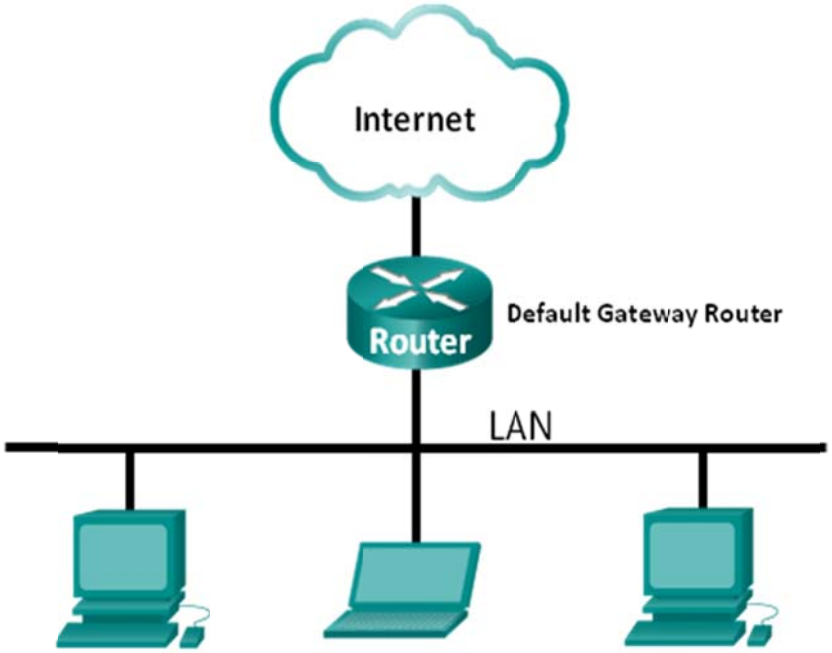
Lab - Using Wireshark to View Network Traffic (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Topology



Objectives

Part 1: (Optional) Download and Install Wireshark

Part 2: Capture and Analyze Local ICMP Data in Wireshark

- Start and stop data capture of ping traffic to local hosts.
- Locate the IP and MAC address information in captured PDUs.

Part 3: Capture and Analyze Remote ICMP Data in Wireshark

- Start and stop data capture of ping traffic to remote hosts.
- Locate the IP and MAC address information in captured PDUs.
- Explain why MAC addresses for remote hosts are different than the MAC addresses of local hosts.

Background / Scenario

Wireshark is a software protocol analyzer, or "packet sniffer" application, used for network troubleshooting, analysis, software and protocol development, and education. As data streams travel back and forth over the network, the sniffer "captures" each protocol data unit (PDU) and can decode and analyze its content according to the appropriate RFC or other specifications.

Wireshark is a useful tool for anyone working with networks and can be used with most labs in the CCNA courses for data analysis and troubleshooting. This lab provides instructions for downloading and installing Wireshark, although it may already be installed. In this lab, you will use Wireshark to capture ICMP data packet IP addresses and Ethernet frame MAC addresses.

Required Resources

- 1 PC (Windows 7, Vista, or XP with Internet access)
- Additional PC(s) on a local-area network (LAN) will be used to reply to ping requests.

Instructor Note: This lab assumes that the student is using a PC with Internet access and can ping other PCs on the local area network. If using academy PCs, then the instructor may wish to pre-install Wireshark on the PCs and advise the students to read through Part 1 and perform Parts 2 and 3 of the lab. Wireshark installation procedure and screenshots may change depending on Wireshark version. This lab is using Wireshark v1.8.3 for Windows 7 (64-bit).

Using a packet sniffer such as Wireshark may be considered a breach of the security policy of the school. It is recommended that permission is obtained before running Wireshark for this lab. If using a packet sniffer such as Wireshark is an issue, the instructor may wish to assign the lab as homework or perform a walk-through demonstration.

Part 1: (Optional) Download and Install Wireshark

Wireshark has become the industry standard packet-sniffer program used by network engineers. This open source software is available for many different operating systems, including Windows, Mac, and Linux. In Part 1 of this lab, you will download and install the Wireshark software program on your PC.

Note: If Wireshark is already installed on your PC, you can skip Part 1 and go directly to Part 2. If Wireshark is not installed on your PC, check with your instructor about your academy's software download policy.

Step 1: Download Wireshark.

a. Wireshark can be downloaded from www.wireshark.org.

b. Click **Download Wireshark**.

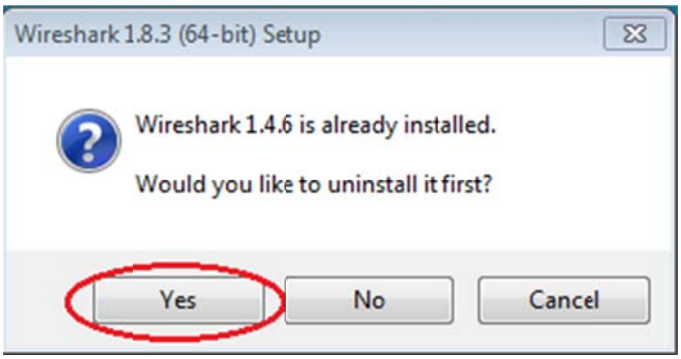
c. Choose the software version you need based on your PC's architecture and operating system. For instance, if you have a 64-bit PC running Windows, choose **Windows Installer (64-bit)**.

After making a selection, the download should start. The location of the downloaded file depends on the browser and operating system that you use. For Windows users, the default location is the **Downloads** folder.

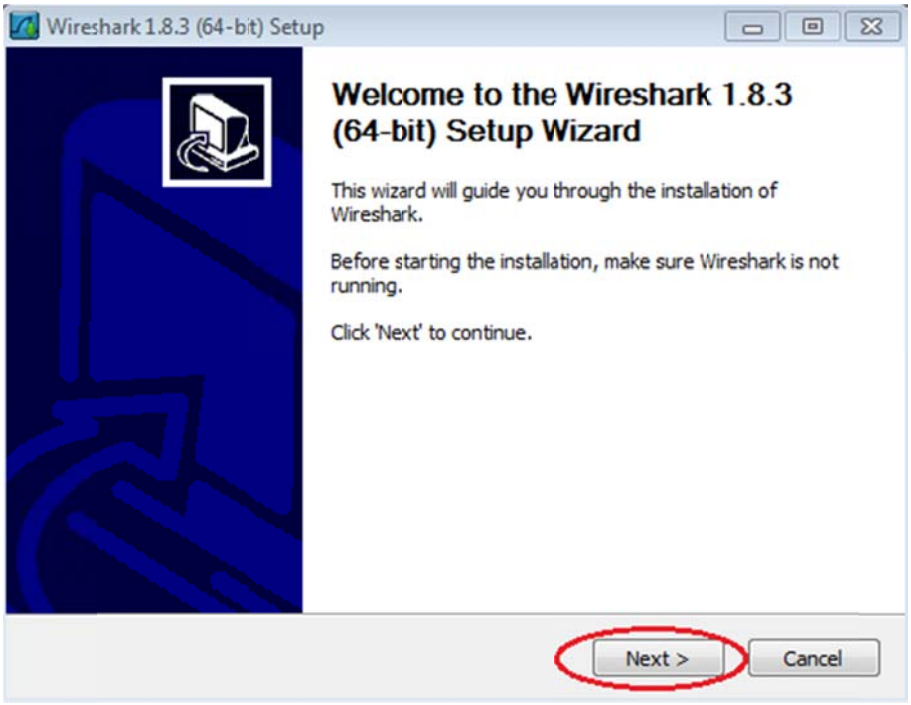
Step 2: Install Wireshark.

a. The downloaded file is named **Wireshark-win64-x.x.x.exe**, where **x** represents the version number. Double-click the file to start the installation process.

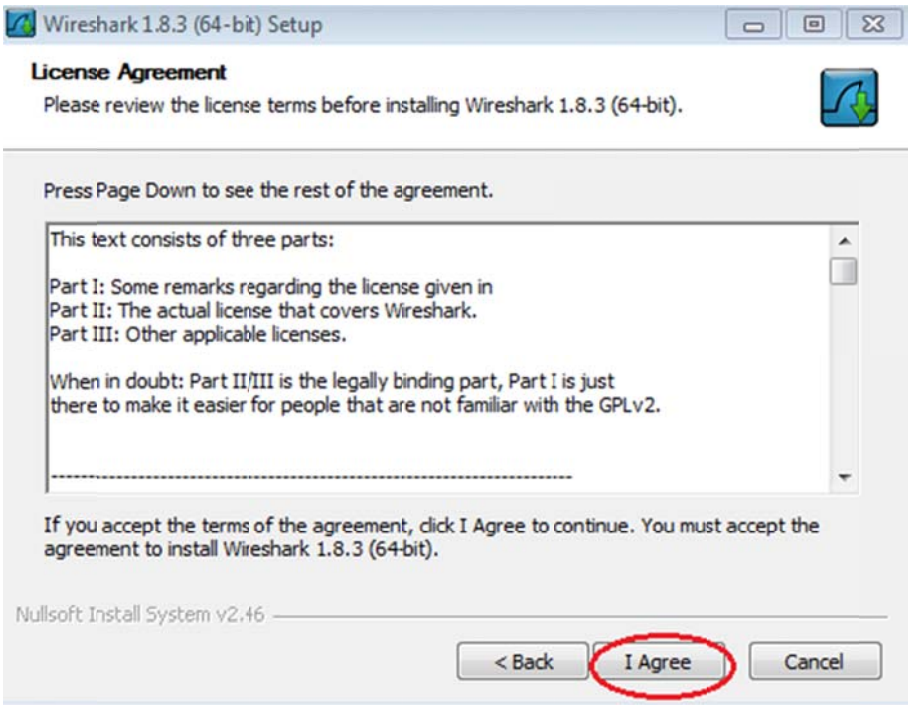
b. Respond to any security messages that may display on your screen. If you already have a copy of Wireshark on your PC, you will be prompted to uninstall the old version before installing the new version. It is recommended that you remove the old version of Wireshark prior to installing another version. Click **Yes** to uninstall the previous version of Wireshark.



