1. **How intranet is different from cloud explain with example.**

Intranet

Just as organizations set up web sites to provide global access to information about their business, they also set up internal web pages to provide information about the organization to the employees. This internal set of web pages is called an intranet. Web pages on the intranet are not accessible to those outside the company; in fact, those pages would come up as “not found” if an employee tried to access them from outside the company’s network.

Cloud

The term Cloud refers to a Network or Internet. In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over public and private networks, WAN, LAN or VPN.

Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.

1. **What is the need to shift the business applications to cloud.**

Best practices to ensure cloud migration success

There are many reasons why an organization chooses to migrate an app or workload to the cloud, and each project will be unique depending on resource allocations, integrations with other services and multiple other factors. Here are some general guidelines for a cloud migration that streamline the process and improve changes for success:

* **Get organizational buy-in.** The transition is much smoother when all stakeholders are on board and know their roles, from management to technical practitioners to end users.
* **Define cloud roles and ownership**. Determine right upfront who is responsible to manage various aspects of the cloud workload. Is it a shared environment? How is identity confirmed and access granted, or limited? This includes proper documentation of setups and processes.
* **Pick the right cloud services**. Cloud providers have a vast menu of services to pick from. Be clear with which ones your workload will tap into, or you risk running extraneous services -- some of which may be interdependent and become problematic to manage.
* **Understand security risks.** Cloud environments can be susceptible to mischief from internet attacks. Misconfigurations are arguably a bigger problem, given the complexity of cloud environments.
* **Calculate cloud costs.** The cloud's pay-as-you-go model may seem attractive and simpler to organizations used to large infrastructure investments. But it's a double-edged sword: Pay close attention to service selections and usage, or you'll get a shock at the end of the month.
* **Devise a long-term cloud roadmap**. If a cloud migration is successful, organizations likely will look to replicate that success for other workloads. Identify the criteria to follow, from project timelines to different deployment options, such as a hybrid cloud setup.

1. **Define the term cloud computing. Explain the term SSL VPN ?**

Cloud computing, in simple terms, is delivery of on demand computing resources on a pay for use basis. The word "Cloud" in Cloud Computing is used as the metaphor for the Internet. Cloud Computing involves use of different sets of hardware and software to work unanimously to deliver many aspects of Internet. In technical terminology, it is the virtualization of resource into separate units to make the individual sets act like standalone servers.

What are the different types of Cloud Computing?

Clouds can be classified in various ways depending upon service type or the architecture. However, in our cloud computing knowledge base, we will classify cloud into the following three types -

Infrastructure as a Service - IaaS is where the entire cloud is the requirement. The client will ask the provider to setup a computing environment; once accomplished, the control is handed to the client.

Platform-as-a-Service - PaaS is most suited for developers who only need a platform to work on their applications and are not too concerned with what goes into the background.

Software as a Service - The most comprehensive example of SaaS is ERP, HRM and account management software - even Gmail is SaaS. In Saas, it is not mandatory to install any applications on the computer. Most apps are web based and are accessed using web address.

Secure socket layer virtual private networks provide secure and private communication for all traffic types between devices equipped with similar technologies across public networks such as the Internet.

There are two major types of SSL VPN:

SSL Portal VPN: Allows single SSL connections to websites, allowing end users to securely access multiple network services. Remote users can access the SSL VPN gateway with any Web browser following authentication through a method supported by the gateway. Access is attained through a Web page that acts as a portal to other services.

SSL Tunnel VPN: Allows Web browsers to securely access multiple network services, as well non-Web-based protocols and applications, through tunnels running under SSL. SSL tunnel VPN requires that the Web browser handle active content and provide functionality that is not accessible through SSL portal VPN.

1. **Explain various applications where cloud is beneficial.**

Top 10 Applications of Cloud Computing

* Online Data Storage
* Backup and Recovery
* Testing and Development
* Cloud Computing in Medical Fields
* Big Data analysis
* Entertainment Applications
* Social Network Platforms
* Anti-virus Applications
* Accounting Application
* Management Applications

1. **Discuss the different issues comes with cloud computing**

The core of the issue is the nature of the cloud and the biggest problem that follows is the way personal data is processed in the cloud having no visibility as to what is happening with the data. Given below are some of the issues that can arise while utilizing cloud computing service.

* **Data privacy and security**
* **Government interception**
* **Data loss**
* **Fixed contracts**
* **Third-party dependency**
* **Multiple jurisdictions**

1. **Security is the number one issue when it comes to cloud computing explains in detail what the related topics to cloud security are.**

**Security Issues in Cloud Computing :**

There is no doubt that Cloud Computing provides various Advantages but there are also some security issues in cloud computing. Below are some following Security Issues in Cloud Computing as follows.

**Data Loss –**

Data Loss is one of the issues faced in Cloud Computing. This is also known as Data Leakage. As we know that our sensitive data is in the hands of Somebody else, and we don’t have full control over our database. So if the security of cloud service is to break by hackers then it may be possible that hackers will get access to our sensitive data or personal files.

**Interference of Hackers and Insecure API’s –**

As we know if we are talking about the cloud and its services it means we are talking about the Internet. Also, we know that the easiest way to communicate with Cloud is using API. So it is important to protect the Interface’s and API’s which are used by an external user. But also in cloud computing, few services are available in the public domain. An is the vulnerable part of Cloud Computing because it may be possible that these services are accessed by some third parties. So it may be possible that with the help of these services hackers can easily hack or harm our data.

**User Account Hijacking –**

Account Hijacking is the most serious security issue in Cloud Computing. If somehow the Account of User or an Organization is hijacked by Hacker. Then the hacker has full authority to perform Unauthorized Activities.

**Changing Service Provider –**

Vendor lock In is also an important Security issue in Cloud Computing. Many organizations will face different problems while shifting from one vendor to another. For example, An Organization wants to shift from AWS Cloud to Google Cloud Services then they ace various problem’s like shifting of all data, also both cloud services have different techniques and functions, so they also face problems regarding that. Also, it may be possible that the charges of AWS are different from Google Cloud, etc.

**Lack of Skill –**

While working, shifting to another service provider, need an extra feature, how to use a feature, etc. are the main problems caused in IT Company who doesn’t have skilled Employee. So it requires a skilled person to work with cloud Computing.

**Denial of Service (DoS) attack –**

This type of attack occurs when the system receives too much traffic. Mostly DoS attacks occur in large organizations such as the banking sector, government sector, etc. When a DoS attack occurs data is lost. So in order to recover data, it requires a great amount of money as well as time to handle it.

1. **What are the benefits and limitations of cloud**

*What are the advantages of cloud computing?*

Cloud computing has four main advantages. It:

* Saves money
* Is safer and more reliable
* Is more flexible
* Makes it easier to collaborate

*What are the disadvantages of cloud computing?*

Cloud computing has some fantastic advantages. But it’s not all sunshine and rainbows.

On the downside, cloud computing services:

* Might go offline at a moment’s notice
* Can raise privacy concerns
* Give you less control
* Can lock you in

1. **Explain any three companies who are using cloud successfully**

1. Apple

When Apple developed Siri, a computer that imitates a human being and assists users by asking inquiries, it revolutionized the entire mobile phone technology. Although Siri’s voice is remarkable, the way she operates is much more so. The cloud receives and processes user inquiries before it responds to them.

Users may also utilize the cloud to exchange data, apps, and upgrades without having to make any physical modifications to their hardware or software. In fact, the majority of people are familiar with Apple’s cloud program, iCloud

2. eBay

People who use eBay want it to operate well and to display the listings for practically anything they can think of. People may miss out on opportunities to put winning bids for the goods they desire most if the site fails at a critical time. As a result, when eBay decided to relocate its marketplace of over a billion listings, it recognized the endeavor as a major project.

It did, however, complete the transfer to Google’s cloud platform in five months with the aid of a team of engineers. That achievement was completed in such a short amount of time that eBay was six months ahead of plan. Furthermore, eBay may consider utilizing Google’s services in a variety of locations across the world, including those who are outside of North America.

In 2018, eBay began experimenting with machine learning techniques to aid in picture identification on Google’s cloud platform. With Google’s aid, a machine learning assignment that took eBay’s in-house systems 40 days to complete took only four days

4. Netflix

From its beginnings as a DVD rental business, this streaming service has gone a long way. It commands the attention of millions of people who are eager to watch one of its hundreds of critically acclaimed programs, films, or documentaries.

Netflix needed to find a method to store all of its data due to its large user base, and a typical in-house data center was rapidly becoming too inefficient. They required scalability in their infrastructure.

Netflix claims that its 117.58 million global customers view 140 million hours of video each day. Simply said, the typical Netflix customer spends 1 hour and 11 minutes each day on the site or 71 minutes per day.

What’s so amazing about Netflix is how they were able to move all of that data at a time when cloud computing was still a relatively new technology.

1. What are different clients used of Cloud computing

Cloud Computing is Used in

**Healthcare Industry**

Cloud computing provides a way for patients to store their medical records digitally and allows medical practitioners to access them from anywhere at any time. This will cut down on the paperwork burden on the medical practitioners and also helps improve the healthcare industry.

**Education Industry**

Cloud Computing helps students to access digital resources. For example, such as video lectures, lecture notes, and presentation materials from anywhere at any point in time. It also allows students to collaborate on projects and assignments online.

Cloud computing provides a way for students to access the information they need at any web-enabled interface at any time without having to be physically present at school or college premises.

**Banking and Finance Industry**

Banks and financial institutions use the cloud technology as they now provide online banking services to their customers. It is easy now for customers to access their accounts from anywhere at any time as long as they have an internet connection.

This new technology provides a way for banks and financial institutions to store their data digitally and it is accessible from anywhere at any point in time. Using cloud computing also allows banks and financial institutions to carry out transactions faster than before as it does not require human interaction or input of manual instructions into computers like traditional banking does.

