Azure

Regions:

Specific geographical location to host your services. Azure provides 60+ regions around the world

Advantages:

1. Low Latency: Can serve from nearest region for faster response
2. High Availability: By deploying in multiple regions, if one region is down. Can serve clients from other regions
3. Global Footprint
4. Adhere to global regulations

Zones:

1. Azure provides multiple availability zones in a region
2. 1 or more discrete data centers
3. Each AZ has independent and redundant power, networking, and connectivity
4. AZ in a region is connected through low latency links

Advantages:

1. Increased availability and fault tolerance within same region

Note: Not all Azure regions has availability zones

Azure Virtual Machines:

To deploy application on cloud we use Virtual Machines. Azure provides Azure Virtual Machines as a service

Features:

1. Create and manage life cycle of VM instances
2. Load Balancing and auto scaling of VM instances
3. Attach storage to virtual machine instances
4. Manage network connectivity and configuration for your VM instances

Azure Virtual Machines - Key Concepts

Image: Choose Operating System and Software

VM Family: Choose the right family of hardware (General purpose or Compute /Storage /Memory optimized or GPU or HPC)

VM Size (B1s, B2s, ...): Choose the right quantity of hardware (2 vCPUs, 4GB of memory) Disks: Attach Virtual Disks to VMs (Block Storage)

Single Instance VM:

* Premium SSD or Ultra Disk: 99.9%
* Standard SSD Managed Disks: 99.5%
* Standard HDD Managed Disks: 95%

Two or more instances in same Availability Set: 99.95%

Availability set is a logical grouping of VMs

* + Fault domains: Group of VMs sharing a common power source and network switch
  + Update domains: Group of VMs that are rebooted (updated) at the same time

Two or more instances in two or more Availability Zones in the same Azure region: 99.99%

Virtual Machine Scale Set:

1. To simplify creation and management of multiple VMs we use Virtual machine Scale Sets
2. Allow us to create and manage a group of Azure VMs, provides high availability to our applications
3. Add a load balancer
4. Distribute VM instances across Multiple AZs
5. Supports Manual scaling and Auto scaling
6. Supports up to 1000 VM instances
7. Static IP Address: Assign a fixed IP address to your VM public IP addresses are charged per Ip per hour
8. Azure Monitoring: Monitoring of our Azure VM
9. Dedicated Hosts: Physical servers dedicated to one customer

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| --- | --- | --- |
| **Terminology** | **Description** | **Azure VM** |
| Availability | Are the applications available when user need them? Like low / No down time | Available Sets and Scale Sets |
| Scalability | Can we handle growth in increased traffic, increase / usage of in no of users, without drop in performance? | By increase VM size (Vertical load balancing), Scale Sets and Load Balancers |
| Resilience | Ability of system to provide acceptability behaviour even when one or more parts of the system fail | Scale Sets and Load balancers |
| Geo Distribution | Distribute applications across regions and zones | Scale Sets and Load balancers |
| Disaster Recovery | How to keep your systems running in face of disasters? | Site Recovery |
| Managing Costs | You want to keep costs low | Auto scaling, Reservations, Spot instances |
| Security | Secure your VMs | Dedicated hosts |

Virtual Scaling:

1. Deploying application/database to bigger instance:

* A larger hard drive
* A faster CPU
* More RAM, CPU, I/O, or networking capabilities

1. In Azure: We can increase VM size

There are limits to vertical scaling

Databases:

Database Snapshots to safe guard the data on timely intervals.

Transaction logs:

Standby database:

Availabilty: Whenever we need data is our data available, can be achieved by multiple standby

Durability: Will my data available after 100 or 1000 years. Can be achieved by taking multiple snapshot, standby and transaction logs.

RTO and RPO:

Recovery Time objective: Maximum acceptable down time

Recovery Point Objective: Maximum acceptable period of data loss

Achieving minimum RTO and RPO is expensive

Trade off based on criticality of data

Consistency:

Categories of Databases:

1. Relational DB
   1. Predefined schema with tables and relationships
   2. Offer strong capabilities
   3. Used for OLTP (online Transaction processing)
   4. Used for OLAP (Online Analytics processing)
2. mysql --host=mysql-mycode.mysql.database.azure.com --user=mysqlmycode@mysql-mycode -p
4. create database todos;
5. use todos;
6. create table user (id integer, username varchar(30) );
7. describe user;
8. insert into user values (1, 'Ranjith');
9. insert into user values (2, 'Ramesh');
10. select \* from user;

For Analytics we have Azure Synapys DB

Azure Cosmos DB is nosql db provided by Azure

In-memory DB Azure Cache for Redis