Azure Data s AI Foundations: From ETL to AI

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slides from : Y.M. Yugandhar Reddy

Dr. Shiva prasad Koyyada

Qualification: PhD in Computer Science
Work Exp.: 15+ years

Competencies:

- **Gen AI – LLMs, RAG, Vector Databases, Langchain, Chatbots, Agents.**
- **Machine Learning & Statistics: In-depth knowledge of supervised and unsupervised learning techniques, statistical analysis, and various machine learning algorithms including Random Forest, SVM, and ensemble methods.**
- **Deep Learning and Computer Vision: Expertise in designing and implementing deep neural networks, CNNs, , and Transfer learning architectures.**
- **Programming & Data Science Tools: Python (scikit-learn, pandas, NumPy), R, C++, and Java and data structures**

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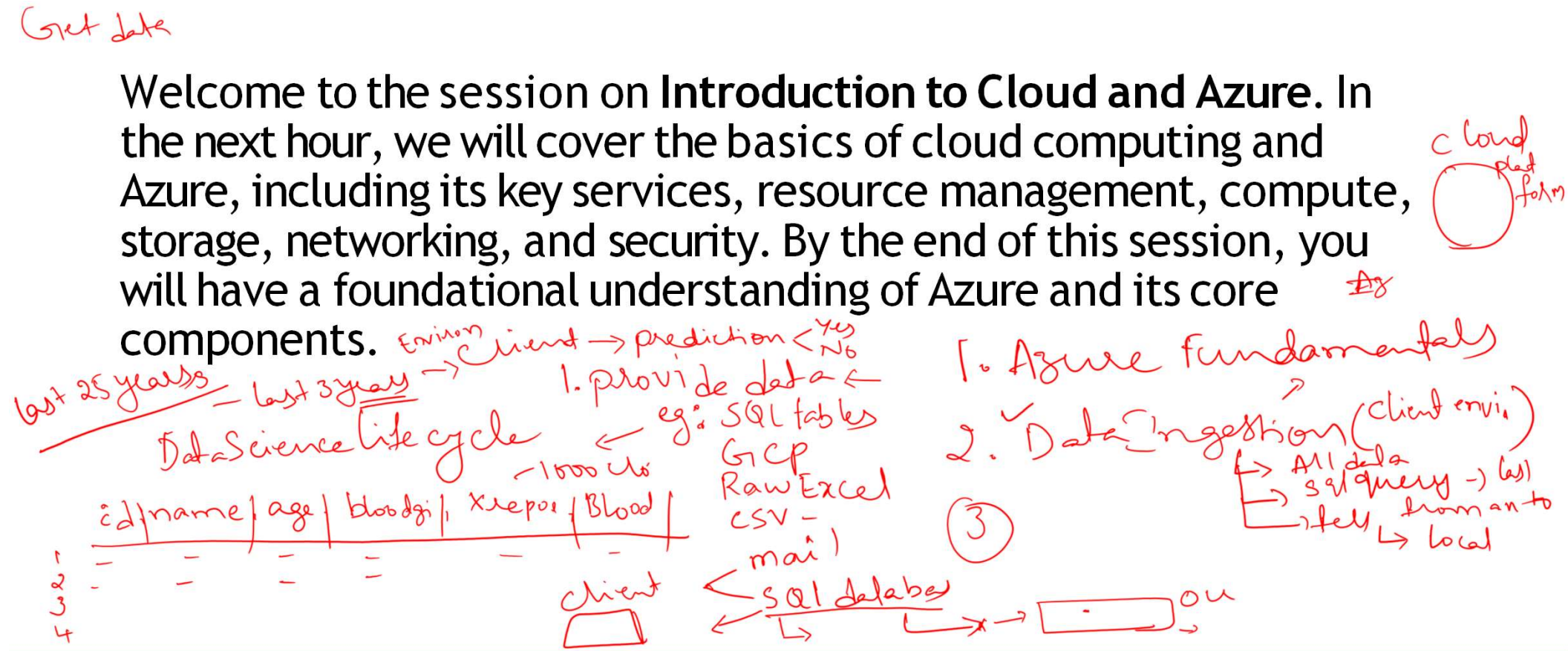
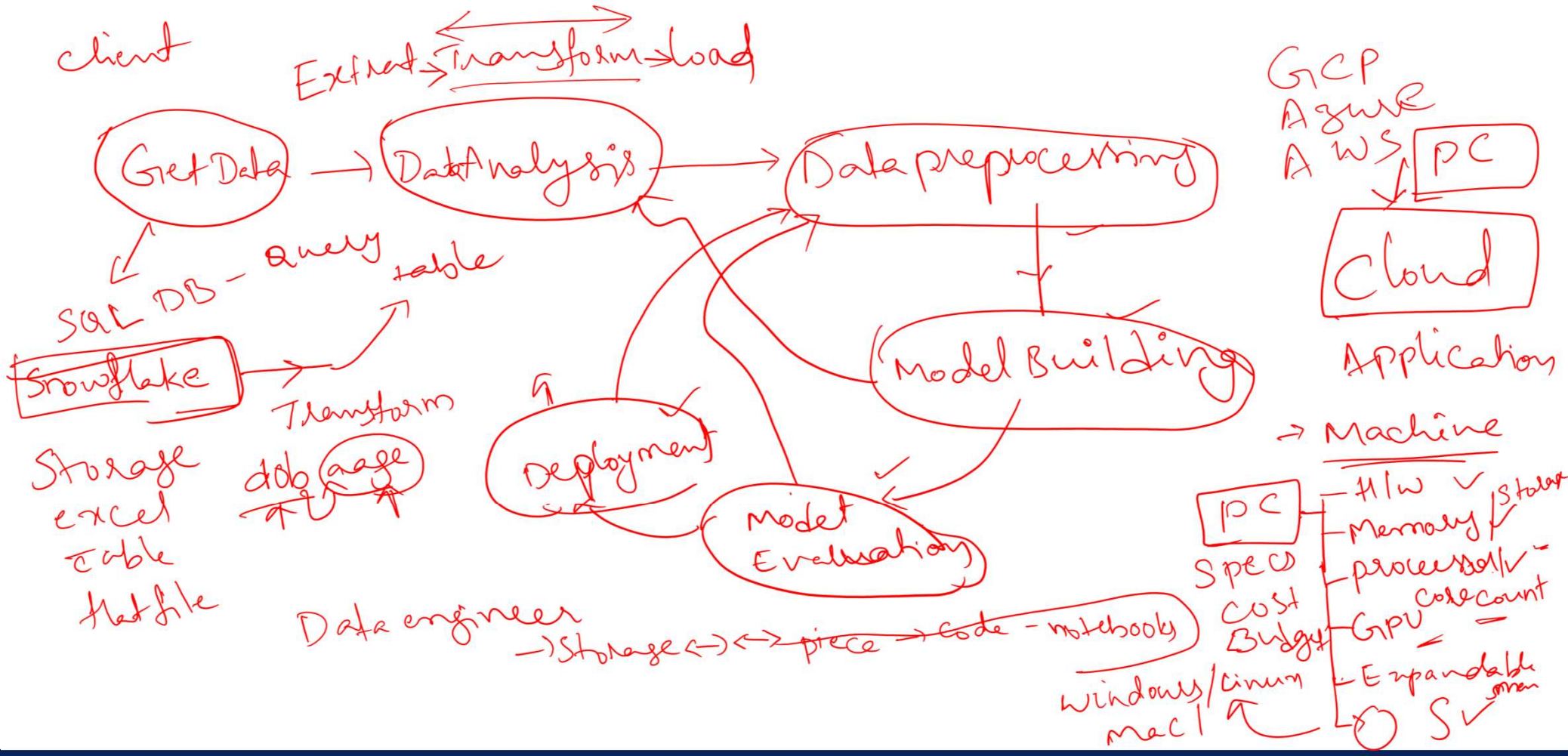
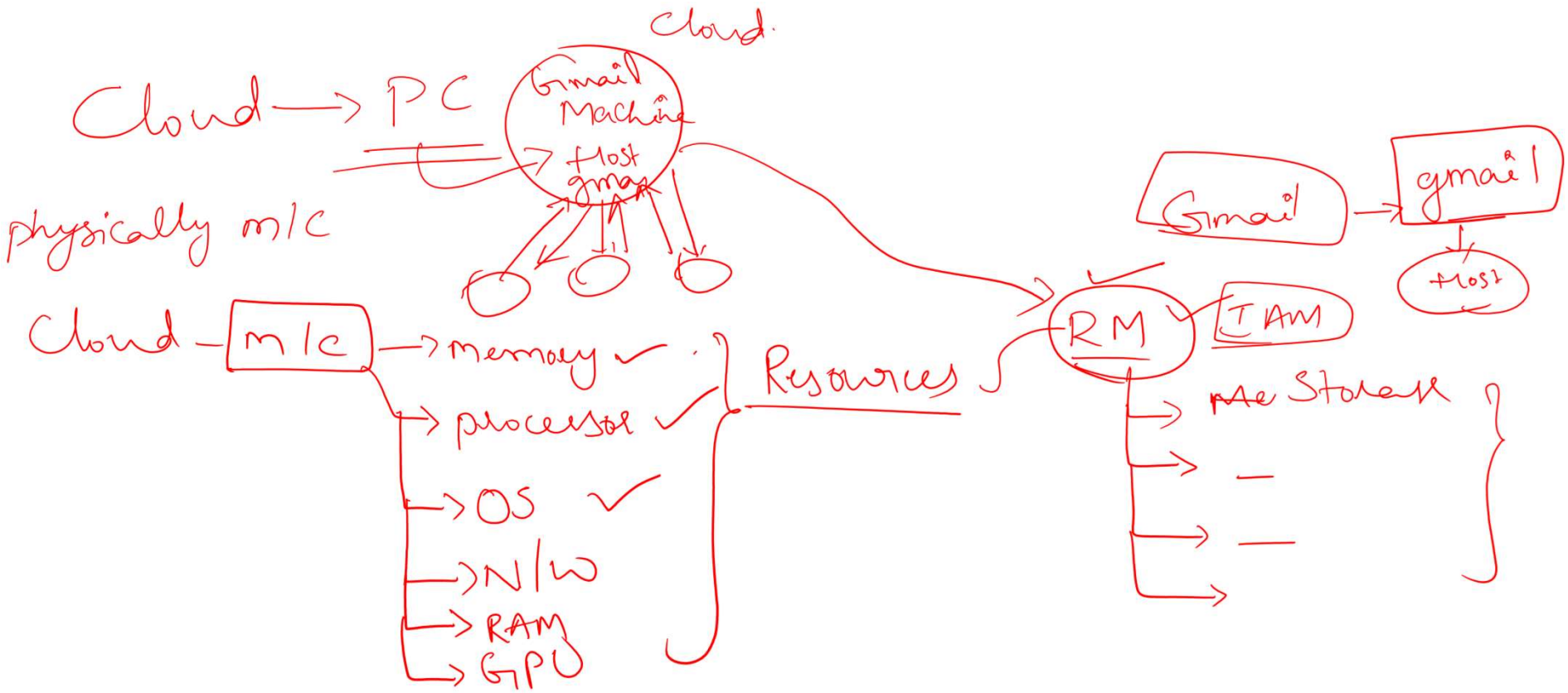
- **with data visualization tools like Tableau and Power BI.**

