CS2842 Computer Systems – Lecture 11

Computer Systems Architecture

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IT SYSTEM ARCHITECTURES

--> the overall design of a computing system and the logical and physical relationship between its components.

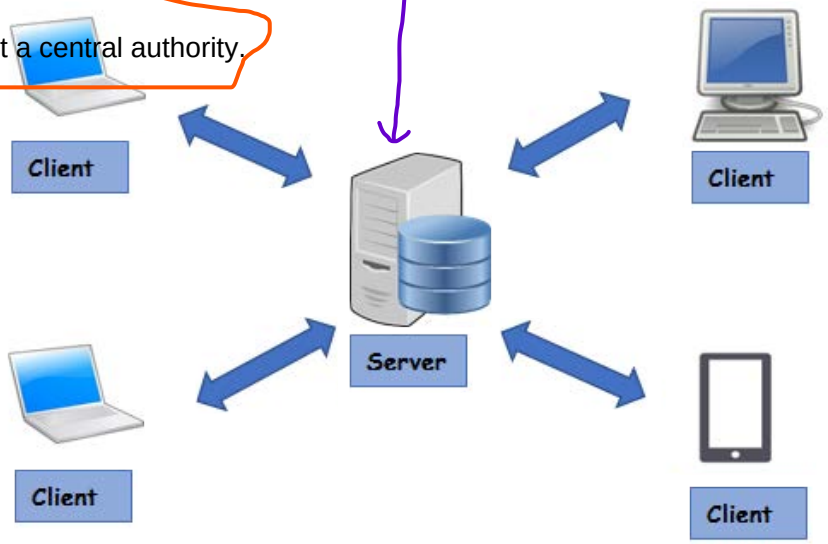
- Distributed processing systems
  - Client-Server Computing
    - 2-tier architecture (2 layers in the architectue)
    - 3-tier architecture
    - N-tier architecture
  - Peer-to-Peer Computing

a specific task can be broken into functions and the functions are dispersed across two or more interconnected processors.

but for huge systems like google there are lots of servers distributed and the client will connect to the closest server. these servers communicate with each other to stay updated

central server

Devices act as both clients and servers,
directly sharing resources and services with each other without a central authority.



CLIENT-SERVER COMPUTING

- A program on a client computer requests services from a program on a server computer
  - Email services
  - File services
  - Print services
  - Web services
  - Database services

ex: one drive, google drive, dropbox

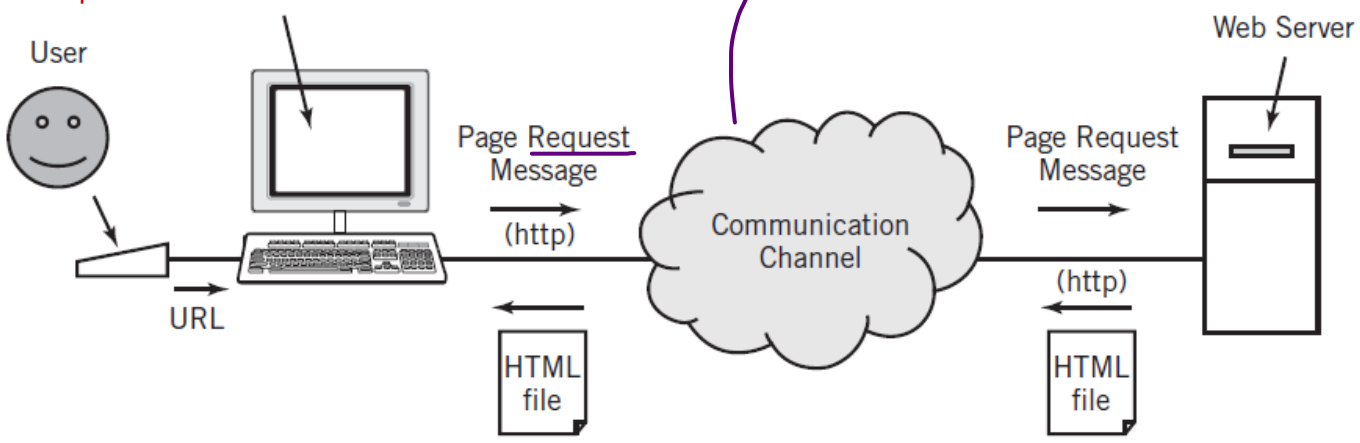
services provided by a web server.

http vs https

main difference is security.
https uses TLS (Transport Layer Security.)

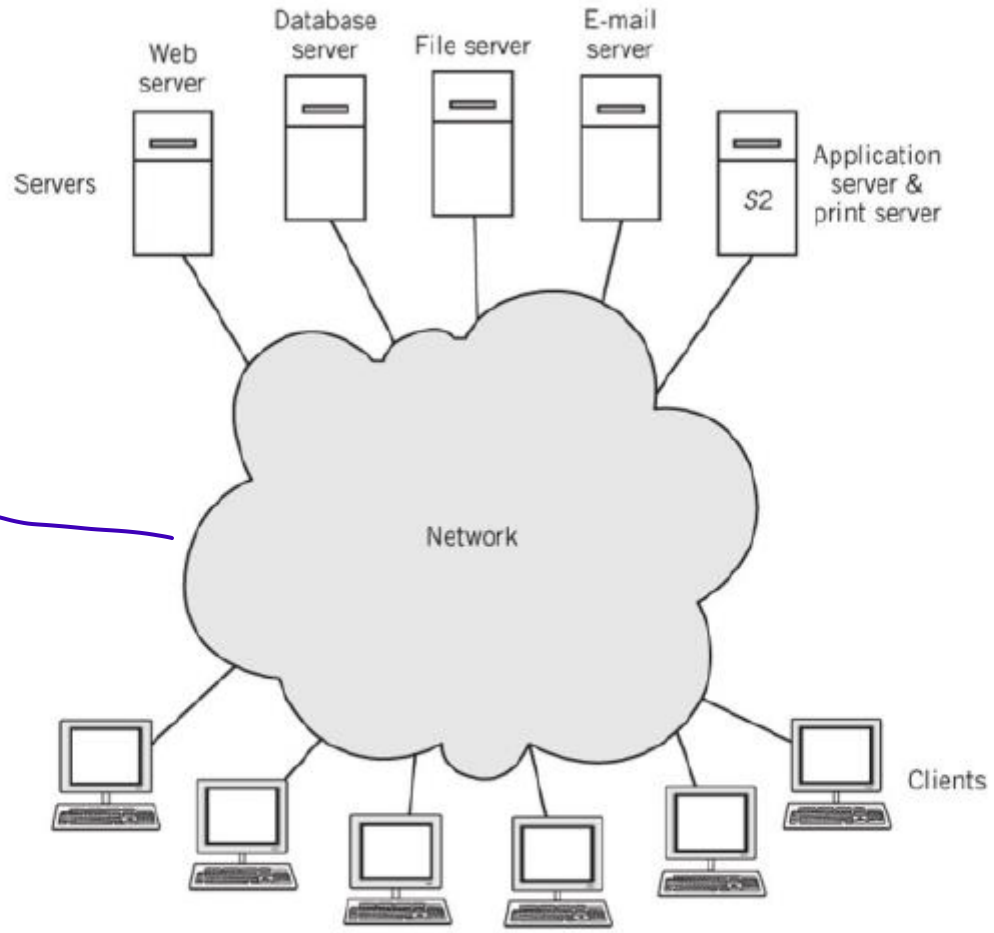
web service example:

meke thiyenawa DNS kiyala domain name thiyena ekak.user request ekak dunnama DNS eken domain eka host karala thiyena server eke IP eka hoyagena ekata ape request eka yawanawa. response eka apahu mage IP ekata enawa



Response

CLIENTS AND SERVERS ON A NETWORK



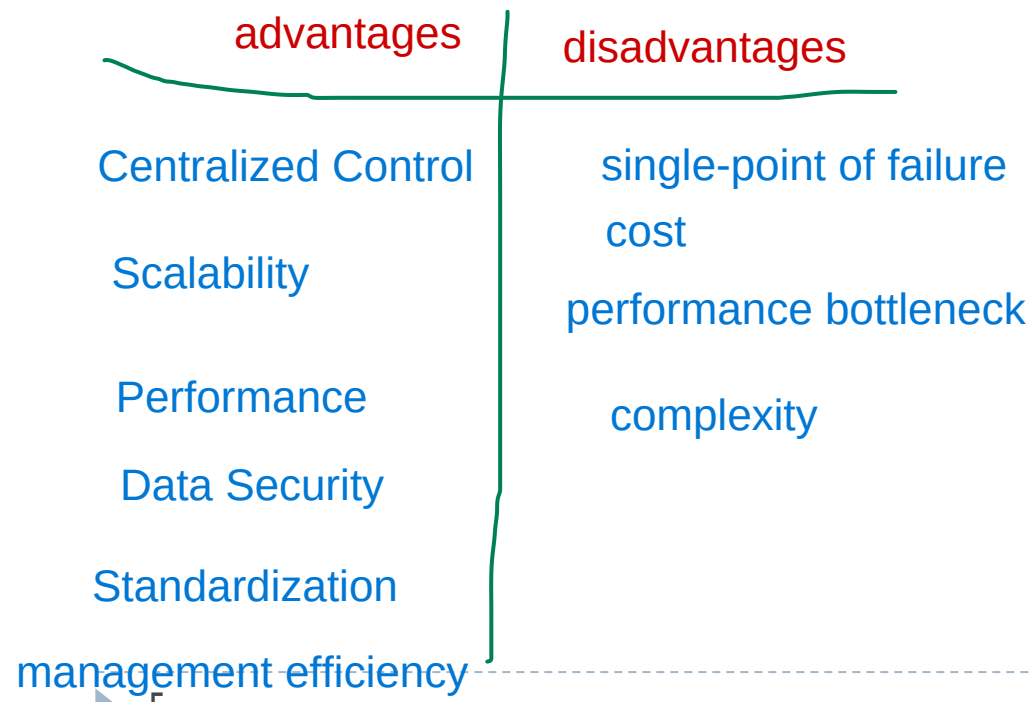
* external ewa nm internet eka
* internal office wala nm eyalage internal network eka.

Image Source : Computer Architecture: A Quantitative Approach, J. L. Hennessy & D.A. Patterson, 3rd Edition

CLIENT-SERVER COMPUTING

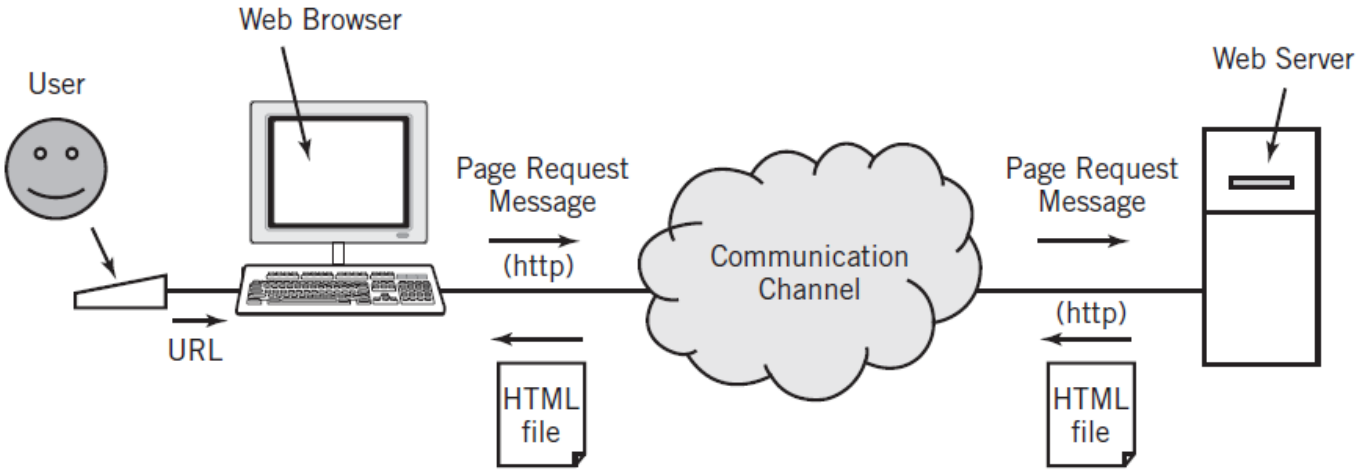
- Explain:
  - Advantages and Disadvantages
  - Centralized or Decentralized
  - Explain how bank customer accesses online banking services

