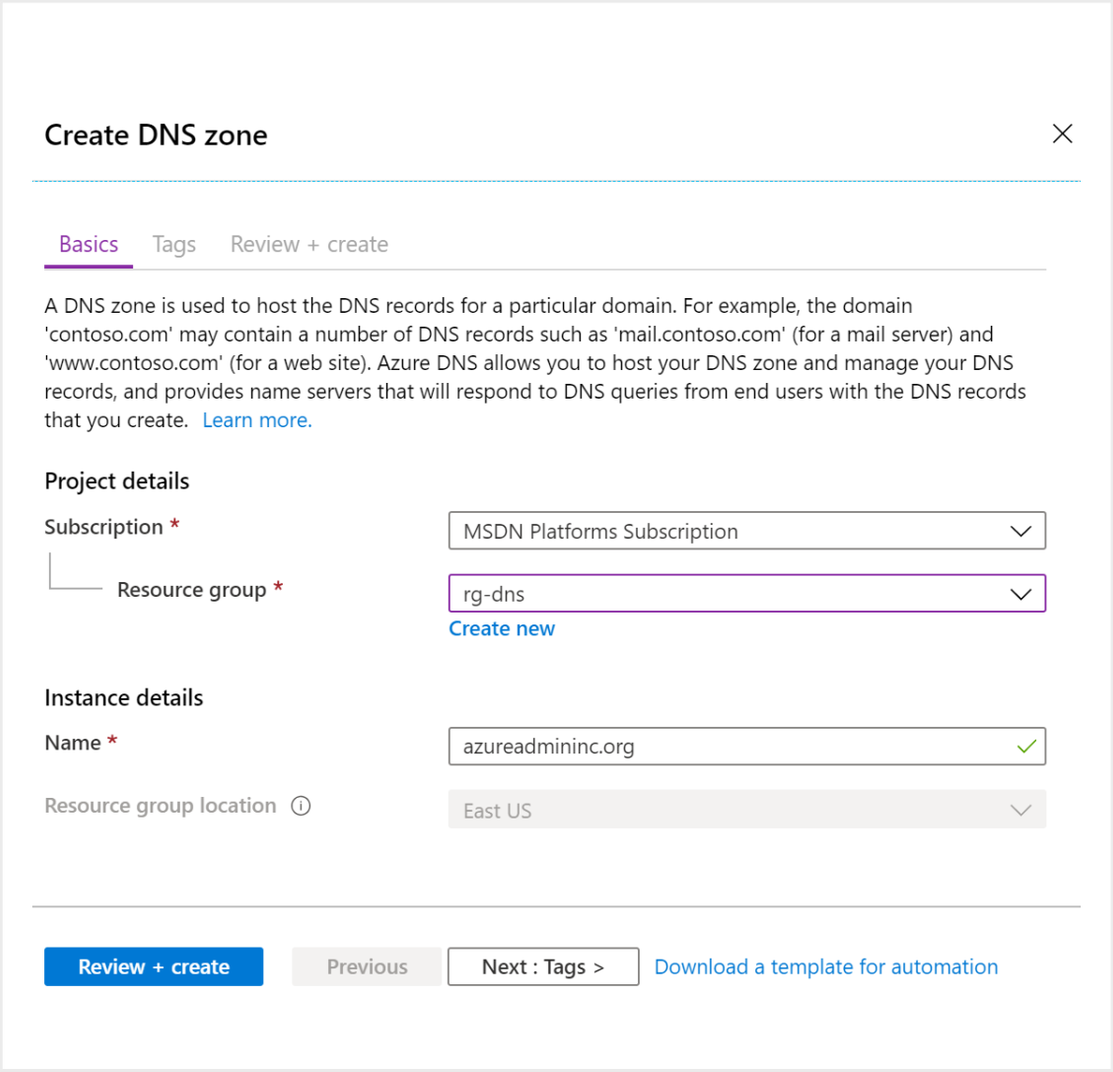
TXT

Create Azure DNS Zones

A DNS zone hosts the DNS records for a domain

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 NS

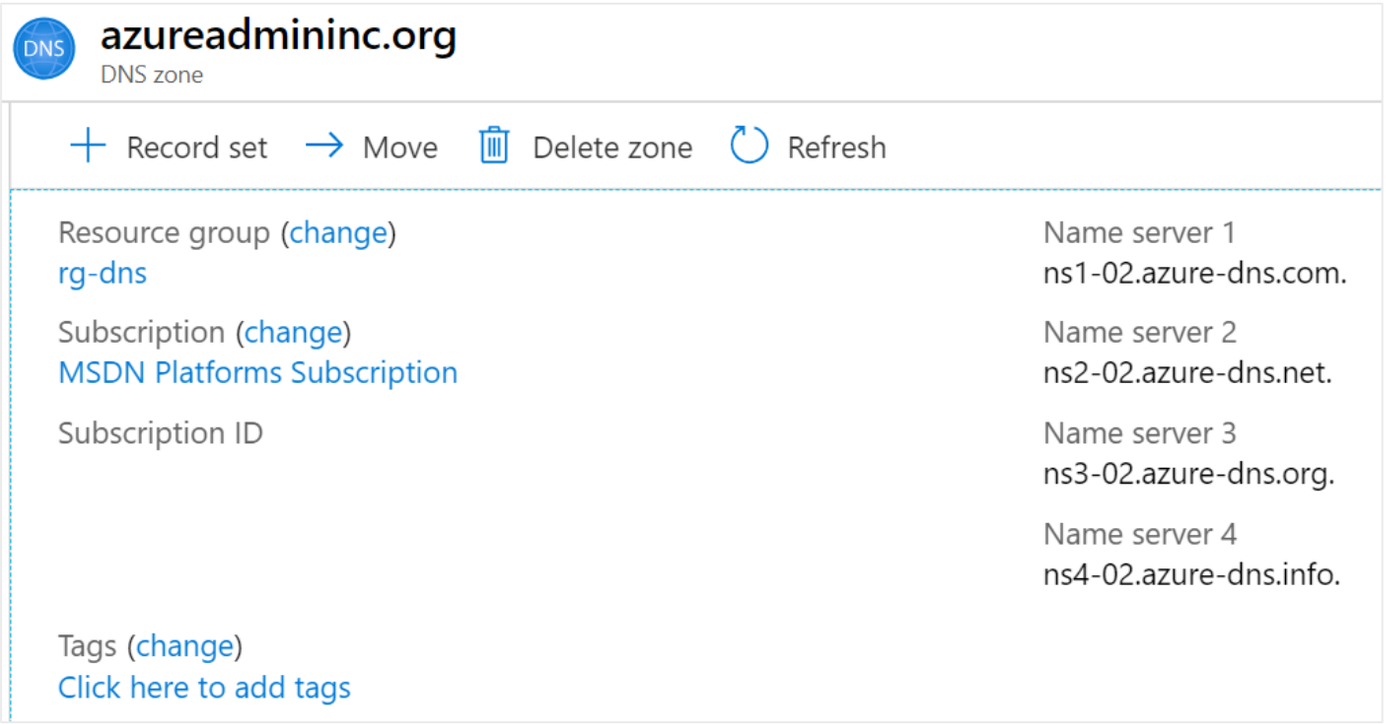


Delegate DNS Domains

