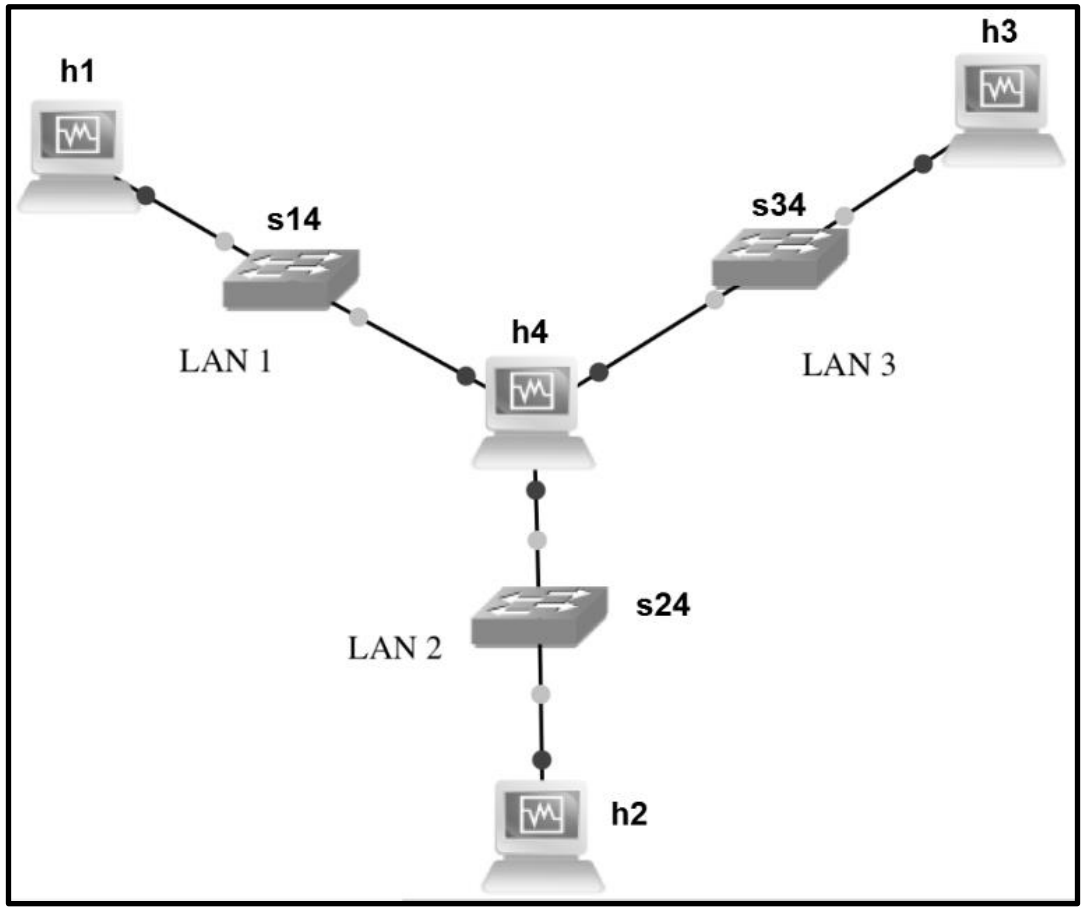
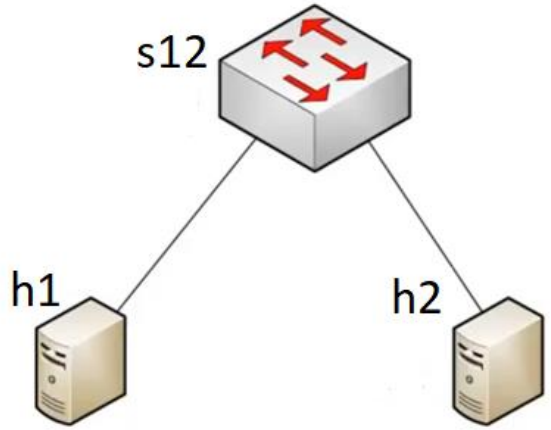
LAN Configuration

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

- Edit a python file, e.g. lanTopology.py:
  - $ sudo nano lanTopology.py
  - $ sudo gedit lanTopology.py
- Run topology:
  - $ sudo python lanTopology.py
- Delete topology:
  - $ sudo mn -c

```
mininet@mininet-vm:~$ cd Downloads
mininet@mininet-vm:~/Downloads$ ls
firstNetwork.py  lanConfig.py  lanTopology.py  mitmConfig.sh  TP1.pdf
mininet@mininet-vm:~/Downloads$ sudo python lanTopology.py
*** Adding controller
*** Adding hosts
*** Adding switch
*** Creating links
*** Starting network
*** Configuring hosts
PC1
*** Starting controller
c0
*** Starting 1 switches
s14 ...
*** Starting terminals on hosts
```

Interfaces

- Show host interfaces and their mode:
  - # ip link

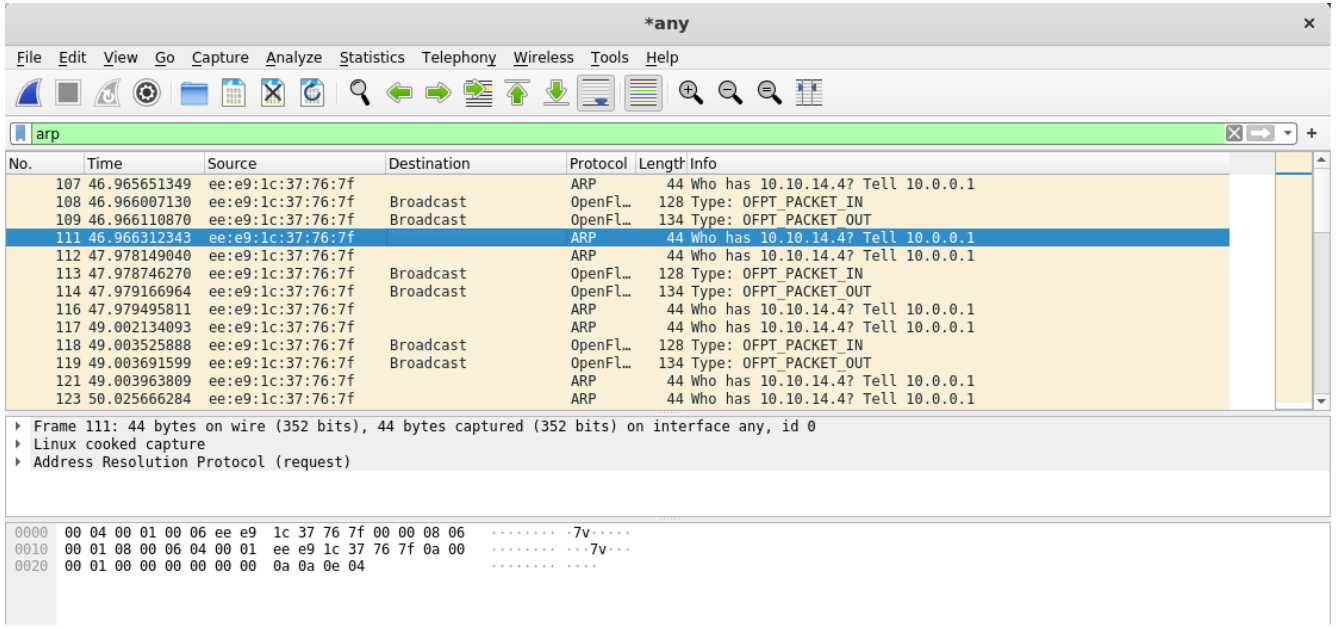
```
root@mininet-vm:/home/mininet/Downloads# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT
 group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: h1-eth0@if13: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state
UP mode DEFAULT group default qlen 1000
    link/ether 3a:f3:e0:36:76:22 brd ff:ff:ff:ff:ff:ff link-netnsid 0
root@mininet-vm:/home/mininet/Downloads#
```

- Change mode of interfaces, e.g. h1-eth0, to UP:
  - # ip link set h1-eth0 up

- ping ×

ARP (Address Resolution Protocol)

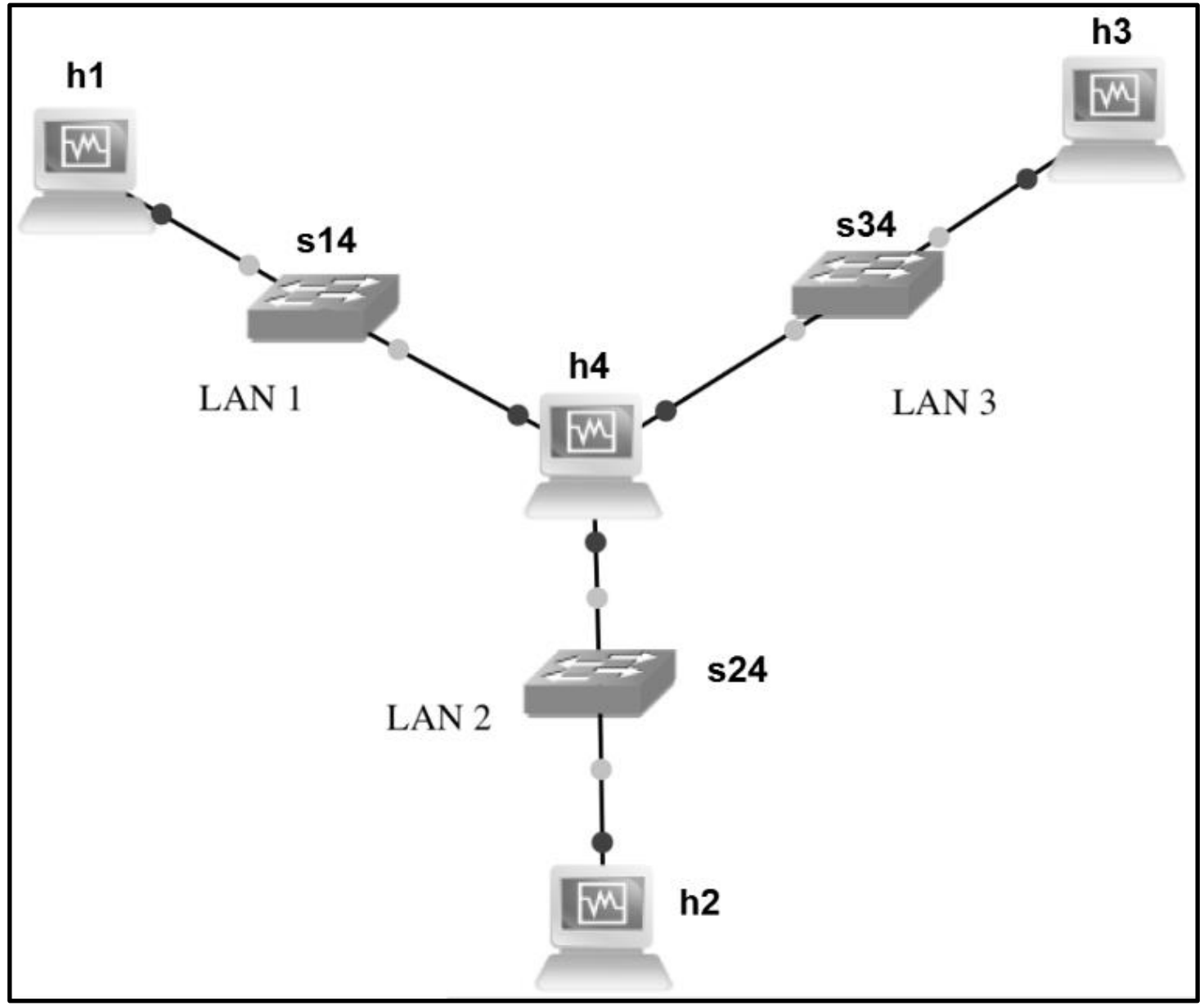
- A procedure for mapping a dynamic IP address to a physical address, known as a media access control (MAC) address.
  - ARP request
  - ARP reply



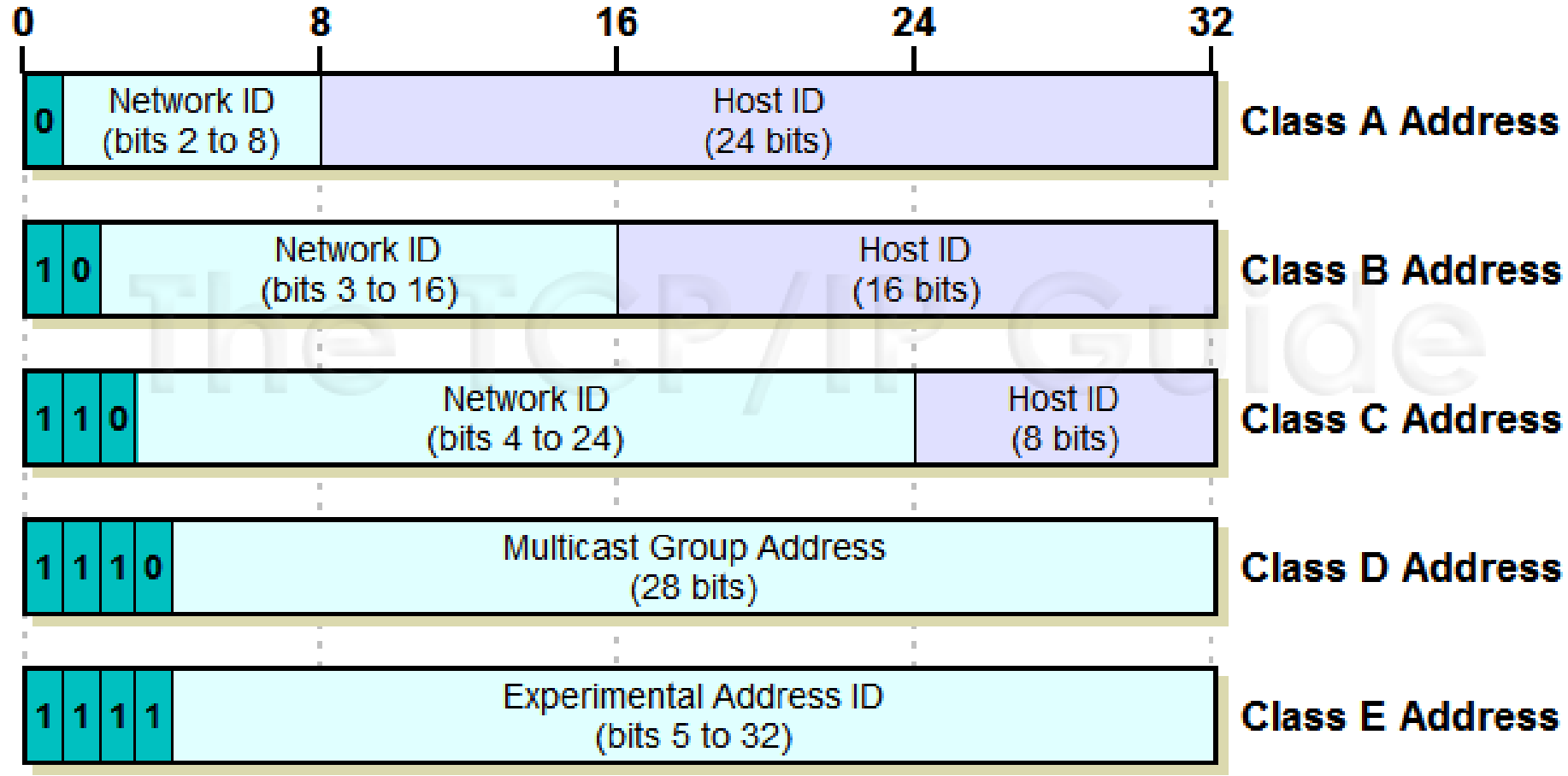
- Open Wireshark:
  - $ sudo wireshark

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

```
root@mininet-vm:/home/mininet/Downloads# arp -a
? (10.10.14.4) at <incomplete> on h1-eth0
```


