

TIME AND ENERGY EFFICIENT FRAMEWORK FOR INTER-OPERATION OF SMART DEVICES (TEEFIOS)

Goal of the project

Development of an integrated real-time and energy efficient inter-operation framework for networks of smart sensors and devices - TEEFIOS.

Short description of the project

- Wireless networks of sensors and smart devices (WSN) are an extremely interesting topic, at the confluence of engineering fields with enormous impact on worldwide society: digital networks, wireless communications, and miniature embedded digital devices.
- Aware of the severe requirements and challenges raised by current applications in this area, we propose a new paradigm - Time and Energy Efficiency (T: or TEE).

The main proposed objectives focus on three distinct layers:

- (a) T:Node, a hardware-software environment and methodology for designing and assessing real-time behavior and efficient energy consumption of embedded devices,
- (b) T:YNet, a system for the development and analysis of TEE communication in wireless ad-hoc networks, and
- (c) T:PIlot, a methodology for the power management of the entire network. An integrated set of tools, benchmarks and databases will also be created to help advanced developers and researchers in the WSN area apply the TEE paradigm to applications with high impact.

Project implemented by

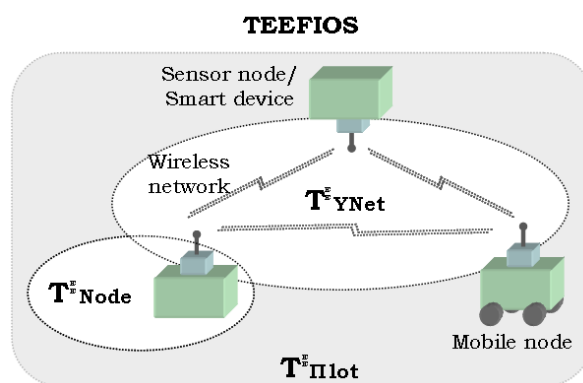
- DSP Labs - Digital Signal Laboratories Timisoara, Department of Computer and Software Engineering, Politehnica University of Timisoara.

Implementation period

01.10.2015 - 30.09.2017 (24 months)

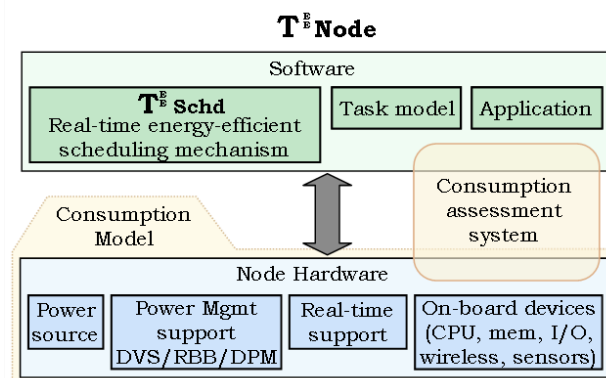
Grant value

548850 RON (~123337 EUR)



Main activities

- Energy consumption model and taxonomy for smart devices;
- Energy optimization real-time scheduling mechanism for smart devices;
- Methodology for node-level energy consumption assessment;
- Real-Time MAC protocol for ad-hoc wireless networks;
- Flexible real-time wireless module for smart devices;
- Framework for real-time communication in WSNs;
- Global power management methodology for networks of smart devices;
- Case studies to validate the TEEFIOS framework;
- Integrated set of databases and web-based tools;
- Information exchange, results dissemination and publication.



Results

- Integrated set of consumption models for smart devices;
- T:Schd, a real-time scheduling technique which optimizes energy consumption;
- Hardware/software methodology for the consumption evaluation of smart devices;
- Database with the energy efficiency evaluation and classification results for different types of smart devices;
- Real-time MAC protocol for ad-hoc wireless networks;
- Functional prototype of a flexible real-time wireless module for smart devices;
- A framework and a set of metrics for the evaluation of real-time wireless communication applications;
- A simulation testbed to evaluate the scalability of time and energy efficient WSN applications;
- T:Plot, a global power management methodology for networks of smart devices;
- A collection of case studies that demonstrate the validity of the proposed framework and its individual components;
- An integrated set of web and database tools for public-level information and access to the TEEFIOS framework services.

Applicability and transferability of the results

- The real-time and energy efficient interoperation framework, along with the associated tool set and databases, will be of valuable use to the advanced developers and researchers in the field of wireless sensor/smart device networks.
- The results of this project will help them apply the TEE paradigm to applications with high impact in scientific, social, economic and environmental areas, such as: disaster recovery, smart buildings and structures, environment monitoring, smart energy grids and metering, robotic collectives, industrial process control, smart vehicles and transportation, security and surveillance.

Fields of interest

- Real-time systems;
- Energy efficiency;
- Sensors and smart devices;
- Wireless communication;
- Ad-hoc networks.

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