Tribhuvan University Prithivi Narayan Campus Pokhara,Kaski



Lab-report of Computer Network

Subject code: CSC

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EXPERIMENT NO:1

TO FIND THE DIFFERENCE BETWEEN HTTP AND HTTPS.

OBJECTIVE:

To understand and analyze the differences between HTTP and HTTPS by capturing and inspecting network traffic using Wireshark.

THEORY:

HTTP:

HTTP is the foundational protocol used for transmitting data on the World Wide Web. It operates at the application layer of the Internet protocol suite and is stateless, meaning each request from a client to server is independent.

- Port: Default port is 80.
- **Security**: Data is transmitted in plain text, making it vulnerable to interception and attacks like eavesdropping and man-in-the-middle.
- Use Case: Suitable for non-sensitive data transfer like browsing non-secure websites.

HTTPS:

HTTPS is an extension of HTTP and provides secure communication over a computer network. It uses SSL/TLS to encrypt the data transmitted between the client and server.

- Port: Default port is 443.
- **Security**: Data is encrypted, making it secure against interception and attacks. It ensures data integrity, confidentiality, and authenticity.
- **Use Case**: Used for sensitive data transfer like online banking, email, and secure transactions.

Steps in Wireshark

1. Setup Environment:

- Install Wireshark from Wireshark.org.
- Ensure you have administrator privileges to capture packets on your network interface.

2. Capture HTTP Traffic:

- Open Wireshark.
- Select the network interface used for internet connection.
- Start capturing packets by clicking the blue shark fin button.
- Open a web browser and navigate to a non-secure website (e.g., http://example.com).
- Stop the capture after the page loads.

3. Capture HTTPS Traffic:

- Clear the previous capture in Wireshark.
- Start a new capture.
- Open a web browser and navigate to a secure website (e.g., https://example.com).
- Stop the capture after the page loads.

4. Analyze Packets:

- Use the filter bar to isolate HTTP and HTTPS packets.
- o For HTTP: Use filter http.
- o For HTTPS: Use filter tls (TLS is used for HTTPS).

DEMONSTRATION:

1)Packet Capture from HTTP websites

1. HTTP

For HTTP we are going to use website http://testphp.vulnweb.com/login.php as it uses <a href="http://testphp.vulnw



Username: test and password: Test is used.

Http filter is used to capture only http packets.

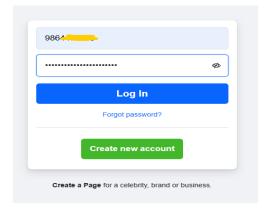
```
[Next Sequence Number: 1700 (relative
Acknowledgment Number: 5327 (relative
Acknowledgment number (raw): 1607856646
                                                                                           (relative sequence number)]
(relative ack number)
                                                                                                                                                                                                                                                                                  33 36 20 45 64 67 2f 31
0d 0a 41 63 63 65 70 74
74 6d 6c 2c 61 70 70 6c
                                                                                                                                                                                                                                                                                                                                                     3a 20 74 6
69 63 61 7
6c 2c 61 7
6c 3b 71 3
69 66 2c 6
61 67 65 2
2e 38 2c 6
69 67 6e 6
3d 62 33 3
65 72 3a 2
65 70 2e 7
6f 67 69 6
                                                                                                                                                                                                                                                                                 74 6d 6c 2c 61 70 70 6c
78 68 74 6d 6c 2b 78 6d
61 74 69 6f 6e 2f 78 6d
69 6d 61 67 65 2f 61 76
2f 77 65 62 70 2c 69 6d
2c 2a 2f 2a 3b 71 3d 30
63 61 74 69 6f 6e 2f 73
63 68 61 6e 67 65 3b 76
37 0d 0a 52 65 66 65 72
3a 2f 2f 74 65 73 74 70
65 62 2e 63 6f 6d 2f 6c
       0101 .... = Header Length: 20 bytes (5) Flags: 0x018 (PSH, ACK)
        Window: 512
        [Calculated window size: 131072]
        [Window size scaling factor: 256]
Checksum: 0xfebe [unverified]
[Checksum Status: Unverified]
        Urgent Pointer: 0
[Timestamps]
                                                                                                                                                                                                                                                                                 65 62 2e 63 6f 6d 2f 6c
0d 0a 41 63 63 65 70 74
        [SEQ/ACK analysis]
TCP payload (659 bytes)
                                                                                                                                                                                                                                                                                                                                                      2d 45 6e
                                                                                                                                                                                                                                                                                  67 3a 20 67 7a 69
HTML Form URL Encoded: application/x-www-form-urlencoded

> Form item: "uname" = "test"

> Form item: "pass" = "test"
                                                                                                                                                                                                                                                                                 0d 0a 41 63 63 65 70 74
65 3a 20 65 6e 2d 55 53
39 0d 0a 0d 0a 75 6e 61
                                                                                                                                                                                                                                                                                                                                                     2d 4c 61 6c
2c 65 6e 3l
6d 65 3d 7
                                                                                                                                                                                                                                                                  02c0
                                                                                                                                                                                                                                                                                70 61 73 73 3d 74 65 73
```

2)Packet Capture from HTTPS websites

For https we are going to use https://www.facebook.com/login as it uses https protocol



ssl									
No. Time	Source	Destination	Protocol L	ength Info					
1578 5.029388	20.205.243.166	192.168.1.82	TLSv1.3	85 Application Da	ita				
1583 5.030535	192.168.1.82	20.205.243.168	TLSv1.3	462 Client Hello (
1592 5.038292	20.205.243.168	192.168.1.82		2878 Server Hello,					
1595 5.039111	20.205.243.168	192.168.1.82	TLSv1.3	721 Application Da				ita	
1596 5.043465	192.168.1.82	20.205.243.168	TLSv1.3	118 Change Cipher	Spec, Appl	ication Data	a		
0101 = Heade	r Length: 20 bytes (- 00€	0a 84 d7	83 5f f4 9d c3	02 40 92	cc a9 9b f1
→ Flags: 0x018 (PSH					00de	4e bc 8e	c6 7a 5f aa e2	6f f4 89	08 4c 70 a2
Window: 68					00e0	e0 73 2b	2d 17 03 03 0c	51 70 ec	77 2c d9 6e
[Calculated windo	w size: 69632]					68 be 25	07 2b a5 a6 d0	19 17 67	eb b0 f8 30
[Window size scal	ing factor: 1024]					69 88 ca	1c 3e d1 11 ab	0e a0 85	a0 12 06 19
Checksum: 0x8b82							fb c8 80 d9 bc		
[Checksum Status:							ee f7 f3 6d 47		
Urgent Pointer: 0							76 0e 1a f3 bc		
<pre>▶ [Timestamps]</pre>							b3 93 37 af bf		
▶ [SEQ/ACK analysis							33 d0 f9 b4 3b		
TCP payload (2824	bytes)						98 85 cf ae ba		
[Reassembled PDU							c3 f6 54 e9 fb		
TCD segment data							a6 f5 63 96 0d		
▼ Transport Layer Secu					0196		7d 50 0e 9a b6		
	yer: Handshake Proto	col: Server Hello			01a0		3b 70 86 c6 89 1a 27 46 50 54		
Content Type: Version: TLS 1							1a 27 46 50 54 68 0a 6f 95 7c		
Length: 122	.2 (0x0303)				91de		8a 88 42 4b d4		
	ocol: Server Hello						5c 20 b0 7f cb		
		pec Protocol: Change	Cinher Sne				e9 56 47 c5 b7		
	Change Cipher Spec (:		cibilei 3ber				27 43 ad a4 22		
Version: TLS 1		20)					e8 79 f7 41 e7		
Length: 1	.2 (0x0303)						b5 59 63 88 4d		
Change Cipher	Spec Message						21 26 31 87 42		
		a Protocol: Hypertext	Transfer F	Protocol	0246		98 c0 12 1e 64		
	pplication Data (23)				0256		5b e8 3d db b3		
Version: TLS 1					0266		67 a7 15 36 78		
Length: 36					0276	f2 37 6c	14 da a6 6f b6	8b f6 <u>c0</u>	e0 60 33 <u>05</u>
	ication Data: 0a84d7	835ff49dc3024092cca99	bf13b4ebc8e	c67a5faae26ff489084	4c7 0280	9a 88 e0	37 69 6c 58 e1	f4 b7 98	de 11 71 52
		ext Transfer Protocol			0290	65 3e db	c7 27 8a 20 f8	3e 1b 9c	48 76 34 a3
TLS segment data	(2650 bytes)						4a dd 0f eb 5d		
41					02be	fc 90 2e	6e 36 84 65 71	db ef 7e	51 f3 5a 3d

DISCUSSION:

Observations in HTTP Packets

When examining HTTP packets, we notice that data is transmitted in plain text. This includes URLs, headers, and any data sent in GET and POST requests. This lack of encryption means that any sensitive information can be easily intercepted and read by attackers, posing significant security risks.

Observations in HTTPS Packets

In contrast, HTTPS packets exhibit encrypted data. The actual content of the communication, such as HTML and form data, is not readable in the captured packets. Additionally, HTTPS traffic includes a TLS handshake process, where the client and server agree on encryption methods and exchange keys to secure the session. This ensures that the data remains confidential and intact during transmission.

CONCLUSION:

The key difference between HTTP and HTTPS lies in security. While HTTP transmits data in plain text, making it susceptible to various attacks, HTTPS secures data through encryption using SSL/TLS. This makes HTTPS the preferred choice for transmitting sensitive information over the internet. The analysis using Wireshark clearly demonstrates the visible differences in packet content and structure between the two protocols, emphasizing the importance of using HTTPS for secure communication

EXPERIMENT NO:2

TO ANALYZE THE TCP/IP MODEL USING WIRESHARK.

OBJECTIVE:

To analyze the TCP/IP model by capturing and inspecting network packets using Wireshark.

THEORY:

The TCP/IP model, also known as the Internet protocol suite, is a set of communication protocols used for the Internet and similar networks. It is commonly represented in four abstraction layers:

- 1. **Link Layer**: Handles the physical connection between the devices, including hardware addressing.
- 2. **Internet Layer**: Responsible for packet forwarding, including routing through different routers.
- 3. **Transport Layer**: Provides end-to-end communication services for applications.
- 4. **Application Layer**: Contains all protocols for specific data communication services on a process-to-process level.

Wireshark is a network protocol analyzer that captures network packets and displays detailed information about them. It allows users to analyze the structure of different network protocols and troubleshoot network issues.

Steps in Wireshark

1) Install Wireshark:

Download and install Wireshark from www.wireshark.org.

2) Capture Packets:

- · Open Wireshark.
- Select the network interface to capture traffic from (e.g., Ethernet, Wi-Fi).
- Click on the 'Start' button to begin capturing packets.

3) Generate Network Traffic:

 Perform activities that generate network traffic, such as browsing the internet, sending emails, or transferring files.

4) Stop Capture:

Click on the 'Stop' button to end the packet capture.

5) Analyze Captured Packets:

- Use the 'Filter' bar to narrow down specific packets (e.g., tcp, udp, http, dns).
- Inspect the different layers of captured packets:
 - o Frame: General information about the captured frame.
 - Ethernet II: Link layer information, including source and destination MAC addresses.
 - Internet Protocol (IP): Internet layer information, such as source and destination IP addresses.
 - Transmission Control Protocol (TCP): Transport layer information, including port numbers and sequence numbers.
 - Hypertext Transfer Protocol (HTTP): Application layer information for web traffic.

DEMONSTRATION:

1) Demonstrate the TCP/IP Model using Wireshark

I. Transport layer (Layer 4)

Capturing packets related to TCP or UDP. To capture the TCP and UDP packets we need to filter out the packets. For this filters "tcp" and "udp" was used.

i) TCP

```
tep

**Frame 3260: 623 bytes on wire (4984 bits), 623 bytes captured (4984 bits) on interface \Device\
**Ethernet II, Src: serd5ib4:e2:cf:f9 (ae:d5:b4:e2:cf:f9), bst: TaicangT&WEL_d2:b2:b0 (c4:48:f8:c
**Internet Protocol Version 6, Src: 2400:1a00:bd0e:06047:96c6:836:c668:e055, Dst: 2a03:2888:f28:i]

**Transmission Control Protocol, Src Port: 50733, Dst Port: 443, Seq: 1393, Ack: 1, Len: 549

**Source Port: 50733

**Destination Port: 443

**[Stream index: 41]

**[Conversation completeness: Complete, WITH_DATA (31)]

*[TCP Segment Len: 549]

**Sequence Number: 1393

**Sequence Number: 13942

**(relative sequence number)

**Sequence Number: 1942

**(relative sequence number)

**Acknowledgment Number: 1 (relative ack number)

**Acknowledgment Number: 1 (relative ack number)

**Acknowledgment Number: 20 bytes (5)

**Flags: 0x018 (PSH, ACK)

**Window: 516

**[Calculated window size: 132096]

*[Window size scaling factor: 256]

**Checksum 5tatus: Unverified]

**Urgent Pointer: 0

**[Timestamps]

**[SEQ/ACK analysis]

**TCP ayload (549 bytes)

**[TCP segment data (549 bytes))

**[TP segment data (549 bytes))

**[TP segment data (549 bytes))

**[Transport Layer: Handshake Protocol: Client Hello

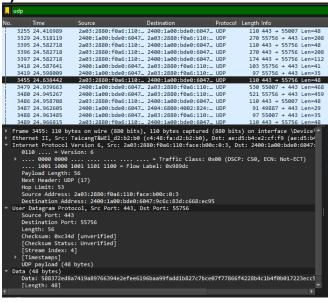
**Content Type: Handshake (22)

**Version: TLS 1.0 (0x0301)

**Length: 1936

**Handshake Protocol: Client Hello
```

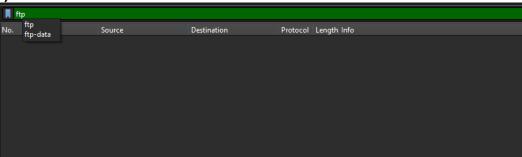
ii) UDP



II. Application layer (Layer 5-7)

Capturing packets associated with specific application. In this layer HTTP, DNS or FTP is captured. To filter these packets filters "http", "dns" or "ftp" is used.

i) FTP



No FTP were capture during the session as no files were transferred.

ii) HTTP

DISCUSSION:

Using Wireshark, we captured and analyzed packets from different layers of the TCP/IP model. The analysis provided insight into the following:

- Link Layer: Ethernet frames showed the MAC addresses and basic frame structure.
- **Internet Layer**: IP packets revealed the source and destination IP addresses, allowing us to understand how packets are routed across the network.
- Transport Layer: TCP and UDP packets highlighted the differences between connectionoriented (TCP) and connectionless (UDP) protocols. We observed sequence numbers, acknowledgments, and retransmissions in TCP packets, demonstrating reliable data transfer.
- **Application Layer**: HTTP packets displayed the requests and responses between web clients and servers, including headers and payload data.

CONCLUSION:

Wireshark is a powerful tool for analyzing network traffic and understanding the TCP/IP model. By capturing and examining packets at various layers, we can diagnose network issues, monitor performance, and gain insights into the underlying protocols that enable internet communication. This practical experience reinforces the theoretical concepts of the TCP/IP model and demonstrates its real-world application in network analysis and troubleshooting.