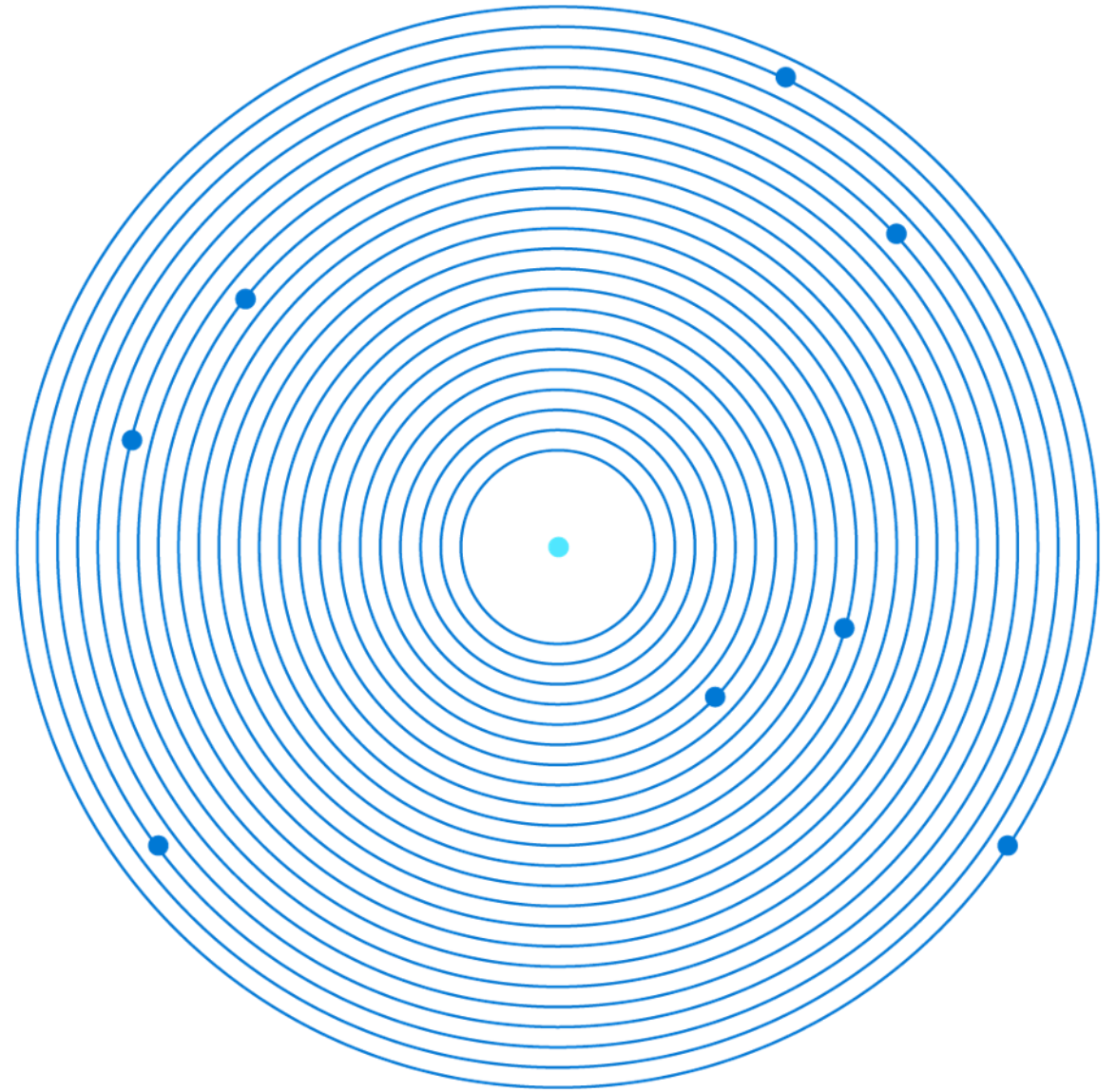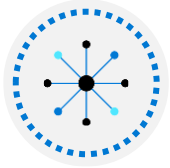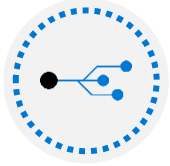# AZ-104T00A
Module 04:
Virtual Networking

Module Overview
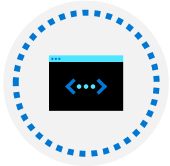
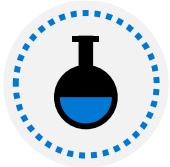Lesson 01: Virtual Networks

Lesson 02: IP Addressing

Lesson 03: Network Security Groups

Lesson 04: Azure Firewall

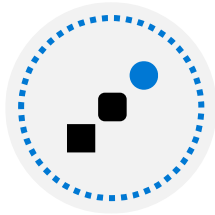Lesson 05: Azure DNS

Lesson 06: Module 04 Lab and Review

Lesson 01: Virtual Networks

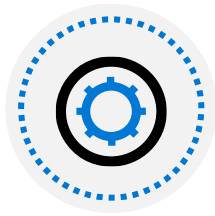# Virtual Networks Overview

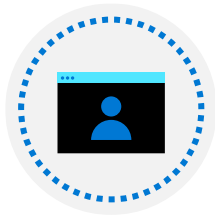Azure Networking Components

Virtual Networks

Subnets

Implementing Virtual Networks

Demonstration – Creating Virtual Networks

Azure Networking Components

Adopting cloud solutions can save time and simplify operations

Azure requires the same types of networking functionality as on-premises infrastructure

Azure networking offers a wide range of services and products

Virtual Network
Microsoft

Create a logically isolated section in Microsoft Azure and securely connect it outward.

Load Balancer
Microsoft

A load balancer that distributes incoming traffic among backend virtual machine instances.

