Week 2 – Introduction to Networking Continued: Famous Models

COMP90007
Internet Technologies

Reading

- You should have come to the end of Chapter 1.3 at this time

- For this lecture please take a look at the rest of Chapter 1:
  - Note that Section 1.4 is the main focus
  - For the remainder sections skim the chapter
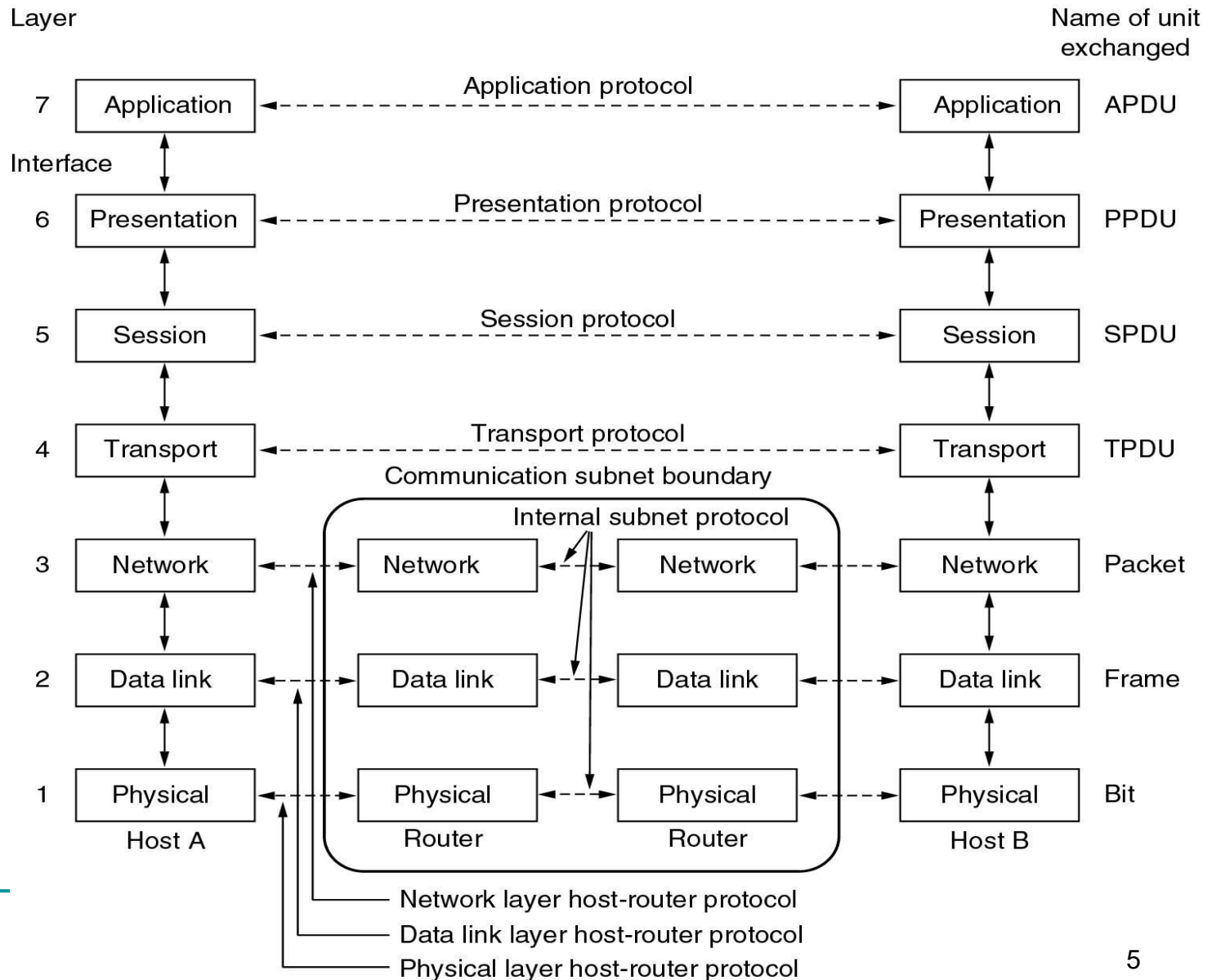 - Slides should be a guide in reading in a focused manner for the rest of this Chapter

OSI Reference Model

- Open Systems Interconnection (OSI)
- ISO is the source
- 7 Layers
- Layer divisions based on principled decisions

OSI Layer Division Principles

1. A layer should be created where a different **abstraction** is needed

2. Each layer should **perform a well defined function**

3. The function of each layer should be chosen with a view toward defining **internationally standardised protocols**

4. The layer boundaries should be chosen to **minimise the information flow across the interfaces**

5. The number of layers should be **large enough that** distinct functions need not to be thrown together in the same layer out of necessity, and **small enough that** the architecture does not become unwieldy
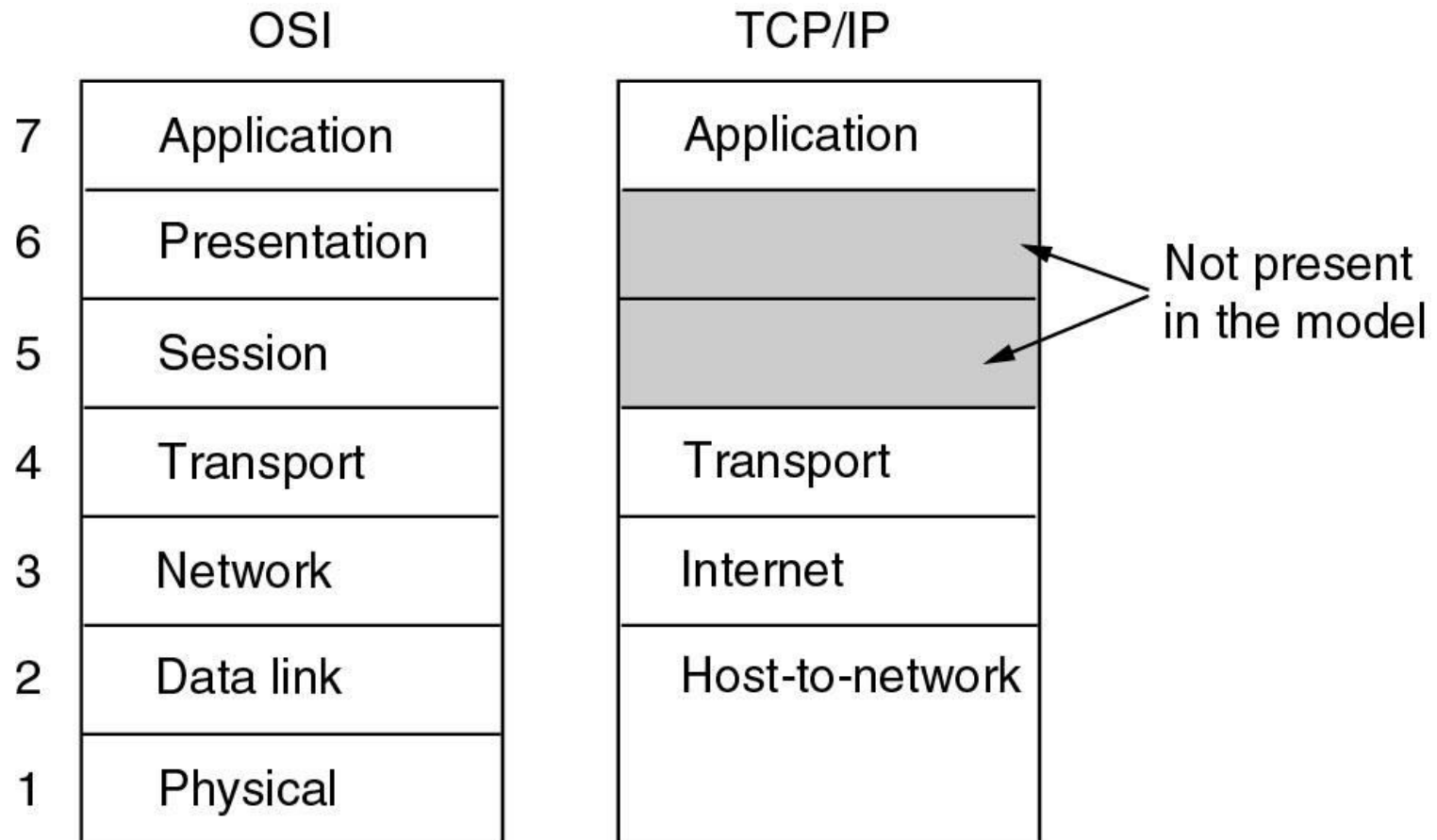
OSI Reference Model

