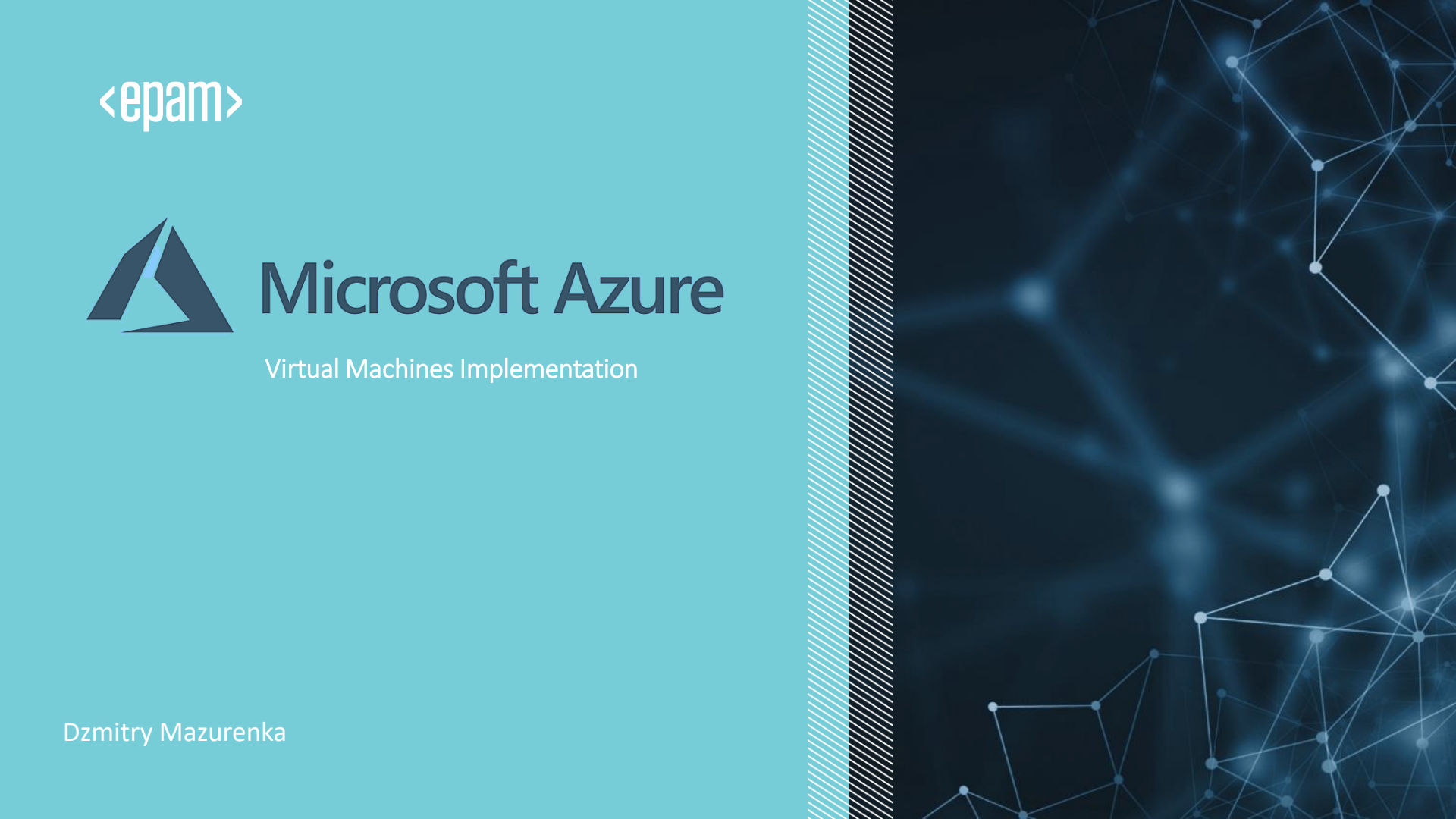
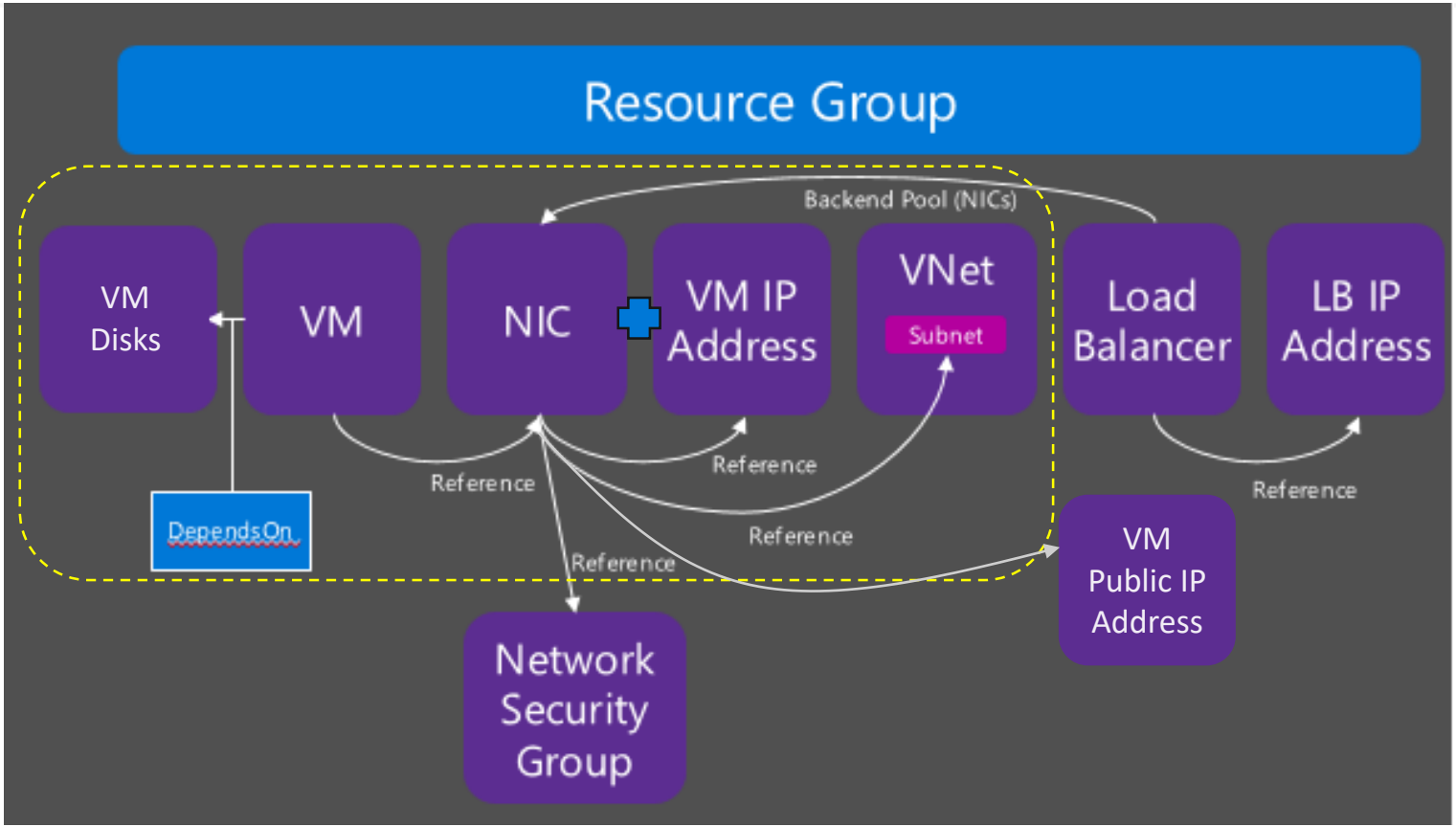

