

# Azure Fundamentals Round Table

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Cloud Solution Architect

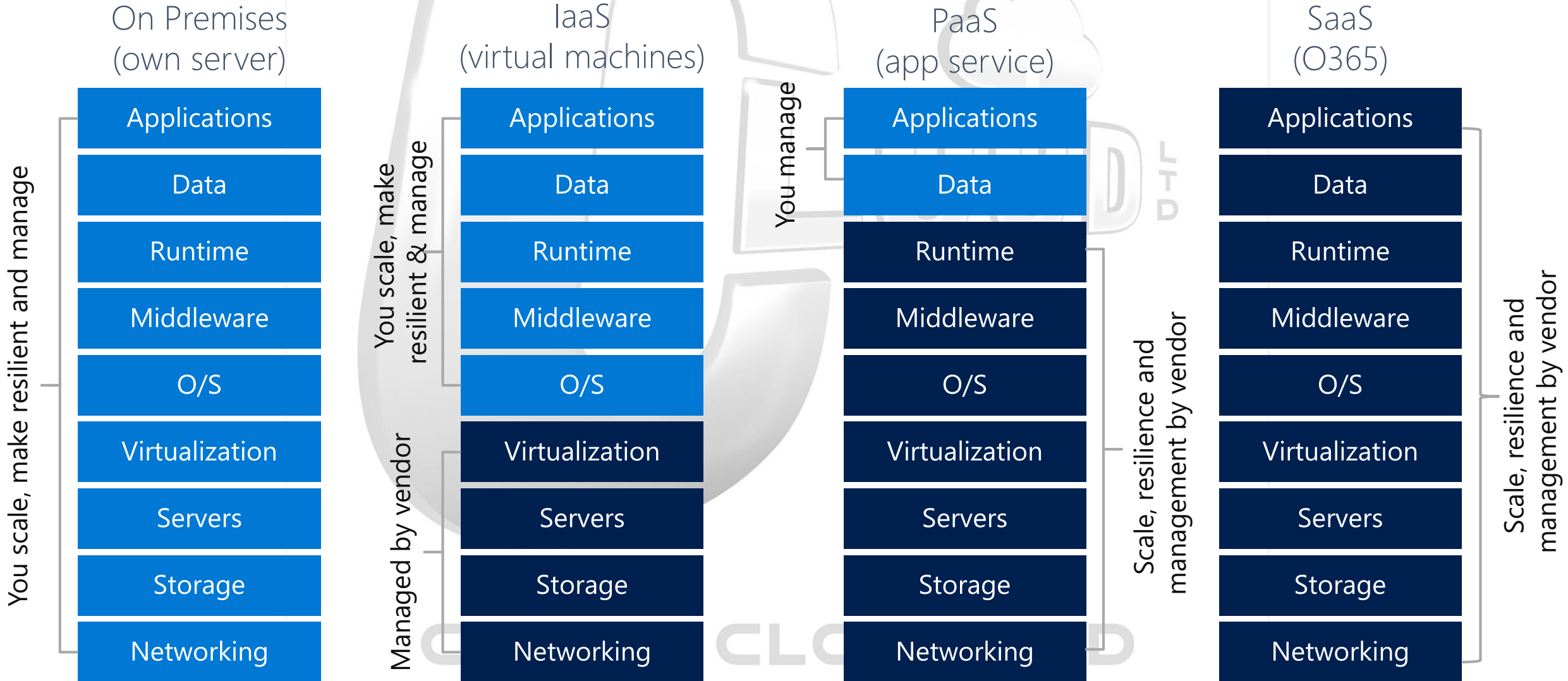
# Global Reach

54<sub>+1</sub>  
Regions  
Worldwide

140<sub>+1</sub>  
Countries



# Cloud Service Models



# Azure Glossary



**Subscription** - logical entity that provides entitlement to deploy and consume Azure resources



**Account** - a global unique entity that gets you access to Azure services and your Azure subscriptions

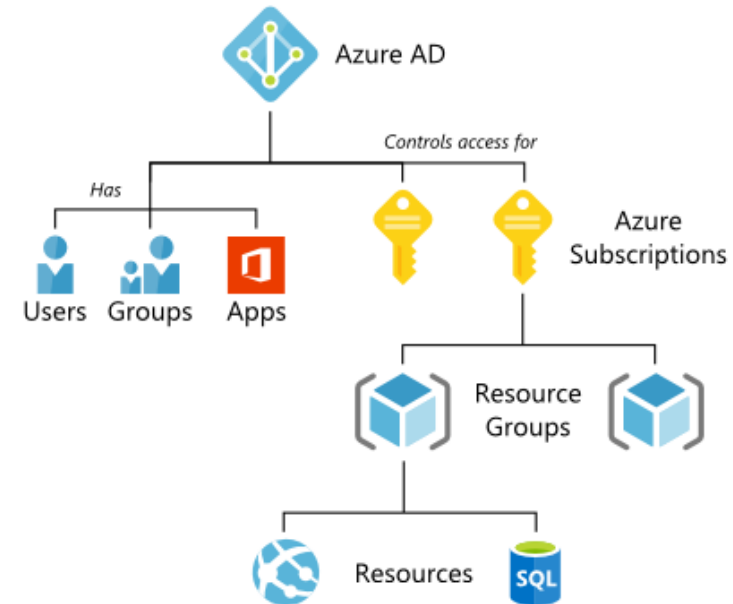


**Resource** - a manageable item that is available through Azure. Virtual machines, storage accounts, databases, and virtual networks are examples of resources.

- **Storage Account** - contains all of your Azure Storage data objects: blobs, files, disks (IaaS), queues, and tables (PaaS).



**Resource Group** - a container that holds related resources for an Azure solution, and that you want to manage as a group.



# Azure VMs

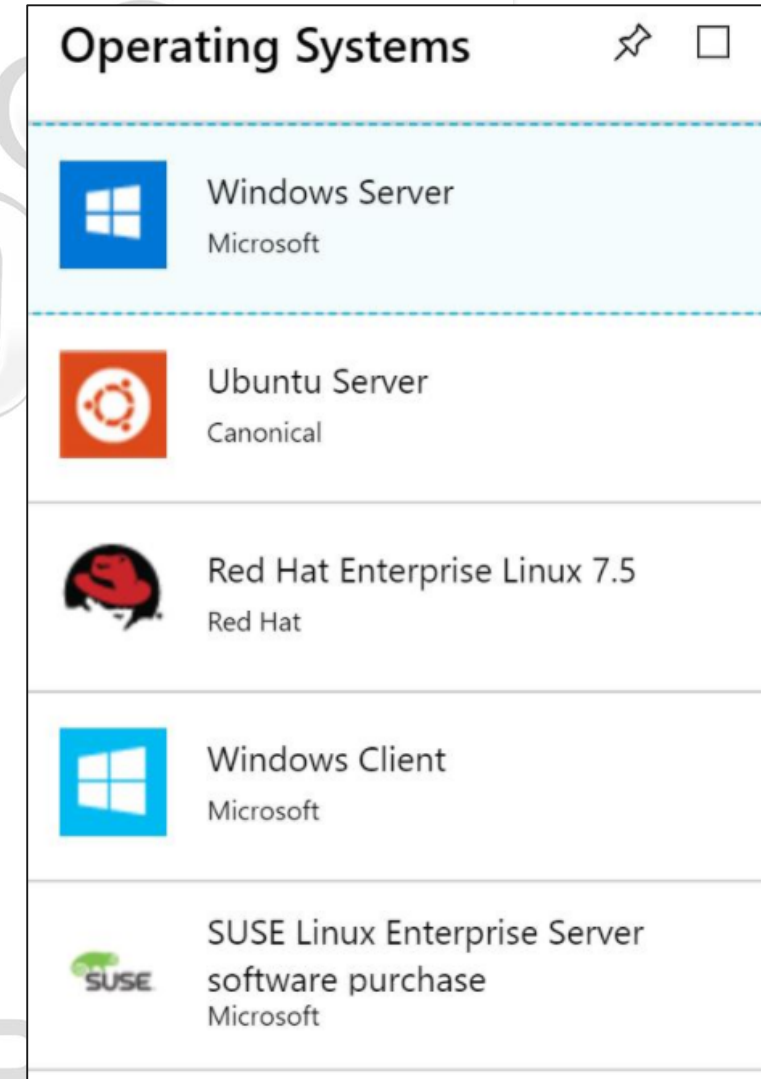


# Virtual Machine Sizing

| VM Type                  | Sizes  | Purpose  |
|--------------------------|--|--|
| General Purpose          | B, Dsv3, Dv3, DSv2, Dv2, Av2, DC             | Testing and development, small to medium databases, and low to medium traffic web servers.       |
| Compute Optimized        | Fsv2, Fs, F                                  | Medium traffic web servers, network appliances, batch processes, and application servers.        |
| Memory Optimized         | Esv3, Ev3, M, GS, G, DSv2, Dv2               | Relational database servers, medium to large caches, and in-memory analytics.                    |
| Storage Optimized        | Lsv2, Ls                                     | Ideal for VMs running databases.   |
| GPU                      | NV, NVv2, NC, NCv2, NCv3, ND, NDv2 (Preview) | Ideal for model training and inferencing with deep learning.                                     |
| High Performance Compute | H  | Fastest and most powerful CPU virtual machines with optional high-throughput network interfaces. |

# Supported Operating Systems

- Windows Server includes many common products, requires a license, doesn't support OS upgrades
- Linux distributions are supported, upgrade of the OS is supported



