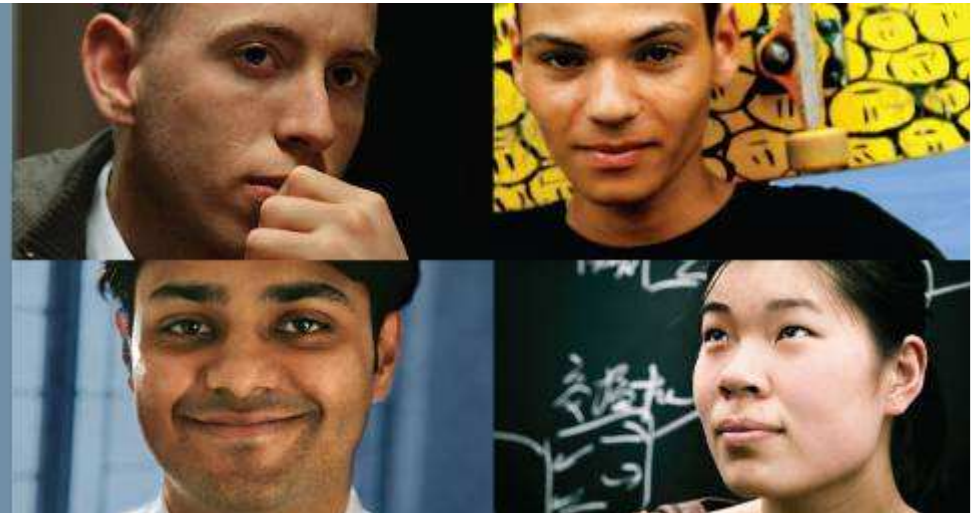


IPv6 Intro Part 2: Address Types and Application



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Objectives

- Describe IPv6 address types and special addresses.
- Describe IPv6 Unicast addresses and assignment methods.
- Explain the stateless autoconfiguration process.
- Describe IPv6 Multicast addresses and their use.
- Describe IPv6 subnetting and aggregation
- Configure and verify IPv6 addressing on networking devices.

IPv6 Address Types





IPv6 Address Space Overview

Prefix Hex Value	Use
0000 to 00FF	<ul style="list-style-type: none"> •Unspecified •Loopback •IPv4-compatible
0100 to 01FF	Unassigned (0.38 % of IPv6 space)
0200 to 03FF	NSAP Network Service AP)
0400 to 1FFF	Unassigned (~11% of IPv6 space)
2000 to 3FFF	Aggregatable global unicast (12.5%)
4000 to FE7F (Huge)	Unassigned (~75% of IPv6 space)
FE80 to FEBF	Link-local
FC00 to FCFF	Unique-local
FF00 to FFFF	Multicast

Note: IPv6 Internet uses 2001::/3 which is < 2% of IPv6 address space

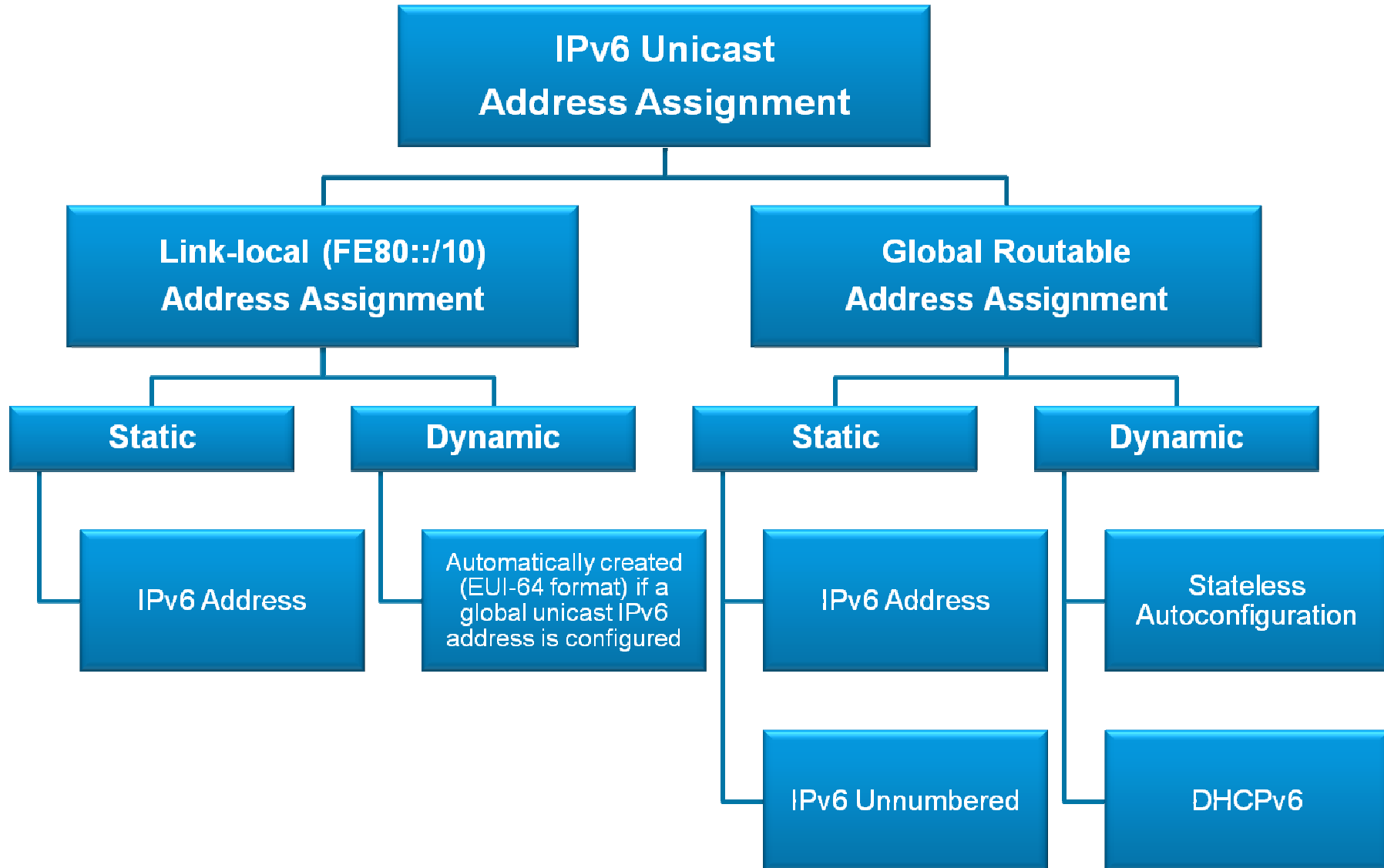


Special IPv6 Addresses

IPv6 Address	Description
::/0	<ul style="list-style-type: none"> • All networks and used when specifying a default static route. • It is equivalent to the IPv4 quad-zero (0.0.0.0)
::/128	<ul style="list-style-type: none"> • Unspecified address and is initially assigned to a host when it first resolves its local link address
::1/128	<ul style="list-style-type: none"> • Loopback address of local host • Equivalent to 127.0.0.1 in IPv4
FE80::/10	<ul style="list-style-type: none"> • Link-local unicast address • Similar to the Windows autoconfiguration IP address of 169.254.x.x
FF00::/8	<ul style="list-style-type: none"> • Multicast addresses
All other addresses	<ul style="list-style-type: none"> • Global unicast address



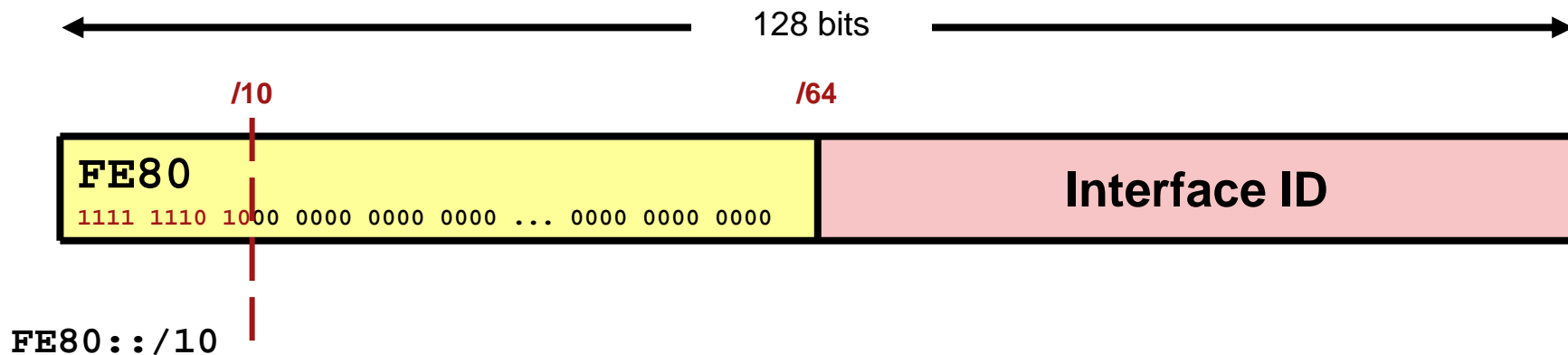
IPv6 Unicast Addresses





IPv6 Link-Local Unicast Address

- Link-local addresses play a crucial role in the operation of IPv6.
- They are dynamically created using a link-local prefix of **FE80::/10** and a 64-bit interface identifier.





