1.4.1 How many nodes are reachable before and after starting the controller?

1.4.1.a Before starting the controller

1. LINEAR

```
mininet@mininet:~$ sudo mn --topo linear,3 --mac --controller remote --switch ovsk
[sudo] password for mininet:
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
Unable to contact the remote controller at 127.0.0.1:6633
Setting remote controller to 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1 s2 s3
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (s2, s1) (s3, s2)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 3 switches
s1 s2 s3 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> X X
h2 -> X X
h3 -> X X
*** Results: 100% dropped (0/6 received)
mininet>
```

2. SINGLE

```
mininet@mininet:~$ sudo mn --topo single,3 --mac --controller remote --switch ovsk
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
Unable to contact the remote controller at 127.0.0.1:6633
Setting remote controller to 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> X X
h2 -> X X
h3 -> X X
*** Results: 100% dropped (0/6 received)
```

3. TREE

```
mininet@mininet:~$ sudo mn --topo tree,3 --mac --controller remote --switch ovsk
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
Unable to contact the remote controller at 127.0.0.1:6633
Setting remote controller to 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7
*** Adding links:
(s1, s2) (s1, s5) (s2, s3) (s2, s4) (s3, h1) (s3, h2) (s4, h3) (s4, h4) (s5, s6) (s5, s7) (s6, h5) (s6, h6) (s7, h7) (s7, h8)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8
*** Starting controller
c0
*** Starting 7 switches
s1 s2 s3 s4 s5 s6 s7 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> X X X X X X X
h2 -> X X X X X X X
h3 -> X X X X X X X
h4 -> X X X X X X X
h5 -> X X X X X X X
h6 -> X X X X X X X
h7 -> X X X X X X X
h8 -> X X X X X X X
*** Results: 100% dropped (0/56 received)
```

1.4.1.b After starting the controller

1. LINEAR

```
mininet@mininet:~$ sudo mn --topo linear,3 --mac --controller remote --switch ovsk
*** Creating network
*** Adding controller
Connecting to remote controller at 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1 s2 s3
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (s2, s1) (s3, s2)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 3 switches
s1 s2 s3 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3
h2 -> h1 h3
h3 -> h1 h2
*** Results: 0% dropped (6/6 received)
```

2. SINGLE

```
mininet@mininet:~$ sudo mn --topo single,3 --mac --controller remote --switch ovsk
*** Creating network
*** Adding controller
Connecting to remote controller at 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3
h2 -> h1 h3
h3 -> h1 h2
*** Results: 0% dropped (6/6 received)
```

3. TREE

```
mininet@mininet:~$ sudo mn --topo tree,3 --mac --controller remote --switch ovsk
*** Creating network
*** Adding controller
Connecting to remote controller at 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7
*** Adding links:
(s1, s2) (s1, s5) (s2, s3) (s2, s4) (s3, h1) (s3, h2) (s4, h3) (s4, h4) (s5, s6) (s5, s7) (s6, h5) (s6, h6) (s7, h7) (s7, h8)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8
*** Starting controller
c0
*** Starting 7 switches
s1 s2 s3 s4 s5 s6 s7 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4 h5 h6 h7 h8
h2 -> h1 h3 h4 h5 h6 h7 h8
h3 -> h1 h2 h4 h5 h6 h7 h8
h4 -> h1 h2 h3 h5 h6 h7 h8
h5 -> h1 h2 h3 h4 h6 h7 h8
h6 -> h1 h2 h3 h4 h5 h7 h8
h7 -> h1 h2 h3 h4 h5 h6 h8
h8 -> h1 h2 h3 h4 h5 h6 h7
*** Results: 0% dropped (56/56 received)
```

Before setting up the switches none of the hosts can communicate with each other because the packets are dropped instantly at the switches because it is the default behavior. After starting the controller each host can reach the others and communicate with them.

