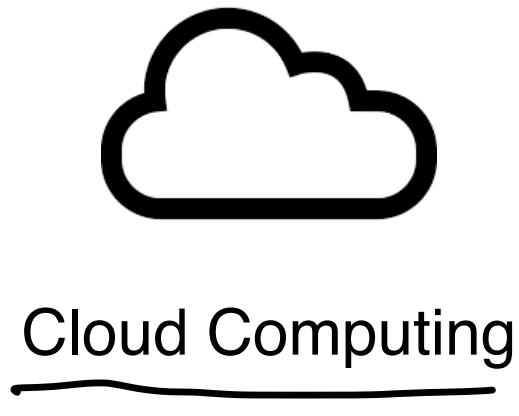


- ① introduction
- ② virtualization
  - ↳ typeI
  - ↳ typeII
- ③ service models
  - ↳ IaaS
  - ↳ PaaS
  - ↳ SaaS
- ④ deployment models
  - ↳ public
  - ↳ private
  - ↳ hybrid



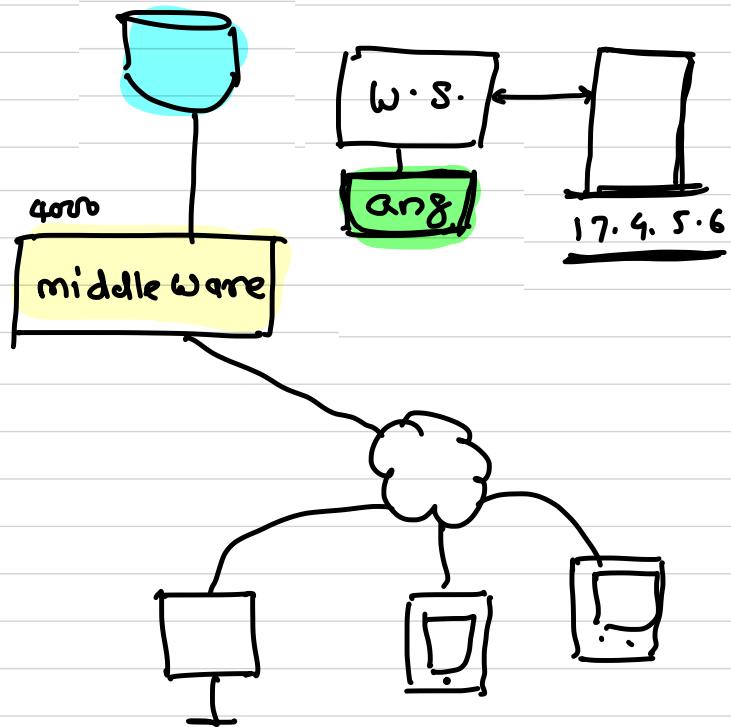
① MySQL db

② backend (express)

③ Frontend (angular)

