Lecture 2

Internet as a service
The airports are ready, and flights can link them. Now what?

Internet Infrastructure
Web Browsing application

Software inside laptop

Step 1: Create a data packet

Wait!! What's inside the packet? English sentences?
Protocols: HTTP

Data packet: sequence of bits

Protocol name → version → The webpage I need

HTTP 3.0 → 01100 01000 01000 00011 01100 10010 1110

cnn.com → bits: 01100 01000 01000 00011 01100 10010 1110

→ cnn.com
Protocols: HTTP

When packet comes back from cnn.com server

Protocol name  ver.  Response  cnn webpage in bits

...  data payload

called control bits

wifi

cnn.com/index.html
Web Browsing application

Step 1: Create a data packet

Step 2: But what is the destination address?
Domain Name Service (DNS)

Step 2: Let's ask DNS server for IP address of cnn.com
Hierarchy Again
Iterative DNS

Please "resolve" cnn.com

DNS protocol pkt

Root NS

Domain NS

Authoritative NS

Please ask .com Domain NS. Here is IP address.
Web Browsing application

Software inside laptop

Step 1: Create a HTTP request packet
Step 2: Get IP address using DNS
Step 3: Add IP address to the "destination IP" field in packet header
Step 4: Send data packet
But say your bank balance is sent using HTTP.

What if packet gets lost?
We need acknowledgments.
important matters

Reliable delivery

unreliable delivery
Questions?
Lecture 3

Internet

concepts, foundations
Facts and Concepts

- Layering: Analogy with airline industry —> protocols —> ISO / OSI architecture —> Success of layering evident today

- Network Edge: Client/server vs. P2P architecture vs. Hybrid

- Network Edge: Connection-less (UDP) vs. Connection-oriented service (TCP)

- Network Edge: Residential access networks: Wired access (DSL vs. Cable)


- Network Core: Circuit switching vs. Packet switching

- Network Core: Circuit switching: FDM vs. TDM

- Network Core: Packet switching: Statistical multiplexing

- Network Core: Packet switching: Datagrams vs. Virtual circuits

- Network Computing: Cloud vs. Edge

- Foundations:
  - Signals: time and frequency domain representation (FFT)
  - Bandwidth, Spectrum
  - Carrier frequency, Modulation, encoding, decoding,
  - Bit rate, bit error rate (BER), Packet error rate (PER)
  - Throughput, Congestion
  - Latency (Transmit time, Propagation delay, Queueing time, Processing time)
  - Wireless: SNR, SINR, Shannon’s capacity,

- Real Internet measurements (Traceroute)

- Timeline and history …