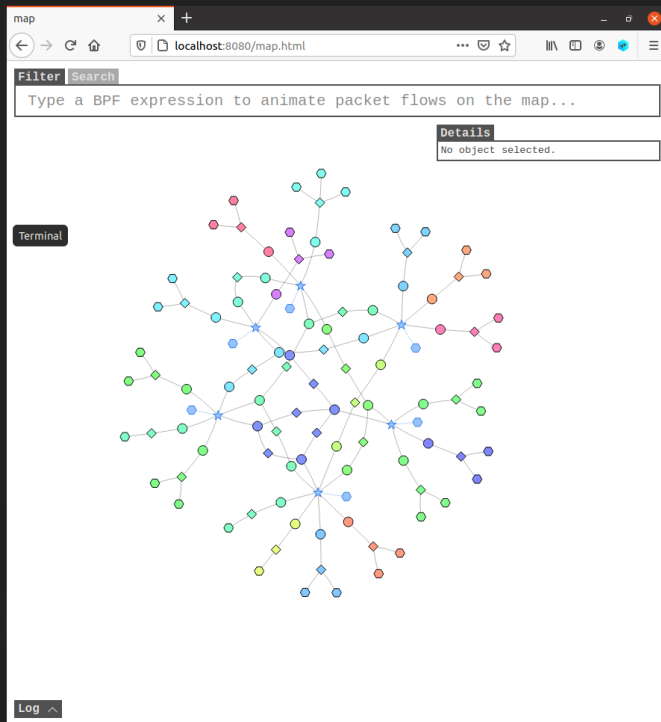


BGP Exploration and Attack

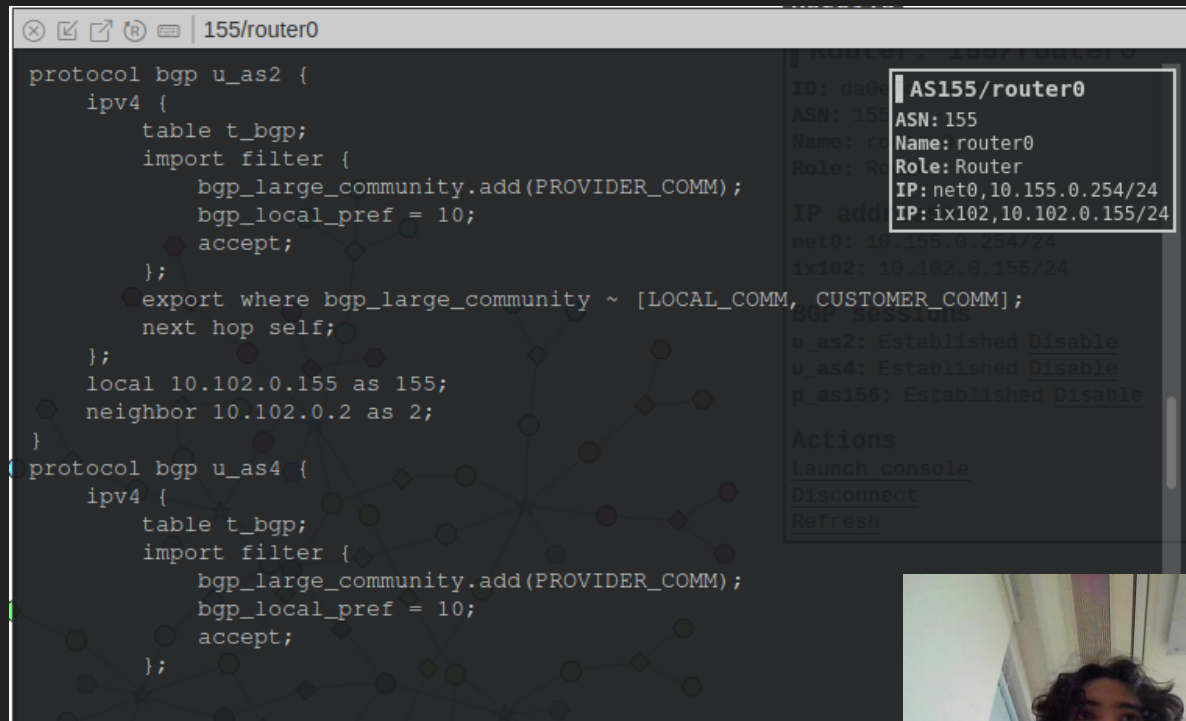


Setup: Network map



Task 1a1: AS-155's peers

- AS-2
- AS-4



155/router0

```
protocol bgp u_as2 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PROVIDER_COMM);
      bgp_local_pref = 10;
      accept;
    };
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];
    next hop self;
  };
  local 10.102.0.155 as 155;
  neighbor 10.102.0.2 as 2;
}

protocol bgp u_as4 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PROVIDER_COMM);
      bgp_local_pref = 10;
      accept;
    };
  };
}
```

AS155/router0

ID: da0
ASN: 155
Name: router0
Role: Router
IP: net0, 10.155.0.254/24
IP: ix102, 10.102.0.155/24

net0: 10.155.0.254/24
ix102: 10.102.0.155/24

u_as2: Established [Disable](#)
u_as4: Established [Disable](#)
p_as156: Established [Disable](#)

Actions

[Launch console](#)
[Disconnect](#)
[Refresh](#)

Task 1a2: Disabling AS-2 as a peer

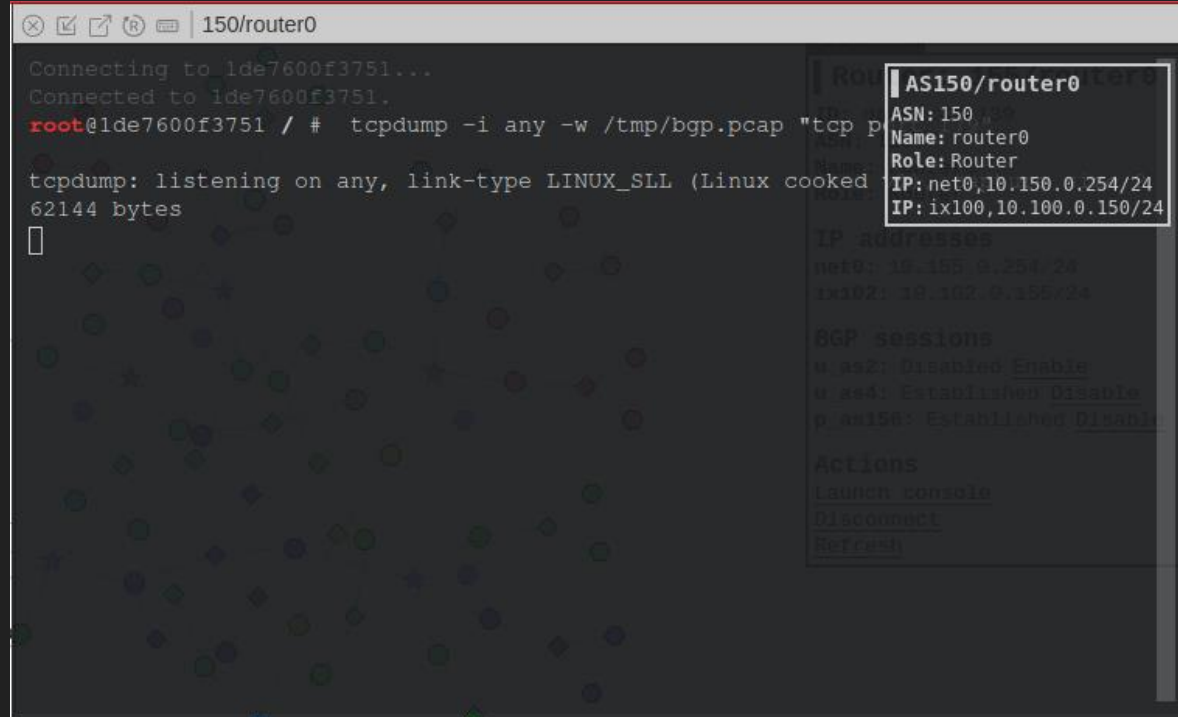
```
155/router0
root@da0e7c4fal39 /etc/bird # birdc show protocols
BIRD 2.0.7 ready.
Name      Proto    Table    State    Since    Info
device1   Device   ---      up       07:38:28.549
kernel1   Kernel   master4  up       07:38:28.549
local_nets Direct   ---      up       07:38:28.549
pipe1     Pipe     ---      up       07:38:28.549  t_bgp <=> master4
pipe2     Pipe     ---      up       07:38:28.549  t_direct <=> t_bgp
u_as2     BGP      ---      up       07:38:44.151  Established 155.0.254/24
u_as4     BGP      ---      up       07:38:38.424  Established 102.0.155/24
p_as156   BGP      ---      up       07:38:31.095  Established
ospf1     OSPF     t_ospf   up       07:38:28.549  Alone sessions
pipe3     Pipe     ---      up       07:38:28.549  t_ospf <=> master4
root@da0e7c4fal39 /etc/bird # birdc disable u_as2
BIRD 2.0.7 ready.
u_as2: disabled
root@da0e7c4fal39 /etc/bird # birdc show protocols
BIRD 2.0.7 ready.
Name      Proto    Table    State    Since    Info
device1   Device   ---      up       07:38:28.549
kernel1   Kernel   master4  up       07:38:28.549
local_nets Direct   ---      up       07:38:28.549
pipe1     Pipe     ---      up       07:38:28.549  t_bgp <=> master4
pipe2     Pipe     ---      up       07:38:28.549  t_direct <=> t_bgp
u_as2     BGP      ---      down    08:32:57.666
u_as4     BGP      ---      up       07:38:38.424  Established
p_as156   BGP      ---      up       07:38:31.095  Established
ospf1     OSPF     t_ospf   up       07:38:28.549  Alone
pipe3     Pipe     ---      up       07:38:28.549  t_ospf <=> master4
root@da0e7c4fal39 /etc/bird #
```

AS155/router0
ASN: 155
Name: router0
Role: Router
IP: net0,10.155.0.254/24
IP: ix102,10.102.0.155/24

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 1b: Listening on AS-150's router



The screenshot shows a terminal window with the title bar "150/router0". The terminal output is as follows:

```
Connecting to ide7600f3751...
Connected to ide7600f3751.
root@ide7600f3751 / # tcpdump -i any -w /tmp/bgp.pcap "tcp p
tcpdump: listening on any, link-type LINUX_SLL (Linux cooked
62144 bytes
█
```

On the right side of the terminal window, there is a sidebar with the following information:

AS150/router0

- ASN: 150
- Name: router0
- Role: Router
- IP: net0,10.150.0.254/24
- IP: ix100,10.100.0.150/24

IP addresses

- net0: 10.150.0.254/24
- ix100: 10.100.0.150/24

BGP sessions

- u as2: Disabled [Enable](#)
- u as4: Established [Disable](#)
- p as156: Established [Disable](#)

Actions

- [Launch console](#)
- [Disconnect](#)
- [Refresh](#)



Task 1b: Triggering changes on AS-150 through AS-155

Details

Router: 155/router0
ID: da0e7c4fa139
ASN: 155
Name: router0
Role: Router

IP addresses
net0: 10.155.0.254/24
ix102: 10.102.0.155/24

BGP sessions
u_as2: Disabled Enable
u_as4: Active Disable
p_as156: Established Disable

Actions
Launch console
Disconnect
Refresh

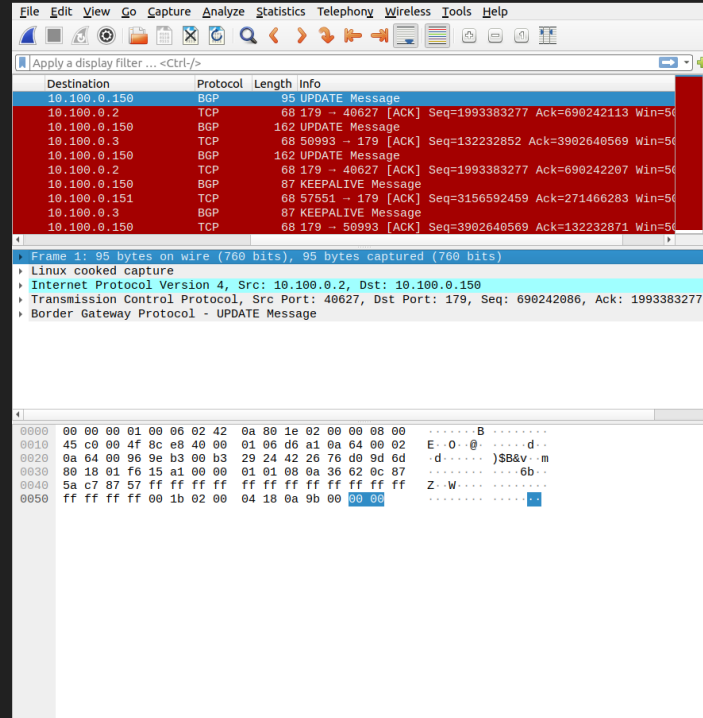


Task 1b: Exporting the captured packets

```
[12/29/21] seed@VM:~/Desktop$ docker cp 1de7600f3751:"tmp/bgp.pcap"  
"/home/seed/Desktop"
```

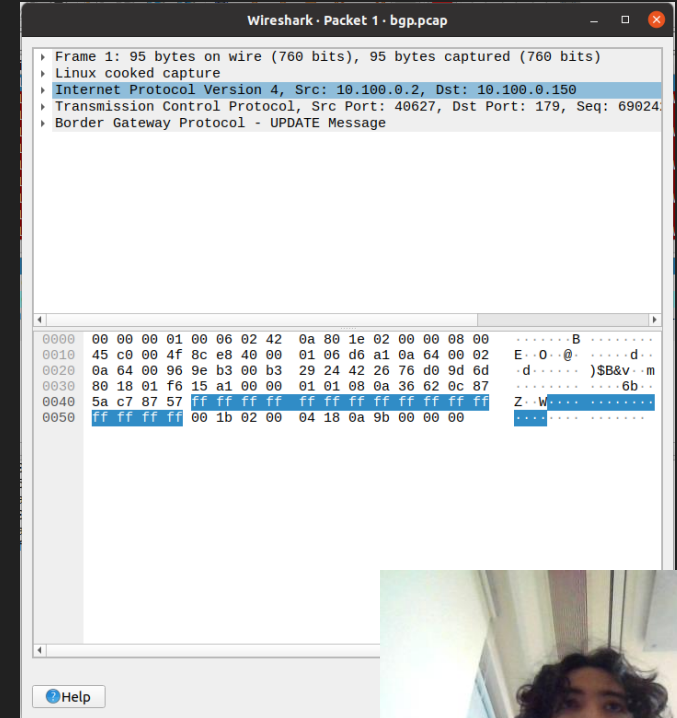


Task 1b: Importing the captured packets into Wireshark



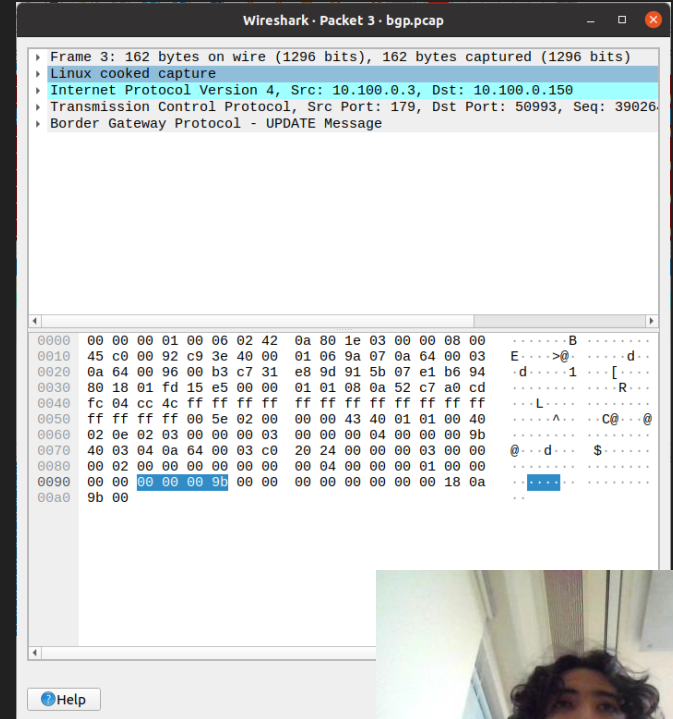
Task 1b: Route advertisement message

- Upon deactivating AS-2 on AS-155's router.



Task 1b: Route withdrawal message

- Upon deactivating AS-2 on AS-155's router.



Task 1c: Disabling AS-4's router

Details

Router: 4/r102

ID: b65d698c9248
ASN: 4
Name: r102
Role: Router

IP addresses
ix102: 10.102.0.4/24
net_102_104: 10.4.1.254/24

BGP sessions
p_rs102: Established Disable
c_as11: Established Disable
c_as154: Established Disable
c_as155: Established Disable
c_as156: Active Disable
ibgp1: Established Disable
ibgp2: Established Disable

Actions
Launch console
Disconnect
Refresh



Task 1c: Testing connectivity in AS-156

```
root@204ca48e2e4c / # ping 10.161.0.71

PING 10.161.0.71 (10.161.0.71) 56(84) bytes of data.
From 10.156.0.254 icmp_seq=1 Destination Net Unreachable
From 10.156.0.254 icmp_seq=2 Destination Net Unreachable
From 10.156.0.254 icmp_seq=3 Destination Net Unreachable
^C
--- 10.161.0.71 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 2056ms
```

AS156/webservice_1
ASN: 156
Name: webservice_1
Role: Host
IP: net0,10.156.0.72/24



Task 1c: Changing AS-155's router configuration

- p_as156 to c_as156.
- AS-156 as customer.

```
155/router0
protocol bgp c_as156 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add CUSTOMER_COMM;
      bgp_local_pref = 20;
      accept;
    };
    export all;
    next hop self;
  };
  local 10.102.0.155 as 155;
  neighbor 10.102.0.156 as 156;
}
ipv4 table t_ospf;
protocol ospf ospf1 {
  ipv4 {
    table t_ospf;
    import all;
    export all;
  };
  area 0 {
```

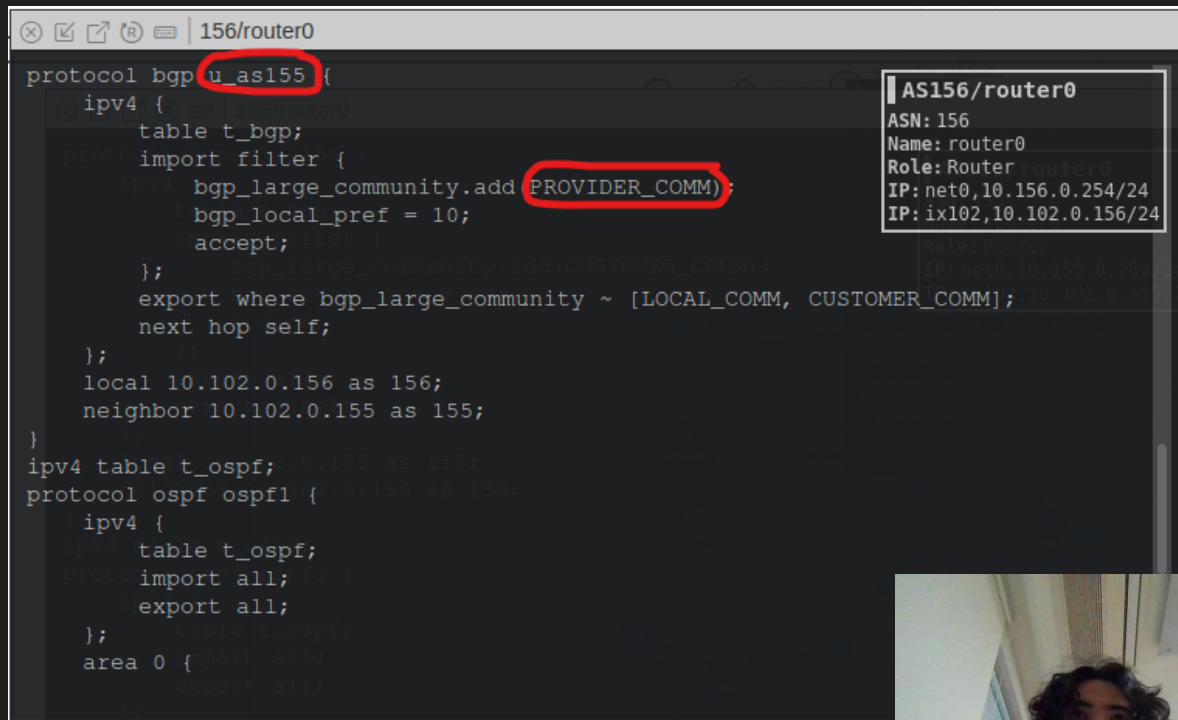
AS155/router0
ASN: 155
Name: router0
Role: Router
IP: net0, 10.155.0.254/24
IP: ix102, 10.102.0.155/24

Refresh



Task 1c: Changing AS-156's router configuration

- p_as155 to u_as155.
- AS-155 as provider.



```
156/router0
protocol bgp u_as155 {
    ipv4 {
        table t_bgp;
        import filter {
            bgp_large_community.add PROVIDER_COMM;
            bgp_local_pref = 10;
            accept;
        };
        export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];
        next hop self;
    };
    local 10.102.0.156 as 156;
    neighbor 10.102.0.155 as 155;
}
ipv4 table t_ospf;
protocol ospf ospf1 {
    ipv4 {
        table t_ospf;
        import all;
        export all;
    };
    area 0 {

```

AS156/router0
ASN: 156
Name: router0
Role: Router
IP: net0, 10.156.0.254/24
IP: ix102, 10.102.0.156/24



Task 1c: Regaining connectivity in AS-156

```
root@204ca48e2e4c / # ping 10.161.0.71
PING 10.161.0.71 (10.161.0.71) 56(84) bytes of data.
64 bytes from 10.161.0.71: icmp_seq=1 ttl=56 time=0.366 ms
64 bytes from 10.161.0.71: icmp_seq=2 ttl=56 time=0.399 ms
64 bytes from 10.161.0.71: icmp_seq=3 ttl=56 time=0.571 ms
^C
--- 10.161.0.71 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2042ms
rtt min/avg/max/mdev = 0.366/0.445/0.571/0.089 ms
```

AS156/webservice_1
ASN: 156
Name: webservice_1
Role: Host
IP: net0,10.156.0.72/24



Task 1d: Testing connectivity between AS-180 and AS-171

```
180/webservice_0  
  
root@549951990f7e / # ping 10.171.0.71  
PING 10.171.0.71 (10.171.0.71) 56(84) bytes of data.  
From 10.180.0.254 icmp_seq=1 Destination Net Unreachable  
From 10.180.0.254 icmp_seq=2 Destination Net Unreachable  
From 10.180.0.254 icmp_seq=3 Destination Net Unreachable  
^C  
--- 10.171.0.71 ping statistics ---  
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 2054ms
```

AS180/webservice_0
ASN: 180
Name: webservice_0
Role: Host
IP: net0,10.180.0.71/24



Task 1d: Changing AS-180's router configuration

180/router0

```
define LOCAL_COMM = (180, 0, 0);
define CUSTOMER_COMM = (180, 1, 0);
define PEER_COMM = (180, 2, 0);
define PROVIDER_COMM = (180, 3, 0);
ipv4 table t_bgp;
protocol pipe {
    table t_bgp;
    peer table master4;
    import none;
    export all;
}
protocol pipe {
    table t_direct;
    peer table t_bgp;
    import none;
    export filter { bgp_large_community.add(LOCAL_COMM); bgp_local_pref=;
}
cept; };
```

AS180/router0

ASN: 180
Name: router0
Role: Router
IP: net0, 10.180.0.254/24
IP: ix105, 10.105.0.180/24

Role: Router

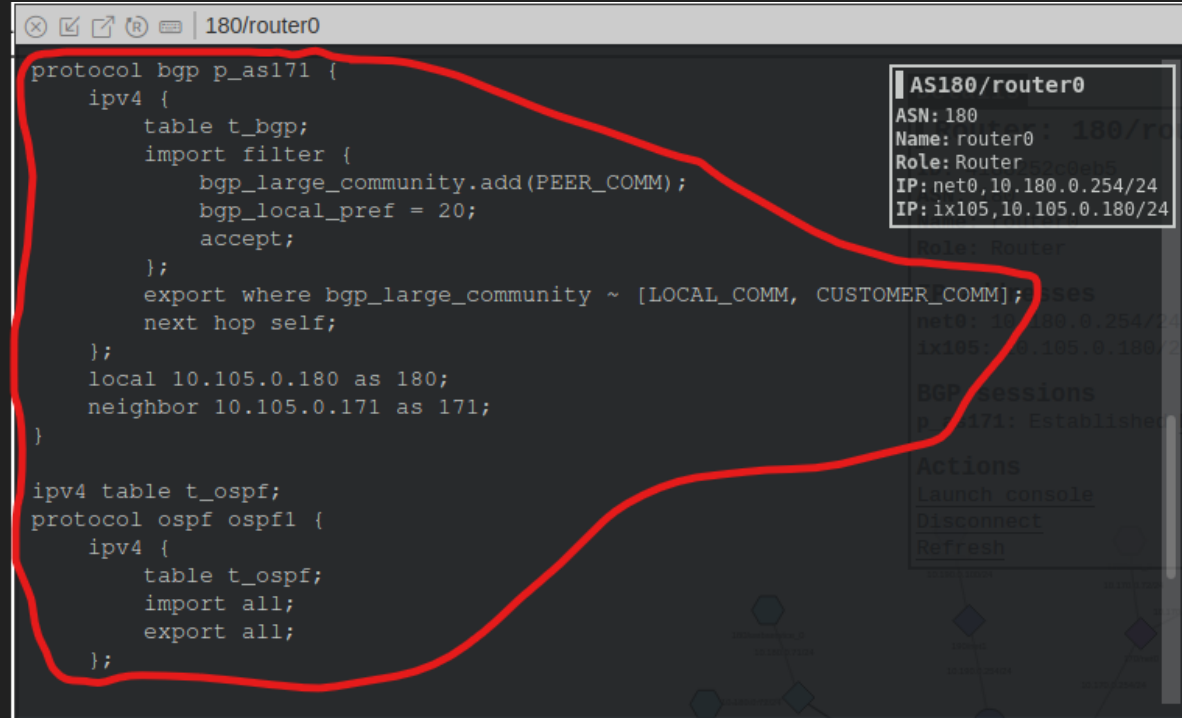
IP addresses
net0: 10.180.0.254/24
ix105: 10.105.0.180/24

BGP sessions
p_as180/180/0 established

Actions
Disconnect
Refresh



Task 1d: Changing AS-180's router configuration



```
180/router0
protocol bgp p_as171 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PEER_COMM);
      bgp_local_pref = 20;
      accept;
    };
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];
    next hop self;
  };
  local 10.105.0.180 as 180;
  neighbor 10.105.0.171 as 171;
}

ipv4 table t_ospf;
protocol ospf ospf1 {
  ipv4 {
    table t_ospf;
    import all;
    export all;
  };
}
```

AS180/router0
ASN: 180
Name: router0
Role: Router
IP: net0,10.180.0.254/24
IP: ix105,10.105.0.180/24

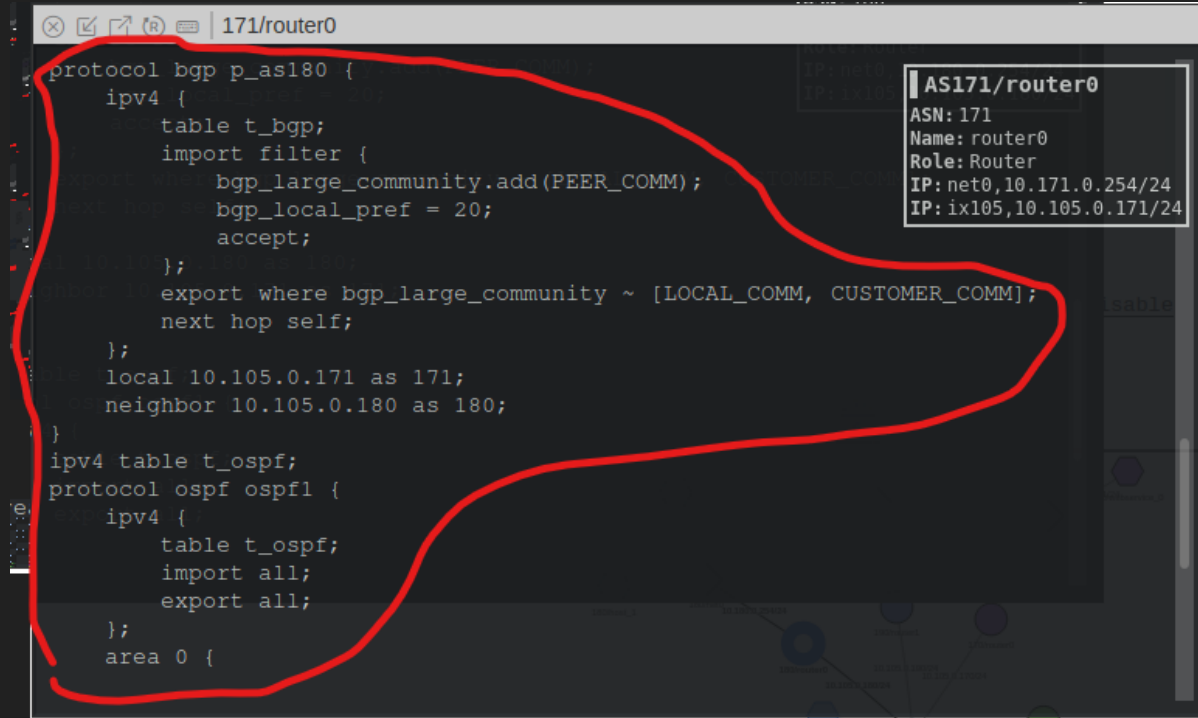
Role: Router
net0: 10.180.0.254/24
ix105: 10.105.0.180/24

BGP Sessions
p_as171: Established

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 1d: Changing AS-171's router configuration



```
171/router0
protocol bgp p_as180 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PEER_COMM);
      bgp_local_pref = 20;
      accept;
    };
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];
    next hop self;
  };
  local 10.105.0.171 as 171;
  neighbor 10.105.0.180 as 180;
}
ipv4 table t_ospf;
protocol ospf ospf1 {
  ipv4 {
    table t_ospf;
    import all;
    export all;
  };
  area 0 {
```

AS171/router0
ASN: 171
Name: router0
Role: Router
IP: net0,10.171.0.254/24
IP: ix105,10.105.0.171/24



Task 1d: Connection between AS-180 and AS-171

```
180/webservice_0
root@549951990f7e / # ping 10.171.0.71
PING 10.171.0.71 (10.171.0.71) 56(84) bytes of data.
64 bytes from 10.171.0.71: icmp_seq=1 ttl=62 time=0.182 ms
64 bytes from 10.171.0.71: icmp_seq=2 ttl=62 time=0.107 ms
64 bytes from 10.171.0.71: icmp_seq=3 ttl=62 time=0.088 ms
^C
--- 10.171.0.71 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2039ms
rtt min/avg/max/mdev = 0.088/0.125/0.182/0.040 ms
```

AS180/webservice_0
ASN: 180
Name: webservice_0
Role: Host
IP: net0,10.180.0.71/24



Task 2a: Pinging AS-3 from AS-162

```
162/host_1  
  
root@78d5bf2c3fb0 / # ping 10.164.0.71  
PING 10.164.0.71 (10.164.0.71) 56(84) bytes of data:  
64 bytes from 10.164.0.71: icmp_seq=1 ttl=59 time=0.251 ms  
64 bytes from 10.164.0.71: icmp_seq=2 ttl=59 time=0.106 ms  
64 bytes from 10.164.0.71: icmp_seq=3 ttl=59 time=0.112 ms  
^C  
--- 10.164.0.71 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2047ms  
rtt min/avg/max/mdev = 0.106/0.156/0.251/0.066 ms
```

AS162/host_1
ASN: 162
Name: host_1
Role: Host
IP: net0,10.162.0.72/24



Task 2a: AS-3 router's ip route before disabling IBGP

```
root@f652daa85708 / # ip route
10.0.0.5 dev dummy0 proto bird scope link metric 32
10.0.0.6 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.7 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.8 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.2.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.0.0/24 dev net_100_103 proto kernel scope link src 10.3.0.254
10.3.0.0/24 dev net_100_103 proto bird scope link metric 32
10.3.1.0/24 dev net_100_105 proto kernel scope link src 10.3.1.254
10.3.1.0/24 dev net_100_105 proto bird scope link metric 32
10.3.2.0/24 proto bird metric 32
    nexthop via 10.3.0.253 dev net_100_103 weight 1
    nexthop via 10.3.1.253 dev net_100_105 weight 1
10.3.3.0/24 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.4.0.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.4.1.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.11.0.0/24 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.12.0.0/24 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.100.0.0/24 dev ix100 proto kernel scope link src 10.100.0.3
10.100.0.0/24 dev ix100 proto bird scope link metric 32
```

