Project Achievements

CELTIC
Telecommunication Solutions

Rethinking the Use of Broadband access for Experience-optimized Networks and Services

RUBENS

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Project Website

www.celtic-initiative.org/projects/rubens

http://wiki-rubens.celtic-initiative.org/
index.php/Main_Page

The objective of RUBENS was to define and evaluate an enhanced broadband access infrastructure that offers personalized Quality-of-Experience in a flexible and scalable way for a large variety of applications, delivery models and devices.

Main focus

Broadband access networks stand at a key crossroad in their history. Similar to the experience of consuming "as you wish/when you wish" Internet content, the network evolutions promise to enable personalized consumption of media, both in terms of the presented content and consumption timing. A key question that both service and network providers have at this point is how this widening range of (mostly multimedia-driven) services can be combined with a "carrier-grade" network infrastructure in an economically viable way.

The technical view

The goal of the project has been translated into a coherent set of techniques that optimize the user experience dynamically,

by finding an optimal co-operation between the network and applications. The RUBENS architecture (see picture) combines adaptability in the content delivery with an increased flexibility in the network. The approach mixes QoS techniques such as "Measurement-based Congestion Notification" with end-to-end admission control, variable bitrate encoding and network-based adaptive streaming (using buffering and "deadline/forecast"-driven selection of what to transmit in each hop instead of just pushing video streams). This mixture allows having a collaborative/multi-layer organization of the scarce network resources to optimize the delivery. Each of these layers also has parameters that can be tuned to handle network congestion (e.g. forecasting longer beforehand to allow to better optimize the network load, or lowering video quality).

However, we do not only consider video streaming as one service, but also as a plurality of applications. Indeed, existing services such as live sport broadcast and feature-movie VoD, are complemented with future forms of personalized TV (e.g.
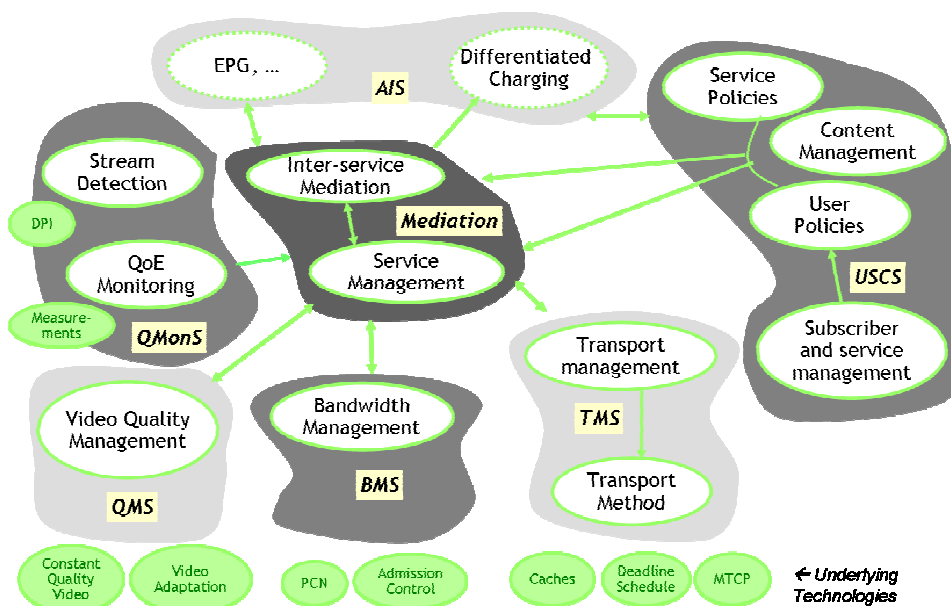
profile-based), and differently marketed services (for instance pre-paid wholesale VoD); all having different requirements for QoE.

This architecture immediately reflects a key outcome of the project: there is no single technique that will yield the best QoE. Depending on a wide variety of environment variables (determined by subscriptions, content, and the offered services themselves), QoE needs to be optimized by tuning for instance the video quality, transport and network configuration in an orchestrated way, ensuring a stable and carrier-grade behaviour. In case of congestion, RUBENS makes an intelligent intersection between network, subscriber and content-related policy to mitigate the resource shortage.
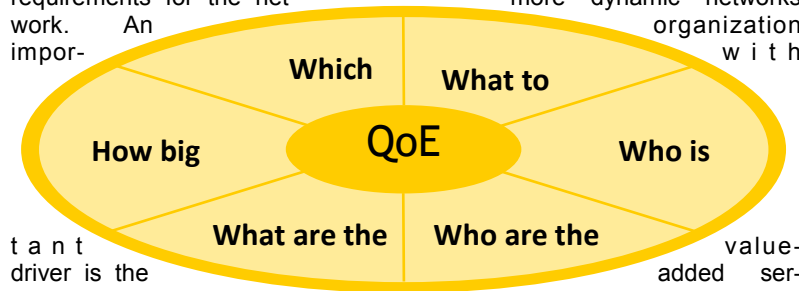
The project has evaluated these balances at an architectural and practical level: through simulations on the behaviour of individual aspects, and a demonstrator functionally integrating proof-of-concepts of the core features.

The economics view

Accompanying the technical studies, a techno-economical validation task supported technical decisions and provided guidelines for strategic decisions. The analysis was split in different questions, each one investigated with appropriate scientific methods.

A major finding is that an implicit demand for QoE does exist. However, it needs to be translated into more specific trends, and resulting requirements for the network. An important

driver is the increasing personalization of services, discontinuity of linear service perception and resulting larger diversity of consumer habits with demand for similar quality assurance but changes in duration, peak and sustainable bandwidth. This results in higher congestion probability, the major technical driver for QoE enhancing technologies. The current best practice of over-dimensioning the network will become increasingly uneconomic and technologies that increase network efficiency like the ones developed in RUBENS will gain the centre stage.

Impact

The RUBENS project brought together 9 key European players out of 6 countries in a collaborative research project, to pave the way for future broadband services.

Future multimedia content will evolve from static broadcast and on-demand, to much more personalized and dynamic consumption patterns. RUBENS has shown that network operators can combine a more dynamic networks organization with value-added services that improve the role of the network access provider in the value chain, in order to facilitate this (r-)evolution. With the largest European providers and the market leader for media delivery in the same consortium, RUBENS is well placed to prepare the resulting new product solutions and concepts for market deployment.

About Celtic

Celtic is a European research and development programme, designed to strengthen Europe's competitiveness in telecommunications through short and medium term collaborative R&D projects. Celtic is currently the only European R&D programme fully dedicated to end-to-end telecommunication solutions.

Timeframe: 8 years, from 2004 to 2011

Clusterbudget: in the range of 1 billion euro, shared between governments and private participants

Participants: small, medium and large companies from telecommunications industry, universities, research institutes, and local authorities from all 35 Eureka countries.

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