do this as a H/W



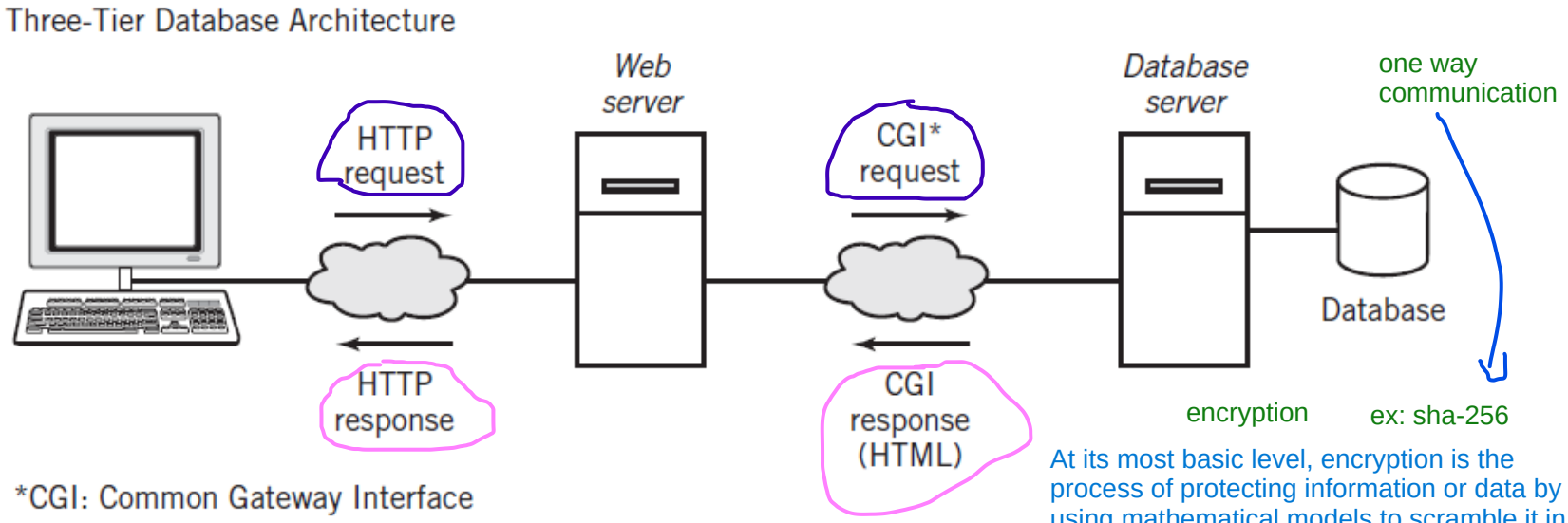
MULTI TIER ARCHITECTURE

- Two-tier architecture
  - Two layers are involved in a service
  - Web-browser and Web server model



MULTI TIER ARCHITECTURE

- Three-tier architecture
  - Three layers are involved in a service
  - Client computer, Web server, Database server

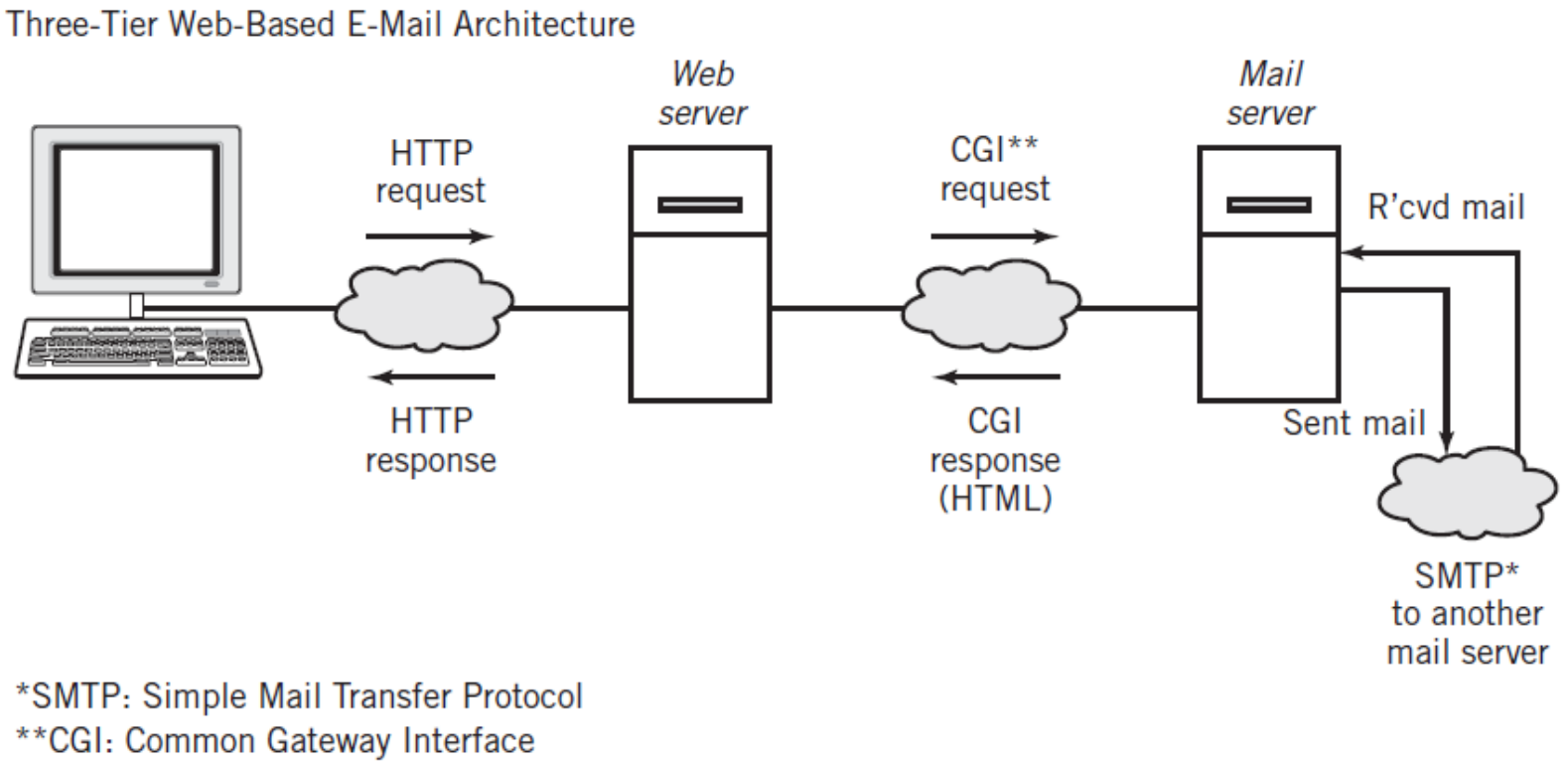


At its most basic level, encryption is the process of protecting information or data by using mathematical models to scramble it in such a way that only the parties who have the key to unscramble it can access it.

* data base eka wenama thiyeddi security ekata hodai
* data base eke computations karanna thiyenawa godak

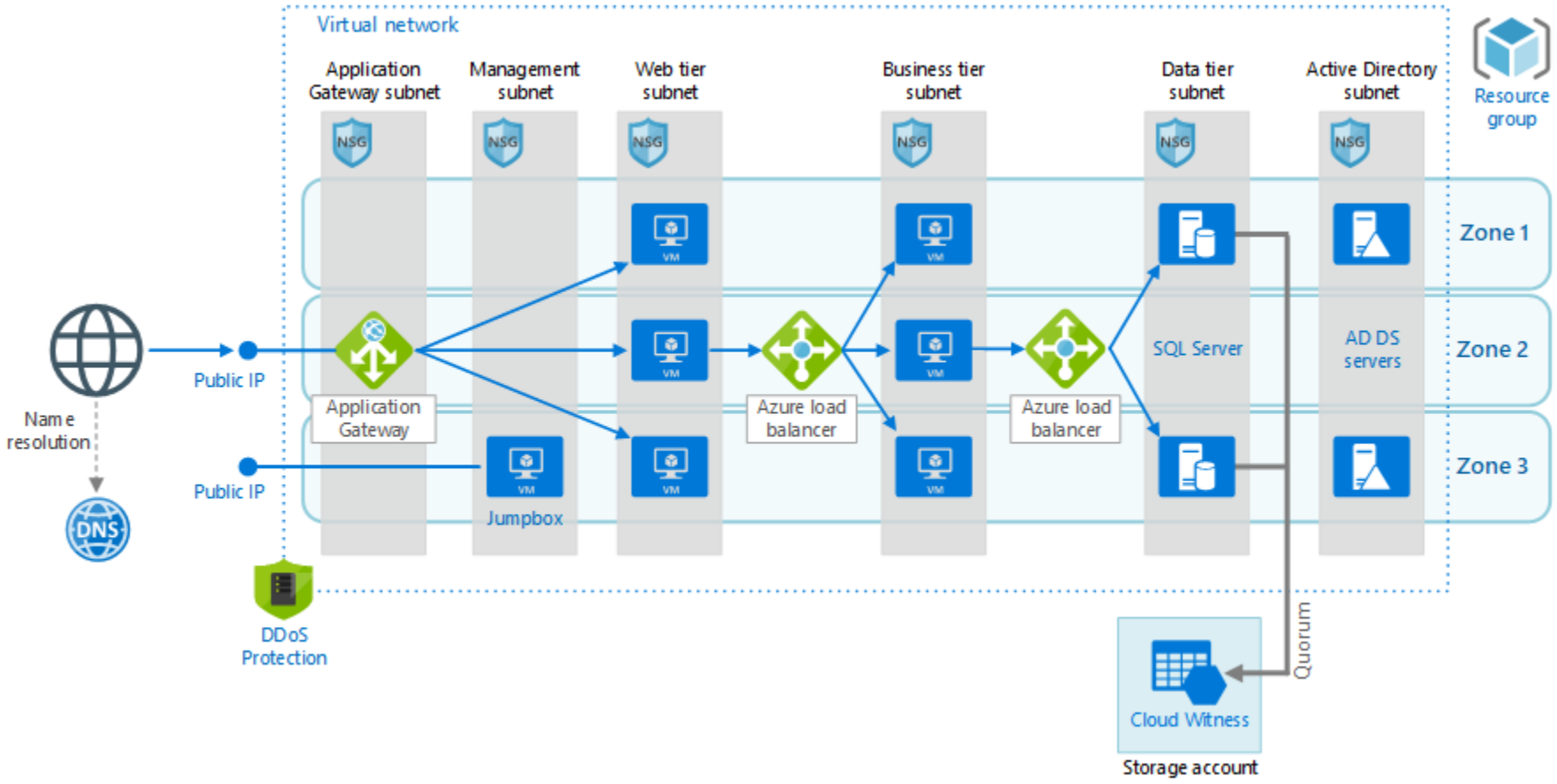
data is separated in another server called the database server

MULTI TIER ARCHITECTURE



- N-tier architecture

MULTI TIER ARCHITECTURE



MULTI TIER ARCHITECTURE

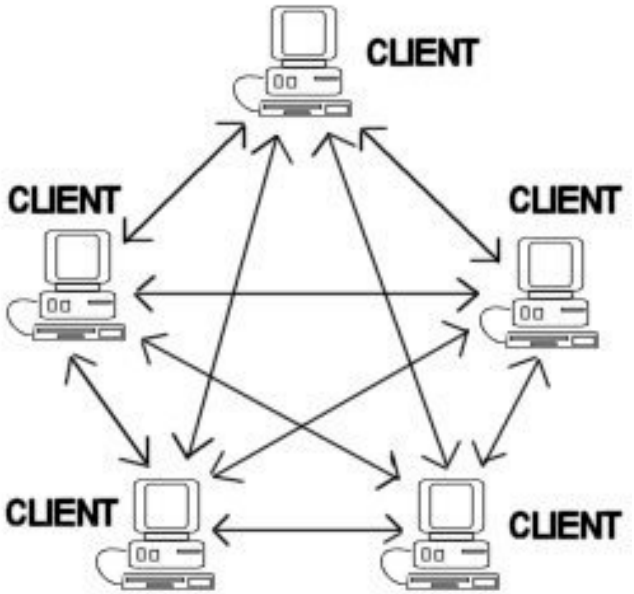
- Explain:
  - Advantages and Disadvantages

home work again :)

