Wireshark Implementation

What is Wireshark?

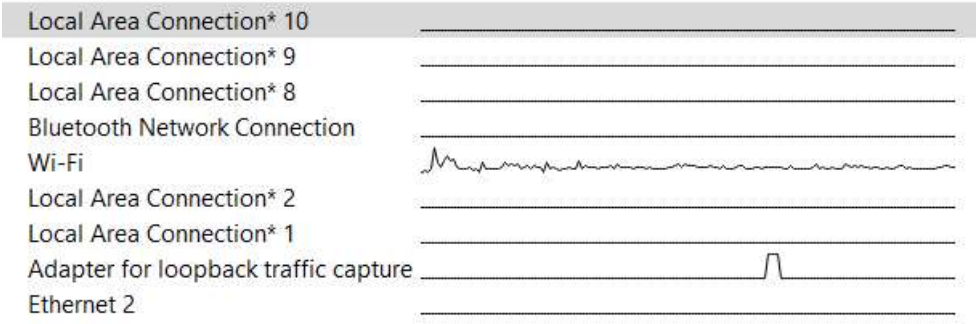
Wireshark is a traffic monitoring and packet analysis tool. It is used for network troubleshooting and detect suspicion activities. It is free and open-source software, thus, is used by many for educational and research purposes.

Various Uses of Wireshark

1. Capture traffic on any network
2. Analyse Traffic
3. Analyse Packets
4. Password Sniffing

1. Capturing Traffic on Any Network

The main screen shows different networks connected to the computer system. Network showing graphs indicate there is a traffic on this network.



For our purpose, let's examine the **VIT Wi-fi network**.

As soon as we click on Wi-Fi, capturing of traffic starts.

1520	14.402462	HewlettP_88:b5:68	Broadcast	ARP	60 Who has 172.16.91.153? Tell 172.16.88.1
1521	14.402462	IntelCor_cb:d3:c9	Broadcast	ARP	60 Who has 169.254.255.255? Tell 172.16.91.44
1522	14.402462	IntelCor_7c:b3:ca	Broadcast	ARP	60 Who has 169.254.255.255? Tell 172.16.93.233
1523	14.511368	51.79.234.100	172.16.93.244	TLSv1.2	93 Application Data
1524	14.511568	172.16.93.244	51.79.234.100	TCP	54 63764 → 443 [FIN, ACK] Seq=1 Ack=40 Win=510 Len=0
1525	14.511705	172.16.91.44	172.16.95.255	UDP	305 54915 → 54915 Len=263
1526	14.512607	51.79.234.100	172.16.93.244	TLSv1.2	78 Application Data
1527	14.512607	51.79.234.100	172.16.93.244	TCP	60 443 → 63764 [FIN, ACK] Seq=64 Ack=1 Win=83 Len=0
1528	14.512716	172.16.93.244	51.79.234.100	TCP	54 63764 → 443 [RST, ACK] Seq=2 Ack=64 Win=0 Len=0
1529	14.525907	198.22.162.81	172.16.93.244	TCP	60 443 → 63752 [ACK] Seq=745 Ack=3224 Win=91 Len=0
1530	14.533684	198.22.162.81	172.16.93.244	TLSv1.2	302 Application Data

Screenshot of traffic at a particular instance. (It is in encrypted form)

There are different colouring schemes for different cases. These colouring rules are set by the wireshark software, and can be customized according to our needs.

Name	Filter
Bad TCP	tcp.analysis.flags && !tcp.analysis.window_update && !tcp.analysis.keep_alive && !tcp.analysis.keep_alive_ack
HSRP State Change	hsrp.state != 8 && hsrp.state != 16
Spanning Tree Topology Change	stp.type == 0x80
OSPF State Change	ospf.msg != 1
ICMP errors	icmp.type eq 3 || icmp.type eq 4 || icmp.type eq 5 || icmp.type eq 11 || icmpv6.type eq 1 || icmpv6.type eq 2 || icmpv6.type eq 3 || icmpv6.type eq 4
ARP	arp
ICMP	icmp || icmpv6
TCP RST	tcp.flags.reset eq 1
SCTP ABORT	sctp.chunk_type eq ABORT
TTL low or unexpected	(! ip.dst == 224.0.0.0/4 && ip.ttl < 5 && !pim && !ospf) || (ip.dst == 224.0.0.0/24 && ip.dst != 224.0.0.251 && ip.ttl != 1 && !(vrrp || carp))
Checksum Errors	eth.fcs.status=="Bad" || ip.checksum.status=="Bad" || tcp.checksum.status=="Bad" || udp.checksum.status=="Bad" || sctp.checksum.status=="Bad" || mst
SMB	smb || nbss || nbns || netbios
HTTP	http || tcp.port == 80 || http2
DCERPC	dcerpc
Routing	hsrp || eigrp || ospf || bgp || cdp || vrrp || carp || gvrp || igmp || ismp
TCP SYN/FIN	tcp.flags & 0x02 || tcp.flags.fin == 1
TCP	tcp
UDP	udp
Broadcast	eth[0] & 1
System Event	systemd_journal || sysdig

Toolbar → View → Coloring rules

2. Analyse Traffic

After stopping the capturing of data, we will have a huge amount of traffic data. This can be analysed to obtain information regarding network traffic, data sent and received, ip addresses involved, etc.

There are various types of protocols in our traffic data. We can filter it according to our needs.

tcp

No.	Time	Source	Destination	Protocol	Length	Info
37	0.469272	13.107.4.52	172.16.93.244	TCP	60	80 → 64532 [FIN, ACK] Seq=540 Ack=112 Win=4194304 Len=0
38	0.469394	172.16.93.244	13.107.4.52	TCP	54	64532 → 80 [ACK] Seq=112 Ack=541 Win=131840 Len=0
39	0.469538	172.16.93.244	13.107.4.52	TCP	54	64532 → 80 [FIN, ACK] Seq=112 Ack=541 Win=131840 Len=0
41	0.494585	13.107.4.52	172.16.93.244	TCP	60	80 → 64532 [ACK] Seq=541 Ack=113 Win=4194304 Len=0
163	2.547473	172.16.93.244	20.198.162.76	TLSv1.2	98	Application Data
167	2.628771	20.198.162.76	172.16.93.244	TLSv1.2	229	Application Data
172	2.672087	172.16.93.244	20.198.162.76	TCP	54	61039 → 443 [ACK] Seq=45 Ack=176 Win=258 Len=0
431	6.886087	13.227.166.100	172.16.93.244	TLSv1.2	93	Application Data
432	6.886087	13.227.166.100	172.16.93.244	TLSv1.2	78	Application Data
433	6.886087	13.227.166.100	172.16.93.244	TCP	60	443 → 64424 [FIN, ACK] Seq=64 Ack=1 Win=131 Len=0
434	6.886200	172.16.93.244	13.227.166.100	TCP	54	64424 → 443 [ACK] Seq=1 Ack=65 Win=257 Len=0
502	8.335310	172.16.93.244	104.85.157.227	TCP	55	64509 → 443 [ACK] Seq=1 Ack=1 Win=509 Len=1 [TCP segment of a reassembled PDU]

For example, if we type ‘tcp’ in display filter, we obtain a list of only those data packets which has TCP protocol. We can also use ‘tcp contains youtube’.

