IPv6 Address and Packet Structure

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Previous Session

- IPv4 Packet Structure
  - 20 Bytes fixed header and variable payload.
  - First Word - Version (4), IHL (4), DSCP (6), ECN (2), and Total Length (16)
  - Second Word - Identification (16), Flags (3), and Fragment Offset (13)
  - Third Word - Time to Live (8), Protocol (8), and Checksum (16)
  - Fourth Word - Source Address (32)
  - Fifth Word - Destination Address (32)
  - Followed by Payload.

Fragment Offset

ID	Total Bytes	Datal Bytes	MF	Fragment Offset
234	1500	1500 - 20 = 1480	1	0

ID	Total Bytes	Datal Bytes	MF	Fragment Offset
234	1500	1500 - 20 = 1480	1	0
234	1020	1020 - 20 = 1000	1	185

1480 % 8 = 185

0 + 185 = 185

ID	Total Bytes	Datal Bytes	MF	Fragment Offset
234	1500	1500 - 20 = 1480	1	0
234	1020	1020 - 20 = 1000	1	185
234	1500	1500 - 20 = 1480	1	310

1480 % 8 = 185

0 + 185 = 185

1000 % 8 = 125

185 + 125 = 310

ID	Total Bytes	Datal Bytes	MF	Fragment Offset
234	1500	1500 - 20 = 1480	1	0
234	1020	1020 - 20 = 1000	1	185
234	1500	1500 - 20 = 1480	1	310
234	560	560 - 20 = 540	0	495

