4G over 3G Mobile Broadband Speed Improvements on Smartphones from End Users' Perspective

Syed Mubashir Ali

Department of Computing, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology, SZABIST, United Arab Emirates

mubashir8733@gmail.com

ABSTRACT

Mobile & wireless communication has been one of the hottest things and developing extremely fast in present times, thanks to the advances of technology in all the fields of mobile and wireless communications. It has not been a long time that 4th generation of mobile networks i.e. 4G, is introduced. Since then, there has been a hype all around regarding the numerous advantages of 4G and that, it is better than 3G. This paper will discuss the uses of mobile broadband on smartphones; compare the data speeds of 3G and 4G and how the speed improvement of 4G over 3G makes not much of a difference to an end user using internet on smart phones / mobile phones.

Indexing terms/Keywords

3G; 3G over 4G;4G mobile broadband; Smartphones; Telecommunication; Communication

Academic Discipline And Sub-Disciplines

Telecommunication; Wireless communication

TYPE (METHOD/APPROACH)

Empirical analysis; Experiment.

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INTRODUCTION

Mobile broadband has become a reality, as internet generation grows accustomed to having broadband access anywhere on the go, and not just in office or at home. There has been an increasing number of mobile broadband connectivity [1] and now everyone from a business user to a K-12 student is carrying a mobile phone capable of using mobile broadband. Corporate users have been using mobile broadband from a long time now but with the arrival and exponential adoption of social networks and demand for online video streaming, most if not all smart phone users are using mobile broadband. This paper will discuss about the uses of internet on mobile phones and then compare 3G with 4G and analyze how the difference in speed between 3G and 4G does not actually makes a considerable difference to the end user using mobile broadband on mobile phones. This paper is organized into seven sections. First section provides the introduction to this paper. Section 2 will briefly describe 3G and 4G technology. Section 3 will discuss about the common uses of mobile broadband on smartphone. Section 4 will elaborate the materials and methodology used. 5th section shows the analysis and findings. Section 6 and 7 includes the limitation and conclusion of this paper respectively.

3G and 4G

3G (Third Generation) of telecommunication technology, also known as UMTS (Universal Mobile Telecommunications System), is said to be the next generation of mobile network. 3G is described as being a generic name for a set of third generation mobile technologies [2] which comprise a host of high-tech infrastructure networks, handsets, base stations, switches and other equipment. This technology enables cell phones to offer high-speed Internet access, data, and video and CD-quality music services. The difference between 3G & GPRS serve similar functions but 3G data services are the next step up from GPRS. The main difference between these two technologies is that 3G is able to achieve significantly faster data transfer rates and this enables one to work faster. 3G offers speeds of up to 384 kilobits per second, that is up to 7 times faster than a standard dial-up connection. [3]

3G used to be the world's best connection method when it comes to mobile phones, and especially for mobile Internet. 3G stands for 3rd generation as it just that in terms of the evolutionary path of the mobile phone industry. 4G means 4th generation. This is a set of standard that is being developed as a future successor of 3G. The main difference between the two is the existence of compliant technologies. There are a bunch of technologies that fall under 3G, including WCDMA, EV-DO, and HSPA etc. A lot of mobile operators are quick to dub their technologies as 4G, such as LTE, WiMax, and UMB, none of these are actually compliant to the specifications set forth by the 4G standard. These technologies are often referred to as Pre-4G or 3.9G. 4G speeds are meant to exceed that of 3G. Current 3G speeds are topped out at 14Mbps downlink and 5.8Mbps uplink. To be able to qualify as a 4G technology, speeds of up to 100Mbps must be reached for a moving user and 1Gbps for a stationary user. Till now, these speeds are only reachable with wired LANs. [4]

MOBILE BROADBAND USES ON SMARTPHONES

According to the survey and empirical study, it was evident that majority of all mobile phone and smartphone users make use of mobile broadband for:

- Emails
- Accessing social networking websites
- Streaming online audio / video
- Video calling
- Using VOIP services for voice chatting
- Using text messengers

Emails mostly are text based and are in size of Kilobytes (KBs) unless they contain heavy attachments. Social networking sites such as Facebook, Twitter etc. are usually a little more data intensive than emails. Video calling, Voice over IP calling and watching streaming online video are the most data intensive usage of mobile broadband on mobile phones. Study indicates that 80% of broadband users need real download speeds of no more than 4 Megabits per second. [5]

MATERIALS AND METHODS

For this study, author has used survey, literature review, experimental and empirical research methodology.

