Computer & Network Security I Homework1

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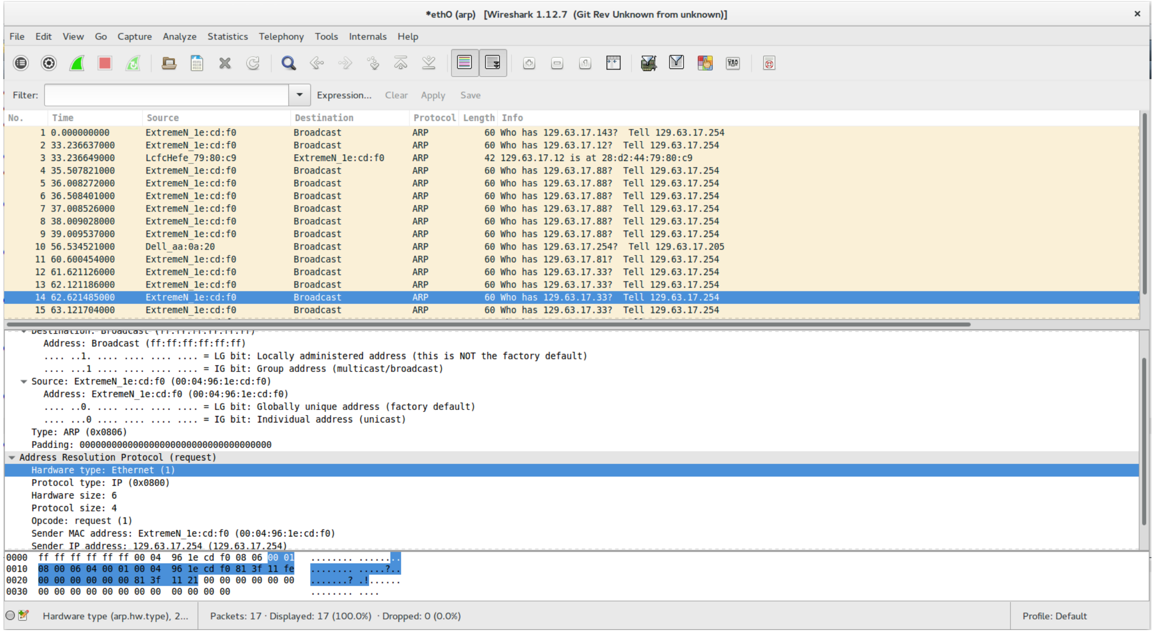
1 1.5

The captured figure is as follows:



*eth0 (arp) [Wireshark 1.12.7 (Git Rev Unknown from unknown)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter:
Expression... Clear Apply Save
Profile: Default

```
No.   Time          Source             Destination        Protocol Length Info
    1 0.000000000   ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.143?  Tell 129.63.17.254
    2 33.236637000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.12?  Tell 129.63.17.254
    3 33.236649000  LcfcHefe_79:80:c9  ExtremeN_1e:cd:f0  ARP          42 129.63.17.12 is at 28:d2:44:79:80:c9
    4 35.507821000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
    5 36.008272000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
    6 36.508401000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
    7 37.008526000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
    8 38.009028000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
    9 39.009537000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.88?  Tell 129.63.17.254
   10 56.534521000  Dell_aa:0a:20      Broadcast          ARP          60 Who has 129.63.17.254?  Tell 129.63.17.205
   11 60.600454000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.81?  Tell 129.63.17.254
   12 61.621126000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.33?  Tell 129.63.17.254
   13 62.121186000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.33?  Tell 129.63.17.254
   14 62.621485000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.33?  Tell 129.63.17.254
   15 63.121704000  ExtremeN_1e:cd:f0  Broadcast          ARP          60 Who has 129.63.17.33?  Tell 129.63.17.254
```

```
  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: ExtremeN_1e:cd:f0 (00:04:96:1e:cd:f0)
    Address: ExtremeN_1e:cd:f0 (00:04:96:1e:cd:f0)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Type: ARP (0x0806)
  Padding: 000000000000000000000000000000000000
Address Resolution Protocol (request)
  Hardware type: Ethernet (1)
  Protocol type: IP (0x0800)
  Hardware size: 6
  Protocol size: 4
  Opcode: request (1)
  Sender MAC address: ExtremeN_1e:cd:f0 (00:04:96:1e:cd:f0)
  Sender IP address: 129.63.17.254 (129.63.17.254)
```

```
0000  ff ff ff ff ff ff 00 04  96 1e cd f0 08 06 00 01   ........ ........
0010  08 00 06 04 00 01 00 04  96 1e cd f0 81 3f 11 fe   ........ .....?..
0020  00 00 00 00 00 00 81 3f  11 21 00 00 00 00 00 00   .......? .!......
0030  00 00 00 00 00 00 00 00  00 00 00 00               ........ ....
```

Hardware type (arp.hw.type), 2... Packets: 17 · Displayed: 17 (100.0%) · Dropped: 0 (0.0%)

As we could see from the upper window in the figure, the ARP packages are all broadcast from the local machine with fixed MAC Address, and the length is also 60 bytes. In the 'Info' field, it asked the query about 'who has 129.63.17.XXX', that is destination IP address, which we want to query for its actual MAC address.

