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Data Rate Measures For 4G Mobile Networks In Albania

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Abstract

Companies of mobile telephony operate in a highly competitive market. Subscribers, with the possibilities given to them to change the operators, can easily change network based on the services offered to them. Due to this, all mobile operators which aim to grow and establish a better position in the market they operate, are involved permanently in offering better services for their current and pretended subscribers. The quality, the speed and all related values to data offered are fields which the operators in Albania aim to improve. From 4 Mobile Operators in Albania, 3 of them offer 4G LTE data service. This paper focus on measuring how real the data values declared by them are and how good is the quality of 4G LTE service offered. Through this paper we will discuss over different measures made in Tirana city related to rate fluctuation of uplink and downlink throughput of data service. The measures are located in 6 different points in Tirana city, which are chosen based on the traffic rate. Measures (made at the same day and time for all the operators in order to have equality) are realized through a Huawei LTE modem for FTP DL/UL.

Keywords

4G LTE, Data Throughput, LTE modem

1. INTRODUCTION

The mobile telecommunication industry operates in a high speed growing market. This is a dynamic area in which every operator needs to stay up to date in order to be competitive and to get as soon as possible competitive advantages. Based on the services offered in this industry the one which has had the most frenetic growth and is growing more and more is the data service offered to subscribers. The data network is developing with galloping steps. In a short period of time we have been witness of going through 2G to 3G and now a days Albanian operators offer 4G LTE technology.

LTE is a network with only eNode-B nodes, and it can be considered as a changed core network that has replaced GPRS core network made from the GGSN (Gateway GPRS support node) and SGSN (Serving GPRS support node) nodes.

In this core network we face some other nodes like: MME (Mobility Management Entity), HSS (Home Subscriber Server), SGW (Serving Gateway) etc. In Albania the number of internet users and specifically of 4G LTE users has seen a growth from year to year. Related to the number of internet users in mobile phone, it varies from 45% to 50% of population. In Albania there are 4 mobile operators, from which 3 of them offer 4G.

This paper will concenter in the upload and download speed offered from the operators. The tools used for the drive test and the further analysis are as per below:

- TEMS Investigation Software
- Two Samsung Galaxy Note 4 mobile phones, 1 x PCTelscanner, 3 x Huawei LTE modem.
- One Laptop Computer, 1 x GPS, TemsDiscovery Tool, ActixTool

2. TEST METHOD

- Huawei LTE modem used for FTP DL/UL in six different points in Tirana City with same radio conditions for 3 operators.
- One scanner for LTE network.

USB LTE stick E3272 [1] supports the maximum speed 150 Mbit/s downlink and 50 Mbit/s in the uplink, which corresponds to LTE category. For its use are needed some drivers (which installs on the first usage), for further connections there are not needed further actions.

- Huawei E3272 can use worldwide:
- LTE: 800/900/1800/2100/2600 MHz
- UMTS: 900/2100 MHz
- GSM: 850/900/1800/1900 MHz

It can be used with both Windows and Mac OS like Windows system from XP (Service Pack 3), Windows Vista (Service Pack 1), to Windows 7 or Windows 8, alternatively you can of course also use it with MAC OS.

We have used TEMS Investigation [2] because it supports the most part of recent technologies, thus it has been seen as the most appropriate tool for this kind of test. It is relatively easy to be used since it can be positioned by the device that was used to make the measure and then with very simplicity the test maker could make the test. It can be used for specific and updated to customer need scenarios like in our case.

3. RESULTS

All measures are made in 45 points in the city of Tirana. 45 points are grouped in 5 main divisions. Grouping is realized according to similarities of the measure points. So the results are expressed analyzed and grouped in the following main divisions: Coffee area, Hotel, Residential Area, Shopping Mall and University. All the measures are made in Tirana city, which is the capital city of Albania. Tirana [3] has a population of 811,649 persons with a density of about 450/km2. Tirana is the most populated area in Albania where the migration process is very high.

Measures are made during 1 week and take in consideration only 3 (Eagle Mobile, Vodafone, AMC) from the 4 mobile operators because only 3 of them offers 4G [4].

The below graph shows the information related to Ping Avg.:

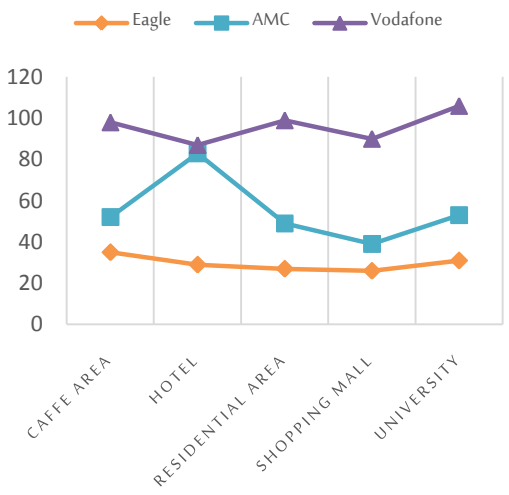

Figure 1. Ping avg.

From the graph we can easily see that the best connection with the antennas belongs for Vodafone operator, then it comes AMC and the last is Eagle Mobile.

