

High-speed Networks, Cybersecurity, and Software-defined Networking Workshop

Jorge Crichigno
University of South Carolina

Western Academy Support and Training Center (WASTC)
2020 Summer Conference
June 15 – June 19

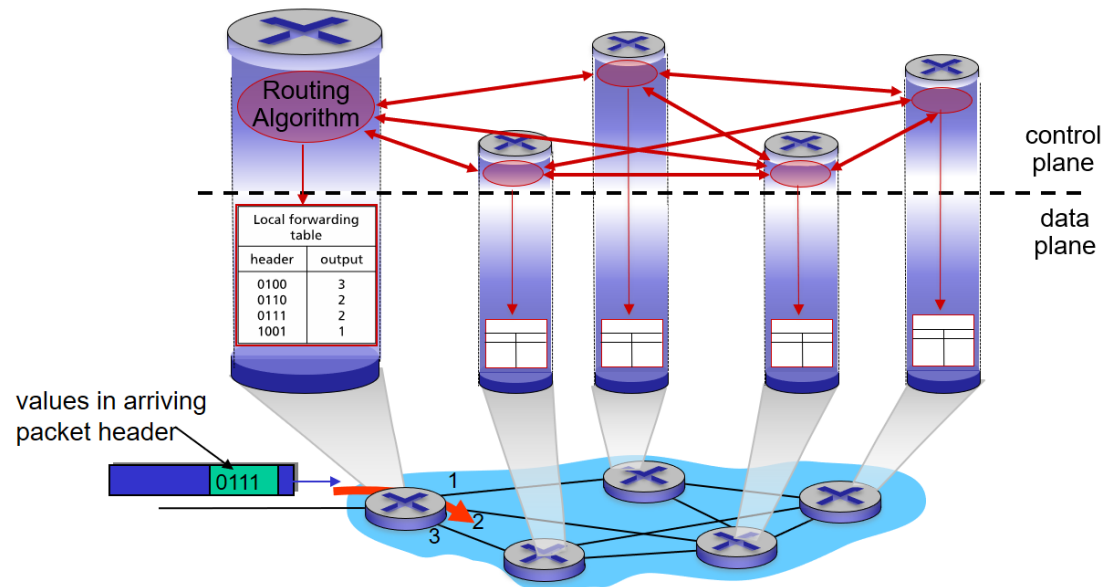


National Science Foundation (NSF), Office of Advanced Cyberinfrastructure (OAC) and Advanced Technological Education (ATE)

Lab 2: Legacy Networks, Distributed BGP Example

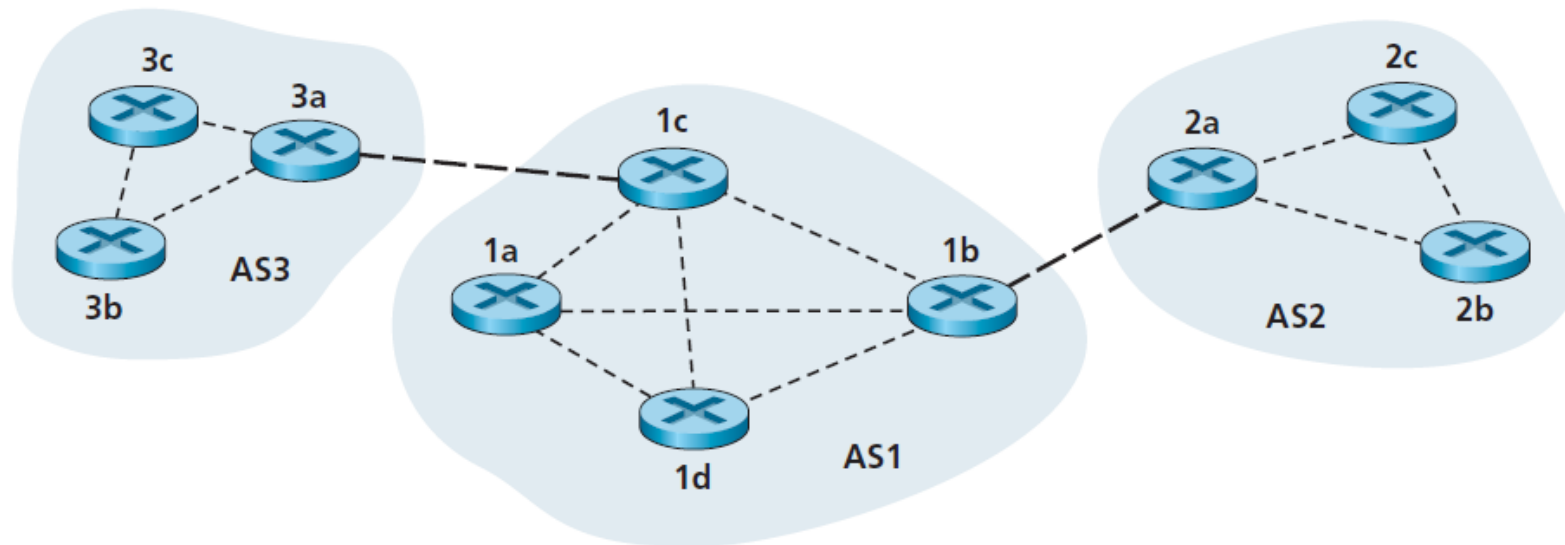
Lab 2: Legacy Networks, Distributed BGP Example

- Legacy routers locally implement both control plane and data plane
- Control plane includes network-wide logic that determines how packets are routed (BGP, OSPF, RIP, etc.)
- Data plane implements forwarding function
- Interface between control plane and data plane is proprietary



