



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**

**An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University,

Chennai



## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **19ECE308- WIRELESS TECHNOLOGIES FOR IOT**

III ECE / VI SEMESTER

UNIT 2 – ARCHITECTURE AND DESIGN PRINCIPLES FOR IOT

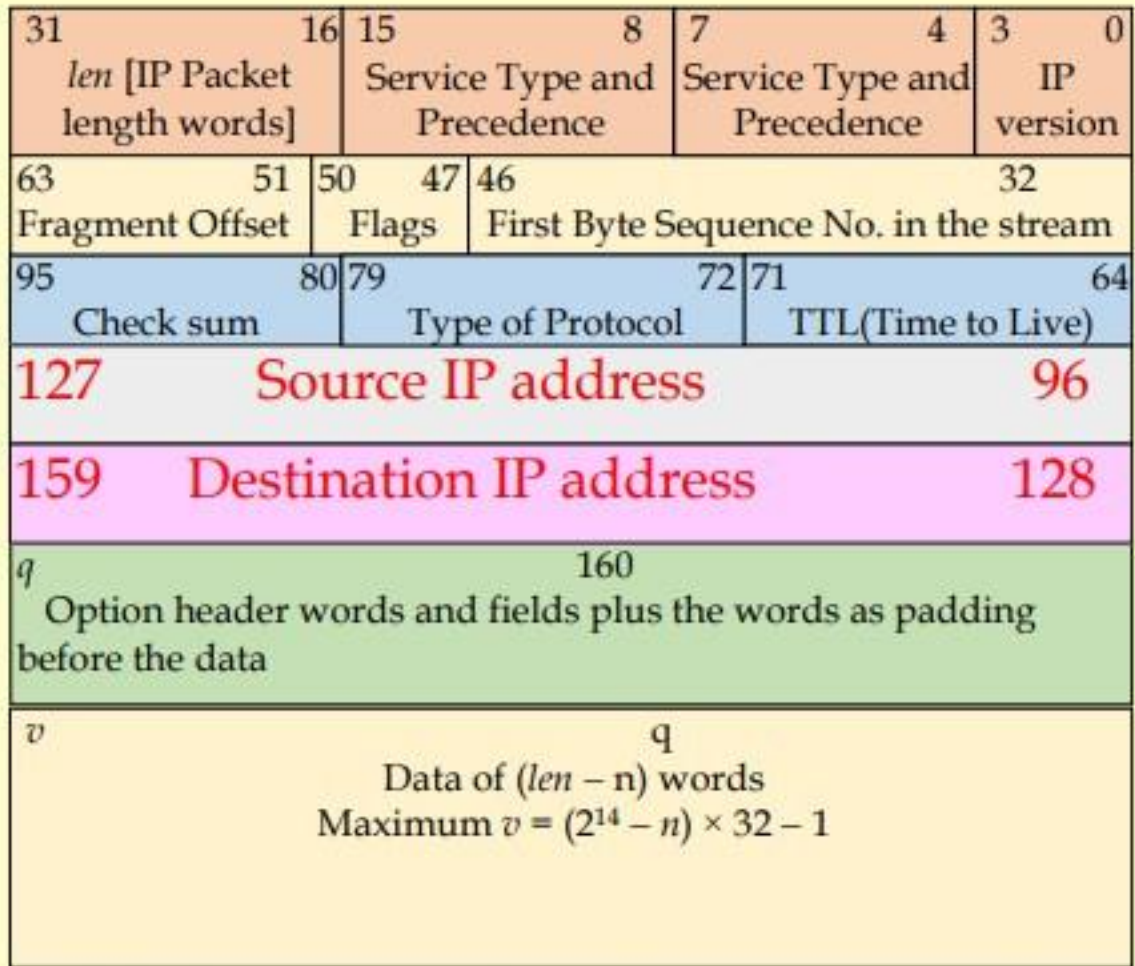
### **TOPIC 5 –IP ADDRESSING IN THE IoT**



## 32-bit IP version 4 address



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



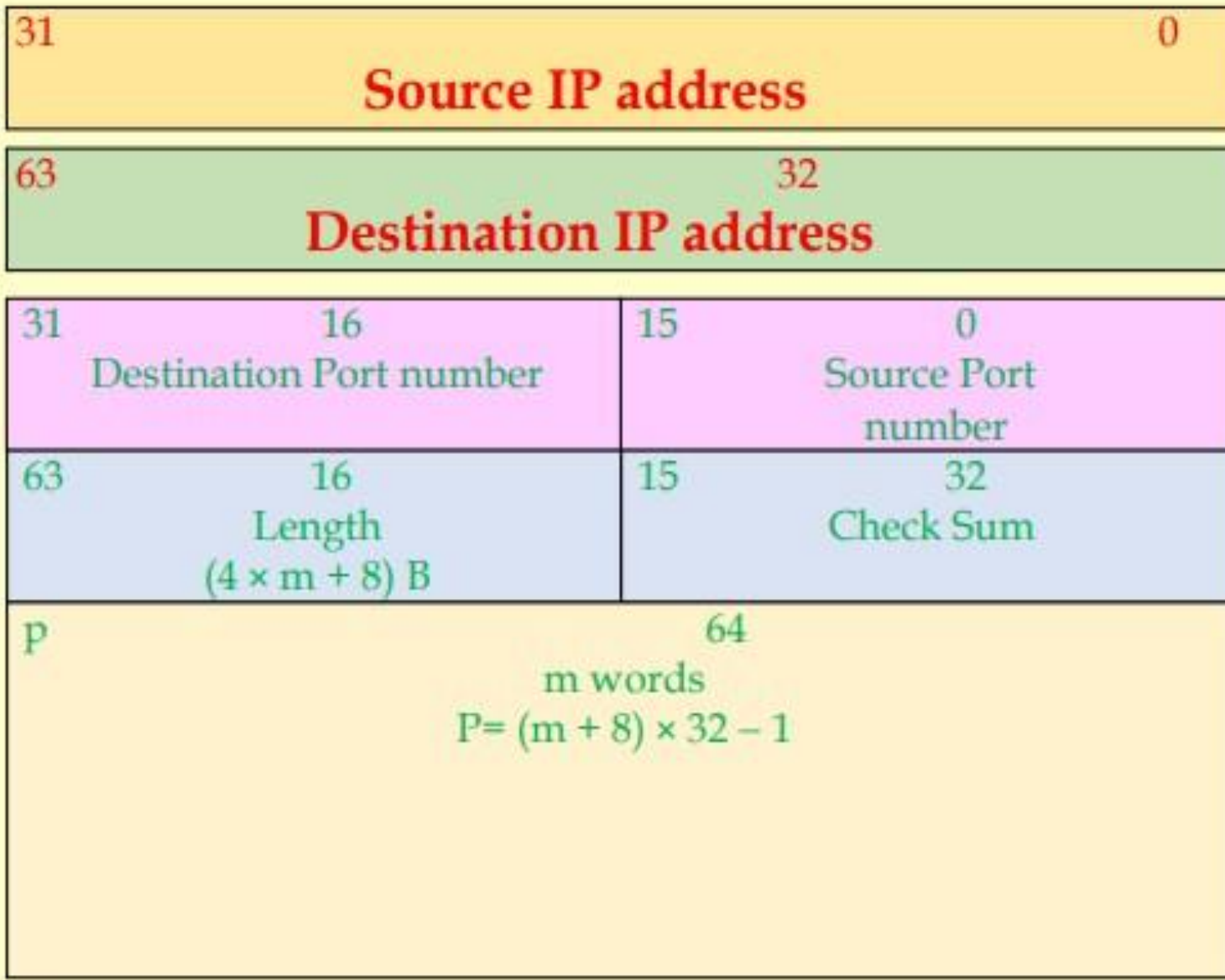
Header

Extended Header

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

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

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



Pseudo Header

Header

Data stack from Application layer

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



## 4-decimal Numbers IP version 4 address



- IP addresses can be between 0.0.0.0 to 255.255.255.255, total 2<sup>32</sup> 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.



## Class A, B and C Networks



- Three x.x.x specifies a network group of  $2^{24} \times 2$  hosts
- Two x.x specifies a network group of  $(2^{16} \times 2)$  hosts,
- One .x specifies a smaller group of  $(2^8 \times 2)$  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.



# IPv6 Large Number of addresses.



- 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