



**Faculty of Computer Applications &  
Information Technology**

**BCA Programme  
Sem-V**

**210301503**

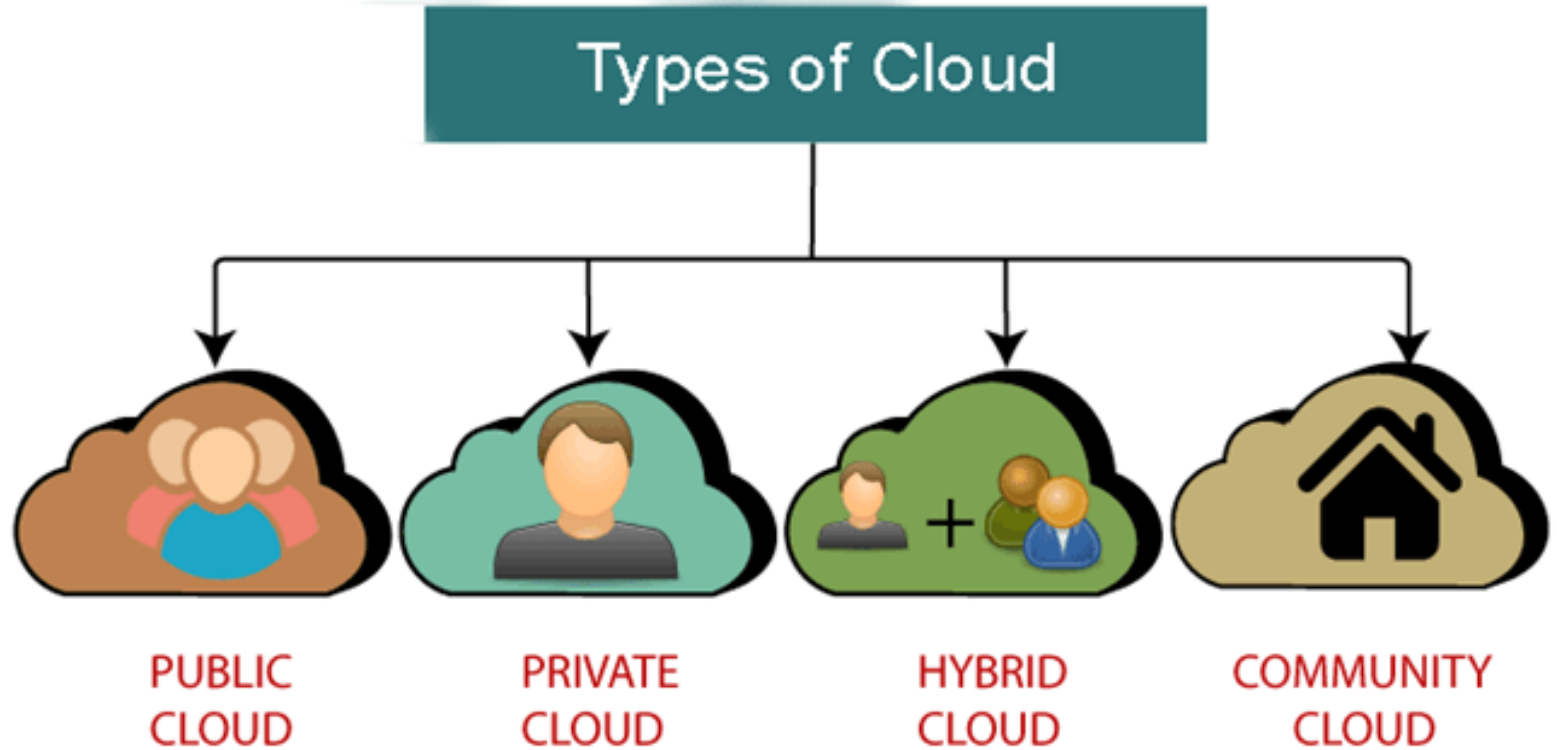
**INTRODUCTION TO CLOUD COMPUTING**

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# Types of Cloud



# Types of Cloud

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Following are the four types of Cloud Deployment Models

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

# Private Cloud

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- The cloud infrastructure is operated solely for **an organization**.
- Private cloud may exist off premises and can be managed by a third party.
- But in a private cloud, the services and infrastructure are always maintained on a private network and the hardware and software are dedicated solely to your organisation.
- In this way, a private cloud can make it easier for an organisation to customise its resources to meet specific IT requirements.
- Private clouds are often used by government agencies, financial institutions, any other mid- to large-size organisations with business-critical operations seeking enhanced control over their environment.

# Private Cloud

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- Thus, two private cloud scenarios exist, as follows:

## **On-site Private Cloud**

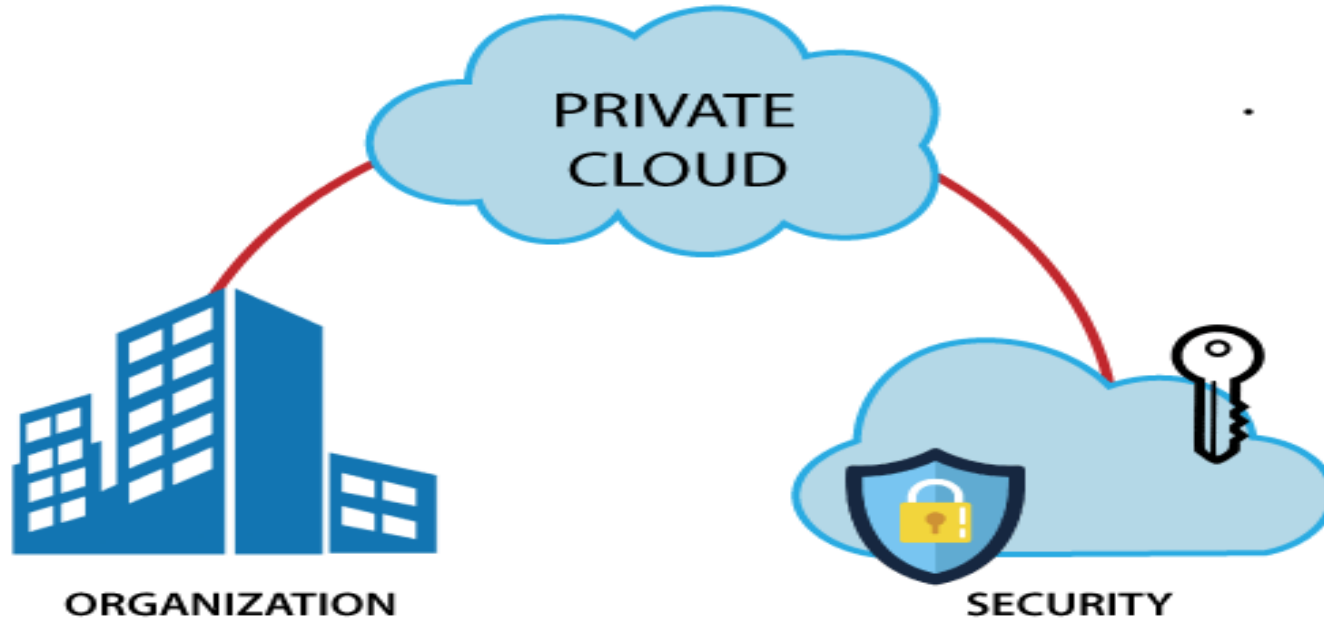
- Applies to private clouds implemented at a customer's premises.

## **Outsourced Private Cloud**

- Applies to private clouds where the server side is outsourced to a hosting company.

# Private Cloud

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# Private Cloud

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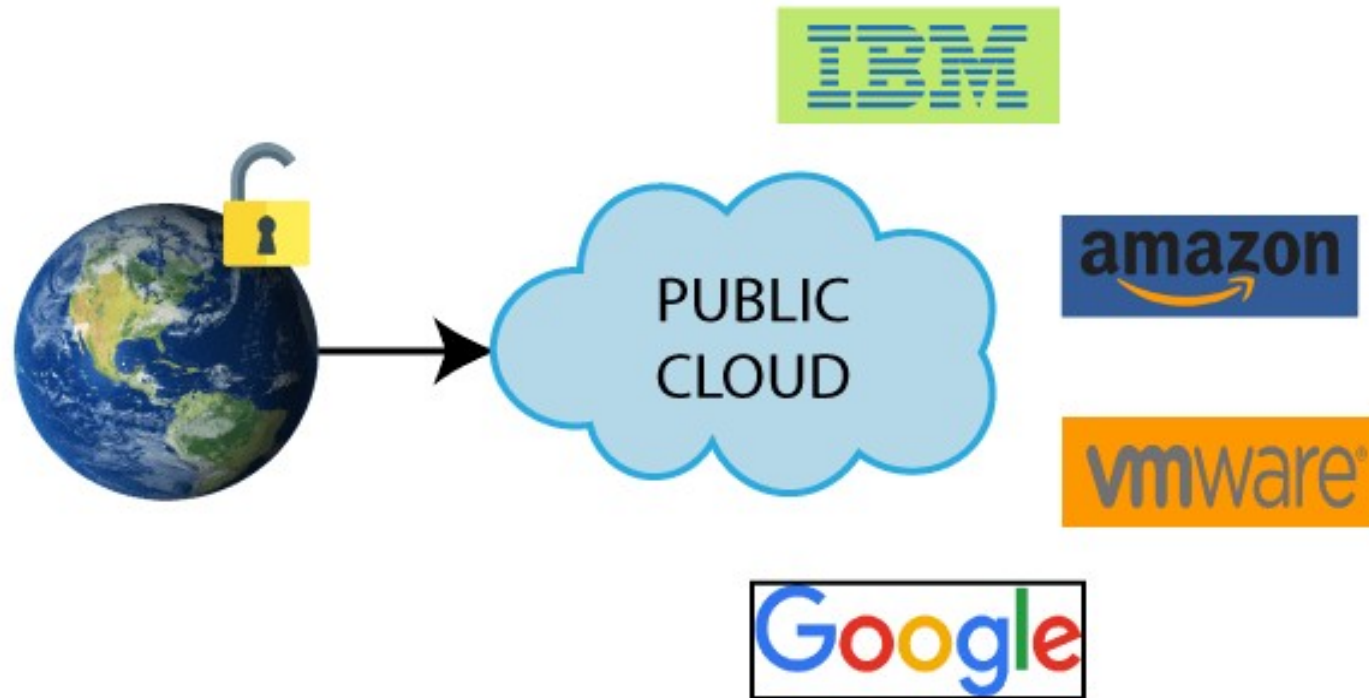
## Examples of Private Cloud:

- VMware Private Cloud
- Rackspace Private Cloud (Powered by OpenStack)
- CloudBees
- Amazon Virtual Private Cloud

## Advantages of Private Clouds:

- **More flexibility**—your organization can customize its cloud environment to meet specific business needs.
- **Improved security**—resources are not shared with others, so higher levels of control and security are possible.
- **High scalability**—private clouds still afford the scalability and efficiency of a public cloud.





# Public Cloud

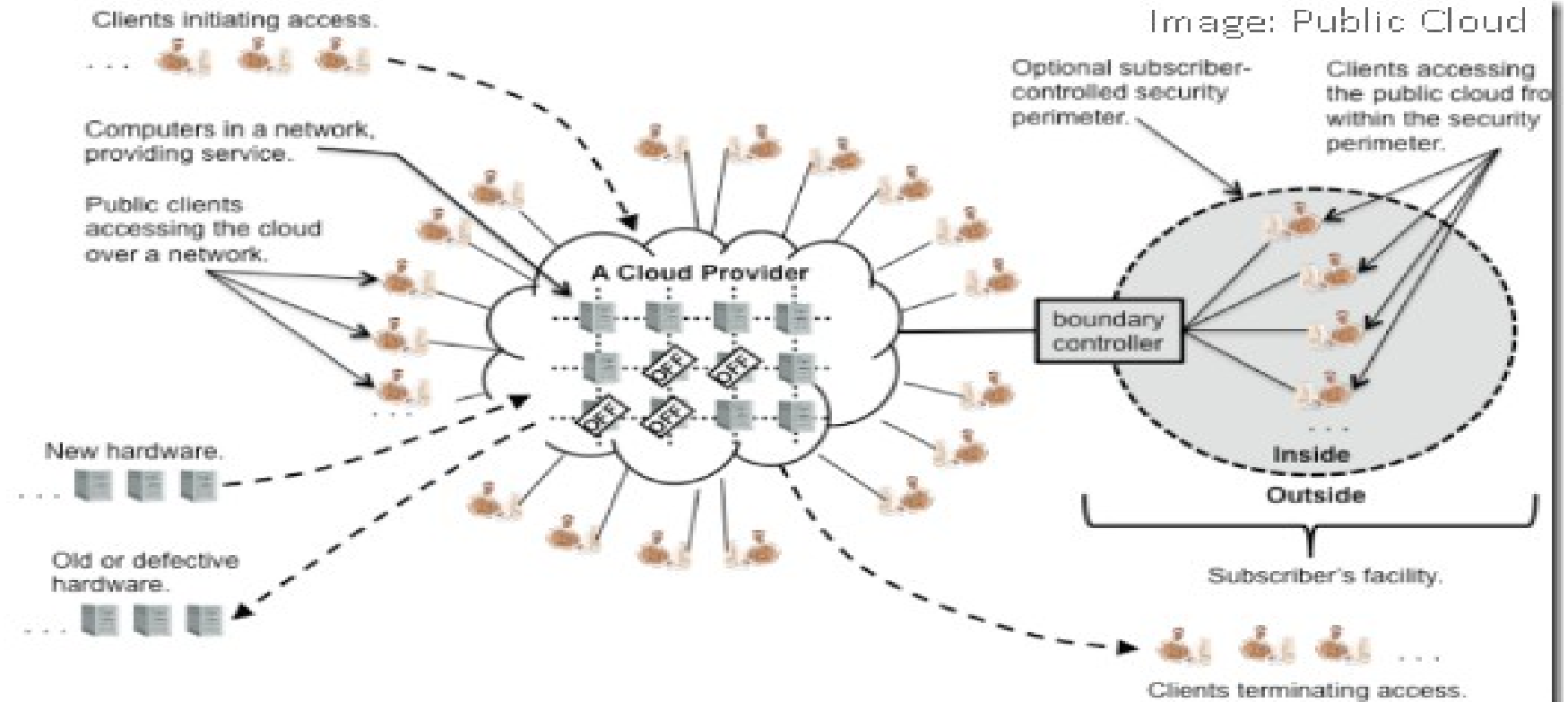
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- **Examples** of Public Cloud:
- Google App Engine
- Microsoft Windows Azure
- IBM Smart Cloud
- Amazon EC2.

Advantages of Public Cloud:

- **Low Cost:** One of the biggest reasons to choose Public Cloud is lower costs. It is because of the “Pay as you use” model.
- **No Maintenance:** As you do not purchase the hardware or software there is no question of maintenance. Your service provider provides the maintenance.
- **High Scalability:** Get high scalability & reliability as you get on-demand resources to meet your business needs.
- **Vast Network:** with a vast network of servers to guard against failure.

# Public Cloud



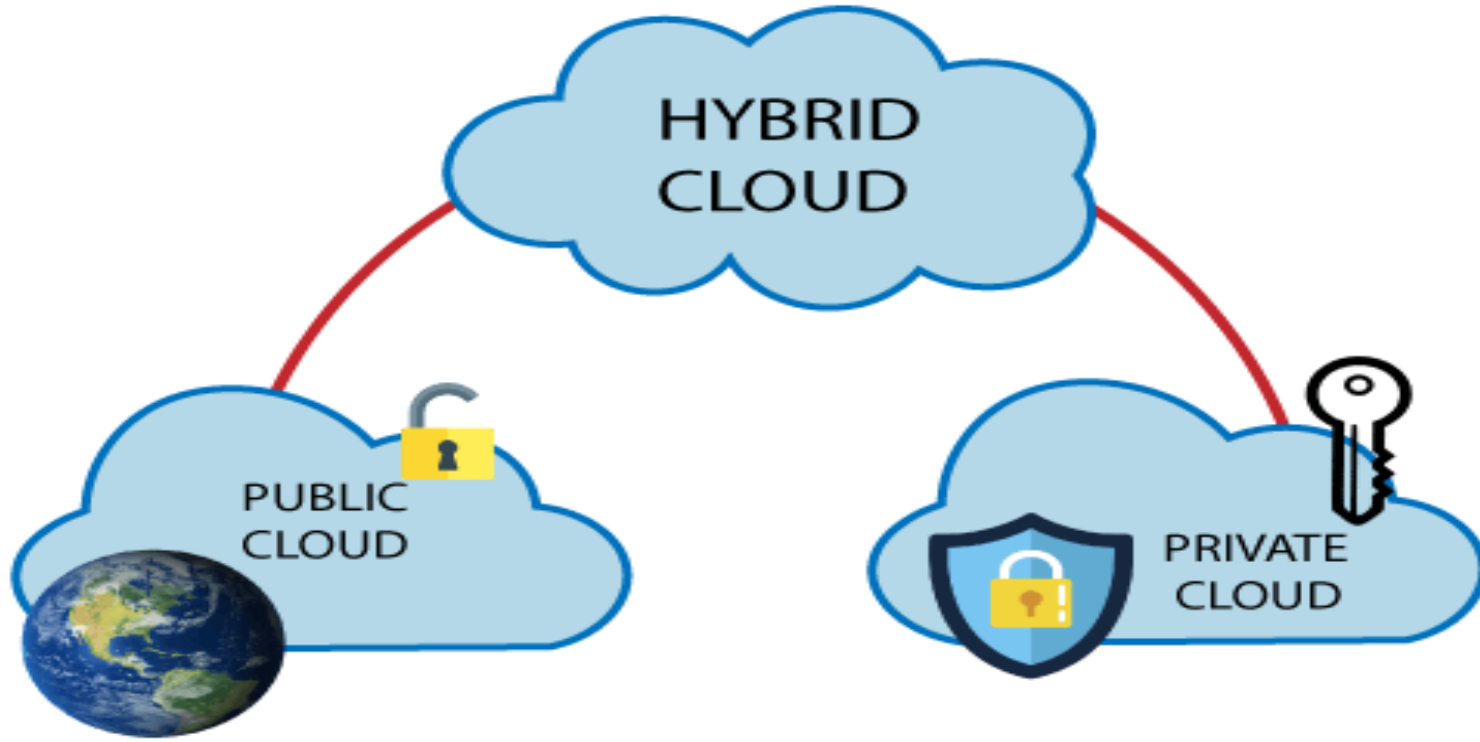
# Hybrid Cloud

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- The cloud infrastructure is a composition of two or more clouds (**private, community, or public**) that remain unique entities but are bound together by **standardized or proprietary technology** that enables data and application portability (e.g., cloud bursting for load-balancing between clouds).
- A hybrid cloud is a computing environment that combines a public cloud and a private cloud by allowing data and applications to be shared between them.
- When computing and processing demand fluctuates, hybrid cloud computing gives businesses the ability to seamlessly scale their on-premises infrastructure up to the public cloud to handle any overflow—without giving third-party datacenters access to the entirety of their data.
- Organizations gain the flexibility and computing power of the public cloud for basic and non-sensitive computing tasks, while keeping business-critical applications and data on-premises, safely behind a company firewall.

# Hybrid Cloud

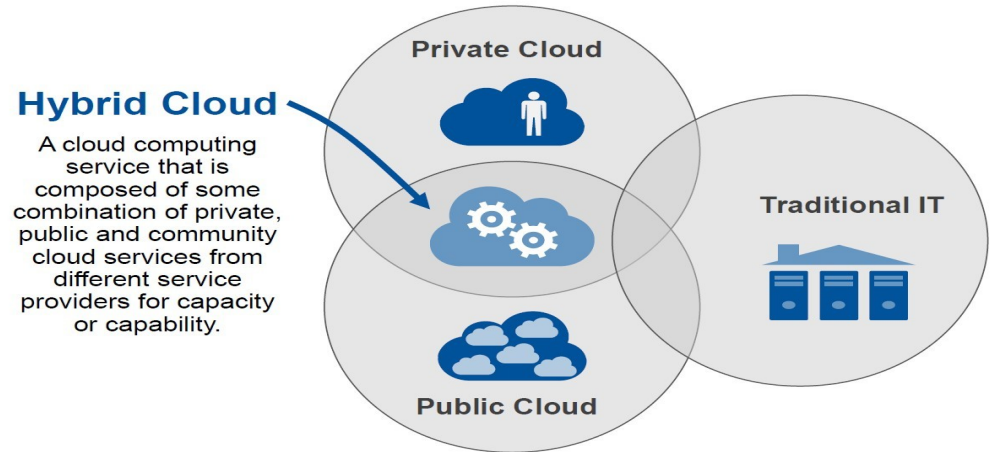
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# Hybrid Cloud

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- **Examples** of Hybrid Cloud:
- Microsoft Azure (capable of Hybrid Cloud)
- Amazon Web Services
- VMware vCloud (Hybrid Cloud Services)



# Advantages of Hybrid Cloud

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- **Saving**– The hybrid cloud helps organizations save costs, both in infrastructure and in application support. It presents a more moderate initial investment.
- **Scalability**– The hybrid cloud is a system capable of adapting to the demands that each company needs, for space, memory, and speed. By moving as many non-critical functions as possible to the public cloud, the organization can benefit from the scalability of the public cloud and, at the same time, reduce the demand from the private one.
- **Security**– Having the most critical data stored in the private cloud not only ensures that they are well protected but also provides that company information is stored according to the parameters established by current data protection regulations.
- **Flexibility**– Having the advantages of the public and private cloud within reach allows organizations a full range of options when they have to choose which service is best for each distinct need

# Disadvantages of Hybrid Cloud

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- **Reliability**– The reliability of the services depends on the technological and financial capacity of the cloud service providers.
- **Information**– The separated information of the company must travel through different nodes to reach their destination, each of them is a source of insecurity.
- **Centralization**– The centralization of the applications and the storage of the data creates an interdependence of the service providers.
- **Security, privacy and compliance**– Security can also be stress in the cloud, mainly if you handle grouped data and customer information. Consistency in the cloud can also become a problem, which may require the creation of a private cloud, if necessary, to protect private data.
- **Proximity**– Ensure that all PC viewing and programming devices are impeccable with web-based organization, stage or establishment. While the IT department may have some greater degree of control in the regulation of the mix, proximity is often “what you see is what you get” in terms of incidental expenses.



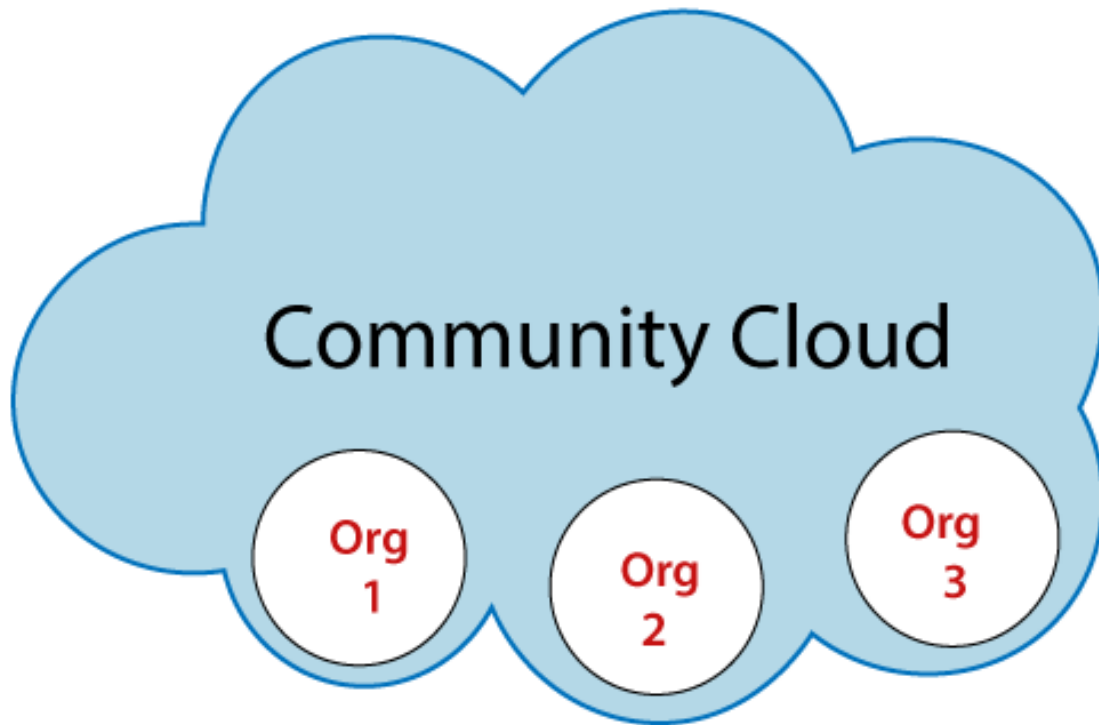
# Community Cloud

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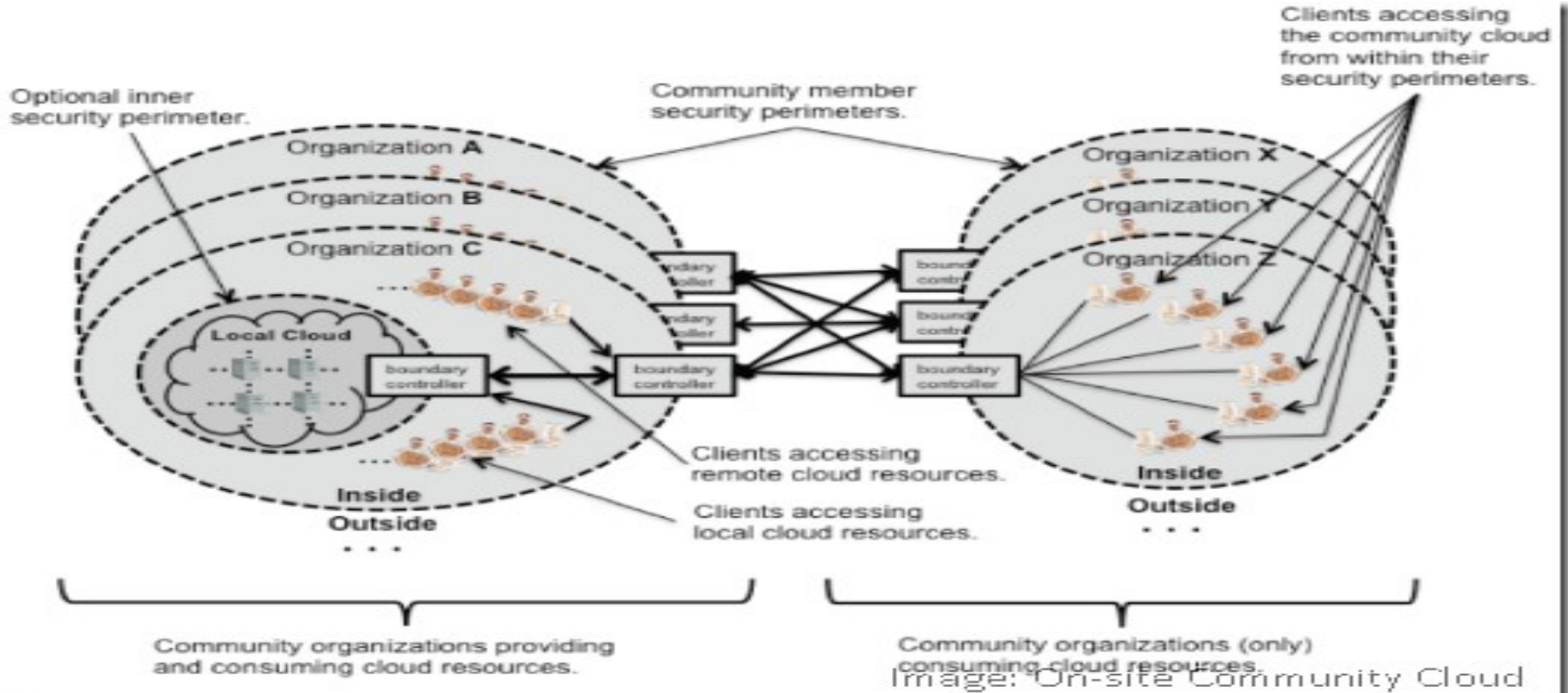
- shared by **several organizations** and supports a specific community that has shared concerns (e.g., **mission, security** requirements, policy, and compliance considerations).
- Government departments, universities, central banks etc. often find this type of cloud useful.
- Community cloud also has two possible scenarios:
- **On-site** Community Cloud Scenario
  - Applies to community clouds implemented on the premises of the customers composing a community cloud
- **Outsourced** Community Cloud
  - Applies to community clouds where where an organization uses a cloud computing environment that is hosted and managed locally within their own facilities or data centers
- **Examples** of Community Cloud:
  - Google Apps for Government
  - Microsoft Government Community Cloud

# Community Cloud

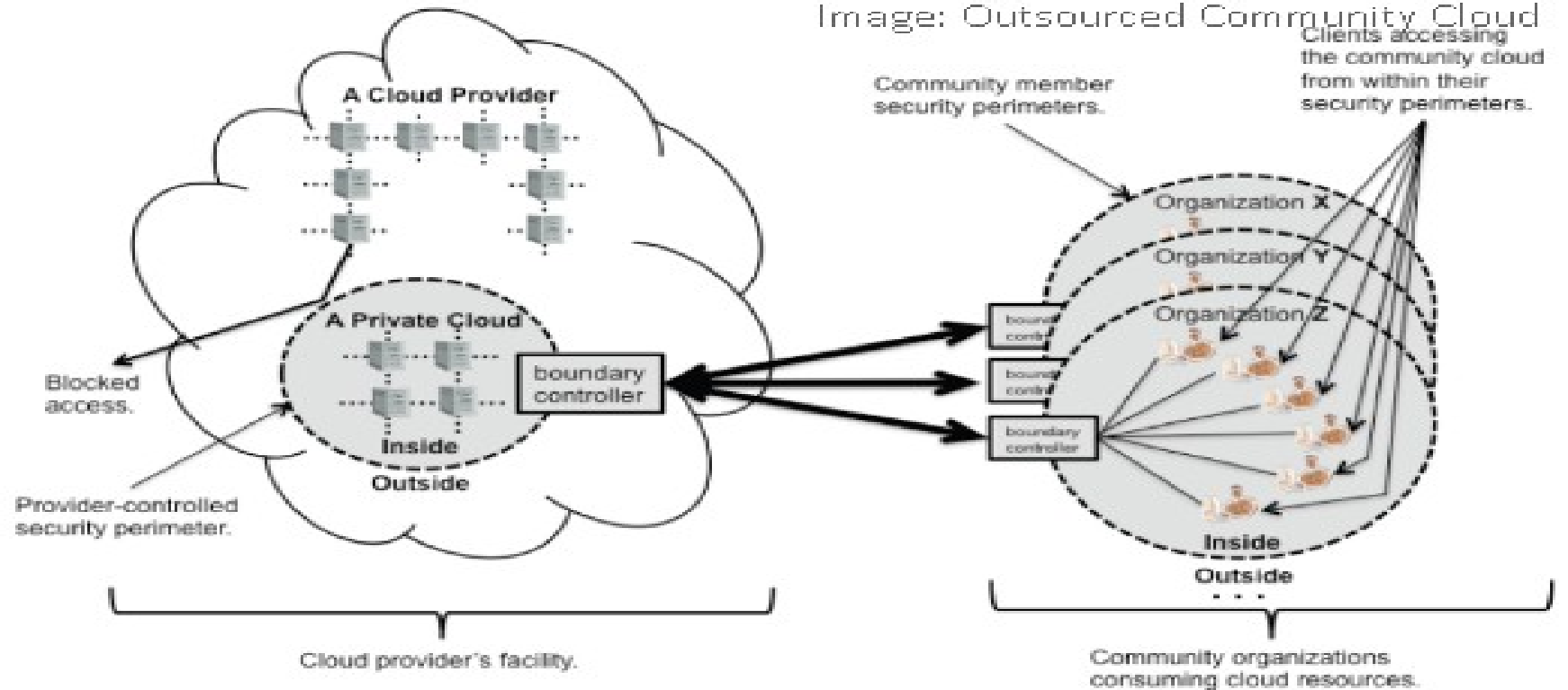
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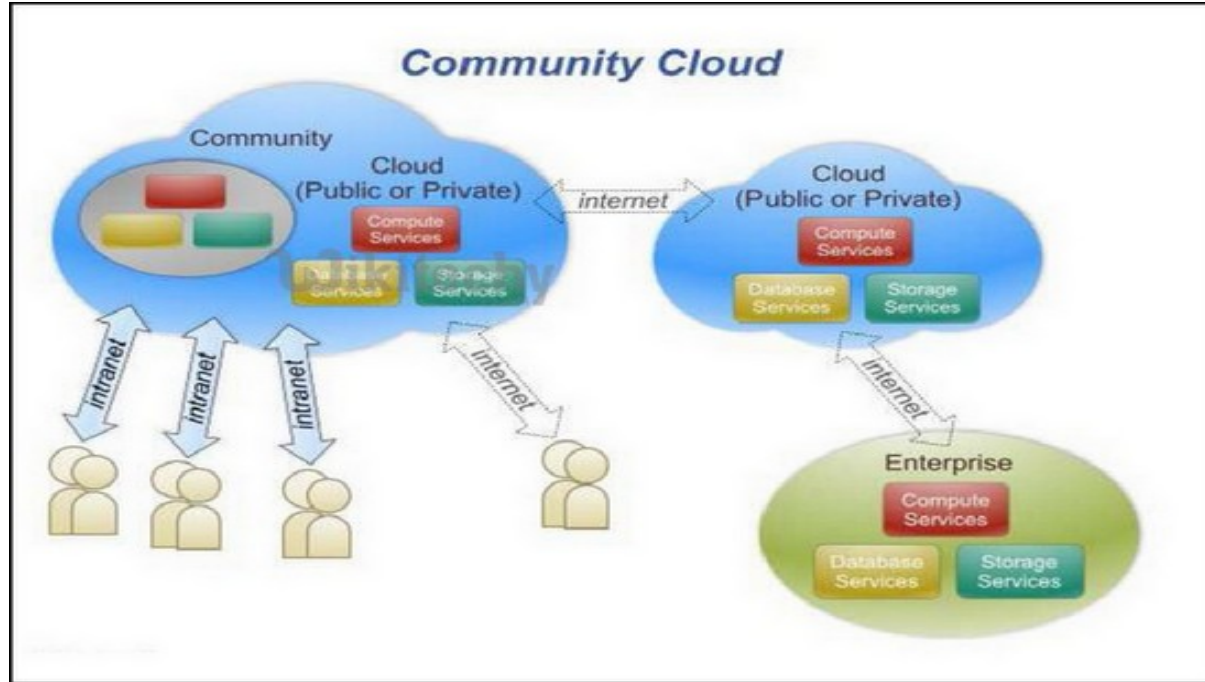
# Community Cloud



# Community Cloud

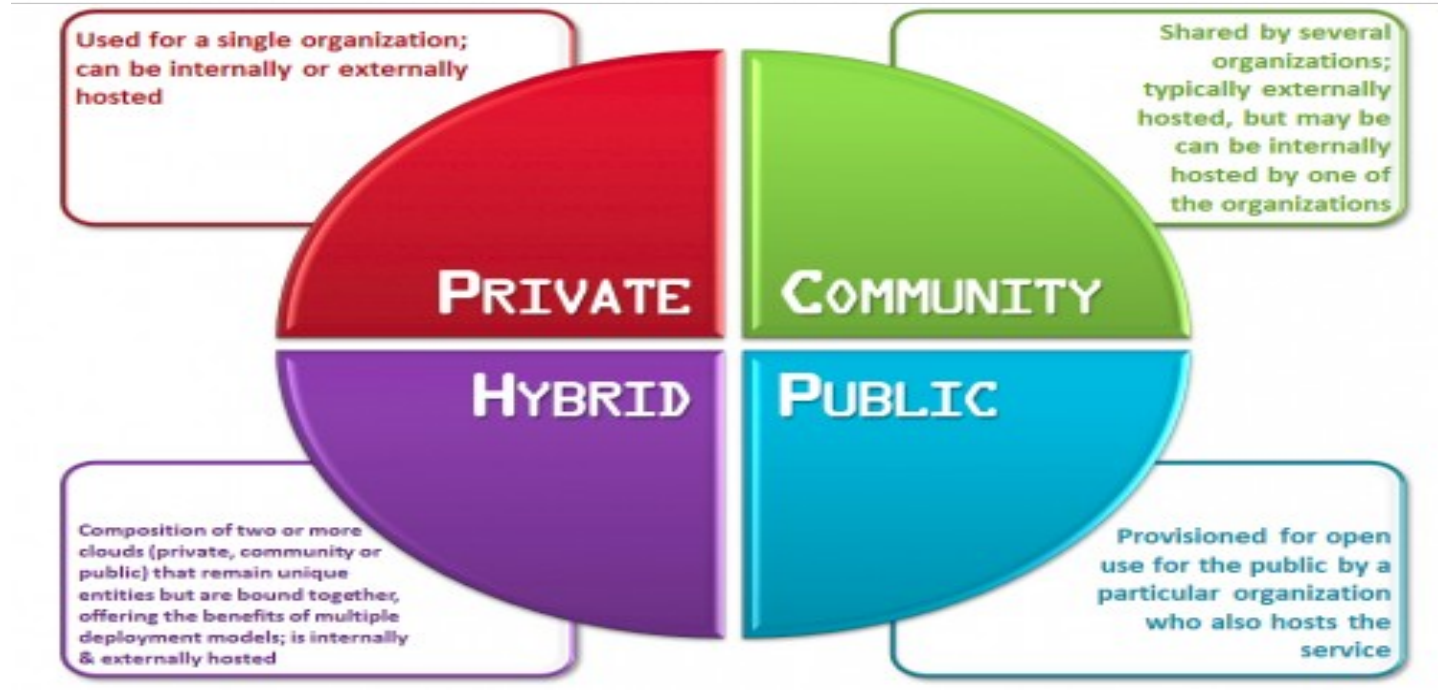


# Community Cloud



# Difference between Types of Clouds

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# Difference between Types of Clouds

Parameters\Type	Public Cloud	Private Cloud	Hybrid Cloud	Community Cloud
<b>Description</b>	In public cloud, services are available for public users.	Private cloud is build up with existing private infrastructure. This type of cloud has some authentic users who can dynamically provision the resources.	Hybrid cloud is a heterogeneous distributed system, resulting from a private cloud, which incorporates different types of services and resources from public clouds.	Different types of cloud are integrated together to meet a common or particular need for some organizations.
<b>Scalability</b>	Very High	Limited	Very High	Limited
<b>Reliability</b>	Moderate	Very High	Medium to High	Very High
<b>Security</b>	Totally Depends on service provider	High class security	Secure	Secure
<b>Performance</b>	Low to medium	Good	Good	Very Good
<b>Cost</b>	Cheaper	High Cost	Costly	Costly
<b>Examples</b>	Amazon EC2, Google AppEngine	VMWare, Microsoft, KVM, Xen	IBM, HP, VMWare vCloud, Eucalyptus	SolaS Community Cloud, VMWare

# Cloud Computing Infrastructure

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- **Cloud infrastructure is the layer of software and hardware between your internal systems and the public cloud. It supports the overall cloud deployment.**
- Cloud infrastructure refers to a **virtual infrastructure** that is delivered or accessed via a network or the internet.
- This usually refers to the on-demand services or products being delivered through the model known as **infrastructure as a service (IaaS)**, a basic delivery model of cloud computing.
- This is a highly automated offering where computing resources complemented with storage and networking services are provided to the user.
- In essence, users have an IT infrastructure that they can use for themselves without ever having to pay for the construction of a physical infrastructure.



# Cloud Computing Infrastructure

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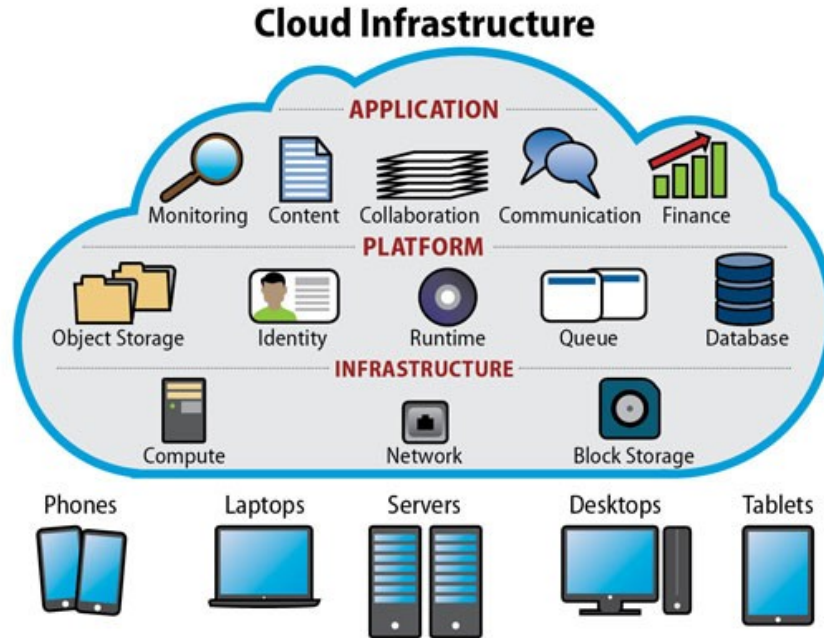
- The components of cloud infrastructure are typically broken down into three main categories: compute, networking, and storage:
- **Compute:** Performs the basic computing for the cloud systems. This is almost always virtualized so the instance can be moved around.
- **Networking:** Usually commodity hardware running some kind of software-defined networking (SDN) software to manage cloud connections.
- **Storage:** Usually a combination hard disks and flash storage designed to move data back and forth between the public and private clouds.

# Cloud Computing Infrastructure

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- Storage is where cloud infrastructure parts ways from the traditional data center infrastructure.
- Cloud infrastructure usually uses locally attached storage instead of shared disk arrays on a storage area network.
- Cloud providers like AWS, Azure and Google charge more for SSD storage than they do for hard disk storage.
- Cloud storage also uses a distributed file system designed for different kinds of storage scenarios, such as object, big data, or block.
- The type of storage used depends on the tasks you need handled.
- Key point: cloud storage can scale up or down as needed.

# Cloud Computing Infrastructure



Cloud infrastructure is the foundation upon which sits platform and any application. Connected devices like a laptop, phone or server transfer data in and out of this larger cloud system.

# Status of Cloud Computing

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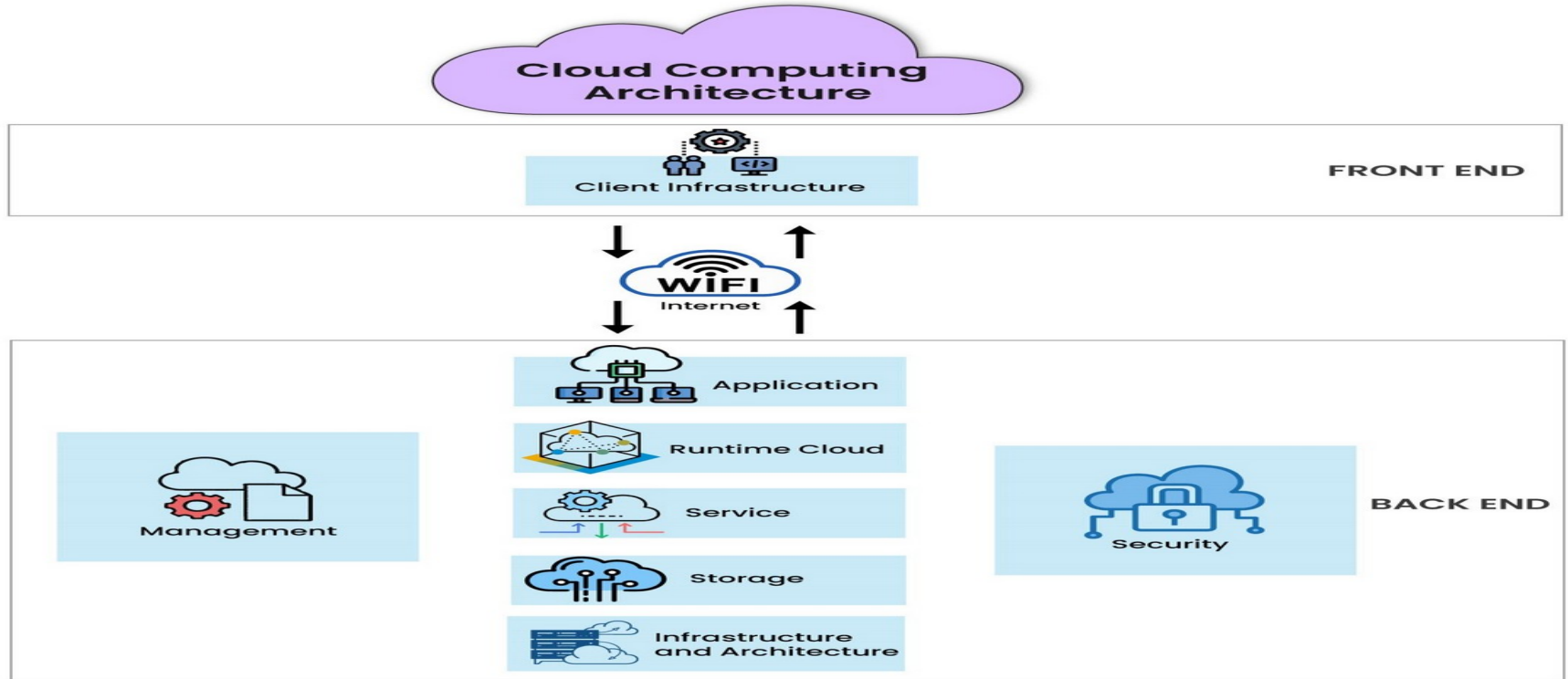
- Today we will talk about Cloud, but we will do it through numbers. We are hearing more and more about Cloud Computing and its growth at global level lately. It seems that companies have come to understand that Cloud services can bring significant benefits and there are few firms that are still not using a Cloud strategy nowadays. One thing is for sure, the Cloud is gaining the ICT market globally.
- Studies estimate that in 2019 Cloud Computing market will achieve \$206,2 billion. The growth compared to 2018, when the value was about \$175,8 billion, is of 17,2 %. Last years the biggest slice was taken by SaaS (Software as a Service) solutions with a share of 41%.
- 41% Software as a Service (SaaS)
- 26% Business Platform as a Service (BPaaS)
- 18% Infrastructure as a Service
- 9% Platform as a Service (PaaS)
- 6% Management and Security Services

# Status of Cloud Computing

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- Software Cloud market has reached the value of \$72.2 billion in 2018, with a growth rate of 22,7%. Gartner claims that SaaS market surpass \$113.1 billion by 2021 at a compound annual growth rate of 12.6%.

