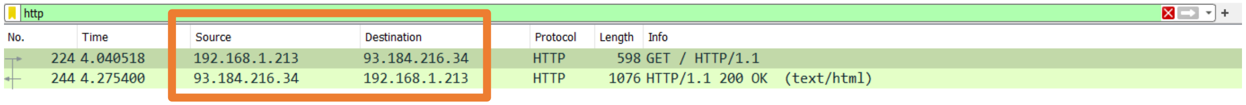
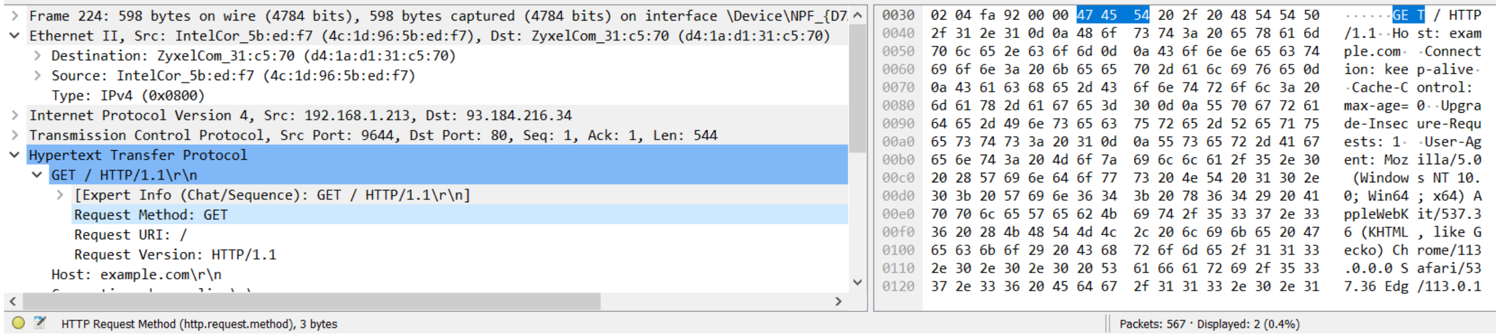
Part 1. Capturing and analyzing Ethernet and IP headers

- first GET request and GET response packets, including IP address of the source and destination:



```
No.     Time        Source          Destination     Protocol  Length  Info
  224 4.040518      192.168.1.213   93.184.216.34   HTTP       598 GET / HTTP/1.1
  244 4.275400      93.184.216.34   192.168.1.213   HTTP      1076 HTTP/1.1 200 OK  (text/html)
```

- GET request packet, number of bytes from the beginning of the Ethernet frame where the ASCII "G" in "GET" appears:



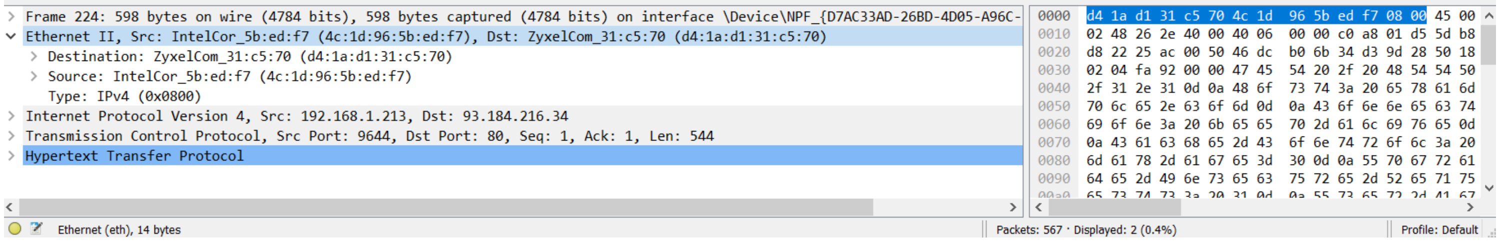
```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7.
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Destination: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
v Hypertext Transfer Protocol
  v GET / HTTP/1.1\r\n
    > [Expert Info (Chat/Sequence): GET / HTTP/1.1\r\n]
      Request Method: GET
      Request URI: /
      Request Version: HTTP/1.1
    Host: example.com\r\n
```

```
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50   ······GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d   /1.1··Ho st: exam
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   ple.com· ·Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive·
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61   max-age= 0··Upgra
0090  64 65 2d 49 6e 73 65 63  75 72 65 2d 52 65 71 75   de-Insec ure-Requ
00a0  65 73 74 73 3a 20 31 0d  0a 55 73 65 72 2d 41 67   ests: 1· ·User-Ag
00b0  65 6e 74 3a 20 4d 6f 7a  69 6c 6c 61 2f 35 2e 30   ent: Moz illa/5.0
00c0  20 28 57 69 6e 64 6f 77  73 20 4e 54 20 31 30 2e    (Window s NT 10.
00d0  30 3b 20 57 69 6e 36 34  3b 20 78 36 34 29 20 41   0; Win64 ; x64) A
00e0  70 70 6c 65 57 65 62 4b  69 74 2f 35 33 37 2e 33   ppleWebK it/537.3
00f0  36 20 28 4b 48 54 4d 4c  2c 20 6c 69 6b 65 20 47   6 (KHTML , like G
0100  65 63 6b 6f 29 20 43 68  72 6f 6d 65 2f 31 31 33   ecko) Ch rome/113
0110  2e 30 2e 30 2e 30 20 53  61 66 61 72 69 2f 35 33   .0.0.0 S afari/53
0120  37 2e 33 36 20 45 64 67  2f 31 31 33 2e 30 2e 31   7.36 Edg /113.0.1
```

HTTP Request Method (http.request.method), 3 bytes

Packets: 567 · Displayed: 2 (0.4%)

- 48-bit Ethernet address and the gateway of the system:



```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7AC33AD-26BD-4D05-A96C-
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Destination: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
> Hypertext Transfer Protocol
```

