Simulate GNS3 network | GNS3- simulates routers, switches, and PCs

Student #- 20 ███████████

IP addressing plan for ██████████

Address Space- ███████ /20

Campus A

Campus B

Reserved	Blue subnet -- /24
Campus A	Green subnet -- /24
Campus B	Reserved -- /24
Reserved	Servers -- /25
	Point-to-point links -- 32 x /30

Entire address space represented by network prefix ██████████

(Left) Your address space, equally partitioned into four blocks

(Right) Details of address blocks within Campus A
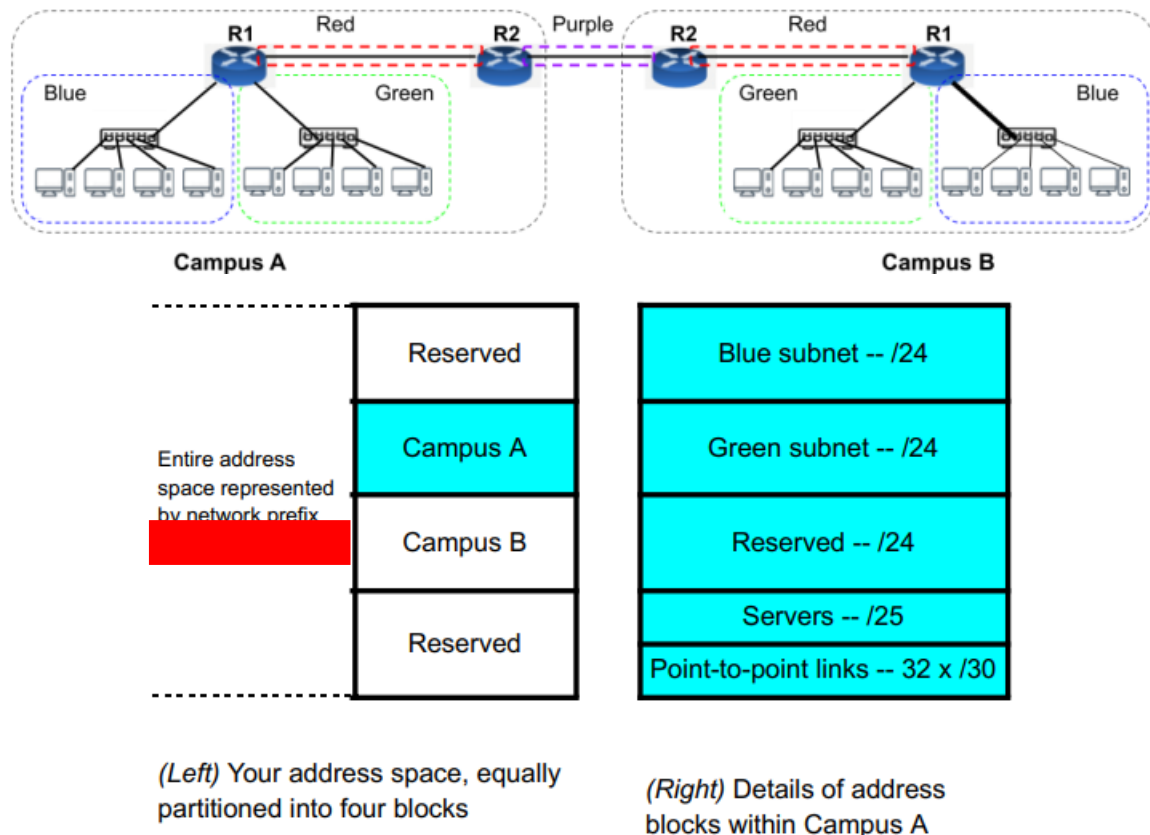
1.

*Address Space in Dotted Decimal- ███████████████████████████ (/20)

*███████████████████████ /20- first 20 bits are the netmask prefix / network address, the rest are don't cares

*Notes- 128, 64, 32, 16 | 8, 4, 2, 1

- /20- Network Prefix Length, means that the first 20bits of all IP addresses (32bits in IPv4) in the network must be similar
- To partition the address space by 4, we use the concept of Permutation and Binary. To represent 4 different groups, we need 2bits (00, 01, 10, and 11). This will result into 4 /22 blocks (used the 2bits after the 20th bit from the MSB).

Groups	Dotted Decimal	Subnet Address	Subnet Range	
Reserved				
Campus A				
Campus B				
Reserved				

For Campus A

*Same utilization of Permutation and Binary concepts in subdivisions

Groups	Dotted Decimal	Subnet Address	Subnet Range	
Blue Subnet				
Green Subnet				
Reserved				
Servers (/25)				
P2P Links (32 x /30)				

For Campus B

Groups	Dotted Decimal	Subnet Address	Subnet Range
Blue Subnet			
Green Subnet			
Reserved			
Servers (/25)			
P2P Links (32 x /30)			

2.

