

LESSON 3.1\_B

98-366 Networking Fundamentals

# Understand the OSI Model

## Part 2

Preview Only

## Lesson Overview

In this lesson, you will learn information about:

- Frames
- Packets
- Segments
- TCP
- TCP/IP Model
- Well-known ports for most-used purposes

## Anticipatory Set

Review and discuss the role of the following items in OSI:

application

presentation

session

transport

network

data link

physical

If you complete the work, you may review the OSI Networking Game

<http://www.gocertify.com/games/osi-game.shtml>

## The Internet Protocol Suite

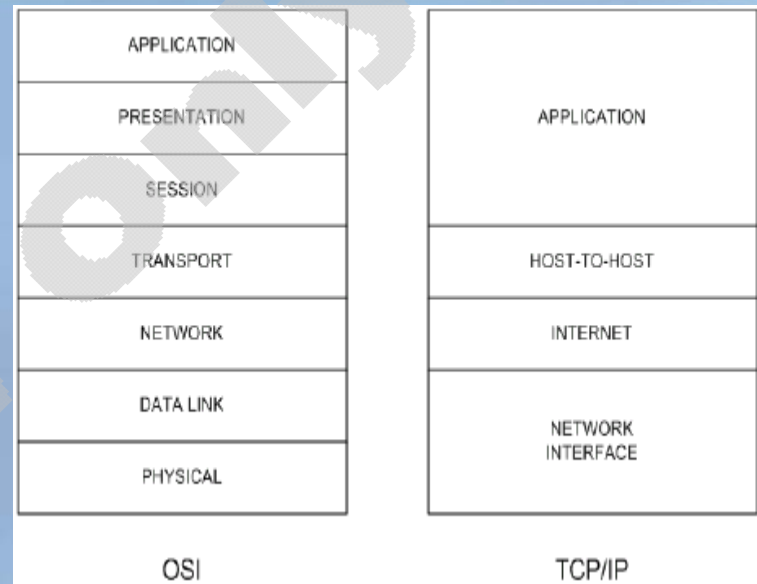
- Includes **Transmission Control Protocol (TCP)** and **Internet Protocol (IP)** and is referred to as **TCP/IP model**.
- Defines general guidelines and implementations of specific networking protocols to enable computers to communicate over a network for common applications (electronic mail, terminal emulation, and file transfer)
- Each layer of the TCP/IP model corresponds to layers of the seven-layer OSI reference model proposed by the ISO.
- **Ipssec (Internet Protocol Security)** is a dual mode, end-to-end, security scheme operating at the Internet Layer of the Internet Protocol Suite or OSI model Layer 3.

**LESSON 3.1\_B**

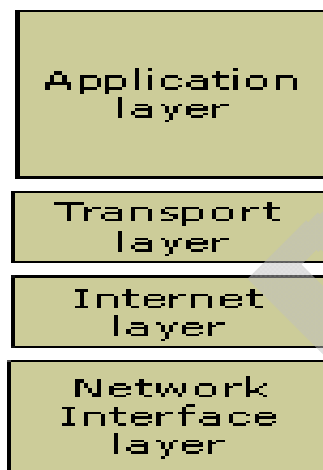
98-366 Networking Fundamentals

The **TCP/IP** is shown in relation to the OSI seven layers.

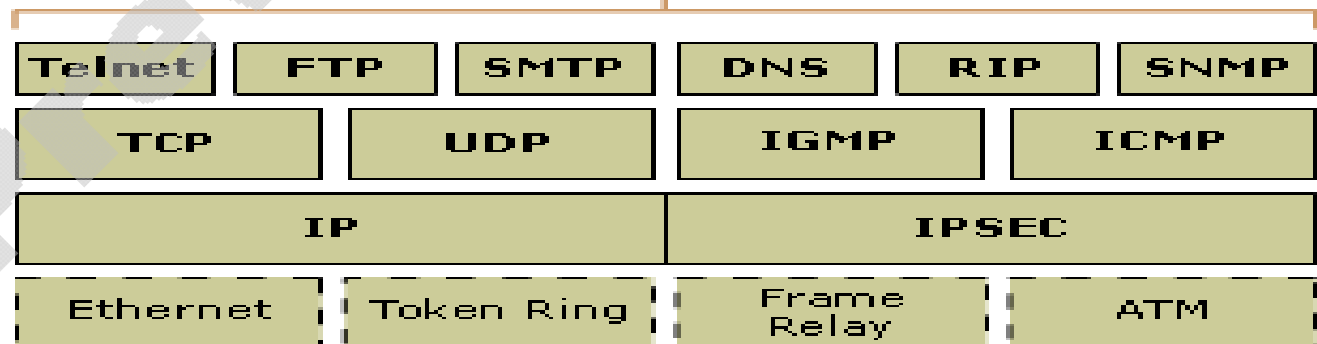
TCP delivers an unstructured stream of bytes identified by sequence numbers with stream data transfer.



