

Assignment 3: An Introduction to the World of SDN

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1 Part 1: Hub Controller and Learning Switch

1.1 pingall Test

The following are the rules installed in the switches:

1. Hub Controller:

```
*** s1 _____  
cookie=0x0, duration=154.396s, table=0, npackets=83, nbytes=7966, priority=0 ac-  
tions=CONTROLLER:65535  
*** s2 _____  
cookie=0x0, duration=154.407s, table=0, npackets=83, nbytes=7966, priority=0 ac-  
tions=CONTROLLER:65535
```

2. Learning Switch Controller

```
*** s1 _____  
cookie=0x0, duration=6.527s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth1",dlsrc=00:00:00:00:00:01,dldst=00:00:00:00:00:02 actions=output:"s1-eth2"  
cookie=0x0, duration=6.523s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth2",dlsrc=00:00:00:00:00:02,dldst=00:00:00:00:00:01 actions=output:"s1-eth1"  
cookie=0x0, duration=6.514s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth1",dlsrc=00:00:00:00:00:01,dldst=00:00:00:00:00:03 actions=output:"s1-eth3"  
cookie=0x0, duration=6.503s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth3",dlsrc=00:00:00:00:00:03,dldst=00:00:00:00:00:01 actions=output:"s1-eth1"  
cookie=0x0, duration=6.496s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth1",dlsrc=00:00:00:00:00:01,dldst=00:00:00:00:00:04 actions=output:"s1-eth3"  
cookie=0x0, duration=6.488s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth3",dlsrc=00:00:00:00:00:04,dldst=00:00:00:00:00:01 actions=output:"s1-eth1"  
cookie=0x0, duration=6.476s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-  
eth2",dlsrc=00:00:00:00:00:02,dldst=00:00:00:00:00:03 actions=output:"s1-eth3"
```

```

cookie=0x0, duration=6.468s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-eth3",dlsrc=00:00:00:00:00:03,dldst=00:00:00:00:00:02 actions=output:"s1-eth2"
cookie=0x0, duration=6.462s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-eth2",dlsrc=00:00:00:00:00:02,dldst=00:00:00:00:00:04 actions=output:"s1-eth3"
cookie=0x0, duration=6.456s, table=0, npackets=1, nbytes=98, priority=1,inport="s1-eth3",dlsrc=00:00:00:00:00:04,dldst=00:00:00:00:00:02 actions=output:"s1-eth2"
cookie=0x0, duration=14.521s, table=0, npackets=53, nbytes=5458, priority=0 actions=CONTROLLER:65535
*** s2 -----
cookie=0x0, duration=6.522s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth3",dlsrc=00:00:00:00:00:01,dldst=00:00:00:00:00:03 actions=output:"s2-eth1"
cookie=0x0, duration=6.518s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth1",dlsrc=00:00:00:00:00:03,dldst=00:00:00:00:00:01 actions=output:"s2-eth3"
cookie=0x0, duration=6.505s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth3",dlsrc=00:00:00:00:00:01,dldst=00:00:00:00:00:04 actions=output:"s2-eth2"
cookie=0x0, duration=6.502s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth2",dlsrc=00:00:00:00:00:04,dldst=00:00:00:00:00:01 actions=output:"s2-eth3"
cookie=0x0, duration=6.486s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth3",dlsrc=00:00:00:00:00:02,dldst=00:00:00:00:00:03 actions=output:"s2-eth1"
cookie=0x0, duration=6.483s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth1",dlsrc=00:00:00:00:00:03,dldst=00:00:00:00:00:02 actions=output:"s2-eth3"
cookie=0x0, duration=6.472s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth3",dlsrc=00:00:00:00:00:02,dldst=00:00:00:00:00:04 actions=output:"s2-eth2"
cookie=0x0, duration=6.470s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth2",dlsrc=00:00:00:00:00:04,dldst=00:00:00:00:00:02 actions=output:"s2-eth3"
cookie=0x0, duration=6.452s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth1",dlsrc=00:00:00:00:00:03,dldst=00:00:00:00:00:04 actions=output:"s2-eth2"
cookie=0x0, duration=6.450s, table=0, npackets=1, nbytes=98, priority=1,inport="s2-eth2",dlsrc=00:00:00:00:00:04,dldst=00:00:00:00:00:03 actions=output:"s2-eth1"
cookie=0x0, duration=14.532s, table=0, npackets=54, nbytes=5548, priority=0 actions=CONTROLLER:65535

```

The following are the observations of the above results:

1. R1
2. R2

1.2 Throughput Test

The following are the Throughput of when the following controllers are used:

1. Hub Controller:20.3 Mbits/sec
2. Learning Switch:29.1 Gbits/sec

Inferences:

1. I1
2. I2

2 Part 2: Layer2-like Shortest Path Routing

The following are the Testing and Measurements Performed:

iperf with two parallel TCP Connections:

1. ECMP On:
 - (a) Throuput:
 - (b) Flow Rules:
2. ECMP Off:
 - (a) Throuput:
 - (b) Flow Rules:

observations:

1. O1
2. O2

2.1 Bonus Part

Load Balancing Mechanism:

1. M1
2. M2

Results:

1. R1
2. R2

Validation of Result:

1. V1
2. V2

Comparision with Random Selection Methodology:

1. M1
2. M2

3 Layer3-like Shortest Path Routing

The following are the experimenting and reports:

1. h1 ping h2 -c 5
2. Rules installed in switches

Assumptions:

1. A1
2. A2

4 Part 4: Comparision with Traditional Routing (OSPF)

Experiments Tested:

iperf result between h1 and h2:

I1

Forwarding Rules:

1. s1
2. S6

Throughput and Convergence Times:

1. SDN (mention source)
2. OSPF (mention source)

Explanation of Result:

1. E1
2. E2