

1. What is cloud computing?

Cloud computing is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. Rather than keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it. Cloud computing is a popular option for people and businesses for a number of reasons including cost savings, increased productivity, speed and efficiency, performance, and security.

2. NIST definition of Cloud Computing

According to the official NIST definition, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

The NIST definition lists five essential characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service. It also lists three "service models" (software, platform and infrastructure), and four "deployment models" (private, community, public and hybrid) that together categorize ways to deliver cloud services. The definition is intended to serve as a means for broad comparisons of cloud services and deployment strategies, and to provide a baseline for discussion from what is cloud computing to how to best use cloud computing.

3. Explain On-demand self-service?

On-demand self-service means that a consumer can request and receive access to a service offering, without an administrator or some sort of support staff having to fulfill the request manually. The request processes and fulfillment processes are all automated. This offers advantages for both the provider and the consumer of the service.

Implementing user self-service allows customers to quickly procure and access the services they want. This is a very attractive feature of the cloud. It makes getting the resources you need very quick and easy. With traditional environments, requests often took days or weeks to be fulfilled, causing delays in projects and initiatives. You don't have to worry about that in cloud environments.

User self-service also reduces the administrative burden on the provider. Administrators are freed from the day-to-day activities around creating users and managing user requests. This allows an organization's IT staff to focus on other, hopefully more strategic, activities.

4. Explain Resource pooling?

Resource pooling is an IT term used in cloud computing environments to describe a situation in which providers serve multiple clients, customers or "tenants" with provisional and scalable

services. These services can be adjusted to suit each client's needs without any changes being apparent to the client or end user.

The idea behind resource pooling is that through modern scalable systems involved in cloud computing and software as a service (SaaS), providers can create a sense of infinite or immediately available resources by controlling resource adjustments at a meta level. This allows customers to change their levels of service at will without being subject to any of the limitations of physical or virtual resources.

The kinds of services that can apply to a resource pooling strategy include data storage services, processing services and bandwidth provided services. Other related terms include rapid elasticity, which also involves the dynamic provisioning of services, and on-demand self-service, where customers could change their levels of service without actually contacting a service provider. All of this automated service provisioning is a lot like other kinds of business process automation, which replaced more traditional, labor-intensive strategies with new innovations that rely on increasingly powerful virtual networks and data handling resources. In these cases, the goal is to separate the client experience from the actual administration of assets, so that the process of delivery is opaque and the services seem to be automatically and infinitely available.

5. Explain Rapid elasticity?

Rapid elasticity is a cloud computing term for scalable provisioning, or the ability to provide scalable services. Experts point to this kind of scalable model as one of five fundamental aspects of cloud computing.

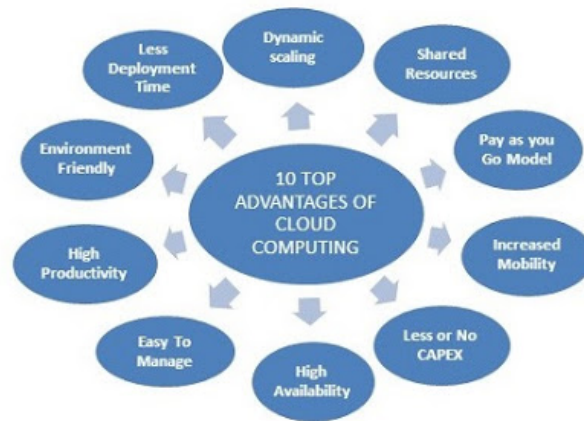
Rapid elasticity allows users to automatically request additional space in the cloud or other types of services. Because of the setup of cloud computing services, provisioning can be seamless for the client or user. The fact that providers still need to allocate and de-allocate resources is often irrelevant on the client or user's side. This is a very essential aspect of cloud technology. In a sense, cloud computing resources appear to be infinite or automatically available. That's much different from older systems, where the limits of storage or memory were immediately visible to a user.

6. What do you mean by Measured service?

Measured service is a term that IT professionals apply to cloud computing. This is a reference to services where the cloud provider measures or monitors the provision of services for various reasons, including billing, effective use of resources, or overall predictive planning.

The idea of measured service is one of five components of a definition of cloud computing supported by the National Institute of Standards and Technology or NIST. These five principles support a higher-level definition of cloud services and describe how they are typically designed. Other aspects of this definition include the terms 'rapid elasticity' and 'resource pooling,' which cover different kinds of resource allocation. There's also 'on-demand self-service,' which refers to more automated service changes, and 'broad network access,' which refers to the overall footprint and capabilities of cloud systems.

7. What are the benefits of cloud computing?



12 Benefits of Cloud Computing:

1. Cost Savings

Once you're on the cloud, easy access to your company's data will save time and money in project startups. And, for those who are worried that they'll end up paying for features that they neither need nor want, most cloud-computing services are pay as you go. This means that if you don't take advantage of what the cloud has to offer, then at least you won't have to be dropping money on it.

