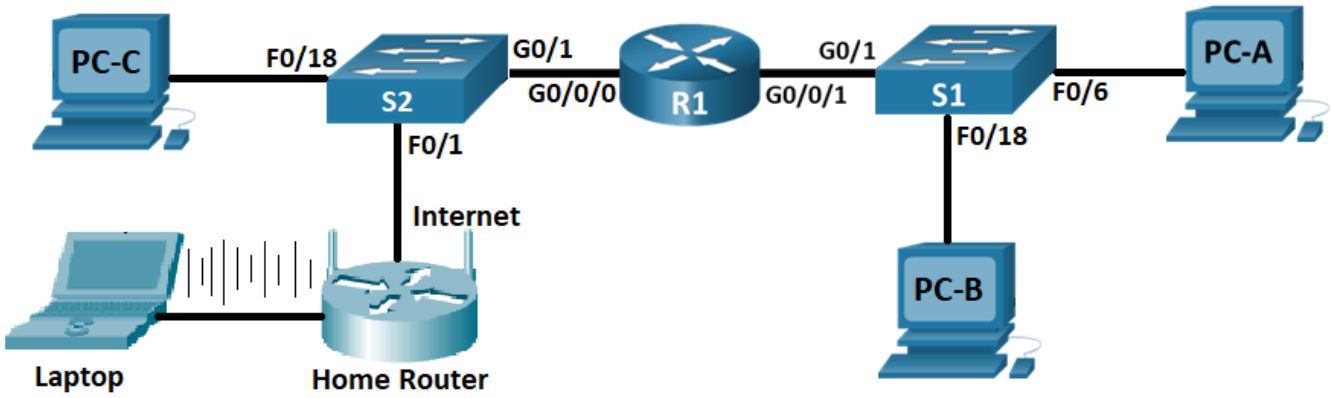
RED RIVER COLLEGE
OF APPLIED ARTS, SCIENCE AND TECHNOLOGY

NTWK-1010 Midterm Project

Topology



Addressing Table

Device	Interface	IP Address / Prefix	Default Gateway
R1	G0/0/0	192.168.0.1 /24	N/A
		2001:db8:acad::1/64	
		fe80::1	
	G0/0/1	192.168.1.1 /24	N/A
		2001:db8:acad:1::1/64	
		fe80::10	
Home Router	Internet	192.168.0.12	192.168.0.1
	Ethernet/Wireless LAN	192.168.100.254	N/A
S1	VLAN 1	192.168.1.10 /24	192.168.1.1
S2	VLAN 1	192.168.0.11 /24	192.168.0.1
PC-A	NIC	192.168.1.20 /24	192.168.1.1
		2001:db8:acad:1::20/64	fe80::10
PC-B	NIC	192.168.1.21 /24	192.168.1.1
		2001:db8:acad:1::21/64	fe80::10
PC-C	NIC	192.168.0.20 /24	192.168.0.1
		2001:db8:acad::20/64	fe80::1
Laptop	NIC	192.168.100.127	192.168.0.1

Objectives

Part 1: LAN Discovery

Part 2: Label and Cable

Part 3: Device Configuration

Part 4: Test and Verify End-to-End Connectivity

Part 5: Use the iOS CLI to Gather Device Information

Part 6: Theory Questions

Part 7: Clean Up

Scenario

In this project you are assuming the role of a junior network administrator tasked with providing full connectivity between three LANs (two existing, one new). You will discover and document your own LAN and integrate into the existing topology created during lab classes. This will include modifying intermediary device configurations to support IPv4 and IPv6 end-to-end connectivity. You will then be asked to test connectivity between end devices, remote management access, display information using common CLI commands and answer theory questions during midterm project sign off with your instructor.

Hands-On Project Required Resources

- 1 Router (Cisco 4221 with Cisco IOS XE Release 16.9.4 universal image or comparable)
- 2 Switches (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
- 1 Home Router
- 2 PCs (Windows with a terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet cables as shown in the topology

Online Project Required Resources

- Laptop installed with Windows 10 or Mac OSX and connection to the Internet
- Packet Tracer version 8.0 or later
- Lab Template.pka file to build the project in packet tracer
- Adobe Reader to view, edit and save lab .pdf file

Instructions

Note: Figures are included at the Appendix of this document.

Part 1: LAN Discovery

Step 1: Gather End Device Information

Using the steps and LAN Addressing table below, record the network configuration of an end device connected to your current LAN providing Internet access.

Note: Steps to obtain IP settings from Windows 10 and Mac OSX operating systems are included. Please contact your instructor for guidance on other operating systems.

Windows 10:

a. From command prompt, enter the command **hostname**

b. Record the hostname provided in the LAN Addressing table below *(see Figure.1)*

c. From command prompt and enter the command **ipconfig /all**

d. Locate the network adapter that contains a **Default Gateway** IP address. *(see Figure.2)*

e. Under the Laptop column, record the **Physical Address, IPv4 Address, Subnet Mask, and Default Gateway** in the table below.

Mac OSX:

f. From Terminal, enter the command **hostname**

g. Record the hostname provided in the LAN Addressing table below. *(see Figure.3)*

h. Open **System Preferences** > **Network** *(see Figure.4)*

i. In the left hand pane, highlight the connected network adapter > **Advanced…** *(see Figure.5)*

j. Under the **Hardware** tab, record the **MAC Address** in the addressing table below. *(see Figure.6)*

k. Under the **TCP/IP** tab, record the **IPv4 Address, Subnet Mask,** and **Router** (Default Gateway) in the table below. (see Figure.7)

Step 2: Gather Home Router Information

Using the steps and LAN Addressing table below, record the network configuration of your home router.

Note: Steps to obtain home router settings will not require management access.

Windows 10:

a. From command prompt, enter the following command to view the hostname of your router:

nslookup [IPv4 default gateway]

e.g. *nslookup 192.168.100.254 (see Figure.8)*

b. Under the home router column, record the hostname in the LAN addressing table below.

c. Copy the IPv4 Default Gateway and Subnet Mask found for Laptop and paste in the IPv4 Address and Subnet Mask rows under the home router column in the LAN Addressing table below.

d. From command prompt, enter the command: **arp -a**.

e. Locate the IPv4 default gateway IP address and record the associated Physical Address under the Router column in the LAN Addressing table below. *(see Figure.9)*

Mac OSX:

f. From terminal enter the following command to view the hostname of your router:

nslookup [IPv4 default gateway]

e.g. *nslookup 192.168.100.254 (see Figure.10)*

g. Under the home router column, record the hostname provided in the LAN addressing table below.

h. Copy the IPv4 Default Gateway and Subnet Mask found for devices and paste in the IPv4 Address and Subnet Mask rows under the Router column in the LAN Addressing table below.

i. From terminal enter the command: **arp -a**.

j. Locate the IPv4 default gateway address and record the associated Mac Address under the Router column in the LAN Addressing table below. *(see Figure.11)*

LAN Addressing Table

	Example Laptop	Laptop	Example Router	Home Router
Hostname	LAPTOP-BG6VUEG	Laptop	homeportal	Home Route
Physical (MAC) Address	00-68-eb-88-ee-fb	0090.2B50.4990	f8-18-97-48-30-e9	000A.F3C1.3101
IPv4 Address	192.168.100.127	192.168.100.127	192.168.100.254	192.168.100.254
Subnet Mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
IPv4 Default Gateway	192.168.100.254	192.168.0.1		

Part 2: Label and Cable

Step 1: Modify the Existing Topology

Note: Instructions provided assumes only online resource requirements. If using hands-on lab requirement, initialize switches and router from lab startup-configuration files.

a. Save a copy of your latest Lab and Midterm Project Template.pka and rename to Midterm Project.pka

b. Open Midterm Project.pka

c. Drag a Laptop and Home Router (WRT300N) into the logical topology.(*see Figure.12 and 13*)

d. Rename Laptop and Home Router based on the hostnames in the LAN Addressing table above.

e. Add/remove cables as necessary to match included topology above.

   1) If laptop uses wireless *see Figure.14 and 15*.

   2) If laptop uses wired, connect to **Ethernet1** on the Home Router.

Part 3: Device Configuration

Step 1: S2 configuration

a. Erase the startup configuration and reload the switch.

b. Give the switch a hostname ending with your first name (e.g. S2John)

c. Prevent unwanted DNS lookups.

d. Enter a login MOTD banner to warn about unauthorized access and contact your academic email for access.

e. Secure physical and remote CLI access to the switch.

   Note: Console and VTY line password: **cisco** | Priv exec password: **class**

f. Configure VLAN 1 interface (SVI) and Default Gateway IPv4 address to allow communication across R1. Record both IP addresses in the addressing table above.

   Note: Choose an IP address that will not conflict with other devices in the same network.

g. Encrypt plain-text passwords.
h. Configure meaningful descriptions on all active switchports
i. Save the configuration.

Step 2: Initial Laptop configuration

a. Update the Laptop's Wireless0 (or Ethernet0 if wired) MAC address to match the LAN addressing table Physical Address. (*see Figure 16*)

b. Open command-prompt and issue the command to view IP settings. Take note of the default gateway IP provided by the home router's DHCP service.

Step 3: Home Router configuration

a. Open a web browser (*see Figure 17*) on the laptop and enter in the default gateway IP address recorded during step 2 b into the URL field and press enter.

Username: **admin**

Password: **admin**

b. Select Administration in the top right and modify and confirm the Router Password to **cisco123**
c. Scroll to the bottom of the page and select **Save Settings** then provide the new credentials to confirm changes.
d. Under **Setup** in the top left, update the **Router IP address** and **Subnet Mask** to match the **Home Router fields** provided in the LAN Addressing Table. Scroll to the bottom of the page and select **Save Settings.** (*see Figure 18 and 19*).
Note: If the IPv4 Address recorded from your home router is within the 192.168.0.0/24 or 192.168.1.0/24 networks an IP conflict will occur. Please contact your instructor for design changes.
e. Open command prompt on the laptop and enter the following command to renew the DHCP lease:

ipconfig /renew

f. Take note of the new **Default Gateway** IP then update the addressing table **Ethernet/Wireless LAN** field with this IP address.
g. Open a web browser on the laptop and enter the new Default Gateway IP address recorded during step 3 f into the URL field and press enter.
h. Login with the modified credentials created during step 3 b:
i. Under the **Setup**, select the **Internet Connection Type** dropdown menu > **Static IP.**
j. Provide an Internet IP Address, Subnet Mask and Default Gateway that will allow communication across R1 without causing an IP conflict within the **192.168.0.0/24** network.
k. Scroll to the bottom and select **Save Settings**.
l. Under the **Home Router Internet** interface in the Addressing Table, record the chosen **IP address** and **Default Gateway**.

Step 4: Final Laptop configuration

a. Under the **Laptop NIC** interface in the addressing table, update the **IP address/Prefix** and **Default Gateway** fields to match the Laptop column fields in the LAN addressing table.

Note: /24 prefix is a subnet mask of **255.255.255.0**

b. Open **IP configuration** on the laptop and set a **static** IP, **Subnet Mask** and **Default Gateway** that match the fields recorded in step 4 a (*see figure 20*)

Part 4: Test and Verify End-to-End Connectivity

Use the ICMP and telnet protocols to test IPv4 and IPv6 connectivity between network devices.

Note: If pings to host computers fail, temporarily disable the computer firewall and retest.

Use the following table to methodically verify connectivity with each outlined network device. Take corrective action to establish connectivity if a test fails:

From	To	Protocol	IP Address	Result	Points
PC-A	R1 G0/0/0	IPv4	192.168.0.1	success	4 points
		IPv6	2001:db8:acad::1	success	4 points
	R1 G0/0/1	IPv4	192.168.1.1	success	2 points
		IPv6	2001:db8:acad:1::1	success	2 points
Laptop	R1 G0/0/1	Telnet	192.168.1.1	success	8 points
	S1 VLAN 1	Telnet	192.168.1.10	success	8 points
	S2 VLAN 1	Telnet	192.168.0.11	success	6 points

Note: To achieve full points for telnet, banner MOTD must be displayed and access to priv exec mode.

Total Points for Part 4

_____/34

Part 5: Use the IOS CLI to Gather Device Information

Step 1: Issue the appropriate command to discover the following information on R1:

Description		Points
Router Model	show version	1 point
IOS Image File	show version	1 point
Total RAM	show version	1 point
CLI Command Used	show history	1 point

Step 2: Enter the appropriate CLI command needed to display the following on R1:

Command Description	Command	Points
Display a summary of important information about the IPv4 interfaces on R1.	show ip interface brief	1 point
Display the IPv4 routing table.	show ip route	1 point
Display the Layer 2 to Layer 3 mapping of addresses on R1.	show arp	1 point
Display detailed IPv4 information about interface G0/0/0 on R1.	show ip interface g0/0/0	1 point
Display a summary of IPv6 interface addresses and status.	show ipv6 interface brief	1 point
Save the current configuration so it will be used the next time the router is reloaded.	copy running-config startup-config	1 point

Step 3: Enter the appropriate CLI command needed to display the following on S2

Command Description	Command	Points
Display a summary of dynamically learned Mac Addresses on each switchport.	show mac address-table	1 point
Display the speed and duplex setting of F0/1 interface.	show interface f0/1	1 point
Display the configuration stored in RAM.	show startup-config	1 point
Display the configuration stored in NVRAM	show startup-config	1 point

Total Points for Part 5

_____/14

Part 6: Theory Questions:

During the Midterm Project sign off, your instructor may ask questions on the following topics:

- **End and intermediary devices**
- **Switch Virtual Interface (SVI)**
- **MAC Address**
- **Unicast, multicast and broadcast messaging**
- **TCP/IP and OSI Reference Models**
- **Type of device, protocol and PDU located at various layers of the OSI model**
- **Bandwidth Terminology**
- **Address Resolution Protocol (ARP) and Neighbor Discovery Protocol (NDP)**

Part 7: Cleanup

Hands-On Delivery:

Save startup configuration files to your laptop and upload to LEARN dropbox.

Contact your instructor for Midterm sign off.

Unless directed otherwise by the instructor, restore host computer network connectivity, and then turn off power to the host computers.

Before turning off power to the router and switch, remove the NVRAM configuration files (if saved) from all devices.

Disconnect and neatly put away all LAN cables that were used.

Online Delivery:

Save and upload Midterm Project.pka and .pdf files to LEARN dropbox.

Note: Remember to copy run start all routers and switches

Contact your instructor for Midterm sign off.