PEER-TO-PEER COMPUTING

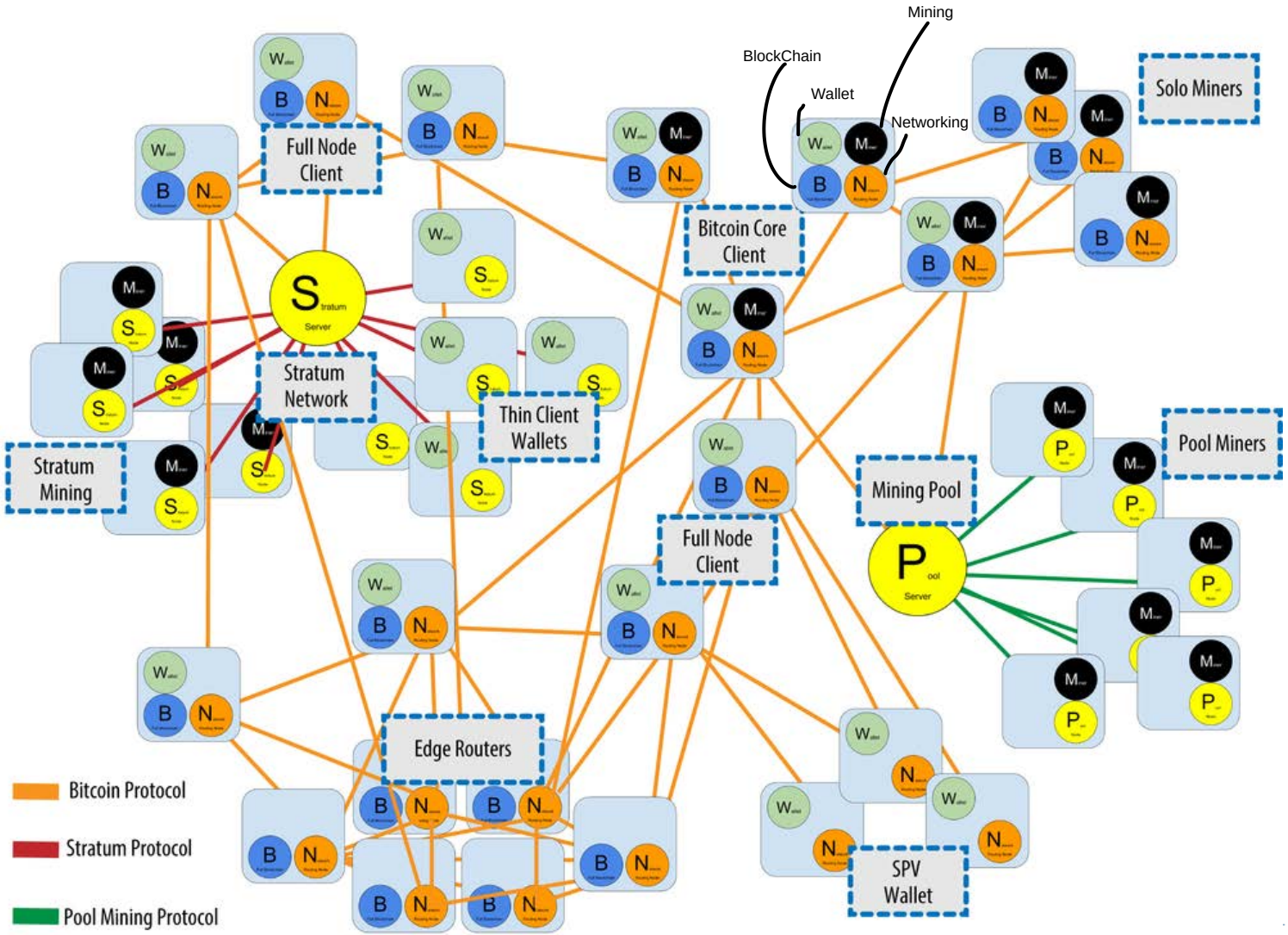
- Computers on a network are treated as equals
- Each computer can share resources with the other computers on the network

- Characteristics of P2P Systems
  - Nodes act as Clients and Servers
  - Highly Dynamic Network
  - No Central Authority
  - Large Scale
  - Autonomous Nodes



Examples for P2P:
*Torrent(seeders and peers)
*BitCoin

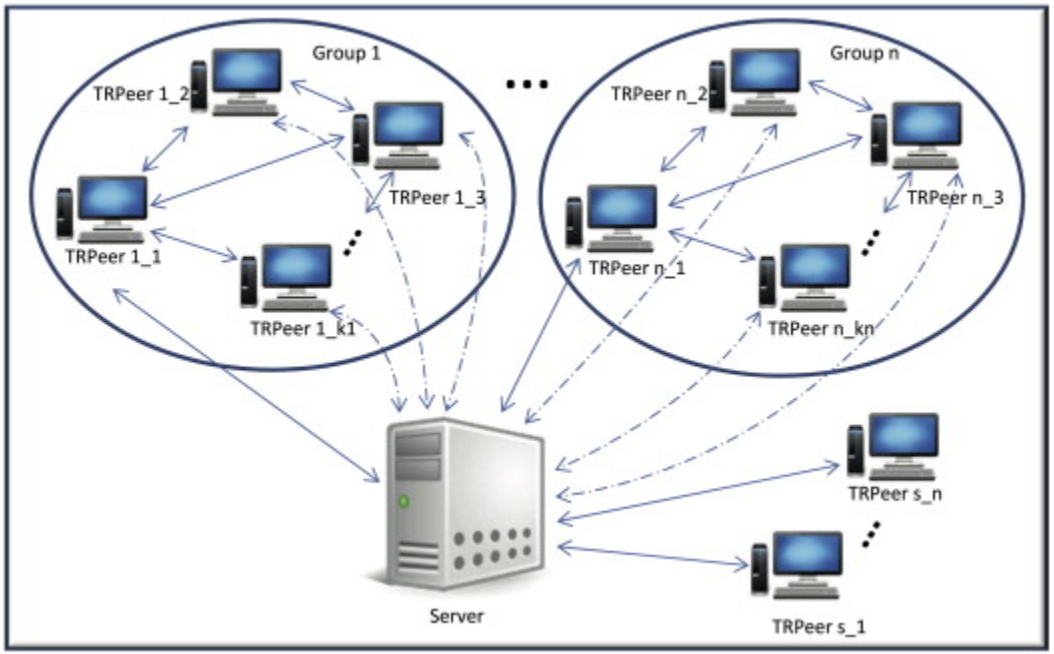
PEER-TO-PEER COMPUTING



HYBRID MODEL OF COMPUTING

- Client-server technology used to locate systems and files

- Then systems can participate in peer-to-peer transactions
  - Instant messaging



central server can be used to locate the clients and it also mangers and monitors all the sub servers.