Introduction to Cloud and Azure

Welcome to the session on **Introduction to Cloud and Azure**. In the next hour, we will cover the basics of cloud computing and Azure, including its key services, resource management, compute, storage, networking, and security. By the end of this session, you will have a foundational understanding of Azure and its core components.







Understanding Cloud Computing

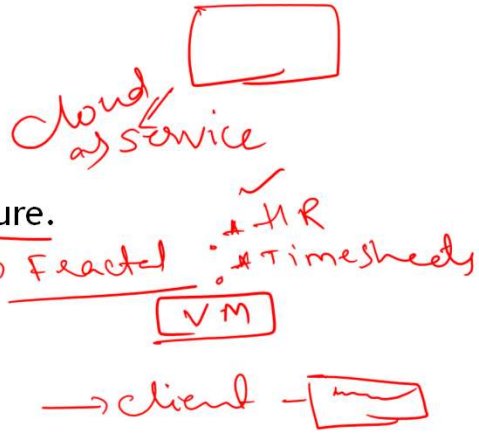
What is Cloud Computing?

Cloud computing delivers computing services like servers, storage, databases, networking, software, and analytics over the internet ("the cloud").

Key Characteristics of Cloud Computing:

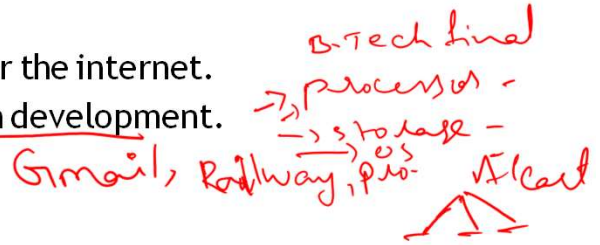
- On-Demand Self-Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

Understanding Cloud Computing



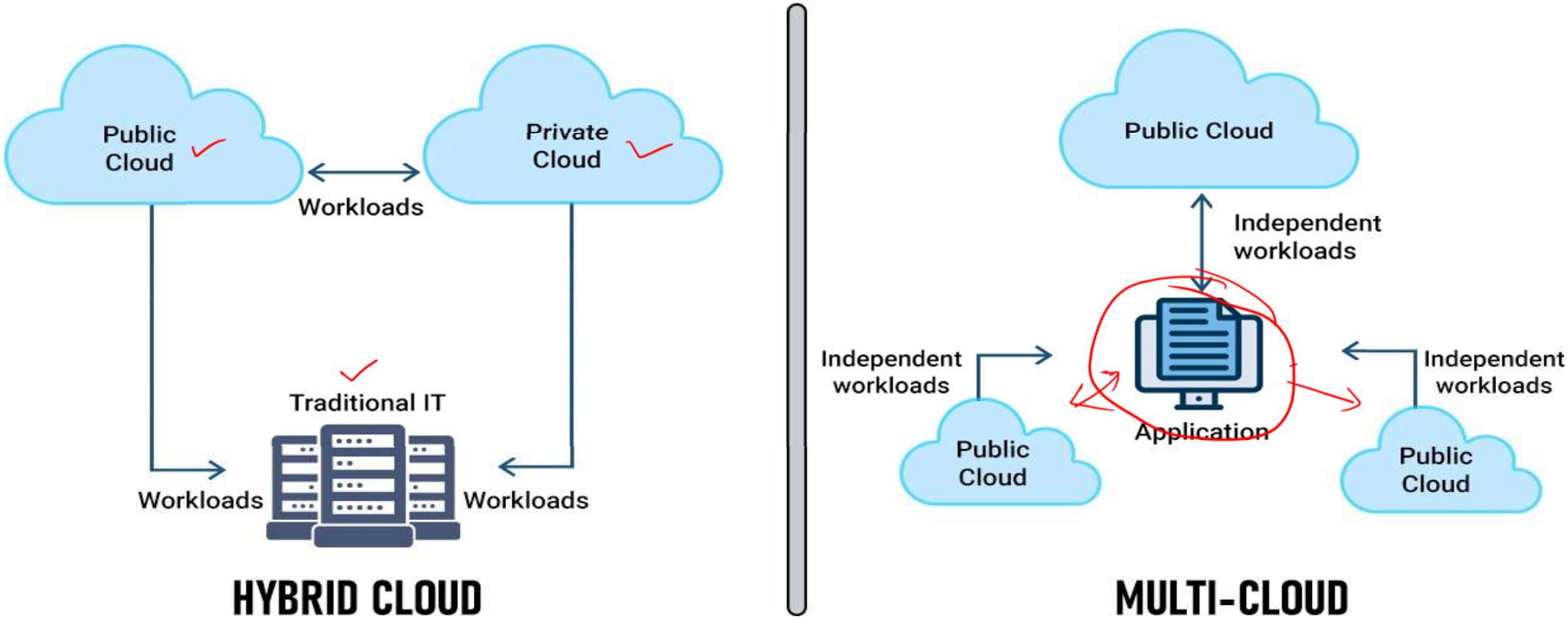
- **Types of Cloud Deployments:**
  - **Public Cloud**: Services offered over the internet, owned by third-party providers like Azure.
  - **Private Cloud**: Dedicated infrastructure for a single organization.
  - **Hybrid Cloud**: A Combination of public and private clouds for flexibility.
  - **Multi Cloud**: A combination of more than one cloud provider

