

Quagga

Software Routing Suite

Internet core routers

- Powerful
- Handling large amounts of traffic
- Built by Huawei, Juniper or Cisco
- They use proprietary operating systems
 - such as Cisco IOS, or JunOS



Quagga

- Free routing software suite
- Similar commands to the ones in Cisco's IOS
- MiniNExT
 - Mininet Extended
 - An extension layer to Mininet
 - Integrates Quagga into Mininet's virtual environment

Quagga

- Implementations of several routing protocols (namely OSPF, RIP and BGP-4)
- Important Quagga processes (daemons):
 - zebra
 - Manage the network interfaces
 - ripd
 - Handles RIP version 2 implementation
 - ripngd
 - Handles RIP routing for IPv6
 - quagga
 - The main service, which is used to call the three daemons above

Starting a Quagga process

- 4 files:

1. daemons
2. debian.conf
3. zebra.conf
4. ripd.conf

1. daemons:

zebra=yes
bgpd=no
ospfd=no
ospf6d=no
ripd=no
ripngd=no
isisd=no

Starting a Quagga process

2. debian.conf

vtysh enable=no

zebra options="--daemon -A 127.0.0.1 -u quagga -g quagga"

bgpd options="--daemon -A 127.0.0.1 -u quagga -g quagga"

ospfd options="--daemon -A 127.0.0.1 -u quagga -g quagga"

ospf6d options="--daemon -A ::1 -u quagga -g quagga"

ripd options="--daemon -A 127.0.0.1 -u quagga -g quagga"

ripngd options="--daemon -A ::1 -u quagga -g quagga"

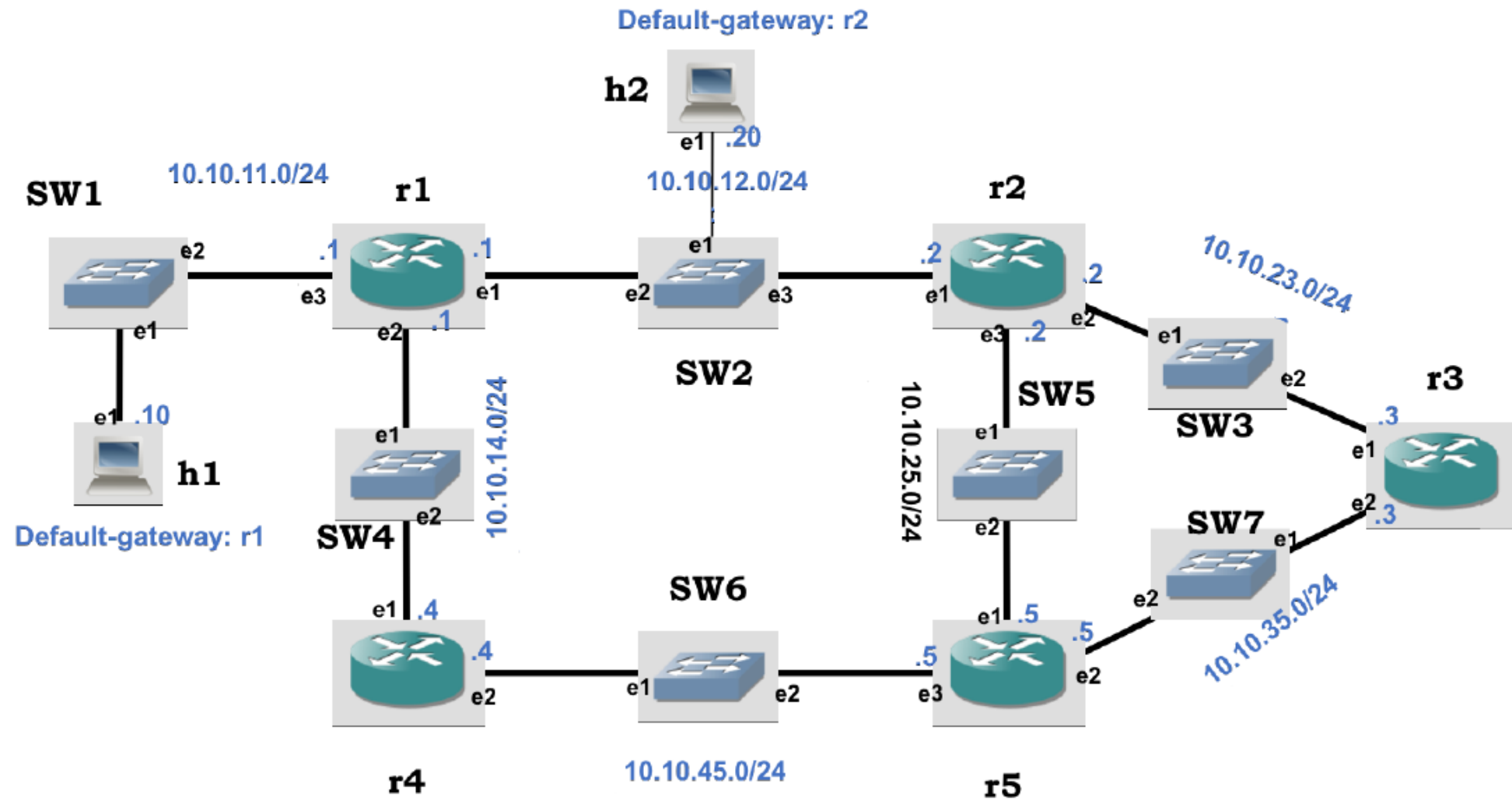
isisd options="--daemon -A 127.0.0.1 -u quagga -g quagga"

