UCF / FLR Workshop on Networking Topics
Session 2: Essentials of BGP, EBGP, IBGP

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Border Gateway Protocol Lab Series

- 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 8.2: Configuring 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

Organization of the Lab Manuals

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

AS, IGP, EGP

- Routers are organized into Autonomous Systems (ASes or ASs)
- What is an AS (RFC 1771)?

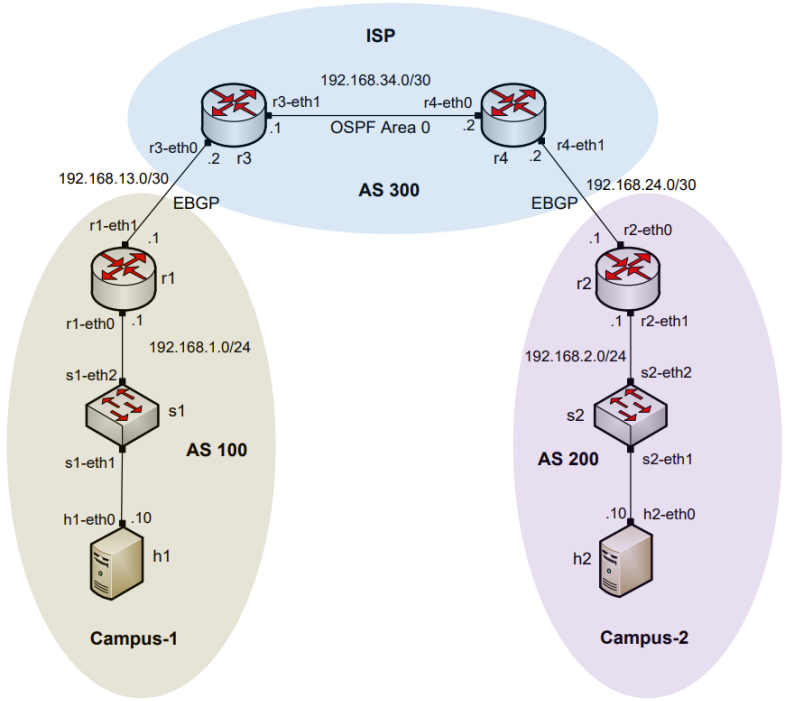
  "A set of routers under the single technical administration, using an IGP and common metrics to route packets within the AS, and using an EGP to route packets to other ASs."

- What is an Interior Gateway Protocol (IGP)?

  A routing protocol used to exchange routing information within an AS (e.g., RIP, OSPF)

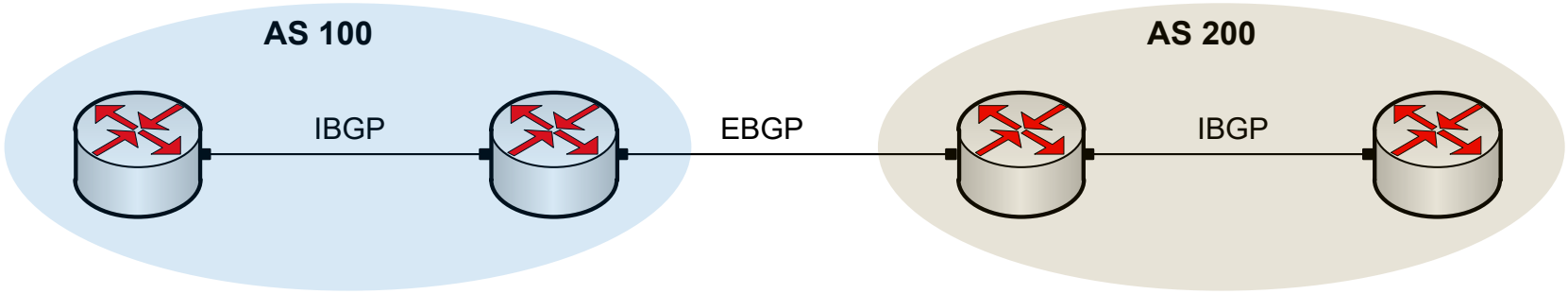
- What is an Exterior Gateway Protocol (EGP)?

  A routing protocol used to exchange routing information between AS



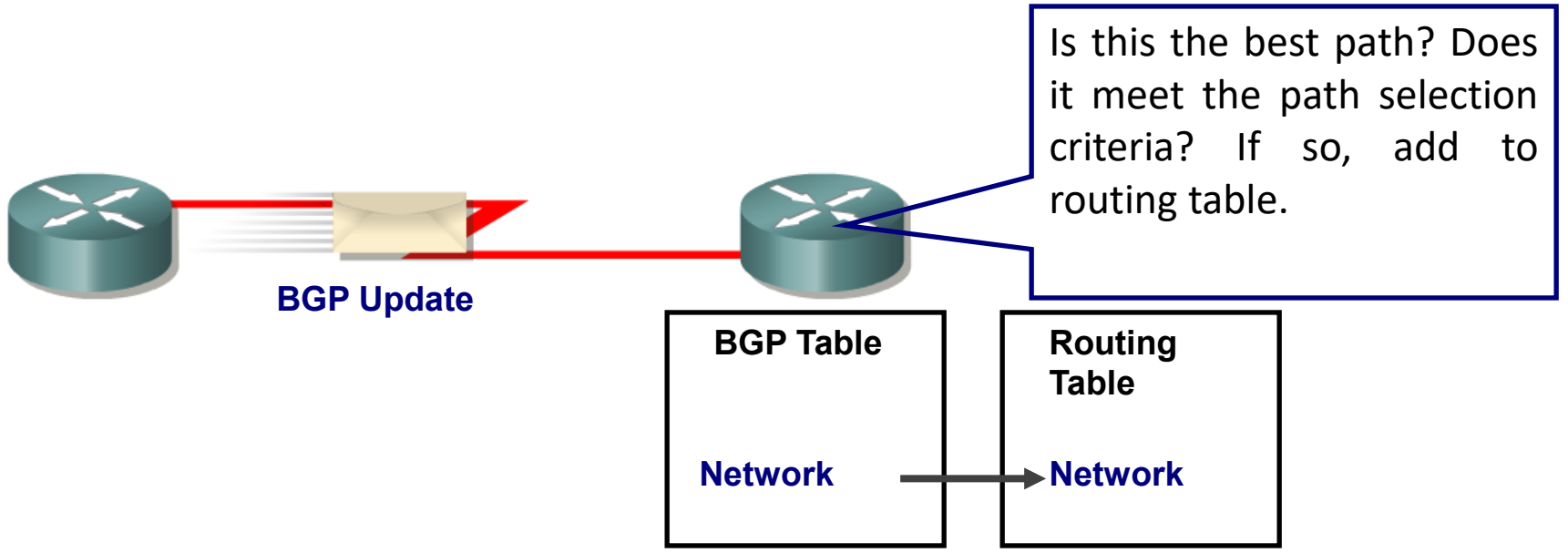
BGP Route Advertisements within an AS

- BGP advertisements from an AS to another is referred to as External BGP (EBGP)
- BGP advertisements within an AS is referred to as internal BGP (IBGP)



BGP – Best Path

- The main goal is to provide interdomain routing
- BGP selects one path as the best path
- It places the selected path in its routing table and propagates the path to its neighbors



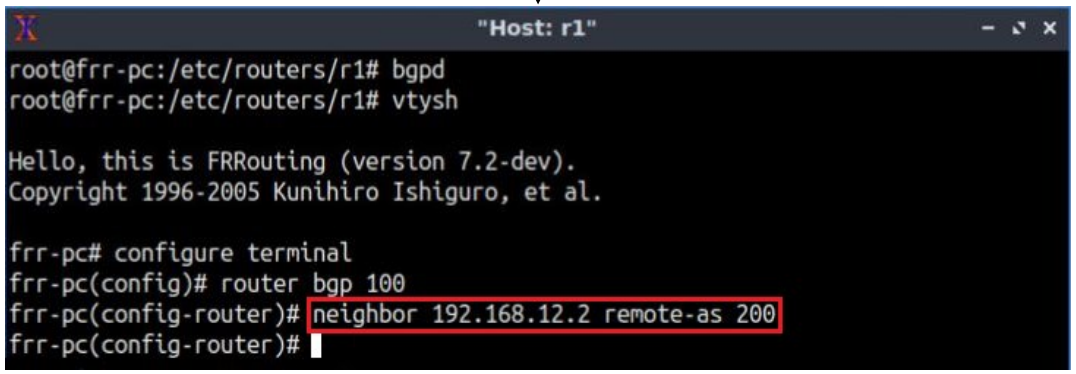
Rick Graziani, “Implementing Cisco IP Routing,” Cisco Press, 2015

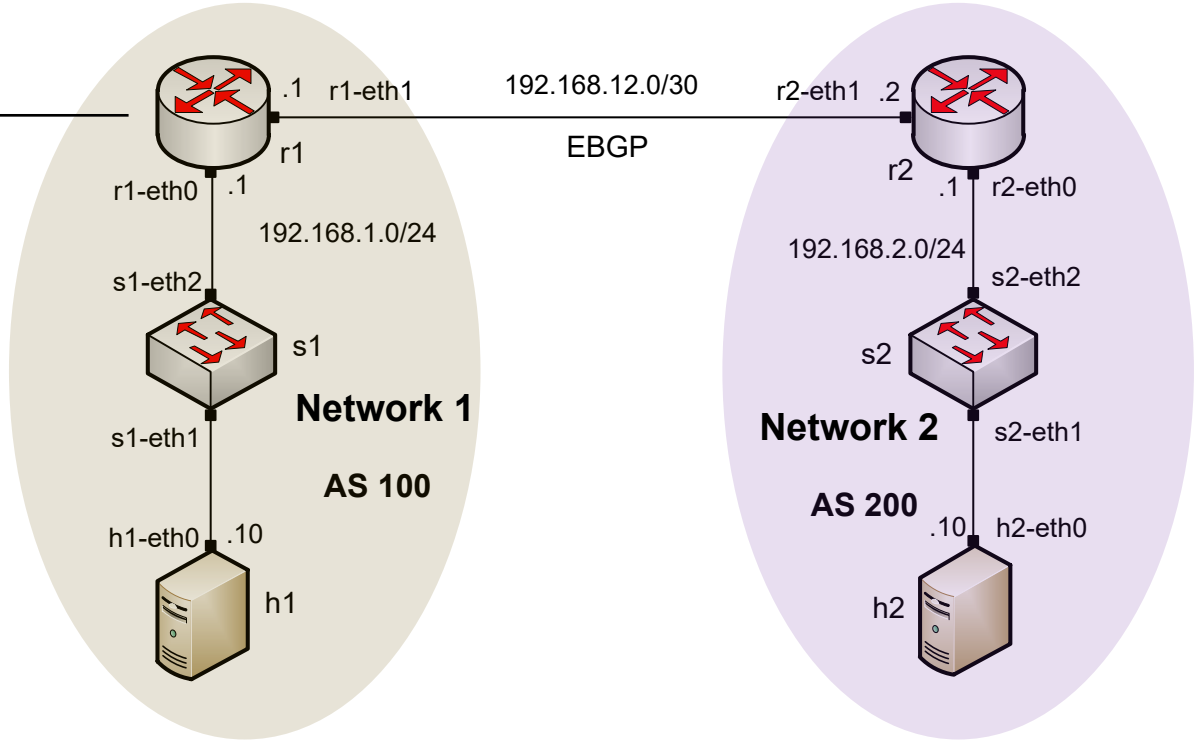
Lab 3: Introduction to BGP

Lab Topology

- Establish BGP neighborhood

Router r1

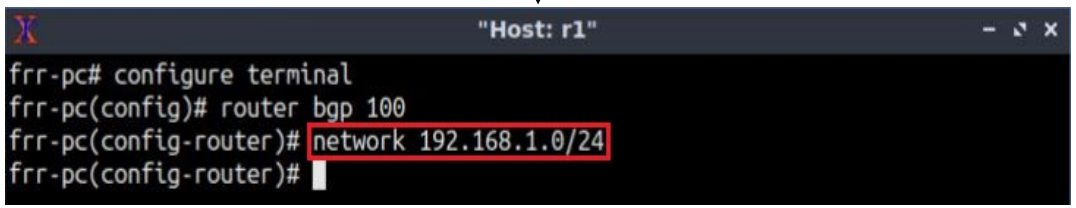


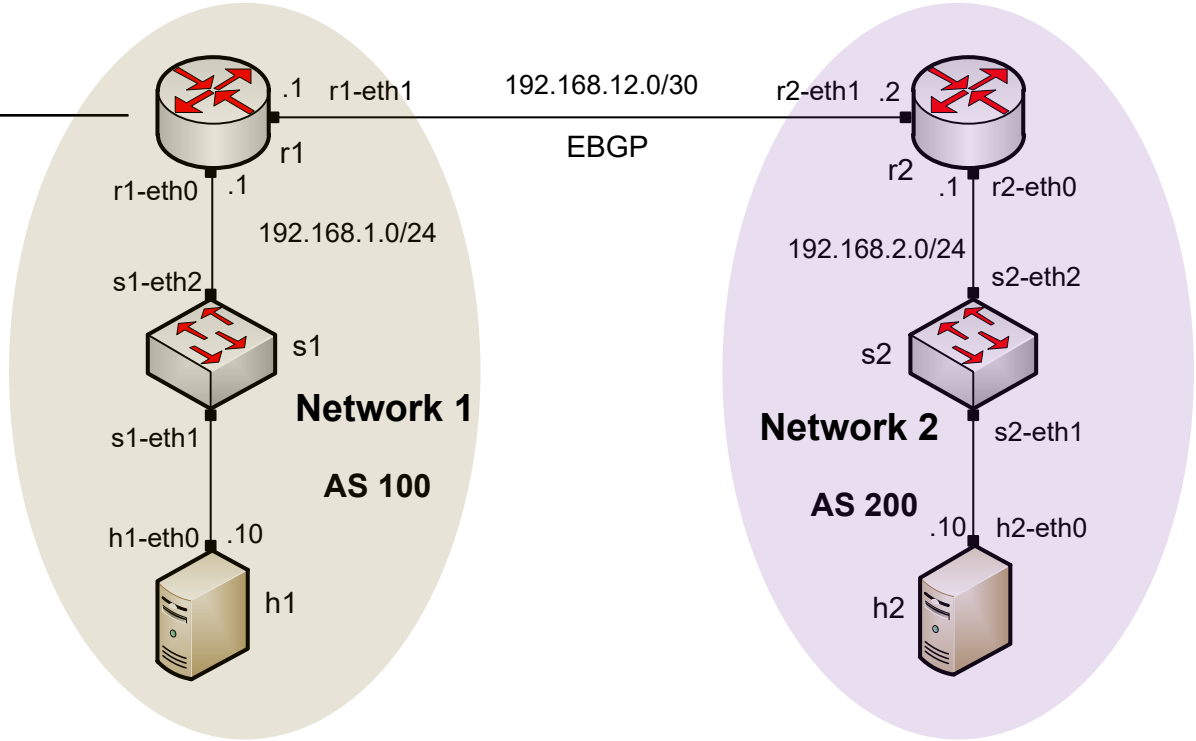


Lab Topology

- Advertise a network in BGP

Router r1

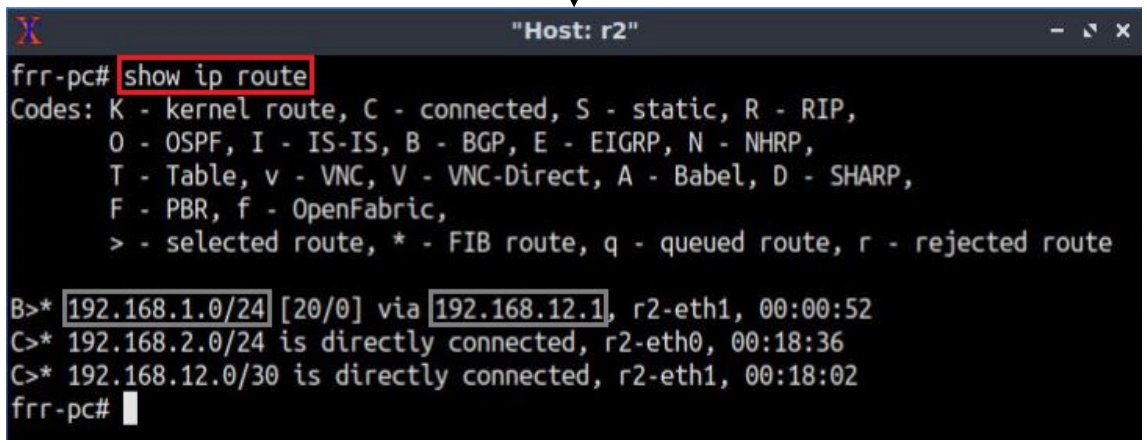


