

Assignment Type:	Assignment	Collaboration Policy:	Default
Assignment Title:	IPv4 Addressing and Routing		

Capture & Collect: Network Lab Machine

1. [5 / __ / 0] Complete the following table based on visiting My IP from a network lab machine.

Trial	Your IP Address	Your Port
1		
2		
3		
4		
5		

Capture & Collect: PiCK

2. [5 / __ / 0] Complete the below table regarding your Pi.

Hostname	IPv4 Address (dotted-quad)	Subnet Mask (dotted-quad)	Ethernet MAC Address

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IPv4 Addressing Basics

3. (15) Complete the below using data captured and collected from a lab machine in the Networking Lab, not from your PiCK; i.e files named *labMach-**.

a. [5 / ____ / 0] Complete the below table using `ifconfig` and `arp` data.

-	Local Host	Other Local Network Host
Hostname	-	-
IPv4 Addr (dotted-quad)		
Your Local Host Subnet Mask (dotted-quad)		
Derived Network Addr (dotted-quad)		
IPv4 Addr (binary)		
Your Local Host Subnet Mask (binary)		
Derived Network Addr (binary)		

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b. [5 / ____ / 0] Complete the below table.

-	Local Host	Non-Local Network Host
Hostname	-	
IPv4 Addr (dotted-quad)		
Your Local Host Subnet Mask (dotted-quad)		
Derived Network Addr (dotted-quad)		
IPv4 Addr (binary)		
Your Local Host Subnet Mask (binary)		
Derived Network Addr (binary)		

c. [5 / ____ / 0] What bitwise Boolean operation does the local host use to derive whether the remote host is on the same local area network or not?

4. (5) Complete the following regarding the classful Class A IPv4 address space.

a. [1 / ____ / 0] Taking into account special purpose networks, how many Class A IPv4 networks are there?

b. [2 / ____ / 0] How many hosts that can be in a Class A network?

c. [2 / ____ / 0] What is the difference between the theoretical maximum number of Class A hosts (no special purpose network designations, no special purpose hosts/addresses designated) and the actual maximum number of Class A hosts in practice; i.e. how many Class A addresses are unusable in practice? Note: We have not discussed IPv4 private address spaces yet; don't over think this question.

5. (5) Complete the following regarding a classful IPv4 address space.

a. [3 / ____ / 0] How many hosts can be in a Class B network?

b. [2 / ____ / 0] How many hosts can be in a Class C network?

6. [10 / ____ / 0] Complete the below table regarding CIDR notation. For the *Number of Hosts* column determine the maximum number of hosts that could be on the network in practice.

Host CIDR	Network Prefix	Subnet Mask	Number of Hosts
172.16.10.1/12			
20/	136.160.80.0	255.255.240.0	
21/	9.9.0.0	255.255.255.192	

Routers

7. [5 / ____ / 0] Complete the below table using Raspberry Pi (RPI) `traceroute` data, use your `RPi-traceroute-other-<OTHER_SIDE>-<YOUR_LASTNAME>.txt` and a `RPi-traceroute-other-<YOUR_SIDE>-<CLASSMATE_LASTNAME>.txt` files. Note: You do not need to use the `traceroute` file from the classmate that you `tracerouted` to; i.e. the two files do not need to be matched.

IP Address		
Router (1 hop)	Router (2 hops)	Destination Host

8. (5) Complete the below using data from your `RPi-traceroute-local-<YOUR_SIDE>-<YOUR_LASTNAME>.txt` file.

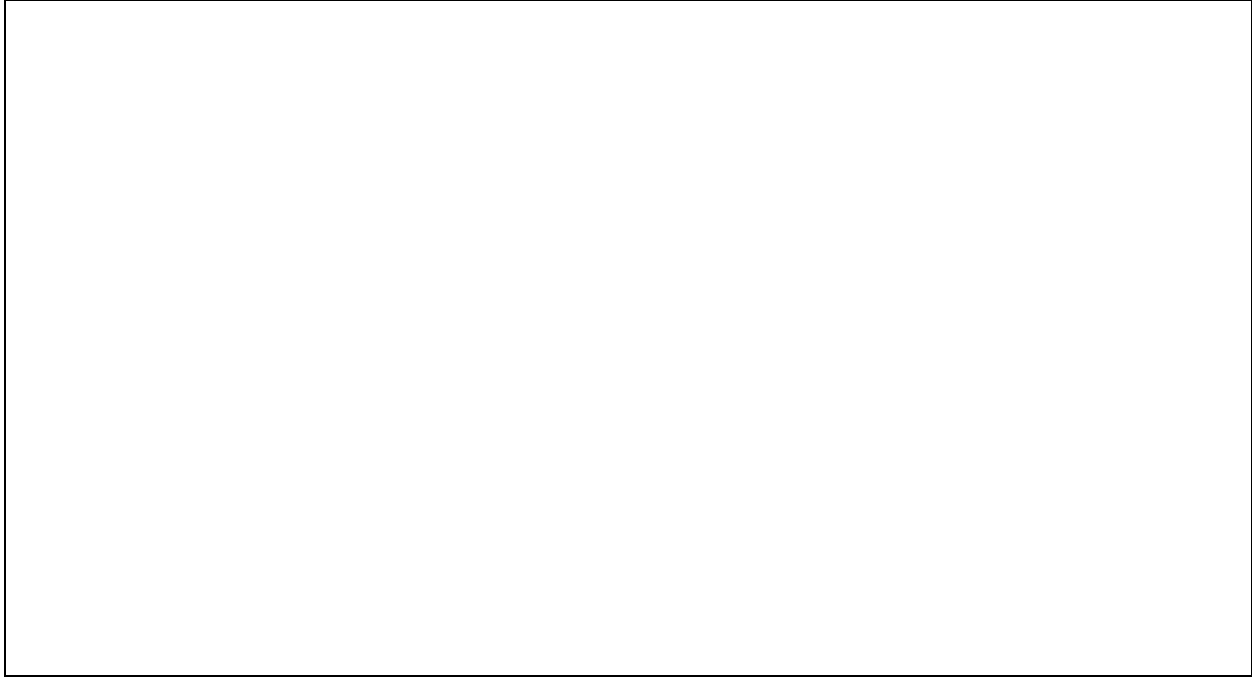
a. [1 / ____ / 0] How many lines of output are there, ignore the `traceroute` header line.

b. [2 / ____ / 0] How many routers are there between your host and the destination host.

c. [2 / ____ / 0] How many hops do packets take between your host and the destination host.

Read through Questions 9–11 before beginning Question 9.

9. [5 / ___ / 0] Based on the traceroute data draw a network diagram that depicts the route between the LEFT and RIGHT classroom networks. Depict hosts and Network layer devices. Depict at least one host on each of the LEFT and RIGHT networks.



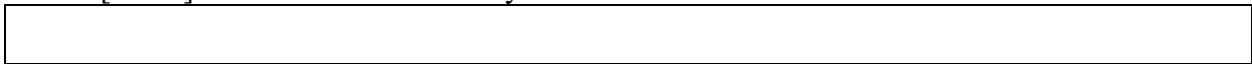
10. [5 / ___ / 0] Label each network interface with that interface's IP address.

11. [5 / ___ / 0] Draw a solid circle connecting the hosts and hardware devices that are in the same broadcast domain.

Use `RPi-labNet-<YOUR_SIDE>-<YOUR_LASTNAME>.pcapng` for Questions 12–13.

12. (5) Complete the below regarding IPv4 protocol details.

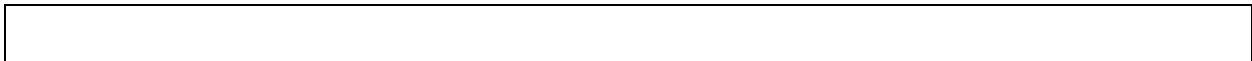
- a. [1 / 0] What is the size in bytes of the TTL field.



- b. [2 / ___ / 0] What is the lowest decimal value that could be represented in the TTL field?



- c. [2 / ___ / 0] What is the highest decimal value that could be represented in the TTL field?



13. (5) Complete the below regarding the values from the TTL fields in the nc communications packets.

a. [2 / ____ / 0] What value does Raspbian, the Raspberry Pi operating system, use as an initial TTL?

b. [3 / ____ / 0] Based on the action a router performs regarding TTL, and that both communicating hosts are using Raspbian, how many routers does the pcap data show that there are between you and the remote host?

Dynamic Host Configuration Protocol

Complete the below and Questions ### ## using RPi-labNet-<YOUR_SIDE>-<YOUR_LASTNAME>.pcapng.

14. (7) Complete the below regarding the observed DORA sequence.

Packet number of DHCP Discover packet from the complete DORA sequence of messages.

DHCP Transaction ID of DHCP Discover packet from the complete DORA sequence of messages.

a. [2 / ____ / 0] What host (name and MAC address) initiated the DORA sequence?

b. [2 / ____ / 0] What is the destination address information for the packet that initiated the DORA sequence?

Destination MAC Address	Destination IP Address
<input type="text"/>	<input type="text"/>

c. [3 / ___ / 0] Review the parameters being requested in the Bootstrap protocol details (see DHCP Option 55: Parameter Request List). Why does it make sense that the initiating host has to send the packet with a source address of 0.0.0.0? Use complete sentences; spelling and grammar count.

15. (8) Continuing with the same observed DORA sequence.

a. [2 / ___ / 0] What is the source address information for the *response* to the Discover packet; i.e. the address information for the DHCP server the replied to the Discover?

Source MAC Address	Source IP Address

b. [3 / ___ / 0] How does the local host know that it is the intended recipient of the Offer packet? Note: The local host doesn't have any network settings configured at time of receiving the Offer message, the local host only knows what it sent in the Discover packet. Use complete sentences; spelling and grammar count.

c. [2 / ___ / 0] Based on the Offer packet, how long (in seconds) is the proposed IP address lease valid for; i.e. what is the proposed period of the IP address lease?

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d. [1 / ___ / 0] What unit of time measure is used for value in the *IP Address Lease Time* field in the Offer packet?

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16. (5) Continuing with the same DORA sequence; complete the below regarding the Request packet.

a. [1 / __ / 0] What is the source address information for the Request packet in the DORA sequence?

Source MAC Address	Source IP Address

b. [1 / __ / 0] What is the destination address information for the Request packet in the DORA sequence?

Destination MAC Address	Destination IP Address

c. [3 / __ / 0] Based on the data in the Request packet, has the local host be assigned an IP address or other network settings yet? Explain, why or why not. Use complete sentences; spelling and grammar count.

17. (5) Complete the below based on the ARP sequences immediately following the successful DORA sequence of messages.

What is the address information for the first set of ARP packets following the DORA sequence?

Source MAC Address	Destination MAC Address

a. [2 / __ / 0] Review the previous assignment ARP material as needed. Explain what the first set of ARP packets mean; i.e. what is the local host doing by sending the ARP packets? Note: You don't need to directly relate this to DORA.

b. [1 / __ / 0] Whose (what host's, by name) information is in the second set of ARP packets?

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c. [2 / __ / 0] Describe the purpose of the second set of ARP packets; i.e. what would a receiving host do upon receiving a packet from that ARP sequence?

Picking back up from the DORA sequence complete the below regarding renewing an IP address lease.

18. [5 / __ / 0] Review the sets of DHCP messages following the successful DORA sequence. Draw a protocol sequence diagram depicting the packets of a single IP address lease renewal. You can represent the messages by protocol and message type; e.g. DHCP Discover, ARP Request, HTTP Get. Remember axes and labels.

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19. (5) Complete the below regarding IP address lease timing.

a. [1 / ___ / 0] Based on the DHCP Acknowledge from the successful DORA sequence, how long is the IP address less valid for?

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b. [2 / ___ / 0] Complete the below table based on DHCP packet times.

Packet Description	Time (sec)	Time Delta (sec)
DORA DHCP Request		
DORA DHCP Acknowledge		
DHCP Request 1		
DHCP Acknowledge 1		
DHCP Request 2		
DHCP Acknowledge 2		

c. [2 / ___ / 0] When will a host ask to renew its IP address least? Note: The hosts are all following algorithm based on current practices in the field.