Application Gateway
Microsoft

Scalable layer-7 load balancer offering various traffic routing rules and SSL termination for backend

Traffic Manager profile
Microsoft

Create a Microsoft Azure Traffic Manager Profile that allows you to control the distribution of user

Virtual network gateway
Microsoft

The VPN device in your Azure virtual network and used with site-to-site and VNet-to-VNet VPN

Virtual WAN
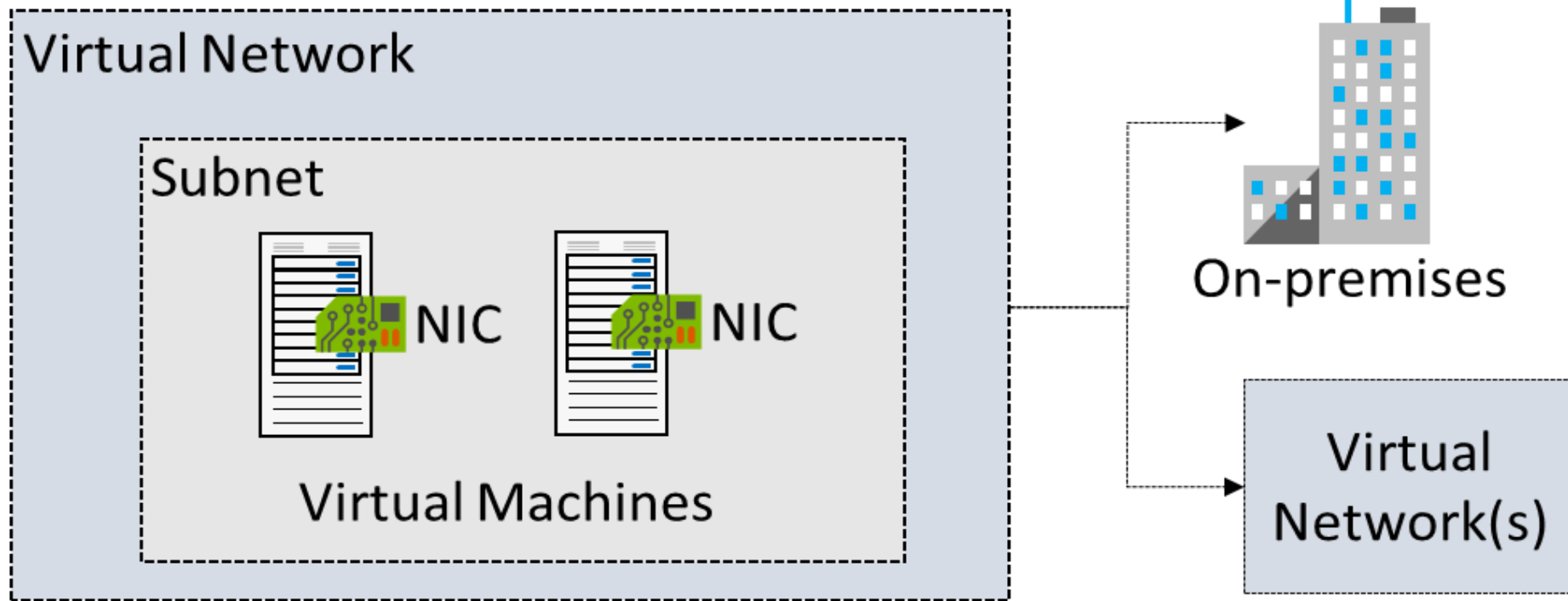Microsoft

Azure Virtual WAN is a networking service that provides optimized and automated branch-to-branch

Virtual Networks

Virtual Network

Subnet

NIC

NIC

Virtual Machines

On-premises

Virtual Network(s)

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

Name	Address range	IPv4 available addresses	Delegated to	Security group
subnet0	10.1.0.0/24	251	-	nsg0
subnet1	10.1.1.0/24	251	-	-
subnet2	10.1.2.0/24	251	-	nsg2
GatewaySubnet	10.1.255.0/24	251	-	-

+ Subnet   + Gateway subnet   ↻ Refresh

🔍 Search subnets

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 virtual network in the subscription

Implementing 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

Create virtual network

Basics IP Addresses Security Tags Review + create

Project details

Subscription * ⓘ

Visual Studio Enterprise

Resource group * ⓘ
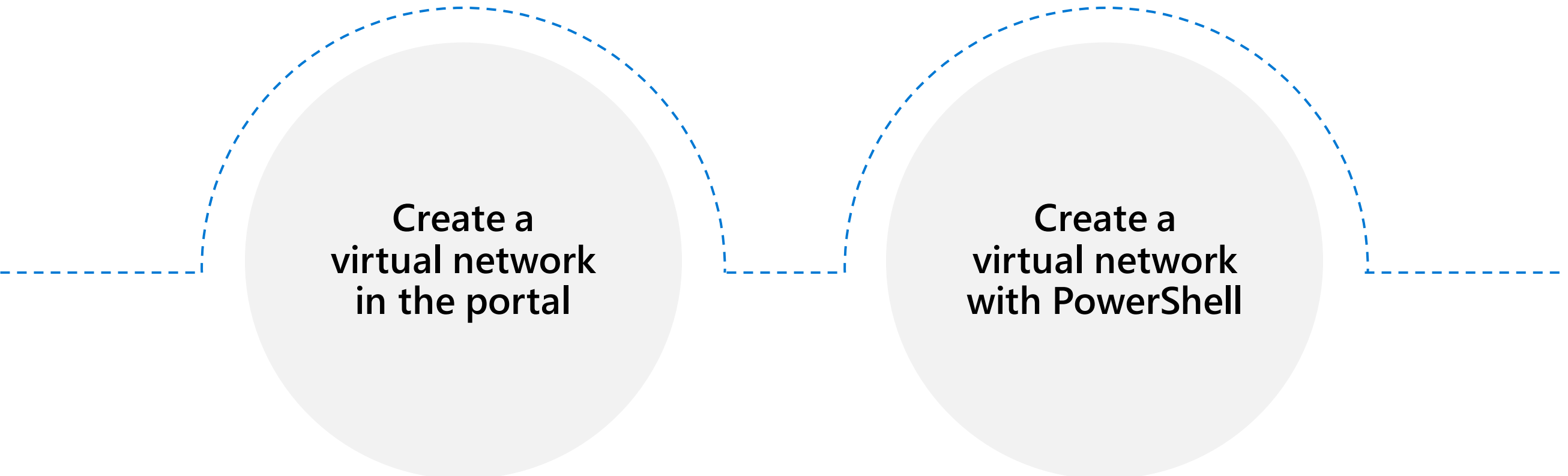
Lab04

Create new

Instance details

Name *

VNet2

Region *

(US) East US 2
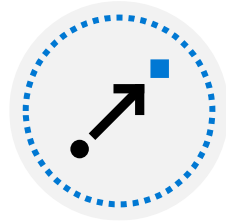
Demonstration – Creating Virtual Networks

