TCP Vs. UDP

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TCP Vs UDP

1st Assignment Web Technology

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Abstract

Data from applications is packaged, transported, and delivered to the appropriate server daemon or application on the destination device. The processes described in the OSI Transport layer accept data from the Application layer and prepare it for addressing at the Network layer. The Transport layer is responsible for the overall end-to-end transfer of application data.

Transaction control protocol (TCP) and User data gram protocol (UDP) are transport layer protocols in OSI model and TCP/IP model.

Different applications have different requirements. Different protocols have been developed to meet them.

Contents:

1- Introduction

In this report, we will cover the main points about the difference between TCP and UDP, not the technical details.

Also we will try to answer the following questions:

1- What is the relation between OSI model and TCP and UDP protocols?

2- In which layer TCP and UDP protocols are operating?

3-What is the difference between TCP and UDP header?

4-What are the main features of TCP and UDP protocols?

5-Whose is specifying whether the segment is TCP or UDP?

6-Which applications are Using TCP and which are using UDP?

2- Objectives

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

Describe the role of two TCP/IP Transport layer protocols: TCP and UDP.

Explain how TCP and UDP each handle transported data.

Identify when it is appropriate to use TCP or UDP and provide examples of applications that use each protocol.

3- The relation between OSI model and TCP and UDP

The transport Layer in OSI model data stream is a logical connection between the endpoints of a network. It provides transport services from a host to a destination. This service is sometimes referred to as an end-to-end service.

- *Primary responsibilities of the Transport Layer:*
  - *Tracking the individual communications between applications on the source and destination hosts.*
  - *Segmenting the data and managing each piece.*
  - *Reassembling the segments into streams of application data.*
  - *Identifying the different applications.*
  - *Performing flow control between end users.*
  - *Enabling error recovery.*
  - *Initiating a session.*

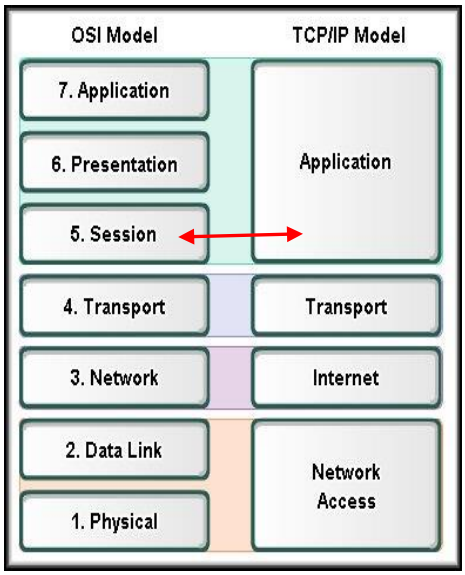

Figure 1

3. A- Segmentation and Reassembly

An Ethernet frame has a maximum frame size or Maximum Transmission Unit (MTU) of 1,518 bytes. When a larger message must be sent, the application data must be segmented into sections that will not exceed the maximum size.

The segment size must also take into account the encapsulation process that must take place before the frame can be transmitted.

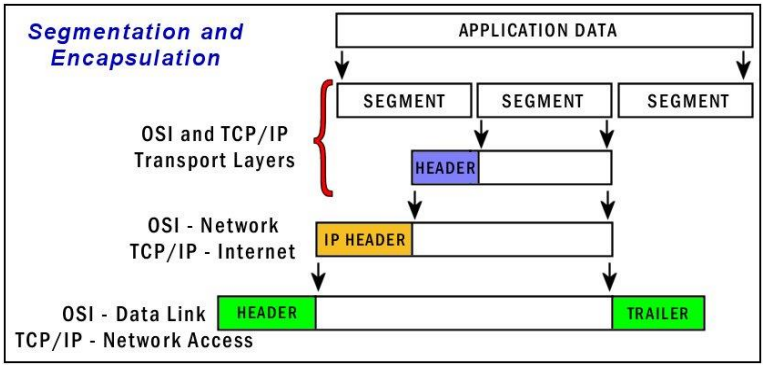

Figure 2

4- TCP Vs UDP

They are two most common Transport Layer protocols but the key difference between TCP and UDP is reliability.

4. A -TCP Connection Establishment and Termination

For a connection to be established, the two end stations must synchronize on each other's initial sequence numbers (ISNs).The ISN is the starting sequence number used when a TCP connection is established (fig 3).

Four step process using the Flag and sequence number fields to terminate session (fig 4).