The pay-as-you-go system also applies to the data storage space needed to service your stakeholders and clients, which means that you'll get exactly as much space as you need, and not be charged for any space that you don't. Taken together, these factors result in lower costs and higher returns. Half of all CIOs and IT leaders surveyed by Bitglass reported cost savings in 2015 as a result of using cloud-based applications.

2. Security

For one thing, a cloud host's full-time job is to carefully monitor security, which is significantly more efficient than a conventional in-house system, where an organisation must divide its efforts between a myriad of IT concerns, with security being only one of them. And while most businesses don't like to openly consider the possibility of internal data theft, the truth is that a staggeringly high percentage of data thefts occur internally and are perpetrated by employees. When this is the case, it can actually be much safer to keep sensitive information offsite. Of course, this is all very abstract, so let's consider some solid statistics.

3. Flexibility

The cloud offers businesses more flexibility overall versus hosting on a local server. And, if you need extra bandwidth, a cloud-based service can meet that demand instantly, rather than undergoing a complex (and expensive) update to your IT infrastructure. This improved freedom and flexibility can make a significant difference to the overall efficiency of your organisation. A

65% majority of respondents to an InformationWeek survey said “the ability to quickly meet business demands” was one of the most important reasons a business should move to a cloud environment.

4. Mobility

Cloud computing allows mobile access to corporate data via smartphones and devices, which, considering over 2.6 billion smartphones are being used globally today, is a great way to ensure that no one is ever left out of the loop. Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up to date with clients and co-worker.

5. Insight

As we move ever further into the digital age, it's becoming clearer and clearer that the old adage “knowledge is power” has taken on the more modern and accurate form: “Data is money.” Hidden within the millions of bits of data that surround your customer transactions and business process are nuggets of invaluable, actionable information just waiting to be identified and acted upon. Of course, sifting through that data to find these kernels can be very difficult, unless you have access to the right cloud-computing solution.

Many cloud-based storage solutions offer integrated cloud analytics for a bird's-eye view of your data. With your information stored in the cloud, you can easily implement tracking mechanisms and build customised reports to analyse information organisation wide. From those insights, you can increase efficiencies and build action plans to meet organisational goals. For example, the beverage company Sunny Delight was able to increase profits by about \$2 million a year and cut \$195,000 in staffing costs through cloud-based business insights.

6. Increased Collaboration

If your business has two employees or more, then you should be making collaboration a top priority. After all, there isn't much point to having a team if it is unable to work like a team. Cloud computing makes collaboration a simple process. Team members can view and share information easily and securely across a cloud-based platform. Some cloud-based services even provide collaborative social spaces to connect employees across your organisation, therefore increasing interest and engagement. Collaboration may be possible without a cloud-computing solution, but it will never be as easy, nor as effective.

7. Quality Control

There are few things as detrimental to the success of a business as poor quality and inconsistent reporting. In a cloud-based system, all documents are stored in one place and in a single format. With everyone accessing the same information, you can maintain consistency in data, avoid human error, and have a clear record of any revisions or updates. Conversely, managing information in silos can lead to employees accidentally saving different versions of documents, which leads to confusion and diluted data.

8. Disaster Recovery

One of the factors that contributes to the success of a business is control. Unfortunately, no matter how in control your organisation may be when it comes to its own processes, there will always be things that are completely out of your control, and in today's market, even a small amount of unproductive downtime can have a resoundingly negative effect. Downtime in your services leads to lost productivity, revenue, and brand reputation.

But while there may be no way for you to prevent or even anticipate the disasters that could potentially harm your organisation, there is something you can do to help speed your recovery. Cloud-based services provide quick data recovery for all kinds of emergency scenarios, from natural disasters to power outages. While 20% of cloud users claim disaster recovery in four hours or less, only 9% of non-cloud users could claim the same. In a recent survey, 43% of IT executives said they plan to invest in or improve cloud-based disaster recovery solutions.

9. Loss Prevention

If your organisation isn't investing in a cloud-computing solution, then all of your valuable data is inseparably tied to the office computers it resides in. This may not seem like a problem, but the reality is that if your local hardware experiences a problem, you might end up permanently losing your data. This is a more common problem than you might realise computers can malfunction for many reasons, from viral infections, to age-related hardware deterioration, to simple user error. Or, despite the best of intentions, they can be misplaced or stolen (over 10,000 laptops are reported lost every week at major airports).

If you aren't on the cloud, you're at risk of losing all the information you had saved locally. With a cloud-based server, however, all the information you've uploaded to the cloud remains safe and easily accessible from any computer with an internet connection, even if the computer you regularly use isn't working.

