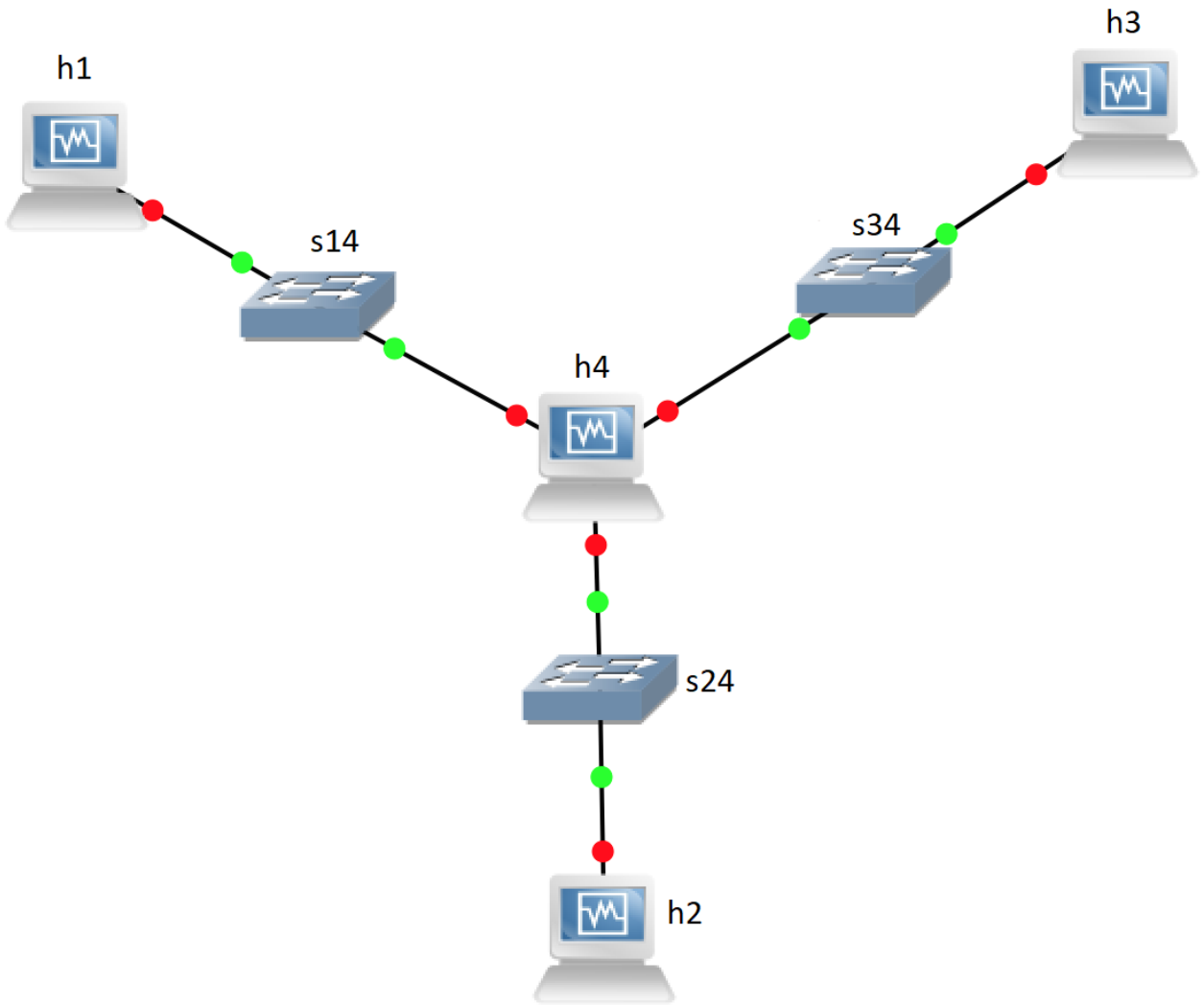
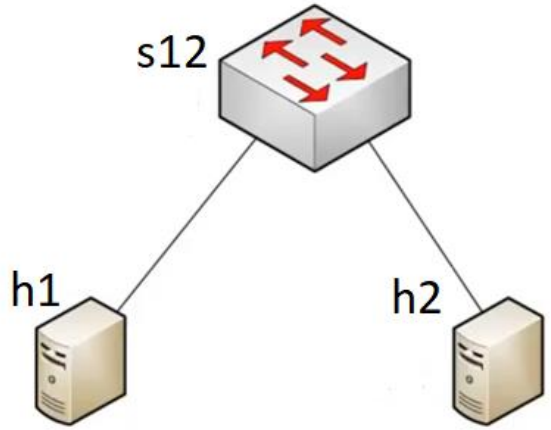
LAN Configuration