IPv6 Link-Local Unicast Address

- When pinging another device using Cisco IOS and a link-local address, the outgoing interface must be specified.

```
R2# ping FE80::202:16FF:FEEB:3D01
Output Interface: serial0/0/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::202:16FF:FEEB:3D01, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 31/34/47 ms
```




IPv6 Link-Local Unicast Address Example

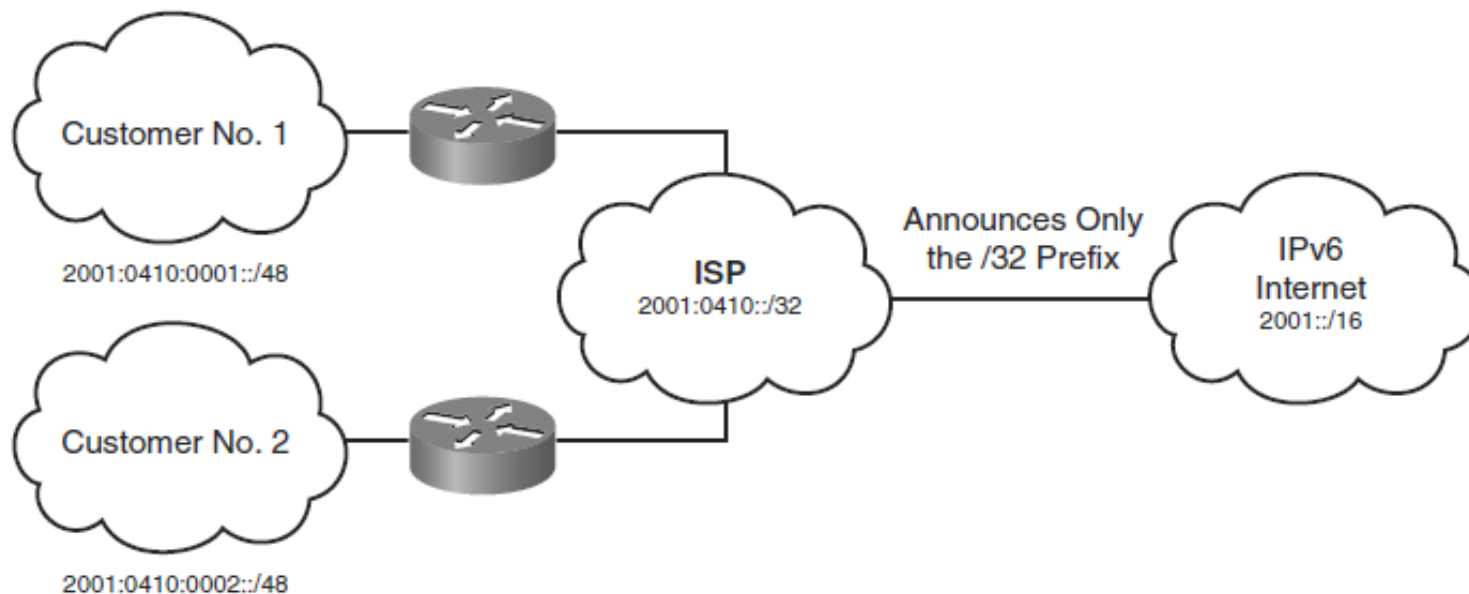
```

R1# show ipv6 interface loopback 100
Loopback100 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::222:55FF:FE18:7DE8
  No Virtual link-local address(es):
  Global unicast address(es):
    2001:8:85A3:4290:222:55FF:FE18:7DE8, subnet is 2001:8:85A3:4290::/64 [EUI]
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF18:7DE8
  MTU is 1514 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ICMP unreachables are sent
  ND DAD is not supported
  ND reachable time is 30000 milliseconds (using 31238)
  Hosts use stateless autoconfig for addresses.
R1#
  
```



IPv6 Global Unicast Address

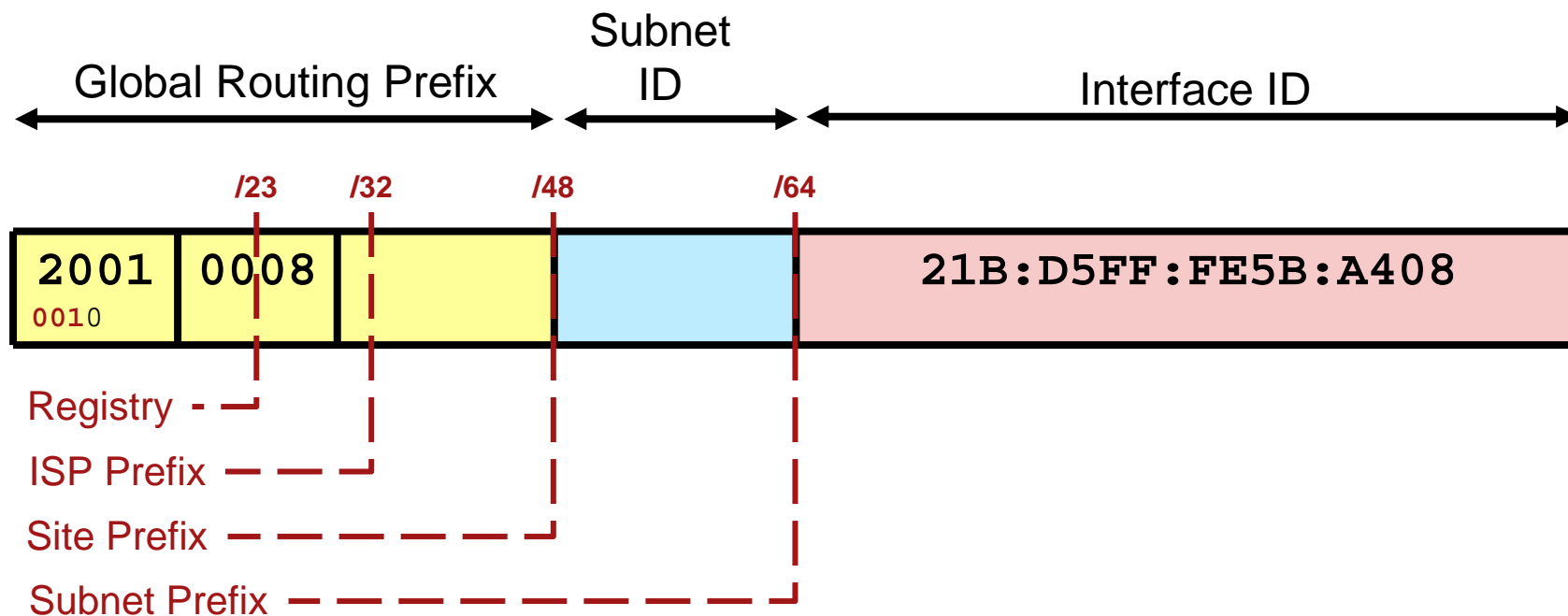
- A global unicast address is an IPv6 address from the global public unicast prefix (2001::/16).
- These addresses are routable on the global IPv6 Internet.
- Global unicast addresses are aggregated upward through organizations and eventually to the ISPs.





IPv6 Global Unicast Address

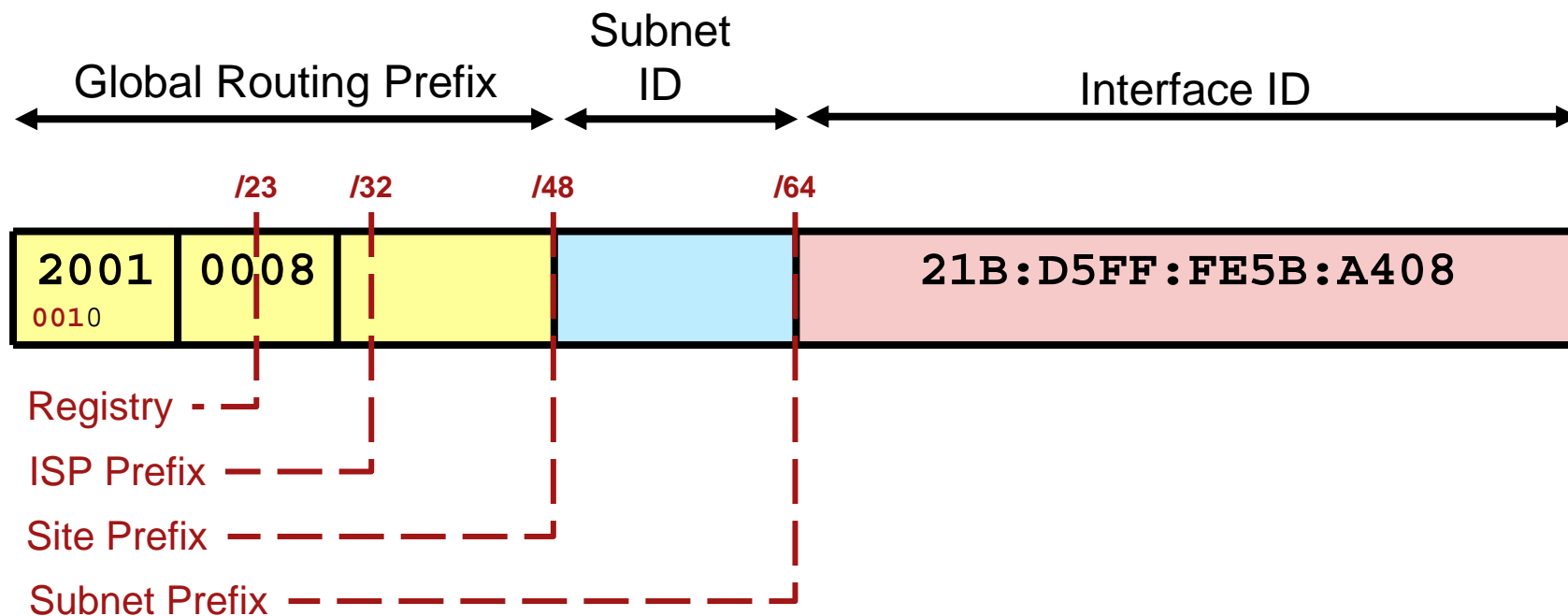
- The global unicast address consists of:
 - A 48-bit global routing prefix
 - A 16-bit subnet ID
 - A 64-bit interface ID





IPv6 Global Unicast Address

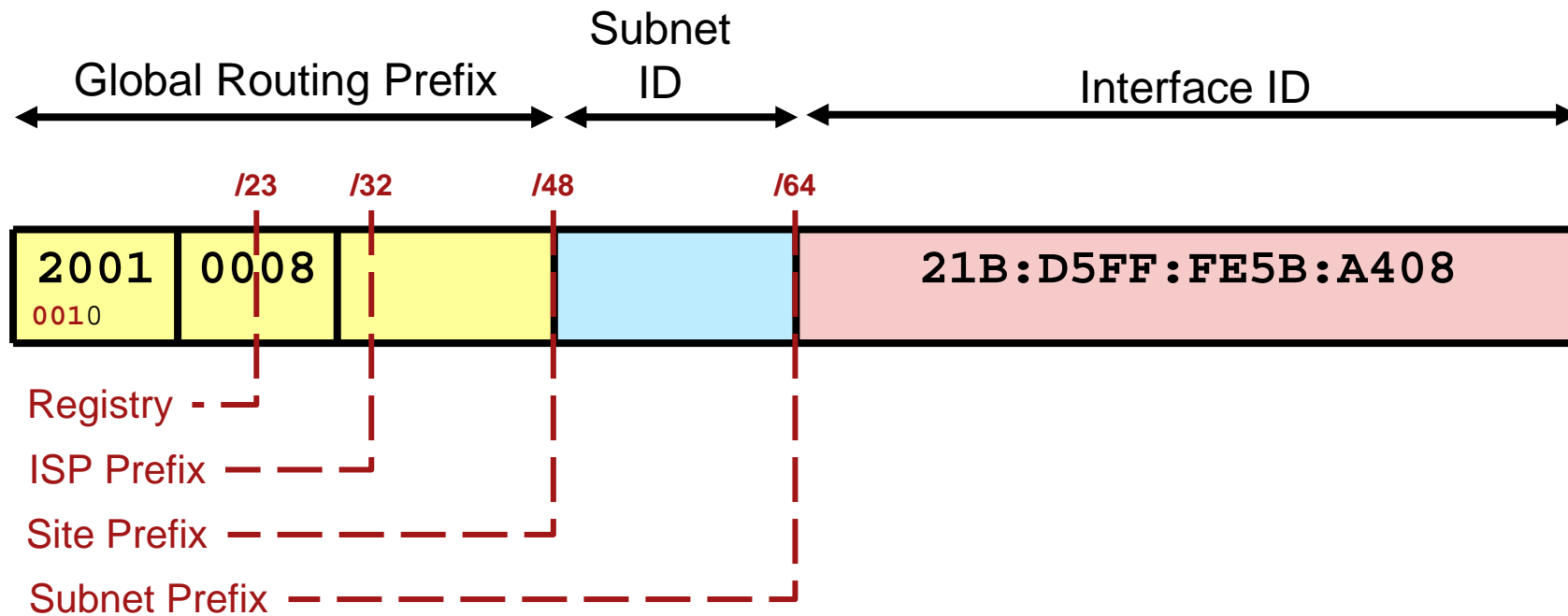
- The current IANA global routing prefix uses the range that starts with binary 0010 (2000::/3).





