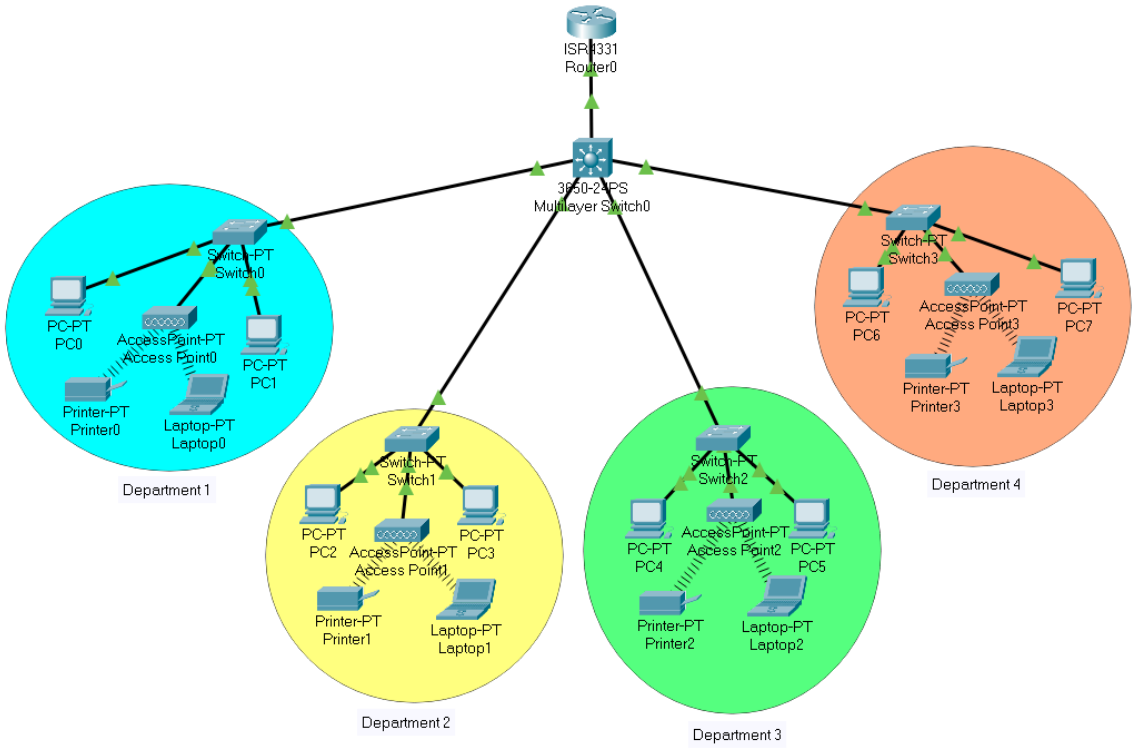
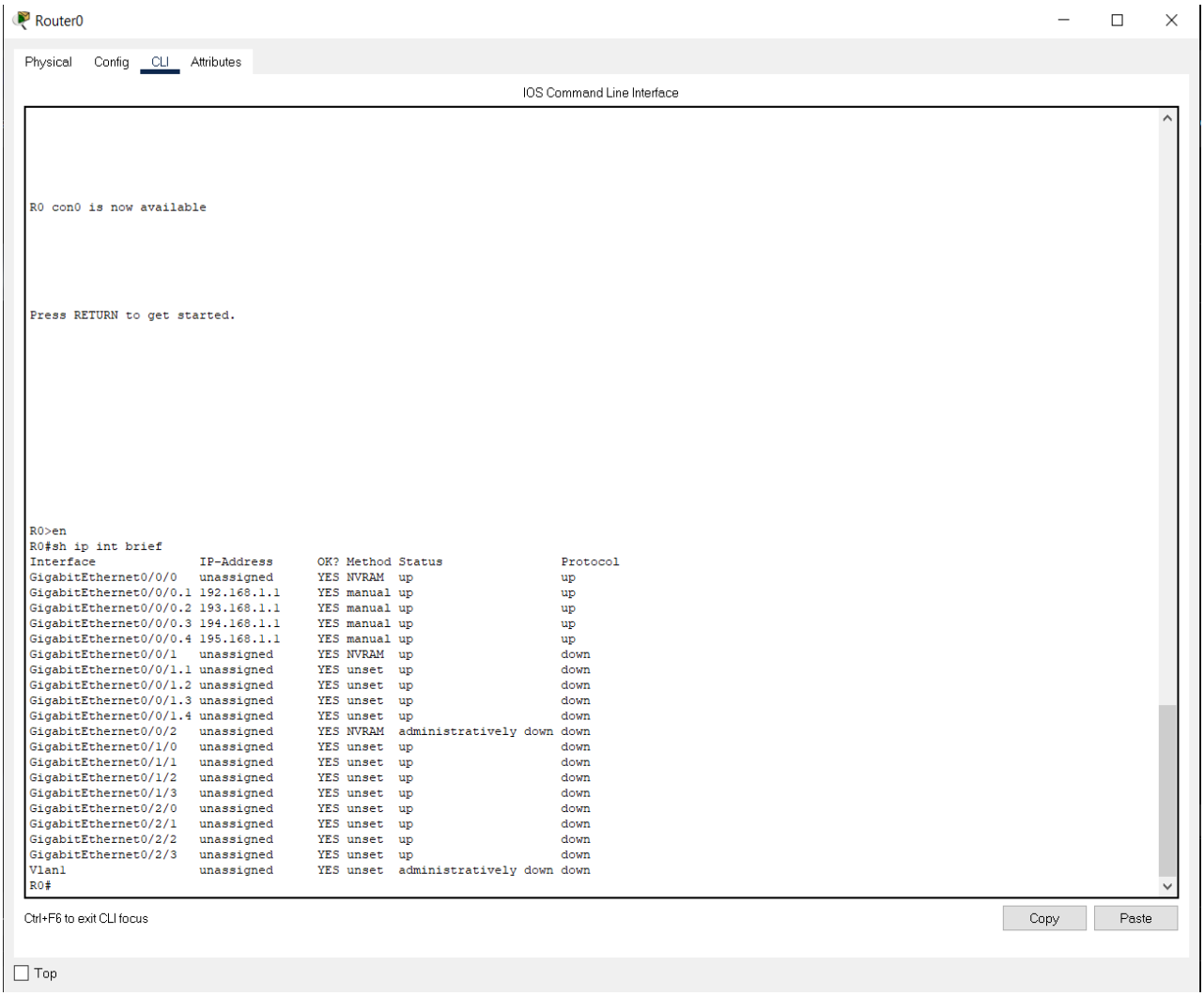
2-Tier Collapsed-Core SOHO Network

