

Cloud Computing

- Q1. Need of cloud computing.
- Q2. Which companies provides cloud services.
- Q3. How cloud is useful to IT engineer.
- Q4. How cloud is related to DevOps.
How they are integrated?

Ans)

Flexibility :- users can scale services to fit their needs, customize applications and access cloud services from anywhere with an internet connection.

Efficiency :- Enterprise users can get applications to market quickly, without worrying about underlying infrastructure costs or maintenance.

Storage options :- users can choose public, private or hybrid storage offerings, depending on security needs and other considerations.

Regular updates :- Services providers regularly update offerings to give users the most up-to-date technology.

Collaboration :- Worldwide access means teams can collaborate from widespread locations.

Ans 2 Companies that provide cloud services:-

- 1) Microsoft Azure
- 2) Google cloud Platform
- 3) IBM
- 4) Amazon web services
- 5) AWS
- 6) VMware
- 7) Microsoft
- 8) Adobe

Ans 3 Cloud useful to IT Engineers

① Scalability

With traditional server hosting, users need to determine the exact hardware that each node of the system would run a particular web application. With cloud systems, users can now scale any part of an application more quickly and easily.

② Cost

Companies and users will be able to save money on computing costs as they will not need any upfront investment and will be able to pay as they go to get the resources they need.

(3)

Quick provisioning of Resources

Developers are now able to quickly create new environments for websites as well as databases and virtual machines.

(4)

Multiple service models

Cloud provides developers and companies with different options to set up their environment which will then meet the unique needs of users. These service models include Platform as a Service and Infrastructure as a Service.

(5)

Geographic Reach

Rather than rely on a single location to host its software, cloud allows users to host applications in data centers all over the world.

(6)

Ease of deployment

A cloud system enables users to configure automated builds that can deploy certain codes, databases, automated testing for applications and automated provisioning/provisioning of a particular server.

Ans

Cloud computing brings accessibility and collaborative workflow tools to facilitate DevOps team.

- a) Cloud acts as a centralized repository to store all the information, code and deployments regarding the application.
- b) This allows access across the entire team without the need for communication between discrete units.
- c) Today, cloud service providers have many tools to facilitate a DevOps approach.
- d) These cloud-based tools allow for better management of the application during its lifecycle as well as the optimization of development tasks.
- e) A cloud repository also allows for the facilitation of another important part of DevOps; quality assurance (QA). Quality assurance in cloud platforms is executed easily.
- f) Strategies like cloud bursting are also useful for testing and deploying cloud applications.

Q) What is cloud?

Q) Layers of cloud. →

Q) Types of cloud services

Q) What is cloud computing?

Utility computing

Utility computing 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 referred as pay per use model as it provides the client the facility to use as per demand and pay accordingly.

Pay per use model

It is a subset of cloud computing allowing user to scale up and down according to needs. Clients, user or business organisations use eminities such as storage, space, hardware, software, network bandwidth. This model is based on its resources to make easily available the resources in technology for eg:- electricity bill. A consumer pays his electricity bill as per the number of units consumed by them. Similarly utility computing works on some concept which is pay per use model.

Process

The process is transformational various steps involved are

- I) determining the need

- 2) Evaluating service providers claim.
- 3) Assessing health of computer resources
- 4) Identifying resource provisioning requirements
- 5) Map out a time frame.

Example

- 1) Travel reservation services
- 2) Online retailers (Amazon, flipkart)
- 3) Startup and small business

Benefits of Utility Computing

- 1) Easy access to IT resources
- 2) Saves time and resources
- 3) Maximizes savings.
- 4) Shorter time to market.

Best practices

- 1) Assess current workload.
- 2) Choose a reliable utility service provider.
- 3) Uphold transparency about shared responsibility.
- 4) Discuss all security concerns with service provider.
- 5) Ensure training for all employees.
- 6) Maintain visibility for utility computing services.
- 7) Scrutinise security contracts.
- 8) Set up identity and access management solutions.
- 9) Check & recheck compliance requirements.
- 10) Leverage automation.

