

Polytechnic University of Puerto Rico
Electrical and Computer Engineering & Computer Science Department
COE 4330, Section 80 – Computer Networks

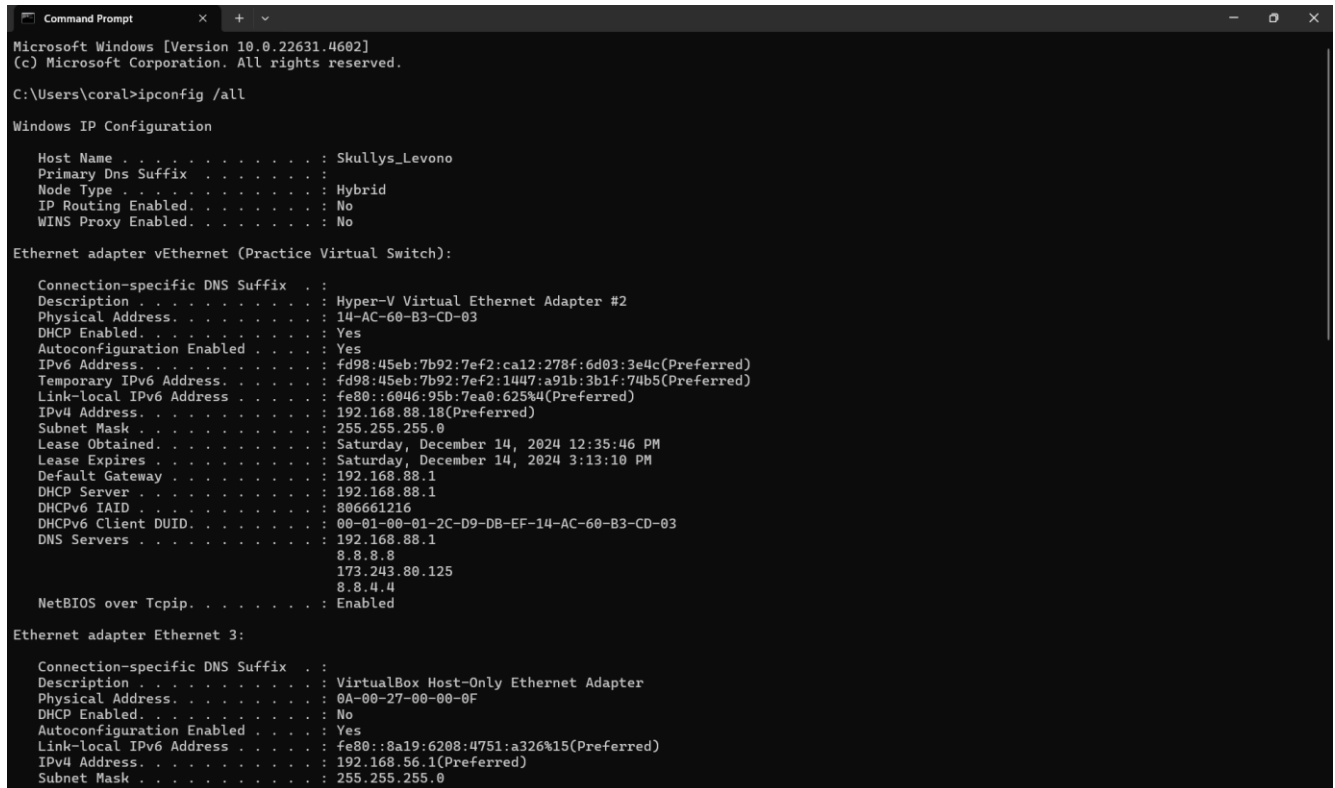
Homework 5

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Completely answer all of the following questions.

1. Open Windows' Command Prompt and type ipconfig /all (in Linux/Unix/Mac type ifconfig). Provide a screenshot that shows the result of executing the command for the network interface in use during the exercise. This screenshot will show your computer's IP address, default gateway, and local DNS servers.



```
Microsoft Windows [Version 10.0.22631.4602]
(c) Microsoft Corporation. All rights reserved.

C:\Users\coral>ipconfig /all

Windows IP Configuration

Host Name . . . . . : Skullys_Levono
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter vEthernet (Practice Virtual Switch):

Connection-specific DNS Suffix . . :
Description . . . . . : Hyper-V Virtual Ethernet Adapter #2
Physical Address. . . . . : 14-AC-60-B3-CD-03
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : fd98:45eb:7b92:7ef2:ca12:278f:6d03:3e4c(Preferred)
Temporary IPv6 Address. . . . . : fd98:45eb:7b92:7ef2:1447:a91b:3b1f:74b5(Preferred)
Link-local IPv6 Address . . . . . : fe80::6046:95b:7ea8:625%4(Preferred)
IPv4 Address. . . . . : 192.168.88.18(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Saturday, December 14, 2024 12:35:46 PM
Lease Expires . . . . . : Saturday, December 14, 2024 3:13:10 PM
Default Gateway . . . . . : 192.168.88.1
DHCP Server . . . . . : 192.168.88.1
DHCPv6 IAID . . . . . : 806661216
DHCPv6 Client DUID. . . . . : 00-01-00-01-2C-D9-DB-EF-14-AC-60-B3-CD-03
DNS Servers . . . . . : 192.168.88.1
                        8.8.8.8
                        173.243.80.125
                        8.8.4.4
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Ethernet 3:

Connection-specific DNS Suffix . . :
Description . . . . . : VirtualBox Host-Only Ethernet Adapter
Physical Address. . . . . : 0A-00-27-00-00-0F
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::8a19:6208:4751:a326%15(Preferred)
IPv4 Address. . . . . : 192.168.56.1(Preferred)
Subnet Mask . . . . . : 255.255.255.0
```

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```
Command Prompt

Ethernet adapter Ethernet 3:

    Connection-specific DNS Suffix  . : 
    Description . . . . . : VirtualBox Host-Only Ethernet Adapter
    Physical Address. . . . . : 0A-00-27-00-00-0F
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::8a19:6208:4751:a326%15(Preferred)
    IPv4 Address. . . . . : 192.168.56.1(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 
    DHCPv6 IAID . . . . . : 1074397223
    DHCPv6 Client DUID. . . . . : 00-01-00-01-2C-D9-DB-EF-14-AC-60-B3-CD-03
    NetBIOS over Tcpip. . . . . : Enabled

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 16-AC-60-B3-ED-23
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

    Connection-specific DNS Suffix  . : 
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
    Physical Address. . . . . : 16-AC-60-B3-FD-33
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::28a3:11e8:92b3:92f7%5(Preferred)
    IPv4 Address. . . . . : 192.168.137.1(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 
    NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Bluetooth Device (Personal Area Network)
    Physical Address. . . . . : 14-AC-60-B3-CD-04
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes
```

```
Command Prompt

IPv4 Address. . . . . : 192.168.137.1(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
    Description . . . . . : Bluetooth Device (Personal Area Network)
    Physical Address. . . . . : 14-AC-60-B3-CD-04
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Ethernet adapter vEthernet (Default Switch):

    Connection-specific DNS Suffix  . : 
    Description . . . . . : Hyper-V Virtual Ethernet Adapter
    Physical Address. . . . . : 00-15-5D-35-2C-00
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::f265:984b:f544:1fde%52(Preferred)
    IPv4 Address. . . . . : 172.26.240.1(Preferred)
    Subnet Mask . . . . . : 255.255.240.0
    Default Gateway . . . . . : 
    DHCPv6 IAID . . . . . : 872420701
    DHCPv6 Client DUID. . . . . : 00-01-00-01-2C-D9-DB-EF-14-AC-60-B3-CD-03
    NetBIOS over Tcpip. . . . . : Enabled

C:\Users\coral>
```

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2. Select the first ICMP Echo Request message sent by your computer and expand the Internet Protocol part of the packet in the packet details window. What is the IP address of your computer? Include a Wireshark screenshot to justify your answers. *2 points*

The IP address of my computer shown in the Wireshark screenshot below is **192.168.88.18**.

The screenshot shows the Wireshark interface with the following details:

Packet List:

No.	Time	Source	Destination	Protocol	Length	Info
742	24.543509	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=1/256, ttl=128 (no response found!)
1303	29.146559	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=2/512, ttl=128 (reply in 1304)
1304	29.202031	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=2/512, ttl=56 (request in 1303)
1386	30.161113	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=3/768, ttl=128 (reply in 1423)
1423	30.201110	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=3/768, ttl=56 (request in 1386)
1734	31.174817	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=4/1024, ttl=128 (reply in 1736)
1736	31.220536	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=4/1024, ttl=56 (request in 1734)

Packet Details:

- > Frame 742: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{CD880491-6C77-45EE-81FC-2C8C01E38EC9}, id 0
- > Ethernet II, Src: CloudNetwork_b3:cd:03 (14:ac:60:b3:cd:03), Dst: Routerboardc_99:fb:5a (18:fd:74:99:fb:5a)
- ✓ Internet Protocol Version 4, Src: 192.168.88.18, Dst: 142.250.217.206
 - 0100 = Version: 4
 - 0101 = Header Length: 20 bytes (5)
 - > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - Total Length: 60
 - Identification: 0x7f19 (32537)
 - > 0000 = Flags: 0x0
 - ...0 0000 0000 0000 = Fragment Offset: 0
 - Time to Live: 128
 - Protocol: ICMP (1)
 - Header Checksum: 0x3a24 [validation disabled]
 - [Header checksum status: Unverified]
 - Source Address: 192.168.88.18
 - Destination Address: 142.250.217.206
 - [Stream index: 47]
- > Internet Control Message Protocol

Packet Bytes:

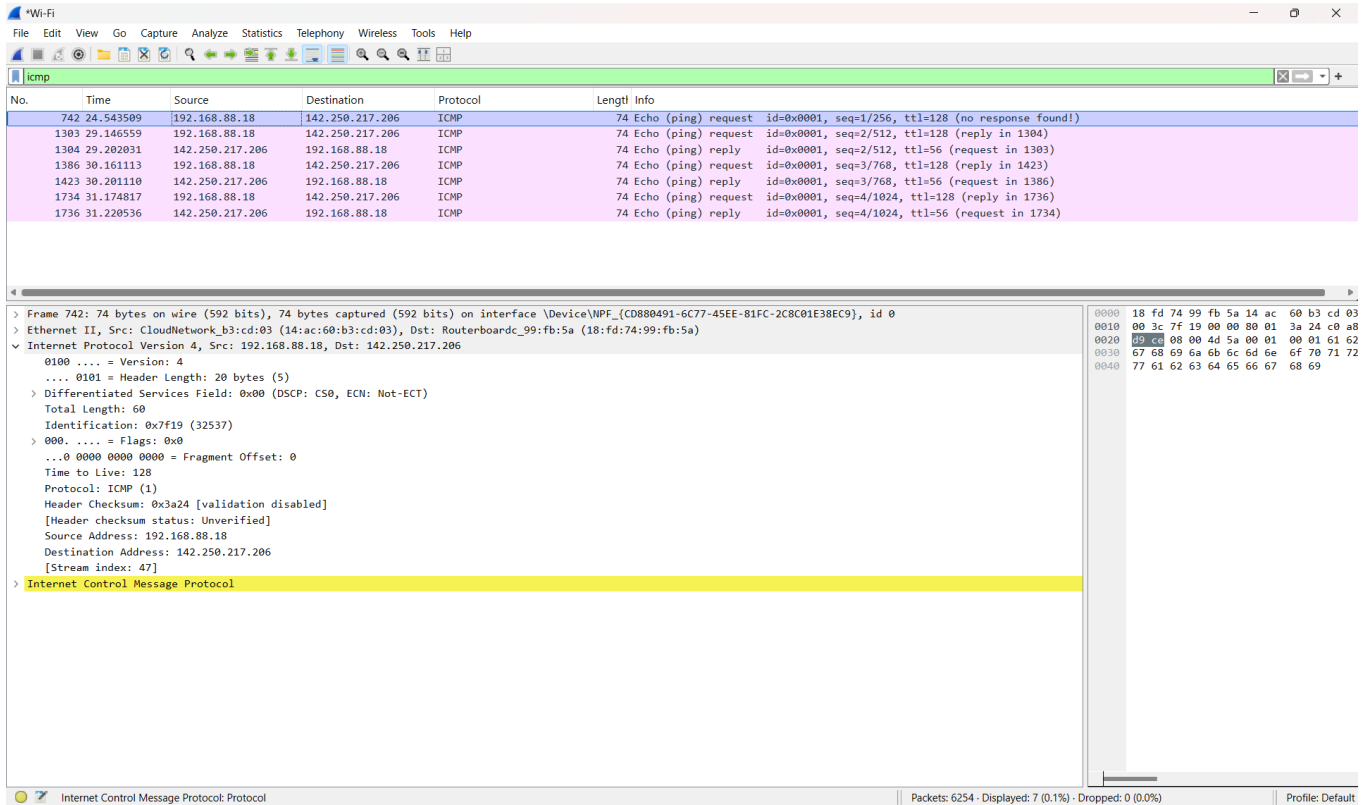
Offset	Hex	ASCII
0000	18 fd 74 99 fb 5a 14 ac 60 b3 cd 03	
0010	00 3c 7f 19 00 00 80 01 3a 24 c0 a8	
0020	60 cd 08 00 4d 5a 00 01 00 01 61 62	
0030	67 68 69 6a 6b 6c 6d 6e 6f 70 71 72	
0040	77 61 62 63 64 65 66 67 68 69	

Status Bar: Internet Control Message Protocol: Protocol | Packets: 6254 - Displayed: 7 (0.1%) - Dropped: 0 (0.0%) | Profile: Default

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3. Within the IP packet header, what is the value in the upper layer protocol field? Include a Wireshark screenshot to justify your answers. *2 points*

The upper layer protocol field's value in the Wireshark screenshot below is 1.



The screenshot shows a Wireshark capture of ICMP Echo (ping) traffic. The packet list pane displays several ICMP Echo (ping) requests and replies. The packet details pane shows the Internet Control Message Protocol (ICMP) header for packet 742, which is an Echo (ping) request. The protocol field is set to 1.

No.	Time	Source	Destination	Protocol	Length	Info
742	24.543509	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=1/256, ttl=128 (no response found!)
1303	29.146559	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=2/512, ttl=128 (reply in 1304)
1304	29.202031	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=2/512, ttl=56 (request in 1303)
1386	30.161113	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=3/768, ttl=128 (reply in 1423)
1423	30.201110	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=3/768, ttl=56 (request in 1386)
1734	31.174817	192.168.88.18	142.250.217.206	ICMP	74	Echo (ping) request id=0x0001, seq=4/1024, ttl=128 (reply in 1736)
1736	31.220536	142.250.217.206	192.168.88.18	ICMP	74	Echo (ping) reply id=0x0001, seq=4/1024, ttl=56 (request in 1734)

Frame 742: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{CD880491-6C77-45EE-81FC-2C8C01E38EC9}, id 0
> Ethernet II, Src: CloudNetwork_b3:cd:03 (14:ac:60:b3:cd:03), Dst: Routerboard_99:fb:5a (18:fd:74:99:fb:5a)
✓ Internet Protocol Version 4, Src: 192.168.88.18, Dst: 142.250.217.206
 0100 = Version: 4
 0101 = Header Length: 20 bytes (5)
 > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 Total Length: 60
 Identification: 0x7f19 (32537)
 > 000. = Flags: 0x0
 ... 0 0000 0000 0000 = Fragment Offset: 0
 Time to Live: 128
 Protocol: ICMP (1)
 Header Checksum: 0x3a24 [validation disabled]
 [Header checksum status: Unverified]
 Source Address: 192.168.88.18
 Destination Address: 142.250.217.206
 [Stream index: 47]
 > Internet Control Message Protocol

Internet Control Message Protocol: Protocol

Packets: 6254 · Displayed: 7 (0.1%) · Dropped: 0 (0.0%)

Profile: Default

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4. How many bytes are in the IP header? How many bytes are in the payload of the IP datagram? Explain how you determined the number of payload bytes. Include Wireshark screenshot(s) to justify your answers. *4 points*

The IP header size is 20 bytes, as indicated by the Header Length field in the Wireshark screenshot. The payload size is 40 bytes, which was determined by subtracting the IP header size from the total length of the IP datagram..

The screenshot shows the Wireshark interface with the 'icmp' filter applied. The packet list shows several ICMP Echo (ping) requests and replies. The selected packet (No. 742) is an ICMP Echo (ping) request from 192.168.88.18 to 142.250.217.206. The packet details pane shows the following information:

- Frame 742: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{CD880491-6C77-45EE-81FC-2C8C01E38EC9}, id 0
- Ethernet II, Src: CloudNetwork_b3:cd:03 (14:ac:60:b3:cd:03), Dst: Routerboardc_99:fb:5a (18:fd:74:99:fb:5a)
- Internet Protocol Version 4, Src: 192.168.88.18, Dst: 142.250.217.206
 - 0100 = Version: 4
 - 0101 = Header Length: 20 bytes (5)
 - > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - Total Length: 60
 - Identification: 0x7f19 (32537)
 - > 0000 = Flags: 0x0
 - ...0 0000 0000 0000 = Fragment Offset: 0
 - Time to Live: 128
 - Protocol: ICMP (1)
 - Header Checksum: 0x3a24 [validation disabled]
 - [Header checksum status: Unverified]
 - Source Address: 192.168.88.18
 - Destination Address: 142.250.217.206
 - [Stream index: 47]
- Internet Control Message Protocol

The packet bytes pane shows the hex data for the selected packet:

```
0000 18 fd 74 99 fb 5a 14 ac 60 b3 cd 03
0010 00 3c 7f 19 00 00 00 01 3a 24 c0 a8
0020 01 00 00 00 00 00 00 00 00 01 01 61 62
0030 67 68 69 6a 6b 6c 6d 6e 6f 70 71 72
0040 77 61 62 63 64 65 66 67 68 69
```

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5. Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented. Include Wireshark screenshot(s) to justify your answers. *2 points*

This IP datagram has not been fragmented. I determined this by examining the Flags and Fragment Offset fields in the Wireshark screenshot.

- The Flags field is set to 0x00**, indicating that the MF (More Fragments) bit is 0, meaning this is not a fragmented datagram.
- The Fragment Offset is 0**, confirming that this is the first or only fragment of the datagram.

The screenshot shows the Wireshark interface with the following details:

- Packet List:** A table showing several ICMP Echo (ping) requests and replies. The selected packet is No. 742, Time 24.543509, Source 192.168.88.18, Destination 142.250.217.206, Protocol ICMP, Length 74. The info column shows 'Echo (ping) request id=0x0001, seq=1/256, ttl=128 (no response found!)'.
- Packet Details:** The selected packet is expanded, showing:
 - > Frame 742: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{CD880491-6C77-45EE-81FC-2C8C01E38EC9}, id 0
 - > Ethernet II, Src: CloudNetwork_b3:cd:03 (14:ac:60:b3:cd:03), Dst: Routerboardc_99:fb:5a (18:fd:74:99:fb:5a)
 - > Internet Protocol Version 4, Src: 192.168.88.18, Dst: 142.250.217.206
 - 0100 = Version: 4
 - 0101 = Header Length: 20 bytes (5)
 - > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - Total Length: 60
 - Identification: 0x7f19 (32537)
 - > 0000 = Flags: 0x00
 - ...0 0000 0000 0000 = Fragment Offset: 0
 - Time to Live: 128
 - Protocol: ICMP (1)
 - Header Checksum: 0x3a24 [validation disabled]
 - [Header checksum status: Unverified]
 - Source Address: 192.168.88.18
 - Destination Address: 142.250.217.206
 - [Stream index: 47]
 - > Internet Control Message Protocol
- Packet Bytes:** The raw data of the packet is shown in hexadecimal and ASCII. The first few bytes are 18 fd 74 99 fb 5a 14 ac 60 b3 cd 03, which correspond to the Ethernet II header.