An IMAP Server For VM/ESA

2000 VM/VSE Technical Conference
Session M43

Romney White
IBM S/390 Software
Romney@vnet.ibm.com

Perry Ruiter
IBM Canada
PRuiter@ca.ibm.com

Agenda

- IMAP Overview
- IMAP for VM
- References

IMAP Overview

- Standards
- Background
- Structure
- Mailboxes
- Messages
- Protocol
- Flows
- Prospects

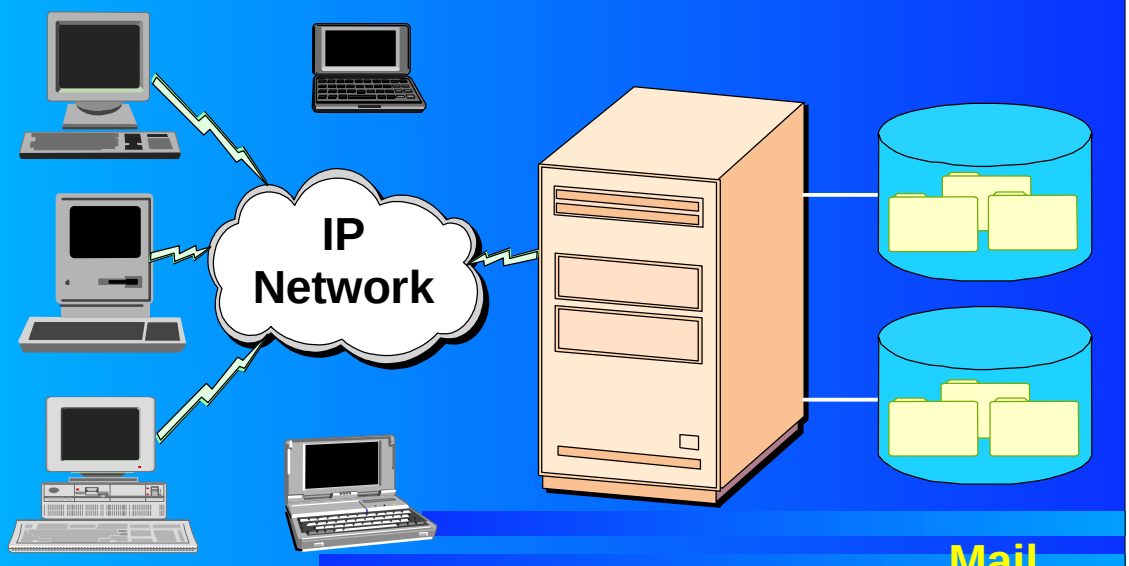
IMAP Overview - Standards

- Internet Message Access Protocol
  - Principal RFC is 2060
    - INTERNET MESSAGE ACCESS PROTOCOL - VERSION 4rev1. M. Crispin. December 1996. (Format: TXT=166513 bytes) (Obsoletes RFC1730) (Status: PROPOSED STANDARD)
  - Many related RFCS
    - 1731, 1732, 1733, 2061,2086, 2087, 2088, 2095, 2177, 2180, 2192, 2193, 2195, 2221, 2342, 2359
  - Still evolving

IMAP Overview - Background

- Successor to Post Office Protocol (POP) and Distributed Mail System Protocol (DMSP)
  - Superset of function
    - Online, disconnected, and offline modes
    - Multiple/shared mailboxes
    - Long-term server-based mail storage
  - Protocol more complex
- Modern Web browsers include IMAP client
  - Common point of access
  - Consistent look and feel

IMAP Overview - Structure



IMAP Overview - Mailboxes

- IMAP permits remote manipulation of message folders (*mailboxes*)
- Allows creation, deletion, and renaming of mailboxes
- Mailboxes can be shared among users
  - Access can be concurrent
  - Facilitates collaboration
  - Not collaborative to the same extent as Lotus Notes

IMAP Overview - Messages

- Messages reside in mailboxes
- IMAP allows
  - Selective fetching of message attributes and message text
  - Searching
  - Removing messages
  - RFC-822 and MIME parsing
  - Message flag manipulation

IMAP Overview - Messages

- Each message has a unique identifier (UID)
  - Persistent
  - Monotonically increasing
  - Uniquely identifies message in mailbox
- Each mailbox has a unique identifier validity value
  - May not be reused (e.g., if mailbox recreated)
  - Combined with UID to produce permanent, server-unique message identifier

IMAP Overview - Messages

- Each message has a sequence number
  - Relative position in mailbox
  - Ordered in ascending sequence by unique identifier
  - Changes as messages are added and deleted

IMAP Overview - Messages

- *Flags* message attribute
  - Permanent or session-only
  - System flags
    - \Seen - message read
    - \Answered - message answered
    - \Flagged - message urgent or special
    - \Deleted - message marked for deletion
    - \Draft - message composition incomplete
    - \Recent - first time message arrival notified
  - User-defined keywords

IMAP Overview - Messages

- Other attributes
  - Internal date and time
  - RFC-822 size
  - Envelope structure
  - Body structure

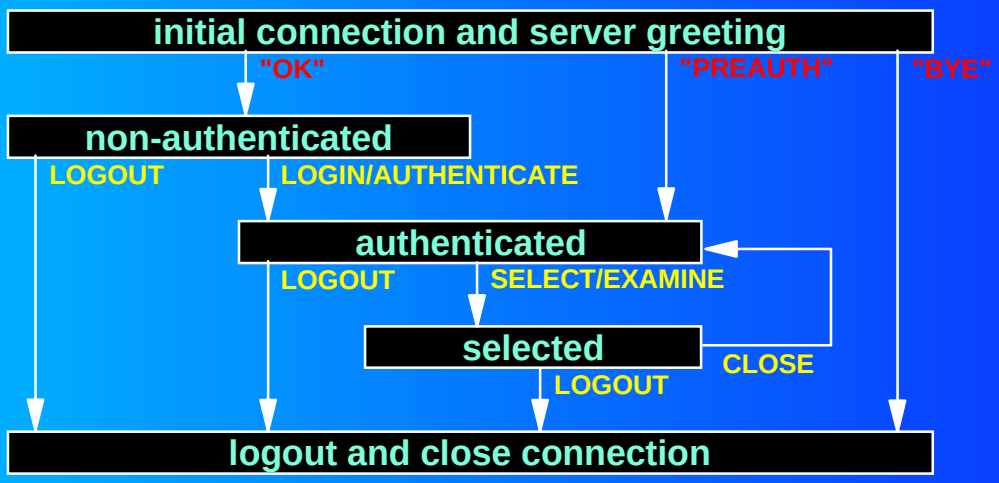
IMAP Overview - Protocol

- Client -> Server
  - Client sends command to server
    - Prefixed with client-generated identifier
  - Server may send data in response
  - Server always sends completion response
    - Tagged with associated command identifier
    - "OK", "NO", or "BAD"
  - Client may have multiple commands in progress concurrently

IMAP Overview - Protocol

- Server -> Client
  - Unsolicited data may be sent to client (e.g., when new message arrives)
    - Untagged (prefixed with *)

IMAP Overview - Flows



IMAP Overview - Prospects

- Increasing number of IMAP servers (66 listed on IMAP Web site as of 2000-02-15)
- SMTP/MIME compares favorably to Lotus Notes and MS Exchange
  - Users/Server
  - Users/Administrator
  - Down time
- Growing homogeneity of mail as proprietary systems incorporate Internet standards

IMAP For VM

- Goals
- Design
- Implementation
- Structure
- Configuration
- Operation
- Status
- Limitations

IMAP For VM - Goals

- Robust, scalable server
  - Support thousands of clients
  - Support tens of thousands of folders
- Take advantage of VM strengths
  - Where a lot of mail resides
  - Where a lot of mail is served
  - Server is up
- Flexible administration

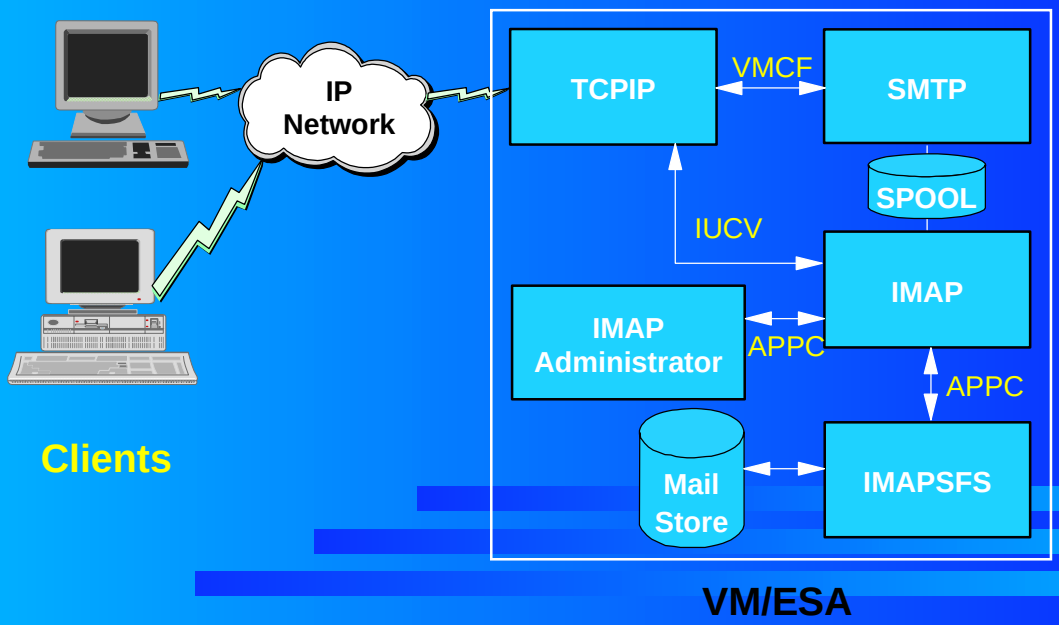
IMAP For VM - Design

- OpenEdition-based
  - Multithreaded, POSIX threads
    - One thread per client connection
  - RSK socket library
- SFS-based mail store
  - Separate unit of work for each thread
  - CSL calls
  - Asynchronous interfaces
  - Capabilities mesh nicely with those required by IMAP RFC

