APNIC46 IPv6 Workshop

PART 1: Setting up VMs for SLAAC & DHCPv6

1) Connect to ipv6-lab SSID / PWD lab-ipv6

2) Browse to http://192.168.3.1/files

3) Download and install latest version of VirtualBox + Extension pack
(if you don't have windows look for https://www.virtualbox.org/wiki/Downloads)

4) Download both files .ova (CLAT with Ubuntu and Client-Ubuntu)

5) Enable routing in your host:

- Windows: https://www.wikihow.com/Enable-IP-Routing
  Easier way method 3 (services.msc, enable/start routing and remote access)
- Linux/Mac OS X
  sudo sysctl -w net.inet.ip.forwarding=1
  sudo sysctl -w net.inet6.ip6.forwarding=1
  Note: You may want to have all this in a shell script un case of rebooting the host

6) Import both OVAs, make sure to update the MAC addresses

7) You will need to change some hardware settings, such as selecting the interface card, enable/disable PAE/NX, USB, etc., all that depends on your own hardware. Even in rare cases changes in your BIOS. Typically, you will need admin access to your host

8) CLAT network 1 should be your bridge/WiFi card

9) CLAT network 2 should be internal network

10) Client-Ubuntu network 1 should be internal network

11) Boot only CLAT VM, if something fails, read details and go to 6 ...

12) Passwords:
CLAT usr/pwd -> root/root
Client-Ubuntu usr/pwd -> ubuntu18/client

13) Modify /etc/network/interfaces (nano, vi, etc.), so eth1 has your "participant" parameters

14) Boot now Client-Ubuntu VM, if something fails, read details and go to 6 ...

15) Click on “activities”, type term, and click on it

16) If everything is fine, ifconfig at the Client will show no global address

17) Modify /etc/radvd.conf, so it matches your own “participant” parameters

18) Restart the service and check status

19) ifconfig at client will now show global address and also
ip -6 route

20) Modify /etc/dhcp/dhcpd.conf, so it matches your own “participant” parameters

21) Restart the service and check status

22) Modify /etc/dhcp/dhcpd6.conf, so matches your own “participant” parameters

- Make sure to use a /60 within your range
- You may want to use https://subnettingpractice.com/ipv6_subnetting.html

23) Restart the service and check status

24) Change interface at the client to use DHCPv6 and check with ifconfig and leases
sudo nano /etc/network/interfaces
sudo ifdown enp0s3
sudo ifup enp0s3

25) You can check leases, both at the client and the server, for example for IPv6:

Server

/var/lib/dhcp/dhcpd6.leases
tail -f /var/log/syslog

Client

/var/lib/dhcp/dhclient6.eth0.leases

26) Change interface at the client to use DHCPv6-PD and check ifconfig and leases

27) Poweroff both VMs

28) Don’t delete the CLAT VM, you will need it for the next hands-on

PART 2: Setting up VM for CLAT

1) Both CLAT network 1 and network 2 should be your bridge/WiFi card

2) Modify /etc/network/interfaces (nano, vi, etc.), so BOTH eth0 and eth1 have your "participant" parameters

3) Modify your Windows/host network parameters, so it is manually configured with your "participant" parameters (both, IPv4 and IPv6)

4) Strongly recommend that you do next steps in a shell file, example:
   nano /etc/clat.sh
   chmod +x /etc/clat.sh

5) The contents of clat.sh should be equivalent to (but with your own config):

```
service network-manager stop
sysctl -w net.ipv4.conf.all.forwarding=1
sysctl -w net.ipv6.conf.all.forwarding=1
sysctl -w net.ipv4.ip_forward=1
ethtool --offload eth0 gro off lro off
ethtool --offload eth1 gro off lro off
modprobe jool_siit pool6=64:ff9b::/96
jool_siit --eamt --add 100.64.0.0/10 2001:470:68ee:3e81::/106
```

6) Execute it:
   /etc/clat.sh

7) Open a windows cmd

8) You should be able to ping to:
   ping 1.1.1.1
   ping www.google.com
   ping -4 www.google.com

9) Trace also traceroute

10) Even browse the same sites as pinged and others ...

Examples for interfaces file

file /etc/network/interfaces

with SLAAC only

```
auto eth0
iface eth0 inet6 auto
```

With SLAAC, DHCPv6 + PD

```
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet6 auto
dhcp 1
request_prefix 1

auto eth1
iface eth1 inet static
address 100.64.0.1
netmask 255.192.0.0
iface eth1 inet6 static
 autoconf 0
 accept_ra 0
 address 2001:470:68ee:3e80::1
 netmask 64
dns-nameservers 2001:470:68ee:30::30
```

With dhcp and PD

```
auto eth0
iface eth0 inet6 dhcp
 request_prefix 1
```

With static config

```
auto eth0
iface eth0 inet6 static
 autoconf 0
 accept_ra 0
 address 2001:470:68ee:30::1
 netmask 64
 gateway 2001:470:68ee:30::30
```

with DHCP only

```
auto eth0
iface eth0 inet6 dhcp
```

Example RADVD file

file at /etc/radvd.conf

```
interface br-lan {
      AdvSendAdvert on ;
      #UnicastOnly on ;
      # Advertise at least every 30 seconds
      MaxRtrAdvInterval 30;
      # in order to force non RFC 6106 compliant clients to get a dns
address
      AdvOtherConfigFlag on ;
      AdvManagedFlag on;

      prefix 2001:470:68ee:30::/64 {
        AdvOnLink on;
        AdvAutonomous on;
      };
      RDNSS 2001:470:68ee:30::30 {
      };
};
```

How to run:

```
service radvd restart
service radvd start
service radvd stop
service radvd status
```

Example DHCP config

file /etc/dhcp.conf

```
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#

# option definitions common to all supported networks...
option domain-name "example.org";
option domain-name-servers ns1.example.org, ns2.example.org;

default-lease-time 600;
max-lease-time 7200;

ddns-update-style none;


# A slightly different configuration for an internal subnet.
subnet 192.168.3.0 netmask 255.255.255.0 {
  range 192.168.3.10 192.168.3.250;
  option domain-name-servers 192.168.3.1;
  option domain-name "ipv6-lab.org";
  option subnet-mask 255.255.255.0;
  option routers 192.168.3.1;
  option broadcast-address 192.168.3.255;
}
```

How to run:

```
service isc-dhcp-server restart
service isc-dhcp-server start
service isc-dhcp-server stop
service isc-dhcp-server status
```

Example for DHCv6 and DHCPv6-PD

file /etc/dhcp6.conf

```
default-lease-time 2592000;

preferred-lifetime 604800;

option dhcp-renewal-time 3600;

option dhcp-rebinding-time 7200;

allow leasequery;

# The subnet where the server is attached
#  (i.e., the server has an address in this subnet)
subnet6 2001:470:68ee::/48 {
pool6 {
        range6 2001:470:68ee::100 2001:470:68ee::300;
#    # Some /64 prefixes available for Prefix Delegation (RFC 3633)
     prefix6 2001:470:68ee:3000:: 2001:470:68ee:3e80:: /60;
}
     option dhcp6.name-servers 2001:4860:4860::8888;
     option domain-name "other-ipv6-lab.org";
}
```

How to run:

```
service isc-dhcp-server6 restart
service isc-dhcp-server6 start
service isc-dhcp-server6 stop
service isc-dhcp-server6 status
```