CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Header & Fragmentation

Lecture No-3

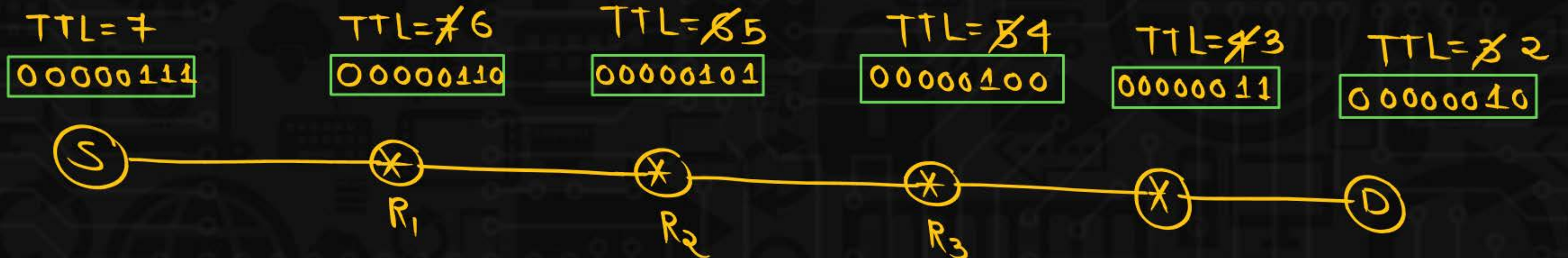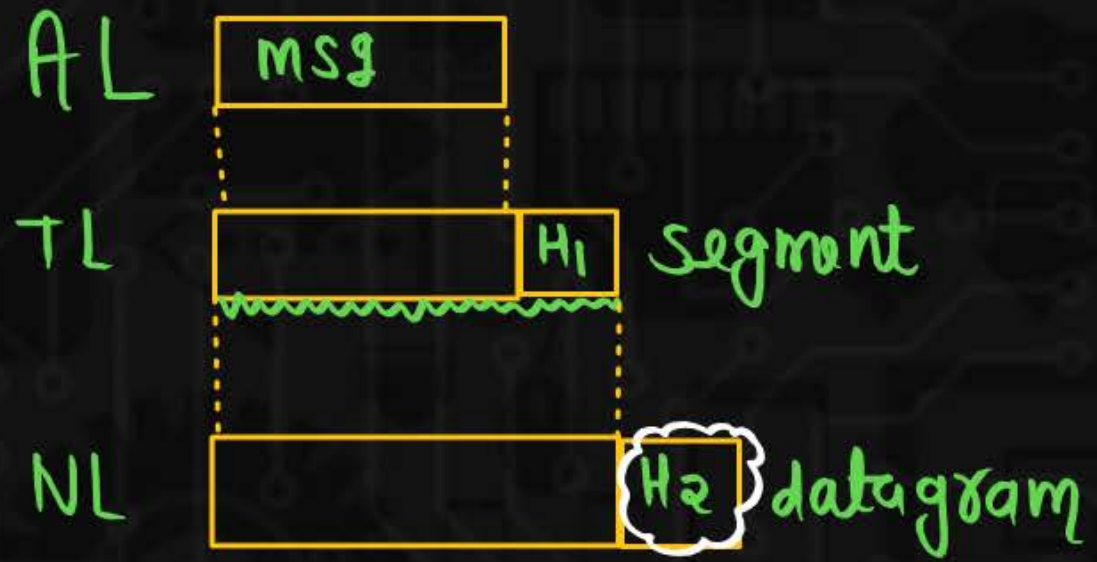By- Ankit Doyla Sir

Header checksum : (16 bit)

It is calculated only for header part not the data because rest of the component in packet already covered by TCP checksum.

Header checksum is calculated at each and every Router because related to IP Header might be change when packet is moving from one router to another.

Every router makes one modification

i.e. TTL so Header checksum is calculated at every Router.

Fragment offset, mF, Total length, option all may be changed at a Router.

