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INVESTIGATION OF FACTORS AFFECTING MOBILE BROADBAND EFFICIENCY

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ABSTRACT

This work was done to examine the factors affecting mobile broadband efficiency. It was carried out at two different locations which are Benin City and Okada Town in Edo State of Nigeria. Three network providers where examined using their USB modems. A software called BB monitor (bandwidth monitor) was installed on three different computers which help to monitor and record the data traffic while the respective modems of the Network Providers were plugged into the USB ports of the computers. The software recorded the data traffics of the different networks for a period of time (14 days).

The average bandwidth for each day was calculated and this was done for fourteen different days. This was done for the three different service providers. These data gotten where plotted into graphs and a proper analysis was done between the bandwidth of the same network under different conditions. The condition taken note of were different locations, time of the day and weather condition. From the analysis it was discovered that change in location, time of the day and weather condition all affected the bandwidth of the mobile broadband services.

KEYWORDS: Bandwidth, Broadband, Download, GSM, Modem, Upload

INTRODUCTION

Mobile broadband is a technology that allows you to access the internet (email, the web, downloads, remote access to office PC, and so on) at high speeds. Mobile broadband internet is fast (and getting faster), continuous (doesn't need to be turned on and off) and independent of your phone calls (so you can use phone and broadband at the same time) [1],

But there is a problem of Broadband efficiency, we are already witnessing the effects of network congestion, with many users complaining of slow network operation on some networks [2], [3] Efficiency is based on a number of factors, but foremost is the amount of spectrum available for broadband services. What is primarily driving network usage currently is rapidly increasing smartphone penetration, at more than 25% now and ready to hit 50% within a year or two [4], [5], [6]. In early days, people used mobile phones to access mobile-specific content, of which there was little. But today's phones can do so much more: browsing the Web at large, e-mail with attachment viewing, navigating with maps, video, social networking, banking, business information access, cloud computing, and entertainment. People love their smartphones, because a small handheld device gives them access to the same tools and information that previously required a desktop computer. [7], [8], [9] And this is just the beginning. New platforms, such as netbooks, are also seeing strong initial adoption and are about to be followed by entirely new categories of devices such as mobile Internet devices and smart books [10], [11], [12] Nobody can anticipate exactly how this world of new mobile computing devices will evolve, but the trends are clear: people desire powerful mobile computers with broadband connections.[13], [14]

METHODS

A software called BB MONITOR (Bandwidth Monitor) was used for the purpose of monitoring each network provider's bandwith and finding out the different constraints on the bandwith so monitored under different conditions. The software was installed on three computers thereafter the USB (universal serial bus) modem for each of the network providers was then plugged into the USB port of each computer. The software recorded the bandwidth of each of the three different network providers (MTN, AIRTEL and GLO) for a period of Seven (14) days. The EDGE technology was used due to the fact the it is available for the different locations considered (Okada Town and Benin City) and for the different mobile broadband service providers as well. The data gotten for the three different networks under different conditions are presented, interpreted graphically and analyzed to know which constraints affected the bandwith in each case.

RESULTS AND DISCUSSIONS

MTN (Normal)

Table 1: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	4.01	2.03	1720	894	2590
Day2	4.91	2.35	2110	1010	3120
Day3	2.88	1.81	1240	795	2010
Day4	1.86	0.616	821	273	1070
Day5	5.38	1.87	2310	825	3120
Day6	22.2	3.94	9530	1690	11200
Day7	21.3	3.94	9160	1690	10900
Day8	7.91	2.43	3400	1050	4440
Day9	0.096	0.096	45.1	42.7	87.8
Day10	21.2	3.25	9080	1390	10500
Day11	26	4.34	11200	1870	13000
Day12	14	2.75	5990	1180	7170
Day13	0.24	0.104	108	48.8	157
Day14	7.99	1.66	3430	728	4140

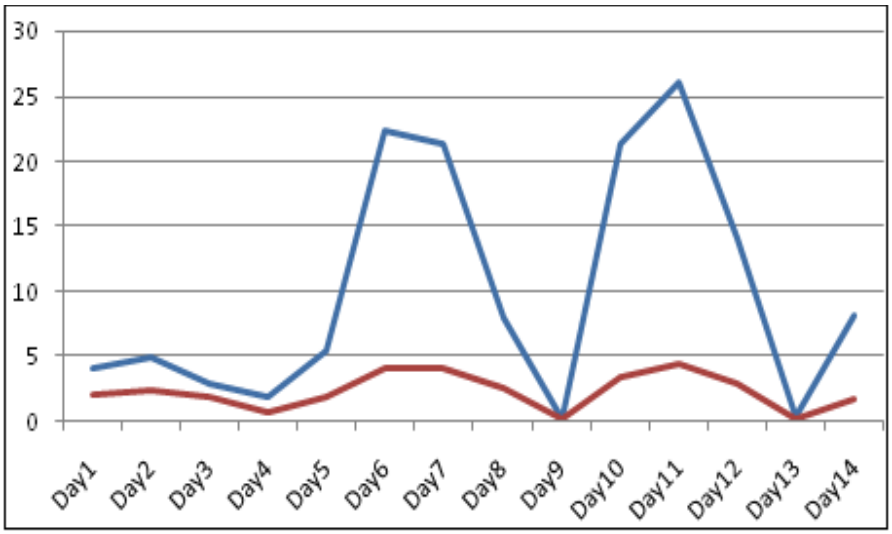

Figure 1: Average DL and UL Rate (K Bits/S)

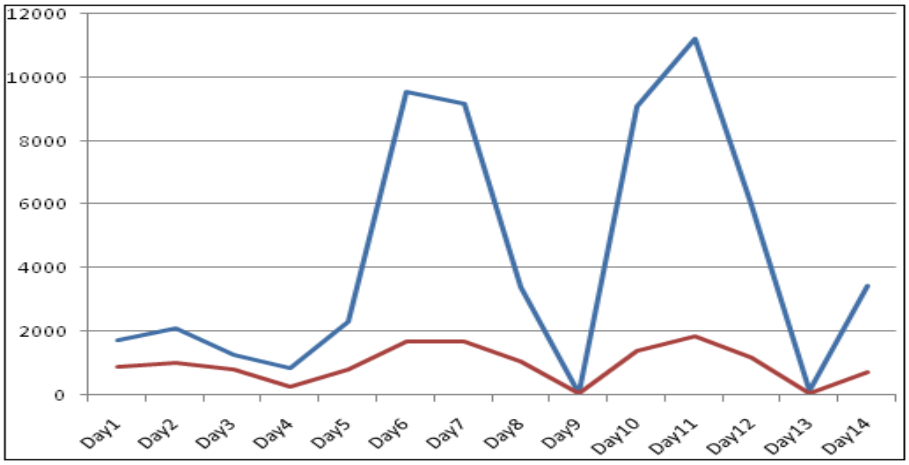

Figure 2: Average DL and UL Volume (KB)

GLO (Normal)

Table 2: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	0.056	0	25.4	2.67	28.1
Day2	8.71	2.22	3740	950	4690
Day3	2.94	1.57	1270	689	1940
Day4	10.3	2.77	4410	1190	5600
Day5	10	2.99	4310	1280	5590
Day6	5.13	2.24	2200	960	3160
Day7	2.84	1.72	1220	756	1960
Day8	4.28	2.55	1840	1100	2940
Day9	8.74	3.1	3750	1340	5090
Day10	5.81	2.76	2500	1180	3680
Day11	5.33	3.44	2290	1480	3770
Day12	8.23	2.42	3530	1040	4570
Day13	8.24	2.87	3540	1230	4770
Day14	9.54	2.74	4100	1180	5270