GOOGLE: SYSTEM ARCHITECTURE

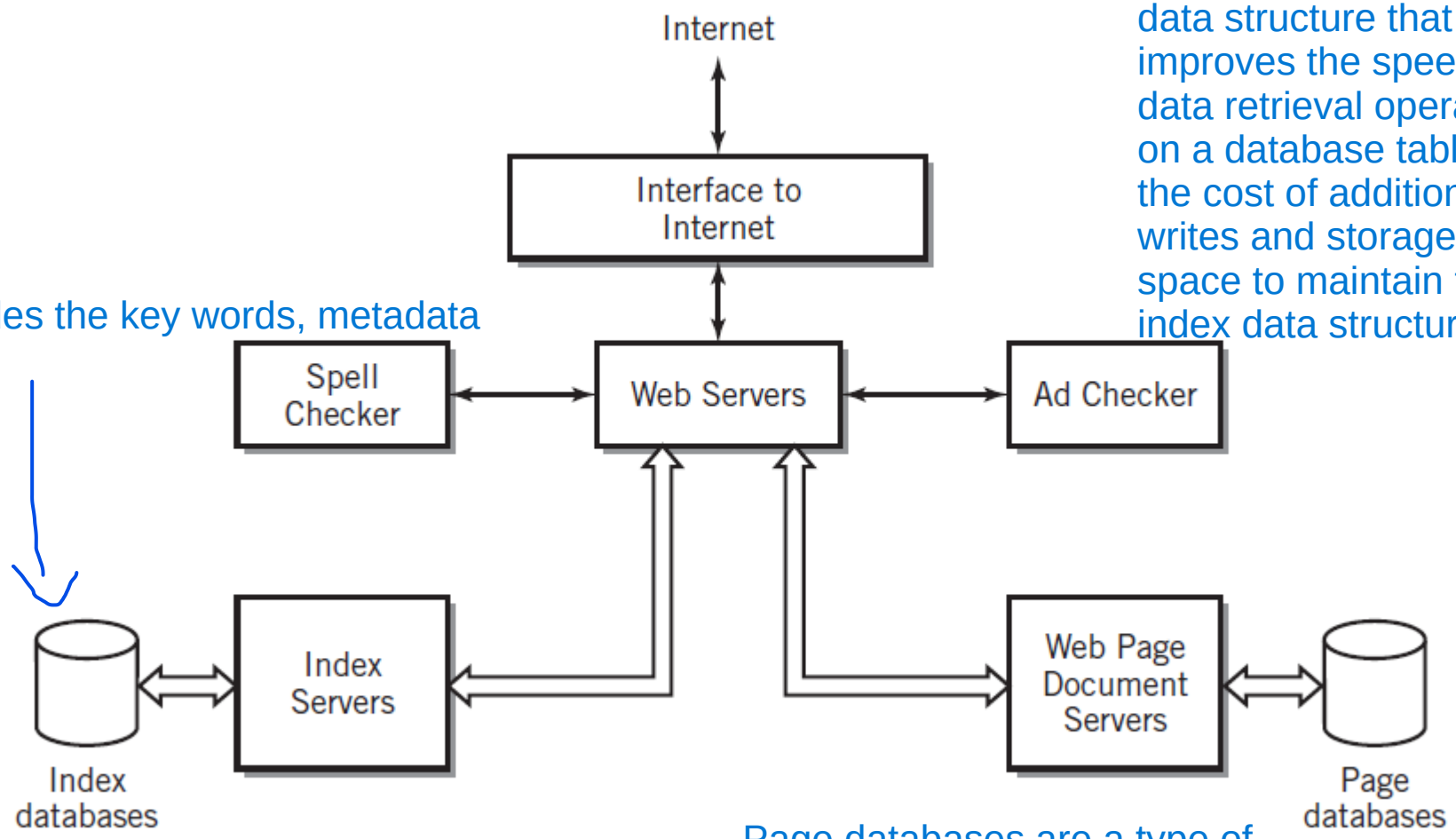
- Provide powerful, fast search capability for material on the Internet
- Derive income from advertising that is targeted to each user based on their searches

recommender systems are used

- Basic requirements
  - Capable of responding to millions of simultaneous requests from all over the world
  - Perform a web crawl of the Internet retrieve and organize data
  - Establish ranking of results with appropriately targeted advertising
  - High reliability of the system
  - System is easily scalable and cost effective

GOOGLE SEARCH ARCHITECTURE

A database index is a data structure that improves the speed of data retrieval operations on a database table at the cost of additional writes and storage space to maintain the index data structure



includes the key words, metadata

https://g.co/bard/share/84bc838c5bfb

Page databases are a type of database that store information in a series of pages, similar to how a website is organized.

EXAM QUESTION

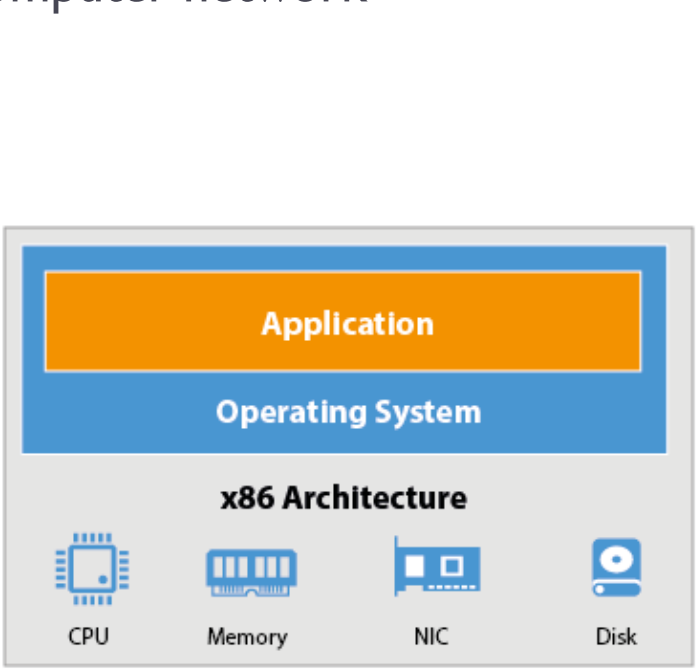
c) You are required to design an instant messaging application similar to Skype. Explain each of the following computer system architectures. What do you think is the most suitable system architecture? Explain your answer

