

Ran Xia Lab 06

```
Command Prompt

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . :

Wireless LAN adapter Local Area Connection* 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . :

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . : hcd1.wa.comcast.net
IPv6 Address. . . . . : 2601:5cc:c700:2f30::91db
IPv6 Address. . . . . : 2601:5cc:c700:2f30:7941:2cc9:58e4:80a0
Temporary IPv6 Address. . . . : 2601:5cc:c700:2f30:188f:5c10:77d8:76d6
Link-local IPv6 Address . . . . : fe80::7941:2cc9:58e4:80a0%10
IPv4 Address. . . . . : 10.0.0.13
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::62ff:fe7f:cf9d%10
                          10.0.0.1

Ethernet adapter Bluetooth Network Connection 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . :

C:\Users\xia_r>
```

My IP is 10.0.0.13

1. What is the MAC address from your computer?

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

No. Time Source Destination Protocol Length Info
+---+
77 22:05:53.472049 10.0.0.13 128.119.245.12 HTTP 536 GET /wireshark-labs/HTTP-ethereal-lab-files.html HTTP/1.1
86 22:05:53.511250 128.119.245.12 10.0.0.13 HTTP 535 HTTP/1.1 200 OK (text/html)
88 22:05:53.846069 10.0.0.13 128.119.245.12 HTTP 474 GET /favicon.ico HTTP/1.1
89 22:05:53.877579 128.119.245.12 10.0.0.13 HTTP 538 HTTP/1.1 404 Not Found (text/html)

[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:tcp:http]
[Coloring Rule Name: HTTP]
[Coloring Rule String: http || tcp.port == 80 || http2]
Ethernet II, Src: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8), Dst: Intel_80:00:00 (00:50:f1:80:00:00)
  Destination: Intel_80:00:00 (00:50:f1:80:00:00)
    Address: Intel_80:00:00 (00:50:f1:80:00:00)
      ...0. .... = LG bit: Globally unique address (factory default)
      ...0. .... = IG bit: Individual address (unicast)
    Source: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
      Address: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
      ...1. .... = LG bit: Locally administered address (this is NOT the factory default)
      ...0. .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
  > Internet Protocol Version 4, Src: 10.0.0.13, Dst: 128.119.245.12
  > Transmission Control Protocol, Src Port: 49187, Dst Port: 80, Seq: 1, Ack: 1, Len: 482
  > Hypertext Transfer Protocol

0000 00 50 f1 80 00 00 9e 43 a0 a9 83 e8 08 00 45 00 :P...C.....E-
0010 02 0a 4e 0a 40 00 80 06 2b 53 0a 00 00 0d 80 77 :..N@...+S...w
0020 f5 0c c0 23 00 50 14 60 f6 d2 20 85 71 47 50 18 :..#P...gGP
0030 01 00 e0 ea 00 00 47 45 54 30 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

Packets: 115 - Displayed: 4 (3.5%) - Dropped: 0 (0.0%)
Profile: Default
```

```
Select Command Prompt

DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #3
Physical Address. . . . . : 46-03-2C-5E-9F-34
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . : hsd1.va.comcast.net
Description . . . . . : Intel(R) Dual Band Wireless-AC 8265
Physical Address. . . . . : 9E-43-A0-A9-83-E8
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : 2601:5cc:c700:2f30::91db(Preferred)
Lease Obtained. . . . . : Friday, March 29, 2019 9:49:50 PM
Lease Expires . . . . . : Friday, April 5, 2019 9:49:50 PM
IPv6 Address. . . . . : 2601:5cc:c700:2f30:7941:2cc9:58e4:80a0(Preferred)
Temporary IPv6 Address. . . . . : 2601:5cc:c700:2f30:f8af:5cf0:77da:76d6(Preferred)
Link-Local IPv6 Address . . . . . : fe80::7941:2cc9:58e4:80a0%10(Preferred)
IPv4 Address. . . . . : 10.0.0.13(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Thursday, March 28, 2019 10:29:50 PM
Lease Expires . . . . . : Friday, April 5, 2019 9:49:40 PM
Default Gateway . . . . . : fe80::582c:62ff:fe7f:c9d3%10
DHCP Server . . . . . : 10.0.0.1
DHCPv6 IAID . . . . . : 178144160
DHCPv6 Client DUID. . . . . : 00-03-00-01-9E-43-A0-A9-83-E8
DNS Servers . . . . . : 2001:558:feed::1
                        2001:558:feed::2
                        75.75.75.75
                        75.75.76.76
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Bluetooth Network Connection 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Bluetooth Device (Personal Area Network) #2
Physical Address. . . . . : 44-03-2C-5E-9F-38
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

