kathara lab

bgp: stub-as with frr

Version	1.0
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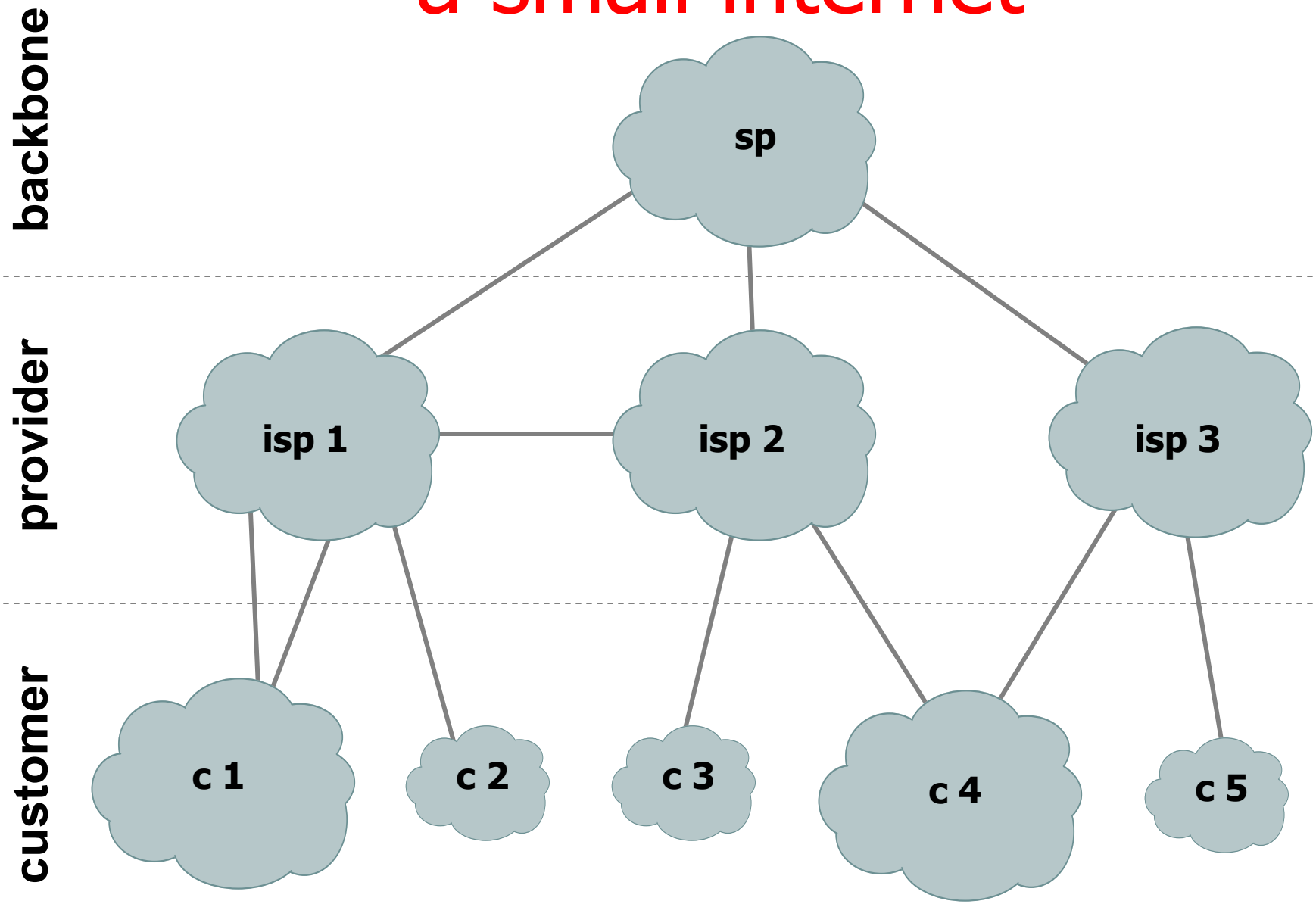
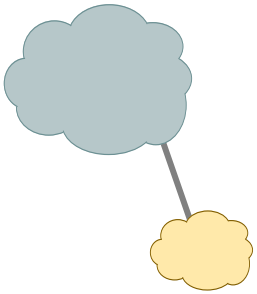
Description	architecture of a stub network; kathara version of a netkit lab