IMAP For VM - Implementation

- Mostly written in C
- Some Assembler
  - Page-aligned storage allocation
  - *SPL interface
  - Interrupt handling
  - Pattern matching

IMAP For VM - Structure



IMAP For VM - SMTP Configuration

- Move supplied command exit and PIPE filter onto an accessed disk
- Update SMTP's config file to activate PUNCH command exit
  - All files destined for local delivery routed to IMAP server

IMAP For VM - SFS Configuration

- User Directory
  - IUCV *IDENT
  - OPTION MAXCONN 2000
  - OPTION APPLMON
  - **No** IUCV ALLOW
- IMAP server must be filepool administrator
- Strongly recommend a dedicated filepool

IMAP For VM - IMAP Server Configuration

- System requirements
  - VM/ESA 2.3.0 or later
  - LE 1.8
  - SMTP APAR PQ31576 required
  - CMS APAR VM62318 recommended
- User Directory
  - IUCV *SPL
  - IUCV ANY or IUCV IMAPSFS
  - IUCV ALLOW

IMAP For VM - IMAP Server Configuration *(continued)*

- $SERVER$ NAMES

```
:nick.VMIPC
 :list.user1 user2 ...
```

- PROFILE EXEC on A-disk
  - 'GLOBAL LOADLIB SCEERUN'
  - Optional 'IMAPMAIN'

IMAP For VM - IMAP Server Configuration *(continued)*

- IMAP CONFIG
  - Required statements
    - FilePoolID
    - BadFileID
  - Optional statements
    - MailOriginID
    - IdleTimeout
  - Others

IMAP For VM - Administration Machine Configuration

- Access to (suitably renamed) IMAPSAMP EXEC
  - Use IMAP server user identifier as file name
- Must be listed in server's $SERVER$ NAMES file
- Admin commands include:
  - ENROLL, DELETE
  - SHAREFOLDER
  - ALERT
  - TRACE ON/OFF CODEFLOW/SOCKETIO
  - Others

IMAP For VM - Server Initialization

- Server started by invoking IMAPMAIN
  - Initialize global data area
  - Read and process configuration file
  - Start console thread
  - Start mail arrival processing thread
  - Start administrative request handler thread
  - Start client listener thread
    - Each new connection runs in own thread

IMAP For VM - User Enrollment

- Administrator issues IMAP ENROLL command (e.g., IMAP ENROLL SMITH)
- Server
  - Enrolls user in filepool
  - Creates INBOX directory (folder)
  - Creates MAILBOX INDEX in user's root directory to hold list of folders

IMAP For VM - Mail Arrival

- Mail redirected to IMAP server via command exit (PUNCH)
- Server asynchronously reads mail via *SPL IUCV system service
- If destined for enrolled IMAP user, add mail item to INBOX by
  - Generating UID for new item
  - Parsing note and creating "<UID> NOTE" file
  - Adding entry to NOTE INDEX for new item
- Otherwise, TRANSFER to owner's reader

IMAP For VM - Client Operation

- Use any IMAP4rev1 (RFC 2060) compliant client. Tested with:
  - Two levels of Netscape Messenger
  - Two levels of Outlook Express
  - Two levels of Mulberry
  - One level of Pine
- To enter AUTHENTICATED state, must LOGIN with userid/password
  - Userid/password combination must be valid for VM access
  - Userid must be enrolled in IMAP SFS filepool

IMAP For VM - Status

- August, 1999 - Limited beta
- September, 1999 - Open beta
- O.K. - that was a little optimisitic
  - Unhappy with several design points
  - Changes would have been disruptive
- Conducted limited beta
  - Six customers
  - Good feedback received
- Open beta started in April, 2000

IMAP For VM - Limitations

- AUTHENTICATE command not implemented (optional feature)
  - Hope to have an authentication exit shortly
- Additional function RFCs

References

- RFCs: http://www.rfc-editor.org/rfc.html
- IMAP List: imap@u.washington.edu
- IMAP List Server: listproc@u.washington.edu
- IMAP Home Page: http://www.imap.org/
- VM TCP/IP Home Page: http://www.ibm.com/s390/vm/related/tcpip/
- *Lotus Notes Release 4, Microsoft Exchange, and SMTP/MIME* (Creative Networks, Inc.) http://www.creative.com/impact/specials/cds/index.htm