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D5.5

Report on dissemination and standardisation activities, including report on 1st workshop

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Abstract:
This document reports on the dissemination and standardisation activities of the second year of the SOCRATES project. It describes how SOCRATES knowledge and results have been exchanged with other European projects, with the scientific community and with standardisation bodies and other fora. Further a report on the 1st SOCRATES workshop is included. The project partners’ initial plans regarding exploitation of the gained knowledge and results are also presented.

Keyword list:
Dissemination instruments; presentations; publications; project workshops; liaisons to standardisation bodies and other fora; exploitable results
Executive Summary

This document provides an overview of the dissemination, interaction, and standardisation activities within the second year (January – December 2009) of the SOCRATES project. It describes how results and knowledge obtained in the project have been exchanged with other European projects, with the scientific community and with standardisation bodies and other fora. In addition it gives a first overview of the project partners’ exploitation plans.

Dissemination to peers in research and industry has been achieved through twenty-four (fifteen in 2009) presentations at conferences and workshops, and seventeen (nine + 2 submitted in 2009) conference/workshop publications. While the publications in 2008 were mainly on the project plans and approach, the publications in 2009 are focused more on concept development with initial quantitative results regarding self-organisation for various use cases. It is expected that publications and presentations in the third year will present more quantitative results from self-organisation algorithms developed in the project.

Dissemination of the project results to the scientific community and industry has also been established via the first workshop (“Self-organisation for Beyond 3G Wireless Networks”) organised in cooperation with the FP7 project E³, as a pre-conference workshop of the ICT Mobile Summit 2009 in Santander, Spain. This workshop attracted around 35 participants (25 outside SOCRATES/E³) from the R&D community and triggered interesting interactions.

SOCRATES has established close contacts with the COST 2100 project, which resulted in a joint workshop in February 2007 at TU Braunschweig. Other established interactions are with FP7 Projects E³ (via the joint workshop and personal contacts on assessment of SON methods) and WHERE (with regard to exchanging scientific views on localisation techniques, models, and evaluation for the mobile terminals).

The matured self-organisation concepts in SOCRATES and the quantitative results obtained so far have enabled the project partners to define concrete exploitation plans. The exploitation plans comprise things like application of the tools and methodologies developed in the project for assessing the gains from self-organisation features, providing consultancy for parties that (intend to) deploy self-organising features in their wireless access networks, application of the knowledge and expertise developed in SOCRATES in defining self-organising features to be implemented in network equipment, influence standardisation, etc.

Finally, SOCRATES has links with standardisation bodies 3GPP (RAN2, RAN3, and SA5) via partner’s liaison persons to these groups. This interaction resulted in identifying the relevant 3GPP work items for SOCRATES, identifying suitable time period for contributions and one technical contribution to SA5 on load balancing. SOCRATES has also established links to other relevant forums such as e.g. NGMN and WWRF. SOCRATES has provided NGMN with new insight in cell outage management and helped in defining the scope and plans for the ‘Optimisation for Common Channels’ sub-topic in the NGMN Operational Efficiency (OPE) project. In addition, the project introduced in WWRF the main challenges on integration of different self-organisation functions.
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<th>Definition</th>
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<tr>
<td>3GPP</td>
<td>3rd Generation Partnership Programme</td>
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<td>COM</td>
<td>Cell Outage Management</td>
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<td>COST</td>
<td>European Cooperation in the Field of Scientific and Technical Research</td>
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<td>EPC</td>
<td>Evolved Packet Core</td>
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<td>HeNB</td>
<td>Home eNode B</td>
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<td>HO</td>
<td>Handover</td>
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<tr>
<td>IMS</td>
<td>IP Multimedia System</td>
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<td>INM</td>
<td>Integrated Network Management</td>
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<td>IP</td>
<td>Internet Protocol</td>
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<tr>
<td>LTE</td>
<td>3rd Generation Long Term Evolution</td>
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<td>MLB</td>
<td>Mobility Load Balancing</td>
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<td>NGMN</td>
<td>Next Generation Mobile Networks</td>
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<td>OAM</td>
<td>Operation and Maintenance</td>
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<td>OPE</td>
<td>Operational Efficiency</td>
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<td>RAN</td>
<td>Radio Access Network</td>
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<td>SA</td>
<td>System Architecture</td>
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<td>SME</td>
<td>Small or Medium Enterprise</td>
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<td>SON</td>
<td>Self-Organisation Network</td>
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<td>UTRAN</td>
<td>UMTS Terrestrial Radio Access Network</td>
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<td>WP</td>
<td>Work Package</td>
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<td>WWRF</td>
<td>Wireless World Research Forum</td>
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1 Introduction

Dissemination activities are crucial for SOCRATES as a research project in order to exchange the insights and results with the research community, to have impact in standardization and industry, and also to generate feedback from (or cooperation with) relevant stakeholders. Dissemination within SOCRATES is based upon the output of all technical work packages, and coordinated by WP5 in Activity 5.6 “Integration, demonstration, and dissemination”. The SOCRATES dissemination plan has been developed in [1] and the overview of the dissemination achievements within the first project year has been presented in [2]. The current deliverable is a follow-up of [2] with an overview of the project’s dissemination activities in the second year.

As the self-organisation concepts in the SOCRATES project are becoming more mature the consortium partners have defined concrete exploitation plans based on the project results, see Chapter 5. This aspect was not covered in the previous dissemination deliverable [2].

This document is structured as follows. An overview of the project publications in conferences, workshops and meetings is given in Chapter 2 along with brief description about the interaction with other relevant European research projects. Chapter 3 presents a summary of the first SOCRATES workshop on ”Self-organisation for Beyond 3G Wireless Networks” in cooperation with the FP7 project E3. The contribution and information exchange with 3GPP standardisation and other relevant international forums (e.g. NGMN) is given in Chapter 4. The exploitation plans regarding the project results by the various partners and overview of the exploitable results is presented in Chapter 5. The document is concluded in Chapter 6.
2 Dissemination to the scientific community

This chapter provides information about the dissemination activities of SOCRATES towards the scientific community. It includes participation (e.g., presentations) in meetings, conferences and workshops (Section 2.1), publications (Section 2.2), and contacts/cooperation with other European projects (Section 2.3).

2.1 Participation in scientific meetings, conferences and workshops

During the first and second year, the SOCRATES project and its results have been presented at scientific meetings, conferences, workshops, and conference calls with NGMN. A list of the presentations that have been given is shown below. The presentations themselves are available on the SOCRATES website www.fp7-socrates.eu.

  Presentation: "Self-optimisation in wireless networks" (invited presentation)
- 09.12.2009: FirW (Faculteit IngenieursWetenschappen) PhD Symposium, Ghent, Belgium
  Poster presentation: "Self-optimisation in 3GPP LTE networks"
- 30.09.2009: RAS Hot Topics Workshop, Brussels, Belgium
  Presentations: 
  - "SOCRATES - A quick overview"
  - "Optimisation of Home eNodeBs - Management of relays and repeaters"
  Presentation: "Cell outage management in LTE networks"
  Presentation: "Requirements for X-map estimation in wireless self-organising networks"
  Poster presentation: "Cell outage management in LTE networks"
- 28.08.2009: Conference call with the WHERE project
  Presentation: "X-map estimation"
- 15.07.2009: Conference call with the NGMN Operational Efficiency project
  Presentation: "Cell outage management in LTE networks"
- 09.06.2009: Workshop on Self-organisation for Beyond 3G Wireless Networks, Santander, Spain [Workshop organised by the SOCRATES and E³ projects, see Chapter 3]
  Presentations: 
  - "SOCRATES project overview"
  - "Assessment criteria"
  - "Algorithms for self-optimisation"
  - "Algorithms for self-configuration and self-healing"
- 27.05.2009 - 29.05.2009: 7th International Conference on Wired / Wireless Internet Communications (WWIC), Twente, The Netherlands
  Presentation: "Self-organisation in future mobile cellular networks" (invited presentation)
- 05.05.2009 - 07.05.2009: Wireless World Research Forum Meeting 22, Paris, France
  Presentation: "Self-organisation in wireless networks - use cases and their interrelation"
  Presentation: "Embedding multiple self-organisation functionalities in future radio access networks"
- 10.03.2009 - 11.03.2009: 3G Optimisation and UMTS 900, Prague, Czech Republic
  Presentation: "Self-optimising and self-healing networks"
- 18.02.2009: Joint Workshop COST 2100 SWG 3.1 & FP7-ICT-SOCRATES, Braunschweig, Germany
  Presentations: 
  - "Embedding multiple self-organisation functionalities in future radio access networks"
  - "Cell outage management in LTE networks"
  - "Self-optimisation of LTE home base stations"
2.2 List of publications

Below is a list of the SOCRATES publications of the first and second project year. These publications are available on the SOCRATES website www.fp7-socrates.eu.


2.3 Contacts and co-operation with other European projects

Within the FP7 ‘Future Networks’ project portfolio, SOCRATES participates in the clusters ‘Radio Access and Spectrum Management’ and, to a lesser extent, in ‘Future Internet Technologies’. There are several other projects in these clusters addressing self-organisation or related issues, e.g., EFIPANS, AUTOI, 4WARD, E³, CARMEN, EURO-NF (NoE), but mostly within a much broader scope. Closely related to the work in SOCRATES is the work on self-organisation in (multi access) wireless networks in the E³ project. Contacts with related projects have been established or strengthened via the FP7 concertation meetings and co-located workshops, and via bilateral meetings. In particular, SOCRATES participated in two panel discussions (on “Self-organising Wireless Infrastructure” and on “Extending the Network beyond Macro: Pico cells, Femto cells and Relays”) at the “Hot Topics” workshop organised by the RAS cluster (September 30, 2009, Brussels). In addition, a presentation was given at the workshop on “Localisation and Context Awareness” organised by the WHERE project (September 28, 2009. See below for more information about cooperation with WHERE. Further, SOCRATES gave an invited presentation “Self-optimisation of Wireless Networks” at the workshop NET-COOP 2009 organised by the NoE Euro-NF in Eindhoven, November 23, 2009.

SOCRATES is working on generating X-Maps, which require positioning information of the mobiles as an input. FP7- WHERE is a project dedicated to localisation and positioning techniques in wireless communication. A liaison has been set-up to discuss the exchange of information on these topics between WHERE and SOCRATES. As a kick-off activity a phone conference has been held on August 28, 2009 bringing together researchers from both projects. As a follow-up to this phone conference SOCRATES has participated in the Localisation and Context Awareness Workshop organised by WHERE at Brussels and contributed with a presentation on "Requirements for X-map estimation in wireless self-organising networks". Discussions among the two projects are ongoing.
The contacts initiated in 2008 with the E³ project have led, among other, to the successful organisation of a joint SOCRATES/ E³ workshop on “Self-organisation for Beyond 3G Wireless Networks” at the ICT Mobile Summit in Santander, June 9, 2009. Also EFIPSANS was invited to give a presentation at this workshop. Further cooperation with E³ has particularly focussed on the assessment of self-organisation methods for wireless access networks. Based on presentations from both sides, E³ and SOCRATES discussed this topic at the SOCRATES plenary meeting in Braunschweig, February 18, 2009.

