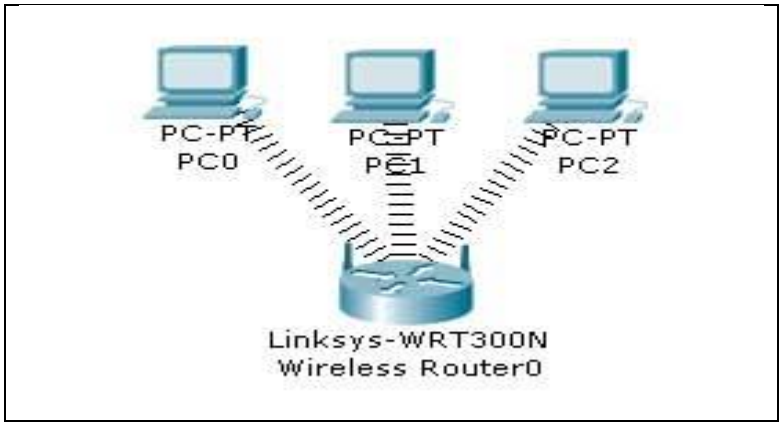
NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCE
Computer Network Lab (CL-307)
Lab Session 09

Wireless Network



In this topology we have three pc connected with Linksys Wireless routers.

- **DHCP is configured and enabled on Wireless router**
- **IP pool for DHCP is 192.168.0.100 to 192.168.0.150**
- **PC are configured to receive IP from DHCP Server**
- **No security is configured**
- **Default SSID is configured to Default**
- **Topology is working on infrastructure mode**
- **Default user name and password is admin**
- **IP of wireless is set to 192.168.0.1**

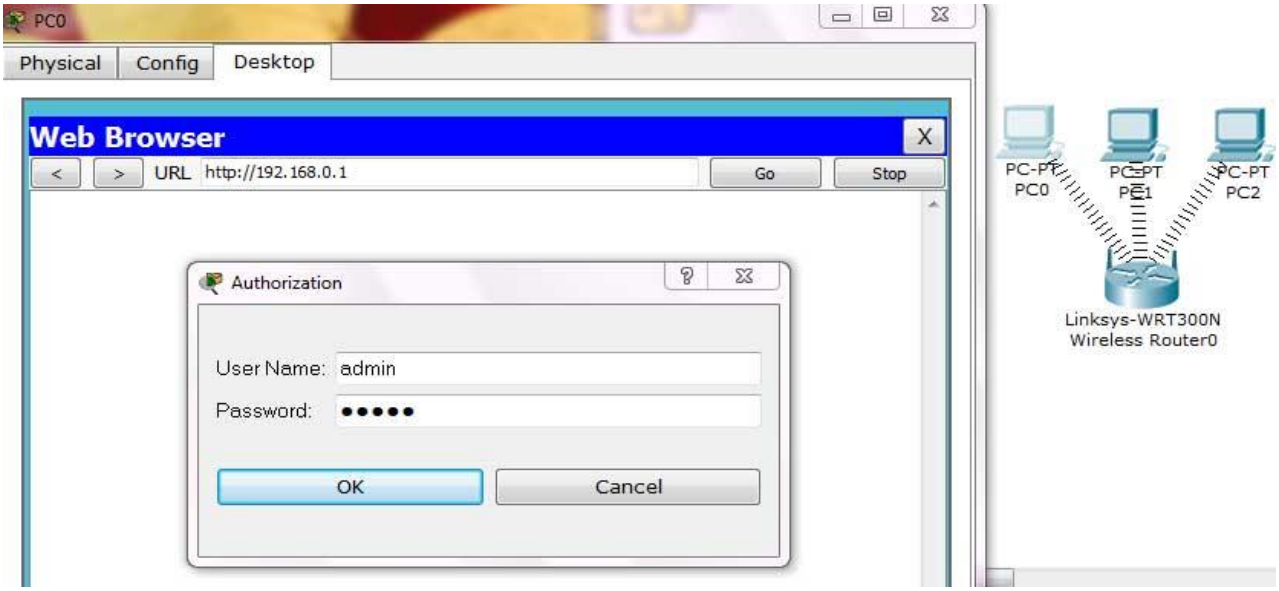
Now your task is to:-

- **Configure Static IP on PC and Wireless Router**
- **Change SSID to Mother Network**
- **Change IP address of router to 10.0.0.1 and 10.0.0.2 of PC0 10.0.0.3 of PC1 10.0.0.4 of PC2**
- **Secure your network by configuring WAP key on Router**
- **Connect PC by using WAP key**

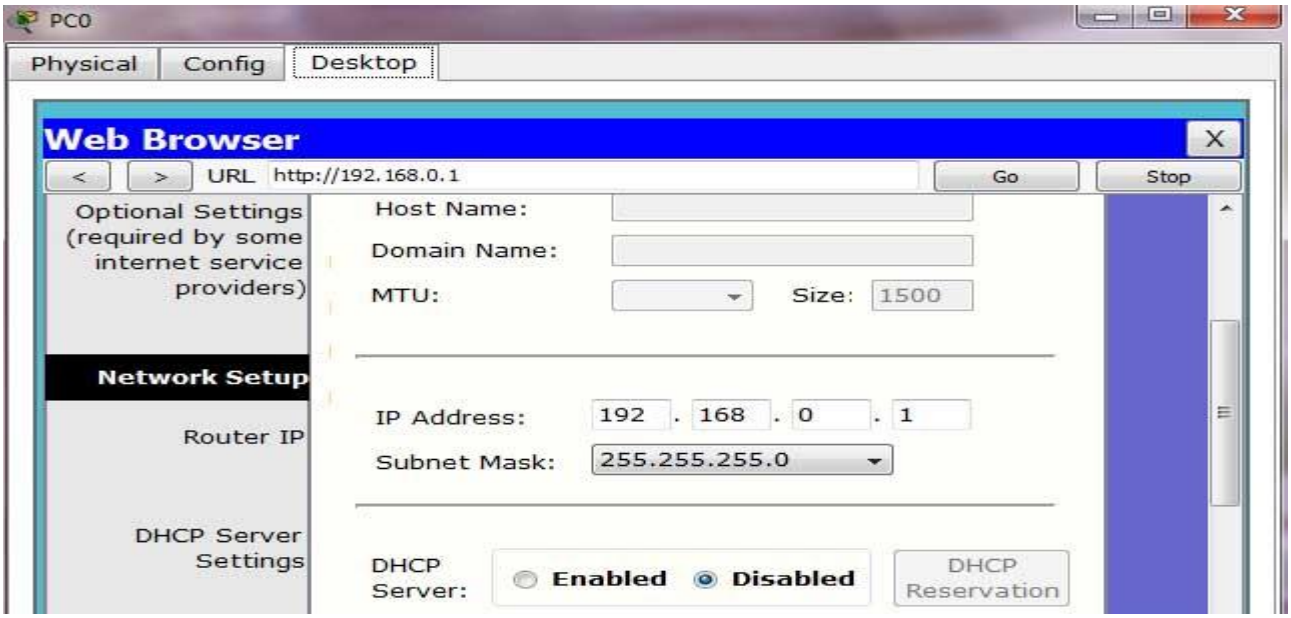
To complete these tasks follow this step by step guide of how to configure wireless network