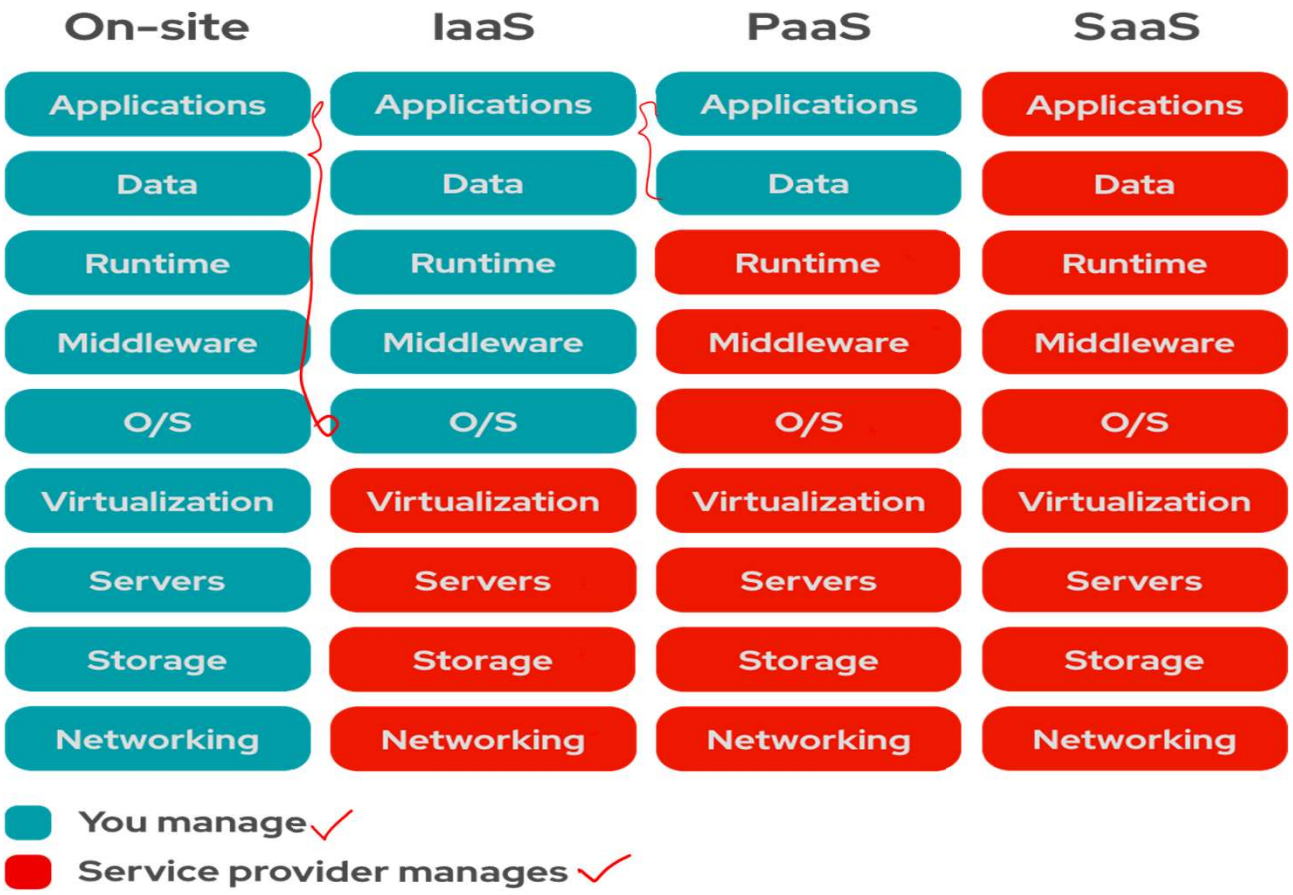
Cloud Service Models:



- **Infrastructure as a Service (IaaS)**: Provides virtualized computing resources over the internet.
- **Platform as a Service (PaaS)**: Offers hardware and software tools for application development.
- **Software as a Service (SaaS)**: Delivers software applications over the internet.

HYBRID CLOUD VS. MULTI-CLOUD OPERATIONS





Overview of Azure Cloud s Services

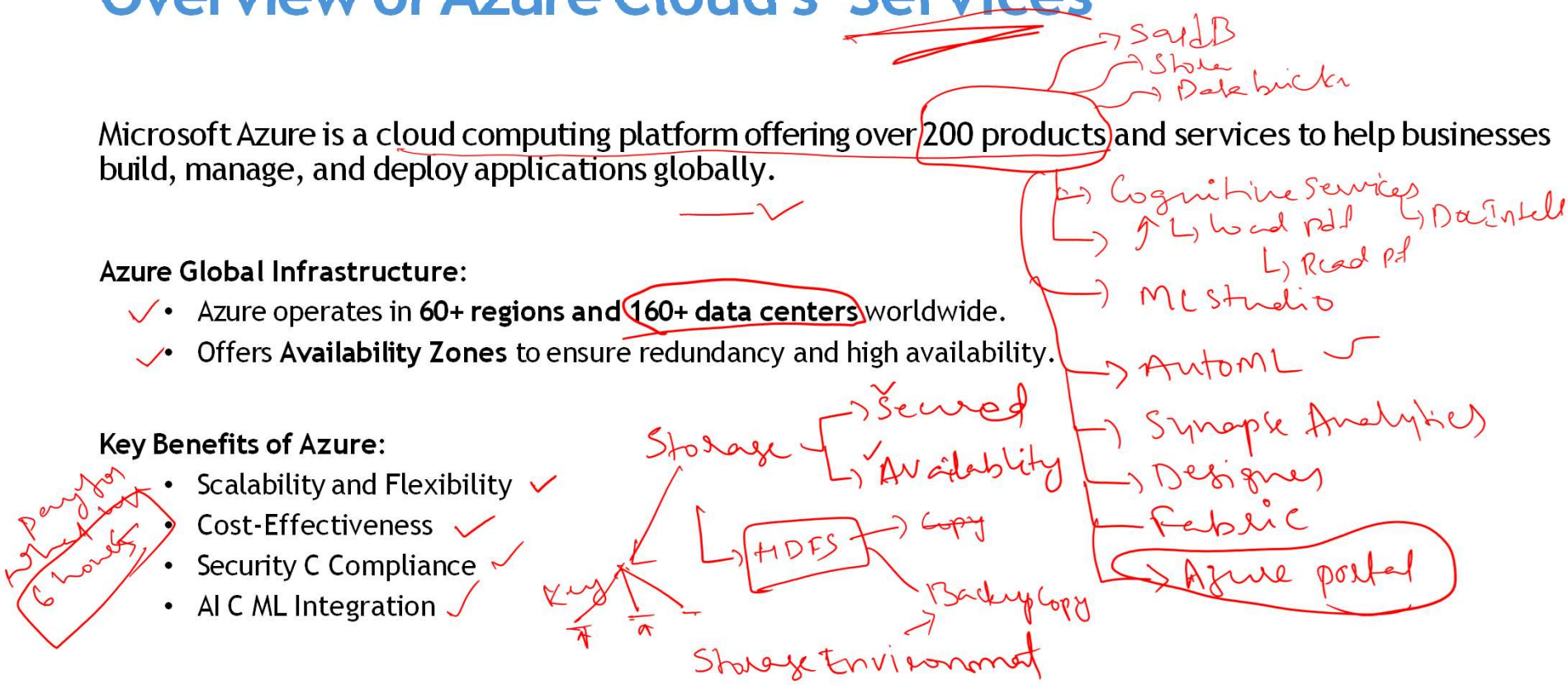
Microsoft Azure is a cloud computing platform offering over 200 products and services to help businesses build, manage, and deploy applications globally.

Azure Global Infrastructure:

- Azure operates in **60+ regions and 160+ data centers** worldwide.
- Offers **Availability Zones** to ensure redundancy and high availability.