1.4.2 Flowtables?

1. LINEAR

```
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=2.226s, table=0, n_packets=0, n_bytes=0, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s2
 cookie=0x0, duration=18.344s, table=0, n_packets=0, n_bytes=0, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s3
 cookie=0x0, duration=20.512s, table=0, n_packets=0, n_bytes=0, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=17.347s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s1-eth2"
 cookie=0x0, duration=17.341s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s1-eth1"
 cookie=0x0, duration=17.341s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s1-eth2"
 cookie=0x0, duration=44.856s, table=0, n_packets=10, n_bytes=616, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s2
 cookie=0x0, duration=19.715s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s2-eth2"
 cookie=0x0, duration=19.712s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s2-eth1"
 cookie=0x0, duration=19.708s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:01 actions=output:"s2-eth2"
 cookie=0x0, duration=19.706s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s2-eth3"
 cookie=0x0, duration=19.696s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:02 actions=output:"s2-eth1"
 cookie=0x0, duration=19.681s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s2-eth3"
 cookie=0x0, duration=47.225s, table=0, n_packets=13, n_bytes=798, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s3
 cookie=0x0, duration=23.554s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s3-eth2"
 cookie=0x0, duration=23.550s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s3-eth1"
 cookie=0x0, duration=23.541s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s3-eth2"
 cookie=0x0, duration=51.067s, table=0, n_packets=11, n_bytes=658, priority=0 actions=CONTROLLER:65535
```

2. SINGLE

```
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=15.399s, table=0, n_packets=5, n_bytes=350, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=4.082s, table=0, n_packets=2, n_bytes=196, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s1-eth1"
 cookie=0x0, duration=4.078s, table=0, n_packets=2, n_bytes=196, priority=1,in_port="s1-eth3",dl_dst=00:00:00:00:00:01 actions=output:"s1-eth1"
 cookie=0x0, duration=4.077s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s1-eth3"
 cookie=0x0, duration=4.075s, table=0, n_packets=2, n_bytes=196, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s1-eth2"
 cookie=0x0, duration=4.073s, table=0, n_packets=2, n_bytes=196, priority=1,in_port="s1-eth3",dl_dst=00:00:00:00:00:02 actions=output:"s1-eth2"
 cookie=0x0, duration=4.072s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s1-eth3"
 cookie=0x0, duration=28.963s, table=0, n_packets=16, n_bytes=1008, priority=0 actions=CONTROLLER:65535
```

