



# Computer Networks Advanced Course

Email

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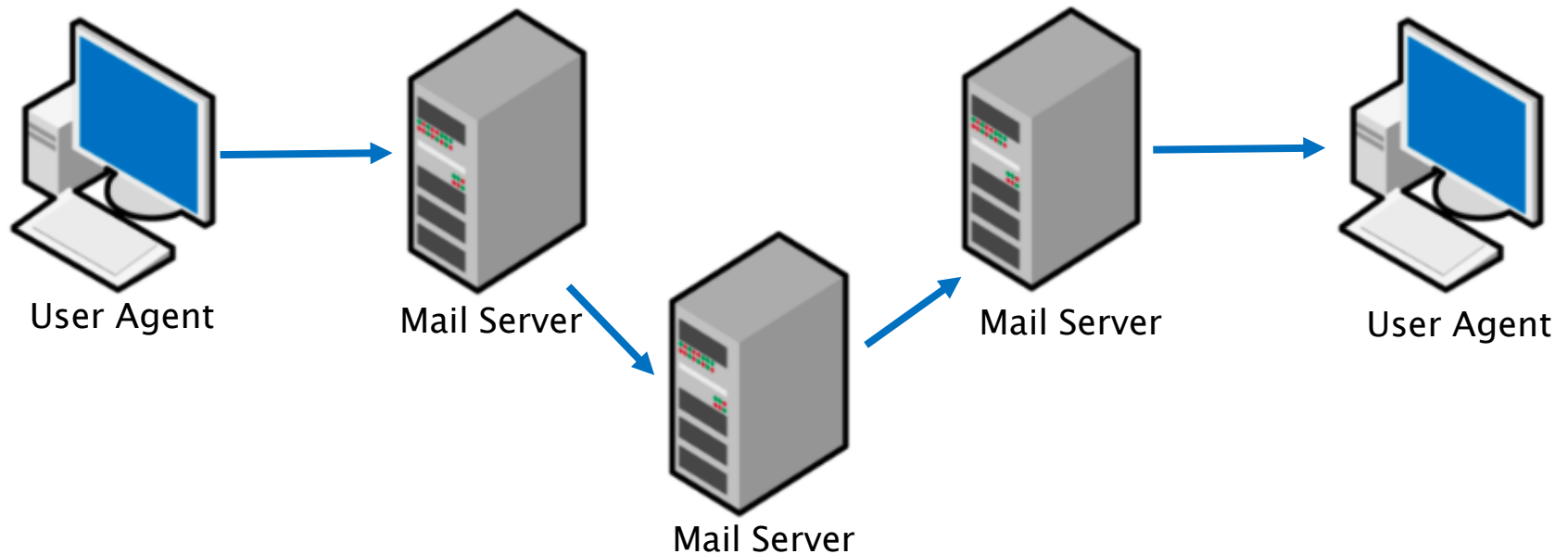
# Lesson Topics

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- ▶ Email architecture – sending, retrieving
  - SMTP
  - POP3
  - IMAP
  - HTTP/S
- ▶ Hands on with wireshark
- ▶ SMTP programming

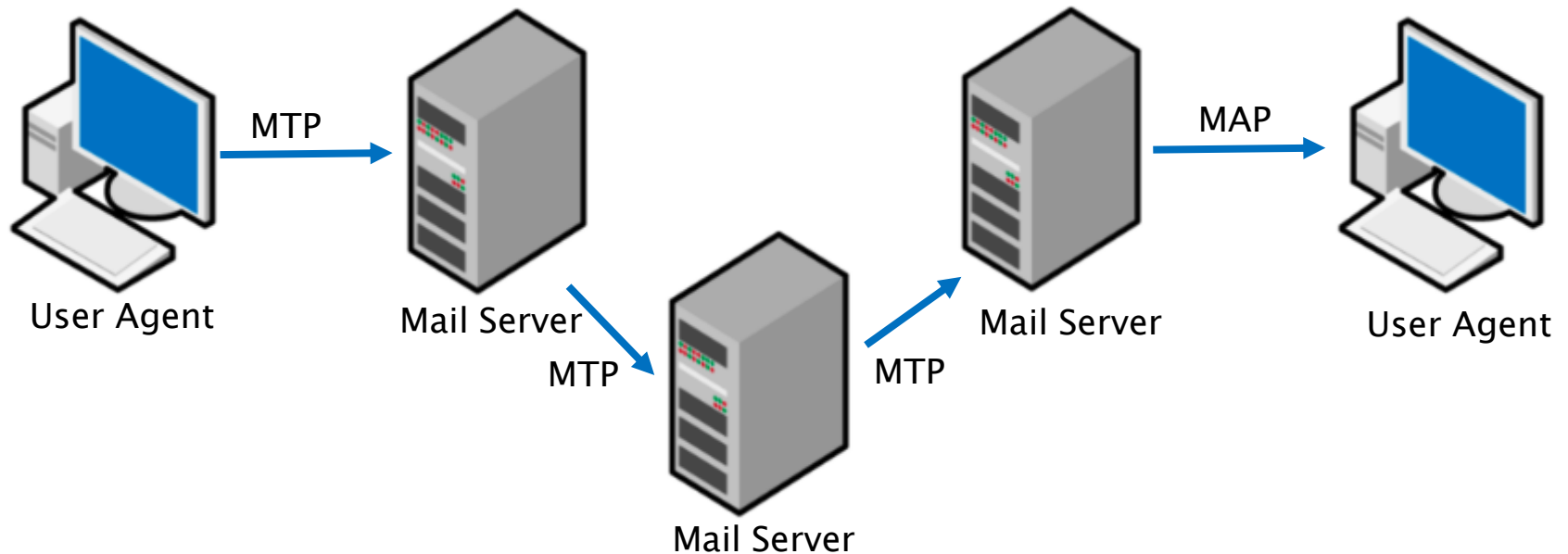
# Email Architecture

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- ▶ User agents (clients) – provide users with email functionality (read, reply, delete etc)
- ▶ Mail servers – store mail boxes, communicate with servers and agents

# Email Architecture



- ▶ Mail transfer protocol: to send emails
  - SMTP – Simple Mail Transfer Protocol
- ▶ Mail access protocols: to retrieve emails
  - POP3
  - IMAP
  - HTTP/S

# Access Protocols – POP3

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- ▶ Post Office Protocol
- ▶ RFC 1939, May 1996
- ▶ Modes of operation
  - Download and delete
  - Retrieve messages and stores locally, server deletes
  - Download and keep
    - Same, but server keeps
  - Why is it troublesome? Consider office/home user

# Access Protocols – IMAP

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- ▶ Internet Message Access Protocol
- ▶ RFC 9051, Aug 2021
- ▶ Mail kept on the server
- ▶ Built to manage multiple devices for the same client
- ▶ Client can manage folders on the server
- ▶ Solves POP3 sync problem

# About POP3

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## ▶ Pros:

- Once downloaded, no need for Internet connection
- Saves storage on mail server

## ▶ Cons:

- Need for backup
- May be more vulnerable to viruses since mails are fully downloaded



# About IMAP

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## ▶ Pros:

- Emails stored on the server → adapted to multiple devices
- Thus, all is saved: sent, draft, and deleted mails or created folders
  - All devices are synchronized

## ▶ Cons:

- Requires internet connection



# Access Protocols – HTTP/S

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- ▶ Yahoo mail, Hotmail, Gmail, etc.
- ▶ IMAP special client no longer required
- ▶ User agent is browser
- ▶ HTTP/S
  - GET method– pull emails from server
  - POST method – push email to server

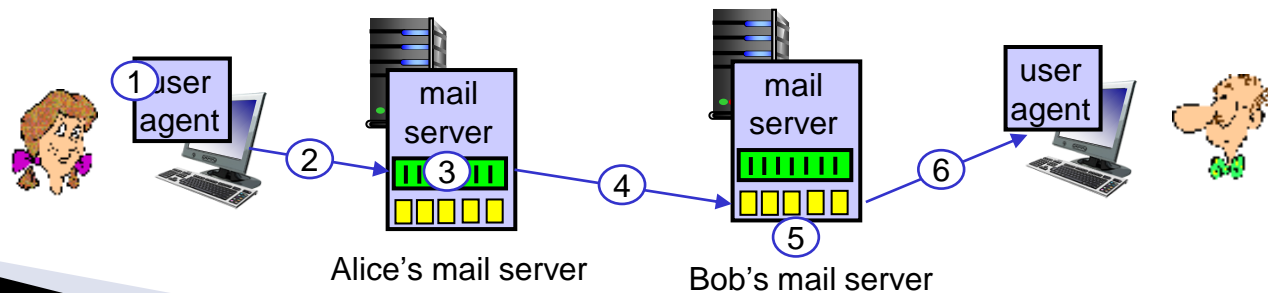
# SMTP

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- ▶ Simple Mail Transfer Protocol
- ▶ RFC 5321, Oct 2008
- ▶ From client to server and server to server
- ▶ Study hands on using wireshark
- ▶ Questions:
  - Client IP, Server IP
  - What does the client send on the first message? Server?
  - Extract username, password
  - What is the message?
  - How is disconnection done?

# Scenario: Alice sends e-mail to Bob

- 1) Alice uses UA to compose e-mail message "to" bob@someschool.edu
- 2) Alice's UA sends message to her mail server using SMTP; message placed in message queue
- 3) client side of SMTP at mail server opens TCP connection with Bob's mail server
- 4) SMTP client sends Alice's message over the TCP connection
- 5) Bob's mail server places the message in Bob's mailbox
- 6) Bob invokes his user agent to read message (IMAP/POP3)



# Lessons Learnt

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- ▶ Client – server model operation
- ▶ Using socket module
- ▶ Programming client and server
- ▶ Basic communication protocol