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



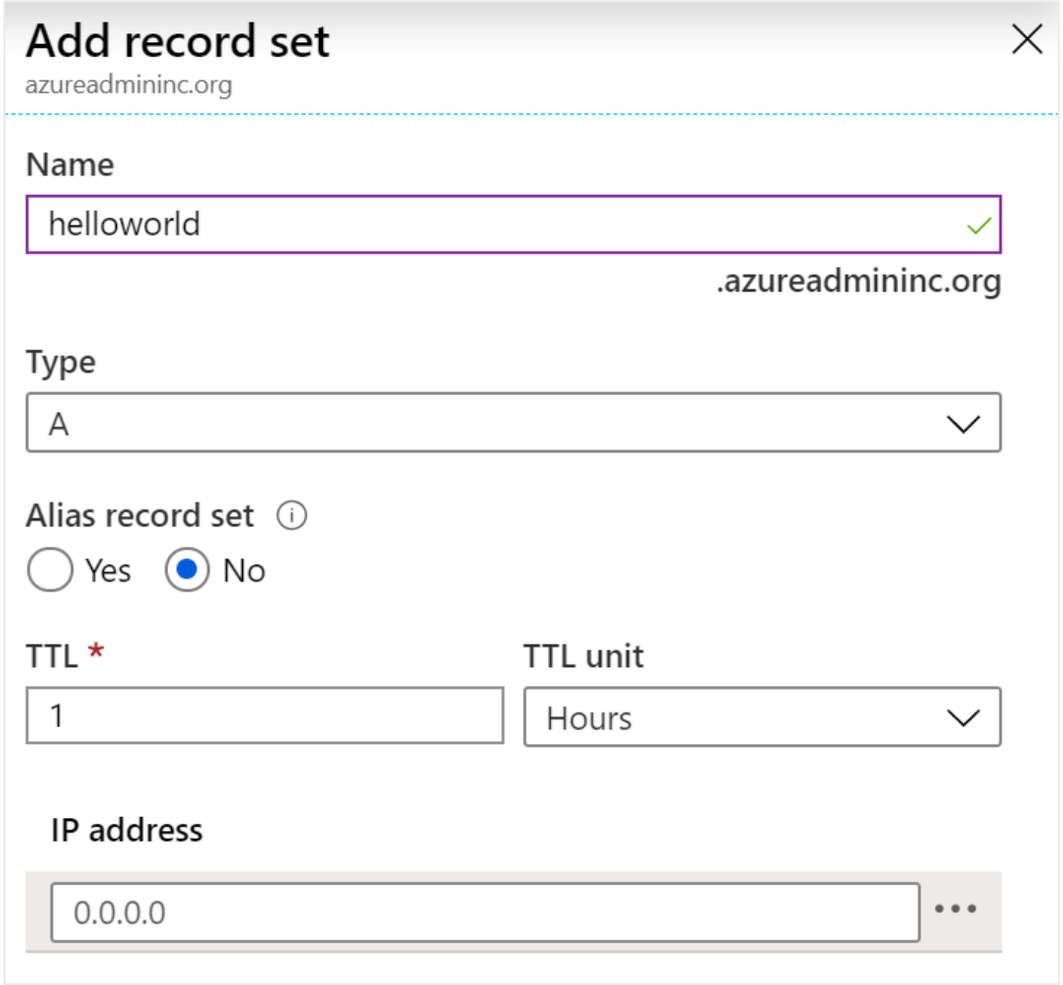
Add DNS Record Sets

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

You can add up to 20 records to any record set

A record set cannot contain two identical records