epam
Microsoft Azure
Virtual Machines Implementation
Dzmitry Mazurenka

Agenda

- Overview of Virtual Machines
- Planning for Azure VMs
- Disks
- Connectivity
- Availability
- Scalability
- Security
- Extensions
- Monitoring

OVERVIEW OF VIRTUAL MACHINES

VM and necessary resources



PLANNING FOR AZURE VMs

VM sizes

Type	Sizes	Description
General purpose	B, Dsv3, Dv3, DSv2, Dv2, Av2	Balanced CPU-to-memory ratio. Ideal for testing and development, small to medium databases, and low to medium traffic web servers.
Compute optimized	Fsv2, Fs, F	High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, batch processes, and application servers.
Memory optimized	Esv3, Ev3, M, GS, G, DSv2, Dv2	High memory-to-CPU ratio. Great for relational database servers, medium to large caches, and in-memory analytics.
Storage optimized	Ls	High disk throughput and IO. Ideal for Big Data, SQL, and NoSQL databases.
GPU	NV, NVv2, NC, NCv2, NCv3, ND	Specialized virtual machines targeted for heavy graphic rendering and video editing, as well as model training and inferencing (ND) with deep learning. Available with single or multiple GPUs.
High performance compute	H	Our fastest and most powerful CPU virtual machines with optional high-throughput network interfaces (RDMA).

