

EUI-64 Process and Randomly Generated

EUI-64 Process

```
PCA> ipconfig
Windows IP Configuration
Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  : 
    IPv6 Address. . . . . : 2001:db8:acad:1:fc99:47ff:Ffe75:cee0
    Link-local IPv6 Address . . . . : fe80::fc99:47FF:FE75:CEE0
    Default Gateway . . . . . : fe80::1
```

Randomly Generated Interface ID

```
PCE> ipconfig
Windows IP Configuration
Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  : 
    IPv6 Address. . . . . : 2001:db8:acad:1:50a5:8a35:a5bb:66e1
    Link-local IPv6 Address . . . . : fe80::50a5:8a35:a5bb:66e1
    Default Gateway . . . . . : fe80::1
```

Dynamic Link-Local Addresses

Dynamically Created Link-Local Addresses

EUI-64 generated Interface ID

```
PCA> ipconfig
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  :
    IPv6 Address. . . . . : 2001:db8:acad:1:fc99:47ff:fe75:cee0
    Link-local IPv6 Address . . . . : fe80::fc99:47ff:fe75:cee0
    Default Gateway . . . . . : fe80::1
```

Random 64-bit generated Interface ID

```
PCB> ipconfig
Windows IP Configuration

Ethernet adapter Local Area Connection:

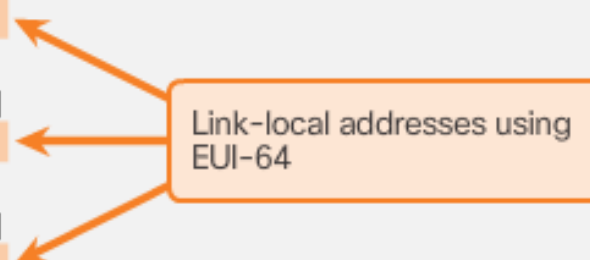
    Connection-specific DNS Suffix  :
    IPv6 Address. . . . . : 2001:db8:acad:1:50a5:8a35:a5bb:66e1
    Link-local IPv6 Address . . . . : fe80::50a5:8a35:a5bb:66e1
    Default Gateway . . . . . : fe80::1
```

Dynamic Link-Local Addresses (cont.)

Router's EUI-64 Generated Link-Local Address

```
R1# show interface gigabitethernet 0/0
GigabitEthernet0/0 is up, line protocol is up
  Hardware is CN Gigabit Ethernet, address is fc99.4775.c3e0
(bia fc99.4775.c3e0)
<Output Omitted>

R1# show ipv6 interface brief
GigabitEthernet0/0      [up/up]
  FE80::FE99:47FF:FE75:C3E0
  2001:DB8:ACAD:1::1
GigabitEthernet0/1      [up/up]
  FE80::FE99:47FF:FE75:C3E1
  2001:DB8:ACAD:2::1
Serial0/0/0             [up/up]
  FE80::FE99:47FF:FE75:C3E0
  2001:DB8:ACAD:3::1
Serial0/0/1             [administratively down/down]
  unassigned
R1#
```



Link-local addresses using EUI-64

Static Link-Local Addresses

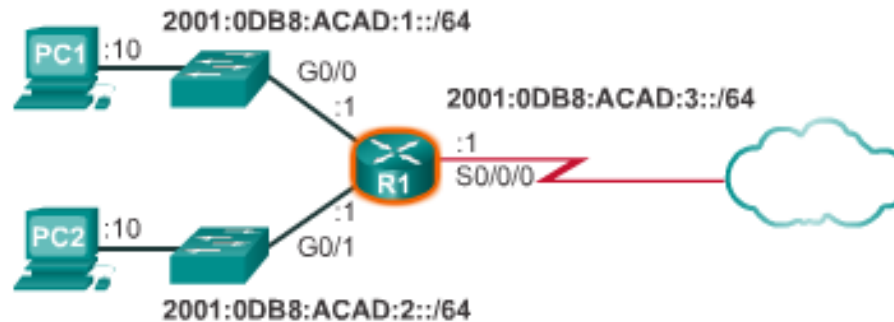
Configuring Link-local Addresses on R1

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

```
ipv6 address link-local-address link-local
```

```
R1(config)#interface gigabitethernet 0/0  
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)#exit  
R1(config)#interface gigabitethernet 0/1  
R1(config-if)#ipv6 address fe80::1 link-local  
R1(config-if)#exit  
R1(config)#interface serial 0/0/0  
R1(config-if)#ipv6 address fe80::1 link-local  
R1(config-if) #
```

Verifying IPv6 Address Configuration



```
R1# show ipv6 interface brief
GigabitEthernet0/0    [up/up]
FE80::FE99:47FF:FE75:C3E0
2001:DB8:ACAD:1::1
GigabitEthernet0/1    [up/up]
FE80::FE99:47FF:FE75:C3E1
2001:DB8:ACAD:2::1
Serial0/0/0           [up/up]
FE80::FE99:47FF:FE75:C3E0
2001:DB8:ACAD:3::1
Serial0/0/1           [administratively down/down]
unassigned
R1#
```