Appendix

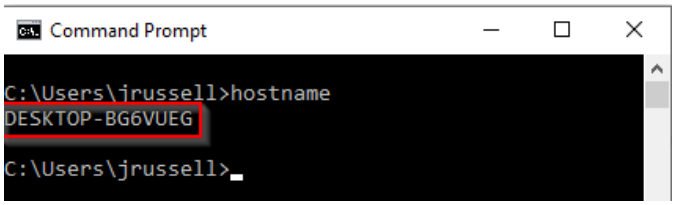


Figure 1

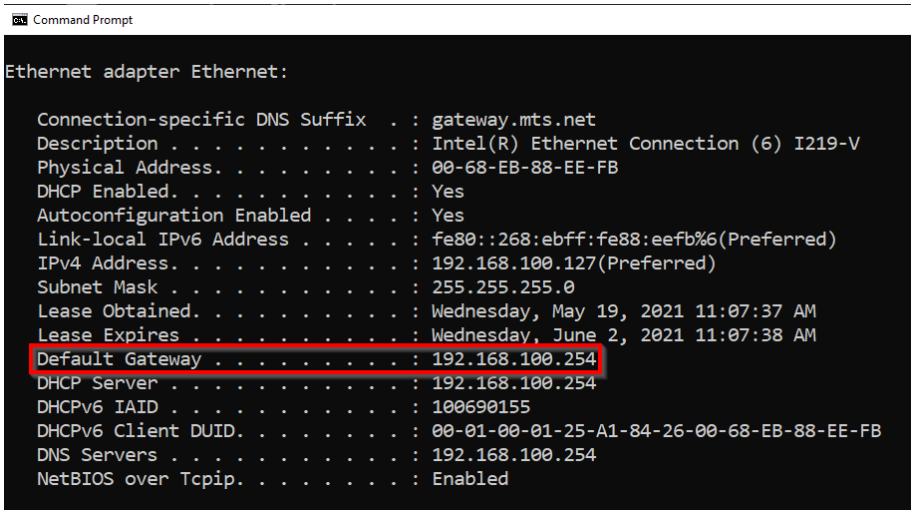


Figure 2

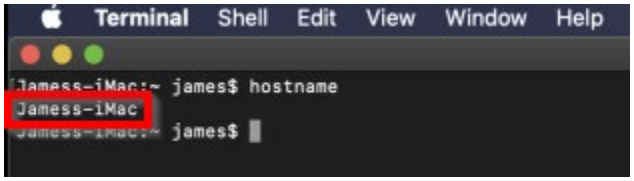


Figure 3

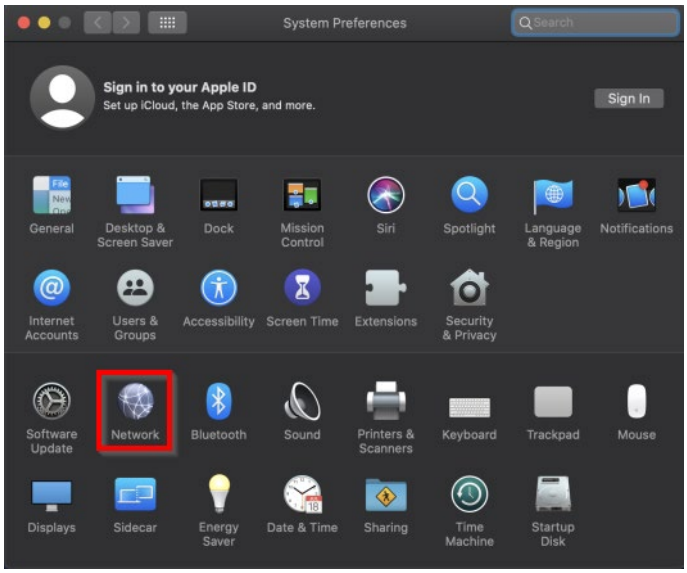
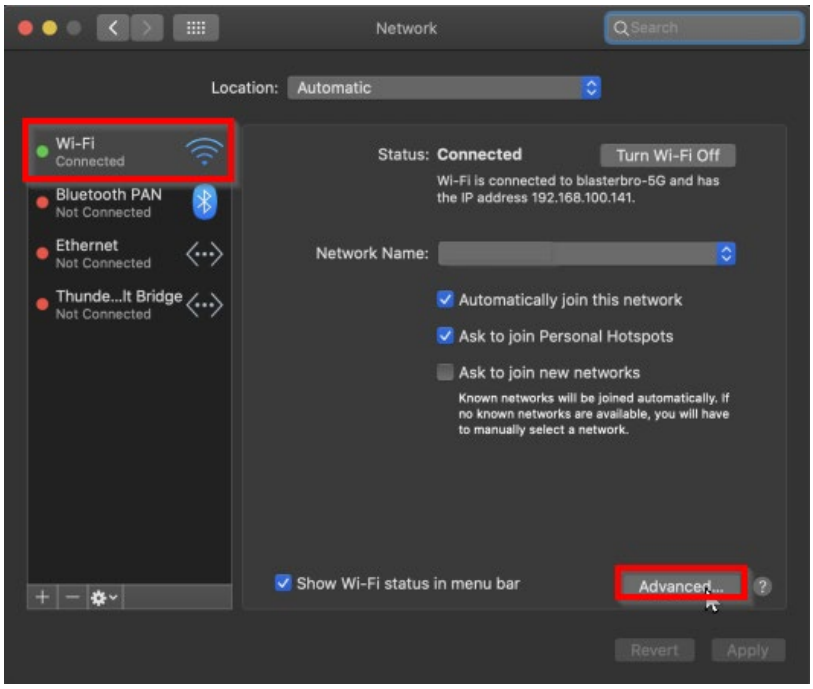


Figure 4



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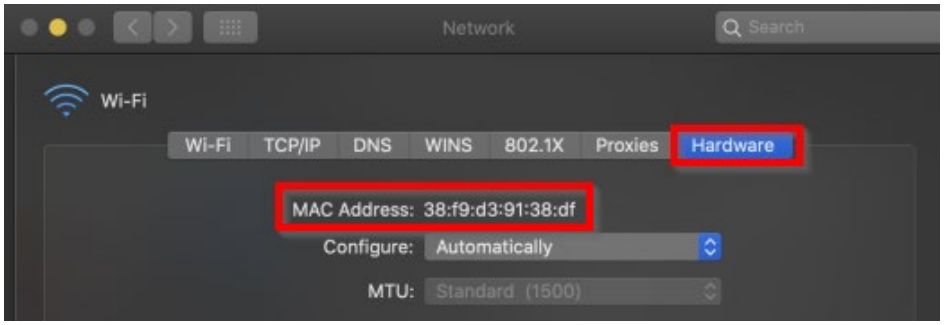

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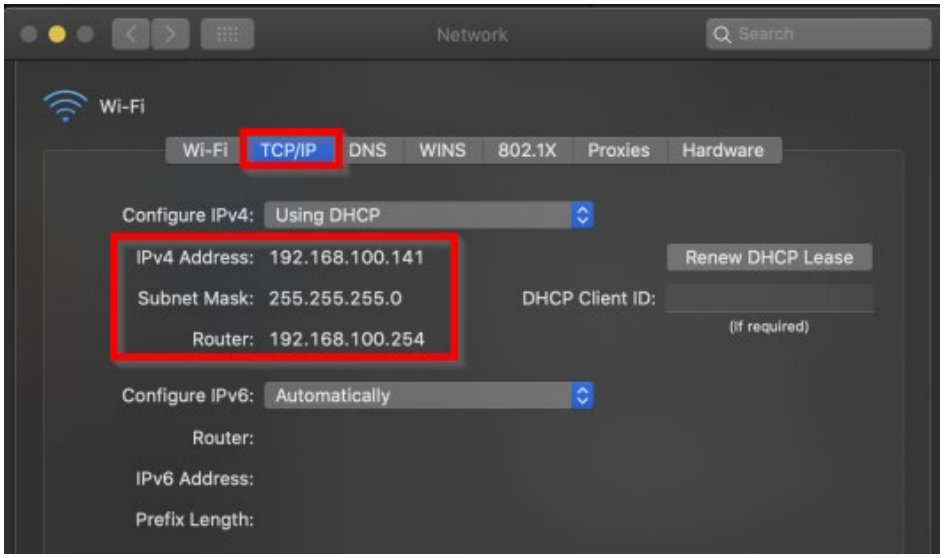
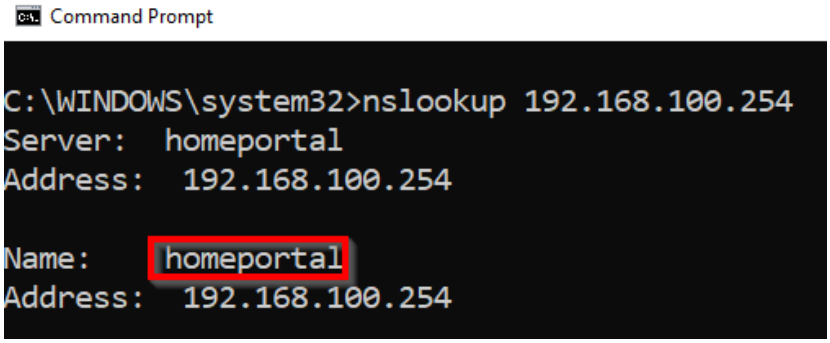


Figure 7



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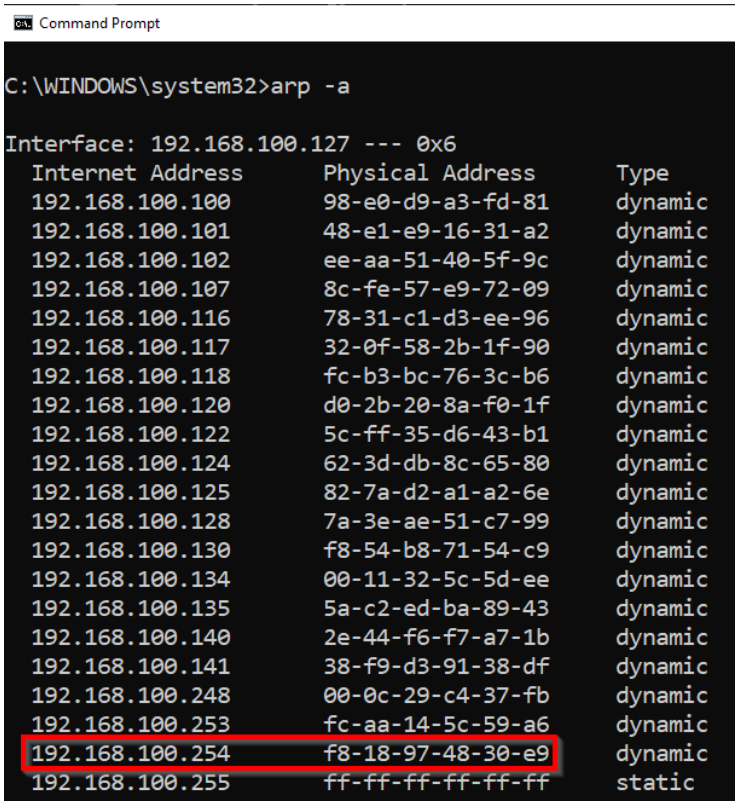


Figure 9

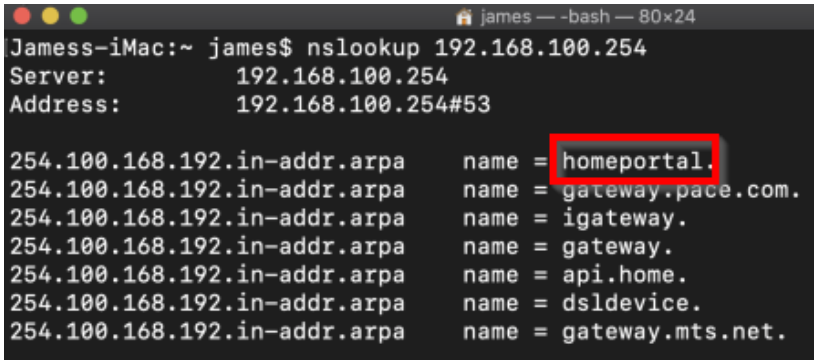


Figure 10

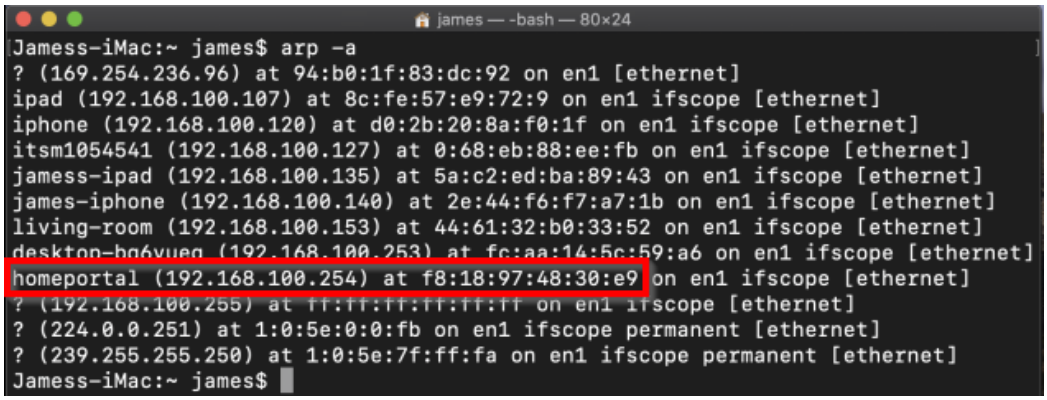
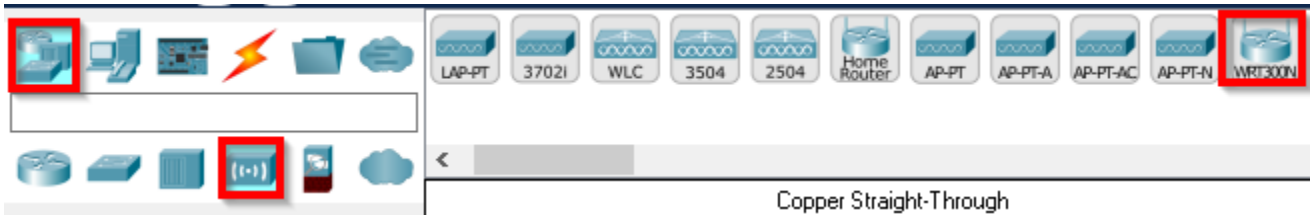


