PAESSLER
THE NETWORK MONITORING COMPANY

CHEAT SHEET

IPv6 SUBNETS

IPv6 HEADER

Version (4)	Traffic Class (8)	Flow Label (20)	
Payload Length (16)		Next Header (8)	Hop Limit (8)
Source Address (128) (16 bytes)			
Destination Address (128) (16 bytes)			

Version (4 bits): IP-Version – always set to 6 (0110)

Traffic Class (8 bits): Used to identify and distinguish between different classes of priorities

Flow Label (20 bits): Identifies unique flows (optional)

Payload length (16 bits): Length of the payload in bytes

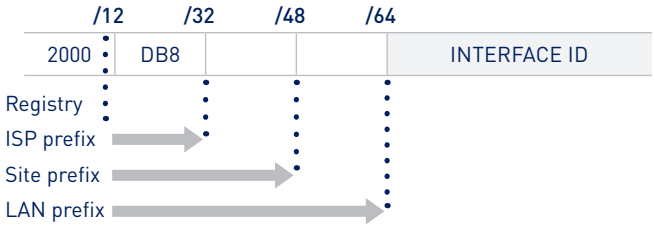
Next Header (8 bits): Identifies the following header or protocol

Hop Limit (8 bits): Number of hops until packet gets discarded (TTL in IPv4)

Source Address (128 bits): Source IP address

Destination Address (128 bits): Destination IP address

ADDRESS ALLOCATION



- **64 bits** reserved for the interface ID
- **16 bits** reserved for the end site
- **16 bits** reserved for each service provider
- **29 bits** reserved for all service providers

ADDRESS FORMAT

GLOBAL UNICAST

Global Prefix	Subnet	Interface ID
48	16	64

LINK-LOCAL UNICAST

FE80::/64	Interface ID
64	64

MULTICAST

FF	Flags	Scope	Group ID
8	4	4	112

ADDRESS REPRESENTATION

An IPv6 address has 128 bits
fe80:0000:e05c:0000:0000:8b85:d65c:edd7

Leading zeros in a field are optional
fe80:0:e05c:0:0:8b85:d65c:edd7

Successive fields of 0 represented as ::, but only once in an address
fe80:0:e05c::8b85:d65c:edd7

In a URL, it is enclosed in brackets
http://[fe80:0:e05c::8b85:d65c:edd7]:8080/index.html

ADDRESS SCOPES

Default Route	::/0
Unspecified	::/128
Loopback Address	0:0:0:0:0:0:0:1 or ::1/128
IPv4-mapped	::FFFF:192.0.2.1
IPv4-Compatible IPv6	0:0:0:0:0:0:A.B.C.D
Teredo	2001::/32
Documentation	2001:DB8::/32
6to4	2002::/16
Unique Local	FC00::/7
Link-Local Unicast	FE80::/10
Site-Local Unicast	FEC0::/10
Multicast	FF00::/8

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EXTENSION HEADERS

(NH = Next Header)			
		IPv6 Header NH = TCP	TCP Header + Data
	IPv6 Header NH = Routing	Routing Header NH = TCP	TCP Header + Data
IPv6 Header NH = Routing	Routing Header NH = Fragment	Fragment Header NH = TCP	TCP Header + Data

ICMPv6 ERROR MESSAGES (TYPE/CODE)

1 Destination Unreachable
- 0-no route to destination
- 1-communication with destination administratively prohibited
- 2-(not assigned)
- 3-address unreachable
- 4-port unreachable

2 packet too big

3 Time exceeded
- 0-hop limit exceeded in transit
- 1-fragment reassemble time exceeded

4 parameter problem
- 0-erroneous header field
- 1-unrecognized next header type
- 2-unrecognized IPv6 option

NEXT HEADER FIELDS

000	IPv6 Hop-by-Hop-Option	**017**	User Datagram (UDP)
006	Transmission Control (TCP)	**043**	Routing Header
044	Fragment Header	**046**	Reservation Protocol (RSVP)
050	Encap Security Payload (ESP)	**051**	Authentication Header (AH)
055	IP Mobility (MOBILE)	**058**	ICMP for IPv6
059	No Next Header for IPv6	**060**	Destination Options
089	OSPFIGP	**135**	Mobility Header
094	IP-within-IP Encapsulation Protocol (IPIP)		
103	Protocol Independent Multicast (PIM)		
002	Internet Group Management (IGMP)		
047	Gerenal Routing Encapsulation (GRE)		

TRANSITION MECHANISMS

DUAL STACK	Enables a node to communicate with IPv6-only or IPv4-only nodes concurrently
TUNNELING	IPv6 traffic is encapsulated into IPv4 → Enables IPv6 islands or nodes to communicate over an IPv4 network
TRANSLATION	Stateless IP/ICMP Translation (SIIT) translates IP header fields and enables IPv4-only networks & nodes to communicate with IPv6 only networks & nodes

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