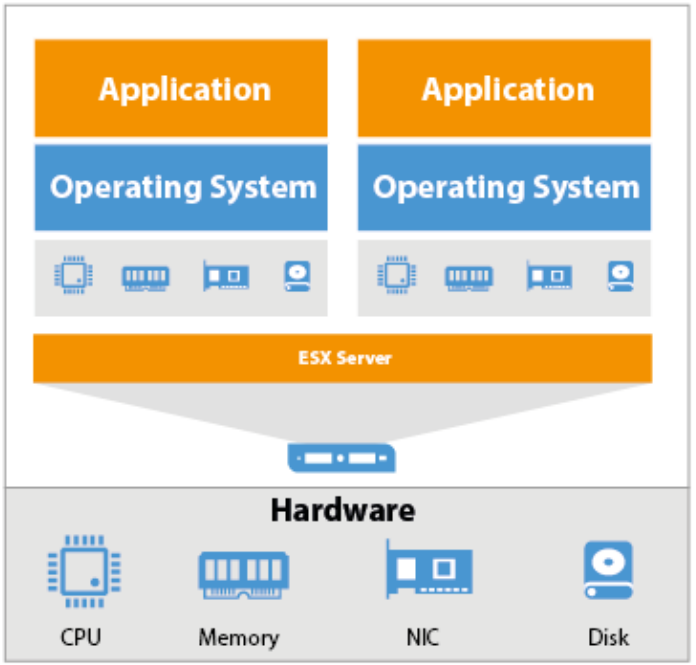
- Client-Server Architecture
- Peer-to-Peer Architecture
- Hybrid Model of above.

[7 Marks]

VIRTUALIZATION

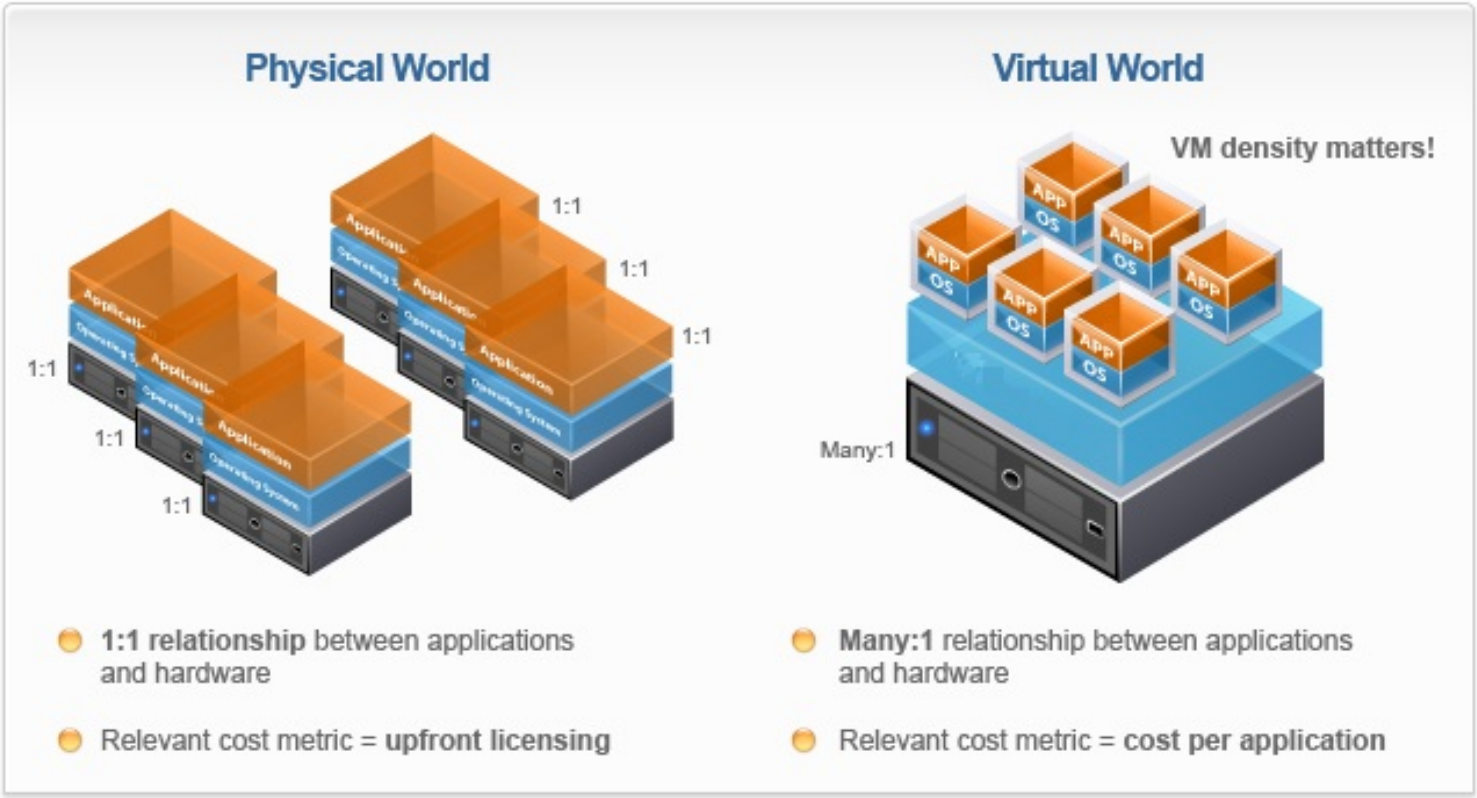
- Converts physical IT resource into virtual IT resource
  - Hardware
  - Operating systems
  - Storage devices
  - Computer network





https://www.veeam.com/blog/why-virtual-machine-backups-different.html

VIRTUALIZATION

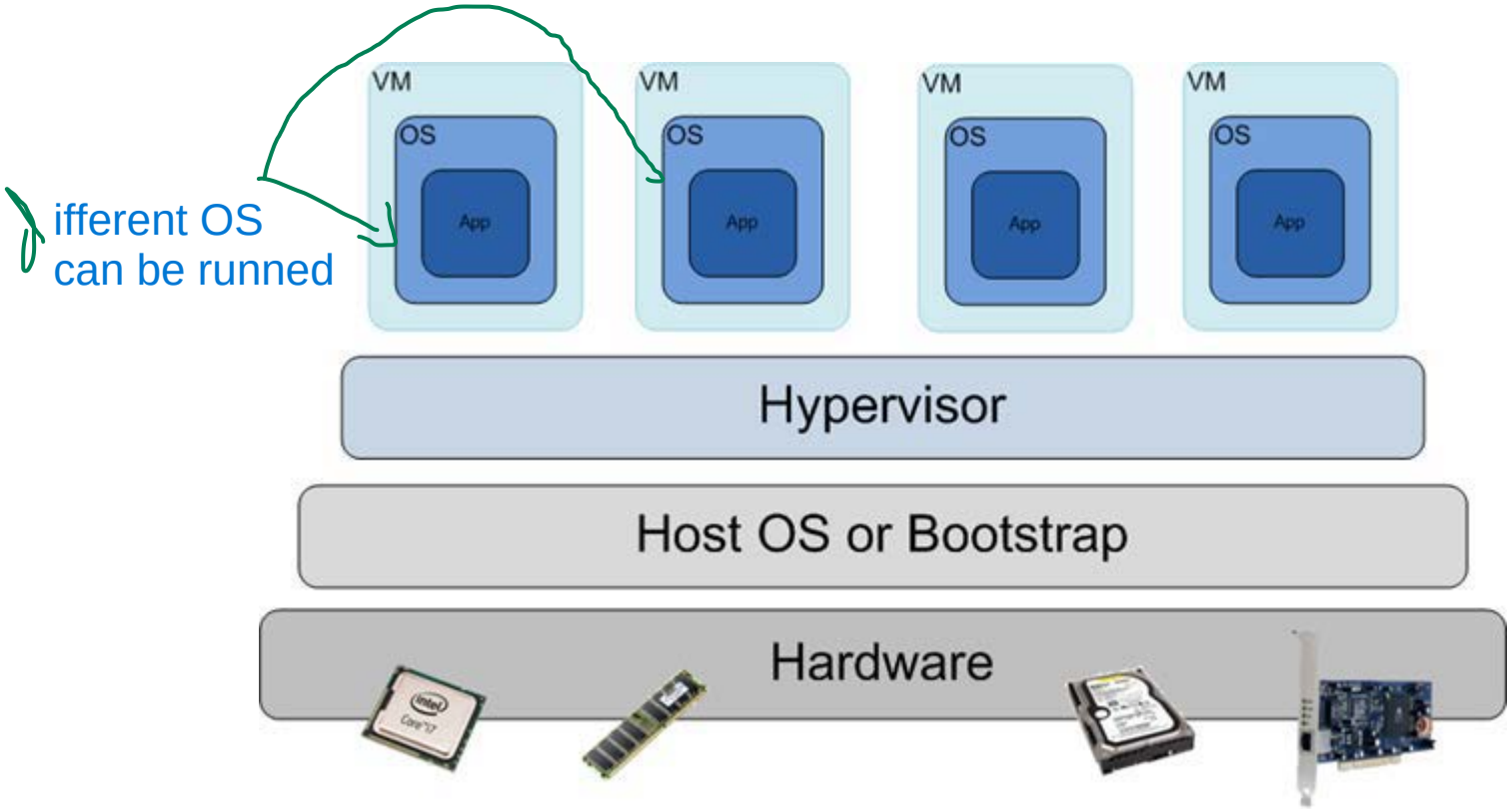


TYPES OF VIRTUALIZATION

- Hardware virtualization
- Storage virtualization
- Network virtualization
- Desktop virtualization
- Application virtualization

HARDWARE VIRTUALIZATION

- Virtualization software used to separate the underlying physical host hardware https://youtu.be/FZR0rG3HKIk?si=S0eOaLx0lja2SE0l



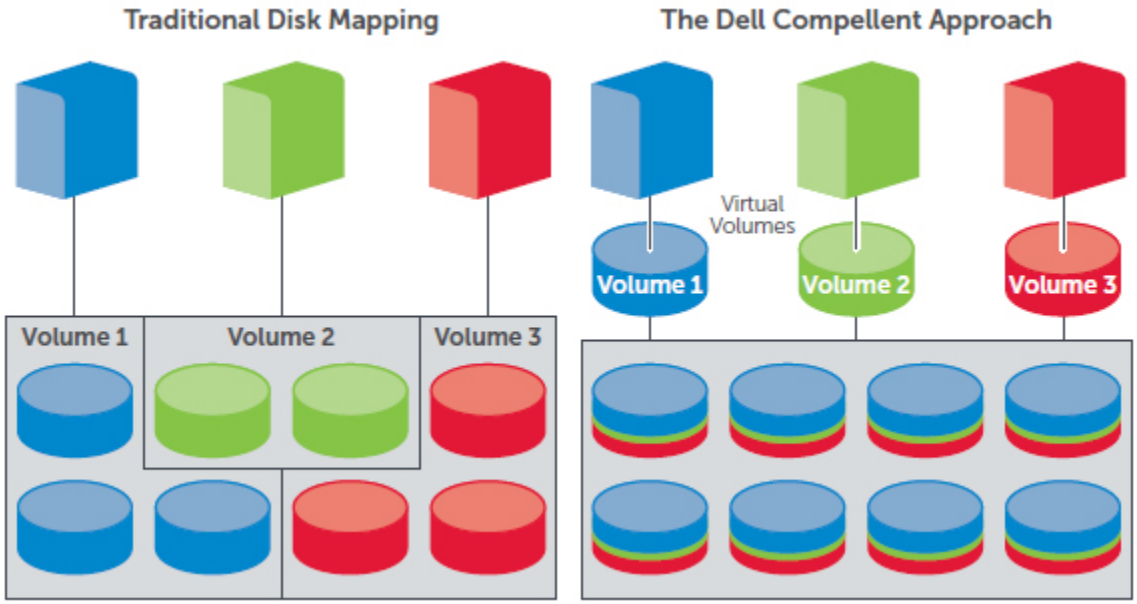
hypervisor pull the resources from the physical server and allocate them in to the virtual environment.

HARDWARE VIRTUALIZATION

- Advantages
  - More efficient than OS virtualization as VMs directly interact with hardware
  - Ability to install different OS in VMs
  - Higher resource utilization & reduced cost
  - Migration
    - Live migration: moving a running virtual machine across physical machines without disconnecting the client or application
- Disadvantages
  - Hardware compatibility issues

STORAGE VIRTUALIZATION

- Virtual pool of storage resources
  - Storage resources can be organized, allocated, and managed without regard for their physical architecture
  - Large datasets
  - Migration
  - Issues?



https://www.sanstorageworks.com.au/Compellent-Dynamic-Capacity.asp

THANK YOU

REFERNCES

- The Architecture of Computer Hardware, Systems Software & Networking: An Information Technology Approach - 5th Edition, Irv Englander -John Wiley and Sons