# Storage Options

- Two types of disks: Unmanaged and Managed
  - Unmanaged disks require you to manage the storage accounts and VHDs
  - Managed disks are maintained by Azure (recommended)
- Two type of storage tiers: HDD and SSD
- Premium SSD storage offers high-performance, low-latency SSD disk support
- Use premium SSD storage for virtual machines with input/output (I/O)-intensive workloads



# Virtual Machine Disk Storage



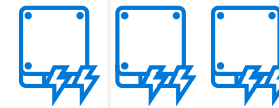
Standard HDD



Standard SSD



Premium SSD



Ultra SSD\*

Low-cost storage

Consistent performance

High performance

Sub-millisecond latency

Single disk max value

SIZE

32TiB

32TiB

32TiB

64TiB

IOPS

2,000

2,000

20,000

80,000 – 160,000

BANDWIDTH

500 MBps

500 MBps

750 MBps

2,000 MBps

(\*)Not available in all regions

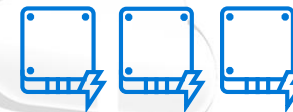
# Virtual Machine Disk Storage - example



Standard HDD



Standard SSD



Premium SSD

Low-cost storage

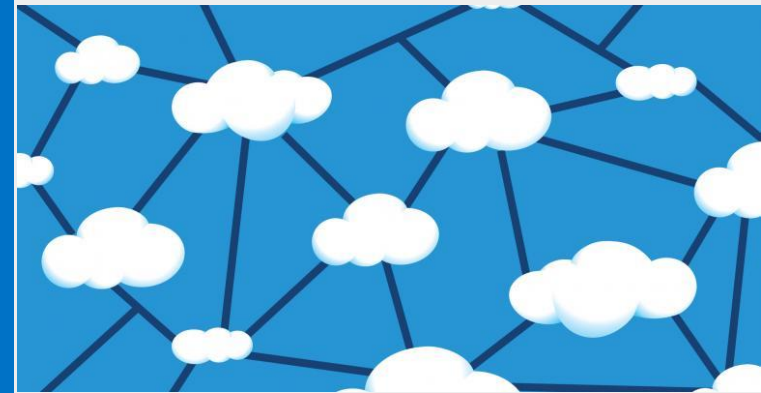
Consistent performance

High performance

256GB Single disk value

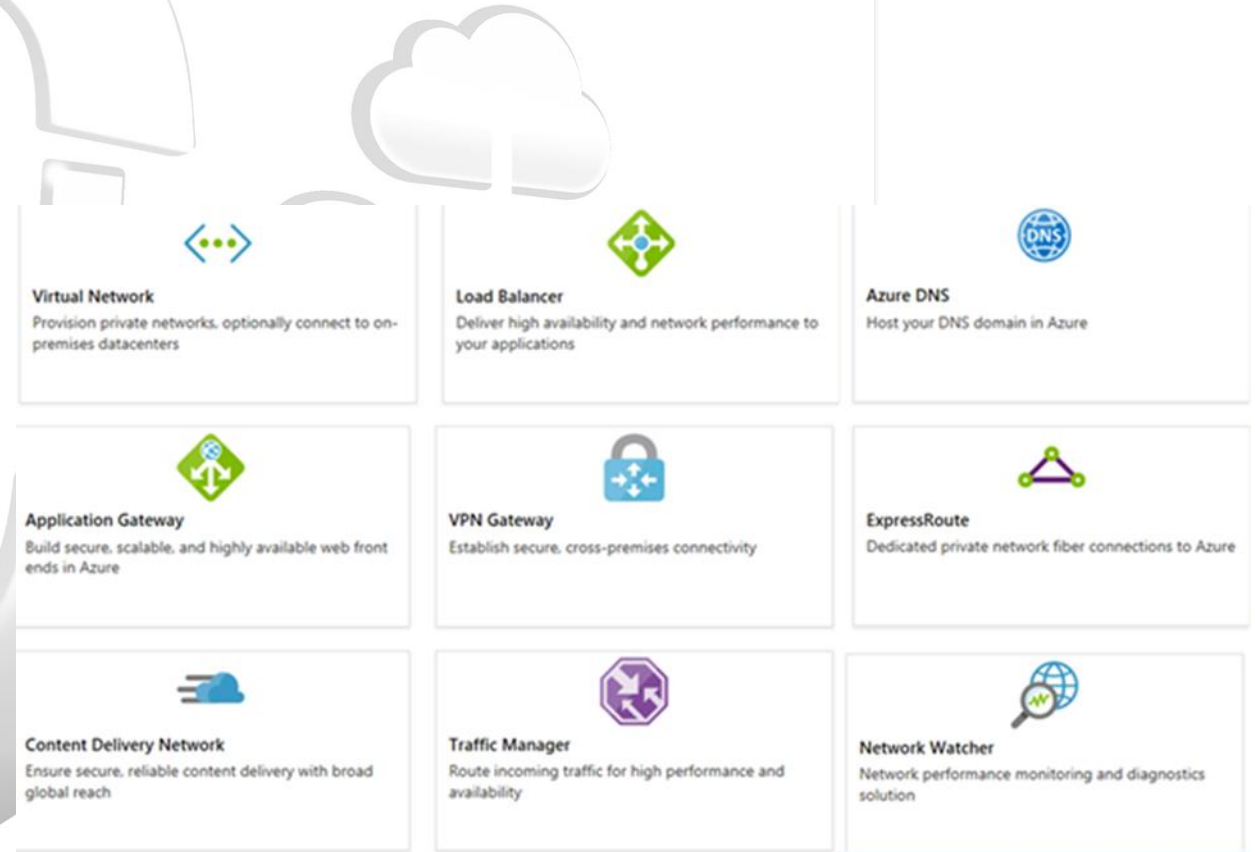
|                      | Standard HDD        | Standard SSD        | Premium SSD       |
|----------------------|---------------------|---------------------|-------------------|
| PRICE                | \$11.33             | \$19.20             | \$41.81           |
| STORAGE TRANSACTIONS | \$0.002/10000 units | \$0.002/10000 units | Included in price |
| IOPS                 | Up to 500           | Up to 500           | 1,100             |
| BANDWIDTH            | Up to 60 MBps       | Up to 60 MBps       | 125 MBps          |

# Azure Networking

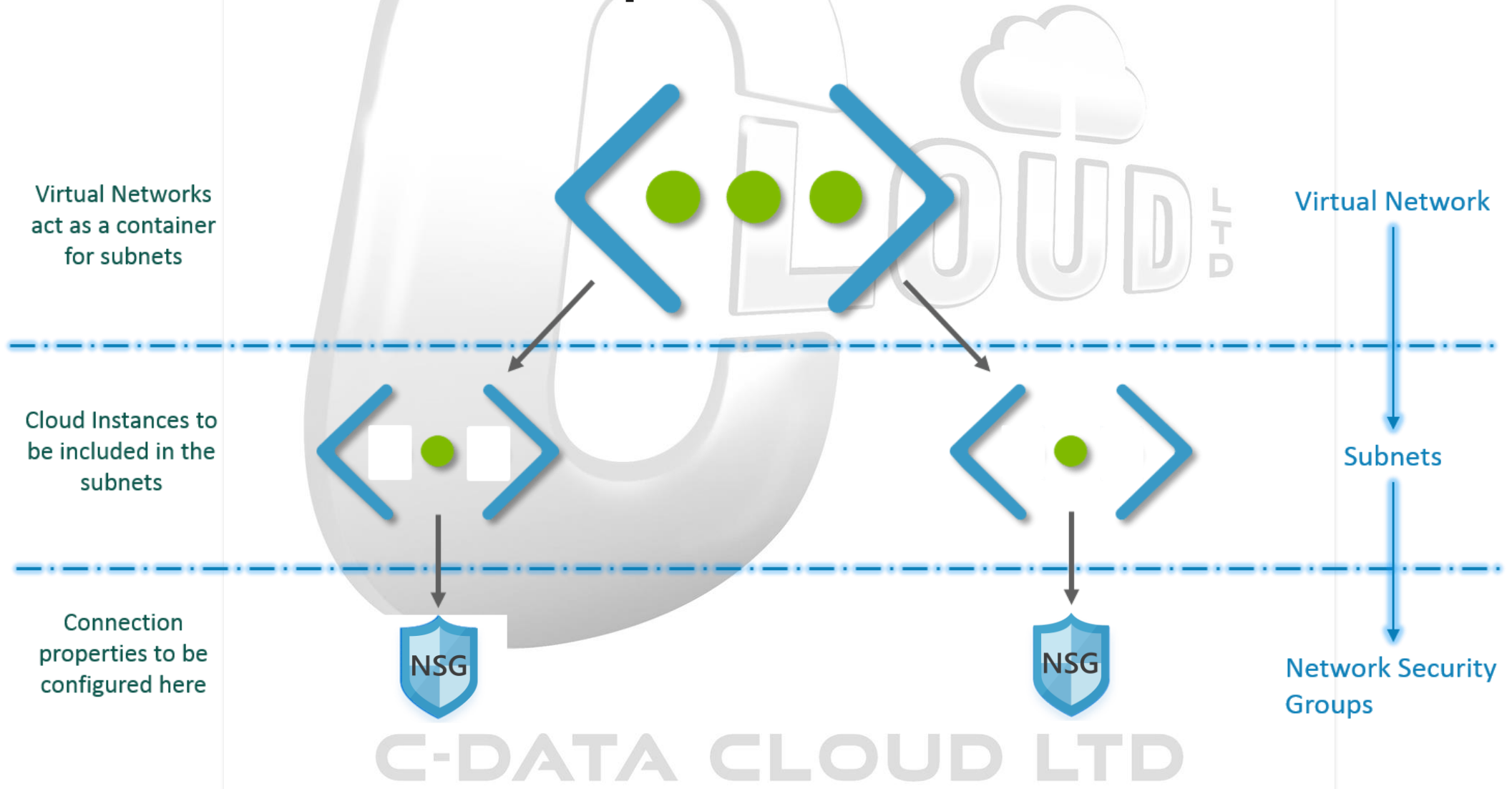


# Azure Networking Components

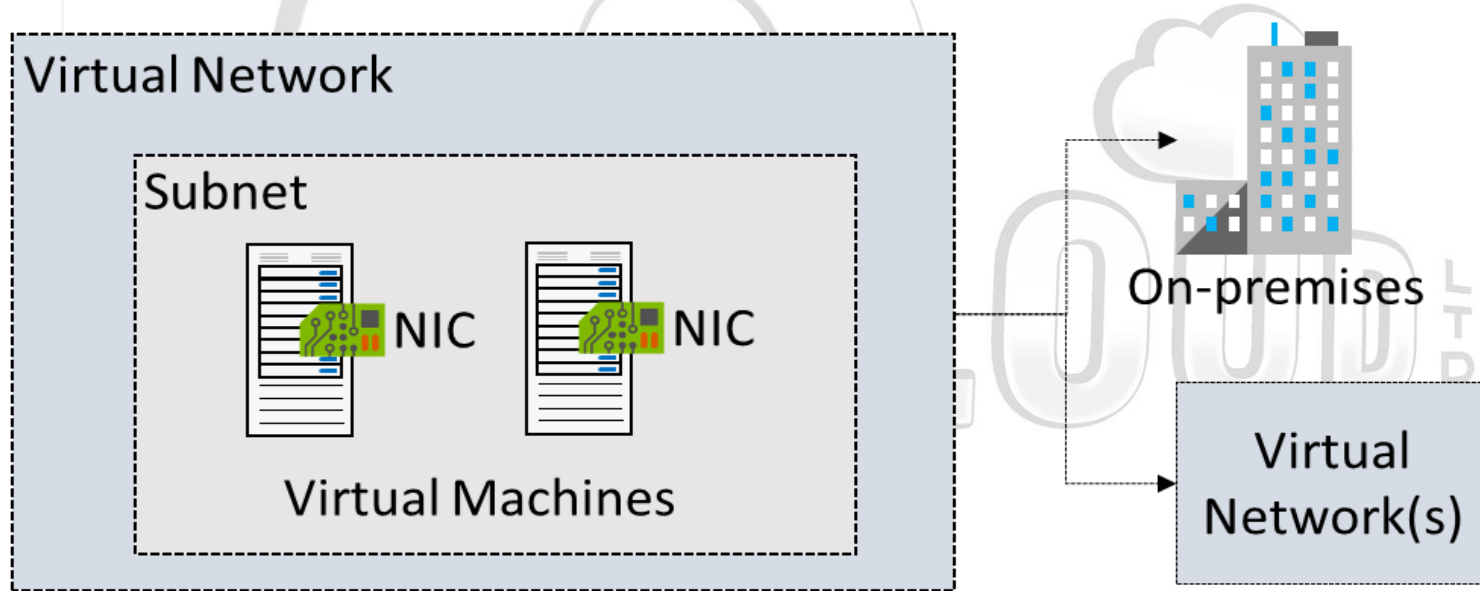
- Adopting cloud solutions can save time and simplify operations
- Azure requires the same types of networking functionality as on-premises infrastructure
- Azure networking offers a wide range of services and products



# Virtual Networks Components

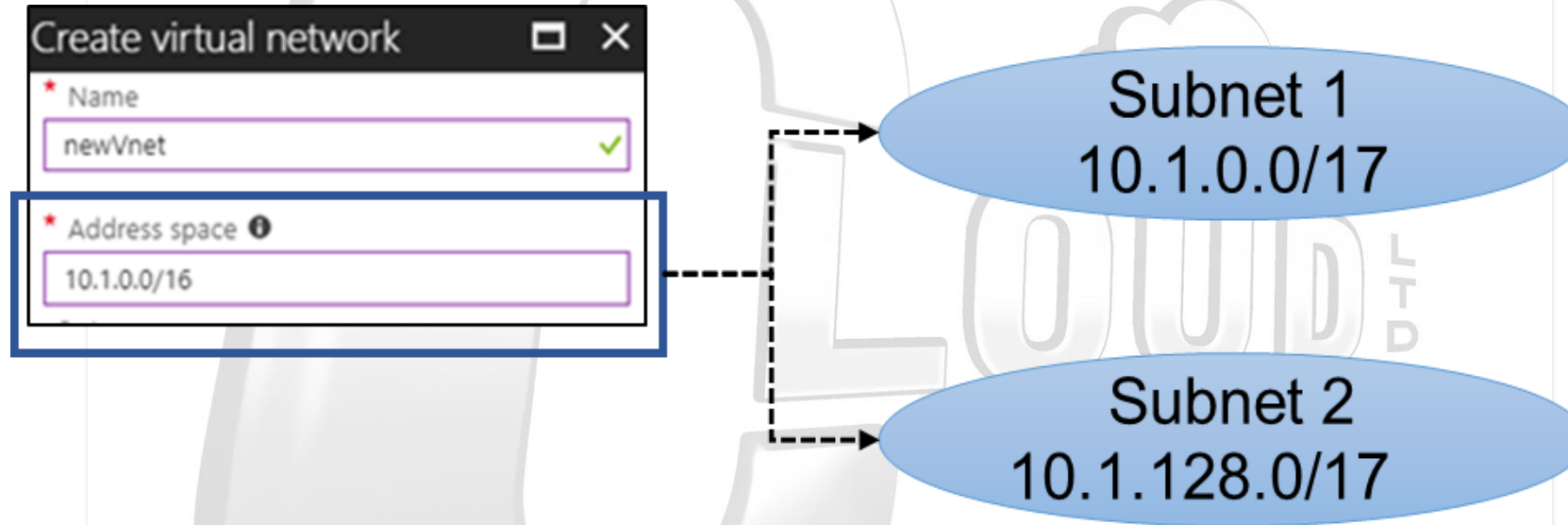


# Virtual Networks



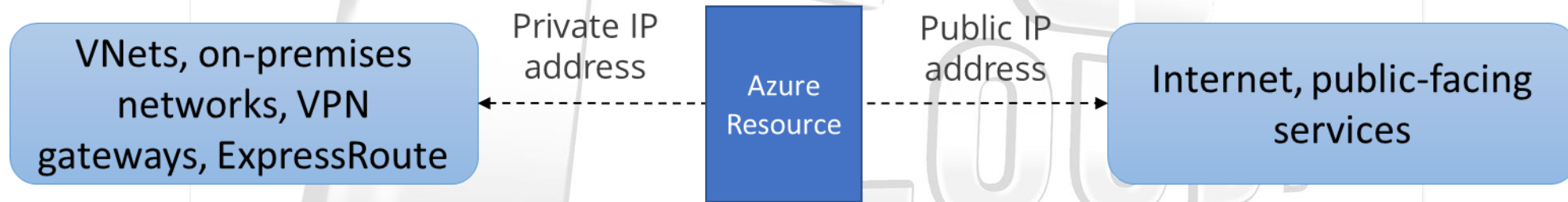
- Logical representation of your own network
- Create a dedicated private cloud-only VNet
- Securely extend your datacenter With VNets
- Enable hybrid cloud scenarios

# 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

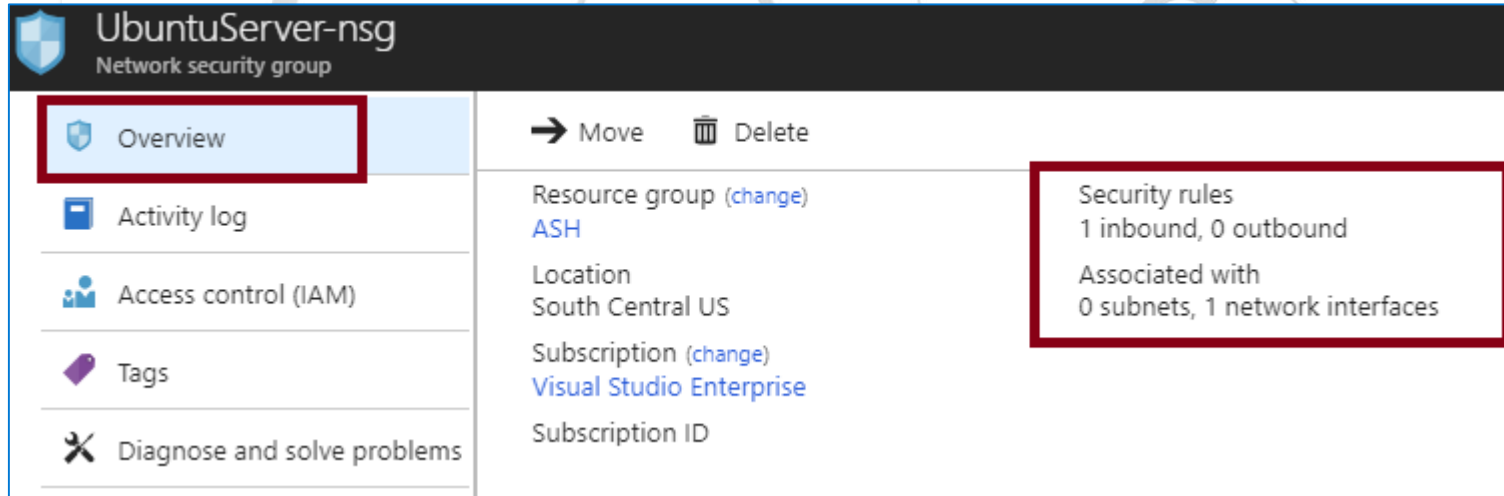
# IP Addressing



- **Private IP addresses** are 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** is used for communication with the Internet, including Azure public-facing services



# Network Security Groups (NSG)



The screenshot displays the Azure portal interface for a Network Security Group (NSG) named 'UbuntuServer-nsg'. The interface is divided into a left-hand navigation pane and a main content area. The 'Overview' tab in the navigation pane is highlighted with a red box. The main content area shows the NSG's configuration, including its resource group (ASH), location (South Central US), and subscription (Visual Studio Enterprise). A red box highlights the 'Security rules' section, which indicates that there is 1 inbound rule and 0 outbound rules, and that the NSG is associated with 0 subnets and 1 network interface.

| Section         | Details   |
|-----------------|---|
| Navigation      | Overview (highlighted), Activity log, Access control (IAM), Tags, Diagnose and solve problems |
| Actions         | Move, Delete  |
| Resource group  | ASH   |
| Location        | South Central US  |
| Subscription    | Visual Studio Enterprise  |
| Subscription ID |   |
| Security rules  | 1 inbound, 0 outbound   |
| Associated with | 0 subnets, 1 network interfaces   |

- You can limit network traffic to resources in a virtual network using a NSG
- A NSG contains a list of security rules that allow or deny inbound or outbound network traffic
- An NSG can be associated to a subnet or a network interface

# NSG Rules

- 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.

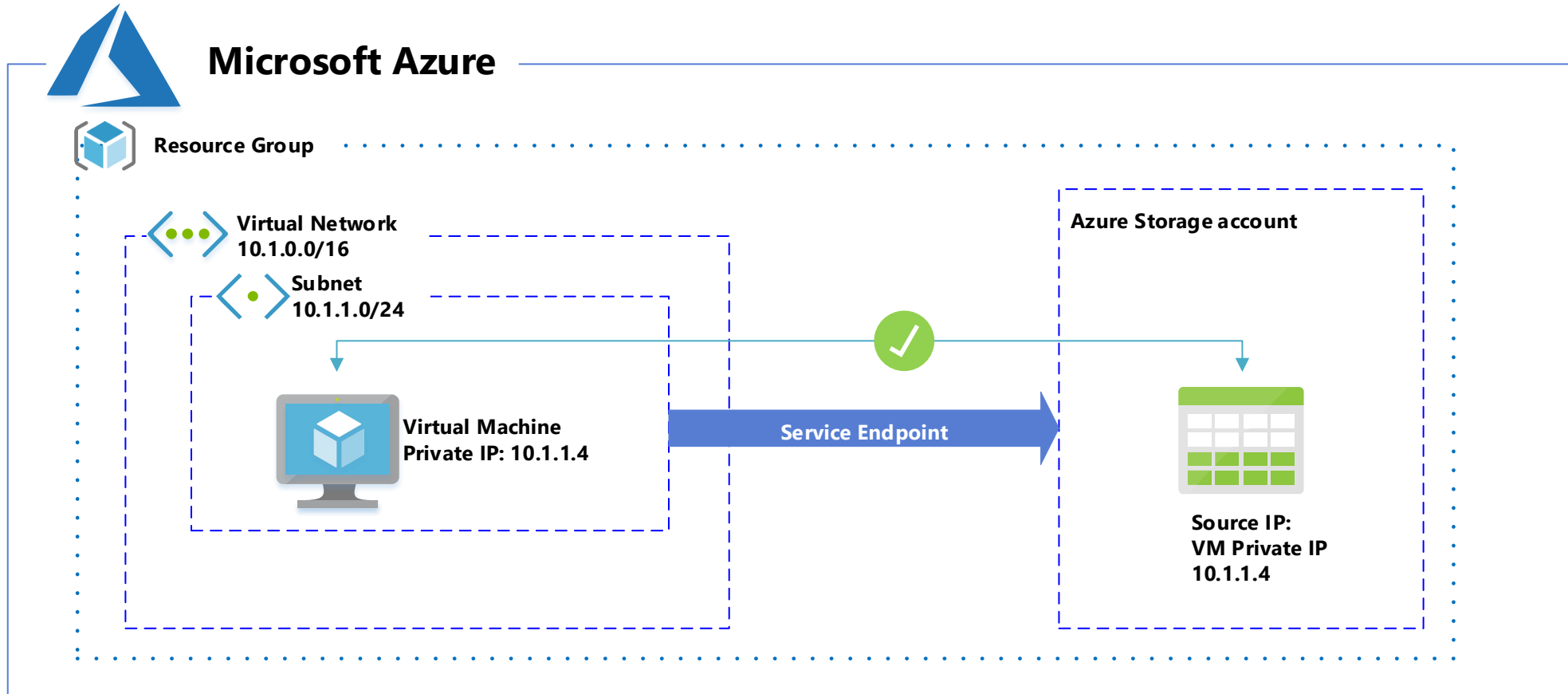
VM1-nsg - **Inbound security rules**  
Network security group

| PRIORITY | NAME                          | PORT | PROTOCOL | ACTION  |
|----------|-------------------------------|------|----------|---------|
| 65000    | AllowVnetInBound              | Any  | Any      | ✔ Allow |
| 65001    | AllowAzureLoadBalancerInBound | Any  | Any      | ✔ Allow |
| 65500    | DenyAllInBound                | Any  | Any      | ✘ Deny  |

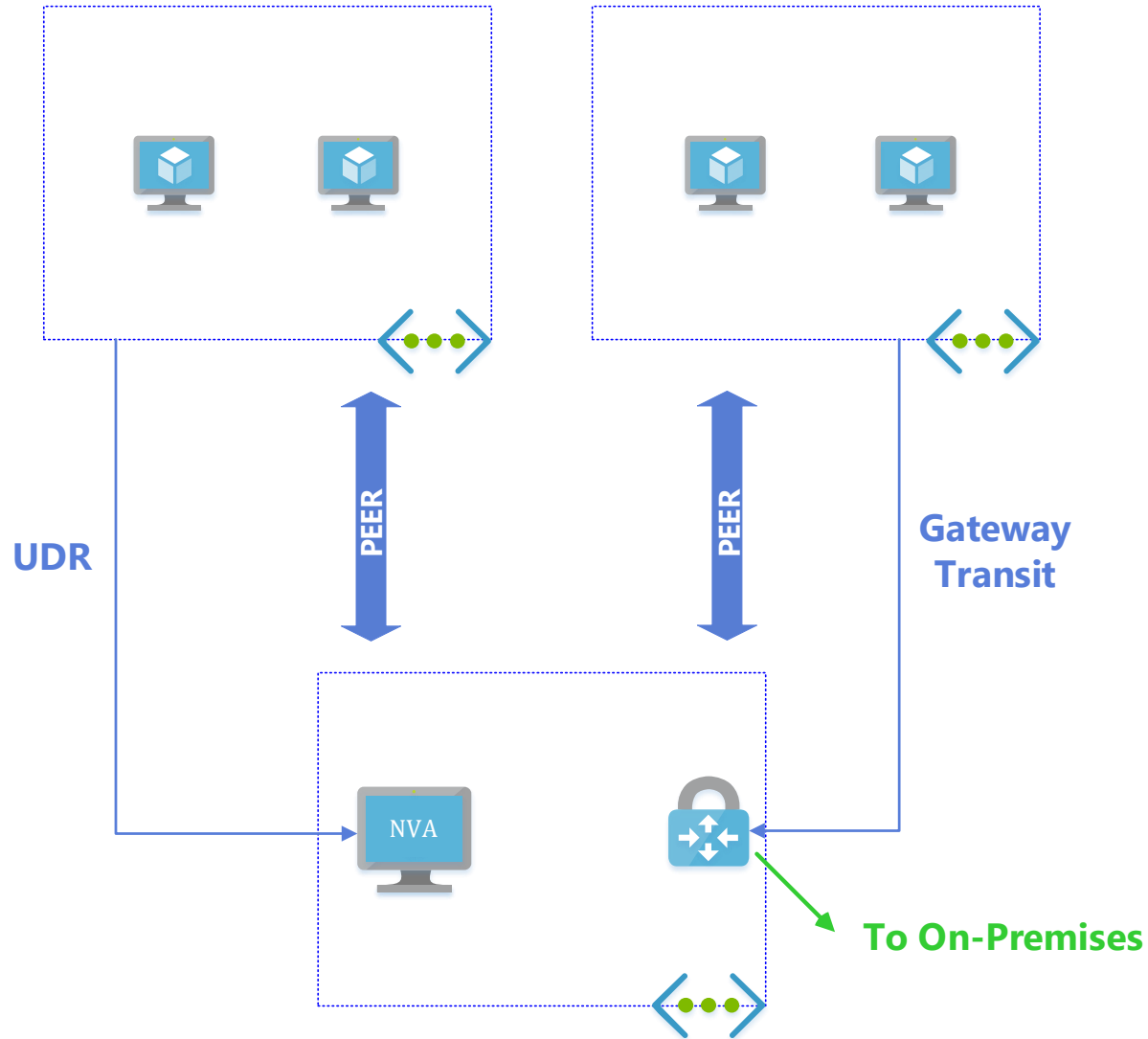
VM1-nsg - **Outbound security rules**  
Network security group

| PRIORITY | NAME                  | PORT | PROTOCOL | ACTION  |
|----------|-----------------------|------|----------|---------|
| 65000    | AllowVnetOutBound     | Any  | Any      | ✔ Allow |
| 65001    | AllowInternetOutBound | Any  | Any      | ✔ Allow |
| 65500    | DenyAllOutBound       | Any  | Any      | ✘ Deny  |