1480 % 8 = 185

0 + 185 = 185

1000 % 8 = 125

185 + 125 = 310

1480 % 8 = 185

185 + 310 = 495

@ 0	@ 185	@ 310	@ 495
1	2	3	4

@ Receiver

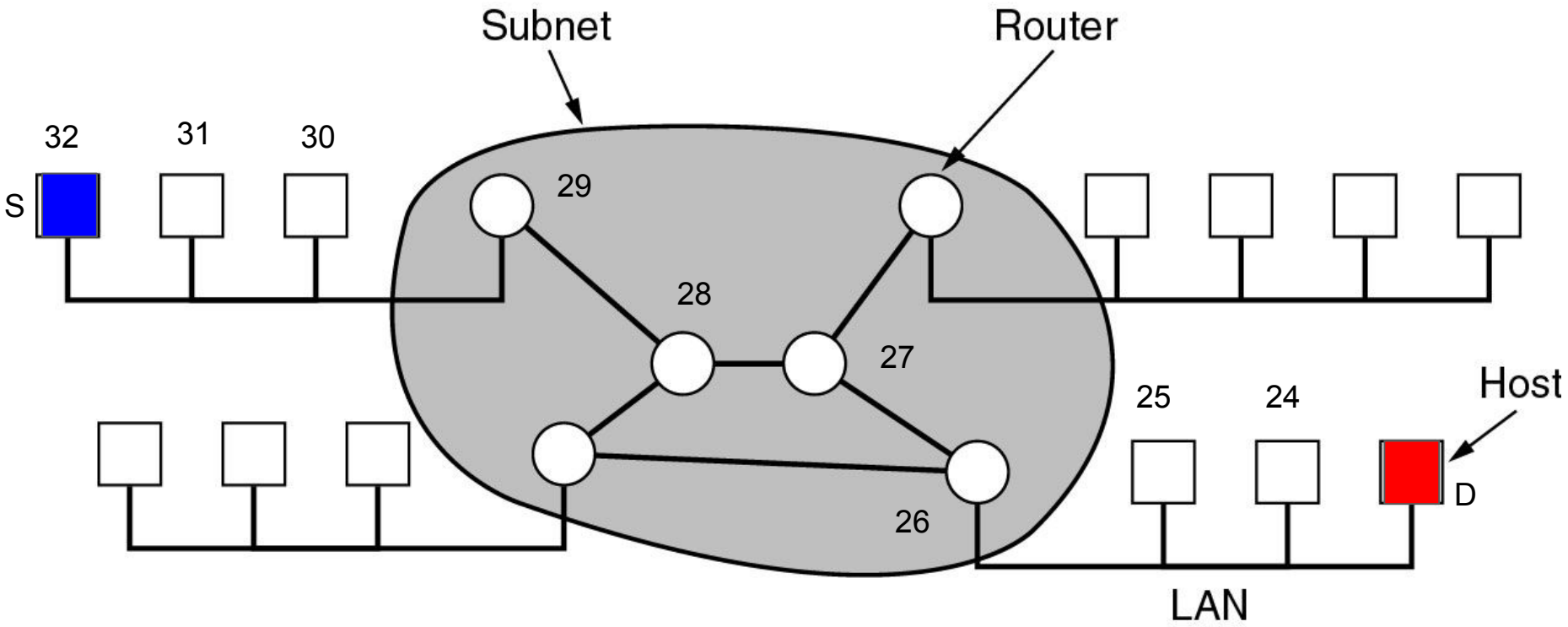
@ 495	@ 310	@ 0	@ 185

