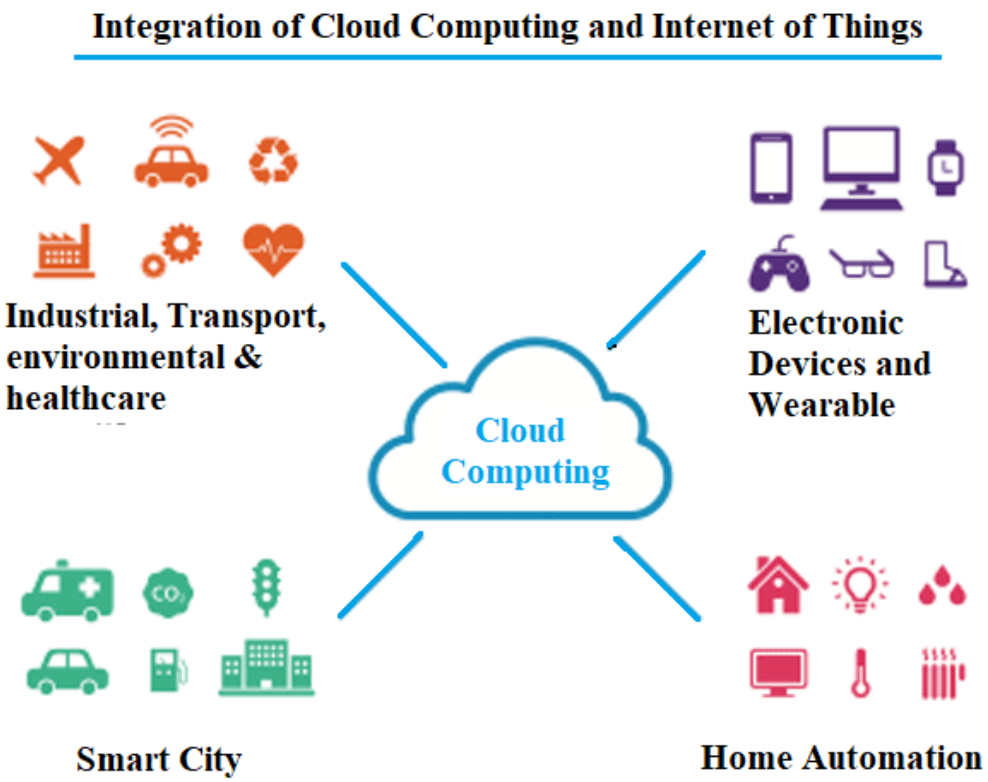
CH – 5
Cloud computing and data management

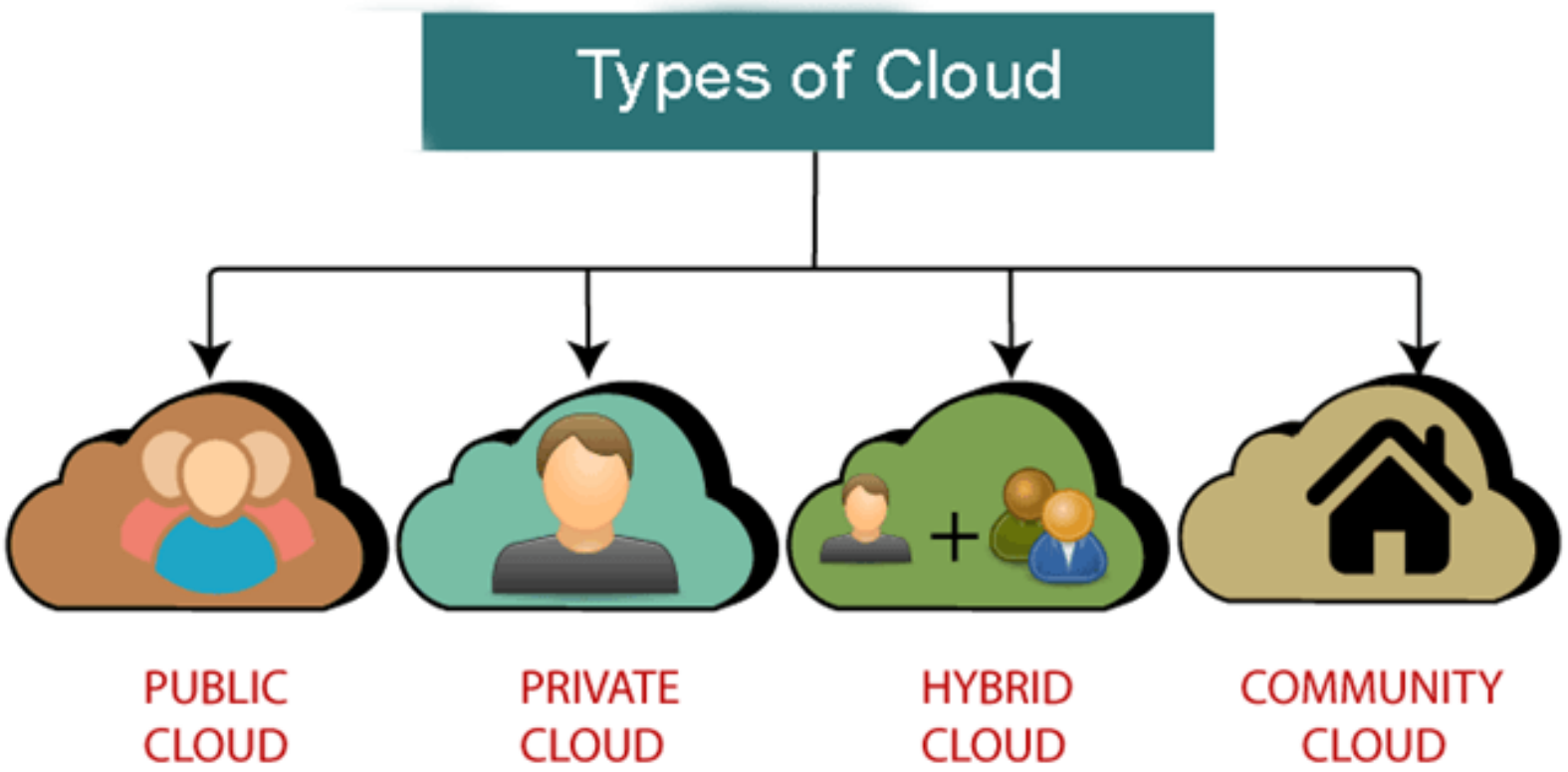


- The Internet of Things (IoT) is a vast network of interconnected devices. These devices have particular parts (called sensors) and software that help them collect and share information.
- The main strength of IoT is its ability to gather essential information from diverse sources autonomously.
- One of the technology which is used in IoT is cloud computing.

Cloud computing

- Cloud computing is a way to use computer services, like storing information or running programs, over the internet without using our machines or equipment.
- It makes it easy for people to access data from anywhere in the world.
- One example of cloud computing is online storage services like Dropbox or Google Drive. They let us save files in a different place and open them on any device with internet access.