C:\Users\xia r>
```

As shown in both Wireshark and cmd, my Mac address is 9E – 43 – A0 – A9 – 83 – E8.

2. What is the destination MAC address?

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

http
No. Time Source Destination Protocol Length Info
77 22:05:53.472049 10.0.0.13 128.119.245.12 HTTP 536 GET /wireshark-labs/HTTP-ethereal-lab-file3.html HTTP/1.1
86 22:05:53.511215 128.119.245.12 10.0.0.13 HTTP 335 HTTP/1.1 200 OK (text/html)
88 22:05:53.846069 10.0.0.13 128.119.245.12 HTTP 474 GET /favicon.ico HTTP/1.1
89 22:05:53.877579 128.119.245.12 10.0.0.13 HTTP 538 HTTP/1.1 404 Not Found (text/html)

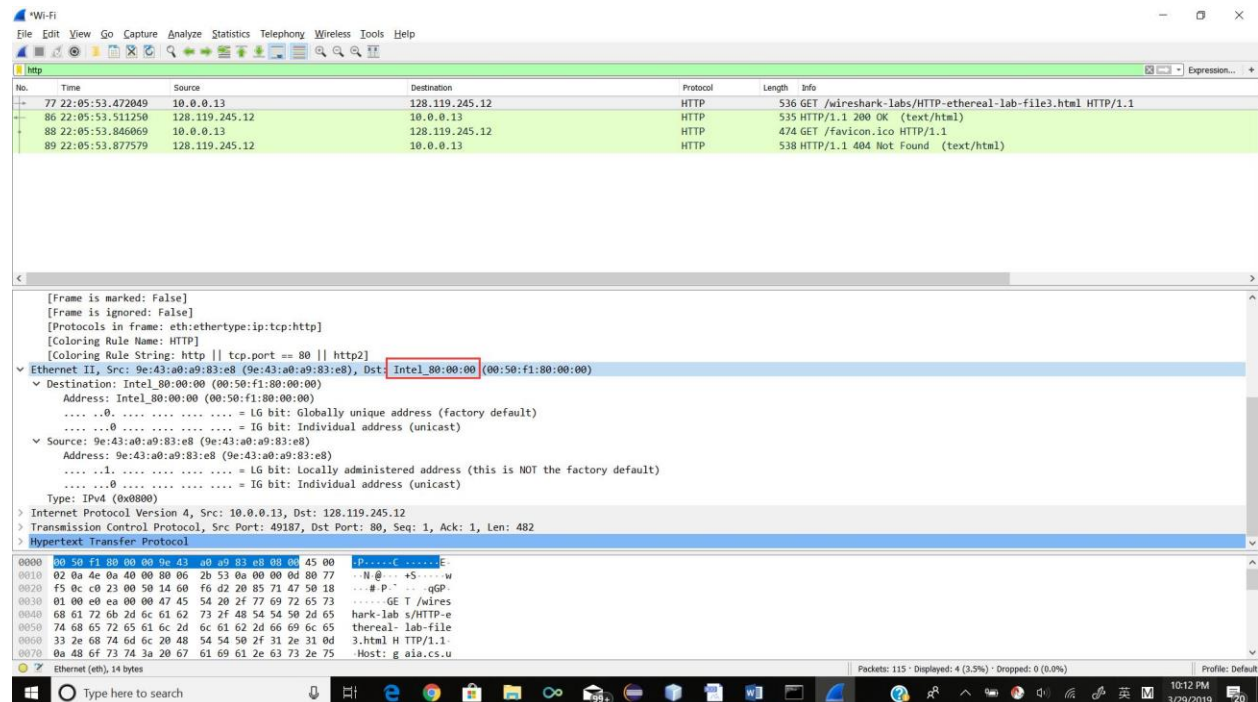
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:tcp:http]
[Coloring Rule Name: HTTP]
[Coloring Rule String: http || tcp.port == 80 || http2]
Ethernet II, Src: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8), Dst: Intel_80:00:00:00:50:f1:80:00:00
  Destination: Intel_80:00:00:00:50:f1:80:00:00
    Address: Intel_80:00:00:00:50:f1:80:00:00
      ..0. .... = LG bit: Globally unique address (factory default)
      ....0 .... = IG bit: Individual address (unicast)
  Source: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
    Address: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
      ..1. .... = LG bit: Locally administered address (this is NOT the factory default)
      ....0 .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
  Internet Protocol Version 4, Src: 10.0.0.13, Dst: 128.119.245.12
  Transmission Control Protocol, Src Port: 49187, Dst Port: 80, Seq: 1, Ack: 1, Len: 482
  Hypertext Transfer Protocol

0000 00 50 f1 80 00 00 50 43 a0 a9 83 e8 08 00 45 00 :P...C.....E-
0010 02 0a 4e 0a 40 00 80 06 2b 53 0a 00 0d 80 77 :..N@...+S....w
0020 f5 0c c0 23 00 50 14 60 f6 d2 20 85 71 47 50 18 :...#P...qGP...
0030 01 00 e0 ea 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 50 2d 65 :hark-lab s/HTT-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 2d 48 54 50 2f 31 2e 31 0d :3.html H TTP/1.1
0070 0a 48 6f 73 74 3a 2d 67 61 69 61 2e 63 73 2e 75 :-Host: g aia.cs.u

wireshark_87ECFD9-CA2E-4423-8880-ESC87989374_20190329220550_a17772.pcapng
```

