Project no: 100204

pSHIELD

pilot embedded **S**ystems arc**HI**tectur**E** for multi-**L**ayer **D**ependable solutions

Instrument type: Capability Project

Priority name: Embedded Systems / Rail Transportation Scenarios

Dissemination Report

For the
pSHIELD-project

Deliverable D7.1.2

Partners contributed to the work:

SESM, Italy
CWIN, Norway
MAS, Norway
ATHENA, Greece
THYIA, Slovenia

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Issue 2		Incorporates comments from issue 1 review

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Glossary

ESs	Embedded Systems
SPD	Security Privacy Dependability
FSK	Frequency-Shift Keying
AFSK	Audio Frequency-Shift Keying
UCS	Use case Scenario
HW	Hardware
SW	Software

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1   Introduction

The pSHIELD project deliverable D7.1.2 "Dissemination report" is prepared in frame of the projects Work Package 7 in Task 7.1. This task aims at disseminating the project results and at influencing new standards. The deliverable contains collected list of all the consortium efforts made during the project.

The standardization and industrial dissemination and exploitation activities play an essential role in the validation of research results in the industrial sector. Therefore, such activities are considered as integral part of the project both in terms of industrial research and experimental development.

Detailed dissemination and standardization strategies have been reported in Technical Annex sections 4.2 and 4.3. Dissemination activities consisted in the publication of all important results in well-known conferences and journals. The research issues of the project were promoted through the organization of special sessions in conferences and workshops on the research topics of the project. The universities contributed to the dissemination of knowledge by producing scientific publications, by organizing and participating to dissemination events (international conferences and workshops) on the main research pSHIELD topics.

2 Dissemination Activities

pSHIELD has dissemination activities towards the following main areas:

- Targeted Industrial Dissemination

- Scientific dissemination

- Industrial publications

- Workshops and Exhibitions

2.1 Targeted Industrial Dissemination

2.1.1 Industrial Contacts

This text summarises the feedback provided from companies and public organisations after meetings with pSHIELD participants. These meetings are established to either discuss technology, applications or aspects of the eco-system for secure sensor information. "Note: The word "status" is used in this text as the status of December 2011 (the end of the pSHIELD project)".

Figure 1 – Poster presented at national ICT conference VerdIKT

From the Norwegian side, the main focus is on bringing pSHIELD sensors into a standardised machine-to-machine (M2M) and machine-to-business (M2B) environment. Movation is member of ETSI and Artemisia, and through these ones foster interoperability as e.g. ETSI TS102.690 "Functional architecture for an M2M platform". Movation has the main focus on bringing pSHIELD results to the sensor and Telecom industry in Norway. A close cooperation of the pSHIELD partners Movation and CWIN is established with Telenor Objects, resulting in the first implementation of a mobile IoT platform foreseen for demonstrations with the Norwegian Rail Authorities. CWIN concentrates on the extensions of the platform towards sensor description and access, both based on semantic technologies.

From Slovenian side, the main focus is on the next generation networks (NGNs) in which the pSHIELD SPD networks like SPD-WSNs will take part for many application scenarios, like critical infrastructure protections, smart grids, intelligent transportation and social mobility networking. The SPD-WSNs are the main research focus area of THYIA. As member of WWRF forum, Artemisia, Net!Works (before e-Mobility TP), member of security steering board TMGS TA2, HLG KETs, Artemis TP Slovenia, ICT TM Slovenia, THYIA widely disseminated the pSHIELD concepts and results. In parallel, THYIA's national project TITRES (Technology Innovation in Telecommunications for Rational Ecological Systems) included smart grid concepts and SPD features for the next smart devices that THYIA is developing for the European market. Additional, THYIA is contributing with innovative SPD concepts in ME3GAS JU ARTEMIS project which addressed smart metering, M2M devices and smart grid infrastructures. We have contributions on the national workshops organised by industrial partners and Slovenian's Government where we demonstrated the pSHIELD advantages and new concepts for EDs.

2.1.2 Potential Industrial Contacts

Figure 2 – ABB Norway - logo

ABB in Norway has two groups with research interests related to SHIELD issues. The security group represented by Judith Rossebø and the wireless sensor group represented by Paal Orten. ABB was one of the core developers of the WirelessHART protocoll, and expects that an industrial uptake will require SPD functionalities as indicated by pSHIELD.

