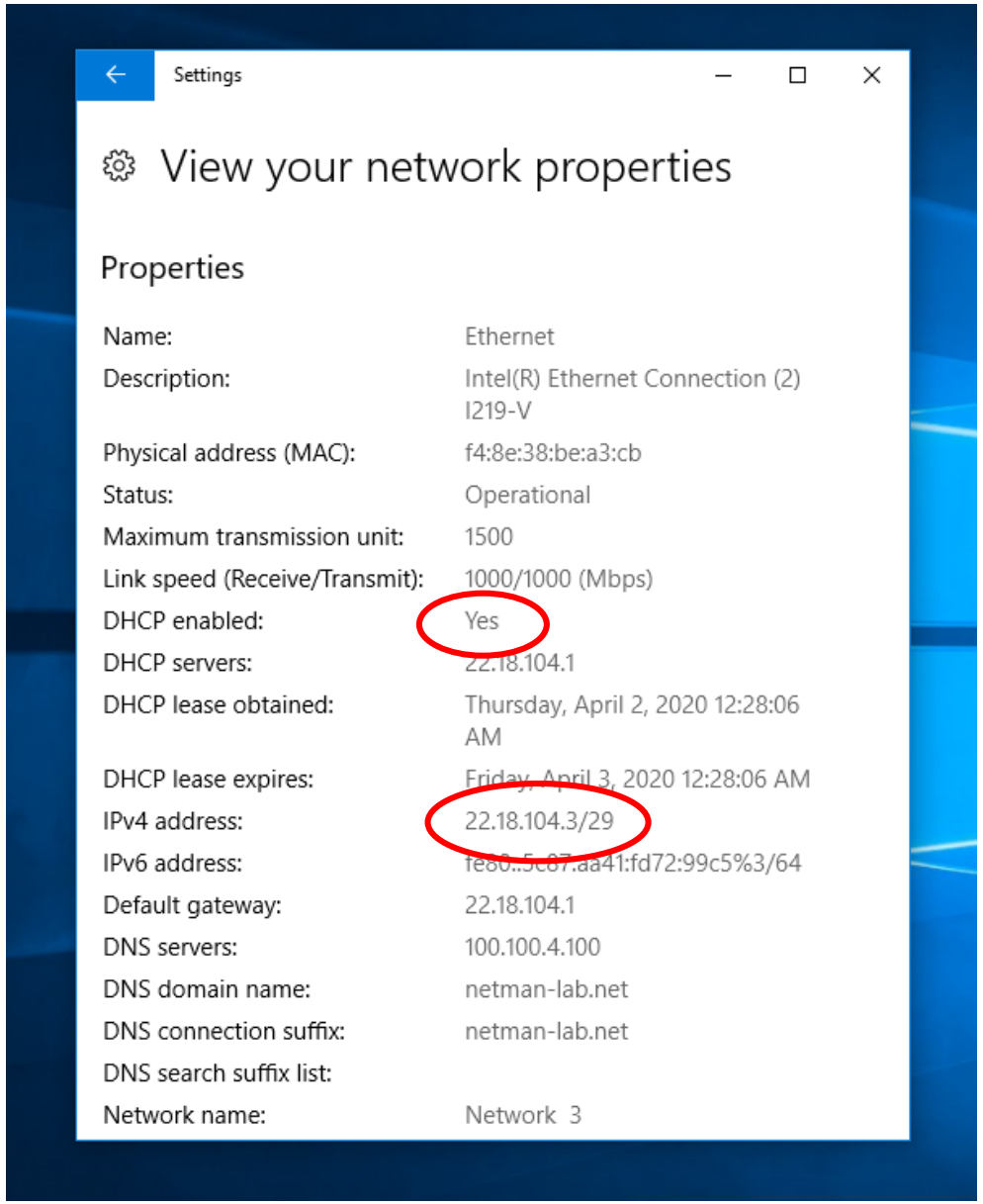
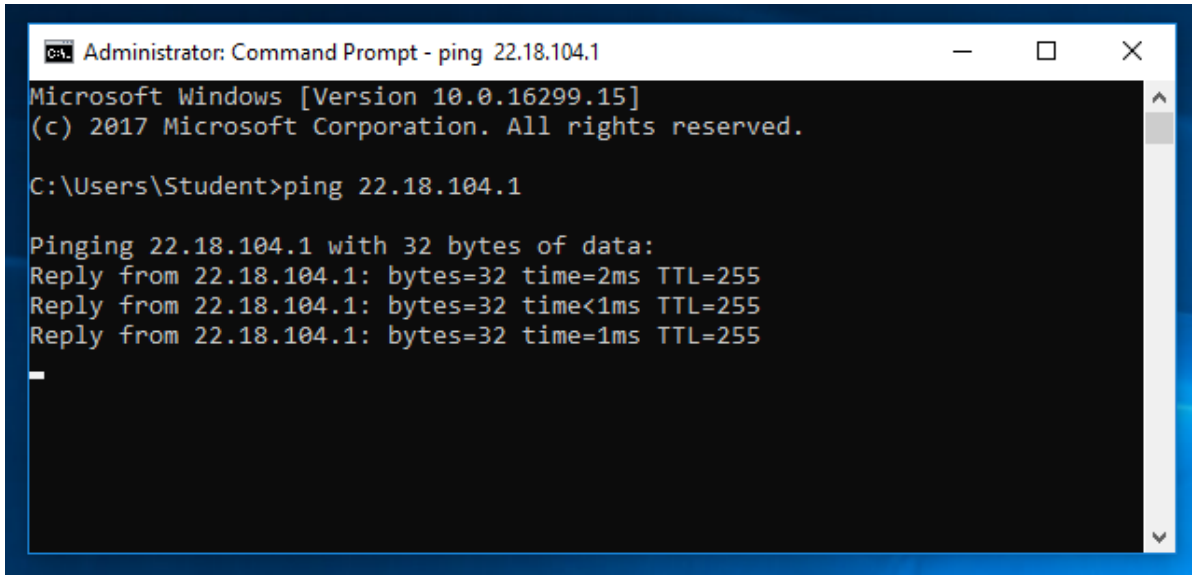
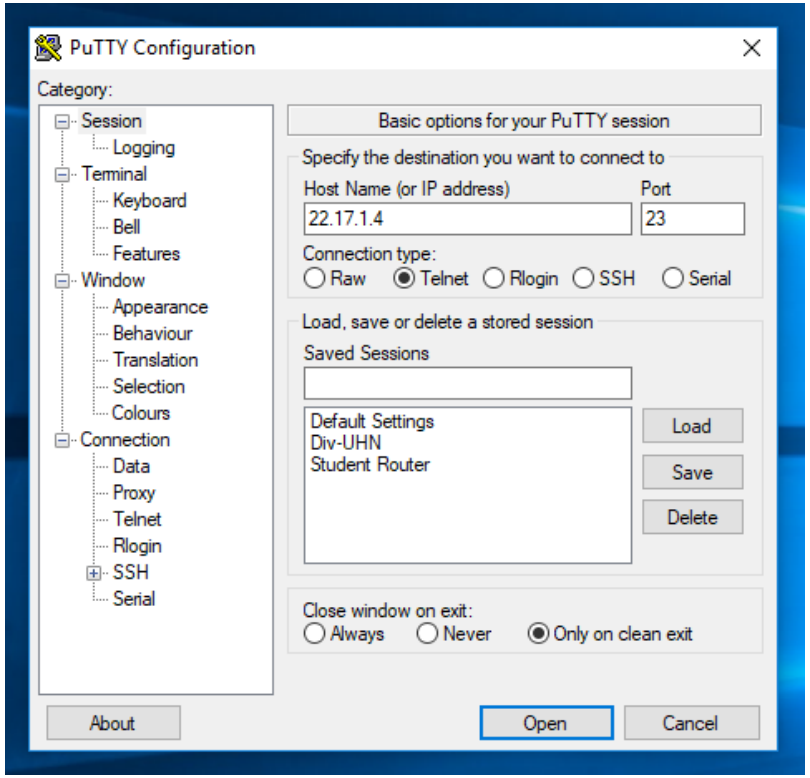
PE 1





The first few steps of the lab pertain to verifying the correct DHCP-leased IP address for your computer and verifying that you can ping your layer 3 switch and access it with a putty session.



On your L3 switch, Create the VLAN interface that will be your point-to-point OSPF connection to your student router.

