

IPv6 address notations:

2001:0db8:0000:0000:0000:1428:57ab standard notation
 2001:db8:0:0:0:0:1428:57ab suppressing leading zeros
 2001:db8::1428:57ab zero compressed notation
 fe80::5efe:192.168.20.100 mixed notation, compressed

IPv6 address types: Unicast prefixes

2001: Globally assigned unicast
 2002: Reserved for 6to4 encapsulation
 fe80: Link-Local (not routed at all)
 fc00: Centrally Assigned Unique Local Address (ULA-central)
 fd00: Unique Local Address (ULA, not routed in the Internet)

IPv6 address types: Multicast prefixes and Scopes

ff01: Interface (does not leave local host)
 ff02: Link-local (does not leave local subnet)
 ff05: Site-local (does not leave local site)
 ff0e: Global (does leave to the Internet)

IPv6 address types: Multicast hosts

::1 All nodes	::b All mobile agents
::2 All routers	::c SSDP
::3 unassigned	::d All PIM router
::4 DVMRP router	::e RSVP-encapsulation
::5 OSPF IGP	::16 LLNMR
::6 OSPF IGP DR	::101 NTP server
::7 ST router	::1:1 Link name
::8 ST hosts	::1:2 All DHCP relay agents
::9 All RIP routers	::1:3 DNS & LLNMR
::a All EIGRP routers	::1:ff:xxxx Solicited node multicast

IPv6 address types: Anycast

2001:620:20:1:: Anycast for Subnet-Router address
 2001:7fd::1 Anycast for Root-Nameserver of RIPE NCC

IPv6 address examples:

fe80::230:64ff:fe6b:8532 Link-Local unicast address
 2001:620::230:64ff:fe6b:8532 Global unicast address
 ff02::2 Multicast to all routers on local subnet
 ff05::1:3 Multicast to all DHCP servers within the site
 ff05::101 Multicast to all NTP servers within the site
 ff0e::101 Multicast to all NTP servers in the Internet

IPv6 special addresses:

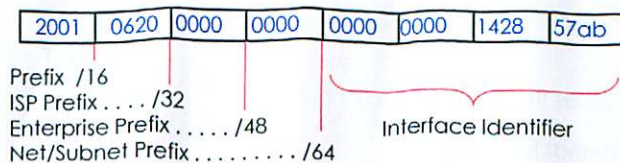
::/128 unspecified address with all zero bits, used as source address only
 ::1/128 local host (loopback address)

IPv6 deprecated address prefixes:

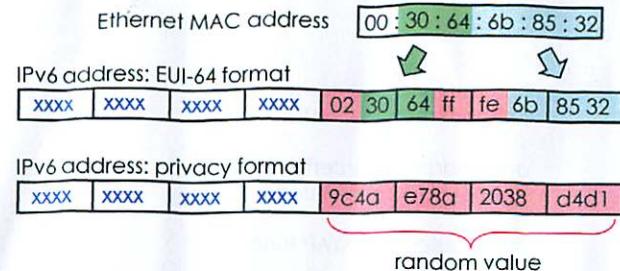
::w.x.y.z/96 zero prefix was used for IPv4-compatible addresses
 fec0::/10 site-local prefix valid only inside local organization
 3ffe::/16 reserved for 6Bone (Internet test nets)

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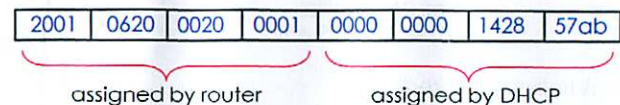
IPv6 address formats: (best practices)



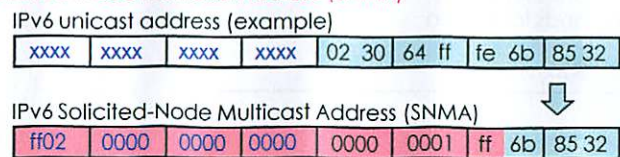
IPv6 Stateless Address Autoconfiguration (SLAAC)



IPv6 Stateful Address Configuration (via DHCP)



Solicited-Node Multicast Address (SNMA)



SNMA derived from unicast address: ff02::1:ff6b:8532

Wireshark display filters:

eth.addr[0:2]==3333	filters MAC multicasts 33:33:xx
eth.addr[0:3]==33:33:ff	filters neighbor solicitations
ipv6.addr[0:2]==fd00	filters from/to prefix fd00/16
ipv6.host contains "fd00::3"	filters on exact string 'fd00::3'
ipv6.addr[0:8]==fd00:0000:0000:0000	filters from/to prefix fd00::/64
icmpv6.type == 133	filters on 'Router Solicitation'
icmpv6.type == 134	filters on 'Router Advertisement'
icmpv6.type == 135	filters on 'Neighbor Solicitation'
icmpv6.type == 136	filters on 'Neighbor Advertisement'
icmpv6.type == 137	filters on 'Redirect Message'

IPv6 Neighbor Discovery (ND)

Neighbor Solicitation	Neighbor address resolution, sent to Solicited-Node Multicast Address (SNMA)
Neighbor Advertisement	Response to 'Neighbor Solicitation' sent back to requester
Router Solicitation	Router address resolution, sent to ff02::2
Router Advertisement	Response to 'Router Solicitation' sent to ff02::1
Duplicate Address-Detection (DAD)	Sent to own Solicited-Node Multicast Address (SNMA)

Multicast Listener Discovery (MLD)

Multicast Listener Query	Sent by a multicast router to poll a network segment for group members
Multicast Listener Report	Sent by a host when it joins a multicast group, or in response to an MLD Multicast Listener Query sent by a router.
Multicast Listener Done	Sent by a host when it leaves a host group.

Other ICMPv6 messages

Destination Unreachable	Error message
Packet Too Big	Error message
Time Exceeded	Error message
Parameter Problem	Error message
Redirect Message	Router informs node about better next-hop address
Echo Request/Reply	Connectivity test

Tunneling/encapsulation methods:

6in4 (static)	IPv6-over-IPv4 Tunneling (RFC4213)
6in4 (heartbeat)	Automatic 6in4 tunnel using AICCU clients
6rd	IPv6 Rapid Deployment for ISPs (RFC 5569)
6to4	IPv6 in IPv4 encapsulation, no NAT support
AYIYA	Anything In Anything UDP Tunneling
ISATAP	Intra-site Automatic Tunnel Addr. Protocol
(::5efe:w.x.y.z)	Address example: fe80::5efe.192.168.1.100
L2TP	Layer Two Tunneling Protocol (RFC2661)
Teredo tunnel	IPv6 tunneled over UDP port 3544 (RFC4380)
TSP	Tunnel Setup Protocol for IPv6 Tunnel Broker
GRE tunnel	IPv6 inside Generic Routing Encapsulation
MPLS tunnel	IPv6 over Multiprotocol Label Switching

IPv6/IPv4 translation methods:

NAT-PT	Network Address Translation - Protocol Translation
NAPT-PT	Network Address Port Translation - Protocol Transl.
SIIT	Stateless IP/ICMP Translation

Windows commands: (VISTA, Server 2008 & Windows 7)

<code>ipconfig /all</code>	displays details of all interfaces
<code>ping ::1</code>	test internal IPv6 stack
<code>ping fe80::230:19ff:fe3e:8621%7</code>	ping address on local subnet through interface ID 7
<code>netsh interface ipv6 ?</code>	displays available commands for IPv6
<code>netsh interface ipv6 show interface</code>	displays status of all interfaces and interface IDs
<code>netsh interface ipv6 show address</code>	displays all internal IPv6 addresses
<code>netsh interface ipv6 show neighbors</code>	displays resolved neighbors table
<code>netsh interface ipv6 show route</code>	displays routing table
<code>netsh interface ipv6 show destinationcache</code>	displays destination cache
<code>netsh interface ipv6 set global randomizeidentifiers=disabled</code>	turns off random interface I/D
<code>netsh interface ipv6 set global randomizeidentifiers=enabled (default)</code>	turns on random interface I/D
<code>netsh interface ipv6 add address "Local Area Connection 2" fd00:0:0:2::3</code>	adds address to interface
<code>netsh interface ipv6 delete address "Local Area Connection 2" fd00:0:0:2::3</code>	deletes address on interface
<code>netsh interface ipv6 isatap set router 192.168.39.1</code>	adds router for ISATAP tunnel
<code>netsh interface ipv6 set address <interface> fe80::xxxx anycast</code>	used for routers and servers only
<code>netsh interface ipv6 delete dns "Local Area Connection 2" all</code>	deletes all DNS entries
<code>netsh interface ipv6 delete dns "Local Area Connection 2" fec0:0:0:ffff::3</code>	deletes specific DNS entry
<code>netsh interface ipv6 reset</code>	resets all IPv6 user settings (reboot required)
<code>netsh interface 6to4 ?</code>	displays available commands for 6to4
<code>netsh interface isatap ?</code>	displays available commands for Isatap
<code>netsh interface teredo ?</code>	displays available commands for Teredo

More netsh commands: <http://technet.microsoft.com/en-us/library/cc778925.aspx>

Linux / Unix commands:

<code>ifconfig</code>	displays details of all interfaces
<code>ping6 ::1</code>	test internal IPv6 stack
<code>ifconfig eth0 grep "inet6 addr:"</code>	displays IPv6 details of interface eth0
<code>ip -6 addr add 2001:0db8:0:f101::1/64 dev eth0</code>	adds IPv6 address on interface eth0
<code>ip -6 addr del 2001:0db8:0:f101::1/64 dev eth0</code>	deletes IPv6 address on interface eth0
<code>ip -6 neigh show</code>	displays all neighbors
<code>ip -6 route show dev eth0</code>	displays routes on interface eth0
<code>ip -6 route add 2000::/3 via 2001:0db8:0:f101::1</code>	adds route via next hop address
<code>ip -6 route del 2000::/3 via 2001:0db8:0:f101::1</code>	deletes route via next hop address
<code>ip -6 route add 2000::/3 dev eth0 metric 1</code>	adds route via interface eth0 and metric
<code>ip -6 route del 2000::/3 dev eth0</code>	deletes route via interface eth0

More Linux commands: http://ldp.org/HOWTO/html_single/Linux+IPv6-HOWTO/

IPv6

Quick Reference



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