

# Data Communications and Networking CW1

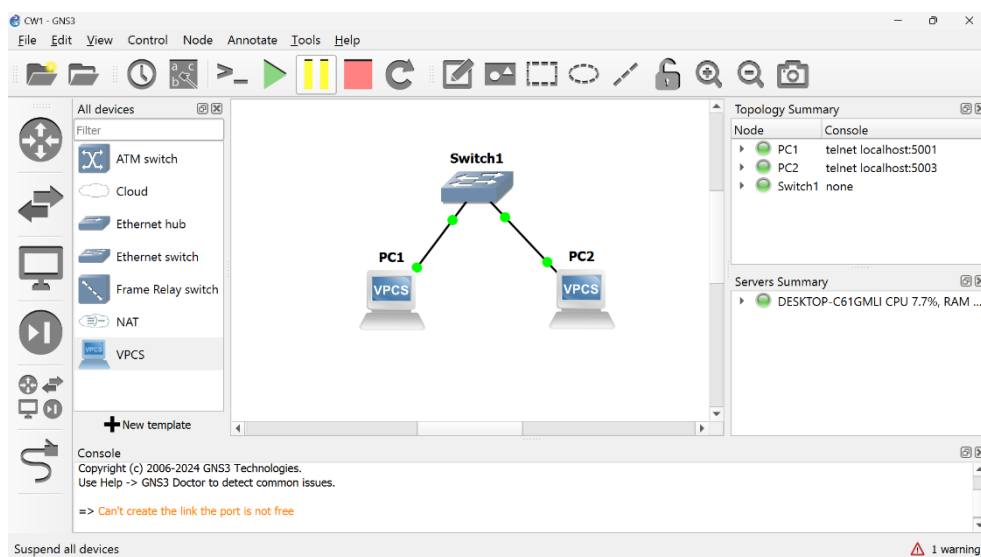
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BSc Computer Science

## Part 1: Connectivity and Virtual PCs (VPCs):

### Topology



### PC1 Console

```
DESKTOP-C61GMLI - PuTTY

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> 
```

## PC2 Console

```
DESKTOP-C61GMLJ - PuTTY
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Press '?' to get help.

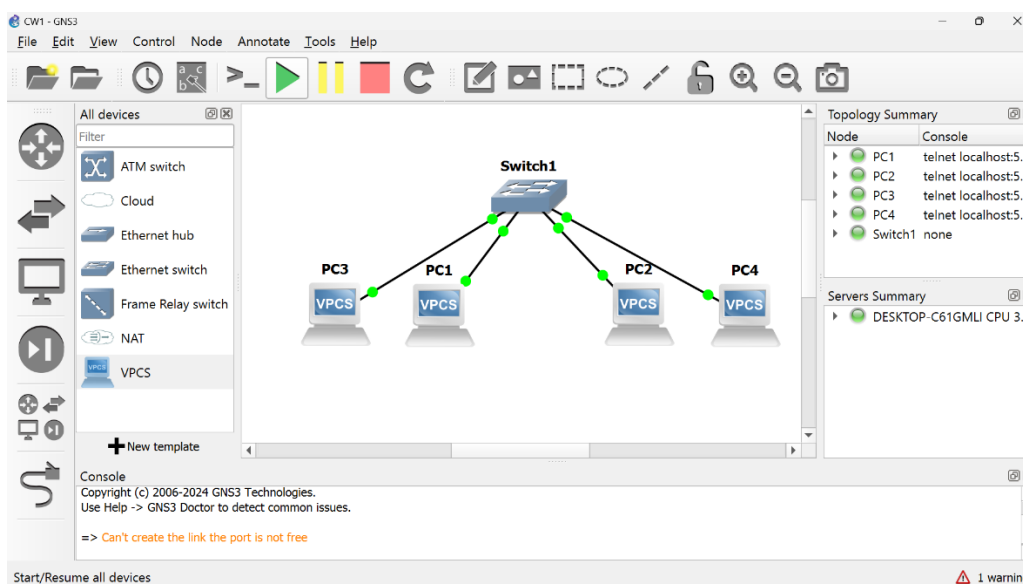
Executing the startup file

PC2> ip 192.168.1.2/24
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=2.711 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=3.918 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=2.131 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=3.166 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=0.974 ms
PC2>
```

## Part 2: Subnets:

### Topology



## PC3 Console

Add two VPCs, PC3 and PC4. Set their IP address to 192.168.1.129/25 and 192.168.1.130/25 respectively. Make sure they can ping each other.

```
DESKTOP-C61GMLJ - PuTTY
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Press '?' to get help.

Executing the startup file

PC3> ip 192.168.1.129/25
Checking for duplicate address...
PC1 : 192.168.1.129 255.255.255.128
PC3>
```

```
DESKTOP-C61GMLJ - PuTTY
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Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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Press '?' to get help.

Executing the startup file

PC4> ip 192.168.1.130/25
Checking for duplicate address...
PC1 : 192.168.1.130 255.255.255.128
PC4>
```

