Network Security on Azure

How to stay safe & secure Cloud workloads the right way?

(by Stefan Rapp, 11.12.2024, 12:00 – 12:45)

What is Network Security all about?

Focus on…

"Network **Architecture**" → Groundwork

…Bad Results

Network Security is suffering!

- Vulnerabilities & Potential breaches
- Network Complexity
- Operational Inefficiencies (slower)
- Scalability Issues (growth & changes)
- Compliance Risks (industry standards & regulations)
- Inconsistent Security Settings (each team)

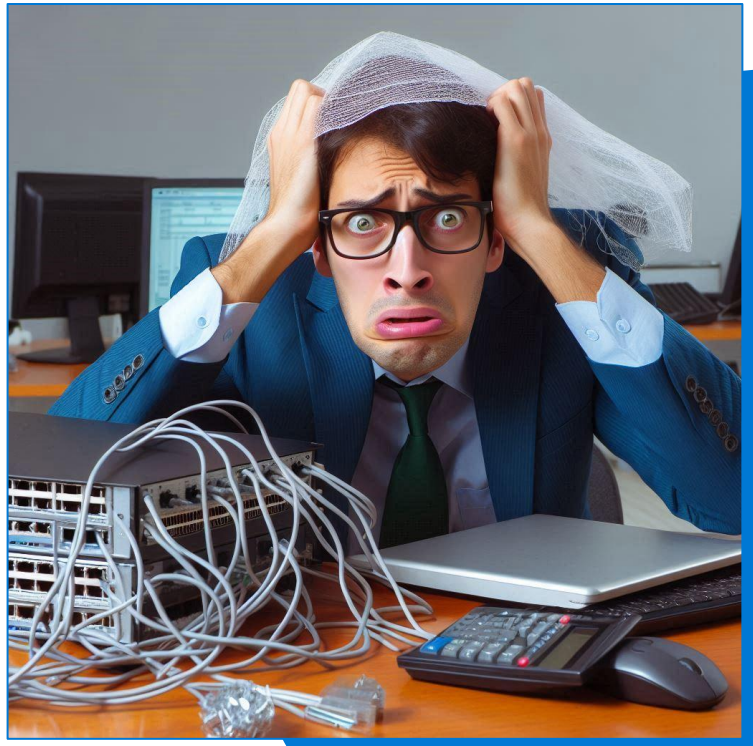


Table of contents

Which requirements must be fulfilled before an enterprise can successfully start with Azure workloads (modernization).

Prerequisites of Azure Network Services

Prerequisites Checklist

What is needed before bringing the first Workload to Azure?

Cloud Strategy
(Goal, Destination, etc.)

Azure Governance

- Azure Billing & Cost Management
- Azure Hierarchy
- Azure RBAC
- Azure Policies
- Naming Convention
- Tag & Lock Strategy

Azure Core Infrastructure

- General Design
- **Network Architecture & Security**
- Hybrid Connection
- Azure Firewall & Azure NVA
- Logging & Monitoring
- etc.

Cloud Automation

- No "*Click-Click-Cloud*"/"*ClickOps*"
- Infrastructure as Code (IaC)
- Central Module Library
- Reusability
- Module Lifecycle
- CI/CD
- etc.

Azure Security

What kind of Azure resources are relevant to bring application workloads to the cloud?

Overview Azure Network Services

Azure Networking Services – Overview

Networking Capabilities to secure Azure Services

- **Access** & **Connect** Azure resources and on-premises resources
- **Support, Protect**, and **Monitor** applications in the Azure network.

Connectivity

Connect to **Azure** & **on-premises** resources

- Virtual Network & Peerings
- Virtual WAN
- ExpressRoute & VPN
- Azure DNS
- User defined Routes
- NAT Gateway
- ...etc.

Application Protection

Protect cloud applications

- Private Links
- DDoS Protection
- Azure Firewall
- Network Security Groups
- Web Application Firewall (WAF)
- Private Endpoints
- ... etc.

Application Delivery

Deliver applications in the Azure network

- Azure CDN
- Azure Front Door Service
- Traffic Manager
- Application Gateway
- Internet Analyzer
- Load Balancer
- ...etc.

Network Monitoring

Monitor network resources

- Network Watcher
- ExpressRoute Monitor
- Azure Monitor
- VNet Flow Log
- ...etc.

- Microsoft **CAF** for Azure
- Azure Well-architected Framework (**WAF**)

Azure Virtual Network (VNet) is the fundamental building block for the private network in Azure.

Azure Virtual Network

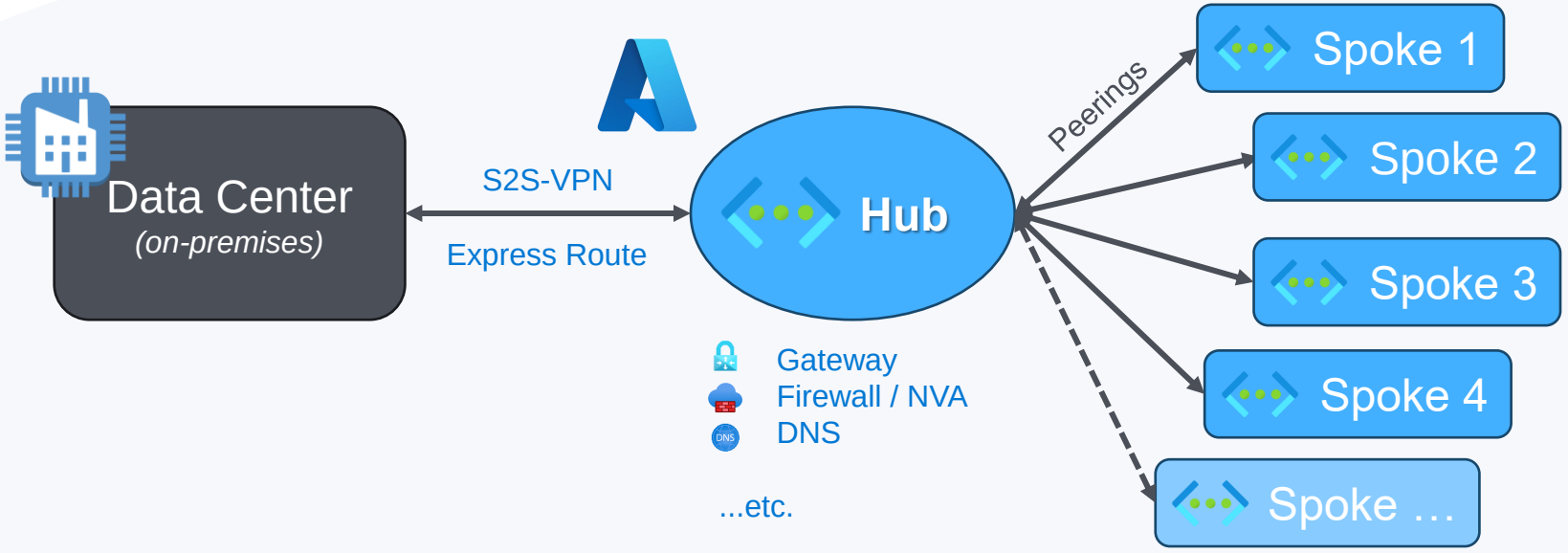
Azure Networking Services

Azure Virtual Network

- Fundamental building block in Microsoft Azure to connect cloud resources.

- **Hub & Spoke Architecture**

  - Hub Network: **Shared** Azure Services
  - Spoke Network: VNets isolated and manage app workloads **separately**
  - VNet Peering ist <u>nicht</u> **Transitiv**!



Network Segmentation

Isolating resources in the network from each other

- Azure VNet → **/22**
  - Azure Subnet → **/26** → Number of possible Subnets **16**
  - Azure Subnet → **/27** → Number of possible Subnets **32**

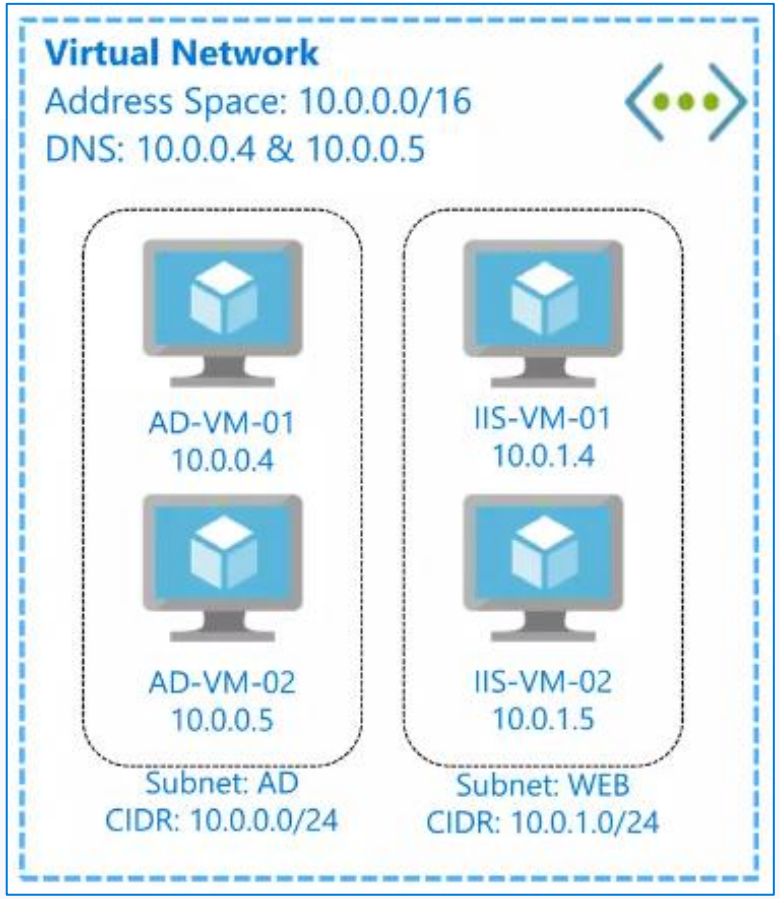
(Visual Subnet Calculator - Split/Join)

Subnet address	Range of addresses	Useable IPs	Hosts	Divide	Join				
10.100.4.0/26	10.100.4.0 - 10.100.4.63	10.100.4.1 - 10.100.4.62	62	Divide	/26	/25	/24	/23	/22
10.100.4.64/26	10.100.4.64 - 10.100.4.127	10.100.4.65 - 10.100.4.126	62	Divide	/26				
10.100.4.128/26	10.100.4.128 - 10.100.4.191	10.100.4.129 - 10.100.4.190	62	Divide	/26	/25			
10.100.4.192/26	10.100.4.192 - 10.100.4.255	10.100.4.193 - 10.100.4.254	62	Divide	/26				
10.100.5.0/26	10.100.5.0 - 10.100.5.63	10.100.5.1 - 10.100.5.62	62	Divide	/26	/25	/24		
10.100.5.64/26	10.100.5.64 - 10.100.5.127	10.100.5.65 - 10.100.5.126	62	Divide	/26				
10.100.5.128/26	10.100.5.128 - 10.100.5.191	10.100.5.129 - 10.100.5.190	62	Divide	/26	/25			
10.100.5.192/26	10.100.5.192 - 10.100.5.255	10.100.5.193 - 10.100.5.254	62	Divide	/26				
10.100.6.0/26	10.100.6.0 - 10.100.6.63	10.100.6.1 - 10.100.6.62	62	Divide	/26	/25	/24	/23	
10.100.6.64/26	10.100.6.64 - 10.100.6.127	10.100.6.65 - 10.100.6.126	62	Divide	/26				
10.100.6.128/26	10.100.6.128 - 10.100.6.191	10.100.6.129 - 10.100.6.190	62	Divide	/26	/25			
10.100.6.192/26	10.100.6.192 - 10.100.6.255	10.100.6.193 - 10.100.6.254	62	Divide	/26				
10.100.7.0/26	10.100.7.0 - 10.100.7.63	10.100.7.1 - 10.100.7.62	62	Divide	/26	/25	/24		
10.100.7.64/26	10.100.7.64 - 10.100.7.127	10.100.7.65 - 10.100.7.126	62	Divide	/26				
10.100.7.128/26	10.100.7.128 - 10.100.7.191	10.100.7.129 - 10.100.7.190	62	Divide	/26	/25			
10.100.7.192/26	10.100.7.192 - 10.100.7.255	10.100.7.193 - 10.100.7.254	62	Divide	/26				