*Start OpenVPN

*Credentials-

-
-
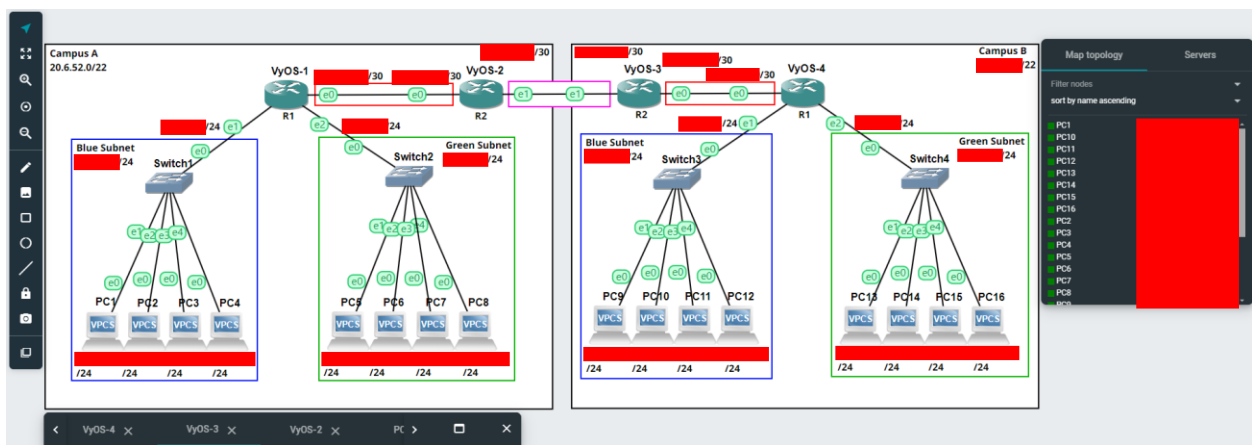
*The positions of Blue and Green Subnets are swapped on Campus B (but the links used are the same)

*Commands-

- ip <IP address>/<subnet>- for setting up a PC's IP address and subnet
- save
- show ip- for checking current PC's configurations

- Routers-
    - configure / conf
    - exit
    - set interfaces ethernet <eth#> address <IP address>/<subnet>-
    - delete / del interfaces ethernet <eth#> address <IP address>/<subnet>-
    - commit- lock changes (for temp file...)
    - save
    - show interfaces / int
- Tab- shows list of possible commands...
- Arrows up or down- command history...
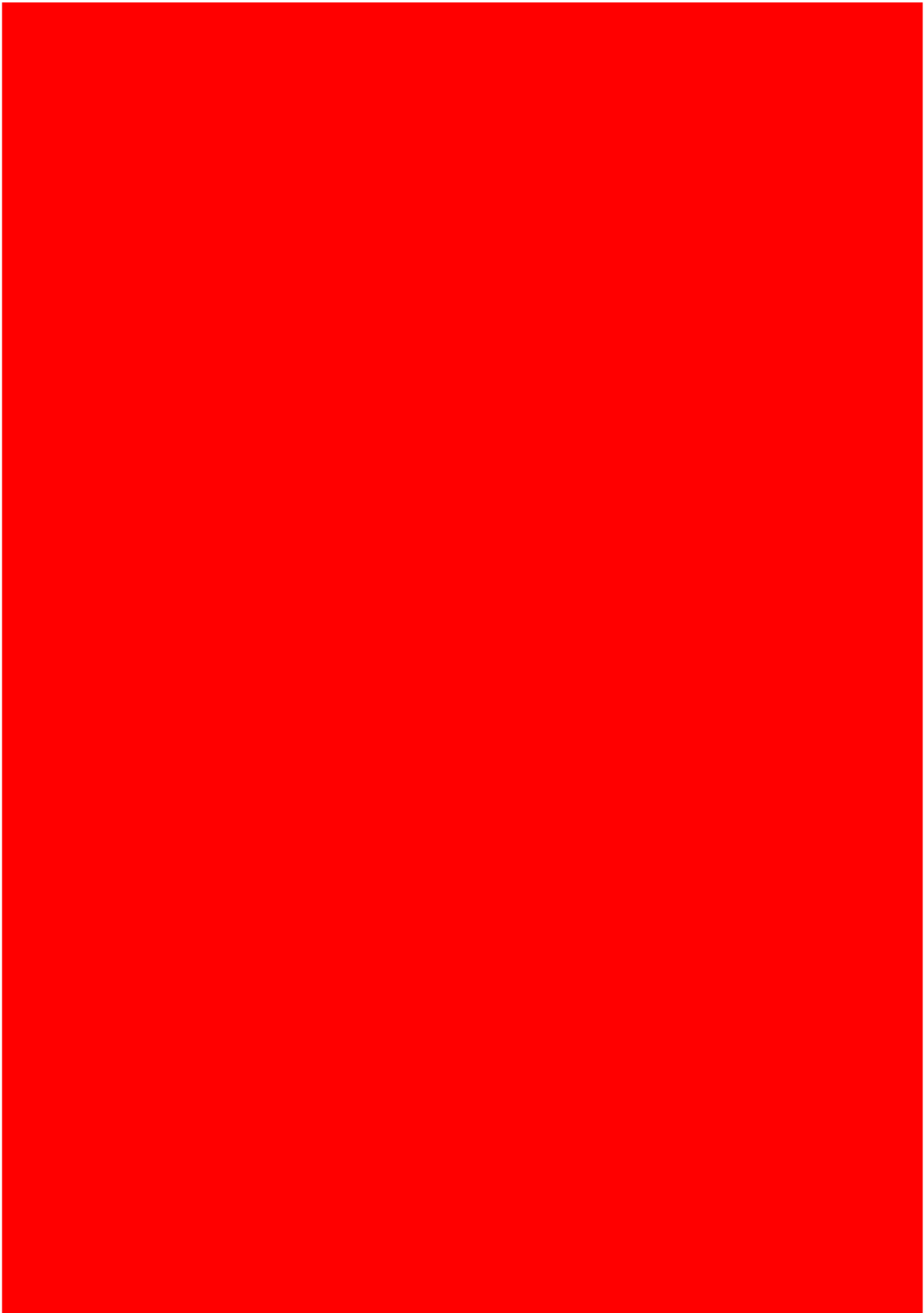
For Campus A