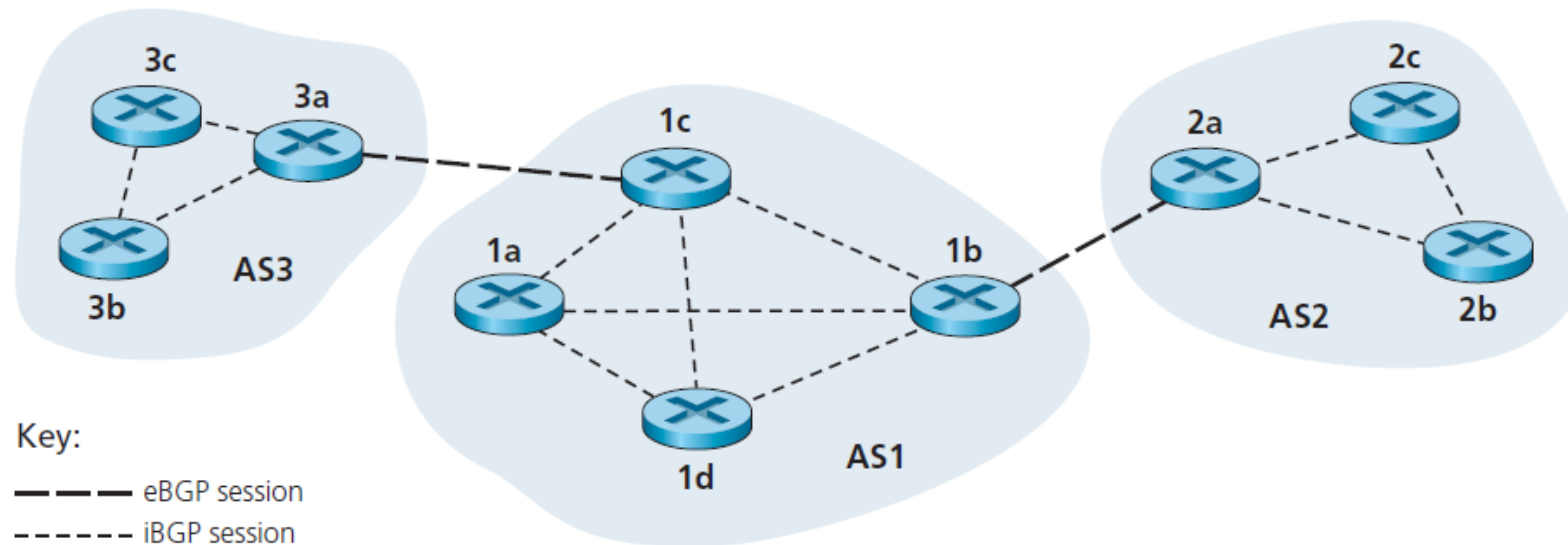
Border Gateway Protocol

- The Border Gateway Protocol (BGP) version 4 is the standard inter-autonomous system (AS) protocol in today's Internet
 - An AS is a group of routers typically under the same administrative control (e.g., ISP, company)
 - BGP is the *"glue that holds the Internet together"*
- In BGP, pairs of routers exchange routing information over TCP (default port 179)



Border Gateway Protocol

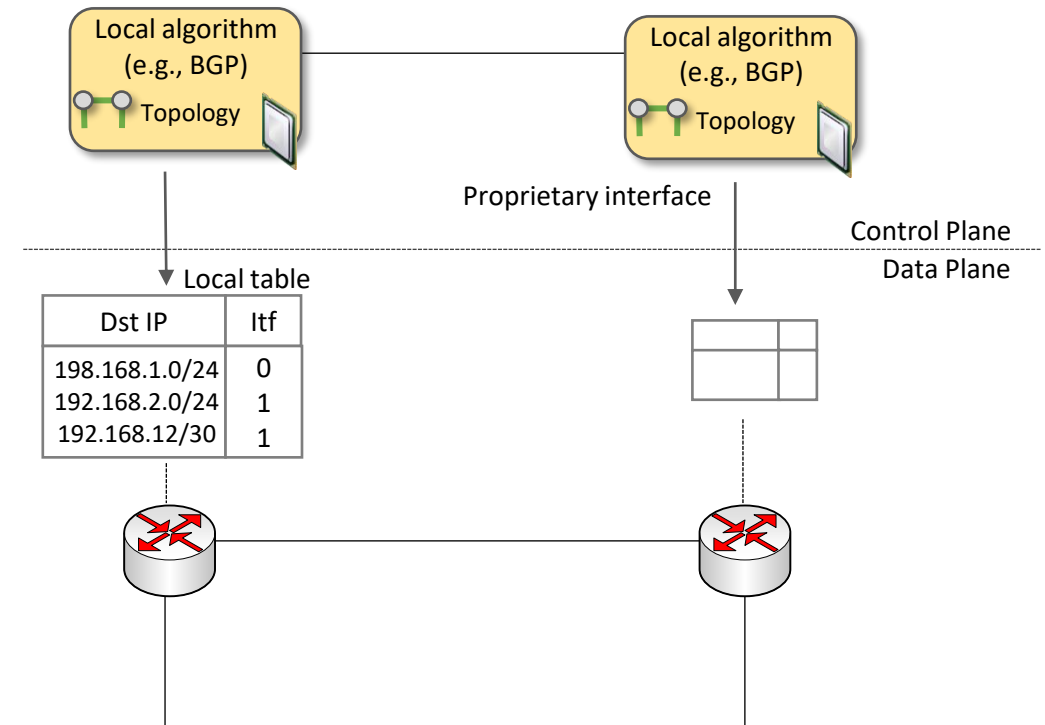
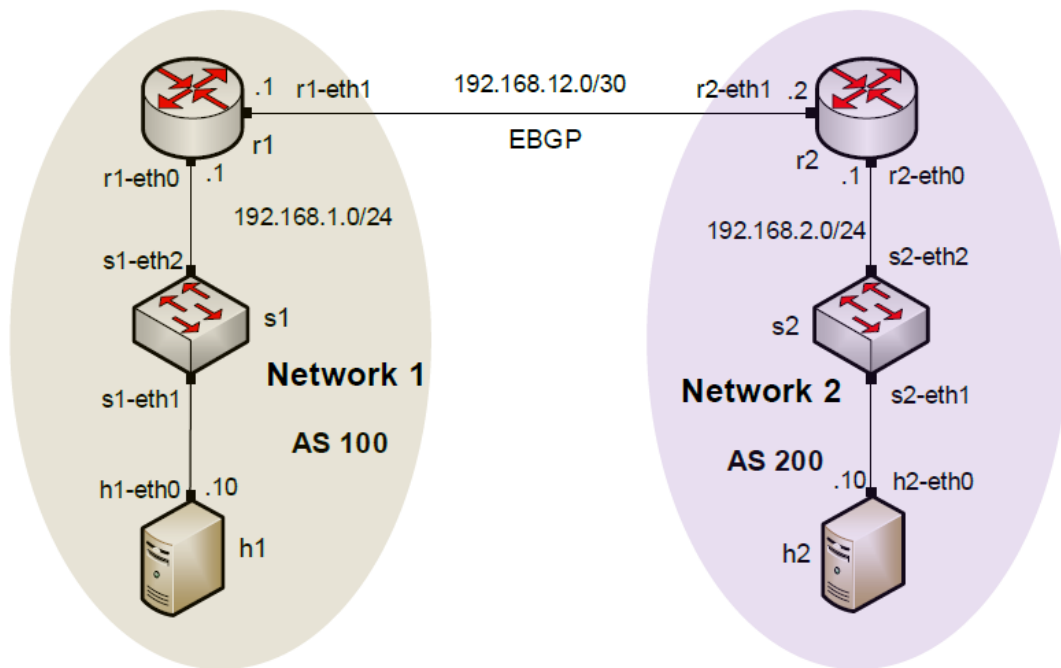
- BGP provides each AS a means to:
 - eBGP: obtain subnet reachability information from neighboring ASes
 - iBGP: propagate reachability information to AS-internal routers
 - Determine “good” routes to other networks based on reachability information and policy
- It allows a subnet to advertise its existence to rest of Internet: “I am here”



