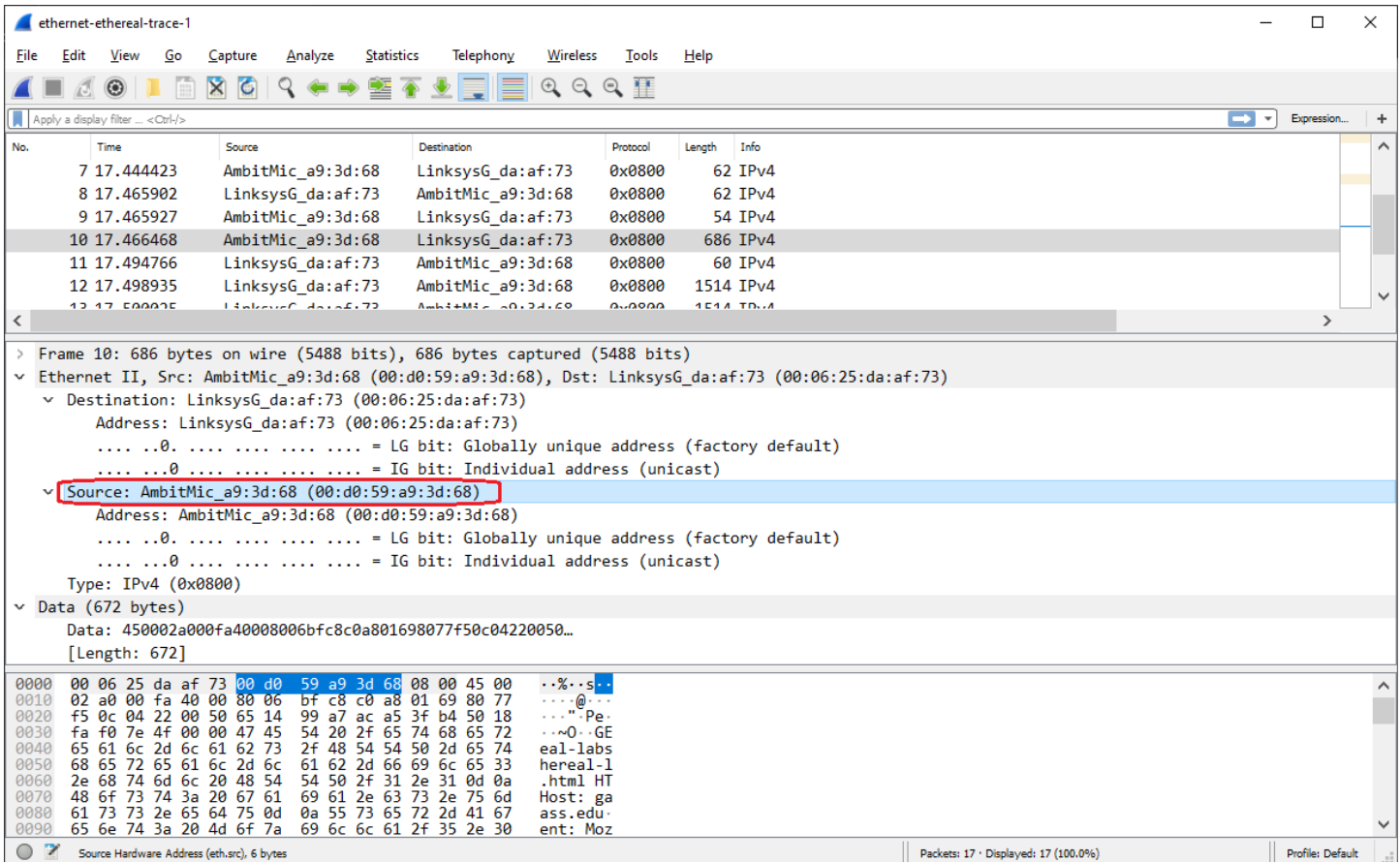


Lab 5: Wireshark

- 1) What is the 48-bit Ethernet address of your computer?

The MAC address of my computer is 00:d0:59:a9:3d:68.



- 2) What is the 48-bit destination address in the Ethernet frame? Is this the Ethernet address of gaia.cs.umass.edu? (Hint: the answer is *no*). What device has this as its Ethernet address? [Note: this is an important question, and one that students sometimes get wrong. Re-read pages 468-469 in the text and make sure you understand the answer here.]

The destination address in the Ethernet frame is 00:06:25:da:af:73. This is the ethernet address for the Linksys router, not the ethernet address for gaia.cs.umass.edu.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
7	17.444423	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
8	17.465902	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	62	IPv4
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
13	17.500025	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 10: 686 bytes on wire (5488 bits), 686 bytes captured (5488 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)

▼ Destination: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

▼ Data (672 bytes)

Data: 450002a000fa40008006bfc8c0a801698077f50c04220050...

[Length: 672]

```

0000 00 06 25 da af 73 00 d0 59 a9 3d 68 08 00 45 00  ..%...s..
0010 02 a0 00 fa 40 00 80 06 bf c8 c0 a8 01 69 80 77  ....@...
0020 f5 0c 04 22 00 50 65 14 99 a7 ac a5 3f b4 50 18  ....Pe...
0030 fa f0 7e 4f 00 00 47 45 54 20 2f 65 74 68 65 72  ...O...GE
0040 65 61 6c 2d 6c 61 62 73 2f 48 54 54 50 2d 65 74  eal-labs
0050 68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65 33  hereal-l
0060 2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d 0a  .html HT
0070 48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75 6d  Host: ga
0080 61 73 73 2e 65 64 75 0d 0a 55 73 65 72 2d 41 67  ass.edu-
0090 65 6e 74 3a 20 4d 6f 7a 69 6c 6c 61 2f 35 2e 30  ent: Moz

```

Source Hardware Address (eth.src), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

- 3) Give the hexadecimal value for the two-byte Frame type field. What upper layer protocol does this correspond to?

The hex value for the two-byte Frame type field is 0x800. The value corresponds to the IPv4 upper layer protocol.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
7	17.444423	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
8	17.465902	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	62	IPv4
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
13	17.500025	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 10: 686 bytes on wire (5488 bits), 686 bytes captured (5488 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)

▼ Destination: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

▼ Data (672 bytes)

Data: 450002a000fa40008006bfc8c0a801698077f50c04220050...

[Length: 672]

```

0000 00 06 25 da af 73 00 d0 59 a9 3d 68 08 00 45 00  ..%...s..
0010 02 a0 00 fa 40 00 80 06 bf c8 c0 a8 01 69 80 77  ....@...
0020 f5 0c 04 22 00 50 65 14 99 a7 ac a5 3f b4 50 18  ....Pe-
0030 fa f0 7e 4f 00 00 47 45 54 20 2f 65 74 68 65 72  ...O--GE
0040 65 61 6c 2d 6c 61 62 73 2f 48 54 54 50 2d 65 74  eal-labs
0050 68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65 33  hereal-l
0060 2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d 0a  .html HT
0070 48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75 6d  Host: ga
0080 61 73 73 2e 65 64 75 0d 0a 55 73 65 72 2d 41 67  ass.edu-
0090 65 6e 74 3a 20 4d 6f 7a 69 6c 6c 61 2f 35 2e 30  ent: Moz

```

Source Hardware Address (eth.src), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

- 4) How many bytes from the very start of the Ethernet frame does the ASCII “G” in “GET” appear in the Ethernet frame?

The ASCII ‘G’ in “GET” appears after 54 bytes from the very start of the ethernet frame.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
7	17.444423	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
8	17.465902	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	62	IPv4
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
13	17.500025	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 10: 686 bytes on wire (5488 bits), 686 bytes captured (5488 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)

▼ Destination: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0. = LG bit: Globally unique address (factory default)

....0. = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

▼ Data (672 bytes)

Data: 450002a000fa40008006bfc8c0a801698077f50c04220050...

[Length: 672]

Offset	Hex	ASCII
0000	00 06 25 da af 73 00 d0 59 a9 3d 68 08 00 45 00	..%..s..
0010	02 a0 00 fa 40 00 80 06 bf c8 c0 a8 01 69 80 77	...@...~
0020	f5 0c 04 22 00 50 65 14 99 a7 ac a5 3f b4 50 18	...".Pe..
0030	fa f0 7e 4f 00 00 47 45 54 20 2f 65 74 68 65 72	...O..GE
0040	65 61 6c 2d 6c 61 62 73 2f 48 54 54 50 2d 65 74	...eal-labs
0050	68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65 33	hereal-l
0060	2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d 0a	.html HT
0070	48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75 6d	Host: ga
0080	61 73 73 2e 65 64 75 0d 0a 55 73 65 72 2d 41 67	ass.edu.
0090	65 6e 74 3a 20 4d 6f 7a 69 6c 6c 61 2f 35 2e 30	ent: Moz

Bytes 14-685: Data (data.data)

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

Next, answer the following questions, based on the contents of the Ethernet frame containing the first byte of the HTTP response message.

- 5) What is the value of the Ethernet source address? Is this the address of your computer, or of gaia.cs.umass.edu (Hint: the answer is *no*). What device has this as its Ethernet address?

The value of the ethernet source address is 00:06:25:da:af:73. This is neither the address of my computer nor the address of gaia.cs.umass.edu. This is the ethernet address of the router.

The image shows a Wireshark packet capture window titled "ethernet-ethereal-trace-1". The packet list pane at the top shows several packets. Packet 12 is selected, showing it is an Ethernet II frame from LinksysG_da:af:73 to AmbitMic_a9:3d:68, containing an IPv4 packet of 1514 bytes.

The packet details pane for packet 12 shows the following structure:

- Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - = LG bit: Globally unique address (factory default)
 - = IG bit: Individual address (unicast)
 - Source: LinksysG_da:af:73 (00:06:25:da:af:73)
 - Address: LinksysG_da:af:73 (00:06:25:da:af:73)
 - = LG bit: Globally unique address (factory default)
 - = IG bit: Individual address (unicast)
 - Type: IPv4 (0x0800)
- Data (1500 bytes)
 - Data: 456005dc8f2f4000370676f78077f50cc0a8016900500422...
 - [Length: 1500]

The packet bytes pane at the bottom shows the raw data in hexadecimal and ASCII. The first 6 bytes (00 d0 59 a9 3d 68) correspond to the destination MAC address. The next 6 bytes (00 06 25 da af 73) correspond to the source MAC address. The ASCII column shows the start of an HTTP response: "HTTP/1.1 200 OK" followed by a date and server information.

6) What is the destination address in the Ethernet frame? Is this the Ethernet address of your computer?

The destination address in the ethernet frame is 00:d0:59:a9:3d:68. Yes, this is the address of my computer.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
13	17.500025	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
14	17.500069	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
15	17.500057	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 12: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)

▼ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

▼ Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0 = LG bit: Globally unique address (factory default)

....0 = IG bit: Individual address (unicast)

▼ Source: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0 = LG bit: Globally unique address (factory default)

....0 = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

▼ Data (1500 bytes)

Data: 456005dc8f2f400037067f78077f50cc0a8016900500422...

[Length: 1500]

```

0000 00 d0 59 a9 3d 68 00 06 25 da af 73 08 00 45 60  ..Y.=h..
0010 05 dc 8f 2f 40 00 37 06 76 f7 80 77 f5 0c c0 a8  .../0.7
0020 01 69 00 50 04 22 ac a5 3f b4 65 14 9c 1f 50 10  -i P"...
0030 1b 28 5e d0 00 00 48 54 54 50 2f 31 2e 31 20 32  -(^...HT
0040 30 30 20 4f 4b 0d 0a 44 61 74 65 3a 20 53 61 74  00 OK..D
0050 2c 20 32 38 20 41 75 67 20 32 30 30 34 20 31 37  , 28 Aug
0060 3a 31 39 3a 33 37 20 47 4d 54 0d 0a 53 65 72 76  :19:37 G
0070 65 72 3a 20 41 70 61 63 68 65 2f 32 2e 30 2e 34  er: Apac
0080 30 20 28 52 65 64 20 48 61 74 20 4c 69 6e 75 78  0 (Red H
0090 29 0d 0a 4c 61 73 74 2d 4d 6f 64 69 66 69 65 64  )..Last-

```

Source Hardware Address (eth.src), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

7) Give the hexadecimal value for the two-byte Frame type field. What upper layer protocol does this correspond to?

The hex value for the two-byte Frame type field is 0x800. This value corresponds with the IPv4 upper layer protocol.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
9	17.465927	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
10	17.466468	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	686	IPv4
11	17.494766	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	60	IPv4
12	17.498935	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
13	17.500025	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4
14	17.500069	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	54	IPv4
15	17.500077	LinksysG_da:af:73	AmbitMic_a9:3d:68	0x0800	1514	IPv4

> Frame 12: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)

▼ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

▼ Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0 = LG bit: Globally unique address (factory default)

....0 = IG bit: Individual address (unicast)

▼ Source: LinksysG_da:af:73 (00:06:25:da:af:73)

Address: LinksysG_da:af:73 (00:06:25:da:af:73)

....0 = LG bit: Globally unique address (factory default)

....0 = IG bit: Individual address (unicast)

Type: IPv4 (0x0800)

▼ Data (1500 bytes)

Data: 456005dc8f2f4000370676f78077f50cc0a8016900500422...

[Length: 1500]

```

0000 00 d0 59 a9 3d 68 00 06 25 da af 73 08 00 45 60  .Y.=h..
0010 05 dc 8f 2f 40 00 37 06 76 f7 80 77 f5 0c c0 a8  ../@.7.
0020 01 69 00 50 04 22 ac a5 3f b4 65 14 9c 1f 50 10  .iP..."
0030 1b 28 5e d0 00 00 48 54 54 50 2f 31 2e 31 20 32  ^..HT
0040 30 30 20 4f 4b 0d 0a 44 61 74 65 3a 20 53 61 74  00 OK.D
0050 2c 20 32 38 20 41 75 67 20 32 30 30 34 20 31 37  , 28 Aug
0060 3a 31 39 3a 33 37 20 47 4d 54 0d 0a 53 65 72 76  :19:37 G
0070 65 72 3a 20 41 70 61 63 68 65 2f 32 2e 30 2e 34  er: Apac
0080 30 20 28 52 65 64 20 48 61 74 20 4c 69 6e 75 78  0 (Red H
0090 29 0d 0a 4c 61 73 74 2d 4d 6f 64 69 66 69 65 64  )..Last-

