Cloud Computing

Course code:20CS4701C

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UNIT-1

PART 1:Introduction to Cloud:

1.Cloud Computing at a Glance
2. The Vision of Cloud Computing
3.Defining a Cloud
4. A Closer Look
5.Cloud Computing Reference Model
6. Characteristics and Benefits.

PART 2:Virtualization:

Introduction,
Characteristics of Virtualized Environment
Taxonomy of Virtualization Techniques
Virtualization and Cloud computing
Pros and Cons of Virtualization,
Technology Examples- VMware and Microsoft Hyper-V.

BEFORE CLOUD COMPUTING

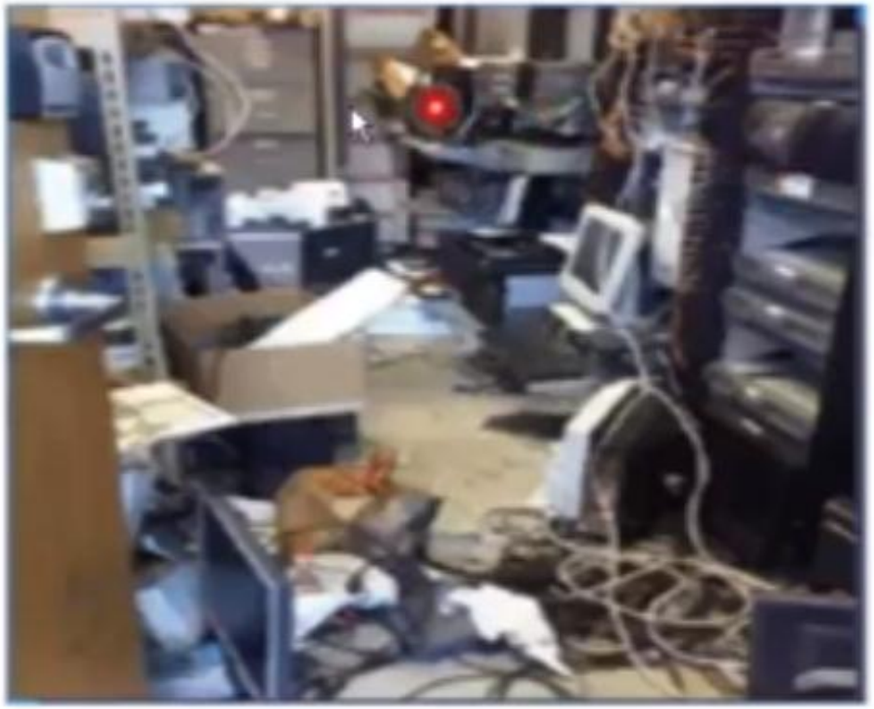
Before cloud

- Buy a stack of server
- High traffic because of more servers
- Monitoring and maintain servers
- In that server room, there should be a database server, mail server, Web servers, networking, firewalls, routers, modem, switches, QPS.

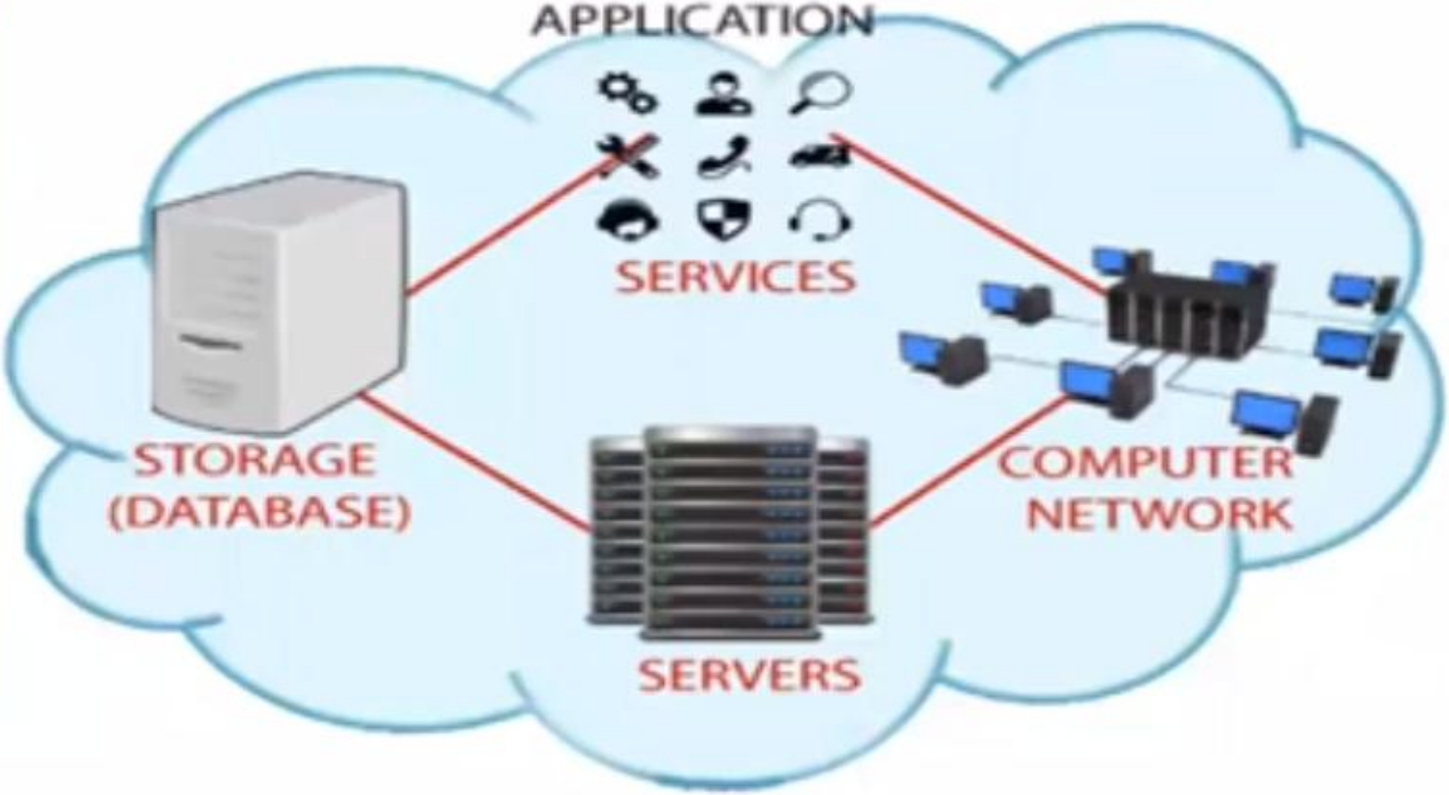
To reduce the IT infrastructure cost, Cloud Computing technology came

Why Cloud Computing?

Before Cloud Computing



After Cloud Computing



How Does Cloud Computing Work?

- Cloud computing provides a simple way to access servers, storage, databases and a broad set of application services over the Internet.
- A Cloud services platform such as Amazon Web Services owns and maintains the network-connected hardware required for these application services, while you provision and use what you need via a web application.

Advantages of Cloud

- Low Cost: To run cloud technology, users don't require high power computers & technology because the application will run on the cloud and not on users' PC.
- Storage capacity: The Cloud storage capacity is unlimited & generally offers a vast storage capacity of 2000-3000 GBs or more based on the requirement.
- Low cost of IT infrastructure: As discussed earlier, the investment will be less if an organization uses Cloud technology; even the IT staffs and server engineers are also not required.

Advantages of Cloud

- Increase computing power: Cloud servers have a very high-capacity of running and processing tasks as well as the processing of applications.
- Reduce Software Costs: Cloud minimizes the software costs as users don't need to purchase software for organizations or every computer.
- Updating: Instant software update is possible & users don't have to face the choice problem between obsolete & high-upgrade software.

Disadvantages of Cloud

- Internet speed: Cloud technology requires high-speed internet connection as web-based applications often require large bandwidth amount.
- Constant Internet Connection: Its impossible to use cloud infrastructure without the Internet. To access any application or cloud storage, a constant internet connection is required.
- Security: Data storage might not be secure. With cloud computing, all the data gets stored in the cloud & hence the unauthorized user may gain access to the user's data in the cloud.

1.Cloud Computing at a Glance

History of Cloud Computing

- During 1961, John MacCharty delivered his speech at MIT that "Computing Can be sold as a Utility, like Water and Electricity." According to John MacCharty it was a brilliant idea.
- But people at that time don't want to adopt this technology. They thought the technology they are using efficient enough for them.
- So, this concept of computing was not appreciated much so and very less will research on it.
- But as the time fleet the technology caught the idea after few years this idea is implemented. So, this is implemented by Salesforce.com in 1999

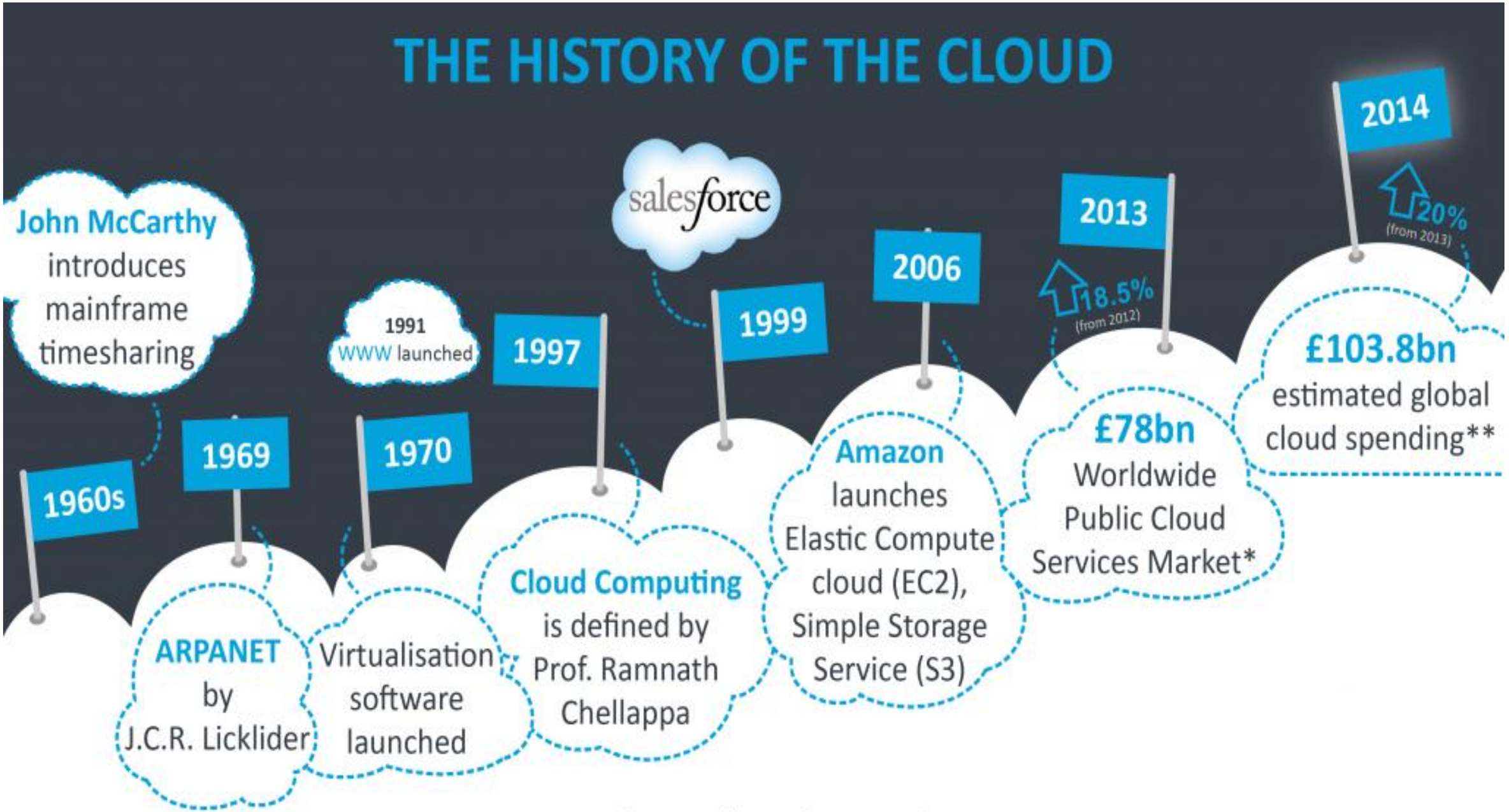
Contd..

- This company started delivering an **enterprise application** over the internet and this way the boom of Cloud Computing was started.

- In 2002, Amazon started Amazon Web Services (AWS), Amazon will provide storage, computation over the internet.
- In 2006 Amazon launched Elastic Compute Cloud Commercial Service which is open for Everybody to use.

- After that in 2009, Google Play also started providing Cloud Computing Enterprise Application as other companies will see the emergence of cloud Computing they also started providing their cloud services.

- Thus, in 2009, Microsoft launch Microsoft Azure and after that other companies like Alibaba, IBM, Oracle, HP also introduces their Cloud Services. In today the Cloud Computing become very popular and important skill.



* Gartner, ** Constellation Research

2.Vision of cloud computing

1.Scalability and Flexibility: One of the core tenets of cloud computing is its unparalleled scalability. Cloud resources can be rapidly scaled up or down to meet fluctuating demands, reducing the need for hefty upfront investments in hardware and infrastructure. This flexibility allows organizations to adapt swiftly to changing market conditions and seasonal variations.

2.Cost-Efficiency: Cloud computing is inherently cost-effective. It eliminates the need for significant capital expenditures on on-premises hardware. Users only pay for the resources they consume, making it an attractive option for businesses of all sizes. The operational expense model aligns costs with actual usage, optimizing budget allocation.

3.Accessibility: The cloud's ubiquity ensures that users can access their data, applications, and services from virtually anywhere with an internet connection. This promotes remote work, global collaboration, and enhanced customer reach. Regardless of geographical constraints, cloud computing enables seamless connectivity.

4.Reliability and Redundancy: Cloud service providers invest heavily in redundancy and data backup, guaranteeing high levels of data integrity and minimizing downtime. This reliability ensures that critical operations can continue without disruption, instilling confidence in users and businesses.

Contd.

5.**Innovation and Agility**: Cloud computing empowers innovation by providing developers with the tools, platforms, and services needed to rapidly build and deploy applications. The agility it offers allows organizations to respond to market changes, customer demands, and competitive pressures with unprecedented speed and efficiency.

6.Security and Compliance: Cloud providers prioritize security measures and compliance standards, often exceeding the capabilities of individual organizations. Users can leverage these robust security frameworks to enhance their own security postures and comply with industry-specific regulations, thereby reducing the burden of compliance.

7.Environmental Sustainability: Cloud computing contributes to environmental sustainability through resource optimization. By sharing and efficiently managing resources within data centers, cloud providers often boast a smaller carbon footprint compared to traditional on-premises data centers. This aligns with global efforts to reduce the environmental impact of technology infrastructure.

3.Defining cloud

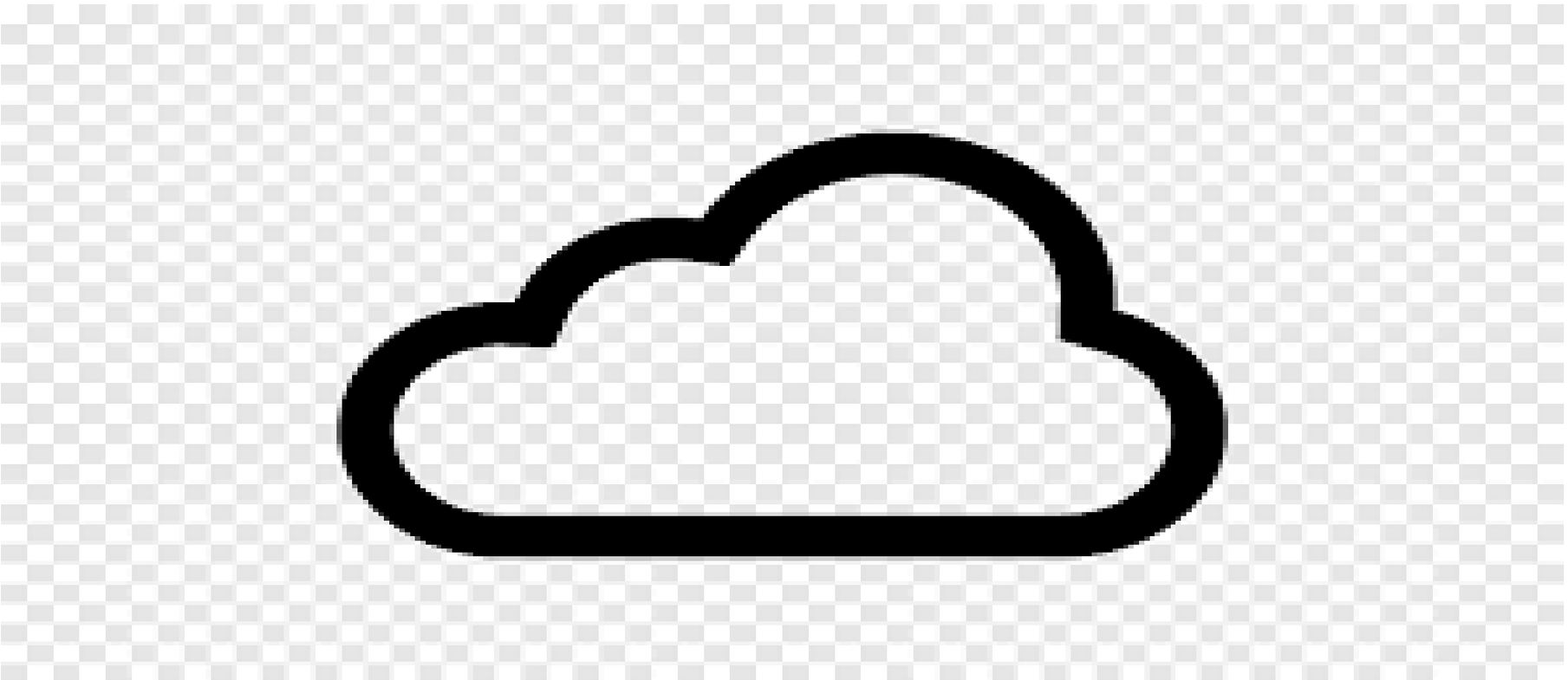
- **cloud" refers to servers that are accessed over the Internet, and the software and databases that run on those servers. Cloud servers are in data centers all over the world.**

or

- ***A* cloud refers to a distinct IT environment that is designed for the purpose of remotely provisioning scalable and measured IT resources.**

