Core Azure services and products

* + Azure compute:
  + On-demand computing service providing computing resources such as disks, processors, memory, networking and operating systems.
    - **Azure VMs**
      * Good for testing and developing
      * Good for scalability and agility
      * Can extend a datacentre into a cloud
      * Helps with disaster recovery
    - **VM scale set:** Compute resource that you can use to deploy and manage a set of identical VMs. Scale VMs for big compute/big data
    - **App services:** Quickly build, deploy, and scale enterprise-grade apps (PaaS)
      * Offers scaling and high availability
      * You pay for the compute resources your app uses
      * You can have dedicated or shared hardware, and choose the memory
    - **Azure service fabric:** distributed systems platform that runs in azure/on prem
    - **Azure functions:** functions run in response to an event or message. No need to be concerned with platform or inf - serverless
      * Abstraction of servers - platform manages everything for you
      * Event driven
      * Micro billing - Pay only for the time when their code runs
      * Scale automatically
    - **Azure Logic Apps:** Like azure functions, but without writing any code. Executes logic triggered by Azure services
      * Functions execute code, but logic apps execute workflows based on an event trigger
      * They are stateful, whereas functions can be both

* + **Azure kubernetes**
  + **Azure batch**: managed service for parallel and high performance computing applications
  + **Azure virtual desktop:** Desktop service that runs on cloud, allowing users to use any cloud-hosted version of windows
    - Simplified management: Secure access using RBAC and azure AD
    - Performance management: You can load balance users using host pools, which are collections of VMs with the same configuration
      * Breadth mode load balancing: users allocated across the host pool
      * Depth mode: Users are fully allocated on one VM before moving to the next
    - You can reduce costs for this by bringing your own microsoft license

* + Azure Networking
    - **Azure Virtual Network:** A virtual network is scoped to a single region; however, multiple virtual networks from different regions can be connected using virtual network peering.
      * With Azure Virtual Network you can provide:
        + Isolation and segmentation
        + Communication between azure resources via:

Virtual networks: can connect VMs and azure k8, app service, and scale sets

Service endpoint: Connect to other azure resource types, such as database and storage. Improved security and routing

* + - * + Route network traffic via:

Route tables: define rules about how traffic should be directed

Border gateway protocol: Works with Azure VPN gateways and expressroute to propagate on prem BGP route to Azure VN

* + - * + Filter network traffic via:

Network security groups: Inbound and outbound security rules

Network virtual appliances: Specialised VM that carries out network functions, such as running a firewall or performing WAN optimisation

* + - * + Peering: connects virtual networks using User Defined Routes to allow admins to control subnets within and between Vnets

* + SETTING UP A VN:
    - You need a sub, resource group, network name, and region
    - Address space:
      * You need to define internal address space in CIDR format.
      * It needs to be unique in your sub and any other networks you connect to
    - Subnet
    - Service endpoints such as Azure cosmos DB, key vault, etc
    - NAT gateway: You can configure a subnet to use a static outbound IP address to access the internet
    - Bastion host: Provides a SSH/RDP connectivity via azure portal over SSL
    - DdoS protection: a premium service
    - Firewall: Cloud-based network security service

* + **Azure Load Balancer**
  + **Azure application gateway:** Web traffic load balancer to manage web app traffic

* + **VPN gateway:** fast DNS responses and ultra-high domain availability.
    - Provides encrypted communication with resources via:
      * Point-to-site VPN: Client initiates VPN connection to connect computer inside Azure VN
      * Site-to-site VPN: Links on prem vpn to azure vpn in a VN
      * Azure expressRoute: For higher BW and security
    - It uses either:
      * Policy based VPNs: Specify statically the UP addr of packets that should be encrypted through each tunnel.
        + Supports IKE1
        + Uses **static** routing
        + Used for specific scenarios such as compatibility with legacy on prem VPN devices
      * Route-based VPN: IPSec tunnels are modelled as a network interface/virtual tunnel interface. Static/**dynamic** routing decided which one of these tunnel interfaces are used to send packer.
        + Preferred option for on prem devices
        + Supports IKE2

