Lab 2: Build and test a Wired (Ethernet) Network

Marks: 10

Note: Lab Tasks (Task 0) begins in the next page.

Things that you will need to know or learn:

- The correct cable type for connecting network devices (pre-lab cable document).
- Identification and purpose of the Linksys E2500: 4 Ethernet ports, 1 Internet port , power buttons (two), power light, Ethernet port lights, and Internet port light (pre-lab, lecture- Linksys-document).
- How to create an **Ethernet (**wired) network with the Linksys Router (in-lab-Linksys-cables).
- Describe the network components (switch, router) (from lecture).
- What a valid IPv4 address, subnet mask, and default gateway look like (from lectures and pre-lab)
- How to determine your IPv4 address and subnet masks using **ipconfig** (from lectures and pre-lab)
- How to verify basic network connectivity using **ping** (from lectures and in-lab)
- Using the command prompt window
- How to use **Wireshark** to see actual network traffic (pre-lab Wireshark- document)

What you need to submit and when:

Demo your lab 2 in class and answer some questions to your lab instructor.

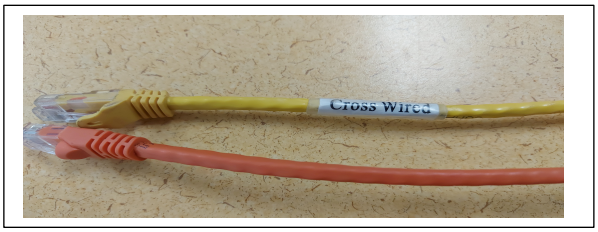
Required Equipment/Software:

- For laptops without an RJ45 port: RJ45 adapter to USB
- Network cables,RJ45 cross-over and straight-through, Linksys (E2500) router
- Wireshark is installed and working
- Pre-lab documents (references and resources

pre- lab Documents-HowToIP_Win-Wireshark-Linksys-cables-ICMP-doc.docx

Note: Cross over: orange and yellow cables
Straight through blue, red, gray, pink, green

Cable Types

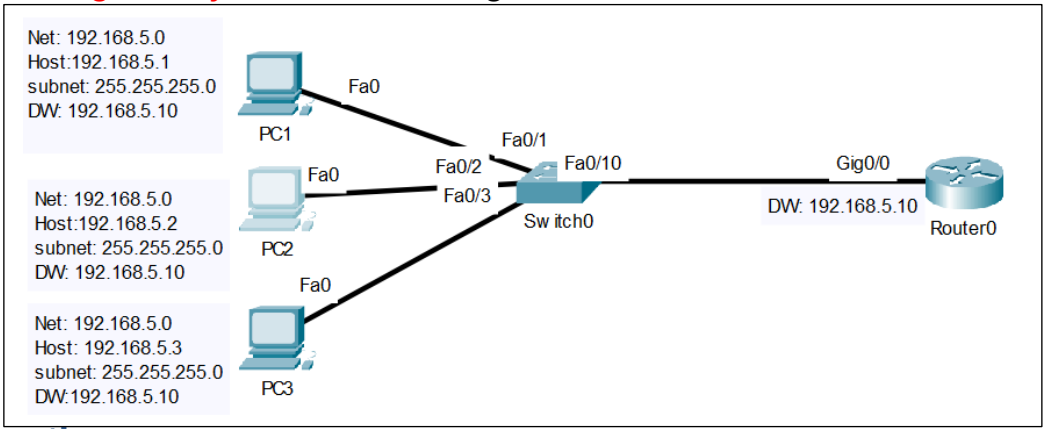


- You will be using 2 types of cables: straight-through and crossover
- A straight-through cable is used for connecting **different** types of devices (e.g., PC to switch, PC to hub, router to switch)
- A Cross-over cable connects "like" devices (PC to PC, PC to router, server to router, router to router, switch to switch, switch to Hub, hub to hub.

What is an IP address? a unique number assigned to a device on the network (Host)

What is a subnet mask? a number to separate the network ID from the host ID.

What is the default gateway: a number assigned to the router interface with the local LAN.



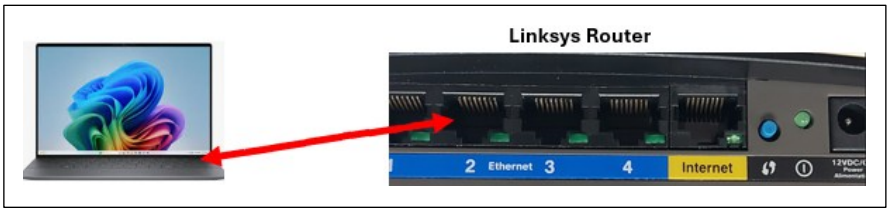
Task 0: Preparation

1-**Disable** all Network interfaces, Wireless (**WIFI**), VMware (Virtual machine), **antivirus**, and **Windows firewall defender** on your laptop computer. Your only connection to the network must be via the **Ethernet wired** interface.

2- Do not start until you have completed ALL steps in this task.

Task 1: Build a Network with Linksys Router (Dynamic IP address)

In this task, you will build and test a network of two physical devices: **your laptop (end device)** and a **Linksys router (DHCP-intermediary device)**. This is the network topology on which we will build in subsequent labs.



1. **Do not** start Task 1 until you have completed all Task 0 steps.
2. Obtain a Linksys router, power adapter, and straight-through and crossover cables.
3. Power **on** your **Linksys** router and wait until the router's **green** power indicator LED is **on** steadily before proceeding to the next step. Note that during boot-up, router reset, and firmware upgrades, the power indicator light flashes slowly**.** Consult the Reference documentation (Linksys doc) for an explanation of the meaning of other power indicator states.
4. **Reset** the router back to the Factory default. (Use a pen or a pencil to press on the the **reset** hole on the bottom of the router for a few seconds) If done correctly, all port lights (**green**) should together light up and then turn off. **How to obtain a Dynamic IP address from a Linksys router?**
5. Ensure your **Laptop's Ethernet** network adapter (wired) is configured to **obtain its IPv4 address automatically** via Dynamic Host Configuration

Protocol (read: reference doc. How to IP in Windows 11)

6. Using the correct cable, connect your laptop's **Ethernet (RJ45)** port to any of the Linksys router's **Ethernet (Switch) ports**. (LAN 1,2,3,4).

What is the correct cable type to connect your laptop to the Ethernet port? Answer in the answer sheet.

Your laptop will attempt to obtain an IPv4 address from your Linksys router (DHCP). Please **be patient,** as this process may take up to **60** seconds.

7. Ensure that the **green** light corresponding to the Linksys's Ethernet port you connected to is **flashing.** This is an indication that there is network activity on the port.
8. Use the Command Prompt window and type the correct command to obtain the following information:
IPv4 address, Subnet Mask, Default Gateway
Answer in the answer sheet.

NOTE:

The IPv4 address that should be assigned to your laptop, Ethernet Network adapter is of the form **192.168.1.X** (where **X** is greater than 1). Any other IP address, like **169.16.X.X** (**Link Local),** is an indication of a problem or wrong IP address.

9. Using the Command Prompt, use the correct command to check connectivity to the **default gateway**.
You have used this command in **Lab 1**. Make sure you have 4 TTLs (0% loss).
Copy and paste the command and output to your answer sheet.

Task 2: Configure Laptop with IPv4 (Static Address)

In this task, you will manually assign a **static** IP address to your laptop and ping your default gateway again.

1. Refer to the included Pre-Lab 2 documentation to configure the following **static IP address** to your laptop:

IPv4 address: 192.168.1.**X**, where **X** is **10 times** the router Ethernet port 1,2,3,4 number your laptop is connected to.
Subnet mask: 255.255.255.0

Default Gateway: Enter the value noted from **Task 1.**

2. What command do you use to verify that the IP address assigned in the previous step has been successfully assigned to your Ethernet (wired) adapter? What is the IP address it reports? **answer in your answer sheet.**

3. **What command** do you use to confirm that your laptop is connected to the default gateway? **answer in your answer sheet.**

4. **IMPORTANT:** Set your computer to again obtain an IP address automatically.

