IPv6 Essentials Cheat Sheet v1.4

IPv6 Addressing

Address Type	IPv6 Notation	Binary Prefix
Unspcecified	**::/128**	**0000...0 (128 bits)**
Loopback	**::1/128**	**0000...1 (128 bits)**
Multicast	**ff00::/8**	**1111 1111 xxxx xxxx**
Link-Local	**fe80::/10**	**1111 1110 1000 0000**
Global Unicast (GUA)	**2000::/3**	**001x xxxx xxxx xxxx**
Unique Local (ULA)	**fc00::/7**	**1111 110x xxxx xxxx**
6to4 (tunnel)	**2002::/16**	
Teredo (tunnel)	**2001:0000::/32**	
IPv4-Mapped IPv6	**0:0:0:0:0:ffff:a.b.c.d**	
Documentation	**2001:0db8::/32**	

Well Known Multicast Addresses

Address	Description	Scope
ff01::1	**All Nodes Address**	**Interface-local**
ff02::1	**All Nodes Address**	**Link-local**
ff01::2	**All Routers Address**	**Interface-local**
ff02::2	**All Routers Address**	**Link-local**
ff05::2	**All Routers Address**	**Site-local**
ff02::4	**DVMRP Routers**	**Link-local**
ff02::5	**OSPF IGP Drothers**	**Link-local**
ff02::6	**OSPF IGP DRs**	**Link-local**
ff02::9	**RIPng Routers**	**Link-local**
ff02::a	**EIGRPv6 Routers**	**Link-local**
ff02::c	**Microsoft SSDP**	**Link-local**
ff02::d	**All PIM Routers**	**Link-local**
ff02::12	**VRRPv3**	**Link-local**
ff02::16	**All MLDv2 Routers**	**Link-local**
ff02::1:2	**DHCPv6 Servers/Agents**	**Link-local**
ff05::1:3	**DHCPv6 Servers/Agents**	**Site-local**
ff0x::101	**Network Time Protocol**	**Variable**
ff02::1:ffxx:xxxx	**Solicited-Node Address**	**Link-local**

IPv6 Address Shorthand Notation

2001:0db8:0006:1ab5:0000:0000:0000:ba11

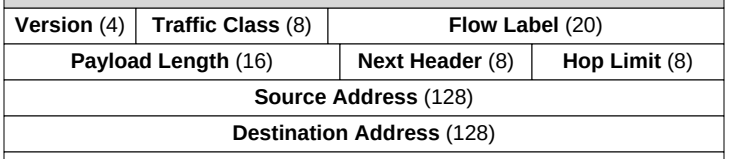
remove leading zeros to achieve

2001:db8:6:1ab5:0:0:0:ba11

additional reduction by replacing consecutive fields of zeros with double-colon "::" option (can only be done once) to achieve

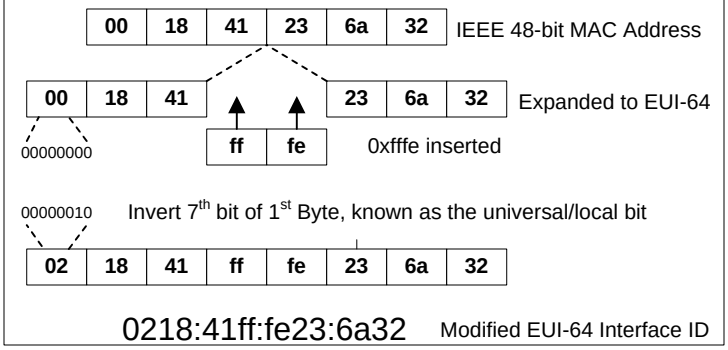
2001:db8:6:1ab5::ba11

IPv6 Header



Version : IP version number, 6 for IPv6
Traffic Class : Similar to IPv4 ToS field. Used by nodes to identify and distinguish between different classes or priorities of IPv6 packets
Flow label : Used by a source to label sequences of packets for which it requests special handling by the IPv6 routers
Payload Length : Length of the IPv6 payload (may also include extension headers)
Next Header : Identifies the type of header following the IPv6 header
Hop Limit : Decremented by 1 by every router that forwards the packet
Source Address : IPv6 address of the originator of the packet, will be a unicast address
Destination Address : IPv6 address of the intended recipient or final destination of the packet, can be unicast or multicast address

Interface ID from MAC Address



ICMPv6 Message Types

128	**Echo Request**
129	**Echo Reply**
130	**Multicast Listener Query**
131	**Multicast Listener Report**
132	**Multicast Listener Done**
133	**Router Solicitation**
134	**Router Advertisement**
135	**Neighbor Solicitation**
136	**Neighbor Advertisement**
137	**Redirect Message**
138	**Router Renumbering**
139	**ICMP Node Information Query**
140	**ICMP Node Information Response**
143	**Multicast Listener Report (MLDv2)**
144	**Home Agent Discovery Request**
145	**Home Agent Discovery Reply**
146	**Mobile Prefix Solicitation**
147	**Mobile Prefix Advertisement**

IPv6 Next Header Fields

(Extension Headers)

0	**IPv6 Hop-byHop Option**
41	**IPv6 encapsulation**
43	**Routing Header for IPv6**
44	**Fragment Header for IPv6**
50	**Encap Security Payload (ESP)**
51	**Authentication Header (AH)**
59	**No Next Header for IPv6**
60	**Destination Options for IPv6**

IPv6 Address Types

Link-Local – Automatically assigned per interface, not routable
Global Unicast Address (GUA) – Assigned by SLAAC, Stateful (DHCPv6), or manual, routable to Internet
Unique Local Address (ULA) – Assigned by SLAAC, Stateful (DHCPv6), or manual, not routable to Internet, is routable within enterprise (like private address)

Unicast – one-to-one (link-local, unique local, global)
Anycast – one-to-nearest (allocated from Unicast)
Multicast – one-to-many (also replaces broadcast)

Wireshark Display Filters for IPv6

ipv6 – all IPv6 traffic
icmpv6 – all IPv6 ICMPv6 traffic
dhcpv6 – all DHCPv6 traffic
icmpv6.type == 133 – all router solicitations
icmpv6.type == 134 – all router advertisements
icmpv6.type == 135 – all neighbor solicitations
icmpv6.type == 136 – all neighbor advertisements
icmpv6.type == 137 – all redirect messages

IPv6 Neighbor Discovery Protocol

Neighbor Solicitation (NS) – Neighbor address resolution (similar to IPv4 ARP)
Neighbor Advertisement (NA) – Response to Neighbor Solicitation requests
Router Solicitation (RS) – Sent by nodes "looking" for IPv6 routers on-link
Router Advertisements (RA) – Sent periodically by routers and in response to RS
Duplicate Address Detection (DAD) – Sent to own Solicited-Node Multicast Address