4.1 Mobility Scenario

Broadband services over cellular networks have opened up prospects for users to stay connected on the move and new services tailors to the mobility of users. [6] This study will consider the stationary scenario for the experiment.

4.2 Target Cellular Network

In United Arab Emirates (UAE), there are two mobile service providers. The first telecom service provider is Etisalat [7] which is also the most widely used and the other is Du. Together, they control about 100% of the UAE national mobile service market. As the two leaders in the market, they are the first ones to roll out the latest technology and offer comparable services and rates. For this study, Etisalat's 3G and 4G mobile broadband network has been used.

4.3 Experimental Setup

The main goal of our experiment was to analyze the difference in performance in usage and its effect to user experience using mobile broadband on mobile phone. In our experimental setup, we used an Apple IPhone 4S and IPhone 5. IPhone 4S was being setup to use 3G network and iPhone 5 to use 4G LTE network of Etisalat. The experiment was setup in open air where both 3G and 4G signal strength was between 90-100%

ANALYSIS

The author begins the analysis with first using the YouTube® application in both mobile phones. A high definition (HD) video was being played at the same time on both mobile phones. There was no significant lag or buffering while playing the HD video on both 3G and 4G enabled phones except the fact that video while being played for 30 seconds over 3G, was buffered till 1 minute whereas the same being played on 4G network when reached 30 seconds; was buffered till the end of video i.e. 3 minutes and 20 seconds. Since any user plays and watches a video in sequence and even if the user forwards or rewinds the video, there is no lag or buffering delay in both 3G and 4G mobile broadband.

Then a social networking application of Facebook® was executed on both the phones and used the stop watch to analyze the time taken for the news feeds to be displayed. On 3G it took around 0.5 seconds whereas on 4g it took around 0.45seconds. This small amount of difference in milliseconds was unnoticeable to the end user without using the precision stopwatch.

Then a Voice over IP (VoIP) application of Skype® was being executed and a demo call was being executed to the Skype call test account. Both the calls from the two phones using 3G and 4G network were without any voice distortion or delay.

LIMITATIONS

For this study, the author used Apple Inc. IPhone. The speed improvements may be more evident if multiple mobile phones from different manufacturers would have been used. This study did not use any software or hardware to measure the actual throughput of the mobile internet while conducting the experiment that may have some impact on the performance. As for all the wireless technologies, there was a variation in signal strength of the mobile network especially for 4G network as it is still in wider implementation phase in UAE. Last but not the least, the analysis of this study has been done through empirical evidence of what author observed the speed of internet while using the mobile broadband on mobile phone for different usage scenarios.

CONCLUSION

While testing 3G and 4G mobile broadband on mobile phones with the regular end user's usage scenario, it gives no significant performance improvement that could impact the user experience of a mobile broadband user on mobile / smart phone. Although while downloading music from ITunes, 4G downloaded a 4.5MB mp3 song way faster than on 3G network. Overall it is observed that the speed improvements of 4G over 3G may be more of a significance for a mobile broadband user on laptop or mobile user downloading a big file in 100s of MBs but the normal usage by most users won't feel significant difference.

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Author' biography with Photo

Syed Mubashir Ali has completed his BS in Computer Engineering from National University of Computer and Emerging Sciences – FAST, Karachi, Pakistan. Currently he is enrolled in MS Computing in IT at Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology, SZABIST, Dubai, United Arab Emirates. His research interest includes IT infrastructure, Cloud computing, Standardization of IT, IT governance, E-Learning, Enterprise resource planning and IT performance measurement.