Changing the drop-down Type, changes the information required



Plan for Private DNS Zones

Use your own custom domain names

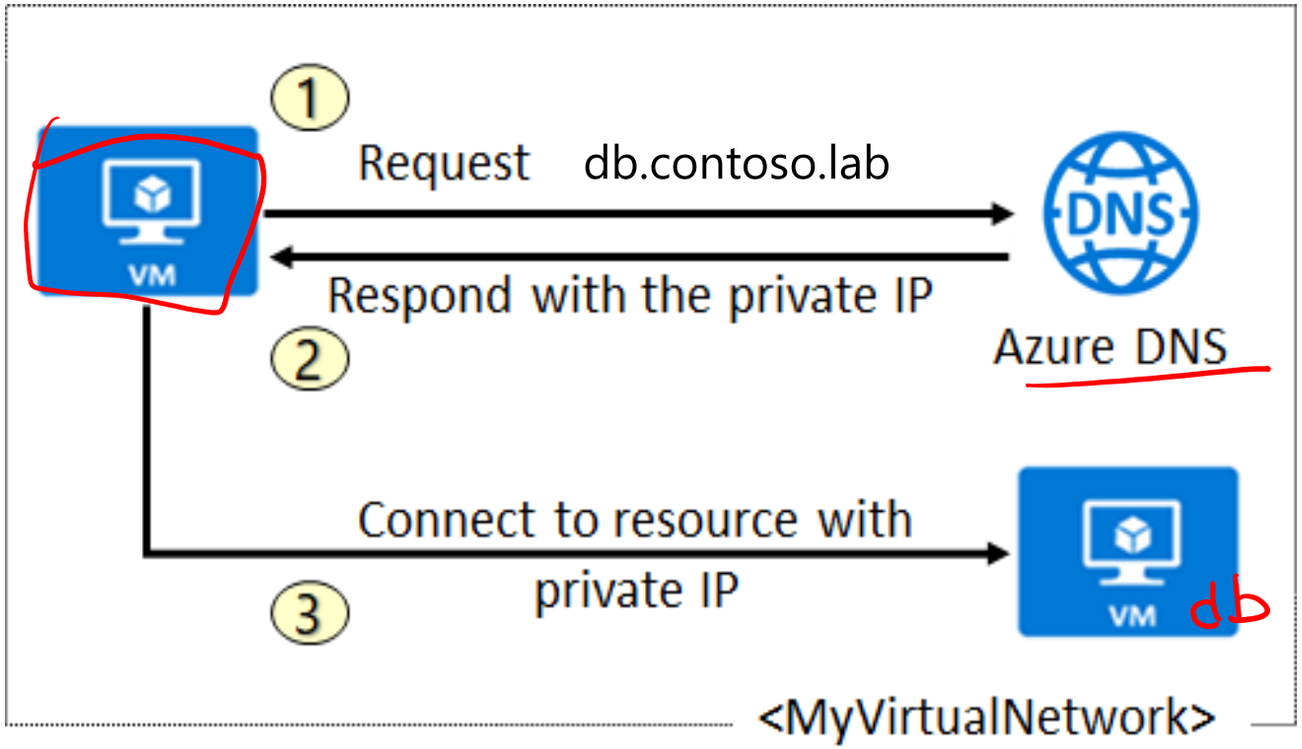
Provides name resolution for VMs within a VNet and between VNets