J. Kurose, K. Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson/Addison Wesley, 2017.

Lab 2: Legacy Networks, Distributed BGP Example

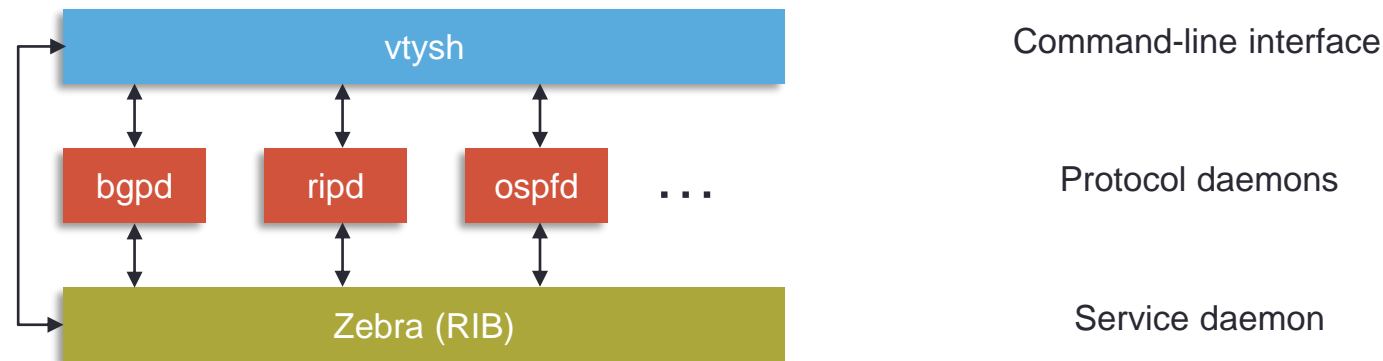
- The lab shows how legacy devices implement their own control plane
- It also shows
 - i) an open source implementation of a legacy routing protocol stack (FRR)
 - ii) how routers run BGP to exchange route information in a distributed approach



