# What is the IMAP4 protocol?

Training kit

Trainer's booklet


High school

CyberEco

مَعًـا لِدَعْـم السَّلامة الرَّقميَّة

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الوكالة الوطنية للأمن السيبراني

National Cyber Security Agency

# What is IMAP4 Protocol?

## High School

## Training kit

## Trainer's Booklet

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**December, 2023**

**Doha, Qatar**

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## General content of the Kit

First: General Introduction to the training kit

Second: Scientific content

# First: General Introduction to the Training Kit

Below is an explanation of some details relevant to the objectives of the training kit, along with general guidelines for the trainer on how to handle this kit, while providing him with the scientific content that will be relied upon during the training.

## General idea

The concept of this training kit is to equip the trainer with tools and training resources, making it easier for him to deliver information to the trainees. In general, each training material consists of two parts: One part for the trainee and another for the trainer. The training kit serves as a general guide and support for the trainer, and its scientific content is the same as that of the trainee, but here the training content is presented differently. Additionally, the kit equips the trainer with training tools and methods that support him in the training process.

## Objectives of the Training Kit

1. Providing the trainer with training tools that help him deliver the training content to the students.
2. To present information and training content in an easy and simple manner.
3. To offer training content on the IMAP4 protocol along with multiple training tools and methods.

## Contents of the Training Kit

**The training kit includes several training tools, as detailed below:**

1. **Presentation files.**
2. **Training games,** such as shape coloring, drawings and crossword puzzles, which the trainer presents to the students to ensure their interaction with the training content.
3. **Educational videos.**
4. **Competitions,** Contests in the form of inferential questions presented by the trainer to encourage interaction between the students.
5. **Training cards**, comprising general information accompanied by illustrative images, presented by the teacher to the students.
6. **Sketches**, including information about the main topics in the training content.

# Content of the Training Kit

# WorkShop Timetable

| Content | Allocated Time |
|---|---|
| General introduction | 5 minutes |
| The theoretical aspect | 25 minutes |
| Educational Videos | 25 minutes |
| Short break | 20 minutes |
| Training games | 25 minutes |
| Dialogue and discussion with students | 15 minutes |
| Graduation project | 5 minutes |
| Total training time | 2 hours |

# Trainer's Guidance Manual

**The following is an explanation of some general guidelines for the trainer, revolving around how to use this training kit:**

1. The scientific content of the kit may exceed the children's ability to comprehend, especially in terms of general concepts and Terminologies. Therefore, the trainer must simplify these concepts and present them in a way that is understandable to high school students.
2. The trainer presents slides for each point discussed. For example, when talking about the concept of the IMAP4 protocol, the corresponding slide is presented, and the same applies to all scientific content.
3. After explaining the scientific material, a simple test is given to them, such as "Mark (✔) or (✘) for each sentence.
4. During the explanation of the first chapter, specially designed images for the "Did you know that..?" section are distributed.
5. The trainer displays the part related to "Sketches" While students are solving exercises and exercises
6. At the end of the training, the mentioned competition questions are presented.
7. During the presentation of the scientific material for each chapter, a portion of the allocated time is used to present several links related to the content of the chapter.
8. Regarding exercises directed towards students; a file with exercises will be attached at the end of this kit. These exercises are divided into two parts: a part to be given to students during training, which are classroom exercises, and the other part assigned for students to answer at home, which are non-classroom exercises. This division will be explained at the end of this kit.
9. After completing the explanation of the scientific material, the trainer uses the videos mentioned in a separate file, and he can also display the videos during the explanation of the scientific material if he deems it necessary, it is up to his discretion.

# Graduation Project

**The graduation project is a task carried out by the student, aimed at achieving several goals, Here is an explanation of the most important ones:**

- Ensure that the student has absorbed the information and ideas presented and is capable of applying them in their daily life.
- Consolidate the information and ideas that were presented to the student.
- The project serves as a link between theoretical information and practical real-world application.

**Regarding the mechanism for assigning students to the project, and how to implement it, the following guidance can be provided:**

- The graduation project can be individual or group-based, In case of a group project; the number of students participating in one project should not exceed three students.
- The students choose the project topic, and the trainer can provide some assistance or ideas in this field, the student's choice of the project topic is made with indirect supervision from the trainer.
- The topic of the graduation project must be consistent with the training content that was presented to the students.
- The graduation project can be within one of the following scenarios, which are non-binding concepts. The trainer can choose other concepts that he find suitable. Here are some suggestions:
  - Write a short story, report or article about IMAP4.
  - Take on the role of the trainer and write general guidelines for his colleagues or parents explaining the concept and importance of IMAP4.

# Second: Scientific Content

# Chapter One

## The Concept of the IMAP4 Protocol

- First: The Importance of the IMAP4 Protocol
- Second: The Difference between IMAP4 and Other Email Protocols


## First: The importance of the IMAP4 protocol

The IMAP4 protocol, an abbreviation for "Internet Message Access Protocol", which deals with email messages alongside other protocols like POP3. It involves a computer operation connecting two devices over a network for message exchange.

The IMAP4 protocol has faced strong competition from the POP3 protocol because the latter uses a model of accessing email without an internet connection. This means that email messages are retrieved from the mail server and then removed from the server, which saves storage space. Although millions of people now use the POP3 protocol to access incoming email messages, the main problem with this type of email protocols is that the messages are permanently deleted from the server, preventing multiple devices from viewing emails.This, alongside data security and integrity issues, poses risks such as device corruption, theft, hacking via ransomware, phishing attacks, and other cyber threats that compromise sensitive information and data.

Therefore, using the IMAP4 protocol is preferable for a large user base as it allows users to access their email from a remote server while keeping the messages on that server. It also enables users to track the messages they have already viewed and manage multiple mailboxes, as well as move messages from one mailbox to another, which helps protect data from tampering or destruction. However, this requires the use of two-factor authentication, data encryption, and a strong and hard-to-guess password.This is unlike the POP3 protocol, which doesn't permit users to manage emails on the server.

IMAP4 is a protocol for accessing messages over the Internet, which is a program used to retrieve incoming email, by storing mail messages on a remote server away from users, where it allows them to view and manage messages as if they were stored on their personal device. The IMAP4 protocol enables users to organize email messages in folders, mark messages for follow-up, and save message drafts on the server. Users also benefit from the features of this protocol by displaying read or unread messages.

IMAP4 acts as an intermediary between the email server and email users, by reading messages through this protocol outside the server without the need to download or store mail messages on their personal devices, which means that email is not linked to a specific device, but users can access it from anywhere in the world using different devices such as desktop computers, laptops, smartphones, and tablets.

## Overall, the Advantages of the IMAP4 protocol are:

1. Access to email messages from multiple devices: Users can access their email messages using applications like Gmail on their smartphones and desktop computers simultaneously.
2. Quick and efficient access to email messages.
3. Multiple users can share a mailbox.
4. Users can organize their email messages by creating folders and subfolders
5. Supporting email functionalities, such as search and sorting.
6. Displaying unread emails in the inbox, eliminating the need for periodic checking or prompting users to click on messages upon receipt [(1)].
7. Ideal for those who need to access their email while traveling or using different devices.
8. Directly handling messages on the email server, instead of downloading them to the user's device.
9. In IMAP4 protocol, providing email presence on the server ensures higher security in case the user loses or damages their device.
10. Eliminating the need to re-download messages when transitioning between devices as they are stored remotely. [(2)]

1. IMAP4 (Internet Message Access Protocol). On site: https://cutt.us/Ff11z
2. Advantages and Disadvantages of the IMAP4 Protocol. On site: https://cutt.us/a9sGf

## Second: The difference between IMAP4 protocol and the rest of the protocols followed in email

### Email protocol

An email protocol is a program that connects one computer to another to exchange email messages. When sending an email, there are three elements in the exchange equation (two devices + server) ;One of the devices sends the email to the other (the recipient), while the mail server's task is to store the messages and allow the receiving device to access and download them when needed. (1)

There are four different mail protocols, in terms of features, uses and importance, which are: POP3, IMAP4, SMTP, and HTTP. For example, there are several email applications such as Outlook and Gmail, and each supports different email protocols. Outlook, for instance, supports email servers compatible with the IMAP4 and POP3 protocols. Here is a detailed explanation of the different protocols.

### POP3 Protocol

POP3 is a simple and old protocol designed for use on a single computer, supporting only one-way email synchronization, which means allowing users to download email messages from the server to the client only on their own computer (2).

POP3 enables email users with temporary internet access to access their messages, read them, or compose new messages or reply to them even if they are not connected to the internet, and then send them when they reconnect to the internet. Examples of this type of email protocol include Yahoo.