# Virtual Network Architecture/Topology



# VNet Peering Architecture



## Configuration

### Configure virtual network access settings

Allow virtual network access from training-Vnet1 to training-Vnet2 ⓘ

Disabled Enabled

Allow virtual network access from training-Vnet2 to training-Vnet1 ⓘ

Disabled Enabled

### Configure forwarded traffic settings

Allow forwarded traffic from training-Vnet2 to training-Vnet1 ⓘ

Disabled Enabled

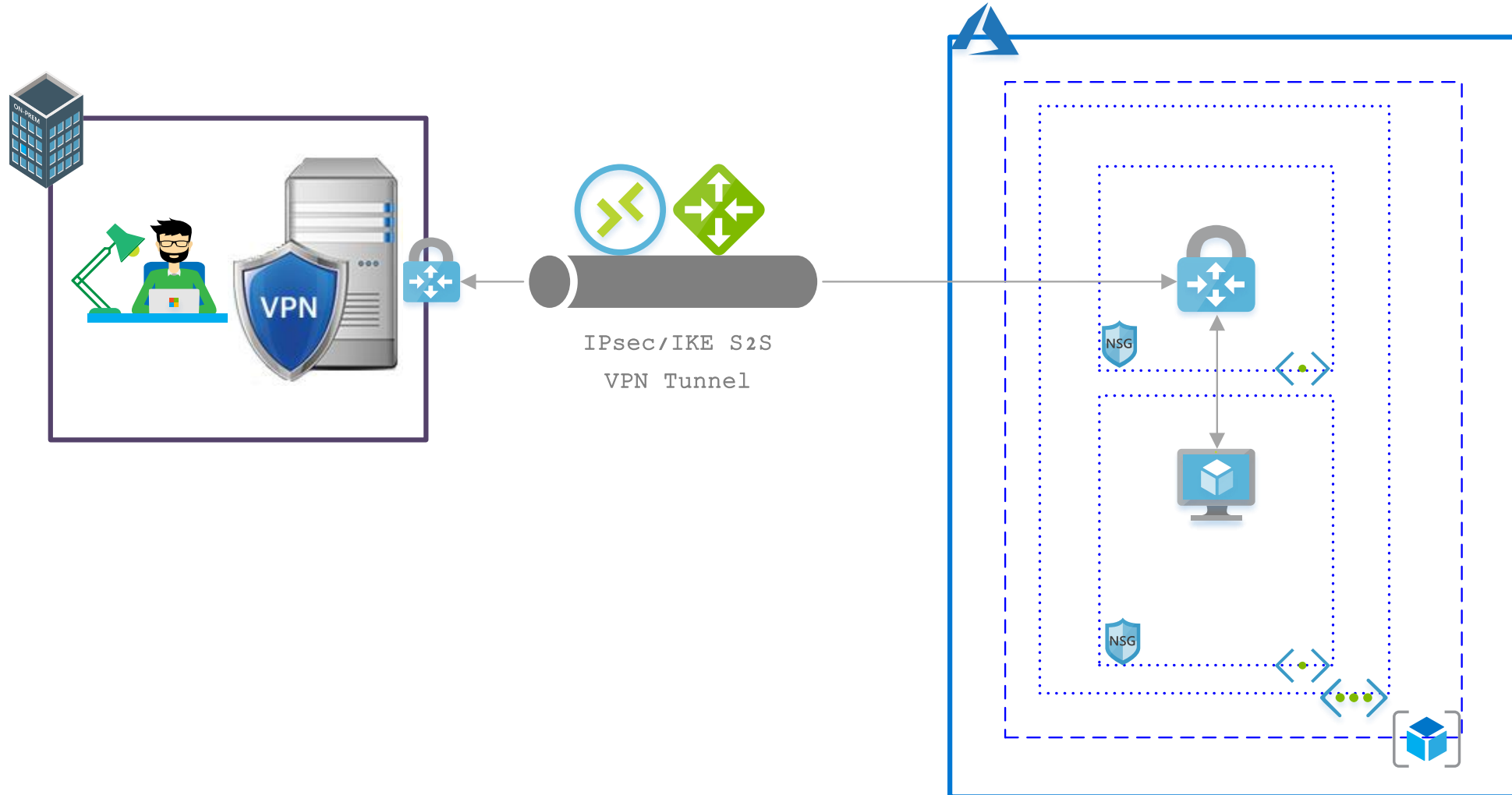
Allow forwarded traffic from training-Vnet1 to training-Vnet2 ⓘ

Disabled Enabled

### Configure gateway transit settings

Allow gateway transit ⓘ

# VPN S2S Architecture

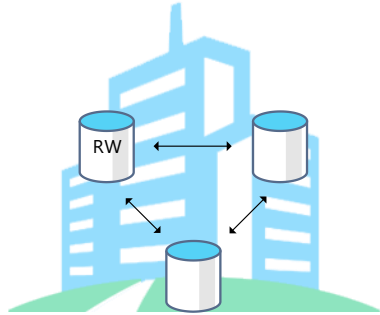


# Storage



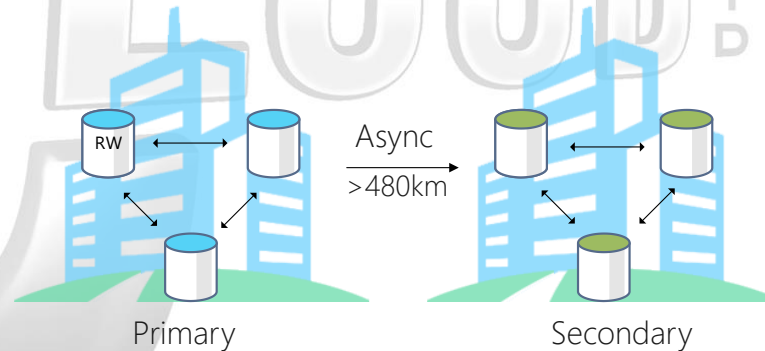
# Azure Storage Redundancy

- Data in Azure storage account is always replicated to ensure durability and high availability.
- Replication ensures that your storage account meets the SLA for Storage.



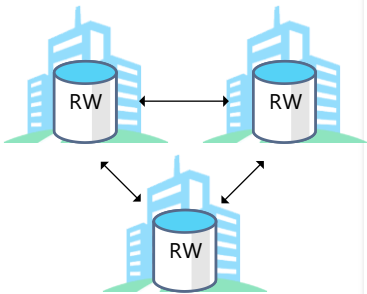
## LRS

- Multiple replicas across a datacenter
- Protect against disk, node and rack failures
- SLA: 99.9%



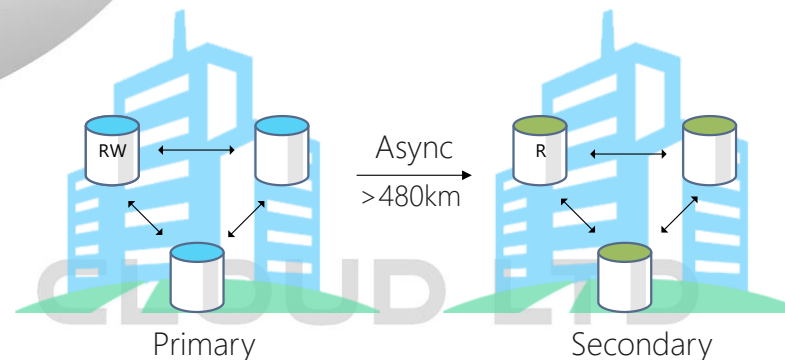
## GRS

- Multiple replicas across each of 2 regions
- Protect against major regional disasters
- SLA: 99.9%



## ZRS

- Replicas across 3 Datacenter in zone
- Protect against disk, node, rack and failures
- Available in 8 regions
- SLA: 99.9%



## RA-GRS

- GRS + Read access to secondary
- Separate secondary endpoint
- SLA: 99.99% (read), 99.9% (write)

# Azure Storage Services

- **Azure Blobs:** A massively scalable object store for text and binary data
- **Azure Files:** Managed file shares for cloud or on-premises deployments
- **Azure Tables:** A NoSQL store for schema less storage of structured data
- **Azure Queues:** A messaging store for reliable messaging between application components



## Blobs

REST-based object storage for unstructured data

[Learn more](#)



## Files

File shares that use the standard SMB 3.0 protocol

[Learn more](#)



## Tables

Tabular data storage

[Learn more](#)



## Queues

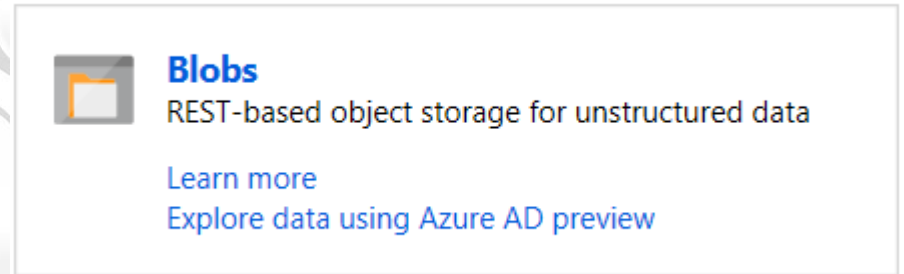
Effectively scale apps according to traffic

