Advanced IPv6 Training Course

Lab Manual
<table>
<thead>
<tr>
<th>Prefix</th>
<th>E0/01</th>
<th>E0/02</th>
<th>E0/03</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0.1/30</td>
<td>2001:ff</td>
<td>XX:0:01::b/127</td>
<td>XX:0:02::a/127</td>
</tr>
<tr>
<td>10.0.2/30</td>
<td>2001:ff</td>
<td>XX:0:01::a/127</td>
<td>XX:0:02::b/127</td>
</tr>
<tr>
<td>10.0.5/30</td>
<td>2001:ff</td>
<td>XX:0:01::a/127</td>
<td>XX:0:03::b/127</td>
</tr>
<tr>
<td>10.0.9/30</td>
<td>2001:ff</td>
<td>XX:0:01::a/127</td>
<td>XX:0:03::b/127</td>
</tr>
<tr>
<td>10.0.10/30</td>
<td>2001:ff</td>
<td>XX:0:02::a/127</td>
<td>XX:0:03::b/127</td>
</tr>
</tbody>
</table>

**Addressing Plan**
Command Overview
Routing

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>ping</td>
<td>ping ipv6</td>
</tr>
</tbody>
</table>

You can use the ping command to check the destination IP address you want to reach and record the results. The ping command displays whether the destination responded and how long it took to receive a reply.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>traceroute</td>
<td>traceroute ipv6</td>
</tr>
</tbody>
</table>

The traceroute command is used to discover the route that packets actually take when traveling to their destination.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>show ip route</td>
<td>show ipv6 route</td>
</tr>
</tbody>
</table>

This command displays the current contents of the routing table.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>show interfaces [summary]</td>
<td>show interfaces [summary]</td>
</tr>
</tbody>
</table>

This command displays statistics for all interfaces configured on the router.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>show ip interface [brief]</td>
<td>show ipv6 interface [brief]</td>
</tr>
</tbody>
</table>

This command displays a brief summary of the interfaces on a device. It’s useful for quickly checking the status of the device.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>show ip router</td>
<td>show ipv6 router</td>
</tr>
</tbody>
</table>

This command shows the IP routing table for a router.
### Command Overview

**OSPF**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>show ip route [ospf]</code></td>
<td>This command displays the current state of the routing table</td>
</tr>
<tr>
<td><code>show ipv6 route [ospf]</code></td>
<td></td>
</tr>
<tr>
<td><code>show ip ospf interface [brief]</code></td>
<td>This command gives a brief summary of what interface is currently configured with OSPF on the router, as well as the IP address and subnet mask of that interface.</td>
</tr>
<tr>
<td><code>show ipv6 ospf interface [brief]</code></td>
<td></td>
</tr>
<tr>
<td><code>show ip ospf database</code></td>
<td>This command displays the lists of information related to the Open Shortest Path First (OSPF) database for a specific router</td>
</tr>
<tr>
<td><code>show ipv6 ospf database</code></td>
<td></td>
</tr>
<tr>
<td><code>show ip ospf neighbor</code></td>
<td>This command displays the neighbor data structure and OSPF-related neighbor information</td>
</tr>
<tr>
<td><code>show ipv6 ospf neighbour</code></td>
<td></td>
</tr>
</tbody>
</table>
## Command Overview

### BGP

<table>
<thead>
<tr>
<th>Command</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>show ip bgp</td>
<td>Shows entries in the BGP routing table.</td>
</tr>
<tr>
<td>show bgp ipv6 unicast</td>
<td></td>
</tr>
<tr>
<td>show ip bgp neighbors</td>
<td>Shows information about BGP and TCP connections to neighbors.</td>
</tr>
<tr>
<td>sh bgp ipv6 unicast neighbors</td>
<td></td>
</tr>
<tr>
<td>show ip bgp summary</td>
<td>Shows the status of all BGP connections.</td>
</tr>
<tr>
<td>sh bgp ipv6 unicast summary</td>
<td></td>
</tr>
<tr>
<td>show ip bgp neighbors peer-ip advertised-routes</td>
<td>Shows prefixes advertised by particular BGP peer. Variable <code>peer-ip</code> should be replaced with the IP of the neighbor.</td>
</tr>
<tr>
<td>show bgp ipv6 neighbors peer-ip advertised-routes</td>
<td></td>
</tr>
<tr>
<td>show ip bgp prefix-list name</td>
<td>Shows information about a prefix list or prefix list entries. Variable <code>name</code> should point to a existing named list.</td>
</tr>
<tr>
<td>show bgp ipv6 prefix-list name</td>
<td></td>
</tr>
<tr>
<td>clear ip bgp *</td>
<td>Resets all (asterisk implies all neighbors) BGP connections using hard or soft reconfiguration for address family sessions.</td>
</tr>
<tr>
<td>clear bgp ipv6 unicast *</td>
<td></td>
</tr>
</tbody>
</table>
Command Overview
dhcppv6

