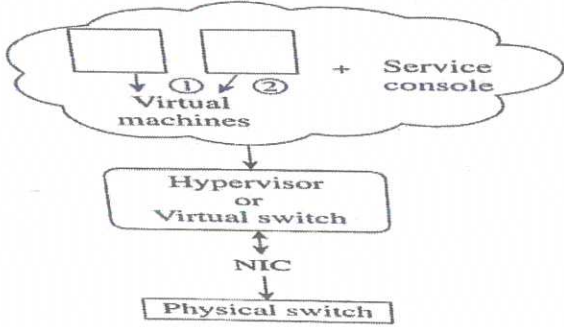
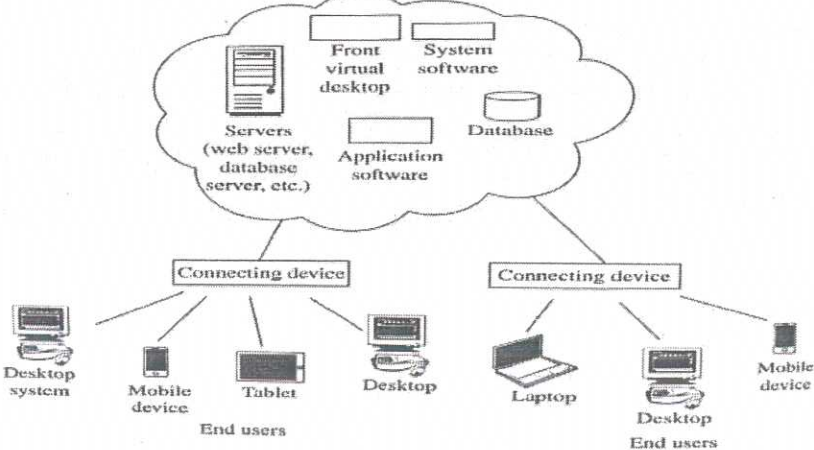
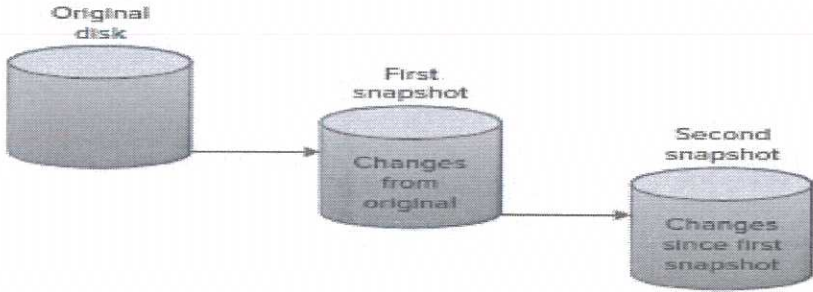




|             |  |             |   |  |
|-------------|--|-------------|---|--|
| <p>II.2</p> | <p>A VM provides an isolated environment for running its own OS and applications, independent from the underlying <u>host</u> system or other VMs on that host. A VM's OS, commonly referred to as the <u>guest OS</u>, can be the same as or different from the <u>host OS</u> and the OSes of other VMs on the host.</p> <p>A single computer can host multiple VMs running different OSes and applications without affecting or interfering with each other. Although the VM is still dependent on the host's physical resources, those resources are <u>virtualized</u> and distributed across the VMs and can be reassigned as necessary.</p> |             | 3 |  |
| <p>II.3</p> | <p>Virtual switch is like a logical switching built into VMware so that a virtual machine network can be managed as per the requirement. Virtual switches act as an interface between virtual ethernet and the physical ethernet</p>  <p>FIG. 7.2 Virtual switch</p>   | 1<br><br>2  | 3 |  |
| <p>II.4</p> | <ol style="list-style-type: none"> <li>1. Improved workload management</li> <li>2. Reduced hardware cost</li> <li>3. Increased flexibility for working remotely</li> <li>4. Simplified application deployment:</li> <li>5. Simplified operating system image management</li> <li>6. Elimination of resource conflicts:</li> </ol>  | 1 mark each | 3 |  |
| <p>II.5</p> | <p>A template is a mold, a pre configured ,pre loaded virtual machine that is used to stamp out copies of a commonly used server.</p>  | 3           | 3 |  |
| <p>II.6</p> |  <p>Fig. 3.1 Cloud architecture</p>  | 3           | 3 |  |

| II.7                        | <p>A change in technology in WWW.</p> <p>It is designed to increase data security and customization of application. Web-based service hosting, social networking, sharing videos, etc., are important provisions provided by Web 2.0.</p> <p>The important features of Web 2.0 are as follows:</p> <ul style="list-style-type: none"> <li>☐ Easy to access</li> <li>☐ User interaction and participation</li> <li>☐ Rich customization features</li> <li>☐ Easy communication through video chatting, instant messaging facilities, etc.</li> <li>☐ User-friendly writing tools and applications</li> <li>☐ Data management and analysis</li> <li>☐ Multimedia supporting tools</li> <li>☐ Web application and hosting</li> </ul> | 3                 | 3                 |                             |                          |  |   |  |
|-----------------------------|---|-------------------|-------------------|-----------------------------|--------------------------|--|---|--|
| II.8                        | <p><b>Accessibility:</b> It is the major responsibility of every central origin that data is accessible to users.</p> <p><b>Functioning :</b>Optimal service and functioning should be offered by the data center.</p> <p><b>Supple:</b> High-priority business needs should be satisfied without any disruption of accessibility and with the least charge.</p> <p><b>Safety:</b> Data must be protected from illegal and malevolent users.</p> <p><b>Manageability:</b> Reduced IT expenses on the data center and increase the consumption of prevailing resources.</p>  | 3                 | 3                 |                             |                          |  |   |  |
| II.9                        | <ul style="list-style-type: none"> <li>● It improves parallelism and allocation of resources</li> <li>● get software renewals (with no charge)</li> <li>● improves monetary burden</li> <li>● Pay as per use:</li> <li>● Reduced investment and proportional costs :</li> <li>● Accessibility from anywhere:</li> <li>● Increased scalability:</li> <li>● Increased availability and reliability:</li> <li>● Dynamic provisioning</li> </ul>  | Any six           | 3                 |                             |                          |  |   |  |
| II.10                       | <p>Backup is a replica of the manufactured data, generated and maintained for the only intention of improving corrupted or deleted data.</p> <p>Backups are carried out for three key reasons-documentation, operational restores, and disaster recovery.</p> <p>Full backup is a backup of the total data on the manufactured amounts at a point in time and is generated by replication of the data on the manufacture amounts to a second storage tool.</p> <p>Cumulative backup</p> <p>Synthetic full backup</p>  | 3                 | 3                 |                             |                          |  |   |  |
| <b>PART C</b>               |   |                   |                   | 42                          |                          |  |   |  |
| III.1                       | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th data-bbox="331 1928 730 2007" style="text-align: center;">Type 1 Hypervisor</th> <th data-bbox="735 1928 1129 2007" style="text-align: center;">Type 2 Hypervisor</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 2013 730 2040" style="text-align: center;">Runs directly on a physical</td> <td data-bbox="735 2013 1129 2040" style="text-align: center;">Runs on top of a host OS</td> </tr> </tbody> </table>  | Type 1 Hypervisor | Type 2 Hypervisor | Runs directly on a physical | Runs on top of a host OS |  | 7 |  |
| Type 1 Hypervisor           | Type 2 Hypervisor   |                   |                   |                             |                          |  |   |  |
| Runs directly on a physical | Runs on top of a host OS  |                   |                   |                             |                          |  |   |  |

