
# AUTOCONFIGURATION AND DHCP FOR IPV6

*Francisco J. Obispo*
*fobispo@gmail.com*

*Director de Operaciones y Red Académica*
*Fundación Centro Nacional de Innovación Tecnológica*
*http://www.cenit.gob.ve*
*Caracas - Venezuela*

# Topics

- Background: the need for auto-configuration
- Router Advertising (RA)
- DHCPv6
  - ✓ Stateless (DHCPv6 Options)
  - ✓ Stateful (Full IPv6 and Prefix Assignments)

# Background

*The need for auto-configuration*

- Avoid Manual configurations
- Prevent unnecessary traffic in the network
- Provide a scalable solution to huge networks
- “Ease” configuration, facilitate site renumbering

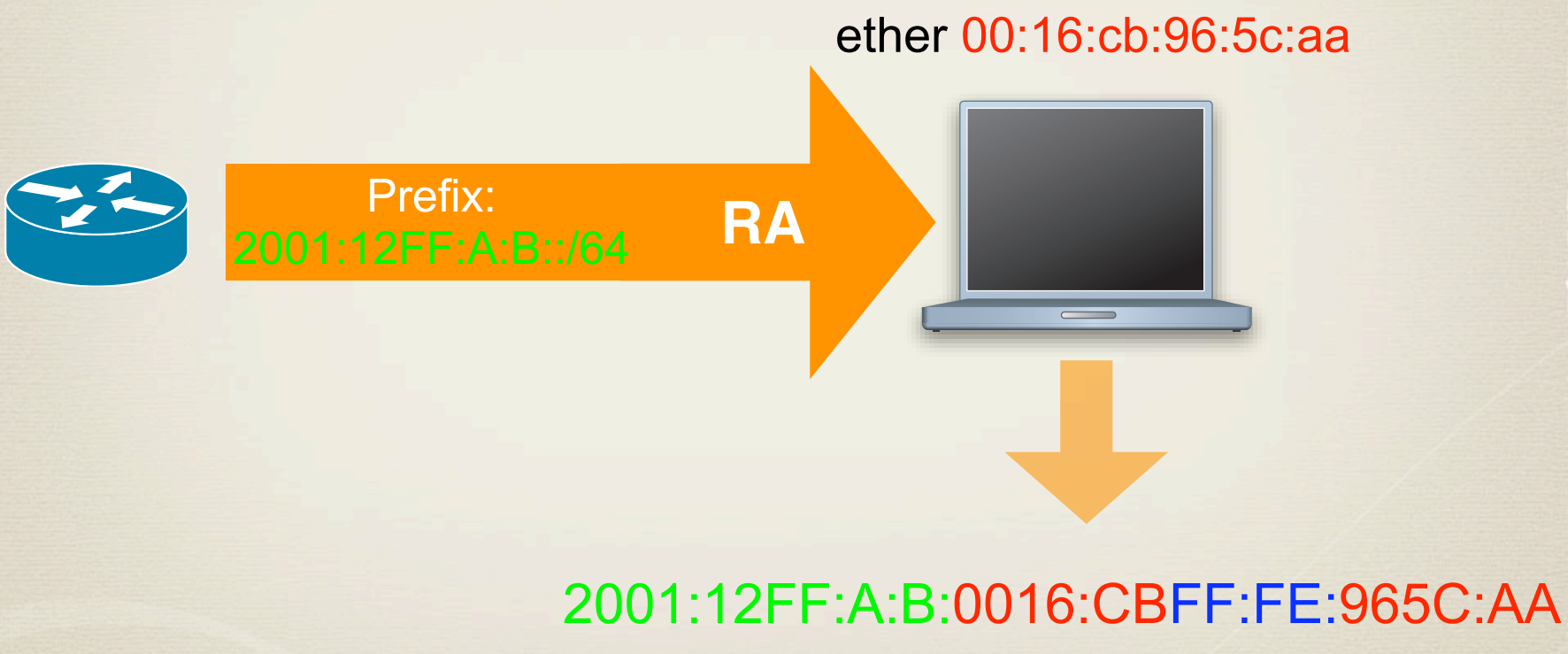
# ROUTER ADVERTISEMENTS

# Router Advertisements

*Design Goals*

- Manual configuration before connecting to the network not required
- Small sites should not require presence of “stateful” servers
- Large sites with multiple networks and router should not require “stateful servers”
- Facilitate graceful renumbering
- Give the “admins” the ability to mix other configuration methods

