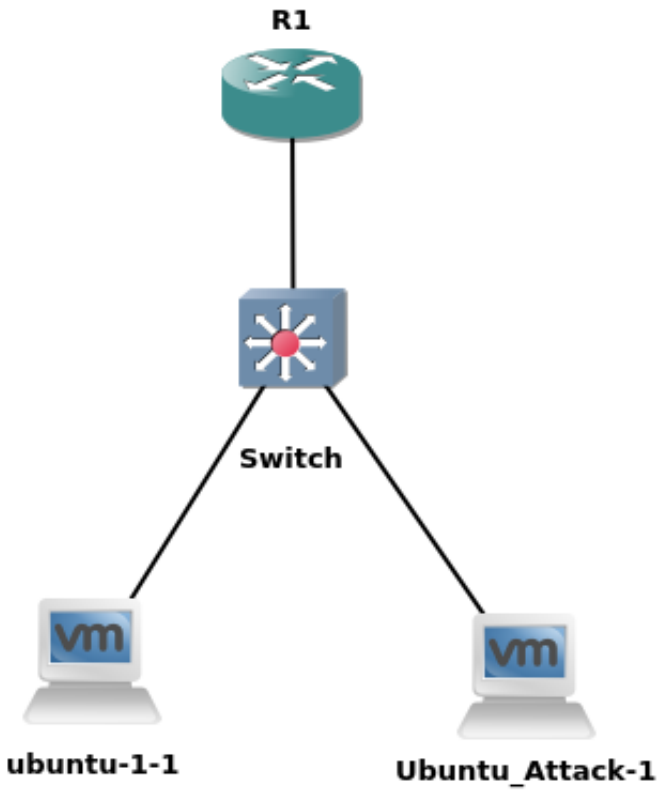
LAB: IPv6 Stateless DHCPv6

Lab Environment

Open the GNS3 project file: `IPv6_Stateless_DHCPv6.gns3`

- The lab topology has:
  - 1xRouter
  - 1xSwitch
  - 1xUbuntu (Desktop) client VM
  - 1xUbuntu (Server) attacker VM, with THC-IPv6 toolset already installed (we will not use the toolkit for this lab)



- Lab setup:
  - start the devices one by one (not to overwhelm your host machines)
  - start the router R1 and configure as below.
  - then start switch and configure as below.

- then start the client VM (verify the correct address configuration)
- and finally start the attacker VM and follow the instructions below.

- Confirm interface name:
  - On the ubuntu attacker VM, check the IP configuration to see the interface name:

    ```
    ifconfig
    ```

    OR

    ```
    ip route show | grep " src " | cut -d " " -f 3,12
    ```

  - In this guide the interface name is `ens32` for ubuntu*1 and* `ens34` *for Ubuntu*Attack. Depending on the version of Ubuntu the interface name may be `enp0s3` or something different. Where `ens32` or `ens34` is used in this guide replace it with your interface name.

Configure the Router:

1. Configure the DHCPv6 server

```
ipv6 dhcp pool STATELESS-DHCPv6
 dns-server 2406:6400::1 !this is the loopback0 address
 domain-name apnic.net
```

2. Bind the DHCPv6 pool to the interface towards the client:

```
interface FastEthernet0/0.100
ipv6 dhcp server STATELESS-DHCPv6
ipv6 nd other-config-flag
```

   - Clients will use the IPv6 prefix in the RA to compute their address using SLAAC, which means the DHCPv6 server will not track or maintain IPv6 addresses used by clients (hence, stateless).
   - The `O` (other-config) flag in the RA tells the clients to obtain other information (dns, domain, etc) from the DHCPv6 server
   - the `A` (auto-config) flag is still set (default) in the RAs to the clients

3. Verify the configuration with the following commands

```
show ipv6 interface !look at ND stats and different multicast groups joined (a
nything different?)
show ipv6 route !shows the ipv6 routing table
show ipv6 neighbors !list the neighbors
```

4. Enable ICMPv6 Neighbor Discovery (ND) messages and DHCPv6 debugging on the router

```
debug ipv6 nd
debug ipv6 dhcp
```

   - could also use packet capture if wireshark is installed, as shown below:

```
right-click on any link of the GNS3 topology, and click "start capture"
```

5. Save your configurations

```
wr
```

Configure the switch:

1. The switch configuration is the same as the previous lab (SLAAC lab).

2. Verify the switch configuration

```
sh interfaces trunk ! make sure the trunk carries all VLANs and are in forward
ing state
sh vlan brief ! check the vlan database
```

The Client VM (Ubuntu Desktop)

1. Turn ON (start) both the VMs (Ubuntu_1 and 2). You should be logged in automatically (username and password below)

```
username: apnic
password: training
```

