



# UCF / FLR Workshop on Networking Topics

## Hands-on Session 5: SDN Concepts, Controllers, Flow Tables

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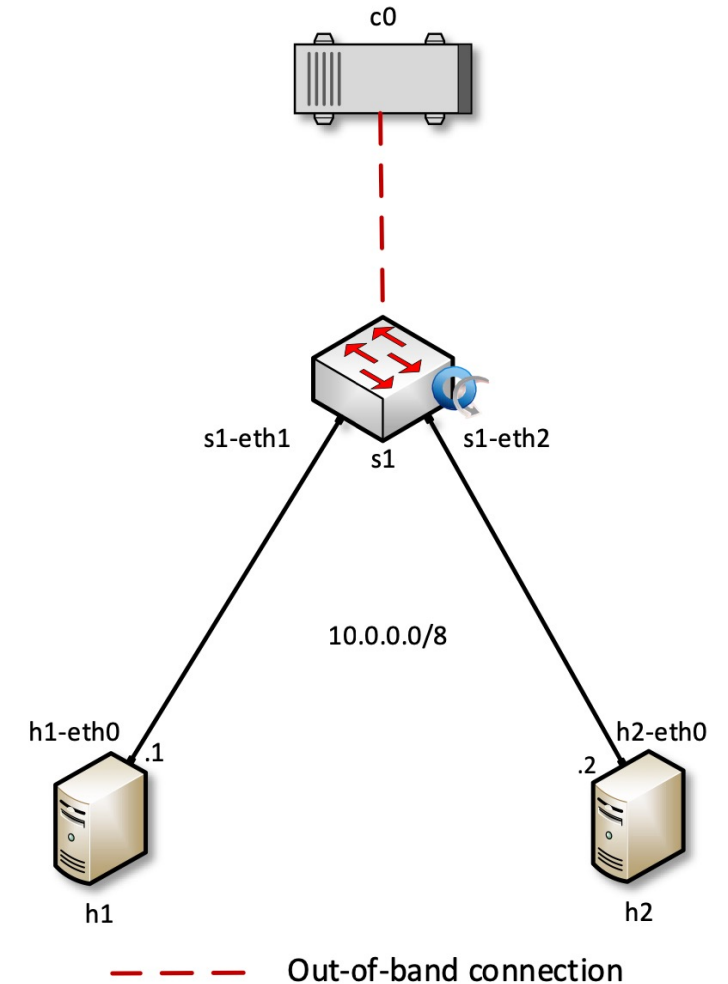
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# Lab 6: Introduction to OpenFlow

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- The topology consists of:
  - The Open Network Operating System (ONOS) controller, an open source SDN controller
  - Open Virtual Switch (OVS) device; OVS is an open source SDN switch
  - Hosts, serving as the end-users
- Activities include
  - Configure OpenFlow switches using `ovs-ofctl`
  - Run ONOS controller and activate some of its applications
  - Inspect the flow entries installed by the activated ONOS applications
  - Inspect the communication between the controller and the switch