|       |  |  |             |   |  |
|-------|--|--|-------------|---|--|
|       | <p>host</p> <p>That's why it's also known as a bare metal hypervisor.</p> <p>Type 1 hypervisor has direct access to the underlying physical host's resources— e.g., CPU, RAM, storage, and network interface.</p> <p>Enterprise data centres and cloud service providers use Type 1 hypervisors</p> <p>Eg: VMware vSphere, VMWare ESXi, Microsoft Hyper-V, Oracle VM Server, Citrix Hypervisor.</p>  | <p>It's also known as a hosted hypervisor.</p> <p>When a Type 2 hypervisor needs to communicate with the underlying hardware or access hardware resources, it must go through the host OS first.</p> <p>They're more common among end users. ie they are used in personal computers</p> <p>Eg: VMware Workstation, VMware Fusion, Oracle VirtualBox, Oracle Solaris Zones.</p> |             |   |  |
| III.2 | <ul style="list-style-type: none"> <li>● Sharing of resources helps cost reduction</li> <li>● Isolation: Virtual machines are isolated from each other as if they are physically separated</li> <li>● Encapsulation: Virtual machines encapsulate a complete computing environment</li> <li>● Hardware Independence: Virtual machines run independently of underlying hardware</li> <li>● Portability: Virtual machines can be migrated between different hosts.</li> <li>● Saves the power and cooling requirements</li> <li>● Saves money on hardware and electricity</li> <li>● Saves money on floor space.</li> <li>● Saves company's hardware maintenance and management costs .</li> <li>● saves the time system administrators took to perform many other routine tasks.</li> </ul> |  | Any seven   | 7 |  |
| III.3 | <p><b>Types of Virtualization</b></p> <ul style="list-style-type: none"> <li>. Application Virtualization</li> <li>. Network Virtualization</li> <li>. Desktop Virtualization</li> <li>. Storage Virtualization</li> <li>. Server Virtualization</li> <li>. Data virtualization</li> </ul>   |  |             | 7 |  |
| III.4 | <p>Two Softwares</p> <p>Its Diagram</p> <p>Explanation</p>   |  | 1<br>4<br>2 | 7 |  |

|       |   |     |   |  |
|-------|---|-----|---|--|
| III.5 | <p><b>VM Clone</b></p> <p>A VM clone is a copy of a virtual machine. The existing virtual machine is known as the parent, while the new VM is called the clone. After the cloning operation, the clone VM runs as a separate virtual machine.</p> <p>The new virtual machine is configured with the same virtual hardware, installed software, and other properties that were configured for the original virtual machine.</p> <p>VM cloning is most useful for deploying multiple identical virtual machines to a group of users.</p> <ul style="list-style-type: none"> <li>• Changes made to a clone do not affect the parent virtual machine.</li> <li>• Changes made to the parent virtual machine do not appear in a clone.</li> </ul> <p><b>There are two types of VM clones:</b></p> <ul style="list-style-type: none"> <li>● full clones : A full clone is a completely separate copy of a VM that shares no system resources with the parent once it's running</li> <li>● linked clones.. A linked clone continues to share virtual disks with the parent after it's created.</li> </ul> <p><b>Snapshot</b></p> <p><i>Snapshots</i> are like, a capturing of a VM's state at a particular point in time. They provide a stake in the ground that you can easily return to in the event that some change made to the VM caused a problem you'd like to undo.</p> <p>Figure below is a basic illustration of how snapshots work.</p>  <p>A virtual machine snapshot (VM snapshot) is the state of a virtual machine (VM) that is copied and stored at a specified time. It develops a copy of the VM that is used for VM migration, backup and restore procedures. A virtual machine snapshot allows a VM to be restored to a former state of snapshot creation</p> | 3.5 | 7 |  |
| III.6 | <p>The two desktop virtualization techniques basically used for providing services to users are as follows:</p> <ul style="list-style-type: none"> <li>• Remote desktop services (RDS)</li> </ul>   | 3.5 | 7 |  |

• Virtual desktop infrastructure (VDI)

Remote Desktop Services

Remote desktop services (RDS) are an important feature of Microsoft Windows Server which permits users to remotely access Windows applications and graphical desktops. The various technologies which are a part of remote desktop services are as follows:

1. Remote application, launched with Windows Server 2008, permits the user to access personal applications on a shared server. This is occasionally termed as "application publishing" or 'seamless windows'
2. Remote desktop virtualization host, launched with Windows Server 2008 R2, permits users to dynamically link up to a virtual desktop allocated from a pool or an individual virtual desktop.

