Network Programming

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Communicating with Email Servers

Content

- Introduction
- Operating principle of email
- SMTP
- POP3, IMAP and MAPI

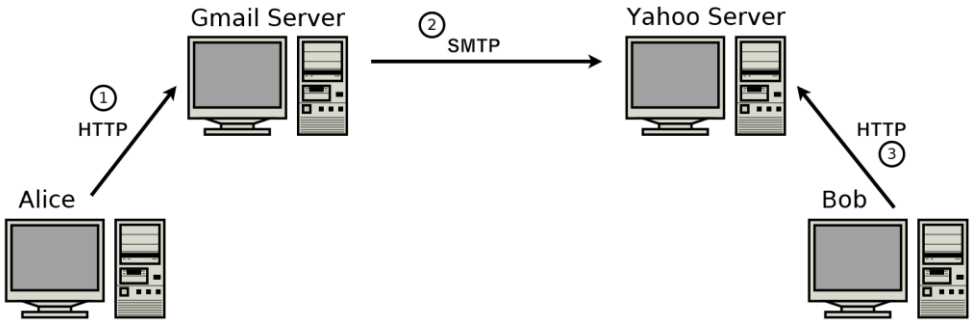
1. Introduction

- Email is cheap, fast, and can be picked up conveniently
- Emails can be automatically generated and sent, making them ideal for automated status notification
- How to send and receive emails from a .NET applications?

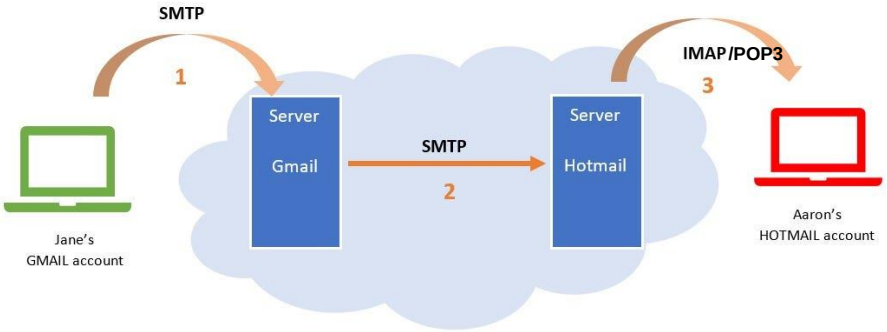
2. Operating Principle of Email

2. Operating Principle of Email

- Using webmail:



- Using email app:

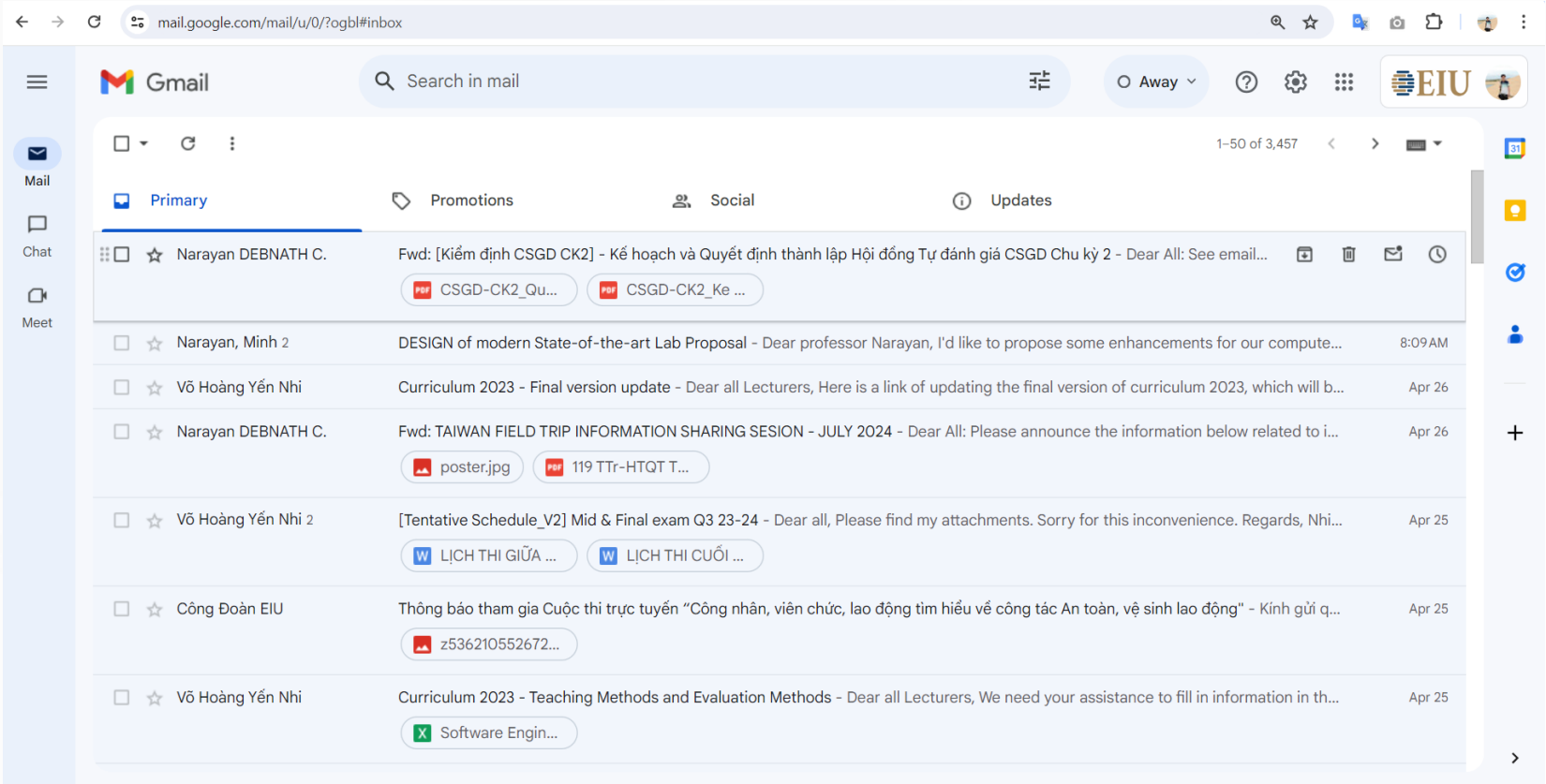


Webmail and Email apps

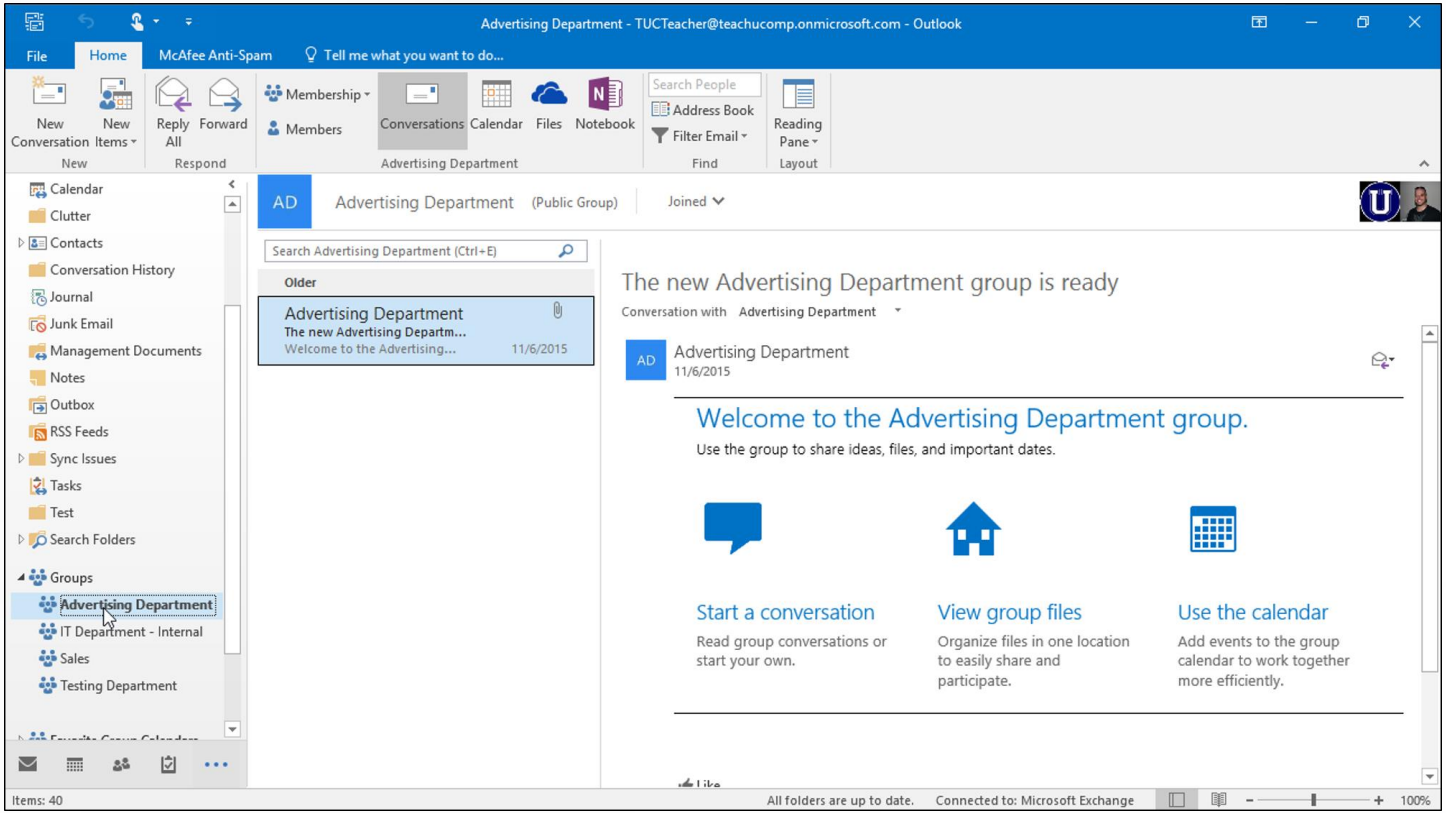
- **Webmail** is very popular now for sending and receiving mail from your mail provider. Gmail, Outlook.com, Hotmail.com…

- **Email apps** are programs that you install on computer to manage email. They interact with an email service such as Gmail or Outlook.com to receive and send email Outlook, Apple Mail, or Thunderbird

Webmail


mail.google.com/mail/u/0/?ogbl#inbox
Gmail
Search in mail
Away
EIU
Mail
Chat
Meet
1–50 of 3,457
Primary
Promotions
Social
Updates
Narayan DEBNATH C.
Fwd: [Kiểm định CSGD CK2] - Kế hoạch và Quyết định thành lập Hội đồng Tự đánh giá CSGD Chu kỳ 2 - Dear All: See email...
CSGD-CK2_Qu...
CSGD-CK2_Ke ...
Narayan, Minh 2
DESIGN of modern State-of-the-art Lab Proposal - Dear professor Narayan, I'd like to propose some enhancements for our compute...
8:09 AM
Võ Hoàng Yến Nhi
Curriculum 2023 - Final version update - Dear all Lecturers, Here is a link of updating the final version of curriculum 2023, which will b...
Apr 26
Narayan DEBNATH C.
Fwd: TAIWAN FIELD TRIP INFORMATION SHARING SESION - JULY 2024 - Dear All: Please announce the information below related to i...
Apr 26
poster.jpg
119 TTr-HTQT T...
Võ Hoàng Yến Nhi 2
[Tentative Schedule_V2] Mid & Final exam Q3 23-24 - Dear all, Please find my attachments. Sorry for this inconvenience. Regards, Nhi...
Apr 25
LỊCH THI GIỮA ...
LỊCH THI CUỐI ...
Công Đoàn EIU
Thông báo tham gia Cuộc thi trực tuyến "Công nhân, viên chức, lao động tìm hiểu về công tác An toàn, vệ sinh lao động" - Kính gửi q...
Apr 25
z536210552672...
Võ Hoàng Yến Nhi
Curriculum 2023 - Teaching Methods and Evaluation Methods - Dear all Lecturers, We need your assistance to fill in information in th...
Apr 25
Software Engin...

