Cloud Computing

Peer-to-Peer

Client-server

Basic Concepts

(1) Deployment model
(2) Service model

→ (i) Public Cloud: Easily accessible to general public. Less secure.
Eg:- emails.

(ii) Private Cloud: Accessible to within an organisation. More secure.

(iii) Community cloud: Few services given to specific NGO's etc.

(iv) Hybrid cloud: Combination of any 2 of above clouds.

Service Models -

(i) Iaas (Infrastructure as a Service)
(ii) Saas (Software - - -)
(iii) Paas (Platform - - -)

Amazon → EC2 → computing
↳ S3 → Storage

IaAS providers → AWS, Microsoft Azure, Google cloud.
↓
hardware resources, system, provided with OS. → (Application developers)

PaaS → OS of your choice.

SaAS → Software managing, implimentation done by it. (End users)
It provides UI to access their services uploaded on cloud.

IaaS → cloud practitioners, production team or deployment team.

Coordination among the service models is done by devops.

openstack → cloud computing OS.
It works only on IaAS.

↳ Deployment Modell

(i) ~~Open~~ On premises distribution.
(ii) openstack based public cloud.
(iii) Hosted open stack private cloud
(iv) Open stack as service.
(v) Appliance based openstack.

Types of cloud –

(i) Public cloud: Less secure but made more secure using various algorithm.
- It refers to internet based computing for public use.
- It provides less security resulting in more privacy risks.
- Its very cost effective and provides free access to users.
- Eg – gmail

(ii) Private cloud: It refers to internet based computing for particular organisation.
- It provides access to users with nominal fee.
- It is customised according to the demand of the users.
- It provides more security resulting in less privacy risks.
- For eg – Microsoft Azure, Oracle etc.

(iii) Hybrid cloud: It is heterogeneous mixture of both public & private cloud providing users the benefits of both types. It is cost effective and security effective. It is customised according to the needs of organisation. It is used for critical activities which needs good efficiency but without making it public.

Eg – Google drive

(iv) Community cloud: It is internet based computing which is used by a business community or industry sector. It is also customised according to the requirement of business organisation. Its infrastructure is shared b/w organisation that has shared concern or task.

Cloud may be managed by third party or an organisation.

IaAS
PaAS
SaAS
} Advantages, Dicadv. services, diagram (Do yourself)

→ Characteristics of cloud -

(i) On demand self services:

(ii) It doesnot require any human administrator. Users themselves can monitor and manage.

(ii) Flexibility: Access it from any where whenever, wherever you want can get access.

(iii) Scalability: Handles the growing demand efficiently.

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(iv) Resource pulling: Cloud service provider can share resources among clients providing each

client services as per the requirement.

(v) Broad network access: Means no geographical boundaries are there.

(vi) cost effective: Pay as per your use.

(vii) security: Provides additional security features such as user authentication.

(viii) Automation: Enables IT teams and developers to create, modify and maintain cloud resources without involvement of any human.

(ix) Measured services: Cloud services used by providers are monitored by providers as well as analyst.

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→ Limitations of Cloud –

(i) Internet Connectivity

(ii) Data Leakage

(iii) Limited Control

Imp.

Q. Compare cloud, cluster and grid computing.

- Cluster → in which group of computers are linked together so that they can act as a single entity.

- Grid → It is a collection of computer resources from multiple locations to reach a common goal.

Important

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Parameter	Cluster	Grid	Cloud
Resource handling	Centralised	distributed	Both
Scalability	No	Yes	yes
Reliability	No	Half	full
Network type	Private	Private	Public
Virtualisation	Half	Half	Full
Size	Single Large	single large	small, medium Large

Accessing the role of openstandard

Openstandard is a standard that is freely available for adaption, implementation & updates. Eg - XML, Sql, Html.

Openstandard establishes protocols and building blocks that can help make applications more functional and inter-operatable.

Cloud computing technology is the result of conversions of many different standards.

The standards help to enable different business models can support such as Saas, Web 2.0 applications and utility computing.

These businesses require open standards so that data is both portable and universally accessible.

Virtualisation -

- Discuss various virtualisation types.
- Load balancing in virtualization & how virtualisation is related to cloud computing.

Virtualisation refers to creation of virtual copies (not actual) multiple copies of something such as server, desktop, device etc.

VPC (Virtual Private Cloud)

Private cloud computing env. contained with public cloud. It is a multi-tenant model that provides an isolated env. within public cloud.

Virtualisation is of 4 types -

(i) Hardware
(ii) Operating system
(iii) Server (for load balancing)
(iv) Storage virtualisation.