Key Benefits of Azure:

- Scalability and Flexibility
- Cost-Effectiveness
- Security C Compliance
- AI C ML Integration



Overview of Azure Cloud s Services

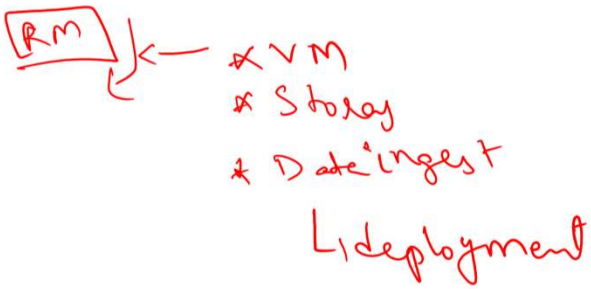
Core Azure Services:

- **Compute:** Virtual Machines, Containers, Serverless Computing
- **Storage:** Blob Storage, File Storage, Disk Storage
- **Networking:** Virtual Networks, Load Balancers, VPN Gateways
- **Security:** Azure Security Center, Identity C Access Management

Azure Resource Manager (ARM) s Resource Groups

What is Azure Resource Manager (ARM)?

Azure Resource Manager (ARM) is the deployment and management service for Azure, allowing users to manage resources through declarative templates.



Role of Resource Groups in Azure:

- Logical containers for managing and organizing resources.
- Helps in applying policies, monitoring, and managing costs.

Benefits of Using ARM s Resource Groups:

- Simplifies resource deployment and management.
- Ensures consistency and security.
- Enables role-based access control (RBAC).

Compute Services in Azure

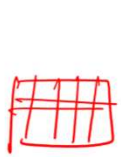
Virtual Machines (VMs): Provides on-demand, scalable computing power.

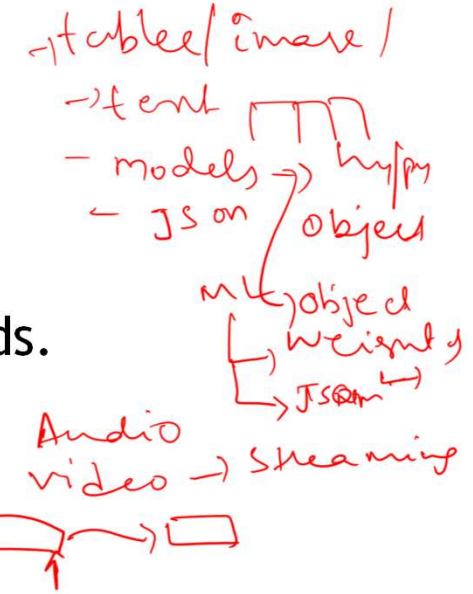
Azure App Services: A fully managed platform for web applications.

Azure Functions: Serverless computing for event-driven applications.

Azure Kubernetes Service (AKS): Managed Kubernetes for container orchestration.

Storage Services in Azure





Azure Storage Types:

- **Blob Storage:** Object storage for unstructured data.
- **File Storage:** Fully managed file shares.
- **Disk Storage:** Premium and standard SSDs for VM workloads.
- **Queue s Table Storage:** Messaging and NoSQL storage.

Azure Backup s Disaster Recovery:

- Azure Site Recovery for business continuity.
- Backup solutions for VMs, databases, and files.

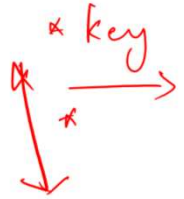
Networking Basics in Azure

Azure Networking Components:

- **Virtual Networks (VNets):** Isolated networks for secure communication.
- **Load Balancers:** Distributes traffic across multiple resources.
- **VPN Gateway:** Secure site-to-site connectivity.
- **Azure DNS s Traffic Manager:** Domain name resolution and traffic routing

Azure Security and Compliance Basics

Shared Responsibility Model:
Azure ensures the security **of** the cloud while customers ensure security **in** the cloud.



Identity s Access Management:

- **Azure Active Directory (Azure AD):** Manages identities and authentication.
- **Role-Based Access Control (RBAC):** Grants permissions based on user roles.

Azure Security Center s Defender:

- Threat protection and security posture management.

Compliance s Regulatory Certifications:

- Azure meets various global regulatory standards like ISO, GDPR, and HIPAA.

Lab Access s Hands-On Demo

Access to Lab setup and guidelines

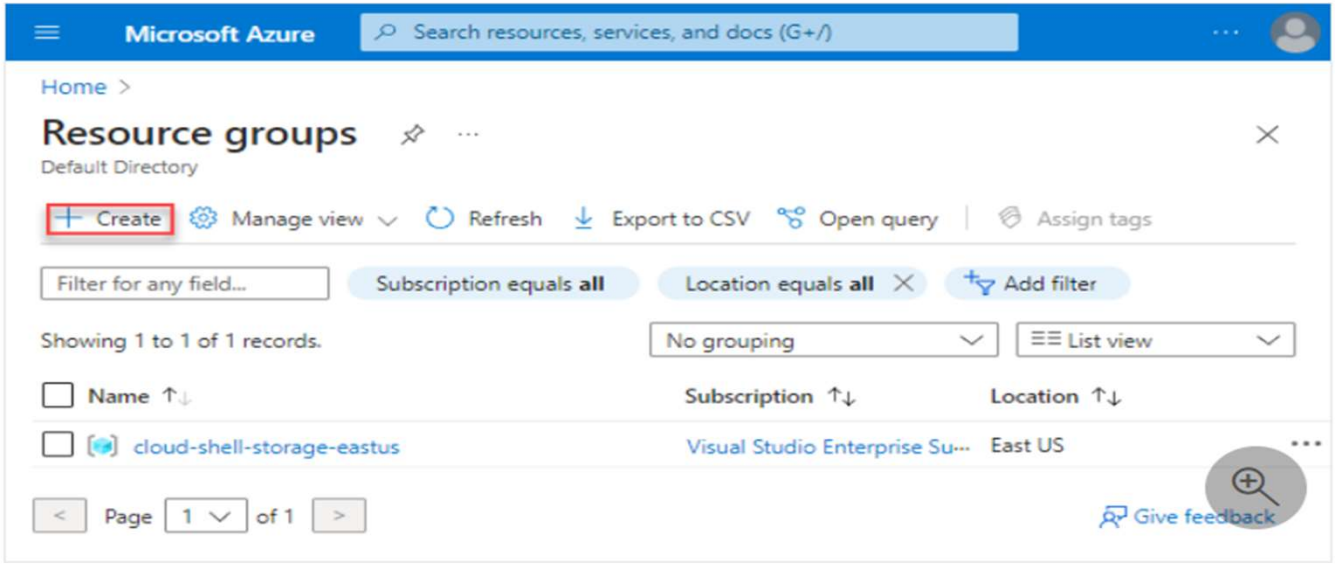
- Azure Portal access → azure portal – username, password → portal.azure.com
  - → Authentication
  - → Authentication

Creating resources in the Azure Portal

- Resource Group → Create/Delete
- Storage Account → Storage account :-
- Virtual Machine → VM/ → add an image [window, Linux
- Networking
- Regions
- Security C Access

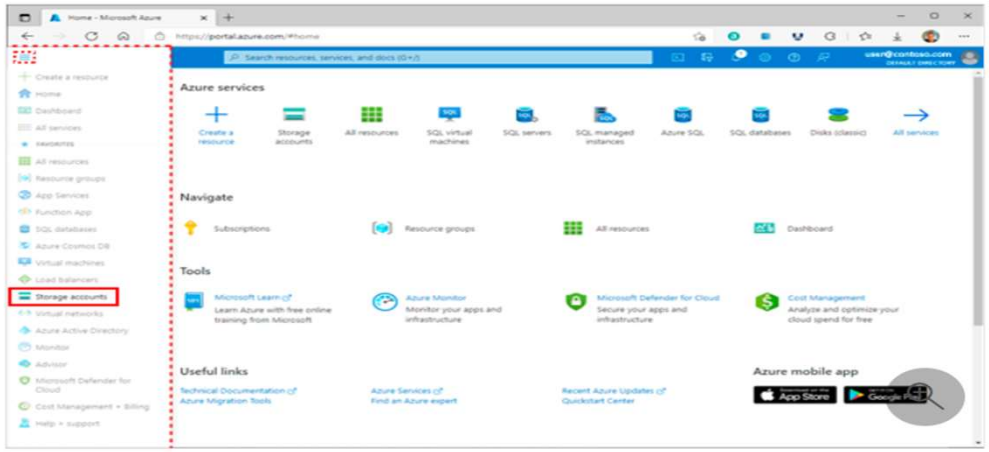
Create a Resource Group

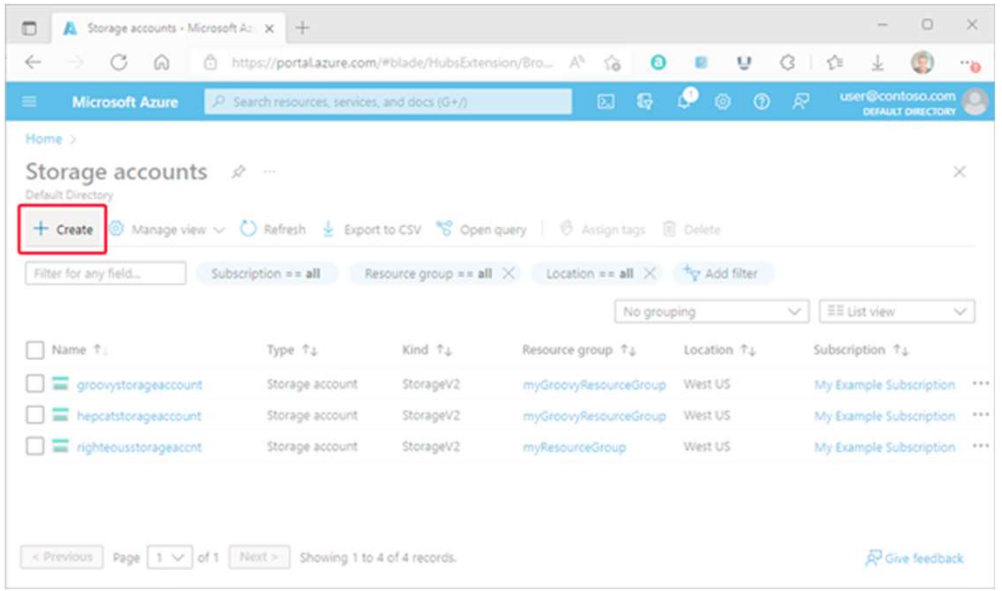
1. Sign in to the Azure portal.
2. Select **Resource groups**.
3. Select **Create**.



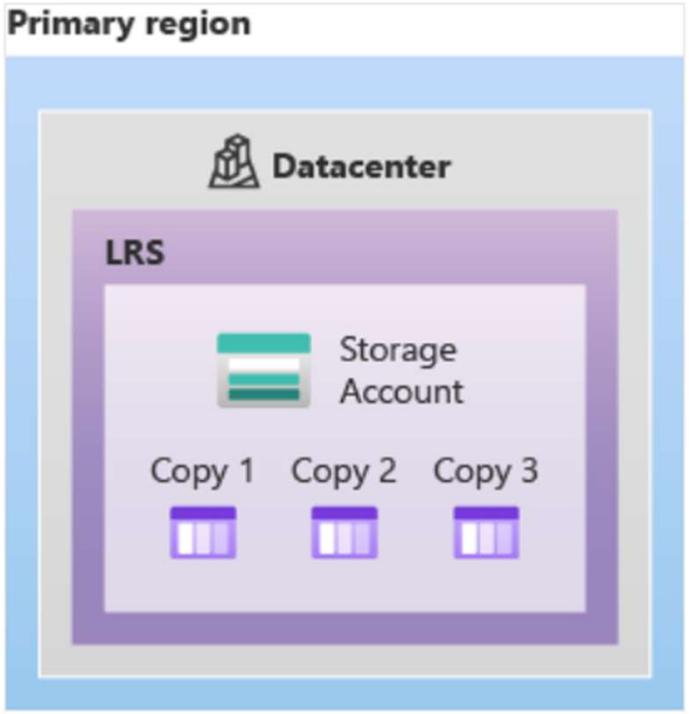
Create a Storage Account

1. From the left portal menu, select **Storage accounts** to display a list of your storage accounts. If the portal menu isn't visible, select the menu button to toggle it on.