In the middle window, there are detailed headers of the ARP packages, we can see some detailed information, for example, protocol type is 'IP', Sender MAC address is '00:04:96:1e:cd:f0', Sender IP address is '129.63.17.254', Target

MAC address are all zero, because that's what we want to query using ARP, and destination IP address is '129.63.17.33', that's the target MAC's IP address. We can also see other useful information in the package headers.

In the lower window of the figure, that is the hexadecimal format of the ARP package, we can correspond the header information in the specific location of this value.

As we only capture the ARP package from the steps, we can only see the ARP packages. When we use browser to visit some website, it sets up TCP/IP connections to the remote server, and finally get to know the server's IP address. But when it cannot find the target MAC address in ARP cache, it will start the ARP query and broadcast to local network iteratively, after the target machine receives the query and return its MAC address, it will be finally passed to the source machine and then the query is finished.

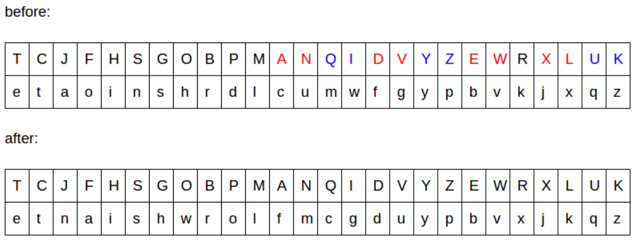
2 1.7

2.1 1.7.a

```
char = A, count = 10, frequency  = 2.717391
char = B, count = 16, frequency  = 4.347826
char = C, count = 40, frequency  = 10.869565
char = D, count = 8, frequency  = 2.173913
char = E, count = 4, frequency  = 1.086957
char = F, count = 27, frequency  = 7.336957
char = G, count = 22, frequency  = 5.978261
char = H, count = 26, frequency  = 7.065217
char = I, count = 9, frequency  = 2.445652
char = J, count = 29, frequency  = 7.880435
char = K, count = 0, frequency  = 0.000000
char = L, count = 2, frequency  = 0.543478
char = M, count = 12, frequency  = 3.260870
char = N, count = 10, frequency  = 2.717391
char = O, count = 20, frequency  = 5.434783
char = P, count = 15, frequency  = 4.076087
char = Q, count = 9, frequency  = 2.445652
char = R, count = 3, frequency  = 0.815217
char = S, count = 23, frequency  = 6.250000
char = T, count = 57, frequency  = 15.489130
char = U, count = 0, frequency  = 0.000000
char = V, count = 8, frequency  = 2.173913
char = W, count = 4, frequency  = 1.086957
char = X, count = 2, frequency  = 0.543478
char = Y, count = 6, frequency  = 1.630435
char = Z, count = 6, frequency  = 1.630435
```

2.2 1.7.b

By sorting the frequence using decreasing order, we can get some corresponding relation between the two sequence, as the following figure shows



before:

T	C	J	F	H	S	G	O	B	P	M	A	N	Q	I	D	V	Y	Z	E	W	R	X	L	U	K
e	t	a	o	i	n	s	h	r	d	l	c	u	m	w	f	g	y	p	b	v	k	j	x	q	z

after:

T	C	J	F	H	S	G	O	B	P	M	A	N	Q	I	D	V	Y	Z	E	W	R	X	L	U	K
e	t	n	a	i	s	h	w	r	o	l	f	m	c	g	d	u	y	p	b	v	x	j	k	q	z

However, some order is not correct, as our sequence is not ideal and my disrupted by frequency, so we need to manually build the relation and exclude some wrong relation, as the after shows.

After I build the relation, the new translated plain text is here as follows: **Methods of making messages unintelligible to adversaries have been necessary. Substitution is the simplest method that replaces a character in the plain text with a fixed different character in the cipher text. This methods preservers the letter frequency in the plain text and so one can search for the plain text from a given cipher text by comparing the frequency of each letter against the know common frequency in the underlying language.**

3 1.13

4 1.29

5 1.37