S. No.	Topics
1	What's in it for you? Before Cloud Computing About Hypervisors and virtualization
2	What is cloud computing? Types of Cloud Computing Public Cloud Private Cloud Hybrid Cloud IP Addressing with Types
3	Cloud Architecture Benefits IaaS, PaaS, SaaS
4	Benefits Of Cloud Computing
5	Cloud Management
6	Microservices Architecture How MicroServices Works? Benefits Microservices Challenges of MicroServices Characteristics of MicroServices MicroServices in Cloud

S. No.	Topics
7	Cloud VS on-prem Security Introduction On-prem Security Benefits Cost of On-prem Security Benefits of Cloud Security Cons of Cloud Security
8	Cloud Computing Security Deep Dive What is Cloud Security Principal of Cloud Computing Security Cloud Computing Security Best practice
9	Module Review AWS Certification Road Map Azure Certification Road Map

What's in it for you:

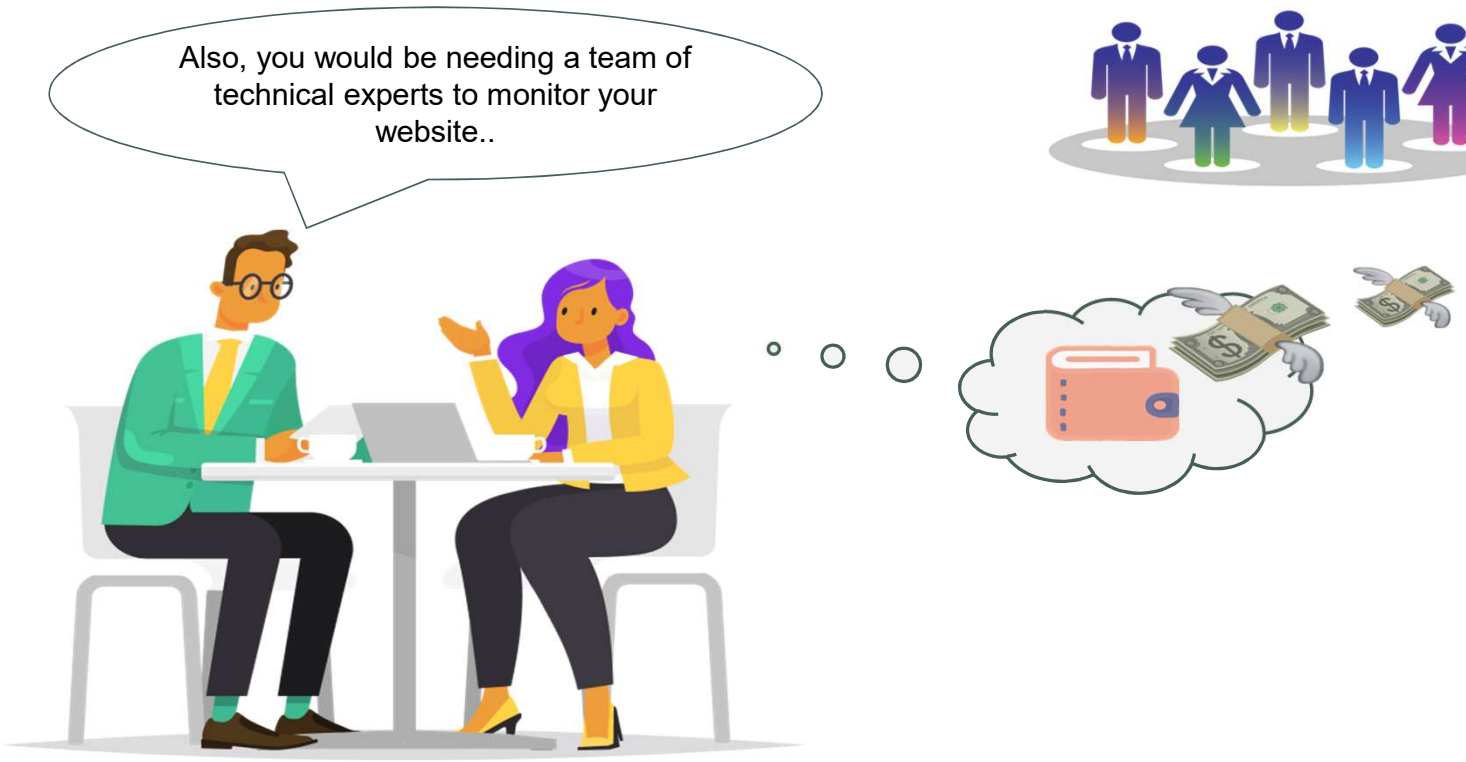
What's in it for you:

- Before Cloud Computing
- What is Cloud Computing
- Benefits of Cloud Computing
- Types of Cloud Computing
- Categories of Cloud Computing

Before Cloud Computing:

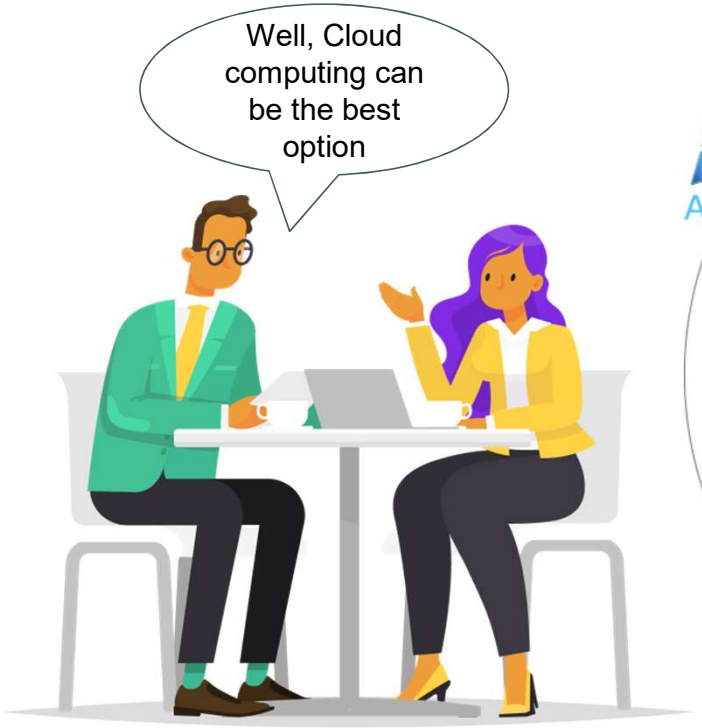
Before Cloud Computing:

Before Cloud Computing:



Before Cloud Computing:

Before Cloud Computing:



What is cloud computing

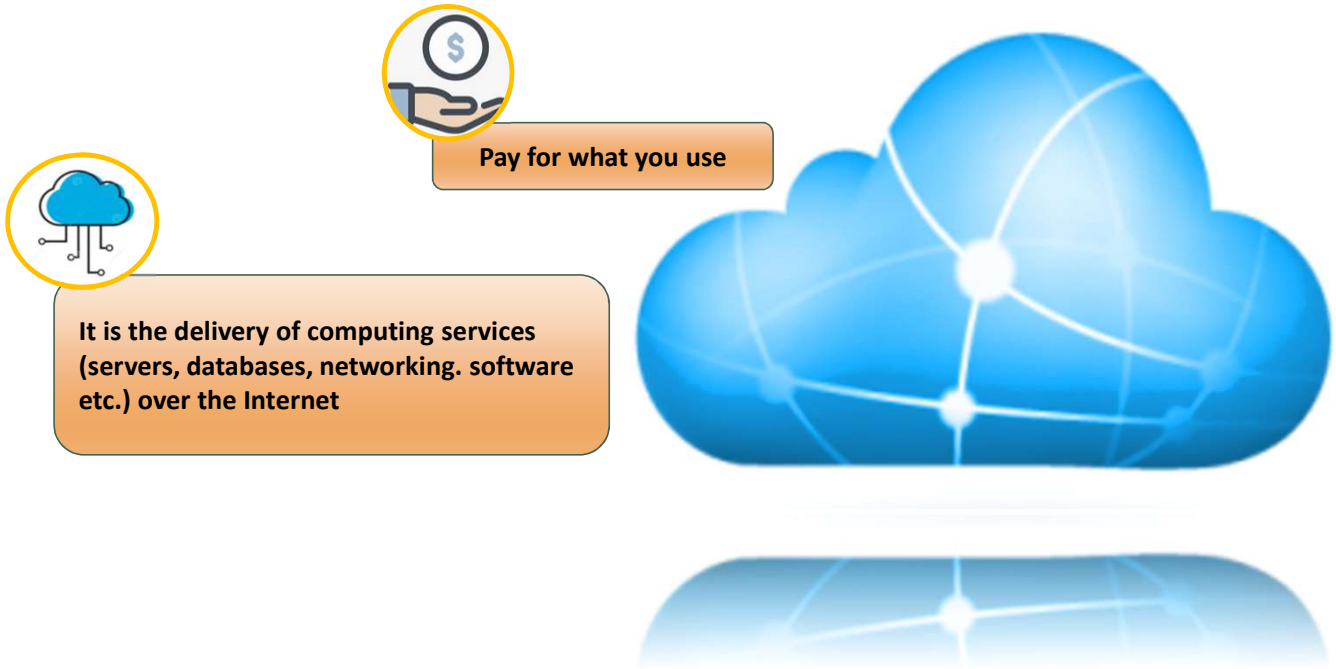
What is cloud Computing?

Cloud Computing is the use of a network of remote servers hosted on the Internet to store, manage and process data rather than a local server

What is cloud Computing?

It is the delivery of computing services (servers, databases, networking, software etc.) over the Internet

What is cloud Computing?



What is cloud Computing?

What is cloud Computing?

Cloud computing service providers give the ability to manage applications and services through a global network

Example: Amazon Web Services and Microsoft Azure

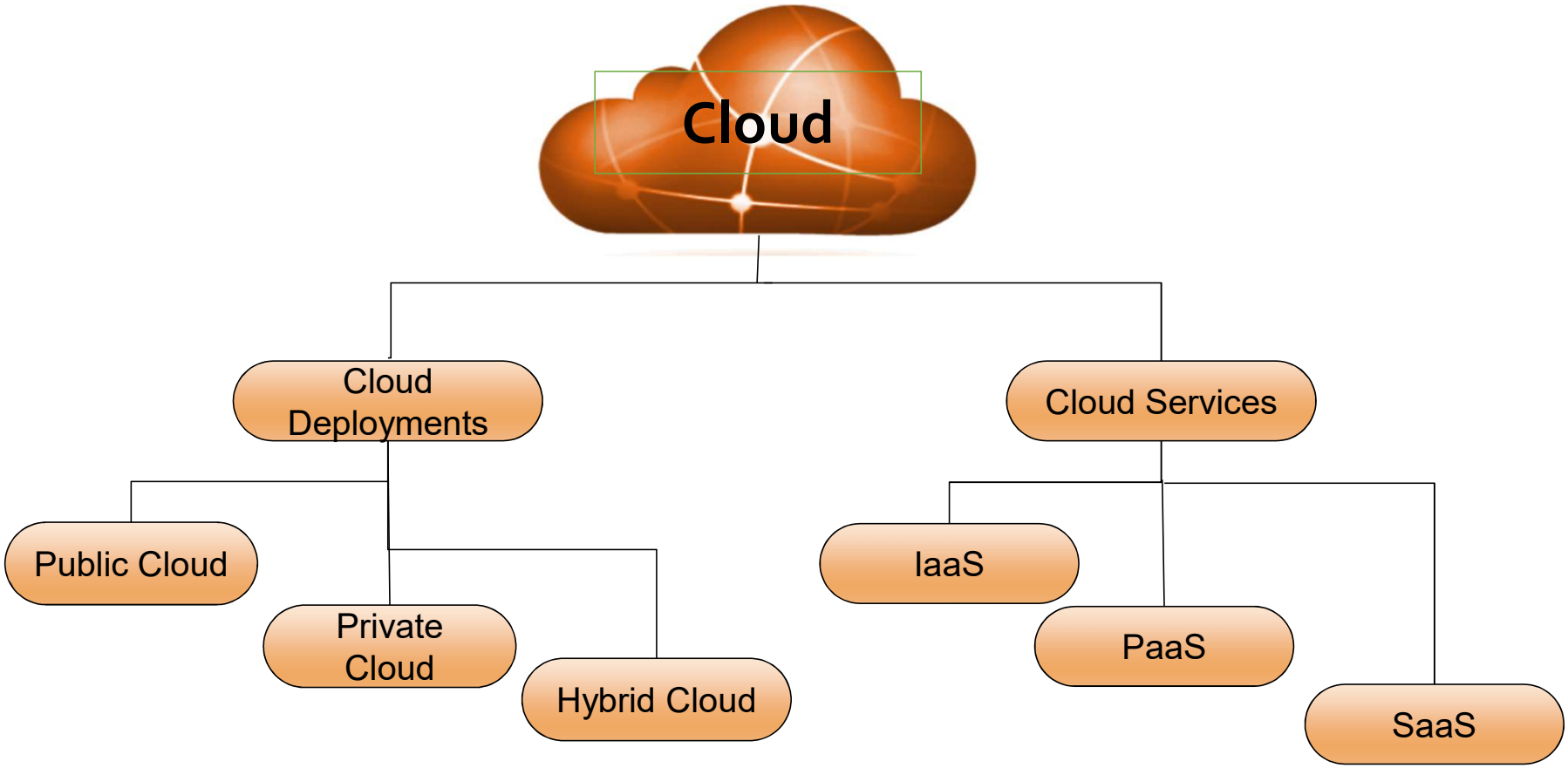
Q&A Session

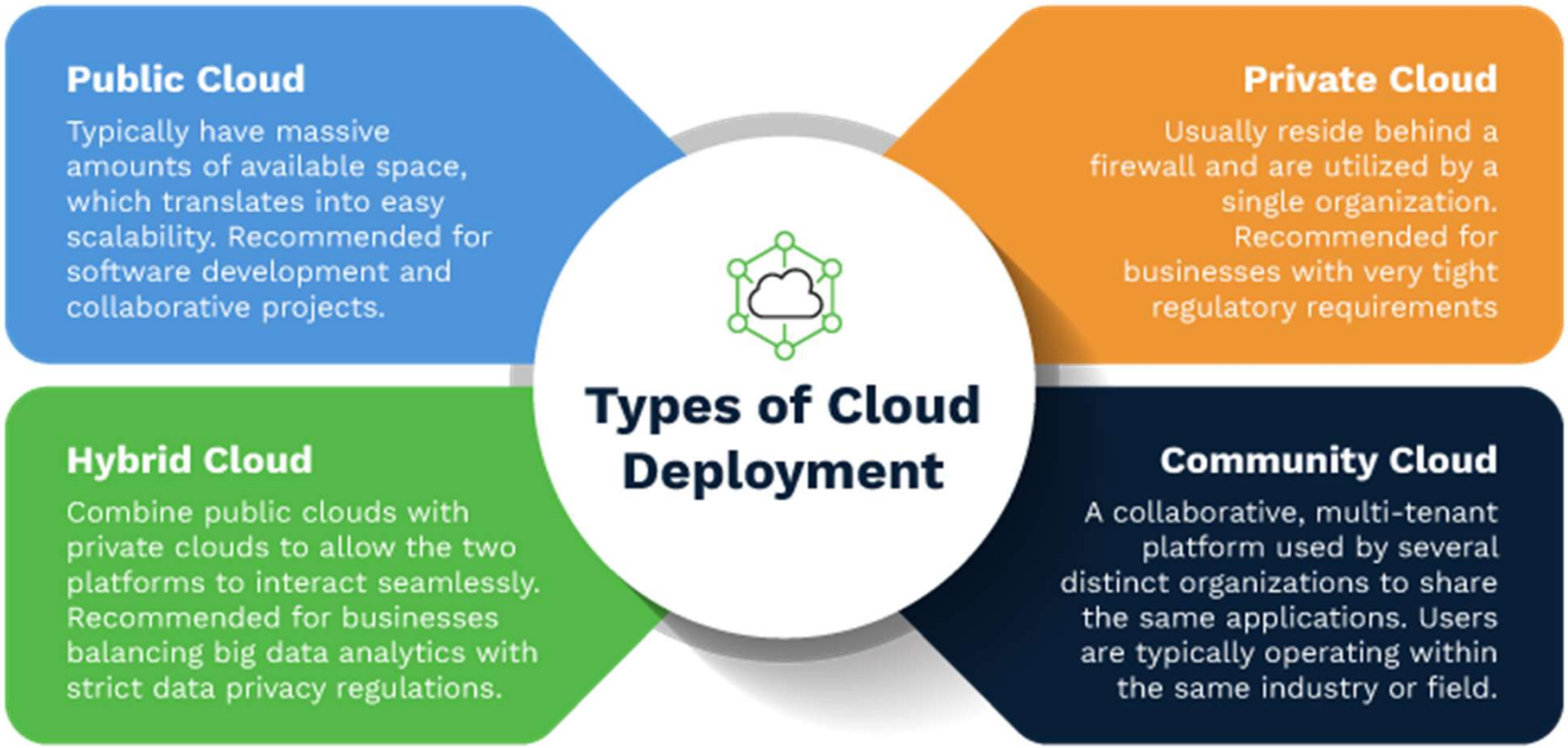
1. What is one benefit of cloud computing?
    a. Computer resources can be quickly provisioned.
    b. A workload can quickly move to a cloud computing environment.
    c. There is no operational cost for a cloud computing environment.
    d. The resources can quickly move from one cloud environment to another.

1. What is one benefit of a cloud computing environment?
    a. It improves server performance.
    b. It minimizes network traffic to the virtual machines.
    c. It automatically transforms physical servers into virtual machines.
    d. It maximizes server utilization by implementing automated provisioning.

3. What is the role of virtualization in cloud computing?
    a. It removes operating system inefficiencies.
    b. It improves the performance of web applications.
    c. It optimizes the utilization of computing resources.
    d. It adds extra load to the underlying physical infrastructure and has no role in cloud computing.

Type(s) Of **Cloud Computing**


Cloud
Cloud Deployments
Cloud Services
Public Cloud
Private Cloud
Hybrid Cloud
IaaS
PaaS
SaaS


Public Cloud
Typically have massive amounts of available space, which translates into easy scalability. Recommended for software development and collaborative projects.
Private Cloud
Usually reside behind a firewall and are utilized by a single organization. Recommended for businesses with very tight regulatory requirements
Types of Cloud Deployment
Hybrid Cloud
Combine public clouds with private clouds to allow the two platforms to interact seamlessly. Recommended for businesses balancing big data analytics with strict data privacy regulations.
Community Cloud
A collaborative, multi-tenant platform used by several distinct organizations to share the same applications. Users are typically operating within the same industry or field.

Deployment Models

PUBLIC CLOUD : The Public Cloud allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness, e.g., e-mail.

PRIVATE CLOUD : The Private Cloud allows systems and services to be accessible within an organization. It offers increased security because of its private nature.

COMMUNITY CLOUD : The Community Cloud allows systems and services to be accessible by group of organizations.

HYBRID CLOUD : The Hybrid Cloud is mixture of public and private cloud. However, the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.

Benefits

Public Cloud	Private Cloud	Hybrid Cloud
No maintenance costs	Dedicated, secure	Policy-driven deployment
High scalability, flexibility	Regulation compliant	High scalability, flexibility
Reduced complexity	Customizable	Minimal security risks
Flexible pricing	High scalability	Workload diversity supports high reliability
Agile for innovation	Efficient	Improved security

Drawbacks

Public Cloud	Private Cloud	Hybrid Cloud
Potential for high TCO	Expensive with high TCO	Potential for high TCO
Decreased security and availability	Minimal mobile access	Compatibility and integration
Minimal control	Limiting infrastructure	Added complexity

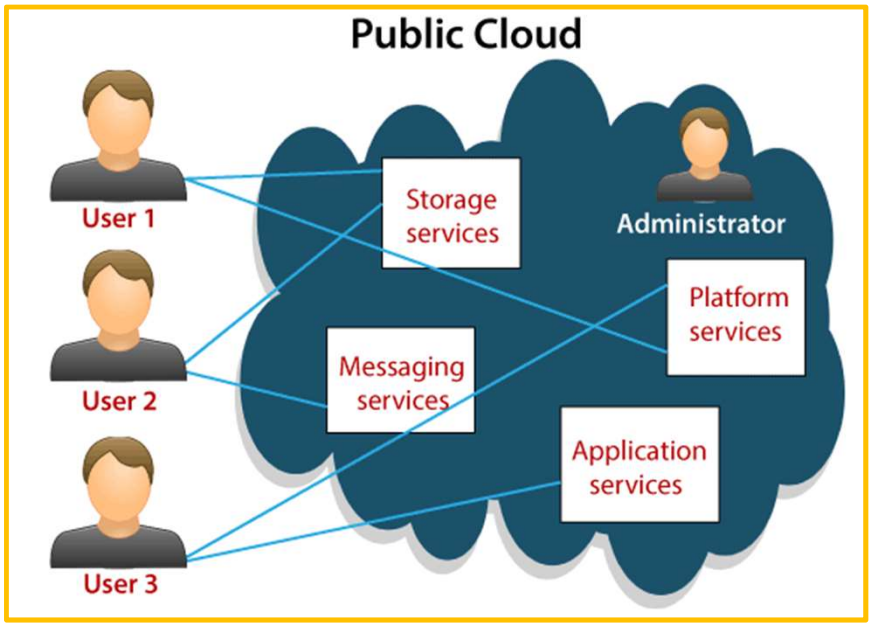
What Is Public Cloud?

The public cloud refers to the cloud computing model in which **IT services are delivered via the internet.**

The public cloud offers vast choices in terms of solutions and computing resources.

The defining features of a public cloud solution include:

- ➔ High elasticity and scalability
- ➔ A low-cost subscription-based pricing tier



What Is Public Cloud?

When To Use Public Cloud?

The public cloud is most suitable for these types of environments:

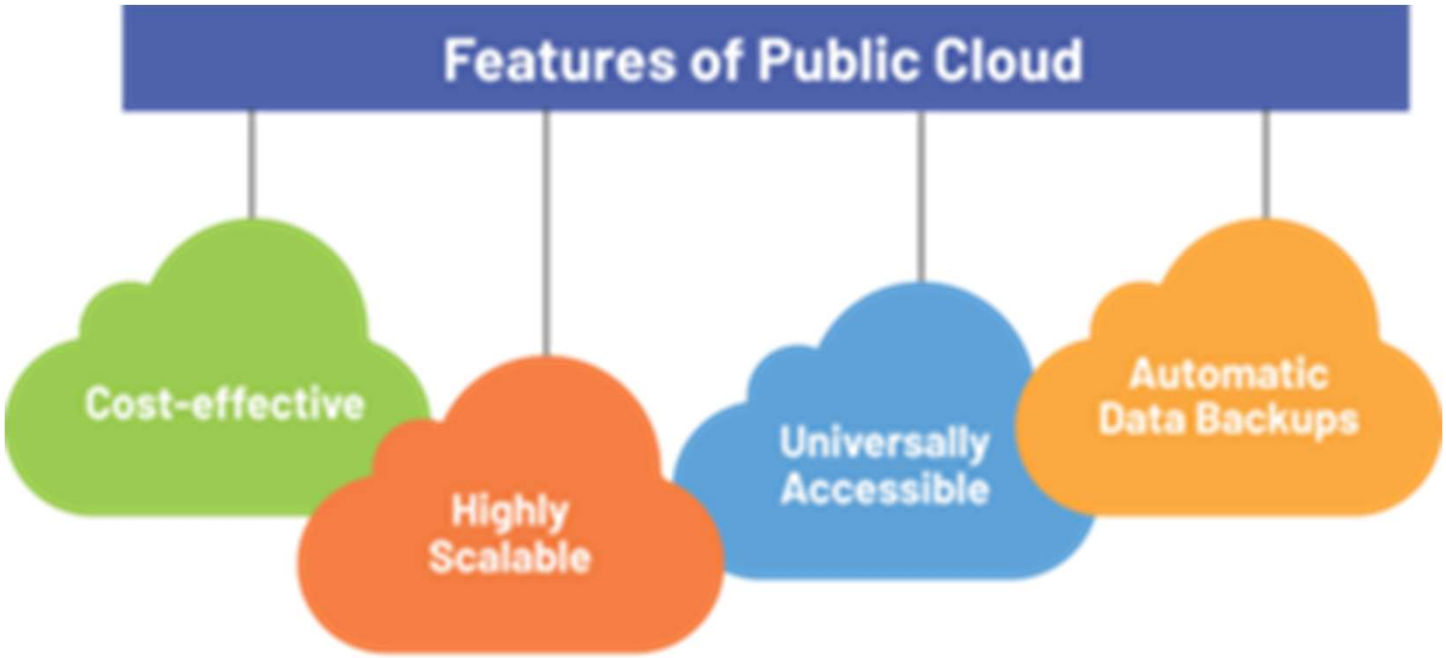
- ➔ Predictable computing needs, such as communication services for a specific number of users
- ➔ Apps and services necessary to perform IT and business operations (elasticity & scalability)
- ➔ Additional resource requirements to address varying peak demands.
- ➔ Software development and test environments

Advantages Of Public Cloud?

People appreciate these public cloud benefits:

- **No CapEx**. No investments required to deploy and maintain the IT infrastructure.
- **Technical agility.** High scalability and flexibility to meet unpredictable workload demands.
- **Business focus.** The reduced complexity and requirements on in-house IT expertise is minimized, as the cloud vendor is responsible for infrastructure management.
- **Affordability.** Flexible pricing options based on different SLA offerings
- **Cost agility.** The cost agility allows organizations to follow lean growth strategies and focus their investments on innovation projects

Advantages Of Public Cloud?



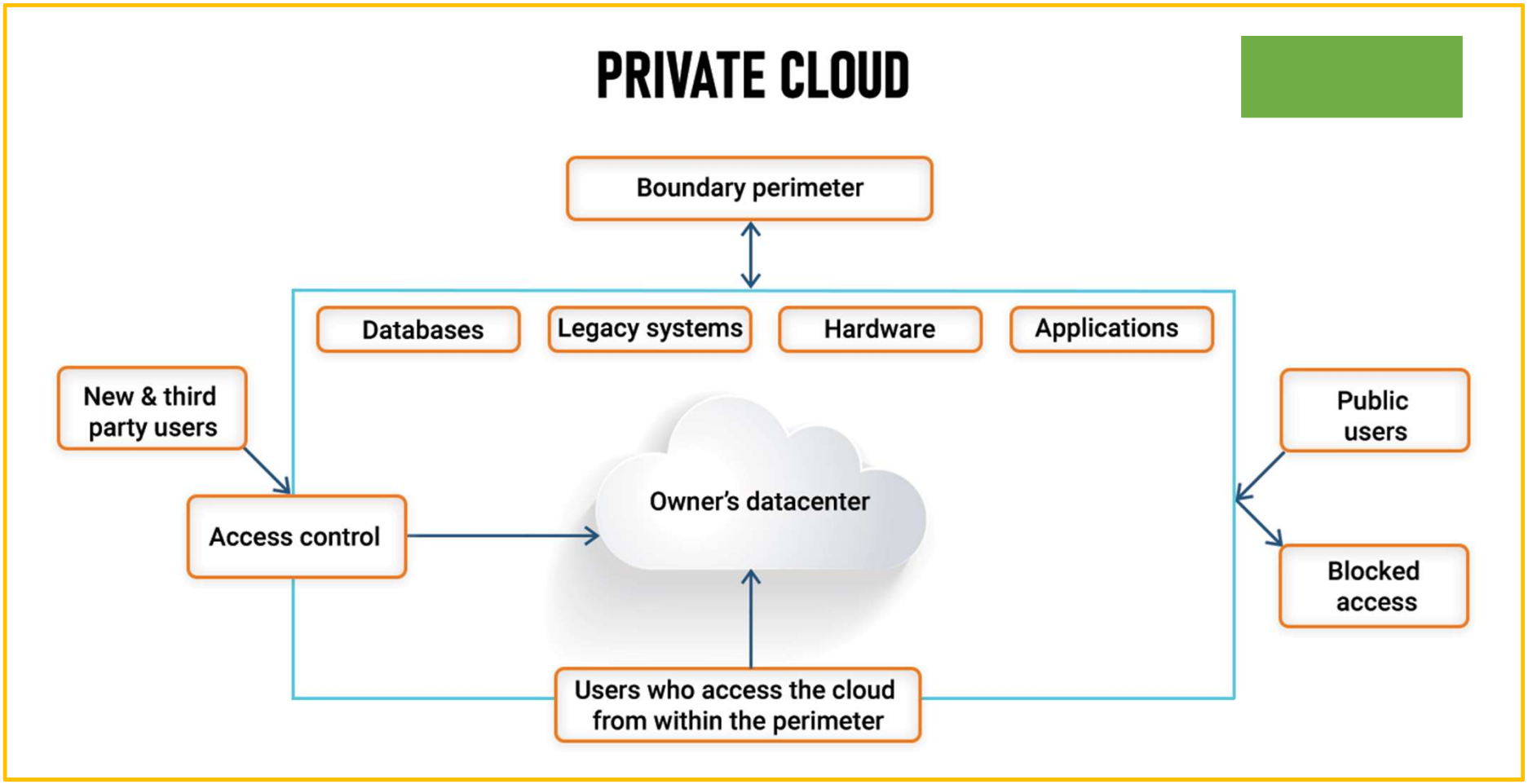
Drawbacks Of Public Cloud?

The public cloud does come with limitations:

- **Lack of cost control**. The total cost of ownership (TCO) can rise exponentially for large-scale usage, specifically for midsize to large enterprises.
- **Lack of security.** Public cloud is the least secure by nature this is the reason it isn't best for sensitive mission-critical IT workloads.

What Is Private Cloud?

- The private cloud refers to any cloud solution dedicated for use by a single organization.
- In the private cloud, you're not sharing cloud computing resources with any other organization.
- The data center resources may be located on-premise or operated by a third-party vendor off-site.
- The computing resources are isolated and delivered via a secure private network, and not shared with other customers.
- Private cloud is customizable to meet the unique business and security needs of the organization.


PRIVATE CLOUD
Boundary perimeter
Databases
Legacy systems
Hardware
Applications
New & third party users
Access control
Owner's datacenter
Public users
Blocked access
Users who access the cloud from within the perimeter

When To Use Private Cloud?

The private cloud is best suited for:

- ➔ Highly regulated industries and government agencies
- ➔ Securing Sensitive data
- ➔ Companies that require strong control and security over their IT workloads and the underlying infrastructure
- ➔ Large enterprises that require advanced data center technologies to operate efficiently and cost-effectively
- ➔ Organizations that can afford to invest in high performance and available technologies

Advantages Of Private Cloud?

The most popular benefits of private cloud include:

- **Exclusive environments.** Dedicated and secure environments that cannot be accessed by other organizations.
- **Custom security.** Compliance to stringent regulations as organizations can run protocols, configurations, and measures to customize security based on unique workload requirements
- **Scalability without tradeoffs**. High scalability and efficiency to meet unpredictable demands without compromising on security and performance
- **Efficient performance.** The private cloud provides high SLA performance and efficiency.
- **Flexibility**. The private cloud is flexible as you transform the infrastructure based on ever-changing business and IT needs of the organization.

DrawBacks Of Private Cloud?

The private cloud has drawbacks that might limit use cases:

- **Price.** The private cloud is an expensive solution with a relatively high TCO compared to public cloud alternatives, especially for short-term use cases.
- **Mobility difficulty**. Mobile users may have limited access to the private cloud considering the high security measures in place.
- **Scalability depends**. The infrastructure may not offer high scalability to meet unpredictable demands if the cloud data center is limited to on-premise computing resources

DrawBacks Of Private Cloud?

Cost

Prices square measure substantial within the case of building Associate in Nursing on-premise personal cloud. The running value would come with personnel value and periodic hardware upgrade prices. within the case of outsourced personal cloud, operating expense can embody per resource usage and subject to vary at the discretion of the service supplier.

Under-utilization

In some instances the resources signed will be under-utilized. Hence, optimizing the use of all resources may be a challenge.

Capacity Ceiling

Because of physical hardware limitations with the service supplier, there can be a capability ceiling to handle solely specific amount of servers or storage.

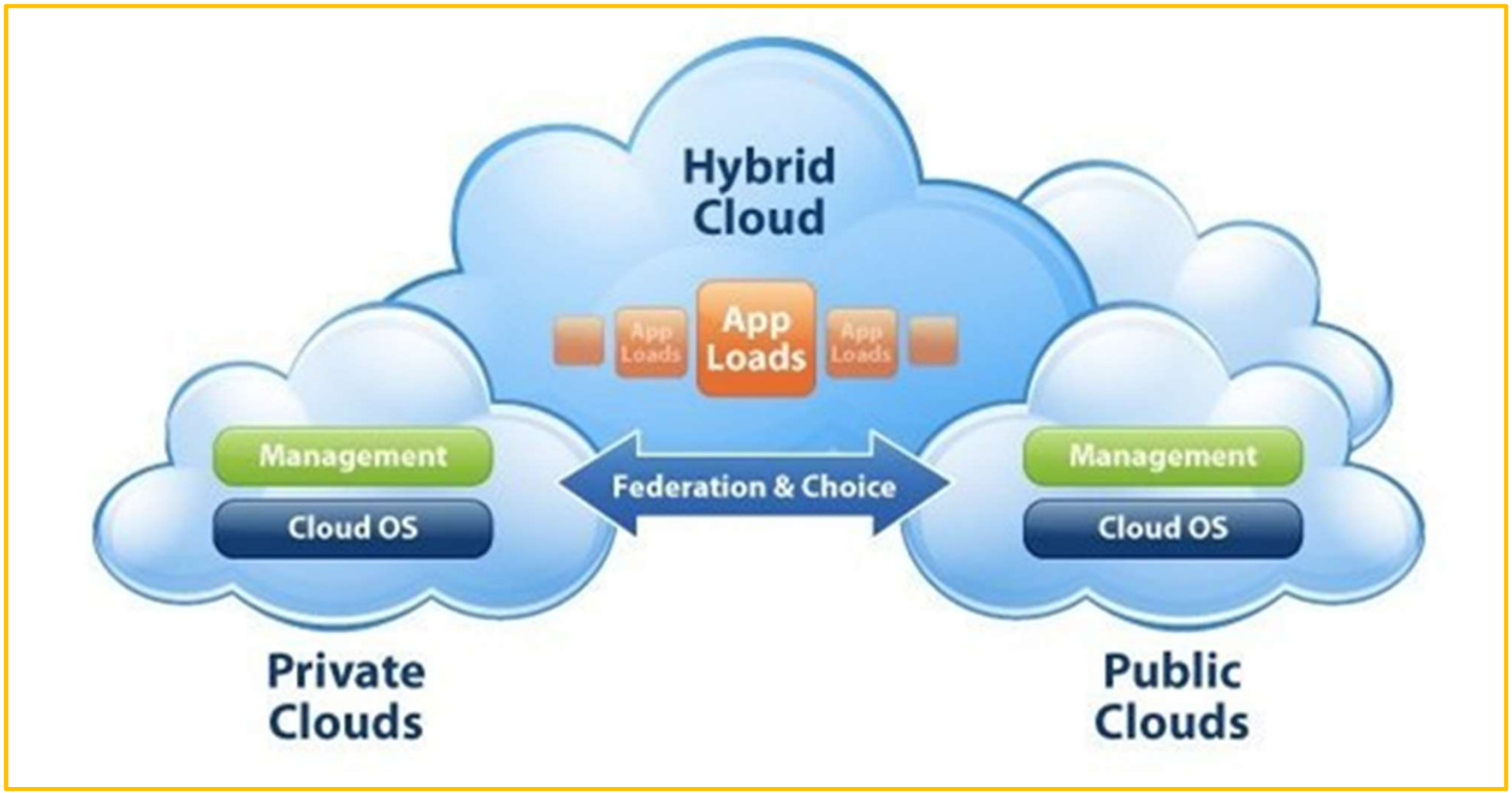
Vendor Lock-in

This could be a serious impediment privately cloud adoption particularly once the hardware and infrastructure is outsourced.

What Is Hybrid Cloud?

The hybrid cloud is any cloud infrastructure environment that combines both public and private cloud solutions.
The resources are typically orchestrated as an integrated infrastructure environment.
Apps and data workloads can share the resources between public and private cloud deployment based on organizational business and technical policies around aspects like:

- ➔ Security
- ➔ Performance
- ➔ Scalability
- ➔ Cost
- ➔ Efficiency


Hybrid Cloud
App Loads
App Loads
App Loads
Management
Cloud OS
Federation & Choice
Management
Cloud OS
Private Clouds
Public Clouds

When To Use Hybrid Cloud?

Here's who the hybrid cloud might suit best:

- ➔ Organizations serving multiple verticals facing different IT security, regulatory, and performance requirements
- ➔ Optimizing cloud investments without compromising on the value that public or private cloud technologies can deliver
- ➔ Improving security on existing cloud solutions such as SaaS offerings that must be delivered via secure private networks
- ➔ Strategically approaching cloud investments to continuously switch and tradeoff between the best cloud service delivery model available in the market

Example:
Netflix, Hulu, Uber and Airbnb all rely heavily on hybrid cloud data storage due to its on-demand and pay-per-use features. Netflix and Hulu experience spikes in bandwidth demand when a new bingeable series debuts on their respective platforms.

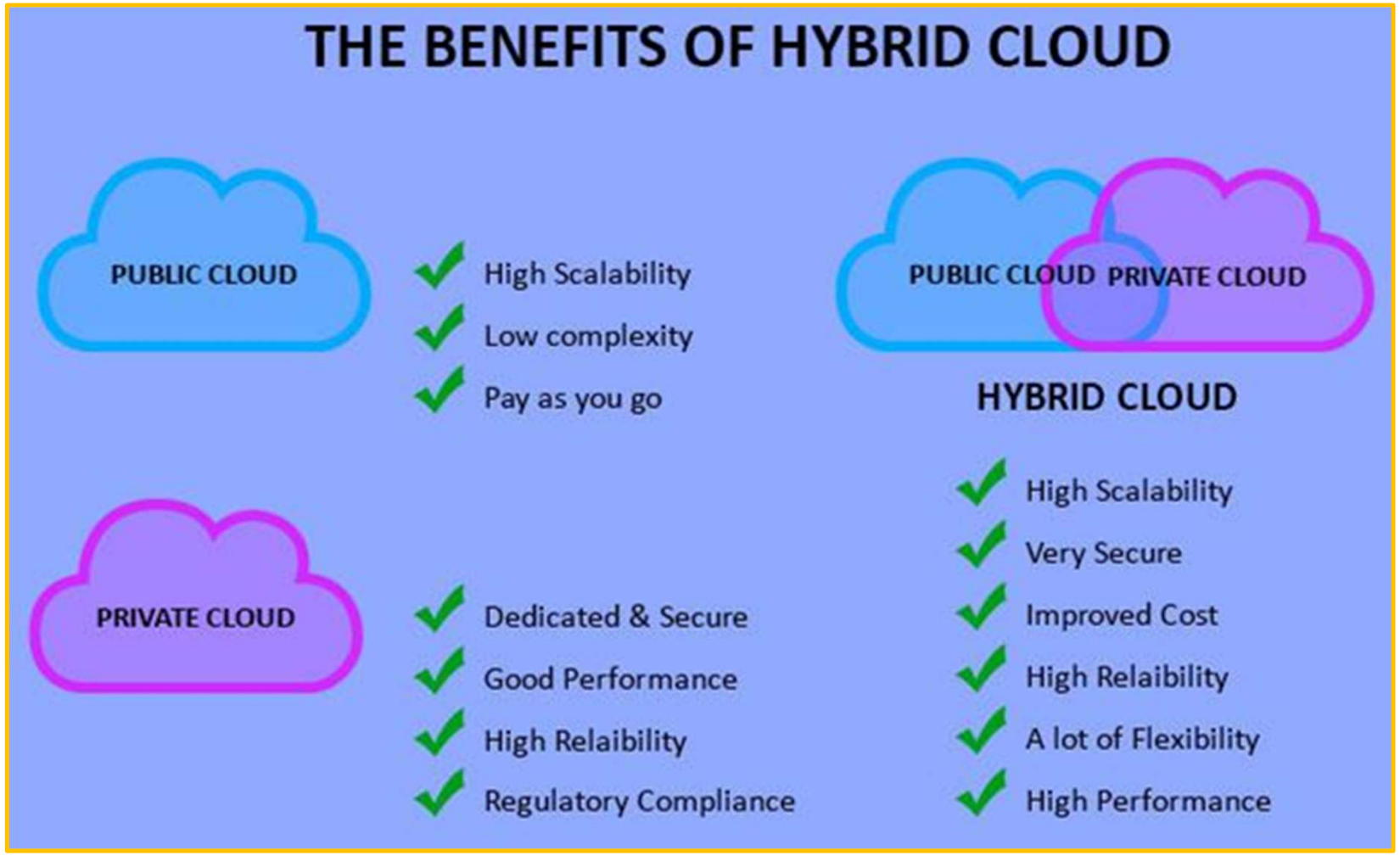
Advantages Of Hybrid Cloud?

Policy-driven option. Flexible policy-driven deployment to distribute workloads across public and private infrastructure environments based on security, performance, and cost requirements.

Scale with security. Scalability of public cloud environments is achieved without exposing sensitive IT workloads to the inherent security risks.

Reliability. Distributing services across multiple data centers, public and private, results in maximum reliability.

Cost control. Improved security posture as sensitive IT workloads run on dedicated resources in private clouds while regular workloads are spread across inexpensive public cloud infrastructure to tradeoff for cost investments


THE BENEFITS OF HYBRID CLOUD
PUBLIC CLOUD
High Scalability
Low complexity
Pay as you go
PUBLIC CLOUD
PRIVATE CLOUD
HYBRID CLOUD
PRIVATE CLOUD
Dedicated & Secure
Good Performance
High Relaibility
Regulatory Compliance
High Scalability
Very Secure
Improved Cost
High Relaibility
A lot of Flexibility
High Performance

Drawbacks Of Hybrid Cloud?

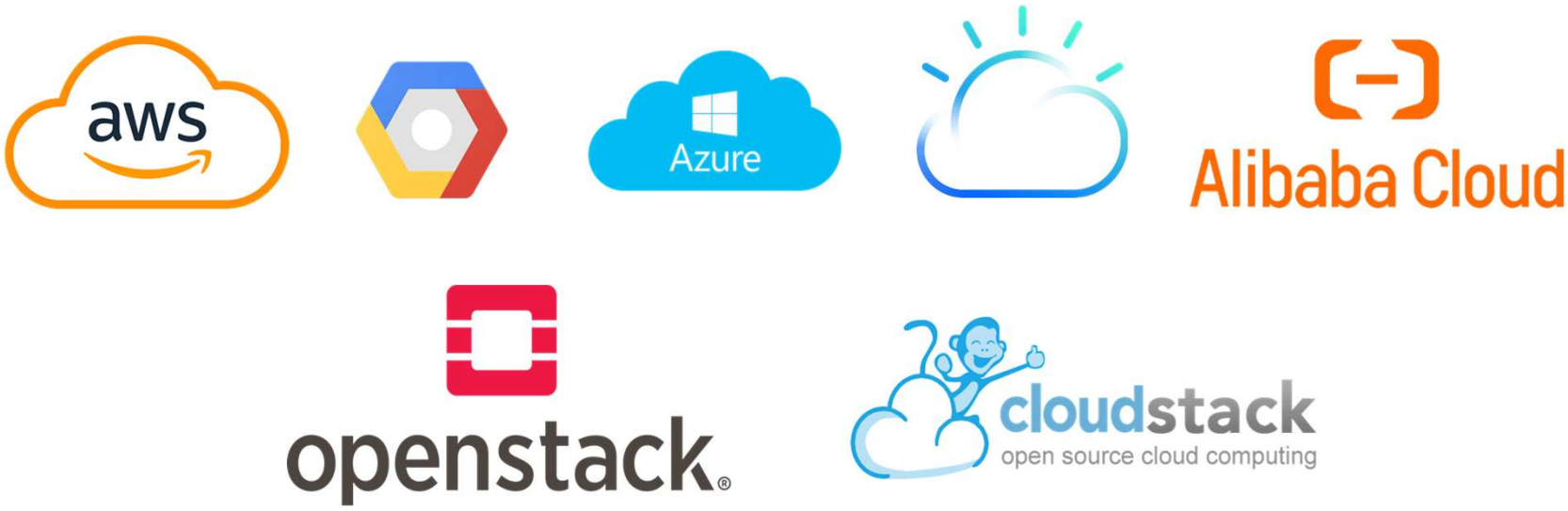
Common drawbacks of the hybrid cloud include:

Price. Toggling between public and private can be hard to track, resulting in wasteful spending.

Management. Strong compatibility and integration is required between cloud infrastructure spanning different locations and categories (cloud to cloud spanning, on-prem and cloud spanning).

Added complexity. Additional infrastructure complexity is introduced as organizations operate and manage an evolving mix of private and public cloud architecture.

Types of Cloud Computing



Q&A Session

1. A company would like to leverage cloud computing to provide advanced collaboration services (i.e., video, chat, and web conferences) for its employees but does not have the IT resources to deploy such an infrastructure. Which cloud computing model would best fit the company needs?

a. Hybrid Cloud
b. Public Cloud
c. Private Cloud
d. Virtual Private Cloud.

2. A company is considering a cloud environment to improve the operating efficiency for its data and applications. The company is part of an industry where strict security and data privacy issues are of the highest importance. Which type of cloud would be a good choice?

a. Hybrid cloud
b. Public cloud
c. Private cloud
d. Governed cloud

Q&A Session

3. What is a public cloud?
    a. A cloud formation that can be seen across the globe
    b. A cloud service that can only be accessed from a publicly shared computer
    c. A multi-tenant cloud environment accessed over the internet
    d. A cloud environment owned, operated and controlled by a public company

Cloud Architecture

Cloud Computing Architecture:

Cloud architecture is the way technology components combine to build a cloud, in which resources are pooled through virtualization technology and shared across a network.

The components of a cloud architecture include:

- A front-end platform (the client or device used to access the cloud)
- A back-end platform (servers and storage)
- A cloud-based delivery model (SaaS, PaaS, IaaS)
- A network (IP addresses ,routing etc)

Together, these technologies create a cloud computing architecture on which applications can run, providing end-users with the ability to leverage the power of cloud resources.

Benefits Of Cloud Architecture:

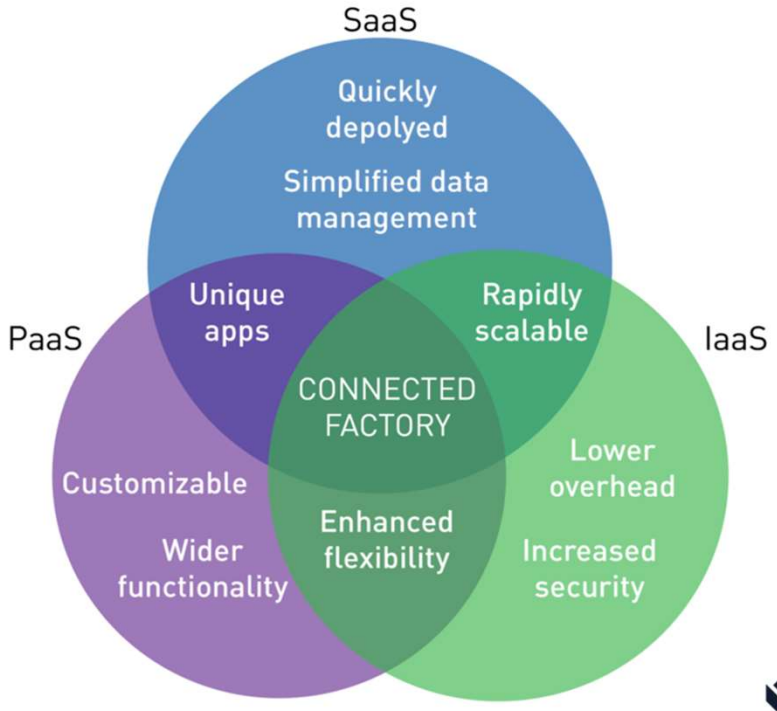
- It reduces or eliminate their reliance on on-premises server, storage, and networking infrastructure.
- Organizations adopting cloud architecture often shift IT resources to the public cloud, **eliminating the need for on-premises servers and storage, and reducing the need for IT data center real estate, cooling, and power, and replacing them with a monthly IT expenditure.**
- This shift from capital expenditure to operating expense is a major reason for the popularity of cloud computing today.

