

# Configuration Manual

In this research project, the problem of having multiple controllers in a Software Defined Network has been focused. An algorithm called Round Robin Switch Scheduler has been built to make sure that the controllers are load balanced and result in significantly better network performance.

In order to develop, deploy and run experiments to implement the algorithm logic, the following tools and technologies have been used.

- 1. Mininet and Mininet Python API** – Mininet is an emulator software which emulates large scaled Software Defined Networks quite efficiently. It can be installed and configured in three ways:
  - Download a mininet VM from <http://mininet.org>
  - Install mininet from git by using the command  
`git clone git://github.com/mininet/mininet`  
`mininet/util/install.sh`
  - The third option is to manually install Mininet on an existing Ubuntu Virtual Machine
- 2. Download Ubuntu Desktop 20.04** Operating System and install it on **Oracle Virtual Box** virtualization software.  
To run Mininet networks, the virtual machine will need to have at least 2GB of RAM and 8GB Hard disk. Furthermore, to enable SSH to the VM, a Host-Only Network adapter has to be added along with the default one.
- 3. XTerminal** – It is one of the most useful tools to launch graphical interface applications and multiple host windows in Mininet environment. It needs to be enabled in `/etc/ssh/ssh_config`. Use nano or gedit to modify the config file. Go to the entry 'X11 Forwarding' and change it to 'Yes' and save the file.
- 4. Gnuplot and Iperf** – Iperf is utilized to populate the network with traffic and measure the performance such as throughput.  
Gnuplot is a tool, pre-installed with Mininet, used to plot graphs based from an output file.

Once an output file is generated, we need to launch Gnuplot shell by typing the command 'gnuplot'. Within this shell, we need to set a

terminal. In this case we set the terminal to xterm by the command 'set terminal xterm'.

Once done, the graph is plotted with linespoints, Graph title, X Label and Y Label.

- 5. Wireshark** - Wireshark is one of the best packet analyser tools and it is widely used by researchers, developers and networking engineers. It records detailed information of the packets generated on a particular network interface. In this project, Wireshark has been used on the Ubuntu VM and on individual hosts from the Mininet Network. It lists all the packets with details such as Time, Source (MAC address/IP address), Destination (MAC address/IP address), Protocol (ICMP, MDNS, OF etc).