Create a
virtual network
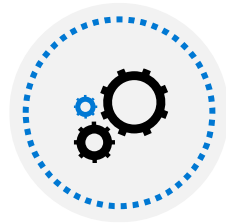in the portal

Create a
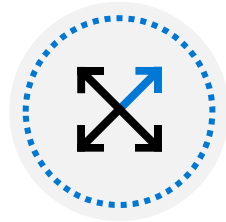virtual network
with PowerShell

Lesson 02: IP Addressing

IP Addressing Overview
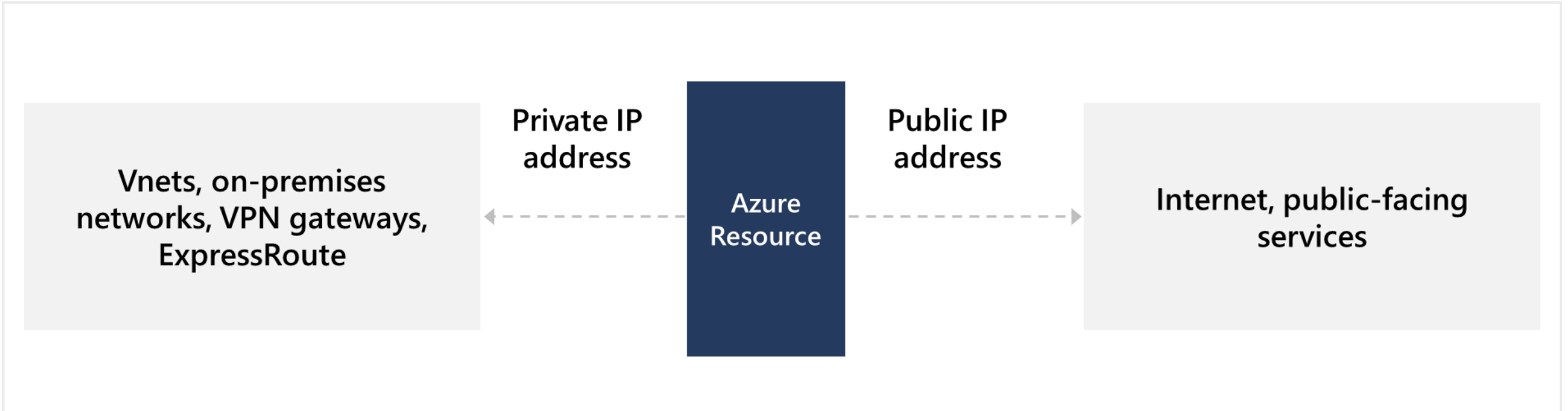
IP Addressing

Creating IP Addresses

Public IP Addresses

Private IP Addresses

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

Creating 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

Create public IP address

IP Version * ⓘ
(●) IPv4   ( ) IPv6   ( ) Both

SKU * ⓘ
(●) Basic   ( ) Standard

IPv4 IP Address Configuration

Name *

[   ]

IP address assignment *
(●) Dynamic   ( ) Static

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.

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
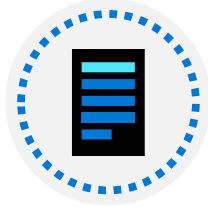
Lesson 03: Network Security Groups

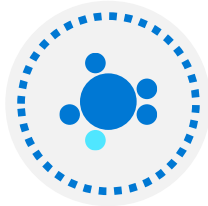# Network Security Groups Overview
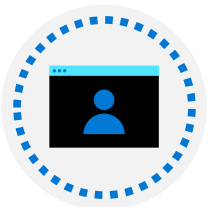
Network Security Groups (NSG)

NSG Rules

NSG Effective Rules

Creating NSG Rules

Demonstration – NSGs

Network Security Groups

nsg0
Network security group | ⓘ Directory: Microsoft

🔍 Search (Ctrl+/) «

🛡 Overview

▢ Activity log

👤 Access control (IAM)

◆ Tags

🔧 Diagnose and solve problems

→ Move   🗑 Delete   ↻ Refresh

Resource group (change) : rg01

Location : East US

Subscription (change) :

Subscription ID :

Tags (change) : Click here to add tags

Custom security rules : 1 inbound, 0 outbound

Associated with : 1 subnets, 0 network interfaces

≪

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

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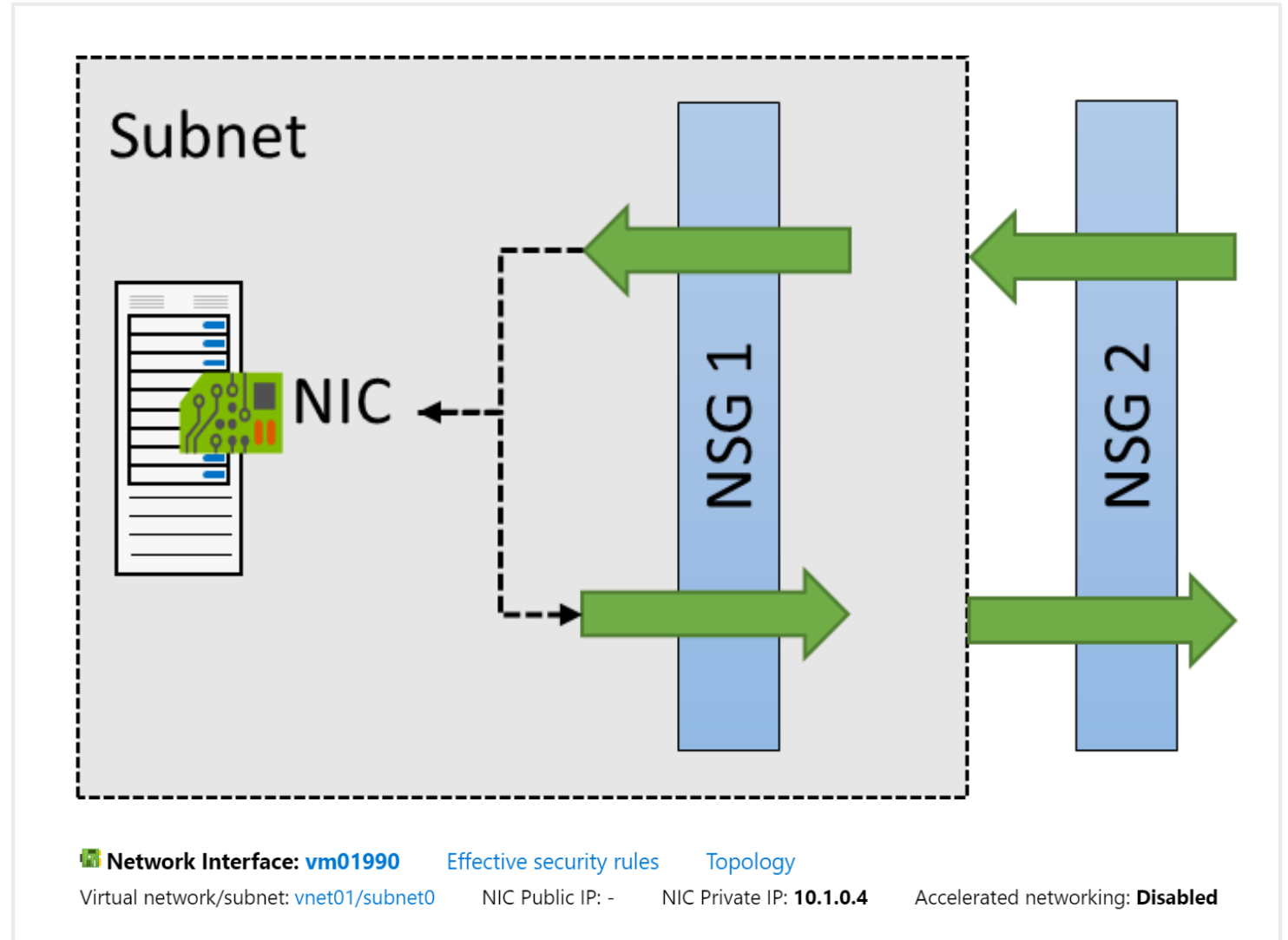
There are default security rules. You cannot delete the default rules, but you can add other rules with a higher priority