[Learn more](#)



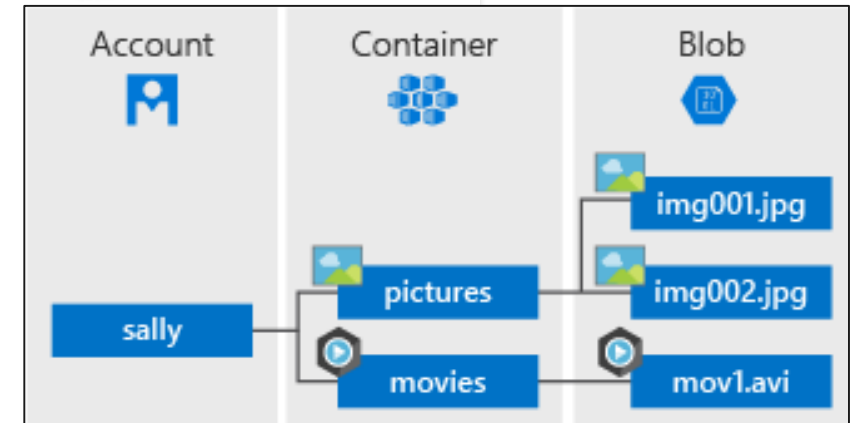
# Blob Storage

- Stores unstructured data in the cloud
- Can store any type of text or binary data
- Also referred to as *object storage*
- Common uses:
  - Serving images or documents directly to a browser
  - Storing files for distributed access
  - Streaming video and audio
  - Storing data for backup and restore, disaster recovery, archiving
  - Storing data for analysis by an on-premises or Azure-hosted service



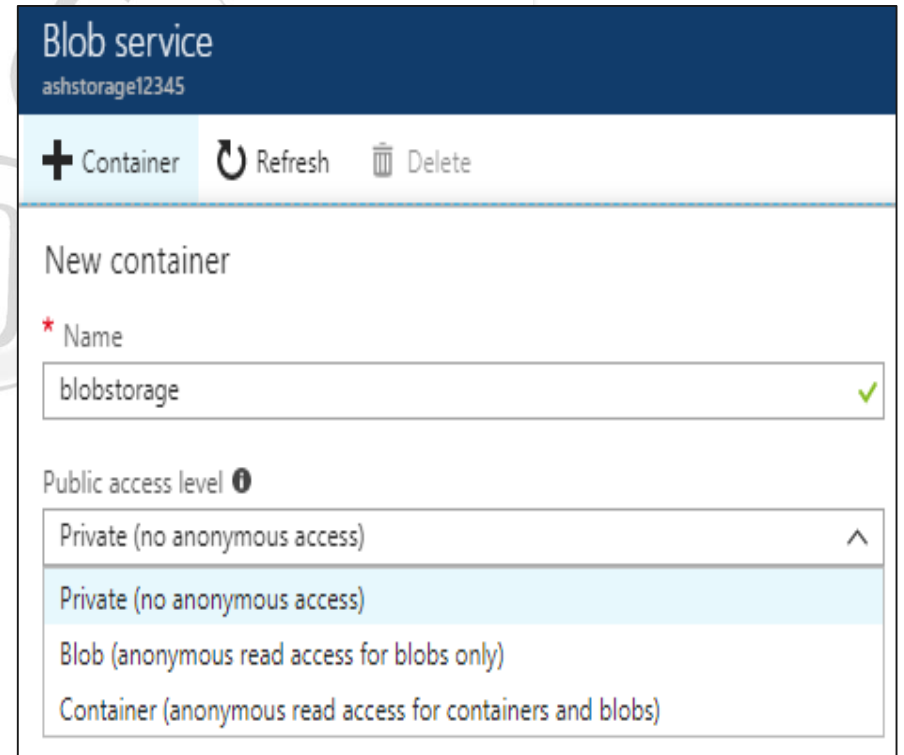
**Blobs**  
REST-based object storage for unstructured data

[Learn more](#)  
[Explore data using Azure AD preview](#)



# Blob Containers

- All blobs must be in a container
- Accounts have unlimited containers
- Containers can have unlimited blobs
- **Private blobs** - no anonymous access
- **Blob access** - anonymous public read access for blobs only
- **Container access** - anonymous public read and list access to the entire container, including the blobs



# Azure Files

- Managed file shares in the cloud that are accessible via SMB
- Common uses:
  - Replace and supplement
  - Lift and shift
  - Azure File Sync
  - Shared applications
  - Diagnostic data
  - Tools and utilities



## Files

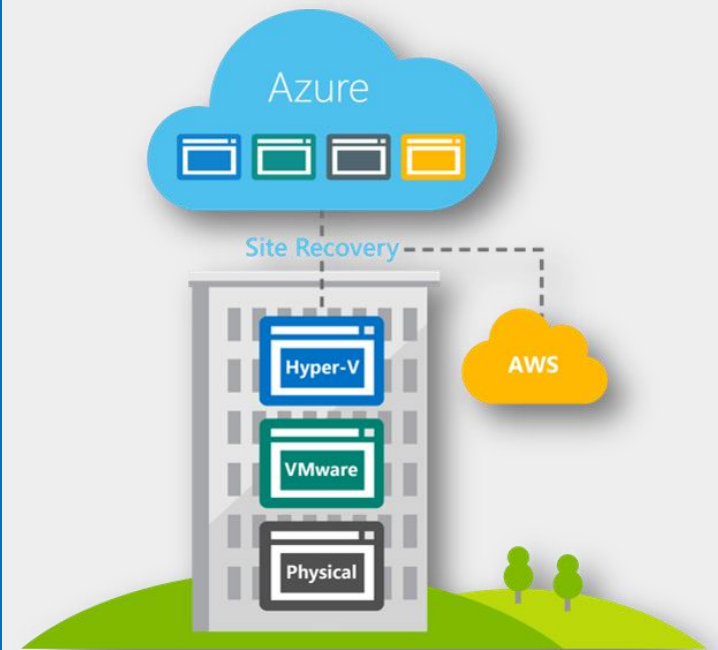
File shares that use the standard SMB 3.0 protocol

[Learn more](#)

# Lab

- **Exercise 0: Prepare the lab environment**
- **Exercise 2: Implement and use Azure File Storage**

# Backup and Site Recovery solutions



# Azure Backup

- Azure-based service used to back up and restore data in Microsoft cloud
- Automatic Storage Management
- Multiple storage options
- Unlimited data transfer
- Data encryption
- Application consistent backup
- Long-term retention

# Recovery Services Vault VM Backup Options

- Azure Workloads
- On-Premises Workloads

**vmbackuptestwest - Backup**  
Recovery Services vault

Where is your workload running?  
Azure

What do you want to backup?  
Virtual machine

- Virtual machine
- Azure FileShare (Preview)
- SQL Server in Azure VM (Preview)

**Step: Configure Backup**

Backup

**vmbackuptest - Backup**  
Recovery Services vault

Where is your workload running?  
On-Premises

What do you want to backup?  
4 selected

- Files and folders
- Hyper-V Virtual Machines
- VMware Virtual Machines
- Microsoft SQL Server
- Microsoft SharePoint
- Microsoft Exchange
- System State
- Bare Metal Recovery

**Step: Prepare Infrastructure**

Prepare Infrastructure

✓ Multiple servers can be protected using the same Recovery Services vault

# On-Premises Workloads

## MARS Agent

- Backup or recover files and folders on physical or virtual Windows OS
- No separate backup server required
- Not application aware; file, folder, and volume-level restore only
- No support for Linux

Where is your workload running?

On-Premises

What do you want to backup?

2 selected

- Files and folders
- Hyper-V Virtual Machines
- VMware Virtual Machines
- Microsoft SQL Server
- Microsoft SharePoint
- Microsoft Exchange
- System State
- Bare Metal Recovery



# On-Premises Workloads

## Azure Backup Server (MABS)

- App-aware backups, file/folder/volume backups, and machine state backups (bare-metal, system state)
- Each machine runs the DPM/MABS protection agent, and the MARS agent runs on the MABS/DPM
- Flexibility and granular scheduling options
- Manage backups for multiple machines in a protection group

Where is your workload running?

On-Premises

What do you want to backup?

