

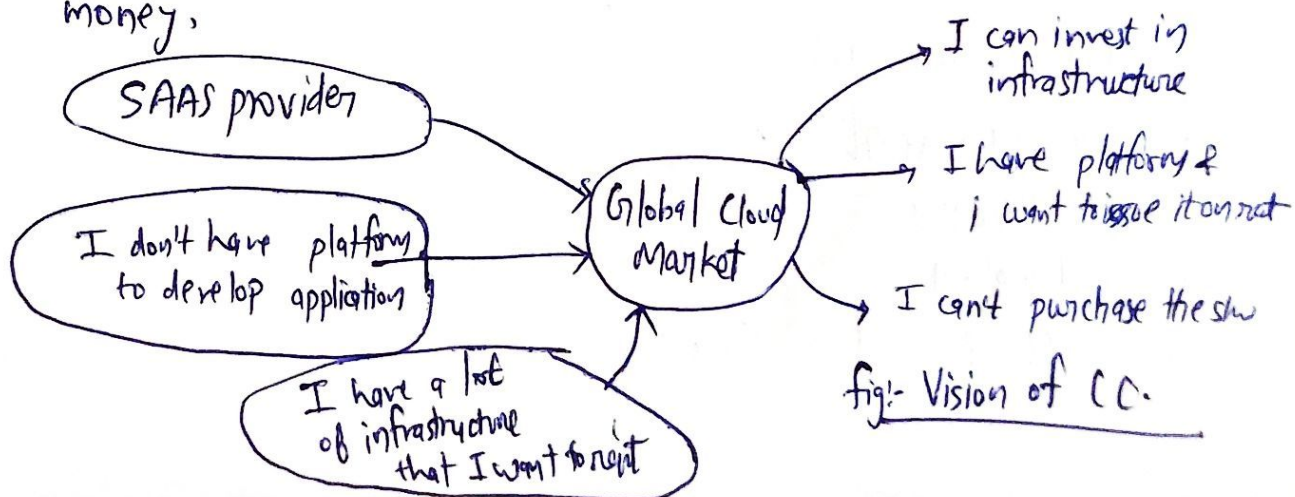
Q-2 (1) Google App Engine :- GAE is a platform as a service (PaaS) cloud computing platform for developing & hosting web applications in google managed data centers. Applications are sandboxed and run across multiple servers. App Engine offers automatic scaling for web-applications - as the no. of requests increases for an application. App Engine automatically allocates more resources for the web application to handle additional demand.

GAE is free up to certain level of consumed resources. Fees are charged for additional storage, bandwidth or instance hours required by application.

(2) Enabling Technologies:-

- Broadband networks and internet architecture
- Data center technology
- Virtualization technology
- Web technology
- Multi tenant technology

(3) Vision:- CC provides the facility to provision virtual h/w runtime environment and services to a person having money.



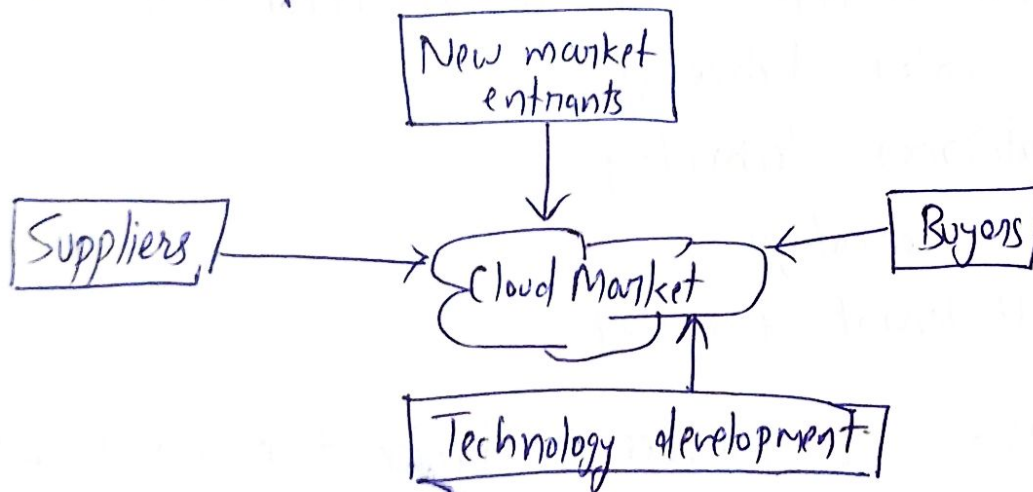
## dy - Evaluating the Cloud's Business ~~and~~ Impact & Economics:-

Large companies are saving costs, reducing staff and improving system scalability by moving from on-site data centers to the cloud. ④

Small companies are leveraging pay-on-demand models to "right size" their computing needs quickly & cost efficiently.

