6DISS

South America Workshop

WALC 2006 (Quito, Ecuador – 26-28 July '06)

Router configuration #1

Miguel Baptista (miguel.baptista@fccn.pt)

Pedro Lorga (lorga@fccn.pt)

Simon Muyal (muyal@renater.pt)

Laboratory Exercise: *IPv6 Router's configuration #1*

Objectives

In this laboratory exercise you will complete the following tasks:

- *Enable and configure IPv6 on a Cisco's router interface*
- *Visualize some information regarding IPv6*
- *Configure the Router Advertisement (RA) on a Cisco's router interface*

Visual Objective

The following figure shows the configuration of the current laboratory:

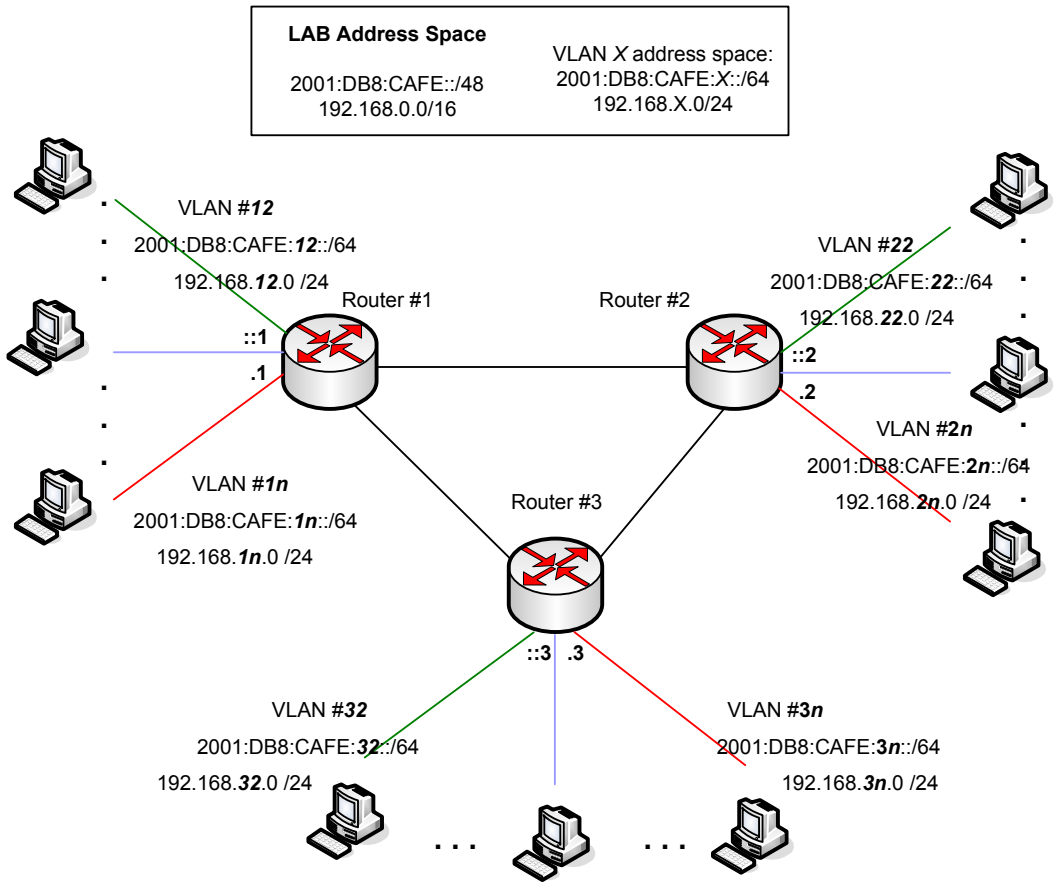

Figure 1: Scenario topology

Setup/Scenario

In this scenario there are three Cisco 1800 routers, numbered 1 to 3. This equipment has 2 Fast Ethernet layer 3 capable ports (FE0 and FE1) and 8 Fast Ethernet Switch ports (FE2 to FE9).

The routers will be connected to each other using FastEthernet interfaces. The switch's FastEthernet ports are where the PCs will connect. Each router has up to 7 VLANs, each one configured in a switching FE port (except FE port 9). These VLANs already have an IPv4 address assigned.