10. Automatic Software Updates

For those who have a lot to get done, there isn't anything more irritating than having to wait for system updates to be installed. Cloud-based applications automatically refresh and update themselves, instead of forcing an IT department to perform a manual organisation wide update. This saves valuable IT staff time and money spent on outside IT consultation. PCWorld lists that 50% of cloud adopters cited requiring fewer internal IT resources as a cloud benefit.

11. Competitive Edge

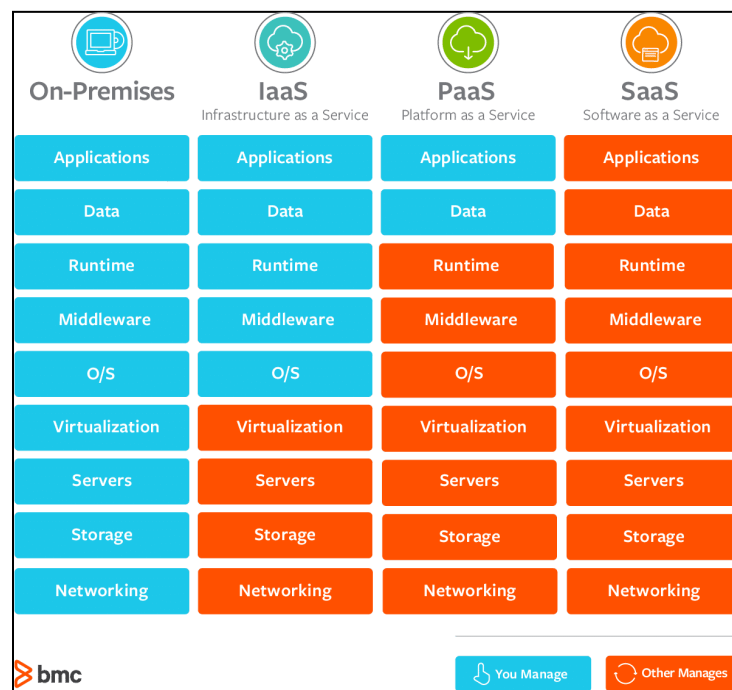
While cloud computing is increasing in popularity, there are still those who prefer to keep everything local. That's their choice, but doing so places them at a distinct disadvantage when competing with those who have the benefits of the cloud at their fingertips. If you implement a cloud-based solution before your competitors, you'll be further along the learning curve by the time they catch up. A recent Verizon study showed that 77% of businesses feel cloud technology gives them a competitive advantage, and 16% believe this advantage is significant.

12. Sustainability

Given the current state of the environment, it's no longer enough for organisations to place a recycling bin in the breakroom and claim that they're doing their part to help the planet. Real sustainability requires solutions that address wastefulness at every level of a business. Hosting on the cloud is more environmentally friendly and results in less of a carbon footprint.

Cloud infrastructures support environmental proactivity, powering virtual services rather than physical products and hardware, and cutting down on paper waste, improving energy efficiency, and (given that it allows employees access from anywhere with an internet connection) reducing commuter-related emissions. A Pike Research report predicted data centre energy consumption will drop by 31% from 2010 to 2020 based on the adoption of cloud computing and other virtual data options.

8. Types of Services.



1. IaaS (Infrastructure as Service)

This is the most common service model of cloud computing as it offers the fundamental infrastructure of virtual servers, network, operating systems and data storage drives. It allows for the flexibility, reliability and scalability that many businesses seek with the cloud, and removes the need for hardware in the office. This makes it ideal for small and medium sized organisations looking for a cost-effective IT solution to support business growth. IaaS is a fully outsourced pay-for-use service and is available as a public, private or hybrid infrastructure.

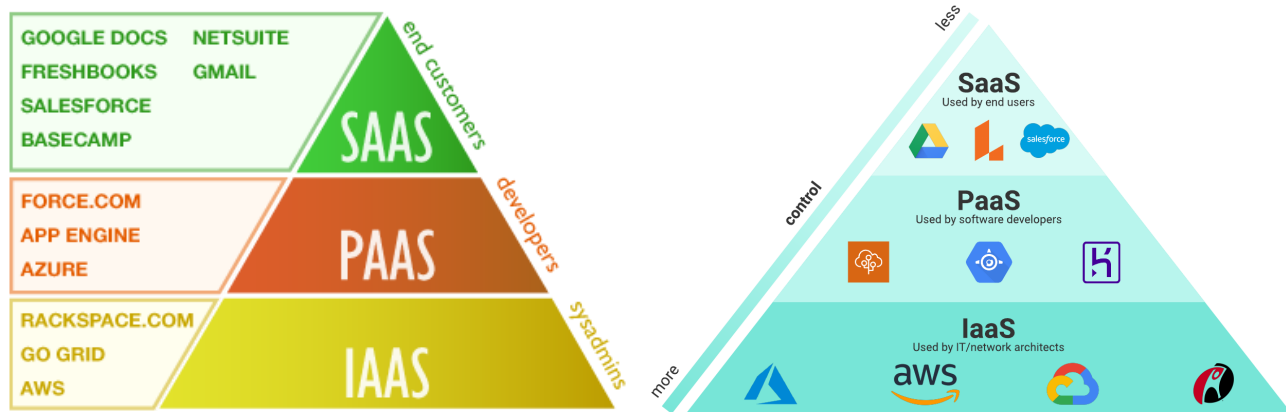
2. PaaS (Platform-as-a-Service)