Status: Ongoing communication with ABB, resulting in an invitation to the Industrial Embedded System Workshop (19.-20. October 2011) in Trondheim. Main focus is on the "measurable security" for embedded systems. ''Industry is not yet ready to join on a commonly identified security measure across heterogeneous platforms'' can be used to describe the perception of industry.

Figure 3 – Norwegian Defence Research Establishment (FFI) - logo

FFI is the prime institution responsible for defence-related research in Norway. The Establishment is the chief adviser on defence-related science and technology to the Ministry of Defence and the Norwegian Armed Forces' military organization.

In the area of authentication and identity management in tactical and mobile networks, FFI is interested in a cooperation on "identity management in the internet of things", including tags (NFC), sensors and embedded systems. The challenge they are facing is to estalish an IdM which is scalable, can use non-consistent communicaiton channels such as NFC and to use cryptalgorithsm being supported by microcontrolers. pSHIELD is of interest for them, especially with respect to identity and cryptography.

Status: FFI is looking towards a strategic project in this domain.

2.1.3 Ongoing targeted dissemination

Figure 4 – SIMlink, security infrastructure suitable for pSHIELD

Figure 5 – WLAN sim

SIMLink, having developed a WLAN SIM, see this element as a

- security options with OTA (over the air application install) and controlling of devices

- interesting technology for micro- and personal-nodes

- several sensor applications in the market

Status: SIMlink analyses how the technology can be used to support home appliances in a secure way, e.g. heat control systems (in collaboration with Danfoss)

- pSHIELD collaboration meeting between CWIN, Telenor Objects, JBV (the Norwegian National Rail Administration) and SINTEF, May 12 2010. The partners agree to exchange knowledge and prototypes for the exchange of information and sensors based on the Shepherd platform.

- 9. May 2011, An example of the pSHIELD personal node platform (embedded Linux) was provided to ESIS and Telenor Objects, who used the platform within the electrical motorcycle of ESIS. This motorbike is part of the Telenor Innovation Fair at Fornebu, Norway.

Figure 6 – Telenor Innovation Fair Opening with the minister of economy Trond Giske

- 5. April 2011, Presentation of "Security, Privacy and Dependability" of embedded systems to the National Hospital "Rikshospitalet". The goal of this meeting is to elaborate the applicability of pSHIELD integrated sensors for eHealth purposes, together with Telenor Objects.

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Feedback:

- need focus on standards for communication

- apps for mobile phone available?

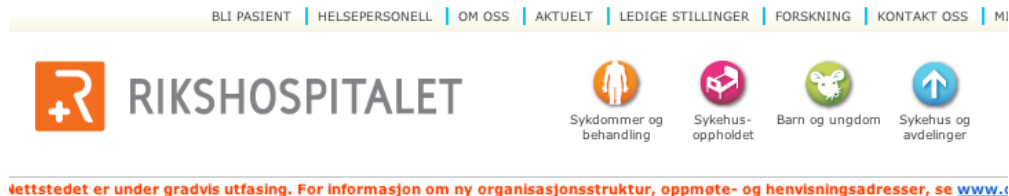- low power Bluetooth sensors and mobile phone as gateway?

Figure 7 – RIKSHOSPITALET

- 29. April 2011, Prototypical implementation of pSHIELD embedded platform with Telenor Objects integration was tested on a train of the National Rail Authority (Jernbaneverket). This prototypical implementation will be used to demonstrate the interworking of sensors onboard the train with the Telecom M2M platform "Shepherd" of Telenor Objects.

The first implementation took place, and the photos are on [[1]]. The Norwegian Rail Administration (JBV) is extremely cooperative (thanks!) and opens for having the pSHIELD equipment onboard during long-term (1-3 weeks) measurement journeys.

Figure 8 – JBV Measurement locomotive (left) and use case for "Shepherd" platform of Telenor Objects (right)

2.2   Scientific dissemination

- Mariana Esposito, Inaki Eguia, Francesco Flammini, Alfio Pappalardo and Erkuden Rios, "Formalizing SPD metrics for Embedded Systems Multilayer approach" Second Eastern European and Mediterranean Software Process Improvement Conference (EuroMed SPI II), Zamudio, Spain, October 6-7, 2011.