Every PC will have two students and the PC will connect to a port on the switch.

Preparing the LAB

Step 1 - *Connect your PC to a switch port. The router has IPv4 DHCP configured. You should get an address from the range shown in the table 1.*

Step 2 – *Check your IPv4 address using the command line. The third octet will be your group's number and also the VLAN you will be using for the rest of this exercise. You can see that the* ***VLAN = (router_number * 10) + port_number.***

*E.g. if your IPv4 address is 192.168.**37**.10 you are connected to the switch port **7** of router **3** and your VLAN is **37**.*

Group	Connect (router/port)	VLAN	IPv4 Network	Default Gateway
12	(1/2)	12	192.168.12.0/24	192.168.12.1
13	(1/3)	13	192.168.13.0/24	192.168.13.1
…	…	…	…	…
18	(1/8)	18	192.168.18.0/24	192.168.18.1
22	(2/2)	22	192.168.22.0/24	192.168.22.2
23	(2/3)	23	192.168.23.0/24	192.168.23.2
…	…	…	…	…
28	(2/8)	23	192.168.28.0/24	192.168.28.2

32	(3/2)	32	192.168.32.0/24	192.168.32.3
33	(3/3)	33	192.168.33.0/24	192.168.33.3
…	…	…	…	…
38	(3/8)	38	192.168.38.0/24	192.168.38.3

Table 1: Host's addresses

Task 1: *Enabling and configuring IPv6 on a Cisco Router*

Complete the following steps:

Step 1: Checking IPv6 capability

Until the moment, all routers only have IPv4 addresses. Now it's time to configure IPv6 on the routers interfaces. Telnet your router using IPv4. The address you should use is your IPv4 default gateway. (192.168.***Y***.***X*****,** where: ***Y***=VLAN and ***X***=router number).

Password: **6diss**

Enable secret: **6diss**

Enter the privileged mode to configure the router.(**Tip:** `router`***X***`> enable`)

After you typed the password, the prompt of the router should be like this: `router`***X***`#`

Now check the configuration to see if the lines appear:

- ipv6 enable
- ipv6 unicast-routing

(**Tip:** `router`***X***`> show running-config`)

- The **`ipv6 enable`** command makes possible the use of IPv6 on all router interfaces. If you only want to configure IPv6 on some interfaces, you should rather use this command in the specific interfaces. The **`ipv6 unicast-routing`** enables IPv6 routing on the Cisco router. If this line was not configured the router should not forward any IPv6 packets.

Note: If a router doesn't have those commands, probably its IOS lacks IPv6 capabilities. You should check your vendor for details.

Step 2: Enabling IPv6 on your interface

- Enter the privileged mode to configure the router.(**Tip:** `router`***X***`>` **`enable`**)
- Enter configuration mode (**Tip:** `router`***X***`#` **`configure terminal`**)
- Enter interface configuration mode of your VLAN interface. (**Tip:** `router`***X***`(config)#` **`interface vlan`** `vlan-interface-number`)
  Remember, your VLAN interface number is the third octet of your IPv4 address, on other words interface ***VLAN*** = ***(router_number * 10) + port_number***
  E.g. if your IPv4 address is 192.168.***37***.10 you are connected to the switch port ***7*** of router ***3*** and your VLAN is ***37***.
- Enable IPv6 on that interface.
  (**Tip:** `router`***X***`(config-if)#` **`ipv6 enable`**)

Step 3: Configure an IPv6 address

Now that you have enabled IPv6 on the VLAN interface, you must assign it an IPv6 address, according to the following format:

2001:DB8:CAFE:***your_vlan_number***::***router_number*** (consult table 2)

E.g., for group ***28*** *(Router 2, port 8),* the address should be 2001:DB8:CAFE:**28**::***2*** /64

(**Tip:** `RouterX(config-if)#` **`ipv6 address`** `ipv6_address/mask`**)**

Group	IPv6 Address
12	2001:DB8:CAFE:12::**1** /64
13	2001:DB8:CAFE:13::**1** /64
…	…
18	2001:DB8:CAFE:18::**1** /64
22	2001:DB8:CAFE:22::**2** /64
23	2001:DB8:CAFE:23::**2** /64

…	…
28	2001:DB8:CAFE:28::**2** /64
32	2001:DB8:CAFE:32::**3** /64
33	2001:DB8:CAFE:33::**3** /64
…	…
38	2001:DB8:CAFE:38::**3** /64

Table 2: IPv6 host's addresses

Task 2: *Visualize some IPv6 related information*

Complete the following exercise's steps

Step 1: Check your IPv6 address

Now that you have an IPv6 address on your VLAN interface, you should be able to ping it successfully. Test it.

