

UNIVERSITI TEKNOLOGI MARA SHAH ALAM

**SPEED TEST ANALYSIS OF LTE MOBILE
NETWORKS IN MALAYSIA**

NURFAIRUZ ZAFIRAH FUAD

Dissertation submitted in partial fulfillment of the requirement for the
degree of
Master of Science
(Telecommunication and Information Engineering)

Faculty of Electrical Engineering

July 2017

ACKNOWLEDGEMENTS

First and foremost, I would like to express greatest gratitude to my supervisor lecturer, Dr Yusnani binti Mohd Yussoff for guiding me throughout and willingly share the experience and knowledge during final year project session. Nevertheless, I would like to thank and express greatest gratitude to my colleagues from Telekom Malaysia, Celcom and Digi Communication for willingly to share knowledge and help to give a better picture and understanding the process of Speed test and drive test situation based on their experiences.

Last but not least, I am grateful to acknowledge my family, my friends and course mates for their generous help. Needless to say, without all the above help and support, my Final Year Project would not have been so fruitful. I believe and trust that this paper will help the mobile users and mobile operators to move forward to improve the mobile network performance in Malaysia.

ABSTRACT

Despite the huge growths in the mobile network with the LTE technology usage, the network operators are facing challenges to provide the best mobile network for the users. LTE technology is the key elements for mobile operators to provide the best mobile network to their users. Different mobile operators provide a difference network performance to the mobile users. Based on the speed test, this study investigates on what factors that can impact the network performance of LTE technology. Mobile users are facing different experience in mobile network coverage. Users received varying LTE signal in their devices at different locations.

This paper focuses on which mobile operators provide the best network performances to their mobile users. Besides drive test, LTE performance can also be measured by a speed test. This paper represented the LTE network performance from the speed test analysis of two different types of smartphones. This speed test of LTE mobile network is based on the three major mobile operators in Malaysia which are Celcom, Maxis and Digi. Speed test is performed by `Speed test by Ookla` and `OpenSignal` mobile applications. The parameters of speed test are calculated based on latency, download and upload speed. This speed test is performed anywhere and anytime in Malaysia. This is to prove the users` behavior of using LTE mobile network.

The results presented the average speed of the LTE network in Malaysia based on the top three mobile operators in Malaysia such as Celcom, Digi and Maxis. In this paper, we analyzed the factors that impact the LTE network performance based on the results collected. We also analyzed the best coverage and LTE network performance based on the lower latency, higher download speed and upload speed. The data analyzation method is also discussed and the results from the analysis will be presented. Finally, a report based on the overall conducted study will be written together with conclusion and recommendation of future.

LIST OF TABLES

Table 1 LTE Performance Goals 14

Table 2 LTE performance requirements..... 21

Table 3 LTE latency requirement..... 33

Table 4 LTE latency metric by ITU..... 34

Table 5 User plane latency 34

Table 6 User plane latency in uplink 36

Table 7 Summary of speed test 40

Table 8 Network performance between operators (VASP)..... 47

LIST OF FIGURES

Figure 1 LTE architecture main components 11

Figure 2 Architecture of evolved UMTS Terrestrial Radio Access Network..... 12

Figure 3 Digi Telecommunication network coverage..... 26

Figure 4 Maxis Telecommunication network coverage..... 27

Figure 5 Speed test mobile tools setup..... 29

Figure 6 The LTE throughput formula 32

Figure 7 User plane latency components..... 35

Figure 8 LTE network KPI graph..... 37

Figure 9 Average speed test results 40

Figure 10 Comparison speed test with phones 41

Figure 11 Apple iPhone 6 and Samsung S7 Edge networks bands supports..... 42