Custom topology



```python
#!/usr/bin/python
"""
This example shows how to create a Mininet object and add nodes to it
"""
#Importing Libraries
from mininet.net import Mininet
from mininet.node import Controller
from mininet.cli import CLI
from mininet.log import setLogLevel, info

#Function definition: This is called from the main function
def firstNetwork():
    #Create an empty network and add nodes to it.
    net = Mininet()
    info( '*** Adding controller\n' )
    net.addController( 'c0' )

    info( '*** Adding hosts\n' )
    h1 = net.addHost( 'h1', ip='10.0.0.1' )
    h2 = net.addHost( 'h2')

    info( '*** Adding switch\n' )
    s12 = net.addSwitch( 's12' )

    info( '*** Creating links\n' )
    net.addLink( h1, s12 )
    net.addLink( h2, s12 )

    info( '*** Starting network\n')
    net.start()

    #This is used to run commands on the hosts

    info( '*** Starting xterm on hosts\n' )
    h1.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h1 &')
    h2.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h2 &')

    info( '*** Running the command line interface\n' )
    CLI( net )

    info( '*** Closing the terminals on the hosts\n' )
    h1.cmd("killall xterm")
    h2.cmd("killall xterm")

    info( '*** Stopping network' )
    net.stop()
```

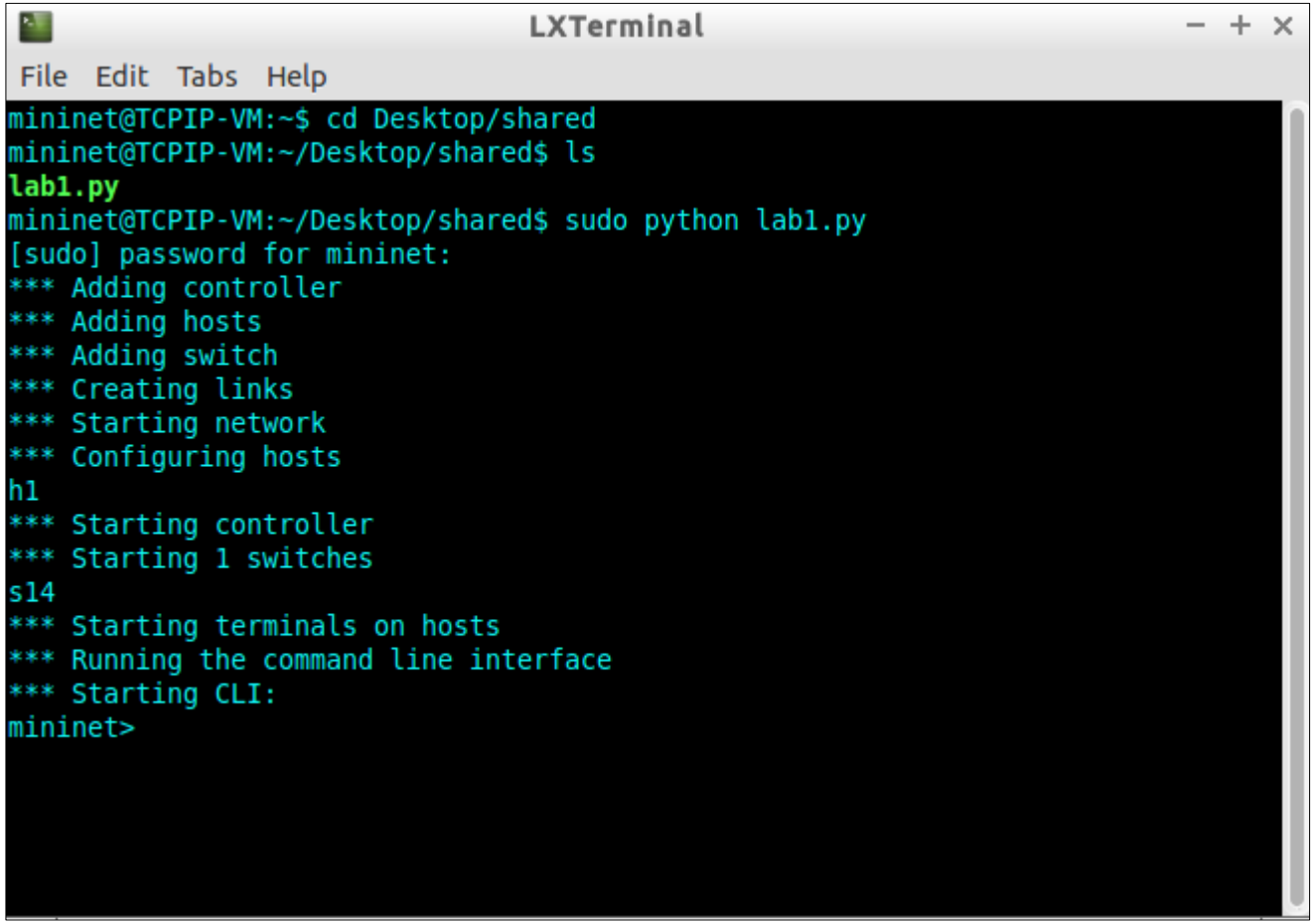



```python

#main Function: This is called when the Python file is run
if __name__ == '__main__':
    setLogLevel( 'info' )
    firstNetwork()