* + DEPLOYING A VPN GATEWAY
    - You need:
      * Virtual network with enough address space for the additional subnet needed for the VPN gateway
      * Gateway subnet with /27 mask
      * Public IP addr
      * Local network gateway for on prem network config
      * Virtual network gateway for routing traffic between the virtual network and on prem datacentre/other VNs
      * Connection: Create a connection resource to connect the two gateways
      * On prem, you also need: A VPN device and a public facing IPV4 addr

* + How to ensure high availability:
    - ACTIVE/STANDBY: Standby instance resumes connection when there is maintenance or disruption
    - ACTIVE/ACTIVE: A unique IP addr assigned to both instances, then create separate tunnels from the 2 on prem devices to each instance.
    - Expressroute failover: Configure VPN gateway as a failover path for ExpressRoute connections
    - Zone redundant gateways: VPN/expressroute gateways deployed in azure availability zone for availability and fault tolerance

* + **Azure DNS**
  + **CDN**: Distributed network of servers to deliver web content to users
    - Azure CDN places the replicas of data at the datacenter closest to the user side. The datacenter closest to the users is called edge nodes, which contain a cache of files that provides the edge of the internet to users.
  + **DDOS protection**
  + **Azure traffic manager:** Distributes network traffic across azure regions worldwide

* + **Azure ExpressRoute:** Connects on prem network to azure over high BW, non internet, secure connections. This can be for any to any network, point to point ethernet, or virtual cross connection.
    - Benefits:
      * Layer 3 connectivity
      * Connectivity to cloud services across all regions, and global on prem connectivity
      * Dynamic routing using BGP
      * Redundancy via redundant devices
      * Uptime SLA

* + **Azure network watcher:** monitor and diagnose network issues using scenario based analysis
  + **Azure firewall:** High security, high availability firewall with unlimited scalability
  + **Azure virtual WAN**: Unified WAN to connect local and remote sites

* + Azure Storage

* + **Data categories in Azure**:
  + **Structured data**: i.e. relational data (SQL)
  + **Semi-structured data**: Not stored in a relational format, meaning the fields do not neatly fit into tables, rows, and columns. Semi-structured data contains tags that make the organization and hierarchy of the data apparent (i.e. books, blogs, and HTML documents). (NoSQL)
  + **Unstructured data**: i.e. pdf, jpg etc

* + Store files, messages, tables, and other types of information. The most common storage service types in Azure:
    - **Disk storage**: VHDs for VMs, can be SSDs or HDDs
    - **Containers (Blobs)**: Object storage solution. Optimized for storing massive amounts of unstructured data, such as text or binary data. Ideal for images or documents, files, Streaming video and audio, backup. Devs don’t need to think about managing disks.
    - **Files**: Network file shares via SMB, NFS or REST. VMs can mount shares in Azure.
      * You can replace on prem file share with an azure file share by mounting it to the same letter.
      * Encrypts data at rest
      * You can use a shared access signature to access the share from anywhere using a URL
    - **Queues**: used to store and retrieve millions of messages. Queue messages can be up to 64 KB in size. Queues are generally used to store lists of messages to be processed asynchronously.
    - **Tables**: Stores large amounts of structured data. The service is a NoSQL datastore which accepts authenticated calls from inside and outside the Azure cloud. Azure tables are ideal for storing structured, non-relational (noSQL) data.
      * ALL THESE OPTIONS ARE:

**Durable** and highly **available** with redundancy and replication.

**Secure** through automatic encryption and role-based access control.

**Scalable** with virtually unlimited storage.

**Managed**, handling maintenance and any critical problems for you.

**Accessible** from anywhere in the world over HTTP or HTTPS.

* + Azure access tiers: Used for balancing storage costs with access needs. Can be set at the blob level
    - **Hot access tiers:** Store data that is frequently accessed, e.g. website images. Can be set at account level
    - **Cool access tiers:** data that is infrequently accessed and stored for at least 30 days, e.g. invoices. Can be set at account level
    - **Archive access tier:** rarely accessed data stored for at least 180 days, with flex latency requirements, e.g. backups. Cant be set at account level

* + Azure Database Services:

