

Introduction to Networking (2)

COMP90007 Internet Technologies

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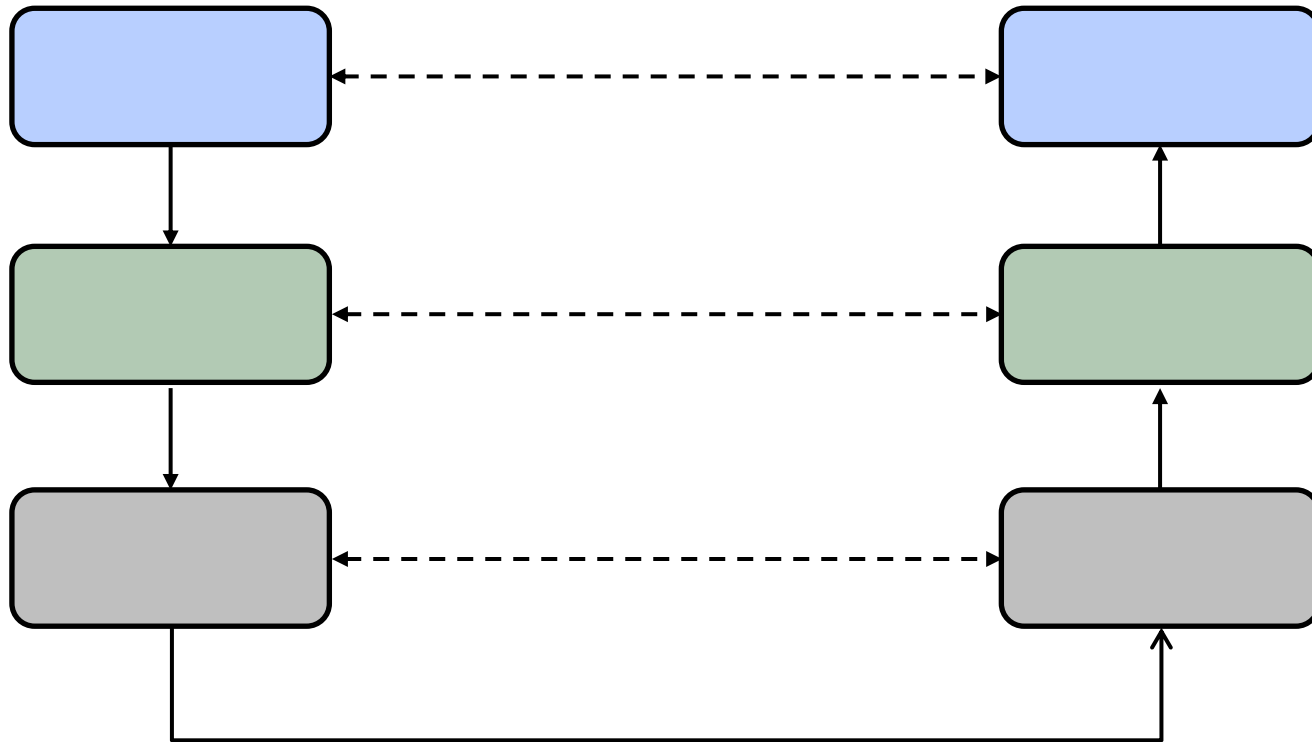
Semester 2, 2024

Reference Models

- The OSI Reference Model
- The TCP/IP Reference Model
- A Comparison of OSI and TCP/IP
- A Critique of the OSI Model and Protocols
- A Critique of the TCP/IP Reference Model

Reference Model

- Concepts and their relationship



Why Do We Need a Reference Model?