Change the network mask of the first two PCs from /24 to /25. Can they ping each other?

```

DESKTOP-COYUMLU - PuTTY
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Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC2> ip 192.168.1.2/24
Checking for duplicate address...
PC2 : 192.168.1.1 255.255.255.0

PC3> ping 192.168.1.2
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=1.584 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=1.796 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=1.432 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=64 time=1.328 ms
64 bytes from 192.168.1.2: icmp_seq=5 ttl=64 time=1.218 ms

PC3> ping 192.168.1.129
no gateway found

PC3> ping 192.168.1.130
no gateway found

PC3>

```

```

DESKTOP-COYUMLU - PuTTY
Welcome to Virtual PC Simulator, version 0.6.2
Registered to Galing
Build time: Apr 10 2019 02:42:18
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For more information, please visit us! freecore.com.cn.

Press '?' to get help.

Executing the startup file

PC2> ip 192.168.1.1/24
Checking for duplicate address...
PC2 : 192.168.1.1 255.255.255.0

PC3> ping 192.168.1.1
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=0.710 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=0.718 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=0.510 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=0.560 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=0.574 ms

PC2> ping 192.168.1.129
Checking for duplicate address...
PC2 : 192.168.1.1 255.255.255.0

PC2> ping 192.168.1.1
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=0.848 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=0.790 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=0.547 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=0.588 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=0.722 ms

PC2>

```

Ping from PC2 to PC1 is successful even after changing the mask to 25.

Ping from PC1 to PC2 is successful even after changing the mask to 25.

Can you ping PC3 or PC4 from PC1? Why?

```

DESKTOP-COYUMLU - PuTTY
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Press '?' to get help.

Executing the startup file

PC2> ip 192.168.1.1/24
Checking for duplicate address...
PC2 : 192.168.1.1 255.255.255.0

PC3> ip 192.168.1.129
Checking for duplicate address...
PC3 : 192.168.1.1 255.255.255.128

PC3> ping 192.168.1.2
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=1.584 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=1.796 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=1.432 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=64 time=1.328 ms
64 bytes from 192.168.1.2: icmp_seq=5 ttl=64 time=1.218 ms

PC3> ping 192.168.1.129
no gateway found

PC3> ping 192.168.1.130
no gateway found

PC3>

```

Ping from PC1 to PC3 failed because there was no gateway found.

Ping from PC1 to PC4 failed because there was no gateway found.

## Part 3: VLANs:

Node properties

Switch1 configuration

General

Name: Switch1

Console type: none

Settings

Port: 8

VLAN: 2

Type: access

QinQ EtherType: 0x8100

Ports

Port	VLAN	Type	EtherType
0	1	access	
1	1	access	
2	2	access	
3	2	access	
4	1	access	
5	1	access	
6	1	access	
7	1	access	
8			

Add

Delete

Reset

OK

Cancel

Apply

## Pings between PC1 and PC2

```
PC1> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=3.059 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=3.125 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=3.171 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=3.311 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=1.332 ms
```

```
PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=3.212 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=3.061 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=3.270 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=3.270 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=2.620 ms
```