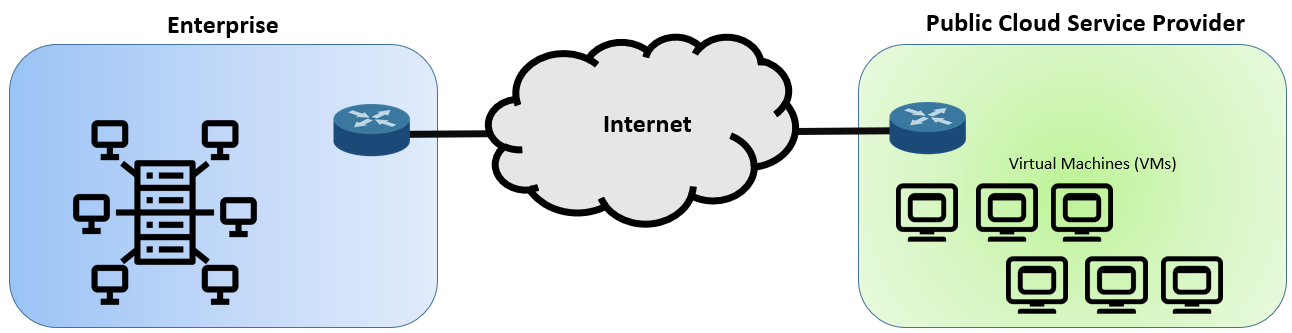
1. What are different levels of connectivity needed for accessing the cloud?

The Different WAN to Cloud Connectivity Options

There are different WAN connectivity options between the client and the cloud service provider. We will discuss the public cloud deployment model more since the on-premises cloud does not need interconnections since all the infrastructure is within the enterprise network.

Enterprise WAN to Cloud via the Internet

Imagine a business having to operate without using a cloud. All the applications needed are stored in a data center which is expensive to maintain and put up, and access to it is tedious. So connecting your enterprise network and the public cloud via the Internet is one of the fastest and most cost-effective ways of connecting your end-users and the cloud service the enterprise needs.



1. **When you plan to move to a Cloud Solution how will you find the right Vendor.**

Before you move any part of your operations to the cloud, it is important to establish which solution is right for your business. Since the costs of reversing cloud migration can be substantial, it is best to get it right the first time around.

Start by performing a business process analysis. This will allow you to identify which of your business systems will produce the greatest ROI and benefit most from cloud migration, with the least risk and complexity.

Some of the most obvious elements to move into the cloud include email, data backup, and file sync and share. Line of business applications such as invoicing systems, CRMs, and production management tools will need deeper analysis based on your goals, budgets, policies, business readiness, and existing technology framework.

Next, you will need to determine which cloud service models you require: IaaS, SaaS, and/or PaaS (Platform as a Service), which provides a platform to build a service or application environment that you can use in the cloud.

Once you have chosen your cloud model, you will need to decide between a public, private, or hybrid cloud types. Your resources can be hosted publicly by a third-party cloud provider, such as Microsoft Azure or AWS; alternatively, you can create your own private cloud, or you can opt for a hybrid of the two. The latter is useful when businesses still want to benefit from the cost savings of public cloud, but need to process certain confidential data privately.

Before selecting a public cloud service, you should examine the service-level agreement (SLA) to ascertain how they will deal with outages and what their security monitoring and reporting protocols of services are.

For more tips on how to make the cloud work for your business, check out this webinar.

With so many factors to consider, you may want to enlist external help with your business’s cloud migration.

1. **Explain in detail the concept of cloud storage.**

Cloud storage offers a simple way to store and/or move data in a secure and safe manner. It allows individuals and businesses to keep their files stored with the cloud services provider for on-demand access on any of their devices. Cloud storage can also be used to archive data that requires long-term storage but does not need to be accessed frequently, such as certain financial records. Increasingly, files stored "in the cloud" are utilized for group collaboration.

Cloud storage works by allowing a client computer, tablet, or smartphone to send and retrieve files online to and from a remote data server. The same data is usually stored on more than one server simultaneously so that clients can always access their data even if one server is down or loses data. For example, a laptop computer owner might store personal photos both on hard drive and in the cloud.

* Cloud storage allows individuals and businesses to store and retrieve computer files via an internet-connected device.
* Cloud storage has grown increasingly popular among individuals who need larger storage space and for businesses seeking an efficient off-site data back-up solution.
* Because of cloud storage's increasing popularity and use, cloud security has become a major concern to protect data integrity, prevent hacking attempts, and avoid file or identity theft.

1. **Name the companies with example who are providing software as service**

1. Salesforce

The big daddy of the list, Salesforce is a top SaaS company that launched the concept based on customer relationship management (CRM). It has since expanded into platform development, marketing, machine learning (ML), analytics, and social networking. The company is considered one of the most innovative cloud software solutions providers on the market and generates most of its annual recurring revenue from its cloud SaaS tool set.

2. Microsoft

One of the reinventors in business technology, the company has since become one of the largest SaaS companies in the world after moving its desktop productivity suite Office to the cloud. Now, Office 365 outsells the packaged, client version. It also offers Dynamics CRM, SharePoint collaboration, and even SQL Server databases on demand. The Microsoft team also heavily invests in customer acquisition, customer onboarding, customer success, and customer retention, which makes it a strong contender for enterprise customers with a wide array of customers.