Step 2: Analyzing your VLAN interface

Check the IPv6 status on your interface VLAN. Now see the multicast addresses the VLAN has joined. Can you describe what each one represents?

- (**Tip1:** `Router`***`X`***`# show ipv6 interface vlan` your-vlan-number)
- (**Tip2:** `Router`***`X`***`# show ipv6 interface brief`)

Task 3: *Modify some parameters on Router Advertisement messages*

Complete the following exercise's steps

Step 1: Suppress Router Advertisement messages

On Cisco routers, after you configured an IPv6 address on an interface, the router will start sending router advertisement messages. These messages will carry a network prefix equal to the network prefix configured on the routers' interface. If you don't want to have Router Advertisement messages on a link you can disable it on the router's interface.

- Enter on your VLAN interface configuration mode and disable the RA messages. (Tip: `router`***`X`***`(config-if)#` **`ipv6 nd ra suppress`**)
- Execute the **`show ipv6 interface vlan`** your-vlan-number command.
- You can check if RA messages are disable using the following command:
  `Show running-config | section interface Vlan``your-vlan-number`
- Enter again on your VLAN interface configuration mode and enable the RA messages. (Tip: `router`***`X`***`(config-if)#` **`no ipv6 nd ra suppress`**)

  Execute **`show ipv6 interface vlan`** your-vlan-number. Can you identify the differences from this output when you have RA enable and disable?

Step 2: Change the time interval between Router Advertisement messages

By default, on Cisco routers, router advertisements are sent every 200 seconds. Check this value on your interface VLAN (**Tip1:** `Router`***`X`***`#` **`show ipv6 interface vlan`** your-vlan-number) and see if it is using the default value.

Now, change the time interval of RA messages to 30 seconds.
(**`Tip:`** `Router`***`X`***`(config-if)#` **`ipv6 nd ra interval …)`**
Besides the **`show ipv6 interface vlan`** your-vlan-number command you can also see the value of the current time interval on the running-configuration.

Summary

After completing these exercises, you should be able to:

- *Enable and configure IPv6 addresses on a Cisco's router interface*
- *Enable and Configure Router Advertisement messages*

Appendix A

Task 1

Step 1: To see the configuration of the router use the **`show running-config`** command.

Use the space key to go for the following page or *enter* to see the next line.

Step 2: Let's see an example of how to configure the interface Vlan 28

Enter configuration mode:

```
Router2# configure terminal
Router2(config)#
```

Enter interface configuration mode:

```
Router2(config)# interface vlan 28
Router2(config-if)# ipv6 enable
```

This feature enables IPv6 link-local addresses on the interface, thus enabling IPv6 on that interface.

Step 3: To configure an IPv6 address on interface Vlan 28 do:

Enter configuration mode:

```
Router2# configure terminal
Router2(config)#
```

Enter interface configuration mode:

```
Router2(config)# interface vlan 28
```

Then configure the IPv6 address on it:

```
Router2(config-if)# ipv6 2001:db8:cafe:28::2/64
```

Task 2

Step 1: Output example

```
Router2# ping 2001:db8:cafe:28::2

        Type escape sequence to abort.
        Sending 5, 100-byte ICMP Echos to 2001:DB8:CAFE:34::3, timeout is
        2 seconds:
        !!!!!
```

Step2: Output example

```
router2# show ipv6 interface vlan 28
```

```
Vlan28 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::216:C8FF:FE30:5E4A
  No Virtual link-local address(es):
  Global unicast address(es):
      2001:DB8:CAFE:28::2, subnet is 2001:DB8:CAFE:28::/64
   Joined group address(es):
      FF02::1
      FF02::2
      FF02::1:FF00:1
      FF02::1:FF30:5E4A
   MTU is 1500 bytes
```

The multicast joined groups are:

FF02::1
All link-local hosts.

FF02::2
All link-local routers.