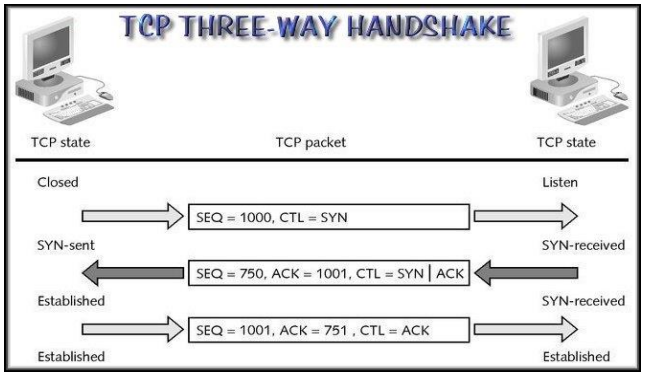

Figure 3

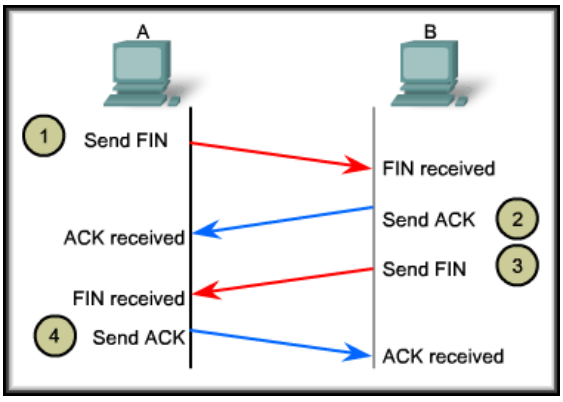

Figure 4

4. B- the difference between TCP and UDP header

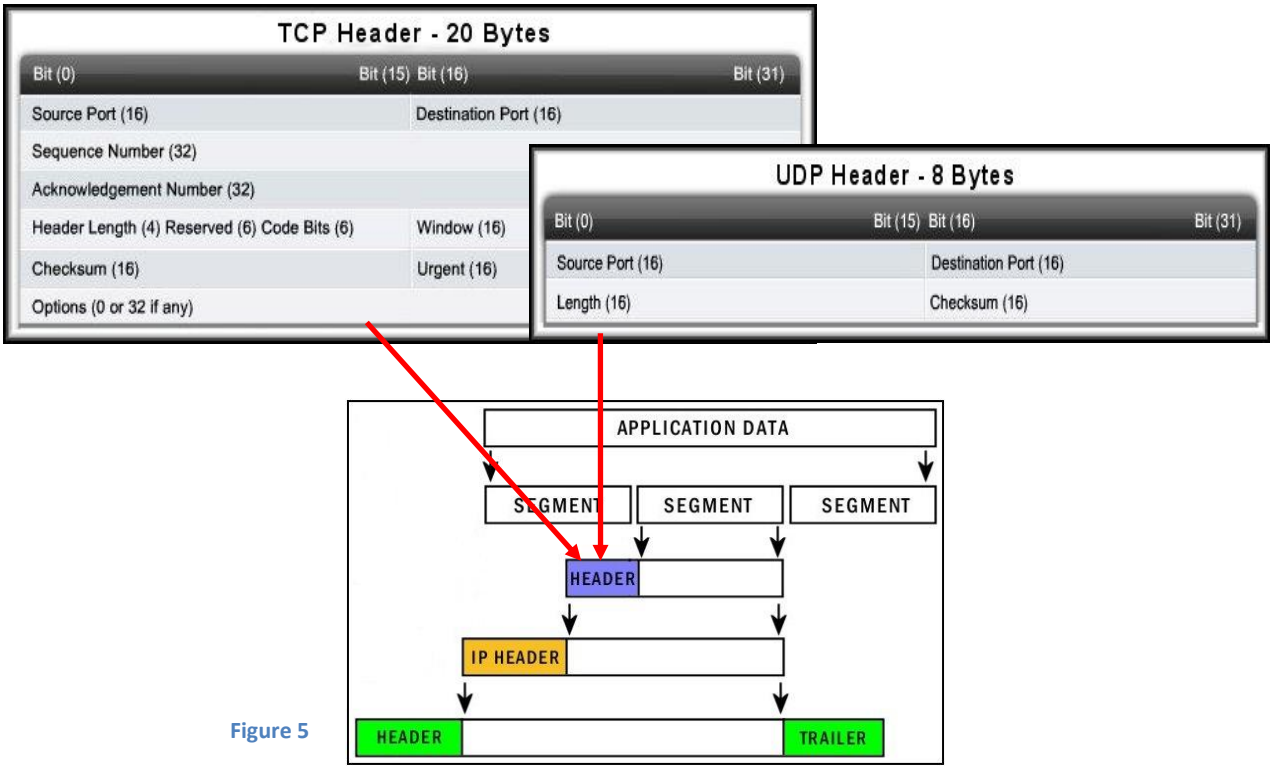

Figure 5

4. C- the main features of TCP and UDP protocols

User Datagram Protocol (UDP)

- *Connectionless*
- *"Best Effort" delivery*
- *Low overhead*
- *No error checking, No flow control*

Transmission Control Protocol (TCP)

- *Connection-oriented*
- *Reliable delivery*
- *Error checking*
- *Flow control*

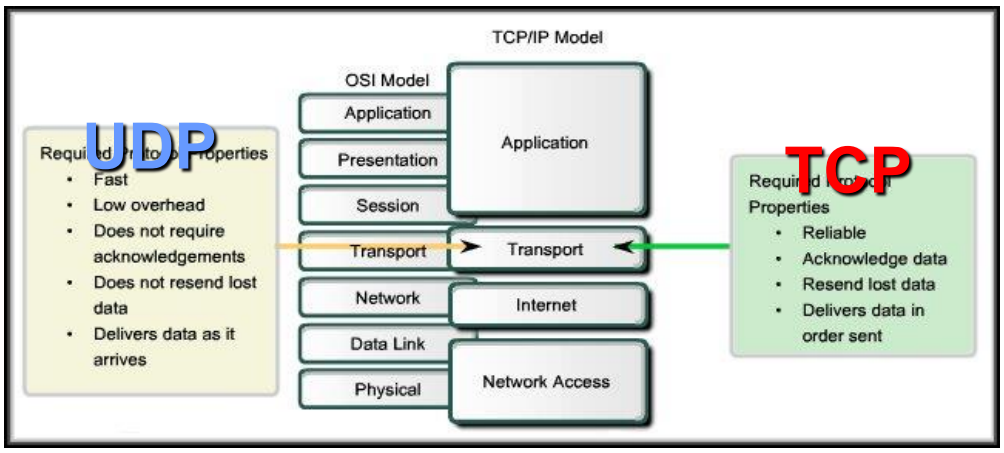

Figure 6

5- Identifying the Conversations

At the TCP/IP Internet Layer: The IP Packet Header has a Protocol field that specifies whether the segment is TCP or UDP.

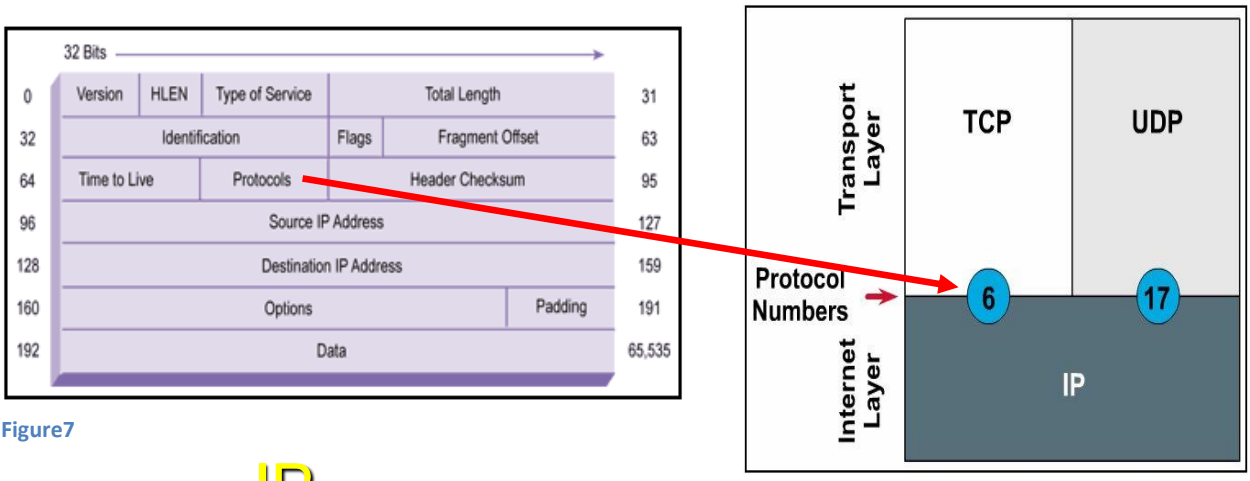

Figure7

IP Packet Header

When a packet is encapsulated at the Network Layer, it is coded to identify the source of the packet (TCP or UDP). When a packet is decapsulated at the destination, the code is used to send the packet to the proper protocol (TCP or UDP).