Virtualisation in Cloud computing -

It plays very important role in cloud computing technology, in this users can share the data present in cloud like

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applications etc. but actually shares infrastructure with the help of it. The main use of virtualisation technology is to provide application with standard versions of cloud users.

Suppose if next version of that application is released then the cloud provider has provide latest version to their cloud users and practically it is impossible because its expensive. To overcome this problem, virtualisation is used.

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While using virtualisation all servers and software applications which are required by cloud providers are maintained by the 3rd party people and cloud providers has to pay money on annual or monthly basis.

Load balancing & Virtualisation-

Cloud load balancing is defined as the method of splitting work load and computing properties in cloud computing.

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It enables enterprise to manage work load demands or application demands by distributing resources among numerous computers, networks or servers. As traffic on internet is growing rapidly which is about 100% of anually off traffic. Hence, the workload on server growing so fast which leads to overloading of servers mainly for popular web servers. There are 2 solutions to overcome problem

of overloading —

(i) single server solution

(ii) Multiple server solution

When multiple servers are alotted with the help of load balancer to divide working capacity of cloud storage which gets allocated to guest ie VM ware by this division, workflow continue in smooth manner.

Cloud Hypervisor:

It is a software that enables sharing of cloud providers physical computer & memory resources across multiple computer resources. It is also known as VM monitor which is a software that create and run virtual machines.

→ Advantages —

Successfully run and monitor concurrent VM on a host. Eg VM, Oracle, Virtual box. It allows multiple guest OS to

run on single host OS at same time.

—— * * * * ——

Utility Computing: It is a service provisioning model that offers computing resources such as hardware, software, storage etc. to the clients as and when they require them on demand basis. It is also refered as pay-per use model as it provides the client the facility to use as per demand & pay accordingly.

Pay-per use model - It is a subset of cloud computing allowing user to scale up and down according to needs. Clients, users or business organisations use amenities such as storage, space, hardware, software, network bandwidth. This model is based on its resources to make easily available the resources in technology. Eg - electricity bill - a consumer pays his electricity bills per no. of units consumed by us. Similarly, Utility computing works on same concept which is pay per use model.

Steps involved in pay per use →

The process is transformational. Various steps involved are -

(i) Determining the need.
(ii) Evaluating service providing claims.
(iii) Accessing health of computer resources.
(iv) Identifying resource provisioning environment.
(v) Map out a time frame.

Example - Travel reservation service, online retailers (amazon, flipkart), startup and small businesses.

⇒ Benefits of utility computing -

(i) Easy access to IT resources.
(ii) Save time & resources.

(iii) Maximise saving.
(iv) Shorter time to market.

→ Best practices

(i)
(ii) Choose a reliable service provider.
(iii) Upload transparency about shared responsibilities.

* * * * *

→ Machine image : It stores meta data, permissions and data from multiple disk of VM disk. Machine image can be used in system failure / maintainence,

backup and recovery, instance cloning scenario. It is raw copy of operating system and com software for a particular env. on a specific platform. Ease of portability.

Machine Imaging is the process used to provide system portability and provision and deploy system through capturing state of system using system image.

Eg- AMI (Amazon machine image) It is system image used

in cloud computing.

AWS uses AMI to store copies of virtual machine.

An AMI is a file system image that contains an OS all device drivers any application and state information that working machines should have.

⇒ Porting application-

Application portability in cloud computing provides flexibility to move to different platforms or different cloud service vendors but technology and provider

restrictions persist.

Portable applications are beneficial in migration of infrastructure, platforms and services from one cloud service providers to another.

Barriers

(i) Security

(ii) Compatibility

(iii) Many have different positions

• They form a technology with lack of standard cloud APIs which can be utilised by cloud providers or vendors in

developing their technology waste product.

• Hard code database schema and uncertainty about rights of users to get access and manage data stored in the cloud.

• Data access problems are another aspect of service related data management cycle.

Capacity Planning -

It determine whether systems are working properly used to measure their performance

determine usage of patterns and predict future demand of cloud capacity. The goal of capacity planning is to maintain workload without improving efficiency.

Defining baseline & metrics -

In business current system capacity or workload should be determined as measurable quantity overtime. Many developers create cloud based application and websites based on lamp solution stand. (LAMP)

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LAMP → PHP (Scripting Lang.)
↓ → MySql (Database)
Linux → Apache
(OS) (http webserver)

System Metrics –

1 Determining that each system
2 is capable of and how ~~syste~~
3 resources of a system affect
4 system level performance.

Network Capacity –

6 It is maximum amount of data
that can be reliably transferred
b/w different locations over a
network.

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Scalability & Elasticity in Cloud computing –

Cloud Elasticity: Ability of cloud
to automatically expand or compress
the infrastructural resources on
a sudden up & down in
requirement so that workload
can be managed efficiently.
Eg – Consider online shopping site
whose transaction workload
increases during festive season.
For this particular period of time
resources need a spike up. In order

MAR APR MAY

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to handle these sittiations we can go for cloud elasticity services rather than cloud scalibility. As soon as, the season goes out the deployed resources can be asked for withdrawing.

C.E is short term & C.S is for long term.

Cloud Scalability : It is used to handle growing workload where good performance is also needed to work efficiently with software

on application. for eg - consider you are owner of a company whose database size was small in earlier days but as time passed you business grow and size of database also increased. So, in this case, you just need to request your cloud service vendor to scaleup your database capacity to handle heavy workload.

⇒ Characteristics of scalability -

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1) It is used to fulfil static needs while elasticity is used to

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fulfil dynamic needs of business organisation.

2) Scalibility is pay-per use service.

3) Scalability is useful where workload remains high and increase statistically.

4) Scalability is a long term planning whereas elasticity is a short term planning.

Imp Q - Explain architecture of openstack, its various types of services and workflow of services

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openstack : It is an open source platform that uses pooled virtual resources to build and manage public and private clouds.

3 components

IaAS SaAS PaAS

The tools that comprise openstack platform called projects handle the core cloud computing services to compute networking, storage, Identity and image services. More than a dozen projects can also be

handled together to create unique deployable cloud.

Openstack and virtualisation management platforms make it easier to manipulate features and functions of virtual resources.

- openstack actually uses virtual resources to run a combination of ~~two~~ tools.

Workflow : It is a series of commands known as scripts. Those scripts are bundled into packages called projects that relate tasks

that create cloud environment.

In order to create environment, openstack relies on 2 types of softwares -

(i) Virtualisation → that creates a layer of virtual resources abstracted from hardware.

(ii) Base OS → that carries out commands given by openstack.

Architecture

9 components :-

(i) Nova (Compute) : It manages computer resources deleting, creating & handling the scheduling

(ii) Neutron (networking service): It is responsible for connecting all networks across openstack. It manages all networks & IP addresses.

(iii) Swift (Object storage): It is object storage services with high fall tolerance capability and it is used to retrive unstructural data objects.

(iv) Cindu (Block storage): It is responsible for providing block storage that is used to made

accessible using API.

(v) Key stone (Identity service): It is responsible for all type of authentication & authorisation in all type of services.

(vi) Glance (Image service provider): It is responsible for registering, storing & retrieving virtual disk images from complete network.

(vii) Horizon (Dashboard): It is responsible for providing web-based interface for open-stack services. It is used to manage, provision

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and monitor cloud resources.

(viii) Ceilometer (Telemetery): It is responsible for metering & billing of services used.

(ix) Heat (Orchestration): It is used for on-demand services provisioning with auto-scaling of cloud resources.

MST Ques

Q1- What is utility computing? Example, process defination, test practices & benefits.

Ans- Subset of cloud → def.
Process → all 5 point with discription.

(i) It involves accessing internal needs and combination of services and resources required. They provide valuable integrated fully customised utility computing solutions and resources as per the clients needs.

(ii) Evaluating the service provider claims: It is essential to determine

whether their services will empower users to be more effective in accomplishing their goal on time. Understanding which taste to be supported and what level of resources will be provided if essential.

(iii) Access the health of computing resource: It is typical to deploy source that look after the and dynamic resources monitoring utility computing resource involves identifying failures and network storage & app resources.

(iv) Identifying the source provisioning: It involves analysing service provider scalability to customise & configure resources to meet customer's need and establishing a load balance without over provisioning or under provisioning resources.

(v) Time spam: The final step for architecturing a utility computing submission involves maping out the schedule identifying when a specific resource needed and for how much time.

Best practices

(i) Access current workload.

(ii) Choose a reliable utility service provider.

(iii) Uphold transparency.

(iv) Discuss all security concern with service provider.

(v)

(vi) Maintain visibility

(vii)

(viii) Setup identity & occur management solution.

(ix) Check & recheck compliance requirement.

(x) Revenge automation.

Q2- Discuss different types of clouds and diff. type of services in cloud.

Ans- dfination → cloud computing

- 4 types of cloud: public, private, community, hybrid.

Draw diagram & explain.

- example: iaas, paas, saas
- architecture
- types of services.