**show ipv6 dhcp**
The show ipv6 dhcp command shows the DUID of the device.

**show ipv6 dhcp binding**
The show ipv6 dhcp binding command shows information about two clients, including their DUIDs, IAPDs, prefixes, and preferred and valid lifetimes.

**show ipv6 dhcp database**
The show ipv6 dhcp database command provides information on the binding database agents TFTP, NVRAM, and flash.

**show ipv6 dhcp pool**
The show ipv6 dhcp pool command provides information on the configuration pool, including the static bindings, prefix information, the DNS server, and the domain names.

**show ipv6 dhcp interface**
The show ipv6 dhcp interface command provides informations about interface status regarding server or client configuration.
Command Overview
NAT64

**show nat64 translations**

With the `show nat64 translations` command, we are able to see the active translations on the router. It shows the protocols that are translated and the mapped IP addresses.

**show nat64 adjacency ipv6**

The `show nat64 adjacency ipv6` command displays the information about the NAT64 managed adjacencies.

**show nat64 statistics**

The `show nat64 statistics` command displays NAT64 packet count statistics. It also displays the amount of sessions and expired translations.
Configuration Router 1

version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname U01_R01
!
boot-start-marker
boot-end-marker
!
no aaa new-model
no ip icmp rate-limit unreachable
!
no ip domain lookup
ip cef
ipv6 unicast-routing
ipv6 multicast rpf use-bgp
ipv6 cef
!
multilink bundle-name authenticated
!
archive
log config
hidekeys
!
ip tcp synwait-time 5
!
interface Loopback0
  ip address 172.1.255.1 255.255.255.255
!
interface Ethernet0/0
  ip address 10.1.0.1 255.255.255.252
  speed auto
duplex full
ipv6 address 2001:FF01:0:1::A/127
ipv6 nd ra suppress all
no ipv6 redirects
ipv6 ospf 1 area 0
ipv6 ospf network point-to-point
!
interface Ethernet0/1
  ip address 10.1.0.5 255.255.255.252
  speed auto
duplex full
ipv6 address 2001:FF01:0:2::A/127
ipv6 nd ra suppress all
no ipv6 redirects
ipv6 ospf 1 area 0
ipv6 ospf network point-to-point
!
interface Ethernet1/0
ip address 172.16.0.1 255.255.255.0
speed auto
duplex full
ipv6 address 2001:FF69::1/64
ipv6 nd ra suppress all
no ipv6 redirects

interface Ethernet1/1
no ip address
shutdown
speed auto
duplex full

router ospf 1
passive-interface Ethernet1/0
passive-interface Ethernet1/1
network 10.1.0.0 0.0.3.255 area 0
network 172.1.255.0 0.0.0.255 area 0
default-information originate always

router bgp 101
bgp log-neighbor-changes
no bgp default ipv4-unicast
neighbor 2001:FF69::66 remote-as 66
neighbor 2001:FF69::99 remote-as 99
neighbor 172.16.0.66 remote-as 66
neighbor 172.16.0.99 remote-as 99
neighbor 172.1.255.2 remote-as 101
neighbor 172.1.255.3 remote-as 101

address-family ipv4
network 10.1.0.0 mask 255.255.252.0
neighbor 172.16.0.66 activate
neighbor 172.16.0.66 prefix-list out-filter out
neighbor 172.16.0.99 activate
neighbor 172.16.0.99 prefix-list out-filter out
neighbor 172.1.255.2 activate
neighbor 172.1.255.2 next-hop-self
neighbor 172.1.255.2 update-source Loopback0
neighbor 172.1.255.3 activate
neighbor 172.1.255.3 next-hop-self
neighbor 172.1.255.3 update-source Loopback0
exit-address-family