# Router Advertisements

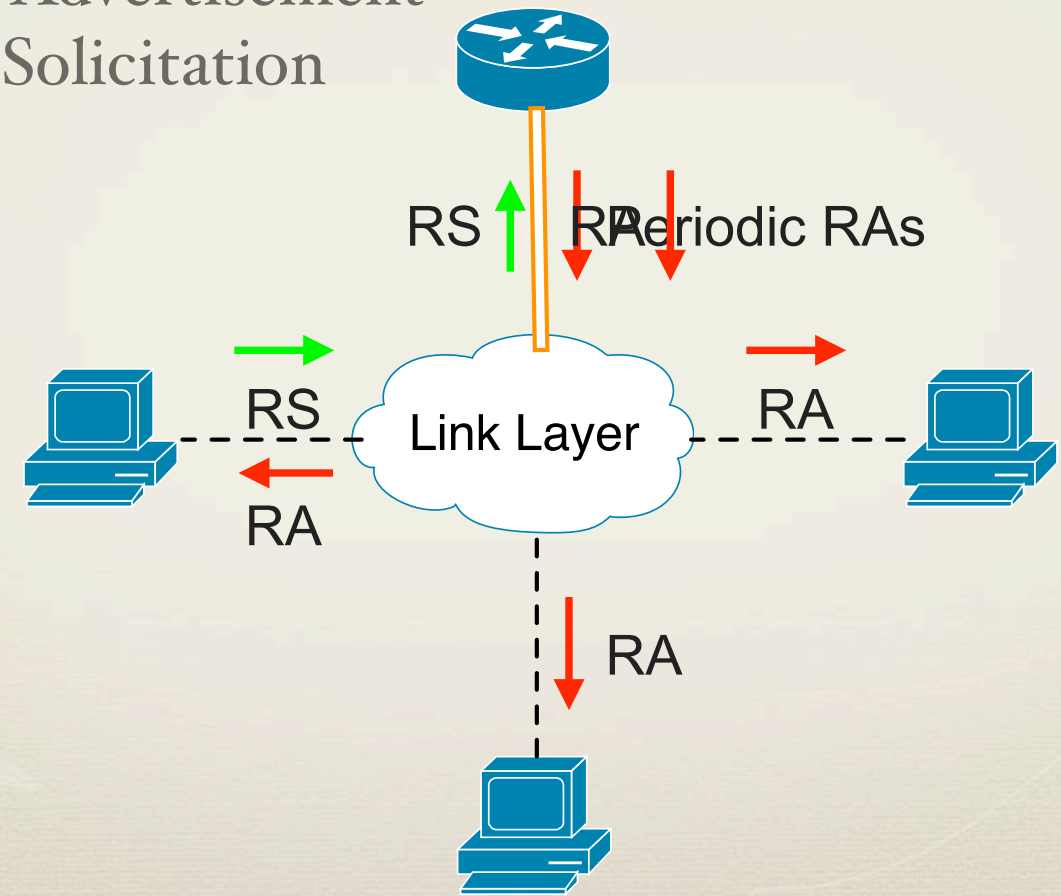


# Router Advertisements

- It is a “stateless” protocol (no information is stored on the routers about the client)
- Advertisements are ICMPv6 Messages sent to Multicast Group FF02::1 (all systems)
- Router Solicitations are sent to Multicast Group FF02::2 (all routers)

# Router Advertisements

RA - Router Advertisement
RS - Router Solicitation

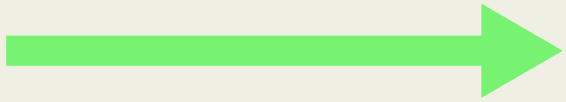


# Router Advertisements

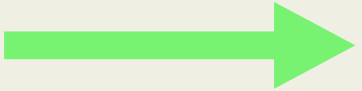
*Implementing in Linux*

- Install the radvd package: aptitude install radvd
- Add the following to /etc/radvd.conf

```
interface eth0
{
   AdvSendAdvert on;
   prefix 2001:ABCD:A:0:1::/64
   {
      AdvOnLink on;
      AdvAutonomous on;
   };
};
```



Interface used to send ADV



Enable Advertisements

Prefix

Adv. Using Link Layer

Autonomous Flag

# Router Advertisements

*Implementing in Linux*

- Make sure you have support to IPv6 routing enabled:

```
echo "1" > /proc/sys/net/ipv6/conf/all/forwarding
```

