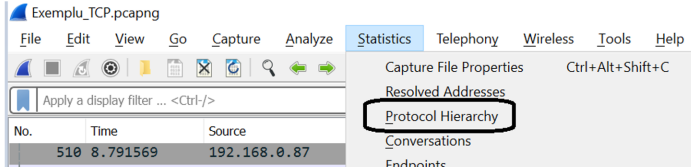


# Rețele de calculatoare

## Temă 3

### I. Statistici

- Utilizând utilitarul **Protocol Hierarchy** din cadrul wireshark stabiliți ce protocol este folosit mai mult. Dați răspunsul în valori procentuale.

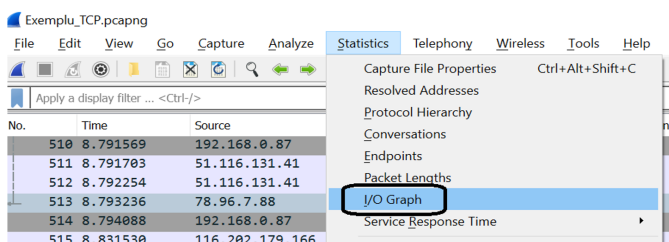


Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s	PDUs
Frame	100.0	16914	100.0	16617050	3371 k	0	0	0	16914
Ethernet	100.0	16914	1.4	236892	48 k	0	0	0	16914
Internet Protocol Version 6	0.1	14	0.0	560	113	0	0	0	14
User Datagram Protocol	0.1	14	0.0	112	22	0	0	0	14
Internet Protocol Version 4	99.8	16875	2.0	337500	68 k	0	0	0	16875
User Datagram Protocol	32.9	5569	0.3	44552	9039	0	0	0	5569
Transmission Control Protocol	66.8	11306	1.4	232336	47 k	8874	183696	37 k	11306
Address Resolution Protocol	0.1	25	0.0	700	142	25	700	142	25

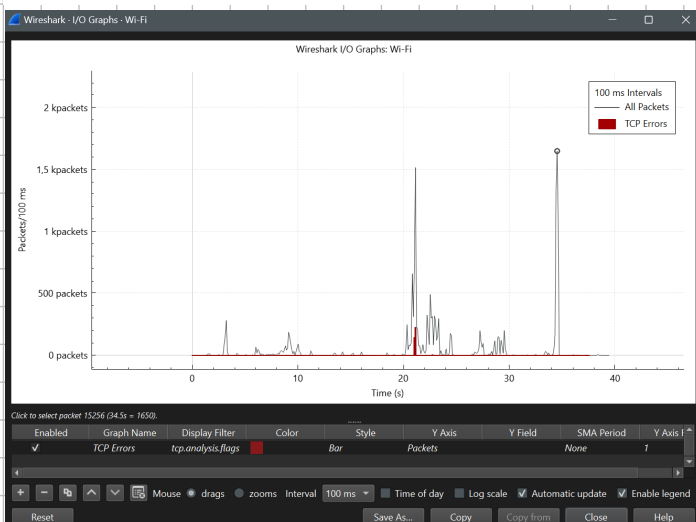
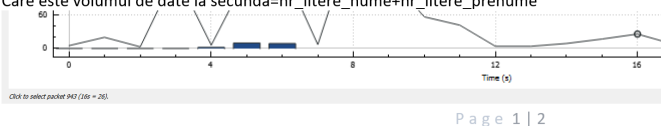
TCP - este folosit mai mult  $\rightarrow 66,8\%$  (în IPV4)  
 UDP  $\rightarrow 0,1 + 32,9 \rightarrow 33\%$