IPv6 Global Unicast Address

- The subnet ID can be used by an organization to create their own local addressing hierarchy.





IPv6 Global Unicast Address Example

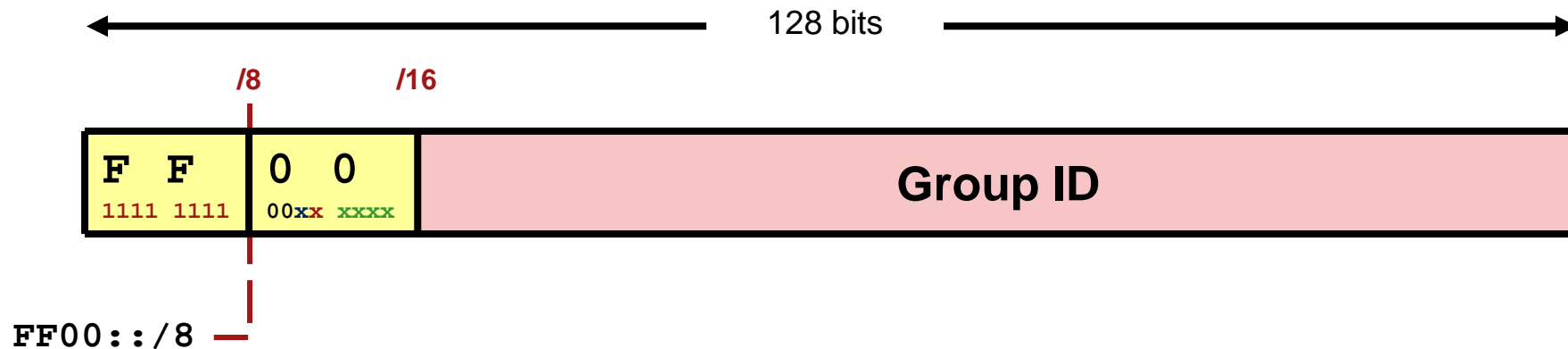
```

R1# show ipv6 interface loopback 100
Loopback100 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::222:55FF:FE18:7DE8
  No Virtual link-local address(es):
  Global unicast address(es):
    2001:8:85A3:4290:222:55FF:FE18:7DE8, subnet is 2001:8:85A3:4290::/64 [EUI]
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF18:7DE8
  MTU is 1514 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ICMP unreachables are sent
  ND DAD is not supported
  ND reachable time is 30000 milliseconds (using 31238)
  Hosts use stateless autoconfig for addresses.
R1#
  
```



IPv6 Multicast Addresses

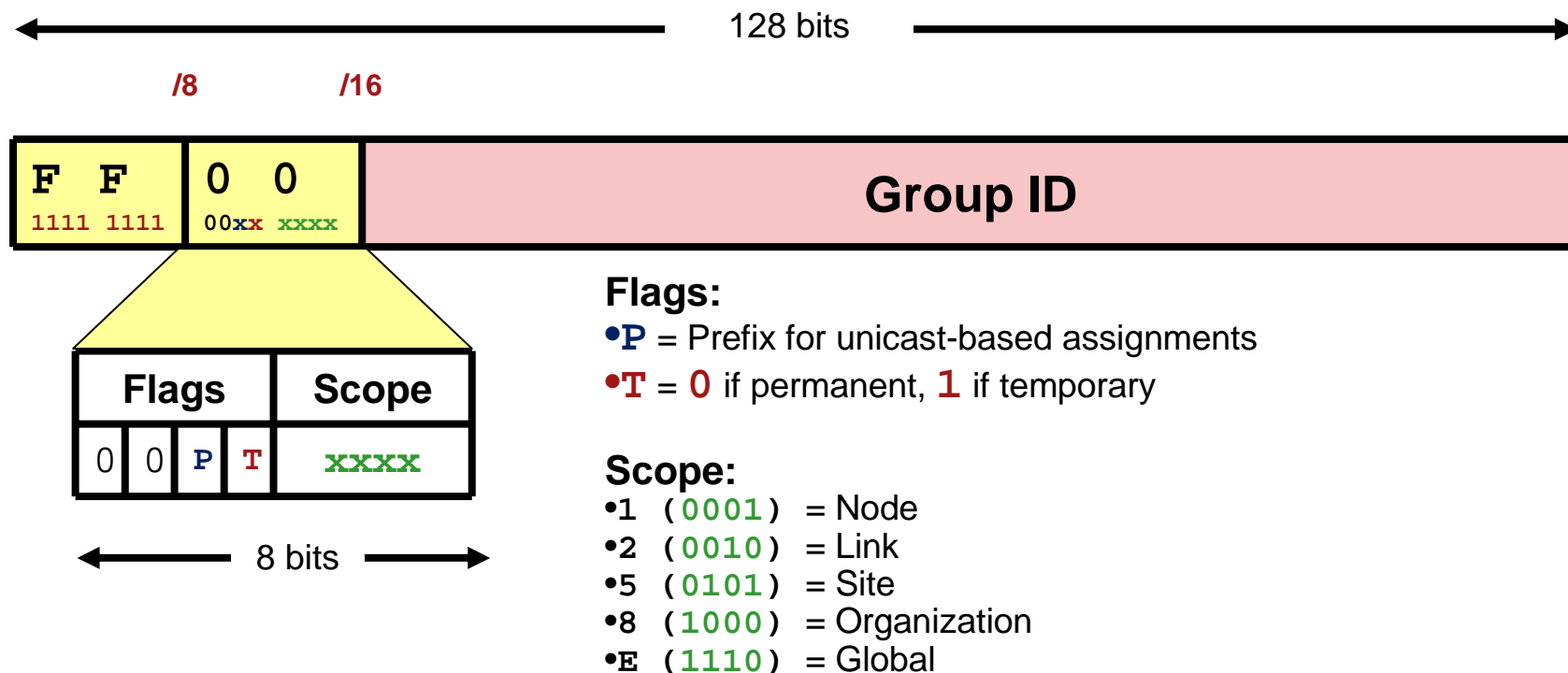
- Multicasting is at the core of many IPv6 functions and is a replacement for the broadcast address.
- They are defined by the prefix **FF00::/8**.





IPv6 Multicast Address

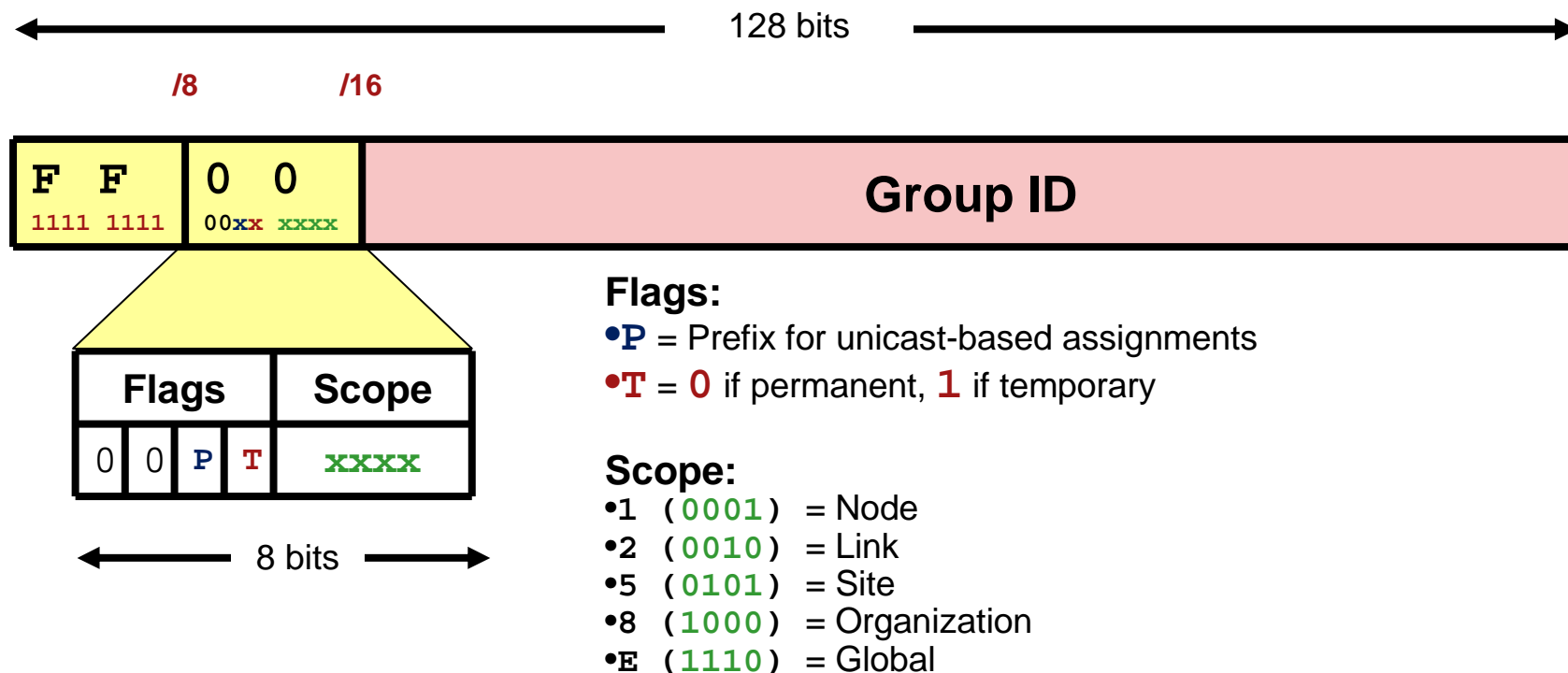
- The second octet of the address contains the prefix and transient (lifetime) flags, and the scope of the multicast address.





IPv6 Multicast Address

- The multicast addresses **FF00::** to **FF0F::** are permanent and reserved.





