



COMPUTER NETWORK

Lab 3a

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1. Select one UDP packet from your trace. From this packet, determine how many fields there are in the UDP header. Name these fields.
Ans: There are 4 fields in the UDP header: Source Port, Destination Port, Length, Checksum.

No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 2402:800:63ba:ec40::...
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.217.217
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:6804:1000:0000:0000:0000:0000:0000
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.231
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME voutul

> Frame 87: 91 bytes on wire (728 bits), 91 bytes captured (728 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 6, Src: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36, Dst: 2402:800:20ff:6666::1
✚ User Datagram Protocol, Src Port: 57535, Dst Port: 53
 Source Port: 57535
 Destination Port: 53
 Length: 37
 Checksum: 0x4d85 [unverified]
 [Checksum Status: Unverified]
 [Stream index: 10]
 > [Timestamps]
 UDP payload (29 bytes)
 > Domain Name System (query)

2. By consulting the displayed information in Wireshark's packet content field for this packet, determine the length (in bytes) of each of the UDP header fields.
Ans: The UDP header has a fixed length of 8 bytes. Each of 4 header fields is 2 bytes.

No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 2402:800:63ba:ec40::...
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.217.217
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:6804:1000:0000:0000:0000:0000:0000
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.231
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME voutul

> Frame 87: 91 bytes on wire (728 bits), 91 bytes captured (728 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 6, Src: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36, Dst: 2402:800:20ff:6666::1
✚ User Datagram Protocol, Src Port: 57535, Dst Port: 53
 Source Port: 57535
 Destination Port: 53
 Length: 37
 Checksum: 0x4d85 [unverified]
 [Checksum Status: Unverified]
 [Stream index: 10]
 > [Timestamps]
 UDP payload (29 bytes)
 > Domain Name System (query)

0000 9c 65 ee c9 2d cf dc fb 48 5e 45 34 86 dd 60 0c -e..... H^E4...
0010 6c 4b 00 25 11 40 24 02 08 00 63 ba ec 40 b9 5d 1K.%@\$.-c-@..
0020 b5 a8 a3 ac 0b 36 24 02 08 00 20 ff 66 66 00 00 6\$.-ff..
0030 00 00 00 00 00 01 e0 bf 00 35 00 25 4d 85 54 de 5%M.T..
0040 01 00 01 00 00 00 00 00 07 79 6f 75 74 75 you
0050 62 65 03 63 6f 6d 00 00 01 00 01 be.com...



3. The value in the Length field is the length of what? Verify your claim with your captured UDP packet.

Ans: The length field specifies the number of bytes in the UDP segment (header plus data). An explicit length value is needed since the size of the data field may differ from one UDP segment to the next.

The length of UDP payload for selected packet is 29 bytes. 37 bytes - 8 bytes = 29 bytes.

No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 240
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.2
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:68
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.23
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME voutu

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> Frame 87: 91 bytes on wire (728 bits), 91 bytes captured (728 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0

> Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)

> Internet Protocol Version 6, Src: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36, Dst: 2402:800:20ff:6666::1

> User Datagram Protocol, Src Port: 57535, Dst Port: 53

Source Port: 57535

Destination Port: 53

Length: 37

Checksum: 0x4d85 [unverified]

[Checksum Status: Unverified]

[Stream index: 10]

> [Timestamps]

> UDP payload (29 bytes)

> Domain Name System (query)

0000 9c 65 ee c9 2d cf dc fb 48 5e 45 34 86 dd 60 0c .e.....H^E4...`

0010 6c 4b 00 25 11 40 24 02 08 00 63 ba ec 40 b9 5d lK.%@\$....c..@.]

0020 b5 a8 a3 ac 0b 36 24 02 08 00 20 ff 66 66 00 006\$....ff..

0030 00 00 00 00 00 01 e0 bf 00 35 00 25 4d 85 54 de5.%M.T

0040 01 00 00 01 00 00 00 00 00 00 79 6f 75 74 75youtube

0050 62 65 03 63 6f 6d 00 00 01 00 01 be.com... .

4. What is the maximum number of bytes that can be included in a UDP payload?

Ans: The maximum number of bytes that can be included in a UDP payload is $(2^{16} - 1)$ bytes plus the header bytes. This gives 65535 bytes – 8 bytes = 65527 bytes.

5. What is the largest possible source port number?

Ans: The largest possible source port number is $(2^{16} - 1) = 65535$.