This is where cloud computing providers deploy the infrastructure and software framework, but businesses can develop and run their own applications. Web applications can be created quickly and easily via PaaS, and the service is flexible and robust enough to support them. PaaS solutions are scalable and ideal for business environments where multiple developers are working on a single project. It is also handy for situations where an existing data source (such as CRM tool) needs to be leveraged.

3. SaaS (Software as a Service)

This cloud computing solution involves the deployment of software over the internet to various businesses who pay via subscription or a pay-per-use model. It is a valuable tool for CRM and for applications that need a lot of web or mobile access – such as mobile sales management software. SaaS is managed from a central location so businesses don't have to worry about maintaining it themselves, and is ideal for short-term projects.

9. Example of each type of service.

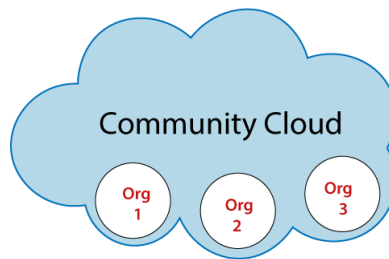


Examples of SaaS, PaaS, and IaaS

1. SaaS examples: BigCommerce, Google Apps, Salesforce, Dropbox, MailChimp, ZenDesk, DocuSign, Slack, Hubspot.
2. PaaS examples: AWS Elastic Beanstalk, Heroku, Windows Azure (mostly used as PaaS), Force.com, OpenShift, Apache Stratos, Magento Commerce Cloud.
3. IaaS examples: AWS EC2, Rackspace, Google Compute Engine (GCE), Digital Ocean, Magento 1 Enterprise Edition*.

10. What is a Community cloud?

Community cloud is a cloud infrastructure that allows systems and services to be accessible by a group of several organizations to share the information. It is owned, managed, and operated by one or more organizations in the community, a third party, or a combination of them.



Example: Our government organization within India may share computing infrastructure in the cloud to manage data.

Advantages of Community Cloud

1. Cost effective: Community cloud is cost effective because the whole cloud is shared between several organizations or a community.
2. Flexible and Scalable: The community cloud is flexible and scalable because it is compatible with every user. It allows the users to modify the documents as per their needs and requirements.
3. Security: Community cloud is more secure than the public cloud but less secure than the private cloud.
4. Sharing infrastructure: Community cloud allows us to share cloud resources, infrastructure, and other capabilities among various organizations.

Disadvantages of Community Cloud

Community cloud is not a good choice for every organization.

1. Slow adoption to data
2. The fixed amount of data storage and bandwidth is shared among all community members.
3. Community Cloud is more costly than the public cloud.
4. Sharing responsibilities among organizations is difficult.

11. What are the different data types used in cloud computing?

The various cloud data types include –

- emails,
- text,
- Boolean,
- decimal,
- locale,
- number,
- date,

- images,
- contracts, etc.

12. Which are the different layers that define cloud architecture?

Cloud computing working on the virtualization and dynamic allocation of resources.

Architecturally, Cloud can be divided as 4 layers:

Physical layer: Contains physical servers, network etc

Infrastructure layer: Virtualized servers, networking and storage resources. Infrastructure as a Service is the hosted delivery of infrastructure services such as servers, networks and other hardware to consumers. IaaS provides consumers access to on-demand, scalable storage and compute power.

Platform layer: which contains components or services like Windows Azure, Google App Engine. A platform for development, deployment. Platform as a Service offers a complete platform and the tools to develop and deploy applications on the platform.

Application Layer: This is the layer end users interact with. This contains software which are delivered as service like Gmail, Salesforce, dropbox etc. Software as a Service is the hosted delivery of Software that consumers can access over the internet. Two features of a SaaS application are scalability and configurability. SaaS applications should be able to quickly scale with demand. In mature SaaS applications, the customer should be able to customize their instance of the software using meta-data.

13. Which platforms are used for large scale cloud computing?

Apache Hadoop and MapReduce are the platforms used for large scale cloud computing.

14. What are the different layers in cloud computing? Explain working with them.

There are 3 layers in the hierarchy of cloud computing.

Infrastructure as a service (IaaS): It provides cloud infrastructure in terms of hardware such as memory, processor, speed etc.

Platform as a service (PaaS): It provides a cloud application platform for the developer.

Software as a service (SaaS): It provides the cloud applications to users directly without installing anything on the system. These applications remain on cloud.

15. What do you mean by software as a service?

Software as a service (or SaaS) is a way of delivering applications over the Internet—as a service. Instead of installing and maintaining software, you simply access it via the Internet, freeing yourself from complex software and hardware management.

SaaS applications are sometimes called Web-based software, on-demand software, or hosted software. Whatever the name, SaaS applications run on a SaaS provider's servers. The provider manages access to the application, including security, availability, and performance.

Software As a Service (SaaS) is an important layer of cloud computing. It provides cloud applications like Google is doing. It facilitates users to save their document on the cloud and create as well.

16. What is the platform as a service?

It is also a layer in cloud architecture. This model is built on the infrastructure model and provides resources like computers, storage and network. It is responsible for providing complete virtualization of the infrastructure layer, making it look like a single server and invisible to the outside world.

17. What is on-demand functionality? How is it provided in cloud computing?

Cloud computing provides on-demand access to the virtualized IT resources. It can be used by the subscriber. It uses a shared pool to provide configurable resources. Shared pool contains networks, servers, storage, applications and services.

18. What are the platforms used for large scale cloud computing?

The following platforms are used for large scale cloud computing:

- Apache Hadoop
- MapReduce

Some of the huge vendors are GCP, AWS, Azure that are main cloud computing providers.

19. What are the different models for deployment in cloud computing?

These are the different deployment model in cloud computing:

- Private cloud
- Public cloud
- Hybrid cloud
- Community cloud - Community cloud is a cloud infrastructure that allows systems and services to be accessible by a group of several organizations to share the information. It is owned, managed, and operated by one or more organizations in the community, a third party, or a combination of them.

20. What is private cloud?

Private clouds are used to keep the strategic operations and other reasons secure. It is a complete platform which is fully functional and can be owned, operated and restricted to only an organization or an industry. Now a day, most of the organizations have moved to private clouds due to security concerns. Virtual private cloud is being used that operate by a hosting company.

Private cloud is also known as an internal cloud or corporate cloud.

Private cloud provides computing services to a private internal network (within the organization) and selected users instead of the general public.

Private cloud provides a high level of security and privacy to data through firewalls and internal hosting. It also ensures that operational and sensitive data are not accessible to third-party providers.

HP Data Centers, Microsoft, Elastra-private cloud, and Ubuntu are the example of a private cloud.

21. What is public cloud?

A public cloud is a type of computing in which a service provider makes resources available to the public via the internet. Resources vary by provider but may include storage capabilities, applications or virtual machines. Public cloud allows for scalability and resource sharing that would not otherwise be possible for a single organization to achieve.

Some public cloud providers offer resources for free, while clients pay for other resources by subscription or a pay-per-usage model. Cloud services are available to individual users, as well, and prices scale depending on the user's resource needs. Organizations with huge amounts of data need to develop a cloud migration strategy before choosing a cloud vendor.

22. What are Hybrid clouds?

Hybrid cloud is a solution that combines a private cloud with one or more public cloud services, with proprietary software enabling communication between each distinct service. A hybrid cloud strategy provides businesses with greater flexibility by moving workloads between cloud solutions as needs and costs fluctuate.

Hybrid cloud services are powerful because they give businesses greater control over their private data. An organization can store sensitive data on a private cloud or local data center and simultaneously leverage the robust computational resources of a managed public cloud. A hybrid cloud relies on a single plane of management, unlike a multi-cloud strategy wherein admins must manage each cloud environment separately.

23. What is the difference between cloud computing and mobile computing?

Cloud computing uses distributed networks to process data, while computing for mobiles involves using new devices and interfaces to access smartphones and tablets. Mobile computing is consumer-facing while cloud computing is business-facing. Mobile computing may use a cloud behind the scenes, but it could also use legacy systems (including mainframes) behind the scenes.

24. What is the difference between scalability and elasticity?

	Cloud Elasticity	Cloud Scalability
1	Elasticity is used just to meet the sudden up and down in the workload for a small period of time.	Scalability is used to meet the static increase in the workload.
2	Elasticity is used to meet dynamic changes, where the resources need can increase or decrease.	Scalability is always used to address the increase in workload in an organization.
3	Elasticity is commonly used by small companies whose workload and demand increases only for a specific period of time.	Scalability is used by giant companies whose customer circle persistently grows in order to do the operations efficiently.

4	It is a short term planning and adopted just to deal with an unexpected increase in demand or seasonal demands.	Scalability is a long term planning and adopted just to deal with an expected increase in demand.
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25. What are the security benefits of cloud computing?