As given in question our network is running on 192.168.0.0 network and all PC's are DHCP clients and functioning properly. So we will first connect to Wireless router to off DHCP.

Double click on PC and select Web Browser. As given in question IP of Wireless router is 192.168.0.1 so give it in Web browser and press enter, now it will ask for authentication which is also given in question. Give user name admin and Password to admin

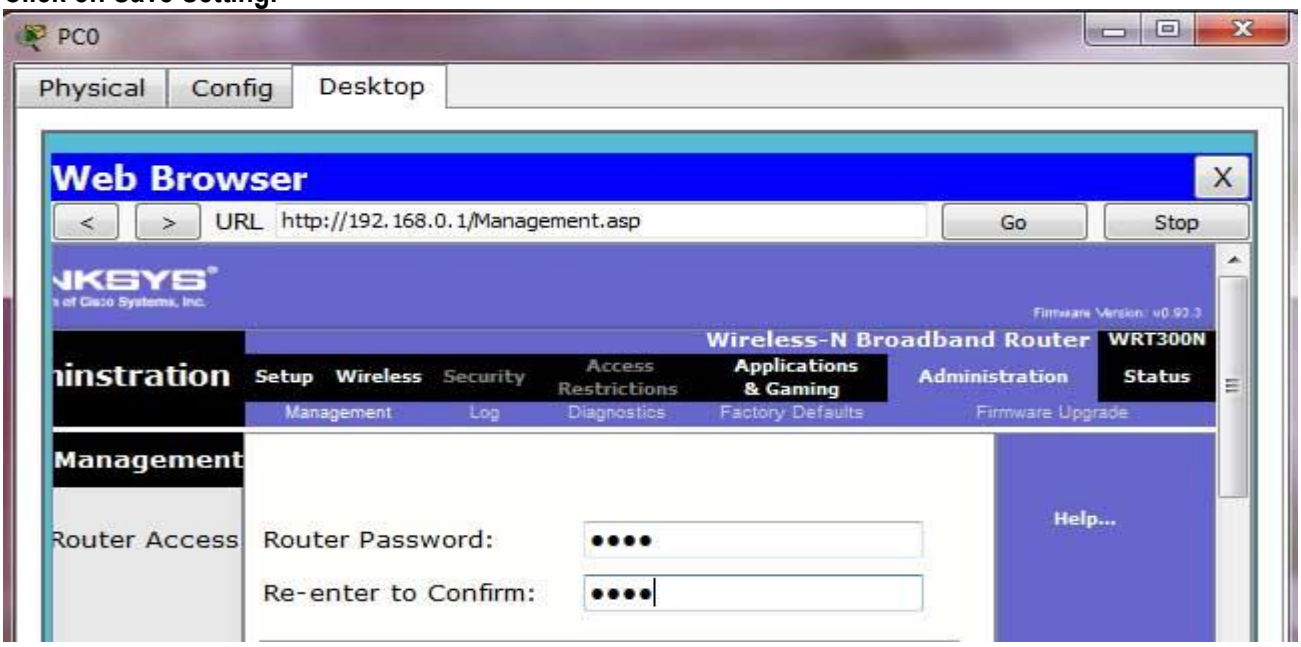


This will bring GUI mode of Wireless router. Scroll down screen to Network Step and Select Disable DHCP

