FIT3142 Laboratory #7
Measuring Network Performance

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Contents

1 Laboratory Task Definition (100% Marks)

Background

This laboratory exercise is intended to provide you with practice using `nttcp` and `sockperf`, both of which were developed to measure network performance. The `sockperf` tool can measure both latency and throughput, and is widely used for testing cluster fabric performance.

Your individual 2 Tasks comprise the following:

1.1 Task 1 (33.3% Marks)

1. Pair up with another student and take turns running `nttcp` as receiver and transmitter, as described in this task.
2. Determine which machine will operate as the server. Identify its IP address and run `nttcp -i -v` on it. Demonstrate this to your tutor.
3. On the client machine run `nttcp -t -T SERVER_IP`, where `SERVER_IP` is the IP address of the machine selected to be the server. Demonstrate this to your tutor.
4. Perform `nttcp` throughput tests for buffer lengths of 64, 128, 512, 1024, 2048, 4096 and 16,384 bytes, and record the results. Tabulate the measured throughput as a function of the buffer size. Explain what you observe and why it happens.
5. Perform nttcp throughput tests for buffer lengths of 64, 128, 512, 1024, 2048, 4096 and 16,384 bytes, and record the results, using UDP mode. Tabulate the measured throughput as a function of the buffer size. Explain what you observe and why it happens.

1.2 Task 2 (33.3% Marks)

1. Perform a local process to process ping-pong test on your desktop using `sockperf`, by launching the server in one window, and the client in another.
   (a) Launch server on local host: `myhost% ./sockperf sr --tcp`
   (b) Launch client on local host: `myhost% ./sockperf pp -i 127.0.0.1 --tcp -t 10`
   (c) Repeat the test five times, record the latency, and calculate the average latency per test.
2. Perform a local process to process throughput test on your desktop using `sockperf`, by launching the server in one window, and the client in another.
   (a) Launch client on local host: `myhost% ./sockperf tp -i 127.0.0.1 --tcp -t 10`
   (b) Repeat the test five times, record the throughput, and calculate the average throughput per test.
   (c) Launch client on local host with optimal message size: `myhost% ./sockperf tp -i 127.0.0.1 --tcp -t 10 --msg-size=1472`
   (d) Repeat the test five times, record the throughput, and calculate the average throughput per test.
3. Pair up with another student and take turns running `sockperf` as server and client, using the ping-pong test between hosts. Demonstrate this to your tutor.
   (a) Launch server on remote host: `myhost% ./sockperf sr --tcp`
   (b) Launch client on local host: `myhost% ./sockperf pp -i <serverhost> --tcp -t 10`
   (c) Repeat the test five times, record the latency, and calculate the average latency per test.
4. Pair up with another student and take turns running `sockperf` as server and client, using the throughput test between hosts. Demonstrate this to your tutor.
   (a) Launch client on remote host: `myhost% ./sockperf tp -i <serverhost> --tcp -t 10`
   (b) Repeat the test five times, record the throughput, and calculate the average throughput per test.
   (c) Launch client on local host with optimal message size: `myhost% ./sockperf tp -i <serverhost> --tcp -t 10 --msg-size=1472`
   (d) Repeat the test five times, record the throughput, and calculate the average throughput per test.

5. Tabulate the results and explain the differences observed between short and optimal message sizes in the throughput tests. Compare latency results for the local and host-to-host tests and explain the differences observed ;
6. Explain the differences observed in results for the Task 2 throughput tests, and the Task 1 throughput tests.

1.3 Task 3 (33.3% Marks)

1. Each of the Laboratory PCs has two network interfaces. One interface operates on the common (shared) network for these Lab areas, and the other is connected to a dedicated network switch. You can use the `ifconfig` tool from the command line to find the IP addresses for each of these interfaces.
2. Using the second (dedicated) network interfaces on a pair of machines, rather than the common network interfaces, repeat the testing you performed in Task 2 for the paired local and remote hosts (Steps 3 and 4).
3. Explain the differences observed in results for the Task 3 throughput tests, and the Task 2 remote host throughput tests.

Recommended Reading Materials:

1. `nttcp` manual page
2. `http://sockperf.googlecode.com/svn/branches/sockperf_v1/doc/main.dox`
3. `http://tldp.org/LDP/intro-linux/html/` for students without Linux experience.

It is strongly recommended that you read the supporting materials and understand the tasks you are to perform before you attend the tutorial. There will not be sufficient time during the tutorial for you to do the preparation and assigned tasks.

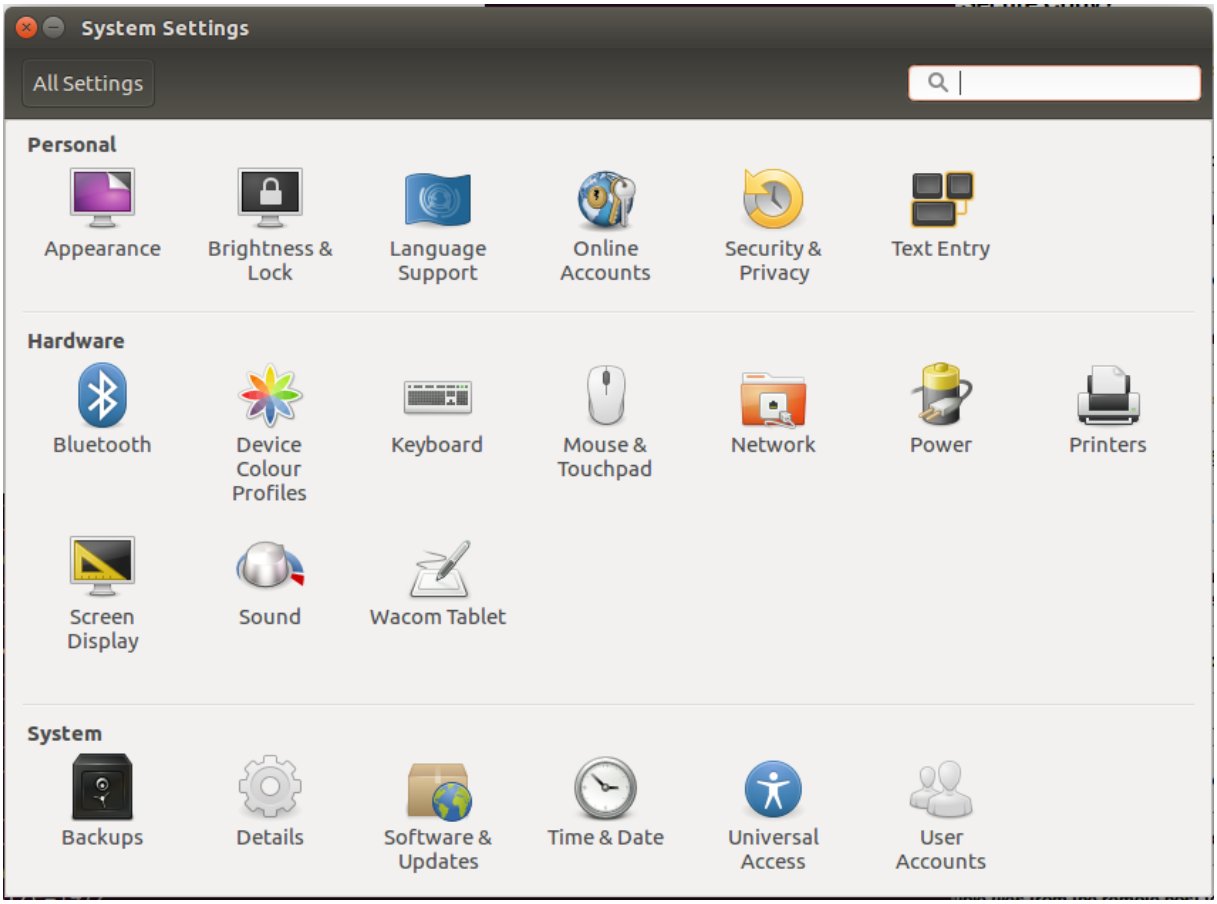
2 Assessment Checklist

1. (33.3% marks) Show and describe in words successful completion of Task 1.
2. (33.3% marks) Show and describe in words successful completion of Task 2.
3. (33.3% marks) Show and describe in words successful completion of Task 3.

