

kathara lab

bgp: multi-homed with frr

Version	1.0
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Description	configuration of a multi-homed network with backup and load sharing; kathara version of a netkit lab

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preconditions

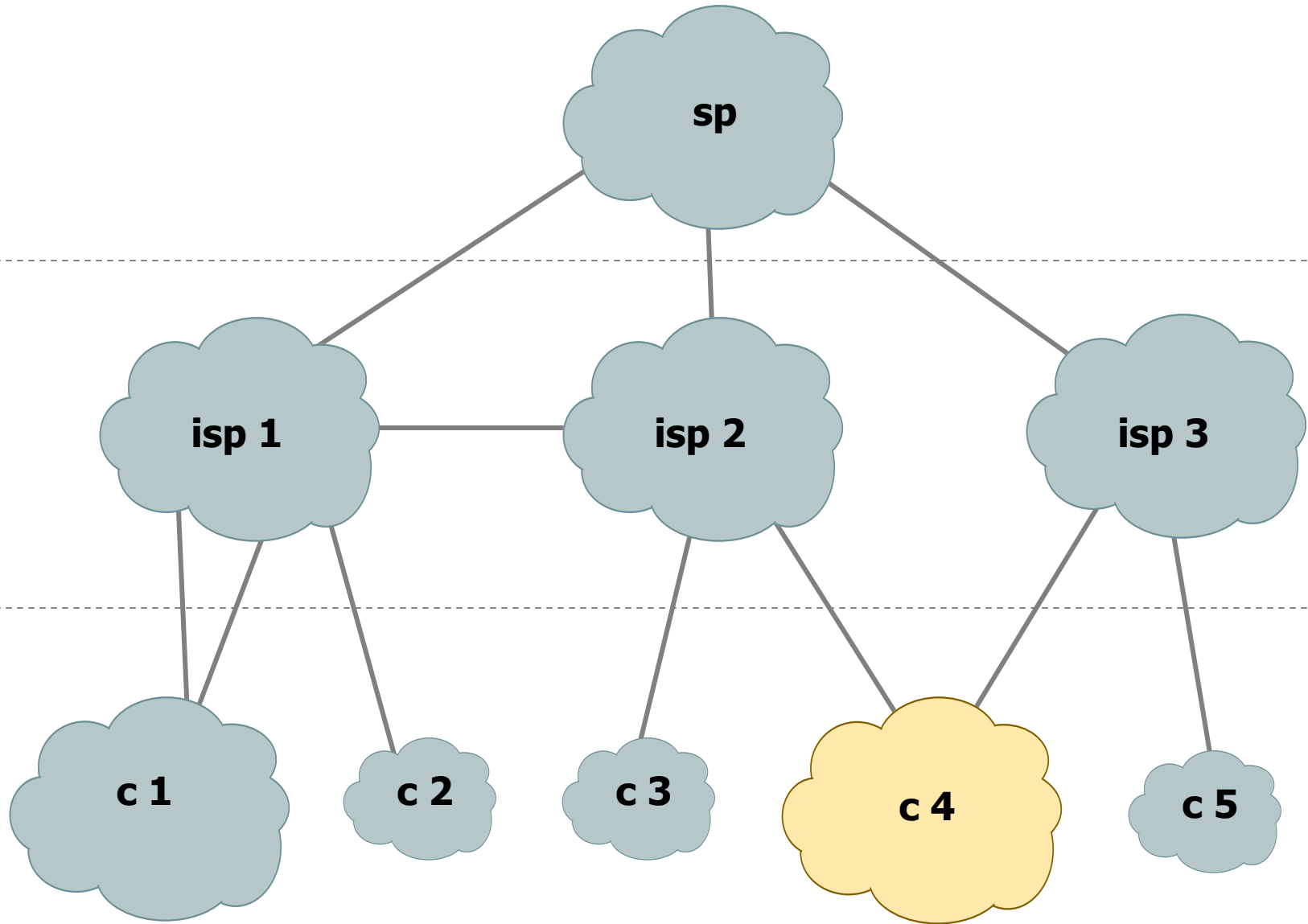
- for this lab we assume you have chosen “kathara/frr” as the default image of your Kathará installation
 - execute “kathara settings”
 - select “choose default image”
 - select “kathara/frr”
 - exit from the settings procedure

