

low Energy COnsumption NETworks

The ECONET project aims at studying and exploiting dynamic adaptive technologies (based on standby and performance scaling capabilities) for wired network devices that allow saving energy when a device (or part of it) is not used.

At A Glance: ECONET

Low Energy COnsumption NETworks



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EC Contribution: € 6.1 m

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Main Objectives

The ECONET project will be devoted at re-thinking and re-designing wired network equipment and infrastructures towards more energy-sustainable and eco-friendly technologies and perspectives.

As the Future Internet is taking shape, it is therefore recognised that, among other basic concepts and key aspects, energy efficiency should pervade the network infrastructure as a whole to such extent as to become part of the network design criteria and to carry across multiple networking domains for the achievement of a general target. There are two main motivations that drive the quest for “green” networking: environmental one, related to the reduction of wastes and impact on CO₂ emissions, and the economic one, stemming from the need of operators to reduce the cost of keeping the network up and running at the desired service level, while counterbalancing the ever-increasing cost of energy.

Enabling the reduction of energy requirements of wired network equipment by 50%

The overall idea is to introduce novel green network-specific paradigms and concepts enabling **the reduction of energy requirements of wired network equipment by 50%** in the short to mid-term (and by 80% in the long run).

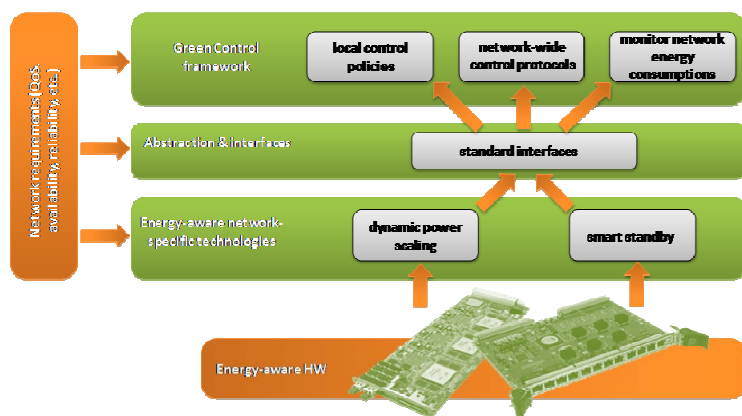
To this end, the main challenge will be to design, develop and test novel technologies, integrated control criteria and mechanisms for network equipment enabling energy saving by **dynamically adapting network capacities and resources to current traffic loads and user requirements, while ensuring end-to-end Quality of Service.**

Therefore, this project aims at exploring a coordinated set of approaches and concepts to deliver novel solutions and technologies for reducing the carbon footprint of next generation infrastructures for telecommunication networks. Thanks to the presence of major manufacturing companies, telecoms and ISPs, ECONET will propose its innovative technologies to standardization bodies for extending in the green direction the next generation network and Future Internet architectures and protocols.

Key Issues

The below figure summarizes the ECONET vision and identifies the three main research axes of the project, namely:

- 1) Green Technologies for Network Device Data Plane,
- 2) Green Strategies at the Control Plane, and



- 3) Green Abstraction Layer.

In the first axis, novel network-specific capabilities will be investigated and developed to optimise the power management features (e.g. standby and power scaling primitives). Research activities will cover several HW/FW technologies and network device typologies (e.g. home-gateway, DSLAM, switches, routers) in order to explore specific energy-saving solutions and techniques with respect to legacy and future HW and network requirements.

The second axis will investigate the design and development of local and distributed frameworks for energy-efficient flexible and cognitive network OAM, with the aim to enable dynamic, scalable, ad-hoc optimized resource allocation in terms of trade-off between energy consumption and network performance.

The third axis will focus on the development of a standard and general purpose interface for exposing and controlling the novel green capabilities and functionalities, realized with different typologies of network equipment and of HW technologies. This axis will be the key for the integration and the development of energy-aware device prototype platforms, including both data-plane green capabilities and control strategies, for project dissemination, demonstration and proof-of-concept activities.

ECONET will ultimately deliver a number of novel energy-aware device prototypes, on which large-scale experimental tests will be conducted. With a significant dissemination effort allocation, the project will aim at maximising the impact of project results on industrial and network operator communities as well as on standardization bodies,

thus bridging the gap between long term research and industrial deployment.

Technical Approach

ECONET is organized in 7 work-packages, 5 of which are strictly technical WP (WP2-6). The project developments will cover the definition of requirements, metrics and performance indexes in WP2, the design and development of network-specific energy-aware capabilities in WP3, the introduction and the design of the novel green abstraction layer in WP4, and the introduction and the development of control strategies aimed at optimizing and monitoring energy consumption of single devices and of the overall network in WP5. These developments will be demonstrated and qualified in representative industrial test cases in WP6 realized in the test plant of Telecom Italia S.p.A. Moreover, WP7 will be dedicated to the dissemination of results and the transfer of knowledge for exploitation purposes. As one of the main project objectives, WP7 will also include activities related to the establishment of new standards. Finally, WP1 will assure efficient and effective project coordination and management.

Expected Impact

The expected impact of ECONET is to strengthen the positioning of European industry in the field of Future Internet technologies by proposing:

- Innovative **integrated technologies for enabling energy efficiency** in next-generation wired network devices.
- Novel standard interfaces (i.e. **green abstraction layer**), internal to the devices, for easy intercommunications between heterogeneous energy-aware HW and SW.
- Innovative criteria for smart **control, management and monitoring of energy consumption** both in local and distributed ways (outcomes of the **green control plane**).
- **Protocol extensions** for the support and the network-wide interoperability of energy efficiency enhancements.
- **Contributions to Standardization Bodies (ETSI, HGI, EU EuP, IEEE, and ITU-T)** in the area of consumption reductions.
- Concrete **reduction of Telecoms' and ISPs' operating costs (OPEX)** with advantages in their competitiveness towards end-customers.
- **wider market opportunities and competitiveness to manufacturers** in selling their energy-aware products thanks to the increase of CAPEX of telecoms and ISPs.