- By using cloud computing, **users and companies do not have to manage physical servers themselves or run software applications on their own machines.**

SYMBOL OF CLOUD

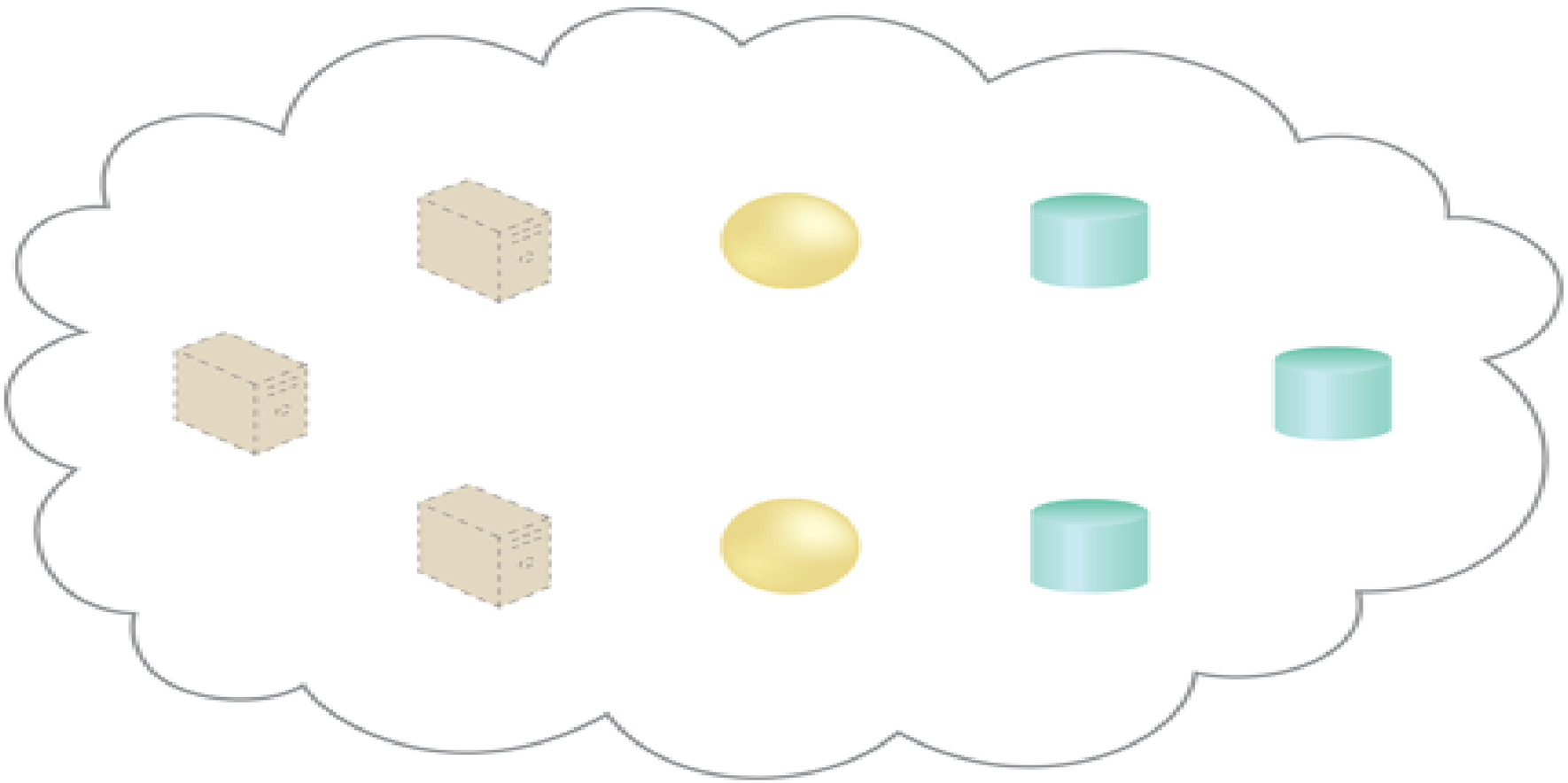


IT RESOURCE

“An IT resource is a physical or virtual IT-related artifact that can be either software based, such as a virtual server or a custom software program, or hardware-based, such as a physical server or a network device.”

IT RESOURCES AND SYMBOLS

CLOUD EXAMPLE



ON-PREMISE

“is a software ,is made available to employees in the company it was installed in own servers or private clouds .”

An IT resource that is on-premise cannot be cloud-based and vice-versa.

Concepts & Terminology

On-Premise

- An IT resource that is hosted in a conventional IT enterprise
- An on-premise IT resource can access and interact with a cloud based IT resource.
- An on-premise IT resource can be moved to a cloud, changing it to cloud-based IT resource.
- Redundant deployments of an IT resource can exist in both on premise and cloud environments.
- **Cloud Consumers**
- **Cloud Providers**

CLOUD CONSUMERS AND CLOUD PROVIDERS

“The party that uses cloud-based IT resources is called the Cloud Consumer.”

“The party that provides cloud-based IT resources to the users is called the Cloud Providers.”

SCALING

"Scaling is defined as the ability of the IT resource to handle increased or decreased usage demands."

Types of Scaling

- ***Horizontal Scaling : Scaling out and scaling in***
- ***Vertical Scaling : Scaling up and scaling down***

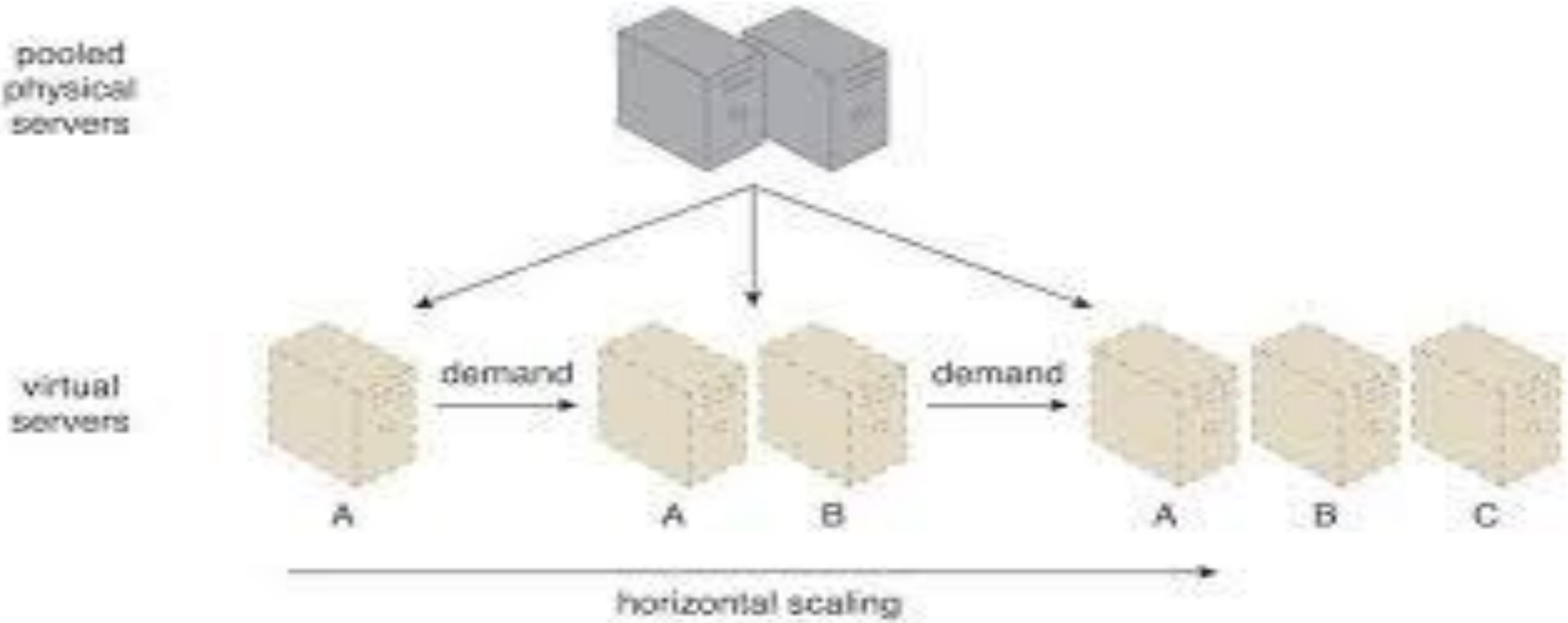
HORIZONTAL SCALING

"The allocating and releasing of IT resources that are of the same type is referred to as horizontal scaling."

Scaling out : The horizontal allocation of resources is referred to as scaling out.

Scaling in : The horizontal releasing of resources is referred to as scaling in.

EXAMPLE OF HORIZONTAL SCALING



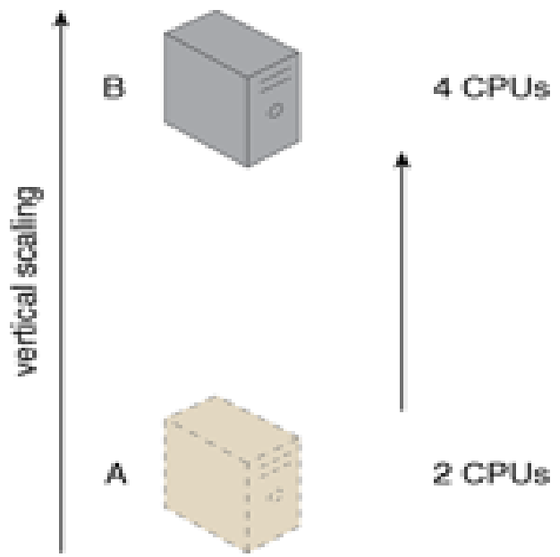
VERTICAL SCALING

"When an existing IT resource is replaced by another with higher or lower capacity is known as vertical scaling."

Scaling up: Replacing of an IT resource with another that has a higher capacity is known as scaling up.

Scaling down: Replacing of an IT resource with another that has a lower capacity is known as scaling down.

EXAMPLE OF VERTICAL SCALING



HORIZONTAL SCALING vs VERTICAL SCALING

Horizontal Scaling	Vertical Scaling
Less expensive (through commodity hardware components)	More expensive (specialized servers)
IT resources instantly available	IT resources normally instantly available
Resource replication and automated scaling	Additional setup is normally needed
Additional IT resources needed	No additional IT resources needed
Not limited by hardware capacity	Limited by maximum hardware capacity

4. A Closer Look

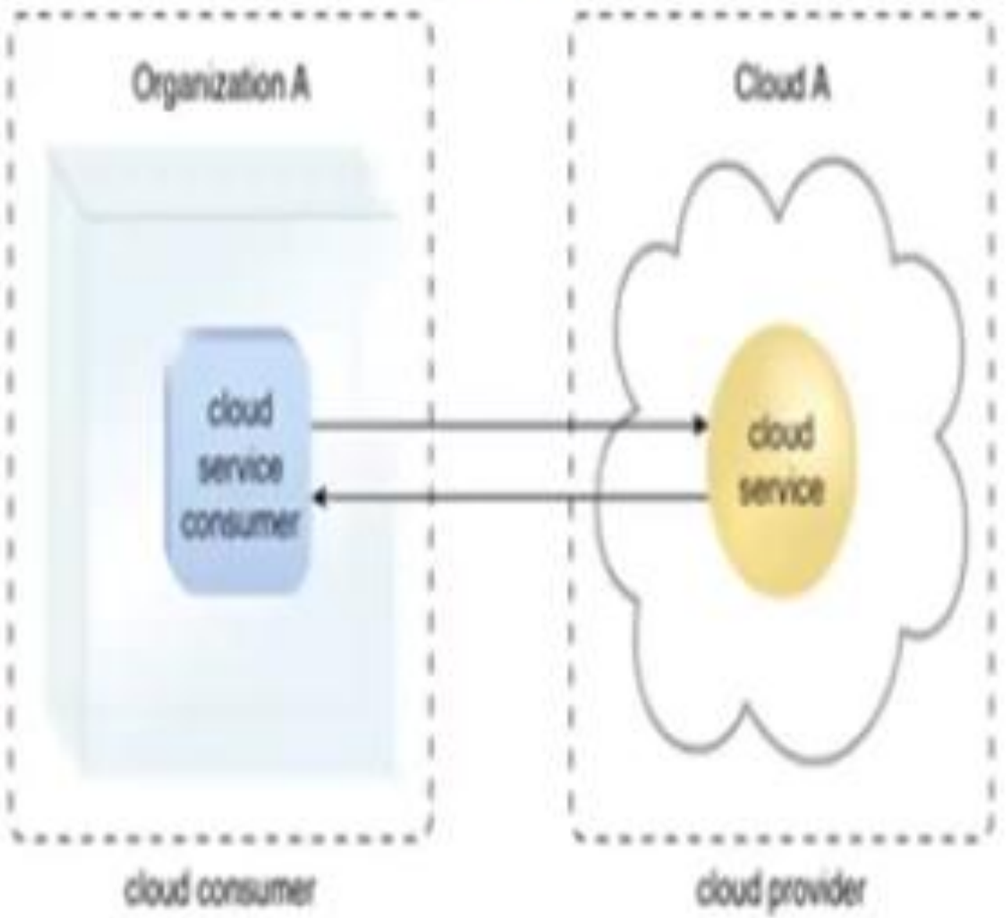
CLOUD SERVICE

“ A cloud service is any IT resource that is made remotely accessible via a cloud.”

A cloud service can exist as a simple web-based software program with a technical interface invoked via the use of a messaging protocol, or as a remote access point for administrative tools or larger environments and other IT resources.

Concepts & Terminology

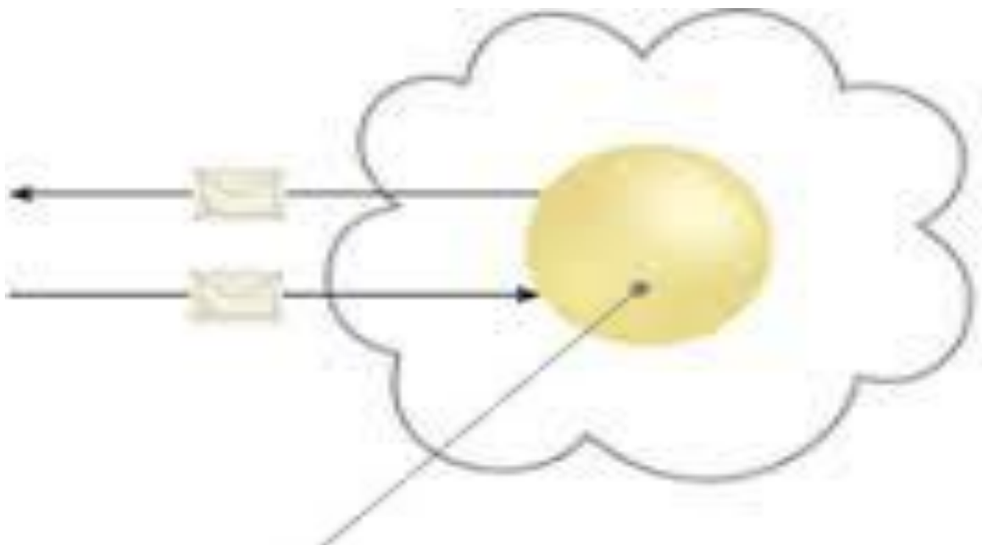
- A *cloud consumer* is an organization (or a human) that has a formal contract with a cloud provider to use IT resources made available by the cloud provider.
- Specifically, the cloud consumer uses a cloud service consumer to access a cloud service



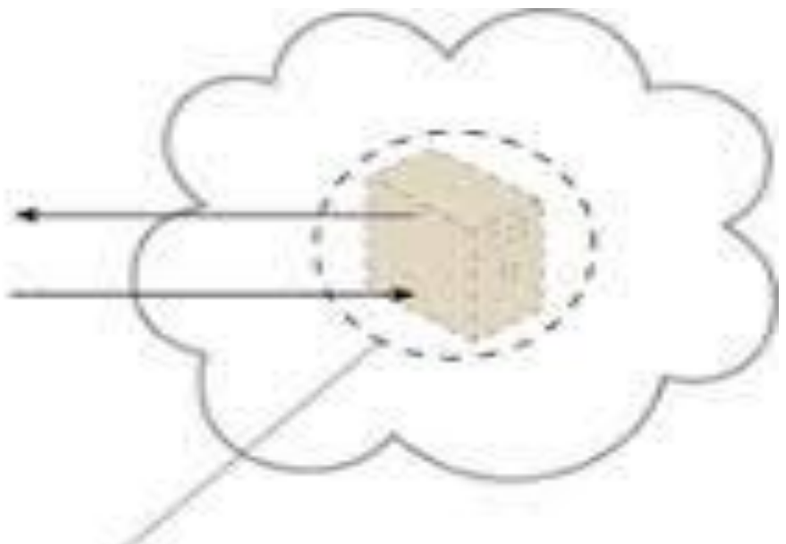
Concepts & Terminology

- **Cloud providers** manage the infrastructure and platforms that run the applications.
- In the SaaS model, **cloud providers** install and operate application software in the **cloud** and **cloud** users access the software from **cloud** clients.
- Website of cloud providers

EXAMPLES OF CLOUD SERVICES



remotely accessed Web service
acting as a cloud service



remotely accessed virtual server
acting as a cloud service

CLOUD SERVICE CONSUMER

“A cloud service consumer is a temporary runtime role assumed by a software program when it accesses a cloud service.”

EXAMPLES OF CLOUD SERVICE CONSUMER

Introduction

What is computing?

The process of utilizing computer technology to complete a task.

Computing may involve computer hardware and/or software, but must involve some form of a computer system.

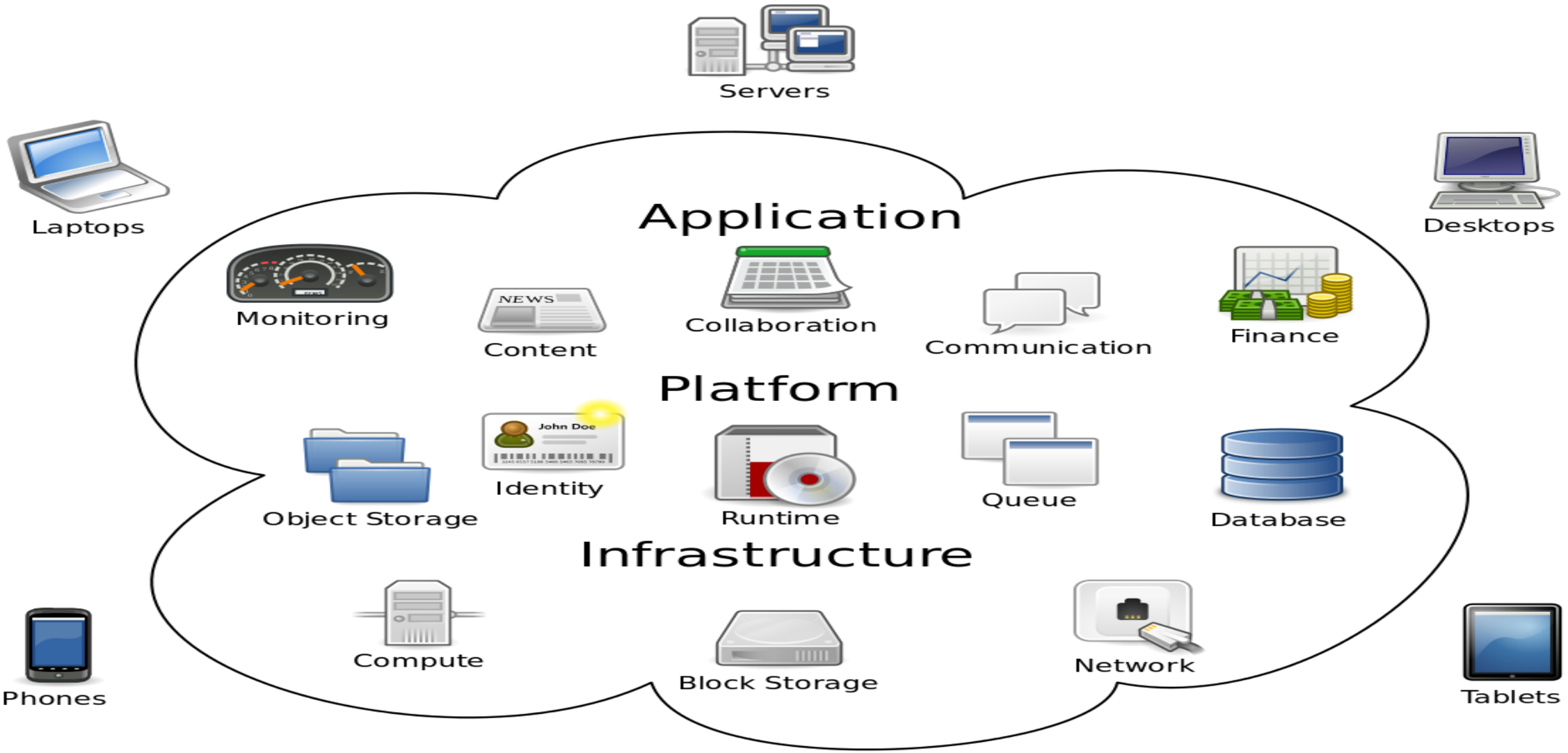
What is cloud computing?

Cloud computing refers to the delivery of computing services over the internet, including storage, processing power, and software applications.

It allows users to access resources and services on-demand, without the need for physical infrastructure or local servers.

Examples

- **Email and Office Tools (SaaS)**like Gmail or Microsoft Office 365: don't install an email server on your computer; instead, you access your email service online.
- **Cloud Storage** like Dropbox, Google Drive, and iCloud: These services store your files on the cloud, allowing you to access them from anywhere with an internet connection.
- **Cloud Hosting and Development Tools (PaaS/IaaS)** like Amazon Web Services (AWS) and Google Cloud Platform: These provide developers with tools to build and host applications, manage databases, and analyze data.



Cloud computing

CLOUD COMPUTING DEFINITIONS

“A standardized IT capability (services, software, or infrastructure) delivered via Internet technologies in a pay-per-use, self-service way.”

- Forrester Research

CLOUD COMPUTING DEFINITIONS

“ Cloud computing is a on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. ”

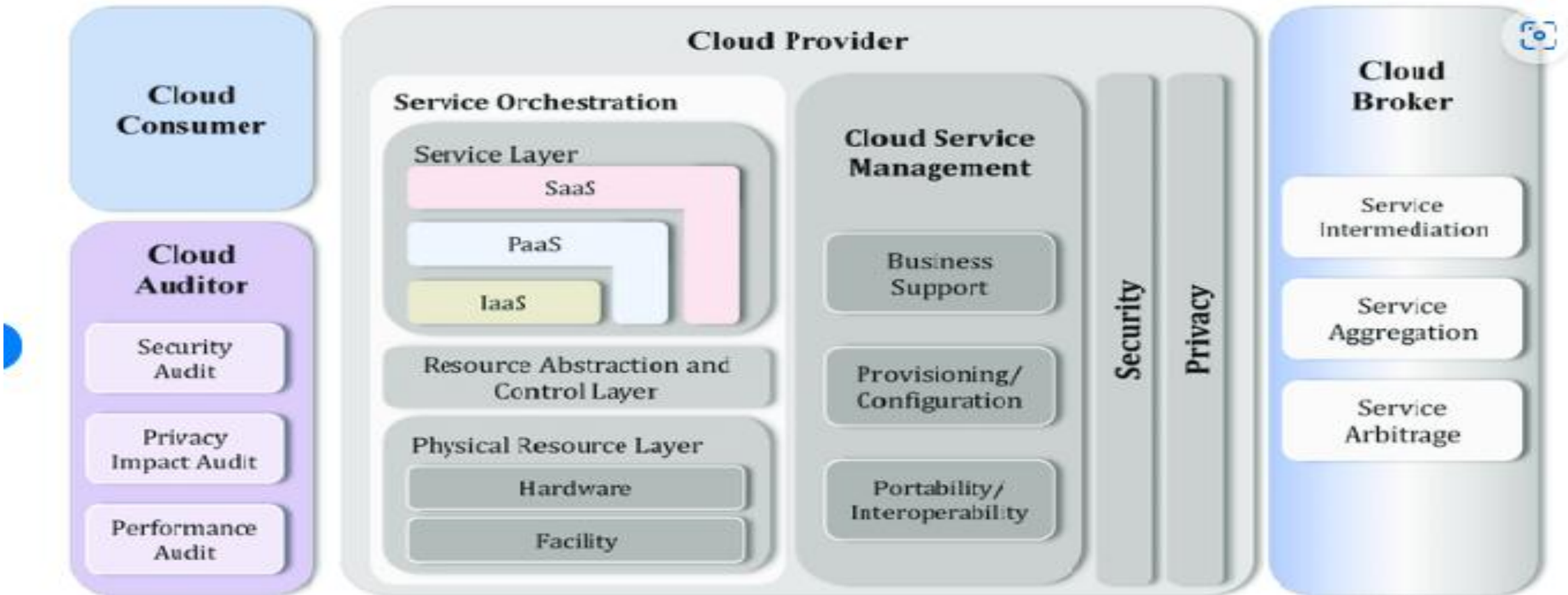
- NIST (National Institute of Standards and Technology)

CLOUD COMPUTING DEFINIIONS

“ Cloud Computing is a specialized form of distributed computing that introduces utilization models for remotely provisioning scalable and measured resources. “

- simplified general definition used in Cloud Computing industry

5.Cloud Computing Reference Model



1.Roles and boundaries

2. Cloud characteristics

3. Cloud delivery models

4. Cloud deployment models.

Cntd.

- Roles and Boundaries:
- Organizations and humans can assume different types of pre-defined roles depending on how they relate to and/or interact with a cloud and its hosted IT resources. Each of the upcoming roles participates in and carries out responsibilities in relation to cloud-based activity. The following are the roles in the cloud-based activity:

  - Cloud Provider
  - Cloud Consumer
  - Cloud Service Owner
  - Cloud Resource Administrator
  - Additional Roles
  - Organizational Boundary
  - Trust Boundary

CLOUD PROVIDER

The organization that provides cloud-based IT resources is the Cloud Provider.

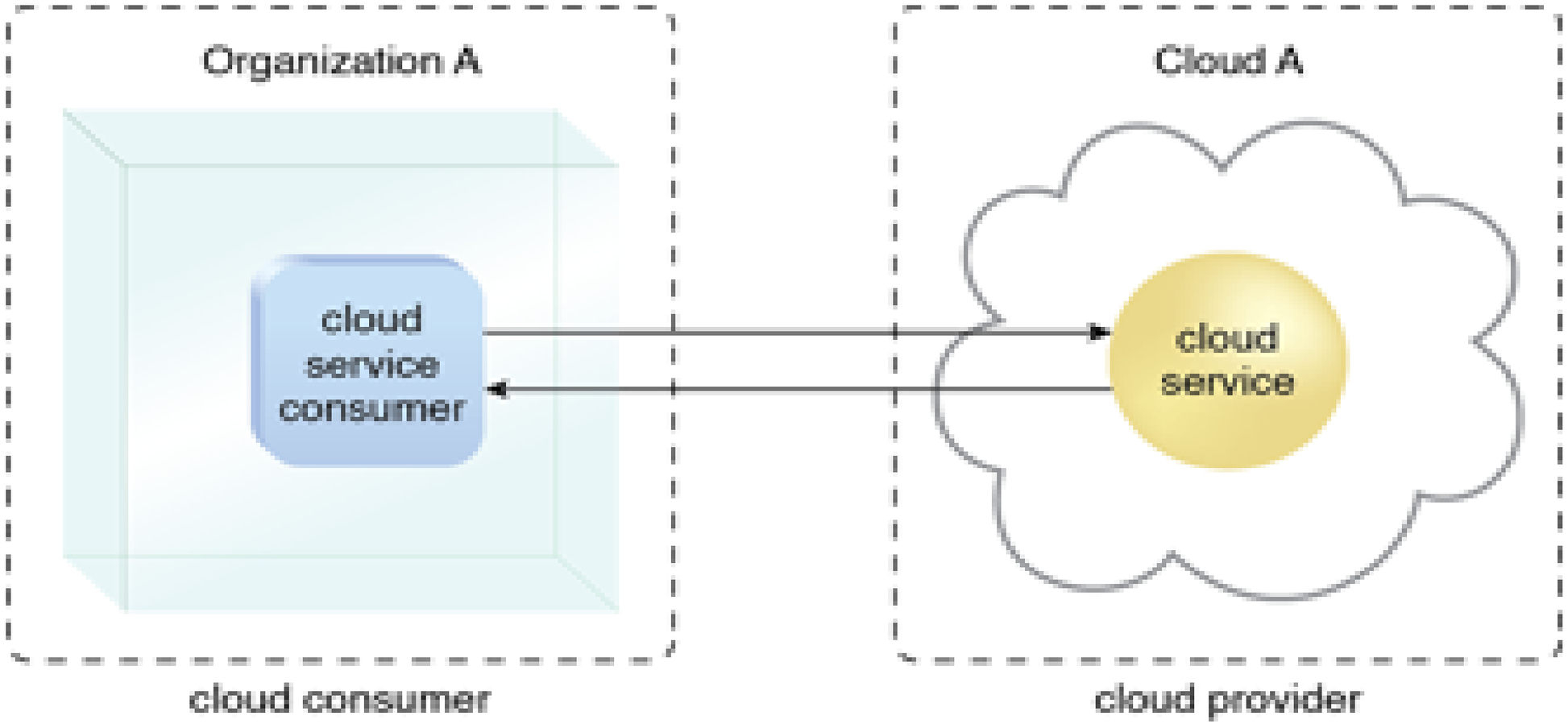
- The cloud provider is responsible for making cloud services available to cloud consumers, as per agreed upon SLA guarantees.
- The cloud provider is further tasked with any required management and administrative duties to ensure the on-going operation of the overall cloud infrastructure.

CLOUD CONSUMER

A cloud consumer is an organization or an individual person that has a formal contract or agreement with a cloud provider to use IT resources made available by the cloud provider.

- Generally, the cloud consumer uses a cloud service consumer to access a cloud service.

CLOUD PROVIDER AND CLOUD CONSUMER

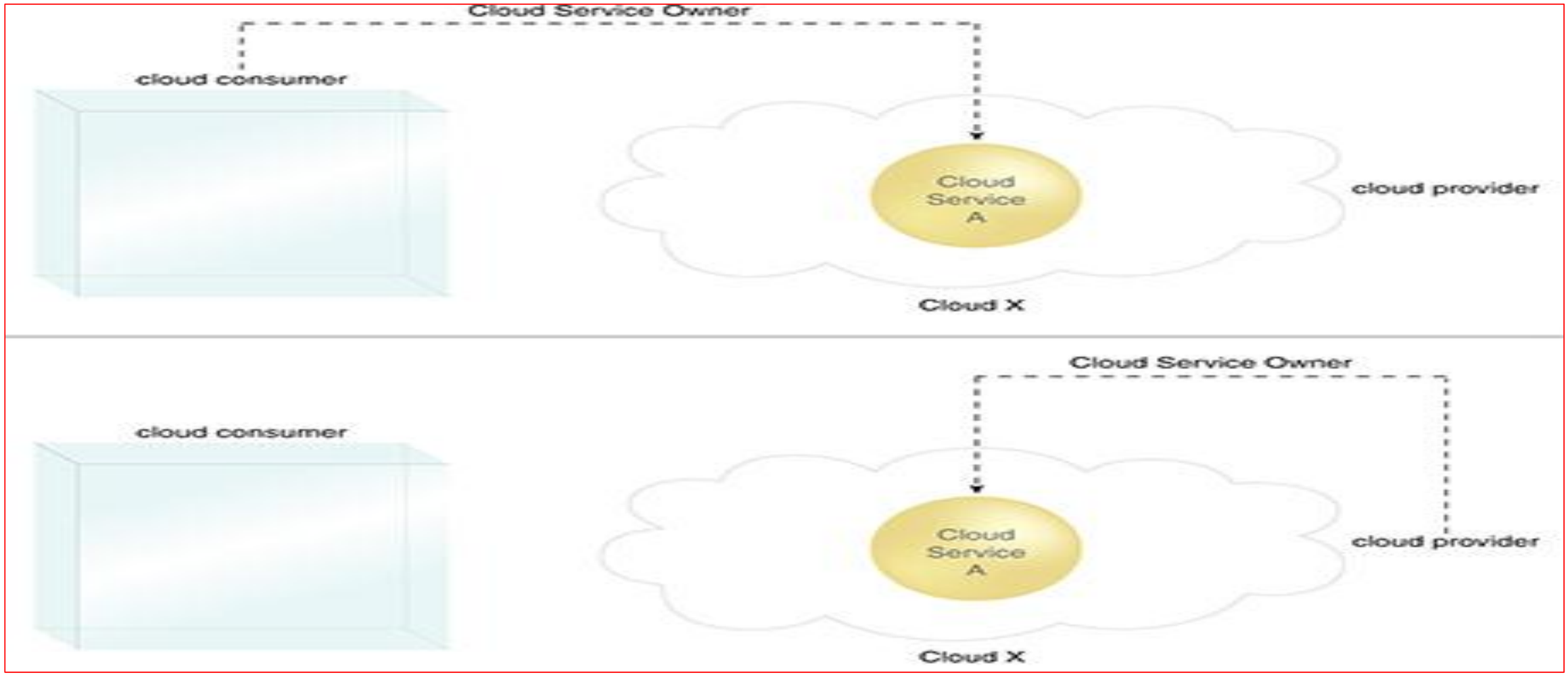


CLOUD SERVICE OWNER

The person or organization that legally owns a cloud service is called a cloud service owner.

- The cloud service owner can be the cloud consumer, or the cloud provider that owns the cloud within which the cloud service resides.

CLOUD SERVICE OWNER

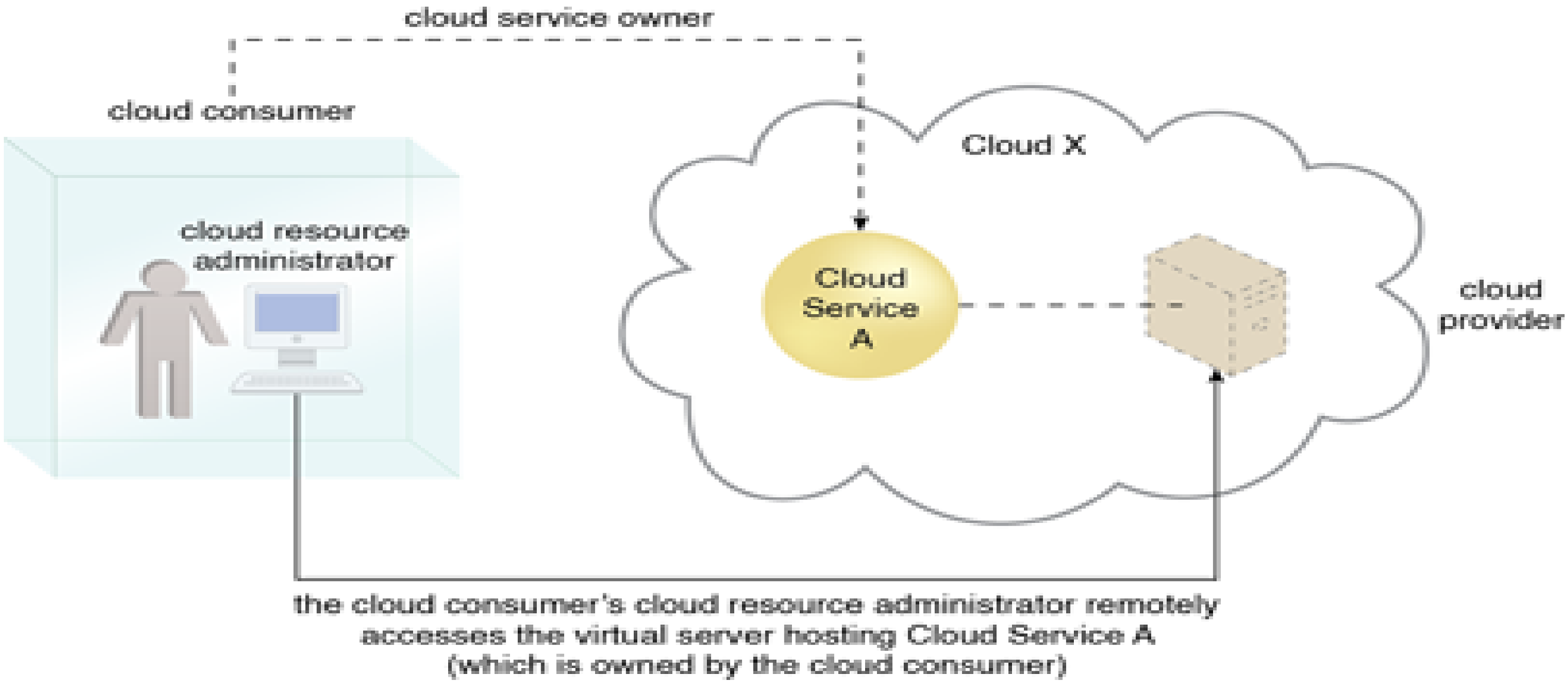


CLOUD RESOURCE ADMINISTRATOR

A cloud resource administrator is the person or organization responsible for administering a cloud-based IT resource (including cloud services).

- The cloud resource administrator can be (or belong to) the cloud consumer or cloud provider of the cloud within which the cloud service resides.
- Alternatively, it can be (or belong to) a third party organization contracted to administer the cloud-based IT resource.

CLOUD RESOURCE ADMINISTRATOR



ADDITIONAL ROLES..

Cloud Auditor

A third-party that **conducts independent assessments of cloud environments is known as cloud auditor.**

Cloud Broker

The party that is responsible **for managing and negotiating the usage of cloud services between cloud consumers and cloud providers** is known as cloud broker.

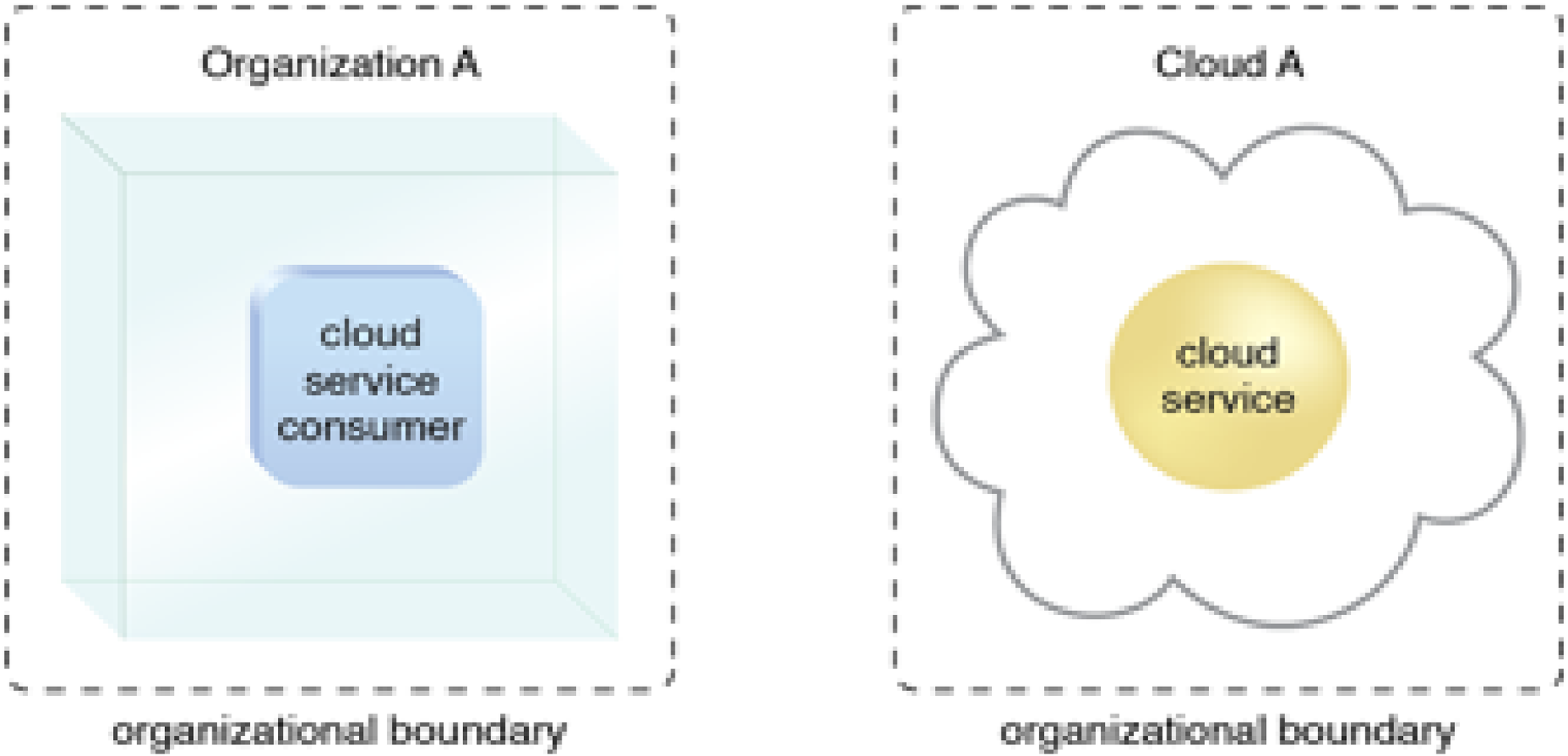
Cloud Carrier

The party that provides the **wire-level connectivity between cloud consumers and cloud providers is known as cloud carrier.**

ORGANIZATIONAL BOUNDARY

An organizational boundary **represents the physical perimeter that surrounds a set of IT resources that are owned and governed by an organization.**

ORGANIZATIONAL BOUNDARY



6.CLOUD CHARACTERISTICS

An IT environment requires a specific set of characteristics to enable the remote provisioning of scalable and measured IT resources in an effective manner.

The following are the common characteristics for majority of the cloud environments:

- **On-demand Usage**
- **Ubiquitous Access**
- **Multitenancy (and Resource Pooling)**
- **Elasticity**
- **Measured Usage**
- **Resiliency**

ON-DEMAND USAGE

A cloud consumer can unilaterally access cloud-based IT resources giving the cloud consumer the freedom to self-provision these IT resources. **Configured usage of the self provisioned IT resources can be automated, requiring no further human involvement by the cloud consumer or cloud provider.**

This results in an ***"on-demand usage"*** environment. Also known as ***"on-demand self-service usage"***.

UBIQUITOUS ACCESS

"Ubiquitous access" represents the ability for the cloud service to be widely accessible. Establishing ubiquitous access for a cloud service can require support for a wide range of devices, transport protocols, interfaces, and security technologies.

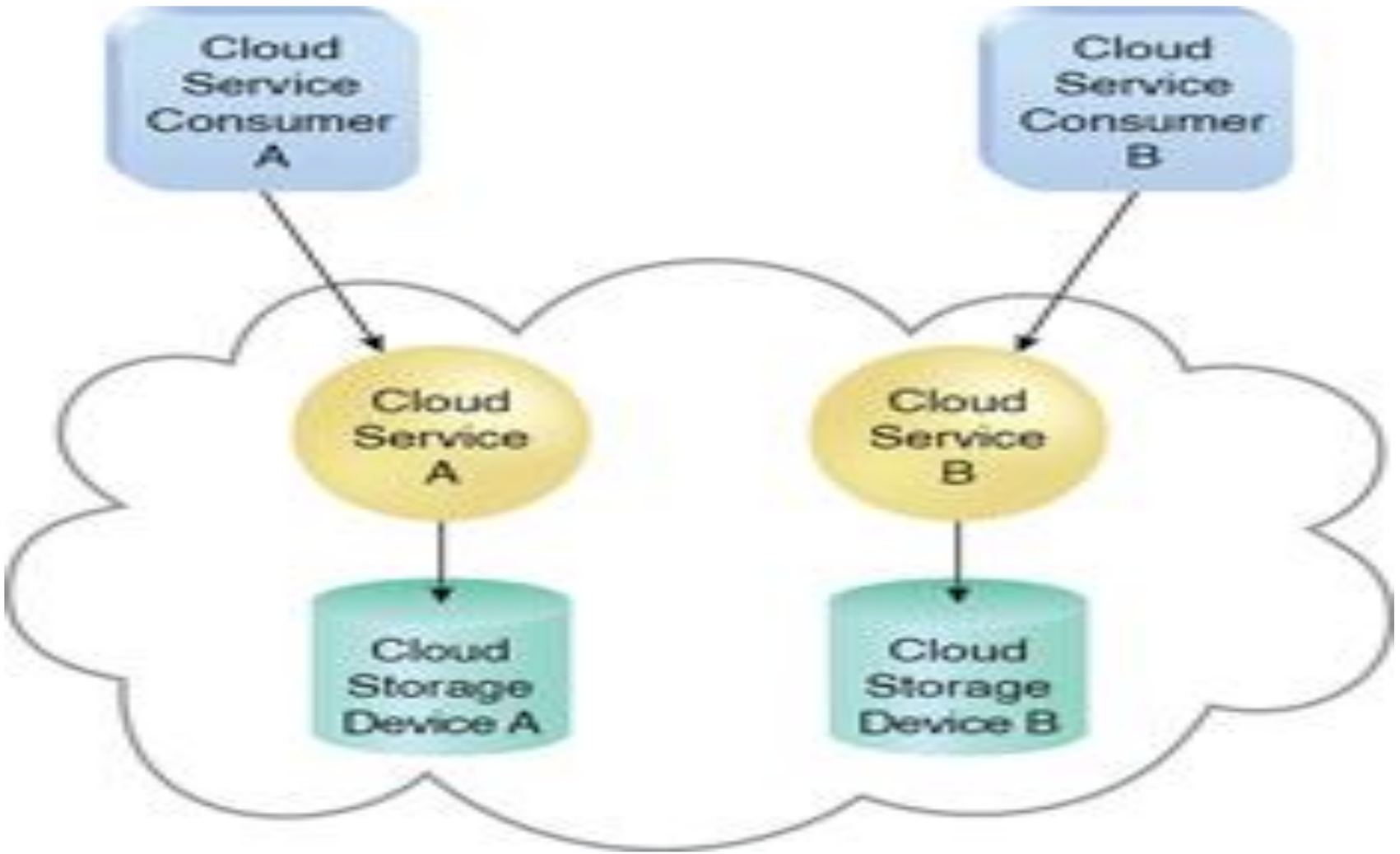
To enable this level of access generally requires that the cloud service architecture be tailored to the particular needs of different cloud service consumers.

MULTITENANCY (RESOURCE POOLING)

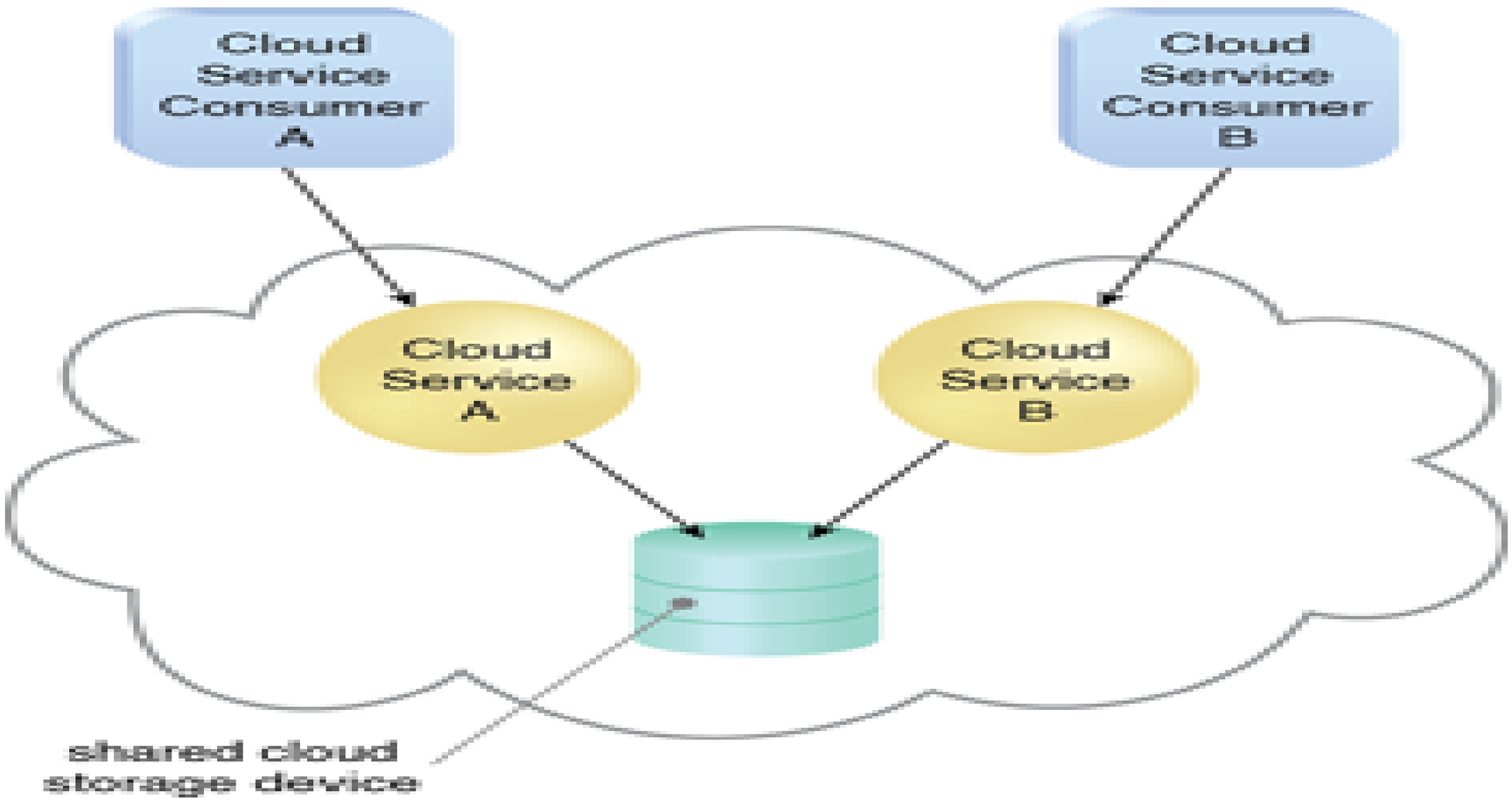
The characteristic of a software program that enables an instance of the program to serve different consumers (tenants) whereby each is isolated from the other, is referred to as ***"Multitenancy"***.

A cloud provider pools its IT resources to serve multiple cloud service consumers by using multitenancy models that frequently rely on the use of virtualization technologies. Through the use of multitenancy technology, IT resources can be dynamically assigned and reassigned, according to cloud service consumer demands.

EXAMPLE OF SINGLE TENANT ENVIRONMENT



EXAMPLE OF MULTI TENANT ENVIRONMENT



ELASTICITY

"Elasticity" is the automated ability of a cloud to transparently scale IT resources, as required in response to runtime conditions or as pre-determined by the cloud consumer or cloud provider.

The Elasticity refers to the ability of a cloud to automatically expand or compressed the infrastructural resources on a sudden-up and down in the requirement so that the workload can be managed efficiently. This elasticity helps to minimize infrastructural cost.

MEASURED USAGE

The ***"measured usage"*** characteristic represents the ability of a cloud platform to keep track of the usage of its IT resources, primarily by cloud consumers.