multi-homed network

backbone

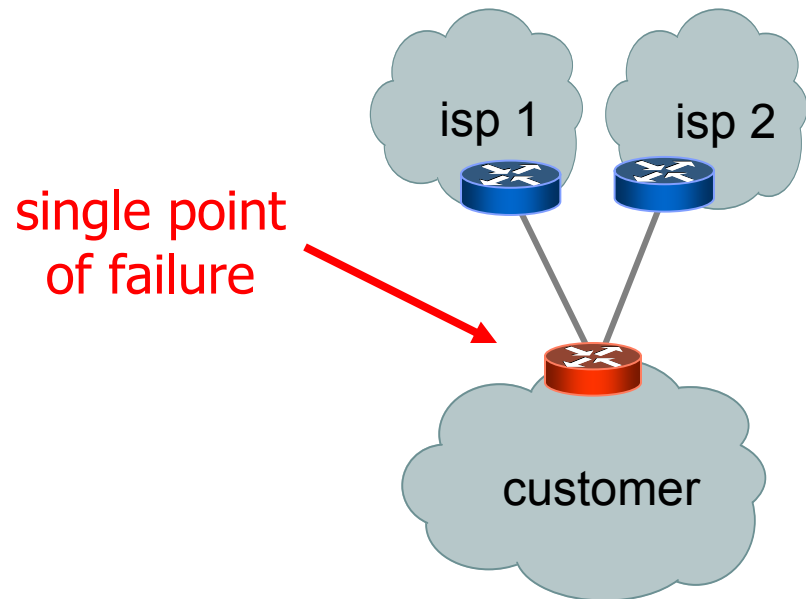
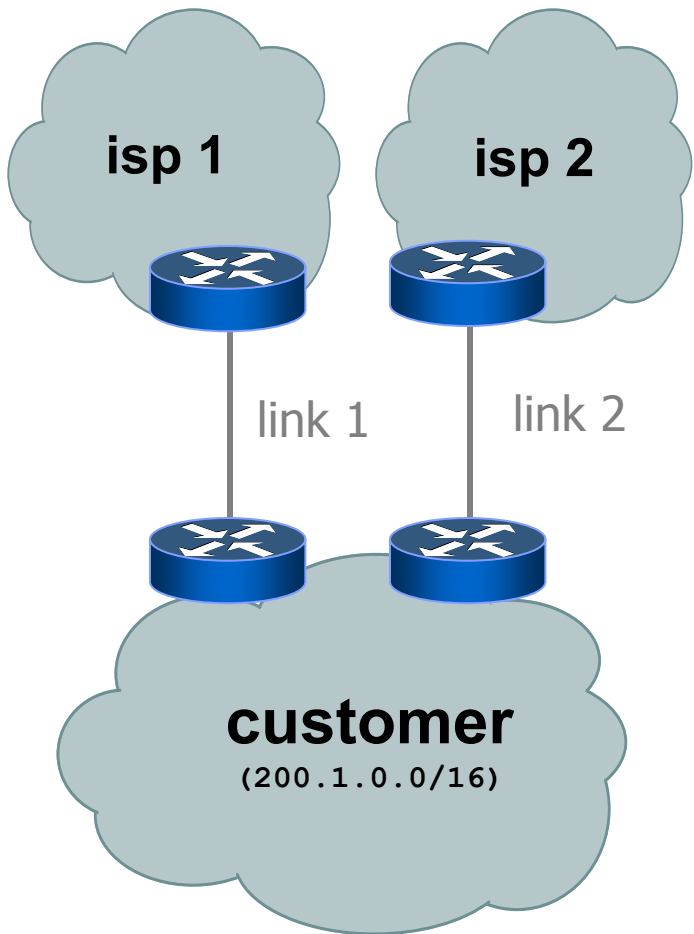
provider