FF02::1:FF***xx***:***xxxx***
Solicited-node address. A node must configure this multicast address for each of its IPv6 unicast and anycast addresses. The address is formed from the 104-bit prefix FF02:0000:0000:0000:0000:0001:FF concatenated with the final 24 bits of the unicast or anycast address.

Output example

```
router2# show ipv6 interface brief
        FastEthernet0              [up/up]
        FastEthernet1              [up/up]
        … (Output omitted) …
        FastEthernet2              [up/down]
        FastEthernet3              [up/up]
        …
        Vlan1                      [administratively down/down]
        Vlan22                     [up/down]
            FE80::217:E0FF:FED6:A12
            2001:DB8:CAFE:22::2
        Vlan23                     [up/up]
            FE80::217:E0FF:FED6:A12
            2001:DB8:CAFE:23::2
        Vlan24                     [up/down]
            FE80::217:E0FF:FED6:A12
            2001:DB8:CAFE:24::2
        Vlan25                     [up/down]
            FE80::217:E0FF:FED6:A12
            2001:DB8:CAFE:25::2
        Vlan26                     [up/down]
            FE80::217:E0FF:FED6:A12
            2001:DB8:CAFE:26::2
        Vlan27                     [up/down]
```

```
        FE80::217:E0FF:FED6:A12
        2001:DB8:CAFE:27::2
    Vlan28                    [up/down]
        FE80::217:E0FF:FED6:A12
        2001:DB8:CAFE:28::2
    …
```

Task 3

Step 1: Disable Router Advertisement messages on interface VLAN 28

```
Router2# configure terminal
Router2(config)#
Router2(config)# interface vlan 28
Router2(config-if)# ipv6 nd ra suppress
```

Output example:

`Router2# show ipv6 interface vlan 28` command output

```
Router2#sh ipv6 interface vlan 28
Vlan33 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::217:E0FF:FED6:A12
  No Virtual link-local address(es):
  Global unicast address(es):
    2001:DB8:CAFE:28::2, subnet is 2001:DB8:CAFE:28::/64
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:FF00:3
    FF02::1:FFD6:A12
  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
  Hosts use stateless autoconfig for addresses.
```

You can check if RA messages are disable using:

```
Router2# Show running-config | section interface Vlan28
```

```
interface Vlan28
 ip address 192.168.28.2 255.255.255.0
 ipv6 address 2001:DB8:CAFE:28::2/64
 ipv6 enable
 ipv6 nd ra suppress
```

Now let's enable Router advertisement messages on interface VLAN 28

```
Router2# configure terminal
Router2(config)#
Router2(config)# interface vlan 28
Router2(config-if)# no ipv6 nd ra suppress
```

Output example:

```
Router2# show ipv6 interface vlan 28
   Vlan28 is up, line protocol is up
    IPv6 is enabled, link-local address is FE80::217:E0FF:FED6:A12
   …
    (Output omitted)
   …
     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
     ND advertised default router preference is Medium
     Hosts use stateless autoconfig for addresses.
```

Step 2:

Check current time interval

```
Router2# show ipv6 interface vlan 28
   Vlan28 is up, line protocol is up
   IPv6 is enabled, link-local address is FE80::217:E0FF:FED6:A12
   …
    (Output omitted)
   …
     ND router advertisements are sent every 200 seconds
     ND router advertisements live for 1800 seconds
     ND advertised default router preference is Medium
     Hosts use stateless autoconfig for addresses.
```

Change the time interval between Router Advertisement on interface VLAN28

```
Router2# configure terminal
Router2(config)#
Router2(config)# interface vlan 28
Router2(config-if)# ipv6 nd ra interval 30
```

Let's check the current time interval

```
Router2# show ipv6 interface vlan 28
   Vlan28 is up, line protocol is up
   IPv6 is enabled, link-local address is FE80::217:E0FF:FED6:A12
   …
    (Output omitted)
   …
     ND router advertisements are sent every 30 seconds
     ND router advertisements live for 1800 seconds
     ND advertised default router preference is Medium
     Hosts use stateless autoconfig for addresses.
```

Or

```
Router2# show running-config | section interface Vlan28
   interface Vlan28
    ip address 192.168.28.2 255.255.255.0
    ipv6 address 2001:DB8:CAFE:28::2/64
    ipv6 enable
    ipv6 nd ra interval 30
```