3. Adobe Creative Cloud

Another reinvention based in San Jose, Adobe was the king of desktop creativity software and has now pivoted to make Photoshop and other audio and video editing tools available via an annual cloud-based SaaS business subscription. The Creative Suite offers graphic design, video editing, web development, and photo editing.

6. Google Workspace

Google Workspace, formerly called G Suite, is mostly a collection of the individual services Google already offers, like Gmail, storage, and calendar, but with added features like custom email and 24/7 support. This solution comes at a subscription price over the free basic services offered, but it also comes with the benefits of Google Cloud and its large collection of enterprise solutions.

1. **What makes the cloud computing system? How it works? Explain six phases of computing paradigms**

As IT technologies are evolving continuously it directly increases the demand of using cloud computing networks. There are some characteristics of cloud network that are mentioned below:

1. Resource pooling

The cloud providing company uses computing resources and then provides cloud services to different customers. The resources can be categorized into virtual and physical resources that can be used and can be allocated to users on their demands.

2. Maintenance is easy

The cloud servers are easy to setup and install and the maintenance of the servers are easy to done. The servers have usually very low downtime and provide continuous service to their customers. The performance of the servers is better and faster than providing proper cloud services.

3. Access to large network

The user is provided the functionality of accessing the large cloud network and can use the resources and services provided by the system. The user can use the cloud network to access the data, upload the data from any remote location, and can use services from any device. All it needs is the internet connection that will be used to connect to the cloud network.

4. Availability

The cloud services are always provided to the user. The service is offered 24 X & to the user. The user can use a cloud network as a storage platform and also has the option to buy more space as per the requirements. The user can access the data anytime from the network.

5. Economical

The cloud services is economical if the organization is taking the service. The large organization can take the cloud service and can offered small portion of the cloud to other small organization. By this the affordability of the service will be increase and everyone will get chance to use the cloud services.

6. Automatic system

The cloud services are capable of analyzing the user needs and providing the services according to that. The user can monitor the service, control the usage. The network provides the functionality to the user to access the whole network.

7. Pay as per use

This characteristic of a cloud network makes this more important for use by the customers. The cloud network provides the functionality that the user has to pay only for that service that they use. No extra money they have to pay or no hidden charges are there which makes this service more suitable for use.

1. **Explain about the companies using software plus as a service**

This is basically Microsoft's cloud strategy. Software plus services is guided by three core principles:

Unified application services for interoperability among multiple devices.

Transition of traditional in-house server, storage and other infrastructure solutions to the cloud.

Delivery of integrated development systems for rapid application development.

These solutions and services are primarily delivered on cloud by Microsoft and its partner and provides all different cloud models from SaaS, PaaS, IaaS and hybrid solutions. The set of services delivered under this are Office 365, Windows Azure, System Centre, Dynamics and Intune and are delivered on both a subscription based pricing model and the traditional licensing model.

1. **Explain in detail about virtualization.**

In other words, Virtualization is a technique, which allows to share a single physical instance of a resource or an application among multiple customers and organizations. It does by assigning a logical name to a physical storage and providing a pointer to that physical resource when demanded.

Creation of a virtual machine over existing operating system and hardware is known as Hardware Virtualization. A Virtual machine provides an environment that is logically separated from the underlying hardware.

The machine on which the virtual machine is going to create is known as Host Machine and that virtual machine is referred as a Guest Machine

Types of Virtualization:

* Hardware Virtualization.
* Operating system Virtualization.
* Server Virtualization.
* Storage Virtualization

1. **Explain Google Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings**

Google Cloud Platform Services Summary

The complete list of services that form Google Cloud Platform is shown below. While Google offers many other services and APIs, only the services below are covered by the Google Cloud Platform terms of service, service level agreements (if applicable), and support offerings. Offerings identified below as Software or Premium Software are not Services under the Google Cloud Platform Terms of Service and the Cloud Data Processing Addendum.

**Compute**

App Engine: App Engine enables you to build and host applications on the same systems that power Google applications. App Engine offers fast development and deployment; simple administration, with no need to worry about hardware, patches or backups; and effortless scalability.

Batch: Batch is a fully-managed service that allows you to create batch jobs at scale. The service dynamically provisions certain Google Cloud resources, schedules your batch job on the resources, manages the queue for the job, and executes the job. Batch is natively integrated with Google Cloud services for storage, logging, monitoring, and more.

Compute Engine: Compute Engine offers scalable and flexible virtual machine computing capabilities in the cloud, with options to utilize certain CPUs, GPUs, or Cloud TPUs. You can use Compute Engine to solve large-scale processing and analytic problems on Google's computing, storage, and networking infrastructure.

Google Cloud VMware Engine (GCVE): GCVE is a managed VMware-as-a-Service that is specifically designed for running VMware workloads on Google Cloud Platform. GCVE enables customers to run VMware virtual machines natively in a dedicated, private, software-defined data center.

**Storage**

Cloud Storage: Cloud Storage is a RESTful service for storing and accessing your data on Google's infrastructure. The service combines the performance and scalability of Google's cloud with advanced security and sharing capabilities.

Persistent Disk: Persistent Disk is a durable and high performance block storage service for Google Cloud Platform. Persistent Disk provides SSD and HDD storage that can be attached to instances running in either Compute Engine or Google Kubernetes Engine.

Cloud Filestore: Cloud Filestore is a scalable and highly available shared file service fully-managed by Google. Cloud Filestore provides persistent storage ideal for shared workloads. It is best suited for enterprise applications requiring persistent, durable, shared storage which is accessed by NFS or requires a POSIX compliant file system.

\*Cloud Storage for Firebase: Cloud Storage for Firebase adds customizable Google security (via Firebase Security Rules for Cloud Storage) to file uploads and downloads for your Firebase apps, as well as robust uploads and downloads regardless of network quality through the Firebase SDK. Cloud Storage for Firebase is backed by Cloud Storage, a service for storing and accessing your data on Google's infrastructure.

**Databases**

Cloud Bigtable: Cloud Bigtable is a fast, fully-managed, highly-scalable NoSQL database service. It is designed for the collection and retention of data from 1TB to hundreds of PB.

Datastore: Datastore is a fully-managed, schemaless, non-relational datastore. It provides a rich set of query capabilities, supports atomic transactions, and automatically scales up and down in response to load. It can scale to support an application with 1,000 users or 10 million users with no code changes.

Firestore: Firestore is a NoSQL document database for storing, syncing, and querying data for mobile and web apps. Its client libraries provide live synchronization and offline support, while its security features and integrations with Firebase and Google Cloud Platform accelerate building serverless apps.

Memorystore: Memorystore, which includes Memorystore for Redis and Memorystore for Memcached, provides a fully-managed in-memory data store service that allows customers to deploy distributed caches that provide sub-millisecond data access.

**Networking**

Cloud CDN: Cloud CDN uses Google's globally distributed edge points of presence to cache HTTP(S) load balanced content close to your users.

Cloud DNS: Cloud DNS is a high performance, resilient, global, fully-managed DNS service that provides a RESTful API to publish and manage DNS records for your applications and services.

Cloud IDS (Cloud Intrusion Detection System): Cloud IDS is a managed service that aids in detecting certain malware, spyware, command-and-control attacks, and other network-based threats.

Cloud Interconnect: Cloud Interconnect offers enterprise-grade connections to Google Cloud Platform using Google Services for Dedicated Interconnect, Partner Interconnect and Cloud VPN. This solution allows you to directly connect your on-premises network to your Virtual Private Cloud.

Cloud Load Balancing: Cloud Load Balancing provides scaling, high availability, and traffic management for your internet-facing and private applications.

Media CDN: Media CDN is a content delivery network that leverages Google’s global edge cache nodes to deliver exceptional caching efficiency and end user experiences.

Network Connectivity Center: Network Connectivity Center is a hub-and-spoke model for network connectivity management in Google Cloud that facilitates connecting a customer's resources to its cloud network.

Network Intelligence Center: Network Intelligence Center is Google Cloud’s comprehensive network monitoring, verification, and optimization platform across the Google Cloud, multi-cloud, and on-prem environments.

Network Service Tiers: Network Service Tiers enable you to select different quality networks (tiers) for outbound traffic to the internet: the Standard Tier primarily utilizes third party transit providers while the Premium Tier leverages Google's private backbone and peering surface for egress.

Service Directory: Service Directory is a managed service that offers customers a single place to publish, discover and connect their services in a consistent way, regardless of their environment. Service Directory supports services in Google Cloud, multi-cloud, and on-prem environments and can scale up to thousands of services and endpoints for a single project.

Spectrum Access System: Spectrum Access System enables you to access the Citizens Broadband Radio Service (CBRS) in the United States, the 3.5 GHz band that is available for shared commercial use. You can use Spectrum Access System to register your CBRS devices, manage your CBRS deployments, and access a non-production test environment (if offered).

Traffic Director: Traffic Director is Google Cloud Platform's traffic management service for open service meshes.

Virtual Private Cloud: Virtual Private Cloud provides a private network topology with IP allocation, routing, and network firewall policies to create a secure environment for your deployments.

**Operations**

Cloud Debugger: Cloud Debugger connects your application's production data to your source code by inspecting the state of your application at any code location in production without stopping or slowing down your requests.

Cloud Logging: Cloud Logging is a fully-managed service that performs at scale and can ingest application and system log data, as well as custom log data from thousands of VMs and containers. Cloud Logging allows you to analyze and export selected logs to long-term storage in real time. Cloud Logging includes the Error Reporting feature, which analyzes and aggregates the errors in your cloud applications and notifies you when new errors are detected.

**Developer Tools**

Artifact Registry: Artifact Registry is a service for managing container images and packages. It is integrated with Google Cloud tooling and runtimes and comes with support for native artifact protocols. This makes it simple to integrate it with your CI/CD tooling to set up automated pipelines.

Container Registry: Container Registry is a private Docker image storage system on Google Cloud Platform. The registry can be accessed through an HTTPS endpoint, so you can pull images from your machine, whether it's a Compute Engine instance or your own hardware.

**Data Analytics**

BigQuery: BigQuery is a fully-managed data analysis service that enables businesses to analyze Big Data. It features highly scalable data storage that accommodates up to hundreds of terabytes, the ability to perform ad hoc queries on multi-terabyte datasets, and the ability to share data insights via the web.

Cloud Composer: Cloud Composer is a managed workflow orchestration service that can be used to author, schedule, and monitor pipelines that span across clouds and on-premises data centers. Cloud Composer allows you to use Apache Airflow without the hassle of creating and managing complex Airflow infrastructure.

1. **Explain Amazon Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings**

In 2006, Amazon Web Services (AWS) started to offer IT services to the market in the form of web services, which is nowadays known as cloud computing. With this cloud, we need not plan for servers and other IT infrastructure which takes up much of time in advance. Instead, these services can instantly spin up hundreds or thousands of servers in minutes and deliver results faster. We pay only for what we use with no up-front expenses and no long-term commitments, which makes AWS cost efficient.

Today, AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers multitude of businesses in 190 countries around the world.

What is Cloud Computing?

Cloud computing is an internet-based computing service in which large groups of remote servers are networked to allow centralized data storage, and online access to computer services or resources.

Using cloud computing, organizations can use shared computing and storage resources rather than building, operating, and improving infrastructure on their own.

Cloud computing is a model that enables the following features.

Users can provision and release resources on-demand.

Resources can be scaled up or down automatically, depending on the load.

Resources are accessible over a network with proper security.

Cloud service providers can enable a pay-as-you-go model, where customers are charged based on the type of resources and per usage.

Types of Clouds

There are three types of clouds − Public, Private, and Hybrid cloud.

Public Cloud

In public cloud, the third-party service providers make resources and services available to their customers via Internet. Customer’s data and related security is with the service providers’ owned infrastructure.

Private Cloud

A private cloud also provides almost similar features as public cloud, but the data and services are managed by the organization or by the third party only for the customer’s organization. In this type of cloud, major control is over the infrastructure so security related issues are minimized.

Hybrid Cloud

A hybrid cloud is the combination of both private and public cloud. The decision to run on private or public cloud usually depends on various parameters like sensitivity of data and applications, industry certifications and required standards, regulations, etc.

Cloud Service Models

There are three types of service models in cloud − IaaS, PaaS, and SaaS.

IaaS

IaaS stands for Infrastructure as a Service. It provides users with the capability to provision processing, storage, and network connectivity on demand. Using this service model, the customers can develop their own applications on these resources.

PaaS

PaaS stands for Platform as a Service. Here, the service provider provides various services like databases, queues, workflow engines, e-mails, etc. to their customers. The customer can then use these components for building their own applications. The services, availability of resources and data backup are handled by the service provider that helps the customers to focus more on their application's functionality.

SaaS

SaaS stands for Software as a Service. As the name suggests, here the third-party providers provide end-user applications to their customers with some administrative capability at the application level, such as the ability to create and manage their users. Also some level of customizability is possible such as the customers can use their own corporate logos, colors, etc.

Advantages of Cloud Computing

Here is a list of some of the most important advantages that Cloud Computing has to offer −

Cost-Efficient − Building our own servers and tools is time-consuming as well as expensive as we need to order, pay for, install, and configure expensive hardware, long before we need it. However, using cloud computing, we only pay for the amount we use and when we use the computing resources. In this manner, cloud computing is cost efficient.

Reliability − A cloud computing platform provides much more managed, reliable and consistent service than an in-house IT infrastructure. It guarantees 24x7 and 365 days of service. If any of the server fails, then hosted applications and services can easily be transited to any of the available servers.

Unlimited Storage − Cloud computing provides almost unlimited storage capacity, i.e., we need not worry about running out of storage space or increasing our current storage space availability. We can access as much or as little as we need.

Backup & Recovery − Storing data in the cloud, backing it up and restoring the same is relatively easier than storing it on a physical device. The cloud service providers also have enough technology to recover our data, so there is the convenience of recovering our data anytime.

Easy Access to Information − Once you register yourself in cloud, you can access your account from anywhere in the world provided there is internet connection at that point. There are various storage and security facilities that vary with the account type chosen.

Disadvantages of Cloud Computing

Although Cloud Computing provides a wonderful set of advantages, it has some drawbacks as well that often raise questions about its efficiency.

Security issues

Security is the major issue in cloud computing. The cloud service providers implement the best security standards and industry certifications, however, storing data and important files on external service providers always bears a risk.

AWS cloud infrastructure is designed to be the most flexible and secured cloud network. It provides scalable and highly reliable platform that enables customers to deploy applications and data quickly and securely.

Technical issues

As cloud service providers offer services to number of clients each day, sometimes the system can have some serious issues leading to business processes temporarily being suspended. Additionally, if the internet connection is offline then we will not be able to access any of the applications, server, or data from the cloud.

Not easy to switch service providers

Cloud service providers promises vendors that the cloud will be flexible to use and integrate, however switching cloud services is not easy. Most organizations may find it difficult to host and integrate current cloud applications on another platform. Interoperability and support issues may arise such as applications developed on Linux platform may not work properly on Microsoft Development Framework (.Net).

1. **Cloud is not suitable for enterprises where there are a large number of users.**

Applications not suitable for cloud computing

Cloud is not suitable when there is a concern around privacy and sensitive information. In these cases, cloud should not be used in IT infrastructure without legal advice.

Although cloud acts like a central monolithic IT powerhouse, servers and storage may be dispersed all around the world. When there is a geopolitical concern, data sovereignty and compliance issue, cloud should not be used. For example, most of the governments will not allow a cloud provider to host citizens’ sensitive health information in a data center outside the country’s boundary.

Some applications are tightly bound to a particular type of hardware, chips or drivers. These applications rely on low level specific hardware resources. This category will not work in cloud computing infrastructure.

Large enterprise relational database management systems (RDBMS) are not yet ready for cloud environment. There are several factors. Performance is one of them. Loading the database into cloud can be costly and also cause harmonization problem. Latency may impact Quality of Service (QoS). (Source: Identifying applications for public and private clouds)

If a company needs detailed control of cloud infrastructure for its application, a public cloud will not be suitable. Private cloud is the right choice.

Some applications might have been designed without proper consideration of compatibility. Compatibility and integration is a big issue when planning to migrate an existing application to cloud. This issue might be aggravated in a hybrid cloud scenario. Those applications which cannot be easily ported to cloud environment, are not suitable for cloud.

Sometimes existing applications cannot be moved to cloud. There are no cloud counterparts for these applications either.

We all know that cloud is a new IT services delivery model through Internet. Latency and slow Internet speed will be a bottleneck for cloud applications. In absence of high-speed broadband, cloud computing cannot deliver the services. In this scenario, cloud computing model should not be used.

1. **Public cloud should not be used for mission-critical services.**

What does this mean to the world of systems management and monitoring? I have one saying when it comes to computer systems and systems management: “If it’s a mission-critical application, you need system management and automation software.” Is cloud computing technology mission-critical? You bet it is! Cloud computing users want reliable and highly available technology. Who doesn’t want to receive a paycheck or use online banking?

How do providers achieve high availability? Part of it is the hardware: It’s disaster proof, power- redundant, disk-redundant, and so on. Providers also monitor the applications, the access points, and perform the routine maintenance that needs to happen. All mission-critical applications have behind- the-scenes processes or scripts that must run.

1. **What is KVM (Kernel-based virtual machine) virtualization? Is it Type-1 or Type 2?. Mentionthe advantages and disadvantages of KVM..**

KVM Virtualization is the leading open source complete virtualization solution on x86 hardware and it supports all major operating systems including Linux and Windows. It is developed by Red Hat Corporation to provide a virtualization solution and services on the Linux operating system platform.

Kernel-Based Virtual Machine (KVM) is an open source virtualization module directly built into the Linux kernel, enabling Linux OS to function as a Type 1 (bare-metal) hypervisor. However, worth noting is that the distinction between Type 1 and Type 2 hypervisors can be blurred with KVM, as it can function as either of the two. Furthermore, it enables the hypervisor to deploy separate virtual machines.

**KVM Advantages**

* Since the KVM module is built into the Linux kernel, it comes built-in with most Linux distributions.
* KVM is open source, which means it's free to use, regularly updated, and very secure due to being part of the world's largest open source community.
* KVM is very stable and has excellent performance with suitable hardware.
* KVM has fantastic command-line options with a polished GUI interface.

**KVM Disadvantages**

* Depending on a user's needs and infrastructure, the host hardware needs to be robust.
* Because KVM is a Linux kernel module, it can't run on most operating systems with a few exceptions, such as FreeBSD and illumos.
* Centralized hardware, which can be problematic in cases of failure

1. **What are the differences between Public, Private, and Elastic IP addresses?. Also, provide a use case for each of these addresses**

**PRIVATE IP:** Every EC2 instance that is launched is assigned a primary private IP address from the address range of the subnet. The instances are not reachable over the internet with their private IP address. However, Private IP addresses are useful for communication between instances within the VPC. They remain associated to the instance during restarts. Private IP address allocated to an instance is released only when the instance is terminated.

**PUBLIC IP**

You can choose to assign a Public IP to an EC2 Instance to allow it to be accessible from the Internet. Public IP addresses are not associated with an AWS account. They are assigned from Amazon’s pool of IP addresses. Public IP addresses are released during Instance termination as well as Instance stops. So every-time you stop the instance and start it again, the public IP address of the Instance changes.

To maintain IP address through instance stop/start cycles, you should use Elastic IP addresses. When an Elastic IP address is associated with an EC2 Instance, the public IP address of that instance is released. And when an Elastic IP address is disassociated from an EC2 Instance, a new public IP address is assigned to the instance.

**ELASTIC IP**

An Elastic IP address is a static public IP address that you can request to be allocated to your AWS account. They are region specific and the default limit of Elastic IP addresses allocated to an AWS account is 5. However, you can submit a request to increase the limit. You can associate Elastic IP address with any EC2 Instance within the same region. You can also disassociate the Elastic IP address from an EC2 Instance and associate it with another instance.

