



# Celtic-Plus

## Newsletter 2/2015

World record transmission field trial –  
Celtic-Plus Flagship Project SASER-Siegfried

How to incubate project ideas – Celtic-Plus  
Proposers Day in Antwerp

How France fosters international cooperation  
within Celtic-Plus



# Editorial

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## Dear readers,

Celtic-Plus is currently revising its “Celtic-Plus Purple Book”. This book outlines the scope of Celtic-Plus and describes topical research challenges for potential Celtic-Plus projects. Its main objective is to serve as a stimulus for organisations planning their strategic research topics. It is not prescriptive, because Celtic-Plus is a bottom-up programme where proposers can submit any project proposals, as long as they are within the wide scope of ICT and telecommunication.

The revision of the Purple Book inspired me to have a closer look at societal and economical megatrends and the related disruptive developments in the different sectors. Keeping an eye on disruptive developments is important, because they determine which technology will flourish, and which will become irrelevant – sometimes incredibly fast. I am curious to see how disruptive the currently hot ICT topics Internet of Things (IoT), Cloud Computing, Big Data, 5G, Software Defined Networking, Smart Cities, Smart Homes, and Industry 4.0 will be. Particularly IoT has a high potential of changing our lives. Making a vast number of things communicate with each other could lead to a revolutionary leap and a new quality of networking. Boston Consulting Group sees IoT as one of the main drivers for the next wave of economic growth, contributing almost 330 billion euro in Europe by 2020.

Back to daily business: after a drop in Celtic-Plus project proposals in 2013 and 2014 due to the new EU R&D Programme “Horizon 2020” we had very successful Calls in 2015. In our three Calls this year, a total of 15 project proposals were submitted, of which about 10 (at the time of writing the exact number was not yet sure) have obtained the Celtic-Plus Label, a condition to start the project. In addition the new large Celtic-Plus Flagship Project SENDATE (Secure Networking for a Data Center Cloud in Europe) received the Celtic-Plus Label. SENDATE will probably start in the first half of 2016 with various sub-projects, and more than 50 partners from several European countries. This high per-

centage of labelled proposals proves again the excellent quality of proposals and the high success rate in the Celtic-Plus programme. The next chance to submit project proposals to Celtic-Plus is our Spring Call with a submission deadline on 25 May 2016.

In this issue, we present to you results and success stories of our projects, and information on our activities. This year we had four so-called Proposers Days in Vienna, Oulu, Paris and Antwerp, where in total 42 project ideas were presented and discussed with potential partners. Many of these project ideas have developed or will develop into project proposals and later into Celtic-Plus projects. If you are interested to participate in the proposal process, you are invited to have a look at these project ideas on the Celtic-Plus Website at [www.celticplus.eu/project-ideas-from-proposers-days/](http://www.celticplus.eu/project-ideas-from-proposers-days/).

Our next annual Celtic-Plus Event, where we will hear about the success of our running projects and see their demos in an exhibition, will be in Stockholm on 28-29 April 2016, co-located with the EUREKA Innovation Week and hosted by the Swedish EUREKA Chairmanship.

Our “Views from Public Authorities” article features this time the R&D activities of France, one of the most active players in the Celtic-Plus programme.

We hope you enjoy reading this issue of our newsletter and would welcome your comments.

**Peter Stollenmayer**  
 Editor



# Co-operative mobility services of the future

## Celtic-Plus project CoMoSeF



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The Celtic-Plus project CoMoSeF (Co-operative Mobility Services of the Future) developed commercial co-operative mobility solutions and services that were deployed in late 2014 and early 2015. With these solutions CoMoSeF made an important step towards providing ready-to-market traffic information systems for current and future mobile ecosystems in the intelligent transportation systems (ITS) market.

The consortium developed various new solutions able to disseminate traffic-related information between cars, the road infrastructure, transport agencies and others to warn drivers of upcoming hazards and keeping the traffic flow smooth. CoMoSeF services are easy to use and can be deployed in all kinds of vehicles and environments.

Technically CoMoSeF focused on services utilizing both embedded systems and data from CAN-Bus (Controller Area Network vehicle bus) as well as lower-cost nomadic devices. The systems were based on the existing and emerging standards. Indeed standardization is crucial, when bringing ITS (Intelligent Transport System) technology to the mass market.

### Benefits of CoMoSeF solutions

With CoMoSeF services, drivers are able, for example in foggy weather situations, to have a clear view of the street and get warned of pedestrians crossing the road ahead via the driver's mobile device. Traffic authorities are able to exchange their traffic information directly with the road participants, and vice versa. Taxi fleets in Finland use the CoMoSeF equipment, for example, to distribute their information about traffic jams or obstacles for cost-reduced trip planning to the next client. Buses from Otokar in Turkey are equipped with mobile devices updating the driver with speed recommendations and general traffic information.