1. Protection against DDoS. Distributed denial of service attacks are on the rise, and a top cloud computing security solution focuses on measures to stop huge amounts of traffic aimed at a company's cloud servers. This entails monitoring, absorbing and dispersing DDoS attacks to minimize risk.
2. Data security. In the ever-increasing era of data breaches, a top cloud computing security solution has security protocols in place to protect sensitive information and transactions. This prevents a third party from eavesdropping or tampering with data being transmitted.
3. Regulatory compliance. Top cloud computing security solutions help companies in regulated industries by managing and maintaining enhanced infrastructures for compliance and to protect personal and financial data.
4. Flexibility. A cloud computing solution provides you with the security you need whether you're turning up or down capacity. You have the flexibility to avoid server crashes during high traffic periods by scaling up your cloud solution. Then when the high traffic is over, you can scale back down to reduce costs.
5. High availability and support. A best-practices cloud computing security solution offers constant support for a company's assets. This includes live monitoring 24 hours a day, 7 days a week, and every day of the year. Redundancies are built-in to ensure your company's website and applications are always online.

26. What is the usage of utility computing?

The term utility is basically the utility services like water, telephone, electricity, and gas that are provided by any utility company. In a similar manner, the customer when receives utility computing, its computing power on the shared computer network bills is decided on the basis of the consumption which is measured.

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27. Explain System integrators in cloud computing.

An SI or Systems Integrator is an individual or a business that creates computing systems by combining software and hardware components taken from multiple vendors for their clients. In cloud computing, a cloud integrator works like an SI. This is a product or a service that helps their client to negotiate the difficulties of cloud migration. It is also called Integration as a Service. Most organizations of today employ a hybrid cloud model which could be complicated to navigate. This is where cloud computing system integrators would help. They also offer easy and quick deployment and self-provisioning, without needing any coding from the user.

28. What are the open source cloud computing platform databases?

Cloud computing platform has various databases that are in support. The open source databases that are developed to support it is as follows:

- **MongoDB:** is an open source database system which is schema free and document oriented database. It is written in C++ and provides tables and high storage space.
- **CouchDB:** is an open source database system based on Apache server and used to store the data efficiently
- **LucidDB:** is the database made in Java/C++ for data warehousing. It provides features and functionalities to maintain data warehouse.

29. Give some example of large cloud provider and databases?

1. Amazon Web Services

Amazon offers a wide array of cloud database services, which includes NoSQL as well as relational databases. Amazon RDS – Relational Database Service runs on either Oracle, SQL, or MySQL server instances whereas Amazon SimpleDB is primarily a schema-less database that is meant to handle smaller workloads. Amazon DynamoDB falls on the NoSQL databases, which is a Solid State Drive – SSD - that is capable of automatically replicating workloads across three different availability zones. According to AWS CTO Werner Vogels, DynamoDB is the fastest growing database service in the history of AWS. Furthermore, Amazon offers supplementary data-management services such as Redshift – a data warehouse and Data Pipeline – a data integrating service for easier data management.

2. SAP

SAP, the giant in offering enterprise software, now offers a cloud database platform called HANA for complementing the on-premise database-related tools of an organization. One of the major database tools complemented by SAP HANA includes Sybase, and this tool is available in the AWS cloud.

3. EnterpriseDB

Although EnterpriseDB was designed to focus on open-source PostgreSQL databases, its true claim-to-fame was its capability to work on Oracle database applications. The Postgres Plus, Advanced Server of EnterpriseDB, enables businesses to use applications that are designed for Oracle on-premise databases, which run in the cloud from HP and AWS. It comprises scheduled backups as well as binary replications.

30. What is the difference between cloud and traditional datacenters?

	Traditional Data Center	Cloud Data Center (CDC)
Location	On-premises, physically accessible	Virtualized, remote hardware
Management	Internal, business's responsibility	Outsourced to third-party provider
Administration	In-house IT professionals	Employees of the service provider
Reliability	Co-location makes failures dependent, onus is on the business for downtime and repairs	Provider is trusted to meet its promises of availability and reliability

Pricing	Business pays directly for planning, people, hardware, software, and environment	Business pays per use, by resources provisioned
Scalability	Possible, but involves challenges and delay	Completely, instantly scalable

31. What are the differences in Software as a Service (SaaS)?

Software as a service :

Software as a service (SaaS) is a software distribution model in which a cloud provider hosts applications and makes them available to end users over the internet. In this model, an independent software vendor (ISV) may contract a third-party cloud provider to host the application. Or, with larger companies, such as Microsoft, the cloud provider might also be the software vendor.

Examples: Google Apps, Dropbox, Salesforce, Slack.

Different Modes in SAAS

- **Simple multi-tenancy:** In this setup, each client gets its own resources. These resources are not shared with other clients. It is a more secure option, since there is no sharing of resources. But it is an inefficient option, since for each client more money is needed to scale it with the rising demands. Also it takes time to scale up the application in this mode.
- **Fine grain multi-tenancy:** In this mode, the feature provided to each client is the same. The resources are shared among multiple clients. It is an efficient mode of cloud service, in which data is kept private among different clients but computing resources are shared. Also it is easier and quicker to scale up the SaaS implementation for different clients.

