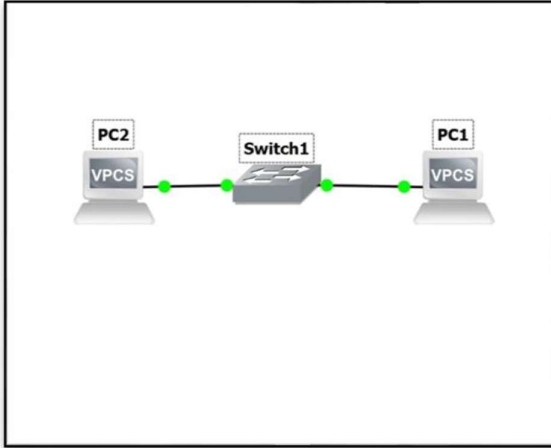# Network Foundations: Subnetting, VLANs & Packet Capture

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).

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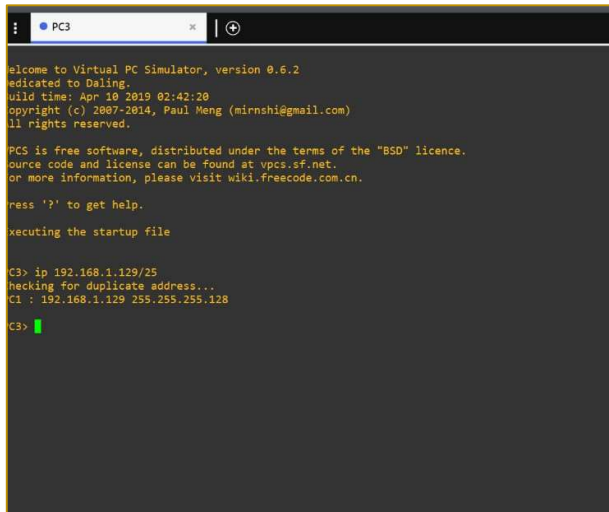
PC 2 IP address has been set to 192.168.1.2. Next, I pinged PC1 from PC 2 and it recognized it.

PART 2: Subnets
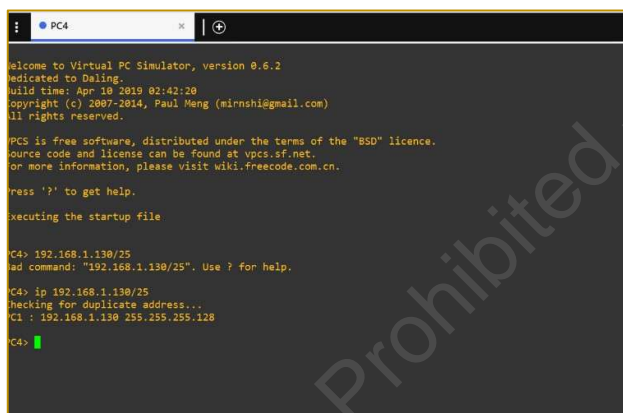
PC3 has been added to the network, not connected to the switch. The IP address of PC3 has been set to 192.168.1.129 on mask/25.
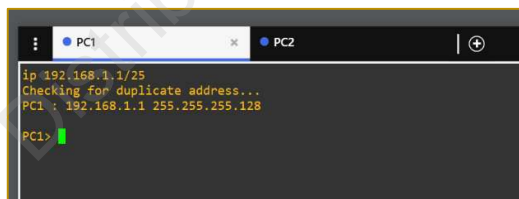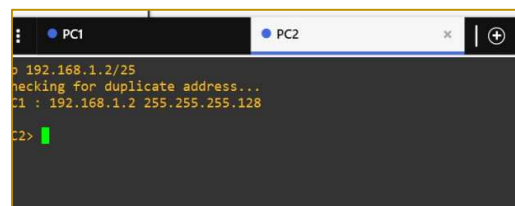
PC4 has been added to the network, not connected to switch. The IP address on PC4 has been set to 192.168.1.130 on mask /25.

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.

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**.

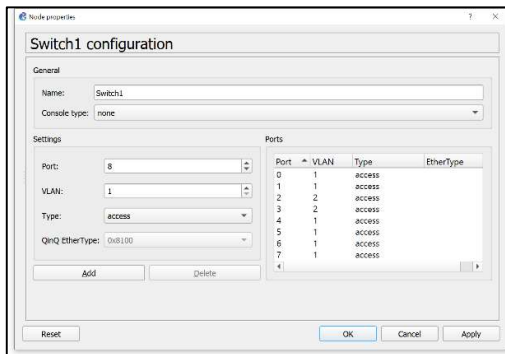Cause: Same VLAN (VLAN 1) and same subnet; L2 switching forwards frames directly.

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

Since PC4 is in VLAN 2 and PC2 is in VLAN 1, they cannot directly communicate even though they are in the same subnet. Unless they are connected via a layer 3 device that can handle inter VLAN routing.

PING PC 4 FROM PC3

Since PC3 and PC4 are on the same VLAN and the same subnet they can ping each.

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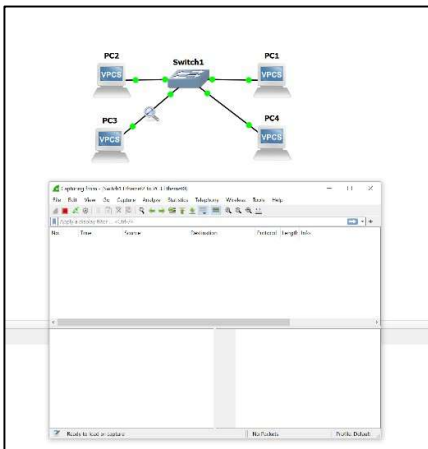
Verification: Sniffing from PC3's link (switch case)

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.
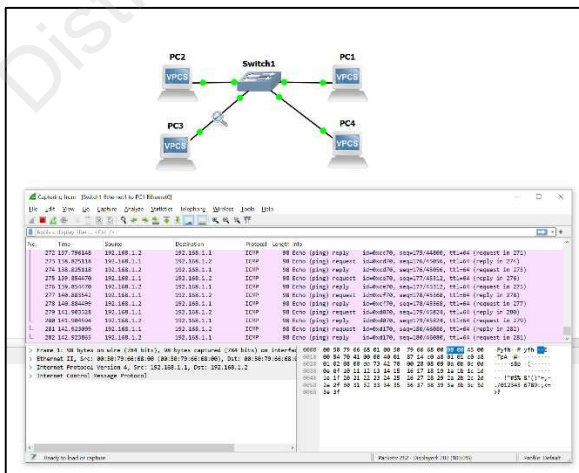
Now the switch has been replaced by a hub. I initiated a constant ping from PC1 to PC2.
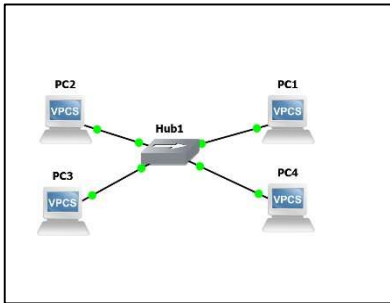
Verification: Sniffing from PC3's link (hub case)

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.