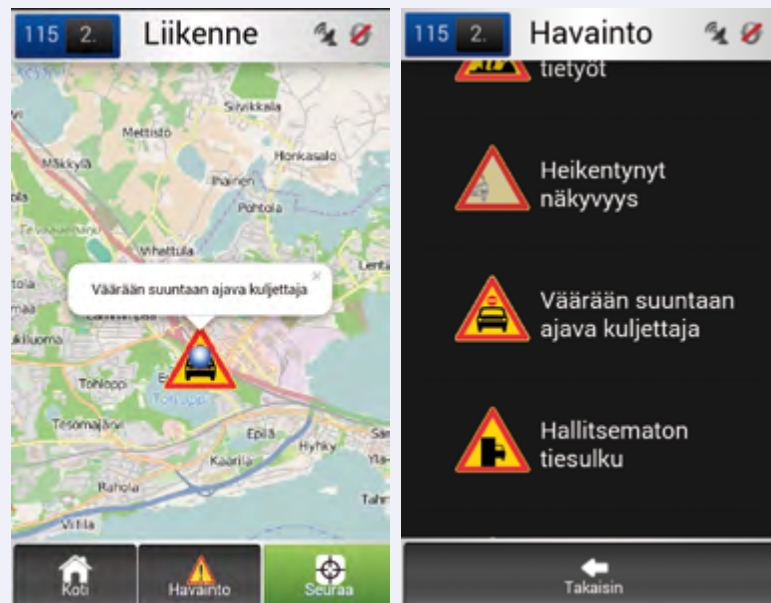


Figure: Tampere Mobile User Interfaces

### Successful pilots around the world

The big strength of CoMoSeF is that it has deployed solutions and services in real-life environments, which have proven their usefulness and viability. 21 partners from Finland, France, Luxembourg, Romania, Republic of Korea, Spain and Turkey developed and deployed 11 pilots, based on the common CoMoSeF architecture, taking the latest standards into account. The CoMoSeF pilot sites were:

- Tampere, Ylivieska and Sodankylä in Finland
- Compiègne in France
- Luxembourg City in Luxembourg
- Cluj in Romania
- Sochi 2014 Winter Olympics in Russia
- Seoul in Korea
- Basque Country in Spain
- Istanbul and Sakarya in Turkey

### Main issues

CoMoSeF dealt with various research and deployment items. The most important of these were based on sensor and observation data and dealt with road weather and traffic information. The communication technologies used were C-ITS, 3G and 4G/LTE. One of the major challenges of car-to-car communication for many years has been that a critical mass of communication infrastructure needs to be reached to avoid accidents in critical situations. CoMoSeF's solutions showed that the combination of centralized and decentralized communication technologies is a

good approach to enable traffic information distribution for safer and smoother trip planning already today.

The figure shows the mobile user interfaces of the CoMoSeF pilot in Tampere, Finland, where probe data were collected from bus and taxi vehicle fleets and transmitted to the data integrator. Real-time traffic data were used as one of the sources of traffic situations, incidents and road condition information. The information was delivered to the end-user service provider's server and further as traffic information service to end users through a web page and Android phones. The refined information was also delivered back to the fleets and used in the existing fleet management systems.

The pilots also contributed to other important European projects and national strategic initiatives in participating countries.

### Conclusion

CoMoSeF provided results that can help to increase traffic safety and fluency and decrease congestion by providing traffic information, weather forecasts, warnings, and other relevant notifications. Thus, it helps to reach the ambitious objectives set by the European Commission.

- Further information: <https://www.celticplus.eu/project-comosef/>



# World record transmission field trial

## Celtic-Plus Flagship Project SASER-Siegfried



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**The Celtic-Plus Flagship Project SASER-Siegfried achieved a world record transmission capacity of 38.4 Terabit per second (Tbps) over the Lyon-Marseille-Lyon fibre link, with 1.2 Tbps super-channels and low-cost hybrid Raman-Erbium amplifiers.**



Figure 1: Receiver side and low-cost hybrid Raman-Erbium optical amplifier deployed in the field on the Lyon-Marseille-Lyon link

The Lyon-Marseille-Lyon legacy fibre link (762 km) has been used in May 2015 to transport 24, 32 and 38.4 Tbps with several tens of  $\geq 1$  Tbps super-channels using 16-QAM, 32-QAM and 64-QAM modulation formats, respectively. That constitutes a world record over a live transport network in terms of aggregated capacity and transmission reach.

### Technical premises

These results have been obtained thanks to the excellent quality of the fibres as well as the reduction of losses between the line equipment (Tx/Rx and amplifiers) and cable heads, the advanced digital signal processing technologies (including spectral shaping, hardware components' imperfections mitigation, and soft-decision FEC) enabling higher-order QAM with spectral efficiencies of 8 bit/s/Hz (for 64-QAM), and the implementation of low-cost and energy-efficient hybrid Raman-Erbium optical amplifiers.

### Answer to increasing bandwidth requirements

The continuous traffic increase over transport networks due to bandwidth-consuming services and new customer services put long-distance optical transport networks under pressure. Wavelength Division Multiplexing (WDM) systems currently deployed over such networks use 100 Gbps wavelengths and are able to carry more than 8 Tbps in one fibre. However, the saturation of these systems will be reached in 4 or 5 years, and it is thus necessary to prepare the next generation of systems able to carry a threefold or fourfold higher capacity.

