Cloud Concepts Glossary

High Availability (HA)

The ability of a system or application to remain operational and accessible with minimal downtime, even during failures or maintenance events. Achieved through redundancy, failover mechanisms, and load balancing.

Scalability

The capability of a system to handle increased workload or user demand by adding resources (either hardware or virtual resources). It can be **vertical (scale-up)** or **horizontal (scale-out)**.

Elasticity

The automatic addition or removal of resources in response to workload changes. It ensures that you only use (and pay for) what you need.

Cloud Agility

The speed and flexibility to deploy, test, and deliver new applications and services quickly using cloud resources. Enables rapid innovation and adaptation to business changes.

Fault Tolerance

The ability of a system to continue functioning even when one or more components fail. Involves redundancy and automated recovery.

RAID (Redundant Array of Independent Disks)

A storage technology that combines multiple physical drives into one logical unit to improve performance, redundancy, or both.

- **RAID 0 (Striping):** Data is split evenly across two or more drives for higher performance. Offers no fault tolerance—if one drive fails, all data is lost.
- **RAID 1 (Mirroring):** Data is duplicated on two drives, providing full redundancy. If one drive fails, data remains accessible. This is the most expensive since it requires double the storage.
- **RAID 5 (Striping with Parity):** Data and parity information are distributed across at least three drives. It offers a balance of performance, storage efficiency, and fault tolerance—one drive can fail without data loss.

Disaster Recovery (DR)

A strategy and set of processes to restore data, applications, and services after a major outage or catastrophic event. Often uses backup sites and cloud-based replication.

Economy of Scaling

Also known as **Economies of Scale**, this refers to the cost advantages that cloud providers achieve by operating on a large scale. As usage increases, the cost per unit of computing or storage decreases because infrastructure, maintenance, and operational costs are spread across many customers. This allows providers like Microsoft Azure to offer services at lower prices.

Capital Expenditure (CapEx) vs Operational Expenditure (OpEx)

- **Capital Expenditure (CapEx):** Upfront investment in physical infrastructure such as servers, storage, and networking hardware. Costs are fixed and depreciated over time. Example: buying a data center server.
- **Operational Expenditure (OpEx):** Ongoing costs for services and resources consumed, usually in a pay-as-you-go model. Cloud computing follows the OpEx model, allowing organizations to scale and pay for only what they use. Example: paying monthly for Azure virtual machines or storage.

Azure Benefit: Shifting from CapEx to OpEx reduces upfront spending and increases financial flexibility.

Consumption-Based Model

A **Consumption-Based Model** means you only pay for the cloud resources you actually use. Similar to utilities like electricity or water, costs are based on actual consumption. Azure bills per second or per minute depending on the service, allowing cost control and scalability without long-term commitments.

Benefits: - No upfront costs. - Pay only for what you use. - Scale up or down as needed. - Cost transparency and predictability.

Differences Between IaaS, PaaS, and SaaS

Infrastructure as a Service (IaaS)

Provides virtualized computing resources such as virtual machines, networking, and storage over the internet. You manage the OS, applications, and data; the provider manages the physical infrastructure. **Examples:** Azure Virtual Machines, Azure Storage, Azure Virtual Network.

Platform as a Service (PaaS)

Provides a platform that allows developers to build, deploy, and manage applications without managing the underlying infrastructure. The provider manages OS, middleware, and runtime. **Examples:** Azure App Service, Azure SQL Database.

Software as a Service (SaaS)

Delivers fully functional applications over the internet. Users simply access the software via a web browser, and everything (infrastructure, platform, updates) is managed by the provider. **Examples:** Microsoft 365, Dynamics 365, Outlook.com.

Cloud Deployment Models

Public Cloud

Owned and operated by third-party providers such as Microsoft Azure, Amazon Web Services, or Google Cloud. Resources (like servers and storage) are shared among multiple organizations but securely isolated through virtualization. Ideal for scalability, flexibility, and cost efficiency. **Example:** Hosting a company website on Azure Web Apps.

Private Cloud

Used exclusively by a single organization, offering greater control and security. Can be hosted on-premises or by a third-party provider. Ideal for organizations with strict compliance or data governance requirements. **Example:** A financial institution running workloads on a dedicated private cloud in its own data center.

Hybrid Cloud

Combines both public and private cloud environments, allowing data and applications to move between them. Offers flexibility, scalability, and optimized cost management while maintaining sensitive data on-premises. **Example:** Using Azure Arc or Azure Stack to manage on-prem resources integrated with Azure public cloud services.