CS 470 Project 2

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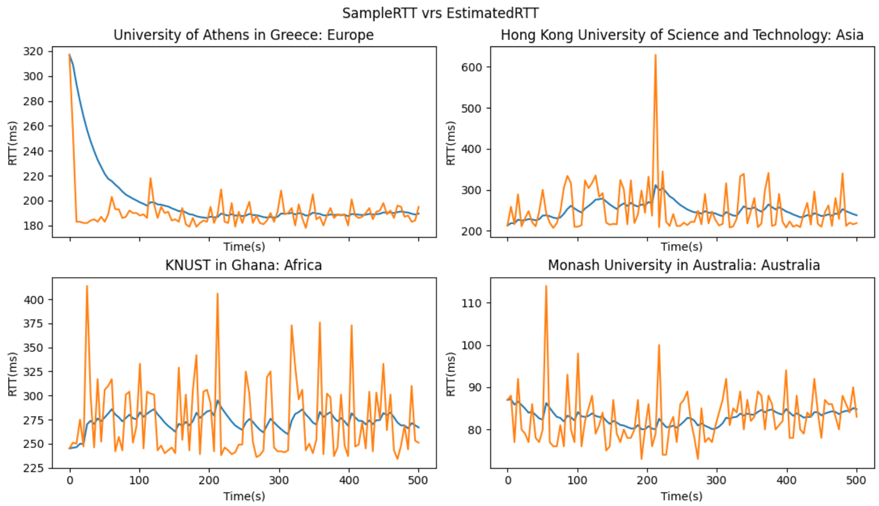
April 13, 2022

1 Project Description

I decided to use python for this project because of the libraries available. For pinging and recording the time it takes to ping each server, I used the libraries ”os” and ”time.” I used the ”numpy” library to construct arrays to store the time, as well as the ”re” library to find the RTT in the ping values returned by the ping function. All of the graphs for the sample RTT and Estimated RTT, as well as the time intervals, were created with matplotlib. The following are the servers pinged:

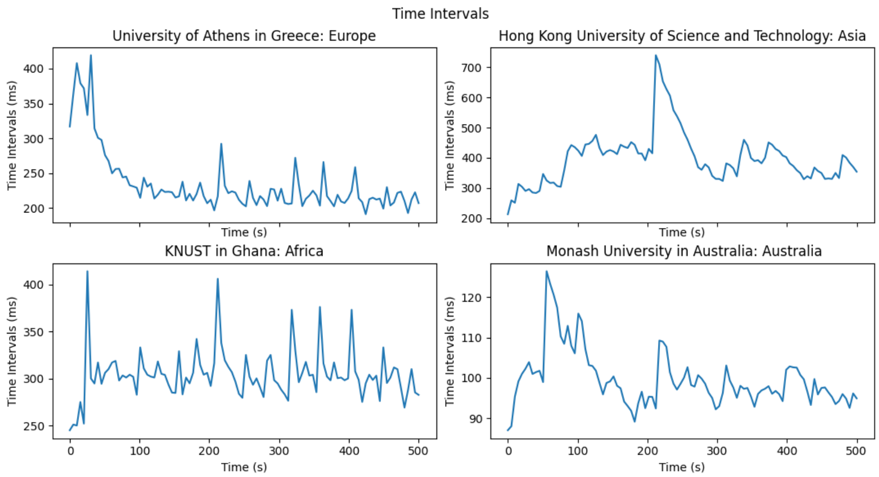
- University of Athens in Greece: 195.134.71.228 in Europe
- Hong Kong University of Science and Technology: 143.89.12.134 in Asia
- KNUST in Ghana: 129.122.16.228 in Africa
- Monash University in Australia 203.82.24.7 in Australia

2 Sample RTT and Estimated RTT



When we look at the graph for Europe, we can see that there are occasional peaks here and there, but overall there are some constant RTTs. There was an initial spike of about 320 milliseconds. The maximum peak measured 320 milliseconds, while the lowest measured 185 milliseconds. The Estimated RTT is rather stable and constant throughout the entire time except for the initial major spike. When you look at the graph from Asia, you can see that it has the greatest peak, and you can see the internet's bursty nature with large spikes and huge drops in RTT. It also exhibited the largest peak of all the graphs, with an RTT of around 600 milliseconds. This might indicate a congested network of some type. The Estimated RTT is in line with the trend, although it is considerably more stable and has an increasing tendency. The graph from Africa is particularly intriguing since it has some of the highest sample RTTs, but the RTTs are also rather consistent. The back and forth peaks in the RTT values suggest that the bursty nature of the internet at that time. The high RTT values can be attributed to a busy server. The graph from Australia looks similar to that of Africa but had some the lowest RTT values compared to the other four. The highest RTT value it recorded was about 110 milliseconds. The trend of the RTT values suggest a bursty nature of the internet and somewhat of a congested network.

3 Timeout Intervals



The timeout interval graphs correlate with their Sample RTT and estimated RTT readings. The timeout value is around 400 milliseconds for Europe at the beginning, which is roughly 80 milliseconds longer than the estimated RTT, which is ideal and implies no data packet loss even though it looks unusual. If the timeout interval was longer than the estimated RTT, then this would have been a concern since TCP would not immediately re-transmit its data, resulting in a congested network and data transfer delays. The timeout interval is determined by adding a margin to the Estimated RTT. When there is a lot of variation in the Sample RTT values, the margin should be wide; when there is minimal variation, the margin should be small. This is when devRTT comes in handy. The Asia graph included several intriguing observations, such as a timeout value of 700 milliseconds, which is roughly 100 milliseconds longer than the estimated RTT. This indicates that the packet was not lost eventhough the timeout interval seemed like a lot. In comparison to the other four graphs, Australia had some of the shortest timeout intervals, which reflects its low estimated RTT. Africa had the most consistent timeout intervals, which mirrored its estimated RTT, which was smooth and constant.