### Learning Objectives →

- Discuss total cost of ~~own~~ ownership for an IT solution.
- Compare & contrast the capital expenses.
- Describe supply side savings made available through large-scale.
- Describe & discuss efficiencies gained to providers.
- Describe the "right sizing" process.
- Identify primary costs of data centers.



→ Some main sectors of business which all benefited by CC such as:

- Government
- Healthcare
- Education
- Small & medium Enterprises



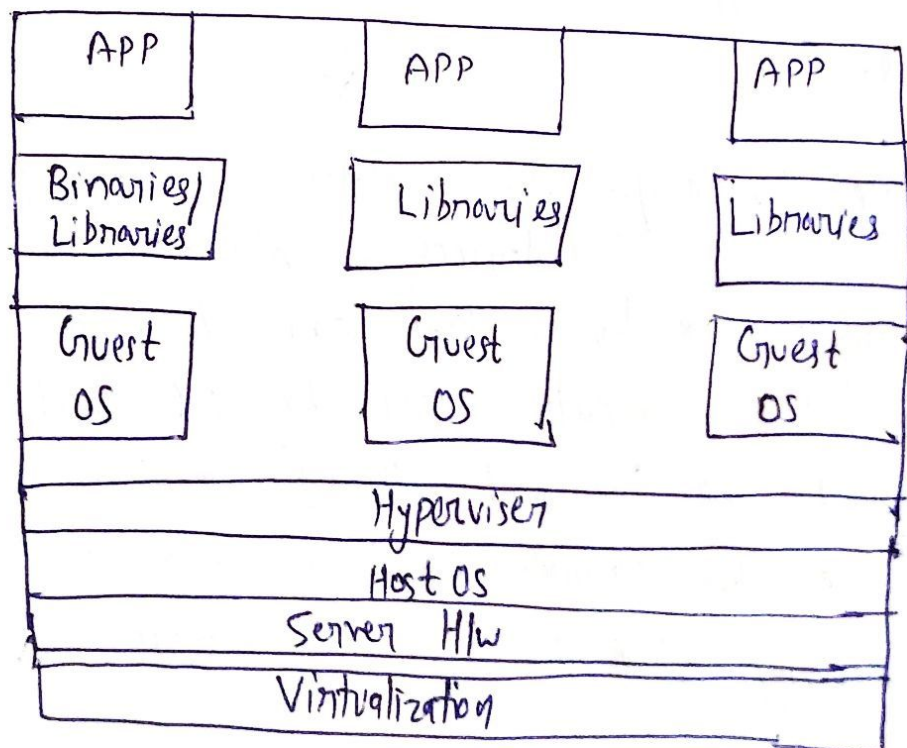
dy-① Virtualization :- It is a technique of how to separate service from underlying physical delivery of that service. It is the process of creating a virtual version of something like computer h/w. It involves using specialized sw to create a virtual or sw created version of a computing resource rather than actual version of same resource. ⑤

→ SaaS is used in virtualization. Moreover, virtualization technologies provide a virtual environment for not only executing applications but also for storage, memory & networking.

Types of Virtualization →

- (i) Application Virtualization
- (ii) Network Virtualization
- (iii) Desktop Virtualization
- (iv) Storage Virtualization
- (v) Server Virtualization
- (vi) Data Virtualization

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## Section - (I)

(6)

Ans-(a) Hybrid Cloud:- A company's cloud deployment is split b/w public & private cloud. Sensitive data remains within private cloud where high security standards can be maintained. Hybrid clouds are well suited to carrying out big data operations on non-sensitive data in public cloud while keeping sensitive data protected in private cloud.

