SNS COLLEGE OF TECHNOLOGY

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Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECE308- WIRELESS TECHNOLOGIES FOR IOT

III ECE / VI SEMESTER

UNIT 2 – for IoT/M2M devices. UNITII ARCHITECTURE AND DESIGN

PRINCIPLES FOR IOT

TOPIC 5 –IP ADDRESSING IN THE IoT

32-bit IP version 4 address

- Four decimal numbers separated by dots, for example, 198.136.56.2 for 32 bits⬚ 11000110 10001000 00111000 00000010.
- Each decimal number is decimal value of an Octet (=8bits).

31	16	15	8	7	4	3	0
len [IP Packet length words]		Service Type and Precedence		Service Type and Precedence		IP version	

63	51	50	47	46	32
Fragment Offset		Flags		First Byte Sequence No. in the stream	

95	80	79	72	71	64
Check sum		Type of Protocol		TTL(Time to Live)	

Header

127	Source IP address	96

159	Destination IP address	128

q	160
Option header words and fields plus the words as padding before the data	

Extended Header

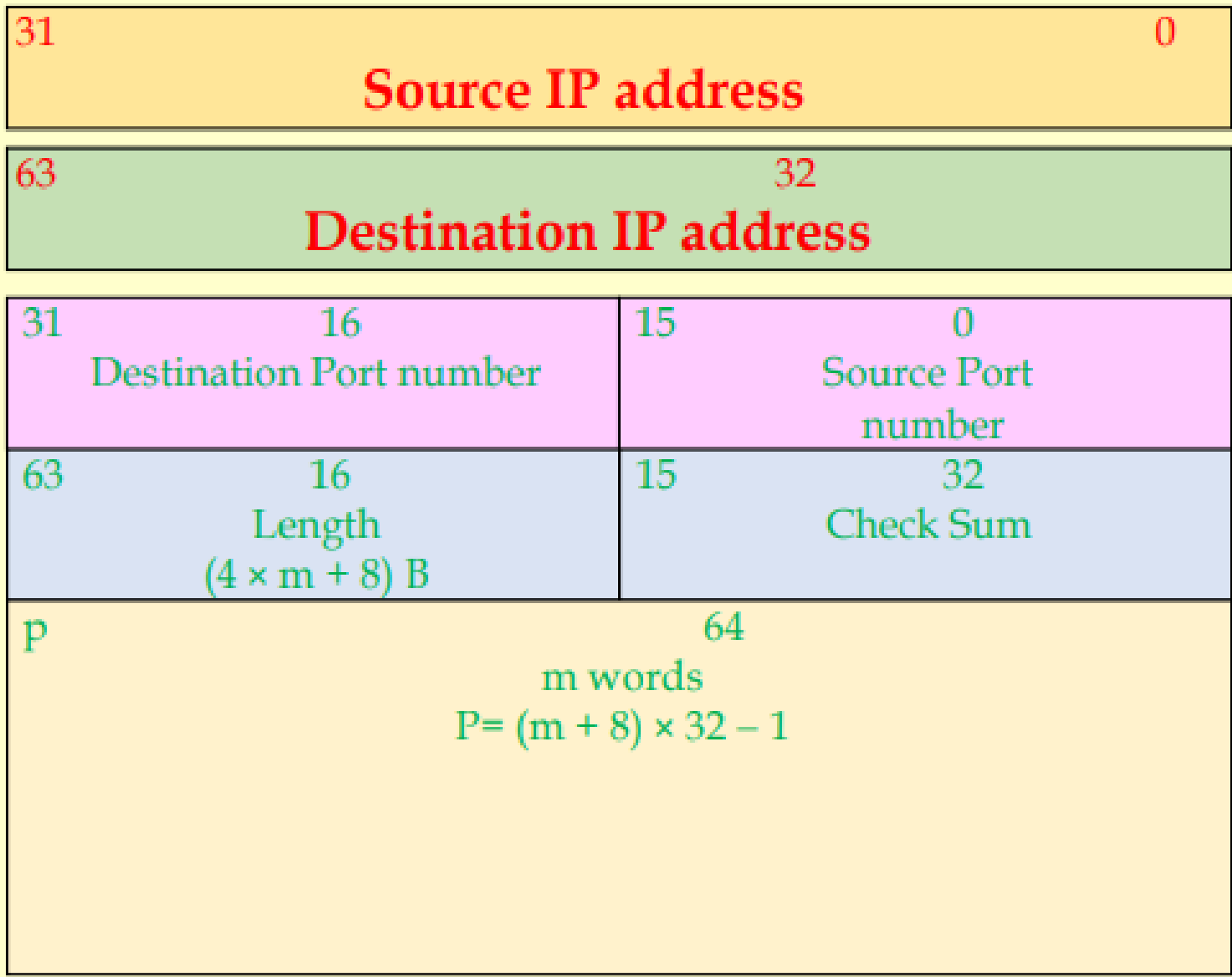| v	q
Data of (len − n) words Maximum $v = (2^{14} − n) \times 32 − 1$	

