

Describe the benefits and considerations of using cloud services

Cloud Computing

Service delivery model over the internet (cloud). This includes but is not limited to

- **compute power** meaning servers such as windows, Linux, hosting environments, etc.
- **storage** like files and/or databases
- **networking** in azure but also outside when connecting to your company network
- **analytics** services for visualization and telemetry data

Key concepts

- **scalability** is the ability to scale, so allocate and deallocate resources at any time
- **elasticity** is the ability to scale dynamically
- **agility** is the ability to react fast (scale quickly)
- **fault tolerance** is the ability to maintain system uptime while physical and service component failures happen
- **disaster recovery** is the process and design principle which allows a system to recover from natural or human induced disasters
- **high availability** is the agreed level of operational uptime for the system. It is a simple calculation of system uptime versus whole lifetime of the system.
 - $\text{availability} = \text{uptime} / (\text{uptime} + \text{downtime})$

Economies of Scale

The principle of economies of scale states that as the companies grow, they become more effective at managing shared operations. Be that HR and hiring, taxes, accounting, internal operations, marketing, big purchases via contracts meaning better discounts, etc. etc.

Because of those, companies can save/earn more which in return allows for reduction in cost of their services to their customers. This is so called 'price per unit'.

It's not possible to go to 0 because in the end some underlying infrastructure needs to run to provide the services. But the larger the scale the more benefits can be passed to customers.

In fact, in the current scale, Microsoft can already offer multiple services for free due to how small a fraction of the cost it is for them.

CapEx vs OpEx

Differences between Capital Expenditure and Operational Expenditure

	Capital Expenditure	Operational Expenditure
Up front cost	Significant	None
Ongoing cost	Low	Based on usage
Tax Deduction	Over time	Same year
Early Termination	No	Anytime
Maintenance	Significant	Low
Value over time	Lowers	No change

What is a consumption-based model?

The consumption-based model is a **pricing model** used in the cloud so that customers are only charged **based on their resource usage**.

This model is characterized by

- **No associated upfront cost**
- **No wasted resources** as such *no charges are incurred for unused resources**. Unused in this case is different per service. For instance, blob storage that stores any data is considered to be used, as it consumes the storage space. Virtual Machines that are running consume CPU, memory and other resources even if there isn't any traffic. Hence they are considered to be used and will incur charges.
- **Pay for what you need**
- **Stop paying when you don't**

Consumption is the virtual metric used to calculate how much each resource (service) in Azure was used. Each service has many smaller metrics that track its consumption to offer best possible pricing model. Those metrics are tracked on very granular level.

Service Models responsibilities

As a service means which party will manage the layer and all the layers below.

- **Software** layer consists of the application (application code and set) & the application data
- **Platform** layer means all the supporting software and the operating system required to host the application
- **Infrastructure** layer consists of hardware the infrastructure and virtualization required to host the platform

Layer	Layer
Application	Software
Data	Software
Runtime	Platform
Middleware	Platform
Operating System	Platform
Virtualization	Infrastructure
Servers	Infrastructure
Networking	Infrastructure
Storage	Infrastructure

Responsibility Matrix

Layer	On-Premises	IaaS	PaaS	SaaS
Application	You	You	You	Cloud provider
Data	You	You	You	Cloud provider
Runtime	You	You	Cloud provider	Cloud provider
Middleware	You	You	Cloud provider	Cloud provider
Operating System	You	You	Cloud provider	Cloud provider
Virtualization	You	Cloud provider	Cloud provider	Cloud provider
Servers	You	Cloud provider	Cloud provider	Cloud provider
Networking	You	Cloud provider	Cloud provider	Cloud provider
Storage	You	Cloud provider	Cloud provider	Cloud provider

Cloud Deployment Model

Cloud Deployment Model is simple a separation which describes where are the company resources deployed. Whenever this is in public cloud provider environment or private datacenter. Below table presents high level deployment model separation

Layer	Cloud Provider	Own Datacentre
Public	✓	✗
Hybrid	✓	✓
Private	✗	✓

Public Cloud

Cloud Provider	Own Datacentre
✓	✗

Key Characteristics

- Everything runs on cloud provider hardware
- No local hardware
- Some services share hardware with other customers

Advantages

- No CapEx (No initial investment)
- High Availability
- Agility

- Pay as you Go (PAYG) pricing
- No hardware maintenance
- No deep technical skills required

Disadvantages

- Not all security and compliance policies can be met
- No ownership over the physical infrastructure
- Rare specific scenarios can't be done

Private Cloud

Cloud Provider	Own Datacenter
✗	✓

Key Characteristics

- Everything runs on your own datacenter
- Self-service should be provided
- You maintain the hardware

Advantages

- Can support any scenario
- Total control over security and infrastructure
- Can meet any security and compliance policy

Disadvantages

- Initial investment is required (CapEx)
- Limited agility constrained by server capacity and team skills
- Very dependent on IT skills & expertise

Hybrid Cloud

Cloud Provider	Own Datacenter
✓	✓

Key Characteristics

- Combines both Public & Private cloud

Advantages

- Great flexibility
- You can run any legacy apps in private cloud
- Can utilize existing infrastructure
- Meet any security & compliance requirements
- Can take advantage of all public cloud benefits

Disadvantages

- Can be more expensive
- Complicated to manage due to larger landscape
- Most dependent on IT skills & expertise from all three models