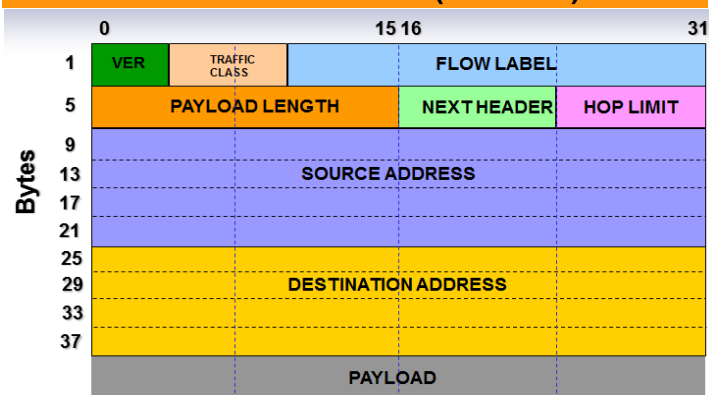


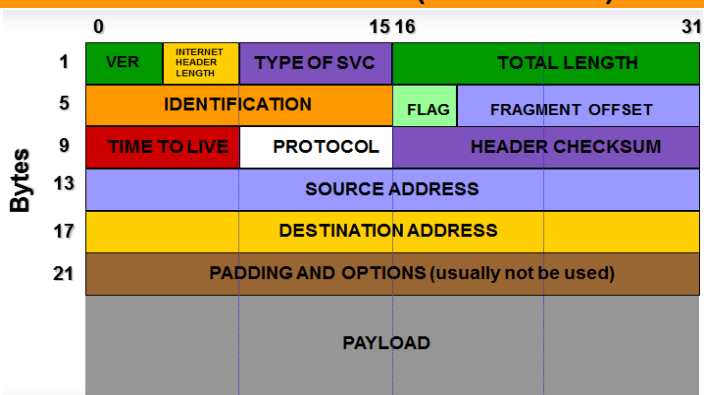
# IPv6 Cheat Sheet

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## IPv6 Protocol Header (40 octets)



## IPv4 Protocol Header (for reference)



Size of IPv6 address = 128 bits or  $2^{128} = 340,282,366,920,938,000,000,000,000,000,000,000,000,000$  addresses

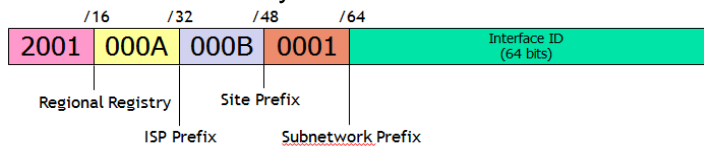
## Addressing Types

Global Unicast Address:

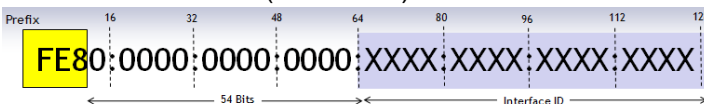


2400::/12 to APNIC                      2600::/12 to ARIN  
 2800::/12 to LACNIC                    2A00::/12 to RIPE  
 2C00::/12 to AfriNIC

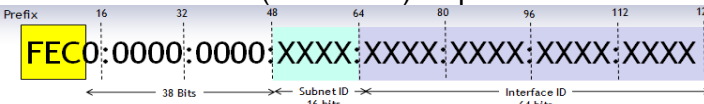
Global IPv6 Hierarchy:



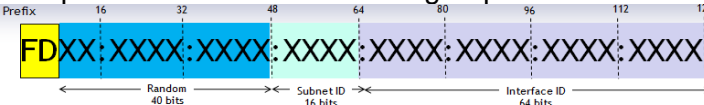
Link Local Address (FE80::/10):



Site Local Address (FEC0::/10) Deprecated:



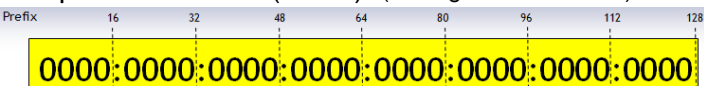
Unique Local Address: FD00:/8 group shown