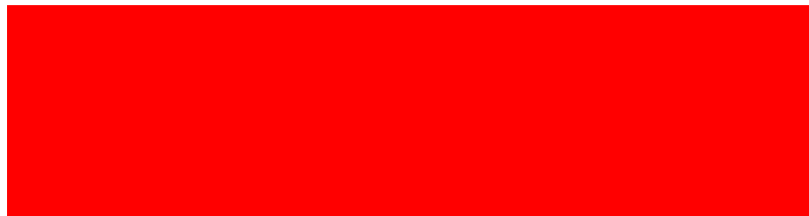*Blue Subnet
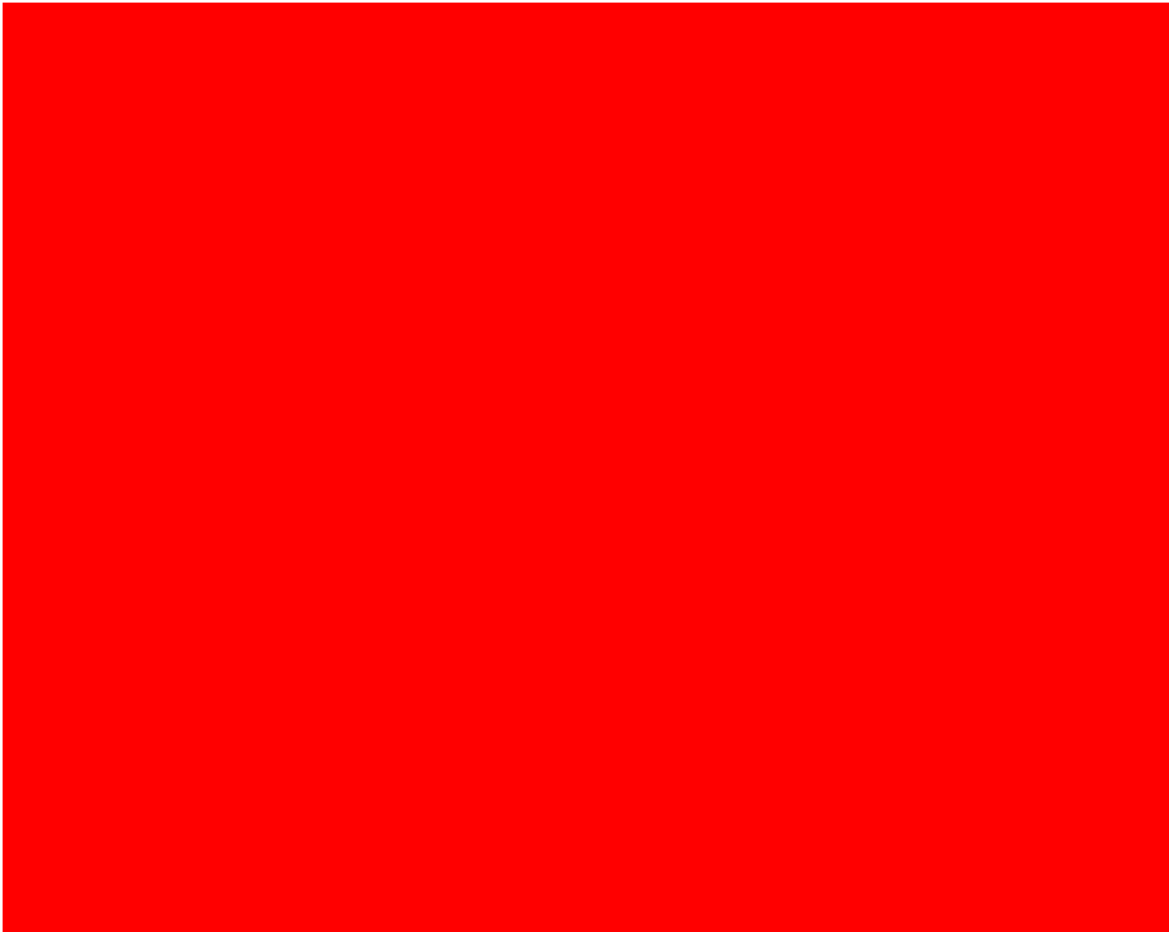
*Green Subnet
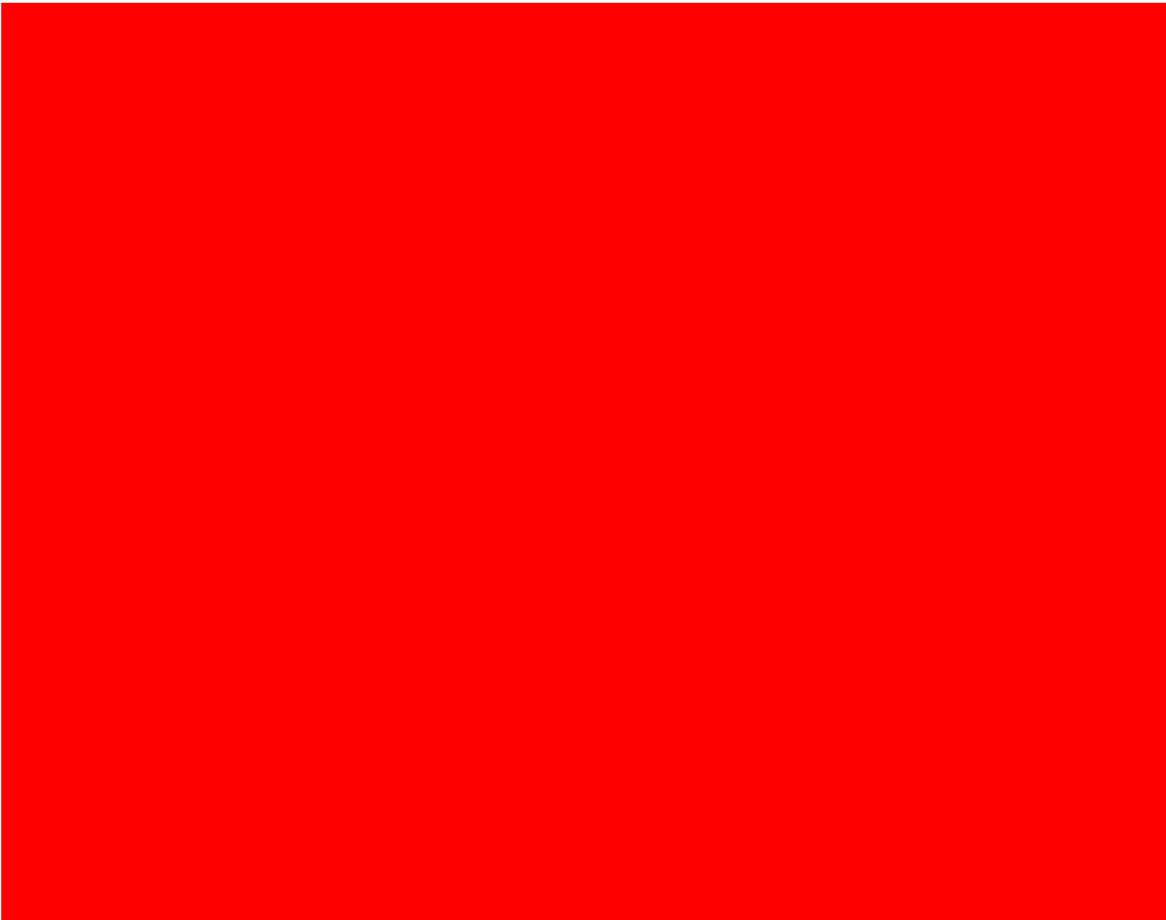
For Campus B