```

Custom topology

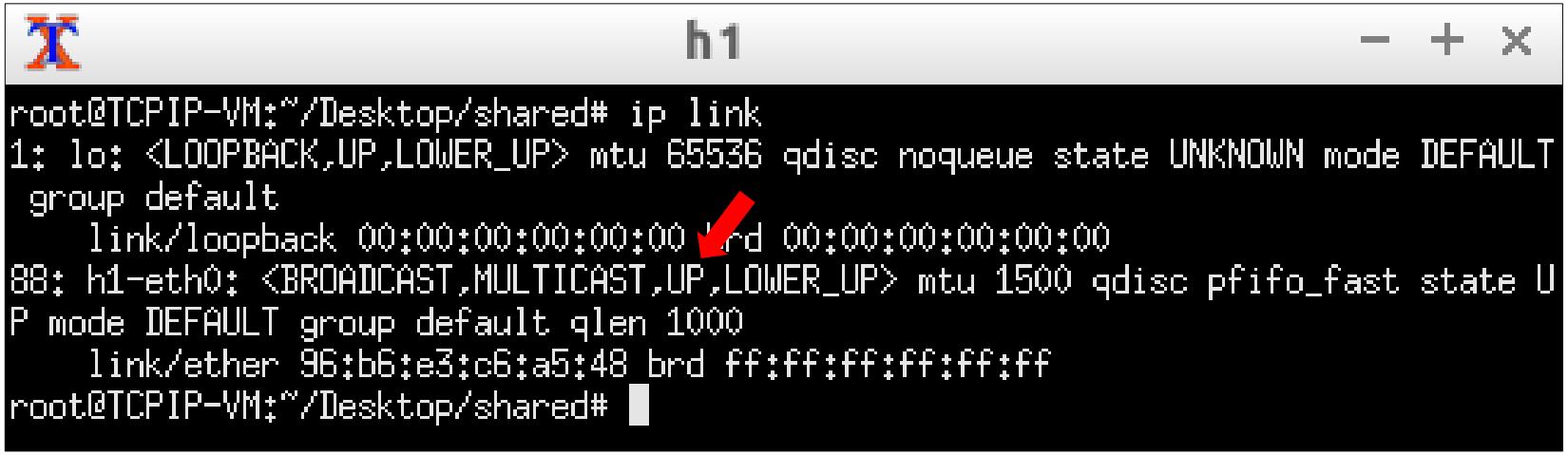
last slide codes

- Change directory to shared folder:
  - $ cd Desktop/shared
- Edit a python file, e.g. lab1.py:
  - $ sudo leafpad lab1.py
- Run topology:
  - $ sudo python lab1.py
- Exit topology:
  - mininet> exit
- Clean up:
  - $ sudo mn -c



Interfaces

- Show the mode of a host interfaces:
  - # ip link



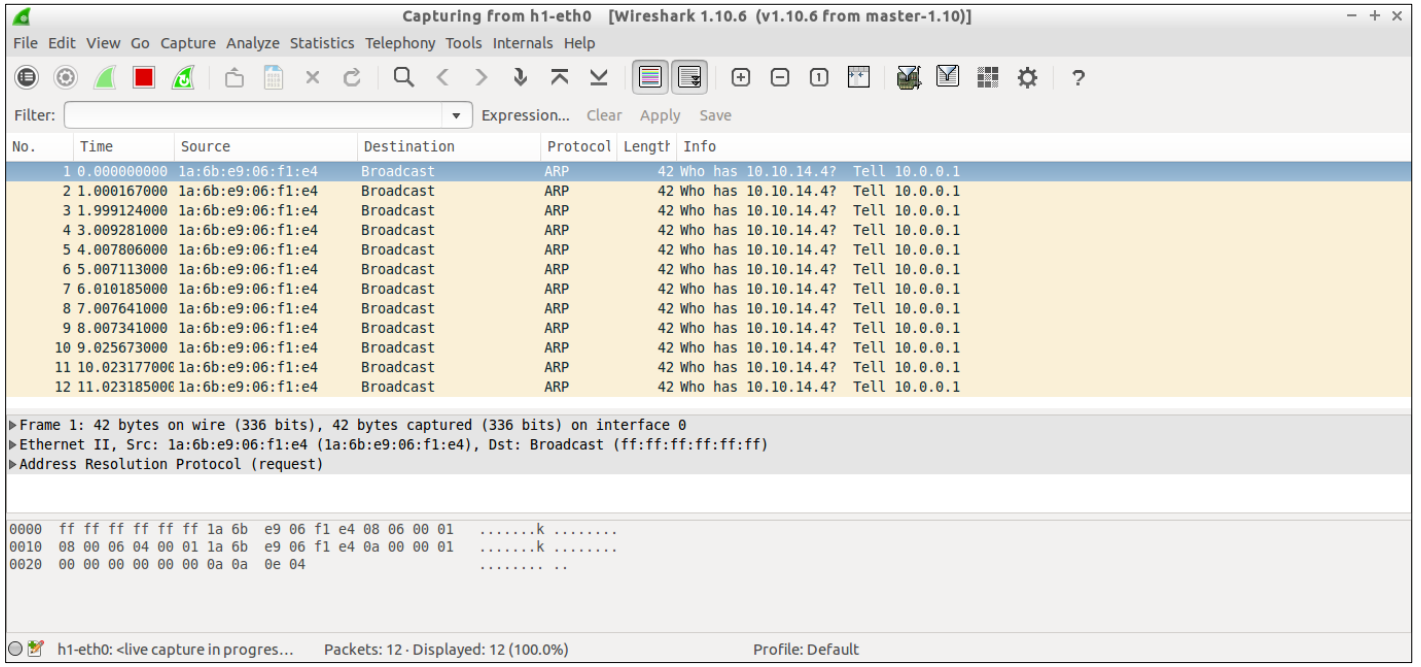
- If an interface mode is DOWN, change it to UP, e.g. h1-eth0:
  - # ip link set h1-eth0 up
- ping ✘