Email app


Advertising Department - TUCTeacher@teachucomp.onmicrosoft.com - Outlook
File
Home
McAfee Anti-Spam
Tell me what you want to do...
New Conversation
New Items
Reply All
Forward
Membership
Members
Conversations
Calendar
Files
Notebook
Search People
Address Book
Filter Email
Reading Pane
New
Respond
Advertising Department
Find
Layout
Calendar
Clutter
Contacts
Conversation History
Journal
Junk Email
Management Documents
Notes
Outbox
RSS Feeds
Sync Issues
Tasks
Test
Search Folders
Groups
Advertising Department
IT Department - Internal
Sales
Testing Department
AD
Advertising Department (Public Group)
Joined
Search Advertising Department (Ctrl+E)
Older
Advertising Department
The new Advertising Departm...
Welcome to the Advertising...
11/6/2015
The new Advertising Department group is ready
Conversation with Advertising Department
AD
Advertising Department
11/6/2015
Welcome to the Advertising Department group.
Use the group to share ideas, files, and important dates.
Start a conversation
Read group conversations or start your own.
View group files
Organize files in one location to easily share and participate.
Use the calendar
Add events to the group calendar to work together more efficiently.
Like
Items: 40
All folders are up to date.
Connected to: Microsoft Exchange
100%

3. Sending an email

- Every email must have a **destination email address**

  <Username>@<domain name>

- Note:
  - <domain name>: is globally recognized under the DNS system
  - <Username>: is recognized only by the recipient mail server

3. Sending an email

- Emails are not immediately delivered to the recipient
- They are initially sent to your ISP's or company's mail server
- From there, they are forwarded to the recipient's mail server or held for a period of time until the recipient's mail server accepts the email.
- Emails are sent using the Simple Mail Transfer Protocol (SMTP)

3. Sending an email

- In order to determine the recipient’s mail server, a DNS mail exchange (MX) query is issued to the local DNS server for that domain name.

- That computer will then return details of where the server or servers that handle incoming mail are located.

4. SMTP – Simple Mail Transfer Protocol

- SMTP is used to **send**, but **not receive**, emails.
- SMTP is a text-based TCP protocol that works on port 25.
- Every mail server in the world must conform to the SMTP standard in order to send emails reliably regardless of destination.

4. SMTP – Simple Mail Transfer Protocol

- SMTP is not a difficult protocol to implement from the ground up and would be a waste of time to redevelop.

- Many commercial email components are available, which can be imported into your application
  - AspEmail
  - Mercury
  - Yandex

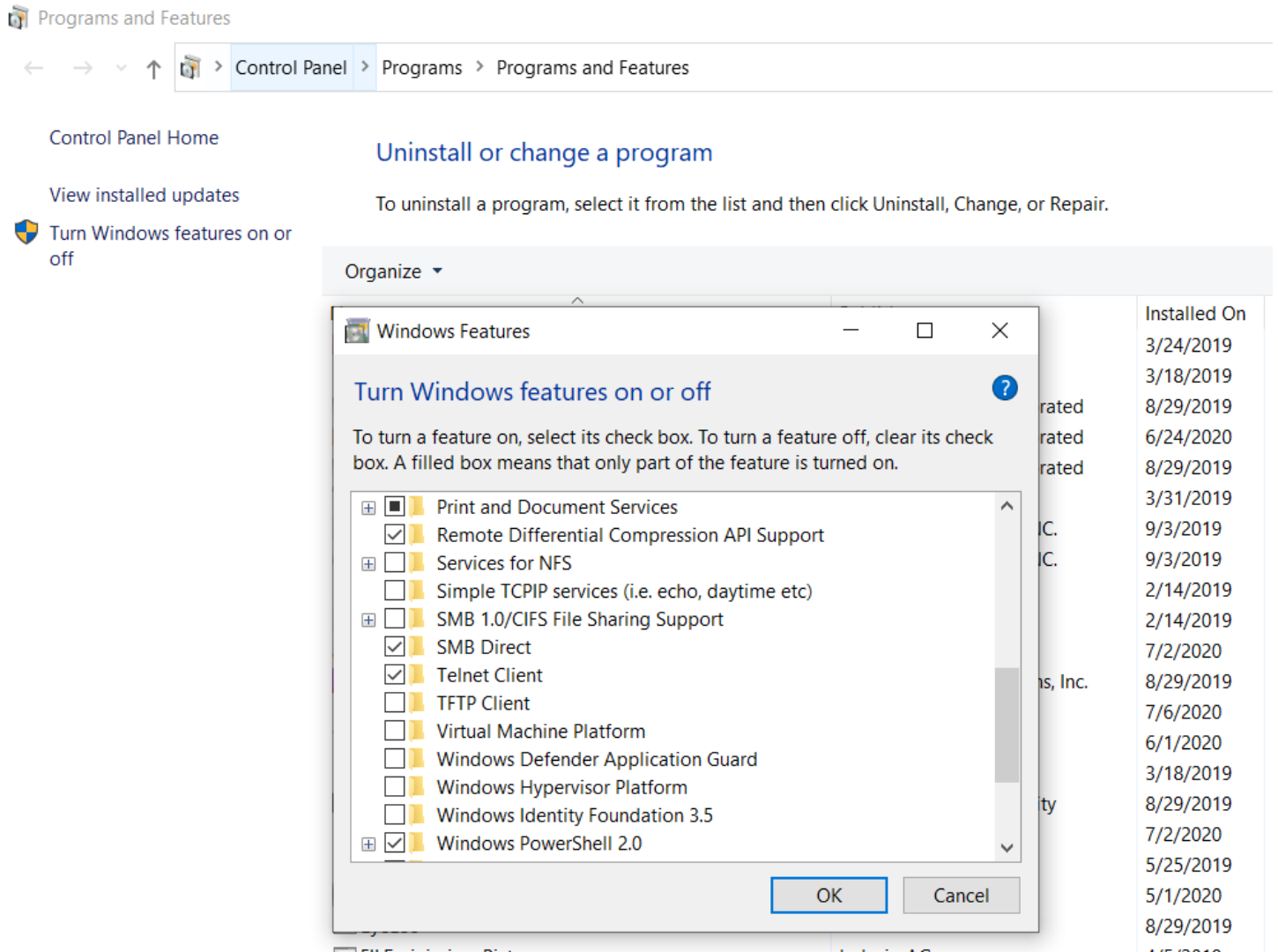
4. SMTP – Simple Mail Transfer Protocol

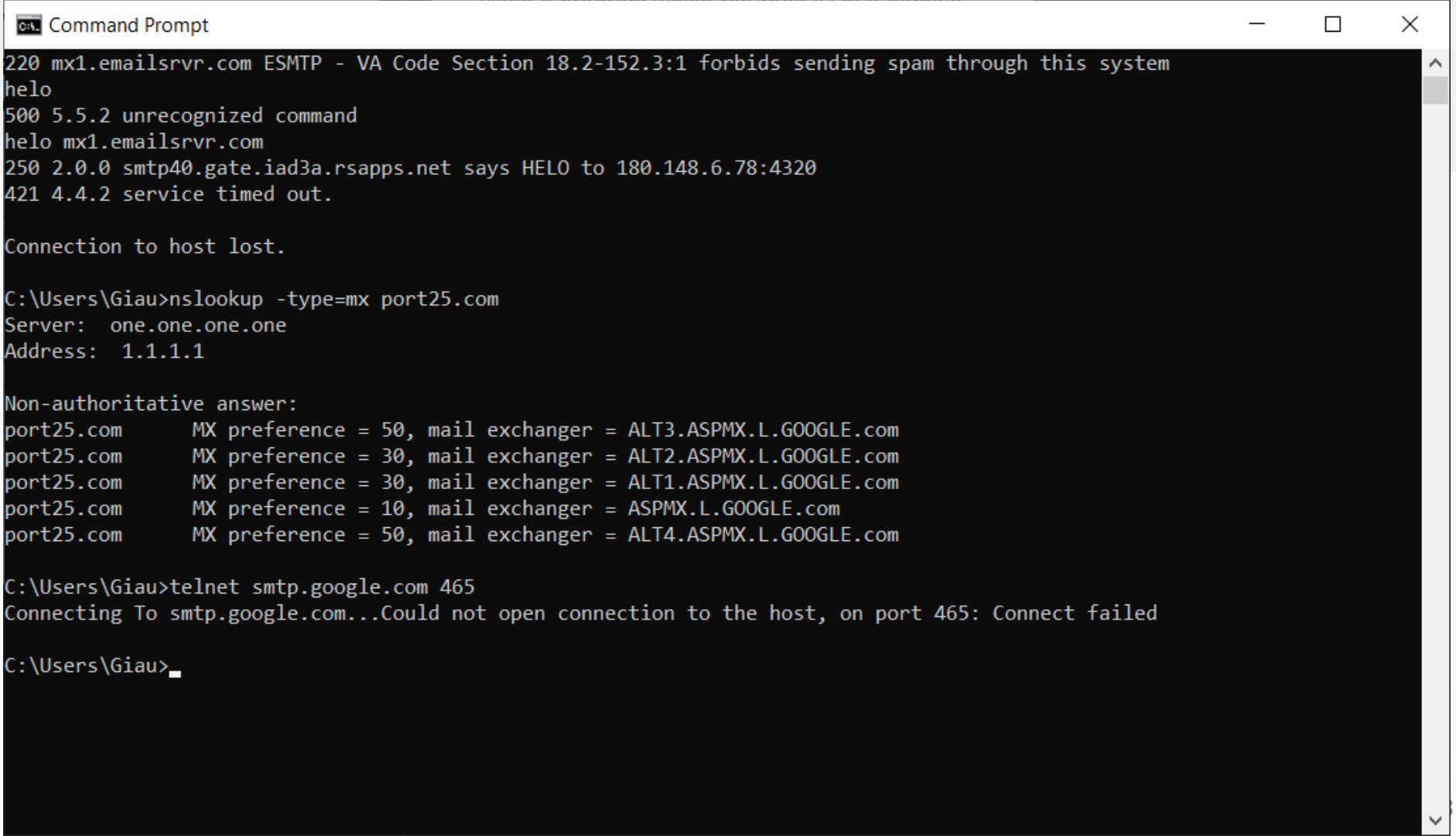
- Before sitting down to code, you should first find out the IP address of ISP's SMTP server

- A good way to test the protocol is to open telnet
  - Open cmd
  - Type: telnet <server name> 25
  - Once the client establishes a TCP connection to the server, the server will always reply with: 220 <some greeting message> <version-number>

Install Telnet Client

- Click **Start**, and then click **Control Panel**.
- On the Control Panel Home page, click **Programs**.
- In the **Programs and Features** section, click **Turn Windows features on or off**.
- In the **Windows Features** list, select **Telnet Client**, and then click **OK**.