- Josef Noll, "Security, Privacy and Dependability in the Internet of Things (IoT)", WWRF#27, invited paper to WG7, 18.-20. October 2011

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- Josef Noll, Zahid Iqbal and Mohammad M.R. Chowdhury, "Integrating context- and content-aware mobile services into the cloud", CWI/CTIF seminar on Mobile Cloud Computing and wireless applications, 24.-25. October 2011, Aalborg University in Copenhagen

- A. V. Voyiatzis , K. Stefanidis and D. N. Serpanos: "Increasing Lifetime of Crypto Keys on Smartphone Platforms with the Controlled Randomness Protocol", In Proceedings of 6th Workshop on Embedded Systems Security WESS 2011, October 2011

- Iñaki Garitano, Roberto Uribeetxeberria and Urko Zurutuza, "Review of SCADA Anomaly Detection Systems", Soft Computing Models in Industrial and Environmental Applications, 6th International Conference SOCO 2011, Salamanca (Spain) in April, 2011, ISBN 9783642196447

- Urko Zurutuza , Enaitz Ezpeleta, Álvaro Herrero and Emilio Corchado "Visualization of Misuse-based Intrusion Detection: Application to Honeynet Data", Soft Computing Models in Industrial and Environmental Applications, 6th International Conference SOCO 2011, Salamanca (Spain) in April, 2011, ISBN 9783642196447

- Ekhiotz Jon Vergara, Simin Nadjm-Tehrani, Mikael Asplund and Urko Zurutuza, "Resource Footprint of a Manycast Protocol Implementation on Multiple Mobile Platforms", Fifth International Conference on Next Generation Mobile Applications, Services and Technologies,NGMAST 2011, Cardiff, Wales, UK, 14-16 September 2011.

- Fiaschetti A., Lavorato F., Suraci V., Palo A., Taglialatela A., Morgagni A., Baldelli A., Flammini F., "On the use of semantic technologies to model and control Security, Privacy and Dependability in complex systems" Proc. Of 30th International Conference on. Computer Safety, Reliability and Security (SAFECOMP'11), Sep. 2011. Naples, Italy

- Sarfraz Alam, Mohammad M. R. Chowdhury, Josef Noll, "Interoperability of Security-enabled Internet of Things", to appear in Wireless Personal Communication Special Issue on "Internet of Things and Future Applications", Springer-Netherland, 2011.

- Mohammad M. R. Chowdhury, Josef Noll, "Securing Critical Infrastructure: A Semantically Enhanced Sensor Based Approach", 2nd International Conference on Wireless Communications, Vehicular Technology, Information Theory and Aerospace & Electronic System Technology, WiRELESS ViTAE 2011, Chennai, India, Feb. 28-March 2011.

- K. Stefanidis, A. V. Voyiatzis and D. N. Serpanos: "Performance of the Controlled Randomness Protocol on .NET Compact Framework Embedded Systems", In Proceedings of 4th IFIP International Conference on New Technologies, Mobility and Security, Paris, France, February 2011

- L. Bixio, M. Ottonello, M. Raffetto, and C.S. Regazzoni, "Comparison among Cognitive Radio Architectures for Spectrum Sensing," EURASIP Journal on Wireless Communications and Networking, vol. 2011, Article ID 749891, 18 pages, 2011. doi:10.1155/2011/749891

- L. Bixio, L. Ciardelli, M. Ottonello, M. Raffetto, C. S. Regazzoni, Sk. S. Alam and C. Armani, "A Transmit Beamforming Technique for MIMO Cognitive Radios,", Wireless Innovation Forum Conference on Communications Technologies and Software Defined Radio, SDR'11 - WInnComm - Europe, Brussels, Belgium, June 22-24, 201

- Sk.S. Alam, L. Marcenaro and C.S. Regazzoni, "Opportunistic Spectrum Sensing and Transmissions", in Cognitive Radio and Interference Management: Technology and Strategy, Meng-Lin Ku and Jia-Chin Lin eds, IGI Global, 2012

- Yen N. T. Pham, "Sensor Integration into Heterogeneous Service Platform and Domain Adaptation", **Master Thesis**, University of Oslo, December 20, 2010.