3. TREE

```
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=2.176s, table=0, n_packets=0, n_bytes=0, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s2
 cookie=0x0, duration=4.146s, table=0, n_packets=8, n_bytes=560, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s3
 cookie=0x0, duration=6.067s, table=0, n_packets=14, n_bytes=980, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s4
 cookie=0x0, duration=7.678s, table=0, n_packets=14, n_bytes=980, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s5
 cookie=0x0, duration=9.500s, table=0, n_packets=14, n_bytes=980, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s6
 cookie=0x0, duration=12.001s, table=0, n_packets=14, n_bytes=980, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s7
 cookie=0x0, duration=19.722s, table=0, n_packets=19, n_bytes=1330, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s1
 cookie=0x0, duration=3.547s, table=0, n_packets=11, n_bytes=910, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s1-eth1"
 cookie=0x0, duration=3.539s, table=0, n_packets=7, n_bytes=686, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:05 actions=output:"s1-eth2"
 cookie=0x0, duration=3.528s, table=0, n_packets=7, n_bytes=686, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s1-eth2"
 cookie=0x0, duration=3.516s, table=0, n_packets=7, n_bytes=686, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s1-eth2"
 cookie=0x0, duration=3.503s, table=0, n_packets=7, n_bytes=686, priority=1,in_port="s1-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s1-eth2"
 cookie=0x0, duration=3.471s, table=0, n_packets=11, n_bytes=910, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s1-eth1"
 cookie=0x0, duration=3.425s, table=0, n_packets=11, n_bytes=910, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s1-eth1"
 cookie=0x0, duration=3.375s, table=0, n_packets=11, n_bytes=910, priority=1,in_port="s1-eth2",dl_dst=00:00:00:00:00:04 actions=output:"s1-eth1"
 cookie=0x0, duration=44.273s, table=0, n_packets=64, n_bytes=3696, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s2
 cookie=0x0, duration=5.719s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s2-eth1"
 cookie=0x0, duration=5.717s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s2-eth2"
 cookie=0x0, duration=5.707s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s2-eth2"
 cookie=0x0, duration=5.697s, table=0, n_packets=15, n_bytes=1078, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:01 actions=output:"s2-eth1"
 cookie=0x0, duration=5.690s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:05 actions=output:"s2-eth3"
 cookie=0x0, duration=5.680s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s2-eth3"
 cookie=0x0, duration=5.669s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s2-eth3"
 cookie=0x0, duration=5.655s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s2-eth3"
 cookie=0x0, duration=5.645s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s2-eth1"
 cookie=0x0, duration=5.622s, table=0, n_packets=15, n_bytes=1078, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:02 actions=output:"s2-eth1"
 cookie=0x0, duration=5.569s, table=0, n_packets=15, n_bytes=1078, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:03 actions=output:"s2-eth2"
 cookie=0x0, duration=5.567s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s2-eth3"
 cookie=0x0, duration=5.560s, table=0, n_packets=4, n_bytes=336, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:06 actions=output:"s2-eth3"
 cookie=0x0, duration=5.551s, table=0, n_packets=4, n_bytes=336, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:07 actions=output:"s2-eth3"
 cookie=0x0, duration=5.538s, table=0, n_packets=4, n_bytes=336, priority=1,in_port="s2-eth2",dl_dst=00:00:00:00:00:08 actions=output:"s2-eth3"
 cookie=0x0, duration=5.526s, table=0, n_packets=12, n_bytes=952, priority=1,in_port="s2-eth3",dl_dst=00:00:00:00:00:04 actions=output:"s2-eth2"
 cookie=0x0, duration=46.422s, table=0, n_packets=73, n_bytes=4438, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s3
 cookie=0x0, duration=2.458s, table=0, n_packets=2, n_bytes=196, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s3-eth1"
 cookie=0x0, duration=2.456s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s3-eth2"
 cookie=0x0, duration=2.435s, table=0, n_packets=17, n_bytes=1386, priority=1,in_port="s3-eth3",dl_dst=00:00:00:00:00:01 actions=output:"s3-eth1"
 cookie=0x0, duration=2.433s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s3-eth3"
 cookie=0x0, duration=2.422s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s3-eth3"
 cookie=0x0, duration=2.400s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:05 actions=output:"s3-eth3"
 cookie=0x0, duration=2.386s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s3-eth3"
 cookie=0x0, duration=2.368s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s3-eth3"
 cookie=0x0, duration=2.358s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s3-eth3"
 cookie=0x0, duration=2.340s, table=0, n_packets=17, n_bytes=1386, priority=1,in_port="s3-eth3",dl_dst=00:00:00:00:00:02 actions=output:"s3-eth2"
 cookie=0x0, duration=2.339s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s3-eth3"
 cookie=0x0, duration=2.332s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:04 actions=output:"s3-eth3"
 cookie=0x0, duration=2.323s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s3-eth3"
 cookie=0x0, duration=2.312s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:06 actions=output:"s3-eth3"
 cookie=0x0, duration=2.304s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:07 actions=output:"s3-eth3"
 cookie=0x0, duration=2.297s, table=0, n_packets=1, n_bytes=98, priority=1,in_port="s3-eth2",dl_dst=00:00:00:00:00:08 actions=output:"s3-eth3"
 cookie=0x0, duration=36.469s, table=0, n_packets=58, n_bytes=3556, priority=0 actions=CONTROLLER:65535
```

```
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s4
 cookie=0x0, duration=10.523s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s4-eth3"
 cookie=0x0, duration=10.518s, table=0, n_packets=21, n_bytes=1498, priority=1,in_port="s4-eth3",dl_dst=00:00:00:00:00:03 actions=output:"s4-eth1"
 cookie=0x0, duration=10.511s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s4-eth3"
 cookie=0x0, duration=10.508s, table=0, n_packets=21, n_bytes=1498, priority=1,in_port="s4-eth3",dl_dst=00:00:00:00:00:04 actions=output:"s4-eth2"
 cookie=0x0, duration=10.448s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s4-eth3"
 cookie=0x0, duration=10.437s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s4-eth3"
 cookie=0x0, duration=10.388s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s4-eth1"
 cookie=0x0, duration=10.386s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s4-eth2"
 cookie=0x0, duration=10.370s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:05 actions=output:"s4-eth3"
 cookie=0x0, duration=10.363s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s4-eth3"
 cookie=0x0, duration=10.354s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s4-eth3"
 cookie=0x0, duration=10.341s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s4-eth3"
 cookie=0x0, duration=10.327s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s4-eth3"
 cookie=0x0, duration=10.319s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:06 actions=output:"s4-eth3"
 cookie=0x0, duration=10.306s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:07 actions=output:"s4-eth3"
 cookie=0x0, duration=10.299s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s4-eth2",dl_dst=00:00:00:00:00:08 actions=output:"s4-eth3"
 cookie=0x0, duration=51.226s, table=0, n_packets=75, n_bytes=4634, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s5
 cookie=0x0, duration=12.686s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s5-eth3"
 cookie=0x0, duration=12.676s, table=0, n_packets=11, n_bytes=854, priority=1,in_port="s5-eth3",dl_dst=00:00:00:00:00:05 actions=output:"s5-eth1"
 cookie=0x0, duration=12.666s, table=0, n_packets=11, n_bytes=854, priority=1,in_port="s5-eth3",dl_dst=00:00:00:00:00:06 actions=output:"s5-eth1"
 cookie=0x0, duration=12.657s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s5-eth3"
 cookie=0x0, duration=12.654s, table=0, n_packets=11, n_bytes=854, priority=1,in_port="s5-eth3",dl_dst=00:00:00:00:00:07 actions=output:"s5-eth2"
 cookie=0x0, duration=12.641s, table=0, n_packets=11, n_bytes=854, priority=1,in_port="s5-eth3",dl_dst=00:00:00:00:00:08 actions=output:"s5-eth2"
 cookie=0x0, duration=12.610s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s5-eth3"
 cookie=0x0, duration=12.580s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s5-eth3"
 cookie=0x0, duration=12.564s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s5-eth3"
 cookie=0x0, duration=12.540s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s5-eth3"
 cookie=0x0, duration=12.514s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s5-eth3"
 cookie=0x0, duration=12.492s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:04 actions=output:"s5-eth3"
 cookie=0x0, duration=12.461s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s5-eth1"
 cookie=0x0, duration=12.459s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s5-eth2"
 cookie=0x0, duration=12.451s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s5-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s5-eth2"
 cookie=0x0, duration=12.438s, table=0, n_packets=7, n_bytes=518, priority=1,in_port="s5-eth2",dl_dst=00:00:00:00:00:06 actions=output:"s5-eth1"
 cookie=0x0, duration=53.410s, table=0, n_packets=78, n_bytes=4564, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s6
 cookie=0x0, duration=17.284s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s6-eth3"