AL | msg

TL | H_1 segment

NL | H_2 datagram

TTL = 7
00000111

TTL = ~~7~~6
00000110

TTL = ~~6~~5
00000101

TTL = ~~6~~4
00000100

TTL = ~~4~~3
00000011

TTL = ~~8~~2
00000010

S ── ⊗ R₁ ── ⊗ R₂ ── ⊗ R₃ ── ⊗ ── D

TL = 320
OFFset = 0
MF = 0
ID = 100

300	20
D	H

(A)

300	20
D	H

(X)

mtU
= 120B

(B)

100	20

100	20

100	20

100	100	100	IDNo
0	1	1	MF
200	100	0	OFFset
120	120	120	TL

Source Address :

This 32 bit defines the IPV4 address of source. This field remain unchanged during the time the IPV4 data gram travel from the source Host to destination Host.

Destination Address :

This 32 bit Field defines the IPV4 address of the destination. This field remain unchanged during the time the IPV4 data gram travel from source host to destination host.

| Not changed	May be changed	Def. changed
1. VER	1. HL	1. TTL
2. Services	2. Total Length	2. checksum
3. Identification No.	3. MF	
4. DF	4. Fragment offset	
5. Protocal	5. option	
6. S.IP		
7. DIP		

Option :

The Header of IPV4 data gram is made of two parts a fixed part and a variable part. The fixed part is 20 Byte long and variable part that can be maximum of 40 Bytes.

There are 5 options

1. Strict source Routing ⎫
    Source will decide the Route
2. Loose source Routing ⎭

3. Record Routing ⎫ *Router will decide the Route*
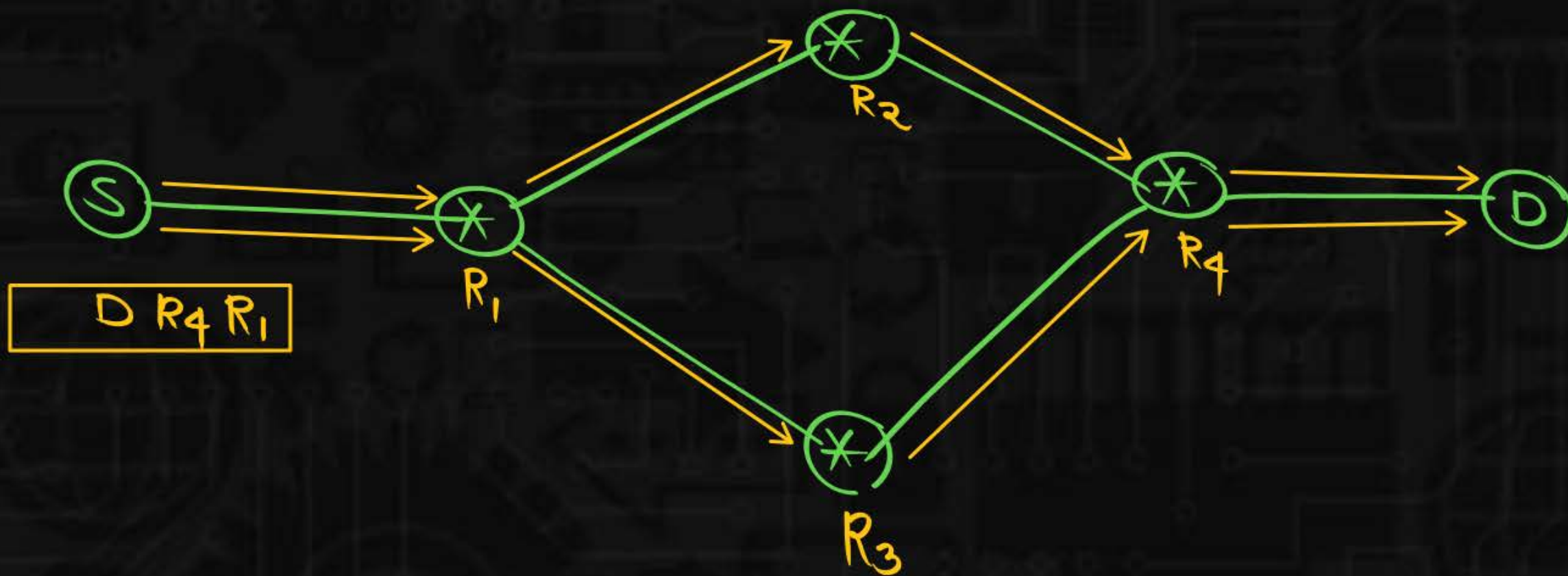
4. Time stamp

5. Padding

Strict Source Routing :

A strict source routing is used by the source to predetermine a route for data gram as it travel through the internet.
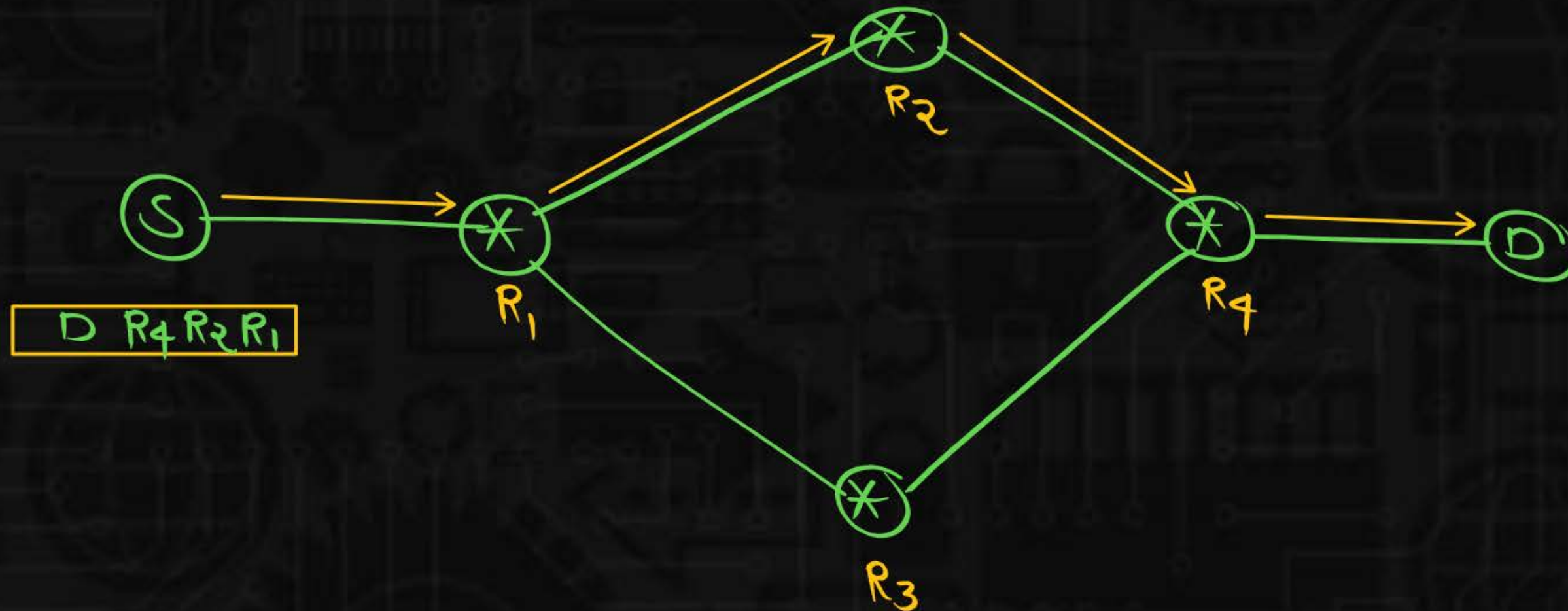
Loose source Routing :

A loose source route option is similar to strict source route but it is less rigid. Each router in the list must visited, but the data gram can visit other outer as well.
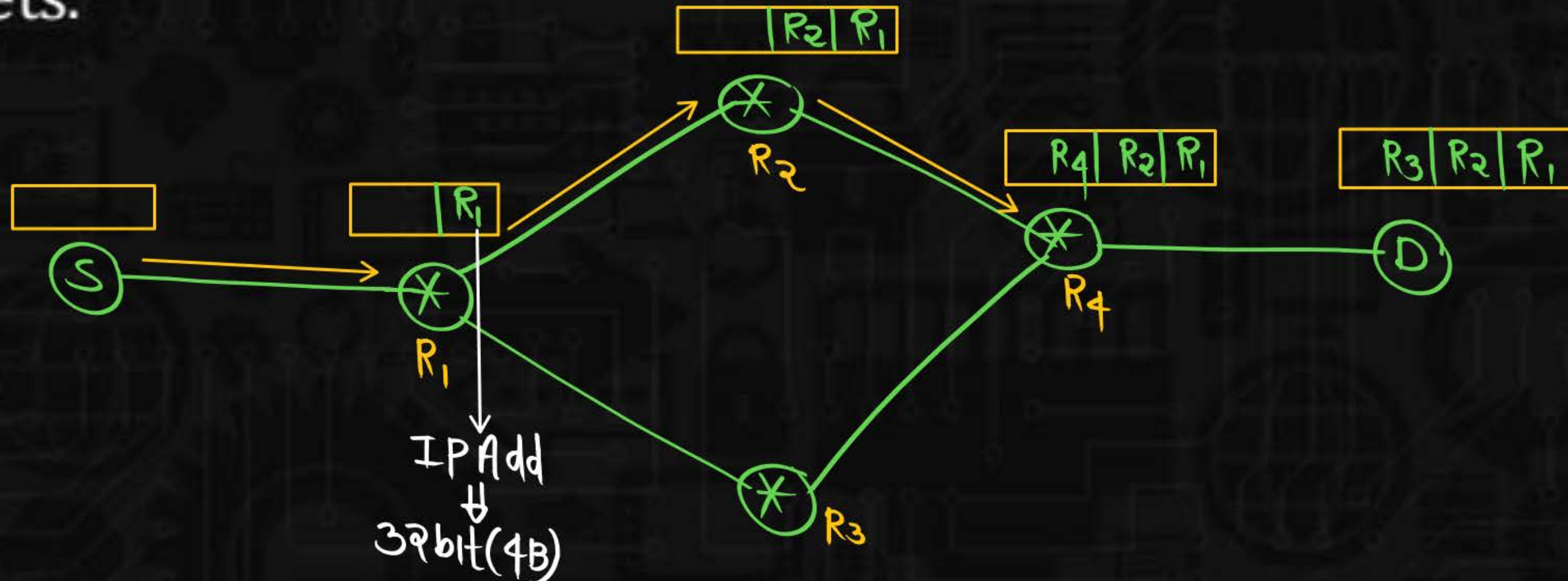
Two Route

S R$_1$ R$_2$ R$_4$ D

S R$_1$ R$_3$ R$_4$ D

D R$_4$ R$_1$

Record Routing :

A record route option is used to record the internet routers that handle the data gram. It can list up to 9 router Address.

All the Router are supposed to record their IP Add on their IP packets.

$R_2 | R_1$

$R_4 | R_2 | R_1$

$R_3 | R_2 | R_1$

R_1

S

R_1

R_2

R_4

R_3

D

IP Add
↕
32 bit (4B)

Option = 40Byte

$$\frac{40B}{4B} = 10 \text{ Router IP Address Recorded}$$

Note :

First 16 bits (2 byte) are reserved for option type(8 bit) and length (8 bit). Out of 40 byte only 38 bytes are remaining for storing ipv4 addresses. In 38 byte we can store 9 ipv4 addresses as each ipv4 address is of 4 byte

Time stamp :

It is used to find out delays at each router. Every router should record incoming time and outgoing time

10:05 Am   10:10 Am

delay = 5 min