

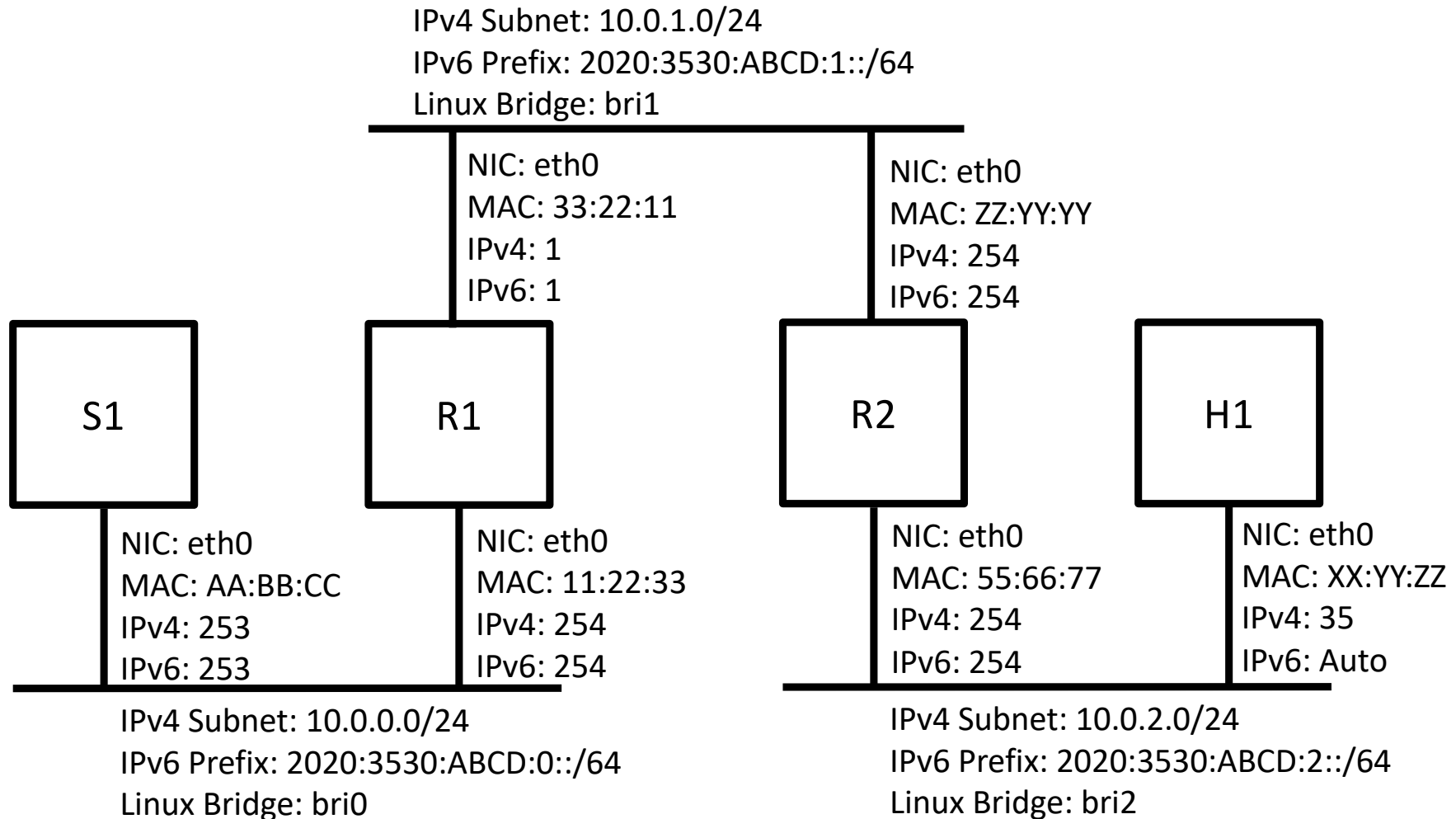
Basic Networking Hands-on: VyOS and Static Routing

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Objective and Contents

- Objective
 - Interconnecting multiple subnets
 - Understanding the static routing in IPv4 and IPv6
 - Understanding a router
- Contents
 - Installing 2 VM instances of VyOS
 - Configuring the more subnets
 - Checking connectivity between throughout the network

Network Diagram of the Day



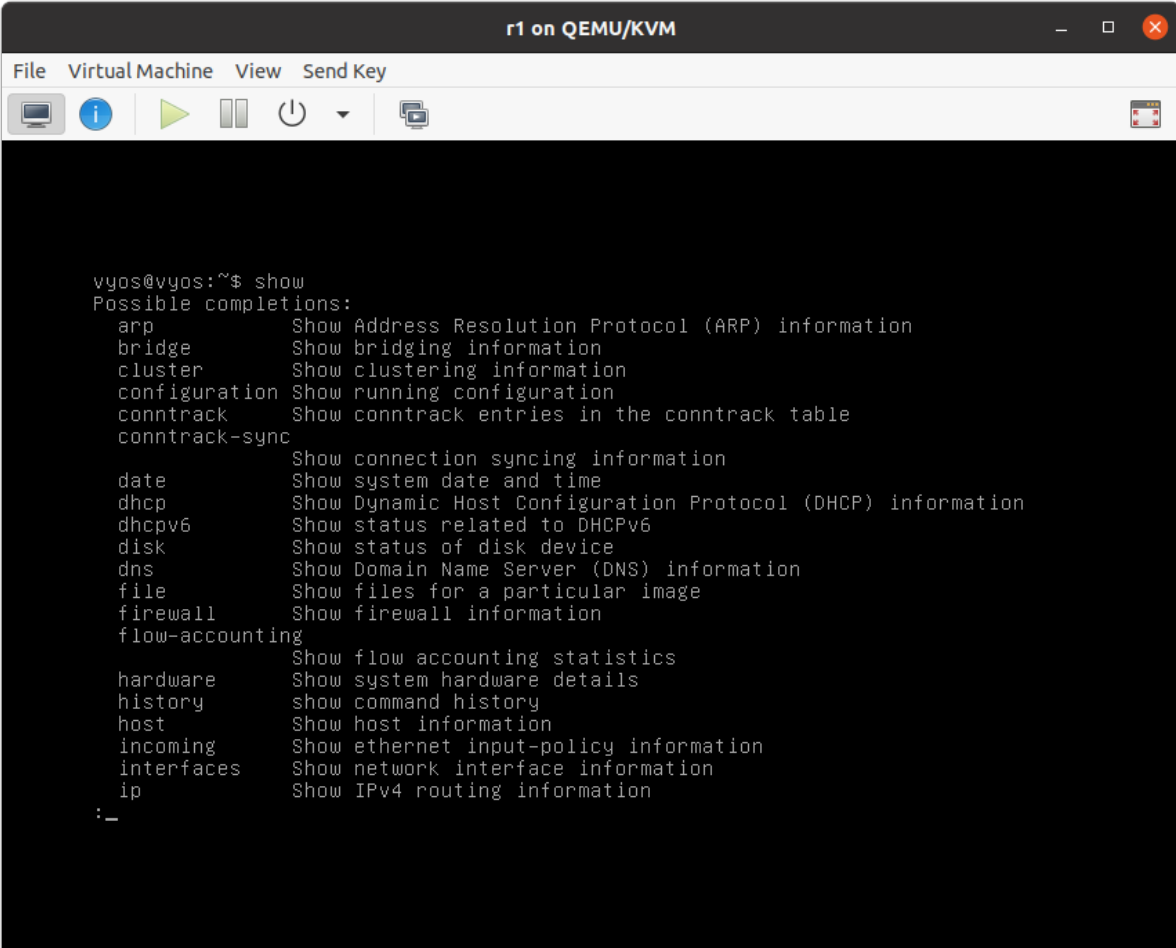
Preparation for Running VyOS as a VM

- Copy ISO image of VyOS 1.1.8 to your laptop
- Install a VyOS instance on virt-manager
- Login to VyOS
- Execute “install image”

The most important commands (1/2)

\$ show ?

- What does it give?



```
r1 on QEMU/KVM
File Virtual Machine View Send Key

vyos@vyos:~$ show
Possible completions:
  arp          Show Address Resolution Protocol (ARP) information
  bridge       Show bridging information
  cluster      Show clustering information
  configuration Show running configuration
  conntrack    Show conntrack entries in the conntrack table
  conntrack-sync Show connection syncing information
  date         Show system date and time
  dhcp         Show Dynamic Host Configuration Protocol (DHCP) information
  dhcpv6       Show status related to DHCPv6
  disk         Show status of disk device
  dns          Show Domain Name Server (DNS) information
  file         Show files for a particular image
  firewall     Show firewall information
  flow-accounting Show flow accounting statistics
  hardware     Show system hardware details
  history      Show command history
  host         Show host information
  incoming     Show ethernet input-policy information
  interfaces   Show network interface information
  ip           Show IPv4 routing information
:_
```

The most important commands (2/2)

\$ sudo SOMETHING

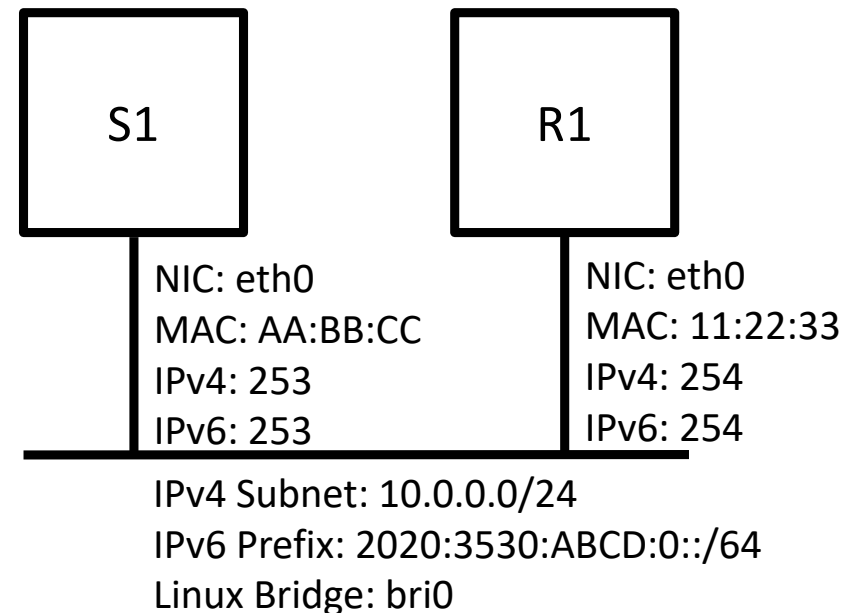
- Allows you to execute Linux commands
 - ip addr show
 - ping, traceroute, tcpdump
 - iperf

```
r1 on QEMU/KVM
File Virtual Machine View Send Key

vyos@vyos:~$ sudo ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 52:54:00:37:d5:32 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::5054:ff:fe37:d532/64 scope link
        valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 52:54:00:b4:ec:d7 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::5054:ff:feb4:ecd7/64 scope link
        valid_lft forever preferred_lft forever
vyos@vyos:~$
```

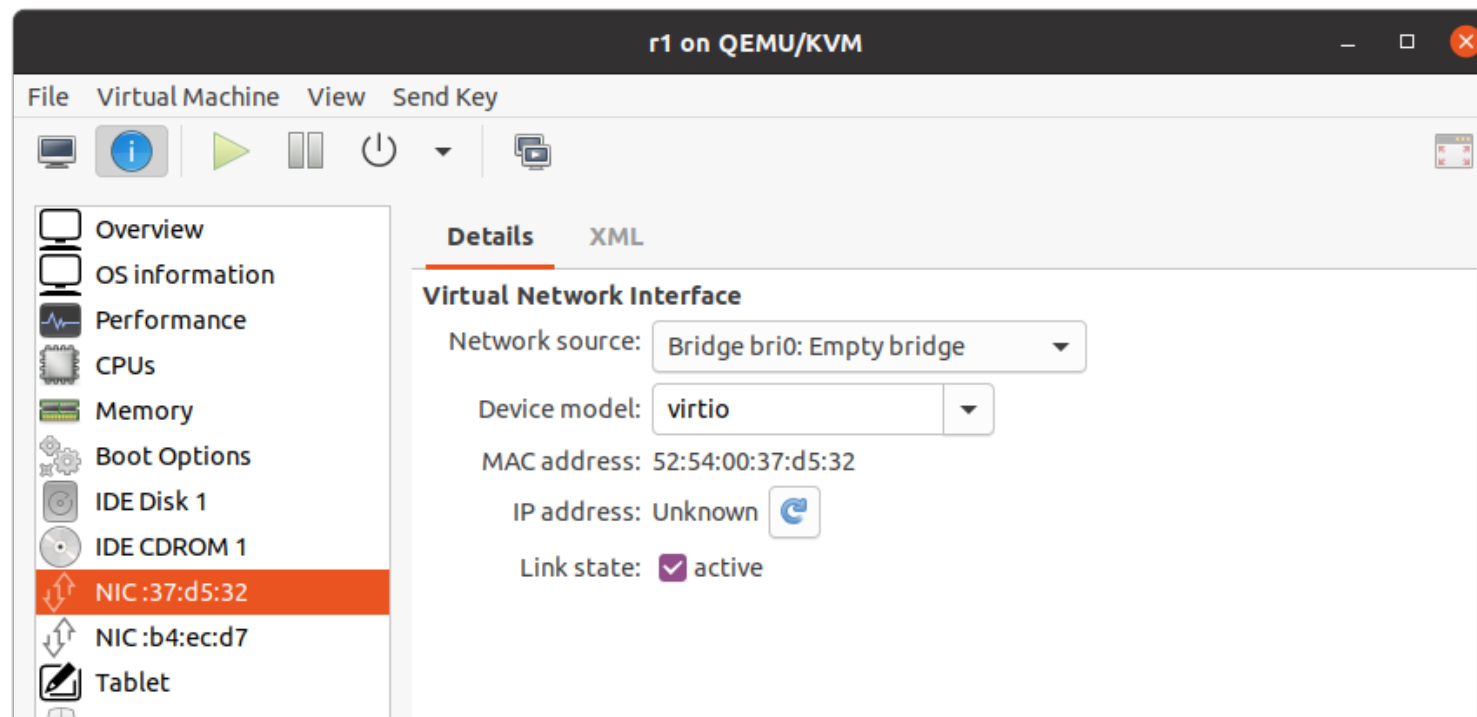
Connecting R1 to the same Linux Bridge with S1

- Goal: S1 and R1 ping each other
- eth0 of R1 must be connected via Bridge I/F (bri0)
- Fix the IPv4/v6 address to give to each NIC by yourself



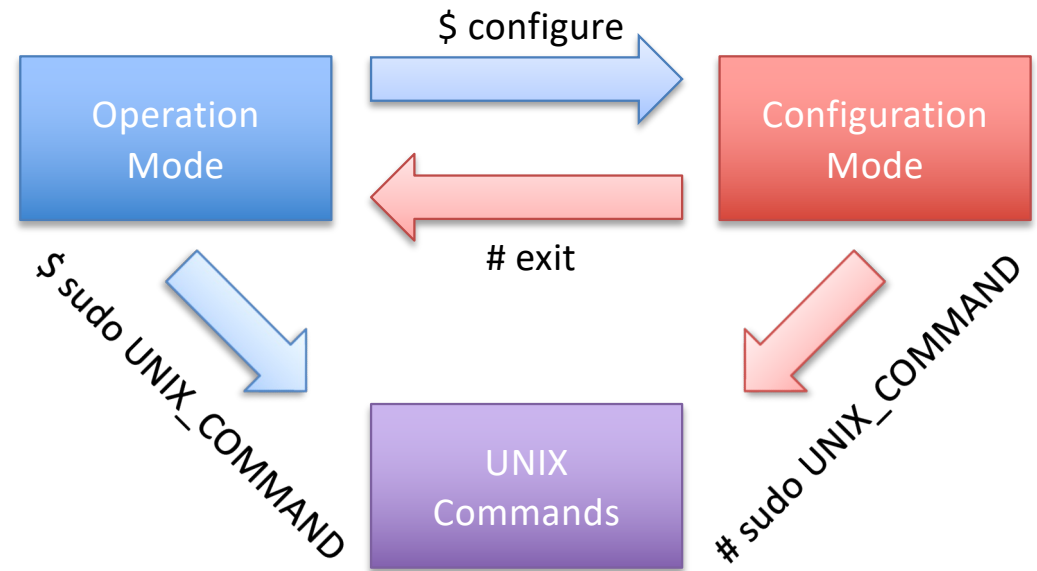
Selecting an appropriate Bridge I/F on virt-manager

- “Network source” must be Bridge I/F for VM-VM connection on the same virt-manager



Basic Operation of VyOS

- Operation Mode
 - Show configuration and status
 - Restart, power off the system
- Configuration Mode
 - Show and set configuration



Showing Status and Configuration

- “\$ show SOMETHING” provides the status of your configuration and protocol behavior
- “# show SOMETHING” provides the configuration of what you have done

Configuring IP Address on VyOS

- Example to configure IPv4/v6 addresses on ethX

```
$ configure
```

```
# set interfaces ethernet eth0 address 10.0.0.254/24
```

```
# set interfaces ethernet eth0 address 2020:3530:ABCD:0::254/64
```

```
# commit
```

```
# save
```

```
[edit]
vyos@vyos# show interfaces
  ethernet eth0 {
    address 10.0.0.254/24
    address 2020:3530:ABCD:0::254/64
    hw-id 52:54:00:37:d5:32
  }
  ethernet eth1 {
    hw-id 52:54:00:b4:ec:d7
  }
  loopback lo {
  }
[edit]
vyos@vyos#
```

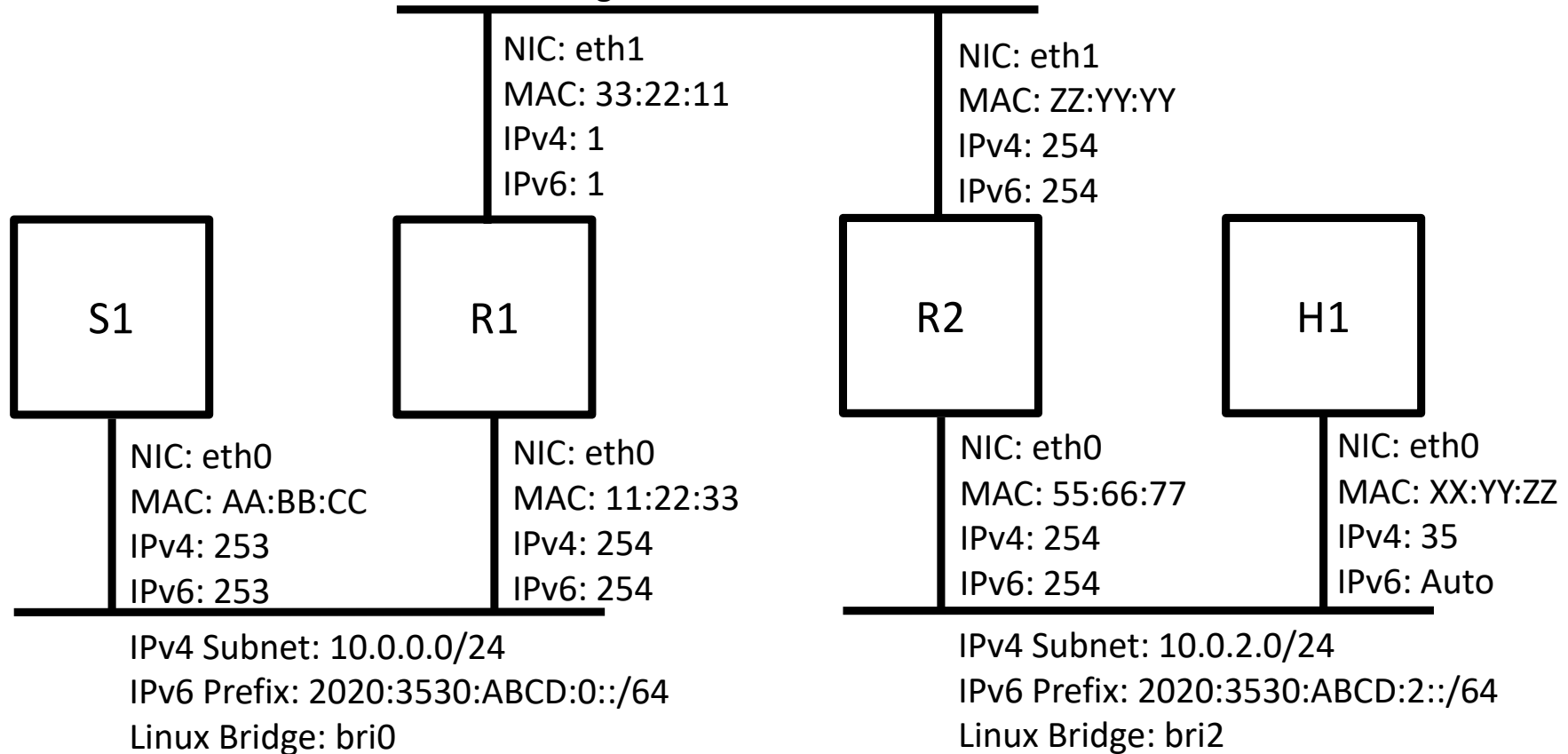
Things to explore further

What we covered till now

IPv4 Subnet: 10.0.1.0/24

IPv6 Prefix: 2020:3530:ABCD:1::/64

Linux Bridge: bri1



Things you can explore until S1 and H1 can ping with each other using IPv4 and IPv6

- Adding a static IPv6 address to S1?
- Installing R2, Relocating H1
- Enabling routing at S1, H1, R1 and R2
- Optional
 - Enabling “Router Advertisement” on R2 so that H1 can configure IPv6 address automatically
 - Enabling AAAA Records in DNS Server (Hostname <-> IPv6 address)

Hint: Setting Up Bridge I/Fs on Host Ubuntu

- Creating 2 additional bridge interfaces (assuming you already have bri0)

```
$ sudo brctl addbr bri1
```

```
$ sudo brctl addbr bri2
```

- Making the interfaces up and running

```
$ sudo ip link set bri1 up
```

```
$ sudo ip link set bri2 up
```

Hint: Configuring Static Route on VyOS

- Example to configure IPv4/v6 static route on ethX

```
$ configure
# set protocols static route 192.168.102.0.0/24 next-hop 192.168.100.1
# set protocols static route6 2013:ABCD:102::/64 next-hop 2013:ABCD:100::1
# commit
# save
```


Hint: Deleting Configurations on VyOS

- Example to delete IPv4 address and static route

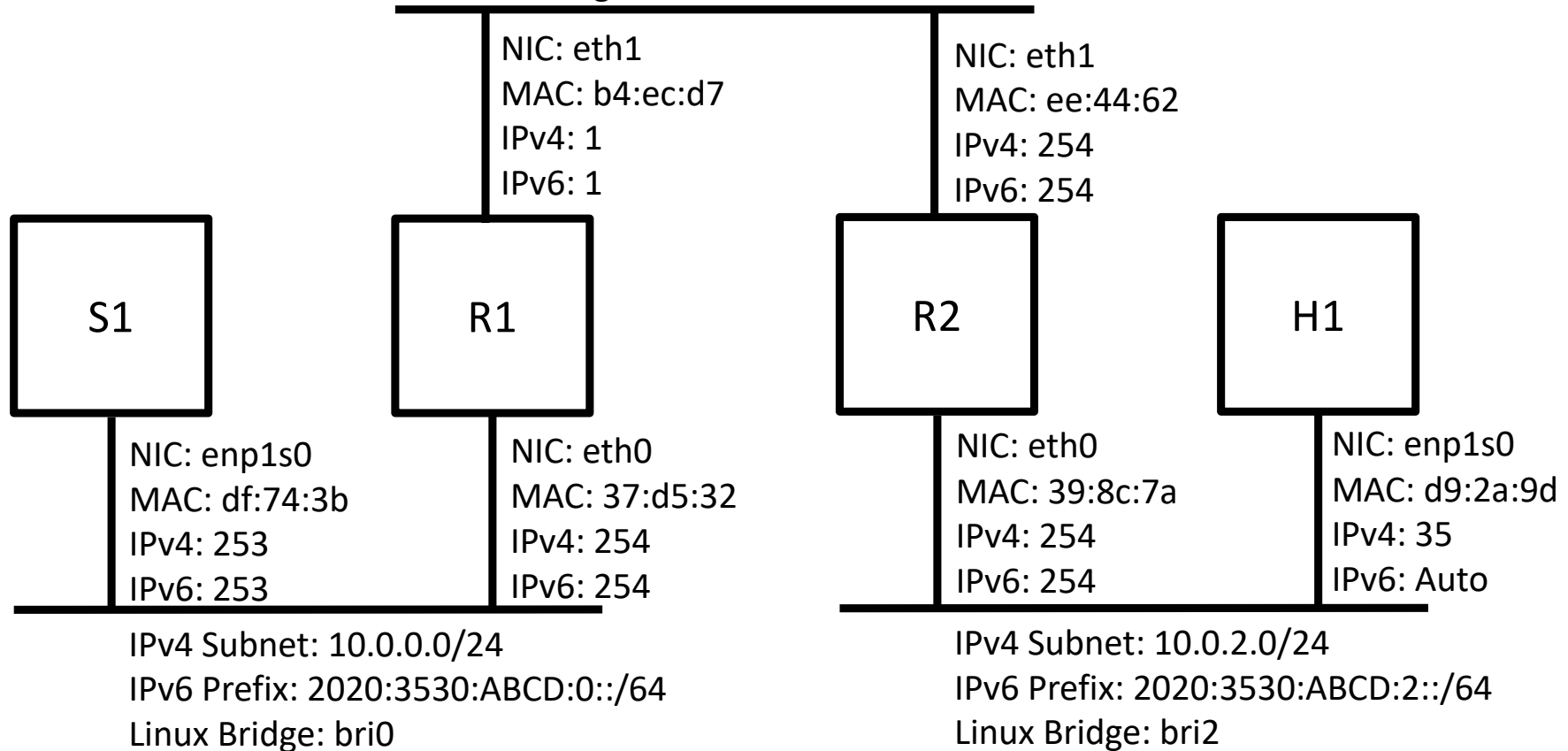
```
$ configure
# delete interfaces ethernet ethY address 192.168.1.10/24
# delete protocols static route 192.168.100.0/24 next-hop 192.168.101.1
# commit
# save
```

Actual Demo Network

IPv4 Subnet: 10.0.1.0/24

IPv6 Prefix: 2020:3530:ABCD:1::/64

Linux Bridge: bri1



Checking IPv4/IPv6 throughput in the network

- ping, ping6
- traceroute, traceroute6
- iperf
- tcpdump
- ip route show, ip -6 route show (on Ubuntu server)
- show ip route, show ipv6 route (on VyOS)

Done!!