Computer Networking Basic Concepts
Self Evaluation - Answer Key
October 2018

Background

Students enrolled in the Cybersecurity Fundamentals Certificate program must have a B (3.0) average in order to be awarded the certificate. CS3690, Network Security, assumes that students have a basic knowledge of computer networking. If you don't, you will quickly become lost, feel overloaded with the course, and be likely to receive a poor grade.

Result: you do not receive a certificate and have a poor grade on your NPS transcript.

Objective

We would like to help you avoid this situation.

This self-assessment is intended to help you determine if you have sufficient background in networking to be successful in CS3690 Network Security.

Directions

1. Take the self assessment without using reference materials or the Internet.
2. Check your answers against the answer sheet provided.
3. How well did you do? We don't expect everyone to get every answer correct, but if your score was low, you might consider postponing enrollment in CS3690 until you have learned some more basic networking.

Correct answers will be highlighted in yellow on the answer sheet.

1. Convert the following numbers in hexadecimal notation to the equivalent number in binary

        a. `0xA7`   _____

        b. `0x081C`   _____

        c. `0xDEADBEEF`   _____

2. What is 86_{10} expressed in 8 bits of binary?

        a. `01100010`
        b. `01010110`
        c. `01010001`
        d. `01101000`

6. All numbers are in binary. Give the result:

        `NOT  10101001  =` _____

3. Convert the following binary numbers to hexadecimal

       a. `01010001`   _____

       b. `11010011`   _____

       c. `00001010`   _____

4. All numbers are in binary. Give the result:

```
        10010011
AND     10001101
```

5. All numbers are in binary. Give the result:

```
        11100101
XOR     10110001
```

7. All numbers are in binary. Give the result:

```
        10101001
 OR     11100001
```

8. What is the value of 2^8 ?

       a. 16
       b. 256
       c. 64
       d. 200,000,000

9. What is $2^9 - 2^8$?

       a. 16
       b. 256
       c. 64
       d. 200,000,000

11. What is the purpose/utility of NAT (in the context of computer networks)?

    a. It returns the assigned IP address of whatever fully-qualified-domain-name it is given.
    b. It is used to swap-out a private IP address with a non-private IP address.
    c. It translates names to IP addresses.
    d. It is used to tunnel private, non-routable, IP addresses inside of a VPN tunnel.

12. What does a "socket-pair" (in the context of computer networking) consist of?

    a. 2 IP addresses and 2 port numbers
    b. 2 MAC addresses and 2 IP addresses
    c. 2 MAC addresses and 2 port numbers
    d. 2 FQDNs (fully-qualified domain names) and 2 IP addresses

13. The ARP protocol is most often/typically used to…

    a. find the fqdn (fully-qualified domain name) of a given IP address.
    b. find the IP address of a given fqdn (fully-qualified domain name).
    c. find the IP address of a given MAC address.
    d. find the MAC address of a given IP address.

14. What network topology does this describe: "every connected device has a direct link to EVERY other connected device"?

    a. Tree
    b. Star
    c. Bus
    d. Mesh

15. Which of these correctly describes the process of encapsulation (not DE-encapsulation) of protocols (in the context of computer networking)?

    a. Protocol headers are added as you go DOWN the stack (higher layers to lower layers).
    b. Protocol headers are added as you go UP the stack (lower layers to higher layers).
    c. Lower layer headers are placed "inside of" upper layer headers.
    d. Upper layer headers are placed "inside of" lower layer headers.

16. Which statement is TRUE with regard to the source and destination MAC addresses of a packet as it traverses from one network to another across an internetwork environment?

    a. These addresses will remain the same for the entire route.
    b. The destination MAC, and only the destination MAC, will change on each network hop.
    c. The source MAC, and only the source MAC, will change on each network hop.
    d. Both source and destination MAC addresses will change on each network hop.

10. (3 points) Given the following file system, where green circles are files, answer the following questions:
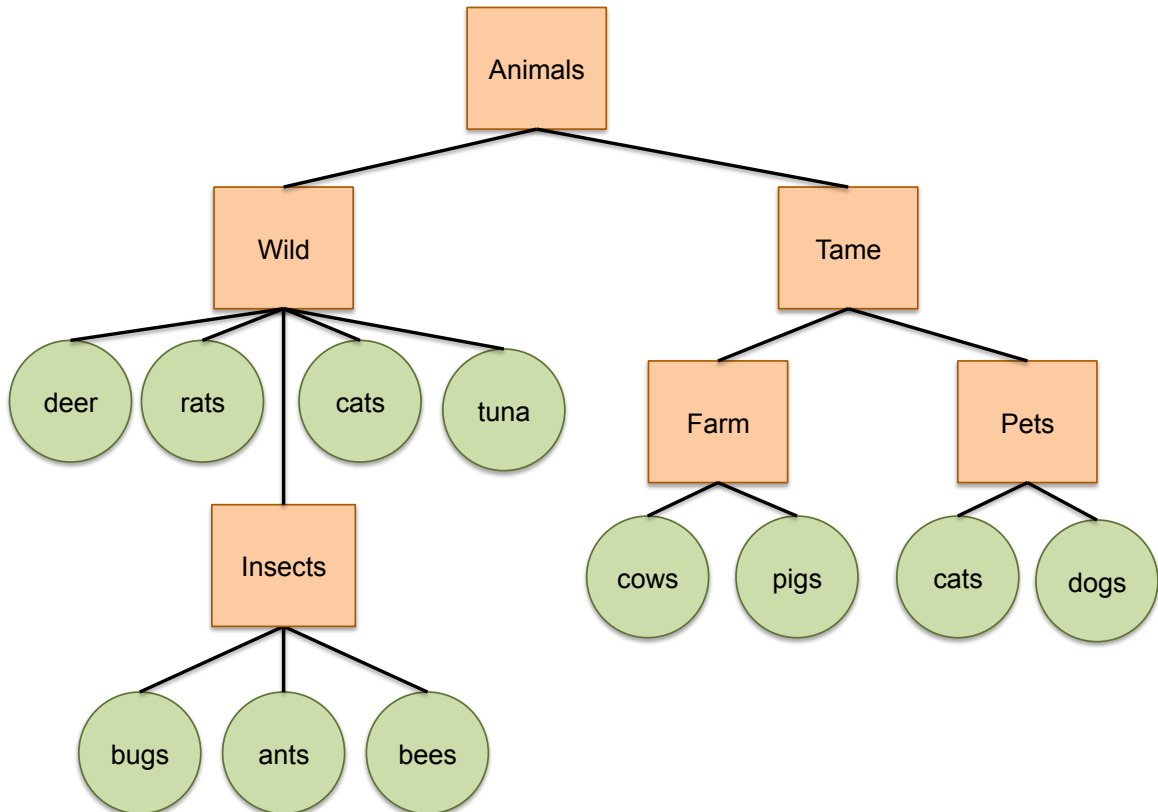
i. Name all of the directories

ii. There are two files called `cats`. Are they the same?

iii. Must the two files called `cats` contain the same information?

iv. Alice has information on domesticated chickens that lay eggs for sale. Into which directory is she most likely to place the `chickens` file?

v. Could a `Fish` directory be created under the `Farm` directory?

vi. If a `Fish` directory was created under the `Farm` directory, could another `Fish` directory be created under the `Wild` directory?

17. Consider the Internet Protocol Stack:

      4. Application Layer
      3. Transport Layer
      2. Internet Layer
      1. Link Layer

i. Data Link layer addressing typically relies on a MAC address to move data:
   a. From its source host to its destination host
   b. Over a single hop (e.g., router-to-router) in its route from source to destination host
   c. From the source host to the Internet Service Provider
   d. From the Internet Service Provider to the destination host

ii. The HTTP protocol is implemented at what layer of the Internet Protocol Stack?

iii. (a) The IP header of a TCP/IP packet includes what important information?

    (b) This information relates to routing at what layer?

iv. (a) The TCP header of a TCP/IP packet includes what important information?

    (b) This information is important to routing at what layer?

v. The following devices operate at which layer of the Internet Protocol Stack?
   a. Switch:
   b. Hub:
   c. Router:

vi. What is the most obvious difference between IPv4 and IPv6 addressing?
   IPv6 is a 64-bit address while IPv4 is a 32-bit address (i.e., more possible addresses in IPv6)

vii. What is the difference between a public IP address and a private IP address?
   A private IP address is used for internal addressing on a LAN but is not directly addressable from the Internet

viii. All of the following are true about UDP packets except which of the following (select all that apply).
   a. They are connectionless
   b. They provide reliability
   c. Multiple packets can be received and processed in any order at the destination
   d. They are acknowledged by the destination upon receipt

ix. Which of the following port numbers are considered "client ports"?
   a. 22
   b. 3578
   c. 443
   d. 30414
   e. 2000

x. A TCP/IP connection uses what sequence of packets to establish the reliable connection?
   a. Syn – Syn/Ack – Ack
   b. Syn – Syn/Ack – Syn/Ack – Ack
   c. Syn – Ack
   c. Syn/Ack – Syn – Ack

18. Which of these are valid IPv4 addresses?

   a. 255.255.255.255
   b. 875.326.102.34
   c. 120.28.232.1

19. When is UDP usually the preferred choice of transport protocol over TCP?

   a. When relatively large files are being transferred and reliable delivery is desired.
   b. When every byte of payload must be accounted for (i.e., continually resent until received).
   c. When "streaming" data needs to be delivered as close to real-time as possible.
   d. Whenever the payload is video (or other multimedia) type content.

END