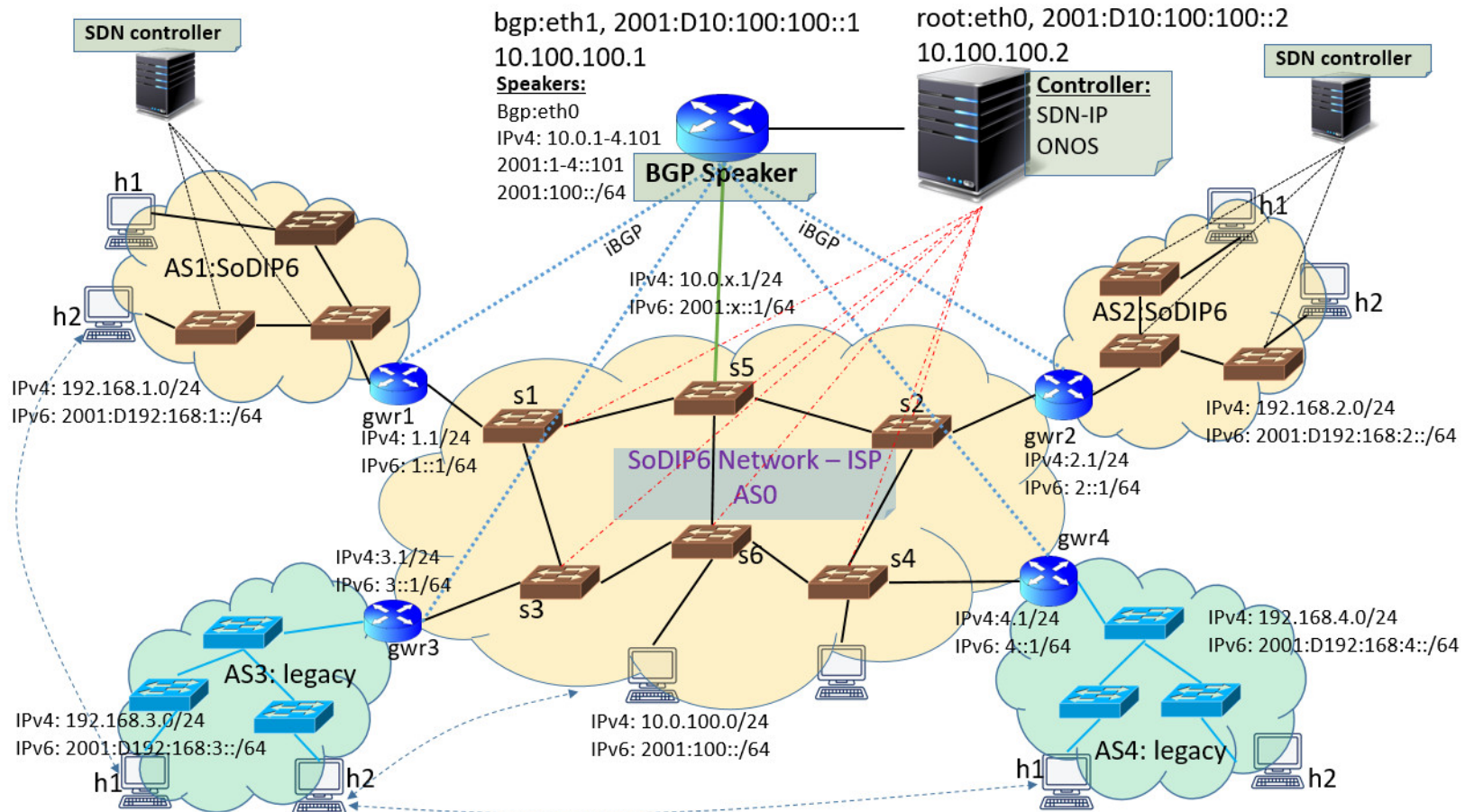


Some glimpses of ongoing ONOS/SDN-IP tests/implementation for SoDIP6 networks (use-case)

Authors: Babu R Dawadi, Danda B Rawat, Shashidhar R Joshi, and Pietro Manzoni



ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11

10.0.3.11

Switches: 6

ONOS Summary

Devices :	6
Links :	14
Hosts :	8
Topology SCCs :	1
<hr/>	
Intents :	13
Tunnels :	0
Flows :	103
Version :	1.2.1.sdnpip

sdnnp@mininet...