6 selected

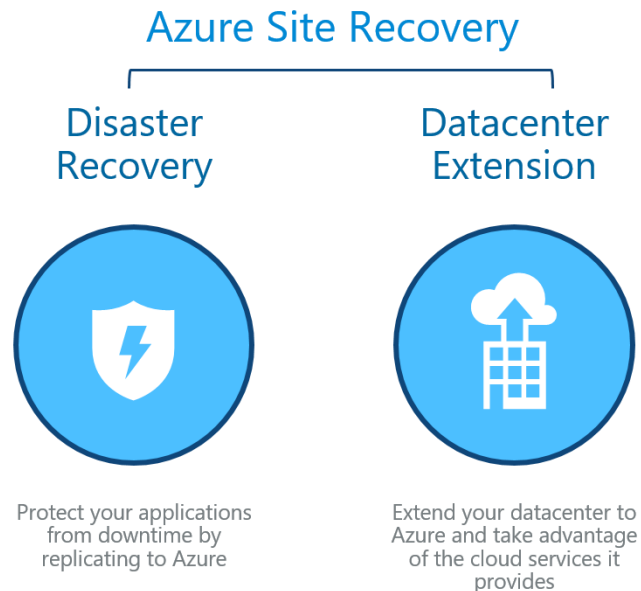
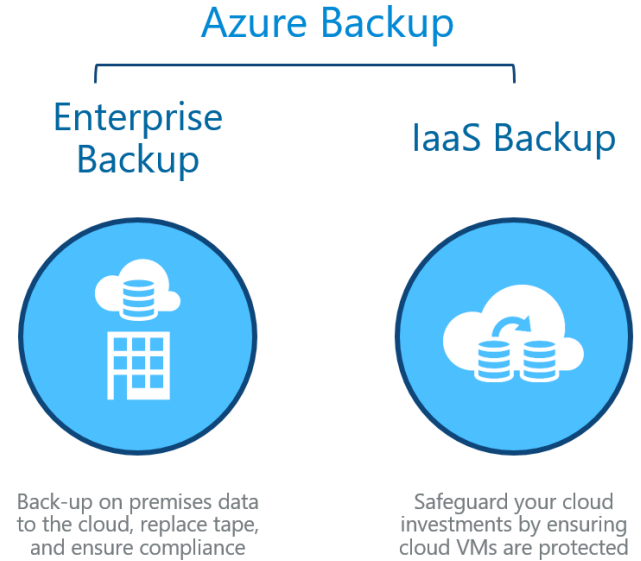
- Files and folders
- Hyper-V Virtual Machines
- VMware Virtual Machines
- Microsoft SQL Server
- Microsoft SharePoint
- Microsoft Exchange
- System State
- Bare Metal Recovery

# Backup Component Comparison

| Component                 | Benefits  | Limits  | Protects   | Backup Storage   |
|---------------------------|---|---|--|--|
| Azure Backup (MARS) agent | <ul style="list-style-type: none"> <li>• Backup files and folders on physical or virtual Windows OS</li> <li>• No separate backup server required.</li> </ul>   | <ul style="list-style-type: none"> <li>• Backup 3x per day</li> <li>• Not application aware</li> <li>• File, folder, and volume-level restore only</li> <li>• No support for Linux</li> </ul> | <ul style="list-style-type: none"> <li>• Files</li> <li>• Folders</li> </ul>   | <ul style="list-style-type: none"> <li>• Recovery services vault</li> </ul>                                  |
| Azure Backup Server       | <ul style="list-style-type: none"> <li>• App aware snapshots</li> <li>• Full flex for when to backups</li> <li>• Recovery granularity</li> <li>• Linux support on Hyper-V and VMware VMs</li> <li>• Backup and restore VMware VMs</li> <li>• Doesn't require a System Center license</li> </ul> | <ul style="list-style-type: none"> <li>• Cannot backup Oracle workloads</li> <li>• Always requires live Azure subscription</li> <li>• No support for tape backup</li> </ul>                   | <ul style="list-style-type: none"> <li>• Files</li> <li>• Folders,</li> <li>• Volumes</li> <li>• VMs</li> <li>• Applications</li> <li>• Workloads</li> </ul> | <ul style="list-style-type: none"> <li>• Recovery services vault</li> <li>• Locally attached disk</li> </ul> |

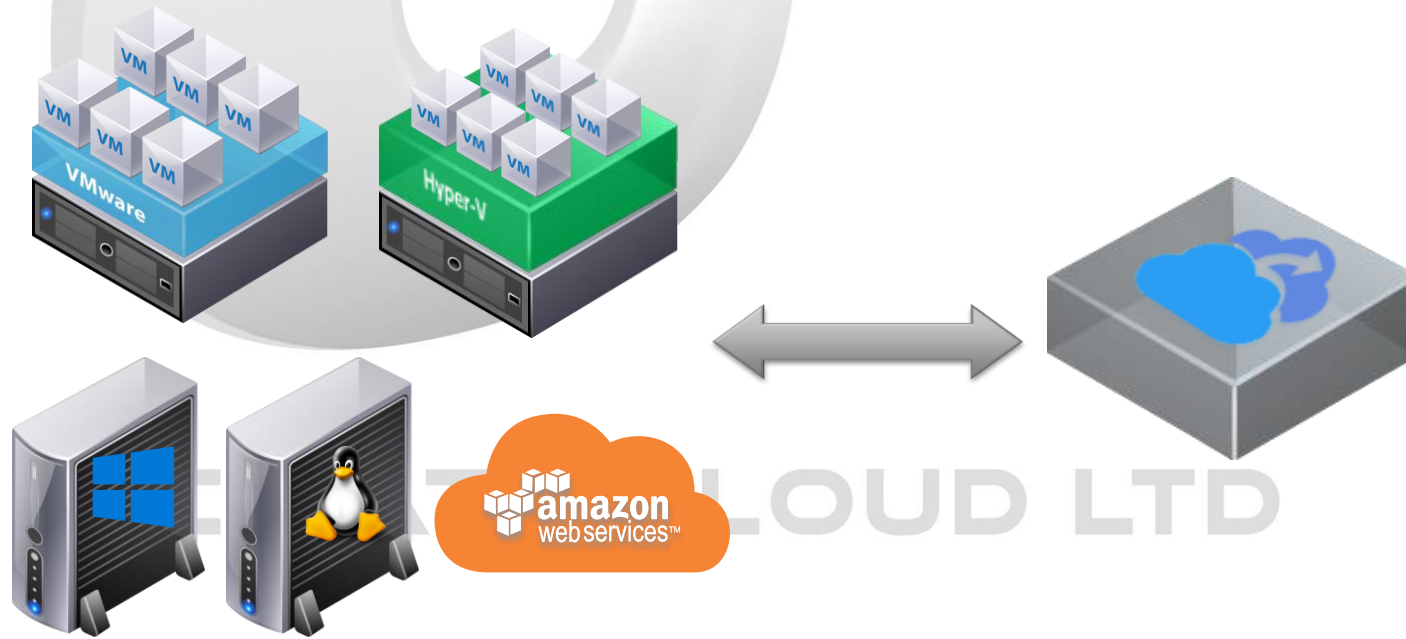
# Disaster Recovery ≠ Backup

- Backup is all about **Data Availability**
  - Value Prop – Restore data
  - Service – Azure Backup
  - Scenarios
    - Oops Delete
    - Long term retention
- Disaster Recovery is all about **Application Availability**
  - Value Prop – Recover Application
  - Service – Azure Site Recovery
  - Scenarios
    - Disaster Recovery
    - Migration

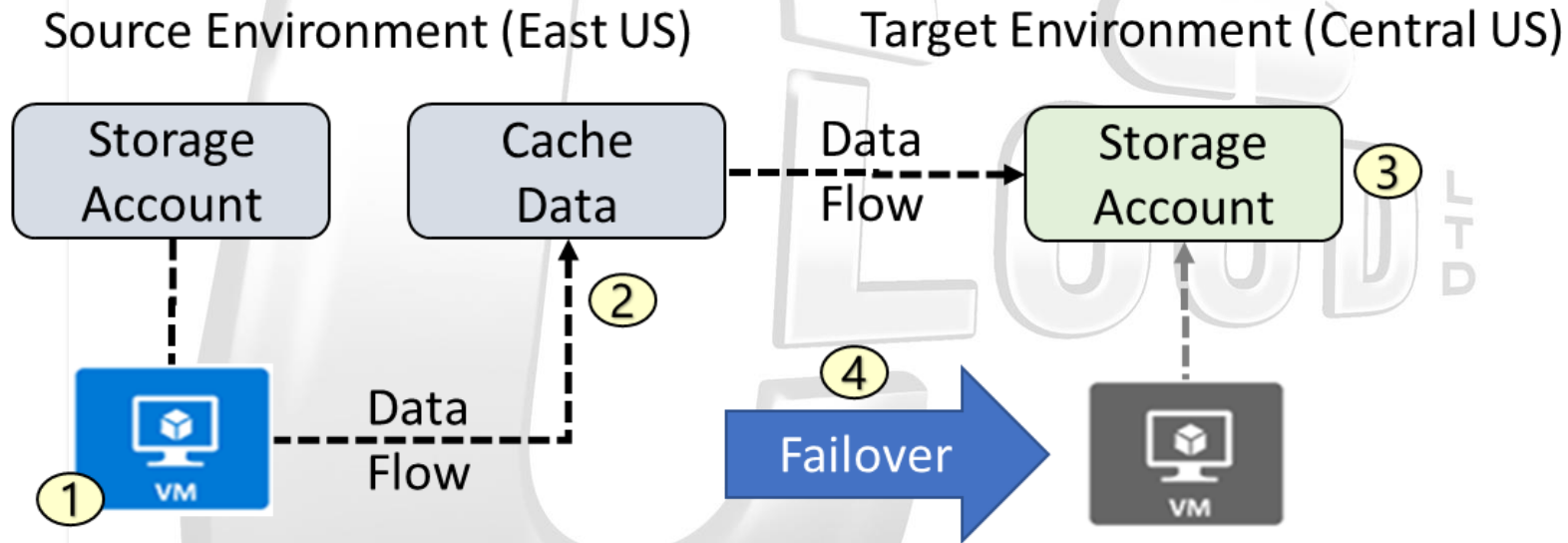


# Azure Site Recovery (ASR) Scenarios

- Replicate Azure VMs from one Azure region to another
- Replicate on-premises VMware VMs, Hyper-V VMs, physical servers (Windows and Linux), Azure Stack VMs to Azure
- Replicate on-premises VMware VMs, Hyper-V VMs managed by System Center VMM, and physical servers to a secondary site



