



SooGREEN

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Service Oriented Optimization of GREEN Mobile Networks

Mobile networks are witnessing an exponential growth of traffic volumes, associated with the emergence of new services. This situation pushes towards an evolution of network architectures and of content delivery solutions.

SooGREEN addresses the need to reduce the energy consumption of services in different mobile network architectures, while taking into account the development of smart grids.

Main Focus

- ◆ **Modeling the energy consumption of services** in different mobile network architectures taking into account the end-to-end path.
- ◆ **Definition of KPIs for energy efficiency of services** and adequate measurement and reporting methods (for energy efficiency standard evolutions).
- ◆ A joint **dynamic optimization of the mobile access network and content delivery** solutions.
- ◆ **Design of energy efficient Virtualized and Centralized Radio Access Net-**

works considering hardware, software, network link and cloud orchestration.

- ◆ Proposal of solutions for enabling the **bi-directional interaction of the mobile network and the smart grid** by exploiting the flexibility of some services and the energy storage capabilities in the network.
- ◆ An efficient **passive cooling solution for central offices** hosting centralized base stations.
- ◆ The **optimization of the energy storage** in base station sites of mobile access network, thanks to an innovative Battery Management System and a new energy concept of integrated fuel cell and in situ production of hydrogen by electrolysis.

Approach

The SooGREEN project designs network control algorithms, develops practical demonstrators, proposes contributions to standardization bodies and disseminates results through scientific publications.

The Work is split into 6 technical Work Packages:



SooGREEN



◆ **Modelling and Measurement of services energy consumption in mobile networks**

It gives models that allow simulating the proposed mobile network optimization techniques and assessing their theoretical performances. The Key Performance Indicators (KPIs) developed will enable realistic design of energy reduction schemes, both on access network or on hardware level.

◆ **Energy-oriented optimization of service delivery solutions in mobile networks**

It aims to design mobile networks that are able to absorb this drastic increase of traffic while mastering their energy consumption.

This will be achieved through two complementary axes: access network energy efficiency increase and end-to-end optimization of content delivery solutions.

◆ **Energy efficient service delivery in Centralized and Virtual RAN**

It intends to provide a clear and global view on the actual energy gains potential of the VRAN/CRAN approach, including hardware/software architecture, front-hauling communication, resources orchestration, service delivery, and central office cooling.

◆ **Interaction between service delivery in mobile networks and smart grids**

It enlarges the vision towards a wider interaction of mobile networks with the smart grid, taking into account the energy generation and storage capabilities of mobile networks, as well as the service requirements and corresponding network constraints.

◆ **Dissemination**

It maximizes the impact of project achievements on scientific community, industry, regulators and standardization.

◆ **Solutions Integration and Harmonization**

It ensures the integration of the previous work packages results: inter-operability of energy savings mechanisms, development of a common simulation platform and of a demonstrator.

Expected results

- ◆ **Global models for end-to-end energy consumption of services** (OTT, P2P, web browsing, IoT/WoT)
- ◆ **Definition of adequate measurement data** for energy consumption of services, and methodologies for correlating these in order to **create KPIs for service energy consumption**.

◆ **An energy efficient Virtual RAN demonstrator.**

◆ **Solutions and demonstrators for improving the network energy efficiency by a joint optimization of network configuration and service parameters.** This includes the dynamic reconfiguration of the access network parameters and the adaptation of the service delivery solutions.

◆ **Demonstrator for efficient cooling solutions in telecommunication centers**

◆ **Solutions for an adaptation of the service delivery** in mobile networks to the smart grid.

◆ **A demonstrator on the peak shaving** capability.

◆ **Enhanced storage capabilities enablers for increasing the energy autonomy of mobile network sites.**

Impact

In a context where mobile network ecosystem evolves quickly with actors coming from software and Internet, SooGREEN industrial partners expect to benefit from the project results:

- ◆ **Telecom manufacturers target to keep their leadership** thanks to the performance optimization in virtualized network.
- ◆ **Mobile Network Operators are obliged to optimize their network costs**, as well for CAPEX and OPEX, OPEX that are currently being dominated by Energy costs.
- ◆ **Mobile Network Operators target at playing a central role through connection and control of connected objects.**
- ◆ **Telecom Operators will profit from smart grid development for diversifying their offer.**

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 organizations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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