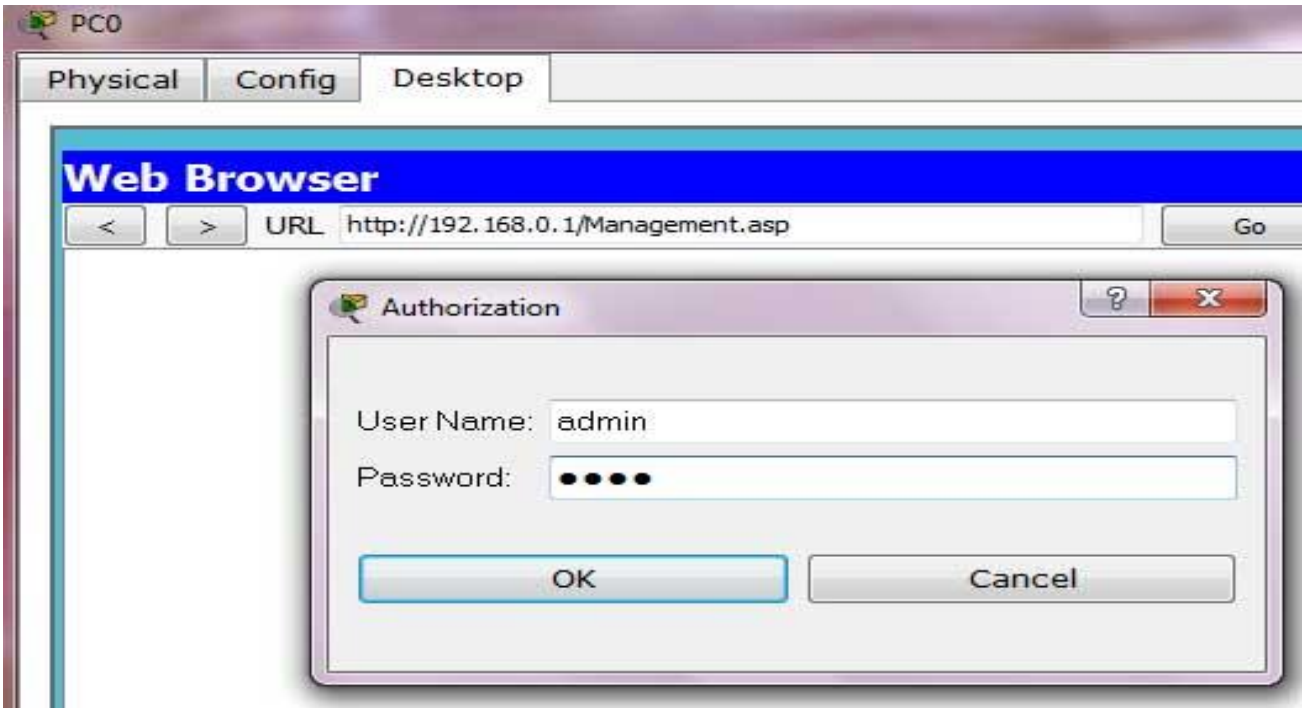


Go in end of page and click on save setting this will save setting click on continue for further setting

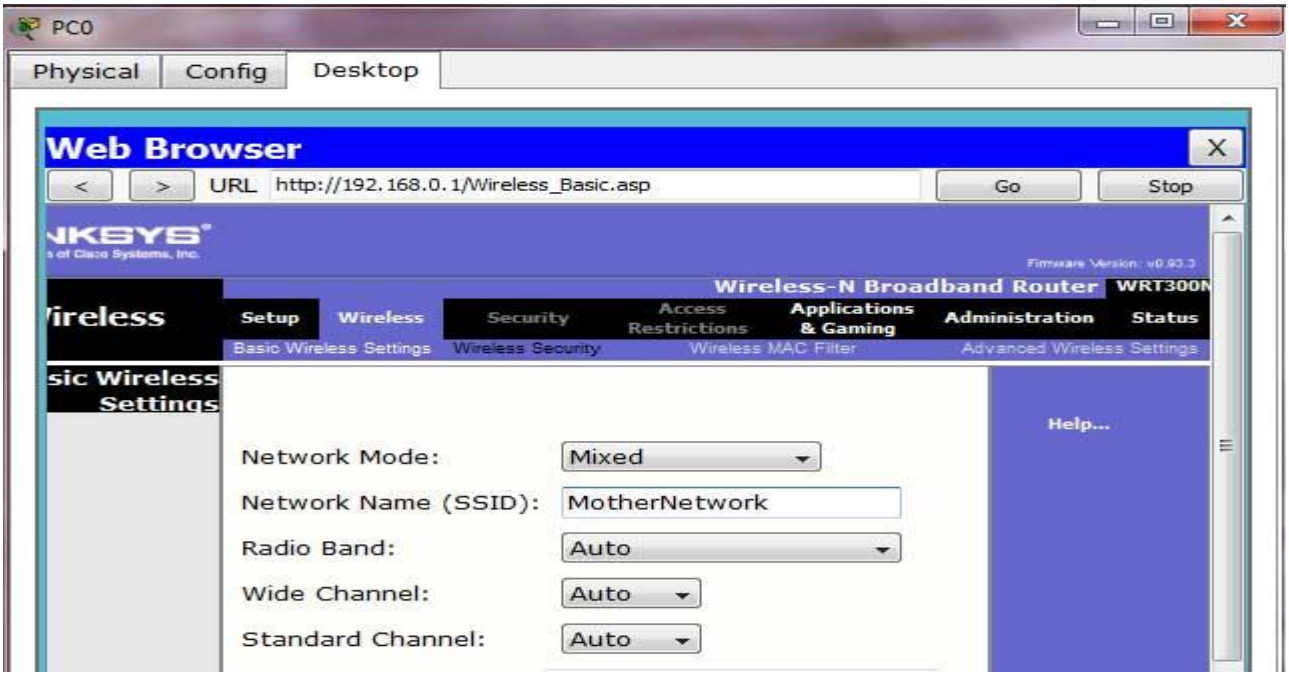
Now select Administration from top Manu and change password to test and go in the end of page and Click on Save Setting.



Click on continue for further setting. This time it will ask you to authenticate again give new password test this time



Now click on wireless tab and set default SSID to MotherNetwork



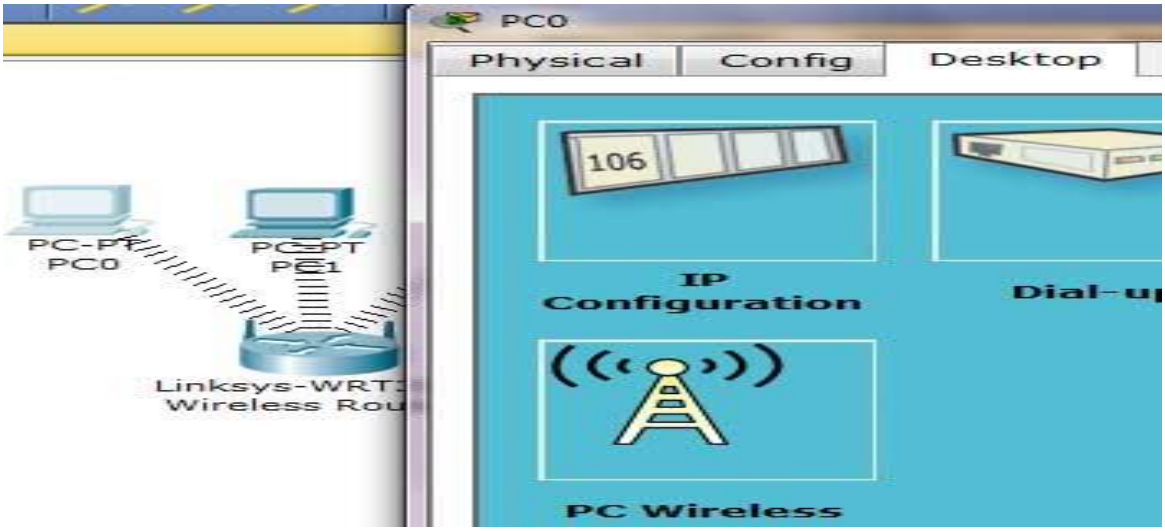
Now Select wireless security and change Security Mode to WEP

