Mobile network signal strength in Makerere University.

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20-May-2017

Abstract

Many students need to connect to the internet for personal and study purposes in Makerere University. Network across the University is a big factor in smooth access for the students. Data was collected from locations across the university. It was found out that network across the university was good however there were some poor signal zones. Students have sufficient network for reliable data connection.

Contents

1 Intoduction

A mobile network or cellular network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. This base station provides the cell with the network coverage which can be used for transmission of voice, data and others. A cell might use a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed service quality within each cell.[1]

1.1 Background

Following the recent surge in internet usage in Africa; between 2000 and 2017 the growth rate in Africa is 7,557.2%[2], access to the internet has been critical to students to complement their class work. This has been done through research online, access to tutorials and books, etc. At Makerere University, students are mostly known to use internet for socialmedia. This has been attributed to high internet access costs and poor network coverage. This research will provide data for the signal strength of mobile networks in the university. It can be used by telecom companies to verify actual signal strengths in the university compared to signal sent from the transmission towers in order to boost network coverage within the university. The university itself can provide cellular network repeaters to boost signals within its faculties and halls of residence to allow smooth network access by students.

2 Methodology

The research will be carried out individually. I will develop a data collection electronic form using Open Data Kit (ODK). Then build the Aggregate server using the Google AppEngine platform thus creating an electronic data collection system. Then determine the locations for data collection within the university and collect data from those locations using the system that will be installed on my phone. The network signals will be collected using my phone which has a reading of network signal.

3 Results

The research was carried out between 7th May 2017 and 20th May 2017. Research planning and design started on 7th to 16th. Data collection was carried out from 17th to 19th. Analysis and report of findings carried out on 20th.

3.1 Findings

- Figure 1: Data collected from device.

location	network	type	signal	coords Latitude	coords Longitude	coords Altitude	coords Accuracy	pic
College of engineering, design, art and technology	Smart	HSPAP	-87	0.33634157	32.56499417	1219.0	4.0	
School of food technology, nutrition and bio engineering	Smart	HSPAP	-73	0.3372448	32.56436305	1223.0	4.0	
Physics Department	Smart	HSPA	-97	0.33664534	32.56578862	1222.0	5.0	
Livingston Hall	Smart	HSPAP	-79	0.33859831	32.56754871	1205.0	5.0	
Africa Hall	Smart	HSPAP	-87	0.33765335	32.56832606	1205.0	5.0	
Nkurumah Hall	Smart	HSPA	-87	0.33634885	32.56885378	1212.0	5.0	
School of business	Smart	EDGE	-93	0.33578039	32.56848749	1219.0	5.0	
Women and gender studies	Smart	EDGE	-80	0.33500144	32.56872748	1198.0	5.0	
The library	Smart	EDGE	-77	0.33499243	32.56827433	1221.0	5.0	

Figure 1: Data Table (a)

- Figure 2: More data collected from device.
- Figure 3: Bar graph of HSPA+ network locations and signal strength.
- Figure 4: Bar graph of HSPA network locations and signal strength.
- Figure 5: Bar graph of EDGE network locations and signal strength.
- Figure 6: North part of the university with network signals.
- Figure 6: Middle part of the university with network signals.
- Figure 6: South part of the university with network signals.

3.2 Discussion

3.2.1 Network technologies

HSPA [3] HSPA is the combination of HSDPA and Enhanced UL also called HSUPA. The maximum channel rate for Enhanced UL is 5.8 Mbps, with a peak data rate of 5.4 Mbps. The maximum channel rate for HSDPA is 14.4 Mbps, with a peak user data rate of 13.4 Mbps (on MAC level), compared with a maximum user data rate of 384 kbps.

EDGE [4] EDGE (Enhanced Data rates for Global Evolution), or Enhanced GRPS. Download speeds of 120Kbps to 384Kbps placed EDGE as an early pre-taste of 3G, although it was labeled 2.75G by industry watchers.