Layer

Name of unit
exchanged

7	Application	← - - - - - Application protocol - - - - - →	Application	APDU
	Interface			
6	Presentation	← - - - - Presentation protocol - - - - →	Presentation	PPDU
5	Session	← - - - - - Session protocol - - - - - →	Session	SPDU
4	Transport	← - - - - Transport protocol - - - - →	Transport	TPDU

Communication subnet boundary

Internal subnet protocol

3	Network	← - - → Network ← - - → Network ← - - →	Network	Packet
2	Data link	← - - → Data link ← - - → Data link ← - - →	Data link	Frame
1	Physical	← - - → Physical ← - - → Physical ← - - →	Physical	Bit

Host A   Router   Router   Host B

Network layer host-router protocol
Data link layer host-router protocol
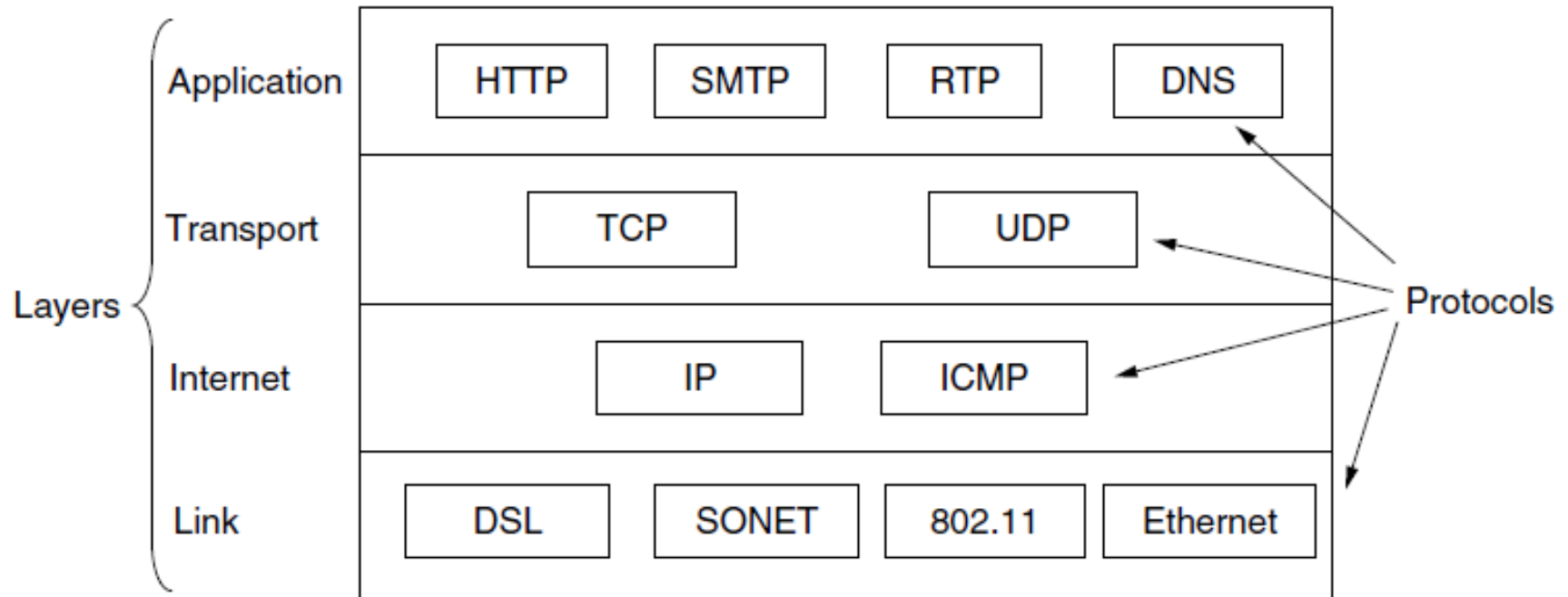Physical layer host-router protocol

