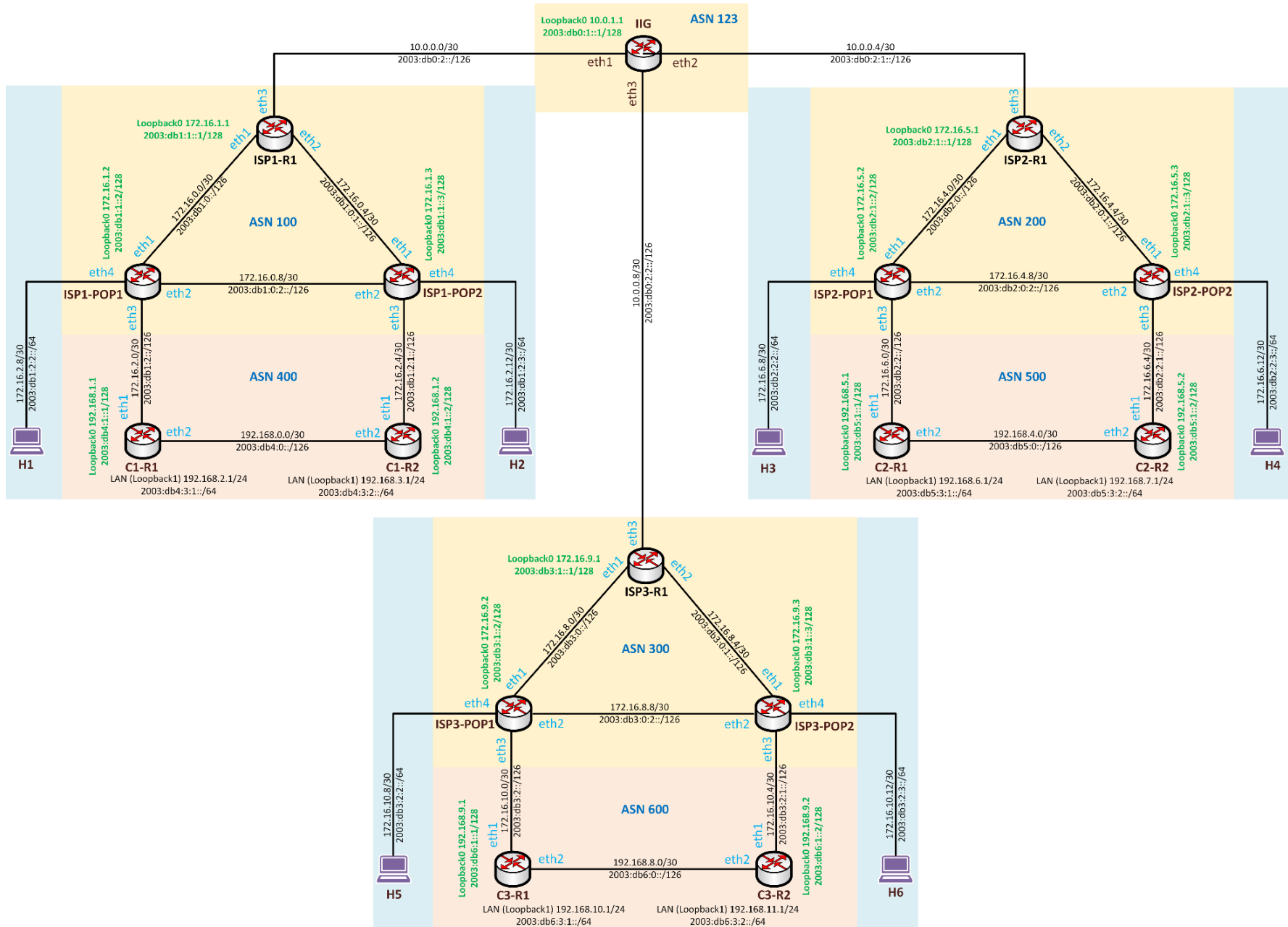


# Lab-5: BGP Policy Lab for IPv6

bdNOG11 IPv6 Routing Workshop on MikroTik RouterOS – LAB Topology



## IP Address Allocation

Organizations hold below number resources from RIR			
	ASN	IPv4	IPv6
IIG	123	10.0.0.0/22	2003:db0::/32
ISP1	100	172.16.0.0/22	2003:db1::/32
ISP2	200	172.16.4.0/22	2003:db2::/32
ISP3	300	172.16.8.0/22	2003:db3::/32
C1	400	192.168.0.0/22	2003:db4::/32
C2	500	192.168.4.0/22	2003:db5::/32
C3	600	192.168.8.0/22	2003:db6::/32

## IP Address Breakdown Plan

IIG	2003:db0::/32	10.0.0.0/22	
	Infra P2P	2003:db0:0::/48	10.0.0.0/24
	Infra Loopback	2003:db0:1::/48	10.0.1.0/24
	PE-CE	2003:db0:2::/48	10.0.2.0/24
	CE LAN	2003:db0:3::/48	10.0.3.0/24

ISP1	2003:db1::/32	172.16.0.0/22	
	Infra P2P	2003:db1:0::/48	172.16.0.0/24
	Infra Loopback	2003:db1:1::/48	172.16.1.0/24
	PE-CE	2003:db1:2::/48	172.16.2.0/24
	CE LAN	2003:db1:3::/48	172.16.3.0/24

C1	2003:db4::/32	192.168.0.0/22	
