

# **Quantifying and Enhancing Quality** of Experience for Smartphone User<sub>mQoL</sub>

Alexandre De Masi & Assoc. Prof. Katarzyna Wac {alexandre.demasi, katarzyna.wac}@unige.ch

# Problem and Goal

is smartphone application installations The number of flawgrowing applications function day. Some every best conditions The the lessly, when rise. others only directly problem. this experience impacted by İS user mobile Internet gateway Internet gateway app.server device mobile service provider wireless network provider Internet Quality of Service (QoS), *i.e.*, objective quality of a mobile service Quality of Experience (QoE) , *i.e.* , subjective quality of a mobile service

# Quantifying

Our application runs on the user's smartphone collecting a plethora of metrics from the multiple layers. We use **Experience Sampling Method** (ESM) to quantify human emotion level. We focus our approach on the subjective and objective user's inputs. Our servers get the data for analysis.







K. Wac and A. K. Dey : Mobile User Experience Beyond the Laboratory: Towards a Methodology for QoE-QoS Evaluation in Natural User Environments, mobilities.ca, Sping 2011.

Our goal is to quantify and enhance the **Quality of Experience** (QoE) for the mobile users depending on the nature of the application (e.g. audio, video, text) & the context of the user (e.g. moving between home and work). We focus on the QoE of users in movement (e.g. public transport)

We observe users in the wild and focus on their interaction and expectation with many **smartphones**-based services, such as video, audio, social network and chats application. We also observe the network's QoS and the smartphone OS state. We will generate a model able to quantify the end experience while relying on the available metrics and user expectation.

# Service, Experience & Expectation

QoE is defined by Qualinet [3] as the degree of delight or annoyance of the user of an application or service. It integrates the technical metrics of QoS and the perceptual feeling of the user. The expectation has a direct impact on the overall experience of a user.

The majority of the QoE research done in the past focus on mapping QoS to QoE [2] & audio and video content [5]. The studies quantify QoE is done with a **Mean Option Score** (MOS) scale [4] and much of the time done in laboratory setting [1].

# Enhancing

We use a layered approach to achieve our goal of a less annoyed user, e.g. a user not able to execute an action on an application.

#### Human

Assessing of the user emotional state e.g. annoyance or delight during application use via ESM. Preparing the user for a bad experience or/and proposing an alternative.

#### Application

New API for allowing fine-grained information about the overall health of the operating system for better resource management and detecting bottleneck.

#### Network

Utilisation of new network protocols that offers better handover, redundancy and multiplexes streams e.g. QUIC and MPTCP.

Once we have enough data for training the model, we stop asking the



### Studies

Mobile Communications and Computing for Quality of Life Living Lab European Network Quality Experience of on

European

**Network of** 

Living Labs

- Multitude private studies run since March 2012 (stress & intimacy)
- September 2017, first public QoE study available on the Google Play Store.

# References

- Pedro Casas et al. "On the analysis of QoE in cellular networks: From [1] subjective tests to large-scale traffic measurements". In: IWCMC 2015 - 11th International Wireless Communications and Mobile *Computing Conference* (2015), pp. 37–42. DOI: 10.1109/IWCMC. 2015.7289054.
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# www.qol.unige.ch

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- Florian Wamser et al. "YoMoApp: A tool for analyzing QoE of [5] YouTube HTTP adaptive streaming in mobile networks". In: 2015 European Conference on Networks and Communications, EuCNC 2015 (2015), pp. 239–243. DOI: 10.1109/EuCNC.2015.7194076.

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