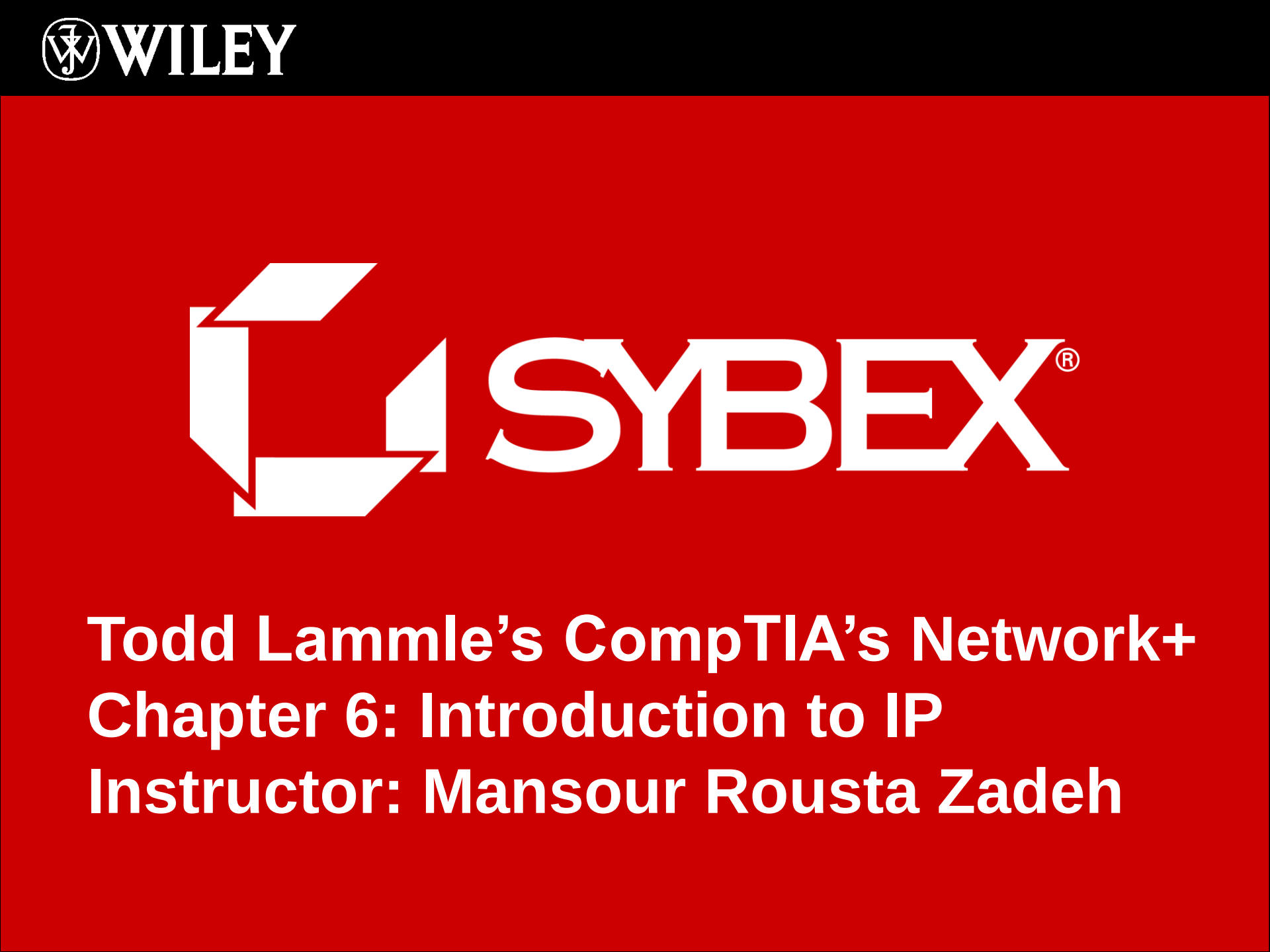



# Todd Lammle's CompTIA's Network+
# Chapter 6: Introduction to IP
# Instructor: Mansour Rousta Zadeh

# Chapter 6 Objectives

**The Following CompTIA Network+ Exam Objectives Are Covered in This Chapter:**

- **1.1 Explain the function of common networking protocols**
  - **TCP**
  - **FTP**
  - **UDP**
  - **TCP/IP suite**
  - **DHCP**
  - **TFTP**
  - **DNS**
  - **HTTP(S)**
  - **ARP**
  - **SIP (VoIP)**
  - **RTP (VoIP)**
  - **SSH**
  - **POP3**
  - **NTP**
  - **IMAP4**
  - **TELNET**
  - **SMTP**
  - **SMNP2/3**
  - **ICMP**
  - **IGMP**
  - **TLS**

# Chapter 6 Objectives (cont.)

- **1.2 Identify commonly used TCP and UDP default ports**

**TCP ports**

- FTP – 20, 21
- SSH – 22
- TELNET – 23
- SMTP – 25
- DNS – 53
- HTTP – 80
- POP3 – 110
- NTP – 123
- IMAP4 – 143
- HTTPS – 443

**UDP ports**

- TFTP – 69
- DNS – 53
- BOOTPS/DHCP – 67
- SNMP – 161

# Chapter 6 Objectives (cont.)

- **1.4 Given a scenario, evaluate the proper use of the following addressing technologies and addressing schemes**
  - **DHCP (static, dynamic APIPA)**

# What is TCP/IP?

- Because TCP/IP is so central to working with the Internet and intranets, it's essential for you to understand it in detail.
- TCP/IP first came on the scene in 1973. Later, in 1978, it was divided into two distinct protocols: TCP and IP.
- Then, back in 1983, TCP/IP replaced the Network Control Protocol (NCP) and was authorized as the official means of data transport for anything connecting to ARPAnet, the Internet's ancestor that was created by ARPA, the DoD's Advanced Research Projects Agency way back in 1957 in reaction to the Soviet's launching of Sputnik.
- ARPA was soon re-dubbed DARPA, and it was divided into ARPAnet and MILNET (also in 1983); both were finally dissolved in 1990.

# TCP/IP History

- Most of the development work on TCP/IP happened at UC Berkeley in Northern California, where a group of scientists were simultaneously working on the Berkeley version of UNIX, which soon became known as the BSD, or Berkeley Software Distribution series of UNIX versions.
- Of course, because TCP/IP worked so well, it was packaged into subsequent releases of BSD UNIX and offered to other universities and institutions if they bought the distribution tape.
- All of this led to the DoD model….

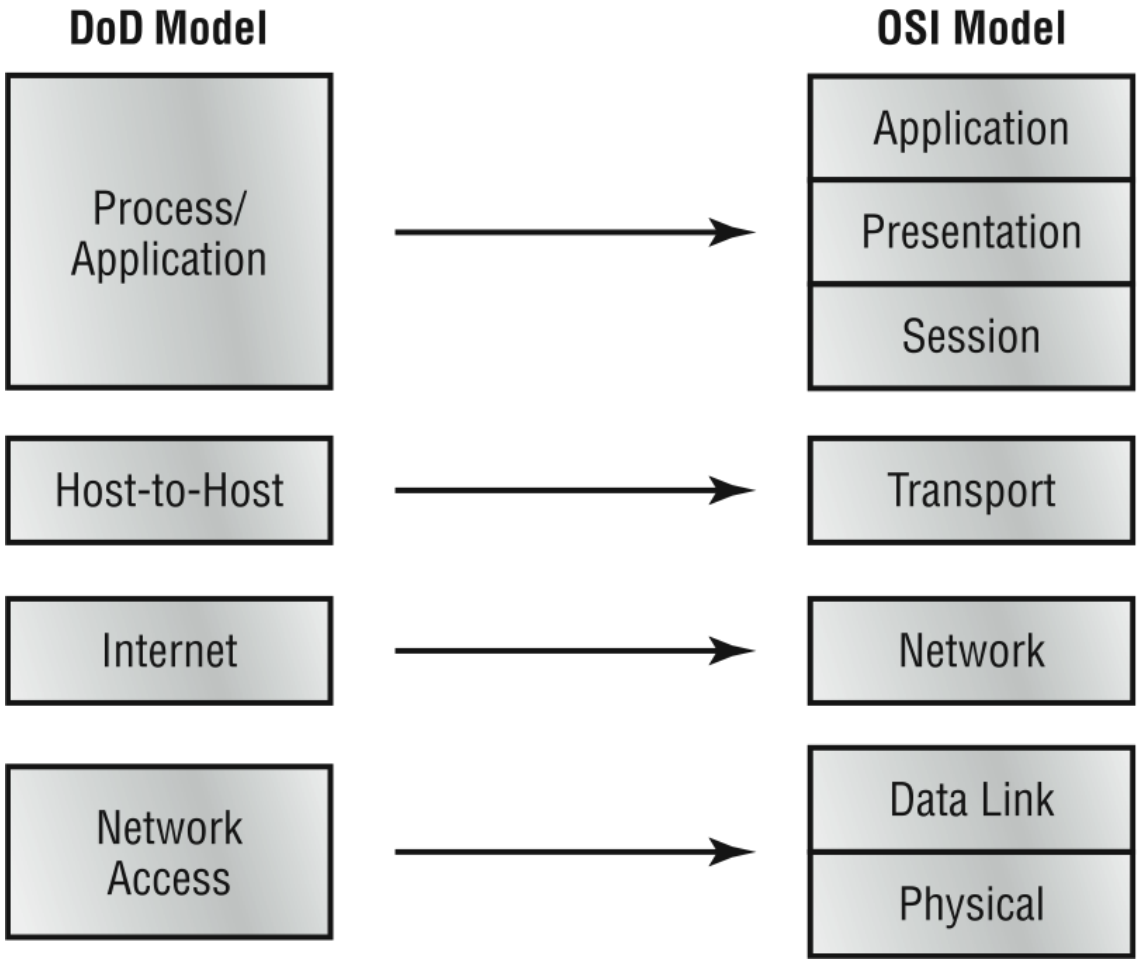
# DoD Model

The DoD model is basically a condensed version of the OSI model—it's composed of four, instead of seven, layers:

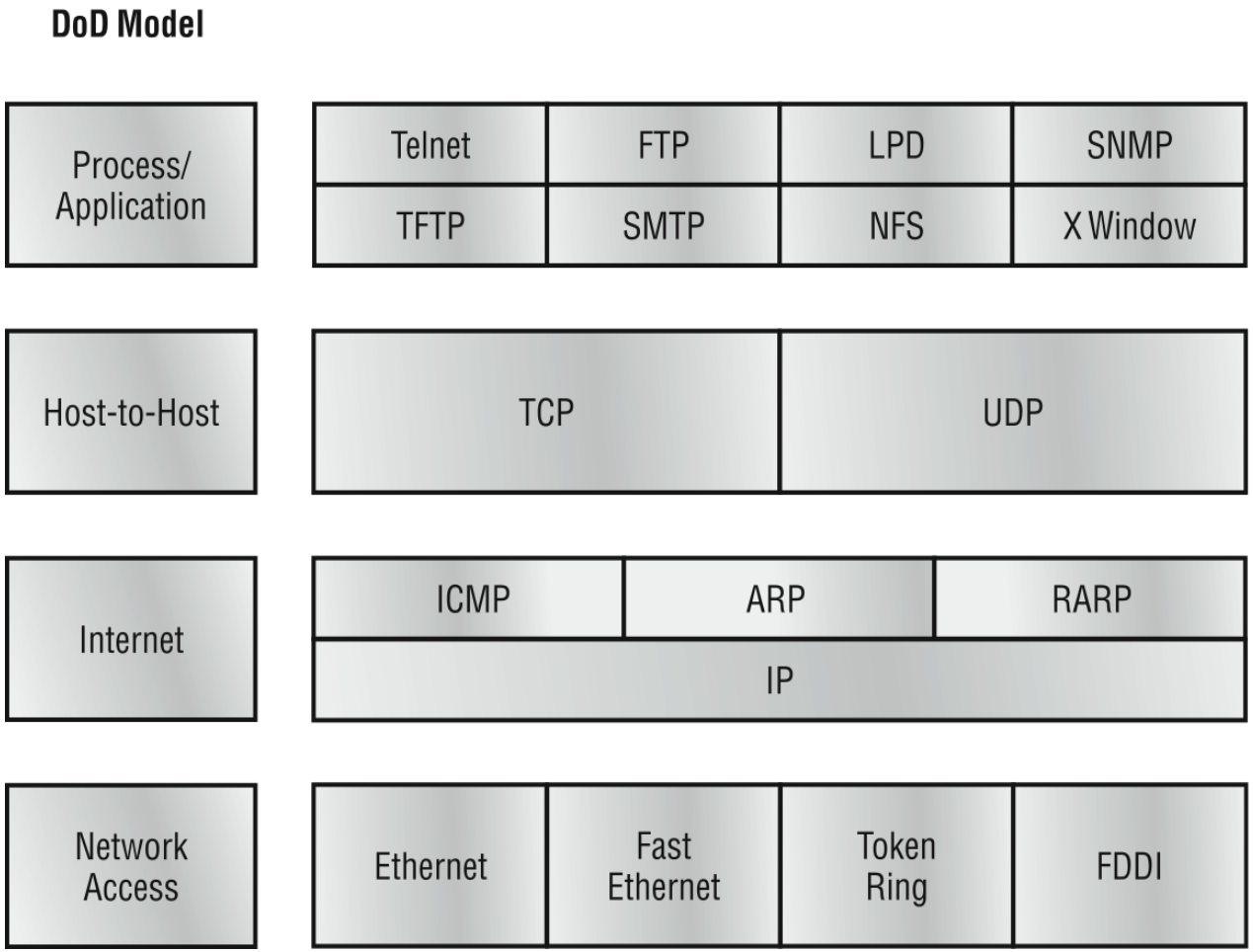
- Process/Application layer
- Host-to-Host layer
- Internet layer
- Network Access layer

- The figure on the next slide shows a comparison of the DoD model and the OSI reference model. As you can see, the two are similar in concept, but each has a different number of layers with different names.
- However, the DoD and OSI are so similar that the layer names are actually interchangeable.

# DoD Model


DoD Model
OSI Model
Process/ Application
Application
Presentation
Session
Host-to-Host
Transport
Internet
Network
Network Access
Data Link
Physical

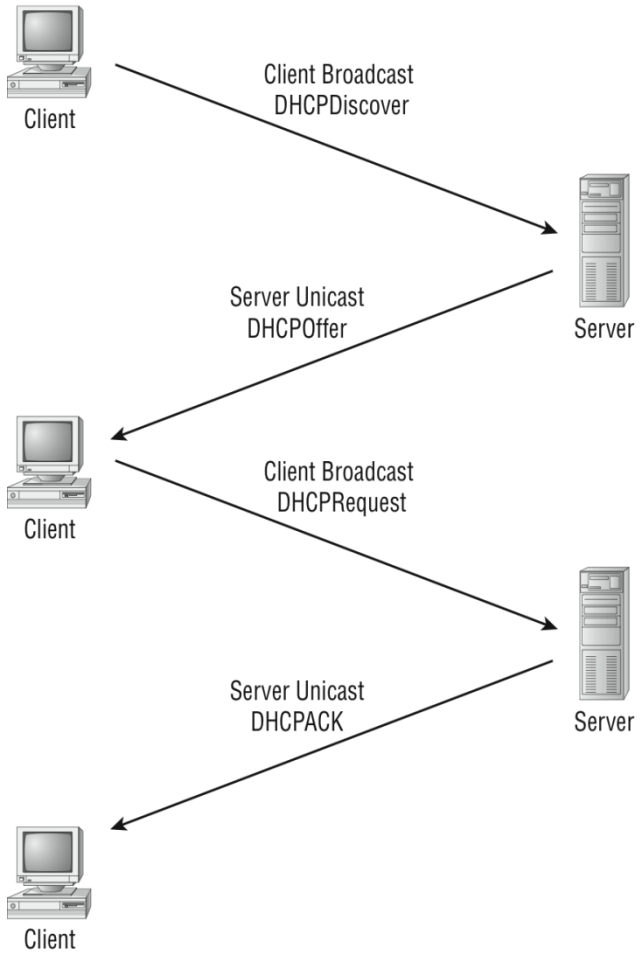
# TCP/IP Protocol Suite



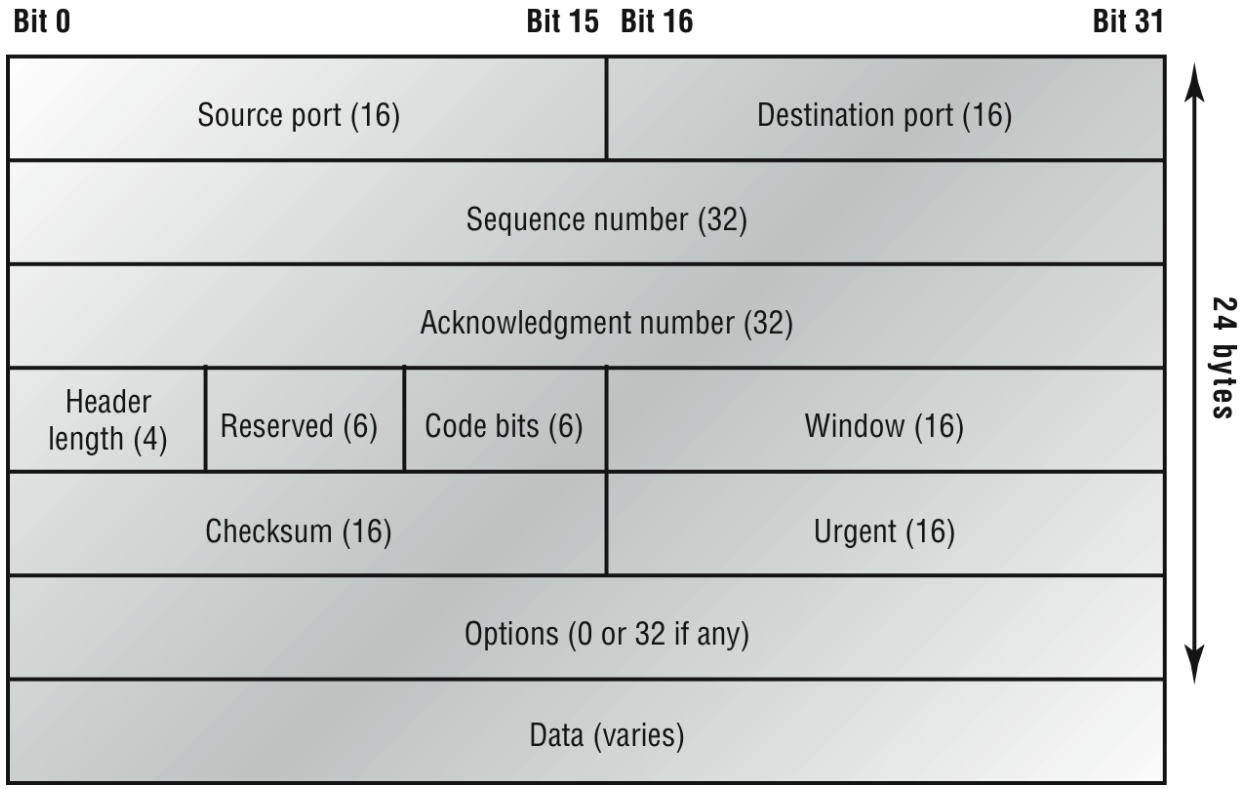
# TCP/IP Protocols (cont.)

- POP
- IMAP4
- TLS
- SIP
- RTP
- SSH
- HTTP
- HTTPS
- NTP
- NNTP
- LDAP
- IGMP
- DNS
- DHCP

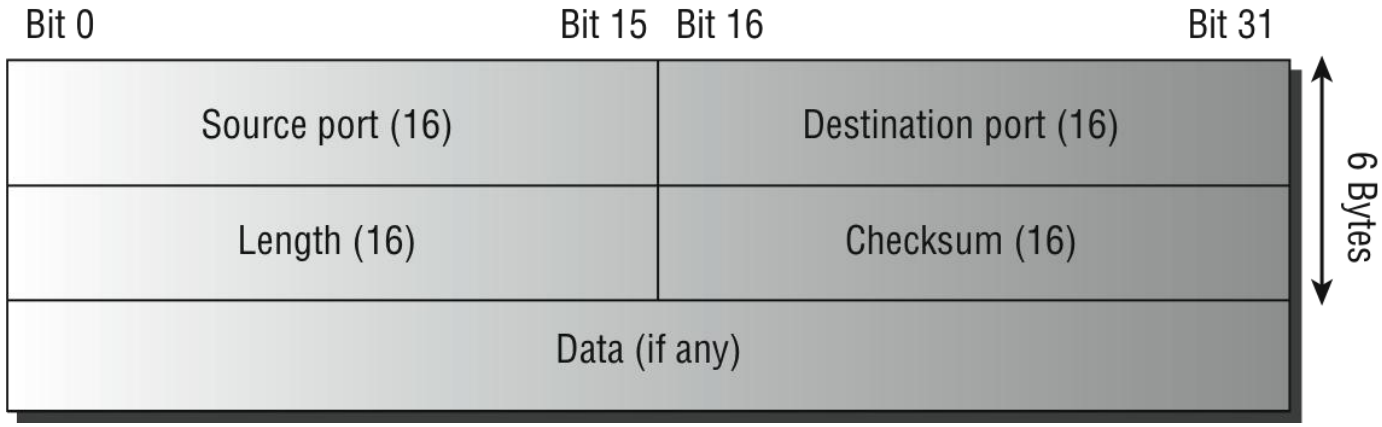
# DHCP Client four-step process



# TCP Segment


Bit 0
Bit 15
Bit 16
Bit 31
Source port (16)
Destination port (16)
Sequence number (32)
Acknowledgment number (32)
Header length (4)
Reserved (6)
Code bits (6)
Window (16)
Checksum (16)
Urgent (16)
Options (0 or 32 if any)
Data (varies)
24 bytes

