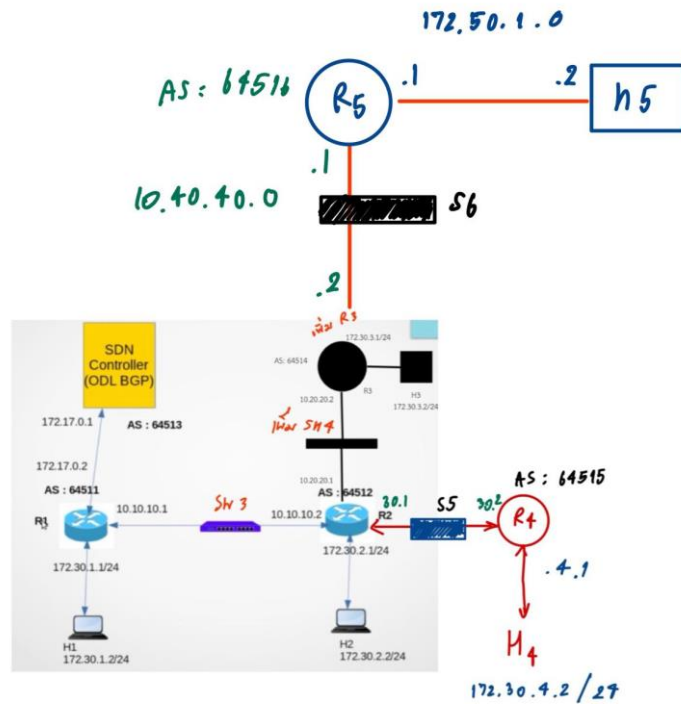


เพิ่ม R4 กับ R5



1.Topo1.py

```
test@test: ~/Desktop/ODL_week9/odlbgp/add_r4-r5
test@test:~/Desktop/ODL_week9/odlbgp/add_r4-r5$ sudo python3 topo1.py
*** Adding switch
r1: kwargs {'ip': '172.30.1.1/24'}
r1: update resources {}
r2: kwargs {'ip': '172.30.2.1/24'}
r2: update resources {}
r3: kwargs {'ip': '172.30.3.1/24'}
r3: update resources {}
r4: kwargs {'ip': '172.30.4.1/24'}
r4: update resources {}
r5: kwargs {'ip': '172.30.5.1/24'}
r5: update resources {}
h1: kwargs {'ip': '172.30.1.2/24', 'defaultRoute': 'via 172.30.1.1'}
h1: update resources {}
h2: kwargs {'ip': '172.30.2.2/24', 'defaultRoute': 'via 172.30.2.1'}
h2: update resources {}
h3: kwargs {'ip': '172.30.3.2/24', 'defaultRoute': 'via 172.30.3.1'}
h3: update resources {}
h4: kwargs {'ip': '172.30.4.2/24', 'defaultRoute': 'via 172.30.4.1'}
h4: update resources {}
h5: kwargs {'ip': '172.30.5.2/24', 'defaultRoute': 'via 172.30.5.1'}
h5: update resources {}
*** Creating links
*** Starting network
*** Configuring hosts
r1 r2 r3 r4 r5 h1 h2 h3 h4 h5
*** Starting controller

*** Starting 4 switches
s3 s4 s5 s6 ...
*** Running CLI
*** Starting CLI:
```

2. links

```
containernet> links
h1-eth0<->r1-eth0 (OK OK)
h2-eth0<->r2-eth0 (OK OK)
h3-eth0<->r3-eth0 (OK OK)
h4-eth0<->r4-eth0 (OK OK)
h5-eth0<->r5-eth0 (OK OK)
r1-eth1<->s3-eth1 (OK OK)
r2-eth1<->s3-eth2 (OK OK)
r2-eth2<->s4-eth1 (OK OK)
r2-eth3<->s5-eth1 (OK OK)
r3-eth1<->s4-eth2 (OK OK)
r4-eth1<->s5-eth2 (OK OK)
r3-eth2<->s6-eth1 (OK OK)
r5-eth1<->s6-eth2 (OK OK)
containernet>
```

