

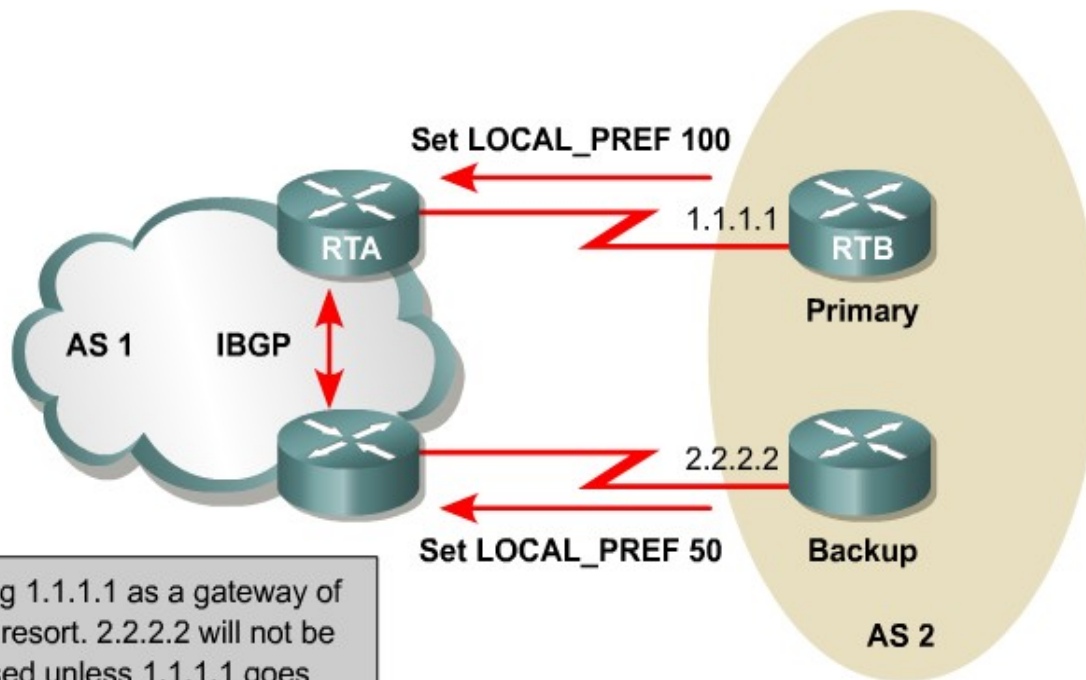


BGP Route filtering & Load Balancing

Set local-preference (LOCAL_PREF)

- Anvendes til at give en Route højere præference over en anden Route til samme destination
 - Højeste LOCAL_PREF foretækkes
- LOCAL_PREF udveksles mellem iBGP Peers men **ikke** eBGP Peers

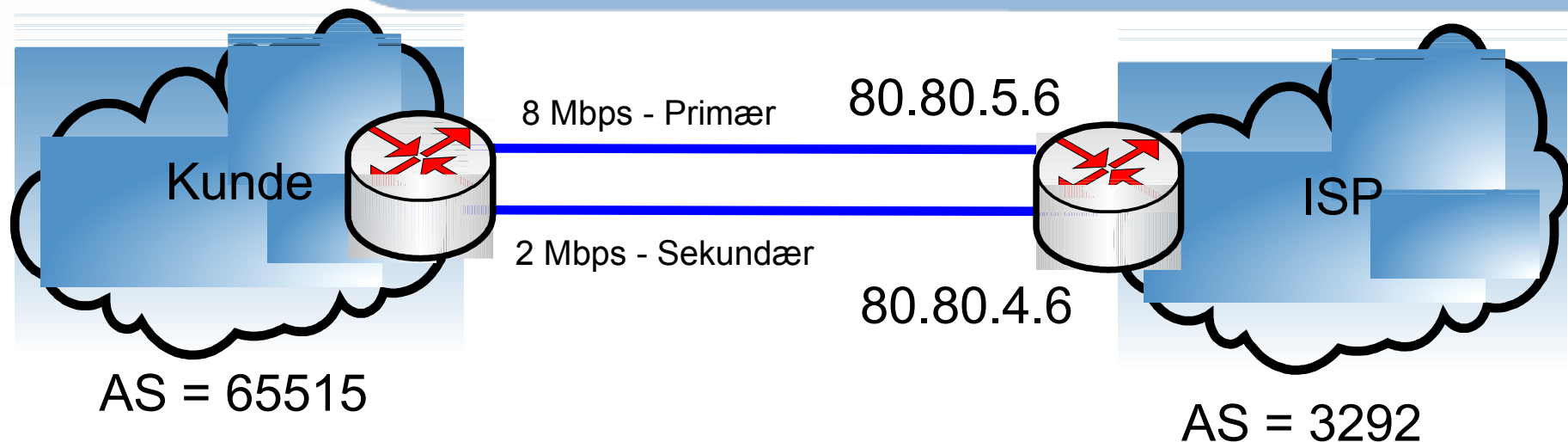
Default Routing I BGP



Using 1.1.1.1 as a gateway of last resort. 2.2.2.2 will not be used unless 1.1.1.1 goes down.

IBGP peers can exchange Local Preference attributes and prefer the same default route.

Local Preference eksempel

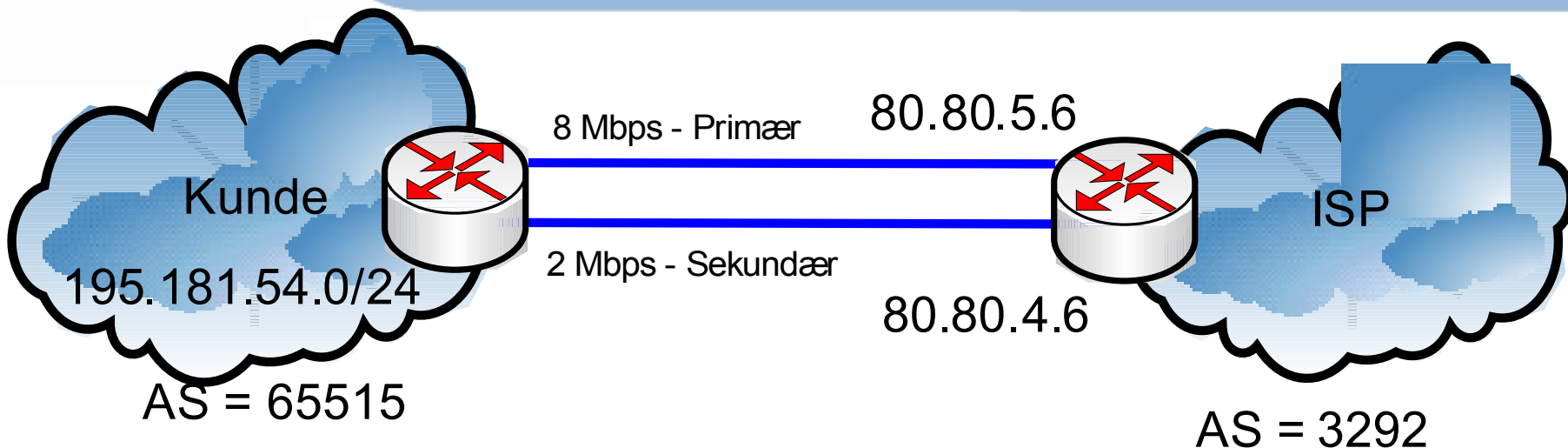


```
hostname KUNDE
!  
route-map PRIMAER-LOCAL-PREF permit 10  
  set local-preference 1000  
route-map SEKUNDAER-LOCAL-PREF permit 10  
  set local-preference 500  
!  
router BGP 65515  
  neighbor 80.80.5.6 route-map PRIMAER-LOCAL-PREF in  
  neighbor 80.80.4.6 route-map SEKUNDAER-LOCAL-PREF in
```

Multiple Exit Discriminator (MED)