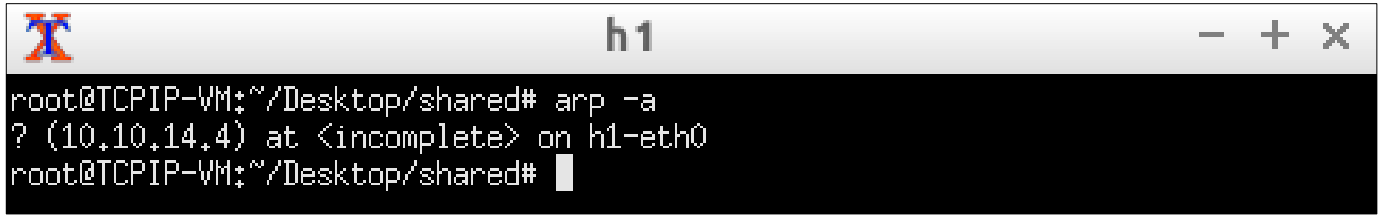
ARP (Address Resolution Protocol)

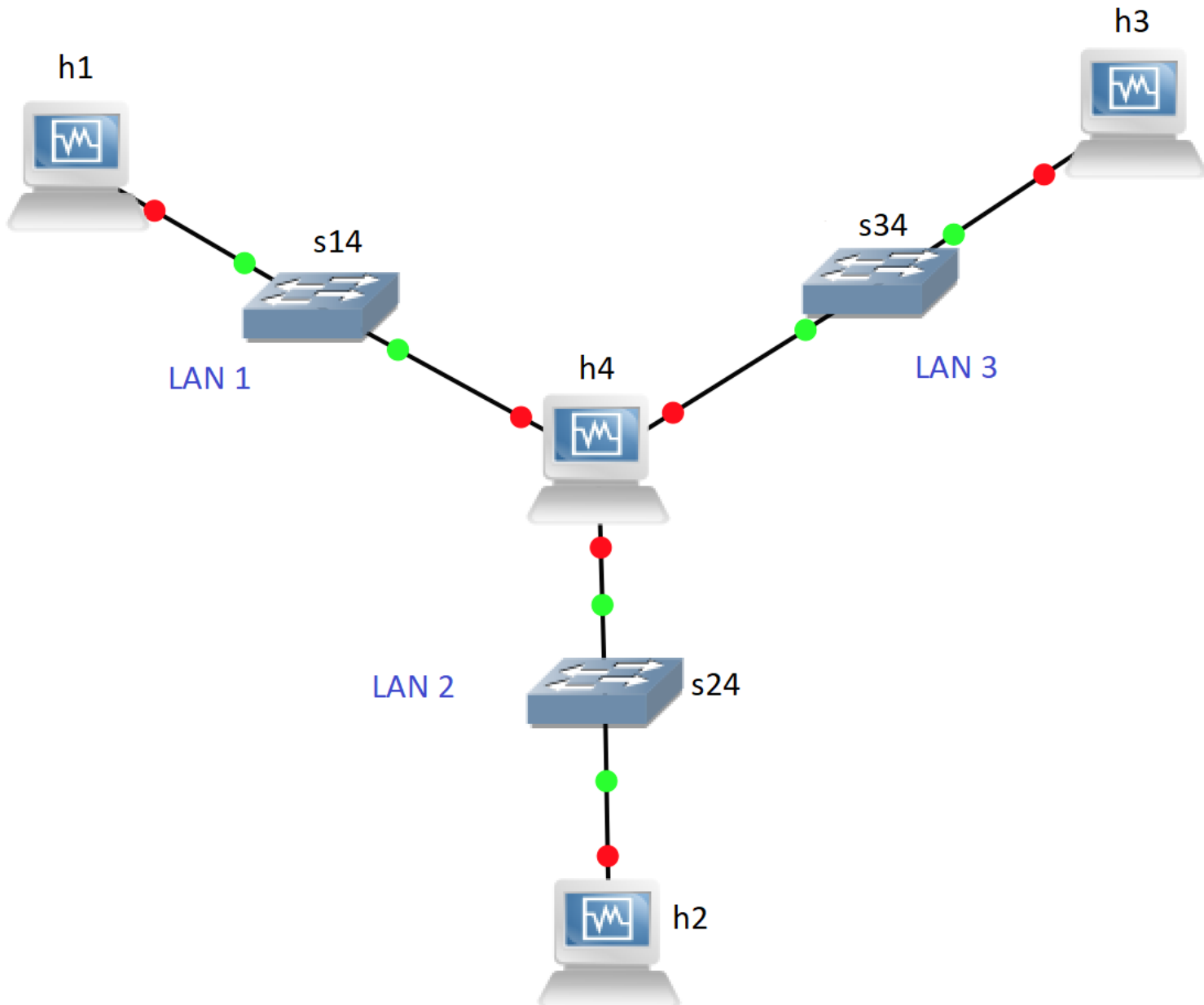
- A procedure for mapping a dynamic IP address to a physical address, known as a media access control (MAC) address.
  - ARP request
  - ARP reply
- Open Wireshark on a host:
  - # wireshark &