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s	PDUs
Frame	100.0	16914	100.0	16617050	3371 k	0	0	0	16914
Ethernet	100.0	16914	1.4	236892	48 k	0	0	0	16914
Internet Protocol Version 6	0.1	14	0.0	560	113	0	0	0	14
User Datagram Protocol	0.1	14	0.0	112	22	0	0	0	14
Simple Service Discovery Protocol	0.1	12	0.0	5721	1160	12	5721	1160	12
Multicast Domain Name System	0.0	2	0.0	86	17	2	86	17	2
Internet Protocol Version 4	99.8	16875	2.0	337500	68 k	0	0	0	16875
User Datagram Protocol	32.9	5569	0.3	44552	9039	0	0	0	5569
Simple Service Discovery Protocol	0.2	30	0.1	13507	2740	30	13507	2740	30
QUIC IETF	31.8	5374	19.8	3287733	667 k	5374	3268468	663 k	5454
Multicast Domain Name System	0.1	14	0.0	614	124	14	614	124	14
Domain Name System	0.8	133	0.1	10047	2038	133	10047	2038	133
Data	0.1	18	0.0	3660	742	18	3660	742	18
Transmission Control Protocol	66.8	11306	1.4	232336	47 k	8874	183696	37 k	11306
Transport Layer Security	14.3	2413	74.6	12390121	2514 k	2413	10457259	2121 k	2573
Hypertext Transfer Protocol	0.0	8	0.0	3085	625	4	965	195	8
Online Certificate Status Protocol	0.0	4	0.0	3749	760	4	3749	760	4
Data	0.1	11	0.1	13402	2719	11	13402	2719	11
Address Resolution Protocol	0.1	25	0.0	700	142	25	700	142	25

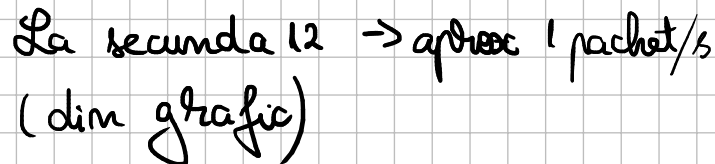
- Utilizând utilitarul **I/O Graph** schimbați baza de timp la 1/10 dintr-o secundă și răspundeți la următoarele întrebări:



- Care este volumul maxim de pachete/s și când îl găsiți?
- Care este volumul de date la secundă = nr. litere\_nume + nr. litere\_prename



a) Volumul maxim de pachete se atinge la secunda 34,5 și anume 1650 pachete/s  
 b) CIOBANU BARIA  
 7 + 5 = 12



3. Utilizând o trasă de Wireshark, care este dimensiunea antetului UDP, dacă luăm în considerare mai multe pachete.
4. Utilizând al 4-lea cadru (frame), care este portul sursă și portul destinație al cadrului?
5. Pentru cel de-al 3-lea cadru DNS, care este suma, în octeți, a tuturor antetelor cadrului?

