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

Jorge Crichigno
University of South Carolina

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Overview SDN Lab Series

SDN Lab Series

The labs provide learning experiences on essential SDN topics

- Mininet

- Legacy networks, Border Gateway Protocol (BGP)

- FRR routing, an open routing implementation

- MPLS networks – early efforts toward SDN

- SDN fundamentals – controllers, switches
  - ONOS controller
  - Open Virtual Switch (OVS)

- Traffic isolation with VXLAN

- OpenFlow

- Interconnection between SDN and legacy Networks

SDN Lab Series

Lab experiments

Lab 1: Introduction to Mininet

Lab 2: Legacy Networks: BGP Example as a Distributed System and Autonomous Forwarding Decisions

Lab 3: Early efforts of SDN: MPLS example of a control plane that establishes semi-static forwarding paths

Lab 4: Introduction to SDN

Lab 5: Configuring VXLAN to Provide Network Traffic Isolation

Lab 6: Introduction to OpenFlow

Lab 7: Interconnection between legacy networks and SDN networks

SDN Lab Series

- The goal of the SDN Lab Series is to provide a practical experience to students and IT practitioners
- The labs provide background information which is reinforced with hands-on activities
- A good book on SDN network (which matches the SDN Lab Series) is "Software Defined Networking, A Comprehensive Approach"
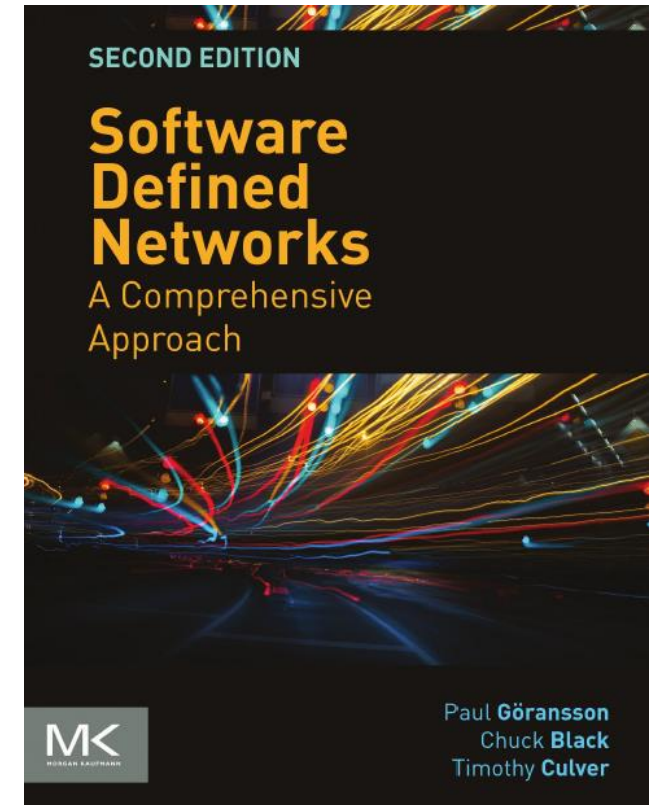
Organization of Lab Manuals

Each lab starts with a section *Overview*

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

Section 1

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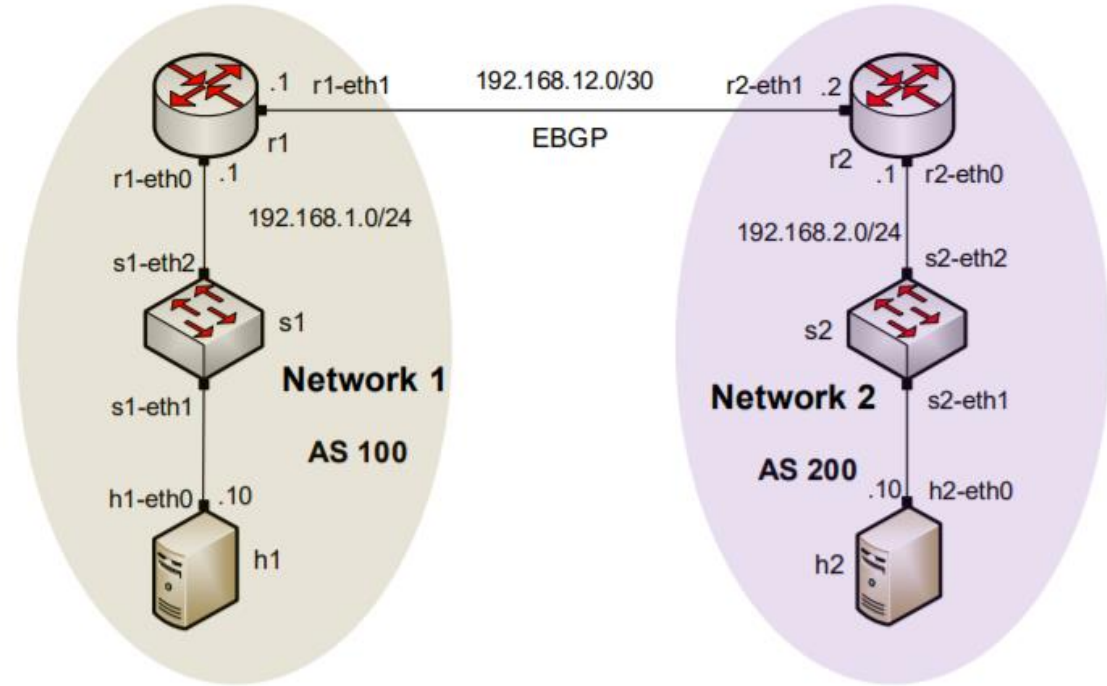- Section 1 is optional (i.e., the reader can skip this section and move to lab directions)

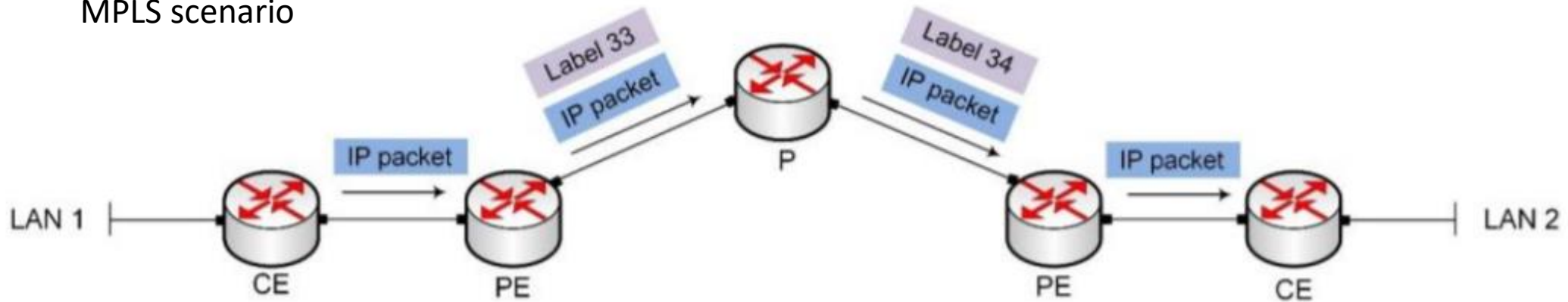*Section 2… n*

- Step-by-step directions

Examples

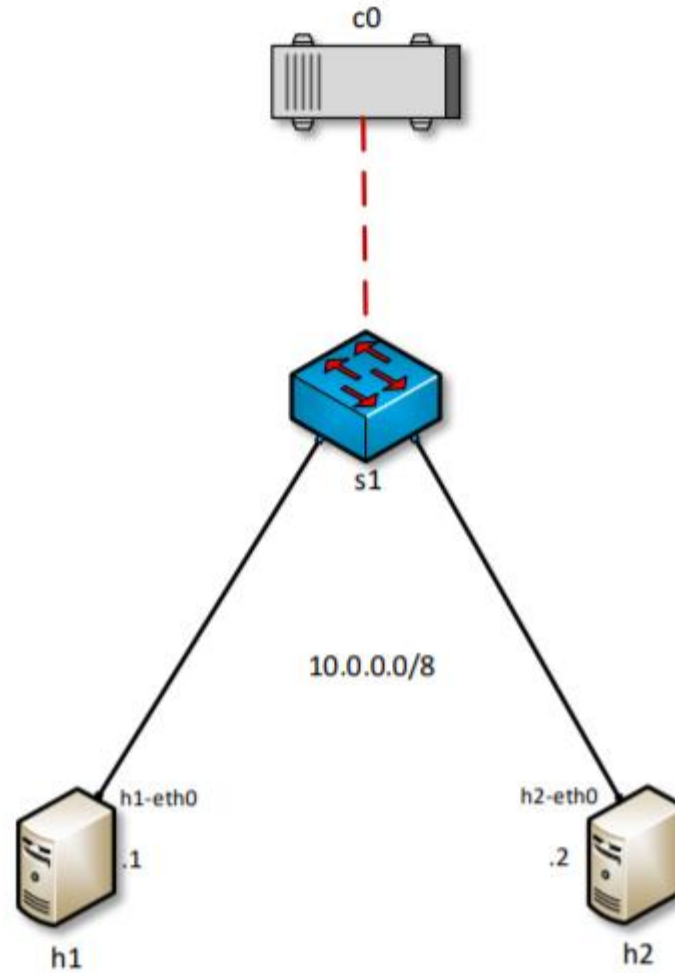## Legacy networks

BGP scenario

MPLS scenario

Examples

SDN networks

Examples

Interconnection of SDN and legacy networks

c0

10.0.0.3/24

s1-eth3   s1-eth2
s1
s2-eth1   s2-eth2   s1-eth1   s3-eth2   s3-eth1
s2   s3

r1-eth0 ⎰ 192.168.12.1/30
        ⎱ 192.168.13.1/30

r2-eth1   192.168.12.2/30   r3-eth1
r2   192.168.13.2/30   r3
                    r1-eth1
r2-eth0 .1   10.0.0.1/24   .1   r3-eth0
                      r1

s4-eth2   s5-eth2
s4   192.168.2.0/24   192.168.3.0/24   s5

s4-eth1   r5-eth1

h1-eth0 .10   .10   h2-eth0

h1   h2

AS 200   **AS 100**   **AS 300**

– – – Out-of-band connection