



ONOS

Basic ONOS Tutorial

Eueung Mulyana

<https://telematika.org/remark/onos2>

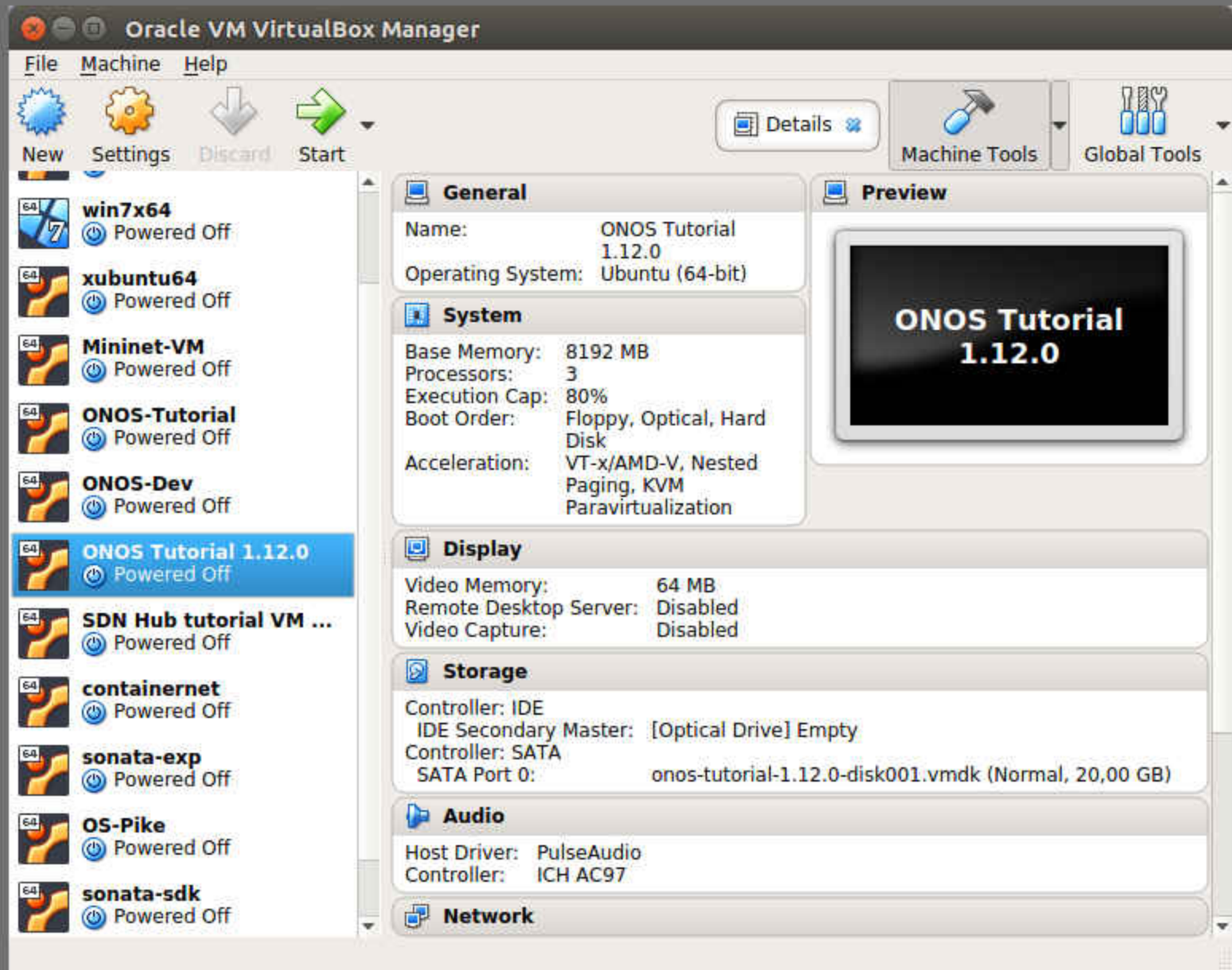
Intro+Labs | Attribution-ShareAlike CC BY-SA

ONOS official VM [onos-tutorial-1.12.0.ova](#)
VirtualBox 5.2.6 | Ubuntu 16.04.3

Getting Started

- Import VM + Start
- Setup ONOS Cluster
- ONOS CLI
- ONOS GUI
- Spine Leaf Topology

Ref:[[Basic ONOS Tutorial](#)]





Trash



ONOS CLI



File System



ONOS GUI



Home



Setup ONOS
Cluster



Spine Leaf
Topology



USA MPLS
Topology



GEANT
Topology

Start VM | Cred: [sdn/rocks](#)



Trash



ONOS CLI



File System



ONOS GUI



Home

Setup ONOS
ClusterSpine Leaf
TopologyUSA MPLS
TopologyGEANT
TopologyTerminal
Emulator

Screenshot

```
Terminal
File Edit View Terminal Tabs Help
f4a84e77ba76e64119442982f89b187f641124d9eb2e7915070e563cdae41783
Waiting for onos-1 startup...
Waiting for onos-2 startup...
Waiting for onos-3 startup...
Activating OpenFlow and ProxyARP applications...
Activated org.onosproject.openflow
Activated org.onosproject.proxyarp
Welcome to Open Network Operating System (ONOS)!

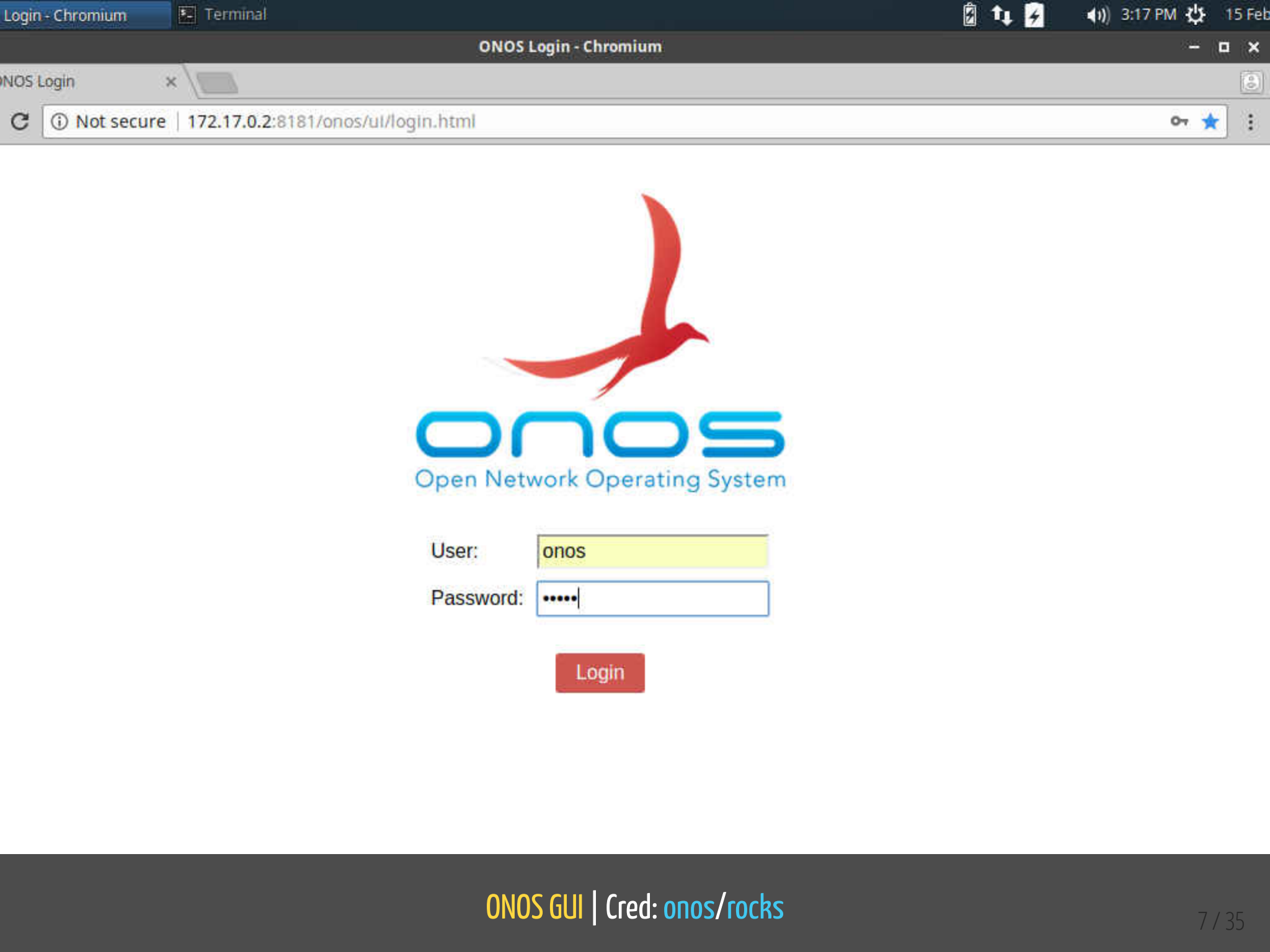
  ONOS


Documentation: wiki.onosproject.org
Tutorials:    tutorials.onosproject.org
Mailing lists: lists.onosproject.org


Come help out! Find out how at: contribute.onosproject.org


Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'system:shutdown' or 'logout' to shutdown ONOS.


onos>
```