- A reference model provides a ***common baseline for the development*** of many services and protocols by independent parties
- It's engineering ***best practice*** to have an ***abstract reference model***, and corresponding implementations are always required for validation purposes
- Networks are very complex systems, a reference model can serve to ***simplify the design process***

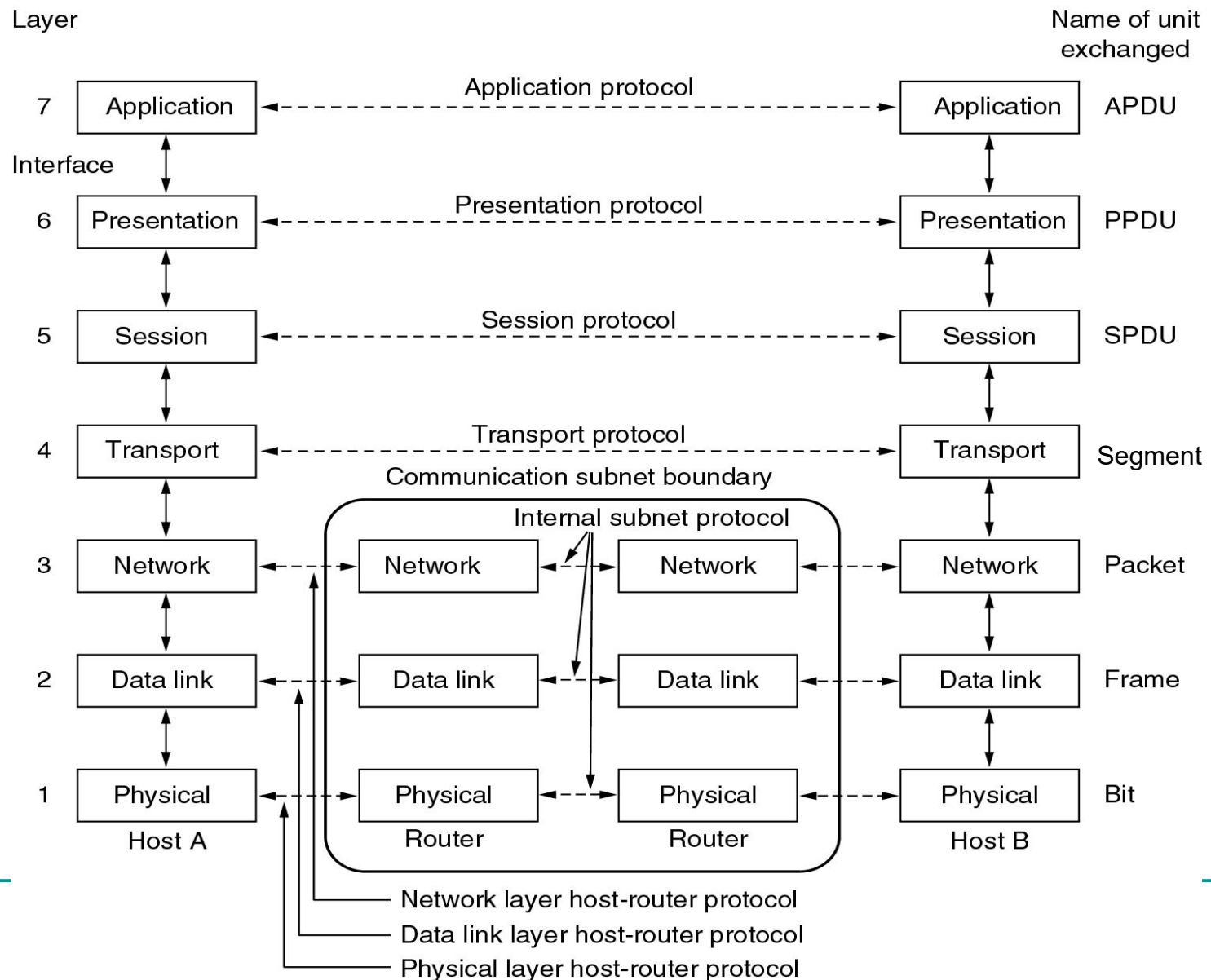
OSI Reference Model

- Open Systems Interconnection (OSI)
- ISO, John Day (revised 1995)
- 7 Layers
- Layer divisions based on principled decisions

OSI Layer Division Principles

- A layer should be created where a **different abstraction** is needed.
- Each layer should **perform a well-defined function**.
- The layer boundaries should be chosen to **minimise the information flow across the interfaces**.
- The number of layers should be **large enough** to separate distinct functions; and **small enough that** the architecture does not become too complex.
- The function of each layer should be chosen considering **internationally standardised protocols**.