Designed by Sam Rajan

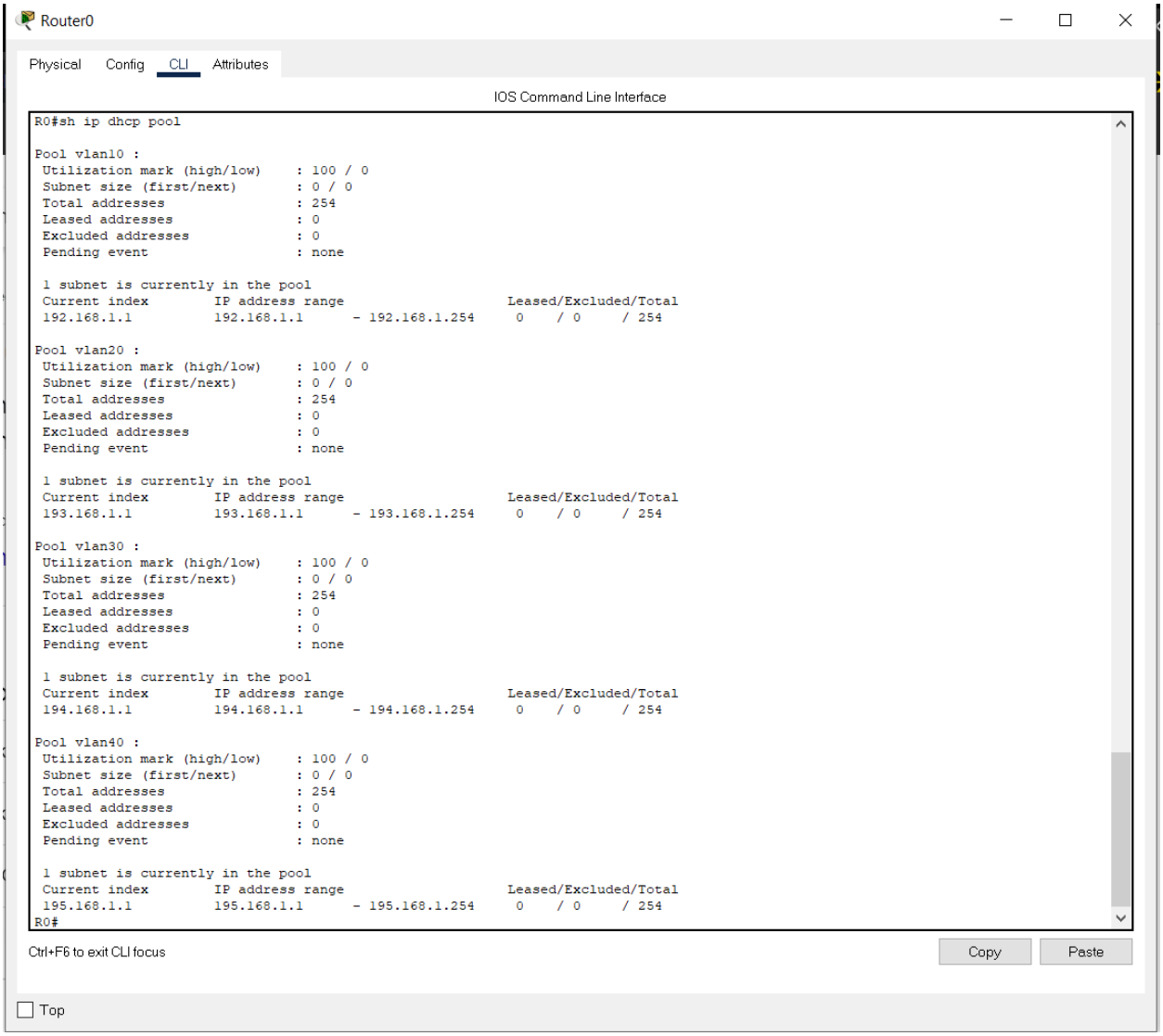
The following diagram below depicts the 2-Tier Collapsed Core SOHO (Small Office/Home Office) network created using Cisco's Packet Tracer software. The network features 4 departments which each have their own assigned DHCP pools. Each department features a PT switch, two desktop PCs, a wireless AP, a printer, and a laptop. The wireless AP allows the printer and laptop to wirelessly connect to the department VLAN and use the network to communicate to other departments. Each department's wireless AP uses WPA-2K authentication and has a separate password used for connecting to each VLAN. The multilayer switch conducts the switching between departments and comprises the condensed distribution and core layer. The interface between the multilayer switch is split into 4 sub-interfaces to facilitate the router-on-a-stick configuration. Each sub-interface corresponds to a distinct VLAN and DHCP group respective to each department.



Router Configurations:

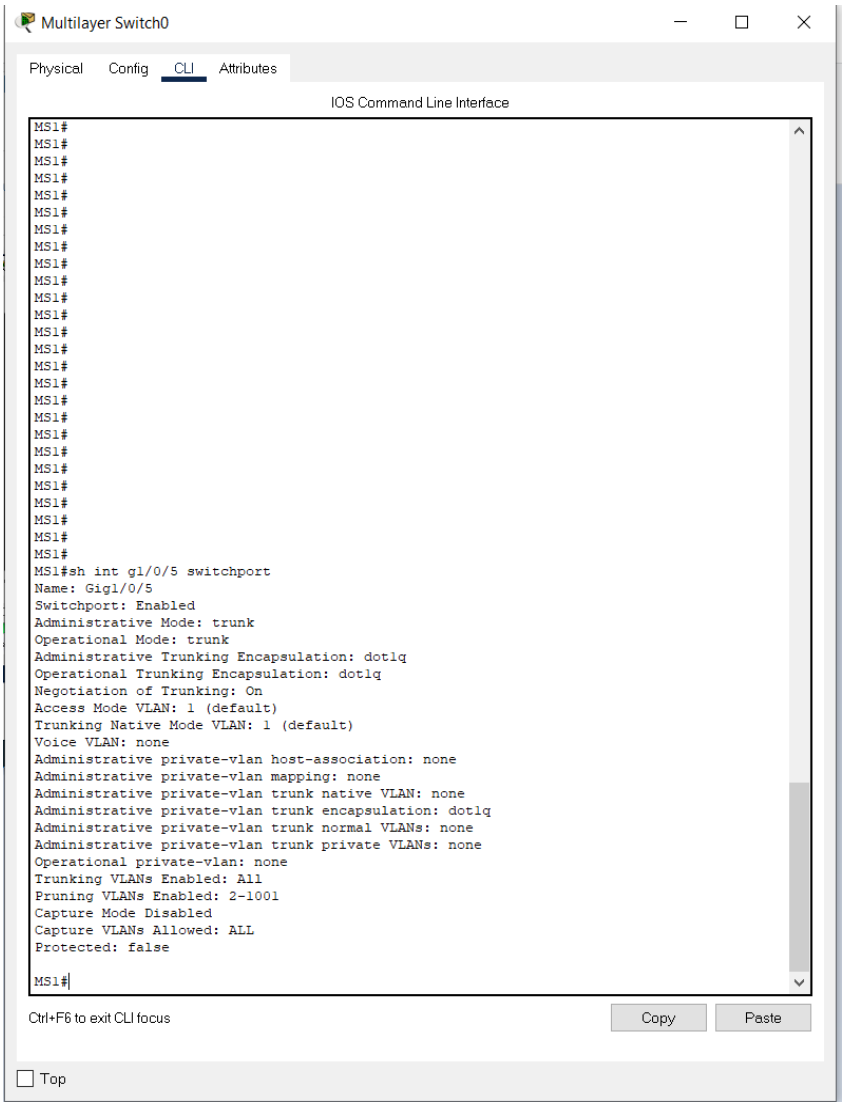


As can be seen in the image above, the GigabitEthernet0/0/0 interface has been divided into 4 sub-interfaces. Each sub-interface is assigned the default gateway for each respective department network and will be used in the assignment of the DHCP pools. GigabitEthernet0/0/0.1 corresponds to the 192.168.1.0/24 network, GigabitEthernet0/0/0.2 corresponds to the 193.168.1.0/24 network, GigabitEthernet0/0/0.3 corresponds to the to 194.168.1.0/24 network, and GigabitEthernet0/0/0.4 corresponds to the 195.168.1.0/24 network.

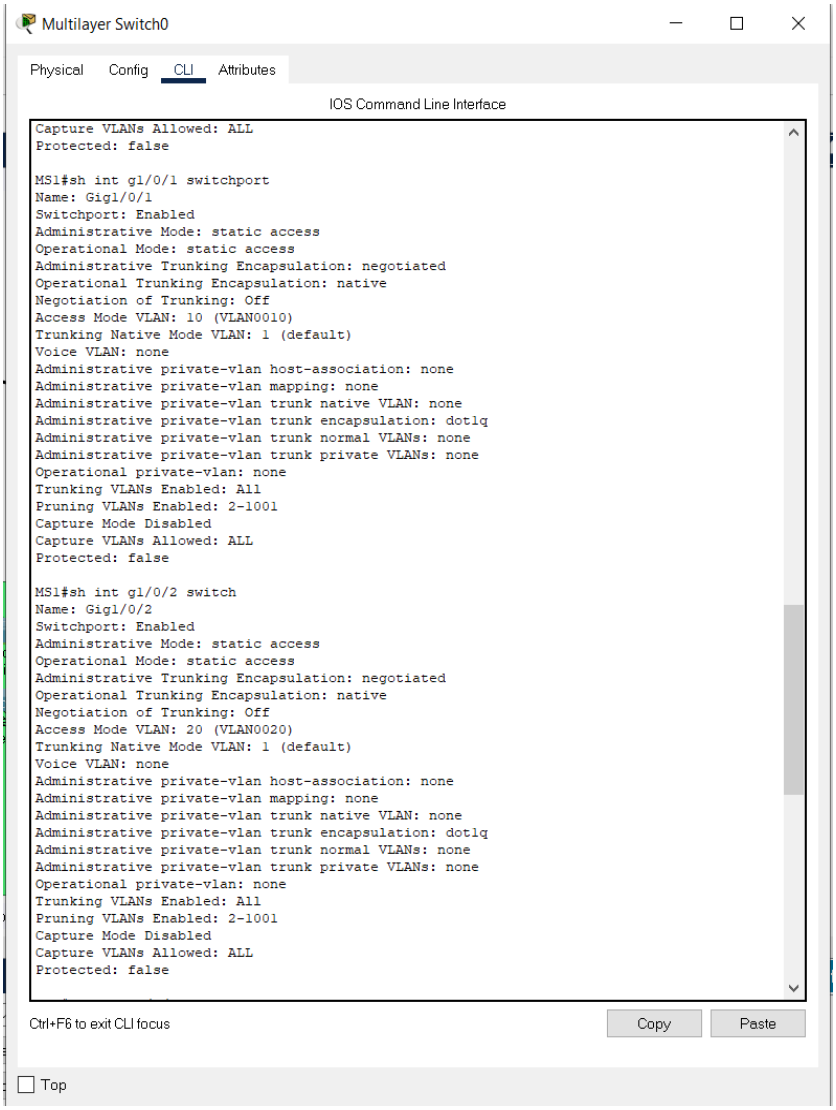


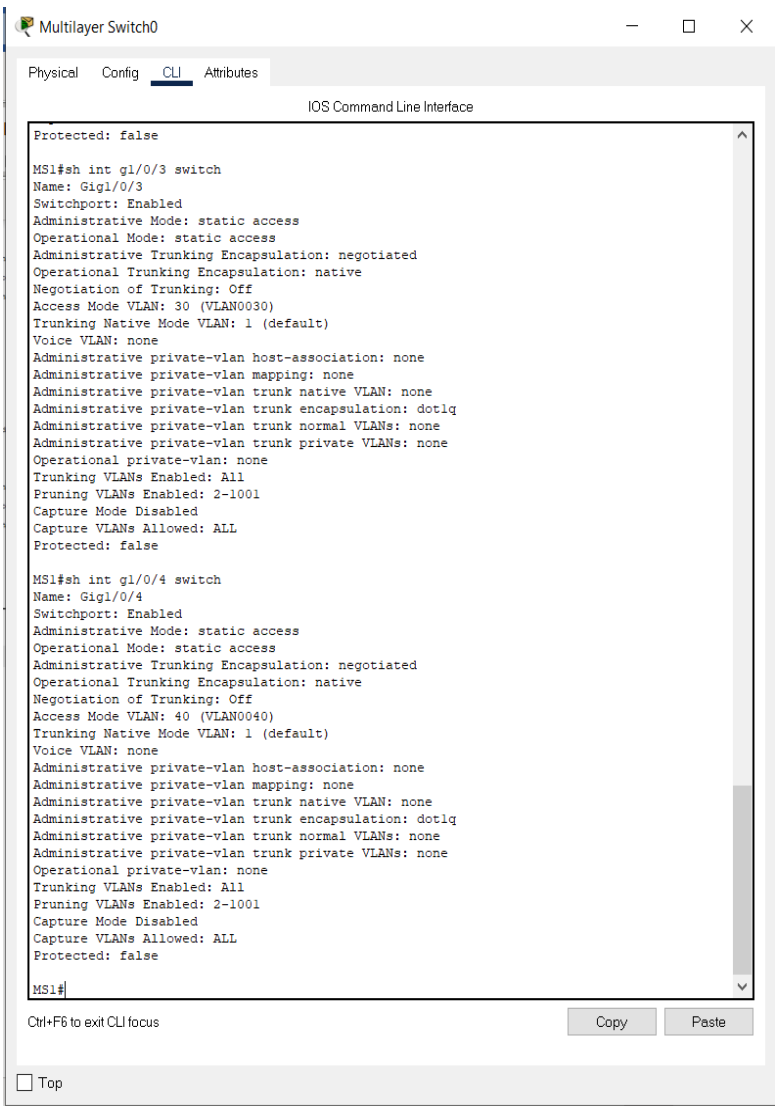
This image shows the DHCP pool configurations on the router as per the respective VLANS that will be assigned to each department. VLAN 10 corresponds to Department 1, VLAN 20 corresponds to Department 2, VLAN 30 corresponds to Department 3, and VLAN 40 corresponds to Department 4. The vlan10 pool corresponds to the 192.168.1.1 – 192.168.1.254 address range, the vlan20 pool corresponds to the 193.168.1.1 – 193.168.1.254 address range, the vlan30 pool corresponds to the 194.168.1.1 – 194.168.1.254 address range, and the vlan40 pool corresponds to the 195.168.1.1 – 195.168.1.254 address range.

Multilayer Switch Configurations:



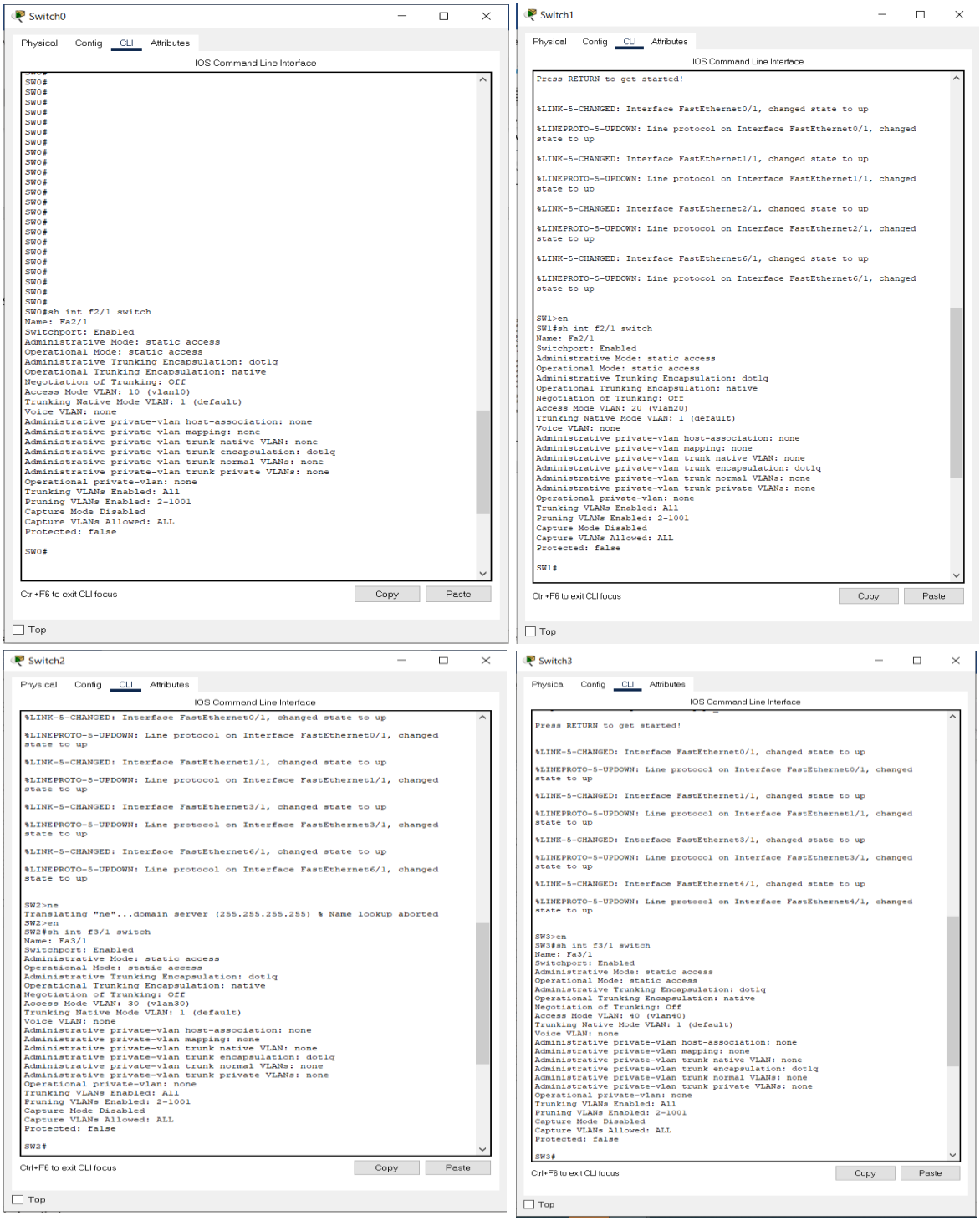
The multilayer switch comprises the entire condensed core/distribution layer. The GigabitEthernet1/0/5 interface (which connects the switch to the router and has been split into sub-interfaces) has been configured to be in trunking mode and uses 802.1q encapsulation.





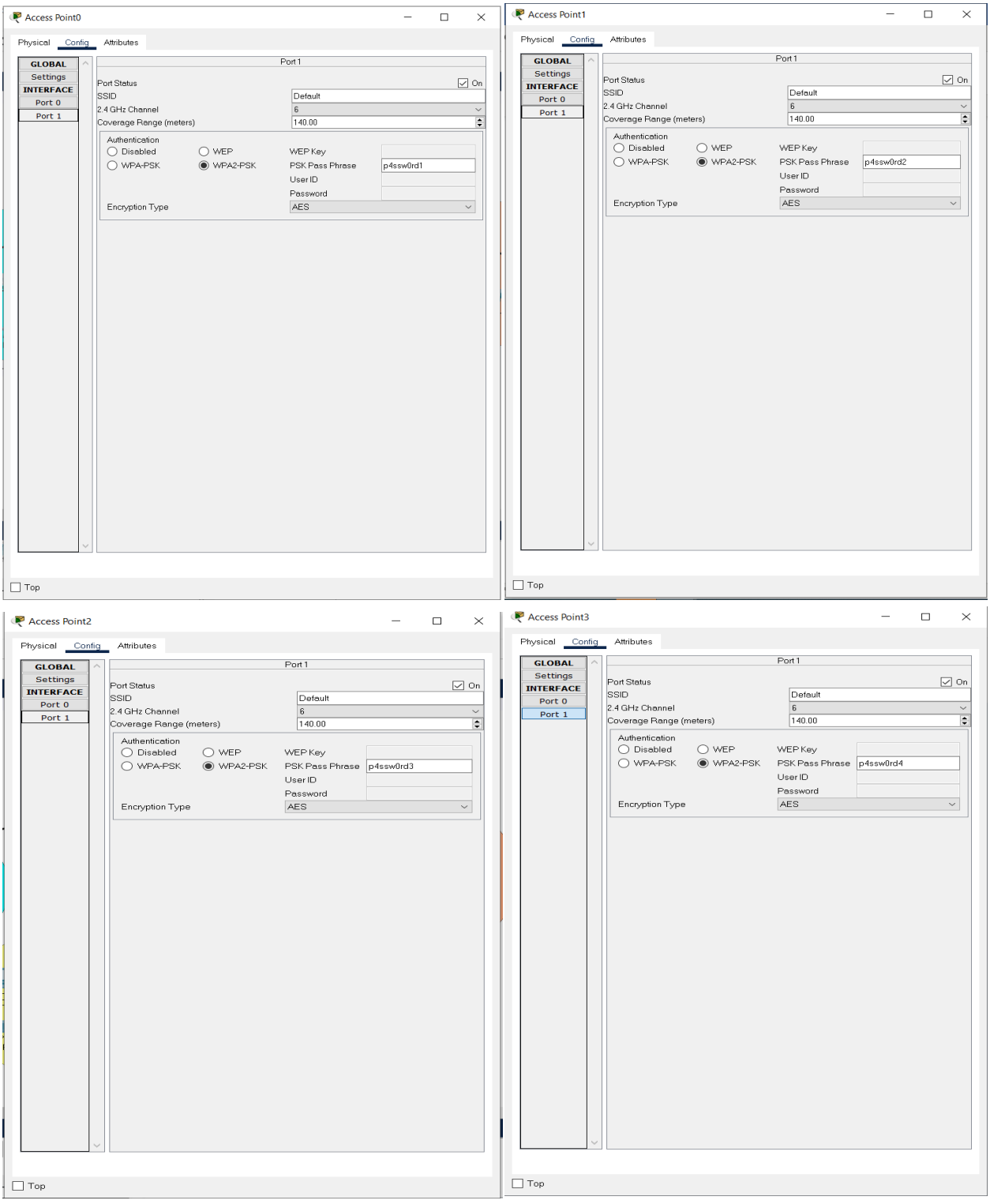
The interfaces GigabitEthernet1/0/1 – GigabitEthernet1/0/4 are all configured to be access ports for the respective department VLANs. GigabitEthernet1/0/1 is used to access VLAN10, GigabitEthernet1/0/2 is used to access VLAN20, GigabitEthernet1/0/3 is used to access VLAN30, and GigabitEthernet1/0/4 is used to access VLAN40.

Access Layer Switch Configurations:



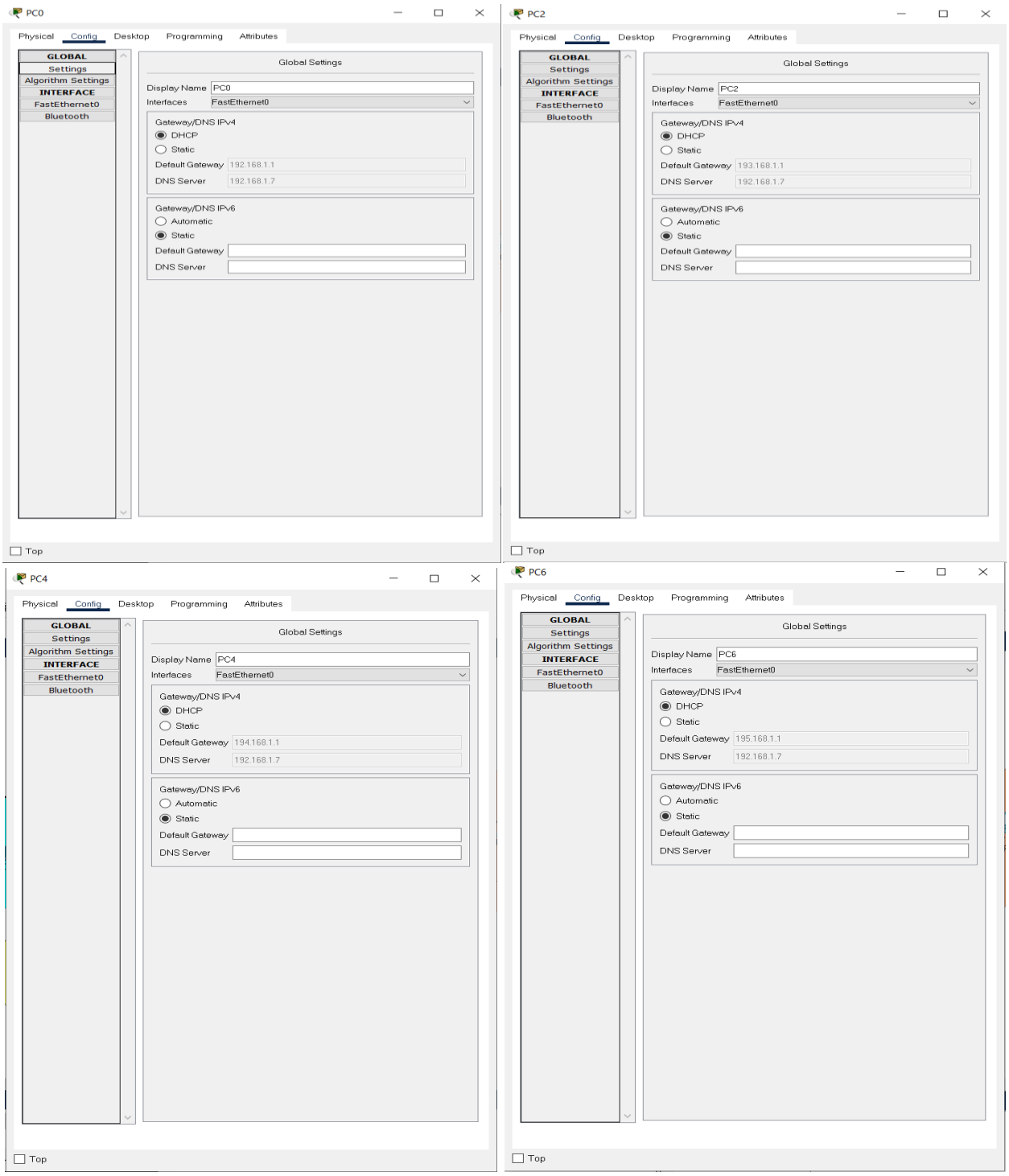
The interfaces connecting each access switch for each respective department VLAN to the multiplayer switch have been configured to be in access mode. Switch 0 corresponds to VLAN10, switch 2 corresponds to VLAN20, switch 3 corresponds to VLAN30, and switch 4 corresponds to VLAN40. The interfaces on each switch connecting to the PCs and wireless APs are also configured to be in access mode.

Wireless AP Configurations:

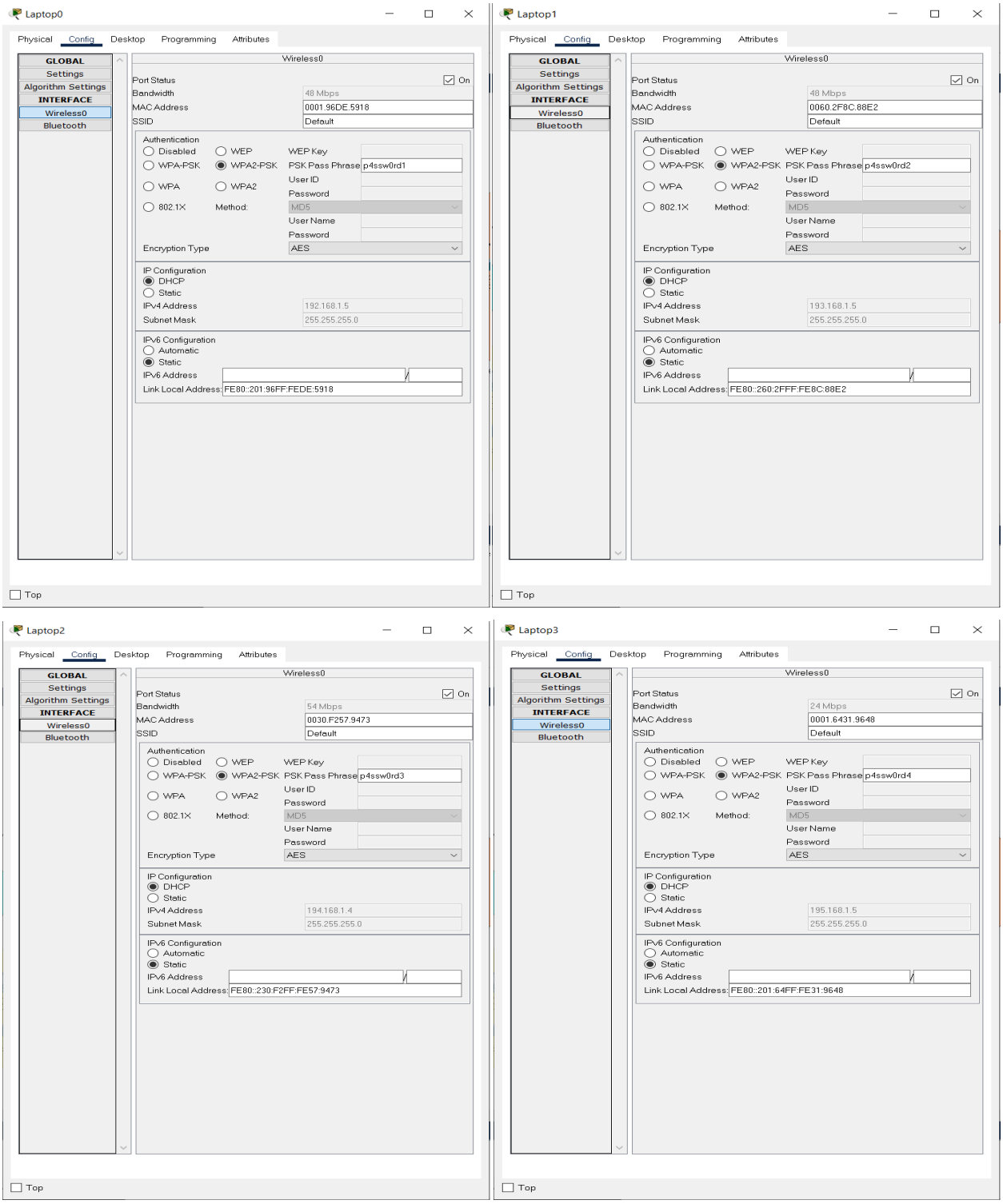


The wireless APs for each department use WPA2-PSK authentication and all have separate passwords. AP 0 corresponds to department 1, AP 1 corresponds to department 2, AP 2 corresponds to department 3, and AP 4 corresponds to department 4.

