LAB 03 Network Subnetting

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CMPS1192 Networking Fundamentals
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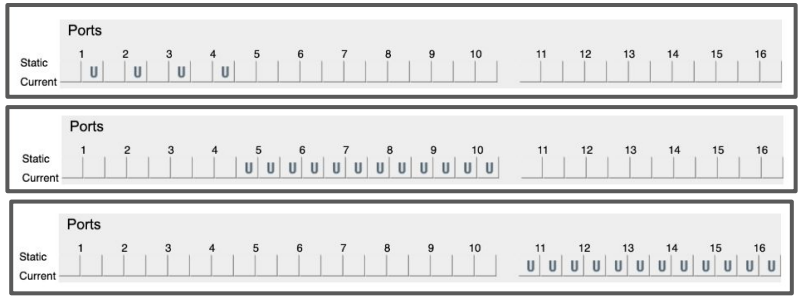
VLAN Setup (Layer 2) 5 Hosts

- VLAN 1 (default)
- VLAN 2 (IT)
- VLAN 3 (Finance)



1	1	2	2
1	1	2	2

2	3	3	3
2	3	3	3

Port Table

MAC Address Table

Current Address Table

	VLAN ID	MAC
1	VLAN 1	f8e43bb24d29
2	VLAN 2	40c2ba147870
3	VLAN 2	9829a64230e1
4	VLAN 3	00e04c680041
5	VLAN 3	00e04c6800f0

CIDR

- Classless Inter Domain Routing
- Replaces the legacy Classful IP (Class A, B and C).
- CIDR Notation represents the number of consecutive 1s in subnet mask (e.g. /24 = 11111111 11111111 11111111 00000000

Group Size	128	64	32	16	8	4	2	1
Subnet	128	192	224	240	248	252	254	255
CIDR	/25	/26	/27	/28	/29	/30	/31	/32
3rd Octet	/17	/18	/19	/20	/21	/22	/23	/24
2nd Octet	/9	/10	/11	/12	/13	/14	/15	/16
1st Octet	/1	/2	/3	/4	/5	/6	/7	/8

Designing Subnet for 192.168.3.0 /29 Network

5 Hosts

Assigned IP Block	192.168.3.0 /29
Subnet Binary	11111111 11111111 11111111 11111000
Network ID	192.168.3.0
Broadcast IP	192.168.3.7
First Host IP	192.168.3.1
Last Host IP	192.168.3.6
Next Network	192.168.3.8
# of IP Addresses (2^3)	8 (6 usable)
Subnet Mask	255.255.255.248

Statically Assigning IPs

IP Address	192.168.3.2 (Andres)
	192.168.3.3 (Jennessa)
	192.168.3.4 (Abner)
	192.168.3.5 (Jose)
	192.168.3.6 (Asael)
Subnet Mask	255.255.255.248
Default Gateway (No Router Used)	192.168.3.1

Same VLAN + Same Network

```
jennx@JS-PC in ~ via ⬢ v20.11.1
❯ ping 192.168.3.3

Pinging 192.168.3.3 with 32 bytes of
Reply from 192.168.3.3: bytes=32 time
Reply from 192.168.3.3: bytes=32 time
Reply from 192.168.3.3: bytes=32 time
Reply from 192.168.3.3: bytes=32 time

Ping statistics for 192.168.3.3:
    Packets: Sent = 4, Received = 4,
Approximate round trip times in milli
    Minimum = 0ms, Maximum = 0ms, Ave
```

```
Ethernet II, Src: ASIXElectron_b2:4d:29 (f8:e4:3b:b2:4d:29), Dst: JS-
> Destination: JS-PC.local (40:c2:ba:14:78:70)
> Source: ASIXElectron_b2:4d:29 (f8:e4:3b:b2:4d:29)
  Type: IPv4 (0x0800)
  [Stream index: 4]
Internet Protocol Version 4, Src: 192.168.3.2 (192.168.3.2), Dst: JS-
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
  Total Length: 60
  Identification: 0x4864 (18532)
> 000. .... = Flags: 0x0
  ...0 0000 0000 0000 = Fragment Offset: 0
  Time to Live: 64
  Protocol: ICMP (1)
  Header Checksum: 0xab07 [validation disabled]
  [Header checksum status: Unverified]
  Source Address: 192.168.3.2 (192.168.3.2)
  Destination Address: JS-PC.local (192.168.3.3)
  [Stream index: 4]
```