5

Next: TCP/IP Reference Model

- Transmission Control Protocol/Internet Protocol

- Cerf & Kahn (1974)

- 4 layers

TCP/IP Model Illustrated

- The TCP/IP reference model wrt OSI

	OSI	TCP/IP	
7	Application	Application	
6	Presentation		Not present in the model
5	Session		
4	Transport	Transport	
3	Network	Internet	
2	Data link	Host-to-network	
1	Physical		

Reference Models and Protocols

Comparing OSI and TCP/IP Models

- Concepts central to the OSI model
- Services
- Interfaces
- Protocols

A Critique of the OSI Model and Protocols

- Why OSI did not take over the world?
- Bad timing
- Bad technology
- Bad implementations
- Bad politics

Bad Timing

- The apocalypse of the two elephants
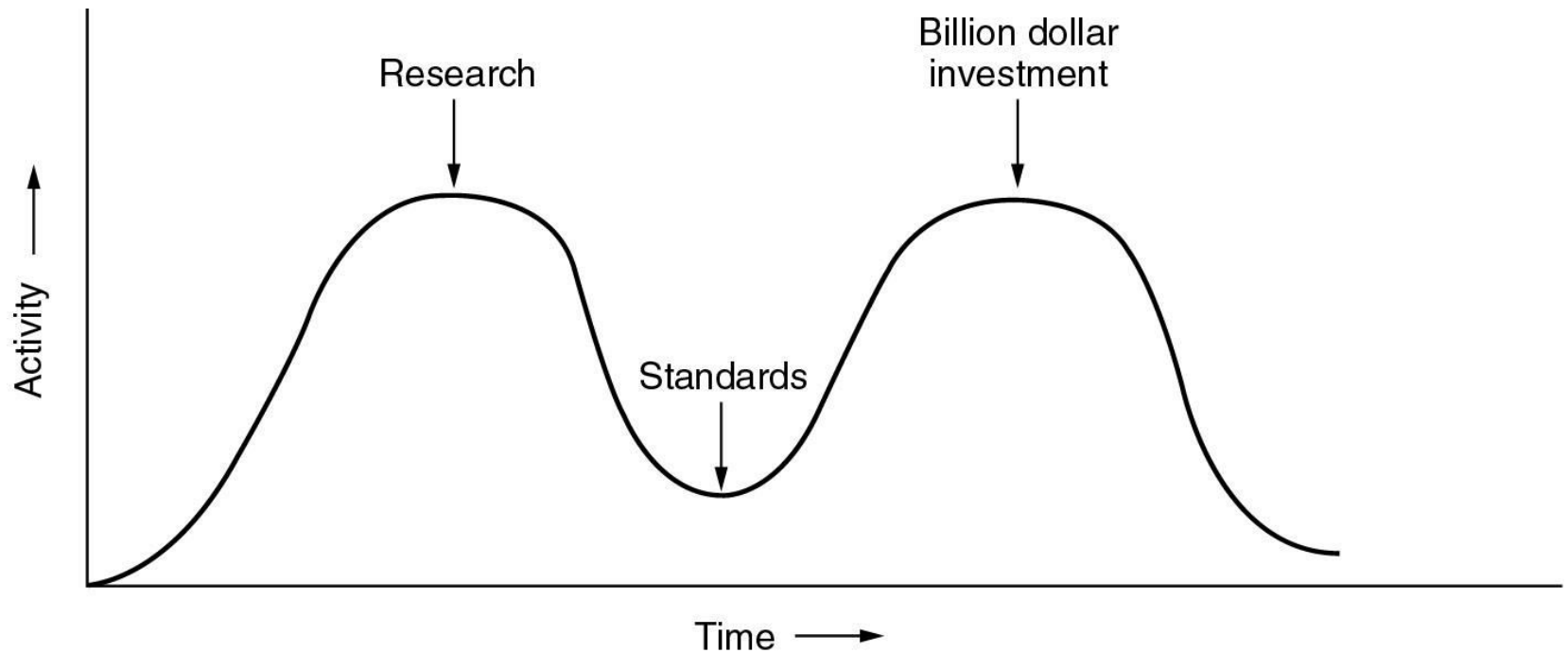
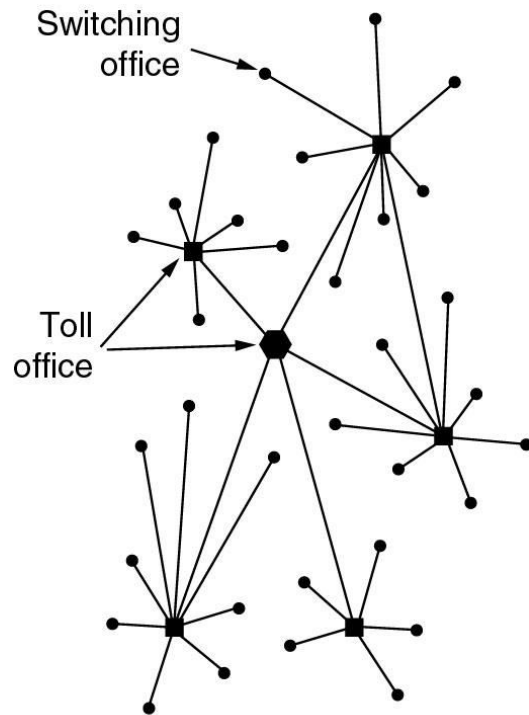# A Critique of the TCP/IP Reference Model