32. Why API's is used in cloud services?

Continued adoption of cloud computing and growth of cloud hosting services has encouraged system administrators to look for additional ways to integrate with cloud models. Cloud computing is witnessing some direct use scenarios that require higher levels of customization. The environment of Cloud Application Programming Interface (API) owes its existence to the ability of enhancing cloud experience and a greater level of compatibility across different clouds.

A cloud API is a type of Application Programming Interface that facilitates development of services as well as applications for provisioning cloud platforms, hardware, and software. It acts as a service gateway to enable indirect and direct cloud software and infrastructure services to cloud users.

33. What are the advantages of cloud services?

- Usability and accessibility.
- Security.
- Cost-efficient.
- Convenient sharing of files.
- Automation.
- Multiple users.
- Synchronization.
- Convenience.

34. What are the different data centers in cloud computing?

A data center is a physical facility that enterprises use to house their business-critical applications and information. As they evolve from centralized on-premises facilities to edge deployments to public cloud services, it's important to think long-term about how to maintain their reliability and security.

Data centers are often referred to as a singular thing, but in actuality they are composed of a number of technical elements. These can be broken down into three categories:

- Compute: The memory and processing power to run the applications, generally provided by high-end servers
- Storage: Important enterprise data is generally housed in a data center, on media ranging from tape to solid-state drives, with multiple backups
- Networking: Interconnections between data center components and to the outside world, including routers, switches, application-delivery controllers, and more

These are the components that IT needs to store and manage the most critical resources that are vital to the continuous operations of an organization.

Types of data centers :

Hyperscale Data Center

A Hyperscale (or Enterprise Hyperscale) data center is a facility owned and operated by the company it supports. This includes companies such as AWS, Microsoft, Google, and Apple. They offer robust, scalable applications and storage portfolio of services to individuals or businesses.

Colocation Data Center

Colocation Data Centers consist of one data center owner selling space, power and cooling to multiple enterprise and hyperscale customers in a specific location. Interconnection is a large driver for businesses. Colocation data centers offer interconnection to Software as a Service (SaaS) such as Salesforce, or Platform as a service (PaaS) like Azure. This enables businesses to scale and grow their business with minimum complexity at a low cost.

Wholesale Colocation Data Center

Wholesale colocation data centers consist of one owner selling space, power and cooling to enterprise and hyperscale like standard colocation. In these instances Interconnection is not really a requirement. These facilities are used by hyperscale or large companies to hold their IT infrastructure.

Enterprise Data Center

An enterprise data center is a facility owned and operated by the company it supports and is often built on site but can be off site in certain cases also. May have certain sections of the data center caged off to separate different sections of the business.

Telecom Data Center

A telecom data center is a facility owned and operated by a Telecommunications or Service Provider company such as BT, AT&T or Verizon. These types of data centers require very high connectivity and are mainly responsible for driving content delivery, mobile services, and cloud services.

35. What are the basic clouds in cloud computing?

There are four types of basic clouds in cloud computing:

1. Public cloud
2. Private cloud
3. Hybrid cloud
4. Community cloud

36. What are the most essential things that must be followed before going for a cloud computing platform?

Following are the essential things one should consider before going for any cloud computing platform

1.Adaptability : How will cloud solutions cater to your heterogeneous needs, will it be adaptable ?

2.Security : Of course, security is always an aspect to consider when talking about cloud computing. Service providers promise that they can be more secure than physical data centers. Protection of expertise and assets is a key requirement.

3.Integration : Typical applications rely on data from other applications. The worst case would be to have separate data pools with unsynchronized content, which can lead to redundancy and inconsistency across applications. So integration of your application and its dependency with compatibility is to be thought of thoroughly.

4.Migration : The aspect of integration leads us to the next point: migration. What do you do, if your cloud provider goes out of business? Are you able to migrate your valuable business data to another platform or have you locked-in a particular vendor? These questions should be asked before the decision for a particular provider is made.

5.Scalability: Does your cloud service fulfill your needs regarding scalability?
The model that you are using is scalable or not.

37. How does virtualization work in cloud computing?

Virtualization is the "creation of a virtual (rather than actual) version of something, such as a server, a desktop, a storage device, an operating system or network resources". In other words, Virtualization is a technique, which allows the sharing of a single physical instance of a resource or an application among multiple customers and organizations. It does this by assigning a logical name to a physical storage and providing a pointer to that physical resource when demanded.

Types of Virtualization :

- **Hardware Virtualization.** (When virtual machine directly installed on the hardware)
- **Operating system Virtualization.**(When virtual machine directly installed on the OS)
- **Server Virtualization.**(When virtual machine directly installed on the Server)
- **Storage Virtualization.** Storage virtualization is the process of grouping the physical storage from multiple network storage devices so that it looks like a single storage device.

38. What is a Hypervisor?

A hypervisor, also known as a virtual machine monitor or VMM, is software that creates and runs virtual machines (VMs). A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, such as memory and processing.

