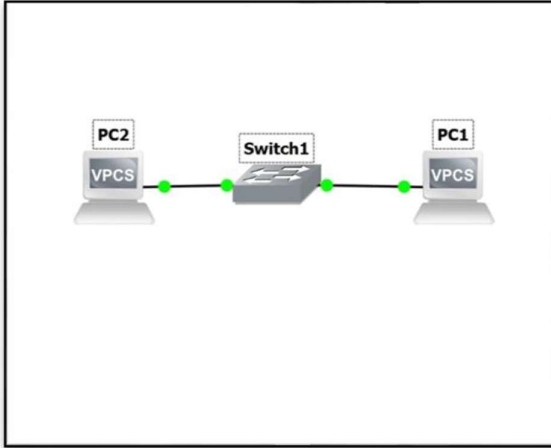


Network Foundations: Subnetting, VLANs & Packet Capture

PART 1: Connectivity and Virtual PC



I have added 2 VPCS, PC1 and PC2. A switch is also added to the network. Both VPCs are connected to the switch (SW1).

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

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

PC1> █
```

The screenshot shows a terminal window with two tabs: 'PC1' and 'PC2'. The 'PC1' tab is active. The terminal displays the process of setting the IP address for PC1. It starts with the command 'ip 192.168.1.2/24', followed by a confirmation message 'Checking for duplicate address...' and the output 'PC1 : 192.168.1.2 255.255.255.0'. Then, the command 'PC1> ip 192.168.1.1/24' is entered, followed by another confirmation message and the output 'PC1 : 192.168.1.1 255.255.255.0'. The prompt 'PC1>' is followed by a green cursor.

PC 1 IP address has been set to 192.168.1.1

```
PC1 PC2
192.168.1.2/24
Bad command: "192.168.1.2/24". Use ? for help.

PC2> ip 192.168.1.2/24
Checking for duplicate address...
192.168.1.2 is being used by MAC 00:50:79:66:68:00
Address not changed

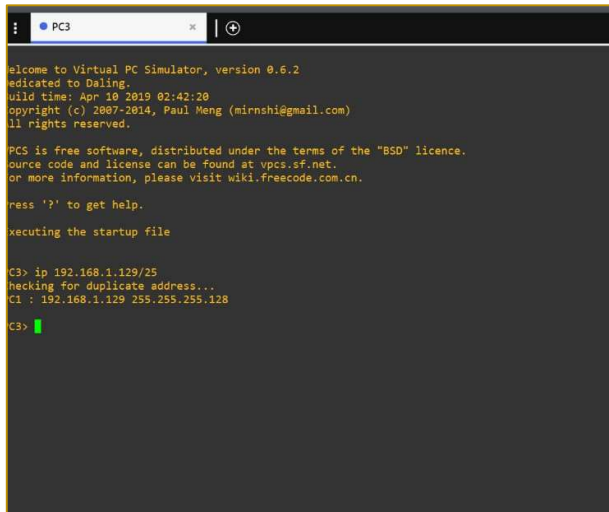
PC2> ip 192.168.1.2/24
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0

PC2> ping 192.168.1.1
84 bytes from 192.168.1.1 icmp_seq=1 ttl=64 time=1.552 ms
84 bytes from 192.168.1.1 icmp_seq=2 ttl=64 time=1.478 ms
84 bytes from 192.168.1.1 icmp_seq=3 ttl=64 time=1.488 ms
84 bytes from 192.168.1.1 icmp_seq=4 ttl=64 time=2.528 ms
84 bytes from 192.168.1.1 icmp_seq=5 ttl=64 time=0.869 ms

PC2> █
```

PC 2 IP address has been set to 192.168.1.2. Next, I pinged PC1 from PC 2 and it recognized it.

PART 2: Subnets



```
PC3
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

PCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

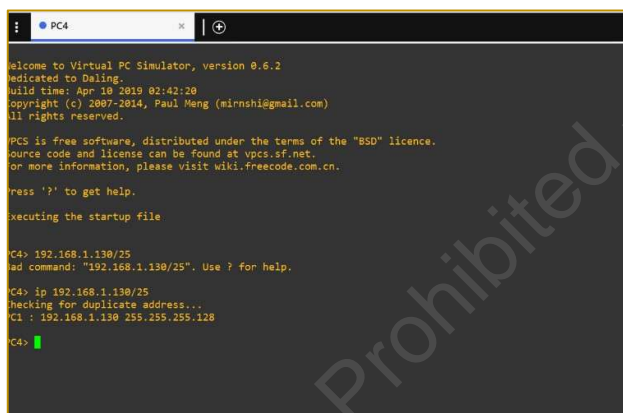
Press '?' to get help.