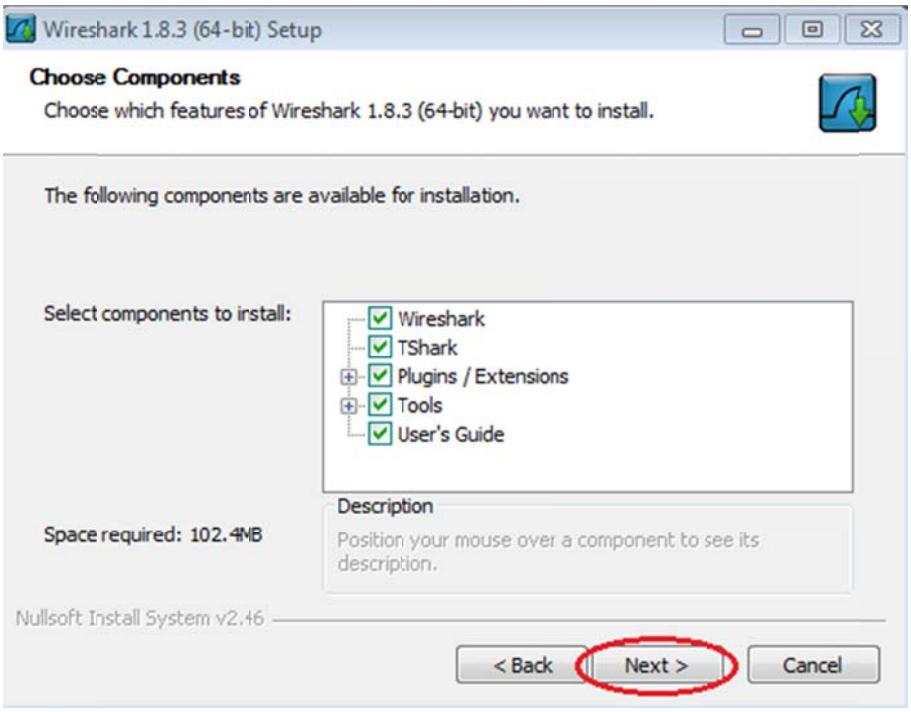
c. If this is the first time to install Wireshark, or after you have completed the uninstall process, you will navigate to the Wireshark Setup wizard. Click **Next**.



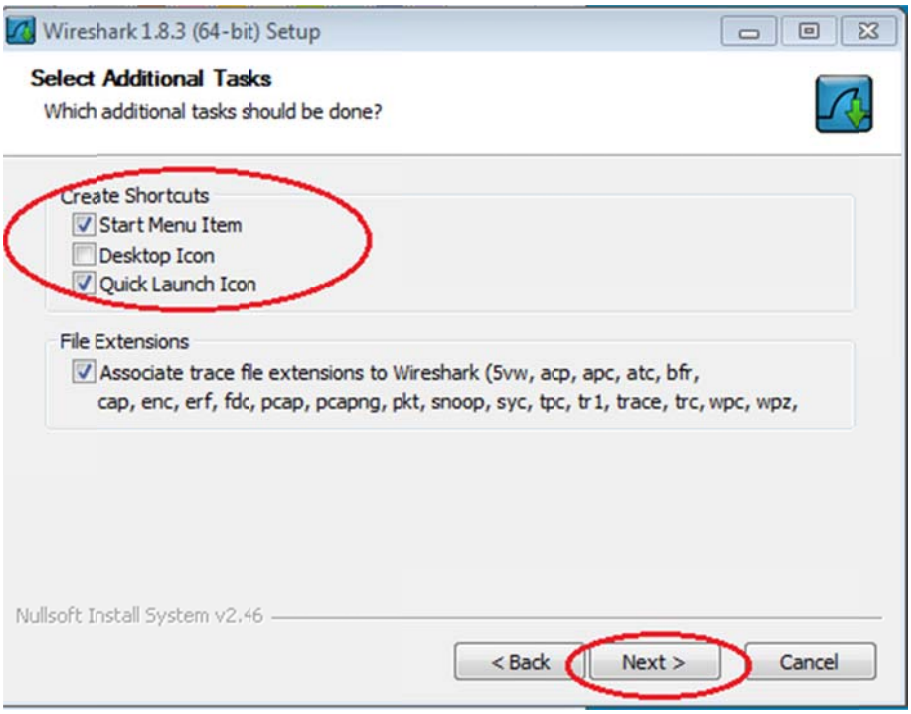
d. Continue advancing through the installation process. Click **I Agree** when the License Agreement window displays.



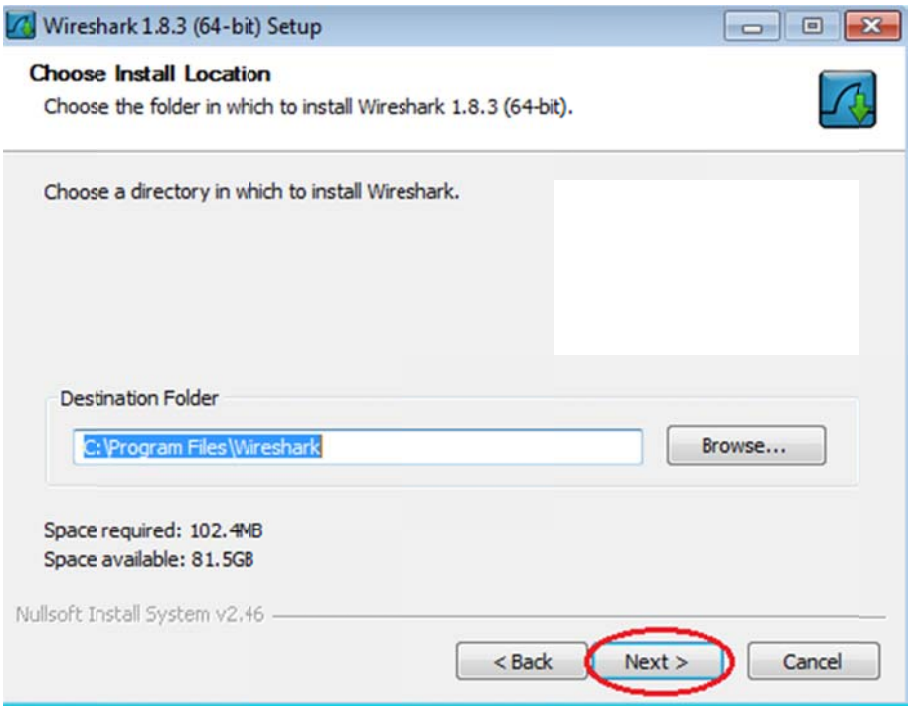
e. Keep the default settings on the Choose Components window and click **Next**.



f. Choose your desired shortcut options and click **Next**.

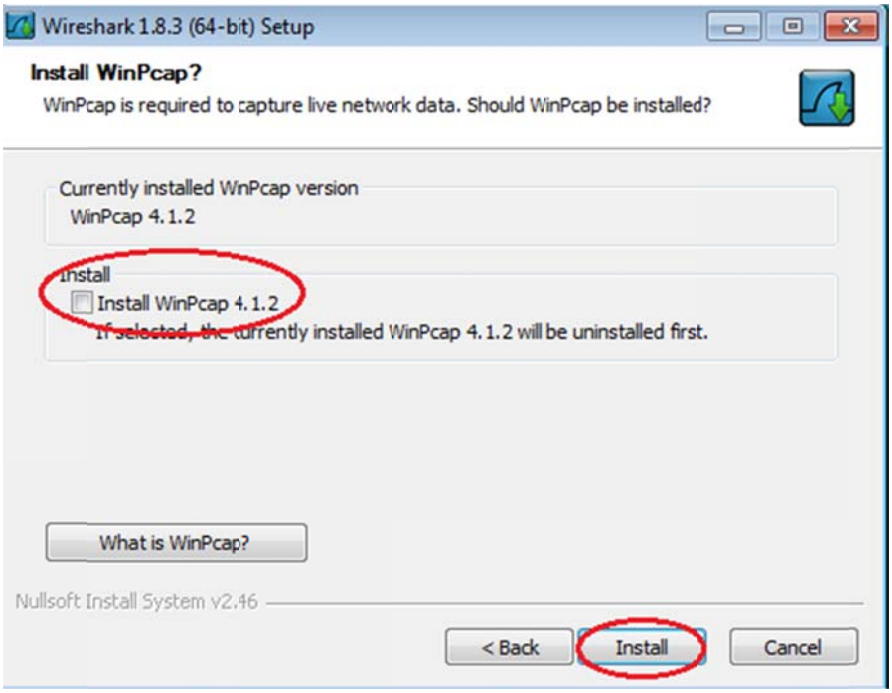


g. You can change the installation location of Wireshark, but unless you have limited disk space, it is recommended that you keep the default location.