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
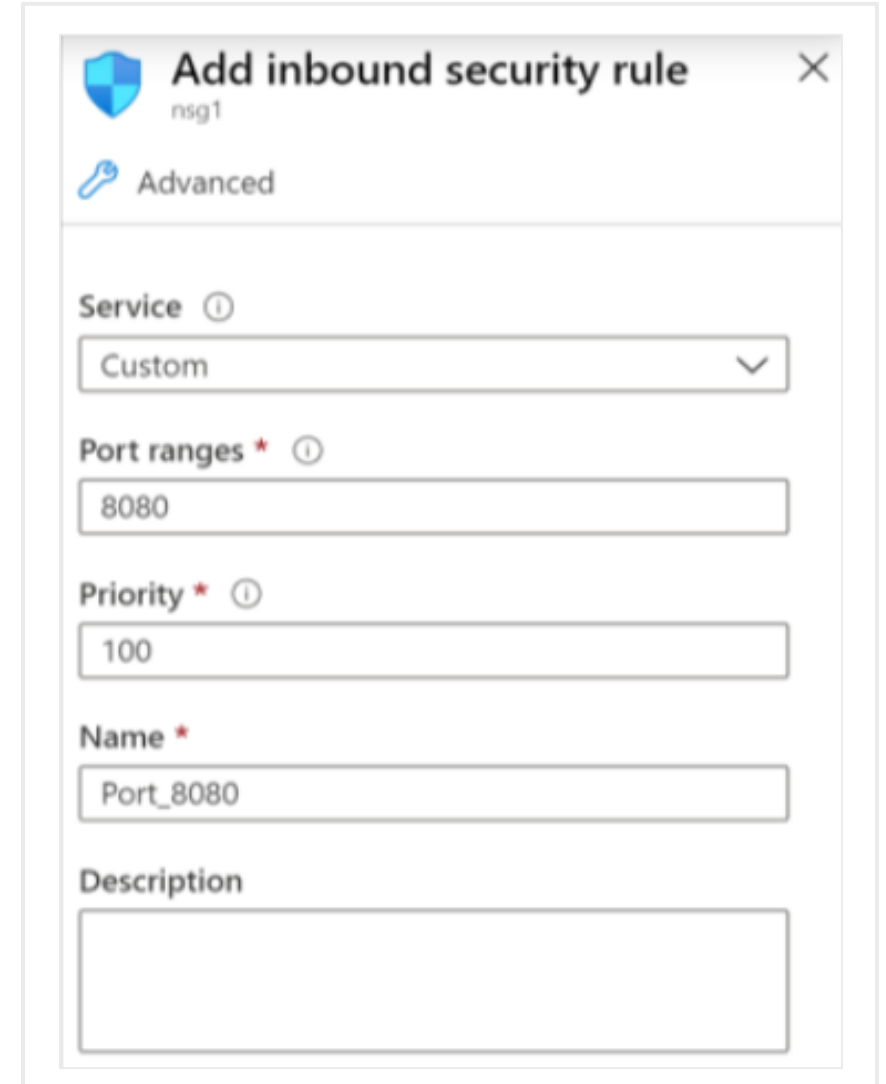

Network Interface: vm01990   Effective security rules   Topology

Virtual network/subnet: vnet01/subnet0   NIC Public IP: –   NIC Private IP: **10.1.0.4**   Accelerated networking: **Disabled**

Creating NSG rules

Select from a large variety of services

Service – The destination protocol and port range for this rule

Port ranges – Single port or multiple ports
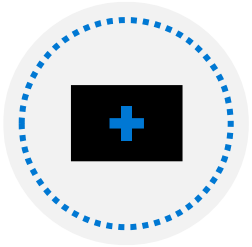
Priority – The lower the number, the higher the priority
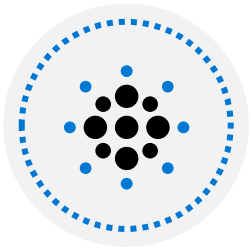
Demonstration – Network Security Rules

12   Access the NSGs blade

+   Add a new NSG

Explore inbound and outbound rules
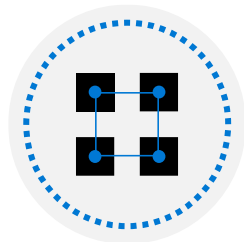
Lesson 04: Azure Firewall

Azure Firewall Overview

 Azure Firewall

 Implementing Firewalls

 Firewall Rules

Azure Firewall

Stateful firewall as a service

Built-in high availability with unrestricted cloud scalability

Create, enforce, and log application and network connectivity policies
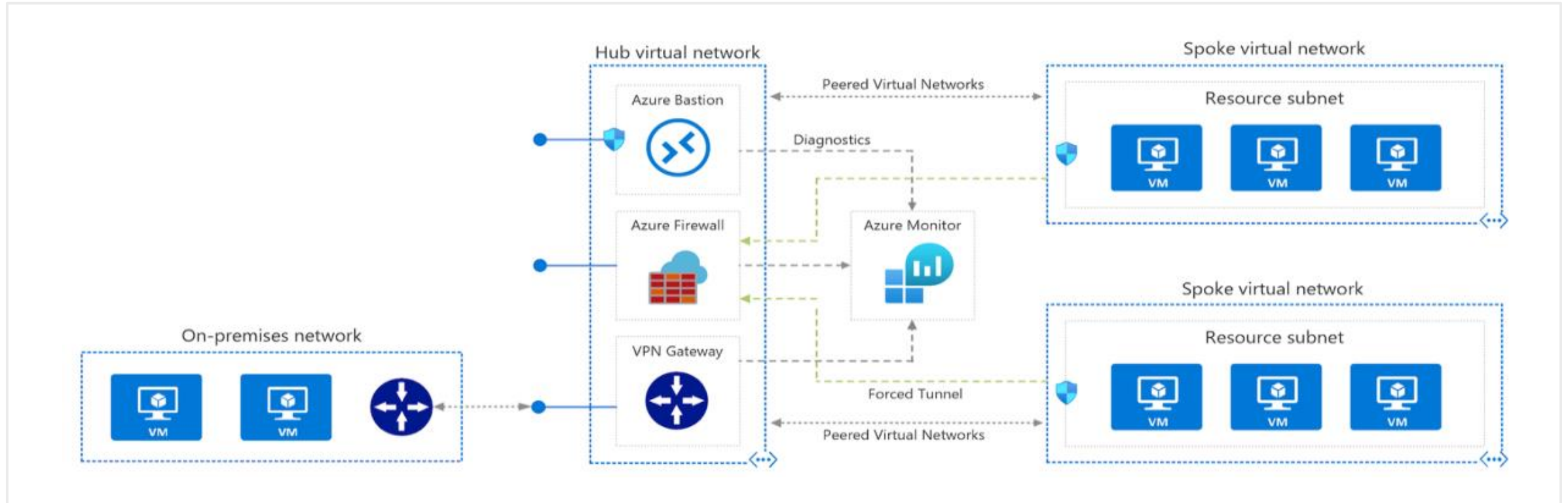
Threat intelligence-based filtering

Fully integrated with Azure Monitor for logging and analytics

Support for hybrid connectivity through deployment behind VPN and ExpressRoute Gateways
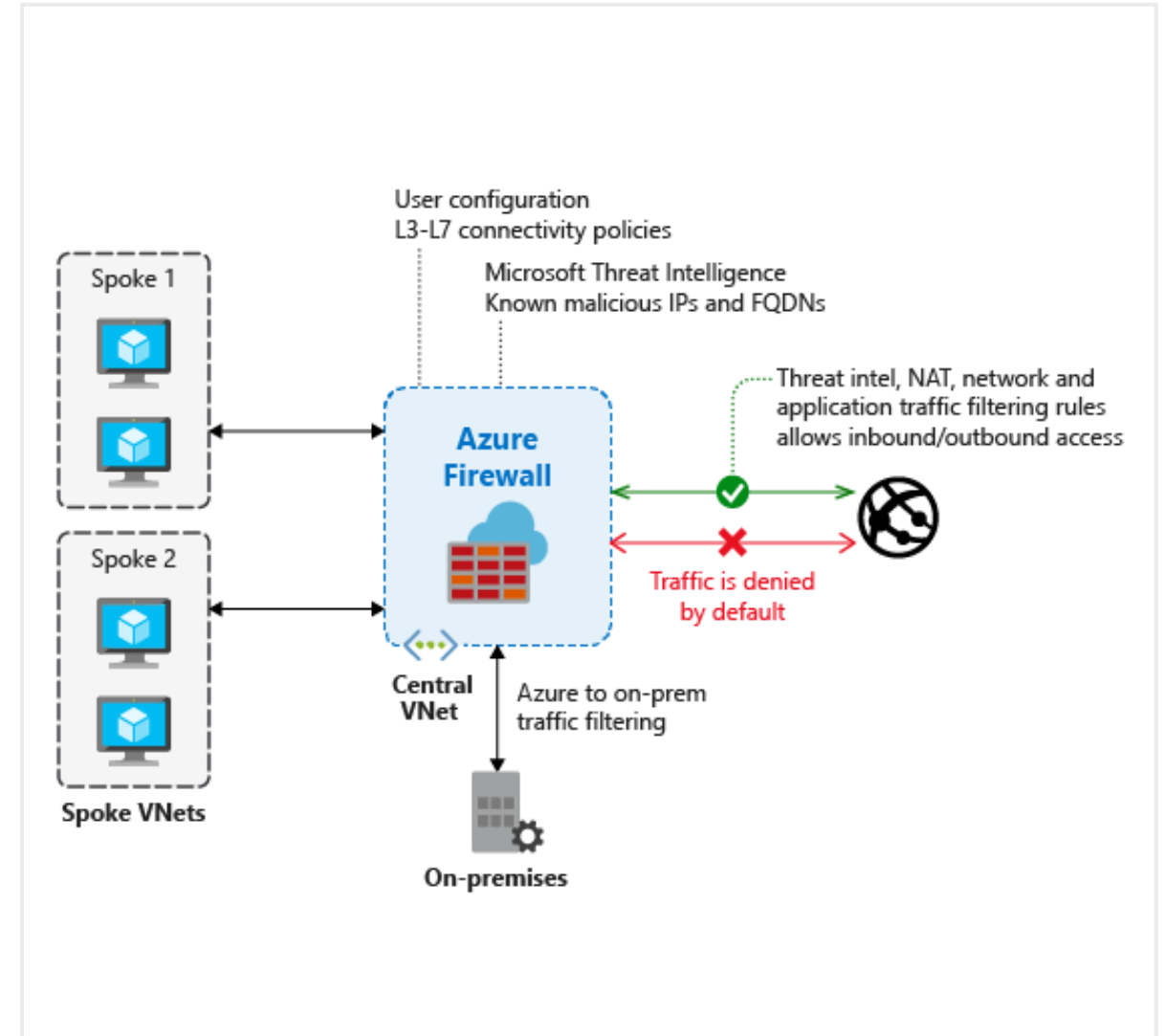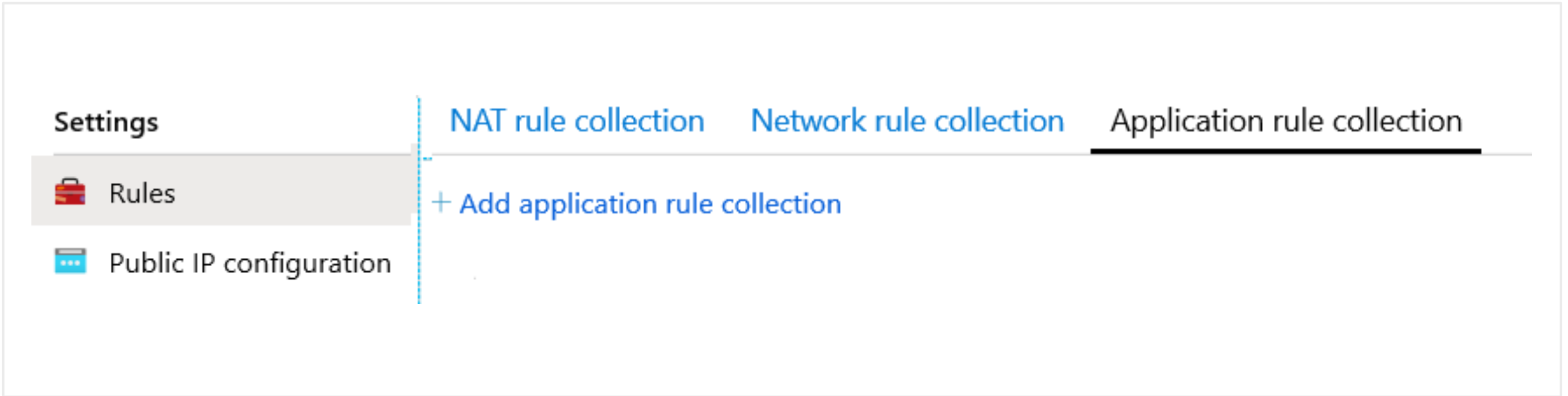
Implementing Firewalls

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

Firewall Rules

Settings

🧰 Rules

🖳 Public IP configuration

NAT rule collection   Network rule collection   Application rule collection

+ Add application rule collection

NAT rules. Configure DNAT rules to allow incoming connections

Network rules. Configure rules that contain source addresses, protocols, destination ports, and destination addresses

Application rules. Configure fully qualified domain names (FQDNs) that can be accessed from a subnet

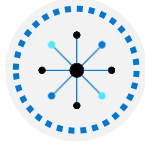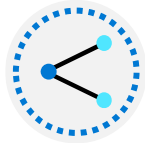# Lesson 05: Azure DNS
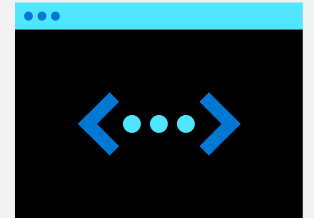
Azure DNS Overview

- Domains and Custom Domains
- Verifying Custom Domain Names
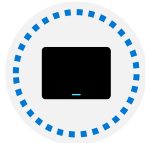- Azure DNS Zones
- DNS Delegation
- DNS Record Sets
- DNS for Private Domains
- Private Zones Scenarios
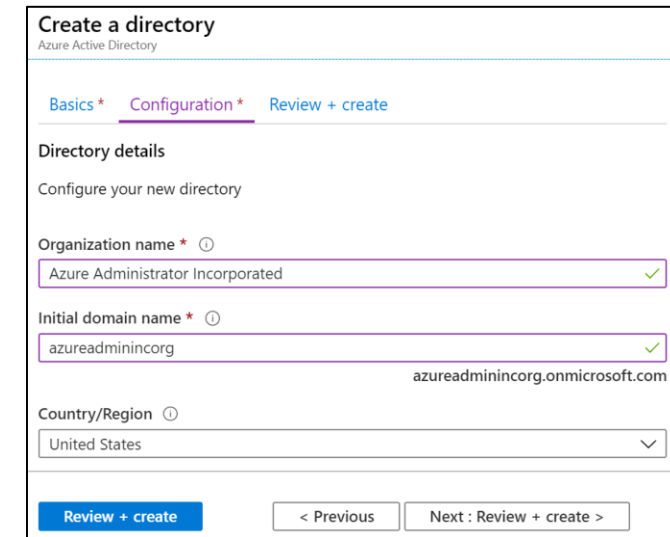- Demonstration – DNS Name Resolution

Domains and Custom Domains

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 (next topic)

Create a directory
Azure Active Directory

Basics *   Configuration *   Review + create

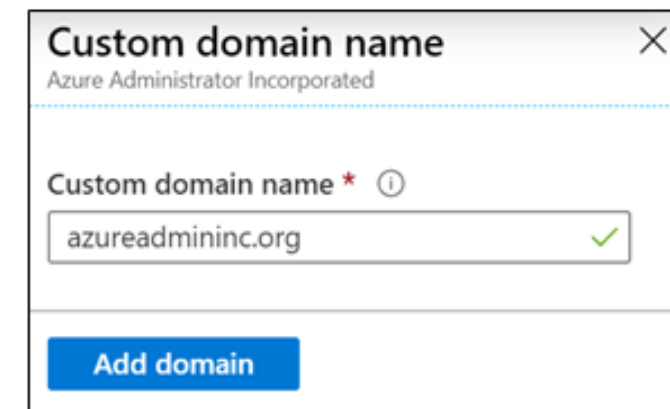**Directory details**

Configure your new directory

Organization name * ⓘ

Azure Administrator Incorporated

Initial domain name * ⓘ

azureadminincorg

azureadminincorg.onmicrosoft.com

Country/Region ⓘ

United States

Review + create   < Previous   Next : Review + create >

Custom domain name   ✕
Azure Administrator Incorporated

Custom domain name * ⓘ

azureadmininc.org

Add domain

Verify the Custom Domain Name

Verification demonstrates ownership of the domain name

Add a DNS record (MX or TXT) that is provided by Azure into your company's DNS zone

Azure will query the DNS domain for the presence of the record

This could take several minutes or several hours

azureadmininc.org
Custom domain name

🗑 Delete | ♡ Got feedback?

ℹ To use azureadmininc.org with your Azure AD, create a new TXT record with your domain name registrar using the info below.

Record type

(TXT   MX)

Alias or host name

@

Destination or points to address

MS=ms79094380

TTL

3600

Share these settings via email
Verification will not succeed until you have configured your domain with your registrar as described above.

Azure DNS Zones

A DNS zone hosts the DNS records for a domain

The name of the zone must be unique within the resource group

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

Create DNS zone ✕

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

DNS **azureadmininc.org**
DNS zone

+ Record set → Move 🗑 Delete zone ↻ Refresh

Resource group (change)
rg-dns

Subscription (change)
MSDN Platforms Subscription

Subscription ID

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.

Tags (change)
Click here to add tags

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

---

Add record set
azureadmininc.org

Name

helloworld   ✓

.azureadmininc.org

Type

A   ⌄

Alias record set ⓘ

○ Yes   ● No

TTL *   TTL unit

1   Hours   ⌄

IP address

0.0.0.0   ...

DNS for Private Domains
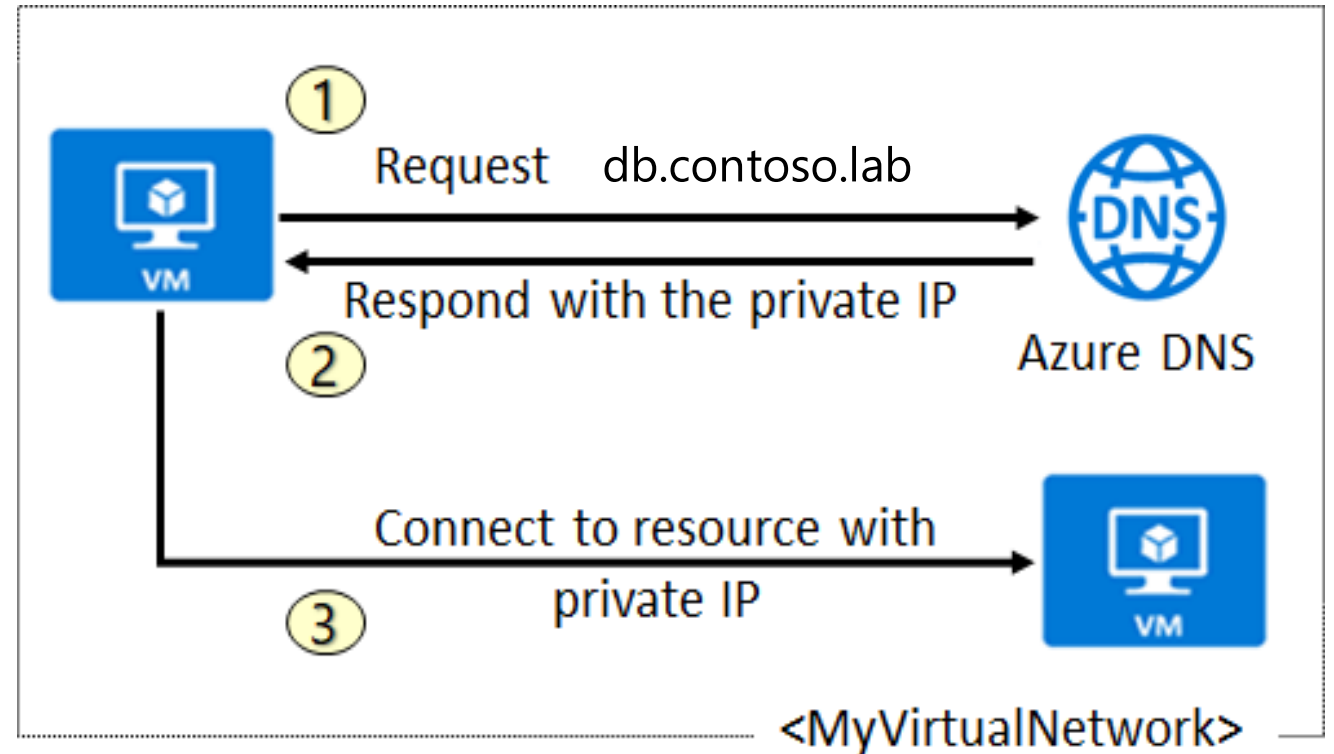
Use your own custom domain names

Provides name resolution for VMs within a VNet and between VNets
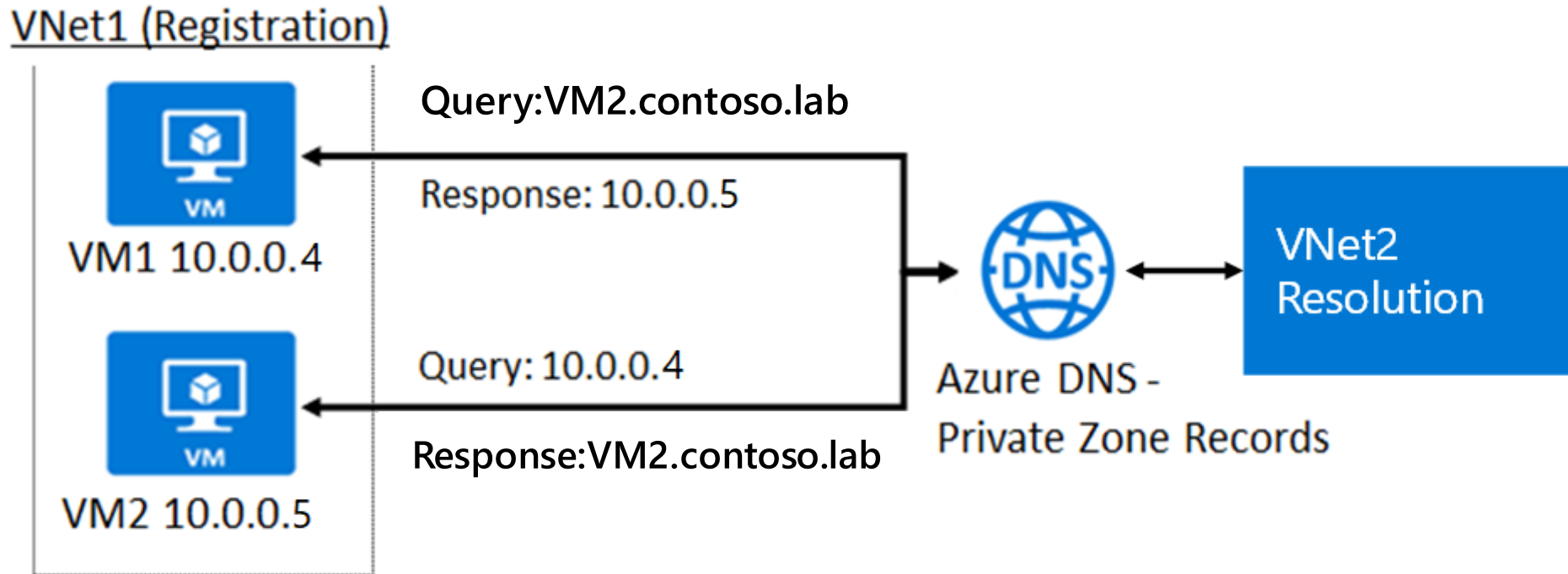
Automatic hostname record management

Removes the need for custom DNS solutions

Use all common DNS records types

Available in all Azure regions

① Request   db.contoso.lab

Respond with the private IP

② Azure DNS

③ Connect to resource with private IP

\<MyVirtualNetwork\>
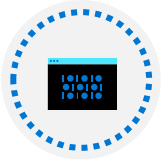
Private Zone Scenarios

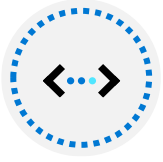DNS resolution in VNet1 is private and not accessible from the Internet

DNS queries across the virtual networks are resolved

Reverse DNS queries are scoped to the same virtual network

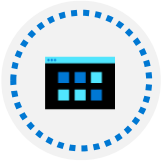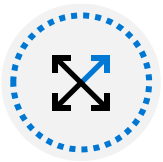# Demonstration – DNS Name Resolution
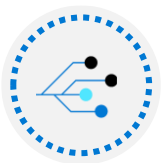
Create a DNS zone

Add a DNS record set

Use PowerShell to view DNS information
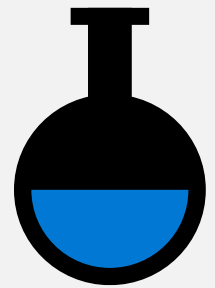

View your name servers

Test the resolution

Explore DNS metrics

Lesson 06: Module 04 Lab and Review

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:
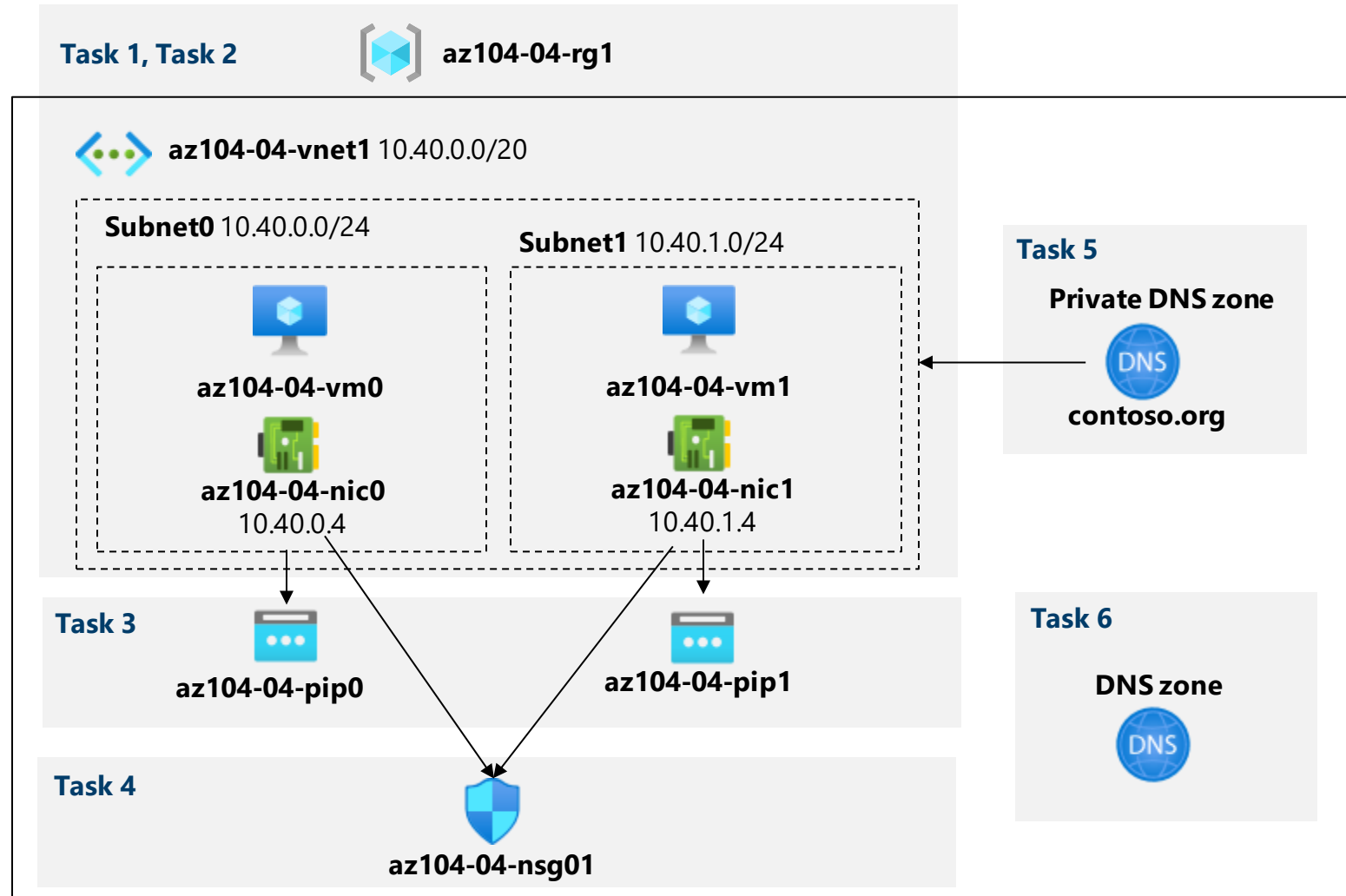Configure network security groups

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

Task 1, Task 2 az104-04-rg1

az104-04-vnet1 10.40.0.0/20

Subnet0 10.40.0.0/24

Subnet1 10.40.1.0/24

az104-04-vm0

az104-04-nic0
10.40.0.4

az104-04-vm1

az104-04-nic1
10.40.1.4

Task 5

Private DNS zone

DNS

contoso.org

Task 3

az104-04-pip0

az104-04-pip1

Task 6

DNS zone

DNS

Task 4

az104-04-nsg01

Module Review

Module Review Questions	Microsoft Learn Modules (docs.microsoft.com/Learn)
	Networking Fundamentals – Principals
	Design an IP addressing schema for your Azure deployment
	Secure and isolate access to Azure resources by using network security groups and service endpoints

End of presentation