Reserved IPv6 Multicast Addresses

Reserved Multicast Address	Description
FF02::1	<ul style="list-style-type: none"> All nodes on a link (link-local scope).
FF02::2	<ul style="list-style-type: none"> All routers on a link.
FF02::9	<ul style="list-style-type: none"> All routing information protocol (RIP) routers on a link.
FF02::1:FFxx:xxxx	<ul style="list-style-type: none"> All solicited-node multicast addresses used for host autoconfiguration and neighbor discovery (similar to ARP in IPv4). The xx:xxxx is the far right 24 bits of the corresponding unicast or anycast address of the node.
FF05::101	<ul style="list-style-type: none"> All Network Time Protocol (NTP) servers.



IPv6 Multicast Address Example

```

R1# show ipv6 interface loopback 100
Loopback100 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::222:55FF:FE18:7DE8
  No Virtual link-local address(es):
  Global unicast address(es):
    2001:8:85A3:4290:222:55FF:FE18:7DE8, subnet is 2001:8:85A3:4290::/64 [EUI]
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FE18:7DE8
  MTU is 1514 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ICMP unreachables are sent
  ND DAD is not supported
  ND reachable time is 30000 milliseconds (using 31238)
  Hosts use stateless autoconfig for addresses.
R1#
  
```



Solicited-Node Multicast Addresses

- The solicited-node multicast address (FF02::1:FF) is used for:
 - Neighbor discovery (ND) process
 - Stateless address autoconfiguration
- The Neighbor discovery (ND) process is used to:
 - Determine the local-link address of the neighbor
 - Determine the routers on the link and default route
 - Keep track of neighbor reachability
 - Send network information from routers to hosts



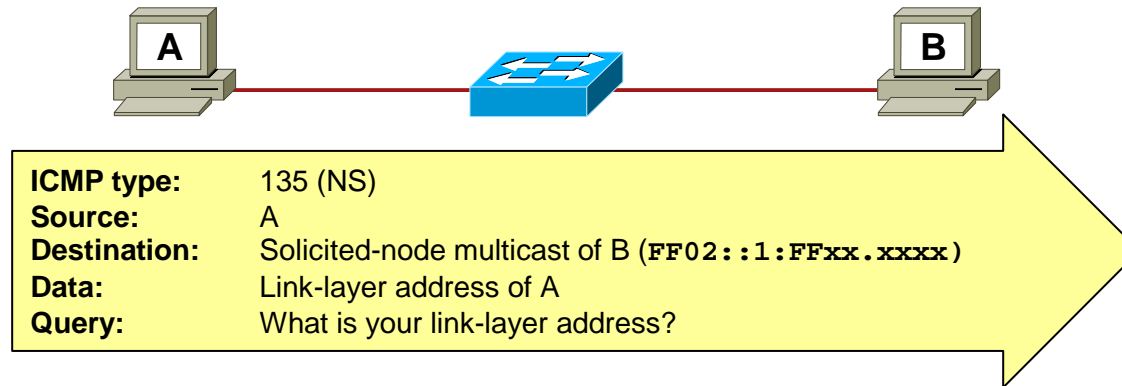
Neighbor Discovery ICMPv6 Packet Types

- Neighbor Discovery uses four ICMPv6 packet types

ICMPv6 Message	Type	Description
Neighbor Solicitation (NS)	135	<ul style="list-style-type: none"> Sent by a host to determine the link-layer address of a neighbor. Used to verify that a neighbor is still reachable. An NS is also used for Duplicate Address Detection (DAD).
Neighbor Advertisement (NA)	136	<ul style="list-style-type: none"> A response to a NS message. A node may also send unsolicited NA to announce a link-layer address change.
Router Advertisement (RA)	134	<ul style="list-style-type: none"> RAs contain prefixes that are used for on-link determination or address configuration, a suggested hop limit value and MTU value. RAs are sent either periodically, or in response to a RS message.
Router Solicitation (RS)	133	<ul style="list-style-type: none"> When a host is booting it sends out an RS requesting routers to immediately generate an RA rather than wait for their next scheduled time.



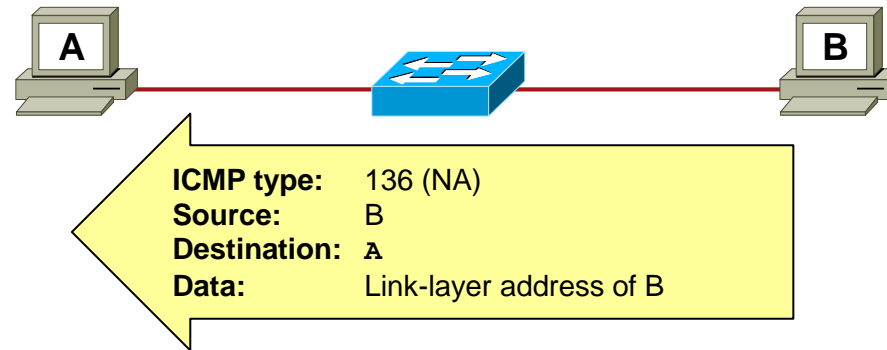
Neighbor Solicitation Example



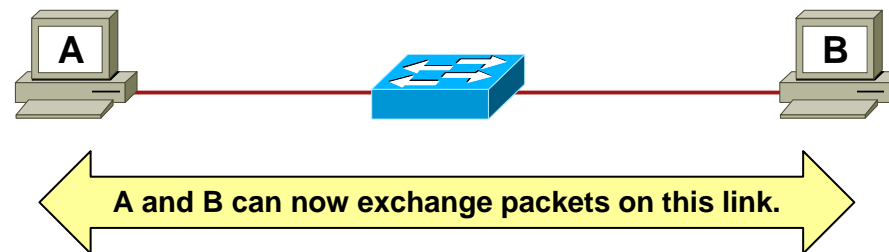
- ICMPv6 Neighbor Solicitation (NS) is similar to IPv4 ARP.
- For Host A to send a packet to Host B it needs the MAC address of Host B.



Neighbor Advertisement Example



- Each destination node that receives the NS responds with an ICMPv6 message type 136, NA, including Host B.





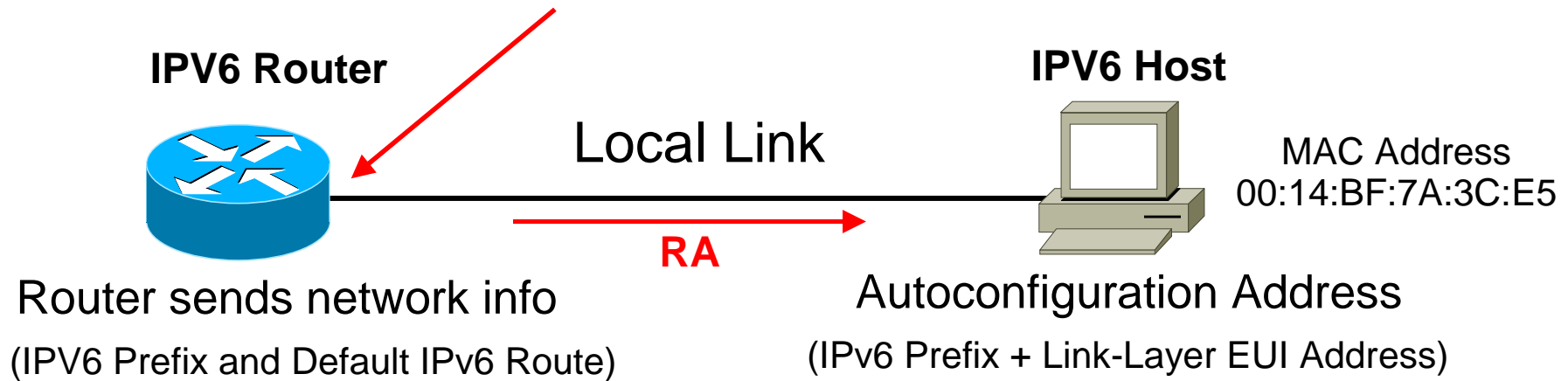
Stateless Address Autoconfiguration (SLAAC)

- Every IPv6 system is able to build its own unicast global address.
 - Enables new devices to easily connect to the Internet.
 - No configuration or DHCP server is required.
- **IPv6 Router** - sends network info on local link.
 - IPv6 prefix
 - Default IPv6 route
- **IPv6 Hosts** - listen on local link and configure themselves.
 - IP Address (EUI-64 format)
 - Default route



Stateless Address Autoconfiguration

An IPv6 address must be configured on the router gateway interface.





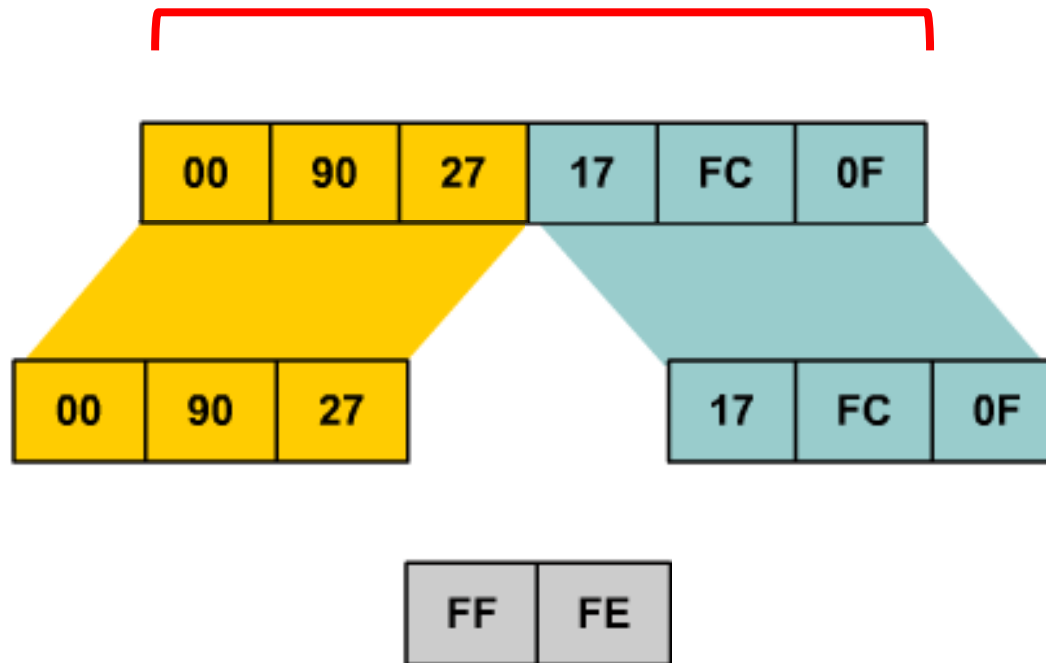
Ethernet EUI-64 IPv6 Addresses

- The first 64 bits are the network portion of the address and are statically specified or learned via SLAAC.
- The interface ID (second 64-bits) is the host portion of the address and is automatically generated by the router or host device.
- The interface ID on an Ethernet link is based on the 48-bit MAC address of the interface with an additional 16-bit **0xFFFE** inserted in the middle of the MAC address.



EUI-64 IPv6 Interface Identifier

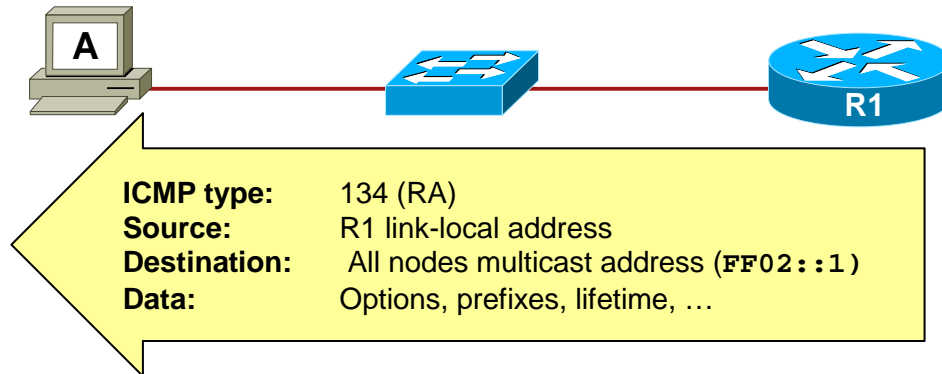
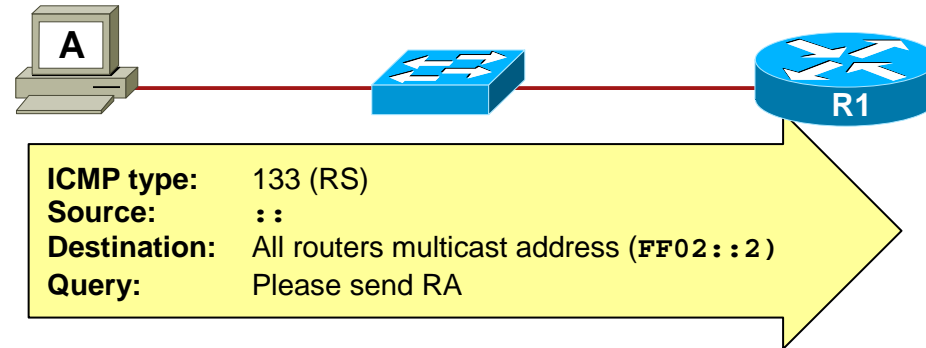
48-bit MAC Address



64-bit IPv6 EUI-64 Interface ID

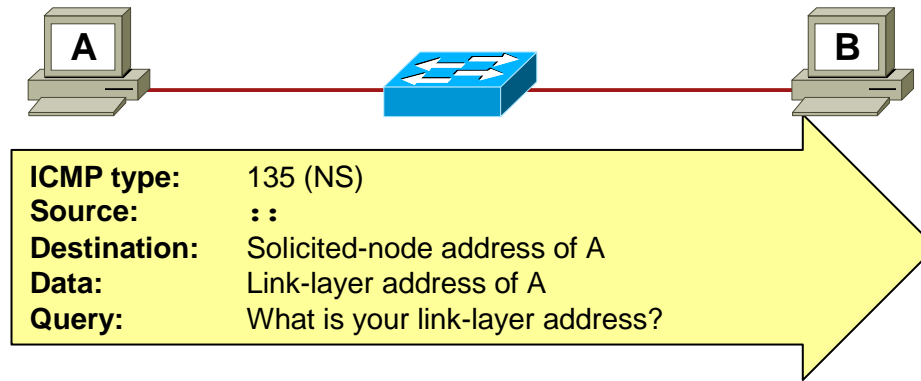


Stateless Autoconfiguration Process





Stateless Autoconfiguration Process



- Host A creates an IPv6 address using the RA supplied by the router.
- Host A verifies that it's new IPv6 address is unique using DAD process.

IPv6 Subnetting and Aggregation





IPv6 Subnetting Overview

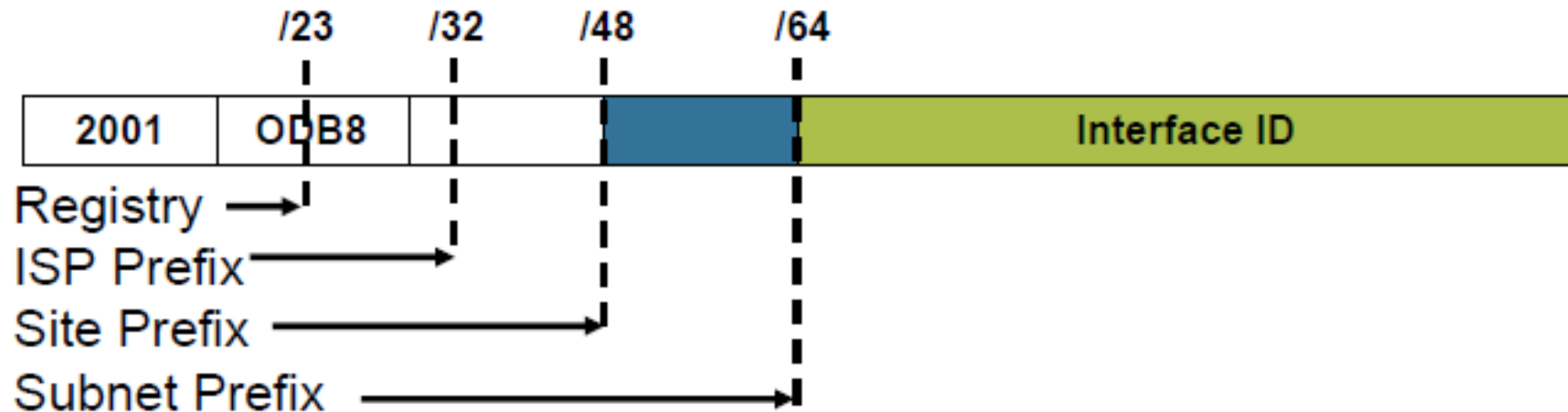
- Not the same as IPv4
- IPv6 does NOT use subnet masks
- CIDR notation is used
 - IPv6 address is in Hex
 - Network mask is in decimal
- Number of subnet bits set to 1 define network prefix
- All other bits are for nodes
- There are no reserved addresses (network or broadcast)

2001:25:12:AB12:3456:DFB5:712:45FF/64



Prefix Length, Allocation of Bits

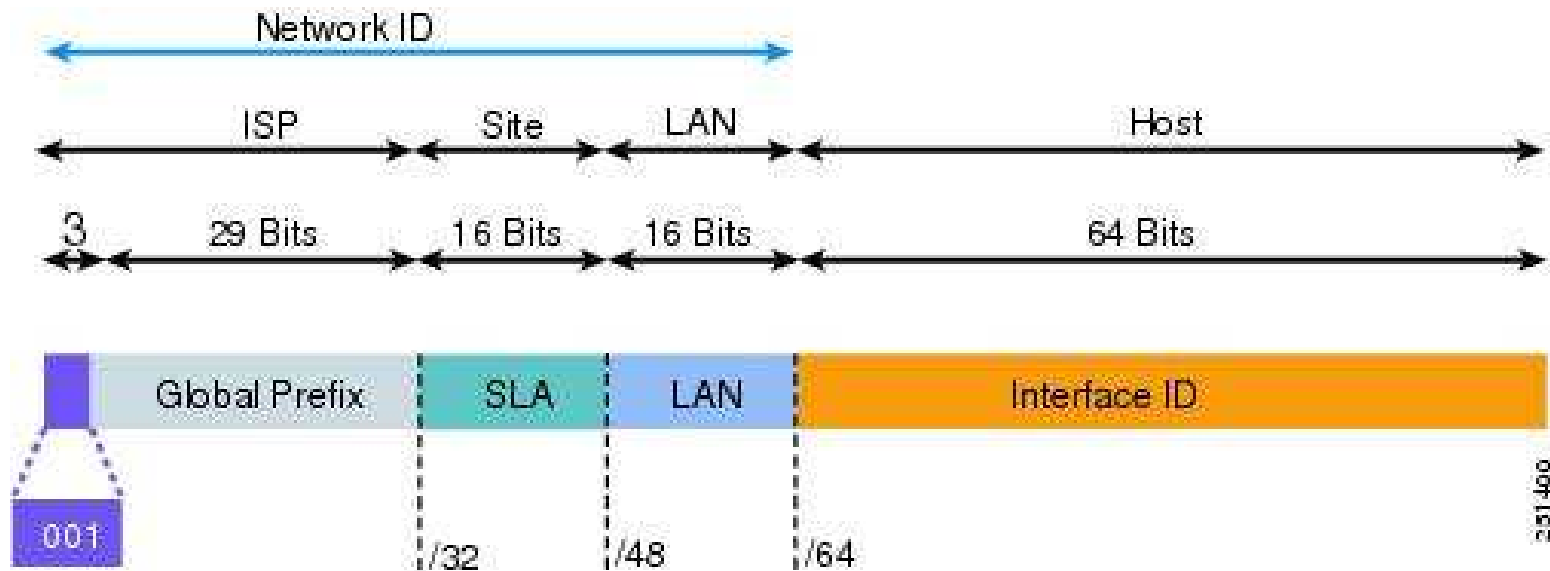
- Example: 2001:DB8:0:2F00:2AA:FF:FE28:9C5A/64
- Prefix length (total number of network bits) is 64
- 16 subnet bits allow 65,535 LANs
- Usually 64 bits are used for hosts in IPv6





IPv6 Subnetting with Global Unicast Addresses

- The global routing prefix is assigned to a service provider by IANA (/32).
- The site level aggregator (SLA) is assigned by the ISP (/48).
- The LAN ID represents individual subnets within the customer site and is administered by the customer (/64).

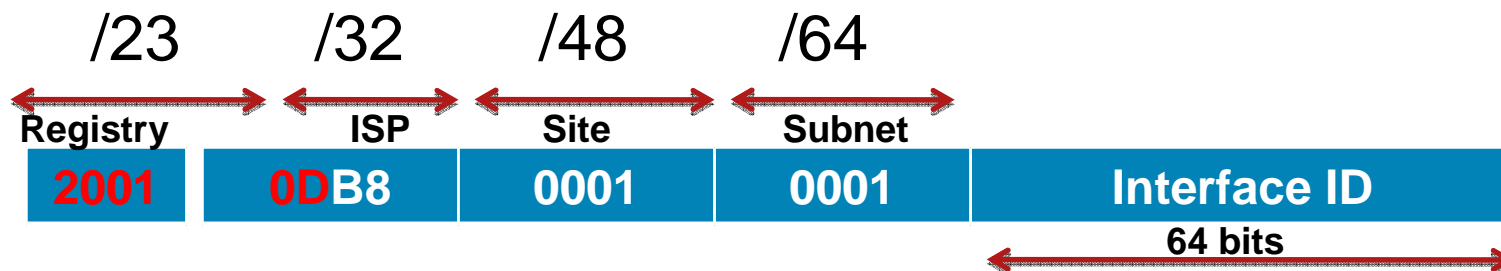




IPv6 Subnetting with Global Unicast Addresses

▪ Default Subnets

- /23 Registry
- /32 ISP Prefix
- /48 Site Prefix
 - Bits 49 to 64 are for subnets
 - $2^{16} = 65,535$ subnets available
- /64 Default Subnet prefix
 - Bits 65 to 128 for Hosts
 - Host bits are either statically assigned, EUI-64, DHCP or random number generated.





