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Introduction To Cloud Computing.

* Define Cloud Computing with its Characteristic.

=> Cloud Computing refers to the delivery of various services over the internet.

Cloud Computing provides services ~~seh~~ such as storage, processing power, databases, software, networking etc.

Cloud Service can provides data center or servers in rent to access the business data

(Features)

=> Characteristic of Cloud Computing:

1 On-Demand Self-Services: User can automatically computing the resources according to its demand without human interaction with the service provider.

2 Broad Network Access: Services are available over the network and accessed by any thin or thick client platform.

3 Resource Pooling: The Services provider can serve the physical and virtual resource assigned and reassigned according to consumer demand.

4 Cost Efficiency: User or Consumer have to pay for only the services they use.

5 C

5 Scalability and Flexibility: Cloud Services can be Flexibiable to allowing businesses to adjust their resources.

6 Security: Cloud Services provides data encryption, identity management and access control for protect the data.

7 Rapid Elasticity: Consumer are capable to use services for unlimited or quantity of time.

8 Measured Services: Resource usage can be monitored, controlled and reported for both the provider and consumer.

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9 Reliability and Availability: Cloud provides high redundancy, ensuring continuous operation and rapid recovery in the case of failures.

* Roots of Cloud Computing:

=> This is a timeline of Cloud Computing:

(1) Mainframe Era (1950-70):

This was the time of Mainframe where big, giant and super-powerful machines are used.

Mainframe are very expensive and difficult to mange and handle, so, only big company can use.

The Mainframe era was include large central computer used by multiple user through terminals.

(2) Service Oriented Architecture (1990):

In 1990s, Service Oriented Architecture is a modular approach to build software.

SOA is design approach where applications are built as smaller, independent pieces called services.

This services are integreted and shared over a network and allow more modular application development.

(3) Grid Computing (1990-2000s):

Grid Computing involves combining many computers to work together on complex and large scale task.

Using this method, We can solve or performed complex task using multiple computer.

This approach accelerates processing and enhanses computational power by pooling resource from multiple locations.

(4) Application Service Providers (Late 1990s):

ASPs were early version of cloud services that provided application or services over the internet.

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User can access and use this application remotely, setting the stage for morden software.

This early concept that basically create basic building blocks for Software-as-a-Service (SaaS).

5 Cloud Computing:

* Explain Cloud Computing Services Model.

=> This are the Five Service Model of Cloud Computing.

(1) Software as a Service (SaaS):

SaaS delivers Software applications over the internet on a subscription basis.

Users access this application through web browser without needing to install.

=> Features:

1 Available from any device with an internet connection.

2 Service provider handles all updates, patches and security.

3 User have to pay only usage amount of software.

4 It allows the users to access the service and features on-demand.

=> Disadvantages:

1 Requires reliable internet access

2 User have to restricted to tailor whole software to specific needs.

3 Can be have data security in Risk.

=> Example: Google Workspace, Salesforce etc.

(2) Platform as a Service:

PaaS provides a platform allowing customers to develop, run and

manage applications without dealing with its underlying structure.

It also includes development tools, middleware and databases.

=> Features :

1 Integrated Development Environment and tools for coding, testing and deployment.

2 Pre-configured software for application hosting.

3 Managed database services for data handling and storage.

4 Reduces the cost of in-house hardware and software.

=> Disadvantages :

1 Application may be become dependent on specific platform.

2 Users have less control over the underlying infrastructure.

3 Can be have Security Problem in

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software infrastructure.

=> Example: Google App Engine, Microsoft Azsure App services etc.

(3) Infrastructure as a Service (IaaS):

IaaS offers virtualized computing resources over the internet.

IaaS offers virtual machines, storage and Network to handle the infrastructure.

=> Advantages:

1 Virtual Networking capabilities, including load balancers and Firewalls.

2 Virtualized storage systems for data.

3 Users can configure virtual machines and resources to meet specific needs.

4 Provides high control over the Operating system and application.

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=> Disadvantages:

1 Required technical expertise to manage system.

2 Users are responsible for that application and data.

3 Dependence on provider for service reliability and performance.

=> Example: Amazon Web Services, Google Cloud Compute Engine etc.