[LXTerminal]

ONOS - Chromium

01:15

ONOS

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11

10.0.3.11

Switches: 6

```
graph TD
    S1[of:000000000000000a1] --- S2[of:000000000000000a5]
    S1 --- S3[of:000000000000000a3]
    S2 --- S4[of:000000000000000a6]
    S3 --- S4
    S4 --- S5[of:000000000000000a2]
    S4 --- S6[of:000000000000000a4]
    S1 --- H1[10.0.1.1]
    S2 --- H2[2001::101]
    S2 --- H3[2001::2:1]
    S3 --- H4[10.0.3.1]
    S4 --- H5[10.0.100.1]
    S4 --- H6[10.0.100.2]
    S4 --- H7[10.0.100.3]
    S5 --- H8[10.0.4.1]
```

ONOS Summary

Devices : 6

Links : 14

Hosts : 8

Topology SCCs : 1

Intents : 13

Tunnels : 0

Flows : 102

Version : 1.2.1.sdnip

Link

Type : direct

A type : device

A id : of:000000000000000a5

A label : of:000000000000000a5

A port : 4

B type : device

B id : of:000000000000000a6

B label : of:000000000000000a6

B port : 5

A → B : direct / online

B → A : direct / online

sdnip@mininet...

[LXTerminal]

ONOS - Chromium

01:17

ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11

10.0.3.11

Switches: 6

```
graph TD
    S1[of:00000000000000a1] --- S5[of:00000000000000a5]
    S5 --- S2[of:00000000000000a2]
    S2 --- S4[of:00000000000000a4]
    S4 --- S6[of:00000000000000a6]
    S6 --- S3[of:00000000000000a3]
    S3 --- S1
    S1 --- H1((10.0.1.1))
    S5 --- H2((2001:2::101))
    S2 --- H3((2001:2::1))
    S3 --- H4((10.0.3.1))
    S6 --- H5((10.0.100.1))
    S6 --- H6((10.0.100.2))
    S6 --- H7((10.0.100.3))
    S4 --- H8((10.0.4.1))
```

ONOS Summary

Devices : 6
Links : 14
Hosts : 8
Topology SCCs : 1

Intents : 13
Tunnels : 0
Flows : 102
Version : 1.2.1.sdnip

Link

Type : direct

A type : device
A id : of:00000000000000a5
A label : of:00000000000000a5
A port : 4

B type : device
B id : of:00000000000000a6
B label : of:00000000000000a6
B port : 5

A → B : direct / online
B → A : direct / online

sdn@mininet-...

[LXTerminal]

ONOS - Chromium

01:17

ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11
10.0.3.11
Switches: 6

```
graph TD
    S1[of:00000000000000a1] --- S2[of:00000000000000a5]
    S2 --- S3[of:00000000000000a2]
    S1 --- S4[of:00000000000000a3]
    S2 --- S5[of:00000000000000a6]
    S3 --- S5
    S4 --- S5
    S5 --- S6[of:00000000000000a4]
    H1((10.0.1.1)) --- S1
    H2((2001::101)) --- S2
    H3((2001::1)) --- S3
    H4((10.0.3.1)) --- S4
    H5((10.0.100.1)) --- S5
    H6((10.0.100.2)) --- S5
    H7((10.0.100.3)) --- S5
    H8((10.0.4.1)) --- S6
    H9((10.0.100.4)) --- S6
```

ONOS Summary

Devices :	6
Links :	14
Hosts :	8
Topology SCCs :	1
Intents :	13
Tunnels :	0
Flows :	104
Version :	1.2.1.sdnip

of:000000000000000000a4

URI :	of:000000000000000000a4
Vendor :	Nicira, Inc.
H/W Version :	Open vSwitch
S/W Version :	2.1.3
Serial Number :	None
Protocol :	OF_10
Master :	10.0.3.11
Latitude :	
Longitude :	
Ports :	4
Flows :	11
Tunnels :	0

sdn@mininet...