Lab 2: Legacy Networks, Distributed BGP Example

FRR routing

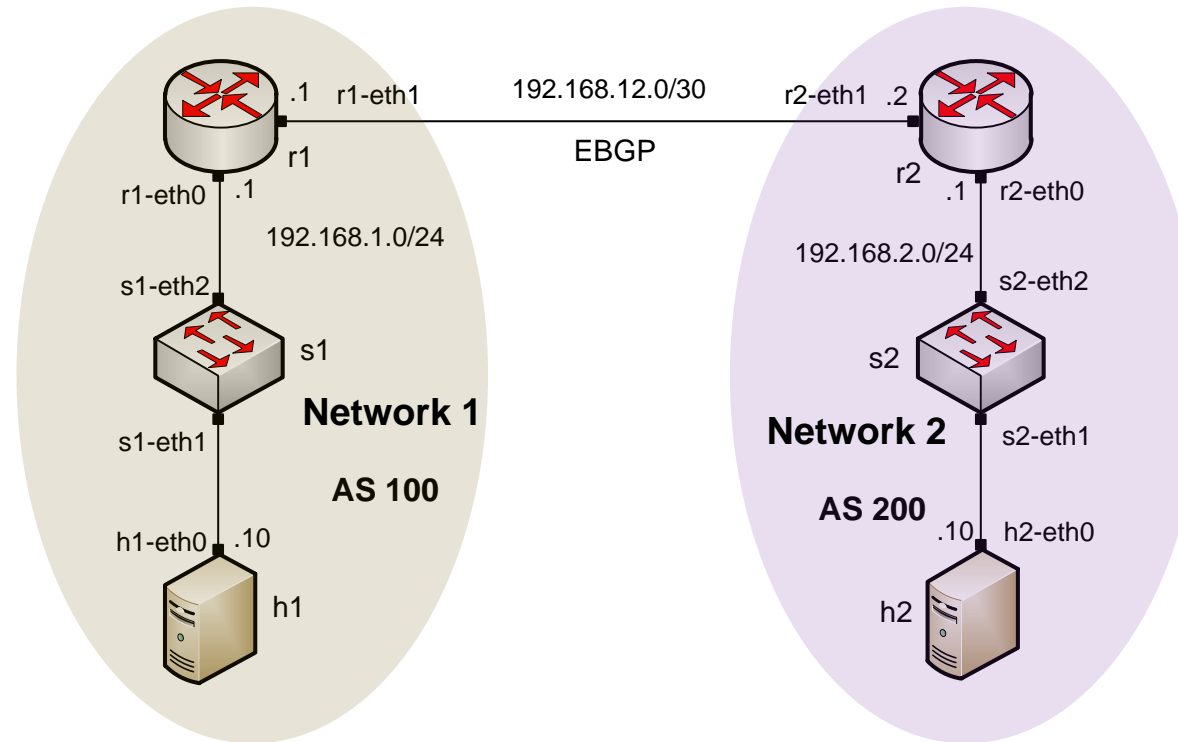
- An open source router
- The configuration is similar to other vendors
- Protocols are implemented as independent processes
- Zebra is the process that controls the routing information base (RIB) (control plane)



FRRouting website, <https://frrouting.org>

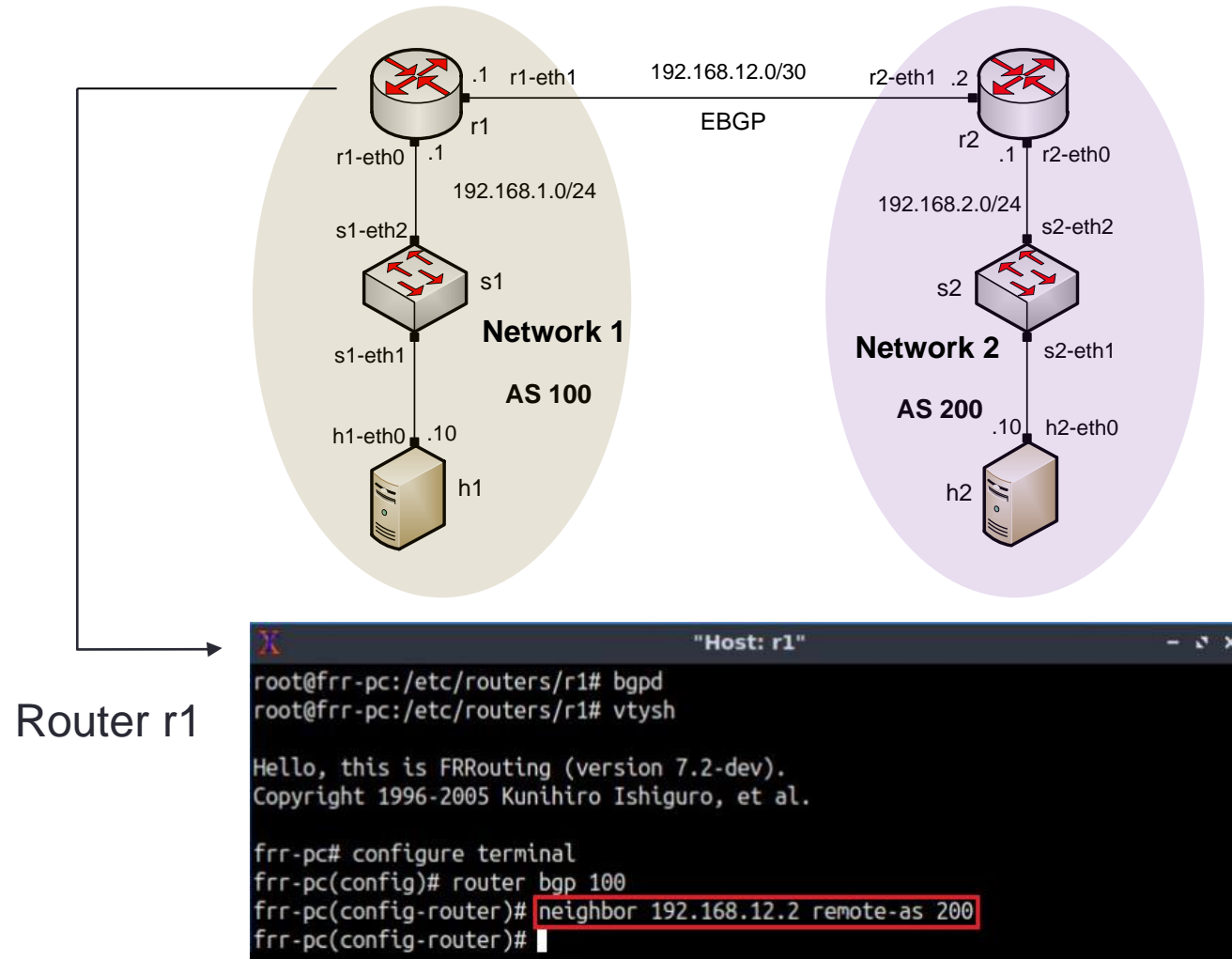
Lab 2: Legacy Networks, Distributed BGP Example

- Network 1 in AS 100 consists of a host, a switch, and a router
- Network 2 in AS 200 consists of a host, a switch, and a router



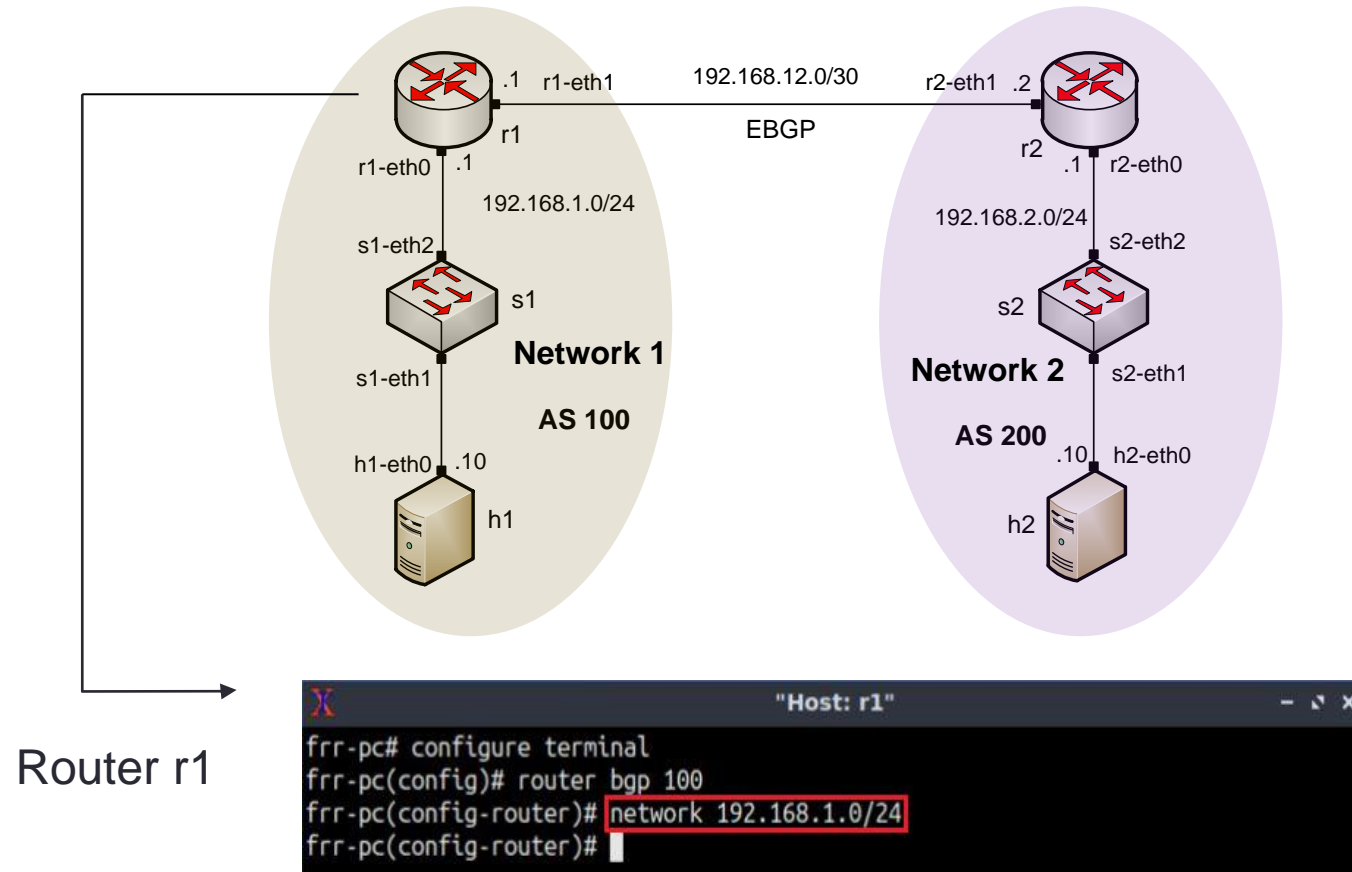
Lab 2: Legacy Networks, Distributed BGP Example

- Establishing BGP neighborhood



Lab 2: Legacy Networks, Distributed BGP Example

- Advertising a network in BGP



Lab 2: Legacy Networks, Distributed BGP Example

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

