INTERNET PROTOCOLS

The Foundation of the Web

GOALS

- Understand the protocols and systems that make the web possible
  - Protocol stacks
  - TCP/IP
  - SMTP and FTP

TCP/IP SUITE

- Prior network protocols were centralized, and proprietary
- Packet-switched
  - Split messages into parts, deliver independently, then reassemble
- Open
  - Specifications are open to the public
  - Enables clients to be "thin"

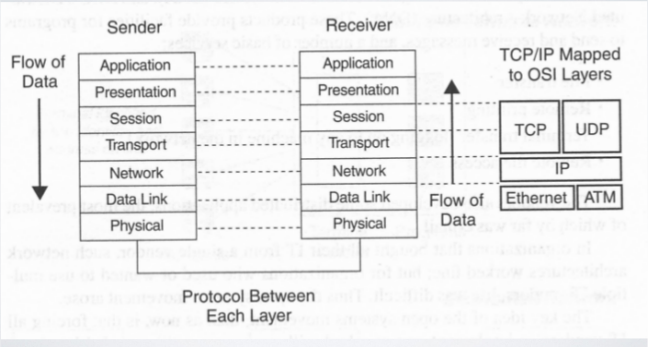
STANDARDS

- IETF - Internet Engineering Taskforce
  - standardizes Internet protocols
  - examples,: TCP, IP, SMTP, RTP, SIP, HTTP
  - final standards document is referred to as a RFC (request for comments)
  - anybody can participate in the IETF!
  - http://www.ietf.org

STANDARDS

- W3C - World Wide Web Consortium
  - standardizes web technologies, mostly markup languages.
  - examples: HTML, XML, XSLT, VoiceXML
  - final standards document is referred to as a "recommendation"
  - participation is fee-based (e.g. mostly big tech companies)
  - http://www.w3c.org

NETWORK STACKS



PROTOCOL STACK

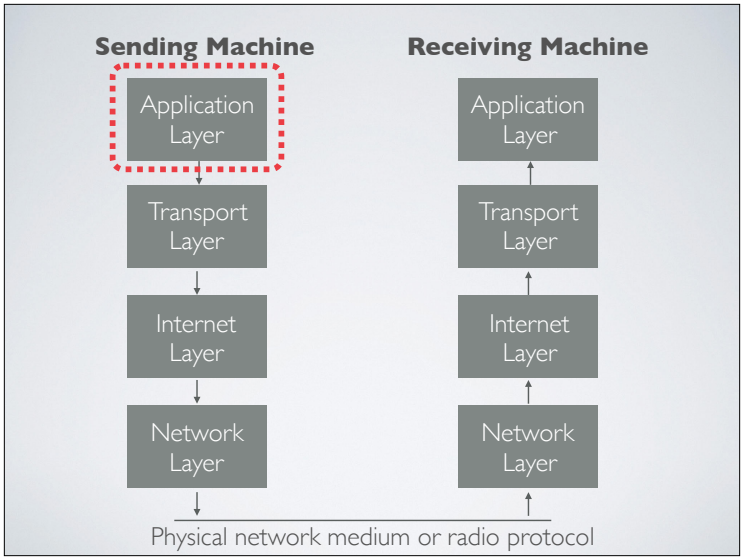
- Network Interface Layer
  - Local physical communication
  - Ethernet / radio interface
- Internet Layer
  - Routing, validity, packet delivery
  - IP

PROTOCOL STACK

- Transport Layer
  - Application to application delivery
  - TCP
- Application Layer
  - SMTP, HTTP

END-TO-END COMMUNICATION

- Messages start at the application layer
- Move down to the physical layer
- Across the network
- Up the protocol stack on the recipient's machine to the application
- Communication seems "end-to-end"



TCP

- Transmission Control Protocol
  - Reliable
  - Connection-oriented
  - Use case: use when reliable transmission is essential.

UDP

- User Datagram Protocol
  - Unreliable
  - Connectionless
  - Use case: use when some packet loss is ok (audio or video transmission)
  - Use case 2: use when packet loss can be engineered out of the system (real time system)

CLIENT-SERVER ARCHITECTURE

- Request-response
- Server listens on a given address/port
- Server waits for clients to connect
- Client sends a request
  - Requests are single-line or block
- Server performs some action and responds
- Servers are stateful or stateless

BEFORE THE WEB

- How to share information?
  - Email (SMTP)
  - File transfer (FTP)
  - Newsgroups (NNTP)
  - Gopher
    - Linked menus of distributed resources

SMTP

- Simple Mail Transfer Protocol
- Typically uses TCP port 25
- Text-based protocol
- Sample message:
  - HELO
  - MAIL FROM:<somebody@gmail.com>
  - RCPT TO:<another@gmail.com>
  - DATA
  - blablaba
  - QUIT

ASSIGNMENT

- Reading:
  - Read chapters 1 & 4 in this free IBM e-book:
    - http://www.redbooks.ibm.com/pubs/pdfs/redbooks/gg243376.pdf
  - Tim Berners-Lee's original Web proposal: http://www.w3.org/History/1989/proposal.html
  - Tim Berners-Lee et al., CACM article on the web: http://dl.acm.org/citation.cfm?doid=179606.179671
- Complete Homework #1 before next week.