Programs and Features
Control Panel
Programs
Programs and Features
Control Panel Home
View installed updates
Turn Windows features on or off
Uninstall or change a program
To uninstall a program, select it from the list and then click Uninstall, Change, or Repair.
Organize
Installed On
3/24/2019
3/18/2019
8/29/2019
6/24/2020
8/29/2019
3/31/2019
9/3/2019
9/3/2019
2/14/2019
2/14/2019
7/2/2020
8/29/2019
7/6/2020
6/1/2020
3/18/2019
8/29/2019
7/2/2020
5/25/2019
5/1/2020
8/29/2019
Windows Features
Turn Windows features on or off
To turn a feature on, select its check box. To turn a feature off, clear its check box. A filled box means that only part of the feature is turned on.
Print and Document Services
Remote Differential Compression API Support
Services for NFS
Simple TCPIP services (i.e. echo, daytime etc)
SMB 1.0/CIFS File Sharing Support
SMB Direct
Telnet Client
TFTP Client
Virtual Machine Platform
Windows Defender Application Guard
Windows Hypervisor Platform
Windows Identity Foundation 3.5
Windows PowerShell 2.0
OK
Cancel


Command Prompt
220 mx1.emailsrvr.com ESMTP - VA Code Section 18.2-152.3:1 forbids sending spam through this system
helo
500 5.5.2 unrecognized command
helo mx1.emailsrvr.com
250 2.0.0 smtp40.gate.iad3a.rsapps.net says HELO to 180.148.6.78:4320
421 4.4.2 service timed out.
Connection to host lost.
C:\Users\Giau>nslookup -type=mx port25.com
Server: one.one.one.one
Address: 1.1.1.1
Non-authoritative answer:
port25.com MX preference = 50, mail exchanger = ALT3.ASPMX.L.GOOGLE.com
port25.com MX preference = 30, mail exchanger = ALT2.ASPMX.L.GOOGLE.com
port25.com MX preference = 30, mail exchanger = ALT1.ASPMX.L.GOOGLE.com
port25.com MX preference = 10, mail exchanger = ASPMX.L.GOOGLE.com
port25.com MX preference = 50, mail exchanger = ALT4.ASPMX.L.GOOGLE.com
C:\Users\Giau>telnet smtp.google.com 465
Connecting To smtp.google.com...Could not open connection to the host, on port 465: Connect failed
C:\Users\Giau>

4. SMTP – Simple Mail Transfer Protocol

- Start a session:

HELO <server name> or EHLO <server name>

MAIL FROM: <email address>

RCPT TO: <email address>

DATA

<email content>

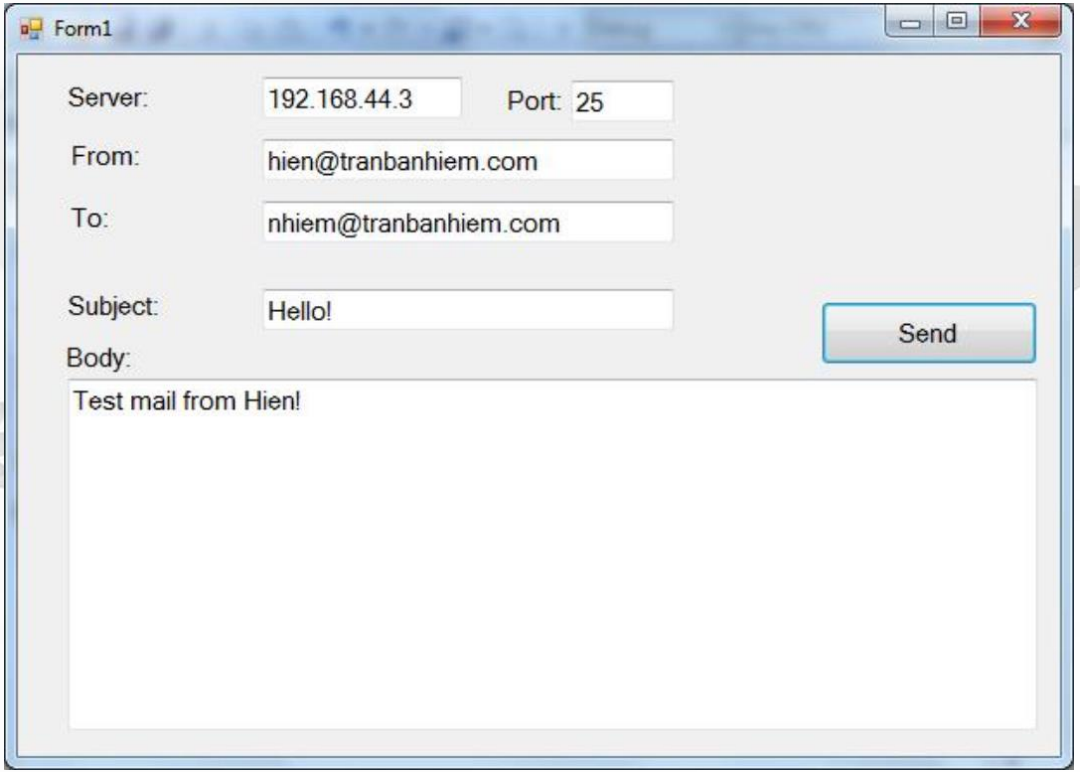
<*enter*>.<enter>

QUIT

4. SMTP – Simple Mail Transfer Protocol

```
S: 220 mail.example.com SMTP server ready
C: HELO mail.example.net
S: 250 Hello mail.example.net [192.0.2.67]
C: MAIL FROM:<alice@example.net>
S: 250 OK
C: RCPT TO:<bob@example.com>
S: 250 Accepted
C: DATA
S: 354 Enter message, ending with "." on a line by itself
C: Subject: Re: The Cake
C: Date: Fri, 03 May 2019 02:31:20 +0000
C:
C: Do NOT forget to bring the cake!
C: .
S: 250 OK
C: QUIT
S: 221 closing connection
```

