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OC²E²AN: Optimized Control Center for Experience Enhancements in Access Networks

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In today's access networks, the experienced quality for the user of Internet applications is not always optimal. This is mainly due to the different and varying requirements of the services to the network and the fact that the network is not aware of the applications it transports. Consequently, it cannot assess how the user experiences the quality of the network. As a result, video streaming packets that have to be delivered in real time, are treated in the same way as file downloads, which are less time-critical, although it would be technically possible to prefer critical data over other non-critical data.

Within the BMBF research project G-Lab (<http://www.german-lab.de>), the *Aquarema* (Application and Quality of Experience Aware Resource Management) concept was developed to cope with this problem. It specifies, based on application-layer information, a cross layer resource management for access networks that have limited network resources. The software suite OC²E²AN is a concrete realization of this concept and a direct successor of *AquareYoum* [2]. OC²E²AN minimizes the stalling of YouTube videos, improves the performance of web browsing in the network, and optimizes the quality of video streams by monitoring quality degradations of the applications and adapting the network accordingly. The aim is to improve the quality of experience (QoE) of the users on that network.

Aquarema [1] specifies the components needed for a dynamic resource management that avoids QoE degradation for the end user. The concept defines four logical units: (1) application monitoring, (2) network monitoring, (3) resource management and (4) a network advisor. Figure 1 depicts these components together with an overview of the implemented realizations in OC²E²AN. The monitoring collects information needed on the client and the network, and reports them to the network advisor. In case of the risk of QoE degradation, the network advisor uses this information to coordinate the resource management tools that conduct control or resource management actions to adequately react on the current situation.

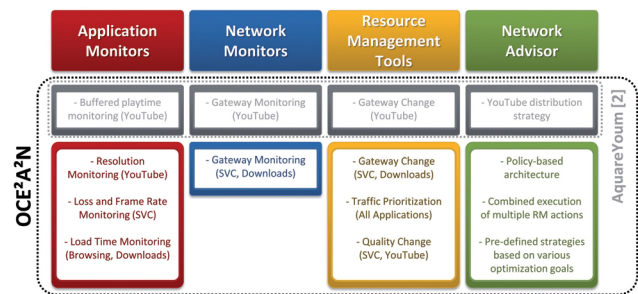


Fig. 1: Overview of OC²E²AN components.

Currently, OC²E²AN offers specific QoE-aware resource management for YouTube video streaming, web browsing, HTTP-based file downloads and video streaming with the scalable video coding (SVC) extension of the H.264/AVC standard. As indicated in the figure, it also includes the functionality of *AquareYoum* [2], our proof of concept implementation.

The functionality of OC²E²AN is presented at NetSys 2013 in Stuttgart. A sketch of the demo setup and used components are depicted in Figure 2.

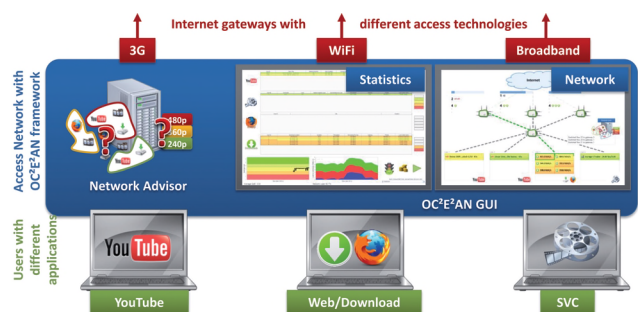


Fig. 2: Setup and components of OC²E²AN.

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- 1 B. Staehle, et al. Aquarema in Action: Improving the YouTube QoE in Wireless Mesh Networks. In *BCFIC '11*, Riga, Latvia, February 2011.
- 2 B. Staehle, et al. AquareYoum: Application and Quality of Experience-Aware Resource Management for YouTube in Wireless Mesh Networks. *Winner of KuVS Communication Software Award*, March 2011.