27/06/21

Azzure

Sandbox
Azzure Portal

Services like remote storage, database hosting, centralized account management.

★ pay-as-you-go, we can runn serverless applications with no coding require

Azure container instances + Azure Kubernets Services } allows to deploy containerised applications with fully managed services

★ Azzure Cosmos DB

Availability, Scalability, Security, Infra. Mgnt., Reliablity

★ delivery of computer services over the internet is known as cloud
It includes Servers, storage, databases, networking, S/w, analytics & intelligence.

→ pay-as-you-go model → lower operating costs,
Run your infra. most efficient
Scale as your business change.

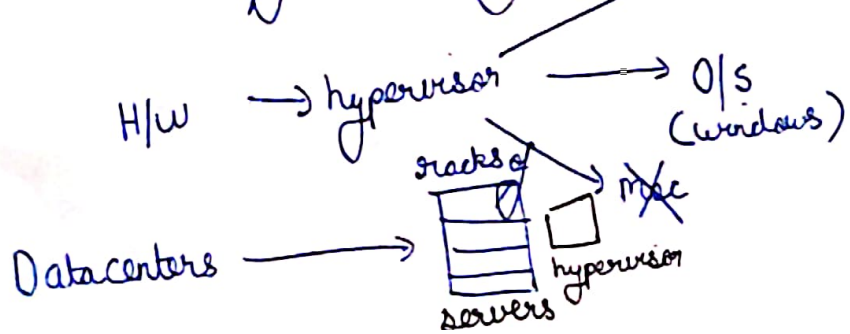
★ It's like renting compute power & storage from someone else's datacenter
↳ how much processing your computer can do.

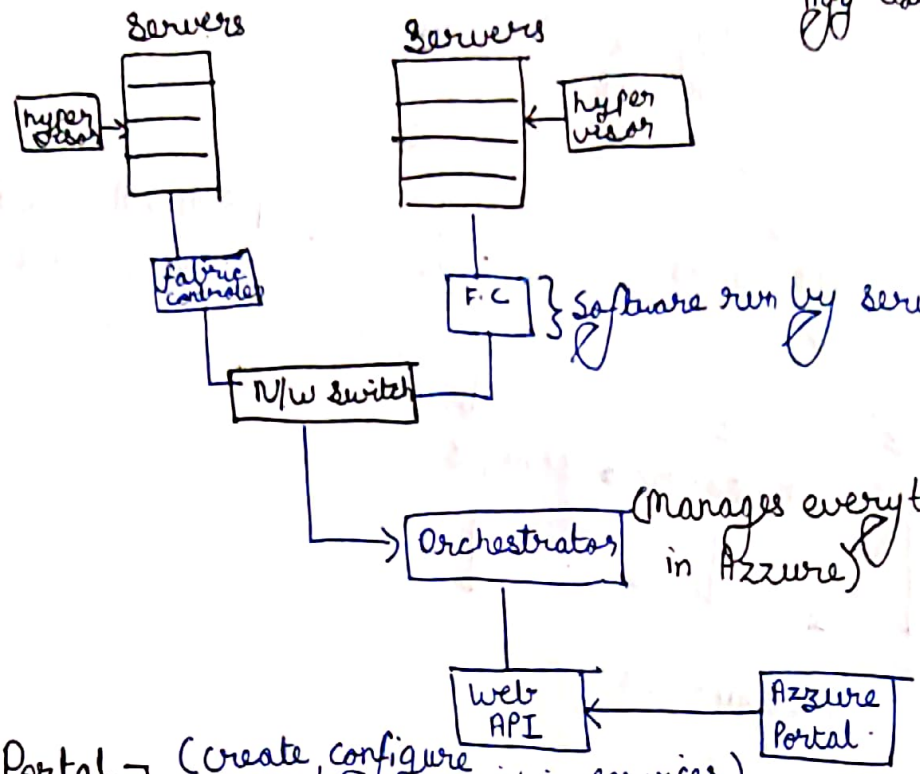
Cloud provide on-demand access to ↴.
→ a nearly limitless pool of raw compute, storage & networking components
→ speech recognition & other cognitive services
→ Analytical services that deliever telemetry data.

→ Azzure gives freedom to build, manage, and deploy applications on a massive global network using your favourite tools and frameworks.

Azzure offers ↴.
→ To be ready for future
→ Build on your teams (open sources, support for all languages)
→ On-premise (within the own house) services designed for hybrid cloud solutions.
→ Trust your cloud (security wise).

★ 100+ services from running on virtual machines to exploring new S/w paradigms



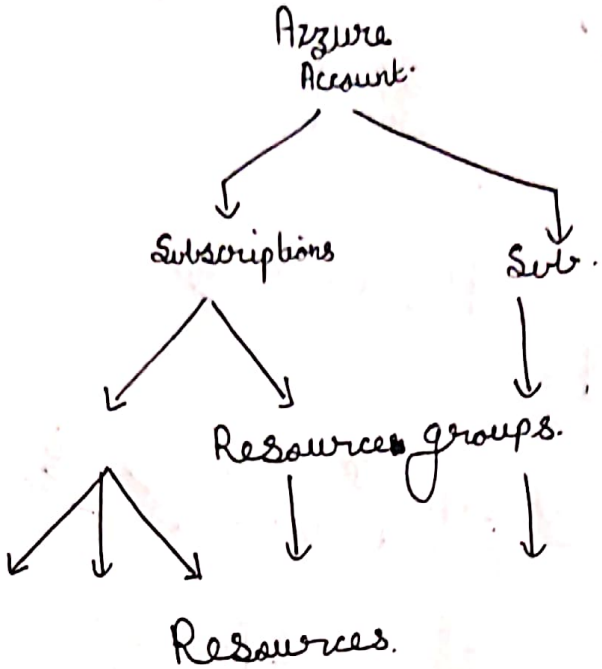


Azzure Portal ↴ (create, configure & maintain services)
web-based, unified console that provides an alternative to command-line tools
→ Build, manage everything from simple web apps to complex cloud deployments
→ create custom dashboards for an organized view of console.
→ configure accessibility options for an optional experience.

* resilience & continuous availability, maintains a presence in every Azzure datacentere
* Azzure Market place } connects users with Azzure partners who deploy there applications in azzure.

Azzure Services ↴.

→ Compute → Scale on demand
→ Networking → Connecting cloud & on-premise infra. (VPN's & load Balancing)
→ Storage →.
→ Mobile → Cross ~~Platfi~~ Platform, send notifications, use xamarine
→ Databases → All types of Open Sources.
→ Web → build, deploy, manage & scale a
→ IOT → Connect, monitor & manage all IOT devices
→ Big Data → open source cluster services & make decisions
→ AI / ML
→ Devops → brings together people, processes & technology
↳ create, build & release pipelines with CICD



ARM → Azzure Ressurce Manager

Different Types of cloud models ↴

→ Public Cloud → Service offered over public internet & available to everyone who wants to purchase them, owned by 3rd party completely. cloud service provider
No capital expenditure, pay for what they use.

→ Private Cloud → Computing resources used exclusively by users from one business or organization. Either physically located (on-premise) datacenter or can be hosted by a 3rd party service providers
Organization are responsible for H/w maintainance & updates

→ Hybrid Cloud → Combine public & private cloud by allowing data & application to be shared b/w them.
Organization control security, compliance or legal requirements

Advantages ↴.

→ high availability (depends on service-level agreement (SLA))
→ Scalability → (vertically or horizontally)
  → vertically by adding RAM or CPUs to a virtual machine (compute capacity)
  → horizontally (by adding instance of resources such as adding VMs to the configure).
→ Elasticity → Advantage of autoscaling so apps has ressource you need
→ Agility → Deploy & configure quickly

→ Geo-distribution → Region specific datacenters deployment.

→ Disaster-recovery → Cloud based backup services ensures data replication to protect at time of event of disaster

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Capital expenses vs. operating expenses.

→ physical servers (on-primise)

CapEx → up-front spending over physical infrastructure, and then declaring those expenses over time, value reduces overtime.

OpEx → Spending money on services or products now, deduct expenses in same year, no up front cost.

↳ cloud services.

→ Cloud computing operates on a consumption-based model i.e. pay as you go. It has benifits like ↴

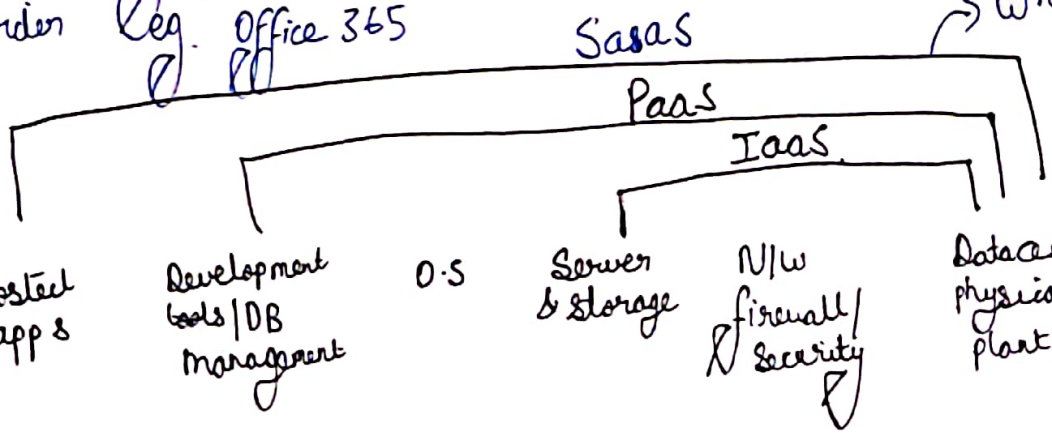
- → no up front costs.
- → no need to purchase & manage costly infra.
- → only pay additional when needed resources
- → stop paying for resources not needed.

Cloud Service Models ↴.

→ Iaas → closest to manage physical servers, Cloud provider keep H/w up & date, but O.S maintainance & n/w configuration depends on users.

→ Paas → managed hosting environment. Cloud provider manages the virtual machines & N/w resources & tenant deploys their apps into the managed hosting environment.

→ Saas → Cloud service provider manages all aspects of application environment such as VMs, N/w resources, data storage, and application. Tenant only provide their data to the application manages by the cloud provider Eg. Office 365



→ What is managed by cloud service provider

IaaS advantage ↴

- → No CapEx
- → Agility
- → Management
- → Consumption based model
- → Skills
- → Uses all cloud benefits (Security & high availability)
- → flexibility.

PaaS advantage ↴.

→ Productivity → only focus on app development only.

Disadvantage → Platform limitation

SaaS → totally managed by cloud service provider
all advantages of IaaS

Disadvantage → S/W limitations

Serverless Computing ↴.

Like PaaS, It enables users to build application faster by eliminating need to manage Infra.
With serverless apps., cloud service provider automatically scales & manages infra.
highly scalable & event driven, only using resources when a trigger occurs.
* servers are still running the code, but serverless means that tasks associated with infra. provisioning are invisible to developer.
increased productivity; better optimize resources & stay focused on inventions.

Core Azzure Concepts

Organizing structure ↓

Management groups → helps in managing access, policy & compliance for multiple Subscriptions.

↓

Subscriptions → groups together user accounts & the resources, there is a limit to each subscription, Organization uses Subscriptions to manage costs & the resources

↓

Resource Groups → logical containers of resources where accounts are deployed & managed.

↓

Resources → instances of services like VM, storage / database

They inherit all the conditions applied to the management group.

→ Resources are created in regions, which are different geographical locations. (datacenters)

→ When we use a service or create a resource such as SQL database or virtual machines (VM), we are using a physical equipment in one or more of these locations.

→ In each region there are 1 or more datacenters that are nearby & networked together with a low-latency N/w.

→ When we deploy resources we generally provide regions

→ Some services are region specific so don't require to provide regions like Azzure Active Directory, Azzure Traffic Manager, Azzure DNS.

★ Azzure has more Global regions than any other cloud provider.

→ Global regions provide better scalability & redundancy & also data residency for our services,

★ some specific Azzure regions are ↓ US DoD Central, US Gov Virgina

★ Azzure has availability zones in order to protect the information from failure. (high availability & low redundancy)

Availability Zones → physically separated datacenters within an Azzure region. each zone has one or more datacenters equipped with independent power, cooling, and networking. It is set up in an isolation boundary. If 1 zone goes down other centuries working, each one connected through high speed, private fiber-optic N/w.

→ It is used in mission-critical applications where we co-locate compute, storage, N/w & data resources

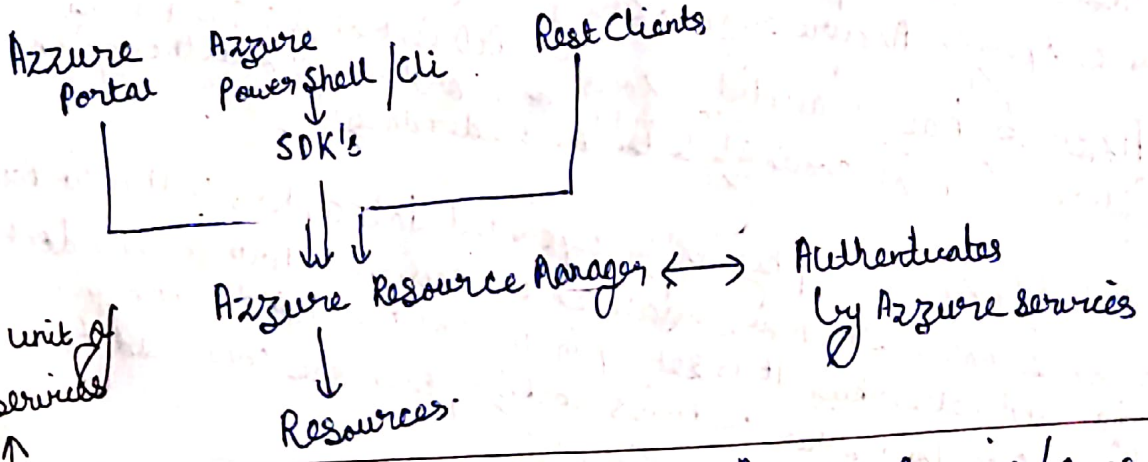
→ They are mainly for mission-critical applications for VMs, managed disks, load balancers, SQL databases.

2 categories → Zonal services
→ Zonal-redundant services

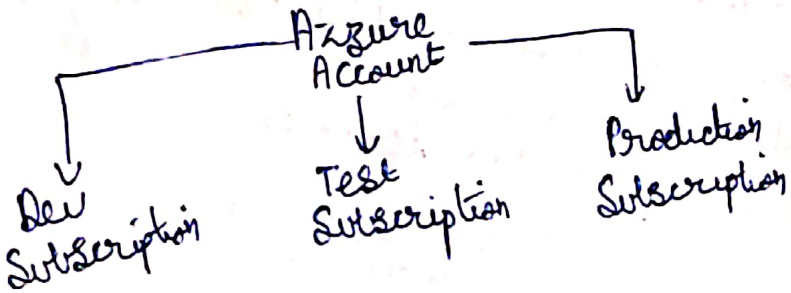
☆ There are minimum 3 datacenters in each region
In order to cope up with events such as natural disaster, civil unrest, power outages or physical n/w outages Azzure provides regional pairs in a radius of at least 300 miles away, It serves as a means for data replication to protect data in disasters.

Azure resource groups are fundamental elements of azzure platform → create, manage, update & delete resources.

→ All resources must be in a Resource group & a resource can only be a member of a single resource group. but they can move within resource group if required.
-> Resource groups can't be nested.
-> we can provide order & organization to resources you create in Azure.
-> logical grouping removes lots of disorder among our ~~the~~ resources.
→ deleting a resource group deletes all within resources.
-> They have a scope for applying role-based access control (RBAC) permissions with this they ease administra. & limit access to allow only what's needed.
-> It provides management features like access control, locks & tags to secure & organize your resources.



Azzure Subscription → first step to use any Azzure service/resource.
It provides authenticated & authorized access to Azzure products



→ An account can have 1 or more subscriptions having different billing models & with different access-management policies

→ Subscription boundary ⟶ billing boundary
↳ Access control boundary

→ multiple subscriptions are needed because of Environment, Organisation structure, Billing, Subscription limit to specific resources, etc.

→ multiple subscriptions can be organised using invoice sections.

Billing Account → Billing profile

Azure Subscriptions ← Invoice section

⇒ Management groups give you enterprise-grade management at a large scale no matter what type of subscription you might have.

★ 10000 management groups can be supported in a single directory
→ max 6 level of depth supported
→ each management group & subscription can support only one parent.

App Service ↴

It is an HTTP-based service that enables you to build and host many types of web-based solutions without managing infrastructure

Azzure Marketplace ↴

online store that hosts applications that are certified & optimised to run in Azure.

06/07/21 Azure Compute Services ↴

→ It is on-demand computing service for running cloud-based applications.
→ provides computing resources such as disks, processors, memory, networking and O.S.
→ Service supports Linux, Windows Server, SQL Server, Oracle, IBM, & SAP.
→ Some prominent services are ↴

→Azure Virtual Machines → Azure App Services
→Azure Container Instances → Azure function (or serverless computing)

• Virtual Machines → S/w emulation of physical computers
→ include virtual processor, memory, storage, N/w resources, hosts O.S.
→ They provide **IaaS**
→ When we need total control over an O.S. & environment VMs are an ideal choice.

→ Virtual Machine Scale Sets → use to deploy & manage a set of identical VMs
→ All VMs configure the same, are designed to support true autoscale.
→ No provisioning of VMs is required, this helps in large-scale services targeting (big compute, big data, containerized workloads)
→ The process of Autoscaling can be manual or automated or both.

→ Container & Kubernets → They helps to deploy & manage containers.
→ Containers are lightweight virtualized application environments.
→ quickly created, scaled out, stopped dynamically.
→ multiple instances of a containerized applications on a single host M/c

→ Azure App Service → quickly build, deploy, and scale enterprise grade web, mobile, and API apps running on any platform.
→ meet rigorous performance, scalability, security & compliance requirements
→ It is a part of PaaS.

→ Functions → are ideal when you are only concerned about the code running your service & not the underlying platform or infrastru.
→ used when you need to perform work in response to an event, timer, or message from another Azure service.

VMs are used when you need → total control over the O.S
→ ability to run custom S/w
→ to use custom hosting configurations.

★ No need to care about physical hardware, just need to configure, update, and maintain the S/w that runs on the VM.
→ Selecting and image is one of the most importance decision
→ image is a template used to create a VM.
→ includes OS & S/w like development tools & web hosting servers.

Examples of when to use VMs ↴.
→ During testing & development → when extending datacenter to cloud.
→ when running apps on cloud. → disaster recovery.
(lifts & shifts) → moving physical server to the cloud. [VMs can help in that by creating an image of the physical server & host it within a VM with little or no changes]

Virtual Machine Scale Sets → allow you to centrally manage, configure, & update a large number of VMs in minute to provide highly available applications.

Azure Batch → enables large-scale parallel & high performance computing (HPC) batch jobs with the ability to scale to tens, thousands of VMs

→ It starts a pool of compute VMs for you
→ install apps & staging data
→ Scales down jobs VMs pool as work completes

When to use Azure App Services ?

App Services helps build & host web apps, background jobs, mobile back ends & RestFul APIs in programming languages of ~~our~~ own choice with managing infra
→ automated scaling & high availability
→ We can deploy from GitHub, Azure DevOps, or any Git repo to support a continuous deployment model
→ App Service plan determines how much H/w is allotted to your host. Like it is dedicated or shared H/w & how much memory is reserved for it
Free tier available to host small, low-traffic sites.
→ host most common App Services like → Web apps, API apps, WebJobs, Mobile Apps
Azure handles most of the infra decisions you deal with in hosting web-accessible apps like deployment & management, secured endpoints, autoscaling, built-in load balancing & traffic manager.

API apps → much like hosting a website, full Swagger support & ability to package & publish your API in Azure marketplace.
Produced apps can be consumed from any HTTP / HTTPS based client.

WebJobs → helps to run a program or script in the same context as a web app, API app or ~~web~~ mobile apps. They can schedule or run by a trigger.

Mobile APPS → quickly build back end for iOS & Android apps, store app data in SQL database, authenticate customer using social media platforms, send push notifications, execute custom back end logic in C# or Node.js.

When to use Azure Containers ?

Containers are useful when want to run multiple instances of an application on a single host machine
→ They are virtualization environment like running multiple virtual machines on a single physical host
→ No need to manage OS., containers are designed to allow you to respond to changes on demand.
→ Containers helps you quickly restart in case of a crash or H/w interruptions.

Most popular container engines is Docker, which is supported by Azure.

Virtual machines virtualize the H/W, Containers virtualize O.S.

→ Containers and managed by container orchestrators which can start, stop & scale application instances on demand.

To manage both Docker & Microsoft-based containers in Azure we have

i) Azure Container instances → fastest & simplest way to run containers without having to manage any virtual machines or adopt any additional services
It is PaaS allowing to upload your containers

ii) Azure Kubernets Service → automating managing & interacting with a large no. of containers is known as orchestration
Kubernets is a complete orchestration service

Containers are often used to create solutions by using microservice architecture.
for eg in a web apps we can make 3 containers front-end, back-end & DB based on our requirements. and scale on demand.

microservice is a way to simplify ~~an~~ architecture by focusing on creating smaller, more manageable, autonomous & independently deployed web services that addresses single business domain or capability.

Azure functions when to use ↴

→ used for event driven logics, serverless computing
→ Serverless computing is the abstraction of servers, infra., & O.S.
→ abstraction of servers means we never explicitly reserve servers that is done by Azure. We just deploy code which then runs with high availability
→ Event driven scale → like timers to start execution at particular time.

Instead of writing an entire application, the developer authors a function having both code & metadata about its triggers & bindings. triggers define how a function is invoked. Bindings are declarative ways to connect to services from within the code

→ Micro-billing → pay only for the time the code runs

→ Benefits ↴
→ no infrastructure management with high availability
→ Scalability
→ only pay for what you use

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There are 2 ways to implement serverless compute ↓

1) Azure functions → function can execute code in almost any modern language
→ used when need to perform work in response to an event (often via rest request, timer, or message from another Azure service)
→ scale automatically on demand
→ fn's are either stateless or stateful, stateless (default) means they're restarted every time they respond to an event
Stateful (Durable Function) a context is passed through the function to track your activity
→ also a general compute platform for running any type of code
→ can run locally or in cloud

ii) Azure Logic Apps →
→ Similar to functions but functions execute code & logic apps execute workflows that are designed to automate business scenarios (built from predefined logic blocks.
→ workflow starts with trigger.
→ Each time the trigger fires, the logic Apps engine creates a logic app instance that runs the actions in the workflow.
→ these actions can include data conversions & flow controls, such as conditional statements, switch statements, loops & branching.
→ created using a visual designer on Azure portal or in Visual Studio.
→ They are JSON files with a known workflow schema.
→ This is an ideal for a business-analyst role.
→ runs only in cloud.

★ fn's & logic Apps create complex orchestrations that are executed to accomplish a complex task.

When to need Azure Virtual Desktop.

→ Azure Virtual desktop is application virtualization service that runs on the cloud.
→ enables users to use a cloud hosted version of windows from any location.
→ connection can be done through any device.
→ you can make sure session host virtual machines (VMs) run near apps & services that connect your data center or the cloud.
→ Sign-in to Azure Virtual Desktop is fast because user profiles are containerized by using FSLogix.
→ It provides centralized security management.
→ User sessions are isolated in both single & multi-session environments.
→ some key features ↓
- Simplified management
- performance using load balancer.
- multi-session windows 10 deployment.

Azure Virtual Network fundamentals ↴ (IaaS)

→ It enable azure resources such as VMs, web apps, databases, to communicate with each other, with users on the internet, and with your on-premises client computers.

It is
→ a set of resources that links other resources.
→ following n/w capabilities provided ↴.
- i) isolation & segmentation → communicate on-premise resources
- ii) internet communications → Route N/w traffic
- → communicate b/w Azure resources → filter N/w traffic
- → connect virtual N/w

→ VN's allows creating multiple isolated virtual N/w.
→ define a private IP address space by using either public or private IP address range.
→ we can configure the VN's to use either an internal or an external DNS servers.
→ A VM connects to internet by default.
→ VM management you can connect via the Azure CLI, Remote desktop protocol, or Secure shell
→ Azure services like App Service, Kubernets service and VM scale sets communicate using VN/w's
→ **Service Endpoints** connects resources like Azure SQL, storage accounts. It links multiple Azure resources to virtual N/w to improve security & provide optimal routing.
→ 3 mechanisms to achieve communication with on-premise resources are ↴.
- Point-to-Site virtual private N/w : client comp. initiates an encrypted VPN connection to connect that computer to the Azure virtual N/w.
- Site to Site VPN :- links on-premise VPN device to Azure VPN gateway in a virtual N/w
- Azure ExpressRoute : for environment needing greater bandwidth & even higher levels of security.

→ Route N/w traffic can be controlled by
- Route tables
- Border Gateway Protocol - helps propagate on-premise BGP to Azure VN's using Express Route.

→ filter traffics by ↴.
- N/w Security groups.
- N/w virtual appliances

→ we can connect VN's using virtual network peering. helping resources in each virtual N/w to communicate with each other.

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→ UDR (user defined routing) is a significant update to Azure's V.N. helping N/w admins to control the routing tables b/w subnets within a VNet,

→ We can create & configure Azure VNet instances from Azure portal, Azure PowerShell on your local computer, or Azure Cloud Shell.

Azure VPN Gateway fundamentals ↓

→ VPNs use an encrypted tunnel within another network

→ typically deployed to connect two or more trusted private N/w to one another over an untrusted N/w (typically the public internet).

→ traffic is encrypted

→ VPNs can enable branch offices to share sensitive info. between locations.

→ VPN gateway is a type of virtual network gateway.

→ VPN gateway are deployed in Azure Virtual N/w.

→ VPN gateway enable following connectivity.

→ Site-to-Site connection Connects on-premise datacenter to VNet.

Point-to-Site " - connects individual devices to virtual Net.

N/w to N/w " - " VNet to VNet.

→ can only deploy only one VPN gateway in each virtual Net. but 1 gateway connects multiple locations.

→ while deploying VPN gateway, you need to specify the VPN type

→ either policy based or Router based.

both these rely on Internet Key Exchange (IKE) which helps in security association.

⇒ Policy-based VPNs.

→ specify statically the IP address of each packets that should be encrypted through each tunnel.

→ supports IKEv1 only → (650 Mbps)

→ Source & destination of tunnel N/w are declared in the policy & don't need to be declared in routing tables.

→ used in places like compatibility with legacy-on premises VPN devices.

⇒ Route-based VPNs ↓.

→ IP routing decides which one of these tunnel interfaces to use when sending each packets.

→ preferred connection method for on-premise devices.

It is used in scenario like

→ connection between virtual N/w

→ Point to Site

→ Multi Site

→ coexistence with an Azure Express Route gateway

(1Gbps)

→ supports IKEv2. , uses any-to-any traffic selectors.

Some VPN Gateways

Basic	100 Mbps	(Dev/Test workloads)
Vpn GW1/Az	650 Mbps	★ It's unsupported to migrate from Basic to the VpnGW1/2/3/Az
Vpn GW2/Az	1 Gbps	
VpnGW3/Az	1.25 Gbps	

Required Azure Resources before deploying a VPN gateway ↴

→ Virtual Network
→ Gateway Subnet.
→ public IP address.
→ local N/w gateway.
→ virtual N/w gateway.
→ connection between VPN gateway & Local N/w gateway.

On-premise resources needed

→ A VPN device that supports public-based / route-based VPN gateways
→ A public-facing (internet-routable) IPV4 address

⇒ High availability scenarios ↴.

→ VPN gateways are deployed as two instances, even if you only see one VPN. (Active & standby)
→ for supporting Border Gateway protocol active/active configuration is used.
unique IP to each instances.
→ Express Route failover
→ Zone-redundant gateways.

Azure Express Route fundamentals ↴.

→ lets you extend your on-premise N/w into the Azure cloud over a private connection with help of a connectivity provider.
→ lets to connect cloud services like Azure, microsoft 365.
→ any-to-any (IP VPN) network connectivity, a point to point ethernet or a virtual cross-connection through a connectivity provider at a colocation facility.

Benefits of using this ↴ → Layer 3 in OSI model. (Open System Interconnection)

→ It provides N/w layer connectivity between your on-premise N/w and the microsoft cloud through connectivity partners.
→ Built in redundancy ~~correctly~~ connectivity with microsoft are highly available.

→ direct ac
→ Express through
→ Dynami
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★ → data
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→ direct access to following services ↴
MS Office 365
MS Dynamics 365
Azure compute services like Az VM's
Cloud services like Cosmos DB & Azure Storage.

→ Express Route Global Reach helps your cross-datacenter traffic to travel through the MS N/w.

→ Dynamic Routing → uses broader gateway protocol (BGP)

⇒ Express Route connectivity models ↴.
- CloudExchange Colocation → both data link layer & N/w layer connection
- Point-to-point Ethernet connections
- Any-to-any connection → integrat wide Area Network (WAN)

★→ data doesn't travels through public internet, so it's not exposed to the potential risks. It is a private connection from your on-premise infra to your Azure infra.
DNS queries, certificate revocation list checking, Azure CDN requests are still sent over the public internet.

★ Express Route does provide private connectivity, but it isn't encrypted.

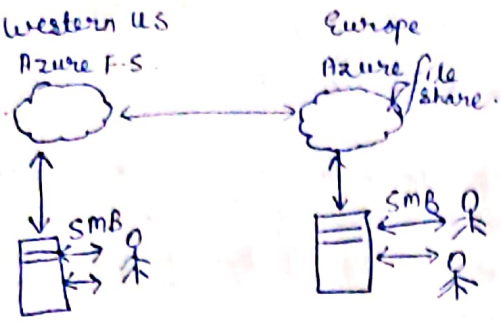
Azure Storage ↴ (cloud storage solution).
→ It helps in storing files, messages, tables & other type of info.
→ It is used by both Iaas and paas.
→ Azure VMs use (Azure Disk Storage) to store virtual disks, however you can't use Azure Disk Storage to store a disk outside a virtual machine.
→ Storage account provides a unique namespace for your Azure Storage Data, that's accessible from anywhere in the world over HTTP or HTTPS.
→ Data is secure, highly available, durable & massively scalable.

Disk Storage → provides disks for Azure Vms
→ allows data to be persistently stored and accessed from an attached virtual hard disk
→ we can use (standard SSD & HDD) disks for less critical work loads,
(premium SSD) for mission-critical production apps.
(ultra disks) for data-intensive workloads such as SAP HANA, heavy works.
→ consistent delivered enterprise-grade durability for IaaS with 0% annualized failure rate.

Blob Storage ↴ Storage Account → Storage Container → Blob Storage

→ It is an object storage solution.
→ It can store massive amounts of data, such as text or binary data.
→ It is unstructured, no restriction on the kind of data
→ can manage thousands of simultaneous uploads, massive video data, constantly growing log files, & can be reached from anywhere with an internet connection.
→ It can contain GB's of binary data streamed from a scientific instrument, an encrypted message from another application, or data in a custom format for an app you are developing.
→ advantage over disk storage is that developers don't think about or manage disks.
data uploaded as blobs, Azure take care of physical storage needs.
→ It is ideal for ↴
→ Serving images or docs directly to a browser
→ Storing files for distributed access
→ Streaming video & audio
→ Storing data for backup & restore, disaster recovery & archiving
→ Storing upto 8TB data for VMs.
→ Storing data for analysis by an on-premises or Azure-hosted service
→ Store blobs in containers which helps in organizing your blobs depending on your business needs.

Azure files ↴.
→ It offers fully managed file shares in the cloud accessible via industry standard Server Message Block & N/w file System protocols.
→ can be mounted concurrently by cloud or on-premise deployments of windows, linux or macOS.
→ Any no. of Azure VMs can mount & access file storage simultaneously
→ Typical usage → to share file anywhere in the world, diagnostic data & application data sharing.
→ Azure files makes it easier to migrate on premise data sharing data to Azure
→ Azure files share can be accessed via multiple VMs which helps ensuring everybody can find them & use same version
→ It helps write data to a file share, & process & analyze the data later.



Azure Storage supports 3 types of blob
i) Block blob (block of data) upto 4.7 TB
ii) Append blob (optimized for append operations)
iii) Page Blob
↳ virtual hard drive (VHD) file
upto 8 TB.

→ We can access the files from anywhere in the world, by using a URL that points to the file.
→ We can use Shared Access Signature (SAS) tokens to allow access to a private asset

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Blob access tiers ↴ (opposite of Azure Table Storage)
→ based on attributes like frequency of access & planned retention period.
→ Data can be differentiated on the basis of how it's generated, processed & accessed over its lifetime.
Available Access tier ↴.
- Hot access tier → data frequently used like images on your website.
- cool access " → " infrequently used stored for at least 30 days (eg invoices for your customer)
- Archive access tier: data rarely used, stored for atleast 180 days, with flexible latency requirement eg long term backups.

→ Hot/cool/Archive tier can be set at the blob level, during upload or after upload.
→ Cool access → Slightly lower availability but still higher durability, retrival latency & throughput similar to hot data.
→ Archive Storage stores data offline & offers the lowest storage costs, but higher costs to rehydrate & access data.

Database & Analytics services ↴
→ all relational, nosql & in memory database
→ availability, scalability, security

Azure Cosmos DB ↴ GREMLIN API → Graph-based applications
→ globally distributed, multi-model DB service.
→ elastically & independently scalable throughput & storage across any number of azure regions world-wide.
→ It provides comprehensive service level agreements for throughput, latency, availability, & consistency guarantees
☆ Cosmos DB supports SQL, MongoDB, Cassandra, Tables & Gremlin API.

→ Cosmos DB supports schema-less data which helps building highly
& 'Always On' application to support constantly changing data
→ You can use this feature to store data that's updated & maintained by users around the world.
→ Cosmos DB is flexible, Azure Cosmos DB stores data is atom-record-sequence (ARS) format. The data is then abstracted & projected as an API
→ With Cosmos DB, developers can stick with the API that they are most comfortable with that makes it flexible.

Azure SQL Database ↴

→ relational database based on the latest stable version of the Microsoft SQL Server database engine.
→ It is high-performance, reliable, fully managed, & secure DB
→ No need to manage infrastructure pluse use program. lang. of your own choice
→ PaaS
→ handles upgrading, patching, backups, monitoring without user involvement.
→ 99.99% availability
→ focus on domain-specific service that has built-in high availability, backups, and other common maintainance service.
→ helps creating highly available & performance data storage layer
→ helps process both relational & non-relational structures, such as graphs, JSON, spatial, and XML.
→ advanced query processing features like in-memory tech & intelligent query processing.
→ Azure Database Migration Service (ADMS) helps in migration existing SQL servers.
→ It provides Microsoft Data Migration Assistant that helps providing required changes prior to migration of DB

Azure DB for MySQL ↴

→ LAMP stack (Linux, Apache, MySQL, PHP)
→ based on MySQL community edition database engine, versions 5.6, 5.7 & 8.0.
→ 99.99% availability SLA with Azure
→ built-in security, fault tolerance, & data protection
→ point-in-time restore to recover a server to an earlier, as far back as 35 days.

helps building highly responsive
anging data
updated & maintained by users

data is Atom-record-sequence
rojected as an API
e API that they are most

e version of the Microsoft

, & secure DB

program. lang. of your own choice

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ta storage layer
structures, such as

ory tech & intelligent query

igration existing SQL servers.
that helps providing received

e, versions 5.6, 5.7 & 8.0.

rlier, as far back as

Azure DB for MySQL provides ↴
→ high availability with no additional cost
→ pay-as-you-go pricing
→ Scale as need within sec
→ protect sensitive data at rest & in motion
→ automatic backups
→ Enterprise-grade security & compliance
→ no administration required
→ different tiers as per need.

Azure DB for PostgreSQL ↴
→ relational DB service in the cloud.
→ community version of the open-source PostgreSQL
→ benefits ↴
→ built in high availability, no additional configuration, replication
→ Simple & flexible pricing, software patching, automatic backups, monitoring & security
→ Scale up & down as needed
→ Point-in time restore for up to 35 days
→ Enterprise-grad security & compliance
available in 2 development options: Single Server & Hyperscale (Citus)

Single Server deployment option delivers ↴
→ vertical Scale as needed, within sec.
→ monitoring & alerting to assess your server.
→ enterprise-grade security

3 tiers here → Basic general purpose & Memory Optimised

Hyperscale → horizontally scales by using sharding, 100GB of data & more is scaled here.
→ support multi-tenant application, real time operation analytics, & high throughput transactions workloads.

Azure SQL Managed Instance ↴
→ scalable cloud data service that provides the broadest SQL Server
→ Compatible with all the benefits of a fully managed platform (PAAS)
→ fully managed PAAS database engine.
↓ It is used over Azure SQL Database when on premise DB is using cyrillic characters for collation but Azure SQL DB only use
SQL_Latin1_General_CP1_CI_AS

Migration Process flow
Discover → Assess → migrate → cutover → optimize

Big Data & Analytics ↴

→ Azure supports a broad range of technologies & service to provide bigdata & analytics solutions, including

→ Azure Synapse Analytics → Azure HDInsights → Azure Data Bricks

→ Azure Datalake "

- Azure Synapse Analytics (Azure SQL Data Warehouse) (formely)
  - → limitless analytics bringing together enterprise data warehousing & big data analytics.
  - → query data on terms either serverless or provisoned resource at scale.
  - → unified experiences to ingest, prepare, manage, serve data for immediate BI and machine learning needs.
- Azure HDInsights → fully managed, open-soure analytics service
  - → ~~most~~ makes easier, faster & more cost-effective to process massive amount of data.
  - → popular open-source frameworks like Apache Spark, Hadoop, Kafka, HBase, Storm & ML services.
  - → also supports extraction, transformation, loading, data warehousing, ML, & IOT.

→ Azure Databricks ↴

- → unlock insights of all your data & build A.I. solutions.
- → set up Apache Spark & then autoscale & collaborate on shared projects
- → supports Python, Scala, R, Java & SQL & data science framework & libraries including Tensorflow, PyTorch & scikit learn.

→ Azure Data Lake Analytics ↴

- → on demand analytics job that simplifies bigdata.
- → instead of deploying, configuring, & tuning H/W you write queries to transform your data & extract valuable insights.
- → pay for your job when it's running, cost effective

21/07/21 Core Solutions & management tools on Azure

IOT → It bridges the physical & digital worlds by enabling devices with sensors & an internet connection to communicate with cloud-based systems via the internet.
→ It enables devices to gather and then relay info for data analysis
→ Some sensors are ↴
→ environment sensors
→ Barcode, QR code, OGR sensors
→ light, color & infrared "
→ motion & touch sensors.
→ error sensors, etc.
→ data collected from sensors are send to specific endpoints in Azure via message. which collected & aggregated and converted to reports & alerts.
→ These data collected can be combined with Azure AI services to help y in predicting things.

⇒ Azure IOT Hub ↴.
→ managed service hosted in cloud acting as central message Hub for bi-directional communication between IOT devices & apps.
→ connect virtually any device to your IOT hub.
→ multiple messaging patterns supported like
→ device to cloud telemetry
→ file upload from device
→ request reply method to control devices.
→ helps maintaining health by tracking events like device creation, device failure, & device connections.

⇒ Azure IOT central ↴.
→ builds on top of IOT Hub by adding dashboard to connect, monitor & manage IOT devices.
→ UI makes work easy
→ set up alerts, firmware updates, etc.
→ Key part is device templates that connects a device without any service-side coding.

⇒ Azure Sphere ↴
→ creates end to end, highly secure IOT solution for customers
→ It encompasses everything from the H/W & O.S. on the device to the secure method of sending messages from the device to the message Hub.
→ Built in communication & security features for devices.

3 parts ↴
→ Azure Sphere Micro Controller Unit (MCU), processes the OS & Signal from attached sensors.
→ Customised Linux OS handling communication & security servic & can run the Vendor's S/W.

→ Azure Sphere security service (AS3) making sure devices not maliciously compromised.

Decision Criteria to decide which IOT service is preferrable ↴

i) Is it critical to ensure that the device is not compromised ?

ii). Do i need a dashboard for reporting and management ?

1/08/21 AI services from Azure ↴

- AI adapts and improves its decision-making ability over time based on its success & failures.
- → It's goal is to create a s/w that's able to adapt or learn something on its own without being explicitely programmed to do it.
- → 2 approaches → deep learning (Neural Network)
  → machine learning (using existing data to train model & predict future)

★ virtually every device or s/w that collects textual, visual, & audio could feed a ML model.

→ 3 primary products by Azure for AI are there ↴

⇒ Azure Machine Learning → platform for making predictions.
- → allow services to train & test models.
- → after running experiments to test the model, you can deploy & use it in real time via a web API endpoints.

With Azure ML we can ↴
- → Create process to obtain data, handle missing data, split data in test or training sets & deliever to training process.
- → Train & evaluate models using tool or programming languages.
- → create pipeline defining when & where to run the compute intensive experiment
- → deploy best-performing algo. as an API to an endpoint so it can be consumed in real time by other apps.

⇒ Azure Cognitive Services → provides pre built ML models that enables apps to see, hear, speak, understood & even begin to reason.
- → helps solving general problems such as analysing text for emotional sentiments
- → accessed via API no prior ML knowledge needed & can easily use these API with few lines of code.

→ provides pretrained data models
→ It can be devided into following categories :
- Language services : process NLP, evaluate sentiments
- Speech services : convert text to speech
- Vision Services : analyze pictures, videos
- Decision services :

⇒ Azure Bot Services :
→ Bot framework for creating virtual agents that understand & reply to questions just like a human
→ behind the scenes uses Azure cognitive services
→ helps in automating needs of human.

⇒ Decision Criteria for which AI service to use :
→ Are you building a virtual agent that interfaces with human via natural language? Azure Bot
→ Do you need a service that can understand the content & meaning of images / video / audio or for translation → Azure cognitive service
→ Do you need to predict user behavior or provide users with personalized recommendation in your app? Azure Cognitive service.
→ Do you want to predict future outcomes based on private historical data? Azure ML.
→ Do you need to build a model by using your own data or perform a different task that listed above? Azure ML.

02/08/21 Azure Serverless Technology.
→ kind of an execution environment that's set up & managed for you.
→ no worry of outrage, code scale on demand
→ It is cloud hosted execution environment that runs your code but abstracts the underlying hosting environment.
→ we are not responsible for setting up & maintain the server.
→ create an instance of the service & you then add your code.
→ configure your serverless apps to respond to events.
  - → Rest endpoints
  - → a periodic timer
  - → a message from another azure service

→ usually handles back-end scenarios.

2 types :-

⇒ Azure functions : host a function using a popular programming language like C#, python, JavaScript, Typescript, Java & powershell. → serverless compute service

→ It is solid choice when demand is variable.
→ It is stateless environment, fn behaves as if restarted everytime.
→ ideal for processing incoming data.
→ perform orchestration tasks by using an extension called durable functions.

⇒ Azure logic Apps : low-code/no-code development platform hosted as a cloud service → serverless orchestration service

- automate & orchestrate tasks
- build scalable solution, whether in the cloud, on-premise, or both.

→ this solution covers app integration, data integration, system integration, etc.
→ designed in a web-based designer
→ link triggers (↳ event) to actions with connectors.
→ logic actions are there like working with variables, decision statement & loops, & tasks that pase & modify data.
→ over 200 connectors in gallery including Salesforce, SAP, Oracle DB, & file shares.
→ custom build also there.

⇒ Decision Criteria :-

→ Do you need to perform orchestration along well known APIs ?
logic apps.
→ Do you need to execute custom algo. or perform specialized data pasing & data lookups ?
Azure functions
→ Do you have existing fn. written in programming language ?
Azure functions.
→ Do you prefer a visual (declarative) workflow or writing imperative code ?
logic apps.

03/08/21 Devops tools by Azure :

→ Devops aims to expedit the release of S/w changes, ensure the ongoing deployability of the system & ensure that all changes meet a high quality bar.
→ Azure offers tools to enable source-code management, continuous Integration & continuous deployment (CI/CD)
→ There are 3 product options provided by Azure :

⇒ Azure DevOps Services :
-> It addresses every stage of the S/w development lifecycle.

→ Azure Repos → centralized source-code repository for code reviews
→ Azure Boards → Kanban boards
→ Azure Pipelines → CI/CD pipeline automation tool.
→ Azure Artifacts → hosting artifacts like compiled source code which can be fed into testing or deployment pipeline steps.
→ Azure Test Plans → automated test tools.

not used to automate a CI/CD process

lacks features to assign individual developers tasks to work on.

⇒ GitHub & GitHub actions :
→ decentralized source-code management tool built over Git
→ Share source-code repository
→ project management including Kanban boards.
→ issues reporting, discussion & tracking
→ CI/CD pipeline automation tool.
→ can run from the cloud or on-premises
→ Github actions enables workflow automation with triggers for many lifecycle events.

★ Github offers public repos. trusted by tens of thousands of open-source project owners. Azure Devops more focused on enterprise development.

⇒ Azure DevTest Labs :
→ provides an automated means of managing the process of building, setting & tearing down VM's that contains builds of your S/w projects.
→ eg testing of a new feature on an old version of an O.S., DevTest sets up everything automatically on requests.

→ Analyze criteria
a) automate & manage test-lab creation → DevTest Labs.
b) building open-source S/w? Github.
c) Source-code mgmt & DevOps tools, what level of granularity needed for permission → Azure Devops server.
d) Sophisticated project mgmt & reporting solution needed ? Devops Azure

Azure Management Tools ↴

→ 2 broad categories → visual tools
→ code-based tools

→ visual tools are less useful when we are trying to access set up a large deployment of resources with interdependencies & configuration options

→ Azure Portal → friendly, graphical UI to view & manage all services

→ Azure Mobile App → monitor health & status of resources
→ check alert, quickly diagnose & fix issues
→ run Azure CLI or powershell commands

→ Azure PowerShell → commands are called cmdlets
→ These commands call the Azure Rest API to perform every possible mgmt task in Azure.
→ cmdlets can be executed independently or combined into a script file
→ capturing commands in a script makes the process repeatable & automatable.
→ available for all platforms & can even access in web via Azure Cloud Shell

→ Azure CLI → executable program to execute commands in Bash
The only difference with powershell is the syntax

→ Arm Templates → (Azure resource mgmt templates)
→ It helps describing resources to be used in JSON format.
→ entire ARM template is verified before any code is executed to ensure the resource will be created & connected correctly.
→ All of the instances can be parallely created at the same time.
→ It can even execute PowerShell & Bash scripts before or after the resources has been set up.

Decision Criteria ↴.

→ Do you need on-off management, administrative, or reporting actions? Azure Portal, CLI/PS, app depending on use case.

→ Do you need to set up one or more resources → ARM template

→ Scripting needed → CLI/PS.

→ Management tools in Azure

3 types → Azure Advisor
→ Azure Monitor
→ Azure Service He
It alerts when yo

Azure Advisor → evaluates
help improve reliability, secu
→ helps cloud optimization
→ available via Azure po
→ Advisory dashboards di

Azure Monitor → platform
→ Application
based on the metrics.
→ logs & metric data is
→ You can view high-le
views by using Po
→ threshold to trig

Azure Service Health
& resources you rely
→ status.azure.com
→ It displays both ma
→ keeps an eye on

service issues affecting your

Decision Criteria

→ Do you need to o
resources &

→ Do you want to
Azure M

→ Do you want
Azure

→ Do you need
to deploy

trying to ~~access~~ set up a large
ces (& configuration options.

view & manage all services

tus of resources
diagnose & fix issues
rshell commands

cmdlets
t API to perform every possible

clently or combined into a script file.
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ent templates)
used in JSON format.
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needed correctly.
dy created at the same time.
ch scripts before or after the resource

administrative, or reporting actions?
:LI/PS, app depending on use case.
resources → ARM template

=> Management tools in Azure → (for visibility, insight, & outage mitigation)

3 types → Azure Advisor
→ Azure Monitor
→ Azure Service Health
→ It alerts when recommendations available

Azure Advisor → evaluates your Azure resources & make recommendations to help improve reliability, security, & performance (consistency) (speed), reduce costs, operational Excellence
→ helps cloud optimization
→ available via Azure portal & the API.
→ Advisory dashboards displays personalized recommendations

Azure Monitor → platform to collect, analyse, visualize & potentially take action. (Application insights)
based on the metrics.
-> Logs & metric data is stored in central repository.
-> You can view high-level reports on the Azure Monitor dashboards or create custom views by using Power BI & Kusto queries.
→ threshold to trigger autoscaling functionality

Azure Service Health → personalized view of the Azure services, regions & resources you rely on.
→ status.azure.com website displays major issues not minor issues
→ It displays both majors or minors.
→ keeps an eye on several events → (provides incident history & RCAs to share with your stakeholders)

- Service issues affecting you right now
- Planned maintenance events affecting availability.
- Health advisories are issues that require to act to avoid service interruption, arranged for in time to allow you to plan.

Decision Criteria

→ Do you need to analyze how you're using Azure to reduce costs, improve resiliency & harden security? Azure Advisor
→ Do you want to monitor Azure services or your usage of Azure? Azure Monitor
→ Do you want to measure custom events alongside other usage metrics? Azure Monitor
→ Do you need to set up alerts for outages or when autoscaling is about to deploy new instances? Azure Monitor

20/08/21 Protection Against Security threats on Azure.

→ Security tools of Azure.

→ Azure Security Center ↴.
Monitoring service that provides visibility of your security postures both on Azure & on-premise
cybersecurity policies

It can ↴
→ monitor security setting across on-premise & cloud workloads
→ automatically apply required security settings to new resources as they come online
→ provides security recommendations
→ continuous monitoring resources & perform automatic security assessments.
-> use ML to detect & block malwares
→ detect & analyse potential inbound attacks.
→ provides just-in time access control for N/w ports.

-> Azure Security Postures ↴.
We can get detailed description of securities using security center.

→ Security Score ↴.
measurement of an organisation security postures.

=> Protection against threats by security center ↴.
→ Just-in-time VM access
→ Adaptive application control
→ Adaptive N/w hardening
→ File integrity monitoring

Security alerts are generated by monitoring (company), they can dismiss false alerts, investigate further, remediate manually or use an automated response with a workflow automation.
workflow automation uses Azure logic apps & security center connectors.
we can automate logic apps on our basis what it will do when alert comes.

Azure Sentinal ↴.
→ On large scale it can benefit SIEM (Security Info. & event management) systems. A SIEM aggregate security data from many different sources.

Azure Sentinal is a cloud based SIEM system.

It is an intelligent security analytics & threat analytics.

Azure Sentinel enables:

- → Collecting data (cloud) at scale
- → detect previous undetected threat
- → investigate threats with AI.
- → respond to incidents rapidly.

Azure Sentinal supports a number of data sources.

- → connect Microsoft Solutions like Ms threat protection solutions, Microsoft 365 sources, Azure Active directory, windows defender firewall.
- → connect another services solutions like AWS CloudTrail, Cybric Analytics, Okta SSO, etc.
- → Connect industry standard data sources:
  like CEF (common event format), Syslog or Rest API.

→ Their is support of investigation graph, the company can review info. from entities directly connected to the alert.

→ Azure Monitor Playbooks can be used to automate response to threats like looking for malicious IP address.

Azure key Vault:

It is centralized cloud service for storing an application's secrets in a single, central location providing secure access to sensitive info by providing access control & logging capabilities.

It can help:

- → manage secret access tokens, passwords, certificates, API keys.
- → manage encryption keys
- → Manage SSL/TLS certificates.
- → Store secrets backed by H/W security modules (HSMs)

→ It uses industry-standard algo., key lengths & HSMs.
→ access monitory & access control.
→ can be integrated with other Azure services.

Azure Dedicated Host → provides dedicated physical servers to host your VMs.

host group is a collection of Dedicated host.

- → gives visibility into, and control over, the server infra. running your VMs.
- → helps address compliance requirements
- → lets you choose the no. of processors, server capabilities.

20/8/21 Secure network connectivity in Azure ↴

Defense in depth ↴

It protects info & prevent it from being stolen by those who aren't authorize to access it.

Layers of depth ↴

Protecting info ← innermost data center
Physical Security
↓
control access to info & change control ← Identity & Access
↓
DDos protection ← Perimeter
↓
Limits communication b/w resources through access control ← N/w
↓
Compute → secures access to virtual machines
↓
Application → protection from vulnerabilities
↓
Data → protection of actual data.

Each layer provides protection so that if one layer is breached, a subsequent layer is already in place to prevent further exposure.

Identity & Access ↴

→ uses single sign-on (sso) and multifactor authentication.
→ audit event & exchanges.

Perimeter ↴.

use perimeter firewalls to identify & alert on malicious attacks against your N/w.

N/w ↴.

→ deny by default
→ restrict inbound internet access & limit outbound access where appropriate
→ implement secure connectivity to on-premise N/w.

Compute ↴.

implement endpoint protection on devices & keep systems patched & current.

Application

→ Store sensitive app. secrets in a secure storage medium.
→ make security a design requirement for all app development.

~~Data~~

⇒ Security Postures → ability to protect from & respond to security threats.

S.P are CIA (confidentiality, Integrity, Availability).

→ Confidentiality → access restrictions
→ Integrity →. prevent • unauthorized changes
↳ can be done using a unique fingerprinting by using one-way hash
→ Availability → Ensure services are functioning & can be accessed by authorized users.

Azure firewalls ↴.

→ A firewall is a N/w security device monitoring incoming & outgoing N/w traffic & decide whether to allow or block specific traffic based on a defining set of security rules.

→ Azure firewall is a managed, cloud based N/w security service that helps protect resources in your Azure VN's.

→ Azure firewall is a stateful firewall. It analyze the complete content of a N/w connection, features high availability & unrestricted cloud scalability.

→ It uses static public IP address for your virtual N/w resources, enabling outside firewalls to identify traffic coming from your virtual networks.

→ provides ↴
- → built in high availability
- → unrestricted cloud scalability
- → inbound & outbound filtering rules
- → Inbound Destination N/w Address Translation (DNAT) support.
- → Azure monitor logging.

Azure firewall configures ↴
- → Apps rules that define fully qualified domain names (FQDN's) accessible from a subnet
- → N/w rules that define source address, protocol, destination port, & destination address.
- → N/w address translation (NAT) define destination IP addresses & ports to translate inbound requests.

->. It also provides firewall called web application firewall (WAF) providing centralized, inbound protection for your web applications

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→ DDOS Attacks →. distributed denial of Services exhausts an apps resources, making the apps slow or unresponsive to legitimate users.
→. blocks & discards DDos traffic
→ DDos protects from unneed expenses ☺
protection

Service tier for DDos Protection ↴.

→ Basic ↴.
  → automatically enabled for free
  → on traffic monitoring & real-time mitigation of common N/w-level attacks
  → Azure global N/w is used to distribute & mitigate attack traffic across Azure regions.

→ Standard ↴.
  → provides additional mitigation capabilities, tuned specifically to Azure VN's resources.
  → always on traffic monitoring & real time mitigation of common level attacks.
  → protection policies are tuned through dedicated traffic monitory & ML algos.

DDos Protection help prevent ↴.
  → volumetric attacks
    flood N/w layer with a substantial amount of traffic
  → Protocol attacks ↴.
  → Resource layer attack
    protection of web application firewall to protect against L7 attacks.

Network Security Group → enables you to filter N/w traffic to and from Azure resources within an Azure N/w. Its like internal firewall.
  ↳ deny by default policy
  → N/w security group rule enables you to filter traffic to & from resources by source & destination IP address port & protocol.

21/08/21 Secure Access to your Apps by using Azure identity Service ↴

→ Identity is a new primary security boundary, accurately proves someone is a valid user of your system.
→ So now the identity layer is more often the target of attack than the network is.

Authentication ↴
process of establishing the identity of a person or service that wants to access a resource. It is checking legitimate credentials & provides the basis for creating a security principal for identity & access control.
→ It establish whether the user is who they say they are.

Authorization ↴
It establish user identity, but authorization is the process of establishing what level of access an ~~author~~ authentic person or service has.
→ specifies what data they are allowed to access and what they can do with it.

Authentication

Person & it credentials

like MFA

Authorization

Apps & resources
Data
Access level

like accessing Postgres

Azure Active Directory ↴.
→ Active directory running on windows Server provides an identity & access management services managed by your own organisation
→ Azure AD cloud based entity (identity) controls the identity accounts. but Ms. assures the service is available globally.
→ connecting Azure directory with AD help in protecting you by detecting suspicious sign-in attempts at no extra cost.
Azure AD can detect sign-in attempts from unexpected locations or unknown devices.

Azure AD is for ↴
→ IT administrators → APP developers → users → online service subscribers

Services Azure AD provides ↴.
→ Authentication
→ Single Sign-On (SSO) enabling you to remember only one username And Password to access multiple app.

App management → AD provides features like App proxy, SaaS apps, the My App Portal, SSO

Device Mgmt. → AD support registration of devices, devices can be managed through Azure Intune.

→ Azure AD helps user access both external & internal resources. (app or your corporate N/w)
↓
MS office 365, Azure portal, saas apps.

Single Sign-on → enables users to sign in one time & use that credential to access multiple resources.

~~What~~ MFA & conditional Access ↴

MFA - process where user is prompted during the sign-in process for an additional form of identification. eg. Fingerprint Scan.

Azure AD Multi-factor authentication ↴
additional form of authentication during sign-in like phone call.

Conditional Access ↴
tool that Azure Directory uses to allow (or deny) access to resources based on identity signals. Signals include who the user is, where the user is, & what device the user is requesting access from.

→ helps IT admins to empower users to be productive wherever & whenever
→ protect the organisation assets.
→ provides more granular MFA experience for users.

Conditional Access are useful when ↴.
→ require multifactor authentication to access an App.
→ require access to service only through client apps.
→ require users to access your apps only from managed devices.
→ block access from untrusted sources, such as access from unknown or unexpected locations.