What should be considered in case of design a VM

1. SLA
   - Is Availability Set needed
   - Disk(s) type (SSD, HDD, Manage Disk)
2. What software do you plan to use
   - VM Size
   - OS Type
3. Do you need to provide HA
   - VM or VMSS
   - Load Balancer
4. Do you have your own license(s) (OS, software)
   - Use option "Bring your own license"
5. How long so you plan to use VM(s)
   - Billing option (Pay as you go, Reserved VMs)
6. For what environment (DEV, SIT, PROD) do you need to utilize VM(s)
   - VM size category (General Purpose, Compute optimized and etc.)
   - Disk(s) type (SSD, HDD, Manage Disk)
7. How often do you plan to change VM settings, increase count
   - Deployment method (ARM, PowerShell, Portal and etc.)
8. How many network interfaces do you need
   - VM Size
9. Do you need to provide access to VM from the Internet
   - Load Balancer
   - NSG
   - Public IP

DISKS

Types of disks

1. Standard HDD disks (Managed and Unmanaged)
2. Standard SSD disks (Managed only)
3. Premium SSD disks (Managed and Unmanaged)
4. Ultra SSD disks (Managed only)

Unmanaged disks

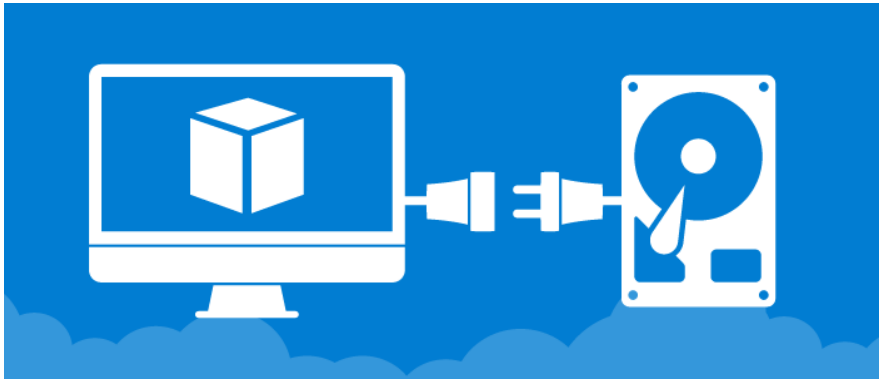
- **Low-cost**

Managed disks

- **Simple and scalable VM deployment**
- **Better reliability for Availability Sets**
- **Highly durable and available**
- **Granular access control**
- **Azure Backup service support**

Disk sub-system

- Attach OS or data disk
  - New (empty)
  - Existing blob
  - Blob snapshot (managed disks)
- Detach
- Temporary disk (D:\ or /dev/sdb)
- Modify disk settings
  - Caching mode (none, read-only, read-write)
  - Disk size
  - Convert from Standard SKU to Premium and vice-versa (managed disks only)
  - Convert between Standard and Premium by moving .vhd file (un-managed disks)

