



Mawlana Bhashani Science and Technology University

Lab-Report

Report No: 01

Course code: ICT-3208

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Experiment No: 01

Experiment Name: Basic mininet commands

Objectives:

- Learn the basic commands in Mininet
- Learn how to create basic network topologies in Mininet
- Learn Mininet API

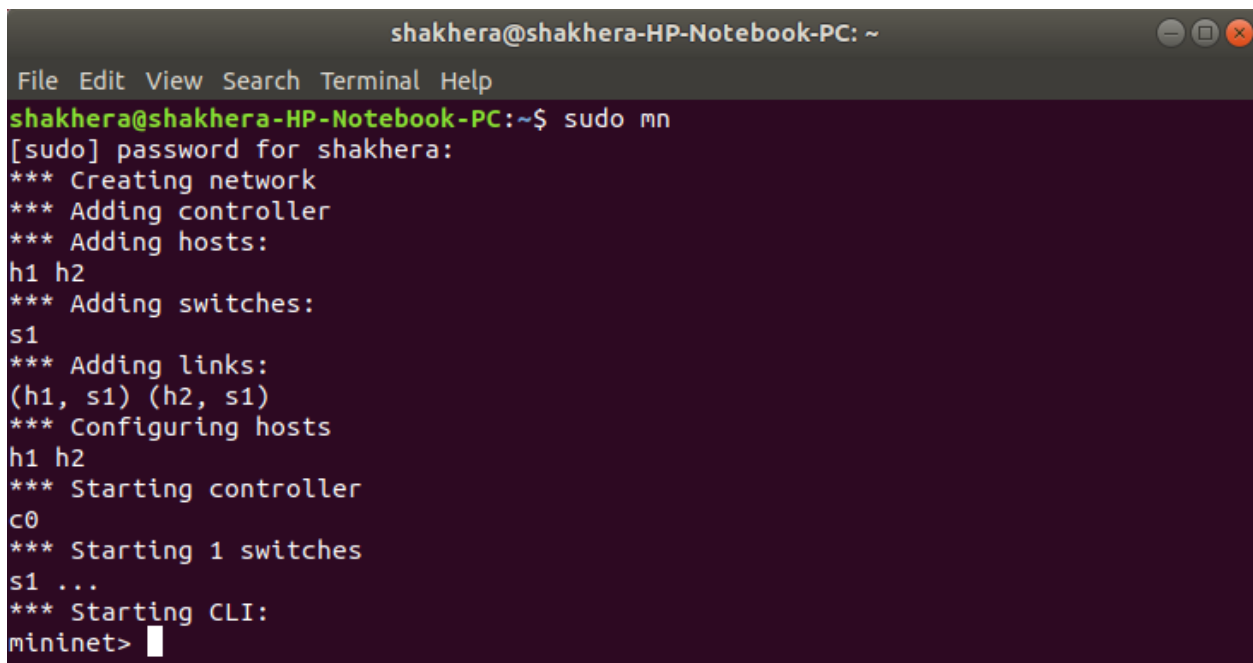
Create Virtual Network:

We will be using CLI(**sudo mn command**) to manage our virtual network. The default topology includes two hosts (h1,h2), OpenFlow Switch(s1) and OpenFlow controller(c0).

Step 1:

To start a minimal topology, enter the command shown below. When prompted for a password, type password and hit enter. Note that the password will not be visible as you type it.

Sudo mn



```
shakhera@shakhera-HP-Notebook-PC: ~  
File Edit View Search Terminal Help  
shakhera@shakhera-HP-Notebook-PC:~$ sudo mn  
[sudo] password for shakhera:  
*** Creating network  
*** Adding controller  
*** Adding hosts:  
h1 h2  
*** Adding switches:  
s1  
*** Adding links:  
(h1, s1) (h2, s1)  
*** Configuring hosts  
h1 h2  
*** Starting controller  
c0  
*** Starting 1 switches  
s1 ...  
*** Starting CLI:  
mininet>
```

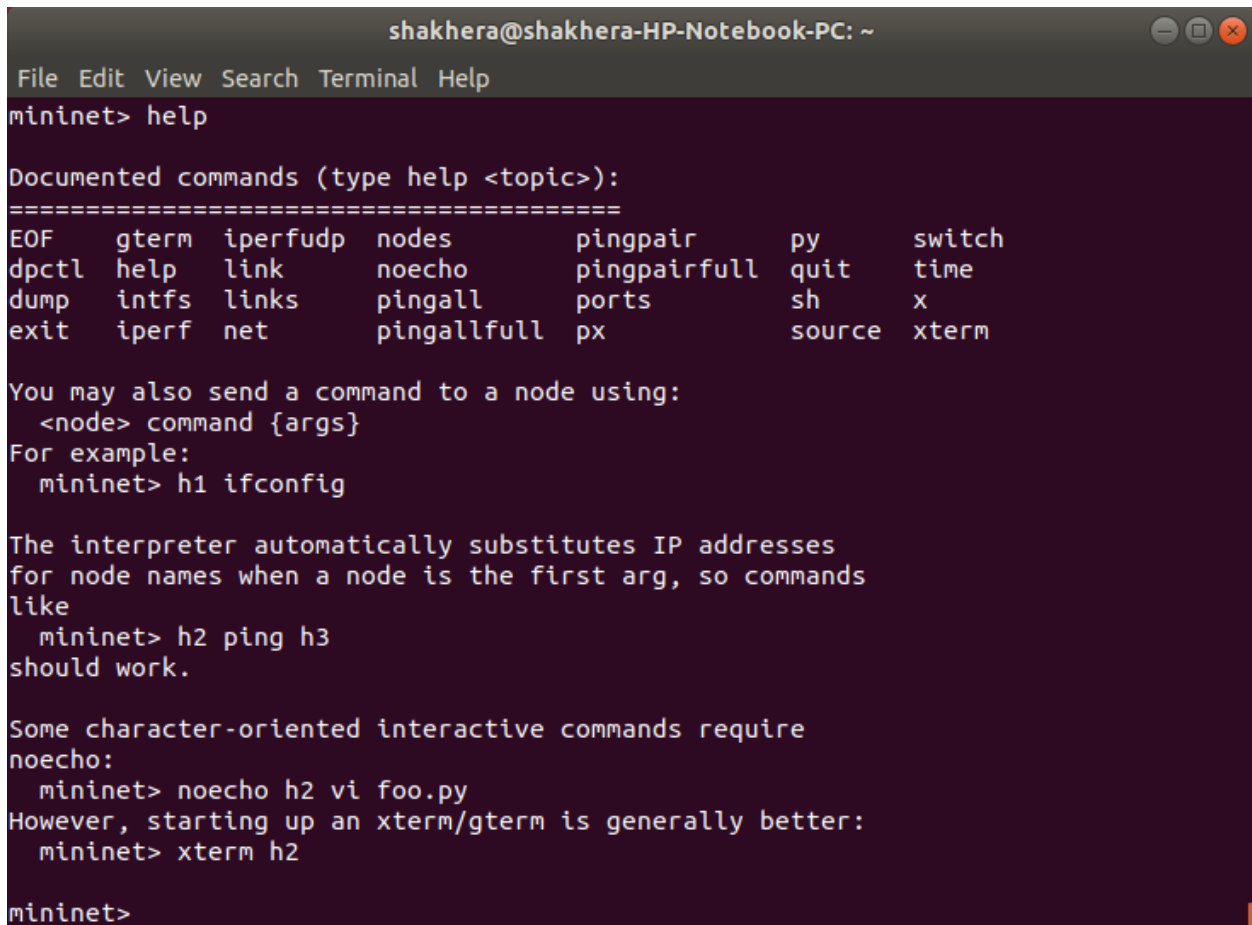
When issuing the `sudo mn` command, Mininet initializes the topology and launches its command line interface which looks like this:

```
mininet>
```

Step 2:

To display the list of Mininet CLI commands and examples on their usage, type the following command:

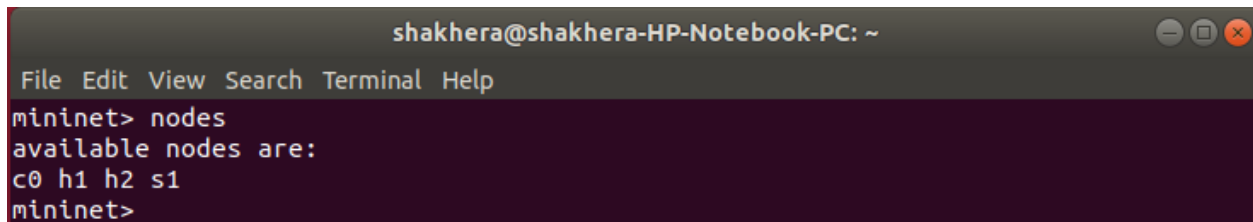
```
help
```

A screenshot of a terminal window titled 'shakhera@shakhera-HP-Notebook-PC: ~'. The terminal shows the command 'mininet> help' and its output. The output lists documented commands in a grid: EOF, gterm, iperfudp, nodes, pingpair, py, switch; dpctl, help, link, noecho, pingpairfull, quit, time; dump, intfs, links, pingall, ports, sh, x; exit, iperf, net, pingallfull, px, source, xterm. It also provides examples of sending commands to nodes, such as 'mininet> h1 ifconfig' and 'mininet> h2 ping h3', and mentions character-oriented interactive commands like 'noecho' and 'xterm'.

Step 3:

To display the available nodes, type the following command:

nodes

A terminal window titled 'shakhera@shakhera-HP-Notebook-PC: ~' with a menu bar (File, Edit, View, Search, Terminal, Help). The prompt is 'mininet>'. The command 'nodes' has been entered, and the output is 'available nodes are: c0 h1 h2 s1'. The prompt is now 'mininet>'.

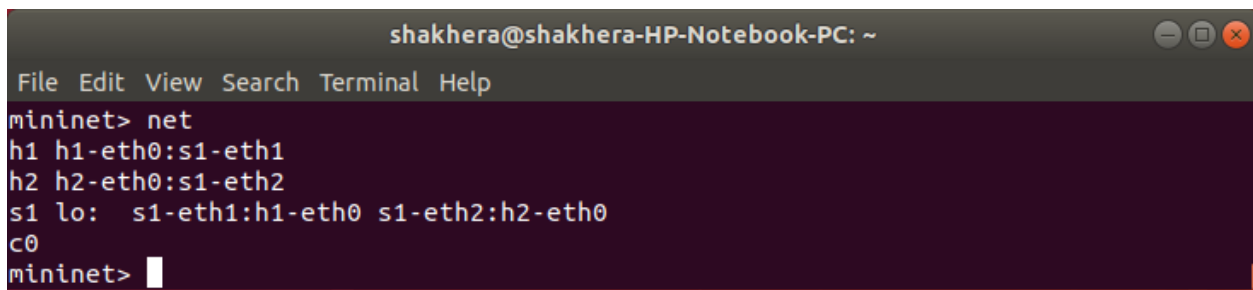
```
shakhera@shakhera-HP-Notebook-PC: ~  
File Edit View Search Terminal Help  
mininet> nodes  
available nodes are:  
c0 h1 h2 s1  
mininet>
```

The output of this command shows that there are two hosts (host h1 and host h2) and a switch (s1).

Step 4:

It is useful sometimes to display the links between the devices in Mininet to understand the topology. Issue the command shown below to see the available links.

net

A terminal window titled 'shakhera@shakhera-HP-Notebook-PC: ~' with a menu bar (File, Edit, View, Search, Terminal, Help). The prompt is 'mininet>'. The command 'net' has been entered, and the output is 'h1 h1-eth0:s1-eth1', 'h2 h2-eth0:s1-eth2', 's1 lo: s1-eth1:h1-eth0 s1-eth2:h2-eth0', and 'c0'. The prompt is now 'mininet>'.

```
shakhera@shakhera-HP-Notebook-PC: ~  
File Edit View Search Terminal Help  
mininet> net  
h1 h1-eth0:s1-eth1  
h2 h2-eth0:s1-eth2  
s1 lo: s1-eth1:h1-eth0 s1-eth2:h2-eth0  
c0  
mininet>
```

Step 5: To proceed, issue the command:

h1 ifconfig

```
shakhera@shakhera-HP-Notebook-PC: ~
File Edit View Search Terminal Help
mininet> h1 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::50d1:cfff:fe94:ba69 prefixlen 64 scopeid 0x20<link
>
    ether 52:d1:cf:94:ba:69 txqueuelen 1000 (Ethernet)
    RX packets 33 bytes 3560 (3.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 10 bytes 796 (796.0 B)
    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> 
```

This command executes the `ifconfig` Linux command on host `h1`. The command shows host `h1`'s interfaces. The display indicates that host `h1` has an interface `h1-eth0` configured with IP address `10.0.0.1`, and another interface `lo` configured with IP address `127.0.0.1` (loopback interface).

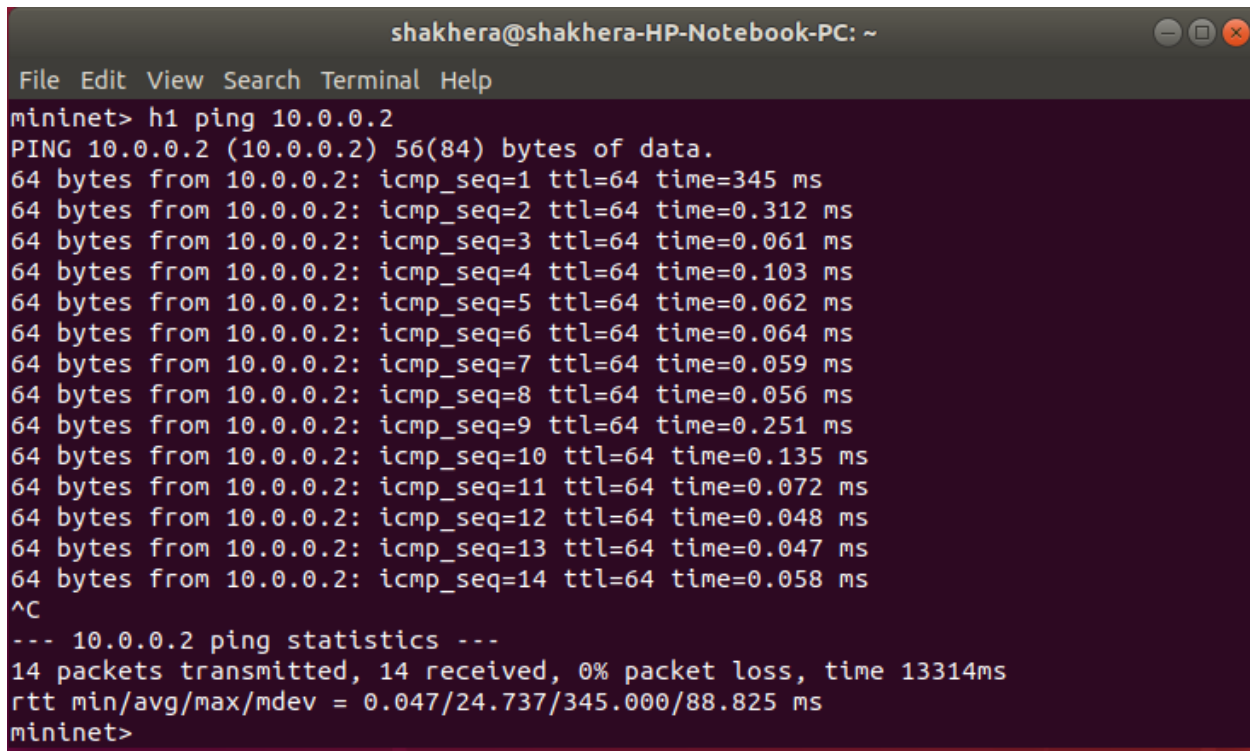
Test connectivity

Mininet's default topology assigns the IP addresses `10.0.0.1/8` and `10.0.0.2/8` to host `h1` and host `h2` respectively. To test connectivity between them, you can use the command `ping`. The `ping` command operates by sending Internet Control Message Protocol (ICMP) Echo Request messages to the remote computer and waiting for a response. Information available includes how many responses are returned and how long it takes for them to return.

Step 1:

On the CLI, type the command shown below. This command tests the connectivity between host h1 and host h2. To stop the test, press Ctrl+c. The figure below shows a successful connectivity test. Host h1 (10.0.0.1) sent four packets to host h2 (10.0.0.2) and successfully received the expected responses.

h1 ping 10.0.0.2

A screenshot of a terminal window titled "shakhera@shakhera-HP-Notebook-PC: ~". The terminal shows a command prompt "mininet>" followed by the command "h1 ping 10.0.0.2". The output displays 14 successful ping responses from 10.0.0.2 to 10.0.0.1, each with a TTL of 64 and a time value. The responses are: icmp_seq=1 (345 ms), icmp_seq=2 (0.312 ms), icmp_seq=3 (0.061 ms), icmp_seq=4 (0.103 ms), icmp_seq=5 (0.062 ms), icmp_seq=6 (0.064 ms), icmp_seq=7 (0.059 ms), icmp_seq=8 (0.056 ms), icmp_seq=9 (0.251 ms), icmp_seq=10 (0.135 ms), icmp_seq=11 (0.072 ms), icmp_seq=12 (0.048 ms), icmp_seq=13 (0.047 ms), and icmp_seq=14 (0.058 ms). After the last response, the user presses Ctrl+C, indicated by "^C". The terminal then shows the ping statistics: "14 packets transmitted, 14 received, 0% packet loss, time 13314ms" and "rtt min/avg/max/mdev = 0.047/24.737/345.000/88.825 ms". The prompt "mininet>" is shown at the bottom.

```
shakhera@shakhera-HP-Notebook-PC: ~
File Edit View Search Terminal Help
mininet> h1 ping 10.0.0.2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=345 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.312 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.061 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.103 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.062 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=0.064 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=0.059 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=0.056 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=0.251 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=0.135 ms
64 bytes from 10.0.0.2: icmp_seq=11 ttl=64 time=0.072 ms
64 bytes from 10.0.0.2: icmp_seq=12 ttl=64 time=0.048 ms
64 bytes from 10.0.0.2: icmp_seq=13 ttl=64 time=0.047 ms
64 bytes from 10.0.0.2: icmp_seq=14 ttl=64 time=0.058 ms
^C
--- 10.0.0.2 ping statistics ---
14 packets transmitted, 14 received, 0% packet loss, time 13314ms
rtt min/avg/max/mdev = 0.047/24.737/345.000/88.825 ms
mininet>
```

Step 2: Stop the emulation by typing the following command:

exit

```
shakhera@shakhera-HP-Notebook-PC: ~  
File Edit View Search Terminal Help  
mininet> exit  
*** Stopping 1 controllers  
c0  
*** Stopping 4 links  
....  
*** Stopping 1 switches  
s1  
*** Stopping 4 hosts  
h1 h2 h3 h4  
*** Done  
completed in 134.928 seconds  
shakhera@shakhera-HP-Notebook-PC:~$
```

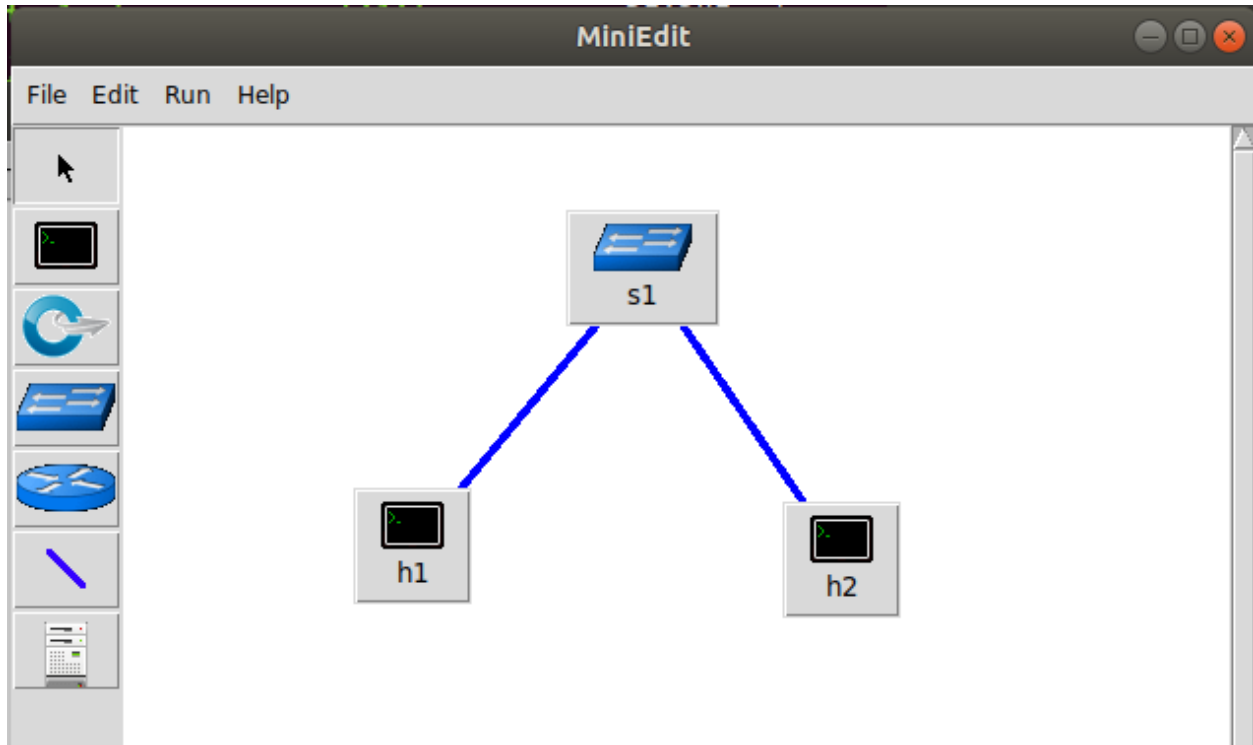
Step 3: Mininet crashes for some reason, clean it up by the following command:

```
shakhera@shakhera-HP-Notebook-PC: ~  
File Edit View Search Terminal Help  
shakhera@shakhera-HP-Notebook-PC:~$ sudo mn -c  
*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes  
killall controller ofprotocol ofdatapath ping nox_corelt-nox_core ovs-openflowd  
ovs-controllerovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/null  
killall -9 controller ofprotocol ofdatapath ping nox_corelt-nox_core ovs-openflo  
wd ovs-controllerovs-testcontroller udpbwtest mnexec ivs ryu-manager 2> /dev/nul  
l  
pkill -9 -f "sudo mnexec"  
*** Removing junk from /tmp  
rm -f /tmp/vconn* /tmp/vlogs* /tmp/*.out /tmp/*.log  
*** Removing old X11 tunnels  
*** Removing excess kernel datapaths  
ps ax | egrep -o 'dp[0-9]+' | sed 's/dp/nl:/'  
*** Removing OVS datapaths  
ovs-vsctl --timeout=1 list-br  
ovs-vsctl --timeout=1 list-br  
*** Removing all links of the pattern foo-ethX  
ip link show | egrep -o '([-_.[:alnum:]]+-eth[[:digit:]]+)'  
ip link show  
*** Killing stale mininet node processes  
pkill -9 -f mininet:  
*** Shutting down stale tunnels  
pkill -9 -f Tunnel=Ethernet  
pkill -9 -f .ssh/mn
```

Build the network topology:

Step 1:

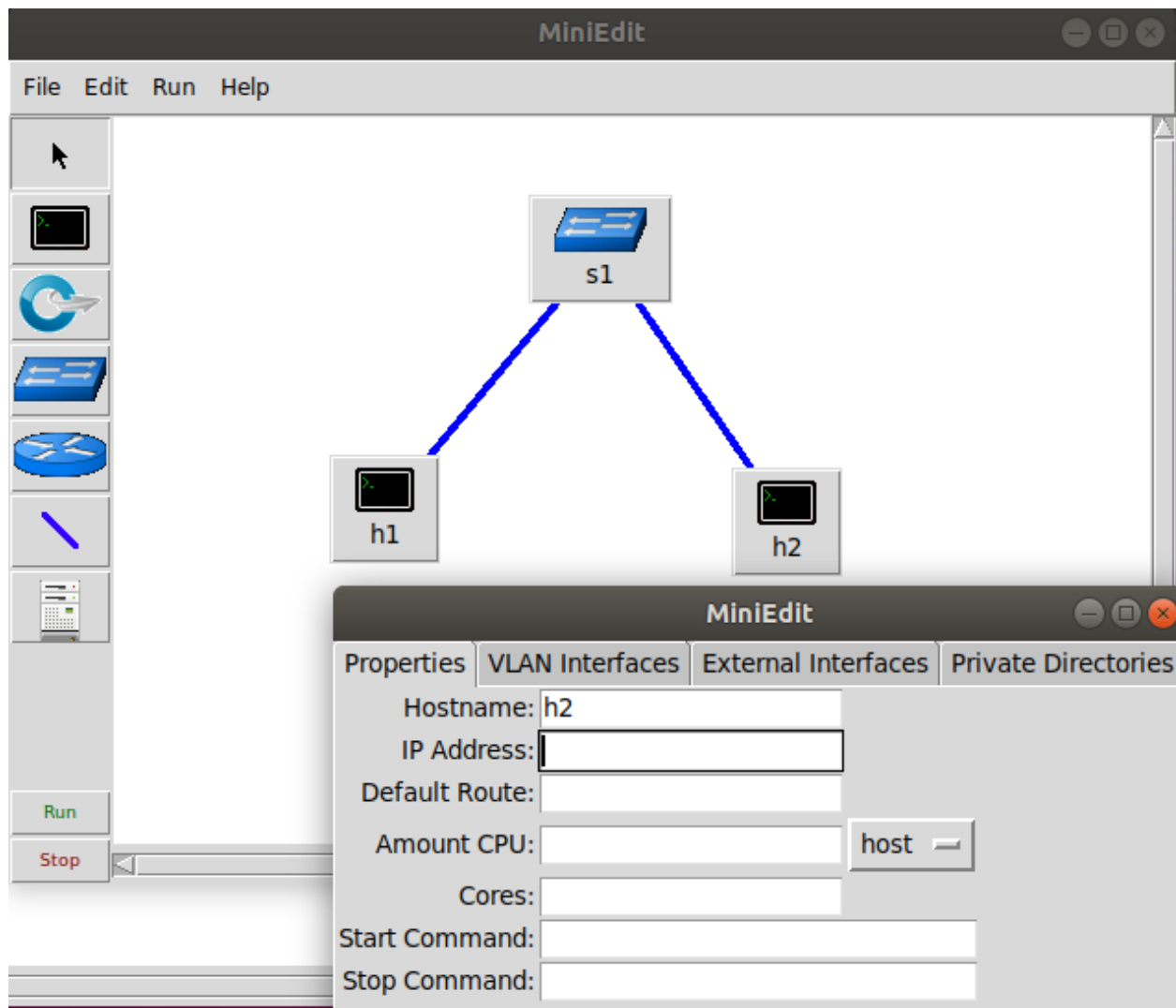
To build the topology illustrated two hosts and one switch must be deployed. Deploy these devices in MiniEdit, as shown below.



Use the buttons described in the previous step to add and connect devices. The configuration of IP addresses is described in Step 2.

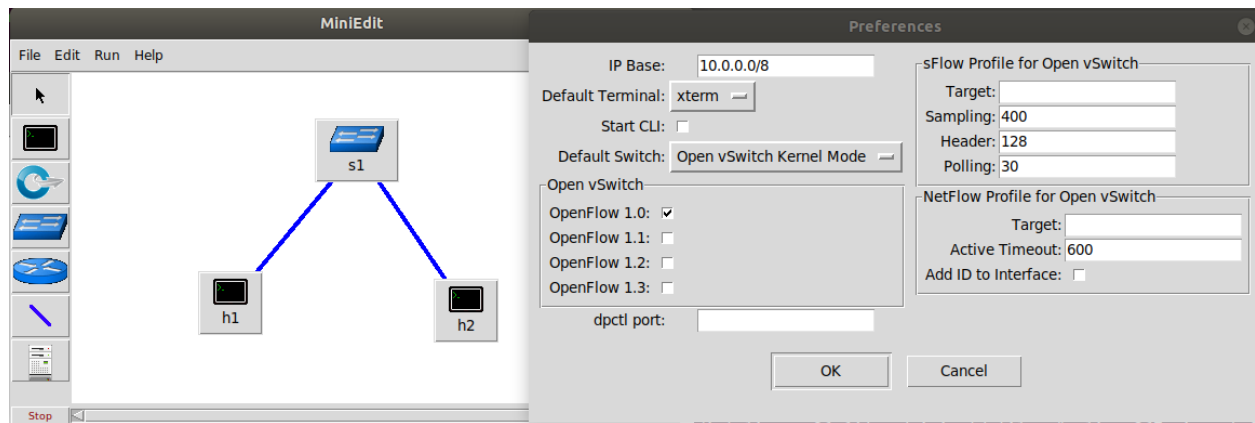
Step 2:

Configure the IP addresses of host h1 and host h2. Host h1's IP address is 10.0.0.1/8 and host h2's IP address is 10.0.0.2/8. A host can be configured by holding the right click and selecting properties on the device. For example, host h2 is assigned the IP address 10.0.0.2/8 in the figure below.



Automatic assignment of IP addresses

Click on Edit, Preferences button. The default IP base is 10.0.0.0/8. Modify this value to 15.0.0.0/8, and then press the OK button.



Discussion:

In this lab we learned how to install and perform basic tasks in Mininet emulator.