## Same network and pings

```
DESKTOP-CSTQM1 - PUTTY
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> ip 192.168.1.1/25
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.128

PC1> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=1.884 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=1.786 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=1.812 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=1.325 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=1.219 ms

PC1> ping 192.168.1.129
No gateway found

PC1> ping 192.168.1.138
No gateway found

PC1> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=64 time=0.859 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=64 time=0.125 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=64 time=0.171 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=64 time=0.212 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=64 time=0.192 ms

PC1> ip 192.168.1.1/24
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0

PC1> ping 192.168.1.3
Host (192.168.1.3) not reachable

PC1>
```

```
DESKTOP-CSTQM1 - PUTTY
PC1 : 192.168.1.2 255.255.255.0

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=0.711 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=0.918 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=0.121 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=0.166 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=0.974 ms

PC2> ip 192.168.1.2/25
Checking for duplicate address...
PC2 : 192.168.1.2 255.255.255.128

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=1.888 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=0.391 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=1.567 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=1.980 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=1.511 ms

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=0.212 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=0.881 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=0.276 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=0.270 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=1.626 ms

PC2> ip 192.168.1.2/24
Checking for duplicate address...
PC2 : 192.168.1.2 255.255.255.0

PC2> ping 192.168.1
No gateway found

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=0.167 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=0.175 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=0.264 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=0.083 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=0.167 ms

PC2> ping 192.168.1.4
Host (192.168.1.4) not reachable

PC2>
```

```
DESKTOP-CSTQM1 - PUTTY
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC3> ip 192.168.1.129/25
Checking for duplicate address...
PC3 : 192.168.1.129 255.255.255.128

PC3> ip 192.168.1.3/24
Checking for duplicate address...
PC3 : 192.168.1.3 255.255.255.0

PC3> ping 192.168.1.4
84 bytes from 192.168.1.4 icmp_seq=1 ttl=64 time=2.896 ms
84 bytes from 192.168.1.4 icmp_seq=2 ttl=64 time=1.231 ms
84 bytes from 192.168.1.4 icmp_seq=3 ttl=64 time=0.865 ms
84 bytes from 192.168.1.4 icmp_seq=4 ttl=64 time=0.262 ms
84 bytes from 192.168.1.4 icmp_seq=5 ttl=64 time=0.198 ms

PC3>
```

```
DESKTOP-CSTQM1 - PUTTY
PC3: 192.168.1.129
Bad command: "ip 192.168.1.138/25". Use ? for help.

PC4> ip 192.168.1.138/25
Checking for duplicate address...
PC4 : 192.168.1.138 255.255.255.128

PC4> ip 192.168.1.4/24
Checking for duplicate address...
PC4 : 192.168.1.4 255.255.255.0

PC4>
```

PC1 from PC2: Working    PC3 from PC1: Host not reachable

PC4 from PC2: Host not reachable    PC4 from PC3: Working

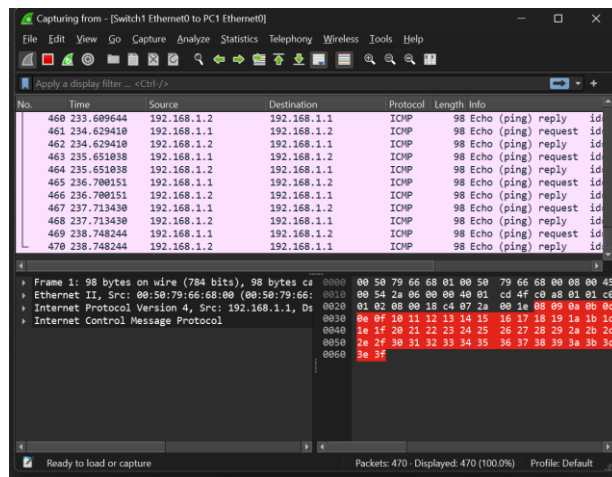
The switch delivers traffic to the port which belongs to the same VLAN.