@ Receiver - After Re Arrangement of Fragments

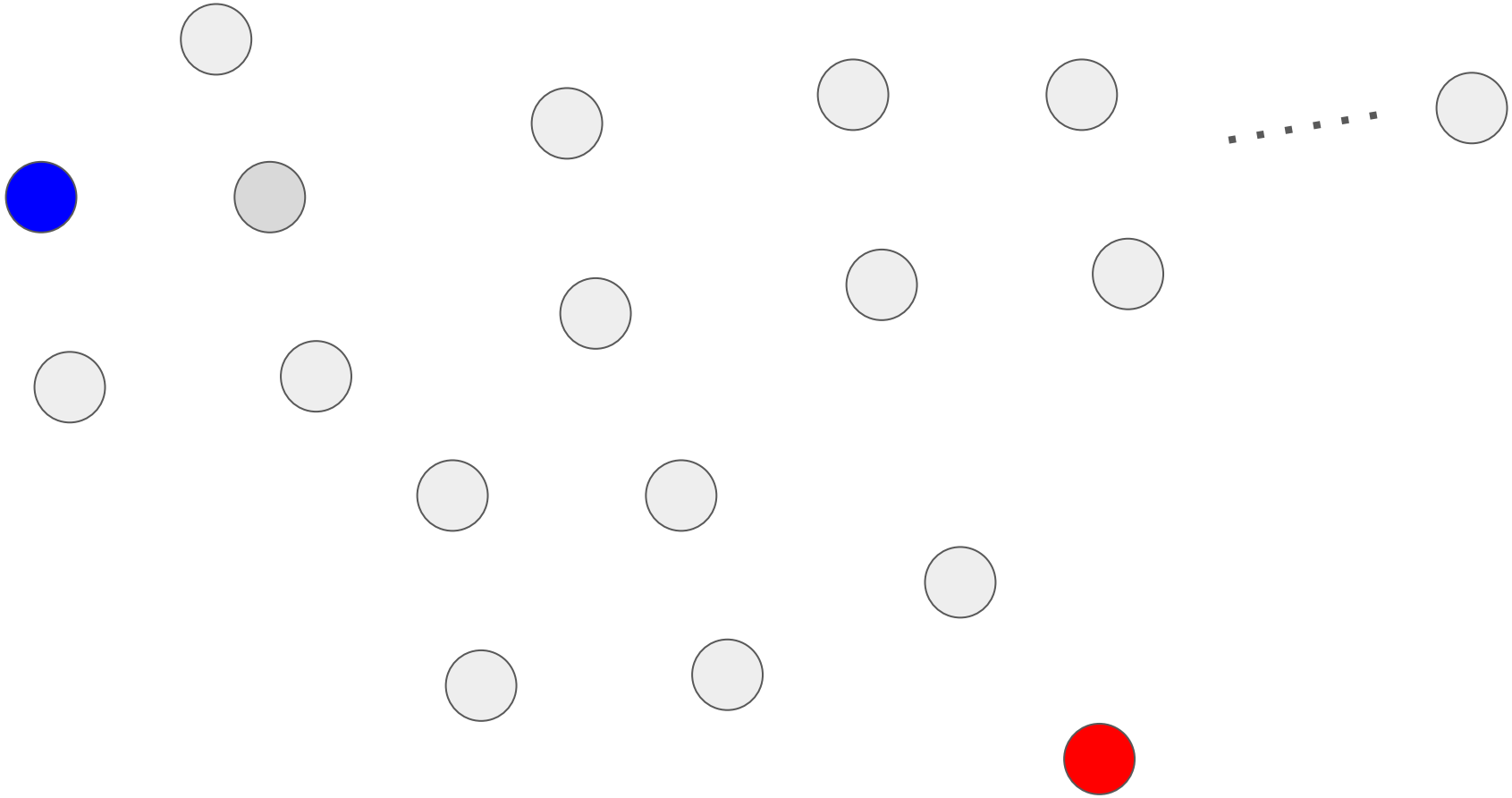
@ 0	@ 185	@ 310	@ 495

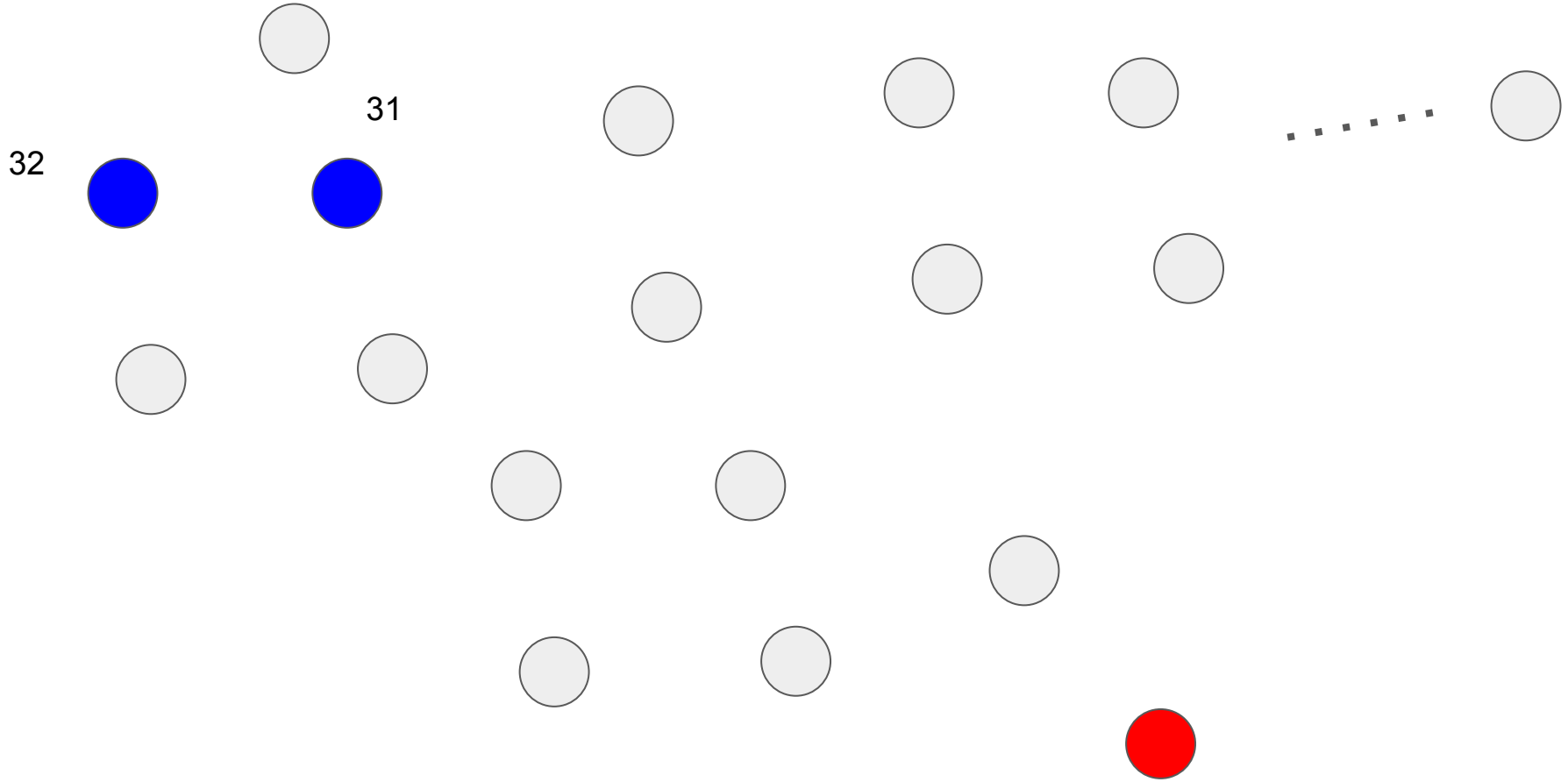
TTL

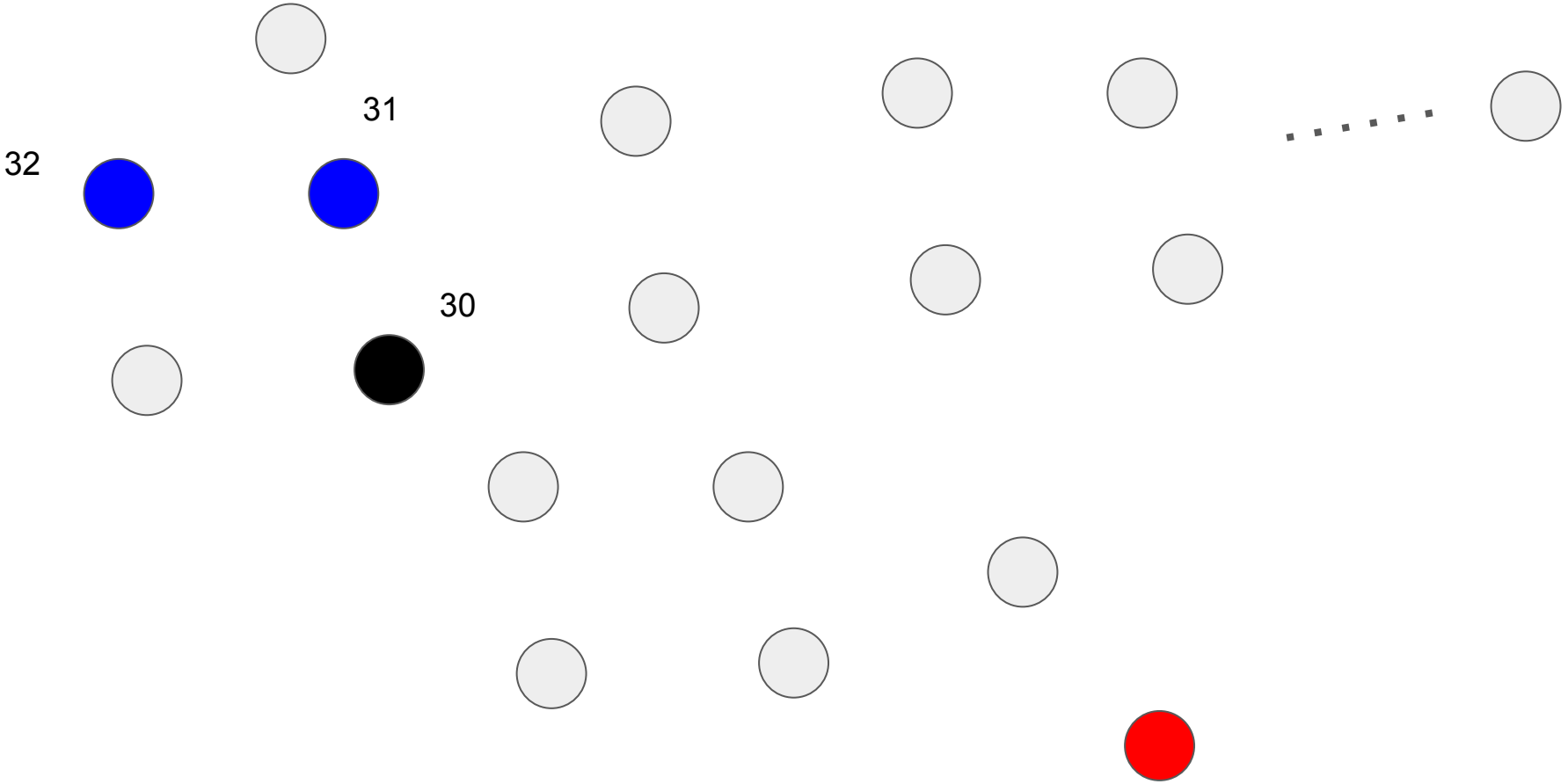
TTL= 32

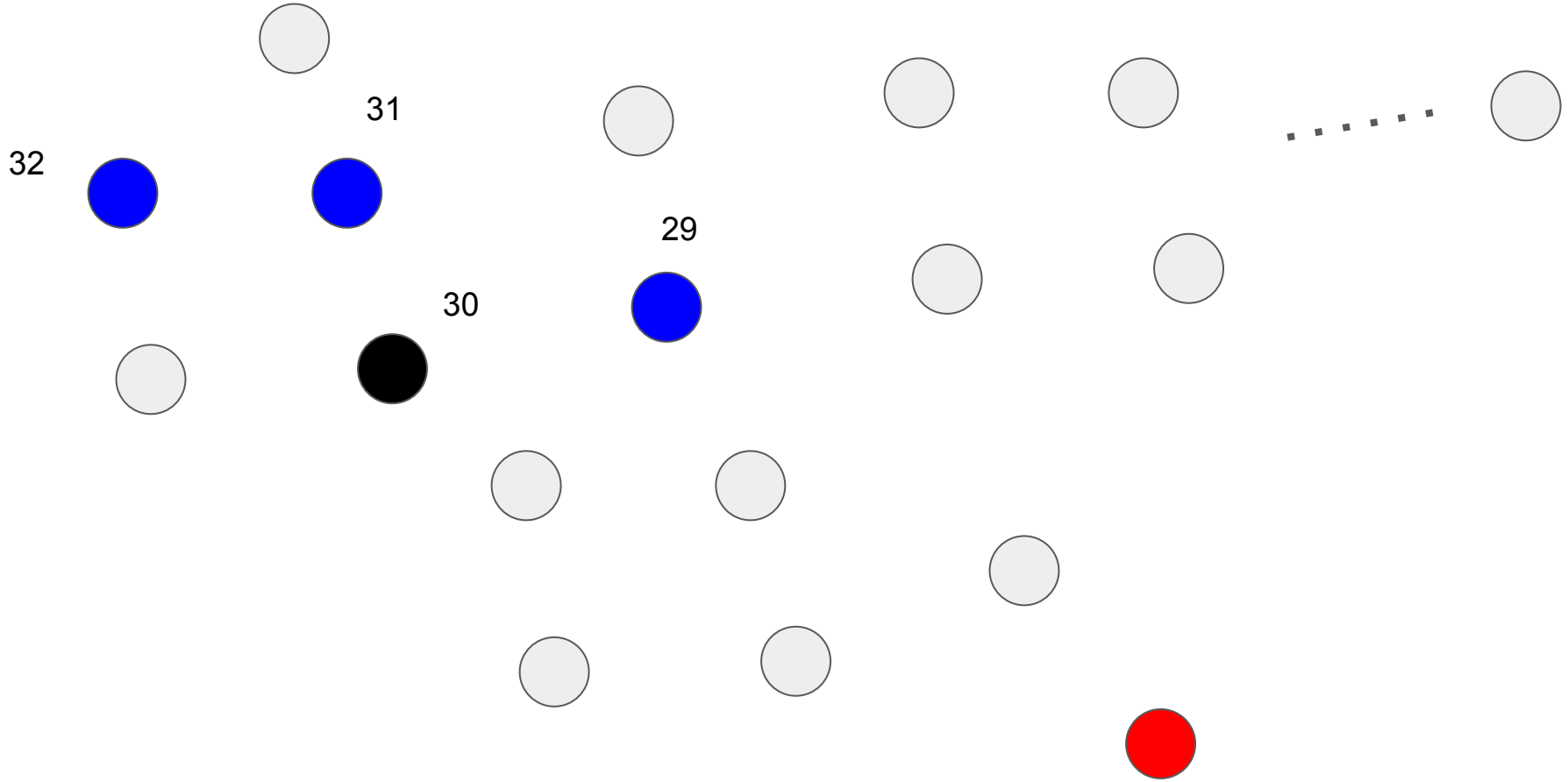