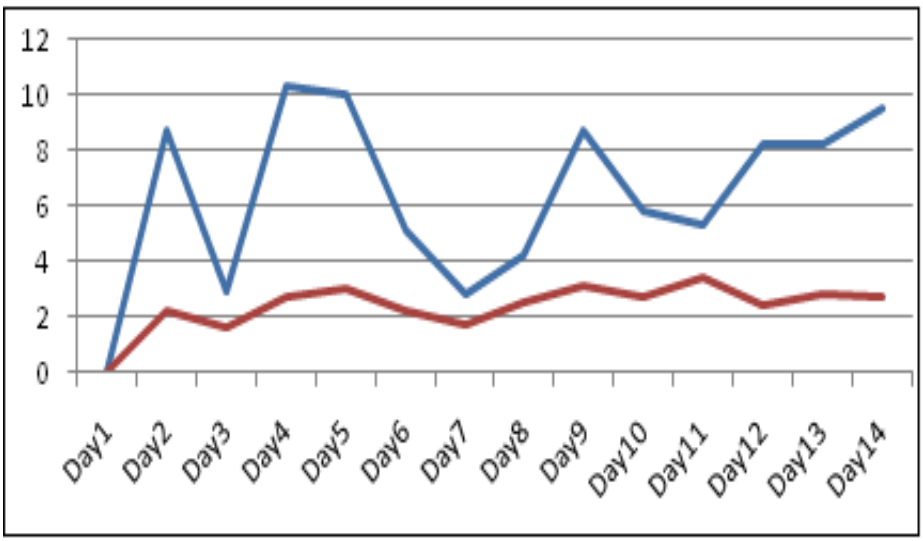

Figure 3: Average DL and UL Rate (K Bits/S)

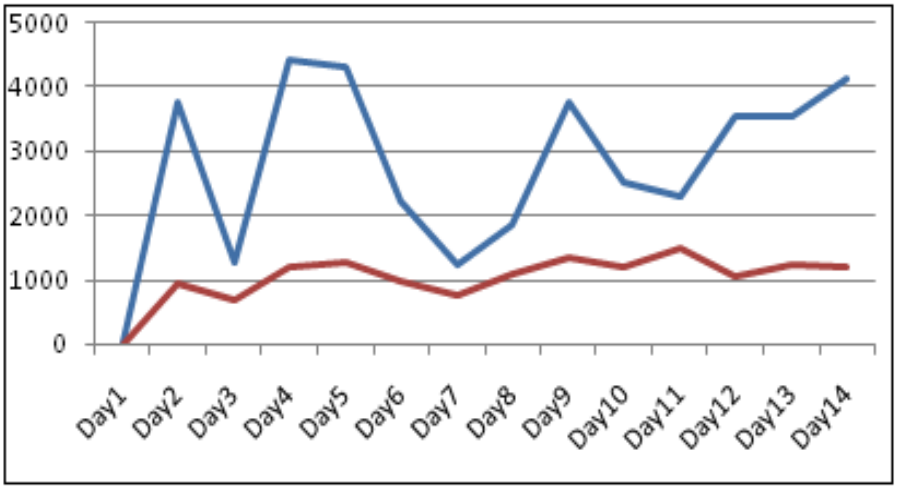

Figure 4: Average DL and UL Volume (KB)

AIRTEL (Normal)

Table 3: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	15.9	2.02	6840	887	7700
Day2	0.424	0.52	187	231	418
Day3	6.03	2.7	2590	1160	3750
Day4	3.67	1.46	1580	645	2210
Day5	0.776	0.544	341	241	582
Day6	9.14	8.11	3920	3480	7400
Day7	2.53	1.09	1090	479	1550
Day8	1.6	0.528	706	235	941
Day9	5.27	3.55	2260	1530	3790
Day10	3.1	2.09	1330	919	2230
Day11	2.85	1.29	1220	569	1780
Day12	7.54	2.79	3240	1200	4440
Day13	4.96	1.71	2130	755	2870
Day14	0.152	0.04	66.9	17.9	84.8

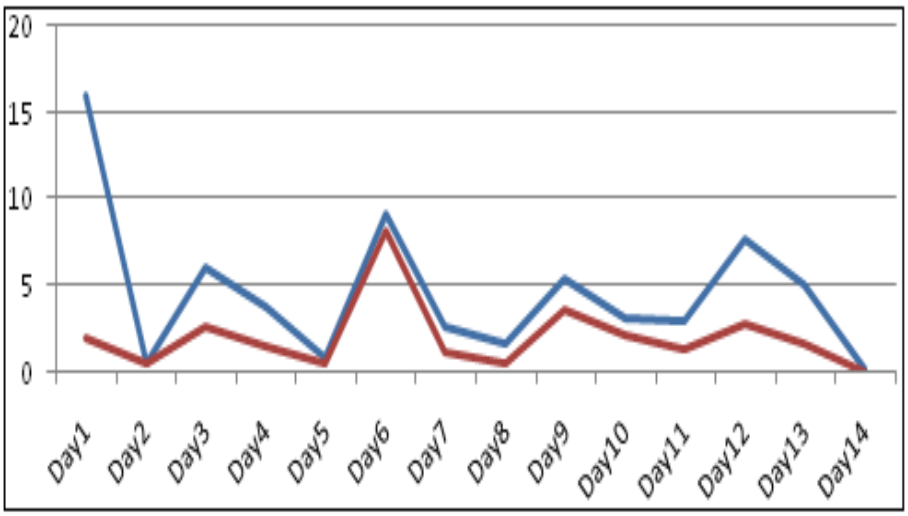

Figure 5: Average DL and UL Rate (K Bits/S)

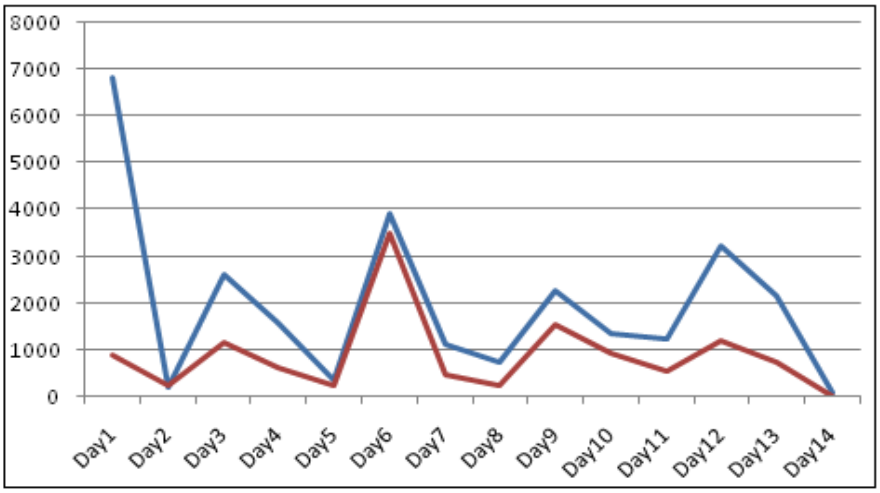

Figure 6: Average DL and UL Volume (KB)

MTN (Rain)

Table 4: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	10.3	2.77	4410	1280	5600
Day2	10	2.99	4310	1350	5590
Day3	8.71	3.1	3750	1180	5090
Day4	5.33	2.76	2500	1480	3680
Day5	9.54	3.44	2290	1180	5270
Day6	8.69	2.74	4100	899	4610
Day7	9.06	2.04	3890	980	4870
Day8	0.48	2.29	214	369	584
Day9	4.39	0.648	1890	287	2170
Day10	1.86	0.616	821	273	1070
Day11	4.91	2.35	2110	1010	3120
Day12	2.88	1.81	1240	1690	2010
Day13	22.2	3.94	9530	42	11200
Day14	0.096	0.096	4.51	1190	1094

