INTRODUCTION TO CLOUD COMPUTING

DEDICATED SERVER

- Dedicated server is physical server (single server) having its own network port, hard disks, RAM, CPU, network card, etc, …and it is not shared by any other server
- It is entirely dedicated to you (single client use) and you have only running your resources on it
- Dedicated hosting is the best choice for privacy
- It is more expensive than the cloud servers.

Usage

- This is the traditional, reliable and highly recommended way of hosting web sites, web apps or anything else

EXISTING PROBLEMS (PROBLEMS OF DEDICATED SERVER)

- Single point of failure
  - System crashes, power failure, etc,.
- Less security
- Limited storage support
- Overhead of handling multiple requests from client (user)

POINTS

- Cloud servers and dedicated servers are two popular web hosting platforms.

# DIFFERENCE BETWEEN DEDICATED SERVER vs CLOUD SERVER

1. Availability

- Cloud provides fault tolerance system with help of multiple nodes (instances)
- In case, **if any node fails**, then monitoring nodes will take care of the **workload of failed nodes** automatically
- Full availability is not possible in dedicated servers. Because they don't have multiple nodes.

Dedicated Server

Cloud Servers
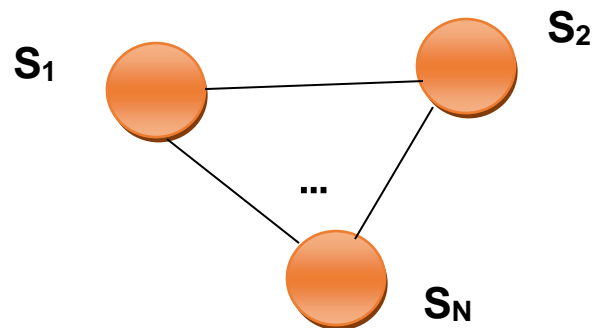
S_1, S_2, … S_n → number of servers in cloud.

2. Scalability of resources

- It is very easy and simple to maintain the allotted resources in cloud
- Increase or decrease of allotted resources such as Computing cores, RAM, storage as per workloads
- Dedicated server is its own collection of hardware. Hence it is a bit difficult and time consuming task.

3. Backup and security

- Cloud provides backup of data with help of data replications
- Cloud provides data safety through secure and encrypted solutions
- Maintaining backup and security is difficult in dedicated servers.

Data Replication

- Posting or storing the same data (information) to multiple servers in cloud

- Main aim is to provide full availability of data.
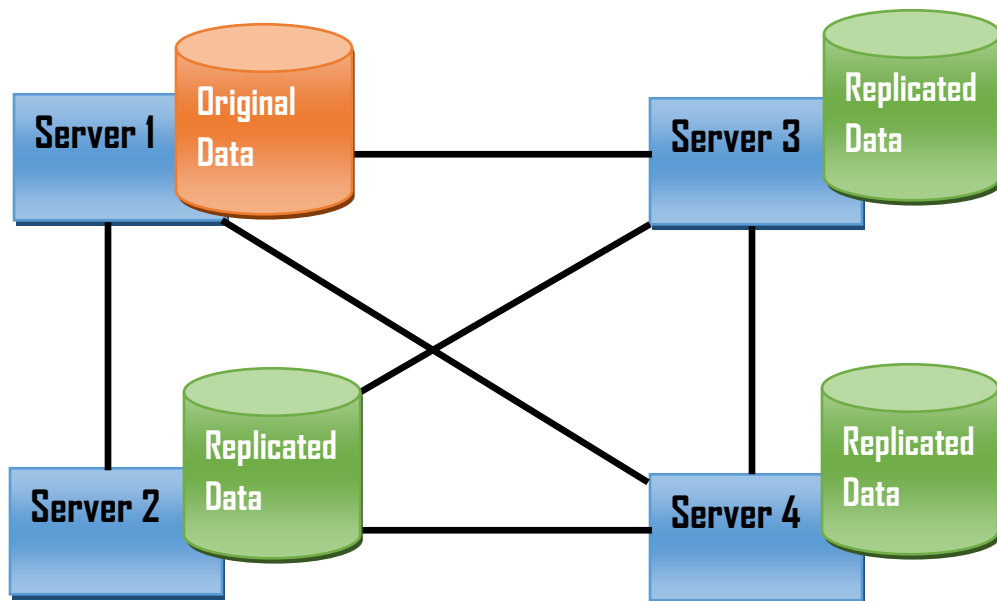
4. Data storage

- Cloud provides huge amount of data storage (PB of data)

- Dedicated server provides only limited storage support (GB of data)

5. Level of control

- In cloud servers, one does not have complete control and is limited to offerings provided by the cloud service providers (e.g. Microsoft, Amazon, etc, …) (we have limited control as per the plans provided by cloud service provider)

- In cloud servers, the complete control is maintained by cloud service providers (CSP)

- In dedicated server, one has full control to add applications, programs and performance enhancing measures to its machine

CLOUD SERVICE PROVIDERS

- Cloud providers are 3rd party companies that offer cloud computing services such as PaaS, SaaS, IaaS to individuals or other business through private cloud or public cloud.
- It is also called as cloud providers or CSPs
- **Ex.** Amazon, Microsoft, Adobe Systems, Oracle corporations, SAP, Salesforce.com, Rackspace, Google, etc, …

Objectives of Cloud Computing

- To increase the backup of data
- Full availability
- On-demand-service
- Pay per use
- To reduce the overhead of multiple requests from client
- To increase the security of data.

CLOUD COMPUTING (INTERNET COMPUTING)

- It stands for CLOUD → **C**ommon **L**ocation-Independent **O**nline **U**tility that is available on **D**emand.

- The term cloud refers to a network or internet (Next generation internet computing)

- It is computing based on the internet (Delivery of computing service over the internet)

- The main advantage of the internet computing is used to deliver the resources (virtual machines, servers, storage, etc) to the cloud customer at the right time.

- Cloud can provide services over the network (i.e., on public network or on private networks., WAN, LAN or VPN)
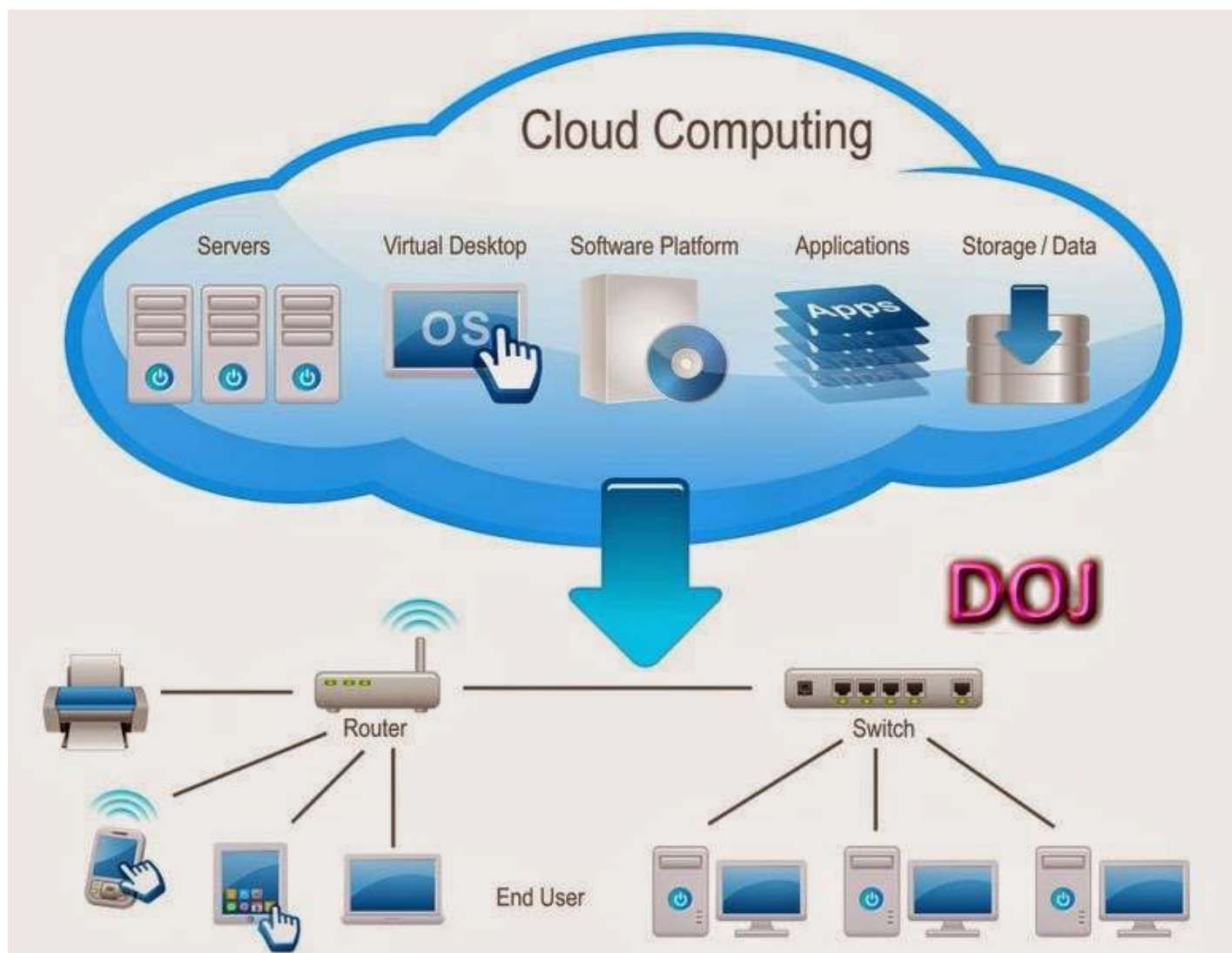
CLOUD

