Ken Q. Yang

What Have We Learned?

- 1. Network Concepts and Architectures 2. Communication Protocols (e.g. TCP/IP,Bluetooth)
- 3. Doing Useful Work on a Network How?
- •Lectures,
- Dectures,
- •Reading and programming
- •Project & presentations (30% of total grade) •Exams (20% for exam 1 + 30% for final).

Main Focus of This Semester

- 1. Principles and concepts of networking
- 2. TCP/IP Architecture
- Internet3. Ethernet LAN
- Ethernet LAN
 Wireless Communication
- Wheless Communication
 Bluetooth
- 5. Network performance analysis

Introduction: Summary

- Covered materials!
- Internet overview
- what's a protocol?
- □ network edge, core, access
 - network • packet-switching versus
- circuit-switching access net, physical media
- performance: loss, delay
- per for mance loss, delay
- layering and service models

Transport Layer 3-3

You now have:

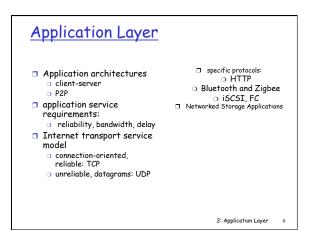
networking

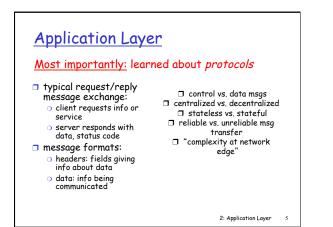
context, overview,

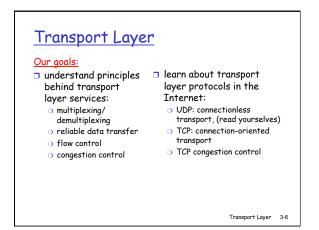
'feel" of networking

more depth, detailed

understanding of







Principles of Congestion Control

Congestion:

- informally: "too many sources sending too much data too fast for *network* to handle"
- different from flow control!
- manifestations:
 - lost packets (buffer overflow at routers)
 long delays (queueing in router buffers)
- o long delays (queuein
- □ a top-10 problem!
- Delay and performance analysis

Transport Layer 3-7

Network Layer

- Forwarding and routing
- Virtual circuit and datagram networks
- What's inside a router
- Router architectures
- Routing algorithms
 - Link state
- Distance VectorIP protocol

Transport Layer 3-8

Wireless and Bluetooth protocol

- ≻Bluetooth Protocol Stack
 - ≻Physical Layer
 - ≻Baseband
 - >Link Manager Protocol (LMP)
 - ►L2CAP
- ≻RFCOMM ≻BlueZ
 - Full source code is available under the GPL
 - Socket based interfaces
 - Simple API for development tasks
 - > Access to all Bluetooth host layers

Transport Layer 3-9

Link Access and LAN Protocols

□ Link layer services

- Framing, access, reliable delivery, flow control
- Shared Medium Access (multiple access control MAC)
 - Static allocation: channel partitioning
 - Random access: Slotted, CSMA/CD, CSMA/CA
 - Taking turns: token passing protocol
 - Delay analysis of a LAN
- □ CSMA/CD and Ethernet:

Transport Layer 3-10

Ken Yang, ECE. UNI Network Security Security Issues and requirements Traditional Encryptions DES Public Key encryption Firewalls Application gateways.