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

Things that you will need to know or learn:

- The correct type of cabling to use when connecting network devices (from pre-lab).
- Identification and purpose of the Linksys E2500 Ethernet ports, Internet port, power port, buttons (two), power light, Ethernet port lights and Internet port light (from pre-lab, lecture).
- How to determine if the Linksys router is powered up and functioning correctly (from lecture and in-Lab).
- How to create an Ethernet (wired) network with the Linksys Router (from in-lab).
- Describe the network components (switch, router) (from lecture).
- What a valid IPv4 address looks like; what a valid subnet mask looks like (from lectures and pre-lab)
- How to determine your IPv4 address and subnet masks using ipconfig (from lectures and pre-lab)
- How to determine your Default Gateway address (from lectures and pre-lab)
- How to verify basic network connectivity using ping (from lectures and in-lab)
- How to copy text from the command line window (aka DOS box)
- How to use the windows "Snipping Tool" to screen capture and highlight/annotate (From lecture)
- How to use Wireshark to see actual network traffic (from in-lab)

What you need to submit and when:

- Complete the in-lab part of the lab including Instructor Signoffs before the end of your lab period.
- Complete the "Lab 2 Post-lab" before the end of Sunday (Sep.23)

Required Equipment/Software:

- Network cables from the instructor
- Linksys router from the instructor
- Wireshark installed and working (done in Lab 01)
- Lab documents downloaded to your laptop

References and Resources:

- How to IP in Windows (on Blackboard in Labs/ Lab 02)
- How to Wireshark (on Blackboard in Labs/ Lab 02)
- How to Cable (on Blackboard in Labs/ Lab 02)
- Linksys E2500 (on Blackboard in Labs/ Lab 02)
- http://www.linksys.com/ca/support-article?articleNum=142360

Cable Types

- You will be using 2 types of cables; straight through and crossover.
- A straight through cable is used for connecting different (electrically) types of devices (e.g. PC to switch, router to switch)
- A crossover cable is used for connecting "like" devices (e.g. PC to PC, PC to router, router to router, switch to switch)

- A rollover cable (not within the scope of this course) is a Cisco proprietary cable that is used to connect from a serial port.

Task 0: Preparation

0.1 You must view the "Getting Started with Lab2" video and read the Lab References prior to beginning the activities described in this document.

0.2 Confirm you have downloaded the following from BB "Labs - > Lab 02" to your computer:

- 0.2.1 Lab 02 – In-Lab Activies.pdf (this document)
- 0.2.2 Resource files
  - 0.2.2.1 HowToIP_Win7.pdf
  - 0.2.2.2 HowToWireShark.pdf
  - 0.2.2.3 Cables.pdf
  - 0.2.2.4 ICMP.pdf
  - 0.2.2.5 Linksys E2500
  - 0.2.2.6 http://www.linksys.com/ca/support-article?articleNum=142360

0.3 Disable the Wireless Network Interface of your Laptop computer. Your only connection to the network connection must be via the Ethernet (wired) interface.

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

Task 1: Build Network with Linksys Router

In this task you will build and test a network which consists of two physical devices: your laptop and a Linksys router. This is the network topology on which we will build upon in subsequent labs.

1. Do not start task 1 until you have completed all Task 0 steps.
2. Obtain a Linksys router, power adapter, power adapter, straight through and crossover cables from your instructor.
3. Power on your Linksys router and wait for 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 for an explanation of meaning of other power indicator states.
4. Reset the router back to factory defaults.
5. Ensure your Laptop's Ethernet network adapter is configured to obtain its IPv4 address automatically via Dynamic Host Configuration Protocol (DHCP). (Ref: "How to IP in Windows 7")
6. Using the correct cable connect your laptop's Ethernet network adapter to any of your Linksys router's switches' Ethernet ports. Your laptop will attempt to obtain an IPv4 address from your Linksys's DHCP server. Please be patient as this process may take up to 60 seconds.
   What is the correct cable type to connect your laptop to the router's switches' Ethernet port?
   _____
7. Ensure that the green light corresponding to the Linksys's Ethernet port you connected into is flashing. This is an indication that there is network activity on the particular port.

8. At the windows command prompt, type **ipconfig.** Locate in the ipconfig output and note in the space below, the IPv4 address and subnet mask that has been assigned to your Ethernet network adapter by the Linksys's DHCP server.