3 Configuring the Second Network Interface on a Lab PC

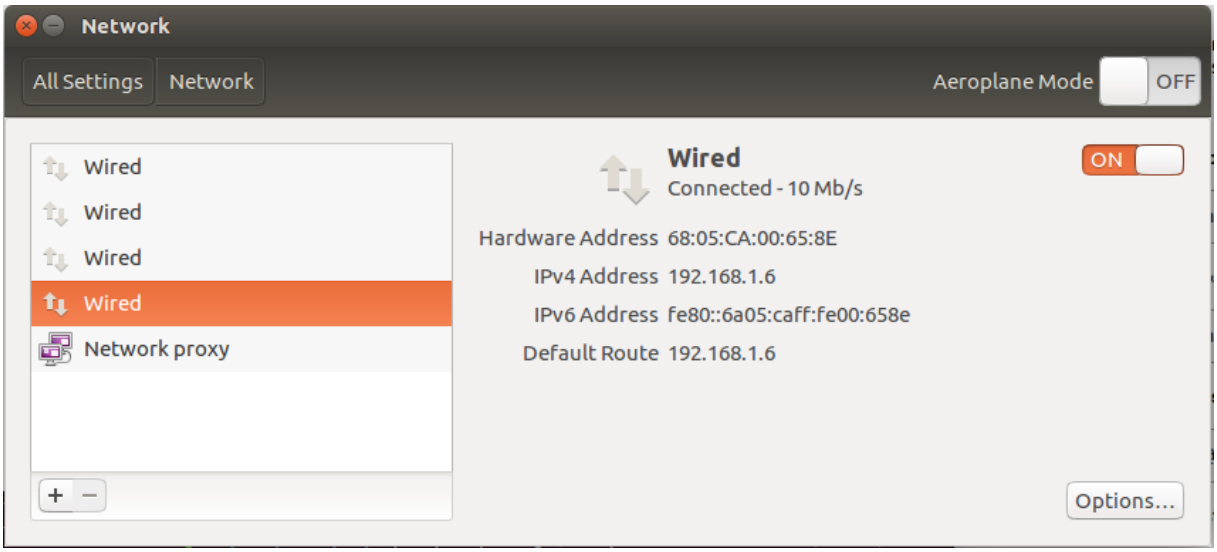
The PCs running Linux in the networking labs are equipped with an additional network interface. While the Linux operating system has a configuration file for this interface, it will not necessarily activate the interface at boot time.

The network interface must be active for you to be able to perform lab tasks.



Open the `System Settings` and locate the `Network Settings` tool.

Launch the `Network Settings` tool.



Locate the second network interface in the pane. It will have an IPV4 address of 192.168.1.N, where N is a small integer, and it should show `Connected - 10 Mb/s`.

Activate the interface using the slider in the upper right hand corner of the pane.

Using `ifconfig` from the command line, check to see if the interface is properly active.

The second network interface should appear as `enp3s0` with the IPV4 address shown in the `Network Settings` tool pane.

Take note of this IPV4 address, as this may be needed during the lab if the PC is used as the server in the task.

Also note the IPV4 address of the native network interface `eno1`, as this may also be needed during the lab if the PC is used as the server in the task.

If this fails, consult your tutor.

```
lkumarap@026-147-006wl:~/Desktop/Lab7$ ifconfig
docker0   Link encap:Ethernet  HWaddr 02:42:26:b4:a7:77
          inet addr:172.17.0.1  Bcast:0.0.0.0  Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

eno1      Link encap:Ethernet  HWaddr 64:00:6a:72:28:d0
          inet addr:118.138.163.136  Bcast:118.138.163.255  Mask:255.255.254.0
          inet6 addr: 2001:388:608c:6c52:f17a:2f1:7945:434e/64 Scope:Global
          inet6 addr: fe80::b591:dd22:eb27:5fd4/64 Scope:Link
          inet6 addr: 2001:388:608c:6c52:49ba:23ed:1694:ccf5/64 Scope:Global
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2296717 errors:0 dropped:0 overruns:0 frame:0
          TX packets:790091 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1125795124 (1.1 GB)  TX bytes:225560561 (225.5 MB)
          Interrupt:20 Memory:f7200000-f7220000

enp3s0    Link encap:Ethernet  HWaddr 68:05:ca:00:65:8e
          inet addr:192.168.1.6  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::6a05:caff:fe00:658e/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:87490 errors:0 dropped:0 overruns:0 frame:0
          TX packets:118684 errors:0 dropped:0 overruns:0 carrier:0
          collisions:3678 txqueuelen:1000
          RX bytes:6915160 (6.9 MB)  TX bytes:99268904 (99.2 MB)
          Interrupt:16 Memory:f71c0000-f71e0000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:103409 errors:0 dropped:0 overruns:0 frame:0
          TX packets:103409 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:13730794 (13.7 MB)  TX bytes:13730794 (13.7 MB)

vmnet1    Link encap:Ethernet  HWaddr 00:50:56:c0:00:01
          inet addr:172.16.94.1  Bcast:172.16.94.255  Mask:255.255.255.0
          inet6 addr: fe80::250:56ff:fec0:1/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:7811 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

vmnet8    Link encap:Ethernet  HWaddr 00:50:56:c0:00:08
          inet addr:192.168.57.1  Bcast:192.168.57.255  Mask:255.255.255.0
          inet6 addr: fe80::250:56ff:fec0:8/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:7763 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lkumarap@026-147-006wl:~/Desktop/Lab7$
```