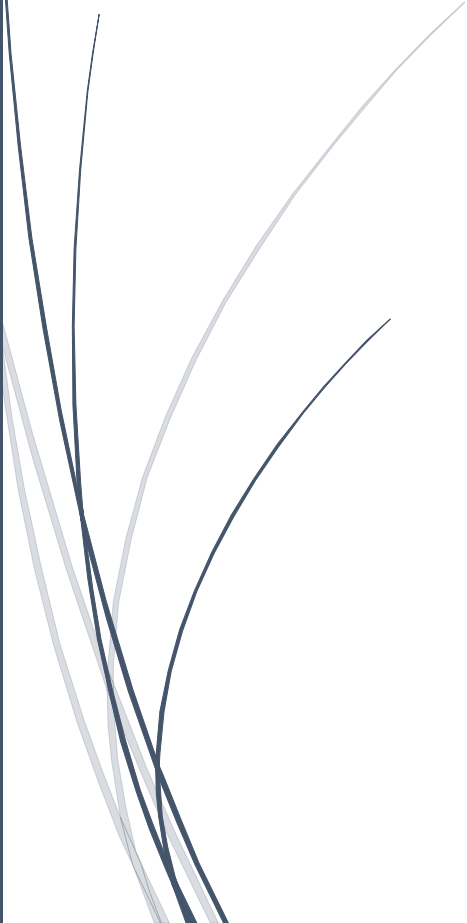


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4/6/2023

Cloud Computing Architecture Assessment 1

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Suneth Fernando

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Introduction

Cloud computing and its service models—IaaS, PaaS, and SaaS—will be covered in this study. (SaaS). We'll examine each service model's pros and cons and give examples of when it's suitable.

The study will also discuss using IaaS in high availability cases and choosing infrastructure and availability zone configurations based on money and service level. Cloud computing "locations," "availability zones," and "resource groups" can be used to assure high availability and error tolerance.

We will also address backup and recovery strategies for IaaS settings, including remote storage, disaster recovery, and prioritisation of key services during outages.

Finally, we will discuss IaaS resource management best practices, including resource group management and high-availability virtual machine and storage setup.

Virtualisation:

Virtualization is the construction of a virtual version of computing resources such as servers, storage devices, and networks in the context of cloud computing. The technology of virtualization permits the creation of multiple virtual resources on a single physical resource, which can then be allocated to multiple users or applications.

Virtualization is used by cloud computing providers to construct virtual machines (VMs) or virtual instances, which are self-contained and isolated environments capable of running multiple operating systems and applications on a single physical server. The virtualization layer abstracts the underlying hardware and exposes it to the users as a collection of virtual resources.

There are numerous advantages to virtualization in cloud computing. It enables more efficient use of hardware resources, for instance, by allowing multiple virtual machines to operate on a single physical machine. It also provides flexibility, allowing users to provision and deprovision resources as required swiftly and easily.

In conclusion, virtualization is a crucial aspect of cloud computing because it enables providers to offer scalable and efficient computing resources to users. Virtualization enables cloud service providers to offer Infrastructure as a Service (IaaS), where users can rent virtual instances of computing resources such as servers, storage, and networks rather than purchasing and managing physical hardware themselves.

The virtualization layer generates a virtual machine that appears to the user as a dedicated physical machine, replete with its own operating system, applications, and virtualized hardware resources, when a user requests a virtual instance from a cloud provider. These virtual machines can be simply provisioned, scaled, and deprovisioned, giving users greater flexibility and agility.

Another important advantage of virtualization in cloud computing is the ability to establish secure, isolated environments. On the same physical hardware, each virtual machine operates in its own environment, entirely isolated from other virtual machines. This isolation ensures that problems or issues with one virtual machine do not influence other virtual machines running on the same physical hardware.

Virtualization also provides a layer of abstraction that enables cloud providers to more efficiently manage their physical hardware resources. A single physical server can support multiple virtual machines, each with its own virtualized resources, such as CPU, memory, and storage, thanks to virtualization. This enables cloud providers to utilise their hardware resources more efficiently, reducing costs and increasing scalability.

Virtualization is a fundamental technology that enables cloud providers to offer scalable, flexible, and efficient computing resources to their customers.

Virtual machine:

A virtual machine (VM) is a software simulation of a physical computer that operates independently of the underlying hardware in the context of cloud computing. Virtual machines enable cloud providers to offer Infrastructure as a Service (IaaS) to their users, in which users can rent virtual instances of computing resources such as servers, storage, and networks rather than purchasing and managing physical hardware themselves.

A cloud provider creates a virtual instance of a computer system within the provider's infrastructure when a user requests a virtual machine. This virtual instance functions similarly to a dedicated physical computer, with its own operating system, applications, and virtualized hardware resources such as CPU, memory, and storage.

The virtualization layer presents the underlying hardware to the virtual machine as a collection of virtual resources. This enables multiple virtual machines to operate on a single physical machine, maximising hardware utilisation and reducing costs.

In cloud computing, virtual devices provide a number of benefits. For instance, they enable users to operate multiple operating systems and applications on the same physical hardware, providing greater flexibility and allowing users to select the optimal environment for their particular requirements. Each virtual machine operates in its own environment and is entirely isolated from other virtual machines on the same physical hardware, providing isolation and security.

In general, virtual machines are a crucial component of cloud computing, allowing cloud providers to offer scalable, flexible, and efficient computing resources to users. Cloud providers can offer users a wide spectrum of computing resources, from fundamental virtual machines with limited resources to high-performance virtual machines optimised for specific workloads, such as big data processing or machine learning, using virtual machines.

Moreover, virtual machines can be simply provisioned, scaled, and deprovisioned as required, granting users greater flexibility and agility. This allows users to rapidly add or remove computing resources in response to fluctuating demand without worrying about the underlying hardware.

Additionally, virtual machines are highly portable, allowing users to transfer their virtual machines between cloud providers or between on-premises infrastructure and the cloud. This gives consumers more options and flexibility when selecting a cloud service provider or administering their computing resources.

Virtual machines provide an abstraction layer between the user and the underlying hardware, making it simpler to manage and optimise resources. Using virtual machine technology, for instance, cloud providers can autonomously balance workloads across multiple physical servers, ensuring that resources are used efficiently and workloads are not impacted by hardware failures.

In general, virtual machines are a fundamental component of cloud computing, allowing cloud service providers to offer scalable, flexible, and efficient computing resources to their customers.

Evaluation of Cloud benefits

Infrastructure as a service:

Infrastructure as a Service (IaaS) is a cloud computing paradigm that enables consumers to rent virtualized computing resources from a cloud provider, including servers, storage, and networks. IaaS has many advantages, but there are also some disadvantages to consider.

Infrastructure as a Service (IaaS) advantages:

- One of the primary advantages of IaaS is its ability to scale up or down in response to changing business requirements. Users are able to scale up or down their computing resources as required, enabling them to respond swiftly to fluctuating demand or new opportunities.
- IaaS can be more cost-effective than traditional on-premises infrastructure due to the fact that users only pay for what they use and do not have to purchase and maintain their own hardware. Typically, cloud service providers offer pricing models that correspond to consumption patterns, such as pay-as-you-go or reserved instances.
- IaaS provides a high degree of flexibility because users can select and configure the computing resources they require, such as the amount of CPU, memory, and storage, according to their specific needs. The geographic location of the cloud data centres can also be selected by users to optimise performance and compliance with data regulations.
- Accessibility: IaaS enables users to access computing resources from any location with an internet connection, enabling them to work remotely or collaborate with coworkers in disparate locations.

Infrastructure as a Service (IaaS) disadvantages:

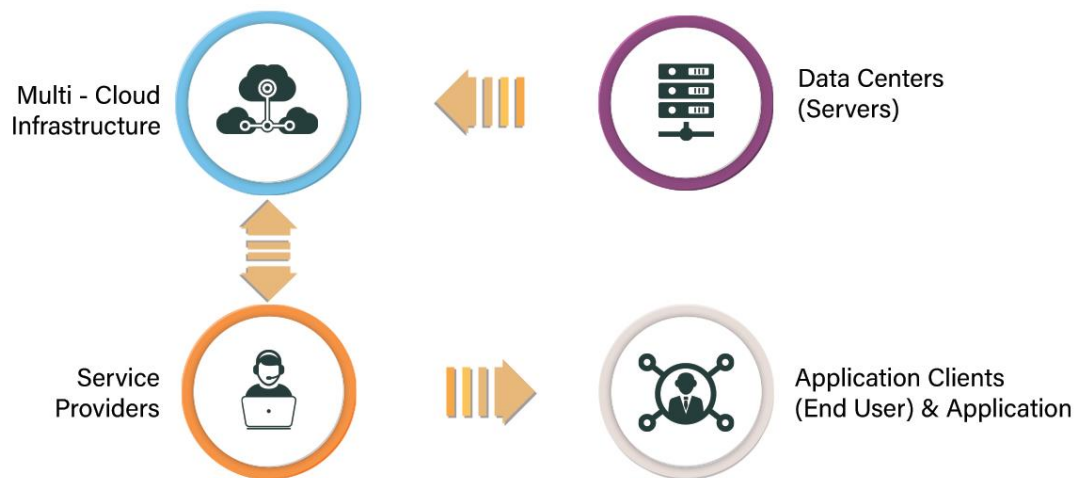
- With IaaS, users entrust their data and applications to a third-party cloud provider, which may pose data security and compliance concerns. Users must ensure that the cloud service provider has adequate security measures in place and complies with applicable regulations.
- While IaaS can provide flexibility, it can also add complexity, as users must administer their own virtual machines, operating systems, and applications. To administer their IaaS environments, users may have to invest in training or employ specialised personnel.
- IaaS relies on Internet connectivity to gain access to computing resources, which can result in latency and outage if the Internet connection is sluggish or unreliable. This may have an effect on application performance and user efficiency.
- Vendor lock-in: Users who rely on a specific cloud provider's IaaS offering may experience vendor lock-in, which makes switching to a different cloud provider or migrating to on-premises infrastructure difficult. This may restrict a user's ability to negotiate pricing or leverage new technologies.

IaaS provides numerous advantages, including scalability, cost-efficiency, adaptability, and accessibility. When contemplating IaaS as a computing model, users should be aware of the potential drawbacks, such as security concerns, complexity, reliance on internet connectivity, and

vendor lock-in.



HOW IAAS WORKS



Platform as a service:

PaaS is a cloud computing model that enables users to develop, operate, and manage applications without having to manage the underlying infrastructure. PaaS has many advantages, but there are also some disadvantages to consider.

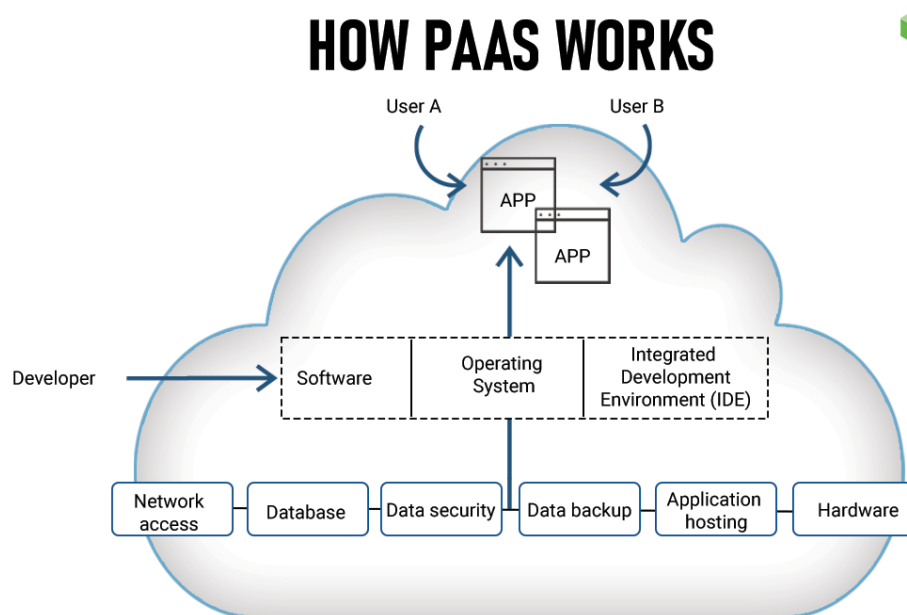
Platform as a Service (PaaS) advantages:

- **Productivity:** PaaS can boost developer productivity because it allows users to focus on developing and deploying applications without managing the underlying infrastructure. PaaS platforms typically offer preconfigured environments for various programming languages and tools, in addition to integration with other cloud services.
- **Scalability:** PaaS can provide simple scalability, allowing users to add additional resources as required to support applications. PaaS platforms typically provide automated scalability capabilities that can respond to fluctuating demand and guarantee efficient resource utilisation.
- **Cost-effectiveness:** PaaS can be cost-effective because users only pay for what they consume and do not need to invest in or maintain their own infrastructure. PaaS platforms typically provide pricing models that correspond to utilisation patterns, such as pay-per-use or reserved instances.
- **Flexibility:** PaaS provides a high degree of flexibility because users can select from a variety of programming languages, development tools, and deployment methods. In addition to integrating with other cloud services, such as databases, messaging, and storage, PaaS platforms typically offer integration with other cloud services, such as databases, messaging, and storage.

The following are disadvantages of Platform as a Service (PaaS):

- PaaS platforms may establish vendor lock-in, making it difficult to migrate to a different platform or on-premises infrastructure. Depending on the PaaS platform, users may also be restricted in terms of the programming languages, tools, and libraries they can employ.
- Users entrusting their applications and data to a third-party provider may introduce security hazards to PaaS platforms. Users must ensure that the PaaS provider has implemented appropriate security measures and complies with applicable regulations.
- While PaaS can facilitate application development and deployment, it can also introduce complexity by requiring users to acquire new development tools and processes. In addition, PaaS platforms typically offer a high level of abstraction, which can make it challenging to diagnose and rectify application issues.
- Depending on the platform, PaaS platforms may restrict a user's ability to customise the underlying infrastructure and environment. Users with specific infrastructure or compliance requirements may be concerned about this.

PaaS provides numerous advantages, including increased productivity, scalability, cost-efficiency, and adaptability. When contemplating PaaS as a computing model, users should be aware of the potential drawbacks, such as vendor lock-in, security concerns, complexity, and limited customizability.



Software as a service:

Software as a Service (SaaS) is a cloud computing paradigm in which software applications are hosted and delivered over the internet, enabling consumers to access them via a web browser or mobile application. There are a number of advantages to SaaS, but there are also some disadvantages to consider.

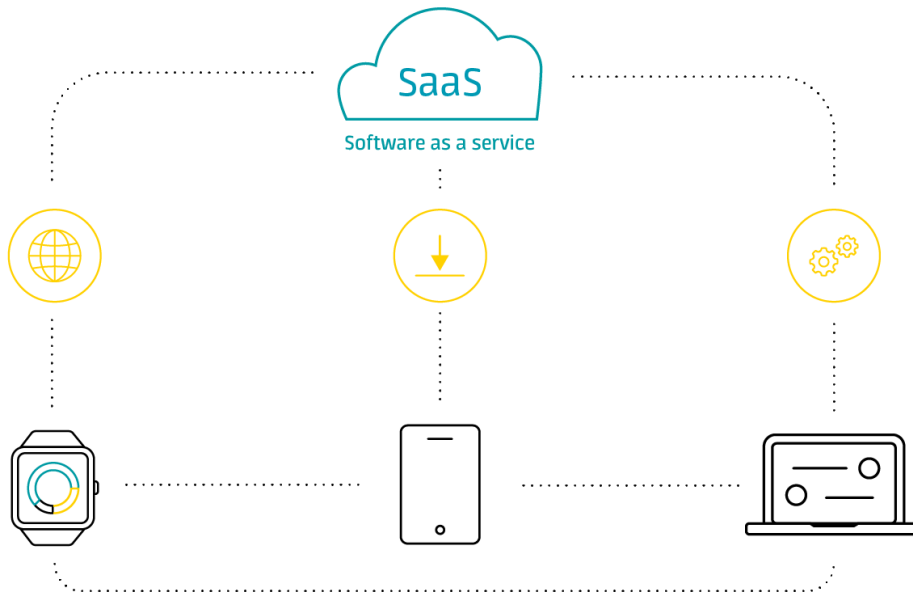
The advantages of Software as a Service (SaaS) are as follows:

- SaaS applications are highly accessible because they can be accessed from anywhere with an internet connection. This is especially advantageous for remote employees and teams located in various regions of the world.
- SaaS applications are designed to be extremely scalable, allowing users to add or remove users as required without worrying about the underlying infrastructure. SaaS providers manage the scalability of the application and infrastructure, ensuring a consistent user experience.
- SaaS applications are typically offered on a subscription basis, enabling users to pay only for the services they employ. This may be more cost-effective than conventional software licencing models, which necessitate an initial investment in software and hardware.
- SaaS applications are typically designed to be user-friendly, with intuitive interfaces and straightforward enrollment procedures. This makes it simple for users to rapidly become proficient with the software and reduces the need for extensive training.

The disadvantages of Software as a Service (SaaS) include:

- Data security: Storing data in the cloud can pose security risks, especially when handling sensitive data. Users must ensure that the SaaS provider has implemented appropriate security measures and complies with applicable regulations.
- Customization: Typically, SaaS applications are designed to be highly standardized, which can restrict a user's ability to tailor the software to their specific requirements. This may be a concern for users who require highly customised business software.
- SaaS applications may not readily integrate with other software applications, especially if they are hosted on-premises. This can present difficulties for users who must utilise multiple software applications.
- SaaS providers may make it difficult for consumers to transfer to a different provider or migrate to an on-premises solution, resulting in vendor lock-in. On the SaaS platform, there may also be restrictions on the features and functionality available to users.

In conclusion, SaaS provides numerous advantages, including accessibility, scalability, cost-effectiveness, and usability. When contemplating SaaS as a computing model, users should be aware of the potential drawbacks, such as data security risks, limited customization, integration challenges, and vendor lock-in.



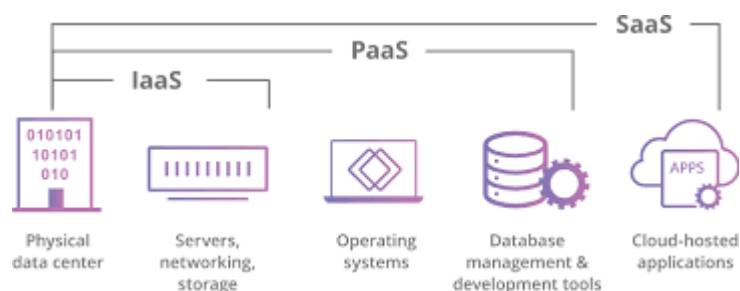
Three cloud computing models—IaaS, PaaS, and SaaS—have pros and cons.

IaaS lets users build and run their own IT infrastructure using virtualized computing resources like virtual servers, storage, and networking. Since users handle the infrastructure, this method offers the most flexibility but needs the most expertise and management.

PaaS lets users build and launch apps without worrying about technology. This method is scalable, flexible, and lets users focus on application development rather than system management. Users have limited hardware and programme stacks.

SaaS lets users use cloud-hosted software without managing hardware or apps. Users can access the application via a web browser or mobile app, making it the most convenient. Customization and interaction may be limited.

User needs determine the cloud computing model. IaaS is best for experts and managers, while PaaS is best for developers and deployers. Users who need software apps without infrastructure or application control should use SaaS. Before choosing a method, users should weigh its pros and cons.



Evaluation of Availability:

Three cloud computing models—IaaS, PaaS, and SaaS—have pros and cons.

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References

- [1] C. Babcock, Virtualization's next wave of problems, 2011.
- [2] D. Chappell, Introducing the Windows Azure Platform., 2012.
- [3] VMware, Server Configuration Guide – ESX Server 3.0.1 and VirtualCenter 2.0.1, 2007.
- [4] W. Kim, 'Cloud architecture: a preliminary look', 2011.
- [5] W. Kim, Cloud computing adoption, 2011.