Automatic hostname record management

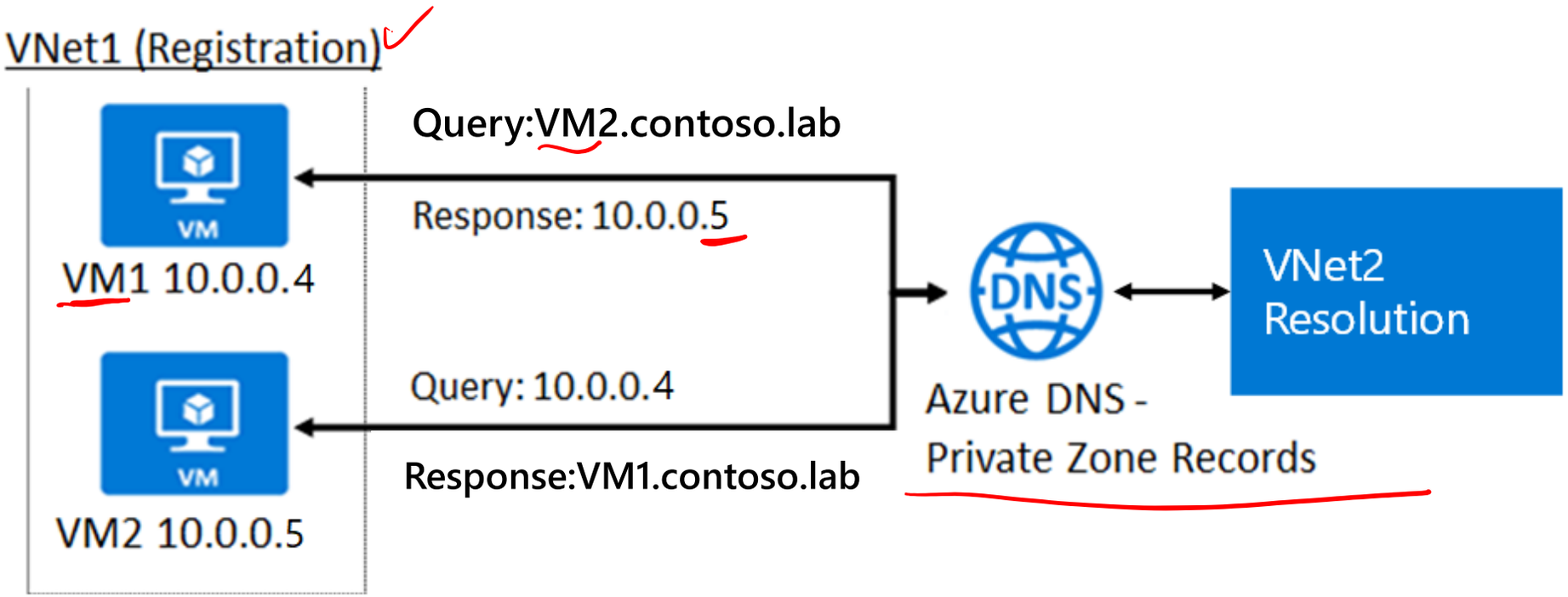
Removes the need for custom DNS solutions

Use all common DNS records types

Available in all Azure regions



Determine Private Zone Scenarios



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

DNS queries across the virtual networks are resolved

Reverse DNS queries are scoped to the same virtual network

Demonstration - DNS

- 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

Summary and Resources – Configure Azure DNS

Knowledge Check	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Host your domain on Azure DNS (Sandbox) Implement DNS for Windows Server IaaS VMs

A *sandbox* indicates a hands-on exercise.