tcp or udp

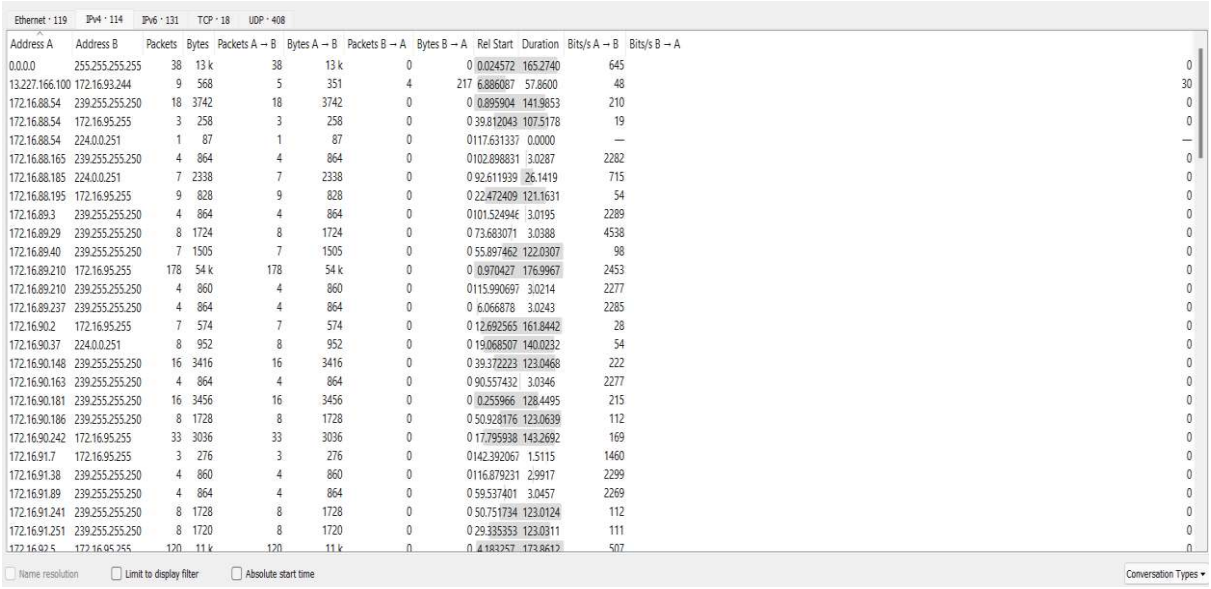
No.	Time	Source	Destination	Protocol	Length	Info
29	0.426212	172.16.94.113	172.16.95.255	UDP	62	2007 → 2007 Len=20
32	0.441568	13.107.4.52	172.16.93.244	TCP	66	80 → 64532 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1440 WS=256 SACK_PERM=1
33	0.441699	172.16.93.244	13.107.4.52	TCP	54	64532 → 80 [ACK] Seq=1 Ack=1 Win=132352 Len=0
34	0.441910	172.16.93.244	13.107.4.52	HTTP	165	GET /connecttest.txt HTTP/1.1
35	0.467244	13.107.4.52	172.16.93.244	TCP	60	80 → 64532 [ACK] Seq=1 Ack=112 Win=4194304 Len=0
36	0.469272	13.107.4.52	172.16.93.244	HTTP	593	HTTP/1.1 200 OK (text/plain)
37	0.469272	13.107.4.52	172.16.93.244	TCP	60	80 → 64532 [FIN, ACK] Seq=540 Ack=112 Win=4194304 Len=0
38	0.469394	172.16.93.244	13.107.4.52	TCP	54	64532 → 80 [ACK] Seq=112 Ack=541 Win=131840 Len=0
39	0.469538	172.16.93.244	13.107.4.52	TCP	54	64532 → 80 [FIN, ACK] Seq=112 Ack=541 Win=131840 Len=0
40	0.492297	172.16.94.76	172.16.95.255	UDP	305	54915 → 54915 Len=263
41	0.494585	13.107.4.52	172.16.93.244	TCP	60	80 → 64532 [ACK] Seq=541 Ack=113 Win=4194304 Len=0
42	0.506081	172.16.92.193	172.16.95.255	UDP	305	54915 → 54915 Len=263

Filtering ‘tcp or udp’ protocols. For ‘https’, we use ‘tls’.

We can also obtain analysis of traffic using wireshark.

Toolbar → Statistics → I/O Graphs

We can also obtain summary of conversations between endpoints.



Ethernet · 119 | IPv4 · 114 | IPv6 · 131 | TCP · 18 | UDP · 408

Address A	Address B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bits/s A → B	Bits/s B → A
0.0.0.0	255.255.255.255	38	13 k	38	13 k	0	0	0.024572	165.2740	645	0
13.227.166.100	172.16.93.244	9	568	5	351	4	217	6.886087	57.8600	48	30
172.16.88.54	239.255.255.250	18	3742	18	3742	0	0	0.895904	141.9853	210	0
172.16.88.54	172.16.95.255	3	258	3	258	0	0	39.812043	107.5178	19	0
172.16.88.54	224.0.0.251	1	87	1	87	0	0	117.631337	0.0000	—	—
172.16.88.165	239.255.255.250	4	864	4	864	0	0	102.898831	3.0287	2282	0
172.16.88.185	224.0.0.251	7	2338	7	2338	0	0	92.611939	26.1419	715	0
172.16.88.195	172.16.95.255	9	828	9	828	0	0	22.472409	121.1631	54	0
172.16.89.3	239.255.255.250	4	864	4	864	0	0	101.52494€	3.0195	2289	0
172.16.89.29	239.255.255.250	8	1724	8	1724	0	0	73.683071	3.0388	4538	0
172.16.89.40	239.255.255.250	7	1505	7	1505	0	0	55.897462	122.0307	98	0
172.16.89.210	172.16.95.255	178	54 k	178	54 k	0	0	0.970427	176.9967	2453	0
172.16.89.210	239.255.255.250	4	860	4	860	0	0	115.990697	3.0214	2277	0
172.16.89.237	239.255.255.250	4	864	4	864	0	0	6.066878	3.0243	2285	0
172.16.90.2	172.16.95.255	7	574	7	574	0	0	12.692565	161.8442	28	0
172.16.90.37	224.0.0.251	8	952	8	952	0	0	19.068507	140.0232	54	0
172.16.90.148	239.255.255.250	16	3416	16	3416	0	0	39.372223	123.0468	222	0
172.16.90.163	239.255.255.250	4	864	4	864	0	0	90.557432	3.0346	2277	0
172.16.90.181	239.255.255.250	16	3456	16	3456	0	0	0.255966	128.4495	215	0
172.16.90.186	239.255.255.250	8	1728	8	1728	0	0	50.928176	123.0639	112	0
172.16.90.242	172.16.95.255	33	3036	33	3036	0	0	17.795938	143.2692	169	0
172.16.91.7	172.16.95.255	3	276	3	276	0	0	142.392067	1.5115	1460	0
172.16.91.38	239.255.255.250	4	860	4	860	0	0	116.879231	2.9917	2299	0
172.16.91.89	239.255.255.250	4	864	4	864	0	0	59.537401	3.0457	2269	0
172.16.91.241	239.255.255.250	8	1728	8	1728	0	0	50.751734	123.0124	112	0
172.16.91.251	239.255.255.250	8	1720	8	1720	0	0	29.335353	123.0311	111	0
172.16.92.5	172.16.95.255	120	11 k	120	11 k	0	0	4.183257	173.8612	507	0

Name resolution | Limit to display filter | Absolute start time | Conversation Types

Toolbar → Statistics → Conversations

3. Analyse Packets

There are many data packets being sent and received across network at any instance of time.

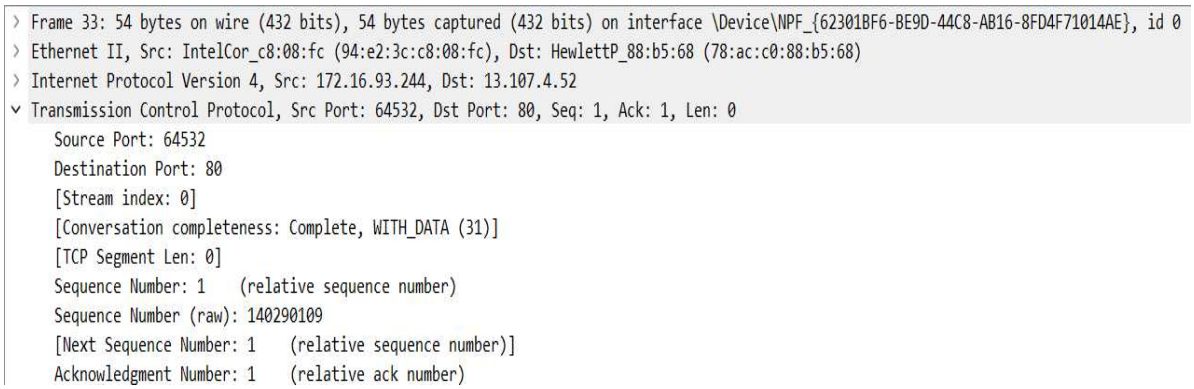
Upon selecting a particular packet, we obtain greater details from the Status pane below.

For example, upon selecting the given data packet

33 0.441699 172.16.93.244 13.107.4.52 TCP 54 64532 → 80 [ACK] Seq=1 Ack=1 Win=132352 Len=0

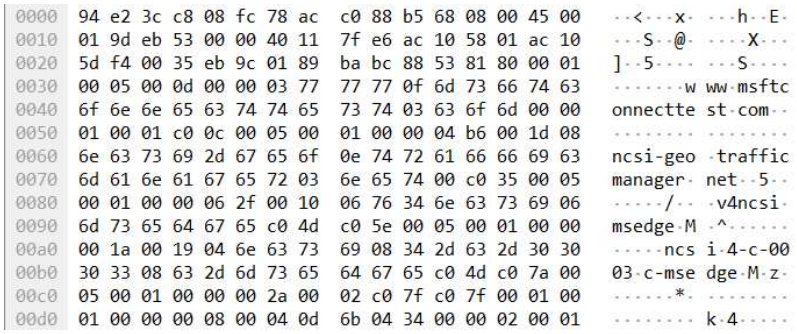
few of the details are already displayed in the list such as serial number, **relative** time of data packet being transferred, source address, destination address, protocol, length of data packet in bytes and other information.

In the Status pane below,

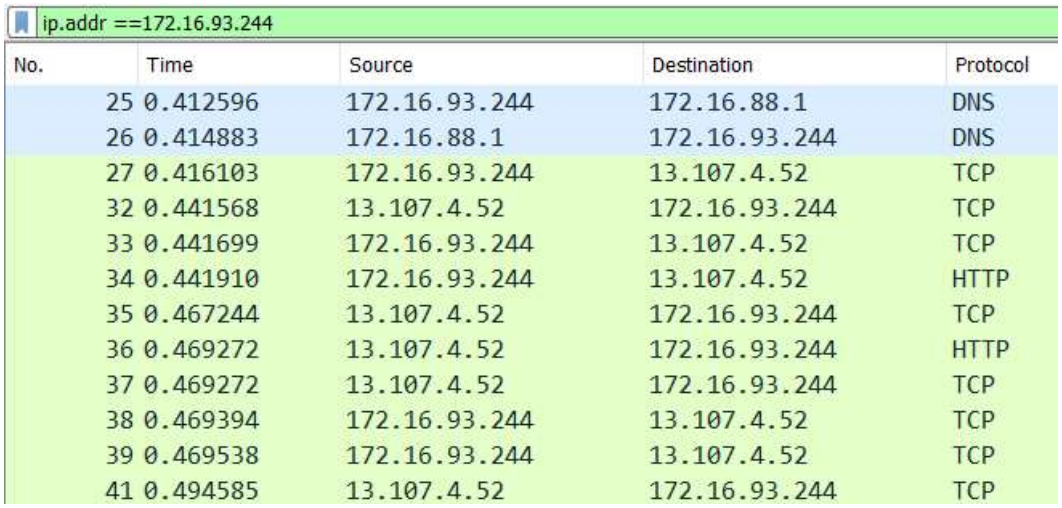


We can see greater details such as source port number, destination port number, etc.

The data info is shown in the raw hexadecimal form.



We can also filter out data packets being sent or received from a particular ip address.



In this, only those packets are displayed which has its source or destination as ip.addr==172.16.93.244

If we want only those packets whose source is this ip address, then ip.src==172.16.93.244

And for destination, ip.dst==172.16.93.244

We can filter out using port addresses too.

tcp.port==463

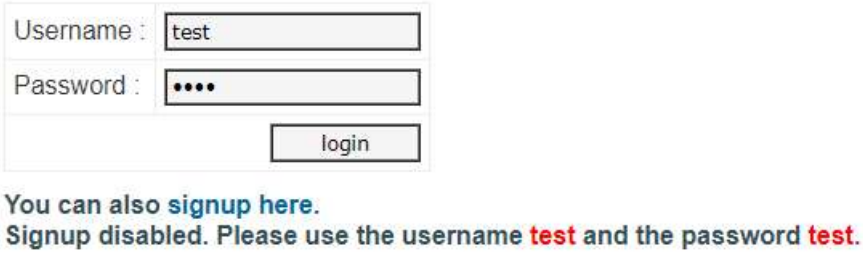
4. Password Sniffing

The info of the packets is encrypted on most of the sites so we cannot decipher it.

To demonstrate password sniffing, let us use an unsecured login test site, exclusively used for such demonstration purposes.

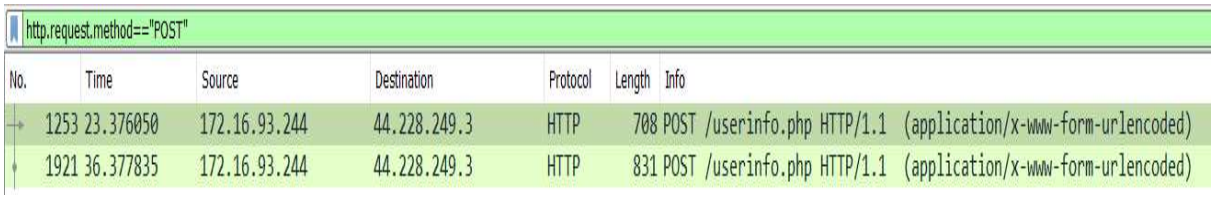
Site : [login page (vulnweb.com)]

While demonstrating password sniffing, wireshark must continue capturing traffic on the network.

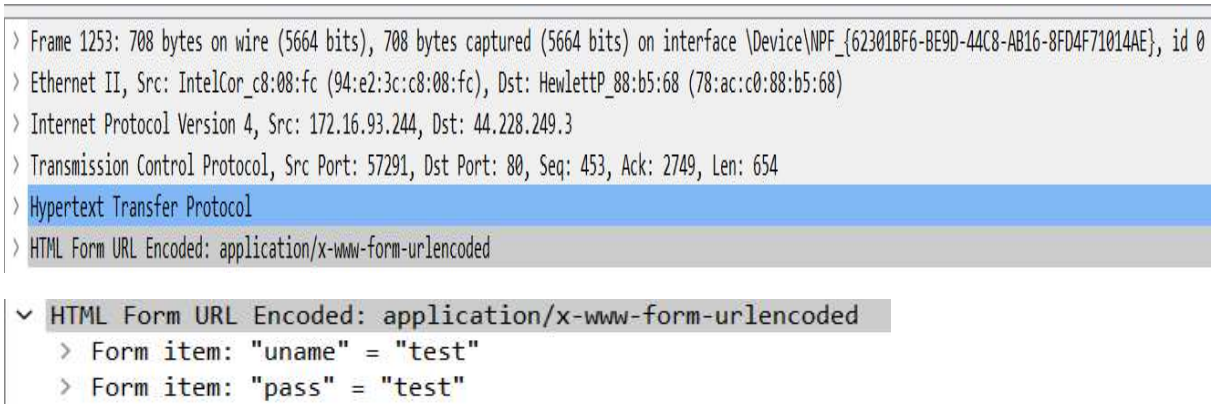


This is for demonstration purpose only. The ID used is ‘test’ and password is ‘test’.

Using the command http.request.method==”POST” in display filter, we get



On clicking the userinfo.php encoded, we can see the ID and Password in the screen below.



Thus, Wireshark enabled by these use cases, is used by cyber security officials, network security engineers and system admins across various places to check for sniffing activities, network issues, performance issues or any troubleshooting with respect to network, and as an analysis tool.

----------Thank you----------