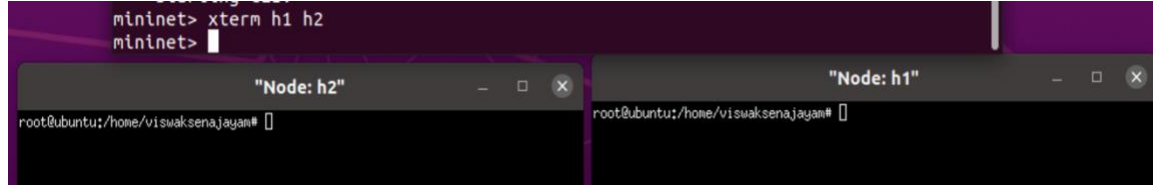


Assignment 2 – Mininet Installation and Basic Commands

1. How do I open a Xterm on a host?

```
mininet> xterm h1 h2
```



2. How do I get to know all the nodes in the topology?

```
mininet> nodes
```

it shows the available nodes(one controller, two hosts, one switch

```
mininet> nodes
available nodes are:
c0 h1 h2 s1
```

3. How do I run a command 'ps -aef' on specific host h2?

```
mininet> ps -aef #in terminal h2
```

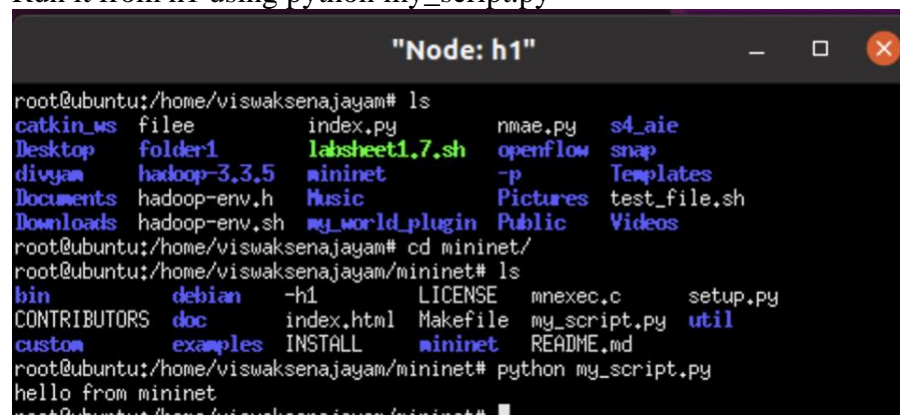
It will print all the processes running on host h2

```
root@ubuntu:/home/viswaksenajayam# ps -aef
UID          PID    PPID  C STIME TTY          TIME CMD
root           1        0  0 Nov02 ?        00:00:17 /lib/systemd/systemd --system
root           2        0  0 Nov02 ?        00:00:00 [kthreadd]
root           3        2  0 Nov02 ?        00:00:00 [rcu_gp]
root           4        2  0 Nov02 ?        00:00:00 [rcu_par_gp]
root           5        2  0 Nov02 ?        00:00:00 [slub_flushwq]
root           6        2  0 Nov02 ?        00:00:00 [netns]
root           8        2  0 Nov02 ?        00:00:00 [kworker/0:0H-events_highpri]
root          10        2  0 Nov02 ?        00:00:00 [mm_percpu_wq]
root          11        2  0 Nov02 ?        00:00:00 [rcu_tasks_rude_]
root          12        2  0 Nov02 ?        00:00:00 [rcu_tasks_trace]
root          13        2  0 Nov02 ?        00:00:05 [ksoftirqd/0]
root          14        2  0 Nov02 ?        00:00:31 [rcu_sched]
root          15        2  0 Nov02 ?        00:00:00 [migration/0]
root          16        2  0 Nov02 ?        00:00:00 [idle_inject/0]
root          18        2  0 Nov02 ?        00:00:00 [cpuhp/0]
root          19        2  0 Nov02 ?        00:00:00 [cpuhp/1]
root          20        2  0 Nov02 ?        00:00:00 [idle_inject/1]
root          21        2  0 Nov02 ?        00:00:00 [migration/1]
root          22        2  0 Nov02 ?        00:00:04 [ksoftirqd/1]
root          24        2  0 Nov02 ?        00:00:00 [kworker/1:0H-events_highpri]
root          25        2  0 Nov02 ?        00:00:00 [kdevtmpfs]
root          26        2  0 Nov02 ?        00:00:00 [inet_frag_wq]
root          28        2  0 Nov02 ?        00:00:00 [kauditd]
```

4. How to run an example Python program on a specific host h1?

Create from inside mininet

Run it from h1 using python my_script.py



5. How do I start a web server on a host and access the index page from another host?

→ start the server

Python3 -m http.server 8080

```
"Node: h2"

root@ubuntu:/home/viswaksenajayam# python3 -m http.server 9000
Serving HTTP on 0.0.0.0 port 9000 (http://0.0.0.0:9000/) ...
10.0.0.1 - - [03/Nov/2023 14:14:19] "GET / HTTP/1.1" 200 -
```

Get file

Wget https://10.0.0.1x

```
"Node: h1"

root@ubuntu:/home/viswaksenajayam/mininet# wget 10.0.0.2:9000
--2023-11-03 14:14:19-- http://10.0.0.2:9000/
Connecting to 10.0.0.2:9000... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2360 (2.3K) [text/html]
Saving to: 'index.html.3'

index.html.3      100%[=====] 2.30K  --.-KB/s  in 0s

2023-11-03 14:14:19 (385 MB/s) - 'index.html.3' saved [2360/2360]
```

6. How do I get the IP address corresponding to a host?

```
mininet> h1 ifconfig -a
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::fc18:76ff:fe80:a1fd prefixlen 64 scopeid 0x20<ether>
    ether fe18:76:a8:a1fd txqueuelen 1000 (Ethernet)
    RX packets 124 bytes 22759 (22.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 89 bytes 11001 (11.0 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
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

mininet> h2 ifconfig -a
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::f4ce:5fff:fe4c:9111 prefixlen 64 scopeid 0x20<ether>
    ether f6:ec:e5:4c:09:11 txqueuelen 1000 (Ethernet)
    RX packets 121 bytes 15656 (15.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 92 bytes 18104 (18.1 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
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 2 bytes 100 (100.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2 bytes 100 (100.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
"Node: h1"

index.html.3      100%[=====] 2.30K  --.-KB/s  in 0s

2023-11-03 14:14:19 (385 MB/s) - 'index.html.3' saved [2360/2360]

root@ubuntu:/home/viswaksenajayam/mininet# ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::fc18:76ff:fe80:a1fd prefixlen 64 scopeid 0x20<ether>
    ether fe18:76:a8:a1fd txqueuelen 1000 (Ethernet)
    RX packets 121 bytes 15656 (15.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 92 bytes 18104 (18.1 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
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 2 bytes 100 (100.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2 bytes 100 (100.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

"Node: h2"

Keyboard interrupt received, exiting.
root@ubuntu:/home/viswaksenajayam# ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::f4ce:5fff:fe4c:9111 prefixlen 64 scopeid 0x20<ether>
    ether f6:ec:e5:4c:09:11 txqueuelen 1000 (Ethernet)
    RX packets 121 bytes 15656 (15.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 92 bytes 18104 (18.1 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
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 2 bytes 100 (100.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2 bytes 100 (100.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

7. How do I find out all the interface for a switch?

```
mininet> dctl show
*** s1 *****
OFPT_FEATURES_REPLY (xid=0x2): dpid:0000000000000001
n_tables:254, n_buffers:0
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP
actions: output enqueue set_vlan_vid set_vlan_pcp strip_vlan mod_dl_src mod_dl_dst mod_nw_src mod_nw_dst mod_nw_tos mod_tp_src mod_tp_dst
1(s1-eth1): addr:9a:52:fd:7a:27:91
    config: 0
    state: 0
    current: 10GB-FD COPPER
    speed: 10000 Mbps now, 0 Mbps max
2(s1-eth2): addr:3e:8a:28:17:c6:87
    config: 0
    state: 0
    current: 10GB-FD COPPER
    speed: 10000 Mbps now, 0 Mbps max
LOCAL(x1): addr:b2:53:ff:91:21:44
    config: PORT_DOWN
    state: LINK_DOWN
    speed: 0 Mbps now, 0 Mbps max
OFPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0
```

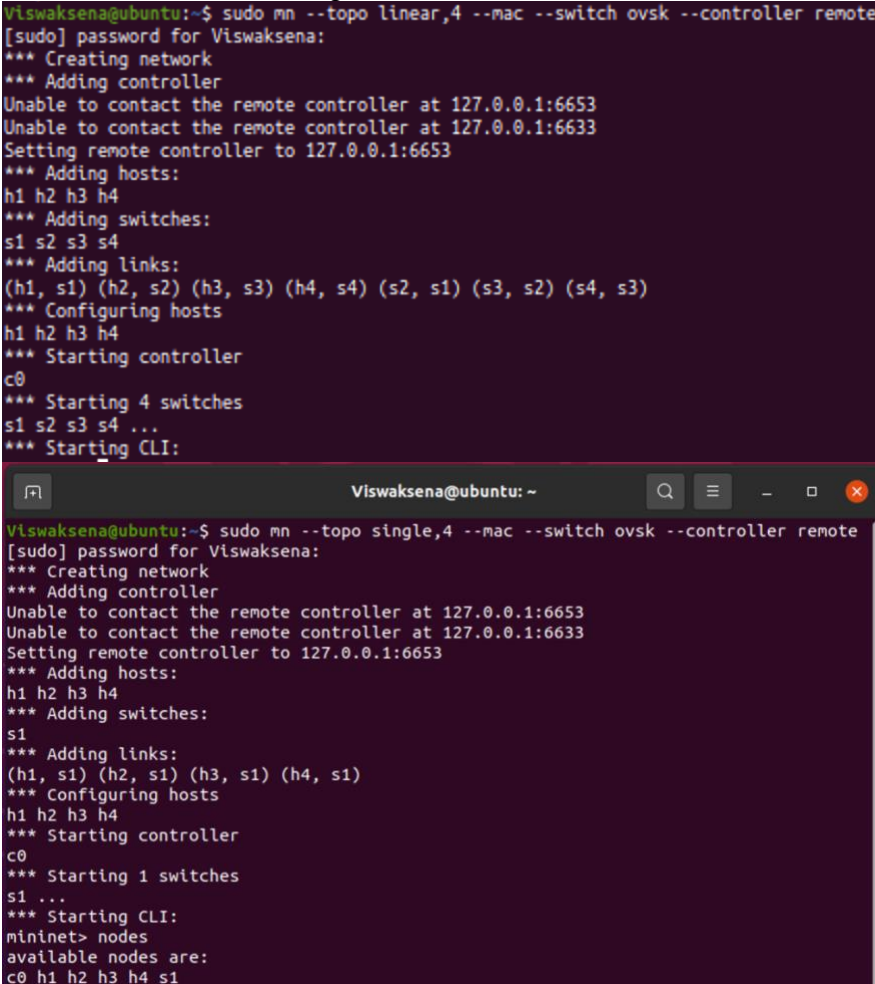
8. What does the command iperf do?

A tool for ensuring that a network can meet its performance requirements and for troubleshooting network problems.

9. Try out linear, Single topology with different number of nodes and switches

`sudo mn --topo linear,4 --mac --switch ovsk --controller remote`

Based on the value input before `--mac --switch ovsk` it gives the specified number of nodes and switches in a linear configuration.



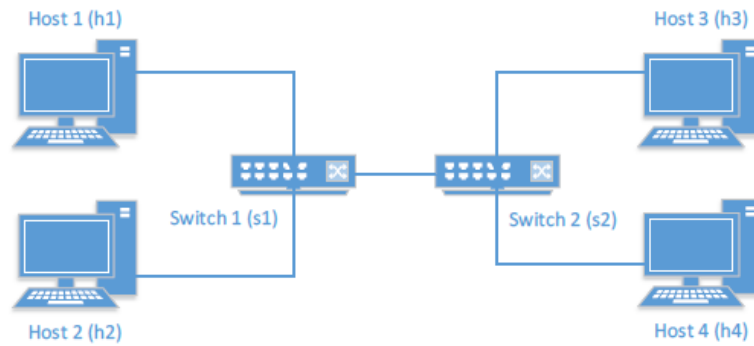
```
Viswaksena@ubuntu:~$ sudo mn --topo linear,4 --mac --switch ovsk --controller remote
[sudo] password for Viswaksena:
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
Unable to contact the remote controller at 127.0.0.1:6633
Setting remote controller to 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (h4, s4) (s2, s1) (s3, s2) (s4, s3)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:

Viswaksena@ubuntu:~$ sudo mn --topo single,4 --mac --switch ovsk --controller remote
[sudo] password for Viswaksena:
*** Creating network
*** Adding controller
Unable to contact the remote controller at 127.0.0.1:6653
Unable to contact the remote controller at 127.0.0.1:6633
Setting remote controller to 127.0.0.1:6653
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1) (h4, s1)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> nodes
available nodes are:
c0 h1 h2 h3 h4 s1
```

10. Create a topology with 4 hosts and 2 switches as follows and ping all the nodes.

(Code should be submitted) You may use the following url for Python based

mininet APIs http://mininet.org/api/classmininet_1_1net_1_1Mininet.html



Code:-

```

1 from mininet.topo import Topo
2
3 class MyTopo(Topo):
4     def __init__(self):
5         Topo.__init__(self)
6
7         s1 = self.addSwitch('s1')
8         s2 = self.addSwitch('s2')
9
10        h1 = self.addHost('h1')
11        h2 = self.addHost('h2')
12        h3 = self.addHost('h3')
13        h4 = self.addHost('h4')
14
15        self.addLink(h1, s1)
16        self.addLink(h2, s1)
17        self.addLink(h3, s2)
18        self.addLink(h4, s2)
19
20        self.addLink(s1, s2)
21
22 topos = {'mytopo': (lambda: MyTopo())}
23

```

```

Viswaksena@ubuntu:~$ sudo mn --custom /home/viswaksenajayam/mininet_topology.py --topo mytopo
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4
*** Adding switches:
s1 s2
*** Adding links:
(h1, s1) (h2, s1) (h3, s2) (h4, s2) (s1, s2)
*** Configuring hosts
h1 h2 h3 h4
*** Starting controller
c0
*** Starting 2 switches
s1 s2 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4
h2 -> h1 h3 h4
h3 -> h1 h2 h4
h4 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)

```