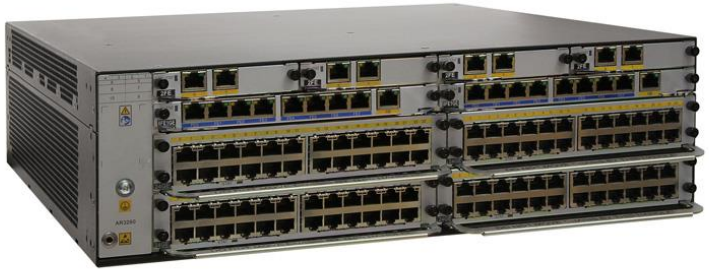
Quagga

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

- 3 files:
  1. daemons
  2. debian.conf
  3. zebra.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

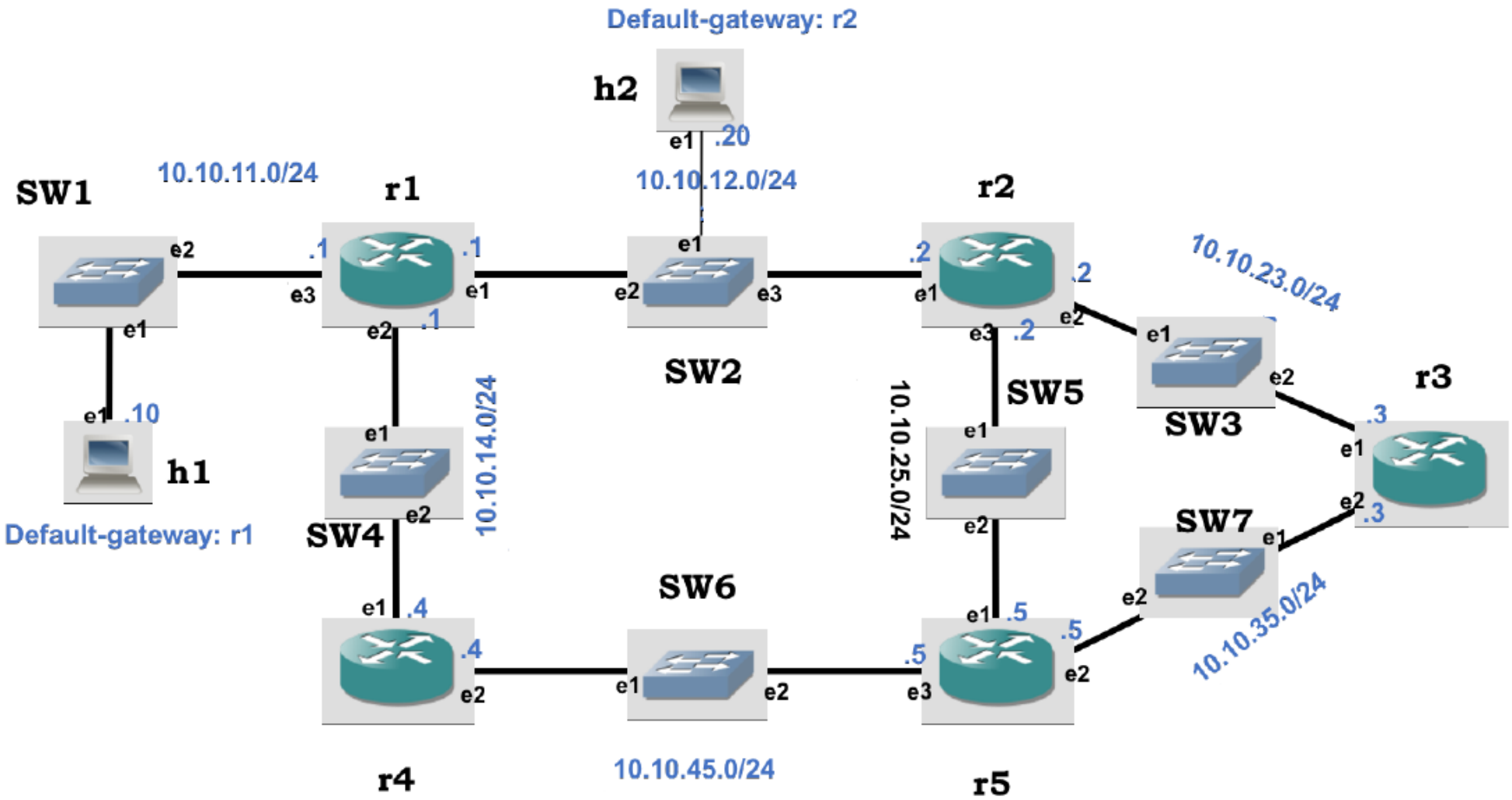
```
!
! Zebra configuration file for r1
!
hostname r1
password quagga
enable password quagga
log file /home/mininet/Downloads/lab7/configs/r1/logs/zebra.log
debug zebra packet

interface r1-eth1
no shutdown
ip address 10.10.12.1/24

interface r1-eth2
no shutdown
ip address 10.10.14.1/24

line vty
```

Network topology



- $ sudo python lab7_network.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>
```

- mininext> r1 ping r2 -c 4

```
mininext> r1 ping r2 -c 4
connect: Network is unreachable
mininext>
```

- Edit/create the configuration file zebra.conf for r1:
  - $ sudo leafpad configs/r1/zebra.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:/#
```

```
mininext> r1 ping r2 -c 4
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=9.04 ms
64 bytes from 10.10.12.2: icmp_seq=2 ttl=64 time=0.864 ms
64 bytes from 10.10.12.2: icmp_seq=3 ttl=64 time=0.160 ms
64 bytes from 10.10.12.2: icmp_seq=4 ttl=64 time=0.103 ms

--- 10.10.12.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 2999ms
rtt min/avg/max/mdev = 0.103/2.541/9.040/3.764 ms
mininext> _
```

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)#
```