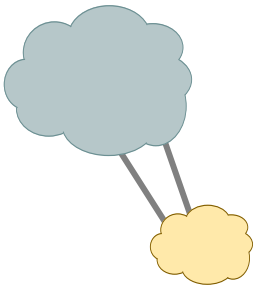
a small internet



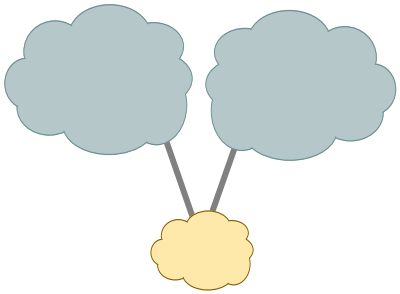
customer classification



- stub networks
  - one link to a single isp

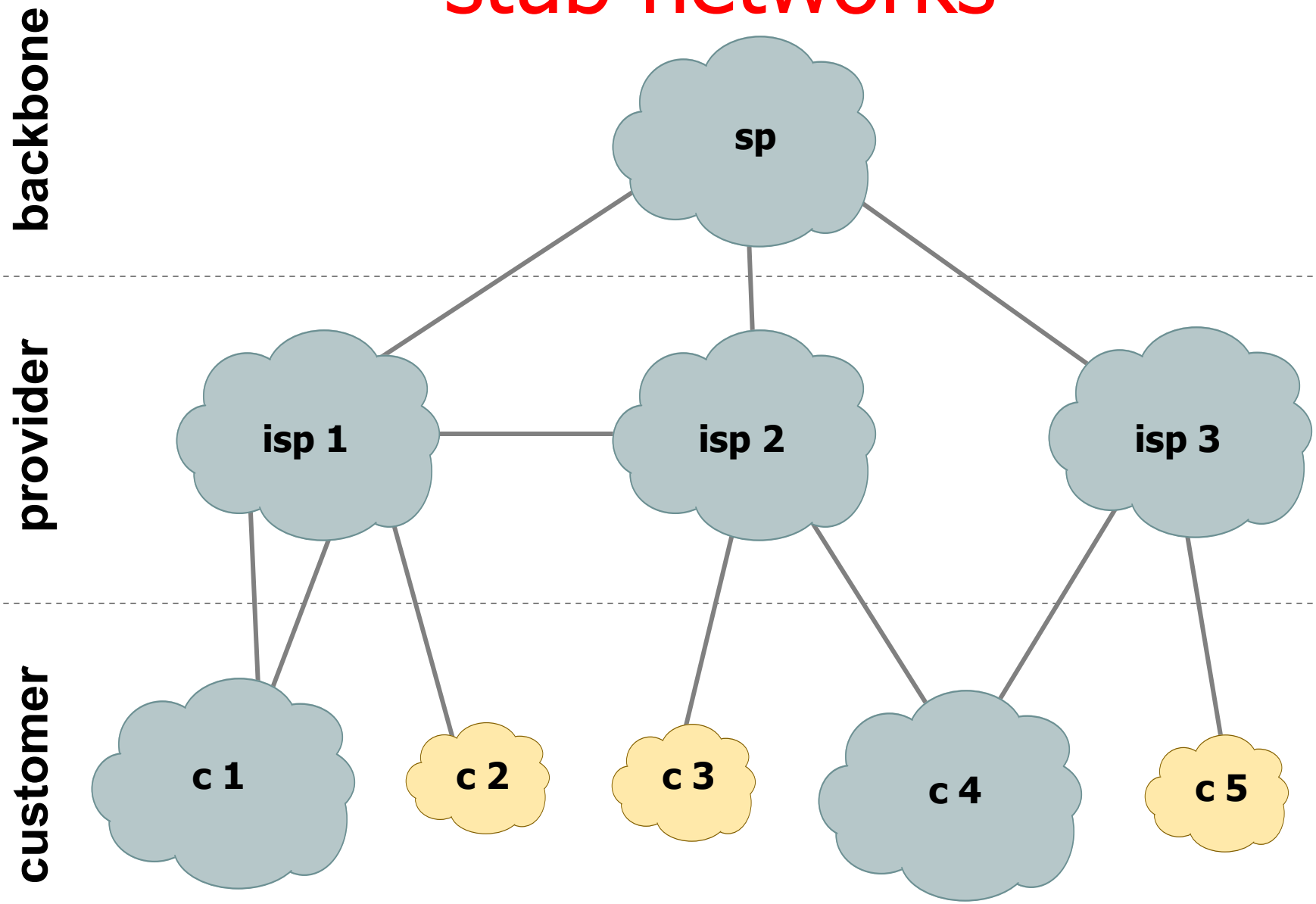


- multi-homed stub network
  - two or more links to the same isp
  - purposes: backup or load sharing

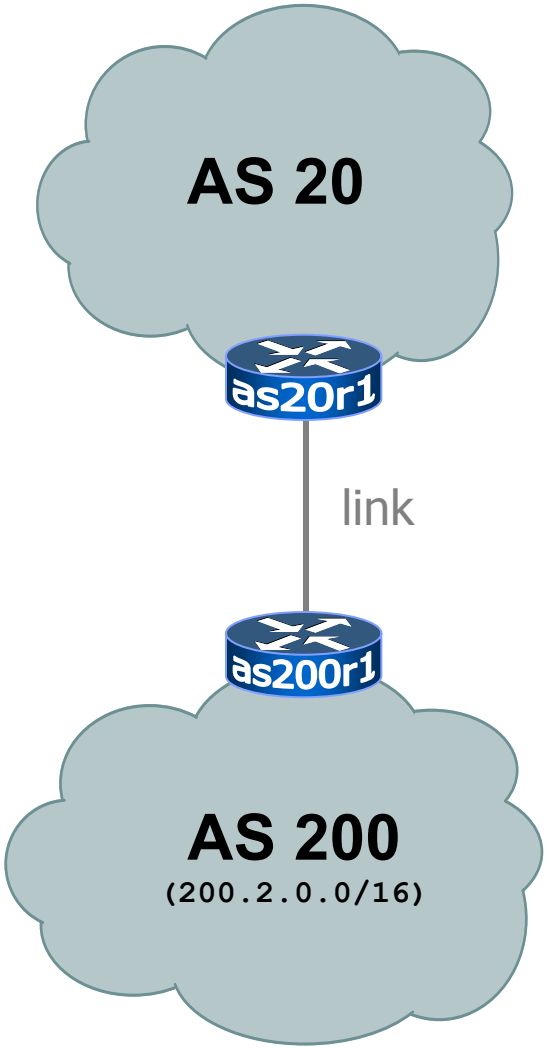


- multi-homed network
  - two or more links to different isps
  - purposes: backup or load sharing