Why to use it

Hypervisors make it possible to use more of a system's available resources and provide greater IT mobility since the guest VMs are independent of the host hardware. This means they can be easily moved between different servers. Because multiple virtual machines can run off of one physical server with a hypervisor, a hypervisor reduces:

- Space
- Energy
- Maintenance requirements

39. What is a Bare metal hypervisor?

When a hypervisor is installed directly on the hardware of a physical machine, between the hardware and the operating system (OS), it is called a bare metal hypervisor. Because the bare metal hypervisor separates the OS from the underlying hardware, the software no longer relies on or is limited to specific hardware devices or drivers. This means bare metal hypervisors allow operating systems and their associated applications to run on a variety of types of hardware. They also allow multiple operating systems and virtual machines (guest machines) to reside on the same physical server (host machine).

40. Explain installation of VMware for installing Linux OS on windows?

Installation of VMware : https://www.vmware.com/support/ws5/doc/ws_install_winhost.html

Installing Linux Os on VMware :

<https://www.makeuseof.com/tag/install-linux-windows-vmware-virtual-machine/>

41. What are the different types of virtualisation?

ANS: Virtualization is the creation of virtual servers, infrastructures, devices and computing resources.

TYPES:

1. Network virtualization: Network virtualization in cloud computing is a method of combining the available resources in a network by splitting up the available bandwidth into different channels, each being separate and distinguished.
2. Storage Virtualizing: Using this technique gives the user an ability to pool the hardware storage space from several interconnected storage devices into a simulated single storage device that is managed from one single command console.
3. Server Virtualization: This technique is the masking of server resources. It also makes a lot of resources available for sharing and utilizing, while maintaining the capacity to expand them when needed.
4. Data Virtualization : This kind of cloud computing virtualization technique is abstracting the technical details usually used in data management, such as location, performance or format, in favor of broader access and more resiliency that are directly related to business needs.
5. Desktop Virtualizing: As compared to other types of virtualization in cloud computing, this model enables you to emulate a workstation load, rather than a server. This allows the user to access the desktop remotely.
6. Application Virtualization: Software virtualization in cloud computing abstracts the application layer, separating it from the operating system.

42. Explain Hardware virtualisation?

Ans: Hardware virtualization : It is the abstraction of computing resources from the software that uses cloud resources. It involves embedding virtual machine software into the server's hardware components. That software is called the hypervisor. The hypervisor manages the shared physical hardware resources between the guest OS & the host OS.

43. Explain OS virtualisation?

- Operating system virtualizations includes a modified form than a normal operating system so that different users can operate its end use different applications. This whole process shall perform on a single computer at a time.
- In OS virtualizations, the virtual eyes environment accepts command from any of the user operating it and performs different task on the same machine by running different applications.

44. Explain server virtualisation?

Server virtualization is the process of dividing a physical server into multiple unique and isolated virtual servers by means of a software application. Each virtual server can run its own operating systems independently.

45. Explain storage virtualisation?

Storage virtualization is the pooling of physical storage from multiple storage devices into what appears to be a single storage device -- or pool of available storage capacity -- that is managed from a central console. The technology relies on software to identify available storage capacity from physical devices and then aggregate that capacity as a pool of storage that can be used by traditional architecture servers or in a virtual environment by virtual machines

46. What is a Virtual machine manager?

Virtual Machine Manager (VMM): Also called a “hypervisor,” this is one of many hardware virtualization techniques that allow multiple operating systems, termed guests, to run concurrently on a host computer.

47. What is the usage of virtualization platform in implementing cloud?

Virtualization is the foundation of cloud computing. It enables creation of an intelligent layer of abstraction to hide the intricacies of the software or hardware that is underlying beneath the layer.

Virtualization is used for deployment of models of cloud hosting services including Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) among others.

Following are the three Important Attributes of Virtualization that Signify its Role in Cloud Computing:

- Partitioning can be used for supporting a multitude of operating systems and applications within a single physical system such as a web server.

- Isolation imparts protection to virtual machines from any events such as virus attacks or crashes in other machines. Additionally, encapsulation is also used for protection of every application to prevent it from interfering with other applications.

- Virtual machines can use encapsulation for being represented as well as stored as single files in order to facilitate their identification and presentation to other applications

48. What are some large cloud providers and databases?

- AWS
- Microsoft azure
- Oracle database
- Google cloud platform
- IBM DB2
- MongoDB Atlas
- Openstack

49. What is own cloud? where its use?

- ownCloud is a suite of client–server software for creating and using file hosting services.
- ownCloud is a file server that enables secure storage, collaboration and sharing. It is convenient to store files in the cloud, so they are available on any device and can be shared with a few clicks.

50. Installation steps and configuration of own cloud?

Refer EXP 3

51. Explain implementation of IAAS service using AWS. (How to create Amazon EC2 instance)

link:<https://www.javatpoint.com/how-to-create-amazon-ec2-window>