3. ping

```
containernet>
containernet> h1 ping h5
PING 172.30.5.2 (172.30.5.2) 56(84) bytes of data.
64 bytes from 172.30.5.2: icmp_seq=1 ttl=60 time=0.423 ms
64 bytes from 172.30.5.2: icmp_seq=2 ttl=60 time=0.230 ms
^C
--- 172.30.5.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1019ms
rtt min/avg/max/mdev = 0.230/0.326/0.423/0.098 ms
containernet>
```

```
containernet>
containernet> h1 ping h4
PING 172.30.4.2 (172.30.4.2) 56(84) bytes of data.
64 bytes from 172.30.4.2: icmp_seq=1 ttl=61 time=0.299 ms
64 bytes from 172.30.4.2: icmp_seq=2 ttl=61 time=0.184 ms
^C
--- 172.30.4.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1007ms
rtt min/avg/max/mdev = 0.184/0.241/0.299/0.059 ms
containernet>
```

4. traceroute

```
containernet>
containernet> h1 traceroute h4
traceroute to 172.30.4.2 (172.30.4.2), 64 hops max
 1  172.30.1.1  0.006ms  0.003ms  0.004ms
 2  10.10.10.2  0.004ms  0.003ms  0.003ms
 3  10.30.30.2  0.343ms  0.004ms  0.003ms
 4  172.30.4.2  0.003ms  0.003ms  0.003ms
containernet>
```

```

containernet>
containernet> h1 traceroute h5
traceroute to 172.30.5.2 (172.30.5.2), 64 hops max
 1  172.30.1.1  0.003ms  0.002ms  0.002ms
 2  10.10.10.2  0.002ms  0.002ms  0.001ms
 3  10.20.20.2  0.287ms  0.002ms  0.001ms
 4  10.40.40.1  0.720ms  0.002ms  0.001ms
 5  172.30.5.2  0.001ms  0.001ms  0.000ms
containernet>

```

Code

Topo1.py

```

Open  topot1.py  Save
~/Desktop/ODL_week9/odlbgp/add_r4-r5

1 from mininet.net import Containernet
2 from mininet.node import RemoteController, Docker, OVSSwitch
3 from mininet.cli import CLI
4 from mininet.log import setLogLevel, info
5 from mininet.link import TCLink, Link
6
7 # topo diagram
8 # h1----r1---s3---r2-----h2
9
10
11 def topology():
12     "Create a network with some docker containers acting as hosts."
13
14     net = Containernet(controller=RemoteController)
15
16     info('*** Adding switch\n')
17
18     #add r
19     r1 = net.addDocker('r1', ip='172.30.1.1/24', dimage="knet/urouter:1.4")
20     r2 = net.addDocker('r2', ip='172.30.2.1/24', dimage="knet/urouter:1.4")
21     r3 = net.addDocker('r3', ip='172.30.3.1/24', dimage="knet/urouter:1.4")
22     r4 = net.addDocker('r4', ip='172.30.4.1/24', dimage="knet/urouter:1.4")
23     r5 = net.addDocker('r5', ip='172.30.5.1/24', dimage="knet/urouter:1.4")
24
25
26     #add h
27     h1 = net.addDocker('h1', ip='172.30.1.2/24', defaultRoute='via 172.30.1.1', dimage="knet/host-ubuntu:1-2")
28     h2 = net.addDocker('h2', ip='172.30.2.2/24', defaultRoute='via 172.30.2.1', dimage="knet/host-ubuntu:1-2")
29     h3 = net.addDocker('h3', ip='172.30.3.2/24', defaultRoute='via 172.30.3.1', dimage="knet/host-ubuntu:1-2")
30     h4 = net.addDocker('h4', ip='172.30.4.2/24', defaultRoute='via 172.30.4.1', dimage="knet/host-ubuntu:1-2")
31     h5 = net.addDocker('h5', ip='172.30.5.2/24', defaultRoute='via 172.30.5.1', dimage="knet/host-ubuntu:1-2")
32
33     #add sw
34     s3 = net.addSwitch('s3', failMode='standalone')
35     s4 = net.addSwitch('s4', failMode='standalone')
36     s5 = net.addSwitch('s5', failMode='standalone')
37     s6 = net.addSwitch('s6', failMode='standalone')