 **ONOS** Open Network Operating System

**172.17.0.2**
✓ 172.17.0.2
Devices: 0

**172.17.0.3**
✓ 172.17.0.3
Devices: 0

**172.17.0.4**
✓ 172.17.0.4
Devices: 0

**ONOS Summary**

Version : 1.12.0

Devices : 0

Links : 0


Hosts : 0

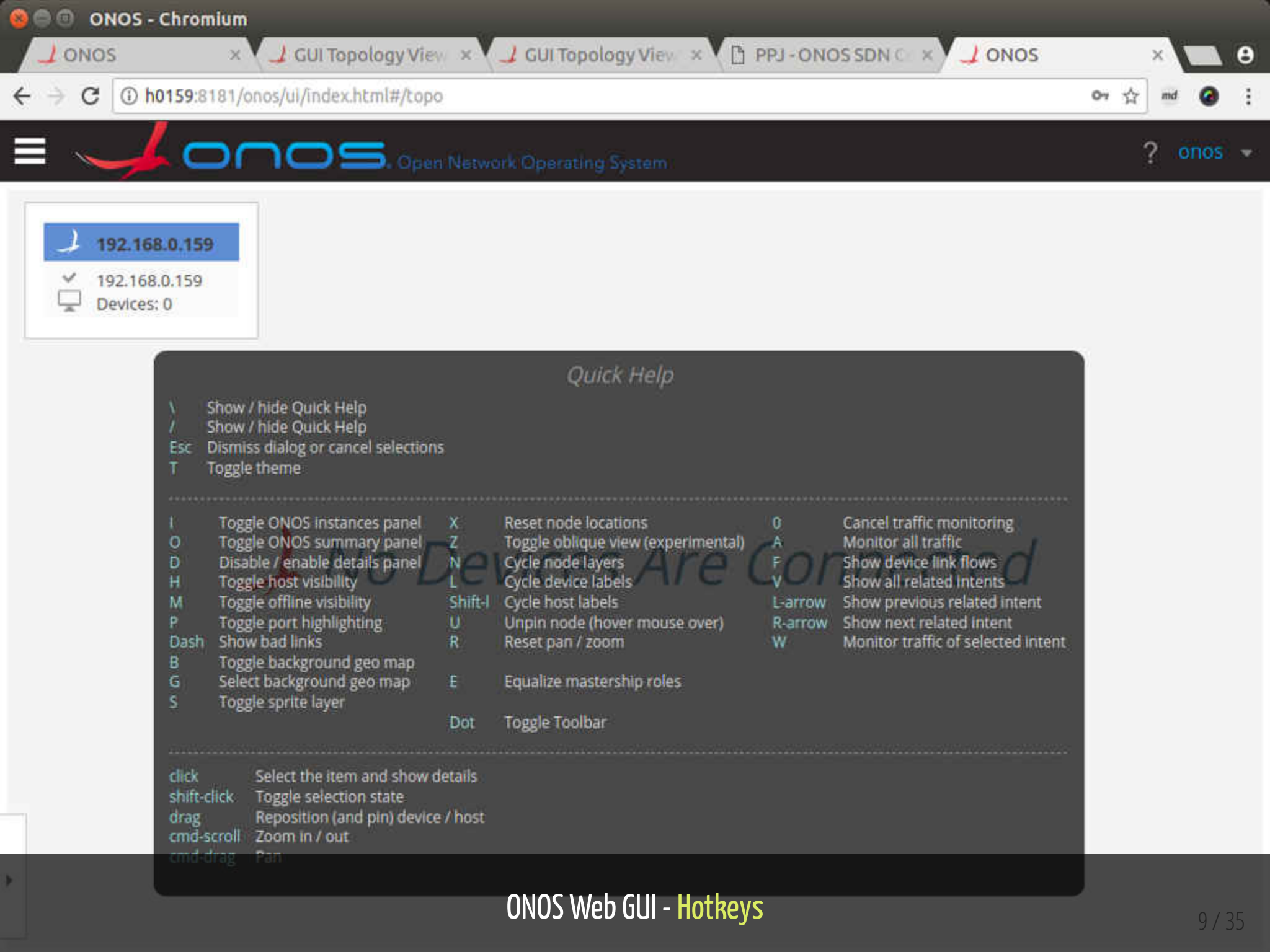
Topology SCCs : 0

Intents : 0

Tunnels : 0

Flows : 0

 *No Devices Are Connected*



192.168.0.159



192.168.0.159



Devices: 0

Quick Help

\ Show / hide Quick Help
/ Show / hide Quick Help
Esc Dismiss dialog or cancel selections
T Toggle theme

I	Toggle ONOS instances panel	X	Reset node locations	O	Cancel traffic monitoring
O	Toggle ONOS summary panel	Z	Toggle oblique view (experimental)	A	Monitor all traffic
D	Disable / enable details panel	N	Cycle node layers	F	Show device link flows
H	Toggle host visibility	L	Cycle device labels	V	Show all related intents
M	Toggle offline visibility	Shift-I	Cycle host labels	L-arrow	Show previous related intent
P	Toggle port highlighting	U	Unpin node (hover mouse over)	R-arrow	Show next related intent
Dash	Show bad links	R	Reset pan / zoom	W	Monitor traffic of selected intent
B	Toggle background geo map				
G	Select background geo map	E	Equalize mastership roles		
S	Toggle sprite layer				
		Dot	Toggle Toolbar		

click Select the item and show details
shift-click Toggle selection state
drag Reposition (and pin) device / host
cmd-scroll Zoom in / out
cmd-drag Pan



ONOS CLI



ONOS GUI



Setup ONOS
Cluster

ONOS Open Network Operating System

172.17.0.2

172.17.0.2
 Devices: 0

172.17.0.3

172.17.0.3
 Devices: 6

172.17.0.4

172.17.0.4
 Devices: 0

Version :

Devices :

Links :

Hosts :

Topology SCCs :

Intents :

Tunnels :

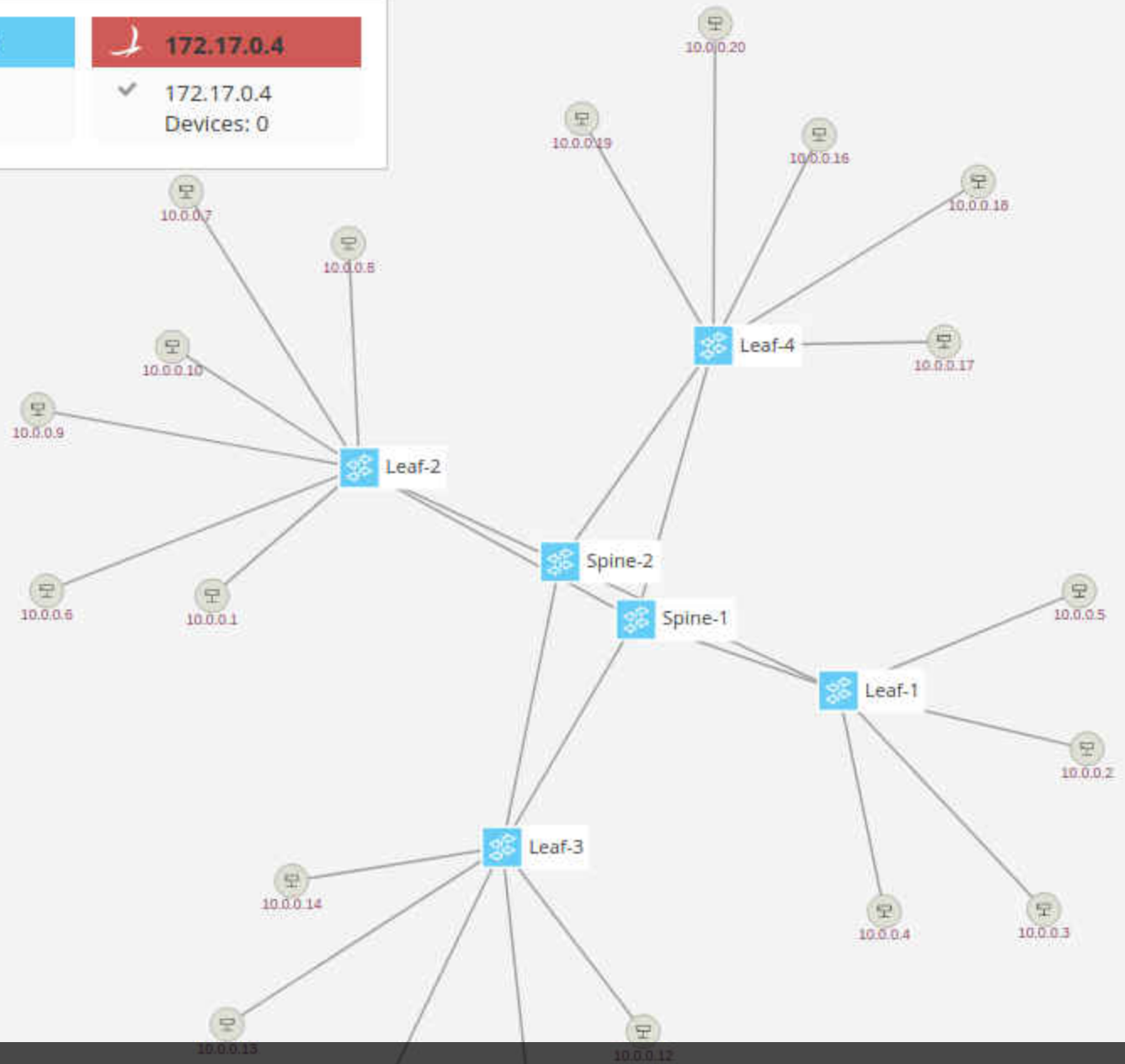
Flows :

```




Terminal
File Edit View Terminal Tabs Help
Connecting to remote controller at 172.17.0.4:6653
c2 (172.17.0.4)
*** Creating network
*** Adding hosts:
h11 h12 h13 h14 h15 h21 h22 h23 h24 h25 h31 h32 h33 h34 h35 h41 h42 h43 h44 h45
*** Adding switches:
s1 s2 s11 s12 s13 s14
*** Adding links:
(h11, s11) (h12, s11) (h13, s11) (h14, s11) (h15, s11) (h21, s12) (h22, s12) (h23, s12) (h24, s12) (h25, s12) (h31, s13) (h32, s13) (h33, s13) (h34, s13) (h35, s13) (h41, s14) (h42, s14) (h43, s14) (h44, s14) (h45, s14) (s11, s1) (s11, s2) (s12, s1) (s12, s2) (s13, s1) (s13, s2) (s14, s1) (s14, s2)
*** Configuring hosts
h11 h12 h13 h14 h15 h21 h22 h23 h24 h25 h31 h32 h33 h34 h35 h41 h42 h43 h44 h45
*** Starting controller
c0 c1 c2
*** Starting 6 switches
s1 s2 s11 s12 s13 s14 ...
*** Waiting for switches to connect
s1 s2 s11 s12 s13 s14
*** Sending a gratuitous ARP from each host
h11 h12 h13 h14 h15 h21 h22 h23 h24 h25 h31 h32 h33 h34 h35 h41 h42 h43 h44 h45
*** Starting CLI:
mininet>
  
```

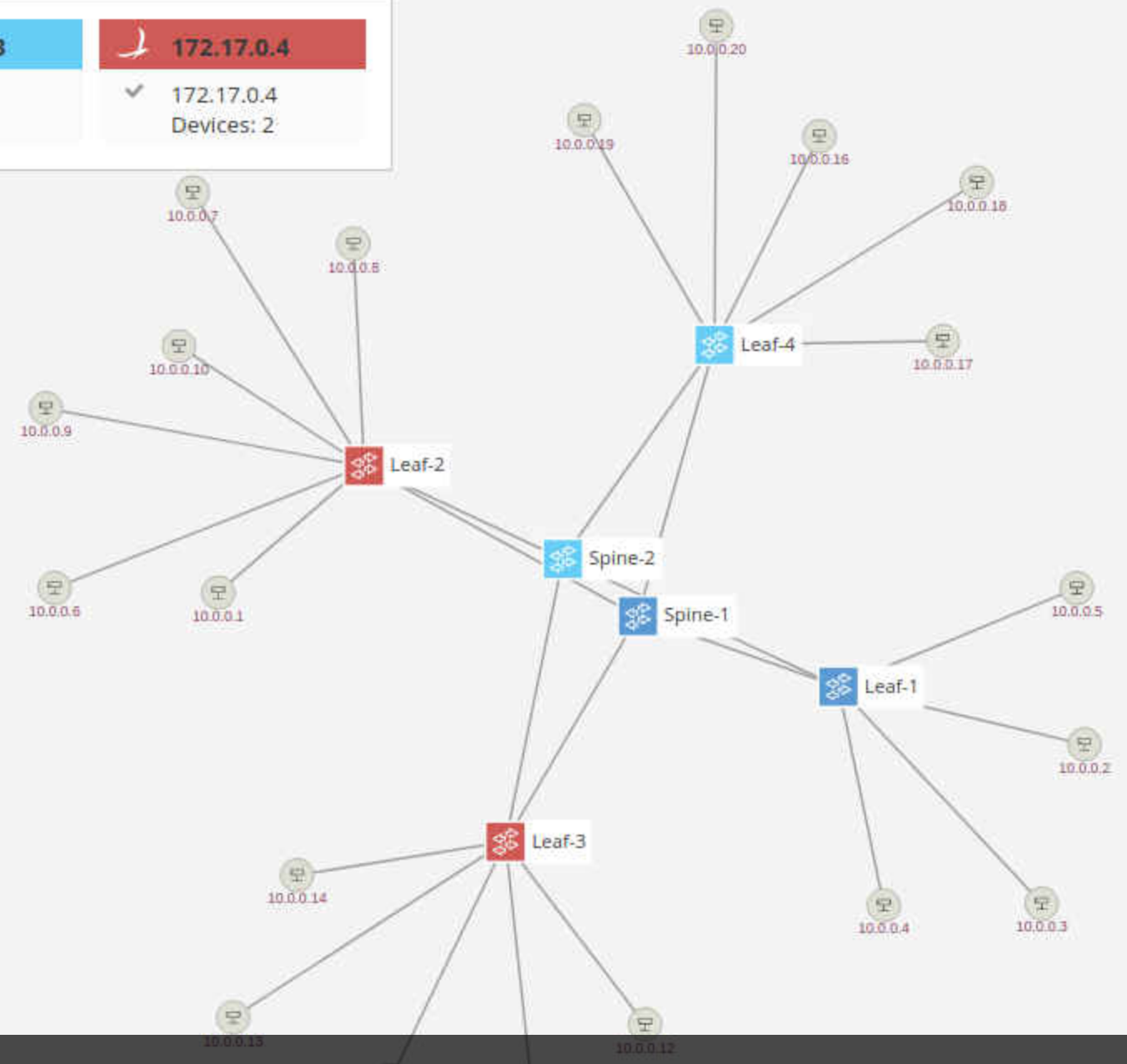
Spine Leaf Topology | Mininet

 172.17.0.2	 172.17.0.3	 172.17.0.4
 172.17.0.2  Devices: 0	 172.17.0.3  Devices: 6	 172.17.0.4  Devices: 0



Unbalanced | Host View via 'H'-Key

 172.17.0.2	 172.17.0.3	 172.17.0.4
 172.17.0.2  Devices: 2	 172.17.0.3 Devices: 2	 172.17.0.4 Devices: 2



Mastership Re-balancing | Hotkey 'E'

Check

CLI + Mininet

```
onos> apps -a -s
```

+ 23	org.onosproject.optical-model	1.12.0	Optical Network Model
+ 27	org.onosproject.openflow-base	1.12.0	OpenFlow Base Provider
+ 28	org.onosproject.lldpprovider	1.12.0	LLDP Link Provider
+ 30	org.onosproject.hostprovider	1.12.0	Host Location Provider
+ 35	org.onosproject.drivers	1.12.0	Default Drivers
+ 83	org.onosproject.openflow	1.12.0	OpenFlow Provider Suite
+ 252	org.onosproject.proxyarp	1.12.0	Proxy ARP/NDP

```
mininet> h11 ping -c3 h41
```

```
PING 10.0.0.16 (10.0.0.16) 56(84) bytes of data.
```

```
--- 10.0.0.16 ping statistics ---
```

```
3 packets transmitted, 0 received, 100% packet loss, time 2014ms
```

FWD App

CLI + Mininet

```
onos> app activate fwd
```

```
Activated org.onosproject.fwd
```

```
onos> apps -a -s
```

+ 23	org.onosproject.optical-model	1.12.0	Optical Network Model
+ 27	org.onosproject.openflow-base	1.12.0	OpenFlow Base Provider
+ 28	org.onosproject.lldpprovider	1.12.0	LLDP Link Provider
+ 30	org.onosproject.hostprovider	1.12.0	Host Location Provider
+ 35	org.onosproject.drivers	1.12.0	Default Drivers
+ 83	org.onosproject.openflow	1.12.0	OpenFlow Provider Suite
+ 252	org.onosproject.proxyarp	1.12.0	Proxy ARP/NDP
+ 260	org.onosproject.fwd	1.12.0	Reactive Forwarding

```
mininet> h11 ping -c3 h41
```

```
PING 10.0.0.16 (10.0.0.16) 56(84) bytes of data.
```

```
64 bytes from 10.0.0.16: icmp_seq=1 ttl=64 time=64.1 ms
```

```
64 bytes from 10.0.0.16: icmp_seq=2 ttl=64 time=0.748 ms
```

```
64 bytes from 10.0.0.16: icmp_seq=3 ttl=64 time=0.105 ms
```

```
--- 10.0.0.16 ping statistics ---
```

```
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
```

```
rtt min/avg/max/mdev = 0.105/21.677/64.180/30.055 ms
```

```
onos> app deactivate fwd
```

```
Deactivated org.onosproject.fwd
```

```
onos> apps -a -s
```

+ 23	org.onosproject.optical-model	1.12.0	Optical Network Model
+ 27	org.onosproject.openflow-base	1.12.0	OpenFlow Base Provider
+ 28	org.onosproject.lldpprovider	1.12.0	LLDP Link Provider
+ 30	org.onosproject.hostprovider	1.12.0	Host Location Provider
+ 35	org.onosproject.drivers	1.12.0	Default Drivers
+ 83	org.onosproject.openflow	1.12.0	OpenFlow Provider Suite
+ 252	org.onosproject.proxyarp	1.12.0	Proxy ARP/NDP

```
onos> help onos
```

```
COMMANDS
```

onos:add-host-intent	Installs host-to-host connectivity int
onos:add-multi-to-single-intent	Installs connectivity intent between m
onos:add-optical-intent	Installs optical connectivity intent
onos:add-point-intent	Installs point-to-point connectivity i
onos:add-protected-transport	Adds ProtectedTransportIntent
onos:add-single-to-multi-intent	Installs connectivity intent between a
onos:add-test-flows	Installs a number of test flow rules -
onos:add-vnet-intent	Installs virtual network connectivity
onos:allocations	Lists allocated resources
onos:annotate-device	Annotates network model entities
onos:annotate-link	Annotates network model entities
onos:annotate-port	Annotates port entities
onos:app	Manages application inventory
onos:app-ids	Lists application ID information
onos:apps	Lists application information
onos:balance-masters	Forces device mastership rebalancing
onos:cfg	Manages component configuration
onos:cluster-devices	Lists devices of the specified topolog
onos:cluster-links	Lists links of the specified topology
onos:clusters	Lists all clusters in the current topo
onos:config-link	Configure link.
onos:config-link-discovery	Adds configuration to disable LLDP lin
onos:counter	Displays the current value of a atomic
onos:counters	Lists information about atomic counter
onos:cycle-intents	Installs random intents to test throug
onos:device-add-interface	Configures a device interface
onos:device-configuration	[Deprecated]Gets the configuration of
onos:device-controllers	gets the list of controllers for the g
onos:device-interfaces	Lists all interfaces or interfaces of

ONOS

CLI Commands

onos> devices

```
id=of:0000000000000001, available=true, local-status=connected 34m3s ago, role=MASTER, type=Slave
id=of:0000000000000002, available=true, local-status=connected 34m3s ago, role=STANDBY, type=Slave
id=of:000000000000000b, available=true, local-status=connected 34m3s ago, role=MASTER, type=Slave
id=of:000000000000000c, available=true, local-status=connected 34m3s ago, role=STANDBY, type=Slave
id=of:000000000000000d, available=true, local-status=connected 34m3s ago, role=STANDBY, type=Slave
id=of:000000000000000e, available=true, local-status=connected 34m3s ago, role=STANDBY, type=Slave
```

onos> links

```
src=of:0000000000000001/1, dst=of:000000000000000b/1, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000001/2, dst=of:000000000000000c/1, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000001/3, dst=of:000000000000000d/1, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000001/4, dst=of:000000000000000e/1, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000002/1, dst=of:000000000000000b/2, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000002/2, dst=of:000000000000000c/2, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000002/3, dst=of:000000000000000d/2, type=DIRECT, state=ACTIVE, expected=false
src=of:0000000000000002/4, dst=of:000000000000000e/2, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000b/1, dst=of:0000000000000001/1, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000b/2, dst=of:0000000000000002/1, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000c/1, dst=of:0000000000000001/2, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000c/2, dst=of:0000000000000002/2, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000d/1, dst=of:0000000000000001/3, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000d/2, dst=of:0000000000000002/3, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000e/1, dst=of:0000000000000001/4, type=DIRECT, state=ACTIVE, expected=false
src=of:000000000000000e/2, dst=of:0000000000000002/4, type=DIRECT, state=ACTIVE, expected=false
```

onos> hosts

```
id=00:00:00:00:00:01/None, mac=00:00:00:00:00:01, locations=[of:000000000000000b/3], vlan=None
id=00:00:00:00:00:02/None, mac=00:00:00:00:00:02, locations=[of:000000000000000b/4], vlan=None
id=00:00:00:00:00:03/None, mac=00:00:00:00:00:03, locations=[of:000000000000000b/5], vlan=None
id=00:00:00:00:00:04/None, mac=00:00:00:00:00:04, locations=[of:000000000000000b/6], vlan=None
id=00:00:00:00:00:05/None, mac=00:00:00:00:00:05, locations=[of:000000000000000b/7], vlan=None
id=00:00:00:00:00:06/None, mac=00:00:00:00:00:06, locations=[of:000000000000000c/3], vlan=None
id=00:00:00:00:00:07/None, mac=00:00:00:00:00:07, locations=[of:000000000000000c/4], vlan=None
id=00:00:00:00:00:08/None, mac=00:00:00:00:00:08, locations=[of:000000000000000c/5], vlan=None
id=00:00:00:00:00:09/None, mac=00:00:00:00:00:09, locations=[of:000000000000000c/6], vlan=None
id=00:00:00:00:00:0A/None, mac=00:00:00:00:00:0A, locations=[of:000000000000000c/7], vlan=None
id=00:00:00:00:00:0B/None, mac=00:00:00:00:00:0B, locations=[of:000000000000000d/3], vlan=None
id=00:00:00:00:00:0C/None, mac=00:00:00:00:00:0C, locations=[of:000000000000000d/4], vlan=None
id=00:00:00:00:00:0D/None, mac=00:00:00:00:00:0D, locations=[of:000000000000000d/5], vlan=None
id=00:00:00:00:00:0E/None, mac=00:00:00:00:00:0E, locations=[of:000000000000000d/6], vlan=None
```

ONOS

CLI Commands

onos> flows

deviceId=of:0000000000000001, flowRuleCount=3

id=100007a585b6f, state=ADDED, bytes=220077, packets=2717, duration=2102, liveType=UNKNOWN

id=100009465555a, state=ADDED, bytes=220077, packets=2717, duration=2103, liveType=UNKNOWN

id=10000ea6f4b8e, state=ADDED, bytes=0, packets=0, duration=2102, liveType=UNKNOWN, priori

deviceId=of:0000000000000002, flowRuleCount=3

id=1000002bbd8d4, state=ADDED, bytes=220239, packets=2719, duration=2103, liveType=UNKNOWN

id=10000c70edd85, state=ADDED, bytes=126, packets=3, duration=2103, liveType=UNKNOWN, pric

id=10000dc56d70b, state=ADDED, bytes=220239, packets=2719, duration=2103, liveType=UNKNOWN

deviceId=of:000000000000000b, flowRuleCount=3

id=10000494083df, state=ADDED, bytes=109917, packets=1357, duration=2103, liveType=UNKNOWN

id=100005f2b175b, state=ADDED, bytes=109917, packets=1357, duration=2103, liveType=UNKNOWN

id=10000648d5a4f, state=ADDED, bytes=294, packets=7, duration=2103, liveType=UNKNOWN, pric

deviceId=of:000000000000000c, flowRuleCount=3

id=1000026a0ffae, state=ADDED, bytes=109917, packets=1357, duration=2103, liveType=UNKNOWN

id=1000096b12177, state=ADDED, bytes=252, packets=6, duration=2098, liveType=UNKNOWN, pric

id=10000f5cb6cad, state=ADDED, bytes=109674, packets=1354, duration=2098, liveType=UNKNOWN

deviceId=of:000000000000000d, flowRuleCount=3

id=1000061e06af9, state=ADDED, bytes=252, packets=6, duration=2103, liveType=UNKNOWN, pric

id=10000b4f580c9, state=ADDED, bytes=109674, packets=1354, duration=2098, liveType=UNKNOWN

id=10000c023e2a3, state=ADDED, bytes=109917, packets=1357, duration=2103, liveType=UNKNOWN

deviceId=of:000000000000000e, flowRuleCount=3

id=100001eb71f99, state=ADDED, bytes=109836, packets=1356, duration=2103, liveType=UNKNOWN

id=100002145004b, state=ADDED, bytes=252, packets=6, duration=2098, liveType=UNKNOWN, pric

id=10000cc389fc9, state=ADDED, bytes=109836, packets=1356, duration=2103, liveType=UNKNOWN

onos> paths of:0000000000000000 <TAB>

of:0000000000000001 of:0000000000000002 of:000000000000000b

of:000000000000000c of:000000000000000d of:000000000000000e

onos> paths of:0000000000000000e of:0000000000000000 <TAB>

of:0000000000000001 of:0000000000000002 of:000000000000000b

of:000000000000000c of:000000000000000d of:000000000000000e

onos> paths of:0000000000000000e of:000000000000000b

of:000000000000000e/2-of:0000000000000002/4==>of:0000000000000002/1-of:000000000000000b/2; cos

of:000000000000000e/1-of:0000000000000001/4==>of:0000000000000001/1-of:000000000000000b/1; cos

ONOS

CLI Commands

```
onos> add-host-intent 00:00:00:00:00:01/None 00:00:00:00:00:10/None
Host to Host intent submitted:
HostToHostIntent{id=0x0, key=0x0, appId=DefaultApplicationId{id=2, name=org.onosproject.cli},
```

```
onos> intents
```

```
Id: 0x0
State: INSTALLED
Key: 0x0
Intent type: HostToHostIntent
Application Id: org.onosproject.cli
Resources: [00:00:00:00:00:01/None, 00:00:00:00:00:10/None]
Treatment: [NOACTION]
Constraints: [LinkTypeConstraint{inclusive=false, types=[OPTICAL]]]
Source host: 00:00:00:00:00:01/None
Destination host: 00:00:00:00:00:10/None
```

```
onos> intents -i
```

```
Id: 0x0
State: INSTALLED
Key: 0x0
Intent type: HostToHostIntent
Application Id: org.onosproject.cli
Resources: [00:00:00:00:00:01/None, 00:00:00:00:00:10/None]
Treatment: [NOACTION]
Constraints: [LinkTypeConstraint{inclusive=false, types=[OPTICAL]]]
Source host: 00:00:00:00:00:01/None
Destination host: 00:00:00:00:00:10/None
Installable: [FlowRuleIntent{id=0x100002, key=0x0, appId=DefaultApplicationId{id=72, name=org.
```

