



Hands-on Workshop on Network Technologies



Hands-on session 2: Local Preference and MED Attributes Lab 8.1 - BGP Lab Series



Jose Gomez¹, Jorge Crichigno²
¹Fort Lewis College (FLC)
²University of South Carolina (USC)

<https://research.cec.sc.edu/cyberinfra/>

Tuesday, Jul 28, 2026
Online

Lab Series: Border Gateway Protocol

- Lab experiments

Lab 1: Introduction to Mininet

Lab 2: Introduction to Free Range Routing (FRR)

Lab 3: Introduction to BGP

Lab 4: Configure and verify EBGp

Lab 5: BGP Authentication

Lab 6: Configure BGP with Default Route

Lab 7: Using AS_PATH BGP Attribute

Lab 8: Configuring IBGP and EBGp Sessions, Local Preference, and MED

Lab 8.1: Configuring OSPF, IBGP and EBGp Sessions, Local Preference, and MED

Lab 9: IBGP, Next Hop and Full Mesh Topology

Lab 10: BGP Route Reflection

Lab 11: Configuring BGP Local Preference, and AS_PATH Prepending

Lab 11.1: Configuring BGP Local Preference, and AS_PATH Prepending

Lab 12: Hot Potato Routing and BGP LOCAL_PREF Attribute

Lab 13: Configuring Local Preferences on a Per Route Basis

Organization of the labs

Each lab starts with a section *Overview*

- Objectives
- Lab topology
- Lab settings: passwords, device names
- Roadmap: organization of the lab

Section 1

- Background information of the topic being covered (e.g., fundamentals of BGP)
- Section 1 is optional (i.e., the reader can skip this section and move to lab directions)

Section 2... n

- Step-by-step directions

Local Preference and MED Attributes

Lab activities are described in Lab 8.1, BGP Lab Series

Hands-on Labs on BGP

- Webpage with PowerPoint presentations:

https://research.cec.sc.edu/cyberinfra/NT_2026

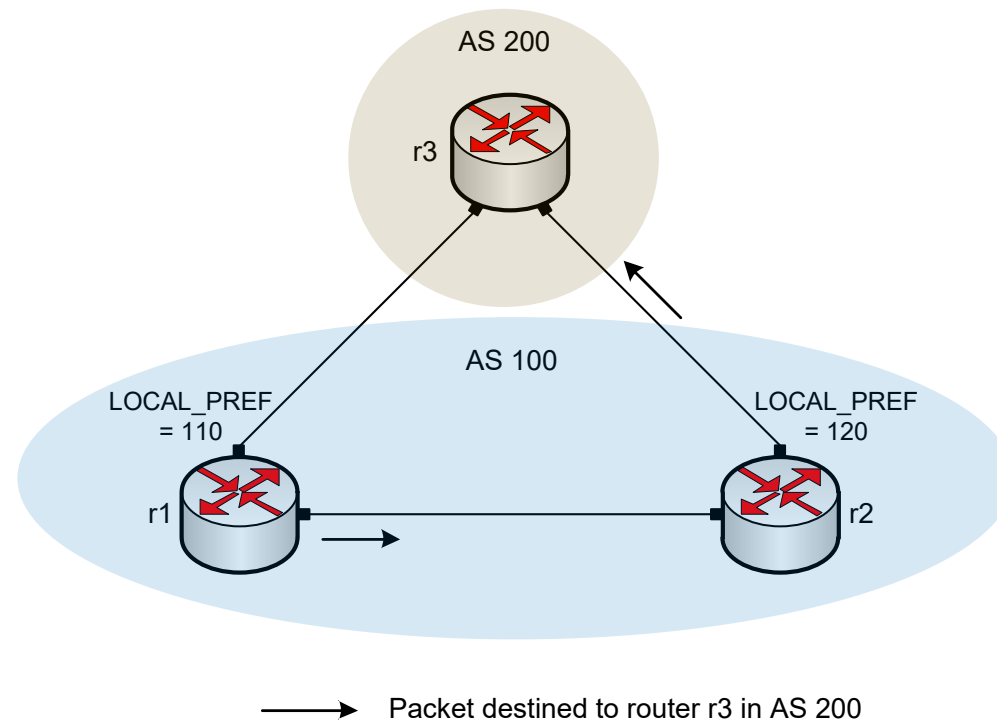
Hands-on session 2 (3:15PM-3:55PM): to access labs for Session 2 (BGP LOCAL_PREF and MED Attributes).