1. The difference between POP and IMAP4? Microsoft. Available at the link:.https://cutt.us/4HCmG
2. A Quick Guide to IMAP4, POP3,and SMTP Ports? On site: https://cutt.us/tNM4K

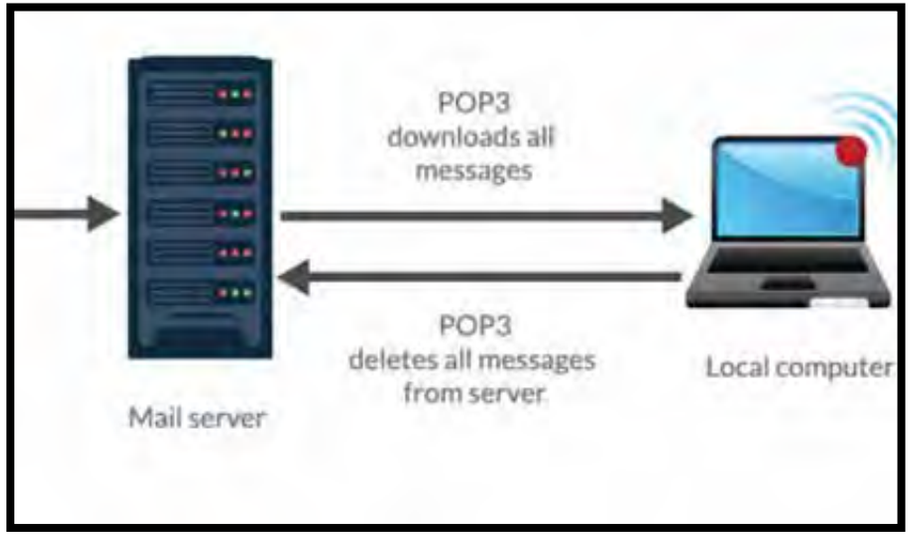



**Illustration of How the POP3 Protocol Works**

**However, there are several drawbacks to the POP3 protocol that make it less ideal compared to other email protocols, including:**

- Marking messages as read on multiple devices, which means that every time the user downloads a message from his email on a different device, it will appear as a new message, even if they have already read it on another device.
- Some of the drawbacks of this protocol also include Incapable of synchronizing sent items: meaning that they cannot be saved on any device other than the one where it was composed.
- Users must continually set up their device to periodically check their email server to recognize newly received messages.
- Users need to manually create items like personal folders or adjust settings individually on all devices, Specifically, if the user writes an email on one of their devices, they must do so again on every device they own and use with the POP3 protocol.[1]
- **On the other hand, the advantages of the POP3 protocol include:**

1. Ability to store mail on devices.
2. Access to mail without internet connection. Internet connectivity is only required for sending and receiving email messages.
3. Provides space saving for users by deleting messages after downloading. and some email hosts offer significant mailbox storage capacity, sometimes up to 500 megabytes
4. Users can leave copies of their email on multiple POP3 servers.
5. Users can consolidate multiple email accounts into one mailbox.
6. Data is more secure because no email is stored on the server POP3[2].

1. What Is Email Protocol? , By Debashree Sen. On site: https://cutt.us/wOTyv
2. Understanding Post Office Protocol (POP3). On site: https://cutt.us/nOAEp

## IMAP4 (Internet Message Access Protocol)

The IMAP4 protocol supports users' access to their email messages, whether they are connected to the internet or not, similar to POP3 protocol. It also allows users to download email messages to their personal devices while keeping a copy on the server, and that copy available on the server is considered the original version of the message.

One of the advantages of the IMAP4 protocol is that it saves time for email users by allowing them to search for email messages on the server. It also enables users to create new mailboxes that appear as folders on the server and move messages between folders. Examples of popular applications that use the IMAP4 protocol include Gmail and Microsoft Outlook.

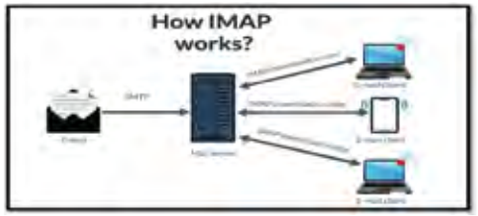



**Illustration of How the IMAP4 Protocol Works**

**Image Source: siteground** (1)

The IMAP4 protocol allows logging in through multiple email users on computers or mobile devices and read the same messages It also synchronizes all the changes made across multiple devices. Note that deleting messages from the server depends on the user deleting them from their email, and users can benefit from the IMAP4 protocol in various ways. Here are some of its important uses:

- Logging in using multiple devices simultaneously.
- Synchronizing and storing the user's email archive on the server, allowing all connected devices to access the stored messages.
- Messages sent, received, or stored on the server cannot be deleted except by the user(1).

### As for the Disadvantages of the IMAP4 protocol, they include:

- Limiting message storage to 200 MB or 500 MB unless you purchase more professional email services.
- Storing all messages on the server increases the chances of E-mail theft and unauthorized access, especially if the user's password is insecure or weak. (2)

1. What Are Email Protocols? on site: https://cutt.us/Oh47c
2. POP3 vs IMAP4. Which Is Better? On site: https://cutt.us/cFCCb

## SMTP (Simple Mail Transfer Protocol)

It is a simple text-based protocol that works well when devices are connected to each other, and it only specializes in sending email messages unlike POP3 and IMAP4 protocols, which provide message retrieval from the server, and this is the reason behind the decline in reliance on it, and to overcome this drawback SMTP protocol provides the possibility of placing email messages in a queue on the server. However, one drawback of this type of protocol is the lack of email authentication for the sender. Additionally, it lacks security features, which can result in the user receiving unwanted messages. SMTP is commonly used in UNIX systems and simple applications like mailsend, while commercial applications refrain from relying on this protocol due to its drawbacks.

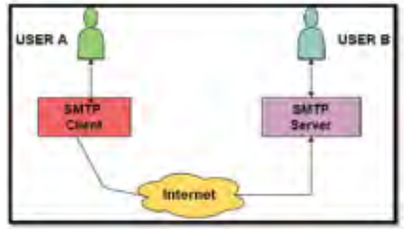



**Illustration of How the SMTP Protocol Works:**
Source: Studytonight:[1]

1. SMTP Protocol. On site: https://cutt.us/VzjGe

### Pros and Cons of SMTP Protocol:

#### Disadvantages of SMTP:

- The primary drawback of the SMTP protocol is the lack of security features, making it susceptible to exploitation and allowing for the transmission of «spoofed" email messages from any sender address.
- Server limitations: The protocol imposes several rules for hosting and internet connectivity, limiting the volume of messages that can be sent through it.

#### Advantages of SMTP:

- Ability to perform statistics from the sent messages to create statistical reports for sent newsletters, such as click-through rates and open rates.
- SMTP enables synchronization of Smarthost server: For instance, if a user has 100 desktop computers used for managing customer relationships and desires synchronization, the user doesn›t need to configure the protocol on each individual device. Instead, they can manage all email accounts through a Smarthost server [2].

2. What is SMTP? Advantages and disadvantages of an SMTP server. On site: https://cutt.us/UedJl

## HTTP (Hypertext Transfer Protocol)

HTTP plays an important role by allowing internet browser users to access their mail messages, whether for sending or receiving. And among the most famous applications that use this protocol are Hotmail and Yahoo. HTTP (Hypertext Transfer Protocol) is used to access data on the World Wide Web (www), where it can be used to transfer data whether as plain text or audio or video and more. This protocol is characterized by its efficiency in moving between documents quickly, as well as delivering messages instantly.

### There are two types of HTTP messages:

- **Request message:** The user sends a message consisting of a request line, headers, and sometimes text.
- **Response message:** The server responds to the user with a message consisting of a status line, headers, and sometimes text.(1).

To access the desired document on the internet, the user needs an address.

Here, the HTTP protocol ‹Uniform Resource Locator (URL)› is used to specify any type of information on the internet, defining four parts as follows:

1. HTTP Messages. On site: https://cutt.us/223yx

- Method: It is the protocol used to retrieve the document from the server, such as HTTP.
- Host: It is the computer where the information is stored and is given a domain name starting with «www."
- Port: The URL may contain the server's port number, but it is optional.
- Path: It is the file path where the information is stored.

## Advantages of HTTP protocol:

- Connectionless protocol: The user initiates the request, waits for the response from the server, which processes the request and sends the response back to the user. After receiving the response, the user terminates the connection. Thus, the actual connection between the user and the server in this protocol occurs only during the request and response time.
- Data can be sent as long as both the user and the server know how to interact with the data content.hey are only asked to select the type of content .They are only asked to select the type of content
- Both the user and the server know each other only during the current request, and therefore neither of them retains information about the requests.