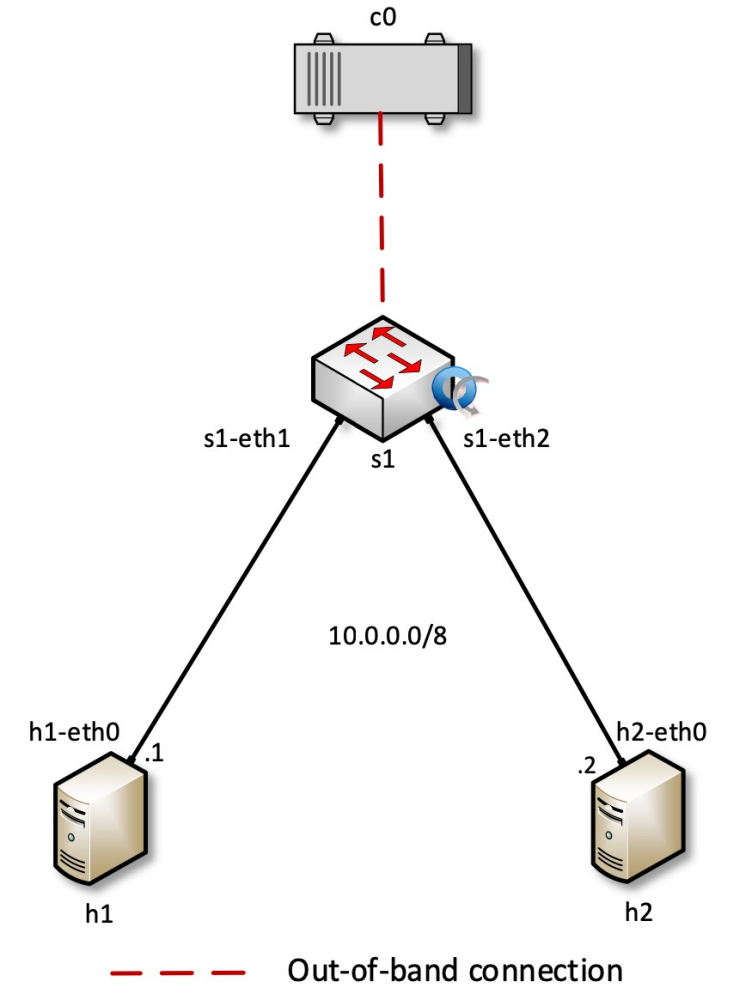
# Activating the OpenFlow Application

Add flows using ovs-ofctl

```
root@admin: /home/sdn
File Actions Edit View Help
root@admin: /home/sdn
root@admin:/home/sdn# ovs-ofctl add-flow s1 in_port=1,actions=output:2
root@admin:/home/sdn#
```

Show the flow table using ovs-ofctl

```
root@admin: /home/sdn
File Actions Edit View Help
root@admin: /home/sdn
root@admin:/home/sdn# ovs-ofctl dump-flows s1
 cookie=0x0, duration=1103.758s, table=0, n_packets=0, n_bytes=0, in_port="s1-eth1" actions=output:"s1-eth2"
 cookie=0x0, duration=958.951s, table=0, n_packets=0, n_bytes=0, in_port="s1-eth2" actions=output:"s1-eth1"
root@admin:/home/sdn#
```