[LXTerminal]

ONOS - Chromium

01:19

ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11

10.0.3.11

Switches: 6

```
graph TD; S1[Switch 1] --- S2[Switch 2]; S1 --- S3[Switch 3]; S2 --- S4[Switch 4]; S3 --- S4; S4 --- S5[Switch 5]; S5 --- S6[Switch 6]; H1((Host 1)) --- S1; H2((Host 2)) --- S2; H3((Host 3)) --- S3; H4((Host 4)) --- S4; H5((Host 5)) --- S5; H6((Host 6)) --- S6;
```

ONOS Summary

Devices : 6

Links : 14

Hosts : 5

Topology SCCs : 1

Intents : 13

Tunnels : 0

Flows : 105

Version : 1.2.1.sdnip

00:00:00:00:00:0

1/-1

00:00:00:00:00:01

2001:4::101, 10.0.4.101, 2001:2::101, 10.0.3.101, 2001:3::101, 10.0.2.101, 10.0.1.101, 2001:1::101, fe80::200:ff:fe00:1

none

sdn@mininet-...

[LXTerminal]

ONOS - Chromium

00:41

ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11

10.0.3.11

Switches: 6

ONOS Summary

Devices : 6

Links : 14

Hosts : 5

Topology SCCs : 1

Intents : 13

Tunnels : 0

Flows : 105

Version : 1.2.1.sdnip

00:00:00:00:02:0

1/-1

MAC : 00:00:00:00:02:01

IP : 2001::1, 10.0.2.1, fe80::200:ff:fe00:201

VLAN : none

Latitude :

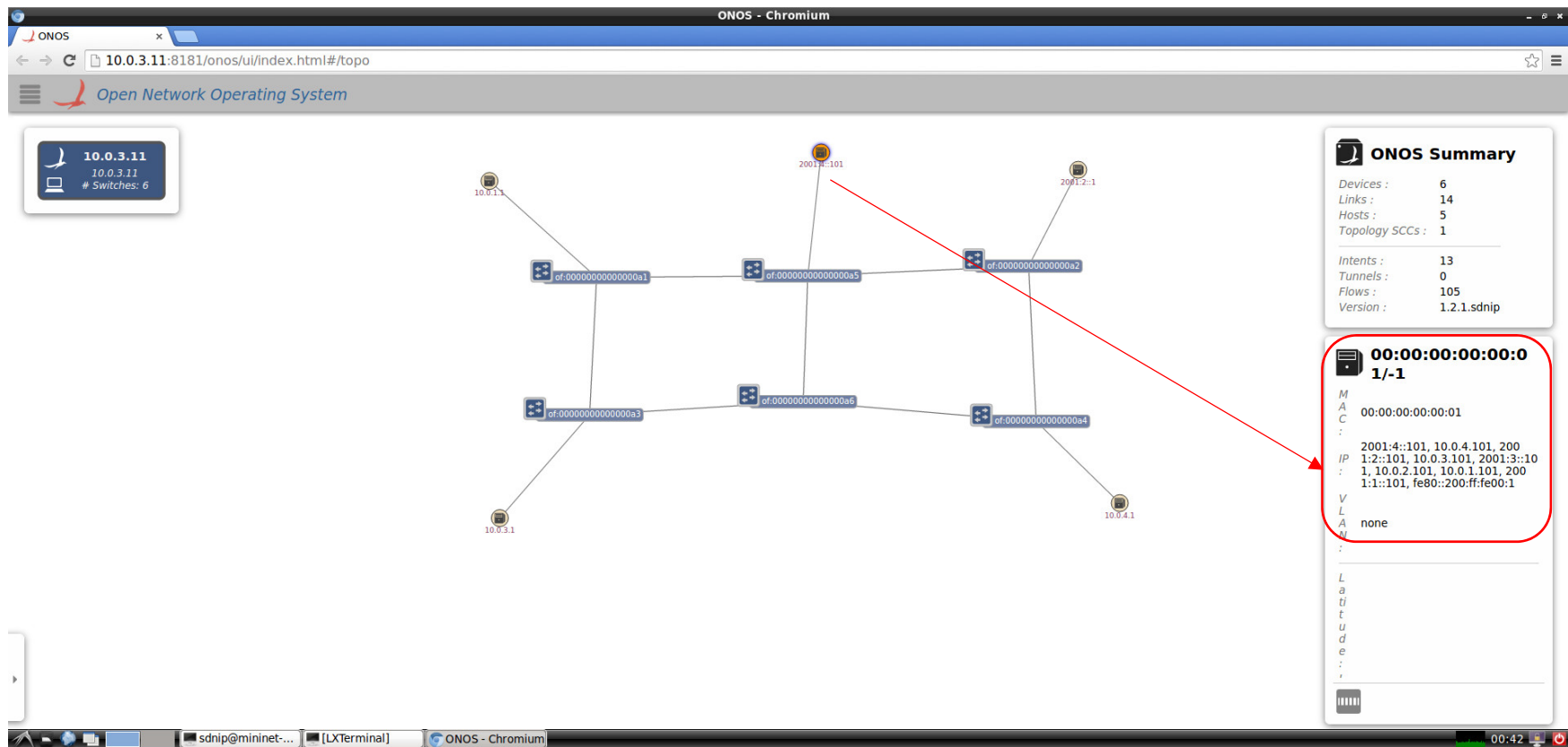
Longitude :

sdn@mininet...

[LXTerminal]

ONOS - Chromium

00:42




```
onos> intents
id=0x2, state=INSTALLED, key=0x2, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, TCP_DST{tcpPort=179}, IPV4_SRC{ip=10.0.2.1/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
id=0x8, state=INSTALLED, key=0x8, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, TCP_DST{tcpPort=179}, IPV4_SRC{ip=10.0.1.1/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
id=0x0, state=INSTALLED, key=0x0, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, TCP_DST{tcpPort=179}, IPV4_SRC{ip=10.0.2.101/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}
id=0x7, state=INSTALLED, key=0x7, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, IPV4_SRC{ip=10.0.1.101/32}, TCP_SRC{tcpPort=179}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}
id=0x81, state=WITHDRAWN, key=192.168.1.0/24, type=MultiPointToSinglePointIntent, appId=org.onosproject.sdnip
  selector=[ETH_TYPE{ethType=800}, IPV4_DST{ip=192.168.1.0/24}]
  treatment=[ETH_DST{mac=00:00:00:00:01:01}]
  ingress=[ConnectPoint{elementId=of:00000000000000a4, portNumber=1}, ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, ConnectPoint{e
0a1, portNumber=1}]
id=0x5, state=INSTALLED, key=0x5, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=1}, IPV4_SRC{ip=10.0.2.1/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
id=0x9, state=INSTALLED, key=0x9, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, IPV4_SRC{ip=10.0.1.1/32}, TCP_SRC{tcpPort=179}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
id=0xa, state=INSTALLED, key=0xa, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=1}, IPV4_SRC{ip=10.0.1.101/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}
id=0x6, state=INSTALLED, key=0x6, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, TCP_DST{tcpPort=179}, IPV4_SRC{ip=10.0.1.101/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}
id=0x3, state=INSTALLED, key=0x3, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, IPV4_SRC{ip=10.0.2.1/32}, TCP_SRC{tcpPort=179}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
id=0x4, state=INSTALLED, key=0x4, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=1}, IPV4_SRC{ip=10.0.2.101/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}
id=0x1, state=INSTALLED, key=0x1, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=6}, IPV4_SRC{ip=10.0.2.101/32}, TCP_SRC{tcpPort=179}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.2.1/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a2, portNumber=1}
id=0xb, state=INSTALLED, key=0xb, type=PointToPointIntent, appId=org.onosproject.sdnip
  selector=[IP_PROTO{protocol=1}, IPV4_SRC{ip=10.0.1.1/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.101/32}]
  ingress=ConnectPoint{elementId=of:00000000000000a1, portNumber=1}, egress=ConnectPoint{elementId=of:00000000000000a3, portNumber=1}
onos>
```

File Edit Tabs Help

```

    ingress=ConnectPoint{elementId=of:0000000000000a1, portNumber=1}, egress=ConnectPoint{elementId=of:0000000000000a3, portNumber=1}
onos> devices
id=of:00000000000000a1, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48617
id=of:00000000000000a2, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48618
id=of:00000000000000a3, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48619
id=of:00000000000000a4, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48620
id=of:00000000000000a5, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48621
id=of:00000000000000a6, available=true, role=MASTER, type=SWITCH, mfr=Nicira, Inc., hw=Open vSwitch, sw=2.1.3, serial=None, protocol=OF_10, channelId=10.0.3.1:48622
onos> flows
deviceId=of:00000000000000a1, flowRuleCount=10
  id=100008507e769, state=ADDED, bytes=2442, packets=33, duration=2000, priority=5, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=800}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=100008507fdef, state=ADDED, bytes=1764, packets=42, duration=2000, priority=40000, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=806}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=100008507fdef, state=ADDED, bytes=0, packets=0, duration=2000, priority=5, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=806}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=1000086e42306, state=ADDED, bytes=17560, packets=188, duration=2000, priority=5, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=86dd}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=1000086eb6535, state=ADDED, bytes=104814, packets=1294, duration=2000, priority=40000, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=88cc}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=1000086ed202b, state=ADDED, bytes=104814, packets=1294, duration=2000, priority=40000, tableId=0 appId=org.onosproject.core, payload=null
    selector=[ETH_TYPE{ethType=8942}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=100008714e102, state=FAILED, bytes=0, packets=0, duration=0, priority=40000, tableId=0 appId=org.onosproject.core, payload=null
    selector=[IP_PROTO{protocol=58}, ICMPV6_TYPE{icmpv6Type=135}, ETH_TYPE{ethType=86dd}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=100008714e4c3, state=FAILED, bytes=0, packets=0, duration=0, priority=40000, tableId=0 appId=org.onosproject.core, payload=null
    selector=[IP_PROTO{protocol=58}, ICMPV6_TYPE{icmpv6Type=136}, ETH_TYPE{ethType=86dd}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=CONTROLLER}], deferred=[], transition=None, cleared=false, metadata=null}
  id=1d000080b1524d, state=FAILED, bytes=0, packets=0, duration=0, priority=10, tableId=0 appId=org.onosproject.fwd, payload=null
    selector=[IPV6_SRC{ip=2001:1::101/128}, IN_PORT{port=3}, ETH_SRC{mac=00:00:00:00:00:01}, IPV6_DST{ip=2001:1::1/128}, ETH_DST{mac=00:00:00:00:01:01}, ETH_TYPE{ethType=86dd}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=1}], deferred=[], transition=None, cleared=false, metadata=null}
  id=1d000084fd27cc, state=PENDING REMOVE, bytes=0, packets=0, duration=0, priority=10, tableId=0 appId=org.onosproject.fwd, payload=null
    selector=[IN_PORT{port=3}, ETH_SRC{mac=00:00:00:00:00:01}, ETH_DST{mac=00:00:00:00:01:01}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=1}], deferred=[], transition=None, cleared=false, metadata=null}
  id=23000019c173c1, state=ADDED, bytes=0, packets=0, duration=2000, priority=1000, tableId=0 appId=org.onosproject.net.intent, payload=null
    selector=[IP_PROTO{protocol=1}, IN_PORT{port=2}, IPV4_SRC{ip=10.0.1.101/32}, ETH_TYPE{ethType=800}, IPV4_DST{ip=10.0.1.1/32}]
    treatment=DefaultTrafficTreatment{immediate=[OUTPUT{port=1}], deferred=[], transition=None, cleared=false, metadata=null}
  id=23000019c173c1, state=ADDED, bytes=0, packets=0, duration=2000, priority=1000, tableId=0 appId=org.onosproject.net.intent, payload=null

```


ONOS - Chromium

10.0.3.11:8181/onos/ui/index.html#/topo

Open Network Operating System

10.0.3.11
10.0.3.11
Switches: 6

ONOS Summary

Devices :	6
Links :	14
Hosts :	5
Topology SCCs :	1
Intents :	13
Tunnels :	0
Flows :	105
Version :	1.2.1.sdnpip

00:00:00:00:01:01/-1

MAC : 00:00:00:00:01:01
IP : 10.0.1.1, 2001:1::1, fe80::2
VLAN : none

Latitude :
Longitude :
Uptime :

```
sdnpip@mininet-... | LXTerminal | ONOS - Chromium | 01:02
```

```
onos> hosts
id=00:00:00:00:00:01/-1, mac=00:00:00:00:00:01, location=of:00000000000000a5/1, vlan=-1, ip(s)=[2001:4::101, 2001:3::101, 2001:1::101, 2001:2::101, 10.0.100.254]
id=00:00:00:00:00:01:01/-1, mac=00:00:00:00:00:01:01, location=of:00000000000000a1/1, vlan=-1, ip(s)=[10.0.1.1]
id=00:00:00:00:00:02:01/-1, mac=00:00:00:00:00:02:01, location=of:00000000000000a2/1, vlan=-1, ip(s)=[10.0.2.1]
id=00:00:00:00:00:04:01/-1, mac=00:00:00:00:00:04:01, location=of:00000000000000a4/1, vlan=-1, ip(s)=[10.0.4.1]
id=66:73:8F:C9:DC:41/-1, mac=66:73:8F:C9:DC:41, location=of:00000000000000a6/3, vlan=-1, ip(s)=[10.0.100.3]
id=C6:54:5B:AF:D9:7D/-1, mac=C6:54:5B:AF:D9:7D, location=of:00000000000000a6/2, vlan=-1, ip(s)=[10.0.100.2]
id=DA:08:96:78:6C:3E/-1, mac=DA:08:96:78:6C:3E, location=of:00000000000000a6/1, vlan=-1, ip(s)=[10.0.100.1]
```

```
mininet> isp_h1 ping isp_h2
PING 192.168.2.1 (192.168.2.1) 56(84) bytes of data.
64 bytes from 192.168.2.1: icmp_seq=1 ttl=61 time=3.40 ms
64 bytes from 192.168.2.1: icmp_seq=2 ttl=61 time=3.51 ms
64 bytes from 192.168.2.1: icmp_seq=3 ttl=61 time=1.07 ms
^CsendInt: writing chr(3)
--- 192.168.2.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.071/2.666/3.519/1.128 ms
```

```
mininet> isp_h1 ping isp_h3
PING 192.168.3.1 (192.168.3.1) 56(84) bytes of data.
64 bytes from 192.168.3.1: icmp_seq=1 ttl=61 time=1.54 ms
64 bytes from 192.168.3.1: icmp_seq=2 ttl=61 time=2.42 ms
64 bytes from 192.168.3.1: icmp_seq=3 ttl=61 time=1.71 ms
^CsendInt: writing chr(3)
--- 192.168.3.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 1.547/3.064/6.569/2.050 ms
```

```
mininet> isp_h1 ping6 2001:4::1
OPING 2001:4::1 (2001:4::1) 56 data bytes
64 bytes from 2001:4::1: icmp_seq=1 ttl=61 time=2.12 ms
64 bytes from 2001:4::1: icmp_seq=2 ttl=61 time=1.06 ms
64 bytes from 2001:4::1: icmp_seq=3 ttl=61 time=4.41 ms
^CsendInt: writing chr(3)
--- 2001:4::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 1.064/2.532/4.411/1.397 ms
```

```
mininet> isp_h1 ping sdn_h1
PING 10.0.100.1 (10.0.100.1) 56(84) bytes of data.
64 bytes from 10.0.100.1: icmp_seq=1 ttl=62 time=21.5 ms
64 bytes from 10.0.100.1: icmp_seq=2 ttl=62 time=1.15 ms
^CsendInt: writing chr(3)
--- 10.0.100.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 1.157/11.336/21.515/10.179 ms
```

```
mininet> isp_h2 ping sdn_h1
PING 10.0.100.1 (10.0.100.1) 56(84) bytes of data.
64 bytes from 10.0.100.1: icmp_seq=1 ttl=62 time=17.0 ms
64 bytes from 10.0.100.1: icmp_seq=2 ttl=62 time=0.670 ms
64 bytes from 10.0.100.1: icmp_seq=3 ttl=62 time=0.087 ms
^CsendInt: writing chr(3)
--- 10.0.100.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2023ms
rtt min/avg/max/mdev = 0.087/5.919/17.001/7.839 ms
```

```
mininet> isp_h3 ping6 2001:100::1
PING 2001:100::1 (2001:100::1) 56 data bytes
64 bytes from 2001:100::1: icmp_seq=1 ttl=62 time=0.064 ms
64 bytes from 2001:100::1: icmp_seq=2 ttl=62 time=0.232 ms
^CsendInt: writing chr(3)
--- 2001:100::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1011ms
rtt min/avg/max/mdev = 0.064/0.148/0.232/0.084 ms
```

D:\Backup

Upload Edit Properties New

D:\PhD-Study\Experimental\sdnip\configs\

Name	Size	Type	Changed
..		Parent directory	5/26/2020 7:20:32 PM
addresses.json	1 KB	JSON File	5/26/2020 7:16:19 PM
gui.json	1 KB	JSON File	5/26/2020 7:16:39 PM
network-config.cfg	4 KB	CFG File	5/26/2020 7:40:18 PM
quagga1.conf	1 KB	CONF File	5/25/2020 11:47:18 PM
quagga2.conf	1 KB	CONF File	5/25/2020 11:48:01 PM
quagga3.conf	1 KB	CONF File	5/25/2020 11:47:59 PM
quagga4.conf	1 KB	CONF File	5/26/2020 7:17:29 PM
sdnip.json	3 KB	JSON File	5/26/2020 7:20:13 PM
zebra.conf	1 KB	CONF File	7/15/2015 6:20:35 AM

Ubnt18SDNIP [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Tue 16:06

sdnip@sdnip-VirtualBox: ~/SoDIP6

File Edit View Search Terminal Help

```

0PING 2001:100::2(2001:100::2) 56 data bytes
64 bytes from 2001:100::2: icmp_seq=1 ttl=64 time=15.7 ms
64 bytes from 2001:100::2: icmp_seq=2 ttl=64 time=2.10 ms
64 bytes from 2001:100::2: icmp_seq=3 ttl=64 time=0.156 ms
64 bytes from 2001:100::2: icmp_seq=4 ttl=64 time=0.111 ms
^CsendInt: writing chr(3)

--- 2001:100::2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3046ms
rtt min/avg/max/mdev = 0.111/4.523/15.724/6.516 ms
mininet> sdn_h2 pingo 2001:100::1
*** errRun: ['stty', '-icanon', 'min', '1']
0PING 2001:100::1(2001:100::1) 56 data bytes
64 bytes from 2001:100::1: icmp_seq=1 ttl=64 time=0.075 ms
64 bytes from 2001:100::1: icmp_seq=2 ttl=64 time=0.160 ms
64 bytes from 2001:100::1: icmp_seq=3 ttl=64 time=0.147 ms
64 bytes from 2001:100::1: icmp_seq=4 ttl=64 time=0.145 ms
64 bytes from 2001:100::1: icmp_seq=5 ttl=64 time=0.059 ms
64 bytes from 2001:100::1: icmp_seq=6 ttl=64 time=0.059 ms
64 bytes from 2001:100::1: icmp_seq=7 ttl=64 time=0.155 ms
64 bytes from 2001:100::1: icmp_seq=8 ttl=64 time=0.131 ms
64 bytes from 2001:100::1: icmp_seq=9 ttl=64 time=0.108 ms
^CsendInt: writing chr(3)

--- 2001:100::1 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8174ms
rtt min/avg/max/mdev = 0.059/0.115/0.160/0.040 ms
mininet>

```

Right Ctrl