**TCP /IP model**



**TCP /IP protocol suite**



## TCP/IP

- Provides end-to-end connectivity specifying how data should be formatted, addressed, transmitted, routed, and received
- Protocols exist for a variety of communication services between computers.
- The layers near the top are closer to user application, the layers near the bottom are closer to the physical transmission of the data.
- Viewing layers as providing or consuming a service is a method of abstraction to isolate upper layer protocols.
- The lower layers avoid having to know the details of each and every application and its protocol.

## Transmission Control Protocol (TCP)

- Assembles bytes into segments and passes to IP for delivery
- Provides end-to-end reliable packet delivery through an internetwork
- Mechanisms deal with lost, delayed, duplicate, or misread packets.
- Time-out mechanisms detect lost packets and request retransmission.
- Provides proficient flow control.
  - When sending responses back to the source, the receiving TCP process indicates the highest sequence number it can receive without overflowing its internal buffers.
- Full-duplex operation processes can both send and receive at the same time.
  - Multiplexing means that numerous concurrent upper-layer conversations can be occurring over a single connection.

## LESSON 3.1\_B

### 98-366 Networking Fundamentals

- Each host on a **TCP/IP network** is assigned a unique 32-bit logical address that is divided into two main parts:
  1. Network number – identifies a network and must be assigned by the Internet Network Information Center (InterNIC) if the network is to be part of the Internet
  2. Host number – identifies a host on a network and is assigned by the local network administrator



## Internet Protocol (IP)

- A network layer (Layer 3) protocol that contains addressing information and some control information that enables packets to be routed
- IP is documented in RFC 791 – Request For Comments for Internet Protocol, the specification for how traffic travels over the internet and is the primary network layer protocol in the Internet protocol suite
- Allows large data transfer so file applications do not have to cut data into blocks

## Well-Known Ports

- Most services work with TCP/IP by configuring the server to use a well-known port number.
- The client connects from a random high port.
- Most of these well-known ports are port numbers below 1,024.
- TCP/IP port assignments on Windows are stored in the `\%systemroot%\System32\drivers\etc\services` file.

## LESSON 3.1\_B

### 98-366 Networking Fundamentals

## Examples of known services and ports

FTP 20,21	data transfer
SSH 22	secure shell
telnet 23	telnet protocol
DNS 53	domain name service
SMTP 25	simple mail transfer protocol
DHCP 67,68	dynamic host configuration protocol
TFTP 69	trivial file transfer protocol
HTTP 80	hypertext transfer protocol
POP2/3 109, 110	post office protocol 2, 3
NNTP 119	network news transfer protocol
IMAP4 143	internet message access protocol
HTTPS 443	hypertext transfer protocol over SSL/TLS

## User Datagram Protocol (UDP)

- Part of the Internet Protocol suite
- Programs running on different computers on a network can send short messages known as datagrams to one another.
- A datagram is a self-sufficient and self-contained message sent through the network whose arrival, arrival time, and content are not guaranteed.
- UDP can be used in networks where TCP is traditionally implemented but is not reliable.
- Datagrams may go missing without notice, or arrive in a different order from the one in which they were sent.

## IP responsibilities in UDP

1. Provide connectionless delivery of datagrams
2. Provide fragmentation and reassembly of datagrams to support data links with different maximum-transmission unit (MTU) sizes
  - o The maximum transmission unit (MTU) of a communications protocol of a layer is the size in bytes of the largest protocol data unit that the layer can pass onward; a packet is encapsulated into one or more frames, depending upon the MTU size.

## LESSON 3.1\_B

### 98-366 Networking Fundamentals

## IP Packets

- All IP packets are structured the same way – an IP header followed by a variable-length data field.
- There are 14 fields in an IP packet header.

0	4	8	16	19	31
Version	IHL	Type of Service	Total Length		
Identification			Flags	Fragment Offset	
Time To Live	Protocol		Header Checksum		
Source IP Address					
Destination IP Address					
Options				Padding	

## LESSON 3.1\_B

### 98-366 Networking Fundamentals

- A packet and a frame are both packages of data moving through a network.
- A packet exists at Layer 3 of the OSI Model, a frame exists at Layer 2 of the OSI Model.
- Layer 2 is the Data Link Layer – the best-known protocol in this layer is Ethernet.
- Layer 3 is the Network Layer – the best-known protocol in this layer is IP (Internet Protocol).
- The TCP segment, encapsulates all higher level protocols above it, a segment at the transport layer and the TCP counterparts for these three items.

**LESSON 3.1\_B**

98-366 Networking Fundamentals

## **Lesson Review**

Complete Student Activity NetFund\_SA\_3.1\_B.