- Start the server /etc/init.d/radvd start
- Make sure its running, otherwise check the logs
- radvd does not care about routing, this is done at the OS level

# DHCPV6

*Stateless Mode*

# DHCPv6

*Modes of Operation*

- Two (2) modes of operation
  - ✓ Stateless - used if another method of assigning IPv6 addresses is preferred over DHCPv6
  - ✓ Stateful - used to assign IPv6 address and/or prefixes

# DHCPv6

*Stateless*

- In this mode, the DHCPv6 server will work in a team with RADVD to provide configuration services to the clients
- The RADVD daemon will send RAs periodically to the link layer
- The DHCPv6 daemon will send other configuration parameters
- It will also respond to explicit requests

# DHCPv6

*Stateless*

- The options that can be configured using this mode are:
  - ✓ Recursive Domain Name Servers (DNS)
  - ✓ The Domain Name (for the search path)
  - ✓ NTP Servers
  - ✓ SIP servers
  - ✓ NIS and NIS+ servers
  - ✓ BCMCS Servers (BroadCastMulticastService)

# DHCPv6

*Implementing a server in Unix (Linux & BSD Based)*

- Using the WIDE-KAME DHCPv6 Server (DHCP6S)
- Install the service:

```
aptitude install wide-dhcpv6-server
```

# DHCPv6

*Implementing a server in Unix (Linux & BSD Based)*

- Edit or create /etc/wide-dhcpv6/dhcp6s.conf and add:

```
option domain-name-servers 2001:1338::5 2001:1338::3;
option domain-name "workshop.lacnic.net";
```

# DHCPv6

*Implementing a server in Unix (Linux & BSD Based)*

- Make sure RADVD is running and that all necessary parameters are being announced
- Fire up the clients and wait for the magic to happen

# DHCPv6

*Setting up the Client in Linux/Unix*

- Install the DHCP client package:

  `aptitude install` **`wide-dhcpv6-client`**

- Make sure you have ipv6 support loaded into the OS

  (in linux) modprobe ipv6 ;  echo “ipv6” >>/etc/modules

# DHCPv6

*Setting up the Client in Linux/Unix*

- Edit /etc/wide-dhcpv6/dhcp6c.conf with:

```
interface eth1
{
  information-only;
  request domain-name-servers;
  request domain-name;
  script "/etc/wide-dhcpv6/dhcp6c-script";
};
```

# DHCPv6

*Setting up the Client in Linux/Unix*

- Edit /etc/network/interfaces (or the like) and add the following:

```
iface eth1 inet dhcp
  up /etc/wide-dhcpv6/dhcp6c-ifupdown start
  down /etc/wide-dhcpv6/dhcp6c-ifupdown stop
```

# DHCPV6

*Stateful Mode*

# DHCPv6 Stateful

*Highlights*

- It is a Client-Server Protocol - the client needs to specify the type of resource it wants
- DHCP Servers receive messages from clients using reserved link-scoped multicast addresses (`FF02::1:2, FF05::1:3`)
- Messages can be relayed to a DHCPv6 server if not on the same link using an agent
- Once the client has determined the IPv6 address of the server it may in some circumstances send messages directly using Unicast

# DHCPv6 Stateful

* Disable Stateless auto-configuration in /etc/radvd.conf

```
interface eth0
{
   AdvSendAdvert on;
   prefix 2001:1338:A:0:1::/64
   {
      AdvOnLink on;
      AdvAutonomous off;
   };
};
```

# DHCPv6 Stateful

*Setting up the Server*

* Edit (again) `/etc/wide-dhcpv6/dhcp6s.conf`

```
option domain-name-servers 2001:1338::5 2001:1338::3;
option domain-name "workshop.lacnic.net";

interface eth0 {
        address-pool v6workshop 3600;
};

pool v6workshop {
   range 2001:1338:FFFF:2::1000 to 2001:1338:FFFF:2::5000;
};
```

# DHCPv6 Stateful

*Setting up the client*

* Edit (again) `/etc/wide-dhcpv6/dhcp6c.conf`

```
interface eth1
{
  send ia-na 0;
  request domain-name-servers;
  request domain-name;
  script "/etc/wide-dhcpv6/dhcp6c-script";
};

id-assoc na 0 {

};
```

