Project Achievements

Cost-optimized optical 100 Gbps transport technology for metro networks

Novel optical technologies for 100Gbps data transport in metro and regional area networks were developed. Prototypes for transceiver subsystems with enhanced modulation formats were realized and tested in the laboratory and field environment. Transmission impairments for these formats were also investigated, and compensators to eliminate the effects of these impairments were developed.

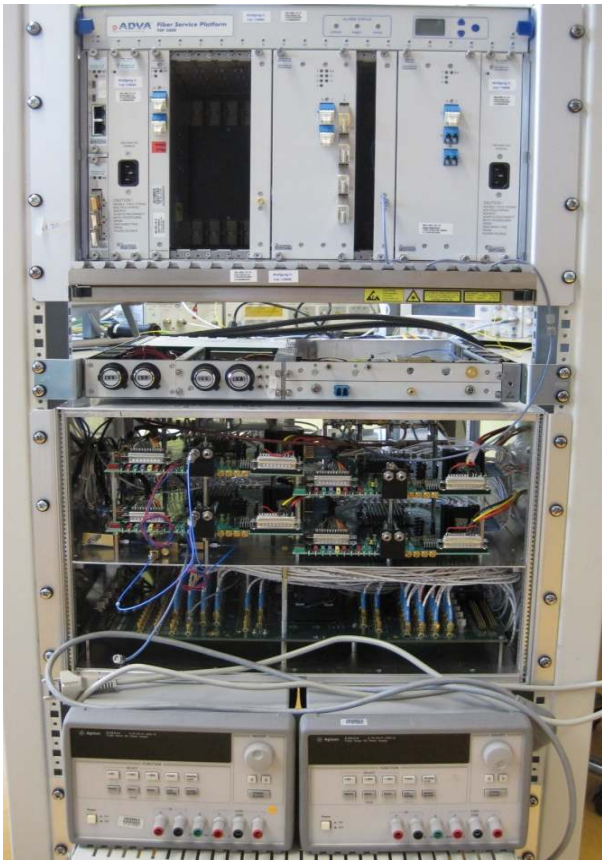
Main focus

The 100GET-METRO project investigated 100 Gbps transport technologies for metro network applications, targeting a cost effective solution, which will enable the use of high data rate technologies also for enterprise users. To achieve this objective, novel modulation formats were investigated, which combine lowest implementation effort with highest system capacity and best tolerance to fibre system impairments. A transceiver demonstrator was realized enabling the transmission of 100 Gbps data streams over 430 km of fibre, using the novel DPSK-3ASK modulation format. The field demonstration using this transceiver was one of the world-wide first 100 Gbps transmission demonstrations, in which forward error correction (FEC) was implemented, enabling real-time error-free transmission.

A second focus of the project was on the evaluation of fibre effects on high data rate and multi-level signals and the development of compensators to overcome these impairments. This focus was complemented by the development of new procedures and equipment for distortion tolerance testing and components to emulate fibre propagation impairments. Development of software models for a more detailed investigation of high-speed transmission systems completed this activity.

Approach

Various modulation formats were investigated in the project. DPSK-3ASK was selected to be implemented in the transceiver demonstrator. Here, amplitude and phase of the optical carrier are modulated, encoding 5 bits in 2 consecutive symbols, resulting in a symbol rate of approximately 40 GBaud. The technology to support this modulation scheme has been available commercially already during the first year



100GET-METRO

Project ID: CP4-001

Start Date: 1 October 2007

Closure date: 31 December 2010

Partners:

ADVA AG Optical Networking, Germany

Agilent Technologies R&D and Marketing GmbH & Co. KG, Germany

Christian Albrecht Universität Kiel, Germany

Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Germany

Technische Universität Hamburg-Harburg, Germany

Technische Universität Dortmund, Germany

VPIsystems, Germany

Co-ordinator:

Michael Eiselt

ADVA AG Optical Networking, Germany

E-mail: meiselt@advaoptical.com

Project Website

www.celticplus.eu/Projects/Celtic-projects/Call4/100GET/100GET-METRO/Project-default.asp

of the project, enabling an early hardware realization. During the progress of the project it became apparent that dynamic transmission data rates, which are adaptive to the quality of the optical link, will become an important topic to enable a more efficient utilization of the transceiver hardware and to reduce cost and energy consumption. The transceiver demonstrator developed during the project enabled one of the first demonstrations of adaptive data rate transmission.

Achieved results

The work carried out in the project resulted in the development of several prototypes, for a 100 Gbps transceiver as well as for test equipment. Simulation models resulting from the project work were included into a commercial software package. The experimental activities culminated in a field trial in the Deutsche Telekom OCTET test bed. This field demonstration was one of the world-wide first 100 Gbps transmission demonstrations with real-time bit-error rate measurements. Forward error correction (FEC) was implemented, enabling error-free transmission.

Going beyond the initial objectives of the project, the transmission of variable data rates was demonstrated with the prototype developed within the project. This was also one of the world-wide first experiments demonstrating an extension of the transmission reach by slightly reducing the transmitted data rate, while using the same optical transceiver. These demonstrations laid the foundation for further work in the novel field of adaptive data rate transmission.

The results of the project were published in approximately 40 peer-reviewed journal articles and conference contributions. Nine invention disclosures filed on project work will enable a commercial exploitation of the project results.

Impact

Due to the large growth rates of data transmission capacity in optical transport networks, system operators require 100 Gbps optical transmission technology as soon as possible. Currently commercially announced solutions are targeted towards long transmission distances in the backbone network. They are based on new technology developments and therefore will only be available at high cost and will not be suited for metro networks. The solutions developed within the project are targeting the shorter transmission distances. By utilizing lower speed technologies for 100 Gbps transport, the project has provided the necessary developments for this technology to be ready in time for early deployments. The technology developed within the project will result in product releases by the commercial partners during the year 2011. Within the project, some of the world's first experimental demonstrations in the field of adaptive data rate transmission were achieved. This novel application has now found large attention in the scientific community and will be further developed leading to lower cost and more energy-efficient optical transport solutions.

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

EUREKA