Welcome to

CS 3516:
Advanced Computer Networks

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Time: 9:00am –9:00am M, T, R, and F
Location: Fuller 320
Fall 2016 A-term

Lecture 1: roadmap

1.1 what is the Internet?
   “nuts and bolts” view
   a service view

   what’s a protocol?

1.2 network edge
   - hosts, access networks, physical media/links
“Fun” internet appliances

IP picture frame
http://www.ceiva.com/

Web-enabled toaster + weather forecaster

Slingbox: watch, control cable TV remotely

Tweet-a-watt: monitor energy use

Internet refrigerator

Internet phones
What’s the Internet: “nuts and bolts” view

- millions of connected computing devices:
  - hosts = end systems
  - running network apps

- communication links
  - fiber, copper, radio, satellite
  - transmission rate: bandwidth

- Packet switches: forward packets (chunks of data)
  - routers and switches

Hardware components.
What’s the Internet: “nuts and bolts” view

- **Internet**: “network of networks”
  - Interconnected ISPs

- **Protocols** control sending, receiving of msgs
  - e.g., TCP, IP, HTTP, Skype, 802.11

- **Internet standards**
  - RFC: Request for comments
  - IETF: Internet Engineering Task Force

Software components.
Analogy to Road Networks

End systems = buildings
Packet switches = intersections
Links = road segments
What’s the Internet: a service view

- **Infrastructure that provides services to applications:**
  - Web, VoIP, email, games, e-commerce, social nets, …

- **provides programming interface to apps**
  - hooks that allow sending and receiving app programs to “connect” to Internet
  - provides service options, analogous to postal service
Analogy to Post Service
What’s a protocol?

**human protocols:**
- “what’s the time?”
- “I have a question”
- introductions

... specific msgs sent
... specific actions taken when msgs received, or other events

**network protocols:**
- machines rather than humans
- all communication activity in Internet governed by protocols

Protocols define format, order of msgs sent and received among network entities, and actions taken on msg transmission, receipt
What's a protocol?

A human protocol and a computer network protocol:

A human protocol:
- Hi
- Hi
- Got the time?
- 2:00

A computer network protocol:
- TCP connection request
- TCP connection response
- <file>

Q: other human protocols?
Chapter 1: roadmap

1.1 what is the Internet?
1.2 network edge
   - end systems, access networks, links
A closer look at network structure:

- **network edge:**
  - hosts: clients and servers
  - servers often in data centers

- **access networks, physical media:** wired, wireless communication links

- **network core:**
  - interconnected routers
  - network of networks
Access networks and physical media

Q: How to connect end systems to edge router?

- residential access nets
- institutional access networks (school, company)
- mobile access networks

keep in mind:
- bandwidth (bits per second) of access network?
- shared or dedicated?
Access net: digital subscriber line (DSL)

- use *existing* telephone line to central office DSLAM
  - data over DSL phone line goes to Internet
  - voice over DSL phone line goes to telephone net
- < 2.5 Mbps upstream transmission rate (typically < 1 Mbps)
- < 24 Mbps downstream transmission rate (typically < 10 Mbps)
Access net: home network

- **Access point (54 Mbps)**
- **Wired Ethernet (100 Mbps)**
- **Router, firewall, NAT**
- **Cable or DSL modem**
- **To/from headend or central office**
- **Wireless devices**
- Often combined in single box
Questions?