## Part 4: Wireshark:

### Continuous ping

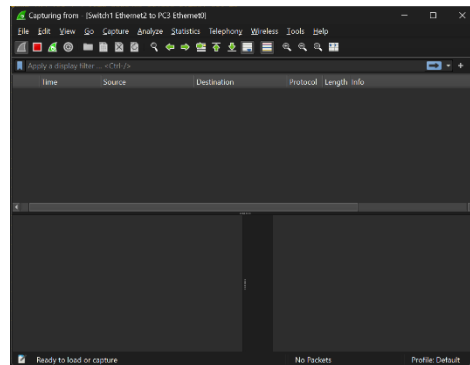
```
DESKTOP-CSTQM1 - PUTTY
84 bytes from 192.168.1.2 icmp_seq=183 ttl=64 time=0.965 ms
84 bytes from 192.168.1.2 icmp_seq=184 ttl=64 time=1.886 ms
84 bytes from 192.168.1.2 icmp_seq=185 ttl=64 time=1.611 ms
84 bytes from 192.168.1.2 icmp_seq=186 ttl=64 time=2.738 ms
84 bytes from 192.168.1.2 icmp_seq=187 ttl=64 time=0.188 ms
84 bytes from 192.168.1.2 icmp_seq=188 ttl=64 time=1.588 ms
84 bytes from 192.168.1.2 icmp_seq=189 ttl=64 time=1.219 ms
84 bytes from 192.168.1.2 icmp_seq=190 ttl=64 time=0.159 ms
84 bytes from 192.168.1.2 icmp_seq=191 ttl=64 time=1.616 ms
84 bytes from 192.168.1.2 icmp_seq=192 ttl=64 time=1.707 ms
84 bytes from 192.168.1.2 icmp_seq=193 ttl=64 time=1.188 ms
84 bytes from 192.168.1.2 icmp_seq=194 ttl=64 time=1.283 ms
84 bytes from 192.168.1.2 icmp_seq=195 ttl=64 time=1.381 ms
84 bytes from 192.168.1.2 icmp_seq=196 ttl=64 time=1.559 ms
84 bytes from 192.168.1.2 icmp_seq=197 ttl=64 time=1.164 ms
84 bytes from 192.168.1.2 icmp_seq=198 ttl=64 time=1.288 ms
84 bytes from 192.168.1.2 icmp_seq=199 ttl=64 time=1.169 ms
84 bytes from 192.168.1.2 icmp_seq=200 ttl=64 time=1.255 ms
84 bytes from 192.168.1.2 icmp_seq=201 ttl=64 time=1.384 ms
84 bytes from 192.168.1.2 icmp_seq=202 ttl=64 time=1.283 ms
84 bytes from 192.168.1.2 icmp_seq=203 ttl=64 time=1.413 ms
84 bytes from 192.168.1.2 icmp_seq=204 ttl=64 time=1.803 ms
84 bytes from 192.168.1.2 icmp_seq=205 ttl=64 time=1.154 ms
84 bytes from 192.168.1.2 icmp_seq=206 ttl=64 time=1.188 ms
84 bytes from 192.168.1.2 icmp_seq=207 ttl=64 time=1.406 ms
84 bytes from 192.168.1.2 icmp_seq=208 ttl=64 time=1.248 ms
84 bytes from 192.168.1.2 icmp_seq=209 ttl=64 time=1.523 ms
84 bytes from 192.168.1.2 icmp_seq=210 ttl=64 time=1.184 ms
84 bytes from 192.168.1.2 icmp_seq=211 ttl=64 time=1.164 ms
84 bytes from 192.168.1.2 icmp_seq=212 ttl=64 time=1.485 ms
84 bytes from 192.168.1.2 icmp_seq=213 ttl=64 time=1.484 ms
84 bytes from 192.168.1.2 icmp_seq=214 ttl=64 time=1.892 ms
84 bytes from 192.168.1.2 icmp_seq=215 ttl=64 time=0.393 ms
84 bytes from 192.168.1.2 icmp_seq=216 ttl=64 time=0.881 ms
84 bytes from 192.168.1.2 icmp_seq=217 ttl=64 time=1.288 ms
84 bytes from 192.168.1.2 icmp_seq=218 ttl=64 time=0.438 ms
84 bytes from 192.168.1.2 icmp_seq=219 ttl=64 time=1.251 ms
84 bytes from 192.168.1.2 icmp_seq=220 ttl=64 time=0.367 ms
84 bytes from 192.168.1.2 icmp_seq=221 ttl=64 time=0.498 ms
84 bytes from 192.168.1.2 icmp_seq=222 ttl=64 time=1.558 ms
84 bytes from 192.168.1.2 icmp_seq=223 ttl=64 time=0.663 ms
```

Sniffing on PC1's link using Wireshark. Which protocol is used for pings?

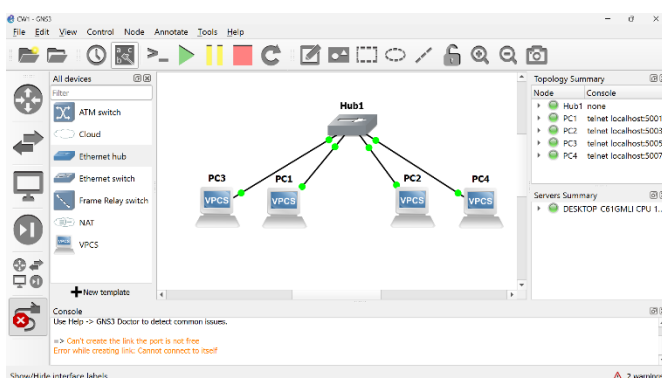


ICMP is the protocol used for pings.

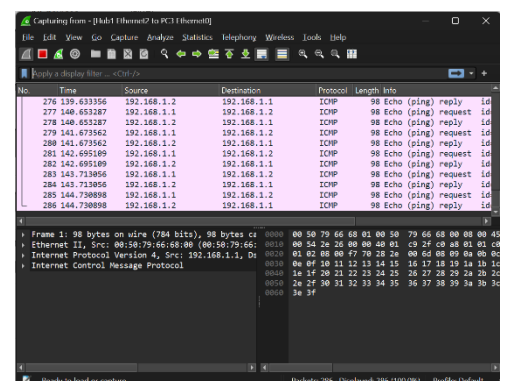
Start sniffing on PC3's link using Wireshark. Can you see the pings from there? Why?



You cannot see the pings from there because in an ethernet switch since it is not the same connection you are looking at and a switch only looks at its own connection.



Replacing the switch by a hub



The protocol being used is still ICMP, but the difference is that now using the hub, you can see the pings between PC1 and PC2 on the link of PC3 since it is a hub being used.