Project Achievements

Quality of Real Time Applications End-to-End over Heterogeneous Domains

QUAR2

QUAR2 aimed to develop and establish a new standard for a system that can provide high quality Voice and Video services over IP networks (V2oIP). The QUAR2 solution presents a common platform for heterogeneous network environments based on existing IP networks infrastructure, offering guaranteed quality.

Main focus

The main objective of the QUAR2 project was to perform the necessary research, development and validation of a system that can provide toll-quality voice and video service over heterogeneous IP networks and over heterogeneous network environments. This will allow to offer audio-video services at low prices while spanning over the whole European continent and beyond, despite the heterogeneity of its communications infrastructure.

Such a set of services will help to dramatically reduce geographical and cultural distances, allowing a global community based on new open technologies from network to applications.

The QUAR2 project has been in line with the ongoing effort of smooth migration from circuit-switch based networks to packet-based networks and services. Therefore, QUAR2 relied on emerging Next Generation Networks (NGN) infrastructures, providing carrier-class quality of service at low operational costs using standard interfaces resulting in multiple value-added services to the benefit of the European end users.

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Partners

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Approach

Nowadays, Quality of Service (QoS) is one of the key issues of real-time multimedia services demanded by Next Generation Network (NGN) customers. Currently, there are several approaches trying to solve the QoS issues of IP networks, such as the utilization of advanced audio or video compression algorithms, dynamic reservation of resources at the access network, services differentiation at the core network or even over-provisioning of bandwidth resources on the network.

However, independently to the technology in use, it is absolutely necessary for a real-time services operator to control the customers' experience of multimedia services.

The QUAR2 project provided an innovative and specific approach to solve the QoS issue: the research is based on measuring and predicting, in real-time and non-intrusively, the perceived quality of voice and video over IP communications. This prediction provides the necessary data to control the end-to-end quality of multimedia communications by means of intelligent management systems deployed into the Next Generation Network. This paradigm allows the deployment and introduction of value added services, in particular real-time applications such as Voice and Video over IP.

Achieved results

The QUAR2 project developed a full system capable of controlling the end-to-end quality of service for multimedia applications based on the SIP protocol. At the first level, the control is based on **QoS Probes** in charge of measuring in real-time the perceptual quality of the multimedia sessions, thus obtaining the MOS (Mean Opinion Score) of every customer's communication in a non-intrusive way. The perceived quality is assessed for voice and video over IP sessions.

The obtained QoS measurements and the network statistics obtained from the access and core networks are passed as input data to an innovative subsystem called the **Predictor Resource Manager**. This element has been developed for the prediction of the behaviour of the whole network in terms of quality of service perceived by the customer. The predictor reports the prediction results to a high-level subsystem called the **Service Controller**. This element is the intelligent subsystem of the architecture that manages the end-to-end Quality of Service of multimedia sessions. It provides extended SIP interfaces to end users and management interfaces with the **Resource Managers** that ultimately control the individual resources of the heterogeneous access networks.

Thus, depending on the quality of service requested by each customer and the real status of the network, the system allows to reserve the necessary resources for each type of access network, choose the most appropriate voice or video compression algorithm to be used during the communication, and even modify the multimedia characteristics of an already established multimedia session. That way, every broadband customer will be able to enjoy at any time the highest quality of service in voice and video over IP offered by the real-time operator's network. This approach has been simulated for EPON (Ethernet Passive Optical Networks), xDSL and Cable networks.

Finally, the QUAR2 architecture and this innovative technique had been deployed and validated in a fully featured **testbed** that includes real xDSL and Cable access networks interconnected through the Internet. At the customer premises, two advanced terminals were used: a **Video-Softphone** with QoS signalling features and an **advanced IP-PBX** equipment, developed and adapted to QUAR2's specific requirements.

About CELTIC

Celtic is a European research and development programme, established as Eureka cluster, 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. Launched in November 2003, Celtic (Cooperation for a sustained European Leadership in Telecommunications) was founded and has been supported by major European telecommunication players, both vendors and operators. Celtic fills the gap between public R&D programmes not specifically focused on telecoms and short-term R&D efforts by the telecoms industry

Timeframe: 8 years, from 2004 to 2011

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

Participants: companies from the telecommunications industry (small, medium and large), universities, research institutes, and local authorities from all 35 Eureka countries may participate in Celtic projects.

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Impact

QUAR2 represented a migration effort to overcome the major obstacles to deliver Quality of Service for voice and video over IP applications. The project produced a global platform with the key pieces in order to manage QoS within NGN networks: the Service Controller, the Resource Managers, the QoS Predictor and the advanced end-user devices. This innovative new architecture plus the key concepts and the methods employed will enable the Service Provider to enhance its service portfolio with the next generation high-quality voice and video over IP services, utilizing their existing core and access networks and achieving a significant reduction of its capitalization and operation expenditures.

Finally, the QUAR2 solution constitutes a significant advance to the provisioning of quality of experience and will allow cheaper, flexible and simpler services operation, while improving the real-time multimedia applications of NGN networks and beyond.