# UDP Segment


Bit 0
Bit 15
Bit 16
Bit 31
Source port (16)
Destination port (16)
Length (16)
Checksum (16)
Data (if any)
6 Bytes

# TCP and UDP

**Table 6.1: Key Features of TCP and UDP**

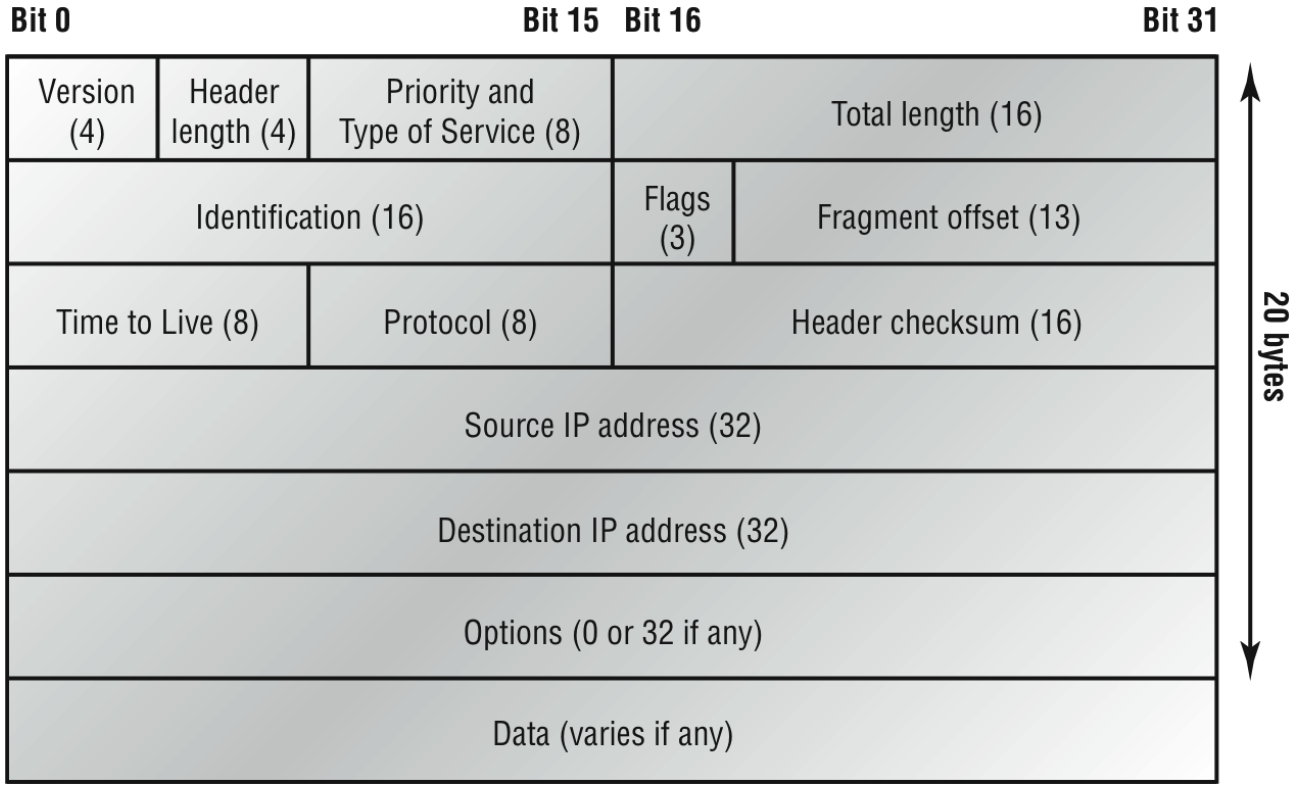
| TCP | UDP |
| --- | --- |
| Sequenced | Unsequenced |
| Reliable | Unreliable |
| Connection-oriented | Connectionless |
| Virtual circuit | No virtual circuit |
| High overhead | Low overhead |
| Acknowledgments | No acknowledgment |
| Windowing flow control | No windowing or flow c |

