Elective I

Cloude Computing

History:
→ DARPA
The defense advanced Reserch Projects is an agency of the United state department of Defense responsible for the development of emergeng technology use by the military
→ Intergalatic Computer Network
→ First network
Client-server architecture
→ Larger network among same organization
→ Cross enterprise network.

Characteristics of cloud computing

Cloud computing is the on-demand delivery of computer power, database storage, applications and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing.

- It is beyond one organization & accesible by group of people cross platform, cross-enterprise.
→ Hides complexity & emplementation details from the end-user

→ On demand self-service
→ Broad network access
→ Resource pooling
→ Rapid elasticity
→ Measured service

→ User-centric
→ task-centric
→ powerful
→ Highly accesible
→ intelligent
→ programmable

On demand self-service
Users are able to provision cloud computing resource without requiring human interaction, mostly done through a web-based self service portal (management console)

Broad network access
Cloud computing resource are accessible over the network, supporting heterogenous client platform such as mobile devices and workstation.

Resource pooling
Service multiple customers from the same physical resource, by securely separating the resources on logical level

Rapid elasticity:
Resources are provisioned and released on-demand/or automated based on triggers or parameters. This will make sure your application will exactly the capacity of need at any point of time.

Measured Service:
Resource usage are monitored, measured and reported transparently based on utilization

Advantage of cloud computing

→ Trade capital expense for variable expense
→ Benefit from massive economies of scale.
→ Stop guessing capacity
→ Increase speed and agility
→ Stop spending money running and maintaining data centers
→ Go global in minutes

① Trade capital expense for Variable expenses

Instead of having to invest heavily in data centers & servers before you know how you're going to use them, you can pay only when you consume computing resources and pay only how much you consume

→ Benefit from massive economies of scale

many customers are aggregated on the cloud, provider AWS can achieve higher economic scale which translate lower pay as you go price

→ Stop guessing capacity

Eliminate guessing on your infrastructure capacity need.

You can access as much or as little capacity as you need and scale up & down as required with only a few minute notice

→ Increase speed & agility

In cloud computing env. new IT resources only a click away

→ Increase the agility for the org^n

→ Stop spending money running and maintaining data center

→ Go global in minute

Easy deploy your appl^n in multiple regions around the world.

Disadvantage of cloud computing

1. Downtime
2. Security and Privacy
3. Vulnerability to attack
4. Limited control and flexibility
5. Vendor lock-in.
6. Costs