IPv6 Subnetting with Global Unicast Addresses

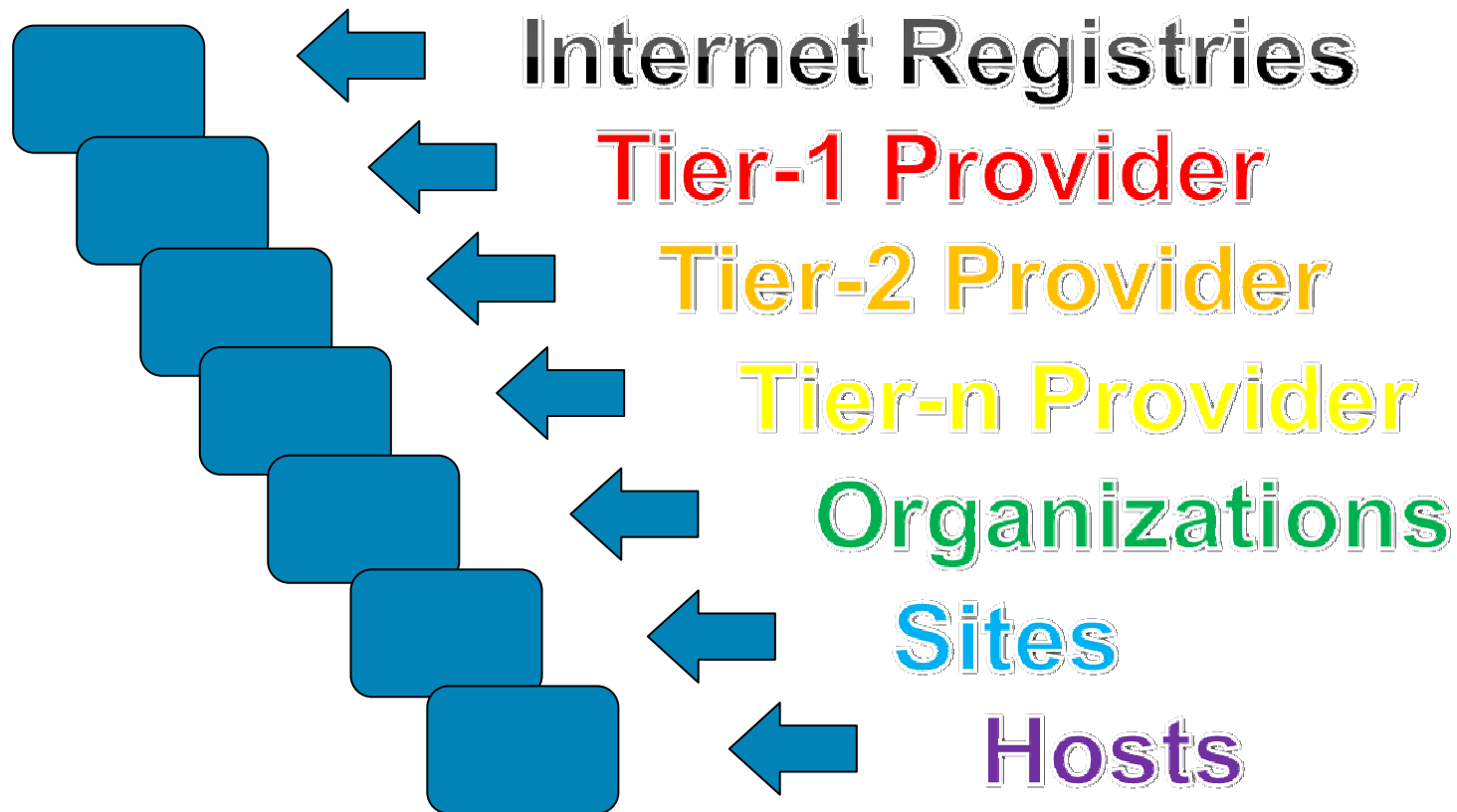
IPv6 prefix	# of Subnets	# of Hosts
2001:520:1:1::3FFF /128	1	1
2001:520:0:1:: /64 (default prefix for subnet)	1	2 ⁶⁴
2001:520:0:: /48 (default Site prefix)	2 ¹⁶	2 ⁶⁴ per subnet

- 61 Global Network bits and 64 Host bits
- No more “bit borrowing” as with IPv4
- 2⁶⁴ hosts possible in a single broadcast domain
- Autoconfiguration will take care of most of them
- VLANs become the method of isolation



IPv6 Address Hierarchy

- Large address space
- Allows for multiple levels





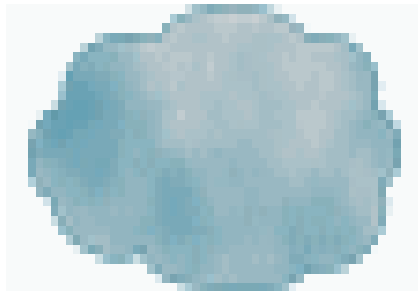
IPv6 Address Aggregation

- Large prefix assigned to an organization
 - Can handle even the largest networks
- ISPs summarize routes
 - All customer prefixes into one prefix
 - Make it available to the Internet
- Aggregation provides:
 - Efficient routing
 - Scalable routing
 - Fewer routes in global IPV6 routing table



Aggregation Example

Global Routing Table
2001:051A::/35



ISP A
AS 60000
2001:051A::/35



Routing Table
2001:051A:A1::/48 AS 60000
2001:051A:A2::/48 AS 60000

Customer A1



2001:051A:A1::/48

Customer A2

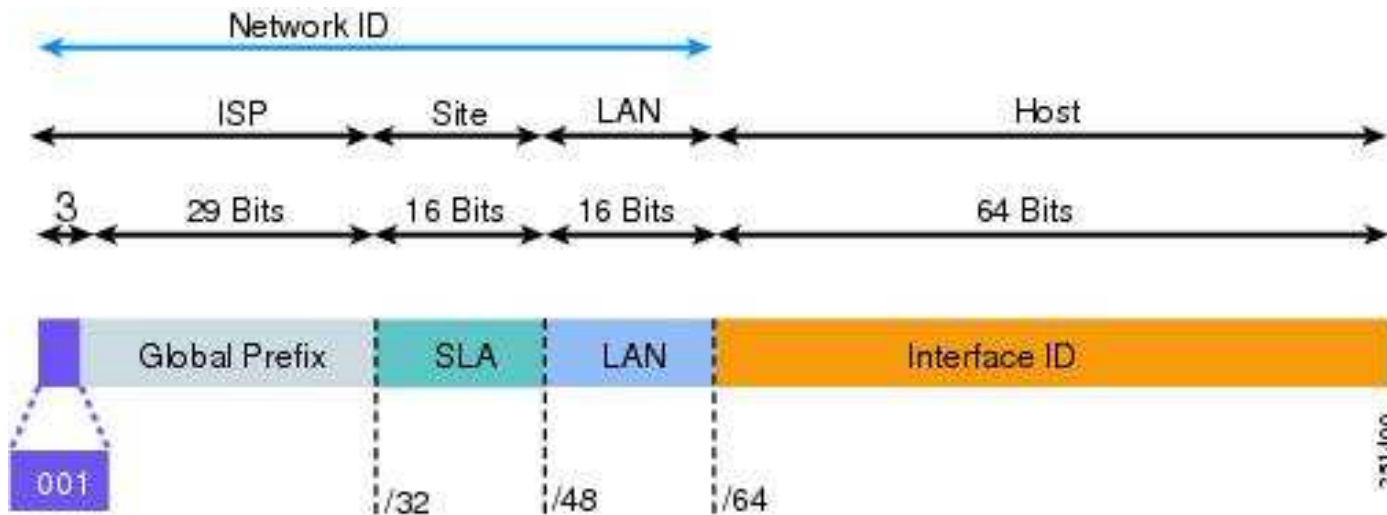


2001:051A:A2::/48



Subnetting Global Addresses

- **2001:05a8::0/32**
- Subnets the ISP can create:
 - $2^{16} = 65,536$
 - 2001:05a8:**0001**::0 – 2001:05a8:**ffff**::0/48





Subnetting Global Addresses

- Customer now has 16 network bits with which to create 2^{16} networks (or 2^8 if ISP used /56)
- 2001:05a8:0001:0001::0 – 2001:05a8:0001:ffff::0/64
- 2001:05a8:94ad:0001::0 – 2001:05a8:94ad:ffff::0/64
- 2001:05a8:b002:0001::0 – 2001:05a8:b002:ffff::0/64
- 2001:05a8:ffff:0001::0 – 2001:05a8:ffff:ffff::0/64



Subnetting Global Addresses

- Apply 1 of these /64 prefixes to a router interface
 - 2001:05a8:0001:00a1::0 /64
- Hosts per subnet (a /64 is a single host)
 - 2001:05a8:0001:00a1::1 –
2001:05a8:01a1:00a1:FFFF:FFFF:FFFF:FFFF/64

Implementing IPv6





Verifying IPv6

Command	Description
<pre>show ipv6 interface [brief] [type number] [prefix]</pre>	<p>Displays the status of interfaces configured for IPv6.</p> <ul style="list-style-type: none"> •The brief keyword displays a brief summary. •The prefix keyword displays the IPv6 neighbor discovery prefixes that are configured on a specified interface.
<pre>show ipv6 routers [interface-type interface-number] [conflicts]</pre>	<p>Displays IPv6 router advertisement information received from on-link routers (those locally reachable on the link).</p> <ul style="list-style-type: none"> •The conflicts keyword displays information about routers advertising parameters that differ from the advertisement parameters configured for the specified interface on which the advertisements are received.
<pre>show ipv6 neighbors [interface-type interface-number ipv6- address ipv6-hostname statistics]</pre>	<p>Displays IPv6 neighbor discovery cache information for the specified neighbors.</p> <ul style="list-style-type: none"> •The optional statistics parameter displays neighbor discovery cache statistics.