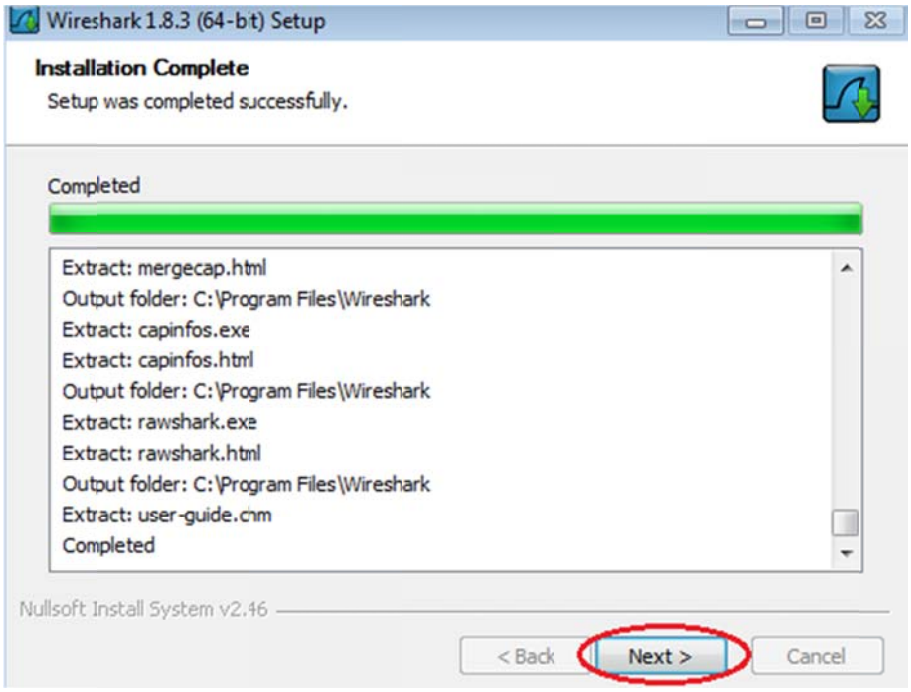


h. To capture live network data, WinPcap must be installed on your PC. If WinPcap is already installed on your PC, the Install check box will be unchecked. If your installed version of WinPcap is older than the version that comes with Wireshark, it is recommend that you allow the newer version to be installed by clicking the **Install WinPcap x.x.x** (version number) check box.

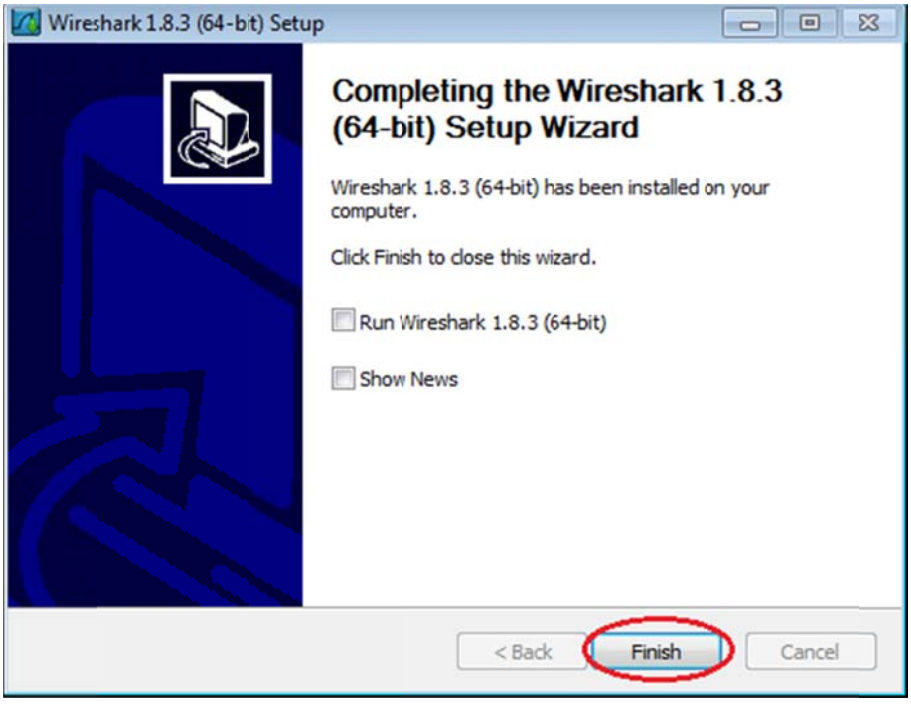
i. Finish the WinPcap Setup Wizard if installing WinPcap.



j. Wireshark starts installing its files and a separate window displays with the status of the installation. Click **Next** when the installation is complete.



k. Click **Finish** to complete the Wireshark install process.



Part 2: Capture and Analyze Local ICMP Data in Wireshark

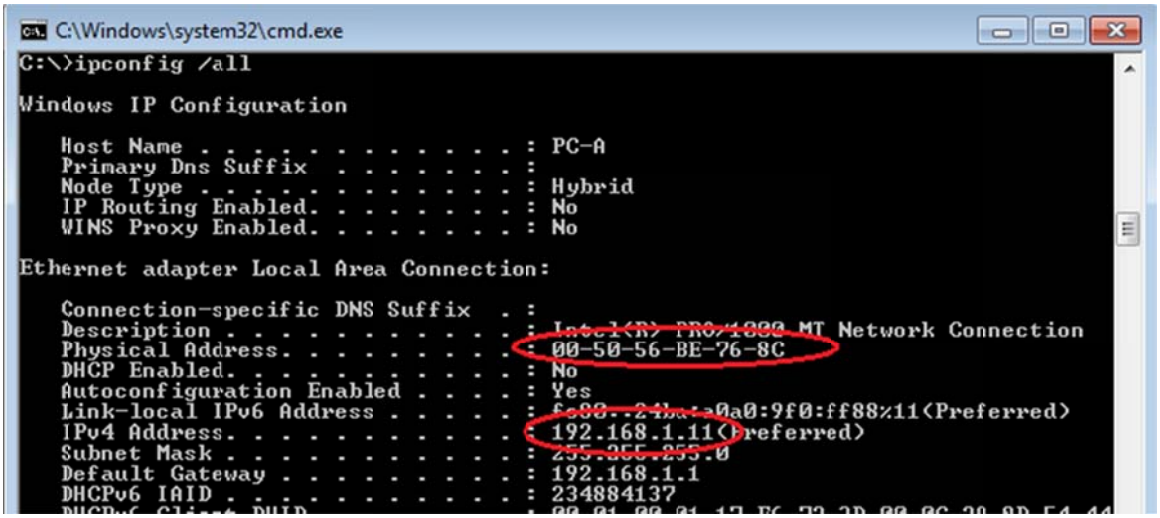
In Part 2 of this lab, you will ping another PC on the LAN and capture ICMP requests and replies in Wireshark. You will also look inside the frames captured for specific information. This analysis should help to clarify how packet headers are used to transport data to their destination.

Step 1: Retrieve your PC's interface addresses.

For this lab, you will need to retrieve your PC's IP address and its network interface card (NIC) physical address, also called the MAC address.

a. Open a command window, type **ipconfig /all**, and then press Enter.

b. Note your PC interface's IP address and MAC (physical) address.

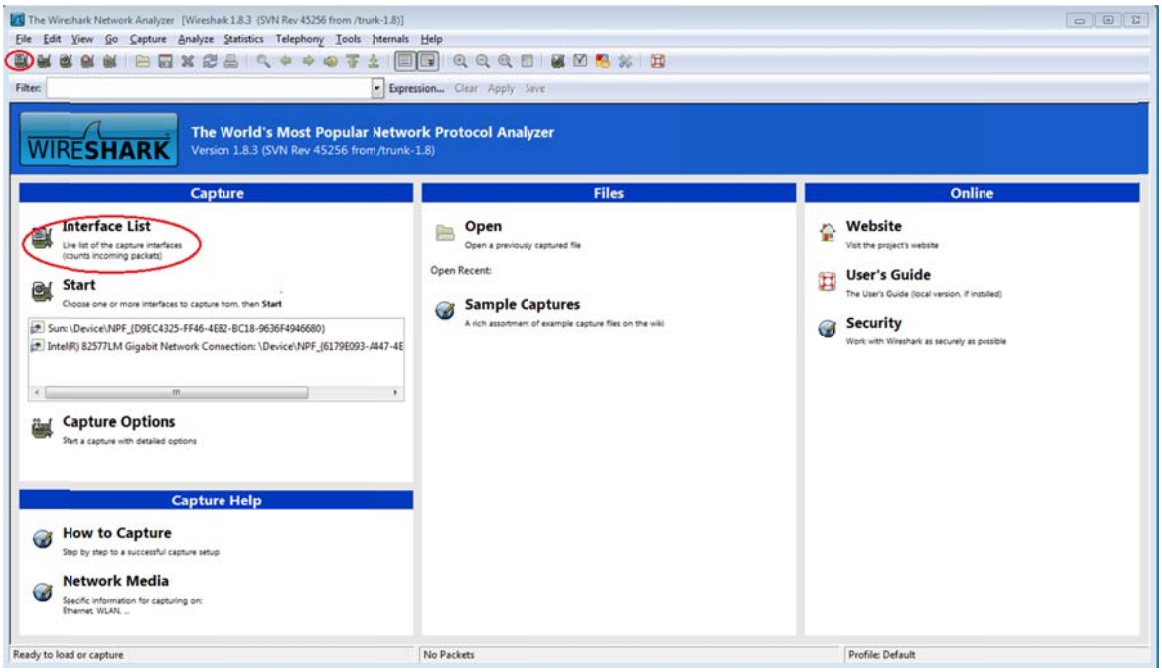


c. Ask a team member for their PC's IP address and provide your PC's IP address to them. Do not provide them with your MAC address at this time.

Step 2: Start Wireshark and begin capturing data.

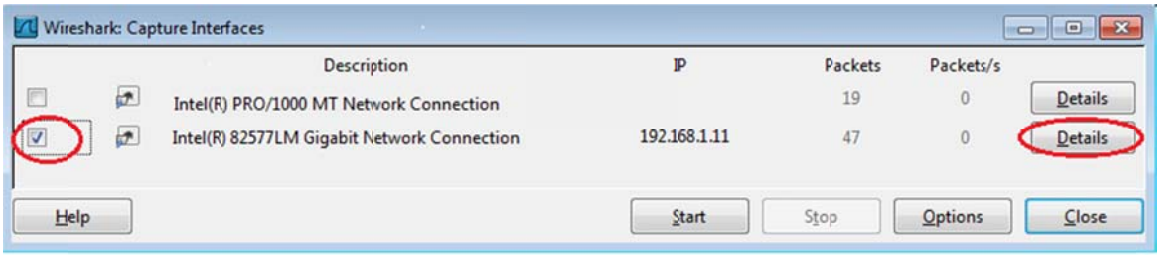
a. On your PC, click the Windows **Start** button to see Wireshark listed as one of the programs on the pop-up menu. Double-click **Wireshark**.

b. After Wireshark starts, click **Interface List**.

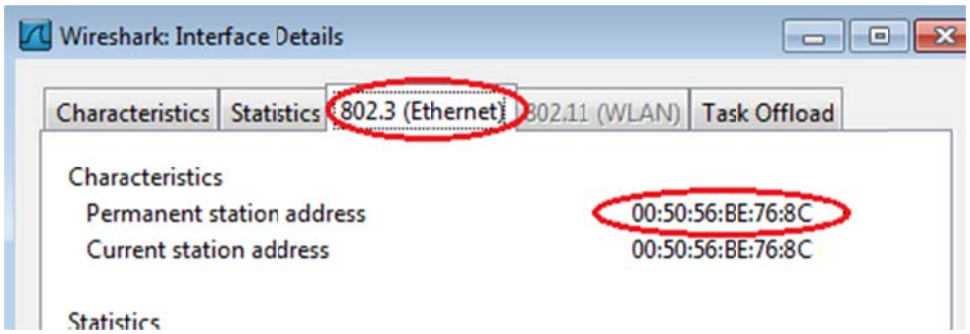


Note: Clicking the first interface icon in the row of icons also opens the Interface List.

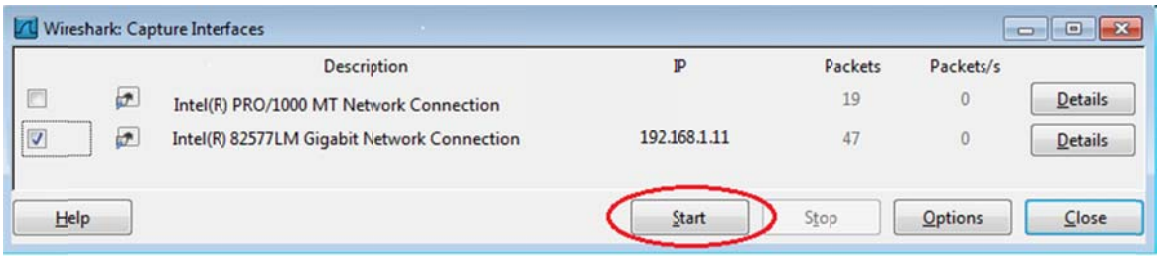
c. On the Wireshark: Capture Interfaces window, click the check box next to the interface connected to your LAN.



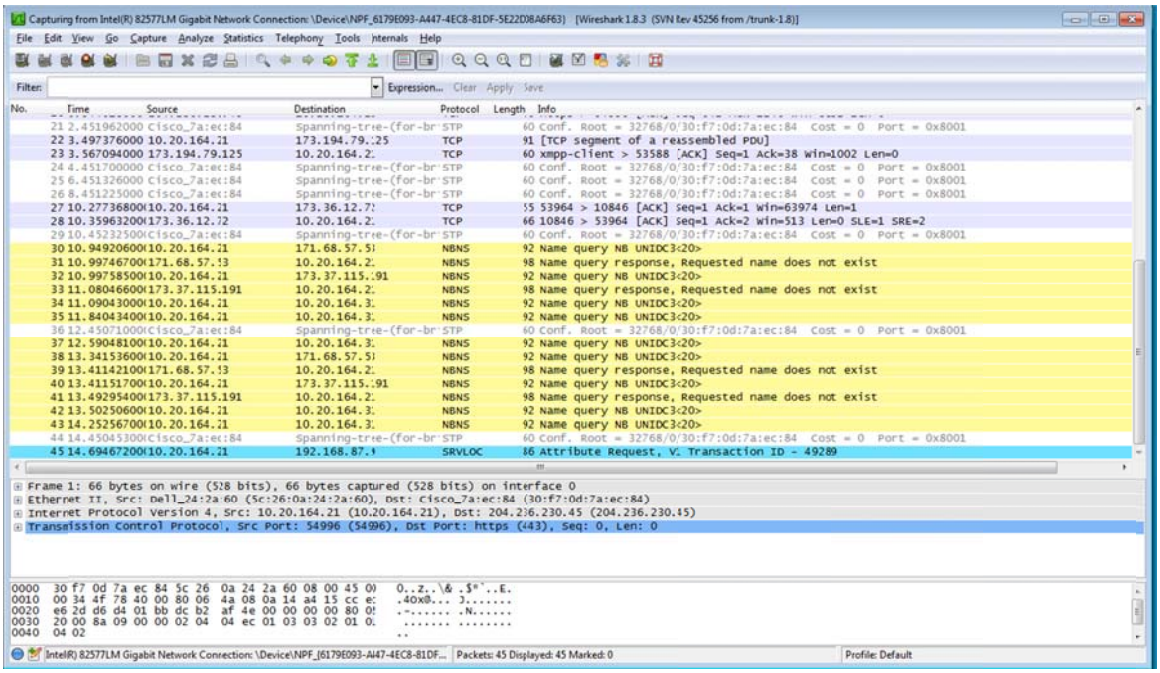
Note: If multiple interfaces are listed and you are unsure which interface to check, click the **Details** button, and then click the **802.3 (Ethernet)** tab. Verify that the MAC address matches what you noted in Step 1b. Close the Interface Details window after verifying the correct interface.



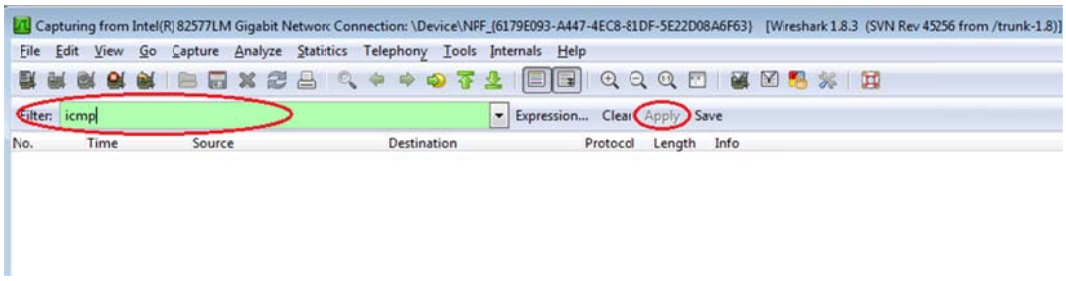
d. After you have checked the correct interface, click **Start** to start the data capture.



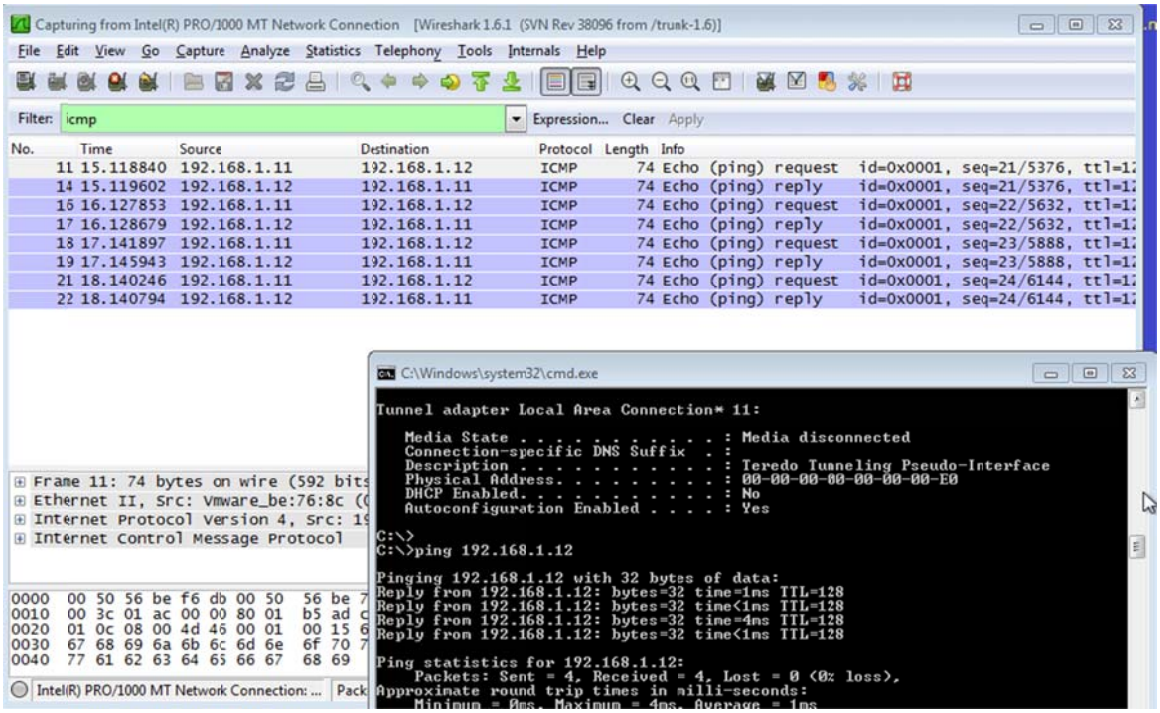
Information will start scrolling down the top section in Wireshark. The data lines will appear in different colors based on protocol.



e. This information can scroll by very quickly depending on what communication is taking place between your PC and the LAN. We can apply a filter to make it easier to view and work with the data that is being captured by Wireshark. For this lab, we are only interested in displaying ICMP (ping) PDUs. Type **icmp** in the Filter box at the top of Wireshark and press Enter or click on the **Apply** button to view only ICMP (ping) PDUs.

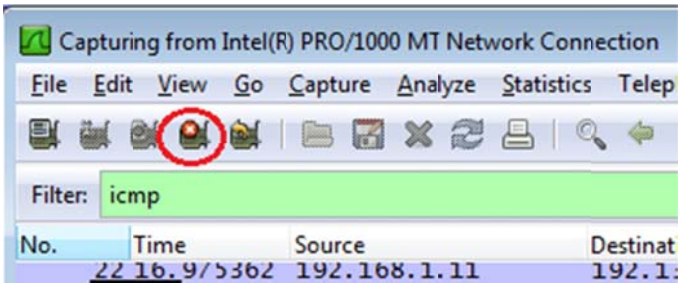


f. This filter causes all data in the top window to disappear, but you are still capturing the traffic on the interface. Bring up the command prompt window that you opened earlier and ping the IP address that you received from your team member. Notice that you start seeing data appear in the top window of Wireshark again.



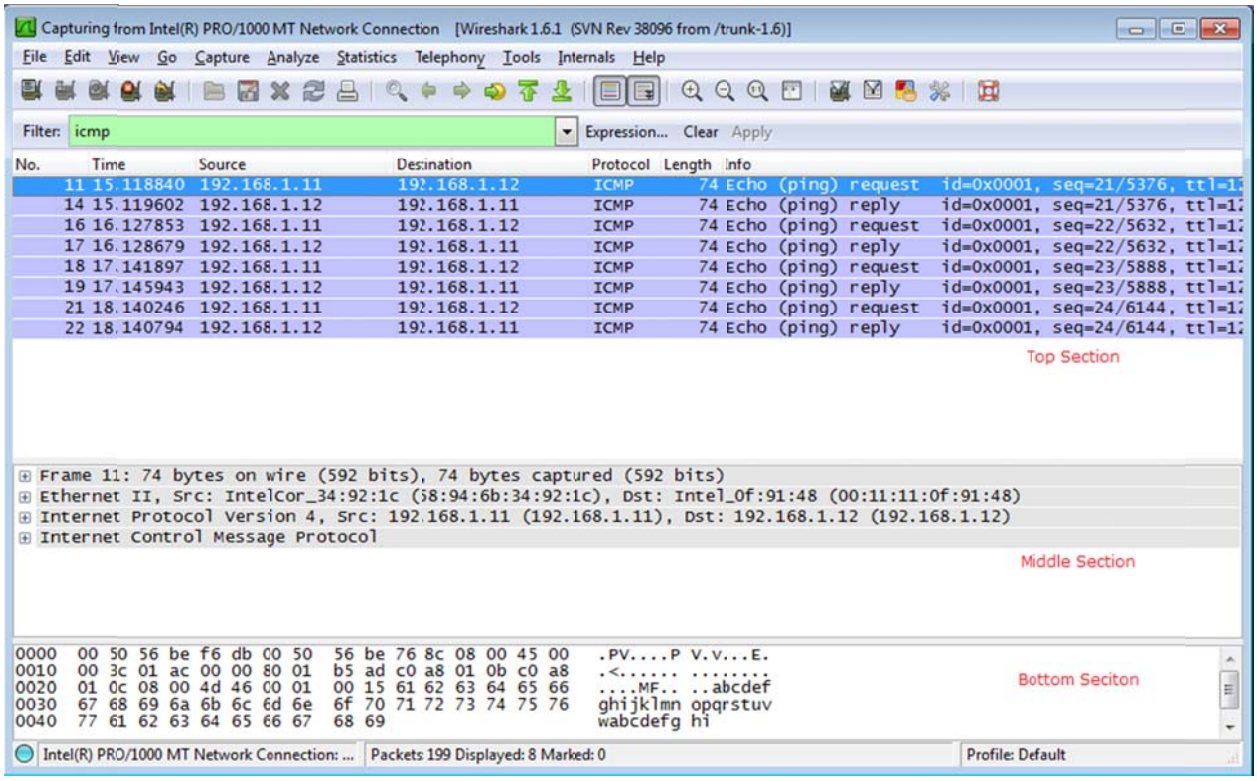
Note: If your team member's PC does not reply to your pings, this may be because their PC firewall is blocking these requests. Please see Appendix A: Allowing ICMP Traffic Through a Firewall for information on how to allow ICMP traffic through the firewall using Windows 7.

g. Stop capturing data by clicking the **Stop Capture** icon.

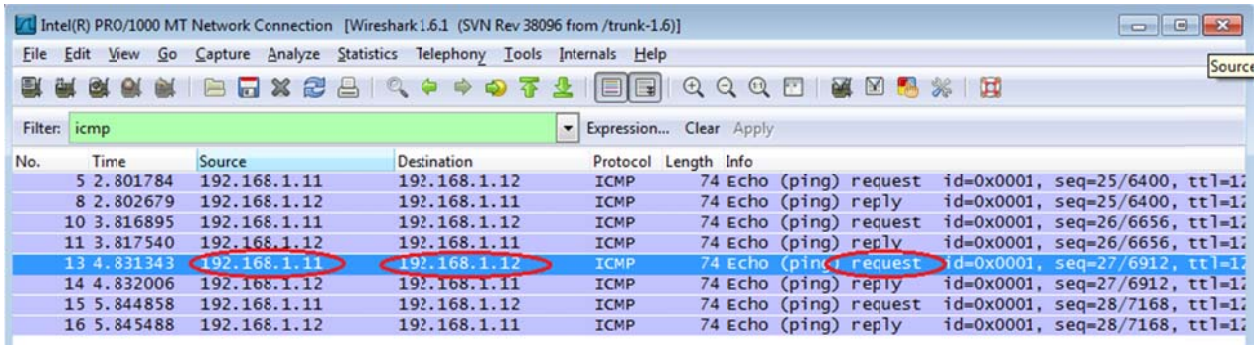


Step 3: Examine the captured data.

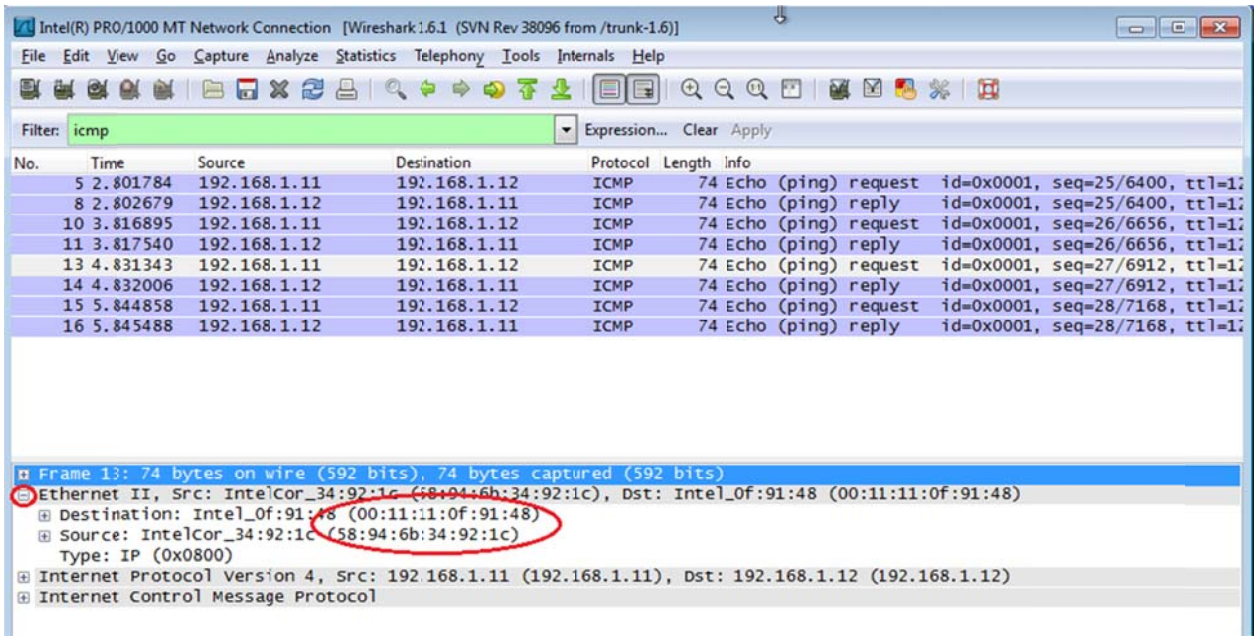
In Step 3, examine the data that was generated by the ping requests of your team member's PC. Wireshark data is displayed in three sections: 1) The top section displays the list of PDU frames captured with a summary of the IP packet information listed, 2) the middle section lists PDU information for the frame selected in the top part of the screen and separates a captured PDU frame by its protocol layers, and 3) the bottom section displays the raw data of each layer. The raw data is displayed in both hexadecimal and decimal form.



a. Click the first ICMP request PDU frames in the top section of Wireshark. Notice that the Source column has your PC's IP address, and the Destination contains the IP address of the teammate's PC you pinged.



b. With this PDU frame still selected in the top section, navigate to the middle section. Click the plus sign to the left of the Ethernet II row to view the Destination and Source MAC addresses.



Does the Source MAC address match your PC's interface? _____ Yes

Does the Destination MAC address in Wireshark match the MAC address that of your team member's?

_____ Yes

How is the MAC address of the pinged PC obtained by your PC?

_____

The MAC address is obtained through an ARP request.

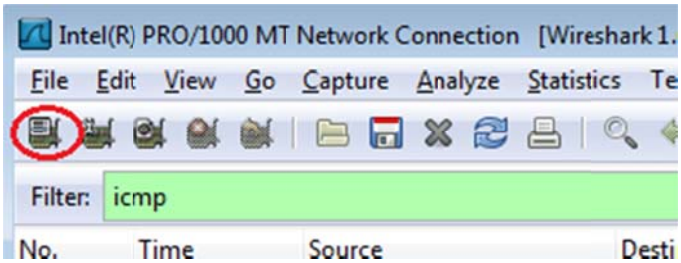
Note: In the preceding example of a captured ICMP request, ICMP data is encapsulated inside an IPv4 packet PDU (IPv4 header) which is then encapsulated in an Ethernet II frame PDU (Ethernet II header) for transmission on the LAN.

Part 3: Capture and Analyze Remote ICMP Data in Wireshark

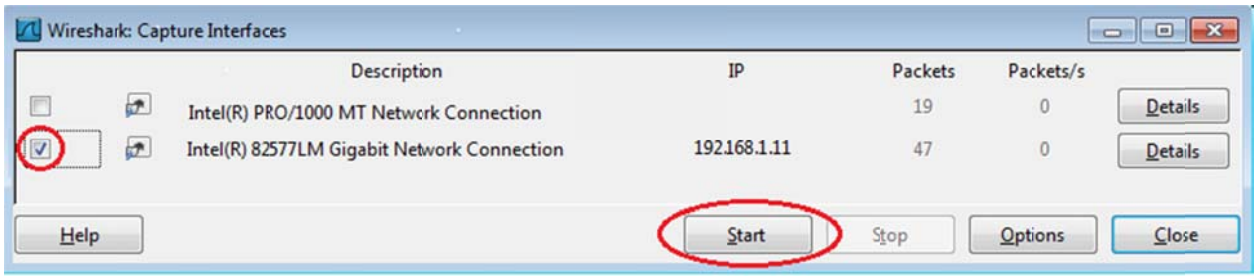
In Part 3, you will ping remote hosts (hosts not on the LAN) and examine the generated data from those pings. You will then determine what is different about this data from the data examined in Part 2.

Step 1: Start capturing data on interface.

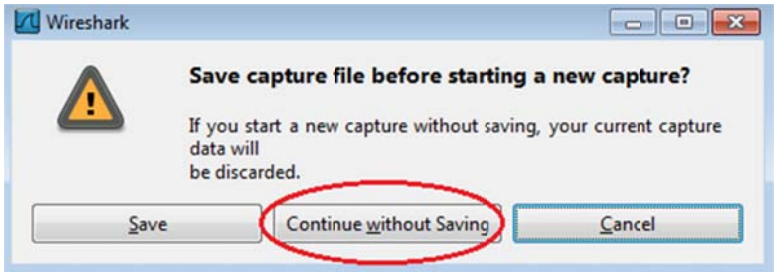
a. Click the **Interface List** icon to bring up the list PC interfaces again.



b. Make sure the check box next to the LAN interface is checked, and then click **Start**.

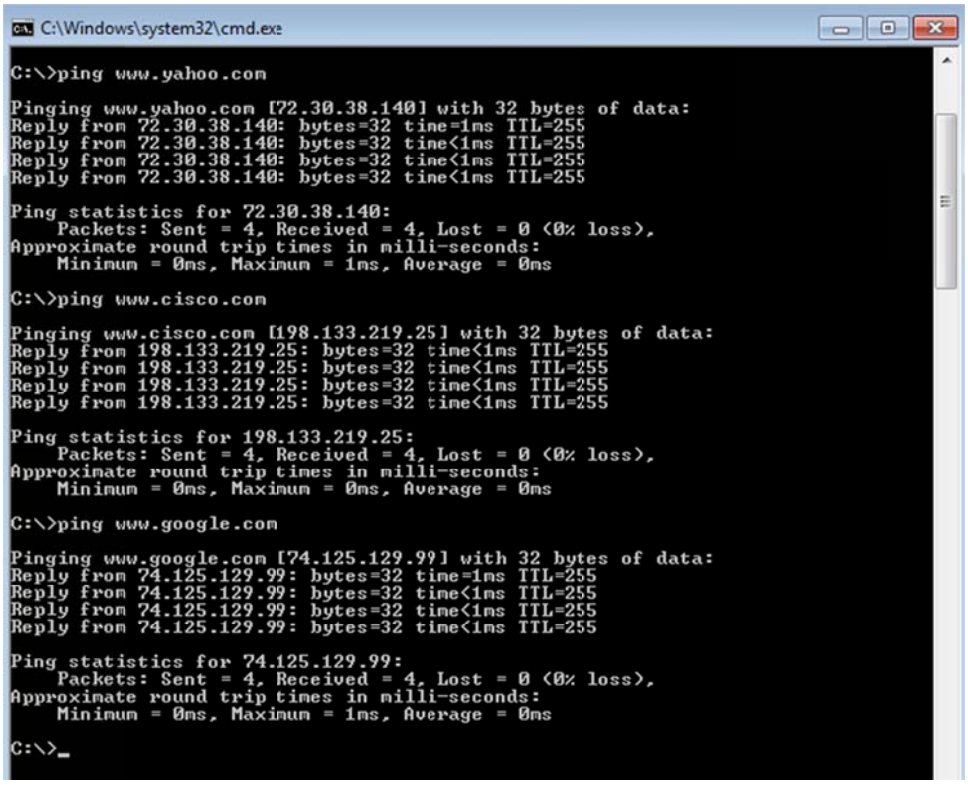


c. A window prompts to save the previously captured data before starting another capture. It is not necessary to save this data. Click **Continue without Saving**.



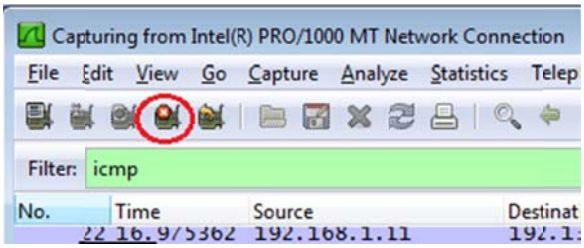
d. With the capture active, ping the following three website URLs:

1) www.yahoo.com
2) www.cisco.com
3) www.google.com



Note: When you ping the URLs listed, notice that the Domain Name Server (DNS) translates the URL to an IP address. Note the IP address received for each URL.

e. You can stop capturing data by clicking the **Stop Capture** icon.



Step 2: Examining and analyzing the data from the remote hosts.

a. Review the captured data in Wireshark, examine the IP and MAC addresses of the three locations that you pinged. List the destination IP and MAC addresses for all three locations in the space provided.

1st Location: IP: _____._____._____._____ MAC: ____:____:____:____:____:____

2nd Location: IP: _____._____._____._____ MAC: ____:____:____:____:____:____

3rd Location: IP: _____._____._____._____ MAC: ____:____:____:____:____:____

IP addresses: 72.30.38.140, 192.133.219.25, 74.125.129.99 (these IP addresses may vary)

MAC address: This will be the same for all three locations. It is the physical address of the router's default-gateway LAN interface.

b. What is significant about this information?

_____

The MAC addresses for all three locations are the same.

c. How does this information differ from the local ping information you received in Part 2?

_____

_____

A ping to a local host returns the MAC address of the PC's NIC. A ping to a remote host returns the MAC address of the default gateway's LAN interface.

Reflection

Why does Wireshark show the actual MAC address of the local hosts, but not the actual MAC address for the remote hosts?

_____

_____

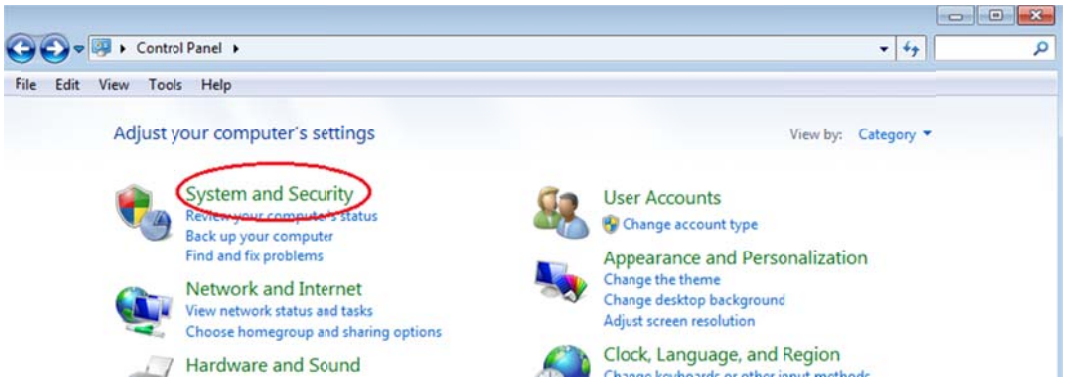
MAC addresses for remote hosts are not known on the local network, so the MAC address of the default-gateway is used. After the packet reaches the default-gateway router, the layer 2 information is stripped from the packet and a new Layer 2 header is attached with the destination MAC address of the next hop router.

Appendix A: Allowing ICMP Traffic Through a Firewall

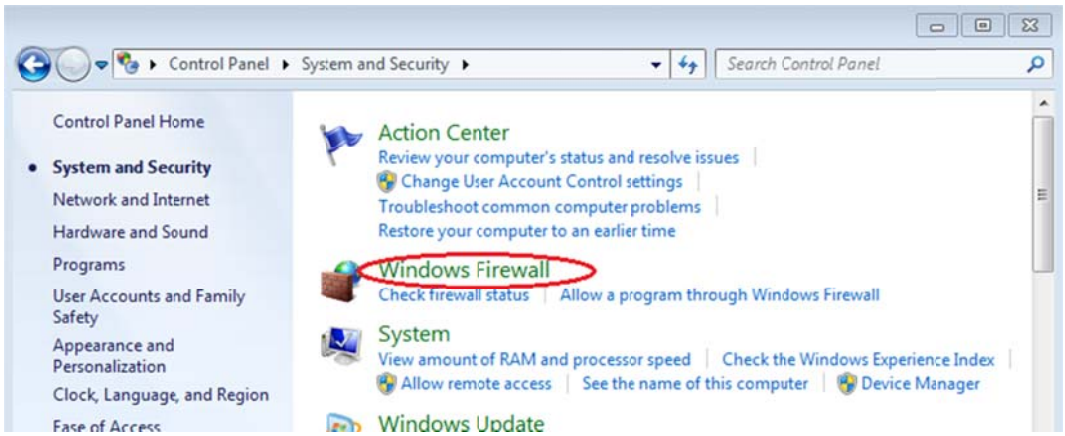
If the members of your team are unable to ping your PC, the firewall may be blocking those requests. This appendix describes how to create a rule in the firewall to allow ping requests. It also describes how to disable the new ICMP rule after you have completed the lab.

Step 1: Create a new inbound rule allowing ICMP traffic through the firewall.

a. From the Control Panel, click the **System and Security** option.

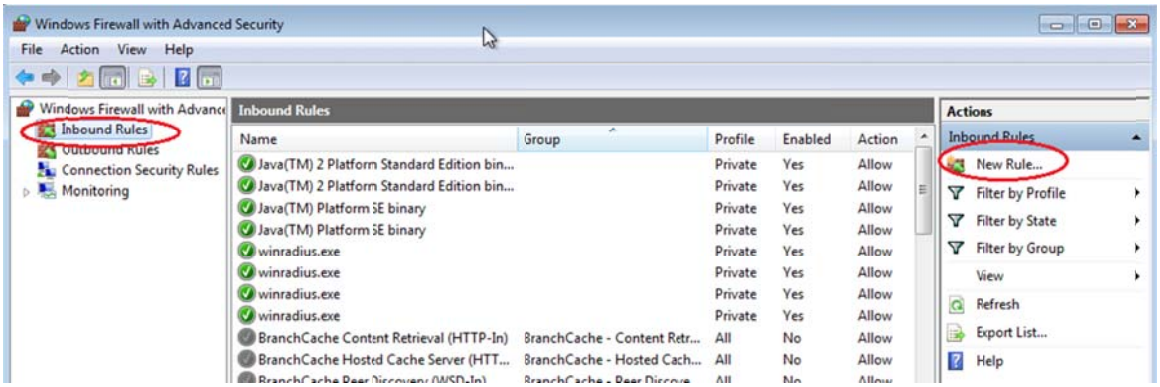


b. From the System and Security window, click **Windows Firewall**.

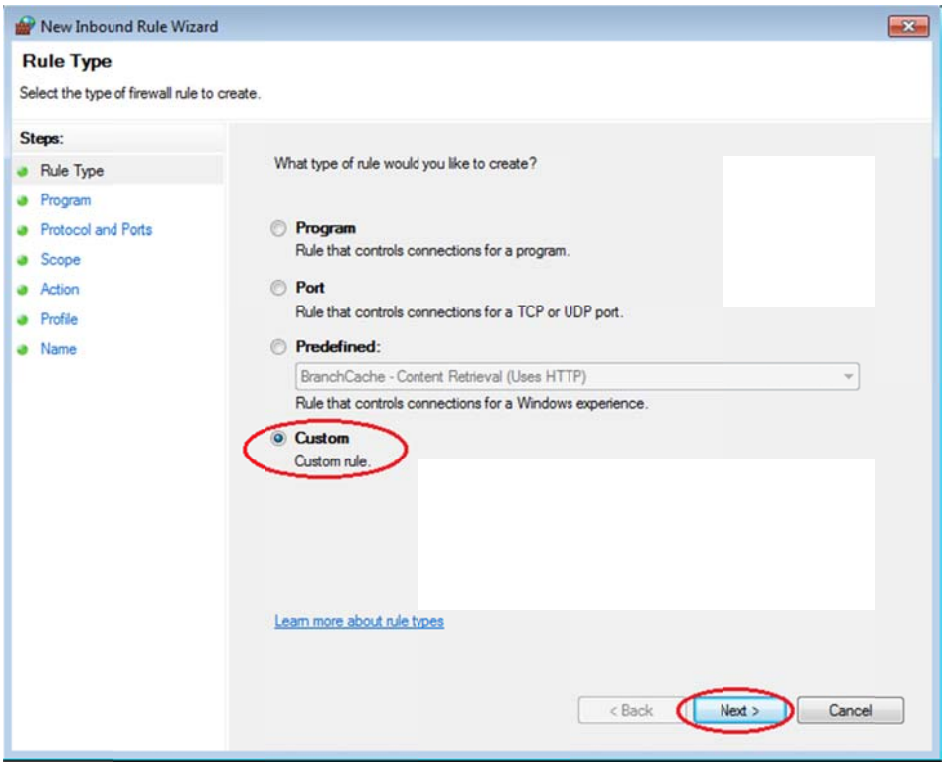


c. In the left pane of the Windows Firewall window, click **Advanced settings**.

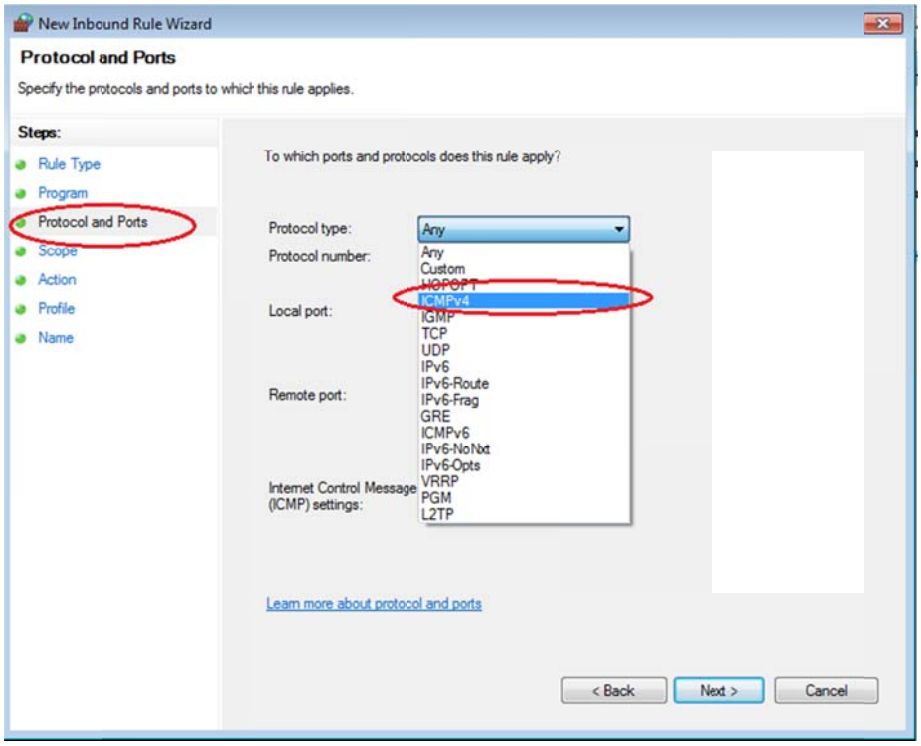
d. On the Advanced Security window, choose the **Inbound Rules** option on the left sidebar and then click **New Rule…** on the right sidebar.



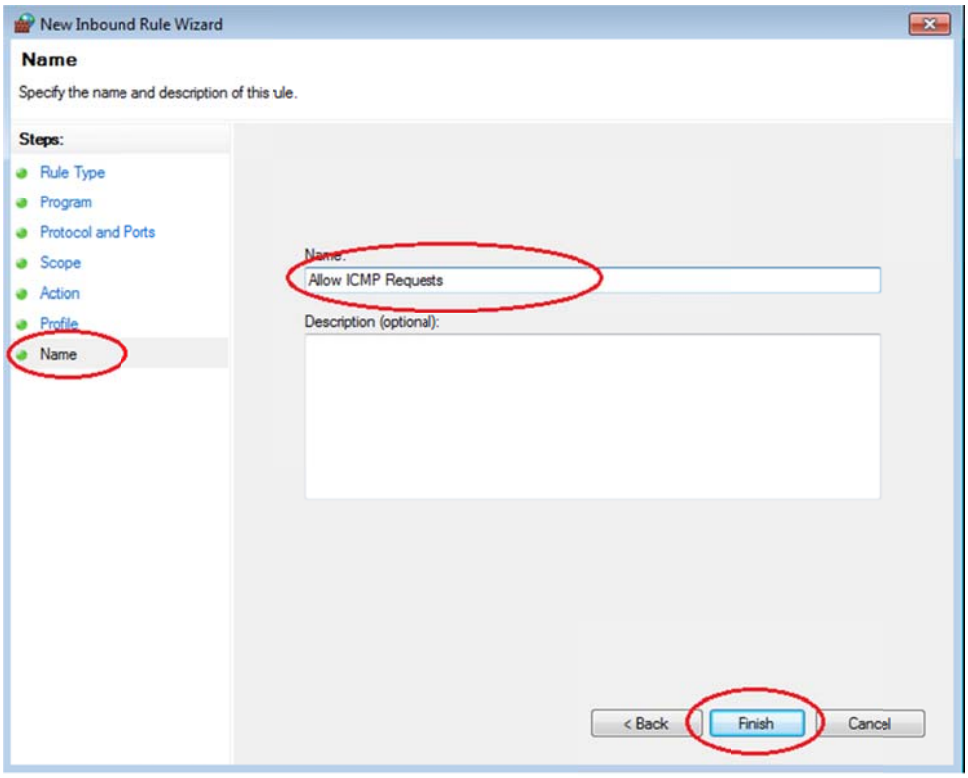
e. This launches the New Inbound Rule wizard. On the Rule Type screen, click the **Custom** radio button and click **Next**



f. In the left pane, click the **Protocol and Ports** option and using the Protocol type drop-down menu, select **ICMPv4**, and then click **Next**.



g. In the left pane, click the **Name** option and in the Name field, type **Allow ICMP Requests**. Click **Finish**.

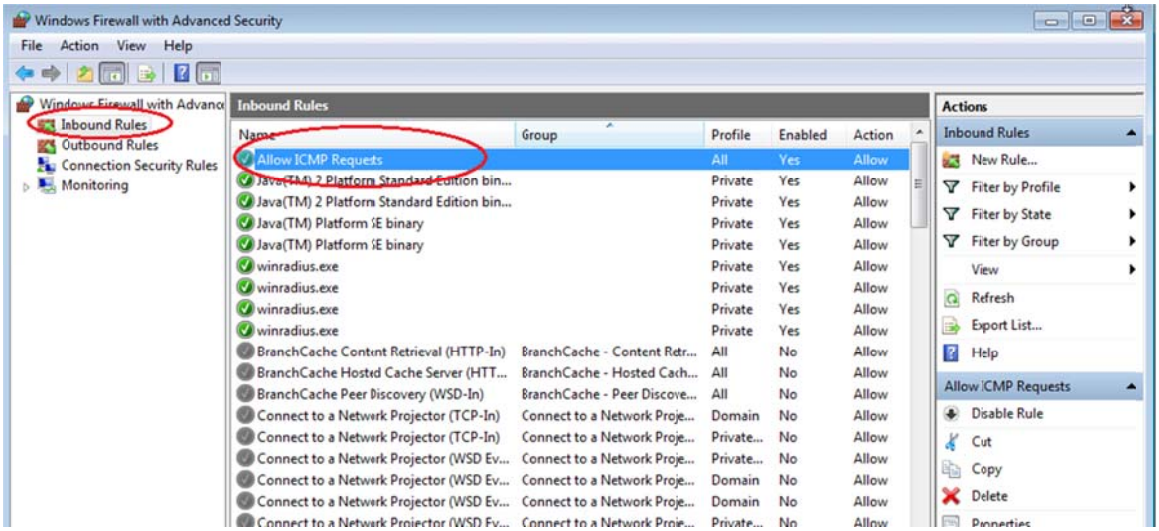


This new rule should allow your team members to receive ping replies from your PC.

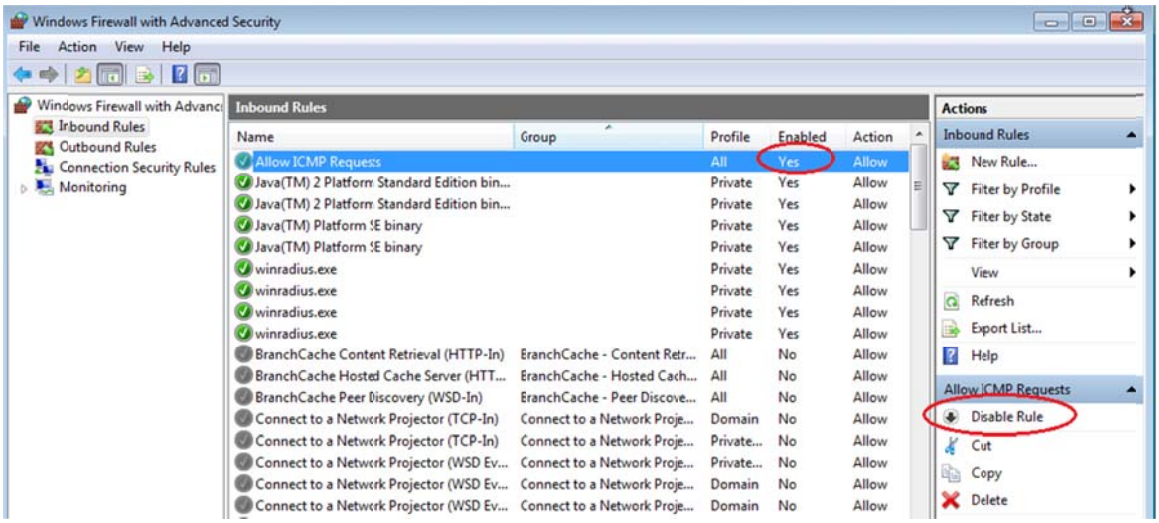
Step 2: Disabling or deleting the new ICMP rule.

After the lab is complete, you may want to disable or even delete the new rule you created in Step 1. Using the **Disable Rule** option allows you to enable the rule again at a later date. Deleting the rule permanently deletes it from the list of Inbound Rules.

a. On the Advanced Security window, in the left pane, click **Inbound Rules** and then locate the rule you created in Step 1.



b. To disable the rule, click the **Disable Rule** option. When you choose this option, you will see this option change to **Enable Rule**. You can toggle back and forth between Disable Rule and Enable Rule; the status of the rule also shows in the Enabled column of the Inbound Rules list.



c. To permanently delete the ICMP rule, click **Delete**. If you choose this option, you must re-create the rule again to allow ICMP replies.