Executing the startup file

C3> ip 192.168.1.129/25
Checking for duplicate address...
C1 : 192.168.1.129 255.255.255.128

C3>
```

PC3 has been added to the network, not connected to the switch. The IP address of PC3 has been set to 192.168.1.129 on mask /25.



```
PC4
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

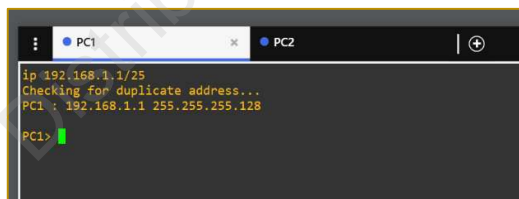
Executing the startup file

C4> 192.168.1.130/25
Bad command: "192.168.1.130/25". Use ? for help.

C4> ip 192.168.1.130/25
Checking for duplicate address...
C1 : 192.168.1.130 255.255.255.128

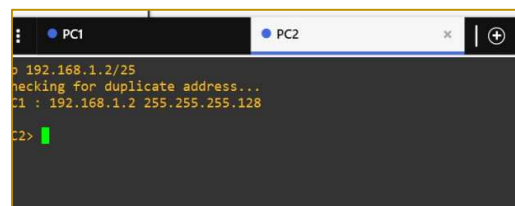
C4>
```

PC4 has been added to the network, not connected to switch. The IP address on PC4 has been set to 192.168.1.130 on mask /25.



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

PC1>
```



```
PC2
ip 192.168.1.2/25
Checking for duplicate address...
C1 : 192.168.1.2 255.255.255.128

C2>
```

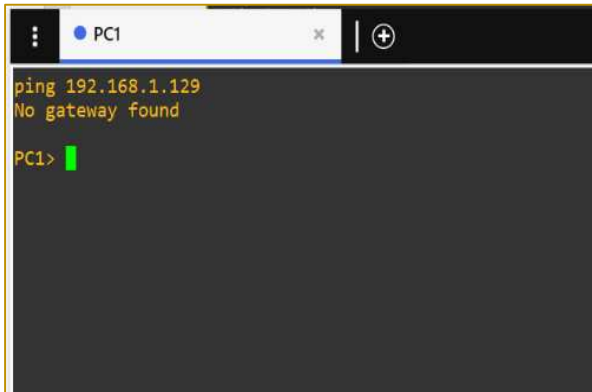
Both PC1 and PC2 have been reassigned to the /25 mask.

Verification: Reachability to PC3/PC4

Status: Not reachable from PC1/PC2.

Cause: Different IP networks (PC1 = 192.168.1.1/24 vs PC3 = 192.168.1.129/25, PC4 = 192.168.1.130/25) and no router; PC3/PC4 are not connected to SW1.

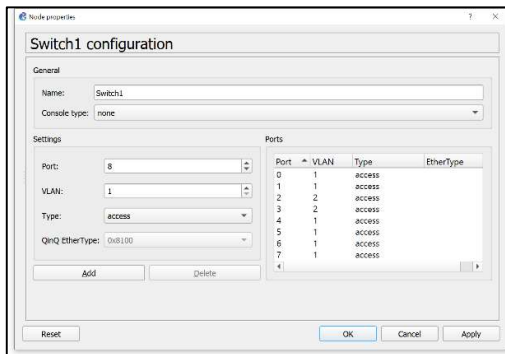
Remediation: (i) Place all hosts in the same subnet, or (ii) connect all to SW1 and add a router with per-subnet interfaces as default gateways.



The image shows a terminal window titled 'PC1'. The command 'ping 192.168.1.129' has been entered, and the output is 'No gateway found'. The prompt 'PC1>' is visible on the next line.

```
PC1> ping 192.168.1.129
No gateway found
PC1>
```

PART 3: VLANs



PC 3 AND PC4 are connected to ports 2 and 3 respectively. Therefore, I have changed the VLAN ports of PC3 and PC4 to VLAN 2.