Despite this high bandwidth demand, it is imperative for operators to keep the legacy fibre infrastructure of optical transport networks for many more years. Enabling these networks to

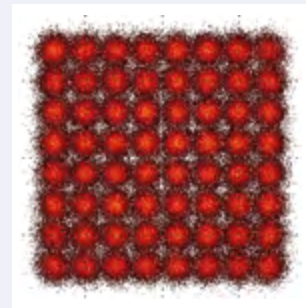


Figure 2: 64QAM constellation carrying 1.2 Tbps

carry several tens of Tbps without major modifications of the existing infrastructure will result in significant CAPEX (Capital Expenditure) savings for the operators.

### Conclusion

With the Celtic-Plus Flagship Project SASER-Siegfried, Orange, Coriant, Ekinops and Keopsys have reached a world record optical transmission capacity, transporting 38.4 Tbps over 762 km. This record-breaking capacity approaches the limit of single-mode optical fibre (estimated around 100 Tbps). By increasing the amplification bandwidth from 35 nm (the bandwidth used into the field trial) to 90 nm (by using the L-band), we would have reached this capacity limit.

This field trial is a crucial step towards permitting the involved equipment vendors and operators to keep their leadership in the competitive race among the actors in the optical communications domain.

- More information on SASER-Siegfried and the trial:  
<https://www.celticplus.eu/project-saser-siegfried/>  
<https://www.celticplus.eu/saser-siegfried-record-breaking-transmission-field-trial>



# How to incubate project ideas

## Celtic-Plus Proposers Day in Antwerp



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On 28 October 2015, Celtic-Plus held its fourth and last Proposers Day of the year in Antwerp, Belgium, kindly hosted by Alcatel-Lucent. Celtic-Plus Proposers Days are incubators of ideas for Celtic-Plus project proposals. They offer excellent opportunities for innovative people to explore public-private partnership collaborations in the area of ICT and to discuss ideas with peers from other organisations. Furthermore, Proposers Days provide the opportunity to find required partners, liaise with funding agencies, and get visibility in the Celtic-Plus community.

The Celtic Office organises three to four Proposers Days per year in different EUREKA countries. In 2015, before the Antwerp event, Proposers Days had already been held in Vienna, Paris, and Oulu, Finland. In addition, an online Proposers Day was held via Web conference.

### Welcome and sparkling keynote

For the Proposers Day in Antwerp, more than 75 people had registered, which nearly perfectly corresponded to the room capacity. The host, Alcatel-Lucent, provided a perfect local organisation and created a friendly atmosphere for open and constructive discussions in their newly refurbished meeting area. The audience was welcomed by Ingrid Van de Voerde, Executive Director Bell Labs Belgium, who showed several concrete cases of commercial benefits of participating in the Celtic-Plus Programme, and by the Celtic-Plus Chairman, Jacques Magen, who invited all Belgian ICT organisations to actively participate in Celtic-Plus.

The welcome was followed by a sparkling keynote address by Dr. Fahim Kawsar, leader of the Internet of Things research at Bell Labs. He asked interesting questions like "If everything is



Welcome speech by Ingrid Van de Voerde, Executive Director Bell Labs Belgium



The Celtic-Plus Chairman, Jacques Magen welcomes the participants of the Proposers Day



Pekka Eloranta from Mobisoft talked about Celtic-Plus project CoMoSeF

connected why would you need a device?", and pointed out that the battery is the most important item on the ICT Maslow Pyramid. Pekka Eloranta from Mobisoft reported about the impacts of the successful Celtic-Plus project CoMoSeF (Co-operative Mobility Services of the Future). He stressed that working within the Celtic-Plus environment gives the right framework and the freedom for projects aiming at exploitable results providing real added value.

The core contents of the Proposers Day was the presentation of ten interesting project idea pitches, which were well received and thoroughly discussed.



Dr. Fahim Kawsar, leader of the Internet of Things research at Bell Labs, giving a sparkling keynote speech

### IoT, Cloud Computing and Big Data

Amongst the presented project ideas at this and at earlier Proposers Days in 2015, IoT, Cloud Computing and Big Data were the most popular subjects.

For example, at this Proposers Day in Antwerp, we had IoT-related ideas regarding Smart Cities, Cloud-based video analytics, and Big Data for Earth observation. At the last Proposers Day in Paris, for example, we had ideas about "Smart & energy-efficient end to end security deployment platform for IoT", "Service oriented smart IoT", and "Utilization of NFV to support IoT services in heterogeneous networks and clouds".





Celtic-Plus Proposers Day, Antwerp, 28 October 2015

### Public funding in Belgium, France, and Israel

Representatives from the public funding authorities of Belgium, France, and Israel attended the Proposers Day and explained the funding in their countries. In Belgium there are two funding authorities for ICT-related projects: one is in charge of the Brussels region (Innoviris), and one for Flanders (IWT – Agency for Innovation by Science and Technology). Good projects are welcome to apply for funding without being bound by specific calls or subjects. France (DGE, Direction Générale des Entreprises) is continuing to fund Celtic-Plus projects in a bottom-up way, and has during the last years actually been the country with the most funded Celtic-Plus projects. Important for French participants are the tax benefits in addition to grants. In Israel (OCS, Office of the Chief Scientist) the main goal of funding participants to Celtic-Plus projects, is to strengthen the industry and enable markets.

### Participating in Celtic-Plus is easy

Celtic Office Operations Director Peter Herrmann explained in a best-practise session how easy it is to submit a project proposal to Celtic-Plus. By the different Call deadlines proposals get submitted to the Celtic-Plus online proposal portal. A template for the proposal is available on the Celtic-Plus Web at [www.celticplus.eu](http://www.celticplus.eu). Usually within a month, the proposals are evaluated by independent experts and labelled in a special Celtic-Plus Labelling meeting with the Public Funding Authorities. Within less than typically six weeks pro-



Mathilde Reumaux, Innoviris, representing the Brussels region funding authority

posers get a reply whether their projects received the Celtic-Plus Label, and what comments were made by the experts and Funding Authorities. As soon as the public funding is ensured, labelled project can start. The typical success rate is 60-70%. The Celtic Office is happy to provide any required support through all the phases.

### Conclusion

The Celtic-Plus Proposers Days are crucial means to incubate new ideas for new Celtic-Plus projects, to discuss these ideas with interested experts and to network with other organisations to build strong consortia for successful projects. Even organisations and experts not directly participating at a Proposers Days can benefit from the ideas and discussions.



Danny Van Steenkiste, IWT, representing the Flemish region funding authority

Summaries and contacts of the ideas are available on the Celtic-Plus website at <https://www.celticplus.eu/project-ideas-from-proposers-days>

Next year we will continue with a series of attractive Proposers Days. Please stay tuned for the location and time via:

- Celtic-Plus website, events section – [https://www.celticplus.eu/?post\\_type=tribe\\_events](https://www.celticplus.eu/?post_type=tribe_events)
- Twitter – <https://twitter.com/CelticPlus>
- LinkedIn – <https://www.linkedin.com/grp/home?gid=3875389>

# How France fosters international cooperation with- in Celtic-Plus



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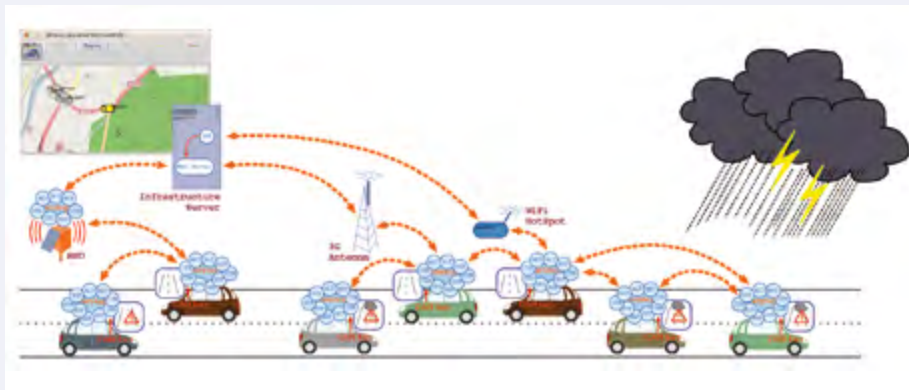
**In France, The French Ministry for the Economy, Industry and Digital Affairs (MEIDA) supports the strategic initiative Celtic-Plus for European cooperation in the telecommunication area, within the framework of EUREKA, and is involved in its management, representation and promotion. MEIDA is a member in the public authority board of Celtic-Plus.**

## The EUREKA network

EUREKA is an intergovernmental network of more than 40 members and associated members to foster international research, development and innovation projects. The EUREKA Clusters are industry-driven bottom-up strategic initiatives, focusing on topics like telecommunication or software intensive systems. They are complementary to the instruments of the EU, being more flexible regarding the proposed topics, the execution of projects, and the choice of partners from non-EU countries. Projects in EUREKA Clusters are directly funded by the participating countries.

## The Celtic-Plus Cluster

Within the different EUREKA Clusters, Celtic-Plus, which is focused on telecommunications including networks, services and applications, is particularly relevant for the French industry as the development of telecommunications infrastructures and of their use contributes critically to the integrated added value. Several French companies are members of the Celtic-Plus Core Group, including Alcatel-Lucent, Orange, Gemalto, Thales and Technicolor.



Celtic-Plus project COMOSEF: French pilot scenario: prevention of sudden bad weather by analysis of wipers, fusion of distributed data, alert propagation and opportunistic information ascent on the infrastructure

## Celtic projects in France since 2009

28 Celtic-Plus projects have been funded in France between 2009 and 2014. These projects account for a total funding from MEIDA of almost 42 million euros. This corresponds to approximately 4 funded projects per year, and 1.5 million euros of funding per project. This makes France one of the main contributors of Celtic-Plus.

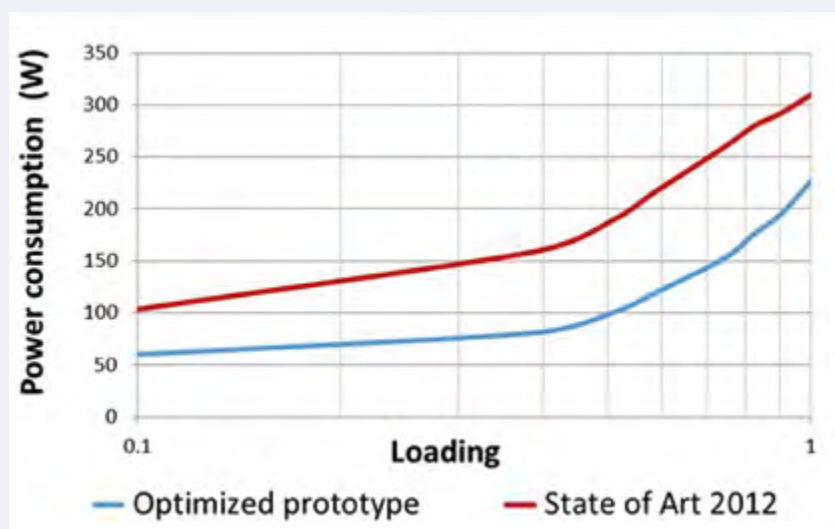
## Flagship projects and successful projects

France has been involved in major successful Celtic-Plus projects like 100GET, finished in 2010, followed by the EO-Net project on flexible optical networks, and SASER (Safe and Secure European Routing), which is the current Celtic-

Plus flagship project. SASER comprises 61 partners from 5 countries, including 14 French partners with a French total budget of approximately 12 million euros corresponding to 5 million euros in funding. Among the recent very successful projects where France has been involved are COMOSEF, which dealt with large-scale deployment of Intelligent Transport Systems, and OPERANET 2, which focused on energetic optimisation in mobile networks (see figures).

## Funding in France

EUREKA is an international network and not a funding programme. Funding opportunities are different in the various member countries. In France the MEIDA is the national funding body.



Celtic-Plus project OPERANET 2: Power consumption gain of an "envelop tracking" amplifier obtained in the project, as a function of the base station loading rate, compared to the 2012 state-of-the-art





Once a project has been labelled by Celtic-Plus, i.e. confirmed the high quality of the project, the French partners of a project may approach MEIDA to submit a funding application. France is committed to the bottom-up mechanism defining the Clusters and does not restrict its funding to specific topics, insofar as the relevant research areas are already identified by Celtic-Plus. However, an emphasis on energy-efficiency and security in ICT, or useful applications of ICT (like for smart cities or e-health) is appreciated. The funding rates are 25% for large companies, 45% for SMEs if the project is labelled by a French competitive cluster (30% otherwise), and usually 100% of the marginal costs for research centres and universities.

### Conclusion

Celtic-Plus is a bottom-up R&D programme that complements other international and national programmes, and offers a flexible international cooperation framework. It is a very interesting and important programme for French companies supported since its beginning by MEIDA.

- More information on MEIDA and its Directorate-General for Enterprises: <http://www.entreprises.gouv.fr/home?language=en-gb>
- More information on EUREKA: <http://www.eurekanetwork.org>

- More information on SASER: <https://www.celticplus.eu/project-saser>
- More information on COMOSEF: <https://www.celticplus.eu/project-comosef>
- More information on OPERANET 2: <http://projects.celticplus.eu/opera-net2>

## Energy-efficient radio access networks

### Celtic-Plus project Opera-Net 2



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**After more than three years, the Celtic-Plus project Opera-Net 2 ended in May 2015 with numerous achievements focused on environmental impacts reduction. The 11 European project partners succeeded to manage modelling, hardware and software design in the area of energy, material efficiency, innovating cooling solutions, new power amplifier components, network architectures, off-grid power systems and field trials. This article presents a selection of the achievements.**

#### Combining hardware design and network optimization

The project combined network optimization methods such as Smart Frame Filling with hardware optimizations based on an Envelope Tracking power amplifier.

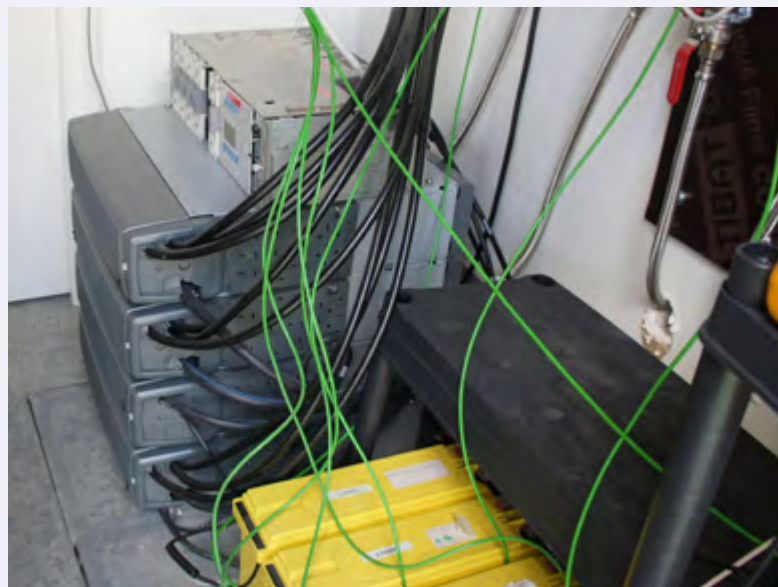


Figure 1: Experimental water-cooled radio base station

Envelope tracking is a high-speed technique that dynamically adjusts the power amplifier energy consumption to the traffic level. Smart Frame Filling is a scheduling technique compliant with the 3GPP standard that dynamically creates silent time frames during low traffic periods in which the base station does not transmit any data. The ability of the amplifiers to be switched off during these silent periods enables a power consumption reduction.

When combining those optimization methods and during low traffic conditions, energy savings could reach about 50% at radio module level.

#### New cooling techniques

As cooling can consume more than 50% of radio base station (RBS) site energy, new efficient techniques have been developed and demonstrated. A very efficient method is passive cooling: based on a phase change liquid and thermosiphon loop, this system has been experimented in an outdoor telecom cabinet with good performances of up to 800 W and 40°C outside temperature. This system is self-operated using natural fluid circulation without any electricity.





Figure 2: External view of the Hybrid system in Orange Labs in Lannion (France)

Another technique is liquid cooling, which can tackle challenges coming from higher power density needed to handle higher data rates. Liquid cooling enables 45% cooling capacity increase, 75% heat density upgrade and thus 40% cooling volume reduction on the device level. This allows new site locations, as heavy ventilation or additional electrical power is no longer necessary. Similarly, when heat is transferred in a liquid, it is much easier to reuse it for other purposes, which significantly reduces the environmental impact of a radio base station site.

Liquid cooled and legacy air-cooled radio base station sites were demonstrated and their performance was compared at Orange Labs in Lannion, France.

At radio base station level, the liquid cooled energy consumption is 9 times lower as an air-cooled solution, with the additional high potential of re-using the heat for possible non-telecom applications.

### Multi-string battery storage for off-grid hybrid power system

Improvements regarding energy storage and charging efficiency in off-grid systems have been experimented on an Orange Labs trial platform

using a combined photovoltaic, wind and gas generator system. The lead battery is divided into four strings associated to a new software controller. This power storage architecture and the dynamic management of the charge-discharge current of each battery string have been measured during a whole year. Measurements and theoretical assessments concluded 12% more energy stored on a yearly basis thanks to better battery charging efficiency during low production periods.

### Material efficiency

Often forgotten in the considerations about environmental impact reduction is the use of environment-friendly material. The project studied and developed a new material efficient casing of the base station which optimizes the use, reuse and recycling of materials throughout the whole life cycle.

Different to the initial product (Remote Radio Head casing part), the equipment designed by Opera-Net 2 uses 100% of recycled material (aluminium die cast) which leads to 50% decrease in Global Warming Potential (GWP).

### Conclusion

Most of the project achievements presented in this article have a short-term industrial development potential. Combined with the standardization activities initiated by the project, the achievements will significantly enhance the energy efficiency of future mobile networks.

Opera-Net 2 project partners: Orange, Alcatel-Lucent Bell Labs France, Arelis-Thomson Broadcast, Freescale, Nokia, Efore, VTT, Alpha Technologies, Telecom Bretagne, Université de Caen, Cardiff University

- More information about Opera-Net 2: <https://www.celticplus.eu/project-opera-net2/>



# QuEEN

## Quality of Experience in Networks



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**Quality of Experience (QoE) is a concept where the quality of a service is represented in the way an actual user would assess it. Evaluating QoE requires accounting for the intrinsic technical quality of a given service and for its ergonomic performance. Being a user centric concept, it encompasses also aspects ranging from the context of use of a service to the psycho-physical ability of the users, their personal history and motivation for using a service.**

**The QuEEN project investigated the concept of QoE from various perspectives: the theoretical basis, operational measurements as well as technical, economical and business aspects.**

### Theoretical perspective

The theoretical results of the project are grouped in the so-called QoE framework consisting of:

1. A **terminology** coherently defining the various concepts (service, quality, QoE etc.) necessary to deal with QoE. This terminology is based on an already established set of definitions, but introduces some new concepts, e.g. related to temporal aspects of the QoE.
2. The **ARCU model** (Application – Resources – Context – User): a vector space-like theoretical abstraction allowing modeling QoE.
3. The **QoE-layered model**: an operational approach to the ARCU model. This model is similar in spirit to the standard 7 layers OSI (Open Systems Interconnection) model. It consists of 6 layers (Resource, Application, Interface, Context, Human, User), allowing accounting for the various aspects of QoE.

The relation between the ARCU and the QoE-layered models is depicted in the figure. Theoretical results of the QuEEN project are not limited to the QoE-framework. Many models related to the various layers of the QoE-layered model have been studied and published.

### Operational perspective

The QuEEN-agent specified and developed in the project is a software agent implementing the

QoE-layered model. The QuEEN-agent is a distributed SNMP compliant agent. It comes with a set of APIs (Application Programming Interfaces) allowing easy integration of user-defined models in each layer. Using these models, the QuEEN-agent performs evaluations of the QoE as defined in the QoE-layered model. Users' defined models typically require external data as input. APIs are provided in order to inter-connect the QuEEN-agent with external data collection equipment or with applications using the QoE-evaluations.

- The QuEEN-agent Java implementation and documentation are available at <https://gitlab.willab.fi/queen/queen-agent.git>

### Technical, economical and business perspectives

The economic importance of QoE cannot be overestimated. The QuEEN project investigated the impact of a better understanding of QoE, from the theory to the estimation. In the telecommunication domain for instance, the billing of subscriptions is traditionally QoS-based (Quality of Service). Mathematical approaches have been defined during the project to allow new QoE-based billing schemes. Other examples of results include the introduction of QoE into value networks (methodology for understanding, visual-

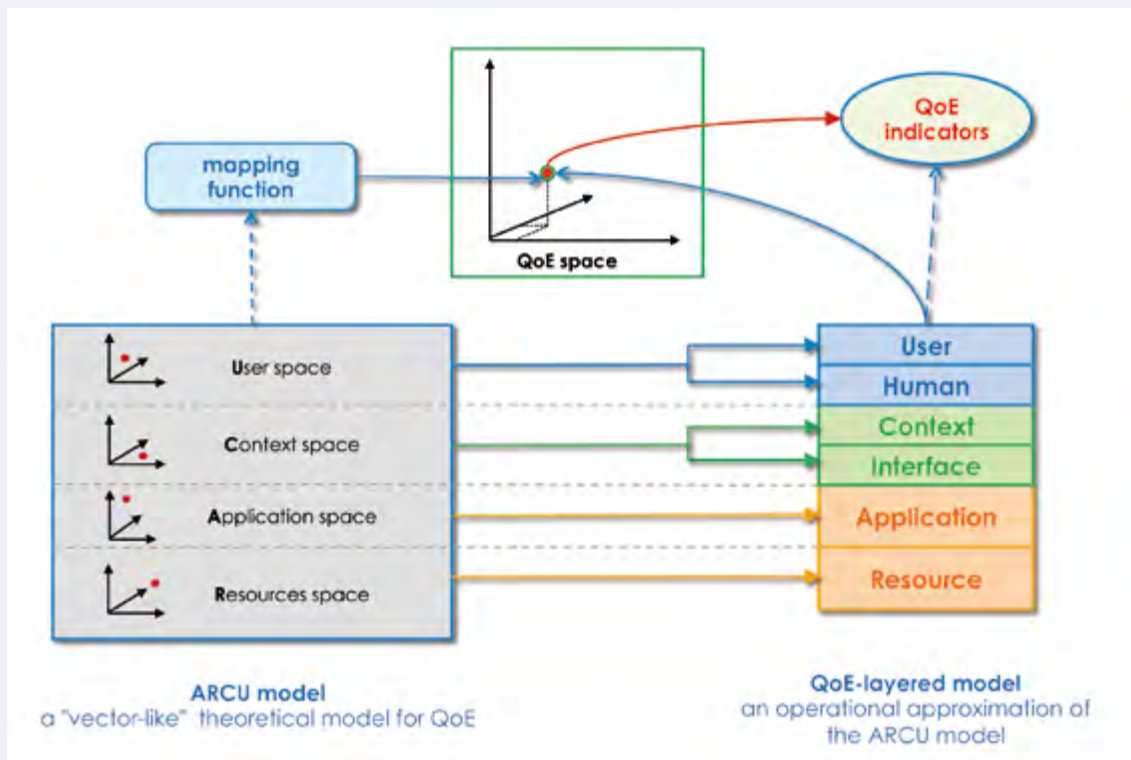


Figure: Relationship between the ARCU and the QoE-layered models



izing and optimizing interactions between economic actors) or the definition of QoE-based Service Level Agreements.

### Conclusion

The QuEEN project was extremely ambitious regarding its scope, which ranged from the theory of QoE to technical aspects (the evaluation of QoE) and prospective investigations. Thanks to the coherence and interdisciplinary composition of the consortium (up to 25 partners from 8 European countries), the project has successfully

achieved its main objectives.

The QoE framework and the specification of the publicly available QuEEN-agent have been published by ETSI (ETSI TS 103 294). The project produced three other ETSI and ITU-T documents, and contributed to 3 ITU-T recommendations. Project activities led to more than 100 scientific publications on all aspects of QoE and the (co-) organisation of 6 international conferences or

workshops.

Results of the project also led to the development of four new products:

- Emotracker and e-commerce recommender by ITAInnova (Spain)
- IPTV GPON Probe by Telnet (Spain)
- The telemedicine system QuoTe by VTT (Finland)

Beyond these results, we hope that the global approach to QoE developed during the project will help the QoE related community and be a source of inspiration for further work.

- More information: <https://www.celticplus.eu/project-queen/>

## Celtic-Plus Event 2016

### Co-located with EUREKA Innovation Week 2016

Stockholm, Sweden, 28-29 April 2016

**The Celtic-Plus Event 2016 will be organised on 28-29 April 2016 in Stockholm, Sweden, co-located with the EUREKA Innovation Week 2016 from 25-29 April 2016, organised and hosted by the Swedish EUREKA Chairmanship at the Stockholm City Conference Centre.**

#### Networking with proposers and experts

The event will include a session on innovative project ideas for experts from the ICT community to discuss emerging R&D needs and proposals for related collaborative projects. This is an extraordinary opportunity for participants to present their companies and expertise, to offer project ideas for collaboration and to find partners.

#### Exhibition and demos

Results of about 15 commercially important Celtic-Plus projects will be presented at the related exhibition. The prototypes evolving from these projects will allow the audience to experience in an interactive and playful way the technological progress made in those projects.

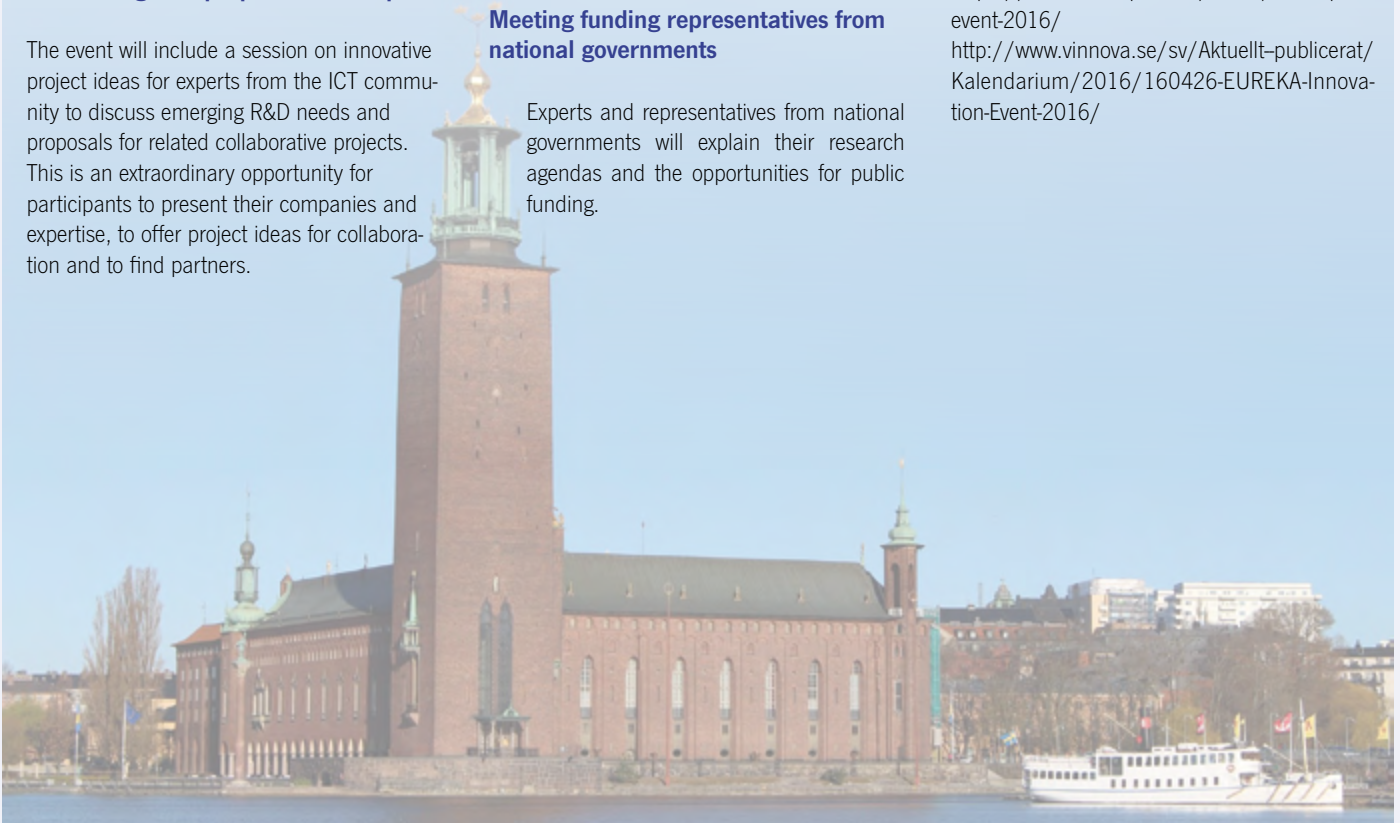
#### Meeting funding representatives from national governments

Experts and representatives from national governments will explain their research agendas and the opportunities for public funding.

#### Celtic-Plus Award

Every year Celtic-Plus selects the three best rated Celtic-Plus projects for the Celtic Excellence Awards. At the event the winners will be announced and celebrated.

- Further information: <https://www.celticplus.eu/event/celtic-plus-event-2016/>  
<http://www.vinnova.se/sv/Aktuellt-publicerat/Kalendarium/2016/160426-EUREKA-Innovation-Event-2016/>







[www.celticplus.eu](http://www.celticplus.eu)

#### About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new "Smart Connected World" paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

