

DE050 Computer Network and Security

H. Anthony Chan

<https://cis.cihe.edu.hk/Anthony-Chan/index.html>

What I have is only borrowed from God so that I may serve others. H. Anthony Chan

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science. (Albert Einstein)

Communication Networks
102 Page 1 September 10, 2019

Communication Networks Overview

- ♦ What is the Internet?
- ♦ What's a protocol?
- ♦ Network structure, network edge
- ♦ Network core
- ♦ Access network
- ♦ LAN topology
- ♦ Physical media
- ♦ Internet structure and ISPs
- ♦ Performance: loss, delay
- ♦ Protocol layers, service models
- ♦ History

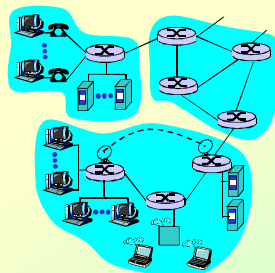
What I have is only borrowed from God so that I may serve others. H. Anthony Chan

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science. (Albert Einstein)

Communication Networks
102 Page 2 September 10, 2019

A closer look at network structure:

- ♦ **network edge:** applications and hosts
- ♦ **network core:**
 - routers
 - network of networks
- ♦ **access networks, physical media:** communication links



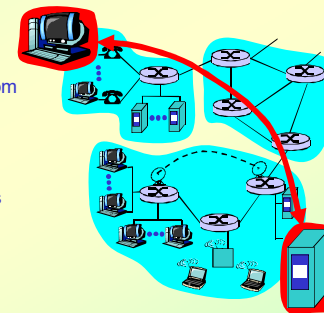
What I have is only borrowed from God so that I may serve others. H. Anthony Chan

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science. (Albert Einstein)

Communication Networks
102 Page 3 September 10, 2019

The network edge:

- ♦ **end systems (hosts):**
 - run application programs
 - e.g., Web, email
 - at "edge of network"
- ♦ **client/server model**
 - client host requests, receives service from always-on server
 - e.g., Web browser/server; email client/server
- ♦ **peer-peer model:**
 - minimal (or no) use of dedicated servers (host interaction symmetric)
 - e.g.: Gnutella, KaZaA



What I have is only borrowed from God so that I may serve others. H. Anthony Chan

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science. (Albert Einstein)

Communication Networks
102 Page 4 September 10, 2019

Network edge: connection-oriented service

- ♦ **Goal:** data transfer between end sys.
- ♦ **handshaking:** setup (prepare for) data transfer ahead of time
 - Hello, hello back human protocol
 - **set up "state"** in two communicating hosts
- ♦ TCP - Transmission Control Protocol
 - Internet's connection-oriented service
- ♦ **TCP service** [RFC 793]
 - ♦ reliable, in-order byte-stream data transfer
 - loss: acknowledgements and retransmissions
 - ♦ flow control:
 - sender won't overwhelm receiver
 - ♦ congestion control:
 - senders "slow down sending rate" when network congested

Network edge: connectionless service

- ♦ **Goal:** data transfer between end systems
 - same as before!
- ♦ **UDP - User Datagram Protocol** [RFC 768]
 - connectionless
 - unreliable data transfer
 - no flow control
 - no congestion control

Network edge

- ♦ **App's using TCP:**
 - ♦ HTTP (WWW), FTP (file transfer), Telnet (remote login), SMTP (email)
- ♦ **App's using UDP:**
 - ♦ streaming media, teleconferencing, DNS, Internet telephony

DE050 Computer Network and Security

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science. (Albert Einstein)

© 2019