The virtual platform (Netlab) is reachable through the following link:

<https://netlab.cec.sc.edu>

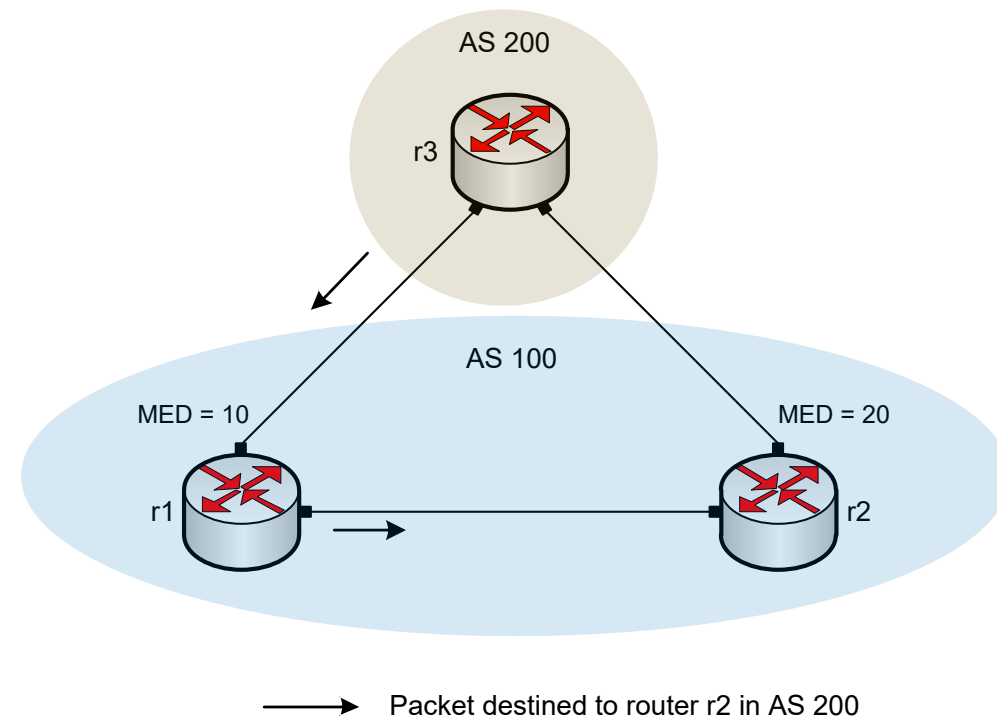
LOCAL_PREF Attribute

- The LOCAL_PREF attribute is advertised among Internal BGP (IBGP) routers
- It indicates the preferred path to external Autonomous Systems (ASes) when an AS has multiple routes to another AS
- The BGP route with the highest LOCAL_PREF value is preferred



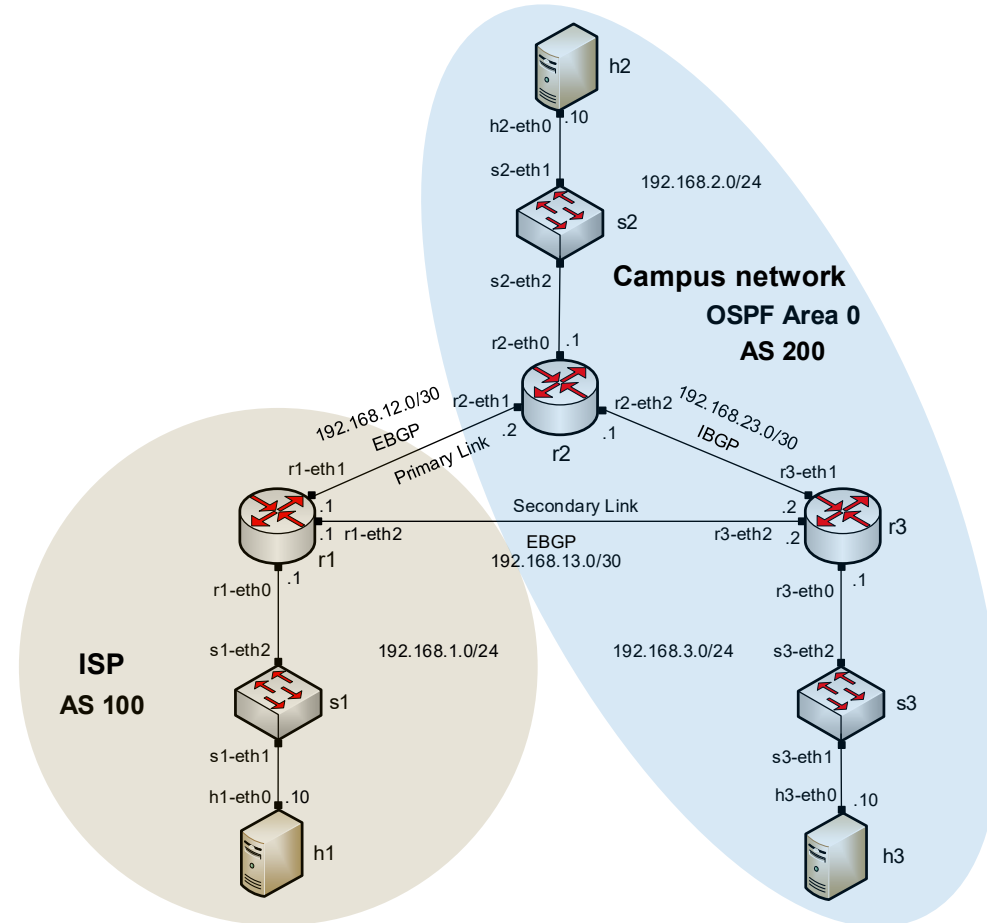
MED Attribute

- The MED attribute indicates to external neighbors the preferred path into an AS
- It is used when there are multiple entry points to the same AS
- The BGP route with the lowest MED value is preferred



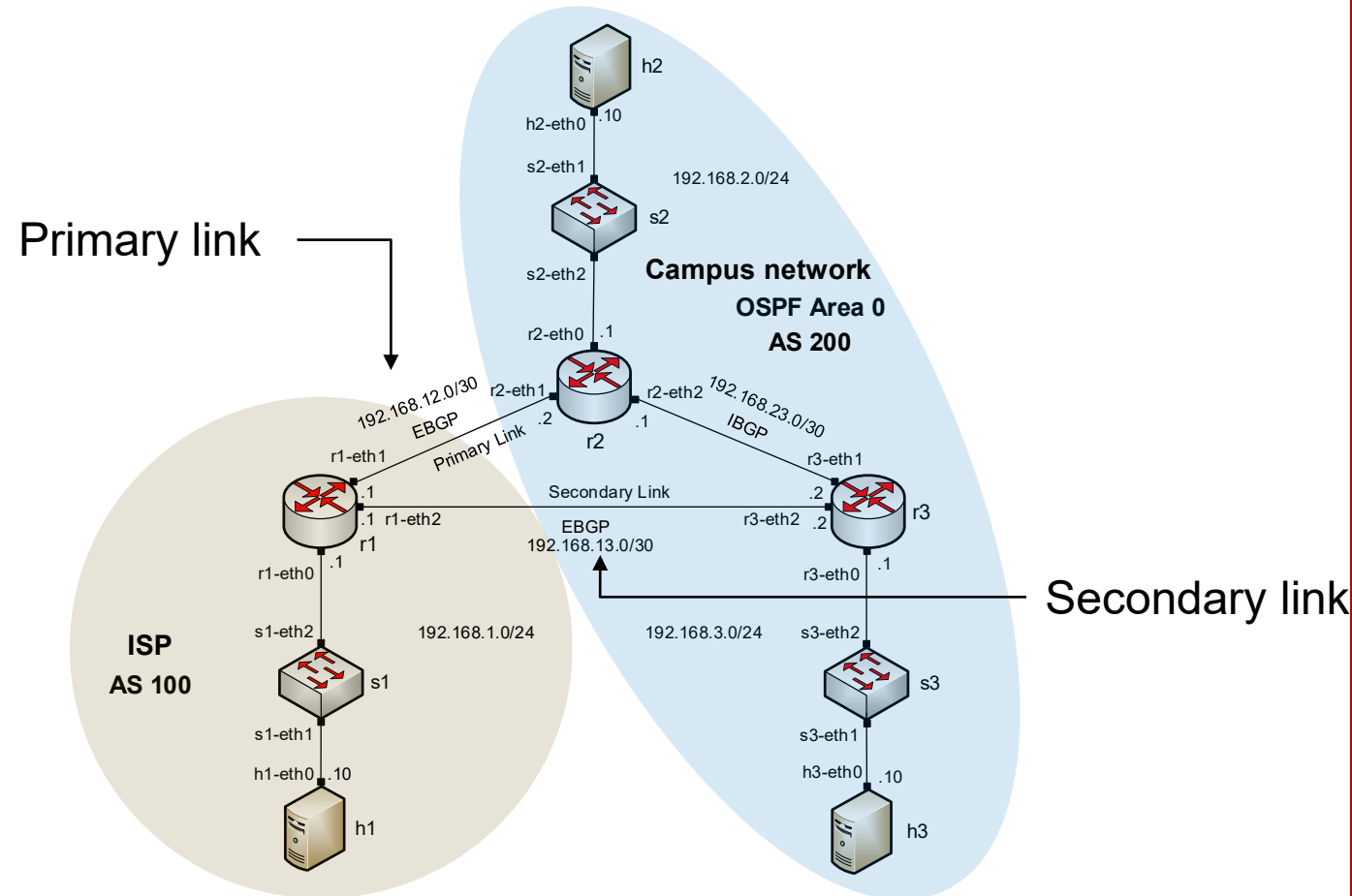
Lab Topology

- Configure OSPF as IGP in AS 200
- Configure BGP as EGP between AS 100 and AS 200



