Introduction to Cloud Computing

IT4090 – Cloud Computing

Lecture Outline

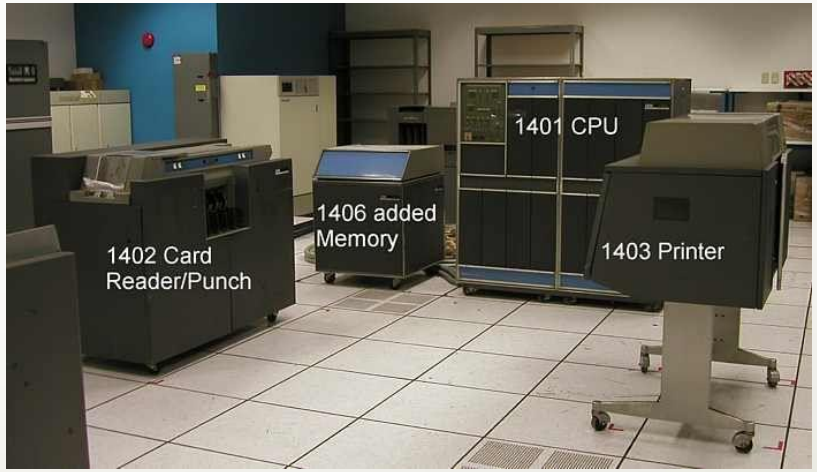
- Evolution of IT Infrastructure
- Cloud Computing Characteristics
- Cloud Computing Service Models
- Cloud Computing Deployment Models
- Cloud Service Providers
- Cloud Computing Benefits

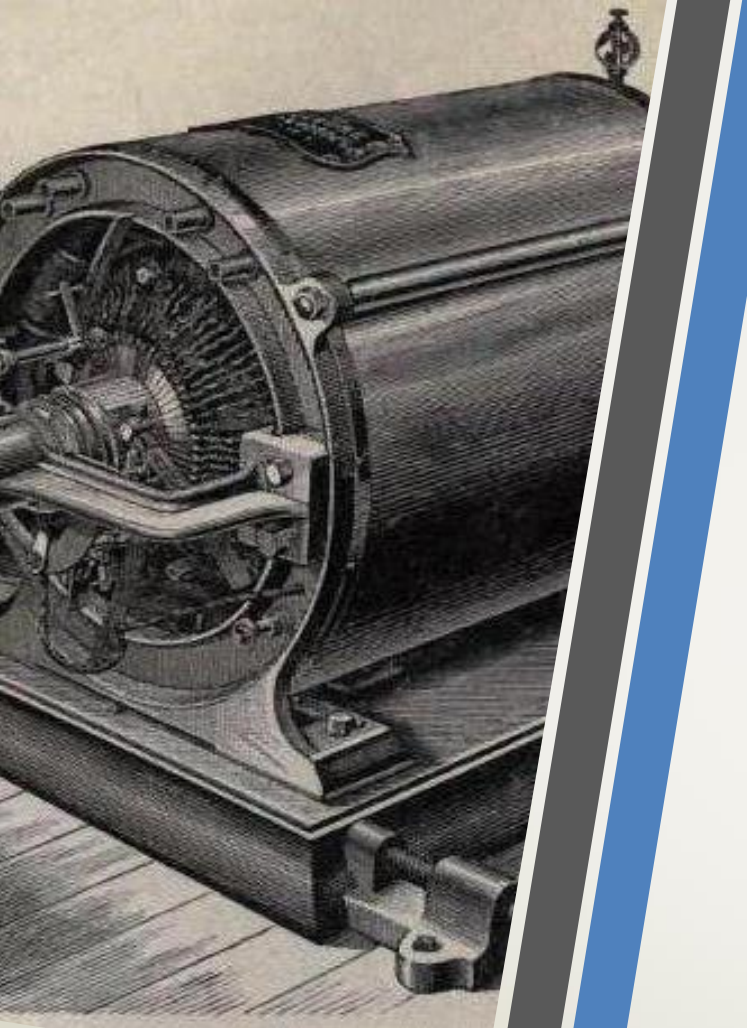
Evolution of IT Infrastructure

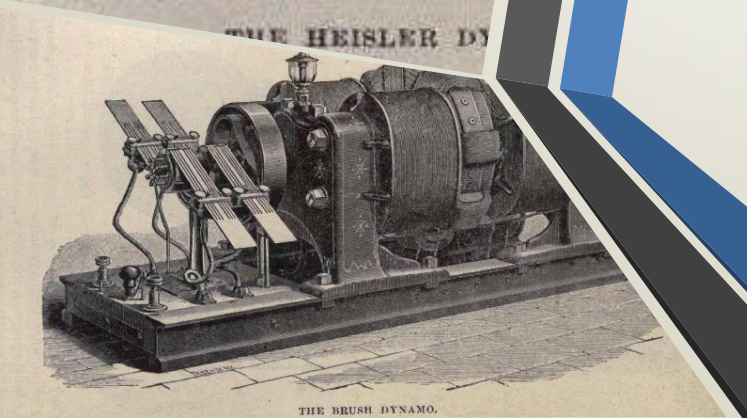
Introduction to Cloud Computing

IT Infrastructure Evolution Stages

- Mainframe / Mini Computers
- Personal Computer
- Client / Server Computing
- Web Based Enterprise Applications
- Cloud Computing / Mobile Computing