# Azure to Azure Architecture



1. VM is registered with Azure Site Recovery
2. Data is continuously replicated to cache
3. Cache is replicated to the target storage account
4. During failover the virtual machine is added to the target environment

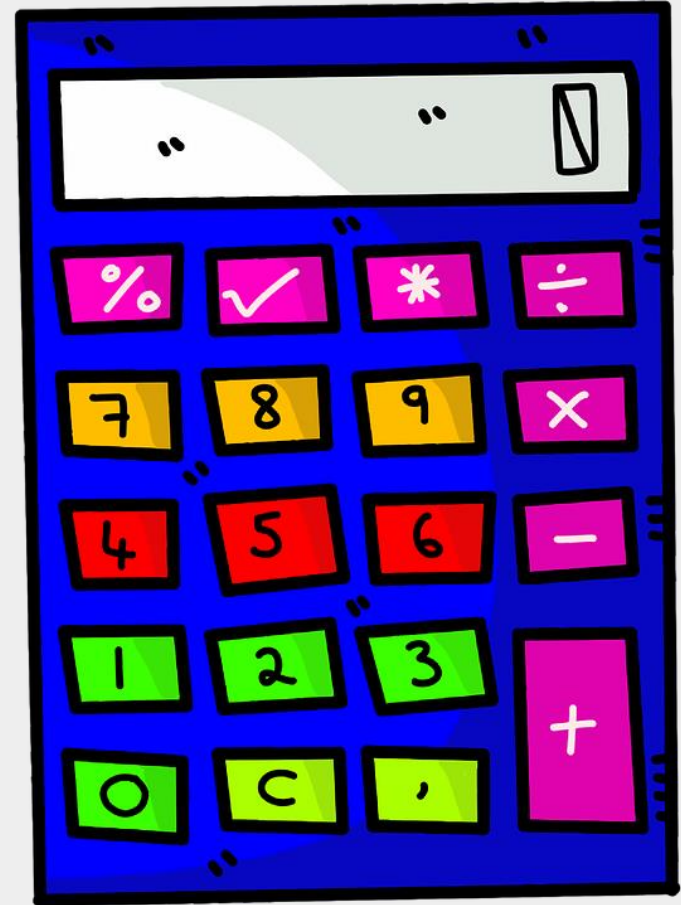
# Lab – M7

**Back up Windows machines with the Azure Backup  
MARS agent**

<https://docs.microsoft.com/en-us/azure/backup/backup-configure-vault>

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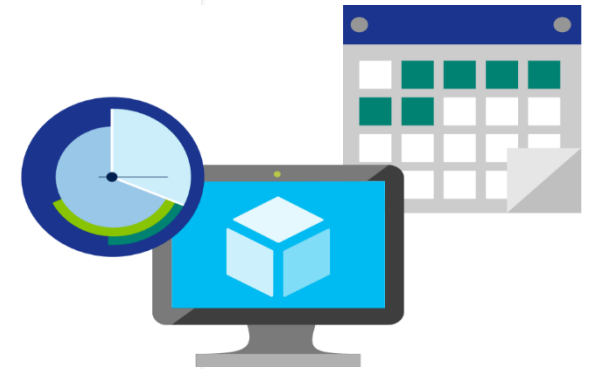
# Azure Price Calculator



# Factors affecting costs

There are three primary factors affect costs:

- **Resource Type:** Costs are resource-specific, so the usage that a meter tracks and the number of meters associated with a resource depend on the resource type.
- **Services:** Azure usage rates and billing periods can differ between Enterprise, Web Direct, and CSP customers.
- **Location:** The Azure infrastructure is globally distributed, and usage costs might vary between locations that offer particular Azure products, services, and resources.





# Zones for Billing Purposes

- *Bandwidth* refers to data moving in and out of Azure datacenters. Some inbound data transfers are free, such as data going into Azure datacenters. For outbound data transfers—such as data going out of Azure datacenters—pricing is based on Zones.
- A *zone* is a geographical grouping of Azure Regions for billing purposes. Zones are:
  - Zone 1. Includes West US, East US, West Europe, and others.
  - Zone 2 . Includes Australia Central, Japan West, Central India, and others.
  - Zone 3. Includes Brazil South only.
  - DE Zone 1. Includes Germany Central and Germany Northeast.



# Pricing calculator

- Helps you estimate the you need and configure them according to your specific requirements

- Azure provides a detailed estimate of the costs associated with your selections and configurations

### Your Estimate

Virtual Machines
+ -
1 D2 v3 (2 vCPU(s), 8 GB RAM) x 730 Hours;

\$188.57

---

Virtual Machines

REGION:  
West US ▼

OPERATING SYSTEM:  
Windows ▼

TYPE:  
(OS Only) ▼

TIER:  
Standard ▼

INSTANCE:  
D2 v3: 2 vCPU(s), 8 GB RAM, 50 GB Temporary storage, \$0.209/hour ▼

+ Clone

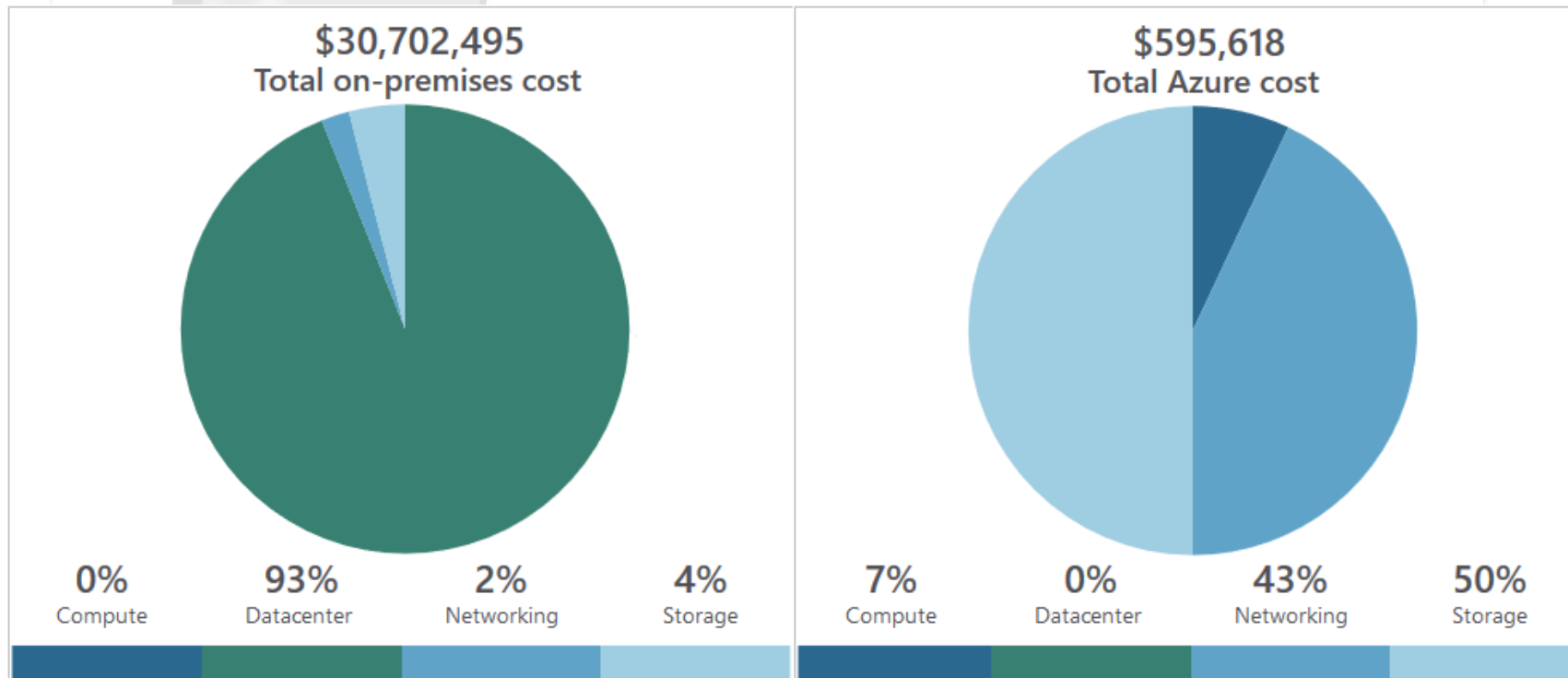
- Delete

More info

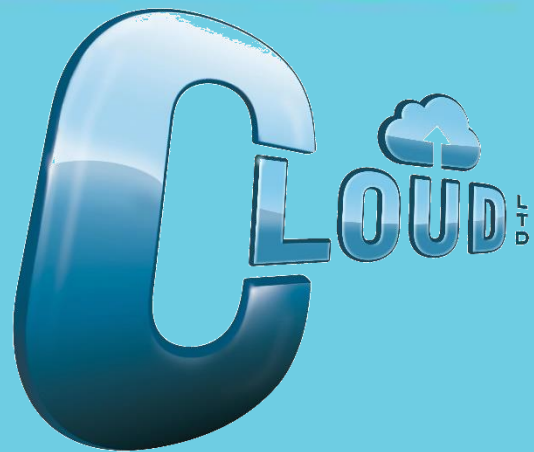
- \$ [Pricing details](#)
- i [Product details](#)
- 📄 [Documentation](#)

# Total cost of ownership (TCO) calculator

- A tool that you use to estimate cost savings you can realize by migrating to Azure
- A report compares the costs of on-premises infrastructures with the costs of using Azure products and services to host infrastructure in the cloud



**THANK  
YOU**



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