Hands-on Session 5: SDN Concepts, Controllers, Flow Tables
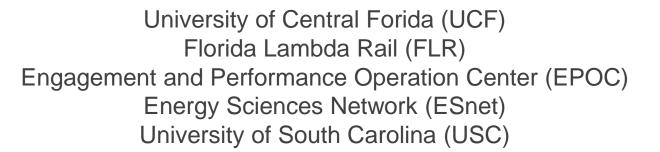
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UCF / FLR Workshop on Networking Topics
Thursday, May 22, 2025

1

Software Defined Networking 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 Routing within an SDN network

  Lab 8 Interconnection between Legacy Networks and SDN Networks

  Lab 9 Configuring Virtual Private LAN Service (VPLS)

  Lab 10 Applying Equal-cost Multi-path Protocol (ECMP) within SDN networks

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 SDN)
 - ➢ Section 1 is optional (i.e., the reader can skip this section and move to lab directions)

Section 2… n
 - ➢ Step-by-step directions

Introduction to SDN

Lab activities are described in Lab 4, Software Defined Networking Lab Library

Hands-on Labs on Software Defined Networking

- Webpage with PowerPoint presentations:

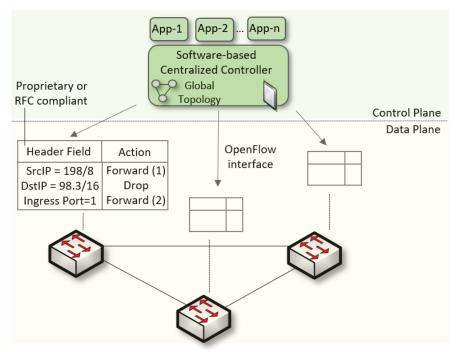   https://research.cec.sc.edu/cyberinfra/ucf_flr_workshop

Hands-on session 5 (11:10AM-11:55AM): to access labs for Session 5 (Introduction to SDN).

The virtual platform (Netlab) is reachable through the following link:
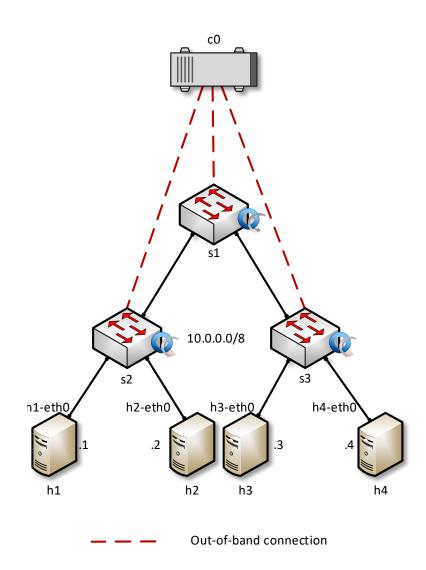
    https://netlab.cec.sc.edu

Flow Tables

- Flow tables are the fundamental data structures in an SDN device
- They allow the device to evaluate incoming packets and take the appropriate action
- Flow tables consist of entries, each of which has match fields and actions
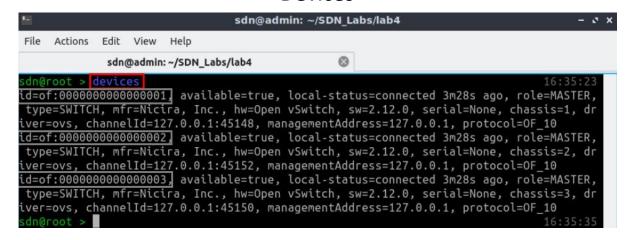- OpenFlow explicitly specifies protocol headers on which it operates / matches

Lab 4: Introduction to SDN

- The topology consists of:
  - The Open Network Operating System (ONOS) controller, an open source SDN controller
  - Open Virtual Switch (OVS) devices; OVS is an open source SDN switch