Lab Topology

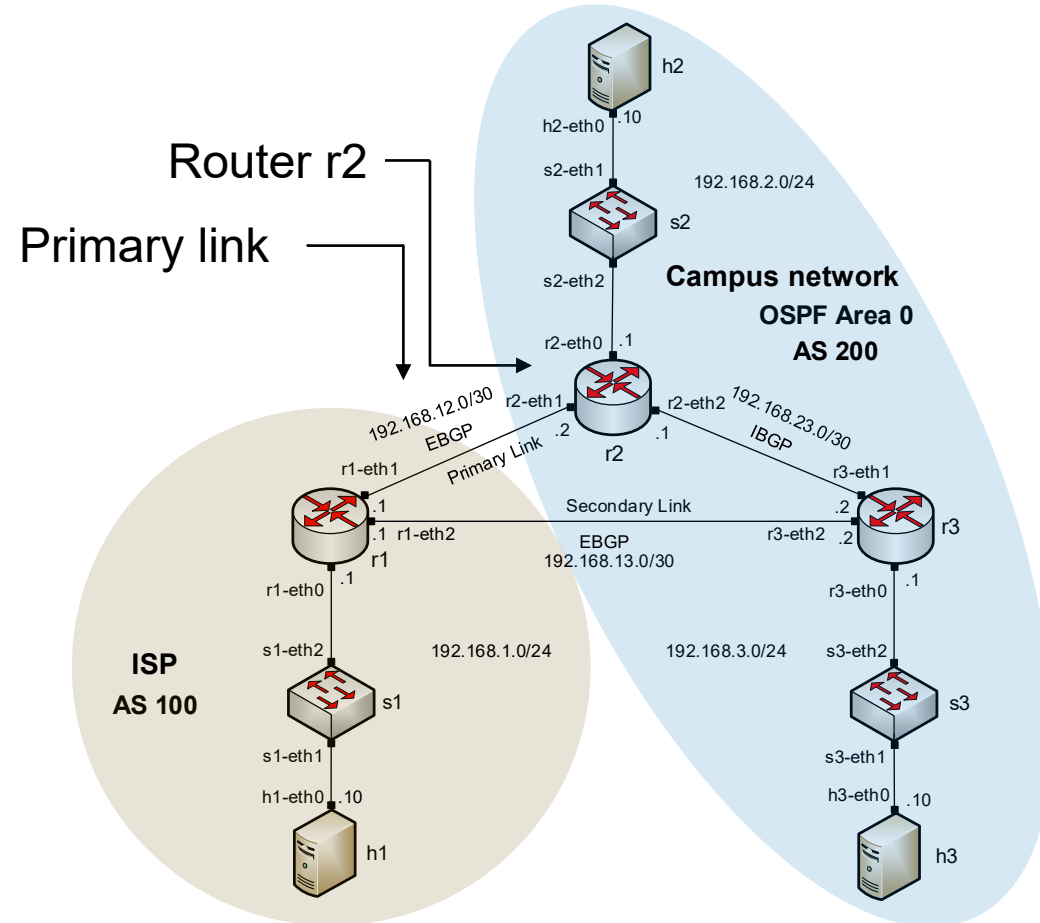
- Configure LOCAL_PREF and MED attributes to favor the primary link over the secondary one



Lab Configuration

- Create a route map to set the LOCAL_PREF attribute of the primary link

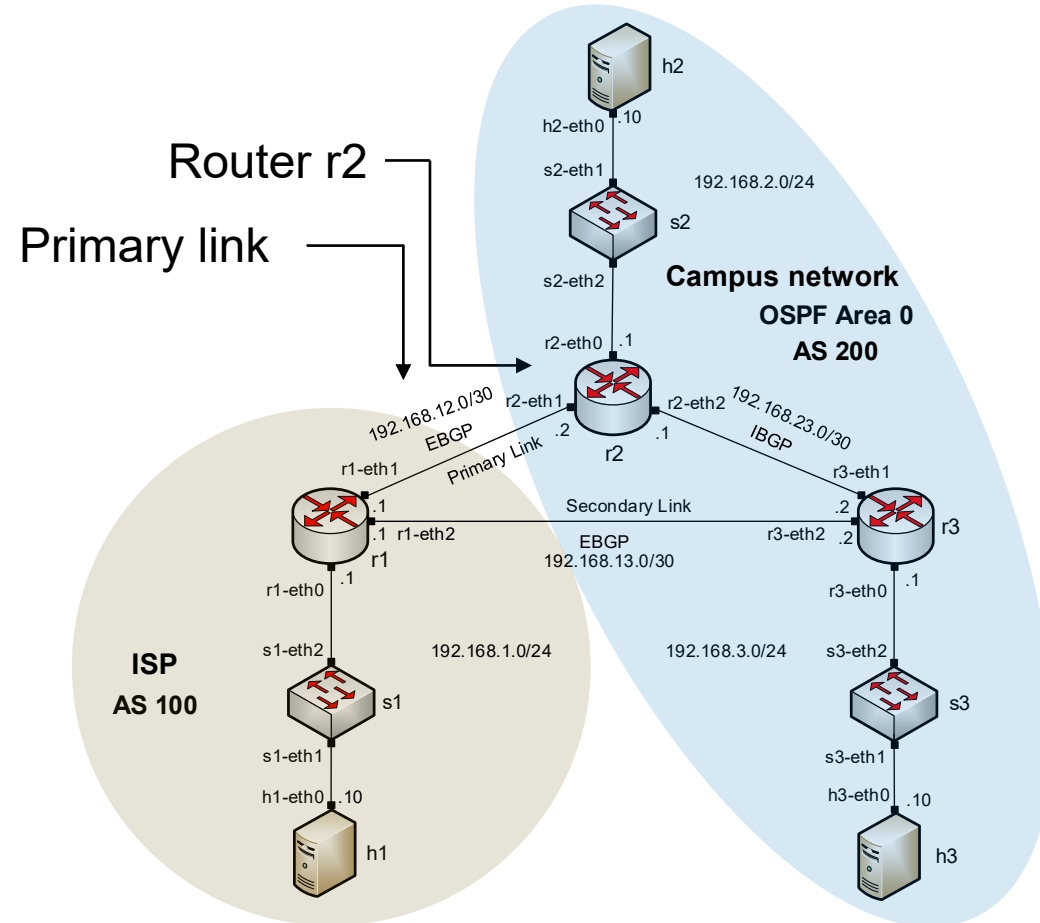
```
Host: r2
frr-pc# configure terminal
frr-pc(config)# route-map primary_in permit 10
frr-pc(config-route-map)#
```



Lab Configuration

- Set the LOCAL_PREF value of the primary link to 150

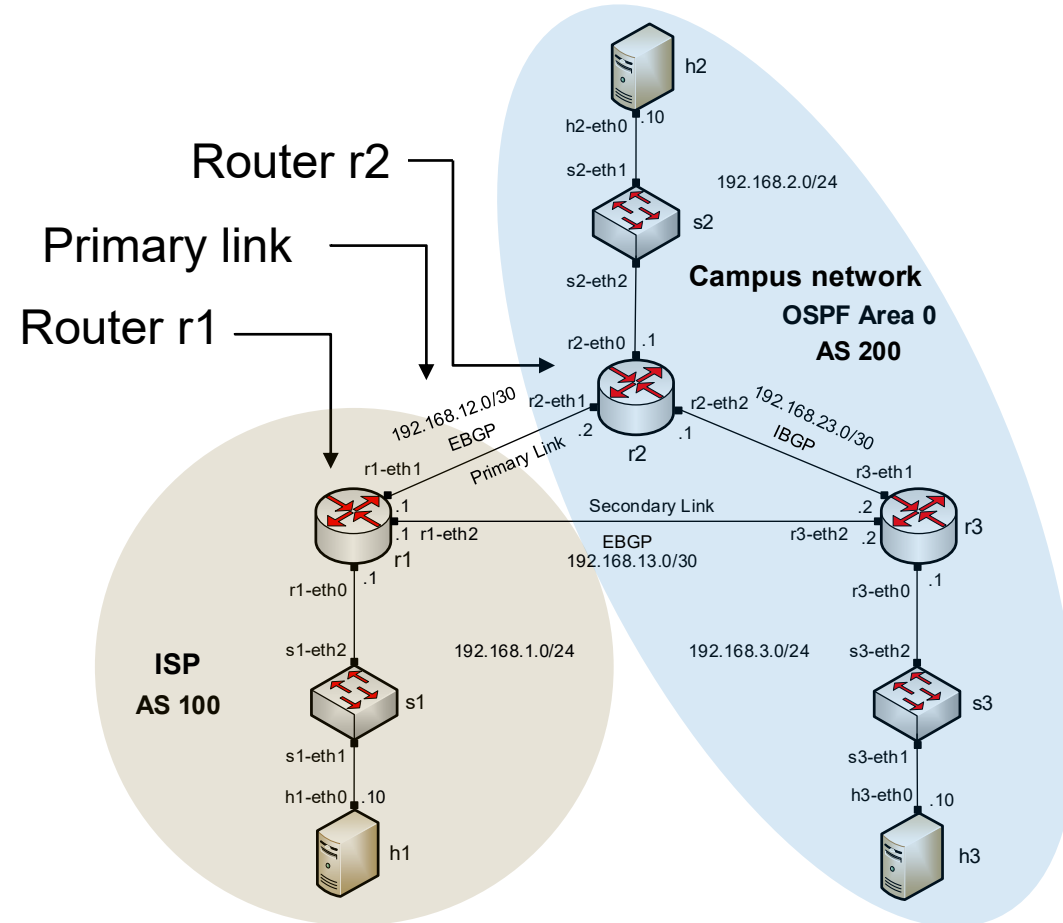
```
Host: r2
frr-pc# configure terminal
frr-pc(config)# route-map primary_in permit 10
frr-pc(config-route-map)# set local-preference 150
frr-pc(config-route-map)#
```



Lab Configuration

- Assign the route-map to the BGP neighbor (router r1)

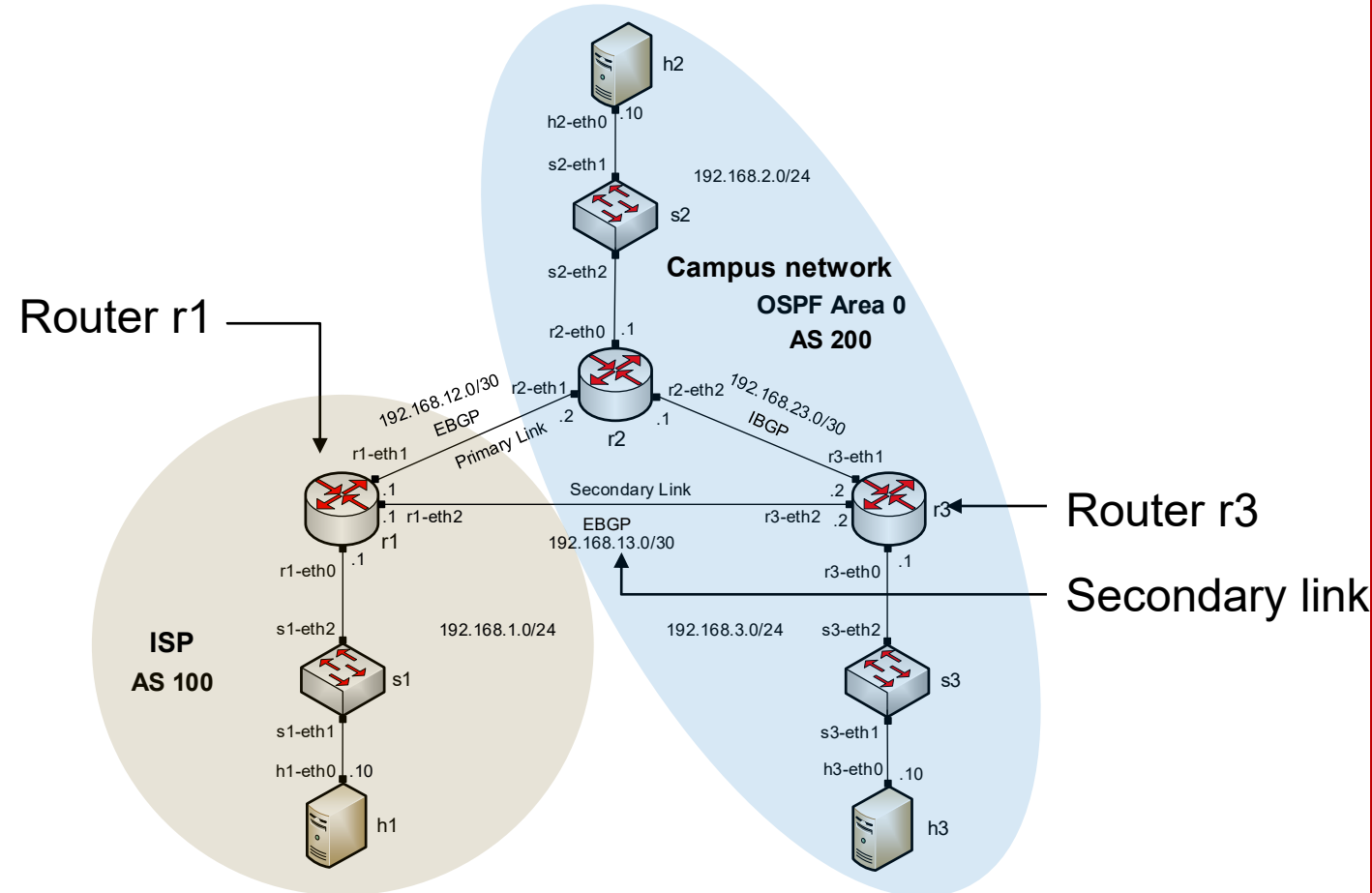
```
frr-pc# configure terminal
frr-pc(config)# route-map primary_in permit 10
frr-pc(config-route-map)# set local-preference 150
frr-pc(config-route-map)# exit
frr-pc(config)# router bgp 200
frr-pc(config-router)# neighbor 192.168.12.1 route-map primary_in in
frr-pc(config-router)#
```



Lab Configuration

- Similarly, configure LOCAL_PREF on router r3 for the secondary link

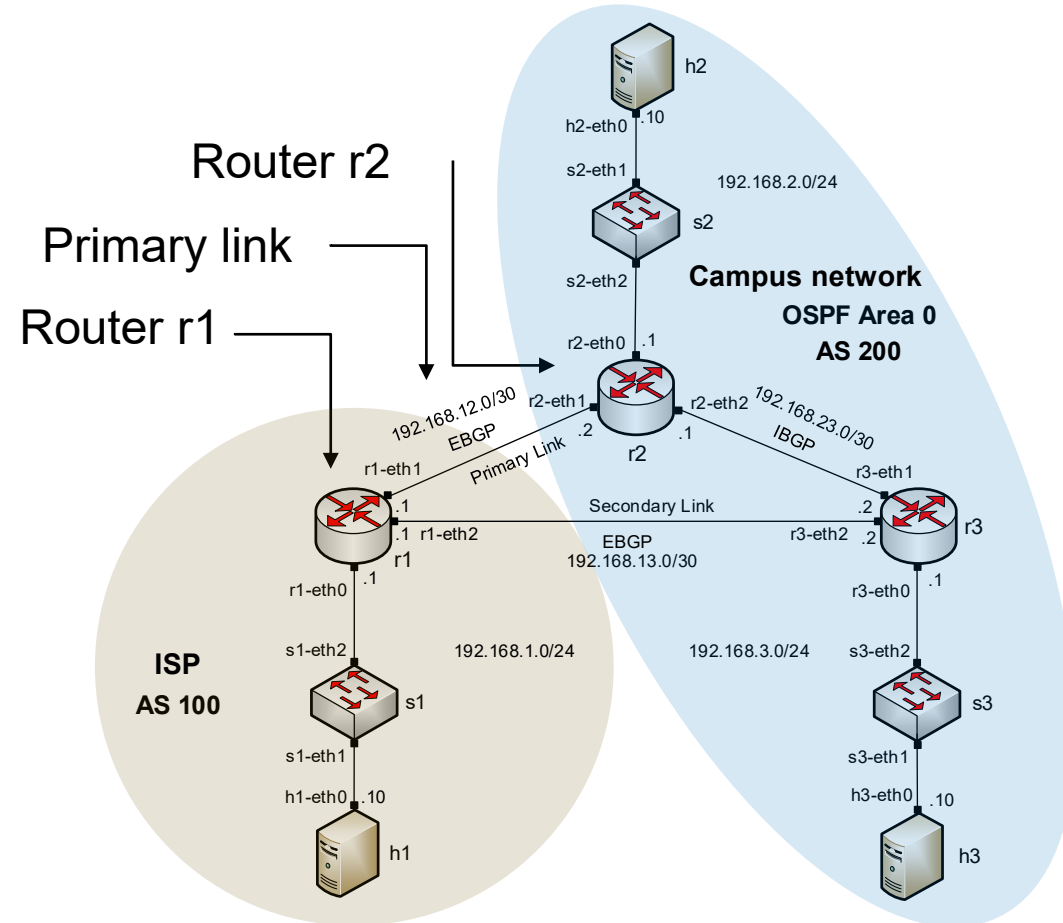
```
Host: r3
frr-pc# configure terminal
frr-pc(config)# route-map secondary_in permit 10
frr-pc(config-route-map)# set local-preference 125
frr-pc(config-route-map)# exit
frr-pc(config)# router bgp 200
frr-pc(config-router)# neighbor 192.168.13.1 route-map secondary_in in
frr-pc(config-router)# end
```