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#int vlan 204
STUDENT_SW4(config-if)#ip add 22.18.204.1 255.255.255.248
STUDENT_SW4(config-if)#ip ospf 4 area 4
STUDENT_SW4(config-if)#ip ospf network point-to-point
STUDENT_SW4(config-if)#exi
STUDENT_SW4(config)#
STUDENT_SW4(config)#do ping 22.18.204.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.18.204.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

Verify connectivity by Pinging the router's VLAN 204 ip address

```
Current configuration : 184 bytes
!
interface GigabitEthernet0/1
 description TRUNK TO SWITCH_FARM_SWITCH PORT 4
 switchport trunk allowed vlan 104,204
 switchport trunk encapsulation dot1q
 switchport mode trunk
end
```

Ensure your L3 switch's trunk port allows the VLAN. You can also use the command "show vlan" to ensure VLAN 204 exists in the switch VLAN database

```
STUDENT_SW4(config-if)#
STUDENT_SW4(config-if)#
STUDENT_SW4(config-if)#do sh ip ospf ne

Neighbor ID     Pri   State           Dead Time   Address         Interface
1.0.1.4           0   FULL/  -        00:00:34    22.18.204.2     Vlan204
STUDENT_SW4(config-if)#
```

Use the command "show ip ospf neighbor" to verify your Neighbor adjacency with your student router

```
STUDENT_SW4(config-if)#
STUDENT_SW4(config-if)#
STUDENT_SW4(config-if)#do sh run | sec ip dhcp
ip dhcp excluded-address 22.18.104.1 22.18.104.2
ip dhcp pool STUDENT_LAN
 network 22.18.104.0 255.255.255.248
 default-router 22.18.104.1
 dns-server 100.100.4.100
 domain-name netman-lab.net
STUDENT_SW4(config-if)#
```

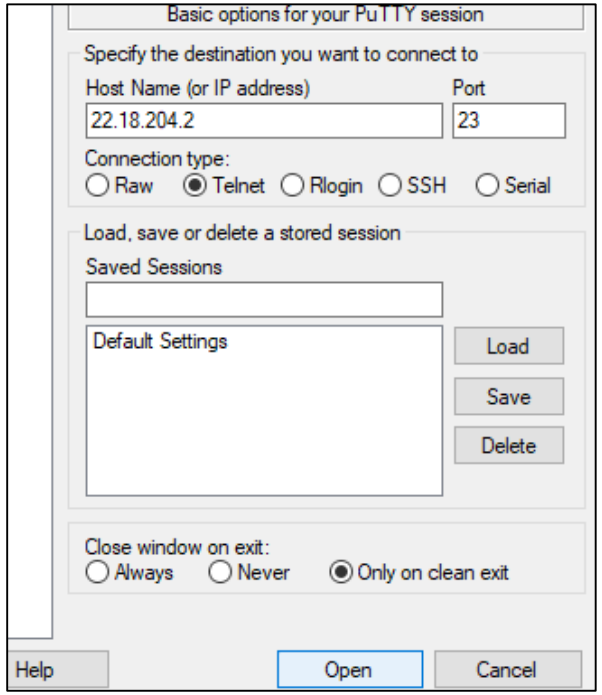
Use the command "show run | sec ip dhcp" to verify that your L3 switch is configured as a DHCP server for vlan 104

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#logging host 22.18.104.3
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

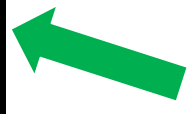
Configure logging (above) and timestamps (below)

```
STUDENT_SW4(config)#service timestamps log datetime msec
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

Use telnet or SSH to open a putty session for your student router: 22.18.204.2

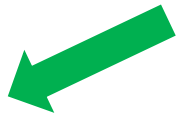


```
STUDENT_R4(config)#clock timezone EST -5 0
STUDENT_R4(config)#
STUDENT_R4(config)#
STUDENT_R4(config)#
```



Set the time zone and DST on your student router

```
STUDENT_R4(config)#clock summer-time EST recurring
STUDENT_R4(config)#
STUDENT_R4(config)#
STUDENT_R4(config)#
```



Then configure it as a Stratum 2 NTP source

```
STUDENT_R4(config)#ntp master 2
STUDENT_R4(config)#
STUDENT_R4(config)#
```

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#ntp server 22.18.204.2
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

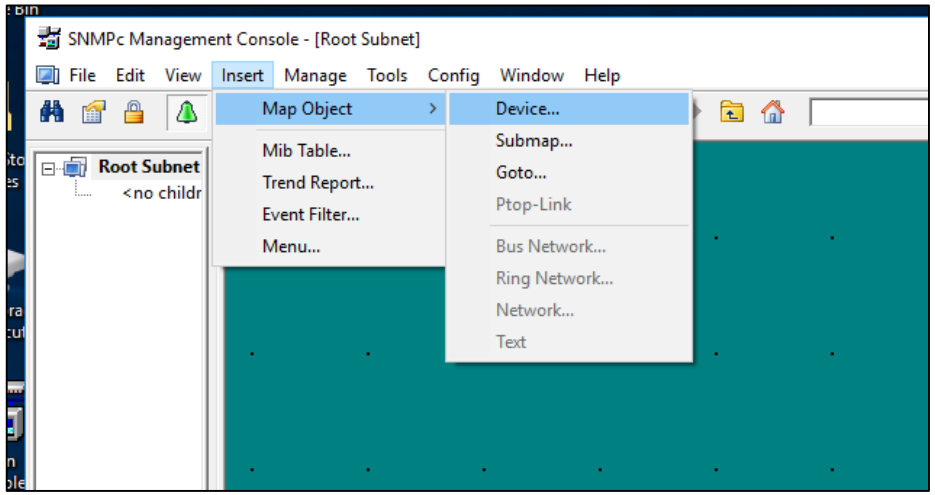
Configure the L3 switch to pull NTP from the student router

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#do sh ntp status
Clock is synchronized, stratum 3, reference is 22.18.204.2
nominal freq is 119.2092 Hz, actual freq is 119.2102 Hz, precision is 2**19
ntp uptime is 6000 (1/100 of seconds), resolution is 8403
reference time is E2300170.22670645 (06:15:12.134 UTC Thu Apr 2 2020)
clock offset is 0.5095 msec, root delay is 1.78 msec
root dispersion is 630.29 msec, peer dispersion is 188.49 msec
loopfilter state is 'CTRL' (Normal Controlled Loop), drift is -0.000008058 s/s
system poll interval is 64, last update was 45 sec ago.
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

Verify that the NTP has synchronized

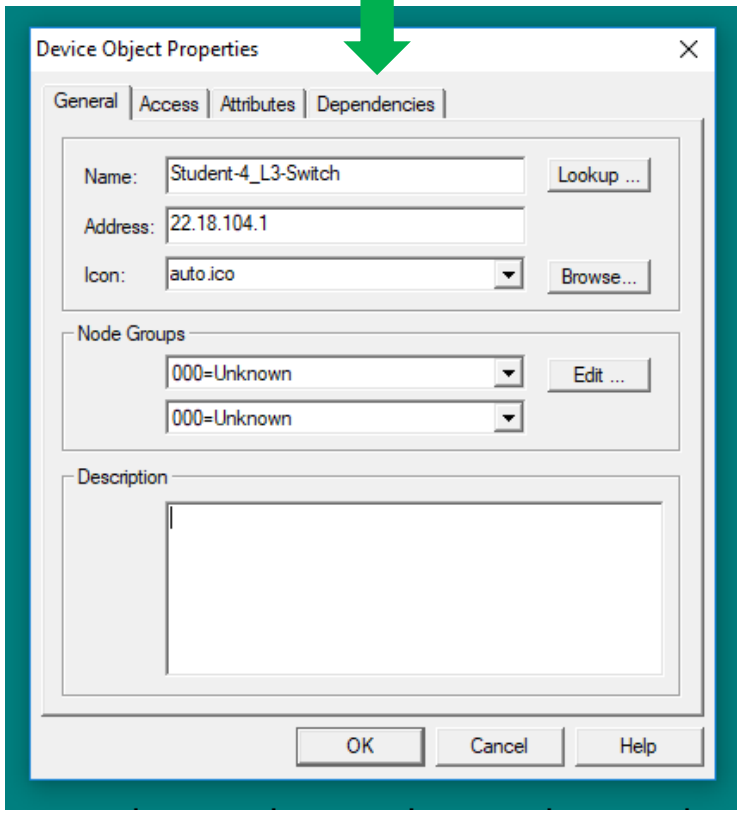
```
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#snmp-server community DEMO1 ro
STUDENT_SW4(config)#snmp-server community DEMO2 rw
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

Configure your L3 switch as an SNMPv2 agent

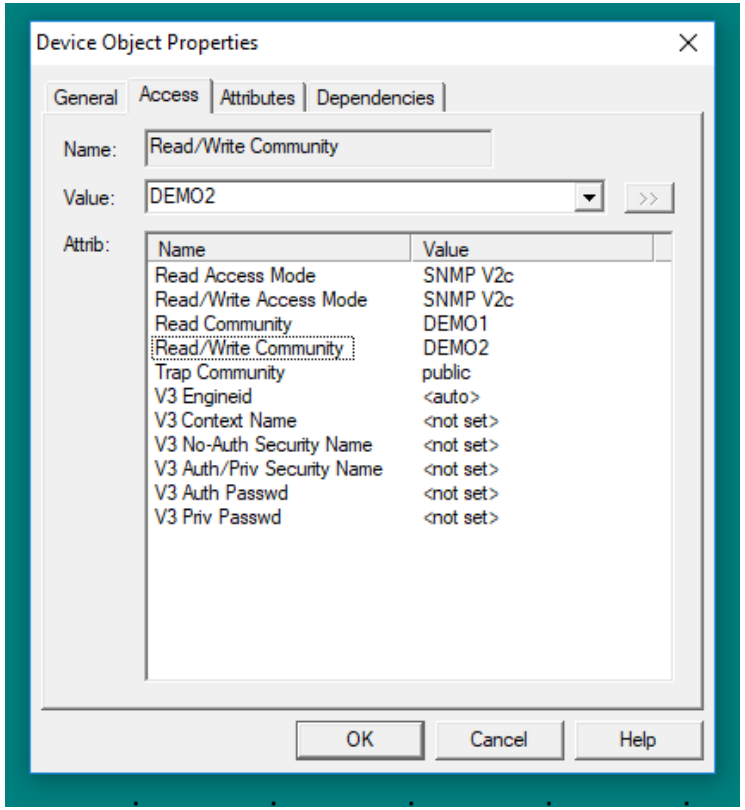


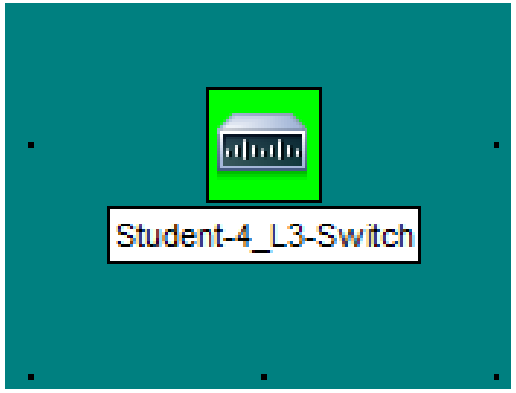
Create a new device on your SNMPc map

Assign it a name and the IP address Of your L3 switch on the general tab



On the access tab, set the read and write mode(s) to SNMPv2 and match the credentials your configured on your layer 3 switch





Your icon should turn green when configured correctly

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#
STUDENT_SW4(config)#snmp-server ifindex persist
STUDENT_SW4(config)#
```

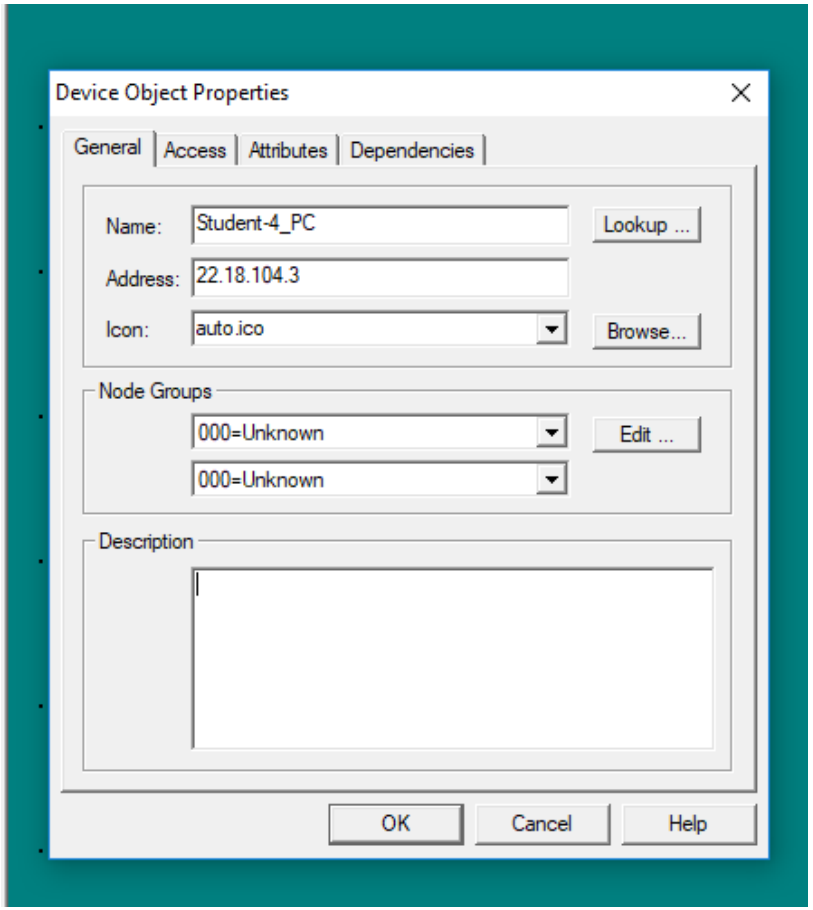
Configure ifindex persist. This configures the device to maintain the interface index in the event of a reboot.

```
STUDENT_SW4(config)#
STUDENT_SW4(config)#do sh ip access-list SNMP-VTY_ACL
Standard IP access list SNMP-VTY_ACL
    5 permit 22.18.104.0, wildcard bits 0.0.0.7 (2 matches)
    10 permit 22.17.17.0, wildcard bits 0.0.0.31 (2012 matches)
STUDENT_SW4(config)#
```

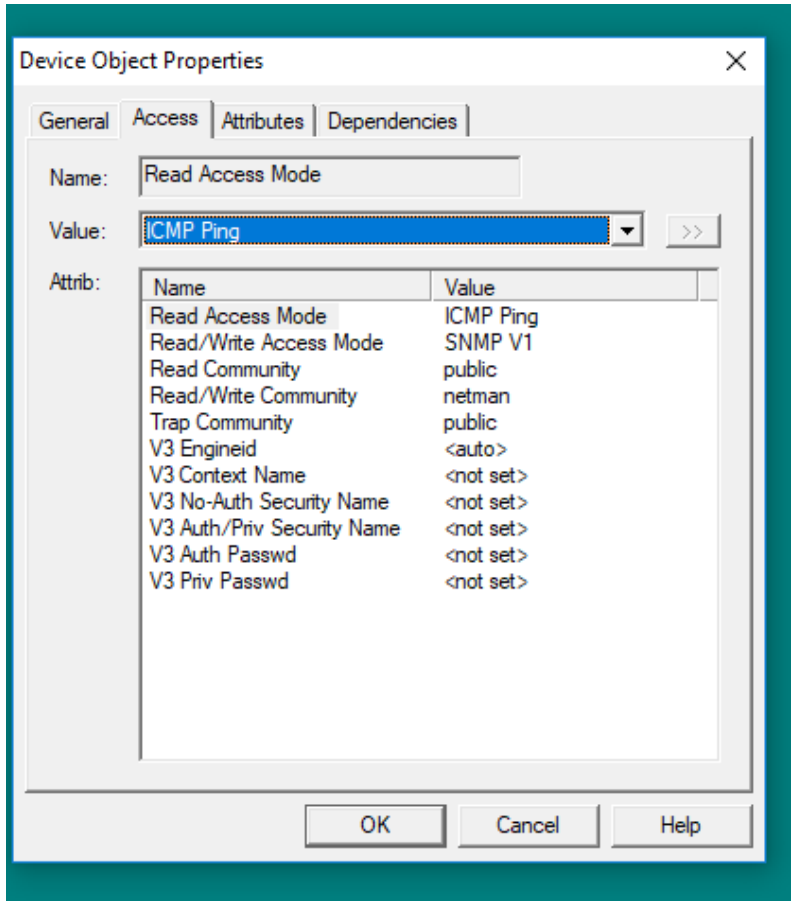
An ACL called SNMP-VTY_ACL is pre-configured on your L3 switch