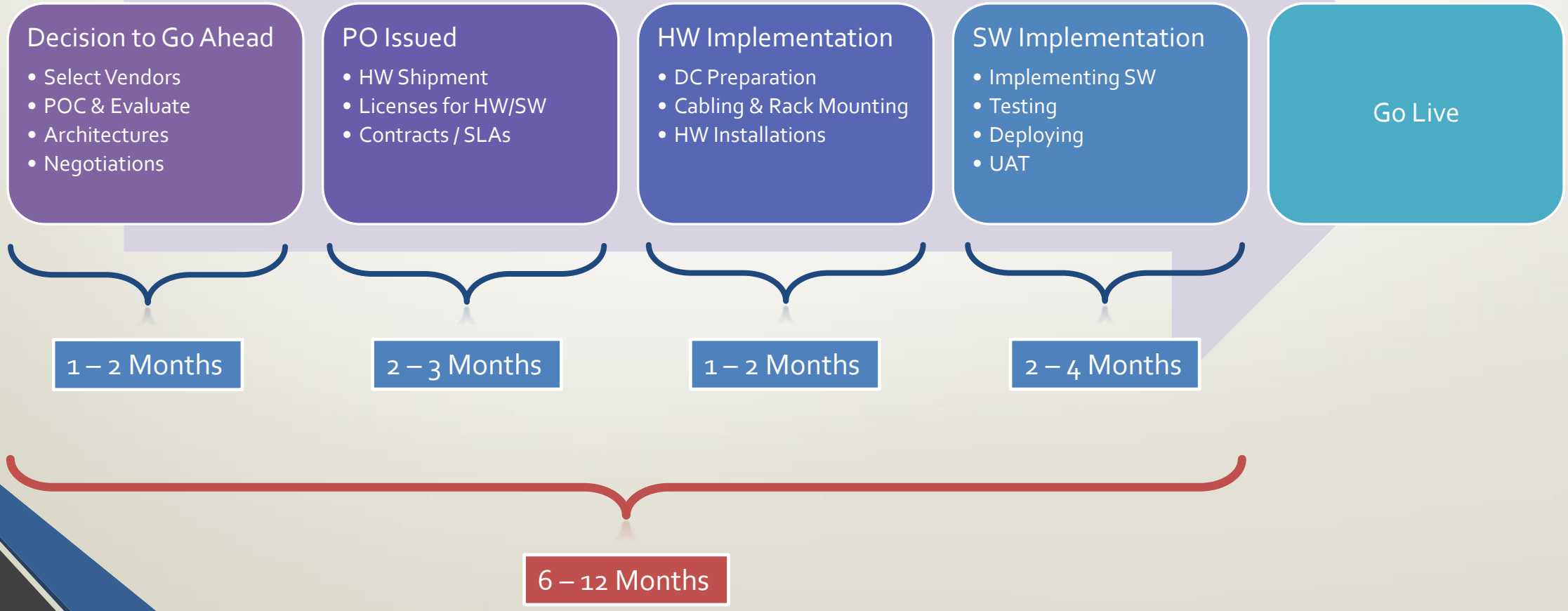
History of Electricity

- In mid 1800s, factories generated their own electricity using dynamos and generators.
- Issues with self generating electricity
  - Spend a lot of money to buy, install and maintain.
  - Need to maintain a specially skilled engineers.
  - Need spare parts for the equipment.
  - Higher operating costs, which is an overhead to the business.
  - Essentially, lot of money, time and effort spent to generate electricity, which is neither the core business nor the core skill.