Cloud

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Client server architecture
distributed computing

Working models

- 1. Deployment Model → how cloud is deployed
- 2. Service Model → what type of services are available

Deployment Model

- (1) public → easily accessible to general public
- (2) private → accessible within an organization
- (3) community → accessible to few organizations
- (4) hybrid → combination of

Service Model

- (1) Infrastructure as a Service (IaaS) → instances of hardware
- (2) Platform as a Service (PaaS)
- (3) Software as a Service (SaaS)

Virtualization

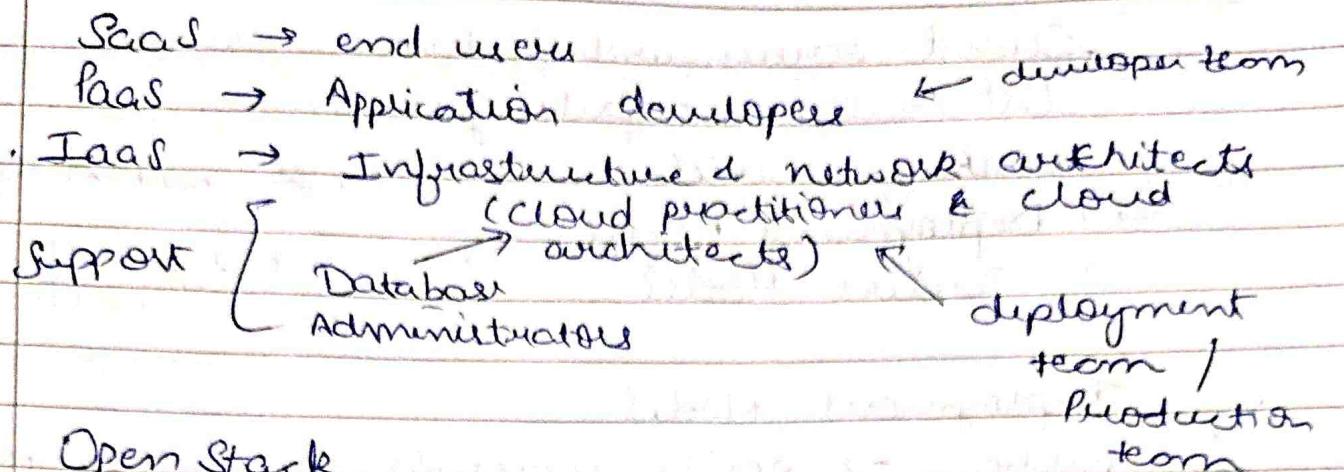
EC2 → for computing

DNS → R3

IaaS → amazon, google, IBM,

Platform as a Service → we don't choose OS, we are allocated OS

Software as a Service → google drive, gmail, youtube, whatsapp
Application



Open Stack

(Q to manage cloud computing)
 work on Infrastructure as a Service.
 free

Deployment Models

- ① Open premises distribution → like a private cloud
- ② open stack based public cloud → use services of others infrastructure
- ③ Hosted open stack private cloud → own data itself
- ④ Open stack as service → need computing services and pay for it.
- ⑤ Appliance based open stack → we need software which does not need OS.

IaaS

Companies → IT, finance

- Q Why public cloud is less secure?
- Q What is hypervisor? → algorithms are applied

Types of Cloud

- ① public → ① it refers to internet based computing for public use.
- ② It provides less security risk as compared to other models resulting to more privacy risk.

(3) It is very cost effective and provides free access to users.

Eg → gmail, IaaS, Paas, SaaS

(II) private :- (1) it refers to internet based computing for a particular organisation.

(2) it provides access to the user with a nominal fee.

(3) It is customised according to the demand of the user.

(4) It provides more security resulting in less privacy risks.

for eg :- microsoft Azure, VMWare, Oracle.

(III) hybrid :- (1) It is heterogeneous mixture of both public and private cloud providing users both benefits of both the type.

(2) It is cost effective and security effective.