Set Key1 to 0123456789

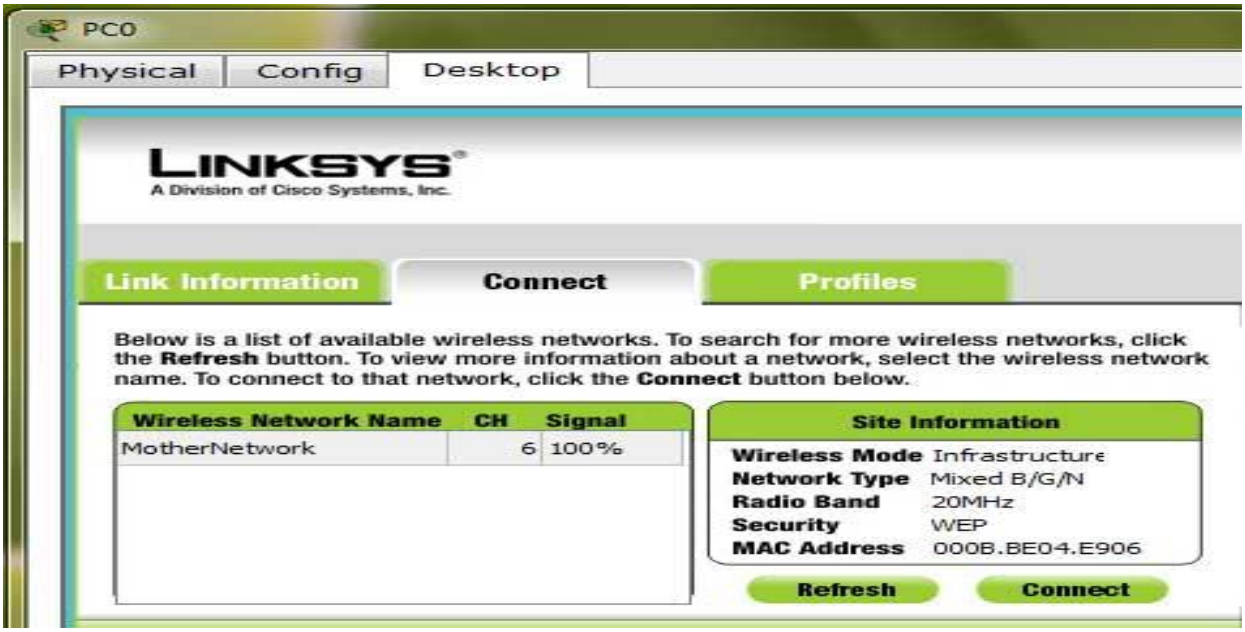
Again go in the end of page and Click on Save Setting
Now we have completed all given task on Wireless router. Now configure the static IP on all three PC's Double click on pc select Desktop tab click on IP configuration select Static IP and set IP as given below.

PC	IP	Subnet Mask	Default Gateway
PC0	192.168.0.2	255.255.255.0	192.168.0.1
PC1	192.168.0.3	255.255.255.0	192.168.0.1
PC2	192.168.0.4	255.255.255.0	192.168.0.1

Now it's time to connect PC's from Wireless router. To do so click PC select Desktop click on PC Wireless

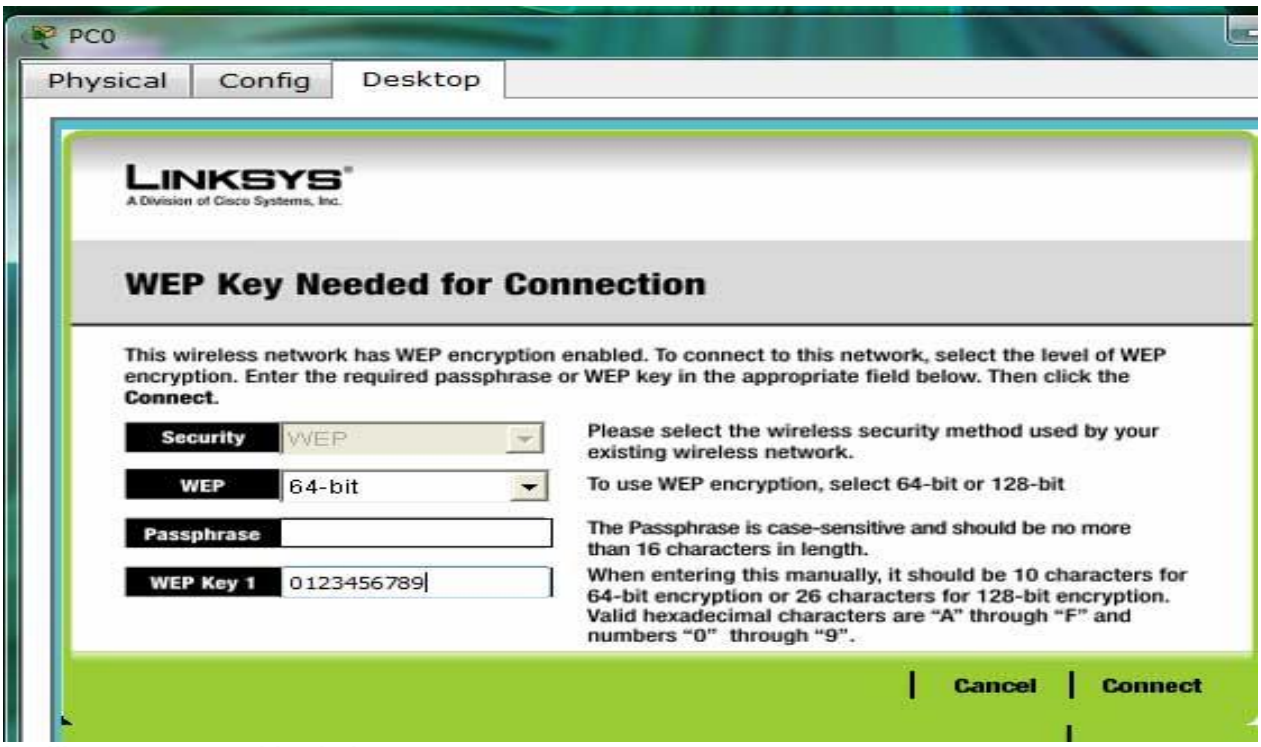


Click on connect tab and click on Refresh button



As you can see in image that Wireless device is accessing MotherNetwork on CH 6 and signal strength is 100%. In left side you can see that WEP security is configured in network. Click on connect button to connect MotherNetwork

It will ask for WAP key insert 0123456789 and click connect



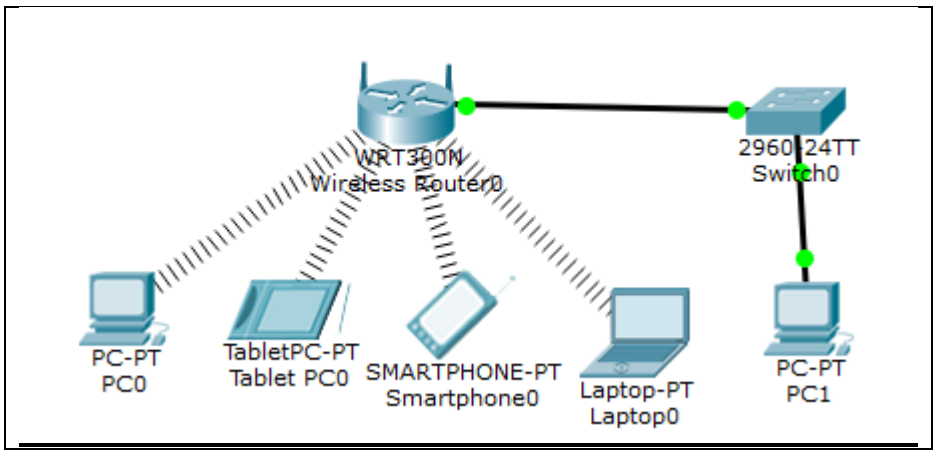
It will connect you with wireless router.

As you can see in image below that system is connected. And PCI card is active.

Repeat same process on PC1 and PC2.

Exercise:

Simulate the below topology.



Wireshark Lab: TCP & UDP

Transmission Control Protocol:

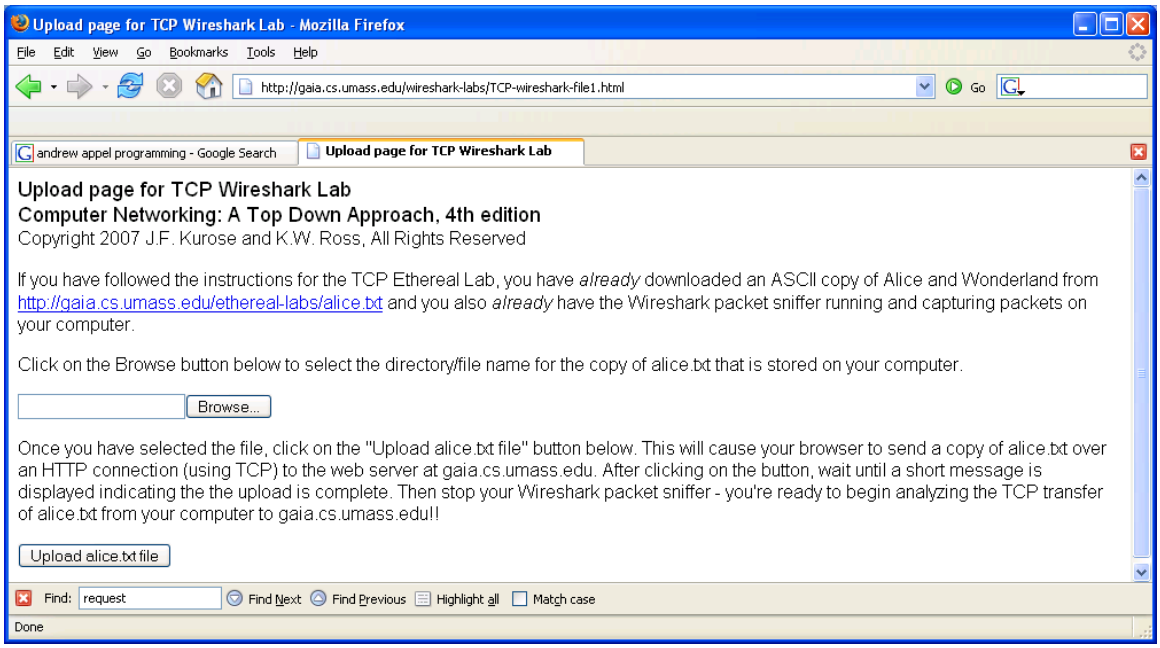
In this lab, we'll investigate the behavior of the celebrated TCP protocol in detail. We'll do so by analyzing a trace of the TCP segments sent and received in transferring a 150KB file (containing the text of Lewis Carrol's *Alice's Adventures in Wonderland*) from your computer to a remote server. We'll study

1. Capturing a bulk TCP transfer from your computer to a remote server

Before beginning our exploration of TCP, we'll need to use Wireshark to obtain a packet trace of the TCP transfer of a file from your computer to a remote server. You'll do so by accessing a Web page that will allow you to enter the name of a file stored on your computer (which contains the ASCII text of *Alice in Wonderland*), and then transfer the file to a Web server using the HTTP POST method (see section 2.2.3 in the text). We're using the POST method rather than the GET method as we'd like to transfer a large amount of data *from* your computer to another computer. Of course, we'll be running Wireshark during this time to obtain the trace of the TCP segments sent and received from your computer.