Destination MAC address is 00: 50: F1: 80: 00: 00.

3. What device has the MAC address shown in the destination?



An Intel device is used. Wireshark capture result matches the searching result from an online MAC lookup website(<https://aruljohn.com/mac/0050F1800000>).

4. Explain the relationship between the destination MAC address and the destination IP address.

With in the same subnet, MAC addresses and IP addresses are mapped via ARP (Address Resolution Protocol) table. When a host doesn't have the paired MAC and IP existing in current ARP table, it broadcasts ARP query packets to all connected devices and the one with the matching IP will sent the host an ARP respond packet with its MAC address.

In this lab, however, the captured HTTP get message shows my gateway's MAC address as destination MAC address and server's IP address as destination address. This is because the packet is transmitted between different subnets. When this happens, as IP is used by routing algorithms to determine the path at network layer, MAC address is used to transfer the frame to connected device at link layer. When datagram arrives at a router, the router regenerates a new frame that encapsulates the datagram with a new destination MAC address. Eventually, the destination MAC address will directly relate to destination IP when datagram gets to the last subnet where the server is.

So even the host does not know the MAC address of the server in a different subnet, it can still send the message to it. And MAC address and ARP come into play when message is transferred between hops.

5. Using the terminal (cmd in Windows, Terminal in mac), run a command to display your full ARP list table. (Find out what the command is, and print a full screen shot of your result.)

```
Select Command Prompt

Lease Expires . . . . . : Friday, April 5, 2019 9:49:50 PM
IPv6 Address. . . . . : 2601:5cc:c700:2f30:7941:2cc9:58e4:80a0(Preferred)
Temporary IPv6 Address. . . . . : 2601:5cc:c700:2f30:f8af:5cf0:77da:76d6(Preferred)
Link-local IPv6 Address . . . . . : fe80::7941:2cc9:58e4:80a0%10(Preferred)
IPv4 Address. . . . . : 10.0.0.13(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Thursday, March 28, 2019 10:29:50 PM
Lease Expires . . . . . : Friday, April 5, 2019 9:49:40 PM
Default Gateway . . . . . : fe80::582c:62ff:fe7f:cf9d%10
                        10.0.0.1
DHCP Server . . . . . : 10.0.0.1
DHCPv6 IAID . . . . . : 178144160
DHCPv6 Client DUID. . . . . : 00-03-00-01-9E-43-A0-A0-83-E8
DNS Servers . . . . . : 2001:558:feed::1
                        2001:558:feed::2
                        75.75.75.75
                        75.75.75.75
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Bluetooth Network Connection 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : 
Description . . . . . : Bluetooth Device (Personal Area Network) #2
Physical Address. . . . . : 44-03-2C-5E-9F-38
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

C:\Users\xia_r>arp -a

Interface: 10.0.0.13 --- 0xa
Internet Address      Physical Address      Type
10.0.0.1              00-50-f1-80-00-00    dynamic
10.0.0.255            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
239.11.28.1           01-00-5e-0b-1d-01    static
239.255.255.250       01-00-5e-7f-ff-fa    static
255.255.255.255       ff-ff-ff-ff-ff-ff    static

C:\Users\xia_r>
```

