Outline

→ Application layer
→ Mail delivery architecture
→ Mail transfer protocol
→ Mail access protocols
APPLICATION LAYER
In the Protocol Architecture

Telnet
FTP
SMTP
HTTP

RTP
SNMP

NFS
XDR
RPC

TCP
UDP

Routing protocols

ARP
IGMP
IP
ICMP

Application
Presentation
Session
Transport
Network
Data link
Client-Server Paradigm

- Server always in execution
- Waiting for requests
- Client initiates communication
Known IP address (name) and port
- Static port
- Standard port
- Traditional model on the Internet
- FTP, WWW, e-mail
Peer-to-peer (P2P) Paradigm

→ No pre-defined role
→ Each host can contact and be contacted
→ I.e., running both client and server
Server (or super peer) might be needed to know others

Newer model

VoIP, emule, Skype
Text-based Protocols

- Inefficient encoding
- Easy to troubleshoot
- No need for protocol analyzer support
MAIL TRANSFER PROTOCOL
SMTP: Simple Mail Transfer Protocol

- Text based
- Client-server
- TCP - port 25
  - Opened by client
- Command-response
- Status code
SMTP Session

Handshaking

Open TCP

220 polito.it
HELO zeit.polito.it
250 ...

MAIL FROM: baldi@polito.it
250 baldi@polito.it sender OK

RCPT TO: box@baldi.info
250 box@baldi.info recipient OK
This is an e-mail message. It contains multiple lines.

354 Enter mail, end with “.” by itself

250 message accepted

QUIT

221 polito.it closing connection
Anti-spamming Measures

Open TCP

HELO baldi.info

220 polito.it

250 ...

MAIL FROM: box@baldi.info

250 box@baldi.info sender OK

RCPT TO: baldi@gmail.com

571 baldi@gmail.com prohibited. We do not relay
Anti-spamming Measures

Open TCP

220 polito.it

HELO baldi.info

250 ...

MAIL FROM: box@baldi.info

250 box@baldi.info sender OK

RCPT TO: baldi@polito.it

250 baldi@polito.it recipient OK
Anti-spamming Measures

Open TCP

HELO zeit.polito.it

250 ...

220 polito.it

MAIL FROM: baldi@polito.it

250 baldi@polito.it sender OK

RCPT TO: baldi@gmail.com

250 baldi@gmail.com recipient OK
Anti-spamming, Anti-spoofing Measures

Open TCP

HELO zeit.polito.it

220 polito.it

MAIL FROM: baldi@polito.it

250 ... 

250 baldi@polito.it sender OK

RCPT TO: baldi@gmail.com

473 baldi@gmail.com relaying prohibited. You should authenticate first

Check Client IP
Message Format

→ ASCII character sequence
→ Possibly limited length lines

From: <sender>
To: <addresses>
CC: <carbon copied>
Subject: <subject line>
...

Body
How about images?

- Can be encoded as character sequence
- E.g. base64
- Recipient must know
Multipurpose Internet Mail Extensions: MIME

→ Additional headers

MIME-Version: 1.0
Content-Type: image/png; name="image001.png"
Content-Description: image001.png
Content-Transfer-Encoding: base64
iVBORw0KGgoAAAANSUhEUgAAAKgAAABDCA
xAAADsQBlSsOGwAAABl0RVh0U29mdhcm
EEQXBBxBxR19URQF3OEzRo0rKvoeCYm4xJen
Content-Type

- text
- plain, html
- image
- jpeg, gif, png
- audio
- video

Important for "rendering"
MAIL ACCESS PROTOCOLS
Webmail
Web server running on mail server host
Providing access to messages through web interface
Messages remain on server
Pros and Cons

- Ideal when not using own PC
- Available from everywhere
- Available only with Internet connection
Post Office Protocol: POP

→ Mono-PC users
→ Messages moved to client
→ Available for off-line access
→ Character-based
→ TCP on port 110
POP Session

Authorization

Open TCP

+OK POP3 serv ready

USER baldi

+OK

PASS whatever_it_is

+OK Congratulations!
SMTP Session

Transaction

QUIT

+OK Bye!

DELE 2

+OK Message 2 deleted

RETR 1

+OK 1495 octets
Received: from ...

LIST

+OK 2 messages
1 1495
2 1948

SMTP Session

Termination
Internet Message Access Protocol: IMAP

- Multi-PC users
  - E.g. 1 PC at work, 1 PC at home
- Character-based
- TCP on port 143
Best of both worlds

- Available for off-line access
- Messages remain on server
- In folder hierarchy
- Synchronize with local copy