Lab 07 - IPv4 Network Address Translation (NAT)

What you will do:

- Using the skills and knowledge acquired in previous labs, you will build, configure and test a Wired (Ethernet) network consisting of fours nodes: two end devices (laptop) and two intermediary devices (Linksys router).
- Capture, analyse and compare NATed and non-NATed traffic.
- Create a static routing table entry.
- Create a DMZ rule to expose a host to the Internet.
- Reset a Linksys router to factory settings
- Implement basic router configuration:
    - Connect to router's management web page
    - Modify the router's IP address
    - Disable and enable Network Address Translation (NAT)
    - Allow anonymous Internet requests
    - Enable and assign device to DMZ zone

Things that you will need to know or learn:

- Everything that you learned in lab 01, 02, 03, 05 and 06 you will need to complete this lab.
- Basic understanding of how NAT works
- How to create a DMZ zone for the purpose of exposing a host to the internet

What you need to submit and when:

- Complete Lab 07 of the lab and demo your results to your lab instructor before the end of your lab period (refer to the instructions below). This part is to be completed **with a partner** BUT each partner must do the post-lab quiz individually.

Required Equipment:

- Equipment requirements per team:
    - Network cables: two straight-through and one crossover
    - Two Linksys routers
    - Wireshark installed and working on both laptops (done in Lab 01)
    - Lab 07 documents downloaded to your laptop
    - Two laptops

References and Resources:

- Lab 01, 02, 03, 04, 05, 06
- Lecture week 06 & 07

Overview

Here is a summary of the activities you will be performing during the inlab portion:

1. Build, configure and test your lab network
2. Create a static route
3. Document your device's logical and physical network addresses
4. Capture, analyse and compare non-NATed and NATed network traffic

Task 0: Preparations

0.1 Find a partner to work with. You must work in teams of exactly two per team.

0.2 All Lab 07 pre lab tasks must be completed prior to beginning the activities described in this document.

0.3 Confirm you have downloaded the following from BB "Labs - > Lab 07" to your computer:

- 0.3.1 Lab 07 – In-Lab Activies.pdf (this document)
- 0.3.2 Lab07-router1-config – router 1 configuration instructions
- 0.3.3 Lab07-router2-config – router 2 configuration instructions

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

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

Task 1: Build, Configure and Test Network

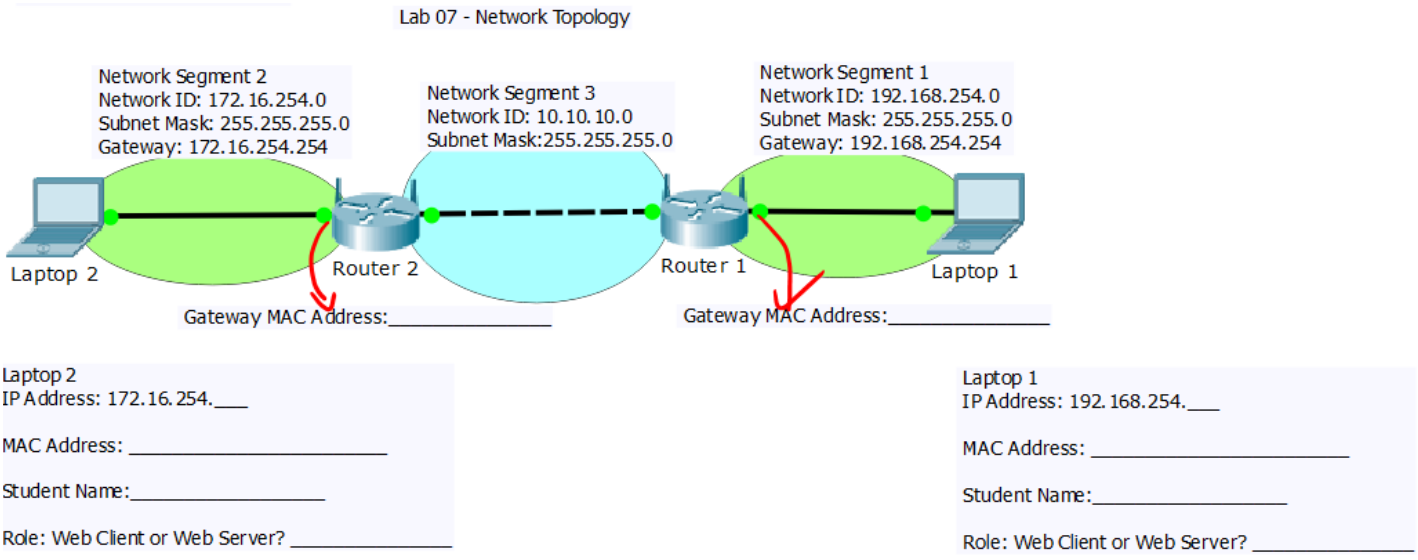
In this task you will build, configure and verify proper operation of the network topology shown in "Lab 07 – Network Topology". The network you are building consists of three separate network segments: Network segment 1, Network segment 2 and Network segment 3.

NOTE ABOUT YOUR TOPOLOGY DIAGRAM. THE IP ADDRESS ASSIGMENTS SHOWN IN THE TOPOLOGY DIAGRAM WILL NOT TAKE EFFECT UNTIL AFTER YOU HAVE COMPLETED STEP 8. ONLY AFTER STEP 8 DO YOU FILL IN THE BLANKS OF THE TOPOLOGY DIAGRAM.

Do not start task 1 until you have completed all Task 0 steps. Remember you are working in teams of two.

1. Power up the routers and wait for the power light to be steady on
2. Reset to factory defaults by pressing (using a pen) the reset switch located at the bottom (NOT THE BACK) of the router.
   a. Keep the reset button depressed until the power light flashes
3. Connect your laptop to any of your Linksys' switch port using the appropriate cable
   a. One laptop per router!
4. Connect the routers together via their respective Internet ports (yellow ports) using the appropriate cable
5. Confirm basic connectivity by making sure you can successfully ping your default gateway. Do an ipconfig to determine your default gateway address (at this point it should be 192.168.1.1)
6. Write on the topology diagram who will be router 1 and who will be router 2.
7. The IP addresses shown in your topology diagram will NOT be in effect until after you have performed the router configuration steps outlined in the next step.
8. Perform the router configuration as per the router configuration document:
   a. ***Refer to Lab07-router1-config if you are router 1***;
   b. ***Refer to Lab07-router2-config if you are router 2***.

9. Do not continue until all local and remote connectivity tests have succeeded!
10. Install and test a Web Server (on only one of the laptops) as per the instructions in Lab 03 Task 2. Clearly identify on the Network Topology the laptop that is the Web server and the laptop that is the Web client.
11. At this point you should have a fully functional network where:
    a. All connectivity tests succeed;
    b. The web server is accessible from the web client.
12. Fill in the blanks in your topology diagram! It counts for four marks and you lose .5 marks per missing item.



Task 2: Observe Non-NATed Network Traffic

In this task you will capture Non-NATed traffic.

1. Both LAPTOPS need to capture the same HTTP traffic generated in this task!!
2. Start your Wireshark capture (ON BOTH LAPTOPS) and apply the following filter!

   http && tcp.port==8088 && ip.addr==w.x.y.z && ip.addr==a.b.c.d

   where w.x.y.z is laptop's 1 IP address and a.b.c.d is laptop's 2 IP address.

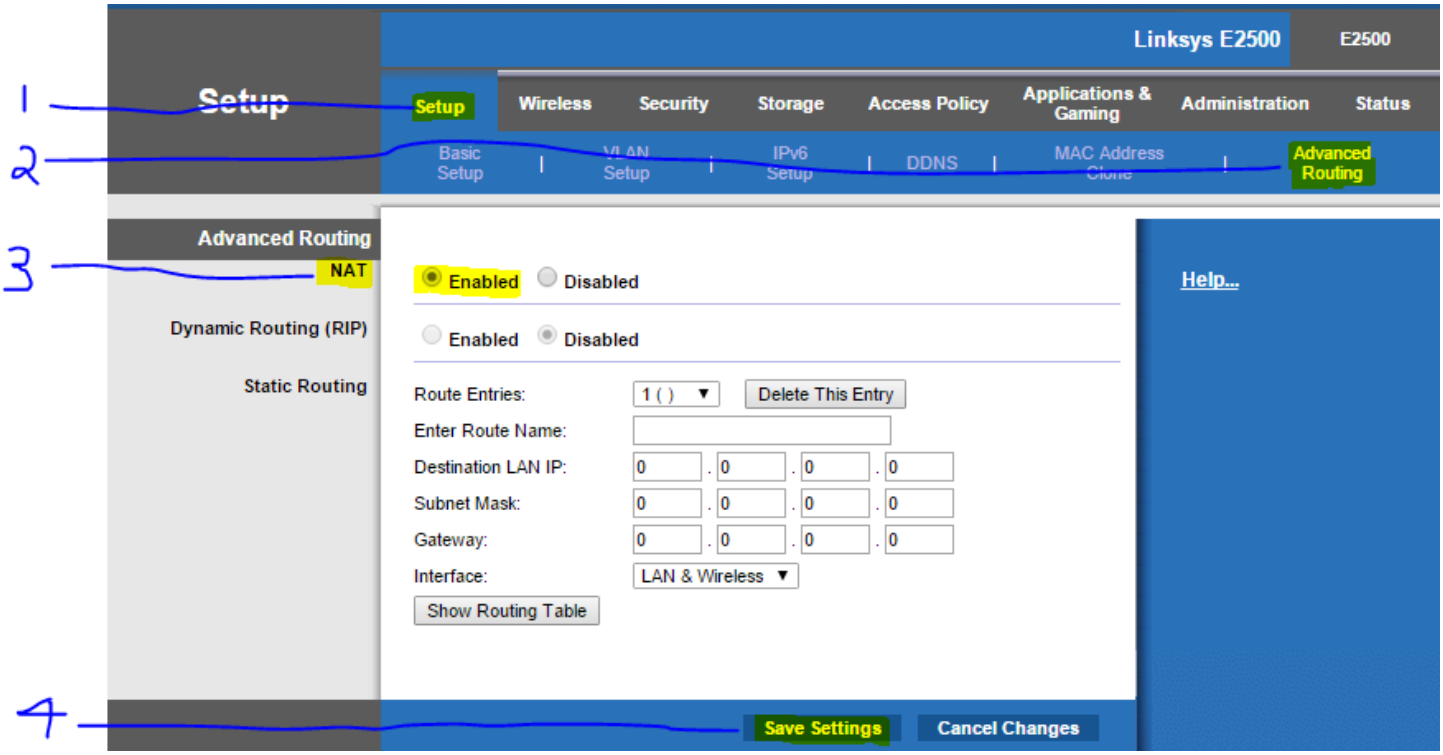
3. On the laptop playing the role of Web client, open the web browser and enter your partner's Web Server address/port! The Web Server page MUST SUCCESSFULLY DISPLAY.
4. The number of filtered frames MUST be identical on BOTH laptops!
5. When step 3 is successfully completed, stop and save the capture on BOTH laptops.
   a. Save as NonNAT-laptop1 if you are laptop 1.
   b. Save as NonNAT-laptop2 if you are laptop2.
6. You will need both these Wireshark captures to perform your analysis and answer Blackboard In-Lab quiz questions.

Task 3: Enable NAT and DMZ Security Feature

In this task you will enable NAT on BOTH routers and the DMZ security feature ***on the router connecting the web server.***

On both routers (enable NAT)!

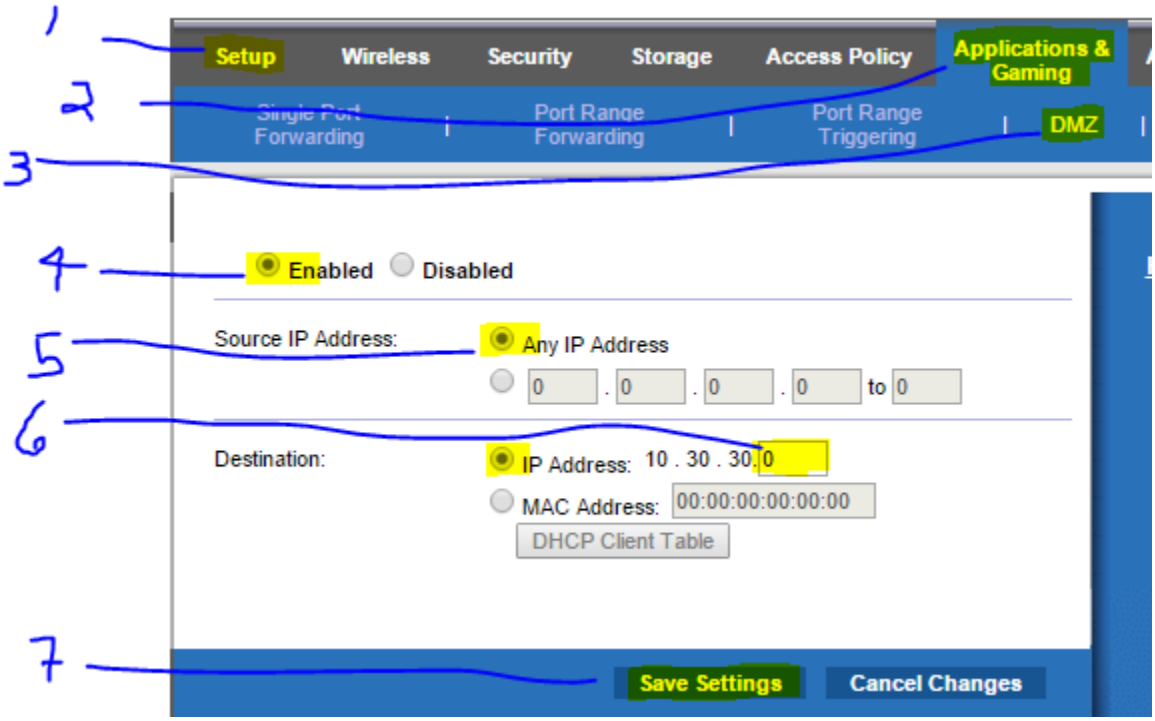
1. Connect to the router's management interface.
2. Enable NAT on your router as per the screen capture below.



On router connecting the web server (enable Demilitarized Zone (DMZ))

Having enabled NAT in the previous step will result in the Web server no longer being directly accessible from the router's Internet interface. Therefore, using the router's DMZ security feature, you will allow the Web Server to be exposed to the internet as if it was directly connected.

1. The following steps are **ONLY** to be performed on the router connecting the Web server.
2. Connect to the router's management interface.
3. Enable the router's DMZ feature and assign the Web Server to the DMZ zone as shown in the screen capture below.
4. NOTE that you must specify the Web Server's IP address in 6 below!
5. Save Settings!



Task 4: Observe NATed Network Traffic

In this task you will capture NATed traffic for later analysis.

1. Both LAPTOPS need to capture the same HTTP traffic generated in this task!!
2. Start your Wireshark capture (ON BOTH LAPTOPS) and apply the following filter!

   http && tcp.port==8088

3. On the laptop playing the role of Web client, open the web browser and enter your partner's Web Server address/port! The Web Server page MUST SUCCESSFULLY APPEAR.
   a. REMEMBER THAT YOUR WEB SERVER IS SHIELDED BY A NAT ROUTER THEREFORE THE IP ADDRESS OF YOUR WEB SERVER TO REMOTE USERS IS THAT OF YOUR ROUTER'S INTERNET INTERFACE!
4. The number of filtered frames MUST be identical on BOTH laptops!

a. Take a screen capture of the summary pane. Your capture must include the Filter field.
   i. Save as:
      1. sc1-NAT-laptop1 if you are laptop 1.
      2. sc1-NAT-laptop2 if you are laptop 2.
b. Note you will need to save both screen captures!!!!
c. Note that the screen captures should be demoed to your lab instructor to show that you have correctly configured NAT and your DMZ settings. The following additional requirement must be met to get full marks. Two marks will be deducted per non-compliant requirement.
   1. On the web client's screen capture, the server's IP is 10.10.10.*. For example, on the client, the destination IP for the HTTP Get will be 10.10.10.* whereas the source will be the client's true IP
   2. On the web server's screen capture, the client's IP is 10.10.10.*. For example, on the server, the source IP for the HTTP Get will be 10.10.10.* whereas the destination will be the server's true IP

5. When step 3 is successfully completed, stop and save the capture on BOTH laptops.
   a. Save as NAT-laptop1 if you are laptop 1.
   b. Save as NAT-laptop2 if you are laptop2.
6. You will need both these Wireshark captures to perform your analysis and answer Blackboard In-Lab quiz questions.

Instructor Signoff_____

Task 5: Analyse/Compare NAT and non-NATed Traffic

1. Exchange Wireshark captures of task 2 and 4 with your partner.
2. Exchange screen captures with your partner.
3. Complete the Blackboard Lab 07 PostLab quiz.

Task 6: Cleanup and Other Tasks

1. Re-enable your firewall
2. Re-enable your Wireless Network and confirm you are able to access the College network.
3. Return the borrowed equipment and cables to your instructor.