SOCRATES has established a contact with the Integrated Network Management (INM) activities in the FP7 4WARD projects. While SOCRATES concentrates on solutions and algorithms for dedicated self-organisation use cases and their implementation in 3G LTE, 4WARD develops high-level concepts for future management paradigms and architectures. 4WARD is interested in results of some of the SOCRATES use cases (for example, Home eNodeB) to which the INM concepts could be applied, or that could be used to verify the INM concepts, respectively. On the other hand, SOCRATES can use the 4WARD concepts as potential outlook or future development of the solutions developed in the use case, especially for the SON use case integration topics. The contact is still in an early phase, a potential result could be a joint contribution to a research conference or a joint publication.

Besides contacts within FP7, SOCRATES has also established contacts with other research groups working on self-organisation in wireless networks or related topics, e.g. through participation in COST 2100 and WWRF.

From the beginning of the project SOCRATES has set a liaison with COST Action 2100 “Pervasive Mobile & Ambient Wireless Communications”. Within COST 2100 the Sub-Working Group 3.1 “Measurement Based Optimisation” is working on topics very relevant to the work in SOCRATES. Via the three partners of the SOCRATES (ATE, TNO, TUBS) who are also a member of COST 2100 four regular input documents to COST 2100 have been submitted. In addition to these regular activities a joint workshop with almost 100 attendees has been organised on February 18, 2009 in Braunschweig with three presentations from both groups, see Appendix B. Due to the success of this workshop a similar event is in preparation for the upcoming COST meeting in February 2010 at Athens.

SOCRATES has contributed to the WWRF22 meeting on May 5th, 2009, with a paper and a presentation on “Self-organisation in Wireless Networks – Use cases and their Interrelation”. The paper gave an introduction to the SOCRATES project and the use cases considered, but concentrated on the challenges of integrating different use cases within a SON solution. The paper was presented by NSN-D, and good feedback has been received on the contribution.

Finally, there are contacts with some former participants of the related Celtic project GANDALF (2005-2007), in particular Orange (through Zwi Altman) and the University of Malaga, who are continuing their work in the field of self-optimisation of wireless networks.
3 SOCRATES workshops

The SOCRATES project has organised a first workshop in June 2009; a second, final one will take place at the end of the project. The goal of these workshops is to inform other parties (including operators, manufacturers and academia) about the project’s results and to get feedback from parties not involved in the project.

3.1 First workshop

The first SOCRATES workshop on "Self-organisation for Beyond 3G Wireless Networks" took place on June 9th, 2009 as a pre-conference workshop of the ICT Mobile Summit 2009 conference in Santander, Spain. It was organised jointly with the FP7 E³ project, and comprised presentations on the results of both projects, three invited talks and a presentation from the FP7 project EFIPSANS that placed the topic self-organisation in a broader networking perspective. The complete program (call for participation) can be found in Appendix A.

The workshop's target audience were academic researchers and engineers. The workshop mainly aimed at persons responsible for research, R&D engineers and technical developers involved in planning, deployment or operations & maintenance of beyond 3G networks, within telecom operators, telecom vendors and SMEs active in the telecom sector. To mobilise participation, the call for participation has been sent out towards large mailing lists and potentially interested individual colleagues several times before the workshop. Further the workshop has been announced on the public websites of the SOCRATES, E³ and EFIPSANS projects and on the website of the ICT Mobile Summit 2009 conference.

With more than 35 registered participants from 14 different countries, of which +/- 25 participants outside the SOCRATES / E³ consortia, the workshop was very well attended. A list of participants is included in Appendix B. The presentations were well received and triggered lively, interesting discussions. With the permission of all presenters, a copy of all workshop presentations is available via http://www.fp7-socrates.eu/?q=node/31.

3.2 Second workshop

During the SOCRATES project board meeting in September 2009, and after consulting the project officer, it has been decided to organise the final workshop around February / March 2011, preferably in conjunction with the final review. The aim is to co-locate this workshop with either a larger conference or with an FP7 concertation meeting taking place during the target period, in order to attract a high number of participants. Besides presentations on the results obtained by the SOCRATES project, also demonstrations of the methods and algorithms for self-organisation of wireless networks developed in WP3 on 'Self-optimisation' and WP4 on 'Self-configuration and self-healing' will be given.
4 3GPP standardisation and related activities

This chapter presents the links SOCRATES has with 3GPP and NGMN. In order to have impact regarding the self-organisation functions in newly developed wireless cellular systems such as LTE the SOCRATES project has established links with 3GPP standardisation groups that are mainly responsible for self-organisation (RAN2, RAN3 and SA5). The interaction is established via the 3GPP representatives from the industrial partners in the SOCRATES consortium:

- RAN2 interaction via Vodafone
- RAN3 interaction via NSN
- SA5 interaction via Ericsson

The resulting impact in RAN2, RAN3, and SA5 is briefly described in Sections 4.1, 0, and 4.3, respectively. The project interaction with NGMN is described in Section 4.4.

4.1 3GPP RAN2

For 3GPP Release 9, there was one activity in 3GPP RAN2 during 2009 that was relevant to SOCRATES. This was a study item on ‘Minimisation of Drive Tests’. This activity considered how to use UE measurements to reduce the need for drive tests. The measurements from the UEs can be used for manual network optimisation, but they can also be used for SON.

A conference call was held on May 27, 2009, with the Vodafone 3GPP RAN2 liaison to discuss the coverage map estimation activity in SOCRATES, which is strongly related to the drive test minimisation activity in RAN2. The initial results of the SOCRATES activity were presented, and the impact of location estimation accuracy was discussed.

For 2010, it is expected that there will be a work item in Release 10 on minimisation of drive tests, which will define the detailed specifications.

4.2 3GPP RAN3

Within the 3GPP specification groups, the LTE topics of RAN 3 are the S1 and X2 interface and E-UTRAN specifications. The RAN3 liaison for SOCRATES is supported by NSN.

From the perspective of self-organising networks the major activity currently handled in RAN3 (for LTE Release 9, expected to be continued for Release 10) is on Mobility Load Balancing (MLB), which matches with the SOCRATES load balancing use case. Three SOCRATES members also participate in RAN3 (VOD, NSN, EAB) and the activities are monitored and reported to the other project members. There have been no dedicated contributions out of SOCRATES to RAN3 as the use case work has not reached a sufficient maturity level. Joint contributions are expected for 2010 when algorithm development and simulations are completed, and dedicated input on required measurements and parameter settings is available.

The second dedicated SON activity in RAN3 in on Mobility Robustness, which corresponds to the SOCRATES Handover Optimisation use case. Topics are, for example, HO parameter optimisation and negotiation, and reporting issues. While the SOCRATES HO use case has not reached sufficient maturity status to contribute to RAN3, and Release 9 is almost closed, there may be opportunities to contribute to Release 10 issues.

Another activity in RAN3 concentrates on home access, which is partially related to the SOCRATES Home eNodeB use case. However, the standardisation activities do currently not concentrate on HeNB related SON topics. It remains to be seen how far SON-related HeNB topics will become urgent in RAN3 in 2010.

4.3 3GPP SA5

The purpose of SA5 is to provide charging and operations and management solutions. The scope is UTRAN (3G), E-UTRAN (LTE), Core Network (CN + EPC) and IP Multimedia System (IMS). In SA5 a number of activities are directed towards Self-Organising Networks (SON), which is the main research area for SOCRATES.

During the 2009 the contacts with SA5 delegates has been on informal basis, where our SA5 liaison have, on a regular basis, reported to the status to SOCRATES.
So far one contribution was sent to SA5, basically containing the work done in the use case Load Balancing Optimisation. The contribution was entitled as “Improving Load Balancing Optimization”. The status now is that more discussion is needed and the document is in “not agreed” status. It will be handled in future meetings.

Currently, the SA5 activities that fit quite well with the agenda of SOCRATES, are in the area of generic SON functions and a generic O&M framework. The ongoing SON work in SA5 (and RAN3) is in the following areas: HO parameter optimization, Capacity and coverage optimization, Interference control, Self-optimization monitoring and management, Load balancing, and Mobility Robustness Optimization. Recently, SA5 has increased its interest and activity on coordination between Self Optimization functions. This fits well with the newly started activity in SOCRATES WP3 about *multiple interacting functionalities*. In the area of self-healing the problem with cell outage is on the SA5 agenda. Specific problems are definitions of trigger conditions and architecture for Self-healing. For self-configuration the focus is on defining which parameters to auto-generate, and which parameters to plan.

### 4.4 NGMN

The results of the SOCRATES Cell Outage Management (COM) use case were presented to the NGMN Operational Efficiency (OPE) project during a conference call on July 15, 2009. This presentation was requested by NGMN as SOCRATES has done useful work on what is a relatively new topic. The SOCRATES input provided insight into various aspects of COM, and it was stated that it will be used to further define the NGMN activity on this topic. NGMN also requested a follow-up call as soon as further results are available.

The ‘Self-optimisation of physical channels’ use case description from [3] was used to help define the scope and plans for the ‘Optimisation for Common Channels’ sub-topic in the NGMN Operational Efficiency (OPE) project.
5 Exploitation

This chapter addresses ‘exploitable results’ of the SOCRATES project. It concerns results which are classified as “knowledge having a potential for industrial or commercial application in research activities or for developing, creating or marketing a product or process, or for creating or providing a service” [4].

First, in Section 5.1, the exploitation plans of each partner are briefly described. Next, Section 5.2 gives an overview of the exploitable results and knowledge.

The current chapter will be further refined during the third project year, and will result in deliverable [5] in M34.

5.1 Exploitation plans

5.1.1 TNO

As a non-profit organisation for applied research it is TNO ICT’s mission to initiate and support innovations in the ICT industry (and in other businesses where ICT plays a crucial role) through contract research and consultancy. The SOCRATES project provides an excellent opportunity for TNO to expand its leading-edge expertise on network operations to the promising field of mobile network self-organisation. The gained knowledge, both on LTE in general and on self-organisation, will in particular be used to support and advise mobile network operators.

We distinguish roughly three phases in the envisioned role of TNO ICT regarding the introduction of self-organisation in mobile networks.

• Phase 1 (2009-2011): Provide consultancy regarding (i) the (potential) benefits of self-organisation (ii) the actually available functionalities on the short and medium term based on the state-of-the-art of this technology, and (iii) the main implications for network operations. Based on this TNO ICT will support network operators in taking strategic decisions regarding future investments in network equipment and the organisation of their network operations.

• Phase 2 (2011-2014): Support network operators in making concrete introduction plans, and in preparing tenders and assessing offers from vendors. Simulation tools, assessment methodologies and deep knowledge on self-organisation methods as being developed in SOCRATES will be used here to evaluate and trade-off different scenarios and solutions.


In addition, cooperation with equipment vendors is envisioned in the design or enhancement of algorithms and architectures for self-optimisation.