Cloud Deployment Models



Public Cloud

- Public Cloud provides a **shared platform** that is accessible to the **general public** through an Internet connection.
- Public cloud operated on the **pay-as-per-use model** and administrated by the **third party**, i.e., Cloud service provider.
- In the Public cloud, the same storage is being used by multiple users at the same time.
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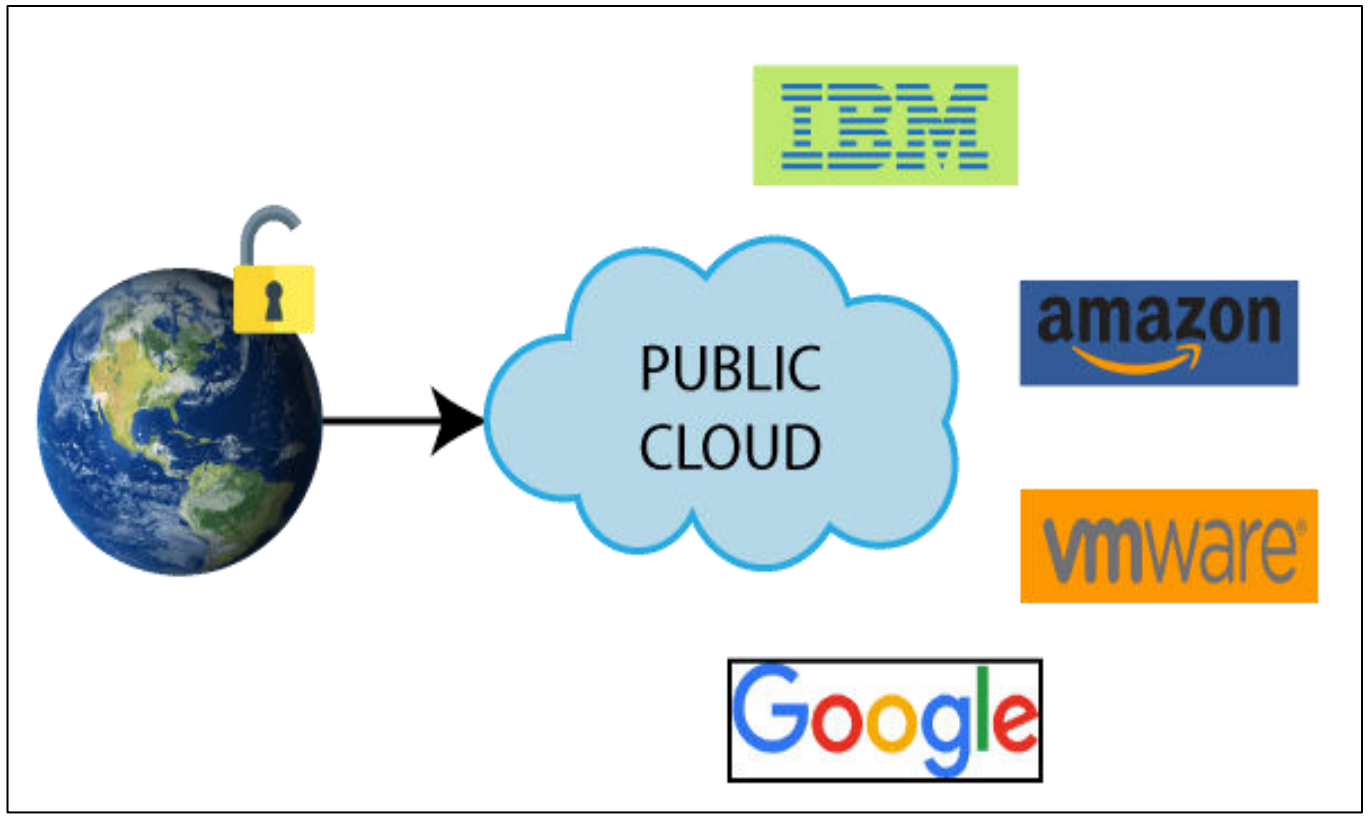


Advantages of Public Cloud

There are the following advantages of public cloud –

1) **Low Cost**
Public cloud has a lower cost than private, or hybrid cloud, as it shares the same resources with a large number of consumers.

2) **Location Independent**
Public cloud is location independent because its services are offered through the internet.

3) **Save Time**
In Public cloud, the cloud service provider is responsible for the manage and maintain data centers in which data is stored, so the cloud user can save their time to establish connectivity, deploying new products, release product updates, configure, and assemble servers.

4) **Quickly and easily set up**

Organizations can easily buy public cloud on the internet and deployed and configured it remotely through the cloud service provider within a few hours.

5) **Business Agility**

Public cloud provides an ability to elastically re-size computer resources based on the organization's requirements.

6) **Scalability and reliability**

Public cloud offers scalable (easy to add and remove) and reliable (24*7 available) services to the users at an affordable cost.

Disadvantages of Public Cloud

1) Low Security
Public Cloud is less secure because resources are shared publicly.

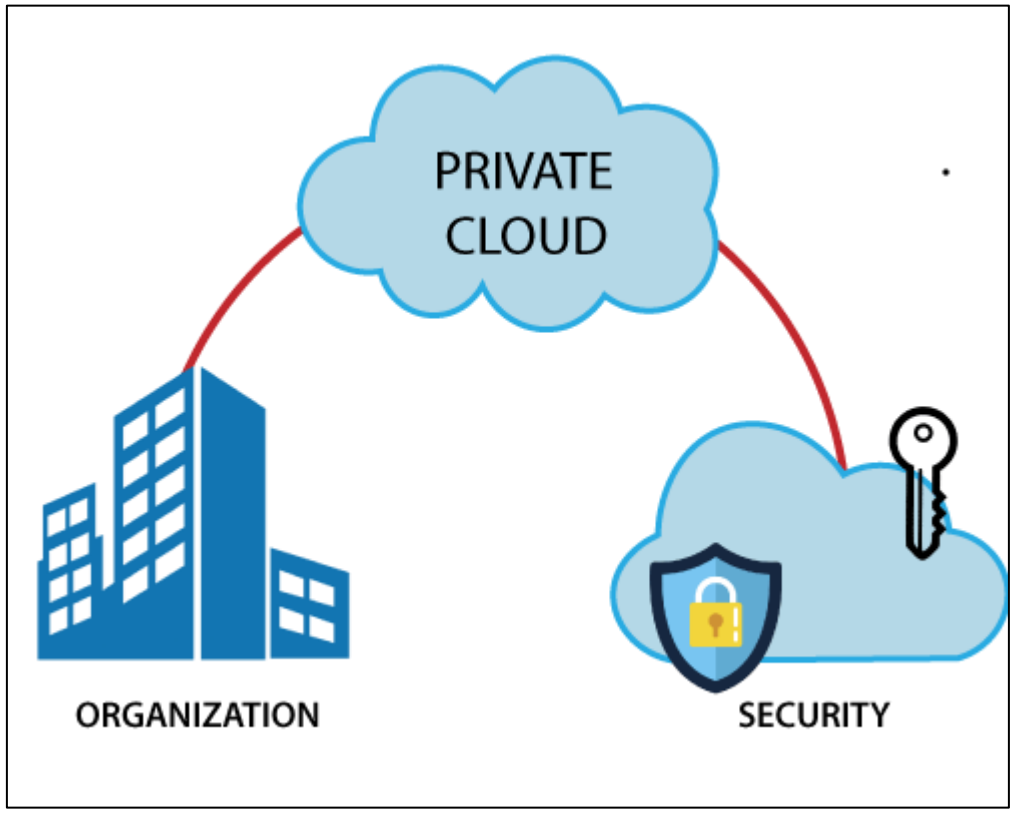
2) Performance
In the public cloud, performance depends upon the speed of internet connectivity.

3) Less customizable
Public cloud is less customizable than the private cloud.

Private Cloud

- 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.



Advantages of Private cloud

There are the following advantages of Private Cloud –

1) More Control

Private clouds have more control over their resources and hardware than public clouds because it is only accessed by selected users.

2) Security & privacy

Security & privacy are one of the big advantages of cloud computing. Private cloud improved the security level as compared to the public cloud.

3) Improved performance

Private cloud offers better performance with improved speed and space capacity.

