

# Project Achievements



## IP Network Monitoring for Quality of Service Intelligent Support

The objective of PNQSIG was on the development of mechanisms that allow monitoring and managing of services offered for Next Generation IP Networks, such as IPTV, Mobile TV, VoIP or videoconference. The management was performed from a customer perspective, i.e. assuring the optimal levels of Quality of Experience (QoE).

### Main focus

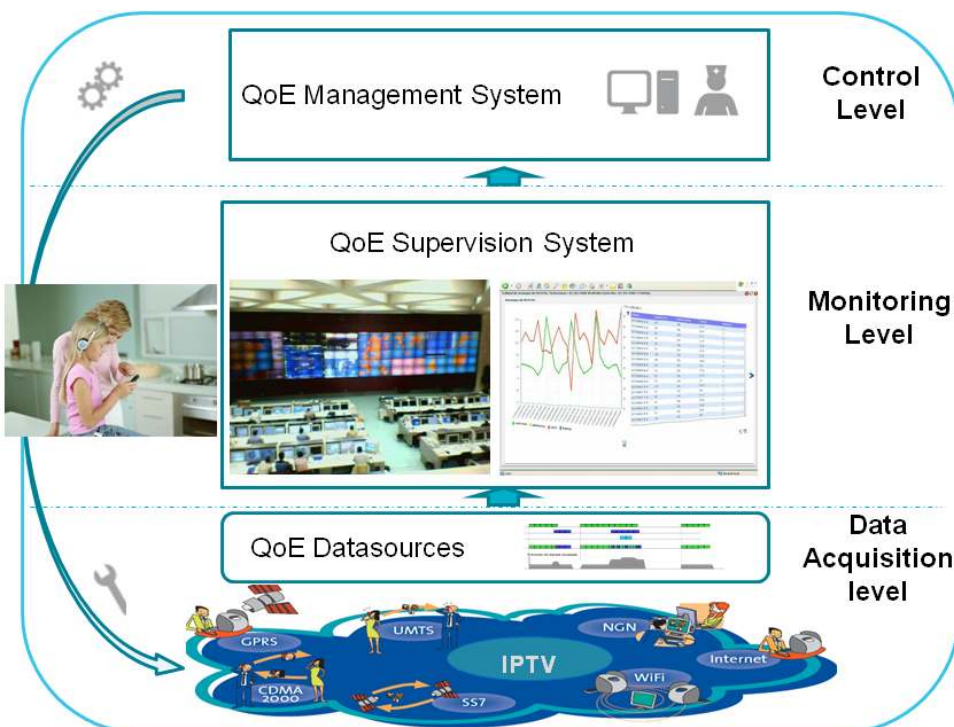
The IPNQSIS project, in which 18 companies and institutions from Spain, France, Sweden and Finland collaborated, developed next generation management architectures to improve the QoE-driven network management, which includes:

- ◆ Monitoring video services within a multi-domain framework through several countries in Europe.

- ◆ Enhancing algorithms to combine QoE-QoS analysis with network operation and traffic modelling.
- ◆ Updating European collaboration projects -TRAMMS (CELTIC), MOMENT (FP7) and national initiatives- and Future Internet studies to assure video services quality from customer perspective.
- ◆ Multimedia services management platform to assure the QoE delivered to end users, see in figure 1 the Customer Experience Management System (CEM) approach.

### Approach

The focus of IPNQSIS was on the definition of requirements, the design and the implementation of a CEM prototype, composed of three different levels: data sources (for example, probes), monitoring



# IPNQSIS

## IPNQSIS

Project ID: CP7-009

Start Date: 1 October 2010

Closure date: 30 April 2013

### Partners:

Acreo Swedish ICT AB, Sweden  
Alcatel-Lucent Espana SA, Spain  
Alkit Communications, Sweden  
Broadcom Networks Spain S.L., Spain  
Diseños y Consulting de Electrónica y comunicaciones, S.A., Spain  
Ericsson AB, Sweden  
Indra Sistemas, S.A., Spain  
Institut Telecom, France  
IP-Label Newtest, France  
Lund University, Sweden  
Naudit High Performance Computing and Networking, S.L., Spain  
NetHawk Oyi, Finland  
Net Technology, Finland  
PPO-Yhtiöt Oy, Finland  
Procera Networks, Sweden  
Softtelecom, Spain  
Vierling Communication, France  
Technical Research Center of Finland, Finland  
University Paris-Est Créteil, France

### Co-ordinator:

Antonio Cuadra-Sánchez  
Indra Sistemas, S.A., Spain  
E-mail: [acuadra@indra.es](mailto:acuadra@indra.es)

### Project Websites:

[www.celticplus.eu/projects/celtic-projects/call7/IPNQSIS/ipnqsis-default.asp](http://www.celticplus.eu/projects/celtic-projects/call7/IPNQSIS/ipnqsis-default.asp)  
<http://projects.celtic-initiative.org/ipnqsis/>  
<http://www.ipnqsis.org>

tools and a control module. This way the objective was to develop the mechanisms that allow monitoring and managing services offered on Next Generation IP Networks, such as video services, videoconferencing, IPTV, Mobile TV and VoIP from a customer perspective, i.e. assuring the optimal levels of Quality of Experience (QoE).

The results of the analysis were applied to the integrated management of network resources to improve the user's experience. The technology also makes it possible to develop tools to enable greater correlation between the quality of the service and the actual experience of the user, thereby ensuring greater customer satisfaction.

## Achieved results

This project ended in April 2013 and the main objectives have been carried out, from the definition of a general Customer Experience Management (CEM) architecture to IPNQSIS prototypes focused on IPTV multimedia services.

The results of the project comprise Quality of Service (QoS) measurement tools, mechanisms to quantify the Quality of Experience (QoE), its correlation with the QoS parameters, and their influence on QoE. The outcome of the analysis is being applied to the integrated management of network resources to improve the user's experience.

Our technology makes it also possible to develop tools to enable greater correlation between the quality of the service and the actual experience of the user, thereby ensuring greater customer satisfaction.

The project developed methods to monitor and analyze detailed content demand patterns of over the top media services. Results have been produced in academic submissions and project deliverables. In addition ten new products and 16 improved products from different business lines have been developed, such as Traffic analysis for improving customer experience and reducing network cost, Correlation between QoE-QoS in multimedia applications, IPTV QoE Monitoring and QoE Network Management.

## Impact

The achievements of this European project can objectively be considered to be of high quality and value given the amount of papers (40) published in leading international symposiums, publications (Transactions on Computers, Transactions on Emerging Telecommunications Technologies, LNCS, etc.) and conferences (IEEE ICC, IEEE GlobeCom, IFIP WWIC, IEEE ICCIT, IEEE ISPS, NoC, IEEE ICUMT, IM IEEE, QoMEX, TRAC IEEE, Future Network & Mobile Summit, and Telecom I+D, among others) and the

eight standards (ETSI, HomePlug, IEEE and VQEG) it has generated.

Future research in this area will extend its scope to next generation services such as OTT (Over The Top) services. Specifically, the project NOTTS (Next generation over-the-top multimedia services), which obtained the Celtic label in December 2012, will continue the activities regarding QoE management on a task dedicated to this purpose.

An important goal for improving telecommunications services was to get a clear picture about how customers perceive the quality of the multimedia services. To achieve this goal quality indicators were required to monitor the experience of the customers while using the services of an operator. With those indicators necessary measures can be implemented to improve the productivity of the applications, and, consequently, increase the customer satisfaction. IPNQSIS (IP Network Monitoring for Quality of Service Intelligent Support) developed a platform to evaluate the experience of users in order to improve the productivity of applications and the quality of services. This technology enables the monitoring of data and the implementation of tools to achieve greater correlation between the quality of the service and the actual customer experience.

The IPNQSIS consortium led by Indra, Spain's number one IT multinational company, was composed by 18 members belonging to the best companies, universities and research centers. This work has been partially funded by the CDTI in Spain under PRINCE project, DGCIS in France, VINNOVA in Sweden and TEKES in Finland.

## 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.

## Celtic Office

c/o Eurescom, Wieblingen Weg 19/4,

69123 Heidelberg, Germany

Phone: +49 6221 989 405, e-mail: office@celtic-initiative.org

www.celtic-initiative.org