Both TCP and UDP use port numbers to pass information to the upper layers. These ports are actually termed sockets.

A socket is simply the combination of the device's IP address and the source/destination port for the data, separated by a colon.

- *e.g. 207.134.65.2:80 reference an HTTP socket.*

5. A- Port Addressing Types

Port numbers are managed and assigned by the Internet Assigned Number Authority (IANA).

Port Number Range	Port Group
0 to 1023	Well Known (Contact) Ports
1024 to 49151	Registered Ports
49152 to 65535	Private and/or Dynamic Ports

Table 1

6-Using both TCP and UDP protocols

Some applications may use both TCP and UDP.

For example, the low overhead of UDP enables DNS to serve many client requests very quickly. Sometimes, however, sending the requested information may require the reliability of TCP. In this case, the well known port number of 53 is used by both protocols with this service.

Port Number	*Application*	***Layer4 Protocol***	*Description*
20	*FTP*	*TCP*	*File Transfer Protocol – Data*
21	*FTP*	*TCP*	***File Transfer Protocol – Control Commands***
23	*TELNET*	*TCP*	*Terminal connection*
25	*SMTP*	*TCP*	*Simple Mail Transfer Protocol - Email*
53	*DNS*	*UDP*	*Domain Name System*
67,68	*DHCP*	*UDP*	*Dynamic Host Configuration Protocol*
69	*TFTP*	*UDP*	*Trivial File Transfer Protocol*
80	*HTTP*	*TCP*	*Hypertext Transfer Protocol*

Table 2

Applications of TCP and UDP

TCP	*UDP*
File Transfer Protocol (FTP)	*Trivial File Transfer Protocol (TFTP)*
Telnet	*Domain Name System (DNS)*
Simple Mail Transfer Protocol (SMTP)	***Simple Network Management Protocol (SNMP)***
Post Office Protocol (POP3)	***Dynamic Host Configuration Protocol (DHCP)***
Hypertext Transfer Protocol (HTTP)	

Table 3

7-Conclusion

Characteristics	*TCP*	*UDP*
Acronym for:	*Transmission Control Protocol*	*User Datagram Protocol or Universal Datagram Protocol*
Function:	*As a message makes its way across the internet from one computer to another. This is connection based.*	*UDP is also a protocol used in message transport or transfer. This is not connection based which means that one program can send a load of packets to another and that would be the end of the relationship.*
Usage:	*TCP is used in case of non-time critical applications.*	*UDP is used for games or applications that require fast transmission of data. UDP's stateless nature is also useful for servers that answer small queries from huge numbers of clients.*
Examples:	*HTTP, HTTPs, FTP, SMTP Telnet etc...*	*DNS, DHCP, TFTP, SNMP, RIP, VOIP etc...*
Ordering of data packets:	*TCP rearranges data packets in the order specified.*	*UDP has no inherent order as all packets are independent of each other. If ordering is required, it has to be managed by the application layer.*
Speed of transfer:	*The speed for TCP is slower than UDP.*	*UDP is faster because there is no error-checking for packets.*
Reliability:	*There is absolute guarantee that the data transferred remains intact and arrives in the same order in which it was sent.*	*There is no guarantee that the messages or packets sent would reach at all.*
Header Size:	*TCP header size is 20 bytes*	*UDP Header size is 8 bytes.*
Streaming of data:	*Data is read as a byte stream, no distinguishing indications are transmitted to signal message (segment) boundaries.*	*Packets are sent individually and are checked for integrity only if they arrive. Packets have definite boundaries which are honored upon receipt, meaning a read operation at the receiver socket will yield an entire message as it was originally sent.*
Weight:	*TCP requires three packets to set up a socket connection, before any user data can be sent. TCP handles reliability and congestion control.*	*UDP is lightweight. There is no ordering of messages, no tracking connections, etc. It is a small transport layer designed on top of IP.*
Data Flow Control:	*TCP does Flow Control. TCP requires three packets to set up a socket connection, before any user data can be sent. TCP handles reliability and congestion control.*	*UDP does not have an option for flow control*
Error Checking:	*TCP does error checking*	*UDP does error checking, but no recovery options.*

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