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

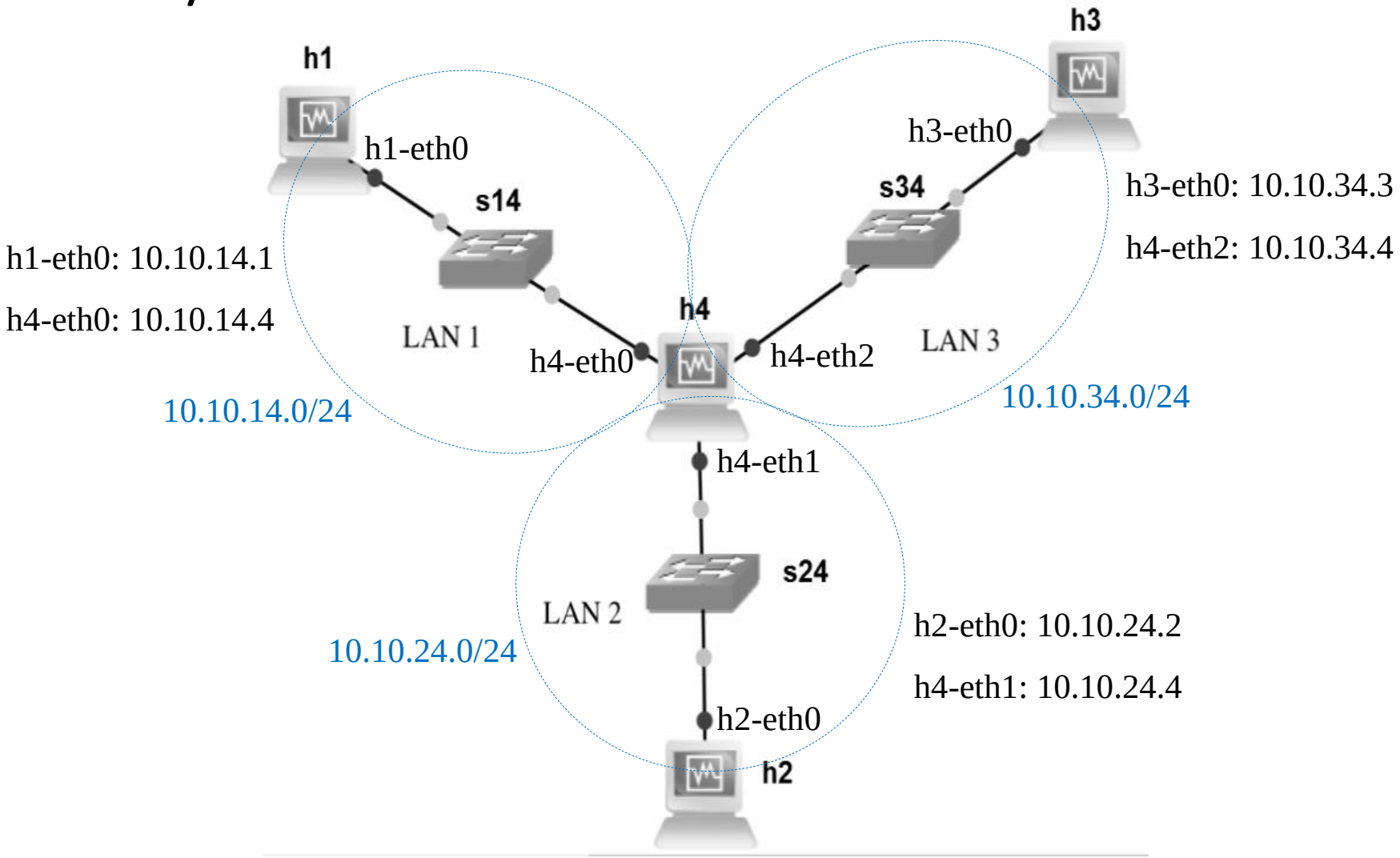
IP Address Class Bit Assignments and Network/Host ID Sizes



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

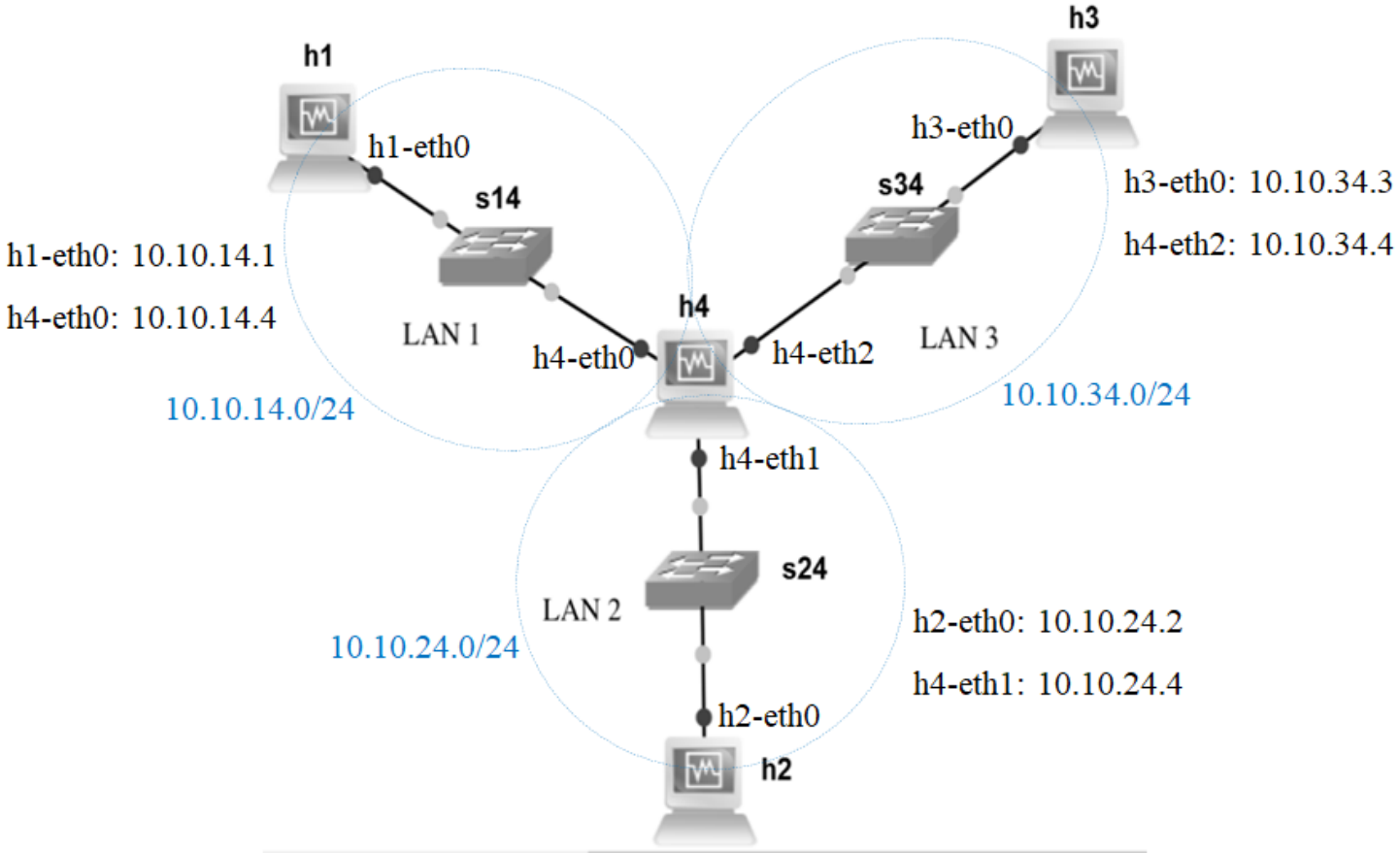

h1
h3
h1-eth0
h3-eth0
s14
s34
h1-eth0: 10.10.14.1
h4-eth0: 10.10.14.4
h3-eth0: 10.10.34.3
h4-eth2: 10.10.34.4
LAN 1
h4
LAN 3
h4-eth0
h4-eth2
10.10.14.0/24
10.10.34.0/24
h4-eth1
s24
LAN 2
10.10.24.0/24
h2-eth0: 10.10.24.2
h4-eth1: 10.10.24.4
h2-eth0
h2

Add or delete IP addresses

- # ip addr add (del) 10.10.14.1/24 dev h1-eth0

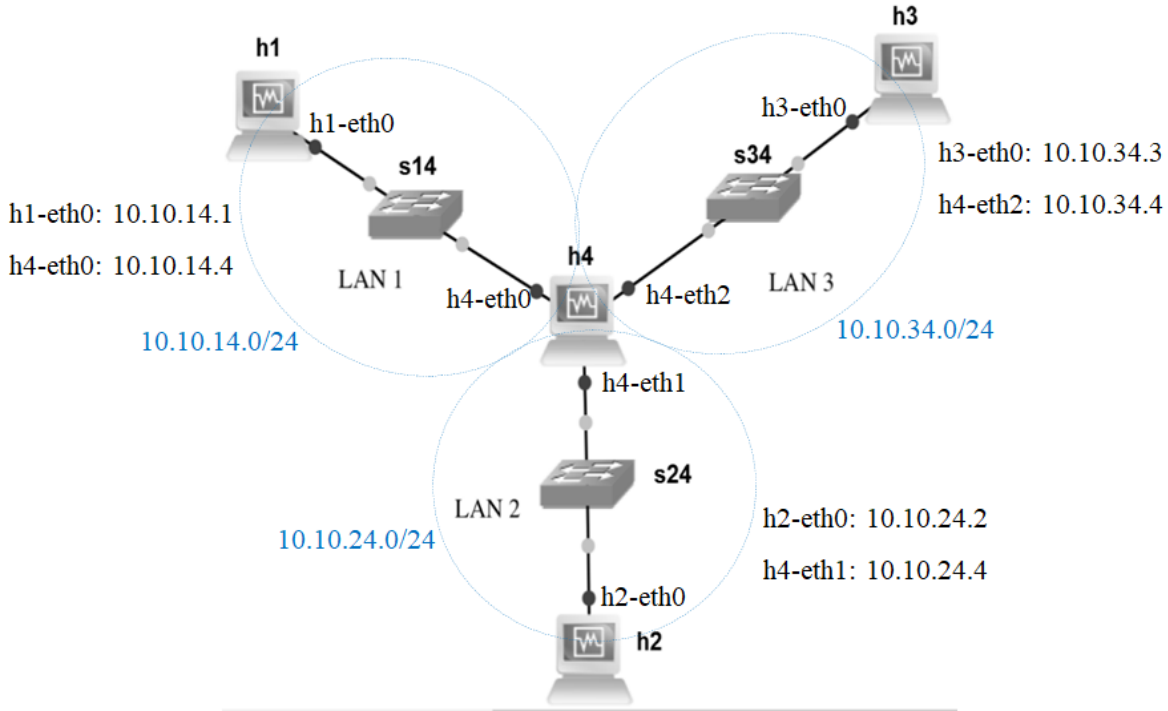
- # ifconfig -a

```
root@mininet-vm:/home/mininet/Downloads# ifconfig -a
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.10.14.1  netmask 255.255.255.0  broadcast 0.0.0.0
        ether 3a:f3:e0:36:76:22  txqueuelen 1000  (Ethernet)
        RX packets 21  bytes 1442 (1.4 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 79  bytes 6622 (6.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 25  bytes 2440 (2.4 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 25  bytes 2440 (2.4 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```



h1 ping h3

- Show routing table of h1:
  - # ip route
- Add default gateway to h1:
  - # ip route add default via 10.10.14.4
- Enable IP forwarding on h4:
  - # echo 1 > /proc/sys/net/ipv4/ip_forward




```
root@mininet-vm:/home/mininet/Downloads# ip route
10.10.14.0/24 dev h1-eth0 proto kernel scope link src 10.10.14.1
root@mininet-vm:/home/mininet/Downloads# ip route add default via 10.10.14.4
root@mininet-vm:/home/mininet/Downloads# 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
```

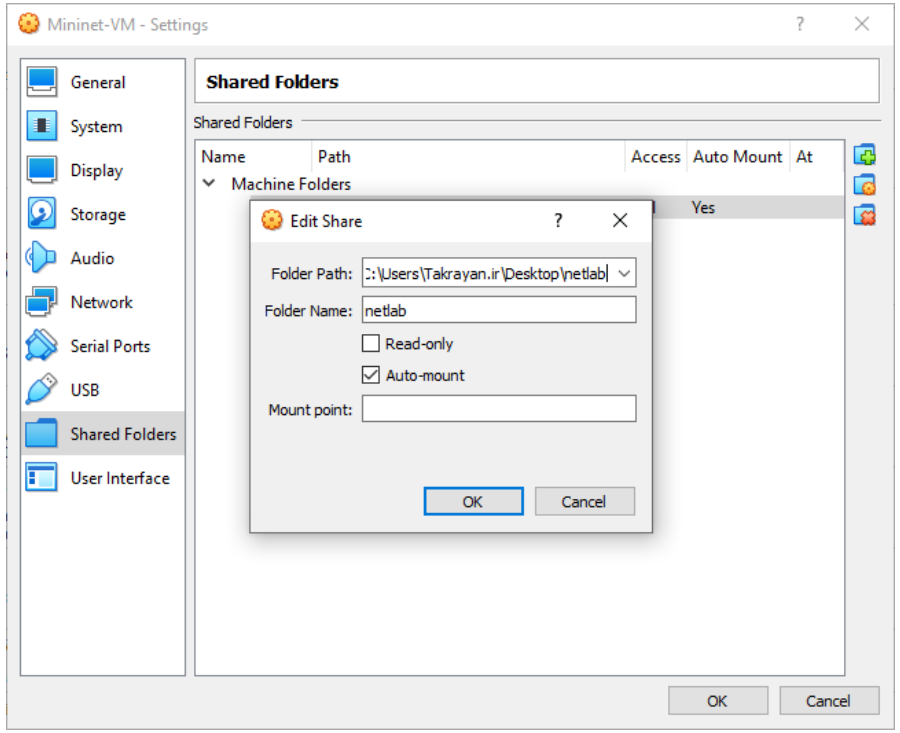
Shared folders

1.Install via terminal:

- $ sudo apt-get update
- $ sudo apt-get install virtualbox-guest-x11

2.Install via UI:

- Devices > Insert Guest Additions CD Image



- $ sudo su
- $ cd /media
- $ ls

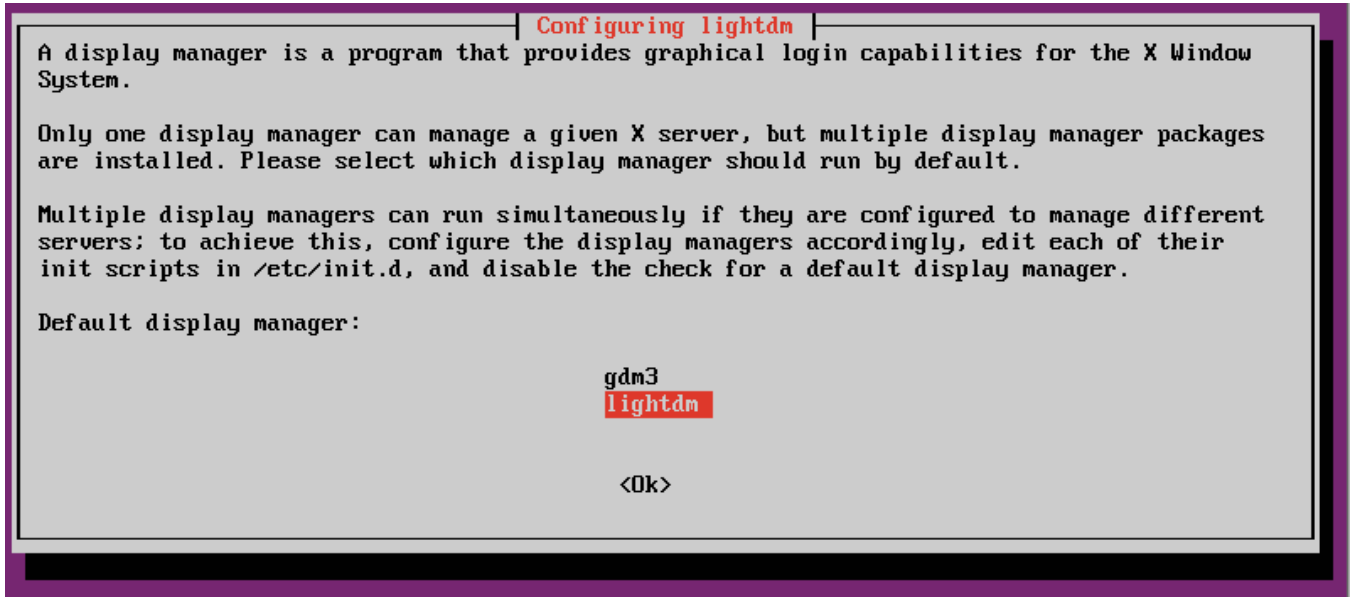
xterm

- $ sudo apt-get update
- $ sudo apt-get install xterm

- Open a new terminal
  1. SSH from Windows
  2. Desktop environment

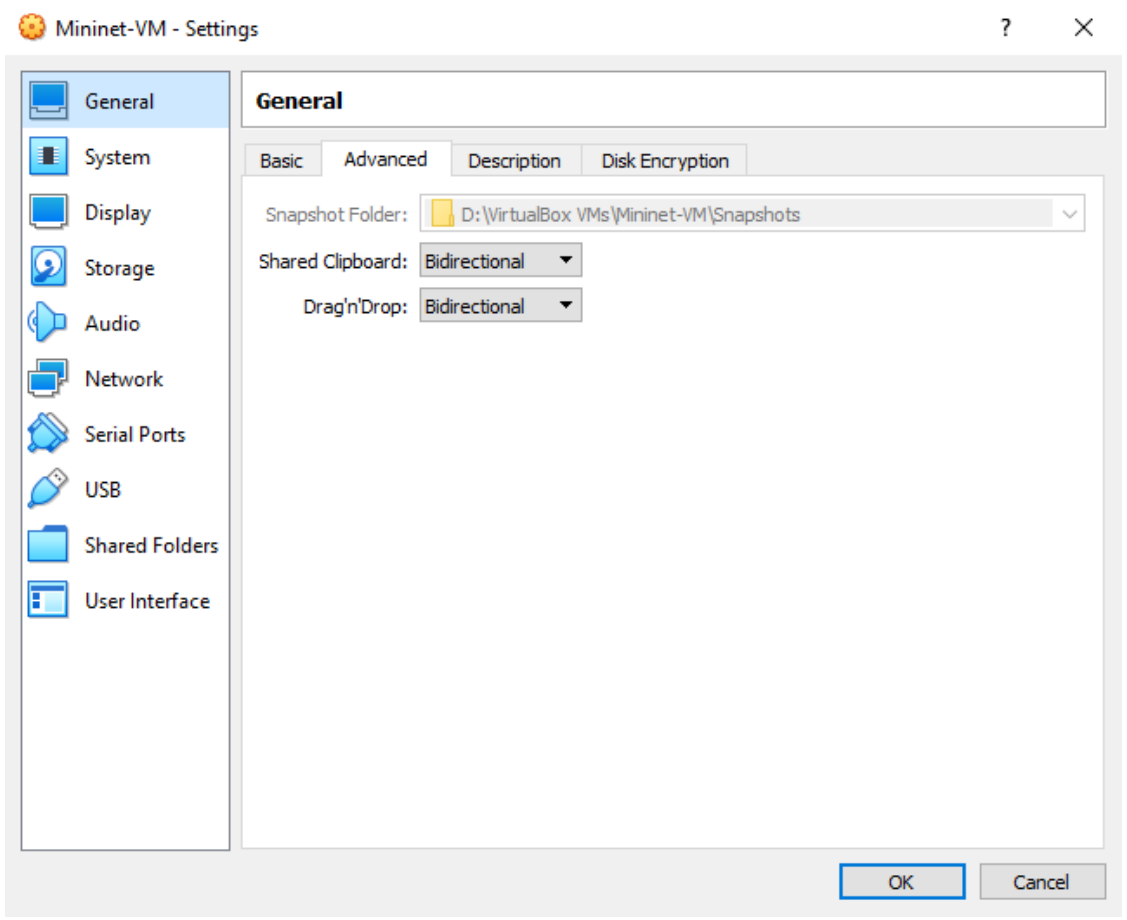
Install the desktop environment

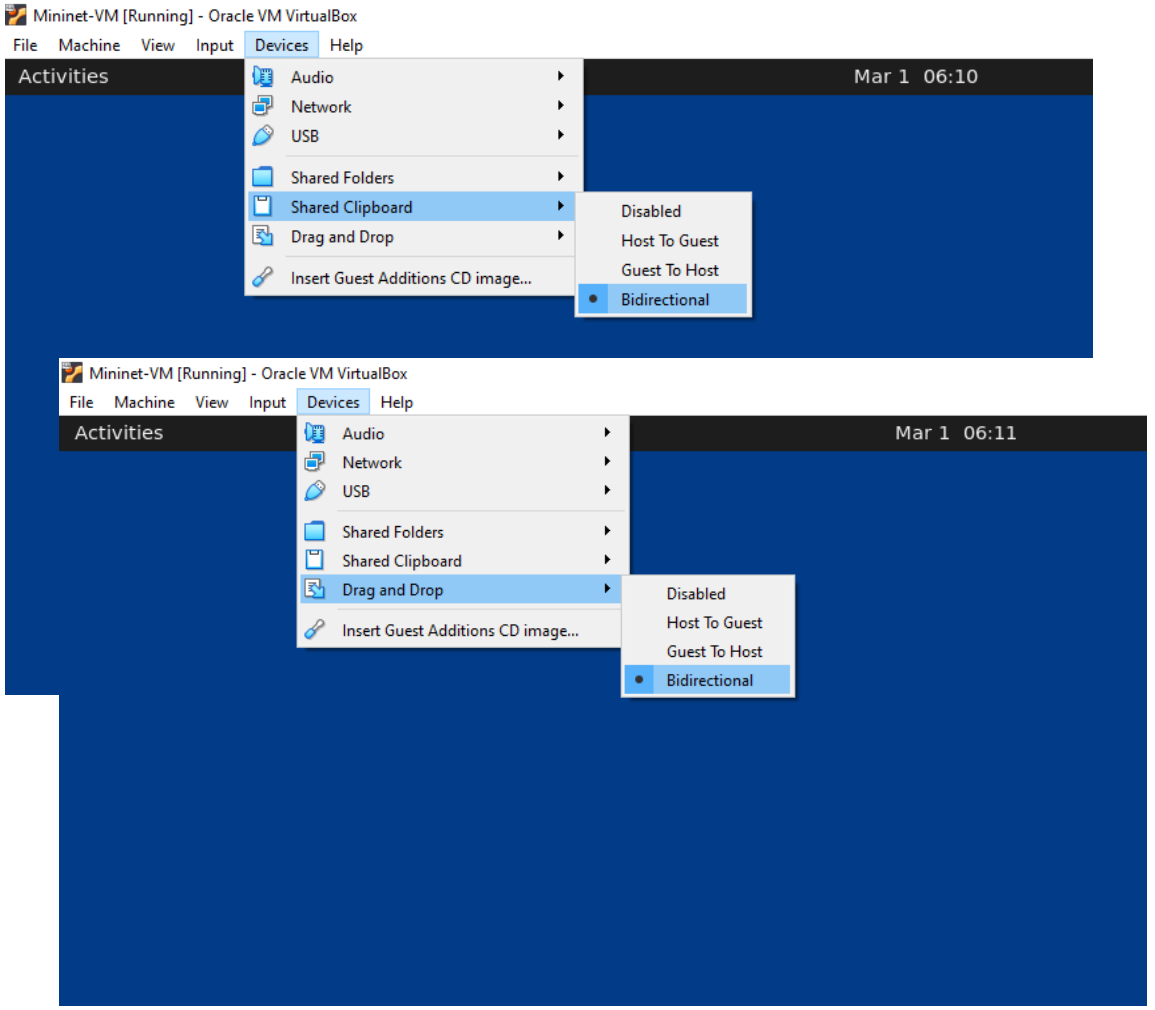
- $ sudo apt-get update
- $ sudo apt-get install xinit x11-xserver-utils lxde



- $ sudo reboot

Shared clipboard





Some errors

- Xterm: Xt error: Can’t open display
  - $ export DISPLAY=localhost:0.0
- Not open terminal
  - $ sudo apt-get update
  - $ sudo apt-get upgrade
  - $ sudo apt-get install xorg
  - $ sudo apt-get install openbox
  - $ sudo apt-get install fxlrg
  - $ sudo apt-get install xserver-xorg-core
  - $ sudo apt-get install xserver-xorg
  - $ sudo apt-get install xauth