mapping to physical address

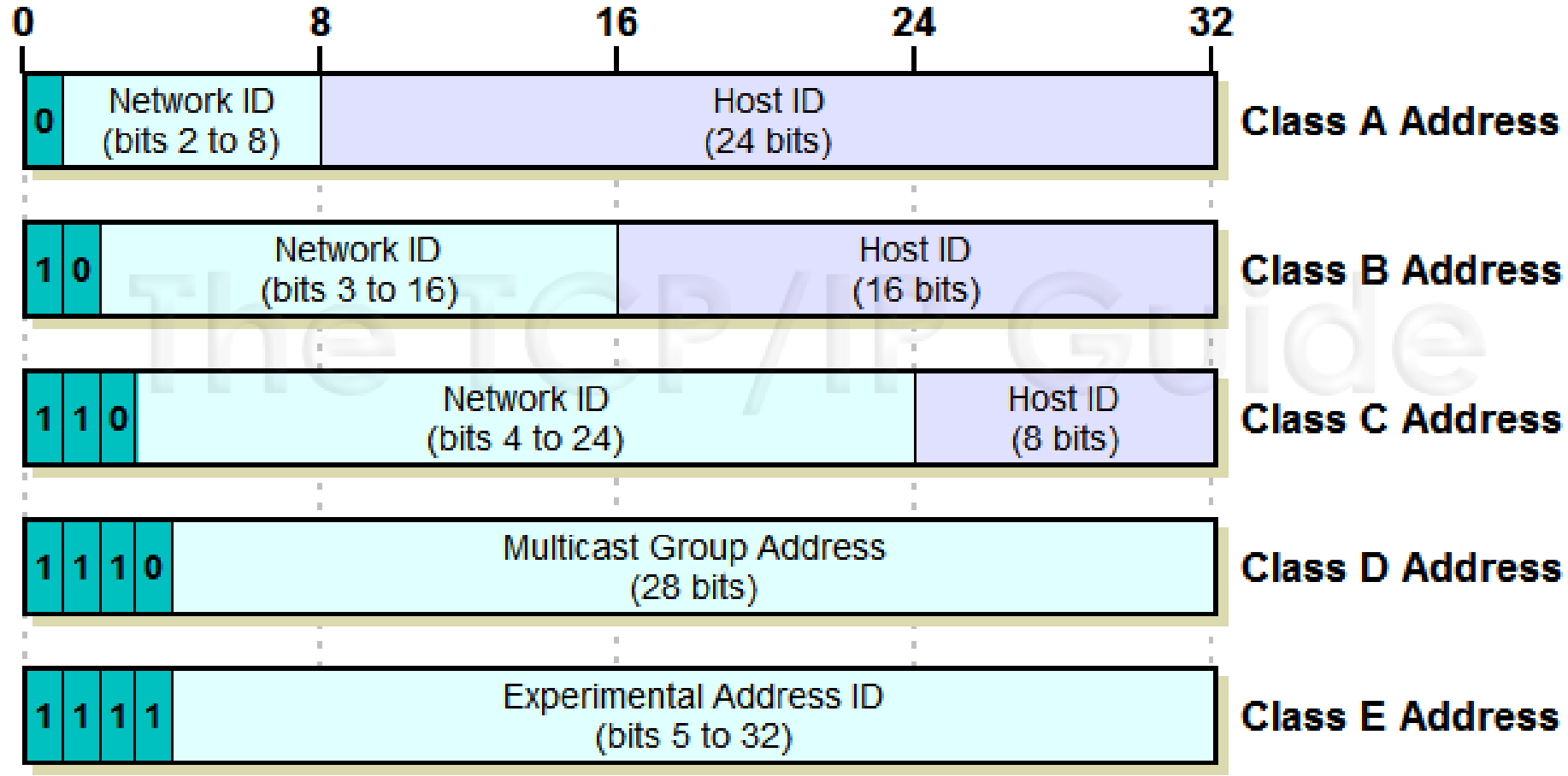
- Show ARP table of a host:
  - # arp -a






h1
h3
s14
s34
LAN 1
h4
LAN 3
LAN 2
s24
h2

IP Address Class Bit Assignments and Network/Host ID Sizes

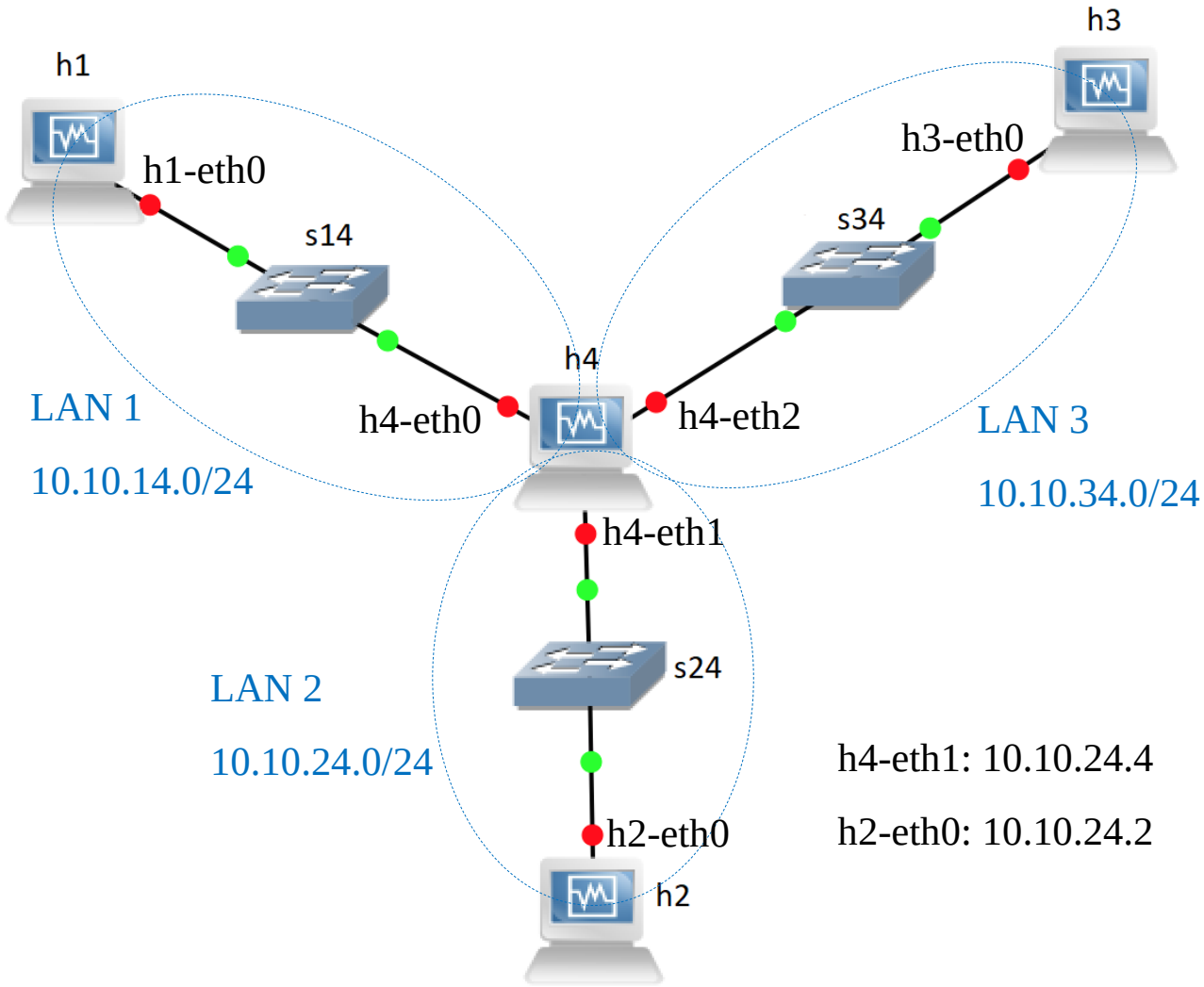


IP Address classes: Chart Representation

Address Classes	Range	Bit Pattern of 1st byte	Decimal Range	Default Subnet Mask	Reserved for
A	1.0.0.0 to 127.255.255.255	0xxxxxxx	1 to 127	255.0.0.0	Governments
B	128.0.0.0 to 191.255.255.255	10xxxxxx	128-191	255.255.0.0	Medium Companies
C	192.0.0.0 to 223.255.255.255	110xxxxx	192-223	255.255.255.0	Small Companies
D	224.0.0.0 to 239.255.255.255	1110xxxx	224-239	Not Applicable	Reserved for Multicasting
E	240.0.0.0 to 255.255.255.255	11110xxx	240-255	Not Applicable	Experimental or future use

10.10.0.0/16

کل شبکه



h1-eth0: 10.10.14.1

h4-eth0: 10.10.14.4

h3-eth0: 10.10.34.3

h4-eth2: 10.10.34.4

h4-eth1: 10.10.24.4

h2-eth0: 10.10.24.2

Assign an IP address to an interface

clear device

- # ip addr flush dev h1-eth0

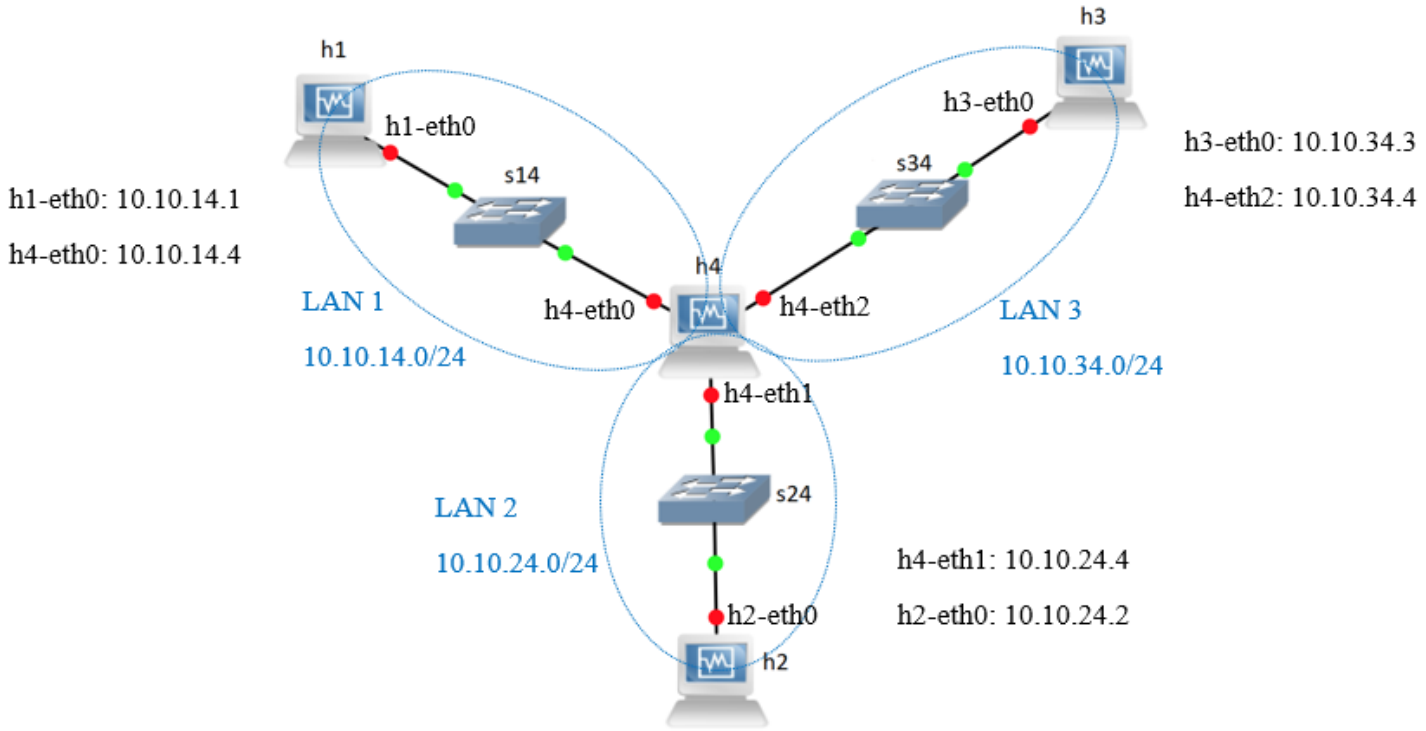
ip addr flush instructs the ip utility to flush or clear all IP addresses. dev eth0 specifies the network device (eth0) to perform the operation on.

- # ip addr add 10.10.14.1/24 dev h1-eth0

mask

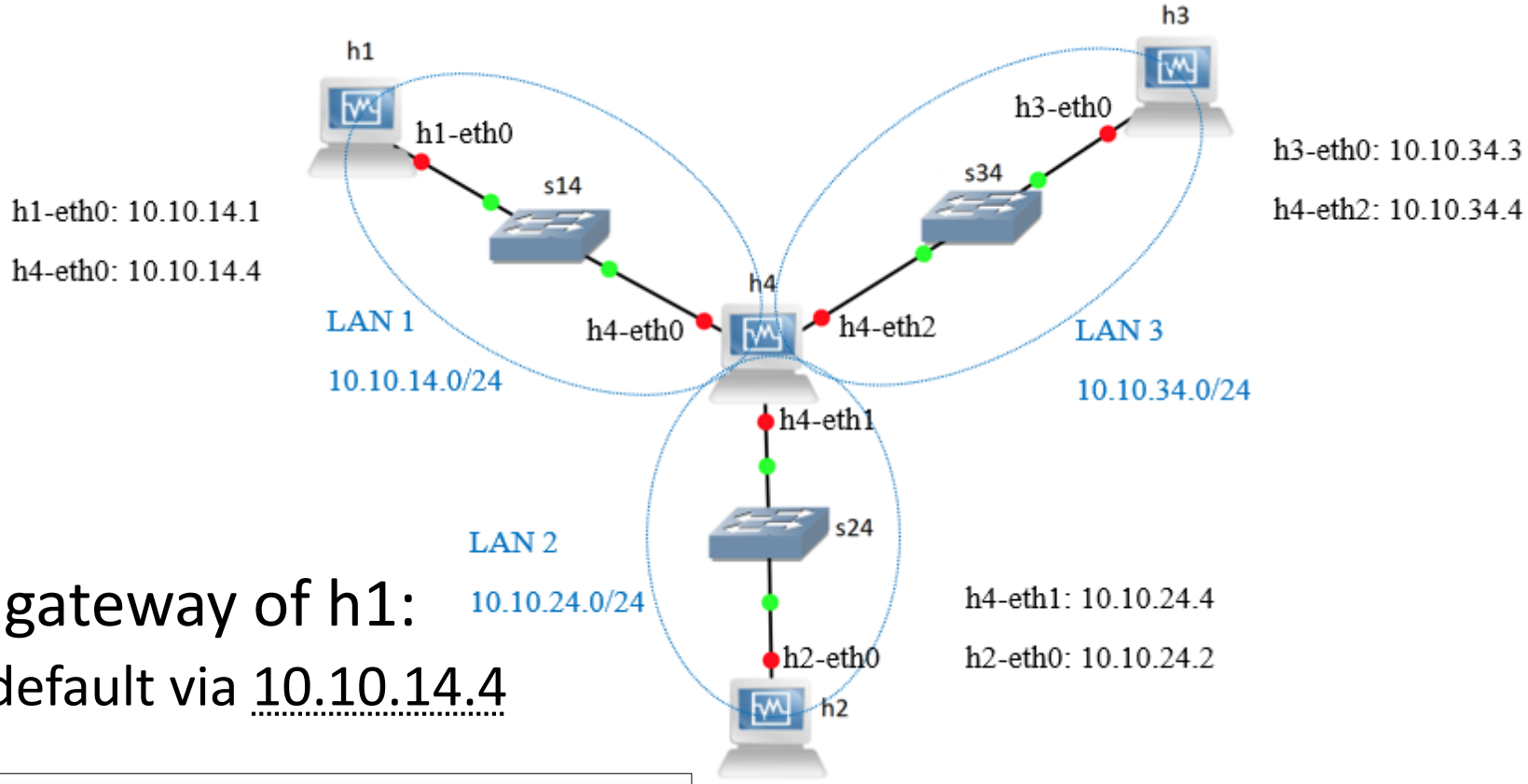
- # ifconfig -a

```
h1
root@TCPIP-VM:~/Desktop/shared# ip addr flush dev h1-eth0
root@TCPIP-VM:~/Desktop/shared# ip addr add 10.10.14.1/24 dev h1-eth0
root@TCPIP-VM:~/Desktop/shared# ifconfig
h1-eth0   Link encap:Ethernet  HWaddr 76:42:fd:85:98:43
          inet addr:10.10.14.1  Bcast:0.0.0.0  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:18 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1756 (1.7 KB)  TX bytes:828 (828.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@TCPIP-VM:~/Desktop/shared#
```



first hub router: default gateway

Set gateway



- Show routing table:
  - # ip route
- Add(Delete) default gateway of h1:
  - # ip route add(del) default via 10.10.14.4

```
h1
root@TCPIP-VM:~/Desktop/shared# ip route
10.10.14.0/24 dev h1-eth0  proto kernel  scope link  src 10.10.14.1
root@TCPIP-VM:~/Desktop/shared# ip route add default via 10.10.14.4
root@TCPIP-VM:~/Desktop/shared# ip route
default via 10.10.14.4 dev h1-eth0
10.10.14.0/24 dev h1-eth0  proto kernel  scope link  src 10.10.14.1
root@TCPIP-VM:~/Desktop/shared#
```

Convert into router

- Convert h4 into a router:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward