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Subject: Types of Cloud Computing Services

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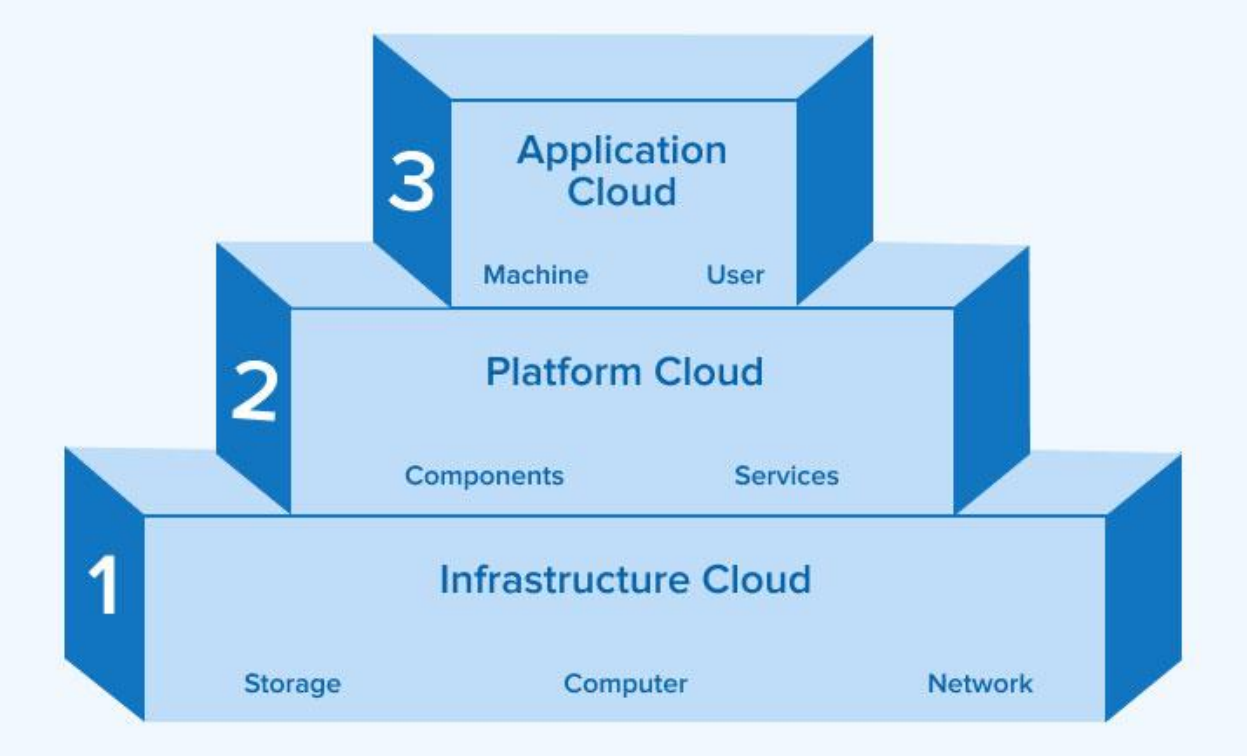
Types of Cloud Computing Services

Cloud computing offers a variety of services that cater to different business and individual needs. These services are delivered over the Internet and provide flexible, scalable, and cost-effective solutions, eliminating the need for users to manage physical hardware or software infrastructure. Depending on the level of control and responsibility, cloud services are generally classified into three main categories:

- **Software as a Service (SaaS)**
- **Platform as a Service (PaaS)**
- **Infrastructure as a Service (IaaS)**

Each type serves a specific purpose and is designed to simplify computing tasks, improve efficiency, and reduce operational costs.

Cloud computing models can be mapped with layers of business value pyramid as shown below diagram.



2. What are Cloud Service Models?

Cloud computing must be a crucial aspect of your business growth strategy. Here's how you can make the most of it and satisfy a unique set of your business requirements.

With the time passing by, meeting customers expectations such as offering fast, secured and reliable services have become pretty much daunting. There is an unprecedented burden on organizations to enhance their IT infrastructure which nobody talks about these days.

Fortunately, acquiring extra hardware is not the only option left. We have plenty of cloud-based service providers offering three unique service models.

IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service) are the three service models that come under cloud computing services. They are also referred to as cloud computing service models or cloud service models.

The three types of cloud models and their characteristics are briefly described below so that it can make your decision for choosing the right cloud service model according to your business requirements a bit easy task.

2.1 Infrastructure as a Service (IaaS)

The infrastructure cloud provides cloud storage and computing resources as a service that enables developers and IT organizations to deliver business solutions. IaaS has evolved from the virtual private server (VPS) concept. An IaaS cloud provider gives complete flexibility to consumers in choosing desktops, servers or on-demand network access.

Consumers can customize the entire infrastructure package by selecting CPU hours, data storage space, bandwidth etc. Rather than buying expensive servers and taking the headache of setting up the physical data centers and underlying infrastructure, IaaS cloud as the most flexible cloud computing model helps businesses in reducing IT CAPEX and OPEX by a big proportion.

In simple words, IaaS allows remote management of data center infrastructures. IaaS contains sub-categories: Public, Private and Combination. The Public cloud consists of shared computing resources and networking resources, managed by a cloud service provider. By contrast, the private cloud provides secure user access to your cloud resources and is managed by the organization it serves. The hybrid cloud is maintained by both internal and external cloud providers.

IaaS adds value to businesses through Business agility; Cost reduction; Reliability, Scalability; Privacy & governance; and single integrated user experience. Some of the most

popular IaaS cloud service providers include Amazon Web Services, Microsoft Azure, and Google Compute Engine.

Benefits of Choosing Infrastructure as a Service

- **Enhanced performance and save upfront cost.**
- **It comprises intensive information security measures like end-to-end encryption.**
- **Provides scalability and flexibility like none other cloud services.**
- **Keeps your data restored and up-to-date.**

Disadvantages of IaaS

Discussing the advantages is not enough, to understand a model completely, we must also look at its disadvantages.

- **Limited control: When you subscribe to IaaS, your service provider manages everything from upkeep and upgrades to infrastructure maintenance. Every time you need to make a necessary adjustment, no matter how small it is, you have to ask your service provider for it.**
- **Security issues: In an IaaS computing model, the responsibility of protecting the data and applications lies with users. Maintaining that responsibility grows difficult with each passing day as new threats arise continuously.**

- **Legacy systems: No matter how much you want to make a transition from on-premise to cloud infrastructure, some legacy systems aren't compatible with it. To make a shift , you either need significant updates or complete replacements to function in a cloud environment.**

Basic Characteristics of IaaS

- **Computing resources distributed as a service.**
- **Dynamic, on-demand scaling of computing resources.**
- **Utility-based pricing model.**
- **Concurrent users on a single piece of computing hardware.**