School of agricultural sciences	Smart	HSPAP	-95	0.33475532	32.56792188	1247.0	5.0
Department of mathematics	Smart	HSPAP	-89	0.33557381	32.56602374	1246.0	5.0
College of natural sciences	Smart	EDGE	-75	0.33486452	32.56731544	1220.0	5.0
College humanities and social sciences	Smart	HSPA	-83	0.3328924	32.56805685	1226.0	5.0
School of social sciences	Smart	HSPA	-81	0.33289939	32.56872358	1241.0	5.0
School of Computing and Informatics Technology block A	Smart	EDGE	-89	0.33192806	32.57043225	1236.0	4.0
School of Computing and Informatics Technology block B	Smart	EDGE	-93	0.3313477	32.57041617	1229.0	5.0
School of psychology	Smart			0.33040974	32.56973014	1219.0	5.0
College of education and external studies	Smart	EDGE	-89	0.32980933	32.56812547	1211.0	7.0
Mary Stuart Hall	Smart	EDGE	-93	0.33072242	32.56719205	1186.0	7.0

Figure 2: Data Table (b)

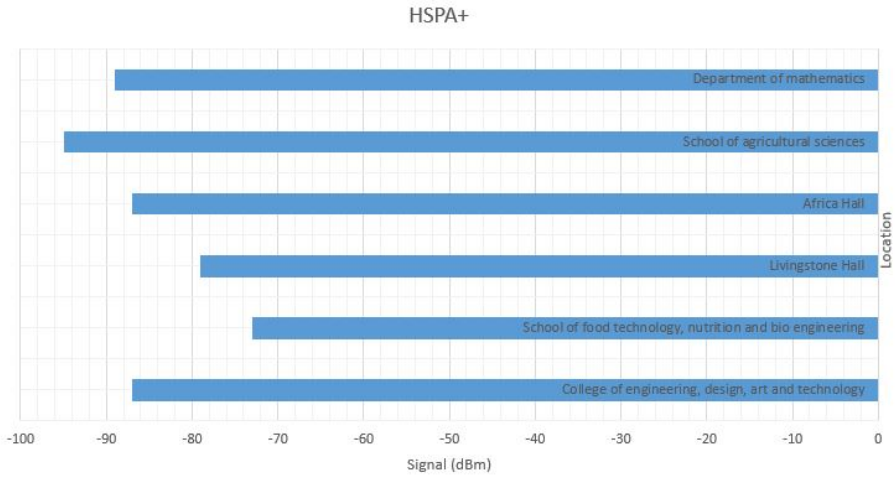

Figure 3: HSPA+

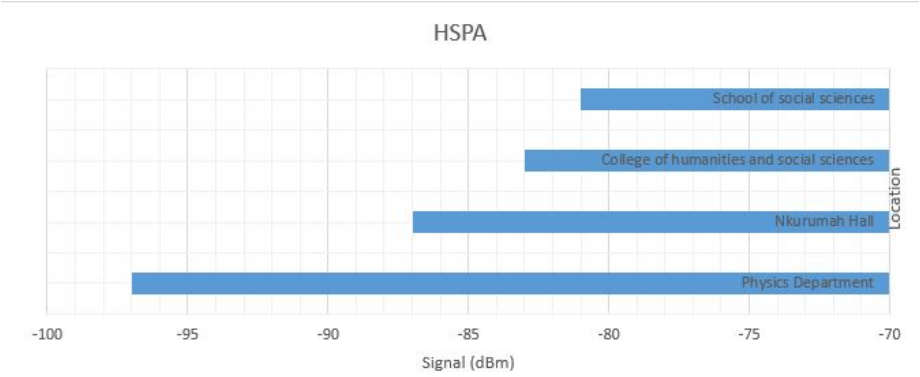

Figure 4: HSPA

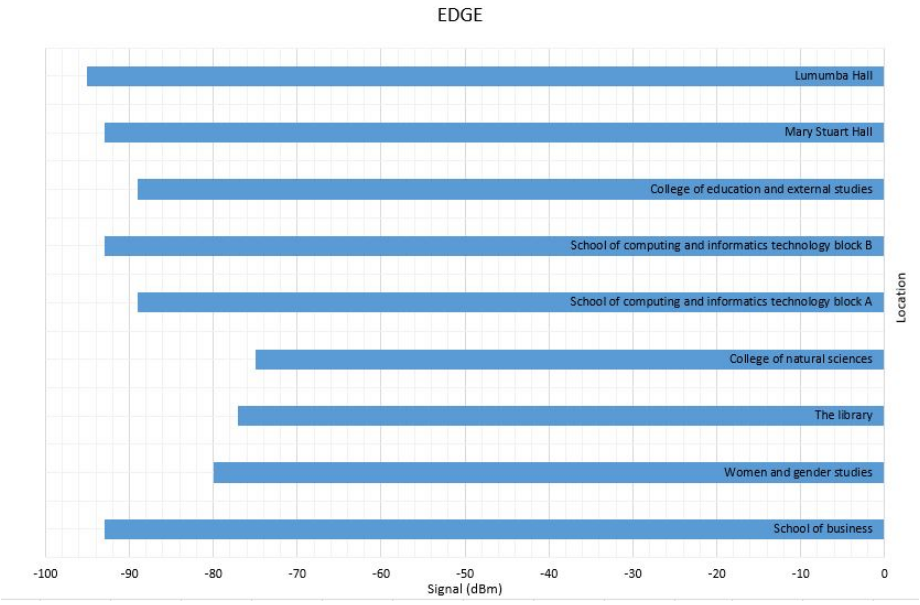

Figure 5: EDGE

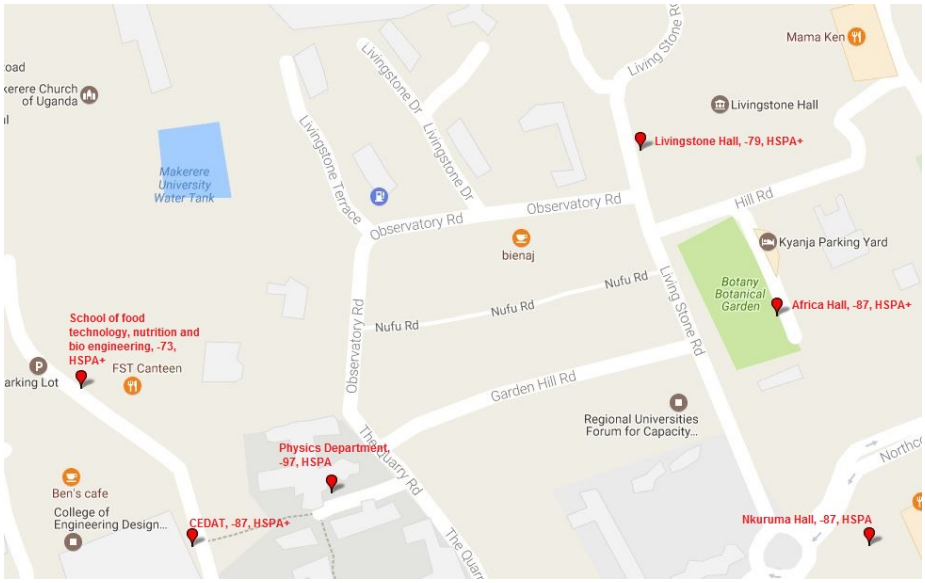

Figure 6: North part of the University

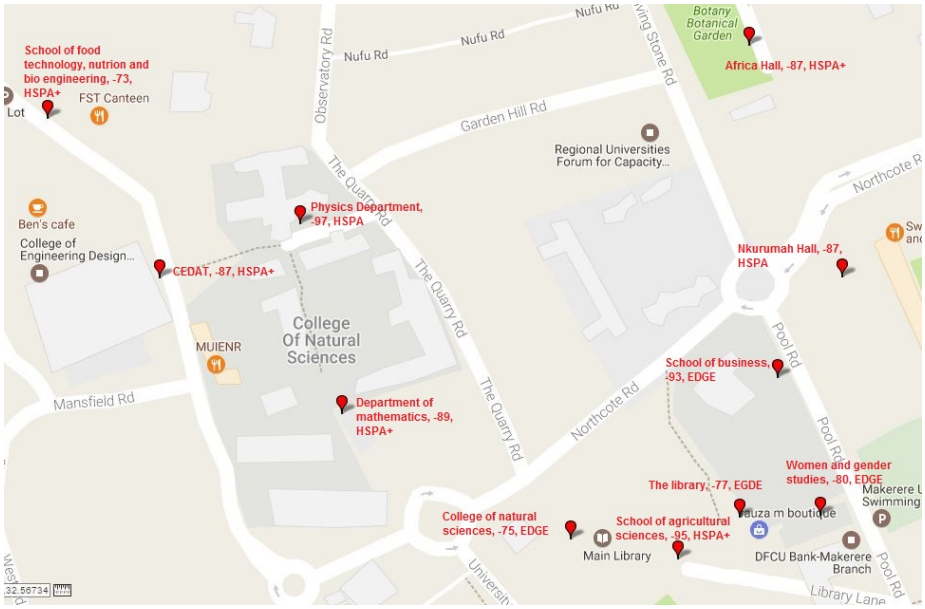

Figure 7: Middle part of the University

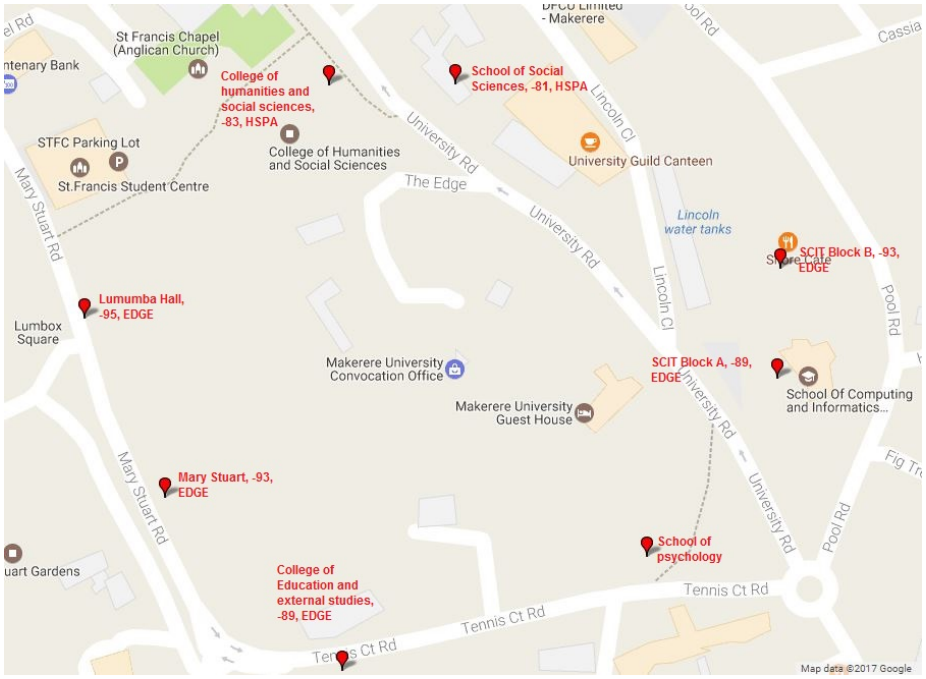

Figure 8: South part of the University

3.2.2 Mobile Phone Signal

A mobile phone signal (also known as reception and service) is the signal strength (measured in dBm) received by a mobile phone from a cellular network (on the downlink). Depending on various factors,such as proximity to a tower,any obstructions such as buildings or trees, etc.,this signal strength will vary. Most mobile devices use a set of bars of increasing height to display the approximate strength of this received signal to the mobile phone user. On Android devices, tools like Network Signal Info[5] can directly show the signal strength (in dBm). Signal is usually measured in dBm. dBm is the power ratio in decibels of the radio power per one milliwatt. A signal of -60dBm is nearly perfect, and -112dBm is call-dropping bad. If you're above about -87 dBm, Android will report a full 4 bars of signal.[6]

4 Conclusion

Mobile network distribution around the university is generally good with some exceptions of locations situated within the university unlike locations situated at the edge of the university.

References

[1] Guowang Miao; Jens Zander; Ki Won Sung; Ben Slimane (2016). Fundamentals of Mobile Data Networks. Cambridge University Press. ISBN 1107143217.

[2] Internet Usage Statistics [Online]. Available: http://www.internetworldstats.com/stats.htm

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[5] "Network Signal Info - Android Apps on Google Play". Retrieved 2016-06-29.

[6] How To Measure Cell Signal Strength on Android Phones [Online] Available: http://www.tested.com/tech/android/557-how-to-measure-cell-signal-strength-on-android-phones/