Intents

```

mininet> h11 ping -c3 h41
PING 10.0.0.16 (10.0.0.16) 56(84) bytes of data.
64 bytes from 10.0.0.16: icmp_seq=1 ttl=64 time=0.786 ms
64 bytes from 10.0.0.16: icmp_seq=2 ttl=64 time=0.126 ms
64 bytes from 10.0.0.16: icmp_seq=3 ttl=64 time=0.158 ms

--- 10.0.0.16 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.126/0.356/0.786/0.304 ms

mininet> h11 ping -c3 h42
PING 10.0.0.17 (10.0.0.17) 56(84) bytes of data.

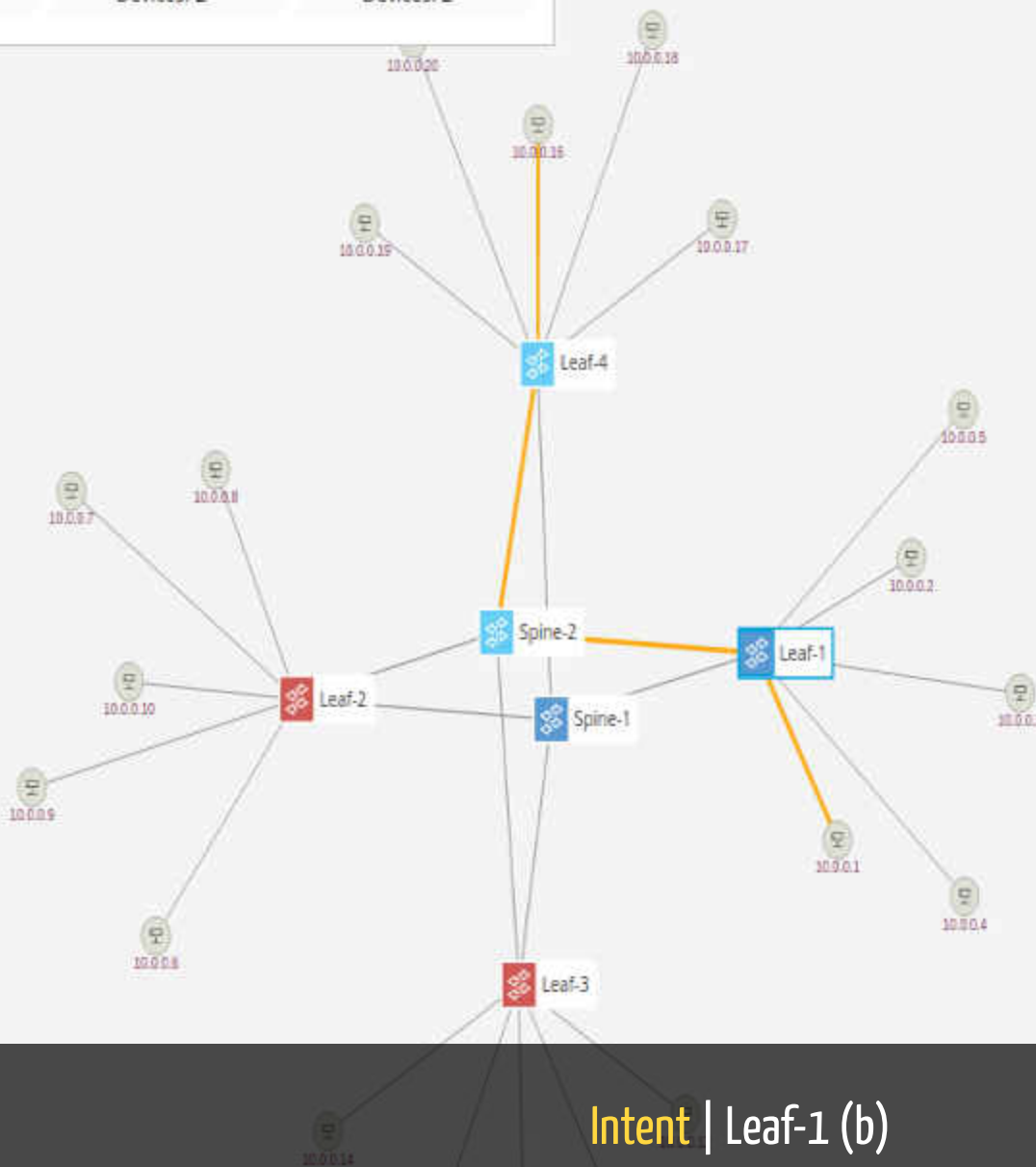
--- 10.0.0.17 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2008ms


onos> flows -s
deviceId=of:0000000000000001, flowRuleCount=3
  ADDED, bytes=300591, packets=3711, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
  ADDED, bytes=300591, packets=3711, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
  ADDED, bytes=0, packets=0, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[in
deviceId=of:0000000000000002, flowRuleCount=5
  ADDED, bytes=300753, packets=3713, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
  ADDED, bytes=126, packets=3, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
  ADDED, bytes=300753, packets=3713, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:1, ETH_DST:00:00:00:
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:4, ETH_DST:00:00:00:
deviceId=of:000000000000000b, flowRuleCount=5
  ADDED, bytes=150255, packets=1855, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
  ADDED, bytes=150255, packets=1855, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
  ADDED, bytes=378, packets=9, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:2, ETH_DST:00:00:00:
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:3, ETH_DST:00:00:00:
deviceId=of:000000000000000c, flowRuleCount=3
  ADDED, bytes=150174, packets=1854, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
  ADDED, bytes=252, packets=6, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
  ADDED, bytes=150174, packets=1854, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
deviceId=of:000000000000000d, flowRuleCount=3
  ADDED, bytes=252, packets=6, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
  ADDED, bytes=150174, packets=1854, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
  ADDED, bytes=150174, packets=1854, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
deviceId=of:000000000000000e, flowRuleCount=5

```

Intents

172.17.0.2	172.17.0.3	172.17.0.4
✓ 172.17.0.2 Devices: 2	✓ 172.17.0.3 Devices: 2	✓ 172.17.0.4 Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 16

Hosts : 20

Topology SCCs : 1

Intents : 1

Tunnels : 0

Flows : 24

Leaf-1

URI : of:0000000000000000b

Vendor : Nicira, Inc.

H/W Version : Open vSwitch

S/W Version : 2.5.2

Serial # : None

Protocol : OF_13

Ports : 8

Flows : 5

Tunnels : 0



Intent | Leaf-1 (b)

