

Field trial with Integrated ROADMs and GMPLS compliance

FIRM aims to deploy a field trial consisting on an optical transport network based on ROADMs (Re-configurable Optical Add/Drop Multiplexing) with GMPLS (Generalised Multi-Protocol Label Switching) compliance to set-up and teardown light-paths dynamically under an ASON (Automatic Switched Optical Network) architecture. FIRM will develop an integrated system by turning a static OADM into a ROADM with tuneable transceivers, introducing embedded intelligence inside the system and developing an open CCI (Communications Controller Interface).

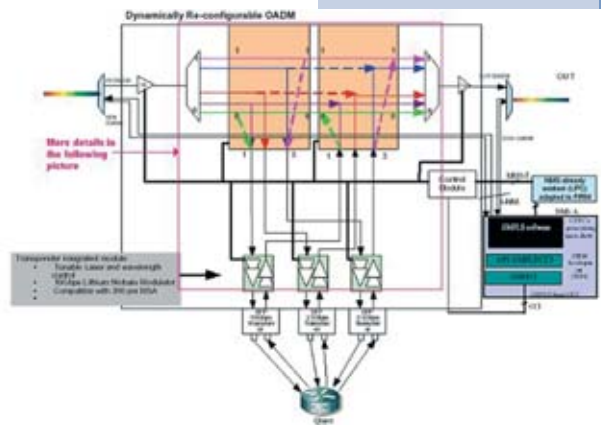
Main focus

The ROADM enables unprecedented flexibility for the network manager. The network will be reconfigurable on the fly, allowing frequent changes in network connectivity, multicasting and broadcasting. OADMs on the market are either fixed or, at best, manually reconfigurable, and wavelengths can only be routed to a limited number of ports, thus leading to inherent limitations. The proposed innovative ROADM enables on demand provisioning and improves the QoS provided to customers. By using a novel technology of multicast-capable optical switches and tuneable transponders together with a unified control plane (GMPLS), R-OADM provides innovative ser-

vices and protection schemes, such as drop and continue (for inter-ring connectivity) and multi-drop, which enables multicast/broadcast and can be used for truly O-VPN (Optical Virtual Private Network).

The FIRM project focuses on software developed to control and manage an R-OADM and to enable new services. This software shall reduce the limitations of today networks and increase their QoS while reducing capital and operating expenditures (CAPEX and OPEX).

By upgrading existing products with the integration of external devices, a cost-effective solution can be offered within a short time. This solution will address seamless migration towards dynamic networks.



Standard Single Mode Fiber imposes the use of chromatic dispersion compensation module when operating at 10 Gbit/s with reach beyond 80 km. The project will implement and test new transmission fiber to avoid dispersion compensation module for longer reach and to minimize non-linear effects in WDM operation.



Firm

Project ID: CP1-028

Start Date: 1 July 2004

Completion date: 30 June 2006

Partners

InTune, Ireland

Fundación I2CAT, Spain

Sercalo, Switzerland

Telefónica I+D, Spain

Universidad Politécnica de Cataluña, Spain

Universidad Politécnica de Valencia, Spain

Co-ordinator

Jesús-Felipe Lobo-Poyo

Telefónica I+D, Spain

E-mail: jflp@tid.es

Project web site

www.celtic-initiative.org/projects/firm

Approach

The FIRM project is subdivided in six work packages that will assure the achievement of the following goals:

Implementation strategy for Next Generation Optical Networks:

Business model and techno-economic viability analysis in a short/medium-time-scale

Interoperability of Fully Optical Components:

This will assure a successful integration through a correct assembly of optical components from different providers, guaranteeing an efficient interoperability between the resources they share. A comprehensive control-module system with embedded intelligence to control and monitor all the components of the ROADMs will be achieved.

Implementation of CCI GMPLS

compliance: The lack of some standards in the field of optical networking is one of the factors which is more severely limiting the implementation of truly "optical layer products". FIRM plans to collaborate with some standards definition groups.

Wide variety of access clients

interfaces: The cost-effective integrated system solution will be capable of integrating several access technologies as 10Gigabit Ethernet, 1GEth, CWDM (Coarse Wavelength-Division Multiplexing), and SDH (Synchronous Digital Hierarchy)

among others. These clients will use an easy and cheap XFP (eXtensible Filtering Pipelines) or SFP (Small-Form Pluggable) transceivers, which are the last current industry development.

Provision of a Pan-European test-bed facility for Optical Transport Networks:

The FIRM field trial, with the R-OADM developed, will provide an open and intelligent optical network to companies or research centers that do not have the possibility to evaluate their products in a real environment with broadband services or applications and real end-users.

Optical Network Protection:

There must be automatic protection at transport network level to guarantee signal integrity.

Main results

The main result of the project will be a reconfigurable, control-and-management (C&M) enabled OADM (FIRM ROADMs), which will be an integrated solution to allow a technology evolution without replacing currently static ROADMs. This will be achieved through a node controller with C&M interfaces and the addition of tuneable/reconfigurable elements.

An ASON and all-optical WDM switching field trial will be built in the last phase of the project. This field trial will be composed of FIRM ROADMs, a GMPLS control plane,

tuneable lasers up to 10Gbps and real end-users. Moreover, a basic Network Management System (NMS) will be adapted to trigger connection requests (soft-permanent), as well as to manage remotely the active optical devices of the FIRM ROADMs.

In addition, FIRM will provide a wide range of broadband and digital applications to stress the field trial network and test its performance. Also, new transmission fibre allowing to suppress chromatic dispersion compensation in metropolitan networks will be implemented and system validated.

Finally, an effort in contributing to standard development of control/transport interfacing will be made through collaborations with the IETF, ITU-T and OIF, among others.

Impact

Telecommunication networks are emerging as the central link of the information-based economy and society. The common denominator of emerging communication services is a robust, flexible and intelligent network infrastructure. Focusing on the development of ROADMs, the FIRM project contributes to the evolution from current SDH/ATM infrastructures to intelligent and flexible all-optical networks.

FIRM contributes to the development of technologies and architectures that allow a generalized availability of broadband access, which is a key enabler to the wider deployment of the information and knowledge-based society and economy. This is done by defining network and network node architectures, concepts and solutions for all optical transport networks which will enable increased bandwidth capacity in the underlying optical core and metro networks, proportional to the expected evolution in user requirements and services. Such new and efficient concepts for network management and control will lower the operational and capital costs (OPEX and CAPEX) and will enhance the delivery of new services and end-to-end connectivity.

Thus, FIRM will contribute to enhance Europe's competitiveness in the development of flexible and intelligent all optical networks.

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 the only European R&D programme fully dedicated to end-to-end telecommunication solutions.

Timeframe: 5 years, from 2004 to 2008

Cluster budget: in the range of 1 billion euro, shared between governments and private participants

Participants: small, medium and large companies from the telecommunications industry, universities, research institutes, and local authorities from 33 countries

CELTIC Office

c/o Eurescom,
Schloss-Wolfsbrunnenweg 35,
69118 Heidelberg, Germany
Phone: +49 6221 989 372, e-mail: office@celtic-initiative.org
www.celtic-initiative.org