	Infra P2P	2003:db4:0::/48	192.168.0.0/24
	Infra Loopback	2003:db4:1::/48	192.168.1.0/24
	PE-CE	2003:db4:2::/48	192.168.2.0/24
	CE LAN	2003:db4:3::/48	192.168.3.0/24

ISP2	2003:db2::/32	172.16.4.0/22	
	Infra P2P	2003:db2:0::/48	172.16.4.0/24
	Infra Loopback	2003:db2:1::/48	172.16.5.0/24
	PE-CE	2003:db2:2::/48	172.16.6.0/24
	CE LAN	2003:db2:3::/48	172.16.4.0/24

C2	2003:db5::/32	192.168.4.0/22	
	Infra P2P	2003:db5:0::/48	192.168.4.0/24
	Infra Loopback	2003:db5:1::/48	192.168.5.0/24
	PE-CE	2003:db5:2::/48	192.168.6.0/24
	CE LAN	2003:db5:3::/48	192.168.7.0/24

<b>ISP3</b>	2003:db3::/32	172.16.8.0/22	
	Infra P2P	2003:db3:0::/48	172.16.8.0/24
	Infra Loopback	2003:db3:1::/48	172.16.9.0/24
	PE-CE	2003:db3:2::/48	172.16.10.0/24
	CE LAN	2003:db3:3::/48	172.16.11.0/24

<b>C3</b>	2003:db6::/32	192.168.8.0/22	
	Infra P2P	2003:db6:0::/48	192.168.8.0/24
	Infra Loopback	2003:db6:1::/48	192.168.9.0/24
	PE-CE	2003:db6:2::/48	192.168.10.0/24
	CE LAN	2003:db6:3::/48	192.168.11.0/24

### Final IP Plan

P2P IP				Loopback		LAN Block
Link Between		IPv4 Block	IPv6 Block	Router	IPv4 / IPv6	IPv4 / IPv6
IIG	ISP1-R1	10.0.0.0/30	2003:db0:2::/126	IIG	10.0.1.1	N/A
IIG	ISP2-R1	10.0.0.4/30	2003:db0:2:1::/126		2003:db0:1::1/128	N/A
IIG	ISP3-R1	10.0.0.8/30	2003:db0:2:2::/126			
ISP1-R1	ISP1-POP1	172.16.0.0/30	2003:db1:0::/126	ISP1-R1	172.16.1.1	N/A
ISP1-R1	ISP1-POP2	172.16.0.4/30	2003:db1:0:1::/126		2003:db1:1::1/128	N/A
ISP1-POP1	ISP1-POP2	172.16.0.8/30	2003:db1:0:2::/126	ISP1-POP1	172.16.1.2	N/A
ISP1-POP1	C1-R1	172.16.2.0/30	2003:db1:2::/126		2003:db1:1::2/128	N/A
ISP1-POP2	C1-R2	172.16.2.4/30	2003:db1:2:1::/126	ISP1-POP2	172.16.1.3	N/A
ISP1-POP1	H1	172.16.2.8/30	2003:db1:2:2::/64		2003:db1:1::3/128	N/A
ISP1-POP2	H2	172.16.2.12/30	2003:db1:2:3::/64			
ISP2-R1	ISP2-POP1	172.16.4.0/30	2003:db2:0::/126	ISP2-R1	172.16.5.1	N/A
ISP2-R1	ISP2-POP2	172.16.4.4/30	2003:db2:0:1::/126		2003:db2:1::1/128	N/A
ISP2-POP1	ISP2-POP2	172.16.4.8/30	2003:db2:0:2::/126	ISP2-POP1	172.16.5.2	N/A
ISP2-POP1	C2-R1	172.16.6.0/30	2003:db2:2::/126		2003:db2:1::2/128	N/A
ISP2-POP2	C2-R2	172.16.6.4/30	2003:db2:2:1::/126	ISP2-POP2	172.16.5.3	N/A
ISP2-POP1	H3	172.16.6.8/30	2003:db2:2:2::/64		2003:db2:1::3/128	N/A
ISP2-POP2	H4	172.16.6.12/30	2003:db2:2:3::/64			

P2P IP				Loopback		LAN Block
Link Between		IPv4 Block	IPv6 Block	Router	IPv4 / IPv6	IPv4 / IPv6
ISP3-R1	ISP3-POP1	172.16.8.0/30	2003:db3:0::/126	ISP3-R1	172.16.9.1	N/A
ISP3-R1	ISP3-POP2	172.16.8.4/30	2003:db3:0:1::/126		2003:db3:1::1/128	N/A
ISP3-POP1	ISP3-POP2	172.16.8.8/30	2003:db3:0:2::/126	ISP3-POP1	172.16.9.2	N/A
ISP3-POP1	C3-R1	172.16.10.0/30	2003:db3:2::/126		2003:db3:1::2/128	N/A
ISP3-POP2	C3-R2	172.16.10.4/30	2003:db3:2:1::/126	ISP3-POP2	172.16.9.3	N/A
ISP3-POP1	H5	172.16.10.8/30	2003:db3:2:2::/64		2003:db3:1::3/128	N/A
ISP3-POP2	H6	172.16.10.12/30	2003:db3:2:3::/64			
C1-R1	C1-R2	192.168.0.0/30	2003:db4:0::/126	C1-R1	192.168.1.1	192.168.2.1/24
					2003:db4:1::1/128	2003:db4:3:1::/64
				C1-R2	192.168.1.2	192.168.3.1/24
					2003:db4:1::2/128	2003:db4:3:2::/64
C2-R1	C2-R2	192.168.4.0/30	2003:db5:0::/126	C2-R1	192.168.5.1	192.168.6.1/24
					2003:db5:1::1/128	2003:db5:3:1::/64
				C2-R2	192.168.5.2	192.168.7.1/24
					2003:db5:1::2/128	2003:db5:3:2::/64
C3-R1	C3-R2	192.168.8.0/30	2003:db6:0::/126	C3-R1	192.168.9.1	192.168.10.1/24
					2003:db6:1::1/128	2003:db6:3:1::/64
				C3-R2	192.168.9.2	192.168.11.1/24
					2003:db6:1::2/128	2003:db6:3:2::/64

## Task-15: Configure Inbound Prefix Filtering on IIG for IPv6

### IIG

```
/routing filter add chain=ISP1-V6-IN prefix=2003:db1::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP1-V6-IN prefix=2003:db4::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP1-V6-IN action=discard
```

```
/routing filter add chain=ISP2-V6-IN prefix=2003:db2::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP2-V6-IN prefix=2003:db5::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP2-V6-IN action=discard
```

```
/routing filter add chain=ISP3-V6-IN prefix=2003:db3::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP3-V6-IN prefix=2003:db6::/32 prefix-length=32-48 action=accept
/routing filter add chain=ISP3-V6-IN action=discard
```

```
/ routing bgp peer print
```

Flags: X - disabled, E - established

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	10.0.0.2	100
1	E default	10.0.0.6	200
2	E default	10.0.0.10	300
3	E default	2003:db0:2::2	100
4	E default	2003:db0:2:1::2	200
5	E default	2003:db0:2:2::2	300

```
/routing bgp peer set 3 in-filter=ISP1-V6-IN
/routing bgp peer set 4 in-filter=ISP2-V6-IN
/routing bgp peer set 5 in-filter=ISP3-V6-IN
```

## Task-16: Configure Inbound Prefix Filtering on ISPs for IPv6 (ISP1-R1, ISP2-R1, ISP3-R1)

### ISP1-R1

```
/routing filter add chain=IIG-V6-IN prefix=::/0 prefix-length=0-48 action=accept  
/routing filter add chain=IIG-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.1.2	100
1	E default	172.16.1.3	100
2	E default	2003:db1:1::2	100
3	E default	2003:db1:1::3	100
4	E default	10.0.0.1	123
5	E default	2003:db0:2::1	123

```
/routing bgp peer set 5 in-filter=IIG-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP2-R1

```
/routing filter add chain=IIG-V6-IN prefix=::/0 prefix-length=0-48 action=accept  
/routing filter add chain=IIG-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.5.2	200
1	E default	172.16.5.3	200
2	E default	2003:db2:1::2	200
3	E default	2003:db2:1::3	200
4	E default	10.0.0.5	123
5	E default	2003:db0:2:1::1	123

```
/routing bgp peer set 5 in-filter=IIG-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP3-R1

```
/routing filter add chain=IIG-V6-IN prefix=::/0 prefix-length=0-48 action=accept  
/routing filter add chain=IIG-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.9.2	300
1	E default	172.16.9.3	300
2	E default	2003:db3:1::2	300
3	E default	2003:db3:1::3	300
4	E default	10.0.0.9	123
5	E default	2003:db0:2:2::1	123

```
/routing bgp peer set 5 in-filter=IIG-V6-IN
```

```
/ipv6 route print where bgp
```

## Task-17: Configure Inbound Prefix Filtering on POPs for IPv4

### ISP1-POP1

```
/routing filter add chain=C1R1-V6-IN prefix=2003:db4::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C1R1-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.1.1	100
1	E default	2003:db1:1::1	100
2	E default	172.16.2.2	400
3	E default	2003:db1:2::2	400

```
/routing bgp peer set 3 in-filter=C1R1-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP1-POP2

```
/routing filter add chain=C1R2-V6-IN prefix=2003:db4::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C1R2-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.1.1	100
1	E default	2003:db1:1::1	100
2	E default	172.16.2.6	400
3	E default	2003:db1:2:1::2	400

```
/routing bgp peer set 3 in-filter=C1R2-V6-IN
```

```
/ipv6 route print where bgp
```



### ISP2-POP1

```
/routing filter add chain=C2R1-V6-IN prefix=2003:db5::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C2R1-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.5.1	200
1	E default	2003:db2:1::1	200
2	E default	172.16.6.2	500
3	E default	2003:db2:2::2	

```
/routing bgp peer set 3 in-filter=C2R1-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP2-POP2

```
/routing filter add chain=C2R2-V6-IN prefix=2003:db5::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C2R2-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.5.1	200
1	E default	2003:db2:1::1	200
2	E default	172.16.6.6	500
3	E default	2003:db2:2:1::2	500

```
/routing bgp peer set 3 in-filter=C2R2-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP3-POP1

```
/routing filter add chain=C3R1-V6-IN prefix=2003:db6::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C3R1-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.9.1	300
1	E default	2003:db3:1::1	300
2	E default	172.16.10.2	600
3	E default	2003:db3:2::2	600

```
/routing bgp peer set 3 in-filter=C3R1-V6-IN
```

```
/ipv6 route print where bgp
```

### ISP3-POP2

```
/routing filter add chain=C3R2-V6-IN prefix=2003:db6::/32 prefix-length=32-48 action=accept  
/routing filter add chain=C3R2-V6-IN action=discard
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	172.16.9.1	300
1	E default	2003:db3:1::1	300
2	E default	172.16.10.6	600
3	E default	2003:db3:2:1::2	600

```
/routing bgp peer set 3 in-filter=C3R2-V6-IN
```

```
/ipv6 route print where bgp
```

## Task-18: Configure TE on C1, C2 and C3

### C1-R1

```
/routing filter add chain=ISP1-V6-IN set-bgp-local-pref=200  
/routing filter add chain=ISP1-V6-OUT set-bgp-med=100
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.1.2	400
1	E default	2003:db4:1::2	400
2	E default	172.16.2.1	100
3	E default	2003:db1:2::1	100

```
/routing bgp peer set 3 out-filter=ISP1-V6-OUT
```

```
/routing bgp peer set 3 in-filter=ISP1-V6-IN
```

### C1-R2

```
/routing filter add chain=ISP1-V6-IN set-bgp-local-pref=100  
/routing filter add chain=ISP1-V6-OUT set-bgp-med=200
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.1.1	400
1	E default	2003:db4:1::1	400
2	E default	172.16.2.5	100
3	E default	2003:db1:2:1::1	100

```
/routing bgp peer set 3 out-filter=ISP1-V6-OUT
```

```
/routing bgp peer set 3 in-filter=ISP1-V6-IN
```

## C2-R1

```
/routing filter add chain=ISP2-V6-IN set-bgp-local-pref=200  
/routing filter add chain=ISP2-V6-OUT set-bgp-med=100
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.5.2	500
1	E default	2003:db5:1::2	500
2	E default	172.16.6.1	200
3	E default	2003:db2:2::1	200

```
/routing bgp peer set 3 out-filter=ISP2-V6-OUT  
/routing bgp peer set 3 in-filter=ISP2-V6-IN
```

## C2-R2

```
/routing filter add chain=ISP2-V6-IN set-bgp-local-pref=100  
/routing filter add chain=ISP2-V6-OUT set-bgp-med=200
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.5.1	500
1	E default	2003:db5:1::1	500
2	E default	172.16.6.5	200
3	E default	2003:db2:2:1::1	200

```
/routing bgp peer set 3 out-filter=ISP2-V6-OUT  
/routing bgp peer set 3 in-filter=ISP2-V6-IN
```

### C3-R1

```
/routing filter add chain=ISP3-V6-IN set-bgp-local-pref=200  
/routing filter add chain=ISP3-V6-OUT set-bgp-med=100
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.9.2	600
1	E default	2003:db6:1::2	600
2	E default	172.16.10.1	300
3	E default	2003:db3:2::1	300

```
/routing bgp peer set 3 out-filter=ISP3-V6-OUT  
/routing bgp peer set 3 in-filter=ISP3-V6-IN
```

### C3-R2

```
/routing filter add chain=ISP3-V6-IN set-bgp-local-pref=100  
/routing filter add chain=ISP3-V6-OUT set-bgp-med=200
```

```
/routing bgp peer print
```

#	INSTANCE	REMOTE-ADDRESS	REMOTE-AS
0	E default	192.168.9.1	600
1	E default	2003:db6:1::1	600
2	E default	172.16.10.5	300
3	E default	2003:db3:2:1::1	300

```
/routing bgp peer set 3 out-filter=ISP3-V6-OUT  
/routing bgp peer set 3 in-filter=ISP3-V6-IN
```