Verifying IPv6 Address Configuration (cont.)

```
R1# show ipv6 route
IPv6 Routing Table - default - 7 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user
Static

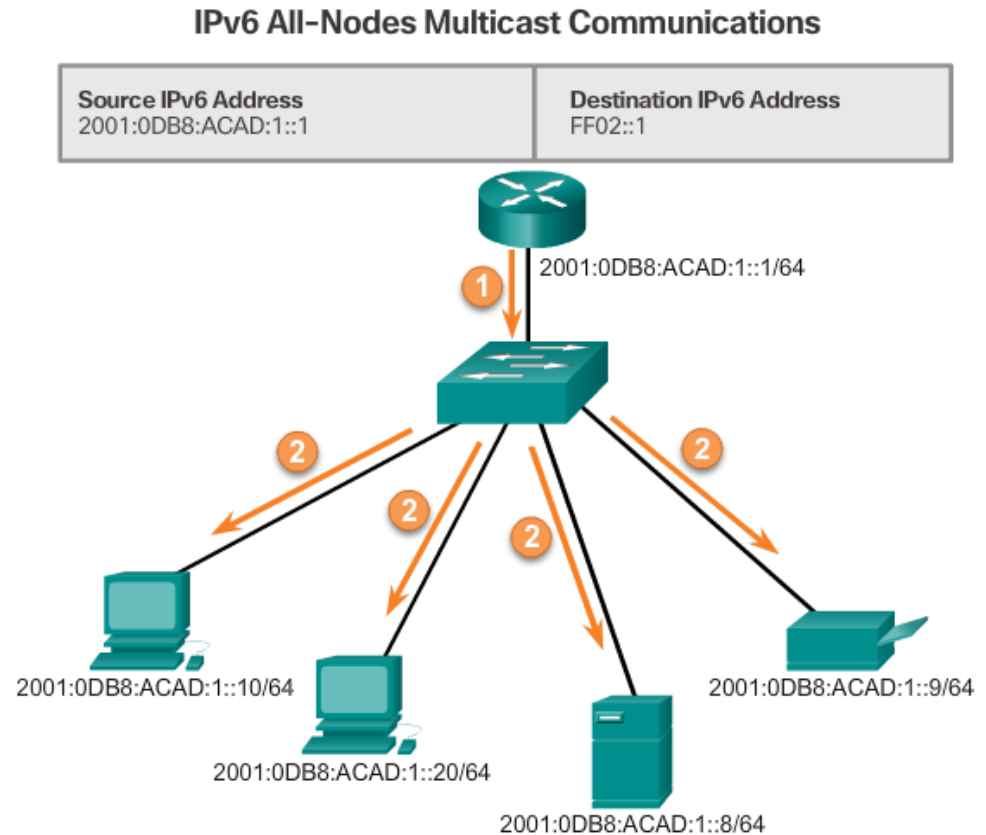
<output omitted>

C   2001:DB8:ACAD:1::/64 [0/0]
    via GigabitEthernet0/0, directly connected
L   2001:DB8:ACAD:1::1/128 [0/0]
    via GigabitEthernet0/0, receive
C   2001:DB8:ACAD:2::/64 [0/0]
    via GigabitEthernet0/1, directly connected
L   2001:DB8:ACAD:2::1/128 [0/0]
    via GigabitEthernet0/1, receive
C   2001:DB8:ACAD:3::/64 [0/0]
    via Serial0/0/0, directly connected
L   2001:DB8:ACAD:3::1/128 [0/0]
    via Serial0/0/0, receive
L   FF00::/8 [0/0]
    via Null0, receive
R1#
```

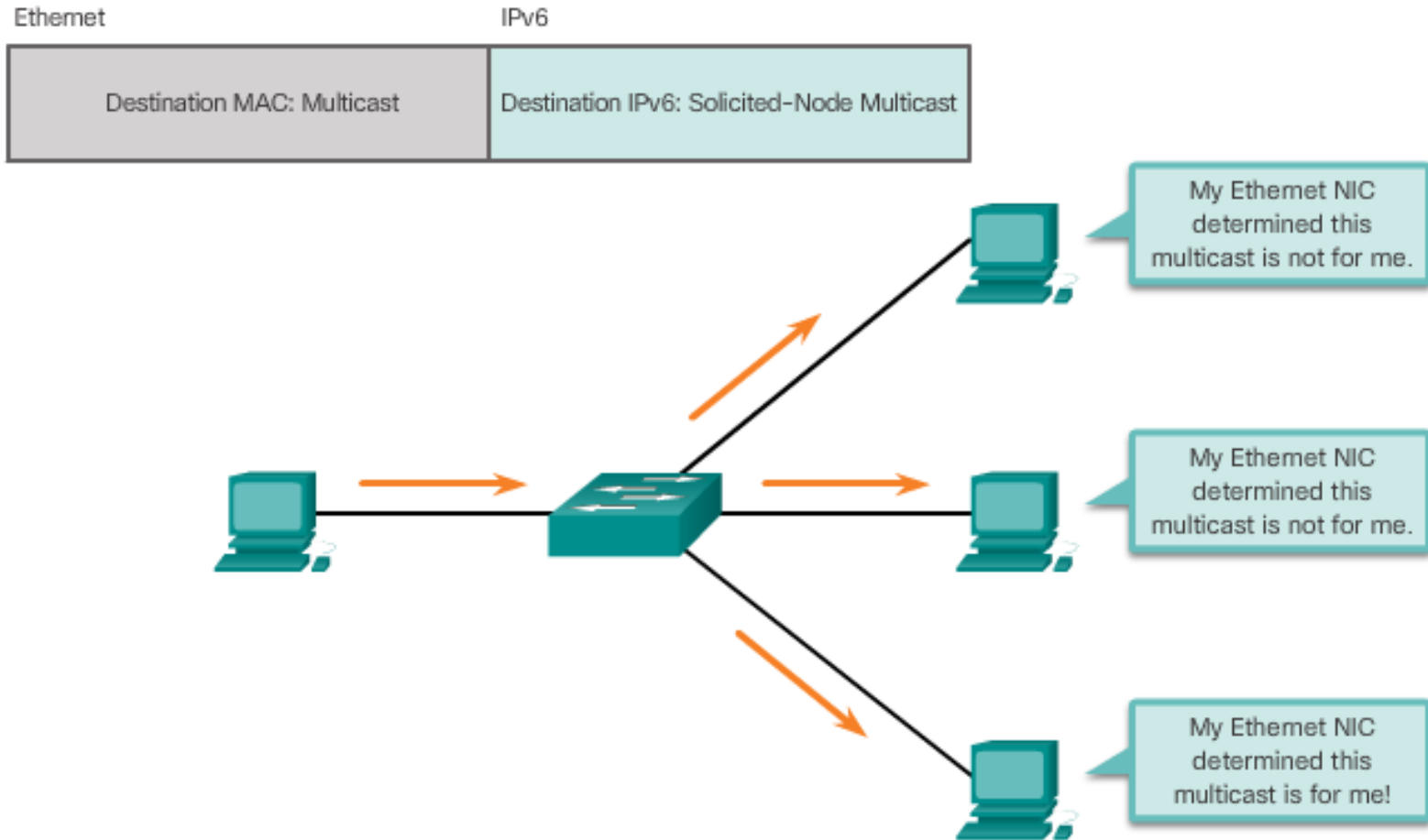
```
R1# ping 2001:db8:acad:1::10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:1::10, timeout
is 2 seconds:
!!!!
Success rate is 100 percent (5/5)
R1#
```