Verification: Ping tests across VLANs

PC1 → PC2: Reachable.

Cause: Same VLAN (VLAN 1) and same subnet; L2 switching forwards frames directly.

PC1 → PC3: Not reachable.

Cause: Different VLANs (VLAN 1 ↔ VLAN 2). Even if IPs are in the same subnet, L2 segmentation blocks traffic without an L3 device (inter-VLAN routing).

PC2 → PC4: Not reachable.

Cause: Different VLANs (VLAN 1 ↔ VLAN 2); no L3 gateway configured.

PC3 → PC4: Reachable (if both in VLAN 2 and same subnet; links up).

Cause: Same VLAN (VLAN 2) and same subnet; frames switch locally.

Remediation (for the failed paths):

Enable inter-VLAN routing (router-on-a-stick with 802.1Q sub interfaces or L3 switch SVIs) and set each host's default gateway to its VLAN interface.



PING PC4 FROM PC 2

PART 4: Wireshark

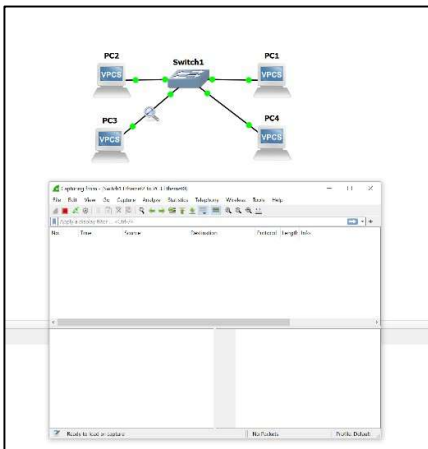
I initiated a continuous ping from PC 1 to PC2 using the command "ping 192.168.1.2 -t". I then initiated the sniff using Wireshark.

Verification: Ping protocol

Protocol: ICMP (Internet Control Message Protocol)

Usage: Network diagnostics and error reporting; ping uses Echo Request/Reply messages to test reachability.

Note: ICMP is not a transport for application data (no ports, not TCP/UDP).

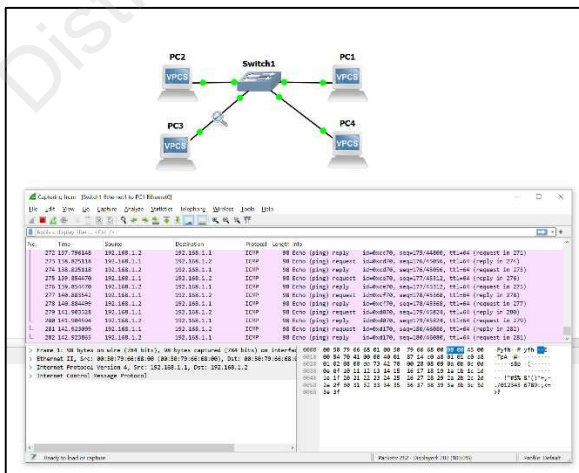


Verification: Sniffing from PC3's link (switch case)

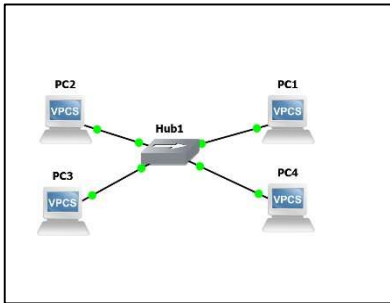
Observation: No, the ping traffic between PC1 and PC2 is **not visible** on PC3's access port.

Cause: A **Layer-2 switch** forwards **unicast** frames only to the destination port based on its MAC table; PC3 isn't a participant in that flow.

Notes: You'd only see **broadcasts** (e.g., ARP) from the **same VLAN**, or the traffic if a **SPAN/mirror** port is configured. On a **hub**, the ping would be visible on all ports.



Now the switch has been replaced by a hub. I initiated a constant ping from PC1 to PC2.



Verification: Sniffing from PC3's link (hub case)

Observation: Yes, the ping traffic is visible on all connected devices.

Cause: A hub operates at Layer 1 and simply repeats every signal it receives to all ports, creating a shared medium.

Result: All hosts see the same frames, so pings between PC1 and PC2 appear on PC3's capture as well.