Disadvantages of Private Cloud

1) **High cost**
The cost is higher than a public cloud because set up and maintain hardware resources are costly.

2) **Restricted area of operations**
As we know, private cloud is accessible within the organization, so the area of operations is limited.

3) **Limited scalability**
Private clouds are scaled only within the capacity of internal hosted resources.

4) **Skilled people**
Skilled people are required to manage and operate cloud services.

Hybrid Cloud

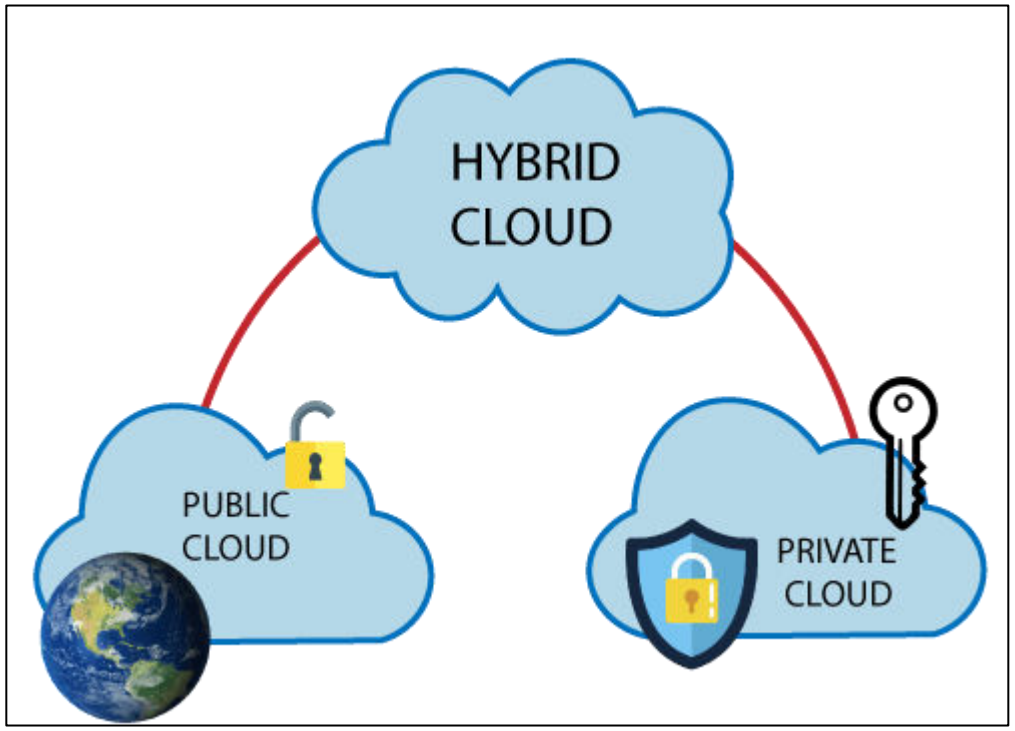
- Hybrid cloud is a combination of public and private clouds. Hybrid cloud = public cloud + private cloud

- The main aim to combine these cloud (Public and Private) is to create a unified, automated, and well-managed computing environment.

- In the Hybrid cloud, non-critical activities are performed by the public cloud and critical activities are performed by the private cloud.

- Mainly, a hybrid cloud is used in finance, healthcare, and Universities.

•The best hybrid cloud provider companies are **Amazon, Microsoft, Google, Cisco,** and **NetApp**.



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Hybrid cloud provides an excellent way for companies to manage the risk.

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In the Hybrid Cloud, networking becomes complex because of the private and the public cloud.

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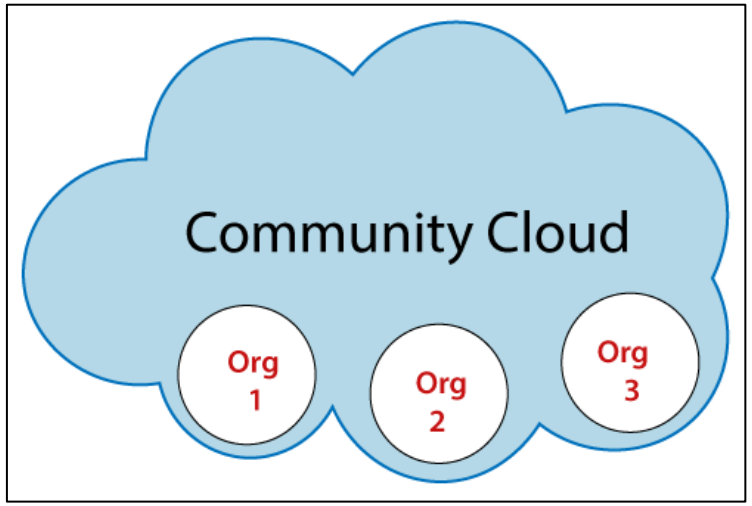
Infrastructure compatibility is the major issue in a hybrid cloud. With dual-levels of infrastructure, a private cloud controls the company, and a public cloud does not, so there is a possibility that they are running in separate stacks.

3) **Reliability**
The reliability of the services depends on cloud service providers.

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.

Community Cloud



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

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Cost effective

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Flexible and Scalable

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Security

Community cloud is more secure than the public cloud but less secure than the private cloud.

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.
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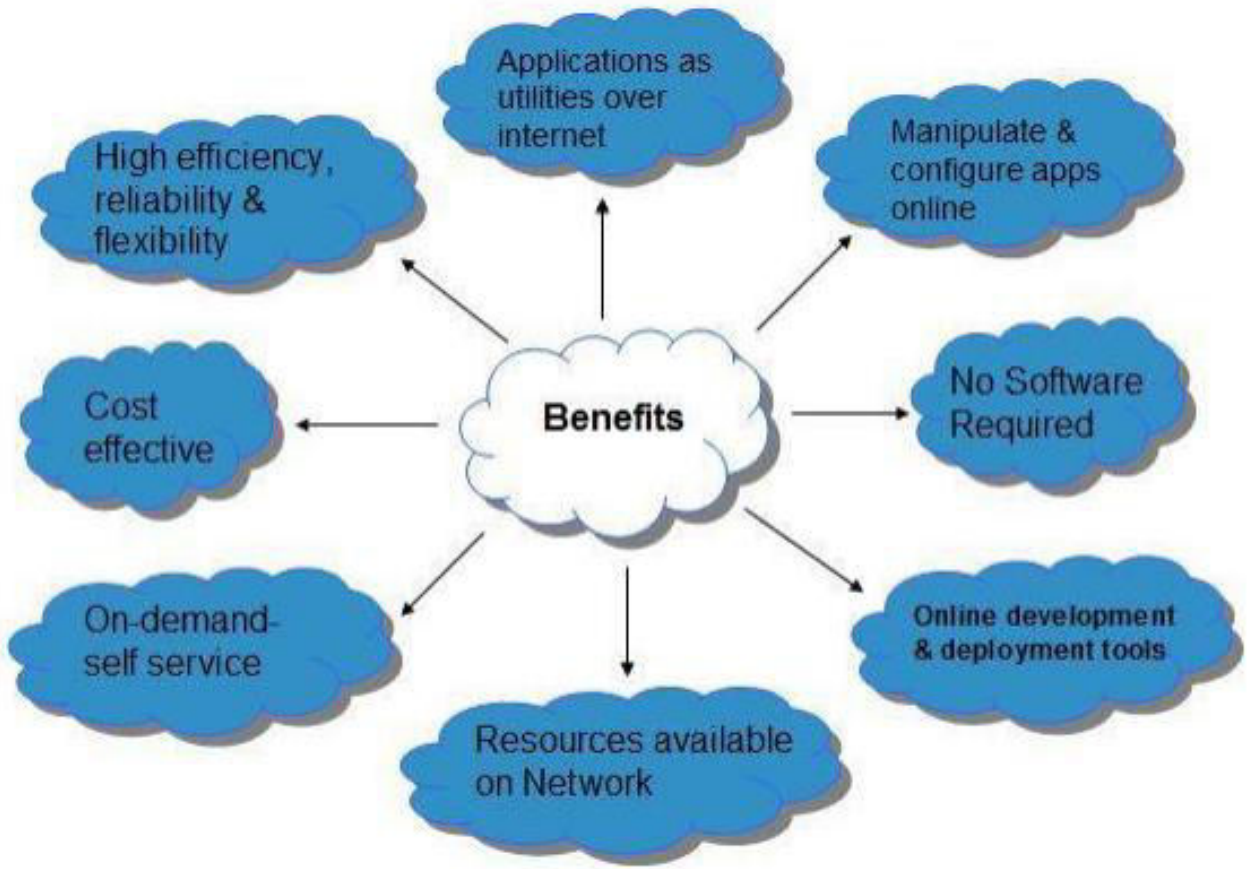
Benefits Cloud Computing



Types Of Cloud Services

Infrastructure as a Service (IaaS)

Platform as a Service (PaaS)

Software as a Service (SaaS)

- **Infrastructure as a service (IaaS) :** IaaS provides ***IT infrastructure i.e., servers, storage, networks, operating systems*** from a cloud provider on a ***pay-as-you-go basis***.

- **Platform as a service (PaaS) :** PaaS provide ***an on-demand environment for developing, testing, delivering and managing software applications***.

- **Software as a service (SaaS):** SaaS *provides software applications over the Internet, on demand on a subscription basis.*

- *Cloud service providers host and manage the software application and infrastructure.*

- *Users connect to the application over the Internet, usually with a web browser* on their phone, tablet or PC.

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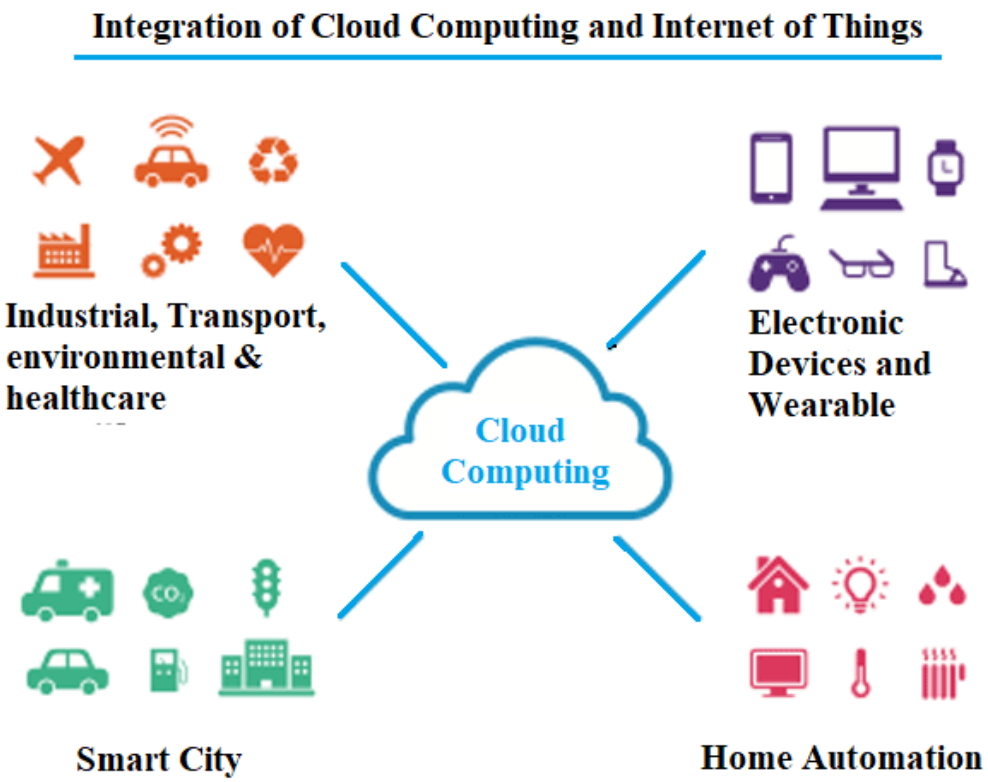

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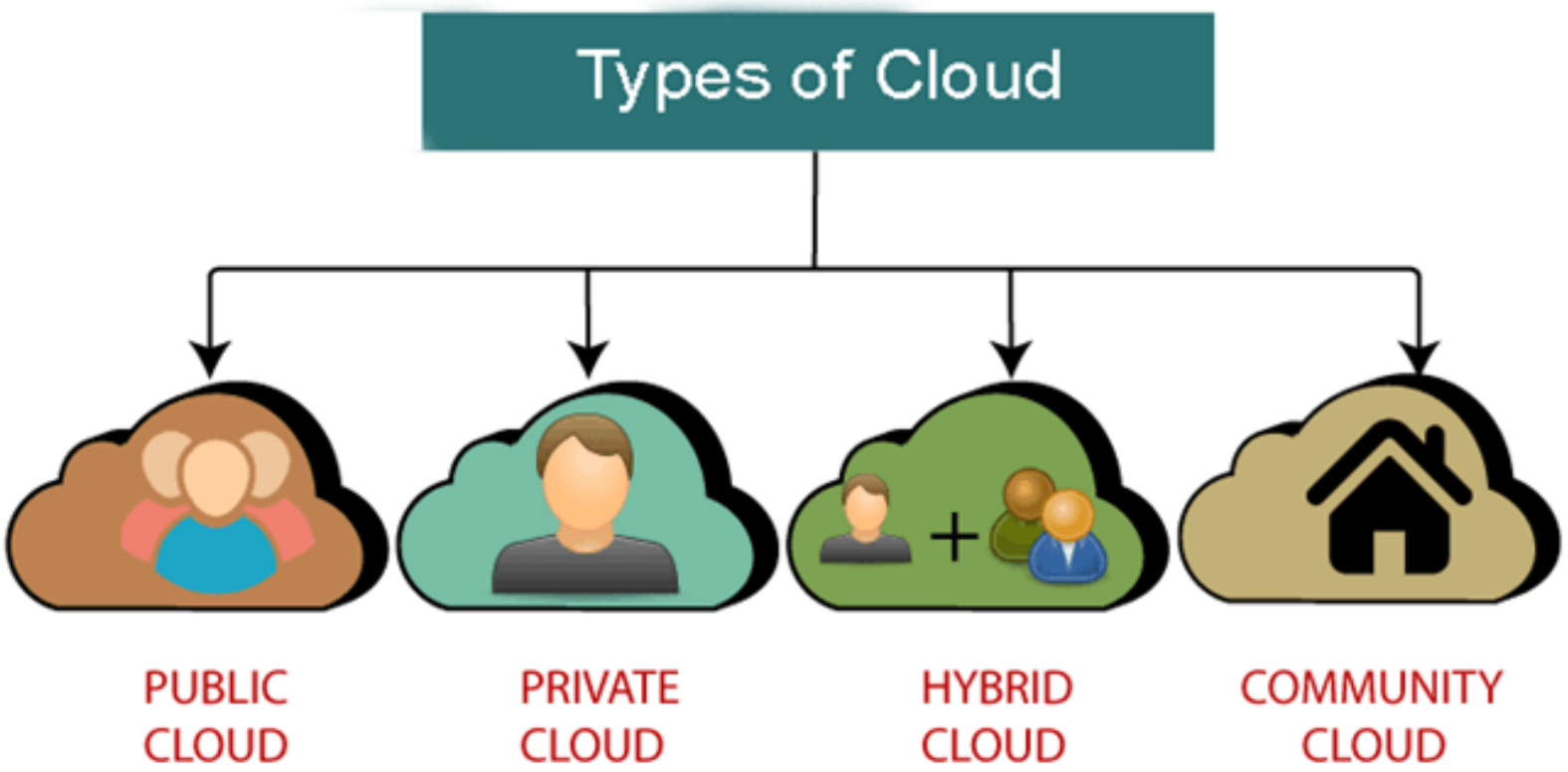