Host Configurations:



These PCs have been configured to use DHCP to receive an IP address. They will receive an IP address based on the department VLAN they belong to. Note that this difference between them can be observed via the distinct default gateways for each PCs. This same setting has been configured for all PCs throughout the network.



The wireless hosts (laptops) have been configured to connect to the AP using their respective passwords. The encryption type used for the connection is AES. All wireless hosts have also been configured to use DHCP to allocate IP addresses to them. These same settings are also used to configure the wireless printers in the network.

Sample connectivity tests:

These tests will showcase the functionality of the network in the most comprehensive way. The tests will involve each of the laptops pinging the laptops in the other departments successfully.

The IPs for each of the department laptops are:

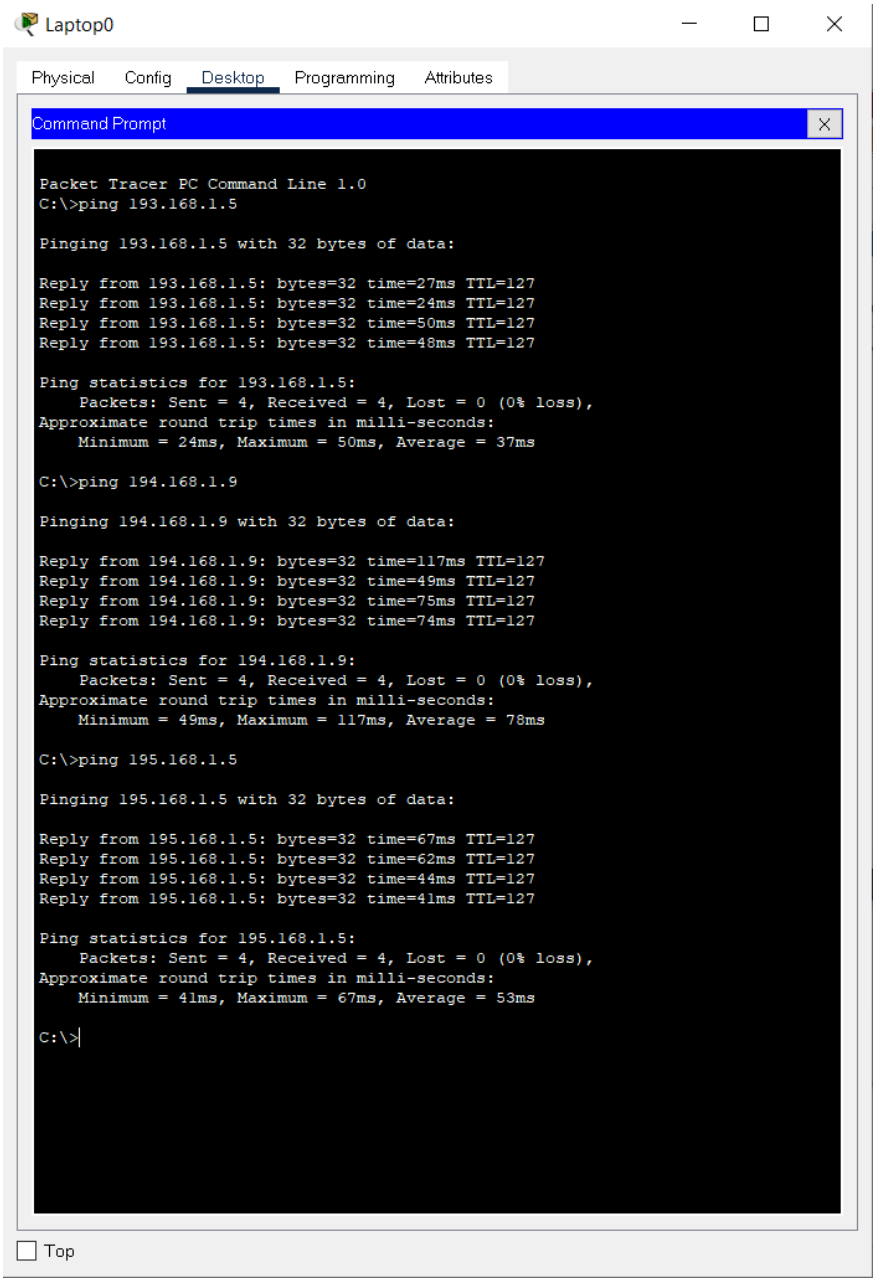
Department 1 (Laptop 0): 192.168.1.3/24

Department 2 (Laptop 1): 193.168.1.5/24

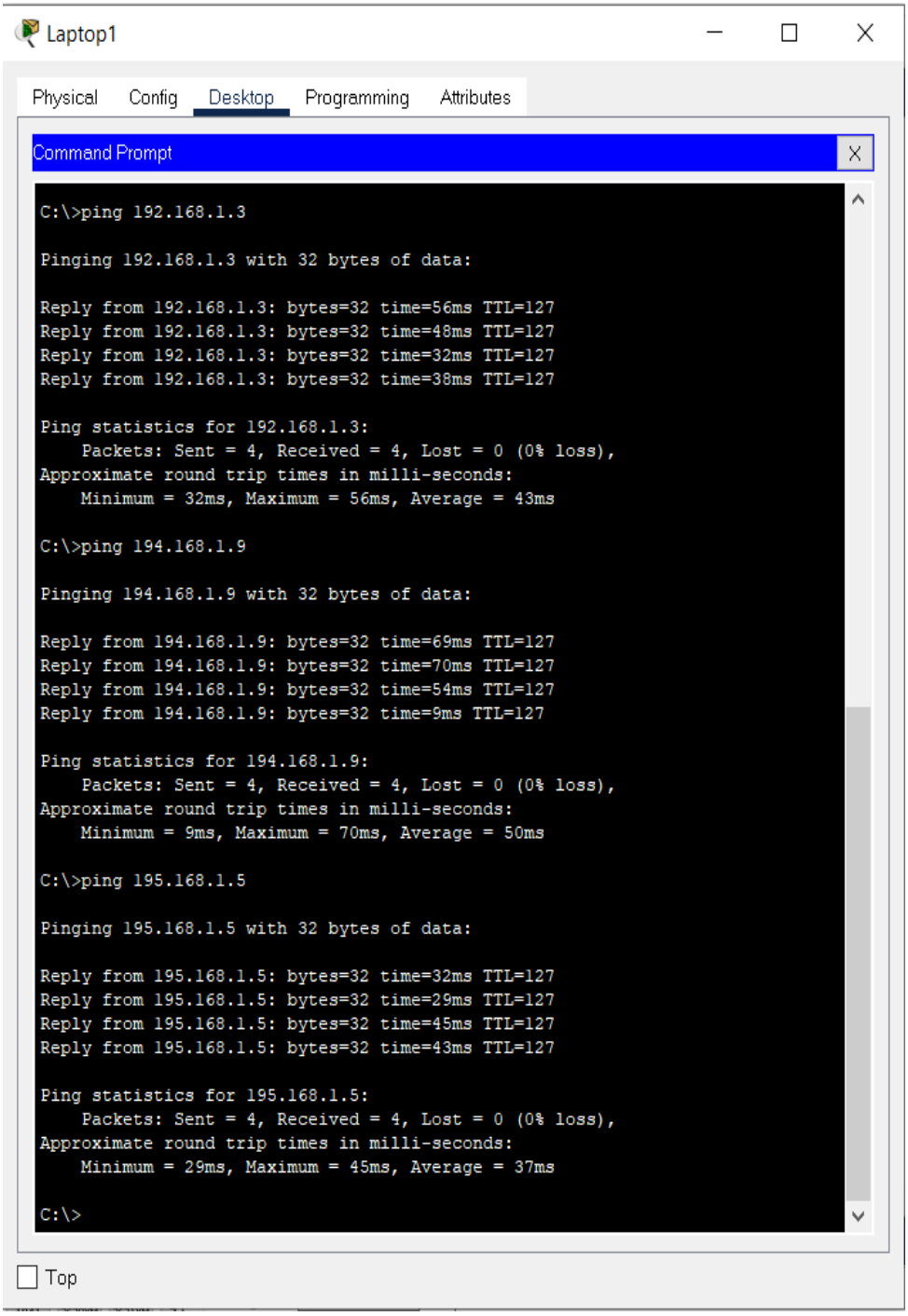
Department 3 (Laptop 2): 194.168.1.9/24

Department 4 (Laptop 3): 195.168.1.5/24

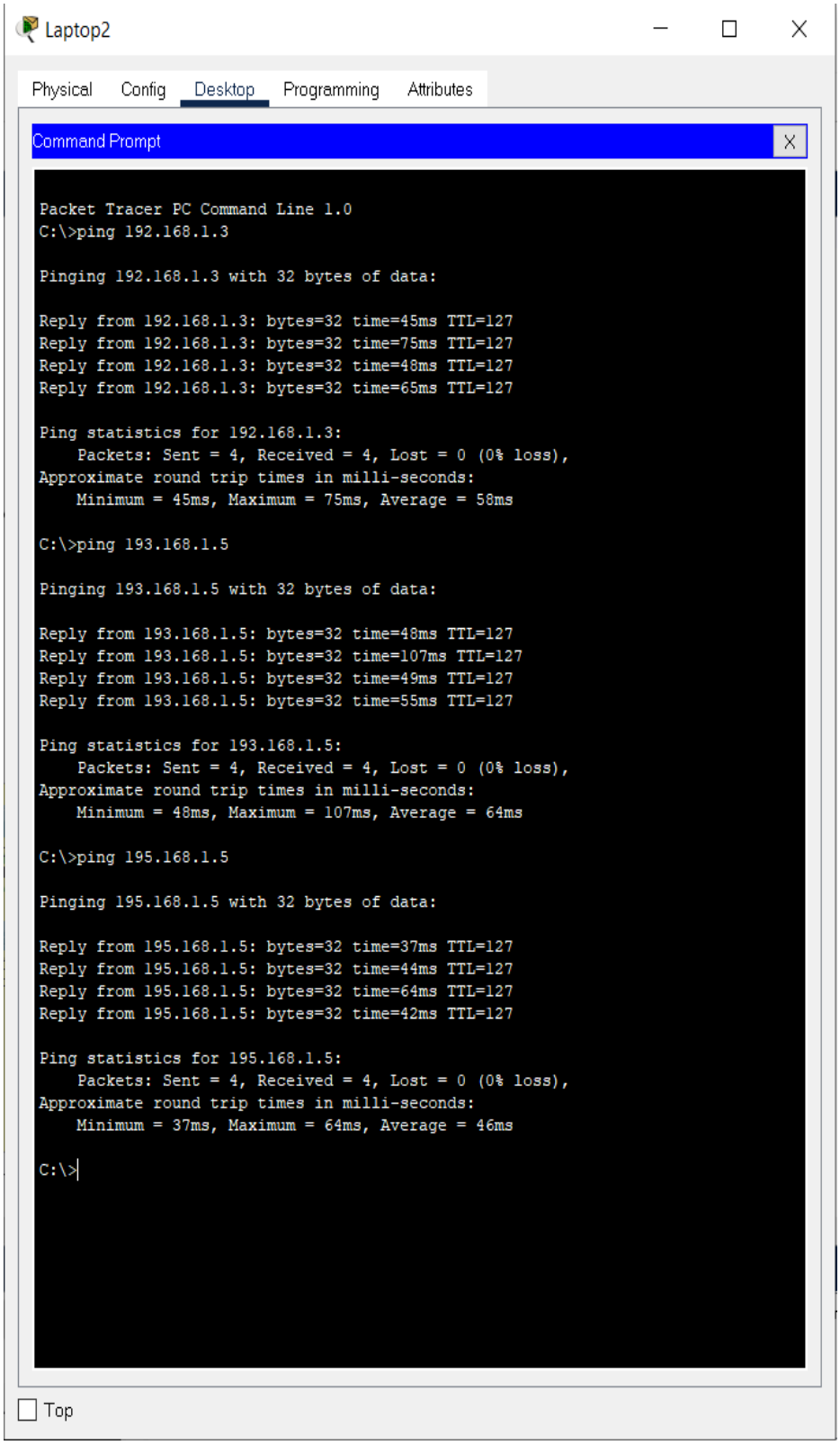
Department 1 (Laptop 0) Pings:



Department 2 (Laptop 1) Pings:



Department 3 (Laptop 2) Pings:



Department 4 (Laptop 3) Pings: