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Thematic Priority:  
SIXTH FRAMEWORK PROGRAM



Priority 2.5.3  
INFORMATION SOCIETY TECHNOLOGIES  
Unit G3 Embedded Systems



Project Acronym:

**SOCRADES**

Project Full Title:

**Service-Oriented Cross-layer infRAstructure for  
Distributed smart Embedded devices**

Proposal/Contract No: EU FP6 IST-5-034116 IP SOCRADES

## **Deliverable 11.2e**

### **Project Report**

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<sup>1</sup> See p.5 for explanation of Dissemination Levels

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<sup>4</sup> A list of company short tags can be found in DoW

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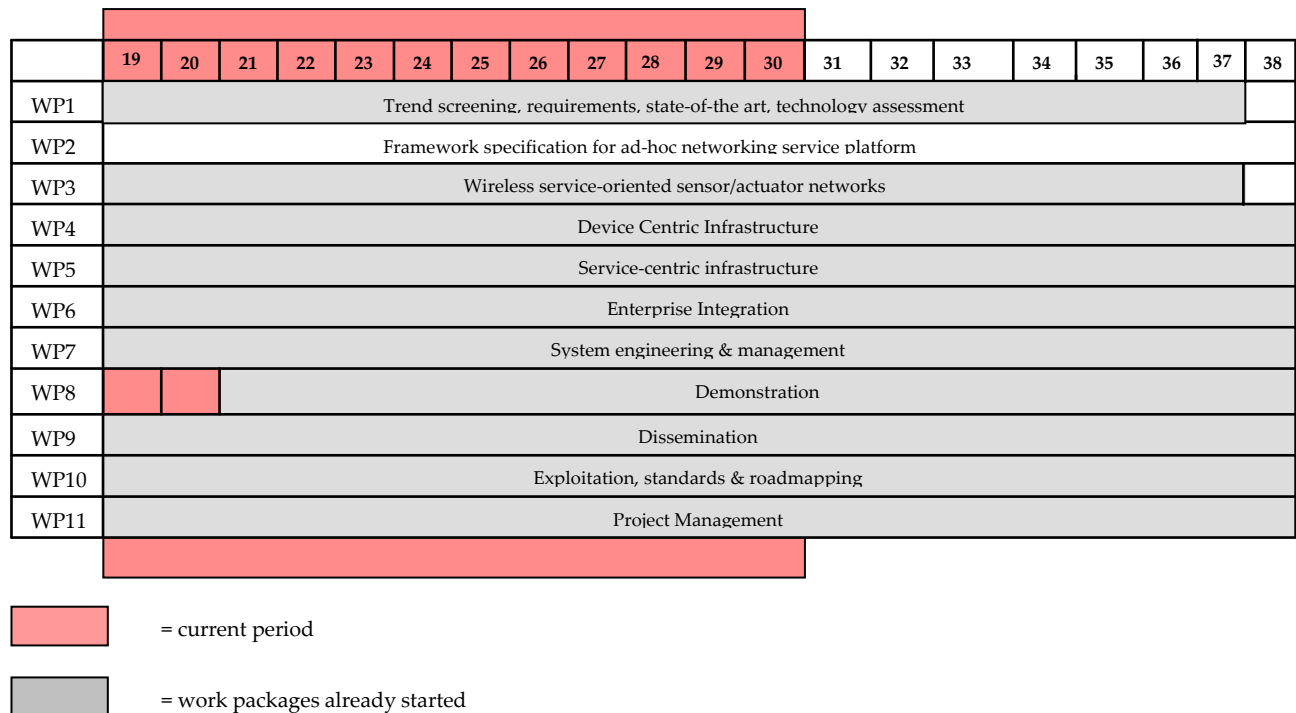
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**Dissemination Level:**

PUBLIC	Public
PP	Restricted to other programme participants (including the Commission Services)
RESTRICTED	Restricted to a group specified by the consortium (including the Commission
CONFIDENTIAL	Confidential, only for members of the consortium (including the Commission Services)

## 1. Executive summary

This progress report presents activities and results achieved by the SOCRADES consortium during the fifth 6-monthly reporting period (September 2008 until February 2009). It is based on the Guidelines for preparing project reports for FP6 (<http://cordis.europa.eu/fp6/find-doc-management.htm#reporting>).



Note: WP2 finished in M18 (1 phase of the project).

**Figure 1: Work plan schedule - Overview**

### 1.1. Summary of the Objectives of the Reporting Period and Related Activities (Project Coordinator)

Based on the work plan addressed in the Annex1, 4<sup>th</sup> Amendment of the SOCRADES DoW, and taking into account the results of the Technical Workshops held in conjunction with PCC meetings, as well as the recommendations of the evaluators after the 4<sup>th</sup> EC Review/ second year (October 28-29, 2008, Brussels, Belgium) and the 3<sup>rd</sup> EC Review / 18-months (June 2008, Lulea, Sweden) meetings, the following main objectives have been addressed in this period:

- SOCRADES General Framework specification (first project milestone), Consolidation of the results obtained after the Second Period (24 months) and of the SOCRADES Early Prototypes (Second and Third Project Milestone).
- Screening of the major RTD values addressed in SOCRADES, against the background of the current market and competition state, as documented in current public reports.
- First specifications and developments of the necessary steps for demonstrating the innovation aspects of the SOCRADES related technologies:

- Improvement and modularization of the architecture of the DPWS stack.
  - Application of the SoA paradigm at the device level (for real and virtual devices).
  - Enterprise integration (integration of devices and IT systems) using WS technology.
  - Application of a formal (Petri Net-based) modelling and analysis/validation approach to formally specify service orchestration and agent-based service choreography at device level.
- Follow-up of the mapping of application of the framework into the three industrial scenarios (electronic assembly, car manufacturing, continuous process);
  - Implementation of a first set of early prototypes coming from the works performed in the individual work packages.
  - Strong publishing activities and dissemination of the research results.
  - Dissemination of SOCRADES in international events concerning different Framework Programs like ITEA2 Fair and Conference (Rotterdam 2008), ICT'08 Conference and Fair (in conjunction with ARTEMIS (Lyon, 2008).
  - External/public demonstrations of project developments/results. Participation of SOCRADES in the ITEA2 Fair (Rotterdam, 2008), ICT'09 Fair (Lyon, 2008). Publication of videos (per Internet) addressing those demonstrations.
  - Follow-up actions for conducting standardization activities focussing on new standardization initiatives, like OASIS.
  - Completion and delivery of a 3<sup>rd</sup> and 4<sup>th</sup> consecutive amendments of the SOCRADES Annex 1
    - 3<sup>rd</sup> Amendment concerning the splitting of the partner #1 (Schneider Electric) into two different partners, i.e., partner #1 (Schneider Electric, Germany) and partner #16 (Schneider Electric Industries SAS, France). Effects of the amendment done retroactive to the initiation of the project (01. September 2006). Date of the Amendment: 01. September 2008.
    - 4<sup>th</sup> Amendment concerning the change of the legal name and situation of the partner #1 (Schneider Electric), i.e., change of the project co-ordinator from Schneider Electric GmbH (Germany) to Schneider Electric Automation GmbH (Germany). Effects of the amendment done retroactive from 01. October 2008. Date of the Amendment: 01. October 2008.

Note\_1: This fourth amendment contents also the SOCRADES Annex 1, First Revision of the SOCRADES Work Plan after the first 18-Months project period, PLUS a rescheduling of work packages, due dates for deliverables and milestones according to an extension of the project duration from 36 to 38 months.

From the management point of view, the project consortium's situation, now with 16 partners and a new company (legally spoken) occupying the coordinator position, i.e., legal and financial aspects, has been stabilized.

### ***1.2. Short evaluation of the status achieved & lessons learned (Project Coordinator)***

The project's first and second yearly milestones (SOCRADES Framework Specification) has been reached and positively evaluated by external experts.

The project's second and third milestones have also been reached with the present report, which confirms the positive evaluation results of the 1<sup>st</sup> and 2<sup>nd</sup> years EC review meetings. This status is particularly showing

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the commitment of the individual partners but also the high degree of integration of work reached within the consortium.

After a first analysis of the market and the state of the competition, the consortium is aware that this initiative is the first (world-wide) to address the application of the SoA paradigm at the device level and the integration of such SoA-compliant devices into enterprise architectures. SOCRADES is a new technology and for that reason, it is in the hands of the partners to spread it as a real innovation. It is worth emphasizing that the SOCRADES consortium is marking the RTD direction (world-wide) in this domain, situation that is confirmed by a big amount of invitations to participate in International Events that the partners started to receiving during the last months, mainly events oriented to define RTD-programs for the next 10-15 years (in the EU, USA, Japan, Korea, etc).

“Road mapping for the adoption of the SOCRADES paradigm” was proposed as one of the essential activities planned for being conducted during the first project year in work package 10 (Task 10.3). However, due to the innovative aspects of the SOCRADES technology, only a few sets of EFTAs were identified during the first year. The deadline to conclude the first and second versions of the Roadmap were extended (authorized by the EU PO and the experts) to the end of the 1<sup>st</sup> 18-months-period and the end of the 2<sup>nd</sup> year / 24-months-period. The results have been submitted on Month 18<sup>th</sup> (D10.4a) and on Month 24<sup>th</sup> (D10.4b). As a matter of fact, it was impossible to define a roadmap for the adoption of a paradigm, as long as the necessary technology roadmap does not exist. At this moment, the first 4 phases to generate the SOCRADES technology roadmap have been finished. Following the recommendations from the experts after the 18-Months EC review meeting, the PCC (during the last meeting hold on October 7-8 2008 in Loughborough) decide to concentrate in the 3<sup>rd</sup> project year on the positioning of the reached results in front of other public existent roadmaps.

The splitting of the partner #1, the change of the legal name of the co-ordinator and the extension of the duration of the project (in a neutral cost approach), i.e., the completion of two consecutive Amendments of the ANNEX I, is showing a very dynamic consortium structure and of course it shows that a continuous day-to-day management work is necessary for the integration of the major technically oriented work packages. This is mainly due to the broad spectrum of innovative aspects addressed in the different work packages, making it a real challenge to maintain all technical developments under an integrative approach, particularly so because the technical work is mainly being performed in a collaborative manner by the major players/ stakeholders of the automation value chain.

### ***1.3. Matters arisen and measures taken (Project Coordinator)***

#### **Technical matters:**

The SOA paradigm involves many new concepts and introduces a vocabulary that is now well known in the IT world but difficult to assimilate in the automation area. Consortium-wide technical workshops have been set up with a period of three months and weekly exchanges of information within work packages have taken place in order to reach a common understanding within the consortium.

The strong commitment of the partners allowed the development of a first set of early SOCRADES prototypes and demonstrators. This set of 1<sup>st</sup> prototypes has been incremental developed and its application to the industrial scenarios has been shown in the 1<sup>st</sup> and 2<sup>nd</sup> years EC review meetings. Some of those prototypes have been presented in public events, e.g. the ITEA2 fair in Rotterdam (October 2008), ICT'09 fair in Lyon (November 2008). The generation of the prototypes and the application of them to the industrial scenarios have been very useful to address the integrative aspects (technological and organizational) of the project, aspects that are very hard to manage in the kind of heterogeneous consortium and particularly due to the partnership between world-wide competitors.

One difficult matter that arose in the first 6-month period of the 3<sup>rd</sup> project year was the improvement of the SOCRADES Annex1 (technical work plan) adapting the original version (part of the already approved 2<sup>nd</sup> Amendment) to the 3<sup>rd</sup> year. Two special days were scheduled for consortia meeting associated to two PCC



meetings (Loughborough, October 2008, and Magdeburg, December 2008), in order to process the 3<sup>rd</sup> and 4<sup>th</sup> Amendments of the Annex I. These two face-to-face PCC meetings were complemented with an Extraordinary PCC-meeting held on January 23<sup>rd</sup> 2009 in Frankfurt, Germany. According to the commitments with the European Commission, the consortium was able to deliver the final (agreed by all partners) version of the 3<sup>rd</sup> Amendment of the DoW-Annex I, which has been accepted by the EC.

During the first months of the project, by screening the SoA-related technologies, the consortium has observed a strong correlation between the DPWS and OPC UA technologies. The major SOCRADES technology developers (Schneider Electric, Siemens and ABB) started activities to conduct to a SOCRADES result called DPUA. The topic has been discussed during the last six SOCRADES technical workshops and a Working Group has been set up, which has started analyzing that correlation and concomitant ISO/IEC standardization actions are being initiated, also as a part of the plan of activities addressed in WP3, WP4 and WP10. The first results of that activity are essential part of the D3.3.

Remark: The due date for D3.3 was initially setup by M23, nevertheless, due to the integrative work of the partners addressed above and the necessary integration of contributions coming from the three international competitors, i.e. Schneider, Siemens and ABB, a new due date was defined, i. e. M27. A letter signed by the WP3 leader (Siemens) was submitted together with the set of deliverables with due date M24, explaining the major reasons for this change of delivery-date of D3.3. Nevertheless, the deliverable was not completed by the new due date. Due to technical discussions among the partners concerning the contents of that deliverable (basically a comparison of DPWS and OPC-UA), it was reviewed and optimized after the PCC-Extraordinary meeting held on January 23 2009. After the assessment of the PCC members, it was finally delivered on March 16<sup>th</sup> 2009 (an acknowledgement of the EC considering the 3,5 months delivery delay was issued by the EC).

#### **4<sup>th</sup> Amendment of the DoW-Annex I:**

Despite of the change of the SOCRADES partner #1, which was the major (legal) initial reason for the necessary new (4<sup>th</sup> Amendment) of the SOCRADES contract, there have been two important technical aspects that played a major role in the definition of new due dates in the project work plan:

1. The integration of results (Pilots/Prototypes) from the different work packages into the Trials planned in WP8 is being delayed by the missing of technological integrative aspects between the WP3 and the WP5 (both work packages are working on a SoA architecture but based on different technologies). The integration of devices exposing services with the two different technologies, i.e., DPWS and OP-UA required the specification and the implementation of a Gateway/Mediator/Translator, and this implementation took more time than the original scheduled.
2. Due to a technological/strategic change of HW platform, Schneider needed to delay the implementation of the DPWS-based control devices that are containing the prototypes developed in WP5. The new HW-Platform, which will be the commercial platform during the differentiation phase of the project results (Exploitation of Results beyond SOCRADES), will be completed with two months delay.

As a consequence, the project duration has been extended from 36 to 38 months in a cost-neutral approach. This means, the project will finish on October 31<sup>st</sup> 2009.

The major changes generated in this reporting period by this extension of the project duration are:

1. The new due date for the 4<sup>th</sup> Major Project Milestone (Integration of results / concepts and applications) is M36 (August 31<sup>st</sup> 2009)
  2. Some of the Milestones associated to the project work packages, with due date in this 3<sup>rd</sup> year were delayed:
    - a. MS 5.1 (new due date M33)
    - b. MS 3.4 (new due date M37)
    - c. MS 5.1 (new due date M33)
-

- d. MS 7.2 (new due date M36)
- e. MS 7.3 (new due date M37)
- f. MS 8.1 (new due date M38)

From the set of deliverables that were scheduled for M30, the D5.2.2 changed its due date to M33, D6.5 to M38.

**Organizational matters:**

Split of SOCRADES partner #1 (Schneider Electric) into two partners, i.e., partner #1 (Schneider Electric GmbH, Germany / Coordinator) and a new partner #16 (Schneider Electric Industries SAS, France). This change was done valid in a retroactive manner from September 1<sup>st</sup> 2006 (initiation of the project).

Change of the legal situation and name of the SOCRADES partner #1 (Schneider Electric GmbH, Germany). The new partner #1 is Schneider Electric Automation GmbH (Germany) and it takes all the responsibilities that were associated to the original partner #1, i.e. particularly the project co-ordination. This change was done valid from October 1<sup>st</sup> 2008.

In both cases, the budget/funding transferred to the respective partners was the initial one addressed in the SOCRADES EU Contract.

**Management matters:**

- Due to all legal changes associated to the 2 consecutive 3<sup>rd</sup> and 4<sup>th</sup> Amendments of the Annex I and also due to the Audit processes ordered by the EU Court of Auditors, the process for the payment of the 2<sup>nd</sup> year Funding was delayed. The EU Commission authorized and transferred the corresponding funding (3<sup>rd</sup> pre-payment) on April 1<sup>st</sup> 2009. Remark: The transfer of funding to the partners is ongoing.

#### **1.4. Next Steps (Project Coordinator)**

**Technical steps:**

- Continuing completing major developments based on the framework specification addressed in Project Milestone 1.
- Improving the implementation of the early prototypes.
- Reaching maturity of the prototypes and early solutions
- Integrating prototypes and solutions into the different industrial domains and also the trials.
- Actualization of the exploitation plan.
- Positioning of the SOCRADES roadmap in front of other existing public roadmaps.

**Management steps:**

- Complete the transfer of the 2<sup>nd</sup> EC funding
- Preparing the 30-months EC review (already scheduled for June 10<sup>th</sup>, 2009 in Brussels, Belgium)

#### **1.5. Analysis of the effort Consumption (Project Coordinator)**

**Contents of the report after 30 months (an Annex to this deliverable will be submitted by May 15<sup>th</sup> 2009):**

**Report from the last 6 months:**

- The audits and the D11.3d were delivered to the EC. It did not address any special/particular issues.

- The leadership of the Task 5.4 (WP5) was transferred from partner # 1 (Schneider Electric Automation GmbH) to partner # 13 (Tampere University of Technology). This transfer of responsibilities was reflected in the transfer of efforts from partner #1 to partner # 13. This transfer of efforts was addressed in the Amendment 4<sup>th</sup> of the DoW (Annex I).
- After the authorization from the EC and the acceptance from the PCC, the efforts allocated to the partner # 14 Jaguar/Ford (for the third project year) were completely transferred to the partner # 8 (Loughborough University). This transfer of efforts was addressed in the Amendment 4<sup>th</sup> of the DoW (Annex I).

## 2. Work Progress Overview (WP Leaders)

### 2.1. WP1 – Trend screening, requirements, state-of-the art, technology assessment

This work package is dedicated to analyzing state-of-the-art of the overall projects subjects, identifying relevant use cases as a basis for requirements specification and finally trend screening throughout the overall project.

#### 2.1.1. Tasks progress

##### *Task 1.3: Trend screening and self-evaluation*

Work on Task 1.3 has been continued during the actual reporting period. This work is dedicated to the continuation of the work on state-of-the-art analysis as started within Task 1.1 throughout the overall project duration. Results of this work were documented within D1.3 within the former reporting period and became enhanced with D1.4. This deliverable was finished at the beginning of this reporting period. Actually work continues on the same subject as D1.3 and D1.4. Results will be reported within D1.5 due for the next reporting period.

D1.4, which became accepted within the last review meeting in October 2008, is structured into 8 sections, each of them dedicated to another technological field. Each section is related to a single section of D1.1 and its Annex.

Section 1 is aimed at providing an update of the state-of-the-art and trend description on middleware concepts and solutions followed by section 2 providing the latest trends on agent-based control. The deliverable proceeds with the trends in service oriented architectures (section 3) to update the common understanding of the subject to the entire project team. Whereas section 4 is dedicated to the trends in networked control (related to WP4), section 5 describes the progress discovered in wireless technologies and sensor networks. Section 6 describes what is going on related to device profiles. The last two sections of this deliverable describe the ongoing trends in engineering of distributed systems and business process integration.

Each chapter is first introduced by an overview of the technical progress discovered related to the selected technology, followed by a description of the progress and its relation to the SOCRADES approach. Finally the relevant references are provided.

Deliverable D1.4 is a collection of contributions from the experts involved in the project distributed across the different work packages. It shows therefore an update of the state of the art at the current stage of the project. This deliverable is passed back to the technical WPs as well as to the project management to support supervision and evaluation of the projects progress.

Work on trend screening has been continued to during this reporting period. Results will be reported within D1.5 due for the next reporting period. Within the latest review meeting, some overlapping was discovered with regards to the road mapping, done within WP10. Co-ordination effort is spent to avoid this for D1.5.

Also, effort was spent to enhance a SOCRADES Glossary.

### 2.1.2. Deviations of the project work program

Work on WP1 is in line with the current planning.

### 2.1.3. List of deliverables for the reporting period (if applicable)

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
D1.4	Trend screening report 2	1	ifak	Report	CONFIDENTIAL	M24	M26

### 2.1.4. List of milestones for the reporting period (if applicable)

There are no WP1 milestones assigned to this reporting period.

### 2.1.5. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC and Technical Workshop	Organizational and Technical	06.-07.10.2008	Loughborough
EC Review Meeting		28.-19.10.2008	Brussels
PCC and Technical Workshop	Organizational and Technical	15.-16.12.2008	Magdeburg

### 2.1.6. Key activities planned for the next period

Activity / Result / Publication	Contents / Objectives	Date	Place
Continue work on Task 1.3			
Provision of D1.5		M34 (M37, after approval)	

## 2.2. WP2 – Framework specification for ad-hoc networking service platform

This WP finished on M18 (1 phase of the project).

## 2.3. WP3 – Wireless service-oriented sensor/actuator networks

### 2.3.1. Work package objectives, starting point of work

For future automation solutions it might be imaginable to equip sensors and actuators with a freely programmable processor each. In such special wired / wireless networked HW/SW systems embedded in distributed smart physical objects, so called “sensor-/actuator networks”, all processors use the same communication medium and are able to communicate directly with each other according to the peer-to-peer-principle – without any coordinating instance. All (or at least the most important of) these processors then could be equipped with corresponding software based on a service oriented architecture concept as e.g. OPC UA or DPWS. This would enable such sensor/actuator networks to provide necessary functionalities for the wished degree of interoperability with the ERP/MES level.

Almost inescapably in context with these sensor-/actuator networks wireless technologies have to be mentioned. Though these from a theoretical point of view are not imperative for sensor-/actuator networks, in practical considerations wired sensor-/actuator networks are not of any relevance as the wiring of a high amount of sensor and actuator nodes would be difficult and not economic.

Against that background, the following research topics are addressed within this work package:

- Node architecture, sensor integration and the interface between sensors and the network,
- Wireless Network topology, self-configuration, self-management, routing, scalability,
- Communication technologies for Wireless Sensor/Actuator Networks (WSN) in industrial environment (e.g. IEEE 802.15.4, 802.15.4a or ZigBee),
- Power supply for the network infrastructure as well as the sensor itself,
- New Services with Wireless Sensor Networks,
- Demonstrator setup.

As a starting point of work it can be stated that consortium members are active in a number of relevant working groups which deal with radio communication and industrial communication e.g. the Institute of Electrical and Electronics Engineers (IEEE), the International Electrotechnical Commission (IEC), the Zentralverband der Elektrotechnik und Elektronikindustrie (ZVEI), the German Commission for Electrical, Electronic & Information Technologies of DIN and VDE (DKE), the German VDI/VDE-Society.

### 2.3.2. Tasks progress

#### *Task 3.3: Mapping of DPWS into wireless nodes*

The initial planning when setting up the SOCRADES project was to use DPWS technology as platform for a SOA based communication infrastructure between device level and ERP level. During the project's runtime several (bigger) partners, nevertheless, got aware of the fact that there might be alternatives to the (sole) usage of DPWS technology in the described context. One of these alternatives is the OPC foundation's OPC UA protocol, especially the binary version of which seems to be very appealing for the usage of lower level devices. As in OPC foundation not only Siemens is a member, but also the project partners ABB, Schneider Electric and SAP, a combination of DPWS and OPC UA was thought about.

Against this background task 3.3 was dedicated to have a more detailed look at the advantages of both technologies and finally came to the conclusion to base further integration work (especially in WP 8) on a translator software called "DPUA"

Due to the high level strategic relevance of this topic the deadline for the deliverable was postponed to November 30<sup>th</sup> 2008; the document was finally submitted on February 9<sup>th</sup> 2009.

#### *Task 3.4: Implementation and validation*

In time.

### 2.3.3. Deviations of the project work program (if applicable)

One minor deviation: D3.3 was submitted on February 9<sup>th</sup> 2009 instead of January 15<sup>th</sup> 2009.

### 2.3.4. List of deliverables for the reporting period (if applicable)

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
D3.3	Mapping of DPWS into wireless nodes	3	Siemens	Doc	Co	15/01/09	09/02/09

### 2.3.5. List of milestones for the reporting period (if applicable)

MS No.	Milestone name	Lead partner	Due date	Actual date
3.3	Mapping of DPWS into wireless nodes	Siemens	15/01/09	09/02/09

### 2.3.6. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC	Organizational and Technical	06-07. 10. 2008	Loughborough
EC Review meeting	Annual review	Oct. 28/29	Brussels
PCC Meeting	Organizational and Technical	15.- 16.12.2008	Magdeburg
Extraord. PCC	Status of the trials, reschedule of project work plan for Amendment 4	23.01. 2009	Frankfurt

### 2.3.7. Key activities planned for the next period

Activity / Result / Publication	Contents / Objectives	Date	Place
Finalisation of task 3.4	Improvement /Details	until Sept. 2009	n.a.
Implementation of Trials in Aachen	See activity	until Sept. 2009	n.a.

## 2.4. WP4 – Device Centric Infrastructure

### 2.4.1. Work package objectives, starting point of work

Deliverable 4.1 offered the premises for the continuation of work on wireless system architectures for control purposes.

Deliverable 4.2 further addressed control over wireless communication. These concern control design, communication system design and also coordination between these two system components. We also devised and executed experimental studies of control performance and communication system behaviour.

Results of the above are to be implemented in the real-life trial T4.5.

### 2.4.2. Tasks progress

#### *Task 4.4: Middleware services for fault-tolerant control applications*

The task is focusing on middleware communication procedures to enable cross-device connectivity. One hindrance to such connectivity is the multiplicity of communication protocols employed in the devices for process industry systems.

In order to address the latest developments in the field, the project proposes to build, in Task 4.5. a wirelessHART based system. The difficulty stands in the availability of compliant devices. Hence, the system will be composed of sub-modules coming from multiple providers, which have to be linked together in order to implement the selected architecture.

The activities in Task 4.4. started with the implementation of middleware capable to interconnect the necessary devices operating on several communication protocols. Aspects of fault tolerance will be considered on-top of such communication procedures.

#### **Task 4.5: Small-scale demonstrator for fault-tolerant wireless control**

Task 4.5. concentrates on meaningfully exposing all the developments acquired during the project execution, in the area of process industry.

Several scenarios are prepared in order to appropriately address any possible risk. One of the risk situations can be identified, for instance, as the unavailability of wirelessHART devices.

The implementation of task 4.5. will also bring additional information with respect to multiple wireless network coexistence in an industrial environment. Issues related to robustness and correctness of communication will be thus exposed from this perspective, too.

A device-to-enterprise scenario is under development in order to validate the past project activities on a large scale. Again, multiple communication related situations are involved, from wireless media (and related protocols) to wired Ethernet connections (and related protocols).

#### **2.4.3. Deviations of the project work program (if applicable)**

n.a.

#### **2.4.4. List of deliverables for the reporting period (if applicable)**

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
4.2	Control and communication protocols for wireless industrial control	4	ABB	R	CO	M26	M26

#### **2.4.5. List of milestones for the reporting period (if applicable)**

n.a.

#### **2.4.6. Meetings attended (if applicable)**

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC	Organizational and Technical	06-07. 10. 2008	Loughborough
2 <sup>nd</sup> Year Review	Validation of activities / profiling the forthcoming ones	28-29.10.08	Brussels
WP4 meeting	Scenarios for T4.4, T4.5.	04.11.08	Stockholm
PCC Meeting	Review of 2 <sup>nd</sup> Year Review / actions ahead	15-16.12.08	Magdeburg
WP4 meeting	Progress of T4.4, T4.5.	03.02.09	Stockholm
Extraordinary PCC Meeting	Trials progress, multi-protocol connectivity issues, answers to reviewer comments, further project development	23.02.09	Frankfurt

#### **2.4.7. Key activities planned for the next period**

Activity / Result / Publication	Contents / Objectives	Date	Place
Implementation of middleware applications in real-life devices	Moving the PC based middleware solution to specific device for communication purposes.	03.09	ABB
Scenarios for inter-partner communication within T4.5.	Extending operability between various actors (partners).	04.09	Partner locations
Implementation of T4.5.	Final result of the WP4.	08.09	Boliden, partner locations

Report on the middleware activities	Deliverable D4.3.	09.09	
Report on the real-life trial	Deliverable D4.4.	10.09	

## 2.5. WP5 – Service-centric infrastructure

### 2.5.1. Work package objectives, starting point of work

This WP aims at bridging application level functionality and device level functionality through a common, unifying technological approach, based on the service oriented architecture (SOA) paradigm, implemented using Web Services and associated technologies, over resource limited devices.

The tasks in WP5 are progressing on schedule (as proposed for amendment 4). Six deliverables (D5.1.2, D5.3.2, D5.4.2, D5.6.1, D5.6.2 and D5.6.3) are in preparation to be submitted in February, D5.6.4 in April and D5.2.2 in May.

### 2.5.2. Tasks progress

#### *Task 5.1: Device-level service component*

This task is now ending. The DPWS stack is fully available and support for its use will be provided to the partners till the end of the project.

This task consolidated the service-oriented framework developed by the SIRENA project, in which device-level functionality is exposed through the DPWS protocol stack, either by the devices themselves or through gateways that front-end low-level device functions with service-oriented façades.

Following Open Source delivery of the DPWS component that occurred during the first 18 months, the present task modified and extensively tested the present DPWS implementation, in order to provide a stabilized reliable DPWS-C version, ready to use in all partner environments, and is providing support to SOCRADES partners and to the Open Source community in order to port and use DPWS in their different environments, and in order to make feasible extension developments to the DPWS stack by the Open Source community.

#### *Task 5.2: Service orchestration engine*

During the last reporting period the orchestration approach based on formal methods for control and coordination of services was further implemented.

The runtime component, which has been delivered in D5.2.1, has been extracted from the graphical engineering and simulation tool that allowed the specification of service models, analysis and execution of service processes. In the current reporting period the runtime component is being prepared for the integration at device-level (automation controller device). The latest version of the DPWS stack is integrated with the runtime component.

Together with TUT efforts have been undertaken to integrate both the BPEL and the HL-PN based approaches on a common application scenario during two joint development sessions so far. This scenario includes the remote access to service providing devices via Internet.

#### *Task 5.3: Service management tools*

This task is now ending. The WS-Management solution, together with generic services, is providing a complete management solution.



This task instantiated the manageability framework specified in WP2, itself based on the WS-Management specification, in a prototype environment. It also specified an extension providing generic services capabilities.

#### *Task 5.4: Service-enabled agent system*

This task is currently active and it continues the developments according to the specifications outlined on the task 2.4. During the previous reporting period, it was explained that the developments concentrated mainly on the creation of complementary operations missing on the WSIG add-on for interfacing agents with web services; this work concluded satisfactorily with the preparation of deliverable 5.4.1, where the work done was explained and some basic communication scenarios between agents and web services were also demonstrated.

The activities for task 5.4 during the present reporting period have concentrated on creating the MAS architecture that will interact with other middleware components. In particular the following activities have been accomplished:

- Specification of descriptions and behaviours for agents representing generic products, modules of the material handling system (i.e., conveyor modules), and robots for assembly and manipulation.
- Implementation of the previously mentioned agents and simulation of their interaction using the JADE-LEAP platform.
- Run-time agent instantiations on the platform, based on the agent's specifications and on the ontological descriptions of the web services available on the shop-floor. This provides also the integration with running instances of the orchestrator and orchestrator engines.

During the remaining period, the agent platform will be deployed, tested, and debugged in conjunction with the assembly line that will be used in the electronic assembly demonstrator.

#### *Task 5.5: Semantic web services deployment*

The results of this task were partially reported through the publication in February 2009<sup>5</sup>. The main components were identified and are being implemented to allow knowledge-based decision making at run-time. A set of tools are being developed to interconnect the orchestration engines, devices interfaced as web services, and ontology service representing the knowledge on the environment, process and products. First experiments were made to show the applicability of the approach at run-time having ontology model, and invocation of the web services based on information retrieved and processed at run-time. The developments are done based on JENA and OWL-S APIs.

#### *Task 5.6: Electronic component for service-oriented devices*

The task is currently active in D5.6.4 to collect appropriate data for a report deliverable. The results of D5.6.1 – D5.6.3 are reported in February/March 2009, where D5.6.2 has been redirected to a different deliverable name with notification of project management. The FPGA prototype of experimental component for uGateway D5.6.1 has been developed. The tools support for the experimental device D5.6.3 has been implemented and tested and can be used for the uGateway debugging and development. The renamed deliverable D5.6.2 is currently under investigation due to non-disclosure issues but current technical development has not been affected by this topic which means e.g. the simulation model with SIMD functionality for software is being debugged and automated SIMD instructions sequence generation for function verification has been developed.

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<sup>5</sup> Lobov, A., Ubis, F., Villaseñor, V. H., Puttonen, J., Martinez Lastra, J. L. Semantic Web Services Framework for Manufacturing Industries. IEEE International Conference on Robotics and Biomimetics, February 22-25, 2009, Bangkok, Thailand

### 2.5.3. Deviations of the project work program (if applicable)

n.a.

### 2.5.4. List of deliverables for the reporting period (if applicable)

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
D5.1.2	DPWS stack – 2nd delivery	5	SE	P, R	CO	M30	M30
D5.3.2	Generic services specification document	5	SE	P, R	CO	M30	M30
D5.4.2	Agent-based decision-making system – integrated with orchestration engine,	5	TUT	P, R	CO	M30	M32
D5.6.1	FPGA prototype of experimental component for $\mu$ Gateway	5	ARM	P, R	CO	M30	M30
D5.6.2	Software stack port to experimental component	5	ARM	P, R	CO	M30	M30
D5.6.3	Tools support for experimental device	5	ARM	P, R	CO	M30	M30

### 2.5.5. List of milestones for the reporting period (if applicable)

MS 5.1

Main components of the service-centric infrastructure are available .

Achieved at M30.

### 2.5.6. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC Meeting	Project Progress – discussion on EU reviewers comments	6-7.10.08	Loughborough
2 <sup>nd</sup> Year Review	Validation of activities / profiling the forthcoming ones	28-29.10.08	Brussels
PCC Meeting	Review of 2 <sup>nd</sup> Year Review / actions ahead	15-16.12.08	Magdeburg
Extraordinary PCC Meeting	Trials progress, multi-protocol connectivity issues, answers to reviewer comments, further project development.	23.02.09	Frankfurt

### 2.5.7. Key activities planned for the next period

Activity / Result / Publication	Contents / Objectives	Date	Place
Support for demonstrators	Provide all the required support to partners to develop demonstrators and trials till the end of the project	M39	

## 2.6. WP6 – Enterprise Integration

### 2.6.1. Work package objectives, starting point of work

The main thrust of work within WP6 aims at the integration of device-level services with higher-level Web Services and business processes situated at the level of business applications, in particular Enterprise Resource Planning (ERP) systems.

The respective remaining tasks are:

- Task 6.2: Integration of aggregated services into business applications
- Task 6.3: Integration of non Web Service enabled devices into business processes

Task 6.2 and Task6.3 have continued in M24-M30.

### 2.6.2. Tasks progress

The main goal of WP6 was focusing on design as well as prototyping a variety of concepts. In more detail:

#### *Task 6.2: Integration of aggregated services into business applications*

The integration architecture presented in previous deliverables is under heavy implementation and testing in order to be fully functional for the trials. In parallel prototype services are developed to be integrated in several demos.

#### *Task 6.3: Integration of non Web Service enabled devices into business processes*

The main focus of this task was to take a closer look to non-WS enabled devices. The work already started in previous period has continued, with focus on the upcoming trials.

### 2.6.3. Deviations of the project work program (if applicable)

n.a.

### 2.6.4. List of deliverables for the reporting period (if applicable)

None.

### 2.6.5. List of milestones for the reporting period (if applicable)

None.

### 2.6.6. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC Meeting	Organizational and Technical	6-7.10.08	Loughborough
2 <sup>nd</sup> Year Review	Annual review	28-29.10.08	Brussels
PCC Meeting	Review of 2 <sup>nd</sup> Year Review / actions ahead	15-16.12.08	Magdeburg
Extraordinary PCC Meeting	Status of the trials, reschedule of project work plan for Amendment 4	23.02.09	Frankfurt

### 2.6.7. Key activities planned for the next period

Activity / Result / Publication	Contents / Objectives	Date	Place
D6.5	Final specifications and prototype implementation of the enterprise integration architecture	M36	
D6.6	SOCRADES Business Evaluation	M38	
Conference Publications	Publish scientific findings / results of WP6	M25-M38	

## **2.7. WP7 – System engineering & management**

### **2.7.1. Work package objectives, starting point of work**

The development of the application engineering environment to support the engineering of distributed systems has been continued by the research team involved in WP7.

In the last 6 months, WP7 was focused on the implementation of prototype engineering tools in compliance with SOCRADES objectives and the progressive development of the associated prototype demonstrator system, which was demonstrated in two major international exhibitions ITEA in Holland and ICT in France, attracting significant interest.

Four deliverables (D7.1, D7.2, D7.3 and D7.4) have already been submitted. Deliverable 7.5 on “Generic service oriented device support and maintenance system” is currently being prepared, and deliverable 7.7 “Report on the validation and demonstration of the system engineering environment” will be completed as scheduled, by the end of the project. In connection with this deliverable, the engineering methods and tools being adopted across the project have been captured and are to be analyzed and evaluated as part of D7.7.

Ifak and Loughborough have been working on integration of device-support and maintenance into the Loughborough prototype demonstrator rig. A study of the application of ontologies to support the required process and resource mappings and associated libraries within the engineering tools is ongoing resulting in significant development on the understanding of how best to structure such libraries in order to enable reuse.

### **2.7.2. Tasks progress**

#### ***Task 7.3 - Application description and configuration***

The development of the engineering tool set has continued and has been extended to support the high level management interactions (i.e., with SAP tools) and low-level device configuration (for ifak device support), in addition to the enhancement of state-based application definition and orchestration.

As part of this task, a web-service based interface has now been integrated into the developed graphical engineering tools, and demonstrated on the Loughborough prototype demonstrator. Furthermore, the application of SOA based integration and virtual engineering support has also been implemented and demonstrated for selected application scenarios.

In collaboration with ifak, the Loughborough engineering demonstrator is now being further enhanced to enable the configuration of legacy sensors and actuators through the engineering tools.

The orchestrator has been progressively enhanced to provide sufficient functionality required for the planned proof-of-concept SOCRADES demonstration scenarios and it now supports both sequence and interlock capabilities. The engineering services have been further developed to provide reconfiguration and remote HMI support.

A distributed control system based on Schneider’s FTB devices has been implemented, tested and evaluated in terms of performance and functionality. Preparation for implementation and evaluation of the next generation of Schneider web-based devices, STB’s, has been made. These devices will progressively replace the FTB’s as once delivered to Loughborough. It is anticipated that the Loughborough demonstrator system will then be used to show the integration of the engineering toolset with Schneider’s ControlBuild application to enable high-level programming of STB based function blocks.

The Loughborough’s prototype was demonstrated in two international exhibitions in Rotterdam (ITEA2008 – 22-23 October) and in Lyon (ICT 2008 - 25-27 November). These exhibitions proved very successful. The demonstrations featured a) the WS-based integration of the engineering tools with the run-time test-rig, b)

WS-based distributed control with remote 3D visualization of machine operation, and c) integration with high level SCADA and management systems again via web services.

#### **Task 7.4 - Simulation and verification**

An application logic simulator and associated 3D component visualization has been integrated with the WS based control system. This allows the distributed control logic to be defined, viewed and machine behavior to be verified before the control logic is downloaded to the physical devices.

The workpackage research team are progressively capturing and evaluating the application engineering methods and tools used by project partners in the different industrial sectors across the project. A template prepared by Loughborough was sent to partners to collect the data. The captured data is being analyzed and formatted for use in the planned "Report on the validation and demonstration of the system engineering environment", D7.7. This report will provide a critical analysis and assessment of aspect of the engineering system including: (re)configuration, process description and validation, device support & maintenance, real to virtual connectivity, and process to business connectivity information related to machine description, configuration and subsequent lifecycle support.

#### **Task 7.5 – Device support and maintenance**

Task 7.5 is focused on implementation of a "mediator" for using legacy device in the service oriented approach. Following close collaboration between Lboro and ifak, the ifak components are being integrated with the Lboro prototype demonstrator, in particular PROFIBUS devices. It is aimed to enable the demonstrator to configure such devices. The control loop data is being converted to the legacy field device facilities. In order to be flexible, the mediator component will be configured by means of a device description for adapting to the different device types.

Ifak engineers are visiting Lboro in mid March to assemble the legacy components and mediators to the Lboro demonstrators. No delay is expected in task 7.5.

#### **2.7.3. Deviations of the project work program (if applicable)**

n.a.

#### **2.7.4. List of deliverables for the reporting period (if applicable)**

None.

#### **2.7.5. List of milestones for the reporting period (if applicable)**

None.

#### **2.7.6. Meetings attended (if applicable)**

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC meeting	Project Progress – discussion on EU reviewers comments	6-7 October 08	Loughborough University
EC Review meeting	Annual review	28-29.10. 2008	Brussels
PCC and Technical Workshop	Organizational and Technical	15.16 Dec 08	Magdeburg

#### **2.7.7. Key activities planned for the next period**

Activity / Result / Publication	Contents / Objectives	Date	Place
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Completion of the engineering toolset	Task 7.3		Lboro
Integration with ifak on legacy device support and configuration on the demonstrator system	Task 7.5		Lboro

## 2.8. WP8 – Application pilots, demonstrators

### 2.8.1. Work package objectives, starting point of work

The main objectives of WP 8 are:

- To specify trials as well as pilot applications for selected industrial scenarios focused on the control of continuous processes and on applications related to manufacturing automation.
- To apply the SOCRADES framework to the pilot applications and trials
- To set up the pilot applications and the trial scenario
- To run trials with tests of real world situations like automatic set-up and system start; device or system failure; staff failure; control failure; control at hard real-time conditions, plug & play situations, change of production, as well as process monitoring and diagnostic capabilities.
- To compare the SOCRADES achievements with the performance of traditional process automation and control technology
- To evaluate and assess the results achieved

Based on end user requirements evaluated in WP 1 and on the results achieved so far in WP2 -7 three industrial pilot applications have been selected to prove the technical feasibility of the SOCRADES technology. The application scenarios are:

- Car manufacturing: oil leak testing
- Manufacturing of electronic devices: assembly automation
- Process industry: control of continuous processes.

Complementary to the industrial pilot applications in WP 8, a "Mechatronic trial site" has been established at the APS Labs. The site provides an experimental platform open to run selected trials of different complexity in cooperation with the SOCRADES partners. The test and demonstration environment is built up from heterogeneous mechatronic devices (robots, gantry, sensors, controllers, PCs, tools, etc.) of different types and suppliers. It also includes distributed networked embedded systems, control loops with different real-time constraints, and a mix of wireless and wired communication infrastructure.

The project work within WP 8 has started in May 2008 (month 21) with concerted actions between APS, SE, Siemens, SAP and ABB to specify the trial scenario and the contributions of the partners. The technology platform envisaged for the trials consists of a SOA-based interaction infrastructure which supports DPWS as well as OPC-UA for communication, monitoring and closed loop control. It integrates SOCRADES middleware solutions developed in the project.

### 2.8.2. Tasks progress

#### *Task 8.1: Specification of the application prototypes and trials*

With special focus on the application of the SOCRADES framework developed in the project so far, the WP 8 partners specified the HW and SW requirements as well as the IT infrastructure to set-up the pilot applications in three industrial domains and the trial site at APS.

While the pilot applications are built up from existing production equipment at the end user sites, the trial scenario will integrate heterogeneous mechatronic components like robots, sensors of different type and

complexity, distributed controllers, and tools with embedded intelligence as an experimental platform to study the interoperability of the systems on device level in real world situations and through a synchronisation with business processes via exchange of WebServices.

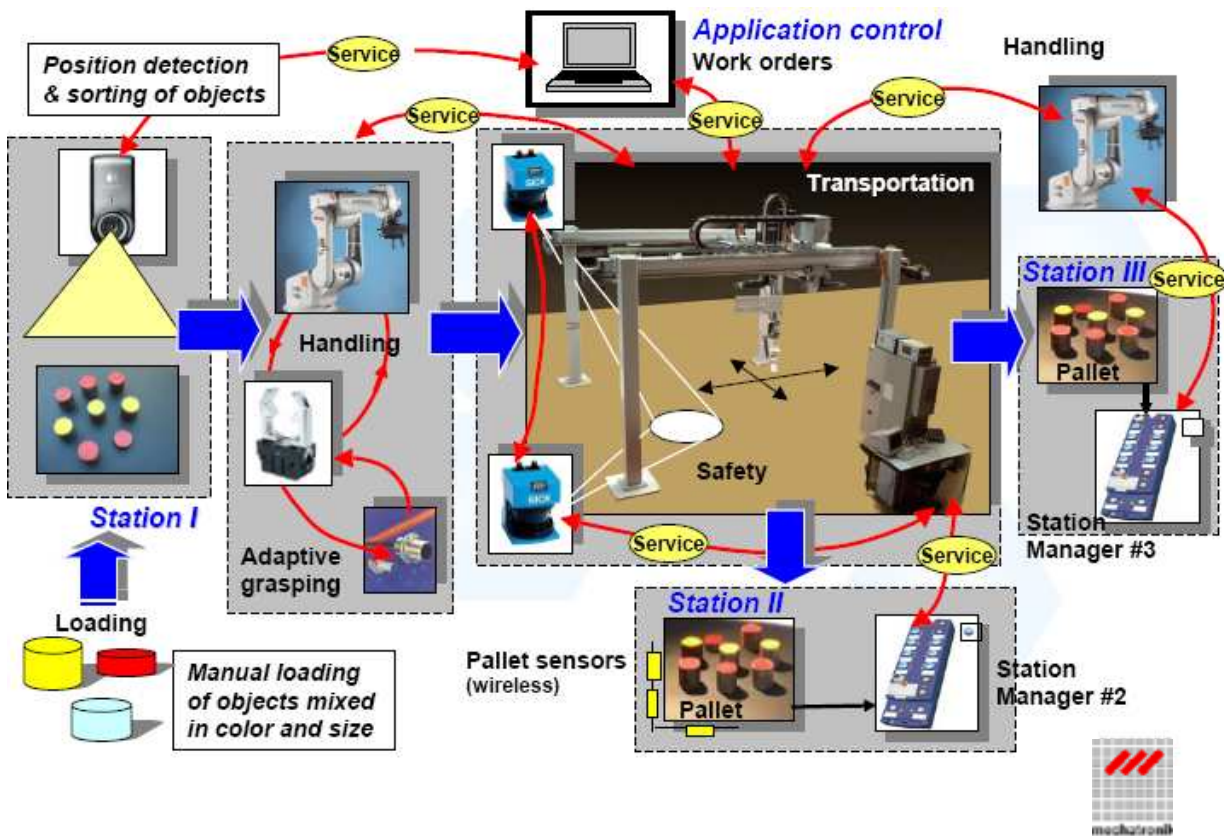


Figure 2: Trial scenario

Envisaged is an automation scenario illustrated in Fig. 2 which enables automated object sorting, handling and transportation as well as fast reconfiguration capabilities in case of changing work orders.

The special technical challenge of the trials is to enable a smooth interaction of the heterogeneous devices through services-based machine-to-machine communication at varying dynamical conditions. To consider in this context are service-driven operations and processes like: configuration, data access and exchange, monitoring, eventing, motion control, sensing, and adaptive control. Results of this specification phase have been reported at the 24 Months Review Meeting in Brussels (October 2008).

### Task 8.2: Application of the SOCRADES Framework to the prototypes and trials

The work of Task 8.2 concentrates on the application of the SOCRADES technology to the industrial pilot applications and the trial scenario. This includes the application of DPWS and related middleware to enable device-to-device interaction and a synchronization of device activity with selected business processes via IP-based WebServices. With regard to the trials special consideration has been given to the different time constraints which are of relevance for the envisaged automation scenario. They are related to sensor-based control loops, the coordinated motion control of robot and gantry as well as to the interaction with a vision system at the loading station and the safety sensors supervise the working space covered by the gantry.

The development of the IT infrastructure to enable the WS-based interaction of all mechatronic devices is progressing well. Key elements of the concept for WS based interaction at different dynamic constraints are so called "embedded WS Units". They enable "stimulation & response" of devices through WS. Due to the

numerous legacy systems involved in the trial scenario, service invocation as well as discovery and messaging will be performed via a Service Registry instead of a peer-to-peer approach.

To cope even with hard real-time constraints in closed loop control (sensor/actor) a clustering of device functionality is implemented in order to expose, if demanded, coordinated actions to the rest of the devices as a single service interface. Clustering is of temporary nature and reprogrammable.

An orchestration engine with basic functionality has been implemented. It will start any activity by stimulation of work orders. They start the service deployment process and the subscription of devices to a given event. The registered subscriptions are used for invoking services and for the propagation of events to the subscribers.

The types of services necessary to run the automation concept have been specified by means of an ontology.. It includes also a first draft of semantic issues and specifications.

The specification of the interfaces to combine the contributions of the partners to the trial scenario is available. For the wireless operating sensors binary OPC-UA is to consider for the exchange of service messages. To couple the wireless sensors to the IP-based trial network a gateway and a translator from OPC-UA to DPWS standard was to consider. In view of these constraints the partners agreed to ask IFAK for support in the development of a draft translator concept with basic functionality.

The project work with specific HW and SW development and implementation of the SOCRADES technology at the different WP 8 partner sites as well as integration of the prototypes into the trial scenario is still going on.

### 2.8.3. Deviations of the project work program

More efforts than previously expected by the WP 8 partners and some technical problems forced us to reschedule the work plan. Based on an extension of the project duration by two months until end of October 2009, the work program of WP8 will be rescheduled. However, no change is intended in terms of the distribution of tasks and their content.

The due-dates for the deliverables D8.1 and D8.2 changed: D8.1 (month 36) and D8.2 (month 38).

### 2.8.4. List of deliverables for the reporting period (if applicable)

None.

### 2.8.5. List of milestones for the reporting period

Milestone M24 has passed with a detailed specification of the trial scenario. The scenario details were presented during the 24Months Review in Brussels.

### 2.8.6. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
WP 8 kick off and status meeting	Specification of trial scenario and of the contributions of the partners	23-24.09. 2008	Aachen
PCC	Organizational and Technical	06-07. 10. 2008	Lboro
EC Review meeting	2 <sup>nd</sup> Year Review Meeting	28-29.10. 2008	Brussels
PCC	Organizational and Technical	15-16 December 2008	Magdeburg
Extraord. PCC	Status of the trials, reschedule of project	23.01.	Frankfurt



	work plan for Amendment 4	2009	
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### 2.8.7. Key activities planned for the next period

Activity / Result / Publication	Contents / Objectives	Date	Place
Technical meeting with SE	STB, services, orchestration engine	Week 13 2009	Aachen
Technical WP 8 meeting	Status of work/ interfaces, services, timing	Week14 2009	Aachen
Start of D8.1 preparation	Thematic template and distribution of work	Week 14 2009	Aachen

## 2.9. WP9 Dissemination

### 2.9.1. Work package objectives, starting point of work

This WP is concerned with the dissemination and promotion of the project results. There are three major strands to the activity in this WP, scientific dissemination, industrial promotion and dissemination via centres and networks of excellence. This WP complements the key standardisation and roadmapping work being carried out in WP10. Several Meetings and phone conferences have been made as well as a good regular synchronization with WP10 is well established. International conference special sessions and workshops will be organised to promote SOCRADES with three major events of this type envisaged over the course of the project.

Dissemination of SOCRADES results are performed by the project partners through an active participation in fairs and conference. For a detailed and comprehensive list see section 4.

### 2.9.2. Tasks progress

#### *Task 9.1: Scientific, technical and general dissemination*

Dissemination, promotion and assessment activities are including the following:

- Publications dedicated to results of this project have been generated for presentation at international conferences or in journals. For a detailed and comprehensive list see section 4.
- Workshops and/or special sessions within international conferences were held. For a detailed and comprehensive list see section 4.

SOCRADES partners are currently members of the editorial board of world known IEEE and IFAC journals. Synergies to international Technical Committees and dissemination activities within those committees are being built.

#### *Task 9.2: Industrial promotion*

Events specifically tailored to different audiences, e.g., in process automation, electrical distribution and manufacturing automation have been organized. For a detailed and comprehensive list see section 4.

The feedback received from these events is being used to assess industrial reaction to and the applicability of SOCRADES in diverse application sectors. It is foreseen that during this project a minimum of three such public events dedicated to the dissemination of SOCRADES in different countries in Europe will be organised.

Moreover, internal dissemination especially within the larger industrial partners of the project is continuously being carried out.

### 2.9.3. List of deliverables for the reporting period

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
D9.1e	Dissemination Plan	9	Polimi	R	CO	M30	M31

This is a plan of the dissemination activities to be carried out in the next 8 months of the project.

### 2.9.4. List of milestones for the reporting period

No milestone was planned for the reporting period.

### 2.9.5. Meetings attended (if applicable)

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC Meeting	PCC topics	6-7 October 2008	Loughborough
EC Review Meeting	2 <sup>nd</sup> year Review Meeting	28-29 October 2008	Brussels
PCC Meeting	Organizational and Technical	15-16 December 2008	Magdeburg
PCC Meeting	Status of the trials, reschedule of project work plan for Amendment 4	23 January 2009	Frankfurt

### 2.9.6. Key activities planned for the next period

Please refer to D9.1e Dissemination Plan.

## 2.10. WP10 – Exploitation, standards & roadmapping

### Work package objectives, starting point of work

During the reporting phase according to the action plan WP10 focused on preparation of deliverables for Task 10.1 (Exploitation Plan), Task 10.2 (Standards) and Task 10.3 (Road mapping). The exploitation plans of partners have been updated. In the area of standardization very good and promising results have been achieved towards introduction of DPWS within OASIS. All activities regarding road mapping were synchronized well with project partners and WP9 in particular and focused on the preparation of exploitation activities focused on creation of a good consistency for demonstration activities that are considered as key exploitation element and to building an effective deployment of project results.

#### 2.10.1. Tasks progress

##### *Task 10.1: Exploitation plan*

Exploitation Plan as major activity performed in this task has been updated by all project partners. Based on the actions defined in the previous project phase the preparation of stronger exploitation was improved and synchronized with dissemination activities. The demonstrators and trials are agreed, defined and shared as key elements to deploy the SOCRADES technologies. The key technology areas have been set and defined and shared for each of demonstrators and trials to provide most promising deployment of results. In close cooperation with WP9 some fairs and conferences to be targeted have been defined (refer to chapter 9 for detailed list). They are aligned to the major technology areas and the Technology roadmap (refer to task 10.3). The individual partner activities were updated and documented in the deliverable D10.1c.

##### *Task 10.2: Specifications for Standards*

Task leader continued standardization activities in particular towards DPWS and OPC-UA. The proposed convergence path between the two solutions has been worked between Siemens, ABB and Schneider and the "DPUA" (Device Profile for Unified Architecture) document has been issued, and will be implemented in the APS trials.

Regarding DPWS, the OASIS standardization is now nearly completed: the DPWS committee draft is under public review till beginning of April and will be immediately followed by the formal standard vote.

It is expected that the standard will be definitely approved on June 1, 2009.

### ***Task 10.3: Road mapping for the adoption of the SOCRADES paradigm***

Following reviewers' recommendations, definition of limit and scope of the (Technology) Roadmap of the SOCRADES paradigm has been initiated. Certain effort has been spent in order to prepare D1.5 (Trend screening, requirements, state-of-the-art, technology assessment) and the final version of the roadmap D10.4c in a more synchronized way.

In order to prepare a questionnaire for validation and prioritization of EFTAs through a survey, a selection of the 44 Expected Features of the Technology Area (EFTA) have been carried out. Due to this selection, 20 EFTAs have been included in the questionnaire. The survey is web-based and will be carried out in the next months.

Moreover, a workshop with external experts is planned in the next months in order to consolidate the results achieved till now and to further upgrade and update the roadmap. This workshop will be organized within an international event (INDIN 2009) with the participation of experts of Europe and also from outside Europe.

#### **2.10.2. Deviations of the project work program (if applicable)**

#### **2.10.3. List of deliverables for the reporting period (if applicable)**

Del. no.	Deliverable name	WP no.	Lead partner	Del. type	Security	Due date	Actual date
10.1d	Exploitation Plan	10	SE	RE	CO	M24	M25

#### **2.10.4. List of milestones for the reporting period (if applicable)**

None.

#### **2.10.5. Meetings attended (if applicable)**

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC Meeting	PCC topics - Synchronize demonstration plan according to exploitation plan - Roadmapping process revision and further actions	6-7 October 2008	Loughborough
Review Meeting	Review Meeting topics	28-29 October 2008	Brussels
PCC Meeting	- Synchronize demonstration plan according to exploitation plan - Roadmapping process revision and further actions	15-16 December 2008	Magdeburg
Extra-ordinary PCC	Consolidation of WP8 trials as key	22.01.2009	Frankfurt

	element for exploitation demos		
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### 2.10.6. Key activities planned for the next period)

Activity / Result / Publication	Contents / Objectives	Date	Place
Exploitation Plan update	Finalize individual exploitation plans by partners	M36	
Standardization	OASIS DPWS committee draft verification Continue "DPUA" standardization	June 2009	
Roadmap	International workshop with external stakeholders  Survey  Continuous monitoring and review (within and outside SOCRADES)	June 2009  April 2009- August 2009	INDIN 2009 - Cardiff  Web

## 3. Consortium management (WP11 – Project management)

### 3.1.1. Work package objectives, starting point of work

Note: This section remains unchanged in comparison to the latest 6M-project progress report (D11.2d).

This WP is concerned with ensuring that the project remains on course and that it is effectively and correctly managed. This includes the following detailed objectives:

- Monitoring, tracking and controlling deviations due to progress, costs, financial and scheduling changes.
- Managing the project according to approved plans.
- Ensuring that the required reporting is prepared and delivered in a timely manner.
- Implementing procedures for quality management.
- Implementing an administration and communication infrastructure to establish a basis for efficient and easy communication within the project. To also ensure that external communication (project Web site, dissemination and exploitation) is done and controlled by the project management.

### 3.1.2. Tasks progress

Note: This section remains unchanged in comparison to the latest 6M-project progress report (D11.2d).

#### *Task 11.2: Progress and cost reporting*

The objective is to establish a clear reporting structure and processes to the European Commission and for the project activities within the project.

Activities performed in this task were:

- Provide templates for the reporting instances to all concerned participants
- Maintain a document repository for incremental reporting

- Create periodic reports.
  - 6-Monthly Project Progress Report. It is an official deliverable to the EU Commission. This report includes 6-monthly financial report based on the yearly financial report template that is being audited each year. Note: In this case, this D11.2e contents a section devoted to this item.

### *Task 11.3: Monitoring, control and quality management*

Activities performed include:

- Progress control
- Cost control
- Checking schedules and milestones
- Risk management
  - Identification of risks and risk management strategies for each WP (included as a part of the 6-monthly report)
  - Identification of risks and risk management strategies for the project as a whole (included as a part of the 6-monthly project report)
- Quality assessment for deliverables and WPs
  - Definition of the assessment procedure for each deliverable and for the assessment of work packages (included in the first version of the project handbook).

### *Task 11.4: Communication management and administration infrastructure*

To perform fast and effective communication in the project, different procedures and tools have been implemented:

- Groove Communication Platform
- Project Webpage ([www.socrades.eu](http://www.socrades.eu))
- Project e-mailing lists (partners, PCC, WPLeaders)

#### **3.1.3. Deviations of the project work program (if applicable)**

n.a.

#### **3.1.4. List of deliverables for the reporting period (if applicable)**

Del. no.	Deliverable name	WP no.	Lead partner	Del. type*	Security	Due date	Actual date
D11.2e	Project Report	11	1	CO		29.02.2009	15.04.2009

#### **3.1.5. List of milestones for the reporting period (if applicable)**

#### **3.1.6. Meetings attended (if applicable)**

Meeting Title	Objectives/ Results Achieved	Date	Place
PCC	Organizational and Technical	06-07. 10. 2008	Lboro
EC Review meeting	2 <sup>nd</sup> Year Review Meeting	28-29.10.	Brussels

		2008	
PCC	Organizational and Technical	15-16.12.2008	Magdeburg
Extraordinary PCC	Status of the trials, reschedule of project work plan for Amendment 4. Processing and Review of D3.3	23.01.2009	Frankfurt

### 3.1.7. Key activities planned for the next period)

Activity / Result / Publication	Contents / Objectives	Date	Place
Extraordinary PCC (Phone meeting)	Organizational and Technical	10.03.2009	
PCC	Organizational and Technical	May 2009	Karlsruhe

## 4. Dissemination report (*Dissemination leader*)

Following the previous Dissemination Plan (D9.1d), in order to enhance industrial dissemination, relevant actions have been done in the reporting period. These are the most important activities:

- SOCRADES project was presented at the ITEA 2 Symposium 2008, held in Rotterdam, the Netherlands, 21 to 22 October 2008. Several posters, representing the various aspects and achievements of the project, were presented to ITEA officials, to representatives of the public authorities and to the press. Moreover, a demonstrator of SOCRADES application on an integrated prototype based on a Ford Machine line was presented.
- SOCRADES participated to ICT 2008, the Europe's biggest research event for information and communication technologies. ICT 2008 was held in Lyon, France, from 25 to 27 November 2008. Both posters, videos and the demonstrator were used to represent the various aspects and achievements of the project. The demonstrator used was the same one adopted at the ITEA 2 Symposium 2008.
- Three videos have been produced till now concerning the implementation results. They are available on SOCRADES website (under Pilot section) and have been published on YouTube. These are the three videos:
  1. Integration Shop Floor (Schneider Device) and Enterprise Systems (in this demo: SAP system). Presented at ITEA2 Symposium 2007
  2. Completely distributed architecture using Schneider Control Devices and Loughborough engineering systems in the Jaguar/Ford manufacturing scenario. Presented at Mach 2008, ITEA2 Symposium 2008, and ICT 2008
  3. Integration of 3-D Simulation-based Engineering System and real devices in the FlexLink/Prodatec electronics/electromechanical scenario. Presented at ITEA2 Symposium 2008, and ICT 2008.
- Within ARTEMIS & ITEA Co-Summit, held in Rotterdam, the Netherlands on 22 October 2008, a session called "Web of Objects" was moderated by François Jammes (SE). Several presentations were given showing SOCRADES results. Presentations are available on SOCRADES website.
- A Special Session on Wireless Industrial automation was organized within the IEEE CASE conference, Washington D.C. August 2008.

Moreover, several papers have been presented and published and other dissemination activities have been carried out during the reporting period. In Table 1 we present a list of these activities.

N°	Actual dates	Type	Type of audience	Countries addressed	Partner involved
1	2008	<i>Paper</i> : M. Rabi, L. Stabellini, A. Proutiere and M. Johansson, "Networked estimation under contention-based medium access", submitted to the inter. Jnl. of Robust and nonlinear control, 2008.	Research	International	KTH
2	Sep 2008	<i>Paper</i> : "An Application of BPEL for Service Orchestration in an Industrial Environment" at the 6th IEEE International Conference on Industrial Informatics (ETFA 2008), Hamburg, Germany.	Research & Industry	International	TUT
3	Sep 2008	<i>Presentation</i> and <i>publication</i> , topic: Orchestration of Service-enabled Manufacturing Systems (IT Revolutions 2008)	Research & Industry	Worldwide	TUT
4	Sep 2008	<i>Presentation</i> : Karl H. Johansson is Keynote Speaker and Invited Lecturer presenting SOCRADES work at: German PhD School on Control Theory of Digitally Networked Dynamical Systems, Dortmund, Germany,	Research		KTH
5	15-19 Sep 2008	<i>Paper and presentation</i> : M. J. Mendes, A. Rodrigues, P. Leitao, A. W. Colombo, F. Restivo, "Distributed Control Patterns using Device Profile for Web Services", MWS'08 - 2008 Middleware for Web Services Workshop	Research & industry	Worldwide	SE
6	15-18 Sep 2008	<i>Paper and presentation</i> : P. Leitao, M. J. Mendes, A. W. Colombo, "Decision-Making System in a Service-oriented Control Architecture for Industrial Automation", ETFA'08 - 13th IEEE International Conference on Emerging Technologies and Factory Automation	Research & industry	Worldwide	SE
7	21 September 2008	<i>Paper</i> : "Unrestricted pure call-by-value recursion". / Nordlander, Johan ; Carlsson, Magnus ; Gill, Andy J.. I: Proceedings of the 2008 ACM SIGPLAN workshop on ML : ML 08. IEEE, 2008. s. 23-34 International Conference on Functional Programming, Victoria, BC, Kanada	Research	International	LTU
8	Expected: Oct 2008	<i>Paper</i> on Journal: "Structural Reasoning: An Approach to the Evaluation of System State Spaces"	International Journal on Computational Intelligence in Control	International	TUT
9	21 – 23 October 2008	<i>Presentation</i> : "Hard real time in SOA systems : application to process control". / Delsing, Jerker ; Seceleanu, Tiberiu. 2008. 17 s. Konferens: Artemis ITEA co summit, nr. 1:st, Rotterdam, Nederländerna	Research	International	LTU

10	21-22 October 2008	<i>Demonstrator</i> : ITEA 2 Symposium & ICT International Exhibition 2008, held in Rotterdam, the Netherlands on 21-22 Oct. SOCRADES Demonstrator presented	Research and industry	International	SE/SAP/Lboro
11	21-22 October 2008	<i>Special Session</i> : Cooperative Objects and Web Services at the ITEA 2 Symposium 2008, held in Rotterdam, the Netherlands.	Research & Industry	International	SE
12	12-14 Nov 2008	<i>Paper</i> : "SOCRADES Technology Roadmap: addressing the future of Manufacturing" presented at Annual 10th International Conference on The Modern Information Technology in the Innovation Processes of the Industrial Enterprises (MITIP 2008)	Research & Industry	International	POLIMI
13	17-19 November 2008	<i>Paper</i> : "Event-triggered strategies for industrial control over wireless networks" presented at the Fourth International Wireless Internet Conference (WICON 2008)	Research & Industry	International	KTH
14	25-27 November 2008	<i>Demonstrator</i> : ICT 2008, Lyon, Fair participation, Europe's biggest research event for ICT. SOCRADES Demonstrator presented	Research & Industry	International	SE/SAP/Lboro
15	25-27 November 2008	<i>Presentation</i> : SOCRADES: Outlooks: ICT/ARTEMIS 2008.	Research & Industry	International	SE
16	25-27 November 2008	<i>Demonstrator</i> : SPS/IPC/DRIVES, Fair. SOCRADES Demonstrator presented	Industry, Research, Public	International	Ifak/SAP
17	30 November 2008	<i>Paper</i> : "A compositional framework for end-to-end path delay calculation of automotive systems under different path semantics". / Feiertag, Nico ; Richter, Kai ; Nordlander, Johan ; Jonsson, Jan. I: Workshop on Compositional Theory and Technology for Real-Time Embedded Systems (CRTS 2008). 2009. 8 s. Barcelona, Spain	Research	International	LTU
18	8-11 Dec 2008	<i>Paper</i> : "SOCRADES: a framework for developing Intelligent systems in manufacturing" general presentation of SOCRADES at The International Conference on Industrial Engineering and Engineering Management (IEEM 2008)	Research & Industry	International	POLIMI
19	8-11 Dec 2008	<i>Paper</i> : "A Technology Roadmap on SOA for smart Embedded devices: towards Intelligent systems in manufacturing" SOCRADES Technology Roadmap at The International Conference on Industrial Engineering and Engineering Management (IEEM 2008)	Research & Industry	International	POLIMI
20	9-11 December 2008	<i>Paper</i> : L. Shi, K. H. Johansson, and R. M. Murray, "Optimal sensor hop	Research & Industry	International	KTH



		selection: sensor energy minimization and network lifetime maximization with guaranteed system performance", IEEE CDC, Cancun, Mexico, 2008.			
21	9-11 December 2008	<i>Paper</i> : E. Henriksson, H. Sandberg, and K. H. Johansson, "Predictive compensation for communication outages in networked control systems", IEEE CDC, Cancun, Mexico, 2008.	Research & Industry	International	KTH
22	9-11 December 2008	<i>Paper</i> : H. Sandberg, M. Rabi, M. Skoglund, and Karl H. Johansson, "Estimation over heterogeneous sensor networks", IEEE CDC, Cancun, Mexico, 2008.	Research & Industry	International	KTH
23	9-11 December 2008	<i>Paper</i> : M. Rabi, K. H. Johansson, and M. Johansson, "Optimal stopping for event-triggered sensing and actuation", IEEE CDC, Cancun, Mexico, 2008.	Research & Industry	International	KTH
24	9-11 December 2008	<i>Paper</i> : B. Johansson, T. Keviczky, K. H. Johansson, and M. Johansson, "Methods and consensus algorithms for solving separable distributed control problems", IEEE CDC 2008	Research & Industry	International	KTH
25	18 – 19 December 2008	<i>Paper</i> : "SALmon - a Service Modeling Language and Monitoring Engine". / Leijon, Viktor ; Wallin, Stefan ; Ehnmark, Johan. I: IEEE International Symposium on Service-Oriented System Engineering : SOSE '08. IEEE, 2008. s. 202-207 Jongli, Taiwan	Research	International	LTU
26	2008	<i>Paper</i> : "Statistical analysis and prioritization of alarms in mobile networks". / Wallin, Stefan ; Leijon, Viktor ; Landén, Leif. I: International journal of business intelligence and data mining. 2009	Research	International	LTU
27	Dec 2008	<i>Presentation</i> and <i>publication</i> , topic: SOA, SWS framework" (ROBIO 2008)	Research & Industry	Worldwide	TUT
28	Dec 2008	<i>Presentation</i> and <i>publication</i> , topic: structural reasoning in Factory Automation" (ROBIO 2008)	Research & industry	Worldwide	TUT
29	Jan. 2009	<i>Book</i> : A. W. Colombo, S. Karnouskos "ICT Shaping the World", <b>Chapter 6</b> : "Towards the Factory of the Future: A Service-oriented cross-layer infrastructure"	Research & Industry	International	Schneider Electric/SAP

**Table 1 Dissemination of knowledge – Overview**

#### 4.1. Internal dissemination activities

In Fehler! Verweisquelle konnte nicht gefunden werden. a list is presented of the activities done by SOCRADES partners in the reporting period, in order to disseminate internally within each company project results.

Actual dates	Type	Audience	Size of audience	Partner
2 Sept 2008	SOCRADES Presentation	Schneider Web services management team	12	Schneider Electric
5 Sept 2008	SOCRADES Presentation and Demo	Schneider Power Business Unit Management	10	Schneider Electric
9 Sept 2008	SOCRADES thesis presentation	R&D team	10	ABB
22-24 Sept 2008	SOCRADES Presentation	Schneider several Business Units architects	15	Schneider Electric
29 Sept 2008	SOCRADES Presentation and Demo	Schneider ISC Business Unit management	5	Schneider Electric

**Table 2 Internal dissemination**

#### 4.2. Training activities

Planned/ Actual dates	Description	Type of audience	Countries addressed	Partner/Responsible involved
16 February 2009	<i>Seminar:</i> Training session on Timber – SW development for real time event driven system	Research & Industry	International	LTU

#### 4.3. Planned activities for the next period

To have more details on the Dissemination plan for the next period, please refer to D9.1e (Dissemination Plan).

As main actions, two special sessions have been organized for the next period:

- Special Session on “Service-Oriented Cross-layer infrastructure for distributed smart embedded devices” organized at 13th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2009), Moscow, Russia, June 3 - 5, 2009.
- Special Session on “Energy Efficient Factories: The role of Industrial Informatics” organized at IECON 2009 is the 35th Annual Conference of the IEEE Industrial Electronics Society, Porto, Portugal, November 3 - 5, 2009.

Finally another participation to an important industrial fair is planned: SPS/IPC/DRIVES 2009, 24-26 November 2009, Nuremberg (Germany).

Moreover, this list, taken from D9.1e Dissemination Plan, presents the dissemination activities already planned by SOCRADES partners.

Planned	Type	Type of audience	Countries addressed	Partner/Responsible involved
1-2 April 2009	<i>Paper:</i> “Development of an Extended Product Lifecycle Management through Service Oriented Architecture.” to be presented at CIRP IPS <sup>2</sup> Conference - Industrial Product-Service Systems, Cranfield, UK.	Research and industry	International	POLIMI
May 2009	<i>Paper:</i> “Enabling Component-Based Design for Embedded Real-Time Software”, Jimmie Wiklander, Jens	Research	International	LTU

	Eliasson, Andrey Kruglyak, Per Lindgren, Johan Nordlander Accepted for publication in Journal of Computers (JCP), ISSN : 1796-203X			
3-5 June 2009	<i>SPECIAL SESSION</i> : Special Session on “Service-Oriented Cross-layer infrastructure for distributed smart embedded devices” at 13th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2009), Moscow, Russia, June 3 - 5, 2009.	Research and industry	International	
3-5 June 2009	<i>Paper</i> : “Trends and roadmaps on SOA-based embedded networks for industrial automation systems: a review” to be presented at INCOM’09 the 13th IFAC Symposium on Information Control Problems in Manufacturing, Moscow, Russia	Research and industry	International	POLIMI
3-5 June 2009	<i>Paper</i> : “Assessing the future of manufacturing: the SOCRADES Technology Roadmap” to be presented at INCOM’09 the 13th IFAC Symposium on Information Control Problems in Manufacturing, Moscow, Russia	Research and industry	International	POLIMI
3-5 June 2009	<i>Paper</i> : V. Villasenor, A. Vidales and J.L. Martinez Lastra “Developing Communications between a Service-Enabled Manufacturing system and a Multi-Agent System” to be presented at INCOM’09 the 13th IFAC Symposium on Information Control Problems in Manufacturing, Moscow, Russia ( <i>Under review</i> )	Research Industry	International	TUT
3-5 June 2009	<i>Paper</i> : “Integration of Cross-layer Web-based Service-oriented Architecture and Collaborative Automation Technologies: The SOCRADES Approach” to be presented at INCOM’09 the 13th IFAC Symposium on Information Control Problems in Manufacturing, Moscow, Russia ( <i>Under review</i> )	Research and industry	International	SE
3-5 June 2009	<i>Paper</i> : R. Harrison, A. Colombo, A. Bepperling, C.S Mcleod, T. Kirkham “A Service Enabled Approach to Automation Management” to be presented at INCOM’09 the 13th IFAC Symposium on Information Control Problems in Manufacturing, Moscow, Russia ( <i>Under review</i> )	Research and industry	International	LBORO/SE
24-26 June 2009	<i>Paper</i> : V. Barot, R. Harrison, C.S. McLeod “An architectural description of a prototype supporting real-time remote data” to be presented at INDIN’09 the 7th IEEE International Conference on Industrial Informatics, Cardiff, UK ( <i>Under review</i> )	Research and industry	International	LBORO
August 2009	C. Ramesh, K J. Johansson, “Multiple access with attention-based tournaments for estimation over networks”, ECC 2009	Research & Industry	International	KTH
August 2009	P. Soldati and M. Johansson, “Deadline-constrained transmission scheduling and data evacuation in wirelessHART networks”, ECC 2009	Research & Industry	International	KTH
23-26 August 2009	<i>Paper</i> : Maben Rabi, Karl Henrik Johansson “Scheduling packets for event-triggered control” to be presented at The European Control Conference (ECC), Budapest, Hungary	Research and industry	International	KTH
August 31 - September 2, 2009	<i>Presentation and publication</i> , topic: MAS (HoloMAS 2009)	Research and industry	Worldwide	TUT
3-5 November 2009	<i>SPECIAL SESSION</i> : Special Session to be organized at IECON 2009 is the 35th Annual Conference of the IEEE	Research and industry	Worldwide	

	Industrial Electronics Society.			
2009	<i>Paper</i> , topic: Specification of a Multi-Agent System-based Decision Support System (Journal EAAI)	Automation and control engineers, electronic and electrical engineers	Worldwide	TUT
Aug. 2009	<i>Journal Paper</i> : P. Phaithoonbuathong, T.Kirkham, R. Harrison, R.P. Monfared, A.A. West "Web Service Based Automation of a Live Production System" submitted (Feb 09) to International Journal of Computer Integrated Manufacturing (IJCIM)	Research and industry	Worldwide	LBORO

## 5. Exploitation report/Report on using and disseminating of knowledge (*Business manager*)

According to the Exploitation Plan (D10.1) several actions have been defined and done in the reporting period. These are the key activities were:

- Definition of values to be demonstrated by SOCRADES
- Alignment of project partners regarding their contributions to key exploitation activities such as demonstrators and trials (WP8)
- Synchronization with WP9 to deliver well-prepared marketing and dissemination activities such as workshops, questionnaires and conferences aligned to key technology areas (EFTA) were SOCRADES project is focused
- Selection of industrial fairs to be used for exploitation/dissemination

## 6. Risk management

This section addresses key risks that have been identified for the whole project and summarizes the main risks related to each work package (if applicable), concerning the current face of the project life cycle.

### 6.1. Risk analysis at project level (*Project Coordinator*)

Description of Risk	Consequences and Seriousness	Risk evaluation (H/M/L)	Response actions	WP No	Undertaken actions from the last 6M report
Missing enough integration of technical results from the major competitors (different weighting of WS-technology)	Weak proof of interoperability of devices from different partner/vendors in the trials	M	Specification and development of Gateway-related components by other partners	3-4-5-8	Re-processing the D3.3 Delaying the set-up of the trials in WP8
Delay in delivering Deliverables with due date from M30 to M36 due to re-scheduling of tasks (extension of the project duration)	Integration of results from different work packages is delayed.  The final implementation of the SOCRADES solution in the Electronics/Electromechanical Scenario and in the trials will be delayed 2 months.	L	Realistic re-scheduling of deliverables and milestones	3-4-5-6-7 and 8	Amendment 4 of the Annex I

## 6.2. Risk analysis per WP (WP Leaders)

Description of Risk	Consequences and Seriousness	Risk evaluation (H/M/L)	Response actions	WP No	Undertaken actions from the last 6M report
D1.4 (reviewers request to keep D1.1 a living document throughout the whole project duration, It is updated through D1.3, D1.4, D1.5)	Low	L	Task 1.3 (D1.3, D1.4, D1.5) cares about trend screening.	WP1	Continuous trend screening
Unavailability of wireless-HART devices / adaptors, or impossibility of employment.	The project will not be able to reflect an analysis on the most novel approach on wireless communication.	M	<ol style="list-style-type: none"> <li>1. Available communication protocols may be used (such as ZigBee).</li> <li>2. Additional middleware procedures to tackle communication translation into wireless-HART protocol.</li> </ol>	WP4	<ol style="list-style-type: none"> <li>1. Sustained effort for the actual implementation of HART devices at the Boliden plant.</li> <li>2. Continuous contact with responsible parts in provisioning of appropriate HW units.</li> </ol>
<p>Delay on receiving STB devices may leave little time to complete the integration of these devices on the demonstrator.</p> <p>The existing FTB device do not provide sufficient memory space to contain necessary code required for the full demonstrations.</p>	The level of functionality in the final demonstrations will be limited if the STB devices are not available.	M	Two alternative approaches the implementation of the control system have been developed in order to support both STB and FTB based solutions.	WP7	Hardware and software related preparation has been carried to for the anticipated arrival of STB devices. A number of training courses have been attended.
Interoperability problems	Reduced functionality	L	<p>Detailed specification with permanent update;</p> <p>Close collaboration of the teams involved in the trials.</p> <p>OPC-UA/DPWS translator</p>	WP8	<p>Technical meetings to coordinate the work</p> <p>Reschedule of work programme</p>
Insufficient Dissemination	Failure to achieve a widespread diffusion of the project results	L	Provide a valid Dissemination Plan and follow it	WP9	Adoption of "Push" technique to improve dissemination and participation to events. Organization of special tracks in conferences and participation to industrial fairs.

Table 2 Risks analysis

## 7. Quality management

This section summarizes the results of the quality assessment activities undertaken during this reporting period. As described in Annex 1 of the project plan, the deliverables as well as the work packages status are monitored and assessed.








## 7.1. Quality Assurance for Deliverables finished during the current period




### 7.1.1. Used procedure




Each deliverable is sent out by the WP Leader (responsible) to the PCC members and contributors for their comments and remarks. After that a call or face-to-face meeting takes place to assess the deliverable and go through the eventual comments for resolution. Once deliverable is approved, it is distributed to the EU Commission.

### 7.1.2. Summary (WP Leader)

In the following table, the current situation of the deliverables is reported

Del. no.	Deliverable name	WP no.	Lead partner	Del. type*	Security	Due date	Actual date	Status  6	Approval Project Coord. (date)
D3.3	Mapping of DPWS into wireless nodes	3	Siemens	Report	CO	M27 (Nov. 08)	09/02/09		
D4.2	Control and communication protocols for wireless industrial control	4	ABB	Report	CO	M26 (Okt. 08)	M26		
D5.1.2	DPWS stack – 2nd delivery	5	SEI	Prototype		M30	M31		
D5.2.2	Model-based Orchestration engine – integrated in SoA architecture	5	SE			M30	Rescheduled for M33 (DoW – 4 <sup>th</sup> amendm.)		
D5.3.2	Generic services component	5	SEI	Report	CO	M30	M31		
D5.4.2	Agent-based decision-making system – integrated with orchestration engine	5	TUT			M30	Rescheduled for M32 (DoW – 4 <sup>th</sup> amendm.)		
D5.6.1	FPGA prototype of experimental component for $\mu$ Gateway	5	ARM	Report	CO	M30	M31		
D5.6.2	Software stack port to experimental component	5	ARM	Report	CO	M30	M31		

6  = Deliverable assessed  
 = Deliverable in pending assessment  
 = Deliverable not ready

D5.6.2	Tools support for experimental device	5	ARM	Report	CO	M30	M31		
D6.5	Final specifications and prototype implementation of the enterprise integration architecture	6	SAP			M30	Rescheduled for M36 (DoW – 4 <sup>th</sup> amendm.)		
D9.1e	Dissemination plan, 5th release	9	Polimi			M30	M31		
D11.2e	Progress report (5 <sup>th</sup> release)	11	SE			M30	M31		

## 8. Reactions on the Recommendations of the EU Reviewers (PCC)

Recommendation	Reaction	Responsible
<p><b>Recommendation 1:</b> Harmonise the state-of-the-art descriptions in WP1 (D1.1, D1.3, D1.4) and D10.4b. A possible remedy could be as follows: The pure technical aspects, as far as they are not yet contained in WP1, should be shifted to WP1 (into future D1.5 and/or possibly into an additional appendix for D1.1). The next version of D10.4 should concentrate more on the roadmap aspects of the SOCRADES technologies only, i.e. existing and expected future meaning, acceptance and use of these technologies, their markets, and necessary products (as a vision, see recommendation 4).</p>	<p>Certain effort is spent to analyze the content of D1.4 and D10.4b. This is the basis for providing D1.5 and the final version of the roadmap in a more synchronized way. Special attention will be put to the collection and direction of material as well as to the checking of the final documents.</p>	<p><b>WP1 leader</b></p>
<p><b>Recommendation 2:</b> Better exploitation plans are expected as concrete project results are now emerging.</p>	<p>All partners have been emerged by Schneider Electric to continuously update, precise, share and align their contributions in particular for key exploitation actions such as demonstrations.</p>	<p><b>Schneider (WP10)</b></p>
<p><b>Recommendation 3:</b> Define a set of methodological guidelines to ease the application of SOCRADES service-oriented approach and tool suite.</p>	<p>LOU is investigating the key aspects of engineering processes and the way in which to prototype tools from the various project partners are fulfilling this need.</p> <p>The different tools and methods</p>	<p><b>LOU/TUT/SE</b></p>

	<p>are being studied and will be critically analysed. The intention is to propose an initial methodology for SOA engineering processes to support example scenarios of use within the SOCRADES project's various application domains.</p> <p>TUT: The SOCRADES architecture was defined in order to provide the description of the basic components in SOA for embedded devices. This should leave some freedom to other parties to fit into the SOCRADES approach. On the other hand some of the tools developed contain tutorials that can be tried out by user using just a PC (not making a user to install the actual network of service-embedded embedded devices while learning). This simplifies the learning of the tools for the user and also at the same time serves as a good introduction to SOCRADES principles in utilization of SOA.</p>	
<p><b>Recommendation 4:</b> Lower the ambitions with respect to road mapping by focussing the analysis on SOCRADES vision (clarification of recommendation 6 from previous interim review).</p> <p>The recommendation from the previous review stated:</p> <p><i>"Lower the ambitions with respect to road mapping towards achievable objectives"</i></p>	<p>For the "(Technology) Roadmap of the SOCRADES paradigm" several actions to focus and limit the scope have been defined and initiated. A dedicated survey is prepared and rolled out as well as road mapping workshops are prepared.</p>	<p><b>Schneider</b></p>
<p><b>Recommendation 5:</b> Provide videos more focused on business problems addressed within SOCRADES and with a project approach, not a company approach.</p>	<p>New videos are available on the website. These videos fulfil the requests of the reviewers.</p>	<p><b>POLIMI</b></p>
<p><b>Recommendation 6:</b> Give in the live and recorded demonstrations systematic</p>	<p>The demonstrators planning as one of the key elements in</p>	<p><b>Schneider</b></p>



<p>highlights on the benefits of the proposed service-oriented solutions compared to legacy solutions (following the approach applied for D10.1c annex B where the expected customer benefits are made explicit).</p>	<p>exploitation have been updated by partners to focus and align on those benefits to be used for further activities in this area.</p>	
<p><b>Recommendation 7:</b> Make a detailed and realistic work plan for the month 30 and 36 deliverables. The proposals of resource reallocation should be taken into account in this plan.</p>	<p>Generation of the 4<sup>th</sup> Amendment of the Annex I, with an extension of the project duration from 36 to 38 months. As addressed in Section 1.3 of this document, there is a set of deliverables for which the due dates have been delayed.</p> <p>Example: LOU: the WP7 work plan was revisited and no delay is expected for tasks and deliverables and all are expected to be completed as schedules.</p>	<p><b>Project Coordinator</b></p>
<p><b>Recommendation 8:</b> Define services, which are to be implemented in the Boliden application.</p>	<p>Such activities have already been started between all the partners in WP4. End of March should bring the full description of the scenario to be run in the Boliden plant and distributed at partner's locations.</p> <p>An interaction with the trials in WP8 is also under scrutiny.</p>	<p><b>ABB/LTU/KTH</b></p>
<p><b>Recommendation 9:</b> Use future D8.1 to produce a detailed transparent and understandable description for the application of SOCRADES concepts from the functionality and engineering point of view.</p>	<p>The template for the D8.1 is preparation. It will include descriptions of four industrial pilot systems and of the trial scenario. Special consideration will be given to functionality and engineering.</p>	<p><b>WP8 leader</b></p>
<p><b>Recommendation 10:</b> With the next versions of the "Releases Notes for DPWS C Stack Component" and "Releases Notes for WS-Management Component" the SOCRADES specific contributions need to be better elaborated.</p>	<p>The SOCRADES specific contributions are addressed/referenced in D5.1.2 (Releases Notes for DPWS C stack component).</p>	<p><b>Schneider (WP5 Leader)</b></p>
<p><b>Recommendation 11:</b> The roadmap document(s) should be assigned to a public dissemination level</p>	<p>This will be done. Moreover, in order to obtain a broad dissemination of SOCRADES roadmap, two actions are planned:</p>	<p><b>WP9 leader (Book, Notes ...)</b></p>

	1) an "executive summary" of the roadmap will be widely disseminated 2) within SOCRADES book (on-going), a specific chapter will be dedicated to SOCRADES roadmap.	
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