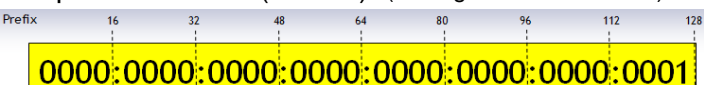
Documentation Format:



Unspecified Format (::/128): (analogous to "0.0.0.0")



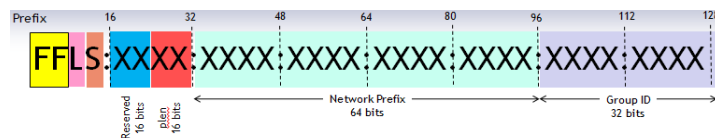
Loopback Address (::1/128): (analogous to "127.0.0.1")



## Next Header Field Definitions

- 000 IPv6 Hop-by-Hop Option
- 002 Internet Group Management Protocol
- 006 Transmission Control Protocol (TCP)
- 017 User Datagram Protocol (UDP)
- 041 IPv6
- 043 IPv6 Routing Header
- 044 IPv6 Fragmentation Header
- 046 Reservation Protocol (RSVP)
- 047 General Routing Encapsulation (GRE)
- 050 Encapsulation Security Payload (ESP)
- 051 Authentication Header (AH)
- 055 IP Mobility (MOBILE)
- 058 ICMPv6
- 059 No Next Header
- 060 IPv6 Destination Options
- 089 OSPF IGP
- 094 IP-in-IP Encap. Protocol (IPIP)
- 103 Protocol Independent Multicast (PIM)
- 135 Mobility for IPv6 (MIPv6) Header

## IPv6 Multicast

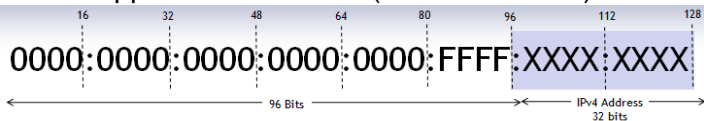


Scope Field 0 = Reserved, 1 = Node/Infc. Local  
 2 = Link Local, 3 = Subnet Local  
 4 = Admin Local, 5 = Site Local  
 8 = Organization Local, E = Global

Flag Bits (L): Format is "ORPT" where  
 T, =1 "well known", =0 "transient"  
 R, =1 Embedded RP, =0 not  
 P, =1 based on unicast, =0 not

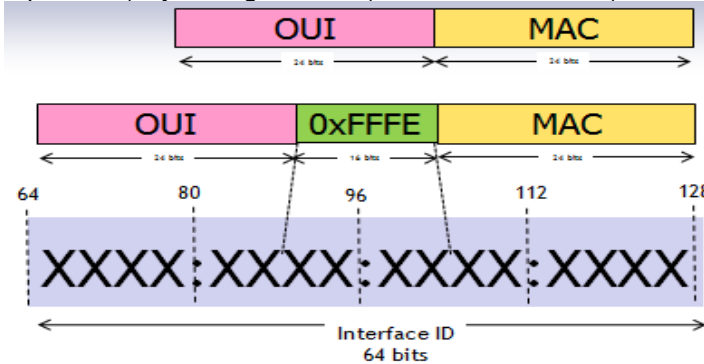
plen = length of the network prefix, locally administered

## IPv6 Mapped IPv4 Address (::FFFF:A.B.C.D)



## IPv6 Interface Addresses

Options: a) By Configuration, b) Pseudo Random, c) EUI:

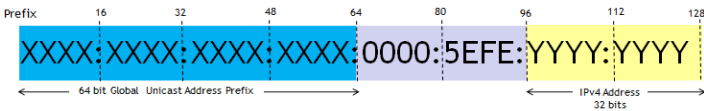


Note: Also flips 7th bit (Universal/Local flag) to 1

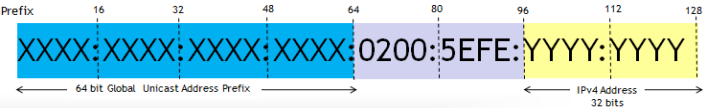
Example: 00d0.5873.4cf1 becomes FE80::2D0:58FF:FE73:4CF1

