41. INTERNET MESSAGE ACCESS PROTOCOL

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The Internet Message Access Protocol is a means of managing electronic mail services which allows performing manipulations of electronic letters and mailboxes, authentication and encryption procedures.

This paper is devoted to the Internet Message Access Protocol (IMAP) and its features relating e-mail keeping and delivery. IMAP is one of the three main standards of e-mail communication. This technology provides a mechanism of exchanging data between e-mail servers and clients. At the moment, the usage of IMAP among e-mail users has been increasing due to its support of device synchronization.

IMAP was formally declared to be an Internet standard in 1988 [1] when its second version was released. The aim of its creation was providing an alternative means of e-mail communication in addition to the Post Office Protocol (POP). In comparison with the previous protocol IMAP requires an e-mail server to be a permanent storage of all electronic letters. It makes possible to get access to the same data from multiple devices. At present, the latest version of the protocol is IMAP4rev2. The description is provided in RFC 9051 [2].

In the OSI model IMAP takes the application level and establishes a reliable TCP-based data stream between mail server and clients. The usage of Transport Control Protocol (TCP) guarantees the absence of data losses during the interaction between server and clients. In order to carry out an operation, regarding e-mail, a client program must send a text command to a server and wait for its response. The server may also send a response without receiving a command to notify the client program about special events. The format of all available commands and responses are provided by RFC 9051 [2].

In IMAP all electronic messages can be accessed with two values: unique identifiers and message sequence numbers. The unique identifier is a special value assigned to only one message. Such values are always constant during client-server interaction and they should remain persistent to support resynchronization of clients from previous sessions. A message sequence number is a relative position from one to the number of messages in the mailbox. As each new message is added, it is assigned a message sequence number that is 1 higher than the number of messages in the mailbox before that new message was added.

An IMAP connection between a mail server and a particular client program is always in one of the four states [2]. Each state limits the set of commands the client can successfully send to the server. When the connection is just established it is in “Not authenticated” state. Upon authentication the state is changed to “Authenticated” and the client is allowed to query information about available mailboxes. When the client program selects a mailbox for accessing the connection is in “Selected” state. In order to terminate the connection its state must be changed to “Logout”. The set of allowed commands and possible responses is also restricted by the settings of the mail server.

The IMAP specification introduces several mechanisms to provide the security of data exchange. The key method of data protection in IMAP is TLS encryption. It is enabled by default if a connection between a mail server and a client uses an Implicit TLS port. When a cleartext port is applied, TLS negotiation can be required by the client with STARTTLS command. In addition to TLS encryption the IMAP specification mentions several recommendations to minimize the risk of data thefts. Thus despite being linked to particular connection states by the specification suspicious server responses should be ignored by mail clients to prevent MITM attacks. When authentication is failed due to invalid credentials, a server should not respond with details why the credentials are invalid. Thus brute force attacks are prevented.

Internet Message Access Protocol is a robust and versatile email protocol designed to facilitate remote access and management of email messages stored on a mail server. Unlike POP3, IMAP employs a synchronization mechanism that ensures consistent email states across multiple devices, enabling real-time updates and modifications. This protocol is particularly advantageous for users requiring multi-device access, as it maintains a unified inbox and preserves message organization.

References:

1.IMAP History and Standards [Electronic resource]. – Mode of access: http://www.tcpipguide.com/free/t_IMAPOverviewHistoryVersionsandStandards-3.htm. – Date of access: 08.03.2025.

2.RFC 9051 [Electronic resource]. – Mode of access: https://datatracker.ietf.org/doc/html/rfc9051. – Date of access: 01.03.2024.