- Sarfraz Alam, "A Security Proxy for User-centric Internet of Things", Wireless World Research Forum (WWRF) #25, Kingston, UK, 16.-18. November 2010

- Sarfraz Alam, Mohammad M. R. Chowdhury, Josef Noll, "An Event-driven Sensor Virtualization Approach for Internet of Things", *poster*, VERDIKT conference, Oslo, 1.-2. November 2010

2.2.1 Tutorials

- Josef Noll, "Security, Privacy and Dependability in the Internet of Things", tutorial at the University of Karlstad, Karlstad, Sweden, 10 October 2011

- Carlo Regazzoni, "Distributed Data Fusion Techniques for Networked Embedded Systems", lecture at the first Erasmus Mundus Joint Doctorate on Interactive and Cognitive Environments (EMJD-ICE) IEEE/ICE Summer School on Networked Embedded Systems, September 3-7, 2011, Klagenfurt, Austria

2.2.2 PhD and Master Education related to pSHIELD

pSHIELD has opened questions of academic requests, thus five master/bachelor theses and six PhD theses are related to the project. The most relevant theses related to pSHIELD are included here.

2.2.2.1 PhD thesis work related to pSHIELD

- Mariana Esposito, cicle XXVI, Ph.D. in Computer and Control Engineering (ongoing research activity).

- Mr. Iñaki Garitano, "Metodología para el diseño, implantación y mantenimiento de sistemas de seguridad para SCADA" - foreseen PhD thesis

- Andrea Fiaschetti, cicle XXV, Ph.D. in System Engineering (ongoing research activity).

- Sarfraz Alam, "Secure interworking of sensor systems in heterogeneous business environments" (tentative title), PhD thesis, to be finished in Q4.2011

- Sk. Shariful Alam, "Opportunistic Spectrum Sensing and Transmissions in Cognitive Radio" (tentative title), PhD thesis, University of Genova, to be finished in Q4.2013

- Kresimir Dabcevic, "Security Threats and Detection Techniques in Cognitive Radio Networks" (tentative title), PhD thesis, University of Genova, to be finished in Q4.2014

- Nastja Kuzmin, "SPD metrics for the future SPD-WSNs," PhD student at University of Ljubljana, to be finished in 2014.

2.2.2.2 Master/Bachelor thesis work related to pSHIELD

- Giorgia Anzidei, "Design and implementation of an architecture for the composition of security services in heterogeneous embedded systems", Master Thesis, University of Rome "La Sapienza", 2011.

  o Abstract: The purpose of this thesis has been the study of the OSGI platform and the design of a discovery/composition architecture based on this middleware.

- Tommaso Proietti, "Modeling and control of Composability in Embedded Systems by means of Hybrid Automata Theory", Bachelor Thesis, University of Rome "La Sapienza", July 2010.

  o Abstract: this thesis provides some basic investigations on the use of Hybrid Automata theory to model elementary Embedded System and build basic control schemes with them.

- Roberto Marrocco, "Formalization of automatic mechanisms for vertical composition of security functionalities in Embedded Systems", Bachelor Thesis, University of Rome "La Sapienza", July 2010.

    o Abstract: this thesis is a preliminary investigation of modeling and control Embedded Systems with respect to "Security, Privacy and Dependability" properties.

- Francesco Lavorato, "Study and development of a semantic framework to model and control security, privacy and dependability in Embedded Systems", Master Thesis, University of Rome "La Sapienza", May 2011. **Abstract: this thesis provides some preliminary analysis and investigation on the use of semantic technologies in the context of Embedded System and SPD issues.

- Stefano Venturi, "Study, design and development of a framework to model and control interconnected complex systems based on Hybrid Automata Theory", Master Thesis, University of Rome "La Sapienza", July 2011.

    o Abstract: this thesis is a further investigation of the potentiality of the Hybrid Automata theory to model and control complex systems (e.g. Systems of Embedded Systems).

- Yen N. T. Pham, "Sensor Integration into Heterogeneous Service Platform and Domain Adaptation", **Master Thesis**, University of Oslo, December 20, 2010.

    o Abstract: established communication module between SunSPOT and Telenor Objects platform

- Pedro Polonia, "pSHIELD - Asymmetric Cryptography", **Master Thesis**, FEUP, University of Porto, June 2011. **Abstract: this thesis provides a research study of asymmetric cryptography in the context of Embedded System.

- Fabio Pozzo, "Location aware OLSR enhanced protocol for mobile ad-hoc networks", Master Thesis, University of Genova, October 2011.

    o Abstract: this thesis proposes a novel method for reducing packet loss in mobile ad-hoc networks. Proposed algorithm is based on the usage of an embedded localization sensor.

2.3   Industrial publications

- Giuseppe Martufi, Fabrizio de Seta, "pSHIELD for Embedded System Security", EDlink 37 (Elsag Datamat Company Magazine), Rome, 2010.

2.4   Workshops and Exhibitions

- Valentina Casola, Mariana Esposito, Francesco Flammini, and Nicola Mazzocca, "Monitoring railway infrastructures, a case-study for the pShield project" The 2nd International Workshop on Mobile Commerce, Cloud Computing, Network and Communication Security 2012 at IMIS 2012. (UNDER REVISION)

- Josef Noll, "Security challenges in the Internet of Things" (Media:CoSummit-SecurityInIoT-Oct2011.pdf), [ARTEMIS/ITEA2 Co-Summit 2011], Panel on Trends in ICT Security, 24-26 October 2011, Helsinki, Finland
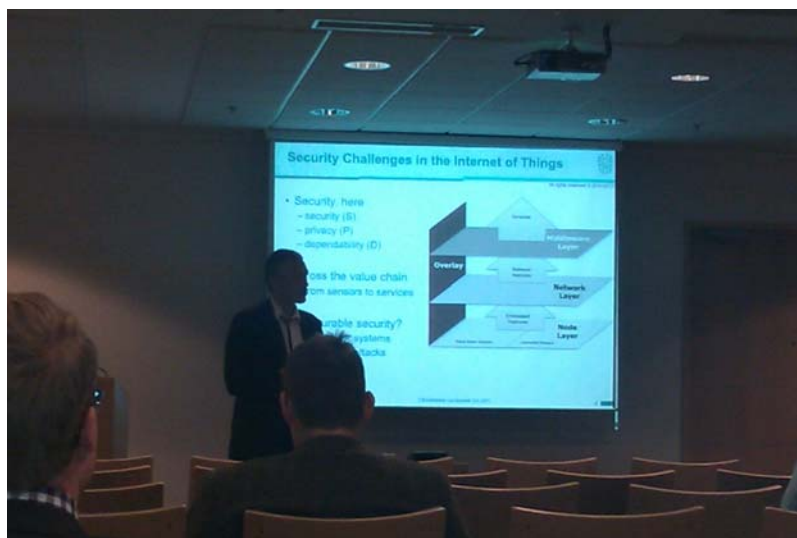
Figure 9 – Panel Presentation ARTEMIS & ITEA2 Co-Summit 2011

- Josef Noll (Movation AS), Przemyslaw Osocha (SESM), "pSHIELD project - demonstration of SPD prototypes", Exhibition, 24-26 October 2011, Helsinki, Finland

- Przemyslaw Osocha, João Carlos Cunha, "SPD Power Node ES solution in pSHIELD framework", ERCIM/EWICS/Cyberphysical Systems Workshop at SAFECOMP 2011, 22 September 2011, Naples, Italy

- Przemyslaw Osocha, "Standardization of future European Embedded Systems solutions", Marie Curie Researchers Symposium „SCIENCE – Passion, Mission, Responsibilities", Polish Presidency of the EU Council, 25-27 September 2011, Warsaw, Poland

- Przemyslaw Osocha (SESM), Yen Pham (CWIN), "pSHIELD-pilot embedded Systems arcHItecturE for multi-Layer Dependable solutions", ARTEMIS Spring Event at Embedded World 2011, 1-3 March 2011, Nuremberg, Germany

- Przemyslaw Osocha (SESM), Yen Pham (CWIN), "Demonstrating Security, Privacy and Dependability for Sensors to Systems", ARTEMIS IA Co-summit 2010 Project Exhibition, 26-27 October 2010, Ghent, Belgium

- "pSHIELD and security in embedded systems", Internal Seminar, Critical Software, 08 October 2010, Coimbra, Portugal

- Spase Drakul, "Strategic Vision of the TITRES project," National Workshop, Ministry of Economy Republic of Slovenia, October 2010, Ljubljana, Slovenia.

3   Conclusions

Deliverable D7.1.2 represents the consortium efforts to spread achievements of the pSHIELD project. It lists dissemination activities towards the following areas: Targeted Industrial Dissemination, Scientific dissemination, Industrial publications and Workshops and Exhibitions.

It is worth to mention, that in such a short project the number of publications should increase actually after the finalization of the project and after reaching actual results from the project. So concluding, it is expected that presented list of the pSHIELD project dissemination activities will actually continue to growth after project closure.

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References

[1]   Technical Annex for ARTEMIS JU pSHIELD project number SP6 100204