Project information

CELTIC
Telecommunication Solutions
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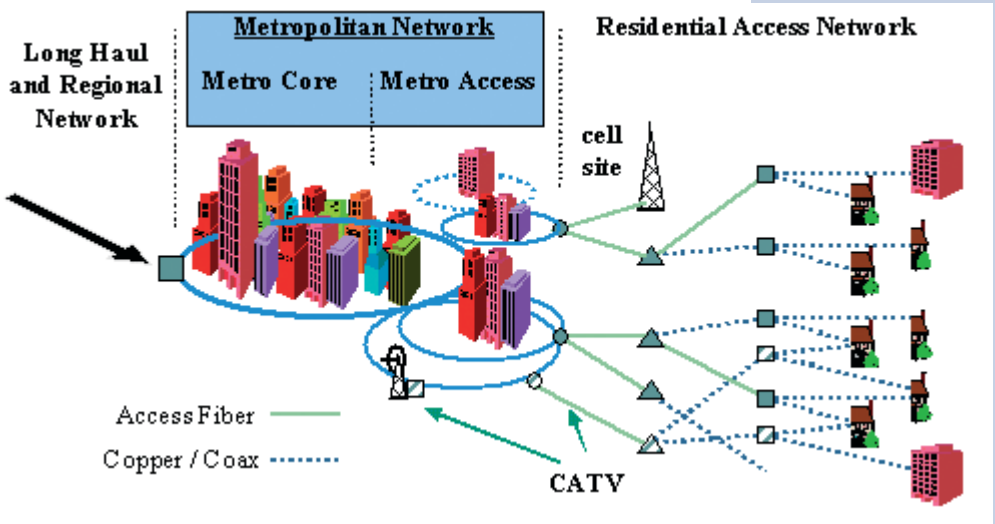
OPtimized Transponders for Robust Optical NETworks

OPTRONET will enable the implementation of a completely transparent optical network for metropolitan and regional communication systems, allowing the expansion of current networks without the traditional transmission limitations. By applying optimized transponders, higher distances can be covered.

Main focus

In a general end-to-end connectivity picture, the current networks consist of three major segments, the residential access, the metro/region and the long-haul network. A metropolitan/regional area network provides the interface link between the end-users ("residential access" or "last-mile" networks) and the backbone long-haul network. The main role of a metropolitan area network segment is to provide traffic grooming and aggregation of a full-range of client protocols from enterprise/private customers in access networks to backbone service provider networks. In addition, since the majority of the traffic stays within the same area, metro networks need to provide efficient networking capabilities within the metro area. Currently, there is a strong desire to migrate from the current SONET/SDH – based network architecture into a more proactive (dynamic and intelligent), multi-service optical network. This will allow to reduce the OPEX (Operating Expenditures) and CAPEX (Capital Expenditure) costs.



OPTRONET

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Completion date: 10 August 2008

Partners

Civcom, Israel

CoreOptics, Germany

Instituto de Telecomunicações, Portugal

Nokia Siemens Networks S.A. Portugal

University of Kiel, Germany

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Co-ordinator

Paulo Monteiro
Nokia Siemens Networks S.A. Portugal
E-mail: paulo.1.monteiro@nsn.com

Project web site

www.celtic-initiative.org/projects/optronet

Approach

OPTRONET stands for optimizing the methods that improve system performance. This involves work in use of alternative modulation formats for increased tolerance to optical transmission impairments, spectral narrowing/dispersion due to filter concatenation, intrachannel crosstalk, optical and electronic channel equalization (ECE), and finally special focus on cost effective components and sub-systems. The project involves:

- **Identifying network solutions** and evolutionary design guidelines for metro networks to support broadband access for all.
- Identifying the system technologies **best fitted** for a metro-optimized system offering.
- **Defining requirements** for system technologies and provide feedback on related standardization bodies.
- Assessing the different systems in terms of **technical/manufacturing feasibility** and improved system performance.
- Identifying the **optimum targeted transparent reach** for systems operating at different bit-rates (evolution path from 2.5Gb/s to 10Gb/s to 40Gb/s).
- Specifying optimum **(performance and cost)** implementations for the system technologies (modulation formats and equalization techniques) under consideration.
- Designing and building **prototypes of novel high-speed transmitters** supporting advanced modulation formats and receiver modules with ability for dynamic signal equalization.
- Working with **directly modulated lasers** (DMLs) and 10Gb/s modulation. Try to overcome limitations induced with electronic channel equalization

Main results

The main outputs of the work in this project are expected to be:

Define requirements for optical interfaces in terms of output power, frequency misalignment from the ITU-grid, and dispersion tolerance to provide feedback on related standardization bodies.

- Achieve **4000 ps/nm uncompensated** reach with less than **2dB penalty at 10 Gb/s**
- Achieve **3dB OSNR sensitivity improvement** without FEC at 10 Gb/s relative to a system utilizing the **conventional NRZ ASK modulation format**.
- Achieve **5000 ps/nm ECE-compensated reach** with less than **2dB penalty at 10 Gb/s**
- Achieve **300 ps/nm ECE-compensated reach** with less than **2dB penalty at 40 Gb/s**
- Perform a **field trial** where the proposed solutions will operate in a field deployed fiber network.
- Identify capabilities and measure performance of 10Gb/s transmission based on **DMLs with the support of ECE**

Results of the project are expected to contribute to the definition of standards in the domain of opto-electronics components/subsystems. In particular, the definition of requirements is expected to be the main contribution of the project.

Impact

The future optical networks either core or metropolitan, entail the provisioning of full connectivity meaning that every node should be able to add, drop or cross-connect traffic. The node sites will coincide with amplifier/regeneration sites but there can be amplifier/regeneration sites without add/drop traffic capabilities. In order to meet this requirement innovative OADM/OXC architectures have to be applied which will set their own limitations in terms of loss, filter profile, etc. In this case, additional impairments have to be considered like intra-channel crosstalk, the well-known dispersion, OSNR reduction etc. The project intends to provide a complete study of the requirements of the future optical networks as well as to use a series of advanced methods in order to overcome the above-mentioned impairments. The methods are expected to give valuable input to European operators and vendors. The innovative methods will be tested in terms of their efficiency in a system point-of-view. These methods will lead to know-how gain towards future products. Additionally, the system capabilities by the use of these methods will give the operators information about the capabilities offered with ultimate goal the customer satisfaction.

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.

CELTIC Office

c/o Eurescom,
Wieblinger Weg 19/4
69123 Heidelberg, Germany
Phone: +49 6221 989 405,
e-mail: office@celtic-initiative.org
www.celtic-initiative.org

EUREKA
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