- It means storing and accessing data and programs over the internet, instead of user computer's hard drive
- It provides a solution of IT infrastructure in low cost

CLOUD STORAGE SYSTEM (ONLINE STORAGE SYSTEM)

- An online storage system enables the end-user (client) to store the large amount of data at the remote server over the internet.
- Once a client posts the data to server, then that user can access the data at any time, at anywhere, through the internet.
- It offers online data storage, infrastructure and applications
- Cloud computing is both a combination of software and hardware based computing resources delivered as a network service
- Examples of Cloud Storage
  - Web e-mail providers such as G-mail, Yahoo, etc, …
  - Online Drives like Box, Gdrive, Dropbox, SkyDrive, etc, …

POPULARITY OF CLOUD SERVICE

- Reduce the complexity of networks
- No need to buy software licenses
- Scalability, reliability and efficiency
- Data / Information at cloud are not easily lost
- Customization

NEED / IMPORTANCE OF CLOUD COMPUTING

- To store the huge amount of data (Petabytes of data) which normally is not possible with single PC
- To increase the availability of data
- To provide a secure access to an application and data which is away from a networked device
- To provide a reliable access to handle the personal data to their customers while servicing

APPLICATION EXAMPLES

- Social networking sites
  - Ex. Facebook, Twitter, Linkedin, etc, …
- E-mail sites
  - Ex. Gmail, Yahoo Mail, Yandex Mail, etc, ...
- Search engines
  - Ex. Google, Bing, Yahoo, etc, …
- Personal cloud storage (Public cloud)
  - Ex. Dropbox, Gdrive, Box, Skydrive, etc, ...
- Business cloud storage (Public Cloud)
  - Ex. Microsoft, Amazon, Google, etc, ...

BENEFITS OF CLOUD COMPUTING

- Increased storage capacity (Unlimited data capacity)
- Increase data reliability
- Backup and recovery
- Improved performance
- Pay just for service
- Access all over the world
- Resources are shared
- Performance and scalability
- Fewer Maintenance issues
- Instant software updates
- Better security
- Fast implementation
- Device Independence.

DISADVANTAGES OF CLOUD COMPUTING

- It needs a constant internet connection
- It can be slow
- It does not work well with low-speed connections
- Stored data can be lost
- Stored data might not be secure.

CLOUD COMPONENTS

- It has three components namely 1. client 2. data centers 3. distributed servers