Cloud Architecture

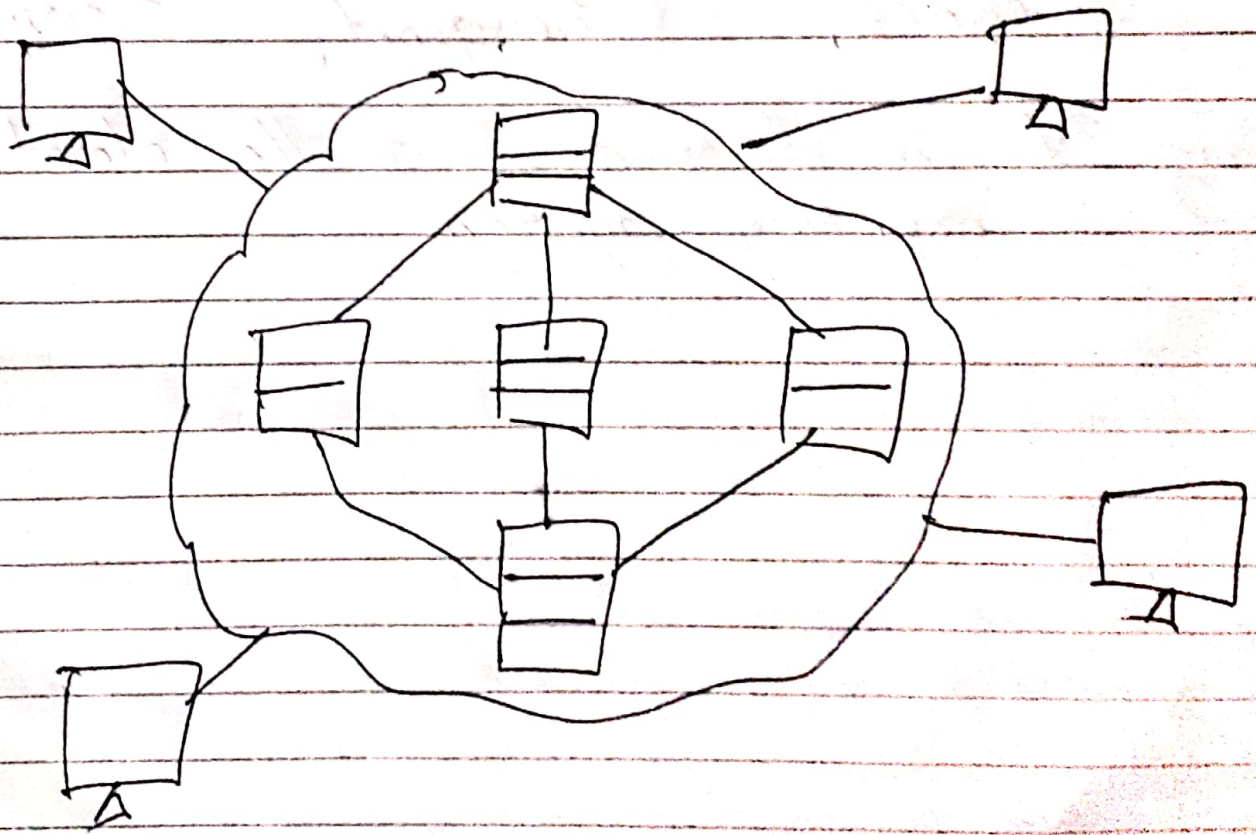


Fig: How users connect to the cloud.

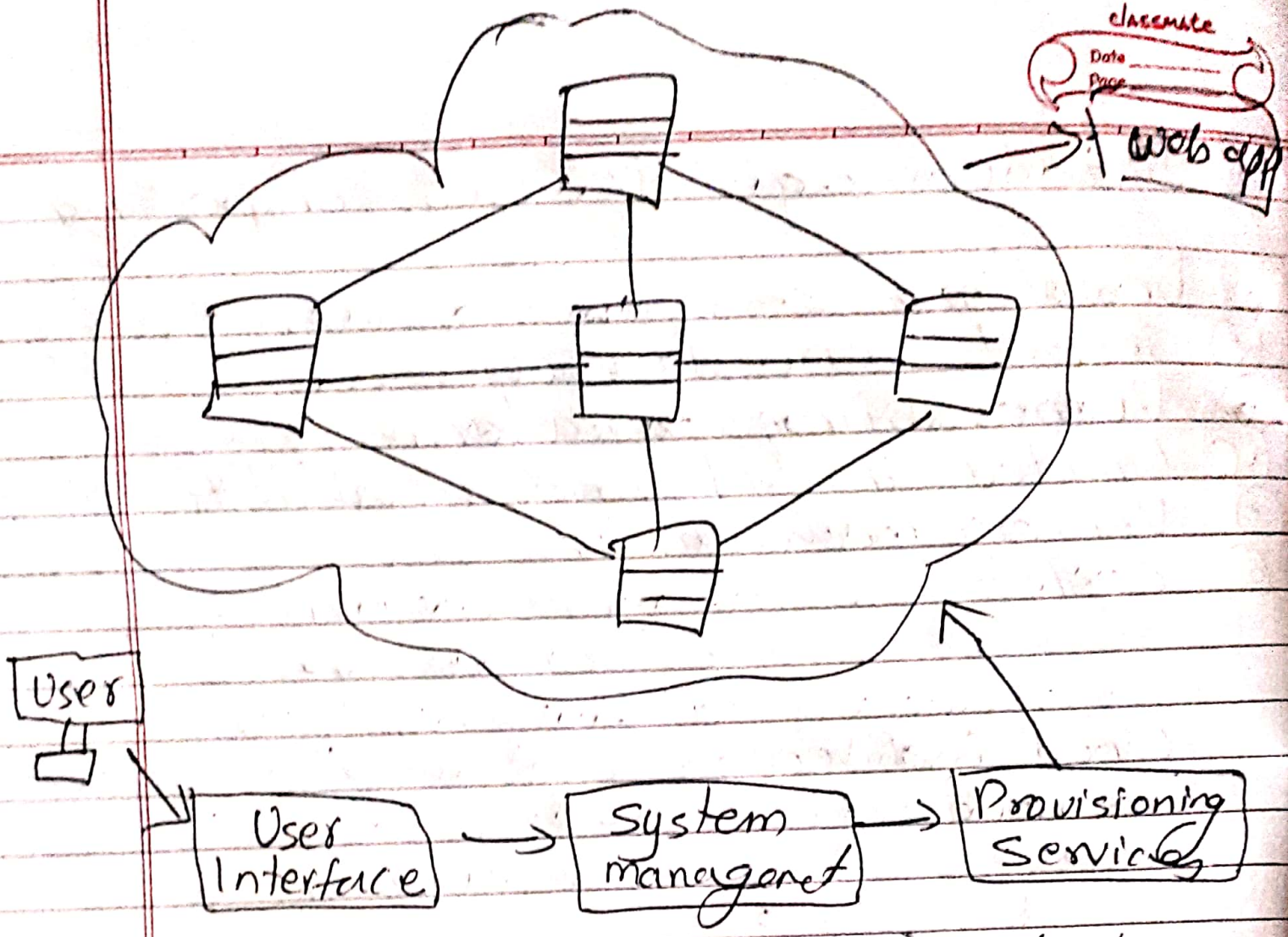


Fig: The architecture behind the cloud Computing system

Pros & cons of CC.

Adv

Lower-cost computing for users
Improved performance
Lower IT infrastructure
fewer Maintenance Issues
Lower software costs
Instant software updates
Increased computing power
Unlimited storage capacity
Increased Data safety (Durability)
Improve compatibility bet^n OS
Easier Group Collaboration

Dis

Require a constant Internet connection
Doesn't work well with low-speed connection
Can be slow
Features might be limited
Data might not be secure

Cloud Computing Risks

1. Consumers have reduced visibility and control
2. On-demand self service simplifies Unauthorized use
3. APIs can be compromised
4. Separation among multiple tenants fail
5. Date deletion is encomplete
6. Credentials are stolen
7. Vendor lock-in complexity strains IT team
8. Stored data is lost
9. Insufficient due diligence encreases cybersecurity risk

Best Practices for cloud Security

→ There will be a risk bef^n the small-large org^n to minimize that the best pratice will be:

① Perform Due Diligence.

Due diligence must be performed across the life cycle of application system being deployed to the cloud including

→ Planning
→ Development and Deployment
→ Operation — how data entered with CSP & app
→ Decommissioning
→ Develop a multiple-CSP strategy

② Managing Access

→ Identify and Authenticate Users
→ Assign User Access Rights
→ Create and Enforce Resource Access Policies

→ Protect Data

→ Protect Data from unauthorized Access
→ Ensure Availability of Critical Data
→ Prevent Disclosure of Deleted data

→ Monitor and Defend

→ Monitor cloud-Deployed resources
→ Analyze both cloud and On-Premises Monitoring
→ Co-ordinate with the CSP

Horizontal scale → replicate

Vertical scale
Increase or decrease CPU RAM, processor.

Total cost of Ownership (TCO)

A common phrase used to represent how much it actually cost to own any combination of h/w system or devices

It includes
- → Original cost of the computer and s/w
- → Hardware & software upgrades
- → Maintenance
- → Tech support
- → Training.

tips to evaluate TOC

→ Recognize that the total cost is comprised of a number of different cost streams

→ Assess the mix of cloud services your application will likely use

→ Understand the role of application load
→ Understand the role of load variation
→ Look for accuracy but not down to the penny and demand a significant cost advantage.

Iass, Pass & Saas

→ Infrastructure as a service
→ Platform as a service
→ Software as a service

Iass

A vendor provides client pay-as-you-go access to storage, networking, servers and other computing resource on the cloud.

Organization use their own platform and application within a service provider's infrastructure

Key Features
→ Instand of purchasing hardware outright user pay for Iaas on demand

→ Infrastructure is scalable depending on processing and storage need

- Saves enterprise the cost of buying and maintaining their own hardware

- Because data is on the cloud, there can be no single point of failure

→ Enables the virtualization of administrative task, freeing up time for other work.

Paas

A service provider often access to a cloud-based environment in which users can build and deliver applications. The provider supplies underlying infrastructure

In addition to storage and other computing resource, user are able to use a suite of prebuilt tools to develop, customize and test their own application

Key feature

- Paas provides a platform with tools to test, develop & host application on the same environment

- Enable organization to focus on development without having to worry about underlying infrastructure

→ Provides manage security, OS, server software & backup

→ facilitates collaborative work even if teams work remotely

SaaS

It is a cloud computing offering that provides users with access to a vendor's cloud based software users do not install applications on their local devices. Instead the applications reside on a remote cloud network accessed through the web or an API

Through the appl^n user can store and analyze data and collaborate on project.

Key features

Saas vendor provide user with software & appln via a subscription model

Users do not have to manage install or upgrade software Saas providers manage this.

Data is secure on the cloud. equipment failure does not result in loss of data.

Use of resource can be scaled depending on service need

application are accessible from almost any internet-connected device from virtually anywhere in the world.

Compute

Compute refers to applications and workload that require a great deal of computation necessitating sufficient resource to handle these computation demands in a efficient manner

Compute is frequently encountered in the server and data center space as well as in cloud computing, where infrastructure and resource can be ideally constructed to efficiently handle compute-intensive app that require large amount of compute power for extended period of time.

Benefits of Compute

Elastic web-scale computing
completely controlled
flexible cloud hosting service
Integrated
reliable
Secure
Inexpensive
easy to start.

Storage

Type of cloud storage

→ Object storage
→ File storage
→ Block storage

Object storage

Applications development on the cloud often take advantage of object storage vast calability and metadata characteristics.

Object storage soln like AWS S3 are ideal for building modern application from scratch that require scale and flexibility, and can also used to import existing data stores for analytics, backup or archive.

File storage

Many application need to access shared files and require a file system. This type of storage is often supported with a Network attached storage (NAS) server.

File storage sol^n like Amazon EFS (Elastic file service) are ideal for use case like large content repositories, development environment media stores, or user home directories.

Block storage

Other enterprise application like database or ERP system often require dedicated, low latency storage for each host

This is analogous to direct attached storage or a storage Area Network

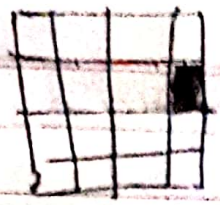
Block-based cloud storage solⁿ like Elastic Block store (EBS) are provisioned with each virtual service and offer the ultra-low latency required for high performance workloads.

Benefits of cloud object storage
-> Durability, availability & scalability
-> Security & compliance
-> Flexible management
-> Query en-place
-> Broad cast ecosystem

Use Cases For cloud Storage

→ Backup & recovery
→ Data Archiving & compliance
→ Big Data Analytics
→ Hybrid cloud storage
- Cloud-native application data
- Disaster Recovery

Block storage



Benefits

- Reliable, secure storage
- Consistent low-latency performance
- Backup, restore, innovate
- Quickly scale up, Easily scale down
- Geographic flexibility
- Optimized performance

Use case

→ Relational database
→ Enterprise application
→ Development & test
→ NOSQL database
→ Business continuity.

Database

RDS (Relational database Service)

Relational database service is a web service that make it easier to set up, operate & scale a relational database in the cloud it provide a cost-efficient and resizable capacity while automating time consuming admenstration tasks such as hardware provisioning, database setup, patching and backups.
It free you to focus on your app'n so you can give them the fast performance, high availability security & compatibility they need.

Benefits of RDS
- Easy to administer
- High scalable
→ Available and durable
→ fast
→ Secure
→ Inexpensive

RDS database engines

→ Amazon aurora
→ postgreSQL
→ MySQL
→ MariaDB
→ ORACLE
→ Microsoft SQL server

What are NOSQL databases

Not only SQL

high operation speed
Scalability flexibility

Relation database

RDS already define structure

NOSQL store in free formal-

① document database (mongo db)
JSON

② key-value db ④ Graph/node database
③ wide column db

NoSQL database are purpose built for specific data models and have flexible schemas for building modern application.
NoSQL database are widely recognized for their ease of development, functionality and performance at scale.
They use a variety of data models include document
graph
key-value
in-memory
and search.

NoSQL db works as book record as usually as a JSON document

Use a NoSQL db
-> flexibility
-> Scalability
-> High performance
-> Highly functional

Serverless

What is Serverless

Serverless is the native architecture of the cloud that enable you to shift more of your operational responsibilities to AWS, increasing your agility & innovation

Serverless allow you to build and run application and services without thinking about servers

It eliminates infrastructure managed tasks as server or cluster provisioning, patching, operating, system maintenance and capality provisioning

- Compressing images

Serverless enable you to build modern application with encreased agulety and lower total cost of ownership. Building serverles appl^ mean that your developer can focus on ther core product instead of worrying about managing and operating servers or runtime, either on the cloud or on-premises. Ther reduced overhead leb developers reclaem time and energy that can be spent on developing great produce with scale d that are reliable

Benefits of serverless

-> No server management
-> flexible scaling
-> Pay for valve
-> Automated High availability

Capabilities of serverless

- Cloud logic layer
- Orchestration & state management
- Responsive data source
- Application modeling framework
- developer ecosystem
- Application & integrations Library
- Security & access control
- Reliability & performance
- Global Scale & reach

1. AWS Lambda which can act as the control plane & logic layer for all your event driven infrastructure resource & web API.

2. Co-ordinate & manage the state of each distributed component of your serverless