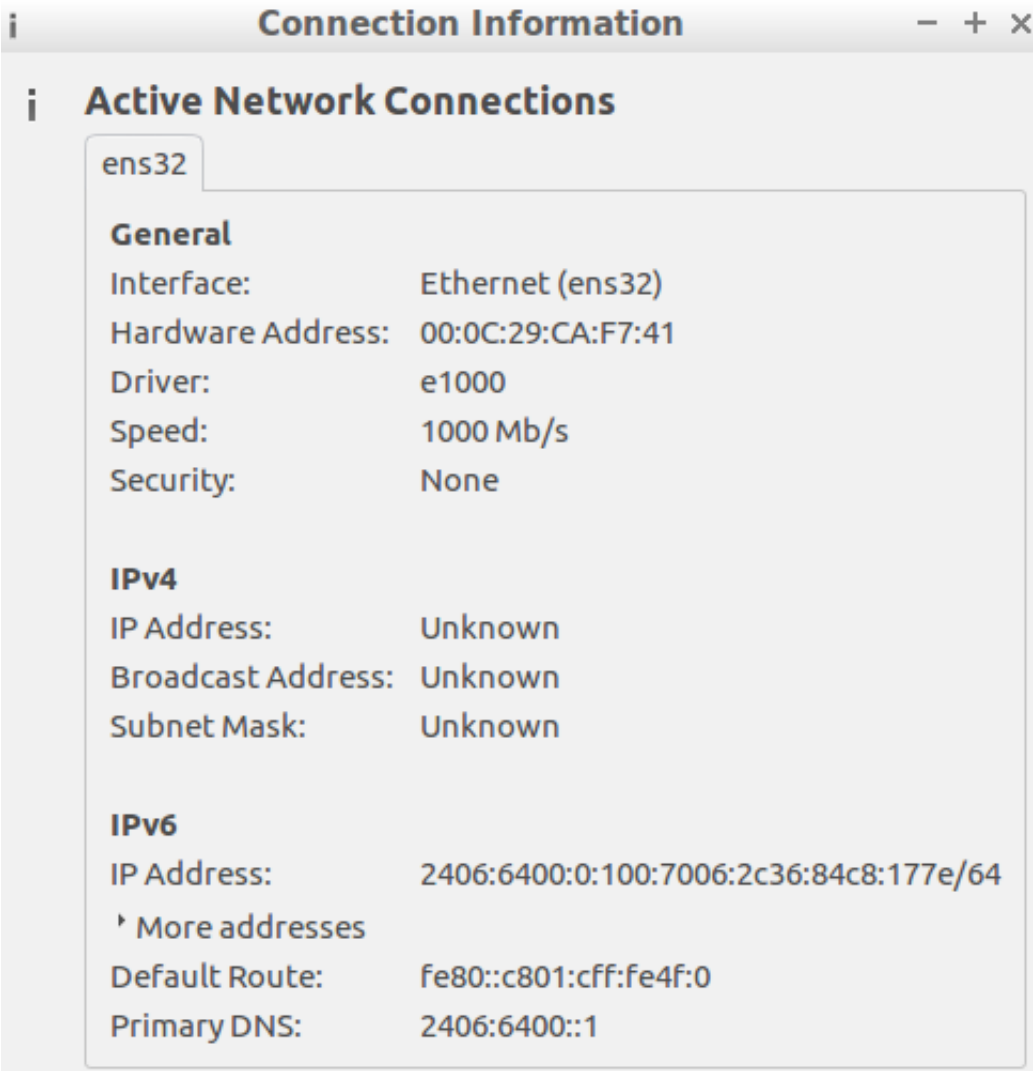
2. Toggle the interface enp0s3

```
sudo ifconfig enp0s3 down/up
```

3. Verify that the interface `enp0s3` is UP and has computed the IPv6 address using SLAAC (A-flag in the RA)

```
ifconfig
# the address should look something like 2406:6400:0:100:x:x:x:x
# where the x:x:x:x (64-bit interface ID) is generated randomly (RFC4941)
# you will see two globally scoped addresses - secured and temporary (RFC7217
compliant)
# secured won't change even after reboot, while temporary (outgoing) will
```

4. Verify that `Other` stateful information (DNS server in this case) has been obtained from the DHCPv6 server. You can see it from the `Connection Information` dropdown menu:



Verification:

- Since you had enabled IPv6 ND and DHCPv6 debugging on the router, you should see both ICMPv6 ND and DHCPv6 messages being exchanged between the router and the IPv6 clients.
- You should see something similar to below (analyse and understand the messages! Ask your instructors if you don't understand).

```
ICMPv6-ND: Received RS on FastEthernet0/0.100 from FE80::D323:CA62:5A85:49F3
ICMPv6-ND: Sending solicited RA on FastEthernet0/0.100
ICMPv6-ND: Request to send RA for FE80::C801:CFF:FE4F:0
ICMPv6-ND: Setup RA from FE80::C801:CFF:FE4F:0 to FF02::1 on FastEthernet0/0.1
00
ICMPv6-ND: Setup RA common:Other stateful configuration
ICMPv6-ND:  MTU = 1500
ICMPv6-ND:     prefix = 2406:6400:0:100::/64 onlink autoconfig
ICMPv6-ND:       2592000/604800 (valid/preferred)
IPv6 DHCP: Received INFORMATION-REQUEST from FE80::D323:CA62:5A85:49F3 on Fast
Ethernet0/0.100
IPv6 DHCP: Using interface pool STATELESS-DHCPv6
IPv6 DHCP_AAA: Retrieved subblock; It has AAA DNS_SERVERS=0
IPv6 DHCP: Source Address from SAS FE80::C801:CFF:FE4F:0
IPv6 DHCP: Sending REPLY to FE80::D323:CA62:5A85:49F3 on FastEthernet0/0.100
ICMPv6-ND: DELETE -> INCMP: FE80::D323:CA62:5A85:49F3
ICMPv6-ND: Sending NS for FE80::D323:CA62:5A85:49F3 on FastEthernet0/0.100
ICMPv6-ND: Resolving next hop FE80::D323:CA62:5A85:49F3 on interface FastEther
net0/0.100
ICMPv6-ND: Received NA for FE80::D323:CA62:5A85:49F3 on FastEthernet0/0.100 fr
om FE80::D323:CA62:5A85:49F3
ICMPv6-ND: Neighbour FE80::D323:CA62:5A85:49F3 on FastEthernet0/0.100 : LLA 00
0c.29ca.f741
ICMPv6-ND: INCMP -> REACH: FE80::D323:CA62:5A85:49F3
```

- Ping each other and also ping the router Loopback0 from the client machines

```
ping6 2406:6400::1 -c 4
```