

No.	Time	Source	Destination	Protocol	Length	Info
154	6.092384	100.64.176.202	128.119.245.12	TCP	54	52666 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0
155	6.092755	100.64.176.202	128.119.245.12	HTTP	550	GET /wreshark-labs/HTTP-ethereal-lab-files.html HTTP/1.1
156	6.093450	128.119.245.12	100.64.176.202	TCP	66	80 → 52667 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1380 SACK_PERM
157	6.093556	100.64.176.202	128.119.245.12	TCP	54	52667 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0
158	6.347390	128.119.245.12	100.64.176.202	TCP	66	80 → 52668 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1380 SACK_PERM
159	6.347530	100.64.176.202	128.119.245.12	TCP	54	52668 → 80 [ACK] Seq=1 Ack=1 Win=131072 Len=0
160	6.367079	128.119.245.12	100.64.176.202	TCP	60	80 → 52666 [ACK] Seq=1 Ack=497 Win=30336 Len=0
161	6.369681	128.119.245.12	100.64.176.202	TCP	1434	80 → 52666 [ACK] Seq=1 Ack=497 Win=30336 Len=1380 [TCP segment of a r...

  

> Frame 155: 550 bytes on wire (4400 bits), 550 bytes captured (4400 bits) on	0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 00 45 00	..3..]E-#...[]E-
> Ethernet II, Src: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c), Dst: HuaweiTe_8a:5d:45	0010	02 18 5f 56 40 00 40 06 00 00 64 40 b0 ca 80 77	...V@...:dd@...W
> Internet Protocol Version 4, Src: 100.64.176.202, Dst: 128.119.245.12	0020	f5 0c cd ba 00 50 4d 82 3b fc b6 17 da d8 50 18	.....PM.;.....P-
> Transmission Control Protocol, Src Port: 52666, Dst Port: 80, Seq: 1, Ack:	0030	02 00 8c 99 00 00 47 45 54 20 2f 77 69 72 65 73	.....GE T /wires
> Hypertext Transfer Protocol	0040	68 61 72 6b 2d 6c 61 62 73 2f 48 54 54 50 2d 65	hark-lab s/HTTP-e
	0050	74 68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65	thereal- lab-file
	0060	33 2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d	3.html H TTP/1.1
	0070	0a 48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75	..Host: g aia.cs.u
	0080	6d 61 73 73 2e 65 64 75 0d 0a 43 6f 6e 6e 65 63	mass.edu ..Connec
	0090	74 69 6f 6e 3a 20 6b 65 65 70 2d 61 6c 69 76 65	tion: ke ep-alive
	00a0	0d 0a 55 70 67 72 61 64 65 2d 49 6e 73 65 63 75	..Upgrad e-Insecu
	00b0	72 65 2d 52 65 71 75 65 73 74 73 3a 20 31 0d 0a	re-Request: 1..
	00c0	55 73 65 72 2d 41 67 65 6e 7a 3a 20 4d 6f 7a 69	User-Age nt: Mozil
	00d0	6c 6c 61 2f 35 2e 30 20 28 5f 69 6e 64 6f 77 73	lla/5.0 (Windows
	00e0	20 4e 54 20 31 30 2e 30 3b 20 57 69 6e 36 34 3b	NT 10.0 ; Win64;
	00f0	20 78 36 34 29 20 41 70 70 6c 65 57 65 62 4b 69	x64) Ap pleWebKi
	0100	74 2f 35 33 37 2e 33 36 20 28 4b 48 54 4d 4c 2c	t/537.36 (KHTML,
	0110	20 6c 69 6b 65 20 47 65 63 6b 6f 29 20 43 68 72	like Ge cko) Chr
	0120	6f 6d 65 2f 31 32 30 2e 30 2e 30 2e 30 2d 53 61	ome/120. 0.0.0 Sa

No.	Time	Source	Destination	Protocol	Length	Info
151	5.929120	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	66	IPv4
152	6.070963	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	66	IPv4
153	6.092215	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66	IPv4
154	6.092384	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	54	IPv4
155	6.092755	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	550	IPv4
156	6.093450	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66	IPv4
157	6.093556	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	54	IPv4
158	6.347390	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66	IPv4

  

> Frame 155: 550 bytes on wire (4400 bits), 550 bytes captured (4400 bits) on	0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 00 45 00	..3..]E-#...[]E-
> Ethernet II, Src: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c), Dst: HuaweiTe_8a:5d:45	0010	02 18 5f 56 40 00 40 06 00 00 64 40 b0 ca 80 77	...V@...:dd@...W
> Data (536 bytes)	0020	f5 0c cd ba 00 50 4d 82 3b fc b6 17 da d8 50 18	.....PM.;.....P-
	0030	02 00 8c 99 00 00 47 45 54 20 2f 77 69 72 65 73	.....GE T /wires
	0040	68 61 72 6b 2d 6c 61 62 73 2f 48 54 54 50 2d 65	hark-lab s/HTTP-e
	0050	74 68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65	thereal- lab-fl
	0060	33 2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d	3.html H TTP/1.1
	0070	0a 48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75	..Host: g aia.cs.
	0080	6d 61 73 73 2e 65 64 75 0d 0a 43 6f 6e 6e 65 63	mass.edu ..Conn
	0090	74 69 6f 6e 3a 20 6b 65 65 70 2d 61 6c 69 76 65	tion: ke ep-aliv
	00a0	0d 0a 55 70 67 72 61 64 65 2d 49 6e 73 65 63 75	..Upgrad e-Insec
	00b0	72 65 2d 52 65 71 75 65 73 74 73 3a 20 31 0d 0a	re-Request: 1..
	00c0	55 73 65 72 2d 41 67 65 6e 7a 3a 20 4d 6f 7a 69	User-Age nt: Moz

1. 我的电脑的 48 位以太网地址是多少？

**c4:23:60:a1:aa:7c**

155	6.092755	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	550
156	6.093450	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66
157	6.093556	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	54
158	6.347390	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66

> Frame 155: 550 bytes on wire (4400 bits), 550 bytes captured (4400 bits) on	0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 00 45 00	..3..]E-#...[]E-
> Ethernet II, Src: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c), Dst: HuaweiTe_8a:5d:45	0010	02 18 5f 56 40 00 40 06 00 00 64 40 b0 ca 80 77	...V@...:dd@...W
> Destination: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	0020	f5 0c cd ba 00 50 4d 82 3b fc b6 17 da d8 50 18	.....PM.;.....P-
> Source: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	0030	02 00 8c 99 00 00 47 45 54 20 2f 77 69 72 65 73	.....GE T /wires
Type: IPv4 (0x0800)	0040	68 61 72 6b 2d 6c 61 62 73 2f 48 54 54 50 2d 65	hark-lab s/HTTP-e

2. 目的地址的 48 位以太网地址是多少？这是 gaia.cs.umass.edu 的以太网地址吗？

这是什么设备的以太网地址？

**c8:33:e5:8a:5d:45**, 这个不是 gaia.cs.umass.edu 的以太网地址, 而是子网的路由器的地址。

3. 给出数据帧的十六进制数, 这对应于哪个上层协议？

**0x0800**, 表示上层协议为 **IPv4**。

> Ethernet II, Src: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c), Dst: HuaweiTe_8a:5d:45	0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 00 45 00	..3..]E-#...[]E-
> Destination: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	0010	02 18 5f 56 40 00 40 06 00 00 64 40 b0 ca 80 77	...V@...:dd@...W
> Source: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	0020	f5 0c cd ba 00 50 4d 82 3b fc b6 17 da d8 50 18	.....PM.;.....P-
Type: IPv4 (0x0800)	0030	02 00 8c 99 00 00 47 45 54 20 2f 77 69 72 65 73	.....GE T /wires

4. 从以太网帧开始到“GET”中的 ASCII 码的“G”字出现间隔的字节数？  
 计数，一共 16\*3+7=55

0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 00 45 00	·3··]E·#`·· ··E·
0010	02 18 5f 56 40 00 00 06 00 00 64 40 b0 ca 80 77	··_V@·@· ··d@··w
0020	f5 0c cd ba 00 50 4d 82 3b fc b6 17 da d8 50 18	····PM· ;····P·
0030	02 00 8c 99 00 00 47 45 54 20 2f 77 69 72 65 73	·····GE T /wires
0040	68 61 72 6b 2d 6c 61 62 73 2f 48 54 54 50 2d 65	hark-lab s/HTTP-e
0050	74 68 65 72 65 61 6c 2d 6c 61 62 2d 66 69 6c 65	thereal- lab-file
0060	33 2e 68 74 6d 6c 20 48 54 54 50 2f 31 2e 31 0d	3.html H TTP/1.1·
0070	0a 48 6f 73 74 3a 20 67 61 69 61 2e 63 73 2e 75	·Host: g aia.cs.u
0080	6d 61 73 73 2e 65 64 75 0d 0a 43 6f 6e 6e 65 63	mass.edu ··Conne

164 6.369681	128.119.245.12	100.64.176.202	HTTP	777 HTTP/1.1 200 OK (text/html)
165 6.369853	100.64.176.202	128.119.245.12	TCP	54 52666 → 80 [ACK] Seq=497 Ack=2761 Win=131072 Len=0
166 6.369939	100.64.176.202	128.119.245.12	TCP	54 52666 → 80 [ACK] Seq=497 Ack=4864 Win=131072 Len=0
168 6.420062	100.64.176.202	128.119.245.12	HTTP	496 GET /favicon.ico HTTP/1.1
168 6.475595	100.64.176.202	172.217.160.109	QUIC	1292 Initial, DCID=f2ee7aff55920023, PKN: 5, PADDING, PING, CRYPTO, CRYPTO...
169 6.568527	100.64.176.202	172.217.160.109	TCP	66 [TCP Retransmission] 52664 → 443 [SVN] Seq=0 Win=64240 Len=0 MSS=1460

> Frame 164: 777 bytes on wire (6216 bits), 777 bytes captured (6216 bits) on  
 Ethernet II, Src: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45), Dst: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)  
 Destination: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)  
 Address: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)  
 .... ..0. .... = LG bit: Globally unique address (factor 2)  
 .... ..0. .... = IG bit: Individual address (unicast)  
 Source: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)  
 Address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)  
 .... ..0. .... = LG bit: Globally unique address (factor 2)  
 .... ..0. .... = IG bit: Individual address (unicast)  
 Type: IPv4 (0x0800)  
 Internet Protocol Version 4, Src: 128.119.245.12, Dst: 100.64.176.202  
 Transmission Control Protocol, Src Port: 80, Dst Port: 52666, Seq: 4141, Ack: 496  
 [4 Reassembled TCP Segments (4863 bytes): #161(1380), #162(1380), #163(1380), #164(1380)]  
 Hypertext Transfer Protocol  
 Line-based text data: text/html (98 lines)

5. 以太网源地址是什么？这是你的电脑的地址吗或者是 gaia.cs.umass.edu 的？  
 c8:33:e5:8a:5d:45 ，这个不是 gaia.cs.umass.edu 的以太网地址，而是子网的路由器的地址。

161 6.369681	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	1434
162 6.369681	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	1434
163 6.369681	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	1434
164 6.369681	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	777
165 6.369853	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	54
166 6.369939	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	54
167 6.420062	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	496

> Frame 161: 1434 bytes on wire (11472 bits), 1434 bytes captured (11472 bits) on	
Ethernet II, Src: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45), Dst: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	
Destination: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	
Address: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	
.... ..0. .... = LG bit: Globally unique address (factor 2)	
.... ..0. .... = IG bit: Individual address (unicast)	
Source: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	
Address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	
.... ..0. .... = LG bit: Globally unique address (factor 2)	
.... ..0. .... = IG bit: Individual address (unicast)	
Type: IPv4 (0x0800)	

6. 以太网目的地址是什么？这是你的电脑的地址吗？  
 c4:23:60:a1:aa:7c, 这是我主机的地址。  
 7. 给出数据帧的十六进制数，这对应于哪个上层协议？

0x0800, 表示上层协议为 IPv4。

```
▼ Source: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)
  Address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)
    .... ..0. .... = LG bit: Globally unique address (factory default)
    .... ..0 .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
```

8. 从以太帧开始到“OK”中的 ASCII 码的“O”字出现间隔的字节数?