AS3/r100
ASN: 3
Name: r100
Role: Router
IP: ix100,10.100.0.3/24
IP: net_100_103,10.3.0.254/24
IP: net_100_105,10.3.1.254/24

IP addresses
BGP sessions
Actions
Launch console



Task 2a: Disabling IX-103 session on AS-3

Details

Router: 3/r100
ID: f652daa85708
ASN: 3
Name: r100
Role: Router

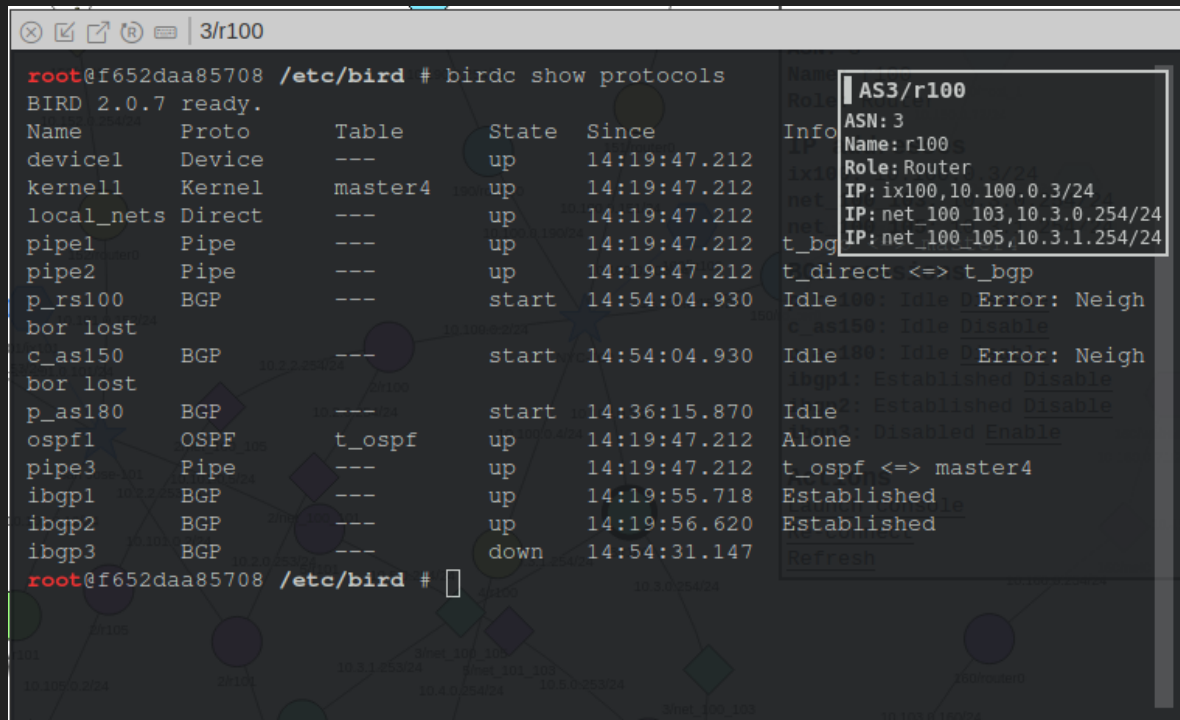
IP addresses
ix100: 10.100.0.3/24
net_100_103: 10.3.0.254/24
net_100_105: 10.3.1.254/24

BGP sessions
p_rs100: Established [Disable](#)
c_as150: Established [Disable](#)
p_as180: Idle [Disable](#)
ibgp1: Established [Disable](#)
ibgp2: Established [Disable](#)
ibgp3: Active [Disable](#)

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 2a: Disabling IX-103 session on AS-3



The screenshot shows a terminal window with the command `birdc show protocols` executed. The output lists various protocols and their states. A network diagram is visible in the background, showing connections between various IP addresses. A sidebar on the right displays configuration details for `AS3/r100`.

```
root@ef652daa85708 /etc/bird # birdc show protocols
BIRD 2.0.7 ready.
Name      Proto      Table      State      Since
device1   Device     ---        up         14:19:47.212
kernel1   Kernel     master4    up         14:19:47.212
local_nets Direct     ---        up         14:19:47.212
pipe1     Pipe       ---        up         14:19:47.212
pipe2     Pipe       ---        up         14:19:47.212
p_rs100   BGP        ---        start      14:54:04.930
bor lost
c_as150   BGP        ---        start      14:54:04.930
bor lost
p_as180   BGP        ---        start      14:36:15.870
ospf1     OSPF       t_ospf     up         14:19:47.212
pipe3     Pipe       ---        up         14:19:47.212
ibgp1     BGP        ---        up         14:19:55.718
ibgp2     BGP        ---        up         14:19:56.620
ibgp3     BGP        ---        down       14:54:31.147
root@ef652daa85708 /etc/bird #
```

AS3/r100 Configuration:

- ASN: 3
- Name: r100s
- Role: Router
- IP: ix100, 10.100.0.3/24
- IP: net_100_103, 10.3.0.254/24
- IP: net_100_105, 10.3.1.254/24

Network Diagram: The diagram shows a network topology with various IP addresses and their connections. Key nodes include `ix100`, `net_100_103`, and `net_100_105`.



Task 2a: AS-3 router's ip route after disabling IBGP.

```
root@ef652daa85708 / # ip route
10.0.0.5 dev dummy0 proto bird scope link metric 32
10.0.0.6 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.7 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.8 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.2.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.0.0/24 dev net_100_103 proto kernel scope link src 10.3.0.254
10.3.0.0/24 dev net_100_103 proto bird scope link metric 32
10.3.1.0/24 dev net_100_105 proto kernel scope link src 10.3.1.254
10.3.1.0/24 dev net_100_105 proto bird scope link metric 32
10.3.2.0/24 proto bird metric 32
10.3.3.0/24 via 10.3.0.253 dev net_100_103 weight 1
10.3.3.0/24 via 10.3.1.253 dev net_100_105 weight 1
10.4.0.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.4.1.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.11.0.0/24 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.12.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.100.0.0/24 dev ix100 proto kernel scope link src 10.100.0.3
10.100.0.0/24 dev ix100 proto bird scope link metric 32
```

AS3/r100
ASN: 3
Name: r100
Role: Router
IP: ix100,10.100.0.3/24
IP: net_100_103,10.3.0.254/24
IP: net_100_105,10.3.1.254/24



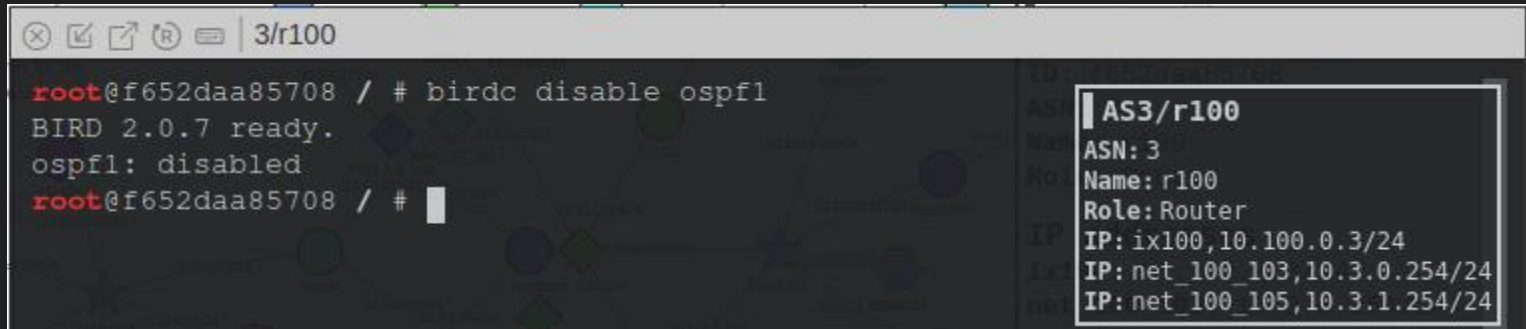
Task 2b: AS-3 router's ip route before disabling OSPF

```
root@f652daa85708 / # ip route
10.0.0.5 dev dummy0 proto bird scope link metric 32
10.0.0.6 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.7 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.0.0.8 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.2.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.0.0/24 dev net_100_103 proto kernel scope link src 10.3.0.254
10.3.0.0/24 dev net_100_103 proto bird scope link metric 32
10.3.1.0/24 dev net_100_105 proto kernel scope link src 10.3.1.254
10.3.1.0/24 dev net_100_105 proto bird scope link metric 32
10.3.2.0/24 proto bird metric 32
    nexthop via 10.3.0.253 dev net_100_103 weight 1
    nexthop via 10.3.1.253 dev net_100_105 weight 1
10.3.3.0/24 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.4.0.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.4.1.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.11.0.0/24 via 10.3.1.253 dev net_100_105 proto bird metric 32
10.12.0.0/24 via 10.3.0.253 dev net_100_103 proto bird metric 32
10.100.0.0/24 dev ix100 proto kernel scope link src 10.100.0.3
10.100.0.0/24 dev ix100 proto bird scope link metric 32
```

AS3/r100
ASN: 3.100.105: 10.3.1.254/
Name: r100
Role: Router
IP: ix100,10.100.0.3/24
IP: net_100_103,10.3.0.254/24
IP: net_100_105,10.3.1.254/24
ibgp1: Established Disable
ibgp3: Active Disable
Actions
Launch console
Disconnect
Refresh



Task 2b: Disabling OSPF on AS-3's router



The screenshot shows a terminal window with a title bar containing icons for window management and the text "3/r100". The terminal output is as follows:

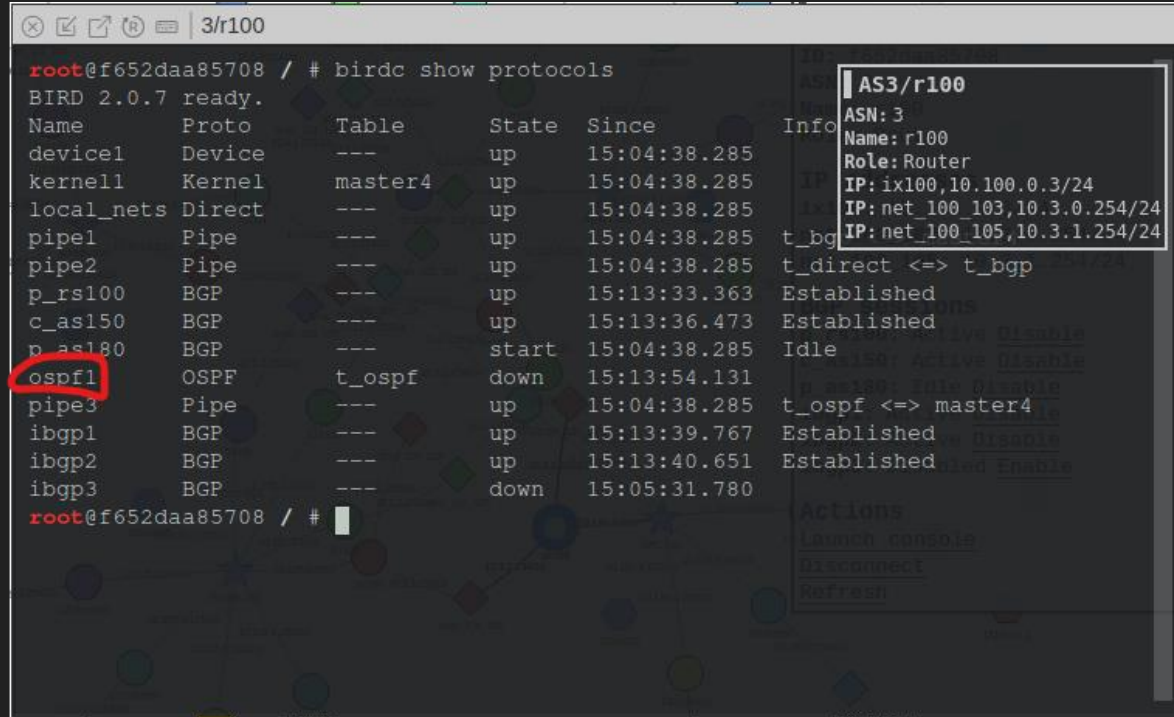
```
root@f652daa85708 / # birdc disable ospf1
BIRD 2.0.7 ready.
ospf1: disabled
root@f652daa85708 / #
```

In the background, a network diagram is visible, showing a central router (r100) connected to other nodes. A tooltip for "AS3/r100" is displayed on the right side of the terminal window, containing the following information:

ID	AS3/r100
ASN	ASN: 3
Name	Name: r100
Role	Role: Router
IP	IP: ix100,10.100.0.3/24
IP	IP: net_100_103,10.3.0.254/24
IP	IP: net_100_105,10.3.1.254/24



Task 2b: Disabling OSPF on AS-3's router



The screenshot shows a network simulator interface. The main window displays a list of protocols for a router. The 'ospf1' entry is highlighted with a red circle. To the right, a detailed view of the selected protocol (AS3/r100) is shown, including its ASN, name, role, and IP addresses. The background features a network topology diagram with various nodes and connections.

```
root@f652daa85708 / # birdc show protocols
BIRD 2.0.7 ready.
Name      Proto    Table    State    Since
device1   Device   ---      up       15:04:38.285
kernel1   Kernel   master4  up       15:04:38.285
local_nets Direct   ---      up       15:04:38.285
pipe1     Pipe     ---      up       15:04:38.285
pipe2     Pipe     ---      up       15:04:38.285
p_rs100   BGP      ---      up       15:13:33.363
c_as150   BGP      ---      up       15:13:36.473
p_as180   BGP      ---      start    15:04:38.285
ospf1     OSPF     t_ospf   down     15:13:54.131
pipe3     Pipe     ---      up       15:04:38.285
ibgp1     BGP      ---      up       15:13:39.767
ibgp2     BGP      ---      up       15:13:40.651
ibgp3     BGP      ---      down     15:05:31.780

root@f652daa85708 / #
```

AS3/r100

- ASN: 3
- Name: r100
- Role: Router
- IP: ix100,10.100.0.3/24
- IP: net_100_103,10.3.0.254/24
- IP: net_100_105,10.3.1.254/24

Actions:

- Launch console
- Disconnect
- Refresh



Task 2b: AS-3 router's ip route after disabling OSPF

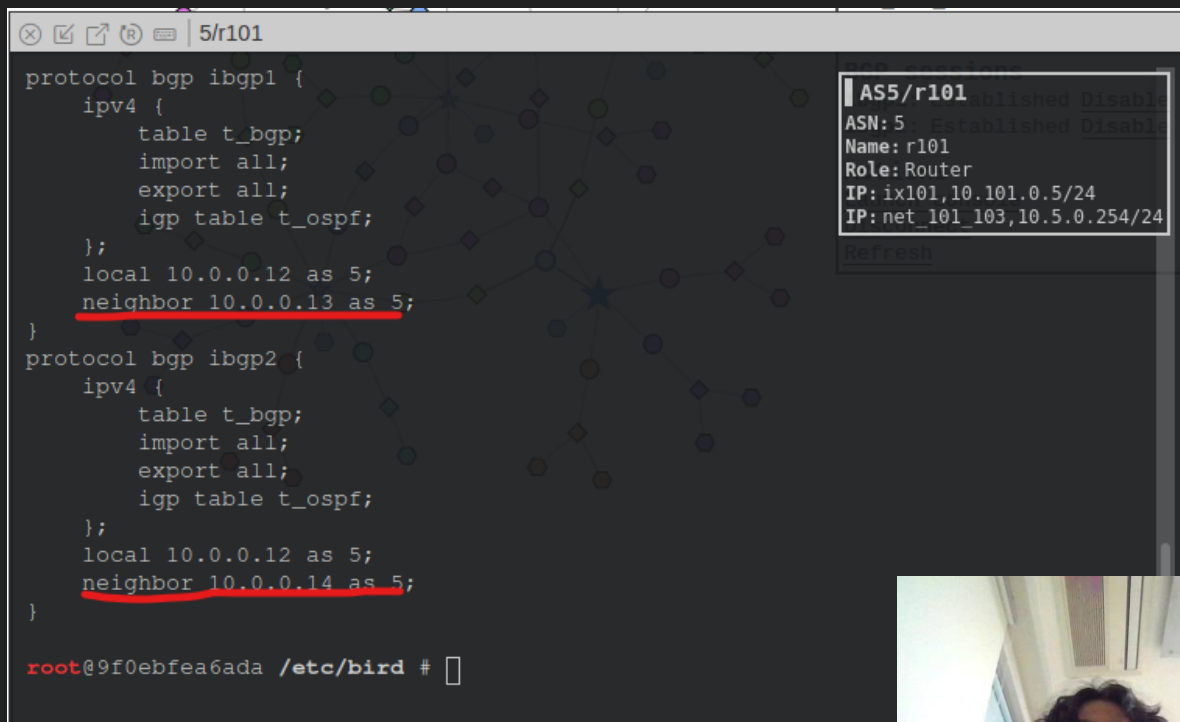
```
root@f652daa85708 / # ip route
10.2.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.0.0/24 dev net_100_103 proto kernel scope link src 10
10.3.0.0/24 dev net_100_103 proto bird scope link metric 3
10.3.1.0/24 dev net_100_105 proto kernel scope link src 10
10.3.1.0/24 dev net_100_105 proto bird scope link metric 32
unreachable 10.3.2.0/24 proto bird metric 32
unreachable 10.3.3.0/24 proto bird metric 32
10.4.0.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.4.1.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
10.11.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.12.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.100.0.0/24 dev ix100 proto kernel scope link src 10.100.0.3
10.150.0.0/24 via 10.100.0.150 dev ix100 proto bird metric 32
10.151.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.152.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.153.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.154.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.155.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.156.0.0/24 via 10.100.0.4 dev ix100 proto bird metric 32
```

AS3/r100
ASN: 300105: 10.3.0.254/24
Name: r100
Role: Router
IP: ix100,10.100.0.3/24
IP: net_100_103,10.3.0.254/24
IP: net_100_105,10.3.1.254/24
ibgp1: Established Disable
ibgp2: Established Disable
ibgp3: Active Disable
Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 2c: AS-5's (IX-101) IBGP configuration

- Other AS-5 locations.



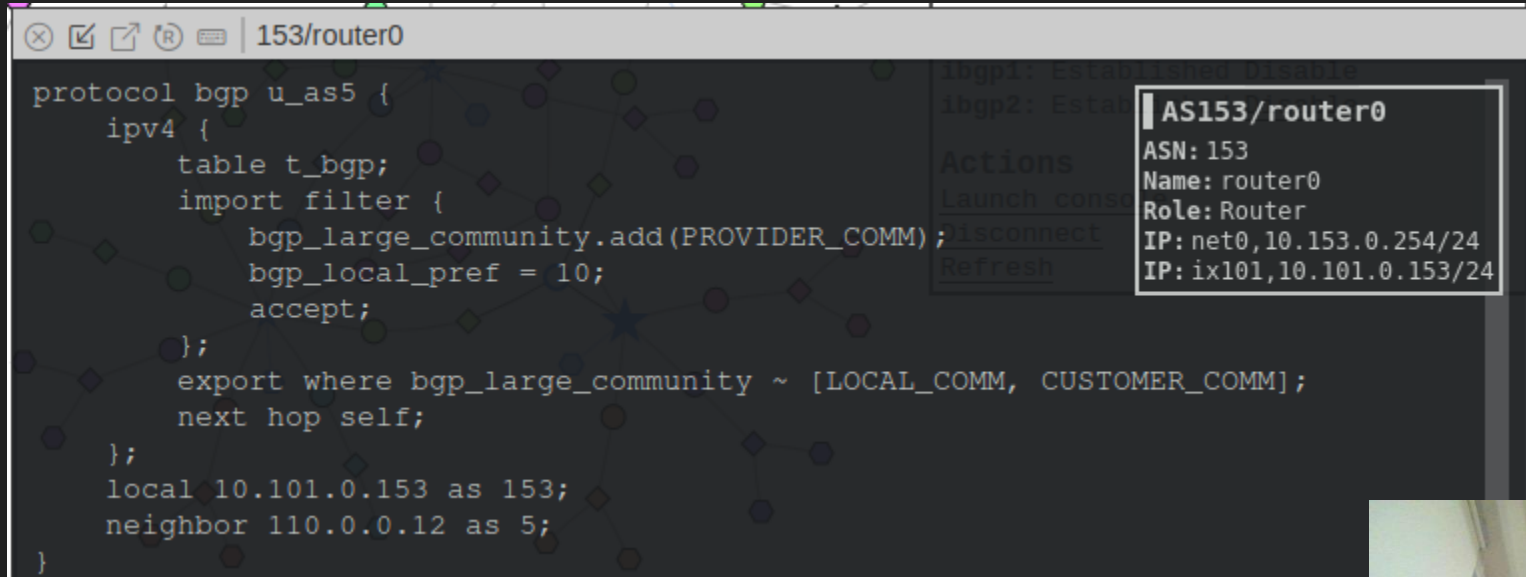
```
5/r101
protocol bgp ibgp1 {
  ipv4 {
    table t_bgp;
    import all;
    export all;
    igp table t_ospf;
  };
  local 10.0.0.12 as 5;
  neighbor 10.0.0.13 as 5;
}
protocol bgp ibgp2 {
  ipv4 {
    table t_bgp;
    import all;
    export all;
    igp table t_ospf;
  };
  local 10.0.0.12 as 5;
  neighbor 10.0.0.14 as 5;
}

root@9f0ebfea6ada /etc/bird #
```

AS5/r101
ASN: 5
Name: r101
Role: Router
IP: ix101,10.101.0.5/24
IP: net_101_103,10.5.0.254/24
Refresh



Task 2c: AS-5 (IX-101) providing service to AS-153



153/router0

```
protocol bgp u_as5 {  
  ipv4 {  
    table t_bgp;  
    import filter {  
      bgp_large_community.add(PROVIDER_COMM);  
      bgp_local_pref = 10;  
      accept;  
    };  
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];  
    next hop self;  
  };  
  local 10.101.0.153 as 153;  
  neighbor 110.0.0.12 as 5;  
}
```

ibgp1: Established Disable
ibgp2: Estab

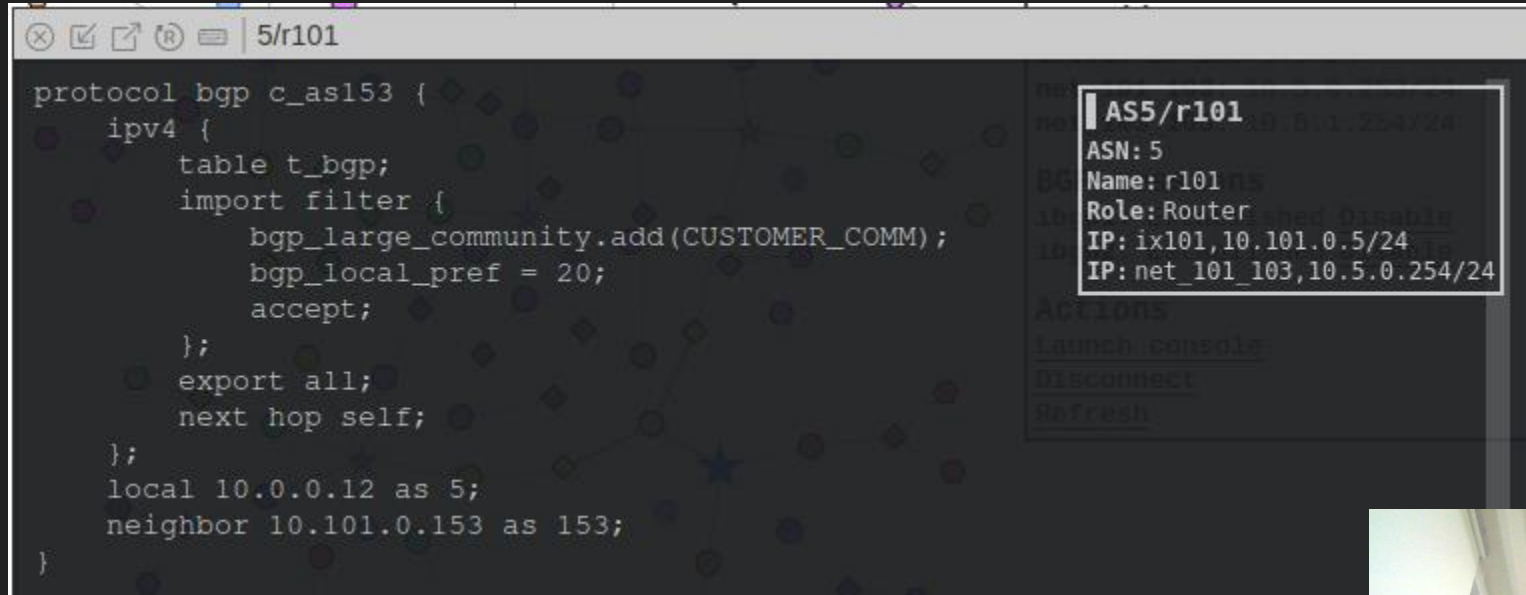
AS153/router0

ASN: 153
Name: router0
Role: Router
IP: net0,10.153.0.254/24
IP: ix101,10.101.0.153/24

Actions
Launch console
Disconnect
Refresh



Task 2c: AS-5 (IX-101) providing service to AS-153



5/r101

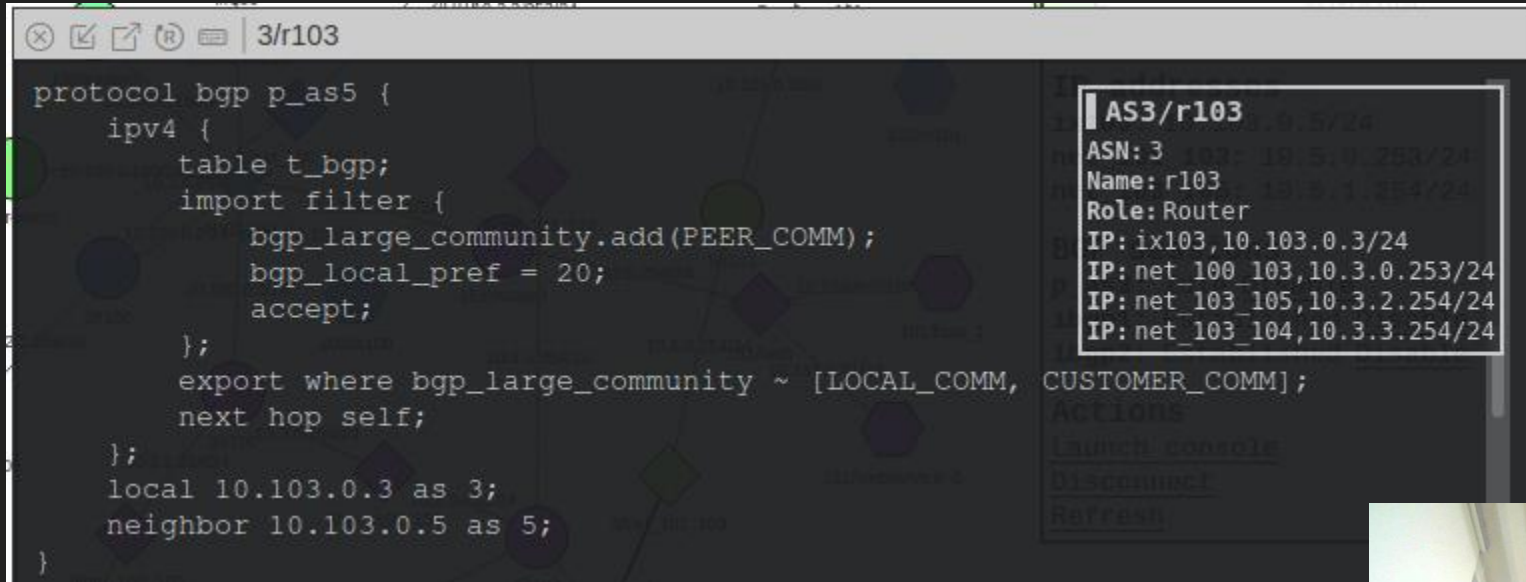
```
protocol bgp c_as153 {  
  ipv4 {  
    table t_bgp;  
    import filter {  
      bgp_large_community.add(CUSTOMER_COMM);  
      bgp_local_pref = 20;  
      accept;  
    };  
    export all;  
    next hop self;  
  };  
  local 10.0.0.12 as 5;  
  neighbor 10.101.0.153 as 153;  
}
```

AS5/r101
ASN: 5
Name: r101 NS
Role: Router [Add](#) [Disable](#)
IP: ix101,10.101.0.5/24
IP: net_101_103,10.5.0.254/24

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 2c: AS-5 (IX-103) peering with AS-3



The screenshot displays a network configuration interface. On the left, a terminal window shows the configuration for a BGP protocol named 'p_as5'. The configuration includes an IPv4 table 't_bgp', an import filter, and a large community 'PEER_COMM'. It also sets a local preference of 20 and configures a neighbor at 10.103.0.5 as AS 5. On the right, a sidebar shows details for 'AS3/r103', including its ASN (3), name (r103), role (Router), and several IP addresses and networks. Below this, there are links for 'Launch console', 'Disconnect', and 'Refresh'.

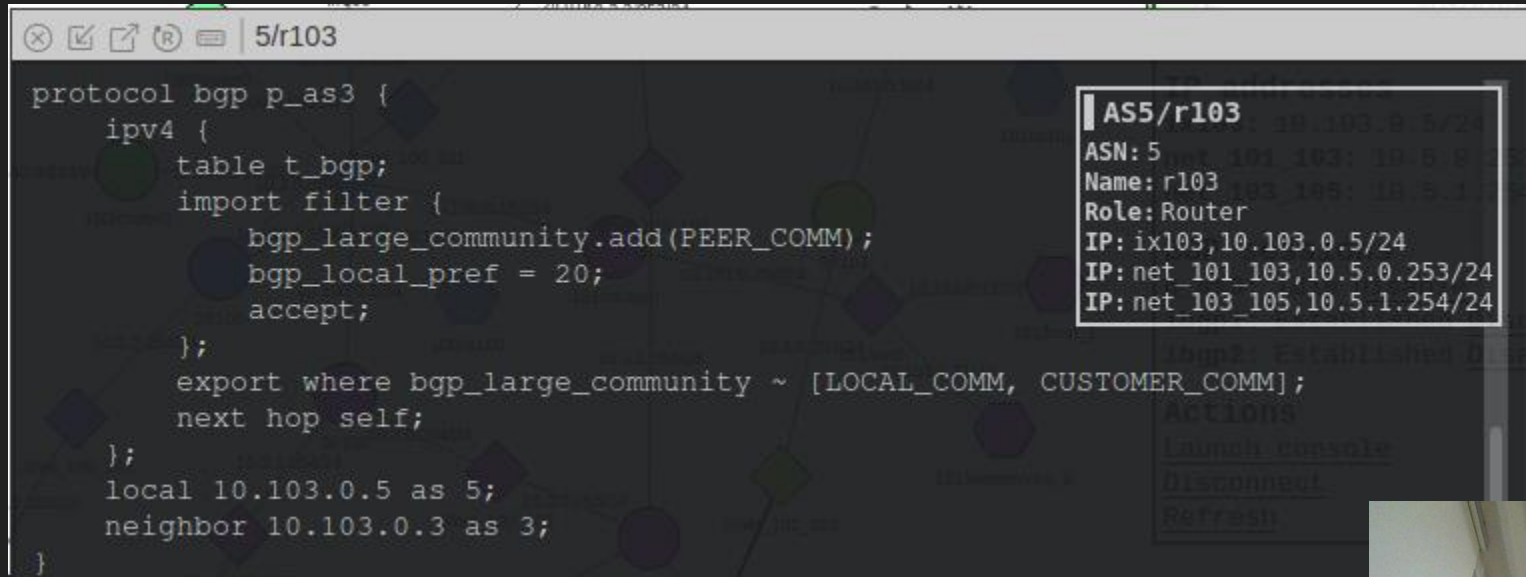
```
protocol bgp p_as5 {  
  ipv4 {  
    table t_bgp;  
    import filter {  
      bgp_large_community.add(PEER_COMM);  
      bgp_local_pref = 20;  
      accept;  
    };  
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];  
    next hop self;  
  };  
  local 10.103.0.3 as 3;  
  neighbor 10.103.0.5 as 5;  
}
```

AS3/r103
ASN: 3
Name: r103
Role: Router
IP: ix103,10.103.0.3/24
IP: net_100_103,10.3.0.253/24
IP: net_103_105,10.3.2.254/24
IP: net_103_104,10.3.3.254/24

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 2c: AS-5 (IX-103) peering with AS-3



5/r103

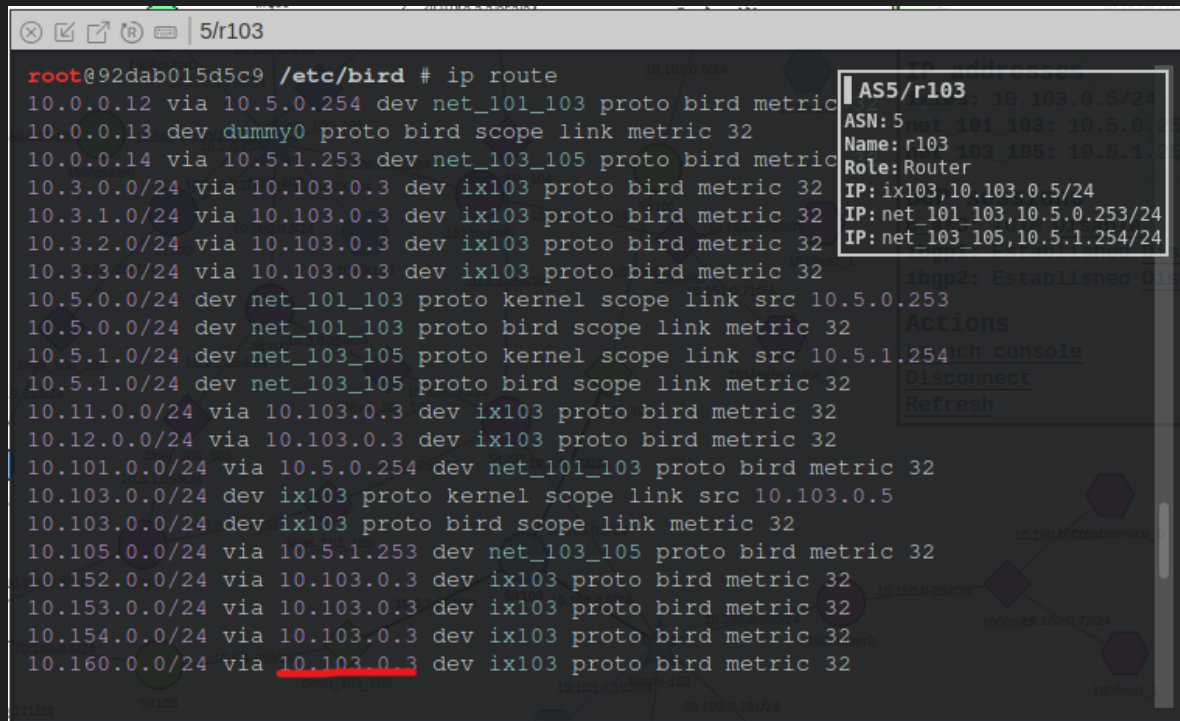
```
protocol bgp p_as3 {  
  ipv4 {  
    table t_bgp;  
    import filter {  
      bgp_large_community.add(PEER_COMM);  
      bgp_local_pref = 20;  
      accept;  
    };  
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];  
    next hop self;  
  };  
  local 10.103.0.5 as 5;  
  neighbor 10.103.0.3 as 3;  
}
```

AS5/r103
ASN: 5
Name: r103
Role: Router
IP: ix103,10.103.0.5/24
IP: net_101_103,10.5.0.253/24
IP: net_103_105,10.5.1.254/24

ACTIONS
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 2c: AS-5 (IX-103) peering with AS-3 proof



```
root@92dab015d5c9 /etc/bird # ip route
10.0.0.12 via 10.5.0.254 dev net_101_103 proto bird metric 32
10.0.0.13 dev dummy0 proto bird scope link metric 32
10.0.0.14 via 10.5.1.253 dev net_103_105 proto bird metric 32
10.3.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.3.1.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.3.2.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.3.3.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.5.0.0/24 dev net_101_103 proto kernel scope link src 10.5.0.253
10.5.0.0/24 dev net_101_103 proto bird scope link metric 32
10.5.1.0/24 dev net_103_105 proto kernel scope link src 10.5.1.254
10.5.1.0/24 dev net_103_105 proto bird scope link metric 32
10.11.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.12.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.101.0.0/24 via 10.5.0.254 dev net_101_103 proto bird metric 32
10.103.0.0/24 dev ix103 proto kernel scope link src 10.103.0.5
10.103.0.0/24 dev ix103 proto bird scope link metric 32
10.105.0.0/24 via 10.5.1.253 dev net_103_105 proto bird metric 32
10.152.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.153.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.154.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
10.160.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32
```

AS5/r103
ASN: 5
Name: r103
Role: Router
IP: ix103, 10.103.0.5/24
IP: net_101_103, 10.5.0.253/24
IP: net_103_105, 10.5.1.254/24

ibgp2: Established
Actions
[Disconnect](#)
[Refresh](#)

Task 3a: Showing all AS-150's routes

- AS elements.
- Shortest route selected.
- OSPF protocol.

```
150/router0
root@1de7600f3751 / # ip route
10.0.0.19 dev dummy0 proto bird scope link metric 32
10.2.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.2.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.0.0/24 via 10.100.0.3 dev ix100 proto bird metric 32
10.3.1.0/24 via 10.100.0.3 dev ix100 proto bird metric 32
10.3.2.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.3.3.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.4.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.4.1.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.11.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.12.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.100.0.0/24 dev ix100 proto kernel scope link src 10.100.0.150
10.100.0.0/24 dev ix100 proto bird scope link metric 32
10.150.0.0/24 dev net0 proto kernel scope link src 10.150.0.254
10.150.0.0/24 dev net0 proto bird scope link metric 32
10.151.0.0/24 via 10.100.0.151 dev ix100 proto bird metric 32
10.152.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.153.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.154.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
10.155.0.0/24 via 10.100.0.2 dev ix100 proto bird metric 32
```

AS150/router0
ASN: 150
Name: router0
Role: Router
IP: net0, 10.150.0.254/24
IP: ix100, 10.100.0.150/24

Task 3b: Giving preference to AS-3 in AS-150

```
150/router0

protocol bgp u_as2 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PROVIDER_COMM);
      bgp_local_pref = 10;
      accept;
    };
    export where bgp_large_community ~ [LOCAL_COMM, CUSTOMER_COMM];
    next hop self;
  };
  local 10.100.0.150 as 150;
  neighbor 10.100.0.2 as 2;
}

protocol bgp u_as3 {
  ipv4 {
    table t_bgp;
    import filter {
      bgp_large_community.add(PROVIDER_COMM);
      bgp_local_pref = 100;
      accept;
    };
  };
}
```

AS150/router0
ASN: 150
Name: router0
Role: Router
IP: net0,10.150.0.254/24
IP: ix100,10.100.0.150/24

Actions
[Disconnect](#)
[Refresh](#)



Task 4: Hosts that don't connect with the other AS-190

Details

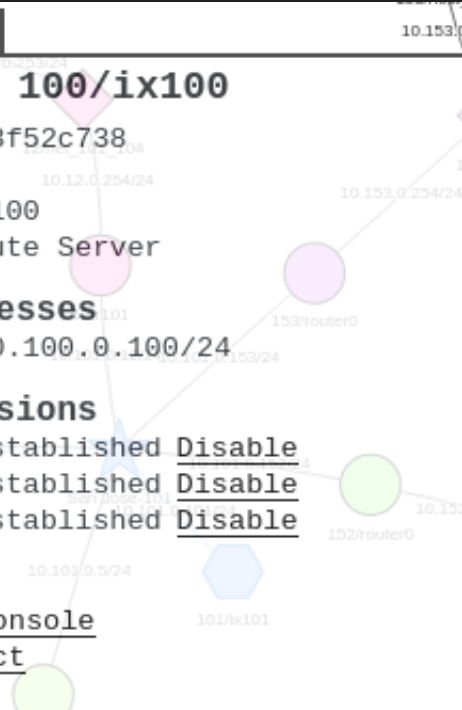
Host: 100/ix100

ID: 76073f52c738
ASN: 100
Name: ix100
Role: Route Server

IP addresses
ix100: 10.100.0.100/24

BGP sessions
p_as2: Established [Disable](#)
p_as3: Established [Disable](#)
p_as4: Established [Disable](#)

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Details

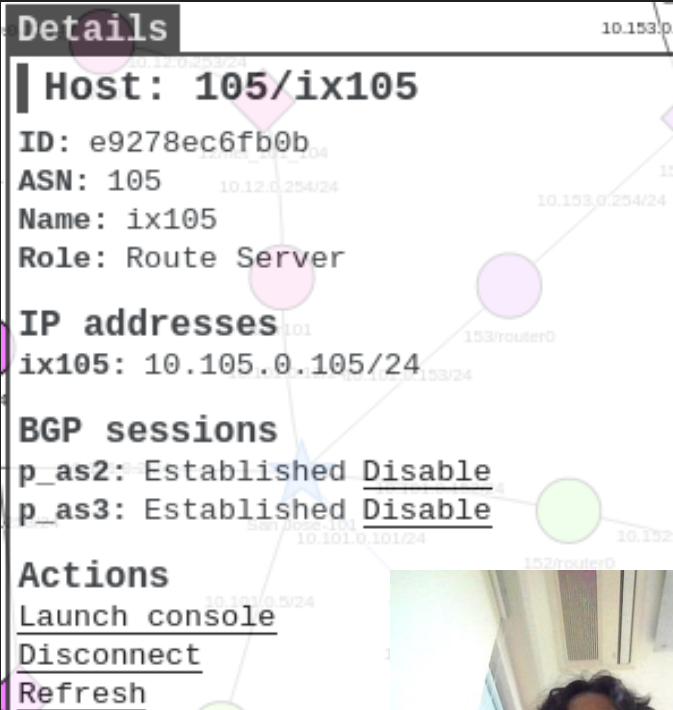
Host: 105/ix105

ID: e9278ec6fb0b
ASN: 105
Name: ix105
Role: Route Server

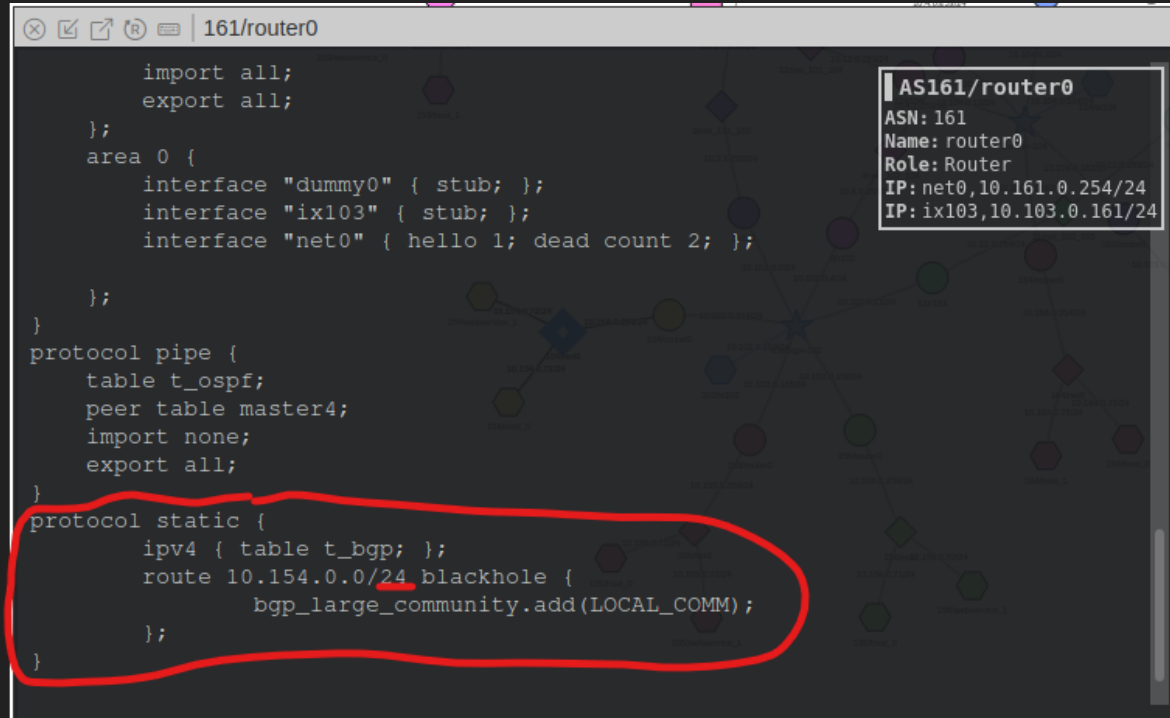
IP addresses
ix105: 10.105.0.105/24

BGP sessions
p_as2: Established [Disable](#)
p_as3: Established [Disable](#)

Actions
[Launch console](#)
[Disconnect](#)
[Refresh](#)



Task 5a: Creating a “blackhole” in AS-154 via AS-161



```
161/router0

import all;
export all;

};

area 0 {
    interface "dummy0" { stub; };
    interface "ix103" { stub; };
    interface "net0" { hello 1; dead count 2; };

};

}

protocol pipe {
    table t_ospf;
    peer table master4;
    import none;
    export all;
}

protocol static {
    ipv4 { table t_bgp; };
    route 10.154.0.0/24 blackhole {
        bgp_large_community.add(LOCAL_COMM);
    };
}
```

AS161/router0
ASN: 161
Name: router0
Role: Router
IP: net0, 10.161.0.254/24
IP: ix103, 10.103.0.161/24



Task 5a: Testing the blackhole in AS-161

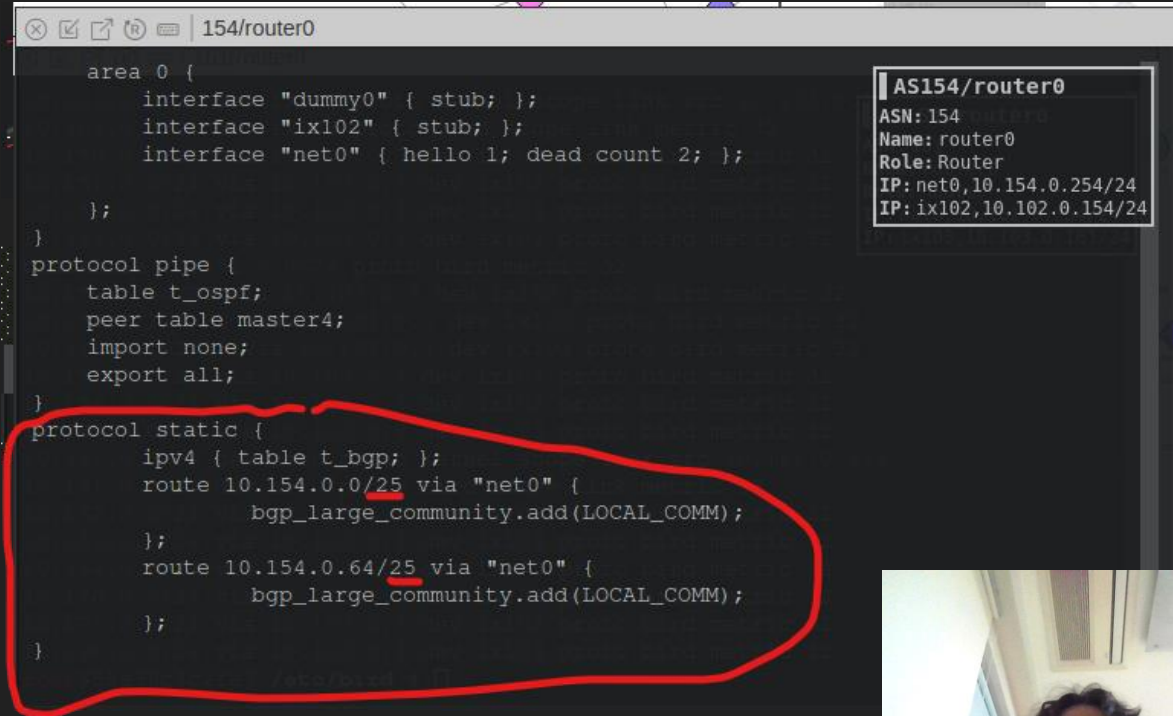
```
161/router0  
  
root@55a39c7c2fe7 /etc/bird # ip route  
10.0.0.27 dev dummy0 proto bird scope link metric 32  
10.2.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.2.1.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.2.2.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.3.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.3.1.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.3.2.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.3.3.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.4.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.4.1.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.11.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.12.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.103.0.0/24 dev ix103 proto kernel scope link src 10.103.0.161  
10.103.0.0/24 dev ix103 proto bird scope link metric 32  
10.150.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.151.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.152.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
10.153.0.0/24 via 10.103.0.3 dev ix103 proto bird metric 32  
blackhole 10.154.0.0/24 proto bird metric 32  
10.154.0.64/26 via 10.103.0.3 dev ix103 proto bird metric 32  
10.154.0.128/26 via 10.103.0.3 dev ix103 proto bird metric 32
```

AS161/router0
ASN: 161
Name: router0
Role: Router
IP: net0, 10.161.0.254/24
IP: ix103, 10.103.0.161/24



Task 5b: AS-154 fighting back and getting traffic back

- For every prefix attacked, creating two.
- The new prefixes are a bit longer (25).



```
154/router0

area 0 {
    interface "dummy0" { stub; };
    interface "ix102" { stub; };
    interface "net0" { hello 1; dead count 2; };
};

protocol pipe {
    table t_ospf;
    peer table master4;
    import none;
    export all;
};

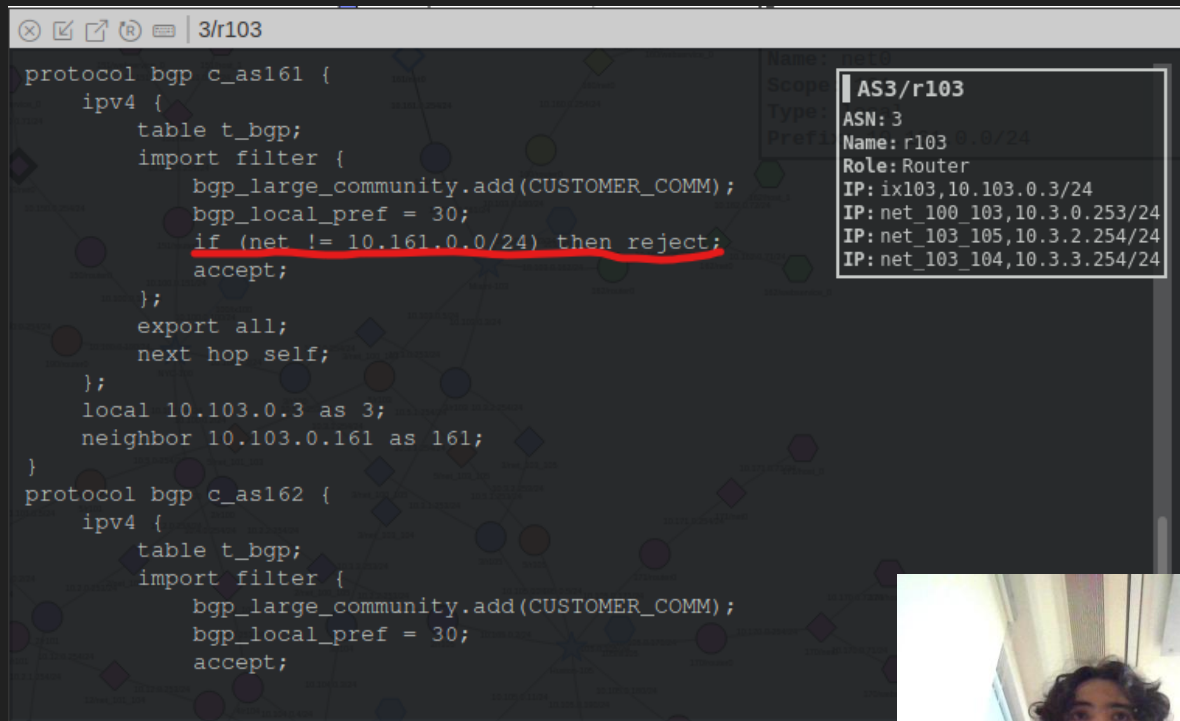
protocol static {
    ipv4 { table t_bgp; };
    route 10.154.0.0/25 via "net0" {
        bgp_large_community.add(LOCAL_COMM);
    };
    route 10.154.0.64/25 via "net0" {
        bgp_large_community.add(LOCAL_COMM);
    };
};
```

AS154/router0
ASN: 154
Name: router0
Role: Router
IP: net0, 10.154.0.254/24
IP: ix102, 10.102.0.154/24



Task 5d: Stopping AS-161's fake announcements

- Only import routes to AS-161.
- Do not disseminate messages.



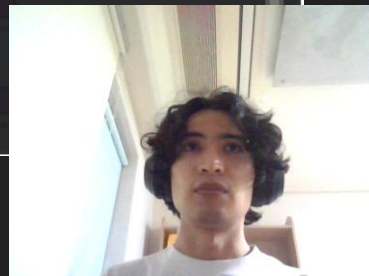
The screenshot shows a network configuration window titled "3/r103". The configuration is for a BGP process named "c_as161". The "import filter" section contains the following logic:

```
protocol bgp c_as161 {  
  ipv4 {  
    table t_bgp;  
    import filter {  
      bgp_large_community.add(CUSTOMER_COMM);  
      bgp_local_pref = 30;  
      if (net != 10.161.0.0/24) then reject;  
      accept;  
    };  
    export all;  
    next hop self;  
  };  
  local 10.103.0.3 as 3;  
  neighbor 10.103.0.161 as 161;  
}
```

The line `if (net != 10.161.0.0/24) then reject;` is underlined in red. Below the configuration, there is another BGP process named "c_as162" with similar settings, but without the rejection logic.

On the right side of the window, a sidebar displays the configuration for "AS3/r103":

Name:	net103
Scope:	AS3/r103
Type:	ASN: 3
Pref1:	Name: r103 0.0/24
	Role: Router
	IP: ix103, 10.103.0.3/24
	IP: net_100_103, 10.3.0.253/24
	IP: net_103_105, 10.3.2.254/24
	IP: net_103_104, 10.3.3.254/24



Thank you!

