

**Module-01> Identity**

- ADDS vs Azure AD
- Azure AD licensing
- Device Identities
- SSPR
- Users & Groups
- Lab 01 – Manage Azure Active Directory Identities

**Module-02> Governance & Compliance**

- Subscriptions
- Policy
- RBAC
- Lab 02a - Manage Subscriptions and RBAC
- Lab 02b - Manage Governance via Azure Policy

**Module-03> Azure Administration**

- Azure Portal
- CloudShell
- PowerShell
- CLI
- ARM
- Lab 03a - Manage Azure resources by Using the Azure Portal
- Lab 03b - Manage Azure resources by Using ARM Templates
- Lab 03c - Manage Azure resources by Using Azure PowerShell (optional)
- Lab 03d - Manage Azure resources by Using Azure CLI (optional)

**Module-04> Virtual Networking**

- Virtual Network, Subnet, Public IP, Private IP
- Network Security Groups
- Azure Firewall
- Azure DNS
- Lab 04 – Implement Virtual Networks

**Module-05> Intersite Connectivity**

- Configure VNet Peering
- Configure VPN Gateway
- Configure ExpressRoute and Virtual WAN
- Lab 05 - Implement Intersite Connectivity

**Module-06> Network Traffic Management**

- Configure Network Routing and Endpoints UDR, Service Endpoints, Private link
- Azure Load Balancer
- Azure Application Gateway
- Network Watcher
- Lab 06 – Implement Traffic Management

**Module-07> Azure Storage**

- Configure Storage Accounts
  - Blob Storage
  - Storage Security
  - Azure File & File Sync
- Lab 07 – Manage Azure Storage

**Module-08> Virtual Machines**

- Configure Virtual Machines
- Configure Virtual Machine Availability
- Configure Virtual Machine Extensions
- Lab 08 – Manage Virtual Machines

**Module-09> App Services**

- Configure Azure App Service Plans
  - Implement Azure App Service Plans
  - Determine App Service Plan Pricing
  - Scale Up and Scale Out the App Service Plan
  - Configure App Service Plan Scaling
- Configure Azure App Services

**Module-09> Containers, AKS**

- Configure Containers
- Configure Azure Kubernetes Service
- Lab 09a - Implement Web Apps
- Lab 09b - Implement Azure Container Instances
- Lab 09c - Implement Azure Kubernetes Service (optional)

**Module-10> Data Protection**

- Configure File and Folder Backups
- Configure Virtual Machine Backups
- Lab 10 – Implement Data Protection

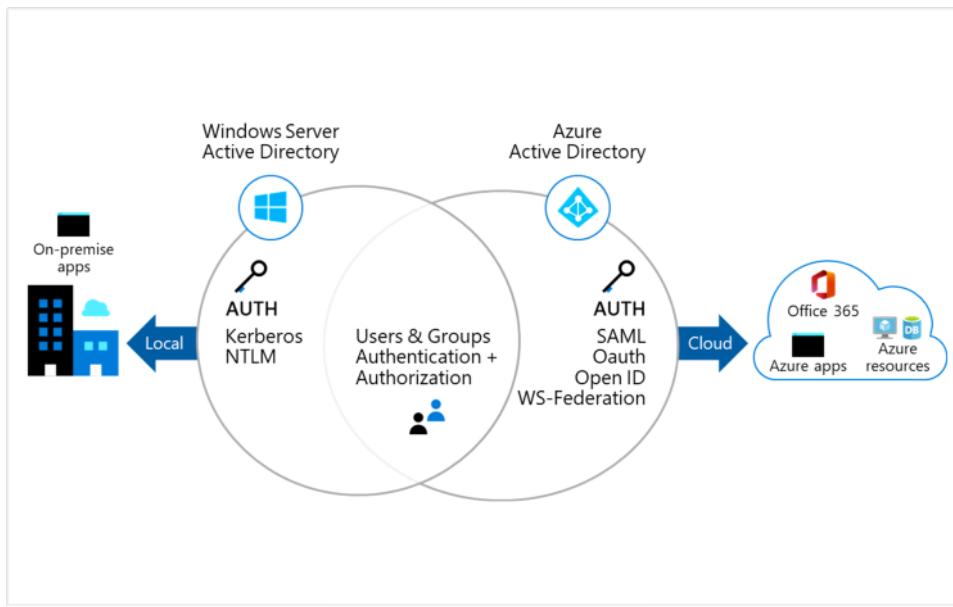
**Module-11> Monitoring**

- Configure Azure Monitor
- Configure Azure Alerts
- Configure Log Analytics
- Lab 11 – Implement Monitoring

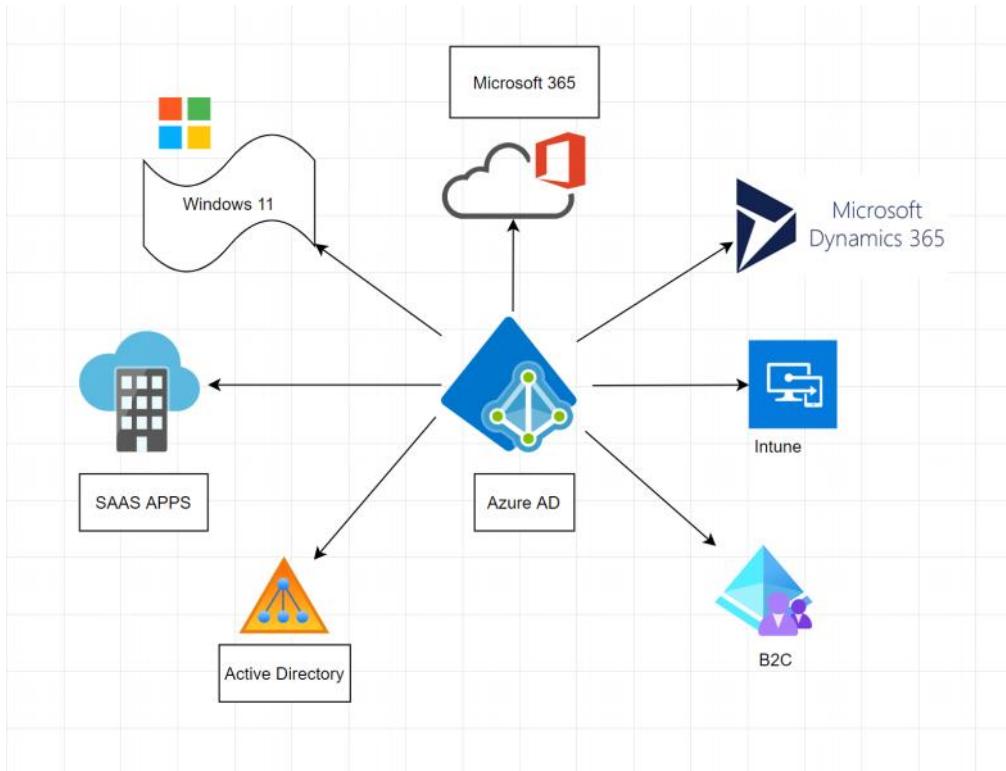
## 01- Administer Identity

Sunday, May 8, 2022 10:38 PM

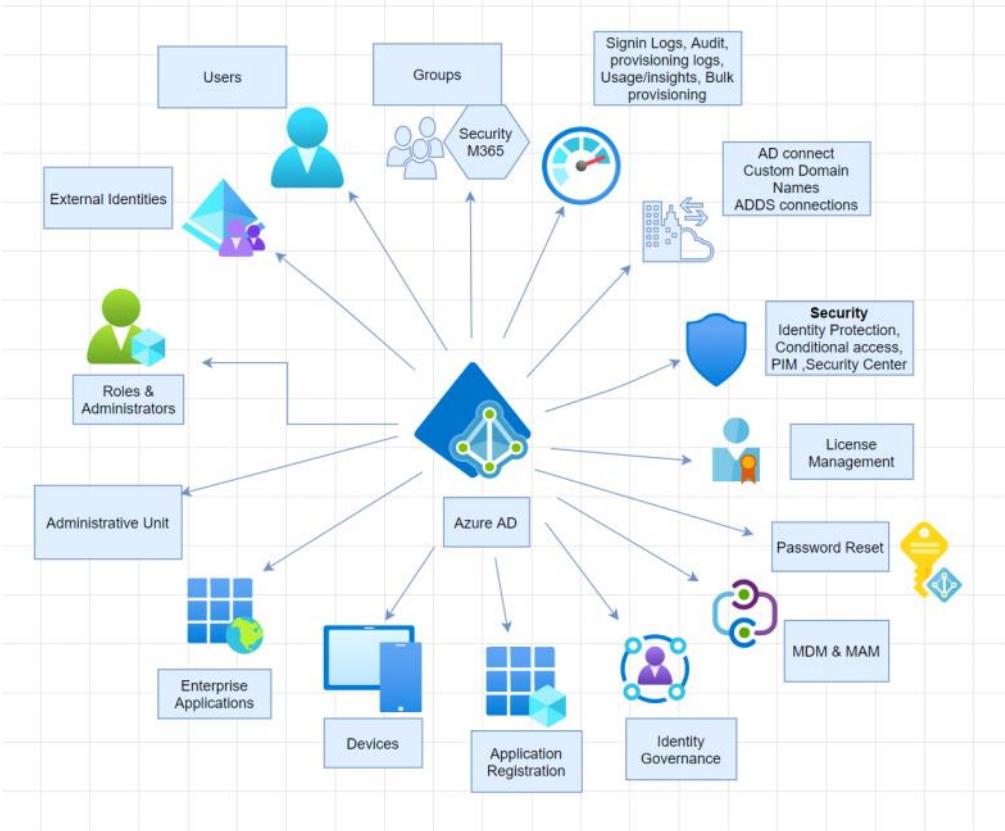
An identity and access management service that helps you access internal and external resources.



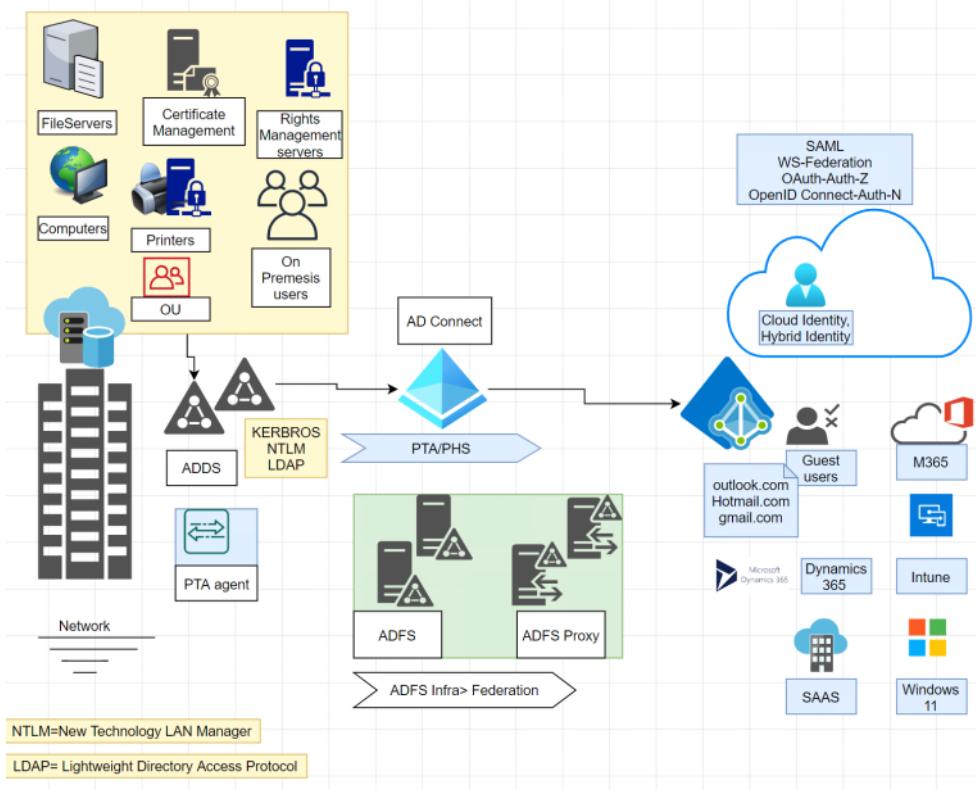
### Connections to Azure AD



### Components of Azure AD



### Hybrid Identity

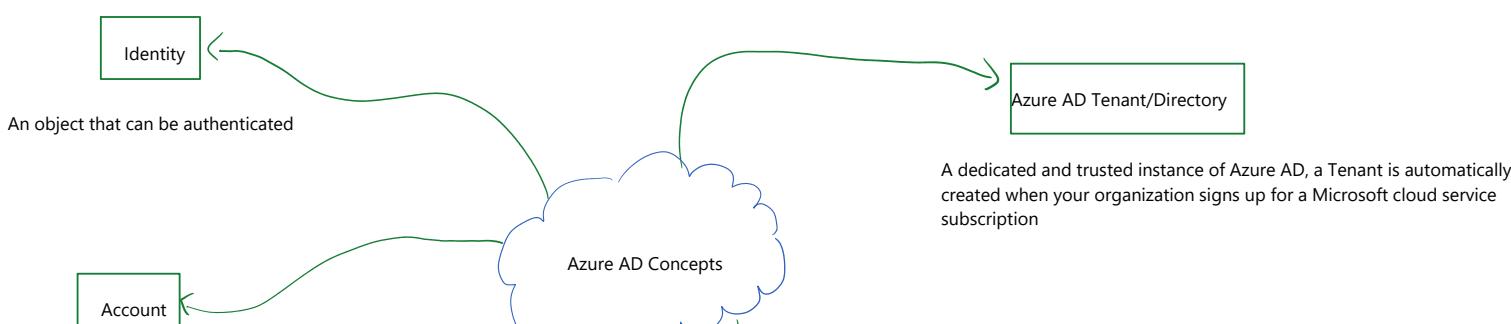


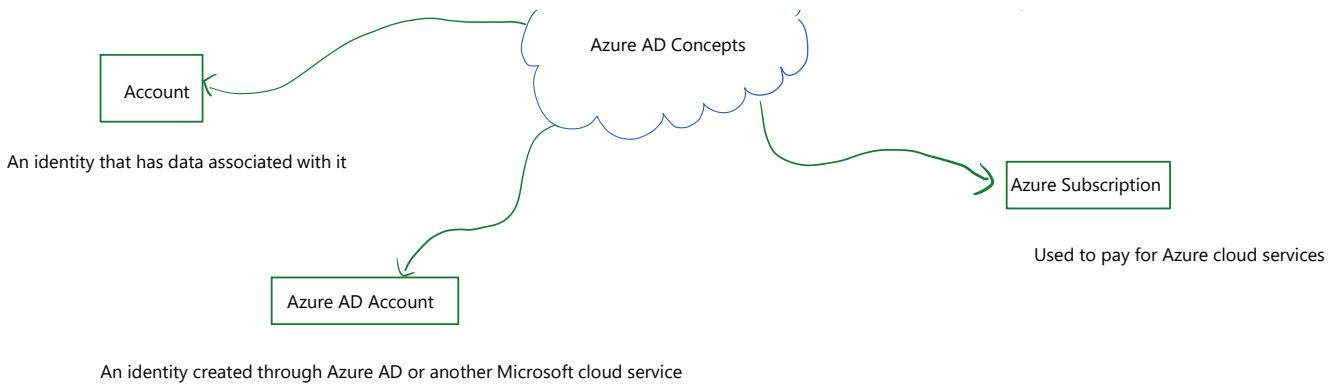
### Azure AD Vs ADDS

Concept	Active Directory (AD)	Azure Active Directory
Users		
Provisioning: users	Organizations create internal users manually or use an in-house or automated provisioning system, such as the Microsoft Identity Manager, to integrate with an HR system.	Existing AD organizations use <a href="#">Azure AD Connect</a> to sync identities to the cloud. Azure AD adds support to automatically create users from <a href="#">cloud HR systems</a> . Azure AD can provision identities in <a href="#">SCIM enabled</a> SaaS apps to automatically provide apps with the necessary details to allow access for users.

Provisioning: external identities	Organizations create external users manually as regular users in a dedicated external AD forest, resulting in administration overhead to manage the lifecycle of external identities (guest users)	Azure AD provides a special class of identity to support external identities. <a href="#">Azure AD B2B</a> will manage the link to the external user identity to make sure they are valid.
Entitlement management and groups	Administrators make users members of groups. App and resource owners then give groups access to apps or resources.	<a href="#">Groups</a> are also available in Azure AD and administrators can also use groups to grant permissions to resources. In Azure AD, administrators can assign membership to groups manually or use a query to dynamically include users to a group. Administrators can use <a href="#">Entitlement management</a> in Azure AD to give users access to a collection of apps and resources using workflows and, if necessary, time-based criteria.
Admin management	Organizations will use a combination of domains, organizational units, and groups in AD to delegate administrative rights to manage the directory and resources it controls.	Azure AD provides <a href="#">built-in roles</a> with its Azure AD role-based access control (Azure AD RBAC) system, with limited support for <a href="#">creating custom roles</a> to delegate privileged access to the identity system, the apps, and resources it controls. Managing roles can be enhanced with <a href="#">Privileged Identity Management (PIM)</a> to provide just-in-time, time-restricted, or workflow-based access to privileged roles.
Credential management	Credentials in Active Directory are based on passwords, certificate authentication, and smartcard authentication. Passwords are managed using password policies that are based on password length, expiry, and complexity.	Azure AD uses intelligent <a href="#">password protection</a> for cloud and on-premises. Protection includes smart lockout plus blocking common and custom password phrases and substitutions. Azure AD significantly boosts security <a href="#">through Multi-factor authentication</a> and <a href="#">passwordless</a> technologies, like FIDO2. Azure AD reduces support costs by providing users a <a href="#">self-service password reset</a> system.
<b>Apps</b>		
Infrastructure apps	Active Directory forms the basis for many infrastructure on-premises components, for example, DNS, DHCP, IPSec, WiFi, NPS, and VPN access	In a new cloud world, Azure AD is the new control plane for accessing apps versus relying on networking controls. When users authenticate, <a href="#">Conditional access (CA)</a> , will control which users, will have access to which apps under required conditions.
Traditional and legacy apps	Most on-premises apps use LDAP, Windows-Integrated Authentication (NTLM and Kerberos), or Header-based authentication to control access to users.	Azure AD can provide access to these types of on-premises apps using <a href="#">Azure AD application proxy</a> agents running on-premises. Using this method Azure AD can authenticate Active Directory users on-premises using Kerberos while you migrate or need to coexist with legacy apps.
SaaS apps	Active Directory doesn't support SaaS apps natively and requires federation system, such as AD FS.	SaaS apps supporting OAuth2, SAML, and WS-* authentication can be integrated to use Azure AD for authentication.
Line of business (LOB) apps with modern authentication	Organizations can use AD FS with Active Directory to support LOB apps requiring modern authentication.	LOB apps requiring modern authentication can be configured to use Azure AD for authentication.
Mid-tier/Daemon services	Services running in on-premises environments normally use AD service accounts or group Managed Service Accounts (gMSA) to run. These apps will then inherit the permissions of the service account.	Azure AD provides <a href="#">managed identities</a> to run other workloads in the cloud. The lifecycle of these identities is managed by Azure AD and is tied to the resource provider and it can't be used for other purposes to gain backdoor access.
<b>Devices</b>		
Mobile	Active Directory doesn't natively support mobile devices without third-party solutions.	Microsoft's mobile device management solution, Microsoft Intune, is integrated with Azure AD. Microsoft Intune provides device state information to the identity system to evaluate during authentication.
Windows desktops	Active Directory provides the ability to domain join Windows devices to manage them using Group Policy, System Center Configuration Manager, or other third-party solutions.	Windows devices can be <a href="#">joined to Azure AD</a> . Conditional access can check if a device is Azure AD joined as part of the authentication process. Windows devices can also be managed with <a href="#">Microsoft Intune</a> . In this case, conditional access, will consider whether a device is compliant (for example, up-to-date security patches and virus signatures) before allowing access to the apps.
Windows servers	Active Directory provides strong management capabilities for on-premises Windows servers using Group Policy or other management solutions.	Windows servers virtual machines in Azure can be managed with <a href="#">Azure AD Domain Services</a> . <a href="#">Managed identities</a> can be used when VMs need access to the identity system directory or resources.
Linux/Unix workloads	Active Directory doesn't natively support non-Windows without third-party solutions, although Linux machines can be configured to authenticate with Active Directory as a Kerberos realm.	Linux/Unix VMs can use <a href="#">managed identities</a> to access the identity system or resources. Some organizations, migrate these workloads to cloud container technologies, which can also use managed identities.

## Azure AD Terms





#### Azure AD Feature comparison based on licenses

Feature name	Azure Active Directory Free	Office 365	Azure Active Directory Premium P1	Azure Active Directory Premium P2
Authentication, single sign-on and multifactor authentication (MFA)	This feature is partially included ⚠️	This feature is partially included ✓	included ✓	included ✓
Cloud authentication (Pass-through authentication, password hash synchronization)	included	included ✓	included ✓	included ✓
Federated authentication (Active Directory Federation Services or federation with other identity providers)	included ✓	included ✓	included ✓	included ✓
Single sign-on (SSO) unlimited <sup>3</sup>	included ✓	included ✓	included ✓	included ✓
Multifactor authentication (MFA) <sup>4</sup>	included ✓	included ✓	included ✓	included ✓
Passwordless (Windows Hello for Business, Microsoft Authenticator, FIDO2 security key integrations <sup>5</sup> )	included ✓	included ✓	included ✓	included ✓
Service-level agreement <sup>6</sup>	not included	not included	included ✓	included ✓
<b>Applications Access</b>				
SaaS apps with modern authentication (Azure AD application gallery apps, SAML, and OAuth 2.0)	included ✓	included ✓	included ✓	included ✓
Group assignment to applications	not included	not included	included ✓	included ✓
Cloud app discovery (Microsoft Defender for Cloud Apps) <sup>7</sup>	not included	not included	included ✓	included ✓
Application Proxy for on-premises, header-based, and Integrated Windows Authentication	not included	not included	included ✓	included ✓
Secure hybrid access partnerships <sup>8</sup> (Kerberos, NTLM, LDAP, RDP, and SSH authentication)	included ✓	included ✓	included ✓	included ✓
<b>Authorization and Conditional Access</b>				
Role-based access control (RBAC)	This feature is partially included ⚠️	This feature is partially included ✓	This feature is partially included ⚠️	included ✓
Conditional Access	not included	not included	included ✓	included ✓
SharePoint limited access	not included	not included	included ✓	included ✓
Session lifetime management <a href="#">Learn more</a>	not included	not included	included ✓	included ✓
Identity Protection (Risky sign-ins, risky users, risk-based conditional access)	not included	not included	not included	included ✓
<b>Administration and hybrid identity</b>				
User and group management	This feature is partially included ⚠️	This feature is partially included ✓	included ✓	included ✓
Advanced group management (Dynamic groups, naming policies, expiration, default classification)	not included	not included	included ✓	included ✓
Directory synchronization—Azure AD Connect (sync and cloud sync)	included ✓	included ✓	included ✓	included ✓
Azure AD Connect Health reporting <sup>9</sup>	not included	not included	included ✓	included ✓
Delegated administration—built-in roles	included ✓	included ✓	included ✓	included ✓
Global password protection and management – cloud-only users	included ✓	included ✓	included ✓	included ✓
Global password protection and management – custom banned passwords, users synchronized from on-premises Active Directory	not included	not included	included ✓	included ✓
Microsoft Identity Manager user client access license (CAL) <sup>10</sup>	not included	not included	included ✓	included ✓
<b>End-user self-service</b>				
	This feature is partially included ⚠️	This feature is partially included ✓	This feature is partially included ⚠️	included ✓

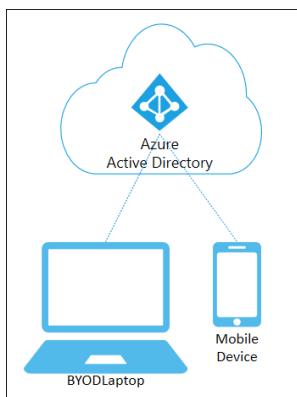
Application launch portal (My Apps)	included ✓	included ✓	included ✓	included ✓
User application collections in My Apps	included ✓	included ✓	included ✓	included ✓
Self-service account management portal (My Account)	included ✓	included ✓	included ✓	included ✓
Self-service password change for cloud users	included ✓	included ✓	included ✓	included ✓
Self-service password reset/change/unlock with on-premises write-back	not included	not included	included ✓	included ✓
Self-service sign-in activity search and reporting	not included	included ✓	included ✓	included ✓
Self-service group management (My Groups)	not included	not included	included ✓	included ✓
Self-service entitlement management (My Access)	not included	not included	not included	included ✓
<b>Identity Governance</b>	This feature is partially included 	This feature is partially included 	This feature is partially included 	included ✓
Automated user provisioning to apps	included ✓	included ✓	included ✓	included ✓
Automated group provisioning to apps	not included	not included	included ✓	included ✓
HR-driven provisioning	not included	not included	included ✓	included ✓
Terms of use attestation	not included	not included	included ✓	included ✓
Access certifications and reviews	not included	not included	not included	included ✓
Entitlements management	not included	not included	not included	included ✓
Privileged Identity Management (PIM), just-in-time access	not included	not included	not included	included ✓
<b>Event logging and reporting</b>	This feature is partially included 	This feature is partially included 	This feature is partially included 	included ✓
Basic security and usage reports	included ✓	included ✓	included ✓	included ✓
Advanced security and usage reports	not included	not included	included ✓	included ✓
Identity Protection: vulnerabilities and risky accounts	not included	not included	not included	included ✓
Identity Protection: risk events investigation, SIEM connectivity	not included	not included	not included	included ✓
<b>Frontline workers</b>	not included	not included	included ✓	included ✓
SMS sign-in	not included	not included	included ✓	included ✓
Shared device sign-out	not included	not included	included ✓	included ✓
Delegated user management portal (My Staff)	not included	not included	included ✓	included ✓

#### Compare Microsoft Office Product features

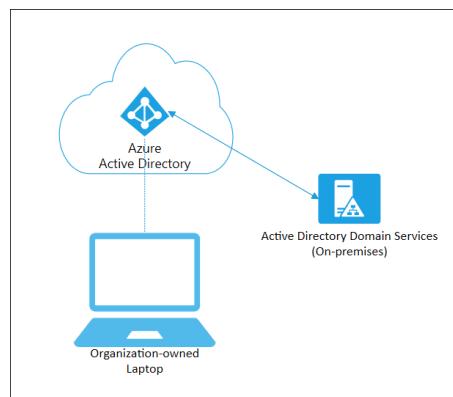
From <<https://www.microsoft.com/en-in/security/business/identity-access-management/azure-ad-pricing>>

### Azure AD Device Identities

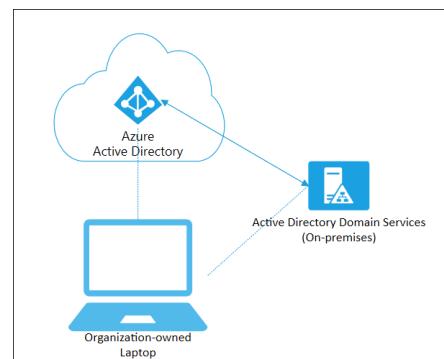
Azure AD registered devices



Azure AD joined devices



Hybrid Azure AD joined devices



- Supports Bring Your Own Device
- Registered devices sign-in using a Microsoft account
- Attached to an Azure AD account granting access to resources
- Control using Mobile Device

- Intended for cloud-first or cloud-only organizations
- Organization-owned devices
- Joined only to Azure AD - organizational account required
- Can use Conditional Access policies
- OS – Windows 10+ devices

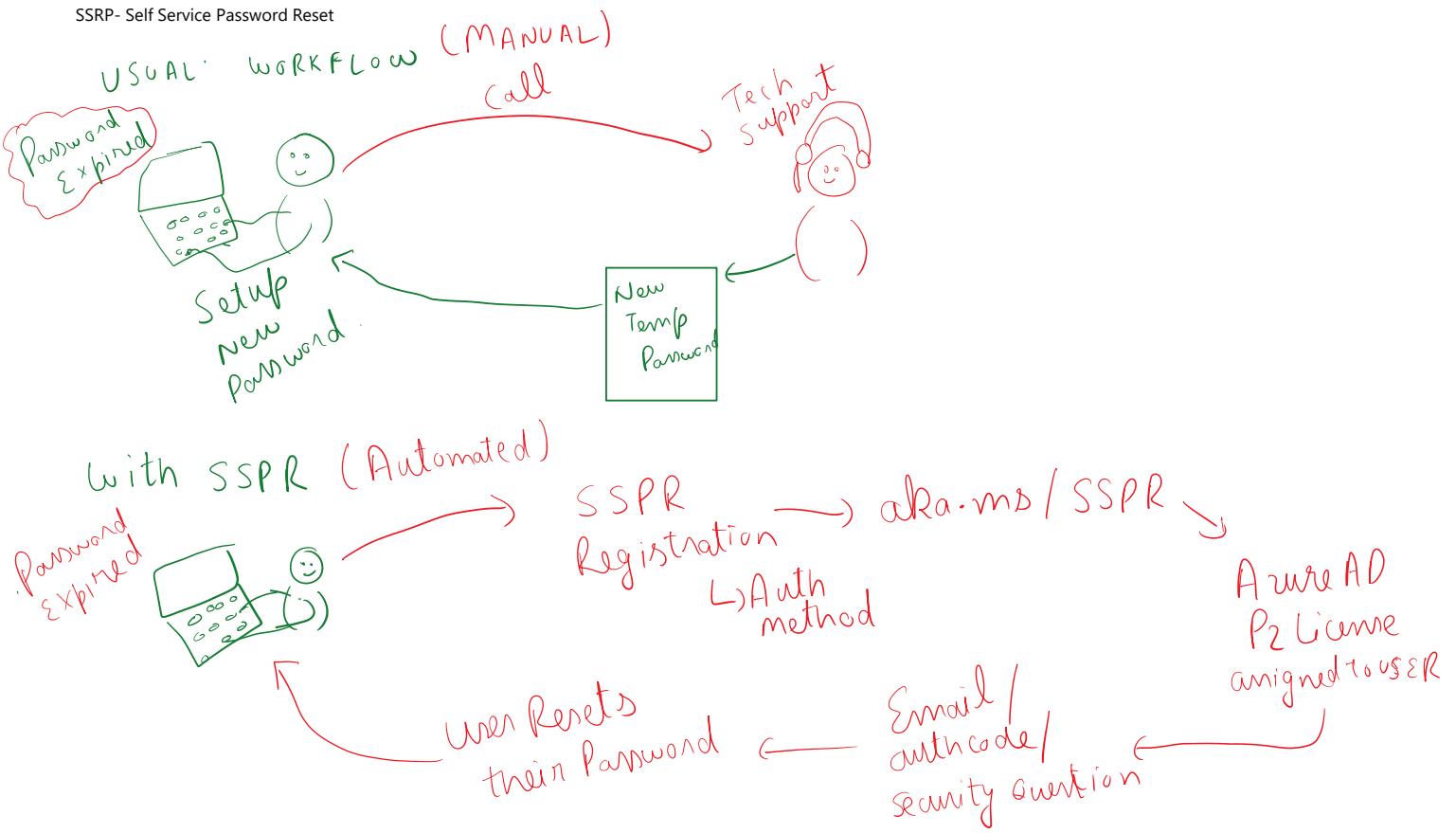
- You have Win32 apps deployed to these devices using Active Directory machine authentication
- You want to continue to use Group Policy to manage the device
- You want to use existing image solutions

- Microsoft account
- Attached to an Azure AD account granting access to resources
- Control using Mobile Device Management (MDM) tools like Microsoft Intune
- OS – Windows 10+, iOS, Android, and MacOS

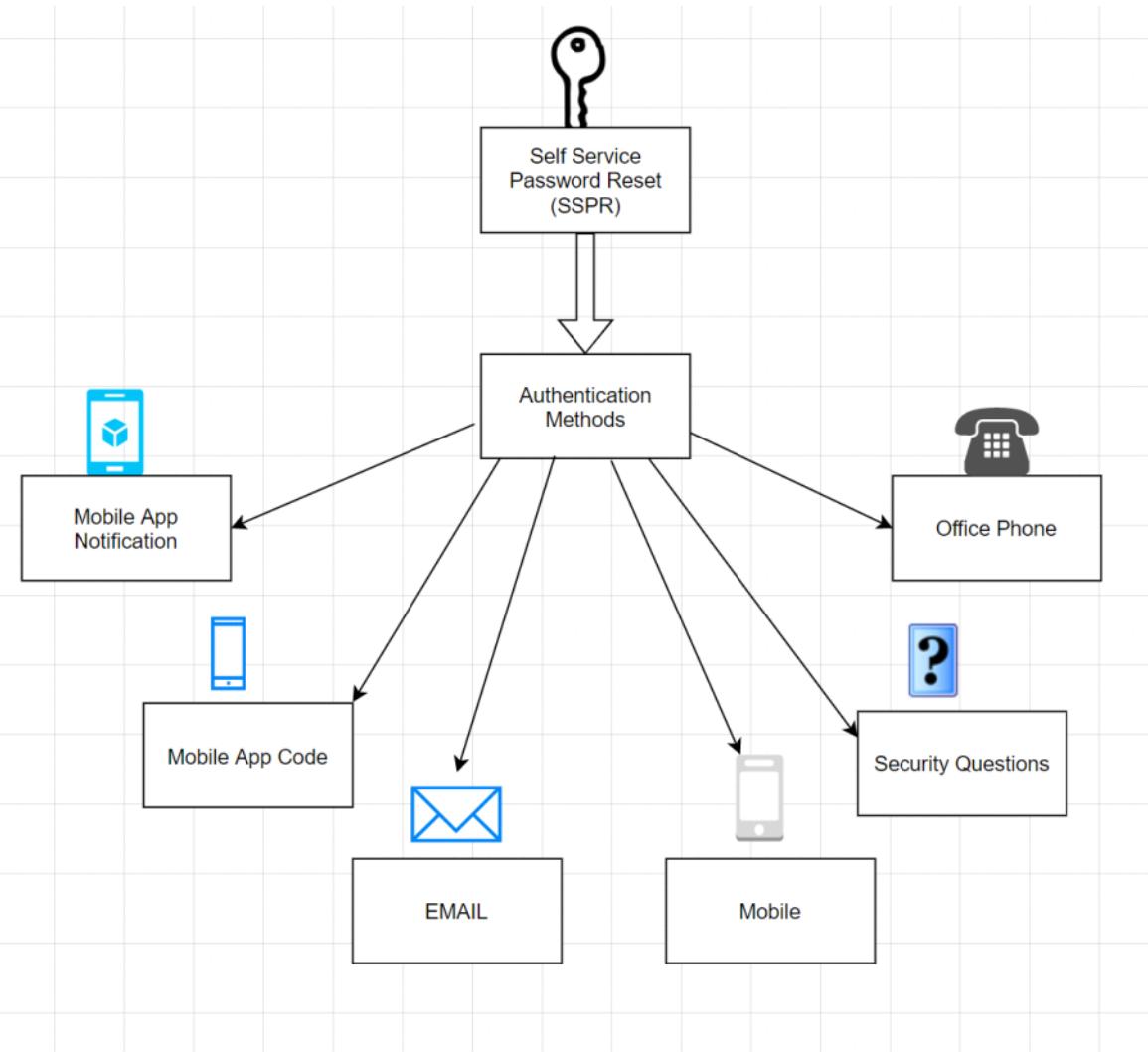
- Can use Conditional Access policies
- OS – Windows 10+ devices

- authentication
- You want to continue to use Group Policy to manage the device
- You want to use existing image solutions to deploy devices
- OS - Windows 7+ devices

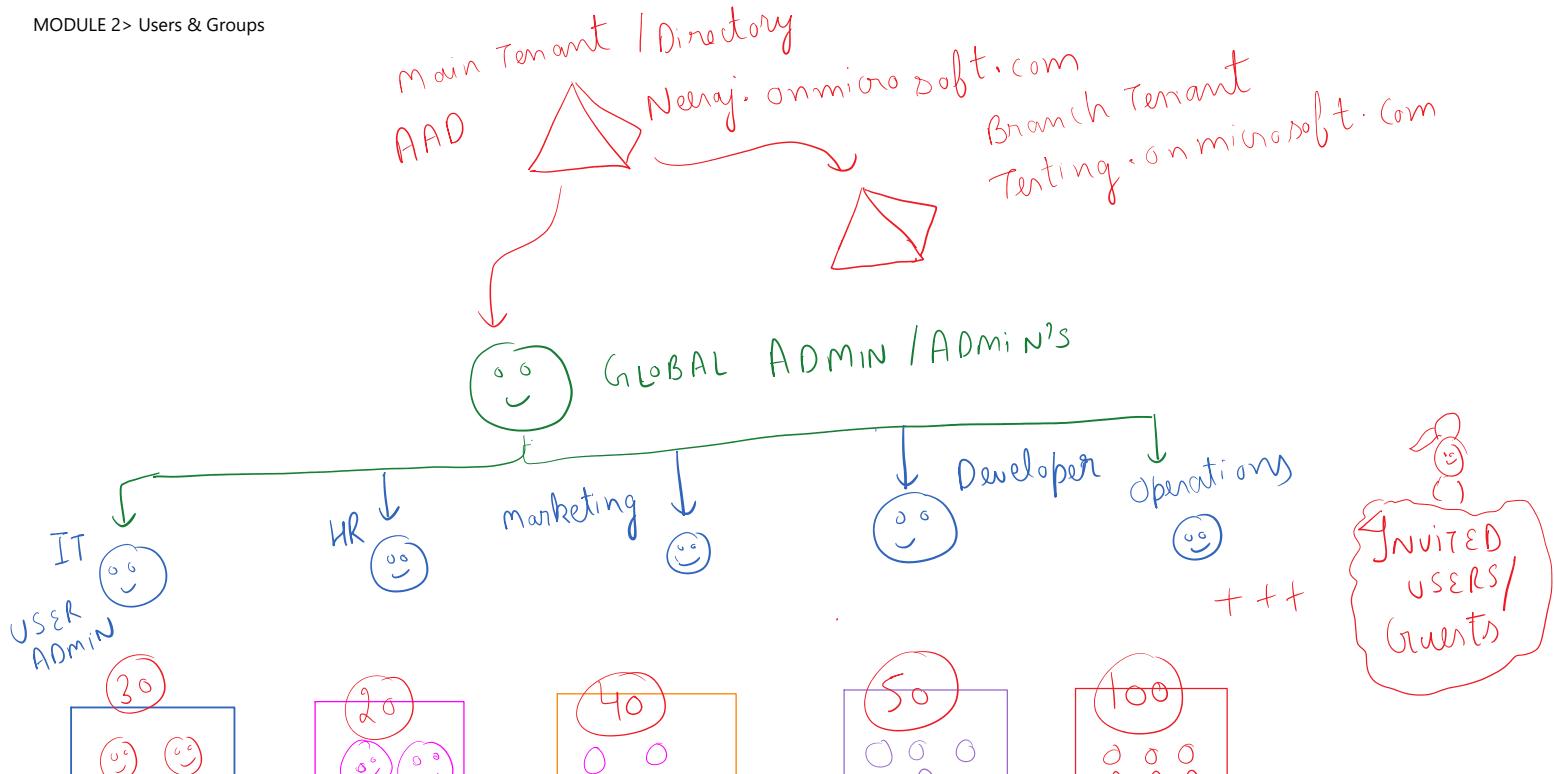
<https://docs.microsoft.com/en-us/azure/active-directory/devices/concept-azure-ad-register>

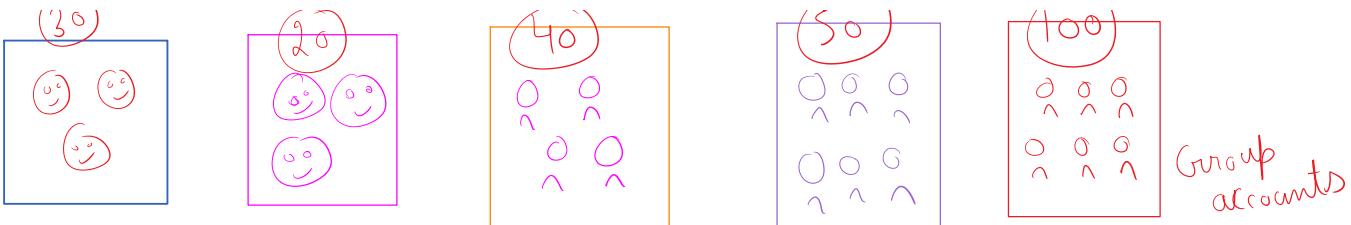


SSPR Authentication Methods

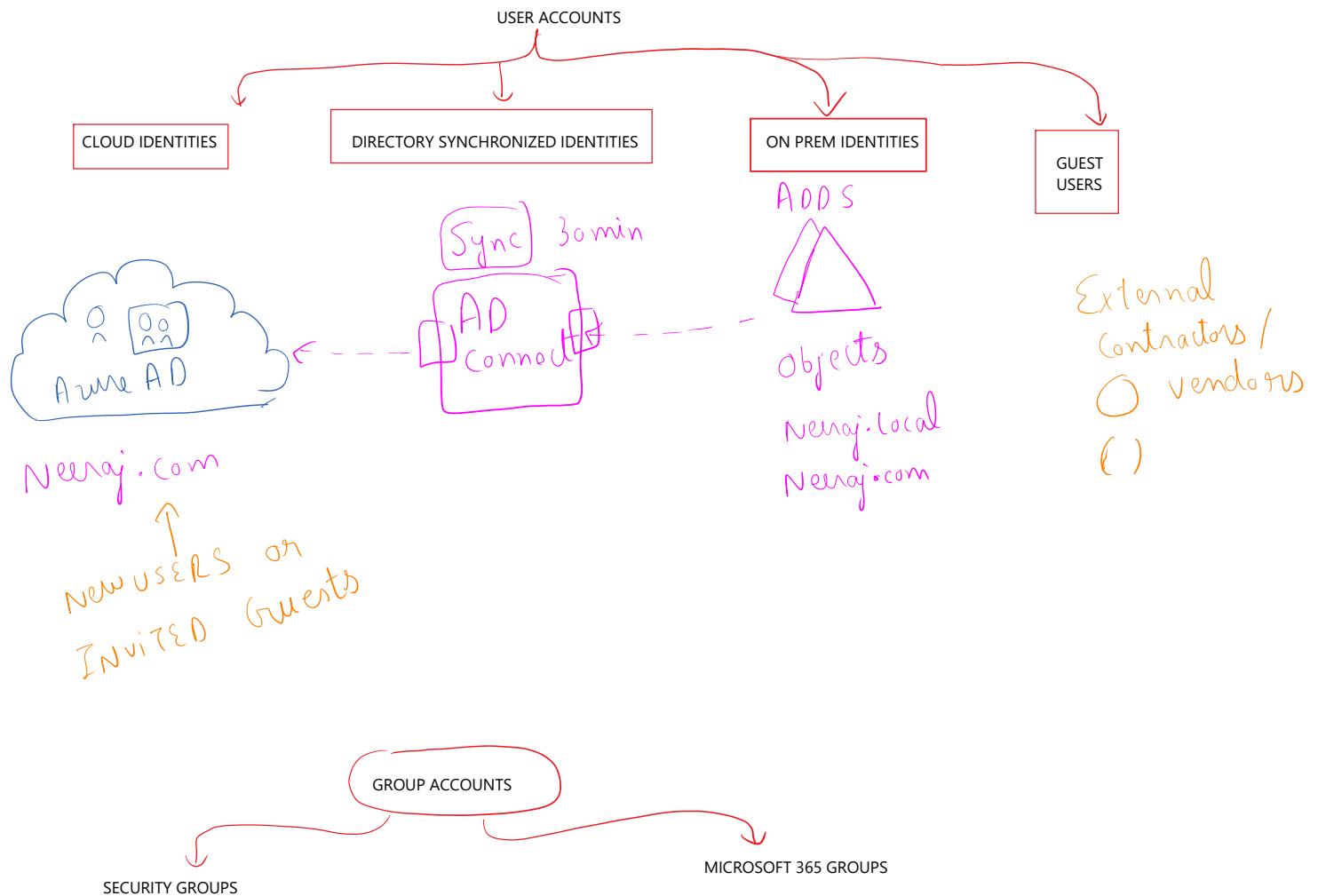


#### MODULE 2> Users & Groups





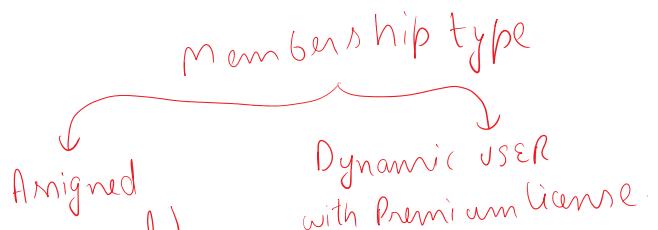
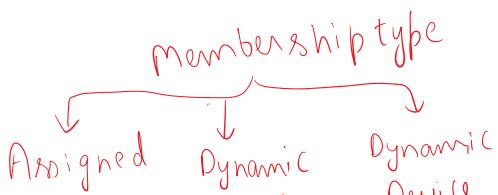
- Bulk Create
- Bulk Delete
- Bulk Invite



- Azure AD Security Groups are analogous to Security Groups in on-prem Windows Active Directory.
- They are Security Principals, which means they can be used to secure objects in Azure AD.
- They can be created natively in Azure AD, or synced from Windows AD with Azure AD Connect.
- Their membership can be static, or it can be generated dynamically with rules.
- Security groups are used to give group members access to applications, resources and assign licenses. Group members can be users, devices, service principals, and other groups.

Microsoft 365 groups are used for collaboration, giving members access to a shared mailbox, calendar, files, SharePoint site, and so on. Group members can only be users.

• Mailbox account created





## ASSIGNMENT TYPES

### ASSIGNED MEMBERSHIP

- Free
- MANUALLY ADD USERS.

### DYNAMIC USERS

- Premium license
- Automatic ADD users To group.
- Dynamic Rules created

### DYNAMIC DEVICE

- SECURITY Group
- Automatically Add & Remove Devices to group.



### Dynamic membership rules

Save Discard Got feedback?

Configure Rules Validate Rules (Preview)

You can use the rule builder or rule syntax text box to create or edit a dynamic membership rule. [Learn more](#)

And/Or	Property	Operator	Value
And	country	Equals	India
	department	Equals	IT

+ Add expression + Get custom extension properties

**Rule syntax**  
(user.country -eq "India") and (user.department -eq "IT")

### License Assignment

- Important to mention the location of user
- Assign licenses to groups> good practice to follow
- Location helps decide pricing, regulatory compliance based on country
- Premium P1 or P2 offers the best features

### License Operations

- View license plans and plan details
- Set the Usage Location parameter
- Assign licenses to users and groups
- Change license plans for users and groups
- Remove a license

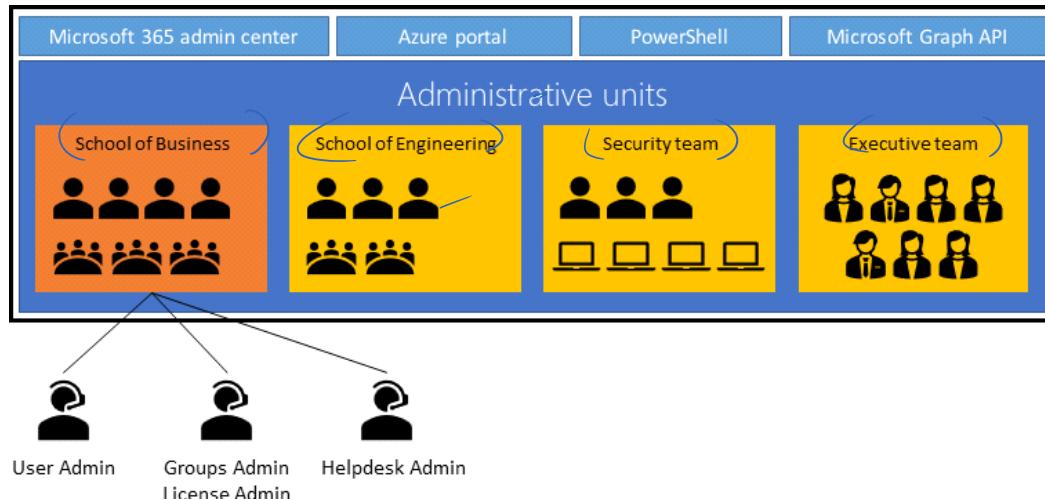
### ADMINISTRATIVE UNIT

An administrative unit is an Azure AD resource that can be a container for other Azure AD resources. An administrative unit can contain only users, groups, or devices.

Administrative units restrict permissions in a role to any portion of your organization that you define. For example, use administrative units to delegate the Helpdesk Administrator role to regional support specialists, so they can manage users only in the region that they support.

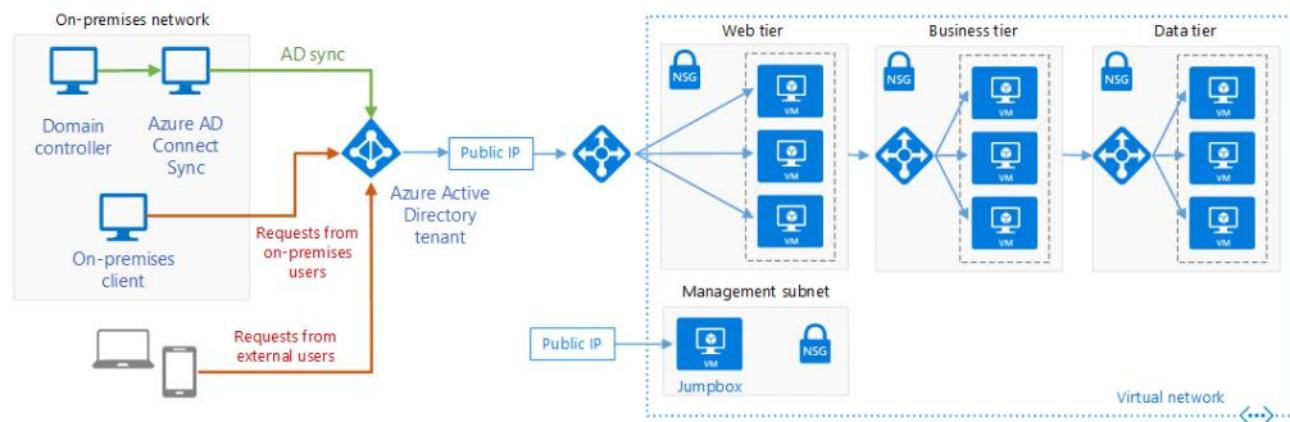
#### License requirements

Using administrative units requires an Azure AD Premium P1 license for each administrative unit administrator, and an Azure AD Free license for each administrative unit member.

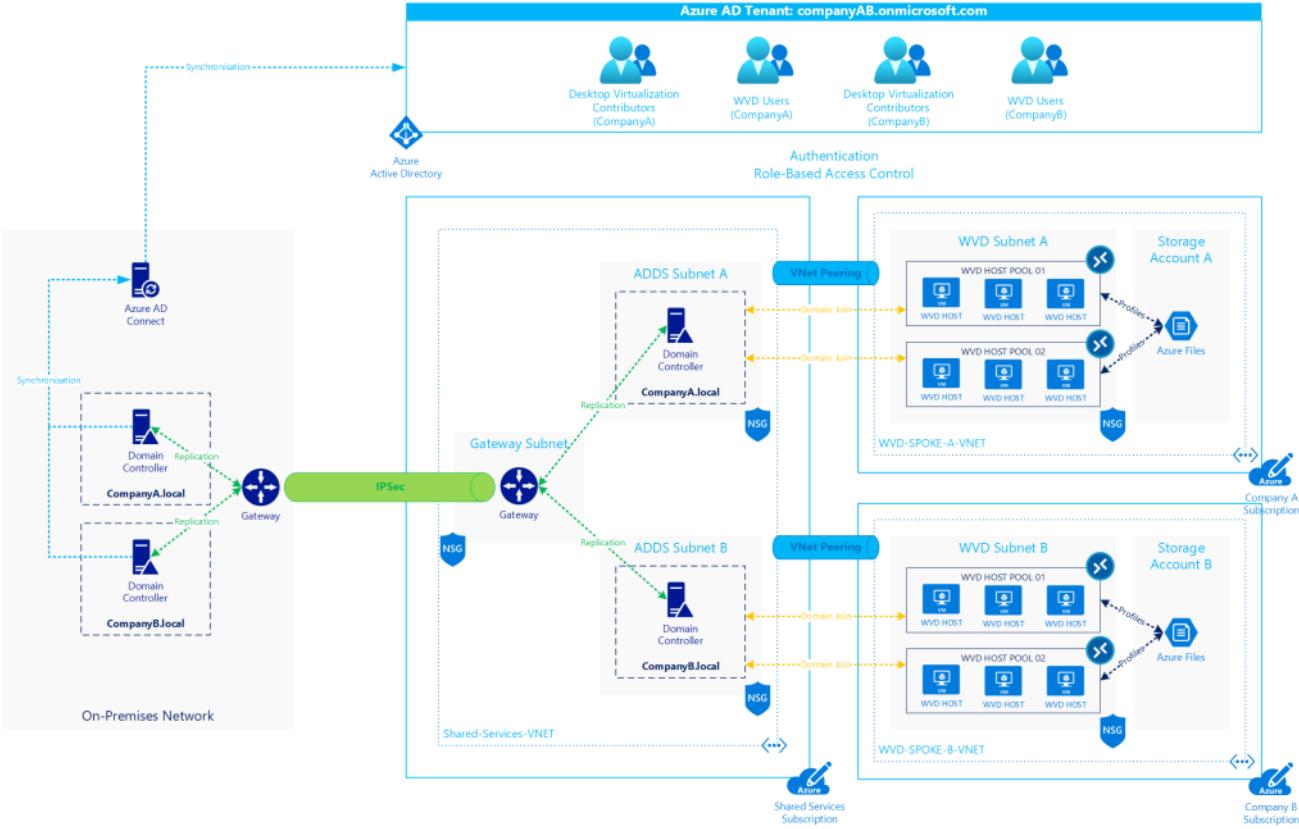


## ARCHITECTURES

### Integrate on-premises AD domains with Azure AD



### Multiple forests with AD DS and Azure AD



<https://docs.microsoft.com/en-us/azure/architecture/example-scenario/wvd/multi-forest>

#### KNOWLEDGE CHECK

- 1. A dedicated and trusted instance of Azure AD is referred to as:**
  - a. An Azure tenant
  - b. An Azure identity
  - c. An Azure account
  
- 2. You are assigning Azure AD roles. Which role will allow the user to manage all the groups in your Teams tenants and be able to assign other administrator roles? Select one.**
  - a. Password administrator
  - b. Security administrator
  - c. Global administrator

- 3. If you delete a user account by mistake, can it be restored? Select one.**
- a. When a user account is deleted, it's gone forever and can't be restored.
  - b. The user account can be restored, but only when it's created within the last 30 days.
  - c. The user account can be restored, but only when it's deleted within the last 30 days.
- 4. Which of the following roles has full access to manage all resources but does not allow you to assign roles? Select one.**
- a. Owner
  - b. Contributor
  - c. Reader
- 5. Your users want to sign-in to devices, apps, and services from anywhere. They want to sign-in using an organizational work or school account instead of a personal account. You must ensure corporate assets are protected and that devices meet standards for security and compliance. Specifically, you need to be able to enable or disable a device. What should you do? Select one.**
- a. Enable the device in Azure AD.
  - b. Join the device to Azure AD.
  - c. Register the device with Azure AD

## 02- Governance

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### Azure Governance & Compliance

#### Azure Global Infrastructure

<https://azure.microsoft.com/en-in/global-infrastructure/>

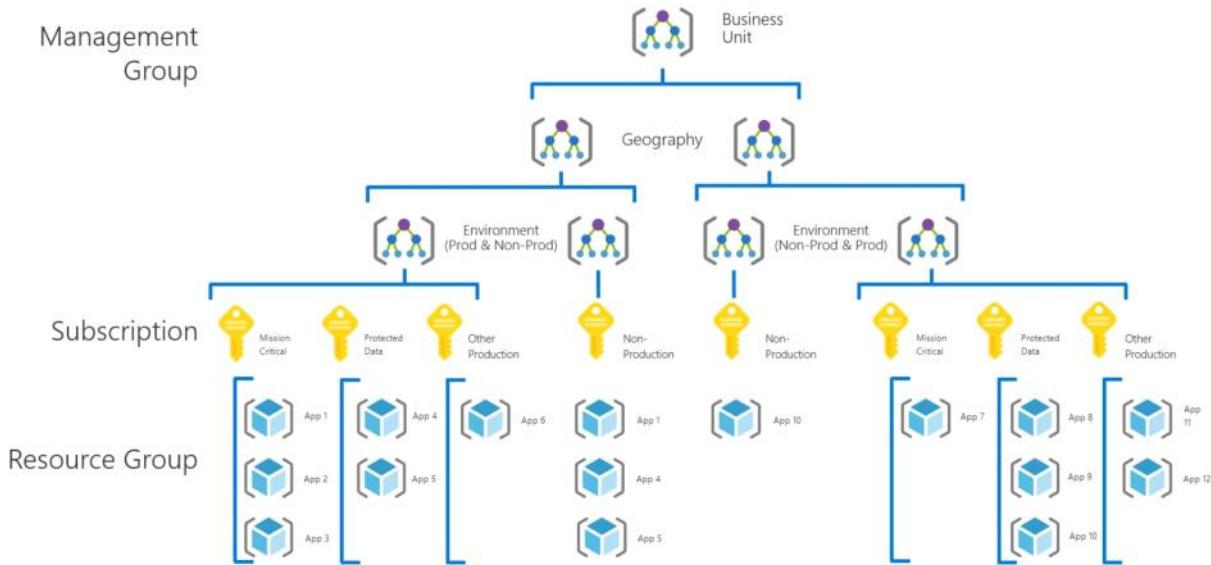
#### 3D Virtual Tour- Azure Datacenter

<https://news.microsoft.com/stories/microsoft-datacenter-tour/>



Operating along more than 175,000 miles of fiber lines across 140 countries and more regions than any other provider...

### Azure Subscriptions



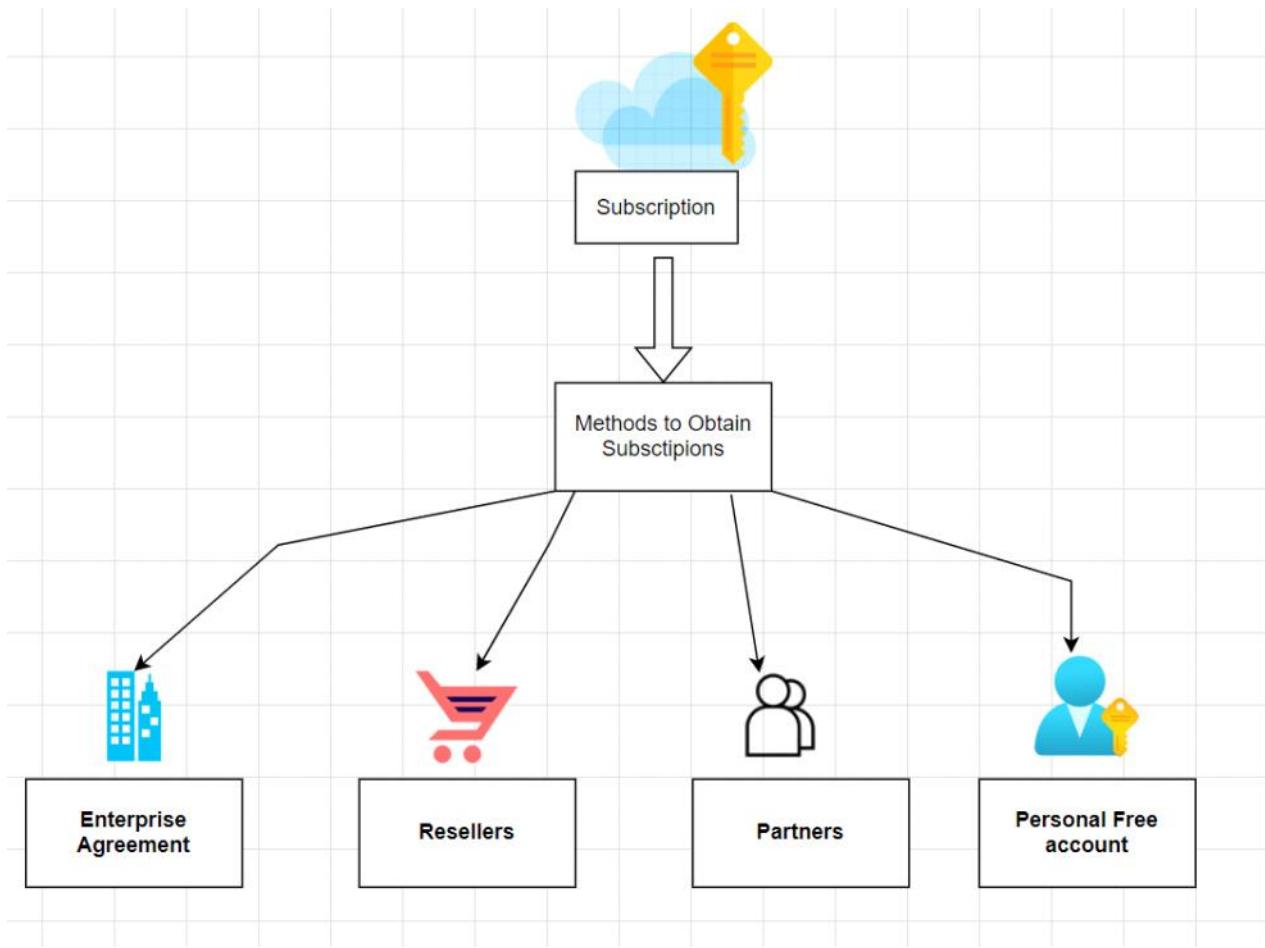
<https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/decision-guides/subscriptions/>

## Subscription Offer types

OFFER NAME	OFFER NUMBER	SPENDING LIMIT
<a href="#">Azure Plan</a>	0017G	Blank
<a href="#">Enterprise Agreement Support</a>	Blank	Blank
<a href="#">Microsoft Azure EA Sponsorship</a>	0136P	Blank
<a href="#">Pay-As-You-Go</a>	0003P	Blank
<a href="#">Support Plans</a>	0041P, 0042P, 0043P	Blank
<a href="#">Free Trial</a>	0044P	Available
<a href="#">Visual Studio Professional subscribers</a>	0059P	Available
<a href="#">Visual Studio Test Professional subscribers</a>	0060P	Available
<a href="#">MSDN Platforms subscribers</a>	0062P	Available
<a href="#">Visual Studio Enterprise subscribers</a>	0063P	Available
<a href="#">Visual Studio Enterprise (BizSpark) subscribers</a>	0064P	Available
<a href="#">Visual Studio Enterprise (MPN) subscribers</a>	0029P	Available
<a href="#">Pay-As-You-Go Dev/Test</a>	0023P	Blank
<a href="#">Enterprise Dev/Test</a>	0148P	Blank
<a href="#">Action Pack</a>	0025P	Available
<a href="#">Microsoft Azure Sponsored Offer</a>	0036P	Blank
<a href="#">Azure Pass</a>	0243P	Blank
<a href="#">Azure in Open Licensing</a>	0111P	Available
<a href="#">Azure for Students</a>	0170P	Available
<a href="#">Microsoft Azure for Students Starter</a>	0144P	Available
<a href="#">Azure in CSP</a>	0145P	Blank
<a href="#">Microsoft Azure Dev Tools for Teaching</a>	Blank	

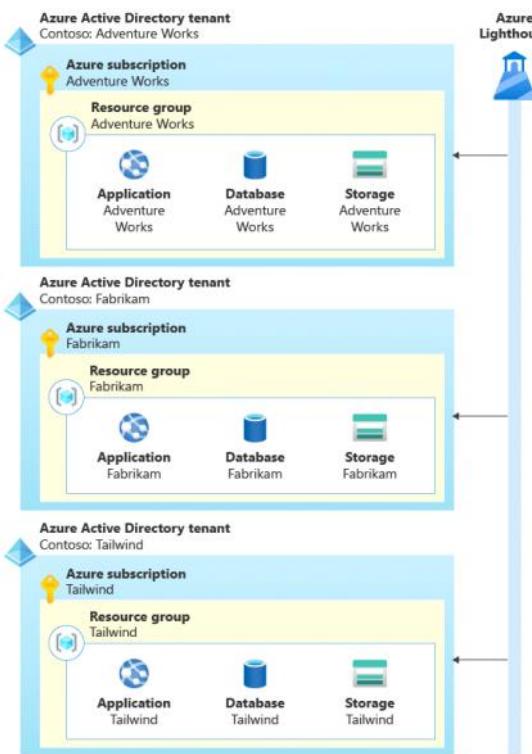
<https://azure.microsoft.com/en-in/support/legal/offer-details/>

## How to Get a Subscription?

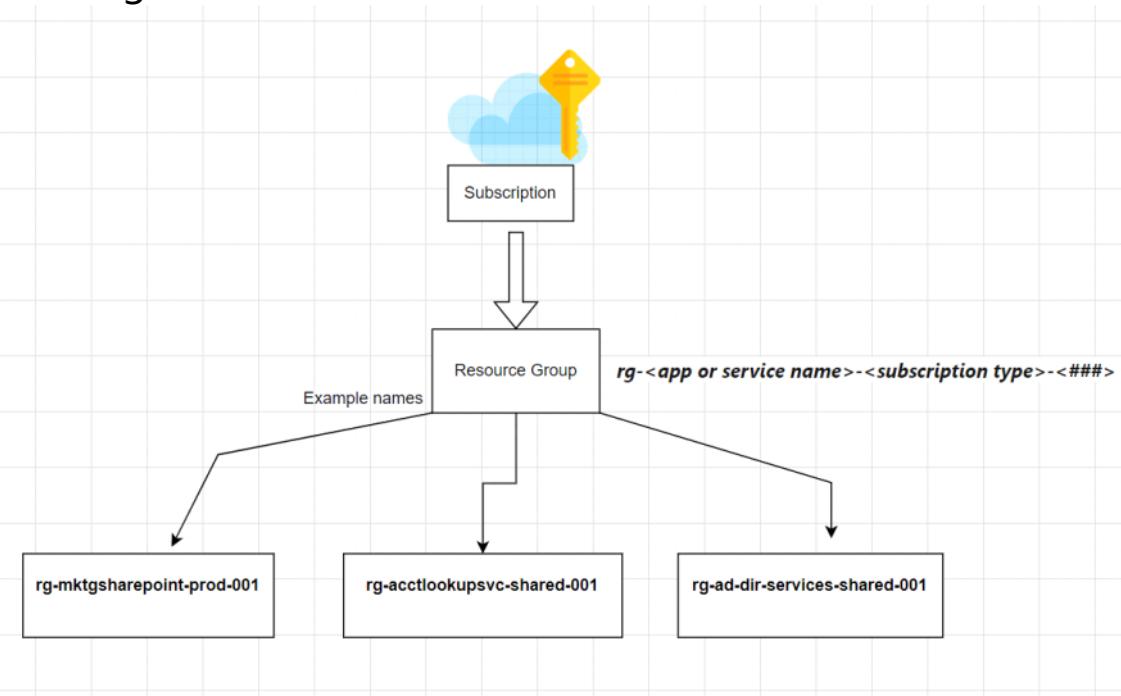


## Resource Groups

Resources with Similar lifecycles should be part of same RG- resources that are created together, updated together & deleted together should be part of same RG.



## Naming



## Resource Quotas

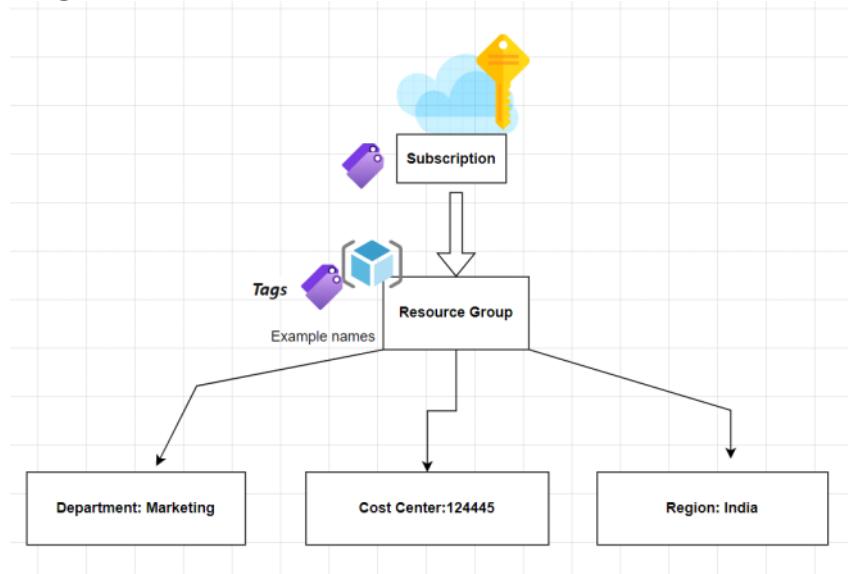
Search (Ctrl+ /) < Request quota increase Refresh Download

Search Compute Region : 7 of 75 Usage : Show all Group by usage

Showing 1 to 100 of 875 records in 2 groups.

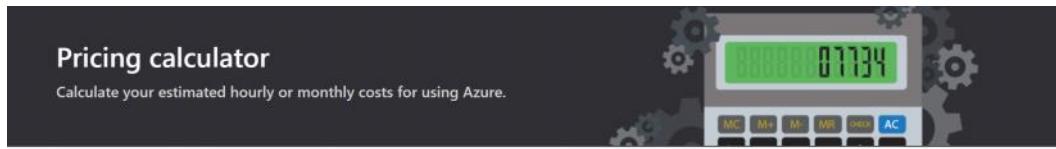
	Quota name	Region	Subscription	Current Usage ↓	Adjustable
Usage at low level (15)					
<input type="checkbox"/> Total Regional vCPUs East US Cloud-Leaders 23% 10 of... Yes					
<input type="checkbox"/> Standard BS Family vCPUs East US Cloud-Leaders 19% 8 of ... Yes					
<input type="checkbox"/> Standard DSv2 Family vCPUs East US Cloud-Leaders 10% 2 of ... Yes					
<input type="checkbox"/> Standard DSv2 Family vCPUs North Europe Cloud-Leaders 10% 2 of ... Yes					
<input type="checkbox"/> Total Regional vCPUs North Europe Cloud-Leaders 4% 2 of ... Yes					
<input type="checkbox"/> Virtual Machine Scale Sets East US Cloud-Leaders 0% 1 of ... No 🤖					
<input type="checkbox"/> Virtual Machine Scale Sets North Europe Cloud-Leaders 0% 1 of ... No 🤖					
<input type="checkbox"/> Virtual Machines East US Cloud-Leaders 0% 3 of ... No 🤖					
<input type="checkbox"/> Premium Storage Managed Disks East US Cloud-Leaders 0% 3 of ... No 🤖					
<input type="checkbox"/> StandardStorageSnapshots West US 2 Cloud-Leaders 0% 4 of ... No 🤖					
<input type="checkbox"/> Virtual Machines North Europe Cloud-Leaders 0% 1 of ... No 🤖					

## Tags



## Cost Management

- AHB- Azure Hybrid Benefit
- Reserved Instances
- Scheduled Stoppage of VM's during non-required hours
- Deletion of Unattached disks
- Right Sizing workloads
- Select right resources
- Right regions- Locations
- Data Transfer costs
- Optimize-Alerts, budgets & azure Advisor



Already an Azure customer? Sign in to create, save, and share cost estimates. [Sign in](#)

**Products**   [Example Scenarios](#)   [Saved Estimates](#)   [FAQs](#)

Select a product to include it in your estimate.

Search products

**Featured**

- Compute
- Networking
- Storage
- Web
- Mobile
- Containers
- Databases
- Analytics

**Virtual Machines**  
Provision Windows and Linux virtual machines in seconds

**Storage Accounts**  
Durable, highly available and massively scalable cloud storage

**Azure SQL Database**  
Managed, intelligent SQL in the cloud

**App Service**  
Quickly create powerful cloud apps for web and mobile

**Azure Cosmos DB**  
Fast NoSQL database with open APIs for any scale

**Azure Kubernetes Service (AKS)**  
Build and scale with managed Kubernetes

**Azure Functions**  
Process events with serverless code

**Azure Cognitive Services**  
Deploy high-quality AI models as APIs

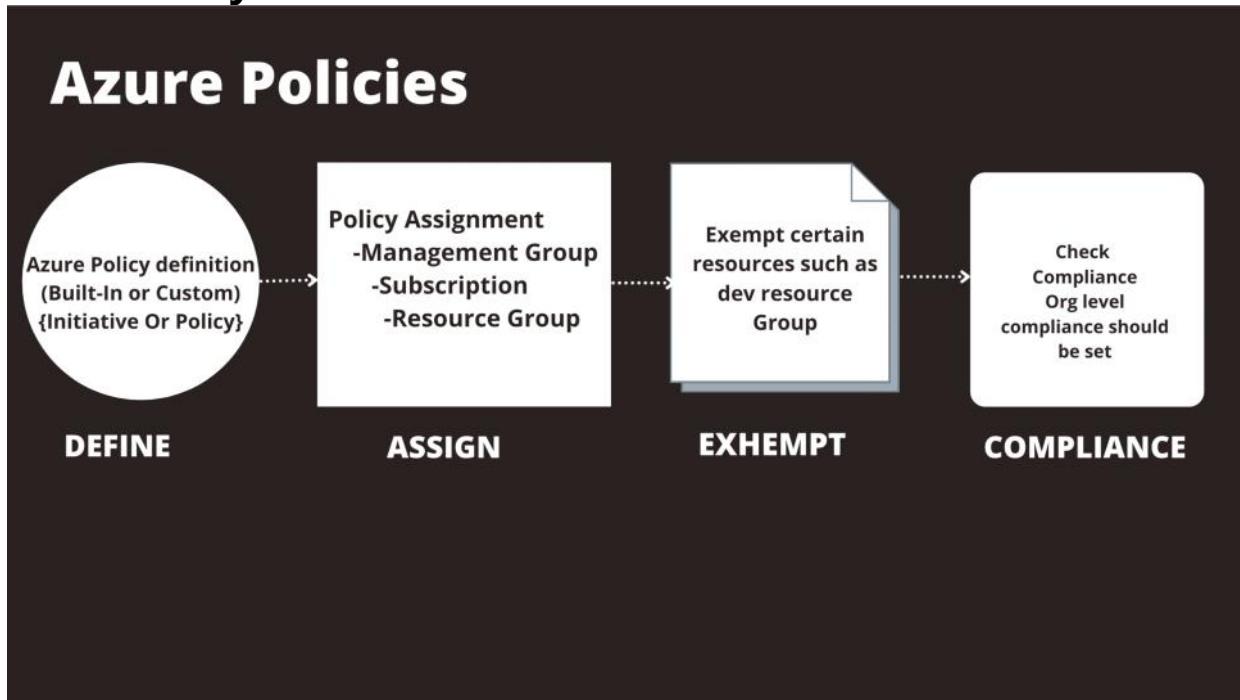
**Azure Cost Management and Billing**  
Manage your cloud spending with confidence

https://azure.microsoft.com/en-in/pricing/calculator/

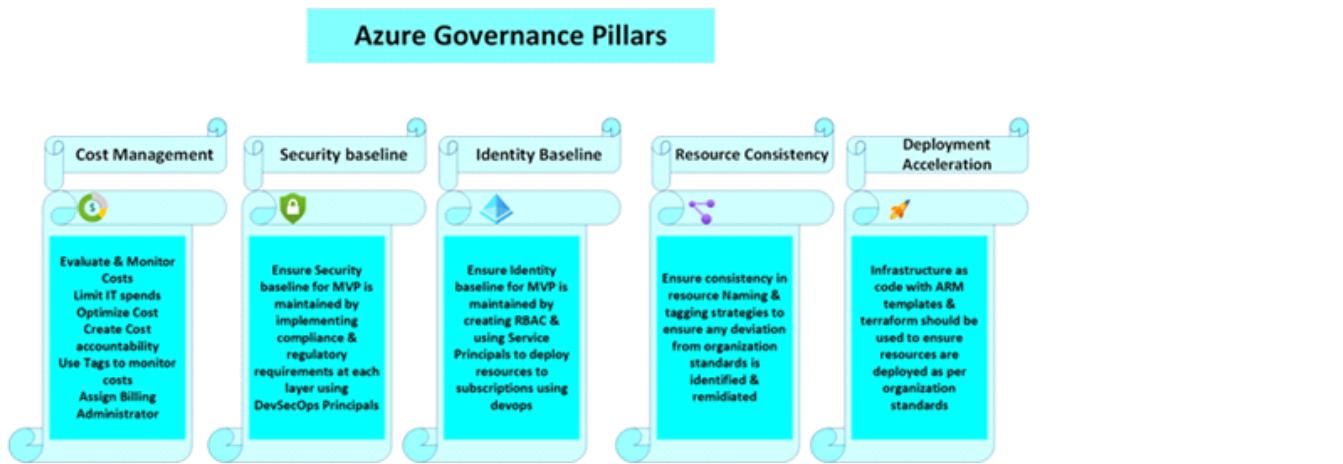
## TCO calculator

<https://azure.microsoft.com/en-in/pricing/tco/calculator/>

## Azure Policy



<https://docs.microsoft.com/en-us/powershell/module/az.resources/get-azpolicydefinition?view=azps-6.5.0>



#### #Get policies

```
Get-AzPolicyDefinition
```

#### # Register the resource provider if it's not already registered

```
Register-AzResourceProvider -ProviderNamespace 'Microsoft.PolicyInsights'
```

#### # Get a reference to the resource group that is the scope of the assignment

```
$rg = Get-AzResourceGroup -Name '<resourceGroupName>'
```

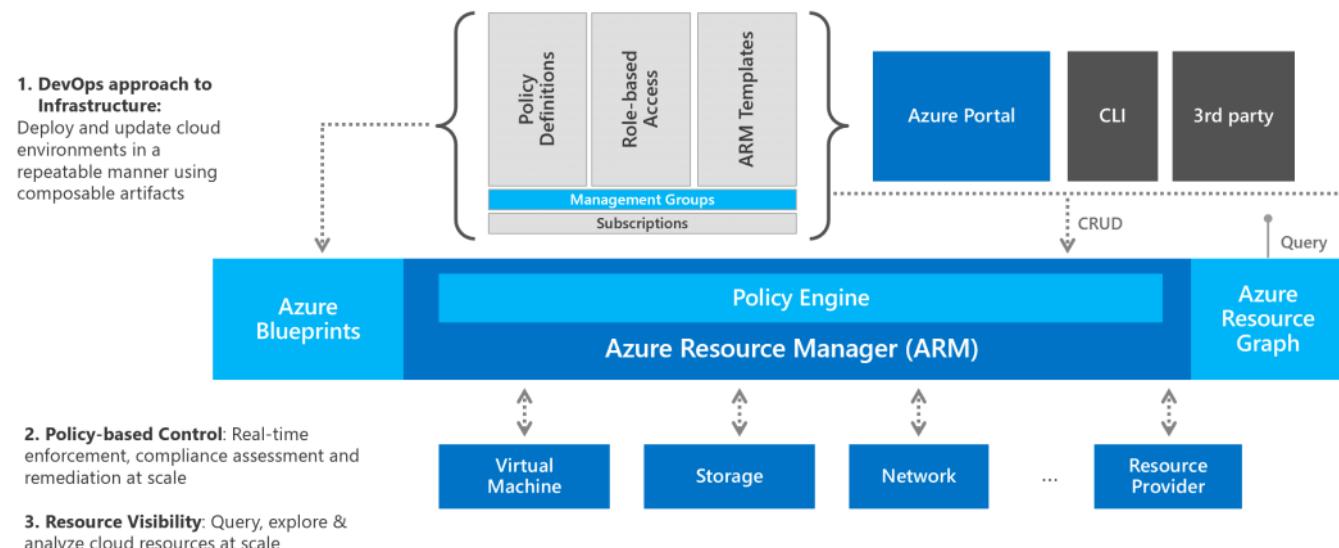
#### # Get a reference to the built-in policy definition to assign

```
$definition = Get-AzPolicyDefinition | Where-Object { $_.Properties.DisplayName -eq 'Audit VMs that do not use managed disks' }
```

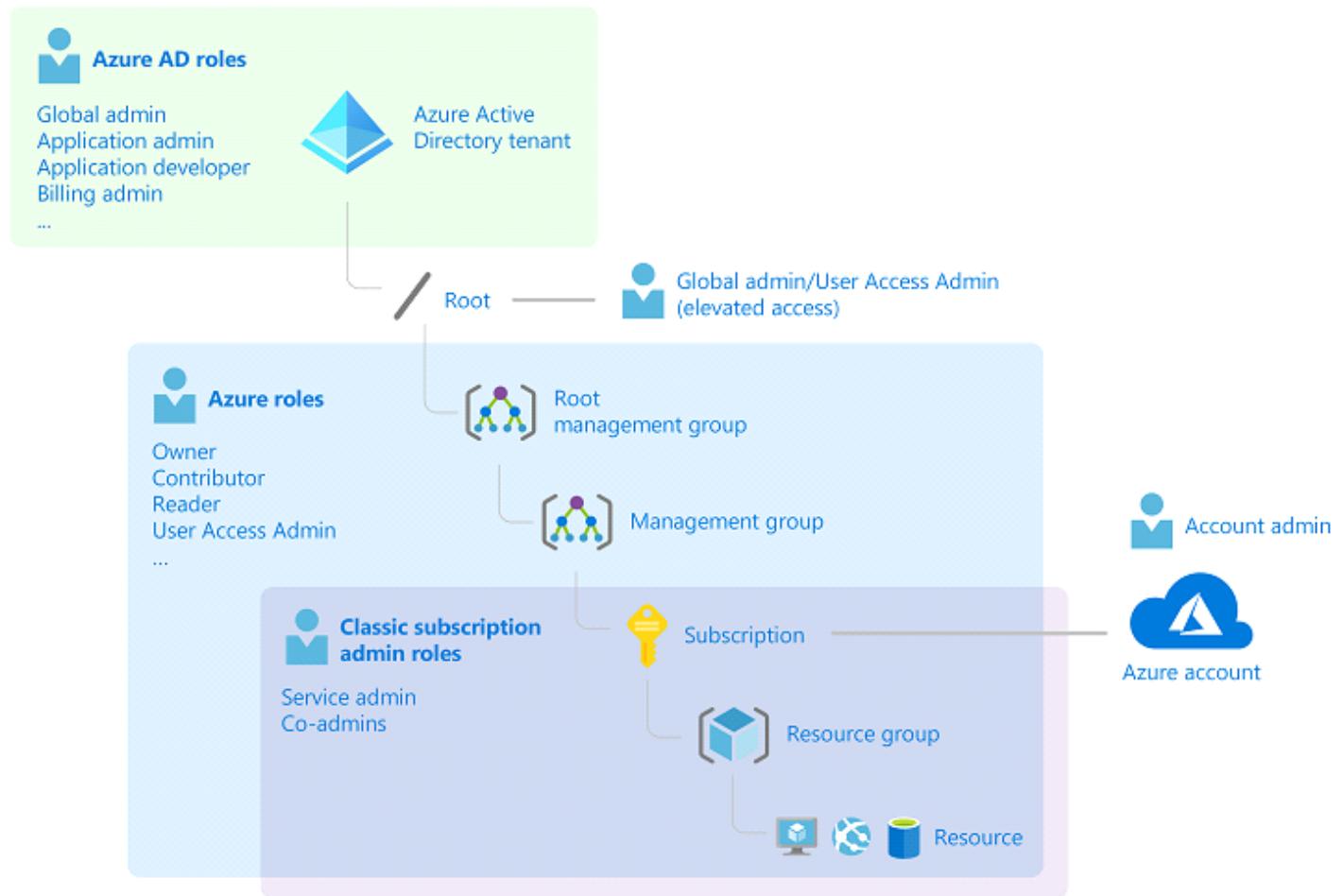
#### # Create the policy assignment with the built-in definition against your resource group

```
New-AzPolicyAssignment -Name 'audit-vm-manageddisks' -DisplayName 'Audit VMs without managed disks Assignment' -Scope $rg.ResourceId -PolicyDefinition $definition
```

## Azure Governance Architecture

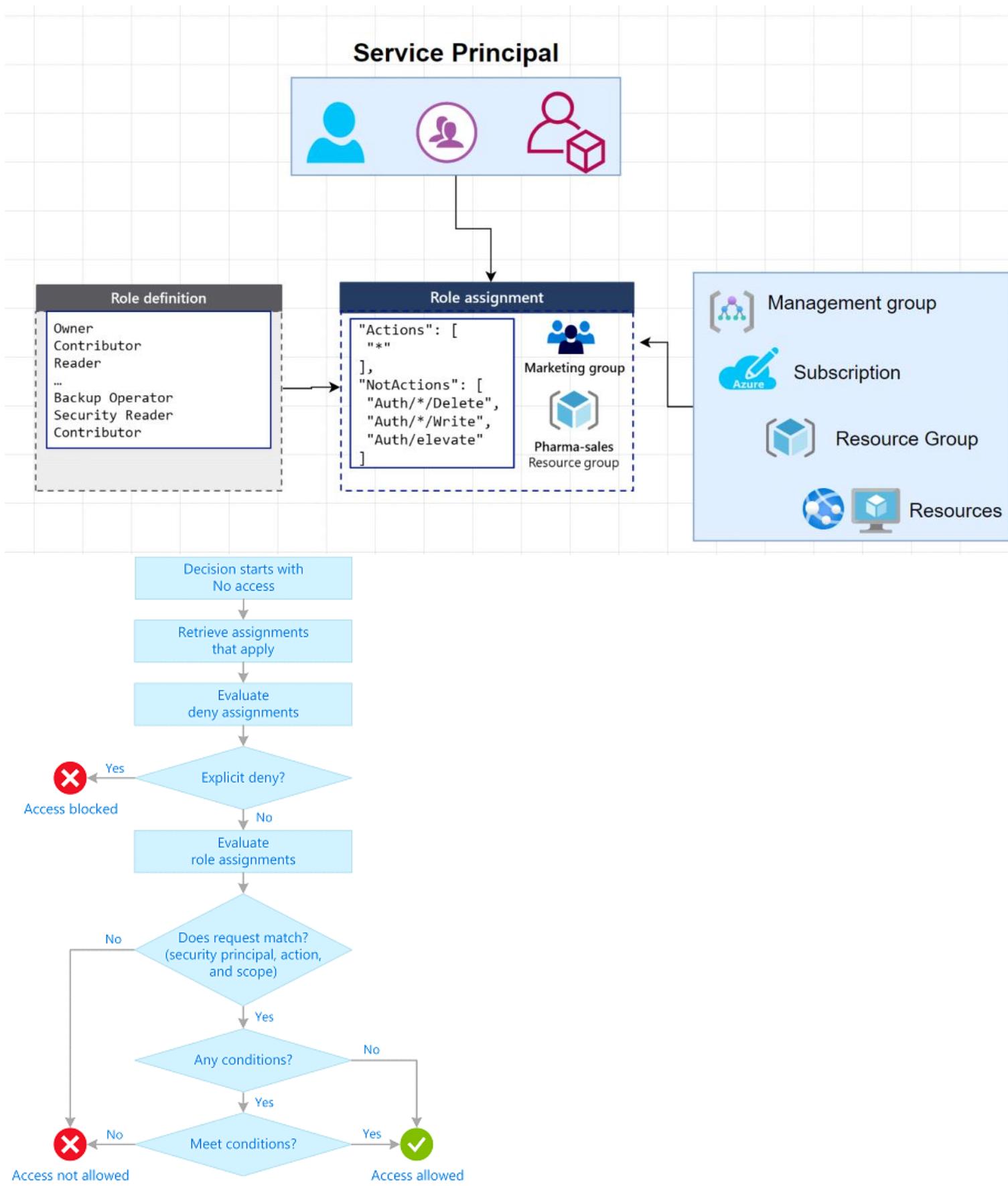


# RBAC-Role Based Access Control



## Azure AD vs Azure RBAC Roles

### Role Assignment



## Knowledge Check

**1. Your company financial controller wants to be notified whenever the company is half-way to spending the money allocated for cloud services. What should you do? Select one.**

- a) Create an Azure reservation.
- b) Create a budget and a spending threshold.
- c) Create a management group.
- d) Enter workloads in the Total Cost of Ownership calculator.

**2. An Azure subscription ... Select one.**

- a. is a logical container used to provision resources in Azure
- b. is associated with a single department or organization
- c. represents a single domain

**3. You have three virtual machines (VM1, VM2, and VM3) in a resource group. The Helpdesk hires a new employee. The new employee must be able to modify the settings on VM3, but not on VM1 and VM2. Your solution must minimize administrative overhead. What should you do? Select one.**

- a) Assign the user to the Contributor role on the resource group.
- b) Assign the user to the Contributor role on VM3.
- c) Move VM3 to a new resource group and assign the user to the Contributor role on VM3.

**4. Which of the following can be used to manage governance across multiple Azure subscriptions?**

- a. Azure initiatives
- b. Resource groups
- c. Management groups

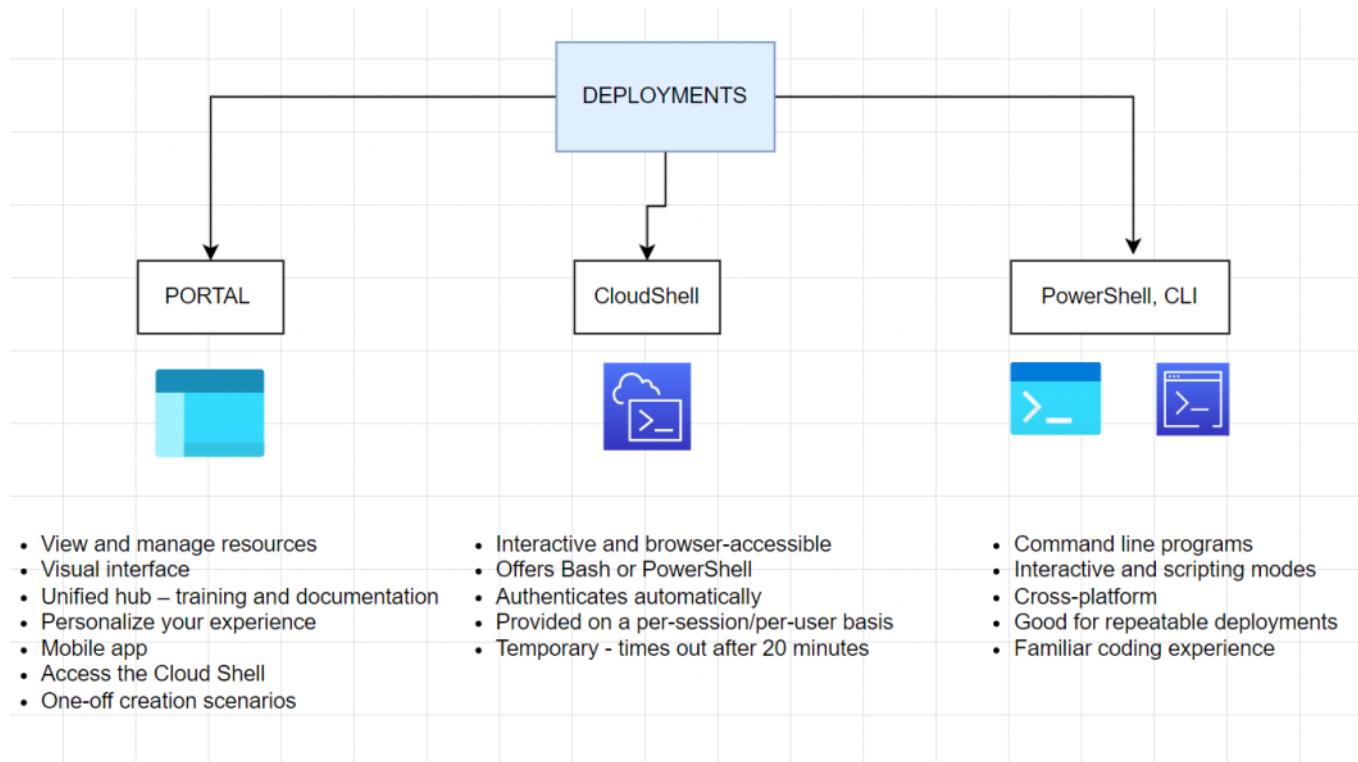
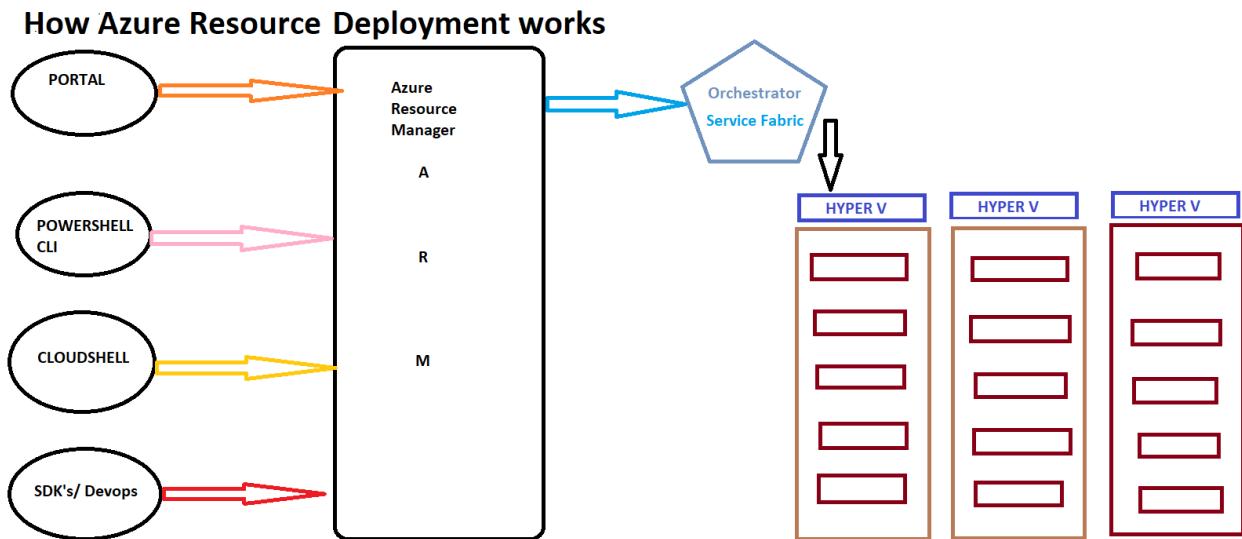
**5. Your organization has several Azure policies that they would like to create and enforce for a new branch office. What should you do? Select one.**

- a) Create a policy initiative
- b) Create a management group
- c) Create a new subscriptions

## 03- Azure Administration

Tuesday, May 31, 2022 3:16 PM

How Azure Deployments work?

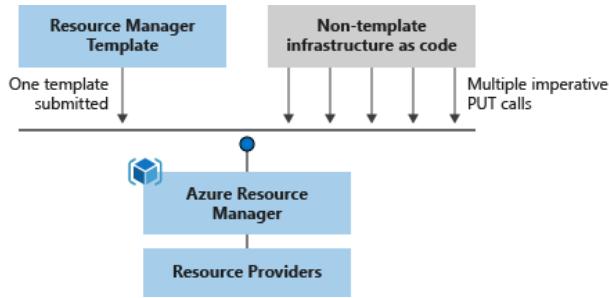


### What Is ARM?

A template (JSON Format) that defines the Infrastructure & configuration of Azure solution

### Why Do we need ARM?

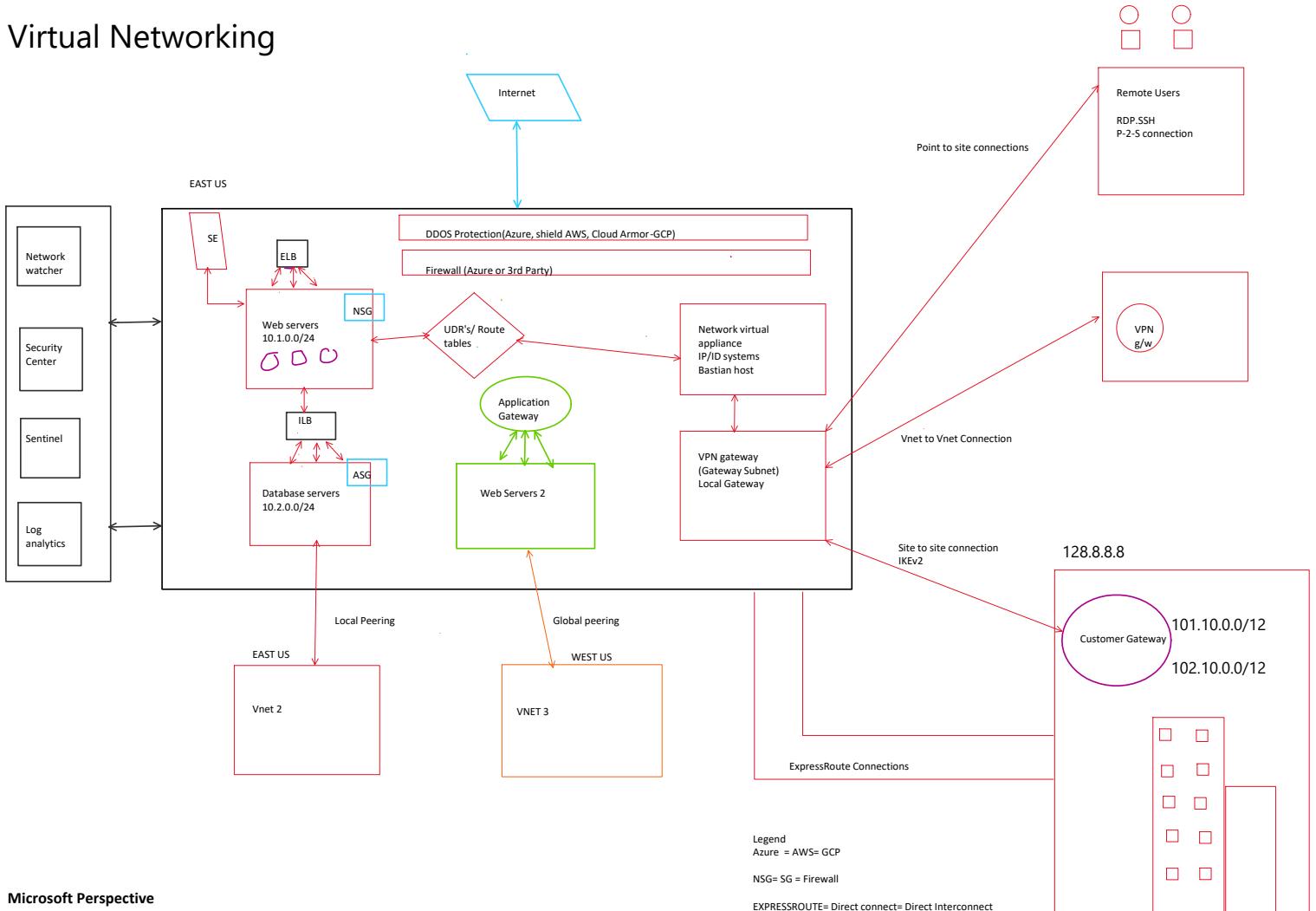
Repeatedly Deploy Solutions throughout their lifecycle & the resources are deployed in a consistent state



```
{
    "$schema": "http://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
    "contentVersion": "",
    "parameters": {},
    "variables": {},
    "functions": [],
    "resources": [],
    "outputs": {}
}
```

Element name	Required	Description
\$schema	Yes	Location of the JSON schema file that describes the version of the template language
contentVersion	Yes	Version of the template
parameters	No	Values that are provided when deployment is executed to customize resource deployment
variables	No	Values that are used as JSON fragments in the template to simplify template language expressions
functions	No	Values that are used as JSON fragments in the template to simplify template language expressions
resources	Yes	Resource types that are deployed or updated in a resource group
outputs	No	Values that are returned after deployment

# Virtual Networking



## Microsoft Perspective

- Vnet in Azure is regional
- Subnets are part of the address space in VNet
- Subnet Mask Range /7-/29

## Virtual Networks

When creating a VNet, it is recommended that you use the address ranges enumerated in RFC 1918, which have been set aside by the IETF for private, non-routable address spaces:

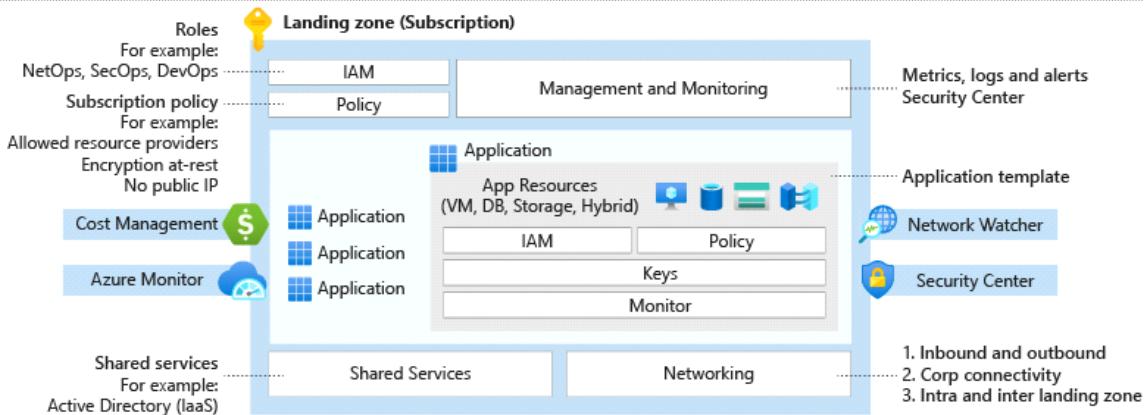
- 10.0.0.0 - 10.255.255.255 (10/8 prefix)
- 172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
- 192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

In addition, you cannot add the following address ranges:

- 224.0.0.0/4 (Multicast)
- 255.255.255.255/32 (Broadcast)
- 127.0.0.0/8 (Loopback)
- 169.254.0.0/16 (Link-local)
- 168.63.129.16/32 (Internal DNS)

Azure assigns resources in a virtual network a private IP address from the address space that you provision. For example, if you deploy a VM in a VNet with address space 10.0.0.0/16, the VM will be assigned a private IP like 10.0.0.4. It is important to note that Azure reserves 5 IP addresses within each subnet. These are x.x.x.0-x.x.x.3 and the last address of the subnet. x.x.x.1-x.x.x.3 is reserved in each subnet for Azure services.

- x.x.x.0: Network address
- x.x.x.1: Reserved by Azure for the default gateway
- x.x.x.2, x.x.x.3: Reserved by Azure to map the Azure DNS IPs to the VNet space
- x.x.x.255: Network broadcast address



nslookup contoso.internal.cloudapp.net 168.63.129.16

nslookup delhi.neerajtech.com. 168.63.129.16

nslookup delhi.Neerajorg.com. 168.63.129.16

nslookup contoso.internal.cloudapp.net 168.63.129.16

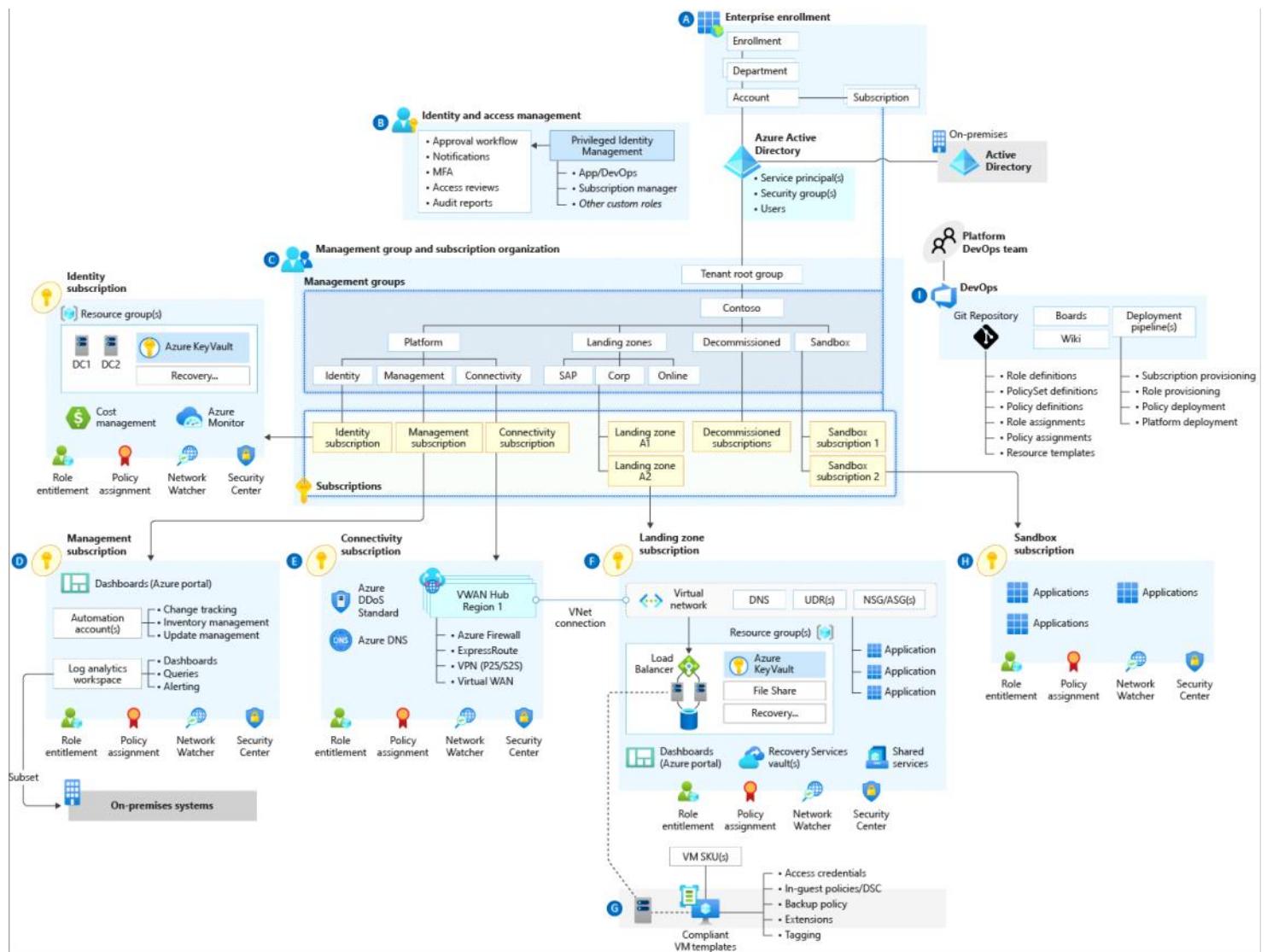
win-10-eus-lab.neerajtech.com.

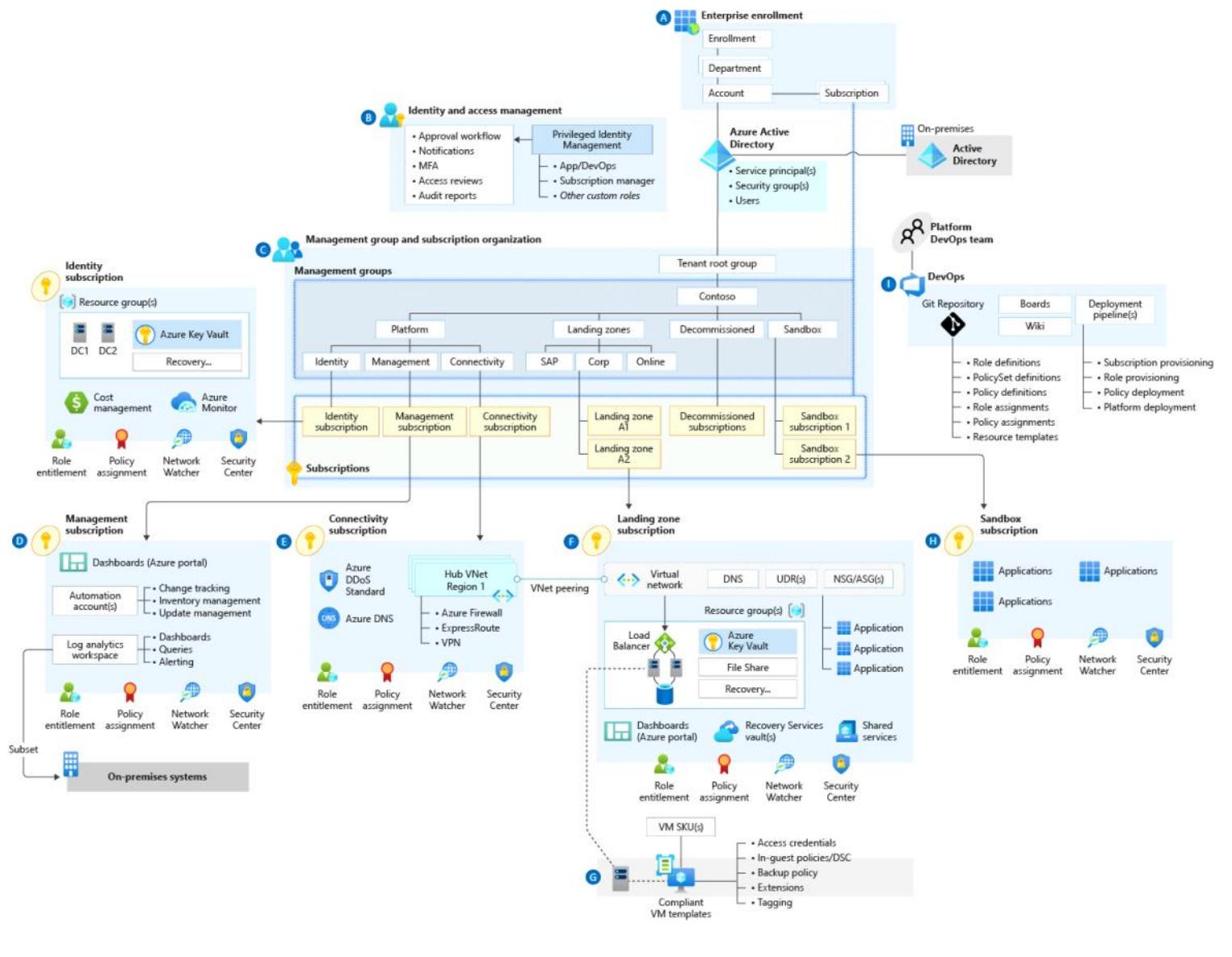
win-10-eus-lab.internal.cloudapp.net

nslookup win-10-eus-lab.internal.cloudapp.net 168.63.129.16

Feature	DDoS Protection Basic	DDoS Protection Standard
Active traffic monitoring & always on detection	●	●
Automatic attack mitigations	●	●
Availability guarantee	○	●
Cost Protection	○	●
Mitigation policies tuned to customers application	○	●
Metrics & alerts	○	●
Mitigation reports	○	●
Mitigation flow logs	○	●
DDoS rapid response support		●

<https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/ready/enterprise-scale/architecture>

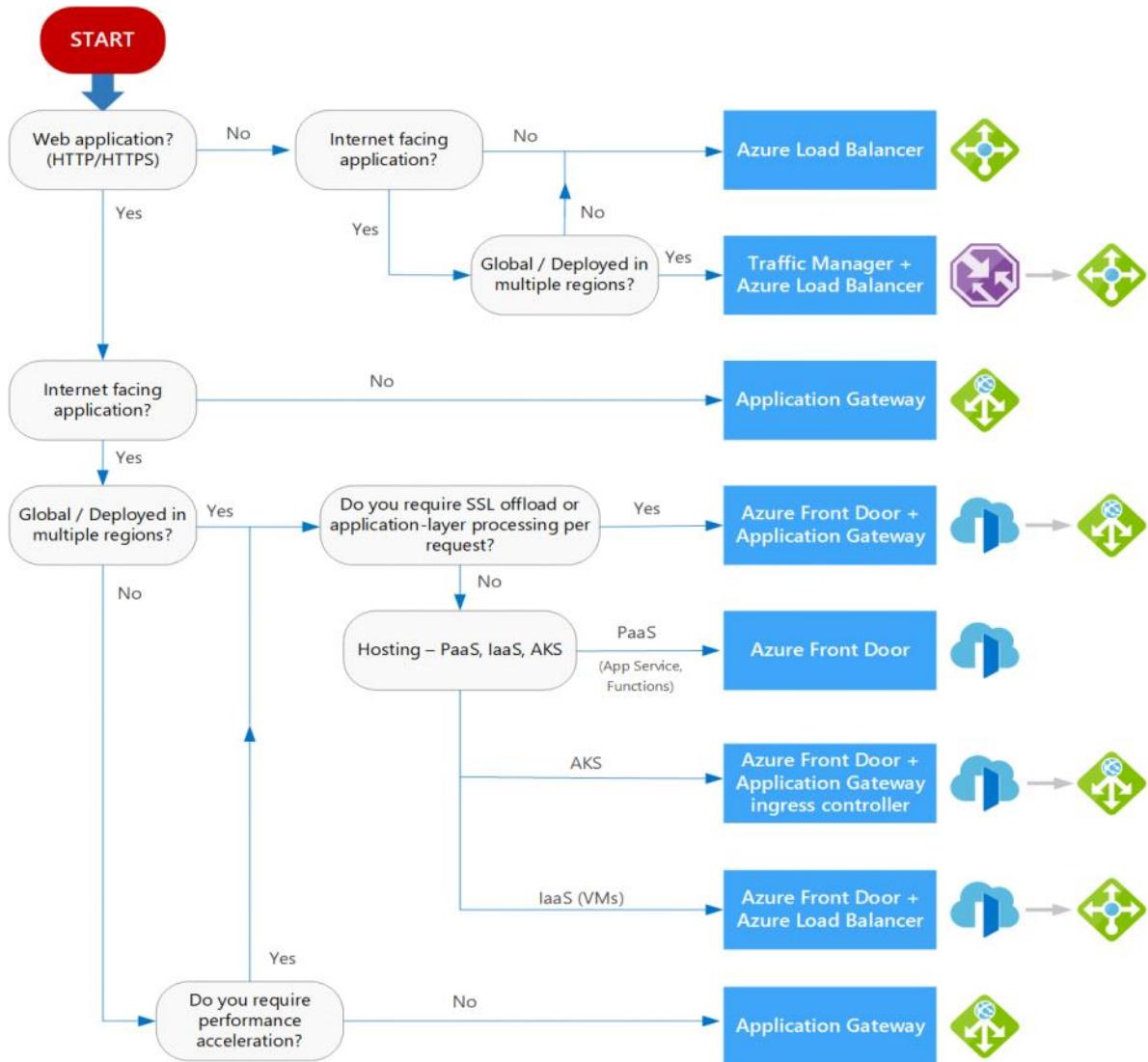




## Load Balancing

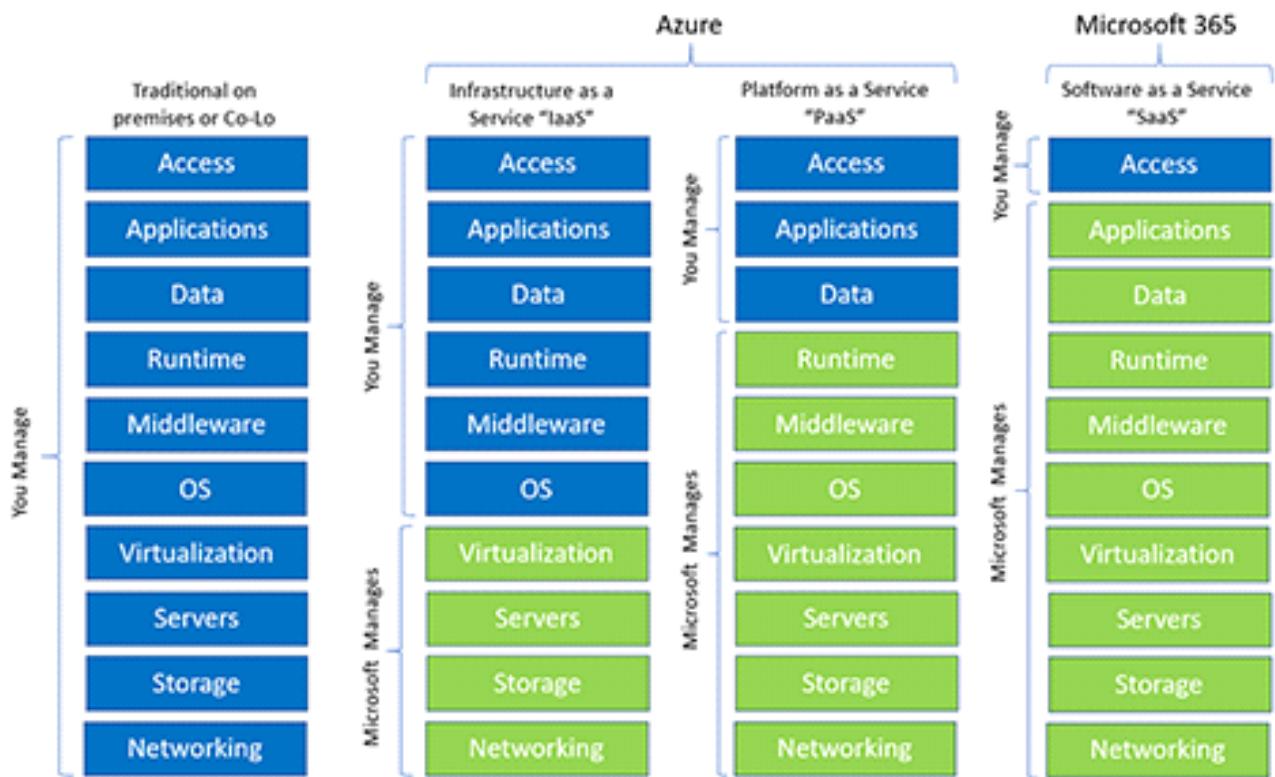
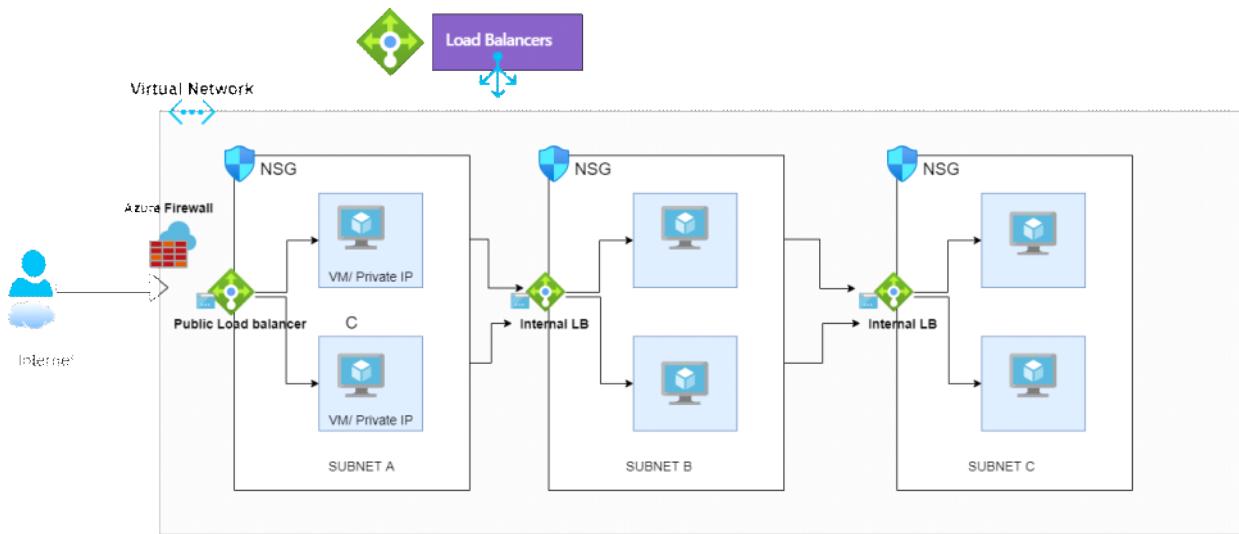
Sunday, June 5, 2022 2:01 PM

### Load Balancing Options



### Load Balancer

- Distribute inbound traffic to backend vm's for scalability & HA
- Layer 4 of OSI- TCP/UDP traffic
- Internal/ Public Facing
- Multiple apps support with multiple IP's & ports
- VM's Must be in same Vnet- can be different AZ's
- Supports Inbound/Outbound use cases- DNAT/SNAT rules
- Supports IPv6 addresses





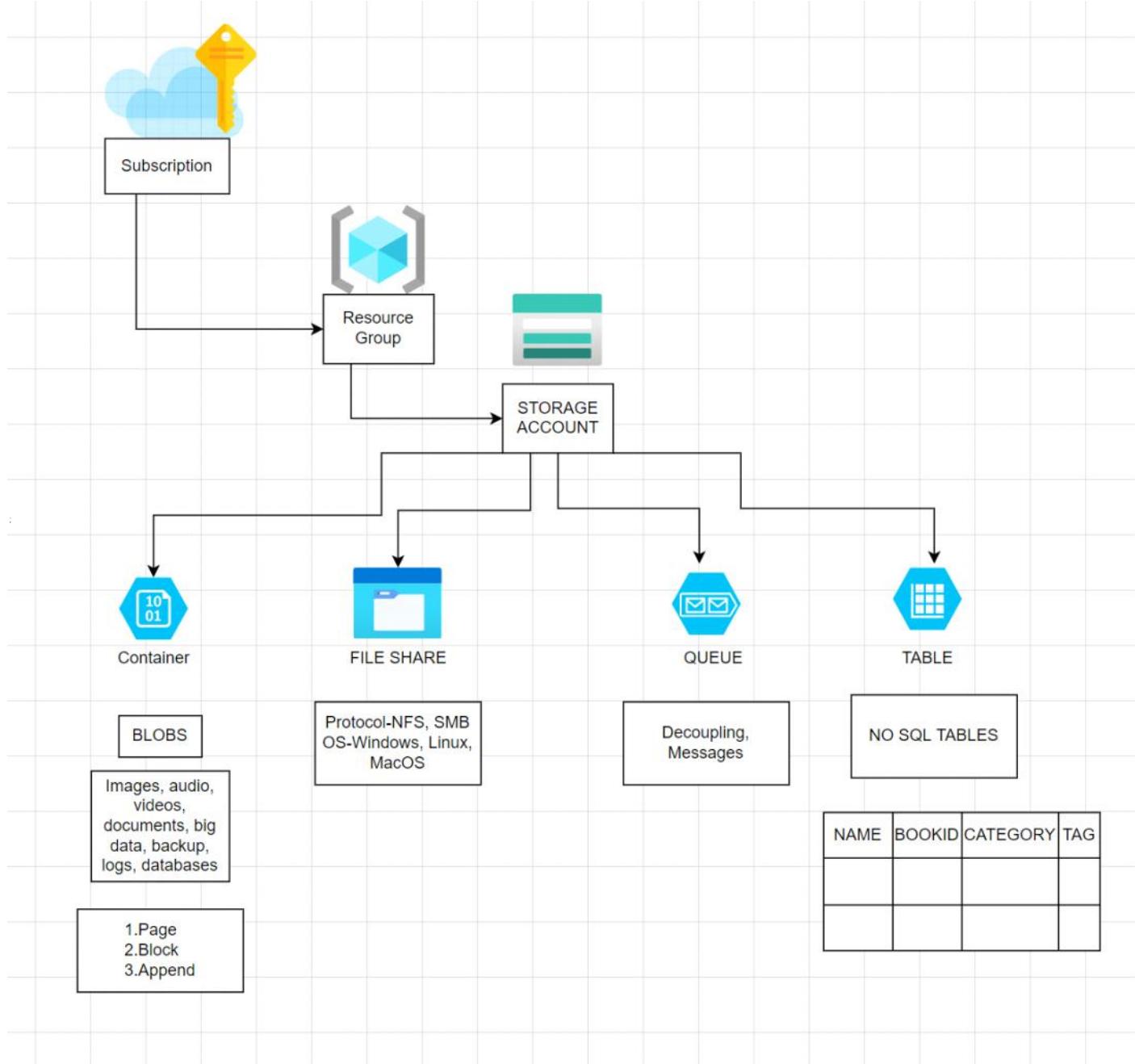
## 07- Storage-main

Saturday, May 21, 2022 6:00 PM

An Azure storage account - Contains Azure Storage data objects, including

- blobs,
- file shares,
- queues,
- tables,
- disks.

### AZURE STORAGE OPTIONS



### Azure Storage

- Object Storage
- 1 storage accounts =5.6 Petabytes storage, only pay for data being stored
- Multiple Data Replication Options
- Storage Tiering options available(Hot, Cool, Archive)
- REST API Compliant

- Multiple client libraries supported-.Net, Java, PHP, Python, Ruby, NodeJS

Blob= Binary large Object= any unstructured data can be uploaded

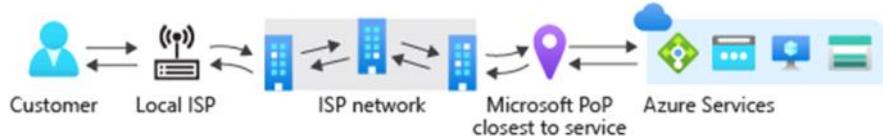
- Blob Storage
  - Used to store massive volumes of unstructured data (raw data, backups etc.)
  - Access files using URL
  - Supports streaming for video & audio files
- File Storage
  - Azure hosted file shares
  - Supports SMB & NFS protocols
  - Supports caching on Windows Servers using File Sync
- Queue Storage
  - Store huge number of messages in a queue up to size of storage account
  - Build asynchronous architecture
  - Limited features – useful in basic scenarios
  - Enterprise Queue/Bus functionality available in Azure Service Bus
- Table Storage
  - Key-value type of NoSQL database
  - Store vast amounts of structured & non-relational data
  - Cosmos DB Table API is similar offering but with many great features

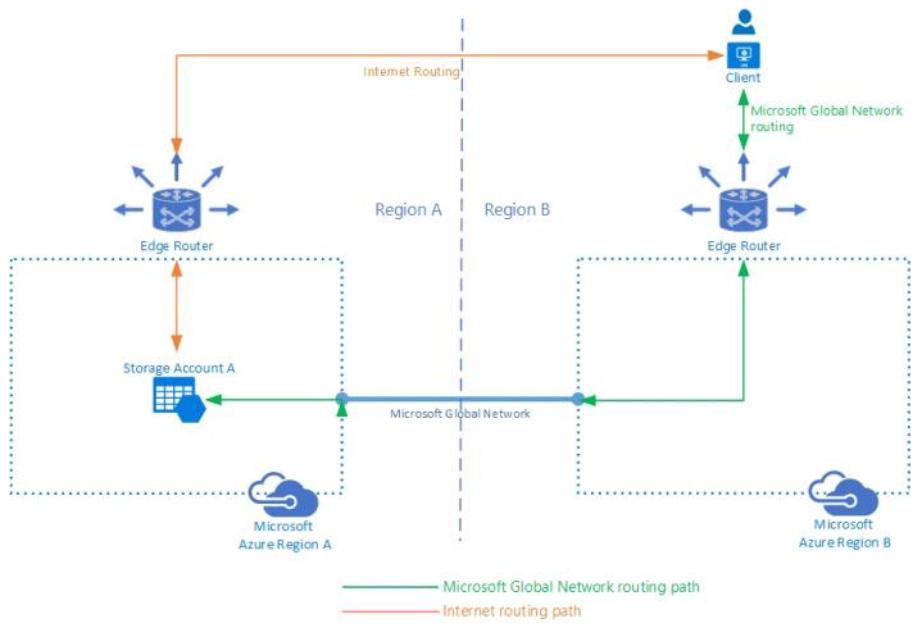
[Architect and optimize your internet traffic with Azure routing preference | Azure Blog and Updates | Microsoft Azure](#)

#### Route via Microsoft global network

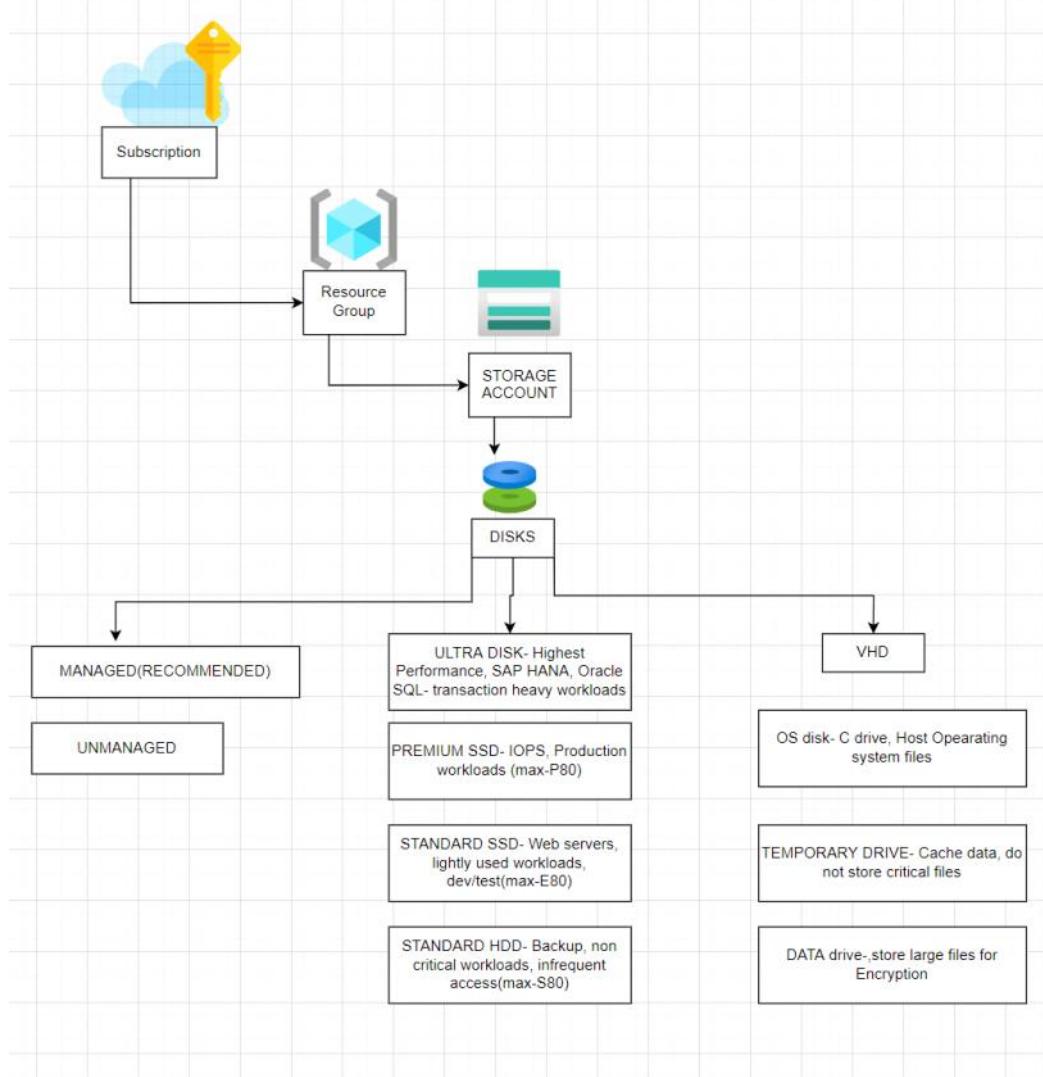


#### Route via ISP network





## DISK OPTIONS



## TYPES OF STORAGE

Type of storage account	Supported storage services	Redundancy options	Usage
Standard general-purpose v2	Blob Storage (including Data Lake Storage1), Queue Storage, Table Storage, and Azure Files	Locally redundant storage (LRS) / geo-redundant storage (GRS) / read-access geo-redundant storage (RA-GRS)  Zone-redundant storage (ZRS) / geo-zone-redundant storage (GZRS) / read-access geo-zone-redundant storage (RA-GZRS)2	Standard storage account type for blobs, file shares, queues, and tables. Recommended for most scenarios using Azure Storage. If you want support for network file system (NFS) in Azure Files, use the premium file shares account type.
Premium block blobs3	Blob Storage (including Data Lake Storage1)	LRS  ZRS2	Premium storage account type for block blobs and append blobs. Recommended for scenarios with high transaction rates or that use smaller objects or require consistently low storage latency. Learn more about example workloads.
Premium file shares3	Azure Files	LRS  ZRS2	Premium storage account type for file shares only. Recommended for enterprise or high-performance scale applications. Use this account type if you want a storage account that supports both Server Message Block (SMB) and NFS file shares.
Premium page blobs3	Page blobs only	LRS	Premium storage account type for page blobs only. Learn more about page blobs and sample use cases.

From <<https://docs.microsoft.com/en-us/azure/storage/common/storage-account-overview>>

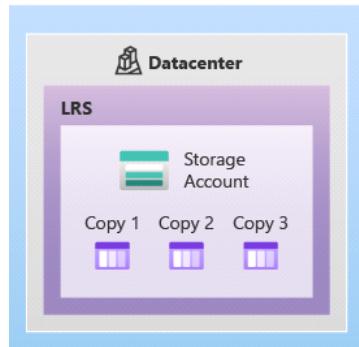
### Storage account endpoints

Storage service	Endpoint
Blob Storage	<a href="https://&lt;storage-account&gt;.blob.core.windows.net">https://&lt;storage-account&gt;.blob.core.windows.net</a>
Data Lake Storage Gen2	<a href="https://&lt;storage-account&gt;.dfs.core.windows.net">https://&lt;storage-account&gt;.dfs.core.windows.net</a>
Azure Files	<a href="https://&lt;storage-account&gt;.file.core.windows.net">https://&lt;storage-account&gt;.file.core.windows.net</a>
Queue Storage	<a href="https://&lt;storage-account&gt;.queue.core.windows.net">https://&lt;storage-account&gt;.queue.core.windows.net</a>
Table Storage	<a href="https://&lt;storage-account&gt;.table.core.windows.net">https://&lt;storage-account&gt;.table.core.windows.net</a>

### Replication Strategies

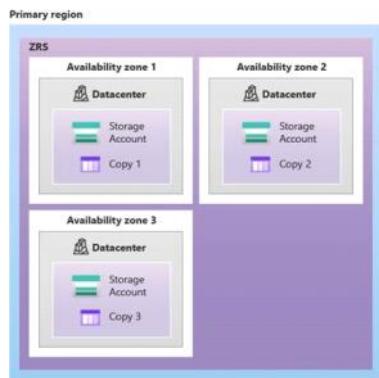
#### Locally redundant storage

### Primary region



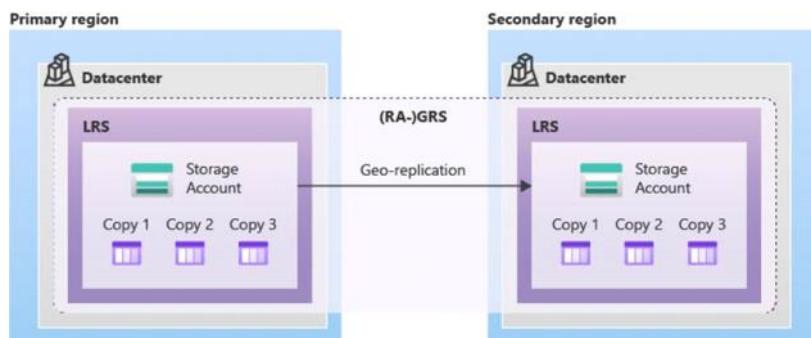
- Three replicas, one region
- Protects against disk, node, rack failures
- Write is acknowledged when all replicas are committed
- Superior to dual-parity RAID

### Zone-redundant storage



- Three replicas, three zones, one region
- Protects against disk, node, rack, and zone failures
- Synchronous writes to all three zones

### Geo-redundant storage



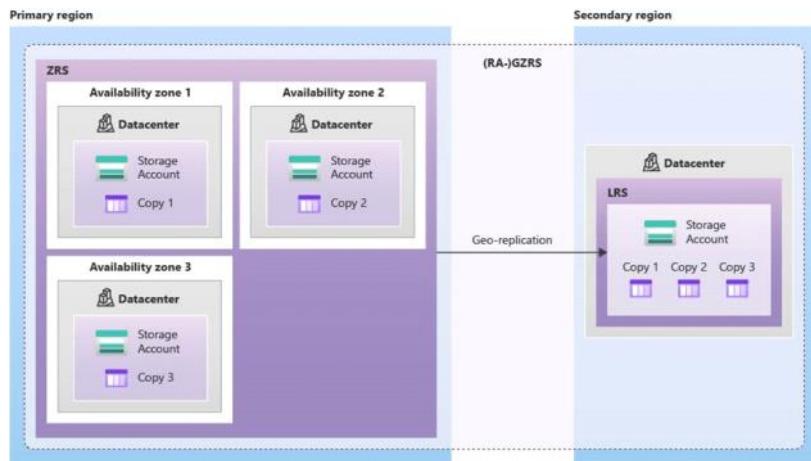
- Six replicas, two regions (three per region)
- Protects against major regional disasters
- Asynchronous copy to secondary

### Read Access- Geo-redundant storage (RA-GRS)

- GRS + read access to secondary
- Separate secondary endpoint

- Recovery point objective (RPO) delay to secondary can be queried

### Geo-zone-redundant storage(GZRS)



- Six replicas, 3+1 zones, two regions
- Protects against disk, node, rack, zone, and region failures
- Synchronous writes to all three zones and asynchronous copy to secondary

### Read Access-Geo-zone-redundant storage (RA-GZRS)

- GZRS + read access to secondary
- Separate secondary endpoint
- RPO delay to secondary can be queried

For more info see-[Link](#)

### Storage Endpoints

Nslookup yield public IP of storage pools

nslookup storagedemose.blob.core.windows.net

```

Server: UnKnown
Address: 168.63.129.16

Name: blob.blz21prdstr06a.store.core.windows.net
Address: 20.150.90.36
Aliases: storagedemose.blob.core.windows.net
  
```

### Private Endpoint

After adding private endpoint nslookup yields private IP of the PE Network Interface Card on a VM allowed to connect to a Storage account

Basics

Resource

3 Virtual Network

4 DNS

5 Tags

6 Review + create

Use private endpoints to privately connect to a service or resource. Your private endpoint must be in the same region as your virtual network, but can be in a different region from the private link resource that you are connecting to. [Learn more](#)

**Project details**

Subscription \*

Azure Pass - Sponsorship



Resource group \*

07\_AZ-104\_Module-07



[Create new](#)

**Instance details**

Name \*

private-endpoint-01



Network Interface Name \*

private-endpoint-01-nic



Region \*

East US



# Create a private endpoint

...

✓ Basics

✓ Resource

③ Virtual Network

④ DNS

⑤ Tags

⑥ Review + create

Private Link offers options to create private endpoints for different Azure resources, like your private link service, a SQL server, or an Azure storage account. Select which resource you would like to connect to using this private endpoint. [Learn more](#)

Connection method ①

Connect to an Azure resource in my directory.

Connect to an Azure resource by resource ID or alias.

Subscription \* ①

Azure Pass - Sponsorship



Resource type \* ①

Microsoft.Storage/storageAccounts



Resource \* ①

storagedemose



Target sub-resource \* ①

blob

blob

table

queue

file

web

dfs

< Previous

Next : Virtual Network >

## Create a private endpoint

✓ Basics ✓ Resource 3 Virtual Network 4 DNS 5 Tags 6 Review + create

### Networking

To deploy the private endpoint, select a virtual network subnet. [Learn more](#)

Virtual network \* ⓘ 07\_AZ-104\_Module-07-vnet

Subnet \* ⓘ 07\_AZ-104\_Module-07-vnet/default (10.0.0.0/24)

Enable network policies for all private endpoints in this subnet. [Learn more ↗](#)

### Private IP configuration

- Dynamically allocate IP address  
 Statically allocate IP address

### Application security group

Configure network security as a natural extension of an application's structure. ASG allows you to group virtual machines and define network security policies based on those groups. You can specify an application security group as the source or destination in an NSG security rule. [Learn more](#)

+ Create

Application security group

< Previous

Next : DNS >

## Create a private endpoint

✓ Basics ✓ Resource ✓ Virtual Network 4 DNS 5 Tags 6 Review + create

### Private DNS integration

To connect privately with your private endpoint, you need a DNS record. We recommend that you integrate your private endpoint with a private DNS zone. You can also utilize your own DNS servers or create DNS records using the host files on your virtual machines. [Learn more](#)

Integrate with private DNS zone  Yes  No

Configuration name

Subscription

Resource group

Private DNS zone

privatelink-blob-core-win...

Azure Pass - Sponsor... ⏺

07\_AZ-104\_Module-07 ⏺

(new) privatelink.blob.cor...

**private-endpoint-01 | DNS configuration**

Private endpoint

Search (Ctrl+ /) Add configuration Refresh

Overview Activity log Access control (IAM) Tags Diagnose and solve problems

Settings Application security groups DNS configuration Properties Locks

Monitoring Insights Alerts Metrics

Automation Tasks (preview) Export template

Support + troubleshooting

**Private DNS integration**

To connect privately with your private endpoint, you need a DNS record. We recommend that you integrate your private endpoint using a private DNS zone. You can also utilize your own DNS servers. [Learn more](#)

**Customer Visible FQDNs**

DNS records visible to the customer

Network Interface	IP addresses	FQDN
private-endpoint-01-nic	10.0.0.5	storagedemose.blob.core.windows.net

**Configuration name FQDN IP address Subscription Private DNS zone DNS zone group**

privatetlink-blob-...	storagedemose.privatetlink...	10.0.0.5	Azure Pass - Sponsorship	privatetlink.blob.core...	default
-----------------------	-------------------------------	----------	--------------------------	---------------------------	---------

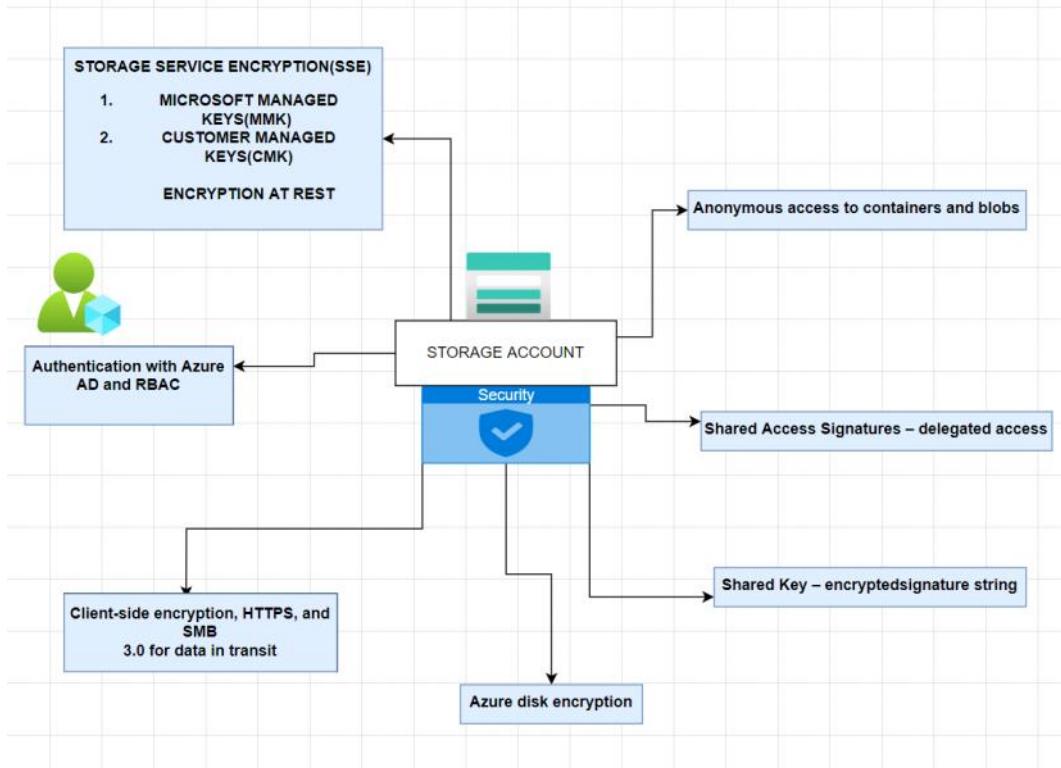
```
nslookup storagedemose.blob.core.windows.net
```

```
Server: UnKnown
Address: 168.63.129.16

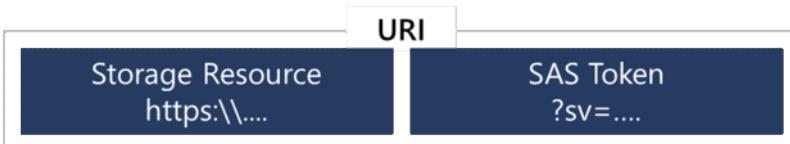
Name: storagedemose.privatetlink.blob.core.windows.net
Address: 10.0.0.5
Aliases: storagedemose.blob.core.windows.net
```

```
PS C:\Users\Neeraj>
```

## STORAGE ACCOUNT SECURITY



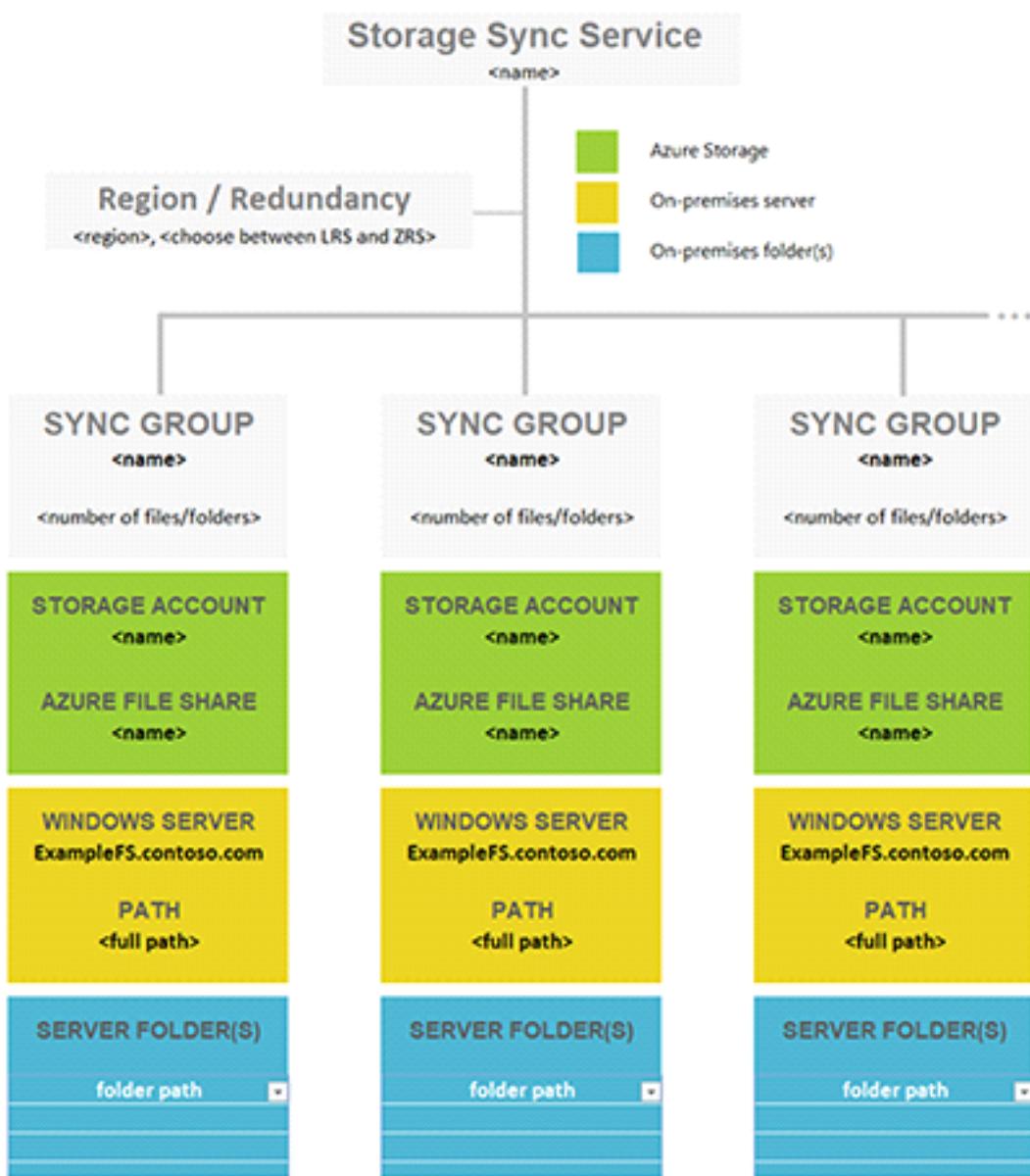
## SAS URI



`https://myaccount.blob.core.windows.net/?sp=r&st=2020-05-11T18:31:43Z&se=2020-05-12T02:31:43Z&spr=https&sv=2019-10-10&sr=b&sig=j0qABJZHfUVeBQ3yVn7kWiCKl00sxCiK1rzEchfAz8U%3D`

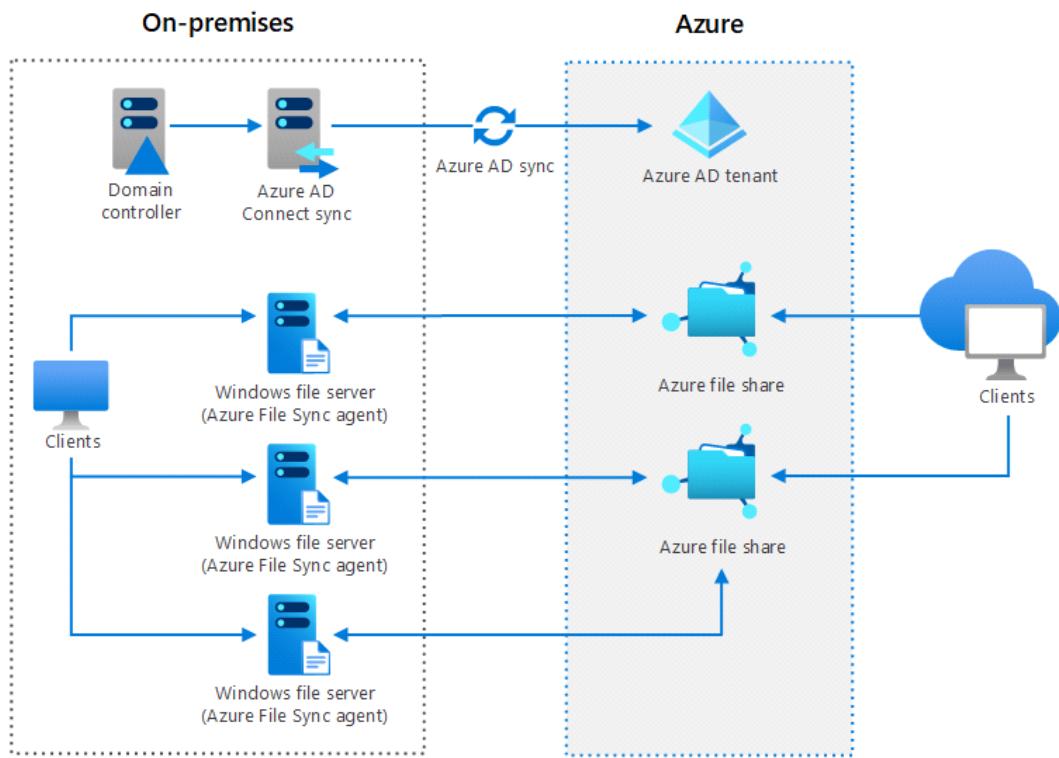
Includes parameters for resource URI, storage services version, services, resource types, start time, expiry time, resource, permissions, IP range, protocol, signature

## FILE SYNC



Azure File  
Sync - Na...

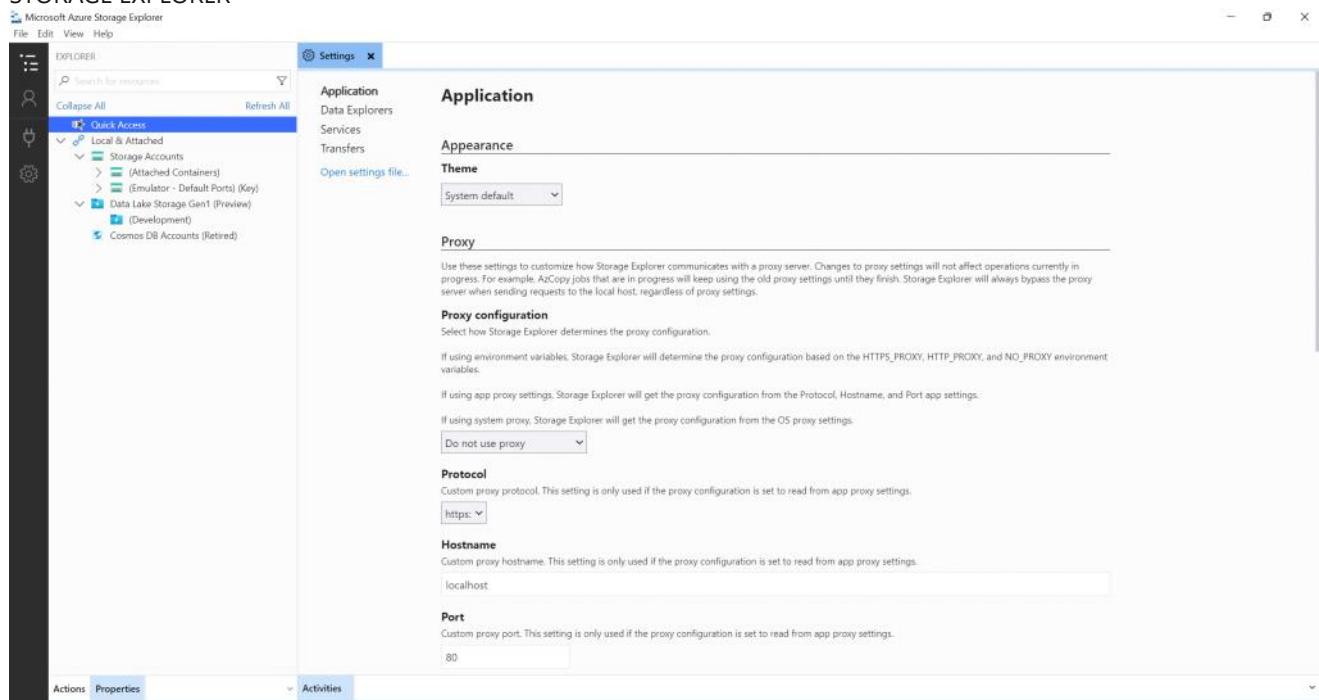
<https://docs.microsoft.com/en-us/azure/storage/file-sync/file-sync-planning>



<https://docs.microsoft.com/en-us/azure/architecture/hybrid/hybrid-file-services>

## STORAGE TOOLS

### STORAGE EXPLORER



## IMPORT EXPORT SERVICE

Azure Migrate | Data Box

Microsoft

Transfer type \*  Import to Azure  Export from Azure

Subscription \* Azure Pass - Sponsorship Resource group \* Expt-RG Source country/region \* United States Destination Azure region \* East US

**Data Box Disk**

35 TB Total usable capacity per order

- Up to 5 disks per order
- Supports Azure Blobs, Files, Managed Disks and ADLS Gen2 accounts
- Copy data to 1 storage account
- USB 3.1/SATA interface
- Refer [pricing page](#) for details.

[Learn more](#)

**Data Box**

80 TB Total usable capacity per order

- 10 day use at no extra cost
- Supports Azure Blobs, Files, Managed Disks and ADLS Gen2 accounts
- Copy data across 10 storage accounts
- 1x1/10 Gbps RJ45, 2x10 Gbps SFP+ interface
- Refer [pricing page](#) for details.

[Learn more](#)

**Data Box Heavy**

800 TB Total usable capacity per order

- 20 day use at no extra cost
- Supports Azure Blobs, Files, Managed Disks and ADLS Gen2 accounts
- Copy data across 10 storage accounts
- 4x1 Gbps, 4x40 Gbps interface
- Refer [pricing page](#) for details.

[Learn more](#)

**Import/Export Job**

1 TB Onwards

- Send up to 10 disks per order
- Supports SATA/SSD disks. [Supported hardware](#)
- Supports Azure Blobs and Files
- Copy data to 1 storage account
- SATA II/III interface
- 5,764 INR Handling fee per disk

[Learn more](#)

**Note:** Azure Data Box is not available for the selected subscription type. Select a different subscription or [Send a request to the operations team for consideration](#).

## AZCOPY

```
azcopy copy "C:\local\path" "sas uri" --recursive=true
```

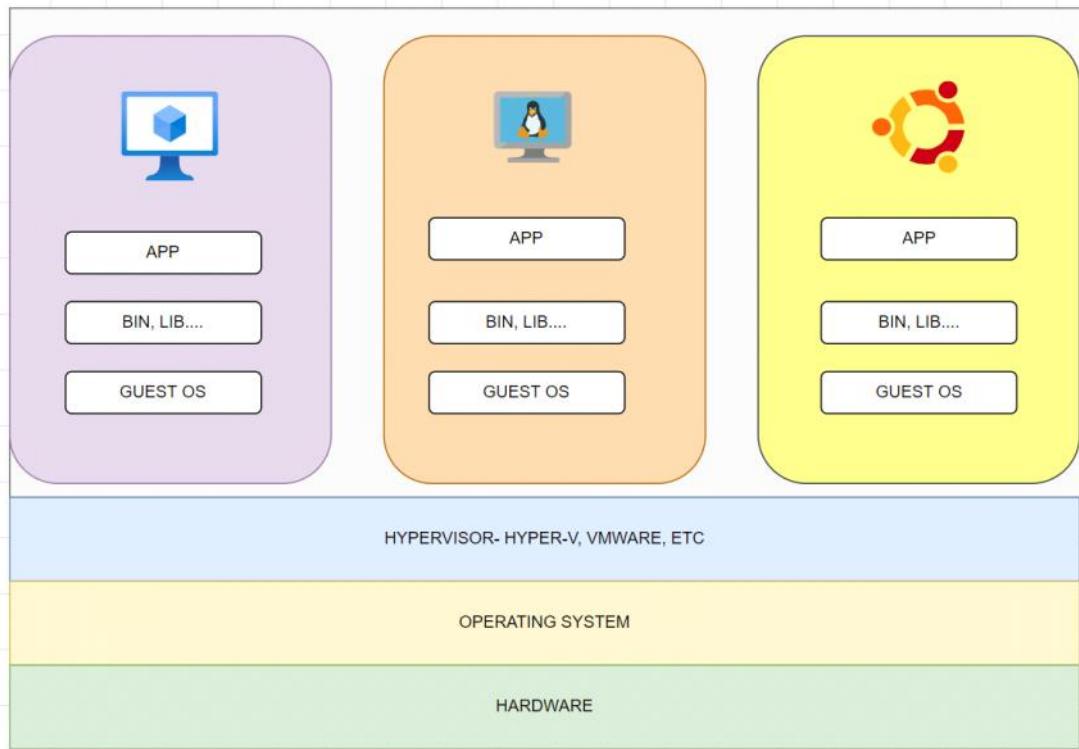
```
azcopy copy "C:\local\path" "sas uri" --recursive=true
```

## 08- COMPUTE

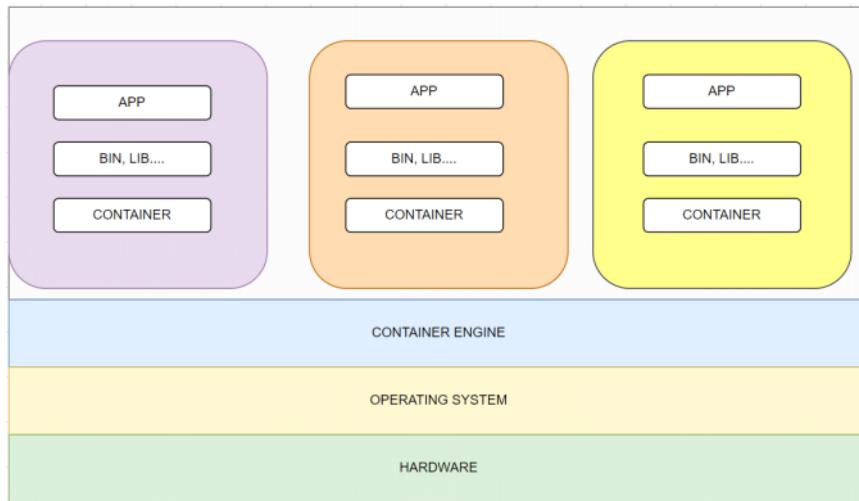
Saturday, May 21, 2022 7:36 PM

### Virtual Machines

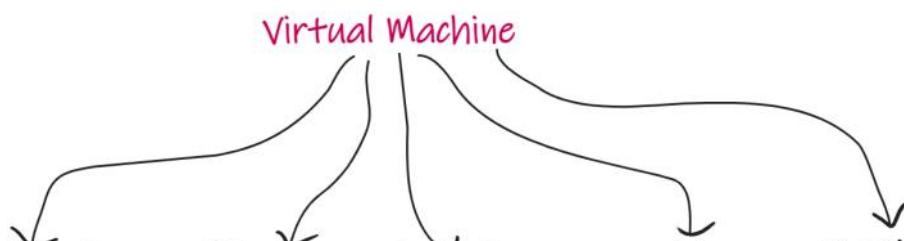
#### Virtual Machine Architecture

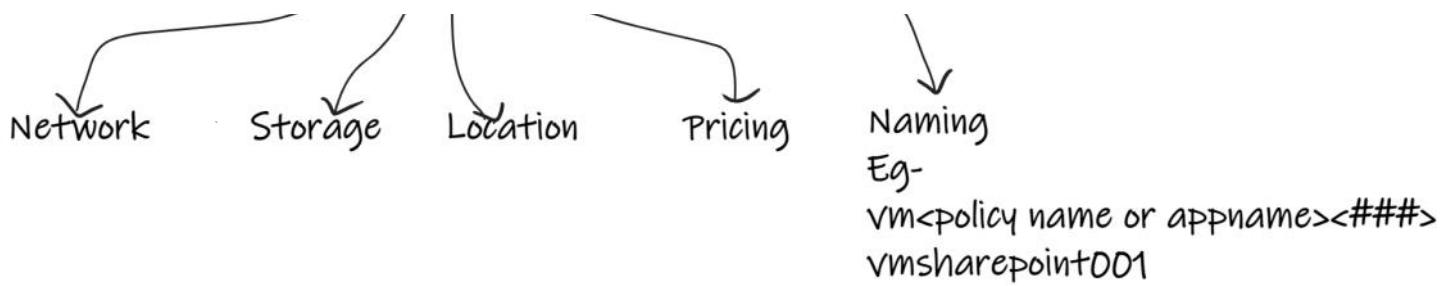


### Containers



### VM Planning





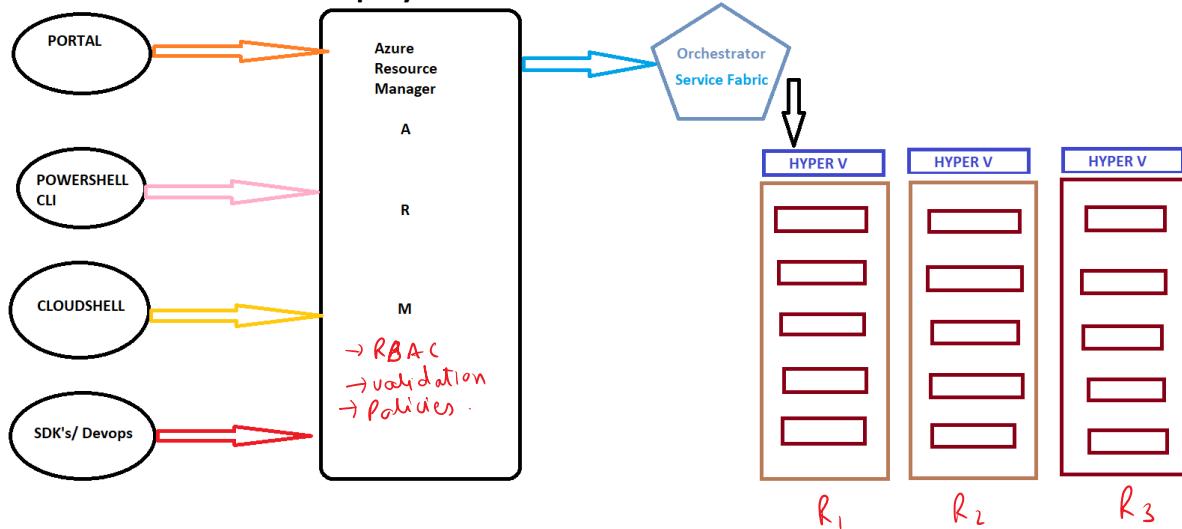
#### VM Sizing

## Virtual Machine Sizing

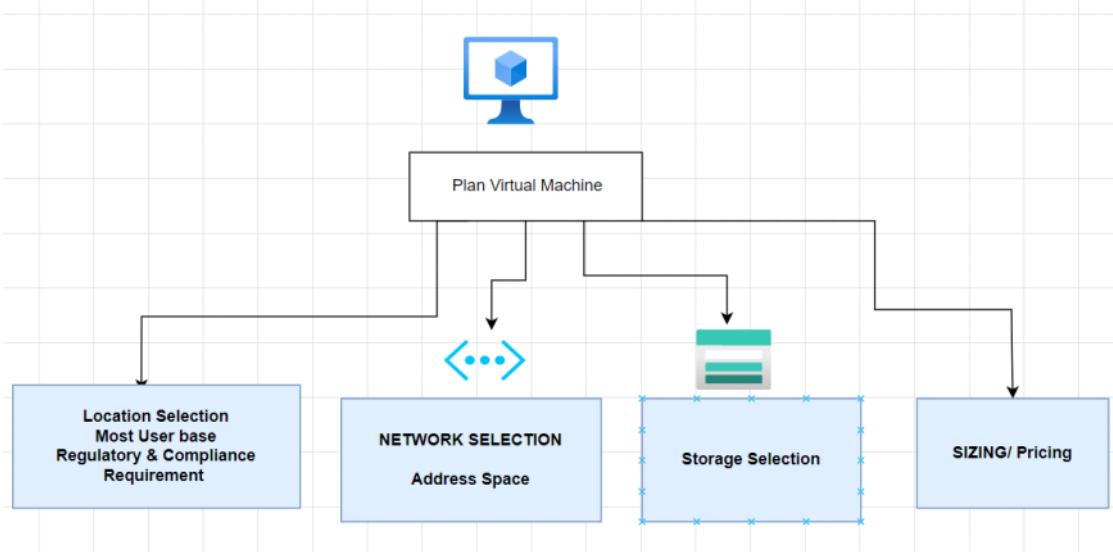
General Purpose  
Compute Optimized  
Memory Optimized  
GPU Optimized  
High Performance  
Compute  
Storage optimized

#### How VM Gets Deployed

## How Azure Resource Deployment works

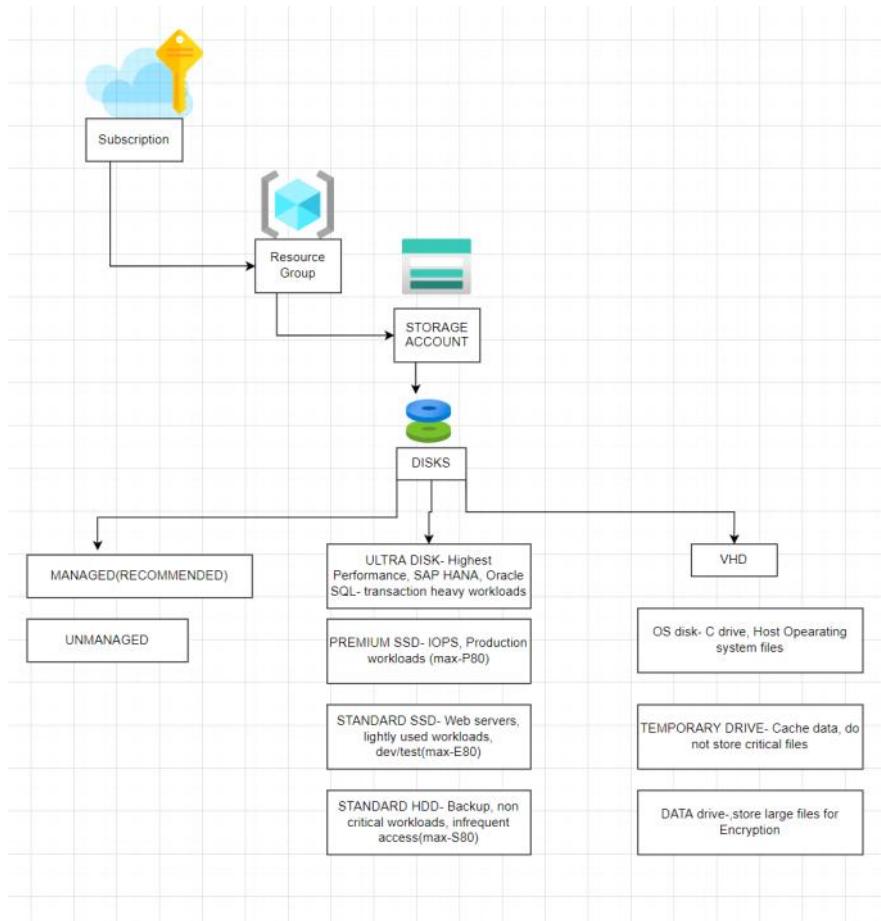


## Planning Virtual Machines



- Start with the network
- Name the VM
- Decide the location for the VM
- Determine the size of the VM
- Understanding the pricing model
- Storage for the VM
- Select an operating system

## Virtual Machine Storage



Each Azure VM has two or more disks:

- OS disk
- Temporary disk (contents can be lost)
- Data disks (optional)

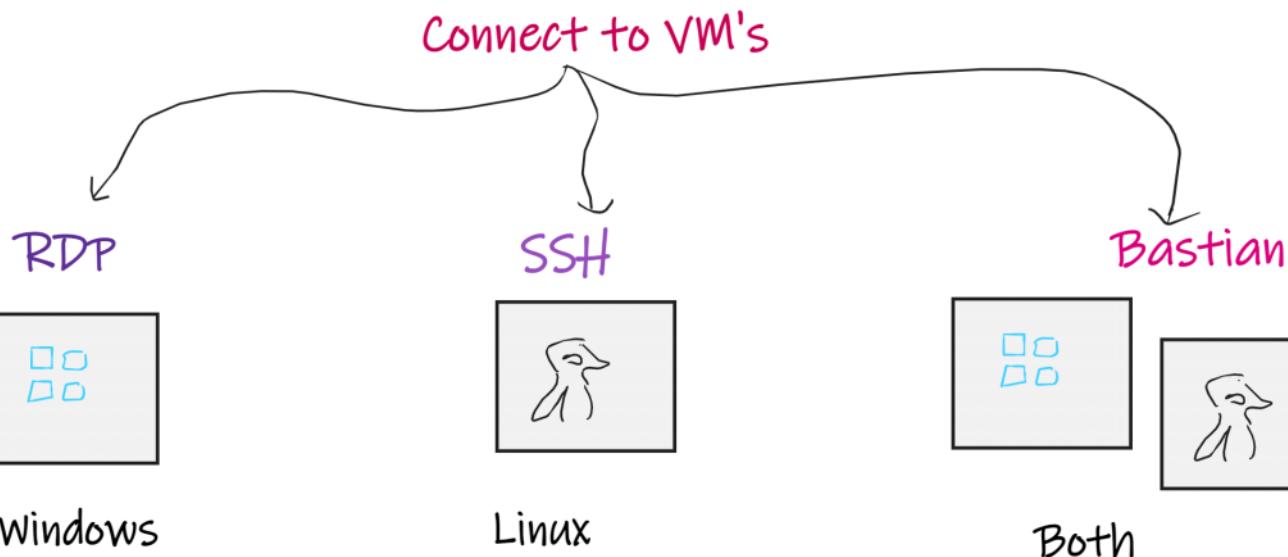
OS and data disks reside in Azure Storage accounts:

- Azure-based storage service
- Standard (HDD, SSD) or Premium (SSD), or Ultra (SSD)

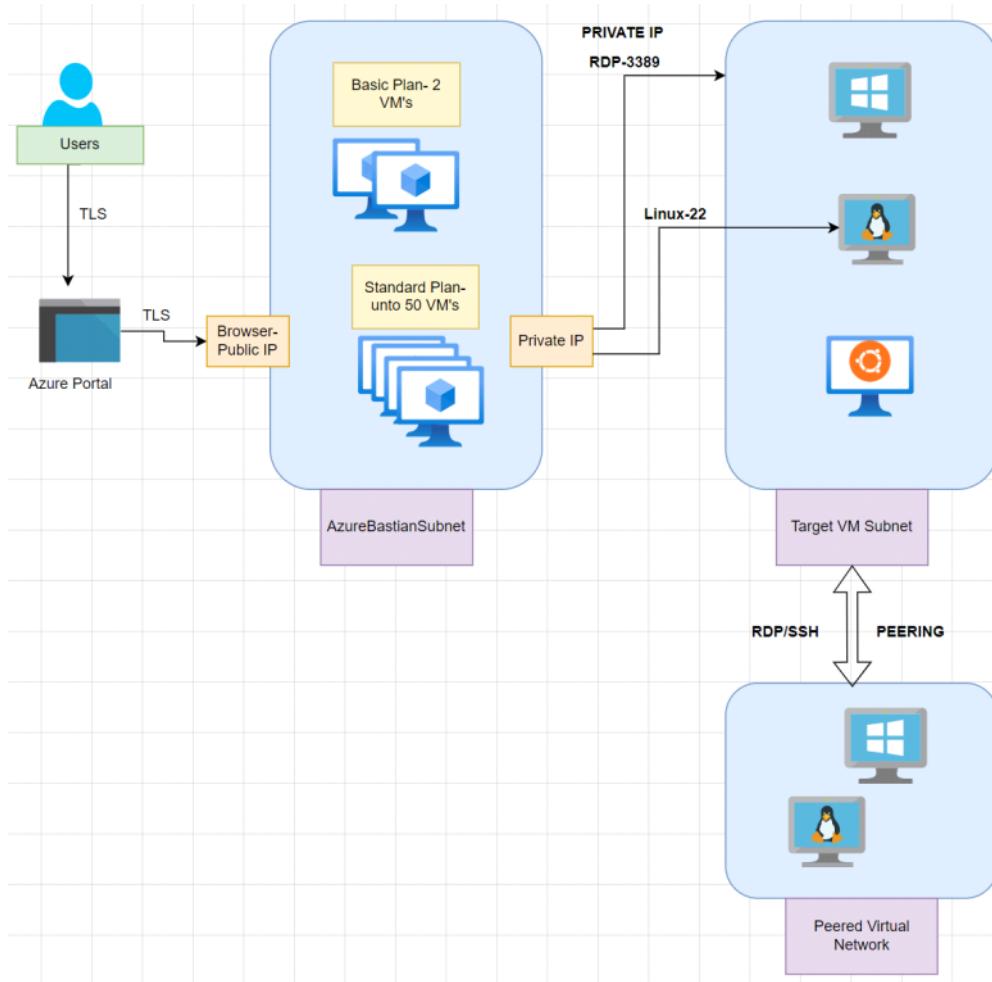
When creating an Azure VM, you can choose between:

- Managed disks (recommended)
- Unmanaged disks

#### **VM Connection Options-**



#### 1 > Azure Bastian

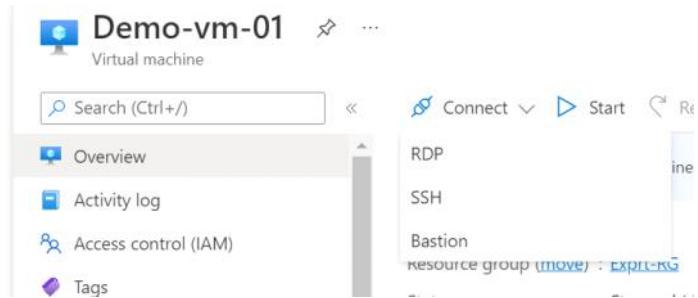


Azure Bastion provides a secure remote connection from the Azure portal to Azure virtual machines (VMs) over Transport Layer Security (TLS). Provision Azure Bastion to the same Azure virtual network as your VMs or to a peered virtual network. Then connect to any VM on that virtual network or a peered virtual network directly from the Azure portal.

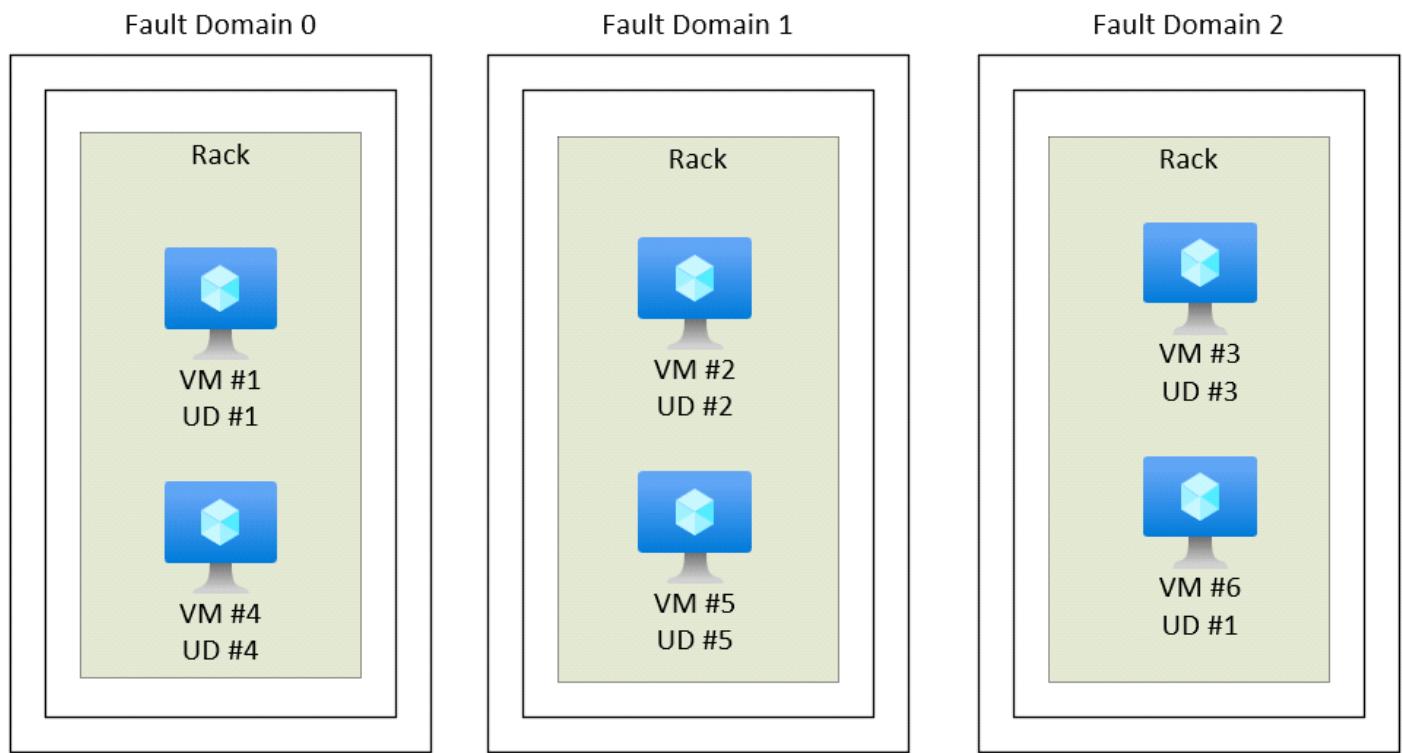
<https://docs.microsoft.com/en-us/azure/bastion/bastion-overview>

2>RDP for Window

3>SSH For Linux



## Availability Set



### Fault domain

- Prevent Hardware failures like limit the impact of potential physical hardware failures, network outages, or power interruptions
- 1 Rack that share common power source and network switch.
- Max= 3 FD per availability set, Default value=2

### Update domain

- Max= 20 UD, Default=5
- Update domains indicate groups of virtual machines and underlying physical hardware that can be rebooted at the same time
- The order of update domains being rebooted may not proceed sequentially during planned maintenance, but only one update domain is rebooted at a time. A rebooted update domain is given 30 minutes to recover before maintenance is initiated on a different update domain.

