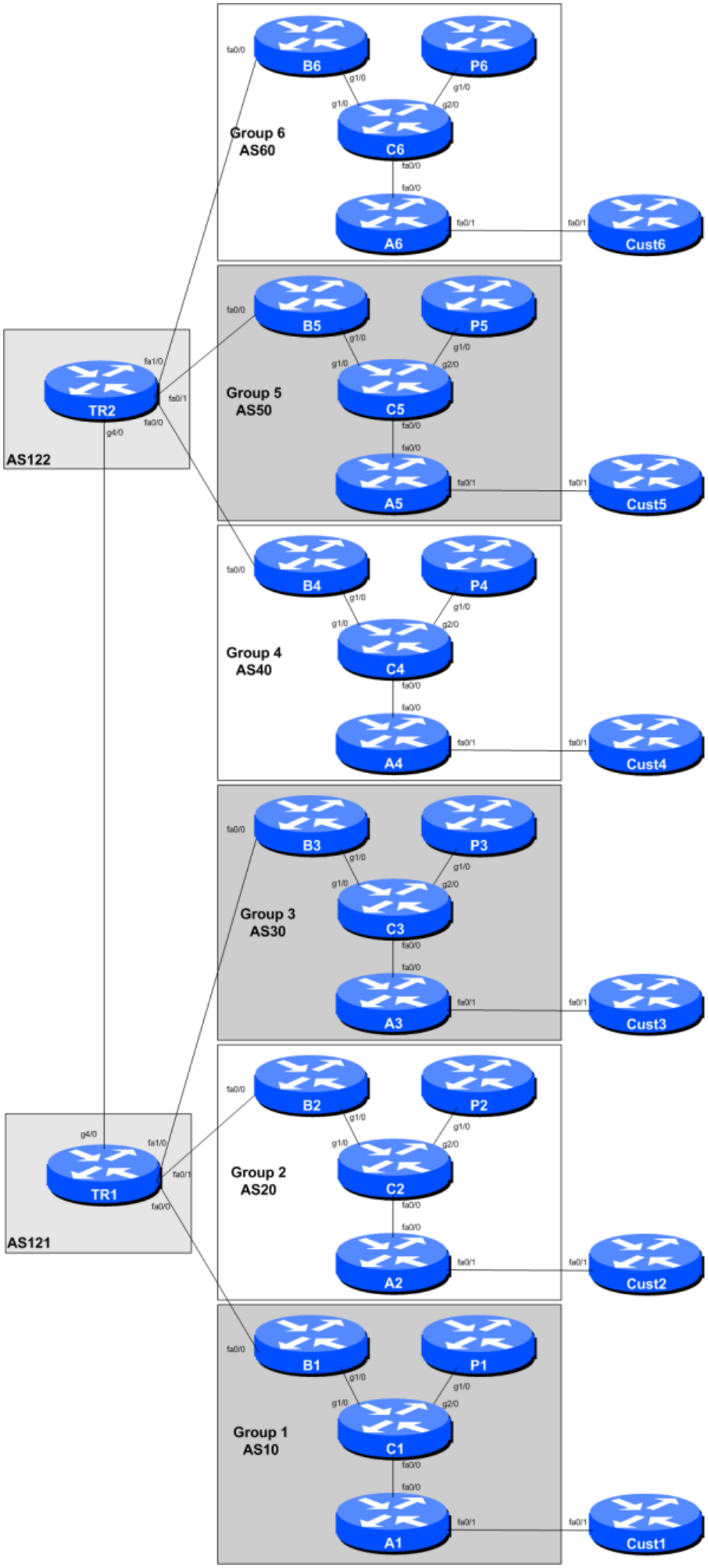
IPv6 Lab - Customer Connections

Background

This series of small labs is going to focus on how to deploy IPv6 into a customer’s network. Several technologies will be examined, including:

- static configuration with static route
- DHCPv6-PD
- 6rd

The lab has been set up to include a sample Customer router connected to the Access router for each Autonomous System. We will use this extended lab network to explore the different technologies. The lab topology is shown in the following diagram:


Group 6
AS60
B6
P6
C6
A6
Cust6
Group 5
AS50
B5
P5
C5
A5
Cust5
Group 4
AS40
B4
P4
C4
A4
Cust4
Group 3
AS30
B3
P3
C3
A3
Cust3
Group 2
AS20
B2
P2
C2
A2
Cust2
Group 1
AS10
B1
P1
C1
A1
Cust1
AS122
TR2
AS121
TR1
fa0/0
fa0/1
fa1/0
g1/0
g2/0
g4/0

Static Configuration

This first lab looks at how to set up a static configuration between network operator and the end-user. This is the traditional method the industry has used for years for IPv4, and is also used for IPv6 in the case of a dual-stack connection from operator to customer and within the customer's own network.