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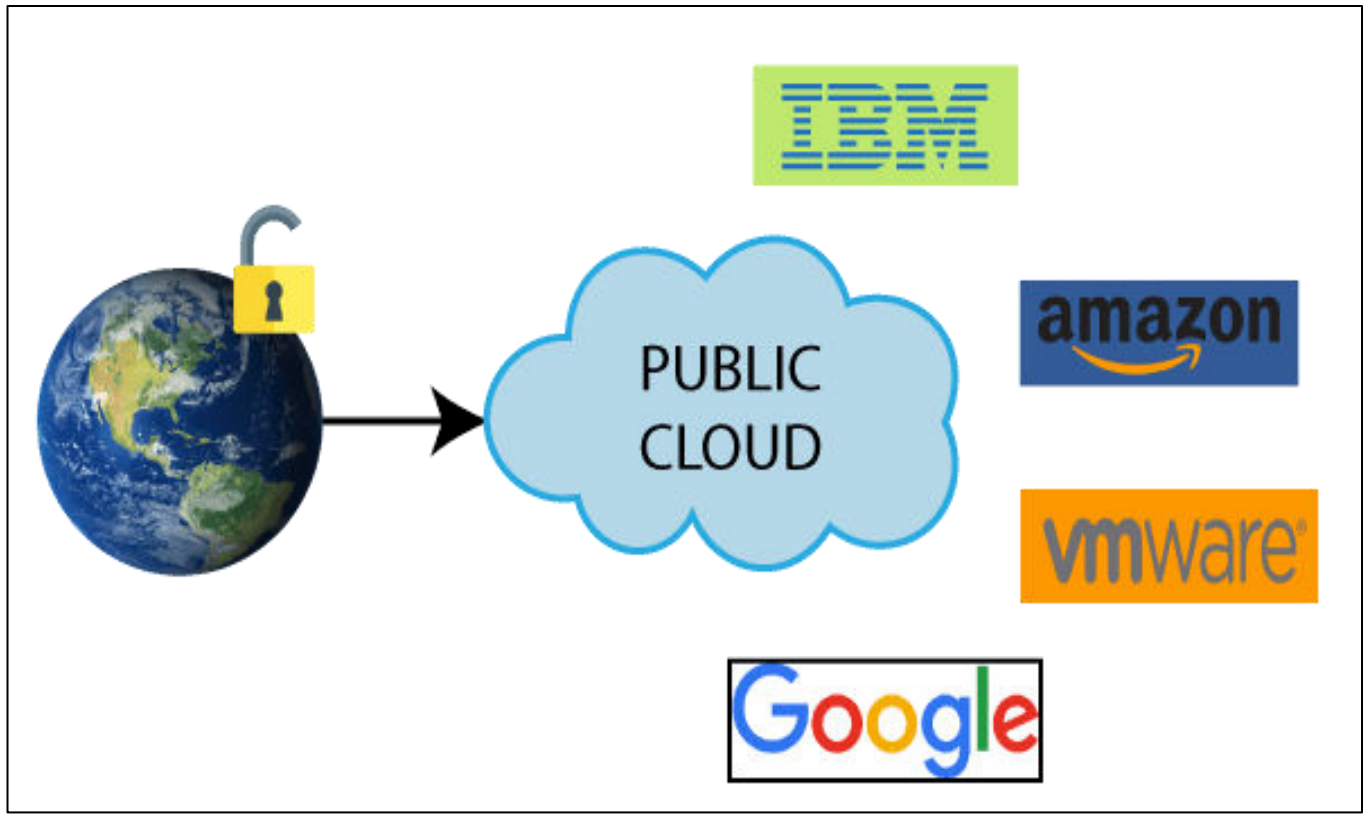

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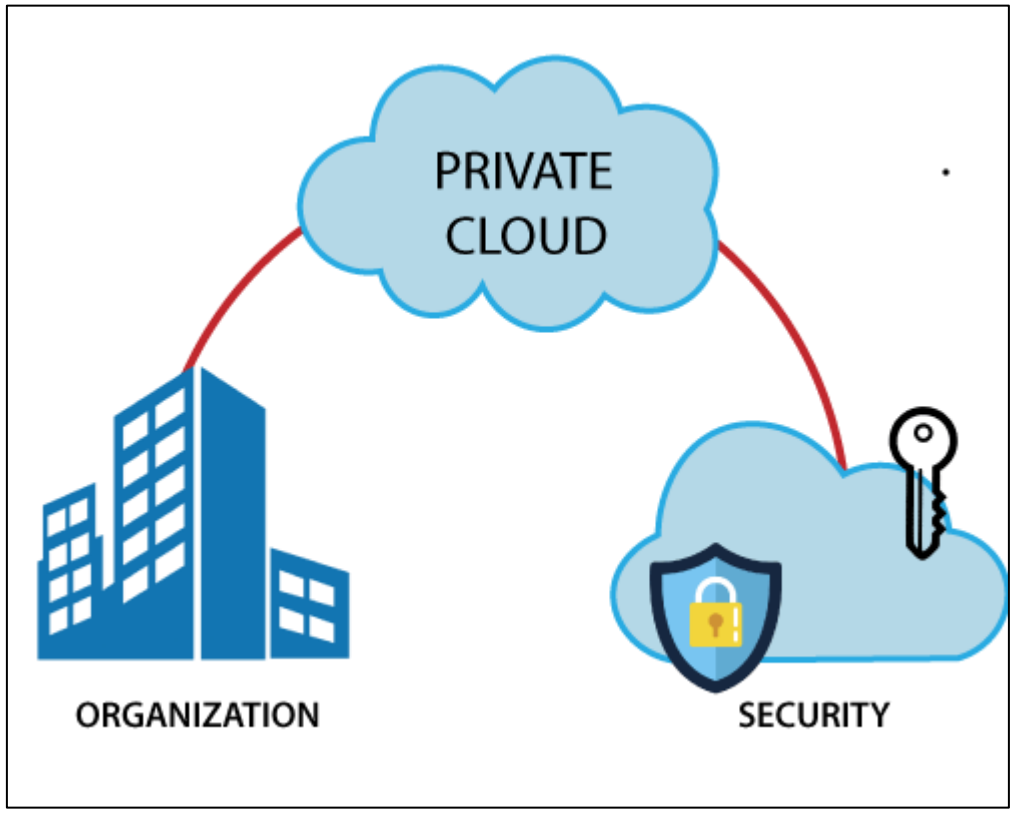

