ICS 451: Today's plan

- email
  - overview
  - structure
- protocols:
  - SMTP
  - POP
  - IMAP
Email overview

- A mail client is used to prepare and read email
  - Message User Agent, MUA
- A mail server forwards and stores email
  - Message Transfer Agent, MTA
  - providing Message Handling Service, MHS
- Global service providing user-to-user transmission of messages
  - everything, including multimedia, encoded using 7-bit ASCII
Email structure

- Email consists of a header and a body, separated by an empty line
  - similar to HTTP, but structure visible to user
- Each line in the header has the form field-name: field value
  - From, To, Subject, Date
- Received fields indicate the path of the message (see book, p. 39)
- Message-id unique for each message
MIME

- Multipurpose Internet Mail Extension
- A way to send non-ASCII data across email
  - non-English text: 江戸
  - multimedia: images, sounds, video
- Mime-Version, Content-Type
- Content-Transfer-Encoding:
  - quoted-printable (=xx is char xx, =3D is =)
  - base64 (6 bits per character A-Za-z0-9+/)
    - padded with = to make multiple of 3 chars
  - 7bit
Email Clients

• Used to prepare email and send it to the first server, and used to read email
  – local application or webmail

• Once email is composed, sent using Simple Mail Transfer Protocol, SMTP
  – server may be default server for machine
  – server may be given by MX record
Typical email transmission

- Sender's MUA sends to local MTA (Mail Submission Agent, MSA)
- MSA sends to MTA indicated by MX record
- MTA sends to receiver's local MTA (Mail Delivery Agent, MDA, stores mail in inbox)
- SMTP used everywhere except MTA to MDA
  - where IMAP and POP may be used
SMTP

- Simple Mail Transfer Protocol
- TCP port 25 (587 for message submission)
- ASCII text based
  - HELO or EHLO begins session
  - MAIL FROM: gives the sender
  - RCPT TO: the receiver
  - DATA gives the body
    - ending with a '.' on a line by itself
  - QUIT ends the session
- Reply codes similar to HTTP
SMTP example

- see *textbook*, pages 44-45
SMTP open relays

- An MTA could accept connections from anywhere and forward email to anywhere
- This is called an Open Relay
- Open Relays are useful to anyone wishing to hide the origin of an email
- Most Relays today apply some authentication before forwarding email
  - e.g. IP-based authentication
- Open Relays used for spam may be blacklisted
POP

• Post Office Protocol
• Downloads messages from local email server
• Authentication, commands, then **QUIT**
• Client sends commands to server:
  – **STAT**, status (list of emails)
  – **RETR**, retrieve a specific email
  – **DELE**, delete an email
• ASCII-based
IMAP

- Internet Message Access Protocol
- Assumes email is permanently stored on server, client just used to view email
  - and save it for offline use
- Lets multiple clients access same mailbox simultaneously
  - (not in textbook)
Email overview (again)

- POP and IMAP used to retrieve messages from server
- HTTP used to send and retrieve over webmail
- SMTP used everywhere else
- Generally message goes from sender MUA to sender MTA (MSA) to receiver MTA to receiver MDA to receiver MUA