$q = (32 \times n − 1)$, [n is number of words = 5 words for header plus options plus padding words

Data Packet (stack) from or to Transport layer (Maximum Size 2^{14} words = 2^{16} B

Recall Source and destination addresses at the header in TCP protocol stack

31			0
Source IP address			

63		32	
Destination IP address			

31	16	15	0
Destination Port number		Source Port number	
63	16	15	32
Length $(4 \times m + 8)$ B		Check Sum	
P		64	
m words $P = (m + 8) \times 32 - 1$			

Header

Recall Source and destination addresses at the header in UDP protocol stack

Data stack from Application layer

4-decimal Numbers IP version 4 address

- IP addresses can be between 0.0.0.0 to 255.255.255.255, total 2^{32} addresses due to 32-bit address.
- Three separate fields with a decimal number each for each set of 8 bits are easier to use.

Subnet address

- Internet address visible to outside world for the routers on the Internet

- Subnet address for use within the group internally, and is invisible to outside world.

- A subnet is a sub-network consisting of number of hosts or nodes or devices or machines.

- Three x.x.x specifies a network group of 224 − 2 hosts
- Two x.x specifies a network group of (216 − 2) hosts,
- One .x specifies a smaller group of (28 − 2) hosts

Class A network group address

- Address n.x.x.x, where x is between 0 to 255 and n is between 1 and 126 for the addresses between 1.0.0.0 and 126.x.x.x.

- This is because the IP address 32-bit has msb bit 31 =0.

Class B Network

- •Class B network group address means address n.m.x.x, where x is between 0 to 255 and n.m is between 128.1 to 191.254 for the addresses between 128.1.0.0 and 191.254.x.x.

- This is because the IP address 32-bit has two msb bits 31-30 = 10

Class C Network

- Class C network group address means address n.m.k.x, where x is between 0 to 255 and n.m.k is between 192.0.1 and 223.255.254 for the addresses between 192.0.1.0 and 223.255.254.x.
- This is because the IP address 32-bit has three msb bits 31-30-29 = 11

Class C Network

- Class C network group address means address n.m.k.x, where x is between 0 to 255 and n.m.k is between 192.0.1 and 223.255.254 for the addresses between 192.0.1.0 and 223.255.254.x.
- This is because the IP address 32-bit has three msb bits 31-30-29 = 11

Dynamic IP Address

- A number of computers, laptops, mobiles and devices may need connection in an organisation to an IP router
- Number of actual users at an instant may be much less.
- Dynamic IP address solves this problem.
- Once a device connects to Internet, it needs to be allotted individual IP address, called dynamic IP address
- When the device connects to a router, the router and device use DHCP (Dynamic Host Control Protocol)
- DHCP actions assign an IP address at an instance to the device.

Domain Names System (DNS)

- An Application which provides the IP address for the corresponding service from the named domain service

- For example, an IP address, 198.136.56.2 (11000110 10001000 00111000 00000010) registered domain name rajkamal.org for the IP address

128-bit address IPv6 address

- A hexadecimal digit represents 4-bit, 0 hex = 0000 binary to f hex = 1111.

- 128-bit address: 32 hexadecimal digits

- Eight sets of 4 hex-digits each separate by a colon or dot in an IPv6 address.

- Example is 16-hexadecimal digits, 40a0: 0acb:8a00:b372:0000: 0000:0000:0000.

- IANA manages the allocation process for the IPv6 addresses
- 64-bit in the last when all zeros then can be omitted

Classification of IPv6 addresses

- Three classes
- Each class differs in the primary addressing and routing methods.
- An interface may be at distinct node

Unicast address

- For a single network interface
- 48-bit or more in unicast specify routing prefix
- 16-bit or less specify a subnet id
- 64-bit are interface identifier

Anycast address

- Address of a group of interfaces

- Anycast address means an address which can be present and used by a group of nodes or interfaces.

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Multicast address

- Address used by multiple hosts

- Acquire the multicast address destination by participating in the multicast distribution protocol among the network routers

- A packet with multicast address delivers to all interfaces that have joined a corresponding multicast group.

MAC (Media Access Control) Address

• Each network card or Ethernet protocol using computer has a unique MAC address for the source and destination node addresses.

Ethernet frame communication

- Data stack (4 B to 1500 B)

- Source node MAC address and destination node MAC address.

- MAC address of each node specified in the firmware of the network card or chip or core

Address Resolution Protocol (ARP) and RARP (Reverse ARP)

- ARP uses a lookup table

- The network 32-bit address provides MAC address of the individual node using the table

- RARP also uses that lookup table

- The table stores the IP address in one column and node MAC address in another