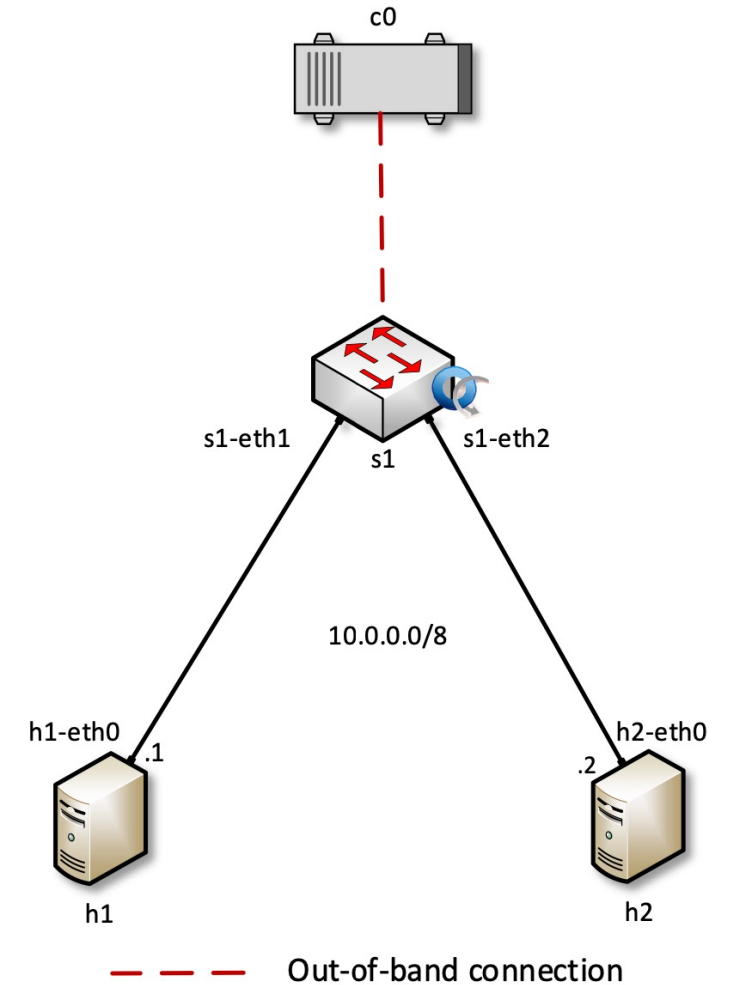
# Activating the OpenFlow Application

Activate ONOS applications

```
root@admin: /home/sdn/SDN_Labs/lab6
File Actions Edit View Help
root@admin: /home/sdn/SDN_Labs/lab6
karaf@root > app activate org.onosproject.fwd
Activated org.onosproject.fwd
karaf@root >
```

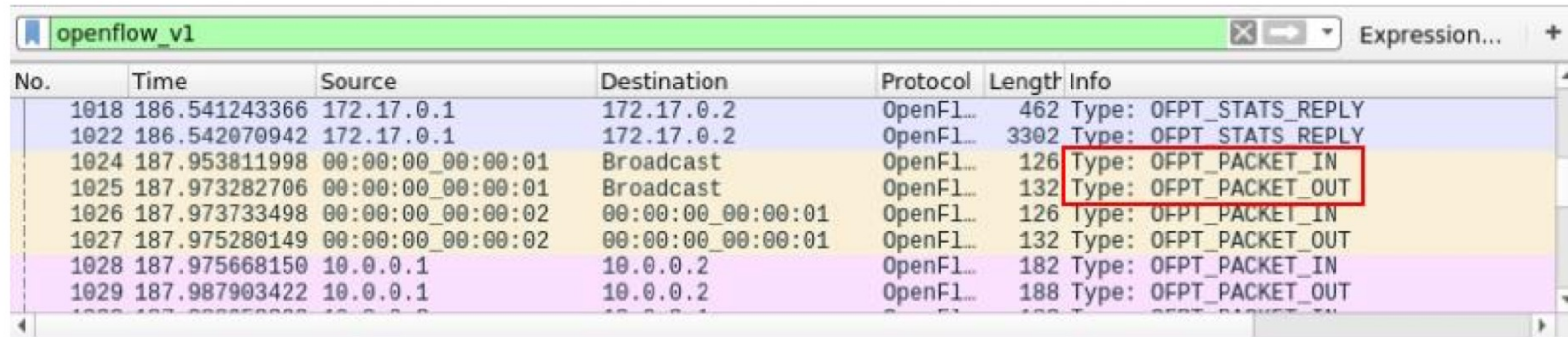
Show the flow entries installed by ONOS applications

```
root@admin: /home/sdn
File Actions Edit View Help
sdn@admin: ~/SDN_Labs/lab6 root@admin: /home/sdn
root@admin:/home/sdn# ovs-ofctl dump-flows s1
cookie=0x10000ea6f4b8e, duration=7615.550s, table=0, n_packets=0, n_bytes=0, priority=
40000,arp actions=CONTROLLER:65535
cookie=0x100007a585b6f, duration=7615.550s, table=0, n_packets=0, n_bytes=0, priority=
40000,dl_type=0x8942 actions=CONTROLLER:65535
cookie=0x100009465555a, duration=7615.549s, table=0, n_packets=0, n_bytes=0, priority=
40000,dl_type=0x88cc actions=CONTROLLER:65535
cookie=0x10000021b41dc, duration=232.161s, table=0, n_packets=0, n_bytes=0, priority=5
,ip actions=CONTROLLER:65535
root@admin:/home/sdn#
```



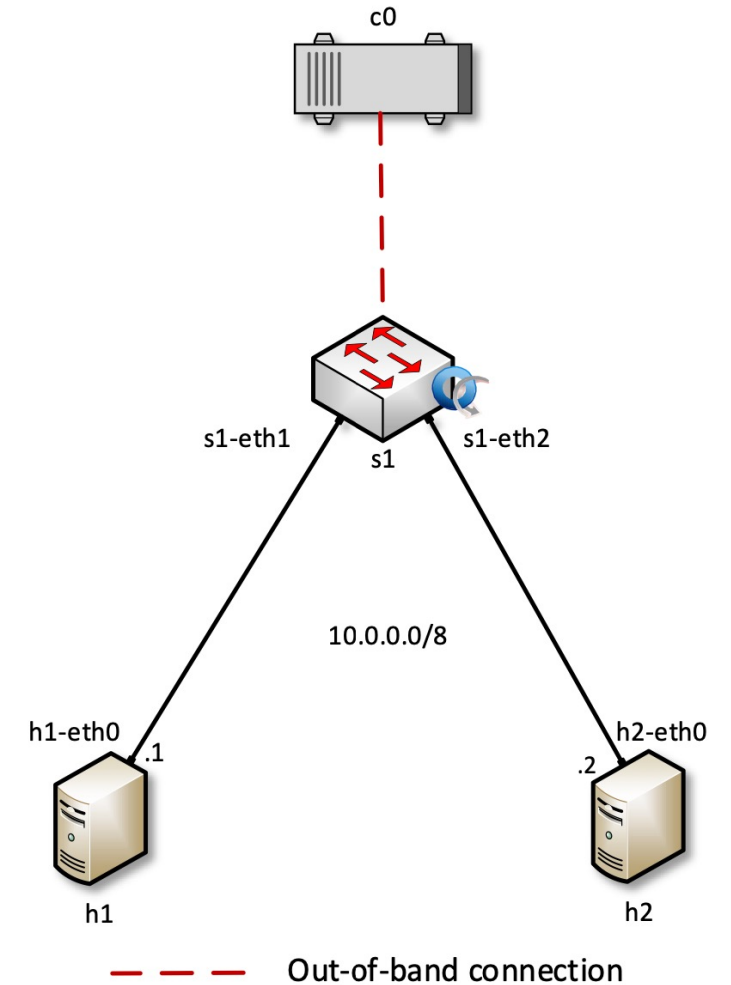
# Activating the OpenFlow Application

Capture and Inspect the communication (PACKET\_IN and PACKET\_OUT messages) between the controller and the switch using Wireshark



The image shows a Wireshark packet capture window titled 'openflow\_v1'. The capture filter is 'Expression...'. The packet list table is as follows:

No.	Time	Source	Destination	Protocol	Length	Info
1018	186.541243366	172.17.0.1	172.17.0.2	OpenFl...	462	Type: OFPT_STATS_REPLY
1022	186.542070942	172.17.0.1	172.17.0.2	OpenFl...	3302	Type: OFPT_STATS_REPLY
1024	187.953811998	00:00:00_00:00:01	Broadcast	OpenFl...	126	Type: OFPT_PACKET_IN
1025	187.973282706	00:00:00_00:00:01	Broadcast	OpenFl...	132	Type: OFPT_PACKET_OUT
1026	187.973733498	00:00:00_00:00:02	00:00:00_00:00:01	OpenFl...	126	Type: OFPT_PACKET_IN
1027	187.975280149	00:00:00_00:00:02	00:00:00_00:00:01	OpenFl...	132	Type: OFPT_PACKET_OUT
1028	187.975668150	10.0.0.1	10.0.0.2	OpenFl...	182	Type: OFPT_PACKET_IN
1029	187.987903422	10.0.0.1	10.0.0.2	OpenFl...	188	Type: OFPT_PACKET_OUT



# Additional Slides





# Workshop on Networking Topics

- Webpage with PowerPoint presentations:

[http://ce.sc.edu/cyberinfra/workshop\\_2023\\_feb.html](http://ce.sc.edu/cyberinfra/workshop_2023_feb.html)

- Hands-on sessions: to access labs for the hands-on sessions, use the following link:

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

- Username: email used for registration
- Password: nsf2023