172.17.0.2

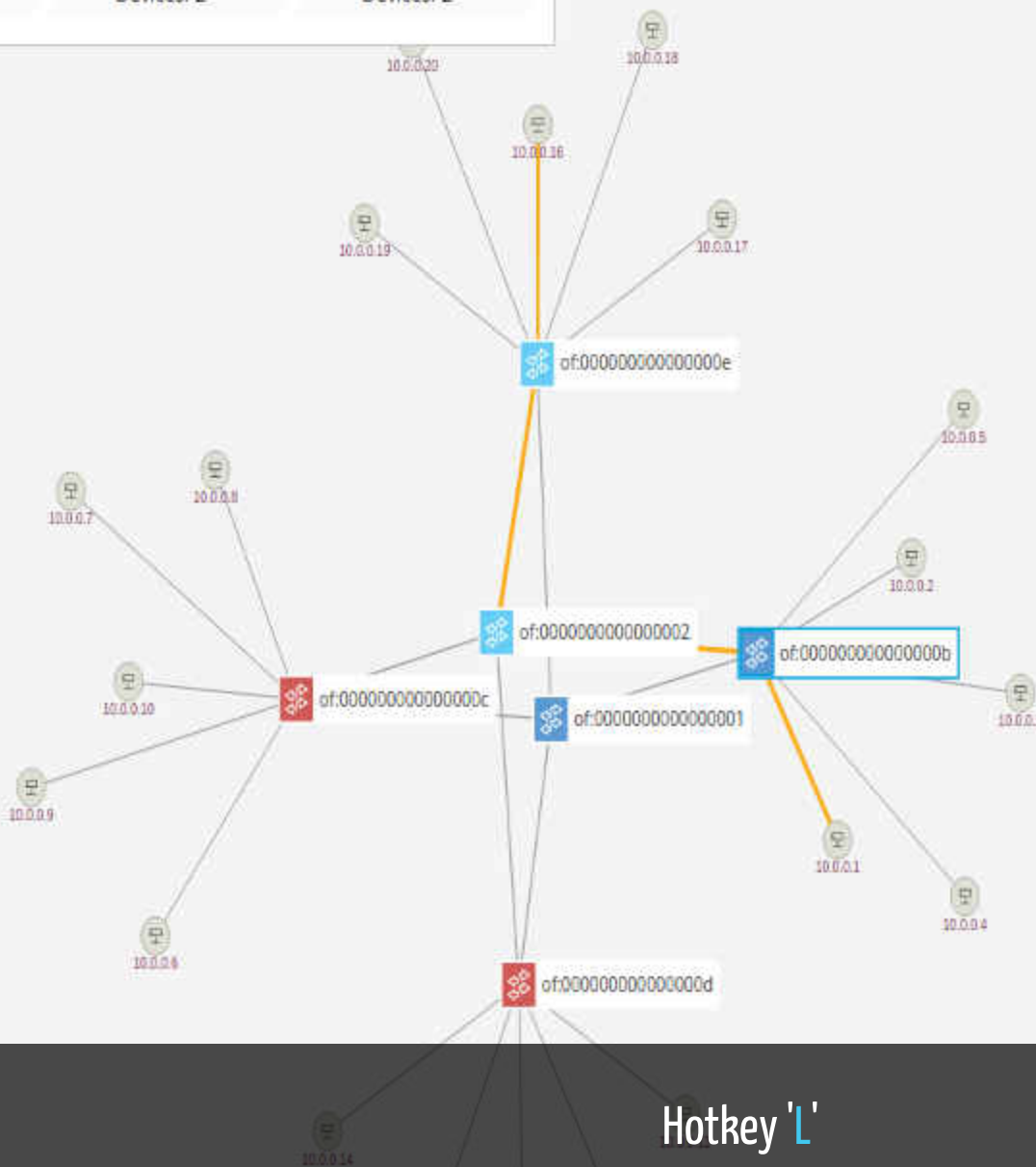
✓ 172.17.0.2
Devices: 2

172.17.0.3

✓ 172.17.0.3
Devices: 2

172.17.0.4

✓ 172.17.0.4
Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 16

Hosts : 20

Topology SCCs : 1

Intents : 1

Tunnels : 0

Flows : 24

Leaf-1

URI : of:0000000000000000b

Vendor : Nicira, Inc.

H/W Version : Open vSwitch

S/W Version : 2.5.2

Serial # : None

Protocol : OF_13

Ports : 8

Flows : 5

Tunnels : 0



```
mininet> link s2 s11 down
```

```
onos> flows -s
```

```
deviceId=of:0000000000000001, flowRuleCount=5
```

```
  ADDED, bytes=393903, packets=4863, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
  ADDED, bytes=393903, packets=4863, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
  ADDED, bytes=0, packets=0, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[in
```

```
  ADDED, bytes=0, packets=0, table=0, priority=100, selector=[IN_PORT:1, ETH_DST:00:00:00:00
```

```
  ADDED, bytes=0, packets=0, table=0, priority=100, selector=[IN_PORT:4, ETH_DST:00:00:00:00
```

```
deviceId=of:0000000000000002, flowRuleCount=3
```

```
  ADDED, bytes=388476, packets=4796, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
  ADDED, bytes=126, packets=3, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
```

```
  ADDED, bytes=388476, packets=4796, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
deviceId=of:000000000000000b, flowRuleCount=5
```

```
  ADDED, bytes=191079, packets=2359, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
  ADDED, bytes=191079, packets=2359, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
  ADDED, bytes=378, packets=9, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
```

```
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:3, ETH_DST:00:00:00:
```

```
  ADDED, bytes=0, packets=0, table=0, priority=100, selector=[IN_PORT:1, ETH_DST:00:00:00:00
```

```
deviceId=of:000000000000000c, flowRuleCount=3
```

```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
  ADDED, bytes=252, packets=6, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
```

```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
deviceId=of:000000000000000d, flowRuleCount=3
```

```
  ADDED, bytes=252, packets=6, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
```

```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
deviceId=of:000000000000000e, flowRuleCount=5
```

```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:lldp], treat
```

```
  ADDED, bytes=294, packets=7, table=0, priority=40000, selector=[ETH_TYPE:arp], treatment=[
```

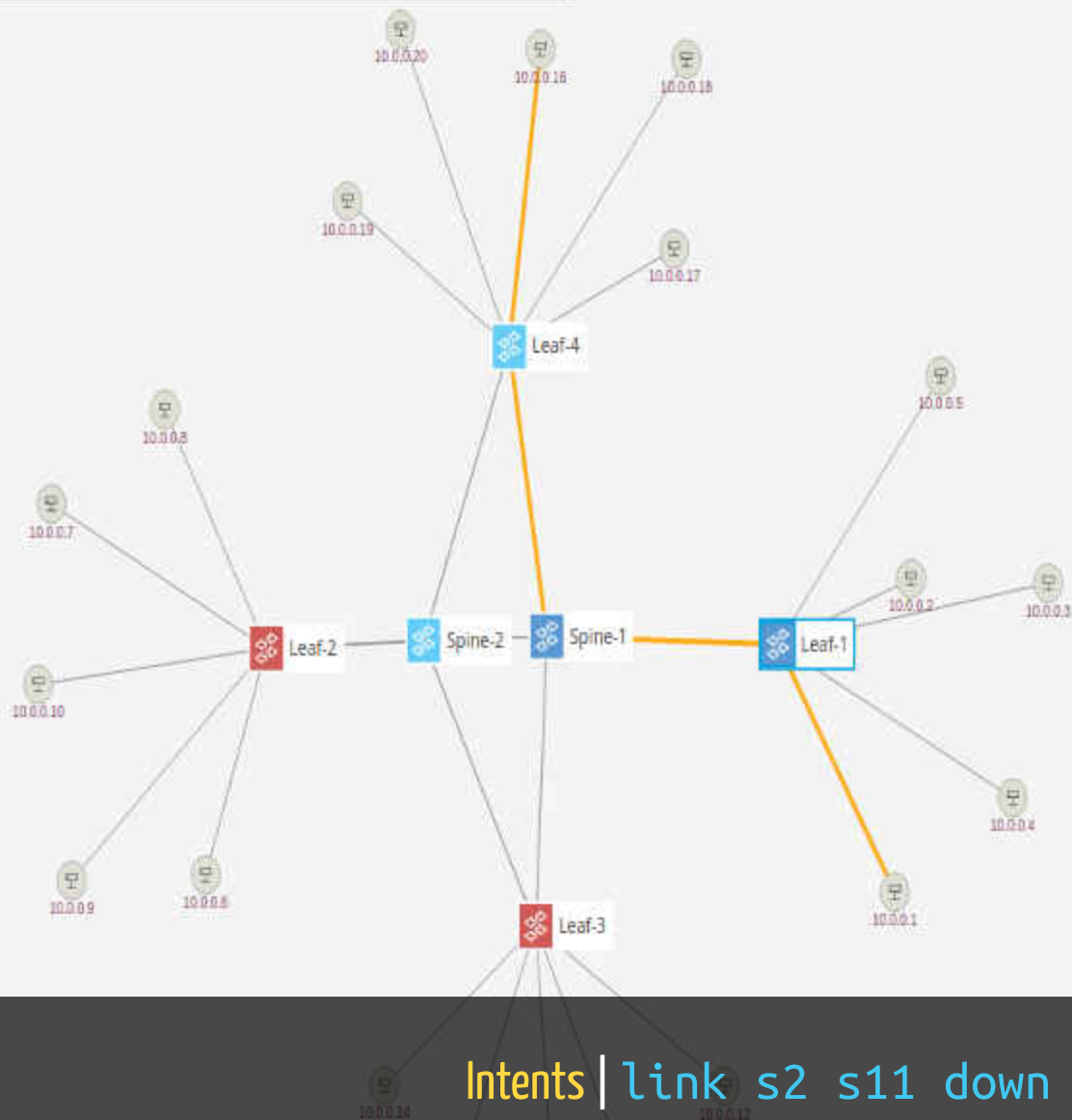
```
  ADDED, bytes=196911, packets=2431, table=0, priority=40000, selector=[ETH_TYPE:bddp], treat
```

```
  ADDED, bytes=0, packets=0, table=0, priority=100, selector=[IN_PORT:1, ETH_DST:00:00:00:00
```

```
  ADDED, bytes=294, packets=3, table=0, priority=100, selector=[IN_PORT:3, ETH_DST:00:00:00:
```

Intents

172.17.0.2	172.17.0.3	172.17.0.4
✓ 172.17.0.2 Devices: 2	✓ 172.17.0.3 Devices: 2	✓ 172.17.0.4 Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 14

Hosts : 20

Topology SCCs : 1

Intents : 1

Tunnels : 0

Flows : 24

Leaf-1

URI : of:0000000000000000b

Vendor : Nicira, Inc.

H/W Version : Open vSwitch

S/W Version : 2.5.2

Serial # : None

Protocol : OF_13

Ports : 8

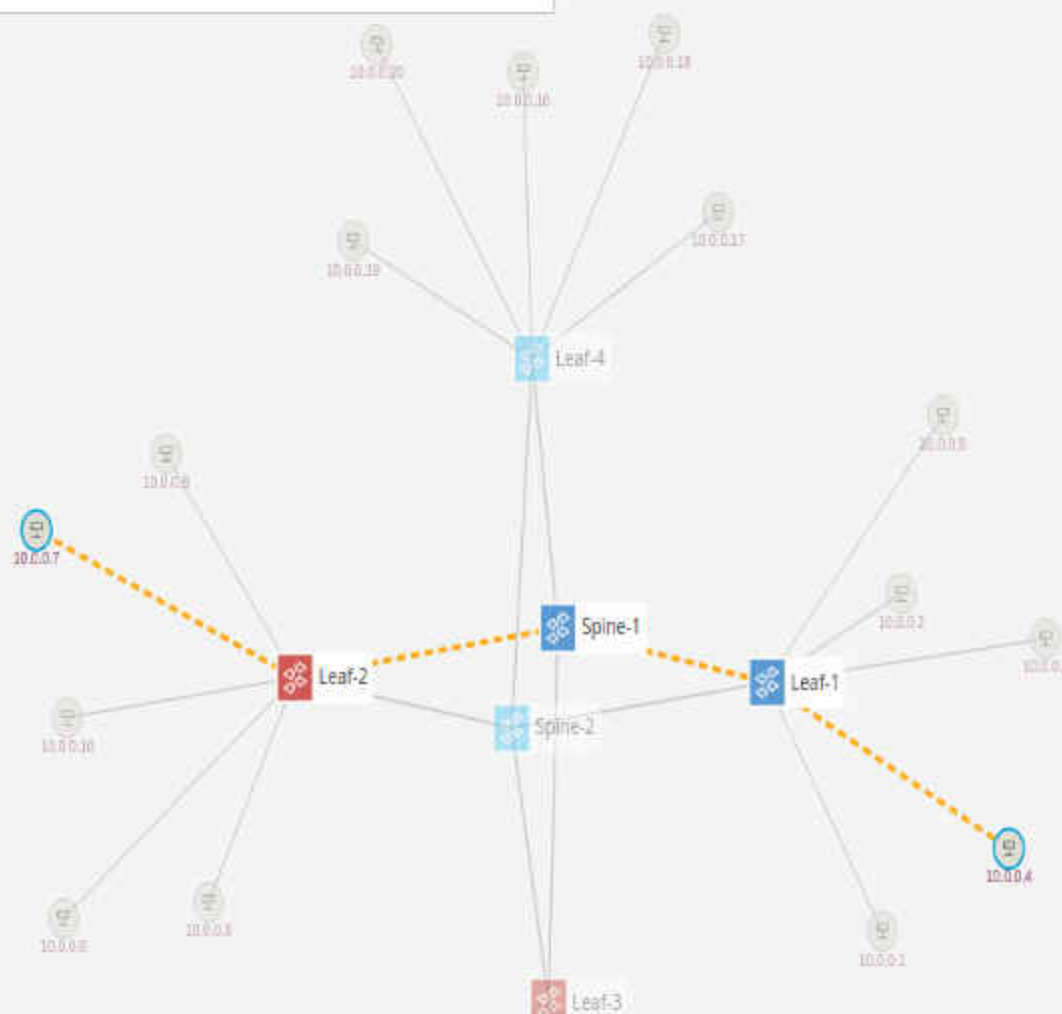
Flows : 5

Tunnels : 0



Intents | link s2 s11 down

172.17.0.2	172.17.0.3	172.17.0.4
✓ 172.17.0.2 Devices: 2	✓ 172.17.0.3 Devices: 2	✓ 172.17.0.4 Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 16

Hosts : 20

Topology SCCs : 1

Intents : 2

Tunnels : 0

Flows : 30

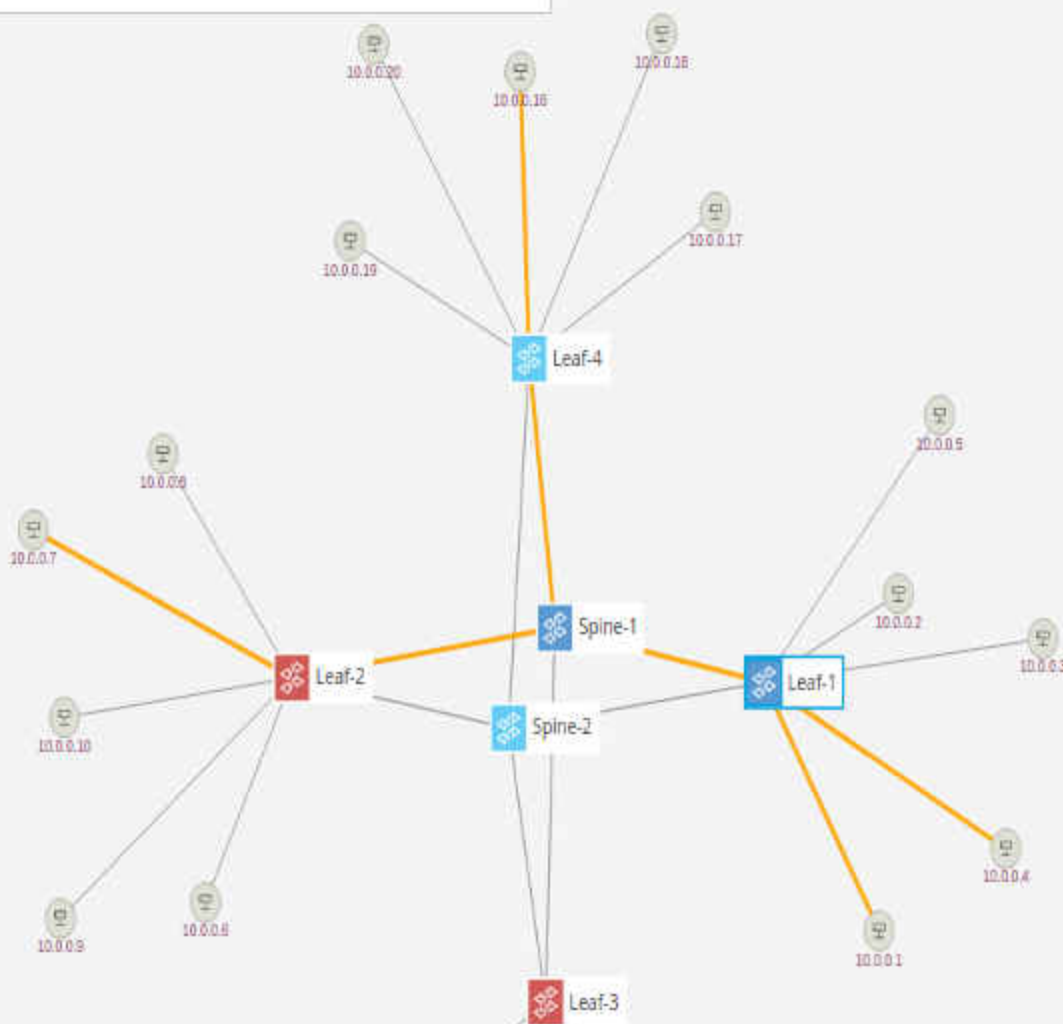
Selected Items

1: 00:00:00:00:00:04/None

2: 00:00:00:00:00:07/None



172.17.0.2	172.17.0.3	172.17.0.4
✓ 172.17.0.2 Devices: 2	✓ 172.17.0.3 Devices: 2	✓ 172.17.0.4 Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 16

Hosts : 20

Topology SCCs : 1

Intents : 2

Tunnels : 0

Flows : 30

Leaf-1

URI : of:0000000000000000b

Vendor : Nicira, Inc.

H/W Version : Open vSwitch

S/W Version : 2.5.2

Serial # : None

Protocol : OF_13

Ports : 8

Flows : 7

Tunnels : 0



Test

Intents via Web UI

```
mininet> py h14.IP()  
10.0.0.4
```

```
mininet> py h22.IP()  
10.0.0.7
```