Fully managed PaaS database services that free up database management time

* + **Microsoft Azure Cosmos DB:** Globally distributed database service that enables you to elastically and independently scale throughput and storage across any number of Azure's geographic regions.
    - It supports schema-less data that lets you build highly responsive and Always On applications to support constantly changing data.
    - Uses any tech, e.g. sql or mongodb.
    - Puts data into API format

* + **Azure SQL Database:** is a relational database as a service (DaaS/PaaS) based on the latest stable version of Microsoft SQL Server database engine.
    - SQL Database is a high-performance, reliable, fully managed and secure database
    - 99.99% availability
    - You can migrate to this service using Azure database migration service

* + **Azure database for MySQL**
    - Relational database service in the cloud
    - It provides:
      * High availability
      * PAYG pricing
      * Scalability
      * Backups
      * security

* + **The Azure Database Migration Service (ADMS)**: A fully managed service designed to enable seamless migrations from multiple database sources to Azure data platforms with minimal downtime (online migrations).

* + **Database for postgreSQL**: Fully managed and scalable postgresql relational database
    - Provides availability, flexible pricing, scalability, automatic backups, security, SSL encryption between client and server
    - Can be used as 2 deployment options:
      * Single server:
        + Built in high availability - 99.99% SLA
        + Monitoring
        + Available in 3 pricing tiers - basic, general purpose, and memory optimized.
      * Hyperscale (citus):
        + Horizontally scales queries across multiple machines using sharding
        + Parallelises incoming sql queries across servers for large datasets
        + Good for apps with 100gb+ data

* + Azure SQL managed instance
    - Scalable cloud data service - PaaS
    - Migrate using the ADMS

* + **SQL server on VM:** Hosts SQL server apps in the cloud
  + **Azure synapse analytics**: fully managed data warehouse with integral security
  + **Azure cache for redis:** fully managed service caches frequently used and static data to reduce latency
  + **Azure database for mariaDB:** fully managed and scalable mariadb relational database with high availability and security

* + **Azure Web:** build and host web apps and HTTP-based web services.
    - **Azure app service:** Create cloud web-based apps
    - **Notification hubs:** Send notifs to any platform from backend
    - **API management:** publish APIs securely and at scale
    - **Azure cognitive search:** Deploy search as a service
    - **Web apps:** Create and deploy web apps at scale
    - **SignalR service**: Add real time web functionalities easily

* + **Azure Marketplace:** Helps connect end users with Microsoft partners, independent software vendors (ISVs), and start-ups that are offering their solutions and services, which are optimized to run on Azure.

* + Azure solutions

* + IOT:

* + Core Azure IOT service types:
    - **IoT Central**: Fully managed global IoT SaaS solution that makes it easy to manage IoT assets at scale.
    - **Azure IoT Hub**: Central message hub for bi-directional communication between your IoT application and the devices it manages. IoT Hub's capabilities help you build scalable, full-featured IoT solutions such as managing industrial equipment used in manufacturing, tracking valuable assets in healthcare, and monitoring office building usage.
    - **IOT edge:** Allows data analysis models to be pushed directly onto IOT devices, so they can react to state changes without consulting AI models

* + Big data and analytics:

* + **Azure Synapse Analytics** (formerly Azure SQL Data Warehouse): A limitless analytics service using parallel processing to run complex queries across huge data
  + **Azure HDInsight**: Processes massive amounts of data with managed hadoop clusters in the cloud. A fully managed, open-source analytics service for enterprises. HDInsight allows you to run popular open-source frameworks and create cluster types such as Apache Spark, Apache Hadoop, Apache Kafka, Apache Hbase, Apache Storm, Machine Learning Services. HDInsight also supports a broad range of scenarios such as extraction, transformation, and loading (ETL); data warehousing; machine learning; and IoT.
  + **Azure Data Lake Analytics**: An on-demand analytics job service that **simplifies big data**. Instead of deploying, configuring, and tuning hardware, you write queries to transform your data and extract valuable insights. The analytics service can handle jobs of any scale instantly by setting the dial for how much power you need. You only pay for your job when it is running, making it more cost-effective.
  + **Azure data bricks:** Apache spark-based analytics, to integrate with other big data services in Azure

* + Artificial intelligence:

* + **Azure Cognitive Services**: A collection of domain-specific pre-trained AI models that can be customized with your data. They are categorized broadly into vision, speech, language, and search.
    - **Personaliser** service predicts behaviour and provides relevant experience.
  + **Azure Machine Learning service**: Provides a cloud-based environment you can use to develop, train, test, deploy, manage, and track machine learning models (python, tensorFlow, scikit-learn). The Azure Machine Learning service can auto-generate a model and auto-tune it for you. It will let you start training on your local machine, and then scale out to the cloud. When you have the right model, you can easily deploy it in a container such as Docker in Azure. --> More customisable

* + Serverless computing:

Execution environment that runs your code but abstracts the underlying hosting environment. You configure serverless apps to respond to events. An event could be a REST endpoint, a periodic timer, or even a message received from another Azure service. --> Like AWS lambda

* + **Azure Functions**: When you need to perform work in response to an event—often via a REST request, timer, or message from another Azure service. They auto-scale and charges incur when function is triggered. --> like AWS lambda
  + **Logic Apps**: A cloud service that helps you automate and orchestrate tasks, business processes, and workflows when you need to integrate apps, data, systems, and services across enterprises or organizations.
    - Logic Apps simplifies how you design and build scalable solutions—whether in the cloud, on premises, or both—for app integration, data integration, system integration, enterprise application integration (EAI), and business-to-business (B2B) integration.
    - They are designed in a web-based designer and can execute logic triggered by Azure services without writing any code. To build enterprise integration solutions with Azure Logic Apps, you can choose from a growing gallery of over 200 connectors. These include services such as Salesforce, SAP, Oracle DB, and file shares.
  + **Event Grid** allows you to easily build applications with event-based architectures. It's a fully managed, intelligent event routing service that uses a publish-subscribe model for uniform event consumption.
    - Event Grid has built-in support for events coming from Azure services, such as storage blobs and resource groups. You can use Event Grid to support your own non-Azure-based events in near-real time, using custom topics. You can use filters to route specific events to different endpoints, and ensure your events are reliably delivered.

* + DevOps:
  + **DevOps Services** Provides development collaboration tools including high-performance pipelines, free private Git repositories, configurable Kanban boards, and extensive automated and cloud-based load testing. DevOps Services was formerly known as [Visual Studio Team Services (VSTS)](https://wiki.sc.nccgroup.com/wiki/Azure_DevOps).
  + **Azure DevTest Lab Services** A service that helps developers and testers quickly create test environments in Azure, while minimizing waste and controlling cost. Users can test their latest application versions by quickly provisioning Windows and Linux environments using reusable templates and artifacts. You can easily integrate your deployment pipeline with DevTest Labs to provision on-demand environments. With DevTest Labs you can scale up your load testing by provisioning multiple test agents and create pre-provisioned environments for training and demos. Lab Services was formally known as [DevOps](https://wiki.sc.nccgroup.com/wiki/DevOps) Test.

* + Azure app service:

* + **Multiple languages and frameworks**: App Service has first-class support for ASP.NET, ASP.NET Core, Java, Ruby, Node.js, PHP, Python, PowerShell, other scripts or executables as background services.
  + [**DevOps**](https://wiki.sc.nccgroup.com/wiki/DevOps)**optimization**: Set up CICD with [Azure DevOps](https://wiki.sc.nccgroup.com/wiki/Azure_DevOps), GitHub, BitBucket, Docker Hub, or Azure Container Registry. Promote updates through test and staging environments. Manage your apps in App Service by using Azure PowerShell or the cross-platform command-line interface (CLI).
  + **Global scale with high availability**: Scale up or out manually or automatically. Host your apps anywhere in Microsoft's global datacenter infrastructure, and the App Service SLA promises high availability.
  + **Connections to SaaS platforms and on-premises data**: Choose from more than 50 connectors for enterprise systems (such as SAP), SaaS services (such as Salesforce), and internet services (such as Facebook). Access on-premises data using Hybrid Connections and Azure Virtual Networks.
  + **Security and compliance**: App Service is ISO, SOC, and PCI compliant. Authenticate users with Azure Active Directory or with social login (Google, Facebook, Twitter, and Microsoft). Create IP address restrictions and manage service identities.
  + **Application templates**: Choose from an extensive list of application templates in the Azure Marketplace, such as WordPress, Joomla, and Drupal.
  + **Visual Studio integration**: Dedicated tools in Visual Studio streamline the work of creating, deploying, and debugging.
  + **API and mobile features**: App Service provides turn-key CORS support for RESTful API scenarios, and simplifies mobile app scenarios by enabling authentication, offline data sync, push notifications, and more.
  + **Serverless code**: Run a code snippet or script on-demand without having to explicitly provision or manage infrastructure, and pay only for the compute time your code actually uses.

* + Azure management tools:
  + **Azure Portal**: The web UI.
  + **Azure PowerShell**:
  + **Azure Command Line Interface (CLI)**
  + **Azure Cloud Shell**: browser-based scripting environment in your portal.
  + **Azure Mobile App**: allows you to access, manage, and monitor all your Azure accounts and resources from your iOS or Android phone or tablet.
  + **Azure REST API**: Provide create, retrieve, update, or delete access to the service's resources.

**Azure Advisor** is a free service built into Azure that provides recommendations on high availability, security, performance, and cost. Advisor analyzes your deployed services and looks for ways to improve your environment across those four areas.

* + QUESTIONS

* + Azure Resource Manager templates use which format?
  + HTML
  + **JSON**
  1. XML

* 1. Which of the following locations ensure data-residency and compliance needs are met for customers who need to keep their data and applications close?
  2. **Geographies**
  3. Regions
  4. Zones

* 1. As a best practice, all resources that are part of an application and share the same lifecycle should exist in the same?
  2. Availability set
  3. Region
  4. **Resource group**

* 1. Microsoft Azure datacenters are organized and made available by?
  2. Geographies
  3. **Regions**
  4. Zones

* 1. Which of the following services are used to ensure availability during maintenance events?
  2. **Availability Set**
  3. Availability Zone
  4. Scale Set

* 1. Which Azure compute resource can be used to deploy to manage a set of identical virtual machines?
  2. Virtual machine availability sets
  3. Virtual machine availability zones
  4. **Virtual machine scale sets**

* 1. Which of the following should be used when the primary concern is to perform work in response to an event (often via a REST command) that needs a response in a few seconds?
  2. Azure App Service
  3. Azure Container Instances
  4. **Azure Functions**

* 1. Which of the following services is a distributed network of servers that can efficiently deliver web content to users?
  2. Azure App Services
  3. **Azure Content Delivery Network**
  4. Azure Cosmos DB

* 1. Which of the following is optimized for storing massive amounts of unstructured data, such as videos and images?
  2. **Blobs**
  3. Files
  4. Queues

* 1. Which is true about Azure Load Balancer?
  2. **Azure Load Balancer distributes traffic among similar systems, making your services more highly available.**
  3. Azure Load Balancer works with internet-facing traffic only.
  4. You must use Azure Load Balancer if you want to distribute traffic among your virtual machines running in Azure?

* 1. Which of the following is used when someone is only concerned about the code running the service, instead of the underlying platform or infrastructure?
  2. Azure App Service
  3. Azure Container Instances
  4. **Azure Functions**

* 1. Which of the following is part of the Azure Artificial Intelligence service?
  2. HDInsight
  3. **Azure Machine Learning service**
  4. Azure DevTest Labs

* 1. Which of the following cloud services provides development collaboration tools including high-performance pipelines, free private Git repositories, and configurable Kanban boards?
  2. **Azure DevOps Services**
  3. Azure Event Grid
  4. HDInsight

* 1. Which of the following terms ensure that both data-residency and compliance needs are met for customers who need to keep their data and applications close?
  2. **Geographies**
  3. Regions
  4. Zones

* 1. While away from the office on a business trip, there is need to restart a virtual machine and one of the Azure web apps. You only have access to your Android phone. What tool will let you connect to Azure and restart these two items?
  2. **Azure Mobile App**
  3. Azure portal
  4. PowerShell