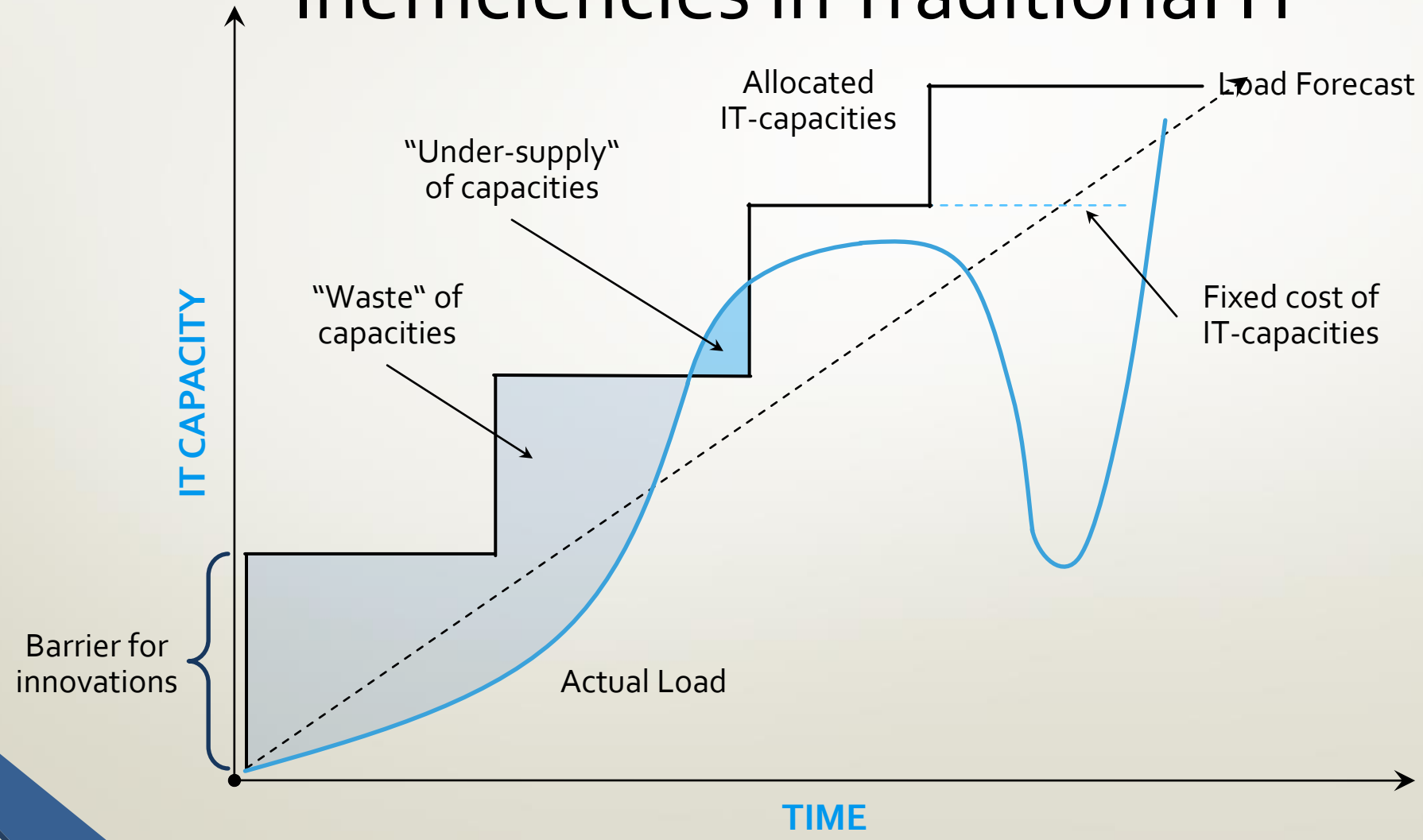
History of Electricity

- In late 1800s, electricity providers emerged. They had larger number of electricity generators installed and distributed electricity to customers over wires.
- Those who needs electricity paid a monthly cost and used it.
- Advantages
  - No need to buy and maintain expensive machines.
  - No need to maintain specially skilled engineers to maintain these machines.
  - Just connect to the grid and consume power.
  - No need to pay money upfront, pay for what you consume.
  - Anyone can consume the service, and it is easy to get connected.

Traditional IT



Inefficiencies in Traditional IT



Cloud: A Better Alternative

1

Provision Environments (Servers, Networks, Storage, Databases, Apps) in minutes.

2

Pay as you Go (PAYG) pricing (pay for what you provision as you use)

3

Add / Remove capacity as and when required.

