TDC 413
Lab #1 - A Simple Network
ASSIGNMENT DOCUMENT
Due by Saturday, April 29, 11:59 pm

Completing the Lab:

There are two ways to complete this lab:

1- You could physically go to CDM 348. There are many pods in the room. There is no reservation required. You could walk in and work on any available pod. There are also lab assistants there that you could ask for general help. The Network Security lab in room 348 of CDM building is open 12 – 10 pm M-F and 12 – 5 pm Sat and Sundays.

2- Using Packet Tracer. Start with file TDC413-lab1.pkt.

Submitting your Answers:

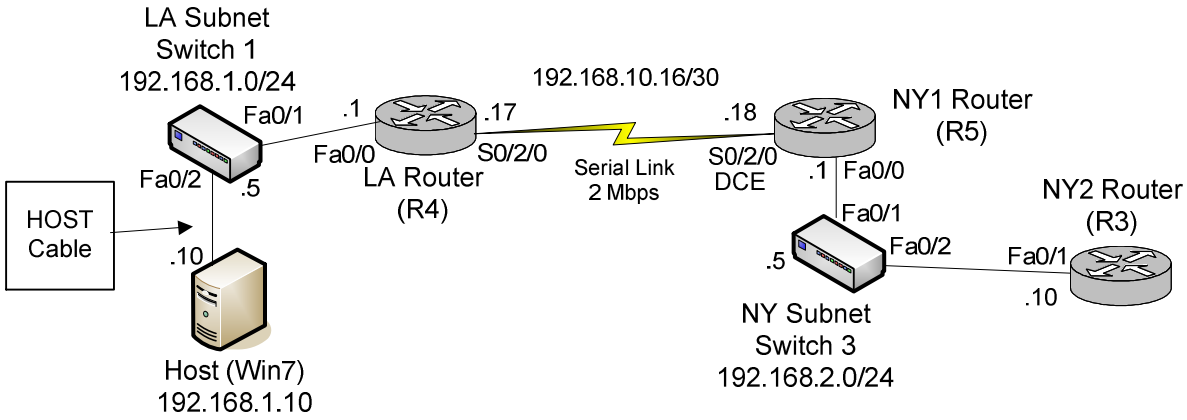
There is a separate Lab #1 Answers document that accompanies this assignment. You should type all answers into the Answers document and submit it according to instructions.
If you are doing the lab in room 348, you should bring this Answers document into the Lab with you on a thumb drive so you can edit it there.

Starting the Lab:

BEFORE you start configuring any equipment you should do the following:

1. Make sure you have an active CDM login name and password. If you do not, follow the "CDM Account Activation" instructions in this document:
   http://my.cdm.depaul.edu/resources/Terminal_services_guide.pdf
2. Read this Assignment Document completely.
3. Examine and understand the network diagram.
4. Type information about each of the subnets in the network diagram into Table #1 in your Answers document.
5. Type IP address information shown in the network diagram into Table #2 in your Answers document.
6. Determine what static routes must be configured so that any device on the LA Subnet can ping to any device on the NY Subnet. Type one line of information into Table #3 for each static route that is needed.

Once you have completed these steps, you should implement your network, following the directions below, test it, and then copy and paste screenshots into your Answers document as specified in Part 4 of that document. If you want me to check your values in Tables #1, #2, and/or #3 before implementing the lab, you can send them to me by e-mail and I will check them and respond within 24 hours.



Lab #1 Network Diagram

Lab Implementation

In Lab #1 you will implement a hypothetical network between New York (NY) and Los Angeles (LA) sites. The implementation instructions below assume that you are doing the lab in room 348. If you are doing the lab on Packet Tracer, you should figure out what parts apply to you and what parts do not.

When you first go into the lab, you should find one of the nine "Regular Pods" that is not being used, sit down and start using it. There should be a box of network cables, rack of equipment, 2 monitors, and host machines as described in class.

Part I: Inspect Pod equipment and Register for Lab

You should have a cable box containing an assortment of blue straight-through cables, blue serial cables and orange crossover cables. In front of you should be 2 computer monitors.

There are 4 computers that can be displayed on the left monitor – they are: Host #1, Host #2, Host #3 and MGMT. These computers are stacked by the network rack and there should be a small KVM switch labeled "IOGear" nearby with buttons marked "Host #1", "Host #2", "Host #3", and "MGMT". Pushing one of these buttons connects that computer to the keyboard, mouse and display on the table. The yellow light shows which computer is currently connected. To start, push the "MGMT" button so you are connected to the Management computer.

Sign In for the Lab

At the start of every lab session in room 348, you should Sign In to the lab environment. Login to the Management computer using your CDM username and password. Once you are logged in, a web page on netlabs.cdm.depaul.edu should display. On this page, click the **Local Sign In** in upper right. If this is your first time using the lab this quarter, click **Register** button under REGISTER FOR LAB!, fill out your information. Under SIGN IN!, select TDC 413, and click **Sign In** button, fill out form and **Submit**.

Part II: Clear Pods, Set up management windows, Open Answers

On your MGMT computer desktop, there should be an application called **Clear Pods** (with a red "X" logo). Double-click to run this, type a key, and wait until all windows have closed before proceeding. This should clear any configuration information that might have been left by a previous student.

Disconnect any extra cables.

Look at Routers R3, R4, R5 and Switches S1 and S3 on the equipment rack. They should have cables connected to interfaces marked "Console". DO NOT remove any of these Console cables. These are needed for device management. However, if there are any additional cables plugged into data interfaces marked "FE" (Fast Ethernet) or "Serial", then remove these cables now.

Set up mPuTTY windows

On your MGMT computer desktop, there should be an application called **mPuTTY**. Double-click to start this application. Click the "+" at top left to show all available PuTTY windows, and double-click on the names of each of the 5 network devices you will use for this lab: Router 3, Router 4, Router 5, Switch 1 and Switch 3. This will open five PuTTY windows**,** each of which connects you to Cisco CLI for the corresponding device. After each connection is made, hit Enter a few times until you get a prompt from that device. If prompt asks whether you want to continue with the system configuration dialog, answer **no** and Enter. If it asks whether it should terminate autoconfig, answer **yes**. When you get to the initial "Router>" or "Switch>" prompt you are set. You can click on the top tab for each window and drag them over to the right-hand monitor for easier access if you wish.

Check for old IP or VLAN configuration and reboot if necessary

On each of the 5 PuTTY windows, go into privileged mode and execute "show ip int brief" to see if all IP addresses have been cleared off this device, for example:

Switch> **enable**

Switch# **show ip int brief**

On each Switch, you should also execute **show vlan brief.** If you see any old IP addresses or you see any switch ports on VLANs other than VLAN 1, you should reboot that router or switch. This is only necessary if you see some old IP or VLAN information that must be erased:

To reboot: If you are on a Switch, execute **delete vlan.dat** first
To reboot: Execute **erase startup-config** and then **reload**.

Part III: Configure and Connect Win7 Host

Try pressing the Host #1, Host #2 and Host #3 buttons on the KVM switch. If any of these hosts are already booted in Windows, then go ahead and use it. If not, but if one of them is showing a black screen titled "GNU GRUB" at the top, then use arrow keys to select "Windows 7E sp1" and hit Enter to boot the host into Windows 7. Remember which host (#1, #2 or #3) you are using.

Once the Windows login screen appears, login with: user: **lanlab** pwd: **lanlab**

Find a data cable hanging in front of your equipment rack with a label corresponding to your Host (cable label will be **HOST1**, **HOST2** or **HOST3**). This is already connected to the **GigEth** interface on your Win7 Host (you don't have to verify this). Following the Lab #1 network diagram, connect this cable to interface Fa0/2 on Switch 1. Watch for green light on Switch 1.

Set the IP address for the LAN GigEth interface on this host as follows:

1) Right-click on network icon in lower right of desktop and select "Open Network and Sharing Center" (or go to Network and Sharing Center from Control Panel)
2) Click on "Change Adapter Settings"
3) Double-click on LAN interface (usually labeled "Local Area Connection")
4) Click on "Properties", double-click "IPv4", then click "Use the following IP address"
5) Enter the Host IPv4 address, Subnet mask and Default gateway information from the Lab #1 network diagram and Table #2.
6) Click **OK**

Now you can close out all windows on your desktop and open a Command Window (by clicking **Start** button, then type **cmd** in text box and hit Enter). You will use this command window to execute **ping** and **tracert** commands from this Win7 Host.

Part IV: Connect and Configure all Router/Switch Interfaces

1. Connect all data cables

Connect Ethernet cables (you decide if they should be straight-through or crossover cables) between device interfaces as shown in the Lab #1 network diagram. Connect a blue serial cable between interface s0/2/0 on router R4 and interface s0/2/0 on router R5. Look for DTE and DCE labels on the ends of the serial cable and make sure that the DCE end is connected to router R5, as shown in the network diagram.

2. Set hostname on each device

For all labs in this course, you must set the hostname (in global configuration mode) for each network device to be a meaningful name followed by your initials. For example, on router R3, I might configure:

Router> **enable**
Router# **conf t**
Router (config)# **hostname NY2_Rtr_RG**
NY2_Rtr_RG(config)#

Side note: if you are annoyed by the status messages that interrupt your typing on the device consoles or "domain lookup" errors when you mistype commands, you can stop them by entering the following at the global config prompt on any switch or router:

(config)# **line console 0**
(config-line)# **logging synchronous**
(config-line)# **exit**
(config)# **no ip domain lookup**

3. Configure router and switch interface addresses

For each interface listed in Table #2 of Lab #1 Answers, go into interface configuration mode, set the IP address and subnet mask for the interface, and execute a **no shutdown** command, as shown in class. For Switch 1 and Switch 3 you must also configure a default gateway address. Remember that you must also configure a **clock rate** command on router R5.

4. Test Each 1-Hop Connection

Once you have configured IP addresses at both ends of each link, test each one-hop link between IP devices at layers 1, 2 and 3 as follows: (note: a one-hop link is any connection between devices that does not go through an intermediate router).

Layer 1 test: Verify that you see green lights on connected switch/router interfaces.

Layer 2 test: In global configuration mode on a router, execute **show interface** followed by the interface name (like **show interface fa0/0**). Check that the output says "Line is up" (Layer 1 OK) and also "Protocol is up" (Layer 2 OK).

Layer 3 test: Do a **ping** from one end of the link to the other. For example, on LA Router (R4) execute a **ping 192.168.1.5** to test connection to Switch, then **ping 192.168.1.10** to test connection to Host, then execute **ping 192.168.10.18** to test serial connection to NY1 Router. On a router, it will take about 10 seconds for a ping to fail (2 seconds for each of 5 attempts).

NOTE: If you ever need to interrupt whatever the router/switch is doing and get back to command prompt immediately – type **Ctrl/Shift/6.**

Part V: Add Static Routes for Multi-Hop Paths

Now that your network is fully connected and all links are tested, look at the routing tables on each of the 3 routers (use **show ip route**). In each routing table, you will see only the IP subnets that are directly connected to that router.

Try executing **ping 192.168.2.10** on the Win7 Host (or on LA Switch). It will fail because LA Router has no route to NY Subnet (192.168.2.0/24) in its routing table.

As discussed in class, in order to have end-to-end connectivity, both the LA Subnet (192.168.1.0/24) and the NY Subnet (192.168.2.0/24) must be present in the routing tables of all routers**.**

Following Table #3 of your Answers and the examples in class, you should configure static routes on routers R3, R4 and R5 so that each routing table contains a route to LA Subnet and a route to NY Subnet. You can do this by configuring static routes as shown in class. Enter the information for these static routes into Table #3 of your Lab #1 Answers if you have not already done so.

You will know you are successful when both the Host computer and Switch 1 can ping to both Switch 3 (192.168.2.5) and NY2 Router (192.168.2.10). You do NOT have to be able to ping from LA Router (R4) to NY2 Router (R3).

Part VI: Fill out remainder of Lab #1 Answers

Once all pings are successful, then plug your thumb drive containing your Lab #1 Answers file into a USB port on your Host computer. Open the file in MS Word, execute the commands for Answers Part 4a and 4b in the Command Window on the Host computer, then copy and paste a screenshot of each result into the Answers file as specified. Now save and close your Answer files, move the thumb drive to a USB port on the Management computer, and copy and paste the windows showing the remaining

results before saving it. This Answers file should then be converted to PDF and submitted on D2L for the Lab #1 assignment.

What if you need to stop in the middle?

What if you run out of time and need to stop working on the lab in the middle? In this case, you can save the running configuration of each switch/router to a text file on your thumb drive and then restore them when you come back on another day.

To save your configuration: Execute a **show running-config** to view configuration. Highlight from the end (at the bottom of the config) to the ! before hostname. Ctrl-c to copy it (don't right click or it will run the highlighted material)

Open Notepad or another text editing application and paste it (Ctrl-v) and save the file. You now have saved a copy of the configuration. If you were to come back later, you could paste this material from Notepad into a (config)# prompt and it will re-run all the commands and restore your configuration to where it was before. Note that, in a PuTTY window, you should paste with a right-click; Ctrl-V does not work in PuTTY. The switch/router would then be configured exactly as it is now – all you would have to do is plug in the cables and execute **no shutdown** on each interface. You also may want to type up your lab commands to a text file before you go to the lab to reduce your lab time and typing errors (a major source of frustration).

Part VI: Clean Up

At the end of every lab you do in this class, you should clear all cables and configurations so the next student starts with a clean POD. Do the following:

- Exit out of all PuTTY windows and close mPuTTY application.
- On Management computer, execute **Clear Pod** application to erase your configurations.
- On Management computer, open browser to http://netlabs.cdm.depaul.edu, click **Local Sign In,** then select your user id under SIGN OUT! and click **Sign Out** button.
- On Win7 Host, go back to Network and Sharing Center and erase your LAN interface configuration and click **OK**. Then execute **Log off**.
- Unplug all data cables that you plugged in to rack equipment. Return the cables to the cable box.
- Remember to save your Answers file and take your thumb drive with you.