*Blue Subnet
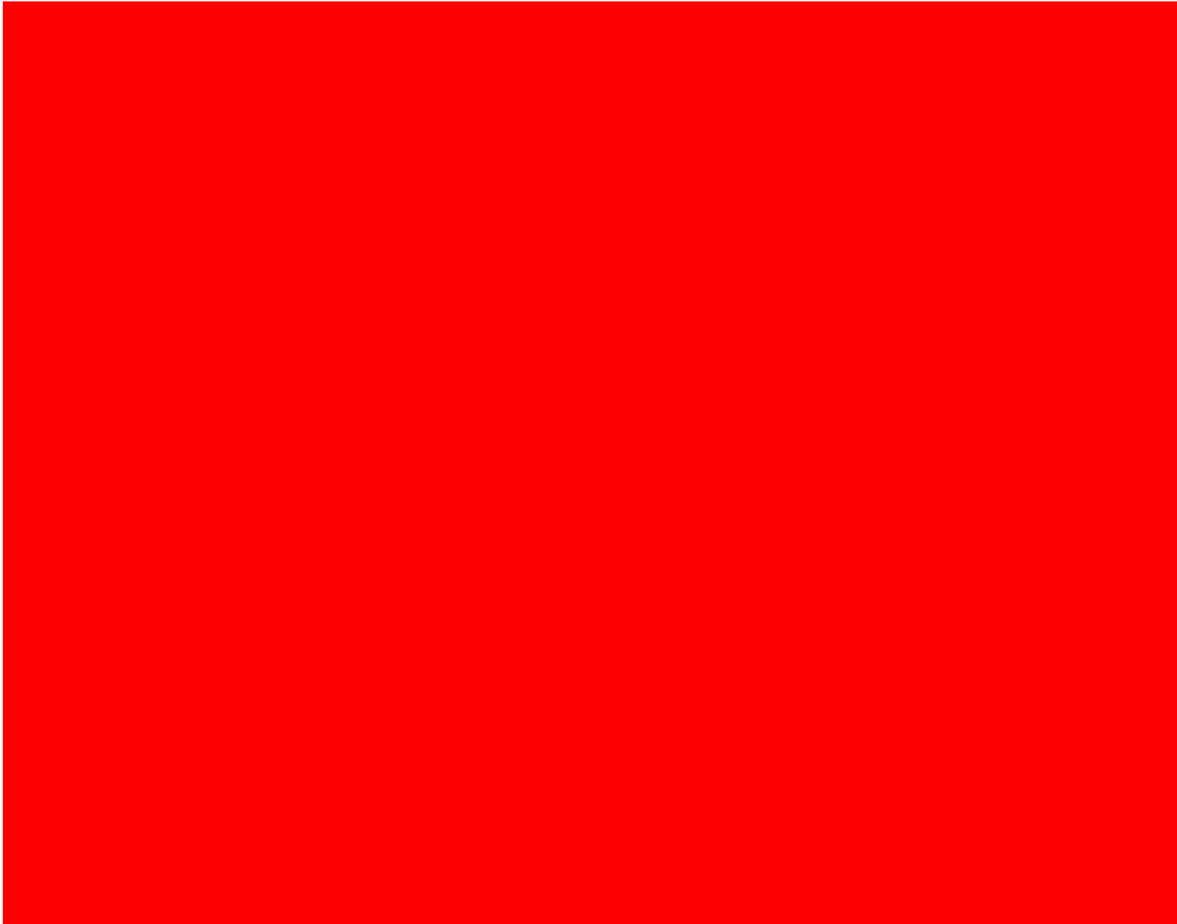
*Green Subnet

*Left- R1 on Campus A, Right- R2 on Campus B

    a. From a PC in the Blue subnet, is it possible to ping another PC w/in the same subnet? Why or why not?

- Yes. All PCs/hosts in the Blue subnet were configured such that they are within the same network (same network prefix, same bit sequence starting from the MSB up to the 24th bit [/24]), and there is 1 switch connecting all of them.

    b. From a PC in the Blue subnet, is it possible to ping R1's directly connected interface? Why or why not?

- Yes, the interface was set to have an address of ⬛⬛⬛⬛⬛/24 (same subnet, same network prefix, thus same local network), and they're all connected to 1 switch.

c. From a PC in the Blue subnet, is it possible to ping a PC in the Green subnet? Why or why not?

- No. PCs from the Blue Subnet (i.e. from Campus A) and Green Subnet (i.e. from Campus A) have /24 subnets but they differ with respect to network prefix (i.e. first 24 bits from the MSB), thus they don't belong to the same local network. Although the interfaces (for Blue and Green Subnets) were already configured, the PCs have not been given default gateways yet, that are needed to communicate with hosts from other local networks.

3.
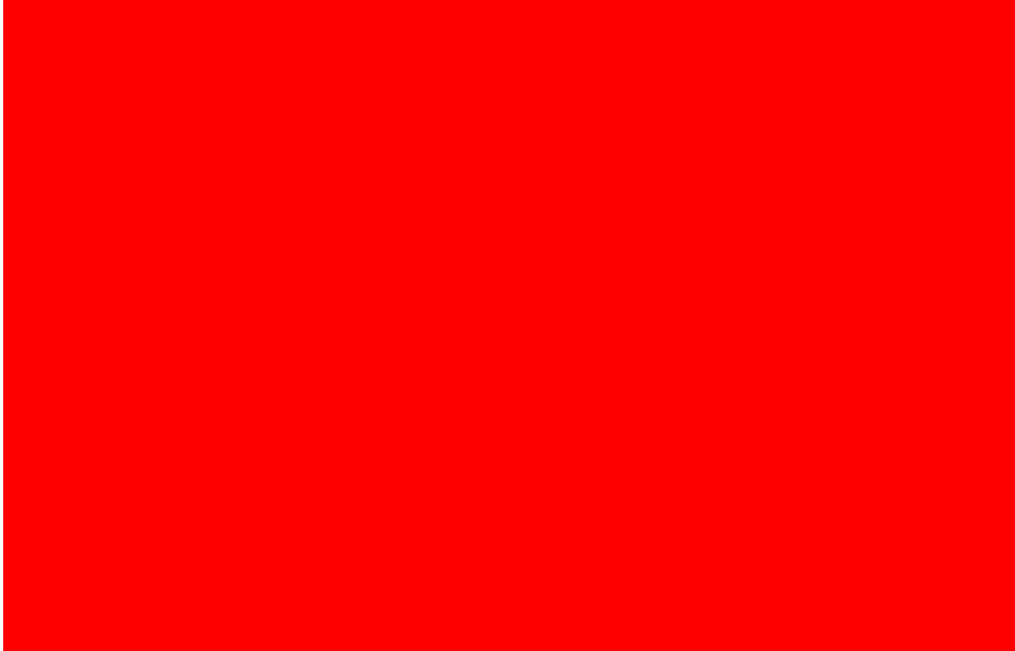
*Commands-

- set protocols static route <dest IP address>/<subnet> next-hop <next hop router address>- static routing
- show protocols

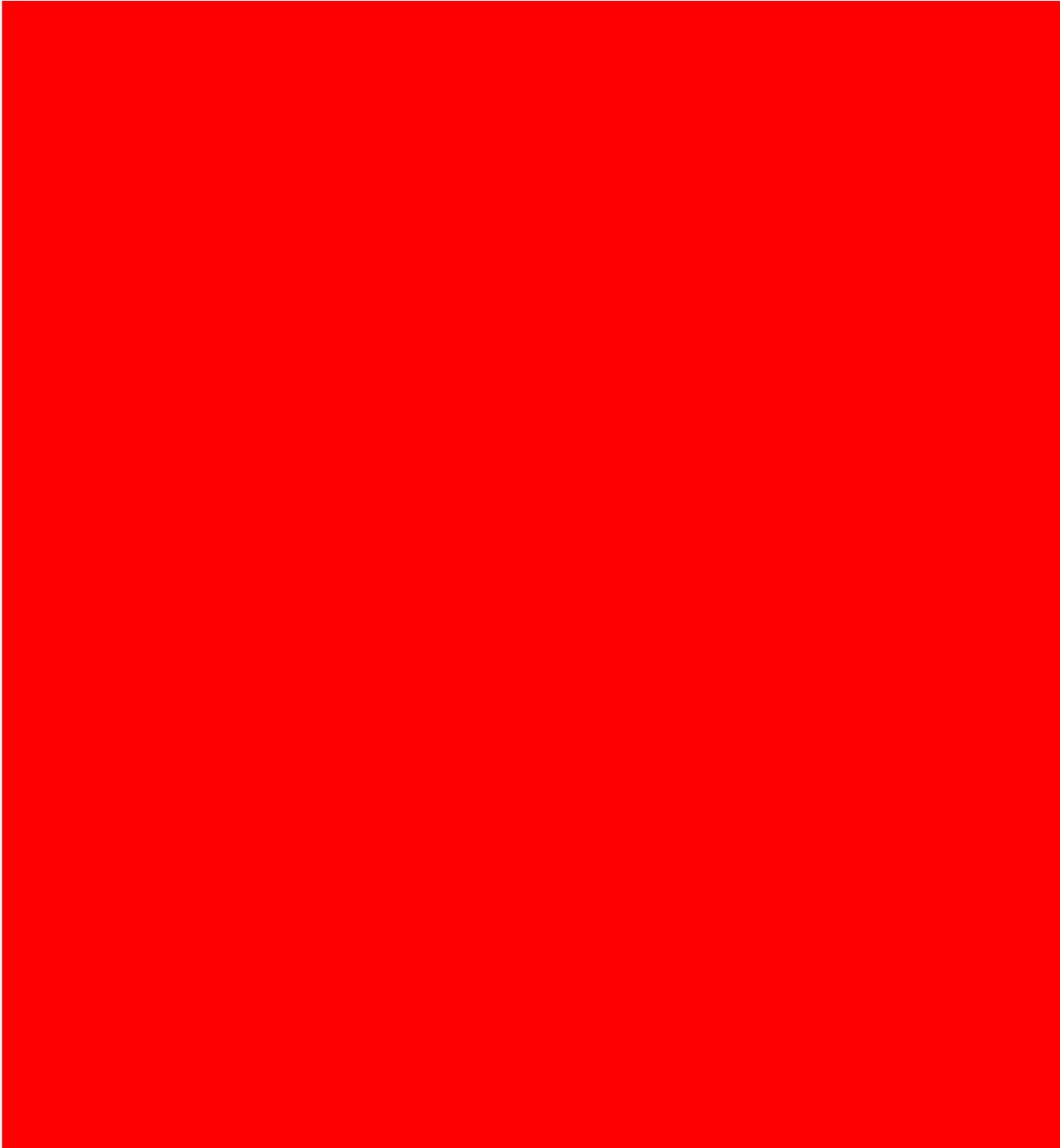*R1 on Campus A

*R1 on Campus B

*Fixed this into-

a. From a PC in the Blue subnet, is it possible to ping a PC in the Green subnet? Why or why not?

- No, not yet. What we did is we just set the router such that when the destination is to the Blue subnet, it routes the packets to the appropriate interface (i.e.   ), and vice versa. But we still don't set the default gateway for the PCs; if the gateway is not yet configured, it is not possible to communicate with PCs from another network.