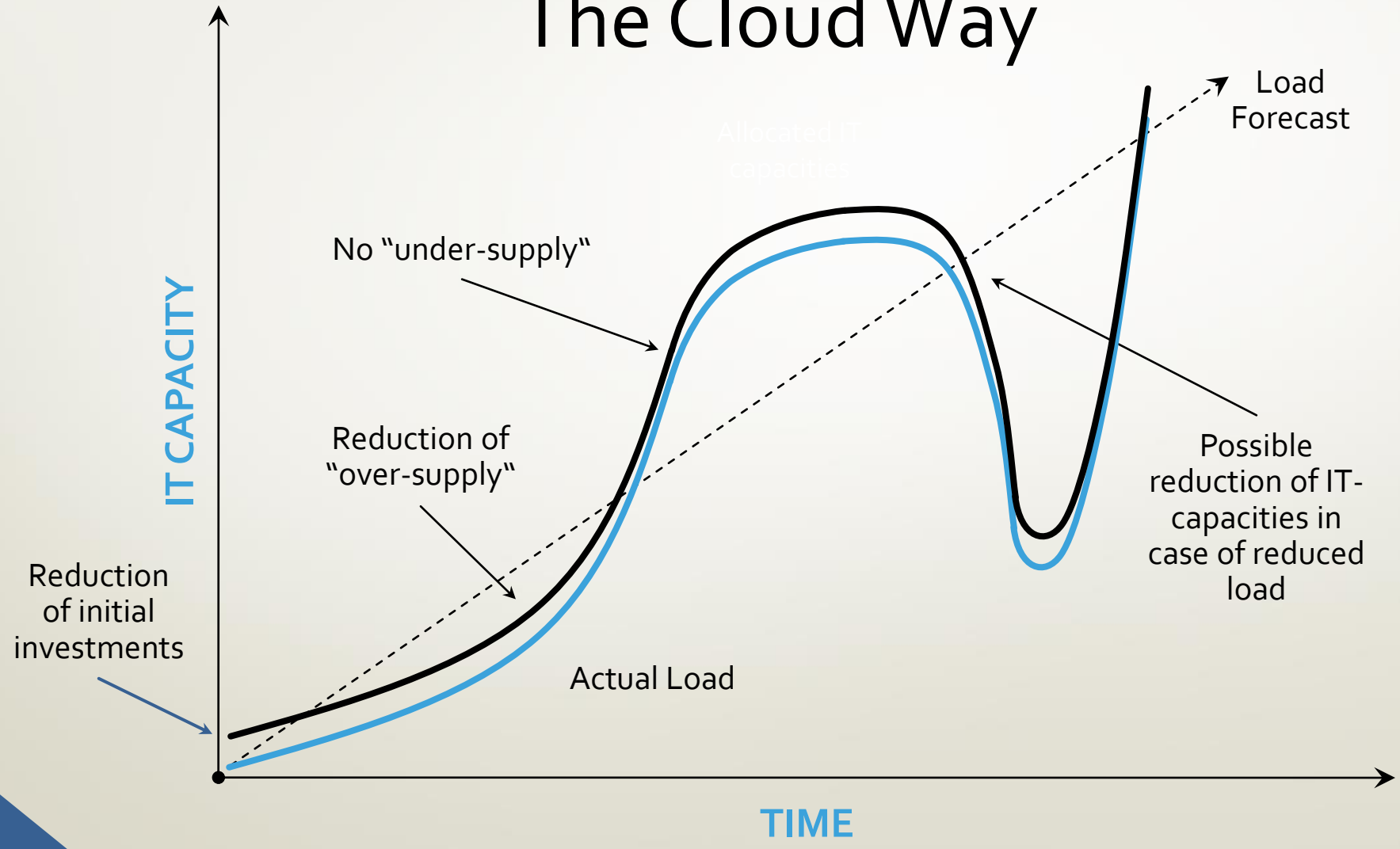
4

Destroy and stop paying if you don't need it.

Cloud Computing and the IT Industry

- IT Industry uses Cloud Computing the same way we use electricity.
- Before Cloud
  - Every company had their own data center, expensive to implement and maintain.
  - Had to maintain specialized engineers to maintain the data center.
  - Deviated from their core business
- With Cloud
  - No need to maintain a data center
  - Consume resources as you wish and pay for what you consume
  - Can focus more on the core business

The Cloud Way



Why do we need Cloud?

Business Agility

Faster time-to-market

Foster innovation

Flexibility and Scalability

Focus on core business

Customer Experience

Always available services

Multiple venues / regions

Cost

Pay-as-you-Go

Transform Capital Expenditure (CAPEX) to Operational Expenditures (OPEX)

Cost savings

NIST Definition of Cloud

Cloud computing is a model for enabling ubiquitous, convenient, 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.

Source: National Institute of Standards and Technology

Essential Characteristics of Cloud

On-demand self-service

- Consumers can provision computing resources
- Virtual serves, Network, storage
- Can be provisioned on-demand (whenever you need it)
- No interaction with the service provider is needed

Resource Pooling

- Providers computing resources are pooled
- Dynamically assigned and reassigned to demand
- Customer has no knowledge over exact location
- May specify location at a higher level (Region, Country)

Essential Characteristics of Cloud

Rapid Elasticity

- Ability to elastically provision and release
- May happen automatically in line with the demand

Broad network access

- Capabilities are available over the network
- Access is through standard mechanism for heterogenous clients

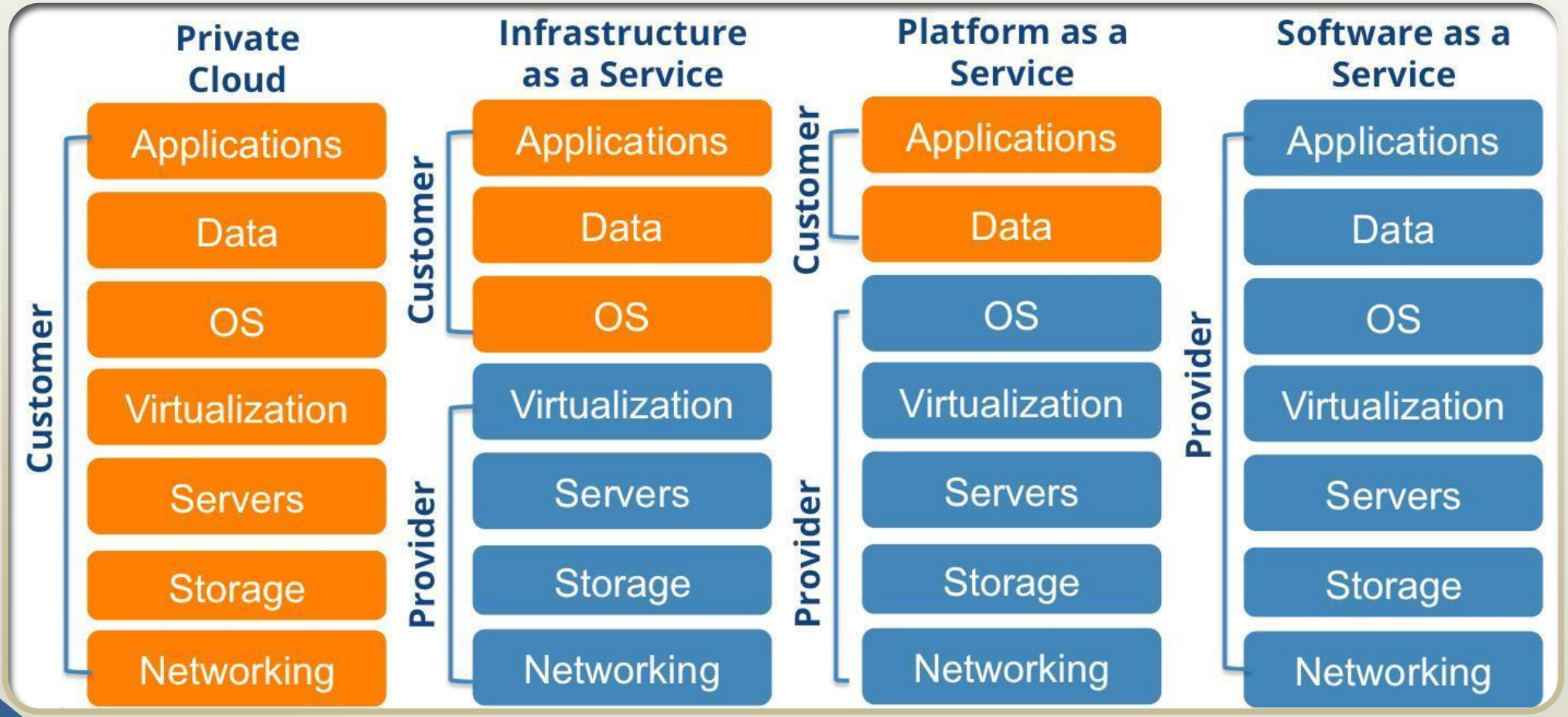
Measured Service

- Automatically control and optimized resources using metering capability
- Pay-per-use basis
- Resources usage can be monitored, controlled and reported

Is Cloud a Technology or a Model?

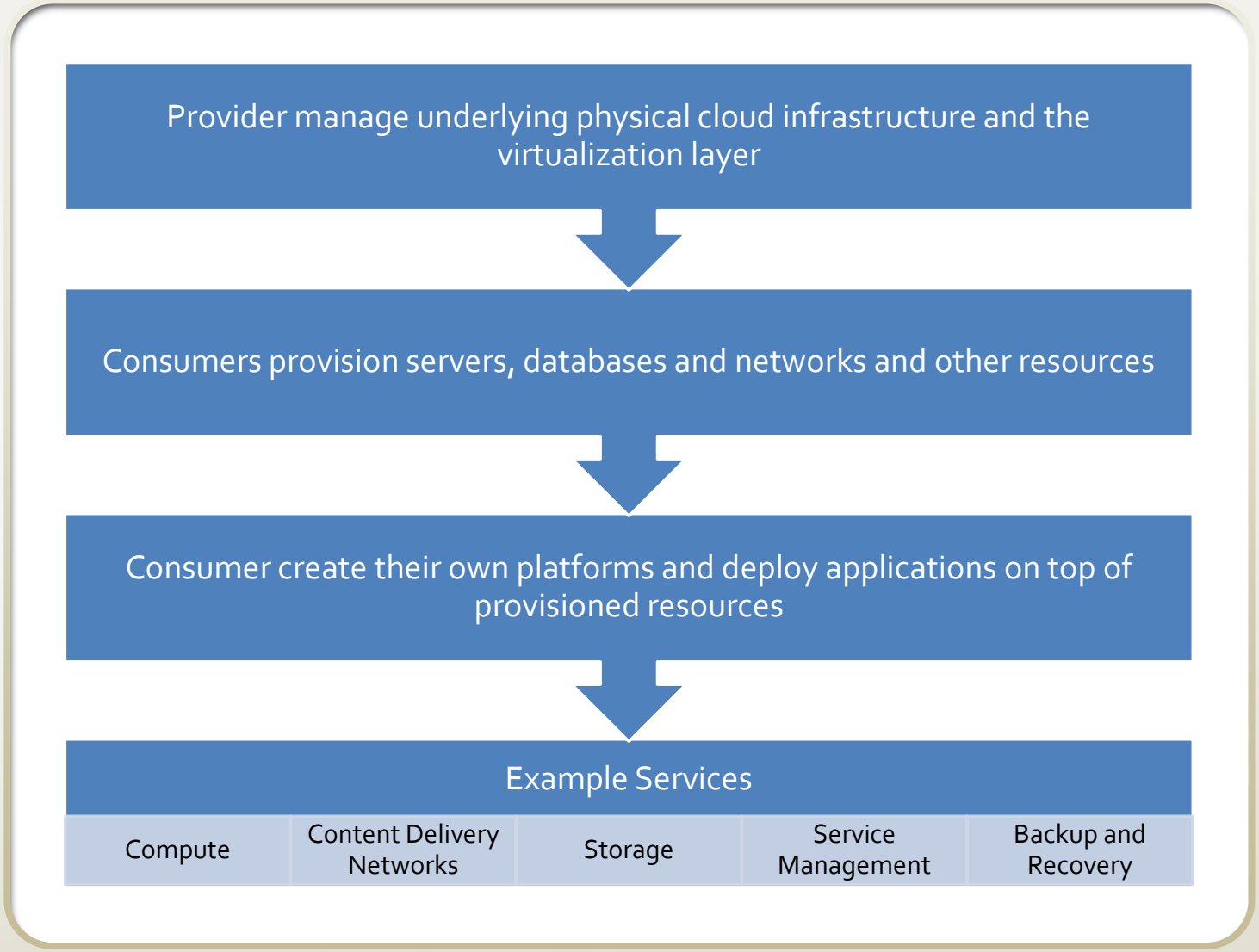
- Cloud is not a technology
- Cloud can be thought of as an either
  - A Business Model
  - A Delivery Model
- Underlying technology behind cloud is Virtualization