Starting a Quagga process

3. zebra.conf

```
!  
! Zebra configuration file for r1  
!  
hostname r1  
password quagga  
enable password quagga  
  
log file /home/mininet/Desktop/shared/lab8/configs/r1/logs/zebra.log  
debug zebra packet  
  
interface r1-eth1  
no shutdown  
ip address 10.10.12.1/24  
  
line vty
```

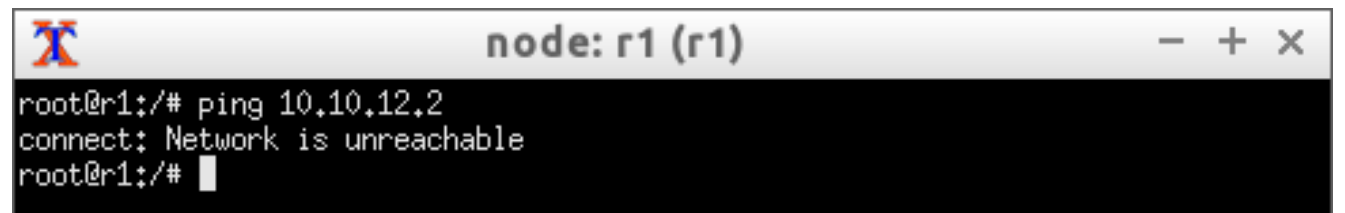
Network topology



- \$ sudo python lab8.py
- mininext> net

```
mininext> net
h1 h1-eth1:SW1-eth1
h2 h2-eth1:SW2-eth1
r1 r1-eth3:SW1-eth2 r1-eth1:SW2-eth2 r1-eth2:SW4-eth1
r2 r2-eth1:SW2-eth3 r2-eth2:SW3-eth1 r2-eth3:SW5-eth1
r3 r3-eth1:SW3-eth2 r3-eth2:SW7-eth1
r4 r4-eth1:SW4-eth2 r4-eth2:SW6-eth1
r5 r5-eth1:SW5-eth2 r5-eth2:SW7-eth2 r5-eth3:SW6-eth2
SW1 lo: SW1-eth1:h1-eth1 SW1-eth2:r1-eth3
SW2 lo: SW2-eth1:h2-eth1 SW2-eth2:r1-eth1 SW2-eth3:r2-eth1
SW3 lo: SW3-eth1:r2-eth2 SW3-eth2:r3-eth1
SW4 lo: SW4-eth1:r1-eth2 SW4-eth2:r4-eth1
SW5 lo: SW5-eth1:r2-eth3 SW5-eth2:r5-eth1
SW6 lo: SW6-eth1:r4-eth2 SW6-eth2:r5-eth3
SW7 lo: SW7-eth1:r3-eth2 SW7-eth2:r5-eth2
c0
mininext>
```

- root@r1:/# ping 10.10.12.2

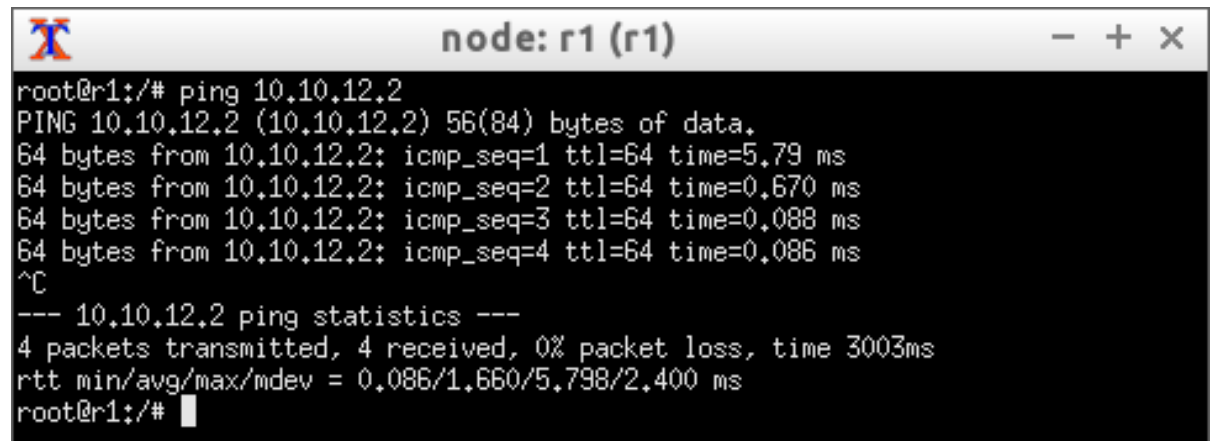
A terminal window titled "node: r1 (r1)" with standard window controls. The terminal shows a root user at r1 attempting to ping 10.10.12.2. The output indicates the network is unreachable.

```
node: r1 (r1)
root@r1:/# ping 10.10.12.2
connect: Network is unreachable
root@r1:/#
```