- HTTP uses an advanced system for addressing files, making it easy to identify them on the web, which makes using the public easier with the internet.
- It provides the ability to download plug-ins and display relevant data, such as flash players and Acrobat reader (PDF files).
- Reducing access time in communication.
- Storing all HTTP pages within what is known as "page cache memory" on the internet upon first visit, which makes loading content faster when visiting pages again.

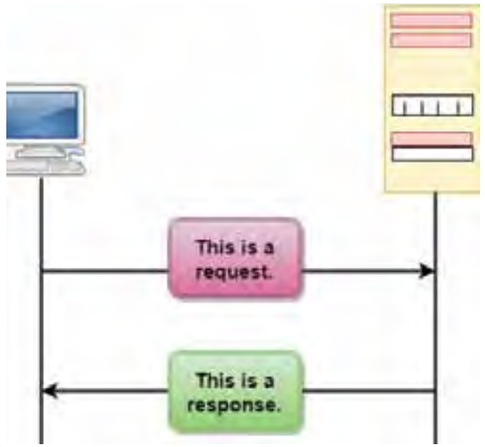



**Illustration of the Request-Response Exchange between User and Server**

## Disadvantages of HTTP protocol:

- Data integrity: Due to the absence of encryption methods in the HTTP protocol, the chances of content manipulation increase, making it an insecure choice for data.
- Data privacy: One of the disadvantages of HTTP is the issue of privacy, where any intruder can intercept the request and display the content on the web page, as well as collect confidential information such as username and password.
- HTTP requires multiple connections to transfer a web page, which means more administrative costs.
- Clients fail to take actions to close the connection despite receiving all the required data from HTTP.
- HTTP consumes more energy due to its increased usage of system resources; therefore, it is not the best option for Internet of Things (IoT) devices that have wireless sensor networks [(1)].

1. 5 Advantages and Disadvantages of HTTP | Drawbacks & Benefits of HTTP. On site: https://cutt.us/IkfNB

# Chapter Two

## How IMAP4 Protocol Works

- First: IMAP4 Protocol and Email Organization and Protection
- Second: The mechanism for accessing email and the IMAP4 protocol.


## First: IMAP4 Protocol and Email Organization and Protection

The IMAP4 protocol follows a user-server architecture and is the most commonly used email protocol. It involves a combination of user and server operations that are executed on other network-connected computers. IMAP4 operates through another protocol, TCP/IP, for communication. Once the connection is established on either of its encrypted or unencrypted ports, the server starts its operation. The primary purpose of the IMAP4 protocol is to provide users with a convenient and efficient way to access, manage, and organize email messages stored on the mail server.

### How does the IMAP4 protocol work?

The IMAP4 protocol operates through a series of sequential procedures. **Here is an explanation of the most important steps:**

1. **Connecting to the server:** To access the user's email, they must connect to their specific email server (e.g., Outlook) using the IMAP4 protocol.
2. **Authentication:** In this step, the user inputs their contact information (username and password) to the server, which verifies and authorizes the access to the user's mailbox if the credentials are correct.
3. **Synchronization:** Once the user accesses their email, they retrieve the list of messages and folders from the mail server, allowing him to synchronize between both parties. Any changes made to messages, such as moving or deleting them, are reflected on the server as well.
4. **Accessing messages:** When the user requests to read email messages, the IMAP4 protocol begins transferring only the necessary parts of the email, such as headers and the main text. Attachments are not automatically downloaded unless requested by the user.
5. **Processing messages:** The user can perform several operations on their emails, such as marking them as read, flagging them for follow-up, or moving them to different folders. These actions are performed on the server to maintain a unified mailbox across all user devices.
6. **Disconnecting:** The connection with the server is cut off once the user finishes using the mail.

## Security concerns for IMAP4

**Despite the advantages of IMAP4 protocol, there are some security concerns that may occur through it, such as:**

- Increased risk of sensitive information exposure to eavesdropping or external attacks: IMAP4 transfers data, including login credentials and email content, in plain text format. This increases the risk of information being intercepted or subjected to external attacks. To enhance security, data encryption is recommended.
- Ease of accessing email messages in case of a breach: IMAP4 stores email messages on the mail server, and in case of a breach, intruders' gaining access to messages becomes inevitable, leading to privacy violation and data theft. Hence, it›s advisable to employ two-factor authentication should be used, along with strong and different passwords that are difficult to guess. Additionally, the security of the user›s device, where copies of email messages are temporarily stored, should be ensured. In case of device compromise or theft, the risk of unauthorized access to email messages increases. Strong passwords for devices and the use of up-to-date software are necessary precautions [(1)].

To address these security concerns, users should ensure that they use IMAP4 with SSL/TLS encryption, choose an email provider that follows strong security measures, use strong passwords, enable two-factor authentication, and keep their personal devices secure.

### Example of an electronic attack using the IMAP4 protocol:

The attack known as "IMAP4-based password spraying" targeted Microsoft Office 365 users in 2018, where cybercriminals exploited the IMAP4 protocol to bypass multi-factor authentication (MFA) measures and gain unauthorized access to user accounts by using a technique called "password spraying." Attackers attempted to log into multiple accounts using commonly used passwords, bypassing the security layer provided by the protocol. This onine attack targeted high-profile organizations and compromised their email accounts, highlighting the importance of using unique and strong passwords and implementing multi-factor authentication [(2)].

1. Legacy protocols in hybrid environments – new report demonstrates IMAP4 security risks. On site: https://cutt.us/uYzIb

2. Attackers are exploiting IMAP4 to bypass MFA on Office 365, G Suite accounts,  Zeljka Zorz, Editor-in-Chief, Help Net Security, 2019. On site: https://cutt.us/n4n2C

## Second: The mechanism for accessing email and the IMAP4 protocol

### The email mechanism

is an electronic communication method for sending and receiving messages over the internet, currently the most common form of communication. It features functionalities like synchronization and security, as well as features related to spam emails.

**Email consists of:**

- **Sender:** The person who sends an email containing information with the aim of delivering it to the recipient.
- **Recipient:** The receiver who obtains the information sent by the sender via email.
- **Email address:** It is the address on which the sender and recipient communicate similar to receiving physical mail at home.
- **Mailer:** This program ensures the possibility of reading, writing, managing and deleting emails in email services such as Gmail, Outlook and others.
- **Mail server:** It is responsible for sending, receiving, managing and recording all data that is done by its own email programs, as well as processing them.

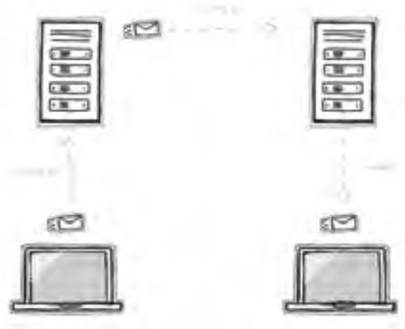


**Illustration of the transmission and reception mechanism between SMTP and IMAP4 servers [1].**

1. IMAP4: Network Protocol Explained. On site: https://cutt.us/QF7xk

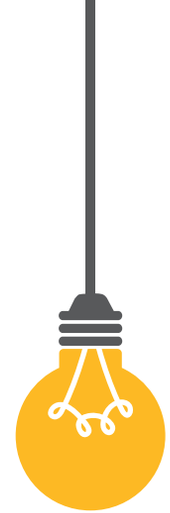
- **SMTP:** It is a simple mail transfer protocol that uses the Internet to send and receive messages. It is used by email software such as Gmail or Outlook to send email messages to the user›s email server. Often, the user's email service provider hosts the email server, such as Google. Then, the email server uses SMTP to send the user's message to the recipient's email serve.[1]
- **Following this, the Internet Message Access Protocol (IMAP4) is used by the email user (the recipient) to retrieve the sender's message from the mail server and place it in his inbox.**

## Email Workflow:

1. When the sender uses mail, it is redirected to Simple Mail Transfer Protocol (SMTP) to verify the recipient's email address.
2. The SMTP protocol stores the sent email on the server for later transfer using any of the basic protocols POP3 or IMAP4.
3. In case the recipient has a different domain address (for example, the sender's domain Gmail differs from the recipient's domain Hotmail), then SMTP protocol connects with Domain Name Server (DNS) which communicates with the other address used by the receiver and then the sender's SMTP connects with the recipient's SMTP to deliver the email.
4. If both SMTPs of sender and recipient are unable to communicate with each other due to internet issues, then the email is placed in a specific SMTP queue until the problem is resolved. However, if the issue persists, the message is returned to the sender.
5. When the recipient uses the POP3 protocol, the received email is deleted from the web server. However, if using IMAP4, the email is stored on the web server for the recipient to manage at any time. [2]

1. SMTP & IMAP4: What Is It? How Does It Work? On site: https://cutt.us/a9q5b
2. What Is IMAP4 and How Does It Work? By Durga Prasad Acharya. On site: https://cutt.us/jNNBq

# Exercises and training



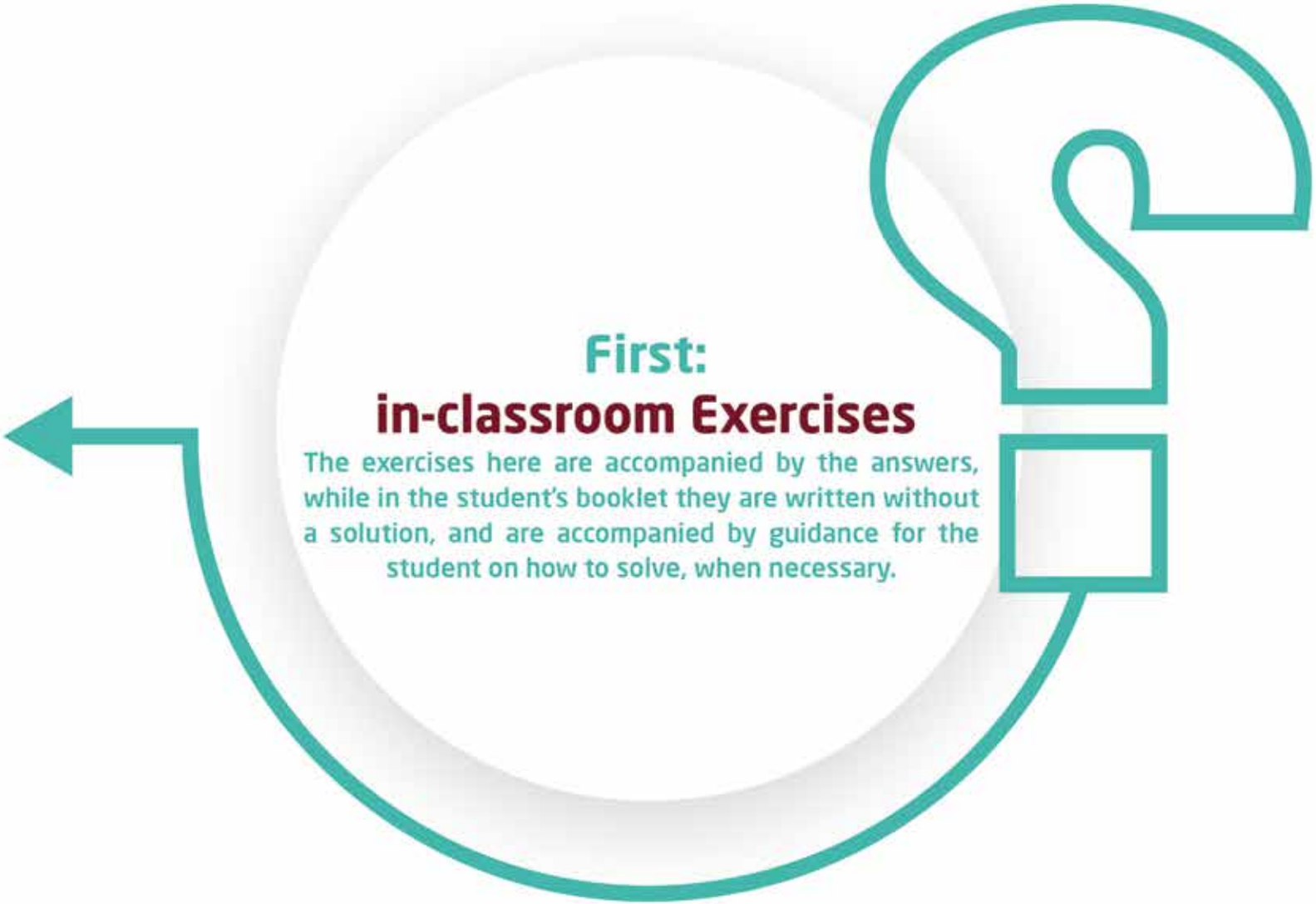
- **Exercises are a major part of the training process, and they achieve several goals and aims, as follow:**
- Exercises are an effective tool to assess students' utilization of the training content and its impact on their cognitive inventory.
- They serve as a vital means to reinforce information and knowledge, constituting a rapid review of the training content
- They help to identify knowledge gaps among students.
- They act as a form of feedback for the trainer, providing information on the effectiveness of the training kit and the training method.

## Approach to Dealing with Exercises:

The exercises mentioned in this section are comprehensive of the training content in this kit, here's an outline of the proposed methodology for dealing with them:

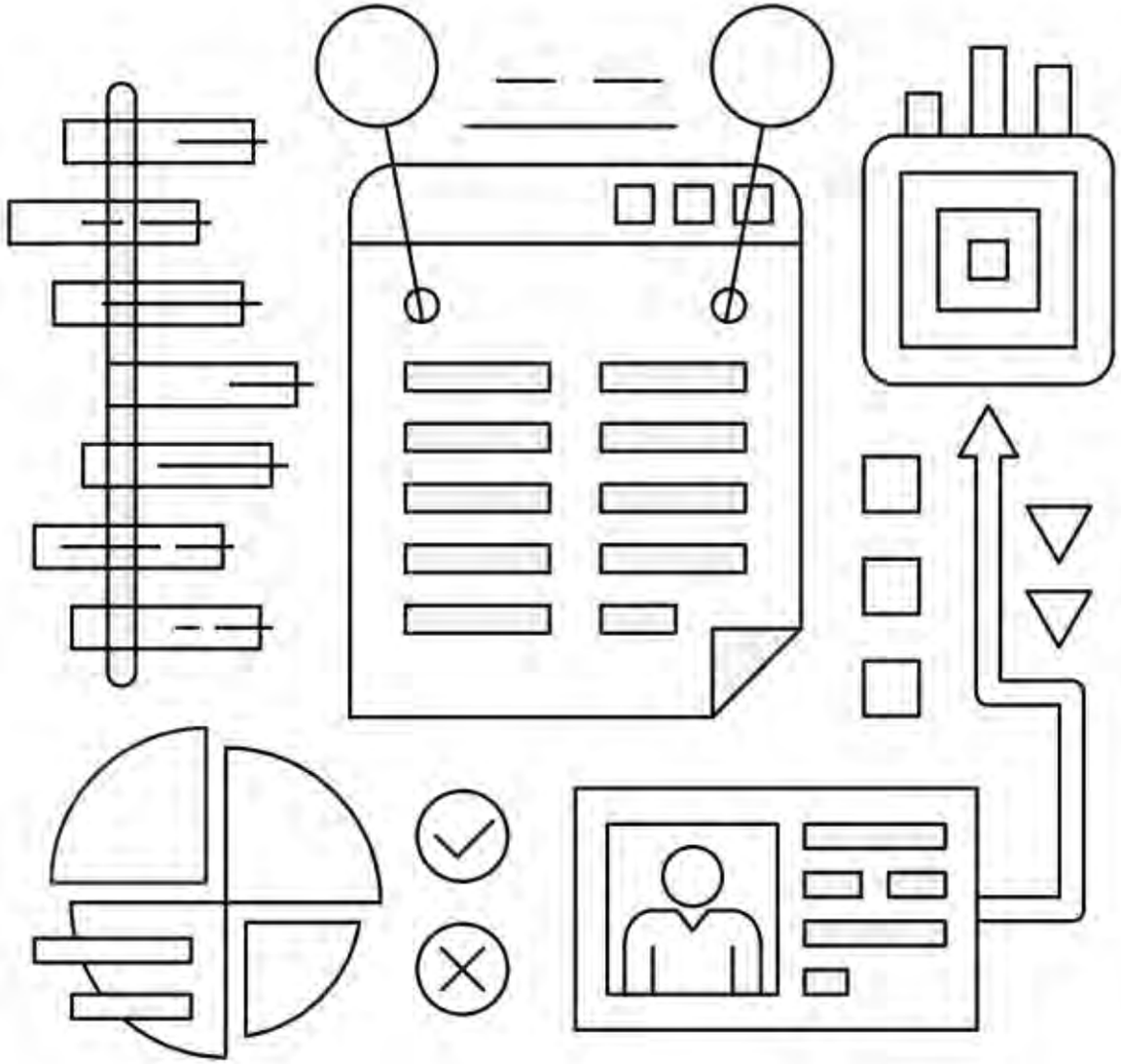
- During the training, after introducing an idea, the trainer will request students to open their respective booklet and answer the specific question, directly related to the presented idea or subject
- The exercises are carefully selected to be simple, easily understood, and solvable by middle school students. The trainer may offer support to students in answering some exercises if necessary, at their discretion.
- The exercises are divided into two parts; one for in-classroom use, called classroom exercises, and another is non-classroom, to be completed at home by the students.
- The answers for each exercise are provided, highlighted in a different color.

**Below is an explanation of exercises specific to Middle school students, arranged according to chapters and classified as in-classroom and homework exercises (Non-classroom Exercises). These exercises, in the form presented here, are the same as those in the students' booklet.**



## First:
## in-classroom Exercises

The exercises here are accompanied by the answers, while in the student's booklet they are written without a solution, and are accompanied by guidance for the student on how to solve, when necessary.



# Pay Attention!

## (IMAP4)

IMAP4 stands for Internet Message Access Protocol. It is a program that is used to access incoming email. It stores email messages on a remote server, away from users, and then allows them to view and manage messages as if they were stored on their personal computer.

# Pay Attention!

The (IMAP4) protocol allows users to organize email messages into folders, mark messages for follow-up, and save draft messages on the server. Users can also take advantage of the protocol's features to show messages that have been read or that are still unread.

## Exercise 1

**Complete the following sentences:**

1. Email is a means of exchanging digital **messages** through **the internet** or interconnected networks.

2. Instant messaging means the transmission of **a message** at the same time of sending them, while **email** relies on **authentication** and forwarding, and **Incoming** messages can be saved in mailboxes for users to access at any time.

3. A protocol is **a set of** rules and sending regulations that **facilitate** a particular process and using these **protocols** enables us to organize the process of **receiving** of email messages between users.

4. There are three basic protocols currently in use, which are the SMTP system, the POP3 system, and the **IMAP4** system.

5. The **SMTP** protocol is used for sending **email**, while the **IMAP4** and **POP3** are used for receiving email **Messages**

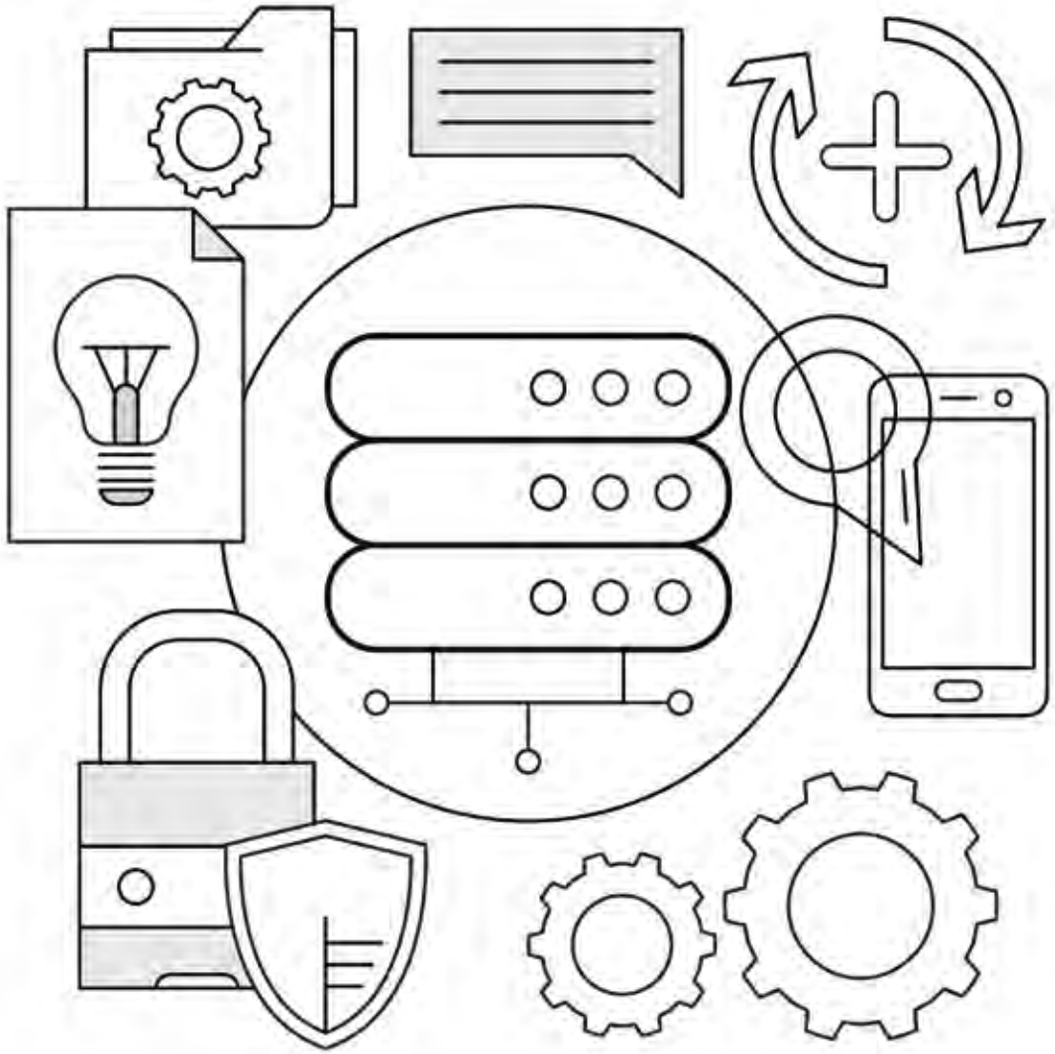
# Pay Attention!

The (IMAP4) protocol acts as an intermediary between the email server and the email user. This is done by reading the messages through the protocol outside of the server without the need to download or store email messages on their personal devices.

## Exercise 2

**Match the terms from column (A) with their corresponding meanings in column (B):**

| Column (A) | | Column (B) |
|---|---|---|
| IMAP4 | ○ | ● Internet Message Access Protocol 4. |
| The IMAP4 protocol is used for | ○ | ● Receive messages. |
| The IMAP4 protocol allows users to | ○ | ● Accessing the server and selecting the messages to be read. |
| The IMAP4 protocol helps with | ○ | ● Keeping messages in email without deletion. |
| The IMAP4 protocol is considerd | ○ | ● The latest and specialized in receiving messages. |



## Do you know that...?

There are two types of HTTP messages: the request message and the response message.

# Pay Attention!

## Email Protocol

An email protocol is a program that connects one computer to another to exchange email messages.

# Exercise 3

**Mark (✓) or (✗) in front of the following sentences:**

1. One of the important features of the IMAP4 protocol is that it allows users to access text messages. ✗
2. The IMAP4 protocol acts as an intermediary between email servers and email clients. ✓
3. The IMAP4 protocol saves you the trouble of downloading email messages from the server to the email client. ✓
4. The IMAP4 protocol allows users to access their email from any device. ✓
5. The IMAP4 protocol automatically updates itself when the user makes any changes to the files on the email. ✓
6. Users cannot access their email accounts when using a different device. ✗
7. The IMAP4 protocol and other protocols work to divide technical processes, preventing computers and servers from connecting to each other. ✗
8. The IMAP4 protocol is used to send email messages. ✗
9. The IMAP4 protocol is a paid protocol. ✗
10. You can only use the IMAP4 protocol on one device without others. ✗

# Pay Attention!

## Email Protocol

When sending an email, there are three elements in the exchange equation (two devices + server) ; One of the devices sends the email to the other (the recipient), while the mail server's task is to store the messages and allow the receiving device to access and download them when needed.

# Exercise 4

**Complete the following sentences:**

1. The main feature of IMAP4 is that it ___allow___ users to access their **electronic** mail ___messages___ from ___another___ device
2. The IMAP4 protocol acts as an intermediary between the email ___server___ and the email ___user___, instead of **downloading** email messages from the server to ___server___ client.
3. Through the ___IMAP4___ protocol, users can access their email **messages** from any different ___device___ without any problem.
4. IMAP4 protocol users do not need to connect to the same ___device___ where they originally read the ___email___
5. The IMAP4 protocol is used for **receiving** email messages.

## Exercise 5

Identify which of the following sentences relate to the **IMAP4** protocol and which ones belong to the **SMTP** and **POP3** protocols:

| | Protocol Type |
|---|---|
| 1. You can access your email messages from any device. | **IMAP4** |
| 2. Used to transfer simple mail from a local client to the recipient's address. | **SMTP** |
| 3. Email messages can only be accessed from the device they were downloaded on. | **POP3** |
| 4. Email messages cannot be accessed in offline mode. | **SMTP** |
| 5. Messages are downloaded into the device, which takes longer to display messages. | **POP3** |
| 6. Once downloaded, email messages are deleted from the server. | **POP3** |
| 7. Protects devices by filtering messages. | **POP3** |
| 8. The server stores email messages as intermediaries between the server and the client. | **IMAP4** |

| | Protocol Type |
|---|---|
| 9. Subject lines and sender names are quickly filled in email. | **HTTP** |
| 10. The number of messages an account can send within a specific timeframe is regulated. | **IMAP4** |
| 11. Email messages can be accessed in offline mode. | **POP3** |
| 12. Message groups are not downloaded until the user clicks on them. | **IMAP4** |
| 13. Preserves the same storage space for emails by automatically deleting messages. | **POP3** |
| 14. Requires more server space as it does not automatically delete messages. | **IMAP4** |
| 15. Works in conjunction with MTA software to transfer messages to the right destination. | **POP3** |

# Pay Attention!

Email is an electronic communication method for sending and receiving messages over the internet, currently the most common form of communication. It features functionalities like synchronization and security, as well as features related to spam mail.


## Exercise 6

**Identify the true and false statements in the following sentences:**

| | | |
|---|---|---|
| 1 | Users can access and read their email from any device. | **false** |
| 2 | Users can open email messages even when not connected. | **false** |
| 3 | When a user logs into their email, the email server retrieves all their email messages. | **false** |
| 4 | Email users cannot see any data related to the email until they open a message. | **false** |
| 5 | Email deletes old messages periodically. | **false** |


Second:
Non-classroom Exercises

## Pay Attention!

POP3

POP3 is a simple and old protocol designed for use on a single computer, supporting only one-way email synchronization, which means allowing users to download email messages from the server to the client only on their own computer.

## IMAP4 Protocol

- IMAP protocol supports users' access to their email messages whether they are connected to the internet or not.
- Users can download email messages to their devices while keeping a copy on the server.
- It saves time for email users by allowing them to search for email messages on the server.

## POP3 Protocol

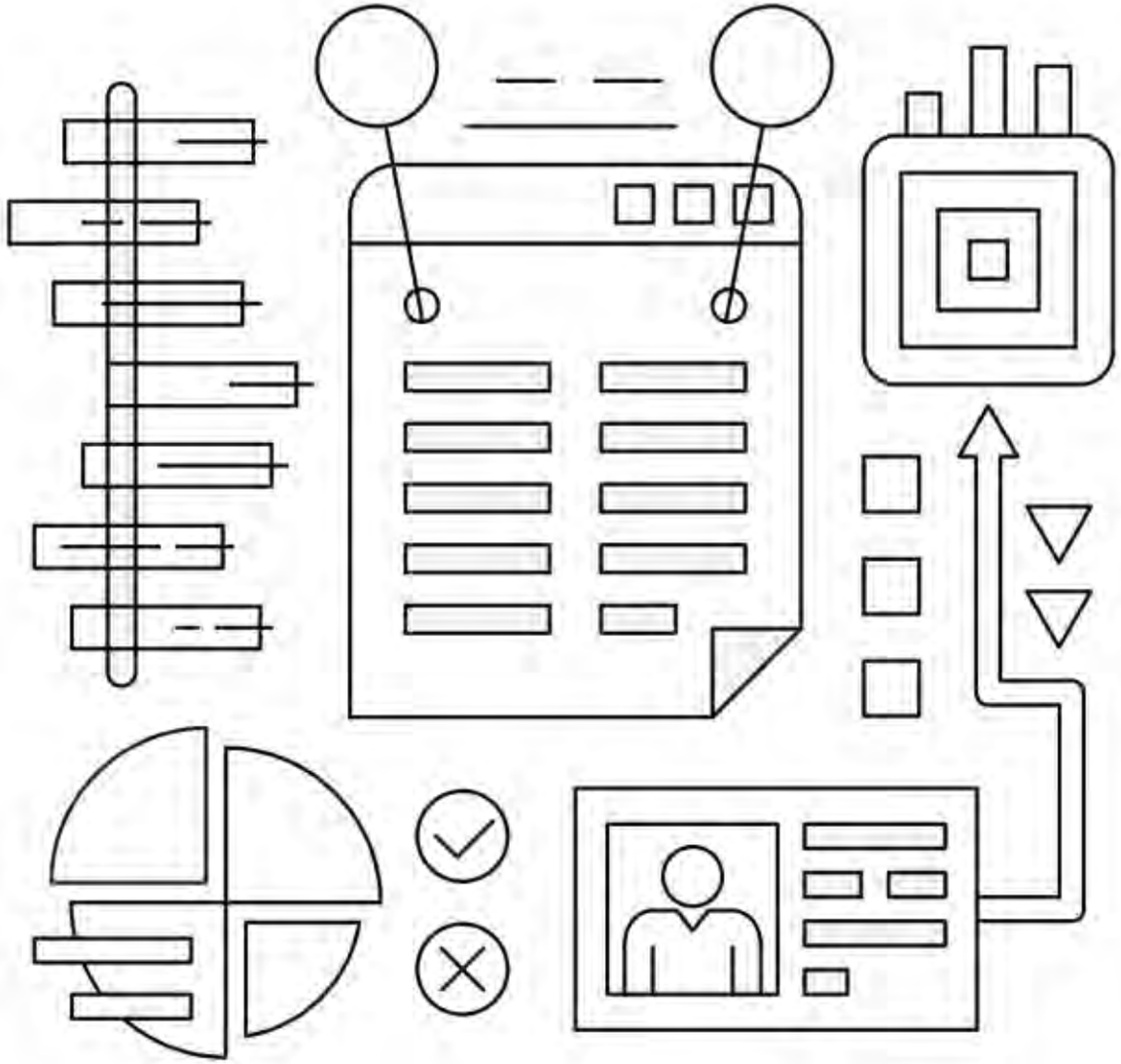
- Ability to store email on devices.
- Access to email without an internet connection, as internet connectivity is only required for sending and receiving email messages.
- Deleting messages after downloading them saves user storage space, utilizing the storage capacity provided by some email hosts, which can reach up to **500** megabytes in some cases.
- Users can leave copies of their email on multiple POP servers.
- Users can consolidate multiple email accounts into one mailbox.
- Data is more secure as no email is stored on the POP server.

## SMTP Protocol

- Ability to generate statistics from sent messages to create statistical reports for newsletters, such as click-through and open rate reports.
- It allows synchronization with a Smarthost server. For example, if a user has 100 desktop computers used for managing customer relationships and wants synchronization, they don't need to individually configure the protocol on each device. With a Smarthost server, they can manage all email accounts.

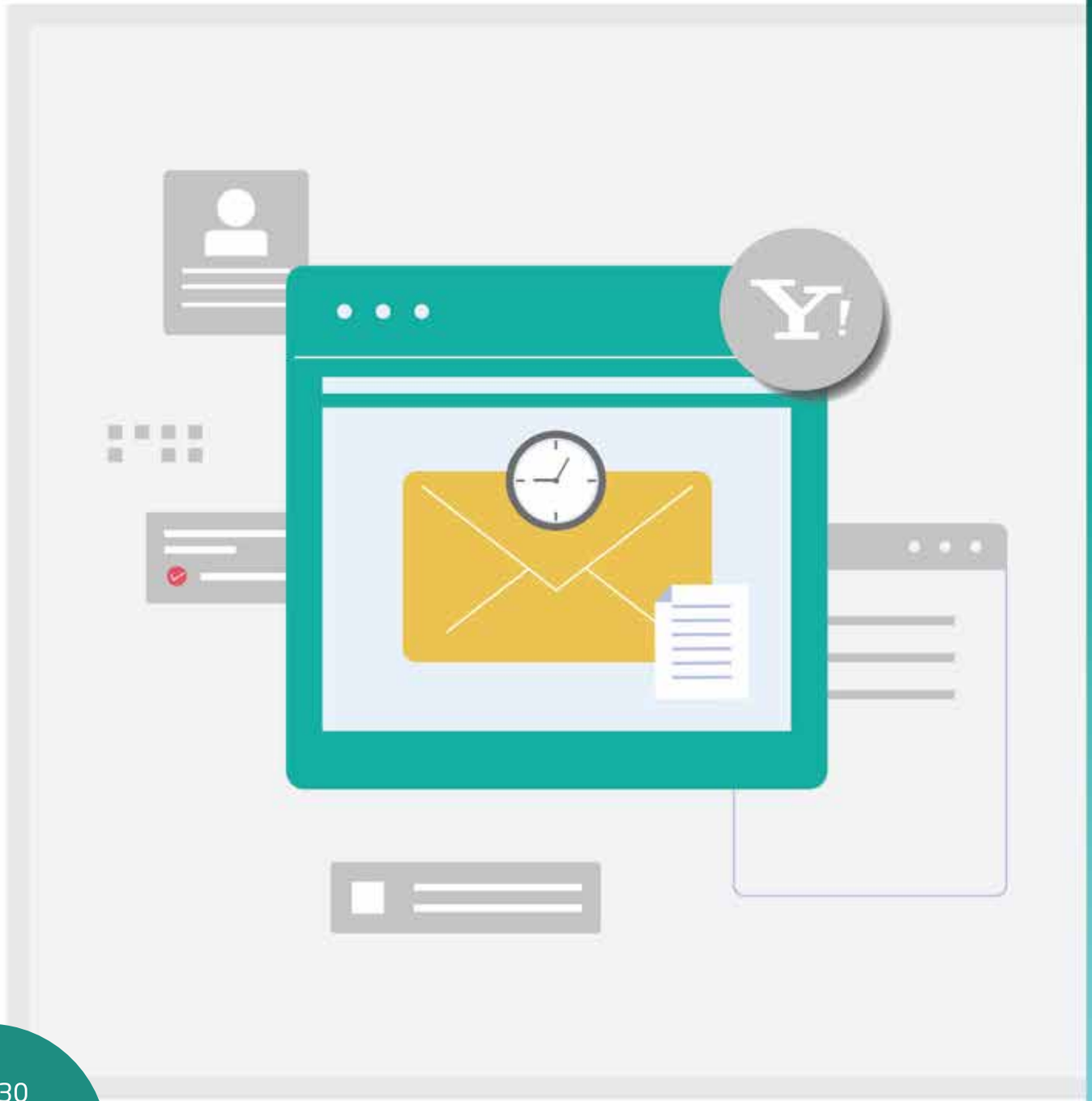
## Exercise 1

Write 3 features for each of the following:




# Do you know that...?

All HTTP pages are stored in what is known as the page cache on the internet when you visit them for the first time, which makes loading the content faster when you visit the pages again.



## Pay Attention!

POP3 enables email users with temporary internet access to access their messages, read them, or compose new messages or reply to them even if they are not connected to the internet, and then send them when they reconnect to the internet. Examples of this type of email protocol include Yahoo.

The IMAP4 protocol supports users' access to their email messages, whether they are connected to the internet or not, just like POP3 protocol.

# Exercise 2

There is more than one fundamental security issues - three problems - in the operation of the IMAP4 protocol. **Could you discuss them and provide practical solutions?**

1

2

3

The student's answer is correct if he points out that the main problem is related to keeping emails on the server, which increases the chances of being stolen or hacked

## Do you know that...?

To overcome the security concerns of protocol IMAP4, you should use encryption, two-factor authentication, and strong passwords.


## Pay Attention!

**SMTP** is a simple text-based protocol that works well when devices are connected to each other. It is only specific to sending email messages, unlike the protocol of both POP3 and IMAP4, which provide message retrieval from the server. This is why reliance on it has declined.

## Exercise 3

Extract the following words from the table.

**Instructions:**

Read the words below carefully and search the table for consecutive letters that form these words.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| s | a | v | e | p | r | o | t | o | c | o | l |
| s | e | t | t | i | n | g | s | p | o | r | t |
| a | r | c | h | i | v | e | e | r | a | s | e |
| m | e | s | s | a | g | e | s | b | l | k | s |
| i | n | b | o | x | w | h | s | e | n | t | y |
| s | t | o | r | a | g | e | n | m | o | v | e |
| d | e | v | i | c | e | d | e | l | e | t | e |
| e | m | a | i | l | b | u | s | e | r | s | a |

Protocol - Email - Messages - Users - Device- Settings - Inbox

Sent - Storage - Archive - Delete - Move - Port - Save - Erase

# Pay Attention!

## SMTP

One of the drawbacks of SMTP is the lack of email sender authentication, along with the absence of security features, leading to users receiving unwanted messages.

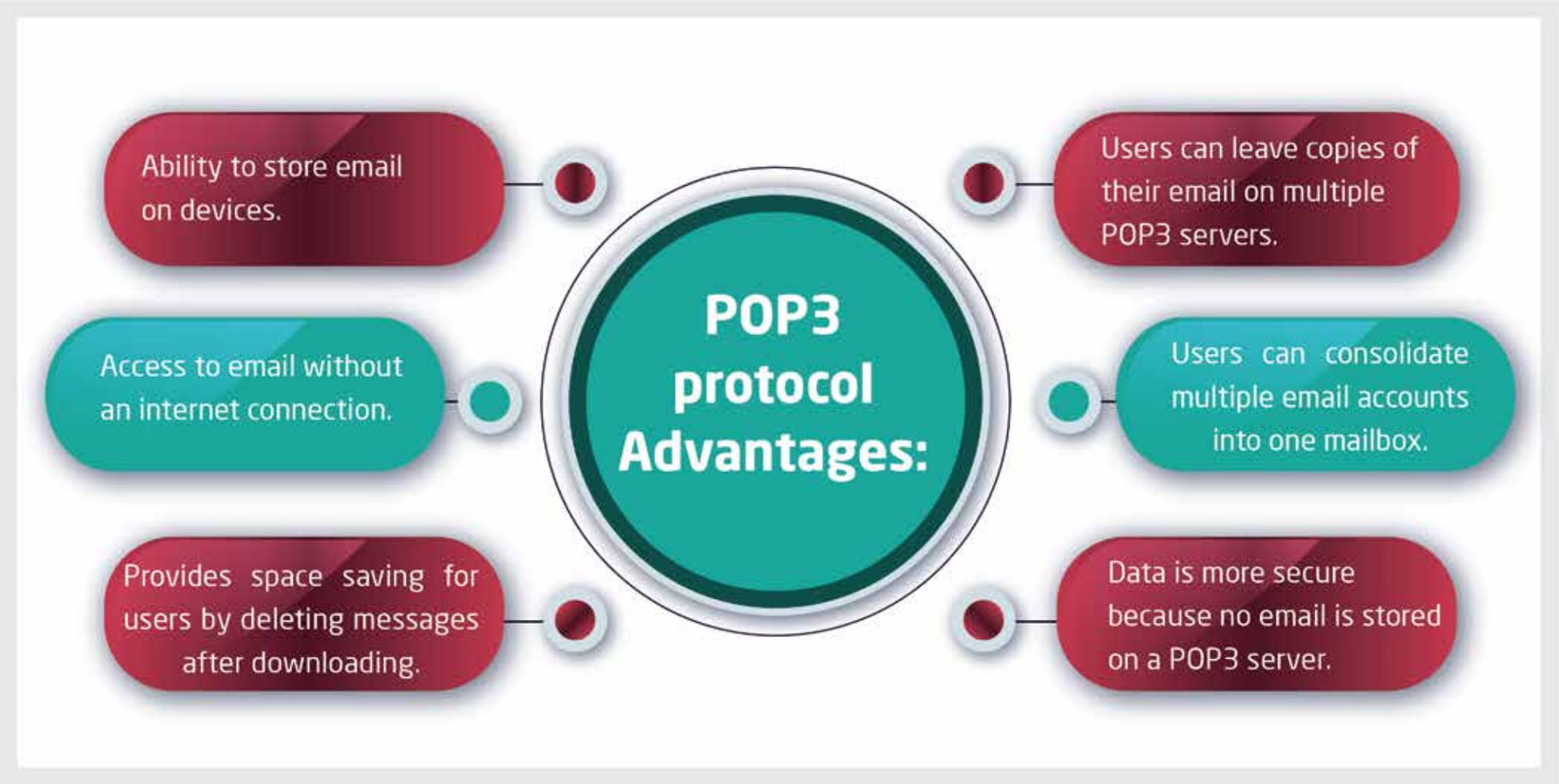
## Do you know that...?

Email consists of: sender, recipient, email address, Mailer, mail server, SMTP.

## IMAP4 protocol Advantages:

- Access to email messages from multiple devices.
- Quick and efficient access to email messages.
- Multiple users can share a mailbox.
- Organize email messages.
- Supporting email functionalities, such as search and sorting.
- Displaying unread emails in the inbox.

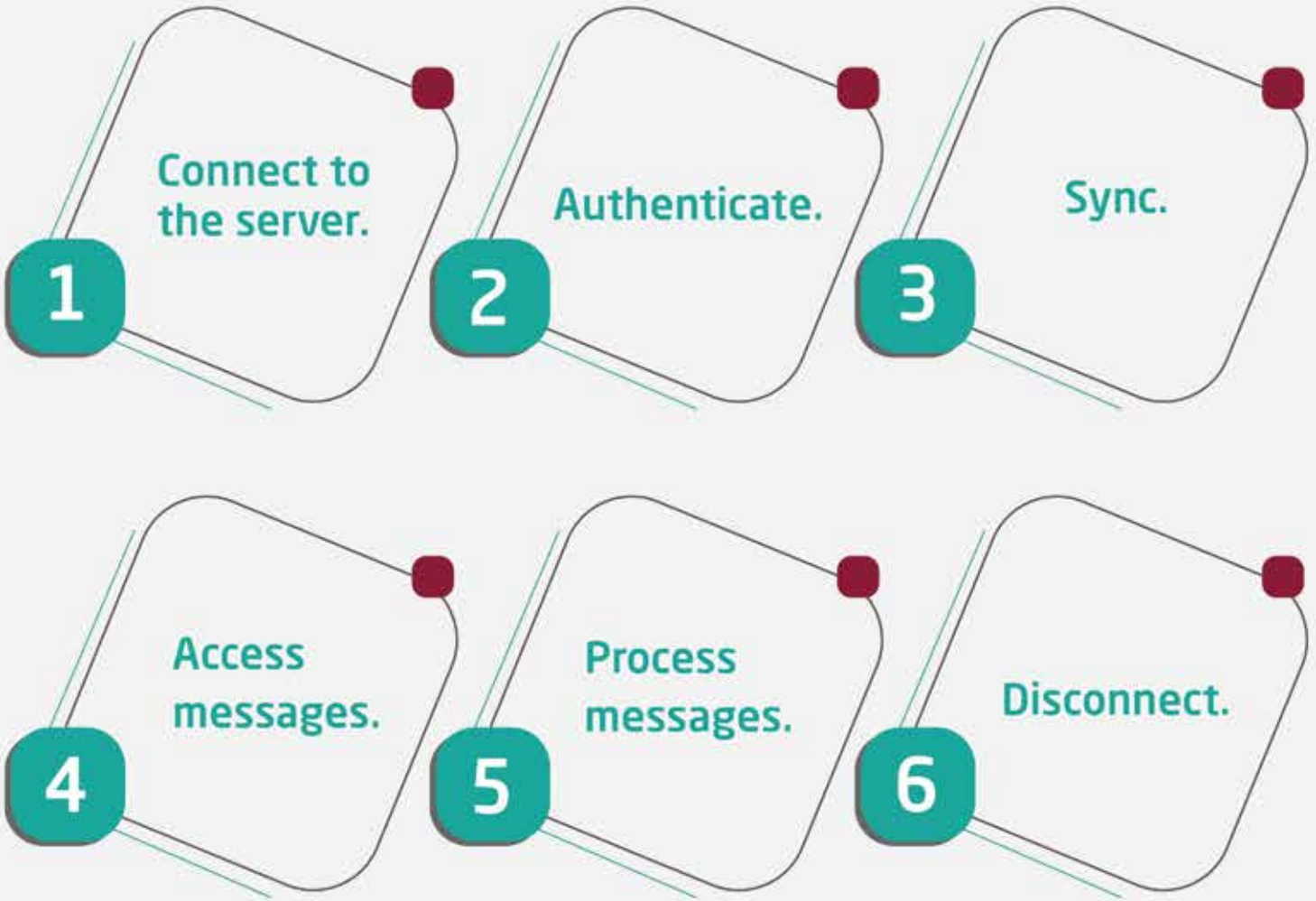
- Ideal for those who need to access their email while traveling or using different devices.
- Directly handling messages on the email server, instead of downloading them to the user's device.
- In IMAP4 protocol, providing email presence on the server ensures higher security in case the user loses or damages their device.
- Eliminating the need to re-download messages when transitioning between devices as they are stored remotely.


POP3 protocol Advantages:
Ability to store email on devices.
Access to email without an internet connection.
Provides space saving for users by deleting messages after downloading.
Users can leave copies of their email on multiple POP3 servers.
Users can consolidate multiple email accounts into one mailbox.
Data is more secure because no email is stored on a POP3 server.

# POP3 protocol Disadvantages:

1. Marking messages as read on multiple devices.
2. Incapable of synchronizing sent items.
3. Users must continually set up their device to periodically check their email server to recognize newly received messages.
4. Users need to manually create items like personal folders or adjust settings individually on all devices.

## How IMAP4 works:



# IMAP4 disadvantages:

- Limiting message storage to 200 MB or 500 MB unless you purchase more professional email services.
- Storing all messages on the server increases the chances of E-mail theft and unauthorized access, especially if the user's password is insecure or weak.


Competitions

## What is it ?

- A protocol that enables users to organize email messages in folders, mark messages for follow-up, and save message drafts on the server. Users can also display read or unread messages. IMAP4
- It is a communication program between a computer and another to exchange email messages between them. . Email Protocol
- Four different email protocols, in terms of features, uses, and importance. SMTP, HTTP ,IMAP4 , POP3
- It is a simple and old protocol designed for use on a single computer, supporting only one-way synchronization of email.. POP3
- It is a simple text-based protocol that works well when devices are connected to each other, and only specializes in sending email messages. . SMTP
- A protocol that enables users who use web browsers to access their email messages for sending or receiving, utilized by popular applications like Hotmail and Yahoo. . HTTP
- It is responsible for sending, receiving, managing, and logging all the data that is done by its own E-mail programs, as well as processing them. Email server

## Mark (✓) or (✗) in front of the following sentences:

1. The IMAP4 protocol does not store email messages on a remote server away from users. ✗
2. IMAP4 enables users to organize email messages in folders, and mark messages for follow-up. ✓
3. IMAP4 users cannot access email messages from multiple devices. ✗
4. The POP3 protocol is ideal for those who need to access their email messages while traveling or using different devices. ✗
5. There are three similar mail protocols in terms of features, uses, and importance. ✗
6. The POP3 protocol allows email users who have temporary internet access to access their messages, read them, or compose new messages or reply to them when they are not connected to the internet. ✓

7. One of the advantages of protocol POP3 is the ability to store mail on users' personal devices. 

8. One of IMAP4's features is time-saving for email users as it allows them to search for email messages on the server. 

9. IMAP4 Protocol does not allow logging in via multiple email users on computers or mobile devices and reading the same messages. 

10. IMAP4 transmits data, including login information and email content in plain text, which increases the risk of exposing sensitive information to spying or external attacks. 

11. The SMTP protocol uses the internet to send and receive messages, and is used by each user's mail program such as Yahoo . 

## Complete the following sentences

1. Email consists of: sender, recipient, email address, Mailer, mail server, and SMTP.

2. When the sender uses the mail program, it is redirected to the Simple Mail Transfer Protocol (SMTP) which verifies the validity of the recipient's email address.

3. The protocol stores the sent email on the server for later transfer using any of the basic protocols POP3 or IMAP4.

4. In case the recipient has a different domain address (for example, the sender's domain Gmail differs from the recipient's domain Hotmail), protocol SMTP connects with server DNS which communicates with the other address used by the recipient and then SMTP of the sender's starts connecting with SMTP of the recipient's to deliver the email.

5. In case both SMTP of the sender and recipient are unable to communicate with each other due to internet problems for example, the mail intended for delivery to the recipient is placed in a queue specific to protocol SMTP until the problem is solved.

6. In case the recipient uses protocol POP3, then the mail he receives is deleted from the web server copy, while in case of using IMAP4, a copy of the email is stored on the web server for interaction at any time desired by the recipient.

7 An example of an online attack using protocol IMAP4 the password spray attack that affected users of Microsoft Office 365 in 2018.

8 To overcome security concerns from protocol IMAP4, one should use encryption, and two-factor authentication strong and different.

9 Protocol The HTTP causes more energy consumption as a result of using more system resources; therefore, it is not the best option for devices for Internet of Things (IoT) that contain wireless sensor networks.

10 All HTTP pages are stored within what is known as the page cache on the internet upon first visit, which makes loading content faster when visiting pages again.

11 There are two types of HTTP messages: request messages and response messages.

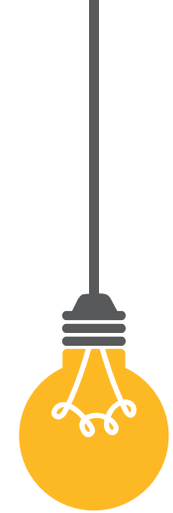
12 The user needs an address to access the desired document on the internet, here protocol HTTP uses a URL (Uniform Resource Locator) to determine any type of information on the internet, where it defines four parts: method, and host, port, and path

# Graduation Project

The graduation project is an assignment that you undertake on your own or in collaboration with one or two of your colleagues, under the supervision of the trainer. Through it, you are required to perform one of the following assignments:

Write a short story, report, or article about a protocol IMAP4.

The student takes on the role of a trainer and writes general guidelines to his colleagues or parents explaining the concept and importance of the IMAP4 protocol.



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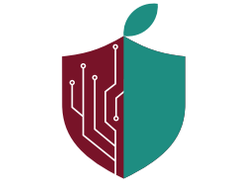

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