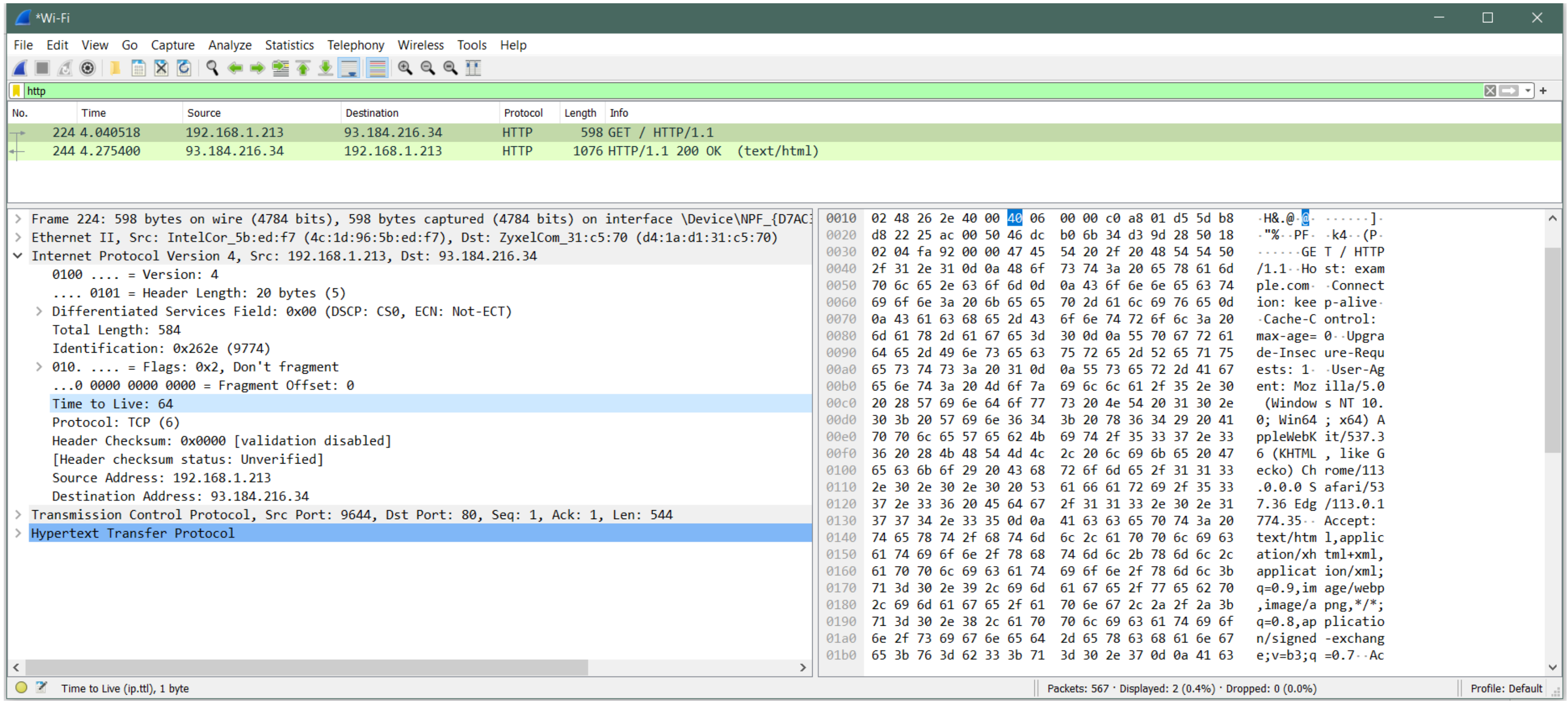
```
0000  d4 1a d1 31 c5 70 4c 1d  96 5b ed f7 08 00 45 00
0010  02 48 26 2e 40 00 40 06  00 00 c0 a8 01 d5 5d b8
0020  d8 22 25 ac 00 50 46 dc  b0 6b 34 d3 9d 28 50 18
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61
0090  64 65 2d 49 6e 73 65 63  75 72 65 2d 52 65 71 75
00a0  65 73 74 73 3a 20 31 0d  0a 55 73 65 72 2d 41 67
```

Ethernet (eth), 14 bytes

Packets: 567 · Displayed: 2 (0.4%)

Profile: Default

- Time to Live:


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

http

```
No.     Time       Source          Destination     Protocol  Length Info
    224 4.040518   192.168.1.213   93.184.216.34   HTTP       598 GET / HTTP/1.1
    244 4.275400   93.184.216.34   192.168.1.213   HTTP      1076 HTTP/1.1 200 OK  (text/html)
```

```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7AC:
> Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
v Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 584
    Identification: 0x262e (9774)
  > 010. .... = Flags: 0x2, Don't fragment
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 64
    Protocol: TCP (6)
    Header Checksum: 0x0000 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.213
    Destination Address: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
> Hypertext Transfer Protocol
```

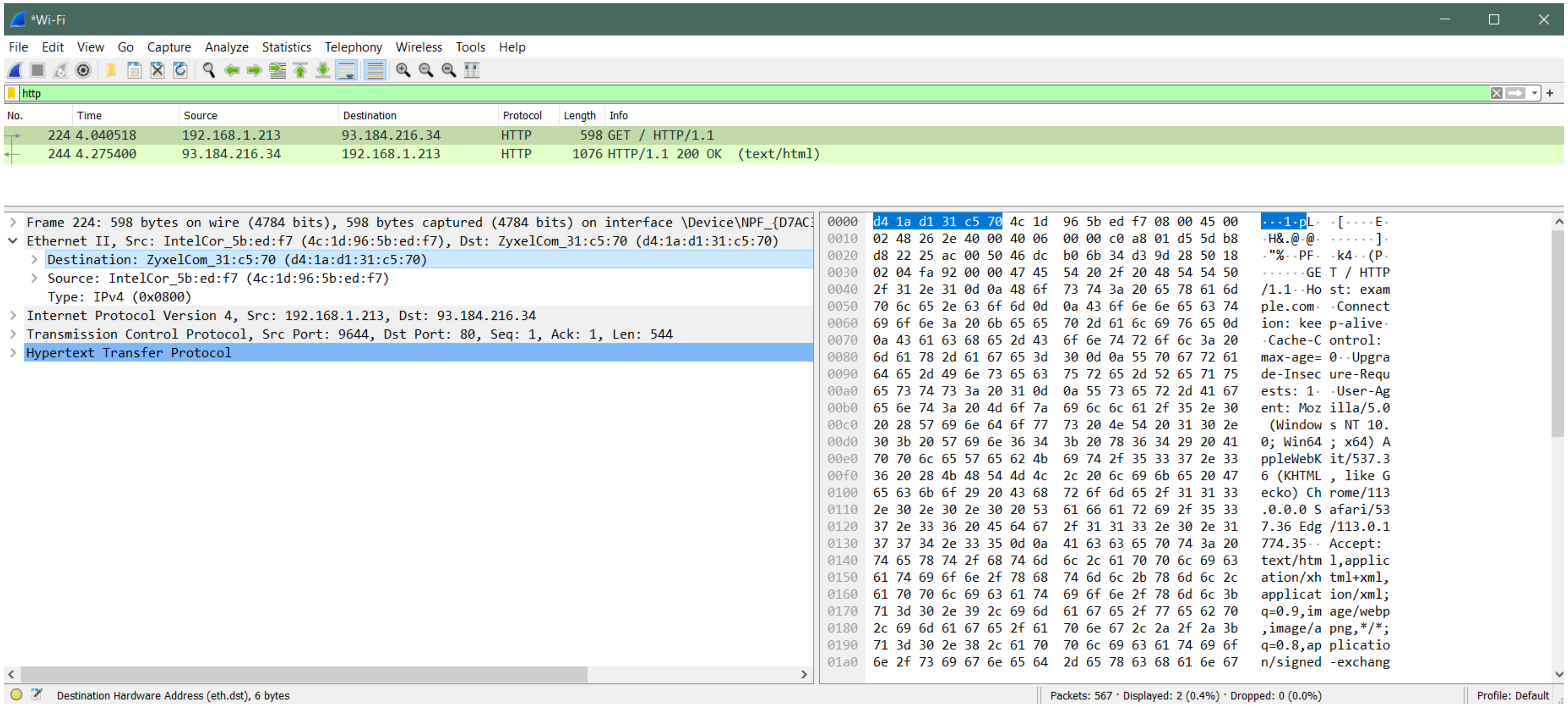
```
0010  02 48 26 2e 40 00 40 06  00 00 c0 a8 01 d5 5d b8   ·H&.@·@· ······]·
0020  d8 22 25 ac 00 50 46 dc  b0 6b 34 d3 9d 28 50 18   ·"%··PF· ·k4··(P·
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50   ······GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d   /1.1··Ho st: exam
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   ple.com· ·Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive·
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61   max-age= 0··Upgra
0090  64 65 2d 49 6e 73 65 63  75 72 65 2d 52 65 71 75   de-Insec ure-Requ
00a0  65 73 74 73 3a 20 31 0d  0a 55 73 65 72 2d 41 67   ests: 1· ·User-Ag
00b0  65 6e 74 3a 20 4d 6f 7a  69 6c 6c 61 2f 35 2e 30   ent: Moz illa/5.0
00c0  20 28 57 69 6e 64 6f 77  73 20 4e 54 20 31 30 2e    (Window s NT 10.
00d0  30 3b 20 57 69 6e 36 34  3b 20 78 36 34 29 20 41   0; Win64 ; x64) A
00e0  70 70 6c 65 57 65 62 4b  69 74 2f 35 33 37 2e 33   ppleWebK it/537.3
00f0  36 20 28 4b 48 54 4d 4c  2c 20 6c 69 6b 65 20 47   6 (KHTML , like G
0100  65 63 6b 6f 29 20 43 68  72 6f 6d 65 2f 31 31 33   ecko) Ch rome/113
0110  2e 30 2e 30 2e 30 20 53  61 66 61 72 69 2f 35 33   .0.0.0 S afari/53
0120  37 2e 33 36 20 45 64 67  2f 31 31 33 2e 30 2e 31   7.36 Edg /113.0.1
0130  37 37 34 2e 33 35 0d 0a  41 63 63 65 70 74 3a 20   774.35·· Accept: 
0140  74 65 78 74 2f 68 74 6d  6c 2c 61 70 70 6c 69 63   text/htm l,applic
0150  61 74 69 6f 6e 2f 78 68  74 6d 6c 2b 78 6d 6c 2c   ation/xh tml+xml,
0160  61 70 70 6c 69 63 61 74  69 6f 6e 2f 78 6d 6c 3b   applicat ion/xml;
0170  71 3d 30 2e 39 2c 69 6d  61 67 65 2f 77 65 62 70   q=0.9,im age/webp
0180  2c 69 6d 61 67 65 2f 61  70 6e 67 2c 2a 2f 2a 3b   ,image/a png,*/*;
0190  71 3d 30 2e 38 2c 61 70  70 6c 69 63 61 74 69 6f   q=0.8,ap plicatio
01a0  6e 2f 73 69 67 6e 65 64  2d 65 78 63 68 61 6e 67   n/signed -exchang
01b0  65 3b 76 3d 62 33 3b 71  3d 30 2e 37 0d 0a 41 63   e;v=b3;q =0.7··Ac
```

Time to Live (ip.ttl), 1 byte

Packets: 567 · Displayed: 2 (0.4%) · Dropped: 0 (0.0%)

Profile: Default

- 48-bit destination and source address in the Ethernet frame:

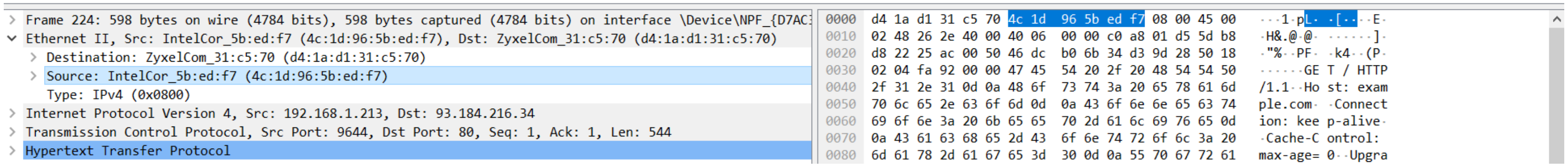

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

```
http
No.   Time      Source          Destination     Protocol Length Info
  224 4.040518  192.168.1.213   93.184.216.34   HTTP      598 GET / HTTP/1.1
  244 4.275400  93.184.216.34   192.168.1.213   HTTP     1076 HTTP/1.1 200 OK  (text/html)
```

```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7AC
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Destination: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
> Hypertext Transfer Protocol
```

```
0000  d4 1a d1 31 c5 70 4c 1d  96 5b ed f7 08 00 45 00   ···1·pL· ·[····E·
0010  02 48 26 2e 40 00 40 06  00 00 c0 a8 01 d5 5d b8   ·H&.@·@· ······]·
0020  d8 22 25 ac 00 50 46 dc  b0 6b 34 d3 9d 28 50 18   ·"%··PF· ·k4··(P·
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50   ······GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d   /1.1··Ho st: exam
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   ple.com· ·Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive·
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61   max-age= 0··Upgra
0090  64 65 2d 49 6e 73 65 63  75 72 65 2d 52 65 71 75   de-Insec ure-Requ
00a0  65 73 74 73 3a 20 31 0d  0a 55 73 65 72 2d 41 67   ests: 1· ·User-Ag
00b0  65 6e 74 3a 20 4d 6f 7a  69 6c 6c 61 2f 35 2e 30   ent: Moz illa/5.0
00c0  20 28 57 69 6e 64 6f 77  73 20 4e 54 20 31 30 2e    (Window s NT 10.
00d0  30 3b 20 57 69 6e 36 34  3b 20 78 36 34 29 20 41   0; Win64 ; x64) A
00e0  70 70 6c 65 57 65 62 4b  69 74 2f 35 33 37 2e 33   ppleWebK it/537.3
00f0  36 20 28 4b 48 54 4d 4c  2c 20 6c 69 6b 65 20 47   6 (KHTML , like G
0100  65 63 6b 6f 29 20 43 68  72 6f 6d 65 2f 31 31 33   ecko) Ch rome/113
0110  2e 30 2e 30 2e 30 20 53  61 66 61 72 69 2f 35 33   .0.0.0 S afari/53
0120  37 2e 33 36 20 45 64 67  2f 31 31 33 2e 30 2e 31   7.36 Edg /113.0.1
0130  37 37 34 2e 33 35 0d 0a  41 63 63 65 70 74 3a 20   774.35·· Accept: 
0140  74 65 78 74 2f 68 74 6d  6c 2c 61 70 70 6c 69 63   text/htm l,applic
0150  61 74 69 6f 6e 2f 78 68  74 6d 6c 2b 78 6d 6c 2c   ation/xh tml+xml,
0160  61 70 70 6c 69 63 61 74  69 6f 6e 2f 78 6d 6c 3b   applicat ion/xml;
0170  71 3d 30 2e 39 2c 69 6d  61 67 65 2f 77 65 62 70   q=0.9,im age/webp
0180  2c 69 6d 61 67 65 2f 61  70 6e 67 2c 2a 2f 2a 3b   ,image/a png,*/*;
0190  71 3d 30 2e 38 2c 61 70  70 6c 69 63 61 74 69 6f   q=0.8,ap plicatio
01a0  6e 2f 73 69 67 6e 65 64  2d 65 78 63 68 61 6e 67   n/signed -exchang
```