(4) Anything / Everything as a Service (Xaas):

- Xaas encompress wide range of services delivered over the internet not limited to Saas, Paas or Iaas.

It includes various service model such as a Database as a Service, Network as a Services etc.

=> Features:

1 Services can scale based on demand of user

2 Allows businesses to choose specific services tailored to their needs.

3 Access to the latest technologies.

4 Wide range of service are available.

=> Disadvantages:

1 Infrastructure can be complex and time-consuming.

2 Trusting different provider can be cause system security in risk.

3 Service Performance can be vary using multiple service.

=> Example: Amazon RDS (Database)
Amazon S3 (Storage).

(5) Function as a Service (FaaS):

FaaS allowing users to execute code in response to events without manging servers.

It enables developers to focus on writing code while service

provider manage the infrastructure.

=> Features:

1 Automatically scales to handle the number of events.

2 Eliminates the need to manage server.

3 Allows developer to writing their code

=> Disadvantages:

1 Functions have typically have time limits for execution.

2 Functions may rely on specific cloud provider service.

3 Debugging the Function is complex.

=> Example: AWS Lambda,
Google Cloud Function etc.

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* Define Cloud Computing Challenges:

=> This are the Challenges of Cloud Computing.

1 Security and Privacy:

Sensitive data stored in the cloud is vulnerable to breaches of data.

Unauthorized access by the employees of the services provider.

2 Legal Issues:

Ensuring that the data is stored within specific geographic locations to comply with local Laws.

3 Performance:

Delays in data transmission can affect performance of the system.

4 Downtime:

Service Outage can disrupt

businees operation, lead to Financial losses.

5 Data Loss:

Risk of data being accidentally deleted or corrupted.

6 Limited Flexibility:

Cloud provider can limit the ability to customize and optimize the cloud environment.

7 Dependence on a Single Provider:

Difficulty in migrating to another provider due to data formate of system.

8 Compatibility Issues:

Integrating the cloud services with existing on-premies systems can be complex.

9 Complex Pricing Model:

Due to the complex structure, it can be lead to high pricing model.

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10 Unexpected Cost:

Mismanaged resource or unexpected usage can lead to high cost.

* Define Cloud Computing Risk:

=) This are the Risk of use to cloud computing.

1 Data Security:

Unauthorized User or potential hacker can gain access to the System.

2 Encryption Risk:

Challenges in manging encryption keys during data transfer and store.

3 Service Outages:

Downtime due to maintenance, update or any issues can disrupt services.

4 Data Availability:

Ensuring data is always accessible when needed.

5 Legal Disputes:

Potential legal issues arising from data breaches or any security issues.

6 Backup Failures:

Risk of backup processes failing, leading to permenent data loss.

7 Recovery Challenges:

Difficulties in recovering data quickly and effectively after a loss.

8 Resource Contention:

Multiple user sharing the same resource can lead to performance degradation.

9 Service Termination:

Risk of the services being terminate or altered by service provider.

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* Layered Architecture of Cloud :

=> There are Four Layer in Cloud Computing Architecture

1) Application Layer
2) Platform Layer
3) Infrastructure Layer
4) Datacenter Layer.

1 DataCenter Layer :

This is the Foundational Layer that includes all the physical hardware.

It includes, Physical Hardware required to power the cloud infrastructure.

Components : CPU, Storage Disk, Memory, network Component.

This includes data center Filled with servers, storage system and networking hardware.

Ensures that all the hardware infrastructure is operational as needed.

Users (SaaS) / Software Developer (PaaS) / System Admin (IaaS)	Application Layer	Gmail, Facebook
	PlatForm Layer	PaaS Provider
	Infrastructure Layer	IaaS Provider
	Datacenter Layer	Data Center

2 Infrastructure as Service Layer:

Provides virtualized computing resources over the internet.

This includes virual machines, storage and networking capabilities.

Allows users to rent virtualized hardware resources, which they can configure and manage as needed.

Components : All the IaaS Provider.

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3 Platform Layer:

Provides a platform allowing customers to develop, run and manage applications without dealing with the infrastructure.

Offers a complete development and deployment environment in the cloud.

Also includes a tools for development, database management and business analytics.

Components : All the PaaS Provider.

4 Application Layer:

Delivers a Software applications over the internet on a subscription basis.