## IPv6 Tunnel Interface Addresses

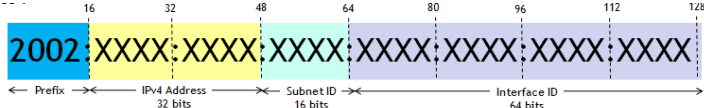
ISATAP: Private IPv4 addresses



ISATAP: Public IPv4 addresses



6to4:



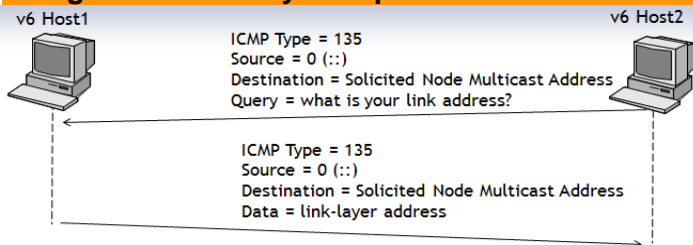
## Ethertype Reference

0800 = IPv4	86DD = IPv6
0806 = ARP	8847 = MPLS Unicast
8035 = Reverse ARP	8848 = MPLS Multicast
8863 = PPOE (Discovery)	8864 = PPOE (PPP sess)

## Stateless Address Autoconfiguration (SLAAC)

Originally in RFC 2462, updated by RFC 4862  
 "Stateless" because it begins from a "dead start" with no information (or "state") at all for the host to work with, and has no need for a DHCP server  
 Host autonomously configures its own Link-Local addr.  
 Router solicitations are sent by booting nodes to request Router Advertisements (RAs) for Prefix

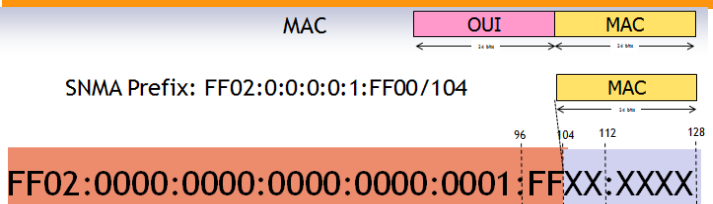
## Neighbor Discovery & Duplicate Address Detect



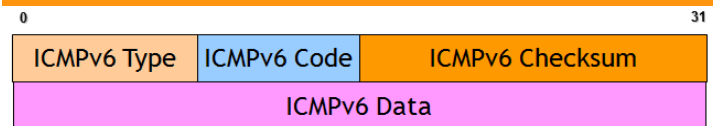
## Well Known IPv6 Multicast Addresses

FF01::1	All nodes on Local Node/Infc.
FF02::1	All nodes on Link Local (analogous to 224.0.0.1)
FF02::1	All Routers on Local Node/Infc.
FF02::2	All Routers on Link Local
FF05::2	All Routers on Local Site
FF02::4	All DVMRP Routers on Link Local
FF02::5	All OSPF IGP Routers on Link Local
FF02::6	All OSPF DRouters on Link Local
FF02::9	All RIP Routers on Link Local
FF02::D	All PIM Routers on Link Local
FF02::16	All MLDv2 Routers on Link Local
FF02::1:2	All DHCP agents on Link Local
FF05::1:3	All DHCP servers on Local Site
FF05::16	All MLDv2 Routers on Link Local
FF01::101	All NTP servers on sender's host
FF02::101	All NTP servers on sender's link
FF05::101	All NTP servers on sender's site
FF0E::101	All NTP servers on the Internet