# Cloud Architecture



# Cloud Architecture

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- The term “cloud computing” refers to the provisioning of network-accessible resources or services on demand, such as storage, databases, software, analytics, and other platforms. Cloud computing technology is used by businesses of all sizes to store their data in the cloud, which can be accessed from any area at any time via an internet connection.
- Architecture of cloud computing is the combination of both [SOA \(Service Oriented Architecture\)](#) and EDA (Event Driven Architecture). Client infrastructure, application, service, runtime cloud, storage, infrastructure, management and security all these are the components of cloud computing architecture.
- The architecture of cloud computing consists of two essential parts:
  - Front End
  - Back End

# Cloud Architecture

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- **Front-End Cloud Architecture:** The front-end cloud architecture is used by the user's side, which consists of user-side applications and interfaces.
- These components are required to gain access to cloud computing services. It also includes components like local networks, web browsers (such as Mozilla Firefox, Google Chrome, Internet Explorer, Opera, and so on), mobile devices, and web applications (such as Gmail, Yahoo, etc.). The front-end architecture interacts with the back end via the networks and sends requests through the middleware.
- **Back-End Cloud Architecture:** The back-end cloud architecture is used by the cloud service provider, who handles and controls all the resources necessary to provide cloud services. It is a vital element of the overall cloud computing architecture since it enhances the front end's functionality and also protects the cloud data.
- It includes massive data storage, deployment models, virtual machines, applications, servers, security measures, etc.



# Cloud Architecture

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- The cloud computing architecture includes the following components:
  - 1. Client Infrastructure:** It is a front-end cloud computing architecture component that delivers a Graphical User Interface (GUI) for users to communicate with the cloud. It includes the applications and user interfaces (such as Gmail, Google Docs, Asana, etc.) required for cloud-based services.
  - 2. Application:** It is a component of back-end cloud computing architecture. It can be any software or platform that a user wants to access. It provides services in the back end that allow users to access their data in accordance with the requests and requirements.
  - 3. Service:** It is also a component of back-end cloud computing architecture, which manages each and every operation that runs on the cloud computing platform. It manages the different types of services that users can access based on their specific requirements.

# Cloud Architecture

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There are three distinct categories of services in cloud computing:

- **Software-as-a-Services (SaaS):** SaaS is a cloud application service. It runs directly through a web browser; therefore, installing and downloading the application is unnecessary.
- **Platform-as-a-Service (PaaS):** PaaS is a cloud platform service. It provides developers with a platform to create, implement, and manage applications without having to worry about the underlying infrastructure. It offers a ready-to-use development environment, including tools, libraries, and runtime, simplifying application development and deployment.
- **Infrastructure-as-a-Service (IaaS):** IaaS is a cloud infrastructure service. It is an essential component of cloud architecture that manages the application data, runtime environment, and middleware.

# Cloud Architecture

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- 4. Runtime Cloud:** It provides virtual machines an environment for executing and running programs at the same time. In other words, it performs similarly to a cloud-based operating system that uses virtualization technologies to execute services, enabling multiple run times on the same server.
- 5. Storage:** It is a significant component of back-end architecture that provides flexible and scalable cloud storage services. These services are used to store and manage data. Several users can access the data simultaneously within the cloud storage system.
- 6. Infrastructure:** It is also a back-end architecture component that provides services on three levels: the host, network, and application. It comprises software and hardware components such as network devices, storage, servers, virtualization, and other resources.

# Cloud Architecture

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**7. Management:** It is also a back-end architecture component that aids in managing back-end components, including services, applications, storage, runtime clouds, cloud infrastructure, and other security-related issues. It establishes the coordination between the front-end and back-end and simultaneously executes several cloud environment functions.

**8. Security:** It is an integral and crucial component at both the front-end and the back-end of a cloud computing architecture. It allows virtual firewalls, which are essential components of cloud security for preventing data loss. It implements different security measures in the back end to secure cloud systems, applications, IPs, files, infrastructure, services, and resources.

**9. Internet:** It serves as a medium or bridge that enables you to connect the front-end and back-end components so they can interact and communicate with each other.

# Key Cloud Attributes

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1. Shared / pooled resources
2. Broad network access
3. On-demand self-service
4. Scalable and elastic
5. Metered by use

# Shared/Pool Resources

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- Resources are drawn from a common pool
- Common resources build economies of scale
- Common infrastructure runs at high efficiency

# Broad Network Access

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- Open standards and APIs
- Almost always IP, HTTP, and REST
- Available from anywhere with an internet connection

# On Demand Self Service

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- Completely automated
- Users abstracted from the implementation
- Near real-time delivery (seconds or minutes)
- Services accessed through a self-serve web interface



# Scalable and Elastic

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- Resources dynamically-allocated between users
- Additional resources dynamically-released when needed
- Fully automated

# Metered by Use

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- Services are metered, like a utility
- Users pay only for services used
- Services can be cancelled at any time

# Metered by Use

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- Services are metered, like a utility
- Users pay only for services used
- Services can be cancelled at any time

# Types of Cloud Computing Services

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- IaaS: Cloud-based Services, pay-as-you-go for services like storage, virtualization, networking
- PaaS: Hardware and software tools available over the internet
- SaaS: software that's available via third party over the internet
- On premise: software that is installed in the same building as your business

# Types of Cloud Computing Services

 <b>On-Premises</b>	 <b>IaaS</b> Infrastructure as a Service	 <b>PaaS</b> Platform as a Service	 <b>SaaS</b> Software as a Service
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

# Examples of Cloud Computing Services

## Common Examples of SaaS, PaaS, & IaaS

Platform Type	Common Examples
<b>SaaS</b>	Google Apps, Dropbox, Salesforce, Cisco WebEx, Concur, GoToMeeting
<b>PaaS</b>	AWS Elastic Beanstalk, Windows Azure, Heroku, Force.com, Google App Engine, Apache Stratos, OpenShift
<b>IaaS</b>	DigitalOcean, Linode, Rackspace, Amazon Web Services (AWS), Cisco Metapod, Microsoft Azure, Google Compute Engine (GCE)

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# **UNIT-2 COMPLETED**

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