OSI Reference Model

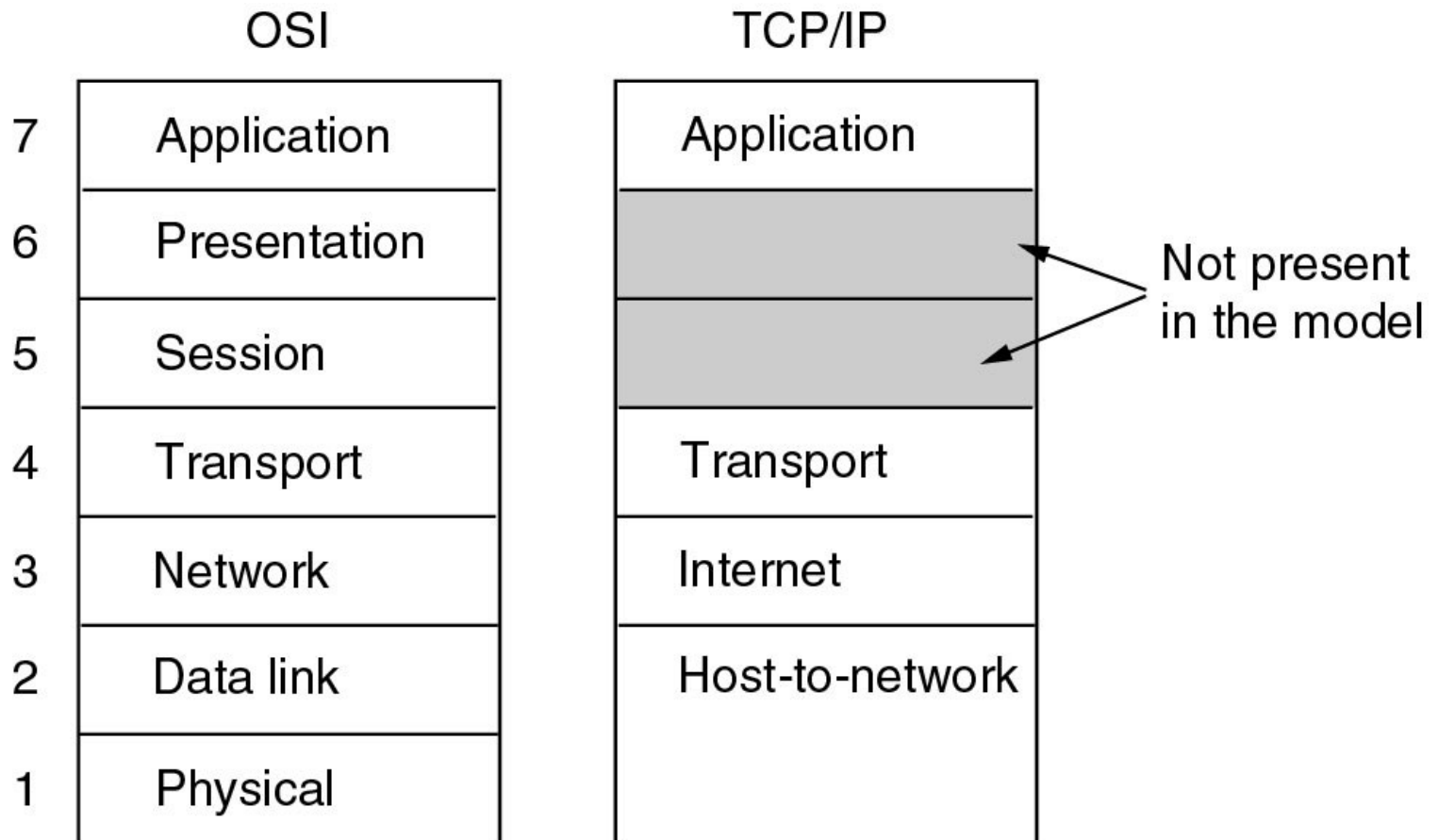


TCP/IP Reference Model

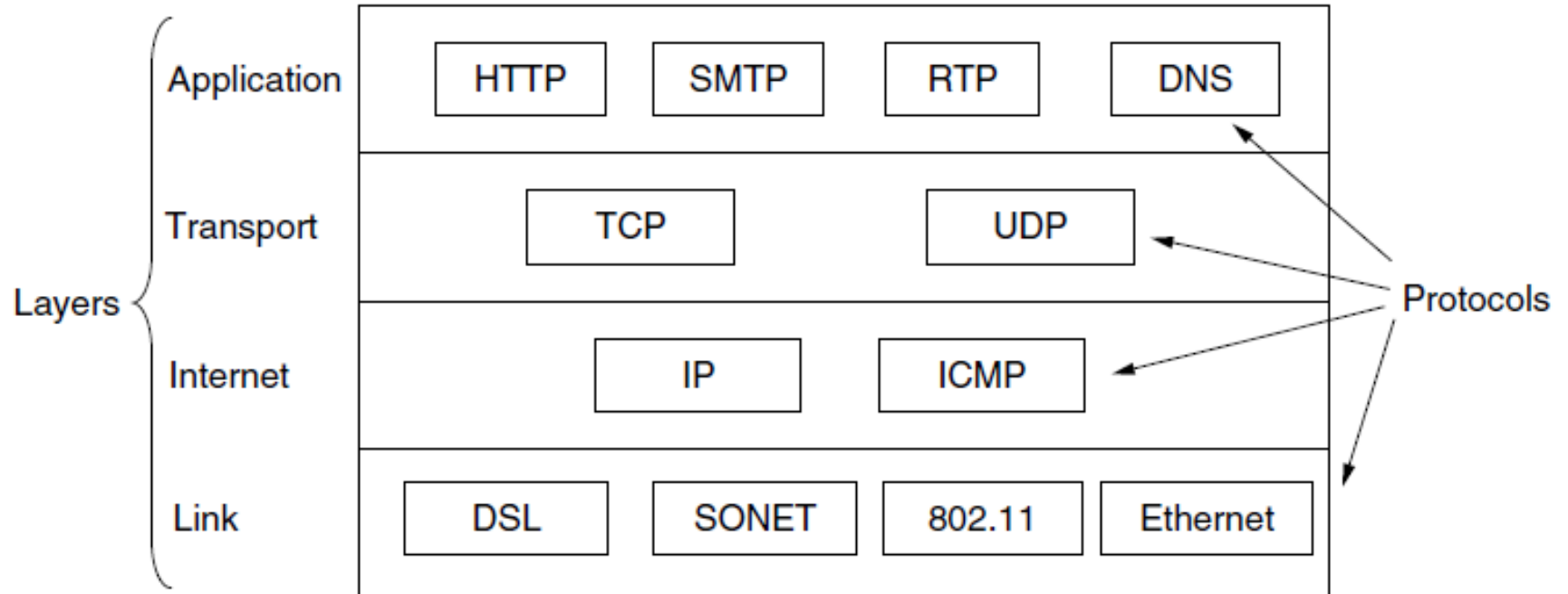
- Transmission Control Protocol/Internet Protocol
- Vint Cerf & Bob Kahn (1974)
- 4 layers



TCP/IP Reference Model (2)



TCP/IP Reference Model (3)