1. **What is a System Container?. Differentiate between System container and Application container with respect to the number of processes and the design purpose. Also, provide one example application for each of these containers.**

**System Containers**

Docker’s focus on application containers is interesting, however, if you consider that originally, containerization technology was designed primarily as a way to containerize a complete operating system (OS) rather than just a single app. A container that runs a full OS is a system container. Solaris containers, which Sun debuted in 2005, were intended mainly as a way to virtualize other Solaris systems on top of a Solaris host. Virtuozzo’s OpenVZ, whose history stretches back even further, was also designed as a container system platform. Most recently, Canonicals’ new LXD container platform, which appeared in 2016, has come on the scene to offer yet another system container option.

|  |  |  |
| --- | --- | --- |
|  | **Application Containers** | **System Containers** |
| **Images** | * Application/service centric * Growing tool ecosystem | * Machine-centric * Limited tool ecosystem |
| **Infrastructure** | * Security concerns * Networking challenges * Hampered by base OS limitations | * Datacenter-centric * Isolated & secure * Optimized networking |

1. **Differentiate between Amazon’s Elastic Beanstalk and Microsoft Azure application platforms with respect to Scalability, Load balancing, and Availability.**

AWS Elastic Beanstalk as "Quickly deploy and manage applications in the AWS cloud". Once you upload your application, Elastic Beanstalk automatically handles the deployment details of capacity provisioning, load balancing, auto-scaling, and application health monitoring.

On the other hand, Azure App Service is detailed as "Build, deploy, and scale web apps on a fully managed platform". Quickly build, deploy, and scale web apps created with popular frameworks .NET, .NET Core, Node.js, Java, PHP, Ruby, or Python, in containers or running on any operating system. Meet rigorous, enterprise-grade performance, security, and compliance requirements by using the fully managed platform for your operational and monitoring tasks.

AWS Elastic Beanstalk and Azure App Service belong to "Platform as a Service" category of the tech stack.

Scalability is the ability of a system to handle increased load. Services covered by Azure Auto scale can scale automatically to match demand to accommodate workload. These services scale out to ensure capacity during workload peaks and return to normal automatically when the peak drops.

INCOMPLETE

1. **Compare the Platform as a Service and Software as a Service with respect to developers and users.**

Software as a Service (SAAS) vs Platform as a Service (PAAS)

1. Software as a Service (SAAS)

SAAS platforms make software available to businesses, organizations, and individuals over the internet and is expected to see further growth. There is usually a monthly or yearly fee, which is scalable if further resources are required. Users do not need to install or run software apps on any computer – everything is available to them by logging into their online account. This can be done from multiple devices. Furthermore, users do not need to maintain or manage the cloud. Software as a Service was the first cloud service to become truly popular. It still dominates among cloud computing. According to Statista, it is one of the most important technologies required to help businesses realize their goals.

Services offered in the SAAS model include but are not limited to:

* Backup data system
* File storage
* Project management tools
* Web-based email

**SAAS Drawbacks**

In case SAAS application is not developed to follow open standards for integration, said integration with existing services and apps may pose challenges.

* Data may not be portable technically or cost effectively across SAAS applications from other vendors. This makes the service difficult to get out of.
* Limited integration support.
* Transfer of sensitive business information might result in security compromise as well as high costs.
* Limited customization and features.
* Most control lies with third-party vendor.
* Your customers depend on the third-party vendor for performance and security.

Who Should Use SAAS Solutions?

If you need an application to run efficiently with minimal attention or input from your business, Software as a Service is ideal. Everything from the applications to the middleware is managed for you.

It is especially suited for:

Small companies or startups that do not have time to manage software or server issues and need to launch quickly

Apps that require both mobile and web access

Apps that are not required very often. Eg., tax software

Short-term projects that need simple, affordable and quick collaboration

**2. Platform as a Service (PAAS)**

Platform as a Service vendors provide software and hardware tools over the internet. These tools are then used to develop apps or software. It's no surprise then that PAAS users tend to be developers.

As the name suggests, PAAS solutions provide a platform for businesses and individuals to create customized applications and software. What this means is that developers don't need to write extensive code and hence don't need to start from scratch. This saves a lot of time and money.

PAAS empowers developers to be creative with app development instead of focusing on tasks such as managing updates or security.

Examples of PAAS: Google App Engine, Windows Azure, AWS Elastic Beanstalk

**PAAS Drawbacks**

* Data in vendor-controlled, third-party servers may not be secure.
* Integration can be a challenge.
* Requirements that drive decisions for some PAAS solutions may no longer apply in future.
* Complex IT system. Configuration changes and customizations might be needed for legacy systems to work smoothly with PAAS.
* Might not be optimized for frameworks and language of your choice.
* Possible loss of some operational control since some customized operations may not apply to PAAS.

Who Should Use PAAS Solutions?

If you are a business or organization that wants to develop unique apps or software while remaining cost-effective, PAAS is for you. It enables you to streamline workflows when various developers are working on the same project.

Your business manages the applications and data, while the middleware, runtime, O/S, servers, and so on are managed for you.

Conclusion

When it comes to cloud computing, not all services need an equal level of system administration knowledge. SAAS requires the least, followed by PAAS, IAAS and on-premise.

Ultimately, the cloud solution you choose will depend heavily on your business needs. Whether you require software development consulting to help you decide, or are ready to reach for cloud application development, BluEnt has you covered.

https://github.com/Amitpnk/BITS-Software-engineering/tree/main/subject