

NTPU, Department of Computer Science and Information Engineering

Chapter 0

Computer Networking:

A Top Down Approach , 4th edition. Jim Kurose, Keith Ross Addison-Wesley, July 2007.





James F. Kurose • Keith W. Ross



Teaching Instructor Yuh-Shyan Chen, Professor

http://www.csie.ntpu.edu.tw/~yschen/

□ yschen@mail.ntpu.edu.tw



Outline

Chapter 0: Syllabus Chapter 1: Introduction **Chapter 2: Application Layer** Chapter 3: Transport Layer Chapter 4: Network Layer Chapter 5: Link Layer and LANs **Chapter 6: Wireless and Mobile Networks** Chapter 7: Multimedia Networking Chapter 8: Network Security Chapter 9: Network Management



Chapter 1 Introduction





Chapter 1: Introduction

Our goal:

- get "feel" and terminology
- more depth, detail later in course
- □ approach:
 - use Internet as example

Overview:

- □ what's the Internet?
- what's a protocol?
- network edge; hosts, access net, physical media
- network core: packet/circuit switching, Internet structure
- performance: loss, delay, throughput
- security
- □ protocol layers, service models
- □ history



Chapter 2 Application Layer





Chapter 2: Application layer

- 2.1 Principles of network applications
 2.2 Web and UTTP
- □ 2.2 Web and HTTP
- **2**.3 FTP
- 2.4 Electronic Mail
 SMTP, POP3, IMAP
 2.5 DNS

- □ 2.6 P2P Applications
- 2.7 Socket programming with TCP
- 2.8 Socket programming with UDP



Chapter 2: Application Layer

Our goals:

- conceptual, implementation aspects of network application protocols
 - transport-layer service models
 - client-server paradigm
 - peer-to-peer
 paradigm

- learn about protocols
 by examining popular
 application-level
 protocols
 - HTTP
 - FTP
 - SMTP / POP3 / IMAP
 - DNS
- programming network applications
 o socket API



Chapter 3 Transport Layer





Chapter 3: Transport Layer

Our goals:

- understand principles
 behind transport layer
 services:
 - multiplexing/demultip lexing
 - reliable data transfer
 - flow control
 - congestion control

- learn about transport layer protocols in the Internet:
 - UDP: connectionless transport
 - TCP: connection-oriented transport
 - TCP congestion control



Chapter 3 outline

- 3.1 Transport-layer services
- 3.2 Multiplexing and demultiplexing
- 3.3 Connectionless transport: UDP
- 3.4 Principles of reliable data transfer

- 3.5 Connection-oriented transport: TCP
 - segment structure
 - reliable data transfer
 - flow control
 - connection management
- 3.6 Principles of congestion control
- 3.7 TCP congestion control



Chapter 4 Network Layer





Chapter 4: Network Layer

Chapter goals:

- understand principles behind network layer services:
 - network layer service models
 - forwarding versus routing
 - how a router works
 - routing (path selection)
 - dealing with scale
 - advanced topics: IPv6, mobility

□ instantiation, implementation in the Internet



Chapter 4: Network Layer

4. 1 Introduction

- 4.2 Virtual circuit and datagram networks
- 4.3 What's inside a router
- □ 4.4 IP: Internet Protocol
 - Datagram format
 - IPv4 addressing
 - ICMP
 - IPv6

□ 4.5 Routing algorithms

- Link state
- Distance Vector
- Hierarchical routing
- 4.6 Routing in the Internet
 - RIP
 - OSPF
 - BGP
- 4.7 Broadcast and multicast routing



Chapter 5 Link Layer and LAN



Computer

4th



Chapter 5: The Data Link Layer

Our goals:

- understand principles behind data link layer services:
 - error detection, correction
 - sharing a broadcast channel: multiple access
 - link layer addressing
 - reliable data transfer, flow control: *done!*
- instantiation and implementation of various link layer technologies



Link Layer

- 5.1 Introduction and services
- 5.2 Error detection and correction
- 5.3Multiple access protocols
- 5.4 Link-Layer Addressing
- □ 5.5 Ethernet

- **5**.6 Hubs and switches
- □ 5.7 PPP
- 5.8 Link Virtualization: ATM and MPLS



Chapter 6 Wireless and Mobile Networks





Chapter 6: Wireless and Mobile Networks

Background:

- # wireless (mobile) phone subscribers now exceeds # wired phone subscribers!
- computer nets: laptops, palmtops, PDAs, Internetenabled phone promise anytime untethered Internet access
- two important (but different) challenges
 - *wireless:* communication over wireless link
 - *mobility:* handling the mobile user who changes point of attachment to network



Chapter 6 outline

6.1 Introduction

Wireless

- 6.2 Wireless links, characteristics
 - CDMA
- □ 6.3 IEEE 802.11 wireless LANs ("wi-fi")
- 6.4 Cellular Internet Access
 - architecture
 - standards (e.g., GSM)

Mobility

- 6.5 Principles: addressing and routing to mobile users
- **Geometry** 6.6 Mobile IP
- 6.7 Handling mobility in cellular networks
- 6.8 Mobility and higherlayer protocols

6.9 Summary



4th

Chapter 7 Multimedia Networking





Chapter 7: Goals

Principles

- **c**lassify multimedia applications
- □ identify network services applications need
- □ making the best of best effort service
- **Protocols and Architectures**
- □ specific protocols for best-effort
- mechanisms for providing QoS
- □ architectures for QoS



Chapter 7 outline

- 7.1 multimedia networking applications
- 7.2 streaming stored audio and video
- 7.3 making the best out of best effort service
- 7.4 protocols for real-time interactive applications RTP,RTCP,SIP

- 7.5 providing multiple classes of service
- 7.6 providing QoS guarantees



Chapter 8 Network Security





Chapter 8: Network Security

Chapter goals:

- understand principles of network security:
 - cryptography and its *many* uses beyond "confidentiality"
 - o authentication
 - message integrity
- □ security in practice:
 - firewalls and intrusion detection systems
 - security in application, transport, network, link layers



Chapter 8 roadmap

8.1 What is network security? 8.2 Principles of cryptography 8.3 Message integrity 8.4 End point authentication 8.5 Securing e-mail **8.6** Securing TCP connections: SSL 8.7 Network layer security: IPsec 8.8 Securing wireless LANs 8.9 Operational security: firewalls and IDS



Chapter 9 Network Management





Chapter 9: Network Management

Chapter goals:

□ introduction to network management

o motivation

• major components

□ Internet network management framework

- MIB: management information base
- SMI: data definition language
- SNMP: protocol for network management
- security and administration

□ presentation services: ASN.1



Chapter 9 outline

□ What is network management?

□ Internet-standard management framework

- Structure of Management Information: SMI
- Management Information Base: MIB
- SNMP Protocol Operations and Transport Mappings
- Security and Administration

ASN.1





Computer network (70%) 期中考 (30%) 期末考 (30%) Homeworks (10%)

Computer network 實習課 (30%)) 實習成績 (出席)) Homeworks