5. At this point we are done using the Linksys router.
Carefully pack and return the router and router power supply, **KEEP** the cables.

Task 3: Configure Laptop with Dynamic Address - Red plug or server

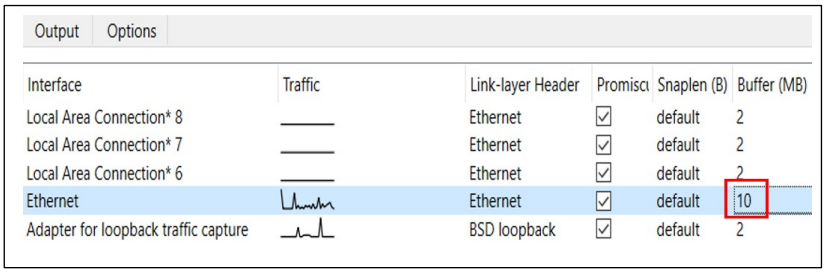
Connect your laptop to the **RED** port on your desk. Your PC should get an IP address **automatically** from a remote server.

Note: your laptop should have an IP address starting with **172.16.X.X.** Any other number like **169.16.X.X (Link-Local)** you are getting is the wrong IP address and needs troubleshooting. (**Reset** your laptop if it is needed)

1. **What command** do you use to verify that your laptop obtained an IP address automatically? **answer in your answer sheet.**
2. **What command** do you use to confirm that your laptop is connected to the network? **answer in your answer sheet.**

Task 4: Use Wireshark to capture network traffic

1. Prepare Wireshark to capture network traffic on your **Ethernet** adapter:
2. Open Wireshark (**run as administrator**)
   A. From Wireshark's menu, click **Capture** –> **Options**.
   B. From the **Capture Options** window, highlight and select the **Ethernet** adapter (NIC). BE SURE TO SELECT THE CORRECT ADAPTER!
   C. Choose the entry of your **Ethernet** adapter, check the Number under **Buffer,** and increase it to **10.**



(Double-click on the number to change it.) This change will ensure the capture buffer is large enough not to discard the packets of interest

should there be a lot of traffic on the wire.

D. Click **Start** (on the Capture Options window) to begin capturing network traffic on the WS. (**Don't** stop the WS)

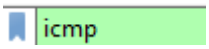
3. Ping the **default gateway (172.16.X.X)**. You should see **4 echoes and 4 replies** (TTL: Time To Live) in CMD. **Stop** the Wireshark capture now.

```
C:\WINDOWS\system32>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time=2ms TTL=64
Reply from 192.168.1.1: bytes=32 time=3ms TTL=64
Reply from 192.168.1.1: bytes=32 time=3ms TTL=64
Reply from 192.168.1.1: bytes=32 time=2ms TTL=64

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms
```

In **WS**, you should see 4 echo **requests** and 4 echo **replies**

A. Examine captured traffic in WS, noting the three panes, each one with increasing amounts of detail. In Wireshark's top pane, you should count at least **eight** lines that have ICMP in the **protocol** column. Refer to the Pre-lab documentation to learn of this protocol.

B. **Think**: Was any other traffic captured by Wireshark?

C. You can **filter** specific "**packets**" in your WS. Type "ICMP" in the **filter box** () and press **Enter** to view just your "**ping**" traffic.

D. Examine the ping message that were sent from your computer to the default gateway. **Think**: What type of messages are these? (See the "info" column and refer to the Pre-Lab reference document)

E. Examine the ping message that were sent from as a response from the default gateway. **Think**: What type of messages are these? (See the "info" column and refer to the Pre-Lab reference document)

F. **Save** the Wireshark capture for grading. Name it ***Lab2-Task4*.pcapng** (The file extension for Wireshark captures)

Clean up and Submission

3.1 Re-enable your firewall, Wireless Network and confirm you can access the College.

3.2 Carefully pack and return the cables

3.3 **Demo your lab 2 in class. Upload the answer sheet and wireshark capture to Brightspace.**

3.4 **Make sure to complete the post-lab 2 quiz by the deadline**