4. SMTP Exercise

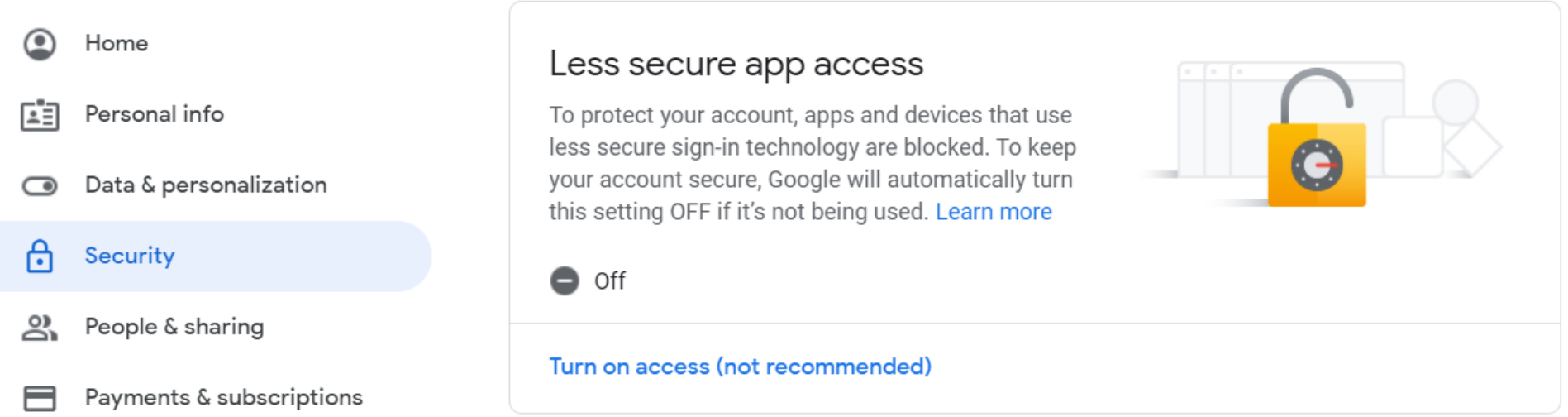


4. SMTP Exercise

- **Step 1:** Get Gmail SMTP information
  - Server address: **smtp.gmail.com**
  - Port:
    - ✓ SSL (Secure Sockets Layer): 465
    - ✓ TLS (Transport Layer Security): 587
  - **Note:**
    - ✓ If you use 2-step verification and the device or app doesn't accept verification codes, set up App Passwords for the desired account (https://myaccount.google.com/apppasswords)
    - ✓ Or you only need to turn on Less secure app access
- **Step 2:** Code your app

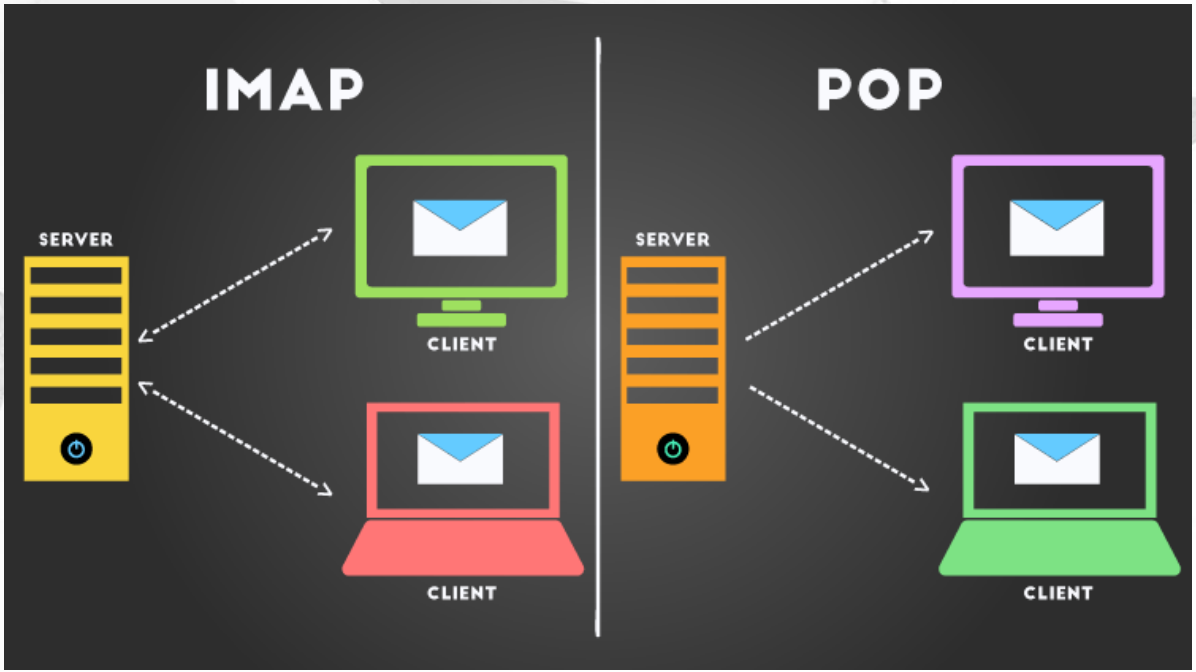
4. SMTP Exercise

Turn on Less secure app access



5. POP3 and IMAP

The standard protocols for receiving emails



5.1. POP3 – Post Office Protocol 3

- POP3 is used to **receive**, but **not send**, emails
- Every ISP has a POP3 server, and many Web hosting companies also supply a POP3 server
- POP3 operates on TCP port **110**

5.1. POP3 – Post Office Protocol 3

- POP works by contacting your email service and downloading all of your new messages from it
- Once they are **downloaded** onto your PC or Mac, they are **deleted** from the email service
- This means that after the email is downloaded, it can only be accessed using the **same computer**
- Sent mail is stored locally on your PC, not on the email server

5.1. POP3 – Post Office Protocol 3

Operating Principle

- Connect to POP3 server
- Get all emails
- Store local
- Delete the emails on the server
- Disconnect

5.1. POP3 – Post Office Protocol 3

- POP3 is also a command-line-based protocol
- Each line is terminated with a line-feed (<enter>) character
- When the server is operating normally, each line will start with +OK. If an error occurs, the line begins with –ERR

5.1. POP3 – Post Office Protocol 3

- To access a mailbox, the client must authenticate

  Client sends:

  USER <username><enter>

  Server replies:

  +OK <welcome><enter>

  Client sends password:

  PASSWORD <password><enter>

5.1. POP3 – Post Office Protocol 3

- To get summary information about the mailbox
  - Client sends: STAT <enter>
  - Server replies: +OK <number of message> <total size><enter>
- To read back an email:
  - Clien sends: RETR <number>
  - Server replies:

    +OK <some message>

    <enter> <mail body> <enter>.<enter>

5.1. POP3 – Post Office Protocol 3

- To delete emails:
  - Client sends: DELE <number>
  - Server replies: +OK <some message> <enter>

- At this point, it is possible simply to close the TCP connection, but it is recommended to send: QUIT <enter>

5.1. POP3 – Post Office Protocol 3

- Start a session:

  USER <username>

  PASS <password>

  STAT // to get summary information about the mailbox

  RETR <number>

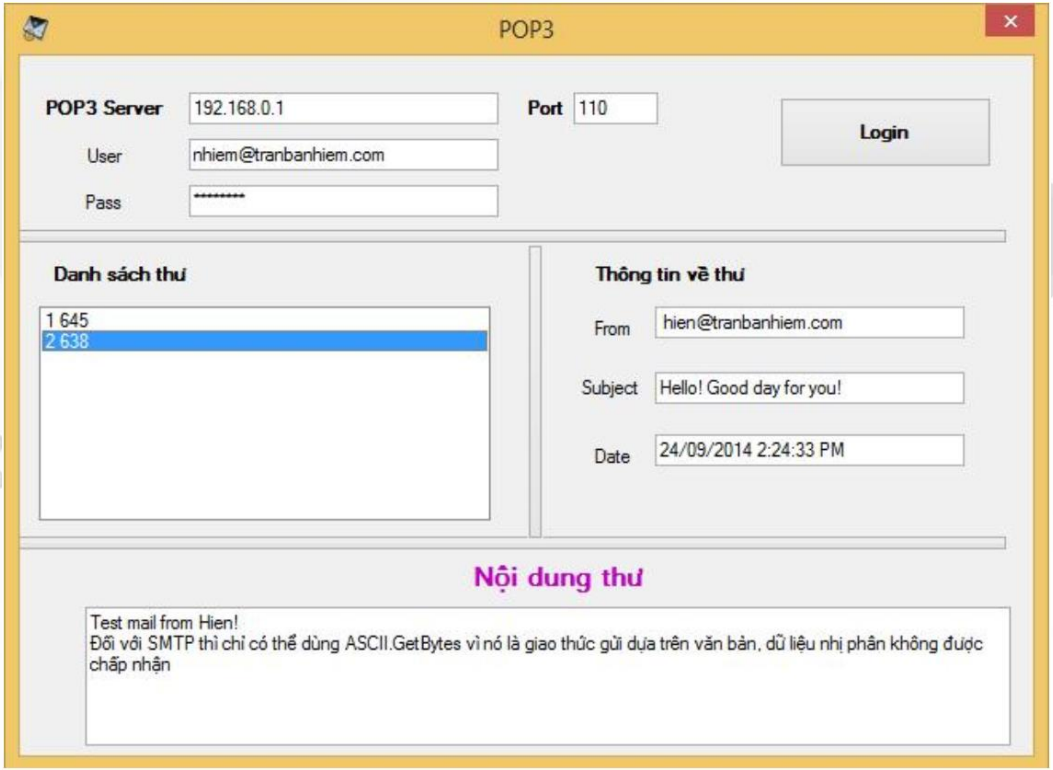
  DELE <number>

  QUIT

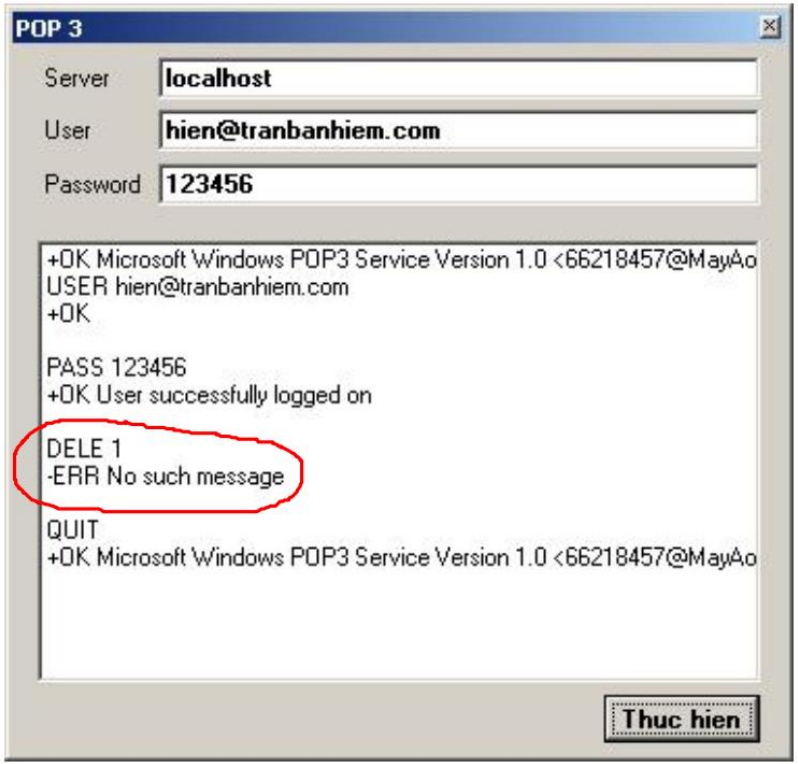
5.1. POP3 – Post Office Protocol 3

```
S:    +OK POP3 server ready
C:    USER bob
S:    +OK user valid
C:    PASS secret
S:    +OK pass valid
C:    STAT
S:    +OK 2 170
C:    RETR 1
S:    +OK 120 octets
S:    hello, how are you bob?, haven't seen you in
S:    ages, any chance you could give me a call
S:    sometime? I'd love to see you. Alice
S:    .
C:    DELE 1
S:    +OK message 1 deleted
```

5.1. POP3 Exercise – Getting Emails



5.1. POP3 Exercise – Deleting Emails



5.2. IMAP – Internet Message Access Protocol

- IMAP was developed at Stanford University in 1986
- IMAP allows you to **access your email wherever you are, from any device**
- When you read an email message using IMAP, you aren’t actually downloading or storing it on your computer; instead, you’re reading it from the email service

5.2. IMAP – Internet Message Access Protocol

- Runs over port 143
- IMAP is a competing technology for POP3. IMAP is much more richly featured than POP3
- Messages stored in an IMAP server can be marked as being answered, flagged, deleted, seen, draft, or recent (fetch only). These flags help manage an IMAP account over multiple clients

5.2. IMAP – Internet Message Access Protocol

- The protocol is similar to the POP3
- It uses a more complicated, but flexible syntax
  - To access a mailbox, the clien must authenticate:
    - ✓ Clien sends: login <username> <password>
    - ✓ If username and password are correct, server replies: OK LOGIN completed
  - To get summary information about the mailbox:
    - ✓ Clien sends: select inbox
    - ✓ Server replies: * <number of message> EXISTS

5.2. IMAP – Internet Message Access Protocol

- To read an email:
  - Clien sends: fetch <number>
  - Server responds with the message body and a message: K FETCH completed
- To delete emails:
  - Clien sends: store <number> +flags \deleted
  - Server responds with: OK +FLAGS completed

5.2. IMAP – Internet Message Access Protocol

```
S:  * OK IMAP4 Service Ready
C:  a001 login marc secret
S:  a001 OK LOGIN completed
C:  a002 select inbox
S:  * 18 EXISTS
S:  * FLAGS (\Answered \Flagged \Deleted \Seen
    \Draft)
S:  * 2 RECENT
S:  * OK [UNSEEN 17] Message 17 is the first
    unseen message
S:  * OK [UIDVALIDITY 3857529045] UIDs valid
S:  a002 OK [READ-WRITE] SELECT completed
C:  a004 fetch 12 rfc822.header
S:  * 12 FETCH (RFC822.HEADER {346}
S:  Date: Wed, 14 Jul 1993 02:23:25 -0700 (PDT)
S:  From: Terry Gray <gray@cac.washington.edu>
S:  Subject: IMAP4 WG mtg summary and minutes
S:  To: imap@cac.washington.edu
S:  cc: minutes@CNRI.Reston.VA.US, John Klensin
    <KLENSIN@INFOODS.MIT.EDU>
S:  Message-Id: <B27397-
    0100000@cac.washington.edu>
S:  MIME-Version: 1.0
S:  Content-Type: TEXT/PLAIN; CHARSET=US-ASCII
S:  )
S:  a004 OK FETCH completed
C:  a005 store 12 +flags \deleted
S:  * 12 FETCH (FLAGS (\Seen \Deleted))
S:  a005 OK +FLAGS completed
C:  a006 logout
S:  * BYE IMAP4 server terminating connection
S:  a006 OK LOGOUT completed
```

6. Microsoft Exchange, MAPI and Exchange ActiveSync

- **Microsoft Exchange Server** is a mail server developed by Microsoft → It runs exclusively on Windows Server OS

- Exchange Server primarily uses a proprietary protocol called **MAPI** (Messaging Application Programming Interface) to talk to email clients, but subsequently added support for POP3, IMAP, and EAS

6. Microsoft Exchange, MAPI and Exchange ActiveSync

- The standard SMTP protocol is used to communicate to other Internet mail servers

- **Exchange ActiveSync** is an Exchange synchronization **protocol** which lets mobile phones access an organization’s information on a server


POP3
IMAP

POP3 vs IMAP

- Choose POP3 if:
  - access emails from only one device
  - need to access emails even without the internet
  - limited storage space on the sever

- Choose IMAP if:
  - access emails from different devices
  - quickly view new emails on the server
  - local storage space is limited
  - worry about data redundancy

7. Spam-blocking pitfalls

- Spam has become a major problem, and every provider is taking actions to curb it.
- Many residential ISPs don’t allow outgoing connections on port 25.
- Many SMTP servers won’t accept mail from a residential IP address → they will send those emails straight into a spam folder.

- For example, if you attempt to deliver an email to Gmail, you may get a response similar to the following:

```
550-5.7.1 [192.0.2.67] The IP you're using to send mail is not authorized
550-5.7.1 to send email directly to our servers. Please use the SMTP
550-5.7.1 relay at your service provider instead. Learn more at
550 5.7.1  https://support.google.com/mail/?p=NotAuthorizedError
```

7. Spam-blocking pitfalls

- **DomainKeys Identified Mail** (DKIM) standard to help prevent spoofing on outgoing messages sent from your domain.

- **Email spoofing** is when email content is changed to make the message appear from someone or somewhere other than the actual source

7. Spam-blocking pitfalls

- **DKIM** adds an encrypted signature to the header of all outgoing messages. Email servers that get signed messages use DKIM to decrypt the message header, and verify the message was not changed after it was sent.

- **Sender Policy Framework** (SPF) specifies which domains can send messages for your organization

Mail Server

roundcube
open source webmail software

PEGASUS MAIL
by David Harris

8. Library

SmtpClient Class

- Namespace: System.Net.Mail
- Allows applications to send email by using the Simple Mail Transfer Protocol (SMTP)

MailMessage Class

- Namespace: System.Net.Mail
- Represents an email message that can be sent using the SmtpClient class.

NetworkCredential Class

- Namespace: System.Net
- Provides credentials for password-based authentication schemes such as basic, digest, NTLM, and Kerberos authentication.

8. Library

MailKit

- Link: https://github.com/jstedfast/MailKit
- MailKit is a cross-platform mail client library built on top of MimeKit.


Q&A