LAB3: Stateful DHCPv6

Lab Environment

Please continue from the previous lab (Stateless DHCPv6)

- The lab topology has:
    - 1x7206VXR router
    - 1xCisco IOU switch
    - 2xUbuntu VMs

Configure the router:

1. Remove the previous stateless DHCPv6 server config from the router

```
no ipv6 dhcp pool STATELESS-DHCPv6
```

2. Also remove the binding from the interface facing the clients

```
interface fa0/0.100
  no ipv6 dhcp server STATELESS-DHCPv6
  no ipv6 nd other-config-flag
```

3. Configure the stateful DHCPv6 server

```
ipv6 dhcp pool STATEFUL-DHCPv6
  address prefix 2406:6400:0:200::/64
  dns-server 2406:6400::1
  domain-name nog.bt
```

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

    - Here, we are setting the M-flag (managed-config) in the RA, which tells the clients to obtain all addressing information from the DHCPv6 server.
    - the DHCPv6 server will maintain records (binding) of every IPv6 address assigned to clients
    - we are also disabling the default A-flag (auto-config) for the IPv6 prefix configured on the router interface (else, the clients would still use SLAAC to configure their addresses from the RA)

```
interface FastEthernet0/0.100
  ipv6 dhcp server STATEFUL-DHCPv6
  ipv6 nd prefix 2406:6400:0:100::/64 infinite infinite no-autoconfig
  ipv6 nd managed-config-flag
```

5. Verify your configuration with the following outputs:

```
show ipv6 interface
! look at ND stats and different multicast groups joined (anything different?)

show ipv6 route
! shows the ipv6 routing table

show ipv6 neighbors
!list the neigbors
```

6. To see the ICMPv6 ND and DHCPv6 messages

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

- you could also use packet capture if you have wireshark on your host machine, as shown below:

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

7. Save your configurations

```
wr
```

Configure the switch:

1. The switch configuration is same as before (no changes necessary)

The Client VMs

1. Toogle the interface enp0s3

```
ifconfig enp0s3 down/up      !need sudo
```

2. Verify that the IPv6 address computed using the stateful DHCPv6 pool prefix (2406:6400:0:200::/64) due to the M-flag in the RA

```
ifconfig

#the address should look something like 2406:6400:0:200:x:x:x:x
#where the x:x:x:x (64-bit interface ID) is generated randomly by the DHCPv6 s
erver
#but you will see only one globally scoped address
```

3. Verify stateful information (IPv6 address prefix and dns server in this case) are obtained from the DHCPv6 server: you can see it from the `Connection Information` dropdown menu
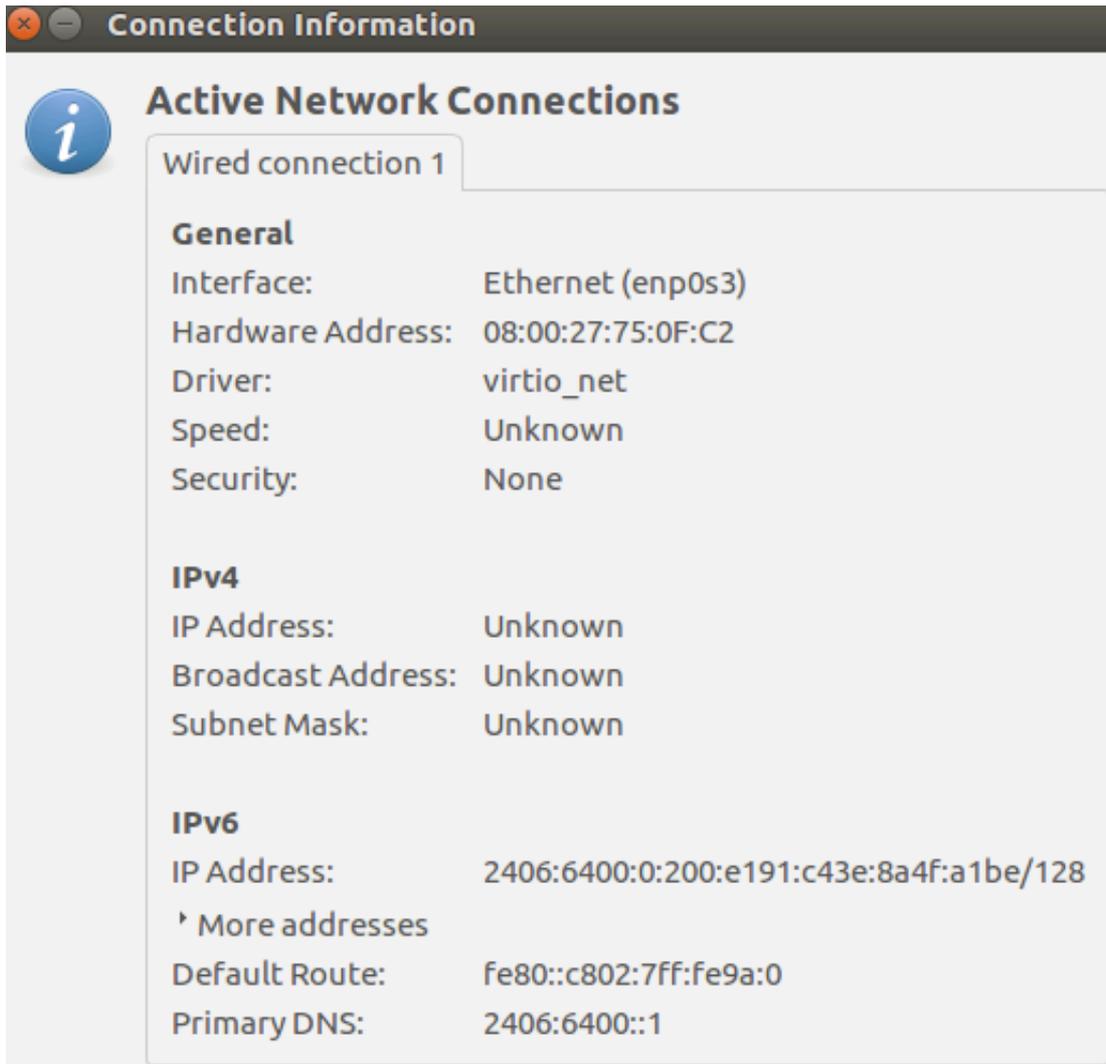
Verification:

- 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 like below on your router (analyse and understand the messages! Ask your instructors if you dont understand).
- Specifially, look for the flags in RA messages and DHCPv6 messages
- If you cant see the DHCPv6 messages, configure the interface to get IPv6 address using dhcp (`/etc/network/interfaces`)

```
*ICMPv6-ND: Received RS on FastEthernet0/0.100 from FE80::A00:27FF:FE75:FC2
*ICMPv6-ND: Glean FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.100
*ICMPv6-ND: Neighbour FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.100 : LLA 080
0.2775.0fc2
*ICMPv6-ND: INCMP -> STALE: FE80::A00:27FF:FE75:FC2
*ICMPv6-ND: Sending solicited RA on FastEthernet0/0.100
*ICMPv6-ND: Request to send RA for FE80::C802:7FF:FE9A:0
*ICMPv6-ND: Setup RA from FE80::C802:7FF:FE9A:0 to FF02::1 on FastEthernet0/0.
100
*ICMPv6-ND: Setup RA common:Managed address configuration
*ICMPv6-ND:  MTU = 1500
*ICMPv6-ND:     prefix = 2406:6400:0:100::/64 onlink
*ICMPv6-ND:          4294967295/4294967295 (valid/preferred)
*IPv6 DHCP: Received SOLICIT from FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.1
00
*IPv6 DHCP: Using interface pool STATEFUL-DHCPv6
*IPv6 DHCP: Creating binding for FE80::A00:27FF:FE75:FC2 in pool STATEFUL-DHCP
v6
*IPv6 DHCP: Binding for IA_NA 27750FC2 not found
*IPv6 DHCP: Allocating IA_NA 27750FC2 in binding for FE80::A00:27FF:FE75:FC2
*IPv6 DHCP: Looking up pool 2406:6400:0:200::/64 entry with username '00010001
228686F8080027750FC227750FC2'
*IPv6 DHCP: Poolentry for user not found
*IPv6 DHCP: Allocated new address 2406:6400:0:200:DC52:73BC:1725:5EFF
*IPv6 DHCP: Allocating address 2406:6400:0:200:DC52:73BC:1725:5EFF in binding
for FE80::A00:27FF:FE75:FC2, IAID 27750FC2
*IPv6 DHCP: Updating binding address entry for address 2406:6400:0:200:DC52:73
BC:1725:5EFF
*IPv6 DHCP: Setting timer on 2406:6400:0:200:DC52:73BC:1725:5EFF for 60 second
s
*IPv6 DHCP_AAA: Retrieved subblock; It has AAA DNS_SERVERS=0
*IPv6 DHCP: Source Address from SAS FE80::C802:7FF:FE9A:0
*IPv6 DHCP: Sending ADVERTISE to FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.10
0
*ICMPv6-ND: STALE -> DELAY: FE80::A00:27FF:FE75:FC2
*IPv6 DHCP: Received REQUEST from FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.1
00
*IPv6 DHCP: Using interface pool STATEFUL-DHCPv6
*IPv6 DHCP: Looking up pool 2406:6400:0:200::/64 entry with username '00010001
228686F8080027750FC227750FC2'
*IPv6 DHCP: Poolentry for user found
*IPv6 DHCP: Found address 2406:6400:0:200:DC52:73BC:1725:5EFF in binding for F
E80::A00:27FF:FE75:FC2, IAID 27750FC2
*IPv6 DHCP: Updating binding address entry for address 2406:6400:0:200:DC52:73
BC:1725:5EFF
*IPv6 DHCP: Setting timer on 2406:6400:0:200:DC52:73BC:1725:5EFF for 172800 se
conds
```

```
*IPv6 DHCP_AAA: Retrieved subblock; It has AAA DNS_SERVERS=0
*IPv6 DHCP: Source Address from SAS FE80::C802:7FF:FE9A:0
*IPv6 DHCP: Sending REPLY to FE80::A00:27FF:FE75:FC2 on FastEthernet0/0.100
```

- Check the DHCPv6 binding on the router:

```
R1#sh ipv6 dhcp binding
Client: FE80::A00:27FF:FE75:FC2
DUID: 00010001228686F8080027750FC2
Username : unassigned
VRF : default
IA NA: IA ID 0x27750FC2, T1 43200, T2 69120
Address: 2406:6400:0:200:DC52:73BC:1725:5EFF
    preferred lifetime 86400, valid lifetime 172800
    expires at May 12 2018 02:10 PM (172238 seconds)
```