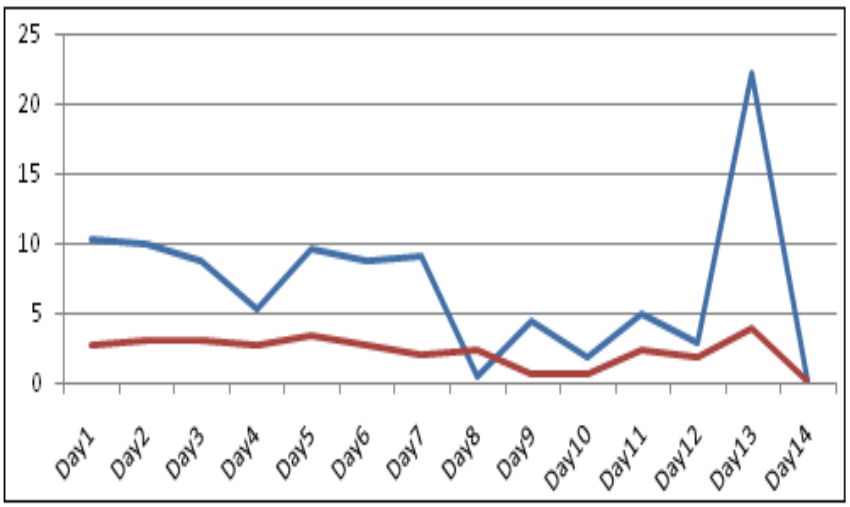

Figure 7: Average DL and UL Rate (K Bits/S)

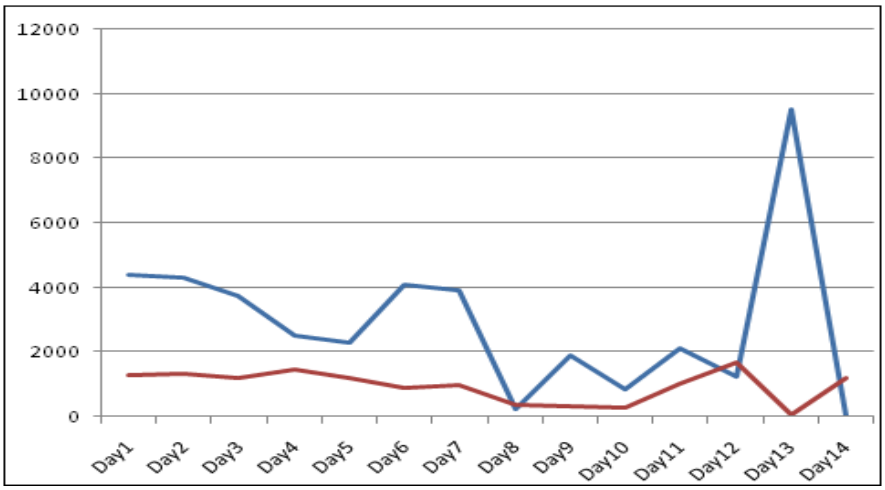

Figure 8: Average DL and UL Volume (KB)

GLO (Rain)

Table 5: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	7.47	1.23	3210	543	3740
Day2	8.31	0.904	3570	399	3960
Day3	4.15	0.88	1780	387	2160
Day4	10.9	1.44	4680	634	5300
Day5	0.402	0.144	181	64.8	246
Day6	0.016	0	7.6	0.324	7.91
Day7	14.2	2.42	6100	1040	7140
Day8	0.152	0.056	69.8	25.9	95.7
Day9	0.048	0.2	23.3	90.2	114
Day10	2.7	1.1	1160	486	1640
Day11	4.87	1.09	2090	481	2560
Day12	0	0	0	0	0
Day13	0.736	0.408	326	182	508
Day14	0	0	0	0	0