As an important spin-off, our research results will be exploited in the form of scientific papers (several have already appeared) and patents, which are useful for strengthening TNO’s technological position.

Finally, besides application to mobile networks, the generated knowledge and experience will also be applied in the context of other communication environments where the need for self-organisation is also emerging.

5.1.2 Atesio

Atesio plans to exploit the results from the SOCRATES project in many ways.

• The expertise developed within SOCRATES will be used in Atesio’s consulting activities when it comes to strategic (multi-technology) network evolution planning.

• The expertise developed within SOCRATES will be used in Atesio’s consulting activities with regards to future network planning and operations software infrastructures.

• The findings from the project will be used at Atesio when developing planning and operations approaches in the domain of LTE networks in particular and multi-technology networks in general.

• Atesio expects to be able – based on the insights developed within SOCRATES – to develop new paradigms for the operation of SON-enabled networks.
5.1.3 Ericsson

Ericsson will exploit the results from the SOCRATES project in many ways. Firstly, the results will influence the work when defining new mobile network concepts, like LTE and LTE Advanced. Especially the research department will take great advantage of the simulators developed in SOCRATES. They will be used for verification of new concepts and serve as a platform for building additional SON features and concepts internally at Ericsson.

The general know-how gained from participation in SOCRATES will support Ericsson in standardisation activities in 3GPP so that Ericsson can be a driver for SON activities in different working groups, mainly RAN3 and SA5.

Ericsson will use new SON algorithms, concepts and other findings developed in the SOCRATES project for new products to be included in future releases of the LTE system.

The research department will engage PhDs and master thesis worker in the area of SON in already ongoing cooperation with different national universities in Sweden.

5.1.4 IBBT

IBBT will exploit the results obtained in the SOCRATES project mainly in research and educational activities. Within the project, IBBT has gained knowledge on LTE and SON in general, and on the self-optimisation of packet scheduling, admission control, handover and load balancing in LTE in particular. Moreover, the IBBT teams have enlarged their experience with the OPNET simulation tool through the inclusion of LTE specific models in the OPNET modeller environment.

Participation in the project has resulted in the definition of two new PhD projects, one in each of the two IBBT research groups (IBCN, University of Ghent; PATS, University of Antwerp) involved in SOCRATES. This Ph.D. research should combine new radio resource allocation algorithms with novel approaches to optimisation, extending the results obtained in SOCRATES. Scientific results are presented at conferences and workshops and in appropriate journals. The obtained knowledge and competences, as well as the increased experience with the OPNET simulation tool, will be exploited and used for participating in future national and European R&D projects, with partners from academia and industry.

The building up of knowledge on the mentioned areas by the IBBT teams that are involved in the project has an immediate impact on their teaching activities, and as such on the education of the students that follow their courses. Indeed, the new insights into the optimisation of radio resource allocation obtained from the active participation in the SOCRATES project have a direct influence on the content of master courses on wireless and mobile networks at the universities of Antwerp and Ghent.

5.1.5 TU Braunschweig

The exploitation of the results and experiences gained in SOCRATES is threefold at TUBS:

- Education: TUBS will use material generated in SOCRATES to update lecture courses. This includes knowledge about LTE in general and SON in the lecture courses “Principles of Mobile Communications” and “Planning of terrestrial Radio Networks”. Additionally the simulation environment developed by TUBS will be used to enhance the lecture course “Modeling and Simulation of Mobile Radio Networks”

- Scientific publications: The participation in SOCRATES has resulted in the definition of two Ph. D. Projects in the areas of Self-Optimisation for multiple use cases and X-Map-Estimation. The scientific results are also presented at conferences and in journals.

- Future Projects: TUBS will use its results from SOCRATES to acquire more research projects on LTE and SON. Especially the LTE simulator currently developed by TUBS will be in the focus of such activities. For example, recently an LTE-related project has been won by TUBS within a national call and another proposal has been submitted in a call of the German Ministry of Economics. TUBS is currently involved in setting up a field trial for LTE800. Other proposals are pending.

5.1.6 Vodafone

The SOCRATES results will be exploited by Vodafone in various ways. Vodafone’s core business is deploying and running mobile networks and in a number of years from now Vodafone will be deploying LTE networks. Various Vodafone internal activities are ongoing to prepare for that roll-out, and the SOCRATES results will feed into those activities.
Firstly, by assessing the value of various SON use cases, Vodafone can determine which SON functionality is required in network equipment. Also, it will be possible to assess what other functionality is required to support the SON functionality. All of this will help define Vodafone’s SON requirements, which will be provided to network vendors.

SON will also have an impact on the network planning for LTE. Understanding SON will enable Vodafone to efficiently plan networks with SON functionality. In addition, it will be possible to also use the expertise gained to ensure that SON functionality is used optimally, as it is expected that the SON functionality itself will require some configuration.

SOCRATES results will also be used as input to the 3GPP standards. Internally in Vodafone, the results will enable Vodafone to understand the potential of SON use cases, and the standardisation requirements for those use cases.

All of the above applies to traditional macro-cell based mobile phone networks, but is also applicable to home base stations (Home eNodeBs for LTE).

5.1.7 Nokia Siemens Networks

NSN plans to exploit the results from SOCRATES work in several ways. The outcomings of SOCRATES use case work will influence the definition of LTE and LTE-Advanced network and OAM research activities and concepts. The NSN research & technology departments will make use of the results of algorithm and simulator development, the definition of new measurements and parameter settings, and SOCRATES concepts regarding SON architecture and interfaces, for the verification of SON concepts and as input to SON feature development within NSN products for future LTE system releases. The SOCRATES results will also be used as input to ongoing cooperation projects with different German universities, and as potential input to new NSN internal research projects.

The self-organisation results jointly developed within SOCRATES will also support NSN to push SON in 3GPP standardisation, mainly in RAN2, RAN3 and SA5 working groups.

5.2 Overview of exploitable results

In order to identify joint exploration interest of SOCRATES results and have a practical overview of these possibilities it was decided to create an overview table for the exploration plans. To make an inventory of the exploitable results of the SOCRATES project, a living table of the results is maintained, as shown below. On a regular basis, all partners are asked to update the information in the table. The table below is a current version of the overview while its final version will be presented in the future deliverable [5].

<table>
<thead>
<tr>
<th>Description of exploitable result / knowledge</th>
<th>Exploitable product(s) or measure(s)</th>
<th>Sector(s) of application</th>
<th>Timetable for use</th>
<th>Patents or other IPR protection</th>
<th>Owner and other partners involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE system simulators / extensions to simulation tools</td>
<td>Consultancy, research projects, verification of new concepts and products</td>
<td>Network operators, vendors, research, others</td>
<td>2009-2016</td>
<td>n/a</td>
<td>TNO, ATE, EAB, IBBT, TUBS, VOD, NSN-PL, NSN-D</td>
</tr>
<tr>
<td>Knowledge on LTE and SON</td>
<td>Consultancy, workshops, research projects, education, PhD theses, concept building and new product ideas</td>
<td>Network operators, vendors, research, standardisation, education, academic</td>
<td>2009-2016</td>
<td>n/a</td>
<td>TNO, ATE, EAB, IBBT, TUBS, VOD, NSN-PL, NSN-D</td>
</tr>
<tr>
<td>Framework for the development of SON methods, including requirements and assessment methodology for SON</td>
<td>Consultancy, research projects, concept building, verification of new concepts</td>
<td>Network operators, vendors, research, others</td>
<td>2009-2016</td>
<td>n/a</td>
<td>TNO, ATE, EAB, IBBT, TUBS, VOD, NSN-PL, NSN-D</td>
</tr>
<tr>
<td>Knowledge on self-optimisation of Home eNodeB</td>
<td>Algorithms used internally for concept building and new products</td>
<td>Network operators, standardisation</td>
<td>2009-2014</td>
<td>To be exploited</td>
<td>EAB, TNO</td>
</tr>
<tr>
<td>Knowledge on (self-optimising) load balancing in LTE</td>
<td>Load balancing algorithms for LTE</td>
<td>Vendors, research, education</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>NSN-PL, IBBT, TUBS</td>
</tr>
<tr>
<td>Knowledge on (self-optimising) interference coordination in LTE</td>
<td>Interference coordination algorithms for LTE</td>
<td>Vendors, research, education</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>ATE, TUBS</td>
</tr>
<tr>
<td>Knowledge on (self-optimising) scheduling in LTE</td>
<td>Scheduling algorithms for LTE</td>
<td>Vendors, research, education</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>TNO, IBBT</td>
</tr>
<tr>
<td>Knowledge on (self-optimising) handover in LTE</td>
<td>Handover algorithms for LTE</td>
<td>Vendors, research, education</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>IBBT, VOD, TUBS</td>
</tr>
<tr>
<td>Knowledge on (self-optimising) admission control in LTE</td>
<td>Admission control algorithms for LTE</td>
<td>Vendors, research, education</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>IBBT, TNO</td>
</tr>
<tr>
<td>Knowledge on automatic generation of default parameters</td>
<td>Algorithms for the automatic generation of default parameters in LTE</td>
<td>Vendors, network operators</td>
<td>2009-2014</td>
<td>To be decided</td>
<td>ATE, NSN-D</td>
</tr>
<tr>
<td>Knowledge on self-healing when cell outage occurs</td>
<td>Algorithms used internally for concept building and / or new products</td>
<td>Network operators, standardisation</td>
<td>2009-2014</td>
<td>To be exploited</td>
<td>ATE, EAB, NSN-D, TNO, TUBS</td>
</tr>
<tr>
<td>Algorithms for SON</td>
<td>(Consultancy on) integration in LTE eNodeB; integration in OAM products for LTE</td>
<td>Vendors, network operators</td>
<td>After 2010</td>
<td>n/a</td>
<td>ATE, NSN-D, NSN-PL, EAB, TUBS</td>
</tr>
<tr>
<td>Concept/Activity</td>
<td>Area of Contribution</td>
<td>Timeframe</td>
<td>Project/Beneficiaries</td>
<td></td>
<td></td>
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<tr>
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<td>------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concepts, scenarios, measurements and parameters for use cases</td>
<td>RAN3 standards contributions</td>
<td>2009-2010</td>
<td>VOD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contribution to standardisation</td>
<td>Standards for SON functionalities</td>
<td>2009-2014</td>
<td>3GPP (RAN2, RAN3, SA5) EAB, NSN-D, NSN-PL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding of realistic network layouts with their coverage and capacity limitations</td>
<td>Consultancy on scenarios of LTE network deployment</td>
<td>2010-2011</td>
<td>n/a ATE, TUBS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete data set for LTE specific scenarios, measurements</td>
<td>Research projects, consultancy, education</td>
<td>2010-2014</td>
<td>To be exploited ATE, TUBS VOD, TNO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge on generating coverage maps automatically</td>
<td>Research projects, education, products for eliminating drive tests</td>
<td>2010-2014</td>
<td>To be exploited ATE, EAB TUBS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SON interfaces and architecture</td>
<td>(Consultancy on) integration in LTE eNodeB; integration in OAM products for LTE</td>
<td>Vendors After 2010</td>
<td>To be done ATE, NSN-D, NSN-PL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SON measurements</td>
<td>(Consultancy on) integration in LTE eNodeB; integration in OAM products for LTE</td>
<td>Vendors After 2009</td>
<td>n/a ATE, NSN-D, NSN-PL</td>
<td></td>
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</tr>
</tbody>
</table>
6 Concluding remarks

This deliverable presented the SOCRATES dissemination activities in the second project year (2009) as a follow up of deliverable [2].

The project presentations (fifteen in 2009) and publications (ten in 2009) in 2009 focused mainly on the research approach, self-organisation concepts, and initial quantitative results obtained in the project.

The first project workshop, in cooperation with the FP7 E³ project, was very successful. It attracted, besides the representatives from the organising projects, around 25 external participants from industry and academia, and triggered much interaction and many useful discussions.

SOCRATES has identified the relevant work subjects in RAN2, RAN3, and SA5 via partner’s liaison persons to these 3GPP standardisation groups. The timelines of the 3GPP work is also used to identify the suitable periods for SOCRATES contributions to the standardisation process. The established links with 3GPP standardisation were used to contribute with concepts and analysis from the project (e.g. the load balancing input to SA5) and secure the SOCRATES impact in the standardisation. Further, the phone conferences with NGMN’s project “Operational Efficiency (OPE)” gave the NGMN consortium more insight in various SON topics addressed in the SOCRATES project, especially on cell outage management and helped in defining the scope and plans for the ‘Optimisation for Common Channels’ sub-topic in the NGMN Operational Efficiency (OPE) project.

The SOCRATES partners have also established their individual exploitation plans and have presented an overview of exploitable results in Chapter 5.
References

[5] Deliverable D5.7 “Exploitation roadmap”, to be delivered in M34
Appendix A.  

1st SOCRATES workshop program

This appendix shows the call for participation, including the workshop program, which has been distributed to announce the 1st workshop (see Chapter 3).

Call for participation

ICT-MobileSummit 2009 Pre-conference Workshop on

Self-organisation for Beyond 3G Wireless Networks

June 09, 2009 - Santander, Spain

The goal of this open workshop is to disseminate the first results of the FP7 projects SOCRATES (www.fp7-socrates.eu) and E³ (www.ict-e3.eu). The program comprises presentations on the results of both projects, three invited talks and a presentation from the FP7 project EFIPSANS (www.efipsans.org) that will place the topic self-organisation in a broader networking perspective. The aim of the workshop is to stimulate discussions and feedback. Through interactions with the participants and the invited speakers, the consortia want to validate their views and approaches on self-organising methods for beyond 3G wireless networks.

The workshop addresses both academic researchers and engineers. It mainly aims at research responsible, R&D engineers and technical developers involved in planning, deployment or operations & maintenance of beyond 3G networks, within telecom operators, telecom vendors and SMEs and large companies active in the telecom sector.

Workshop program:

08:45 - 09:15: Registration

09:15 - 09:30: SOCRATES project overview
Hans van den Berg - SOCRATES Project Coordinator - TNO ICT, The Netherlands

09:30 - 09:45: E³ project overview
Wolfgang König - E³ Project Coordinator - Alcatel Lucent, Germany

09:45 - 10:45: Session 1: Framework for self-organisation
09:45 - 10:15: Assessment criteria
Neil Scully (SOCRATES) - Vodafone R&D, UK
10:15 - 10:45: Requirements and architecture
Klaus Nolte (E³) - Alcatel Lucent, Germany

10:45 - 11:10: Coffee break

11:10 - 11:50: Session 2A: Self-organisation in beyond 3G networks
11:10 - 11:30: Algorithms for self-optimisation
Ove Linnell (SOCRATES) - Ericsson Research, Sweden
Christoph Schmelz (SOCRATES) - Nokia Siemens Networks, Germany

11:50 - 12:30: Invited Talks 1A
11:50 - 12:20: An operator’s view on self-organisation
Trevor Gill - Head of Networks - Vodafone Group R&D, UK
12:20 - 12:30: Discussion

12:30 - 13:30: Lunch

13:30 - 14:10: Invited Talks 1B
13:30 - 14:00: A vendor’s view on self-organisation
Werner Mohr - Head of Research Alliances, Nokia Siemens Networks, Research Technology & Platforms, Munich, Germany
14:00 - 14:10: Discussion

14:10 - 15:00: Session 2B: Self-organisation in beyond 3G networks
14:10 - 14:35: Autonomous self-x functionalities and operation
Kari Kallijärai (E³) - Nokia, Finland
14:35 - 15:00: Simulation of self-x algorithms
Ingo Gaspard (E³) - Deutsche Telekom Laboratories, Germany

15:00 - 15:30: Coffee break

Please turn page over
15:30 - 16:30: Invited Talk 2
15:30 - 16:15: Design and evaluation of self-optimisation algorithms for radio access networks
Zwi Altman - Orange Labs, France
16:15 - 16:30: Discussion
16:30 - 17:00: Session 3: A broader networking perspective on self-organisation
Creating a viable evolution path towards self-managing future internet via a standardisable reference model for autonomic network engineering
Ranganai Chaparadza - EFIPANS Technical Manager - Fraunhofer Fokus, Germany
17:00: Wrapping up & closing

Location:
The workshop will take place at the same location as the ICT-MobileSummit 2009 Conference: Palacio de la Magdalena in Santander.
For more information on travel and hotels, please check the website of ICT-MobileSummit 2009 (www.ict-mobilesummit.eu).

Registration information:
Online registration for the workshop on the website of ICT-MobileSummit 2009 (www.ict-mobilesummit.eu) is required.
Registration fee: 50 euro. This fee includes lunch and coffee breaks.
Appendix B. 1st SOCRATES workshop: list of participants

This appendix shows the list of participants at the 1st SOCRATES workshop (see Chapter 3).

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Organisation</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martin</td>
<td>Bakhuizen</td>
<td>Huawei</td>
<td>Sweden</td>
</tr>
<tr>
<td>Andrea</td>
<td>Barbaresi</td>
<td>Telecom Italia</td>
<td>Italy</td>
</tr>
<tr>
<td>Radoslaw</td>
<td>Bartosiak</td>
<td>Samsung Electronics Polska Sp. z o.o.</td>
<td>Poland</td>
</tr>
<tr>
<td>Chris</td>
<td>Blondia</td>
<td>University of Antwerp - IBBT</td>
<td>Belgium</td>
</tr>
<tr>
<td>Eckard</td>
<td>Bogenfeld</td>
<td>Deutsche Telekom AG</td>
<td>Germany</td>
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<tr>
<td>Ranganai</td>
<td>Chaparadza</td>
<td>Fraunhofer Institute for Open Communication</td>
<td>Germany</td>
</tr>
<tr>
<td>LE PAGE</td>
<td>Christine</td>
<td>NEC Technologies(UK)</td>
<td>France</td>
</tr>
<tr>
<td>Ingo</td>
<td>Gaspard</td>
<td>Deutsche Telekom AG</td>
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<td>Heribert</td>
<td>Geib</td>
<td>National Semiconductor</td>
<td>Germany</td>
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<tr>
<td>Trevor</td>
<td>Gill</td>
<td>Vodafone Group</td>
<td>United Kingdom</td>
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<tr>
<td>Philipp</td>
<td>Hasselbach</td>
<td>Technische Universitaet Darmstadt</td>
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<tr>
<td>Kari</td>
<td>Kalliojarvi</td>
<td>Nokia Corporation</td>
<td>Finland</td>
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<tr>
<td>Edgar</td>
<td>Kuehn</td>
<td>Alcatel-Lucent Bell Labs Germany</td>
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<tr>
<td>Ove</td>
<td>Linnell</td>
<td>Ericsson Research</td>
<td>Sweden</td>
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<td>Remco</td>
<td>Litjens</td>
<td>TNO ICT</td>
<td>Netherlands</td>
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<tr>
<td>Michael</td>
<td>Livschiitz</td>
<td>Schema</td>
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<td>Daniel</td>
<td>Manor</td>
<td>Ubiquam Ltd.</td>
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<td>Rosa</td>
<td>Méndez Calvo</td>
<td>Vindeira - Galician ICT Technology Platform</td>
<td>Spain</td>
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<td>Andrej</td>
<td>Mihailovic</td>
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<td>Ingrid</td>
<td>Moerman</td>
<td>IBBT - IBCN - Gent University</td>
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<td>Werner</td>
<td>Mohr</td>
<td>Nokia Siemens Networks GmbH &amp; Co. KG</td>
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<td>Maciej</td>
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<td>Sarakis</td>
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<td>Greece</td>
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<td>Tsiakas</td>
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<tr>
<td>Hans</td>
<td>Van Den Berg</td>
<td>TNO Information and Communication Technology</td>
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<td>Michal</td>
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<td>Qixun</td>
<td>Zhang</td>
<td>Beijing University of Posts and Telecommunications</td>
<td>China</td>
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</table>
Appendix C. 1st Joint Workshop COST 2100 & SOCRATES workshop program

This appendix shows the workshop program of the first joint Workshop of COST 2100 SWG 3.1 and SOCRATES which was held at Braunschweig on 18 February 2009 (see Chapter 2).

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**Joint Workshop COST 2100 SWG 3.1 & FP7-ICT-SOCRATES**

18 February 2009, Technische Universität Braunschweig, Lecture Hall SN 19.1

Session Chairs: Michał Wogrowski, AGH Univ. of Science and Technology Krakow; Thomas Künner, TU Braunschweig

**Agenda:**

9.00-9.05h  Welcome
Thomas Künner, TU Braunschweig

9.05-9.10h  Introduction to COST 2100 SWG 3.1
Rancia Cardona, Universidad Politécnica de Valencia, COST 2100

9.10-9.15h  Introduction to FP7-ICT-SOCRATES
Hans van den Berg, TNO, SOCRATES

Thomas Janßen, TU Braunschweig, SOCRATES, TD (09) 758

9.40-10.05h  On Input Data for the Mobile Network Online Optimisation Process
Michał Wogrowski, AGH Univ. of Science and Technology Krakow, COST 2100, TD (09) 747

10.05h-10.30h  Call Outage Management in LTE Networks
Mehdi Amiripoor, Ericsson, SOCRATES, TD (09)750

10.30-11.00h  Coffee Break

11.00-11.25h  Performance Analysis of Location Area Re-Planning in a Live GERAN System
Matias Torál, University of Málaga, COST 2100, TD (09) 724

11.25-11.50h  Self-Optimisation of LTE Home Base Stations
Kristina Zetterberg, Ericsson, SOCRATES, TD (09) 744

11.50-12.15h  Performance Measurements and QoS Analysis of High Speed Packet Access Networks
Charalambos N. Pitas, NTUA, COST 2100, TD (09) 764

12.15-12.30h  Concluding Remarks
Nancis Cardona, Universidad Politécnica de Valencia
Hans van den Berg, TNO, SOCRATES

12.30h-13-30h  Lunch