- Create/edit the configuration files for other routers:
 - \$ sudo leafpad configs/r2/daemons
 - \$ sudo leafpad configs/r2/debian.conf
 - \$ sudo leafpad configs/r2/zebra.conf
 - \$ sudo leafpad configs/r2/ripd.conf
- Start Quagga service on each router:
 - root@r1:/# /etc/init.d/quagga start

```
root@r1:/# /etc/init.d/quagga start
Loading capability module if not yet done.
Starting Quagga daemons (prio:10): zebra.
root@r1:/# █
```

```
root@r2:/# /etc/init.d/quagga start
Loading capability module if not yet done.
Starting Quagga daemons (prio:10): zebra.
root@r2:/# █
```



```
node: r1 (r1)
root@r1:/# ping 10.10.12.2
PING 10.10.12.2 (10.10.12.2) 56(84) bytes of data.
64 bytes from 10.10.12.2: icmp_seq=1 ttl=64 time=5.79 ms
64 bytes from 10.10.12.2: icmp_seq=2 ttl=64 time=0.670 ms
64 bytes from 10.10.12.2: icmp_seq=3 ttl=64 time=0.088 ms
64 bytes from 10.10.12.2: icmp_seq=4 ttl=64 time=0.086 ms
^C
--- 10.10.12.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 0.086/1.660/5.798/2.400 ms
root@r1:/# █
```

Quagga monitoring mode

- Connect to the Quagga process running on router:

- `root@r1:/# telnet localhost zebra`

```
root@r1:/# telnet localhost zebra
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

Hello, this is Quagga (version 0.99.22.4).
Copyright 1996-2005 Kunihiro Ishiguro, et al.

r1> █
```

- Inspect the contents of the routing table:

- `r1> show ip route`

```
r1> show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, A - Babel,
       > - selected route, * - FIB route

C>* 10.10.11.0/24 is directly connected, r1-eth3
C>* 10.10.12.0/24 is directly connected, r1-eth1
C>* 10.10.14.0/24 is directly connected, r1-eth2
C>* 127.0.0.0/8 is directly connected, lo
r1> █
```

- Check the status of the network interfaces:
 - r3> show interface

```
r3> show interface
Interface lo is up, line protocol detection is disabled
  index 1 metric 1 mtu 65536
  flags: <UP,LOOPBACK,RUNNING>
  inet 127.0.0.1/8
  inet6 ::1/128
Interface r3-eth1 is up, line protocol detection is disabled
  index 913 metric 1 mtu 1500
  flags: <UP,BROADCAST,RUNNING,MULTICAST>
  Hwaddr: fe:5e:63:a3:f1:59
  inet 10.10.23.3/24 broadcast 10.10.23.255
  inet6 fe80::fc5e:63ff:fea3:f159/64
Interface r3-eth2 is up, line protocol detection is disabled
  index 927 metric 1 mtu 1500
  flags: <UP,BROADCAST,RUNNING,MULTICAST>
  Hwaddr: 6a:aa:d8:e7:77:4d
  inet 10.10.35.3/24 broadcast 10.10.35.255
  inet6 fe80::68aa:d8ff:fee7:774d/64
r3> █
```

Quagga configuration mode

- Enable the configuration mode:

- r3> enable

- (Password: quagga)

```
r3> enable
Password:
r3#
```

- Inspect the running configuration of router:

- r3# show running-config

```
r3# show running-config

Current configuration:
!
hostname r3
password quagga
enable password quagga
log file /home/mininet/Downloads/lab7/configs/r3/logs/zebra.log
!
debug zebra packet
!
interface lo
!
interface r3-eth1
ip address 10.10.23.3/24
ipv6 nd suppress-ra
!
interface r3-eth2
ip address 10.10.35.3/24
ipv6 nd suppress-ra
!
!
!
line vty
no login
!
end
r3#
```

On the fly configuration

- Enter the fly configuration mode:
 - r4# configure terminal
- Enter the configuration mode of interface:
 - r4(config)# interface r4-eth2
- Edit interface:
 - r4(config-if)# ip address 10.10.45.4/24

```
r4# configure terminal
r4(config)# interface r4-eth2
r4(config-if)# ip address 10.10.45.4/24
r4(config-if)#
```