Lab Configuration

- Similarly, configure MED on router r2

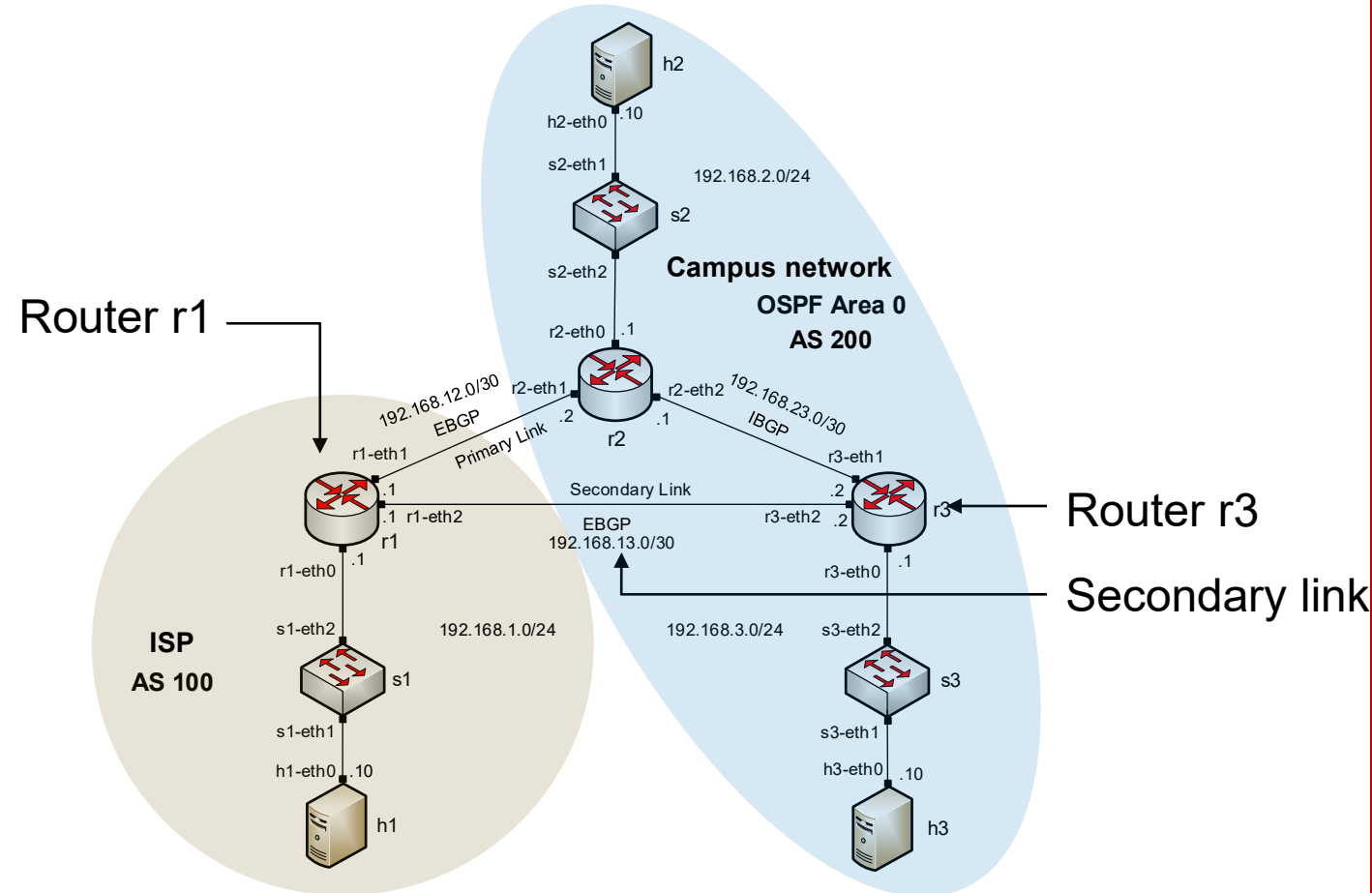
```
frr-pc# configure terminal
frr-pc(config)# route-map primary_med_out permit 10
frr-pc(config-route-map)# set metric 50
frr-pc(config-route-map)# exit
frr-pc(config)# router bgp 200
frr-pc(config-router)# neighbor 192.168.12.1 route-map primary_med_out out
frr-pc(config-router)# end
frr-pc#
```



Lab Configuration

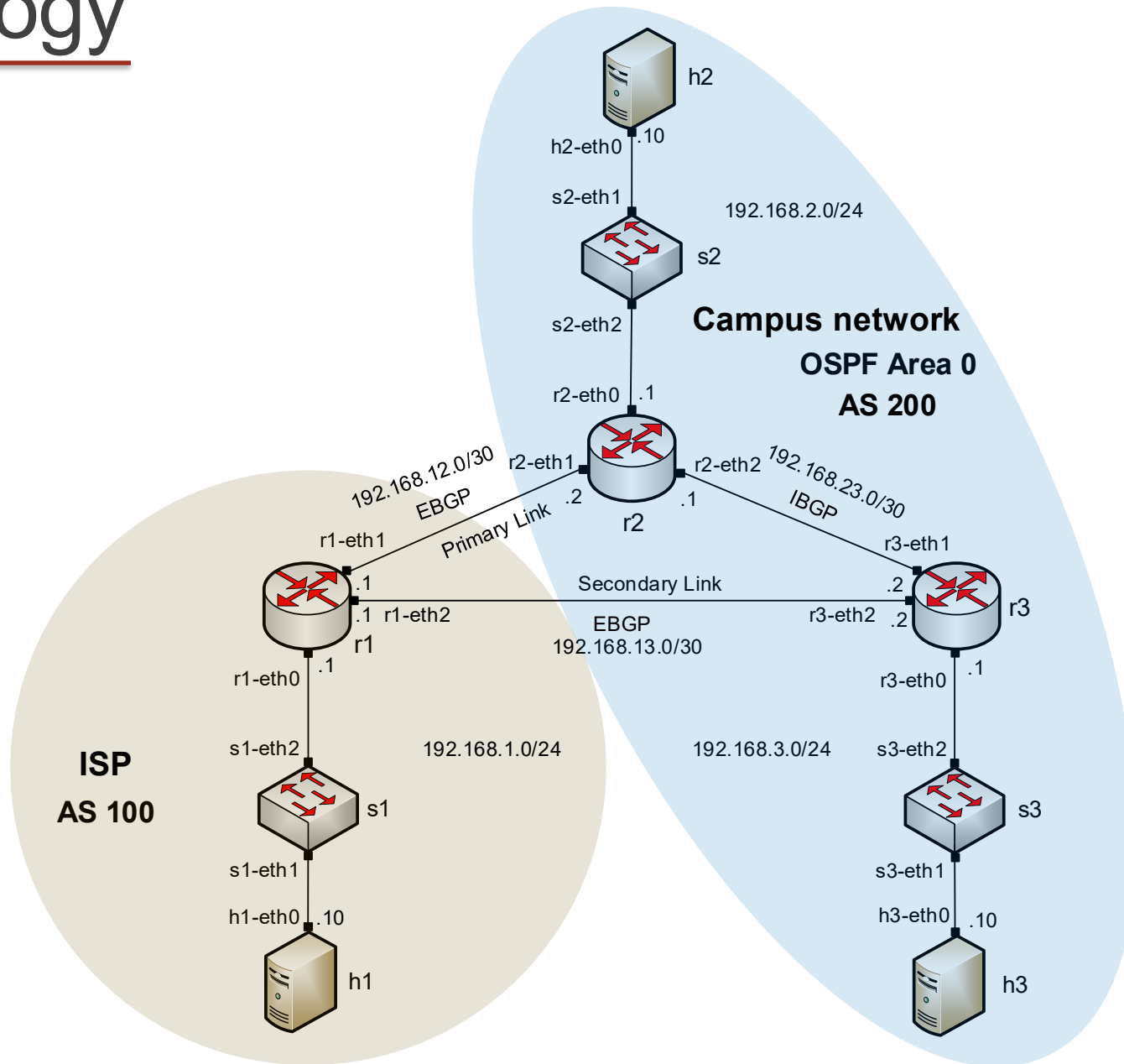
- Similarly, configure MED on router r3

```
Host: r3
frr-pc# configure terminal
frr-pc(config)# route-map secondary_med_out permit 10
frr-pc(config-route-map)# set metric 75
frr-pc(config-route-map)# exit
frr-pc(config)# router bgp 200
frr-pc(config-router)# neighbor 192.168.13.1 route-map secondary_med_out out
frr-pc(config-router)# end
frr-pc#
```



Additional Slides

Lab Topology



Free Range Routing (FRR) Architecture (Lab 2)