Lab 04 – Implement Virtual Networks

Lab 04 – Implement Virtual Networking

Lab scenario

You plan to create a virtual network in Azure that will host a couple of Azure virtual machines. You will deploy them into different subnets of the virtual network. You also want to ensure that their private and public IP addresses will not change over time. To comply with Contoso security requirements, you need to protect public endpoints of Azure virtual machines accessible from Internet. Finally, you need to implement DNS name resolution for Azure virtual machines both within the virtual network and from Internet.

Objectives

Task 1:
Create and configure a virtual network

Task 2:
Deploy virtual machines into the virtual network

Task 3:
Configure private and public IP addresses of Azure VMs

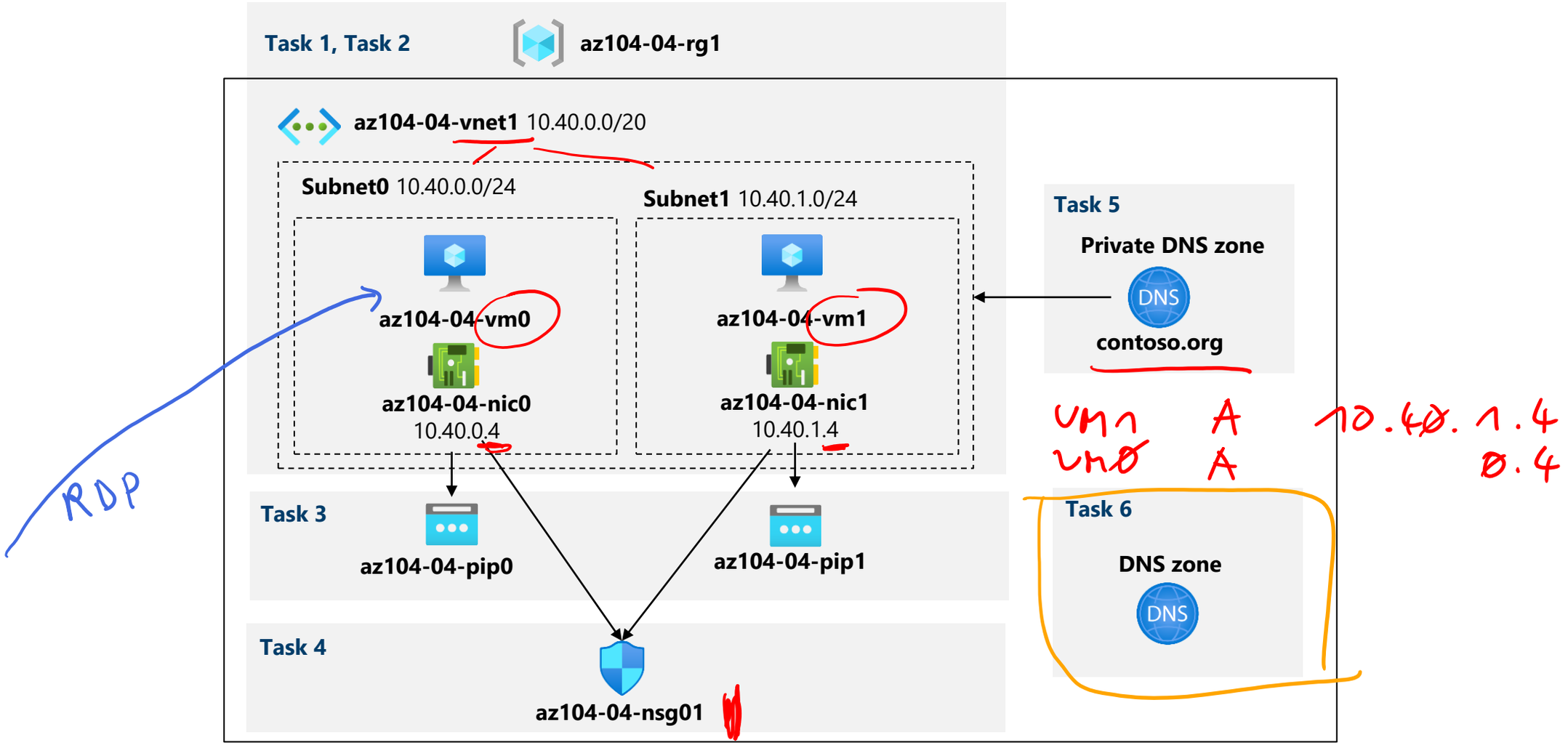
Task 4:
Configure network security groups

Task 5:
Configure Azure DNS for internal name resolution

Task 6:
Configure Azure DNS for external name resolution

Next slide for an architecture diagram

Lab 04 – Architecture diagram



End of presentation