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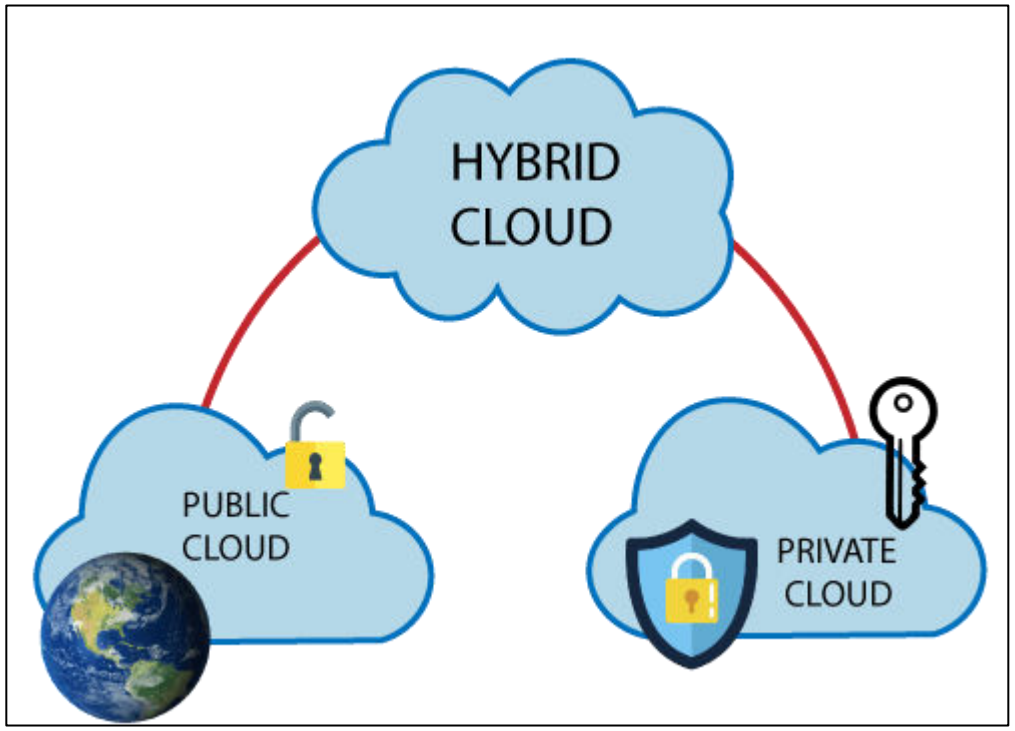

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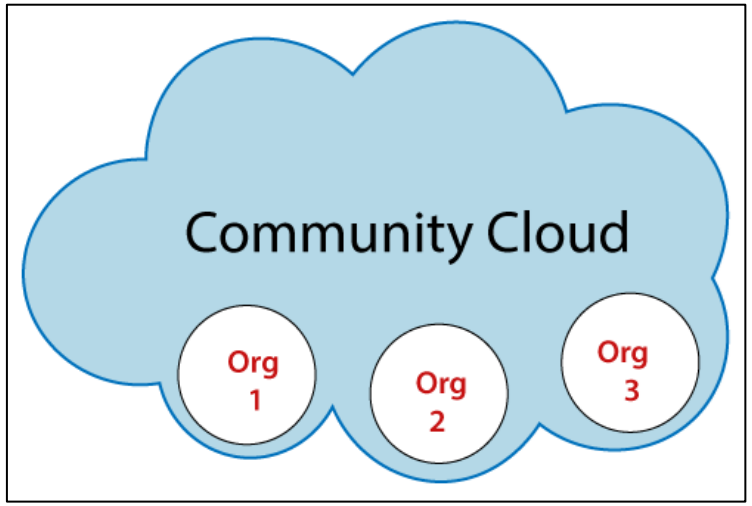

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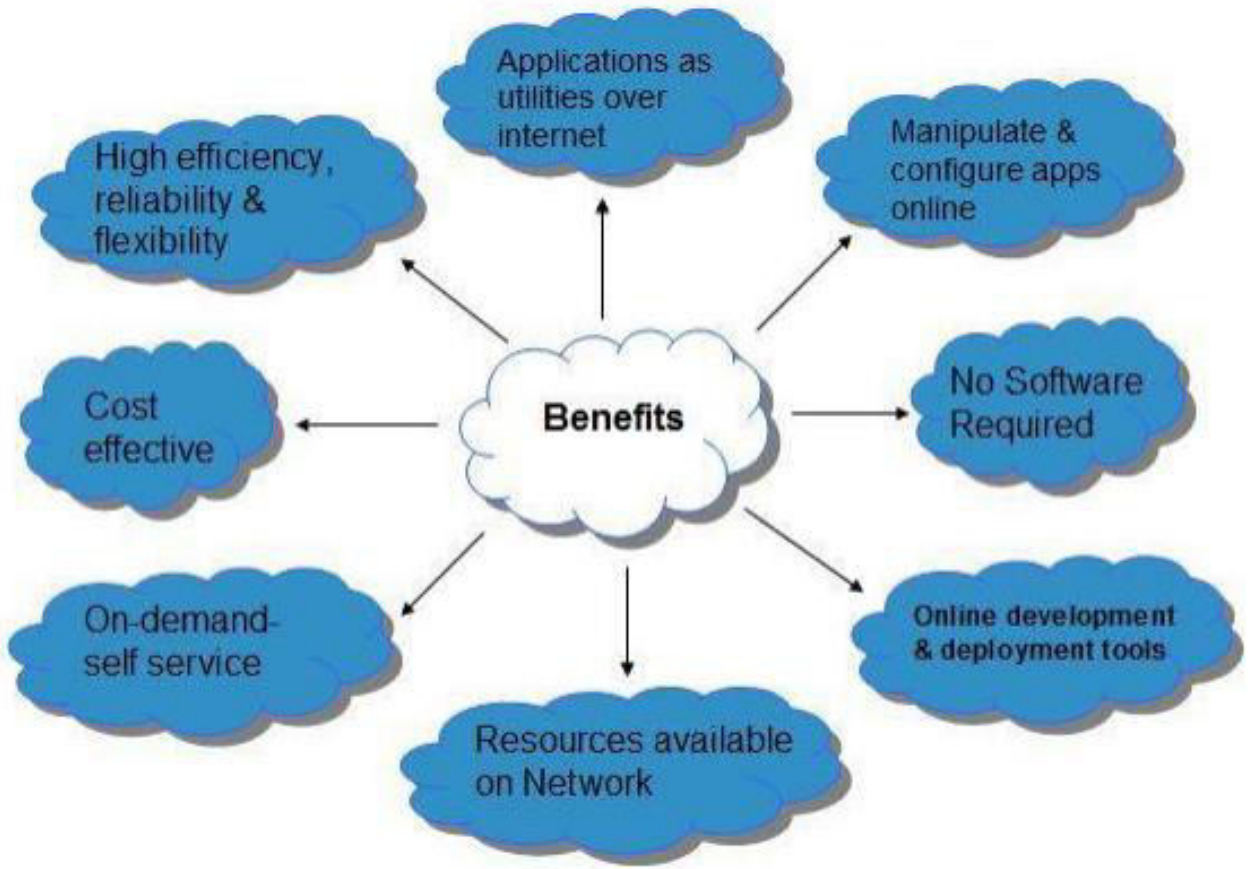

Cloud Service Models

- Cloud service models refer to the different ways or methods in which cloud computing services can be provided to customers or organizations.
- By choosing the right service model, customers or organizations can be confident that their applications or data are secure, available, and scalable if needed.
- But, before choosing the right cloud service model, users or organizations should clearly understand the different models, their advantages, disadvantages, use cases, etc.