Provides access to software application that are hosted and managed by cloud service provider.

Users can access this application via web browser, without installing.

* Explain Types of Cloud or Cloud Computing Deployment Model.

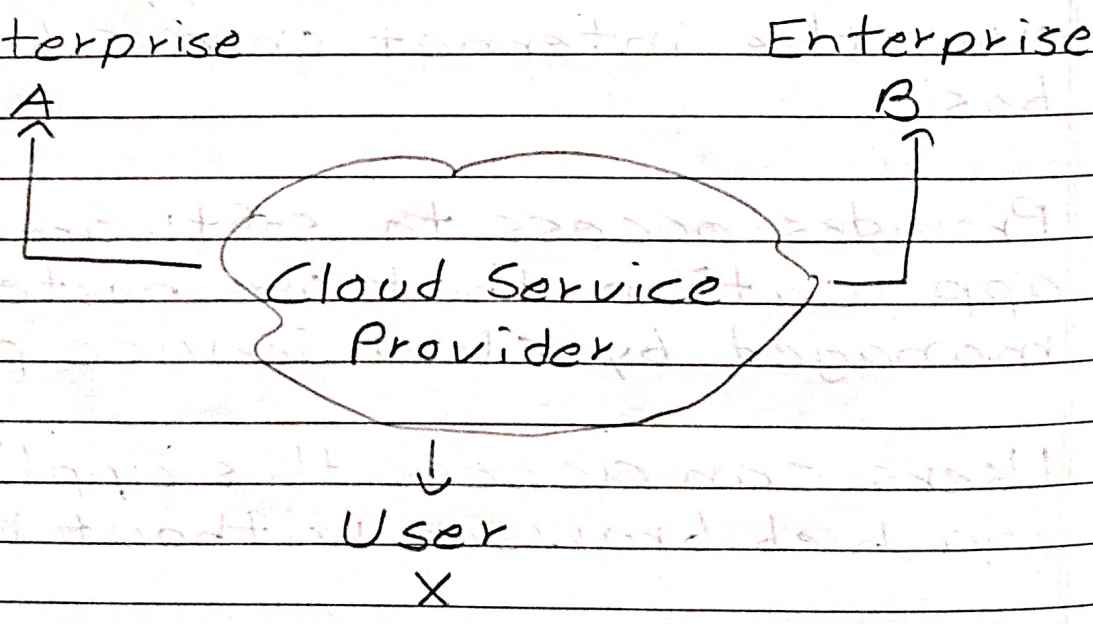
=> There are Main Four Types of Cloud.

1) Public Cloud
2) Private Cloud
3) Hybrid Cloud
4) Community Cloud

1 Public Cloud :

In Public Cloud, Services are offered over the internet by the third party providers.

This type of cloud allows customer and users to easily access systems and services.



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-> Features:

1 Scalability: Easily scale resources up or down based on demand.

2 Wide Accessibility: Services are accessible over the internet from anywhere.

3 Managed Services: Provider handle whole infrastructure management.

-> Disadvantages:

1 Limited Customization: Services are standardized and may not be customizable according user need.

2 Dependence on Provider: Reliance on the service provider availability performance and pricing.

3 Security Concerns: Data is stored off-premies, which may raise security concerns.

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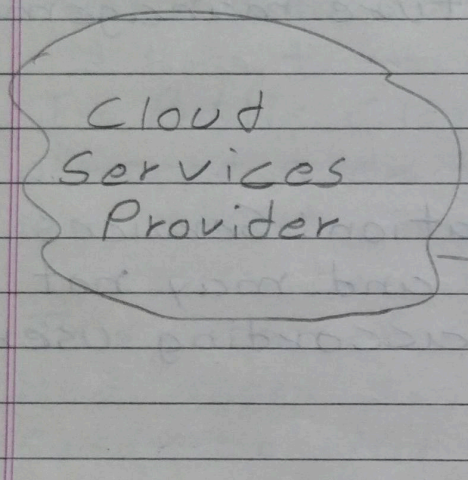
2 Private Cloud:

A Private cloud is a cloud computing environment dedicated to a single organization.

In Private Cloud, model, one-on-one environment for a single user, No need to share with anyone.



-> Features:

1 Enhanced Security: Resources are isolated and access is restricted to the organization.

2 Customization: Infrastructure and services can be tailroed to specific organization needs.

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3 Control : Organization have Greater control over resources.

-> Disadvantages :

1 Higher Cost : Required high operational setup for the maintenance.

2 Limited Scalability : Scaling resources can be more challenging compared to public clouds.

3 Management Overhead : Require in-house expertise for maintenance and management.

3 Hybrid Cloud :

Hybrid cloud is a Combination of Private and Public cloud.

Hybrid Cloud allows the data and applications to be shared between them.

This model offers the flexibility to run workload in the appropriate environment.

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-> Features:

1 Flexibility: Application workload can be move according to requirement.

2 Cost Optimization: Public cloud is cost-effective and Private cloud for sensitive data.

3 Resource Optimization: Optimize resource by using hybrid cloud.

-> Disadvantages:

1 Complexity: Handle Two types of cloud can be complex.

2 Security: Handle Two Types of cloud security can be challenge.

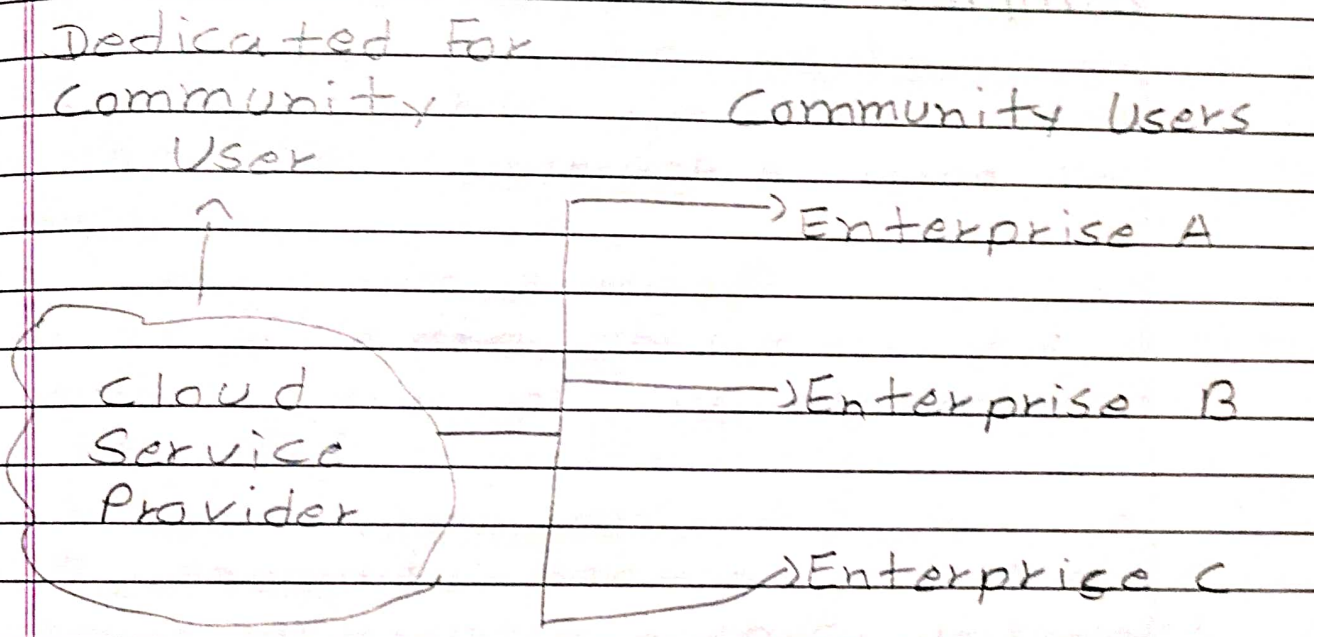
3 Cost Management: Handle two type of cloud cost can be difficult.

4 Community Cloud:

A Community Cloud is collabrative cloud infrastructure shared by

different organization to solve common concerns.

In Community Cloud, Multiple Cloud Provider are work for some common problem like security, performance etc.



-> Features:

1 Security : Enhance security measures

2 Shared Infrastructure

3 Collaboration.

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-> Disadvantages:

1 Limited Control over infrastructure

2 Complex Infrastructure

3 Scalability Issue because of the complex infrastructure.