Microsoft Azure VNets

What are the characteristics of an Azure VNet?

- **Logical isolation** with control over the network
- Support for IP addresses ranges (CIDR)
- **DNS** Support
- **Non-overlapping** address ranges
- Support for **static/dynamic** IPs
- **DHCP** "*out-of-the-box*" available



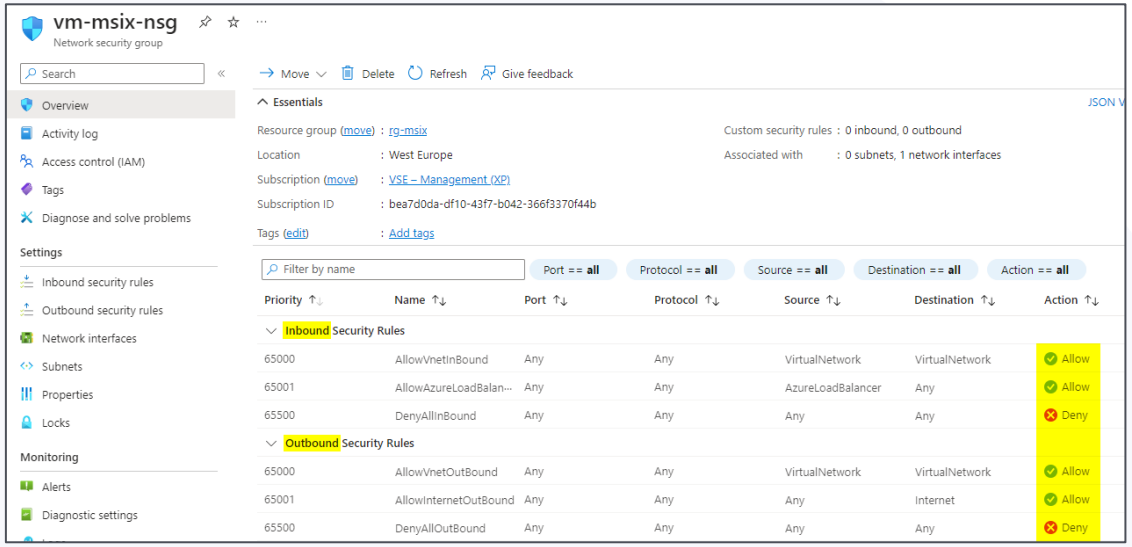
How to **filter** and **control** traffic?

Network Traffic Management

Network Security Groups (NSG)

Use NSG to filter network traffic between Azure resources in an Azure VNet.

- No extra **costs**.
- Enables subnet **segmentation** scenarios.
- Contains a list of ACL **rules** that "*Allow*" or "*Deny*" traffic from/to a VNET. (Layer 3 & 4)
- **Restrict** traffic from/to internal and external sources.
- Rules on URLs or FQDN is <u>not</u> **supported**.
- But "*Service Tags*" can be used for rules.
- Custom rules with **priority** between 100 and 4096.
- Can be assigned to a **NIC** <u>or</u> an Azure **subnet**.

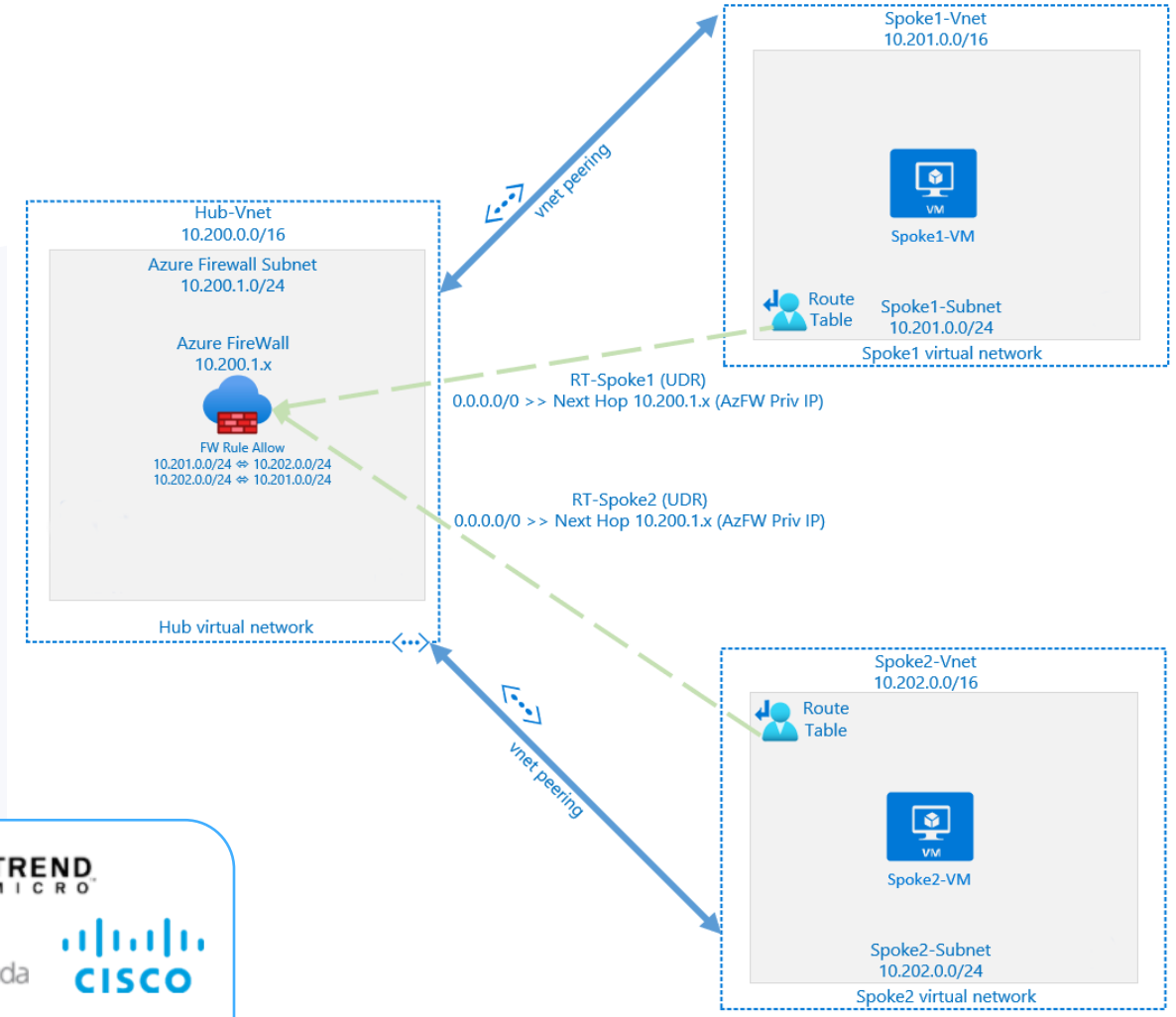


Firewalling & Routing

- Control network traffic
- Centralized Management (SPoC)
  - East-west Traffic (within trusted boundary)
  - North-south Traffic (to external boundary)
- Key Components:
  - Azure Firewall/NVA
  - VNet Peering
  - Route Tables (UDRs)

- Azure Firewall → PaaS *(cloud-native)*

- Azure NVA → IaaS



Provide a secure and direct connectivity to Azure services.

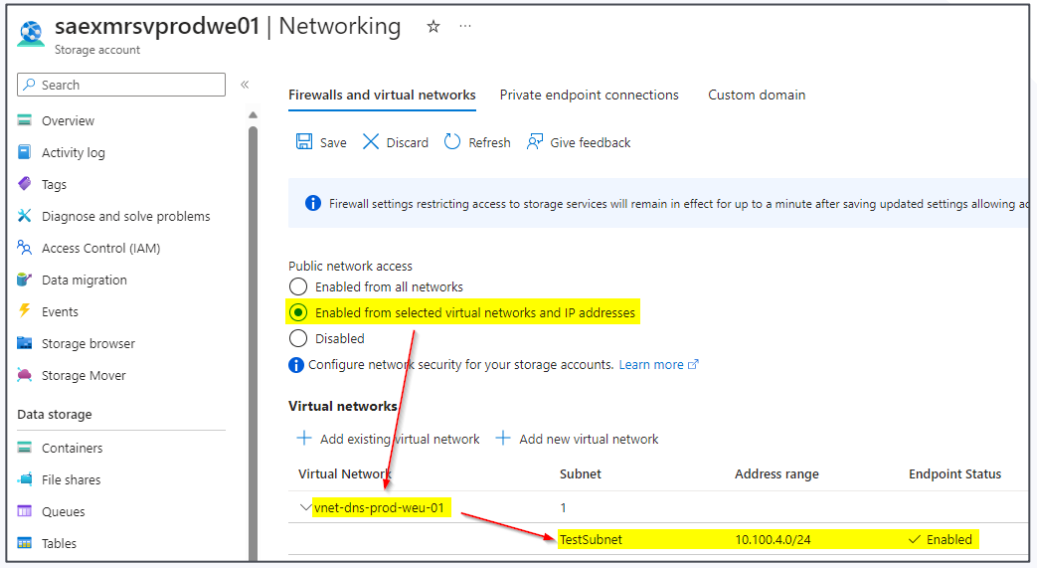
Service & Private Endpoints

Service Endpoints

Overview

ServiceTags_Public_20230925.json

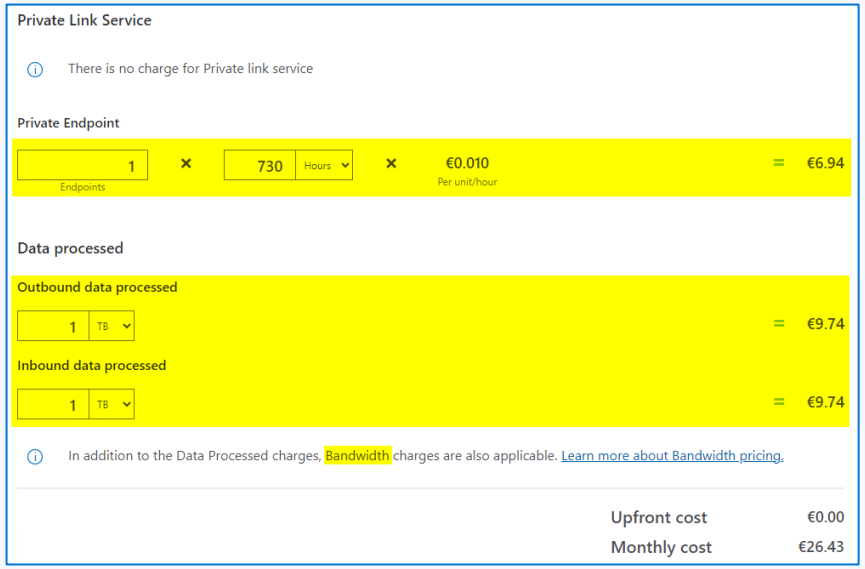
- Azure Services are generally **public**. → Document (JSON)
- Fully **removing** public internet access → Only allow traffic from your **VNet/Subnet**.
- Provide a **secure** and **direct** connectivity to Azure services.
- Enable private IP addresses in the Azure VNet to reach the endpoint of an Azure service.
- An optimized route over the **Azure Backbone** network.
- Goal: Secure your **critical** Azure service resources.
- Without needing a **public IP** address on the VNet.

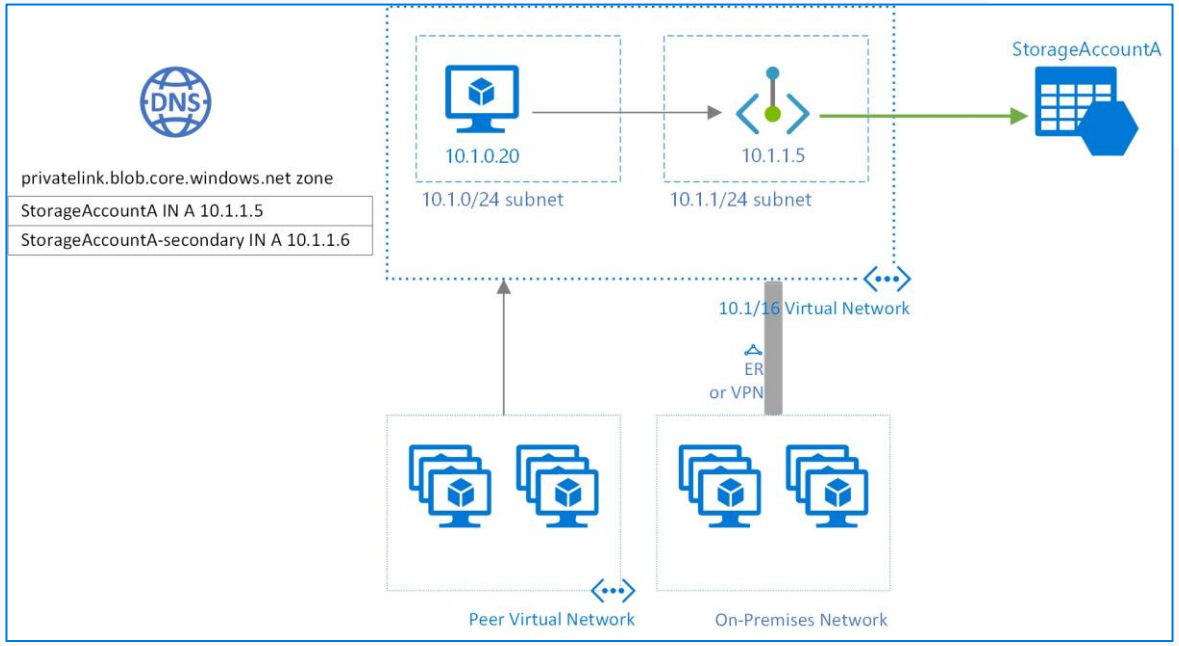


Private Endpoint

Use Private Endpoint with a **private IP** to secure your Azure service.

- Private endpoint = **NIC** that uses a private **IP address** from your VNet.
- Used to bring certain services **into** your VNet.
- Connects **privately** and **securely** to a service that is powered by **Azure Private Link**.
- Private Link resource is the **destination target** of a specified private endpoint (List).
- Causes extra **costs**! 💸 💵 🤑

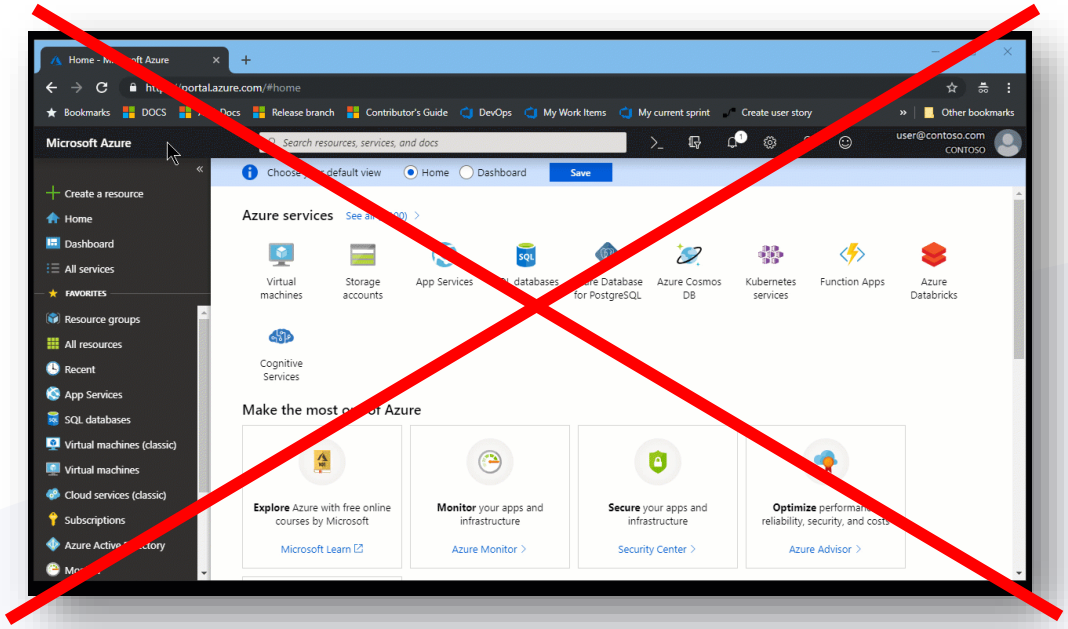




Why IaC is a real game changer?

Infrastructure as Code (IaC)

Mind change administration interface




```
You, 4 weeks ago | 1 author (You)
resource "azurerm_resource_group" "this" {      You, 2 months ago • feat: create initial code base …
  count    = var.create_resource_group ? 1 : 0
  name     = var.resource_group_name
  location = var.module_location

  tags = merge(
    var.module_tags,
    var.resource_group_tags
  )
}

You, 4 weeks ago | 1 author (You)
resource "azurerm_virtual_network" "this" {
  count                   = var.create_virtual_network ? 1 : 0
  location                = var.module_location
  resource_group_name     = try(azurerm_resource_group.this[0].name, var.resource_group_name)
  name                    = var.virtual_network_name
  address_space           = var.virtual_network_address_space
  bgp_community           = var.virtual_network_bgp_community
  dns_servers             = var.virtual_network_dns_servers
  edge_zone               = var.virtual_network_edge_zone
  flow_timeout_in_minutes = var.virtual_network_flow_timeout_in_minutes

  You, 2 months ago | 1 author (You)
  dynamic "ddos_protection_plan" {
    for_each = var.virtual_network_ddos_protection_plan != null ? var.virtual_network_ddos_protection_plan : {}
```

„Click-Click-Cloud“
„Clicky-Bunti“

„Transition 2 cloud“
→ Shift from “*static*” to “*dynamic*” infrastructure

Cloud Operating Model

What are the essential takeaways of the session?

Key Takeaways

Key Takeaways

- Check with your Governance & Platform Team <u>before</u> the start!
- Start making a **plan** → Network **design** (“*But do <u>not</u> click!*”)
- Use Microsoft **CAF** & **Well-architected** Framework
- **Size** your application network according to your workload
  - # of possible hosts
  - # of possible subnets
  - Restrictions from Microsoft
- Think about a suitable **separation** of the application workloads
- How traffic is **controlled** in the given Azure Landing Zone
- Secure Azure Services using the “*Networking*” section
  - Service Endpoints
  - Private Endpoints
- Use **IaC** approach to do resource provisioning in the cloud

PROFILE – Speaker

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#AzureRocks 🤘 🧑‍🎤 🎸

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