**R&D Document: Azure Networking – NSG, ASG, Public IPs, and Access Control**

**1. Overview**

Azure provides robust networking capabilities through NSGs, ASGs, public IPs, and network interfaces. This document outlines their working principles and provides guidelines for setting up secure and controlled access to Virtual Machines (VMs).

**2. Network Security Group (NSG)**

**Purpose:** Controls inbound and outbound traffic to Azure resources like NICs or subnets.

**Components:**

* **Rules:** Each rule has:
  + Priority (100–4096, lower number = higher priority)
  + Name
  + Direction (Inbound/Outbound)
  + Port
  + Protocol (TCP/UDP/Any)
  + Source/Destination IP
  + Action (Allow/Deny)

**Application:**

* Can be associated with:
  + A **Subnet** (affects all resources in subnet)
  + A **Network Interface (NIC)** (affects a specific VM)

**3. Application Security Group (ASG)**

**Purpose:** Simplifies NSG rule management by grouping VMs logically based on application.

**Benefits:**

* Dynamic membership based on NIC association.
* Use ASGs in NSG rules to target group instead of IP addresses.

**4. Allow Specific IPs to Access VMs**

To allow access only from a specific IP range:

**NSG Rule Example:**

yaml

CopyEdit

Name: Allow-RDP-From-Office

Priority: 100

Direction: Inbound

Protocol: TCP

Port: 3389

Source: IP Addresses (e.g., 203.0.113.5/32)

Action: Allow

Then deny all other RDP access if needed:

yaml

CopyEdit

Name: Deny-RDP-Internet

Priority: 200

Direction: Inbound

Protocol: TCP

Port: 3389

Source: Internet

Action: Deny

**5. Deny Internet Access Using NSG**

To block outbound Internet access:

**Outbound Rule:**

yaml

CopyEdit

Name: Deny-Internet

Priority: 100

Direction: Outbound

Protocol: Any

Destination: Internet

Action: Deny

**6. Public IPs in Azure**

**6.1. Types**

| **Type** | **SKU** | **Zone Redundant** | **Enhanced Features** |
| --- | --- | --- | --- |
| Basic | Regional | ❌ | ❌ |
| Standard | Zonal | ✅ | ✅ |

**6.2. Allocation Methods**

| **Method** | **Description** |
| --- | --- |
| Dynamic | IP assigned at VM start; changes if deallocated |
| Static | IP persists across VM lifecycle |

**7. Service Tags**

**Definition:** Predefined label representing a group of IP addresses, such as:

* Internet
* VirtualNetwork
* AzureLoadBalancer

**Use Case:** Simplify rule creation. Instead of IPs, use service tags as source/destination.

Example:

yaml

CopyEdit

Source: VirtualNetwork

Destination: Internet

**8. Allocating Static IPs to All VMs**

**Steps:**

1. Go to **NIC** of VM.
2. Open **IP configurations**.
3. Set IP allocation to **Static**.
4. Assign an IP address from the subnet range.

To allocate a static **public IP**:

* Create a static public IP and associate it with the VM's NIC.

**9. Creating a Network Security Group**

**Azure Portal:**

1. Go to **Networking > Network Security Groups > + Create**.
2. Assign a name and region.
3. Add inbound/outbound rules as required.
4. Associate with a subnet or NIC.

**Azure CLI:**

bash

CopyEdit

az network nsg create --resource-group MyRG --name MyNSG

**10. Creating a Public IP**

**Azure Portal:**

1. Navigate to **Networking > Public IP Addresses > + Create**.
2. Choose SKU (Standard/Basic), IP type (Static/Dynamic), and region.

**Azure CLI:**

bash

CopyEdit

az network public-ip create \

--resource-group MyRG \

--name MyPublicIP \

--allocation-method Static \

--sku Standard

**11. Associating/De-associating Public IP with VM**

**Associate Public IP**

**Azure Portal:**

1. Go to **VM > Networking > NIC > IP Configurations**.
2. Click the IP config name.
3. Select an existing public IP or create a new one.

**Azure CLI:**

bash

CopyEdit

az network nic ip-config update \

--resource-group MyRG \

--nic-name MyNIC \

--name ipconfig1 \

--public-ip-address MyPublicIP

**De-associate Public IP**

bash

CopyEdit

az network nic ip-config update \

--resource-group MyRG \

--nic-name MyNIC \

--name ipconfig1 \

--remove publicIpAddress

**12. Creation of Network Interface (NIC)**

**Azure Portal:**

1. Go to **Networking > Network Interfaces > + Create**.
2. Specify:
   * Subnet
   * Private IP configuration
   * Network Security Group (optional)
   * Public IP (optional)

**Azure CLI:**

bash

CopyEdit

az network nic create \

--resource-group MyRG \

--name MyNIC \

--vnet-name MyVNet \

--subnet MySubnet