customer



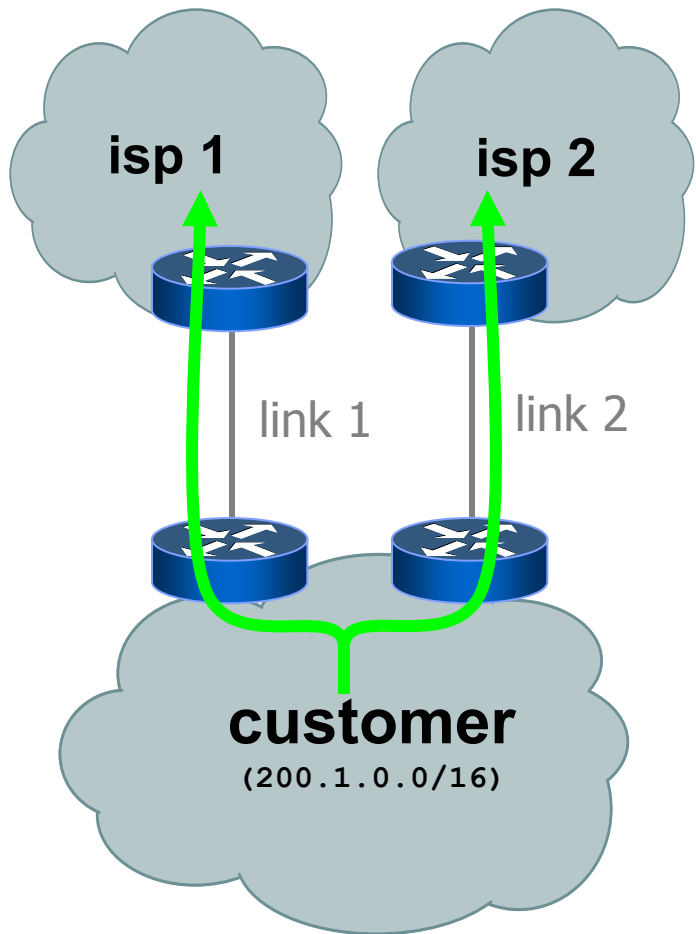
multi-homed network

- two links to two different providers
- generally two routers are involved in order to avoid single points of failures

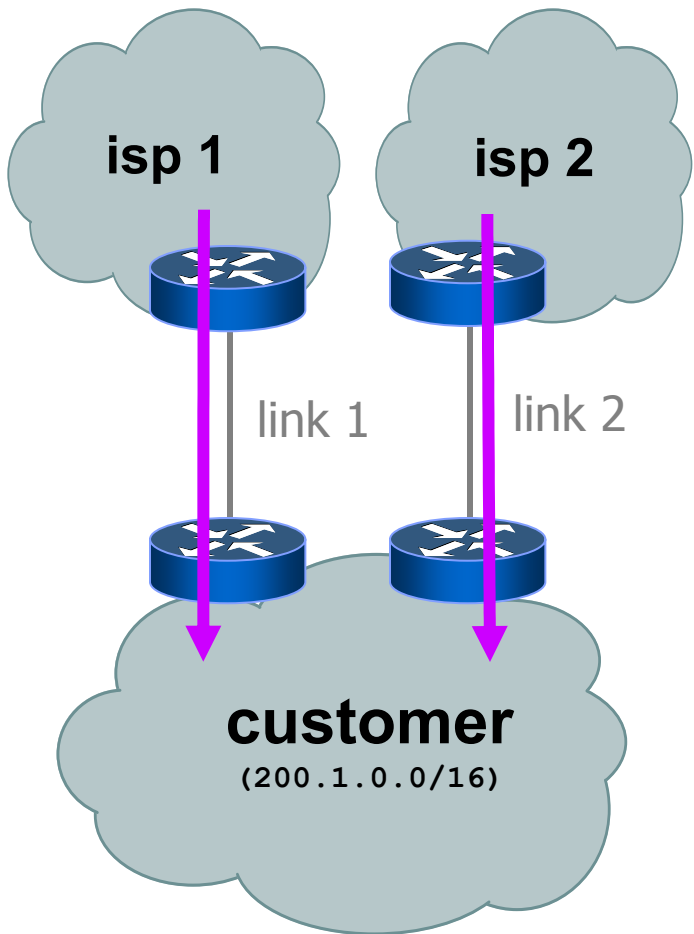


degrees of freedom

- an outbound packet may be sent through one of the two links in order to reach the internet

