USER BEHAVIOUR MONITORING USING MOBILE PHONES TO IMPROVE 5G SERVICES AND PERFORMANCE

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Abstract- 4G has been widely commercialised, and 5G is currently under development. The expected data bandwidth for 5G is 100 times faster than 4G and 500 times faster than 3G; however, the evolution of telecommunication technologies involves both a boost in speed and the enhancement of user experience. The key word used to describe 5G is 'user-centric', rather than 'service-centric' for 4G, and thus user behaviours of mobile data usage should be further investigated. On the other hand, the testing equipment currently being used for base stations is limited to hardware devices, such as spectrum analysers and power meters. These testing methods do not include the considerable potential variations in data demands due to changes in user behaviours, which could be resolved by presuming that all data resources could be dynamically allocated by real-time events.

A complete system has been designed and implemented in this study to investigate current user behaviours regarding mobile data usage. The system consists of three individual parts, including a user iOS application, a web server and an administrative iOS application. Ten devices were tested within the

two-month data collection period. Although the sample size was too small to produce any statistical results, it was found that data usage behaviours differ from user to user, with the exception of using more than 10 times the Wi-Fi over WWAN data at all times. The data also proved that some of the usage case families, which are described in the NGMN 5G white paper, do have strong demands, which could not be fulfilled using current telecommunication technologies due to technological gaps. This paper shows that the system proposed is a feasible method to investigate user behaviours of mobile data usage. If the sample size of users involved could be increased in the future, it would be possible to develop a model for real-time simulations of mobile users in specific areas so that limited connection resources could be dynamically allocated. Moreover, the basic communication infra-structures, such as base stations, should be well-planned and developed in advance to fulfill the potential 5G demand.

Index terms*: **Mobile Phone, 5G, User Behaviour, Cloud Sensing, Wi-Fi, WWAN, Data Analysis.**