LAYERS

(i) SaAS: software as a service.

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- It offers on demand pay per to user.

- It is platform independent & one doesn't need installation of software on PC.
- It transfer single instance of software which makes it available for multiple end users.
- It's quite cheap and its services are managed by vendor.
- This service can be acused by web browser.
  Eg - google drive.

(ii) **PaaS**: Platform as a service.

- It is made up of programming language execution event, operating system, web browser & database.
- It provides users & environment where they can build, compile & run their program without underlying infrastructure.
- User manage data & application resources. Other resources are managed by vendor.
- Used by developers.
- Eg - amazon web services, sports.com

(iii) **IaAS**: Infrastructure as a service.

- This service offers computing infrastructure & architecture

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but in virtual environment for multiple user can access it.

- Vendors are responsible for data storage, virtualisation, servers & networking, users are responsible for handling resources such as application, data, runtime and middleware.
- Eg – Amazon EC2

Assignment

1) Discuss architecture of openstack and list various components of openstack.

2) How object storage & block storage is used to store information in cloud ?

(Submit by – Next Friday 23 sept)

⇒ Accessing the role of open standard –

(i) They provide various benefits to the organisation –

(i) Increased Choice:
- It gives customers freedom to choose products that works best with tools & work in environment.

(ii) Reduced cost: It lowers cost by reducing complexity & no. of tools required to support environment.

(iii) Improved inter-operatibility:
It enables integration which drives greater business ability and responsiveness.

Q- Discuss correlation b/w load balancing & virtualisation.

Ans - L.B is the process of re-distribution of work load in distributed system ensuring no computing machine is overloaded, underloaded or ideal. It reduces cost associated with

document management system
& maximise availability of resources.

Virtualisation : It is the process
of making virtual hardware /
software, virtual servers, infra-
structure, devices & computing
resources.

Correlation : when multiple servers
are allotted with the help of load
balancer to divide working capacity
of cloud storage which alot
to guest is vmware and by

this division, workflow continue
in smooth manner.

Features of cloud computing -

Resource pulling
1 On-demand shelf service
2 Easy maintainence
3 Large network access
4 Availability
5 Automatic system
6 Economical
Security
Pay-as-you-go.
Measured services.

Q- Who are cloud consumers in cloud ecosystem?

Ans- ~~for~~ Cloud consumer is an organisation or human that has a formal contract or agreement with cloud provider to use IT resources made available by cloud provider.

Q- What are serverless components in cloud computing?

Ans- Serverless components give you ~~always~~ a way to compose

and share parts of cloud application.
Example — AWS Lambda, Microsoft Azure functions, Google Cloud Func.

Q- What are cloud enabling technologies?
Ans- Every technology in which internet is used is known as cloud enabling technology.
It is the use of computing resources that are delivered to customers with the help of internet.
Cloud computing technologies are used across various sectors such as

energy and power, oil & gas, building and construction, transport, communication etc.

Q- Discuss limitations of cloud computing.
Ans- (i) Already done.

Q- How does resource replication takes place in cloud computing?
Ans- Cloud replicates the data & store them stratagically on multiple servers located at various geographical locations. Replication

ensures consistency, improves availability and reliability by creating multiple copies of same data on different storage devices at geographical locations.

Q- What is on-demand service?

Ans- It is a service where resources are offered instantly as and when needed. It includes storage space, speed, software applications, servers and networks

Q- What are the most essential things that must be followed before going for cloud computing platform?

Ans- Following are the essential things that must be followed -

(i) up-time

(ii) Loss of data

(iii) Data storage

(iv) Compliance

(v) Business continuity

(vi) Data integrity in cloud computing

Q- What are different cloud computing databases?

Ans- (i) AWS

(ii) Oracle database

(iii) Microsoft Azure

(iv) Google cloud platform

(v) IBM DB2.

(vi) Mongodb Atlas

(vii) Openstack

Q- Define cloud.

Ans- The term cloud refers to servers that are accessed over internet and software and databases that run on these servers.

Q- When you add a software stack, such as an operating system and applications to the service, The model shifts to which mode?

Ans- It is SaaS. This is often because Microsoft, window, Azure platform is best represented as presently using Saas model.

Q- What is the diff. b/w cloud & traditional data centers? How does cloud computing different from internet?

Ans -

	Traditional Data Centre	Cloud Computing
Location	On premises physically available	Virtualised, remote hardware
Manage-ment	internal business responsibility	outsourced to third party provider
admini-stration	In house IT professional	employee of service provider
pricing	business pays directly for planning people hardware & software	business pays per use by source provider