

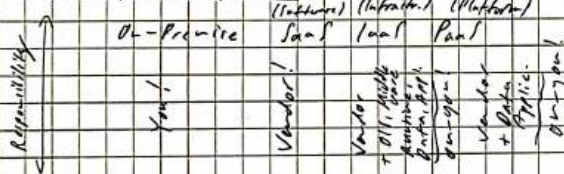
DOMAIN 1 - Describe Cloud Concepts

1.1

Cloud Computing:

Definition: Cloud Computing is the delivery of computing services over the internet

Shared Responsibility Model



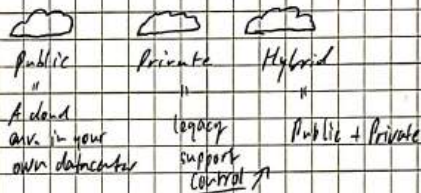
Better Security? → "Yes!"

- Cloud Computing Technology enables security & shift responsibilities to the provider!

Benefits:

- Cloud is cost-effective, global, secure, scalable, elastic and always current

Cloud Deployment Models:



Economies of Scale: "The ability to do things more efficiently or at a lower-cost per unit when operating at a larger scale"

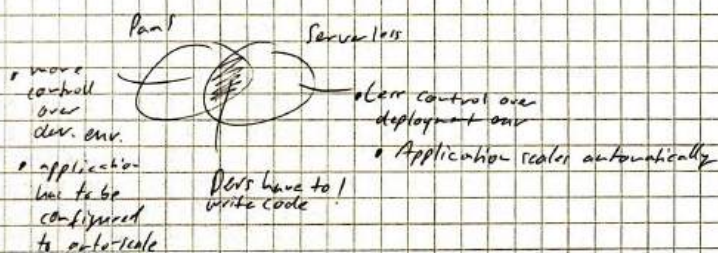
Capital Expenditure (CapEx): "Is the spending of money on physical infrastructure up front"
(On-Premises datacenters)

Operational Expenditure (OpEx): "Is spending money on services or products now and being billed as you go"
(- Public Cloud Consumption pay-as-you-go)

Consumption-based model: "Pay for what you use, typically per unit of time or capacity"

Fixed Price model: "You provision resources and pay for those resources"

Serverless Architecture: A cloud computing execution model where the cloud provider dynamically manages the allocation and provisioning of servers.
(Example: Function-as-a-service)



Serverless computing solutions:

Logic App

A cloud service that helps you schedule, automate, and orchestrate tasks, business processes,

→ Foundation for Power Automate!

Functions

with capabilities to implement code triggered by events occurring in Azure as well as on-premises systems

Event Grid

enables you to easily manage events across many different Azure services and applications - push events

Benefits of using Cloud Services

Availability: Encompasses availability of the infrastructure, applications, and services. Generally expressed as a number of 9's (~99.99...%).

Scalability: The ability of a system to handle growth of users or work.
(Refers to the ability of a system or service to handle more traffic (to-scale))

Elasticity: The ability of a system to automatically grow and shrink based on app demand (Scale-out / Scale-in)

Rapid elasticity and scalability:

Allows the customer to grow or shrink the IT-footprint as necessary to meet needs without excess capacity

Agility:

Focuses on the speed and ease of allocating and deallocating resources (provisioning or scale ref of 10 VMs)

Fault Tolerance:

(Generally, refers to component level failures)
→ The ability to handle faults (hardware failures)

High Availability:

(Generally, refers to service-level failures)
→ The ability to keep services up and running for long periods of time

Disaster Recovery:

→ The ability to recover from an event which has taken down a cloud service
(Generally, focuses on recovery in the event of a service or site failure)

Reliability:

→ The ability of a system to recover from failures and continue to function

(Consists of two principles: Resiliency & Availability)

- Resiliency aims to return an application to a fully functioning state after a failure occurs.
- Availability is to provide consistent access to your application.

Predictability:

Azure enables solutions with predictable cost and performance

(The level of service and performance and the associated cost are known in advance!)

Security:

Protection of customer data
of cloud applications
of cloud infrastructure

! All modules have built-in DDoS protection from Azure DDoS!