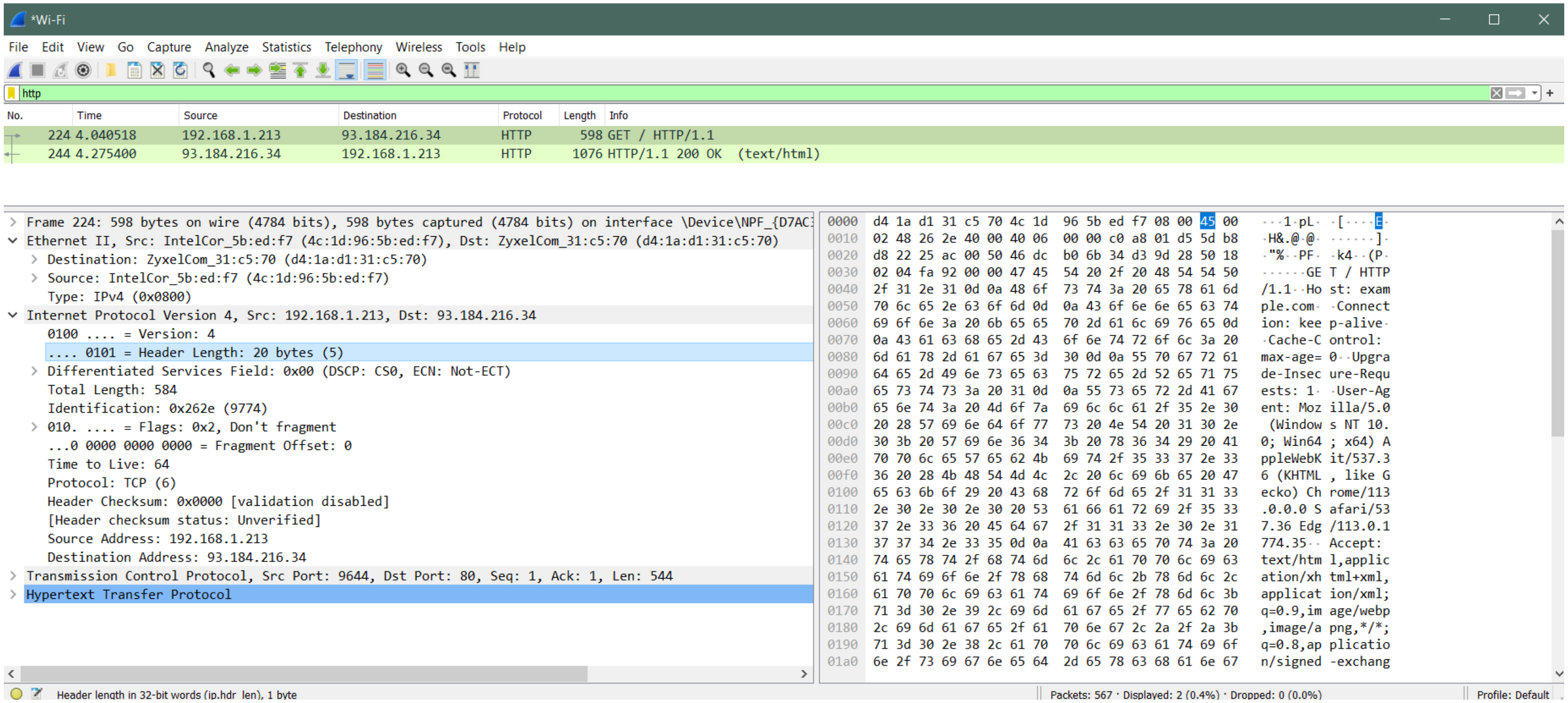
Destination Hardware Address (eth.dst), 6 bytes | Packets: 567 · Displayed: 2 (0.4%) · Dropped: 0 (0.0%) | Profile: Default



```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7AC
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Destination: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
> Hypertext Transfer Protocol
```

```
0000  d4 1a d1 31 c5 70 4c 1d  96 5b ed f7 08 00 45 00   ···1·pL· ·[····E·
0010  02 48 26 2e 40 00 40 06  00 00 c0 a8 01 d5 5d b8   ·H&.@·@· ······]·
0020  d8 22 25 ac 00 50 46 dc  b0 6b 34 d3 9d 28 50 18   ·"%··PF· ·k4··(P·
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50   ······GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d   /1.1··Ho st: exam
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   ple.com· ·Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive·
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61   max-age= 0··Upgra
```

- the header size:


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

http

```
No.   Time      Source          Destination     Protocol  Length  Info
  224 4.040518  192.168.1.213   93.184.216.34   HTTP       598 GET / HTTP/1.1
  244 4.275400  93.184.216.34   192.168.1.213   HTTP      1076 HTTP/1.1 200 OK  (text/html)
```

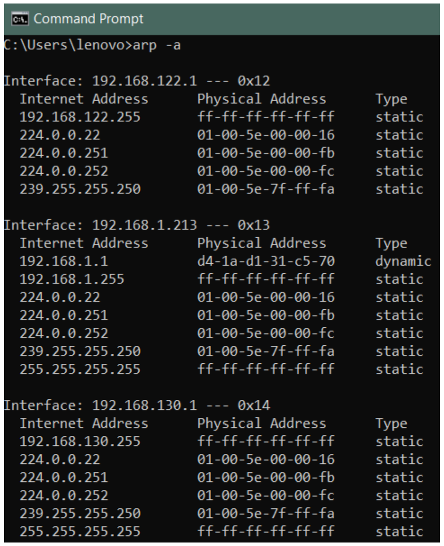
```
> Frame 224: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits) on interface \Device\NPF_{D7AC
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Destination: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: IPv4 (0x0800)
v Internet Protocol Version 4, Src: 192.168.1.213, Dst: 93.184.216.34
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 584
    Identification: 0x262e (9774)
  > 010. .... = Flags: 0x2, Don't fragment
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 64
    Protocol: TCP (6)
    Header Checksum: 0x0000 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.213
    Destination Address: 93.184.216.34
> Transmission Control Protocol, Src Port: 9644, Dst Port: 80, Seq: 1, Ack: 1, Len: 544
> Hypertext Transfer Protocol
```

```
0000  d4 1a d1 31 c5 70 4c 1d  96 5b ed f7 08 00 45 00   ···1·pL· ·[····E·
0010  02 48 26 2e 40 00 40 06  00 00 c0 a8 01 d5 5d b8   ·H&.@·@· ······]·
0020  d8 22 25 ac 00 50 46 dc  b0 6b 34 d3 9d 28 50 18   ·"%··PF· ·k4··(P·
0030  02 04 fa 92 00 00 47 45  54 20 2f 20 48 54 54 50   ······GE T / HTTP
0040  2f 31 2e 31 0d 0a 48 6f  73 74 3a 20 65 78 61 6d   /1.1··Ho st: exam
0050  70 6c 65 2e 63 6f 6d 0d  0a 43 6f 6e 6e 65 63 74   ple.com· ·Connect
0060  69 6f 6e 3a 20 6b 65 65  70 2d 61 6c 69 76 65 0d   ion: kee p-alive·
0070  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
0080  6d 61 78 2d 61 67 65 3d  30 0d 0a 55 70 67 72 61   max-age= 0··Upgra
0090  64 65 2d 49 6e 73 65 63  75 72 65 2d 52 65 71 75   de-Insec ure-Requ
00a0  65 73 74 73 3a 20 31 0d  0a 55 73 65 72 2d 41 67   ests: 1· ·User-Ag
00b0  65 6e 74 3a 20 4d 6f 7a  69 6c 6c 61 2f 35 2e 30   ent: Moz illa/5.0
00c0  20 28 57 69 6e 64 6f 77  73 20 4e 54 20 31 30 2e    (Window s NT 10.
00d0  30 3b 20 57 69 6e 36 34  3b 20 78 36 34 29 20 41   0; Win64 ; x64) A
00e0  70 70 6c 65 57 65 62 4b  69 74 2f 35 33 37 2e 33   ppleWebK it/537.3
00f0  36 20 28 4b 48 54 4d 4c  2c 20 6c 69 6b 65 20 47   6 (KHTML , like G
0100  65 63 6b 6f 29 20 43 68  72 6f 6d 65 2f 31 31 33   ecko) Ch rome/113
0110  2e 30 2e 30 2e 30 20 53  61 66 61 72 69 2f 35 33   .0.0.0 S afari/53
0120  37 2e 33 36 20 45 64 67  2f 31 31 33 2e 30 2e 31   7.36 Edg /113.0.1
0130  37 37 34 2e 33 35 0d 0a  41 63 63 65 70 74 3a 20   774.35·· Accept: 
0140  74 65 78 74 2f 68 74 6d  6c 2c 61 70 70 6c 69 63   text/htm l,applic
0150  61 74 69 6f 6e 2f 78 68  74 6d 6c 2b 78 6d 6c 2c   ation/xh tml+xml,
0160  61 70 70 6c 69 63 61 74  69 6f 6e 2f 78 6d 6c 3b   applicat ion/xml;
0170  71 3d 30 2e 39 2c 69 6d  61 67 65 2f 77 65 62 70   q=0.9,im age/webp
0180  2c 69 6d 61 67 65 2f 61  70 6e 67 2c 2a 2f 2a 3b   ,image/a png,*/*;
0190  71 3d 30 2e 38 2c 61 70  70 6c 69 63 61 74 69 6f   q=0.8,ap plicatio
01a0  6e 2f 73 69 67 6e 65 64  2d 65 78 63 68 61 6e 67   n/signed -exchang
```

Header length in 32-bit words (ip.hdr_len), 1 byte | Packets: 567 · Displayed: 2 (0.4%) · Dropped: 0 (0.0%) | Profile: Default

Part 2. The Address Resolution Protocol

- computer’s ARP cache:



Command Prompt

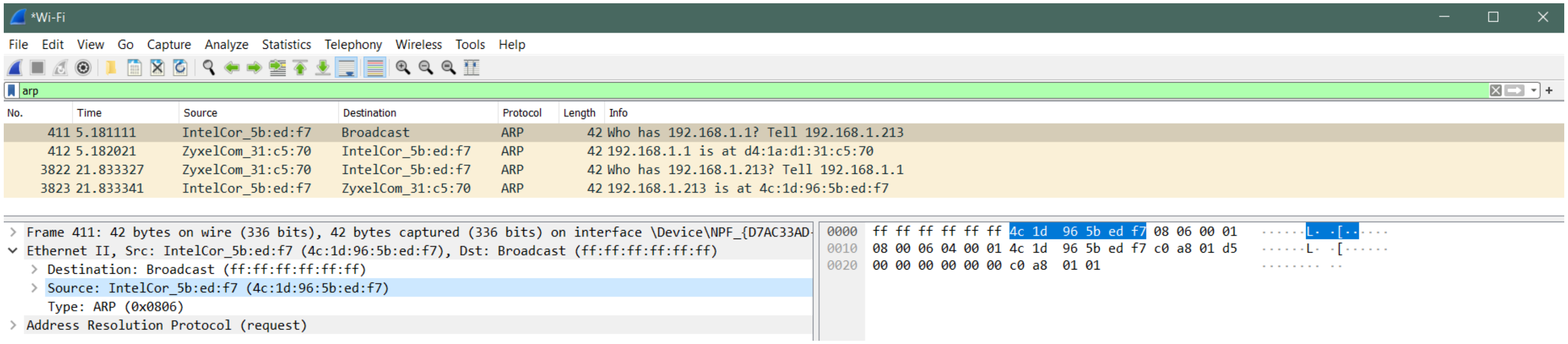
```
C:\Users\lenovo>arp -a

Interface: 192.168.122.1 --- 0x12
  Internet Address      Physical Address      Type
  192.168.122.255       ff-ff-ff-ff-ff-ff     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
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 192.168.1.213 --- 0x13
  Internet Address      Physical Address      Type
  192.168.1.1           d4-1a-d1-31-c5-70     dynamic
  192.168.1.255         ff-ff-ff-ff-ff-ff     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
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.130.1 --- 0x14
  Internet Address      Physical Address      Type
  192.168.130.255       ff-ff-ff-ff-ff-ff     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
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

- the hexadecimal values for the source and destination addresses in the Ethernet frame containing the ARP request message:



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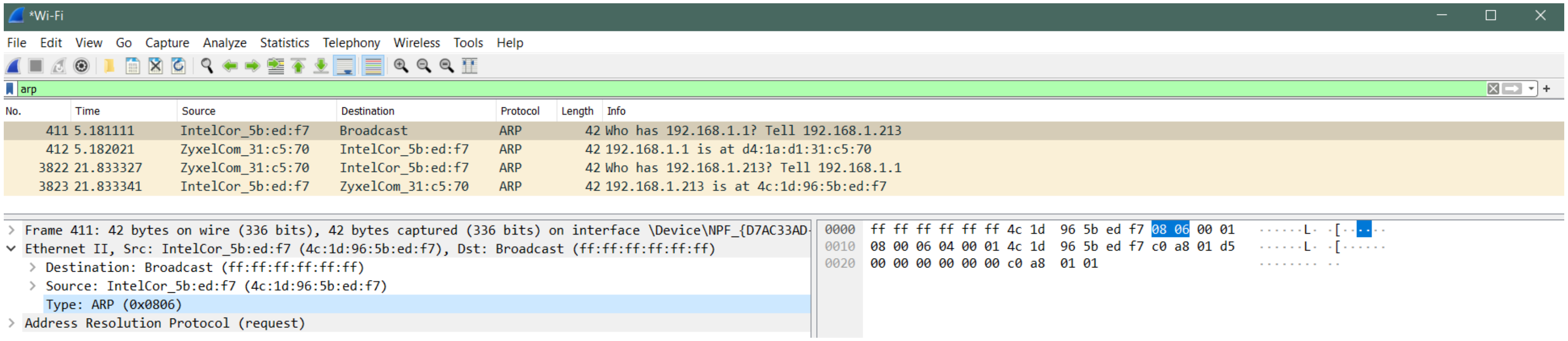
Filter: arp

No.	Time	Source	Destination	Protocol	Length	Info
411	5.181111	IntelCor_5b:ed:f7	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.213
412	5.182021	ZyxelCom_31:c5:70	IntelCor_5b:ed:f7	ARP	42	192.168.1.1 is at d4:1a:d1:31:c5:70
3822	21.833327	ZyxelCom_31:c5:70	IntelCor_5b:ed:f7	ARP	42	Who has 192.168.1.213? Tell 192.168.1.1
3823	21.833341	IntelCor_5b:ed:f7	ZyxelCom_31:c5:70	ARP	42	192.168.1.213 is at 4c:1d:96:5b:ed:f7

```
> Frame 411: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  > Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: ARP (0x0806)
> Address Resolution Protocol (request)
```

```
0000  ff ff ff ff ff ff 4c 1d  96 5b ed f7 08 06 00 01   ······L· ·[······
0010  08 00 06 04 00 01 4c 1d  96 5b ed f7 c0 a8 01 d5   ······L· ·[······
0020  00 00 00 00 00 00 c0 a8  01 01                     ········ ··
```

- the hexadecimal value for the two-byte Ethernet Frame type field: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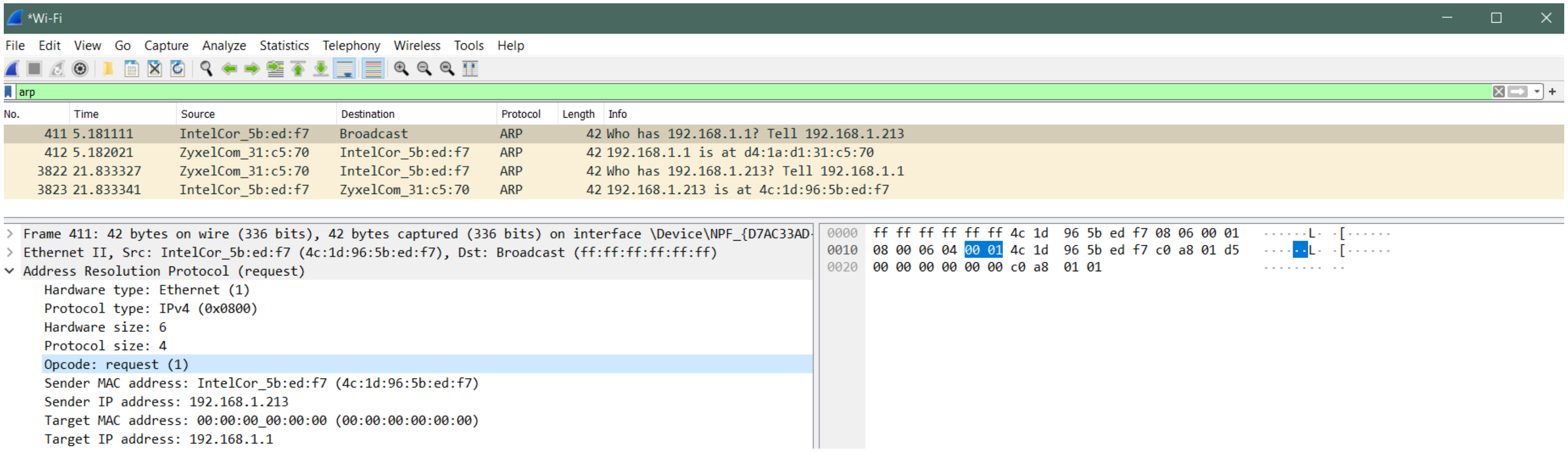
arp

```
No.    Time       Source             Destination        Protocol  Length  Info
   411 5.181111   IntelCor_5b:ed:f7  Broadcast          ARP         42 Who has 192.168.1.1? Tell 192.168.1.213
   412 5.182021   ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP         42 192.168.1.1 is at d4:1a:d1:31:c5:70
  3822 21.833327  ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP         42 Who has 192.168.1.213? Tell 192.168.1.1
  3823 21.833341  IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP         42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 411: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
v Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  > Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  > Source: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Type: ARP (0x0806)
> Address Resolution Protocol (request)
```

```
0000  ff ff ff ff ff ff 4c 1d  96 5b ed f7 08 06 00 01   ······L· ·[······
0010  08 00 06 04 00 01 4c 1d  96 5b ed f7 c0 a8 01 d5   ······L· ·[······
0020  00 00 00 00 00 00 c0 a8  01 01                     ········ ··
```

- the value of the opcode field within the ARP-payload part of the Ethernet frame in which an ARP request is made: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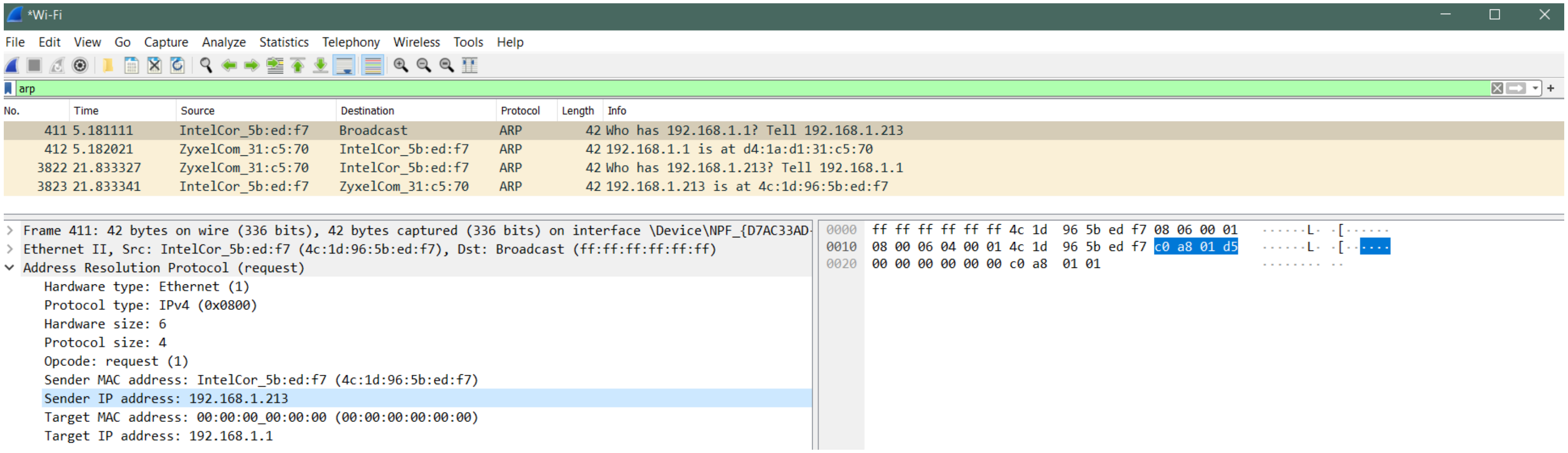
arp

```
No.    Time       Source             Destination        Protocol  Length  Info
   411 5.181111   IntelCor_5b:ed:f7  Broadcast          ARP         42 Who has 192.168.1.1? Tell 192.168.1.213
   412 5.182021   ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP         42 192.168.1.1 is at d4:1a:d1:31:c5:70
  3822 21.833327  ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP         42 Who has 192.168.1.213? Tell 192.168.1.1
  3823 21.833341  IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP         42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 411: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
> Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
v Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Sender IP address: 192.168.1.213
    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 4c 1d  96 5b ed f7 08 06 00 01   ······L· ·[······
0010  08 00 06 04 00 01 4c 1d  96 5b ed f7 c0 a8 01 d5   ······L· ·[······
0020  00 00 00 00 00 00 c0 a8  01 01                     ········ ··
```

- ARP message contains the IP address of the sender:



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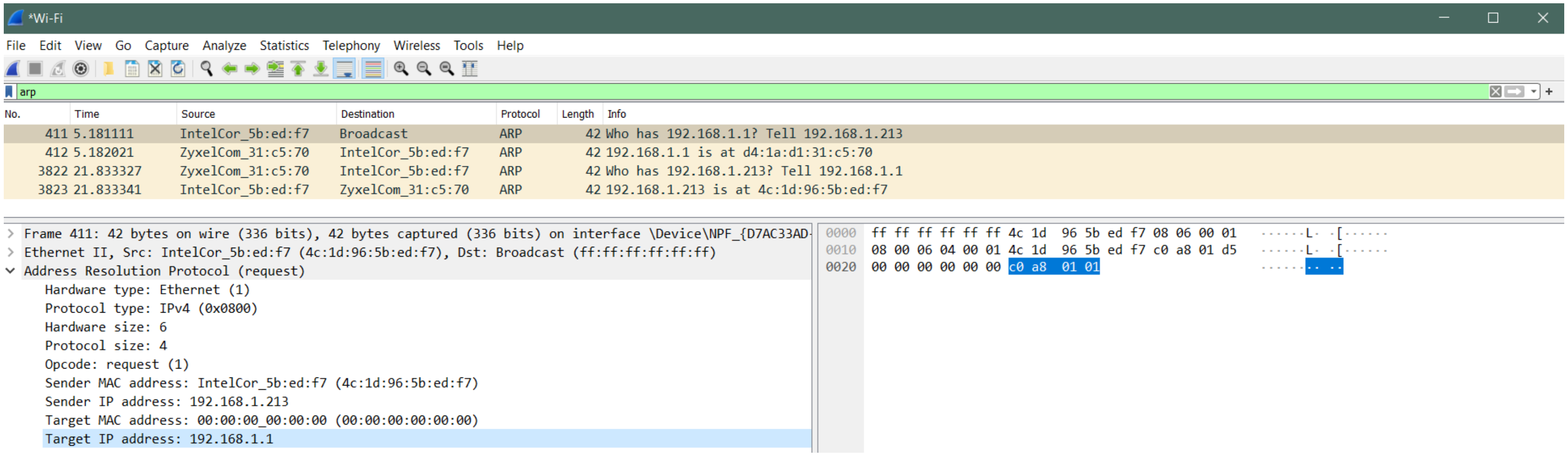
arp

```
No.    Time         Source             Destination        Protocol  Length  Info
  411  5.181111     IntelCor_5b:ed:f7  Broadcast          ARP           42  Who has 192.168.1.1? Tell 192.168.1.213
  412  5.182021     ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP           42  192.168.1.1 is at d4:1a:d1:31:c5:70
 3822  21.833327    ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP           42  Who has 192.168.1.213? Tell 192.168.1.1
 3823  21.833341    IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP           42  192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 411: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
> Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
v Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Sender IP address: 192.168.1.213
    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 4c 1d  96 5b ed f7 08 06 00 01   ······L· ·[······
0010  08 00 06 04 00 01 4c 1d  96 5b ed f7 c0 a8 01 d5   ······L· ·[······
0020  00 00 00 00 00 00 c0 a8  01 01                     ········ ··
```

- the Ethernet address of the machine whose corresponding IP address is being queried:



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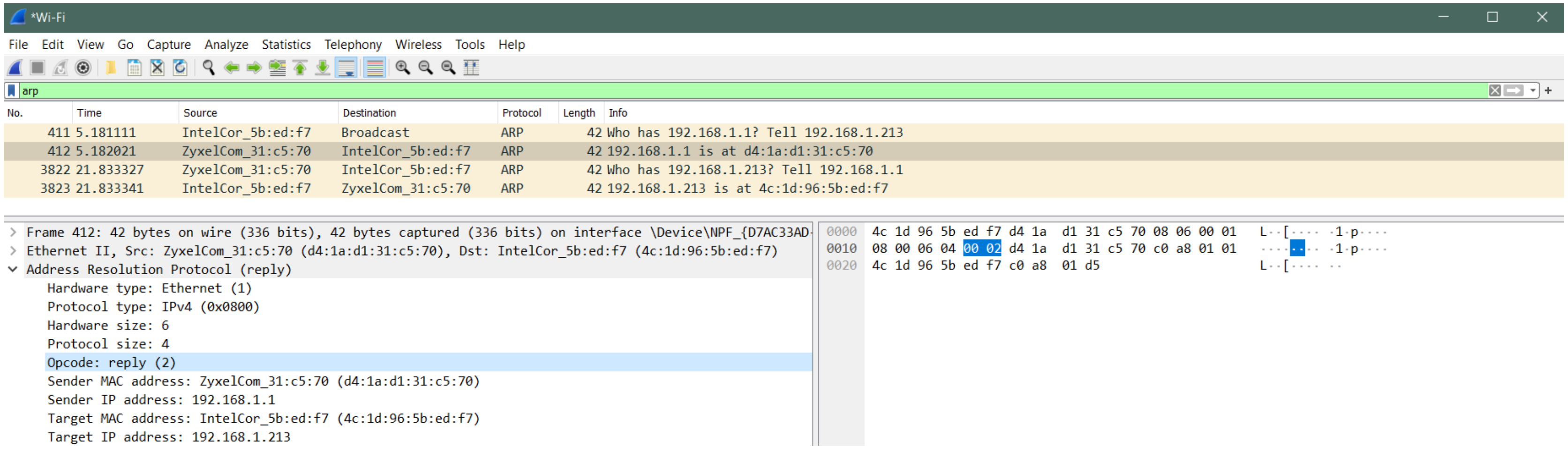
arp

```
No.    Time         Source             Destination        Protocol  Length  Info
  411  5.181111     IntelCor_5b:ed:f7  Broadcast          ARP           42  Who has 192.168.1.1? Tell 192.168.1.213
  412  5.182021     ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP           42  192.168.1.1 is at d4:1a:d1:31:c5:70
 3822  21.833327    ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP           42  Who has 192.168.1.213? Tell 192.168.1.1
 3823  21.833341    IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP           42  192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 411: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
> Ethernet II, Src: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
v Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Sender IP address: 192.168.1.213
    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 4c 1d  96 5b ed f7 08 06 00 01   ······L· ·[······
0010  08 00 06 04 00 01 4c 1d  96 5b ed f7 c0 a8 01 d5   ······L· ·[······
0020  00 00 00 00 00 00 c0 a8  01 01                     ········ ··
```

- in the ARP reply that was sent in response to the ARP request, the value of the opcode field within the ARP-payload part of the Ethernet frame in which an ARP response is made:


*Wi-Fi
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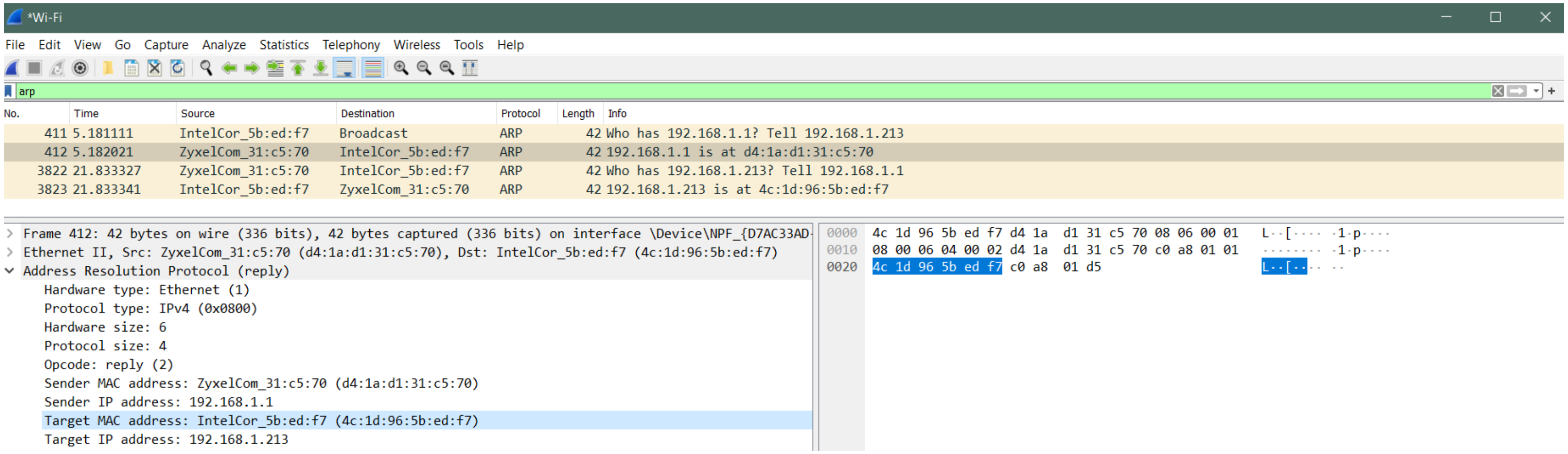
arp

```
No.     Time       Source              Destination        Protocol  Length  Info
  411 5.181111     IntelCor_5b:ed:f7   Broadcast          ARP       42 Who has 192.168.1.1? Tell 192.168.1.213
  412 5.182021     ZyxelCom_31:c5:70   IntelCor_5b:ed:f7  ARP       42 192.168.1.1 is at d4:1a:d1:31:c5:70
 3822 21.833327    ZyxelCom_31:c5:70   IntelCor_5b:ed:f7  ARP       42 Who has 192.168.1.213? Tell 192.168.1.1
 3823 21.833341    IntelCor_5b:ed:f7   ZyxelCom_31:c5:70  ARP       42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 412: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
> Ethernet II, Src: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70), Dst: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
v Address Resolution Protocol (reply)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: reply (2)
    Sender MAC address: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
    Sender IP address: 192.168.1.1
    Target MAC address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Target IP address: 192.168.1.213
```

```
0000  4c 1d 96 5b ed f7 d4 1a  d1 31 c5 70 08 06 00 01   L··[····  ·1·p····
0010  08 00 06 04 00 02 d4 1a  d1 31 c5 70 c0 a8 01 01   ········  ·1·p····
0020  4c 1d 96 5b ed f7 c0 a8  01 d5                     L··[····  ··
```

- the IP address of the machine having the Ethernet address whose corresponding IP address is being queried:


*Wi-Fi
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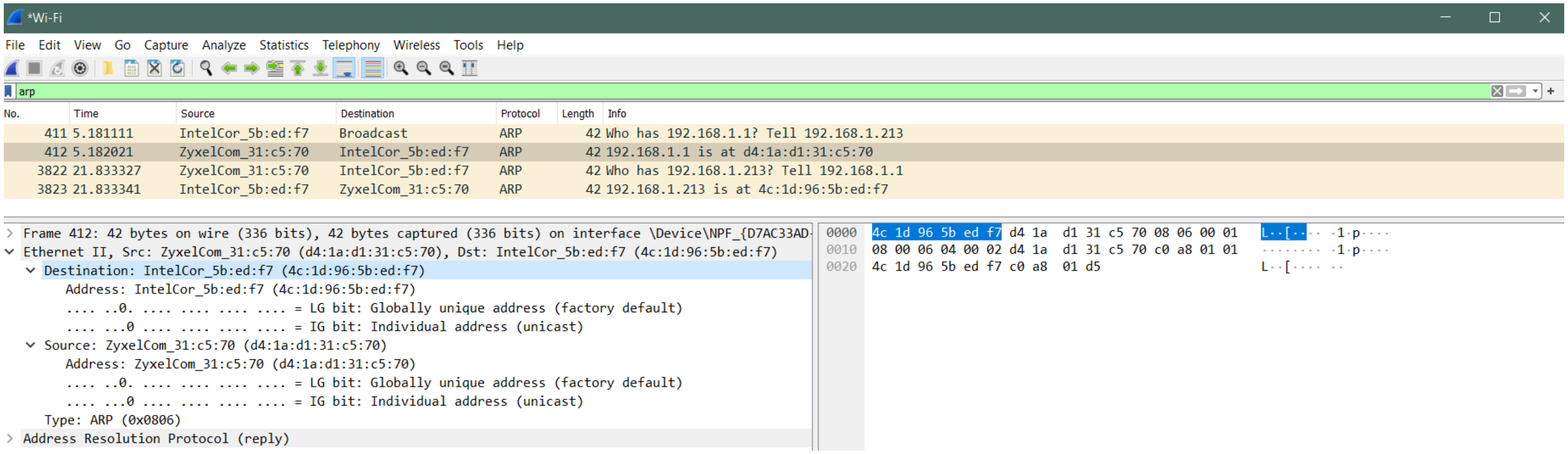
arp

```
No.     Time       Source              Destination        Protocol  Length  Info
  411 5.181111     IntelCor_5b:ed:f7   Broadcast          ARP       42 Who has 192.168.1.1? Tell 192.168.1.213
  412 5.182021     ZyxelCom_31:c5:70   IntelCor_5b:ed:f7  ARP       42 192.168.1.1 is at d4:1a:d1:31:c5:70
 3822 21.833327    ZyxelCom_31:c5:70   IntelCor_5b:ed:f7  ARP       42 Who has 192.168.1.213? Tell 192.168.1.1
 3823 21.833341    IntelCor_5b:ed:f7   ZyxelCom_31:c5:70  ARP       42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 412: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
> Ethernet II, Src: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70), Dst: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
v Address Resolution Protocol (reply)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: reply (2)
    Sender MAC address: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
    Sender IP address: 192.168.1.1
    Target MAC address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
    Target IP address: 192.168.1.213
```

```
0000  4c 1d 96 5b ed f7 d4 1a  d1 31 c5 70 08 06 00 01   L··[····  ·1·p····
0010  08 00 06 04 00 02 d4 1a  d1 31 c5 70 c0 a8 01 01   ········  ·1·p····
0020  4c 1d 96 5b ed f7 c0 a8  01 d5                     L··[····  ··
```

- `the hexadecimal values for the source and destination addresses in the Ethernet frame containing the ARP reply message:`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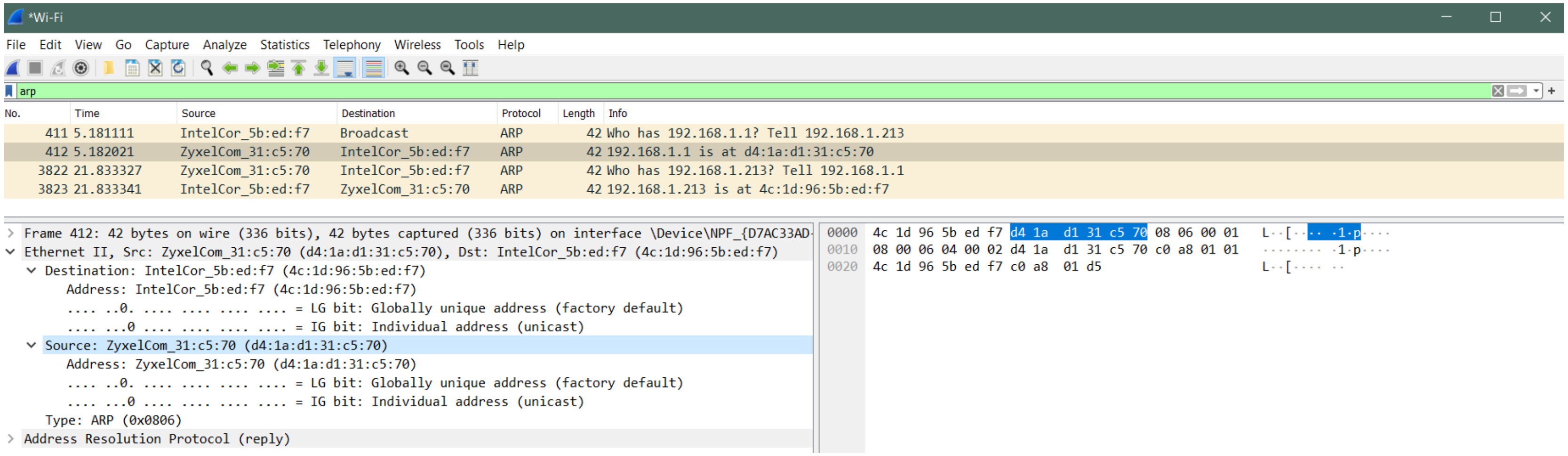
arp

```
No.   Time       Source             Destination        Protocol Length Info
  411 5.181111   IntelCor_5b:ed:f7  Broadcast          ARP          42 Who has 192.168.1.1? Tell 192.168.1.213
  412 5.182021   ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP          42 192.168.1.1 is at d4:1a:d1:31:c5:70
 3822 21.833327  ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP          42 Who has 192.168.1.213? Tell 192.168.1.1
 3823 21.833341  IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP          42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 412: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
v Ethernet II, Src: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70), Dst: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
  v Destination: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
      Address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  v Source: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
      Address: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: ARP (0x0806)
> Address Resolution Protocol (reply)
```

```
0000  4c 1d 96 5b ed f7 d4 1a  d1 31 c5 70 08 06 00 01   L··[····  ·1·p····
0010  08 00 06 04 00 02 d4 1a  d1 31 c5 70 c0 a8 01 01   ········  ·1·p····
0020  4c 1d 96 5b ed f7 c0 a8  01 d5                     L··[····  ··
```


*Wi-Fi
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arp

```
No.   Time       Source             Destination        Protocol Length Info
  411 5.181111   IntelCor_5b:ed:f7  Broadcast          ARP          42 Who has 192.168.1.1? Tell 192.168.1.213
  412 5.182021   ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP          42 192.168.1.1 is at d4:1a:d1:31:c5:70
 3822 21.833327  ZyxelCom_31:c5:70  IntelCor_5b:ed:f7  ARP          42 Who has 192.168.1.213? Tell 192.168.1.1
 3823 21.833341  IntelCor_5b:ed:f7  ZyxelCom_31:c5:70  ARP          42 192.168.1.213 is at 4c:1d:96:5b:ed:f7
```

```
> Frame 412: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{D7AC33AD-
v Ethernet II, Src: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70), Dst: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
  v Destination: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
      Address: IntelCor_5b:ed:f7 (4c:1d:96:5b:ed:f7)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  v Source: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
      Address: ZyxelCom_31:c5:70 (d4:1a:d1:31:c5:70)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: ARP (0x0806)
> Address Resolution Protocol (reply)
```

```
0000  4c 1d 96 5b ed f7 d4 1a  d1 31 c5 70 08 06 00 01   L··[····  ·1·p····
0010  08 00 06 04 00 02 d4 1a  d1 31 c5 70 c0 a8 01 01   ········  ·1·p····
0020  4c 1d 96 5b ed f7 c0 a8  01 d5                     L··[····  ··
```