Comparing OSI and TCP/IP Models

- Different numbers of layers
- OSI distinguishes the following three concepts explicitly
 - Services, interfaces, protocols
- TCP/IP has successful protocols

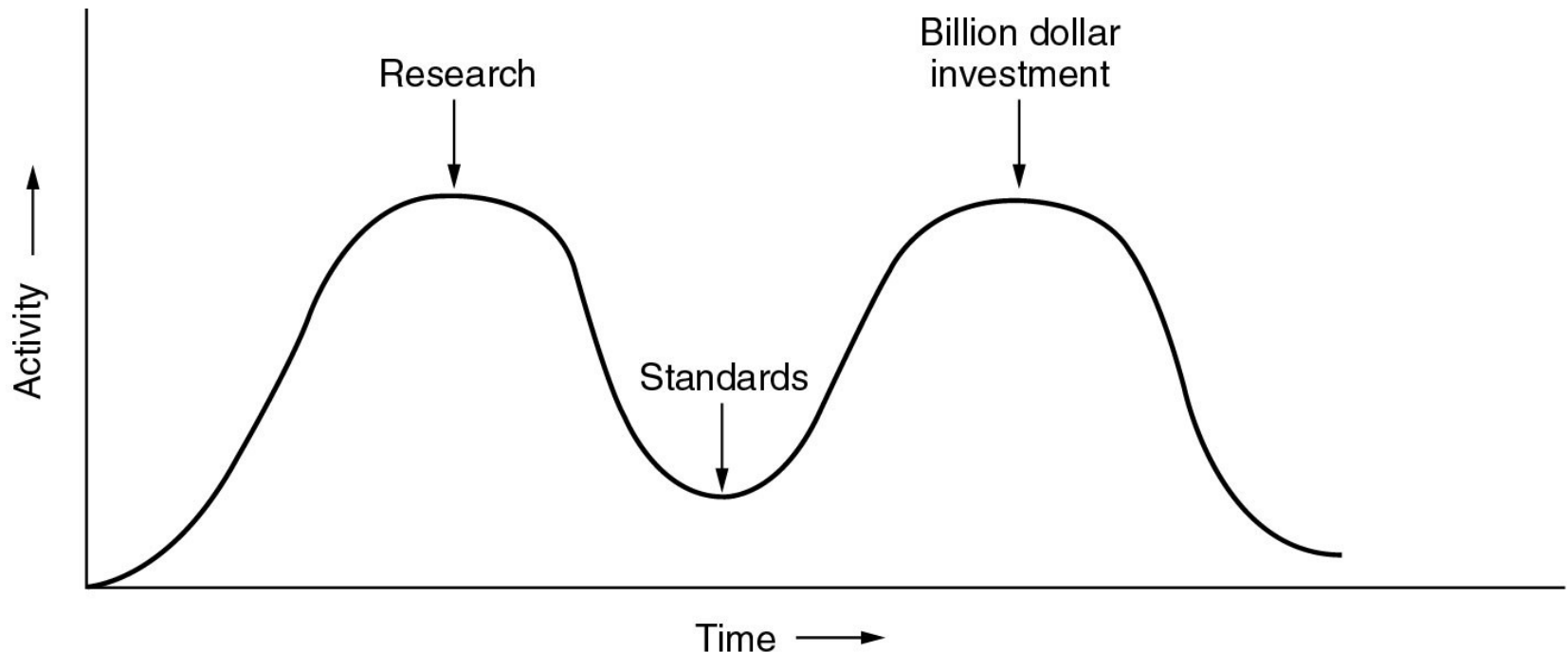
A Critique of the OSI Model

Why OSI did not take over the world?

- Bad technology
- Bad implementations
- Bad timing

A Critique of the OSI Model: Bad Timing

- When is good timing for a standard?



