

Self-Optimisation and Self-Configuration in Wireless Networks

SOCRATES aims at the development, evaluation and demonstration of methods and algorithms for self-configuration, self-optimisation and self-healing, as a promising opportunity to automate radio network planning and optimisation. Key gains are a substantial OPEX reduction and an enhancement of network efficiency and QoS.

At A Glance: SOCRATES

Self-Optimisation and Self-Configuration in Wireless Networks



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Duration: 01/2008 – 12/2010

Total Cost: €4.98m

EC Contribution: €3.25m

Contract Number: INFSO-ICT-216284

Main Objectives

The general objective of SOCRATES is to develop self-organisation methods in order to optimise network capacity, coverage and service quality while achieving significant OPEX (and possibly CAPEX) reductions. Although the developed solutions are likely to be more broadly applicable (e.g. to WiMax networks), the project primarily concentrates on 3GPP's LTE radio interface (E-UTRAN). In more detail the objectives are as follows:

- The development of novel *concepts, methods* and *algorithms* for the efficient and effective self-optimisation, -configuration and -healing of wireless access networks, adapting the diverse radio (resource management) parameters to smooth or abrupt variations in e.g. system, traffic, mobility and propagation conditions. Concrete examples of the radio parameters that will be addressed include: *power settings, antenna parameters, neighbour cell lists, handover parameters, scheduling parameters* and *admission control parameters*.
- The specification of the required *measurement information*, its statistical accuracy and the methods of information retrieval including the needed protocol interfaces, in support of the newly developed self-organisation methods.
- The *validation* and *demonstration* of the developed concepts and methods for self-organisation through extensive simulation experiments. In particular, simulations will be performed in order to illustrate and assess the established capacity, coverage and quality enhancements, and estimating the attainable OPEX (/CAPEX) reductions.
- An evaluation of the *implementation* and *operational impact* of the developed concepts and methods for self-organisation, with respect to the operations, administration and maintenance architecture, terminals, scalability and the radio network planning and capacity management processes.
- *Influence* on 3GPP standardisation and NGMN activities.

SOCRATES aims at OPEX reduction and radio network optimisation

Technical Approach

WP1: Project Management. This work package takes care of the overall management of the project's operational and financial aspects and facilitates in- and external cooperation.

WP2: Use cases and framework for self-organisation. (Non-)technical requirements of the different components of self-organisation (self-optimisation, -configuration and -healing) will be derived from a list of use cases. These use cases define scenarios in which the application of self-organisation methods is envisioned in future access networks. In addition, assessment criteria for methods and algorithms for self-organisation are developed. Jointly, these aspects constitute the framework for the development of self-organisation methods in WP3 and WP4.

WP3: Self-optimisation. Development of new concepts, methods and algorithms for *self-optimisation* of wireless networks that adapt to gradual changes in the radio network. Simulation tools will be applied to assess their performance, using the criteria and methodologies developed in WP2, and to assist in the understanding and further enhancement of the algorithms. Furthermore, the required measurements, interfaces and protocols are specified.

WP4: Self-configuration and self-healing. Development and validation of models and algorithms for *self-configuration* of newly deployed sites or technological features, and *self-healing* of incidental soft/hardware failures by means of local adaptation of radio parameters. In addition, newly required measurements and changes in interfaces to support the developed self-configuration and self-healing algorithms are specified.

WP5: Integration, demonstration and dissemination. WP5 aims at: (i) the *integration* and attuning of the developed self-organisation methods (WP3-4) in line with the framework constituted in WP2; (ii) a *demonstration* of the benefits from the self-organisation methods; (iii) an assessment of the *implications* of the project results on radio network planning and operations, standardisation, technical/business opportunities, regulation and society; (iv) the creation of an *exploitation roadmap* for the project results by identifying obstacles and enablers and determining a deployment roadmap for the use of self-organisation; and (v) the dissemination of project results, including contributions to standardisation (3GPP) and industrial forums (e.g. NGMN), and the organisation of two dedicated workshops.

Key Issues

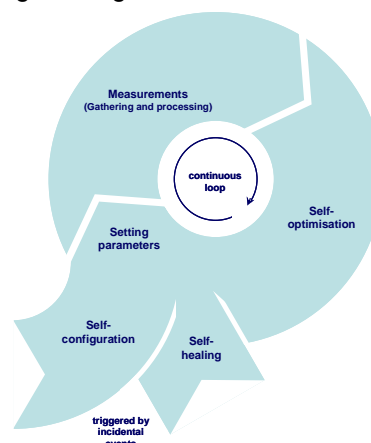
Future mobile radio networks are highly complex systems with a multitude of tuneable control

mechanisms and parameters acting at time scales varying from milliseconds to days. Moreover, there are intricate interdependencies among these control mechanisms and parameters as well as limitations on measurements, signalling and processing. Understanding and mastering these complexities poses major challenges for the design of effective and dependable self-organisation functionalities.

Expected Impact

Bringing together a well suited, strong consortium of two of the world's largest equipment vendors (Ericsson, Nokia Siemens Networks), a leading mobile operator (Vodafone), an SME developing support tools for network planning and operations (Atesio) and three renowned research organisations (IBBT, TNO ICT, TU Braunschweig) with a proven record in successful cooperation with the mobile industry, the SOCRATES project has a great opportunity to achieve considerable impact.

- The SOCRATES project will *influence global standardisation*, by developing solutions for standardised measurements, new or adapted interfaces and new or modified protocols supporting self-organisation functionalities.



- SOCRATES will *reinforce European industrial leadership* by contributing to European dominance in the development of world-wide standards, by creating a 'head start' in the development of self-organising features for radio networks and support tools, and in providing high-level consultancy. In addition, the strong partnership will create stronger synergies between various sector actors and contribute to new business models.
- The findings from the consortium will *create new industrial and business opportunities* within the management and control area of existing and future networks, and will have several important spin-offs, e.g. towards the development of new services with a reduced time-to-market.