Locally redundant storage(LRS)



The diagram shows how your data is replicated within a single data center with LRS:

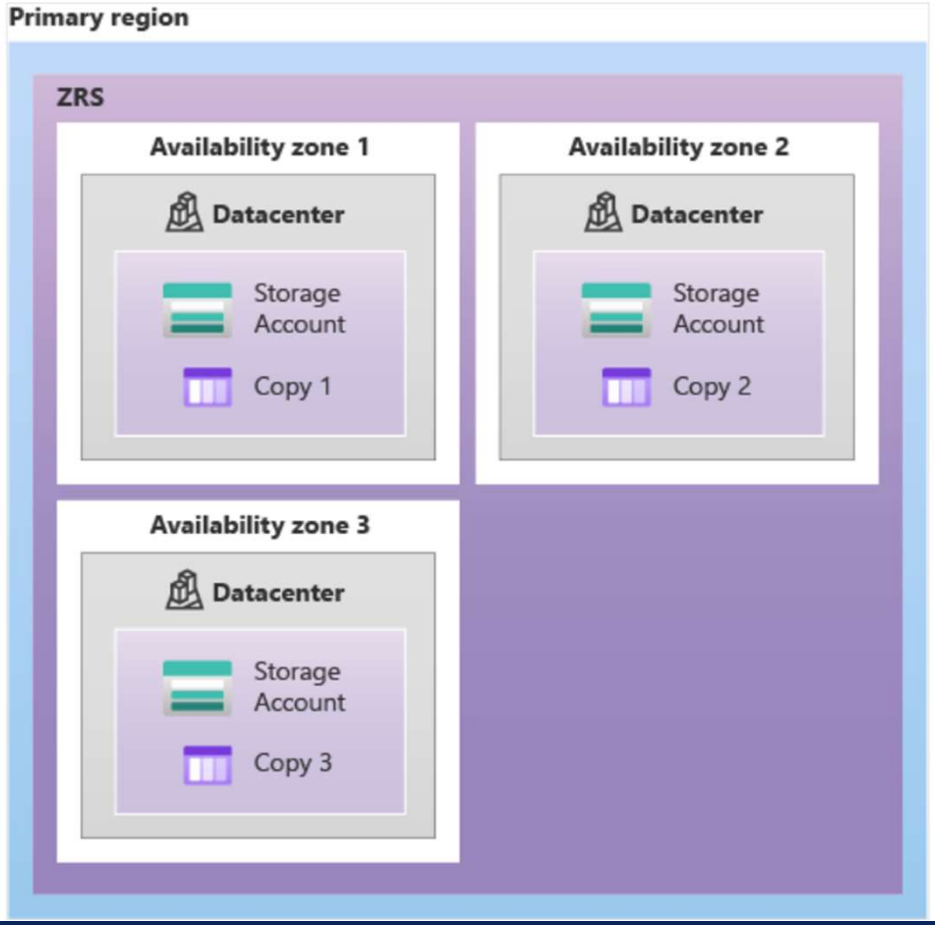
LRS is a good choice for the following scenarios:

•If your application stores data that can be easily reconstructed if data loss occurs, consider choosing LRS.

•If your application is restricted to replicating data only within a region due to data governance requirements, consider choosing LRS. In some cases, the paired regions across which the data is geo-replicated might be within another region. For more information on paired regions, see Azure regions.

•If your scenario is using Azure unmanaged disks, consider using LRS. While it's possible to create a storage account for Azure unmanaged disks that uses GRS, it isn't recommended due to potential issues with consistency over asynchronous geo-replication

Zone redundant storage(ZRS)



- Zone-redundant storage (ZRS) replicates the data within your storage accounts to **three or more Azure availability zones located in the primary region of your choice.**
- Each availability zone is **a separate physical location with independent power, cooling, and networking**
- When you utilize ZRS, your data remains accessible for both read and write operations even if a zone becomes unavailable.
- Microsoft recommends using ZRS in the primary region for scenarios that require high availability. ZRS is also recommended for restricting replication of data to a particular region to meet data governance requirements.
- Microsoft recommends using ZRS for Azure Files workloads. If a zone becomes unavailable, no remounting of Azure file shares from the connected clients is required.

Ref: What are Azure availability zones

Redundancy in a secondary region

- Redundancy options can help provide high durability for your applications.
- In many regions, you can copy the data within your storage account to a secondary region located hundreds of miles away from the primary region.
- Copying your storage account to a secondary region ensures that your data remains durable during a complete regional outage or a disaster in which the primary region isn't recoverable.
- When you create a storage account, you select the primary region for the account.
- The paired secondary region is determined based on the primary region, and can't be changed.

Ref: What are Azure availability zones

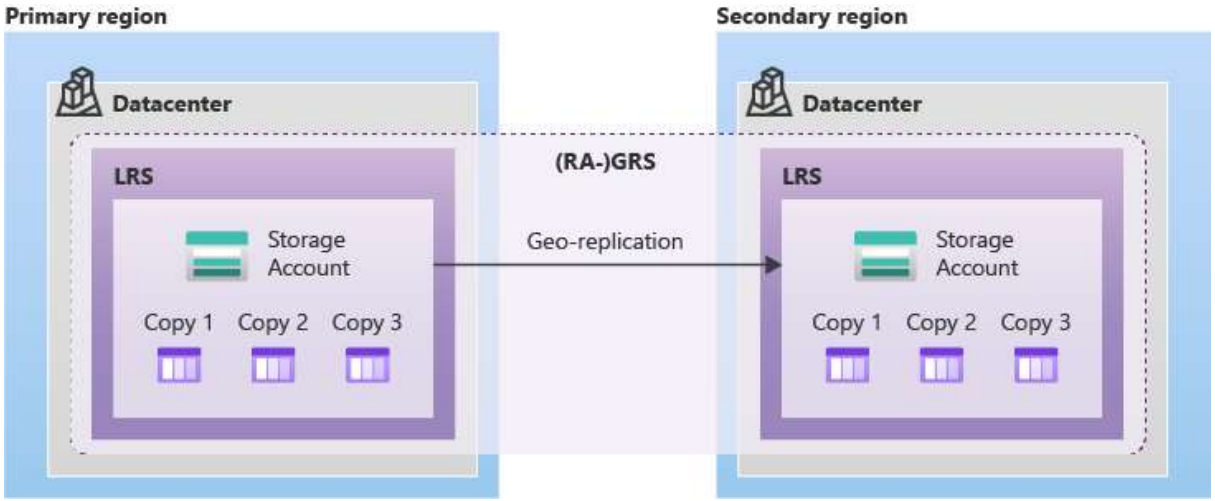
Redundancy in a secondary region

- **Geo-redundant storage (GRS)** copies your data synchronously three times within one or more Azure availability zones in the primary region using LRS. It then copies your data asynchronously to a single physical location in the secondary region. Within the secondary region, your data is copied synchronously three times using LRS.