Internet

Clients

Data Center

Distributed
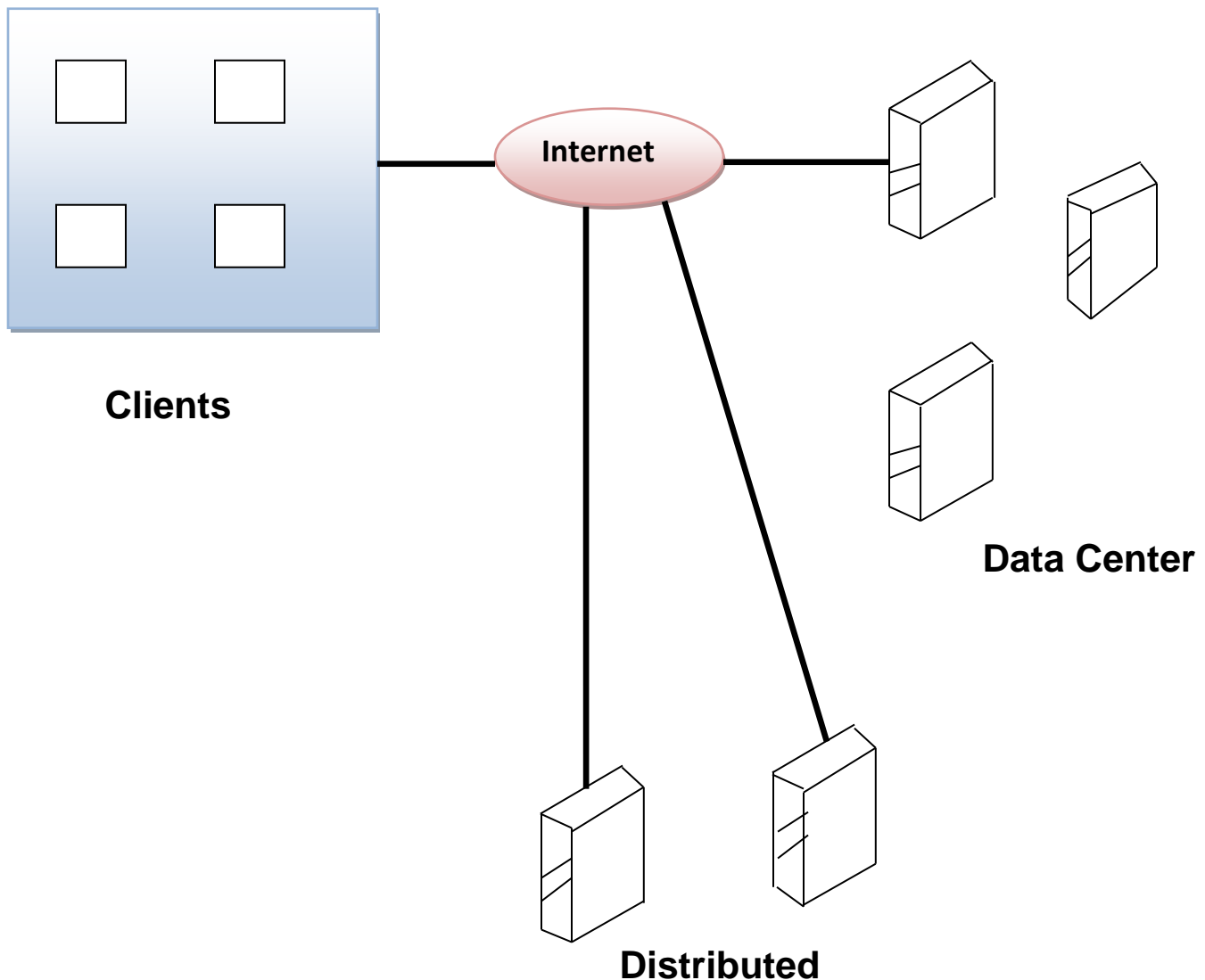
Clients

- Clients are the devices that the end user(s) interact with cloud
- Three types of client users
    - Mobile
    - Thick (Web GUI based application)
    - Thin (Window GUI based application)