16\*4+4=68

0000	c4 23 60 a1 aa 7c c8 33 e5 8a 5d 45 08 00 45 00	.#`.. .3 ..]E..E.
0010	05 8c f3 e1 40 00 1b 06 db fb 80 77 f5 0c 64 40	....@... ..w...d@
0020	b0 ca 00 50 cd ba b6 17 da d8 4d 82 3d ec 50 10	...P.... ..M.=.P.
0030	00 ed ed 5d 00 00 48 54 54 50 2f 31 2e 31 20 32	...].HT TP/1.1 2
0040	30 30 20 4f 4b 0d 0a 44 61 74 65 3a 20 4d 6f 6e	00 OK..D ate: Mon
0050	2c 20 31 31 20 44 65 63 20 32 30 32 33 20 30 36	, 11 Dec 2023 06
0060	3a 31 37 3a 30 32 20 47 4d 54 0d 0a 53 65 72 76	:17:02 G MT..Serv
0070	65 72 3a 20 41 70 61 63 68 65 2f 32 2e 34 2e 36	er: Apac he/2.4.6
0080	20 28 43 65 6e 74 4f 53 29 20 4f 70 65 6e 53 53	(CentOS ) OpenSS
0090	4c 2f 31 2e 30 2e 32 6b 2d 66 69 70 73 20 50 48	L/1.0.2k -fips PH

```
Microsoft Windows [Version 10.0.22631.2792]
(c) Microsoft Corporation. All rights reserved.

C:\Users\CindyWu>c:\windows\system32\arp

Displays and modifies the IP-to-Physical address translation tables used by
address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr]
ARP -d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr] [-v]

-a          Displays current ARP entries by interrogating the current
            protocol data. If inet_addr is specified, the IP and Physical
            addresses for only the specified computer are displayed. If
            more than one network interface uses ARP, entries for each ARP
            table are displayed.
-g          Same as -a.
-v          Displays current ARP entries in verbose mode. All invalid
            entries and entries on the loop-back interface will be shown.
inet_addr  Specifies an internet address.
-N if_addr Displays the ARP entries for the network interface specified
            by if_addr.
-d          Deletes the host specified by inet_addr. inet_addr may be
            wildcarded with * to delete all hosts.
-s          Adds the host and associates the Internet address inet_addr
            with the Physical address eth_addr. The Physical address is
            given as 6 hexadecimal bytes separated by hyphens. The entry
            is permanent.
eth_addr   Specifies a physical address.
if_addr    If present, this specifies the Internet address of the
            interface whose address translation table should be modified.
            If not present, the first applicable interface will be used.

Example:
> arp -s 157.55.85.212 00-aa-00-62-c6-09 .... Adds a static entry.
> arp -a .... Displays the arp table.
```

9. 其中物理地址为 ff-ff-ff-ff-ff-ff 的两个为广播地址, 物理地址前缀为 01-00-5e 的这五个为组播地址, 物理地址为 c8 -33-e5-8a-5d-45 的为单播地址。

Interface: 100.64.176.202 --- 0x8

Internet Address	Physical Address	Type
100.64.128.1	c8-33-e5-8a-5d-45	dynamic
100.64.147.150	c8-33-e5-8a-5d-45	dynamic
100.64.149.73	c8-33-e5-8a-5d-45	dynamic
100.64.153.167	c8-33-e5-8a-5d-45	dynamic
100.64.170.13	c8-33-e5-8a-5d-45	dynamic
100.64.172.158	c8-33-e5-8a-5d-45	dynamic
100.64.176.34	c8-33-e5-8a-5d-45	dynamic
100.64.176.134	c8-33-e5-8a-5d-45	dynamic
100.64.176.172	c8-33-e5-8a-5d-45	dynamic
100.64.177.125	c8-33-e5-8a-5d-45	dynamic
100.64.177.230	c8-33-e5-8a-5d-45	dynamic
100.64.179.234	c8-33-e5-8a-5d-45	dynamic
100.64.191.255	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
239.255.255.250	01-00-5e-7f-ff-fa	static
255.255.255.255	ff-ff-ff-ff-ff-ff	static

No.	Time	Source	Destination	Protocol	Length	Info
313	5.260015	HuaweiTe_8a:5d:45	IntelCor_al:aa:7c	ARP	56	Who has 100.64.176.202? Tell 100.64.128.1
314	5.260031	IntelCor_al:aa:7c	HuaweiTe_8a:5d:45	ARP	42	100.64.176.202 is at c4:23:60:a1:aa:7c
315	5.302320	183.47.101.54	100.64.176.202	OICQ	393	OICQ Protocol
316	5.302743	100.64.176.202	183.47.101.54	OICQ	97	OICQ Protocol
317	5.307721	20.198.147.210	100.64.176.202	TCP	60	443 → 51457 [ACK] Seq=1 Ack=555 Win=64128 Len=0
318	5.309288	20.198.147.210	100.64.176.202	TLSv1.3	1434	Server Hello, Change Cipher Spec, Application Data
319	5.309288	20.198.147.210	100.64.176.202	TCP	1434	443 → 51457 [PSH, ACK] Seq=1381 Ack=555 Win=64128 Len=1380 [TCP segme...
320	5.309288	20.198.147.210	100.64.176.202	TCP	1390	443 → 51457 [PSH, ACK] Seq=2761 Ack=555 Win=64128 Len=1336 [TCP segme...

> Frame 313: 56 bytes on wire (448 bits), 56 bytes captured (448 bits) on interface  
Ethernet II, Src: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45), Dst: IntelCor\_al:aa:7c (c4:23:60:a1:aa:7c)  
Destination: IntelCor\_al:aa:7c (c4:23:60:a1:aa:7c)  
Address: IntelCor\_al:aa:7c (c4:23:60:a1:aa:7c)  
.....0..... = LG bit: Globally unique address (factory default)  
.....0..... = IG bit: Individual address (unicast)  
Source: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)  
Address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)  
.....0..... = LG bit: Globally unique address (factory default)  
.....0..... = IG bit: Individual address (unicast)  
Type: ARP (0x0806)  
Trailer: 00000000000000000000000000000000  
> Address Resolution Protocol (request)

10. 包含 ARP 请求消息的以太网帧中源和目标地址的十六进制值是什么？

源地址：c8:33:e5:8a:5d:45 目的地址：c4:23:60:a1:aa:7c



313	5.260015	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	ARP	56
314	5.260031	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	ARP	42
315	5.302320	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	393
316	5.302743	IntelCor_a1:aa:7c	HuaweiTe_8a:5d:45	0x0800	97
317	5.307721	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	66
318	5.309288	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	1434
319	5.309288	HuaweiTe_8a:5d:45	IntelCor_a1:aa:7c	0x0800	1434

```
> Frame 313: 56 bytes on wire (448 bits), 56 bytes captured (448 bits) on interface 0
Ethernet II, Src: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45), Dst: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)
  Destination: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)
    Address: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ...0 .... = IG bit: Individual address (unicast)
  Source: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)
    Address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)
      .... ..0. .... = LG bit: Globally unique address (factory default)
      .... ...0 .... = IG bit: Individual address (unicast)
  Type: ARP (0x0806)
  Trailer: 00000000000000000000000000000000
> Address Resolution Protocol (request)
```

## 11. 以太网帧上层协议 16 进制值是什么？

```
Type: ARP (0x0806)
Trailer: 00000000000000000000000000000000
> Address Resolution Protocol (request)
```

0x0806，表示 ARP

## 12. 回答问题：

1) 分析可知一共有 20 个字节

The image shows a Wireshark packet capture of an ARP request. The left pane shows the packet details tree with the following structure:

- Ethernet II, Src: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45), Dst: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)
  - Destination: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)
    - Address: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)
  - Source: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)
    - Address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)
  - Type: ARP (0x0806)
  - Trailer: 00000000000000000000000000000000
- Address Resolution Protocol (request)
  - Hardware type: Ethernet (1)
  - Protocol type: IPv4 (0x0800)
  - Hardware size: 6
  - Protocol size: 4
  - Opcode: request (1)
  - Sender MAC address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)
  - Sender IP address: 100.64.128.1
  - Target MAC address: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)
  - Target IP address: 100.64.176.202

The right pane shows the raw packet data in hexadecimal and ASCII:

```
0000  c4 23 60 a1 aa 7c c8 33 e5 8a 5d 45 08 06 00 01  #'.3..]E...
0010  08 00 06 04 00 01 c8 33 e5 8a 5d 45 64 40 80 01  ....3..]Ed...
0020  c4 23 60 a1 aa 7c 64 40 b0 ca 00 00 00 00 00 00  #'.3..]Ed...
0030  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ....
```

2) 操作码的值：为 1

3) 包含了发送方的 IP 地址信息吗？：包含了

Hardware type: Ethernet (1)

Protocol type: IPv4 (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)

Sender IP address: 100.64.128.1

4) ARP 请求中哪里看出要查询 IP 的以太网地址?

从 TARGET MAC address 和 IP address 可以看出来。

Target MAC address: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)

Target IP address: 100.64.176.202

13.

1) 20 个字节

> Frame 314: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0	0000	c8 33 e5 8a 5d 45 c4 23 60 a1 aa 7c 08 06 00 01	.3..]E.#`... ....
▼ Ethernet II, Src: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c), Dst: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	0010	08 00 06 04 00 02 c4 23 60 a1 aa 7c 64 40 b0 ca	....].#`... d@..
▼ Destination: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	0020	c8 33 e5 8a 5d 45 64 40 80 01	.3..]Ed@ ..
Address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)			
.... ..0. .... = LG bit: Globally unique address (factor 2)			
.... ..0. .... = IG bit: Individual address (unicast)			
▼ Source: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)			
Address: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)			
.... ..0. .... = LG bit: Globally unique address (factor 2)			
.... ..0. .... = IG bit: Individual address (unicast)			
Type: ARP (0x0806)			
▼ Address Resolution Protocol (reply)			
Hardware type: Ethernet (1)			
Protocol type: IPv4 (0x0800)			
Hardware size: 6			
Protocol size: 4			
Opcode: reply (2)			
Sender MAC address: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)			
Sender IP address: 100.64.176.202			
Target MAC address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)			
Target IP address: 100.64.128.1			

2) 操作码的值：为 2

3)

Opcode: reply (2)

Sender MAC address: IntelCor\_a1:aa:7c (c4:23:60:a1:aa:7c)

Sender IP address: 100.64.176.202

Target MAC address: HuaweiTe\_8a:5d:45 (c8:33:e5:8a:5d:45)

Target IP address: 100.64.128.1

14. 源地址: c4:23:60:a1:aa:7c 目的地址: c8:33:e5:8a:5d:45

▼ Destination: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	
Address: HuaweiTe_8a:5d:45 (c8:33:e5:8a:5d:45)	
.... ..0. .... = LG bit: Globally unique address (factor 2)	
.... ..0. .... = IG bit: Individual address (unicast)	
▼ Source: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	
Address: IntelCor_a1:aa:7c (c4:23:60:a1:aa:7c)	
.... ..0. .... = LG bit: Globally unique address (factor 2)	
.... ..0. .... = IG bit: Individual address (unicast)	
Type: ARP (0x0806)	

15. 因为 ARP 查询分组是在广播帧中发送的，而响应分组是单播。

EXTRA1

会导致本地主机无法与该 IP 地址对应的节点建立连接

EXTRA2

```
C:\Users\CindyWu>netsh interface ipv4 show interfaces
```

Idx	Met	MTU	State	Name
8	35	1500	connected	WLAN
1	75	4294967295	connected	Loopback Pseudo-Interface 1
17	65	1500	disconnected	蓝牙网络连接
6	25	1500	disconnected	本地连接* 3
4	25	1500	disconnected	本地连接* 4

```
C:\Users\CindyWu>netsh interface ipv4 show interface 8
```

#### Interface WLAN Parameters

```
-----  
IfLuid                      : wireless_32768  
IfIndex                     : 8  
State                       : connected  
Metric                      : 35  
Link MTU                    : 1500 bytes  
Reachable Time              : 31500 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
```

Basic reachable time 为 30000ms, 所求为 30000ms