

ED STIC - Proposition de Sujets de Thèse pour la campagne d'Allocation de thèses 2015

Axe Sophi@Stic :

Titre du sujet :

Mention de thèse :

HDR Directeur de thèse inscrit à l'ED STIC :

Co-encadrant de thèse éventuel :

Nom :

Prénom :

Email :

Téléphone :

Email de contact pour ce sujet :

Laboratoire d'accueil :

Description du sujet :

Context

Internet applications, especially those of multimedia type and in a mobile context, are very sensitive to the delivery service they get from the network. However, the relation between this network service and the quality of these applications as perceived by the end users is often unknown and hard to be quantified. Some of the applications dispose of their own quality estimation techniques such as Skype and Viber. Others leave the users to their own interpretation of the quality they perceive. Linking the quality of Internet applications as perceived by the Internet users to network-level measurements such as bandwidth or delay is more than ever necessary. Such dependence, known in the literature as linking Quality of Experience (QoE) to

Quality of Service (QoS) parameters, serves many purposes. On one side it allows the estimation of the quality an Internet user will obtain before launching the application or even before heading to the place where she/he will connect. On the other side, it helps network operators properly dimension their networks so that to anticipate service degradation and optimise the quality they deliver. The correlation of quality measurements among users, or for the same user among different of his/her locations, can help in troubleshooting the reasons of any degraded quality.

Mission

This proposal fits within our project aiming at the estimation of the quality of Internet applications at the access departing from network-level measurements. Our project, called ACQUA [1], leverages measurements done at the network and device level as done today (bandwidth, delay, loss rate, signal strength, type of wireless connection, etc), and applies over them well calibrated models to estimate/predict the quality of experience for main applications even before launching them. ACQUA is an extensible solution in terms of the applications it can track. It allows a fine-grained profiling of the Internet access at the level of application quality. In a recent work [2], we have proved the feasibility of the approach via a modeling of the Skype use case. The purpose of this PhD proposal is to build upon this experience and develop a generalized approach for Internet access profiling at the application level. The idea is to be able, starting from measurements of the network and information collected from the device of the user, to provide insights on the expected User Quality of Experience for the main applications of internet to the user. The work will first consist in performing large scale measurement campaigns (either in the lab or by using crowdsourcing and user feedback) to link measurements to experience-level metrics (ex. as we have done with the Skype quality meter in [2]), then in establishing clear links in the form of models between measurements and these metrics. The second step will be in integrating these models into the tool ACQUA and in validating their accuracy. For this integration, ACQUA has to be enhanced with the required measurement tools. The third step will consist in studying the measurement plane of ACQUA and in identifying the best way to tune these measurements so as to reduce the load on the network and the device, while providing the best possible quality estimation accuracy.

About the Diana team at Inria Sophia Antipolis (<http://team.inria.fr/diana/>)

The Diana team (ex. Planète) at Inria Sophia Antipolis (INRIA-SAM) conducts research in the domain of networking, with an emphasis on designing, implementing, and evaluating Internet protocols and applications. The team has a strong background in Internet measurements, covering different aspects such as traffic measurement and analysis, Internet access performance, and the understanding of Internet applications and services. Another important component of the team is the design and evaluation of new content-centric architectures for the Internet and the development of large scale platforms for the experimentation of networking protocols.

Prerequisites

The candidate should have a solid background in network protocols and Internet measurements. The work has a strong experimental and measurement component, and involves a modeling part using machine learning techniques (decision trees, Bayesian inference, etc).

References

- [1] ACQUA: Application for prediCting Quality of User experience at Internet Access. URL: <http://planete.inria.fr/acqua/>
- [2] Salim Afra, Damien Saucez, Chadi Barakat, "From network-level measurements to expected Quality of Experience: the Skype use case", Inria technical report, <http://hal.inria.fr/hal-01071373>
- [3] Athula Balachandran, Vyas Sekar, Aditya Akella, Srinivasan Seshan, Ion Stoica, and Hui Zhang. 2013. Developing a predictive model of quality of experience for internet video. SIGCOMM Comput. Commun. Rev. 43, 4 (August 2013), 339-350.
- [4] Qi Alfred Chen, Haokun Luo, Sanae Rosen, Z. Morley Mao, Karthik Iyer, Jie Hui, Kranthi Sontineni, and Kevin Lau. 2014. QoE Doctor: Diagnosing Mobile App QoE with Automated UI Control and Cross-layer Analysis. In Proceedings of the 2014 Conference on Internet Measurement Conference (IMC '14). ACM, New York, NY, USA, 151-164.
- [5] Schatz, Hossfeld, Janowski, and Egger. From Packets to People: Quality of Experience as New Measurement Challenge. In: Data Traffic Monitoring and Analysis. Springer LNCS, 2013.
- [6] K. Mitra et ali. "Context-aware QoE modeling, measurement and prediction in mobile computing systems" IEEE trans. Mobile computing, 2014

English version: