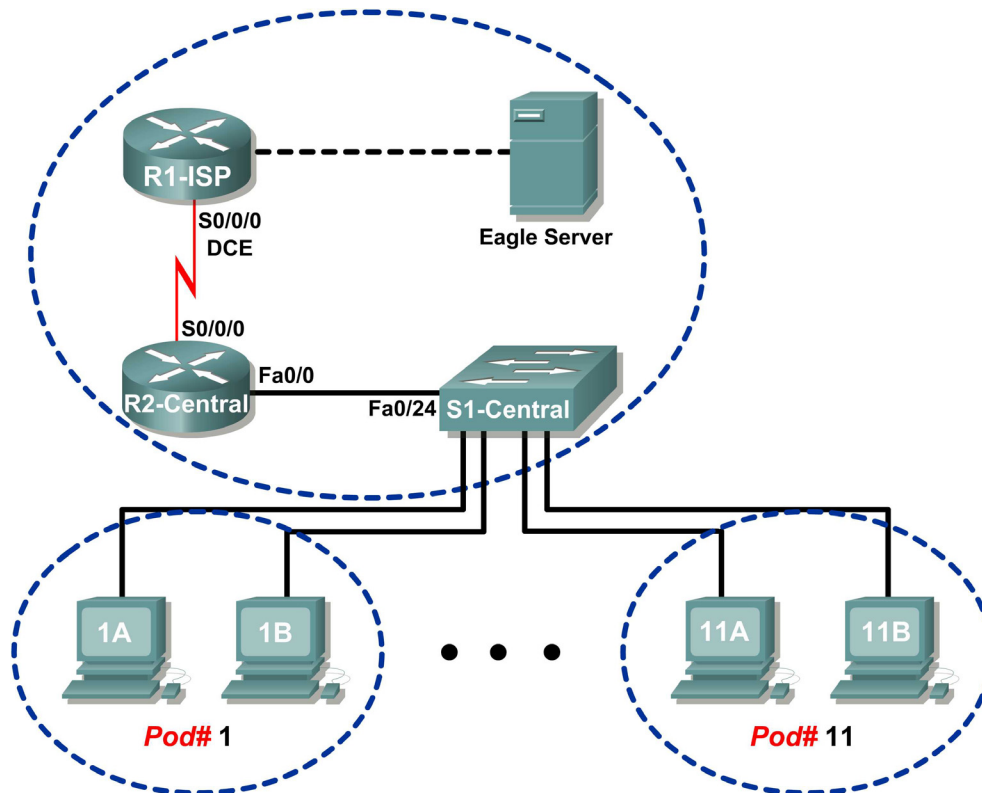


Lab 7.5.2: Frame Examination

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1-ISP	S0/0/0	10.10.10.6	255.255.255.252	N/A
	Fa0/0	192.168.254.253	255.255.255.0	N/A
R2-Central	S0/0/0	10.10.10.5	255.255.255.252	N/A
	Fa0/0	172.16.255.254	255.255.0.0	N/A
Eagle Server	N/A	192.168.254.254	255.255.255.0	192.168.254.253
	N/A	172.31.24.254	255.255.255.0	N/A
hostPod#A	N/A	172.16.Pod#.1	255.255.0.0	172.16.255.254
hostPod#B	N/A	172.16.Pod#.2	255.255.0.0	172.16.255.254
S1-Central	N/A	172.16.254.1	255.255.0.0	172.16.255.254

Learning Objectives

Upon completion of this lab, you will be able to:

- Explain the header fields in an Ethernet II frame.
- Use Wireshark to capture and analyze Ethernet II frames.

Background

When upper layer protocols communicate with each other, data flows down the OSI layers and is encapsulated into a Layer 2 frame. The frame composition is dependent on the media access type. For example, if the upper layer protocol is TCP/IP and the media access is Ethernet, then the Layer 2 frame encapsulation will be Ethernet II.

When learning about Layer 2 concepts, it is helpful to analyze frame header information. The Ethernet II frame header will be examined in this lab. Ethernet II frames can support various upper layer protocols, such as TCP/IP.

Scenario

Wireshark will be used to capture and analyze Ethernet II frame header fields. If Wireshark has not been loaded on the host pod computer, it can be downloaded from URL ftp://eagle-server.example.com/pub/eagle_labs/eagle1/chapter7/, file `wireshark-setup-0.99.4.exe`.

The Windows `ping` command will be used to generate network traffic for Wireshark to capture.

Task 1: Explain the Header Fields in an Ethernet II Frame.

The format for an Ethernet II frame is shown in Figure 1.