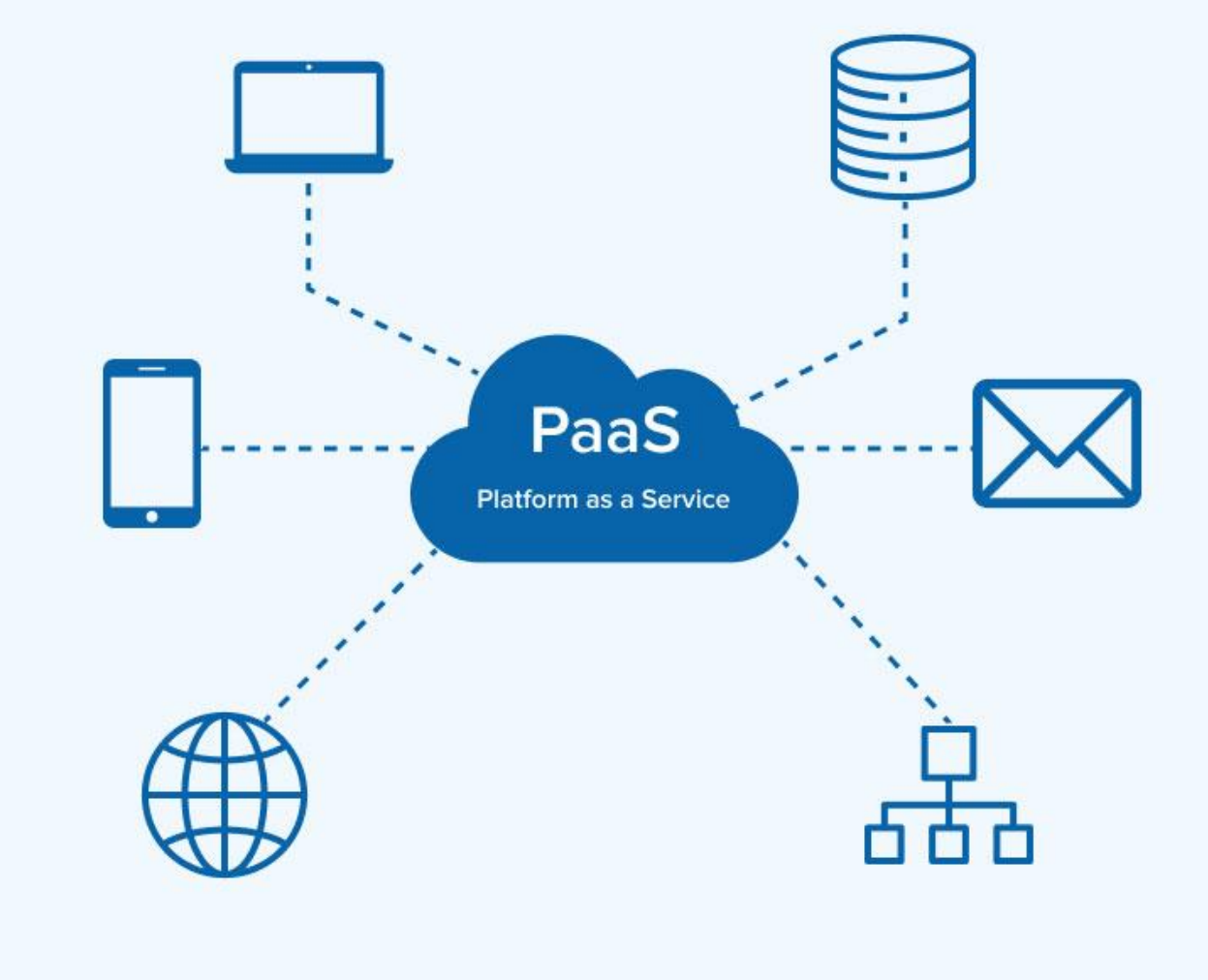
Common Use Cases of IaaS

Implementing an Infrastructure as a Service (IaaS) model is most effective when you understand its common use cases.

- **Software development: IaaS is very quick at setting up development and testing environments compared to on-premises. The rates are cheaper as well.**
- **Startups: Not every startup is financially capable of investing in extensive IT infrastructure. They have to opt for IaaS if they require enterprise-class data center capabilities but can't invest in hardware and infrastructure management.**

- **Ecommerce: Implementing IaaS can really help out online retailers. eCommerce sites often witness sudden traffic spikes. So, they need IaaS's ability to scale on demand during such periods.**
- **IoT, AI and event handling: IaaS is an ideal option for applications dealing with large datasets. Empowered by IaaS, they can easily set up or scale up their computing resources and data storage.**
- **Disaster recovery: Disaster recovery becomes easy with the implementation of IaaS computing model. You no longer need to set up redundant servers at multiple locations. IaaS allows the direct deployment of a disaster recovery solution to the cloud provider's existing geographically dispersed infrastructure.**

2.2 Platform as a Service (PaaS)



The next level up in the cloud services pyramid is the Platform cloud. PaaS(Platform as a Service) delivers development/operating systems environments as a service and provides flexible pricing options depending on various business requirements. It includes a set of development tools and cloud services designed to make coding, deploying, and testing of the applications and the operating system quickly as well as efficiently.

PaaS is similar to SaaS services except that, rather than being software delivered over the web, it is a cloud platform

allowing computing power required for the development/deployment of that software, delivered over the web. Prime examples include Salesforce's Force.com, Azure from Microsoft and Google App Engine.

Benefits of Paas

- **Setting up and getting started becomes easy.**
- **Sharing resources across multiple development teams becomes way easier.**
- **Security and data protection.**
- **In the end, you are bound to receive fruitful and efficient services.**
- **A significant amount of cost is reduced.**

Disadvantages of PaaS

With good news, comes the bad news. Similarly, using PaaS will surely give you some advantages. But as an added bonus, you will get the following disadvantages as well.

- **Dependency: Users are completely dependent on the PaaS providers for platform availability, its maintenance, and upgrades. If the provider faces any problem then it would spell trouble for users as well. Even a small disruption on the provider's part can result in huge loss for the users.**

- **Integrations: You may encounter difficulties in integrating your PaaS solution with other apps, whether it be an old or a new one. An integration is only possible if your provider or any third party offers suitable plugins or APIs.**
- **Limited capabilities: It is not necessary that your PaaS solution would support every app and workload out there. It doesn't even support customized cloud operations and automated workflows. In short, PaaS inhibits both flexibility and operational capabilities of your business.**
- **Runtime: Every business uses a different set of programming languages and development frameworks for their project. It's impossible to optimize a PaaS solution for all use cases. On the other hand, finding a custom solution is a really difficult job.**
- **Data security: Utilization of third-party servers makes your data vulnerable. Moreover, only a limited number of security solutions can be integrated with third-party systems. So, the option of strengthening data security is out of the window unless the third party takes any measures.**

Basic Characteristics of PaaS

- **Single environment to develop, test, deploy, host and maintain applications and IT infrastructure management.**
- **Web-based UI designing tools to create, modify, test, and deploy different UI scenarios.**
- **Multi-tenant architecture facilitating concurrent users.**
- **Load balancing, sensitive data security and failover capabilities for application to be deployed.**
- **OS and Cloud programming APIs to create new apps for the cloud or to cloudify the current apps.**
- **Tools to handle billing and subscription.**

Common Use Cases of PaaS

Considering both benefits and limitations, we can say PaaS is useful in the following cases.

- **Agile development and DevOps: PaaS covers everything you will ever need for agile development and DevOps. It supports CI/CD by offering built-in automation.**
- **Cloud solutions: Name any cloud native technology from microservices to serverless computing and you will find that PaaS already supports them all. Because of this, developers have to build their solutions just once. Then they can be deployed and managed in any**

environment including public, private, on-premise and hybrid environments.

- **API development and management: Developing, running and managing different APIs is easy with PaaS, thanks to its built-in frameworks. These APIs help securely share data and functionalities between apps.**
- **Internet of Things (IoT): Any programming language and framework you might need for IoT development and real-time data processing are supported in PaaS.**
- **Database management: PaaS allows you to set up and manage a database for your organization.**

2.3 Software as a Service (SaaS)

The top most layer of the cloud services pyramid is a functional layer or SaaS layer. This type of cloud delivers a single application through the browser to multiple users using a multitenant architecture. With SaaS platforms, a provider sells an application to customers on a license basis, in a "pay-as-you-go" cloud model allowing users to save on physical hardware.

On the customer side, they do not have to do upfront investment in servers or software development; on the cloud provider side, with just one app to maintain, costs are low

compared to conventional hosting. Salesforce (customer relationship management software), SRM, ERP as the most common examples of SaaS applications.

Benefits of Saas

- **Easy to use.**
- **Test the software functionality in advance.**
- **The Pay-as-you-go model says it all, you have to pay only for what you are using.**
- **Save a significant amount of money, time and resources.**

Disadvantages of SaaS

SaaS is a well-known and widely used cloud computing model. Therefore, it becomes extremely important for you to know its limitations as well.

- **Limited customization: Although SaaS providers allow you to tweak the features and functionalities a little, it does not support advanced customization capabilities. As a result, the SaaS product fails to fulfill your unique project requirements.**
- **Data security: Because it is the job of SaaS providers to ensure data security, you have no choice but to trust them completely with it. Moreover, the servers in which your data is stored are located off-premise. So, you can't enforce any additional security protocols as well.**

- **Lack of control: When using a SaaS solution, you don't have any control over the performance and functionality of the software. You have to trust that the providers will maintain the availability and the performance of the software.**
- **Dependency on Internet connectivity: You will always need an internet connection to use SaaS solutions because they are cloud-based. It's tricky for users who are working from remote areas or need an offline access to the software.**
- **Interoperability: You can't integrate a SaaS solution with your existing app or service. Because SaaS solutions don't support open integrations.**

Characteristics of SaaS

- **Centralized web-based access to company and commercial software.**
- **Entire business process shifting to the cloud, giving superior services to the client.**
- **No hassle of software upgrades and patches as they are managed by the cloud vendor.**
- **Application Programming Interfaces (APIs) allow integration with different applications.**

Common Use Cases of SaaS

SaaS use cases vary widely from personal to enterprise requirements. Every cloud-hosted and ready-to-use software can be categorized as a SaaS solution.

Let's discuss below some of the most popular use cases of SaaS.

- **Remote Collaboration: Information sharing and team communication are no longer limited by geographical boundaries thanks to cloud-based SaaS tools like Slack, Zoom, and Zendesk.**
- **File Storage: You can now store, modify, access, and share files across devices with an internet connection using applications like Dropbox, promoting collaboration.**
- **CRM Solutions: Salesforce has revolutionized businesses interacting with customers by delivering personalized customer experiences increasing customer satisfaction.**
- **E-Commerce Platforms: SaaS-based e-commerce platforms like Shopify give a user-friendly interface to businesses to set up and manage their online stores and broaden their customer base.**
- **Graphic Design: Tools like Canva offer a drag-and-drop interface to create visually appealing posts,**

banners, marketing materials, etc., aligning with the business requirements and customer expectations.