address-family ipv6
redistribute static
network 2001:FF01::/32
neighbor 2001:FF69::66 activate
neighbor 2001:FF69::66 prefix-list out-filter out
neighbor 2001:FF69::99 activate
neighbor 2001:FF69::99 prefix-list out-filter out
neighbor 2001:FF01::2 activate
neighbor 2001:FF01::2 next-hop-self
neighbor 2001:FF01::2 update-source Loopback0
neighbor 2001:FF01::3 activate
neighbor 2001:FF01::3 next-hop-self
neighbor 2001:FF01::3 update-source Loopback0
exit-address-family
!
ip forward-protocol nd
!
nop ip http server
no ip http secure-server
ip route 10.1.0.0 255.255.252.0 Null0 200
!
ip prefix-list out-filter seq 5 permit 10.1.0.0/22
ip prefix-list out-filter seq 10 deny 0.0.0.0/0 le 32
ipv6 route 2001:FF01::/32 Null0
ipv6 router ospf 1
   router-id 172.1.255.1
   default-information originate always
   passive-interface Ethernet1/0
!
ipv6 prefix-list out-filter seq 5 permit 2001:FF01::/32
ipv6 prefix-list out-filter seq 10 deny ::/0 le 128
!
control-plane
!
line con 0
   exec-timeout 0 0
   privilege level 15
   logging synchronous
   stopbits 1
line aux 0
   exec-timeout 0 0
   privilege level 15
   logging synchronous
   stopbits 1
line vty 0 4
   login
!
end
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R66
!
boot-start-marker
boot-end-marker
!
no aaa new-model
!
resource policy
!
memory-size iomem 5
ip subnet-zero
no ip icmp rate-limit unreachable
!
ip cef
no ip dhcp use vrf connected
!
oip ips deny-action ips-interface
!
ipv6 unicast-routing
no ipv6 source-route
ipv6 cef
no ftp-server write-enable
!
multilink bundle-name authenticated
!
oip ip domain lookup
!
archive
log config
hidekeys
!
no crypto isakmp ccm
!
interface Ethernet1/0
  switchport access vlan 69
duplex full
!
interface Ethernet1/1
  switchport access vlan 69
duplex full
!
interface Ethernet1/2
  switchport access vlan 69
duplex full
!
interface Ethernet1/3
  switchport access vlan 69
duplex full
!
interface Ethernet1/4
  switchport access vlan 69
duplex full
!
interface Ethernet1/5
  switchport access vlan 69
duplex full
!
interface Ethernet1/6
  switchport access vlan 69
duplex full
!
interface Ethernet1/7
  switchport access vlan 69
duplex full
!
interface Ethernet1/8
  switchport access vlan 69
duplex full
!
interface Ethernet1/9
  switchport access vlan 69
duplex full
!
interface Ethernet1/10
  switchport access vlan 69
duplex full
!
interface Ethernet1/11
  switchport access vlan 69
duplex full
!
interface Ethernet1/12
  switchport access vlan 69
duplex full
!
interface Ethernet1/13
  switchport access vlan 69
duplex full
!
interface Ethernet1/14
  switchport access vlan 69
duplex full
!
interface Ethernet1/15
  switchport access vlan 69
duplex full
!
interface Vlan1
  no ip address
!
interface Vlan69
  ip address 172.16.0.66 255.255.255.0
  ipv6 address 2001:FF69::66/64
!
router bgp 66
  no bgp default ipv4-unicast
bgp log-neighbor-changes
neighbor 2001:FF69::1 remote-as 101
neighbor 2001:FF69::2 remote-as 102
neighbor 2001:FF69::3 remote-as 103
neighbor 2001:FF69::4 remote-as 104
neighbor 2001:FF69::5 remote-as 105
neighbor 2001:FF69::6 remote-as 106
neighbor 2001:FF69::7 remote-as 107
neighbor 2001:FF69::8 remote-as 108
neighbor 2001:FF69::9 remote-as 109
neighbor 2001:FF69::10 remote-as 110
neighbor 2001:FF69::11 remote-as 111
neighbor 2001:FF69::12 remote-as 112
neighbor 2001:FF69::13 remote-as 113
neighbor 2001:FF69::14 remote-as 114
neighbor 2001:FF69::15 remote-as 115
neighbor 2001:FF69::16 remote-as 116