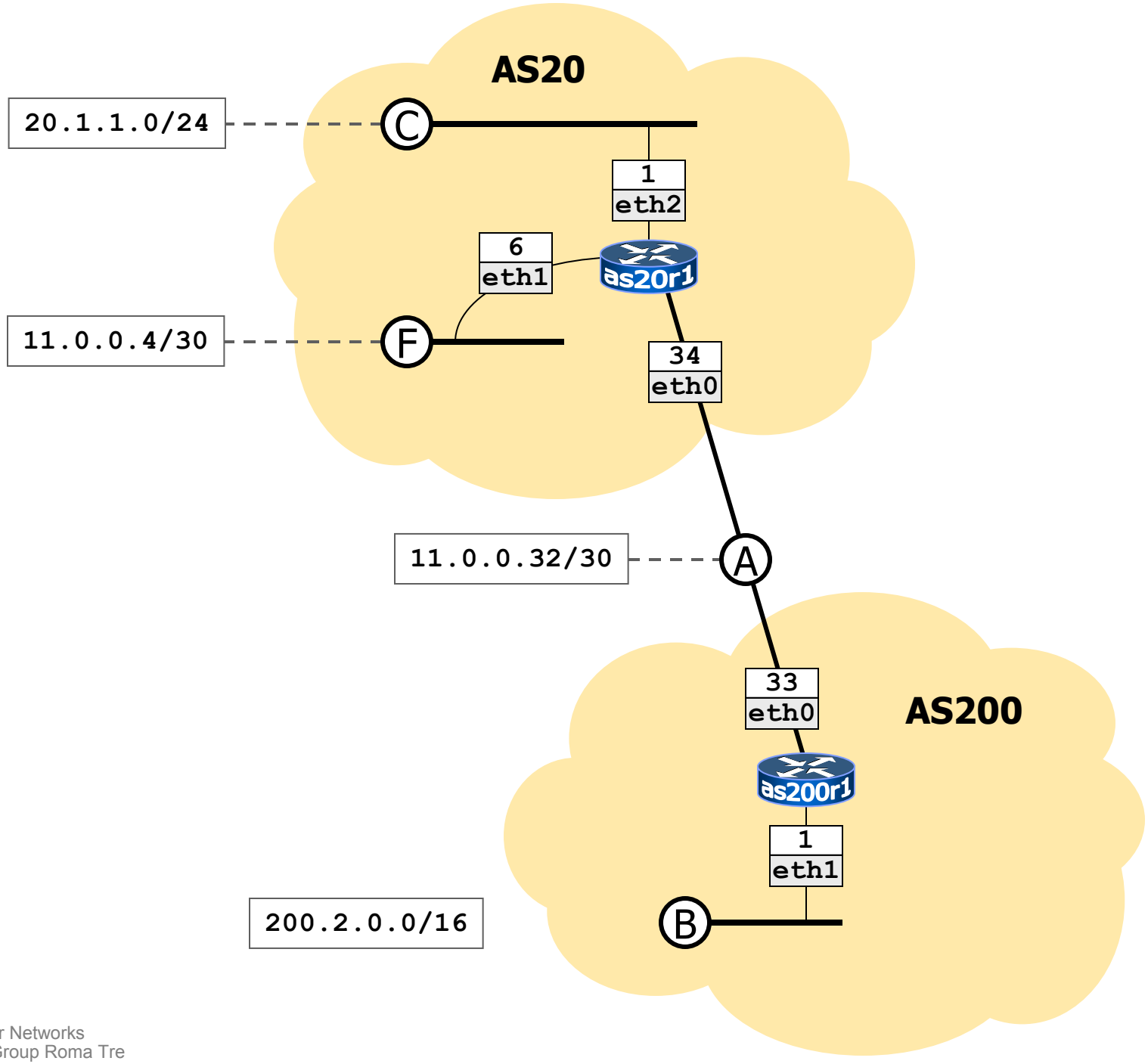
stub networks



stub network architecture



- one of the customer routers is chosen to be the default gateway
- the router is attached to a single router of the isp with a link (possibily more than one)
- a single peering in which as200 announces its route and accepts the default is enough

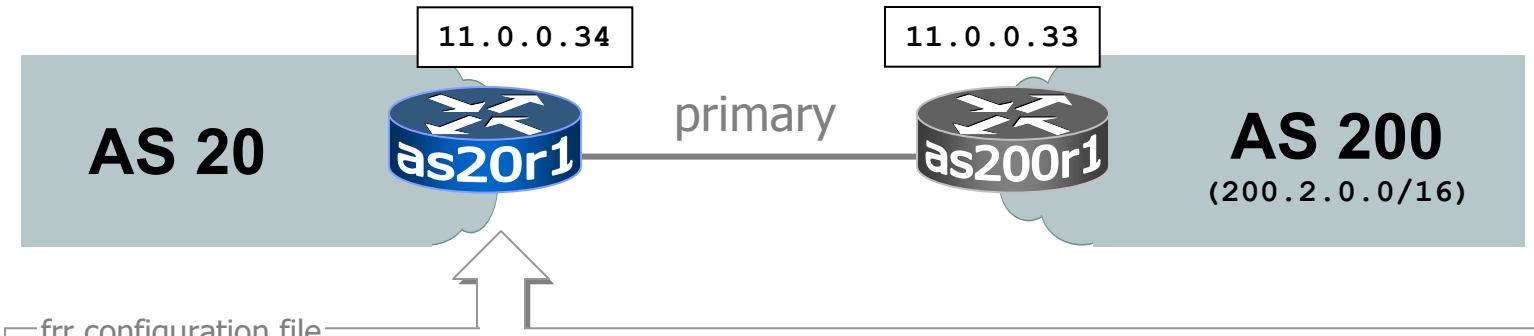


router as200r1 configuration

frr configuration file

```
! router as200r1 (customer side)
!
router bgp 200
no bgp ebgp-requires-policy
network 200.2.0.0/16
neighbor 11.0.0.34 remote-as 20
neighbor 11.0.0.34 description Router as20r1
```

