

Week 2 – Introduction to Networking Continued

COMP90007

Internet Technologies

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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

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Why do we need a network reference model?

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

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OSI Reference Model

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

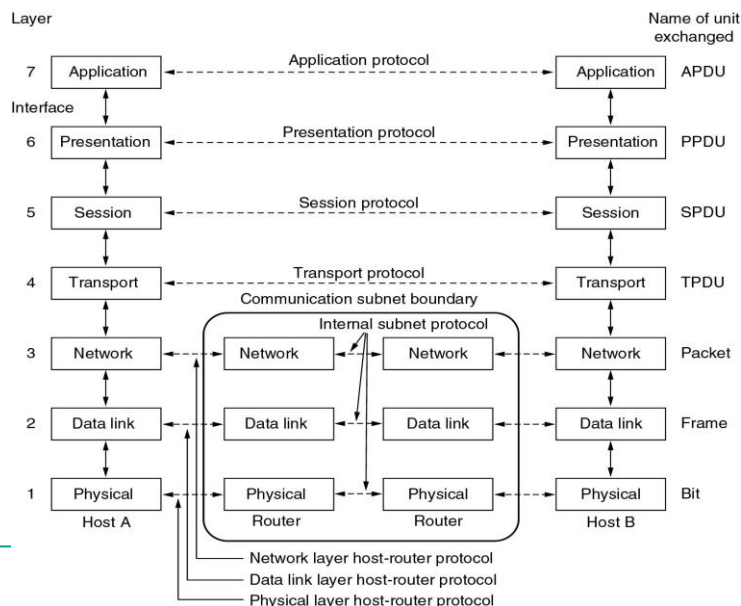
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OSI Layer Division Principles

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

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OSI Reference Model



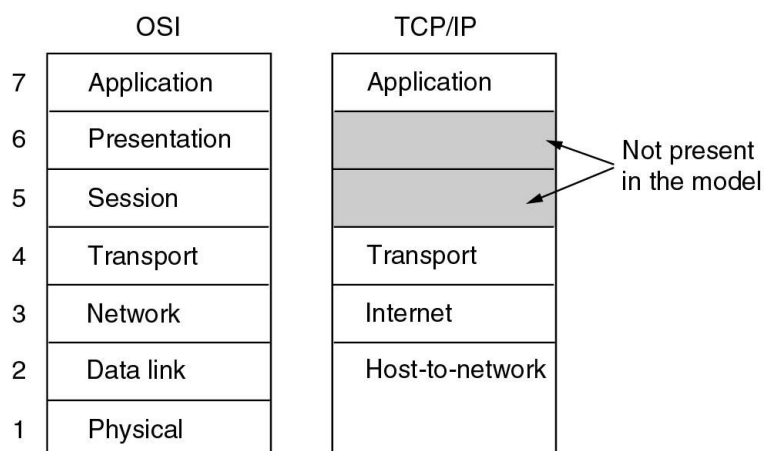
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TCP/IP Reference Model

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

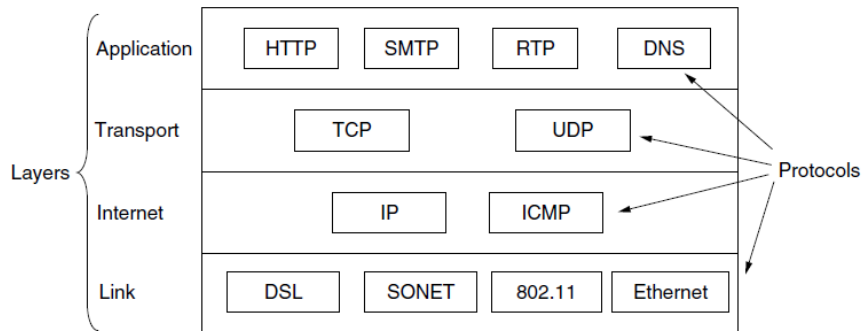
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TCP/IP Reference Model (2)



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TCP/IP Reference Model (3)



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Comparing OSI and TCP/IP Models

Concepts central to the OSI model

- Services
- Interfaces
- Protocols

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A Critique of the OSI Model and Protocols

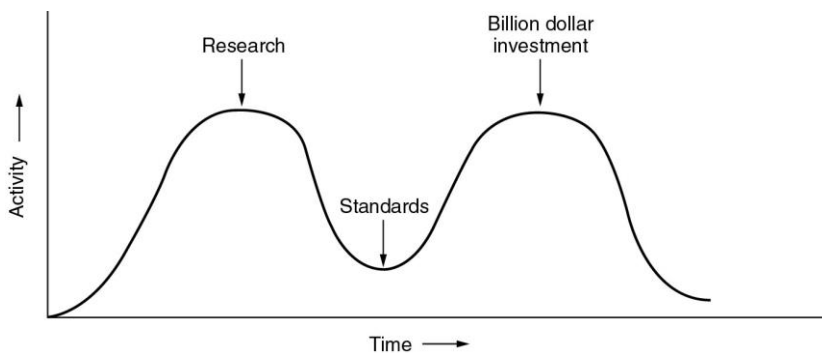
Why OSI did not take over the world?

- Bad timing
- Bad technology
- Bad implementations
- Bad politics

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Bad Timing

- When is good timing for a standard?



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A Critique of the TCP/IP Reference Model

Problems:

- Not a general model
- Service, interface, and protocol not distinguished
- 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

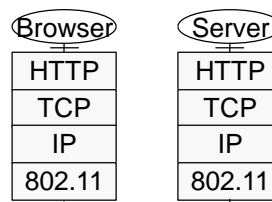
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Hybrid Model

- The hybrid reference model to be used in this semester

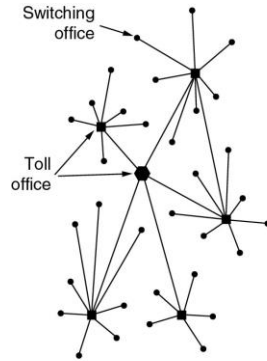
5	Application layer
4	Transport layer
3	Network layer
2	Data link layer
1	Physical layer

A typical network scenario

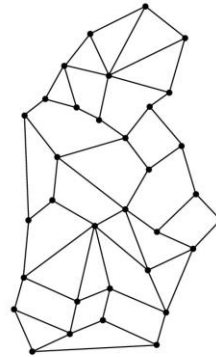


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Origins of Internet: The ARPANET



(a)

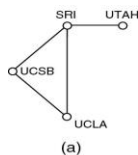


(b)

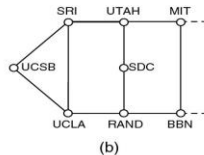
- (a) Structure of the telephone system.
- (b) Baran's proposed distributed switching system.

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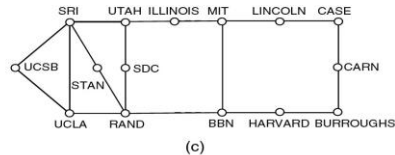
The ARPANET



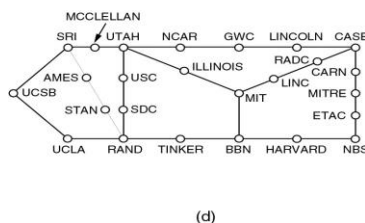
(a)



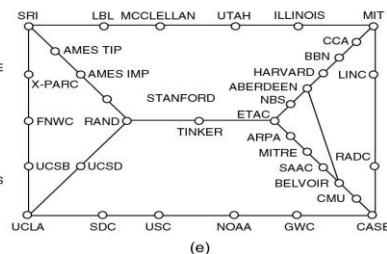
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(c)



(d)

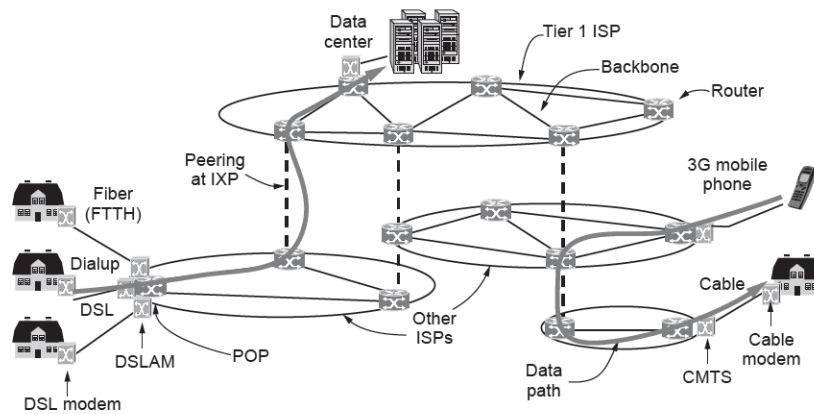


(e)

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

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Architecture of the Internet



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Network Standardisation

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

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