Troubleshooting IPv6

Command	Description
<pre>debug ipv6 nd</pre>	<p>Displays messages associated with ICMPv6 neighbor discovery.</p> <ul style="list-style-type: none"> •ICMPv6 neighbor discovery is the IPv6 replacement for the IPv4 ARP.
<pre>debug ipv6 packet [access-list access- list-name] [detail]</pre>	<p>Displays information associated with IPv6 packet processing.</p> <ul style="list-style-type: none"> •When an IPv6 access list is specified, only packets permitted by the ACL are displayed. •The <code>detail</code> keyword displays more information.



Enable IPv6 Routing

- Enable the forwarding of IPv6 unicast datagrams.

```
Router(config)#
```

```
ipv6 unicast-routing
```

- This command is required before configuring any form of IPv6 routing (static or dynamic).
- Also required to support autoconfiguration of end devices.
- The **no ipv6 unicast-routing** command disables IPv6 routing capabilities of the router.



Enable CEF for IPv6

- Enable Cisco Express Forwarding (CEF) for IPv6 (CEFv6).

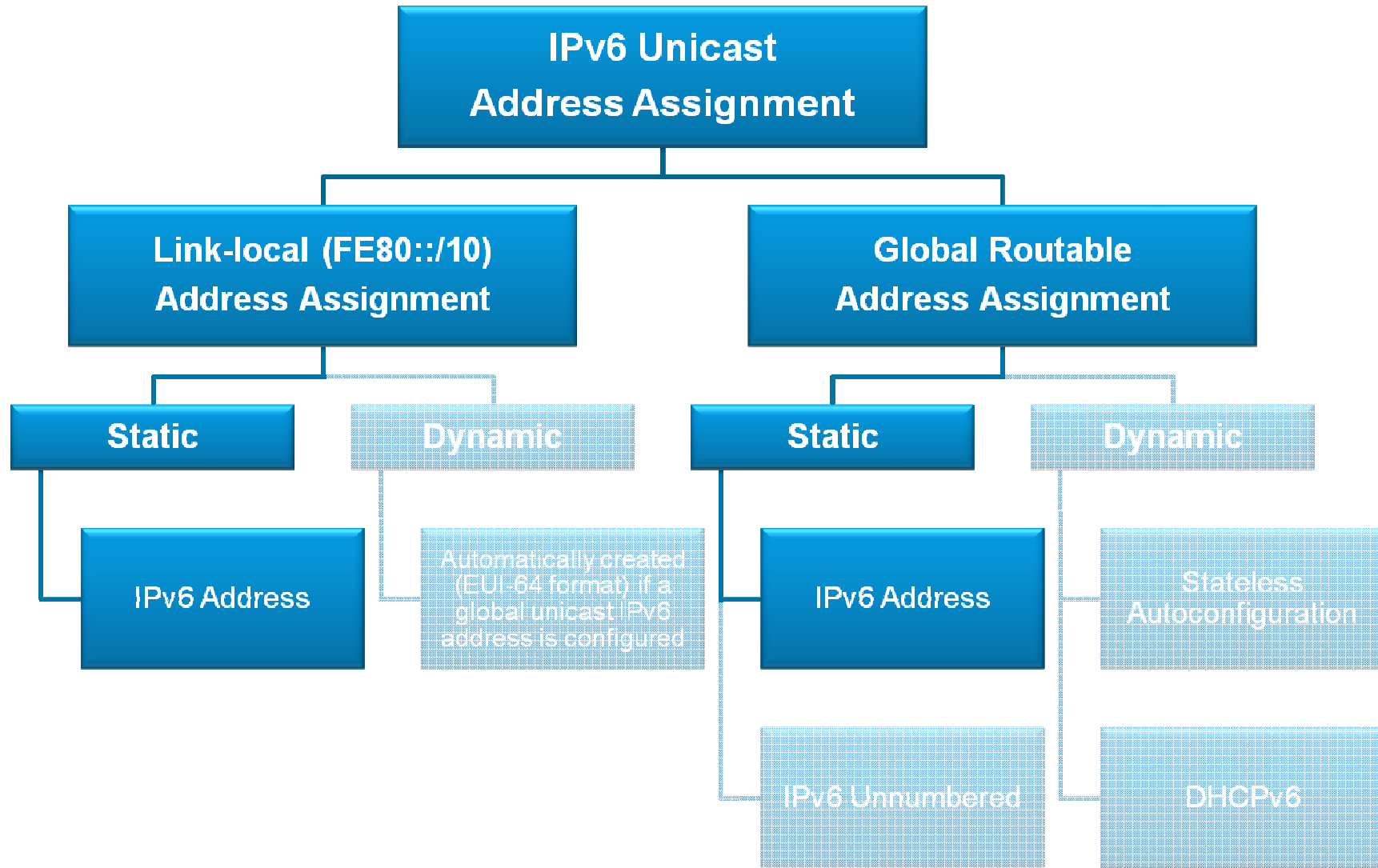
```
Router(config)#
```

```
ipv6 cef
```

- An optional command, CEFv6 is an advanced Layer 3 IP switching technology for the forwarding of IPv6 packets.
 - It is required for some other IPv6 features to operate.
 - When enabled, network entries in the IPv6 routing table are reflected in the Forwarding Information Bases (FIBs).
 - The IPv6 adjacency tables maintain Layer 2 next-hop addresses for all entries that are in each FIB.



Configuring IPv6 Unicast Addresses





Enable IPv6 on an Interface

- Configure an IPv6 address and prefix.

```
Router(config-if)#
```

```
ipv6 address address/prefix-length [link-local | eui-64]
```

- Command is used to statically configure an IPv6 address and prefix on an interface.



Assigning a Link-Local Address



```
R1(config)# interface fa0/0
R1(config-if)# ipv6 address FE80::1 ?
link-local use link-local address
R1(config-if)# ipv6 address FE80::1 link-local
R1(config-if)# end
R1#
```

- Link-local addresses are created:
 - Automatically using EUI-64
 - Manually by specifying an interface ID (as in this example)
- The prefix mask is not required because they are not routed.



Assigning a Static Link-Local Address



```
R1# show ipv6 interface fa0/0
FastEthernet0/0 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::1 [TEN]
  No global unicast address is configured
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:1
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  ND advertised reachable time is 0 milliseconds
  ND advertised retransmit interval is 0 milliseconds
  ND router advertisements are sent every 200 seconds
  ND router advertisements live for 1800 seconds
  Hosts use stateless autoconfig for addresses.
R1(config-if)#
```



Assigning a Static Global Unicast Address

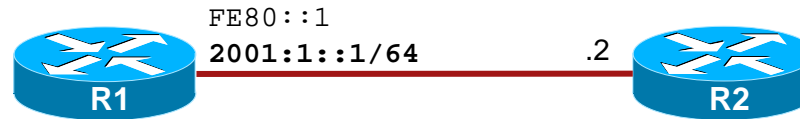


```
R1(config)# ipv6 unicast-routing
R1(config)# interface fa0/0
R1(config-if)# ipv6 address 2001:1::1/64
R1(config-if)#
```

- Global Unicast IPv6 addresses are assigned by omitting the `link-local` parameter.



Assigning a Static Global Unicast Address



```

R1# show ipv6 interface fa0/0
FastEthernet0/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::1 [TEN]
  Global unicast address(es):
    2001:1::1, subnet is 2001:1::/64 [TEN]
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:1
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  ND advertised reachable time is 0 milliseconds
  ND advertised retransmit interval is 0 milliseconds
  ND router advertisements are sent every 200 seconds
  ND router advertisements live for 1800 seconds
  Hosts use stateless autoconfig for addresses.
R1#
  
```



Configuring an EUI-64 IPv6 Global Address

```

R1# config t
R1(config)# int fa0/1
R1(config-if)# ipv6 add 2001::/64 eui-64
R1(config-if)# do show ipv6 interface fa0/1

FastEthernet0/1 is administratively down, line protocol is down
IPv6 is enabled, link-local address is FE80::211:92FF:FE54:E2A1 [TEN]
Global unicast address(es):
  2001::211:92FF:FE54:E2A1, subnet is 2001::/64 [EUI/TEN]
Joined group address(es):
  FF02::1
  FF02::2
  FF02::1:FF54:E2A1
MTU is 1500 bytes

<output omitted>

```



EUI-64 IPv6 Global Address – Example 2

```

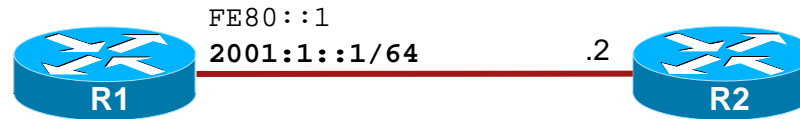
R1(config)# interface loopback 100
R1(config-if)# ipv6 address 2001:8:85a3:4289::/64 eui-64

<output omitted>

R1# show ipv6 interface loopback 100
Loopback100 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::21B:D5FF:FE5B:A408
  Global unicast address(es):
    2001:8:85A3:4289:21B:D5FF:FE5B:A408, subnet is 2001:8:85A3:4289::/64 [EUI]
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF5B:A408
  MTU is 1514 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ND DAD is not supported
  ND reachable time is 30000 milliseconds
  Hosts use stateless autoconfig for addresses.
  
```



Assigning Multiple IPv6 Addresses

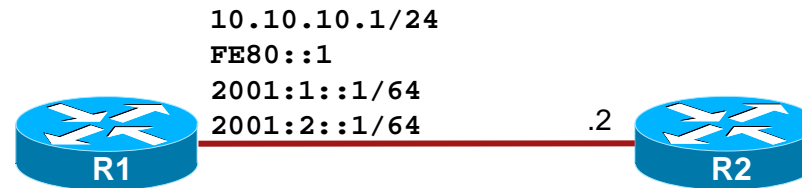


```
R1(config)# interface fa0/0
R1(config-if)# ip address 10.20.20.1 255.255.255.0
R1(config-if)# ip address 10.10.10.1 255.255.255.0
R1(config-if)# ipv6 address 2001:1::1/64
R1(config-if)# ipv6 address 2002:1::1/64
R1(config-if)# end
R1#
```

- Interfaces can have multiple IPv6 addresses assigned to them. These addresses can be used simultaneously.
- What would happen if we configured 2 different IPv4 addresses and 2 different IPv6 addresses on the same interface?