Ethernet II Frame Format					
Preamble	Destination Address	Source Address	Frame Type	Data	FCS
8 Octets	6 Octets	6 Octets	2 Octets	46- 1500 Octets	4 Octets

Figure 1. Ethernet II Frame Format

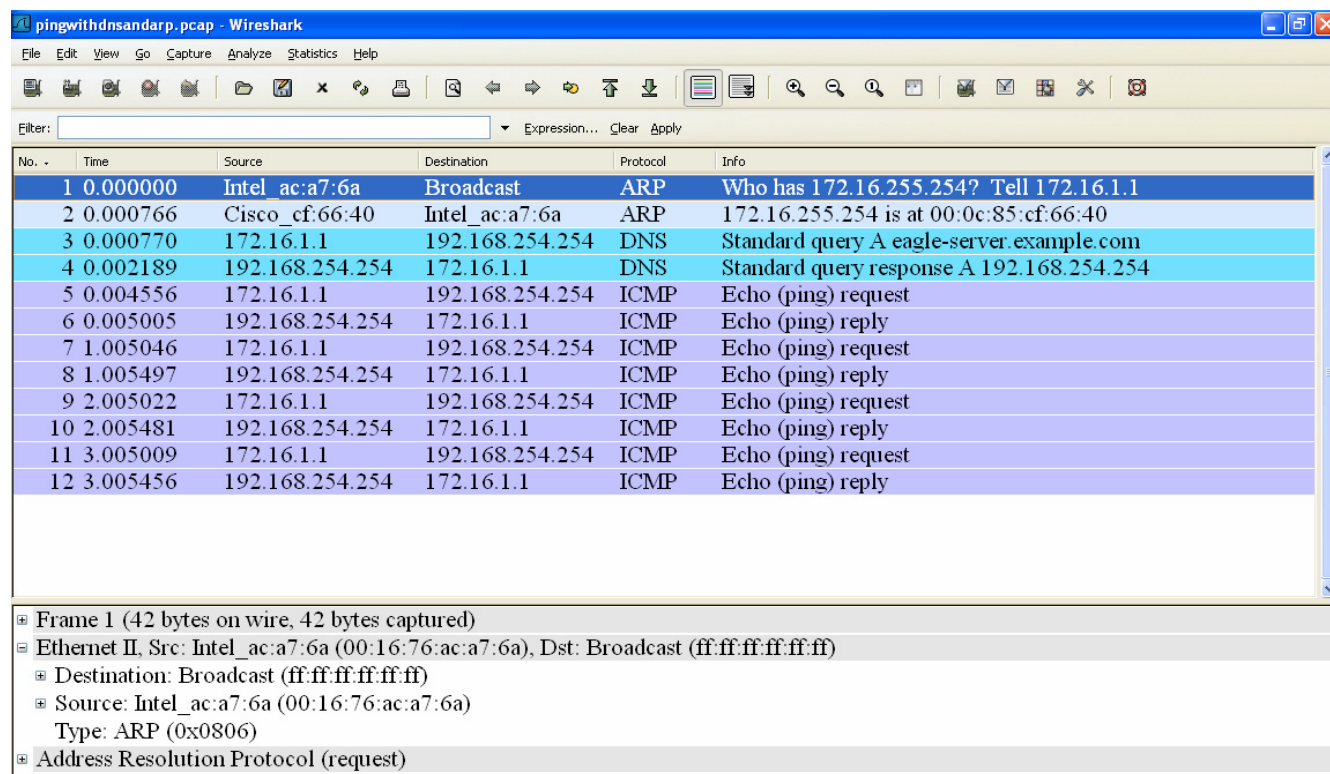


Figure 2. Wireshark Capture of the ping Command

In Figure 2, the Panel List window shows a Wireshark capture of the **ping** command between a pod host computer and Eagle Server. The session begins with the ARP protocol querying for the MAC address of the Gateway router, followed by a DNS query. Finally, the **ping** command issues echo requests.

In Figure 2, the Packet Details window shows Frame 1 detail information. Using this window, the following Ethernet II frame information can be obtained:

Field	Value	Description
Preamble	Not shown in capture.	This field contains synchronizing bits, processed by the NIC hardware.
Destination Address	ff:ff:ff:ff:ff:ff	Layer 2 addresses for the frame. Each address is 48 bits long, or 6 bytes, expressed as 12 hexadecimal digits, 0–9, A–F. A common format is 12:34:56:78:9A:BC. The first six hex numbers indicate the manufacturer of the network interface card (NIC). Refer to http://www.neotechcc.org/forum/macid.htm for a list of vendor codes. The last six hex digits, ac:a7:6a, are the serial number of the NIC. The destination address may be a broadcast which contains all 1s or unicast. The source address is always unicast.
Source Address	00:16:76:ac:a7:6a	
Frame Type	0x0806	For Ethernet II frames, this field contains a hexadecimal value that is used to indicate the type of upper layer protocol in the data field. There are numerous upper layer protocols supported by Ethernet II. Two common frame

Field	Value	Description
		types are: <div> <div>Value</div> <div>Description</div> <div>0x0800</div> <div>IPv4 Protocol</div> <div>0x0806</div> <div>Address resolution protocol (ARP)</div> </div>
Data	ARP	Contains the encapsulated upper level protocol. The data field is between 46 – 1500 bytes.
FCS	Not shown in capture.	Frame Check Sequence, used by the NIC to identify errors during transmission. The value is computed by the sending machine, encompassing frame addresses, type, and data field. It is verified by the receiver.

