

1.) source port, destination port, length, checksum

No.	Time	Source	Destination	Protocol	Length	Info
2	0.440728	10.104.128.179	10.1.1.81	DNS	92	Standard query 0xe016 A keyvalueservice.fe.apple-dns.net
4	0.447387	10.1.1.81	10.104.128.179	DNS	220	Standard query response 0xe016 A keyvalueservice.fe.apple-dns.net A 172.30.35.9 A 98.137.246.7
30	26.045856	10.104.128.179	10.1.1.81	DNS	67	Standard query 0x9138 A ewu.edu
31	26.053007	10.1.1.81	10.104.128.179	DNS	83	Standard query response 0x9138 A ewu.edu A 146.187.224.191
43	39.466822	10.104.128.179	10.1.1.81	DNS	69	Standard query 0x147e A yahoo.com
44	39.473948	10.1.1.81	10.104.128.179	DNS	165	Standard query response 0x147e A yahoo.com A 72.30.35.9 A 98.137.246.7

▶ Frame 2: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface en0, id 0
▶ Ethernet II, Src: Apple_30:62:0e (38:f9:d3:30:62:0e), Dst: Cisco_94:20:00 (68:bc:0c:94:20:00)
▶ Internet Protocol Version 4, Src: 10.104.128.179, Dst: 10.1.1.81
▼ User Datagram Protocol, Src Port: 56769, Dst Port: 53

Source Port: 56769
Destination Port: 53
Length: 58
Checksum: 0x553b [unverified]
[Checksum Status: Unverified]
[Stream index: 0]
[Timestamps]
[Time since first frame: 0.000000000 seconds]
[Time since previous frame: 0.000000000 seconds]

2.) There is a total of 8 bytes and each header is 2 bytes. This is found in the packet byte section. I included the screenshot of only all of them totaling 8 bytes, but individually clicking shows 2 bytes each

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▶ Ethernet II, Src: Apple_30:62:0e (38:f9:d3:30:62:0e), Dst: Cisco_94:20:00 (68:bc:0c:94:20:00)
▶ Internet Protocol Version 4, Src: 10.104.128.179, Dst: 10.1.1.81
▼ User Datagram Protocol, Src Port: 56769, Dst Port: 53

Source Port: 56769
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[Timestamps]
[Time since first frame: 0.000000000 seconds]
[Time since previous frame: 0.000000000 seconds]

0000	68 bc 0c 94 20 00 38 f9 d3 30 62 0e 08 00 45 00	h...8...0b...E
0010	00 4e 3e b6 00 00 ff 11 e6 7b 0a 68 80 b3 0a 01	N>.....{.h...
0020	01 51 dd c1 00 35 00 3a 55 3b e0 16 01 00 00 01	Q...5.:U;.....
0030	00 00 00 00 00 00 0f 6b 65 79 76 61 6c 75 65 73k eyvalues
0040	65 72 76 69 63 65 02 66 65 09 61 70 70 6c 65 2d	ervice.f e.apple-
0050	64 6e 73 03 6e 65 74 00 00 01 00 01	dns.net.

User Datagram Protocol (udp). 8 bytes

3.) The length field is the length of the UDP headers plus the length of the data it holds.
 $58 - 8 = 50$

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4	0.447387	10.1.1.81	10.104.128.179	DNS	220	Standard query response 0xe016 A keyvalueservice.fe.apple-dns.net A 1
30	26.045856	10.104.128.179	10.1.1.81	DNS	67	Standard query 0x9138 A ewu.edu
31	26.053007	10.1.1.81	10.104.128.179	DNS	83	Standard query response 0x9138 A ewu.edu A 146.187.224.191
43	39.466822	10.104.128.179	10.1.1.81	DNS	69	Standard query 0x147e A yahoo.com
44	39.473948	10.1.1.81	10.104.128.179	DNS	165	Standard query response 0x147e A yahoo.com A 72.30.35.9 A 98.137.246.

▶ Frame 2: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface en0, id 0
 ▶ Ethernet II, Src: Apple_30:62:0e (38:f9:d3:30:62:0e), Dst: Cisco_94:20:00 (68:bc:0c:94:20:00)
 ▶ Internet Protocol Version 4, Src: 10.104.128.179, Dst: 10.1.1.81
 ▼ User Datagram Protocol, Src Port: 56769, Dst Port: 53
 Source Port: 56769
 Destination Port: 53
 Length: 58
 Checksum: 0x553b [unverified]
 [Checksum Status: Unverified]
 [Stream index: 0]
 ▶ [Timestamps]
 ▶ Domain Name System (query)

```

0000  68 bc 0c 94 20 00 38 f9 d3 30 62 0e 08 00 45 00  h...8...0b...E
0010  00 4e 3e b6 00 00 ff 11 e6 7b 0a 68 80 b3 0a 01  N>.....{.h...
0020  01 51 dd c1 00 35 00 3a 55 3b e0 16 01 00 00 01  .Q...5.:U;.....
0030  00 00 00 00 00 0f 6b 65 79 76 61 6c 75 65 73    .....k eyvalues
0040  65 72 76 69 63 65 02 66 65 09 61 70 70 6c 65 2d ervice.f e.apple-
0050  64 6e 73 03 6e 65 74 00 00 01 00 01            dns.net.....
  
```

Domain Name System (dns), 50 bytes

4.) 65527 bytes. Because of $(2^{16}-1) - 8$ for the header size = 65527

5.) $(2^{16}-1) = 65535$

6.) The protocol number in hex is 0x11 or 17 in decimal

No.	Time	Source	Destination	Protocol	Length	Info
2	0.440728	10.104.128.179	10.1.1.81	DNS	92	Standard query 0xe016 A keyvalueservice.fe.apple-dns.net
4	0.447387	10.1.1.81	10.104.128.179	DNS	220	Standard query response 0xe016 A keyvalueservice.fe.apple-dns.net A 1
30	26.045856	10.104.128.179	10.1.1.81	DNS	67	Standard query 0x9138 A ewu.edu
31	26.053007	10.1.1.81	10.104.128.179	DNS	83	Standard query response 0x9138 A ewu.edu A 146.187.224.191
43	39.466822	10.104.128.179	10.1.1.81	DNS	69	Standard query 0x147e A yahoo.com
44	39.473948	10.1.1.81	10.104.128.179	DNS	165	Standard query response 0x147e A yahoo.com A 72.30.35.9 A 98.137.246.

0100 = Version: 4
 0101 = Header Length: 20 bytes (5)
 ▶ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 78
 Identification: 0x3eb6 (16054)
 ▶ Flags: 0x0000
 ...0 0000 0000 0000 = Fragment offset: 0
 Time to live: 255
 Protocol: UDP (17)
 Header checksum: 0xe67b [validation disabled]
 [Header checksum status: Unverified]
 Source: 10.104.128.179
 Destination: 10.1.1.81

```

0000  68 bc 0c 94 20 00 38 f9 d3 30 62 0e 08 00 45 00  h...8...0b...E
0010  00 4e 3e b6 00 00 ff 11 e6 7b 0a 68 80 b3 0a 01  N>.....{.h...
0020  01 51 dd c1 00 35 00 3a 55 3b e0 16 01 00 00 01  .Q...5.:U;.....
0030  00 00 00 00 00 0f 6b 65 79 76 61 6c 75 65 73    .....k eyvalues
0040  65 72 76 69 63 65 02 66 65 09 61 70 70 6c 65 2d ervice.f e.apple-
0050  64 6e 73 03 6e 65 74 00 00 01 00 01            dns.net.....
  
```

7.) The UDP checksum is calculated with the 16-bit sum of pseudo header. Pseudo header contains Source IP, Destination IP, Protocol, and UDP/TCP Length. Then the UDP header and data are added. These are summed using ones complement arithmetic.

8.) The source port of the UDP packet sent by the host is the same as the destination port of the reply packet. The destination port of the packet sent by the host is the same as the source port of the reply packet.