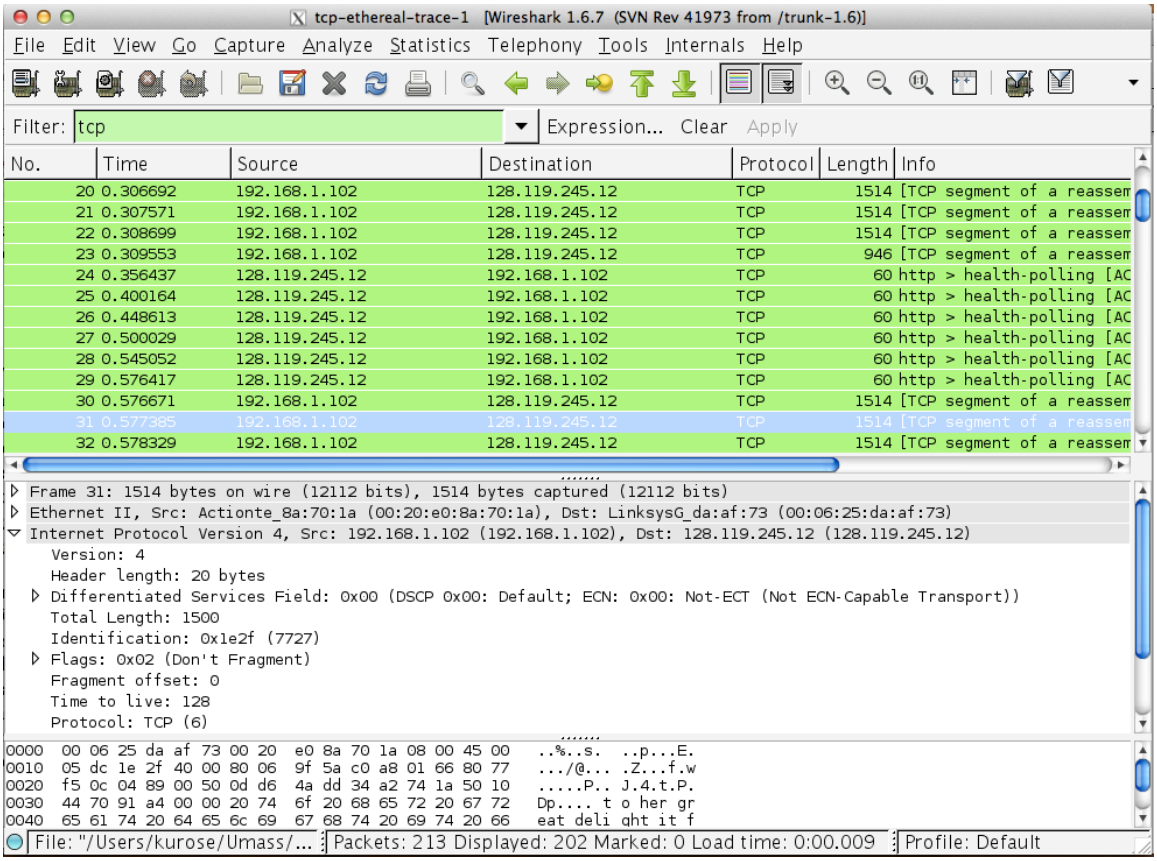
Do the following:

- **Start up your web browser. Go the http://gaia.cs.umass.edu/wireshark-labs/alice.txt and retrieve an ASCII copy of *Alice in Wonderland.* Store this file somewhere on your computer.**
- **Next go to http://gaia.cs.umass.edu/wireshark-labs/TCP-wireshark-file1.html.**
- **You should see a screen that looks like:**



- **Use the *Browse* button in this form to enter the name of the file (full path name) on your computer containing *Alice in Wonderland* (or do so manually). Don't yet press the "*Upload alice.txt file*" button.**
- **Now start up Wireshark and begin packet capture *(Capture->Start)* and then press *OK* on the Wireshark Packet Capture Options screen (we'll not need to select any options here).**
- **Returning to your browser, press the "*Upload alice.txt file*" button to upload the file to the gaia.cs.umass.edu server. Once the file has been uploaded, a short congratulations message will be displayed in your browser window.**

- **Stop Wireshark packet capture. Your Wireshark window should look similar to the window shown below.**



If you are unable to run Wireshark on a live network connection, you can download a packet trace file that was captured while following the steps above on one of the author's computers. You may well find it valuable to download this trace even if you've captured your own trace and use it, as well as your own trace, when you explore the questions below.

2. A first look at the captured trace

Before analyzing the behavior of the TCP connection in detail, let's take a high level view of the trace.

- **First, filter the packets displayed in the Wireshark window by entering "tcp" (lowercase, no quotes, and don't forget to press return after entering!) into the display filter specification window towards the top of the Wireshark window.**

What you should see is series of TCP and HTTP messages between your computer and gaia.cs.umass.edu. You should see the initial three-way handshake containing a SYN message. You should see an HTTP POST message. Depending on the version of Wireshark you are using, you might see a series of "HTTP Continuation" messages being sent from your computer to gaia.cs.umass.edu. Recall from our discussion in the earlier HTTP Wireshark lab, that is no such thing as an HTTP Continuation message – this is Wireshark's way of indicating that there are multiple TCP segments being used to carry a single HTTP message. In more recent versions of Wireshark, you'll see "[TCP segment of a reassembled PDU]" in the Info column of the Wireshark display to indicate that this TCP segment contained data that belonged to an upper layer protocol message (in our case here, HTTP). You should also see TCP ACK segments being returned from gaia.cs.umass.edu to your computer.