Command used to find ARP table in windows OS: arp -a

```

No.      Time      Source      Destination      Protocol Length Info
 86 22:05:53.511250 128.119.245.12 10.0.0.13      HTTP      535      HTTP/1.1 200 OK (text/html)
Frame 86: 535 bytes on wire (4280 bits), 535 bytes captured (4280 bits) on interface 0
Interface id: 0 (\Device\NPF_{87ECDFD9-CA2E-4423-8880-E5CB87989374})
Interface name: \Device\NPF_{87ECDFD9-CA2E-4423-8880-E5CB87989374}
Encapsulation type: Ethernet (1)
Arrival Time: Mar 29, 2019 22:05:53.511250000 Eastern Daylight Time
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1553911553.511250000 seconds
[Time delta from previous captured frame: 0.000392000 seconds]
[Time delta from previous displayed frame: 0.039201000 seconds]
[Time since reference or first frame: 3.389371000 seconds]
Frame Number: 86
Frame Length: 535 bytes (4280 bits)
Capture Length: 535 bytes (4280 bits)
[Frame is marked: True]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:tcp:http:data-text-lines]
[Coloring Rule Name: HTTP]
[Coloring Rule String: http || tcp.port == 80 || http2]
Ethernet II, Src: Intel_80:00:00 (00:50:f1:80:00:00), Dst: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
Destination: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
Address: 9e:43:a0:a9:83:e8 (9e:43:a0:a9:83:e8)
.... 1. .... = LG bit: Locally administered address (this is NOT the factory default)
.... 0 .... = IG bit: Individual address (unicast)
Source: Intel_80:00:00 (00:50:f1:80:00:00)
Address: Intel_80:00:00 (00:50:f1:80:00:00)
.... 0 .... = LG bit: Globally unique address (factory default)
.... 0 .... = IG bit: Individual address (unicast)
Type: IPv4 (0x0800)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.0.13
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
0000 00.. = Differentiated Services Codepoint: Default (0)
.... 00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
Total Length: 521
Identification: 0xfb09 (64265)
Flags: 0x4000, Don't fragment
0... .... = Reserved bit: Not set
.1.. .... = Don't fragment: Set
..0. .... = More fragments: Not set
...0 0000 0000 0000 = Fragment offset: 0
Time to live: 47
Protocol: TCP (6)
Header checksum: 0xcf54 [validation disabled]
[Header checksum status: Unverified]
Source: 128.119.245.12
Destination: 10.0.0.13
Transmission Control Protocol, Src Port: 80, Dst Port: 49187, Seq: 4381, Ack: 483, Len: 481
Source Port: 80
Destination Port: 49187
[Stream index: 17]
[TCP Segment Len: 481]
Sequence number: 4381 (relative sequence number)
[Next sequence number: 4862 (relative sequence number)]
Acknowledgment number: 483 (relative ack number)
0101 .... = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
000. .... = Reserved: Not set
...0 .... = Nonce: Not set
.... 0... = Congestion Window Reduced (CWR): Not set
.... 0... = ECN-Echo: Not set
.... ..0. = Urgent: Not set
.... ...1 = Acknowledgment: Set
.... .... 1... = Push: Set
.... .... 0... = Reset: Not set
.... .... ..0. = Syn: Not set
.... .... ...0 = Fin: Not set
[TCP Flags: .....AP...]
Window size value: 237
[Calculated window size: 30336]
[Window size scaling factor: 128]