DATA CENTERS

- It is collection of servers where data and applications are placed and accessed via internet
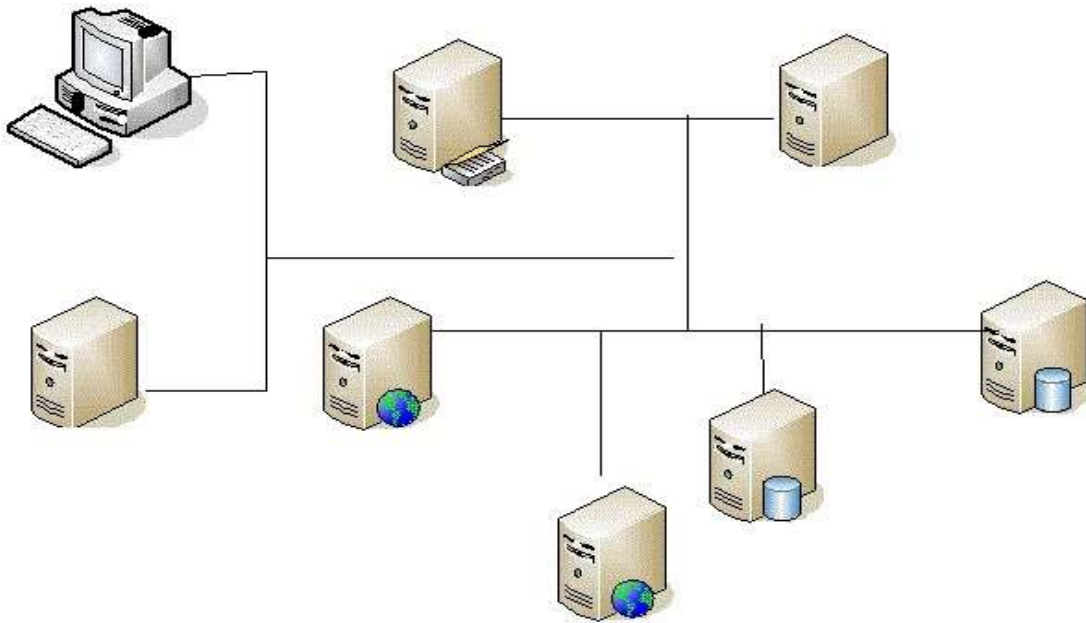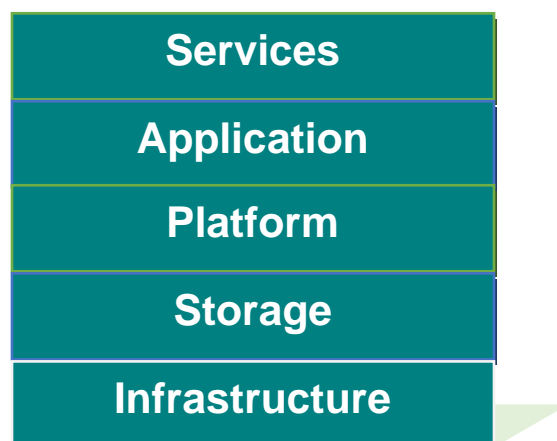- All servers are placed in same location

Screenshots

DISTRIBUTED SERVERS

- Here all the servers are not housed in same location. Because all servers are placed in geographical locations
- Often servers are in geographically different places, but server acts as if they are working next to each other
- Provides fault tolerance system.

Screenshots

OTHER COMPONENTS

(i) Services

- We can store and retrieve data (information) in cloud
- It includes products, services and solutions that are delivered and consumed in real time over the internet

(ii) Applications

- Developing software applications using cloud OS (cloud platform)
- Window / Web applications

(iii) Storage

- Delivery of data storage as a service
- Example.
  - Database (Amazon Simple DB)
  - Web Service (Amazon Simple Storage Service -S3)

(iv) Platform

- Provides the environment for developing applications in cloud

(v) Infrastructure

- Renting hardware resources as services to cloud customers

CLOUD DEVELOPMENT ENVIRONMENTS

- There are number of automated approaches are available for developing cloud applications
- They are:
  1. Business Cloud (Public Cloud)
     - Windows Azure Cloud OS
     - Amazon AWS Cloud
     - Google App Engine
  2. Personal Cloud (Public Cloud)
     - Dropbox Cloud
     - Gdrive Cloud.

BUSINESS CLOUD DEVELOPMENT ENVIRONMENTS

(a) Windows Azure Cloud OS

Supported Languages	:	C#.NET, ASP.NET
IDE	:	Visual Studio IDE
License	:	Closed Source

(b) Google App Engine

Supported Languages	:	Java, Python
IDE	:	Eclipse, Netbeans, etc
License	:	Open Source

(c) Amazon Cloud

Supported Languages	:	Java, C#
IDE	:	Eclipse, Netbeans, Visual Studio etc, …
License	:	Closed Source
Services	:	Amazon S3, Amazon SimpleDB, EC2, etc,…

PERSONAL CLOUD DEVELOPMENT ENVIRONMENTS

(a) Dropbox Cloud

Supported Languages	:	Java, .NET, Python, Java Script, Swift, Objective-C
IDE	:	Netbeans, Visual Studio, XCode, etc, …
License	:	Free + License

(b) Gdrive Cloud

Supported Languages	:	Java, Python, PHP, .NET, Ruby, Node.js, Objective-C
IDE	:	Eclipse, Netbeans, etc
License	:	Free + License.