Assigning Multiple IPv6 Addresses

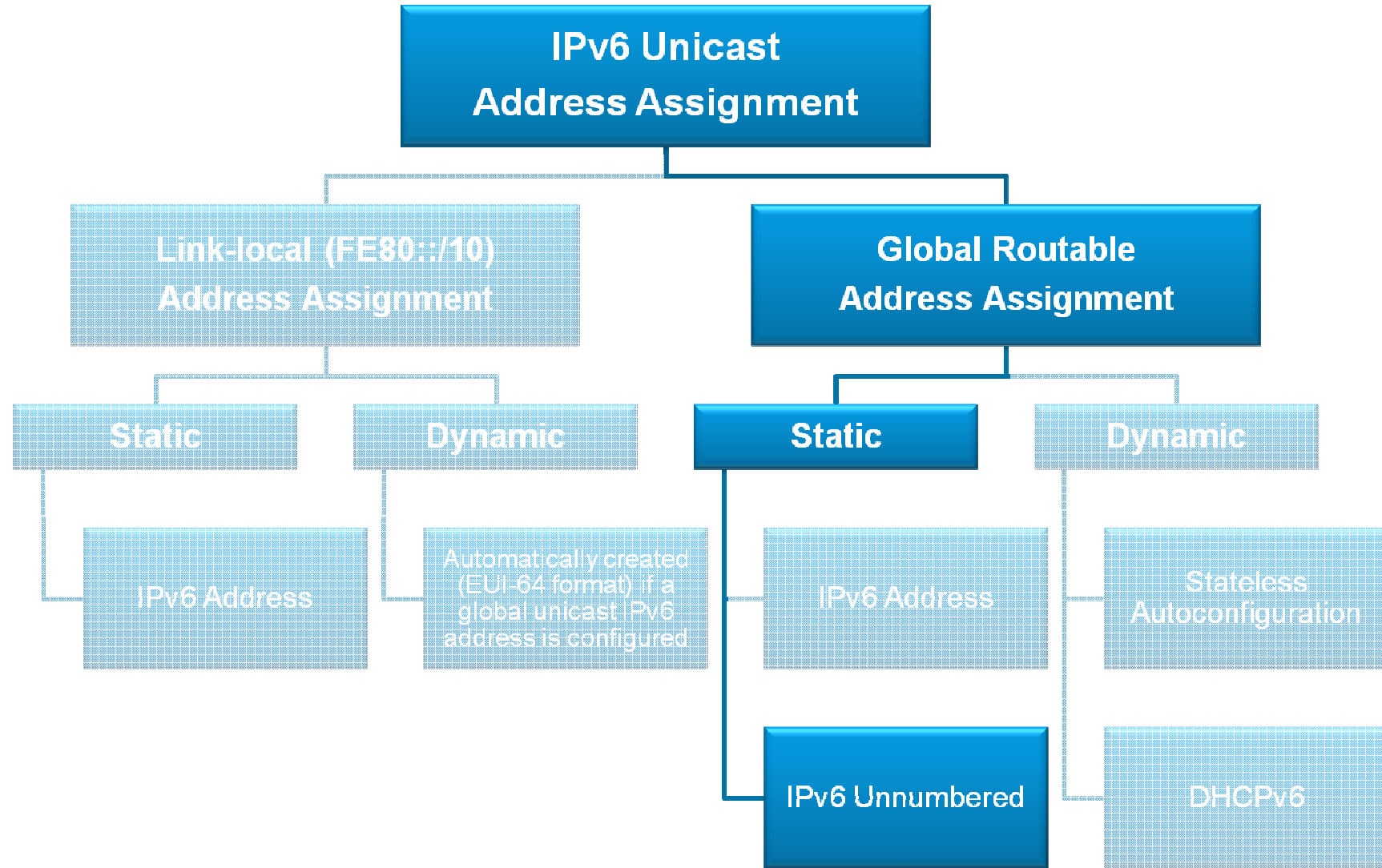


```
R1# show run interface fa0/0
Building configuration...
Current configuration : 162 bytes
!
interface FastEthernet0/0
ip address 10.10.10.1 255.255.255.0
duplex auto
speed auto
ipv6 address 2001:1::1/64
ipv6 address 2002:1::1/64
ipv6 address FE80::1 link-local
end
R1#
```

- The second IPv4 entry replaced the first entry.
- However, both IPv6 addresses have been assigned to the Fa0/0 interface.



Configuring IPv6 Unnumbered Addresses





Enable IP Unnumbered

- Enable IPv6 on an interface without an explicit IPv6 address.

```
Router(config-if)#
```

```
ipv6 unnumbered interface-type interface-number
```



Assigning IPv6 Unnumbered Interfaces



```
R1(config)# interface loopback 10
R1(config-if)# ipv6 address 2001:1::10/64
R1(config-if)# exit
R1(config)#
R1(config)# interface s0/0/0
R1(config-if)# ipv6 unnumbered loopback 10
R1(config-if)# no shut
R1(config-if)#
```



Assigning IPv6 Unnumbered Interfaces

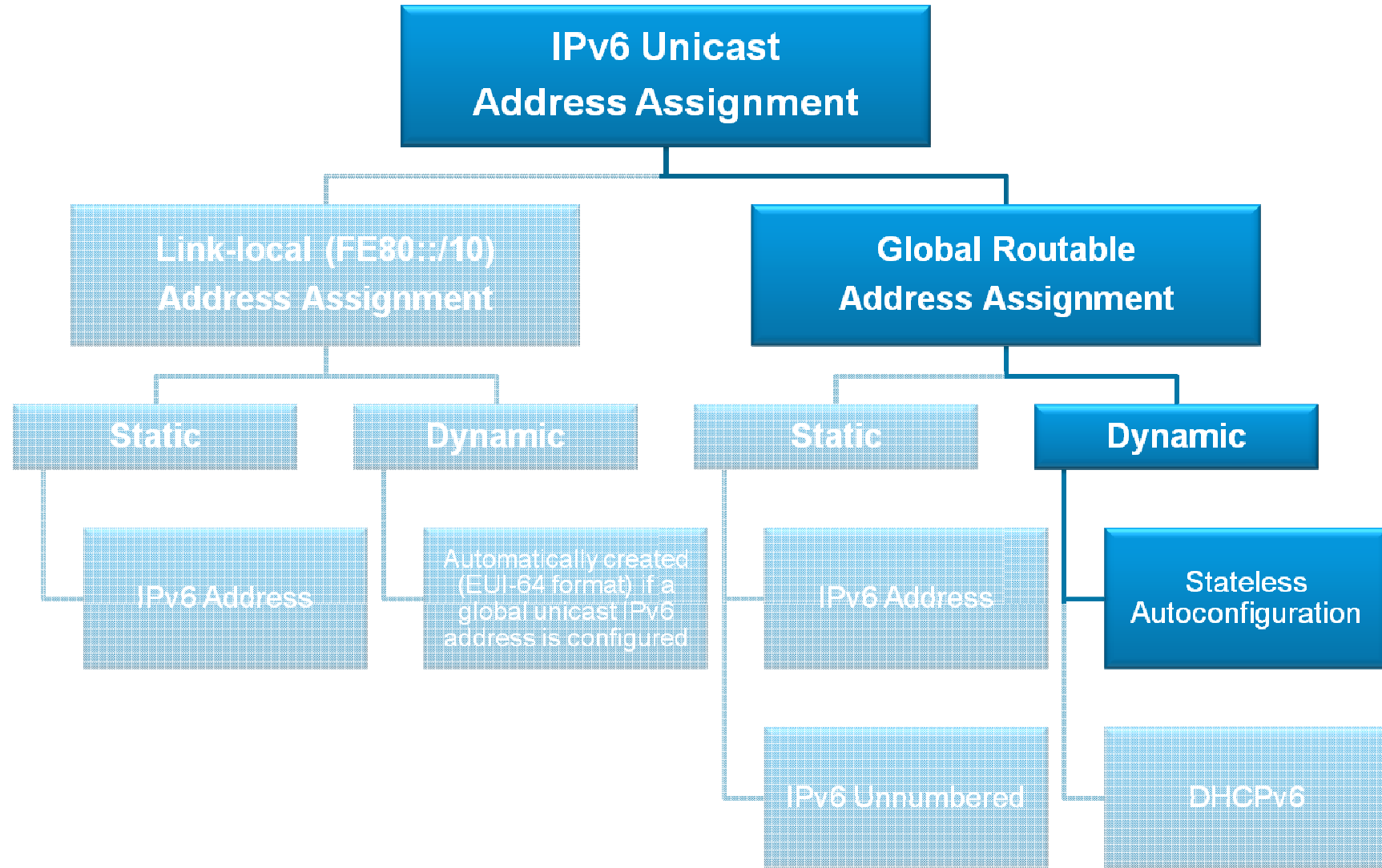


```

R1# show ipv6 interface s0/0/0
Serial0/0/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::222:55FF:FE18:7DE8
  No Virtual link-local address(es):
  Interface is unnumbered. Using address of Loopback10
  No global unicast address is configured
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF18:7DE8
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ICMP unreachables are sent
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds (using 16238)
  Hosts use stateless autoconfig for addresses.
R1#
  
```



Configuring IPv6 Unicast Addresses





Enable Autoconfiguration of a Router Interface.

- Enable the automatic configuration of an IPv6 address.

```
Router(config-if)#
```

```
ipv6 address autoconfig [default]
```

- Enables stateless autoconfiguration which:
 - Automatically configures an IPv6 address using the interface.
 - Enables the IPv6 processing on the interface.
- Addresses are configured depending on the prefixes received in RA messages from other routers.



Alter the Neighbor Detection Timeframe

- Alter the neighbor detection parameter.

```
Router(config-if)#
```

```
ipv6 nd reachable-time milliseconds
```

- Specifies the number of milliseconds that a remote IPv6 node is considered reachable.
- Enables a router to detect unavailable neighbors more quickly.



Statically Add a Neighbor

- Add a neighbor router to the neighbor discovery cache.

```
Router(config)#
```

```
ipv6 neighbor ipv6-address interface-type interface-  
number hardware-address
```




Router EUI-64 Autoconfig Example

Only the network part of the address is supplied in the `ipv6 address` command

```
R1(config)# ipv6 unicast-routing
```

```
R1(config)# int fa0/1
```

```
R1(config-if)# ipv6 addr 2001:db8::/64 eui-64
```

```
R1(config-if)# ipv6 enable
```

```
R1(config-if)# no shut
```



Router Interface EUI-64 Example

Router's fa0/1 interface generates its link-local address and global unicast address

-

```
Router#sho ipv6 int bri
FastEthernet0/0    [administratively down/down]
FastEthernet0/1    [up/up]
FE80::201:42FF:FE44:3C02
2001:DB8::201:42FF:FE44:3C02
```



Good Practice in IPv6 Addressing

- Hosts should have globally routable addresses created with stateless autoconfiguration
 - Use 2001 prefix
 - Use /64 EUI-64 to create them
- Serial links between routers should not use globally routable addresses
 - Use FC00 (Unique-local) prefix and static addressing
 - Use a prefix length /64
 - However, the prefix length could also be, for example, /112



Resources

- <http://www.iana.org/numbers/>
- <http://www.cisco.com/go/ipv6>

- IP address tools (which also support IPv6):
 - IPAT <http://nethead.de/index.php/ipat>
 - ipv6gen <http://techie.devnull.cz/ipv6/ipv6gen/>
 - freeipdb <http://home.globalcrossing.net/~freeipdb/>