- Service, interface, and protocol not distinguished
- Not a general model
- Host-to-network "layer" not really a layer – interface between network and data link layers
- No mention of physical and data link layers
- Minor protocols deeply entrenched, hard to replace

Hybrid Model

- The hybrid reference model to be used in this book. We follow this in this semester

5	Application layer
4	Transport layer
3	Network layer
2	Data link layer
1	Physical layer

A typical network scenario

Browser

HTTP
TCP
IP
802.11

Server

HTTP
TCP
IP
802.11
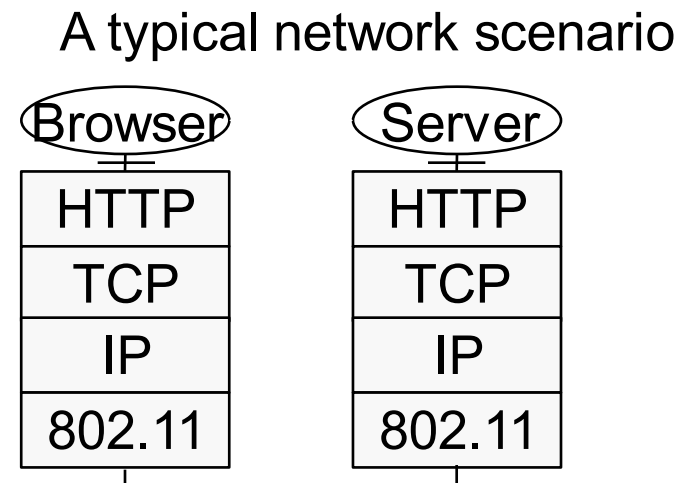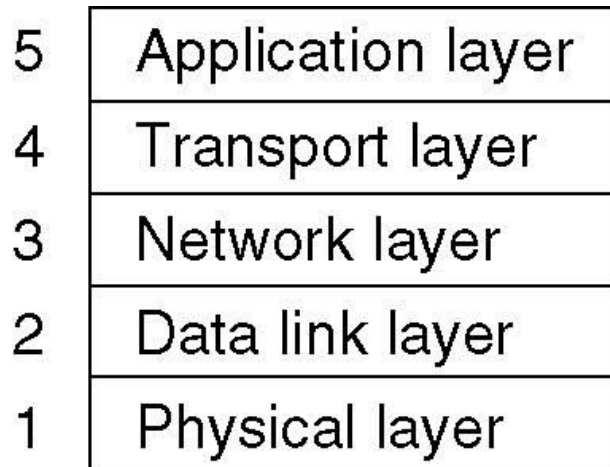
A bit on History of Internet: The ARPANET
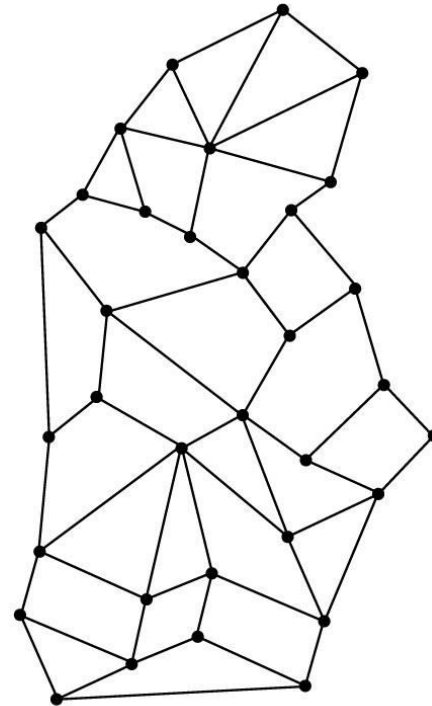
(a)   (b)