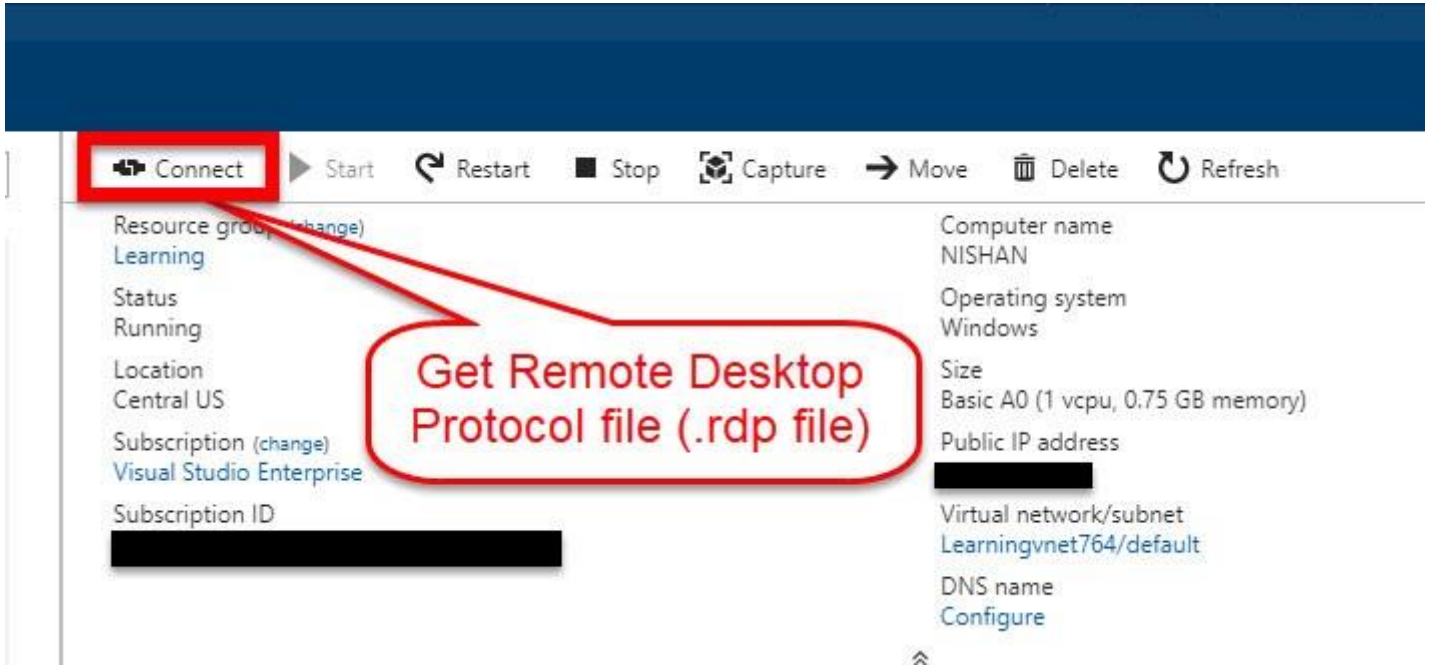


CONNECTIVITY

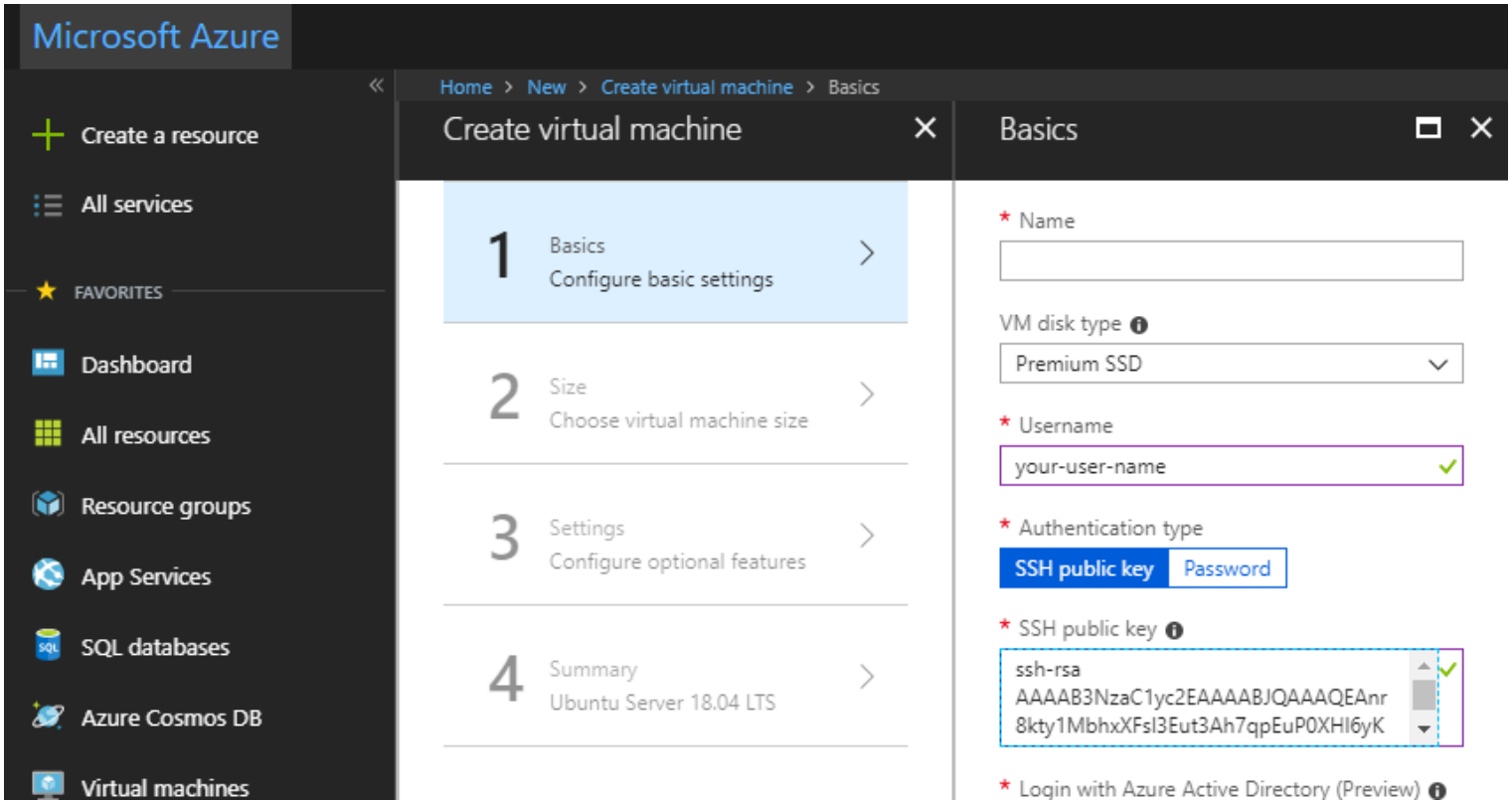
Connectivity

- Windows
  - RDP
    - User-based authentication. Generate .rdp file from Azure Portal
  - WinRM
    - Generate a certificate and upload it to Azure Key Vault
    - Reference to the certificate URL in the VM configuration
- Linux
  - SSH
    - User-based or certificate-based authentication
    - SSH client
  - Remote desktop
    - Xfce4
    - Xrdp
- Standalone
  - Serial port connection
  - Boot diagnostics

Connectivity Demo: RDP

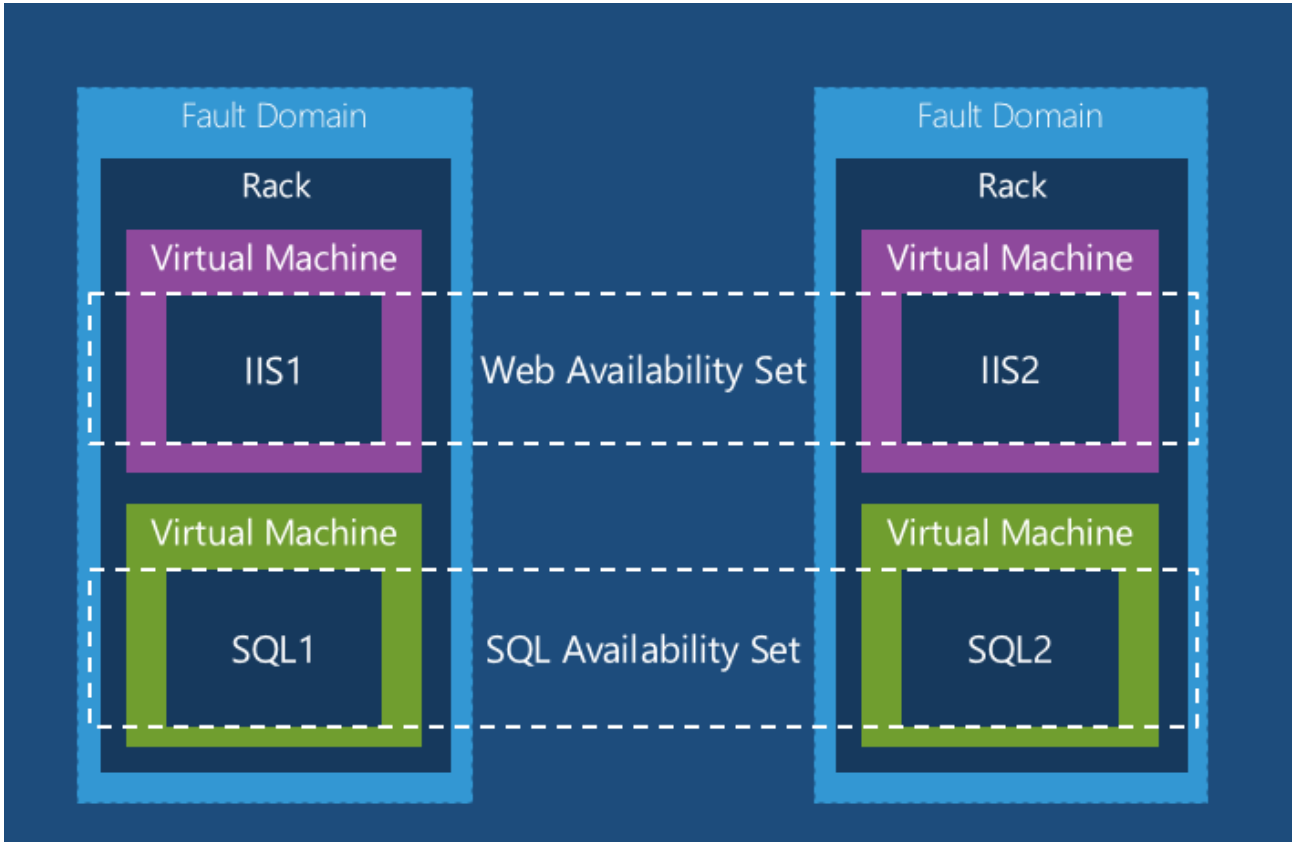


Connectivity Demo: SSH

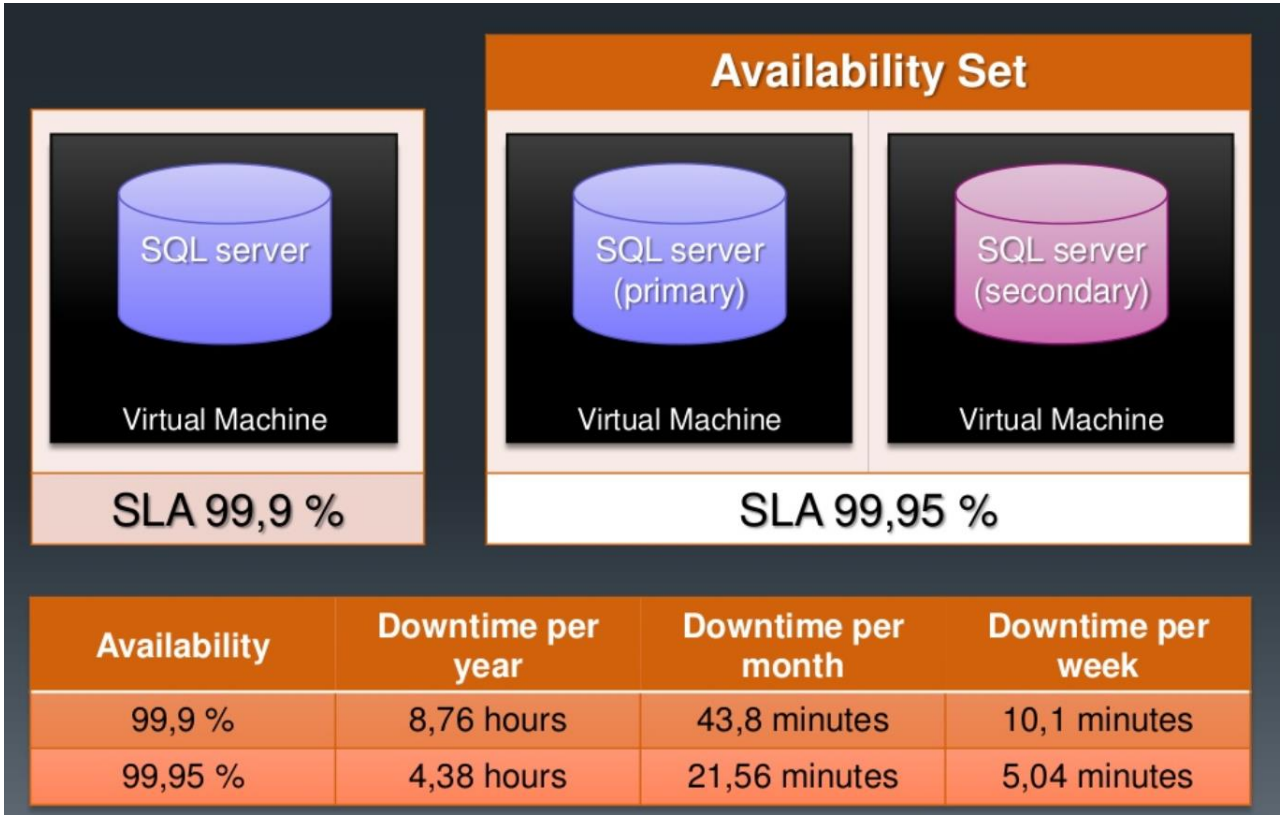


AVAILABILITY

Availability



Availability - SLA

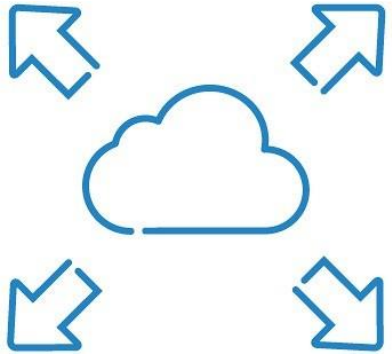


Availability	Downtime per year	Downtime per month	Downtime per week
99,9 %	8,76 hours	43,8 minutes	10,1 minutes
99,95 %	4,38 hours	21,56 minutes	5,04 minutes

SCALABILITY

Scalability

- Vertical scalability
  - Increases VM performance by increasing hardware characteristics
  - Requires temporary downtime:
    - Restart if resizing within the same physical cluster
    - Stop (de-allocate) if resizing requires physical cluster change
- Horizontal scaling
  - VM Scale Sets
    - Auto-scalable
    - Fast
    - Customizable
      - VM extensions



Scale Sets Autoscaling

- Metrics
  - Percentage CPU
  - Network In/Out
  - Disk Read/Write Bytes
  - Disk Read/Write Operations/Sec
  - CPU Credits Remaining/Consumed
- Aggregation
  - Average
  - Minimum
  - Maximum
  - Total
  - Last
  - Count
- Operators
  - Greater than
  - Greater than or equal to
  - Less than
  - Less than or equal to
  - Equal to
  - Not equal to
- Actions
  - Increase count by
  - Increase percent by
  - Increase count to
  - Decrease count by
  - Decrease percent by
  - Decrease count to

Best practices for autoscaling

https://docs.microsoft.com/en-us/azure/monitoring-and-diagnostics/insights-autoscale-best-practices