Figure 11

Figure 12



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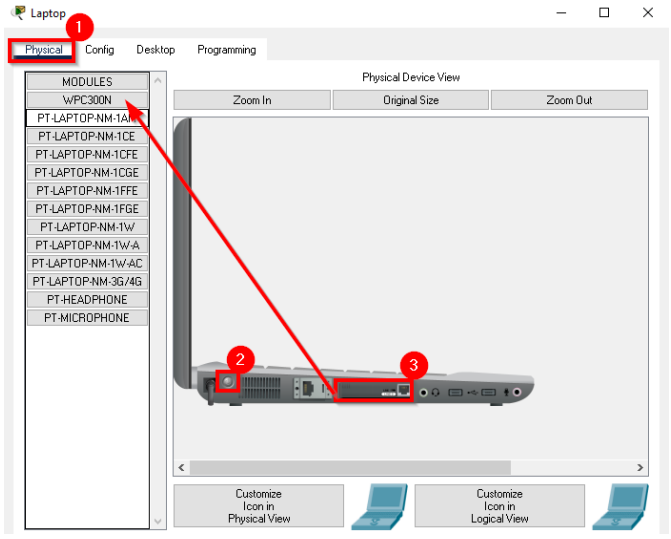

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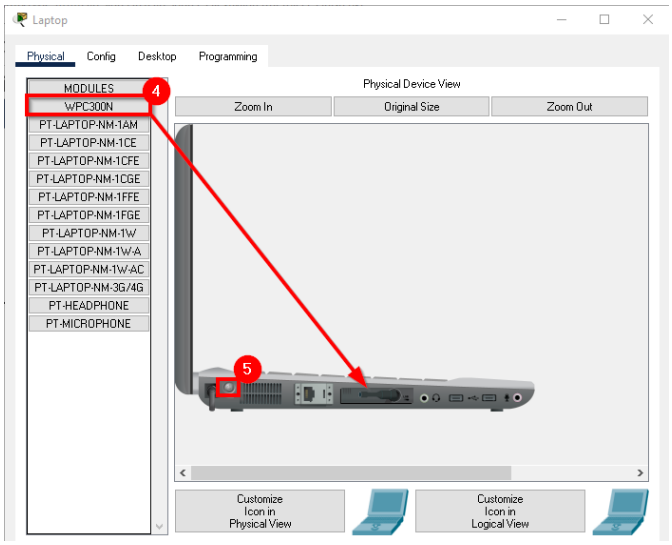