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

b. Configure all the hosts (PCs) in the campus you are working on such that their default gateways are the R1 interfaces directly connected to the same subnet as the host. Is it now possible to ping a PC in the Green subnet from a host in the Blue subnet and vice versa? What
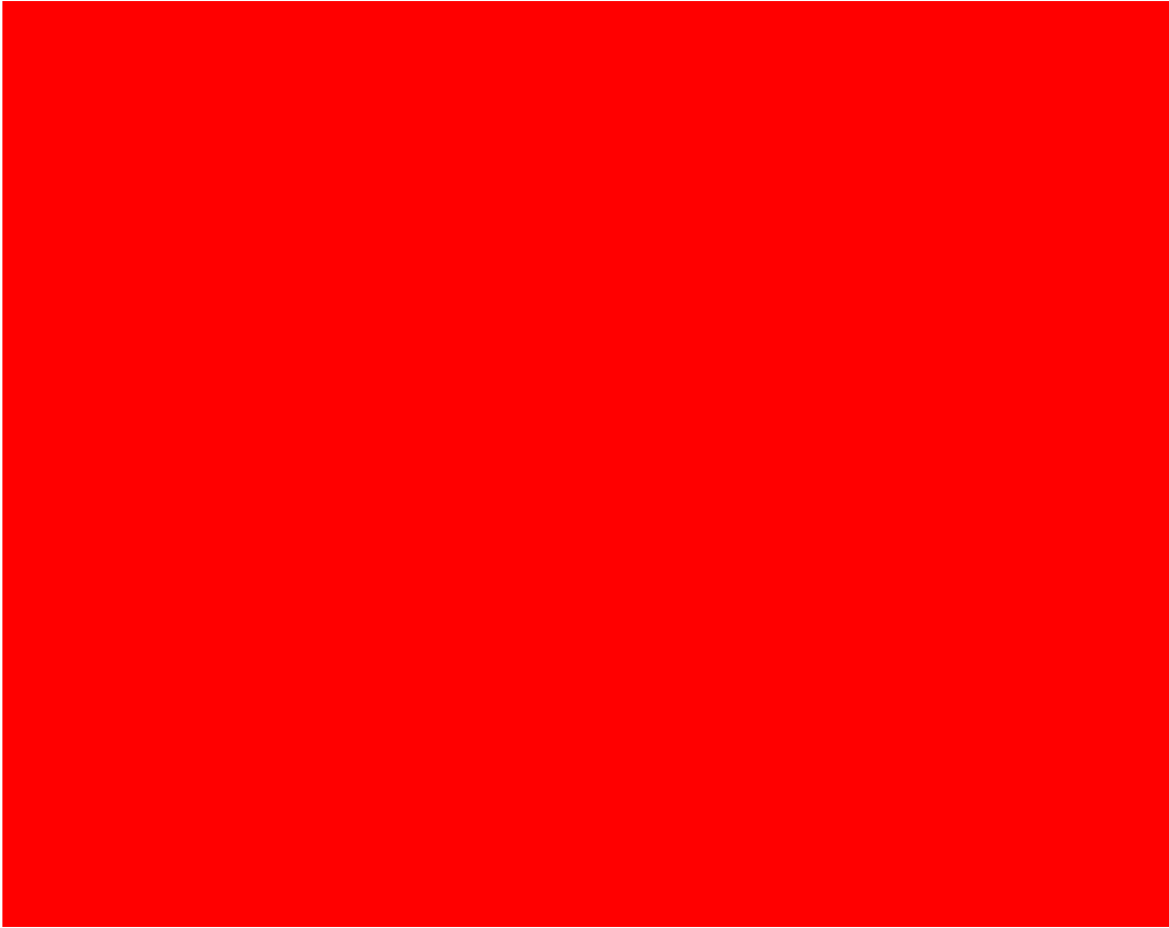
effect, if any, did the presence of a configured default gateway make? Explain your answer in detail.

