Mawlana Bhashani Science And Technology University

Lab-Report

Lab Report No:

Lab Report Name: SDN Controllers and Mininet

Group member ID: IT-18019 and IT-18037

Date of Performance:

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Submitted by

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Submitted To

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1. Objectives:

The objective of the lab 4 is to:
Install and use traffic generators as powerful tools for testing network performance.
Install and configure SDN Controller
Install and understand how the mininet simulator works
Implement and run basic examples for understanding the role of the controller and how it interact with mininet

2. Theory:

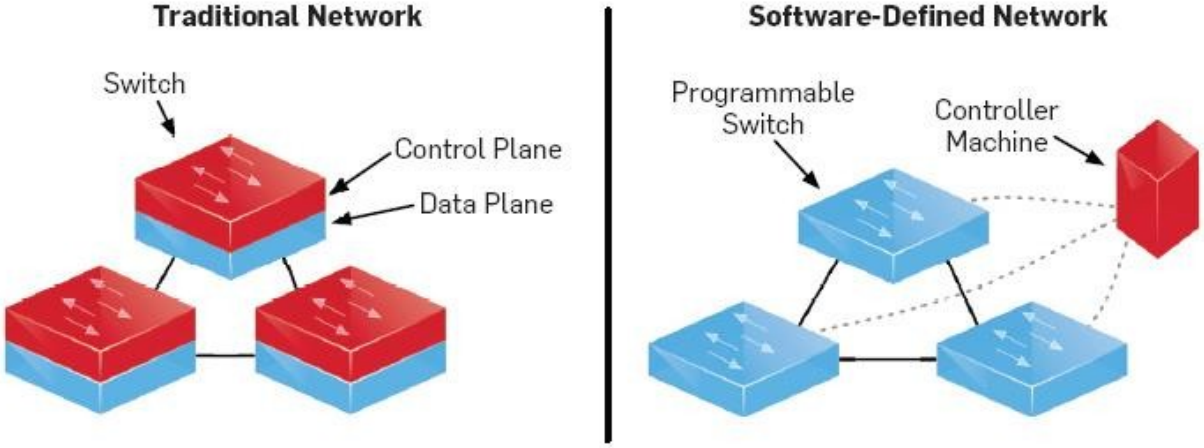
What is iPerf?: iPerf is a tool for active measurements of the maximum achievable bandwidth
on IP networks. It supports tuning of various parameters related to timing, buffers and protocols
(TCP, UDP, SCTP with IPv4 and IPv6). For each test it reports the bandwidth, loss, and other
parameters.
iPerf features
TCP and SCTP
o Measure bandwidth
o Report MSS/MTU size and observed read sizes.
o Support for TCP window size via socket buffers.
UDP
o Client can create UDP streams of specified bandwidth.
o Measure packet loss
o Measure delay jitter
o Multicast capable
Cross-platform: Windows, Linux, Android, MacOS X, FreeBSD, OpenBSD
Cross-platform: Windows, Linux, Android, MacOS X, FreeBSD, OpenBSD,
NetBSD, VxWorks, Solaris,...
Client and server can have multiple simultaneous connections (-P option).
Server handles multiple connections, rather than quitting after a single test.

Can run for specified time (-t option), rather than a set amount of data to
transfer (-n or -k option).
Print periodic, intermediate bandwidth, jitter, and loss reports at specified
intervals (-i option).
Run the server as a daemon (-D option)
Use representative streams to test out how link layer compression affects your
achievable bandwidth (-F option).

2.2. Software Defined Networking:

Software-defined networking was pioneered between 2008 and 2011 by work done at Stanford
University and the Nicira Company (now part of VMware). The basic premise behind SDN is

that by separating control of network functions from hardware devices, administrators acquire
more power to route and direct traffic in response to changing requirements.



Software-Defined vs. Traditional Networking: The key difference between traditional and
software-defined networking is how SDNs handle data packets. In a traditional network, the way
a switch handles an incoming data packet is written into its firmware. Most switches —

particularly those used in commercial data centers rather than enterprise environments —
respond to and route all packets the same way. SDN provides admins with granular control over
the way switches handle data, giving them the ability to automatically prioritize or block certain
types of packets. This, in turn, allows for greater efficiency without the need to invest in
expensive, application-specific network switches.
Benefits of Software-Defined Networking: There are several benefits to the more advanced
level of control afforded by implementing SND in a multi-tenant network environment:
- Automation: SND allows for automation of complex operational tasks that make
networks faster, more efficient and easier to manage.
- Increased uptime: SDN has proven effective in reducing deployment and configuration
errors that can lead to service disruptions.
- Less drain on resources: SDN gives administrators control over how their routers and
switches operate from a single, virtual workflow. This frees up key staff to focus on more
important tasks.
- Better visibility: With SDN, system administrator’s gain improved visibility into overall
network function, allowing them to allocate resources more effectively.
- Cost savings: SND can lead to significant overall costs savings. It also reduces the
amount of spending required on infrastructure by allowing data centers to get the most
use of their existing devices.

2.2.1. Controller:

OVS-testcontroller is a simple OpenFlow controller that manages any number of switches over
the OpenFlow protocol, causing them to function a

Ryu is a component-based software defined networking framework. Ryu provides software
components with well-defined API that make it easy for developers to create new network
management and control applications. Ryu supports various protocols for managing network
devices, such as OpenFlow, Netconf, OF-config, etc. About OpenFlow, Ryu supports fully 1.0,
1.2, 1.3, 1.4, 1.5 and Nicira Extensions. All of the code is freely available under the Apache 2.0
license.
2.2.2. Mininet: Mininet creates a realistic virtual network, running real kernel, switch and
application code, on a single machine (VM, cloud or native) Because you can easily interact
with your network using the Mininet CLI (and API), customize it, share it with others, or deploy it
on real hardware, Mininet is useful for development, teaching, and research. Mininet is also a
great way to develop, share, and experiment with OpenFlow and Software-Defined Networking
systems.

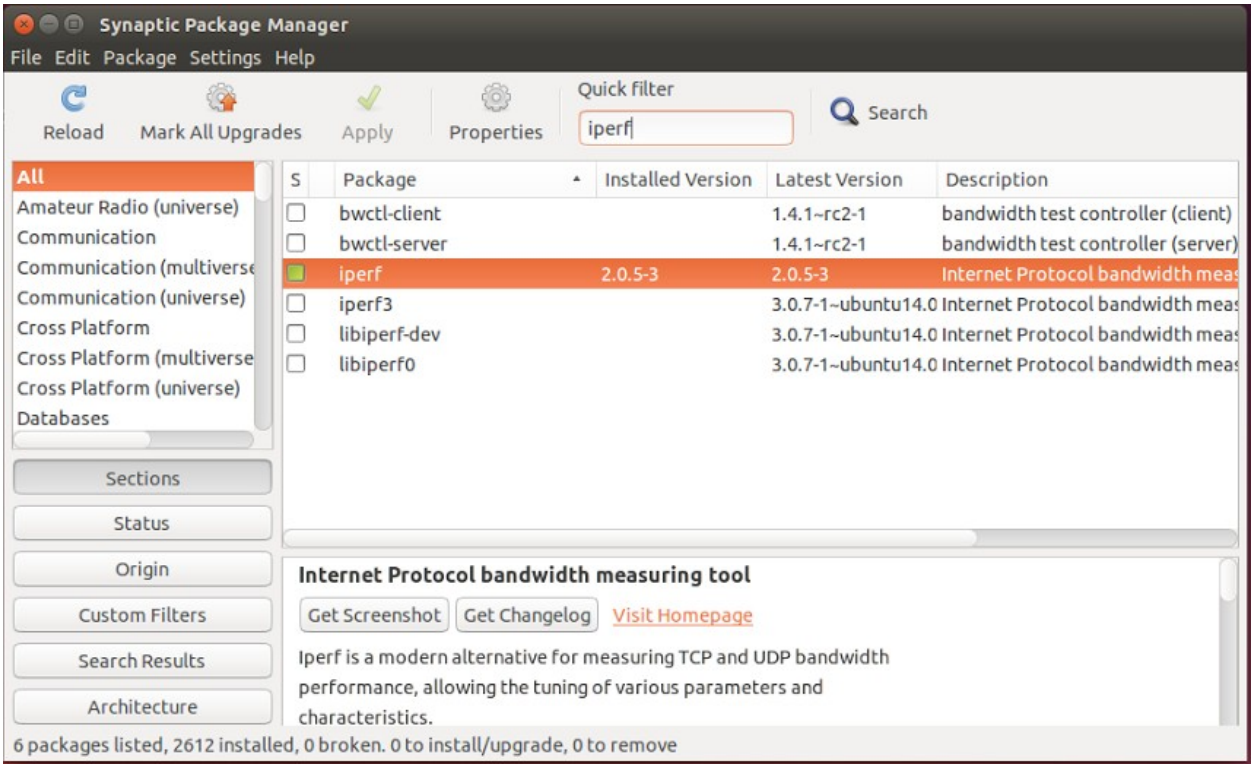
3. Methodology

TIP: For getting extra space in your USB-please use the following tips:

- Empty the trash
- Delete the Android related staff
- Delete the extras for other courses
- Delete the already installed package sources

Install iperf
1. Open the Synaptic Package Manager (Navigator ->System-> Synaptic Package
Manager)
2. Setup the proxy:
o Click on settings-> Preference -> Network
o Click on manual proxy configuration
o HTT and FTP Proxy: proxy.rmit.edu.au Port: 8080
3. Search for Quick filter `iperf`