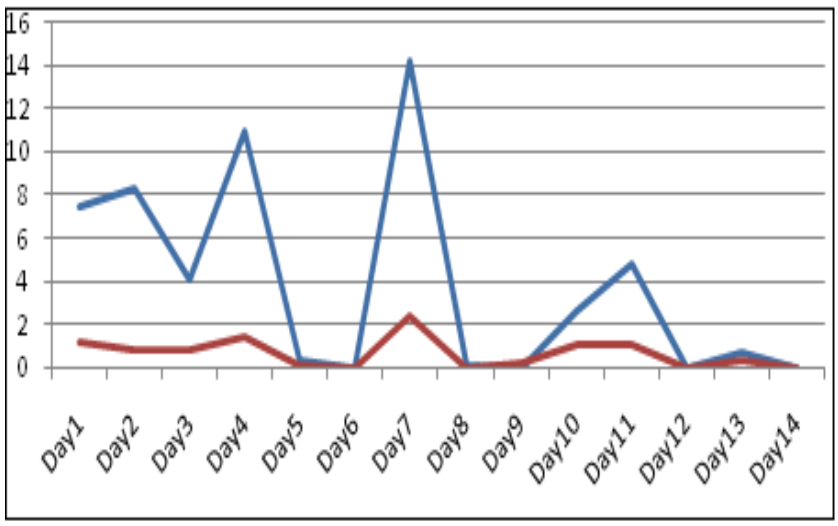

Figure 9: Average DL and UL Rate (K Bits/S)

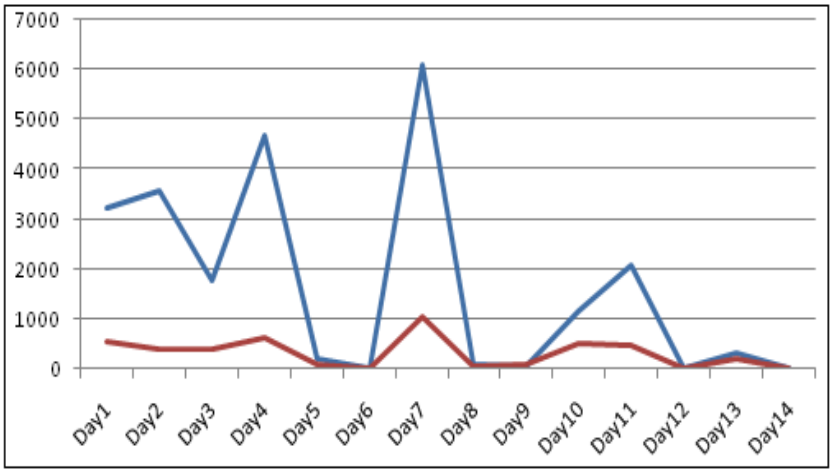

Figure 10: Average DL and UL Volume (KB)

AIRTEL (Rain)

Table 6: Average DL & UL Rate (K Bits/S) and Volume (KB)

Date	Average DL Rate (K Bits/S)	Average UL Rate (K Bits/S)	DL Volume (KB)	UL Volume (KB)	Average Total Data Volume (KB)
Day1	0.408	144	181	64.8	246
Day2	14.2	2.42	6100	1040	7140
Day3	0.048	0.2	23.3	90.2	114
Day4	0.152	0.056	69.8	25.9	95.7
Day5	17.7	0.968	7610	426	8030
Day6	15.9	0.904	6830	400	7220
Day7	0.008	0.008	4	4.73	8.73
Day8	1.46	0.552	642	243	885
Day9	64	240	288.3	107	135
Day10	3.82	2.76	1640	1190	2820
Day11	1.98	1.98	874	874	1710
Day12	2.7	1.1	1160	486	1640
Day13	4.87	1.09	2090	481	2560
Day14	0.736	0.408	326	182	508

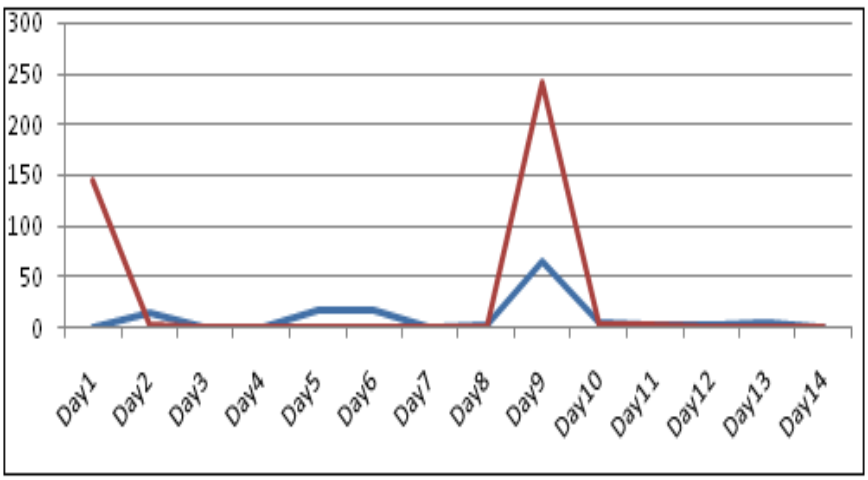

Figure 11: Average Dl and UL Rate (K Bits/S)

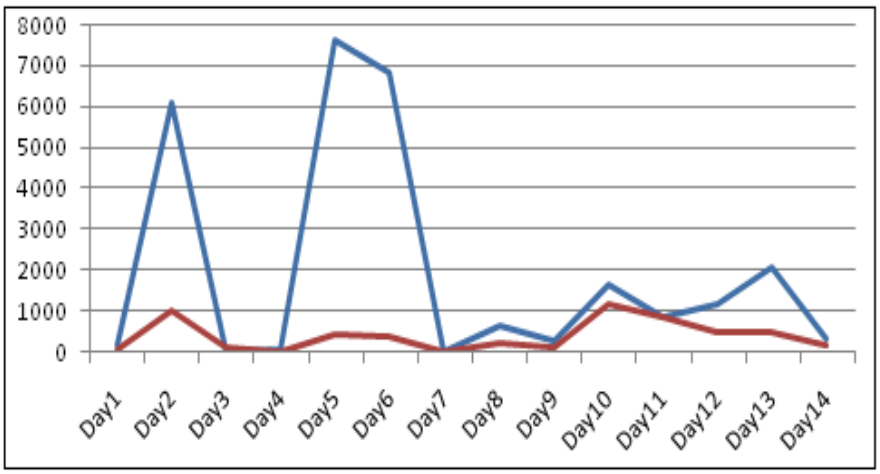

Figure 12: Average DL and UL Volume (KB)

DISCUSSIONS OF RESULTS

The Analysis of the graphs above shows that the three networks experienced similar situations of a drop in download and upload speed during a raining weather which indicates that weather actually affects the efficiency of the networks due to heavy cloud cover.

A change in location of the three different networks also had an effect on the upload and download speed, from the graphs above there was an increase as the networks were moved from Okada to Benin, this increase in efficiency was however attributed to better and more facilities available in Benin than in Okada.

The time of the day also affected the download and upload rates, from the graphs, the three networks had their lowet rates close to mid-day and highest rates close to and after mid-night, this drop and increase in efficiency was traced to the fact that during office hours the networks are practically loaded to full capacity as opposed to mid-night when the networks are actually lightly loaded

CONCLUSIONS

The investigations of the three networks (GLO, MTN and AIRTEL) has shown that locations, weather as well as time of the day were factors that affected the efficiencies of the respective individual networks however the degree to which the efficiencies of each network was affected varied depending on the quality of equipments, facilities and technology employed.

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