SECURITY

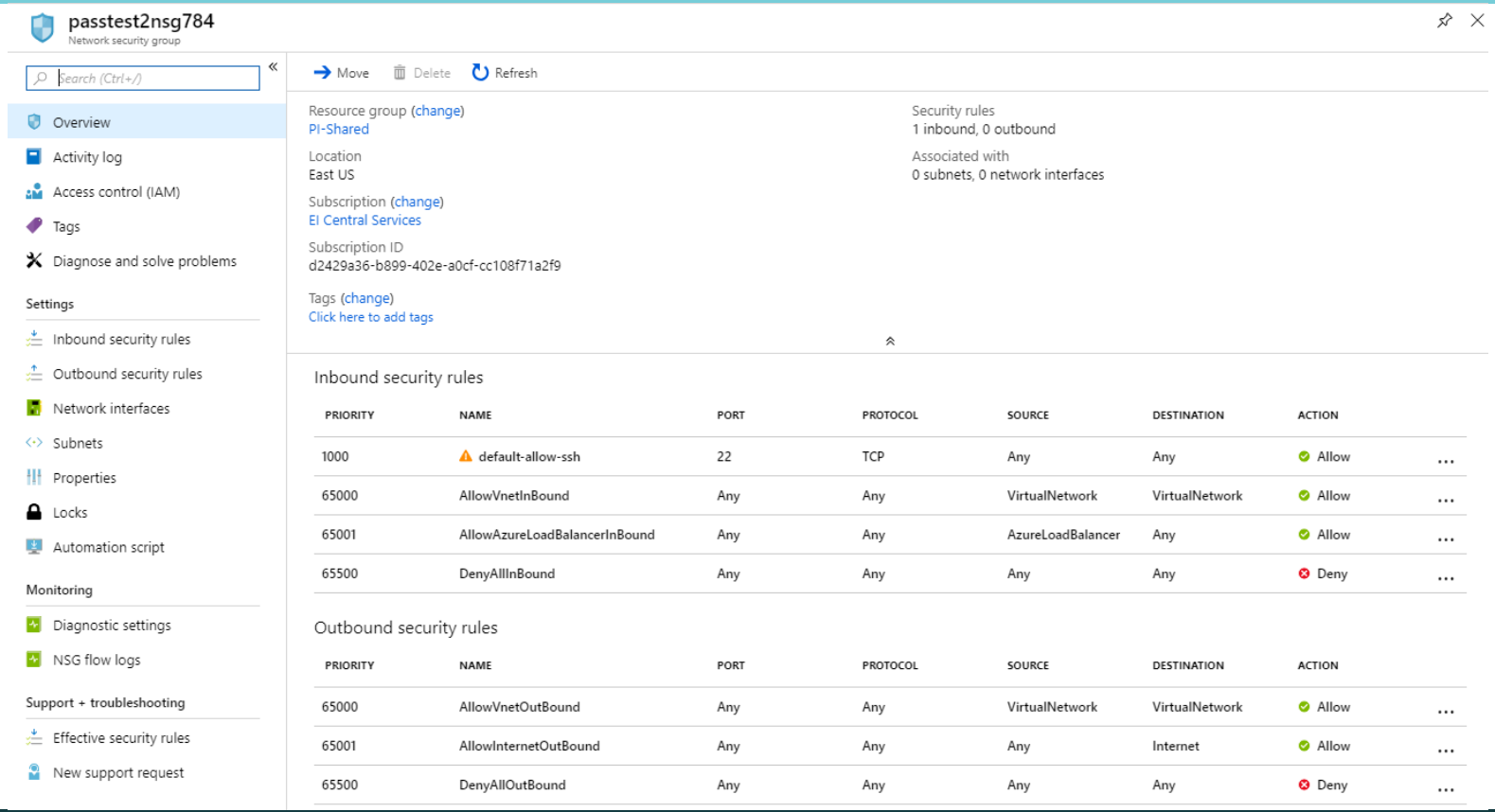
Security - Network Security Groups

- Enables network segmentation and DMZ
- NSG is an Access Control List
  - Filter conditions with allow/deny actions
  - Individual addresses, address prefixes, wildcards

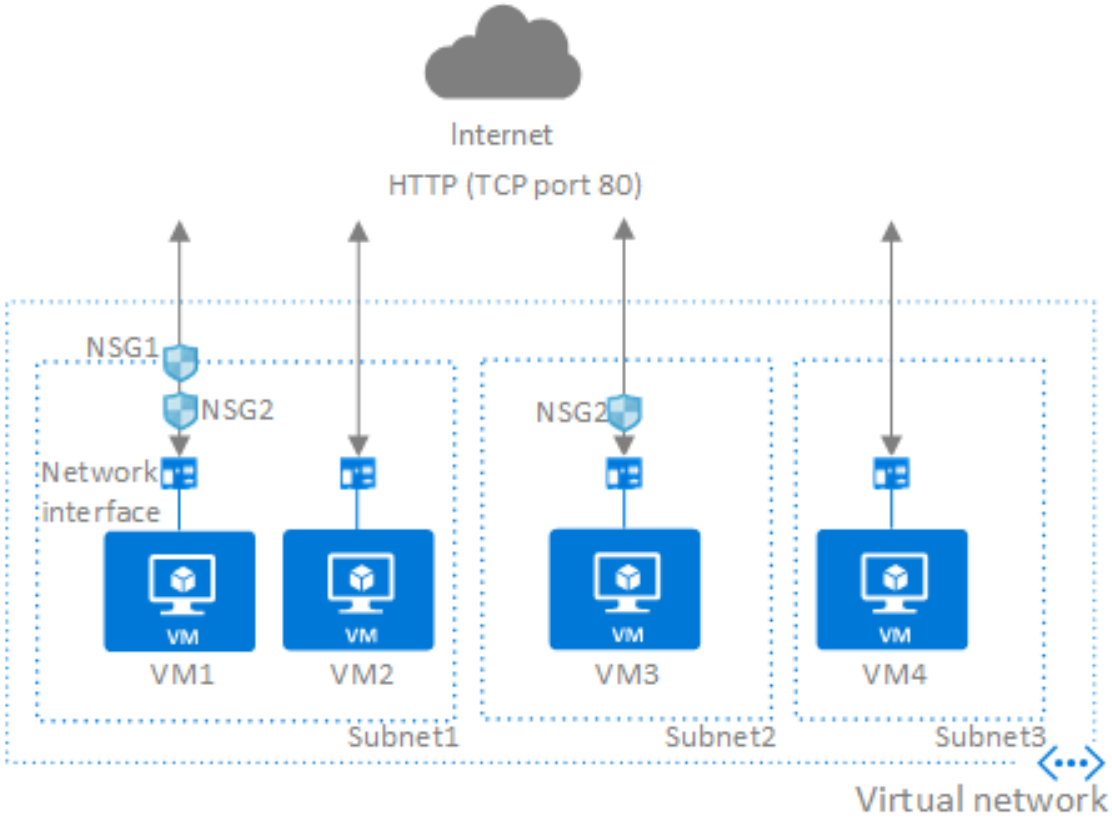
- Associate with VMs or subnets
  - VM NIC
  - Subnet (part of VNet)