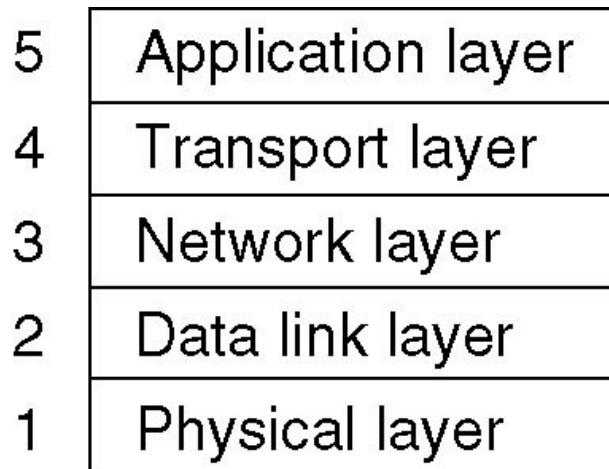
A Critique of the TCP/IP Model

Problems:

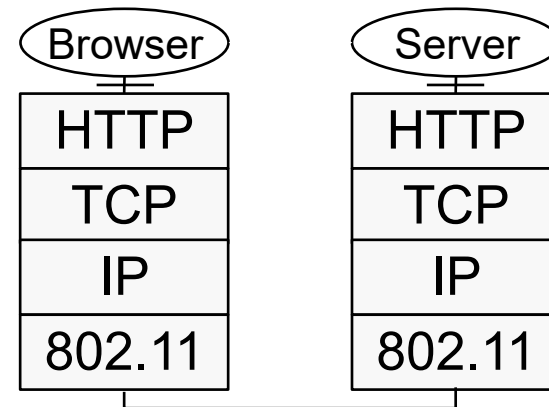
- Not a general model
- Service, interface, and protocol not distinguished
- Did not split physical and data link layers
- Minor protocols deeply entrenched, hard to replace

Hybrid Model

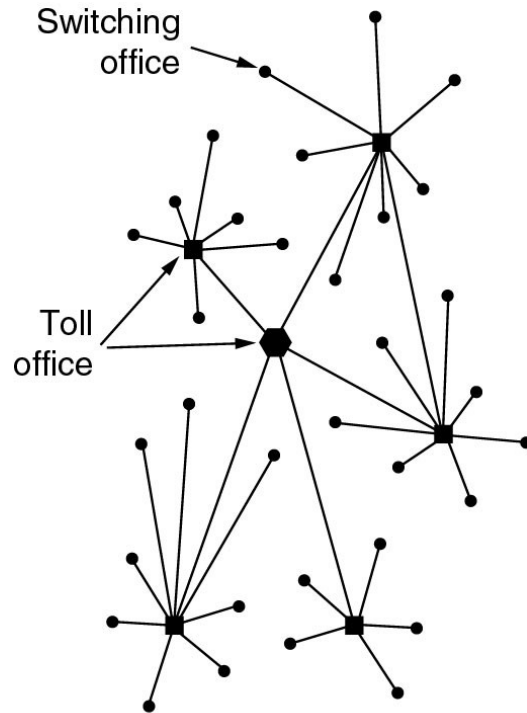
- The hybrid reference model to be used in this subject



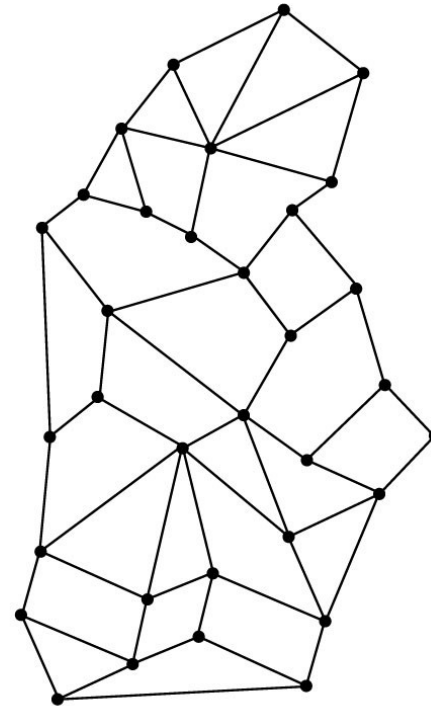
A typical network scenario



Origins of Internet



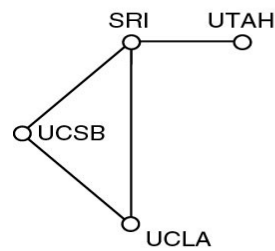
(a)



