

Computer Network Protocols

Data Link Layer

Lesson -2

كلية المستقبل الجامعة
قسم هندسة تقنيات الحاسوب
المرحلة الرابعة

By

Dr. Layth Abdulkareem Hassnawi

Layer 2 Tunneling Protocol (L2TP)

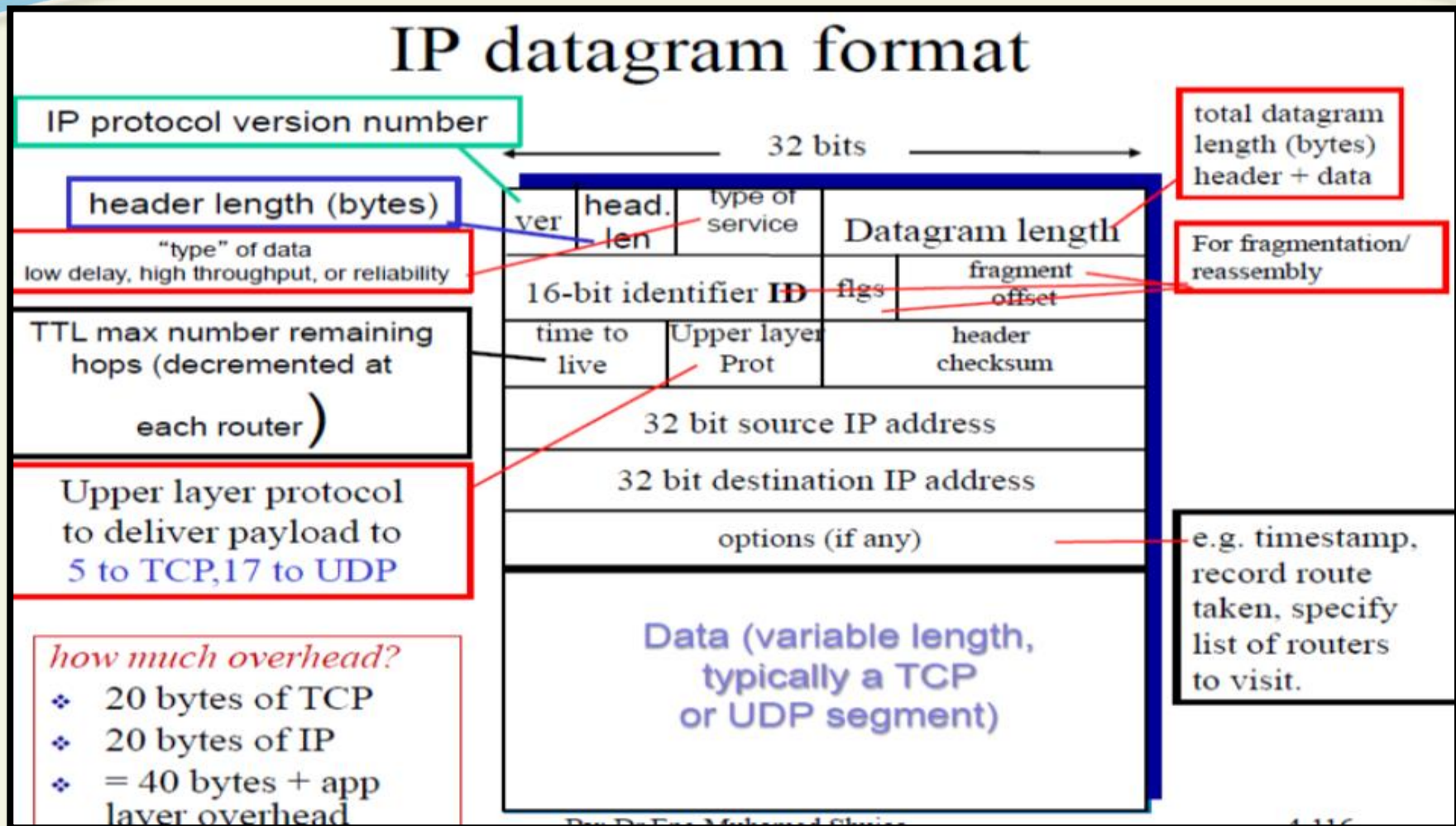
L2TP is a tunneling protocol used to support virtual private networks (VPNs) or as part of the delivery of services by ISPs. The main features of L2TP protocol are:

- *Is an **extension of the Point-to-Point Tunneling Protocol (PPTP).***
- ***Used** by an Internet service provider (ISP) to **enable the operation of a virtual private network (VPN) over the Internet.***
- *The goal of a Virtual Private Network (VPN) is to **provide private communications within the public Internet Infrastructure***

Why is there a need for VPN?

1. Internet has **insufficient security** mechanisms
2. IP packets are **not authenticated or encrypted**
3. Users with access to network **can read content of IP traffic**

IP Datagram Format

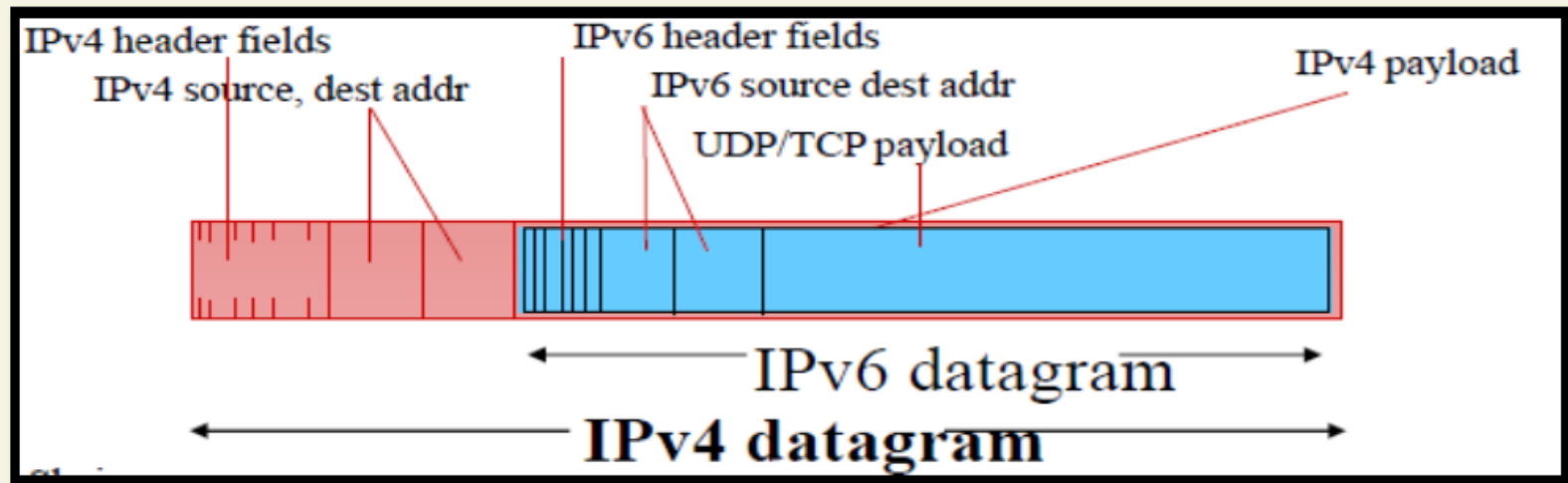


Transition from IPV 4 to IPV 6

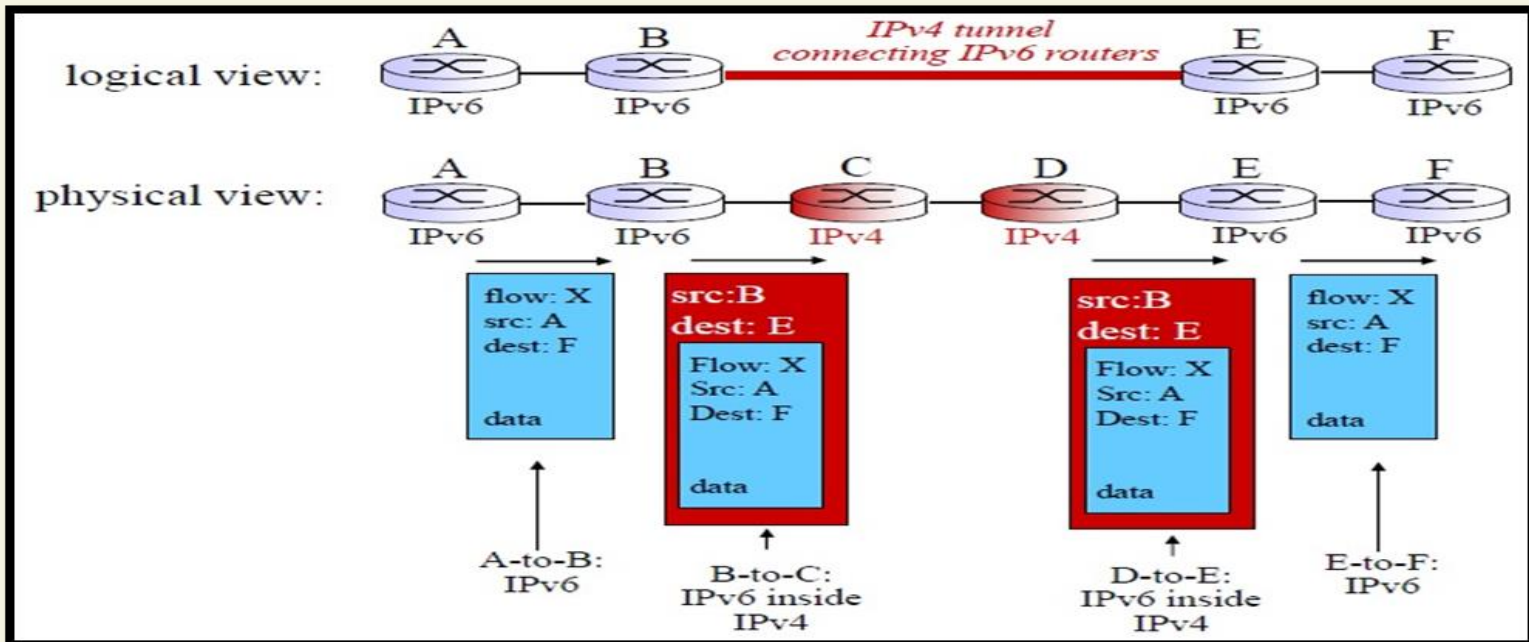
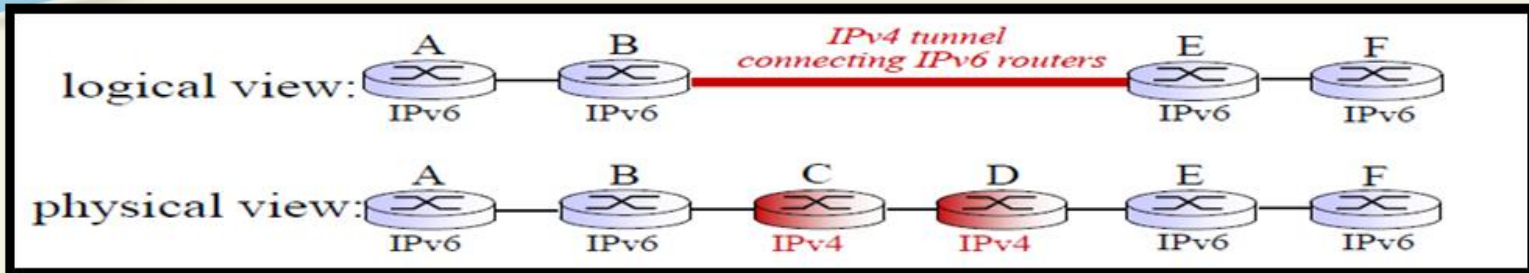
Not all routers can be upgraded simultaneously

How will network operate with mixed IPv4 and IPv6 routers?

Answer: this can be done by Tunneling: IPv6 datagram carried as payload in IPv4 datagram among IPv4 routers



Transition from IPV 4 to IPV 6



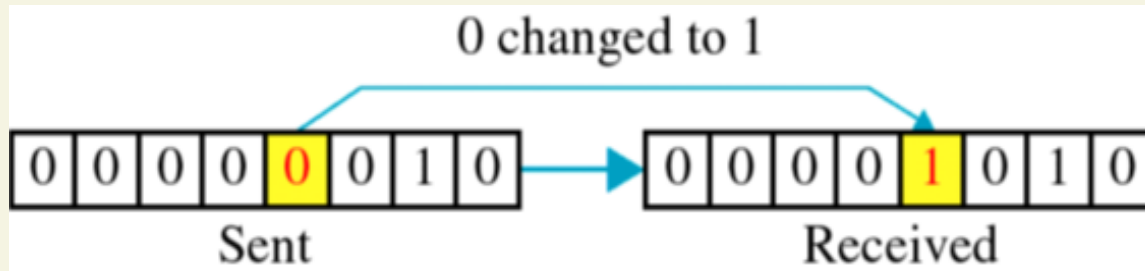
Errors Detection and Correction

Networks must be able to ***transfer data from one device to another with complete accuracy***. Data can be ***corrupted during transmission***. For reliable communication, ***errors must be detected and corrected***. Error detection is implemented either at the data link layer or the transport layer of the OSI model.

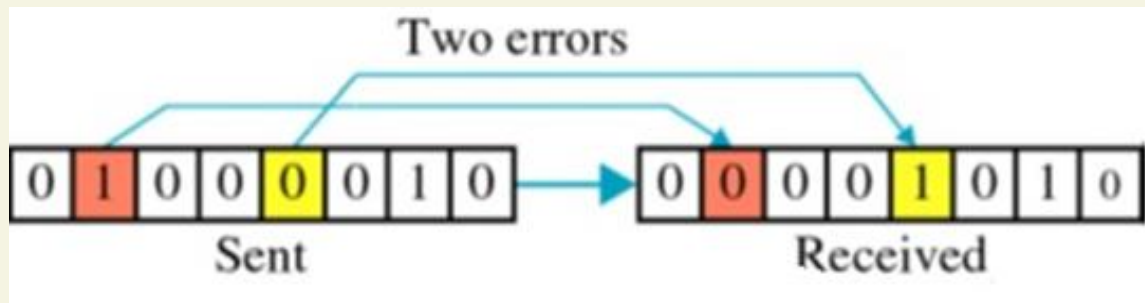
Types of Errors

There are three types of error, these are:

1. Single Bit Error

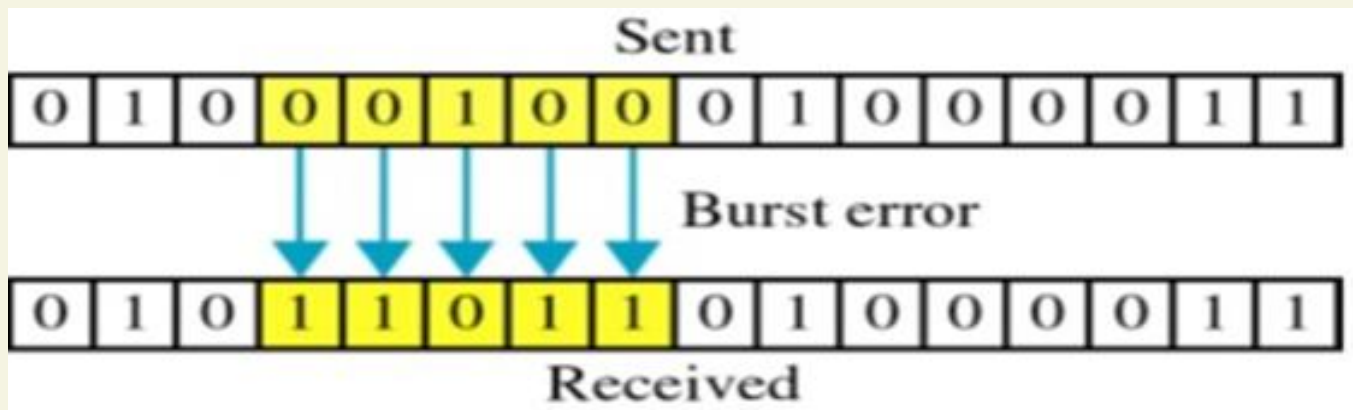


2. Multiple Error



Types of Errors

3. Burst Error: means that two or more bits in the data unit have changed from 1 to 0 or from 0 to 1. Burst errors do not necessarily mean that the errors occur in consecutive bits, the length of the burst is measured from the first corrupted bit to the last corrupted bit. Some bits in between may not have been corrupted.



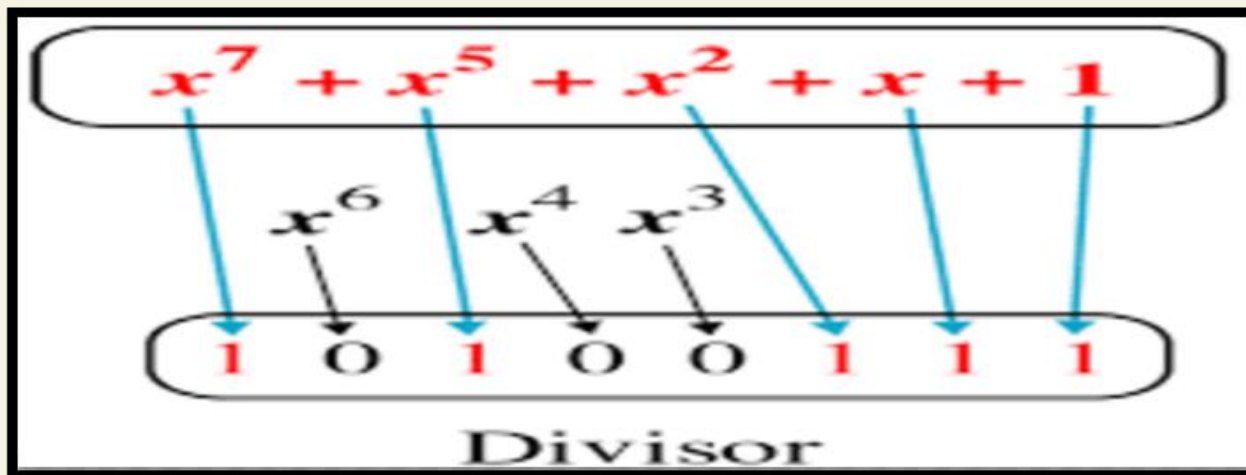
Polynomial Calculation

Byte representation is

x^7 x^6 x^5 x^4 x^3 x^2 x^1 x^0

The rules of calculation according to byte representation are:

1. If you have number "1" alone just put 1 because $x^0=1$
2. Put "1" whenever you find x
3. Put zero whenever you didn't find x
4. All zeros to **LEFT** of number are neglected (00010001)



Polynomial Calculation Examples

$$X^8 + X^7 + X^5 + X^4 + X^2 + X + 1 \text{ it is represented in binary like this: } 110110111$$

Explanation:

$$x^8 = 1$$

$$x^7 = 1$$

$$x^6 = 0 \text{ because it is not there}$$

$$x^5 = 1$$

$$x^4 = 1$$

$$x^3 = 0 \text{ because it is not there}$$

$$x^2 = 1$$

$$x = 1 \rightarrow \text{the rule says that whenever we have } x \text{ alone, we put '1' because } x = x^1$$

$$1 = 1 \rightarrow \text{the rule says that whenever we have } 1 \text{ alone, we put '1' because } 1 = x^0$$

End Of Lesson 2

Thanks For Listening