Configuring the Customer Router

Before we start, each group needs to configure their customer router, to give it the basic configuration. We do exactly as we did at the start of these labs. To help you, the configuration steps are listed here. Consult the Lab Access Instructions to find out how to get to the console port of the Customer Router.

Name the router

```
Router> enable
Router# config terminal
Router(config)# hostname CustX
```

Configure Authentication

```
aaa new-model
aaa authentication login default local
aaa authentication enable default enable
username v6cust secret cust-PW
enable secret cust-EN
service password-encryption
line vty 0 4
 transport preferred none
line console 0
 transport preferred none
```

Configure logging

```
no logging console
logging buffered 8192 debugging
```

Disable DNS resolution

```
no ip domain-lookup
```

Activate IPv6 routing

Turn on IPv6 Routing and activate IPv6 CEF (not on by default in Cisco IOS)

```
ipv6 unicast-routing
ipv6 cef
```

Disable source routing for IPv4 and IPv6

```
no ip source-route
no ipv6 source-route
```

Path MTU Discovery

Enable Path MTU Discovery on the router - this is not enabled by default for connections to the control plane (but it is enabled by default now for BGP).

```
ip tcp path-mtu-discovery
```

Exit configuration mode and save

```
end
write memory
```

Configuring Interfaces on Customer Router

Now that the basic configuration is in place, we need to configure the interface linking the Customer router to our Access router. Refer to the ip address plan for the lab to find out the point-to-point link addresses for both IPv4 and IPv6.

Here is a configuration example:

```
interface FastEthernet0/1
 description P2P Link to ASX0
 ip address 100.68.X.34 255.255.255.252
 no ip directed-broadcast
 no ip redirects
 no ip proxy-arp
 ipv6 address 2001:DB8:X:20::1/127
 ipv6 nd prefix default no-advertise
 ipv6 nd ra suppress all
 no shutdown
!
```

Configuring Interfaces on Access Router

We also need to configure the interface on the Access router which connects to the Customer router. Again, referring to the address plan, here is a possible configuration example:

```
interface FastEthernet0/1
 description P2P Link to CustX
 ip address 100.68.X.33 255.255.255.252
 no ip directed-broadcast
 no ip redirects
 no ip proxy-arp
 ipv6 address 2001:DB8:X:20::0/127
 ipv6 nd prefix default no-advertise
 ipv6 nd ra suppress all
 no shutdown
!
```

Once the interfaces on both the Customer and Access routers have been configured, try and ping the other end - check both IPv4 and IPv6.

Adding a customer route

We previously set up simulated customer connection on the Access Router. We can now redo this, so that rather than pointing the static route at the Null0 interface, we can point it to the actual Customer router we have just configured.

First we delete the static routes we set up earlier:

```
no ip route 100.68.X.64 255.255.255.192 null0
!
no ipv6 route 2001:DB8:X:4000::/52 null0
!
```

And then we add the static routes on the Access router to point to the point-to-point link address on the Customer router:

```
ip route 100.68.X.64 255.255.255.192 100.68.X.34
!
ipv6 route 2001:DB8:X:4000::/52 2001:DB8:X:20::1
!
```

Once this has been configured, check that you can still see the customer IPv4 /26 and IPv6 /52 visible in the iBGP for the AS. Check on the Border, Peering and Core routers, and make sure the prefix is still visible. Use these commands:

```
show ip bgp
show bgp ipv6 unicast
```

Default route on Customer Router

To complete the connectivity we need to set up a static default route (IPv4 and IPv6) on the Customer router pointing to the Access router. We also need to create a source anchor point for the address space we have assigned to the customer. The simplest way to do this is to route create a Loopback interface on the Customer router with a single IP address from IPv4 and IPv6 address blocks in question, and point the entire IPv4 and IPv6 blocks to the Null0 interface. This way we have a target to test connectivity to, as well as following best practices by Null routing any address space which is not in use.

Here is an example for the Customer router:

```
interface Loopback0
 description Address anchor for Customer X
 ip address 100.68.X.64 255.255.255.255
 ipv6 address 2001:DB8:X:4000::0/128
!
ip route 0.0.0.0 0.0.0.0 100.68.X.33
ip route 100.68.X.64 255.255.255.192 Null0
!
ipv6 route ::/0 2001:DB8:X:20::
ipv6 route 2001:DB8:X:4000::/52 Null0
!
```

With this in place it should be possible to reach the Internet from the Customer router. Check connectivity from:

- your AS towards the Customer router too, using the newly created Loopback interface as a target.
- our Customer router, using the newly created Loopback interface as the source, towards the Internet, e.g. to 8.8.8.8 for IPv4 and 2001:4860:4860::8888 for IPv6.

Note: Can you explain why, in the latter case, we are running the traceroute from the Loopback interface, and not using the default (which would be the point-to-point link to the network operator's Access router)?

Once complete, make sure you save a copy of the configuration on the Access and Customer routers - simple copy and paste into a text document is easiest. We will need to revert to this configuration at a future stage in the lab.

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