* for conditional Access one need AZURE AD Premium P1 or P2 license
MS 365 business premium license is also sufficient

21/08/21 Cloud governance strategy on Azure :-

Governance is general process of establishing rules & policies & ensuring that those rules & policies are enforced.

Instead of defining the detailed access requirements for each individual, & then updating Access requirement when new resources are created, azure enables you to control access through Azzure role-based access control (Azure RBAC).

Azure provides built-in roles that describe common access rule for cloud resources. & we can also define own roles.

Types of role :-
- → Owner Role
- → Reader Role
- → Contributor Role.

Azure RBAC is needed to :-
- → allow one user to manage VMs in a subscription & another to make virtual networks.
- → allow a DBA to manage SQL database
- → allow a user to manage all resources in a resource group.
- → allow an app to access all resources in a

Resource manager service that provides a way to organize & secure your cloud resources.
→ accessible via Azure Portal, Azure Cloud Shell, PowerShell & CLI.

RBAC uses an allow model to give read & write access controls.

Azure Portal —left→ Access Control (IAM)

Prevent accidental changes by using resource locks :-

Resource locks prevent resources from being accidently deleted or changed. → like a warning system to remind

Can be managed from Azure portal, powershell, ARM, etc. (all).

Azure Portal —left→ Resource Setting → locks → + add lock

Apply locks to a subscription, resource group, or individual resource.

Set the lock level :-
- → CanNotDelete
- → ReadOnly

★ AzureBlueprints enables you to define the set of standard Azure resources that your organization requires.

→ Organize Azure Resources by using tags ↓

Resource tags are way to organize resources, tags provide extra info, or metadata, about your resources that helps in ↓

- → Resource management
- → Cost " & optimization.
- → Operations "
- → Security
- → Governance & regulatory compliance.
- → workload optimization & automation

→ Resource tags can be added, modified or delete resource tags through PowerShell, Rest API, Azure Portal, etc.

Azure Policy → Service that enables you to create, assign & manage policies that control & audit your resources.

→ This makes resource compliant with coorporate standard.

we can define individual policy & group of related policies, known as initiatives

→ Azure Policy highlights resource that aren't compliant.

→ You can't ever create non compliant resources.

Azure Policy in action with 3 steps ↓.

1. Create a policy definition → like allowing VM at a particular region.
2. Assign the definition to resources
3. Retrieve the evaluation results.

Azure Policy Initiative →. Groups related policies into one set ↓

Azure Blueprints →. It is a way to govern multiple subscriptions.

→ you can define a repeatable set of governance tools & standard Azure resources that your organization requires.

Azure Blueprints orchestrates ↓

- role assignments
- Policy
- ARM templates
- Resource groups.

extra info, as

through

policies that

on as initiatives

at a particular

Azure resource

3 steps ↴
→ Create an Azure blueprint
→ assign the "
→ track " " assignments.

Each component in the blueprint definition is known as artifacts ↴
Blueprint artifacts :
It is possible for artifacts to have no additional parameters or 1 or more parameters too.

ISO-27001

Cloud Adoption framework ↴
→ It provides you with proven guidance to help with your cloud adoption journey.
→ helps you create and implement the business and tech. strategies to needed to succeed in the cloud.
Stages here ↴.
→ Define your Strategy.
→ Make a plan
→ ready your organization
→ adopt the cloud.
→ govern & manage your cloud environment

Subscription Governance Strategy ↴.
Cloud center of excellence team (Cloud enablement team / Cloud custodian team).
↳ empowered to implement governance practices from a centralized location for the entire organisation.
3 main aspects to consider when you create & manage subscriptions: billing, access control, & subscription limits.

★ Every subscription is associated with Azure Active directory

23/08/21 Examine privacy, compliance, & data protection standards in Azure

→ Some compliances are (In 4 stages global, US Gov, Industry, Regional)
- Criminal Justice Info Service.
- Cloud Security Alliance STAR Certification (Azure, Intune & MS Power BI)
- European Union Model Clauses (transfer of personal data outside of EU)
- Health Insurance Portability & Accountability Act.
- ISO/IEC 27018
- Multi-tier cloud Security Singapore.

MS Privacy Statement → It explains what personal data MS collects, how MS uses it & for what purpose.
covers all of MS services, web, apps, software, servers & devices.

Online Service Term (OST). leagal agreement b/w MS & the customer.
The OST details the obligations by both parties to secure customer data.
OST applies specifically include Azure, Dynamics 365, Office 365 & Bing maps.

Data Protection Alberdum → defines the data processing & security terms for online services.

Trust Center → Showcases MS principle for maintaining data integrity in the cloud & how MS implements security, privacy, compliance & transparency

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Azure compliance documentation →
provides detail docs. about legal & regulatory standards & compliance on Azure.

Azure Government →
separate instance of the MS Azure service, addressing the security & compliance needs of US federal agencies, state & local gov. & their solution providers
provides highest level of security.

Azure China 21Vianet → physically separated instance of cloud service located in China. Azure China 21Vianet independently operates.
According to its regulation, IaaS, PaaS must have value added telecom permits only locally registered companies with less than 50% foreign investment qualify for these permits.

23/08/21 Plan and ma

TCO calculator (To
→ It helps you estima
Azure over time
→ with TCO fill a
industry average
→ costs include
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23/08/21 Plan and manage your Azure Cost :-

TCO calculator (Total cost of ownership)

→ It helps you estimate the cost savings of operating your solutions on Azure over time, instead of your on-premises datacenter.

→ With TCO fill all details of on-premise workloads, then review the suggested industry average cost (adjustable).

→ costs include electricity, N/w maintenance & IT labour.

★ No need of Azure subscription to work with TCO calculator.

Define workload → Adjust assumptions → view the report

→ Server (OS, CPU cores, memory)
→ Databases
→ Storage
→ N/w

Adjust assumptions where you specify the S/w is licensed or not if yes cost reduces & Azure can reuse same license.

Purchase Azure Services :-

Types of Azure Subscriptions :-

→ free trial → 12 month of popular free services, 25 services always free.
→ Pay-as-you-go
→ Member offers → existing memberships provide credits & reduce Azure costs.

→ how to purchase Azure Service :-

→ through an Enterprise aggreement
→ directly from web by credit card payment.
→ through a cloud solution provider partnered with Azure

→ factors affecting costs :-

→ usage meters ⇒ resources we use increases meter billing
→ Resource usage ↑↓.

→ Azure Subscription types → Azure Marketplace

★ provisioning a resource in Azure, providing location is necessary.

→ different regions have different cost because geographic regions can impact where your N/w traffic flows.

★ Some data going into Azure datacenters are free. but for data going outside of Azure to cost dependends on zones.

Some zones are :

→ zone 1 - Australia Central
→ zone 2 - Central India
→ zone 3 - UAE Central
→ DE zone 1 - Germany Central

} & many more in each zone.

★ Azure Pricing Calculator → provides estimates & not actual price

↳ it includes :

- Region
- Tier
- Billing Options
- Support "
- Programs & offers
- Azure Dev/Test pricing

↓ to get a more detailed estimate for running a typical workload on Azure each month.

★ Azure Advisor identifies unused or underutilized resources & recommends unused resources that you can remove.
In some cases it automatically remediate or fix the problem.

Azure Reservations → can save you upto 72% as compared to pay-as-you-go prices. (to prepay)

★ Spending limits helps to prevent accidental cost overrun.

★ Azure Cost Mgnt + Billing → free service that helps you understand your Azure bill, manage your account & subscription, monitor & control spending & optimize resource use.

It includes :

→ Reporting (historical data to predict)
→ Data enrichment
→ Budgets
→ Alerting
→ Recommendations

→ Apply tags to identify cost owners.
→ ACM+Bill automatically resize underutilized VMs
→ deallocate VM's during off hours.
→ delete unused resources
→ gradually move from IaaS to PaaS.

25/8/21 Service level agreement

They can affect your application design decisions.

(Availability agreements)

Service level Agreement is a formal agreement between a service company & the customer.

* You don't need Azure subscription to review service SLAs

* primary performance commitment typically focuses on uptime
ranges from 99.9 → 99.99

Service Credit → It is % of fees you paid that are credited back to you according to the claim approval process.

* you might receive a discount on your Azure bill as compensation when a service fails to perform according to its SLA.

→ free products typically don't have a SLA.

Azure Status → provides a global view health of Azure services & regions.

* same virtual machines can be deployed to different availability zone (in same region) to increase availability rather than having 2 or more instances of VM in same region