Assigned IPv6 Multicast Addresses

- IPv6 multicast addresses have the prefix FF00::/8.
- There are two types of IPv6 multicast addresses:
 - Assigned multicast
 - Solicited node multicast



Solicited-Node IPv6 Multicast Addresses



Section 7.3:

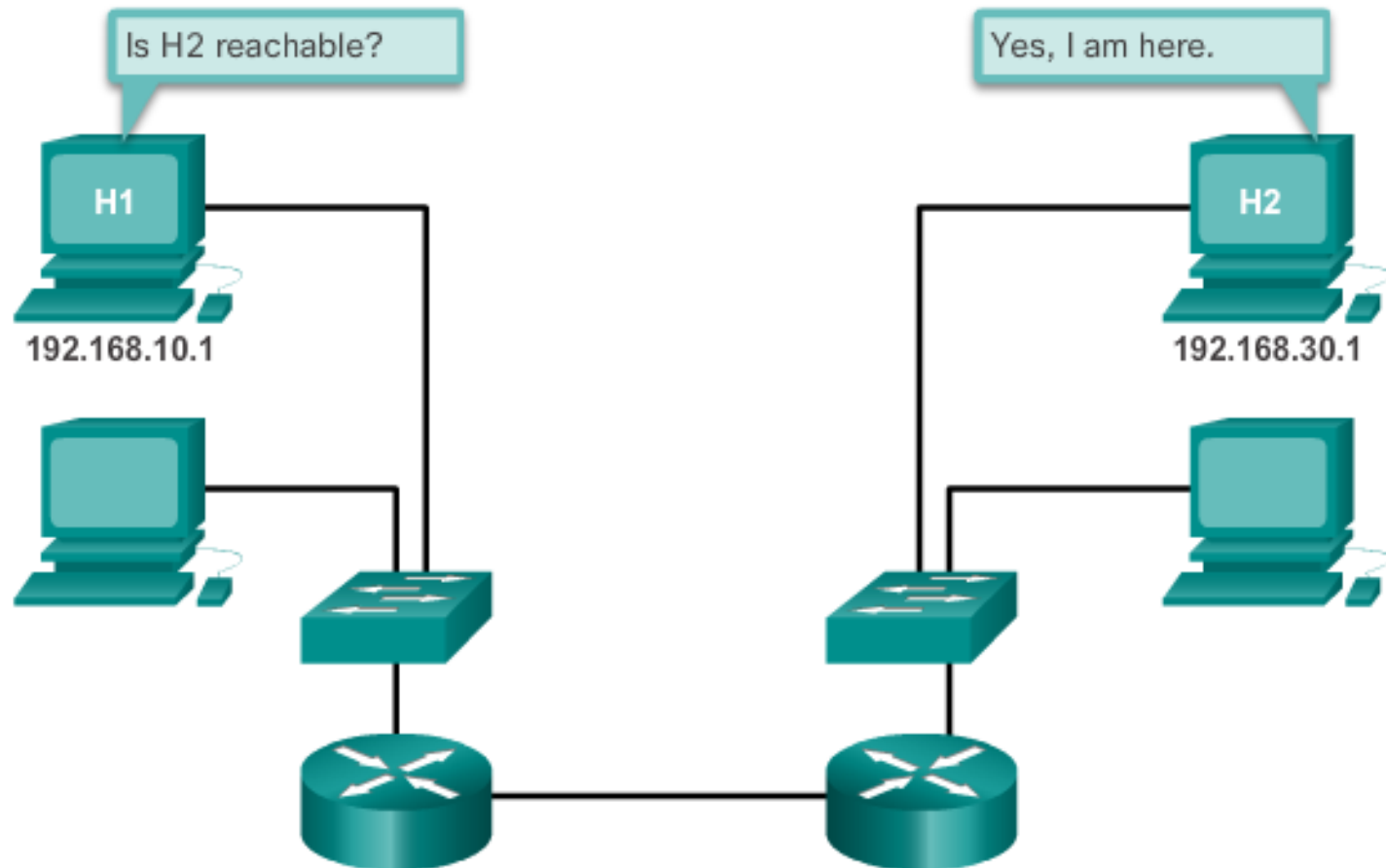
Connectivity Verification

Upon completion of this section, you should be able to:

- Explain how ICMP is used to test network connectivity.
- Use ping and traceroute utilities to test network connectivity.

ICMPv4 and ICMPv6

ICMPv4 Ping to a Remote Host

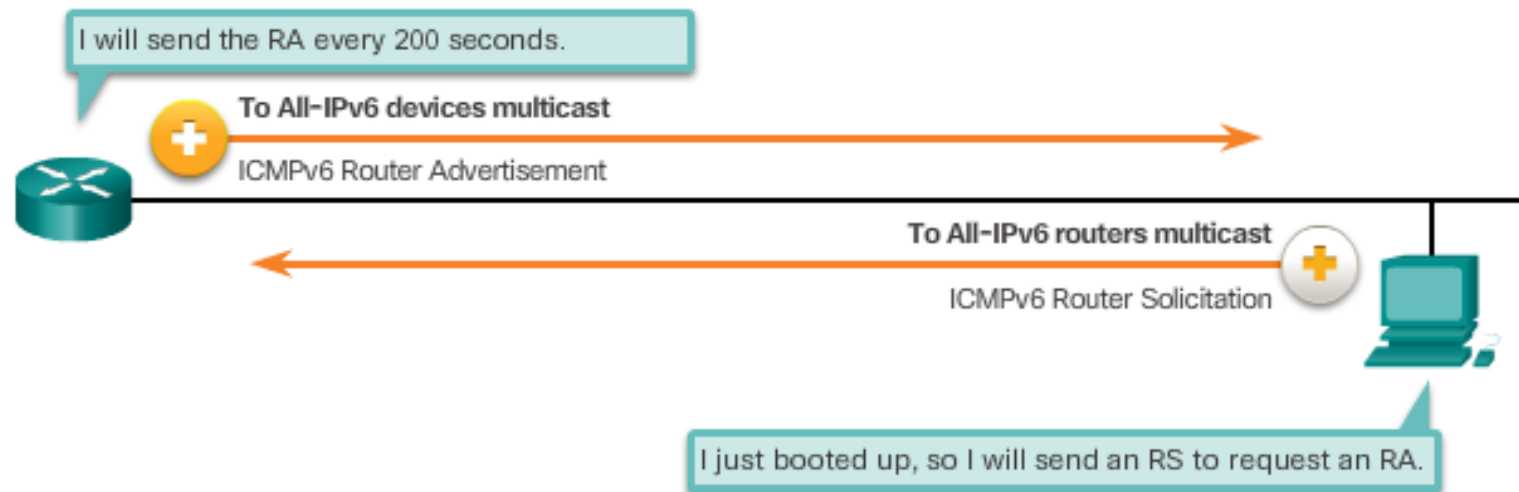


ICMPv4 and ICMPv6 (cont.)

- ICMP messages common to both ICMPv4 and ICMPv6 include:
 - Host confirmation
 - Destination or service unreachable
 - Time exceeded
 - Route redirection
- Although IP is not a reliable protocol, the TCP/IP suite provides for messages to be sent in the event of certain errors. They are sent using the services of ICMP.

ICMPv6 Router Solicitation and Router Advertisement Messages

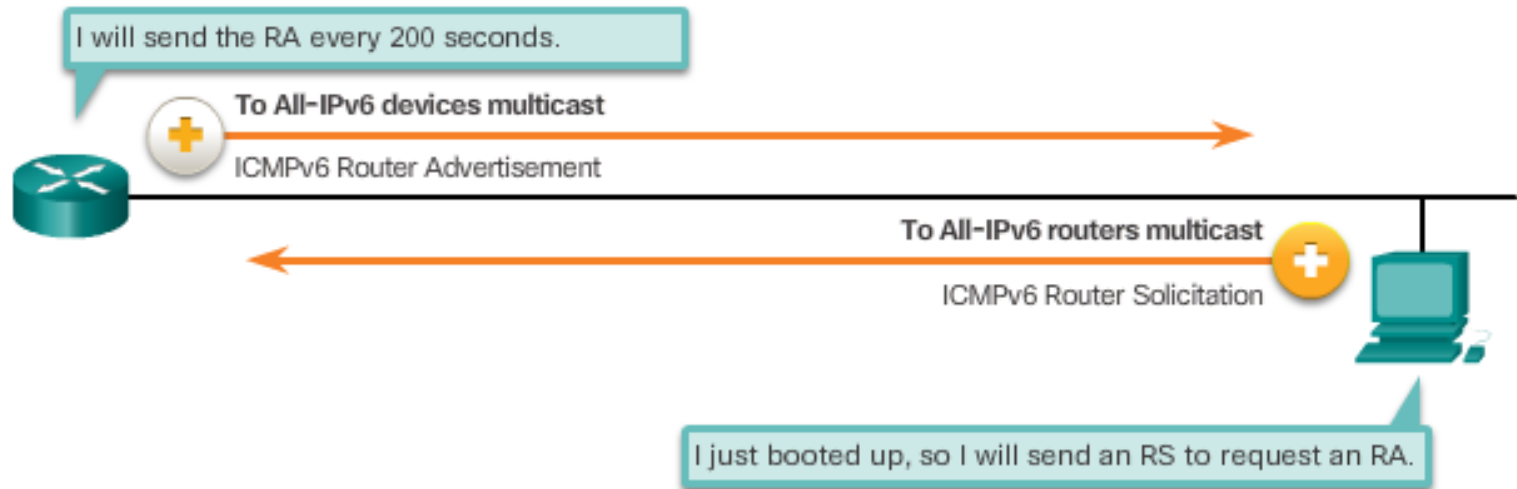
Messaging Between an IPv6 Router and an IPv6 Device



RA messages are sent by routers to provide addressing information to hosts using SLAAC. The RA message can include addressing information for the host such as the prefix, prefix length, DNS address and domain name. A router will send an RA message periodically or in response to an RS message. A host using SLAAC will set its default gateway to the link-local address of the router that sent the RA.

ICMPv6 Router Solicitation and Router Advertisement Messages

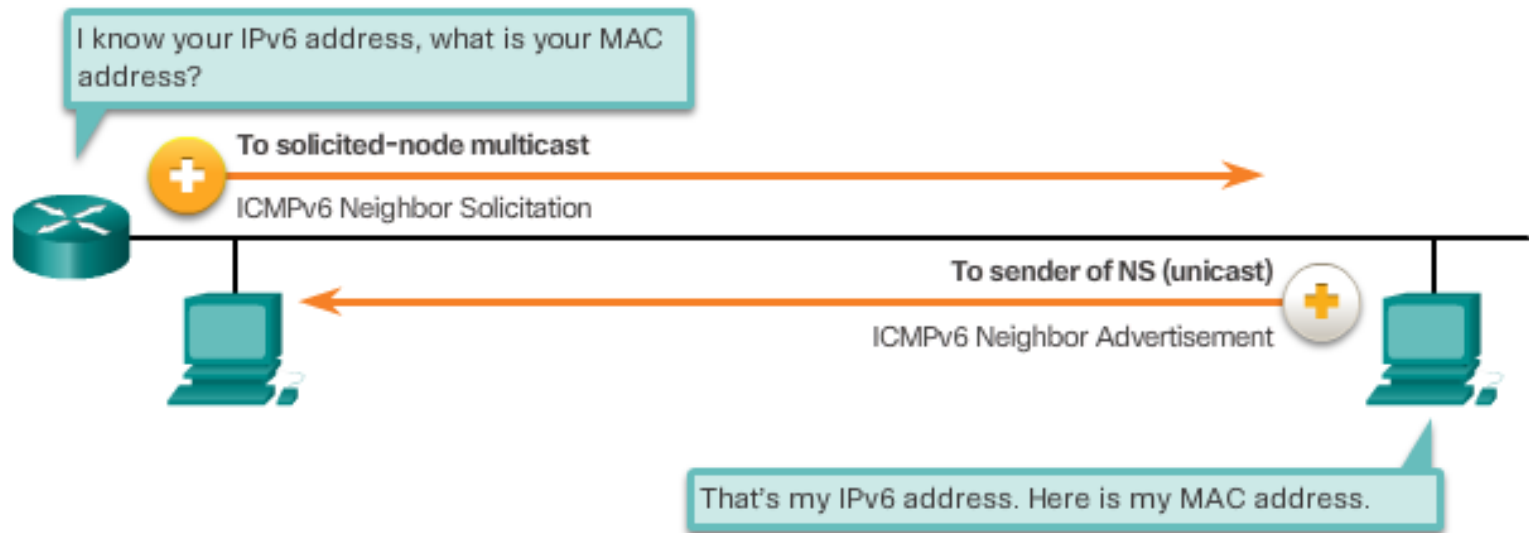
Messaging Between an IPv6 Router and an IPv6 Device



When a host is configured to obtain its addressing information automatically using Stateless Address Autoconfiguration (SLAAC), the host will send an RS message to the router requesting an RA message.

ICMPv6 Router Solicitation and Router Advertisement Messages (cont.)

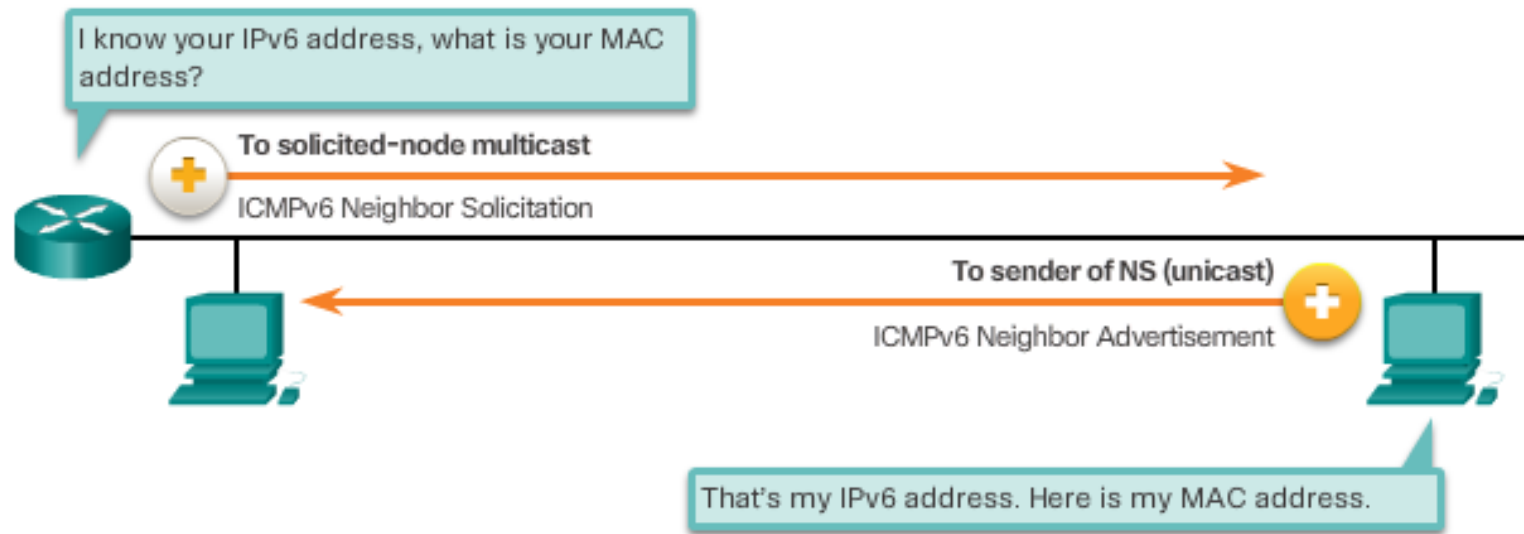
Messaging Between IPv6 Devices



NS messages are sent when a device knows the IPv6 address of a device but does not its MAC address. This is equivalent to an ARP Request for IPv4.

ICMPv6 Router Solicitation and Router Advertisement Messages (cont.)

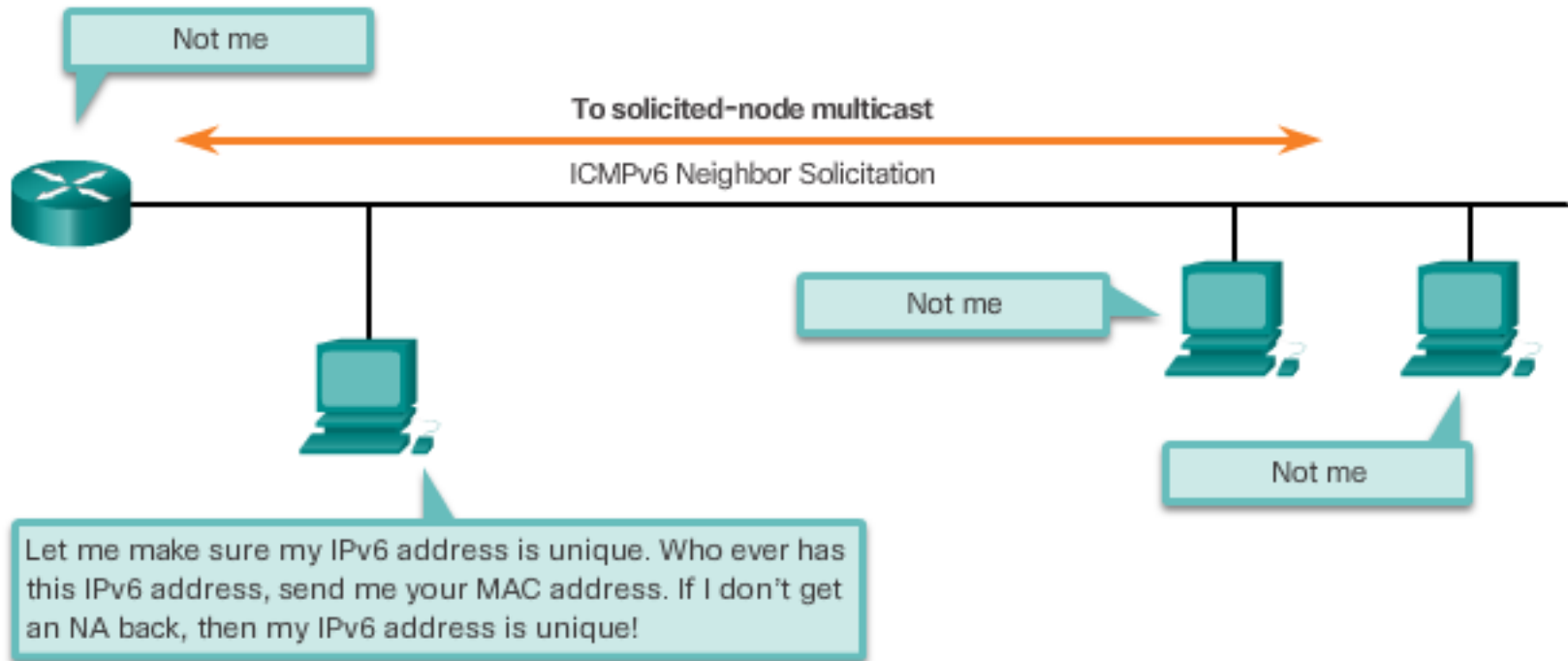
Messaging Between IPv6 Devices



NA messages are sent in response to an NS message and matches the target IPv6 address in the NS. The NA message includes the device's Ethernet MAC address. This is equivalent to an ARP Reply for IPv4.

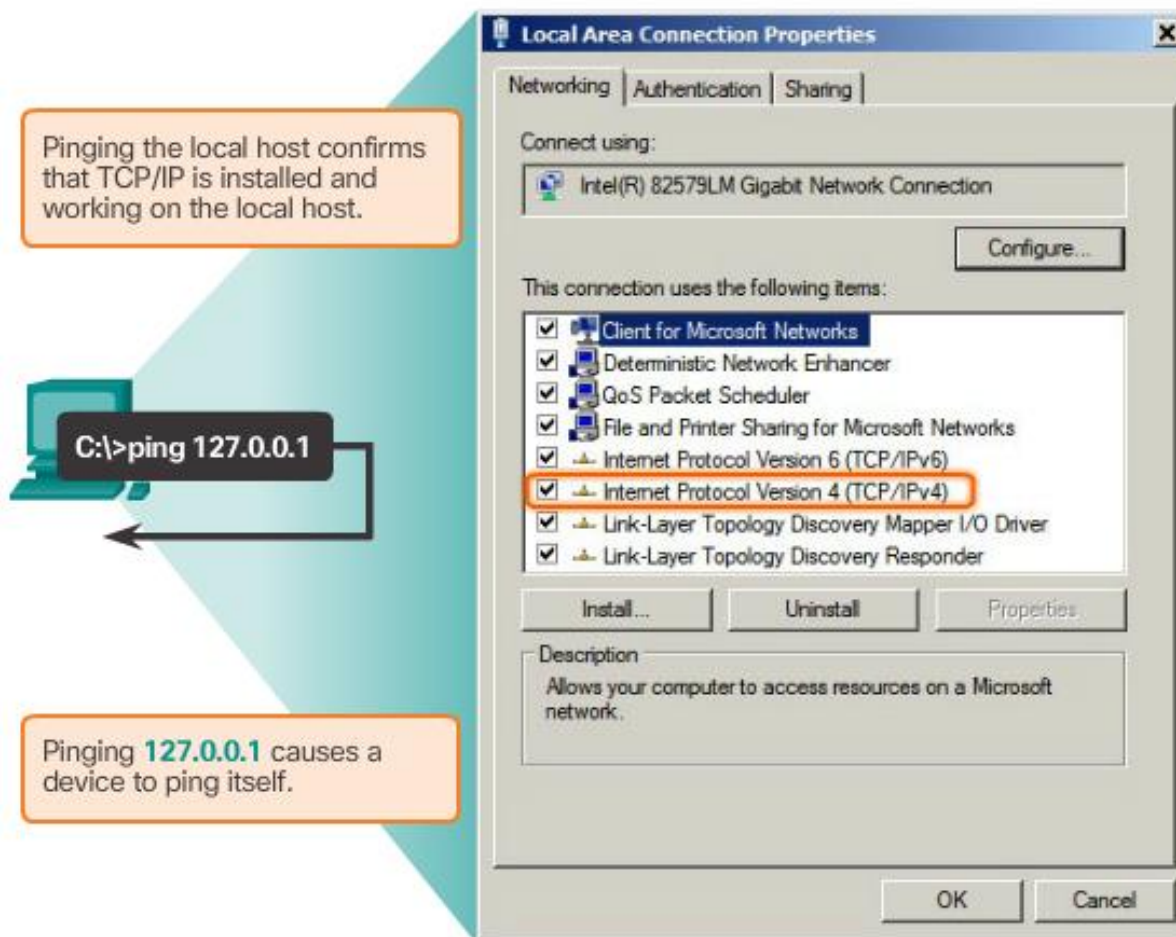
ICMPv6 Router Solicitation and Router Advertisement Messages (cont.)

Duplicate Address Detection (DAD)

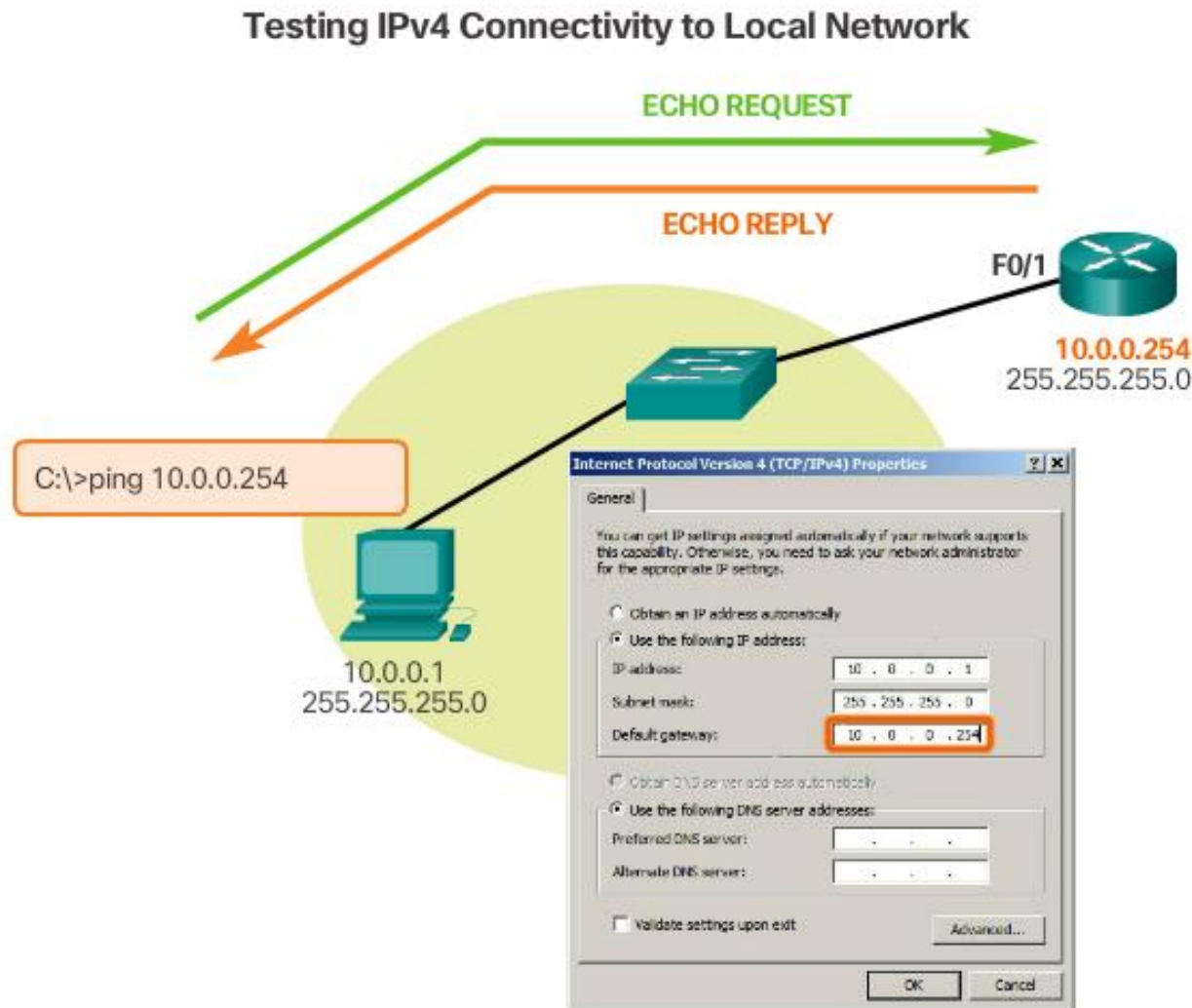


Ping - Testing the Local Stack

Testing Local TCP/IP Stack

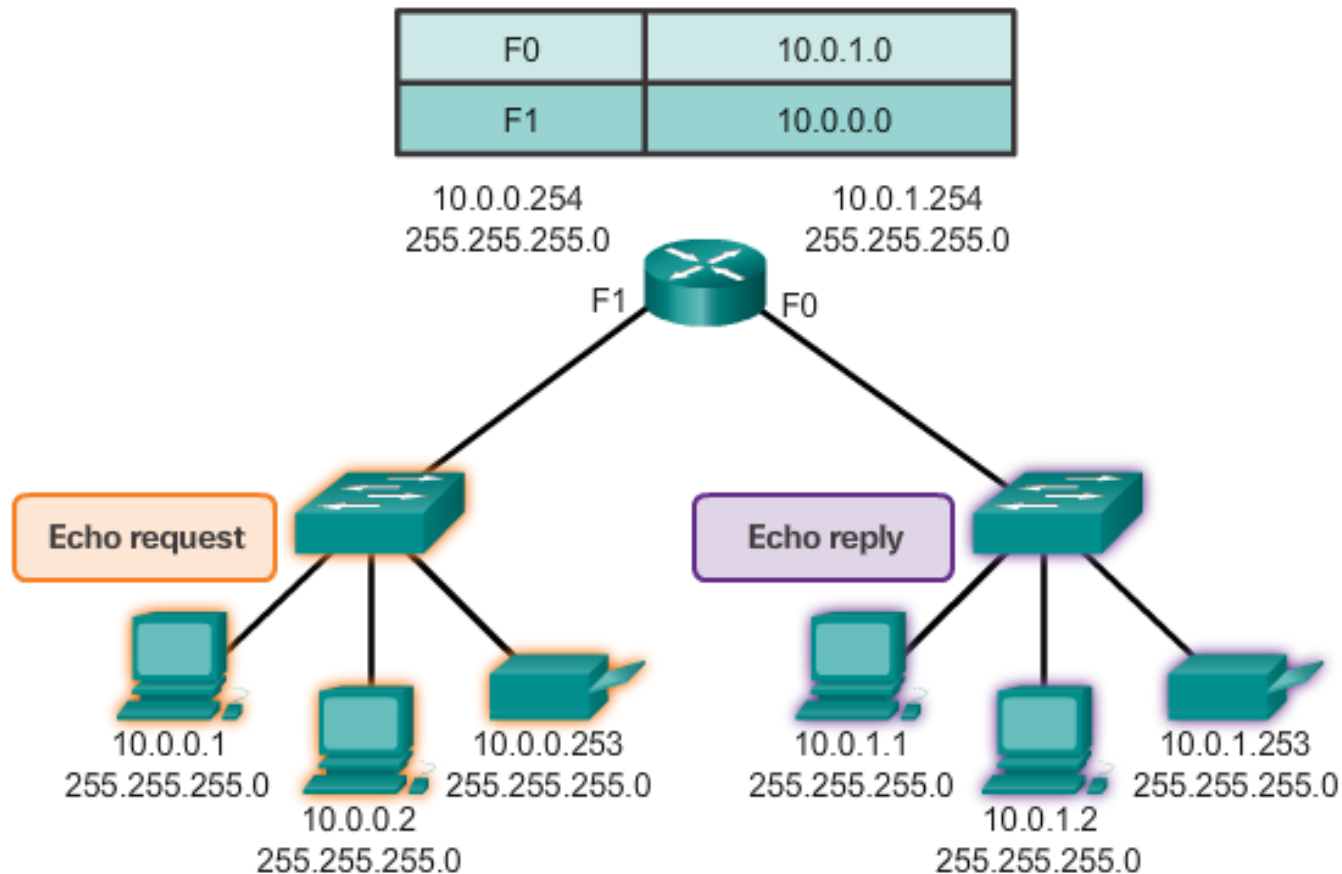


Ping – Testing Connectivity to the Local LAN



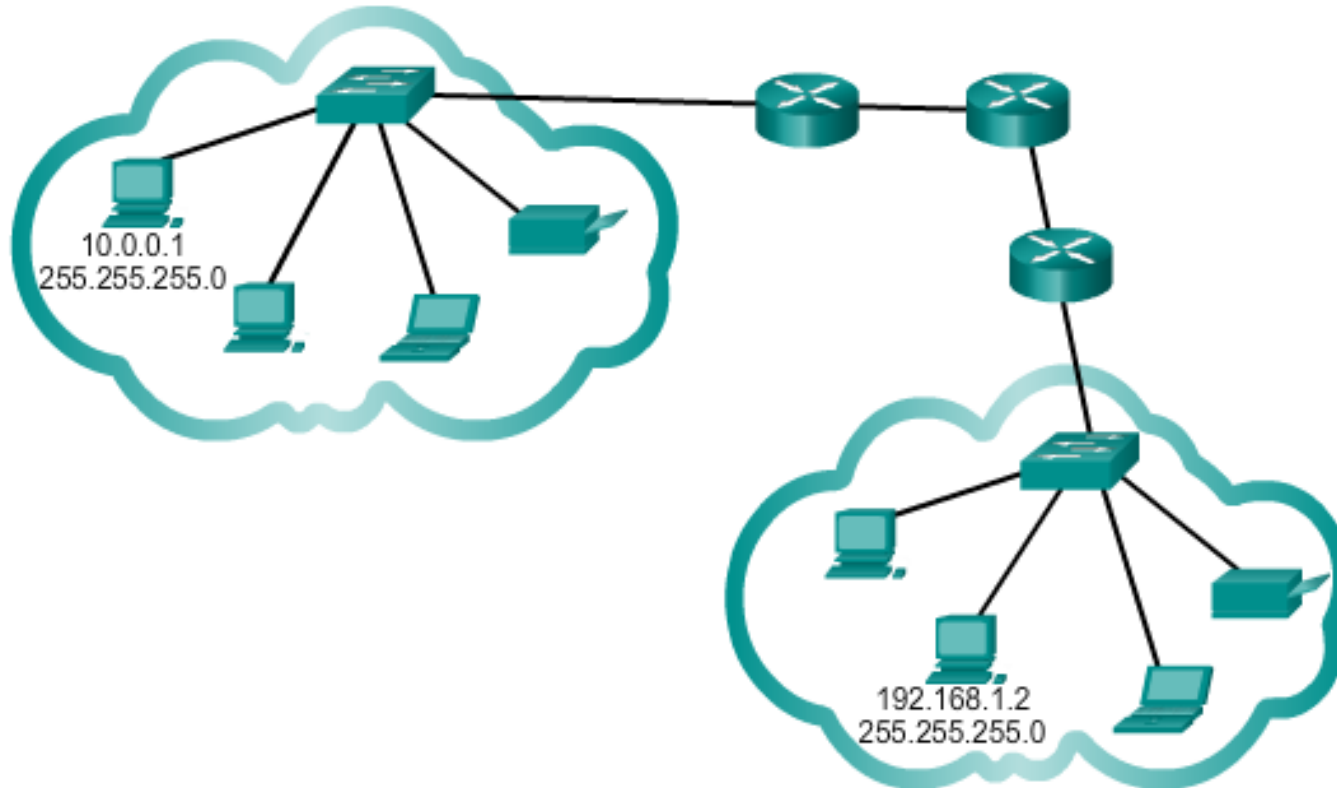
Ping – Testing Connectivity to Remote

Testing Connectivity to Remote LAN
Ping to a Remote Host



Traceroute – Testing the Path

Traceroute (tracert) - Testing the Path



Section 7.4: Summary

Chapter Objectives:

- Explain the use of IPv4 addresses to provide connectivity in a small to medium-sized business network.
- Configure IPv6 addresses to provide connectivity in small to medium-sized business networks.
- Use common testing utilities to verify network connectivity.