Research & Development (R&D) Document

Azure Virtual Network - CIDR, Subnetting & VNet Peering Submitted To: Celebal Technologies, Summer Internship Program – Cloud Infra and Security
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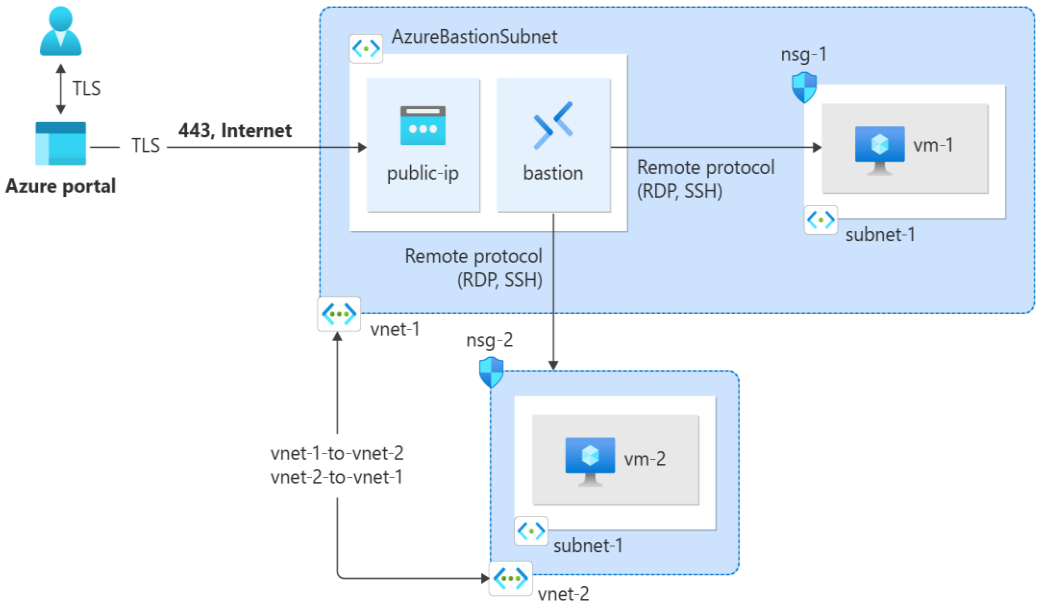
1. Overview of Azure Virtual Network (VNet)

A **Virtual Network (VNet)** in Azure is the fundamental building block for your private network. It enables many types of Azure resources, like VMs, to securely communicate with each other, the internet, and on-premises networks.

- VNets are **isolated**, **region-specific**, and support **address spaces** using **CIDR** blocks.
- VNets can have **multiple subnets**, and each subnet can host one or more virtual machines (VMs).



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2. CIDR Notation in Azure

CIDR (Classless Inter-Domain Routing) notation is used to allocate IP ranges to VNets and subnets.

- **Format:** X.X.X.X/Y
  - Example: 10.0.0.0/16
  - /16 = 65,536 IP addresses
  - /24 = 256 IP addresses

✅ **CIDR Rules in Azure**

- VNet Address Space must not overlap with other VNets if peering is required.
- Each subnet must have a non-overlapping CIDR range within the VNet.
- Reserved IPs: Azure reserves **5 IPs per subnet**.

🔷 **3. Subnetting in VNet**

A **subnet** is a range of IP addresses in your VNet. It allows dividing the network into segments to organize and secure resources.

Example:

If VNet CIDR = 10.1.0.0/16

- Subnet1 (Windows VM): 10.1.1.0/24
- Subnet2 (Linux VM): 10.1.2.0/24

🔷 **4. VNet Peering**

VNet Peering enables direct, private IP connectivity between two VNets in the same or different Azure regions.

□ Types of VNet Peering:

Type	Description
Intra-region Peering	Between VNets in the same region
Global Peering	Between VNets in different Azure regions
VNet-to-VNet	Classic method using VPN gateways, generally deprecated for peering

⚠️ **VNet Peering Prerequisites:**

- No overlapping CIDR ranges.
- Both VNets must be in the same Azure subscription (or use cross-subscription peering).

🔷 **5. Practical Use Case Implementation**

□ Use Case Objective:

- Create 2 VNets: VNet-A and VNet-B
- Each VNet contains 1 subnet:
    - VNet-A → Subnet-A (Windows VM)
    - VNet-B → Subnet-B (Linux VM)

- Enable **mutual ping** using **VNet Peering**

🛠️ Step-by-Step Implementation on Azure Portal

✅ Step 1: Create Resource Group

- Name: RG-NetworkLab

✅ Step 2: Create VNet-A

- Name: VNet-A
- Address space: 10.10.0.0/16
- Subnet-A: 10.10.1.0/24

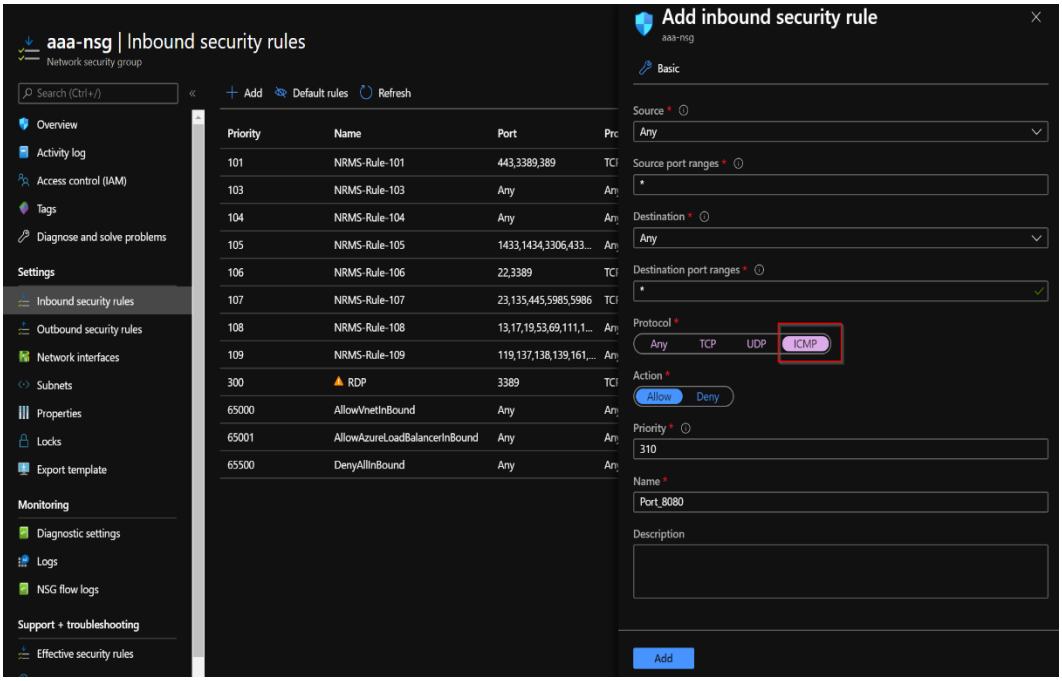
✅ Step 3: Create VNet-B

- Name: VNet-B
- Address space: 10.20.0.0/16
- Subnet-B: 10.20.1.0/24

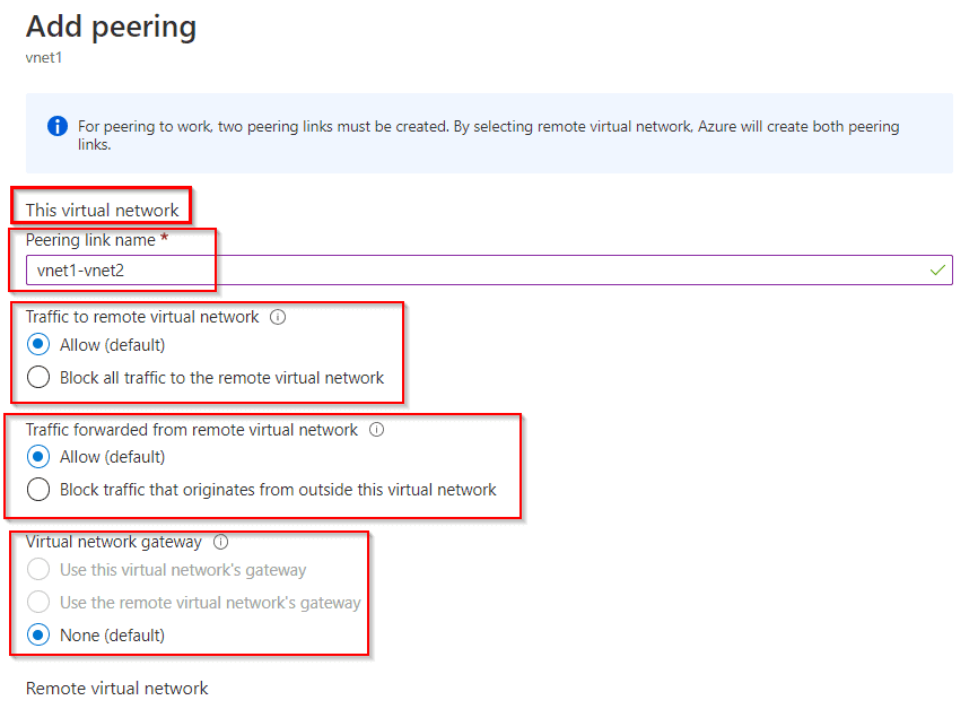
✅ Step 4: Deploy VMs in Subnets

VNet	Subnet	VM OS	VM Name
VNet-A	Subnet-A	Windows	Win-VM-A
VNet-B	Subnet-B	Linux	Linux-VM-B

- Choose Standard B1s VM for testing
- Allow **ICMP (ping)** by configuring **NSG inbound rule**:
    - Protocol: ICMP
    - Priority: 1000
    - Source: Any
    - Destination: Any
    - Allow



☑ Step 5: Create VNet Peering



From VNet-A to VNet-B

- Go to VNet-A → Peerings → Add
- Name: PeeringToVNetB
- Select: VNet-B
- Enable traffic forwarding

From VNet-B to VNet-A

- Similarly, add peering in VNet-B
- Name: PeeringToVNetA

✅ Step 6: Test Connectivity

- **Login to Windows VM**
  - Ping Linux VM Private IP
- **Login to Linux VM**
  - Ping Windows VM Private IP

🔍 Expected Output:

Successful ping reply = Peering works + NSG is correctly configured

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📌 Key Learnings & Summary

Concept	Insight
CIDR	Allows flexible IP range allocation using /X notation
Subnetting	Logical segmentation within a VNet
VNet Peering	Fast, low-latency, secure connection between VNets
Prerequisites	No overlapping IPs, enable peering from both ends
Use Case	Tested real-time with mutual ping between Linux and Windows

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🧠 Recommended CIDR Planning for Enterprise Projects

Component	Recommended CIDR	Purpose
Hub VNet	10.0.0.0/16	Central shared services
Spoke VNet1	10.1.0.0/16	Workload 1 (e.g., app tier)
Spoke VNet2	10.2.0.0/16	Workload 2 (e.g., DB tier)