4. Click on Mark for installation
5. Then click on Apply and wait until the package is installed

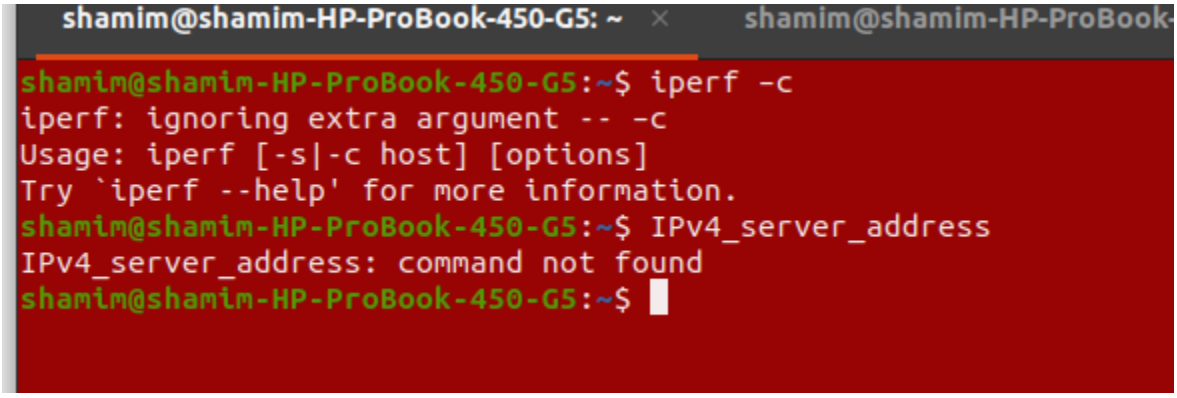


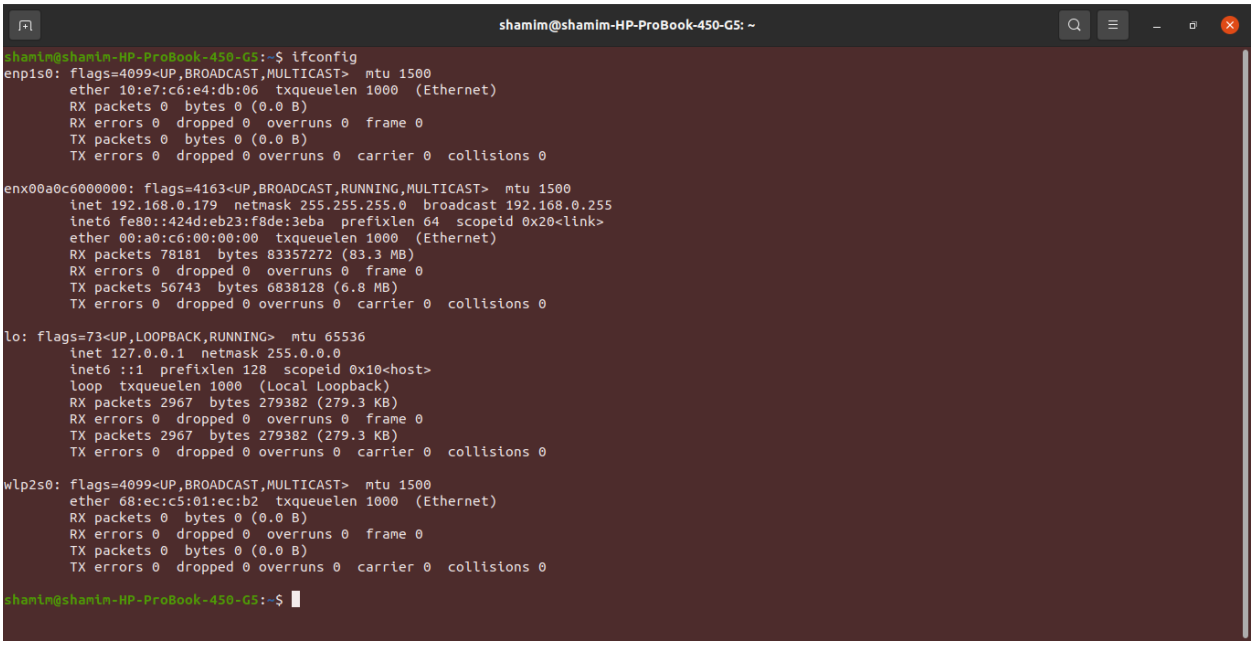
Install mininet
1. In Synaptic Package
2. Search for Quick filter `mininet`
3. Click on Mark for installation
4. Then click on Apply and wait until the package is installed

Install Controller
OVS controller:
1. In Synaptic Package
2. Search for Quick filter `openvswitch-controller`
3. Click on Mark for installation
4. Then click on Apply and wait until the package is installed
RYU controller:

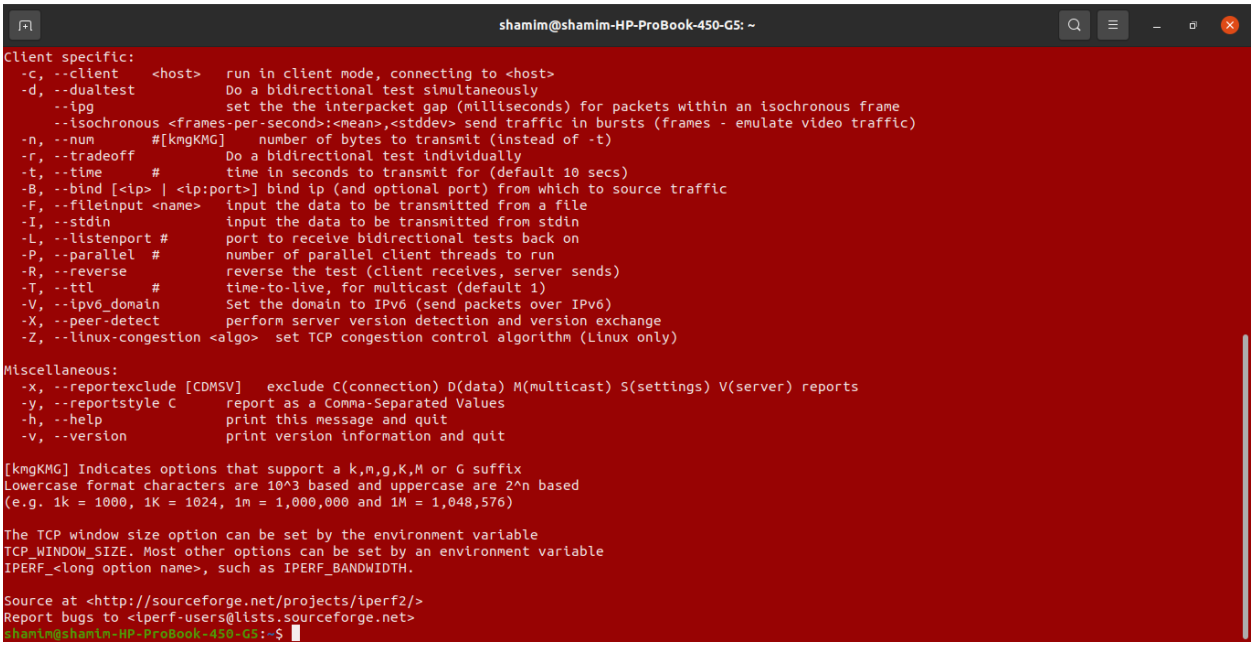
NOTE: Installation valid for Internet access without Proxy
1. Run the command line: sudo pip install ryu
2. In some cases the system will no install the required packages by defoulf, comand line in
this cases is: sudo pip install ryu eventlet routes webob paramiko lxml netaddr
oslo.config msgpack-python greenlet repoze.lru ecdsa six stevedore rfc3986
debtcollector

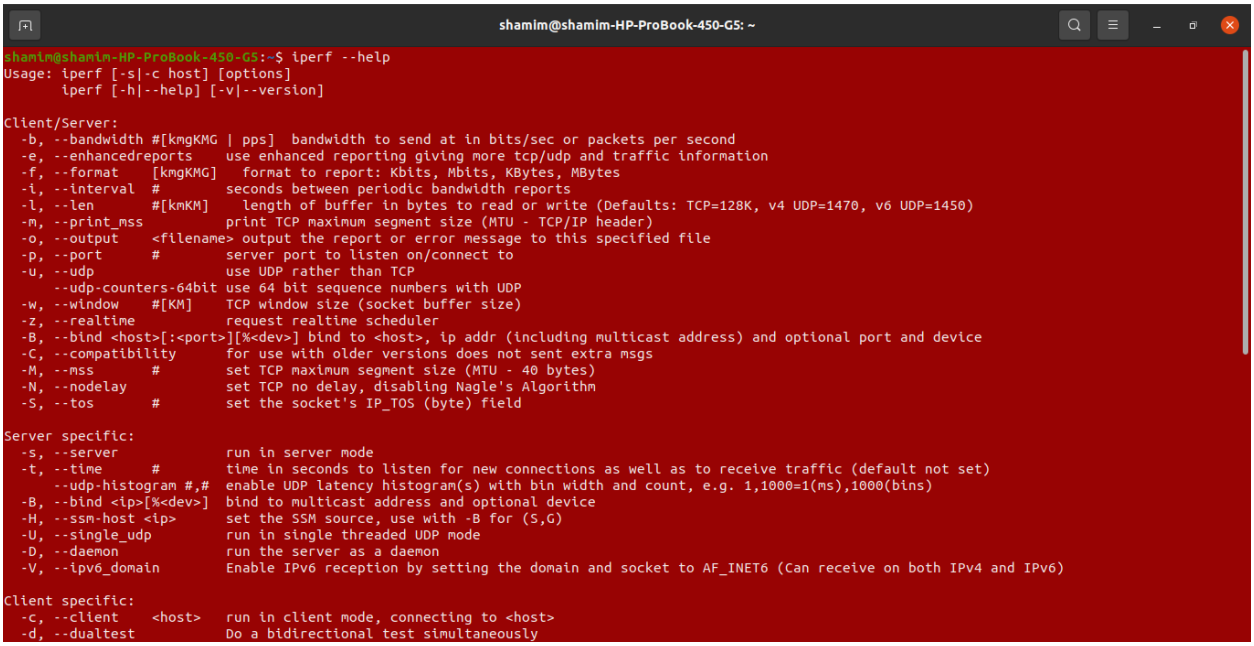
4. Exercises:

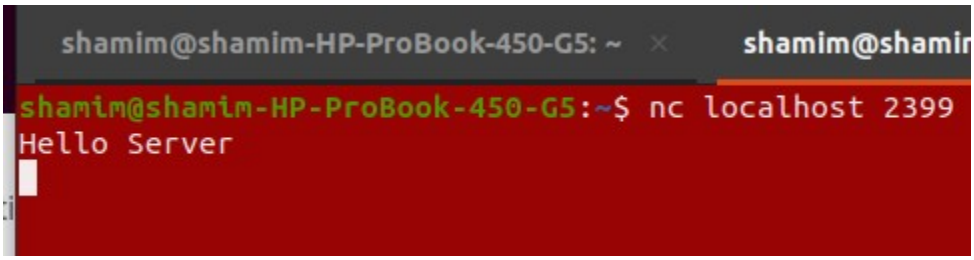


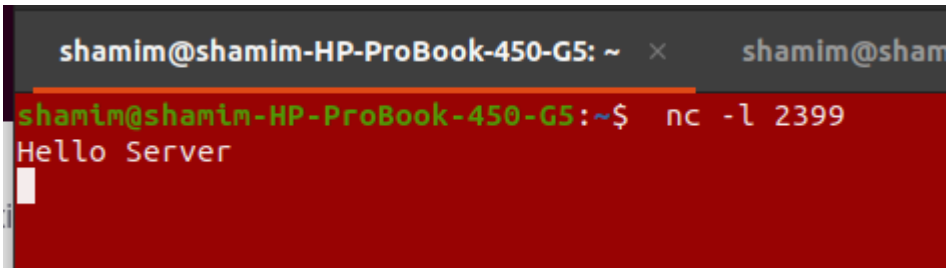


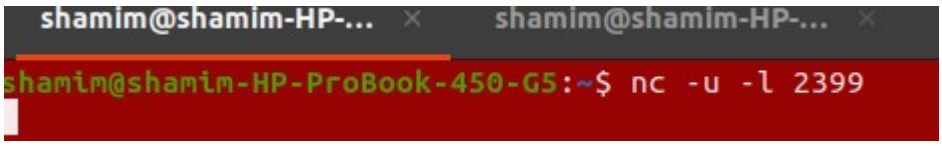
```
shamim@shamim-HP-ProBook-450-G5:~$ iperf -s
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
```