Answer the following questions, by opening the Wireshark captured packet file *tcp-ethereal-trace-1* in http://gaia.cs.umass.edu/wireshark-labs/wireshark-traces.zip (that is download the trace and open that trace in

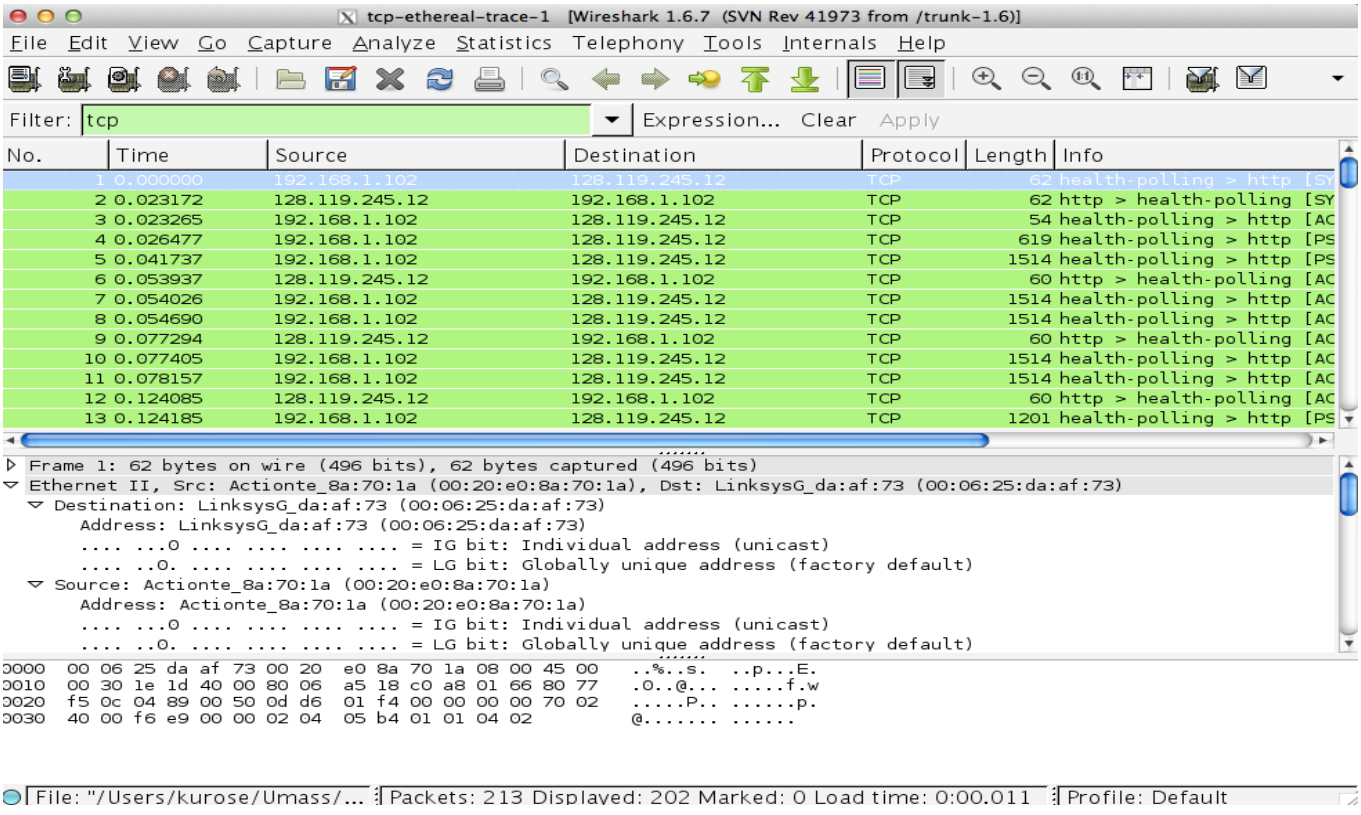
Wireshark; see footnote 2). Whenever possible, when answering a question you should hand in a printout of the packet(s) within the trace that you used to answer the question asked. Annotate the printout to explain your answer. To print a packet, use *File->Print*, choose *selected packet only*, choose *Packet summary line,* and select the minimum amount of packet detail that you need to answer the question.

1. **What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu? To answer this question, it's probably easiest to select an HTTP message and explore the details of the TCP packet used to carry this HTTP message, using the "details of the selected packet header window" (refer to Figure 2 in the "Getting Started with Wireshark" Lab if you're uncertain about the Wireshark windows.**
2. **What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?**

If you have been able to create your own trace, answer the following question:

3. **What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?**

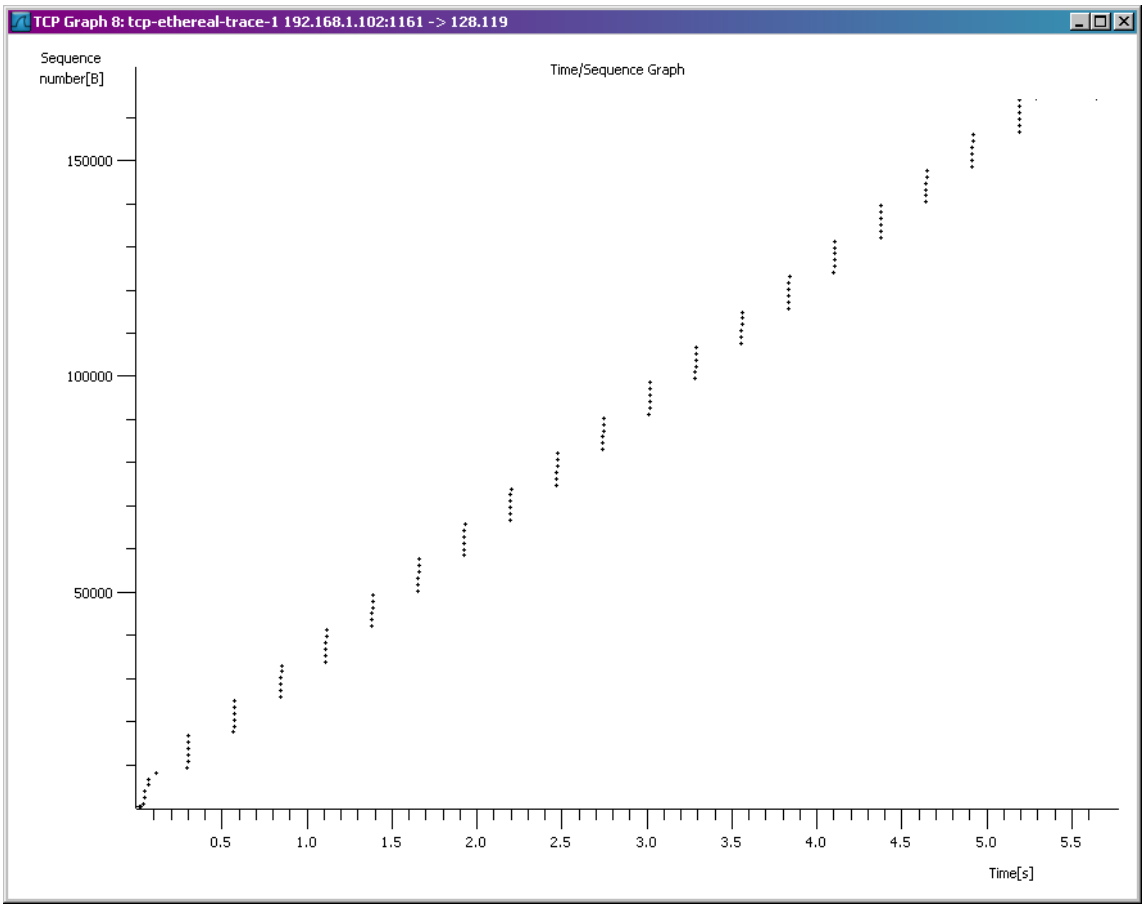
Since this lab is about TCP rather than HTTP, let's change Wireshark's "listing of captured packets" window so that it shows information about the TCP segments containing the HTTP messages, rather than about the HTTP messages. To have Wireshark do this, select *Analyze->Enabled Protocols.* Then uncheck the HTTP box and select *OK*. You should now see a Wireshark window that looks like:



TCP congestion control in action

Let's now examine the amount of data sent per unit time from the client to the server. Rather than (tediously!) calculating this from the raw data in the Wireshark window, we'll use one of Wireshark's TCP graphing utilities - *Time-Sequence-Graph (Stevens*) - to plot out data.

- **Select a TCP segment in the Wireshark's "listing of captured-packets" window. Then select the menu : *Statistics->TCP Stream Graph-> Time-Sequence-Graph(Stevens*). You should see a plot that looks similar to the following plot, which was created from the captured packets in the packet trace *tcp-ethereal-trace-1* in http://gaia.cs.umass.edu/wireshark-labs/wireshark-traces.zip (see earlier footnote):**



Here, each dot represents a TCP segment sent, plotting the sequence number of the segment versus the time at which it was sent. Note that a set of dots stacked above each other represents a series of packets that were sent back-to-back by the sender.

USER DATAGRAM PROTOCOL:

In this lab, we'll take a quick look at the UDP transport protocol. UDP is a streamlined, no-frills protocol. Because UDP is simple and sweet, we'll be able to cover it pretty quickly in this lab.

Start capturing packets in Wireshark and then do something that will cause your host to send and receive several UDP packets. It's also likely that just by doing nothing (except capturing packets via Wireshark) that some UDP packets sent by others will appear in your trace. In particular, the Simple Network Management Protocol (SNMP – see section 5.7 in the text) sends SNMP messages inside of UDP, so it's likely that you'll find some SNMP messages (and therefore UDP packets) in your trace.

After stopping packet capture, set your packet filter so that Wireshark only displays the UDP packets sent and received at your host. Pick one of these UDP packets and expand the UDP fields in the details window. If you are unable to find UDP packets or are unable to run Wireshark on a live network connection, you can download a packet trace containing some UDP packets.

Whenever possible, when answering a question below, you should hand in a printout of the packet(s) within the trace that you used to answer the question asked. Annotate the printout to explain your answer. To print a packet, use File->Print, choose selected packet only, choose Packet summary line, and select the minimum amount of packet detail that you need to answer the question.

1. Select one UDP packet from your trace. From this packet, determine how many fields there are in the UDP header. (You shouldn't look in the textbook! Answer these questions directly from what you observe in the packet trace.) Name these fields.
2. By consulting the displayed information in Wireshark's packet content field for this packet, determine the length (in bytes) of each of the UDP header fields.
3. The value in the Length field is the length of what? (You can consult the text for this answer). Verify your claim with your captured UDP packet.
4. What is the maximum number of bytes that can be included in a UDP payload? (Hint: the answer to this question can be determined by your answer to 2. above)
5. What is the largest possible source port number? (Hint: see the hint in 4.)
6. What is the protocol number for UDP? Give your answer in both hexadecimal and decimal notation. To answer this question, you'll need to look into the Protocol field of the IP datagram containing this UDP segment (see Figure 4.13 in the text, and the discussion of IP header fields).
7. Examine a pair of UDP packets in which your host sends the first UDP packet and the second UDP packet is a reply to this first UDP packet. (Hint: for a second packet to be sent in response to a first packet, the sender of the first packet should be the destination of the second packet). Describe the relationship between the port numbers in the two packets.