Cloud Service Models

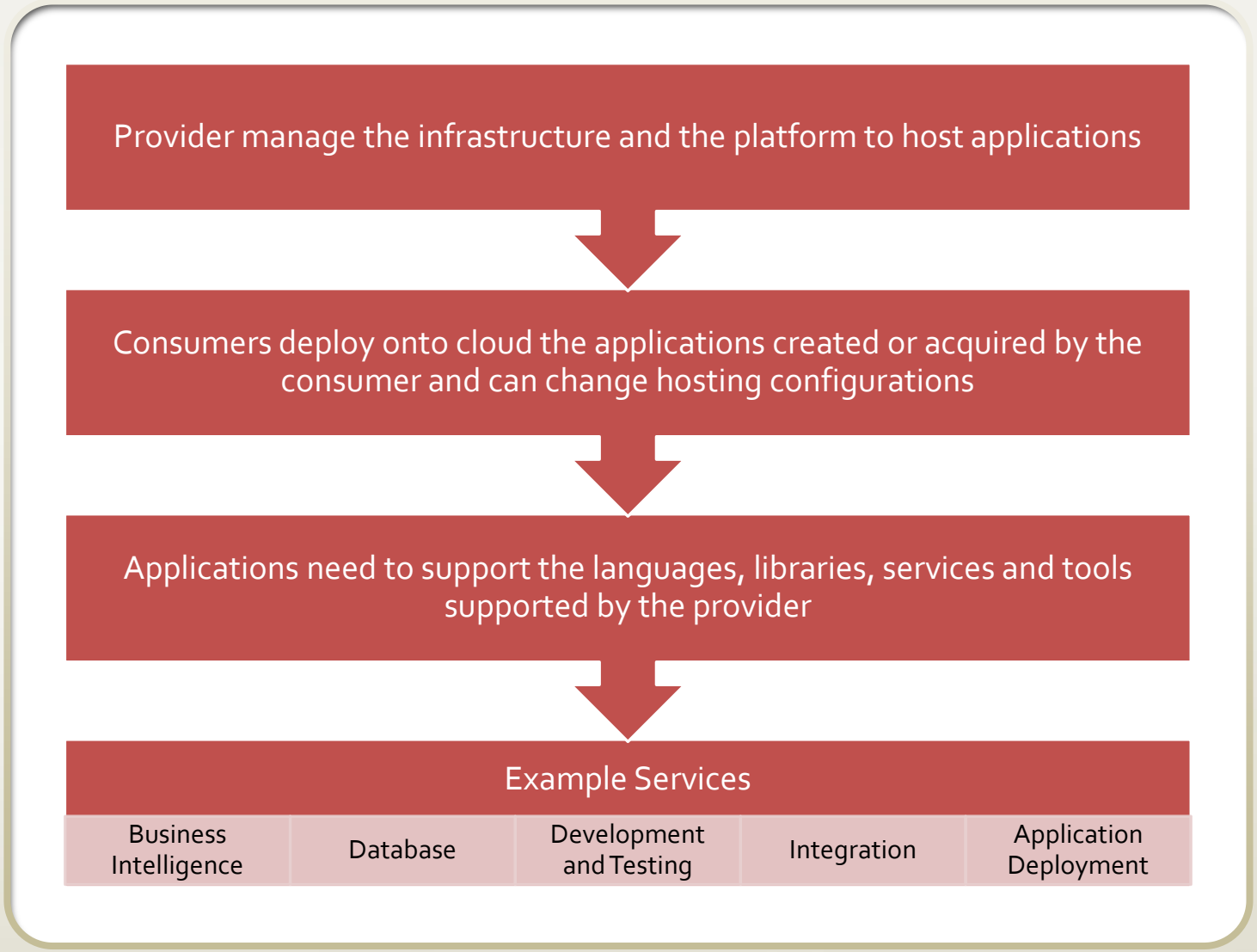


Source: https://askmedawaa.wordpress.com/2018