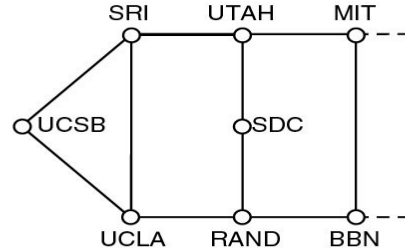
(b)

- (a) Structure of the telephone system.
- (b) Baran's proposed distributed switching system.

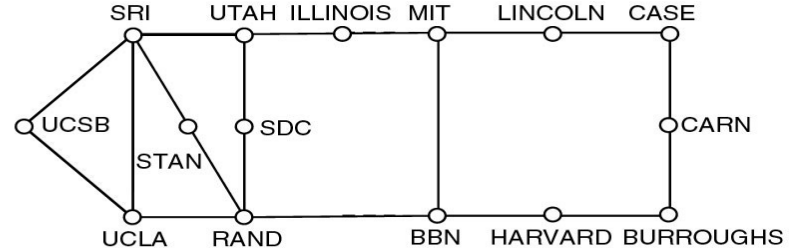
The ARPANET



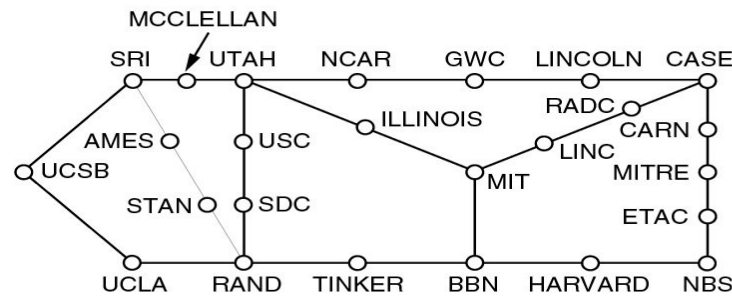
(a)



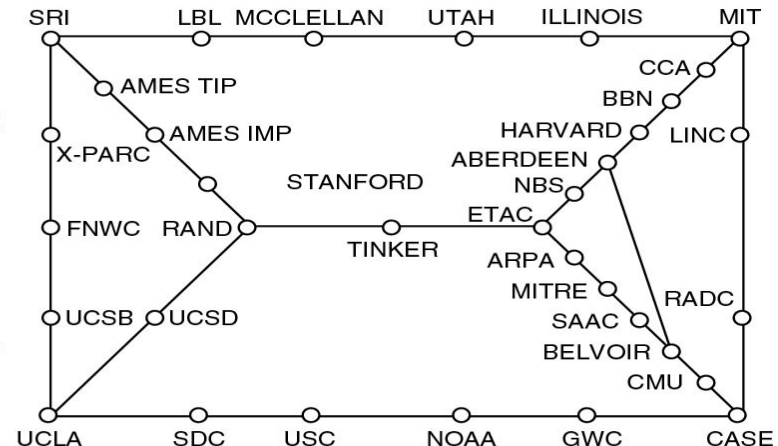
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(c)