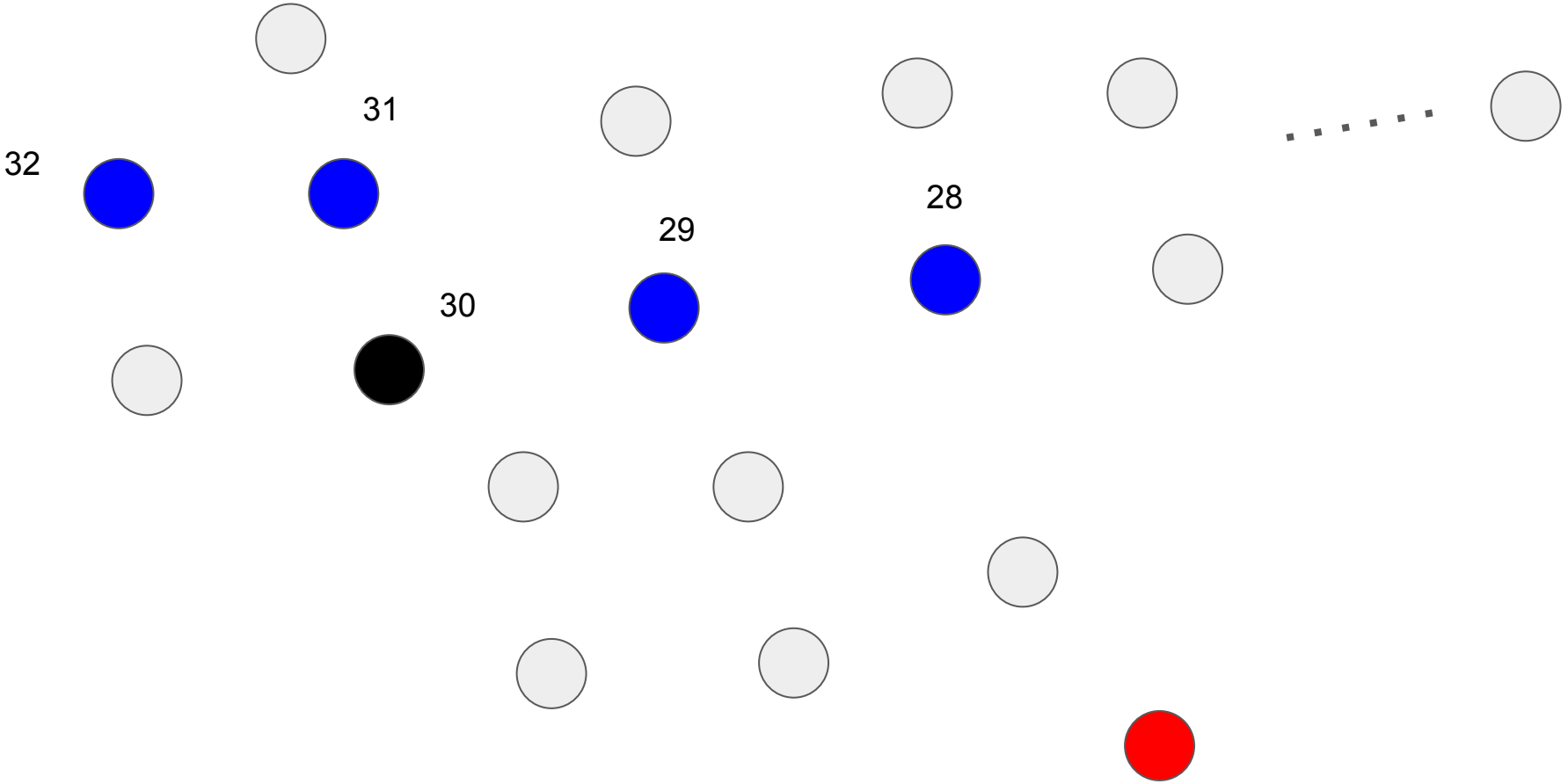
Total Hops = 9

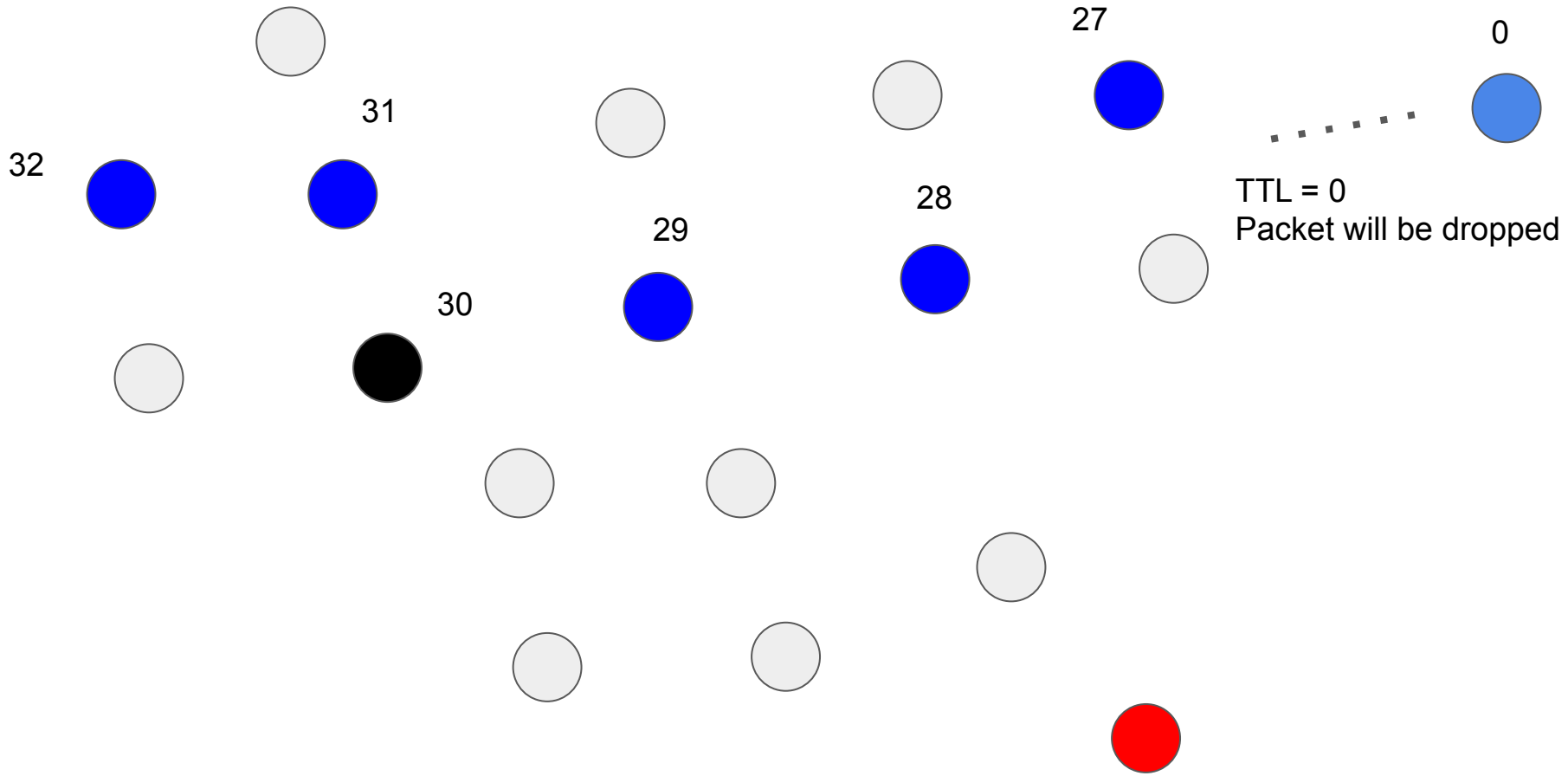


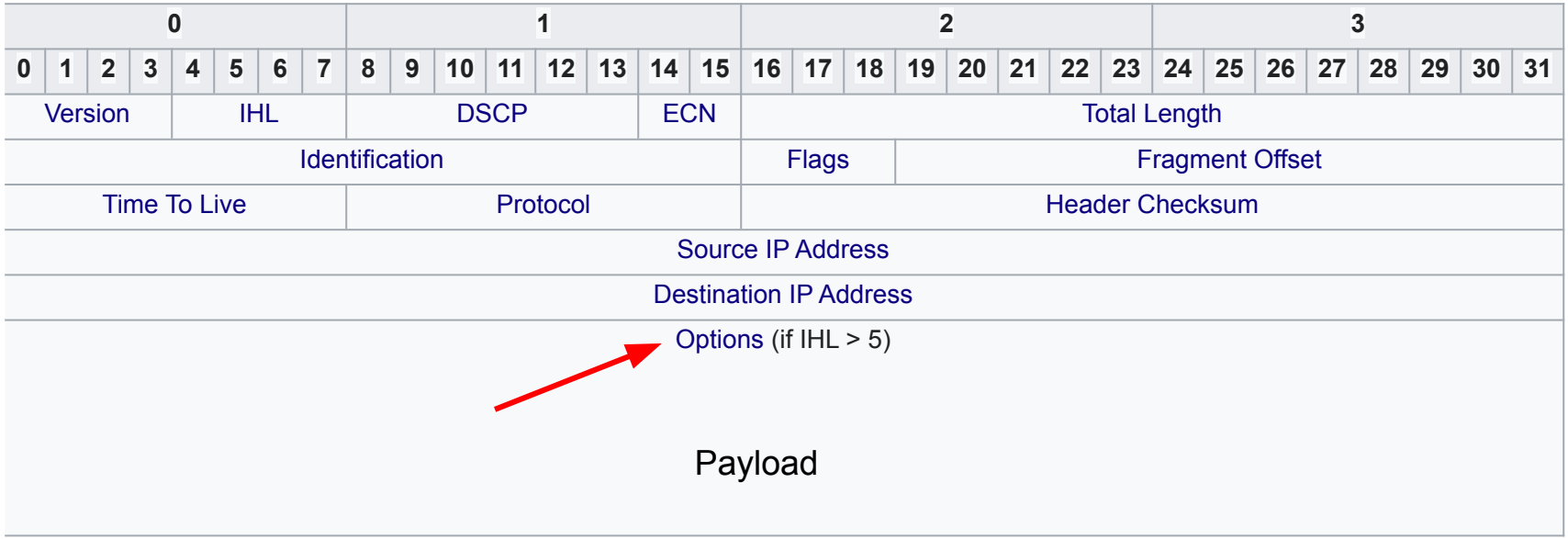

31
32


31
32
30


32
31
29
30


32
31
30
29
28


32
31
30
29
28
27
0
TTL = 0
Packet will be dropped



- Options - Timestamp, Route Followed, Some information to the source / destination.
- How much should be the options field size ?
    - 40 bytes (40 (options) + 20 (fixed header) = 60)

IPv6 Packet Structure

- 128 bit address.
- Default - 40 bytes header
  - IPv4 - 20 bytes header
- Extensions header (depends on the application)
  - IPv4 - options fields
- No limit on extension header
  - IPv4 - 40 bytes options fields

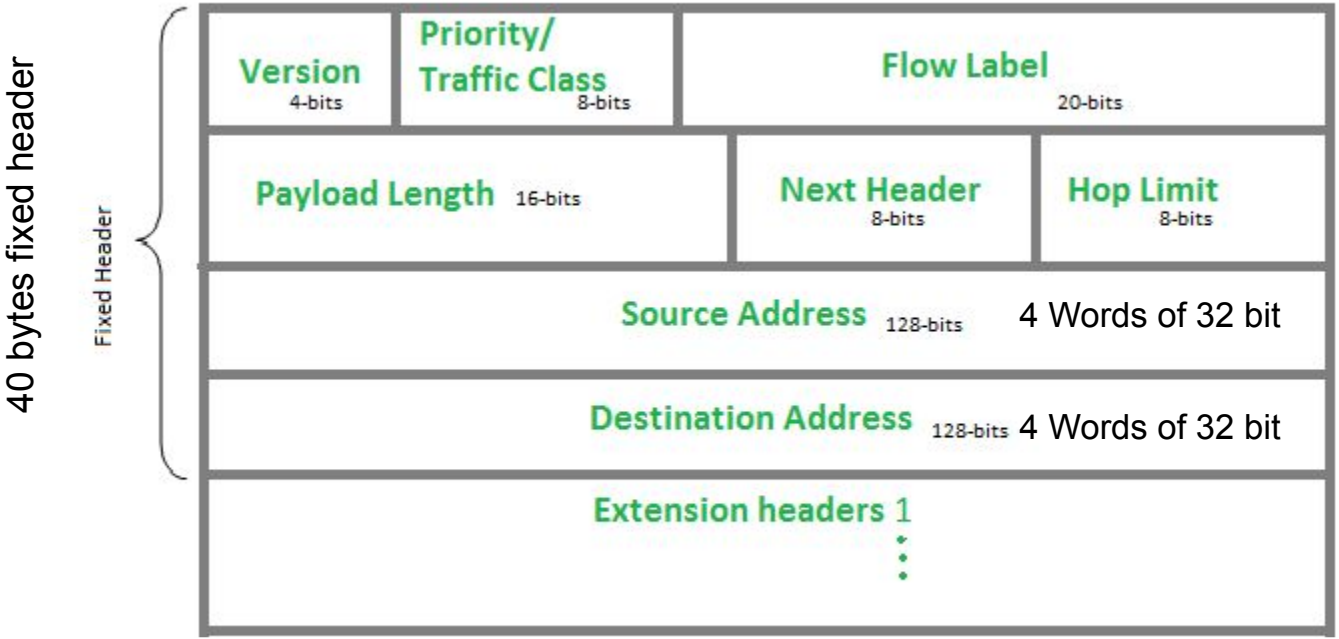
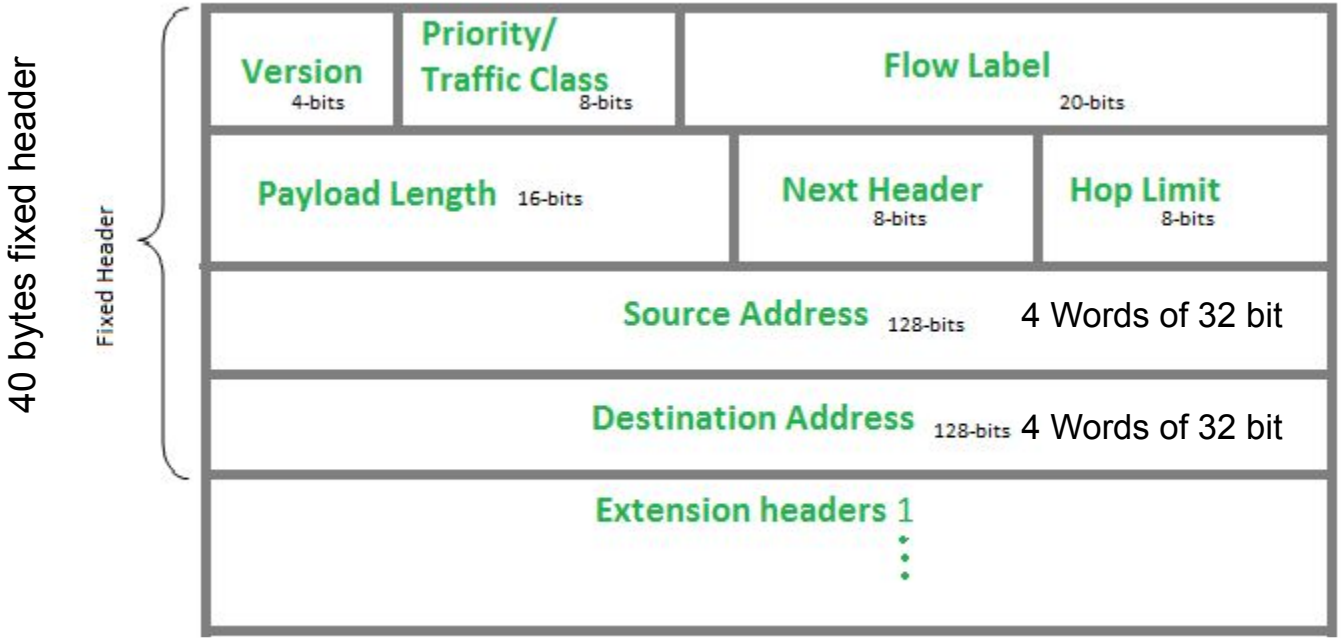


Image Source : Internet

IPv6 Extension Headers

- Hop-by-Hop Options header
- Destination Options header
- Routing header
- Fragment header
- Authentication header
- Encapsulating Security Payload header
- Destination Options header
- Upper-layer header



Fields which are not included from IPv4: IHL, Identifier, Flag, Fragment offset, Header Checksum

Image Source : Internet

Does IPv6 supports fragmentation ?

- Yes.
- Extensions header

Checksum ?

- Yes.
- Extensions header

- Hop-by-Hop Options header
- Destination Options header
- Routing header
- Fragment header
- Authentication header
- Encapsulating Security Payload header
- Destination Options header
- Upper-layer header

IPv6 Address

- 8 groups of four digits
- Each group - 16 bits
- Seperated by “:”
- 128 bits long
- Hexadecimal value.

2001 : 0db8 : 85a3 : 0000 : 0000 : 8a2e : 0370 : 7334

1 2 3 4 5 6 7 8

Types of IPv6 Address

- Unicast
- Broadcast
- Anycast
  - Packets will be delivered to the nearest destination.
  - Among the group, nearest one.

- one-to-one (unicast)
- one-to-all (broadcast)
- one-to-several (multicast)
- one-to-nearest of a group (only in v6) (anycast)

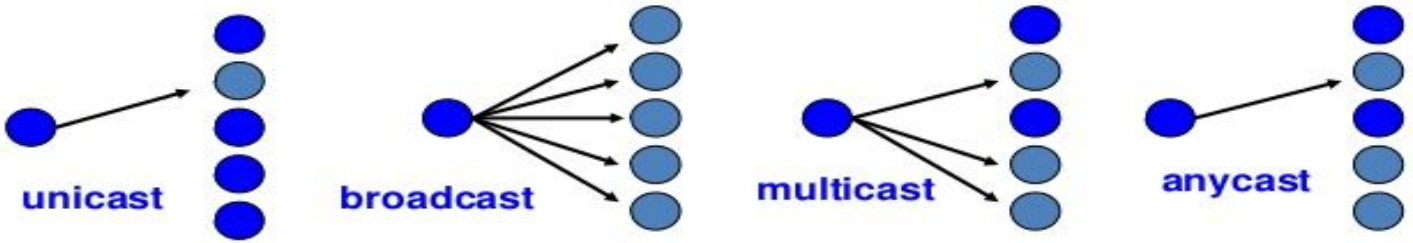


Image Source : Internet

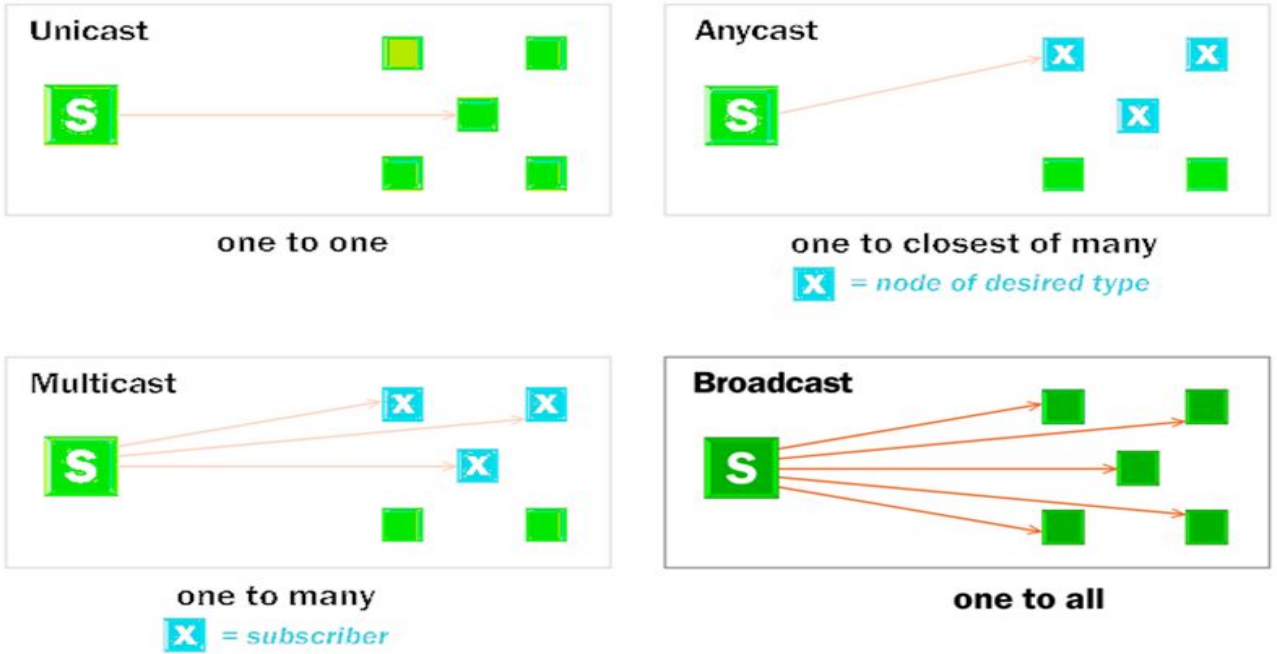


Image Source : Internet