QUICK INTRODUCTION.

* MICROSOFT AZURE, commonly referred as Azure. (60+ Data Center)

* DEFINATION :- AZURE is a cloud computing services created by microsoft for building, Testing, Deploying and manging application and services through microsoft-managed data center.

* Developers - Microsoft
* Initial Release - 27 OCTOBER, 2008
* Operating system - LINUX, WINDOWS, iOS, Android.
* License - closed source, open source, SDK's.
* GLOBAL (DATA CENTER) - 1,65,000 miles fiber + 140 Country.
* ✔ CONTAINERS - Azure Used (Resource Group) to host resources

TYPE OF MICROSOFT AZURE SERVICES-

* SaaS - (Software as a Service) - 3rd Party software over internet
* PaaS - (Platform as a service) - Tools over internet
* IaaS - (Infrastructure as a service) - cloud based services (storage)

HISTORY TIMELINE-

1. OCTOBER, 2008 → Announced Azure.
2. MARCH, 2009 - SQL Database
3. NOV, 2009 - PHP, JAVA, CDN CTP
4. FEB, 2010 - COMMERCIALLY AVAILABLE
5. JUNE, 2010 - .NET, OS VERSIONING
6. OCT, 2010 - PLATFORM ENHACEMENT
7. DEC, 2011 - HPC SCHEDULER
8. JUNE, 2012 - VIRTUAL MACHINE
9. APR, 2014 - (WINDOW AZURE) - TO - (MA)
10. JULY, 2014 - MSN.COM → OUTAGE
11. SEP, 2015 - SWITCH SONIC
12. MARCH, 2016 - SERVICE FABRIC
13. SEP, 2017 - NEW LOGO
14. OCT, 2018 - LINUX ORIENTED GROUP
15. APRIL, 2019 - AZURE FRONT DOOR SERVICE
16. MARCH, 2020 - 44 Million Daily Active User

Microsoft Azure

Content

Microsoft Azure

MODULE # 01

* WHAT IS CLOUD COMPUTING? Is a delivery of Computing services over the Internet., enabling faster Innovation, flexible resources and economies of scale.

(i) COMPUTE- Provide the Compute Power. (memory and processor)
(ii) NETWORKING- Connection of Computer together of VM.
(iii) STORAGE- store of data / Information
(iv) ANALYTICS- * IMPORTANT * KIND of Load, how much memory required etc.

* SERVICE PROVIDER (MICROSOFT AZURE) HOSTING AS A SERVICE PROVIDER.* (ALL SERVICE PROVIDE BY INTERNET *)

PUBLIC CLOUD	PRIVATE CLOUD	HYBRID CLOUD
* General public can host their services.	* organization create a cloud environement in their data center	* organization today adopting today hybrid cloud. which come combination of Public & Private both.
* Public cloud owned by cloud seervices or hosted provider	* organization is responsible for Operating the service they provide	→ Connecting existing datacenter to Azure data center via Internet with help of VPN Tunnel.
* Provide resources and service to multiple organization and user.	* Does not provide access to user outside of the organization	(Example→ Application host on Azure. and data center. and the Database in client data center.)
* Access via- Internet *		
(*EXAMPLE→ AZURE)	(*DISADVATAGE= COST $)	

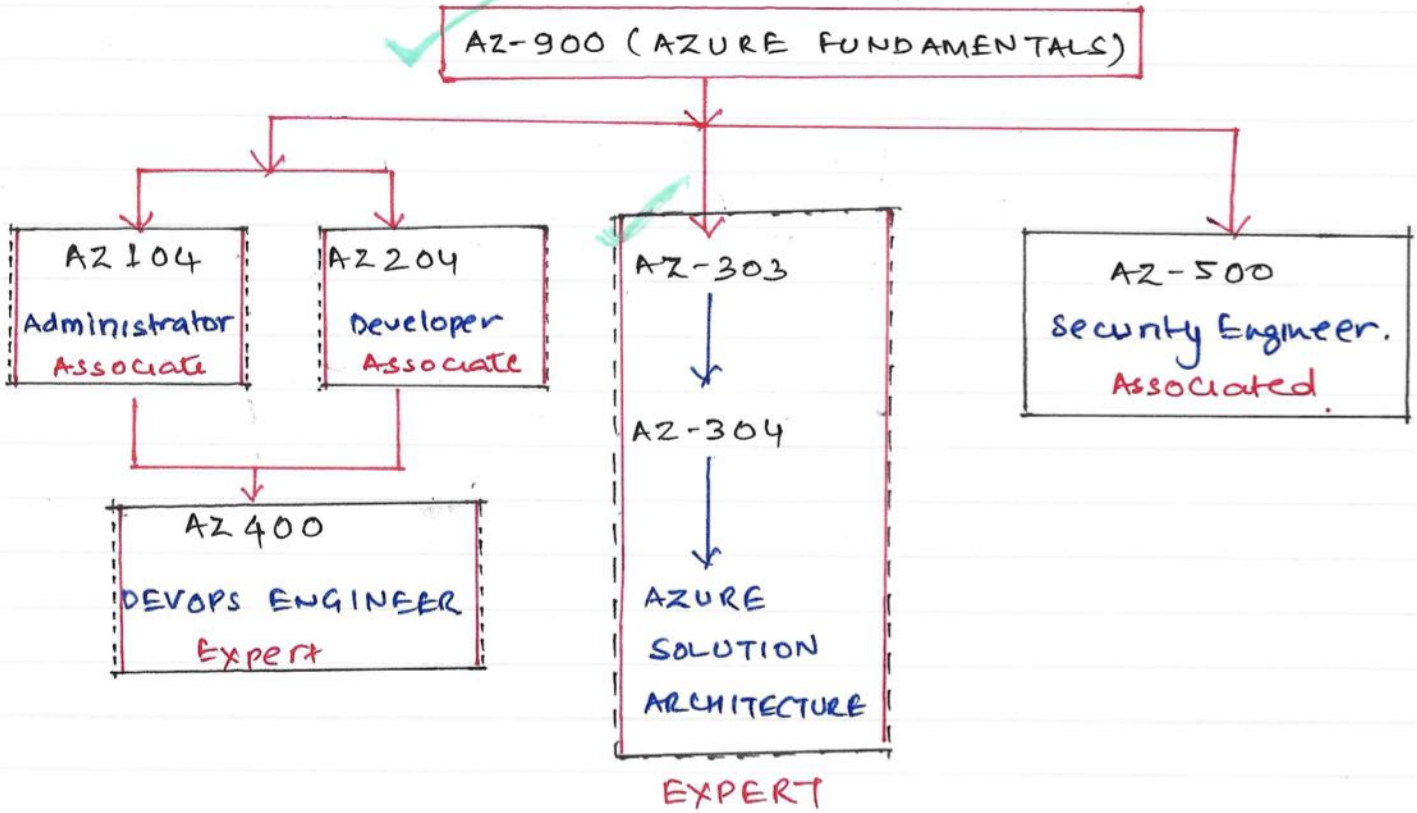
TYPE OF CLOUD

PUBLIC CLOUD	PRIVATE CLOUD	HYBRID CLOUD
Public cloud solution are ready availiable from Azure, Azure provide Infrastructure & services to the public	Are dedicated to one organization and often have much more specific security control then public cloud.	Hybrid sol(n) are a blend of public & private cloud.

AZURE USER ACCOUNT?

open free Azure account from link (www.azure.microsoft.com/en-us/free) that give you 12 month free popular services + 200 $ credit for 30 days + 25 services

AZURE CERTIFICATION!-



CLOUD BENEFIT'S

* **HIGH AVAILIBILITY:-** Application hosted into one data center and copy existing into another Data center

  → Replicate of Data into two different machine (Data Center)

* **SCALABILITY:-** Two type of scalability. (Vertical & Horizontal)

VERTICAL	HORIZONTAL
* SCALE-UP/DOWN * INCREASING/DECREASING - - COMPUTE ENTITY (RAM & PROCESSOR)	* IF ONE VM (VIRTUAL MACHINE) IS HIGLY UTILIZE. THEN TRAFFIC SHIFTED TO ANOTHER VM AND MANAGE BY (LOAD BALANCER)

* **ELASTICITY:-** Only adding the scaling is called elasticity.

* **AGILITY:-** (On-demand services). fast to deploy VM. Control panned / Portal easy to create virtual machine define the properties.

* **DIASTER RECOVERY:-** Replicate the data into another to prevent during diaster time. Easy to recovery. It is part of Availibilty.

* **CONSUMPTION-BASED MODEL:-** Pay as per the use.

* **COST OPTIMIZATION:-** CAPEX & OPEX OPTIMIZATION.

* **GLOBAL REACH-** Availibility of data center across globe.

* **SECURITY:-** Secure to access and use the application.

* CLOUD - CAPEX & OPEX:-

CAPEX - Capital Expenditure	OPEX - Operational Expenditure
* The up-front spending of money on physical infrastructure.	* spends on products and services as needed, pay as you go.
* costs from CAPEX have a value that reduces overtimes.	* get billed immediately.

* CONSUMPTION - BASED - MODEL:-

Azure or any cloud service prouder operate on ~~Consumption~~ Consumption-based model. which mean end user only pay for the resources that they use.

WHATEVER THEY USE IT, IS WHAT THEY PAY FOR.

→ Better cost prediction.
→ Price for individual resources and services are provided.
→ Billing is based on actual usage.

* CLOUD SERVICES:- (OBJECTIVE DOMAIN).

(1) IaaS - (Infrastructure-as-a-service)

(2) PaaS - (Platform-as-a-seavice)

(3) SaaS - (Software-as-a-service).

(4) Identify a services type based on use-case.

(5) Describe the shared responsibility model.

(6) Describe Serverless computing.

(1) INFRASTRUCTURE - AS - A - SERVICE (IaaS) - In this cloud service Infrastructure (Build pay-as-yo-go) by renting servers, virtual-machine, storage, network and operating system from cloud provider's.

①	②	③
SERVER & STORAGE	NETWORKING FIREWALLS/ SECURITY	DATACENTER POWER MANAGEMENT MAINTENANCE

(2) PLATFORM - AS - A - SERVICES (PaaS) - Provides environement for building, Testing and deploying software application, without focusing on managing underying Infrastructure.

(IaaS)		(PaaS)
*1 SERVERS & STORAGE	+	OPERATING SYSTEM *1
*2 NETWORKIN, FIREWALLS/SECURITY		DEVELOPMENT TOOLS *2
*3 DATACENTER / POWER MANAGEMENT		DATABASE MANAGEMENT BUSINESS ANALYTICS

(3) SOFTWARE - AS - A - SERVICE (SaaS) - User connets to and use cloud-based application (app) over the internets.

Example → office 365, emails, Teams software.

(IaaS) + (PaaS) + HOSTED APPLICATIONS / App's.

↓

(SaaS)

* SHARED RESPONSIBILITY MODEL:-

	PRIVATE CLOUD	IaaS	PaaS	SaaS
DATA & ACCESS	**	**	**	**
APPLICATION	**	**	**	AZURE
RUNTIME	**	**	AZURE	AZURE
OPERATING SYSTEM	**	**	AZURE	AZURE
VIRTUAL MACHINE	**	**	AZURE	AZURE
COMPUTE	**	AZURE	AZURE	AZURE
NETWORKING	**	AZURE	AZURE	AZURE
STORAGE	**	AZURE	AZURE	AZURE

** → client are manage the responsibility.

* *RESERVE-LESS COMPUTING* (IMPORTANT) - In general client shared requirement of Infrastructure (ex→ capacity of RAM & processor), but in case no-load on your server but still we have to pay because we reserved the capacity to host application in Data-Center

* → Modern way to work on this approach is change. there is no reserved server for work-load, when request come it will automatically allocated the resource on-need basis and release the resource once no-usage. In Azure ~~below~~ below two entity are important —

* AZURE FUNCTIONS:- Is a code running your services and not the underlying platforms or infrastructure. It creates infrastructure based on an events.

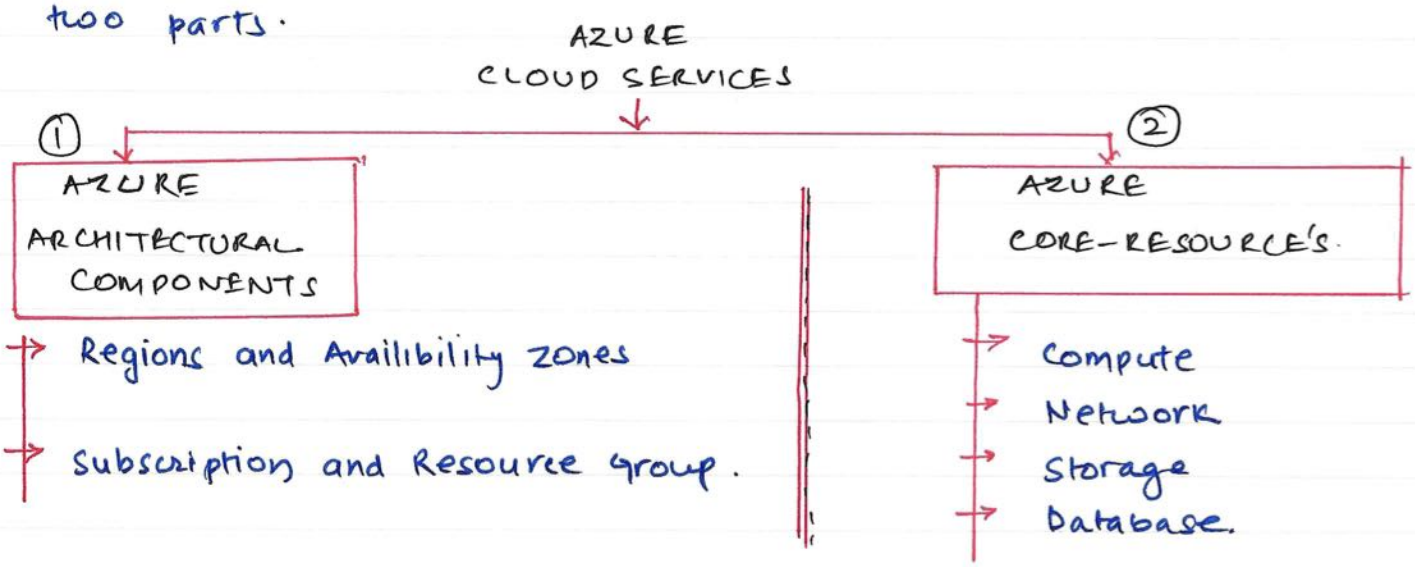
* AZURE LOGIC: Is a cloud service that help you ~~at~~ automate and orchastrate tasks, business process and workflows when you needed to integrate application, Data, systems and services.

SURAJ NOTES

Content

* MODULE #: 02

CLOUD AZURE SERVICES:- Azure services are divided into two parts.



(1) AZURE- ARCHITECTURAL COMPONENTS:- Azure is an Operating System, which manage a data center of microsoft. To manage below are Key architectrual components —

- Region's & Region's Pairs
- Availibility zone
- Azure Resources
- Resource Group.
- Azure Resource Manager's.
- Subscriptions
- Azure Management group's.

→ AZURE ARCHITECTURAL COMPONENTS

(1) REGIONS:- Azure offer's more global regions that any other cloud, provider with 60+ Regions representing over 140+ Countries.

- Regions are made up of one or more data center.
- provide flexibility and scale to reduce customer latency.
- Preserve data residency with a comprehensive compliance offer.

* 1 REGION → MIGHT BE A COLLECTION OF ZONES

REGION PAIR'S:- For Availibility, in ~~next~~ worst case scenario. a complete region might be outage. (might be due to nature problem or some diaster happen, flood, power outage. To avoid this problem Statement a region-pairs is done where microsoft create a pair-zone to prevent data during such diaster.

POINTS —
* → (Both Region → should be in same Geographic location)
* → (At least 300 miles of Separation between region pairs)
* → (Automatic replicate for some services-
* → (~~Route~~ prioritized region recovery in the event outage)
* → (Pair are ~~defined~~ by ~~microsoft~~ (~~microsoft~~).

PAIRING ARE FIXED, DEFINED BY → MICROSOFT ONLY

REGIONS	REGIONS-PAIR
- North central US	- South central US
- East US	- West US
- West US 2	- West central US
- US East 2	- Central US
- India south	- India-central
- Canda central	- Canda East
- Japan East	- Japan West

AVALLABILITY OPTIONS :- Availibility is a factor which decide how much time is our application - up and running.

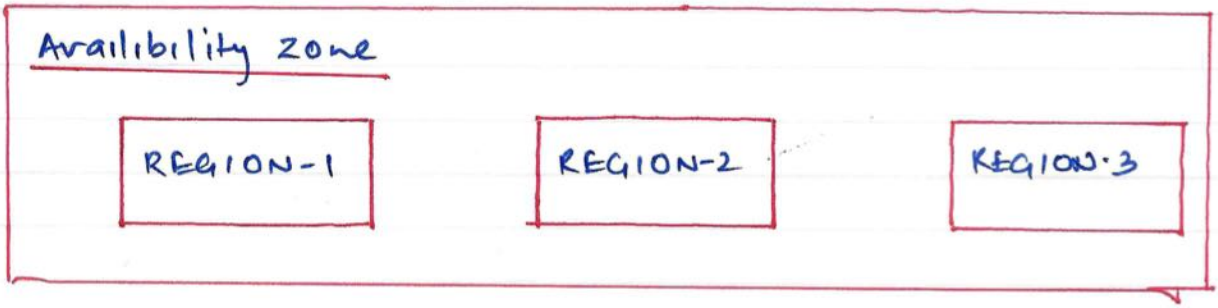
Ex → 100%. mean no down-time, Alway working.

Availibility is defined by → SLA (Service Level Aggrement)

Ex → 99.9%.	Ex → 99.99%	DIASTER RECOVERY
VM	VM, VM ZONE1, ZONE-2 REGION-1	VM, VM Region-1, Region-2
* SINGLE VM HOST ONLY. * Dependent on Single VM	* Each zone have independent Power Backup, physical separated. *	Regional protection with Data Residency Boundaries.
SINGLE-VM	AVALIBILITY-ZONES	REGION-PAIRS

AVALIBILITY ZONE - One zone treated as a one Data Center.

Multiple zone lead for regions, Each data center is equipped with independent power, cooling and networking. each zone are interconnected via fiber-optics networks

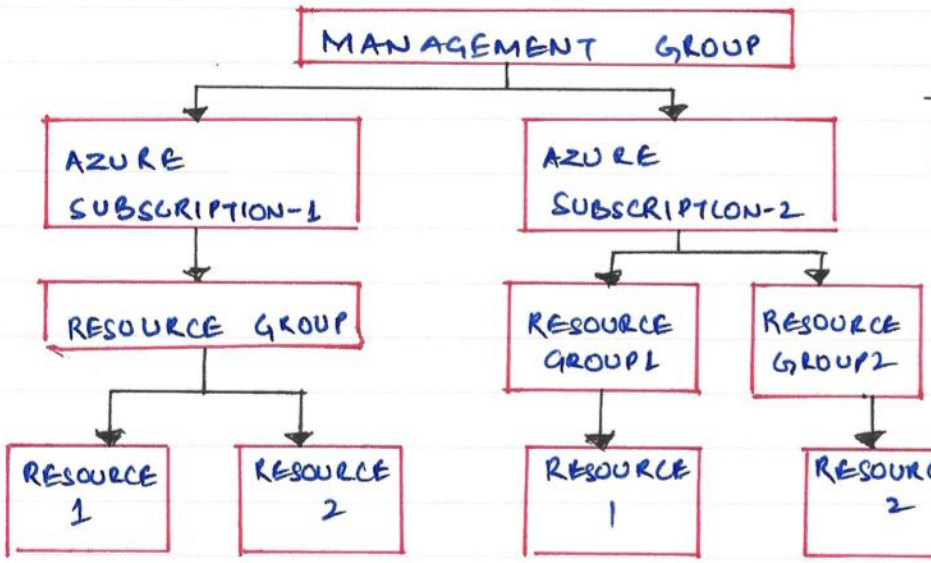


AZURE SERVICES:- There are various services offered in Azure service, few point are capture bellow.

* GENERAL	* COMPUTE	* STORAGE	* NETWORKING
- Management Groups	- Virtual machine	- storage account	- Virtual Network
- Resource Groups	- Kubernetes	- Recovery	- Express Route
- Marketplace	- OS Image	- Data Lake	- Public-IP
- Subscription	- VM-scale sets	- Storage Explorer	- Network Interface
- Templates	- cloud services	- Data Box	- CDN Profile.
- Tag	- Hosts	- Data Shares	- Route tables
- Resource Explorer	-	- HPC caches	- Network security

MANAGEMENT GROUP:-

* Management groups can include multiple Azure Subscription
* 10,000 management group can supported in a single directory.



(1) Management Group

(2) Azure Subscription

(3) Resource Group

(4) Resource

AZURE RESOURCE:-

* After selecting → Region and zone of Data Center.

* Below are the important services as part of Azure—

1. Virtual Machine.
2. Storage Accounts
3. Virtual Network
4. App services
5. SQL Databases
6. functions

→ CORE SERVICES

RESOURCE GROUP:- It is very important to group the resource into a single unit. So Every resource need to be part of resource group.

→ AFTER AZURE ACCOUNT > WE NEED TO CREATE A AZURE GROUP

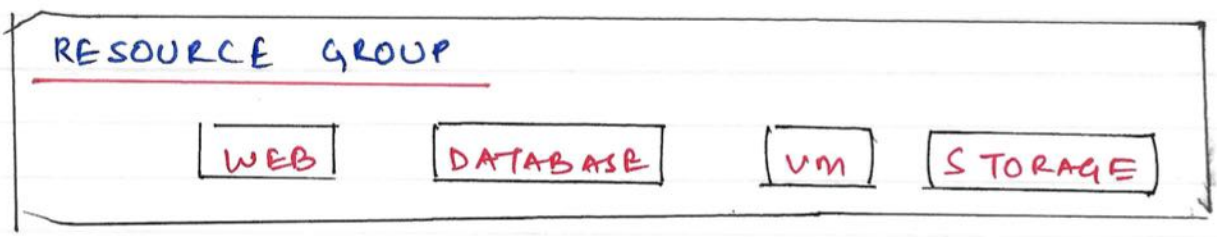
* Every Resource Group have a Location

* Resource can exist in only one resource group.

* (Resource) → can exist in the different Region

* It is possible (Resource @ Region-1) & (Resource group @ R-2)

* A Resource in Resource-Group can be moved from one resource group to another resource-group but one time only associated in 1-Resource group.



(* IF DELETE, RESOURCE GROUP IT WILL AUTOMATICALLY DELETE ALL RESOURCES

SURAJ NOTES

Content

MODULE # 03

[redacted] 1 :- AZURE VIRTUAL MACHINE

Azure Virtual Machine (AVM) is one of several types of on-demand, scalable computing resources that Azures offers.

Azure Virtual Machine (AVM) give you the flexibility of virtualization without having to buy and maintain the physical hardware than run it's.

THINK ABOUT BEFORE CREATING a VM (VIRTUAL MACHINE)

1	Application Resource Name	5	Operating system run on VM
2	Location where resource store	6	Confriguration after VM start
3	Size of VM	7	VM need resource.
4	Maximium number of VM		

* LOCATIONS - There are multiple location in many geographical regions around the world. These are the region is called Locations which specifies the location of virtual machine.

The way to get the availlable location are—

① Azure portal | ② Azure Powershell | ③ REST API | ④ AZURE CLI

* AVAILABILITY :- Azure announced an industry leading single

Instance virtual machine. service level ~~agg~~ agrement of 99.9%. provide you deploy the VM with premium storage of all disks. (BELOW SLA)

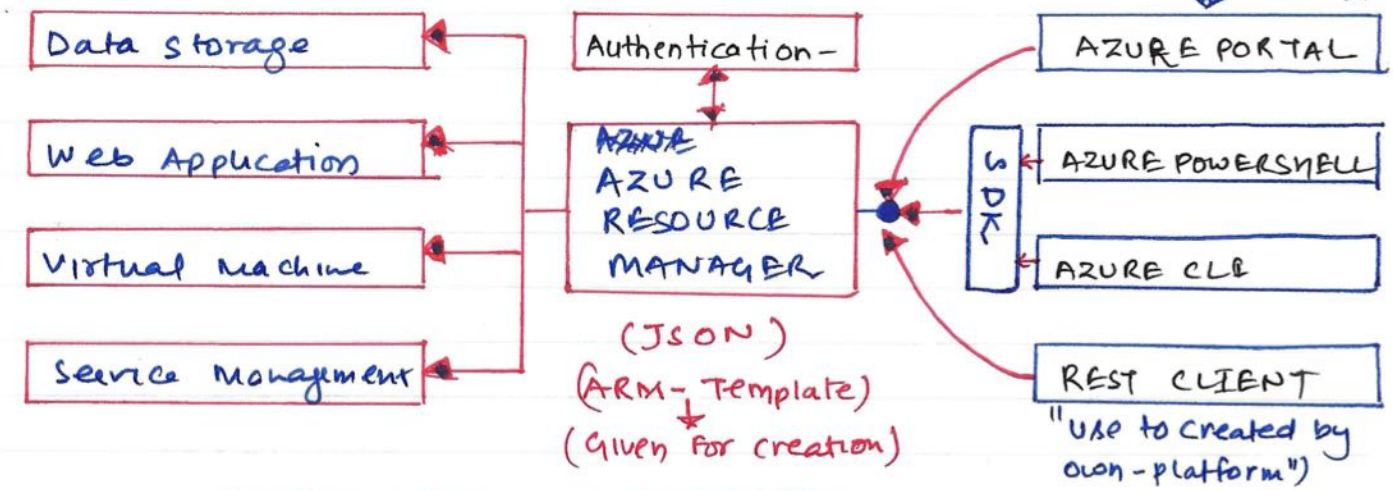
* 99.9% - Two or more instances deployed across two or more Availibity-zone
* 99.95% - 2 or more instance deployed in same Availibity set.
* 99.9% - Single Instance VM using premium SSD/Ultra Disk Full OS
* 99.5% - Single Instance VM with standard SSD Managed Disks
* 95% - Single Instance VM with standard HDD magnetic Disks.

AZURE RESOURCE MANAGER : The Azure resources Manager (ARM) provides a management layer that enables you to create, update and delete resources in your azure subscription.

As we know, Azure is an operating system. which manage data center of microsoft., which manage various service present in data center. (ARM → help to intract with it)

ARM is a Deployment model which can be us, For creating a → web application / virtual machine /or data storage. (

→ AZURE PORTAL IS USED TO COMMUNICATE → ARM



(Billing + Access control Boundaries)

AZURE SUBSCRIPTION!- To start working with azure, we need a subscription of Azure. Azure subscription provides you with authentication & authorized access to Azure account.

BILLING BOUNDARY:- Generate separate billing reports and invoice for each subscription and control resources.

AZURE ACCOUNTS

- Development Subscription
- Test Subscription
- Production Subscription

~~[illegible]~~

AZURE COMPUTE SERVICES

* COMPUTE = MEMORY + PROCESSOR *

* compute where application are Run, computation process, instruction are executed.

COMPUTE SERVICE LIKE!-

- Virtual Machine
- Application Services
- Container Instances
- Azure Kubernetes services (AKS)
- Window virtual Desktop.

VIRTUAL MACHINE!- Virtual Machines are software emulations of physical computer. which included the - (virtual Processor, memory, storage, and networking.)

* VIRTUAL MACHINE = IaaS *

CREATE VIRTUAL MACHINE!- (@AZURE)

1. go → All services
2. click → Virtual Machine.
3. (+) Add - Virtual Machine
4. Choose → Subscription
5. Resoure group → Name.
6. Virtual Machine Name → VM
7. Region - Select Region
8. Image - OS Name (window)*
9. Size - (Processor + RAM) - cost
10. Username
11. Password.
12. INBOUND → ((RDP / HTTP (80))
13. (Open port for public IP)

(* Readymaid OS > Image copy)

Option During Creating Virtual Machine

1. BASICS
2. DISK
3. NETWORKING
4. MANAGEMENT
5. TASK
6. REVIEW + CREATE

(12,000 INR/HR) ← Example

↑

(At last you will get prices)

AFTER VIRTUAL MACHINE CREATION:- Once virtual machine is created. (once we click create button the page will scroll to "ARM Templates (AZURE RESOURCE MANAGEMENT)"

* ARM is a JSON Document (overview > input > output > Templates)
(JSON → JAVA SCRIPT OBJECTION NOTATION)

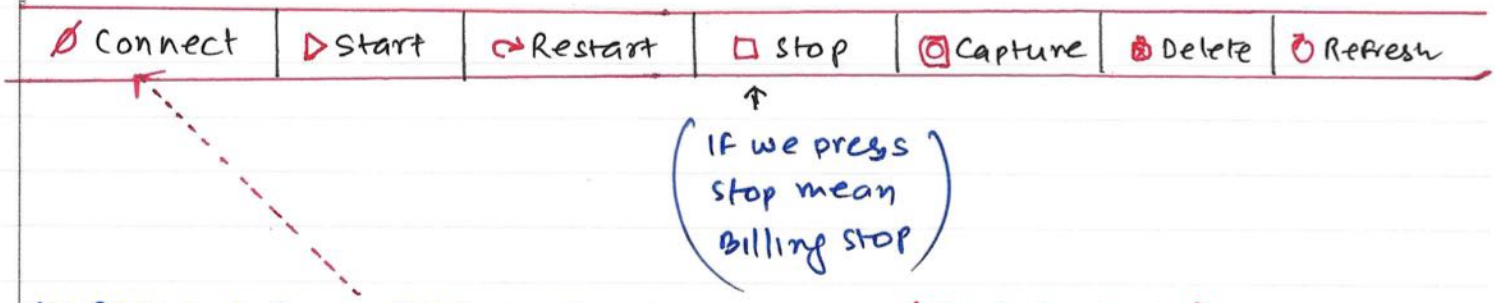
Once virtual machine created it will show file are—

EXAMPLE → (DEMOVM)

* NAME (RESOURCE)	* TYPE	* RESOURCE GROUP	* LOCATION	* SUBSCRIPTION
DemoVM	Virtual Machine	DEMO-GRP	North Europe	Demo AS-1
Demovm-IP	Public IP address	DEMO-GRP	North Europe	Demo AS-1
Demovm_nsg	Network Security Group	DEMO-GRP	North Europe	Demo AS-1
Demovm 334	Network Interface	DEMO-GRP	North Europe	Demo AS-1
DemoVM_OS-DISK	DISK	DEMO-GRP	North Europe	Demo AS-1
demo-grp.net	Virtual Network	DEMO-GRP	North Europe	Demo AS-1
NetworkWatcher	Network Watcher	DEMO-GRP	North Europe	Demo AS-1

(Resource group)

@ TOP



(1) PRESS → CONNECT Button > open > (RDP > SSH)

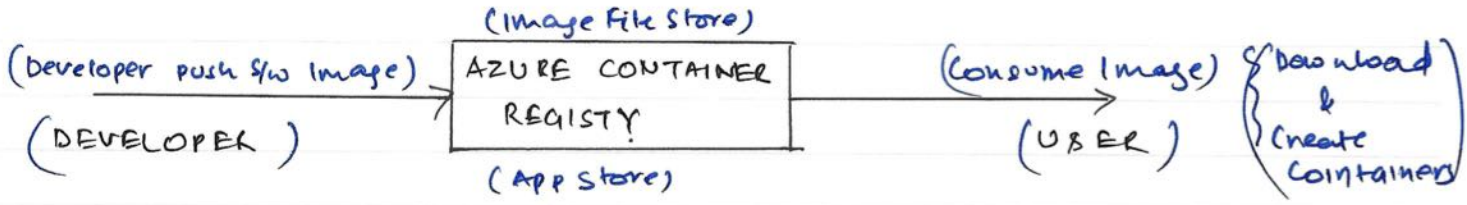
→ (* Public IP = X.X.X.X) ✓
→ (* Port number = 80

Download RDP file

AZURE CONTAINER SERVICES

CONTAINER IS HELPING US IN CREATING ISOLATED WORK LOAD'S ON THE SAME PHYSICAL MACHINE, BUT AT SAME TIME THESE WORKLOAD DO NOT NEED OPERATING SYSTEM

(* In general if we run 2 VM's both need own OS to run the resource, to avoid such requirement need → containers)



→ * Container are created to run the application at user Device
→ * Container is light weight, (Does not have operating system) It will alway used to underline on which it is created.
→ * Container does not required Operating System

AZURE CONTAINER INSTANCES a PaaS offering that runs a container in Azure, without the needs to manage a virtual machine

AZURE KUBERNETS SERVICES:- an orchestrations services for container with distributed architecture and large

* KUBERNETS → is open source software, which is also called a orchestration services. help to active and integrated multiple container with least amount of efforts.

(In Azure → It is coming as AKS.), Need to create multiple VM and top of VM need to create multiple containers.

KUBERNETS SERVICE → FREE

VIRTUAL MACHINE SERIES :-

(INR)
*(SEP-21)

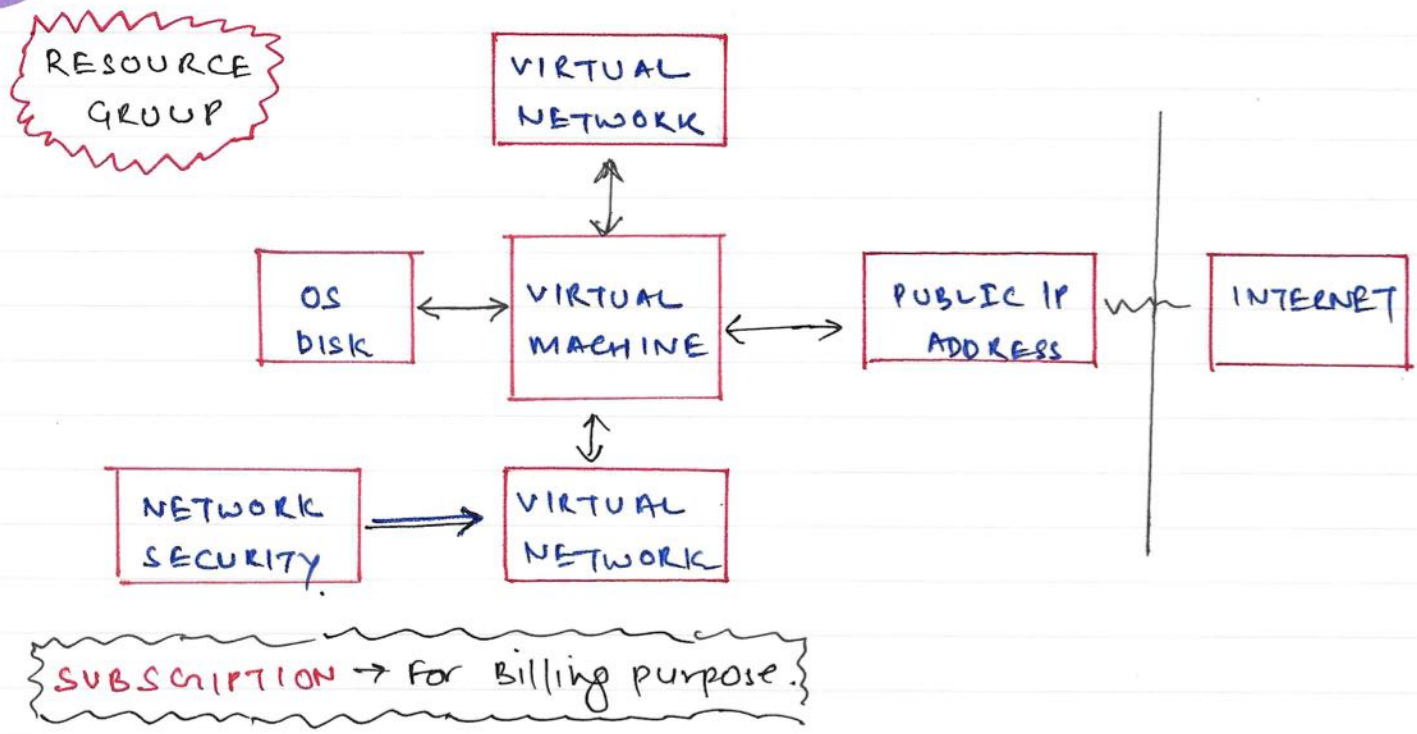
SERIES	VM SIZE FAMILY	USE CASES	PROCESSOR	PRICE* starting per month
A	Entry level VM's	Test server, server POC		1,893
D	General Purpose Compute	Application, Database		2,997
D-V2	Next Gen - General Purpose	Enterprises application		
F	Compute Optimize - VM	Batch Processing, web serv		2,577
G	Memory & storage Optimize	ERP, SAP, SQL		23,088
H	High performance - VM	High performce computing		41,864
L	storage optimize - VM	Mongo DB, DB Warehouse		32,818
N	GPU enable - VM	Graphics, video - - editing		47,333
M	Memory optimized - VM	Required massive Parallel compute.		80,809

* AVALIBILTY ZONE :- HELP TO MAINTAIN SLA 99.95% IN CASE OF DISASTERY RECOVERY.

* PRICING CALCULATOR :- HELP TO GET POSSIBLE COSTS FOR HOSTING THESE RESOURCE IN AZURE.

* AZURE MARKETPLACE :- FOR DEPLOYING AZURE SUBSCRIPTION.

* AZURE VIRTUAL NETWORK :- It Hosts the Virtual Machine in Azure.



1 - VIRTUAL MACHINE:- COMPUTE MACHINE ON AZURE PLATFORM.

2 - OS DISK - VM having disk associated with VM, (storing information) attached other disk to host Data Disk

3 - VIRTUAL NETWORK - is an isolated network on cloud, Virtual network help to create a networking parts. (N/w Interface card)

4 - NETWORK SECURITY - Attached to secure in & out bound data

5 - VIRTUAL NETWORK - Attached on VM machine it is a network Interface card

6 - PUBLIC-IP ADDRESS - Allow to comput through internet.

7 - RESOURCE GROUP - All are part of logical group called resource group

8 - SUBSCRIPTION - for Billing purpose.

7 STEP TO CREATE - VIRTUAL MACHINE:-

1. BASICS

1. Subscription – for billing
2. Resource group – logical group
3. VM Name – VM name
4. Region – Ex – Europe / USA
5. Availibility –
6. Image – Operating System
7. Size – VM size (refer-table)
8. Username – xxxx
9. Password – xxxx
10. Inbound Ports – RDP (3389) Limited traffic

2. DISK'S:-

1. OS DISK – SSD / HDD
2. SSE Encrption –
3. Data DISK

3. NETWORKS

1. Virtual Network –
2. Subnet –
3. Public IP –
4. NIC Security –
5. Inbound Port –

4. MANAGEMENT – Configur monitoring & management option for VM.

5. ADVANCED Additonal agent, scripts or application via VM

6. TAGS Consolidated bills by apply same tag to multiple resource group

(7) REVIEW + CREATE

HOURLY ESTIMIATION = (0.123 USD/HR)

After created we have below resource file in Virtual machine.

Example:- (DEMOVM)

Name	Type	Resource Group.	Location (Ex)	Subscription As (Ex)
demo-grp.vnet	Virtual Network	demo-grp	North Europe	As-1
demovm	Virtual machine	demo-grp	" " "	"
demovm-ip	Public IP address	demo-grp	" "	"
demovm-nsg	Network security group	demo-grp	" "	"
demovm 334	Network Interface	demo-grp	" "	"
demovm-OS DISK-1-	Disk	DEMO-GRP	" "	"
NetworkWatched	Network Watcher	Network watcher	"	"

AVALIBILITY ZONE → HELP TO MAINTAIN SLA 99.95%. IN CASE DISASTER RECOVERY.

SURAJ NOTES

Content

MODULE # 04

VIRTUAL NETWORK : When we created a virtual machine in azure network it will allocate a → virtual network Interface

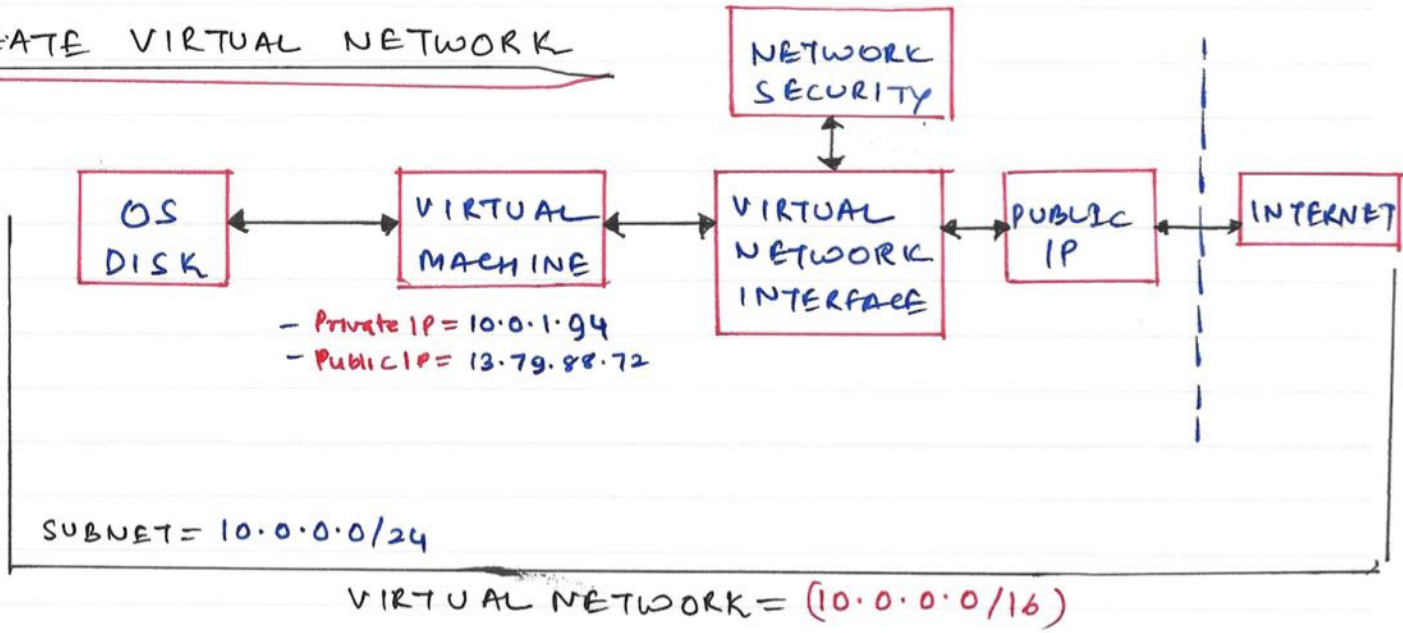
VIRTUAL NETWORK INTERFACE:- Mange all traffic moving in-and-out of the virtual machine (via - virtual network - interface). so the data flow via virtual network interface

1. → IP ADDRESS — help to locate a machine
2. → PUBLIC IP ADDRESS — help to locate machine on internet
3. → PRIVATE IP ADDRESS — help to locate machine on local-network
4. → SUBNETS — It help to separate one or more sub-nets.

AZURE VIRTUAL NETWORK	VIRTUAL PRIVATE N/W GATEWAY	AZURE EXPRESS ROUTE
* A collection of (VM) computer to each other • Internet → Public IP • Intranet → Private IP	CONNECTION via Internet and sending traffic with support of encryption / Decryption	Dedicated lease route only for connection between (Azure Data Center & user)

* When we created a Virtual machine, Automatically it will Create a Virtual network.

* CREATE VIRTUAL NETWORK



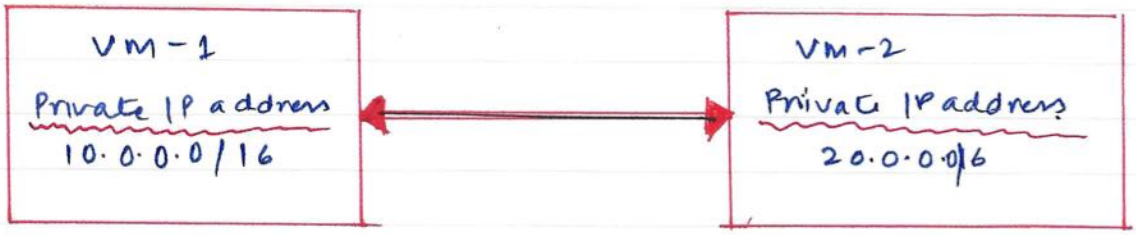
CREATED VIRTUAL NETWORK: Creation of virtual network is divided into 5 steps—

① BASICS	② IP ADDRESS	③ SECURITY	④ TAGS	⑤ REVIEW + CREATE
→ Subscription → Region group. → Instance-Name → Instance Region	→ IPV4 address → IPV6 address → Subnets	→ Host → DDOS Protect → Firewall	Target are name/value pair that enables you to categorize	(Review & create)

TYPE OF NETWORK CONNECTION:-

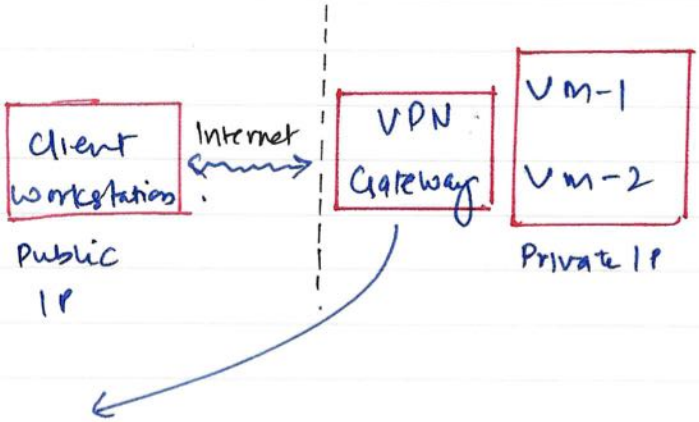
1. VIRTUAL NETWORK (PEERING) → "MORE SECURE"
2. POINT-TO-SITE
3. SITE-to-SITE

1. **VIRTUAL NETWORK (PEERING):-** This basically help to interconnected two different virtual machine based on Private IP address.



Point-to-Site VPN Connection

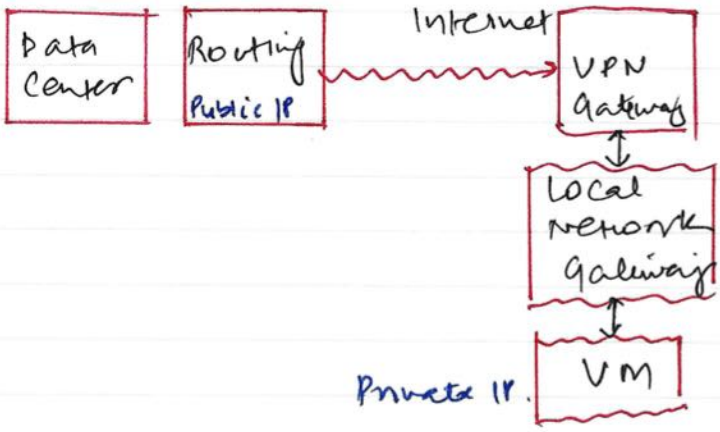
2. POINT-TO-SITE



⇒ VPN Gateway support (P2S) Point to site VPN connection's.

*Since information flow from Internet so we are using VPN Gateway to make it more secure.

3. SITE-TO-SITE



Routing:- H/w Cisco router or machine help to route traffic on internet.

Local N/w Gateway:- Information of public IP of local network help to route

VPN Gateway → Attached from(LNG) to route the traffic

SURAJ NOTES

Content

MODULE #

AZURE STORAGE SERVICES – Below are the type of storage servies, this are the parts of Azure storage servies

① BLOBS	② TABLES	③ QUEUE	FILE ④
- storing object - Image - Video	- Storage Table data	- Storing Queue - Sending message - Recieving message	Creat a file.

HOW TO ADD!

(1) GO TO THE ALL RESOURCE

(2) CLICK ⊕ CREATE BUTTON

(3) SELECT OPTION "STORAGE ACCOUNT"

(4) CLICK WIZARD

(1) – BASICS – Account name / Region / Performance

(2) – ADVANCED – For secure the accounts

(3) – NETWORKING – Public / Private IP's

(4) – DATA PROTECTION – Deletion or Modification

(5) – TAG's – categorization

(6) – REVIEW + CREATE – final creation > CREATE STORAGE ACCOUNT

AZURE STORAGE SERVICES

(1) CONTAINER STORAGE (BLOB) - is optimized for storing amount of unstructured data, such as text or binary data

(2) DISK STORAGE provides disks for virtual machines, application, and other services to access and use.

(3) AZURE FILES:- sets up highly available networks file shared that can be accessed by using the standard server message block (SMB) Protocols.

AZURE STORAGE ACCESS TIER'S

HOT	COOL	ARCHIVE
· optimized for storing data that is accessed frequently	· optimized for storing data that is infrequently accessed ~ at least 30 days	optimized for storing data that is rarely accessed & stored. ~ at least 180 days

(READ & WRITE ARE VERY FREQUENTLY (MOST COST $)) → (LESSER) (Read & write cost more) → (Read & write is expensive) (This cheap to store) It will take time.

0.5m

EXPLORE AZURE MARKETPLACE:- It similar like Playstore,

Azure marketplace allow customer to find, try, purchase and process application and services from hundreds of leading service provider, which are all certified to run on Azure.

1) open source container platforms
2) virtual machine and Database images
3) Application build and Deployment software
4) Developer's tools

AZURE DATABASE SERVICES

* AZURE COSMOS DATABASE:→ is a globally-distributed database that elastically and independently scale.

* AZURE SQL DATABASE → is a relational database as a services (Daas) based on the latest version of microsoft SQL server database engine.

* AZURE DATABASE FOR MySQL → is a fully-managed MySQL database services for application developers.

* AZURE DATABASE FOR POSTGRESQL → is a relational database services based on the open-source Postgres database engine.

SURAJ NOTES

Content

MODULE #

* CORE SOLUTION:-

CORE AZURE SOLUTION	AZURE MANAGEMENT TOOL'S.
I. IOT to Azure Sphere	I. Portal, Powershell, CLI
II. Synapse Analytics to Databricks	II. Advisor
III. Artifical Intelligence	III. Monitor
IV. Machine learning	IV. Service Health.
	V.
	VI.

* AZURE - INTERNET OF THINGS - IOT describe physical objects that are embedded with sensor's, processing ability, software and other technologies and that connect and exchange data with other device and system over the Internet.

* AZURE IOT CENTRAL:- is a fully managed global IOT SaaS Solution that makes it easy to connect, monitor and manage IOT assets at scale.

* AZURE IOT HUB:- is a managed services hosted in the cloud that acts its central message hub bi-directional communication between IOT application and the device it manage.

* IOT CENTER * (DASHBOARD) <=> TOP @ (IOT HUB)

* IOT CENTRAL	(Build top of hub, it has UI to manage multiple device)
* IOT HUB	(device control by IOT HUB)

BIG DATA & ANALYTICS → over a period of time, mostly all organization is capturing a huge amount of data. (Ex → Develop ecommerce website) → how many many people visited etc.

Here Big-Data help to analze the complete data. here we dump all Data and using ETL Tool and process the data and create a data warehouse. Below are the Bg-data Tools —

→ * AZURE SYNAPSE ANALYTICS – A cloud-based enterprise Data warehouse. solution, (Example → Hadoop)

→ * AZURE HD INSIGHT:- A fully-managed, open sourced analytics services for enterprises.

→ * AZURE DATABRICKS:- Apache spark based analytics services.

→ These three are majorly common used to analze huge Data

ARTIFICAL INTELLIGENCE & MACHINE LEARNING:- (ML) is when understand the pattern and learn the output with help of (AI)

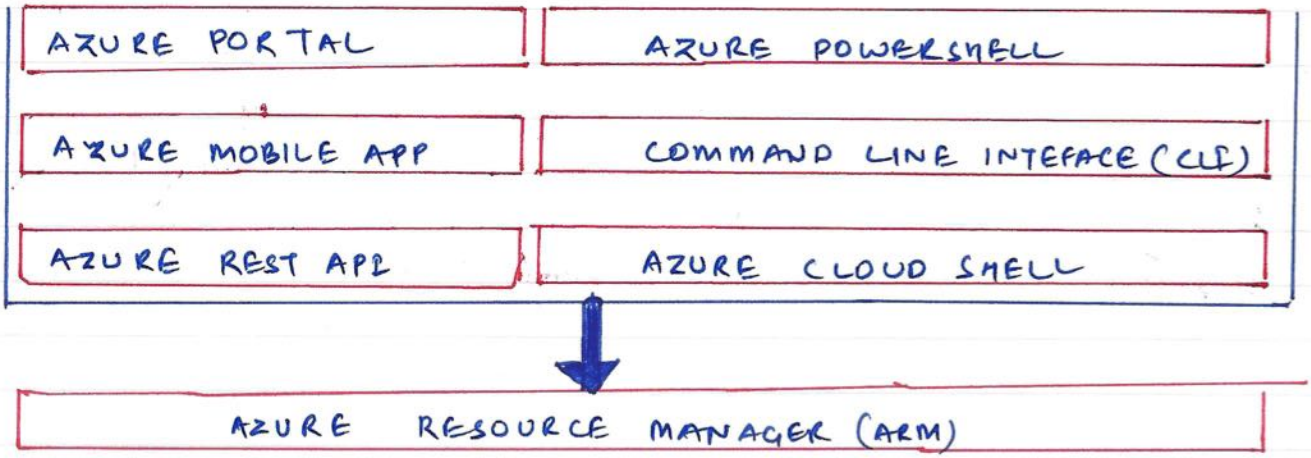
AZURE MACHINE LEARNING:- Cloud-based to develop, and deploy machine learning model

COGNITIVE SERVICE:- QUICKLY enable app to see, hear, speak, understand and interpret a user's needs.

AZURE BOT SERVICES: Develop Intelligent, enterprise-grade bots

AZURE MANAGEMENT TOOLS :- Below are the part of AMT

(AZURE MANAGEMENT TOOLS) -



POWERSHELL- Install power shell locally, create a resource group and virtual machines access and used the cloud shell & review Azure Advisor recommendations

AZURE CLI:- Install the Azure CLI locally, create a resource group and virtual machine, use the cloud shell and review azure recommend

WHEN ALL MODULE INSTALLED, WE NEED ADVISOR (AZURE ADVISOR)

→ Probably we are not use / or using VM upto the capacity.
→ Only one VM is is in use, another one is not use much.
→ Also, when deploy (100 VM) It is not possible to Analge all VM.

* (So the sol(n) is AZURE ADVISOR) *

FREE

AZURE ADVISOR:- Analyze depoyed Azure resource and makes recommendation on best practices to optime Azure Deployement

- Reliability
- security
- performance
- Cost &
- Operation Excellence

(FREE)(RESOURCE)

AZURE ADVISOR!- Analyzes deployed Azure resourc and make recommendiation on best pratices to optimize Deployement

1. Reliability
2. Security
3. Performance
4. Cost
5. Operational Excellence.

AZURE MONITOR!- Azure monitor maximum the availibility and performance of application and services by collecting, analzing and acting on telemetry from cloud and on-premises environments

- Application Insight
- Log Analytics
- Smart Alerts
- Automation Actions
- Customized Dashboard's

AVALIBILITY & PERFORMACE
→ HOW MUCH RAM USE?
→ HOW MUCH CAPACITY PROCESSOR USE?
→ IF LOAD INCREASED ?

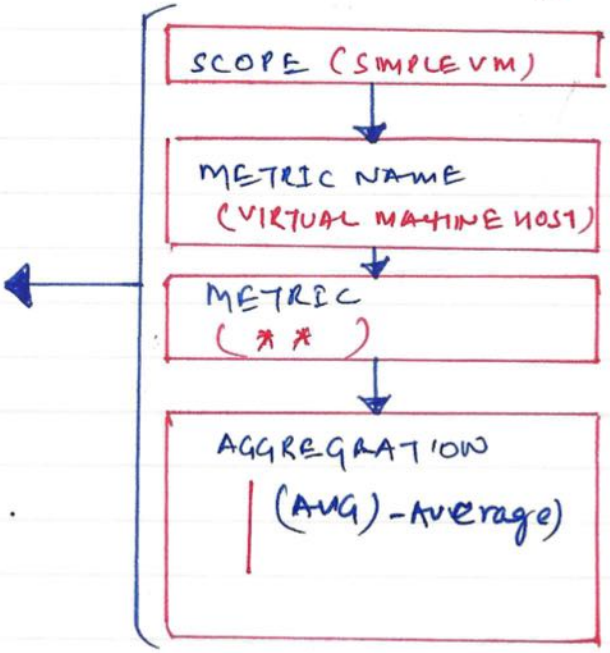
* Alert are charges like CPU util > 90%

Go → Resource Group → Powershell|RG → VM

MONITORING → METRICS (chose metric as per the need.)

METRICS ARE LIKE!- **

i. CPU CREDIT REMAINING
ii. Data Disk Bandwidth
iii. Data Disk IOPS consumption
iv. Inbound flows
v. Disk write Bytes
vi. Network in Total
vii. ~~Percentage CPU~~ Percentage - CPU.
viii.
ix.



* **AZURE SERVICE HEALTH:-** Evaluate the impact of Azure services

Issues with personalized guidance and support, notification and issue resolution updates.

In case any Azure service is down, then it will reflect in (service health) → once issue resloved it will reflect the update on the sam.

* (UNPLANNED OUTAGE / PLANNED OUTAGE) *

* **AZURE RESOURCE MANAGER (ARM) TEMPLATES –**

(* It is a JSON file) → It is declerative

Azure resource manger (ARM) templates are javascript object. this can be used to create and deploy Azure Infrastructure without having to write program commands.

- Declarative Syntax → (1) no need to write program
- Repeatable Result
- Orchestration → (2) No need to write sequencial powershell etc.
- Modular files
- Built-in - validation
- ~~Expo~~ Exportable code

---

* **Beauty of ARM!–**

(1) If you implement ARM and it run particll go in case we re-execute it will do the new changes without repeating to all.

(2) ARM is control by parameter file (same template used in multiple environement).

SURAJ NOTES

Content

MODULE #

SECURITY:- The coming docs will cover the below section

AZURE SECURITY FEATURES	AZURE NETWORK SECURITY
· SECURITY CENTER · RESOURCE HYGIENE · KEY VAULT · DEDICATED HOSTS	· DEFENSE IN DEPTH · NETWORK SECURITY GROUPS · FIREWALLS · DDOS PROTECTION.

01 AZURE SECURITY CENTER : In azure we are creating a resources.,(VM machine, storage) and all these resource need to be secured. The security the resources are from—

(1) Protect from malware.
(2) Protect from unauthorized Access.
(3) Protect from potential attacks / Hackers.

WHEN POSSIBLE? If their is some problem in our infrastructure.

AZURE SECURITY CENTER is inbuilt in Micrsoft Azure. and it is monitoring the services like (Virtual machine, App service) Database, storage). It pronde treat protection to both Azure and on-premise Data center. (In case deployed in other virtual machine).

Protect (AZURE VIRTUAL MACHINE, NON-AZURE VIRTUAL MACHINE and on-premise data center)

3 THING HELP BY SECURITY:→ Next slide

MICROSOFT SECURITY CENTER (AZURE) This will help you.

(1) Provides security recommendation — It will help to assignment and give us recommendation

(2) Detect and Block Malware:- It will help to analze the malware attack, immediately send alert and protect us from such kind of malware attack.

> It will Detect & Block - Malware as well.

(3) ANALYZE AND IDENTIFY POTENTIAL ATTACKS:- It will help to analze potential attach & help to identify the same.

(4) JUST-IN-TIME ACCESS CONTROL FOR PORT'S:-

Suppose we have a virtual machine, now we need to do RDP (Remote Desktop) to that virtual machine so for doing the RDP on virtual machine. We need to open the window port no (#3389) and we are using SSH Login in Linux (Port #22)

Instead open these both port paramentaley. we can configur in such a way that on-demand. when we need to do RDP or SSH System to that virtual machine. That time only port will be open. and these portal will closed automatically after few time-frame.

02. AZURE SECURITY CENTER- CAPABILITES:- (RESOURCE HYGIENES)

(i) POLICY COMPLIANCE!- with help of policy we install some (agent, s/w) which basically help analze the virtual machine. and submit the report in (Log analysis).

As soon we created a Azure machine, the agent software is installed in the same and this is done under policy compliances.

(ii) CONTINUOUS ASSESMENTS!- Assess new deployement resource to ensure that they are configure properly. As soon new vm created with help of (AGENT S/W) install and help us in assesment.

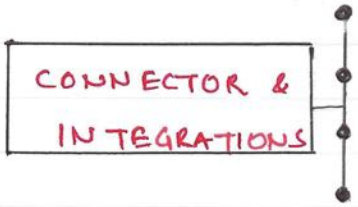
(iii) TAILORED RECOMMENDATION!- Recommendations based on existing workload with instruction on how to implement them.

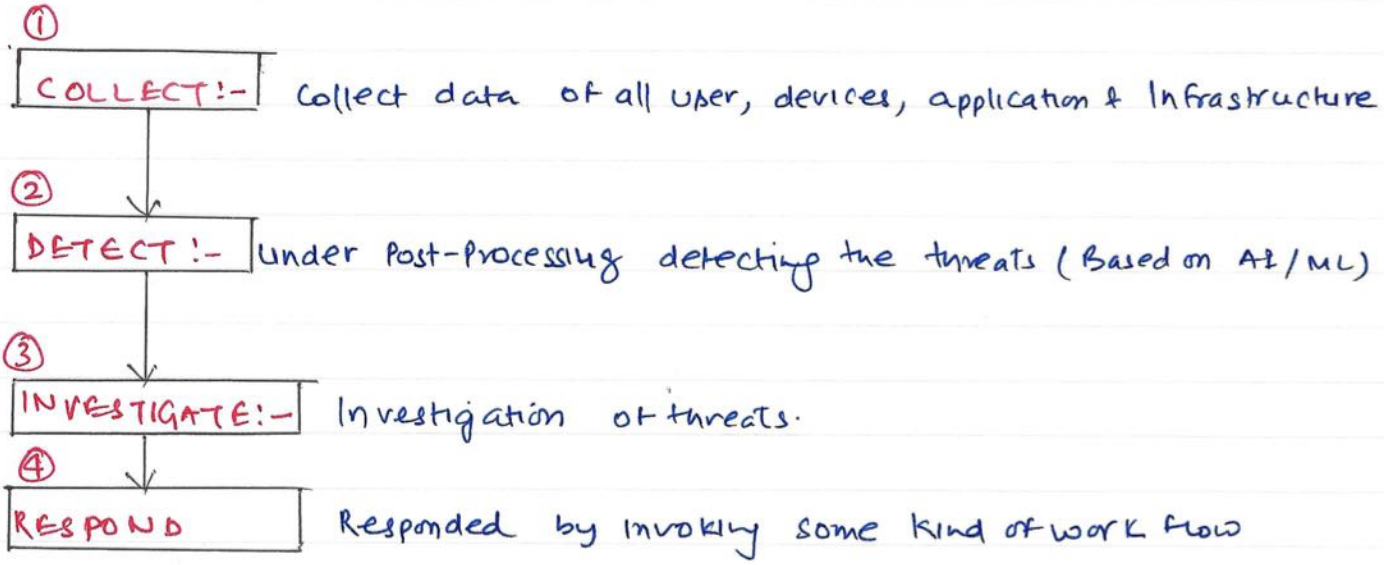
(iv) THREAT PROTECTION!- Analyze attempted threats though alerts and implicted resource reports.

EXAMPLE @ PORTAL'S

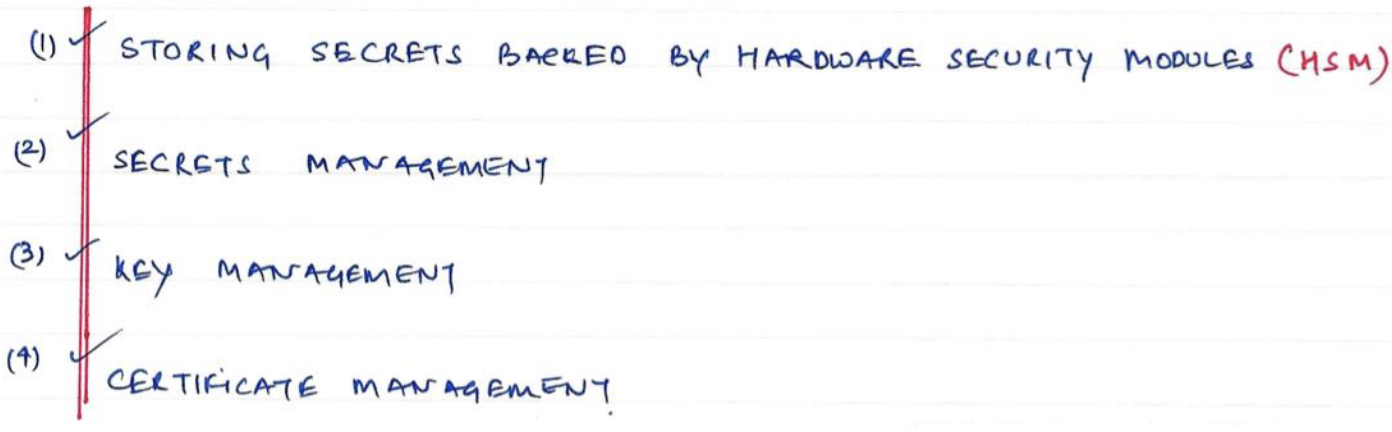
	Controls	Max Scores	current Scores	Potential Score Increase	Unhealthy Resource	Resource Healthy	Action
① →	Enable MFA	10	0	+18% (10 points)	1 of 1		
② →	Secure Management Ports	8	0	+14%. (8 points)	5 of 5		
③	Encrypt data in transit	4	3.11	+2% (0.89 Points)	2 of 4		

AZURE SENTINEL:- Azure sentinel is a security information management (SIEM) and security automated response (SOAR) solution that provides security analytics and threat intelligence across an enterprise.





03. **AZURE KEY VAULT:-** Azure key vault store application secreats in a centralized cloud location in order to securely control access permissions and access logging.



* **AZURE DEDICATED HOSTS:-** Azure dedicated hots provides physical servers that host one or more Azure virtual machines that is dedicated to a single organization load.

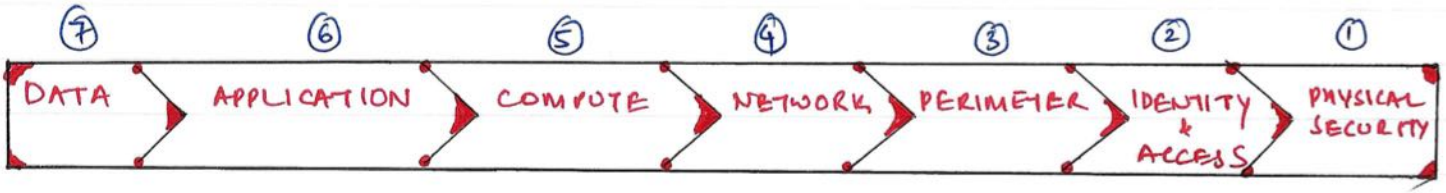
> * This will help to allocated dedicated hardware to specific Subscription → (VM, STORAGE will allocated dedicated).

* **BENEFITS:-**
  - * Hardware isolation at the server level.
  - * control over maintenance event timing.
  - * Aligned with Azure hybrid use benefits.

* **SECURE NETWORK CONNECTIVITY:-**

(How the virtual machie is secured - ?) By -

01. **DEFENSE IN DEPTH** - A layer approach to secure computer System. or virtual network.
  - → Provides multiple levels of protections.
  - → Attacks against one Layer are isolation from subsequent layer



→ * Hacker is majorly interested in. (Password, Credikenal detail) So the protection required at each level.

→ * Hacker need to hack each layer starting from Physical security to the Data Point.

SHARED SECURITY MODEL:- Azure provide shared security model. In this certain thing is take by microsoft and certain thing is take care by customer.

(Ex- Below are the detail around the type of model)

Responsibility	On-Premises	Iaas	Paas	Saas
Data Governance and - - Right Management	Customer	Customer	Customer	Customer
client endpoints	Customer	Customer	Customer	Customer
Account & access management	Customer	Customer	Customer	Customer
Identity & directory infrastructure	Customer	Customer	M/C	M/C
Application	Customer	Customer	M/C	Microsoft
Network control	Customer	Customer	M/C	Microsoft
Operating System.	Customer	Customer	Microsoft	Microsoft
Physical hosts	Customer	Microsoft	Microsoft	Microsoft
Physical networks	Customer	Microsoft	Microsoft	Microsoft
Physical Data Center	Customer	Microsoft	Microsoft	Microsoft

(# M/C = Microsoft / Customer)

NETWORK SECURITY GROUP - NSG filter network traffic to and form, Azure resource on Azure virtual network.

* set inbound & outbound rules to filter by source and destination IP address, ports and protocols.
* Add multiple rules, as needed, with subscription limits
* Overrides default rule's with new higher priority.

AZURE FIREWALL:- Firewall as a services (faas) that grants/denies Server access based on originating IP address, in order to protect network resource.

i. Applies inbound and outbound traffic filtering rules.
ii. Built-in high availability
iii. Unrestricted cloud scalability
iv. User Azure monitor logging

Azure Applicate gateway → Also provides a firewall, web-application firewall (WAF). WAF provides centralized, inbounded protection from web applications.

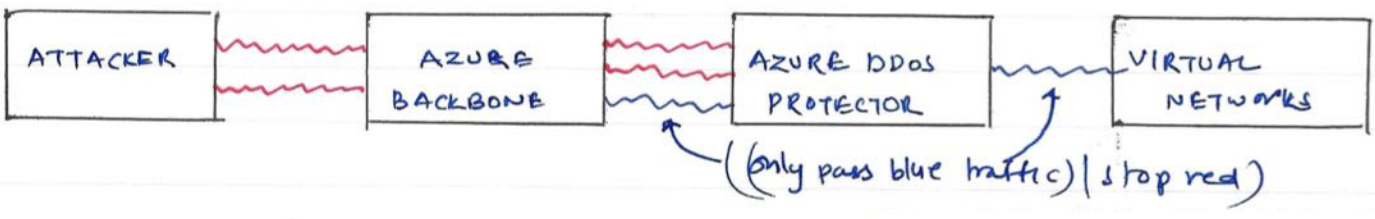
AZURE DDoS (DISTRIBUTED DENIAL OF SERVICES) PROTECTION

If a service requested from multiple location across globe to a specific server, which lead slow or unresponsive. So Azure is designed to handle such situation and block such kind of request.

THE BASIC VERSION OF DDoS IS FREE

* It will automatically detected that traffic is not coming from a needy user. but from a (Bot) and it will blocked. Azure backbone is pre-program to handle such situation.

i. Ensuring for server availibity to acess our request
ii. Basic service tier is automatically enable
iii. for standard service tier adds mitigation capabilities (It will
iv. help to get more detail from where attack happens.



SURAJ NOTES

Content

MODULE #

AZ-900, IDENTITY, GOVERNANCE, PRIVACY & COMPLIANCE.

AZURE IDENTITY SERVICES:-

1. Authentication verus Authorization.
2. Azure AD, MFA, SSO, and condition Access.

AZURE GOVERNANCE FEATURE:-

1. RBAC
2. Resource locks and tags
3. Policy, Blueprints and CAF.

AZURE PRIVACY & COMPLIANCE:-

1. Privacy statement and online services Terms
2. Trust center and compliance documentations
3. Azure sovereign regions.

1. AZURE IDENTITY SERVICES - OBJECTIVE DOMAIN:-

→ Explain the difference between authentications & authorizations
→ Define Azure Active Directory
→ Describe the function & usuage of Azure Active Dictory
→ Describe the functionality and usuage of conditional Accem, - multiple-factor (MFA) and single-sing (SSO).

* Authentications

- Identifies the person or seervices seeking access to a resources.
- Request legitimate access credentials.
- Basis for creating secure identity & access control principles.

(The process of identifying the person to be (claimed) is called Authentication

Authorizations.

- Determines an authenticated person's or seervice's level access
- Define which data they can access, and what they can do with it.

(Based on identity, provide the access to the seervices is called Authorization).

* AZURE ACTIVE DIRECTORY (AAD) - is an Microsoft Azure

cloud-based identity and access management seervices

1. Authentication (employee sign-in to access resources)
2. Single- sing-on (SSO)
3. Application Management
4. Business-to-Business (B2B)
5. Business-to-Customer (B2C)
6. Device Management

* **CONDITION ACCESS** – is used by Azure Active Directory to bring signals together, to make decisions, and enforce organizational policies.

- User or Group Membership
- IP Location
- Devices
- Application
- Risk Detection

↙

Risk Detection → with help of ML / AI Azure detect the patter of login like (city / country) If too Login attempt done from random location it will auto detected risk Detection.

① AZURE PORTAL → ② ACCESS CONTROL (IAM)

③ Check Access → ④ (Add role assignment)

⑤ Assign Roles →
- owner
- Contributer
- Reader

AZURE GOVERNANCES METHODLOGIES

* RBAC (ROLE-BASED ACCESS CONTROL)

- → fine-grained access management
- → segregrate duties within the team and grant only the amount of access to user that they need to perform their jobs.
- → Enable access to the Azure portal and controlling access to resource's.

* Giving role to particular security principle per access the resource.

* RESOURCE LOCK'S : protect your Azure resource from

accidental deletion or modification, Manages Locks at subscription, resource group, or individual resource level with Azure portal.

LOCK TYPES	READ	UPDATE	DELETE.
Can Not Delete	YES	YES	NO
Read only	YES	NO	NO

* mostly services are not able to re-call.
* resource lock help to prevent from accidental deletion.

AZURE PORTAL > SUBSCRIPTION > ~~SERVICES~~ SERACH WINDOW > RESOURCE LOCK

(ADD > (Define) Lock type → ~~Read only~~. > OK)

① Read only.

②

TAGS:-

* Very useful for rolling up billing information
* Define (KEY+VALUE) To define tag for any resource for getting the billing information.
* Provides Metadata for your Azure resources.
* Logically organizes resource into a taxanomy.

AZURE PORTAL:- Example:-

① AZURE PORTAL > ② LEFT SIDE EXPLORE SECTION > ③ TAG's.

① ② ③

AZURE POLICY:-

Azure policy help to enfore organizational Standard and to access Compliances at-scale, Provides governance and resource consistency with regulatory compliance, security cost and management.

→ Evaluates and identifies Azure resource that donot comply with your policies.

→ Provide built-in policy and initiative definations., under Categories such as storage, networking, compute, security center and monitoring.

④

AZURE PORTAL EXAMPLE:-

① AZURE PORTAL > ② SEARCH > ③ POLICY > { Policy Definations, Assignments, Definations, Exemptions }

AZURE BLUEPRINTS:- makes it possible for developement team to rapidly build and stand up new environement.

Developement team can quickly build trust through organizational compliance with a set of built-in components (such as networking) in order to speed up developement & delivery

1. Role Assignments
2. Policy Assignments
3. Azure Resource Manager's Templates
4. Resource Groups.

CLOUD ADOPTION FRAMEWORKS:-

- STRATEGY - Define business justification & expected outcomes
- PLAN - Align actionable adoption plan to business outcomes.
- READY - Prepare the cloud environement for the planned changed.
- MIGRATE - Migrate & Modernize existing workloads.
- INNOVATE - Develops new cloud-native or hybrid solutions.
- GOVERN - Govern the environement & workloads
- MANAGE - operational magements for cloud & hybrid sol(n).

* **AZURE PRIVACY :-** Microsoft comitted to ensuring the privacy of organizations through microsoft contratual agreements, and by providing user control & transparency.

COMPLIANCE :- Microsoft respect law and regulations and provide comprehesive coverage of compliance offerings.

Microsoft provides the mast comprehensive set of compliance offering (including certification and attestations) of any cloud service provider. some compliance offering including -

- CJIS (CRIMINAL JUSTICE INFORMATION SYSTEM)
- HIPAA (HEALTH INSURANCE
- CSA STAR CERTIFICATION
- ISO/IEC 27018
- EU MODEL CLAUSES
- NIST (National Institute of Standards & Technology).

SURAJ NOTES

Content

MODULE #

AZURE PRICING, SERVICE LEVEL AGREEMENT & LIFECYCLE'S

① AZURE SUBSCRIPTIONS:-

* subscription option

② PLANNING & MANGING COSTS

* Available product & services
* Pricing & TCO calculators.

③ SERVICE LEVEL AGREEMENTS

* SLA?
* Calculating your cloud uptime

④ SERVICE LIFE CYCLE

* Preview & general Availibity features

AZURE SUBSCRIPTIONS:-

① Open Azure Portal → ② Login in Azure Portal → ③ Go to subscription → ④ ADD subscription

Choose Subscription

1. Free Trial
2. Pas-As-you-go
3. Azure students.

(→ Choose your subscription as per your work requirement and activated)

(12 month) + ($200 credit) + (Always free (25+ services))

AZURE PURCHASING:- Three main custome types on which the available purchased option for Azure products and services are contingents are -

- → Enterprises
- → Web direct
- → Cloud solution Provider (CSP's)

① Enterprises ② Resellers ③ Partners ④ Personal's

FACTOR AFFECTIONG COSTS:-

① RESOURCE TYPE	② SERVICES	③ LOCATIONS
① - virtual machine		
② - App services (Based on services) Type of customer		
③ - Infrastructure Locations.		

AZURE PURCHASING :- Three main customer type of which the avialiable purchased option for Azure products & Serrices are configured are -

1 -> Enterprises
2 -> Web - Direct
3 -> Cloud solution Pronder (CSP's)

FACTOR AFFECT COSTS :-

* RESOURCE TYPE - (virtual machine -> CPU / RAM / storage.) virtual resource allocated with virtual machine.

* SERVICES - Depend on type of seevice like (Enterprises, web - - direct, cloud solution Partners.

* LOCATION - cost vary between locations that offer Azure product, services and resources.

* Bandwidth - Data moving in-and-out of Azure datacenter.

Some inbound data transfer are free, such as data going in Azure data center. for outbound data transfer - such as data going out of Azure datacenter - pricing is based on zones.

(AZURE > PRICING CALCULATOR) > (CHOOSE SERVICE)

-> once seevice selected (along twith region) the price will be allocated in bottom.

-> Pricing change as location change.

EXPLORE TCO (TOTAL COST OF OWNERSHIP):-

A tool estimate cost saving you can realize by migrating to Azure.

A report compares the costs of on-premises infrastructure with the cost of using Azure product and service in cloud.

EXAMPLE

S.NO	AZURE RESOURCE	ON-PREMISES COST	AZURE COST
1.	COMPUTE	0%.	7%.
2.	DATA CENTER	93%.	0%.
3.	NETWORKING	2%.	43%.
4.	STORAGE	4%.	50%.
	Example cost	= ($30,702,492)	($92,612)

MINIMIZING COSTS:- (PM-UU-CEA)

* 1) PERFORM - Perform cost analyses. Use (Pricing / TCO Calculator)
* 2) MONITOR - Monitor usuage and Azure Advisor.
* 3) USE - Use via free trial customer (spending limits)
* 4) USE - Use Azure Reservation & Azure Hybrid Benfits (HUB)
* 5) CHOOSE - choose Low-cost locations and regions.
* 6) KEEP - Keep up-to-date with latest subscription offer.
* 7) APPLY - Apply tag to identify cost owner

EXPLORE SUPPORT - OPTION :-

Every Azure subscription included free access to billing and subscription support, Azure portal products and services documentation, online self-help documentation, white paper and community support.

(→ ALSO reach to me, in case any support required around the technology.)

	- SCOPE	TECHNICAL SUPPORT
BASIC	Availiable to all Micrsoft Azure accounts	
DEVELOPER	Trial & Non-production environement	Business hours access to supports Engineering via email.
STANDARD	Production workload Enviorement	24x7 access to support Engineer via phone/email
PROFESSIONAL	Business-critical Dependences.	"

MICROSOFT SLA:-

* Performance targets are expressed as uptime and connectivity gurantees

* Performace - targets from 99.9% (3-9) to 99.99% (4-9)

* If a services fails to meet the guamtees, a percentage of montly service fees can be credited.

SLA	DOWNTIME/MONTH	DOWTIME/YEAR
99.9%	43.2 minutes	8.76 hours
99.95%	21.6 minutes	4.38 hours
99.99%	4.32 mmutes	52.56 minutes.