```
STUDENT_SW4(config)#snmp-server community DEMO1 ro SNMP-VTY_ACL
STUDENT_SW4(config)#
STUDENT_SW4(config)#snmp-server community DEMO2 rw SNMP-VTY_ACL
STUDENT_SW4(config)#
STUDENT_SW4(config)#
```

Add the ACL to the SNMPv2 configuration you established

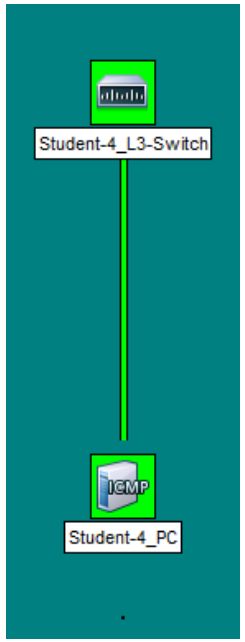


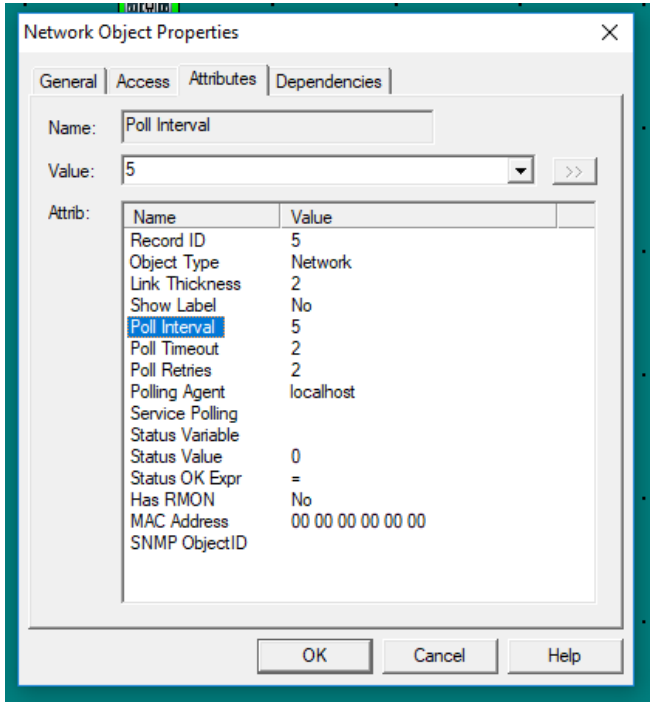
Create a new SNMP icon for your Student PC and give it the corresponding ip address

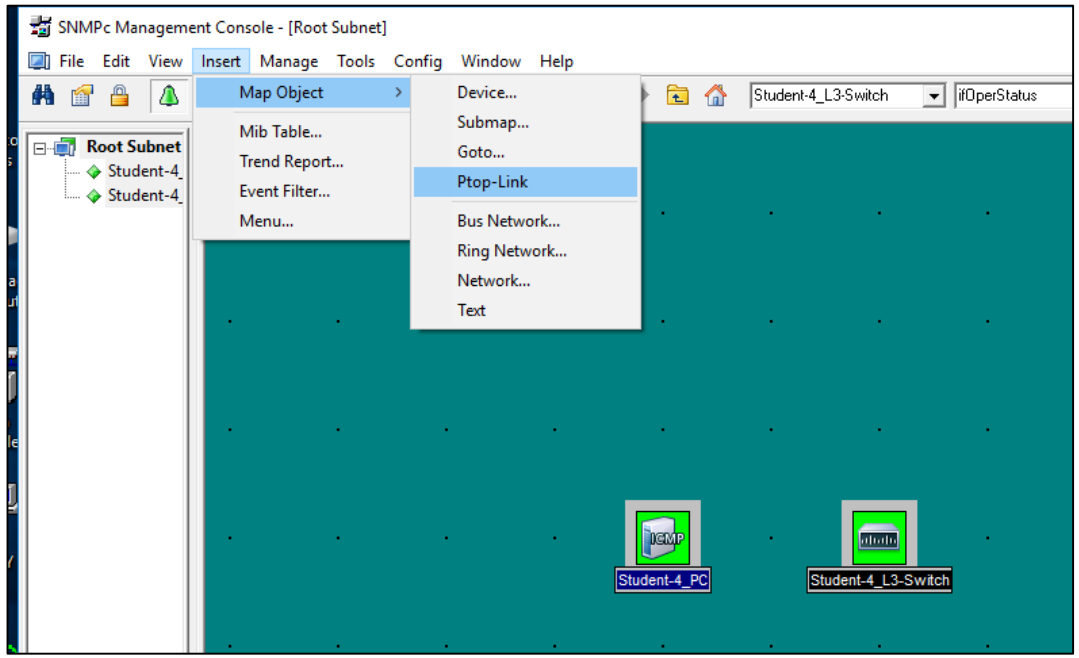


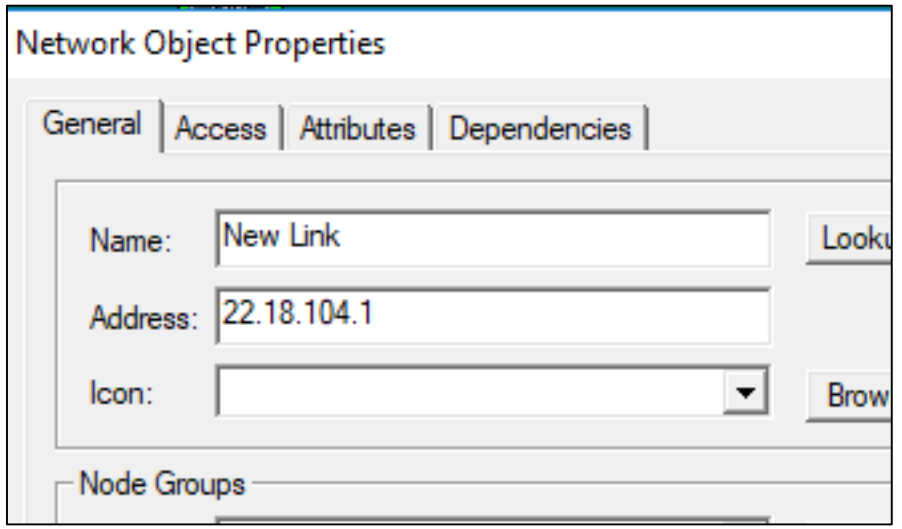
Make the Student PC icon poll for ICMP only

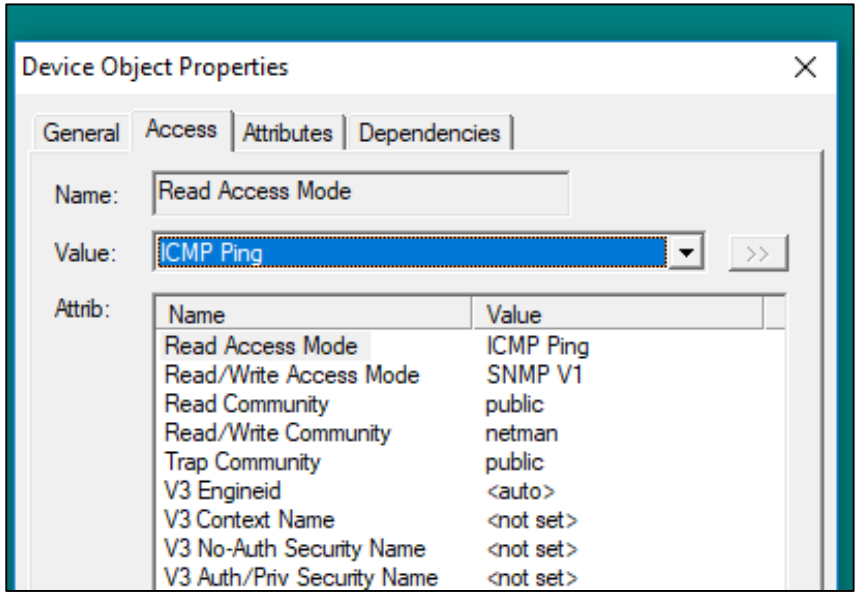
Create a point-to-point Between your switch and PC. Set it for ICMP based on the switch's vlan 104 IP address. P2P links have a "poll interval" of 0 by default, change it to 5









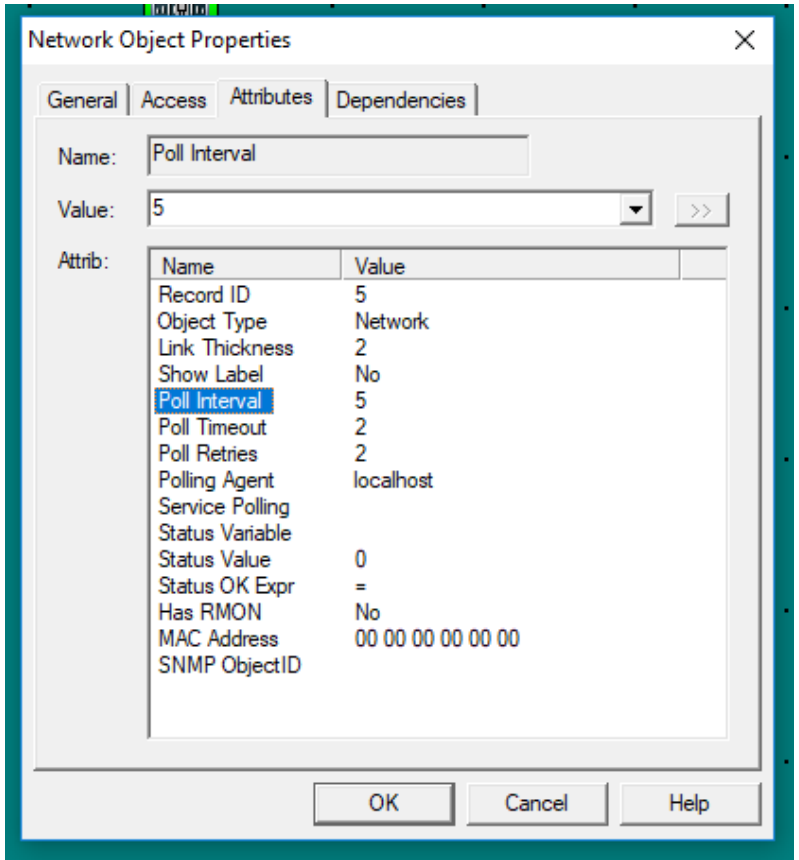


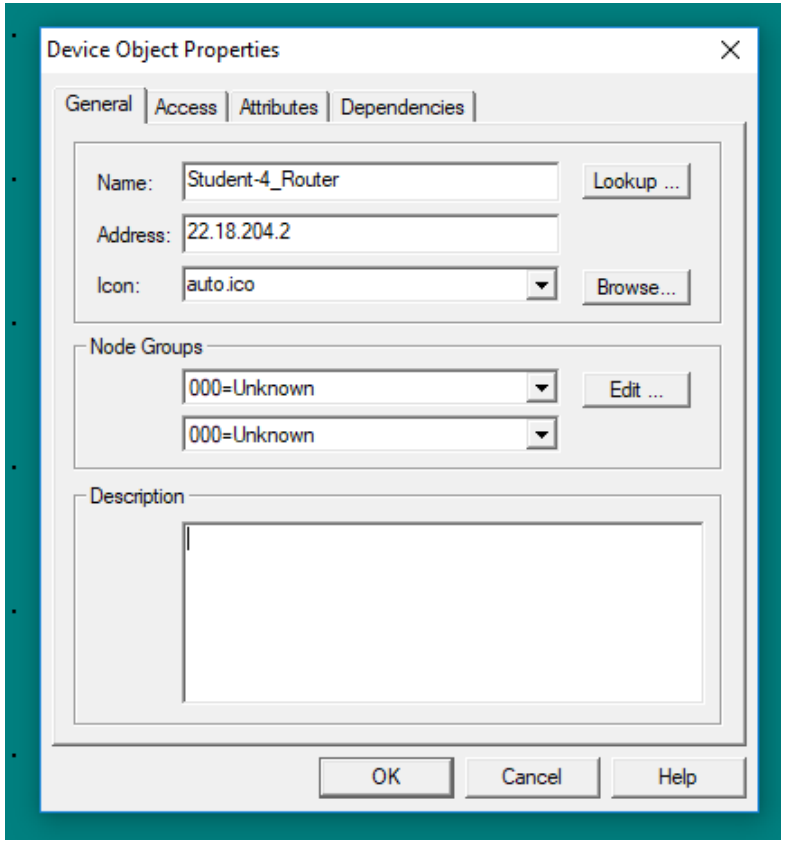
Create a point-to-point between your switch and PC by highlighting the two icons then using the "insert" drop-down menu as shown above-left.

Set it to poll the switch's VLAN 104 IP address as shown above-right.

Set it for ICMP only as shown to the left.

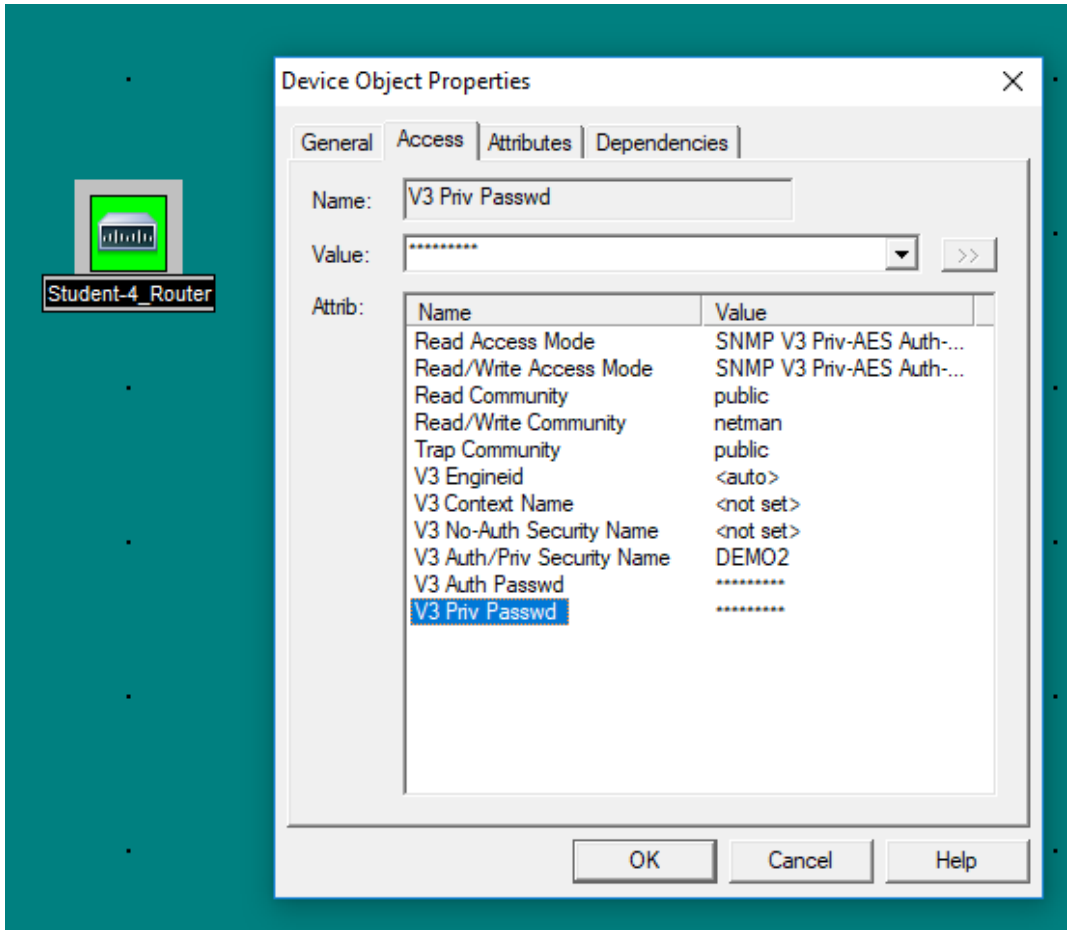
P2P links have a "poll interval" of 0 by default, change it to 5 as show to the right.



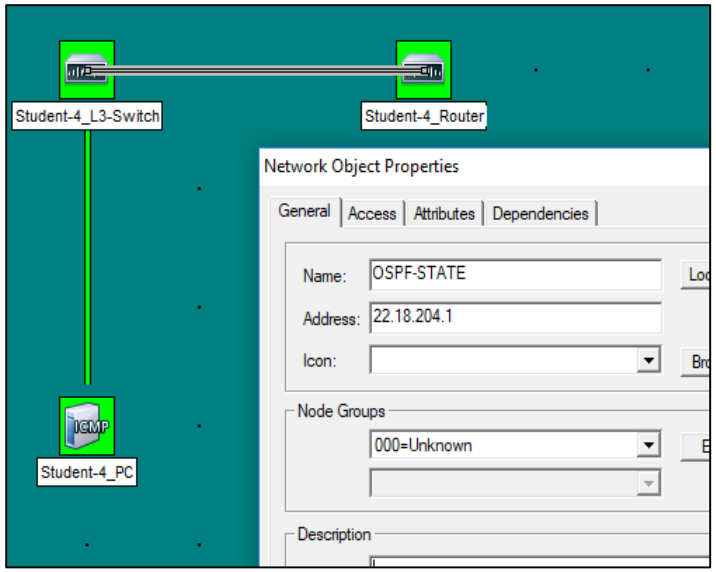


Create an SNMP icon for the student router and assign the router's VLAN 204 ip address on the general tab (left).

On the access tab (right), set the SNMPv3 parameters based on the configuration you create in the student router (below).




```
STUDENT_R4(config)#snmp-server engineID local 1234567890
STUDENT_R4(config)#
STUDENT_R4(config)#snmp-server view NETMAN iso included
STUDENT_R4(config)#
STUDENT_R4(config)#snmp-server group DEMO1 v3 priv
STUDENT_R4(config)#
STUDENT_R4(config)#snmp-server user DEMO2 DEMO1 v3 auth sha demoP@ss1 priv aes 128 demoP@ss2
STUDENT_R4(config)#
```



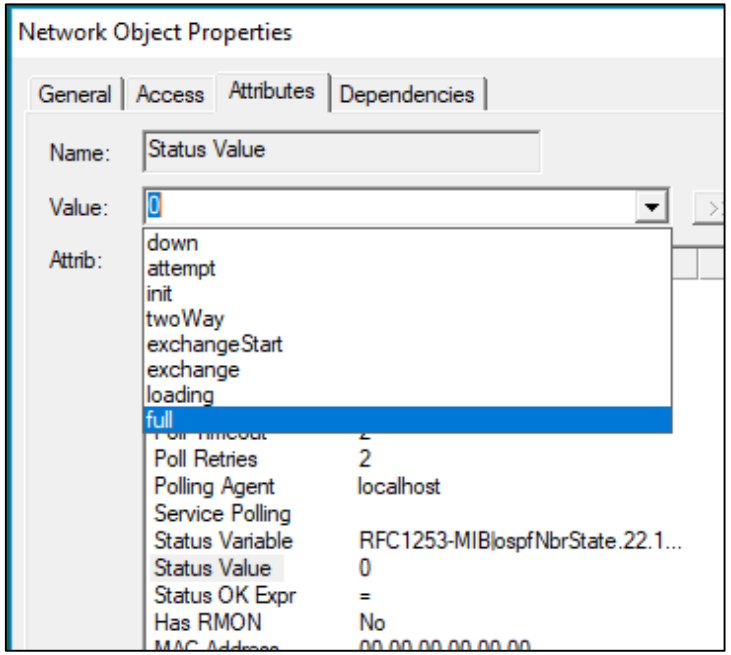
Create a point-to-point between your router and L3 switch. Assign it the ip address of the router (top left).

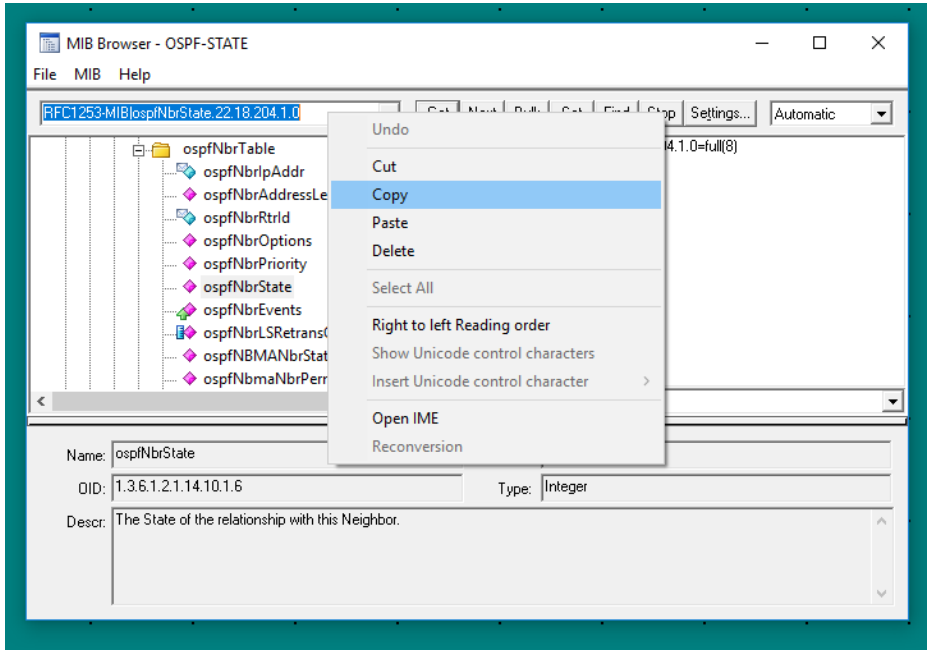
Set the router's SNMPv3 parameters on the access tab of the new link (parameters same as last slide).

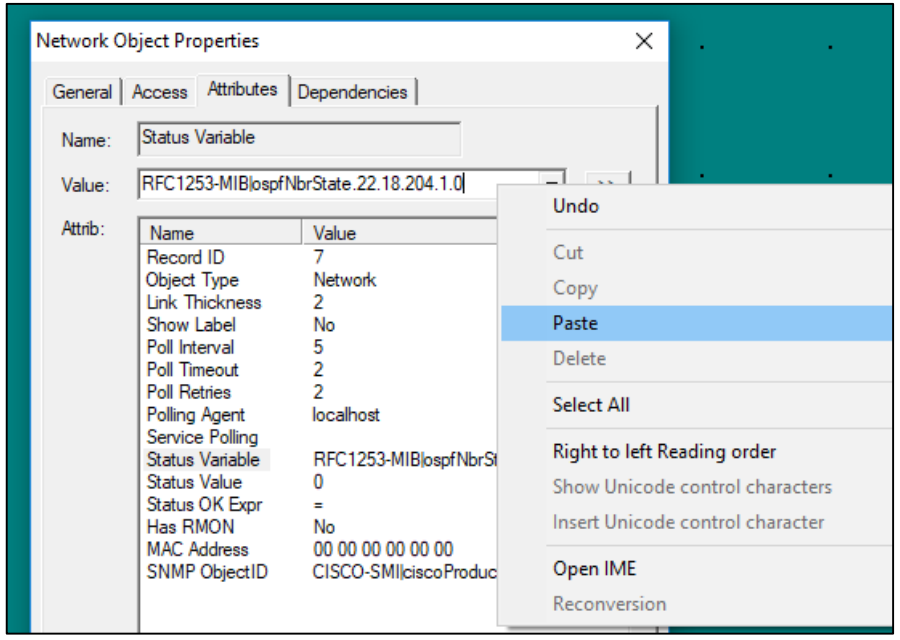
Click tools > MIB browser and then use the MIB browser to expand Mgmt > ospf > ospfNbrTable > ospfNbrState (top right). Click "Get" and copy the OID code for the OSPF neighbor state MIB.

Paste it into the "status variable" field of the link's attributes tab. (bottom right)

After the status variable has been assigned, use the "status value" drop-down to select "full" (bottom left).







```
STUDENT_R4#
STUDENT_R4#ping 2001:aa04:ab02:ac02::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:AA04:AB02:AC02::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/27 ms
STUDENT_R4#
STUDENT_R4#
```

Verify that you have connectivity with your uplink node on IPv6

```
STUDENT_R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
STUDENT_R4(config)#
STUDENT_R4(config)#ipv6 route ::/0 2001:aa04:ab02:ac02::2
STUDENT_R4(config)#
STUDENT_R4(config)#
```

Configure a static IPv6 default route to the uplink node (per your student PE diagram)

```
STUDENT_R4(config)#
STUDENT_R4(config)#int tunnel 59304
STUDENT_R4(config-if)#ipv6 address fc00::104:a002/122
STUDENT_R4(config-if)#ipv6 enable
STUDENT_R4(config-if)#tunnel source 2001:aa04:ab02:ac02::1
STUDENT_R4(config-if)#ipv6 nhrp shortcut
STUDENT_R4(config-if)#ipv6 mtu 1392
STUDENT_R4(config-if)#ipv6 nhrp authentication n3tm@n19
STUDENT_R4(config-if)#ipv6 nhrp network-id 1159304
STUDENT_R4(config-if)#tunnel key 20191214
STUDENT_R4(config-if)#tunnel mode gre multipoint ipv6
STUDENT_R4(config-if)#ospfv3 304 ipv6 area 4
STUDENT_R4(config-if)#ospfv3 network point-to-multipoint
STUDENT_R4(config-if)#ospfv3 cost 2600
STUDENT_R4(config-if)#ospfv3 flood-reduction
STUDENT_R4(config-if)#ospfv3 hello-interval 10
STUDENT_R4(config-if)#ospfv3 dead-interval 40
STUDENT_R4(config-if)#ipv6 pim
STUDENT_R4(config-if)#ipv6 nhrp nhs fc00::104:a001 nbma 2001:e42c:23ab:f00d::2049 multicast
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
```

Use the information on the diagram as well as the template on the last page of the PE lab book to configure an IPv6 DMVPN using OSPFv3

```
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#do sh os ne

          OSPFv3 304 address-family ipv6 (router-id 1.0.1.4)

Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
1.255.4.0         0   FULL/  -        00:00:39    18              Tunnel59304
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
```

Use the command "show ospfv3 neighbor" to verify that you have formed an adjacency with the uplink node

```
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#do sh ipv6 route
IPv6 Routing Table - default - 10 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, RL - RPL, O - OSPF Intra, OI - OSPF Inter
       OE1 - OSPF ext 1, OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1
       ON2 - OSPF NSSA ext 2, la - LISP alt, lr - LISP site-registrations
       ld - LISP dyn-eid, lA - LISP away, a - Application
S   ::/0 [1/0]
     via 2001:AA04:AB02:AC02::2
C   2001:AA04:AB02:AC02::/64 [0/0]
     via GigabitEthernet0/0/0.304, directly connected
L   2001:AA04:AB02:AC02::1/128 [0/0]
     via GigabitEthernet0/0/0.304, receive
LC  2001:CE33:C104:1000::1/128 [0/0]
     via Loopback0, receive
S   2001:CE33:C254:1E01::FF4/128 [1/0]
     via FC00::104:A001
S   2001:E42C:23AB:F00D::/64 [1/0]
     via 2001:AA04:AB02:AC02::2
C   FC00::104:A000/122 [0/0]
     via Tunnel59304, directly connected
O   FC00::104:A001/128 [110/2600]
     via FE80::7E21:DFF:FE5A:A7A0, Tunnel59304
L   FC00::104:A002/128 [0/0]
     via Tunnel59304, receive
L   FF00::/8 [0/0]
     via Null0, receive
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
```

Verify that you have Are dynamically learning OSPFv3 Routes from the uplink node

PE 2

```
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#int tun 104
STUDENT_R4(config-if)#tunnel mode gre ipv6
STUDENT_R4(config-if)#tunnel key 8675304
STUDENT_R4(config-if)#tunnel source 2001:ce33:c104:1000::1
STUDENT_R4(config-if)#tunnel destination 2001:ce33:c254:1e01::ff4
STUDENT_R4(config-if)#ip address 172.30.4.1 255.255.255.252
STUDENT_R4(config-if)#ip tcp adjust-mss 1360
STUDENT_R4(config-if)#ip mtu 1392
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#
```

Once the underlying IPv6 network is established By your DMVPN tunnel, you can configure your IPv4-over-IPv6 GRE tunnel.

```
STUDENT_R4(config)#
STUDENT_R4(config)#key chain NETMAN
STUDENT_R4(config-keychain)#key 1
STUDENT_R4(config-keychain-key)#key-string 31GRpK3y
STUDENT_R4(config-keychain-key)#
STUDENT_R4(config-keychain-key)#exi
STUDENT_R4(config-keychain)#exi
STUDENT_R4(config)#
STUDENT_R4(config)#do sh key chain
Key-chain NETMAN:
    key 1 -- text "31GRpK3y"
        accept lifetime (always valid) - (always valid) [valid now]
        send lifetime (always valid) - (always valid) [valid now]
STUDENT_R4(config)#
```

Create the key chain specified in the PE diagram and instructions. You can view it with the command “show key chain”

```
STUDENT_R4(config)#
STUDENT_R4(config)#router eigrp STDN4
STUDENT_R4(config-router)#address-family ipv4 unicast autonomous-system 104
STUDENT_R4(config-router-af)#network 172.30.4.0 0.0.0.3
STUDENT_R4(config-router-af)#af-interface tunnel104
STUDENT_R4(config-router-af-interface)#authentication mode md5
STUDENT_R4(config-router-af-interface)#authentication key-chain NETMAN
STUDENT_R4(config-router-af-interface)#
STUDENT_R4(config-router-af-interface)#
STUDENT_R4(config-router-af-interface)#
```

Use named-mode EIGRP to specify process number 104 and activate the network. Link the key chain to the address-family Interface and specify the authentication mode

```
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#do sh ip eig ne
EIGRP-IPv4 VR(STDN4) Address-Family Neighbors for AS(104)
H   Address                 Interface              Hold Uptime   SRTT   RTO  Q  Seq
                                                   (sec)         (ms)       Cnt Num
0   172.30.4.2              Tu104                    14 00:00:32    1  1392  0  15
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#
```

Use the command “show IP eigrp neighor” to verify you have formed an eigrp adjacency with the lab core node

```
STUDENT_R4(config)#
STUDENT_R4(config)#router eigrp STDN4
STUDENT_R4(config-router)#address-family ipv4 unicast autonomous-system 104
STUDENT_R4(config-router-af)#topology base
STUDENT_R4(config-router-af-topology)#redist
STUDENT_R4(config-router-af-topology)#redistribute ospf 4 metric 1000000 0 255 1 1500
STUDENT_R4(config-router-af-topology)#
STUDENT_R4(config-router-af-topology)#exi
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#
STUDENT_R4(config-router-af)#exi
```

Redistribute OSPF routes learned by your student router from your layer 3 switch into the EIGRP network so they can be shared upstream into the lab’s core network

```
STUDENT_R4(config)#
STUDENT_R4(config)#router ospf 4
STUDENT_R4(config-router)#redist
STUDENT_R4(config-router)#redistribute eigrp 104 subnets
STUDENT_R4(config-router)#
STUDENT_R4(config-router)#
STUDENT_R4(config-router)#
```

Redistribute EIGRP routes learned by your student router into the OSPF process you have established with your layer 3 switch

```
STUDENT_SW4#
STUDENT_SW4#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B -
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS
       ia - IS-IS inter area, * - candidate default, U - per-user sta
       o - ODR, P - periodic downloaded static route, H - NHRP, l - L
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is 22.18.204.2 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 22.18.204.2
      22.0.0.0/8 is variably subnetted, 6 subnets, 3 masks
C        22.17.1.4/32 is directly connected, Loopback0
O E2     22.17.17.0/27 [110/20] via 22.18.204.2, 00:01:00, Vlan204
C        22.18.104.0/29 is directly connected, Vlan104
L        22.18.104.1/32 is directly connected, Vlan104
C        22.18.204.0/29 is directly connected, Vlan204
L        22.18.204.1/32 is directly connected, Vlan204
      172.30.0.0/30 is subnetted, 2 subnets
O E2     172.30.4.0 [110/20] via 22.18.204.2, 00:01:00, Vlan204
O E2     172.30.104.0 [110/20] via 22.18.204.2, 00:01:00, Vlan204
      206.154.33.0/32 is subnetted, 1 subnets
O E2     206.154.33.232 [110/20] via 22.18.204.2, 00:01:00, Vlan204
STUDENT_SW4#
STUDENT_SW4#
```

The command “show ip route” on your layer 3 switch should now be showing O E2 routes, which are upstream EIGRP routes that have been redistributed into OSPF

The student router’s routing table should have EIGRP routes learned from the core node and OSPF routes learned from the layer 3 switch.

```
STUDENT_R4#
STUDENT_R4#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B -
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS
       ia - IS-IS inter area, * - candidate default, U - per-user sta
       o - ODR, P - periodic downloaded static route, H - NHRP, l - L
       a - application route
       + - replicated route, % - next hop override, p - overrides fro

Gateway of last resort is 172.30.4.2 to network 0.0.0.0

D*    0.0.0.0/0 [90/76805120] via 172.30.4.2, 00:05:03, Tunnel104
      22.0.0.0/8 is variably subnetted, 4 subnets, 3 masks
O        22.17.1.4/32
           [110/2] via 22.18.204.1, 00:46:03, GigabitEthernet0/0/0.20
D        22.17.17.0/27 [90/76810240] via 172.30.4.2, 00:05:03, Tunnel
C        22.18.204.0/29 is directly connected, GigabitEthernet0/0/0.2
L        22.18.204.2/32 is directly connected, GigabitEthernet0/0/0.2
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks
C        172.30.4.0/30 is directly connected, Tunnel104
L        172.30.4.1/32 is directly connected, Tunnel104
D        172.30.104.0/30 [90/76805120] via 172.30.4.2, 00:05:03, Tunn
      206.154.33.0/32 is subnetted, 1 subnets
D        206.154.33.232 [90/79365120] via 172.30.4.2, 00:05:03, Tunne
```

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip sla 99
STUDENT_R4(config-ip-sla)#dns labtech.netman.local name-server 100.100.4.100
STUDENT_R4(config-ip-sla-dns)#freq 10
STUDENT_R4(config-ip-sla-dns)#exi
STUDENT_R4(config)#ip sla schedule 99 start now life forever
STUDENT_R4(config)#
```

The PE has you configure 4 IP SLAs. The first one is a Dns resolution check referencing the 100.100.4.100.

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip sla 98
STUDENT_R4(config-ip-sla)#icmp-echo 172.30.104.2 source-interface tunnel104
STUDENT_R4(config-ip-sla-echo)#freq 5
STUDENT_R4(config-ip-sla-echo)#exi
STUDENT_R4(config)#ip sla schedule 98 start now life forever
STUDENT_R4(config)#
```

The second SLA is a basic icmp-echo to the core node's tunnel interface

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip sla 97
STUDENT_R4(config-ip-sla)#icmp-jitter 22.17.17.1
STUDENT_R4(config-ip-sla-icmpjitter)#freq 5
STUDENT_R4(config-ip-sla-icmpjitter)#exi
STUDENT_R4(config)#ip sla schedule 97 start now life forever
STUDENT_R4(config)#
STUDENT_R4(config)#
```

The third SLA checks for jitter in the path between your router and the WAN Edge router at 22.17.17.1

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip sla 96
STUDENT_R4(config-ip-sla)#icmp-echo 2001:bad:c0de:4234::1 source-interface g0/0/0.304
STUDENT_R4(config-ip-sla-echo)#freq 10
STUDENT_R4(config-ip-sla-echo)#exi
STUDENT_R4(config)#ip sla schedule 96 start now life forever
STUDENT_R4(config)#
```

The last SLA is an IPv6 ICMP echo sourced from the interface adjacent to the IPv6 uplink node.

PE 3

```
STUDENT_R4(config)#
STUDENT_R4(config)#archive
STUDENT_R4(config-archive)#log config
STUDENT_R4(config-archive-log-cfg)#logging enable
STUDENT_R4(config-archive-log-cfg)#logging size 250
STUDENT_R4(config-archive-log-cfg)#hidekeys
STUDENT_R4(config-archive-log-cfg)#path tftp://22.17.17.30/student_rtr_4
STUDENT_R4(config-archive)#write-mem
STUDENT_R4(config-archive)#time-per 2880
STUDENT_R4(config-archive)#exi
STUDENT_R4(config)#
```

Configure the archive capability on your student router

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip scp server enable
```

Configure secure copy

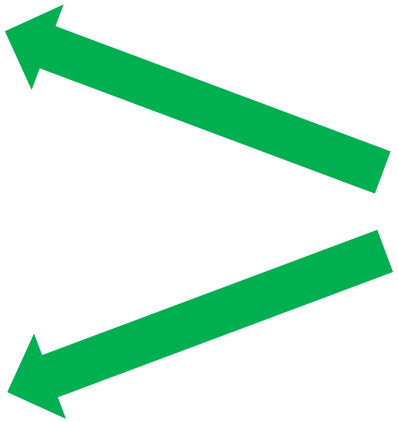
Ensure the student router IOS image in use conforms to the Division standard:

```
STUDENT_R4#verify /md5 flash:/isr4300-universalk9.16.06.04.SPA.bin
.....................................................................
.....................................................................
.....................................Done!
verify /md5 (bootflash:/isr4300-universalk9.16.06.04.SPA.bin) = 15b2ff5f4b6b6d12423d8f2e654795a9

STUDENT_R4#
```

```
STUDENT_R4(config)#
STUDENT_R4(config)#ip multicast-routing distributed
STUDENT_R4(config)#
STUDENT_R4(config)#int tun 104
STUDENT_R4(config-if)#ip pim sparse-mode
STUDENT_R4(config-if)#ip igmp join-group 225.0.0.255
STUDENT_R4(config-if)#
STUDENT_R4(config-if)#int g0/0/0.204
STUDENT_R4(config-subif)#ip pim sparse-mode
STUDENT_R4(config-subif)#ip igmp join-group 225.0.0.255
STUDENT_R4(config-subif)#
```

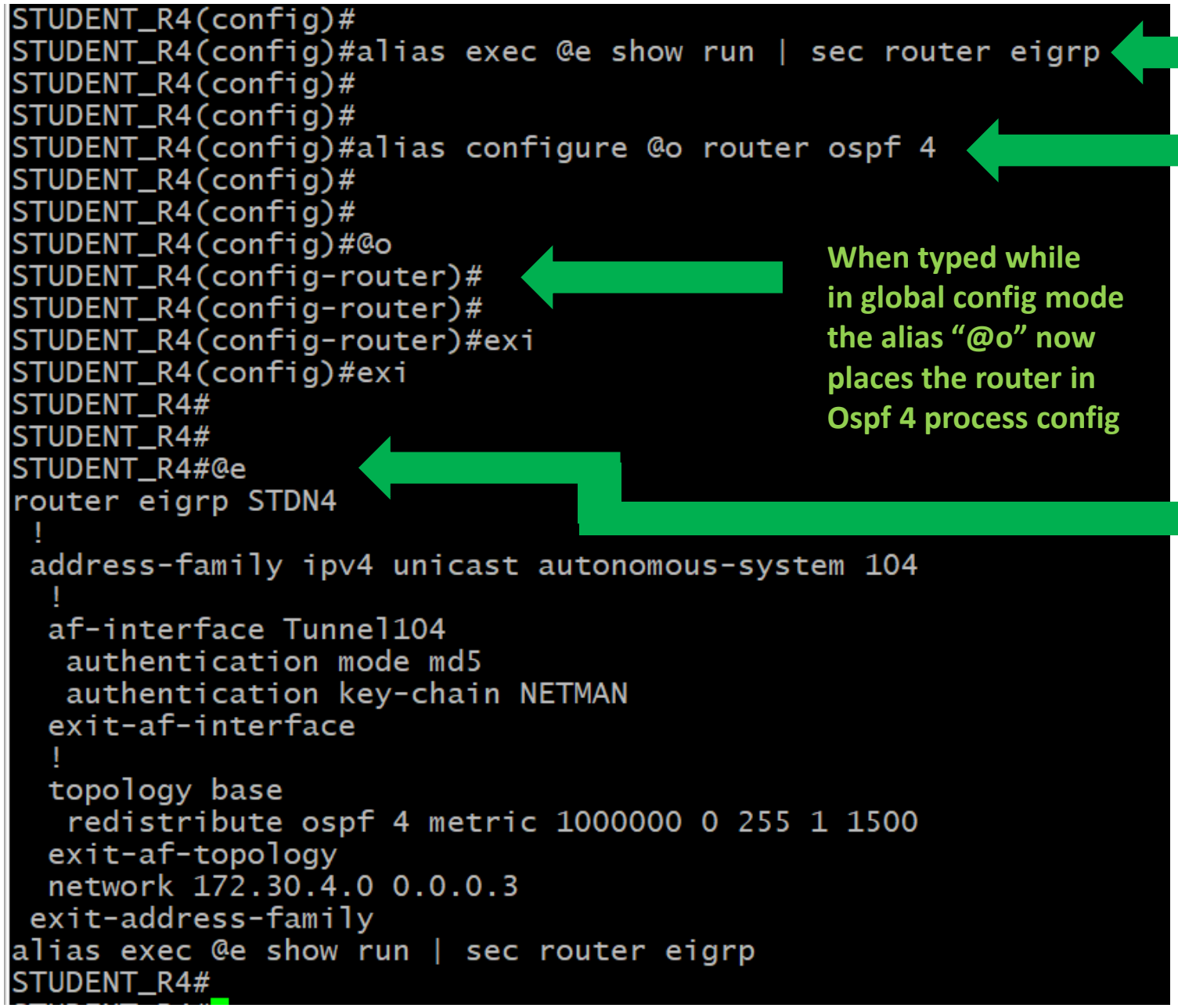
```
STUDENT_SW4(config)#
STUDENT_SW4(config)#ip multicast-routing distributed
STUDENT_SW4(config)#
STUDENT_SW4(config)#int vlan 204
STUDENT_SW4(config-if)#ip pim sparse-mode
STUDENT_SW4(config-if)#ip igmp join-group 225.0.0.255
STUDENT_SW4(config-if)#
STUDENT_SW4(config-if)#int vlan 104
STUDENT_SW4(config-if)#ip pim sparse-mode
STUDENT_SW4(config-if)#ip igmp join-group 225.0.0.255
STUDENT_SW4(config-if)#
```



Configure your router and switch to be able to receive a blue-feed multicast stream. This entails enabling multicast-routing on the router and switch and setting the interfaces in the path for pim sparse-mode.

Statically joining the igmp group can make the multicast feed propagate faster in some cases but it is not necessarily a required configuration.

The PE-3 resources folder has very specific instructions and screenshots detailing the setup of VLC media player for this lab.



2-character alias command to display the output of the command “show run | sec router eigrp”

2-character alias command to automatically place the router into the ospf 4 configuration mode

When typed while in global config mode the alias “@o” now places the router in Ospf 4 process config

When typed, the alias “@e” now displays the running configuration for the router eigrp section

```
STUDENT_R4(config)#
STUDENT_R4(config)#crypto isakmp policy 3
STUDENT_R4(config-isakmp)#group 5
STUDENT_R4(config-isakmp)#encryption aes 192
STUDENT_R4(config-isakmp)#hash md5
STUDENT_R4(config-isakmp)#authentication pre-share
STUDENT_R4(config-isakmp)#exi
STUDENT_R4(config)#
STUDENT_R4(config)#crypto isakmp key netmanistan address ipv6 ::/0
STUDENT_R4(config)#
STUDENT_R4(config)#crypto ipsec transform-set student-set1 esp-sha-hmac esp-aes
STUDENT_R4(cfg-crypto-trans)#mode transport
STUDENT_R4(cfg-crypto-trans)#exi
STUDENT_R4(config)#
STUDENT_R4(config)#crypto ipsec profile lab-pro-2019
STUDENT_R4(ipsec-profile)#set transform-set student-set1
STUDENT_R4(ipsec-profile)#set security-association life sec 1500
STUDENT_R4(ipsec-profile)#exi
STUDENT_R4(config)#
STUDENT_R4(config)#
STUDENT_R4(config)#int tun 59304
STUDENT_R4(config-if)#tunnel protection ipsec profile lab-pro-2019
STUDENT_R4(config-if)#
```

ISAKMP Policy (phase 1)

ISAKMP Pre-Shared Key

IPSEC transform set (Phase 2)

IPSEC Profile (phase 2)

Application of the IPSEC configuration on a tunnel interface

The lab has you create an ISAKMP policy and IPSEC profile by way of IQ-Core script, so the steps are slightly out of order in the lab due to the fact that main point of the task is exporting a script via IQ-Core.

To properly implement IPSEC:

1. Create the ISAKMP policy
2. Define the pre-shared key
3. Create the transform set
4. Create the IPSEC profile
5. Apply it to an interface

```
login as: student
Using keyboard-interactive authentication.
Password:



                                                  WELCOME TO THE DIVISION WAN-EDGE


    1           VIEW 148 NETWORK DETAILS

    2           SHOW OSPF NEIGHBORS

    3           SHOW VLAN 39 SUB-INTERFACE INFORMATION

    4           EXIT THE MENU

 PLEASE CHOOSE AN OPTION
```

Expected view of the Menu when accessed via telnet at 22.17.17.28.
Your own properly configured menu will look similar with different options.

```
STUDENT_R4(config)#
STUDENT_R4(config)#menu ST-4 title c WELCOME TO THE MENU c
STUDENT_R4(config)#menu ST-4 text 1 VIEW CURRENT OSPF NEIGHBORS
STUDENT_R4(config)#menu ST-4 command 1 show ip ospf neighbor
STUDENT_R4(config)#menu ST-4 text 2 VIEW CURRENT EIGRP NEIGHBORS
STUDENT_R4(config)#menu ST-4 command 2 show ip eigrp neighbor
STUDENT_R4(config)#menu ST-4 text 3 EXIT THIS MENU
STUDENT_R4(config)#menu ST-4 command 3 menu-exit
STUDENT_R4(config)#menu ST-4 prompt c CHOOSE A MENU OPTION c
STUDENT_R4(config)#
STUDENT_R4(config)#line vty 0 15
STUDENT_R4(config-line)#autocommand menu ST-4
STUDENT_R4(config-line)#
```

Menu configuration

Application of the menu on the VTY lines

```
TUDENT_R4(config)#flow exporter EXP-1
TUDENT_R4(config-flow-exporter)#destination 22.18.104.4
TUDENT_R4(config-flow-exporter)#source g0/0/0.204
TUDENT_R4(config-flow-exporter)#ttl 7
TUDENT_R4(config-flow-exporter)#transport udp 9996
TUDENT_R4(config-flow-exporter)#
TUDENT_R4(config-flow-exporter)#exi
TUDENT_R4(config)#
```

Configure a flow-exporter. The destination IP address is your Student NFA VM. The source interface in this case is the router's G0/0/0.204 interface because it is closed to the destination.

```
STUDENT_R4(config)#
STUDENT_R4(config)#
STUDENT_R4(config)#flow monitor MON-1
STUDENT_R4(config-flow-monitor)#exporter EXP-1
STUDENT_R4(config-flow-monitor)#cache timeout inact 20
STUDENT_R4(config-flow-monitor)#cache timeout active 180
STUDENT_R4(config-flow-monitor)#record netflow-original
STUDENT_R4(config-flow-monitor)#exi
STUDENT_R4(config)#
```

Configure a flow monitor that references the exporter you created above.

```
STUDENT_R4(config)#
STUDENT_R4(config)#int tun 104
STUDENT_R4(config-if)#ip flow monitor MON-1 input
STUDENT_R4(config-if)#ip flow monitor MON-1 output
STUDENT_R4(config-if)#
```

Apply the flow monitor to an interface in the direction you want to capture traffic.