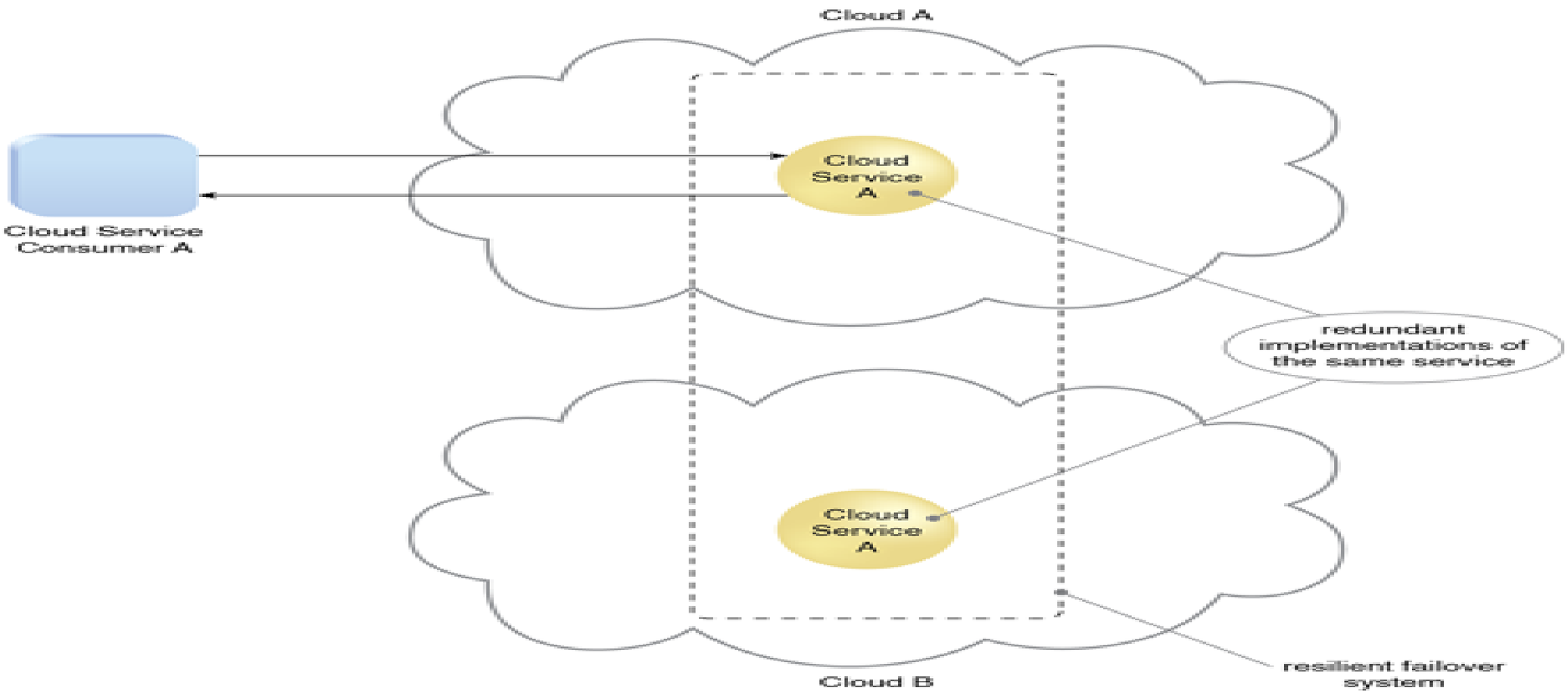
Based on what is measured, the cloud provider can charge a cloud consumer only for the IT resources actually used and/or for the timeframe during which access to the IT resources was granted.

RESILIENCY

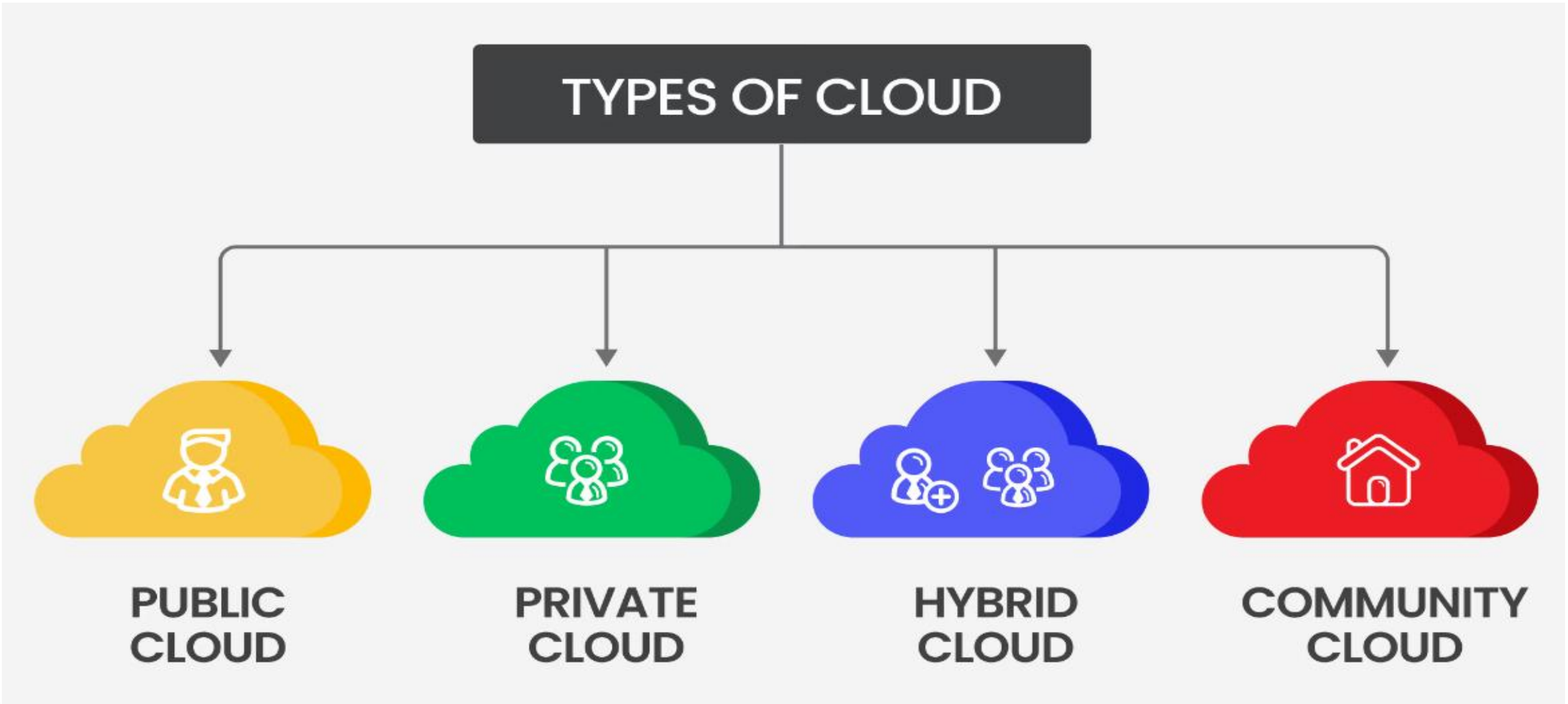
Within cloud computing, the characteristic of ***"resiliency"*** can refer to redundant IT resources within the same cloud (but in different physical locations) or across multiple clouds.

Cloud consumers can increase both the availability and reliability of their applications by leveraging the resiliency of cloud-based IT resources.

EXAMPLE OF RESILIENCY



DEPLYEMENT MODELS



- 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.

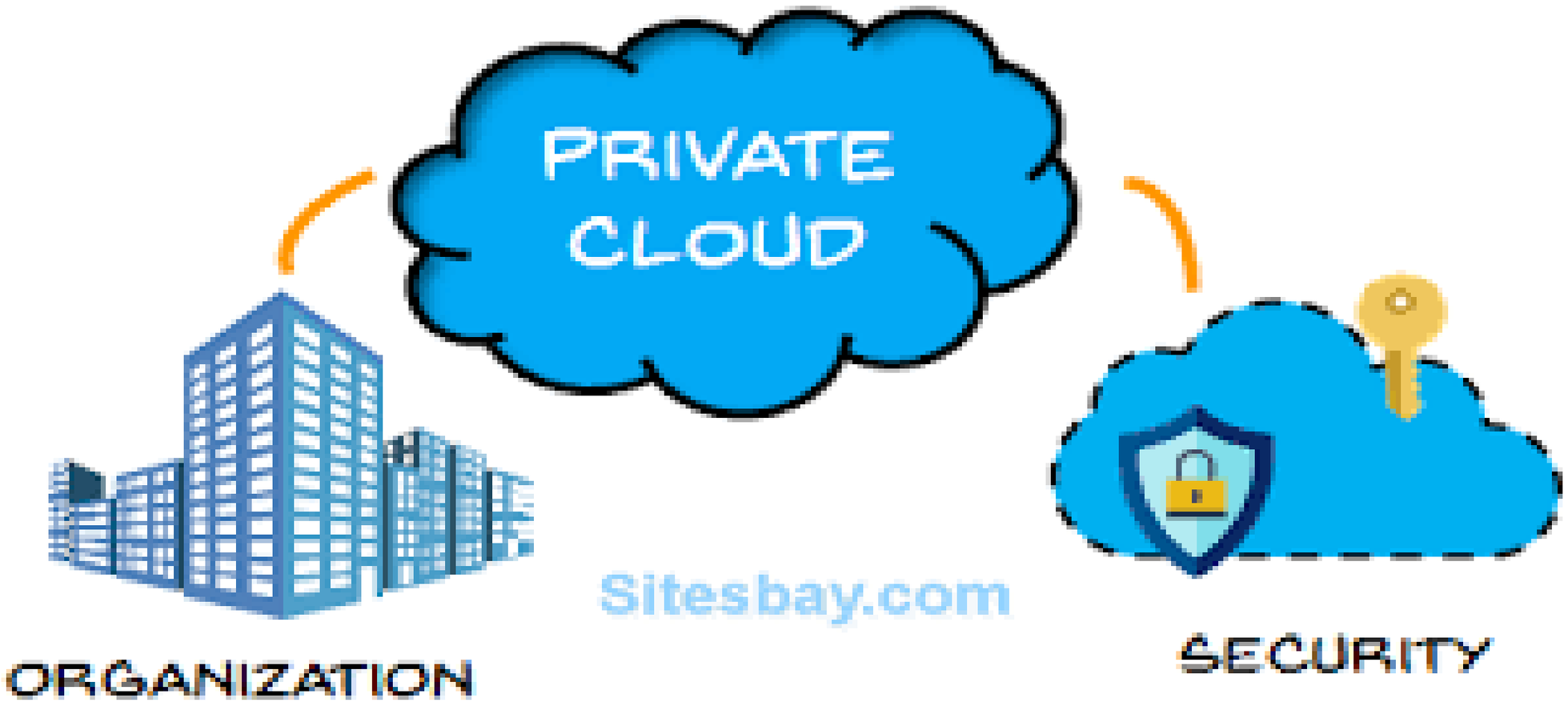
- The **private cloud** allows systems and services to be accessible within an organization. It is more secured because of its private nature.

- The **community cloud** allows systems and services to be accessible by a group of organizations.

- The **hybrid cloud** is a mixture of public and private cloud, in which the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.


Public Cloud

Private Cloud




Community
Cloud


Hybrid Cloud
Workload
Private Clouds
Bridge
Public Clouds

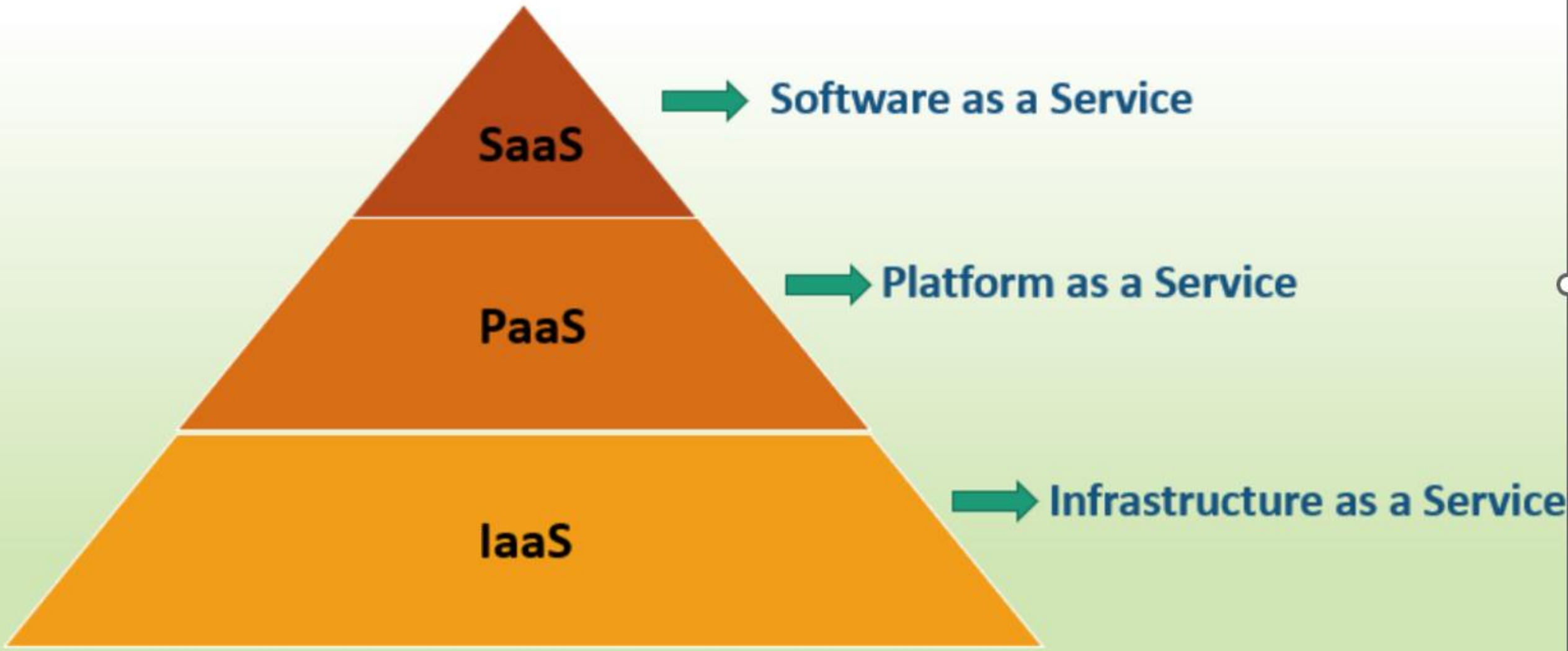
CLOUD DELIVERY MODELS

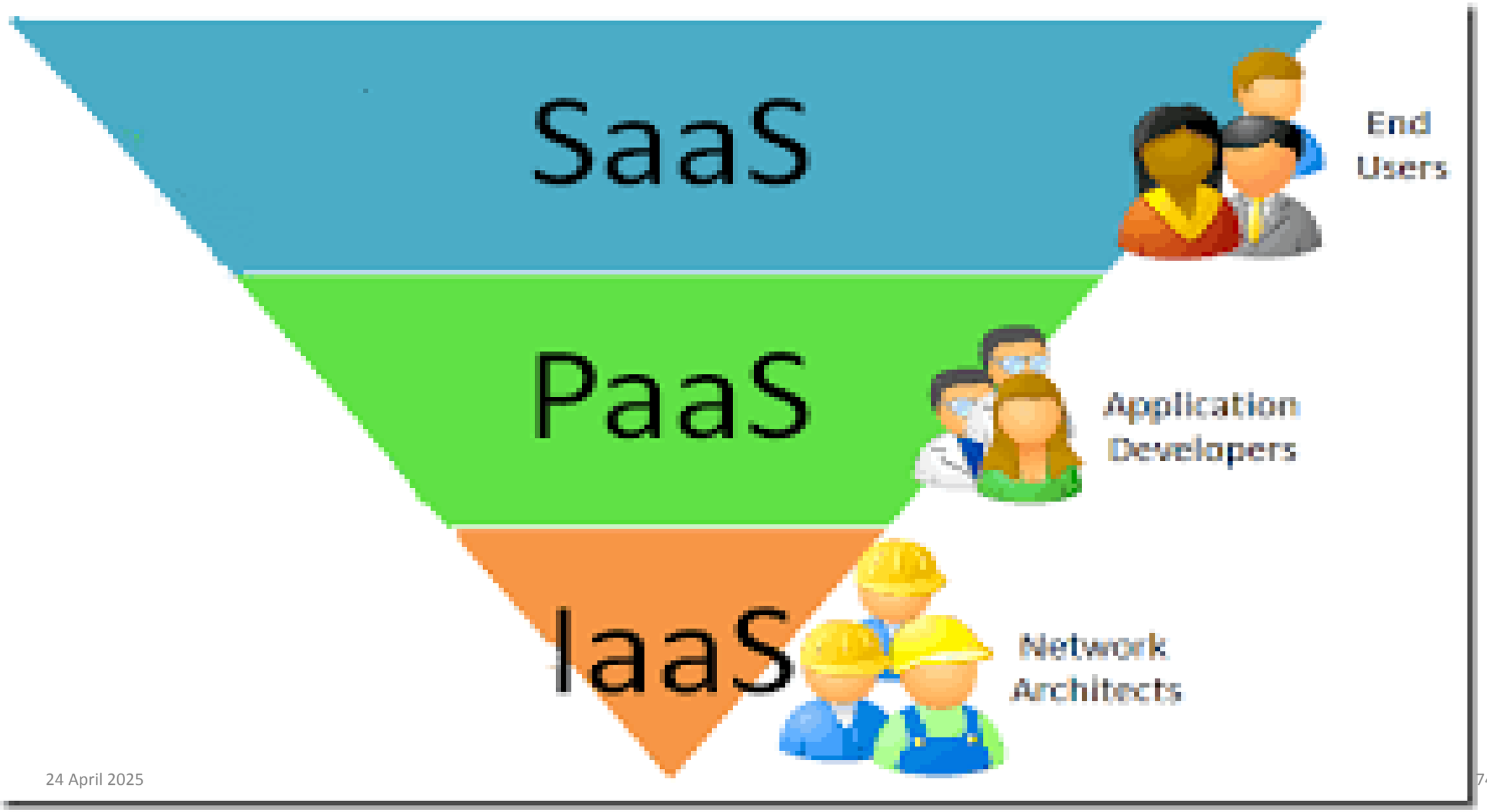
A cloud delivery model represents a specific, pre-packaged combination of IT resources offered by a cloud provider.

The following are the common three cloud delivery models:

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

Cloud Delivery Models



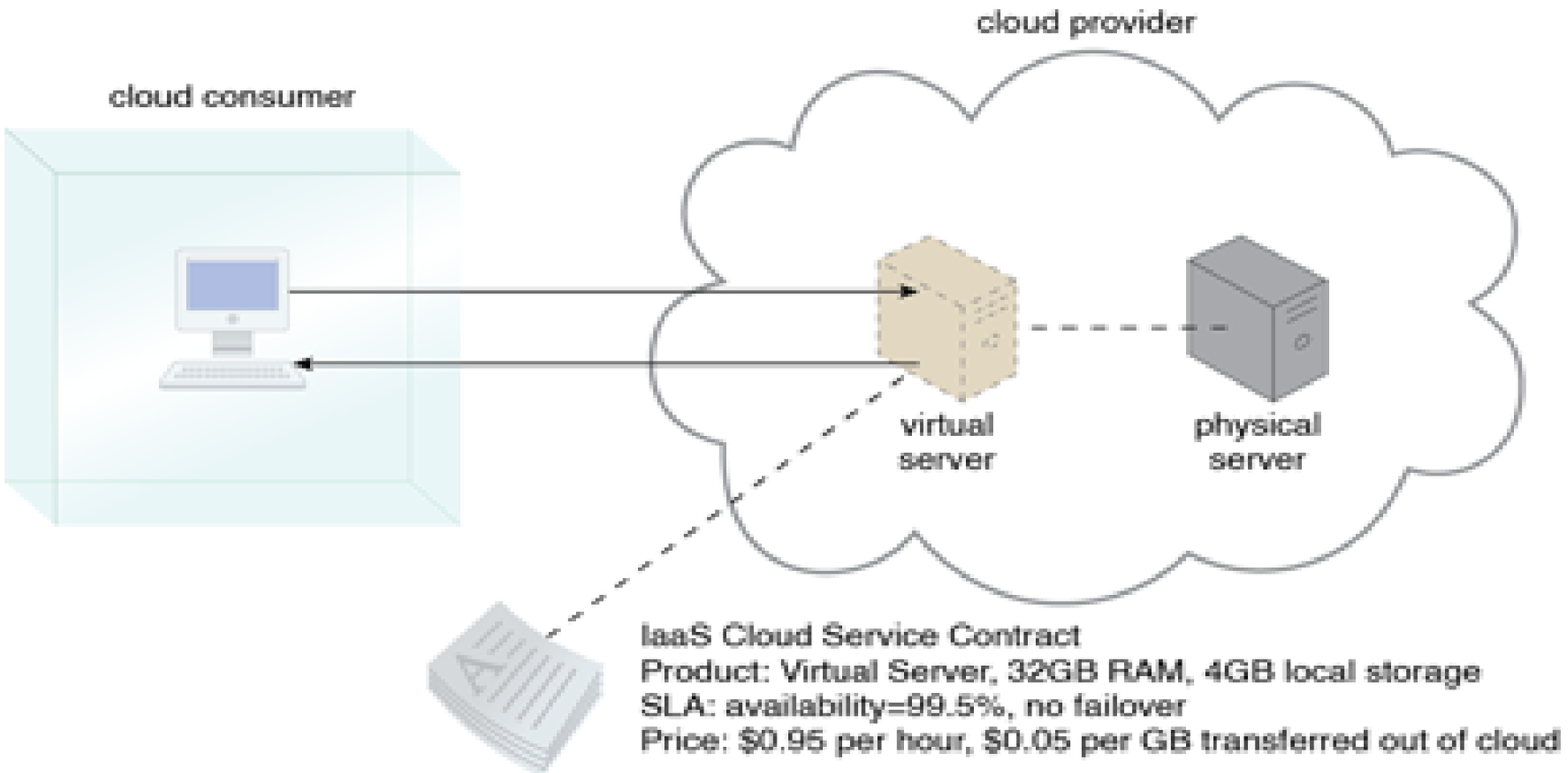

SaaS
End Users
PaaS
Application Developers
IaaS
Network Architects

Infrastructure-as-a-Service (IaaS)

The IaaS delivery model represents a self-contained IT environment comprised of infrastructure-centric IT resources that can be accessed and managed via cloud service-based interfaces and tools.

This environment can include hardware, network connectivity and other raw IT resources.

EXAMPLE OF IaaS DELIVERY MODEL

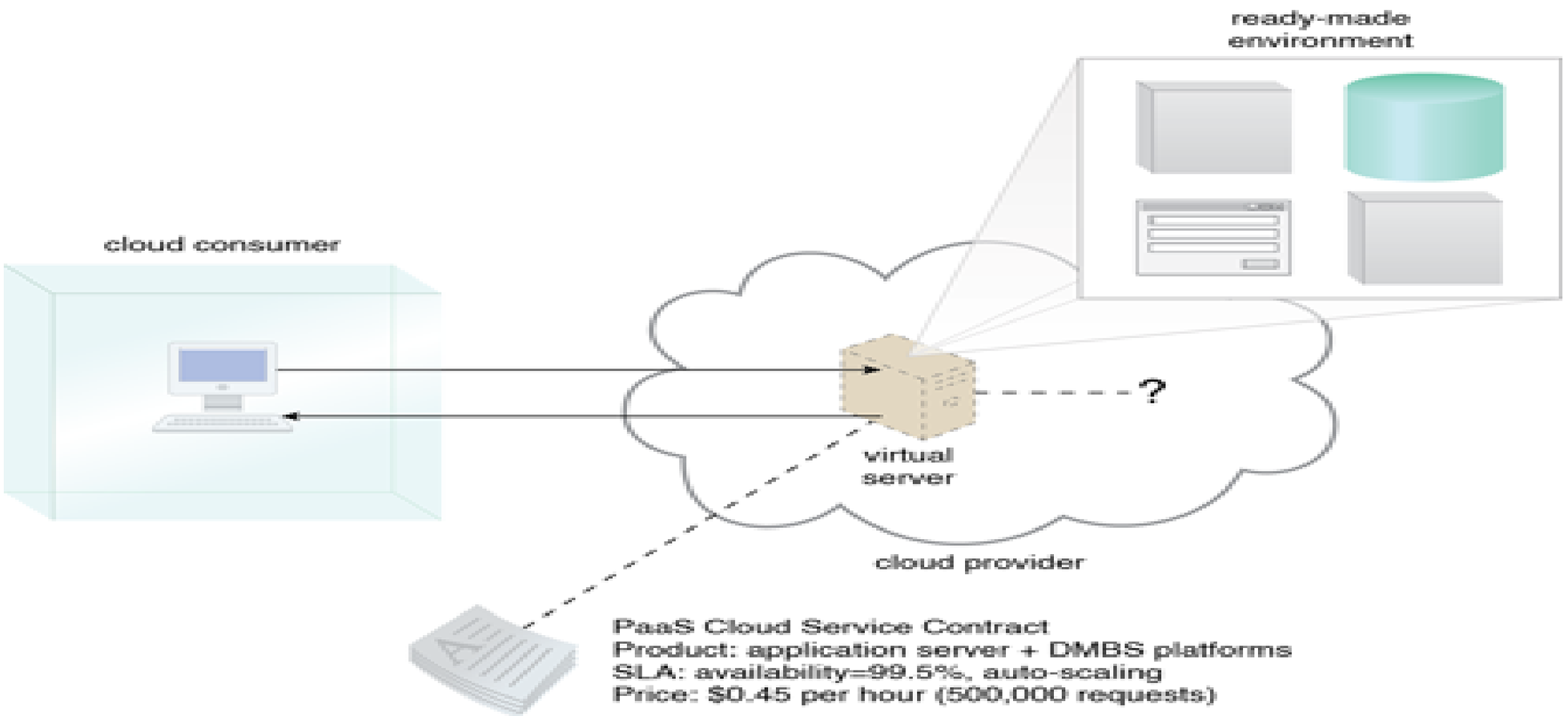


Platform-as-a-Service (PaaS)

The PaaS delivery model represents a pre-defined “ready-to-use” environment typically comprised of already deployed and configured IT resources.

Specifically, PaaS relies on the usage of ready-made environment that establishes a set of pre-packaged products and tools used to support the entire delivery lifecycle of custom applications.

EXAMPLE OF PaaS DELIVERY MODEL



Software-as-a-Service (SaaS)

A software program positioned as a shared cloud service and made available as a “product” or generic utility represents the typical profile of a SaaS offering.

The SaaS delivery model is typically used to make a reusable cloud service widely available to a range of cloud consumers.

An entire marketplace exists around SaaS products that can be leased and used for different purposes and via different terms.

EXAMPLE OF SaaS DELIVERY MODEL

What is Iaas,Paas,Saas

- IaaS: cloud-based services, pay-as-you-go for services such as storage, networking, and virtualization.

- PaaS: hardware and software tools available over the internet.

- SaaS: software that’s available via a third-party over the internet.

- On-premise: software that’s installed in the same building as your business.

Example

YOUR OWN CAR
On-premises solution

LEASED CAR
IaaS

TAXI
PaaS

BUS
SaaS

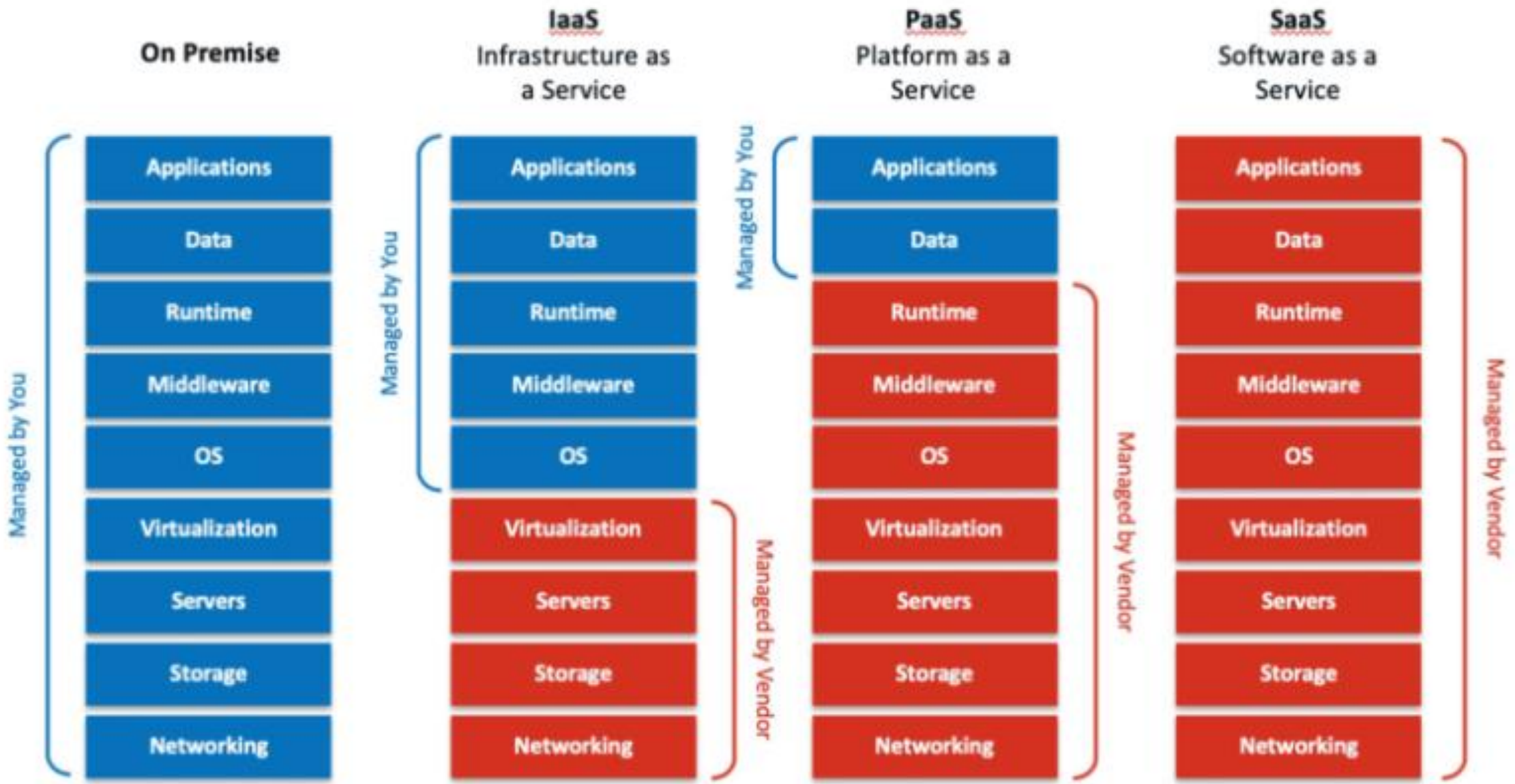
Cntd.

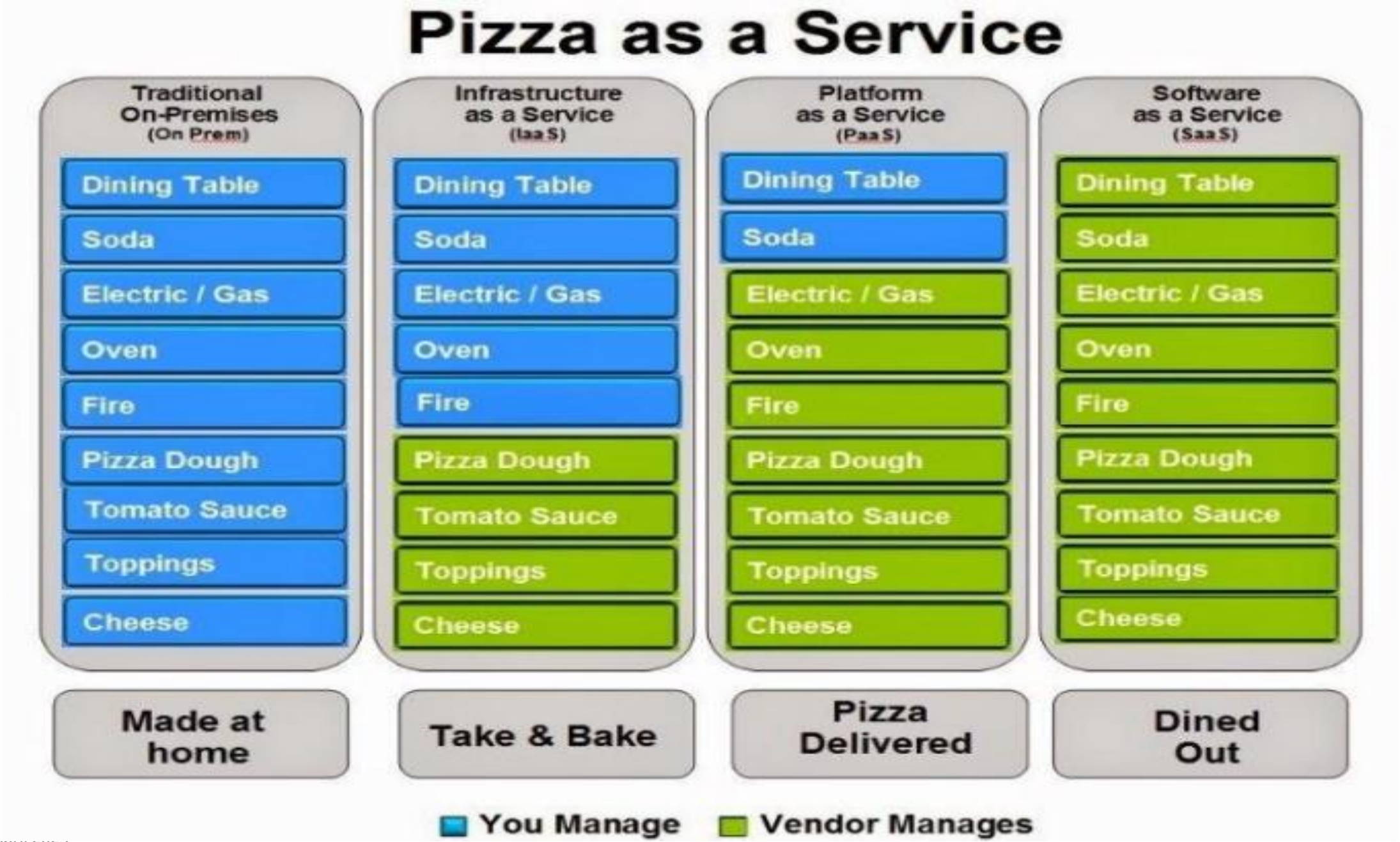
1. **On-premises IT** infrastructure is like owning a car. When you buy a car, you're responsible for its maintenance, and upgrading means buying a new car.

2. **IaaS** is like leasing a car. When you lease a car, you choose the car you want and drive it wherever you wish, but the car isn't yours. Want an upgrade? Just lease a different car

3. **PaaS** is like taking a taxi. You don't drive a taxi yourself, but simply tell the driver where you need to go and relax in the back seat.

4. **SaaS** is like going by bus. Buses have assigned routes, and you share the ride with other passengers.

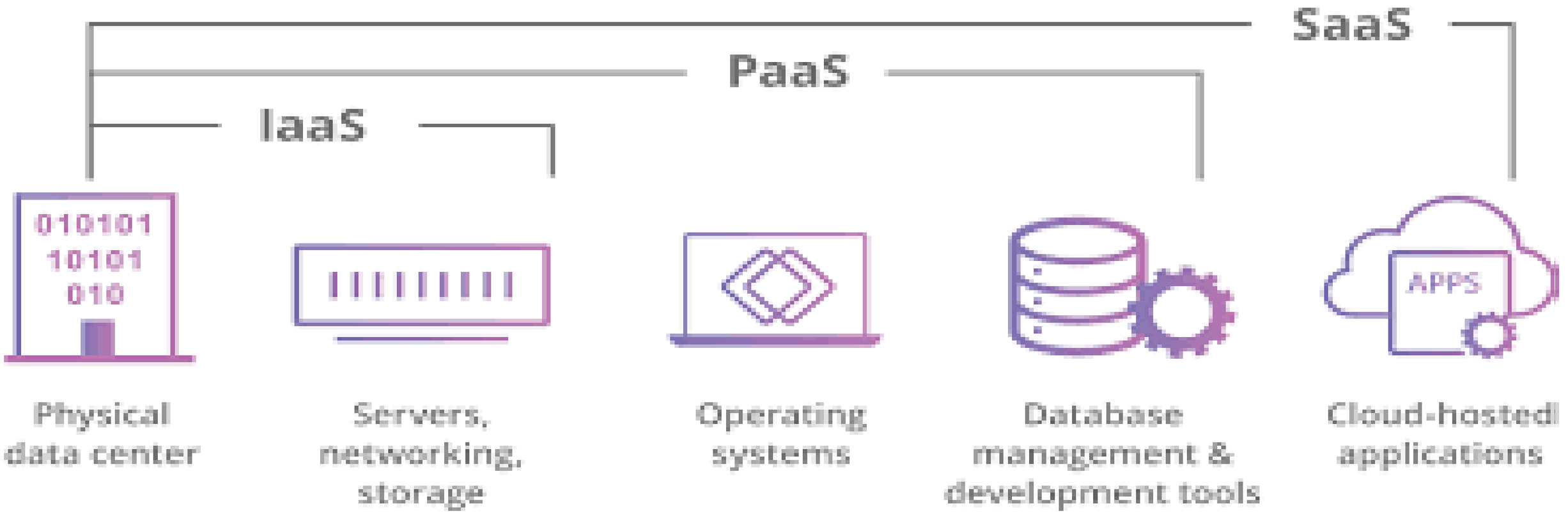

On Premise
IaaS
Infrastructure as a Service
PaaS
Platform as a Service
SaaS
Software as a Service
Applications
Data
Runtime
Middleware
OS
Virtualization
Servers
Storage
Networking
Managed by You
Managed by Vendor


Pizza as a Service
Traditional On-Premises (On Prem)
Infrastructure as a Service (IaaS)
Platform as a Service (PaaS)
Software as a Service (SaaS)
Dining Table
Soda
Electric / Gas
Oven
Fire
Pizza Dough
Tomato Sauce
Toppings
Cheese
Made at home
Take & Bake
Pizza Delivered
Dined Out
You Manage
Vendor Manages

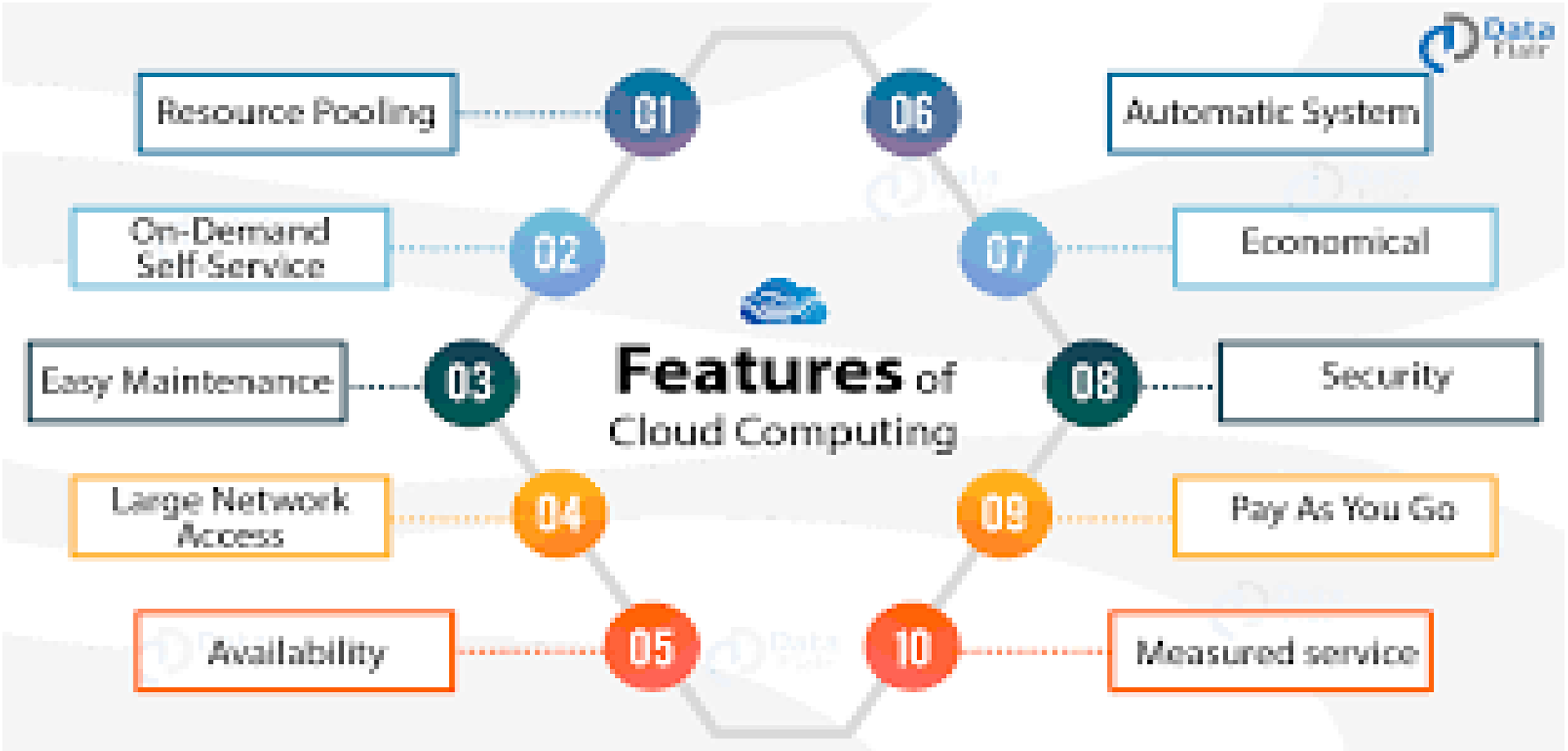
COMPARING CLOUD DELIVERY MODELS

Cloud Delivery Model	Common Cloud Consumer Activities	Common Cloud Provider Activities
SaaS	Uses and configures cloud service	Implements, manages and maintains cloud service. Monitors usage by cloud consumers.
PaaS	Develops, tests, deploys and manages cloud services and cloud-based solutions	Pre-configures platform and provisions underlying infrastructure, middleware and other needed IT resources, as necessary. Monitors usage by cloud consumers.
IaaS	Sets up and configures bare infrastructure, and installs, manages and monitors any needed software.	Provisions and manages the physical processing, storage, networking and hosting required. Monitors usage by cloud consumers.

COMBINING CLOUD DELIVERY MODELS



Why Cloud Computing?



PART 2:Virtualization

1. Introduction
2. Characteristics of Virtualized Environment
3. Taxonomy of Virtualization Techniques
4. Virtualization and Cloud computing
5. Pros and Cons of Virtualization, Technology
6. Examples- VMware and Microsoft Hyper-V.

1.Introduction

- Data centers consist of both physical and virtualized IT resources
- Virtualization is a process of converting **physical IT Resources** in to **virtualized IT resources**.
- The physical IT resource layer refers to the **facility infrastructure** that houses computing/networking systems and **equipment, together with hardware systems and their operating systems.**
- The virtualization layer is comprised of **operational and management tools that are often based on virtualization platforms**
- virtualized components that are **easier to allocate, operate, release, monitor and control.**

2.Characteristics of Virtualization in Cloud Computing

1. Resource Abstraction

Virtualization enables the abstraction of physical resources such as processors, memory, storage, and network components. This abstraction allows multiple virtual instances to run on a single physical machine.For instance, a single physical server can be virtualized into multiple virtual machines (VMs), each operating independently of its operating system.

2. Isolation and Security

Virtualization provides a layer of isolation between different virtual instances. This isolation ensures that resources allocated to one virtual instance do not interfere with others. This characteristic is crucial for ensuring security and preventing unauthorized access..

3. Hardware Independence

One of the defining characteristics of virtualization is its ability to decouple virtual instances from the underlying physical hardware. This hardware independence allows IT teams to migrate virtual instances across different physical hosts without incurring downtime.

4. Scalability

Cloud computing's scalability is greatly amplified by virtualization. Through the creation of VM templates, cloud providers can rapidly provision new virtual instances to meet varying demands.

5.Workload Isolation and Sandboxing

The concept of virtualization also lends itself to the isolation and sandboxing of applications and workloads. Developers can create isolated environments for testing and development without affecting the underlying infrastructure.

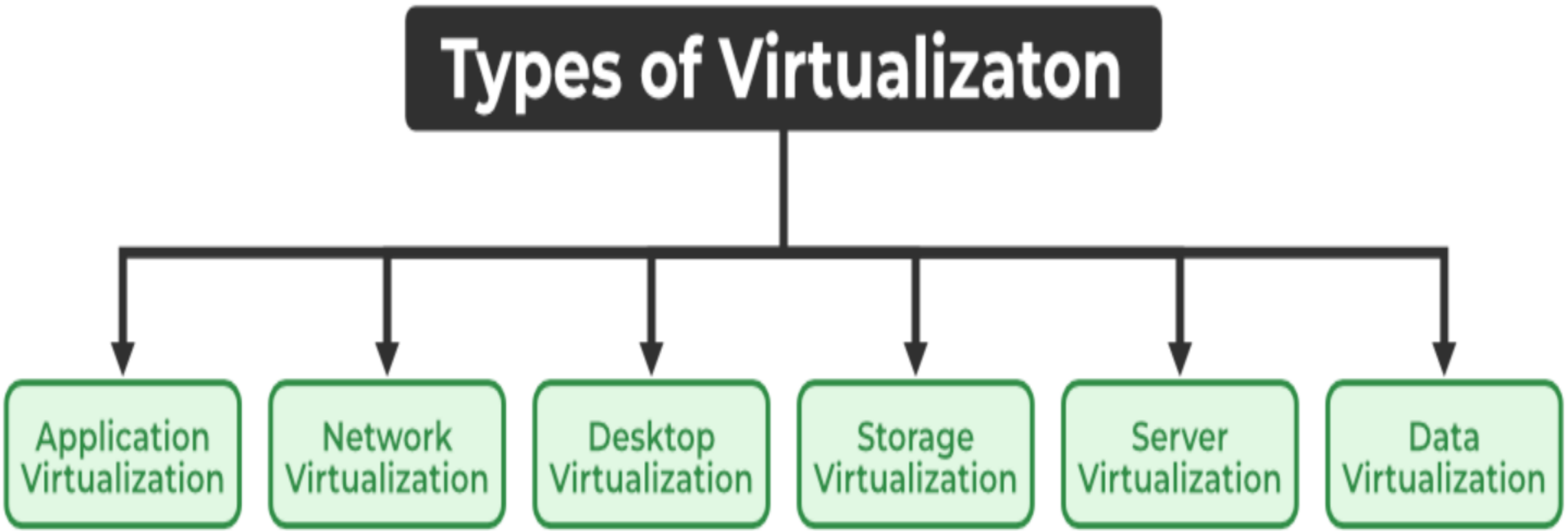
6.Disaster Recovery and Backup

Virtualization enhances disaster recovery and backup strategies. Virtual machine snapshots can be taken at various points in time, providing the ability to restore systems to a specific state. In case of hardware failures or data corruption, organizations can quickly restore virtual instances from these snapshots, minimizing downtime and data loss.

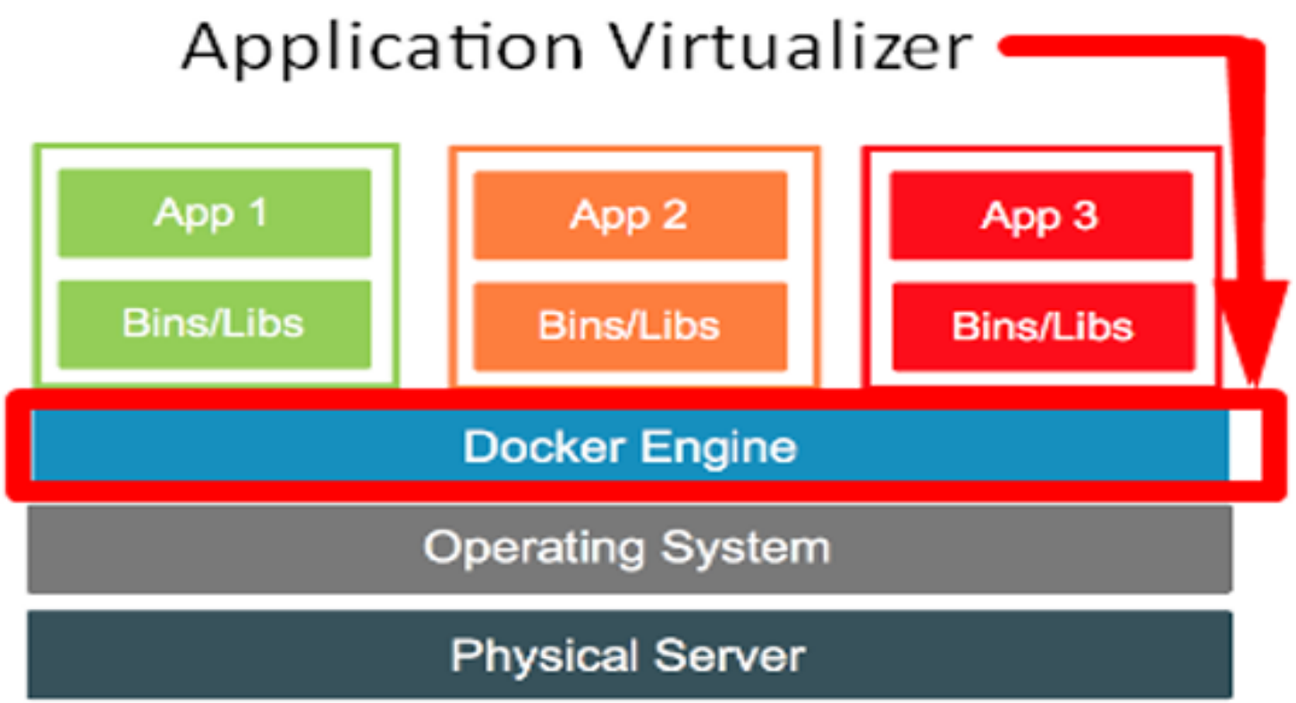
7. Cost Efficiency

Virtualization contributes to cost efficiency by optimizing resource usage. Organizations can reduce hardware and energy costs by consolidating workloads on fewer physical machines

Taxonomy of virtualization



1.Application Virtualization: Application virtualization helps a user to have remote access to an application from a server. The server stores all personal information and other characteristics of the application but can still run on a local workstation through the internet. An example of this would be a user who needs to run two different versions of the same software.



2.Network Virtualization: The ability to run multiple virtual networks with each having a separate control and data plan.

It co-exists together on top of one physical network.

It can be managed by individual parties that are potentially confidential to each other.

Network virtualization provides a facility to create and provision virtual networks

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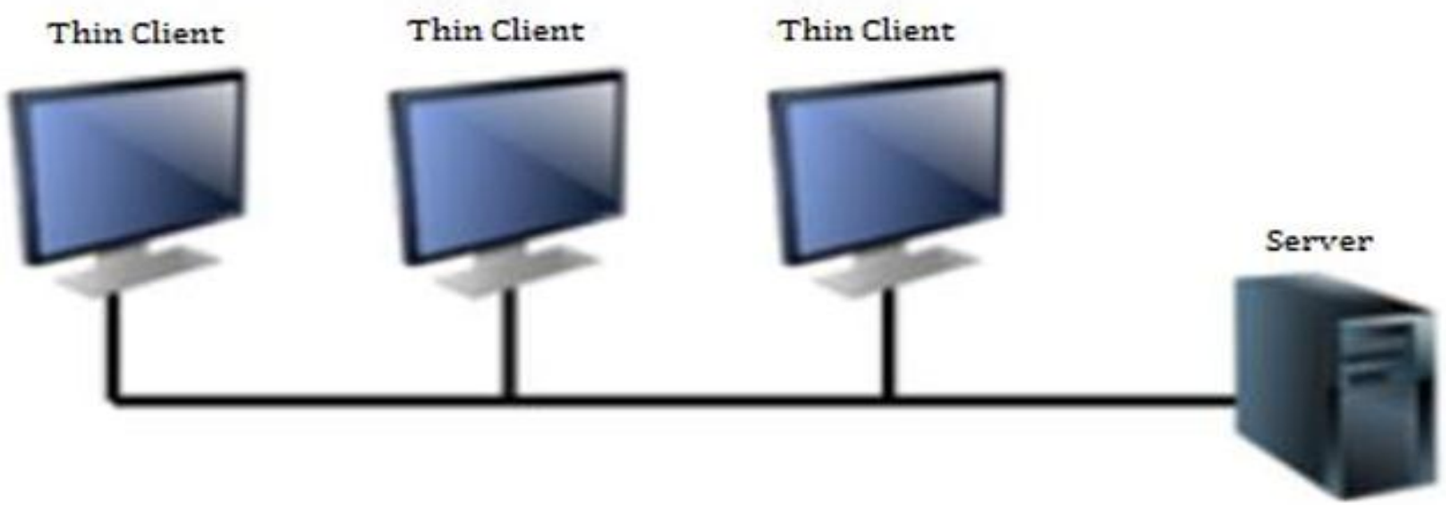
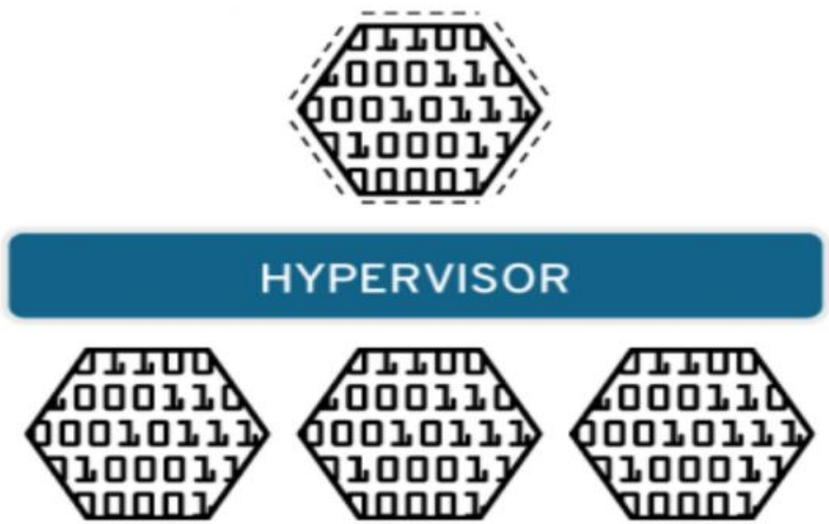
- **3.Desktop Virtualization:**
- **Desktop virtualization allows the users' OS to be remotely stored on a server in the data center.**
- **It allows the user to access their desktop virtually, from any location by a different machine.**
- Users who want specific operating systems other than Windows Server will need to have a virtual desktop.
- The main benefits of desktop virtualization are user mobility, portability.

Desktop Virtualization: allows you to deploy multiple operating systems on a single machine—desktop virtualization allows a central administrator (or automated administration tool) to deploy simulated desktop environments to hundreds of physical machines at once.

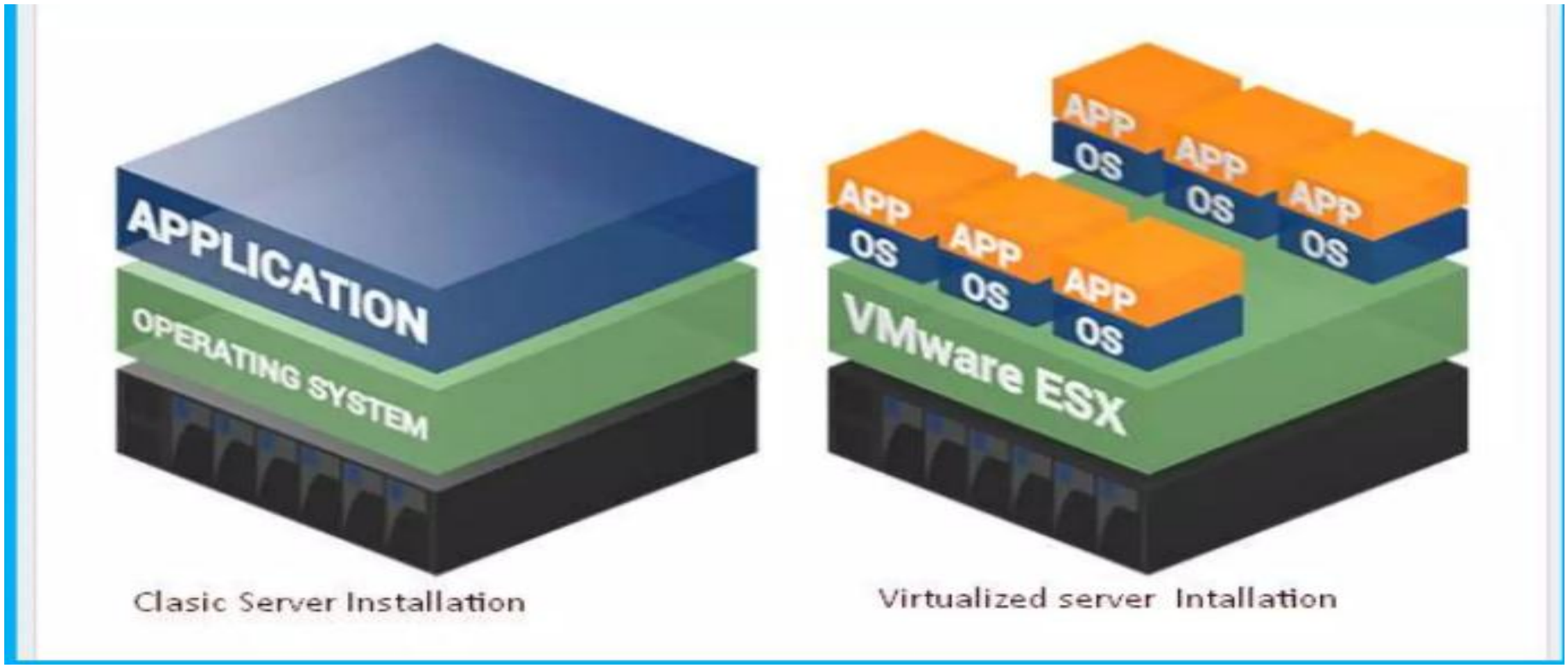


4. Data virtualization

Data virtualization allows companies to treat data as a dynamic supply—providing processing capabilities that can bring together data from multiple sources, easily accommodate new data sources, and transform data according to user needs



Server virtualization



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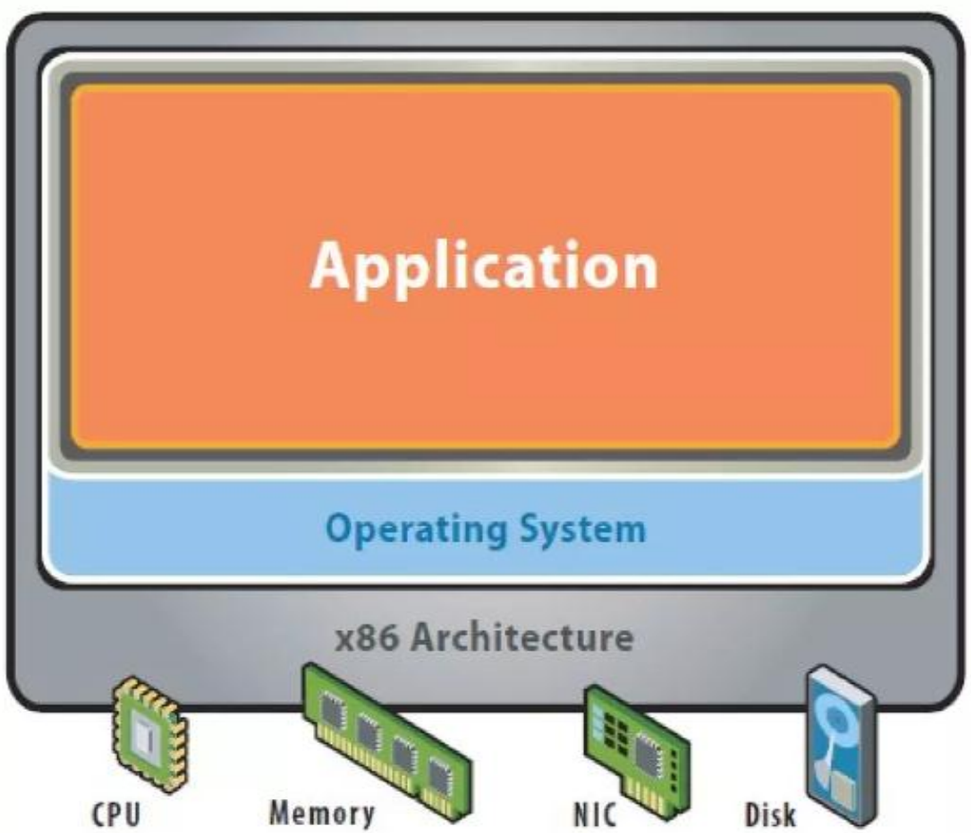
- **5.Server Virtualization:** This is a kind of virtualization in which the masking of server resources takes place.
- Here, the central server (physical server) is divided into multiple different virtual servers by changing the identity number, and processors.

6.Storage Virtualization:

It is an array of servers that are managed by a virtual storage system. The servers aren’t aware of exactly where their data is stored and instead function more like worker bees in a hive.

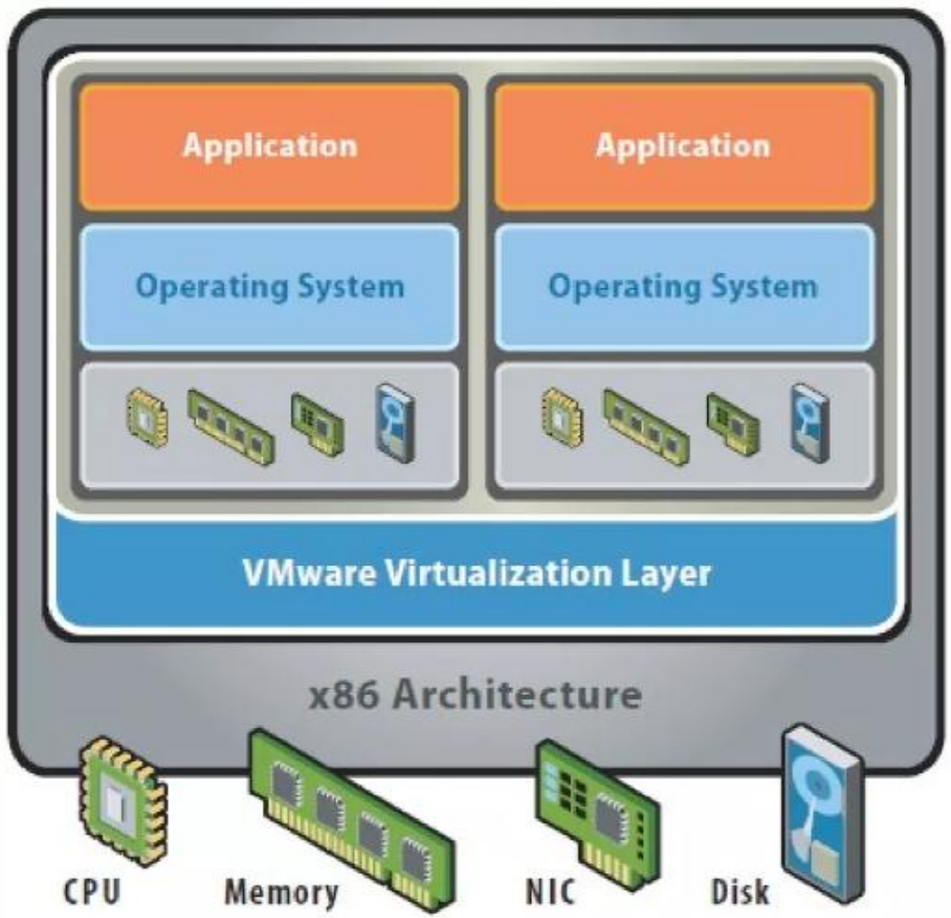
It makes managing storage from multiple sources be managed and utilized as a single repository

4.Virtualization and Cloud computing (BEFORE VIRTULZATION)

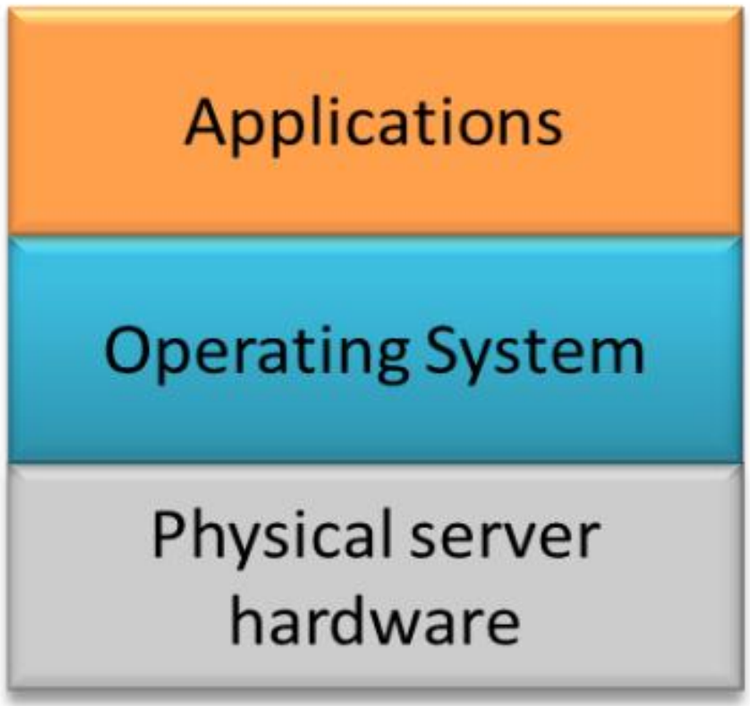


- Single OS image per machine
- Software and hardware tightly coupled
- Running multiple applications on same machine often creates conflict
- Inflexible and costly infrastructure

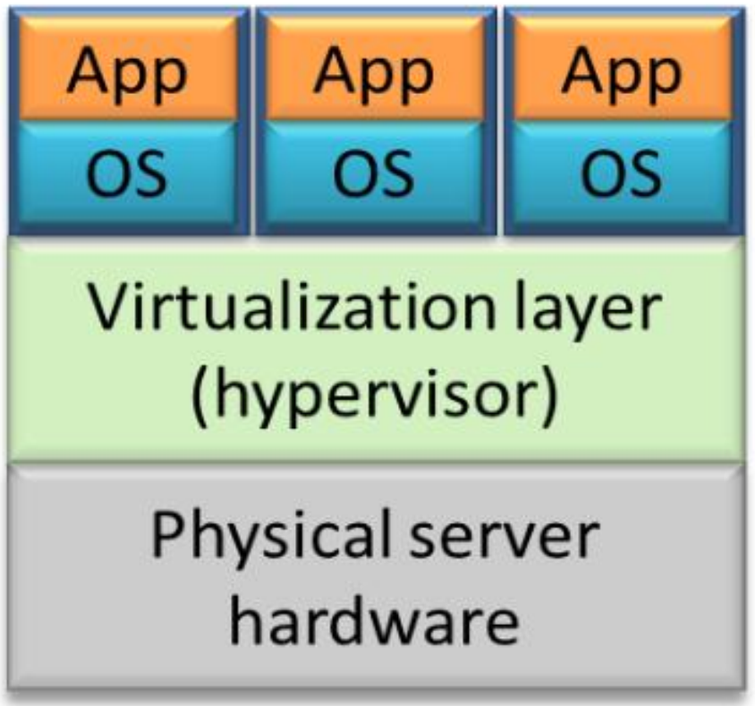
After the virtualization



- Hardware-independence of operating system and applications
- Virtual machines can be provisioned to any system
- Can manage OS and application as a single unit by encapsulating them into virtual Machines



Traditional Architecture



Virtual Architecture

VIRTUALIZATION TECHNOLOGY

The following are the IT resources that can be virtualized:

- Servers – **A Physical server** can be abstracted into a virtual server.
- Storage – **A Physical storage** device can be abstracted into a virtual storage device or a virtual disk.
- Network – **Physical routers** and switches can be abstracted into logical network fabrics, such as VLANs.
- Power – **A physical UPS** and power distribution units can be abstracted into what are commonly known as virtual UPSs.

5.Pros and Cons of Virtualization, Technology

- More flexible and efficient allocation of resources.
- **Enhance development productivity.**
- It lowers the cost of IT infrastructure.
- **Remote access and rapid scalability**.
- High availability and disaster recovery.
- **Pay peruse of the IT infrastructure on demand.**
- Enables running multiple operating systems.

Drawback of Virtualization

- **High Initial Investment:** Clouds have a very high initial investment, but it is also true that it will help in reducing the cost of companies.

- **Learning New Infrastructure:** As the companies shifted from Servers to Cloud, it requires highly skilled staff who have skills to work with the cloud easily, and for this, you have to hire new staff or provide training to current staff.

- **Risk of Data:** Hosting data on third-party resources can lead to putting the data at risk, it has the chance of getting attacked by any hacker or cracker very easily

Advantages

1. Reduced Costs.
2. Efficient hardware Utilization.
3. Virtualization leads to better resource Utilization and increase performance
4. Testing for software development.
5. Increase Availability
6. Save energy
7. Shifting all your Local Infrastructure to Cloud in a day
8. Possibility to Divide Services
9. Running application not supported by the host.

6.Examples- VMware and Microsoft Hyper-V

vmware	VMWARE (ESX, Server)
CITRIX	CITRIX (Xen)
Sun microsystems	SUN xVM (VirtualBox)
Microsoft	MICROSOFT (Hyper-V Server 2008)
Parallels	PARALLELS
VirtualIron	VIRTUALIRON

VMware and Microsoft Hyper-V

Hardware requirements:

- Minimum: 1 GB RAM; Recommended: 2+ GB RAM
- Maximum (64-bit systems): 256 GB RAM
- Hard disk space: Minimum: 10 GB; Recommended: 40 GB or greater. Requires local disk for system, recommended SCSI, SATA limited compatibility. Storage can be attached externally (physical, virtual).
- Hardware must be VMWARE certified.

Microsoft® Hyper-V™ Server 2008

- Launched in October, 2008 (late entry in the market – almost 10 years after VMware).
- Available as a stand-alone product or as part of Windows 2008 Server
- Different licensing and configuration


Thank
You!