Azure

Azure Support Plans: Developer 🡪 Standard 🡪 Professional Direct 🡪 Premier

Public Cloud:

With a public cloud, there is no capital expenditure on server hardware etc. You only pay for cloud resources that you use as you use them

Private Cloud:

A private cloud exists on premises, so you have complete control over security.

Hybrid Cloud:

A hybrid cloud is a mix of public cloud resources and on-premises resources. Therefore, you have a choice to use either.

Software as a service (SaaS) allows users to connect to and use cloud-based apps over the Internet. Common examples are email, calendaring, and office tools. In this scenario, you need to run your own apps, and therefore require an infrastructure.

SaaS provides a complete software solution which you purchase on a pay-as-you-go basis from a cloud service provider. You rent the use of an app for your organization and your users connect to it over the Internet, usually with a web browser. All of the underlying infrastructure, middleware, app software and app data are located in the service providers data center. The service provider manages the hardware and software and with the appropriate service agreement, will ensure the availability and the security of the app and your data as well.

Platform as a service (PaaS) is a complete development and deployment environment in the cloud. PaaS includes infrastructure servers, storage, and networking but also middleware, development tools, business intelligence (BI) services, database management systems, and more. PaaS is designed to support the complete web application lifecycle: building, testing, deploying, managing, and updating.

A PaaS solution does not provide access to the operating system. The Azure Web Apps service provides an environment for you to host your web applications.  
Behind the scenes, the web apps are hosted on virtual machines running IIS. However, you have no direct access to the virtual machine, the operating system or  
IIS

The IaaS service provider manages the infrastructure, while you purchase, install, configure, and manage your own software  
However, virtual machines are examples of Infrastructure as a service (IaaS). IaaS is an instant computing infrastructure, provisioned and managed over the internet.

OpEx is ongoing costs (costs of operations) such as leasing software, employee salaries. If you purchased software as a one-off purchase, that would be CapEx, but leasing software is ongoing so it’s OpEx

Building a data centre infrastructure is capital expenditure, not operation expenditure

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 safeguard the data on timely intervals.

Transaction logs:

Create a process to copy it over to the seconds

Standby database:

Will setup a secondary db which will have a continuous sync with primary db, by this we can have a high availability as we have secondary db as standby, no need to get the snapshots from primary db can get them from secondary db so that primary db won’t be slow.

Availability: Whenever we need data is our data available, can be achieved by multiple standby. 99.99 is good. Have multiple standby for high availability

Durability: Will my data available after 100 or 1000 years. Can be achieved by taking multiple snapshot, standby and transaction logs. 99.99999999 is considered good. Have multiple copies of the data in multiple zones and regions for high durability

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

Hot Standby – RPO -1min, RTO -5mins

Warm Standby – RPO -1 min, RTO – 15 mins

Consistency:

Strong Consistency: Synchronously replication to all replicas

Eventual Consistency: Async replication, A little lag few seconds before changes is available in all replicas

Read-after-Write consistency: Inserts are available immediately

Categories of Databases:

1. Relational DB
   1. Predefined schema with tables and relationships
   2. Offer strong transaction capabilities
   3. Used for OLTP (online Transaction processing)
   4. Used for OLAP (Online Analytics processing)

Recommended Azure Managed Services:

Azure SQL Database: Managed Microsoft SQL server

Azure DB for MYSQL: Managed MySQL

Azure DB for PostgreSQL: Managed PostgreSQL

1. mysql --host=mysql-mycode.mysql.database.azure.com --user=mysqlmycode@mysql-mycode -p
3. create database todos;
4. use todos;
5. create table user (id integer, username varchar(30) );
6. describe user;
7. insert into user values (1, 'Ranjith');
8. insert into user values (2, 'Ramesh');
9. 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

Azure App Service:

Fully managed platform for building, deploying, and scaling web apps, also supports REST APIs and mobile backends

Natively supports .NET, .NET Core, Node Js, Java, Python and PHP

Choose App service plan: define a set of compute resources for a web app

Features:

Automated deployment and management

Auto Scaling

Build in Load Balancing

Imp Points:

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Azure support plan doesn’t support Basic

You are tasked with deploying Azure virtual machines for your company.  
You need to make use of the appropriate cloud deployment solution. 🡪 IAAS

Azure Machine Learning Studio 🡪 build, test, and deploy predictive analytics for the AI solution