Towards Real Energy-efficient Network Design

TREND aims at integrating the activities of major European players in networking, including manufacturers, operators, research centers, to quantitatively assess the energy demand of current and future telecom infrastructures, and to design energy-efficient, scalable and sustainable future networks.

TREND

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Project Coordinator

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Main Objectives

European research cannot ignore key questions on energy consumption of communication networks, like: “Is the current growth of energy consumption in telecom infrastructures sustainable?”; “Can we generate and transport enough electricity to provide high bandwidth access to all in metropolitan areas?”; “Are optical technologies more energy-friendly than electronics?”; “Is the Internet protocol suite needlessly wasting energy?” The main objective of the TREND Network of Excellence is to contribute to the knowledge that will help answering these fundamental questions. Expected achievements include

A new holistic approach to energy-efficient and sustainable networking

- collecting data to assess the power consumption of terminals, devices and infrastructures
- identifying energy-friendly devices, technologies, protocols and architectures, and investigating how they can be introduced in operational networks
- defining new energy-aware network design criteria
- experimentally proving the effectiveness of the proposed approaches

An holistic approach is taken, considering all network segments, from user terminals, to access networks, to backbones, to data centers, both in evolutionary scenarios and in clean-slate designs.

The TREND consortium comprises some major equipment manufacturers, network operators, and university research centers with complementary expertise, and with strong previous involvements and worldwide reputation in matters related to energy consumption in networking. A few distinguished External Collaborating Institutions will also be involved in the technical activities. The synergistic work and dissemination activities of the involved Institutions will raise the consciousness on the environmental impact of network infrastructures, and will provide guidelines for an energy-aware evolution of the Internet, thereby reinforcing the leading European position in designing a sustainable future.

Technical Approach

TREND project is organized in the following six work-packages (WPs):

- WP1: Assessment of power consumption in ICT
- WP2: Energy-efficiency in access and home networks
- WP3: Energy-efficiency in core networks
- WP4: Instrumenting the network for power saving
- WP5: Dissemination and outreach
- WP6: Project organization and management

The first three WPs structure research activities and coordinate integration efforts in different aspects of energy efficiency in networking. These WPs will collectively contribute to create a *distributed centre of excellence* on energy-efficient networking across Europe. Each WP organizes the research activities by identifying research domains and specifying tasks. Integration, exploitation of complementary expertise and rationalization of research efforts will take place also through Integrated Research Actions (IRAs), that involve several partners on carefully selected and well-defined technical topics.

WP4 coordinates experimental activities, which will be realized both to provide an effective framework for integration among partners, and to technically prove the effectiveness of the proposed approaches. Thus, WP4 provides to the distributed centre of excellence the operation of lab facilities. Similarly to IRAs in WP1-3, WP4 will instantiate Joint Experimental Activities (JEAs), by which personnel of different partners will conduct common experimental activities (enabled by mobility actions), sharing lab infrastructures and facilities across different institutions.

WP5 covers dissemination and outreach activities, which are fundamental tasks in NoEs; WP6 deals with project operations and management.

Key Issues

TREND tackles the following issues:

- What is the real power consumption of ICT?
- What are the means to best reduce the energy consumption of today's networks without compromising requirements in network and service performance?
- What are the best suited engineering criteria and principles to actively support energy efficiency in network design, planning, and operation in both short and long terms?
- Which communication and management paradigms and protocols will ensure the most effective distributed energy control?
- What are the most promising and sustainable long-term approaches to energy efficient networking and what are potential migration strategies to achieve this?
- What kind of mutually beneficial incentives can be proposed to network operators, service providers, and users, in order to maximize energy efficiency?

Expected Impact

The main expected achievements of TREND are the following:

- Integrate and restructure existing partners' knowledge on energy-efficiency networking, thereby building a virtual centre of excellence that covers specific issues in the field of energy-efficient networking that can serve European industry with education & training, research tools & testlabs, and pave the way to the development of new technologies & architectures.
- Stimulate and intensify collaboration, as well as exchange of researchers, between the research groups involved in TREND and those active in the field (primarily those active in FP7 projects in energy efficient networking).
- Disseminate the expertise and know-how of these European research groups to a broader audience, both R&D oriented as well as industry- and decision maker oriented.
- Reach out, including links to research activities in national programmes, and to programmes outside Europe.