2	0.440728	10.104.128.179	10.1.1.81	DNS	92	Standard query 0xe016 A keyvalueservice.fe.apple-dns.net
4	0.447387	10.1.1.81	10.104.128.179	DNS	220	Standard query response 0xe016 A keyvalueservice.fe.apple-dns.net A 172.16.172.1
30	26.045856	10.104.128.179	10.1.1.81	DNS	67	Standard query 0x9138 A ewu.edu
31	26.053007	10.1.1.81	10.104.128.179	DNS	83	Standard query response 0x9138 A ewu.edu A 146.187.224.191
43	39.466822	10.104.128.179	10.1.1.81	DNS	69	Standard query 0x147e A yahoo.com
44	39.473948	10.1.1.81	10.104.128.179	DNS	165	Standard query response 0x147e A yahoo.com A 72.30.35.9 A 98.137.246.7


```

> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 78
Identification: 0x3eb6 (16054)
> Flags: 0x0000
...0 0000 0000 0000 = Fragment offset: 0
Time to live: 255
Protocol: UDP (17)
Header checksum: 0xe67b [validation disabled]
[Header checksum status: Unverified]
Source: 10.104.128.179
Destination: 10.1.1.81
> User Datagram Protocol, Src Port: 56769, Dst Port: 53
> Domain Name System (query)
0000 68 bc 0c 94 20 00 38 f9 d3 30 62 0e 08 00 45 00 h...8..0b...E
0010 00 4e 3e b6 00 00 ff 11 e6 7b 0a 68 80 b3 0a 01 .N>.....{h....
0020 01 51 dd c1 00 35 00 3a 55 3b e0 16 01 00 00 01 .Q...5: U;.....
0030 00 00 00 00 00 00 0f 6b 65 79 76 61 6c 75 65 73 .....k eyvalues
0040 65 72 76 69 63 65 02 66 65 09 61 70 70 6c 65 2d ervice f e apple-
0050 64 6e 73 03 6e 65 74 00 00 01 00 01 dns.net

```

No.	Time	Source	Destination	Protocol	Length	Info
2	0.440728	10.104.128.179	10.1.1.81	DNS	92	Standard query 0xe016 A keyvalueservice.fe.apple-dns.net
4	0.447387	10.1.1.81	10.104.128.179	DNS	220	Standard query response 0xe016 A keyvalueservice.fe.apple-dns.net A 172.16.172.1
30	26.045856	10.104.128.179	10.1.1.81	DNS	67	Standard query 0x9138 A ewu.edu
31	26.053007	10.1.1.81	10.104.128.179	DNS	83	Standard query response 0x9138 A ewu.edu A 146.187.224.191
43	39.466822	10.104.128.179	10.1.1.81	DNS	69	Standard query 0x147e A yahoo.com
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```

... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 206
Identification: 0x47f0 (18416)
> Flags: 0x4000, Don't Fragment
...0 0000 0000 0000 = Fragment offset: 0
Time to live: 127
Protocol: UDP (17)
Header checksum: 0x1cc2 [validation disabled]
[Header checksum status: Unverified]
Source: 10.1.1.81
Destination: 10.104.128.179
> User Datagram Protocol, Src Port: 53, Dst Port: 56769
0010 00 ce 47 f0 40 00 7f 11 1c c2 0a 01 01 51 0a 68 ..G.@... ..Q.h
0020 80 b3 00 35 dd c1 00 ba 4d 15 e0 16 81 80 00 01 ..5....M.....
0030 00 08 00 00 00 00 0f 6b 65 79 76 61 6c 75 65 73 .....k eyvalues
0040 65 72 76 69 63 65 02 66 65 09 61 70 70 6c 65 2d ervice f e apple-
0050 64 6e 73 03 6e 65 74 00 00 01 00 01 c0 0c 00 01 dns.net
0060 00 01 00 00 00 2f 00 04 11 f8 b9 44 c0 0c 00 01 ...../...D....
0070 00 01 00 00 00 2f 00 04 11 f8 b9 69 c0 0c 00 01 ...../...i....

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