- **Geo-zone-redundant storage (GZRS)** copies your data synchronously across three Azure availability zones in the primary region using ZRS. It then copies your data asynchronously to a single physical location in the secondary region. Within the secondary region, your data is copied synchronously three times using LRS.

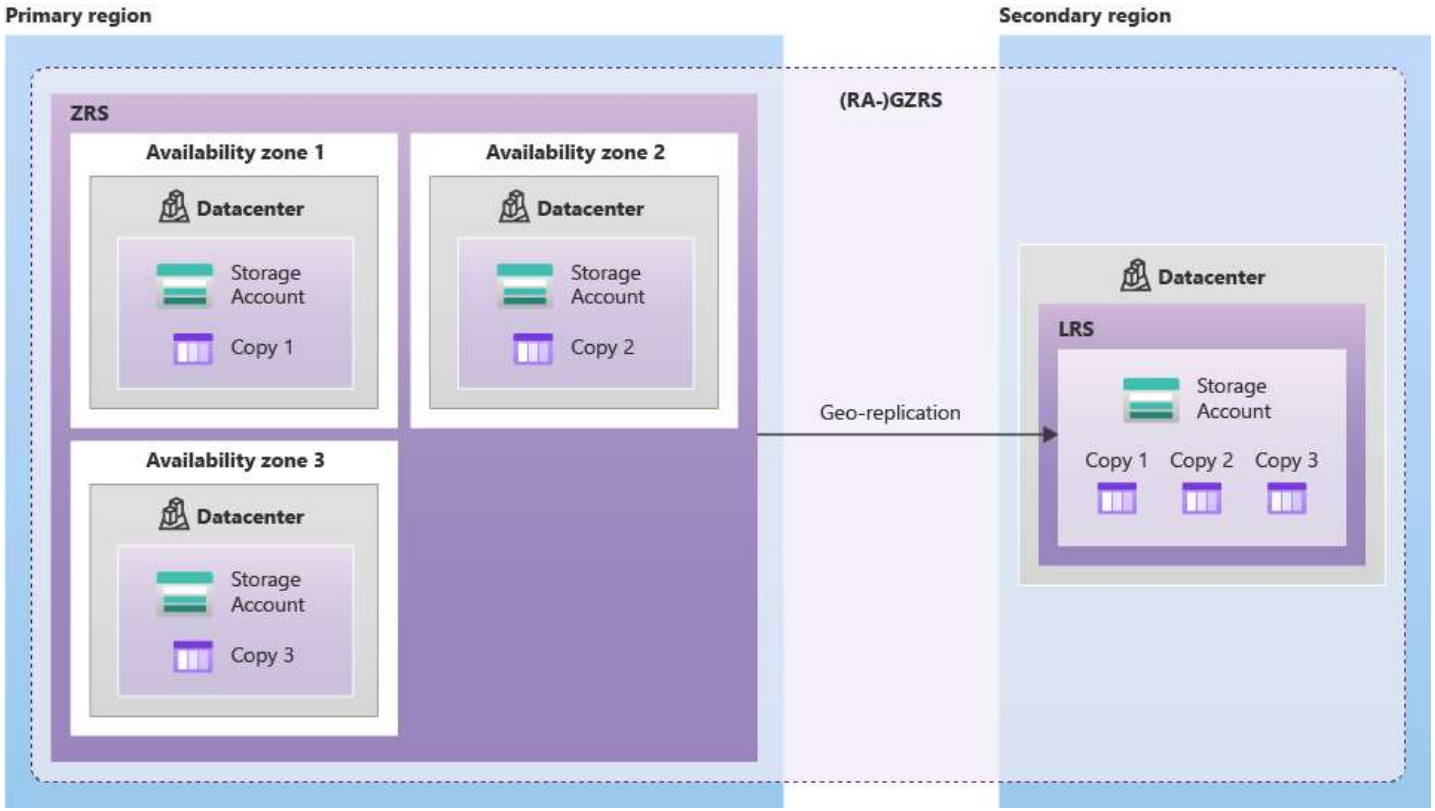
Ref: What are Azure availability zones

Geo-redundant Storage



- Geo-redundant storage (GRS) copies your data synchronously three times to one or more availability zones in the primary region using LRS.
- It then copies your data asynchronously to a single physical location in a secondary region that is hundreds of miles away from the primary region.

Geo-zone redundant Storage



[Azure regions that support geo-zone-redundant storage (GZRS)]

Supported Azure Storage Services

Service	LRS	ZRS	GRS	RA-GRS	GZRS	RA-GZRS
Blob storage (including Data Lake Storage)	✓	✓	✓	✓	✓	✓
Queue storage	✓	✓	✓	✓	✓	✓
Table storage	✓	✓	✓	✓	✓	✓
Azure Files	✓ [1,2]	✓ [1,2]	✓ [1]		✓ [1]	
Azure managed disks	✓	✓ [3]				
Azure Elastic SAN	✓	✓				

Recap s QsA

Summary of Key Takeaways:

- Understanding of cloud computing and Azure's role.
- Knowledge of core Azure services: compute, storage, networking, and security.
- Introduction to resource management in Azure.

Resources for Further Learning:

- Microsoft Learn: https://learn.microsoft.com/en-us/training/
- Azure Free Trial: https://azure.microsoft.com/en-us/free/