In remote desktop services, desktops or applications may be accessed from a range of customer's tools, operating systems along with Java clients, and HTML 5 browsers.

**Virtual desktop infrastructure (VDI)**

3.5

Virtual desktop infrastructure (VDI) refers to the hosting of a desktop OS running in a VM on a server in the virtual data center (VDC).

A user has full access to the resources of the virtualized desktop.

The server-hosted desktop virtualization solution approach is sometimes called virtual desktop environment (VDE).

VDI allows a user to access a remote desktop environment from an endpoint device via a remote desktop delivery protocol.

The hosted remote OS and associated applications are shown on the user's endpoint device display and controlled via the endpoint device's keyboard and mouse.

For the user, the experience is very similar to using the remote desktop services (RDS) solution, except that the desktop OS is running in a VM hosted on a server, instead of on a remote user session on a single server OS.

The main components are endpoint devices, a connection broker, and VM hosting servers.

|              |   |          |          |  |
|--------------|---|----------|----------|--|
| <p>III.7</p> | <p><b><u>High performance computing</u></b></p> <p>The evolution of high performance computers and the internet has resulted in the development of several kinds of cloud computing applications.</p> <p><b><u>Utility and Enterprise Grid computing</u></b></p> <p>It is a distributed and parallel system, that helps to utilize geographically spread resources.<br/> A business net can provide a virtual or traditional environment, to utilize resources at various sites .<br/> Various cloud users request for services provided by the cloud service provider.<br/> A monitoring system monitors the cloud users activities.<br/> Database log is kept to keep track of activities in the network.<br/> User has to pay for the services provided.</p> <p><b><u>Autonomic computing</u></b></p> <p>It has self managing capability , no need of external intervention<br/> Works without human intervention<br/> On failure, computing does not stop, but automatically migrates to another computer in the network.<br/> The aim of autonomic computing is to offer computing systems with self optimizing, self diagnosis and self healing ability.</p> <p><b><u>Service consolidation</u></b></p> <p>Service consolidation means the services by various providers are consolidated and then shared over a network. (merging of multiple resources into one)<br/> Virtualization technique helps in offering the services from different service providers.</p> <p><b><u>Horizontal scaling</u></b></p> <p>Horizontal scaling means scaling by adding more machines to your pool of resources<br/> vertical scaling refers to scaling by adding more power (e.g. CPU, RAM) to an existing machine. (keeps the same number of resources constant but gives them more capacity in terms of memory, CPU speed, disk space, and network.)<br/> Some database scaling techniques are</p> <p>Caching- to reduce memory response time<br/> Table level partitioning- to handle databases efficiently<br/> Sharding- separating datasets into smaller components , across various physical server</p> <p><b><u>Web services</u></b></p> | <p>7</p> | <p>7</p> |  |
|--------------|---|----------|----------|--|

It is defined by the world wide web consortium as a software system designed to support inter operable machine –to-machine interactions over a network.

