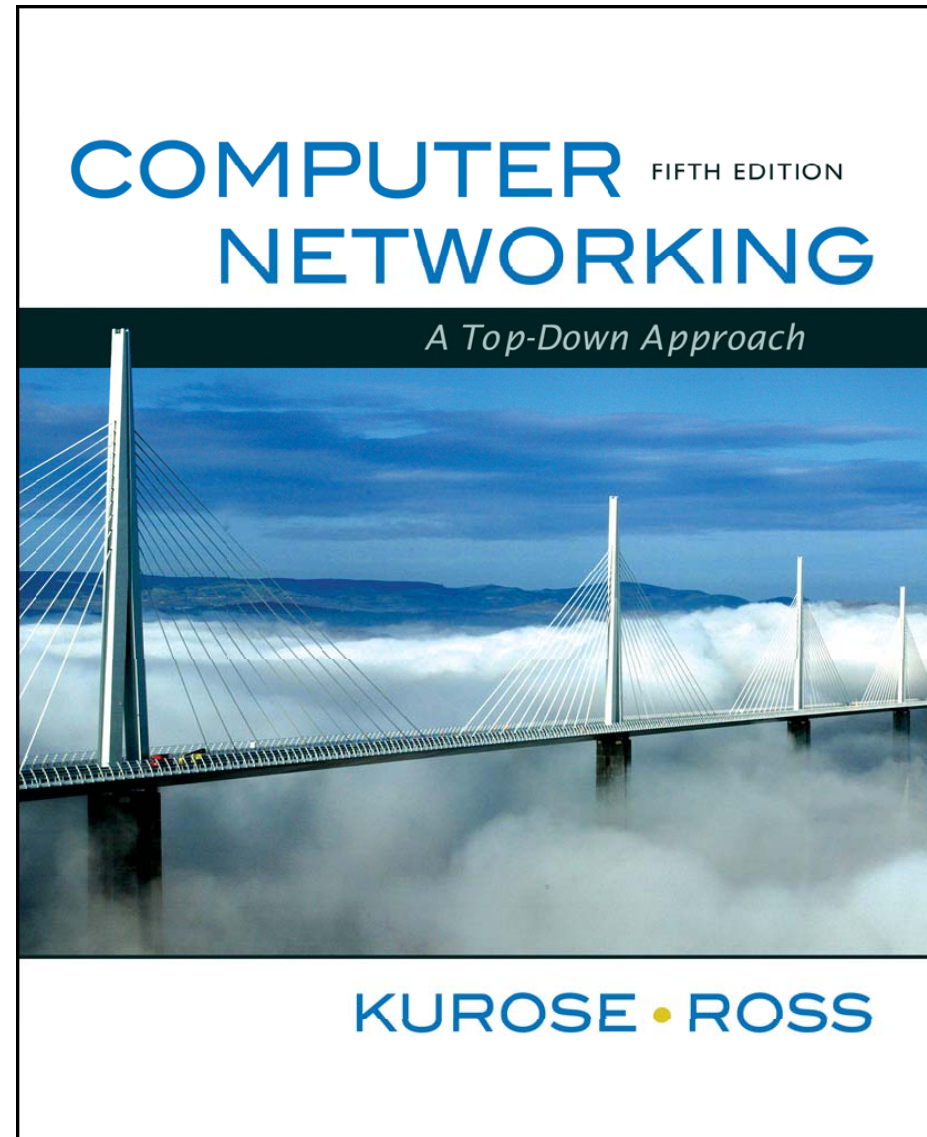


# Chapter 0

*Computer Networking:  
A Top Down Approach ,  
5<sup>th</sup> edition.*

Jim Kurose, Keith Ross  
Addison-Wesley, April  
2009.

歐亞書局代理



# Teaching Instructor

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# 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

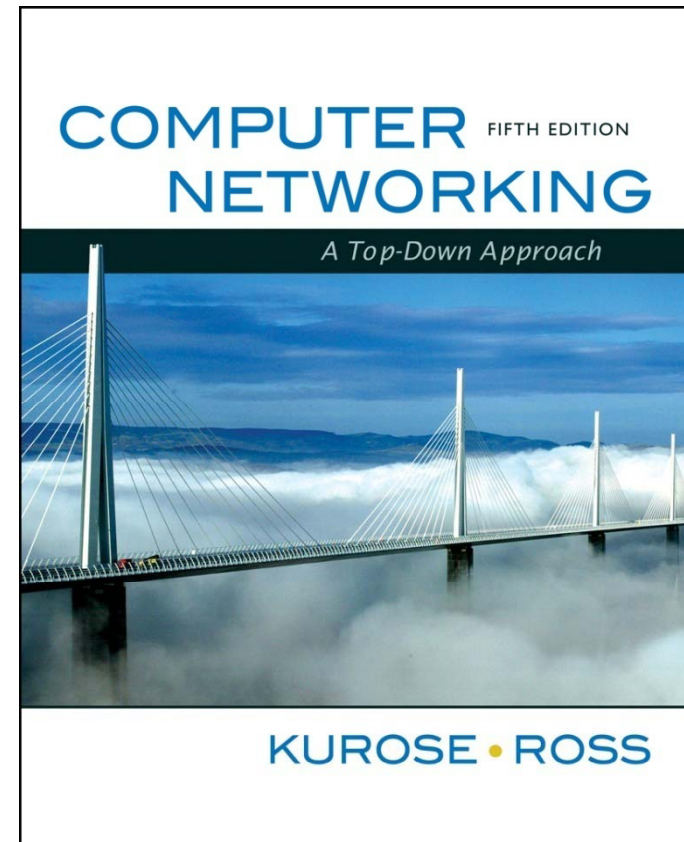
Chapter 7: Multimedia Networking

Chapter 8: Network Security

Chapter 9: Network Management

# Chapter 1

## Introduction



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# Chapter 1: Introduction

## Our goal:

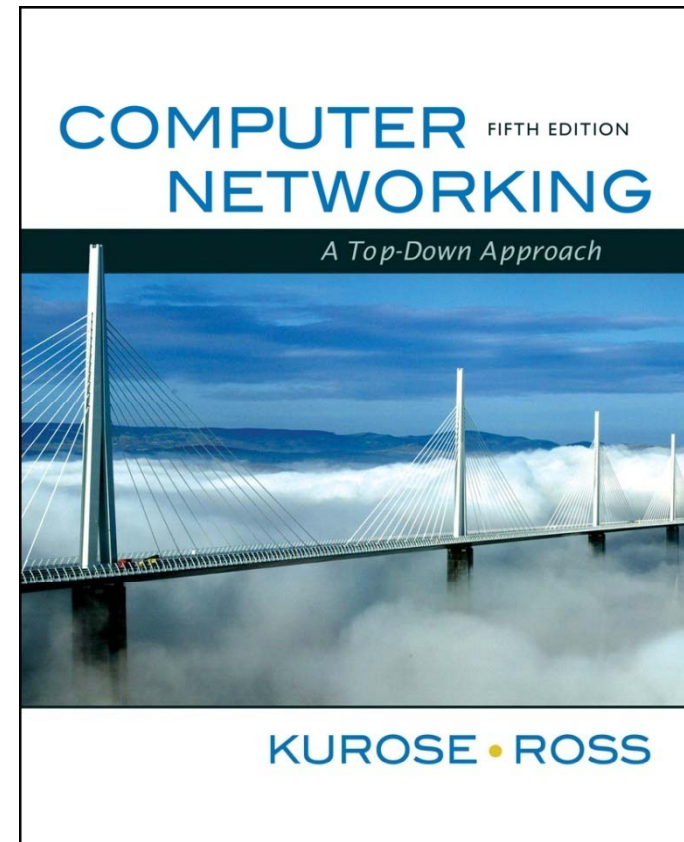
- ❑ get “feel” and terminology
- ❑ more depth, detail *later* in course
- ❑ approach:
  - use Internet as example

## 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



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# 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
  - socket API

# Chapter 2: Application Layer

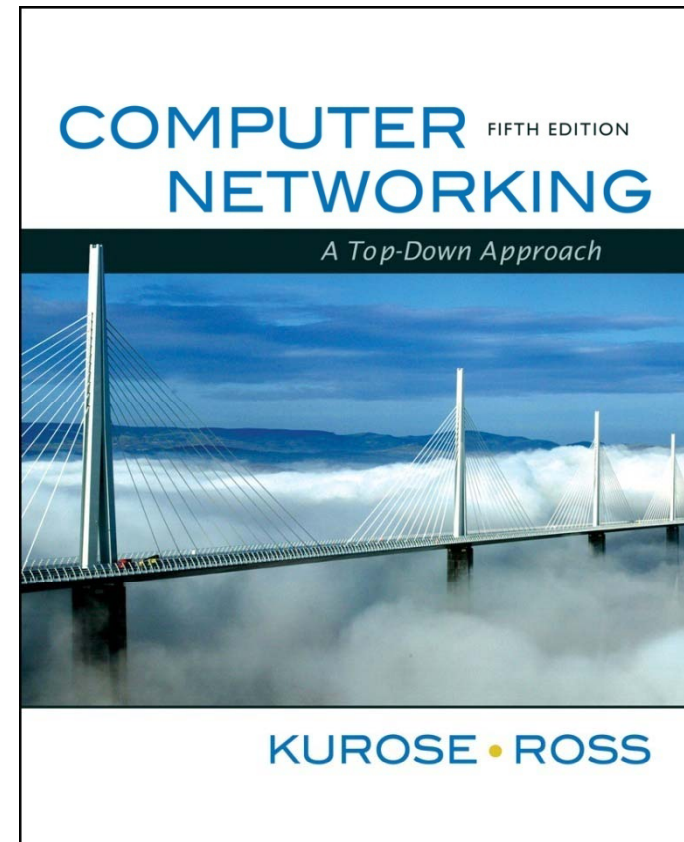
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# Chapter 3

## Transport Layer



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# Chapter 3: Transport Layer

## Our goals:

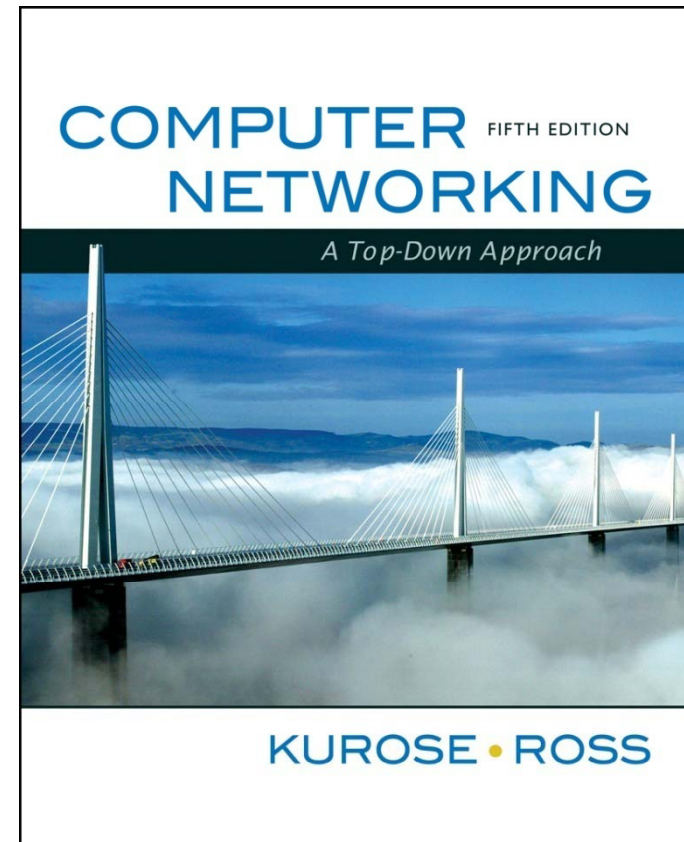
- ❑ understand principles behind transport layer services:
  - multiplexing/demultiplexing
  - reliable data transfer
  - flow control
  - congestion control
- ❑ learn about transport layer protocols in the Internet:
  - UDP: connectionless transport
  - TCP: connection-oriented transport
  - TCP congestion 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