```

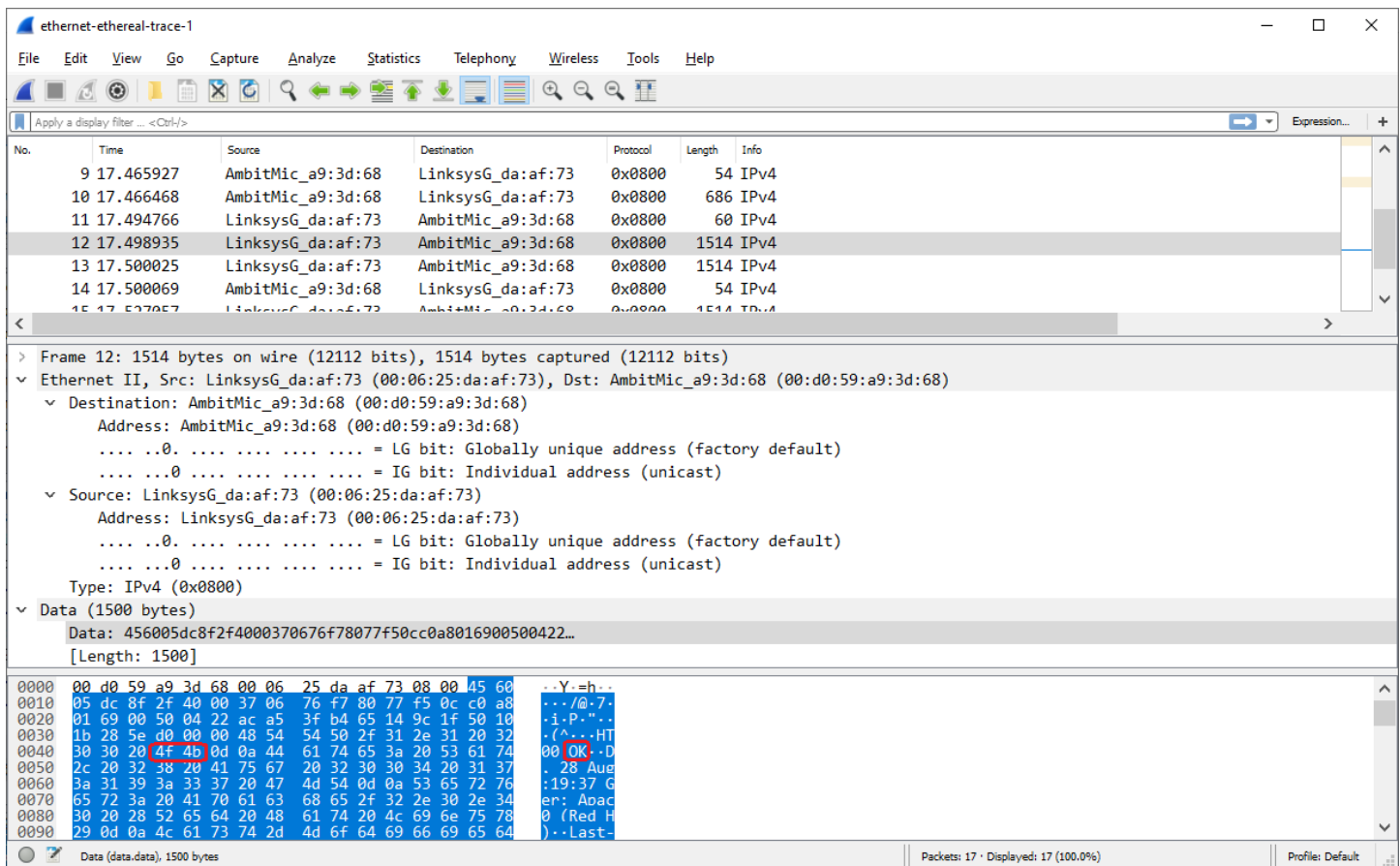
Type (eth.type), 2 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

8) How many bytes from the very start of the Ethernet frame does the ASCII “O” in “OK” (i.e., the HTTP response code) appear in the Ethernet frame?

The ASCII “O” in “OK” occurs after 67 bytes from the very start of the ethernet frame.



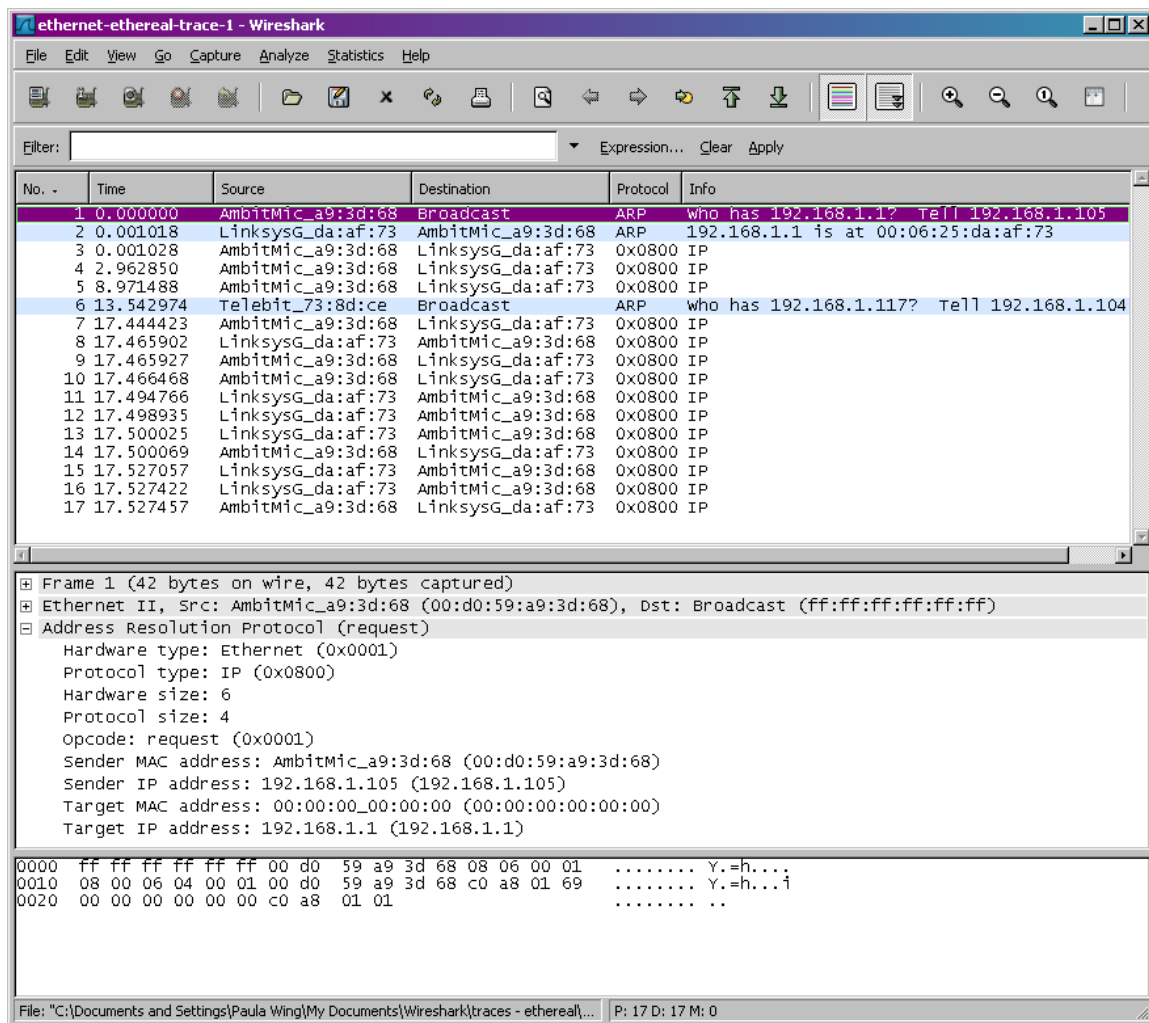
The Windows *arp* command with no arguments will display the contents of the ARP cache on your computer. Run the *arp* command.