Ping Successful

Designing Next Network 192.168.3.8 /29

3 Hosts

Assigned IP Block	192.168.3.8 /29
Subnet Binary	11111111 11111111 11111111 11111000
Network ID	192.168.3.8
Broadcast IP	192.168.3.15
First Host IP	192.168.3.9
Last Host IP	192.168.3.14
Next Network	192.168.3.16
# of IP Addresses (2^3)	8 (6 usable)
Subnet Mask	255.255.255.248

Statically Assigning IPs

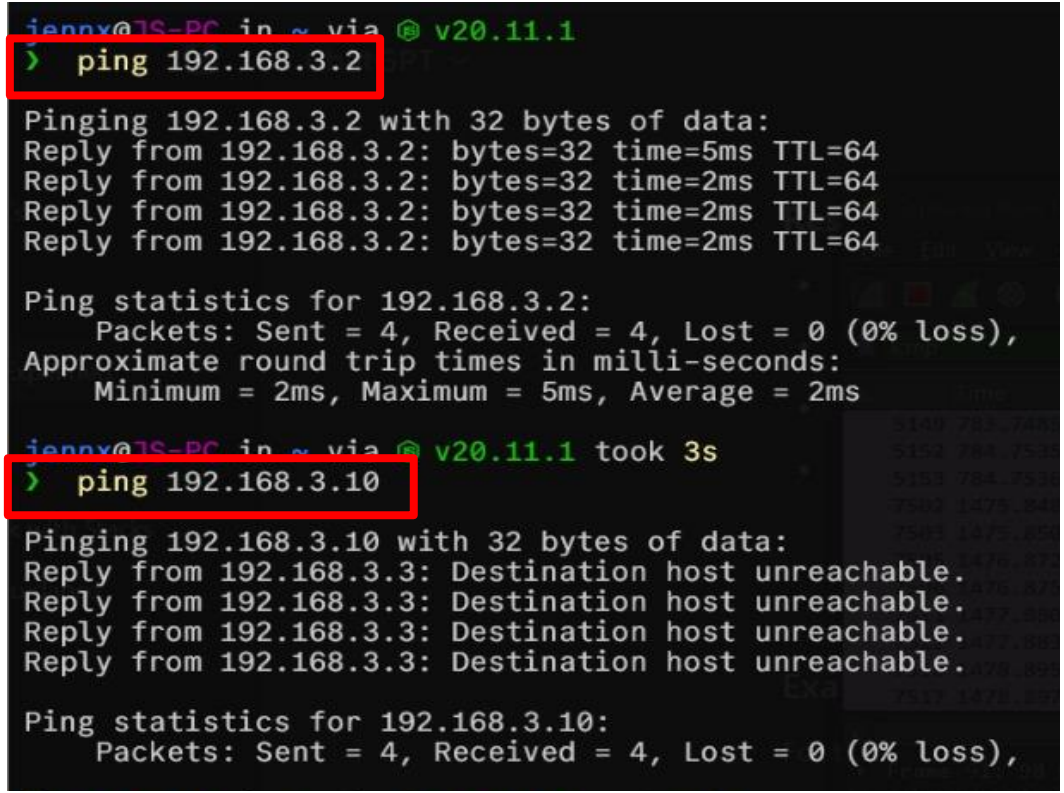
IP Address	192.168.3.2 (Andres)
	192.168.3.3 (Jennessa)
Subnet Mask	255.255.255.248
Default Gateway (No Router Used)	192.168.3.1

First Network

IP Address	192.168.3.10 (Abner)
	192.168.3.11 (Asael)
	192.168.3.12 (Wendy)
Subnet Mask	255.255.255.248
Default Gateway (No Router Used)	192.168.3.9

Second Network

Same VLAN + Different Network



On same network =
Ping successful

On different network =
Ping unsuccessful

FLSM and VLSM

- Fixed Length Subnet Mask (FLSM)
- Both 192.168.3.0 /29 and 192.168.3.8 /29 networks use the same subnet mask of /29.
- Not used much anymore.

- Variable Length Subnet Mask (VLSM)
- The second network could be smaller with /30 (4 available IPs with 2 usable) for more efficient IP space usage.
- The modern way currently used for network design.

NAT and PAT

- We used private IP address range Class C of 192.168.x.x
- Every computer needs a public IP address.
- Network Address Translation (NAT) and Port Address Translation (PAT) translates private IP addresses into public IP address.
- This conserves available public IP addresses.

Routers

- Layer 3 device that connects two separate networks.
- Not done in lab but each interface in the router would be assigned the IP address that each network’s default gateway goes to.

Logical Network View