http://localhost:4200 ✘

public

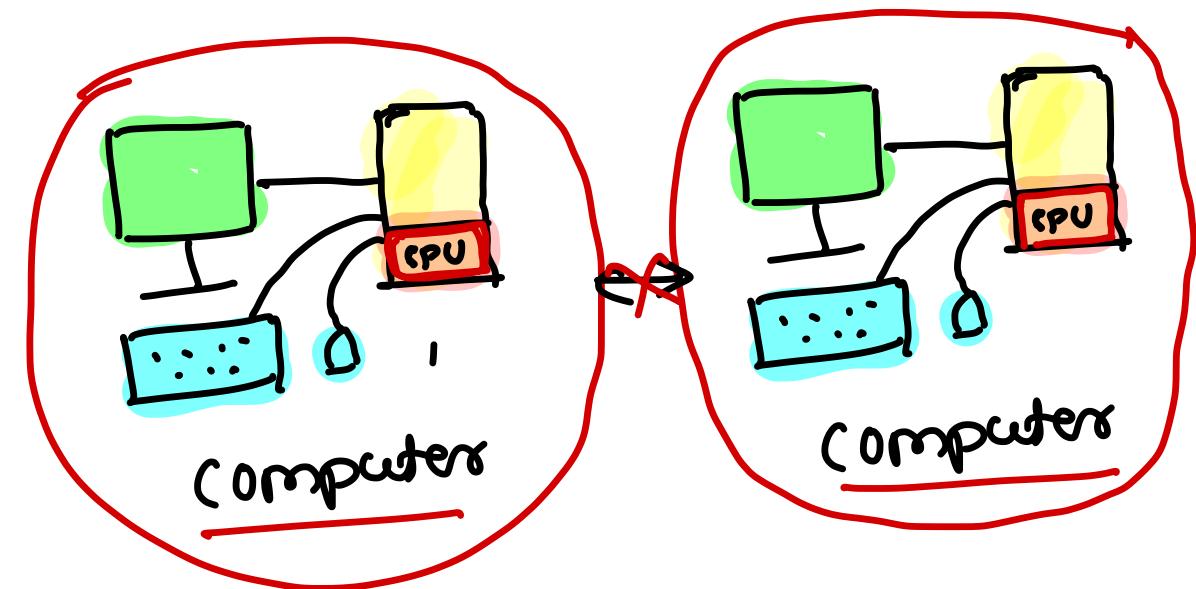
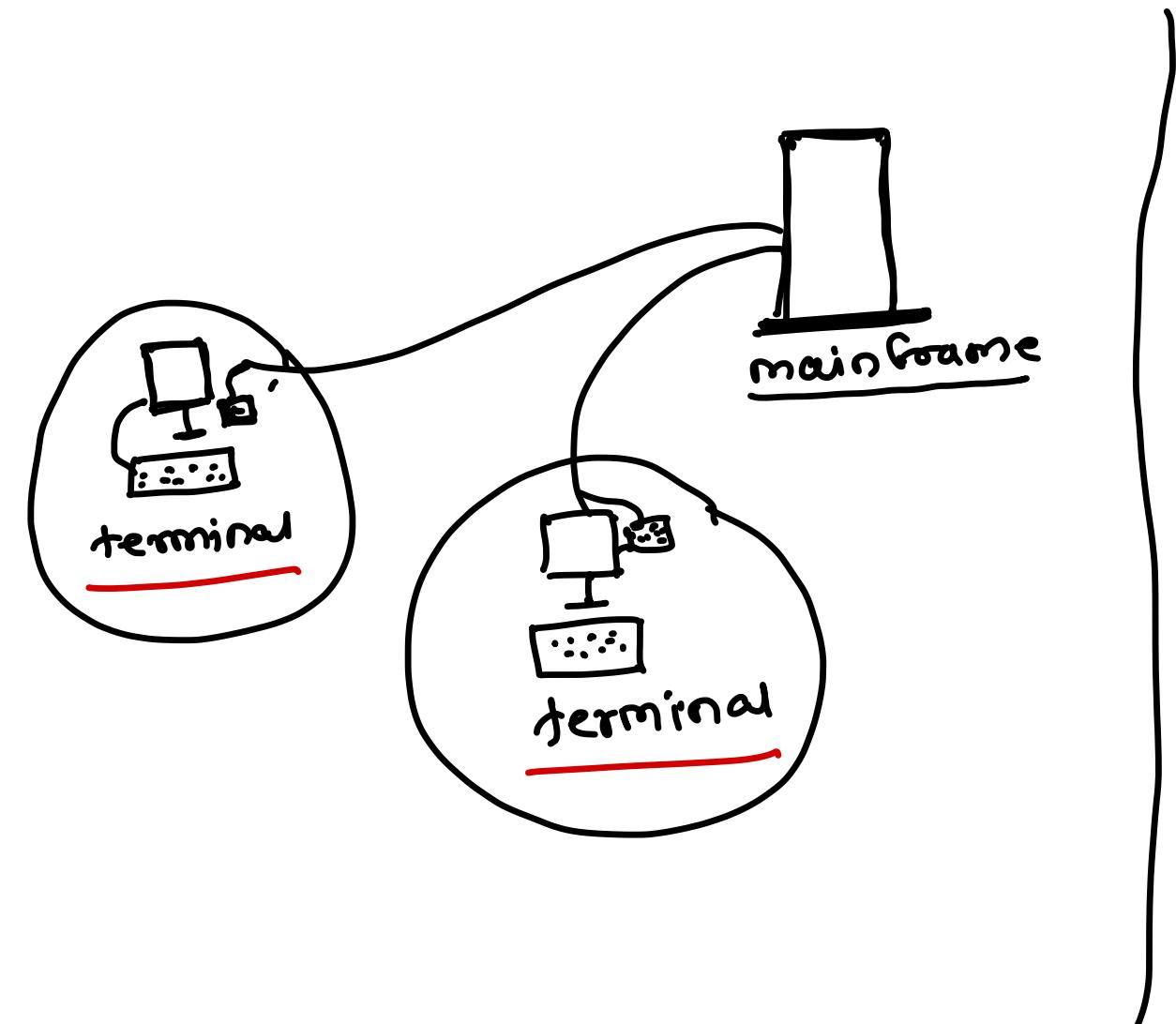


# Computing Models

- ✓ Desktop Computing ←
- ✓ Client-Server Computing ←
- ✓ Cluster Computing ←
- ✓ Grid Computing ←
- ✓ Cloud Computing ←

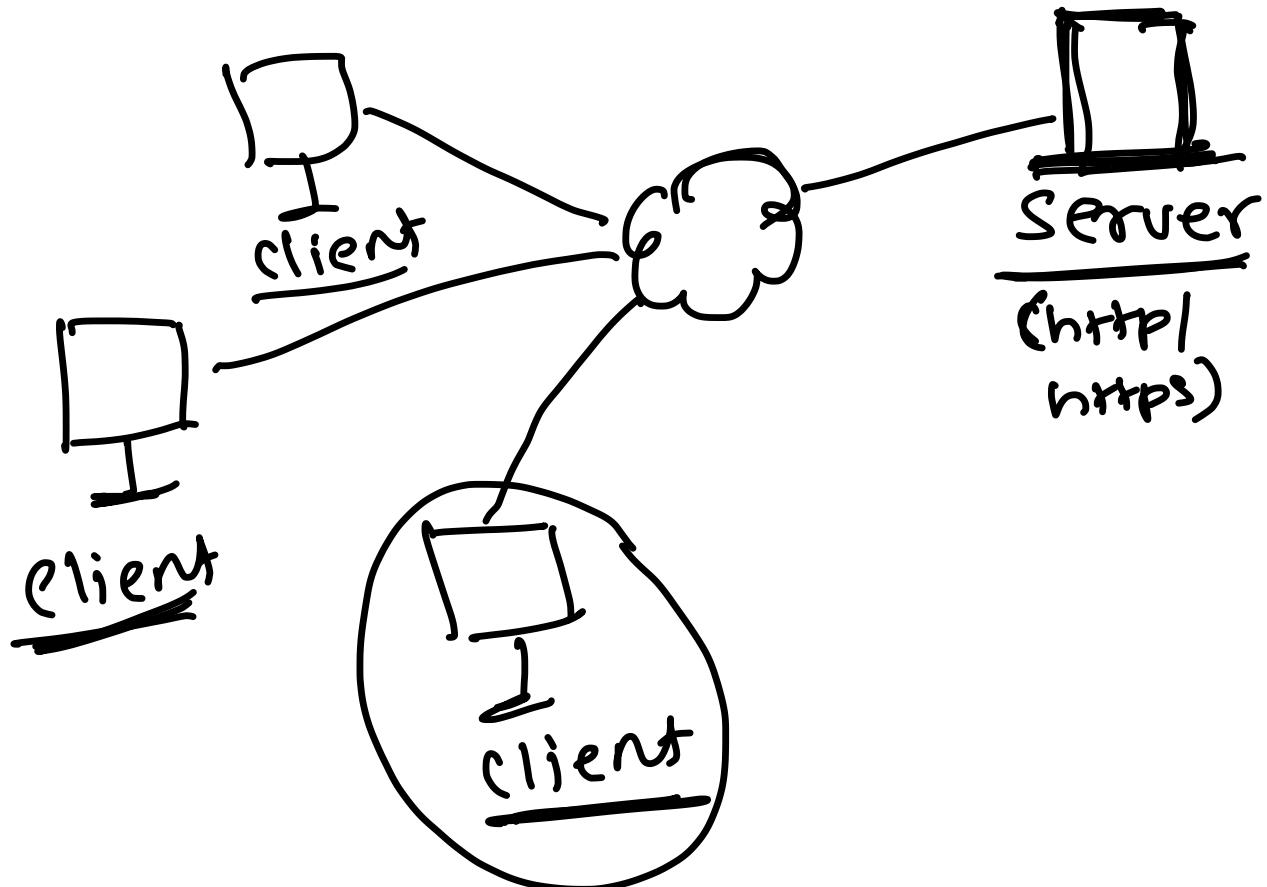


## desktop computing

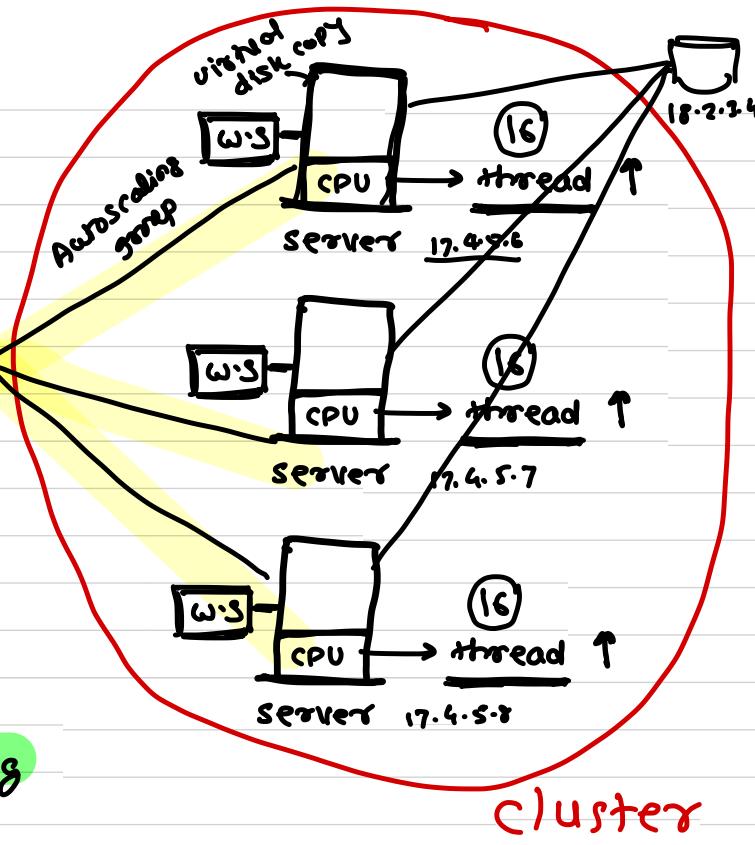
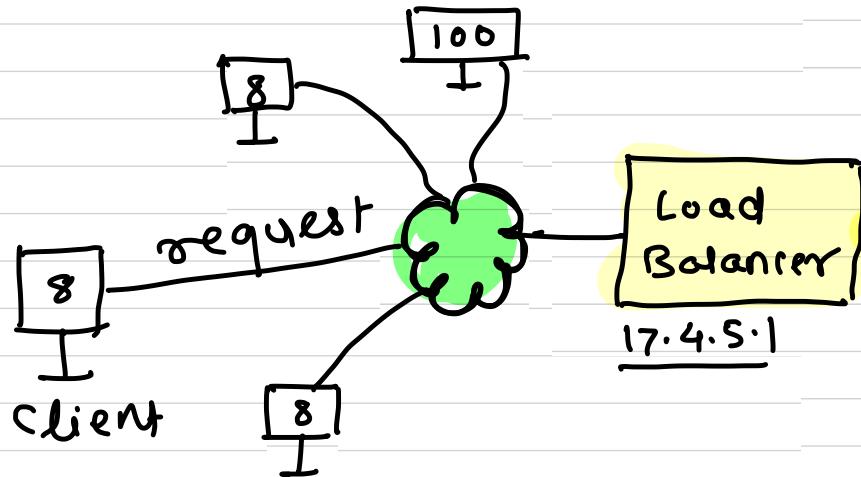