No	Time	Source	Destination	Protocol	Length Info
2185	11.303331	172.217.19.100	192.168.3.109	QUIC	255 Protected Payload (KPo)
2186	11.303331	172.217.19.100	192.168.3.109	QUIC	65 Protected Payload (KPo)
2187	11.303331	172.217.19.100	192.168.3.109	QUIC	254 Protected Payload (KPo)
2188	11.303331	172.217.19.100	192.168.3.109	QUIC	65 Protected Payload (KPo)
2189	11.303709	192.168.3.109	172.217.19.100	QUIC	81 Protected Payload (KPo), DCID=F8e49baF4f35f9a
2190	11.306182	142.250.108.206	192.168.3.109	QUIC	65 Protected Payload (KPo)
2191	11.306852	192.168.3.109	172.217.19.100	QUIC	62 Protected Payload (KPo), DCID=F8e49baF4f35f9a
2192	11.316651	172.217.19.100	192.168.3.109	QUIC	1127 Protected Payload (KPo)
2193	11.316651	172.217.19.100	192.168.3.109	QUIC	69 Protected Payload (KPo)
2194	11.316651	172.217.19.100	192.168.3.109	QUIC	261 Protected Payload (KPo)
2195	11.321142	172.217.19.100	192.168.3.109	QUIC	68 Protected Payload (KPo)
2196	11.321538	192.168.3.109	172.217.19.100	QUIC	80 Protected Payload (KPo), DCID=F8e49baF4f35f9a
2197	11.336951	172.217.19.100	192.168.3.109	QUIC	68 Protected Payload (KPo)
2198	11.336951	172.217.19.100	192.168.3.109	DNS	20 8310 No SIG, no CNAME
2199	12.004116	BiliBiliElectr-15:19:61	Broadcast	ARP	42 who has 192.168.3.1? Tell 192.168.3.135
2200	12.288187	162.159.136.234	192.168.3.109	TLSv1.2	149 Application Data
2201	12.329172	192.168.3.109	162.159.136.234	TCP	54 56218 -> 443 [ACK] Seq=1 Ack=96 Len=0 Len=0
2202	12.377609	192.168.3.109	142.250.110.188	TCP	55 53997 -> 5228 [ACK] Seq=1 Ack=510 Len=0
2203	12.413967	142.250.110.188	192.168.3.109	TCP	66 5228 -> 53997 [ACK] Seq=Ack=2 Len=0 Len=0 SRE=2
2204	12.516759	192.168.3.109	192.168.3.1	DNS	90 Standard query 0x5987 A self-events.data.microsoft.com CNAME self-events-data.trafficmanager.net CNAME onedscloudprodus03.austaliasoutheast.clo.
2205	12.534951	192.168.3.109	192.168.3.1	DNS	120 Standard query response 0x5987 A self-events.data.microsoft.com CNAME self-events-data.trafficmanager.net CNAME onedscloudprodus03.austaliasoutheast.clo.
2206	12.543352	192.168.3.109	104.46.162.227	TCP	56 56392 -> 443 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM
2207	12.004248	192.168.3.109	192.168.3.109	TCP	66 443 -> 56392 [SYN, ACK] Seq=0 Win=65535 Len=0 MSS=1412 WS=256 SACK_PERM
2208	12.002040	192.168.3.109	104.46.162.227	TCP	54 56392 -> 443 [ACK] Seq=1 Ack=1 Win=65535 Len=0
2209	12.810412	192.168.3.109	104.46.162.227	TLSv1.3	346 Client Hello (SHA256,self.events.data.microsoft.com)
2210	13.001880	104.46.162.227	192.168.3.109	TCP	153 Hello Retry Request, Change Cipher Spec
2211	13.002861	192.168.3.109	104.46.162.227	TCP	54 56392 -> 443 [ACK] Seq=293 Ack=100 Win=261888 Len=0
2212	13.004607	192.168.3.109	104.46.162.227	TLSv1.3	417 Change Cipher Spec, Client Hello (SHA256,self.events.data.microsoft.com)
2213	13.377915	104.46.162.227	192.168.3.109	TLSv1.3	1466 Server Hello
2214	13.377915	104.46.162.227	192.168.3.109	TCP	1466 443 -> 56392 [ACK] Seq=1512 Ack=656 Win=1494084 Len=1412 [TCP PDU reassembled in 2217]
2215	13.377915	104.46.162.227	192.168.3.109	TCP	1466 443 -> 56392 [ACK] Seq=1512 Ack=656 Win=1494084 Len=1412 [TCP PDU reassembled in 2217]
2216	13.377915	104.46.162.227	192.168.3.109	TCP	1466 443 -> 56392 [ACK] Seq=4336 Ack=656 Win=1494084 Len=1412 [TCP PDU reassembled in 2217]
2217	13.377915	104.46.162.227	192.168.3.109	TLSv1.3	884 Application Data
2218	13.378185	192.168.3.109	104.46.162.227	TCP	54 56392 -> 443 [ACK] Seq=656 Ack=6498 Win=262144 Len=0
2219	13.386540	192.168.3.109	104.46.162.227	TLSv1.3	128 Application Data

4)

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	BllanElectr_15:19...	Broadcast	ARP	42	Who has 192.168.3.1? Tell 192.168.3.135
2	0.512551	TpLinkTechno_ef:d0...	Broadcast	ARP	42	Who has 192.168.3.206? Tell 192.168.3.1
3	0.915162	192.168.3.109	192.129.221.95	TCP	54	56326 → 80 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
4	0.915741	192.168.3.109	192.107.246.44	TCP	54	56315 → 443 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
5	0.915743	192.168.3.109	92.123.109.59	TCP	54	56315 → 443 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
6	1.228813	192.168.3.109	255.255.255.255	UDP	230	37690 → 6667 Len=188
7	1.333882	192.168.3.135	255.255.255.255	UDP	230	33119 → 6667 Len=188
8	1.474719	192.168.3.109	140.82.113.21	TLSv1.2	131	Application Data
9	1.474796	192.168.3.109	140.82.113.21	TLSv1.2	93	Application Data
10	1.474829	192.168.3.109	140.82.113.21	TCP	1466	56364 → 443 [ACK] Seq=117 Ack=1 Win=510 Len=1412 [TCP PDU reassembled in 11]
11	1.474829	192.168.3.109	140.82.113.21	TLSv1.2	390	Application Data
12	1.481810	192.168.3.109	192.168.3.1	DNS	80	Standard query 0xfeb1 A collector.github.com
13	1.481810	192.168.3.109	192.168.3.1	DNS	74	Standard query 0xe2a8 A api.github.com
14	1.489622	192.168.3.1	192.168.3.109	DNS	90	Standard query response 0xe2a8 A api.github.com A 140.82.121.5
15	1.489622	192.168.3.1	192.168.3.109	DNS	129	Standard query response 0xfeb1 A collector.github.com CNAME glb-d052c2cf8be544.github.com A 140.82.114.21
16	1.491131	192.168.3.109	140.82.121.5	TCP	66	56384 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 KS=256 SACK_PERM
17	1.535766	TpLinkTechno_ef:d0...	Broadcast	ARP	42	Who has 192.168.3.206? Tell 192.168.3.1
18	1.537765	140.82.121.5	192.168.3.109	TCP	66	443 → 56384 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1412 SACK_PERM KS=1024
19	1.538269	192.168.3.109	140.82.121.5	TCP	54	56384 → 443 [ACK] Seq=1 Ack=1 Win=131072 Len=0
20	1.540955	192.168.3.109	140.82.121.5	TCP	1466	56384 → 443 [ACK] Seq=1 Ack=1 Win=131072 Len=1412 [TCP PDU reassembled in 21]
21	1.540955	192.168.3.109	140.82.121.5	TLSv1.3	509	Client Hello (SHA1api.github.com)
22	1.588634	140.82.121.5	192.168.3.109	TCP	54	443 → 56384 [ACK] Seq=1 Ack=1868 Win=69632 Len=0
23	1.588634	140.82.121.5	192.168.3.109	TLSv1.3	1466	Server Hello, Change Cipher Spec, Application Data
24	1.588634	140.82.121.5	192.168.3.109	TCP	1466	443 → 56384 [PSH, ACK] Seq=1413 Ack=1868 Win=69632 Len=1412 [TCP PDU reassembled in 25]
25	1.588634	140.82.121.5	192.168.3.109	TLSv1.3	722	Application Data, Application Data, Application Data
26	1.589913	192.168.3.109	140.82.121.5	TLSv1.3	118	Change Cipher Spec, Application Data
27	1.590083	192.168.3.109	140.82.121.5	TLSv1.3	146	Application Data
28	1.590372	192.168.3.109	140.82.121.5	TLSv1.3	934	Application Data
29	1.590406	192.168.3.109	140.82.121.5	TLSv1.3	398	Application Data
30	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=1 Ack=78 Win=91 Len=0
31	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=1 Ack=117 Win=91 Len=0
32	1.606628	140.82.113.21	192.168.3.109	TLSv1.2	93	Application Data
33	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=0 Ack=1865 Win=96 Len=0
34	1.606628	140.82.113.21	192.168.3.109	TLSv1.2	182	Application Data
35	1.606881	192.168.3.109	140.82.113.21	TCP	54	56364 → 443 [ACK] Seq=1865 Ack=88 Win=510 Len=0

port sursă : 56325  
port destinație : 443

5.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	BllanElectr_15:19...	Broadcast	ARP	42	Who has 192.168.3.1? Tell 192.168.3.135
2	0.512551	TpLinkTechno_ef:d0...	Broadcast	ARP	42	Who has 192.168.3.206? Tell 192.168.3.1
3	0.915162	192.168.3.109	192.129.221.95	TCP	54	56326 → 80 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
4	0.915741	192.168.3.109	192.107.246.44	TCP	54	56315 → 443 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
5	0.915743	192.168.3.109	92.123.109.59	TCP	54	56315 → 443 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
6	1.228813	192.168.3.109	255.255.255.255	UDP	230	37690 → 6667 Len=188
7	1.333882	192.168.3.135	255.255.255.255	UDP	230	33119 → 6667 Len=188
8	1.474719	192.168.3.109	140.82.113.21	TLSv1.2	131	Application Data
9	1.474796	192.168.3.109	140.82.113.21	TLSv1.2	93	Application Data
10	1.474829	192.168.3.109	140.82.113.21	TCP	1466	56364 → 443 [ACK] Seq=117 Ack=1 Win=510 Len=1412 [TCP PDU reassembled in 11]
11	1.474829	192.168.3.109	140.82.113.21	TLSv1.2	390	Application Data
12	1.481810	192.168.3.109	192.168.3.1	DNS	80	Standard query 0xfeb1 A collector.github.com
13	1.481810	192.168.3.109	192.168.3.1	DNS	74	Standard query 0xe2a8 A api.github.com
14	1.489622	192.168.3.1	192.168.3.109	DNS	90	Standard query response 0xe2a8 A api.github.com A 140.82.121.5
15	1.489622	192.168.3.1	192.168.3.109	DNS	129	Standard query response 0xfeb1 A collector.github.com CNAME glb-d052c2cf8be544.github.com A 140.82.114.21
16	1.491131	192.168.3.109	140.82.121.5	TCP	66	56384 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 KS=256 SACK_PERM
17	1.535766	TpLinkTechno_ef:d0...	Broadcast	ARP	42	Who has 192.168.3.206? Tell 192.168.3.1
18	1.537765	140.82.121.5	192.168.3.109	TCP	66	443 → 56384 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1412 SACK_PERM KS=1024
19	1.538269	192.168.3.109	140.82.121.5	TCP	54	56384 → 443 [ACK] Seq=1 Ack=1 Win=131072 Len=0
20	1.540955	192.168.3.109	140.82.121.5	TCP	1466	56384 → 443 [ACK] Seq=1 Ack=1 Win=131072 Len=1412 [TCP PDU reassembled in 21]
21	1.540955	192.168.3.109	140.82.121.5	TLSv1.3	509	Client Hello (SHA1api.github.com)
22	1.588634	140.82.121.5	192.168.3.109	TCP	54	443 → 56384 [ACK] Seq=1 Ack=1868 Win=69632 Len=0
23	1.588634	140.82.121.5	192.168.3.109	TLSv1.3	1466	Server Hello, Change Cipher Spec, Application Data
24	1.588634	140.82.121.5	192.168.3.109	TCP	1466	443 → 56384 [PSH, ACK] Seq=1413 Ack=1868 Win=69632 Len=1412 [TCP PDU reassembled in 25]
25	1.588634	140.82.121.5	192.168.3.109	TLSv1.3	722	Application Data, Application Data, Application Data
26	1.589913	192.168.3.109	140.82.121.5	TLSv1.3	118	Change Cipher Spec, Application Data
27	1.590083	192.168.3.109	140.82.121.5	TLSv1.3	146	Application Data
28	1.590372	192.168.3.109	140.82.121.5	TLSv1.3	934	Application Data
29	1.590406	192.168.3.109	140.82.121.5	TLSv1.3	398	Application Data
30	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=1 Ack=78 Win=91 Len=0
31	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=1 Ack=117 Win=91 Len=0
32	1.606628	140.82.113.21	192.168.3.109	TLSv1.2	93	Application Data
33	1.606628	140.82.113.21	192.168.3.109	TCP	54	443 → 56364 [ACK] Seq=0 Ack=1865 Win=96 Len=0
34	1.606628	140.82.113.21	192.168.3.109	TLSv1.2	182	Application Data
35	1.606881	192.168.3.109	140.82.113.21	TCP	54	56364 → 443 [ACK] Seq=1865 Ack=88 Win=510 Len=0

90 bytes on wire → data + antet  
14 + 20 + 8 = 42  
Ethernet bytes → UDP  
IPv4

Verificare

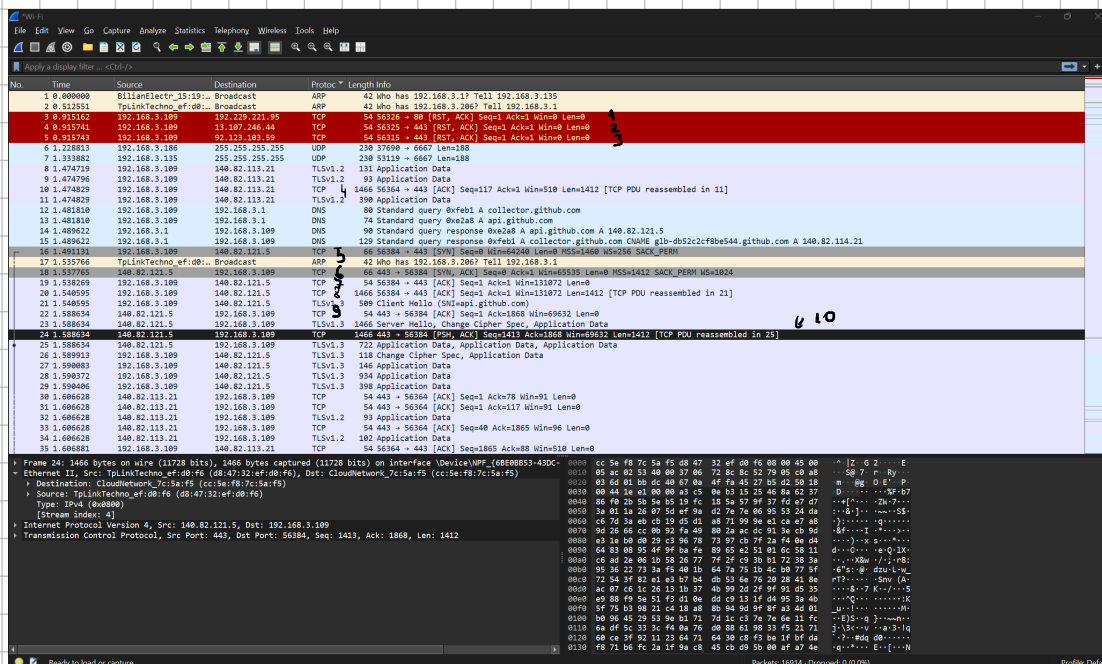
90 -  
20 -  
70 -  
14 -  
56 -  
8 -  
48 -  
=

Internet Protocol Version 4, Src: 192.168.3.1, Dst: 192.168.3.109	
User Datagram Protocol, Src Port: 53, Dst Port: 52868	
Domain Name System (response)	
Frame 4: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NPF... (68008B53-43DC-4EAE-BAD...)	
Ethernet II, Src: TpLinkTechno_ef:d0:f6 (d8:47:32:ef:d0:f6), Dst: CloudNetwork_7c:5a:f5 (cc:5e:f8:7c:5a:f5)	
Destination: CloudNetwork_7c:5a:f5 (cc:5e:f8:7c:5a:f5)	
Source: TpLinkTechno_ef:d0:f6 (d8:47:32:ef:d0:f6)	
Type: IPv4 (0x0800)	
[Stream index: 4]	
Internet Protocol Version 4, Src: 192.168.3.1, Dst: 192.168.3.109	
User Datagram Protocol, Src Port: 53, Dst Port: 52868	
Domain Name System (response)	

Domain Name System (response)	
-------------------------------	--

### III. TCP

- Care este socket-ul pentru sursă celui de-al 10-lea cadru TCP?
- Care este diferența de timp între mesajele SYN și SYN-ACK ale unui singur transfer. Vă rugăm adresativă câmpului „Info” din fereastra wireshark pentru a identifica mesajele.
- Vă rugăm calculați suma tuturor antetelor unui cadru TCP, având date utile (payload). Pentru o parcurgere mai facilă utilizați filtre de display( Display filter).

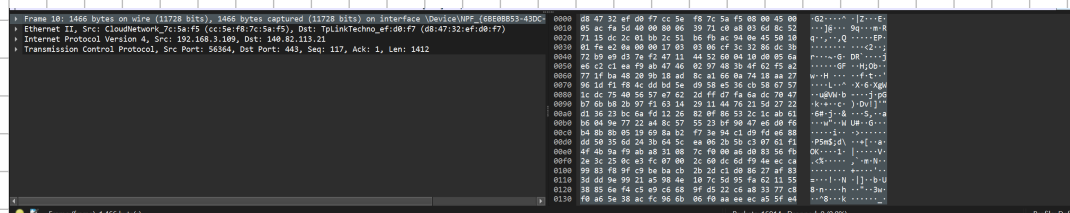


Socket: IP+ SRC PORT  
140.82.121.5: 443

7

ID	Time	Source	Destination	Protocol	Length	Info
16	1.491131	192.168.3.109	140.82.121.5	TCP	66	56384 → 443 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM
17	1.535766	TpLinkTechno_ef00:f6	Broadcast	ARP	42	Who has 192.168.3.206? Tell 192.168.3.1
18	1.537765	140.82.121.5	192.168.3.109	TCP	66	443 → 56384 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1412 SACK_PERM WS=1024
19	1.538769	192.168.3.109	140.82.121.5	TCP	54	56384 → 443 [ACK] Seq=1 Ack=1 Win=65535 Len=0

1.537465 - 1.491131 = 0,046334 secunde



1466 - 1412 = 54 bytes



14+20+20 = 54 bytes