What is the significance of all 1s in the destination address field?

From the information contained in the Packet List window for the **first** frame, answer the following questions about the destination and source MAC address:

Destination Address:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

Source Address:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

From the information contained in the Packet List window for the **second** frame, answer the following questions about the destination and source MAC address:

Destination Address:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

Source Address:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

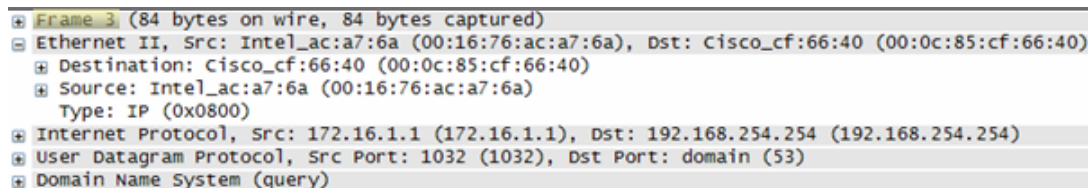


Figure 3. Frame 3 Fields

Figure 3 contains an exploded view of the Frame 3 Wireshark capture. Use the information to complete the following table:

Field	Value
Preamble	
Destination Address	
Source Address	
Frame Type	
Data	
FCS	

In the following task, Wireshark will be used to capture and analyze packets captured on the pod host computer.

Task 2: Use Wireshark to Capture and Analyze Ethernet II Frames.

Step 1: Configure Wireshark for packet captures.

Prepare Wireshark for captures. Click **Capture > Interfaces**, and then click the start button that corresponds to the 172.16.x.y interface IP address. This will begin the packet capture.

Step 2: Start a ping to Eagle Server and capture the session.

Open a Windows terminal window. Click **Start > Run**, type `cmd`, and click **OK**.

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\> ping eagle-server.example.com

Pinging eagle-server.example.com [192.168.254.254] with 32 bytes of
data:

Reply from 192.168.254.254: bytes=32 time<1ms TTL=62
Reply from 192.168.254.254: bytes=32 time<1ms TTL=62
Reply from 192.168.254.254: bytes=32 time<1ms TTL=62
Reply from 192.168.254.254: bytes=32 time<1ms TTL=62

Ping statistics for 192.168.254.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Figure 4. Ping to eagle-server.example.com

Ping eagle-server.example.com, as shown in Figure 4. When the command has finished execution, stop Wireshark captures.

Step 3: Analyze the Wireshark capture.

The Wireshark Packet List window should start with an ARP request and reply for the MAC address of the Gateway. Next, a DNS request is made for the IP address of eagle-server.example.com. Finally, the `ping` command is executed. Your capture should look similar to the one shown in Figure 2.

Use your Wireshark capture of the `ping` command to answer the following questions:

Pod computer MAC address information:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

R2-Central MAC address information:

MAC address: _____
NIC manufacturer: _____
NIC serial number: _____

A student from another school would like to know the MAC address for Eagle Server. What would you tell the student?

What is the Ethernet II frame type value for an ARP Request? _____

What is the Ethernet II frame type value for an ARP Reply? _____

What is the Ethernet II frame type value for a DNS query? _____

What is the Ethernet II frame type value for a DNS query response? _____

What is the Ethernet II frame type value for an ICMP echo? _____

What is the Ethernet II frame type value for an ICMP echo reply? _____

Task 3: Challenge

Use Wireshark to capture sessions from other TCP/IP protocols, such as FTP and HTTP. Analyze the captured packets, and verify that the Ethernet II frame type remains `0x0800`.

Task 4: Reflection

In this lab, Ethernet II frame header information was examined. A preamble field contains seven bytes of alternating `0101` sequences, and one byte that signals the beginning of the frame, `01010110`. Destination and source MAC addresses each contain 12 hex digits. The first six hex digits contain the manufacturer of the NIC, and the last six hex digits contain the NIC serial number. If the frame is a broadcast, the destination MAC address contains all 1s. A 4-byte frame type field contains a value that indicates the protocol in the data field. For IPv4, the value is `0x0800`. The data field is variable and contains the encapsulated upper layer protocol. At the end of a frame, a 4-byte FCS value is used to verify that there were no errors during transmission.

Task 5: Clean Up.

Wireshark was installed on the pod host computer. If Wireshark needs to be uninstalled, click **Start > Control Panel**. Open **Add or Remove Programs**. Highlight Wireshark, and click **Remove**.

Remove any files created on the pod host computer during the lab.

Unless directed otherwise by the instructor, turn off power to the host computers. Remove anything that was brought into the lab, and leave the room ready for the next class.