9) Write down the contents of your computer's ARP cache. What is the meaning of each column value?

The Internet Address column specifies the IP address used for address resolution. The Physical Address column specifies the MAC address used for address resolution. The Type column specifies the IP type used for address resolution, which can either be a static or dynamic IP address.

```
E:\Git\OSU\CS372>arp -a

Interface: 192.168.10.2 --- 0xc
Internet Address      Physical Address      Type
192.168.10.1          1c-b7-2c-c6-cb-08    dynamic
192.168.10.189        00-16-6c-a3-12-90    dynamic
192.168.10.255        ff-ff-ff-ff-ff-ff    static
224.0.0.2             01-00-5e-00-00-02    static
224.0.0.22            01-00-5e-00-00-16    static
224.0.0.251           01-00-5e-00-00-fb    static
224.0.0.252           01-00-5e-00-00-fc    static
224.0.0.253           01-00-5e-00-00-fd    static
239.255.255.250       01-00-5e-7f-ff-fa    static
255.255.255.255       ff-ff-ff-ff-ff-ff    static
```

In the example above, the first two frames in the trace contain ARP messages (as does the 6th message). The screen shot above corresponds to the trace referenced in footnote 1. Answer the following questions:

10) What are the hexadecimal values for the source and destination addresses in the Ethernet frame containing the ARP request message?

The hex value for the source address containing the ethernet frame is 00:d0:59:a9:3d:68. The hex value for the destination address containing the ethernet frame is ff:ff:ff:ff:ff:ff.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony **Wireless** Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

< >

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)

Address: Broadcast (ff:ff:ff:ff:ff:ff)

....1.... = LG bit: Locally administered address (this is NOT the factory default)

....1.... = IG bit: Group address (multicast/broadcast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

....0.... = LG bit: Globally unique address (factory default)

....0.... = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IPv4 (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Sender IP address: 192.168.1.105

Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)

Target IP address: 192.168.1.1

```

0000  ff ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01  ....
0010  08 00 06 04 00 01 00 d0 59 a9 3d 68 c0 a8 01 69  ....
0020  00 00 00 00 00 00 c0 a8 01 01  ....

```

Source Hardware Address (eth.src), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

11) Give the hexadecimal value for the two-byte Ethernet Frame type field. What upper layer protocol does this correspond to?

The hex value for the two-byte Ethernet Frame type field is 0x0806. This value corresponds with the ARP upper layer protocol.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony **Wireless** Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

< >

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)

Address: Broadcast (ff:ff:ff:ff:ff:ff)

.... 1. = LG bit: Locally administered address (this is NOT the factory default)

.... 1. = IG bit: Group address (multicast/broadcast)

▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

.... 0. = LG bit: Globally unique address (factory default)

.... 0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IPv4 (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

Sender IP address: 192.168.1.105

Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)

Target IP address: 192.168.1.1

```

0000 ff ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01 .....
0010 08 00 06 04 00 01 00 d0 59 a9 3d 68 c0 a8 01 69 .....
0020 00 00 00 00 00 00 c0 a8 01 01 .....

```

Source Hardware Address (eth.src), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

12) Download the ARP specification from <ftp://ftp.rfc-editor.org/in-notes/std/std37.txt>. A readable, detailed discussion of ARP is also at <http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/arp.html>.

- How many bytes from the very beginning of the Ethernet frame does the ARP *opcode* field begin?

The ARP opcode field begins after 20 bytes from the start of the ethernet frame.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

- ▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
 - Address: Broadcast (ff:ff:ff:ff:ff:ff)
 -1. = LG bit: Locally administered address (this is NOT the factory default)
 -1. = IG bit: Group address (multicast/broadcast)
- ▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: request (1)
- Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Sender IP address: 192.168.1.105
- Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
- Target IP address: 192.168.1.1

```

0000  ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01  ....
0010  08 00 06 04 00 00 d0 59 a9 3d 68 c0 a8 01 69  ....
0020  00 00 00 00 00 00 c0 a8 01 01  ....
  
```

Opcode (arp.opcode), 2 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

- b. What is the value of the *opcode* field within the ARP-payload part of the Ethernet frame in which an ARP request is made?

The value of the ARP opcode field is 1.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

- ▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
 - Address: Broadcast (ff:ff:ff:ff:ff:ff)
 -1. = LG bit: Locally administered address (this is NOT the factory default)
 -1. = IG bit: Group address (multicast/broadcast)
- ▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: request (1)
- Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Sender IP address: 192.168.1.105
- Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
- Target IP address: 192.168.1.1

```

0000 ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01
0010 08 00 06 04 00 00 d0 59 a9 3d 68 c0 a8 01 69
0020 00 00 00 00 00 c0 a8 01 01
  
```

Opcode (arp.opcode), 2 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

c. Does the ARP message contain the IP address of the sender?

Yes, the IP address of the sender is 192.168.1.105.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

< >

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

- ▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
 - Address: Broadcast (ff:ff:ff:ff:ff:ff)
 -1. = LG bit: Locally administered address (this is NOT the factory default)
 -1. = IG bit: Group address (multicast/broadcast)
- ▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: request (1)
- Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Sender IP address: 192.168.1.105**
- Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
- Target IP address: 192.168.1.1

```

0000 ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01
0010 08 00 06 04 00 01 00 d0 59 a9 3d 68 c0 a8 01 69
0020 00 00 00 00 00 c0 a8 01 01
  
```

Opcode (arp.opcode), 2 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

- d. Where in the ARP request does the “question” appear – the Ethernet address of the machine whose corresponding IP address is being queried?

The Target MAC address field, which is set to 00:00:00:00:00:00, is the Ethernet address of the machine whose corresponding IP address is being queried.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

< >

> Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)

▼ Ethernet II, Src: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

- ▼ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
 - Address: Broadcast (ff:ff:ff:ff:ff:ff)
 -1. = LG bit: Locally administered address (this is NOT the factory default)
 -1. = IG bit: Group address (multicast/broadcast)
- ▼ Source: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)

▼ Address Resolution Protocol (request)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: request (1)
- Sender MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Sender IP address: 192.168.1.105
- Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
- Target IP address: 192.168.1.1

```

0000 ff ff ff ff ff 00 d0 59 a9 3d 68 08 06 00 01 .....
0010 08 00 06 04 00 01 00 d0 59 a9 3d 68 c0 a8 01 69 .....
0020 00 00 00 00 00 00 c0 a8 01 01 .....
  
```

Target MAC address (arp.dst.hw_mac), 6 bytes

Packets: 17 · Displayed: 17 (100.0%)

Profile: Default

13) Now find the ARP reply that was sent in response to the ARP request.

- How many bytes from the very beginning of the Ethernet frame does the ARP *opcode* field begin?

The ARP reply's opcode occurs after 20 bytes from the start of the ethernet frame.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

> Frame 2: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)

▼ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

- ▼ Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)
- ▼ Source: LinksysG_da:af:73 (00:06:25:da:af:73)
 - Address: LinksysG_da:af:73 (00:06:25:da:af:73)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)
 Padding: 00000000000000000000000000000000

▼ Address Resolution Protocol (reply)

Hardware type: Ethernet (1)
 Protocol type: IPv4 (0x0800)
 Hardware size: 6
 Protocol size: 4

Opcode: reply (2)

Sender MAC address: LinksysG_da:af:73 (00:06:25:da:af:73)
 Sender IP address: 192.168.1.1
 Target MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 Target IP address: 192.168.1.105

```

0000  00 d0 59 a9 3d 68 00 06 25 da af 73 08 06 00 01  ..Y.=h..
0010  08 00 06 04 00 02 00 06 25 da af 73 c0 a8 01 01  ....
0020  00 d0 59 a9 3d 68 c0 a8 01 69 00 00 00 00 00 00  ..Y.=h..
0030  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
  
```

Opcode (arp.opcode), 2 bytes | Packets: 17 · Displayed: 17 (100.0%) | Profile: Default

- b. What is the value of the *opcode* field within the ARP-payload part of the Ethernet frame in which an ARP response is made?

The value of the ARP opcode is 2, which corresponds with the “reply” opcode value.

ethernet-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

> Frame 2: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)

▼ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

- ▼ Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)
- ▼ Source: LinksysG_da:af:73 (00:06:25:da:af:73)
 - Address: LinksysG_da:af:73 (00:06:25:da:af:73)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)
 Padding: 00000000000000000000000000000000

▼ Address Resolution Protocol (reply)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: reply (2)
- Sender MAC address: LinksysG_da:af:73 (00:06:25:da:af:73)
- Sender IP address: 192.168.1.1
- Target MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Target IP address: 192.168.1.105

```

0000 00 d0 59 a9 3d 68 00 06 25 da af 73 08 06 00 01  ..Y.=h..
0010 08 00 06 04 00 02 00 06 25 da af 73 c0 a8 01 01  ....
0020 00 d0 59 a9 3d 68 c0 a8 01 69 00 00 00 00 00 00  ..Y.=h..
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
  
```

Opcode (arp.opcode), 2 bytes | Packets: 17 · Displayed: 17 (100.0%) | Profile: Default

- c. Where in the ARP message does the “answer” to the earlier ARP request appear – the IP address of the machine having the Ethernet address whose corresponding IP address is being queried?

The Sender MAC address (00:06:25:da:af:73) and Sender IP address (192.168.1.1) is the “answer” to the earlier ARP request.

The image shows a Wireshark packet capture of an ARP request and reply. The packet list at the top shows five packets. The selected packet is the ARP reply (packet 5). The details pane shows the Ethernet II frame, the ARP message, and the Address Resolution Protocol (reply) section. The Sender MAC address is highlighted with a red box.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	AmbitMic_a9:3d:68	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.105
2	0.001018	LinksysG_da:af:73	AmbitMic_a9:3d:68	ARP	60	192.168.1.1 is at 00:06:25:da:af:73
3	0.001028	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
4	2.962850	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4
5	8.971488	AmbitMic_a9:3d:68	LinksysG_da:af:73	0x0800	62	IPv4

Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)

- Destination: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 - Address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)
- Source: LinksysG_da:af:73 (00:06:25:da:af:73)
 - Address: LinksysG_da:af:73 (00:06:25:da:af:73)
 -0. = LG bit: Globally unique address (factory default)
 -0. = IG bit: Individual address (unicast)

Type: ARP (0x0806)
 Padding: 00000000000000000000000000000000

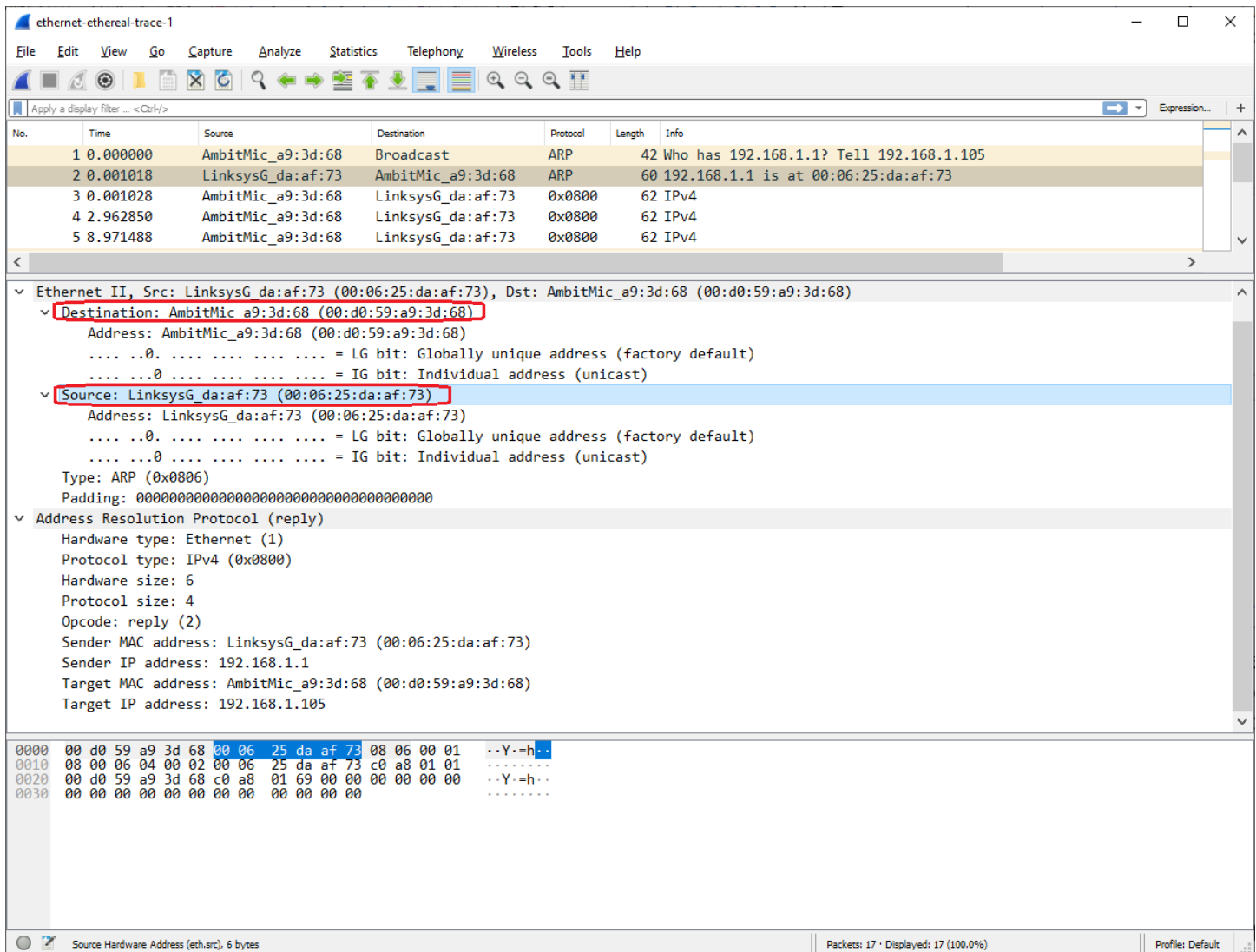
Address Resolution Protocol (reply)

- Hardware type: Ethernet (1)
- Protocol type: IPv4 (0x0800)
- Hardware size: 6
- Protocol size: 4
- Opcode: reply (2)
- Sender MAC address: LinksysG_da:af:73 (00:06:25:da:af:73)**
- Sender IP address: 192.168.1.1**
- Target MAC address: AmbitMic_a9:3d:68 (00:d0:59:a9:3d:68)
- Target IP address: 192.168.1.105

0000 00 d0 59 a9 3d 68 00 06 25 da af 73 08 06 00 01 ..Y.=h..
 0010 08 00 06 04 00 02 00 06 25 da af 73 c0 a8 01 01
 0020 00 d0 59 a9 3d 68 c0 a8 01 69 00 00 00 00 00 ..Y.=h..
 0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00

14) What are the hexadecimal values for the source and destination addresses in the Ethernet frame containing the ARP reply message?

The source address is 00:06:25:da:af:73 and the destination address is 00:d0:59:a9:3d:68 in the ethernet frame containing the ARP reply message.



- 15) Open the *ethernet-ethereal-trace-1* trace file in <http://gaia.cs.umass.edu/wireshark-labs/wireshark-traces.zip>. The first and second ARP packets in this trace correspond to an ARP request sent by the computer running Wireshark, and the ARP reply sent to the computer running Wireshark by the computer with the ARP-requested Ethernet address. But there is yet another computer on this network, as indicated by packet 6 – another ARP request. Why is there no ARP reply (sent in response to the ARP request in packet 6) in the packet trace?

There is no ARP reply sent in response to the ARP request in packet 6 because the router will only send an ARP reply to the source ethernet address for an ARP request. In this case, the wireshark trace was collected 1st ARP request's sender at source address 00:d0:59:a9:3d:68, whereas the 2nd ARP request was sent from a second device at source address 00:80:ad:73:8d:ce. Since the router sent the ARP reply to the 2nd device, the 1st device did not receive the ARP reply for the 2nd device. However, the 1st device received the ARP request from the 2nd device because the 2nd device broadcasted an ARP request to all other devices on the same network.

- 16) EX-1. The *arp* command:
`arp -s InetAddr EtherAddr`
 allows you to manually add an entry to the ARP cache that resolves the IP address *InetAddr* to the physical address *EtherAddr*. What would happen if, when you manually added an entry, you entered the correct IP address, but the wrong Ethernet address for that remote interface?

If you manually added an entry with the correct address but wrong ethernet address, then once a frame reaches the router, the router will remove the IP address from the ethernet frame, use ARP to detect the correct destination MAC address based on the IP address, and proceed to forward the frame using the correct IP and MAC addresses.

- 17) EX-2. What is the default amount of time that an entry remains in your ARP cache before being removed. You can determine this empirically (by monitoring the cache contents) or by looking this up in your operation system documentation. Indicate how/where you determined this value.

The default amount of time that an entry remains in the ARP cache before being removed is 37.5 seconds for my Windows 10 system. This information is based on KB949589 (<https://support.microsoft.com/en-us/help/949589/description-of-address-resolution-protocol-arp-caching-behavior-in-win>). In KB949589, it says "If an entry is not used, and it stays in the "Reachable" state for longer than its "Reachable Time" value, the entry changes to the "Stale" state. If an entry is in the "Stale" state, the Windows Vista TCP/IP host must send an ARP request to reach that destination", which aligns with the definition of an ARP cache timeout value. The log from my Win10 system shows that the Reachable State is set to 37500 ms, which is equal to 37.5 seconds.

```
C:\Windows\system32>netsh interface ipv4 show interfaces
```

Idx	Met	MTU	State	Name
1	75	4294967295	connected	Loopback Pseudo-Interface 1
12	35	1500	connected	Wi-Fi
4	65	1500	disconnected	Bluetooth Network Connection
11	25	1500	disconnected	Local Area Connection* 1
17	5	1500	disconnected	Ethernet
3	25	1500	disconnected	Local Area Connection* 2

```
C:\Windows\system32>netsh interface ipv4 show interface 12
```

```
Interface Wi-Fi Parameters
-----
```

IfLuid	: wireless_32768
IfIndex	: 12
State	: connected
Metric	: 35
Link MTU	: 1500 bytes
Reachable Time	: 37500 ms
Base Reachable Time	: 30000 ms
Retransmission Interval	: 1000 ms
DAD Transmits	: 3
Site Prefix Length	: 64
Site Id	: 1
Forwarding	: disabled
Advertising	: disabled
Neighbor Discovery	: enabled
Neighbor Unreachability Detection	: enabled
Router Discovery	: dhcp
Managed Address Configuration	: enabled
Other Stateful Configuration	: enabled
Weak Host Sends	: disabled
Weak Host Receives	: disabled
Use Automatic Metric	: enabled
Ignore Default Routes	: disabled
Advertised Router Lifetime	: 1800 seconds
Advertise Default Route	: disabled
Current Hop Limit	: 0
Force ARPND Wake up patterns	: disabled
Directed MAC Wake up patterns	: disabled
ECN capability	: application
RA Based DNS Config (RFC 6106)	: disabled
DHCP/Static IP coexistence	: disabled