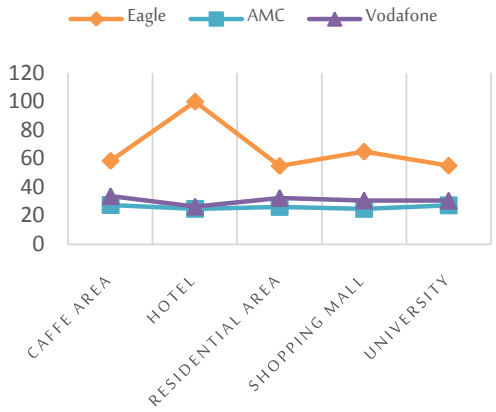

Figure 2. Information related to dl max throughput (Mbit/s)

Related to DL it is seen that the Max Throughput is in the Hotel area and belongs to Eagle Mobile operator. It has a value of 99.93 Mbit/s.

Figure 3. Information related to dl avg. throughput (Mbit/s)

Also it is seen that the highest average throughput related to DL belongs to Eagle Mobile operator. In all the 5 divisions this operator has an upper DL throughput than the other operators.

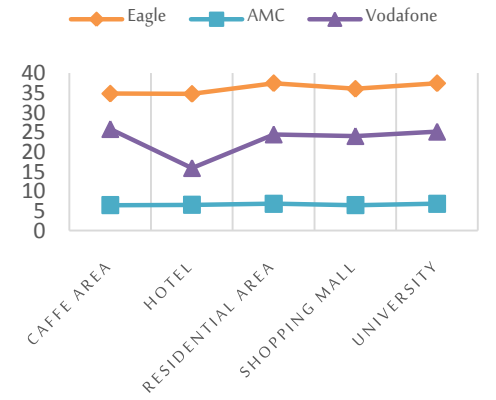

Figure 4. UL max throughput (Mbit/s)

In the UL throughput we have noticed a smaller fluctuation. The values are closer to each other. Even in this case Eagle Mobile operator has the highest values where the max value reached in the residential area with 37.46 Mbit/s.

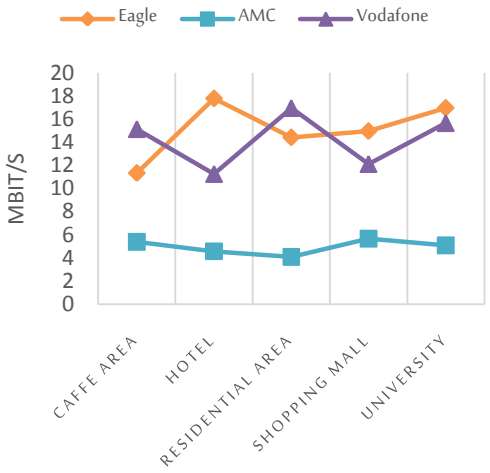

Figure 5. UL avg. throughput (Mbit/s)

In the average throughput of UL there are 2 operators which alter with one another for the highest values (EM and Vodafone). The areas with the highest values are Hotel and Residential areas.

3.1. ANALYSIS

The above table shows information related to mean, median, standard deviation, max and min of measured values. Median values are chosen because since the measures are made in different locations and with irregular schedule the median value describes better the average trends of distributions of both DL Avg. Throughput (Mbit/s) and UL Avg. Throughput (Mbit/s). Standard deviation shows how spread are the values measured. Maximum and minimum data shows the upper and the below value that are measured. From the measured we have noticed that the max values for DL Avg. Throughput (Mbit/s) are measured in Hotel area and belongs to Eagle Mobile operator (60.36 Mbit/s). The min values for DL Avg. Throughput (Mbit/s) are seen in Residential areas
(17.1 Mbit/s). The max values for UL Avg. Throughput (17.81 Mbit/s) are measured in Hotel area and the min values for UL Avg. Throughput (4.09 Mbit/s) are seen in Residential area.
The area with the maximum standard deviation is the hotel area and the area with the least standard deviation is the University area.

Even though we have measured some cases of good UL or DL throughput the averages of all areas are not excellent all the cases, related to the values of 4G LTE that the operators claim to have in the best scenario (100 Mbit/s in downlink and 50 Mbit/s in uplink).

Table 6. Analysis table

AREA		MEAN	MED.	ST.DEV	MAX	MIN
Caffe	DL	23.56	21.31	3.62	28.67	20.71
Hotel	DL	33.21	20.80	19.22	60.36	18.48
Residential	DL	23.70	24.65	5.04	29.34	17.10
Shop.Mall	DL	27.09	23.79	7.08	36.93	20.55
University	DL	24.67	24.29	0.97	26.00	23.72
Caffe	UL	10.63	11.35	4.00	15.14	5.41
Hotel	UL	11.22	11.27	5.40	17.81	4.58
Residential	UL	11.83	14.44	5.57	16.96	4.09
Shop.Mall	UL	10.93	12.13	3.89	14.98	5.69
University	UL	12.58	15.66	5.32	16.99	5.10

4. CONCLUSION

Through this paper we have displayed the results of different measures made in Tirana city for 3 mobile operators who offers 4G LTE data service. From the measures we have analyzed the data and have deducted the standard deviation for the areas under control and also the max and min uplink and downlink throughput for all the locations.

So for a summary we can say that the values that we have measured have reached the max values in DL and UL. But this values are measured only in one area, from one operator. Meanwhile the values in the other areas are far away from the

rates of 4G LTE (100 Mbit/s in downlink and 50 Mbit/s in uplink). But we deduct that for a better analysis and for deeper information an analysis in a longer period of time and with more samples should be made.

ACKNOWLEDGMENT

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