

## Homework #0 Solution

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### Network Administration

#### True/False

1. False. Ideally, one IP address corresponds to one device, but NAT breaks this rule. NAT enables many devices to share one public IP address.
2. False. The number is limited by the number of available external IP addresses and ports.
3. False. An IP address is associated to a network interface rather than the device, and an interface may have many IP associated to it. So if a device has many network interfaces, it may have multiple IP addresses.
4. False. DHCP clients are allocated leases that only last for some period of time. And an IP address may be assigned to other devices if there aren't enough IP addresses.
5. False. Only traffic whose destination is outside of the LAN will pass through the gateway.
6. True. MAC addresses are designed to be unique in the same broadcast domain (although end devices are able to explicitly assign a custom MAC address).
7. False. Suppose we are querying csie.ntu.edu.tw, but the DNS server has no record of it, it may send this query further to the name server that can resolve .ntu.edu.tw domain names.
8. True. For example, Layer 2 Tunneling Protocol (L2TP) when it is set up without IPsec and Point-to-Point Tunneling Protocol (PPTP) or Microsoft Point-to-Point Encryption (MPPE) are all native plaintext tunneling protocols.
9. False. All of these protocols have their vulnerabilities. WEP and WPA have security problems in their design. The only one we should choose to use is WPA2 whose currently known security issues can be patched at the implementation level.
10. True. By forging TCP reset packets, one may end all connections to a specific endpoint and essentially make the service unavailable.

#### Select All that Apply

1. (b)(e)

- (a) Network layer.
- (b) Application layer.
- (c) Network layer.
- (d) Network layer.
- (e) Physical layer.

2. (a)(b)

Valid IP addresses of the given subnet 12.34.56.78/20 range from 12.34.48.1 to 12.34.63.254, the reserved ones are 12.34.48.0 (network) and 12.34.63.255 (broadcast).

3. (a)(d)(e)

There are there IP ranges reserved for private networks: 10.0.0.0 10.255.255.255, 172.16.0.0 172.31.255.255 and 192.168.0.0 192.168.255.255.

### Short Answer Questions

1. Some of the differences are listed as followed.

	2.4G	5G
Channel	3 non-overlapping channels	23 non-overlapping channels
Standard	IEEE 802.11b/g/n	IEEE 802.11a/h/j/n/ac
Network Range	Wider Range	Shorter Range
Interference	Higher	Lower

2. (a) Access remote servers in a private network.

(b) Bypass firewalls that block access to certain sites.

(c) Encrypt traffic when you don't trust your network provider.

(d) Make the internet speed faster. (Only under certain circumstances, e.g. your ISP limit the bandwidth of some sites/content.)

3. The browser will send a type A query to local DNS server to resolve the url and get the corresponding IP address. It will then open a TCP connection with the web server and send an HTTP request to retrieve the document.

4.

$$2^{128} \times 10^3 / 10^{20} / 86400 / 365 \cong 10^{14}(\text{years}).$$

### Basic Command Line Utilities

1. Use `dig` or `nslookup`.

(a) 140.112.8.116

(b) 140.112.30.28

(c) 140.112.30.32

2. Use `traceroute` and you may get results similar to the following.

traceroute to google.com (172.217.160.78), 30 hops max, 60 byte packets

1 10.254.254.254 (10.254.254.254) 0.508 ms 1.109 ms 1.363 ms

2 140.112.149.121 (140.112.149.121) 1.131 ms 1.159 ms 1.500 ms

3 140.112.0.174 (140.112.0.174) 1.250 ms 1.434 ms 1.513 ms

4 140.112.0.190 (140.112.0.190) 3.267 ms 3.345 ms 3.425 ms

5 140.112.0.198 (140.112.0.198) 2.030 ms 2.190 ms 2.609 ms

6 140.112.0.34 (140.112.0.34) 3.117 ms 2.770 ms 2.847 ms

7 72.14.204.212 (72.14.204.212) 3.591 ms 3.624 ms 3.559 ms

8 108.170.244.65 (108.170.244.65) 4.272 ms 2.688 ms 108.170.244.33 (108.170.244.33) 1.960 ms

9 209.85.243.173 (209.85.243.173) 2.695 ms 209.85.243.197 (209.85.243.197) 2.595 ms 2.738 ms

10 tsa01s09-in-f14.1e100.net (172.217.160.78) 2.772 ms 2.840 ms 2.790 ms

3. Use either `ip route`, `route` or `netstat -r`.

(a) 140.112.30.254

(b) 0.0.0.0

(c) 0.0.0.0

4. Use `ifconfig` for both interface and IP, `netstat -i` for interface.

(a) lo, 127.0.0.1

(b) net0, 140.112.30.32

(c) net1, 10.217.44.32

## **System Administration**

Please see the attached shell script file on the course website for sample answers.