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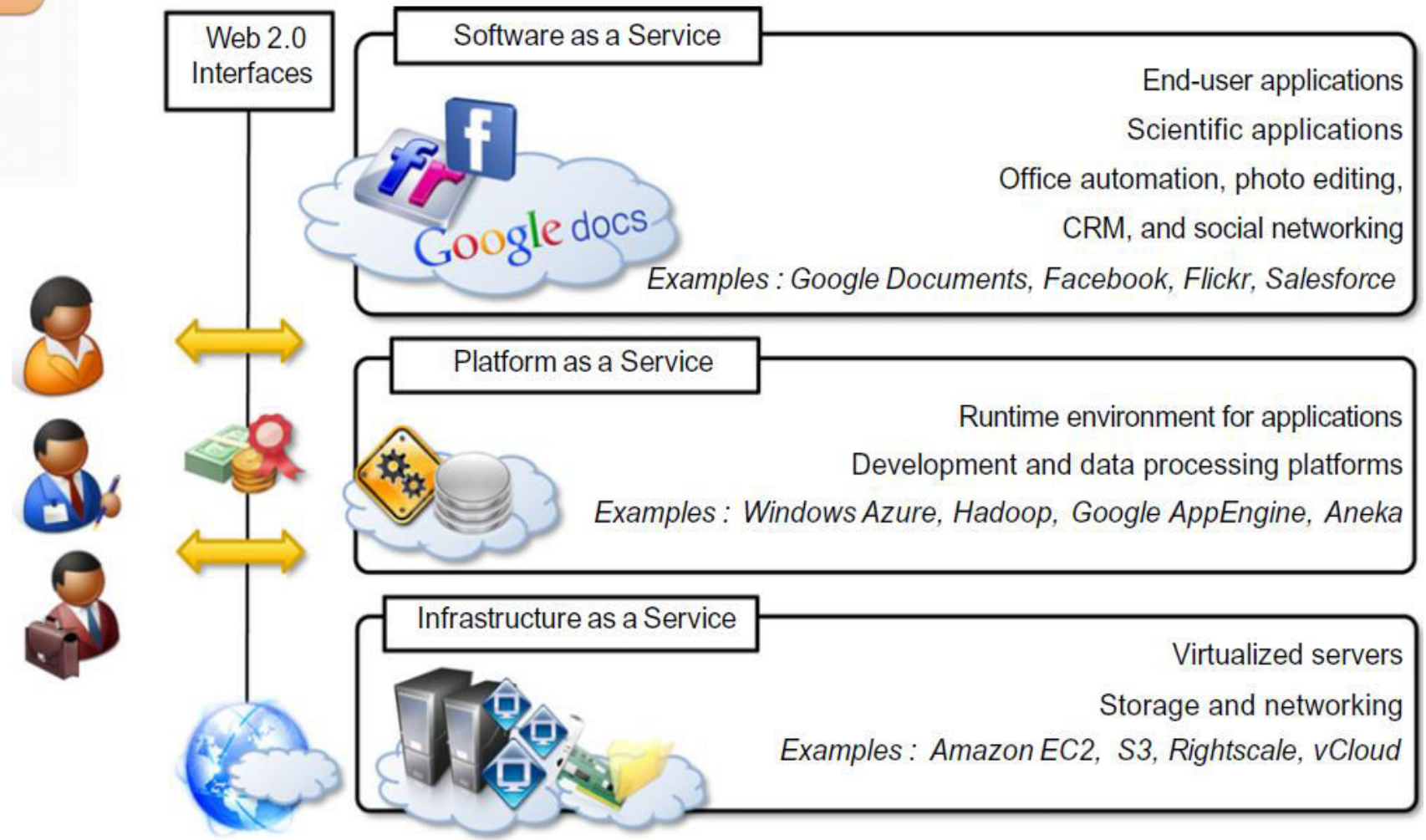
Infrastructure as a Service (IaaS)

Platform as a Service (PaaS)

Software as a Service (SaaS)



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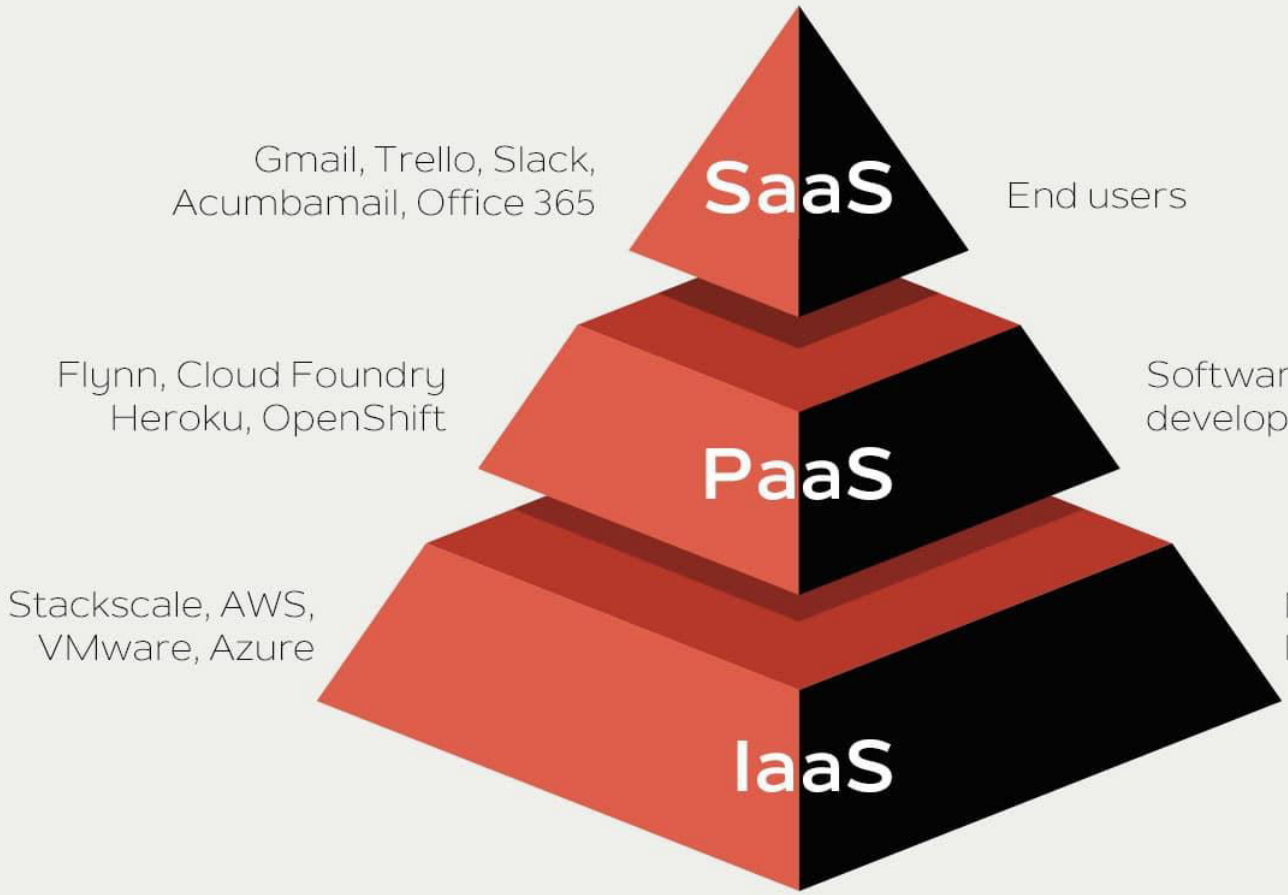
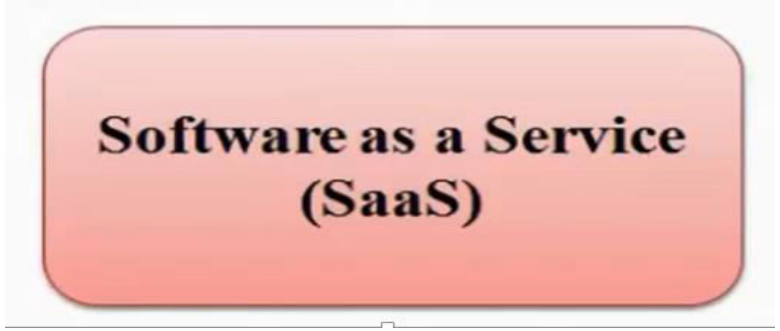


Stackscale



- SaaS or **Software-as-a-Service** cloud service model provides users or organizations with access to software applications that are hosted and maintained by the cloud service provider.