/01/25/what-is-oracle-cloud/

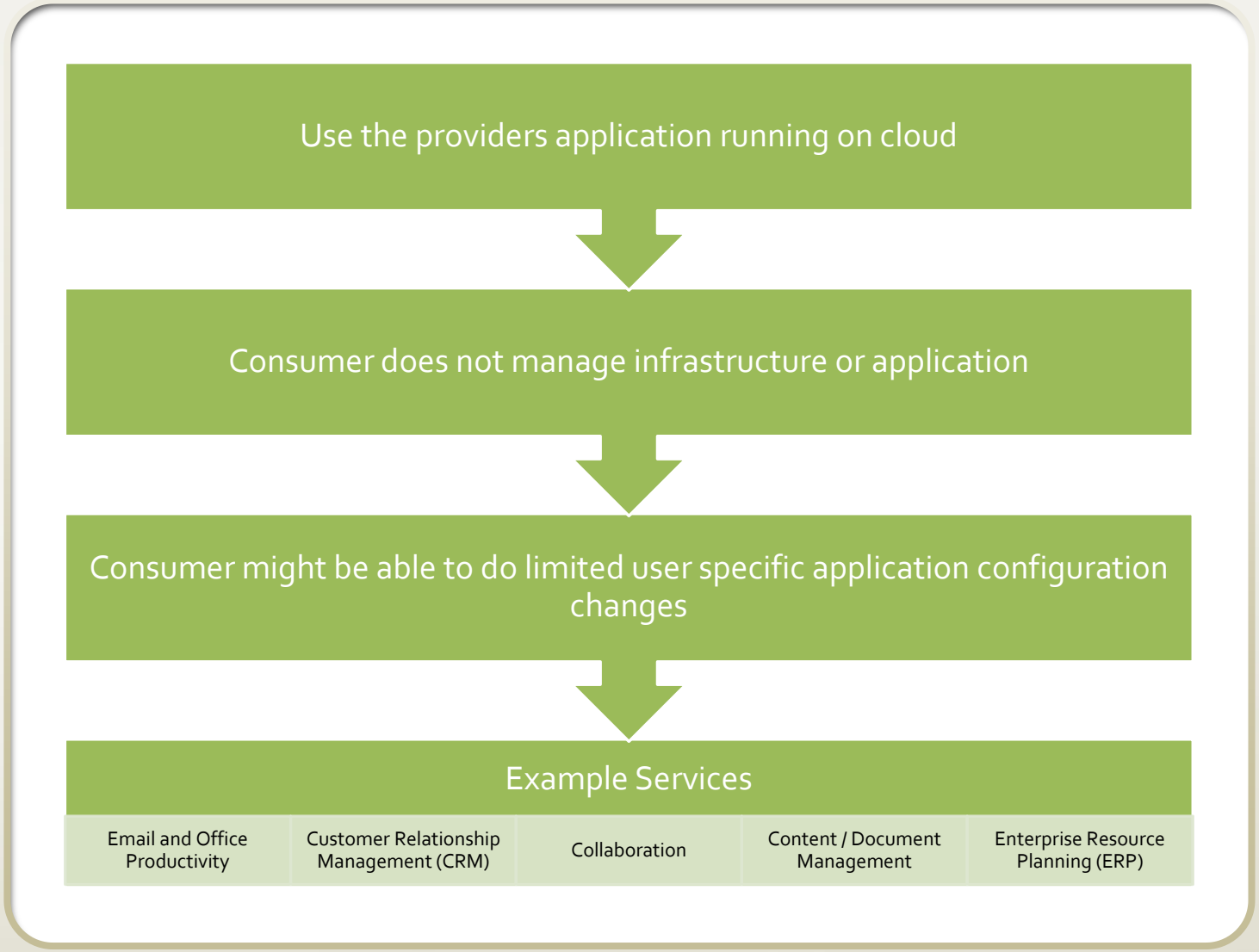
Infrastructure as a Service (IaaS)



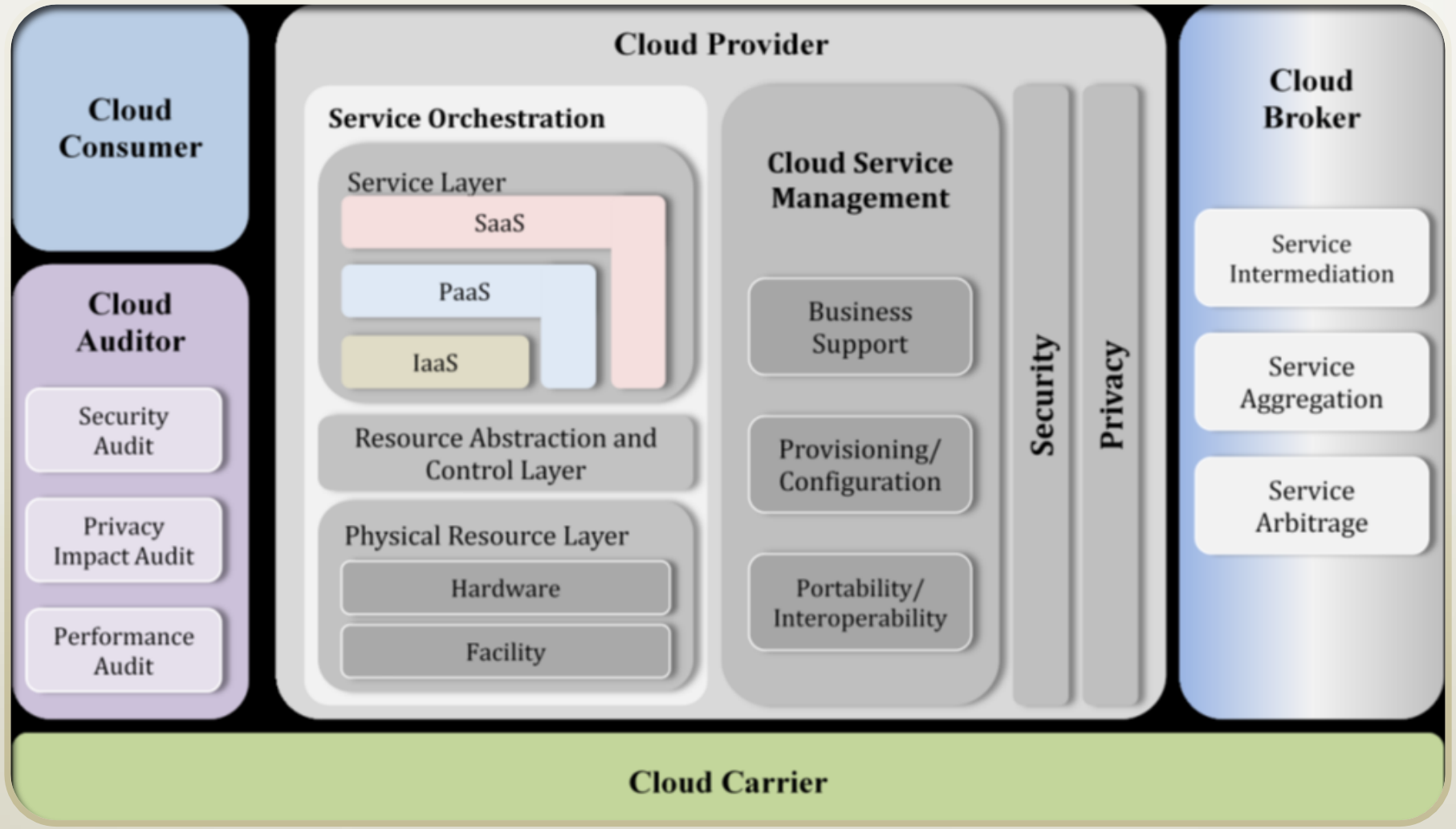
Platform as a Service (PaaS)



Software as a Service (SaaS)



NIST Cloud Computing Reference Architecture



Actors in Cloud Computing

Actor	Definition
Cloud Consumer	A person or organization that maintains a business relationship with, and uses service from, Cloud Providers.
Cloud Provider	A person, organization, or entity responsible for making a service available to interested parties.
Cloud Auditor	A party that can conduct independent assessment of cloud services, information system operations, performance and security of the cloud implementation.
Cloud Broker	An entity that manages the use, performance and delivery of cloud services, and negotiates relationships between Cloud Providers and Cloud Consumers.
Cloud Carrier	An intermediary that provides connectivity and transport of cloud services from Cloud Providers to Cloud Consumers.

Cloud Deployment Models

- Public Cloud
- Private Cloud
- Hybrid Cloud
- Community Cloud

Public Cloud

Provisioned for open use by the general public

Operated by a service provider organization

Located on premise of the cloud provider

Characteristics

- Cost-effective
- On-demand virtually unlimited scalability
- Zero maintenance
- Continuous uptime
- Low level of data security
- Access over internet
- Multi-tenant
- Regulatory compliance

Private Cloud

Provisioned for exclusive use by a single organization

Multiple business units may consume it

Can be owned and managed by the organization , a third party or a combination

May be located on or off premises

Characteristics

- High data security
- Less risky
- Single tenant & compliance
- Reliable
- Expensive
- Management overhead

Hybrid Cloud

Combination of private, public or community clouds

May enable portability of data and applications within the clouds by standards or proprietary technologies

Characteristics

- Secure and safe
- Cost-effective
- Flexibility and scalability
- Portability between private & public
- Data transfer

Community Cloud

- Provisioned for exclusive use by a specific community of consumers with shared concerns
- Concerns may be security, regulatory requirements, compliance etc.
- Can be owned, managed and operated by an organization in the community, a third party or a combination
- Ex:- Government Clouds

Cloud Service Providers (CSP)

- There are close to 300 cloud service providers in the world.
- Top 6 CSPs
  - Amazon Web Services (AWS)
  - Microsoft Azure
  - Google Cloud Platform (GCP)
  - IBM Cloud
  - Alibaba Cloud
  - Oracle Cloud Infrastructure (OCI)
- 120 Billion Dollars global revenue was projected for 2020 before the pandemic

Cloud Service Providers (CSP)

- 60% of the cloud market share is divided among the top three, that is Amazon AWS, Microsoft Azure and the Google Cloud Platform
- AWS – 33% and holding since 2017
- Azure – 20% and increasing from merely a 11% in 2017 to 20% in 2020
- GCP – 7% and holding around the same value since 2017
- Others cater to less than 40% of the market

Gartner Magic Quadrant

Figure 1. Magic Quadrant for Cloud Infrastructure and Platform Services

References

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