Community Cloud:- Community clouds are a recent variation on private cloud model that provide a complete cloud solution for specific business communities. Community clouds are an attractive option for companies in the health, financial or legal spheres that are subject to strict regulatory compliance.

→  
(b) Cloud Computing:- It relates to specific design of new tech and services that allows data to be sent over distributed networks through wireless connections to a remote secure location that is usually maintained by a vendor. It usually serve the multiple clients.

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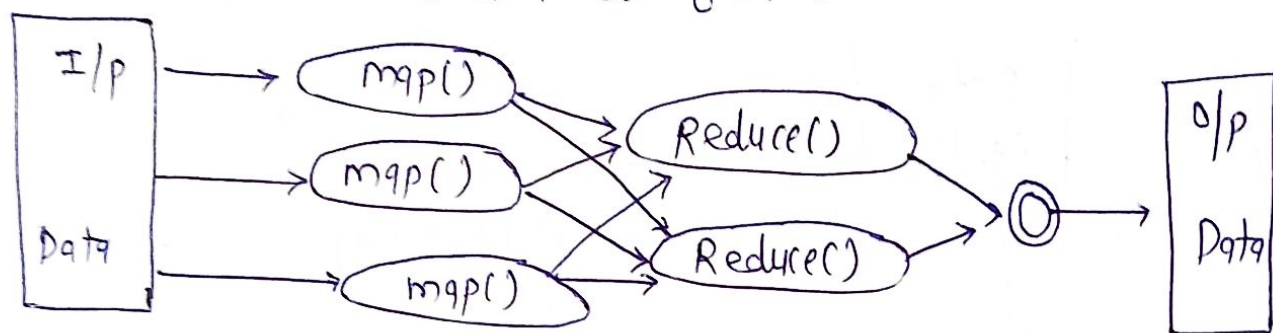
Mobile Computing:- It relates to emergence of new devices & interface smartphones & devices are mobile ~~sen~~ devices that can do a lot of what traditional laptop & desktop computers can do. MC functions include accessing the internet through browsers, supporting multiple sw application with a core OS & sending & receiving different type of data.



➡ MapReduce : - It is a processing technique and a program model for distributed computing based on Java. This algorithm contains two important tasks, namely Map & Reduce. ⑦

→ Map takes a set of data & converts it into another set of data

→ Reduce takes o/p from map as i/p & combines those data tuples into a smaller set of tuples



Shuffling :- It is the process of transferring data from mappers to reducers, it is obvious that it is necessary for the reducers. Shuffling can start even before map phase has finished. Reduce status greater than 0% (but less than 33%) when map status is not yet 100%.

➡ Usage of Utility Computing ⇒ It is a model in which computing resources are provided to customer based on specific demand. The service provider charges exactly for service provided, instead of a flat rate.

It is used such as computing capabilities, storage space and applications services.

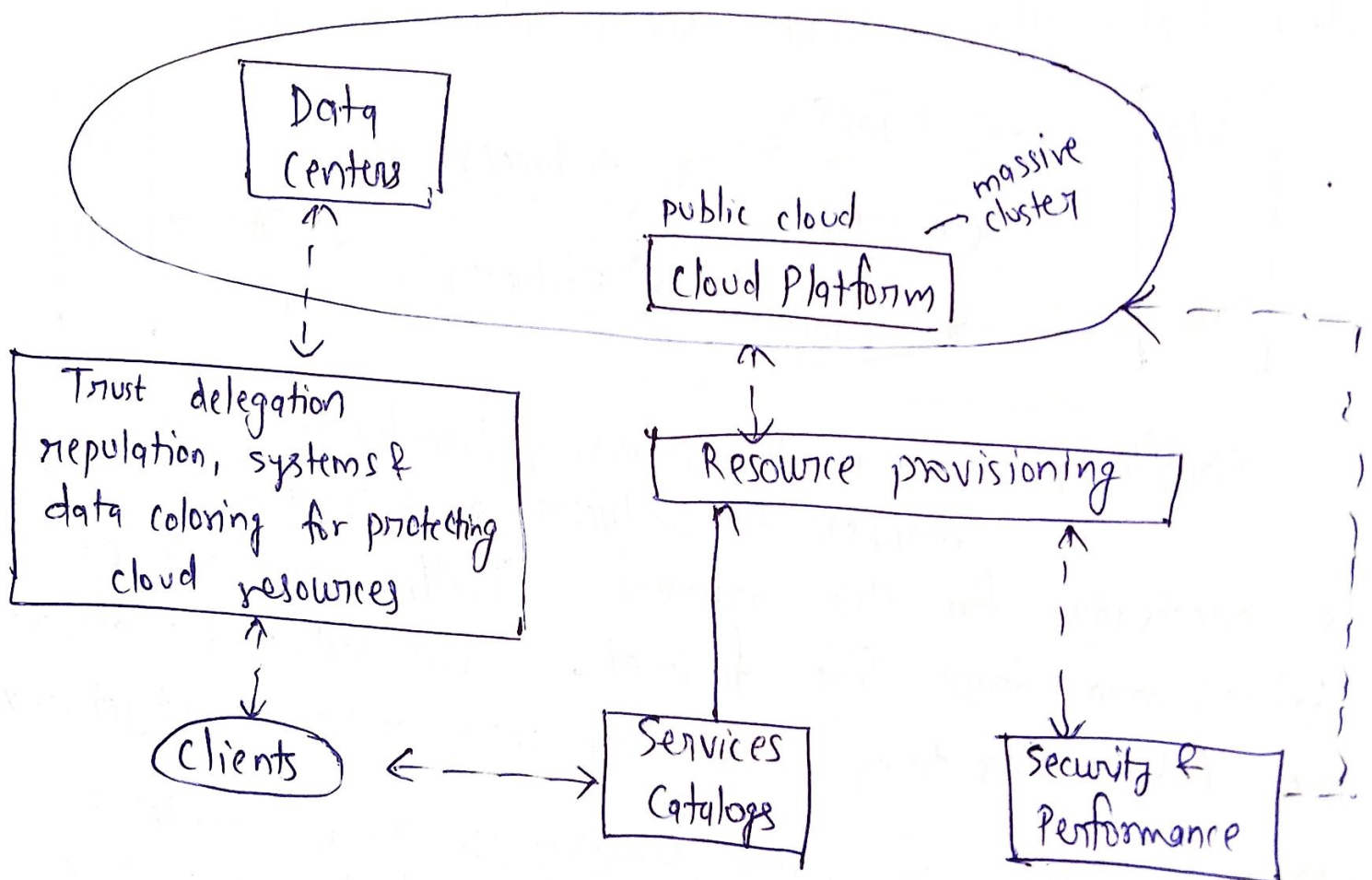
Utility computing helps eliminate data redundancy, as huge volumes of data are distributed across multiple servers.

## Cloud Architecture Design:-

(8)

- (a) cloud platform design goals
- (b) enabling Technologies for clouds
- (c) A generic cloud architecture.

### A generic cloud Architecture





(a) Network virtualization  $\Rightarrow$  It is a process of logically grouping physical networks and making them operate as single or multiple independent networks called Virtual networks. It is where the OS must have the functionality of network virtualization.

Types of Network Virtualization:-

- (i) Server (ii) Application (iii) Network  
(iv) Desktop (v) Storage

(b) VM ware hypervisor  $\Rightarrow$  A hypervisor, also known as VMM, is software

that creates and runs virtual machines.

A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources such as memory & processing.

A hypervisor reduces:

- Space
- Energy
- Maintenance requirements

(c) Federated cloud  $\Rightarrow$  It is the deployment & management of multiple external & internal cloud computing services to match business needs. (2)

$\rightarrow$  A federation is the union of several smaller parts that perform a common action.

$\rightarrow$  Federated cloud acts a major role in the deployment models in the business deals.

(d) (i) Service Level Agreement:- It is the bond for performance negotiated b/w cloud services provider & the client. Earlier, in cloud computing all SLA were negotiated b/w a client & the service consumer.

(ii) Trust Management:- To manage the trust of end user the cryptographic techniques are popular. During data access, data may be loss or may be attacked by the intruder so a trust management system needs to be developed.

The trust factor helps users to identify trustworthy cloud service provider through which they can use cloud services.



(e) → Distributed computing is an environment in which a group of independent & geographically dispersed computer systems take part to solve a complex problem. (3)

→ Grid Computing is to utilize the ideal CPU cycles & storage of million of computer system across a worldwide network function as a flexible, pervasive & inexpensive accessible pool that could be harnessed by anyone who needs it.

Section — (B)

(a) Network Virtualization ⇒ It is a process of logically grouping physical networks & making them operate as single or multiple independent networks called Virtual network.

Tools for NV:-

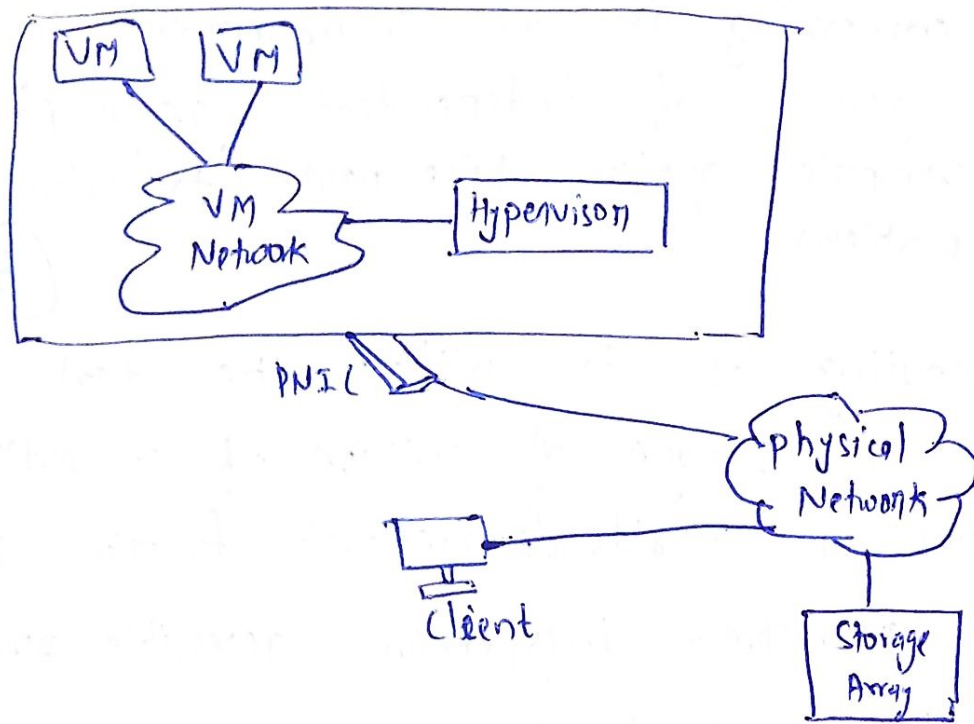
(i) Physical switch OS

(ii) Hypervisor

NV in virtual data center :-

(i) physical Network

(ii) VM network



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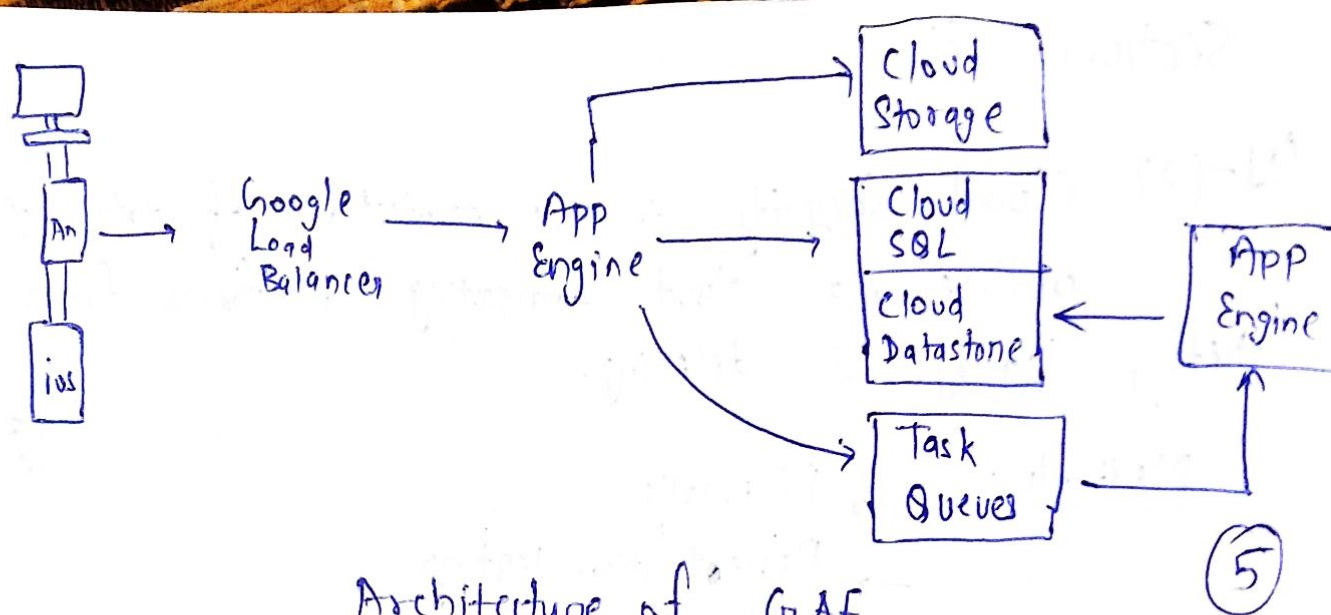
Fig:- Network Virtualization in VDC

(b) Google App ⇒

→ Google App Engine is a cloud computing platform as a service [PaaS] for developing & hosting web-applications in google managed data centers. Applications are sandboxed & run across multiple servers.

→ App Engine offers automatic scaling for web applications as the no. of requests increases for an application, App Engine automatically allocates more resources for the web application to handle the additional demand.





## Architecture of GAE

(c) (i) VM ware hypervisor  $\Rightarrow$  A hypervisor also known as VMM, is software that creates and runs virtual machines.

$\rightarrow$  A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, such as memory & processing.

A hypervisor reduces: -

- Space • Energy • Maintenance requirements

(ii) KVM hypervisor  $\Rightarrow$  KVM is an open source virtualization technology built into Linux. Specifically, KVM lets you turn linux into a hypervisor that allows a host machine to run multiple, isolated virtual environments called guests or VMs.

In KVM, Linux kernel acts as a type-2 Hypervisor, streamlining management and improving performance in virtualized environments.

## Section - (C)

Q-(9) Cloud Security is the protection of data stored online via cloud computing platforms from theft, leakage & deleting.

Methods : - (8)

- Firewalls
- Penetration testing
- Obfuscation
- VPN
- Avoiding public internet connections

### Cloud Security Design Principles :-

- (i) Data in transit protection
- (ii) Asset protection & resilience
- (iii) Separation b/w users
- (iv) Governance framework
- (v) Operational security
- (vi) Supply chain security
- (vii) Identity & authentication
- (viii) Secure use of service and many more...

### Security Challenges :-

- CSPs believe that security is End-users' Issue.
- Lack of Awareness about Cloud Security
- Inconsistent Network Connection Issues
- Lack of Proper Cloud Security Standards



## Ans - (c) (i) cloud application platform:-

→ Public & Private cloud framework is integrated into one ecosystem called Hybrid cloud to increase the efficiency of cloud computing.

Hybrid cloud is an integration of both private & public cloud for high efficiency in performing distinct functions in an organisation.

Eg - GCP, AWS, Azure.

(9)

(ii) CRM:- CRM stands for Customer Relationship Management and is a slw that is hosted in cloud so that the users can access the information using internet.

It provides high level of security & scalability to its users.

ERP:- ERP is an abbreviation for Entity Resource Planning & which helps the enterprises to manage & manipulate their business data as per their needs & user requirements.

It follows pay per user methodologies of payment, that is at the end of the month.

### (iii) Cloud computing applications :-

SaaS provides these applications. Unlike standard desktop application, in SaaS, the application processing is done on data centers.

#### Various types of CCA :-

(10)

- Online File storage
- Photo editing sw
- Digital video sw
- Creating image - album
- Spread sheets
- Presentation sw
- Finding a way on the map
- E-commerce sw
- Miscellaneous applications
- Word processing application.