neighbor 2001:FF69::17 remote-as 117
neighbor 2001:FF69::18 remote-as 118
neighbor 2001:FF69::19 remote-as 119
neighbor 2001:FF69::20 remote-as 120
neighbor 2001:FF69::21 remote-as 121
neighbor 2001:FF69::22 remote-as 122
neighbor 2001:FF69::23 remote-as 123
neighbor 2001:FF69::24 remote-as 124
neighbor 2001:FF69::25 remote-as 125
neighbor 2001:FF69::99 remote-as 99
neighbor 172.16.0.1 remote-as 101
neighbor 172.16.0.2 remote-as 102
neighbor 172.16.0.3 remote-as 103
neighbor 172.16.0.4 remote-as 104
neighbor 172.16.0.5 remote-as 105
neighbor 172.16.0.6 remote-as 106
neighbor 172.16.0.7 remote-as 107
neighbor 172.16.0.8 remote-as 108
neighbor 172.16.0.9 remote-as 109
neighbor 172.16.0.10 remote-as 110
neighbor 172.16.0.11 remote-as 111
neighbor 172.16.0.12 remote-as 112
neighbor 172.16.0.13 remote-as 113
neighbor 172.16.0.14 remote-as 114
neighbor 172.16.0.15 remote-as 115
neighbor 172.16.0.16 remote-as 116
neighbor 172.16.0.17 remote-as 117
neighbor 172.16.0.18 remote-as 118
neighbor 172.16.0.19 remote-as 119
neighbor 172.16.0.20 remote-as 120
neighbor 172.16.0.21 remote-as 121
neighbor 172.16.0.22 remote-as 122
neighbor 172.16.0.23 remote-as 123
neighbor 172.16.0.24 remote-as 124
neighbor 172.16.0.25 remote-as 125
neighbor 172.16.0.99 remote-as 99
!
address-family ipv4
neighbor 172.16.0.1 activate
neighbor 172.16.0.2 activate
neighbor 172.16.0.3 activate
neighbor 172.16.0.4 activate
neighbor 172.16.0.5 activate
neighbor 172.16.0.6 activate
neighbor 172.16.0.7 activate
neighbor 172.16.0.8 activate
neighbor 172.16.0.9 activate
neighbor 172.16.0.10 activate
neighbor 172.16.0.11 activate
neighbor 172.16.0.12 activate
neighbor 172.16.0.13 activate
neighbor 172.16.0.14 activate
neighbor 172.16.0.15 activate
neighbor 172.16.0.16 activate
neighbor 172.16.0.17 activate
neighbor 172.16.0.18 activate
neighbor 172.16.0.19 activate
neighbor 172.16.0.20 activate
neighbor 172.16.0.21 activate
neighbor 172.16.0.22 activate
neighbor 172.16.0.23 activate
neighbor 172.16.0.24 activate
neighbor 172.16.0.25 activate
neighbor 172.16.0.99 activate
no auto-summary
no synchronization
network 10.66.0.0 mask 255.255.255.0
exit-address-family
!
address-family ipv6
neighbor 2001:FF69::1 activate
neighbor 2001:FF69::2 activate
neighbor 2001:FF69::3 activate
neighbor 2001:FF69::4 activate
neighbor 2001:FF69::5 activate
neighbor 2001:FF69::6 activate
neighbor 2001:FF69::7 activate
neighbor 2001:FF69::8 activate
neighbor 2001:FF69::9 activate
neighbor 2001:FF69::10 activate
neighbor 2001:FF69::11 activate
neighbor 2001:FF69::12 activate
neighbor 2001:FF69::13 activate
neighbor 2001:FF69::14 activate
neighbor 2001:FF69::15 activate
neighbor 2001:FF69::16 activate
neighbor 2001:FF69::17 activate
neighbor 2001:FF69::18 activate
neighbor 2001:FF69::19 activate
neighbor 2001:FF69::20 activate
neighbor 2001:FF69::21 activate
neighbor 2001:FF69::22 activate
neighbor 2001:FF69::23 activate
neighbor 2001:FF69::24 activate
neighbor 2001:FF69::25 activate
neighbor 2001:FF69::99 activate
redistribute static
no synchronization
network 2001:FF66::/32
exit-address-family
!
interface Loopback0
  ip address 172.31.255.66 255.255.255.255
!
interface Loopback1
  ip address 10.66.0.1 255.255.255.0
  ipv6 address 2001:FF66::A/32
!
oip http server
no ip http secure-server
ip classless
!
control-plane
!
line con 0
  exec-timeout 0 0
  privilege level 15
  logging synchronous
line aux 0
  exec-timeout 0 0
  privilege level 15
  logging synchronous
line vty 0 4
  login
!
end16