Checksum: 0xa21b [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
[SEQ/ACK analysis]
[iRTT: 0.032697000 seconds]
[Bytes in flight: 1941]
[Bytes sent since last PSH flag: 4861]
[Timestamps]
[Time since first frame in this TCP stream: 0.072299000 seconds]
[Time since previous frame in this TCP stream: 0.000392000 seconds]
TCP payload (481 bytes)
TCP segment data (481 bytes)
[4 Reassembled TCP Segments (481 bytes): #82(1460), #83(1460), #85(1460), #86(481)]
[Frame: 82, payload: 0-1459 (1460 bytes)]

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[Frame: 83, payload: 1460-2919 (1460 bytes)]
[Frame: 85, payload: 2920-4379 (1460 bytes)]
[Frame: 86, payload: 4380-4860 (481 bytes)]
[Segment count: 4]
[Reassembled TCP length: 4861]
[Reassembled TCP Data: 485454502f312e3120323030204f4b0d0a446174653a2053...]
Hypertext Transfer Protocol
HTTP/1.1 200 OK\r\n
  [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
  [HTTP/1.1 200 OK\r\n]
  [Severity level: Chat]
  [Group: Sequence]
Response Version: HTTP/1.1
Status Code: 200
[Status Code Description: OK]
Response Phrase: OK
Date: Sat, 30 Mar 2019 02:05:51 GMT\r\n
Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/5.4.16 mod_perl/2.0.10 Perl/v5.16.3\r\n
Last-Modified: Fri, 29 Mar 2019 05:59:02 GMT\r\n
ETag: "1194-585355e1a4cef"\r\n
Accept-Ranges: bytes\r\n
Content-Length: 4500\r\n
  [Content length: 4500]
Keep-Alive: timeout=5, max=100\r\n
Connection: Keep-Alive\r\n
Content-Type: text/html; charset=UTF-8\r\n
\r\n
[HTTP response 1/2]
[Time since request: 0.039201000 seconds]
[Request in frame: 77]
[Next request in frame: 88]
[Next response in frame: 89]
File Data: 4500 bytes
Line-based text data: text/html (98 lines)
<html><head> \n
<title>Historical Documents:THE BILL OF RIGHTS</title></head>\n
\n
\n
<body bgcolor="#ffffff" link="#330000" vlink="#666633">\n
<p><br>\n
</p>\n
<p></p><center><b>THE BILL OF RIGHTS</b><br>\n
  <em>Amendments 1-10 of the Constitution</em>\n
</center>\n
\n
<p></p><p>The Conventions of a number of the States having, at the time of adopting\n
the Constitution, expressed a desire, in order to prevent misconstruction\n
or abuse of its powers, that further declaratory and restrictive clauses\n
should be added, and as extending the ground of public confidence in the\n
Government will best insure the beneficent ends of its institution; </p><p> Resolved, by the Senate and House of Representatives of the
United\n
States of America, in Congress assembled, two-thirds of both Houses concurring,\n
that the following articles be proposed to the Legislatures of the several\n
States, as amendments to the Constitution of the United States; all or any\n
of which articles, when ratified by three-fourths of the said Legislatures,\n
to be valid to all intents and purposes as part of the said Constitution,\n
namely: </p><p><a name="1"><strong><h3>Amendment I</h3></strong></a>\n
\n
<p></p><p><p>Congress shall make no law respecting an establishment of\n
religion, or prohibiting the free exercise thereof; or\n
abridging the freedom of speech, or of the press; or the\n
right of the people peaceably to assemble, and to petition\n