(3) It is customised according to the need of organisation.

(4) It is used for critical activities which needs good efficiency but without making it public.

Eg → google drive

(IV) community :- (1) It is internet based computing which is used by a business, community or an industry sector.

(2) It is also customised according to the requirement of business organisation.

(3) Its infrastructure is shared between

organization that has shared same concern or task.

- (4) Cloud may be managed by third party or by own organisation.

→ Services offered (IaaS, PaaS, SaaS)
Advantages, disadvantages, services

Characteristics of Cloud

(1) On demand self services :- Cloud services do not require any administrator. User themselves can monitor and manage.

(2) Flexibility :- wherever, whenever you ^{want} can get access.

(3) Scalability :- Handles the growing demand efficiently.

(4) Resource pooling :- Cloud service provider can share resources among clients providing each client with services as per requirement.

(5) Broad network access :- No geographical boundaries are there.

(6) Cost effective :- Pay as per you use.

(7) Security :- Provides additional security features such as user authentication.

(8)

Automation :- enables IT teams and developers to create, modify and maintain cloud resources without involvement of any human.

(9)

Measured services :- Cloud services used by providers are monitored by providers as well as analysed.

Disadvantages

(1) Internet connectivity

(2) Data leakage

(3) Limited control

(4) Data loss and theft

(5) Compare cloud computing, cluster & grid computing.

Cluster → it is type of computing in which group of computers are link 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.

JSP

MSE

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Parameter	Cluster	Grid	Cloud
1. Resource handling	Centralised	distributed	Both
2. Scalability	No	Yes	Yes
3. Reliability	No	Half	Full
4. Network	Private	Private	Public
5. Virtualization	half	half	Full
6. Task size	Single Large	Single Large	Small, medium, large

Accessing the role of open standards

Open standard is a standard that is freely available for adoption, implementation and update.

Eg:- XML, HTML, SQL are types of open standard.

Open standard established protocols and building blocks that can help make application more functional and interoperable.

Cloud computing is the technology is the result of

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convergence of many different standards.

The standards help to enable different business models that cloud computing vendors 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

Q Discuss various virtualisation types, load balancing in virtualisation and 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.

Virtual private cloud :- It's a private cloud computing environment contained within public cloud. It's a multi-tenant model that provides an isolated environment within public cloud.

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Virtualisation is of four types

① Hardware virtualisation

② Operating System virtualisation

③ Server virtualisation (for load balancing)

④ Storage virtualisation

Virtualisation in cloud computing

It plays a very important role in cloud computing technology. In this, users can share the data present in cloud like applications etc but actually shares infrastructure with the help of it.

The main usage of virtualisation technology is to provide application with standard versions of cloud users. Suppose if new version of that application is released then the cloud provider has to provide the latest version to their cloud users and practically it is impossible because its expensive.

To overcome this problem virtualisation technology is used. By using virtualisation all servers and software applications which are required by cloud providers are maintained by the third party people.

and cloud providers has to pay money monthly and on annual basis.

Load Balancing and Virtualization

Cloud load balancing is defined as a method of splitting workload and computing properties in a cloud computing. It enables enterprise to manage workload demands or application demands by distributing resources among numerous computers network and servers.

As traffic on internet is growing rapidly which is about 100% of annually. of present traffic. Hence the workload on server is growing so fast which leads to overloading of servers mainly for popular web servers.

There are two solutions to overcome problem of overloading

- ① Single server solution
- ② Multiple server solution

When multiple servers are allotted with the help of load balancer to divide the working capacity of

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cloud storage which gets allocated to guest i.e. VMware. By this division workflow continue in smooth manner.

Hypervisor

A cloud hypervisor is a software that enables sharing of cloud providers physical computer and memory resources across multiple virtual machines. A Hypervisor is also known as VM monitor which is a software that creates and runs virtual machines.

Advantages

- (1) Successfully run and monitor concurrent VM on a host.
Eg:- VM Oracle Virtual Box it allows multiple guest Operating system to run on a single host system at same time.