  - Ingress → Subnet NSG → VM (NIC) NSG → VM
  - Egress ← Subnet NSG ← VM (NIC) NSG ←VM

Security - Network Security Groups

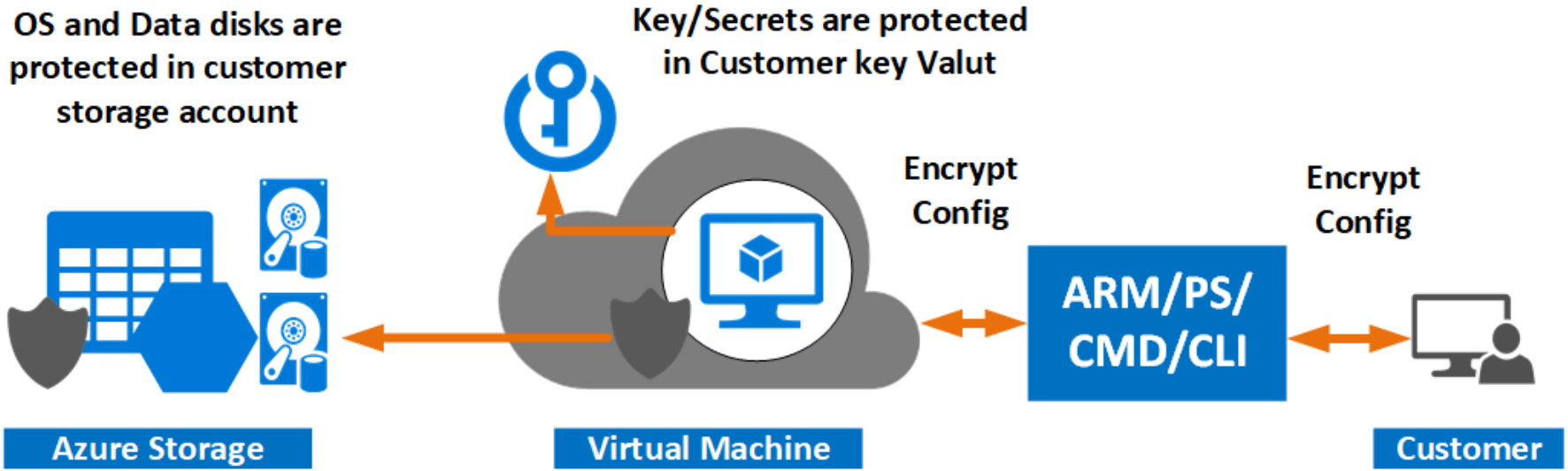


Security – Network Security Groups



Security - Disk encryption

- Azure Disk Encryption leverages existing system-based encryption technologies
  - BitLocker for Windows
  - DM-Crypt for Linux
- Uses Azure Key Vault to store Keys



EXTENSIONS

Extensions

Azure virtual machine (VM) extensions are small applications that provide post-deployment configuration and automation tasks on **Azure VMs**.

- VM Agent - **default**
- Custom script extension (Windows and Linux)
- Cloud-init (Linux only)
- DSC extension (Windows and Linux)
- Microsoft Antimalware extension
- Azure Diagnostics extension
- Log Analytics extension

MONITORING

Monitoring

- Metrics
  - Internal OS metrics (perfmon)
  - Windows Logs
  - Azure-based resource metrics (Azure Monitor)
  - Raw logs/metrics flow
- Presentation
  - OMS/Log Analytics
  - Azure Monitor
- Alerting/Actions
  - OMS/Log Analytics
  - Azure Monitor
  - Actions
    - Webhook / Automation Runbook / Email / Azure Logic App

End of the module