



BONE Major Achievements

WP21 : Green Optical Networking

WP Leaders: Dimitra Simeonidou (UEssex) and Mario Pickavet (UGent-IBBT)

WP Objectives

The main objectives of this Topical Project are:

- to estimate the energy footprint of ICT in general and optical networks in particular
- to present networking solutions that could allow today's and future communication services through more modest energy consumption

Status at start of the BONE-project

In response to a rapidly growing interest in the aspects of energy savings and green ICT, the BONE consortium decided after its 1st year of operation to dedicate a specific TP on this topic. The topics covered by this WP address a wide range of issues: from power consumption and power management of individual network elements and network segments, to routing protocols for energy optimization and proposals for new powering strategies to improve energy efficiency.

Major progress during BONE-project

- Power Consumption and Supply of Individual Network Elements
The collaborative work concentrated mainly on three particular areas, namely on energy efficiency in optical access networks, power consumption and performance evaluation of optical hybrid switching nodes and solar-powered optical passive networks. Also work, in which a set of scheduling algorithms were proposed and compared in order to solve the energy aware scheduling problem through a frame-based approach.
- Energy Saving Potential by Selective Switch-off of Network Elements
This work is studying powering strategy for network devices with the view to achieve significant savings in energy consumption. Different degrees of freedom in the operation of optical networks can be used for the sake of energy efficiency switching off networking resources.
- Green Routing Protocols
The overall scope of this work is to study novel energy aware routing protocols and algorithms for optimizing energy consumption in path computation. In particular this work focuses on investigating routing algorithms, protocols and procedures suitable for layer 1 optical and layer 2 carrier grade Ethernet networks. There were two main research activities in this collaboration, the first focused on investigating a new energy aware routing protocols which can potentially have considerable effect on the reduction of the overall network energy consumption. The second activity, proposed a novel IT+optical network resource scheduling and allocation solution for future Optical Internet where energy reduction problem is addressed on joint selection and joint allocation of both IT and network resources.
- Energy-Efficient Optical Network Design
The work performed in the framework of this collaboration is attempting to quantify the overall network power consumption of the future European network as well as identify and propose approaches, methodologies and algorithms that can be used to design energy efficient optical networks. Results indicate that taking into consideration the energy consumption of the optical network during the design phase results in significant overall savings.

Added value of the BONE NoE

There have been carried out a number of collaborative actions. Most of the collaborating partners took part in informal meetings during the year that have been held at the conferences ICTON 2010 (Munich, Germany), OFC 2010 (San Diego, CA, USA), EU Future Networks & Mobile Summit (Florence, Italy), ECOC 2010 (Torino, Italy) as well as at the BONE Summer and Master School (Budapest, Hungary). Results of WP21 were frequently presented at international conferences. Moreover, WP21 members were also quite active in the organisation of journal special issues, network energy-efficiency symposia, workshops, conference sessions, etc.

The results of this WP provide an understanding of the energy footprint of ICT today and in the coming decade. These results allow evaluating the relative importance of different network segments and technologies (with a focus on optical technologies) in terms of energy consumption and energy optimization and therefore to identify which technical approaches need to be further investigated.