Cloud Computing Architecture:

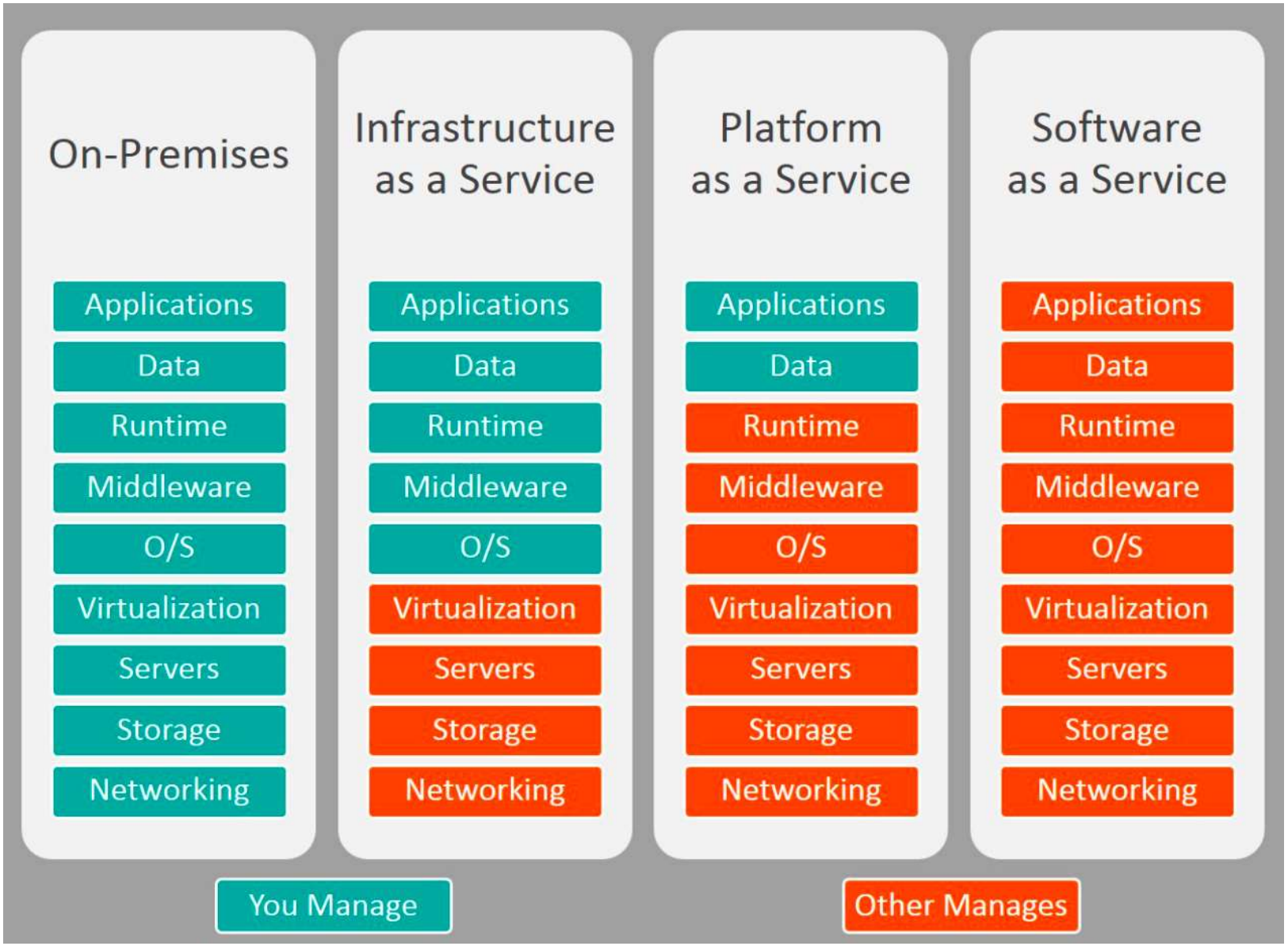
IaaS (Infrastructure as a Service)
Eg: Compute, Storage, Network.

PaaS (Platform as a Service)
Eg: Application development & deployment, Serverless.

SaaS (Software as a Service).
Eg: Email , Docs, App stream



TULIP


On-Premises
Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking
Infrastructure as a Service
Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking
Platform as a Service
Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking
Software as a Service
Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking
You Manage
Other Manages

Benefits Of Cloud Architecture:

There are three major models of cloud architecture that are driving organizations to the cloud. Each of these has its own benefits and key features.

Infrastructure as a Service (IaaS):

- In this, cloud at its simplest form, a third-party provider eliminates the need for organizations to purchase servers, networks or storage devices by providing the necessary infrastructure.
- In turn, organizations manage their software and applications, and only pay for the capacity they need at any given time.

Benefits Of Cloud Architecture:

IaaS:

Advantages

- Offers great flexibility of all cloud computing models
- Highly scalable as per business requirements
- Enables easy automation of deploying networking, processing power, servers & storage
- Flexibility to purchase only need-based hardware and other resources
- Clients retain complete infrastructure control

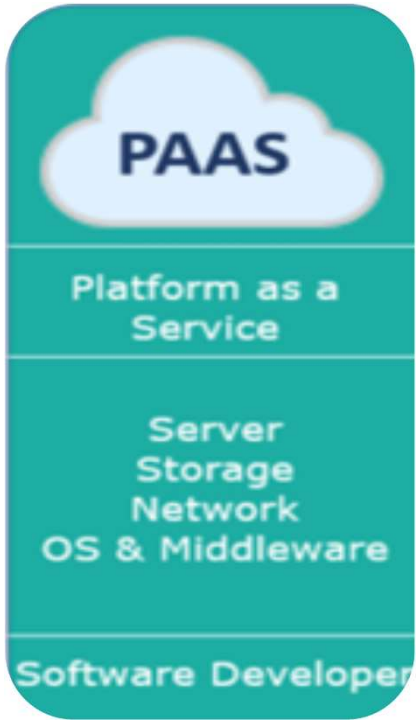
Characteristics

- Cost depends on the consumption
- Scalable services
- Resources are made available as a service
- Multiple users can be included on a single unit of hardware
- Organizations retain full control of infrastructure
- Flexible and dynamic

Benefits Of Cloud Architecture:

Platform as a Service (PaaS):

- In this cloud model, the service provider offers a computing platform and solution stack, often including middleware, as a service. Organizations can build upon that platform to create an application or service.
- The cloud service provider delivers the networks, servers and storage required to host an application while the end user oversees software deployment and configuration settings.



Benefits Of Cloud Architecture:

PaaS:

Advantages

- High availability
- Scalability
- Enabling developers to focus on the creation of custom applications without the responsibility of software maintenance
- Reduced coding time
- Automated business policy
- Enables easy migration to a hybrid model

Characteristics

- Easy scalability
- Offers several services to help in developing, testing and deploying the applications
- The same development app can be accessed by several users
- Integrated databases and web services

Benefits Of Cloud Architecture:

Software as a Service (SaaS):

- SaaS architecture providers deliver and maintain applications and software to organizations over the Internet, thereby eliminating the need for end users to deploy the software on servers.
- SaaS applications are typically accessed via a web interface available from a broad variety of devices and OSes.

Benefits Of Cloud Architecture:

SaaS:

Advantages

SaaS reduces the expenditure and time spent on installation and management of the software.

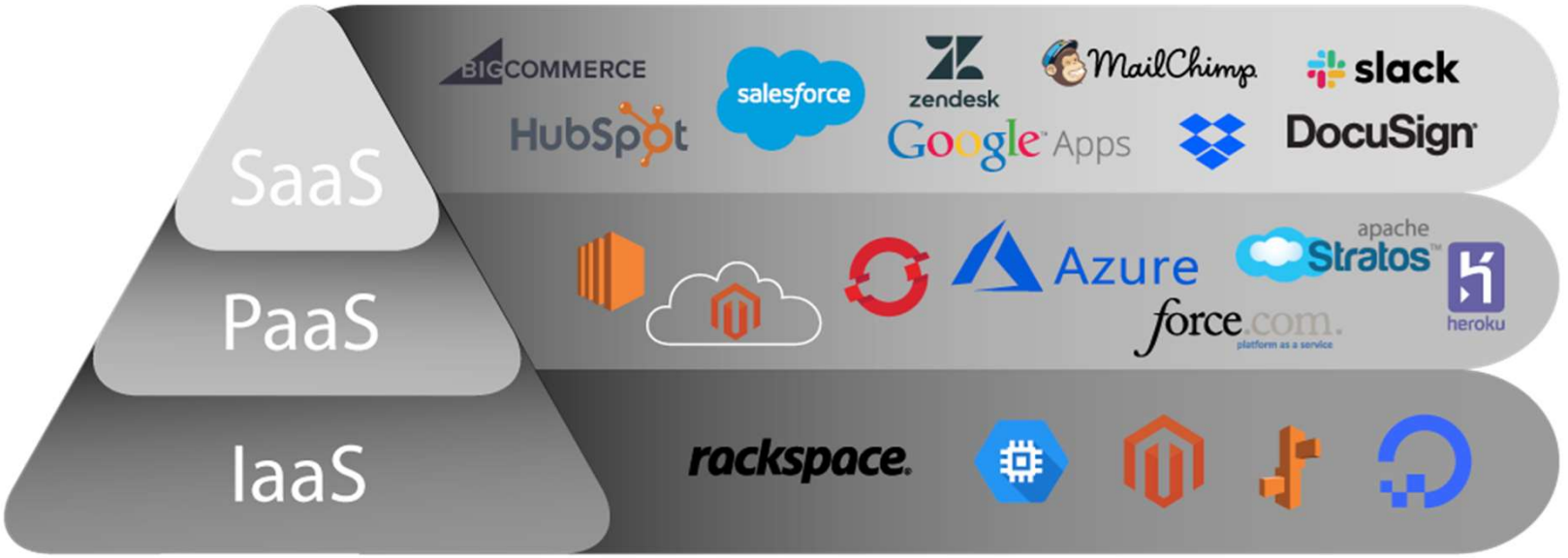
Characteristics

- Centrally located and managed
- Remote server hosting
- Accessible through the internet
- Hardware and software updates are not the user's responsibility

Why Adopt Cloud Architecture:

Organizations have many reasons for adoption of a cloud architecture, includes:

- Accelerate the **delivery of new apps**
- Take advantage of cloud-native architecture such as **Kubernetes and docker** to modernize applications and accelerate digital transformation.
- Ensure **compliance** with the latest regulations
- Deliver greater transparency into resources to **cut costs and prevent data breaches**
- Enable **faster provisioning of resources.**
- Utilize hybrid cloud architecture to **support real-time scalability** for applications as business needs change.
- Meet **service targets** consistently.
- **Leverage cloud reference architecture** to gain insight into IT spending patterns and cloud utilization


SaaS
PaaS
IaaS
BIGCOMMERCE
HubSpot
salesforce
zendesk
Google Apps
MailChimp
slack
DocuSign
Azure
apache Stratos
force.com
platform as a service
heroku
rackspace

Q&A Session

1. Which delivery model is an example of a cloud computing environment that provides users with a web-based email service?
   a. Software as a Service
   b. Platform as a Service
   c. Computing as a Service
   d. Infrastructure as a Service

2. How can company leverage the Platform as a Service cloud computing delivery model?

   a. A company requires more processing power to perform its financial analysis calculations and acquires additional computational resources.
   b. A company requires a customer relationship management solution and obtains an application that addresses its requirements from a cloud provider.
   c. A company is running out of storage space to store a customer database and dynamically request additional space via the cloud provider web services interface.
   d. A company obtains an environment with a software stack from a cloud provider, develops custom application, and makes that application available to its customers on the Internet.

Q&A Session

3. A cloud provider offers an environment for building applications that will run from the customer's environment. Which cloud computing delivery model are they using?

a. Platform as a Service
b. Software as a Service
c. Development as a Service
d. Infrastructure as a Service

4. A company interested in cloud computing is looking for a provider who offers a set of basic services such as virtual server provisioning and ondemand storage that can be combined into a platform for deploying and running customized applications. What type of cloud computing model fits these requirements?

a. Platform as a Service
b. Software as a Service
c. Application as a Service
d. Infrastructure as a Service

Benefits of cloud computing

Benefit Of Cloud Computing

SPEED

Vast amount of computing resources can be provisioned in minutes.

Benefit Of Cloud Computing

COST

It eliminates the expense of buying computer hardware and software

SPEED

Vast amount of computing resources can be provisioned in minutes.

Benefit Of Cloud Computing

SPEED

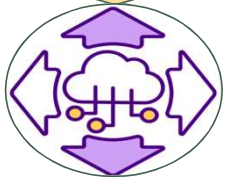
Vast amount of computing resources can be provisioned in minutes.

COST

It eliminates the expense of buying computer hardware and software

SCALABILITY

Easy to scale up your cloud capacity



Benefit Of Cloud Computing

SPEED

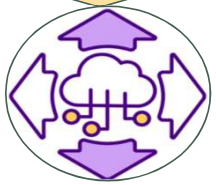
Vast amount of computing resources can be provisioned in minutes.

COST

It eliminates the expense of buying computer hardware and software

SCALABILITY

Easy to scale up your cloud capacity



ACCESSIBILITY

Easy to access data from anywhere

Benefit Of Cloud Computing

SPEED

Vast amount of computing resources can be provisioned in minutes.

COST

It eliminates the expense of buying computer hardware and software

SCALABILITY

Easy to scale up your cloud capacity

ACCESSIBILITY

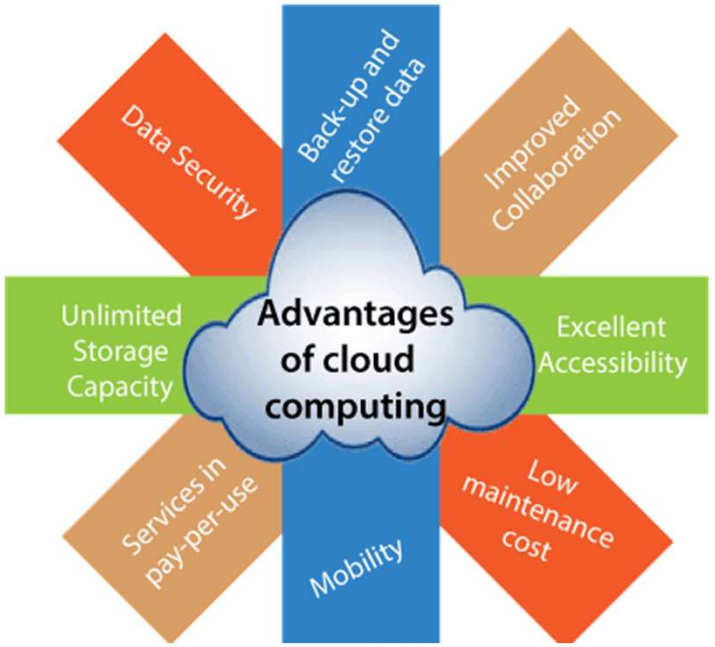
Easy to access data from anywhere

BETTER SECURITY

In cloud, data is secured in a centralized secure location

Advantages and Characteristics Of Cloud Computing

- On-Demand.
- No-Single point of failure.
- Scalable.
- Pay as you go service(s).
- Agile (Go global in minutes).
- Highly available and durable.
- Secure.



Q&A Session

1. Which feature of Cloud services makes it possible to manage computing infrastructure better and more efficiently?
    a. Scalability
    b. Cloud economics
    c. Computing services
    d. None of the above
2. Which of these is an advantage of cloud storage?
    a. Many programs can be run at the same time, regardless of the processing power of your device
    b. Accessible anywhere with an internet connection
    c. Portability
    d. The user has no control over their data
3. Which of the following isn't an advantage of cloud?
    a. Easier to maintain a cloud network
    b. No worries about running out of storage
    c. Immediate access to computing resources
    d. Paying only for what you use