Analyzing Performance of TCP during Handoff in Real Mobile Networks

A progress report submitted as part of a project for the course CSL838 Wireless Networks

by

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1   Introduction

TCP is a core protocol of the internet protocol suite. TCP promises sure shot delivery as part of the transport layer. Over the passage of time, various variants of TCP have been designed which differ in terms of how aggressively they manipulate transmission windows, how they deal with packet loss, packet time outs etc. In our project, we study the performance of some variants of TCP during hand off in real mobile networks. Through this progress report we would discuss the equipment setup and the tools we would use to measure and analyse the above activity. We would also present a timeline about what has been done and what we plan to do, as the project proceeds.

2   Work done till now

- Studying TCP Implementations in Linux Kernels, specifically Ubuntu 14.04

- Configuring TCP Parameters in Ubuntu 14.04

- Determining Tool Setup for analysis of performance

- Finding applications for capturing and analysing cellular network parameters

- Plan for data gathering

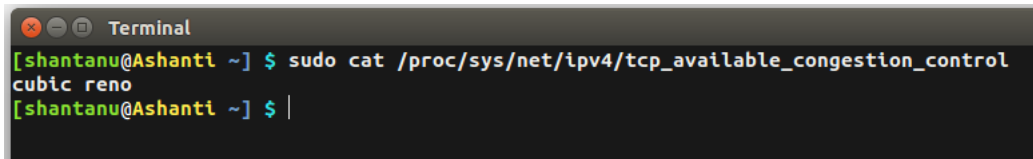These points are further described in the sections below.

3   TCP Implementations in Linux Kernels

After going through linux user manuals and online research, we found that available congestion control algorithms for a linux distribution can be checked by using:

$ **cat** /proc/sys/net/ipv4/tcp_available_congestion_control

The above command must be executed with root privileges.

Running the above command on Ubuntu 14.04 showed the following results:

As the screenshot shows, there are only two algorithms available. For our project, we aim to analyse atleast three algorithms. On further probing the manuals, we found that it is possible to plug in more modules to the kernel using user mode linux package. This will be done in the next phase.

4   Configuring TCP in Ubuntu 14.04

We can switch between different TCP variants (congestion control algorithms) using the following command:

$ **echo** X > /proc/sys/net/ipv4/tcp_congestion_control

where X is the congestion control algorithm listed for the linux kernel.

NOTE: X must be in the list of available congestion control algorithms.
The above command must be executed with root privileges.

3

Above screenshot shows:

- Available congestion control algorithms in Ubuntu 14.04

- Default congestion control algorithm in Ubuntu 14.04

- New congestion control algorithm after the command in run

5 Determining Tool Setup for analysis of performance

After discussion with various people who have worked and analysed performance of certain metrics during hand-off in cellular networks, we have decided to use the following setup:
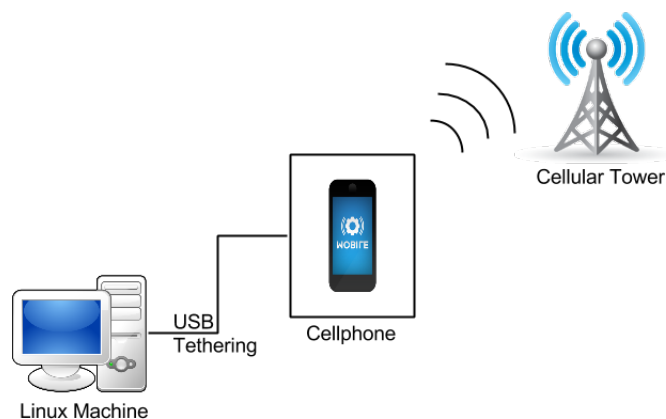
As seen from figure, we will be using USB tethering for connecting the cellphone with the machine. We will then gather data on the cellphone and machine by donwloading a file over the cellular network while jumping from one cell tower to other.

6 Finding applications for capturing and analysing cellular network parameters

We wish to bring to your notice that earlier when we submitted our project proposal, we planned to develop an android application that would gather any data related to cellular network. After researching, we have found that there exist many applications for the android platform that can do this job for us. So, we would be using one of those applications (RF Tracker) for our project.

RF Tracker would help us in keeping track of the following metrics:

- Data Traffic
- RF Data
- WiFi data
- Received Signal Strength indication
- Free Space Loss
- Roaming and Data states
- Possible handoff neighbors

7 Plan for Data gathering

We will be gathering data by RF Drive testing. We will elaborate about this procedure in the main project report. Data gathered through this process

will be presented in the next phase of the project. During this process, we will switch between 3G and 2G modes while gathering and monitoring various parameters of analysis.

8   Timeline

	February 1-15	February 15-28	March 1-15	March 16-31	April 1-15
Milestone 1					
Milestone 2					
Milestone 3					
Milestone 4					

Milestone 1: Understanding implementations of different variants of TCP on Ubuntu 14.04 and changing congestion control algorithm in Ubuntu 14.04

Milestone 2: ~~Development of Android Application.~~ Determine tool setup and data gathering tools and understand their working.

Milestone 3: Data gathering by using the android device on the field and exposing it to handoffs on the mobile carrier's network.

Milestone 4: Performance comparison and data analysis.

9   Conclusion

Since we didnt need to develop an android application for capturing cellular network parameters, we have saved significant time in this phase. Hence, we will start gathering data for the next phase earlier than planned (starting this week instead of first week of March).
In our opinion, so far, the project is right on schedule.