↓
Distributed Denial of Service

↳ Standard tier provider from DDoS attacks

Governance:

A set of rules and policies that guide an organization's cloud operations

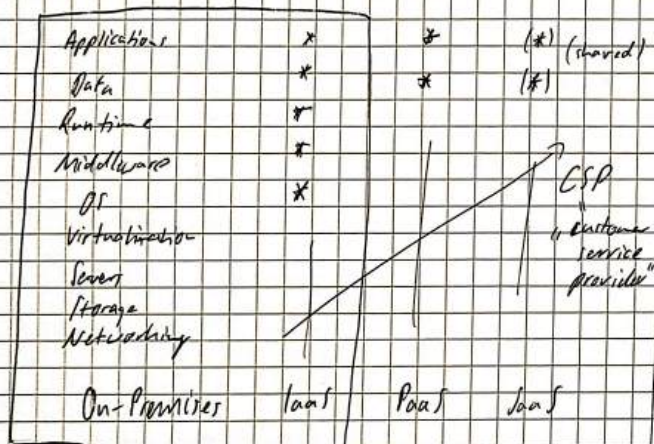
Manageability:

↳ Automatically scale resource deployment based on need.

- Deploy resources based on a pre-configured template.
- Monitors the health of resources

1.3 Describe Cloud Service Types

Shared Responsibility Model (1.1):



→ Hybrid cloud includes IaaS (at minimum), connected by site-to-site VPN

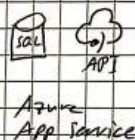
IaaS Use Cases: When to use virtual machines?



- During testing and development.
- VMs provide a quick and easy way to create different OS and application config.

→ When running applications in the cloud

PaaS Use Cases: When to use PaaS services?



→ Development Framework

- PaaS provides a Framework that developers can build upon or developers can customize cloud-based applications
- Create applications using build-in software components

→ Analytics or Business Intelligence

SaaS Use Cases: When to use SaaS services?



Service now

- Email & messaging
- Business Productivity applications
- Finance tracking

DOMAIN 2 - Azure Architecture & Services

2.1 Describe the core architectural components

Azure Geography: A discrete market, typically containing two or more regions, that preserves data residency and compliance boundaries
(US, EU, ...) [East US-2, 3, ...]

Azure Regions: A set of datacenters deployed within a latency-defined perimeter and connected through a dedicated regional low-latency network.

Region Pairs: A relationship between 2 Azure Regions within the same geographic region for disaster recovery purposes.
(for example: West US, East US)

Component-Hierarchy: Management Groups

└ Subscription

└ Resource Group

└ Resources

Management Groups: Provides a level of scope above subscriptions

Each directory is given a single top-level management group called "Root"

Subscriptions:

Why we need multiple subscriptions?

✓ When subscription limits are reached

↳ "Logical container used to provision resources in Azure"

✓ to use different payment methods

✓ to isolate resources between departments and projects

Resource Groups:

A container that holds related resources for an Azure solution

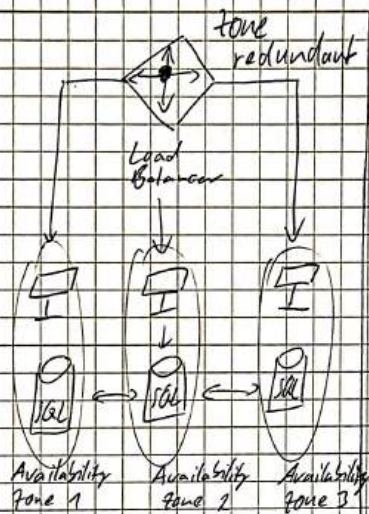
Used to group resources that share a common resource lifecycle.

Resources:

An entity managed by Azure like a virtual machine, virtual network, or storage account.

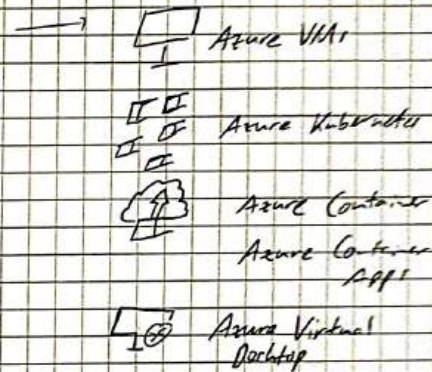
Availability Zones:

- Unique physical locations within a region with independent power, network and cooling
- Comprised of one or more datacenters
- Tolerant to datacenter failures via redundancy and isolation



2.2 Describe Azure compute & networking services

VM-Options



Azure Datacenters:

Are located all over the world

Physical buildings that contain thousands of servers and other hardware to provide cloud computing services

Azure VMs:

Server (compute) virtualization on-demand without need for hardware purchase

Focus < scale
resiliency

Azure Virtual Desktop:

"VDI"

A desktop and app virtualization service that runs in Microsoft Azure

Azure Container Instance (ACI):

Runs Docker containers on-demand in a managed serverless Azure environment

A solution for any scenario that can operate in isolated containers, without orchestration.

Azure Kubernetes Service (AKS):

A hosted Kubernetes Service, where Azure handles critical tasks like health monitoring and maintenance for you.

→ You pay only for the agent nodes within your clusters, not for the masters (free tier)

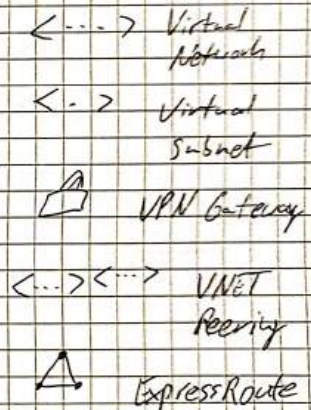
VM Resource Requirements:

- Virtual Disk
- Virtual Network (VNET)
- Network Interface (Virtual NIC)
- Network Security Group
- Public IP Address

App Services:

An HTTP-based service for hosting web applications, REST APIs and mobile back-ends

Network Options



Virtual Network: (VNET)

A logical representation of your network in Azure

- ✓ Create a dedicated private cloud-only network
- ✓ Enable hybrid cloud scenarios

! VMs in different VNETs cannot communicate by default!

Virtual Subnet:

- Segment address space of VNET to create sub-networks
- Allows Azure resource deployment into a specific subnet

VPN Gateway:

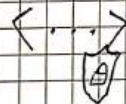
A virtual network gateway that sends encrypted traffic between an Azure VNET and an on-premises location over the Internet.

VNET Peering:

Enables seamless connection of two or more Virtual Networks in Azure.

ExpressRoute:

Extends your on-premises network into Azure over a private connection with the help of connectivity provider



Service Endpoint

- Provides a way to lock down access to all instances of a PaaS service to a VNet

- Accessible from public internet

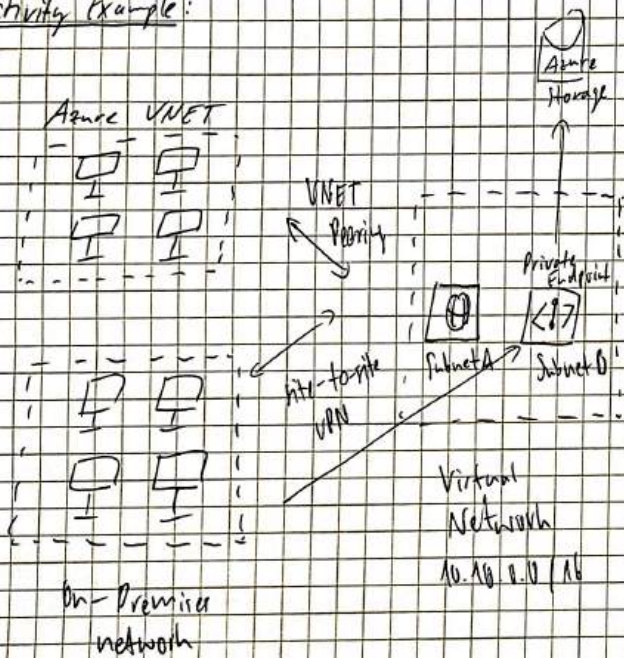


Private Endpoint

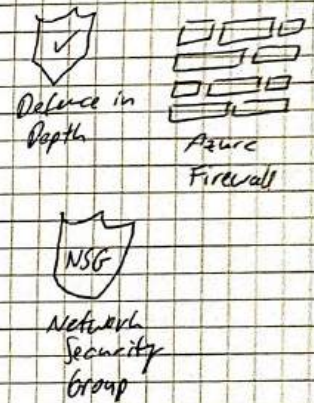
- Grants access to a specific instance (resource) of a PaaS service in your VNET on a private IP address

- Enables access from on-premises without public endpoint

Connectivity Example:



Network Security



2.3 Describe Azure Storage services

Storage Types

- Blob Storage
- Disk Storage
- File Storage
- Storage Tiers

Blob Storage:

Storage optimized for storing massive amounts of unstructured data

→ cannot be contained in a row-column database and does not have an associated data model (images, video, audio)

File Storage:

Fully managed file shares in Azure accessible via SMB or NFS

Disk Storage:

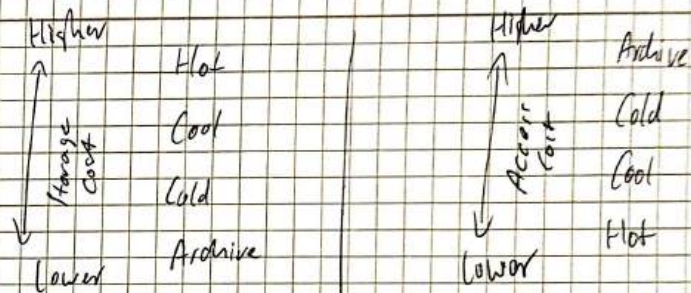
Block level storage volumes that are managed by Azure and used with Azure VMs

Table Storage:

A service that stores structured NoSQL data in Azure (schemas)

Queue Storage:

A service for storing large numbers of messages via HTTP/HTTPS calls



- Storage Tiers -

Storage Redundancy Options:

LRS (= Locally Redundant Storage)

→ Copies your data synchronously 3x times within a single physical location in the primary region

ZRS (= Zone Redundant Storage)

→ Copies your data synchronously across three Azure availability zones in the primary region.

GRS (Geo-Redundant Storage)

- 3 copies using LRS
- ↳ It copies it asynchronously to a single physical location in the secondary region.

GZRS (Geo-Zone Redundant Storage)

- Copies your data synchron. 3x within the primary region using ZRS
- It then copies it asynch. to a single physical location in the 2nd-region

File Movement Options

AzCopy
(Command-line)

Azure Storage Explorer
(graphical interface)

Azure File Sync
(centralize your file shares in Azure File)

(2.4) Describe Azure Identity, access & security

AuthN and AuthZ:

- (Identity)
- Authentication (AuthN)
is the process of proving that you're who you say you are
- Authorization (AuthZ)
is the act of granting an authenticated party permission to do something
- (Access)

Entra ID:

- Entra is MS cloud-based identity and access management service
- ↳ for Internal Resources / External Resources

Authentication Methods

- Single sign-on (SSO) → log in once → used for multiple apps
- MFA → works by requiring 2 or more authentication methods (pin, smart device)
- Conditional Access

DOMAIN 3 - Azure Management & Governance

3.1 Cost Management

BEFORE you DEPLOY → Pricing Calculator
TCO-Calculator → Cost Savings

3.2 Features and Tools in Azure for Governance & Compliance

Cost Impacts: • Factors that can effect Azure resource costs include resource type, services, location, ingress and egress traffic

Reducing Costs: • Factors that can reduce costs include reserved instances, reserved capacity, hybrid use benefit

Methods for Planning & Managing Costs:

Reserve Instances → Reserve VM's in advance and save up to 72% compared to PAYG pricing with 1-yr / 3-yr commitment

Reserved Capacity → Achieve significant savings on Azure SQL Database, Azure Cosmos DB, ...

Hybrid-Use Benefit → A licensing benefit that helps you to significantly reduce the cost of running

3.3

Features and tools for managing and Deploying
Azure resources