

True/False

1.

<http://albert-oma.blogspot.tw/2013/01/nat.html>

False, NAT enables many devices to share one public IP address.

2.

<https://serverfault.com/questions/57878/how-many-valid-nat-mappings-can-a-common-nat-support/57903>

False. Every internal ip:port pair is mapped to an external ip:port pair. An NAT server can only hold its max available port.

3.

http://linux.vbird.org/linux_server/0110network_basic.php

True, every device has its own unique IP address, or it will fail to transmit information to the right device. So a device can only have one IP address at the same time.

4.

<http://www.eltoro.com/how-long-does-an-ip-address-stay-attached-to-a-home-or-business/>

False, the IP address assigned by DHCP is dynamic IP address, so it can change.

5.

[https://en.wikipedia.org/wiki/Gateway_\(telecommunications\)](https://en.wikipedia.org/wiki/Gateway_(telecommunications))

False, only if the device connects to the destination outside the LAN will it pass the gateway.

6.

https://en.wikipedia.org/wiki/MAC_address

True. Every end device has its unique MAC address and it helps to judge whether itself is the recipient of a packet .

7.

<https://dyn.com/blog/dns-why-its-important-how-it-works/>

False, if the information is not stored locally, computer queries recursive DNS servers. If the recursive servers don't have the answer, they query the root name servers. It will not immediately fail.

8.

https://www.google.com.tw/search?ei=uciKWuWYClu00AS5saDQBA&q=vpn+without+encryption&oq=vpn+with+no+&gs_l=psy-ab.1.5.0l5j0i10k1l3j0.39063.67650.0.73086.26.20.5.1.1.0.167.1554.15j4.19.0....0...1c.1j4.64.psy-ab..1.20.1204...0i67k1j0i7i30k1j0i7i10i30k1j33i160k1j0i10i67k1.0.uU0MJH2UYsY

True, there are some variants of VPN do not encrypt the traffic or you can simply turn off the encryption function.

9.

https://en.wikipedia.org/wiki/Wired_Equivalent_Privacy#Weak_security

https://en.wikipedia.org/wiki/Wi-Fi_Protected_Access

False, WEP has many security issues and it is weak and unsafe. WPA is in the intermediate security level. WPA2 is the strongest among the three. So we should choose which to use with concern of security issues.

10.

https://en.wikipedia.org/wiki/Denial-of-service_attack

https://en.wikipedia.org/wiki/TCP_reset_attack

False, TCP reset attacks is to tamper and terminate the Internet connection by sending forged TCP reset packet. DoS attack seeks to make a machine or network resource unavailable to users by flooding the targeted machine or resource with superfluous requests in an attempt to overload systems. So the concepts of the two attacks are different.

Select All that Apply

1.

https://en.wikipedia.org/wiki/Network_layer

https://en.wikipedia.org/wiki/Data_link_layer

https://en.wikipedia.org/wiki/Application_layer

(b)(e) are not in the Network Layer (b)is in Application Layer; (e)is in Data Link Layer.

2.

http://linux.vbird.org/linux_server/0110network_basic.php

Netmask (11111111,11111111,11110000,00000000) -> (255.255.240.0)

(12.34.56.78) AND (255.255.240.0) -> (12.34.48.0)

(a) (12.34.56.123) AND (255.255.240.0) -> (12.34.48.0)

(b) (12.34.63.78) AND (255.255.240.0) -> (12.34.48.0)

(c) (12.34.48.0) AND (255.255.240.0) -> (12.34.48.0)

(d) (12.35.56.78) AND (255.255.240.0) -> (12.35.48.0)

(e) (13.34.56.78) AND (255.255.240.0) -> (13.34.48.0)

(a)(b)(c) are in the same subnet with 12.34.56.78/20.

3.

https://www.arin.net/knowledge/address_filters.html

IPv4 private subnet:

10.0.0.0/8 IP addresses: 10.0.0.0 -- 10.255.255.255

172.16.0.0/12 IP addresses: 172.16.0.0 -- 172.31.255.255

192.168.0.0/16 IP addresses: 192.168.0.0 -- 192.168.255.255

(a)(d)(e) are valid IPv4 private subnet

Short Answer Questions

1.

<https://www.telus.com/en/bc/support/article/dualband-wifi-networks>

- (1) 5GHz offers more bandwidth than 2.4GHz.
- (2) 5GHz offers less interference than 2.4GHz.
- (3) 5GHz covers shorter range, while 2.4GHz covers larger distance.

2.

<https://www.sparklabs.com/viscosity/introtovpn/>

- (1) Hide your IP address and location.
- (2) Encrypt your communications.
- (3) Access your Workplace Remotely

3.

http://linux.vbird.org/linux_server/0110network_basic.php

- (1). Enter an URL into the address bar.
- (2). The browser checks the cache for a DNS record to find IP address.
- (3). Browser initiates a TCP connection with the server.
- (4). The browser sends request through TCP connection.
- (5). The server handles the request and sends back a response.
- (6). The server sends out response.
- (7). The browser displays the webpage.

4.

the computing power of suuuuuupercomputer is 10^{20} flop. The number of flops required per combination check is 1000. So we can do $10^{20}/10^3 = 10^{17}$ checks per second. It takes $2^{128}/10^{17} = 3402823669209384634633.74607431768211456$ seconds = $3402823669209384634633.74607431768211456 / (60*60*24*365) = 107902830708060.14188970529154990113$ years to brute force an AES-128 key

Basic Command Line Utilities

1.

<http://www.pczone.com.tw/vbb3/archive/t-119057.html>

- (a) ping www.ntu.edu.tw → 140.112.8.116
- (b) ping csie.ntu.edu.tw → 140.112.30.28
- (c) ping linux1.csie.ntu.edu.tw → 140.112.30.32

2.

<https://www.wikihow.com/Traceroute>

sign in workstation linux1

traceroute google.com

```
b06902104@linux1 [~] traceroute google.com
traceroute to google.com (216.58.200.46), 30 hops max, 60 byte packets
 1  10.254.254.254 (10.254.254.254)  0.508 ms  1.806 ms  2.038 ms
 2  140.112.149.121 (140.112.149.121)  0.566 ms  0.630 ms  0.688 ms
 3  * * *
 4  140.112.0.190 (140.112.0.190)  0.677 ms  1.253 ms  1.311 ms
 5  140.112.0.198 (140.112.0.198)  0.925 ms  1.017 ms  1.080 ms
 6  140.112.0.34 (140.112.0.34)  1.402 ms  1.052 ms  1.143 ms
 7  72.14.204.212 (72.14.204.212)  1.938 ms  1.677 ms  1.797 ms
 8  108.170.244.65 (108.170.244.65)  1.626 ms  108.170.244.33 (108.170.244.33)  2.053 ms  1.951 ms
 9  209.85.245.253 (209.85.245.253)  1.682 ms  1.750 ms  209.85.245.255 (209.85.245.255)  1.813 ms
10  tsa01s08-in-f14.1e100.net (216.58.200.46)  2.156 ms  2.215 ms  2.320 ms
```

3.

<https://superuser.com/questions/399709/how-to-find-the-gateway-used-for-routing>

(a) ip route get 8.8.8.8 -> 140.112.30.254

(b) ip route get 10.217.44.3 -> it doesn't have to pass gateway

(c) ping linux2.csie.ntu.edu.tw, to get its IP address -> 140.112.30.33

ip route get 140.112.30.33 -> it doesn't have to pass gateway

```
b06902104@linux1 [~] ip route get 8.8.8.8
8.8.8.8 via 140.112.30.254 dev net0 src 140.112.30.32 uid 67864
cache
b06902104@linux1 [~] ip route get 10.217.44.3
10.217.44.3 dev net1 src 10.217.44.32 uid 67864
cache
b06902104@linux1 [~] ip route get 140.112.30.33
140.112.30.33 dev net0 src 140.112.30.32 uid 67864
cache
```

4.

<https://www.cyberciti.biz/faq/linux-list-network-interfaces-names-command/>

/sbin/ifconfig -a

lo : 127.0.0.1; net0 : 140.112.30.32; net1 : 10.217.44.32;

```
b06902104@linux1 [~] /sbin/ifconfig -a
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 485769 bytes 3211010203 (2.9 GiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 485769 bytes 3211010203 (2.9 GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

net0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 140.112.30.32 netmask 255.255.255.0 broadcast 140.112.30.255
    inet6 fe80::9af2:b3ff:feee:aa52 prefixlen 64 scopeid 0x20<link>
    ether 98:f2:b3:ee:aa:52 txqueuelen 1000 (Ethernet)
    RX packets 508408792 bytes 472670304501 (440.2 GiB)
    RX errors 0 dropped 278 overruns 120 frame 0
    TX packets 391110596 bytes 492047314731 (458.2 GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device memory 0x92c00000-92cfffff

net1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.217.44.32 netmask 255.255.255.0 broadcast 10.217.44.255
    inet6 fe80::9af2:b3ff:feee:aa53 prefixlen 64 scopeid 0x20<link>
    ether 98:f2:b3:ee:aa:53 txqueuelen 1000 (Ethernet)
    RX packets 16559749 bytes 18137427290 (16.8 GiB)
    RX errors 0 dropped 383207 overruns 0 frame 0
    TX packets 9955772 bytes 6577470877 (6.1 GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device memory 0x92b00000-92bfffff
```