FTP

- TCP, two connections
- in-band/out-of-band
- stateful
- Commands/Replies
- Security?

Email

- SMTP
  - Push

- POP3

- IMAP

SMTP example

```
S:  220 hamburger.edu
C:  HELO crepes.fr
S:  250  Hello crepes.fr, pleased to meet you
C:  MAIL FROM: <alice@crepes.fr>
S:  250 alice@crepes.fr... Sender ok
C:  RCPT TO: <bob@hamburger.edu>
S:  250 bob@hamburger.edu ... Recipient ok
C:  DATA
S:  354 Enter mail, end with "." on a line by itself
C:  Do you like ketchup?
C:  How about pickles?
C:  .
S:  250 Message accepted for delivery
C:  QUIT
S:  221 hamburger.edu closing connection
```

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SMTP

zeus$ telnet smtp.mailexample.net 25
220 smtp.mailexample.net ESMTP qpsmtpd 0.33-dev ready; send us your mail, but not your spam.
HELO cs360.com
250 mailexample.net says hello to cs360.com
MAIL FROM: <professor@cs360.com>
250 sender ok
RCPT TO: student1138@cs360.com
250 recipient ok
DATA
354 Send mail; end with "." on a line by itself
From: professor@cs360.com
To: student1138@cs360.com
Subject: Cheap Stuff!
Hello! Would you like to buy something?
.
250 Message accepted
QUIT
221 mailexample.net closing connection

POP3/IMAP

- Retrieve email from mail server

POP3

```
zeus$ telnet pop3.mailexample.net 110
+OK POP3 server ready
USER chadd
+OK
PASS iwantmail
+OK login successful
LIST
1 2505
2 14302

.
RETR 1
(send message 1)
DELE 1
QUIT
+OK POP3 server disconnecting
```

MIME

- Email is ASCII
  - uuencode/uudecode (in the old days)
- Multipurpose Internet Mail Extensions (RFC 2045)
  - allows us to send non ASCII data via email
  - examples?
  - No such thing as a free lunch, what does this cost us?
  - where else is this used?

```
MIME-Version: 1.0
Content-type: image/jpeg
Content-Transfer-Encoding: base64
```