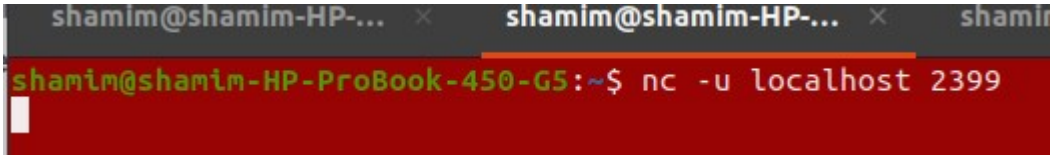


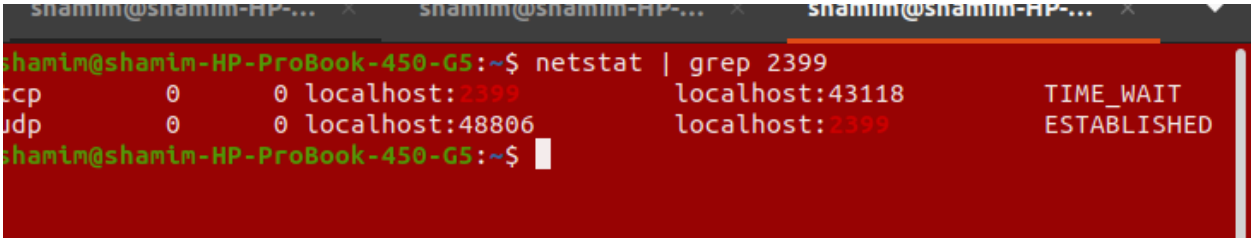

shamim@shamim-HP-ProBook-450-G5: ~
shamim@shamim-HP-ProBook-450-G5:~$ iperf --help
Usage: iperf [-s|-c host] [options]
iperf [-h|--help] [-v|--version]
Client/Server:
-b, --bandwidth #[kmgKMG | pps] bandwidth to send at in bits/sec or packets per second
-e, --enhancedreports use enhanced reporting giving more tcp/udp and traffic information
-f, --format [kmgKMG] format to report: Kbits, Mbits, KBytes, MBytes
-i, --interval # seconds between periodic bandwidth reports
-l, --len #[kmKM] length of buffer in bytes to read or write (Defaults: TCP=128K, v4 UDP=1470, v6 UDP=1450)
-m, --print_mss print TCP maximum segment size (MTU - TCP/IP header)
-o, --output <filename> output the report or error message to this specified file
-p, --port # server port to listen on/connect to
-u, --udp use UDP rather than TCP
--udp-counters-64bit use 64 bit sequence numbers with UDP
-w, --window #[KM] TCP window size (socket buffer size)
-z, --realtime request realtime scheduler
-B, --bind <host>[:<port>][%<dev>] bind to <host>, ip addr (including multicast address) and optional port and device
-C, --compatibility for use with older versions does not sent extra msgs
-M, --mss # set TCP maximum segment size (MTU - 40 bytes)
-N, --nodelay set TCP no delay, disabling Nagle's Algorithm
-S, --tos # set the socket's IP_TOS (byte) field
Server specific:
-s, --server run in server mode
-t, --time # time in seconds to listen for new connections as well as to receive traffic (default not set)
--udp-histogram #,# enable UDP latency histogram(s) with bin width and count, e.g. 1,1000=1(ms),1000(bins)
-B, --bind <ip>[%<dev>] bind to multicast address and optional device
-H, --ssm-host <ip> set the SSM source, use with -B for (S,G)
-U, --single_udp run in single threaded UDP mode
-D, --daemon run the server as a daemon
-V, --ipv6_domain Enable IPv6 reception by setting the domain and socket to AF_INET6 (Can receive on both IPv4 and IPv6)
Client specific:
-c, --client <host> run in client mode, connecting to <host>
-d, --dualtest Do a bidirectional test simultaneously


shamim@shamim-HP-ProBook-450-G5: ~
shamim@shamir
shamim@shamim-HP-ProBook-450-G5:~$ nc localhost 2399
Hello Server


shamim@shamim-HP-ProBook-450-G5: ~
shamim@sham
shamim@shamim-HP-ProBook-450-G5:~$ nc -l 2399
Hello Server


shamim@shamim-HP-...
shamim@shamim-HP-...
shamim@shamim-HP-ProBook-450-G5:~$ nc -u -l 2399





Dear Sir ,i can not install mininet in my linux pc.i try to install this but my system many time fail to run this software .