Non-temporary Address

# DHCPv6 Stateful

*Setting up the client*

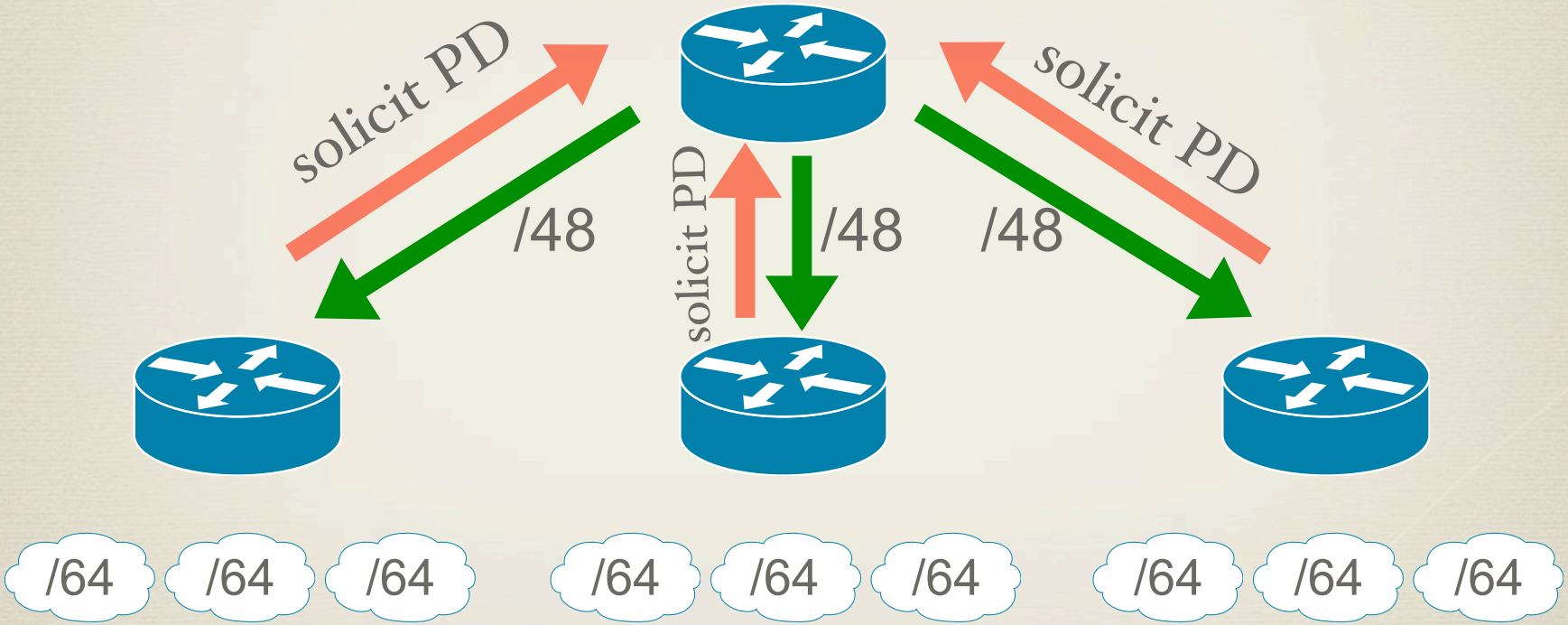
- Other Features:
  - ✓ Authentication
  - ✓ Rapid commit (don't wait for advertisements)
  - ✓ Solicit a specific address to the server using the ia-na option

# DHCPV6

*Prefix Delegation*

# DHCPv6

*Prefix Delegation*



# DHCPv6

*Setting up for Prefix Delegation*

* Edit (server) `/etc/wide-dhcpv6/dhcp6s.conf`

```
host router-salvador {
                duid 00:01:00:01:aa:bb;
                prefix 2001:1338:ABCD::/48 infinity;
};
```

* Edit (client) `/etc/wide-dhcpv6/dhcp6c.conf`

# DHCPv6

*Setting up for Prefix Delegation*

* Edit (client) `/etc/wide-dhcpv6/dhcp6c.conf`

```
interface eth0 {
                send ia-pd 0;
};

id-assoc pd 0{
                prefix-interface wlan0 {
                        sla-id 1;
                };
                prefix-interface wlan1{
                        sla-id 2;
                };
};
```

# DHCPv6

*Setting up for Prefix Delegation*

- The solution in open source is not “too pretty”, it requires additional integration with radvd which is currently unavailable
- Support in Cisco IOS is working
- A testbed can be set up in order to try this technology

# M UITO OBRIGADO