router as20r1 configuration



frr configuration file

```
! router as20r1 (isp side)
router bgp 20
no bgp ebgp-requires-policy
neighbor 11.0.0.33 remote-as 200
neighbor 11.0.0.33 description Router as200r1
neighbor 11.0.0.33 default-originate
neighbor 11.0.0.33 prefix-list customerIn in
neighbor 11.0.0.33 prefix-list defaultOut out
!
network 20.1.1.0/24
network 0.0.0.0/0
!
ip prefix-list customerIn permit 200.2.0.0/16
ip prefix-list defaultOut permit 0.0.0.0/0
```

about `default-originate`

- in zebra, using **`network 0.0.0.0/0`** is enough to
  - place a default route in the local bgp routing table
  - announce it
- using **`default-originate`** for a specific neighbor
  - does not place a default route in the local bgp routing table
  - announces the default route to that neighbor, regardless of the presence of **`network 0.0.0.0/0`** in the local router configuration

about `default-originate`

- **`network 0.0.0.0/0`** may be used at the top of the isp hierarchy to originate the default route
- **`network 0.0.0.0/0`** should **not** be used at intermediate levels of the hierarchy
  - otherwise, routers would prefer the locally originated default route and remove the one offered by their upstream from the forwarding table
- using **`default-originate`** makes the default route appear as if it were originated by the upstream, even if it is not

default-originate and route-maps

- a default route originated with **network** `0.0.0.0/0` is handled like any other route
  - **route-maps** used with a specific neighbor are applied to the default route as well
- a default route originated with **default-originate** is processed by a different **route-map**:

command syntax

neighbor *<neighbor-ip>* **default-originate route-map** *<r-map-name>* **in**

command syntax

neighbor *<neighbor-ip>* **default-originate route-map** *<r-map-name>* **out**

stub as: lab

- start the lab

host machine

```
user@localhost:~$ cd kathara-lab_bgp-stub-as_frr
user@localhost:~/kathara-lab_bgp-stub-as_frr$ kathara lstart
```

- check the frr configuration file

as20r1

```
as20r1:~# less /etc/frr/frr.conf
```

- check the frr log file

as20r1

```
as20r1:~# less /var/log/frr/frr.log
```

stub as: lab

- check the routing table of as20r1

as20r1

```
root@as20r1:/# vtysh

Hello, this is FRRouting (version 7.5.1).
Copyright 1996-2005 Kunihiro Ishiguro, et al.

as20r1-frr# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued, r - rejected, b - backup

C>* 11.0.0.4/30 is directly connected, eth1, 00:14:46
C>* 11.0.0.32/30 is directly connected, eth0, 00:14:46
C>* 20.1.1.0/24 is directly connected, eth2, 00:14:46
B>* 200.2.0.0/16 [20/0] via 11.0.0.33, eth0, weight 1, 00:14:43
as20r1-frr#
```

stub as: lab

- check the bgp status

as20r1

```
as20r1-frr# show ip bgp neighbors
BGP neighbor is 11.0.0.33, remote AS 200, local AS 20, external link
 Description: Router as200r1
Hostname: as200r1
.....
as20r1-frr# show ip bgp
BGP table version is 3, local router ID is 20.1.1.1, vrf id 0
Default local pref 100, local AS 20
Status codes:  s suppressed, d damped, h history, * valid, > best, = multipath,
               i internal, r RIB-failure, S Stale, R Removed
Nexthop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes:  i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 0.0.0.0/0        0.0.0.0                  0         32768 i
*> 20.1.1.0/24      0.0.0.0                  0         32768 i
*> 200.2.0.0/16     11.0.0.33                0             0 200 i

Displayed  3 routes and 3 total paths
as20r1-frr#
```

stub as: lab

- perform several pings on the routers
- terminate the lab