2.1 Azure Data Centers

- Azure provides more than 100 redundant & secure facilities worldwide linked with a network
  - Allows you to gain global reach with local presence and keep your data secure and compliant with local laws
- You can choose the region and sometimes the availability zone you want resources deployed into
  - You can't select a specific datacenter or location within a datacenter

▼ Regions

- Regions = Contains at least one, but often multiple datacenters that are nearly and networked together with a low-latency network
  - Azure assigns and controls the resources within each region to ensure workloads are appropriately balanced
  - Ex: West US, Canada Central, West Europe, Australia East, Japan West
- Some services or VM features are only available in certain regions, such as specific VM sizes or storage types
- Regions provide better scalability, redundancy, and preserves data residency for your services
- **Special Regions**
  - For compliance or legal purposes
  - **Azure Government**
    - **US DoD Central, US Gov Virginia, US Gov Iowa** and more
    - Physical and Logical network-isolated instances of Azure for US government agencies and partners
  - **China East, China North** and more

- Unique partnership between Microsoft and 21Vianet

- Microsoft does not directly maintain the datacenters

▼ Region Pairs

- Each Azure region is always paired with another region within the same geography

  - Ex: West US paired with East US, and South East Asia paired with East Asia

- Pairs are at least 300 (500 km) miles away

- Allows for the replication of resources (VM storage)

  - Some services offer automatic geo-redundant storage using region pairs

- Reduce the likelihood of interruptions to both regions

  - Ex: natural disasters, civil unrest, power outages, or physical network outages

- If one regions fails, services automatically fail over to the other region in its region pair

- Data continues to reside within the same geography as its pair (except for Brazil South) for tax and law enforcement jurisdiction purposes

- If there's an extensive Azure outage

  - One region out of every pair is prioritized to make sure at least one is restored as quick as possible

- Planned Azure updates are rolled out to paired regions one region at a time to minimize downtime and risk of application outage

▼ Geographies

- Each region belongs to a single *geography*

- Defined by geopolitical boundaries or country borders

- Has specific service availability, compliance, and data residency/sovereignty rules applied to it

- Fault-tolerant to withstand complete region failure through their connection to dedicated networking infrastructure

  - **Fault-tolerance**: App ability to self-detect and correct all types of problems in its environment

- **Data residency**

  - Defines the legal or regulatory requirements imposed on data

  - Based on the country or region in which it resides

  - An important consideration when planning out your application data storage

- Geographies are broken up into the following areas

  - Americas

  - Europe

  - Asia Pacific

  - Middle East and Africa

▼ Availability Zones

- Physically separate datacenters within an Azure region

- Allows you to make applications highly available through redundancy

  - Replicate your compute, storage, networking, and data resources in other zones

  - Costs more

  - Primarily for VMs, managed disks, load balancers, and SQL databases

  - **Zonal services:** Pin resource to a specific zone

  - **Zone-redundant services**: Replicates automatically across zones

- Have independent power, cooling, and networking

- Set up to be an **isolation boundary**

  - If one zone goes down, the other continues working

- Identified as 1-2-3

  - Logically mapped to the actual physical zones for each subscription independently

  - Availability Zone 1 in a given subscription might refer to a different physical zone than Availability Zone 1 in a different subscription

- Connected through high-speed, private fiber-optic networks

- There are regions that do not support (multiple) availability zones