the government for a redress of grievances.\n
\n
\n
</p><p><a name="2"><strong><h3>Amendment II</h3></strong></a>\n
\n
<p></p><p><p>A well regulated militia, being necessary to the security\n
of a free state, the right of the people to keep and bear\n
arms, shall not be infringed.\n
\n
\n
</p><p><a name="3"><strong><h3>Amendment III</h3></strong></a>\n
\n
<p></p><p><p>No soldier shall, in time of peace be quartered in any house,\n
without the consent of the owner, nor in time of war, but\n
in a manner to be prescribed by law.\n
\n
\n
</p><p><a name="4"><strong><h3>Amendment IV</h3></strong></a>\n
\n
<p></p><p><p>The right of the people to be secure in their persons, houses,\n
papers, and effects, against unreasonable searches and seizures,\n
shall not be violated, and no warrants shall issue, but upon\n
probable cause, supported by oath or affirmation, and\n
particularly describing the place to be searched, and the\n
persons or things to be seized.\n
\n
\n
</p><p><a name="5"><strong><h3>Amendment V</h3></strong></a>\n
\n
\n
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<p></p><p>No person shall be held to answer for a capital, or otherwise\ninfamous crime, unless on a presentment or indictment of a grand\njury, except in cases arising in the land or naval forces,\nor in the militia, when in actual service in time of war\nor public danger; nor shall any person be subject for the\nsame offense to be twice put in jeopardy of life or limb;\nnor shall be compelled in any criminal case to be a witness\nagainst himself, nor be deprived of life, liberty, or property,\nwithout due process of law; nor shall private property be\ntaken for public use, without just compensation.\n\n</p><p><h3>Amendment VI</h3>\n\n<p></p><p>In all criminal prosecutions, the accused shall enjoy the right\n to a speedy and public trial, by an impartial jury of the state\n and district wherein the crime shall have been committed, which\ndistrict shall have been previously ascertained by law, and\n to be informed of the nature and cause of the accusation;\n to be confronted with the witnesses against him; to have\n compulsory process for obtaining witnesses in his favor,\n and to have the assistance of counsel for his defense.\n\n</p><p><h3>Amendment VII</h3>\n\n<p></p><p>In suits at common law, where the value in controversy shall\n exceed twenty dollars, the right of trial by jury shall be\n preserved, and no fact tried by a jury, shall be otherwise\n reexamined in any court of the United States, than according\n to the rules of the common law.\n\n</p><p><h3>Amendment VIII</h3>\n\n<p></p><p>Excessive bail shall not be required, nor excessive fines\n imposed, nor cruel and unusual punishments inflicted.\n\n</p><p><h3>Amendment IX</h3>\n\n<p></p><p>The enumeration in the Constitution, of certain rights, shall\n not be construed to deny or disparage others retained by the people.\n\n</p><p><h3>Amendment X</h3>\n\n<p></p>\n<p>The powers not delegated to the United States by the Constitution, nor prohibited \n by it to the states, are reserved to the states respectively, or to the people.</p>\n</body></html>