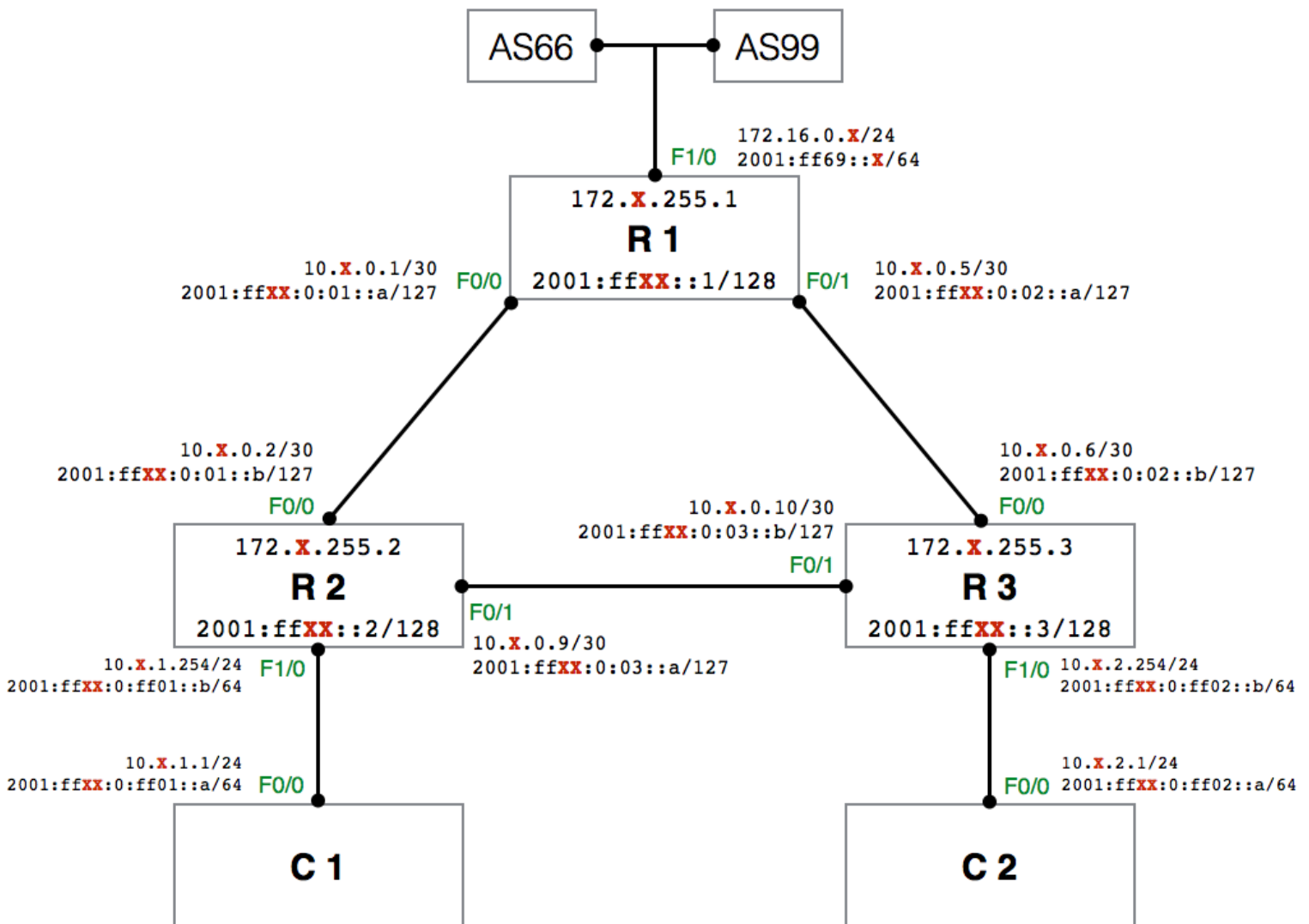


# Advanced IPv6 Training Course

## Lab Manual

# Network Diagram



## Lab information

## Routing/OSPF/BGP



### Interface addresses

	R1	R2	R3	Cust1	Cust2
lo0	172.X.255.1 2001::ffff::1/128	172.X.255.2 2001::ffff::2/128	172.X.255.3 2001::ffff::3/128		
f0/0	10.X.0.1/30 2001::ffff:0:01::a/127	10.X.0.2/30 2001::ffff:0:01::b/127	10.X.0.6/30 2001::ffff:0:02::b/127	10.X.1.1/24 2001::ffff:0:ff01::a/64	10.X.2.1/24 2001::ffff:0:ff02::a/64
f0/1	10.X.0.5/30 2001::ffff:0:02::a/127	10.X.0.9/30 2001::ffff:0:03::a/127	10.X.0.10/30 2001::ffff:0:03::b/127		
f1/0	172.16.0.X/24 2001::ffff::X/64	10.X.1.254/24 2001::ffff:0:ff01::b/64	10.X.2.254/24 2001::ffff:0:ff02::b/64		
f1/1					

# Command Overview

## Routing

<b>ping</b>	<b>ping ipv6</b>
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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

