

Communication Networks 2

SS 2021

Assignment 1

Group 06

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1 Task and Protocol Description

The subject of the first task is to observe email client's network traffic and to extract the username and password from the client. Furthermore, this assignment offers some reflections on the security aspects of protocols using plain text on network traffic.

1.1 Internet Message Access Protocol

The IMAP protocol is used by the most email clients to retrieve email messages from a mail server over a TCP connection. It provides more features than the much simpler Post Office Protocol (POP) like folder structures and permanent connected sessions. The protocol has been defined in the RFC 3501. It uses plain text to transfer messages and has no build in encryption, therefore it is very important to use transport layer encryption like TLS/SSL to prevent eavesdroppers from getting message contents. But it is still possible to operate a server without TLS/SSL.

1.1.1 Authentication

As this report will show, the IMAP protocol contains an authentication message, which leaks the vulnerability. The user must authenticate himself before he can gain access to the mail server. This can be done over different ways, which are described in RFC 4422.

In our case the IMAP server uses **PLAIN Simple Authentication and Security Layer (SASL)** which was designed to have a wider interoperability with other systems because it transfers the login credentials in plain text. The abstract of RFC 4616 which describes the PLAIN method says "The PLAIN mechanism is intended to be used, in combination with data confidentiality services provided by a lower layer" [1], but because this is not done by the IMAP server of this task it was possible to capture the plain text password.

2 Procedure

This section describes the different steps that are needed to recover the forgotten email password from the network traffic between the email client and the email server.

2.1 Traffic capture with WireShark

First all incoming and outgoing traffic needs to be captured by using WireShark. To reduce the number of captured packets the capture filter "not port 22" was used because this prevents the SSH traffic from being captured as well. To get the IMAP authentication message Thunderbird was launched right after the capturing process was started, which was then terminated again after a short time.

2.2 Filter captured traffic

In order to show only the required IMAP messages the display filter "imap" was used. Before that, the filter "pop" was applied to exclude the usage of the Post Office Protocol for mail query. A screen shot of WireShark with the IMAP filter applied can be seen in figure 1. To see the whole traffic between the mail server and the client and not just the IMAP traffic, the source IP address of the first IMAP response message was used as filter (ipv6.addr == 2001:629:2600:a018::1). This was not mandatory to retrieve the password but helped to understand the initial connection establishment.

No.	Time	Source	Destination	Protocol	Length	Info
2823	39.2...	2001:629:2600:a018::1	2001:629:2600...	IMAP	200	Response: * OK [CAPABILITY IMAP4rev1 LITE
4536	39.4...	2001:629:2600:a018:428d:5cff:fe15:9976	2001:629:2600...	IMAP	108	Request: 1 authenticate PLAIN
4539	39.4...	2001:629:2600:a018::1	2001:629:2600...	IMAP	90	Response: +
4541	39.4...	2001:629:2600:a018:428d:5cff:fe15:9976	2001:629:2600...	IMAP	148	Request: AGNuXzA2QGV4MS5jbjsyWiuY24udHV3
4613	39.4...	2001:629:2600:a018::1	2001:629:2600...	IMAP	438	Response: 1 OK [CAPABILITY IMAP4rev1 LITE
5573	39.5...	2001:629:2600:a018:428d:5cff:fe15:9976	2001:629:2600...	IMAP	99	Request: 2 namespace
5574	39.5...	2001:629:2600:a018::1	2001:629:2600...	IMAP	166	Response: 2 OK Namespace completed (0.000
5589	39.5...	2001:629:2600:a018:428d:5cff:fe15:9976	2001:629:2600...	IMAP	135	Request: 3 ID ("name" "Thunderbird" "vers
5591	39.5...	2001:629:2600:a018::1	2001:629:2600...	IMAP	152	Response: 3 OK ID completed (0.000 + 0.00

Frame 2823: 200 bytes on wire (1600 bits), 200 bytes captured (1600 bits) on interface eno1, id 0
Ethernet II, Src: HewlettP_80:32:61 (1c:c1:de:80:32:61), Dst: Giga-Byt_15:99:76 (40:8d:5c:15:99:76)
Internet Protocol Version 6, Src: 2001:629:2600:a018::1, Dst: 2001:629:2600:a018:428d:5cff:fe15:9976
Transmission Control Protocol, Src Port: 143, Dst Port: 57578, Seq: 1, Ack: 1, Len: 114
Internet Message Access Protocol
Line: * OK [CAPABILITY IMAP4rev1 LITERAL+ SASL-IR LOGIN-REFERRALS ID ENABLE IDLE AUTH=PLAIN AUTH=LOGIN] Dovecot ready.\r\n

Figure 1: Captured IMAP traffic

2.3 Decoding the messages and find password

As already explained in section 1 the client requests to authenticate with plane text and sends its credentials in the fourth exchanged IMAP message to the server. Because the credentials are encoded in UTF-8, it is necessary to decode the message string by using the following shell command in the terminal:

```
$ base64 -di <<<AGNuXzA2QGV4MS5jbjJsYWluY24udHV3aWVuLmFjLmF0AFB1Z3Vxb3Rhc2Uy  
$ cn_06@ex1.cn2lab.cn.tuwien.ac.atPeguqotase2
```

In the returned string it is easy to identify the email address followed by the password which is in our case `Peguqotase2`.

3 Conclusion

This shows how easy it is for attackers to retrieve passwords from plain text email traffic. Therefore, it is very important to make sure that all connections to the email server are TLS/SSL encrypted. With IMAP this can be done explicitly over port 143, by using the STARTTLS command, or implicitly over port 993 which enforces a encrypted connection.

References

- [1] Kurt Zeilenga. *The PLAIN Simple Authentication and Security Layer (SASL) Mechanism*. Tech. rep. RFC 4616, August, 2006.