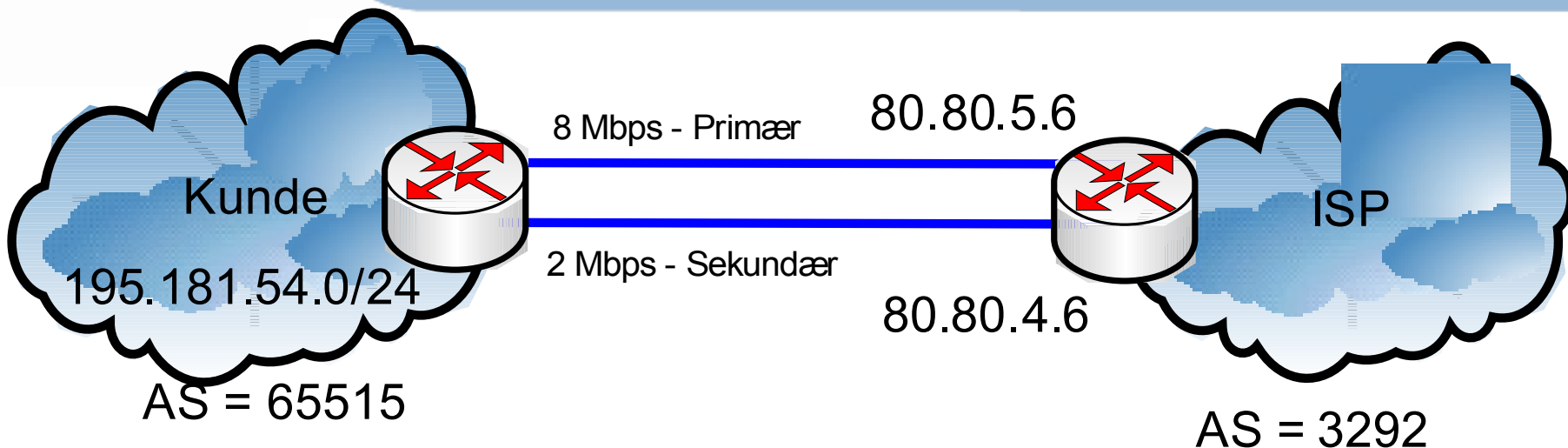
- MED anvendes til at informere Peers om hvilken vej de skal anvende, hvis der er flere mulige veje ind.
 - Local-preference er en lokal beslutning
 - MED anvendes til at give nabo AS et bedre beslutningsgrundlag om bedste vej ind.
 - Laveste MED foretrækkes
 - Default er MED sat til 0.

MED eksempel



```
hostname KUNDE
!  
route-map PRIMAER-MED permit 10  
  set metric 100  
route-map SEKUNDAER-MED permit 10  
  set metric 500  
!  
router BGP 65515  
  network 195.181.54.0 mask 255.255.255.0  
  neighbor 80.80.5.6 route-map PRIMAER-MED out  
  neighbor 80.80.4.6 route-map SEKUNDAER-MED out
```

AS_PATH prepending



```
hostname KUNDE
!  
route-map PREPEND permit 10  
  set as-path prepend 65515 65515 65515  
!  
router BGP 65515  
  network 195.181.54.0 mask 255.255.255.0  
  neighbor 80.80.4.6 route-map PREPEND out
```



Og samlet

```
hostname KUNDE
!
route-map PRIMAER-MED permit 10
    set metric 100
route-map SEKUNDAER-MED permit 10
    set metric 500
!
route-map PRIMAER-LOCAL-PREF permit 10
    set local-preference 1000
route-map SEKUNDAER-LOCAL-PREF permit 10
    set local-preference 500
!
router BGP 65515
    network 195.181.54.0 mask 255.255.255.0
    neighbor 80.80.5.6 route-map PRIMAER-LOCAL-PREF in
    neighbor 80.80.4.6 route-map SEKUNDAER-LOCAL-PREF in
    neighbor 80.80.5.6 route-map PRIMAER-MED out
    neighbor 80.80.4.6 route-map SEKUNDAER-MED out
```

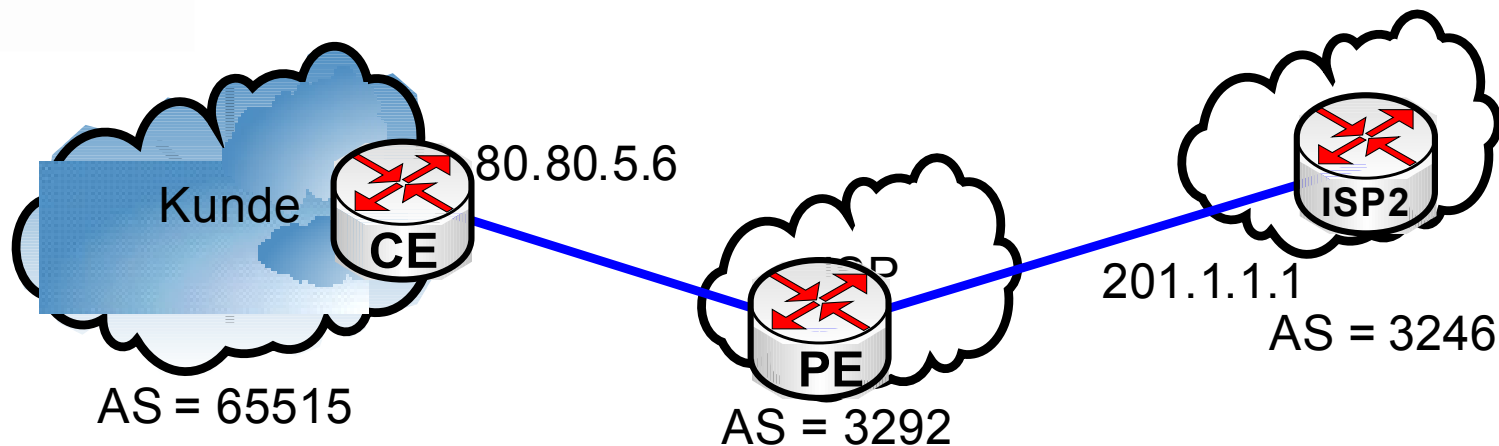
Et andet eksempel

```
RTA (config)#router bgp 3
RTA (config-router)#no auto-summary
RTA (config-router)#neighbor 172.16.20.1 remote-as 1
RTA (config-router)#neighbor 172.16.20.1 route-map BLOCK in
RTA (config-router)#neighbor 172.16.20.1 route-map SETMETRIC1 out
RTA (config-router)#neighbor 192.168.9.2 remote-as 1
RTA (config-router)#neighbor 192.168.9.2 route-map BLOCK in
RTA (config-router)#neighbor 192.168.9.2 route-map SETMETRIC2 out
RTA (config-router)#exit
RTA (config)#route-map SETMETRIC1 permit 10
RTA (config-router-map)#set metric 100
RTA (config-router-map)#route-map SETMETRIC2 permit 10
RTA (config-router-map)#set metric 50
RTA (config-router-map)#route-map BLOCK deny 10
RTA (config-router-map)#exit
RTA (config)#ip route 0.0.0.0 0.0.0.0 172.16.20.1 50
RTA (config)#ip route 0.0.0.0 0.0.0.0 192.168.9.2 40
```

Fjern private AS numre

- ISP kunder anvender ofte private AS numre (64512 – 65535).
- Disse må ikke annonceres på Internettet og skal derfor fjernes.
- AS nummeret erstattes med ISP'ens AS nummer – for eksempel 3292

Fjern private AS numre



```
hostname PE
!  
!  
router BGP 3292
  neighbor 80.80.5.6 remote-as 65515
  neighbor 201.1.1.1 remote-as 3246
  neighbor 201.1.1.1 remove-private-as
```

Gateway of last Resort

- Hvis en Router skal videresende en pakke den ikke kender modtageren på, sendes en ICMP Destination unreachable tilbage.
- For at undgå dette kan konfigureres en Default Gateway også kaldet Gateway of last Resort

```
ip route 0.0.0.0 0.0.0.0 A.B.C.D [distance]
!  
router bgp 200  
  default-information originate
```

Opdatering af BGP tabellen

- Det er muligt at slette BGP tabellen – anvendes til fejlsøgning.
- Kan slettes helt eller enkelt Peer
- PAS PÅ i den virkelige verden!!

```
H1R1# ! Næste linie sletter HELE bgp tabellen
H1R1# clear ip bgp *
H1R1# ! Næste linie sletter Router fra nabo
H1R1# clear ip bgp 172.21.0.2
```

Debug

- Der er mange BGP debug faceliteter

```
H1R1# debug ip bgp ?
A.B.C.D      BGP neighbor address
X:X:X:X::X   IPv6 BGP neighbor address
dampening    BGP dampening
events       BGP events
in           BGP Inbound information
keepalives   BGP keepalives
mpls        BGP MPLS label distribution
out         BGP Outbound information
updates      BGP updates
vpnv4       VPNv4 NLRI information
<cr>
```

Prefix lister

- Prefix lister kan anvendes i stedet for access lister
 - Betydelig bedre performance
 - Supporter løbende opdateringer
 - Access lister svære at redigere
 - Brugervenlig
 - Større fleksibilitet

Prefix lister

- Prefix lister er nummererede
 - Her forbydes annoncering af hemmelige net
- Bemærk der er en deny all til sidst
 - Akkurat som access lists

```
ip prefix-list SECRET-NET seq 10 deny 172.16.0.0/16
ip prefix-list SECRET-NET seq 20 deny 192.168.22.0/24
ip prefix-list SECRET-NET seq 30 permit 0.0.0.0/0 le 32
!
router bgp 100
  neighbor 10.1.2.3 remote-as 200
  neighbor 10.1.2.3 prefix-list SECRET-NET out
```

Prefix lister

- Vi ønsker også at forbyde 192.168.23.0/24

```
H1R1#show ip prefix-list SECRET-NET
ip prefix-list SECRET-NET: 3 entries
  seq 10 deny 172.16.0.0/16
  seq 20 deny 192.168.22.0/24
  seq 30 permit 0.0.0.0/0 le 32
H1R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
H1R1(config)#ip prefix-list SECRET-NET seq 25 deny 192.168.23.0/24
H1R1(config)#exit
H1R1#show ip prefix-list SECRET-NET
ip prefix-list SECRET-NET: 4 entries
  seq 10 deny 172.16.0.0/16
  seq 20 deny 192.168.22.0/24
  seq 25 deny 192.168.23.0/24
  seq 30 permit 0.0.0.0/0 le 32
```

IP Prefix Lists Example

Cisco - RTA

```
RTA(config)#ip prefix-list ELMO deny 0.0.0.0/0
RTA(config)#ip prefix-list ELMO permit 172.16.0.0/16
RTA(config)#router bgp 100
RTA(config-router)#neighbor 192.168.1.1 remote-as 200
RTA(config-router)#neighbor 192.168.1.1 prefix-list ELMO out
```

Cisco - RTA

```
RTA#show ip prefix-list
ip prefix-list ELMO: 3 entries
  seq 5 deny 0.0.0.0/0
  seq 10 permit 172.16.0.0/16
  seq 15 permit 192.168.0.0/16 le 24
```

Route Aggregation

- Anvendes til at summere netværk
 - Når summary-only anvendes, annonceres kun den summerede route.
 - Hvis summary-only undlades, annonceres både subnet og summerede net.

```
Hostname H1R1
!  
router bgp 100  
  no synchronization  
  no auto-summary  
  network 10.1.12.0 mask 255.255.255.0  
  network 10.1.13.0 mask 255.255.255.0  
  network 10.1.14.0 mask 255.255.255.0  
  network 10.1.15.0 mask 255.255.255.0  
  aggregate-address 10.1.12.0 255.255.252.0 summary-only  
  neighbor 192.168.100.12 remote-as 100
```

Route Aggregation

- Som interface til en summeret Route anvendes Null0 interfacet. (Skraldespand)
- Husk. Bedste prefix vælges.
 - Trafik til 10.1.14.1 havner i Serial0/3
 - Trafik til 10.1.13.1 havner i Null0 (Serial0/2 er nede)
 - Der sendes ikke ICMP Destination Unreachable

```
H1R1# show ip route
C      10.1.15.0/24 is directly connected, Serial0/4
C      10.1.14.0/24 is directly connected, Serial0/3
C      10.1.12.0/24 is directly connected, Serial0/1
B      10.1.12.0/22 [200/0] via 0.0.0.0, 14:09:29, Null0
```