Application Architecture
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-> In every application/project we can see below tiers

1) Presentation : It contains user interface

2) Application Tier : It contains core business logic

3) Data Tier : Database is used to store our application data permanently

Note: Every application should be deployed into a webserver so that users can access our application through internet

Load Balancing
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-> If we run our application in one server then burden will increase on that server

-> To reduce burden on the server, we will run our application in multiple servers to handle the load

Infrastructure Setup
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1) We have to purchase computers
2) We have to purchase Web servers
3) We have to purchase Database Servers
4) We have to purchase Network
5) We have to purchase Storage
6) We have to purchase Power & Power Backup
7) We need to setup Server room
8) We need to setup Air Conditioner (AC)

9) We need to hire Network Admin to setup network
10) We need to hire Server admin to setup servers
11) We need to hire DB admin to setup Database

12) We need to take a room for rent
13) We need a security guard to monitor our server room
14) We need to keep high security for our server room

=> To run our application we need do all the above activities i.e Infrastructure setup
=> Infrastructure setup is costly & time taking process.

=> To ovecome all the above challenges we can go for Cloud Computing

What is Cloud Computing?
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=> It is the process of delivering IT resources on demand basis

        Ex: Computing, Storage, Network, Database, Security etc...

=> There are several cloud providers available in the market

        Ex: AWS, Azure, GCP, Salesforce, Alibaba, Oracle Cloud, IBM Cloud etc....

=> Cloud Providers will provide Infrastructure based on 'Pay As You Go' model

Note: Pay As you Go means Pay for use

Cloud Advantages
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1) Cost Effective

2) Security

3) Scalability

4) Availability

5) Realiability

6) Backup

7) Easy to use

8) Unlimited Storage

Cloud Services
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-> Cloud Services are divided into 3 types

1) IaaS : infrastructure as a service

2) PaaS : Platform as a service

3) SaaS : Software as a service

-> In IaaS model cloud provider will give infrastructure then we will setup environment to run our application

-> In PaaS model cloud provider will give platform to run our application

-> In SaaS model cloud provider will give their application to use

AWS Introduction
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-> AWS stands for Amazon Webservices

-> AWS cloud managing by Amazon company

-> AWS is one of the leading Cloud Provider in the market

-> AWS started providing IT resources over internet from 2006 onwards

-> 190+ countries using AWS Cloud

-> AWS providing 200+ Services

-> AWS providing Cloud Services based on 'Pay As You Go' model

AWS Services Names
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EC2 : Elastic Compute Cloud : To create virtual machines

EBS : Elastic Block Store (External HD)

EFS : Elastic File System

S3 : Simple Storage Service : Unlimited Storage

RDS : Relational Database System : To create SQL Databases (Oracle, MySQL, Postgres, MS SQL etc..)

VPC : Virtual Private Cloud : Isolated Network

Route 53 : Domain Name Mapping (URL Mapping)

BeanStalk : For Paas Model

IAM : Identity & Access Management (who can access which service in AWS)

ECS : Elastic Container service (To run containers)

ELB : Elastic Load Balancer (Load Balancing)

Lambda : Serverless Computing (run the code without thinking about servers)

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-> To use AWS provided cloud services we need to create one account in AWS

Note: It will ask debit / credit card for account creation

-> AWS will charge 2 rs for account creation and they will send 2 rs back to our account after account verified

-> In AWS few services are free and few services are paid

-> As part of our training we will use both free and paid services

Note: When we use paid services, after practise completion we need to delete those service to avoid billing

-> If bill got generated we can request AWS Support team to waveoff our bill because we are AWS learners and we are exploring AWS Cloud services.

-> AWS will not deduct bill amount from our card directley. We need to pay that bill manually.

-> If we don't pay AWS bill amount then our AWS account will be terminated.

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-> AWS providing global infrastructure

-> 190+ contries are using AWS Cloud through internet

-> To provide Global Infrastructure AWS using Regions & Availability Zones concept

-> Region means one geograhical location

-> Availability Zone means data center

-> Data Center means a big building which contains servers with network

-> One Region can have multiple Availability Zones (AZ)

-> AWS Having 26 Regions and 84 Availability Zones in the world

-> In india AWS having 1 region (Mumbai) ---- ap-south-1

-> Mumbai region having 3 availability zones

- ap-south-1a
- ap-south-1b
- ap-south-1c

Note: Hyd Region Coming Soon

Note: It is recommended to use Nearest Region in AWS to setup our infrastructure

Note: In AWS few services are global (S3, Route 53 etc...) and few services regional (EC2, VPC, RDS etc...)

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EC2
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-> EC2 stands for " Elastic Compute Cloud "

-> EC2 is the most demanded service in AWS

-> EC2 is used to create virtual machines

-> The Virtual Machine which we create using EC2 service is called as EC2 instance

Alias Names : EC2 Instance / Virtual Machine / VM / Server

-> When we create EC2 instance, AWS will provide default storage and default network

-> Storage will be provided using EBS (Elastic Block Store)

-> Network will be provided using VPC (Virtual Private Cloud)

Creating Windows Virtual Machine
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1) Goto EC2 service

2) Launch instance

3) Select AMI (Windows - Free tier eligible)

4) Select Instance Type (t2.micro - Free tier eligible)

5) Storage (Default 30 GB - Free tier)

6) Network (Default VPC)

7) Create New Pair

8) Create New security group with RDP protocol

=> Once EC2 VM created then click on 'Connect' button and get below details

DNS : ec2-15-207-89-254.ap-south-1.compute.amazonaws.com
Username : Administrator
Password : rcAF2=D3s%g&%O98o?)*xUYd&!vdw?dp

-> Connect to Windows VM using RDP

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What is Key Pair in EC2 ?
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-> Key Pair is the combination of Public Key and Private key

-> AWS will store public key and it will provide private key for us (We have to save that)

-> Private Key file extension will be .pem

-> Public key & Private Key is used to connect with EC2 instance securley

-> If we want to connect with EC2 VM we need to provide private key for AWS then AWS will compare our private key with its public key. If both keys are matched then only AWS will allow to connect with EC2.

Note: One key pair we can use to create multiple instances

Note: Key-Pairs are free of cost (No Bill)

Note: Key pair we can use for any OS Based VM

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Security Groups
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-> Security Group is like a virtual firewall for our EC2 instance

-> Security Group will control Incoming and Outgoing traffic of our EC2 instance

-> To allow the incoming traffic we will configure Inbound Rules

-> To allow the outgoing traffic we will configure Outbound Rules

Windows => RDP : 3389

Linux => SSH : 22

Webserver => HTTP : 80

HTTPS => HTTPS : 443

Note: Security Groups are free

Note: One security group we can use for Multiple Instances

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Assignment
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1) Create a key pair and download .pem file

2) Create Security Group with Inbound Rules (RDP Protocol)

3) Create Windows VM using EC2 (use key pair and SG you have created)

4) Connect to Windows VM using RDP

5) Terminate windows VM

EC2 instances types
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1) On-Demanded Instances

2) Reserved Instances

3) Spot Instances

4) Dedicated Host

OnDemanded Instance
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-> Whenever we want then we can create it

-> Fixed Price (Hourly)

-> Pay For Use

-> No Prior Payments

-> No Committment

Reserved Instances
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-> It is like advanced booking

-> Long Term Commitment

-> Prior Payment we need make

-> Commitment for 1 year or 3 years

-> AWS will provide discount on price

Spot Instances
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-> It is like bidding or Auction

-> AWS will offer high capacity systems for low price

-> 72% savings on price

Dedicated Host Instance
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-> This is a physical machine

-> Licensed Softwares

-> It is very costly when compared with other instance types

-> For EC2 instances minimum billing period is 1 hour

EC2 instance states
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Running --- Billing

Stopped -- No Bill

Terminated -- No Bill

EC2 instance families
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t2. t3, t4, c2, c3, i2, i3, m2, m3, m4 etc....

-> We are using t2.micro instance for practise

Note : t2.micro instances are Free for 1 year (from aws account creation date)

Note: Monthly 750 hours usage is free for 1 year when we go for t2.micro

Note: We can find EC2 instance types service rates in dashboard

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Amazon Machine Image (AMI)
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-> AMI is a template to launch our instances

-> Image represents pre-configured system with softwares installed

-> To create EC2 instance with Windows OS we can use Windows OS AMI

-> To create EC2 instance with Linux OS we can use Linux OS AMI

-> In AWS, we can create our own AMI also

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Types of IP's in AWS
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-> IP stands for Internet Protocol

-> Every Machine should have one IP address

-> IP is like an address for computer

-> AWS providing 3 types of IPs

        1) private ip

        2) public ip

        3) elastic ip (static ip)

-> When we launch EC2 instance then AWS will provide one private ip and one public ip for our instance

-> Private IP is a fixed IP and it is used by AWS for internal purpose. It will not change when we re-start our EC2 instance.

-> Public IP is a dynamic IP. When we re-start our EC2 instance new Public IP will be generated.

Note: To connect with EC2 instance from outside we will use Public IP.

-> Elastic IP means fixed public IP address.

-> We can create Elastic IP and we can associate that elastic ip for our EC2 instance

-> Elastic IP address will not change when we re-start our ec2 instance

Note: Elastic IPs are commercial (paid)

Working process
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1) Create Elastic IP
2) Associate Elastic IP for EC2 instance
3) If we don't want to use elastic ip then De-Associate Elastic IP from EC2 instance
4) Release Elastic IP to AWS (Its mandatory)

***** Note: If we create Elastic IP then we have to associate that Elastic IP otherwise bill will be generated for that******
(We shouldn't keep Elastic IP as un-used ip)

What is EC2
EC2 Instance Types
EC2 Instance Families
EC2 Standard Rates
Working AMI
Key Pair
Security Groups
Types of IP's
        - private ip
        - public ip
        - elastic ip
Launching Windows VM
Connect to Windows using RDP
Launching Linux VM