Virtual Local Area Network(VLAN):

A **VLAN** logically segments one physical switch into multiple virtual switches (broadcast domains), so that devices are grouped and isolated efficiently. This reduces unnecessary traffic and organizes the network for better performance, security, and scalability.

A **switch** is a hardware device that connects multiple network devices, like computers and printers, to form a network.

VLANs are isolated at **Layer 2**, meaning:
- VLAN 2 devices → can talk only to VLAN 2
- VLAN 3 devices → can talk only to VLAN 3

A **router** works at **Layer 3** (Network Layer) — it's capable of routing packets between different IP subnets, and therefore, between VLANs.
Since each VLAN is typically assigned a different subnet, routing is needed for communication.

A **DNSProxy** is a feature on the router that stops dns requests from client devices and forwards them to the DNS Server on behalf of the client device. It acts as a middleman for DNS lookups.

802.1Q VLAN Tagging is a networking standard that allows multiple VLANs to share the same physical network connection.

Create multiple VLANs in GNS3:

1. Open terminal, run gns3 &
2. gns3 opened, create new project/open existing project
3. Click on 'edit' tab -> 'preferences'
4. Click on 'QEMU VM' -> 'new'
5. Give name -> keep going next till you reach disk image.
6. For disk image, upload the vIOS image
   a. To download the vIOS image, go here -> https://drive.google.com/file/d/1QT7dqDeaQsTnzM7jD-_9ucr1p6mxLZh0/view
   b. The above drive has the vIOS image file, which needs to be uploaded when creating the vIOS switch(this is the cisco switch)
7. Next, before closing, click 'edit', then change the 'category' from 'End devices' to 'Switches'
8. Tap on 'symbol' -> 'classic' -> 'isov_l2_virl'

9. Go to 'network', increase the number of adapters to either 4 or 8
10. Also increase the RAM to 768MB (if required)
11. 'OK' -> 'Apply' -> 'OK'
12. Drag and drop vIOS switch to the workspace -> start all devices -> go to console

      Execute the following commands:

```
enable
configure terminal
```

#Create vlans:
```
vlan 2
name VLAN2
exit

vlan 3
name VLAN3
exit
```

#Assign vlans to interfaces:
```
interface GigaBitEthernet0/0
switchport mode access
switchport access vlan 2
no shutdown
exit

interface GigaBitEthernet0/1
switchport mode access
switchport access vlan 3
no shutdown
exit
```

#Assign IP addresses:
```
interface vlan 2
ip address 192.168.2.1 255.255.255.0
no shutdown
exit

interface vlan 3
ip address 192.168.3.1 255.255.255.0
no shutdown
exit
```

```
exit
show ip interface brief
Interface              IP-Address      OK? Method Status              Protocol
GigabitEthernet0/0     unassigned      YES unset  down                down
GigabitEthernet0/1     unassigned      YES unset  down                down
GigabitEthernet0/2     unassigned      YES unset  down                down
GigabitEthernet0/3     unassigned      YES unset  down                down
GigabitEthernet1/0     unassigned      YES unset  down                down
GigabitEthernet1/1     unassigned      YES unset  down                down
GigabitEthernet1/2     unassigned      YES unset  down                down
GigabitEthernet1/3     unassigned      YES unset  down                down
Vlan2                  192.168.2.1     YES manual up                  up
Vlan3                  192.168.3.1     YES manual up                  up
```
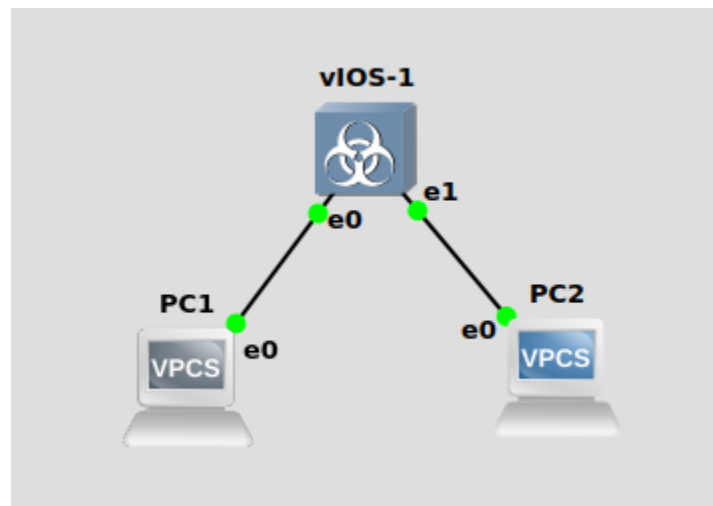
13. Go to the gns3 virtual machine, and drag and drop 2 virtual pcs into the workspace.
14. Connections:

15. Now run `show ip interface brief`

```
Interface              IP-Address      OK? Method Status              Protocol
GigabitEthernet0/0     unassigned      YES unset  up                  up
GigabitEthernet0/1     unassigned      YES unset  up                  up
GigabitEthernet0/2     unassigned      YES unset  down                down
GigabitEthernet0/3     unassigned      YES unset  down                down
GigabitEthernet1/0     unassigned      YES unset  down                down
GigabitEthernet1/1     unassigned      YES unset  down                down
GigabitEthernet1/2     unassigned      YES unset  down                down
GigabitEthernet1/3     unassigned      YES unset  down                down
Vlan2                  192.168.2.1     YES manual up                  up
Vlan3                  192.168.3.1     YES manual up                  up
```