Introduction to Computer Networks

(based on Computer Networks, 5th Edition by Andrew S. Tanenbaum)

by

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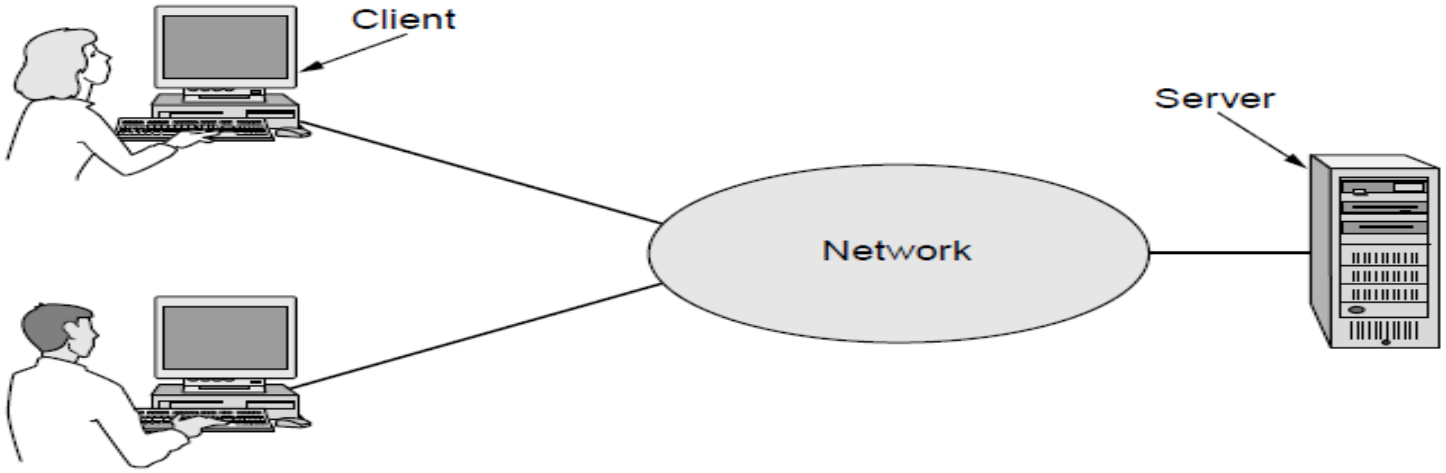
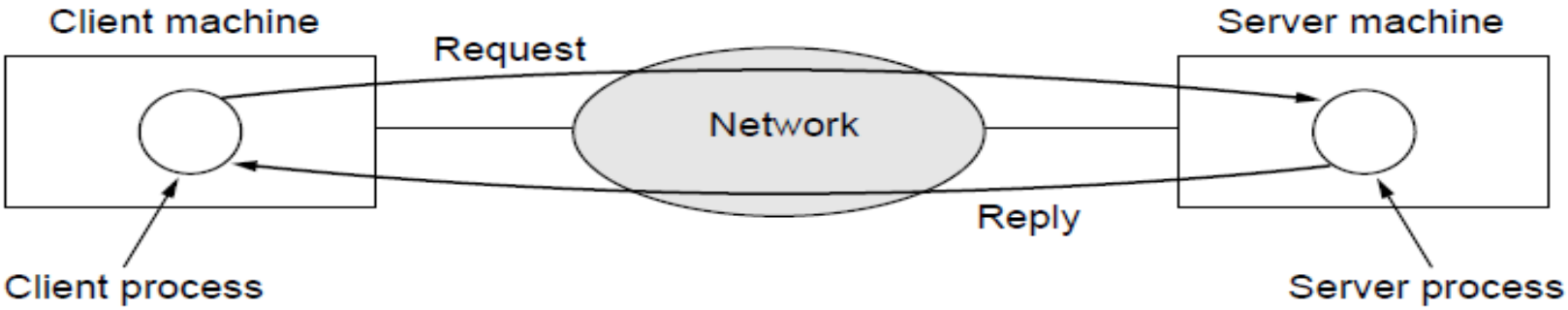
Uses of Computer Networks

- Business Applications
- Home Applications
- Education
- Entertainment
- Media
- Mobile Users
- Social Issues
- Defence

Client Server Environment of Computer Networks



Multiple Clients with a Server



Client Server Communication

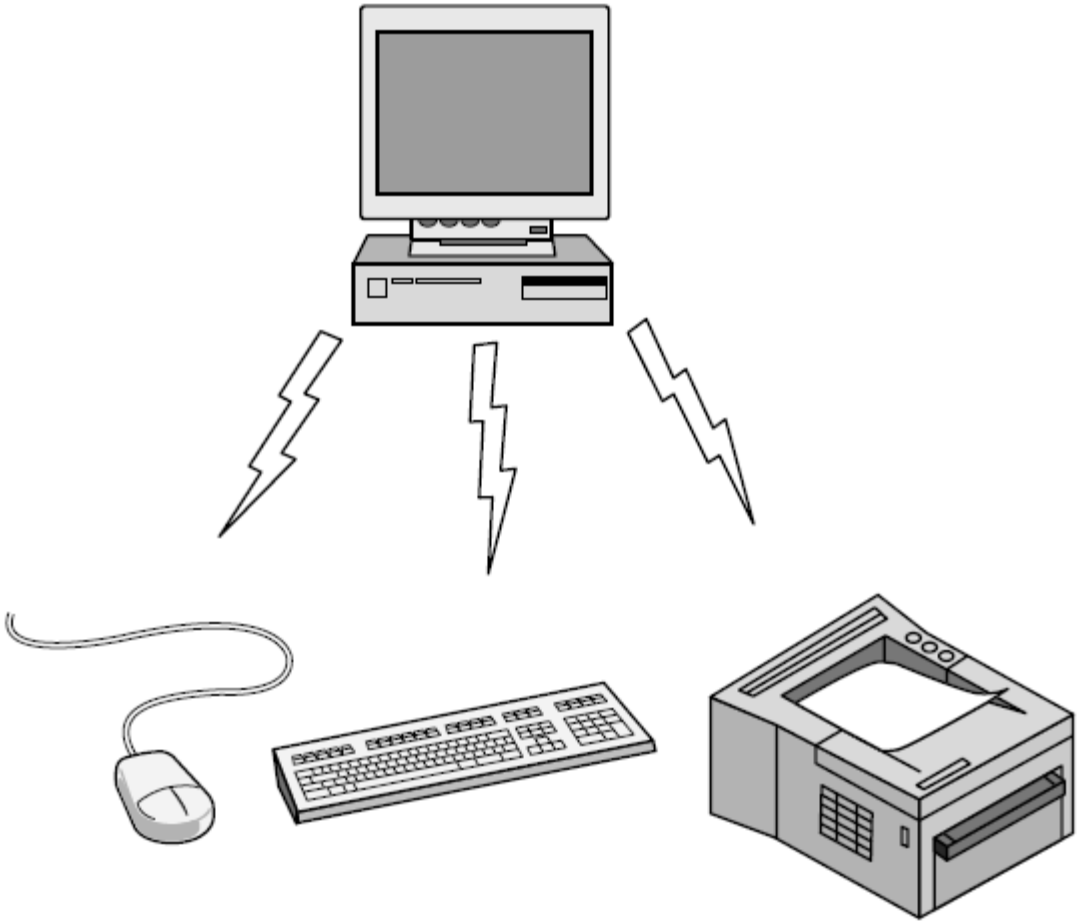
Business(e-Commerce) Applications' Categories

Tag	Full name	Example
B2C	Business-to-consumer	Ordering books online
B2B	Business-to-business	Car manufacturer ordering tires from supplier
G2C	Government-to-consumer	Government distributing tax forms electronically
C2C	Consumer-to-consumer	Auctioning second-hand products online
P2P	Peer-to-peer	Music sharing

Different types of Computer Networks

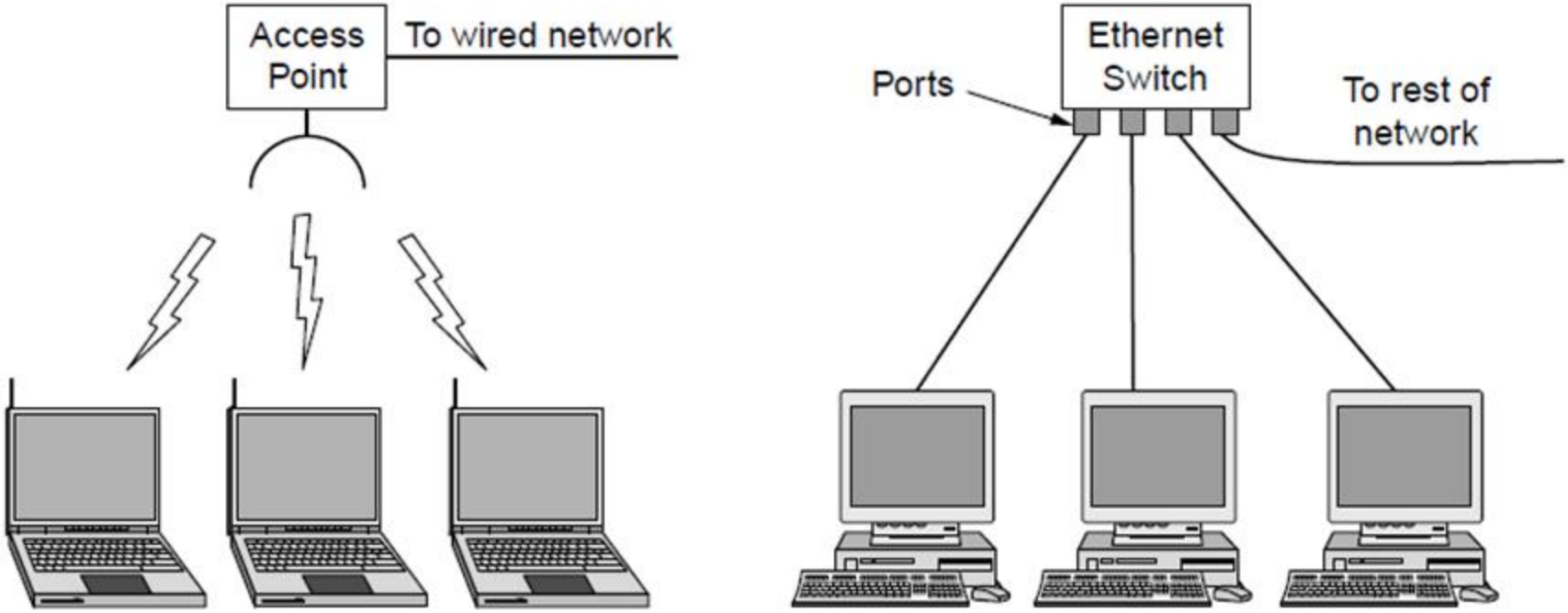
- Personal area networks (bluetooth)
- Local area networks (Ethernet, Token Bus, Token Ring)
- Metropolitan area networks (cable TV Network)
- Wide are networks (mobile networks)
- The internet

Personal Area Network



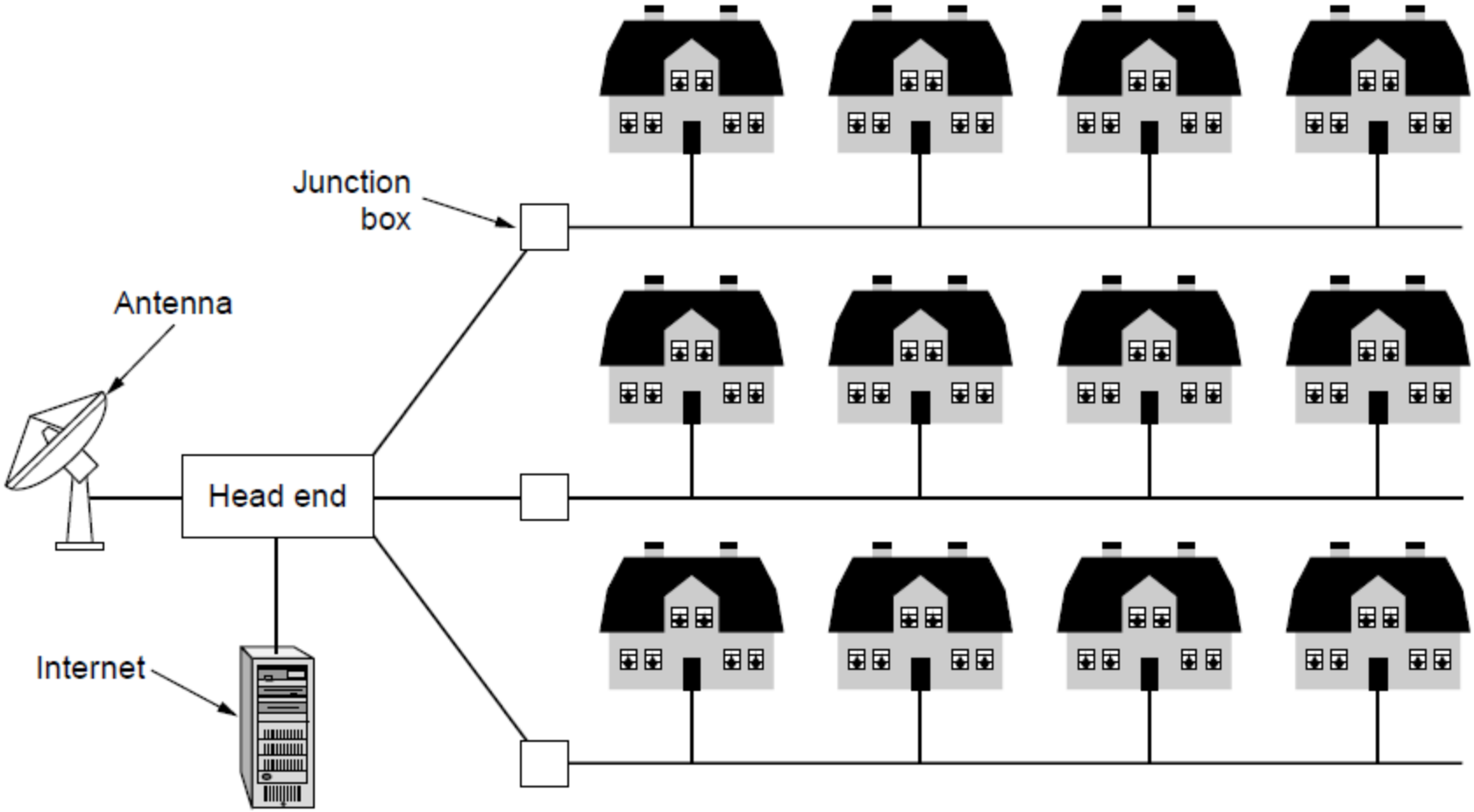
Use of Bluetooth to communicate among personal devices

Local Area Network (LAN)



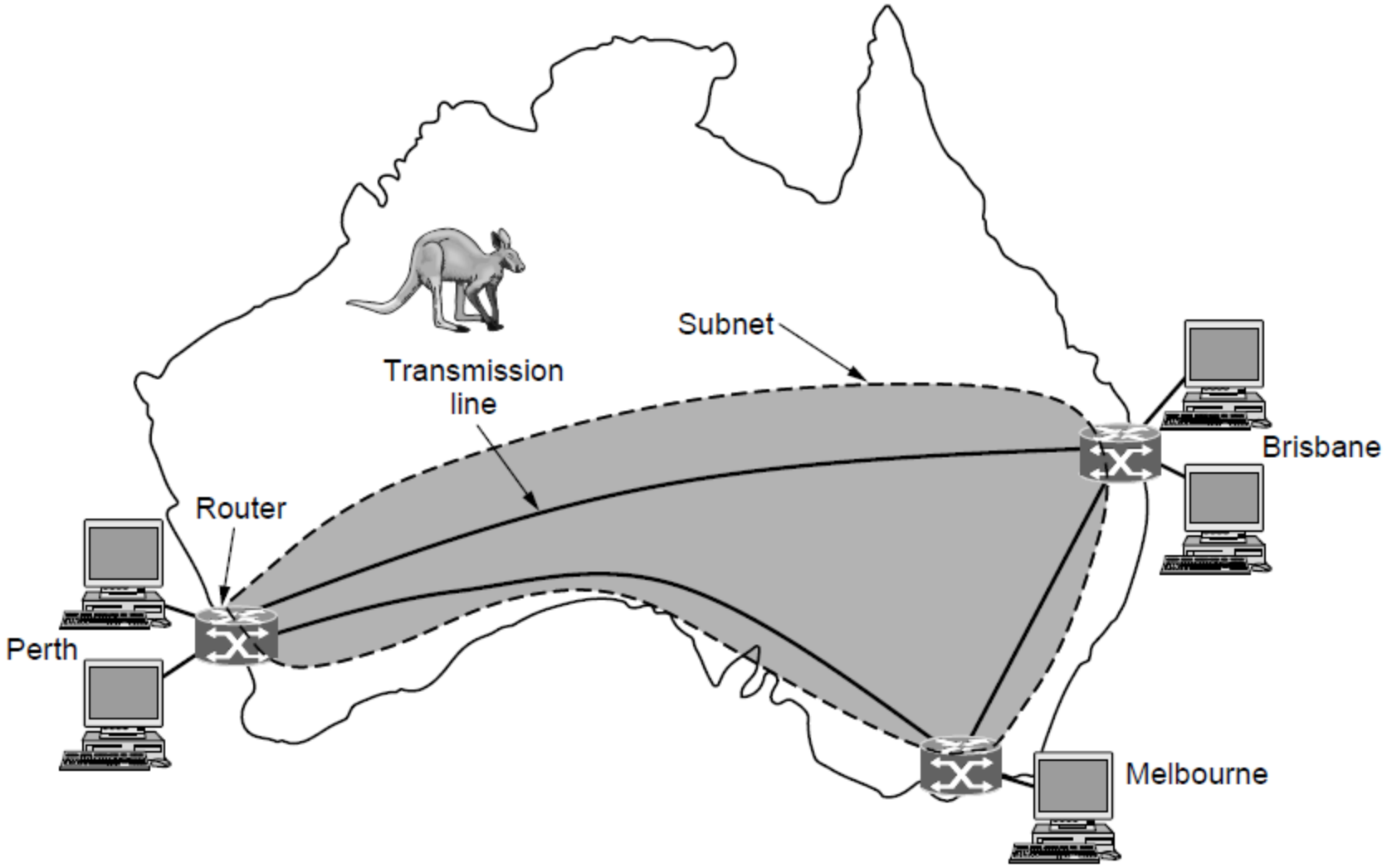
Wireless and wired LANs. (a) 802.11. (b) Switched Ethernet.

Metropolitan Area Network (MAN)



A metropolitan area network for Cable TV.

Wide Area Network (WAN)

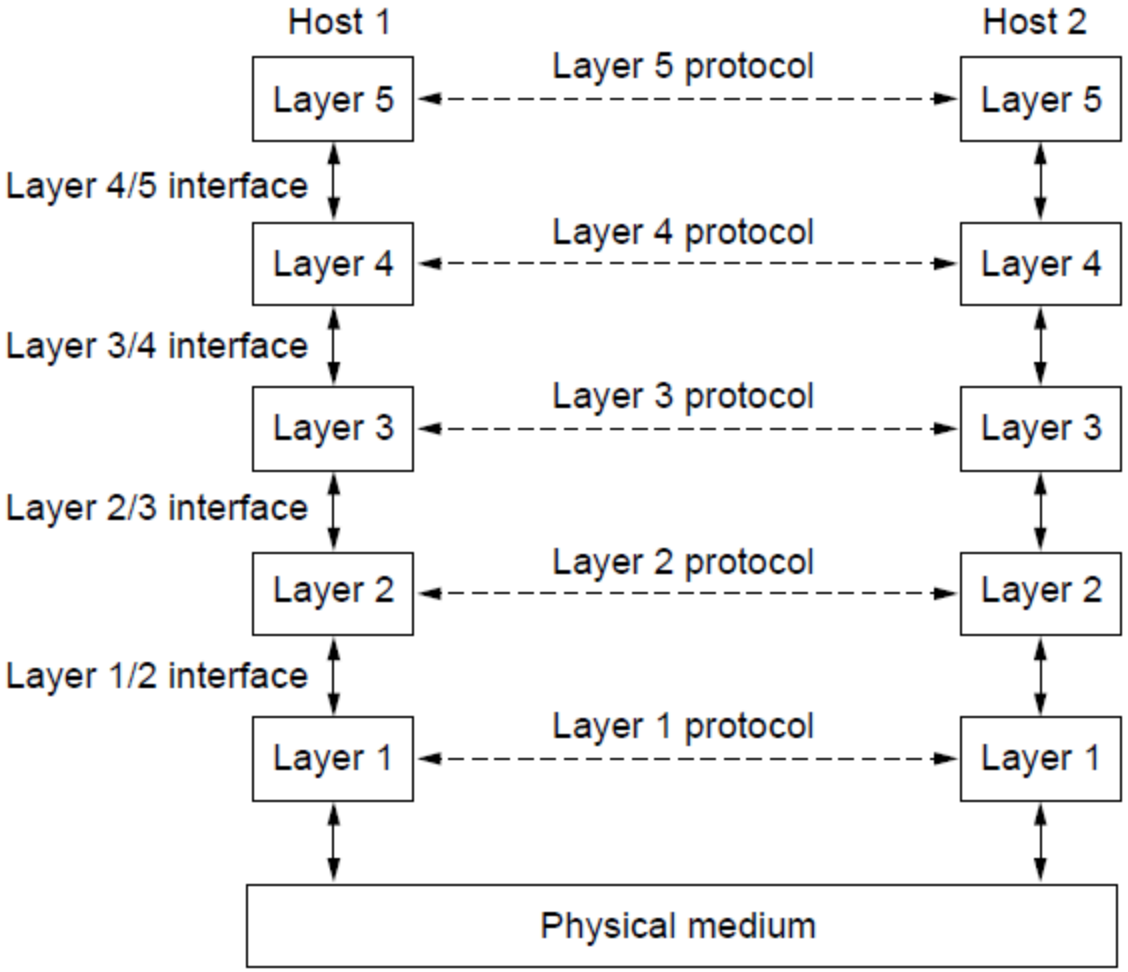


WAN that connects three branch offices in Australia

Network Software Issues

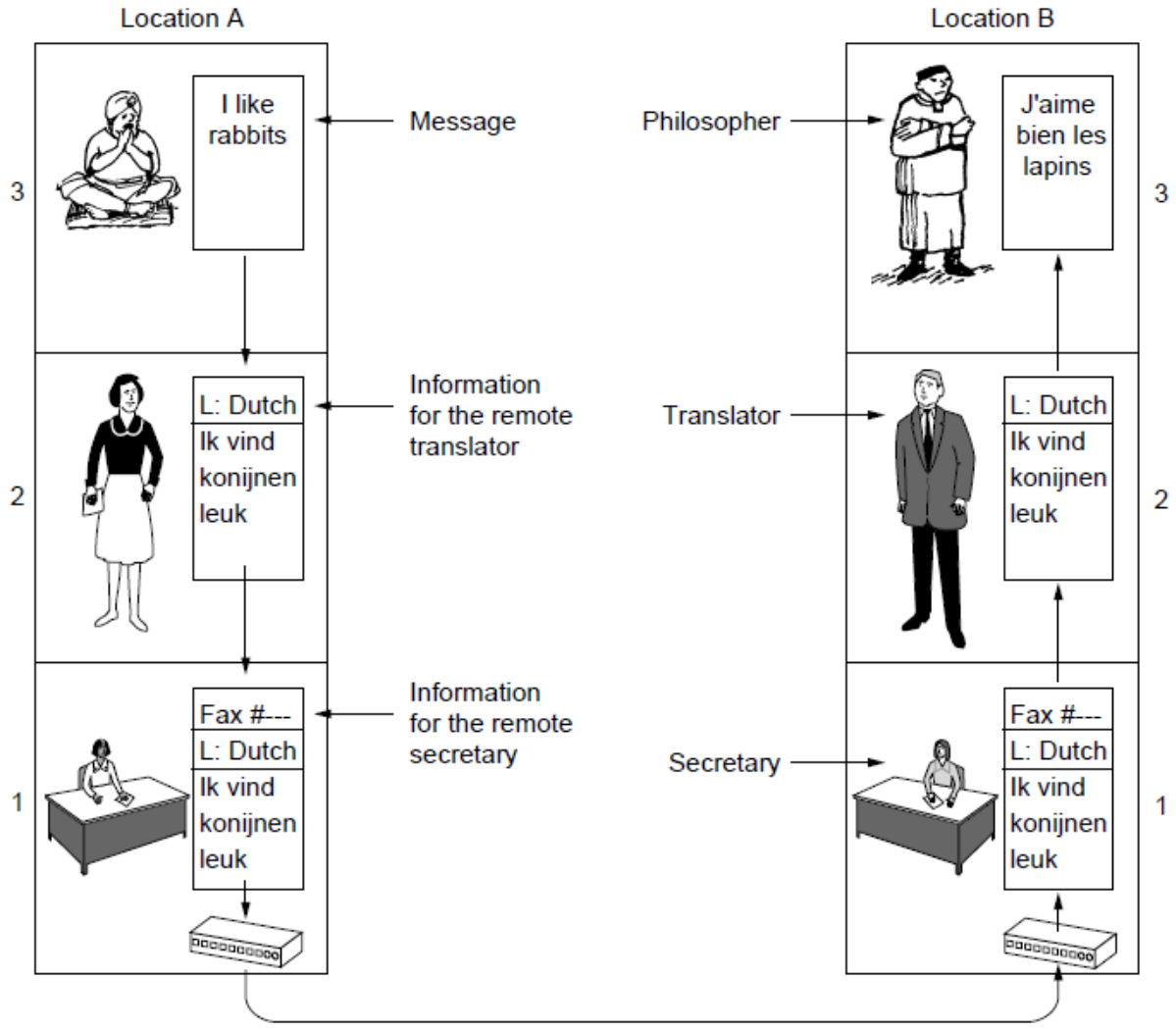
- Protocol hierarchies
- Design issues for the layers
- Connection-oriented versus connectionless service

Layered Architecture and Protocol Hierarchies



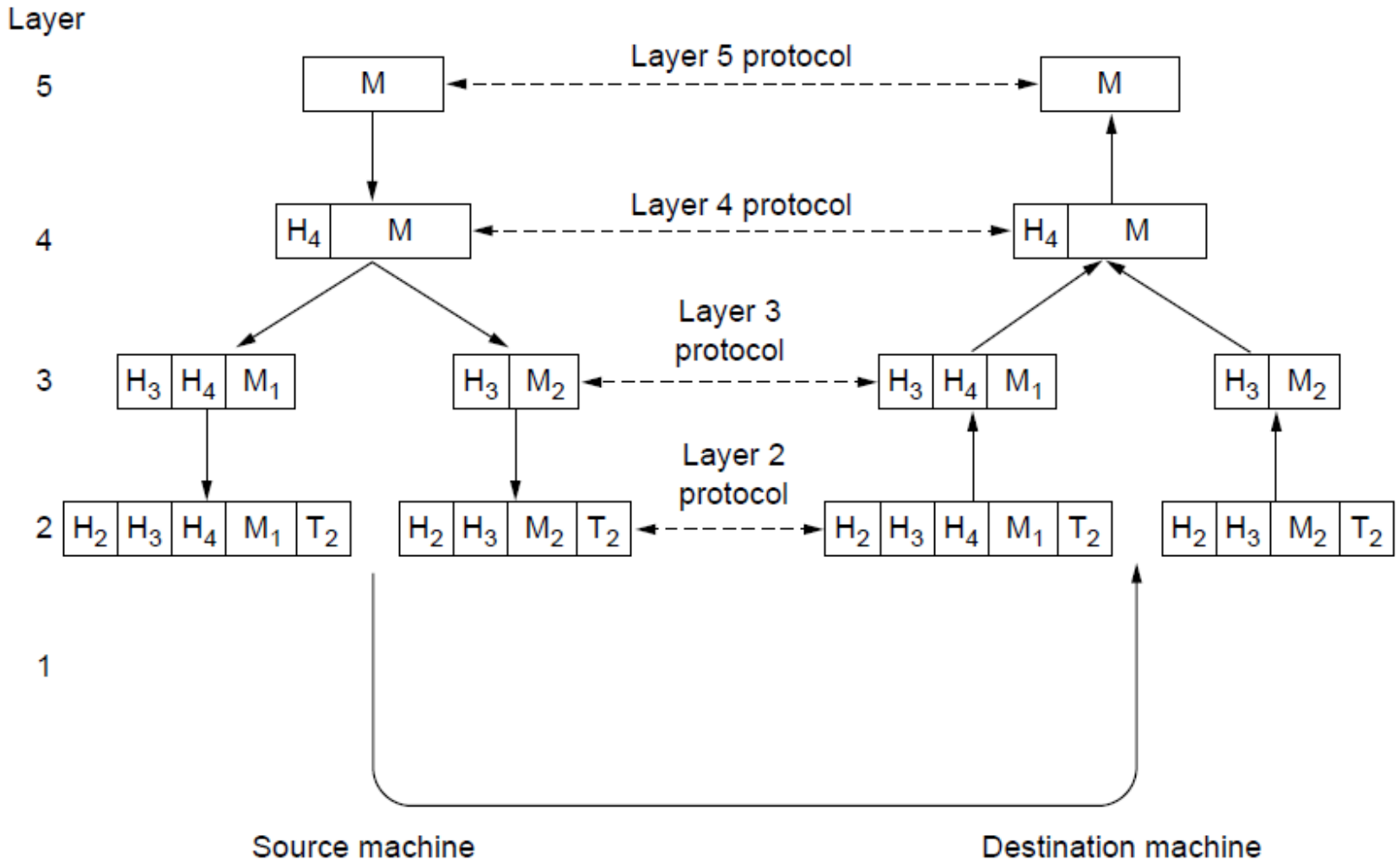
Layers, protocols, and interfaces.

Layered Architecture: A Simple Example



The philosopher-translator-secretary architecture

Flow of Data and Control Information (Header, Trailer) in Layered Architecture



Connection-Oriented vs. Connectionless Service

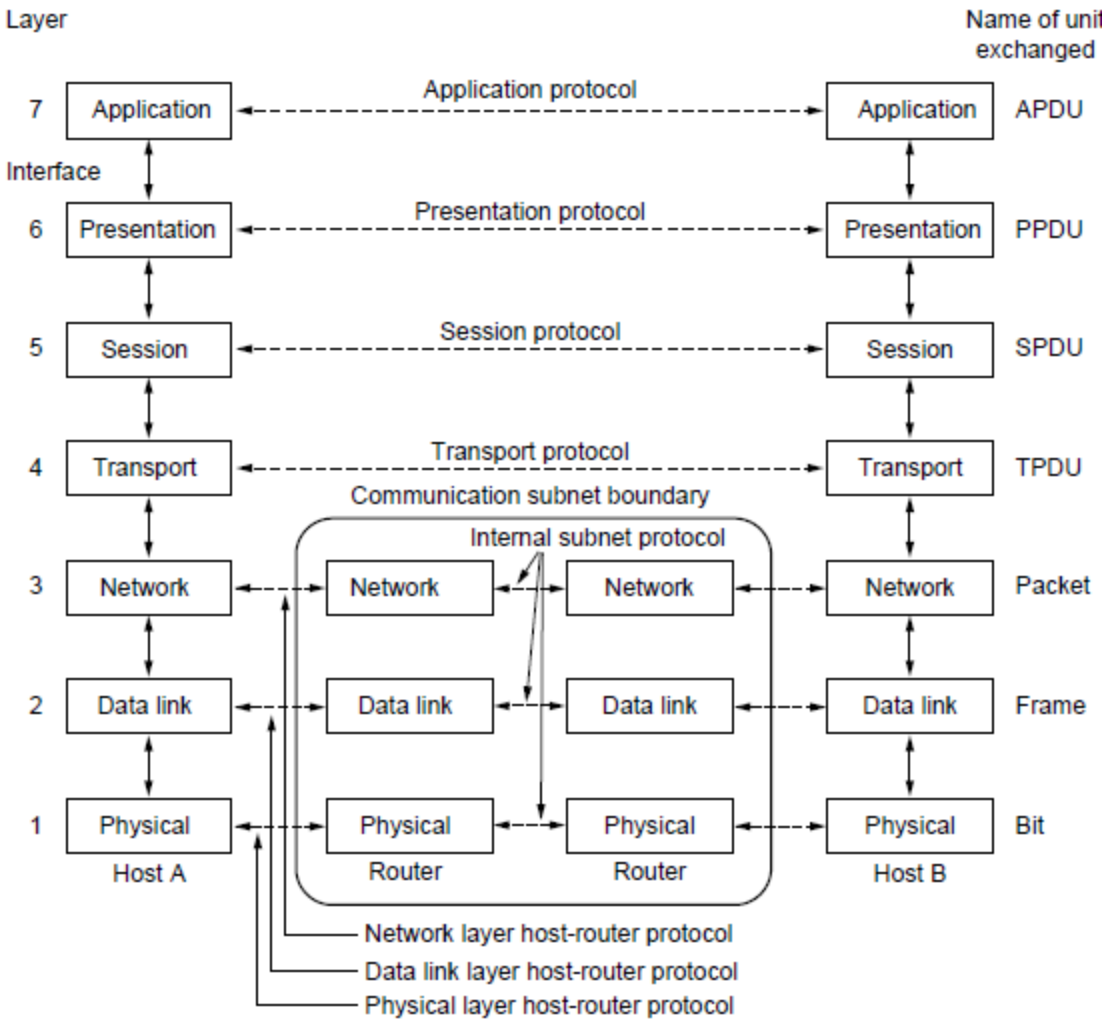
	Service	Example
Connection-oriented	Reliable message stream	Sequence of pages
	Reliable byte stream	Movie download
	Unreliable connection	Voice over IP
Connectionless	Unreliable datagram	Electronic junk mail
	Acknowledged datagram	Text messaging
	Request-reply	Database query

The OSI Reference Model

Principles behind layered architecture:

- Layers created for different abstractions
- Each layer performs well-defined function
- Function of layer chosen with definition of international standard protocols in mind
- Minimize information flow across interfaces between boundaries
- Number of layers optimum

The OSI Reference Model



The OSI reference model

OSI Reference Model Layers

- Application Layer
- Presentation layer
- Session layer
- Transport layer
- Network layer
- Data Link Layer (Logic Link Control (LLC) sublayer on top of Medium Access Control (MAC) sublayer)
- Physical Layer

Critique of the OSI Model and Protocols

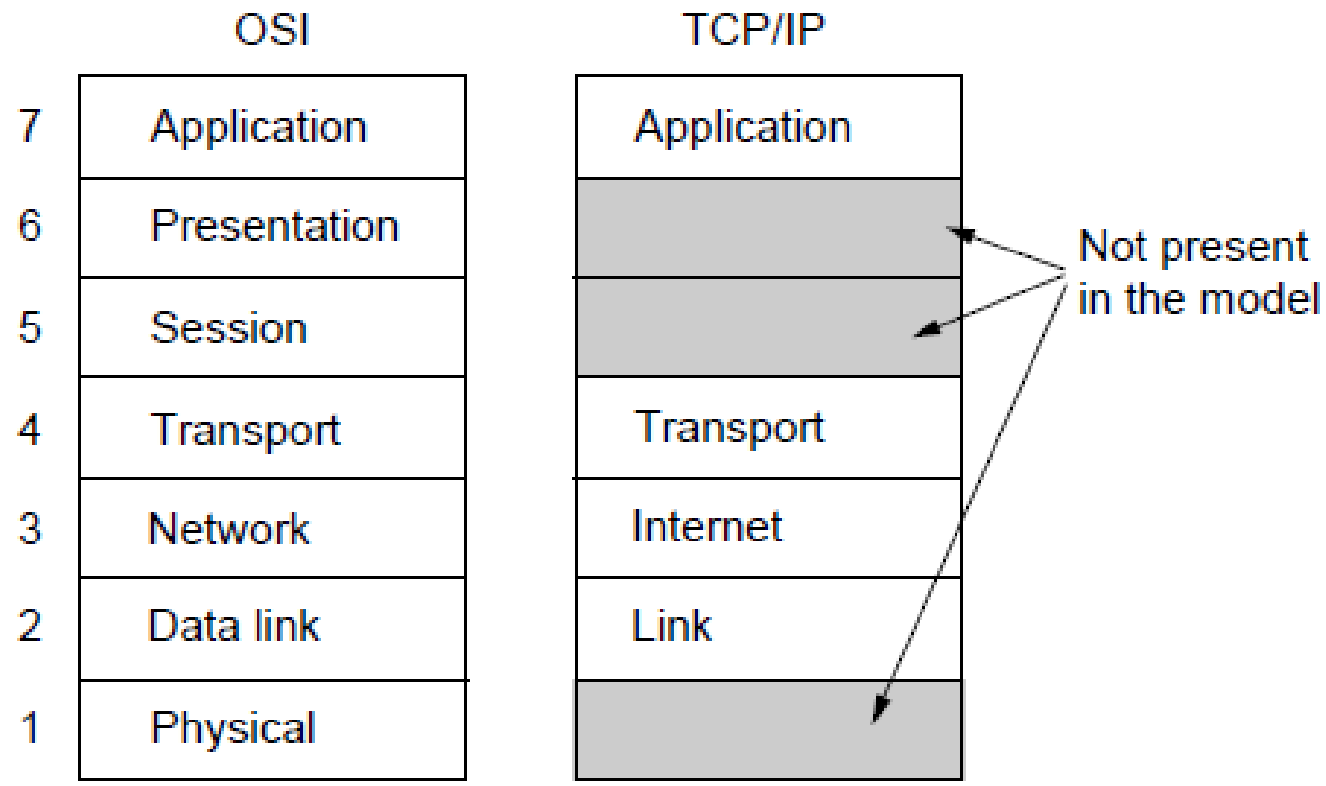
- Bad timing.
- Bad technology.
- Bad implementations.
- Bad politics.

The TCP/IP Reference Model Layers

TCP/IP Reference Model consists of four Layers:

- Application layer
- Transport Layer
- Internet Layer
- Host to Network (Link) Layer

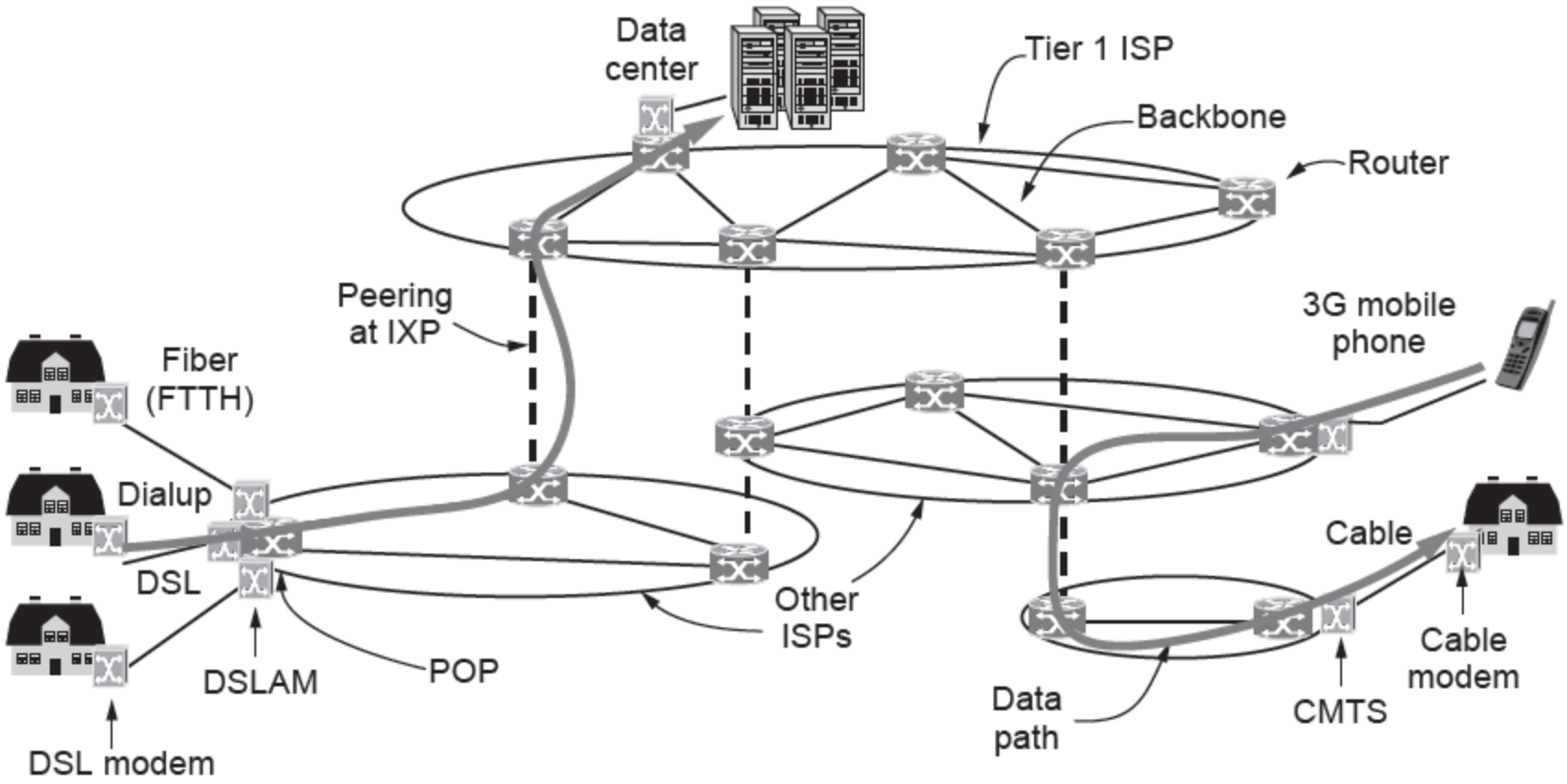
OSI vs. TCP/IP Reference Models



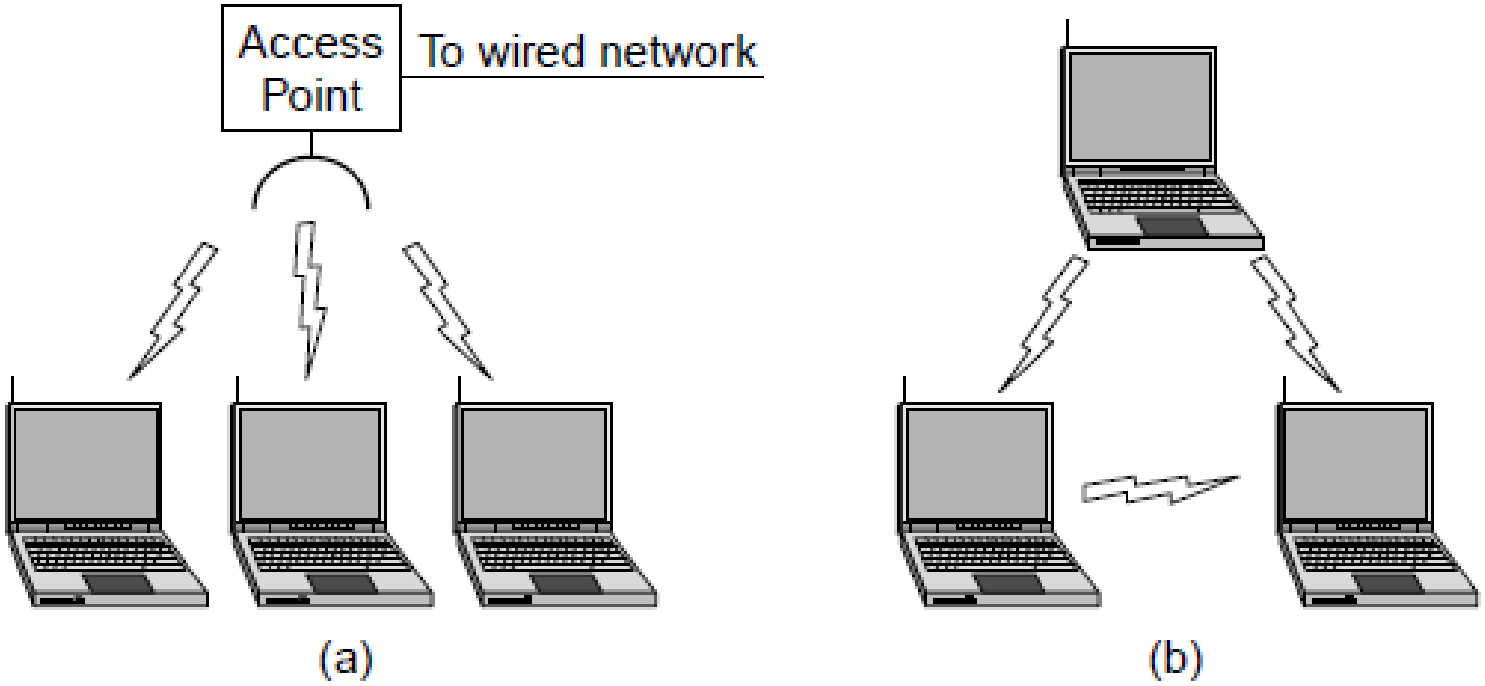
Comparison of OSI and TCP/IP Reference Models

SNo	OSI Ref. Model	TCP/IP Ref. Model
1	Seven Layers	Four Layers
2	Model came first	Protocol came first and the model was just a description of the existing protocols
3	Protocols are better hidden and can be replaced relatively easily	As the model is built on top of protocols, protocols cannot be replaced
4	Never used practically	Mostly Used practically
5	Supports both connectionless and connection oriented communication in the network layer	Supports only connectionless communication in the network (internet) layer
	Supports only connection-oriented service in the transport layer	Supports both connectionless and connection oriented communication in the transport layer
6	introduced by ISO (International Standard Organization)	Developed by DoD USA.
7	Conceptual /Theoretical Model	Client-Server Model used for transmission of data over the Internet

Architecture of the Internet



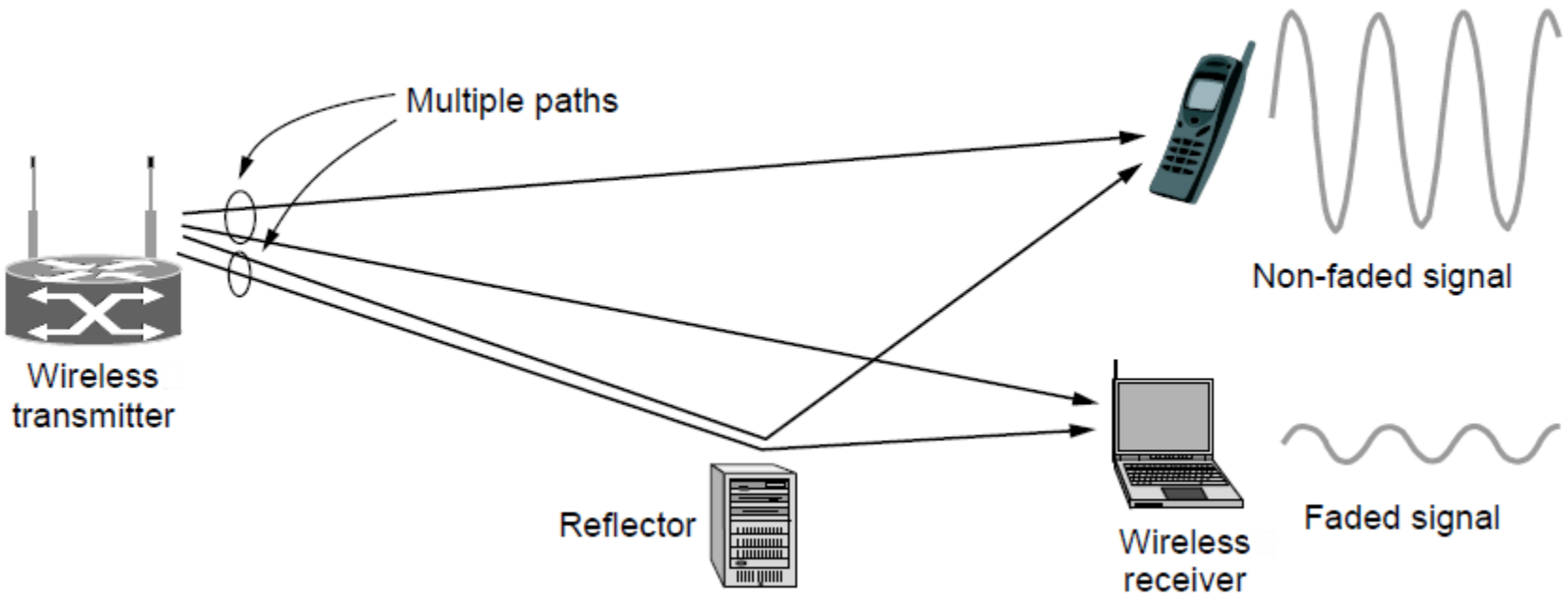
Wireless LAN: 802.11



(a) Wireless network with an access point.

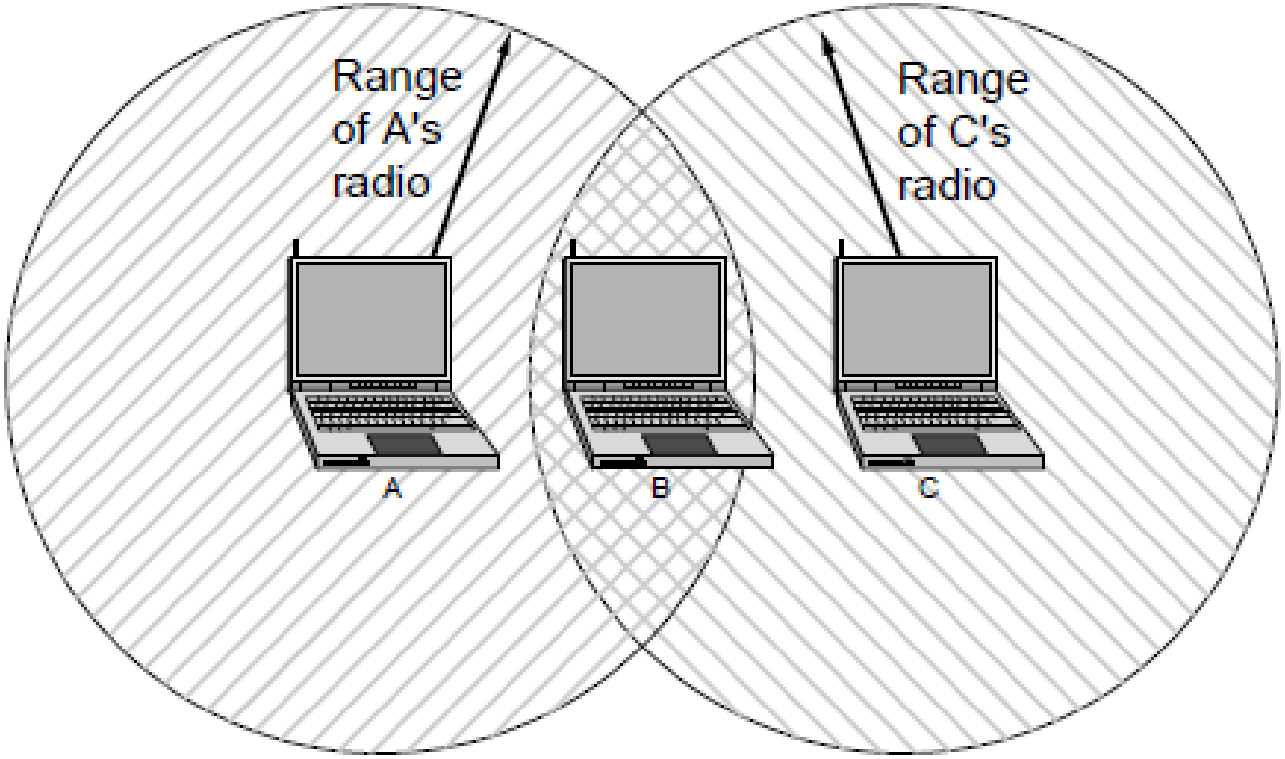
(b) Ad hoc network.

Wireless LANs: 802.11 (Issues)



Impact of Multipath fading

Wireless LANs: 802.11 (Range of Siganals)



Thank You