## Solicited Node Multicast Addresses



## ICMPv6



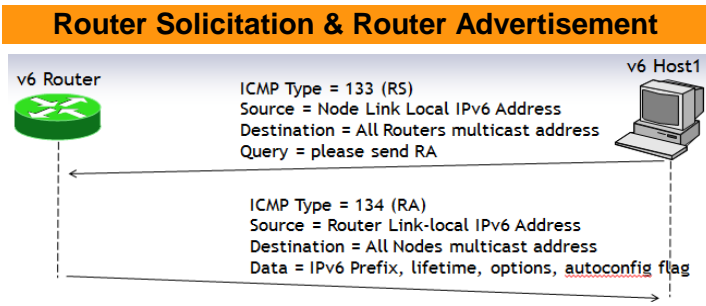
## ICMPv6 Error Messages

- Type = 0-127 Error Messages
- Type = 1 Destination Unreachable
  - Code = 0 No route to destination
  - Code = 1 Administratively Prohibited
  - Code = 2 (unassigned)
  - Code = 3 Address Unreachable
  - Code = 4 Port Unreachable
- Type = 2 Packet Too Big
- Type = 3 Time Exceeded
  - Code = 0 Hop Limit Exceeded
  - Code = 1 Fragment Reass. Time Exceeded
- Type = 4 Parameter Problem
  - Code = 0 Errored Header Field
  - Code = 1 Unrecognized Next Header
  - Code = 2 Unrecognized IPv6 Option

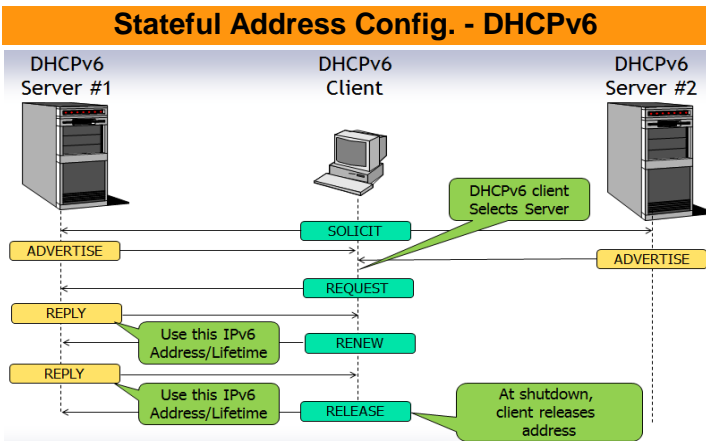
## ICMPv6 Informational Messages

- Type = 128-255 are Informational Messages
- Type = 128 Echo Request (Ping)
- Type = 129 Echo Reply
- Type = 130 Multicast Listener Query

Neighbor Discover replaces ARP



- Type = 131 Multicast Listener Report
- Type = 132 Multicast Listener Done
- Type = 133 Router Solicitation
- Type = 134 Router Advertisement
- Type = 135 Neighbor Solicitation
- Type = 136 Neighbor Advertisement
- Type = 137 Redirect Message
- Type = 138 Router Renumbering
- Type = 139 Node Information Query
- Type = 140 Node Information Response
- Type = 143 Version 2 Multicast Listener Report
- Type = 144 Home Agent Address Discovery Request
- Type = 145 Home Agent Address Discovery Reply
- Type = 146 Mobile Prefix Solicitation
- Type = 147 Mobile Prefix Advertisement



DHCP Client Port = UDP port 546  
 DHCP Server Port = UDP port 547  
 Each client and server has a DHCP Unique Id. (DUID)  
 DUID can have multiple Identity Associations (IAs)

ICMPv6 Flags			
Station Parameters	Stateless Autoconfig.	Stateless DHCP	Stateful DHCP
Prefix/Length	From the Router Advertisement M=0 and O=0	From the Router Advertisement M=0 and O=1	From the Router Advertisement M=1 and O=1
Interface Identifier	Auto Configuration	Auto Configuration	From DHCPv6 Server
DNS, NTP address, etc.	Manual Configuration	From DHCPv6 Server	From DHCPv6 Server

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[IPv6 101 - 2 day ILT or Web Based Delivery](#)  
[IPv6 201 \(Advanced\) - 2 day ILT or Web Based Del.](#)