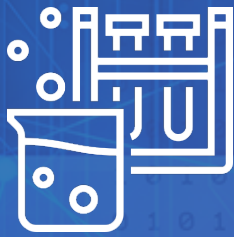


Lab Assignment & Solution



Cybersecurity Professional Program

Network Security

Network Traffic Analysis

NS-04-LS2

Advanced Analysis

Note: Solutions for the instructor are shown in the green box.

Lab Objective

The lab aims to practice analyzing data packets using a packet analysis tool.

Lab Mission

Practice the new ways you learned to capture traffic and analyze a .pcap file.

Lab Duration

25–30 minutes

Requirements

- Advanced knowledge of Wireshark

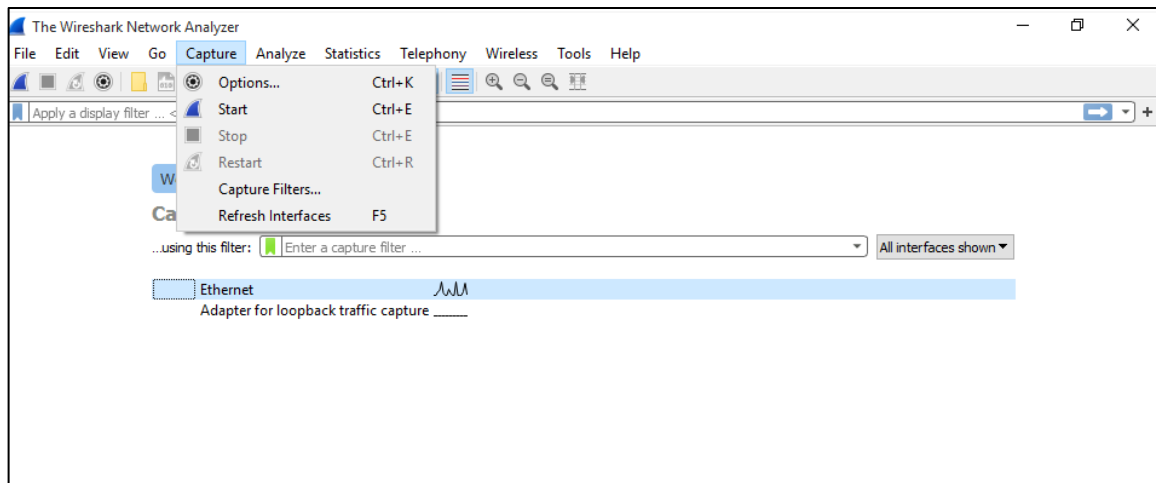
Resources

- Environment & Tools
 - VirtualBox
 - Windows 10 VM (NAT)
 - Wireshark
- Extra Lab Files
 - ***Advanced Analysis.pcap***

Lab Task 1: Filter Configuration

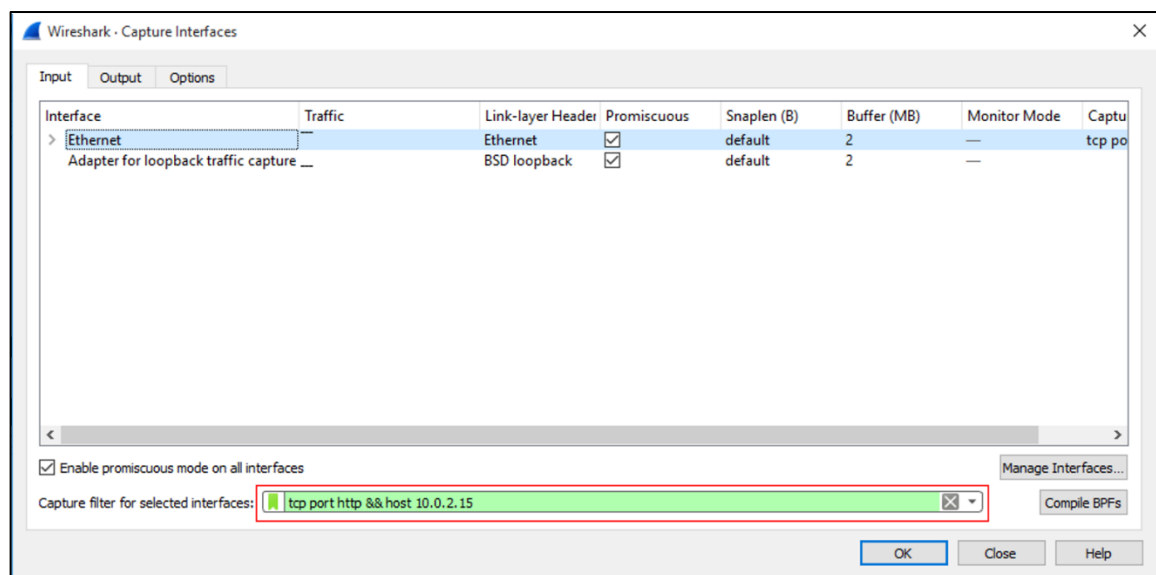
In this task, you will set predefined filters for a network interface controller (NIC).

- 1 On your Windows 10 machine, launch Wireshark, click the **Capture** menu at the top, and select **Options...** or press **Ctrl+K**.



- 2 On the **Options** screen, identify and select the interface with which you are connected to the internet. Apply the following filters at the bottom of the screen:
tcp port http && host [your Win7 VM IP]

This filter will tell Wireshark to capture only traffic related to that IP address and HTTP traffic.



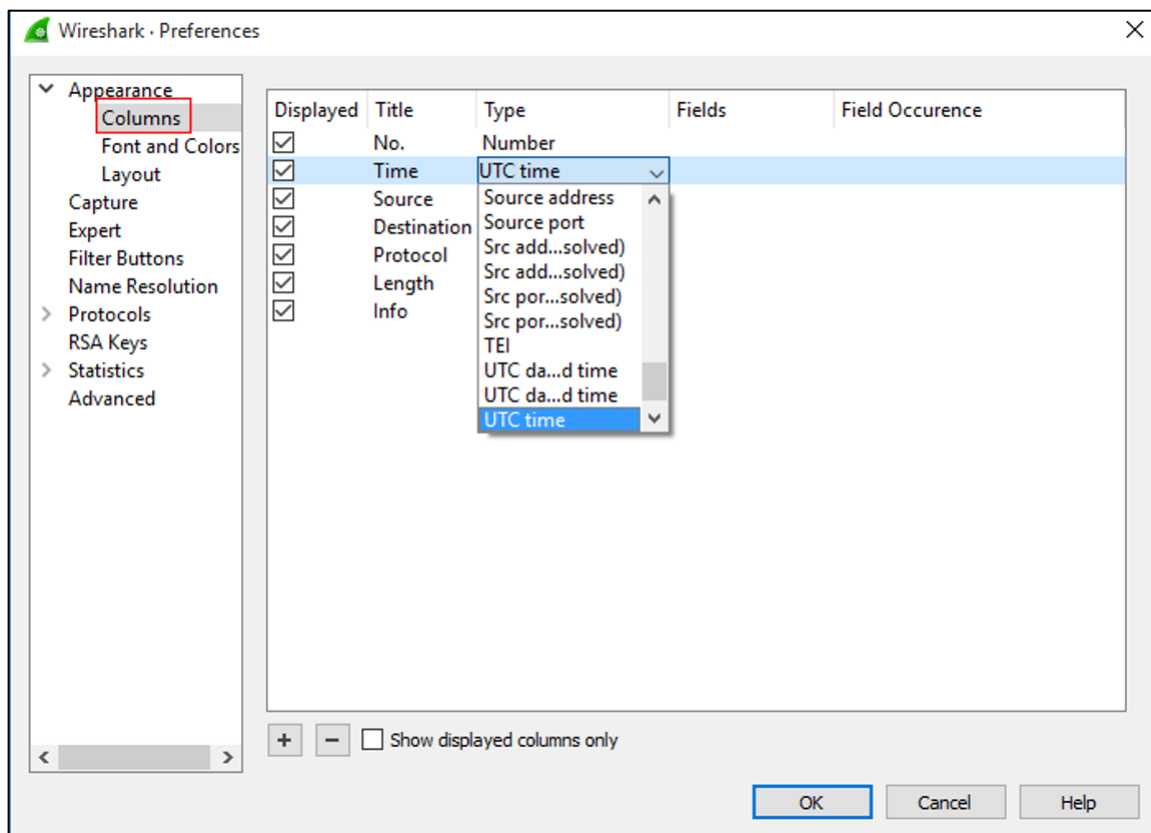
- 3 Open a browser on your Windows 10 VM and navigate to an HTTP site, such as pdf995.com/. You should see only traffic belonging to your VM and part of the HTTP traffic.

No.	Time	Source	Destination	Protocol	Length	Info
123	13:08:56.876085	10.0.2.15	67.195.197.24	TCP	54	49799 → 80 [ACK] Seq=1 Ack=1 Win=65535 Len=0
124	13:08:56.879611	10.0.2.15	67.195.197.24	TCP	54	49799 → 80 [FIN, ACK] Seq=1 Ack=1 Win=65535 Len=0
125	13:08:56.879811	67.195.197.24	10.0.2.15	TCP	60	80 → 49799 [ACK] Seq=1 Ack=2 Win=65535 Len=0
126	13:08:56.881565	10.0.2.15	152.199.19.161	TCP	54	49791 → 80 [FIN, ACK] Seq=925 Ack=24718 Win=64240...
127	13:08:56.881762	152.199.19.161	10.0.2.15	TCP	60	80 → 49791 [ACK] Seq=24718 Ack=926 Win=65535 Len=0
128	13:08:57.170662	72.246.151.57	10.0.2.15	TCP	60	80 → 49506 [ACK] Seq=1 Ack=1 Win=65535 Len=1 [TCP...
129	13:08:58.636247	34.198.128.79	10.0.2.15	TCP	60	[TCP Retransmission] 80 → 49751 [FIN, ACK] Seq=1 ...
130	13:08:58.636247	34.198.128.79	10.0.2.15	TCP	60	[TCP Retransmission] 80 → 49750 [FIN, ACK] Seq=1 ...
131	13:08:58.837564	10.0.2.15	67.195.197.24	TCP	62	[TCP Retransmission] 49797 → 80 [SYN] Seq=0 Win=6...
132	13:08:58.837598	10.0.2.15	67.195.197.24	TCP	62	[TCP Retransmission] 49800 → 80 [SYN] Seq=0 Win=6...
133	13:08:58.865867	67.195.197.24	10.0.2.15	TCP	60	80 → 49797 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0...
134	13:08:58.865938	10.0.2.15	67.195.197.24	TCP	54	49797 → 80 [ACK] Seq=1 Ack=1 Win=65535 Len=0
135	13:08:58.868520	10.0.2.15	67.195.197.24	TCP	54	49797 → 80 [FIN, ACK] Seq=1 Ack=1 Win=65535 Len=0
136	13:08:58.868819	67.195.197.24	10.0.2.15	TCP	60	80 → 49797 [ACK] Seq=1 Ack=2 Win=65535 Len=0

Lab Task 2: Packet Capture

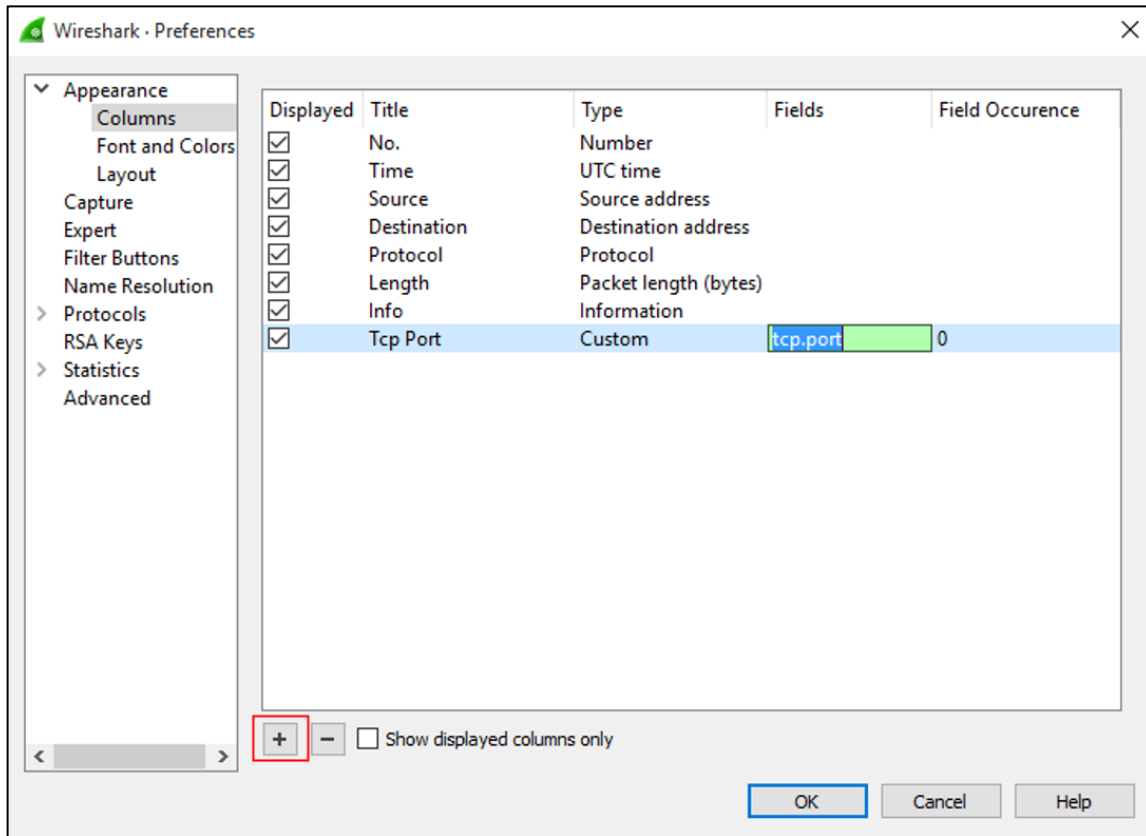
In this task, you will create and modify columns and set up filters based on existing traffic.

- 1 In your Windows 10 VM, start Wireshark and configure it to capture traffic. Then browse to pdf995.com.
- 2 Change the time type to UTC by going back to Wireshark, navigating to the **Edit** tab, and selecting **Preferences**. In the **Preferences** window, go to **Appearance > Columns** and change the type of time in the **Time** column to UTC.



- 3 Add a new column with the name **TCP Port** by clicking the plus sign at the bottom of the window to add a new column. Then change its name to **Tcp Port**, its type to **Custom**, and enter **tcp.port** under **Fields**.

Note: The field shows the source and destination port details.



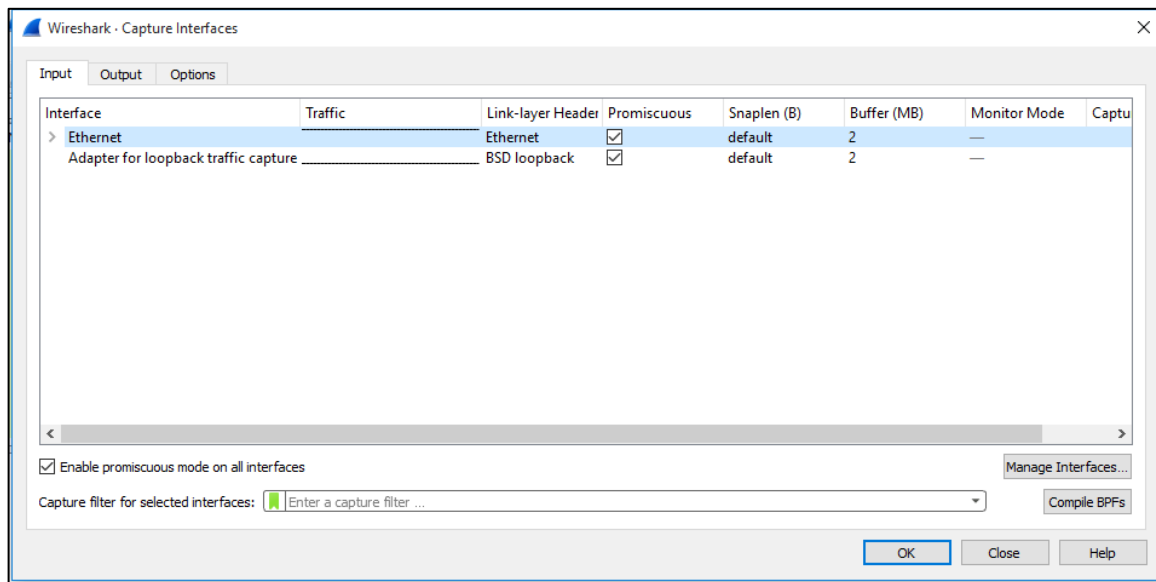
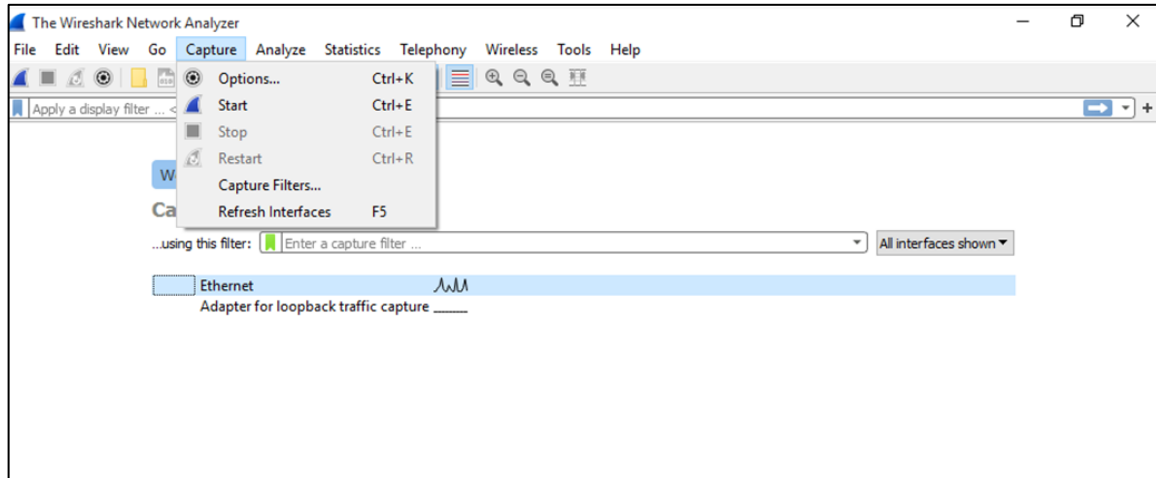
- 4 Click the new column to sort the traffic by **TCP Port**.

Note: The time changed on all packets.

The image shows the Wireshark packet list table. The table has columns: No., Time, Source, Destination, Protocol, Length, Info, and Tcp Port. The packets are sorted by the 'Tcp Port' column. The 'Time' column shows that the time has changed for all packets, indicating a sort operation.

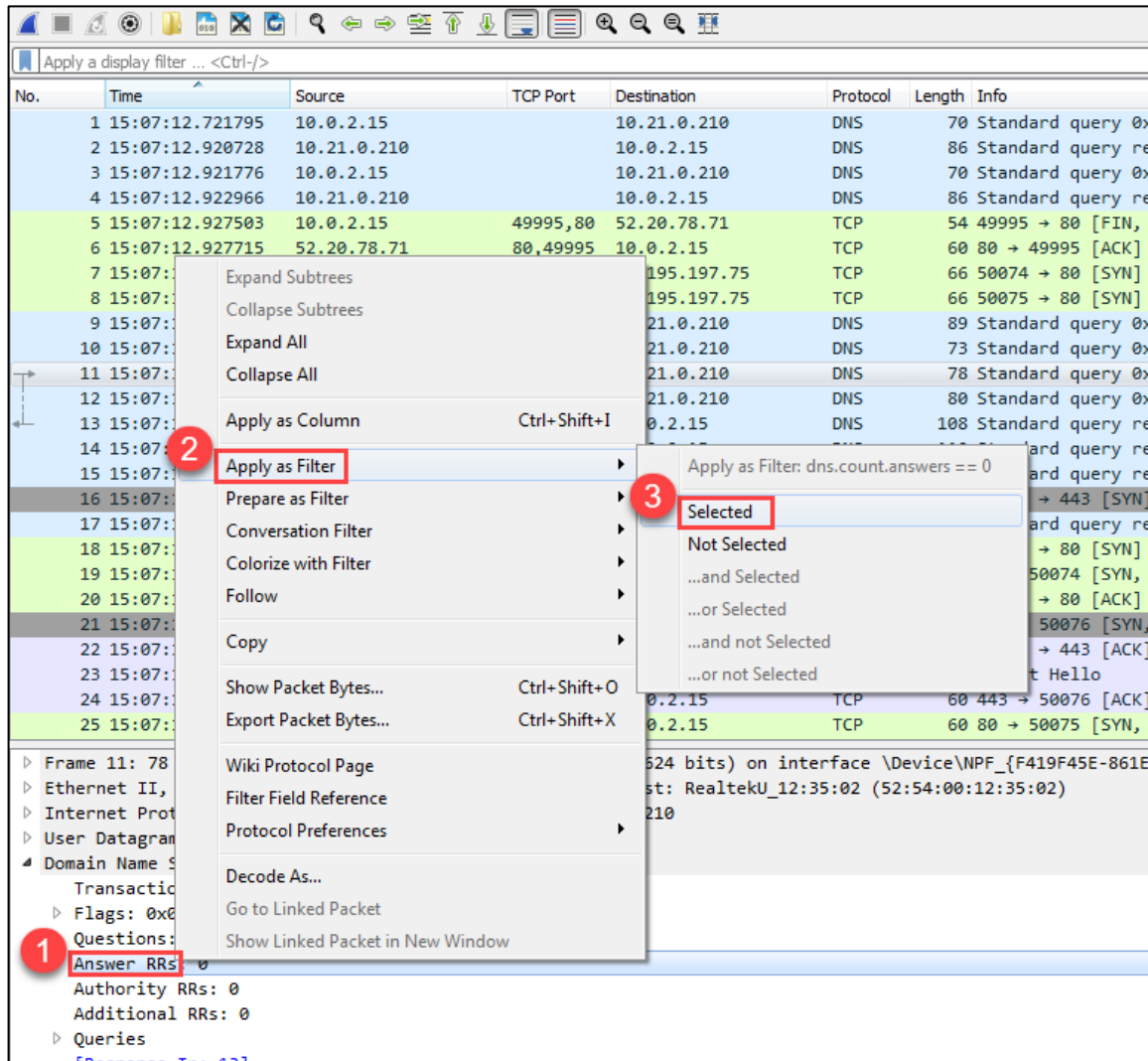
No.	Time	Source	Destination	Protocol	Length	Info	Tcp Port
18520	13:11:42.442632	104.79.231.22	10.0.2.15	TCP	60	[TCP Retransmission] 80...	80,49504
18521	13:11:44.259776	10.0.2.15	34.234.1.180	HTTP	638	GET /embed/Yw/575a37e70...	49814,80
18522	13:11:44.260173	34.234.1.180	10.0.2.15	TCP	60	80 → 49814 [ACK] Seq=54...	80,49814
18523	13:11:44.717310	34.234.1.180	10.0.2.15	HTTP	376	HTTP/1.1 200 OK (text/...	80,49814
18524	13:11:44.717397	10.0.2.15	34.234.1.180	TCP	54	49814 → 80 [ACK] Seq=10...	49814,80
18525	13:11:46.720225	34.198.128.79	10.0.2.15	TCP	60	[TCP Retransmission] 80...	80,49751
18526	13:11:46.720225	34.198.128.79	10.0.2.15	TCP	60	[TCP Retransmission] 80...	80,49750
18527	13:11:48.244786	10.0.2.15	34.234.1.180	HTTP	638	GET /embed/Yw/575a37e70...	49815,80
18528	13:11:48.245304	34.234.1.180	10.0.2.15	TCP	60	80 → 49815 [ACK] Seq=64...	80,49815
18529	13:11:49.006669	34.234.1.180	10.0.2.15	HTTP	376	HTTP/1.1 200 OK (text/...	80,49815
18530	13:11:49.006709	10.0.2.15	34.234.1.180	TCP	54	49815 → 80 [ACK] Seq=12...	49815,80
18531	13:11:50.308006	34.234.1.180	10.0.2.15	TCP	60	[TCP Retransmission] 80...	80,49771
18532	13:11:50.975870	34.198.128.79	10.0.2.15	TCP	60	[TCP Retransmission] 80...	80,49779
18533	13:11:52.229059	10.0.2.15	34.234.1.180	HTTP	638	GET /embed/Yw/575a37e70...	49814,80

- 5 Remove all capture filters and recapture packets without preconfigured filtering. Click the *red square* icon, navigate to the **Capture** menu at the top, and select **Options...** or press **Ctrl+K**. Remove the capture filter and click **OK**.



- 6 Start capturing again, go to the details of a DNS packet, right-click **Answer RRs**, and apply them as a filter.

Note: To generate a DNS query answer, access a site you have not accessed before from this VM via the web browser.

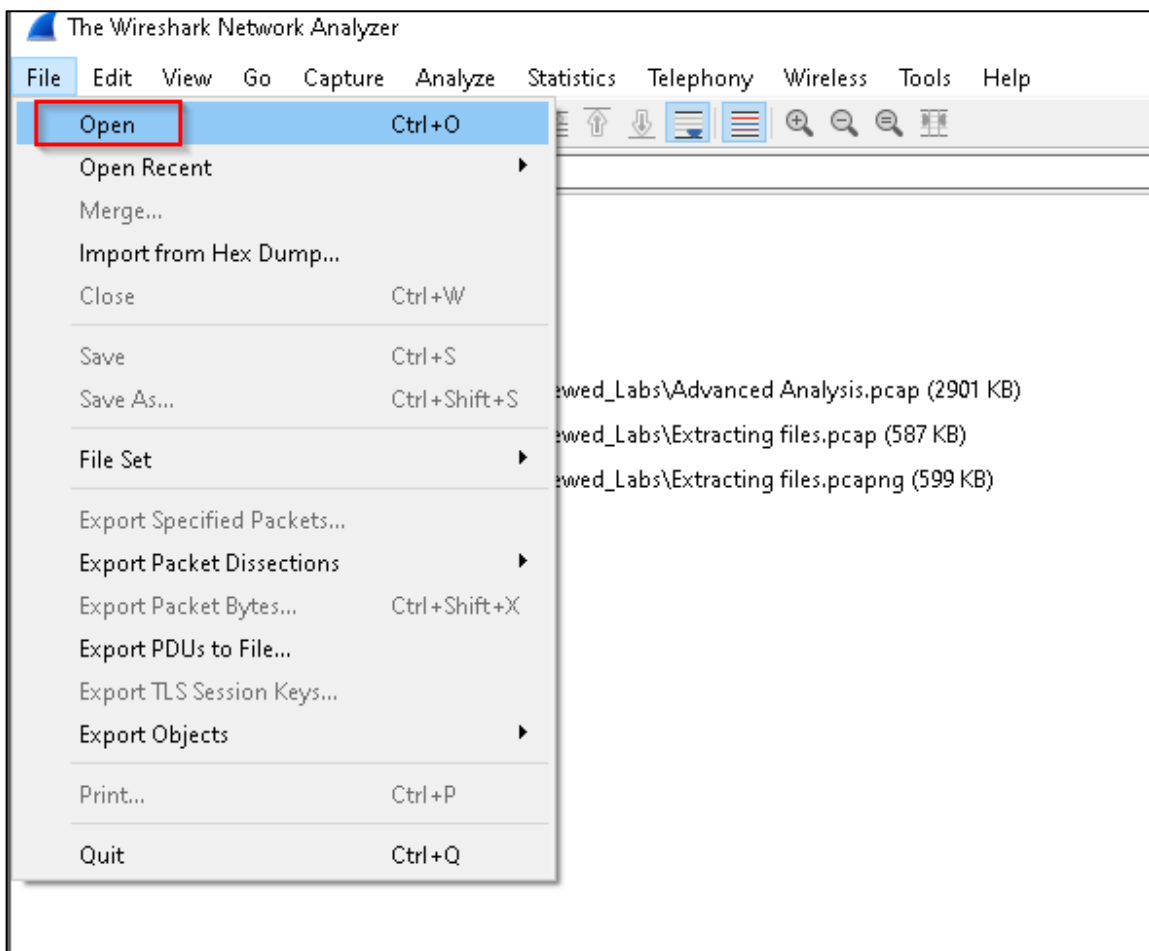


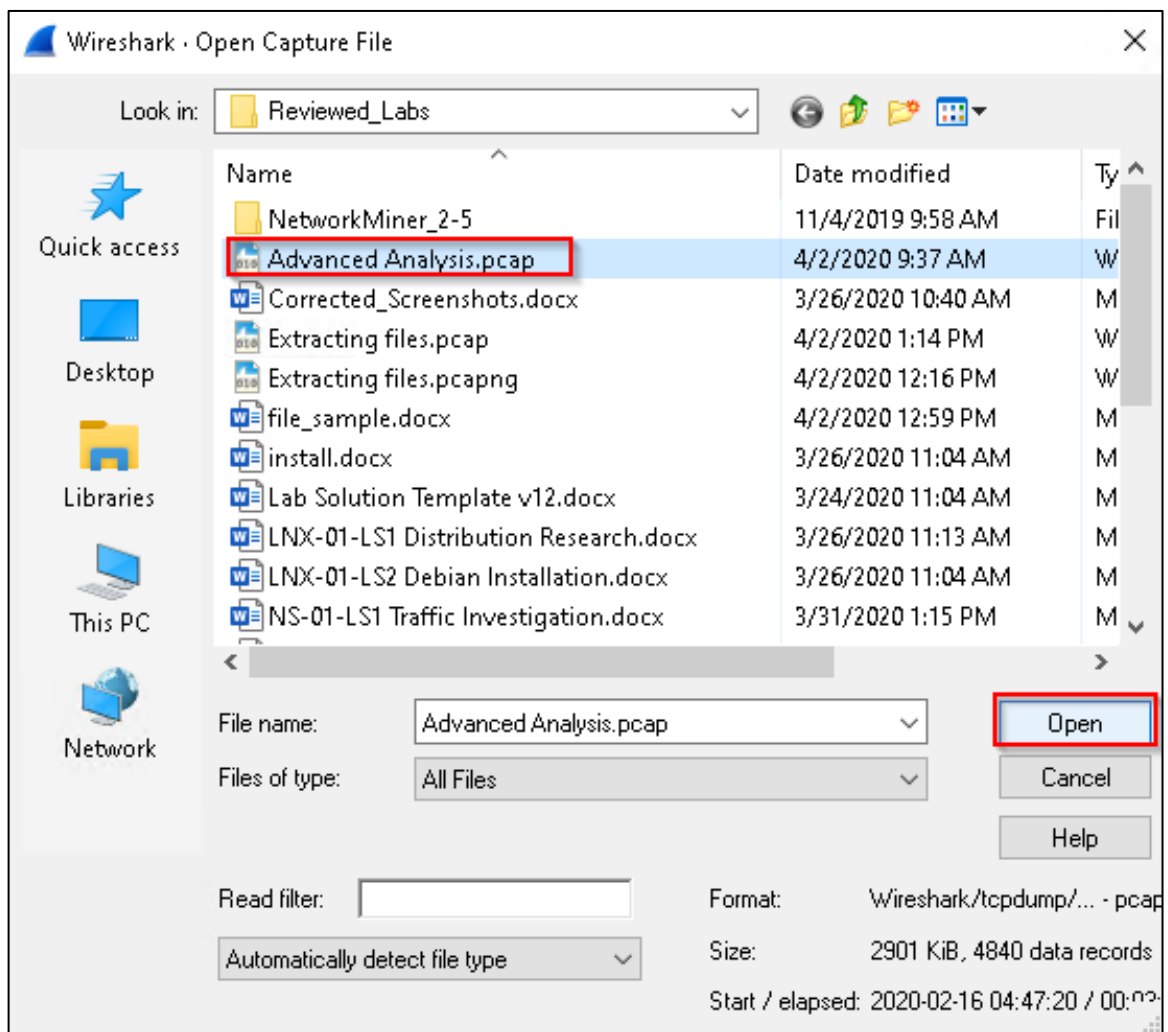
Lab Task 3: PCAP Analysis

This task will analyze the **Advanced Analysis.pcap** file using techniques you learned in this module.

- 1 Transfer the file **Advanced Analysis.pcap** to the Windows 10 VM by using the drag-and-drop feature of VB Guest Additions, which can be viewed in the Windows 10 Installation Guide. Open the **Advanced Analysis.pcap** file with Wireshark.

Note: Open the file using the drop-down menu.





2 What is the percentage of HTTP traffic in the captured file? Examine the statistics to understand the results. In the menu bar at the top, go to **Statistics > Protocol Hierarchy**.

The screenshot shows the Wireshark network protocol analyzer interface. The 'Statistics' menu is open, and the 'Protocol Hierarchy' option is highlighted. The main packet list on the left shows six packets, all from source 'Fortinet_a9:a2:00:00:00:00' to destination '10.21.0.144'. The packet details pane on the right shows the first packet's structure: Ethernet II, Internet Protocol Version 4, and Hypertext Transfer Protocol. The packet bytes pane at the bottom shows the raw data for the first packet.

No.	Time	Source
1	0.000000	Fortinet_a9:a2:00:00:00:00
2	1.024015	Fortinet_a9:a2:00:00:00:00
3	1.101741	10.21.0.144
4	1.105163	192.117.235.2
5	1.106782	10.21.0.144
6	1.107036	10.21.0.144

Frame 1: 60 bytes on wire (480 bits) captured (0.000000 seconds) on interface eth0
> Ethernet II, Src: Fortinet_a9:a2:00:00:00:00, Dst: 10.21.0.144
> Internet Protocol Version 4, Src: 10.21.0.144, Dst: 10.21.0.144
> Hypertext Transfer Protocol

0000 ff ff ff ff ff ff 90 6c ac a1
0010 08 00 06 04 00 01 90 6c ac a1
0020 00 00 00 00 00 00 0a 15 00 90
0030 00 00 00 00 00 00 00 00 00 00

Statistics > Protocol Hierarchy

- Capture File Properties
- Resolved Addresses
- Protocol Hierarchy
- Conversations
- Endpoints
- Packet Lengths
- I/O Graphs
- Service Response Time
- DHCP (BOOTP) Statistics
- ONC-RPC Programs
- 29West
- ANCP
- BACnet
- Collectd
- DNS
- Flow Graph
- HART-IP
- HPFEEDS
- HTTP
- HTTP2
- Sametime
- TCP Stream Graphs
- UDP Multicast Streams
- F5

Packets: 4840 · Displayed: 4840 (100.0%) Profile: Default

You should see that the percentage is 2.1%.

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s
Frame	100.0	4840	100.0	2893461	112 k
Ethernet	100.0	4840	2.3	67760	2633
Internet Protocol Version 6	0.4	18	0.0	720	27
User Datagram Protocol	0.4	18	0.0	144	5
Multicast Domain Name System	0.2	12	0.0	336	13
Link-local Multicast Name Resolution	0.1	6	0.0	132	5
Internet Protocol Version 4	93.0	4502	3.1	90040	3499
User Datagram Protocol	36.5	1768	0.5	14144	549
Simple Service Discovery Protocol	0.1	4	0.0	696	27
NetBIOS Name Service	5.9	286	0.5	14300	555
NetBIOS Datagram Service	0.6	28	0.2	5160	200
SMB (Server Message Block Protocol)	0.6	28	0.1	2864	111
SMB MailSlot Protocol	0.6	28	0.0	700	27
Microsoft Windows Browser Protocol	0.6	28	0.0	456	17
Multicast Domain Name System	0.2	12	0.0	336	13
Link-local Multicast Name Resolution	0.1	6	0.0	132	5
Dropbox LAN sync Discovery Protocol	0.4	18	0.2	4860	188
Domain Name System	2.0	98	0.2	6668	259
Data	27.2	1316	26.3	759776	29 k
Transmission Control Protocol	56.5	2733	66.1	1912657	74 k
Transport Layer Security	31.4	1519	63.3	1831138	71 k
Malformed Packet	0.0	2	0.0	0	0
Hypertext Transfer Protocol	2.1	102	2.3	66465	2583
Online Certificate Status Protocol	0.0	1	0.0	472	18
Line-based text data	1.0	46	0.0	1154	44
Data	0.8	41	6.5	187290	7279
Internet Control Message Protocol	0.0	1	0.0	36	1
Address Resolution Protocol	6.6	320	0.5	14486	563

- Determine which two IPv4s had the longest IP conversation and the number of packets sent in that conversation. Go to **Statistics > Conversations**.

The two IPs are **192.117.235.237** and **10.21.0.144**, and 96 packets were sent.

Wireshark · Conversations - NS-04-LS1 Advance Wireshark.pcap

Ethernet · 24	IPv4 · 66	IPv6 · 2	TCP · 62	UDP · 95							
Address A	Address B	Packets	Bytes	Packets A → B	Bytes A →	Packets B →	Bytes B →	Rel Start	Duration	Bits/s A → B	Bits/s B → A
10.21.0.144	192.117.235.237	96	10 k	48	3755	48	6760	1.101741	201.4484	149	
10.21.0.111	10.21.0.255	21	5250	21	5250	0	0	4.921624	200.2982	209	
10.21.0.112	10.21.0.255	21	5250	21	5250	0	0	4.919045	200.2982	209	
10.21.0.144	10.71.0.118	48	3258	30	2142	18	1116	4.894208	200.1286	85	
3.95.44.182	10.21.0.144	61	4545	22	1807	39	2738	3.307226	194.6067	74	
10.21.0.144	10.21.0.255	9	828	9	828	0	0	15.938454	184.4394	35	
10.21.0.144	224.0.0.251	12	840	12	840	0	0	15.939321	183.9389	36	
10.21.0.144	52.20.78.71	146	51 k	96	30 k	50	20 k	20.640931	183.4092	1335	
10.21.0.144	224.0.0.252	6	384	6	384	0	0	15.940627	183.3482	16	
10.21.0.144	172.217.18.42	32	24 k	17	10 k	15	14 k	15.940002	183.2944	444	
10.21.0.144	52.139.250.253	15	1650	10	755	5	895	23.543609	180.2336	33	
10.21.0.144	157.240.221.60	90	28 k	42	4871	48	23 k	17.866438	172.4659	225	
10.21.0.175	10.21.0.255	6	492	6	492	0	0	18.228241	164.4535	23	
10.21.0.147	10.21.0.255	6	1272	6	1272	0	0	28.058875	150.7327	67	
10.21.0.177	10.21.0.255	13	4587	13	4587	0	0	25.816542	150.4198	243	
10.21.0.144	13.226.6.89	30	9774	15	2371	15	7403	20.220733	149.0694	127	
10.21.0.144	147.75.32.99	38	11 k	19	2546	19	8652	41.834516	135.6720	150	
10.21.0.144	147.75.102.239	96	85 k	30	3022	66	82 k	41.759610	135.6359	178	

- 4 Regarding the previous question, which protocol was used between the two IPs? Right-click the top row where the two IPs are **10.21.0.144** and **192.117.235.237** and apply an **A<->B** bidirectional filter.

Wireshark · Conversations · NS-04-LS1 Advance Wireshark.pcap

Ethernet · 24		IPv4 · 66		IPv6 · 2		TCP · 62		UDP · 95	
Address A	Address B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration
10.21.0.144	192.117.235.237	96	10 k	48	3755	48	6760	1.101741	201.4484
10.21.0.111	10.21.0.255	Apply as Filter		Selected		A → B	0	4.921624	200.2982
10.21.0.112	10.21.0.255	Prepare a Filter		Not Selected		A → B	0	4.919045	200.2982
10.21.0.144	10.71.0.118	Find		...and Selected		B → A	1116	4.894208	200.1286
3.95.44.182	10.21.0.144	Colorize		...or Selected		A → Any	2738	3.307226	194.6067
10.21.0.144	10.21.0.255		9 828	...and not Selected		A → Any	0	15.938454	184.4394
10.21.0.144	224.0.0.251		12 840	...or not Selected		Any → A	0	15.939321	183.9389
10.21.0.144	52.20.78.71		146 51 k			Any → B	20 k	20.640931	183.4092
10.21.0.144	224.0.0.252		6 384		6 384	Any → B	0	15.940627	183.3482
10.21.0.144	172.217.18.42		32 24 k		17 10 k	B → Any	14 k	15.940002	183.2944
10.21.0.144	52.139.250.253		15 1650		10 755		895	23.543609	180.2336
10.21.0.144	157.240.221.60		90 28 k		42 4871	48	23 k	17.866438	172.4659
10.21.0.175	10.21.0.255		6 492		6 492	0	0	18.228241	164.4535
10.21.0.147	10.21.0.255		6 1272		6 1272	0	0	28.058875	150.7327
10.21.0.177	10.21.0.255		13 4587		13 4587	0	0	25.816542	150.4198
10.21.0.144	13.226.6.89		30 9774		15 2371	15	7403	20.220733	149.0694
10.21.0.144	147.75.32.99		38 11 k		19 2546	19	8652	41.834516	135.6720

Advanced Analysis.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

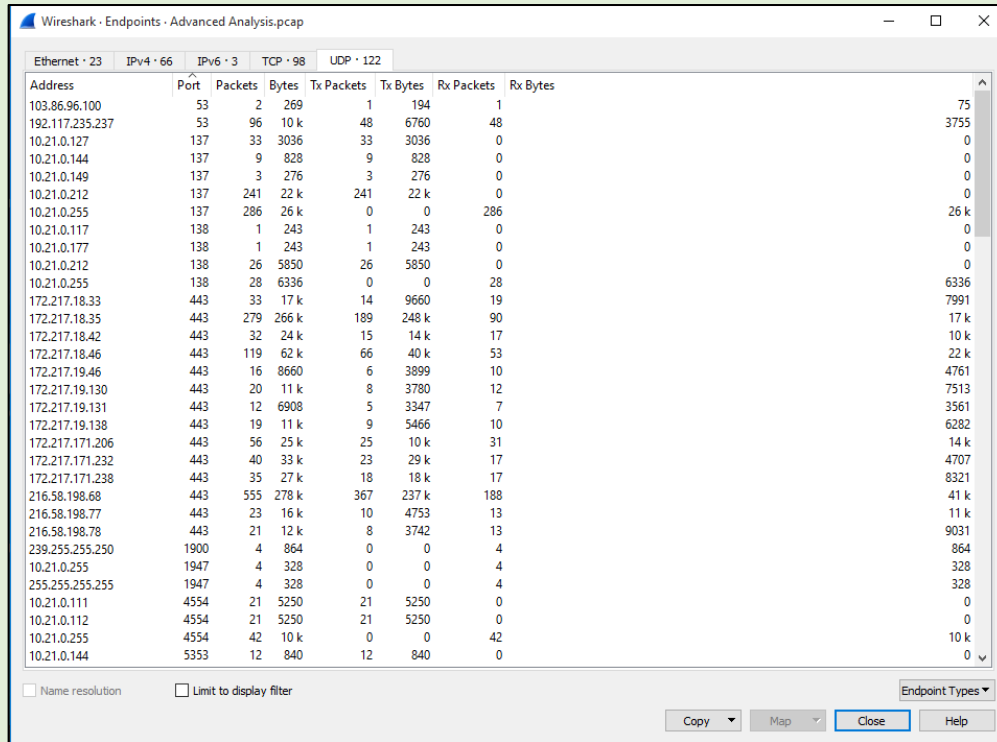
ip.addr==10.21.0.144 && ip.addr==192.117.235.237

No.	Time	Source	Destination	Protocol	Length	Info
3763	09:48:11.748952	10.21.0.144	192.117.235.237	DNS	75	Standard query 0x61d2 A play.google.com
3764	09:48:11.753696	192.117.235.237	10.21.0.144	DNS	91	Standard query response 0x61d2 A play.google.com
3879	09:48:25.048801	10.21.0.144	192.117.235.237	DNS	89	Standard query 0x4cea A clientservices.google.com
3881	09:48:25.052119	192.117.235.237	10.21.0.144	DNS	105	Standard query response 0x4cea A clientservices.google.com
3974	09:48:36.043292	10.21.0.144	192.117.235.237	DNS	75	Standard query 0xf75b A update.eset.com
3975	09:48:36.058743	192.117.235.237	10.21.0.144	DNS	123	Standard query response 0xf75b A update.eset.com
4003	09:48:36.616618	10.21.0.144	192.117.235.237	DNS	73	Standard query 0x1547 A pico.eset.com
4004	09:48:36.619218	192.117.235.237	10.21.0.144	DNS	120	Standard query response 0x1547 A pico.eset.com
4263	09:49:12.184662	10.21.0.144	192.117.235.237	DNS	83	Standard query 0xa95b A nleditor.osi.office.com
4264	09:49:12.193443	192.117.235.237	10.21.0.144	DNS	266	Standard query response 0xa95b A nleditor.osi.office.com
4455	09:49:48.968594	10.21.0.144	192.117.235.237	DNS	86	Standard query 0xe86d A config.teams.microsoft.com
4456	09:49:48.975064	192.117.235.237	10.21.0.144	DNS	180	Standard query response 0xe86d A config.teams.microsoft.com
4504	09:49:53.348562	10.21.0.144	192.117.235.237	DNS	90	Standard query 0x54ef A mobile.pipe.aria.microsoft.com
4505	09:49:53.355260	192.117.235.237	10.21.0.144	DNS	274	Standard query response 0x54ef A mobile.pipe.aria.microsoft.com
4601	09:50:05.699155	10.21.0.144	192.117.235.237	DNS	76	Standard query 0x0ea8 A web.whatsapp.com
4602	09:50:05.707001	192.117.235.237	10.21.0.144	DNS	129	Standard query response 0x0ea8 A web.whatsapp.com
4784	09:50:43.353655	10.21.0.144	192.117.235.237	DNS	87	Standard query 0x9757 A roaming.officeapps.live.com
4785	09:50:43.356873	192.117.235.237	10.21.0.144	DNS	150	Standard query response 0x9757 A roaming.officeapps.live.com

The protocol was DNS.

- 5 Using endpoint statistics, determine which IPs use the DNS protocol on UDP. Go to **Statistics > Endpoints** and see which IPs used port 53 (DNS) UDP.

Answer: **103.86.96.100** and **192.117.235.237** used port 53.



Address	Port	Packets	Bytes	Tx Packets	Tx Bytes	Rx Packets	Rx Bytes
103.86.96.100	53	2	269	1	194	1	75
192.117.235.237	53	96	10 k	48	6760	48	3755
10.21.0.127	137	33	3036	33	3036	0	0
10.21.0.144	137	9	828	9	828	0	0
10.21.0.149	137	3	276	3	276	0	0
10.21.0.212	137	241	22 k	241	22 k	0	0
10.21.0.255	137	286	26 k	0	0	286	26 k
10.21.0.117	138	1	243	1	243	0	0
10.21.0.177	138	1	243	1	243	0	0
10.21.0.212	138	26	5850	26	5850	0	0
10.21.0.255	138	28	6336	0	0	28	6336
172.217.18.33	443	33	17 k	14	9660	19	7991
172.217.18.35	443	279	266 k	189	248 k	90	17 k
172.217.18.42	443	32	24 k	15	14 k	17	10 k
172.217.18.46	443	119	62 k	66	40 k	53	22 k
172.217.19.46	443	16	8660	6	3899	10	4761
172.217.19.130	443	20	11 k	8	3780	12	7513
172.217.19.131	443	12	6908	5	3347	7	3561
172.217.19.138	443	19	11 k	9	5466	10	6282
172.217.171.206	443	56	25 k	25	10 k	31	14 k
172.217.171.232	443	40	33 k	23	29 k	17	4707
172.217.171.238	443	35	27 k	18	18 k	17	8321
216.58.198.68	443	555	278 k	367	237 k	188	41 k
216.58.198.77	443	23	16 k	10	4753	13	11 k
216.58.198.78	443	21	12 k	8	3742	13	9031
239.255.255.250	1900	4	864	0	0	4	864
10.21.0.255	1947	4	328	0	0	4	328
255.255.255.255	1947	4	328	0	0	4	328
10.21.0.111	4554	21	5250	21	5250	0	0
10.21.0.112	4554	21	5250	21	5250	0	0
10.21.0.255	4554	42	10 k	0	0	42	10 k
10.21.0.144	5353	12	840	12	840	0	0