Figure 15

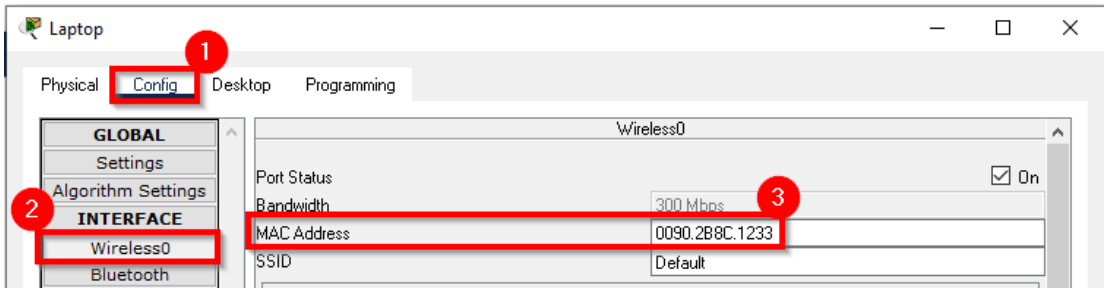

Figure 16

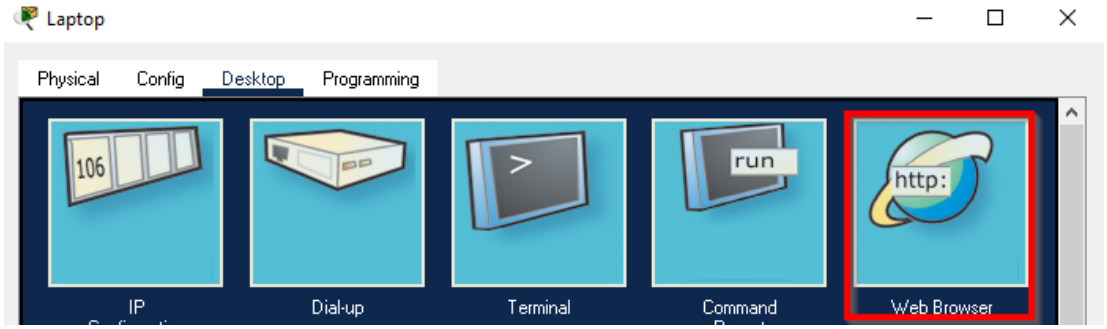

Figure 17

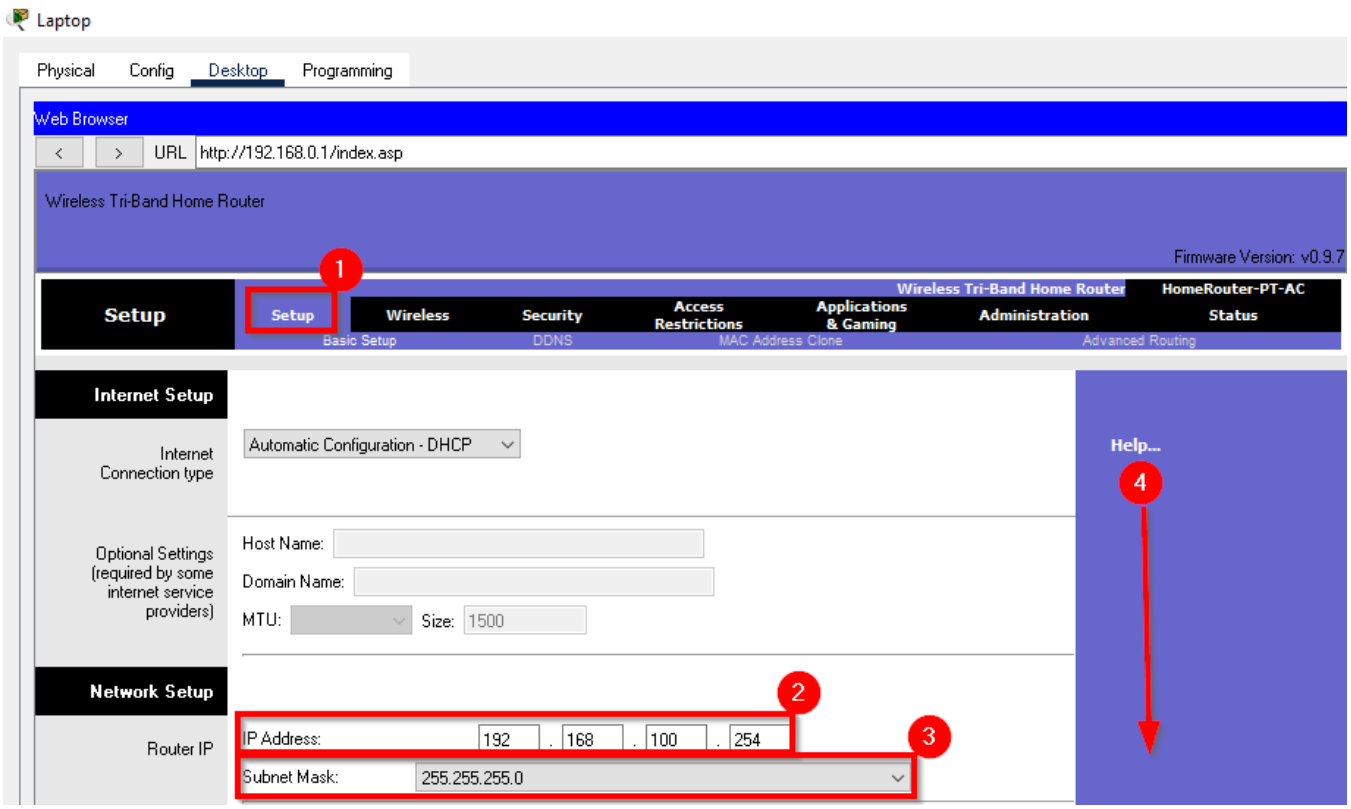

Figure 18

Figure 19

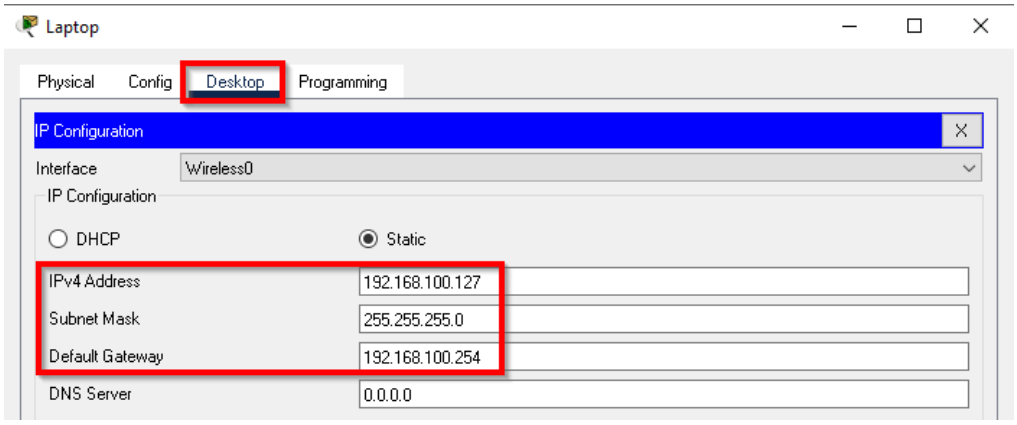

Figure 20