A hand-drawn diagram illustrating the compilation process. On the left, the text "hello.cpp" is underlined and labeled "source". An arrow points from this text to a box containing the word "gcc". Another arrow points from the "gcc" box to the right. To the right of the "gcc" box, the text "hello.out" is underlined, followed by the word "executable", which is also underlined. Below these, in brackets, are the labels "[ARM code]" and "[CPU]".

# client-server computing



# Cluster



## Scaling problems

### → Vertical scaling

- scaling up
- upgrade configuration
- scaling down
- degrade configuration

### → horizontal scaling

- scale out
- create clones
- scale in
- terminate clones

## What is Cloud ?

- The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.
- Is the delivery of on-demand computing resources – everything from data centers over the internet on a pay for use basis
- Cloud computing is an umbrella term used to refer to Internet based development and services
- In addition, the platform provides on demand services, that are always on, anywhere, anytime and any place.
- Pay for use and as needed, elastic
  - scale up and down in capacity and functionalities
- The hardware and software services are available to
  - general public, enterprises, corporations and businesses markets etc

Internet



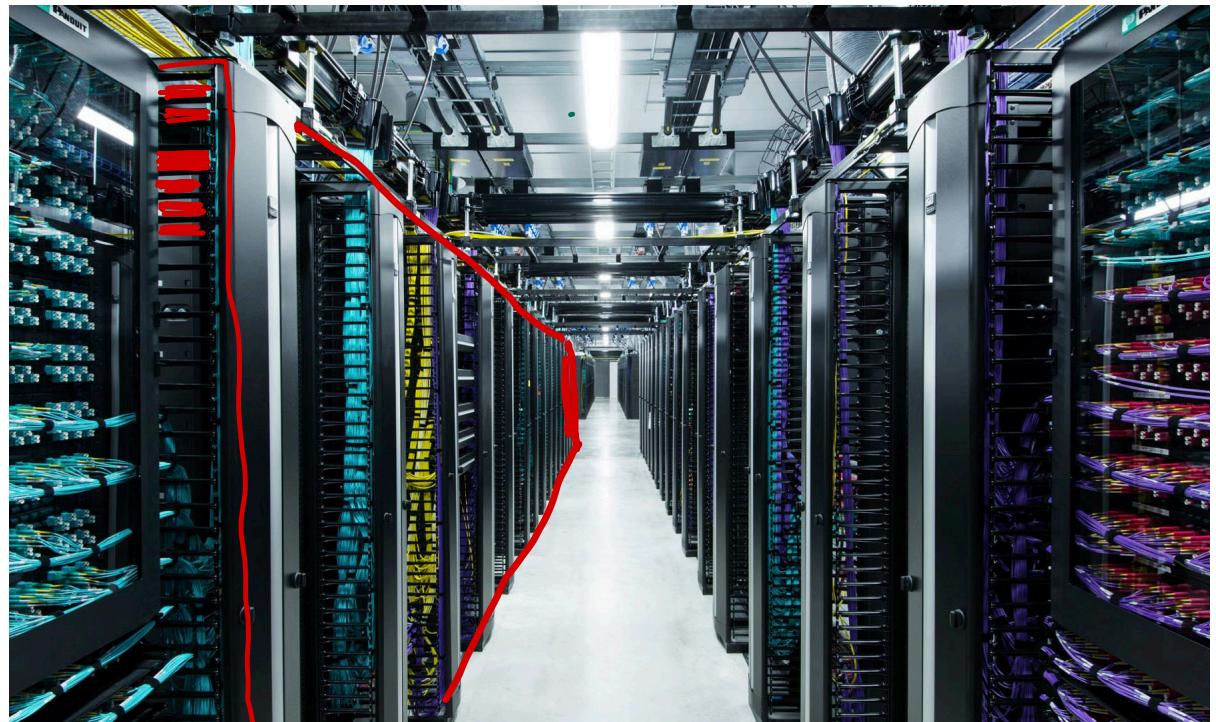
# Data Center

- Where your IT devices and applications are located
- For a non-technical person it is the cloud where the user's files/data is stored
- Components

- ✓ Servers (compute)
- ✓ Security
- ✓ WAN
- ✓ Storage
- ✓ File Sharing

⋮  
⋮

provider  
region  
availability zone  
data center  
building  
floor  
row  
→ server rack  
↳ server  
→ 4 T.B. RAM  
→ 128 T.B. HD  
→ 128 cores & 4 GPU  
→ 9.6 cores & CPU

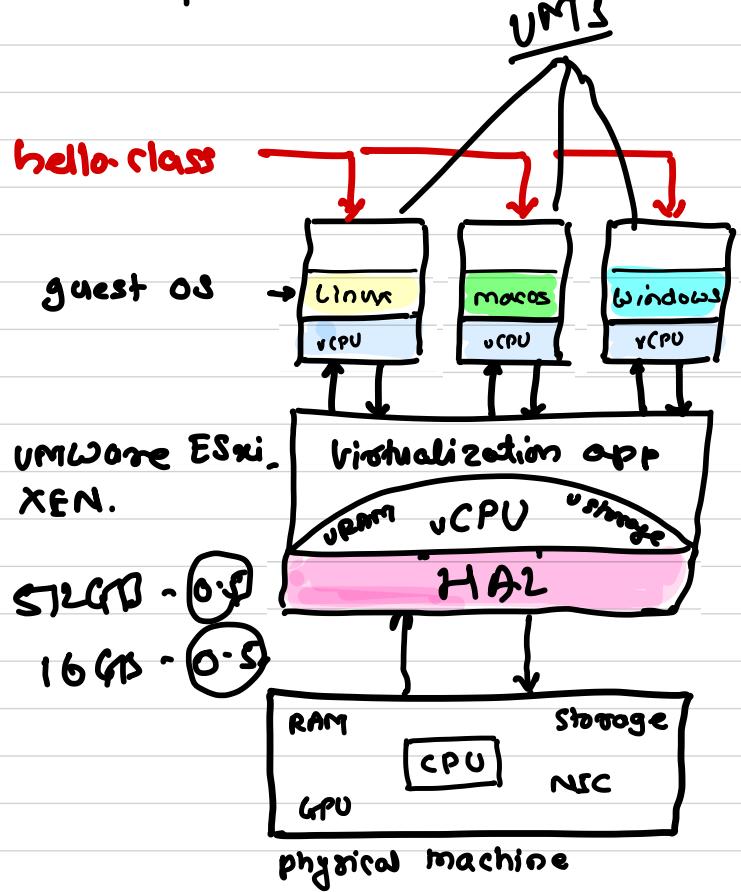


# Virtualization

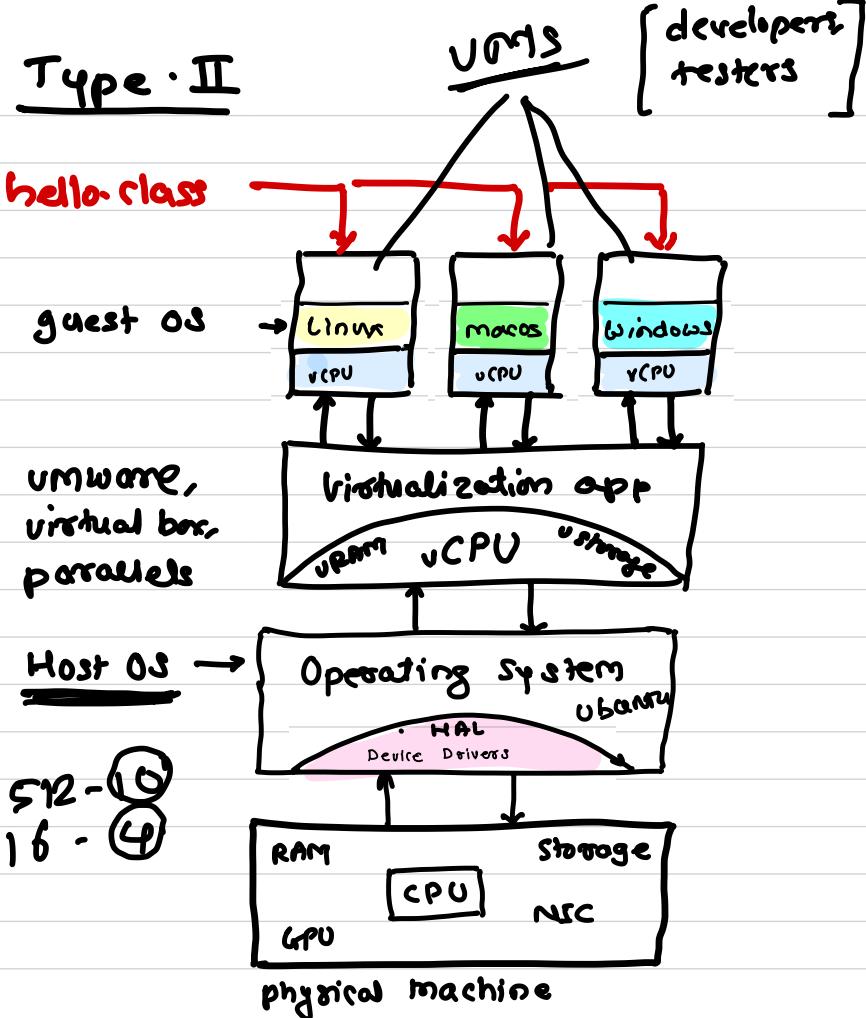
- Refers to the act of creating a virtual (rather than actual) version of something, including virtual computer hardware platforms, storage devices, and computer network resources
- Types
  - Virtualization using VM
    - ✓ Type – I
    - ✓ Type – II
  - Containerization : Docker

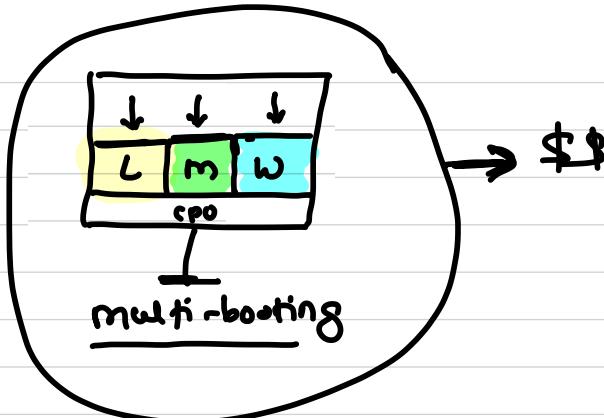


## Type I - cloud providers [AWS, GCP, Azure]



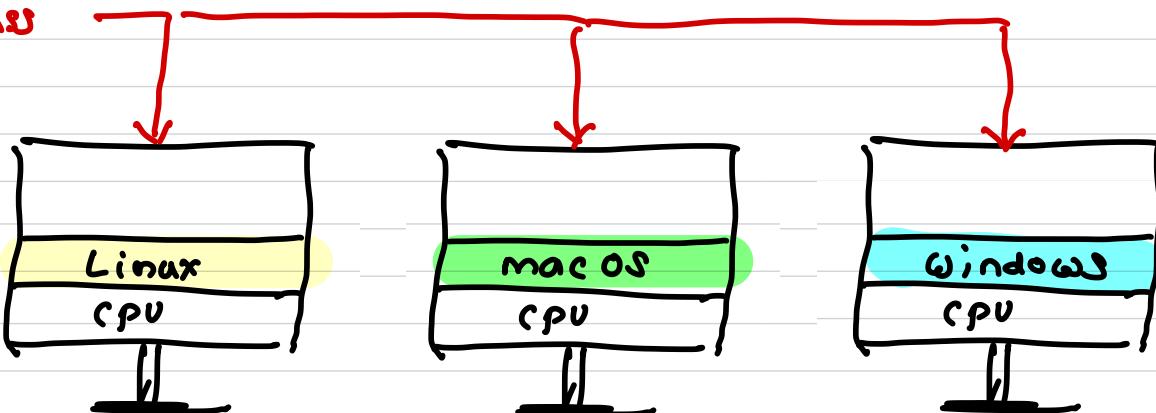
## Type II





hello.java  
- javac  
↓  
hello.class

\$\$\$\$



# Virtualization



# Cloud Computing Characteristics

## **On-demand self-service**



- A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider

## **Broad network access**

- Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms

## **Resource pooling** → Storage, compute, network, etc.. .

- The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand

## **Rapid elasticity**

→ growing  
↳ shrinking

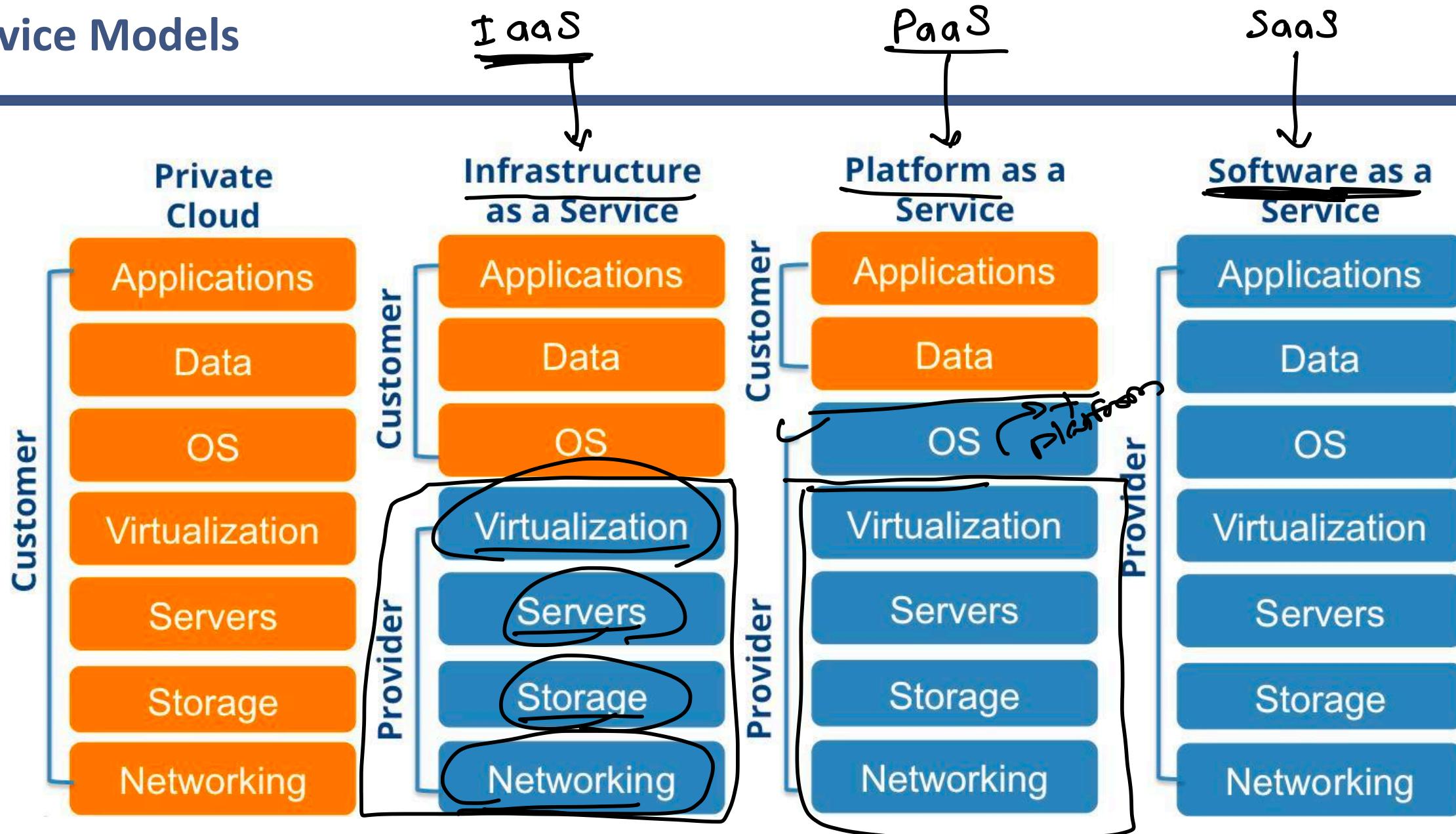
- Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand

## **Measured service** - VM- 10 hrs , DB- 2 days

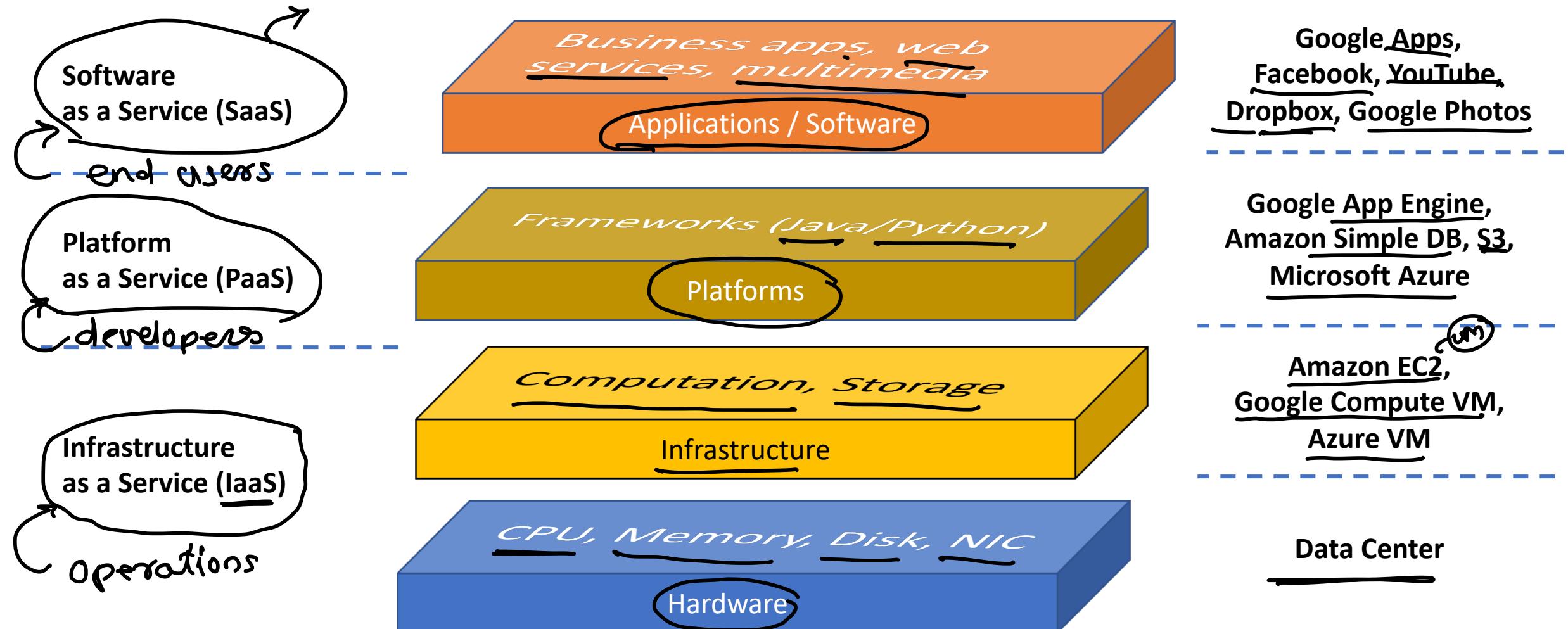
- Resource usage can be monitored, controlled and reported, providing transparency for the provider and consumer