# Port Number Examples

**Table 6.2: Key Protocols That Use TCP and UDP**

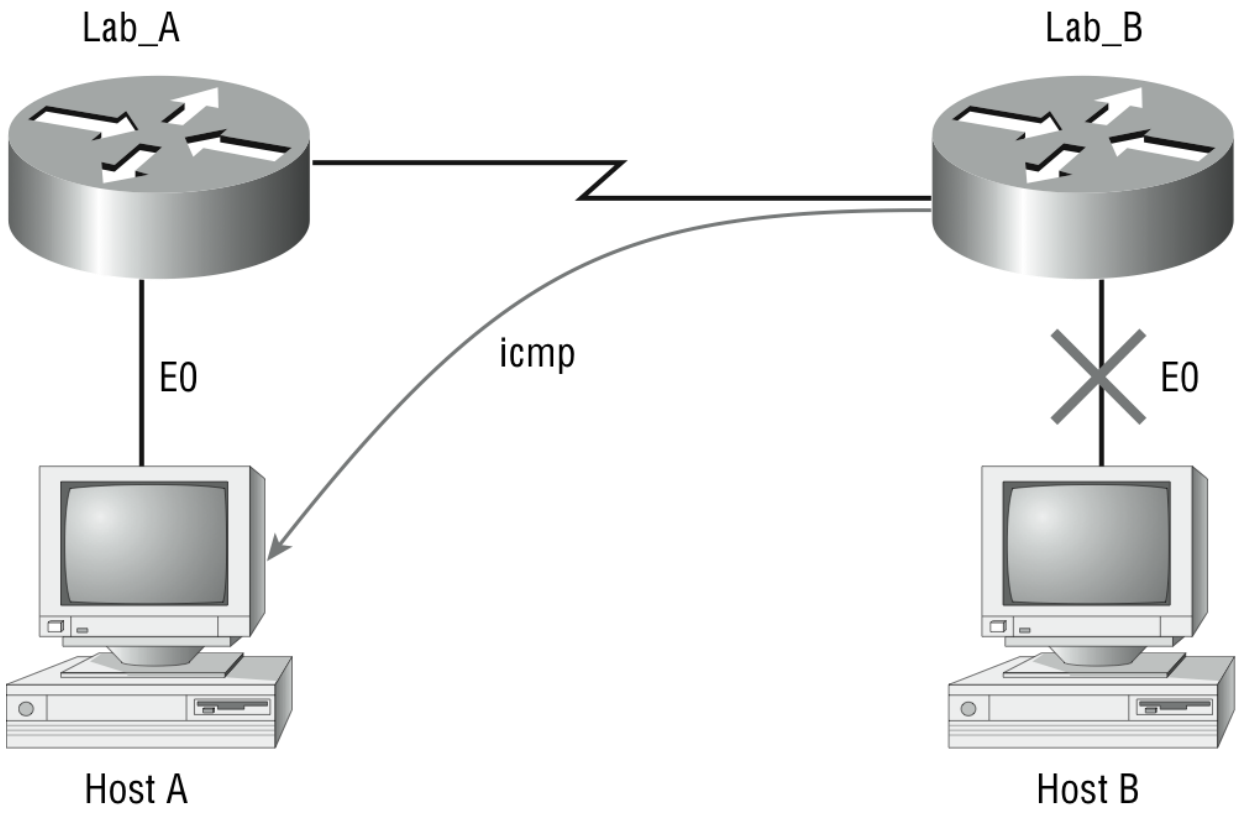
| TCP | UDP |
|---|---|
| Telnet 23 | SNMP 161 |
| SMTP 25 | TFTP 69 |
| HTTP 80 | DNS 53 |
| FTP 20, 21 | BOOTPS/DHCP 67 |
| DNS 53 | |
| HTTPS 443 | |
| SSH 22 | |
| POP3 110 | |
| NTP 123 | |
| IMAP4 143 | |

# IP Header

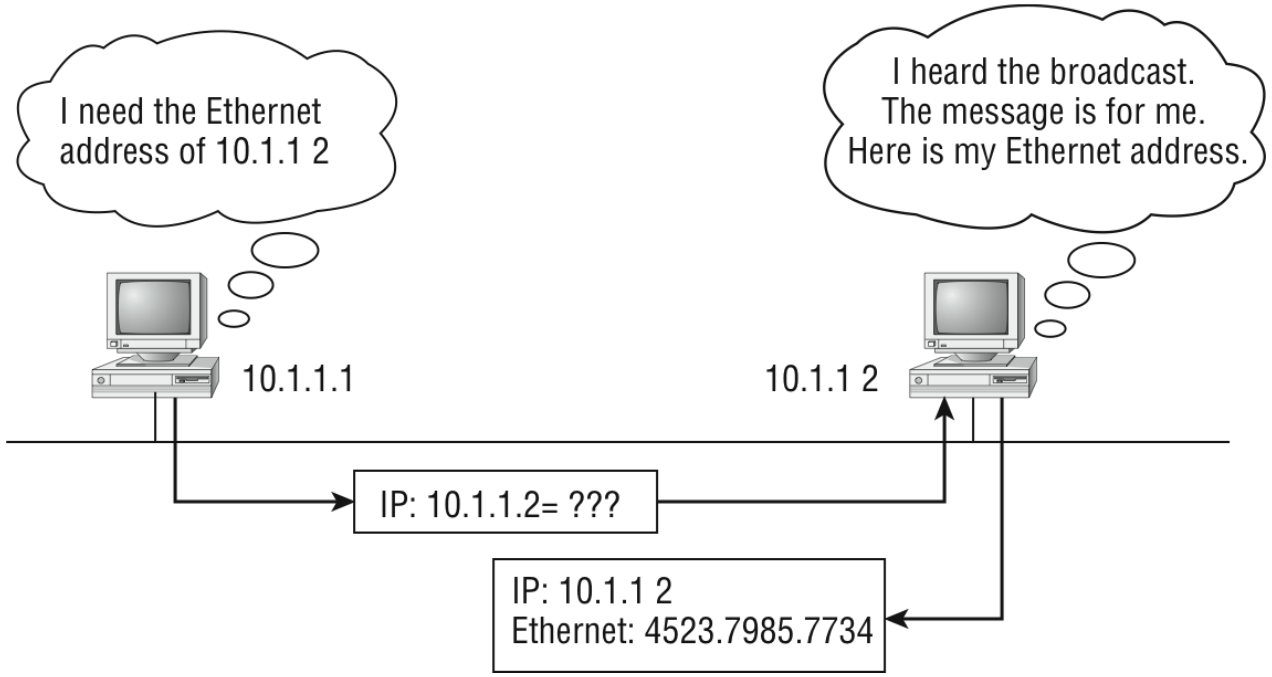

Bit 0
Bit 15
Bit 16
Bit 31
Version (4)
Header length (4)
Priority and Type of Service (8)
Total length (16)
Identification (16)
Flags (3)
Fragment offset (13)
Time to Live (8)
Protocol (8)
Header checksum (16)
Source IP address (32)
Destination IP address (32)
Options (0 or 32 if any)
Data (varies if any)
20 bytes

# ICMP Example

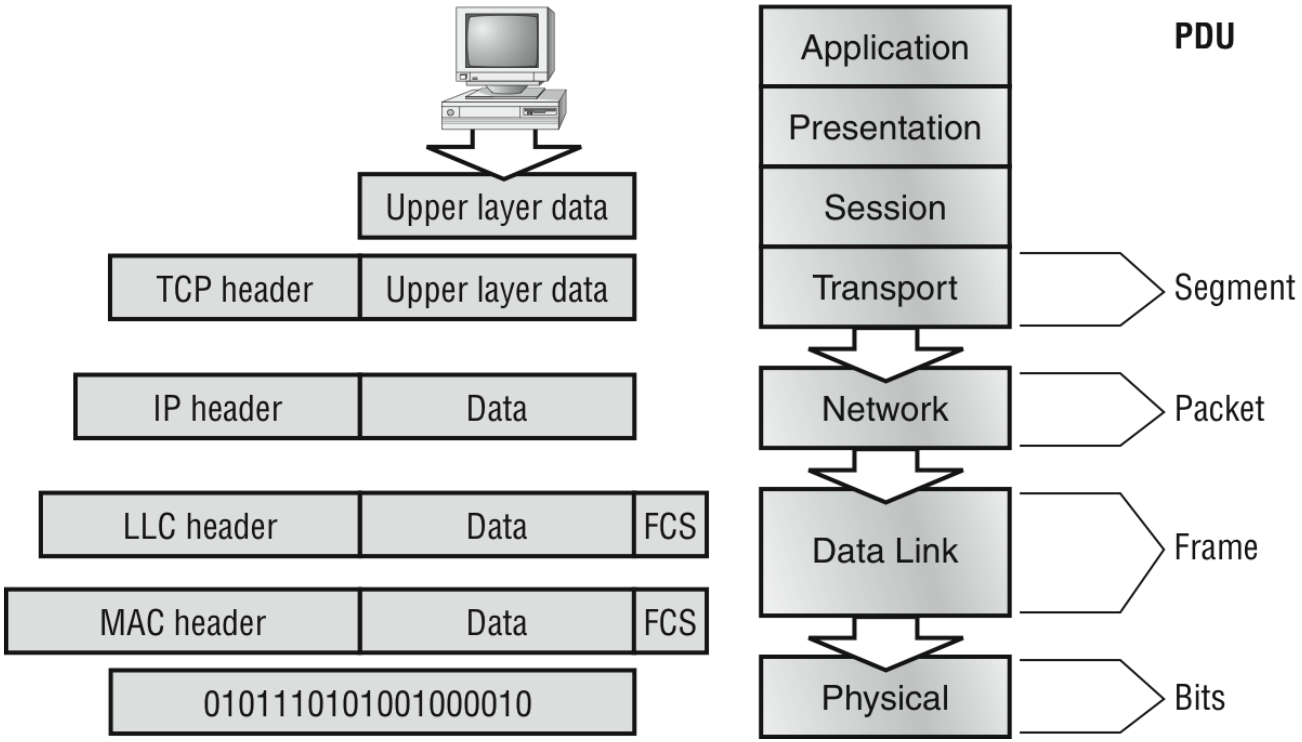
E0 on Lab B is down. Host A is trying to communicate to Host B. What happens?



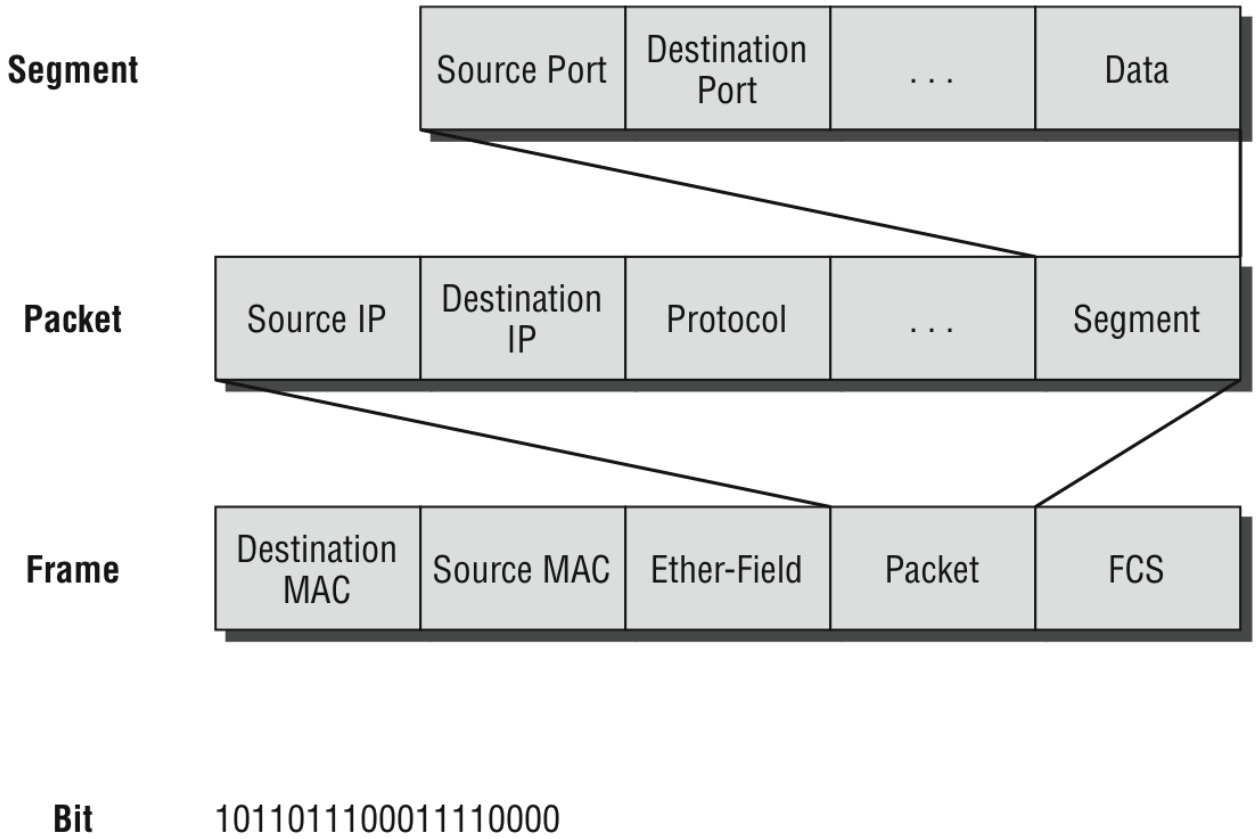
# ARP Example


I need the Ethernet address of 10.1.1 2
I heard the broadcast. The message is for me. Here is my Ethernet address.
10.1.1.1
10.1.1 2
IP: 10.1.1.2= ???
IP: 10.1.1 2
Ethernet: 4523.7985.7734

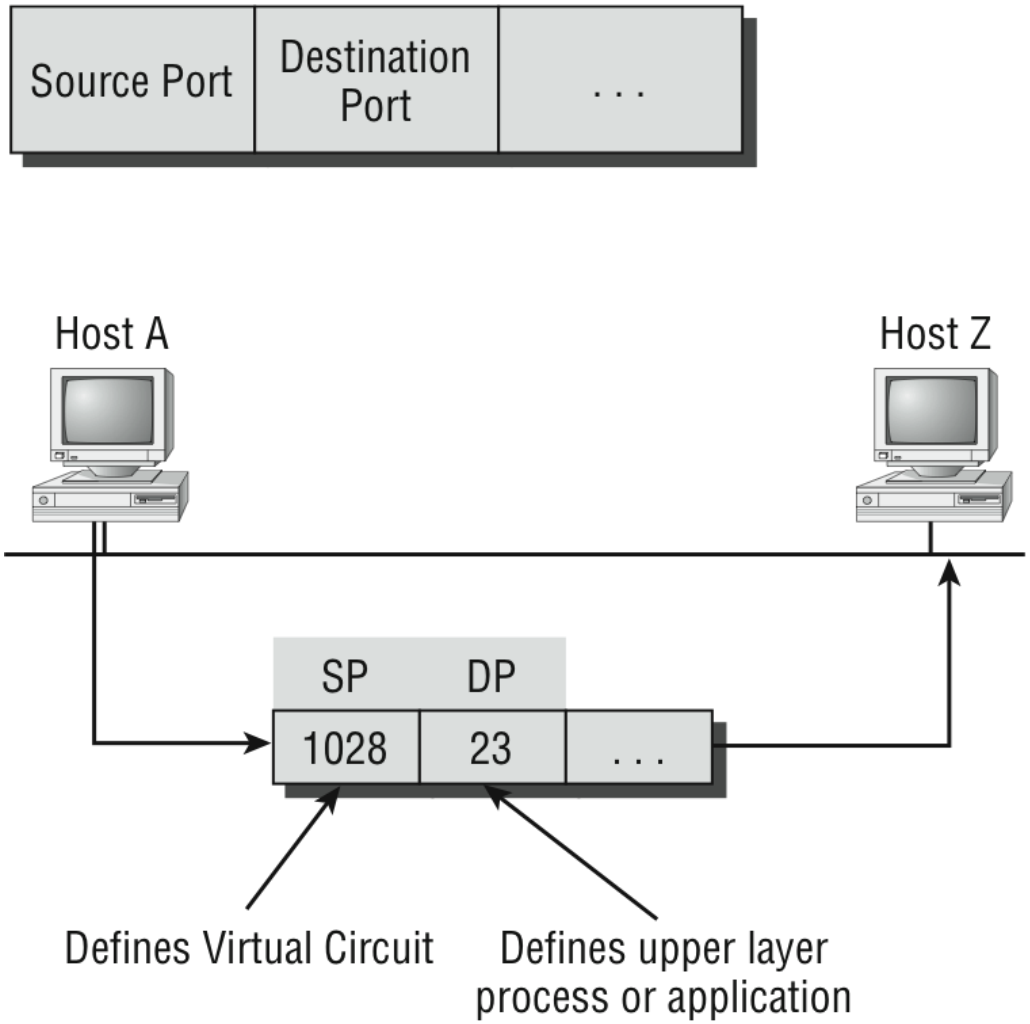
# Data Encapsulation



# Protocol Data Units



# Port Numbers at the Transport Layer



# Summary

- Summary
- Exam Essentials Section
- Written Labs
- Review Questions