- Activities include
  - Run ONOS controller
  - Run simple SDN applications
  - Inspect flow tables
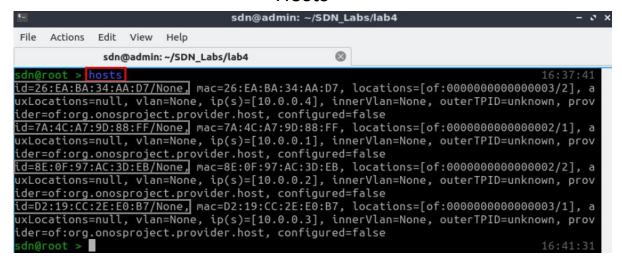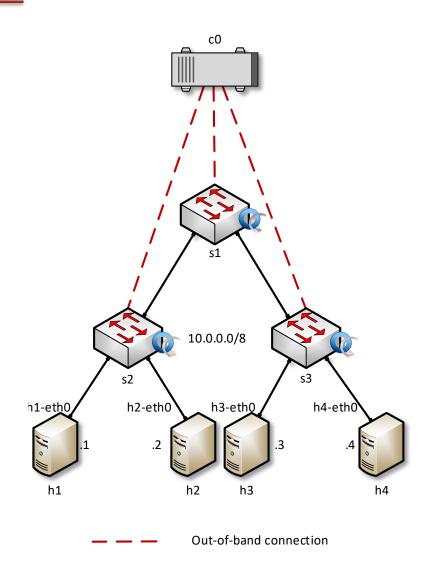 - Interact with ONOS Graphical User Interface (GUI)

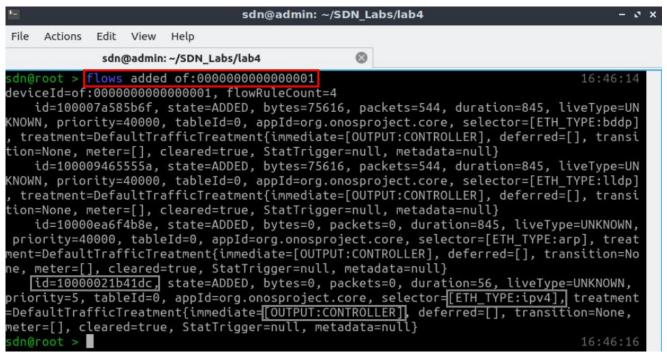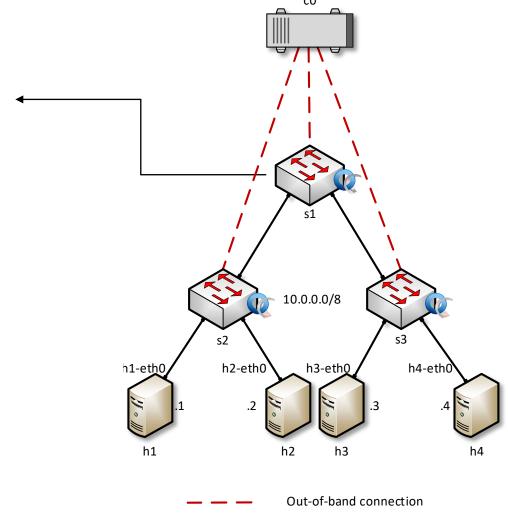# Activating the OpenFlow Application

Devices

Hosts

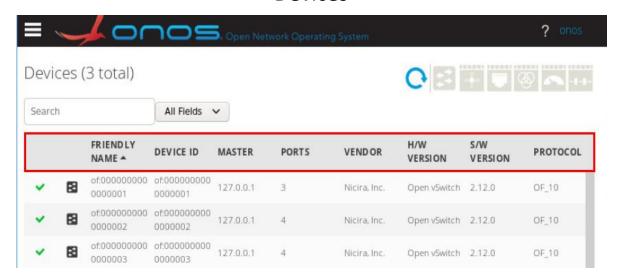# Activating the Forwarding Application

Flows on switch s1
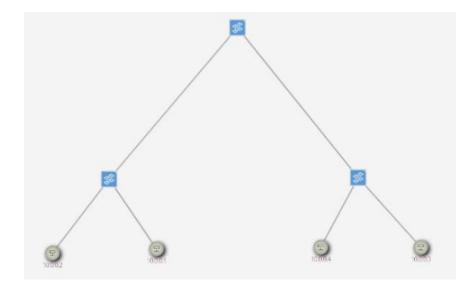
ONOS GUI

Devices

Topology (ONOS GUI view)

Accessing the Platform

We will use the NETLAB virtual platform:

- **URL:** https://netlab.cec.sc.edu/
- **Username:** <email address used for the registration>
- **Temporary Password:** nsf-2025