Project Information

100GET-METRO
Cost-optimized optical 100 Gbps transport technology for metro networks

100GET-METRO investigates novel optical technologies for 100Gbps data transport in metro and regional area networks. The project develops and tests prototypes for transponder subsystems with enhanced modulation formats. Furthermore, transmission impairments for these formats will be investigated, and compensators to eliminate the effects of these impairments will be developed.

Main focus

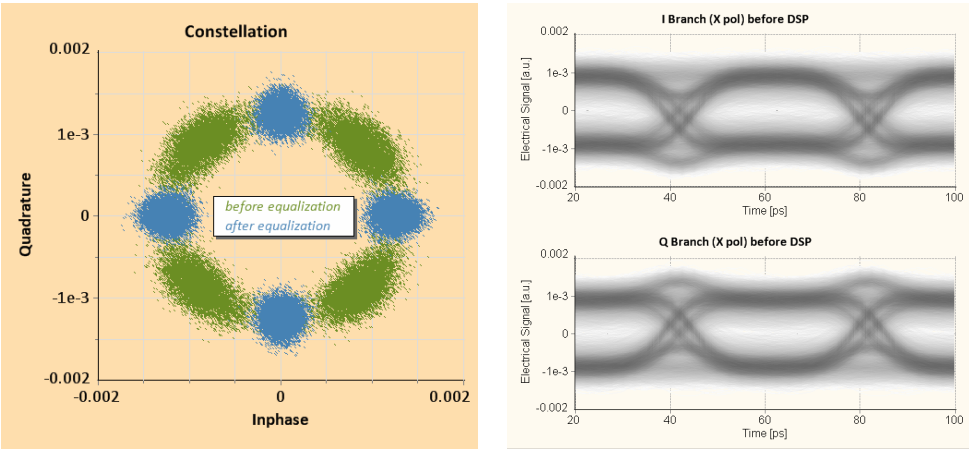
The 100GET-METRO project will investigate 100 Gbps transport technology for metro network applications. One main aspect of these investigations is the realization of cost effective solutions, which will enable the use of high data-rate technologies also for enterprise users. To achieve this, novel modulation formats are investigated, which combine lowest effort with highest system capacity and best tolerance to fiber system impairments.

A second focus of the project will be on the evaluation of fiber effects on high data-rate signals. As the spectral bandwidth of 100 Gbps signals exceeds those of existing data rates, not only first-order effects need to be considered, but higher-order effects will have a severe impact on the transmission quality. The impact of these effects is evaluated and solutions are developed to compensate these effects.

The third focus will be on testing of the developed transceiver modules and compensation solutions. A new procedure and equipment for distortion-tolerance testing will be developed. In addition, components to emulate higher-order distortions will be realized, which can be used for transceiver and system qualification. The modules developed in the framework of this sub-project will be submitted to these test procedures and components in the laboratory and a field-environment network.

Approach

The project is structured into four work packages. In work package 1 (WP1), numerical system simulations will be performed to investigate the propagation tolerances of 100 Gbps signals with various modulation formats. This will lead to an optimized format, which will be realized in a transceiver development.



Constellation diagramme (left) and corresponding eye diagramme after decoding (right) for a polarization multiplexed DQPSK signal. The symbol rate is 25 Gbaud for a channel data rate of 100 Gbps.

100GET-METRO

Project ID: CP4-001

Start Date: 1 October 2007

Closure date: 30 September 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:

Dr. Michael Eiselt

ADVA AG Optical Networking, Germany

E-mail: meiselt@advaoptical.com

Project Website

www.celtic-initiative.org/projects/100GET

Further simulations will investigate the impact of higher-order effects (2nd order PMD, chromatic dispersion slope, phase and amplitude ripple) on a number of modulation formats, yielding requirements for distortion compensators and component specifications. The simulation work will be supported by the development of novel models for BER estimation and receiver impairments.

In WP2, several methods for dynamic distortion compensation will be investigated. As a 100 Gbps signal will have a very small tolerance to chromatic dispersion, the signal quality is sensitive to changes in the fiber environment, which results in changes of the fiber chromatic dispersion. Therefore, a tuneable chromatic dispersion compensator will be developed to counteract environmental changes. In addition, an optical delay-line filter will be developed to compensate for higher-order signal distortions. It will also be investigated, if a low-cost electrical delay-line filter can be used for distortion compensation. In addition, novel compensation algorithms will be investigated, which are targeted for multi-level and differential modulation formats, as those will most likely be used for 100 Gbps transport.

Based on the results of WP1 and WP2, in WP3 laboratory and commercial-grade transceiver set-ups will be developed to investigate the novel modulation formats and the higher-order distortion impacts. A commercial-grade transceiver will have full software and hardware functionality to be integrated in a commercial optical transmission system.

The test of high data-rate systems will require new methods and equipment, as these signals will be sensitive to different (higher-order) effects than lower-rate signals. To this effect, in WP4 a new test method for transponder tolerances will be developed as well as a novel emulator for higher-order distortions. These methods and modules will be used to evaluate the transceiver modules developed in WP3. The modules will be tested in laboratory environments as well as in a field-test network, provided by Deutsche Telekom (OCTET).

Main results

100 Gbps optical transmission for metro network application will be investigated. The outcome will be the prototype of a cost-optimized transceiver. Further investigations will consider the impact of higher order optical effects on high data-rate signals and result in concepts and prototypes for signal-distortion compensators. Furthermore, methods and hardware for transmission system testing will be developed, which will be able to serve as a standard for future high bit-rate transmission-equipment testing. This equipment will be tested extensively using the transceiver modules developed within this project.

Input from the sub-project will also be given to standardization groups (e.g. IEEE802.3ba Task Force), aligned with the input of other 100GET sub-projects.

Impact

Due to the large growth rates of data transmission capacity in optical transport networks, system operators forecast a need for 100 Gbps optical transmission technology for as soon as 2010. By trying to utilize existing lower speed technologies for 100 Gbps transport, this project will provide the necessary developments for this technology to be ready in time for early deployments. In addition, the necessary compensation and measurement technologies are developed to deploy these high data rate systems. The results of 100GET-METRO are intended to lead to commercial products towards the end of 2010.

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