# Service Models

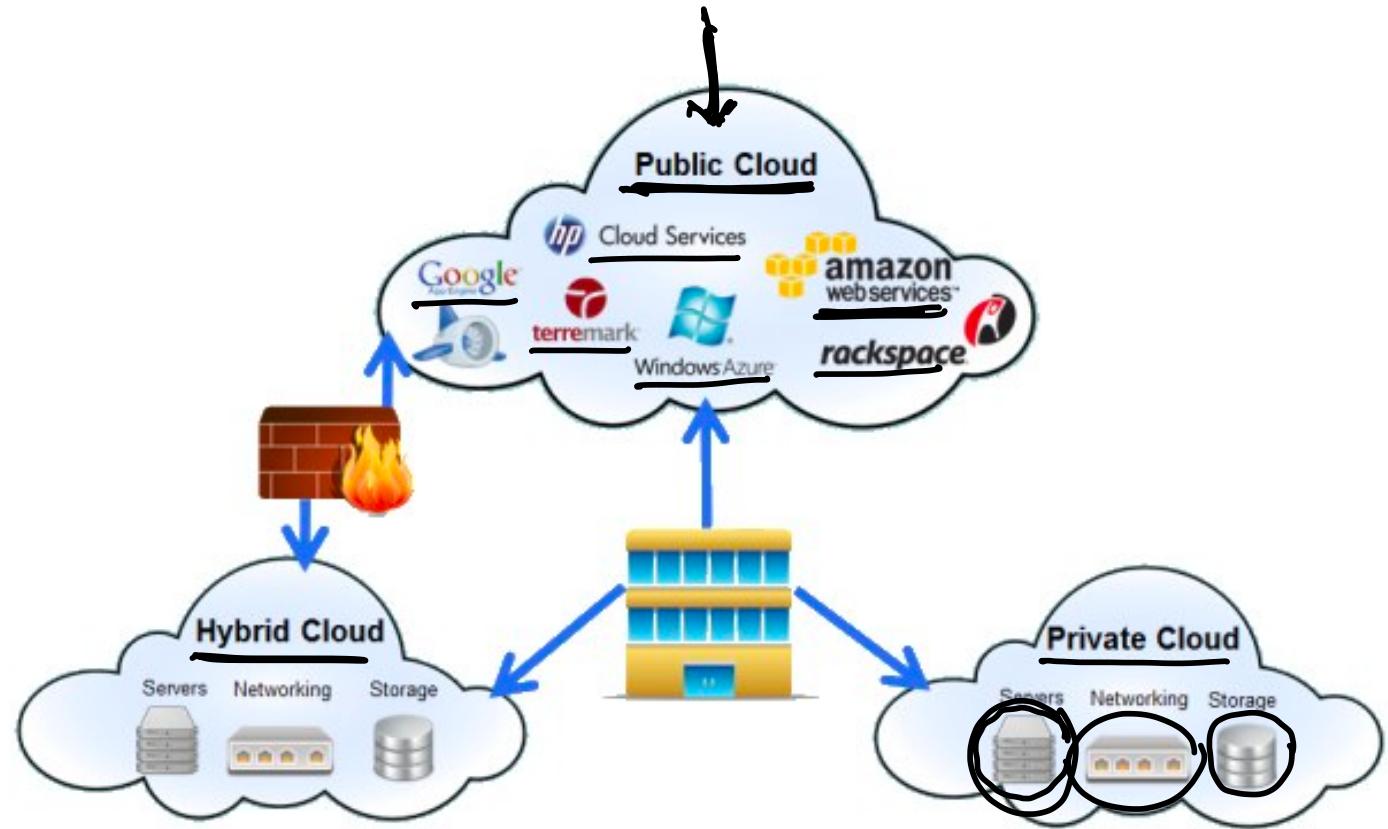


# Service Models



# Deployment models

- Private Cloud
- Public Cloud
- Hybrid Cloud



# Cloud Services

- Compute: used to create the Virtual Machine
- Storage: used to provide the storage
- Database: RDBMS + No SQL
- Security and Identity Management
- Media Services
- Machine Learning
- Cost Management
- Application Integration



# Advantages

- Lower computer costs
- Improved performance
- Reduced software costs
- Instant software updates → *internet*
- Improved document format compatibility
- Unlimited storage capacity
- Increased data reliability
- Universal document access
- Latest version availability



## Disadvantages

- Requires a constant Internet connection
- Does not work well with low-speed connections
- Features might be limited
- Stored data might not be secure
- Stored data can be lost
- Each cloud systems uses different protocols and different APIs



# Cloud Vendors

- AWS →
- Google Compute →
- Azure →
- Others
  - Rackspace
  - digital ocean
  - linode
  - heroku





Sunbeam Infotech

[www.sunbeaminfo.com](http://www.sunbeaminfo.com)