SOAP (Simple Object Access Protocol)-is a protocol for accessing web services

SOAP is an XML based protocol with three sections

It defines a frame work for the message and how it is processed, set of encoding rules etc, interfaces etc

**High scalability architecture**

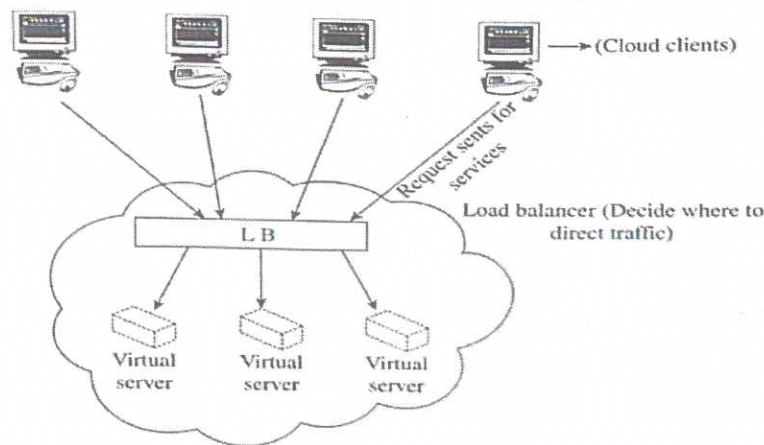
Due to high scalability cloud can support augmented loads

Cloud platform must be constructed with greater scalability to facilitate augmentation capability.

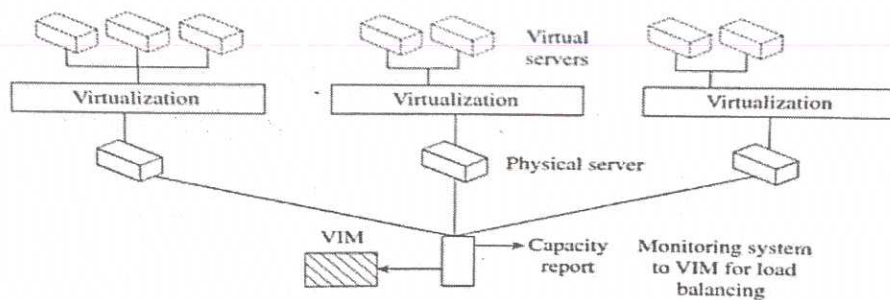
III.8 Load balancing: distribute load( no of requests, number of users etc) across different servers, networks, hard drives etc  
For proper load balancing, a load balancer mechanism is there

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(a)



(b)

Fig. 3.2 (a) Load balancing management (b) Monitoring system for load balancing

figure(5)

The distribution function includes

- High power resource to handle workloads that require more processing power
- Service based on priority
- Directing traffic to a particular resource according to requirement of the user.

Load balancer can

- Optimize resource utilization
- Improve throughput

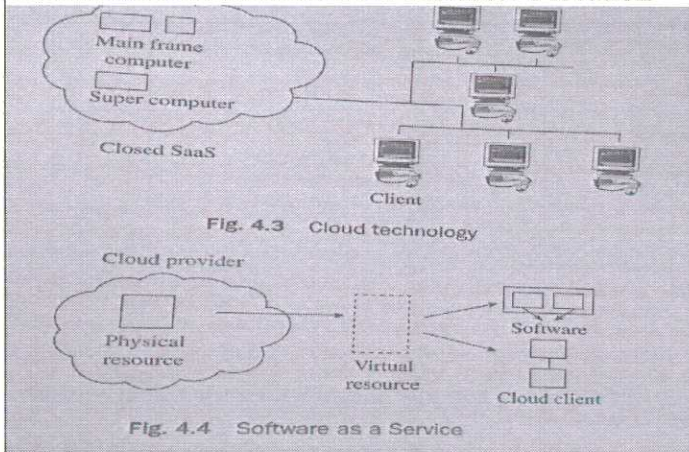
- Maintain quality of service

Load balancer can be hardware or software, it is invisible to cloud user  
 If a cloud user requests for a server, the load balance acts as a resource allocator.  
 Resource is replicated by Virtual Infrastructure Manger (VIM) to generate new Virtual resources  
 VIM gets reports from capacity monitoring system