<b>traceroute</b>	<b>traceroute ipv6</b>
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The traceroute command is used to discover the route that packets actually take when traveling to their destination

<b>show ip route</b>	<b>show ipv6 route</b>
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This command displays the current contents of the routing table

<b>show interfaces [summary]</b>	<b>show interfaces [summary]</b>
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This command displays statistics for all interfaces configured on the router

<b>show ip interface [brief]</b>	<b>show ipv6 interface [brief]</b>
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This command displays a brief summary of the interfaces on a device. It's useful for quickly checking the status of the device

<b>show ip router</b>	<b>show ipv6 router</b>
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This command shows the IP routing table for a router

# Command Overview

## OSPF

<b>show ip route [ospf]</b>	<b>show ipv6 route [ospf]</b>
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This command displays the current state of the routing table

<b>show ip ospf interface [brief]</b>	<b>show ipv6 ospf interface [brief]</b>
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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.

<b>show ip ospf database</b>	<b>show ipv6 ospf database</b>
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This command displays the lists of information related to the Open Shortest Path First (OSPF) database for a specific router

<b>show ip ospf neighbor</b>	<b>show ipv6 ospf neighbour</b>
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This command displays the neighbor data structure and OSPF-related neighbor information

# Command Overview

## BGP

<b>show ip bgp</b>	<b>show bgp ipv6 unicast</b>
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Shows entries in the BGP routing table.

<b>show ip bgp neighbors</b>	<b>sh bgp ipv6 unicast neighbors</b>
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Shows information about BGP and TCP connections to neighbors.

<b>show ip bgp summary</b>	<b>sh bgp ipv6 unicast summary</b>
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Shows the status of all BGP connections.

<b>show ip bgp neighbors <i>peer-ip</i> advertised-routes</b>	<b>show bgp ipv6 neighbors <i>peer- ip</i> advertised-routes</b>
---	--

Shows prefixes advertised by particular BGP peer. Variable *peer-ip* should be replaced with the IP of the neighbor.

<b>show ip bgp prefix-list <i>name</i></b>	<b>show bgp ipv6 prefix-list <i>name</i></b>
--	--

Shows information about a prefix list or prefix list entries. Variable *name* should point to a existing named list.

<b>clear ip bgp *</b>	<b>clear bgp ipv6 unicast *</b>
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Resets all (asterisk implies all neighbors) BGP connections using hard or soft reconfiguration for address family sessions.

# Command Overview

## dhcpv6

### **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

## 6rd

### **show ipv6 tunnel**

For each tunnel running IPv6, use the `show ipv6 tunnel` command to display the tunnel unit number, the name of the dynamic routing protocol used by the tunnel, the time of last input, the number of packets in the last input, and the description string as set by the `description` command.

### **show tunnel 6rd**

The `show tunnel 6rd` command displays 6RD-related information on a tunnel. If an interface is not specified, information about all the 6RD tunnels on the router is displayed.

### **show tunnel 6rd destination**

The `show tunnel 6rd destination` command is used to translate a 6RD prefix to the corresponding IPv4 destination. The IPv4 destination address is displayed in the command output.

### **show tunnel 6rd prefix**

The `show tunnel 6rd prefix` command translates an IPv4 destination address to the corresponding IPv6 6RD prefix. The command output displays the 6rd prefix.



# 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 FastEthernet0/0
 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 FastEthernet0/1
 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 FastEthernet1/0
```

```
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 FastEthernet1/1
no ip address
shutdown
speed auto
duplex full
!
router ospf 1
passive-interface FastEthernet1/0
passive-interface FastEthernet1/1
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
!
no 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 FastEthernet1/0
!
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
```

# Configuration Router 66 / 99

```
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
!
no ip ips deny-action ips-interface
!
ipv6 unicast-routing
no ipv6 source-route
ipv6 cef
no ftp-server write-enable
!
multilink bundle-name authenticated
!
no ip domain lookup
!
archive
 log config
  hidekeys
!
no crypto isakmp ccm
!
interface FastEthernet1/0
 switchport access vlan 69
 duplex full
!
interface FastEthernet1/1
 switchport access vlan 69
 duplex full
!
interface FastEthernet1/2
 switchport access vlan 69
 duplex full
!
interface FastEthernet1/3
 switchport access vlan 69
```

```
duplex full
!
interface FastEthernet1/4
switchport access vlan 69
duplex full
!
interface FastEthernet1/5
switchport access vlan 69
duplex full
!
interface FastEthernet1/6
switchport access vlan 69
duplex full
!
interface FastEthernet1/7
switchport access vlan 69
duplex full
!
interface FastEthernet1/8
switchport access vlan 69
duplex full
!
interface FastEthernet1/9
switchport access vlan 69
duplex full
!
interface FastEthernet1/10
switchport access vlan 69
duplex full
!
interface FastEthernet1/11
switchport access vlan 69
duplex full
!
interface FastEthernet1/12
switchport access vlan 69
duplex full
!
interface FastEthernet1/13
switchport access vlan 69
duplex full
!
interface FastEthernet1/14
switchport access vlan 69
duplex full
!
interface FastEthernet1/15
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
!
no ip 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
```