 cookie=0x0, duration=17.272s, table=0, n_packets=19, n_bytes=1414, priority=1,in_port="s6-eth3",dl_dst=00:00:00:00:00:05 actions=output:"s6-eth1"
 cookie=0x0, duration=17.266s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s6-eth3"
 cookie=0x0, duration=17.262s, table=0, n_packets=19, n_bytes=1414, priority=1,in_port="s6-eth3",dl_dst=00:00:00:00:00:06 actions=output:"s6-eth2"
 cookie=0x0, duration=17.208s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s6-eth3"
 cookie=0x0, duration=17.198s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s6-eth3"
 cookie=0x0, duration=17.162s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s6-eth3"
 cookie=0x0, duration=17.146s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s6-eth3"
 cookie=0x0, duration=17.112s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s6-eth3"
 cookie=0x0, duration=17.103s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:04 actions=output:"s6-eth3"
 cookie=0x0, duration=17.072s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s6-eth1"
 cookie=0x0, duration=17.070s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s6-eth2"
 cookie=0x0, duration=17.057s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:07 actions=output:"s6-eth3"
 cookie=0x0, duration=17.049s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s6-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s6-eth3"
 cookie=0x0, duration=17.034s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:07 actions=output:"s6-eth3"
 cookie=0x0, duration=17.021s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s6-eth2",dl_dst=00:00:00:00:00:08 actions=output:"s6-eth3"
 cookie=0x0, duration=58.008s, table=0, n_packets=82, n_bytes=4900, priority=0 actions=CONTROLLER:65535
mininet@mininet:~$ sudo ovs-ofctl -O openflow13 dump-flows s7
 cookie=0x0, duration=19.603s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:01 actions=output:"s7-eth3"
 cookie=0x0, duration=19.598s, table=0, n_packets=17, n_bytes=1330, priority=1,in_port="s7-eth3",dl_dst=00:00:00:00:00:07 actions=output:"s7-eth1"
 cookie=0x0, duration=19.589s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:01 actions=output:"s7-eth3"
 cookie=0x0, duration=19.585s, table=0, n_packets=17, n_bytes=1330, priority=1,in_port="s7-eth3",dl_dst=00:00:00:00:00:08 actions=output:"s7-eth2"
 cookie=0x0, duration=19.533s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:02 actions=output:"s7-eth3"
 cookie=0x0, duration=19.526s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:02 actions=output:"s7-eth3"
 cookie=0x0, duration=19.487s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:03 actions=output:"s7-eth3"
 cookie=0x0, duration=19.476s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:03 actions=output:"s7-eth3"
 cookie=0x0, duration=19.438s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:04 actions=output:"s7-eth3"
 cookie=0x0, duration=19.430s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:04 actions=output:"s7-eth3"
 cookie=0x0, duration=19.412s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:05 actions=output:"s7-eth3"
 cookie=0x0, duration=19.399s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:05 actions=output:"s7-eth3"
 cookie=0x0, duration=19.385s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:06 actions=output:"s7-eth3"
 cookie=0x0, duration=19.371s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:06 actions=output:"s7-eth3"
 cookie=0x0, duration=19.359s, table=0, n_packets=3, n_bytes=238, priority=1,in_port="s7-eth2",dl_dst=00:00:00:00:00:07 actions=output:"s7-eth1"
 cookie=0x0, duration=19.357s, table=0, n_packets=2, n_bytes=140, priority=1,in_port="s7-eth1",dl_dst=00:00:00:00:00:08 actions=output:"s7-eth2"
 cookie=0x0, duration=60.357s, table=0, n_packets=86, n_bytes=4956, priority=0 actions=CONTROLLER:65535
```

In the flowtables we can see that each packet has an in_port which tells the switch from which port the packet came from. Each of the packets also has the information on where its destination is such that the output port can be computed. So when a packet from one port with a certain destination arrives the switch can lookup in the flowtable to determine which output-port the packet is sent out from.
For example we will follow a packet sent from $h2$ to $h6$ in the tree topology. First the packet arrives at switch $s3$ at the in_port $s3 - eth2$. Because the destination is $00:00:00:00:00:06$ the packet is sent out from port $s3 - eth3$. Then the packet arrives at switch $s2$ on in_port $s2 - eth1$ and is sent further from port $s2 - eth3$. After arriving at switch $s1$ at in_port $s1 - eth1$ and sent then from $s1 - eth2$ to in_port $s5 - eth3$ it is sent to switch $s6$ by using port $s5 - eth1$. At $s6$ the packet arrives at in_port $s6 - eth3$ which in the end leads to the packet be sent from port $s6 - eth2$ to the node $h6$; arriving at its destination.