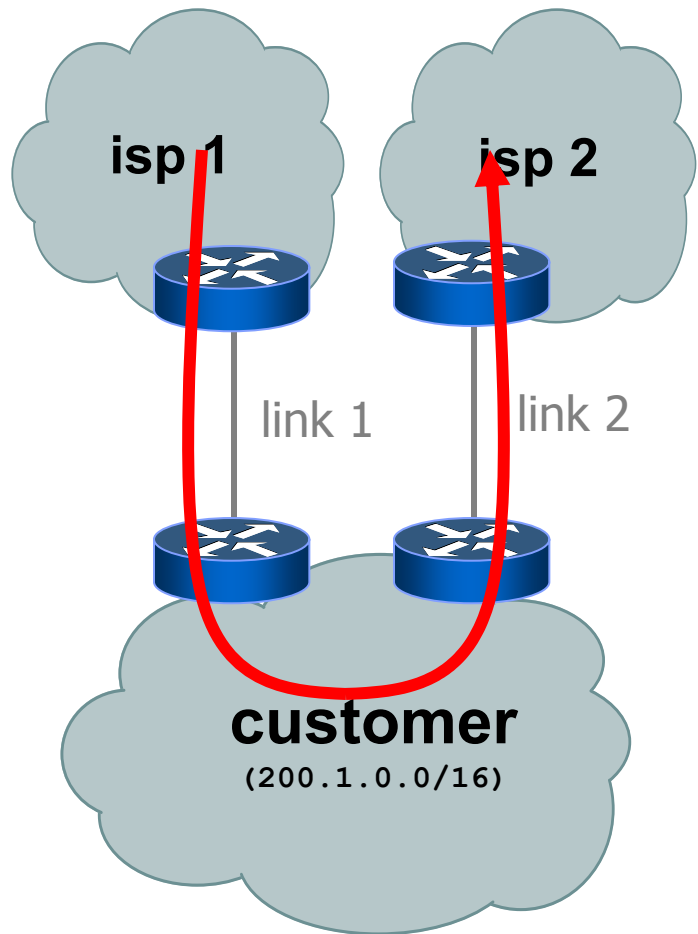


degrees of freedom



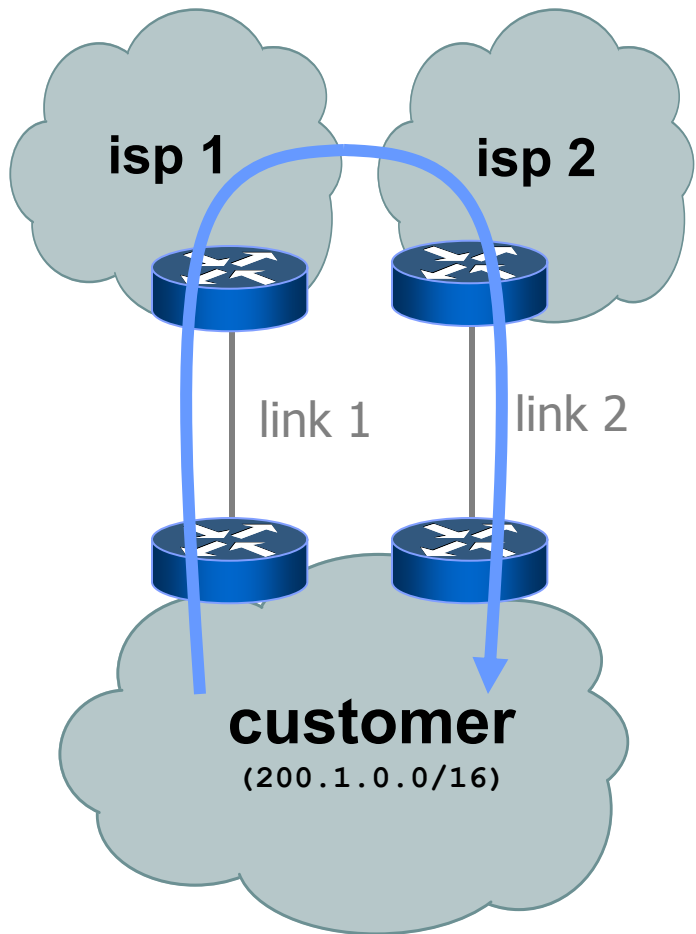
- an outbound packet may be sent through one of the two links in order to reach the internet
- an inbound packet may use any of the two links in order to reach the network

degrees of freedom



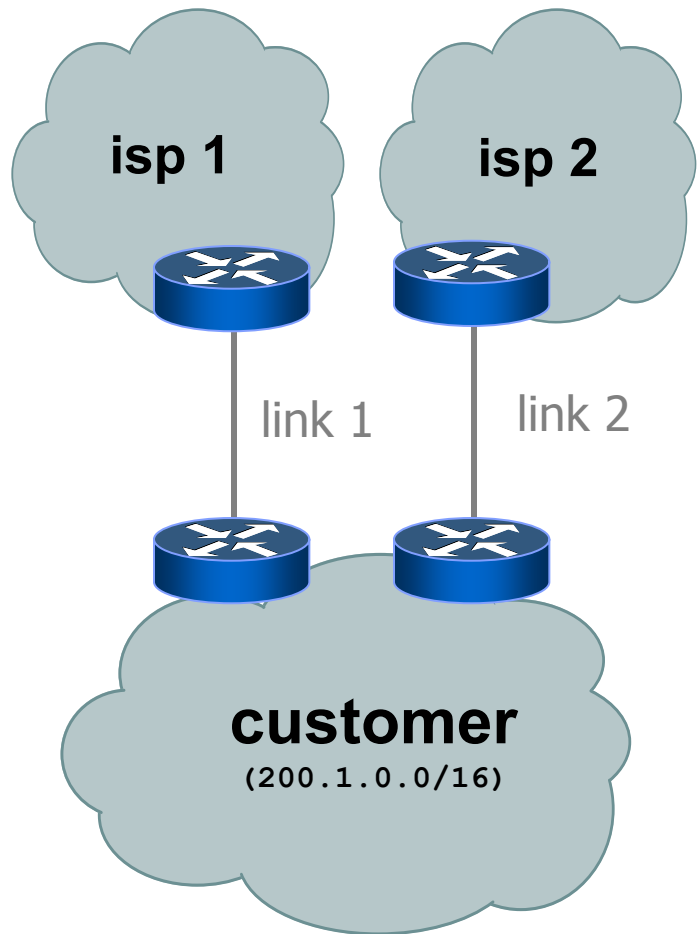
- an outbound packet may be sent through one of the two links in order to reach the internet
- an inbound packet may use any of the two links in order to reach the network
- an internet packet may traverse link 1 and link 2 (or vice versa)

degrees of freedom



- an outbound packet may be sent through one of the two links in order to reach the internet
- an inbound packet may use any of the two links in order to reach the network
- an internet packet may traverse link 1 and link 2 (or vice versa)
- a local packet may traverse link 1 and link 2 (or vice versa)

desired policy: loadsharing

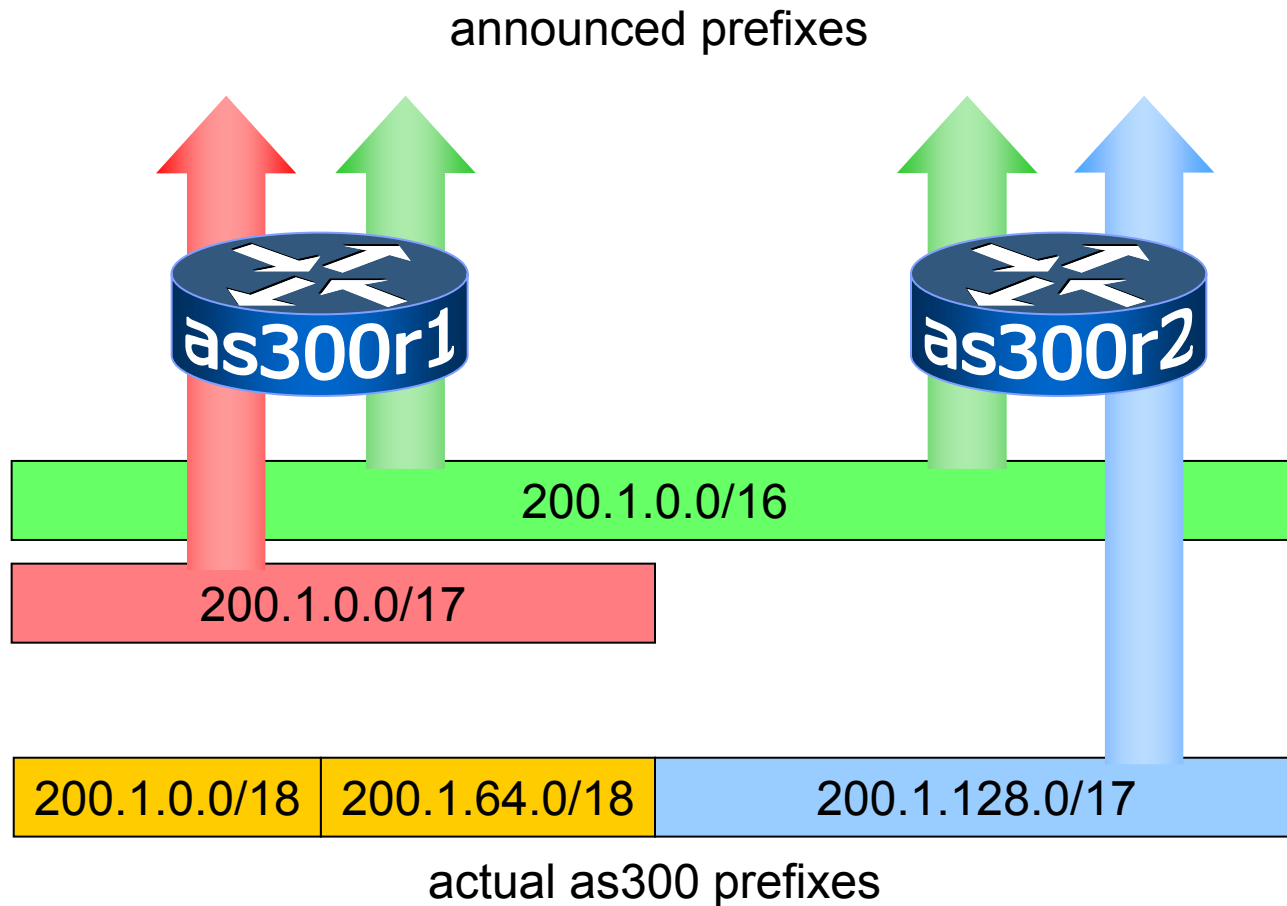


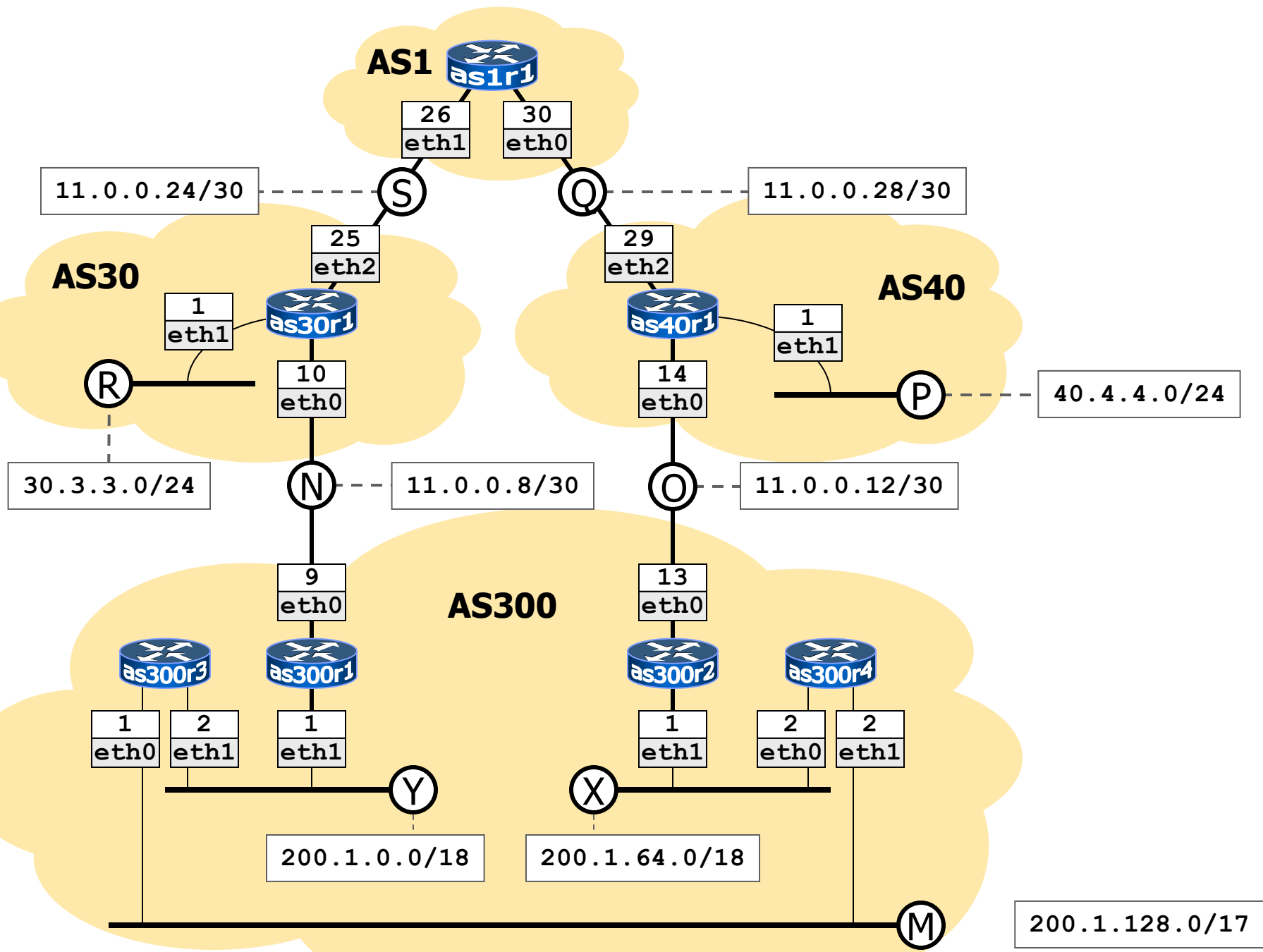
- rule out transit flows
- outbound traffic:
 - half of the internal hosts use link 1
 - the other half uses link 2
- inbound traffic:
 - use link 1 when going to half the internal hosts
 - use link 2 when going to the other half

using bgp for loadsharing

- announce /16 aggregate on each link
- split /16 and announce as two /17s, one on each link
 - rough loadsharing on inbound traffic
 - assumes equal circuit capacity and even spread of traffic across address block
- vary the split until “perfect” loadsharing achieved
- accept the default from upstream
 - basic outbound loadsharing by nearest exit (⇒ no local preference)
 - okay in first approximation as most customer traffic is inbound

using bgp for loadsharing





router as300r1 configuration



—frr bgp configuration file—

```
router bgp 300
no bgp network import-check
!
neighbor 11.0.0.10 remote-as 30
neighbor 11.0.0.10 description Router as30r1
!
network 200.1.0.0/16
network 200.1.0.0/17
!
... (continue)
```

router as300r1 configuration



frr bgp configuration file

... (continue from previous page)

!

```
neighbor 11.0.0.10 prefix-list mineOutOnly out
```

```
neighbor 11.0.0.10 prefix-list defaultIn in
```

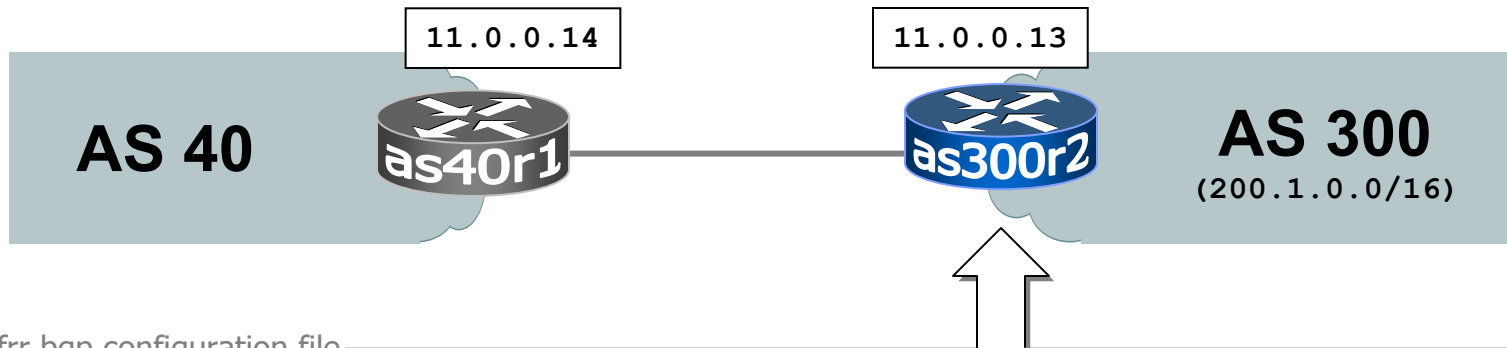
!

```
ip prefix-list mineOutOnly permit 200.1.0.0/16
```

```
ip prefix-list mineOutOnly permit 200.1.0.0/17
```

```
ip prefix-list defaultIn permit 0.0.0.0/0
```

router as300r2 configuration



—frr bgp configuration file—

```
router bgp 300
no bgp network import-check
!
neighbor 11.0.0.14 remote-as 40
neighbor 11.0.0.14 description Router as40r1
!
network 200.1.0.0/16
network 200.1.128.0/17
!
... (continue)
```


router as300r2 configuration



frr bgp configuration file

... (continue from previous page)

!

```
neighbor 11.0.0.14 prefix-list mineOutOnly out
```

```
neighbor 11.0.0.14 prefix-list defaultIn in
```

!

```
ip prefix-list mineOutOnly permit 200.1.0.0/16
```

```
ip prefix-list mineOutOnly permit 200.1.128.0/17
```

```
ip prefix-list defaultIn permit 0.0.0.0/0
```

loadsharing

■ experiment loadsharing

as1r1

```
root@as1r1:/# traceroute 200.1.0.2
traceroute to 200.1.0.2 (200.1.0.2), 64 hops max, 40 byte packets
 1  11.0.0.25 (11.0.0.25)  2 ms  2 ms  1 ms
 2  11.0.0.9 (11.0.0.9)   1 ms  2 ms  1 ms
 3  200.1.0.2 (200.1.0.2)  2 ms  3 ms  3 ms
root@as1r1:/# traceroute 200.1.128.2
traceroute to 200.1.128.2 (200.1.128.2), 64 hops max, 40 byte packets
 1  11.0.0.29 (11.0.0.29)  1 ms  2 ms  1 ms
 2  11.0.0.13 (11.0.0.13)  3 ms  2 ms  3 ms
 3  200.1.128.2 (200.1.128.2) 12 ms  3 ms  2 ms
root@as1r1:/# █
```

■ check the rip routing inside as300

backup

- experiment backup
 - crash collision domain 0 as follows:

as300r2

```
root@as300r2:/# vtysh
.....
as300r2-frr# configure terminal
as300r2-frr(config)# router bgp 300
as300r2-frr(config-router)# neighbor 11.0.0.14 shutdown
as300r2-frr(config-router)# quit
as300r2-frr(config)# quit
as300r2-frr# quit
```

- wait for rip to converge

as300r2

```
root@as300r2:/# route
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	200.1.64.2	0.0.0.0	UG	20	0	0	eth1
11.0.0.12	0.0.0.0	255.255.255.252	U	0	0	0	eth0
200.1.0.0	200.1.64.2	255.255.192.0	UG	20	0	0	eth1
200.1.64.0	0.0.0.0	255.255.192.0	U	0	0	0	eth1
200.1.128.0	200.1.64.2	255.255.128.0	UG	20	0	0	eth1

backup

■ check the routing table of as1r1

as1r1

```
as1r1-frr# show ip bgp
```

```
...
...
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 0.0.0.0/0	0.0.0.0	0		32768	i
*> 11.0.0.8/30	11.0.0.25	0		0 30	i
*> 11.0.0.12/30	11.0.0.29	0		0 40	i
*> 11.0.0.24/30	0.0.0.0	0		32768	i
*> 11.0.0.28/30	0.0.0.0	0		32768	i
*> 30.3.3.0/24	11.0.0.25	0		0 30	i
*> 40.4.4.0/24	11.0.0.29	0		0 40	i
*> 200.1.0.0/16	11.0.0.25			0 30	300 i
*> 200.1.0.0/17	11.0.0.25			0 30	300 i

Displayed 9 routes and 9 total paths

```
as1r1-frr# quit
```

```
root@as1r1:/# traceroute 200.1.128.2
```

traceroute to 200.1.128.2 (200.1.128.2), 30 hops max, 60 byte packets

```
1 11.0.0.25 (11.0.0.25) 0.260 ms 0.120 ms 0.119 ms
2 11.0.0.9 (11.0.0.9) 0.236 ms 0.201 ms 0.225 ms
3 200.1.0.2 (200.1.0.2) 0.301 ms 0.258 ms 0.258 ms
4 200.1.128.2 (200.1.128.2) 0.392 ms
```