- Yes, now that the appropriate default gateway (R1 interface) was given to all PCs, and there is a router configured accordingly (that can connect the 2 subnets), Blue-Green Subnet communications are now possible.
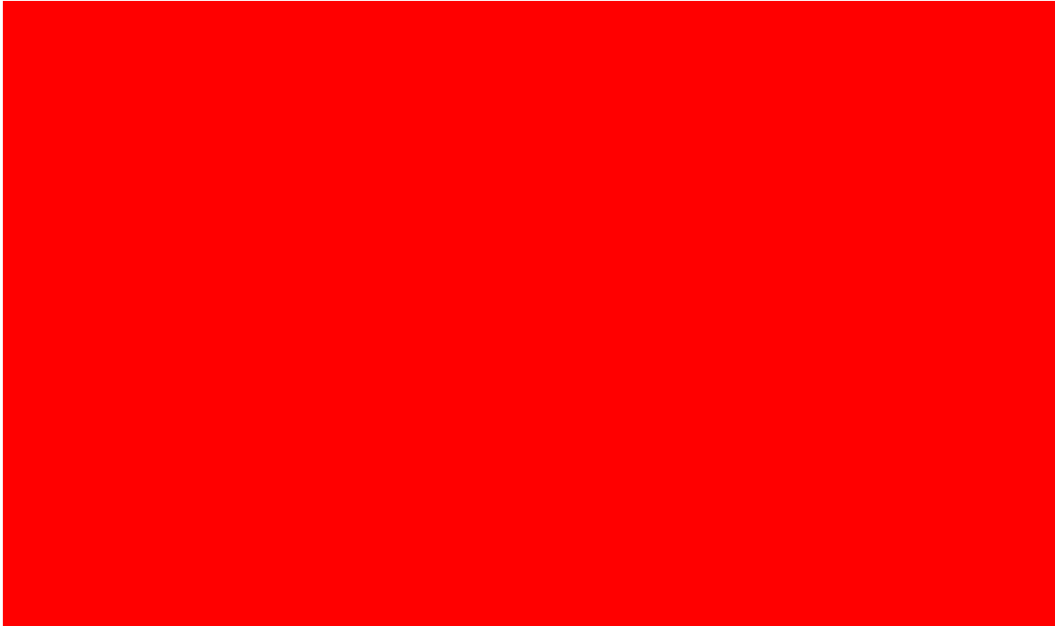
4.
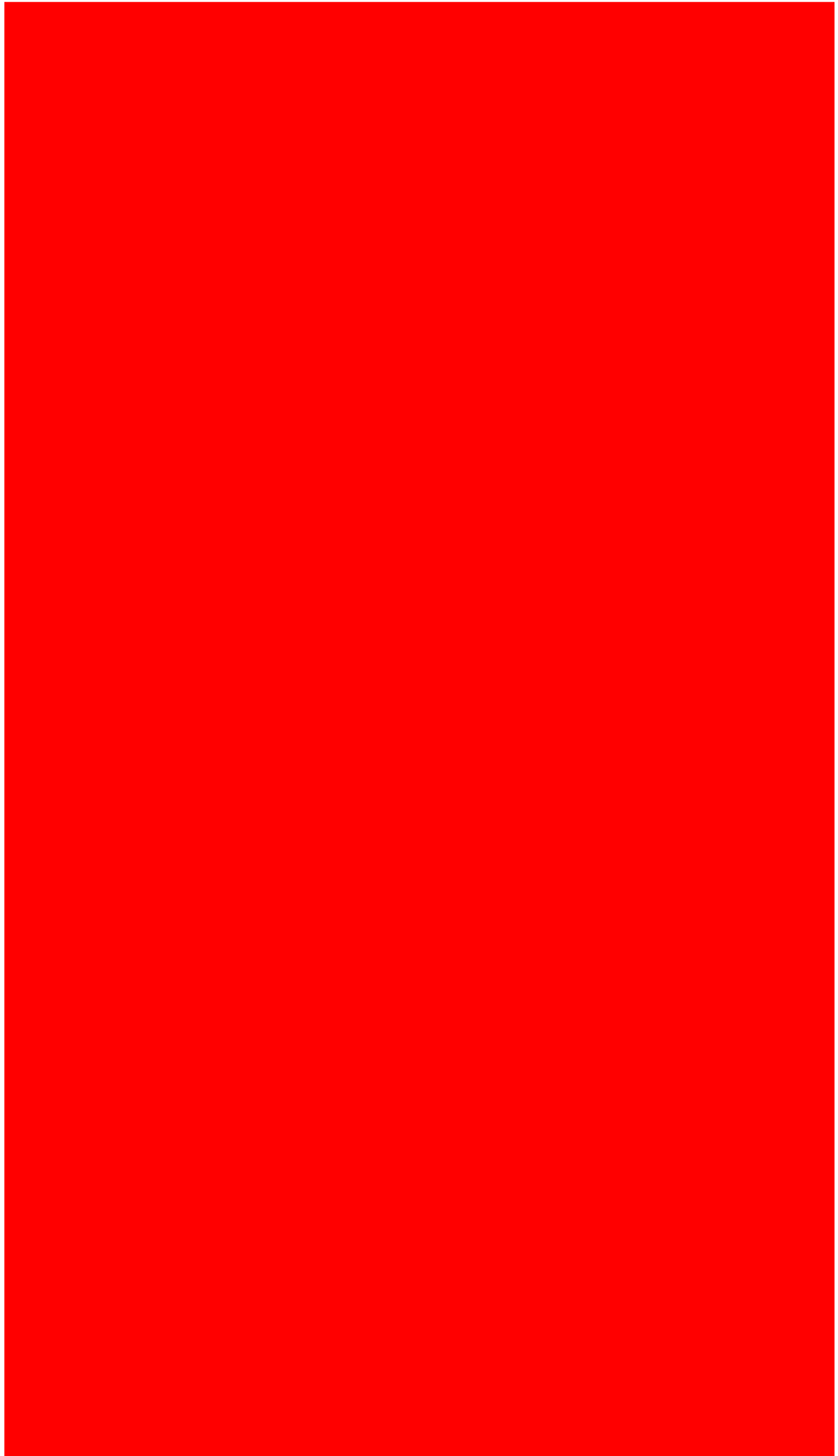
*Set interfaces

