Success Story
COMET

FFG

ftw Creating Communication Technologies

FTW
Forschungszentrum Telekommunkation Wien
COMET – Competence Centers for Excellent Technologies
K1-Centres

Putting Network and Service Quality into an End-User Perspective

Understanding, measuring and managing quality of communication networks and services has become a vibrant field of research. The key reason is that improving quality directly supports operators and providers in winning and keeping customers and reduce churn – given that quality improvements are also noticed. This fact has given rise to concept of Quality of Experience (QoE) which puts the human end-user‘s perception at the heart of measuring and improving network and service quality. FTW conducted several research projects that contributed to the evolution and application of QoE with new subjective quality testing methods, quality models, as well as novel QoE monitoring and management approaches.

QoE as new measurement paradigm

Customers are the ultimate judges of product or service quality, therefore it has become vital for the whole communications industry to move beyond traditional, purely technical Quality of Service (QoS) and adopt a more holistic understanding of quality as perceived by end-users. This shift towards Quality of *Experience* (QoE) raises fundamental questions relating to which technical influence factors (network speed, cloud service availability, device capabilities, etc.) and non-technical factors (user expectations, price, usage context, etc.) are most relevant (see Fig. 1). Furthermore, for practical applications it is of utmost importance to understand how QoE can be measured in real-world systems, which quality levels actually define a satisfying user experience, and ultimately, how these quality levels can be achieved efficiently.

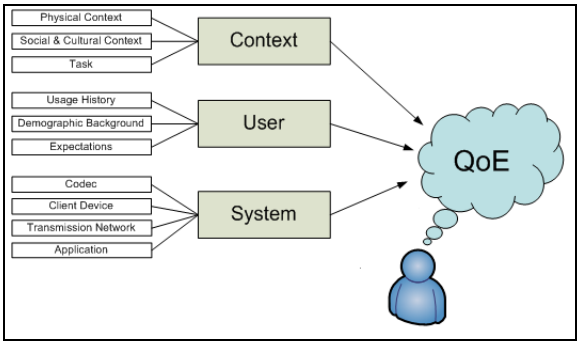

Fig. 1: Quality experienced by the user is influenced by technical and non-technical factors.

Assessing QoE of interactive multimedia broadband services

During the course of a number of projects, FTW has intensively investigated the QoE of every service relevant to fixed and mobile broadband users, ranging from interactive Web (browsing, e-mail, mapping) to more media-intensive (voice, streaming video, IPTV,

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teleconferencing) applications. The goal is to understand the QoE of the ICT applications targeted and to develop models capable of reliably quantifying and predicting QoE so that quality can be truly measured and managed from the customer's perspective.

In this context, the USP of FTW's QoE research approach is grounded on the following two pillars: firstly, *rigorous involvement of end-users* in the research process via more than 50 lab, field and crowdsourcing studies, based on the development of advanced testing tools and methodologies (Fig. 2). This has enabled the generation of a comprehensive body of ground-truth data on human quality perception, along with acceptance and saturation thresholds directly applicable to network and service design and quality management.

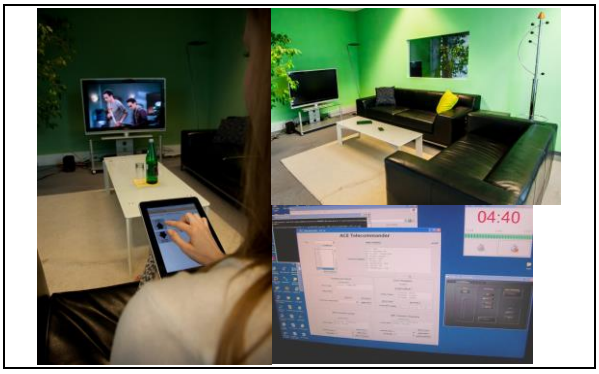

Fig. 2: Quality evaluation in FTW's i:Lab.

Secondly, FTW successfully addresses the multi-dimensional nature of QoE by following a rigorously *interdisciplinary approach that fully covers the interplay between user, application and network*. This is achieved by collecting all relevant data from these different layers for analysis and investigation by a team featuring an equally wide range of expertise.

Application example: QoE-prediction for YouTube video streaming

With the help of aforementioned approaches and methods, FTW developed YOUQMON, a prototype system that allows mobile operators to monitor the QoE of YouTube streaming (the most frequently used and most demanding service nowadays) of each customer in real time. By combining several online passive traffic analysis techniques for detecting events like rebuffering in YouTube video streams with a QoE model that maps technical impairments to a score reflecting the end-user experience, operators can now gauge customer satisfaction in real-time, without having to add measurement software on user terminals (Fig. 3).

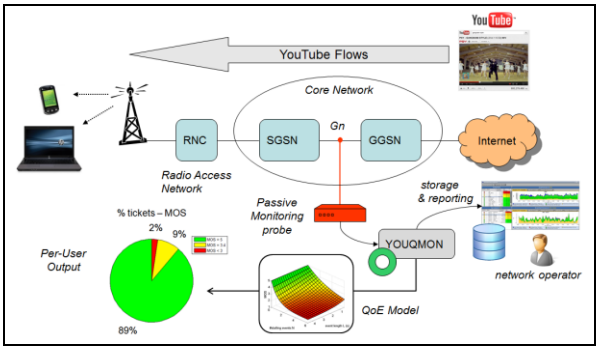

Fig. 3: YOUQMON allows for real-time video QoE estimation on a per-user basis solely relying on measurements in the mobile operator's network.

Impact and effects

The work of FTW had the following impact on its scientific and industrial environment:

- FTW released basic and applied research results in more than 120 publications and organized a number of international scientific high-profile events in the field of user-centric network and service quality assessment, monitoring and management.
- FTW provided Austrian and International industry partners (e.g. Vodafone Global) with know-how in order to realize their quality leadership strategies and to take a leading role in network quality-related standardization (ITU-T, ETSI).
- FTW developed novel QoE measurement extensions for A1/TA's traffic monitoring system that enable e.g. real-time estimation of video QoE on a per-user basis relying on passive network measurements only.

FTW and its partners could demonstrate scientific excellence and further strengthen Austria's position as a leading country for innovation on next-generation communication systems.

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Selected related FTW Projects: ACE 1, ACE 2, ACE 3, Optiband, ETICS, PS.NET