6. What is the protocol number for UDP? Give your answer in both hexadecimal and decimal notation.

Ans: The IP protocol number for UDP is 0x11 in hexadecimal, which is 17 in decimal value.



No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 240:
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.2
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:68
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.23
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME you

> Frame 87: 91 bytes on wire (728 bits), 91 bytes captured (728 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_Se:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 6, Src: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36, Dst: 2402:800:20ff:6666::1
0110 = Version: 6
> 0000 0000 = Traffic Class: 0x00 (DSCP: CS0, ECN: Not-ECT)
.... 1100 0110 1100 0100 1011 = Flow Label: 0xc6c4b
Payload Length: 37
Next Header: UDP (17)
Hop Limit: 64
Source Address: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36
Destination Address: 2402:800:20ff:6666::1
> User Datagram Protocol, Src Port: 57535, Dst Port: 53
> Domain Name System (query)

0000	9c 65 ee c9 2d cf dc fb 48 5e 45 34 86 dd 60 0c	..e.....H^E4..
0010	6c 4b 00 25 10 40 24 02 08 00 63 ba ec 40 b9 5d	1K.%\$...c.@.]
0020	b5 a8 a3 ac 0b 36 24 02 08 00 20 ff 66 66 00 006\$...ff..
0030	00 00 00 00 00 01 e0 bf 00 35 00 25 4d 85 54 de5%M.T.
0040	01 00 00 01 00 00 00 00 00 07 79 6f 75 74 75youtu
0050	62 65 03 63 6f 6d 00 00 01 00 01	be.com....

7. Examine a pair of UDP packets in which your host sends the first UDP packet and the second UDP packet is a reply to this first UDP packet. Describe the relationship between the port numbers in the two packets.
- Ans: The source port of the UDP packet sent by the host is the same as the destination port of the reply packet and vice versa.

No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 2404:
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.24.
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:6806
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.238
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME youtube

> Frame 87: 91 bytes on wire (728 bits), 91 bytes captured (728 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: IntelCor_Se:45:34 (dc:fb:48:5e:45:34), Dst: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf)
> Internet Protocol Version 6, Src: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36, Dst: 2402:800:20ff:6666::1
> User Datagram Protocol, Src Port: 57535, Dst Port: 53
Source Port: 57535
Destination Port: 53
Length: 37
Checksum: 0x4d85 [unverified]
[Checksum Status: Unverified]
[Stream index: 10]
> [Timestamps]
UDP payload (29 bytes)
> Domain Name System (query)

No.	Time	Source	Destination	Protocol	Length	Info
2	19:16:53.617432	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0x682e AAAA play.google.com
7	19:16:53.632505	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	123	Standard query response 0x682e AAAA play.google.com AAAA 2404:
18	19:16:53.658592	2402:800:63ba:ec40::...	2402:800:20ff:8888::...	DNS	95	Standard query 0xbf46 A play.google.com
19	19:16:53.669346	2402:800:20ff:8888::...	2402:800:63ba:ec40::...	DNS	111	Standard query response 0xbf46 A play.google.com A 172.217.24.
87	19:17:02.534228	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x54de A youtube.com
88	19:17:02.534481	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	91	Standard query 0x35aa AAAA youtube.com
90	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	119	Standard query response 0x35aa AAAA youtube.com AAAA 2404:6806
91	19:17:02.539984	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	107	Standard query response 0x54de A youtube.com A 172.217.31.238
159	19:17:02.803241	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xad2b A www.youtube.com
160	19:17:02.803377	2402:800:63ba:ec40::...	2402:800:20ff:6666::...	DNS	95	Standard query 0xd161 AAAA www.youtube.com
162	19:17:02.821338	2402:800:20ff:6666::...	2402:800:63ba:ec40::...	DNS	388	Standard query response 0xad2b A www.youtube.com CNAME youtube

> Frame 91: 107 bytes on wire (856 bits), 107 bytes captured (856 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
> Ethernet II, Src: DASANNet_c9:2d:cf (9c:65:ee:c9:2d:cf), Dst: IntelCor_Se:45:34 (dc:fb:48:5e:45:34)
> Internet Protocol Version 6, Src: 2402:800:20ff:6666::1, Dst: 2402:800:63ba:ec40:b95d:b5a8:a3ac:b36
> User Datagram Protocol, Src Port: 53, Dst Port: 57535
Source Port: 53
Destination Port: 57535
Length: 53
Checksum: 0xfbb8 [unverified]
[Checksum Status: Unverified]
[Stream index: 10]
> [Timestamps]
UDP payload (45 bytes)
> Domain Name System (response)