III.9 There are 3 cloud computing service models  
 Saas

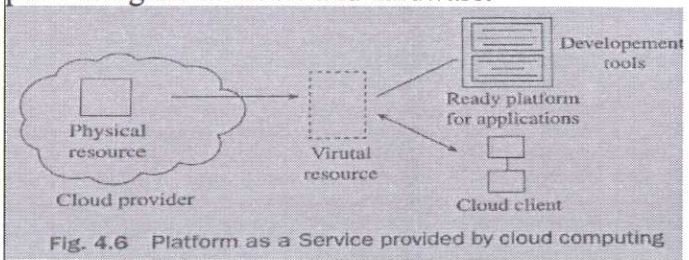
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Applications are hosted by a cloud vendor(supplier)  
 This is available to the customers through the Internet  
 The software is accessed at the customer's location



Paas

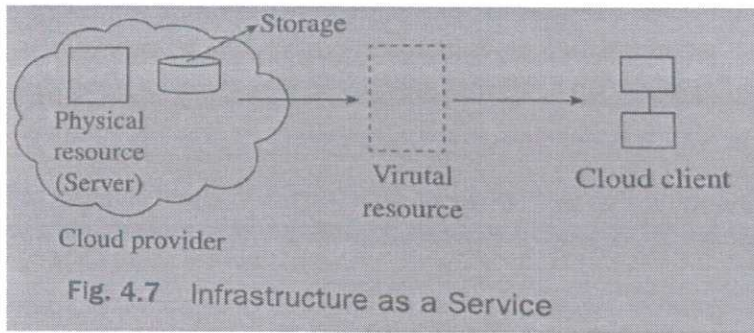
Platform in computer software means  
 Hardware architecture, OS, runtime libraries,  
 All together it is the stage on which computer programs can be run  
 PaaS gives all facilities needed for building and delivering a web application  
 Cloud suppliers provide database, OS, web server and programming language. The application designers can build their application without purchasing the software and hardware.



IaaS

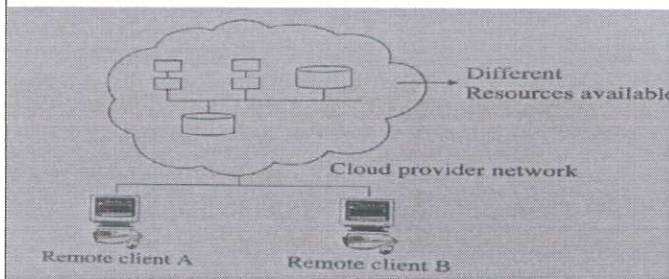
It is the delivery of computer infra structure as a service  
 Cloud supplier provides computers as physical or virtual machines  
 Virtual machines are operated by hypervisor (Xen, Vmware)  
 Other IaaS resources are  
 Image sin Virtual machine image history, blocks of storage, software

collections, firewalls, IP addresses, VLANs  
 Cloud user deploy OS images on their application software and machine  
 Cloud supplier prepare bill based on usage only.



**III.11 Private cloud:**

cloud infrastructure is provided exclusively for a single organization with multiple consumers.  
 Owned , operated and managed by the organization or third party or combination  
 It may exist on /off premises

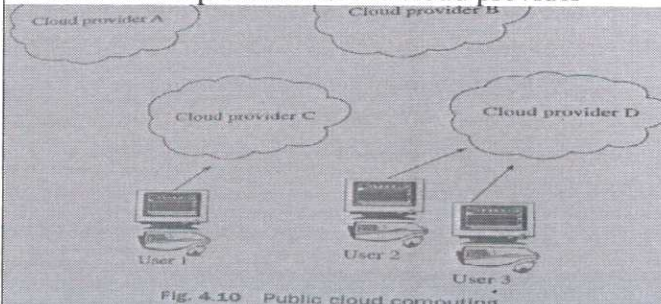


**Community cloud**

Cloud infrastructure is provided for exclusive use by specific community of consumers within an organization( with similar mission, policy, security requirements, )  
 Owned managed and operated by one or more organizations in the community  
 It may exist on /off premises

**Public cloud**

This is for open use by general public  
 May be owned, managed, operated by business academic or government organization or a combination of them.  
 It exists on the premises of the cloud provider