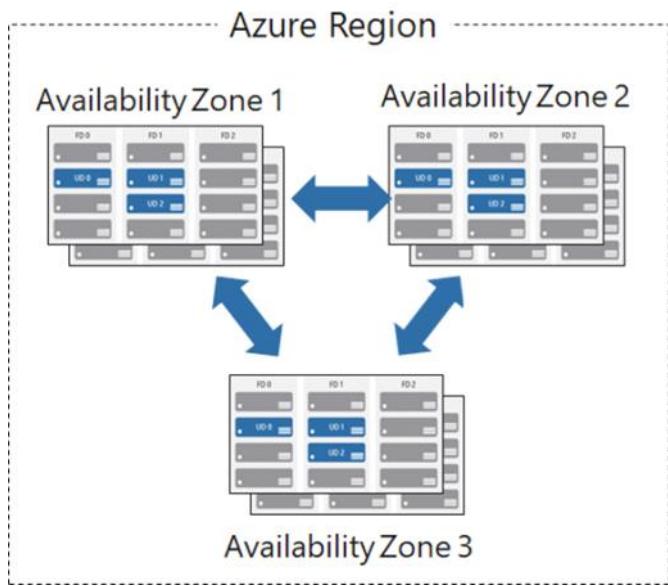
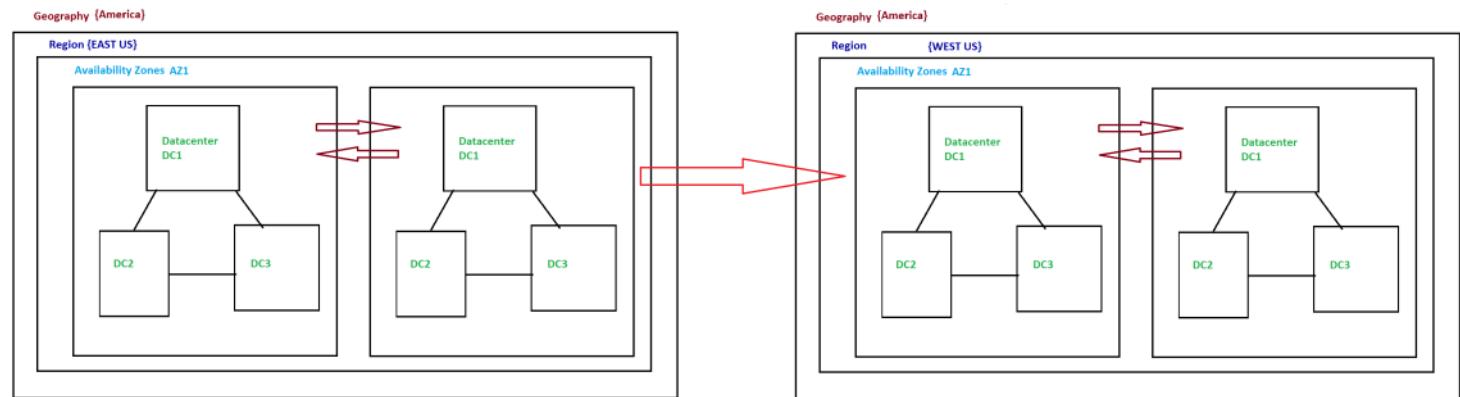
Two or more instances in **Availability Sets = 99.95% SLA**

#### Instance details

Name *	<input type="text" value="avset01"/> ✓
Region *	<input type="text" value="(US) East US"/> ▾
Fault domains	<input type="text" value="2"/>
Update domains	<input type="text" value="5"/>
Use managed disks	<input type="radio" value="No (Classic)"/> <input checked="" type="radio" value="Yes (Aligned)"/>

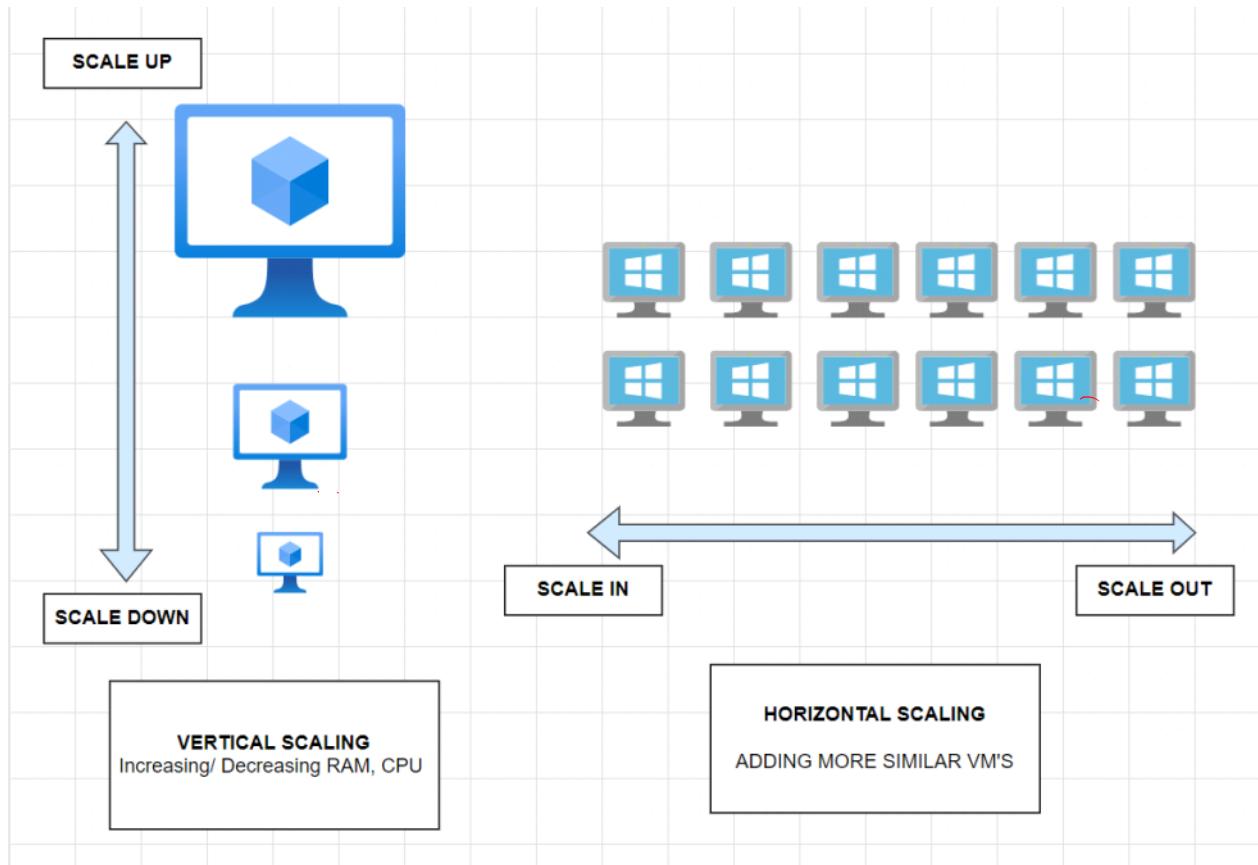
<https://docs.microsoft.com/en-us/azure/virtual-machines/availability-set-overview>

## AVAILABILITY ZONES



- Unique physical locations in a region
- Includes datacenters with independent power, cooling, and networking
- Protects from datacenter failures
- Combines update and fault domains
- Provides 99.99% SLA

## Scaling



- Vertical scaling (scale up and scale down) is the process of increasing or decreasing power to a single instance of a workload; usually manual
- Horizontal scaling (scale out and scale in) is the process of increasing or decreasing the number of instances of a workload; frequently automated

## VM extensions

## Install an Extension

...

<input type="text"/> Search		
 <b>Acronis Backup</b> Acronis, Inc. The most complete, cost-effective and easy-to-manage hybrid local and cloud backup solution available	 <b>Agent for Cloud Workload Protection (Windows)</b> Symantec Corp. Symantec Cloud Workload Protection provides strong security for servers with application protection, intrusion detection/prevention, real-time Anti-	 <b>Agent for Windows Server Monitoring</b> Site24x7 Ensure your Windows server and applications are up and running with our performance data and on-time alerts
 <b>AMD GPU Driver Extension</b> Microsoft Corp. Microsoft Azure Extension for AMD GPU Drivers	 <b>APM Insight .NET Agent</b> Site24x7 Get real time, comprehensive data on all your .NET web applications using Site24x7 APM Insight.	 <b>Application Insights Agent (.NET Preview)</b> Microsoft Corp. Application Insights Agent (.NET Preview)
 <b>Azure AD based Windows Login</b> Microsoft Corp. This extension configures your Windows VM for Azure AD based login.	 <b>Azure Performance Diagnostics</b> Microsoft Corp. Azure Performance Diagnostics extension helps monitor and troubleshoot various performance issues on the VM	 <b>Azure Pipelines Agent</b> Microsoft Corp. Azure Pipelines agent for deployment groups
		

## Desired State Configuration

```
configuration IISInstall
{
  Node "localhost"
  {
    WindowsFeature IIS
    {
      Ensure = "Present"
      Name = "Web-Server"
    }
  }
}
```

- Configuration block(s) have a name
- Node blocks define the computers or VMs that you are configuring
- Resource block(s) configure the resource and its properties
- There are many built-in configuration resources

## 09-Webapp

Sunday, May 22, 2022 11:00 AM

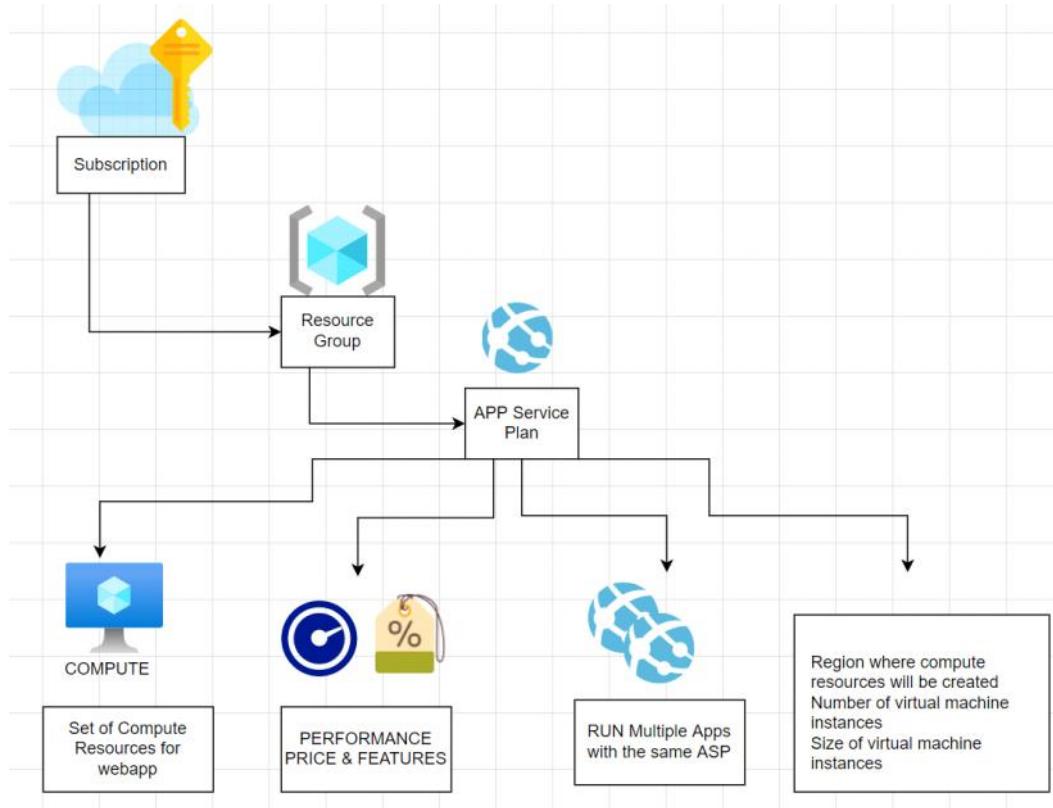
A fully managed platform (PaaS) for building, deploying, and scaling your web apps.

- Different types of App Services: Web Apps, Web Apps for Containers, and API Apps
- Automatically patches and maintains the OS and language frameworks.
- App Service can scale up or out manually or automatically.

App Service supports the following languages:

- .NET
- .NET Core
- Java
- Ruby
- Node.js
- PHP
- Python

### APP SERVICE PLAN



### APP Service Plan Pricing

Region: Central India

Currency: India – Rupee (₹) INR

Display pricing by: Hour

1 USD = 76.53 INR

	Free Try for free	Shared Environment for dev/test	Basic Dedicated environment for dev/test	Standard Run production workloads	Premium Enhanced performance and scale	Isolated High-Performance, Security and Isolation
Web, mobile or API apps	10	100	Unlimited	Unlimited	Unlimited	Unlimited
Disk space	1 GB	1 GB	10 GB	50 GB	250 GB	1 TB
Maximum instances	–	–	Up to 3	Up to 10	Up to 30*	Up to 100
Custom domain	–	Supported	Supported	Supported	Supported	Supported
Auto Scale	–	–	–	Supported	Supported	Supported
Hybrid Connectivity	–	–	Supported	Supported	Supported	Supported
Virtual Network Connectivity	–	–	–	Supported	Supported	Supported
Private Endpoints	–	–	–	–	Supported	Supported
Compute Type	Shared	Shared	Dedicated	Dedicated	Dedicated	Isolated
Pay as you go price	Free	₹1.156/hour	₹6.352/hour	₹8.419/hour	₹16.837/hour	₹34.531/hour

<https://azure.microsoft.com/en-in/pricing/details/app-service/windows/>

#### HTML Code

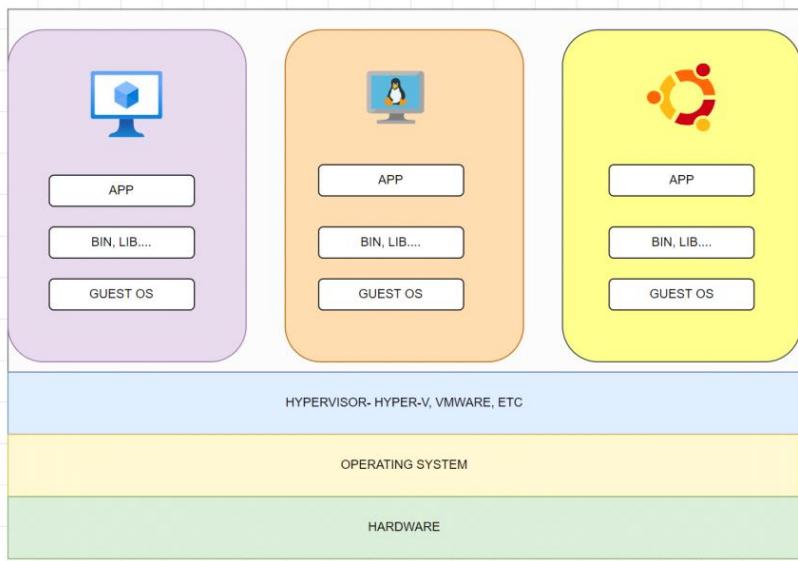
```
<body style= "background-color:lightblue">
<h1>Microsoft learning Webapp</h1>
<h2></h2>
<h3>Azure Solutions architect</h3>
<h4>Course Content</h4>
<p></p>
<p>1_Intro to azure</p>
<p>2_Azure Networking</p>
<p>3_Azure Compute</p>
<p>4_Azure Storage</p>
<p>5_Azure Active directory</p>
</body>
```

## 09-Containers & AKS

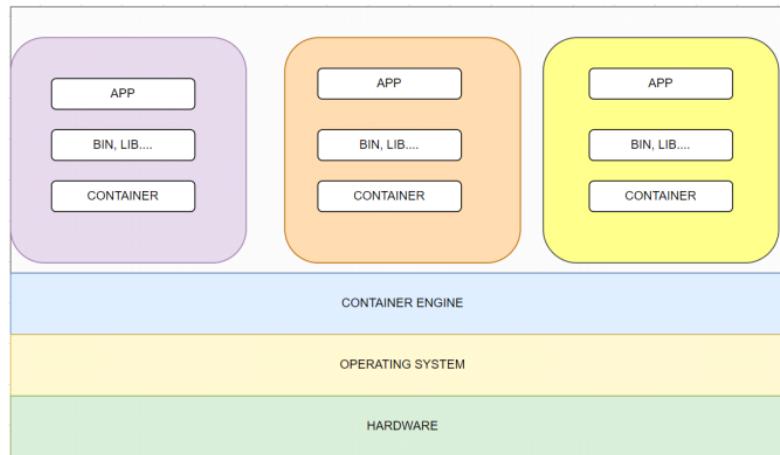
Monday, June 13, 2022 4:05 PM

Virtual Machine vs a Container

### Virtual Machine



### Containers



#### Virtual Machine:

- It runs on top of an emulating software called the hypervisor which sits between the hardware and the virtual machine.
- The hypervisor is the key to enable virtualization. It manages the sharing of physical resources into virtual machines.
- Each virtual machine runs its own guest operating system. They are less agile and have low portability than containers.

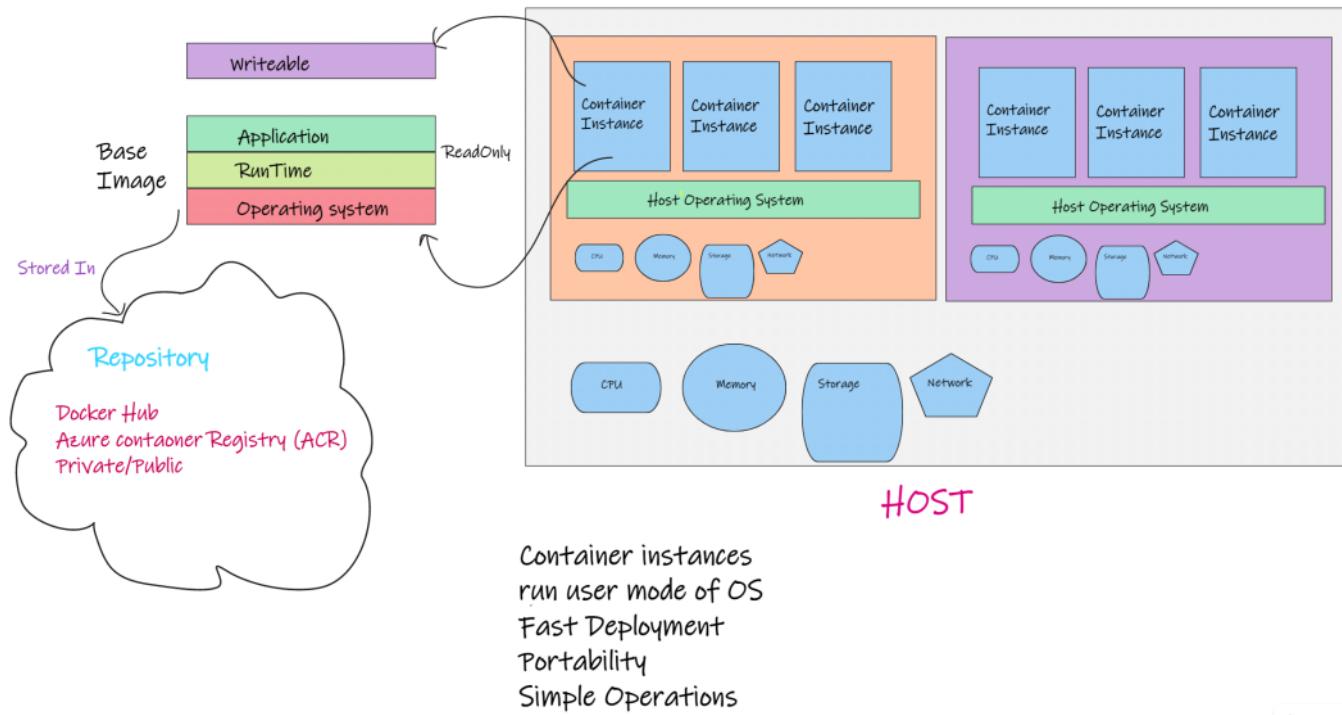
#### Container:

- It sits on the top of a physical server and its host operating system.
- They share a common operating system that requires care and feeding for bug fixes and patches.
- They are more agile and have high portability than virtual machines.

SNo.	Virtual Machines(VM)	Containers
1	VM is piece of software that allows you to install other software inside of it so you basically control it virtually as opposed to installing the software directly on the computer.	While a container is a software that allows different functionalities of an application independently.
2.	Applications running on VM system can run different OS.	While applications running in a container environment share a single OS.
3.	VM virtualizes the computer system.	While containers virtualize the operating system only.
4.	VM size is very large.	While the size of container is very light; i.e. a few megabytes.
5.	VM takes minutes to run, due to large size.	While containers take a few seconds to run.

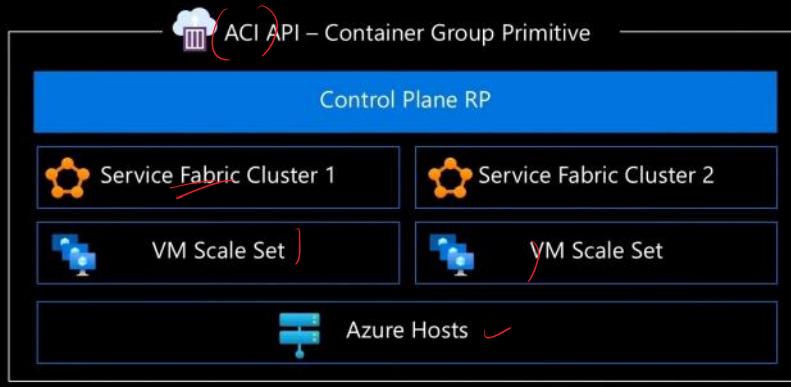
6. VM uses a lot of system memory.	While containers require very less memory.
7. VM is more secure.	While containers are less secure.
8. VM's are useful when we require all of OS resources to run various applications.	While containers are useful when we are required to maximise the running applications using minimal servers.
9. Examples of VM are: Hyper-V, KVM, Xen, VMware.	While examples of containers are: RancherOS, PhotonOS, Containers by Docker.

## Container Architecture

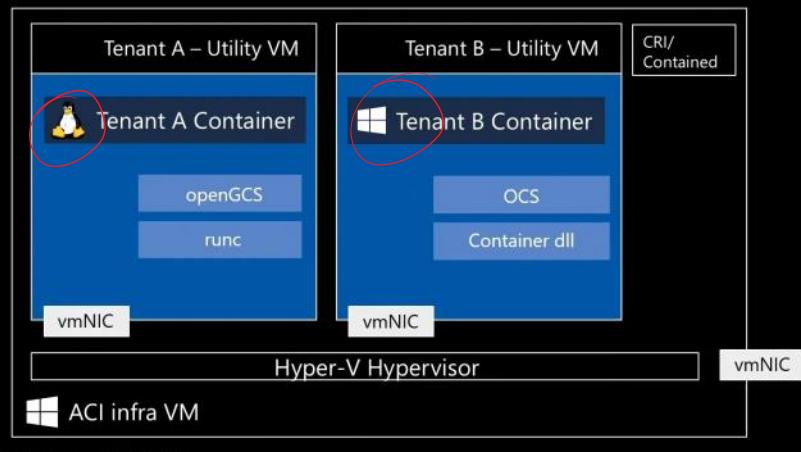


## ACI under the hood

Multitenant, serverless containers platform



## ACI data plane – node view



"LCOW" = Linux Containers on Windows

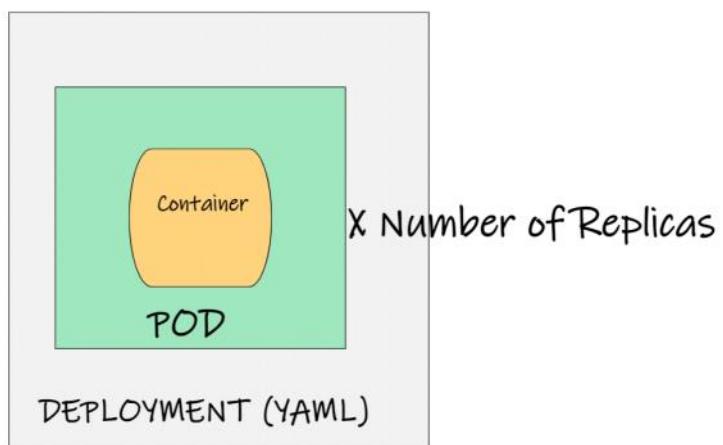
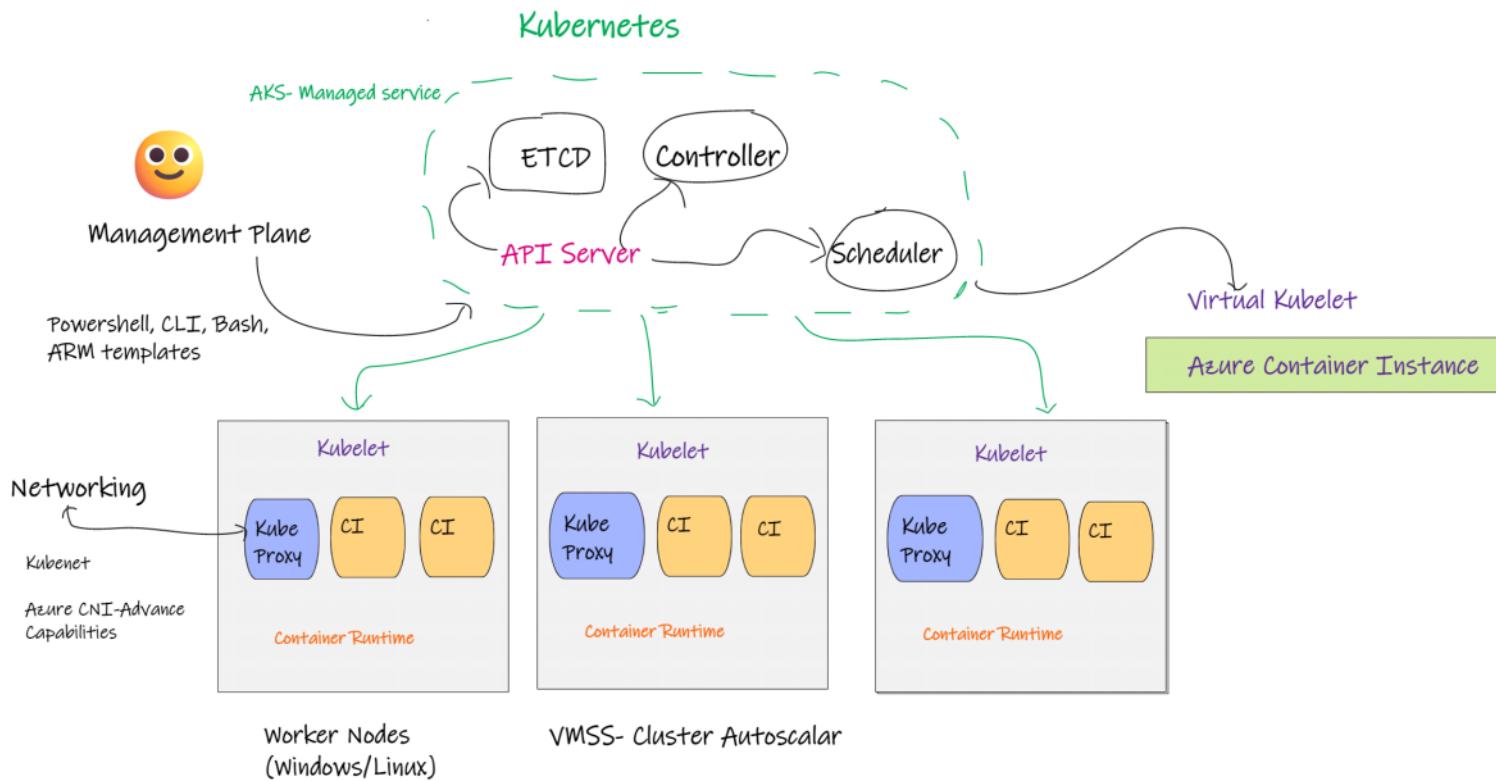
"WCOW" = Windows Containers on Windows

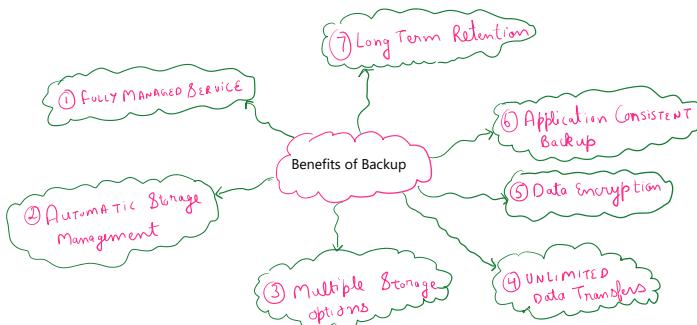
### ISSUES

Deployment  
Autoscaling  
Update  
Libraries  
Storage  
Network

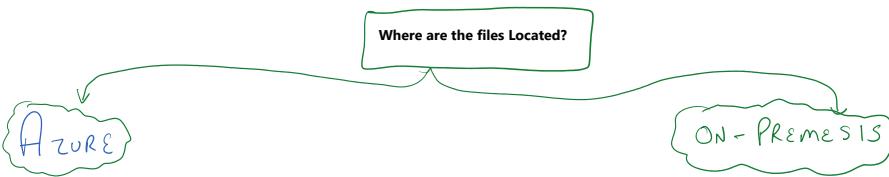
Azure Kubernetes Service

# ORCHESTRATION



**Need For Backup****Azure Backup Center**

- One Stop shop for all your backup needs
- Centralized management Option

**Files- Backup Options**

Where is your workload running?

What do you want to backup?

**Step: Configure Backup**

**Backup**

Home > Recovery Services vaults > vault-01 >

**Configure Backup**

Storage Account:

Where to Backup:

None  Use file shares selected

Add

Policy Details

Backup policy:

Backup Frequency: Daily at 12:00 AM India Standard Time

Retention of daily backup point: Keep backup until it is 1024 MB for 3 days

Configuring backup for any file share in a storage account automatically creates archive container for all the shares in the respective storage account to provide vault credentials for accelerated download of the share.

Where is your workload running?

What do you want to backup?

**Step: Prepare Infrastructure**

**Prepare Infrastructure**

Home > Recovery Services vaults > vault-01 >

**Prepare infrastructure**

Recovery Services Agent

Please follow the steps mentioned below.

1. Install Recovery Services agent  
Download Agent for Windows Server or Windows Client
2. Download vault credentials to register the server to the vault. Vault credentials will expire after 10 days.

Already downloaded or using the latest Recovery Services Agent

**Policy settings**

**Backup policy**  [Create a new policy](#)

**Full backup**

**Backup Frequency** Daily at 12:00 AM (India Standard Time)

**Retention policy** Daily backup will expire after 12:00 AM for 3 days

Configuring backup for any of the storage accounts automatically enables archive for all the objects in the respective storage account to provide quick recovery from accidental deletion of the objects. [Learn More](#)

**Download**

1. Install Recovery Services agent [Download Agent for Windows Server or Windows Client](#)

2. Download vault credentials to register the server to the vault. Vault credentials will expire after 10 days.

Already downloaded or using the latest Recovery Services Agent

3. Schedule backup using Recovery Services Agent UI. [Learn More](#)

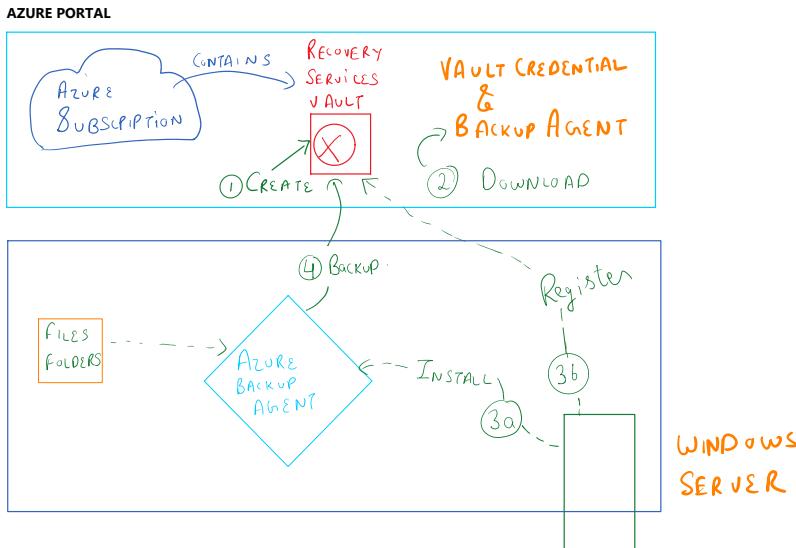
4. Once the backups are scheduled, you can use backup jobs page to monitor the backups. [Browse jobs page](#)

5. You can also Configure Notifications from alerts page to receive email alerts for backup failures. [Browse alerts page](#)

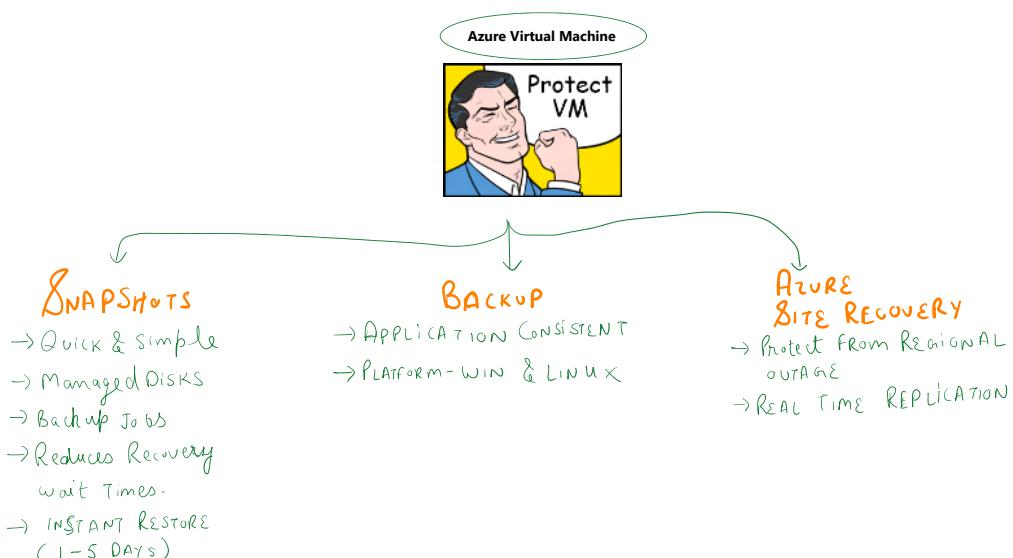
[Learn More](#)

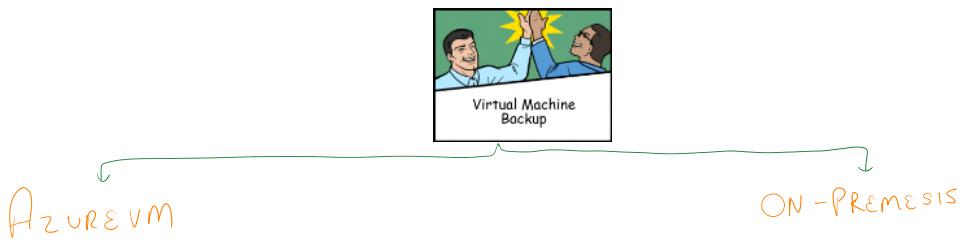
[Edit settings](#)

## Microsoft Azure Recovery Services Agent



1. Create a Recovery Services vault
2. Configure the vault
3. Install and register the agent
4. Create the backup policy
5. Backup files and folders
6. Explore the recover settings
7. Explore the backup properties
8. Delete your backup schedule





Where is your workload running? Azure

What do you want to backup? Virtual machine

Step: Configure Backup

**Backup**

Home > Recovery Services vaults > vault-01 > Configure Backup

Configure Backup

What is the type?  Internal

Hyper-V Virtual Machine

VMWare Virtual Machine

Microsoft SQL Server

Microsoft SharePoint

Microsoft Exchange

System State

Bare Metal Recovery

Retention policy: 1 day

Backup frequency: Every hour

Interval hours: 1

Number of daily backup point: 10

Maximum retention days: 30

Minimum retention days: 0

Maximum retention time: 30 days

Retention period: 30 days

Retention policy: 1 day

Backup now

Next Step

VS Disk Only

Where is your workload running? On-Premises

What do you want to backup? 4 selected

Files and folders

Hyper-V Virtual Machine

VMWare Virtual Machine

Microsoft SQL Server

Microsoft SharePoint

Microsoft Exchange

System State

Bare Metal Recovery

Home > Recovery Services vaults > vault-01 > Prepare infrastructure

Prepare infrastructure

Already using System Center Data Protection Manager or any other System Center Product?

Microsoft Azure Backup Server (MABS)

Download and install the Azure Backup Server (MABS)

Download and install the Azure Backup Service Agent

For more information about installing the Azure Backup Service Agent, click here to go to the latest version of the Azure Resource Manager Agent.

Get Started

Last Step

## Backup Virtual Machines

1. Create a recovery services vault
2. Use the Portal to define the backup
3. Backup the virtual machine

## Restore VM's

1. On the same VM
2. On another VM
3. Restore only files

Home > Recovery Services vaults > vault-01 > Backup Items (Azure Virtual Machine) > win-vm-01

win-vm-01

Backup now | Restore VM | File Recovery | Stop backup | Resume backup | Delete backup data | Restore to Secondary Region | Logins

For backups, try our new Backup Center. It offers Azure Backup customers a unified view of Recovery Services Vaults used for backup in Azure. It also provides improved sorting and filtering along with new governance capabilities. Click here to get the new experience. →

Essentials

Recovery services vault: vault-01

Subscription source: Microsoft

Subscription ID: 8495fe-9f44-4c21-a705-b11644450d88

Alerts (in last 24 hours): View alerts

Jobs (in last 24 hours): View jobs

Restore points

This list is filtered for last 30 days of restore points. To recover from restore point older than 30 days, as well as archive, click here.

Long term retention points can be moved to vault archive. To move all recommended recovery points to vault archive, click here.

Time	Consistency	Recovery type
7/4/2022, 1:40:42 AM	Crash Consistent	Snapshot and Vault Standard
7/4/2022, 9:54:43 AM	Crash Consistent	Snapshot
7/4/2022, 5:34:44 PM	Crash Consistent	Snapshot
7/4/2022, 1:46:36 PM	Crash Consistent	Snapshot
7/4/2022, 1:51:27 AM	Crash Consistent	Snapshot and Vault Standard
7/4/2022, 9:40:50 PM	Crash Consistent	Snapshot
7/4/2022, 5:37:12 PM	Crash Consistent	Snapshot
7/4/2022, 1:42:49 PM	Crash Consistent	Snapshot
7/4/2022, 1:59:00 AM	Crash Consistent	Snapshot and Vault Standard
7/4/2022, 9:40:29 PM	Crash Consistent	Snapshot
7/4/2022, 5:36:49 PM	Crash Consistent	Snapshot
7/4/2022, 1:42:54 PM	Crash Consistent	Snapshot
7/4/2022, 1:42:08 AM	Crash Consistent	Snapshot and Vault Standard
7/4/2022, 9:35:15 PM	Crash Consistent	Snapshot

Restore VM

**Restore Virtual Machine**

win-vm-01

Restore allows you to restore VM/disks from a selected Restore Point.

Restore point \*

This restore point selected

Select

Select restore point

win-vm-01

Start Date	End Date	Recovery point consistency
06/29/2022	07/04/2022	All restore points

DATA CONSISTENT  APPLICATION CONSISTENT  ALL SYSTEM CONSISTENT

Time	Consistency	Recovery Type
7/4/2022, 1:40:42 AM	Catch Consistent	Snapshot and Vault Standard
7/1/2022, 9:53:43 PM	Catch Consistent	Snapshot
7/3/2022, 5:34:44 PM	Catch Consistent	Snapshot
7/3/2022, 1:46:28 PM	Catch Consistent	Snapshot
7/3/2022, 1:51:27 AM	Catch Consistent	Snapshot and Vault Standard
7/2/2022, 9:45:58 PM	Catch Consistent	Snapshot
7/2/2022, 5:57:12 PM	Catch Consistent	Snapshot
7/2/2022, 1:42:49 PM	Catch Consistent	Snapshot
7/2/2022, 1:38:09 AM	Catch Consistent	Snapshot and Vault Standard
7/1/2022, 8:42:29 PM	Catch Consistent	Snapshot
7/1/2022, 5:38:49 PM	Catch Consistent	Snapshot
7/1/2022, 1:45:54 PM	Catch Consistent	Snapshot
7/1/2022, 1:42:06 AM	Catch Consistent	Snapshot and Vault Standard
6/30/2022, 9:33:10 PM	Catch Consistent	Snapshot
6/30/2022, 5:38:03 PM	Catch Consistent	Snapshot
6/30/2022, 1:44:50 PM	Application Consistent	Snapshot
6/30/2022, 12:22:50 PM	Application Consistent	Snapshot

**OK** **Cancel**

Restore

**Restore Virtual Machine**

win-vm-01

Restore allows you to restore VM/disks from a selected Restore Point.

Restore point \*

7/4/2022, 1:40:42 AM

Select

Data Store

Snapshot and Vault Standard

**Restore Configuration**

- Create new  
 Replace existing

**Tip** To create an alternate configuration when restoring your VM (from the following menus), use PowerShell cmdlets.

Restore Type \* **(1)**

Create new virtual machine

Virtual machine name \* **(1)**

Create new virtual machine

Resource group \* **(1)**

Restore disks

10\_AZ-104\_Module-10

Virtual network \* **(1)**

Select an option

Subnet \* **(1)**

Select an option

Staging Location \* **(1)**

Select an option

Can't find your storage account?

**Tip** The identities listed here are based on the MSI configurations in the corresponding Recovery services vault. [Learn more](#).

Identities **(1)** Disabled**Restore****Replace Existing**

## Restore Virtual Machine

win-vm-01

Restore allows you to restore VM/disks from a selected Restore Point.

Restore point \*  

Data Store Snapshot and Vault-Standard

### Restore Configuration

- Create new
- Replace existing

**Tip:** The disk(s) from the selected restore point will replace the disk(s) in your existing VM. [Learn more about In-Place Restore](#).

Restore Type Staging Location \*  

**Tip:** The identities listed here are based on the MSI configurations in the corresponding Recovery services vault. [Learn more](#).

Identities  Disabled

## File Recovery

## File Recovery

win-vm-01

### Download

Your script file is ready to download.

 **Step 2: Download script to browse and recover files**This script will mount the disks from the selected recovery point **as local drives on the machine where it is run**. These drives will remain mounted for 12 hours.**Password to run the script****Step 3: Unmount the disks after recovery**

Unmount disks and close the connection to the recovery point.

Run this script on the machine where you want to copy the files

To restore files larger than 10GB, [restore entire VM](#) to an alternate location or [restore disks using PowerShell](#)

Data transfer rate: up to 10GB/Hr

If you have trouble finding your files,

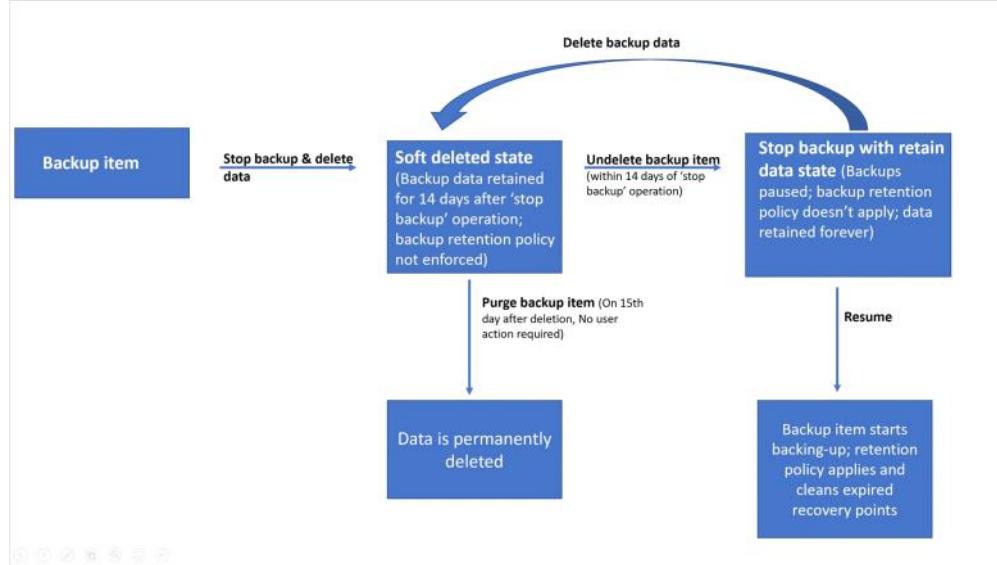
[click here](#)

## MARS agent vs MABS

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	<ul style="list-style-type: none"> <li>• App aware snapshots</li> <li>• Full flex for when to backups</li> </ul>	<ul style="list-style-type: none"> <li>• Cannot backup Oracle workloads</li> <li>• Always requires live Azure subscription</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>

<b>Backup Server (MABS)</b>	<ul style="list-style-type: none"> <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>• No support for tape backup</li> </ul>	<ul style="list-style-type: none"> <li>• Volumes</li> <li>• VMs</li> <li>• Applications</li> <li>• Workloads</li> </ul>	<ul style="list-style-type: none"> <li>• Locally attached disk</li> </ul>
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## Soft Delete



**vault-01 | Properties**

Recovery Services vault

Search (Ctrl+F)

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Properties**
- Locks

Getting started

- Backup
- Site Recovery

Protected items

- Backup items
- Replicated items

Manage

- Backup policies
- Backup infrastructure
- Site Recovery infrastructure
- Recovery Plans (Site Recovery)
- Backup Reports

Monitoring

- Alerts
- Metrics
- Diagnostic settings

Subscription ID: 84f05fe-9144-4c21-a705-b190d4f5b4d8

Resource group: 10\_AZ-104\_Module-10

Diagnostics Settings: Update

**BACKUP**

- Backup Configuration: Update
- Encryption Settings: Update
- Multi-User Authorization (Preview): Update
- Security Settings: Update
- Security PIN: Generate
- Recovery Services Agent: Download
- Backup Credentials:  Already using the latest Recovery Services Agent

Download

**Security Settings**

vault-01

Save Discard

If you have enabled Azure multi-factor authentication, you will be required to additionally authenticate using another device (for example, a mobile phone) while signing in to the Azure portal.

**Soft Delete (For workloads running in Azure)**

Enable this setting to protect backup data for Azure VM, SQL Server in Azure VM and SAP HANA in Azure VM from accidental deletion. Learn more

Enable  Disable

**Security Features (For workloads running on-premises)**

Enable this setting to protect hybrid backups against accidental deletes and add additional layer of authentication for critical operations. Refer this link for minimum agent version requirement to enable this setting. Learn more

Enabled  Disable

**softdel-vm-am-2**

Backup items

Backup now Restore VM File Recovery Stop backup Resume backup Delete backup data **Undelete**

The restore points for this backup item have been deleted and retained in the soft delete state. They were deleted 11 days ago and will be available for 3 more days to recover after which they will be permanently deleted. For more information, [Click here](#).

**Alerts and Jobs**

[View all Alerts \(last 24 hours\)](#)  
[View all Jobs \(last 24 hours\)](#)

**Backup status**

Backup Pre-Check **Passed**  
Last backup status **Warning/Backup disabled**

**Summary**

Recovery services vault: [sogupssoftdeletevault](#)  
Backup policy: -  
Oldest restore point: 8/13/2019, 12:39:32 PM (13 day(s) ago)

**Restore points (1)**

This list is filtered for last 30 days of restore points. To recover from restore point older than 30 days, [click here](#).

TIME	CONSISTENCY	RECOVERY TYPE	...
8/13/2019, 12:39:32 PM	Application Consistent	Snapshot and Vault	...

### Soft delete on Storage accounts

**mainstdmoaccount01 | Data protection** [...](#)

Storage account

Search (Ctrl+I)

**Data management**

- Geo-replication
- Data protection
- Object replication
- Blob inventory
- Static website
- Lifecycle management
- Azure search

**Settings**

- Configuration
- Data Lake Gen2 upgrade
- Resource sharing (CORS)
- Advisor recommendations
- Endpoints
- Locks

**Monitoring**

- Insights
- Alerts
- Metrics
- Workbooks
- Diagnostic settings

Recovery

- Enable operational backup with Azure Backup
- Enable point-in-time restore for containers
- Enable soft delete for blobs
 

Soft delete enables you to recover blobs that were previously marked for deletion, including blobs that were overwritten. [Learn more](#)

Keep deleted blobs for (in days):
- Enable soft delete for containers
 

Soft delete enables you to recover containers that were previously marked for deletion. [Learn more](#)

Keep deleted containers for (in days):

Tracking

- Enable versioning for blobs
- Enable blob change feed

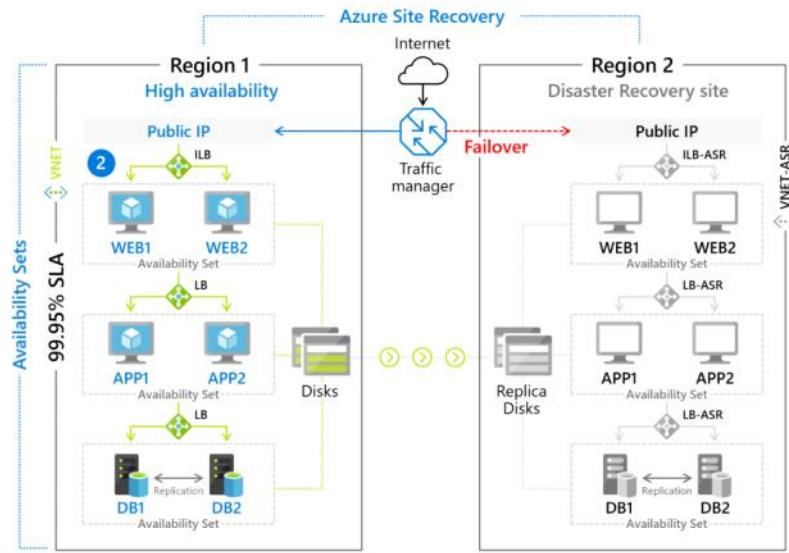
Access control

- Enable version-level immutability support

For more details visit: [Link](#)

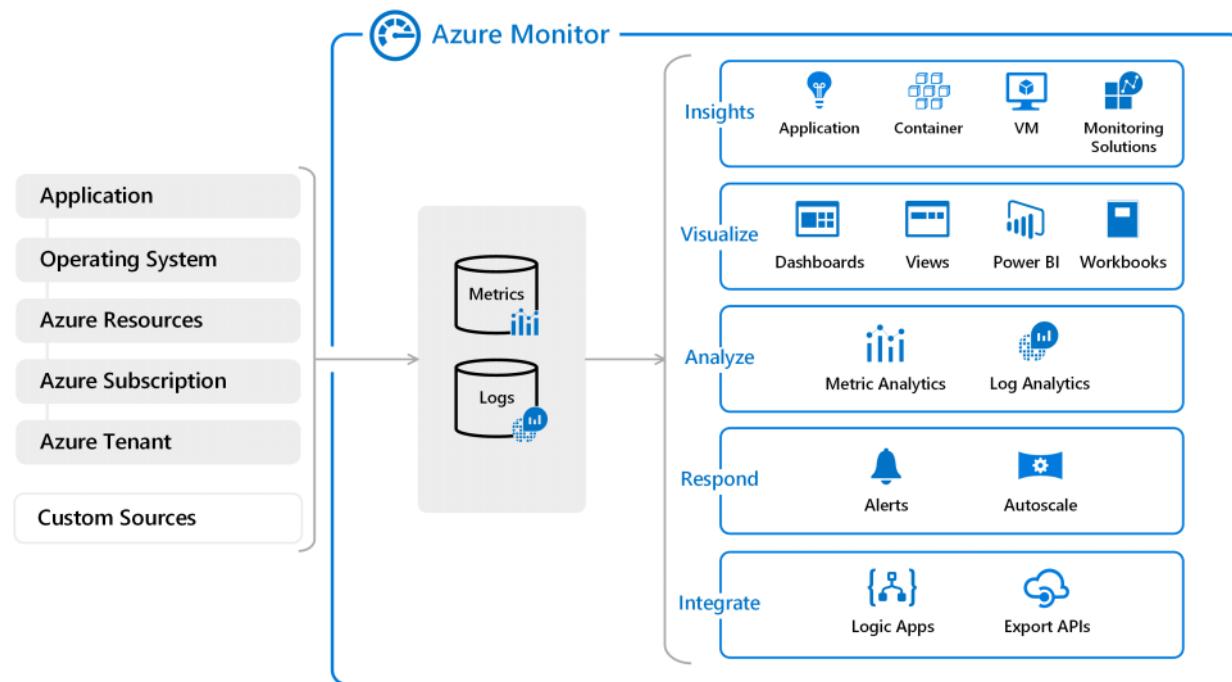
### Azure Site Recovery





## 11-Monitoring

Thursday, June 16, 2022 2:12 PM



# Study Links

Tuesday, May 31, 2022 11:07 AM

## [Course AZ-104T00--A: Microsoft Azure Administrator - Learn | Microsoft Docs](#)

### [Manage Azure Identities and Governance \(15-20%\)](#)

#### [Manage Azure AD objects](#)

- [Creating a new user in Azure AD](#)
- [Add or delete users using Azure Active Directory](#)
- [Create a basic group and add members using Azure Active Directory](#)
- [New-AzureADUser](#)
- [Add or update a user's profile information using Azure Active Directory](#)
- [Edit your group information using Azure Active Directory](#)
- [Manage device identities using the Azure portal](#)
- [How To: Manage stale devices in Azure AD](#)
- [Bulk import group members \(preview\) in Azure Active Directory](#)
- [What is guest user access in Azure Active Directory B2B?](#)
- [Manage guest access with Azure AD access reviews](#)
- [Quickstart: Add guest users to your directory in the Azure portal](#)
- [How to: Plan your Azure AD join implementation](#)
- [Licensing requirements for Azure AD self-service password reset](#)
- [Tutorial: Configure hybrid Azure Active Directory join for managed domains](#)
- [Plan an Azure Active Directory self-service password reset](#)

#### [Manage role-based access control \(RBAC\)](#)

- [Tutorial: Create a custom role for Azure resources using Azure CLI](#)
- [Tutorial: Create a custom role for Azure resources using Azure PowerShell](#)
- [Add or remove role assignments using Azure RBAC and the Azure portal](#)
- [List role assignments using Azure RBAC and the Azure portal](#)
- [Understand deny assignments for Azure resources](#)
- [Understand how multiple Azure Active Directory tenants interact](#)

#### [Manage subscriptions and governance](#)

- [Overview of Management services in Azure](#)
- [What is Azure Policy?](#)
- [Tutorial: Create and manage policies to enforce compliance](#)
- [Quickstart: Create a policy assignment to identify non-compliant resources](#)
- [Lock resources to prevent unexpected changes](#)
- [Use tags to organize your Azure resources](#)
- [Manage Azure resource groups by using Azure PowerShell](#)
- [Manage Azure Resource Manager resource groups by using the Azure portal](#)
- [Create an additional Azure subscription](#)
- [Change your Azure subscription to a different offer](#)
- [What is Azure Cost Management and Billing?](#)
- [Quickstart: Explore and analyze costs with cost analysis](#)
- [Move resources to a new resource group or subscription](#)
- [Create management groups for resource organization and management](#)
- [Manage your resources with management groups](#)

## IMPLEMENT AND MANAGE STORAGE

### [Implement and Manage Storage \(10-15%\)](#)

#### [Manage storage accounts](#)

- [Intro to Azure Storage](#)
- [Configure Azure Storage firewalls and virtual networks](#)
- [Storage account overview](#)
- [Create an Azure Storage account](#)
- [Upgrade to a general-purpose v2 storage account](#)
- [Delegate access with a shared access signature](#)
- [Grant limited access to Azure Storage resources using shared access signatures \(SAS\)](#)
- [Manage storage account access keys](#)
- [Azure Storage redundancy](#)

#### [Manage data in Azure Storage](#)

- [Use the Azure Import/Export service to export data from Azure Blob storage](#)
- [Use the Azure Import/Export service to import data to Azure Blob Storage](#)
- [Get started with Storage Explorer](#)
- [Get started with AzCopy](#)

#### [Configure Azure Files and Azure Blob Storage](#)

- [What is Azure Files?](#)
- [Quickstart: Create and manage Azure file shares with the Azure portal](#)
- [Create an Azure file share](#)
- [Planning for an Azure File Sync deployment](#)
- [Deploy Azure File Sync](#)
- [Tutorial: Extend Windows file servers with Azure File Sync](#)
- [Quickstart: Upload, download, and list blobs with the Azure portal](#)
- [Azure Blob storage: hot, cool, and archive access tiers](#)

## DEPLOY AND MANAGE AZURE COMPUTE RESOURCES

[Deploy and Manage Azure Compute Resources \(25-30%\)](#)

### Configure VMs for high availability and scalability

- [Availability options for virtual machines in Azure](#)
- [Manage the availability of Windows virtual machines in Azure](#)
- [Tutorial: Create and deploy highly available virtual machines with Azure PowerShell](#)
- [What are virtual machine scale sets?](#)

### Automate deployment and configuration of VMs

- [Extend Azure Resource Manager template functionality](#)
- [Azure Resource Manager templates overview](#)
- [Tutorial: Create and deploy your first Azure Resource Manager template](#)
- [Update a resource in an Azure Resource Manager template](#)
- [Create a Windows virtual machine from a Resource Manager template](#)
- [Create a VM from a VHD by using the Azure portal](#)
- [Quickstart: Create and deploy Azure Resource Manager templates by using the Azure portal](#)
- [Download the template for a VM](#)
- [Custom Script Extension for Windows](#)
- [Use the Azure Custom Script Extension Version 2 with Linux virtual machines](#)

### Create and configure VMs

- [Azure Disk Encryption for Linux VMs](#)
- [Azure Disk Encryption for Windows VMs](#)
- [Quickstart: Create and encrypt a Windows virtual machine with the Azure portal](#)
- [Move a Windows VM to another Azure subscription or resource group](#)
- [Sizes for Windows virtual machines in Azure](#)
- [Resize a Windows VM](#)
- [Attach a managed data disk to a Windows VM by using the Azure portal](#)
- [Attach a data disk to a Windows VM with PowerShell](#)
- [Common PowerShell commands for Azure Virtual Networks](#)
- [How to open ports to a virtual machine with the Azure portal](#)
- [Create and manage a Windows virtual machine that has multiple NICs](#)

### Create and configure containers

- [Azure Kubernetes Service \(AKS\)](#)
- [Quickstart: Deploy an Azure Kubernetes Service \(AKS\) cluster using the Azure portal](#)
- [What is Azure Container Instances?](#)
- [Quickstart: Deploy a container instance in Azure using the Azure CLI](#)
- [Quickstart: Deploy a container instance in Azure using the Azure portal](#)

### Create and configure Web Apps

- [App Service overview](#)
- [Create an ASP.NET Core web app in Azure](#)
- [Azure App Service plan overview](#)
- [Manage an App Service plan in Azure](#)

## CONFIGURE AND MANAGE VIRTUAL NETWORKING

[Configure and Manage Virtual Networking \(30-35%\)](#)

**Implement and manage virtual networking** Create and configure VNET peering • configure private and public IP addresses, network routes, network interface, subnets, and virtual network

- [Virtual network peering](#)
- [Create, change, or delete virtual network peering](#)
- [Tutorial: Connect virtual networks with virtual network peering using the Azure portal](#)
- [Configure private IP addresses for a virtual machine using the Azure portal](#)
- [Quickstart: Create a virtual network using the Azure portal](#)
- [Create, change, or delete a network interface](#)
- [Add, change, or delete a virtual network subnet](#)
- [Create, change, or delete a virtual network](#)

### Configure name resolution

- [Create, change, or delete a virtual network peering](#)
- [Name resolution for resources in Azure virtual networks](#)

- [Use Azure DNS to provide custom domain settings for an Azure service](#)
- [How to manage DNS Zones in the Azure portal](#)
- [Quickstart: Configure Azure DNS for name resolution using the Azure Portal](#)
- [Tutorial: Host your domain in Azure DNS](#)
- [Quickstart: Create an Azure private DNS zone using the Azure portal](#)

#### Secure access to virtual networks

- [Work with security roles](#)
- [Create, change, or delete a network security group](#)
- [Tutorial: Deploy and configure Azure Firewall using the Azure portal](#)
- [Create an Azure Bastion host](#)

#### Configure load balancing

- [Application Gateway configuration overview](#)
- [Quickstart: Direct web traffic with Azure Application Gateway using Azure PowerShell](#)
- [Tutorial: Balance internal traffic load with a Basic load balancer in the Azure portal](#)
- [Create an internal load balancer by using the Azure PowerShell module](#)
- [Quickstart: Create a Load Balancer to load balance VMs using the Azure portal](#)
- [Troubleshoot Azure Load Balancer](#)

#### Monitor and troubleshoot virtual networking

- [Step-By-Step: Monitoring On-Premise Active Directory via Azure AD Connect Health](#)
- [Diagnose on-premises connectivity via VPN gateways](#)
- [Network Performance Monitor solution: Performance monitoring](#)
- [What is Azure Network Watcher?](#)
- [Create an Azure Network Watcher instance](#)
- [Troubleshoot Virtual Network Gateway and Connections using Azure Network Watcher Azure CLI](#)
- [Troubleshoot connections with Azure Network Watcher using the Azure portal](#)

#### Integrate an on-premises network with an Azure virtual network

- [Tutorial: Create and manage a VPN gateway using PowerShell](#)
- [Create a route-based VPN gateway using the Azure portal](#)
- [Create a Site-to-Site connection in the Azure portal](#)
- [ExpressRoute overview](#)
- [Tutorial: Create and modify an ExpressRoute circuit](#)
- [About Azure Virtual WAN](#)
- [Tutorial: Create a Site-to-Site connection using Azure Virtual WAN](#)
- [Connect a VPN Gateway \(virtual network gateway\) to Virtual WAN](#)

### MONITOR AND BACK UP AZURE RESOURCES

#### Monitor and Back up Azure Resources (10-15%)

##### Monitor resources by using Azure Monitor

- [Metrics in Azure Monitor](#)
- [Advanced features of Azure Metrics Explorer](#)
- [Quickstart: Monitor an Azure resource with Azure Monitor](#)
- [Get started with Log Analytics in Azure Monitor](#)
- [Get started with log queries in Azure Monitor](#)
- [Overview of log queries in Azure Monitor](#)
- [Create, view, and manage metric alerts using Azure Monitor](#)
- [Metric Alerts with Dynamic Thresholds in Azure Monitor](#)
- [Create Metric Alerts for Logs in Azure Monitor](#)
- [Manage Application Insights resources using PowerShell](#)

##### Implement backup and recovery

- [Configure Azure Backup reports](#)
- [Back up a virtual machine in Azure](#)
- [How to restore Azure VM data in Azure portal](#)
- [Restore a disk and create a recovered VM in Azure](#)
- [Create a Recovery Services vault](#)
- [Manage Azure VM backups with Azure Backup service](#)
- [About Site Recovery](#)
- [Set up disaster recovery of on-premises VMware virtual machines or physical servers to a secondary site](#)