*Left- R2 on Campus A, Right- R2 on Campus B

*Set static routes

*R2 on Campus A

*R2 on Campus B

a. From a PC in 1 campus, is it possible to ping any PC in the other campus? Why or why not?

- No. What we configured for now is we set routes from R2 (on Campus A) to the Campus B network, as well as R2 (on Campus A) to R1 (on Campus A), and vice versa. So, let's say we try to ping a PC from Blue subnet from Campus B (i.e. PC1) using a PC from Blue subnet from Campus A (i.e. PC9). The packets from PC1 were transferred to the switch and it identifies that the destination is not within the local network so the switch transfers the packets to the gateway (R1 interface). Here, we get stuck as we still don't have a configuration for R1 when the packets' destination is not to either the Blue or Green subnets (i.e. on Campus A) *.

b. Configure a default route in R1 that points to R2's directly reachable network interface. Can you now ping any PC w/in the other campus? What effect, if any, did the presence of a configured default gateway make? Explain your answer in detail.

- Yes. Now, we configured R1 to encompass all other destinations other than to either Blue or Green subnets (0.0.0.0/0). Let's continue from *. Here the destination is neither to Blue nor Green subnets, so we set the next hop to (i.e.), an interface of R2 (i.e. on Campus A). We already configured in R2 that when the destination is to the other Campus, it sends the packets to the other Campus' R2. R2 on (i.e. Campus B) identifies that the destination is to either the (i.e. Campus B's) Blue or Green subnets so it gives the packets to R1 (i.e. on Campus B). R1 have configurations to route to either Blue or Green subnets (i.e. Blue subnet).

*Left- R1 on Campus A, Right- R1 on Campus B
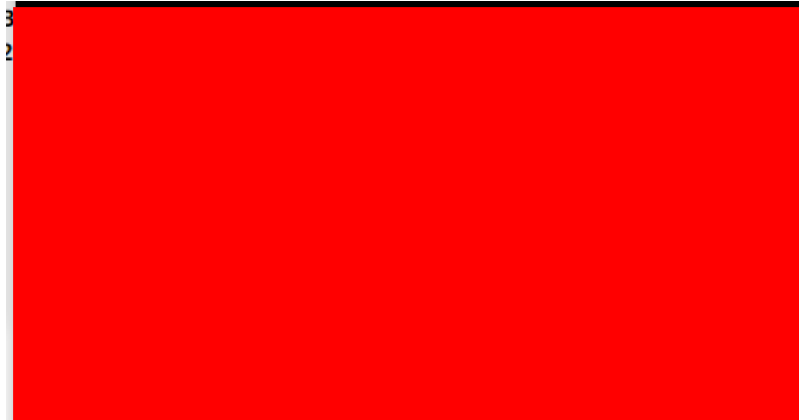
*Notes

- I was now able to ping other PCs/hosts from the other Campuses. Turns out the issue is like a "bug." What I did is I just deleted VyOS 4 then just added a new one. I used the same interfaces and protocols.
- However, the issue where after refreshing / stopping the restarting the nodes, the interfaces and protocols suddenly disappear, has not been addressed yet in my case.