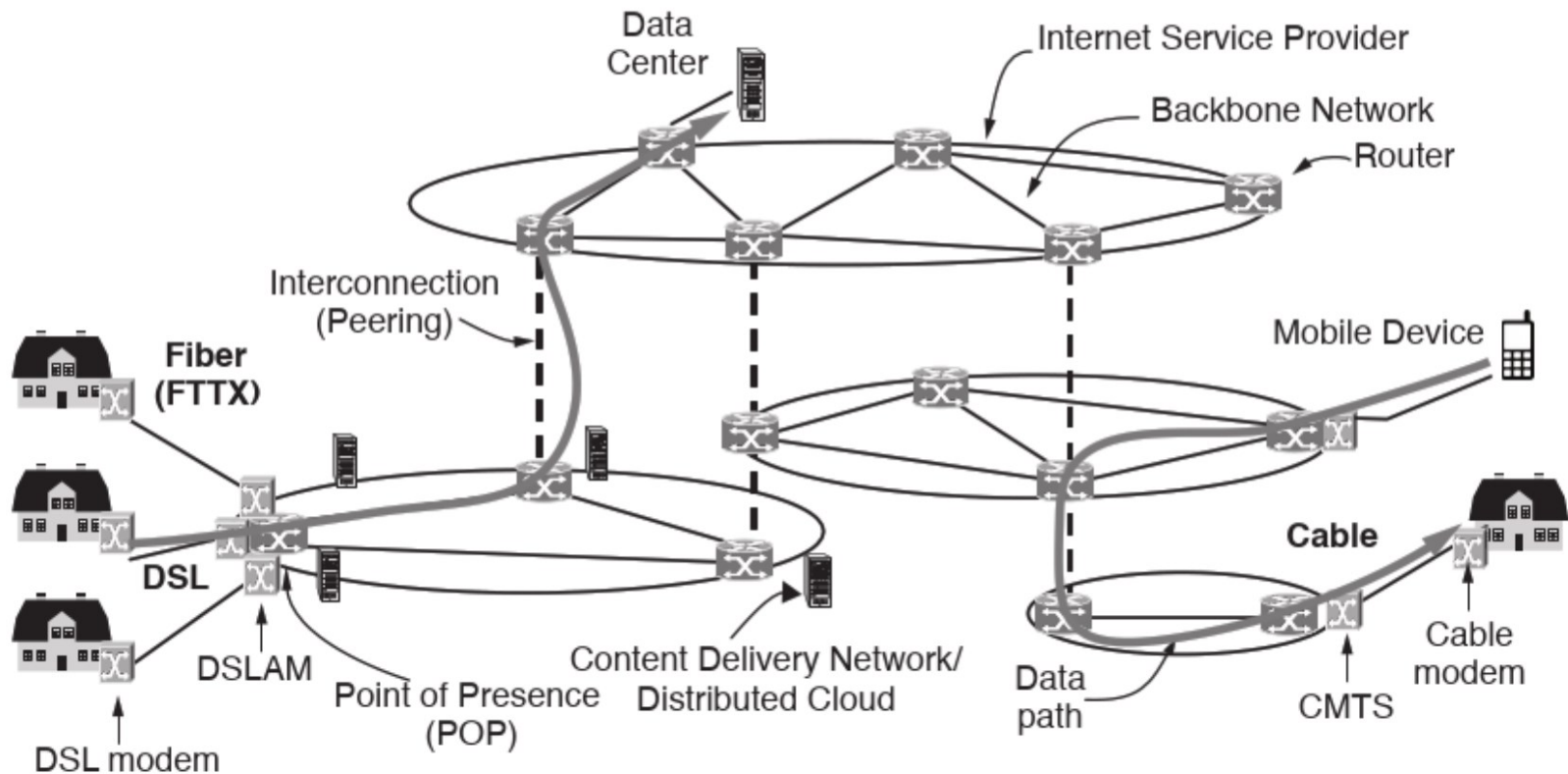
(d)



(e)

- **Growth of the ARPANET** (a) December 1969. (b) July 1970.
- (c) March 1971. (d) April 1972. (e) September 1972.

Architecture of the Internet



Summary

- Computer Networks
- Different types of computer networks
 - Transmission technology
 - Scale
 - Topology
- Protocols, Layers and Services
 - OSI
 - TCP/IP
 - Hybrid model