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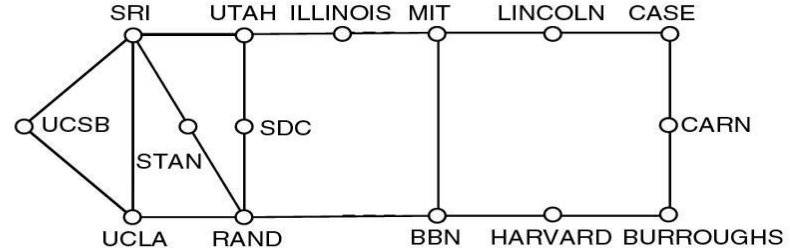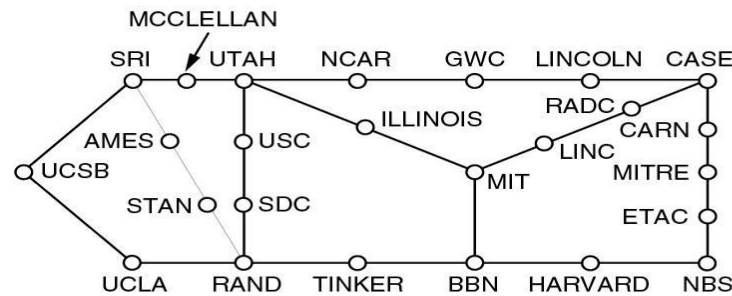- **(b)** Baran's proposed distributed switching system.

The ARPANET
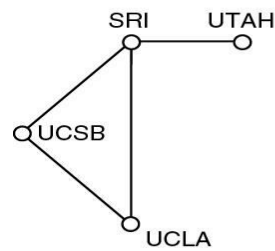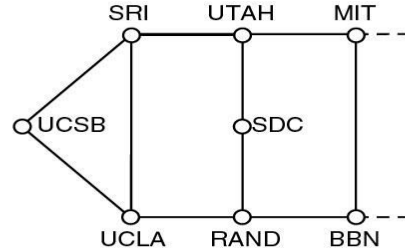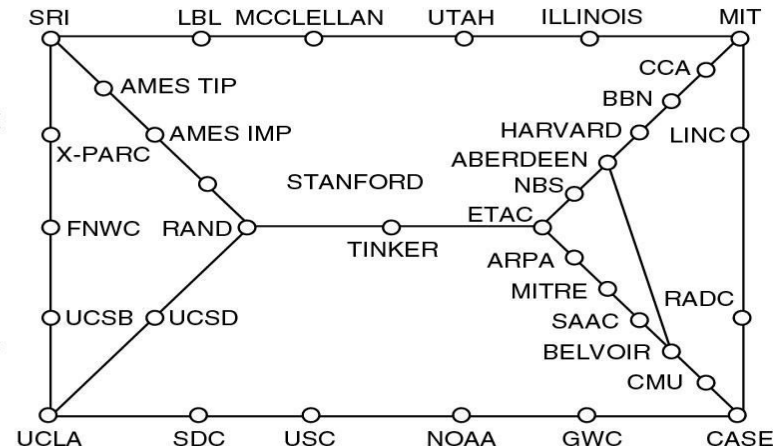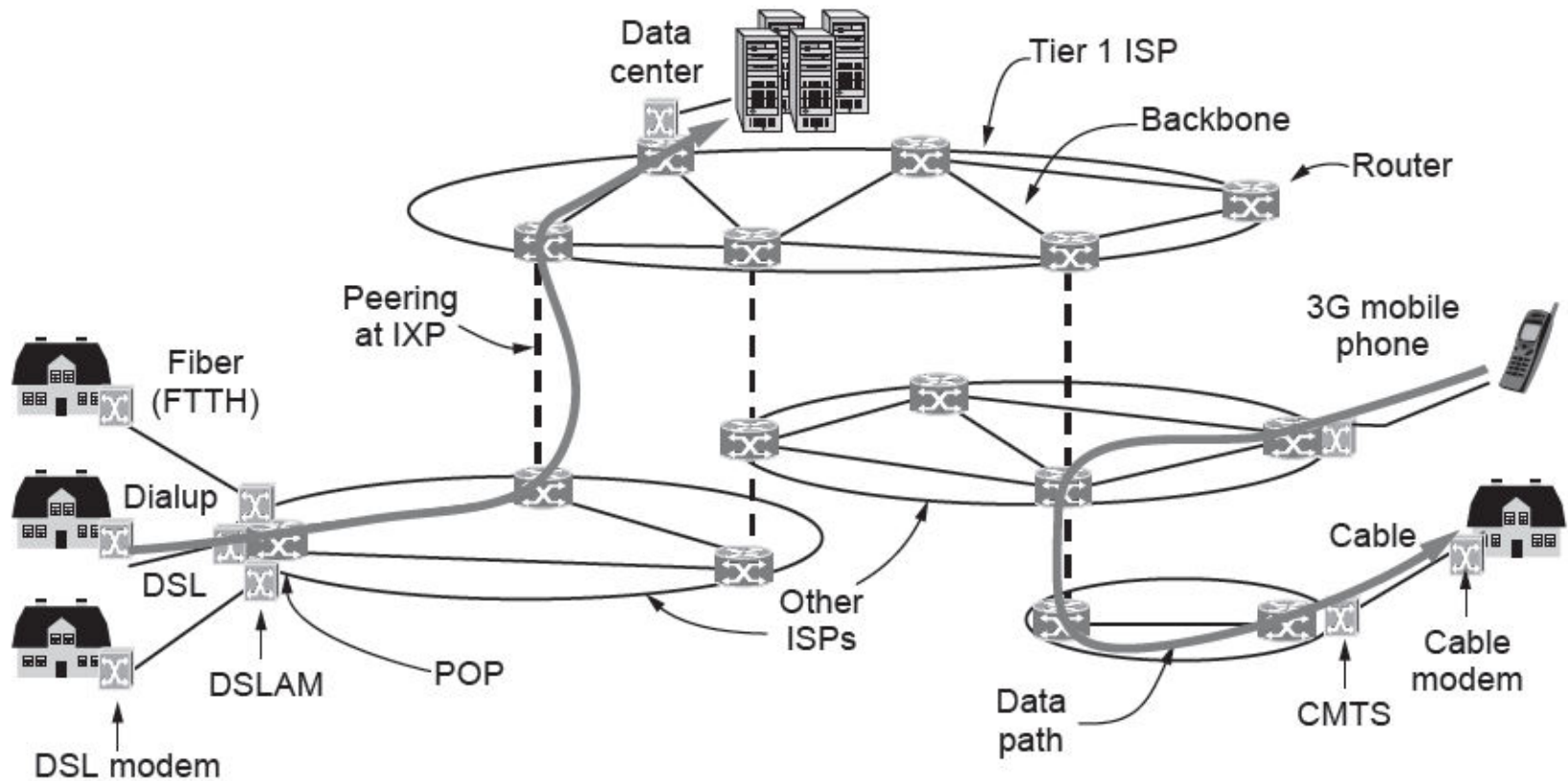

- Growth of the ARPANET (a) December 1969.   (b) July 1970.
- (c) March 1971.   (d) April 1972.   (e) September 1972.

Architecture of the Internet

Key Bodies for Network Standardization

Body	Area	Examples
ITU (International Telecommunication Union)	Telecommunications	ADSL PON MPEG4
IEEE (Institute of Electrical and Electronics Engineers)	Communications	Ethernet, WiFi
IETF (Internet Engineering Task Force)	Internet	HTTP/1.1 DNS
W3C (The World Wide Web Consortium)	Web	HTML5 standard