   IPv4 address: _____._____._____._____
   Subnet Mask: _____._____._____._____

   NOTE:

   1. The IPv4 address that should be assigned to your Ethernet Network adapter is of the form: 192.168.1.x.
   2. The assignment of any other IPv4 address is an indication of a problem including a misconfiguration. For example, the assignment of the address 169.x.y.z indicates a failure of the process to obtain an IPv4 address via DHCP. The exact cause needs to be investigated.

9. Locate in the ipconfig output and note in the space below, the Default Gateway address:
   Default Gateway: _____._____._____._____

10. You will verify basic connectivity (layer 3) to your network (layer 3) by ensuring you can successfully ping your network's default gateway address. At the windows command prompt, type the following command:

    ping a.b.c.d

    where a.b.c.d is the default gateway address you noted in 1.8.

    A successful ping will look similar to this:

    Pinging 192.168.1.25 with 32 bytes of data:

    Reply from 192.168.1.25: bytes=32 time<1ms TTL=255
    Reply from 192.168.1.25: bytes=32 time<1ms TTL=255
    Reply from 192.168.1.25: bytes=32 time<1ms TTL=255
    Reply from 192.168.1.25: bytes=32 time<1ms TTL=255

    Ping statistics for 192.168.15.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 9ms, Average = 5ms

11. Instructor Signoff_____

Task 2: Configure Laptop with IPv4 Static Address

In this task you will modify the network configuration of the task 1 network by manually assigning an IP address (static address) to your laptop and confirming your laptop is still connected to the network.

1. With the help of "How to IP in Windows 7" document, assign the following IPV4 address to your Ethernet (wired) network adapter:

   IPV4 address: 192.168.1.20x where x is the switch's Ethernet port 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 step 3.1 has been successfully assigned to your Ethernet (wired) adapter? _____

3. What command do you use to confirm that your laptop is connected to the network?
   _____

4. Show your instructor the output from the 2 commands and explain what it means.

Instructor Signoff_____

Task 3: Configure Laptop with Dynamic Address (Red Network)

In this task you will modify your laptop's Ethernet network adapter's configuration to automatically obtain an IPv4 address via DHCP. You will connect you laptop to the Internal Lab Network

1. Turn off your Linksys Router, unplug all cables and return the router to the Instructor
2. Plug your Laptop into the "Red" network jack located on the desk
3. With the help of "How to IP in Windows 7" document, configure your Ethernet network adapter to obtain an IPv4 via the Linksys's DHCP server.
4. What command do you use to verify that the IP address assigned in step 3.1 has been successfully assigned to your Ethernet adapter?_____

5. What command do you use to confirm that your laptop is connected to the network?
   _____

6. Show your instructor the output from the 2 commands and explain what it means.

Instructor Signoff_____

Task 4: Use Wireshark to capture network traffic

1. Prepare Wireshark to capture network traffic on your Ethernet adapter:
2. Open Wireshark (run as administer)
    A. From Wireshark's menu, click Capture –> Options
    B. From the Capture Options window, highlight and select the Ethernet adapter with the correct IP address. BE SURE TO SELECT THE CORRECT ADAPTER!
    C. Choose the entry of your Ethernet adapter and change the value of the Buffer size to 10. This change will ensure the capture buffer is large enough as to not discard the packets of interest should there be a lot of traffic on the wire.
    D. Click Start (on Capture Options window) to begin capturing network traffic.

3. Ping your default gateway, and stop the capture when the ping successfully completes. A successful ping consists of four echo requests and four echo reply.
    A. Examine captured traffic, noting the three windows, 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.
    B. What other traffic, if any, was captured by Wireshark?
    C. You can filter specific "packets" in your Wireshark. Type "**icmp**" in the filter box and click *apply* to view just your "ping" traffic. Click *clear* after examining the results as simply erasing the field content with the erase or delete keys will NOT clear the filter. Using filters in Wireshark can help you find packets of interest.
    D. What type of ping message is sent from your laptop to the default gateway? The source IP address will be the address of your laptop and the destination IP address will be the address of the gateway.
    E. What type of ping message is sent by the default gateway in reply to your laptop's ping? This time the source Ip address will be the gateway's address.
    F. Save the Wireshark capture for later examination in class. Save to a file named: ***wireshark-task4***.
7. Show your instructor the Wireshark output and explain what it means.

Instructor Signoff_____

Task 5: Clean up and Submission

5.1 Re-enable your Wireless Network and confirm you are able to access the College network.

5.2 Return the borrowed equipment and cables to your instructor.