

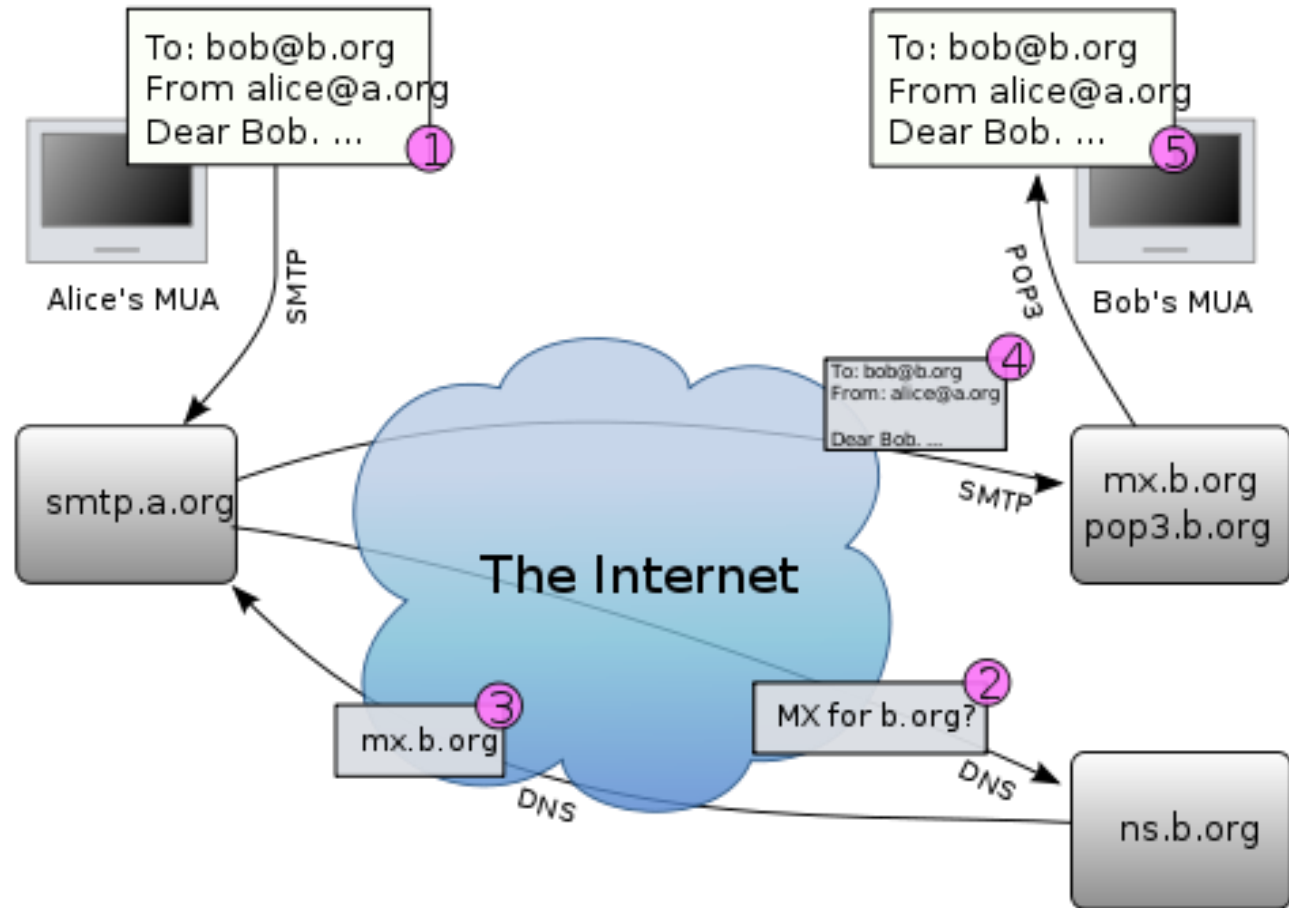
Electronic Mail (e-mail): Protocols

Kameswari Chebrolu

All the figures used as part of the slides are either self created or from the public domain with either 'creative commons' or 'public domain dedication' licensing. The public sites from which some of the figures have been picked include: <http://commons.wikimedia.org> (Wikipedia, Wikimedia and workbooks); <http://www.sxc.hu> and <http://www.pixabay.com>

Architecture

- Sending mails is a PUSH operation
 - SMTP protocol
- Receiving mails is a PULL operation
 - POP3, IMAP, HTTP



Simple Mail Transfer Protocol (SMTP)

- Uses TCP to reliably transfer email messages
- Operates on port 25
- Three phases of transfer based on command (ASCII text) / response (status code and phrase)
 - Handshaking (greeting)
 - Transfer of messages (many messages can be sent on a given connection)
 - Close connection

Example

```
kameswari@asterix: ~  
kameswari@asterix:~$ telnet surya.cse.iitb.ac.in 25  
Trying 10.105.1.14...  
Connected to surya.cse.iitb.ac.in.  
Escape character is '^]'.  
220 ;; ESMTP connection timed out; no servers could be reached Sendmail 8.13.8/8.13.8/De  
bian-3; Tue, 5 Nov 2013 01:20:21 +0530; (No UCE/UBE) logging access from: [10.129.133.15  
1](FAIL)-[10.129.133.151]  
HELO PM.IN  
250 ;; connection timed out; no servers could be reached Hello [10.129.133.151], pleased  
to meet you  
MAIL FROM: <pm@india.org>  
250 2.1.0 <pm@india.org>... Sender ok  
RCPT TO: <chebrolu@cse.iitb.ac.in>  
250 2.1.5 <chebrolu@cse.iitb.ac.in>... Recipient ok  
RCPT TO: <kameswari@gmail.com>  
250 2.1.5 <kameswari@gmail.com>... Recipient ok  
DATA  
354 Enter mail, end with "." on a line by itself  
Please vote for me in the upcoming elections!  
.  
250 2.0.0 rA4JoLSH003005 Message accepted for delivery  
QUIT  
221 2.0.0 ;; connection timed out; no servers could be reached closing connection  
Connection closed by foreign host.
```

Mail Access Protocols

- Message waiting in receiver's mailbox at the receiver's mail server
- Originally, user's logged on to the mail server and execute mail reader on it
 - Mailer reader on local client provides richer set of features (offline viewing, GUI, multimedia attachments)
- Need retrieval protocols: POP3, IMAP and HTTP

Post Office Protocol – V3 (POP3)

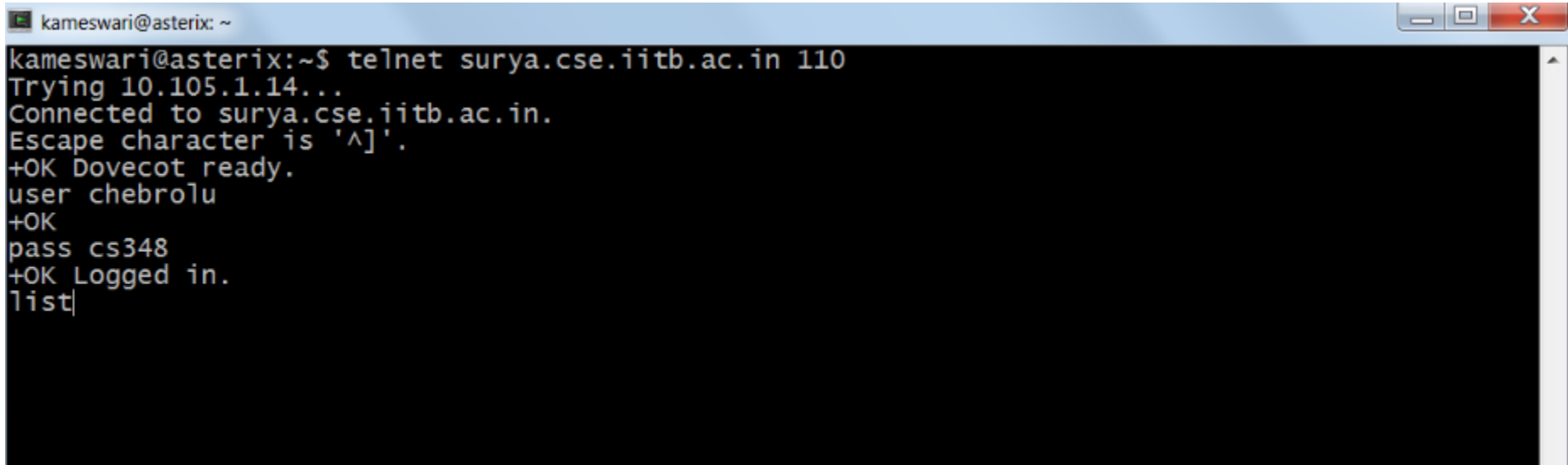
- Very simple protocol (RFC 1939), limited functionality
- Typical usage: emails retrieved, stored (at User's PC) and read offline *"delete"*
- Does not maintain state across sessions
- Uses TCP and operates on port 110

Post Office Protocol – V3 (POP3)

- Three Phases:
 - Authorization: Authentication of user via username /passwd
 - Transaction: retrieve messages, mark deletions, obtain mail statistics
 - Update: After quit, server deletes marked emails
- Disadvantage: Poor support for remote multi-machine access



Example



```
kameswari@asterix: ~  
kameswari@asterix:~$ telnet surya.cse.iitb.ac.in 110  
Trying 10.105.1.14...  
Connected to surya.cse.iitb.ac.in.  
Escape character is '^]'.  
+OK Dovecot ready.  
user chebro1u  
+OK  
pass cs348  
+OK Logged in.  
list|
```


2444 49872
2445 7065
2446 8930
2447 13619
2448 9440
2449 7335
2450 7585
2451 447
2452 7365
2453 750736

.
retr 2451

+OK 447 octets

Return-Path: <pm@india.org>

Received: from PM.IN ([10.129.133.151])

by ;; connection timed out; no servers could be reached (8.13.8/8.13.8/Debian-3) with S
MTP id rA67Ycqo029559;

Wed, 6 Nov 2013 13:07:57 +0530

Date: Wed, 6 Nov 2013 13:04:38 +0530

From: pm@india.org

Message-Id: <201311060737.rA67Ycqo029559@;; connection timed out; no servers could be reached>

To: undisclosed-recipients;;

Please vote for me in the upcoming election!

.
dele 2450

+OK Marked to be deleted.

quit

+OK Logging out, messages deleted.

Connection closed by foreign host.

kameswari@asterix:~\$

IMAP (RFC 3501)

- Provides more complete and complex remote mailbox access
POP3 - retrieve mails
IMAP - mails ^{manage} on mail server
- Emails organized in multiple folders (mailboxes) on server
- IMAP keeps user state across sessions
 - E.g. Names of folders and mappings between message IDs and folder name
- IMAP servers listen on port 143; IMAP over SSL (IMAPS) assigned port 993

IMAP Features

- IMAP clients stay connected, results in faster response time
- Permits multiple email clients (same user but different readers) to simultaneously connect to the mailbox
- Permits partial fetch (e.g. text, no attachments)

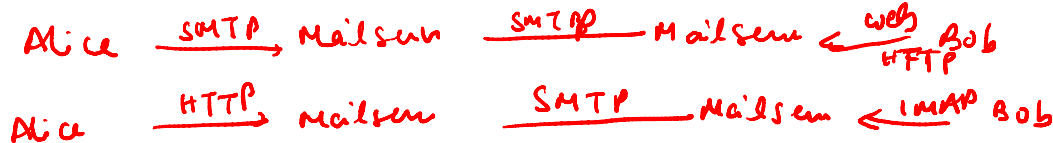
↳ low BW

IMAP Features

- Keeps track of message status (read, replied to, marked for deletion etc)
- Permits server-side searches (e.g. search for messages with subject line “networks”)

Web Access

- Hotmail introduced web-based access in mid 1990s
- Service also provided by Google, Yahoo etc
- User agent is a web-browser and interacts with mailserver via HTTP (as opposed to using SMTP or POP3/IMAP)
 - Mail servers still use SMTP to talk with each other



Summary

- Email is a very widely used application
- Needs two protocols: mail transfer (SMTP) and mail access (POP3, IMAP)
- SMTP: ASCII based involving three phases
- IMAP/Web Access provide more features than POP3