- Users or organizations can access the software using the internet and any browser.

- There is no need to purchase costly software and install bulky software on your own system in order to use it.
- SaaS is also known as "**On-Demand Software**."

- As a user of SaaS software, you don't care where the software is hosted, which operating system it uses, or which language it is written in.

- The SaaS software is made accessible from any device as long you have an internet connection. With SaaS, you do not incur the capital cost of buying servers or software.

- The service provider shields you from software maintenance and you simply connect to the SaaS application via a console dashboard or API.

Advantages of SaaS:

• **Simple deployment:** Using the SaaS cloud service model, users or organizations can use bulky and costly software without purchasing or downloading it on their systems.

• **Saves money:** Users and organizations don't have to purchase or maintain the software, saving them a ton of money.

Disadvantages of SaaS :

•**Fewer customization options:** Software is purchased and maintained by a cloud provider, limiting the customer's ability to customize them per their requirement.

•**Security:** As cloud providers maintain software, customers must trust them to securely store and manage their data.

- Customers should choose this cloud service model when they want to access software without purchasing or managing it on their own system.
- It is best suited for customers who only want to use different software without any hassle.

Platform as a Service (PaaS)

- PaaS or Platform-as-a-Service cloud service model provides users or organizations with access to a deployment platform to manage, build, or run their applications without worrying about physical infrastructure.

- Same as in the SaaS cloud service model, the cloud provider manages and maintains the infrastructure without letting the customer worry about these things. Due to this, users can use that time for more productive tasks.

Advantages of PaaS :

•**Simple deployment:** Using the PaaS cloud service model, users or organizations can focus on developing their applications without worrying about the underlying structure.
•**Saves money:** Users and organizations don't have to purchase or maintain the tools or platforms, saving them a ton of money.

Disadvantages of PaaS :

•**Fewer customization options:** Platform is managed and maintained by a cloud provider, limiting the customer's ability to customize them per their requirement.
•**Less control:** Platform is managed and maintained by a cloud provider, limiting the customer's control over it compared to using their own data centers or platform.

- Customers should choose this cloud service model when they want to focus on developing and deploying their own applications without having to worry about managing the underlying platform.

- It is best suited for customers who want a simplified and streamlined development environment while having better control and customization options

- IaaS or Infrastructure-as-a-Service cloud service model provides users or organizations with virtualized computing resources, such as VM, networking, storage, etc.
- Infrastructure-as-a-Service or IaaS allows customers or organizations to run their applications and manage their data.
- This cloud service model helps customers reduce the cost and complexity of purchasing or managing physical servers.
- IaaS is also known as “Hardware-as-a-Service.”

Advantages of IaaS:

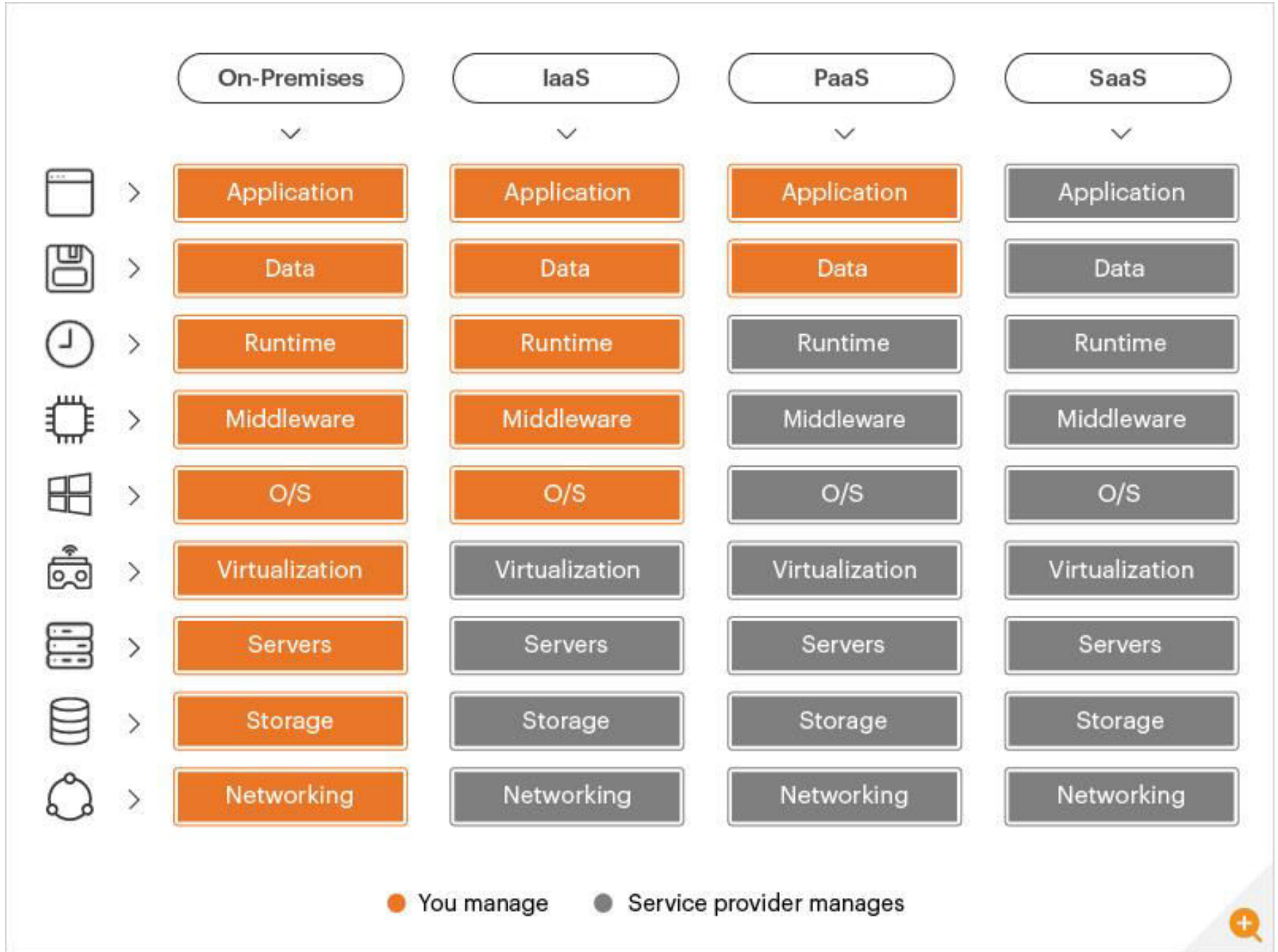
- **Highly flexible:** Users or organizations using IaaS can quickly scale and provision computing resources as per their requirements.
- **Improved efficiency:** Cloud provider has access to more resources in expertise in managing infrastructure effectively. Thus you get improved and updated infrastructure.

Disadvantages of IaaS :

- **Less control:** Underlying infrastructure is managed and maintained by a cloud provider, limiting the customer's ability to customize them per their requirement.
- **Security concerns:** In a shared infrastructure, keeping your data and application safe could be difficult and challenging. And above all, users are responsible for securing their data and applications.

- Customers should choose this cloud service model when they want more flexibility and control over their computing infrastructure.

- It is best suited for customers who don't want to invest in or maintain their data centers.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