Machine Imaging

Machine image is a computer resource that stores configuration, meta data, permissions and data from multiple disks of a VM instance.

Machine image can be used in system

maintenance, backup and recovery, instance cloning scenario.

~~An A machine~~

A machine image is a raw copy of OS and core software for a particular environment on a specific platform.

Machine imaging is a process used to provide system portability and provision and deploy system in cloud through capturing state of system using system image.

e.g. - AMI amazon machine image. It is a 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 machine should have.

Porting Applications

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

Portable applications are beneficial in migration of infrastructure, platform

and services from one cloud service provider to another.

Barriers

- ① They form a technology with lack of standard cloud APIs which can be utilised by cloud provider or vendors in developing their technology based products.
- ② Hard to port database schemas and uncertainty about rights of users to get access and manage data stored in cloud.
- ③ Data access problems are another aspect of service related data lifecycle management.

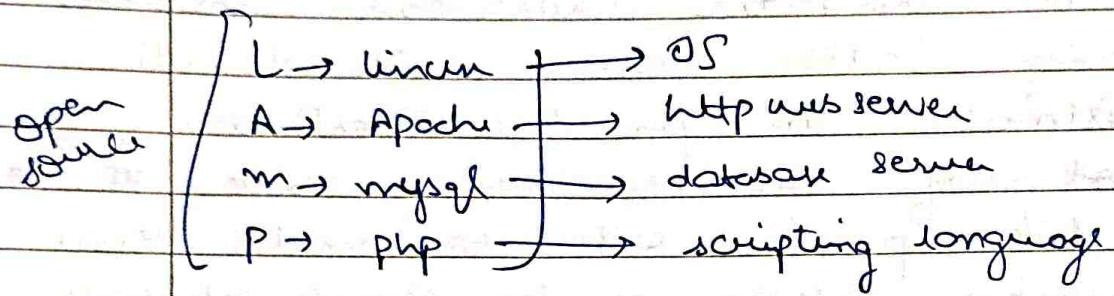
Capacity planning

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 impacting efficiency.

Define baseline and ~~Native~~ Metrics

In business current system capacity or workload should be determined as measurable quantity over time. Many developers create cloud based applications and websites based on LAMP solution stack.



System metrics

Capacity planning must measure system level metrics determining that each system is capable of and how resources of the system effect system level performance.

Network capacity

Network capacity is maximum amount of data that can be reliably transferred between different locations over a network.

Scalability and elasticity in cloud computing

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Cloud elasticity :- ability of cloud to automatically expand or compress the infrastructural resources on a sudden up and down in a requirement so that ~~workdown~~ workload can be managed efficiently.

Eg) consider an online shopping site whose transaction workload increases during festive season like diwali, christmas so for this particular period of time resources need to be spike up. In order to handle these situations we can go for cloud elasticity services rather than cloud scalability. As soon as the season goes out the deployed resources can then be requested for withdrawal.

Cloud elasticity is for short term.
Cloud scalability is for long term.

Cloud Scalability

Cloud Scalability :- It is used to handle growing workload where good performance is also needed to work efficiently with software or applications. for eg:- Consider you are owner of a company whose database size was small in earlier days but as

time passed your business grow and size of database also increased so in this case you just need to request your cloud service vendor to scale up your database capacity to handle a heavy workload.

Characteristics of Scalability

- 1) Scalability is used to fulfil static needs while elasticity is used to fulfil dynamic needs of business organisation.
- 2) Scalability is 'pay per use' service.
- 3) Scalability is useful where workload remains high and increases statistically.
- 4) Scalability is a long term planning whereas elasticity is a short term planning.

OPEN STACK

MSE, Final

 Explain architecture of open stack.

 Its various types . It's various types of services and workflow of services.

Open stack is an open source platform that uses pool pooled virtual resources to build and manage public and private clouds .

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Three components of open stack :-
IaaS, PaaS, SaaS.

The tools that comprise open stack platform called projects handle the core cloud computing services to compute, networking, storage, identity and image services. More than a dozen optional projects can also be bundled together to create unique deployable clouds.

Open stack and virtualisation management platforms make it easier to manage manipulation features and functions of virtual resources. Open stack actually uses virtual resources to run a combination of tools.

WORKFLOW

Open stack is a series of commands known as script. These scripts are bundled into packages called projects that relate tasks that create a cloud environment.

In order to create environment open stack relies on two types of software

(1) Virtualisation :- that creates a layer of



virtual resources abstracted from hardware.

- 2) A base OS :- that carries out commands given by open stack.

ARCHITECTURE

Components

- ① NOVA (compute) :- It manages compute resources like creating, deleting and handling the scheduling.
- ② NEUTRON (networking service) :- It is responsible for connecting all networks across open stack. It manages all networks and IP addresses.
- ③ SWIFT (object storage) :- It is object storage services with high fault tolerance capabilities and it is used to retrieve unstructured data objects.
- ④ CINDER (block storage) :- It is responsible for providing block storage that is made accessible using API.
- ⑤ KYSTONE (identity service) :- Responsible for all types of authentication & authorisation in open stack services.

⑥ GLANCE (image service provider) :- Responsible for registering, storing and retrieving virtual disk images from complete network.

⑦ HORIZON (dashboard) :- Responsible for providing web based interface for open stack services. It is used to manage, provision and monitor cloud resources.

⑧ CEILONETGR (telemetry) :- Responsible for metering and billing of services used.

⑨ HEAT (orchestration) :- used for on demand service provisioning with auto scaling of cloud resources.

Questions → MST

(Q) what is utility computing? Definition, process, eg and best practices. (8M)

Process

(1) Determining the need :-

It involves assessing internal organisational needs and combination of services and resources required. They provide valuable, integrated, fully customized utility computing solutions and resources as per the client's need.

(2) Evaluating the service provider claim :-

It is essential to determine whether their services will empower users to be more effective in accomplishing their goals in time. Understanding which tasks will be supported and what level of resources will be provided is essential.

(3) Access the health effect of computer resources

It is critical to deploy resource monitoring tools that look after its security and dynamic resource configuration requirements, monitoring a utility computing resource involves identifying failures in network, storage and application resources.

④

Identifying resource provisioning requirements
It involves analysing service provider's capability to customize and configure resources to meet customer needs and establishing a load balance without overprovisioning or under-provisioning resources.

⑤

Map out a time frame :-

The final step for architecturing a utility computing solution involves mapping out the schedule i identifying when the specific resource might be needed and for how much time .

Q2

Discuss different types of cloud and different types of services in cloud .

- definition of cloud computing
- 4 types of cloud → public, private, hybrid, community with diagram with
- IaaS, PaaS, SaaS eg. explain

SaaS

→ software as a service

①

Offers on demand pay per use service of application software to the user ② It is platform independent and one doesn't need installation of software in PC.

③

It runs a single instance of software which makes it available for multiple end users .

④

It's quite cheap and its services are

managed by vendor.

This service can be accessed via web browser.

Eg :- google drive

PaaS → Platform as a Service

(1) It is made up of programming language execution environment, operating system, web browser and database.

(2) It provides user and environment where they can build, compile and run their program without underlying infrastructure.

(3) User manages data and application resources. Other resources are managed by vendor.

(4) used by developers.

[Eg] → AWS, force.com

IaaS → Infrastructure as a Service

(1) This service offers computing architecture & infrastructure but in virtual environment so multiple user can access it.

(2) Vendors are responsible for data storage.

(3) Virtualisation, servers and networking users are responsible for handling resources such as applications, data, runtime and middleware.

[Eg] → Amazon EC2

Assignment

- Q1 Discuss architecture of open stack . list various components of open stack.
- Q2 How object storage and block storage is used to store information in cloud ?
- Q3.

Accessing the role of Open standard

- * They provide various benefits to the organisation
 - 1) increased choice :- it gives customer freedom to choose products that work best with tools and work in environment.
 - 2) Reduced cost :- it lower cost by reducing complexity and number of tools required to support environment.
 - 3) improved interoperability :- it enables integration which derive greater business agility and responsiveness.

Discuss Container, Load Balancing and Virtualisation

Load balancing is the process of redistribution of workload in distributed system ensuring

the computing machine is overloaded, underloaded or ideal. It reduces cost associated with document management system and maximise availability of resources.

Virtualisation refers to the process of making a virtual version of hardware or software, virtual servers, infrastructure, devices and computing resources.

Consulation is that when multiple servers are allotted with the help of load balancer to divide working capacity of cloud storage which allot to guest is VMware and by this division workflow continues in free manner

Features of Cloud Computing

- ① Resource pooling
- ② On demand self service
- ③ Easy maintenance
- ④ Large network access
- ⑤ Availability
- ⑥ Automatic system
- ⑦ Economical
- ⑧ Security
- ⑨ Pay as you go
- ⑩ Measured services

Q

Who are cloud consumers in cloud ecosystem?

Ans

Cloud consumer is an organization 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 a way to compose and share parts of cloud application.

Eg:- AWS Lambda, Microsoft Azure functions, Google cloud functions.

Coupling dual booting Vs Virtualisation

Para Virtualisation (little bit changes in guest OS)

Guest OS and Host OS

computation ↑

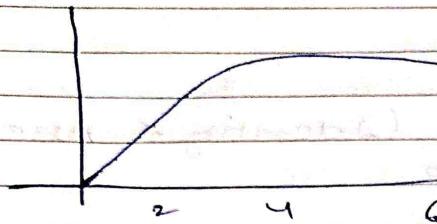
Type 1 virtualisation (bare metal) → more resources ↓

Type 2 virtualisation (with host OS) NO host OS

~~virtual
machines
images~~

all can save the state of OS and then shift to storage device and then using virtualisation for better electricity consumption

Green Cloud → cloud multi



Benefits of virtualisation

- Better utilisation of underlying resource
- More electricity save

Amazon Machine Image (AMI)

- Latency (time to get response)
- Less latency more response

Region of virtual image is a key interest as it depends on speed of its generation.

EC2 instances

Services → Application, game, computing, proxy
Mail, Media etc.

- Auto scaling feature
vertical scaling and horizontal scaling
(1 app in 1 computer) (1 app in 4 computers)

A load balancing
we don't require extra hardware it
does load balancing by its own.

Virtual machine → IP address it have

Virtual private cloud

steps

- (1) AMI
- (2) Instance type
- (3) Network setting → IAM (Identity & Access Management)
keystone in Openstack

Q

Ans what are cloud enabling technologies?

Cloud enabling technology 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 and gas, building and construction, transport, communication etc.

Q

Discuss limitations of cloud computing?

Q

How does resource replication takes place in cloud computing?

Ans.

Cloud replicates the data and stores them strategically on multiple servers located at various geographical locations. Replication ensures consistency, improves availability and reliability by creating multiple copies of some data on different storage devices & geographical locations.

Q Ans. what is on demand functionality?
 On demand functionality 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

- 1) uptime
- 2) loss of data
- 3) Data storage
- 4) compliance
- 5) business continuity
- 6) Data integrity in cloud computing

Q what are different cloud computing databases?
Ans. AWS, Oracle database, microsoft azure, google cloud platform, IBM DB2, MongoDB Atlas, 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 serve the model shifts to which mode?

Ans It shifts to SaaS model. This is often because Microsoft or Window Azure platform is best represented as presently using SaaS model.

Q What is the difference b/w cloud & traditional datacenters? How does cloud computing differs from internet.

Ans

Traditional
datacenters

Cloud

Location on premises,
physically accessible

Virtualised and
remote H/W

Management Internally,
business responsibility

Outsourced to
third party
provider

Administration In house IT
professional

Employee of
service provider

Pricing Business pays
directly for
planning people
hardware &
software

Business pays
per use by
resource provider