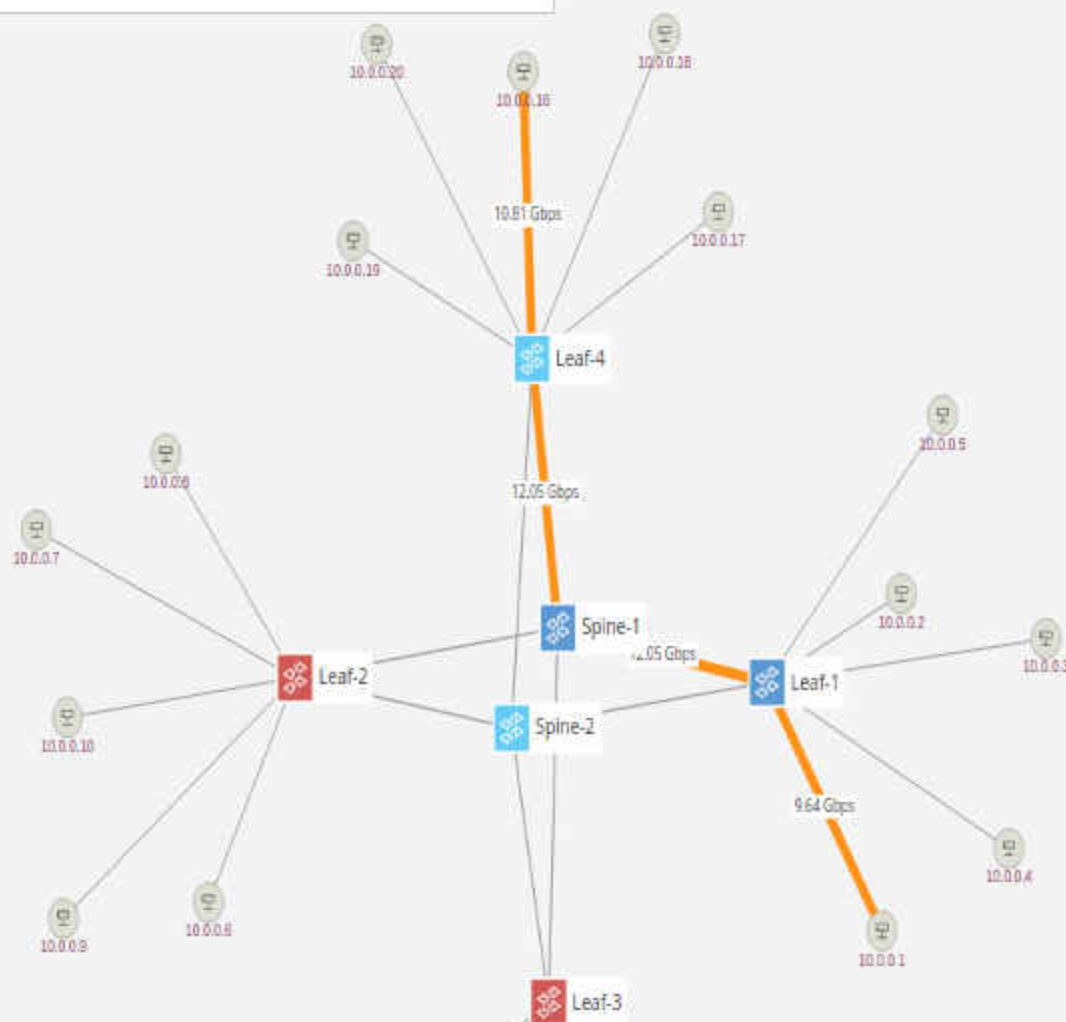
```
mininet> h14 ping -c3 h22  
PING 10.0.0.7 (10.0.0.7) 56(84) bytes of data.  
64 bytes from 10.0.0.7: icmp_seq=1 ttl=64 time=65.2 ms  
64 bytes from 10.0.0.7: icmp_seq=2 ttl=64 time=0.085 ms  
64 bytes from 10.0.0.7: icmp_seq=3 ttl=64 time=0.107 ms
```

```
mininet> h11 ping -c3 h41
```

Show All Traffic

```
mininet> bgIperf h11 h41
h11 <--> h41
Press ^Z to continue in background or ^C to abort
.....
h11 <--> h41: 20.70 Gbps
```

172.17.0.2	172.17.0.3	172.17.0.4
✓ 172.17.0.2 Devices: 2	✓ 172.17.0.3 Devices: 2	✓ 172.17.0.4 Devices: 2



ONOS Summary

Version : 1.12.0

Devices : 6

Links : 16

Hosts : 20

Topology SCCs : 1

Intents : 2

Tunnels : 0

Flows : 30

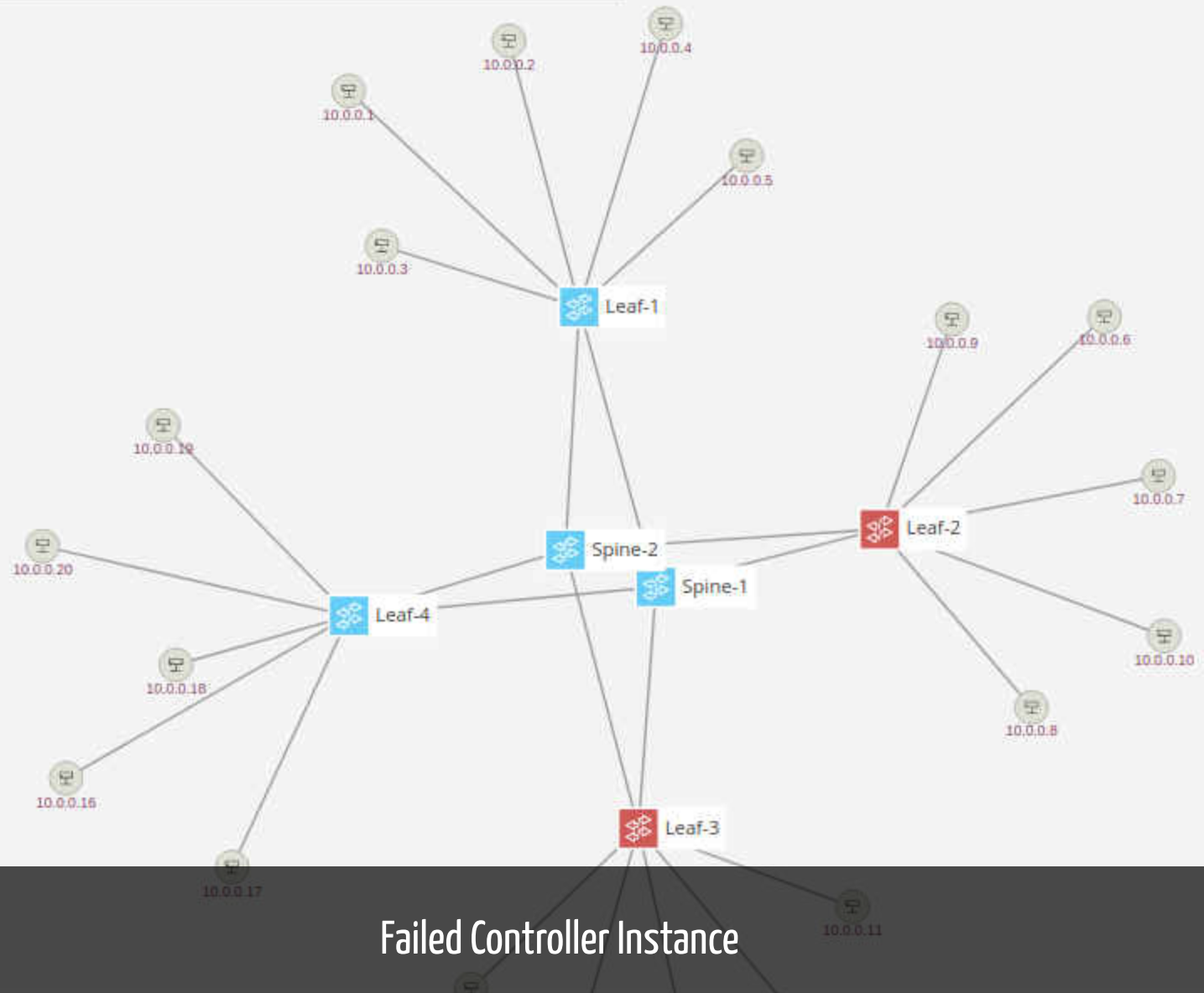
Node Failures

```
onos> shutdown
```

```
Confirm: halt instance root (yes/no): yes
```

```
onos> Connection to 172.17.0.2 closed by remote host.
```

 172.17.0.2	 172.17.0.3	 172.17.0.4
172.17.0.2 Devices: 0	✓ 172.17.0.3 Devices: 4	✓ 172.17.0.4 Devices: 2



Failed Controller Instance

Mastership

Re-balancing

via CLI

onos> balance-masters

or automatically via MLB app

onos> apps -s -a

+ 23	org.onosproject.optical-model	1.12.0	Optical Network Model
+ 27	org.onosproject.openflow-base	1.12.0	OpenFlow Base Provider
+ 28	org.onosproject.lldpprovider	1.12.0	LLDP Link Provider
+ 30	org.onosproject.hostprovider	1.12.0	Host Location Provider
+ 35	org.onosproject.drivers	1.12.0	Default Drivers
+ 83	org.onosproject.openflow	1.12.0	OpenFlow Provider Suite
+ 252	org.onosproject.proxyarp	1.12.0	Proxy ARP/NDP

onos> app activate mlb

Activated org.onosproject.mlb

onos> apps -s -a

+ 23	org.onosproject.optical-model	1.12.0	Optical Network Model
+ 27	org.onosproject.openflow-base	1.12.0	OpenFlow Base Provider
+ 28	org.onosproject.lldpprovider	1.12.0	LLDP Link Provider
+ 30	org.onosproject.hostprovider	1.12.0	Host Location Provider
+ 35	org.onosproject.drivers	1.12.0	Default Drivers
+ 83	org.onosproject.openflow	1.12.0	OpenFlow Provider Suite
+ 252	org.onosproject.proxyarp	1.12.0	Proxy ARP/NDP
+ 284	org.onosproject.mlb	1.12.0	Mastership Load Balancer

```
# shared folders
sdn@onos-tutorial:~$ sudo adduser sdn vboxsf

# static IP
sdn@onos-tutorial:~$ cat /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto enp0s3
iface enp0s3 inet dhcp

# The secondary network interface
auto enp0s8
iface enp0s8 inet static
    address 192.168.56.70
    netmask 255.255.255.0
    network 192.168.56.0
    broadcast 192.168.56.255
    gateway 192.168.56.1
    dns-nameservers 8.8.8.8 8.8.4.4

#iface enp0s8 inet dhcp
```

Some Notes



Refs/Resources

Refs/Resources

1. [ONOS - Wiki](#)
2. [Basic ONOS Tutorial](#)



END

Eueung Mulyana

<https://telematika.org/remark/onos2>

Intro+Labs | Attribution-ShareAlike CC BY-SA