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# Chapter 4: Network Layer

## Chapter goals:

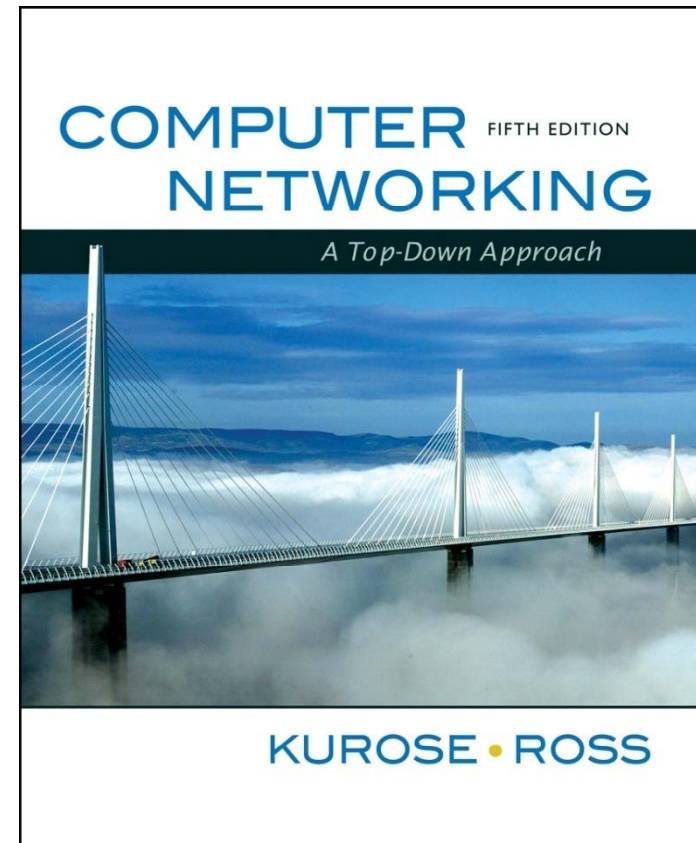
- ❑ understand principles behind network layer services:
  - network layer service models
  - forwarding versus routing
  - how a router works
  - routing (path selection)
  - dealing with scale
  - advanced topics: IPv6, mobility
- ❑ instantiation, implementation in the Internet

# 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 LANs



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Addison-Wesley, April  
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# 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

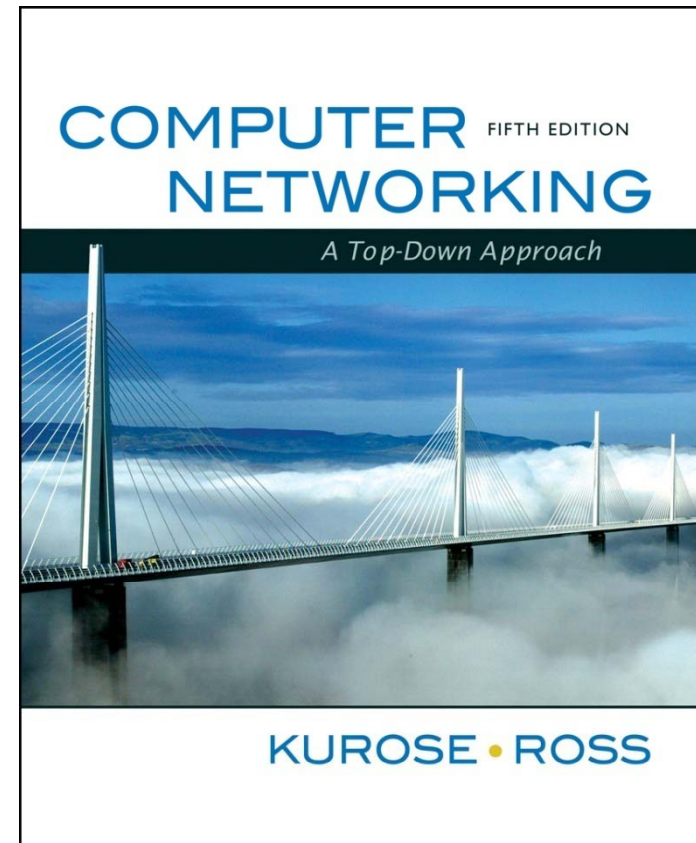


# Link Layer

- ❑ 5.1 Introduction and services
- ❑ 5.2 Error detection and correction
- ❑ 5.3 Multiple access protocols
- ❑ 5.4 Link-layer Addressing
- ❑ 5.5 Ethernet
- ❑ 5.6 Link-layer switches
- ❑ 5.7 PPP
- ❑ 5.8 Link virtualization: ATM, MPLS

# Chapter 6

## Wireless and Mobile Networks



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## Chapter 6: Wireless and Mobile Networks

### Background:

- ❑ # wireless (mobile) phone subscribers now exceeds # wired phone subscribers!
- ❑ computer nets: laptops, palmtops, PDAs, Internet-enabled 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)

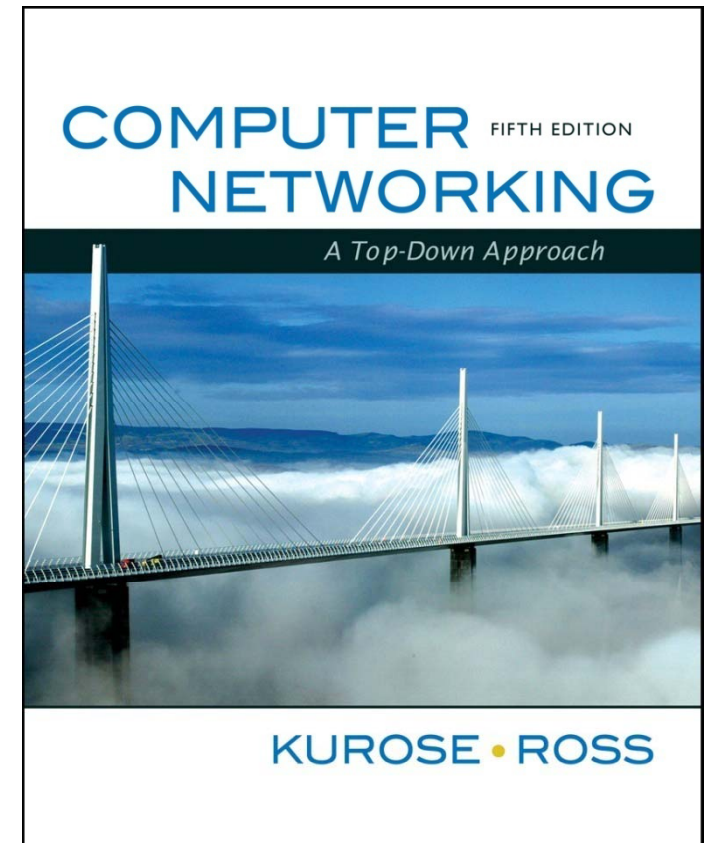
### Mobility

- ❑ 6.5 Principles: addressing and routing to mobile users
- ❑ 6.6 Mobile IP
- ❑ 6.7 Handling mobility in cellular networks
- ❑ 6.8 Mobility and higher-layer protocols

### 6.9 Summary

# Chapter 7

## Multimedia Networking



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# Chapter 7: Goals

## Principles

- ❑ classify 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

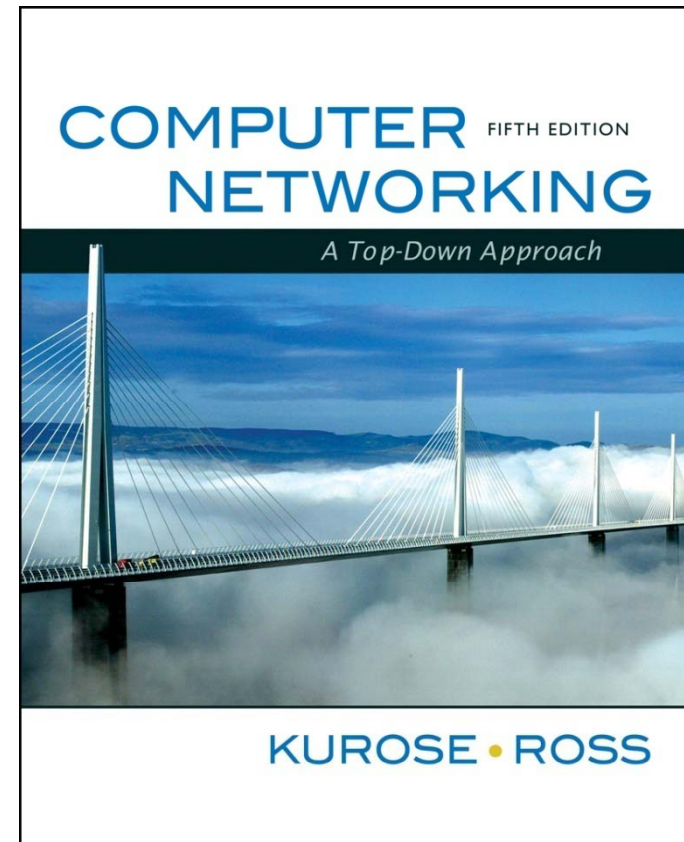
7.4 protocols for real-time  
interactive applications  
RTP,RTCP,SIP

7.5 providing  
multiple classes of  
service

7.6 providing QoS  
guarantees

# Chapter 8

## Network Security



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# Chapter 8: Network Security

## Chapter goals:

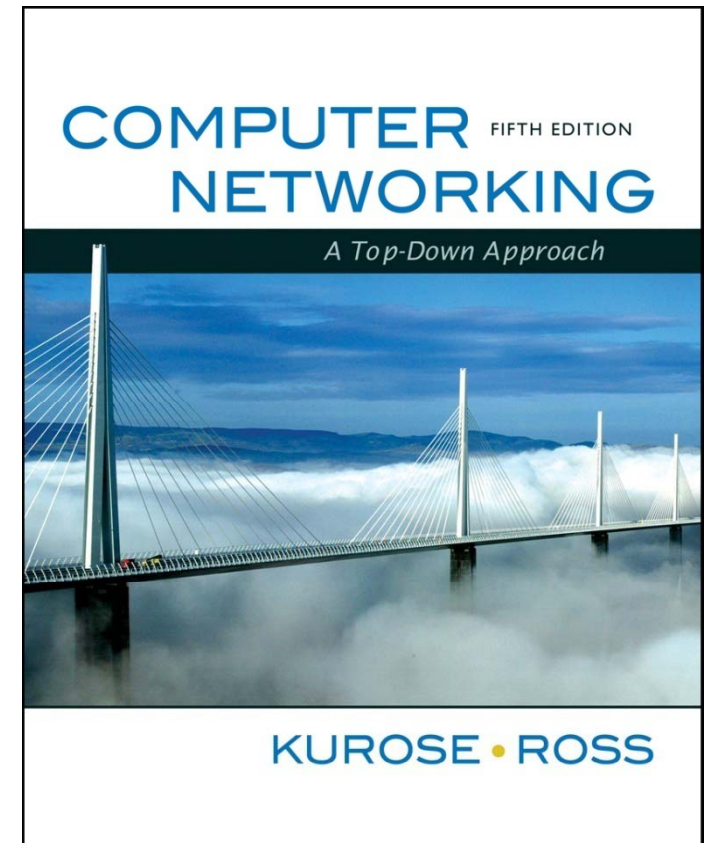
- ❑ understand principles of network security:
  - cryptography and its *many* uses beyond "confidentiality"
  - authentication
  - message integrity
- ❑ security in practice:
  - firewalls and intrusion detection systems
  - security in application, transport, network, link layers

# 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



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# Chapter 9: Network Management

## Chapter goals:

- ❑ introduction to network management
  - 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

# 計分方式

## □ Computer network

- 期中考 (35%)
- 期末考 (35%)
- Homeworks (20%)
- 網路程式作業 (10%)