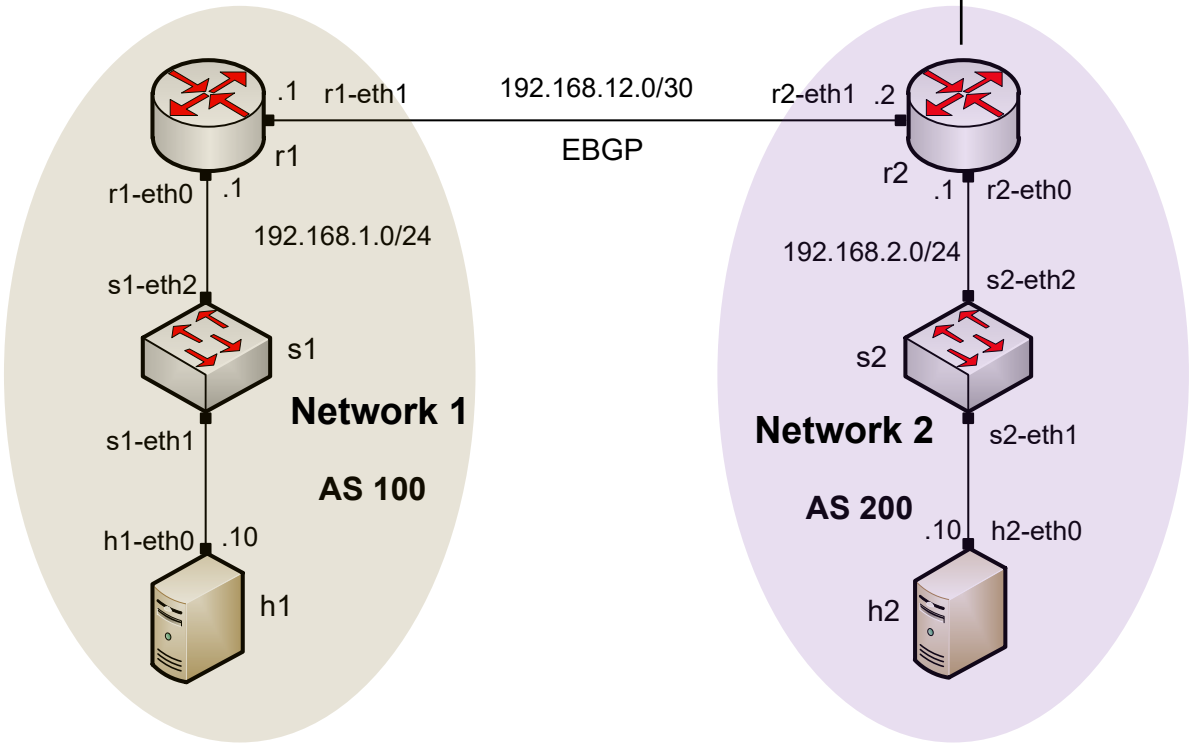


Lab Topology

- Routing table: lists the routes learned from different routing protocols

Router r2





Lab Topology

- BGP table: it lists the routes learned from BGP routing protocol

Router r2

```
"Host: r2"
frr-pc# show ip bgp
BGP table version is 2, local router ID is 192.168.12.2, vrf id 0
Default local pref 100, local AS 200
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
*> 192.168.1.0/24   192.168.12.1             0             0 100 i
*> 192.168.2.0/24   0.0.0.0                  0         32768 i

Displayed  2 routes and 2 total paths
frr-pc#
```