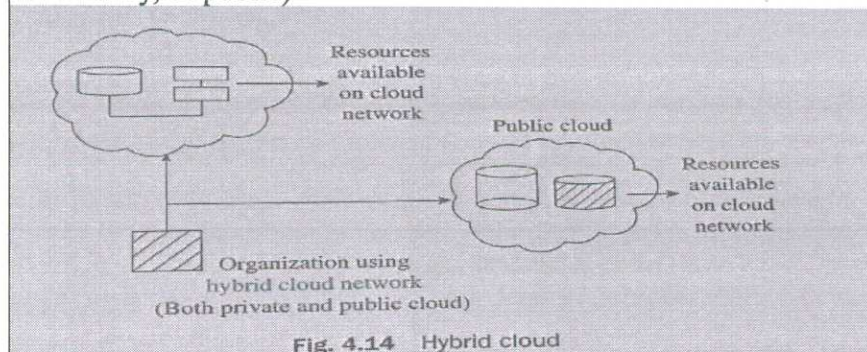


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### Hybrid cloud

Composition of 2 or more distinct cloud infrastructure (private, community, or public)



III.10 The Backup Server commences the back up procedure for distinct customers according to the back up program organized for them. The backup server synchronizes the backup procedure with all the constituents in a backup arrangement. The backup server sustains the information regarding the backup consumers to be dealt with and the storage joints to be employed in a backup function. The backup server recovers the backup-concerned information from the backup list and, on the basis of this information initiates a suitable storage joint to put in the backup media into the backup tools.

Concurrently, it initiates the backup consumers to transmit their metadata to the backup server to back up the data to a suitable storage joint. On getting this demand, the backup consumer transmits trailing information to the backup server. The backup server inscribes this metadata on its backup list.

The backup consumer transmits the data to the storage joint, and the storage joint inscribes the data the storage tool. The storage joint transmits trailing information to the backup server as well in order maintain it updated regarding the media being employed in the backup procedure. A reinstate procedu is manually commenced by the backup consumer. Upon getting a restore demand, the user unlock the reinstate application in order to analyse the consumer's record which has been backed up. Whils choosing the consumer for which a reinstate demand has been made, the user also requires recognizing the consumer who will obtain the reinstated data. Data may be reinstated on a similar consumer or another consumer, given the appropriate consents, and then the user chooses the data which is to be reinstated.

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III.12 The procedure of generating an accurate/similar replica of data is known as replication. The accurate copy of data that is generated is known as replica. Such replicas may be used for revival and resurrect functions in the occurrence of data loss. The main aim of replication is to allow users to have the chosen data at the correct place, in a condition suitable to the needs of revival. This permits reviving industry functions by using the replicas. Replicas may be used to address a number of business

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permanence per- formances, such as those given here:

1. Offering an alternating source for backup to enhance the effect on construction
2. Offering a source for rapid revival
3. Facilitating judgment support actions, like reporting
4. Mounting and analysing projected modification to an application or an operating situation
4. Reviving an application from the copy in the occurrence of a malfunction in the source level

#### Key Factors to Consider with Replicas

Replicas may be continuous or point-in-time (PIT). Continuous replica: The data on the replica is matched with the manufacture data during the entire period.

PIT: The data on the replica is a copied picture of the manufacture at a certain timestamp.

Local replication is the procedure of replicating data inside a similar range or similar data center. Local replication technologies may be categorized on the basis of the site where the replica- tion is carried out.

Compute-based; Replication is carried out using the resources of the CPU of the computer system through software which is working on the compute system. Compute-based regional replication may be more classified as file system snapshot and logical volume management (LVM)- mirroring.

Storage array-based: Replication is carried out on the storage range by using the resources of the CPU of the range via the operating environment of range.

Storage group-based regional replication may be classified follows:

- Pointer-based virtual replication
- Pointer-based complete degree replication
- Complete degree mirroring