```

Open



topo1.py

~/Desktop/ODL_week9/odlbgp/add_r4-r5

```
35 s4 = net.addSwitch('s4', failMode='standalone')
36 s5 = net.addSwitch('s5', failMode='standalone')
37 s6 = net.addSwitch('s6', failMode='standalone')
38
39 info('*** Creating links\n')
40
41 #add h - r
42 net.addLink(h1, r1)
43 net.addLink(h2, r2)
44 net.addLink(h3, r3)
45 net.addLink(h4, r4)
46 net.addLink(h5, r5)
47
48 #add r - sw
49 net.addLink(r1, s3, params1={"ip": "10.10.10.1/24"})
50 net.addLink(r2, s3, params1={"ip": "10.10.10.2/24"})
51 net.addLink(r2, s4, params1={"ip": "10.20.20.1/24"})
52 net.addLink(r2, s5, params1={"ip": "10.30.30.1/24"})
53 net.addLink(r3, s4, params1={"ip": "10.20.20.2/24"})
54 net.addLink(r4, s5, params1={"ip": "10.30.30.2/24"})
55 net.addLink(r3, s6, params1={"ip": "10.40.40.2/24"})
56 net.addLink(r5, s6, params1={"ip": "10.40.40.1/24"})
57
58
59 info('*** Starting network\n')
60 net.start()
61
62 #copy the bird config files
63 s3.cmd("sudo docker cp r1.conf mn.r1:/etc/bird.conf")
64 s3.cmd("sudo docker cp r2.conf mn.r2:/etc/bird.conf")
65 s3.cmd("sudo docker cp r3.conf mn.r3:/etc/bird.conf")
66 s3.cmd("sudo docker cp r4.conf mn.r4:/etc/bird.conf")
67 s3.cmd("sudo docker cp r5.conf mn.r5:/etc/bird.conf")
68
69 s4.cmd("sudo docker cp r1.conf mn.r1:/etc/bird.conf")
70 s4.cmd("sudo docker cp r2.conf mn.r2:/etc/bird.conf")
71 s4.cmd("sudo docker cp r3.conf mn.r3:/etc/bird.conf")
72
72 s4.cmd("sudo docker cp r4.conf mn.r4:/etc/bird.conf")
73 s4.cmd("sudo docker cp r5.conf mn.r5:/etc/bird.conf")
74
75 s5.cmd("sudo docker cp r1.conf mn.r1:/etc/bird.conf")
76 s5.cmd("sudo docker cp r2.conf mn.r2:/etc/bird.conf")
77 s5.cmd("sudo docker cp r3.conf mn.r3:/etc/bird.conf")
78 s5.cmd("sudo docker cp r4.conf mn.r4:/etc/bird.conf")
79 s5.cmd("sudo docker cp r5.conf mn.r5:/etc/bird.conf")
80
81 #add r
82 r1.cmd("bird -c /etc/bird.conf")
83 r2.cmd("bird -c /etc/bird.conf")
84 r3.cmd("bird -c /etc/bird.conf")
85 r4.cmd("bird -c /etc/bird.conf")
86 r5.cmd("bird -c /etc/bird.conf")
87
88
89 info('*** Running CLI\n')
90 CLI(net)
91 info('*** Stopping network')
92 net.stop()
93
94 if __name__ == '__main__':
95     setLogLevel('info')
96     topology()
```

R1.conf

```
Open [v]
1 log "/var/log/bird.log" all;
2 debug protocols all
3
4 router id 10.10.10.1;
5 protocol direct {
6     interface "*";
7 }
8
9 protocol kernel {
10     learn;
11     scan time 20;
12     export all;
13     import all;
14 }
15
16
17 protocol device {
18     scan time 10;
19 }
20
21
22
23 #BGP Configuration
24
25 protocol bgp R2{
26     export all;
27     import all;
28     local as 64511;
29     neighbor 10.10.10.2 as 64512;
30 }
31
32 protocol bgp R3{
33     export all;
34     import all;
35     local as 64511;
36     neighbor 10.20.20.2 as 64514;
37 }
38
39 protocol bgp R4{
40     export all;
41     import all;
42     local as 64511;
43     neighbor 10.30.30.2 as 64515;
44 }
45
46 protocol bgp R5{
47     export all;
48     import all;
49     local as 64511;
50     neighbor 10.40.40.1 as 64516;
51 }
52
53 protocol bgp OD1{
54     export all;
55     import all;
56     local as 64511;
57     neighbor 172.17.0.1 as 64513;
58 }
```

R2.conf

```
Open [v]
1 log "/var/log/bird.log" all;
2 debug protocols all
3
4 router id 10.10.10.2;
5 protocol direct
6     interface "*";
7
8
9
10 protocol kernel {
11     learn;
12     scan time 20;
13     export all;
14     import all;
15 }
16
17
18 protocol device {
19     scan time 10;
20 }
21
22
23
24 #BGP Configuration
25
26 protocol bgp R1{
27     export all;
28     import all;
29     local as 64512;
30     neighbor 10.10.10.1 as 64511;
31 }
32
33 protocol bgp R3{
34     export all;
35     import all;
36     local as 64512;
37     neighbor 10.20.20.2 as 64514;
38 }
39
40 protocol bgp R4{
41     export all;
42     import all;
43     local as 64512;
44     neighbor 10.30.30.2 as 64515;
45 }
46
47 protocol bgp R5{
48     export all;
49     import all;
50     local as 64512;
51     neighbor 10.40.40.1 as 64516;
52 }
53
```

R3.conf

```
Open [v] [F1]
1 log "/var/log/bird.log" all;
2 debug protocols all
3
4 router id 10.20.20.2;
5 protocol direct {
6     interface "*";
7 }
8
9
10 protocol kernel {
11     learn;
12     scan time 20;
13     export all;
14     import all;
15 }
16
17
18 protocol device {
19     scan time 10;
20 }
21
22
23
24 #BGP Configuration
25
26 protocol bgp R2{
27     export all;
28     import all;
29     local as 64514;
30     neighbor 10.20.20.1 as 64512;
31 }
32
33 protocol bgp R1{
34     export all;
35     import all;
36     local as 64514;
37     neighbor 10.10.10.1 as 64511;
38 }
39
40 protocol bgp R4{
41     export all;
42     import all;
43     local as 64514;
44     neighbor 10.30.30.2 as 64515;
45 }
46
47 protocol bgp R5{
48     export all;
49     import all;
50     local as 64514;
51     neighbor 10.40.40.1 as 64516;
52 }
```

R4.conf

```
Open [v] [f]
1 log "/var/log/bird.log" all;
2 debug protocols all
3
4 router id 10.30.30.2;
5 protocol direct {
6     interface "*";
7 }
8
9
10 protocol kernel {
11     learn;
12     scan time 20;
13     export all;
14     import all;
15 }
16
17
18 protocol device {
19     scan time 10;
20 }
21
22
23
24 #BGP Configuration
25
26 protocol bgp R2{
27     export all;
28     import all;
29     local as 64515;
30     neighbor 10.30.30.1 as 64512;
31 }
32
33 protocol bgp R1{
34     export all;
35     import all;
36     local as 64515;
37     neighbor 10.10.10.1 as 64511;
38 }
39
40 protocol bgp R3{
41     export all;
42     import all;
43     local as 64515;
44     neighbor 10.20.20.2 as 64514;
45 }
46
47 protocol bgp R5{
48     export all;
49     import all;
50     local as 64515;
51     neighbor 10.40.40.1 as 64516;
52 }
```


R5.conf

```
Open [v] [x]
1 log "/var/log/bird.log" all;
2 debug protocols all
3
4 router id 10.40.40.1;
5 protocol direct {
6     interface "*";
7 }
8
9
10 protocol kernel {
11     learn;
12     scan time 20;
13     export all;
14     import all;
15 }
16
17
18 protocol device {
19     scan time 10;
20 }
21
22
23
24 #BGP Configuration
25
26 protocol bgp R2{
27     export all;
28     import all;
29     local as 64516;
30     neighbor 10.20.20.1 as 64512;
31 }
32
33 protocol bgp R1{
34     export all;
35     import all;
36     local as 64516;
37     neighbor 10.10.10.1 as 64511;
38 }
39
40 protocol bgp R3{
41     export all;
42     import all;
43     local as 64516;
44     neighbor 10.40.40.2 as 64514;
45 }
46
47 protocol bgp R4{
48     export all;
49     import all;
50     local as 64516;
51     neighbor 10.30.30.2 as 64515;
52 }
```