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SEVENTH FRAMEWORK PROGRAMME

Specific Targeted Research Projects

SOLDER

Spectrum OverLay through aggregation
of heterogeneous DispERsed bands

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WP5 – Exploitation and dissemination

D5.2
Project communication and dissemination plan

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Abstract: The objective of this deliverable is to give the project communication and dissemination plan. Through dissemination actions (conferences, meetings, standardization and regulation efforts, etc.), the project results will be given the proper visibility. The major objectives of the dissemination and the planned dissemination actions are set in this document.

Keywords: SOLDER, communication, exploitation, dissemination

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Executive Summary

This deliverable gives the project communication and dissemination plan. Through dissemination actions in conferences and meetings, standardization and regulation efforts, etc. the project results will be given the proper visibility. The major objectives of the dissemination and the planned dissemination actions are presented in this document.

1. Introduction

The objective of this deliverable is to give the project communication and dissemination plan. Through dissemination actions in conferences and meetings, standardization and regulation efforts, etc. the project results will be given the proper visibility. The major objectives of the dissemination and the planned dissemination actions are set by:

1) Designing, implementing and maintaining a **project external website**. It will include information about the concepts, the vision, the objectives and the expected outcomes as well as the public documents, deriving from the project work, which will be regularly updated, offering links to other relevant sites and links to partners' web sites.
2) Creating and updating regularly a detailed calendar of events, containing all relevant scientific journals, international and national conferences, exhibitions and events. Based on this, articles will be submitted for **publication** as soon as some initial results are ready.
3) Designing a "**communication kit**", including a leaflet and a poster to disseminate the project concept and objectives. It will be distributed at the workshops and the conferences, where project members will participate.
4) Proposing exhibitions and **workshops** with the objectives to receive a feedback on SOLDER study and promote SOLDER technology for future adoption. One workshop organization will be for example within the European Conference on Networks and Communications (EuCNC) and one within an IEEE related conference. SOLDER will disseminate its results through the organization of this workshop (most probably within EuCNC) open to a wide audience. One SOLDER dedicated workshop will report and disseminate the technological achievements of the project (including parts of the final proof-of-concept), as well as the potential application scenarios and impact of the developed technology. Experts who are working in the same field, both from industry and academia, will be invited to give talks.
5) Communicating via **newsletter** every 6 months, presenting the most recent project achievements. The project will target initially existing newsletter in broadband (e.g. NEM), and will investigate during the course of the project whether a separate newsletter is more appropriate.
6) Communicating with relevant **European projects and European network operators**, in order to involve and establish the principal actors in the respective of dissemination and standardization follow up activities, noting that SOLDER might find difficult to directly contribute to some standardisation bodies such as the 3GPP.
7) Attempting to harmonise industrial progress and common understanding through direct inputs to **standardisation bodies**, particularly the IEEE, likely ETSI, but aspirationally also the 3GPP and thus improve their prospects. Moreover, to attempt to smooth the national/international adoption of SOLDER-related technologies and capabilities. SOLDER will intend to be included and to participate to the Radio Access and Spectrum (RAS) cluster "http://www.ict-ras.eu".
8) Addressing **regulators** and regulatory groupings as potential stakeholders, particularly Ofcom, CEPT and ITU, to facilitate the SOLDER technologies from a spectrum regulatory point of view.

This project communication and dissemination plan will lead to the appropriate visibility of SOLDER project and will reach the required level of the project impact.

2. Project communication and dissemination plan

The project communication and dissemination plan is given in this chapter. It consists in:

1) Designing, implementing and maintaining a **project external website**.
2) Creating and maintaining a **project LinkedIn Group**.
3) Creating and maintaining a detailed calendar of all relevant scientific journals, international and national conferences, exhibitions and events for **publication**.
4) Creating and maintaining a "**communication kit**".
5) Organizing one **workshop**.
6) Publishing a **newsletter** every 6 months.
7) Communicating with relevant **European projects and European network operators**.

2.1 Website "http://ict-solder.eu"

The SOLDER project website "http://ict-solder.eu" went public on the 27th of November 2013. It is the space to promote the SOLDER project and communicate about it to the rest of the world. Moreover, it will facilitate the publishing of the results and the dissemination in general. The European Commission (EC) and the office of the Project Officer will be able to monitor news and developments within this SOLDER framework.
This website is the subject of the public deliverable D5.1 "Website" in order to ensure that the project website is up and running. This D5.1 document gives a brief overview of the public webpage content and is supported by screenshots.

2.2 LinkedIn group "https://www.linkedin.com/groups/SOLDER-7422259"

The SOLDER LinkedIn group "https://www.linkedin.com/groups/SOLDER-7422259" has been created on the 4th of December 2013. This SOLDER presence in LinkedIn will enhance the project visibility and will be used to improve the SOLDER dissemination.

2.3 Communication kit

A "**communication kit**", including a leaflet and a poster to disseminate the project concept and objectives has been created. It will be distributed at the workshops and the conferences, where the project members will participate.

2.4 Scientific publications

The SOLDER research results will further be disseminated through publications in journals, conferences and white papers. Only top level journals and conferences will be targeted. Furthermore, joint submissions will be favoured whenever possible. The envisaged dissemination list is as follow:

1) Peer-reviewed major scientific conferences such as the European Conference on Networks and Communications (EuCNC) 2014, June 23-26, held in Bologna, Italy and the Radio Access and Spectrum (RAS) cluster workshop on 23 June in particular, IEEE Global Communications Conference exhibition and industry forum (Globecom), IEEE International Conference on Communications (ICC) and IEEE Wireless Communication and Networks Conference (WCNC), IEEE Personal, Indoor and Mobile Radio Communications (PIMRC), European Microwave Week (EuMW), IEEE Vehicular Technology Conference (VTC);

2) Journals such as IEEE Transactions on Communications (TCOM), Wireless Communications (TWC), Microwave Theory and Techniques (TMTT) and EURASIP on Advances in Signal Processing, having in mind their impact factor;

3) Scientific publication and participation to other fair or event, either industrial or research oriented.

2.5 Workshops

One workshop organization will be for example within the EuCNC or one within an IEEE related conference. SOLDER will disseminate its results through the organization of this workshop (most probably within EuCNC) open to a wide audience. One SOLDER dedicated workshop will report and disseminate the technological achievements of the project (including parts of the final proof-of-concept), as well as the potential application scenarios and impact of the developed technology. Experts who are working in the same field, both from industry and academia, will be invited to give talks.
A workshop in the IEEE ICC will be also a target, noting that this conference is seen as a high level difficulty of acceptance.

SOLDER will also disseminate the results or collected knowledge in technical courses to be delivered worldwide.

SOLDER workshop at IEEE ISWCS 2014, August 26-29, Barcelona, Spain

Already on 18/03/14, the SOLDER workshop proposal for the 11th IEEE International Symposium on Wireless Communication Systems (ISWCS) 2014, August 26-29, Barcelona, Spain was accepted. This workshop is currently being organized and in particular the Call For Papers (CFP) has already started to be distributed, including the RAS cluster emailing list.

2.6 Demonstrations and posters

SOLDER will further present demonstrations and posters at the selected conferences. The use of OpenAirInterface will be promoted in industry and academia.

2.7 Open Source Software (OSS)

The software code resulting from the SOLDER project will be freely available on the SOLDER web-page at "http://ict-solder.eu/dissemination/open-source-software/". Thus, other people who are working in the same field as SOLDER will be able to use these results. This action has the potential to significantly advance knowledge in the SOLDER sector and to promote SOLDER.

2.8 Newsletter

Newsletters will done every 6 months for communication presenting the most recent project achievements. The SOLDER project will target initially existing newsletter in broadband (e.g. NEM), and will investigate during the course of the project whether a separate newsletter is more appropriate.

2.9 Participation and contribution to European Commission concertation and cluster meetings

A Liaison with the Cognitive Radio Standardization initiative (**CRS-i**) has been signed and SOLDER intends to be included and to participate to the **RAS** cluster (http://www.ict-ras.eu).

2.10 Dissemination impact assessment metrics

Consultation and access to SOLDER website

The SOLDER website statistics will be provided. These statistics will include the website traffic i.e. the number of visits, different visitors and pages, the visitors country, the visits average length and the website pages ranking.

3. Standardization plans

The three following **standardisation bodies** are targeted in the scope of the SOLDER project: European Telecommunications Standard Institute (ETSI) Reconfigurable Radio Systems (RRS), 3GPP and IEEE DySPAN-SC and IEEE 1900 Working Groups (WGs).

3.1 ETSI RRS

The ETSI RRS WGs are followed up. SOLDER is in touch with the ETSI RRS Technical Committee (TC) members in order to investigate the mapping of its contributions to their WGs structure.

3.1.1 Overview of ETSI RRS Working Group (WG) activities

In this section, we provide an overview of ETSI RRS working groups (WGs) which are relevant to SOLDER objectives and general topics. ETSI RRS Technical Committee TC created the following three Working Groups related to SOLDER (WGs):

- WG1 focuses on “System Aspects” and develops proposals from a system aspects point of view for a common framework in TC RRS with the aims to guarantee coherence among the different TC RRS WGs and to avoid overlapping and gaps between related activities.
- WG2 focuses on Software Defined Radio (SDR) technology with a particular interest in “Radio Equipment Architecture” and proposes common reference architectures for SDR/CR radio equipment’s (mobile handset devices, radio base stations, etc.), related interfaces, etc.
- WG3 focuses on "Cognitive Management and Control"; the group collects and defines the system functionalities for Reconfigurable Radio Systems which are related to the Spectrum Management and Joint Radio Resource Management across heterogeneous access technologies. Furthermore, the group has developed a Functional Architecture for the Management and Control for Reconfigurable Radio Systems as well as a report on the Cognitive Pilot Channel as an enabler to support the management of the RRS.

Based on that direction, ETSI RRS will complement IEEE standardization effort by proposing technological solutions beyond the scope related to SDR interfaces, CR specific Management and Control architectures and security solutions. Specifically the standards proposed by each WG are listed in Table 1.

Table 1: List of specifications within ETSI RRS WGs related to SOLDER.

ETSI RRS WG	Specification
WG1	**TS 103 143:** "System architecture for information exchange between different Geo-location Databases (GLDBs) enabling the operation of White Space Devices (WSDs)". **EN 303 144:** "Enabling the operation of Cognitive Radio System (CRS) dependent for their use of radio spectrum on information obtained from Geo-location Databases (GLDBs); Parameters and procedures for information exchange between different GLDBs". **TS 103 145:** "System Architecture and High Level Procedures for Coordinated and Uncoordinated Use of TV White Spaces. This technical specification defines the system architecture for the use of spectrum by White Space Devices (WSDs), specifically in the UHF TV Bands".
WG2	**TR 102 681:** This technical report involves the investigation and assessment of possible architectures, related qualities and corresponding costs, expected future technology and cost developments of these architectures, definition of key possible requirements for SDR applications in RBS, the impact on RBS architecture, network management and equipment certification and investigation of architectures facilitating Cognitive Radio (CR). **TR 102 680:** The scope of this technical report is to cover functional architecture and interfaces of an SDR equipment, which can operate multiple radios in parallel by sharing the baseband computation, RF spectrum resources efficiently.
WG3	**TR 102 682:** The scope of this study item is proposed to cover functional architecture for efficient radio resource management and flexible spectrum management in cognitive radio systems. **TR 102 683:** The scope of this study item is proposed to cover cognitive pilot channel to support and facilitate end-to-end connectivity in a heterogeneous radio access environment where technologies are used in a flexible and dynamic manner in their spectrum allocation context.

3.1.2 Recent developments of ETSI RRS related to SOLDER

In this section, we describe the recently published technical specifications within WG1, WG2 and WG3 ETSI RRS, which are related to SOLDER. The relation between SOLDER and the ETSI RRS working groups can be seen as a mutual exchange of information and inputs.

TR 102 947 (Publication: 24/6/2013) – Status: Published

Title: Reconfigurable Radio Systems (RRS): Use Cases for building and exploitation of Radio Environment Maps (REMs) for intra-operator scenarios

Scope and Field of Application: The scope of the work in this technical report is to identify use cases and provide system level functionality for building and exploiting evolutionary Radio Environment Maps (REMs) in a single or multi-RAT context in intra-operator scenarios. Building the REM within RRS context requires the enhancement of existing network entities, protocols and interfaces accomplishing the tasks of requesting, storing and processing geo-located measurements related to the radio environment. It is expected that REMs will be exploited in a RRS context for network troubleshooting and radio resource management optimization. The document includes a general description of the use cases and associated stakeholders as well as information flows and high level requirements. Technical challenges are also identified.

TR 103 062 (Publication 20/4/2011) – Status: Published

Title: Reconfigurable Radio Systems (RRS) Use Cases and Scenarios for Software Defined Radio (SDR) Reference Architecture for Mobile Device
Scope and Field of Application: The scope of this work item is to define a refined set of scenarios and requirements beyond those indicated in ETSI TR 102 680. In particular, this work item will prepare further work within Working Group 2 on the role of the various building blocks of the SDR Reference Architecture for Mobile Device as defined in ETSI TR 102 680, including -Configuration Manager (CM) for (de)installation and (un)loading of radio applications into radio computer as well as management of and access to the radio parameters of those radio applications; -Radio Connection Manager (RCM) for (de)activation of radio applications according to user requests and overall management of user data flows, which can also be switched from one radio application to another; -Flow Controller (FC) for sending and receiving of user data packets and controlling the flow. -Multiradio Controller (MRC) for scheduling the requests on spectrum resources issued by concurrently executing radio applications in order to detect in advance the interoperability problems between them; -Resource Manager (RM) for management of radio computer resources in order to share them among simultaneously active radio applications, while guaranteeing their real-time requirements. Also, various types of user entities with different levels of responsibility and freedom of action will be defined.

TS 103 095 (Publication 11/1/2013) – Status: Published

Title: Reconfigurable Radio Systems (RRS); Radio Reconfiguration related Architecture for Mobile Devices
Scope and Field of Application: This Technical Specification will define the architecture for reconfiguring the radios in mobile devices. The work will be based on the Use Cases defined in ETSI TR 103 062 ("Use Cases and Scenarios for SDR Reference Architecture for Mobile Device"), ETSI TR 102 839 ("Multiradio Interface for Software Defined Radio (SDR); Mobile Device Architecture and Services") , ETSI TR 102 944 ("Use Cases for Baseband Interfaces for Unified Radio Applications of Mobile Device") and the requirements defined in ETSI TS 102 969 ("Radio Reconfiguration related Requirements for Mobile Devices").

TR 102 684 (Publication 13/4/2012) – Status: Published

Title: Reconfigurable Radio Systems (RRS); Feasibility Study on Control Channels for Cognitive Radio Systems
Scope and Field of Application: The scope of this work item is to identify and study communication mechanisms: (1) for the coexistence and coordination of different cognitive radio networks and nodes, operating in unlicensed bands like the ISM band or as secondary users in TV White Spaces; (2) for the management of Opportunistic Networks, operating in the same bands as mentioned above. The scope and definition of Opportunistic Networks will be elaborated within this WI; in particular, it is expected that Opportunistic Networks will

include mechanisms for operator-governed ad-hoc coverage extensions or capacity extensions of infrastructure networks. The communication is expected to include procedures from terminal to terminal as well as between a terminal and infrastructure networks. These mechanisms could be radio access technology (RAT) specific or/and be RAT-independent.

TR 102 802 (Publication 12/2/2010) – Status: Published

Title: Reconfigurable Radio Systems (RRS); Cognitive Radio System Concept
Scope and Field of Application: Scope of work to be undertaken: This feasibility study will define possible requirements for and formulate an overall and harmonized technical concept of the Cognitive Radio System. Both infrastructure as well as infrastructure-less radio networks will be covered. Based on such system concept and requirements the identification of candidate topics for standardization at ETSI is the key target of this study including also a survey of related activities in other SDOs.

3.1.3 Standardization plan within ETSI RRS

SOLDER participants have a clear information from the ETSI RRS TC chair, Dr. Markus Mueck regarding the status of the specifications and technical reports, which could be interested within the SOLDER's scope. Nevertheless, their plans are not quite clear and to this end the following standardization plan cannot be considered as the final one, and the updates will be provided at each yearly report on dissemination and exploitation. However, the Table 2 explains all possible contribution in a generic way in order to cover all options that SOLDER partners can have.

Table 2: List of possible contribution in a generic way.

ETSI RRS WG activity	SOLDER standardization plan
TR RRS 102 947	New Radio Access Technologies Mobile Network Operator (MNO) operates and maintains an heterogeneous mobile network deployed using reconfigurable radio nodes (e.g. RBSs) and provides mobile services (voice and data) to its customers. Challenges to be addressed: - Interference mitigation - Measurements capabilities of the terminal - Measurement overhead impact to interface capacity - System optimization
TR 103 062	This is about the reconfigurable architecture for mobile device: - Terminal centric configuration in heterogeneous radio context - Provision of new cognitive feature

ETSI RRS WG activity	SOLDER standardization plan
TR 102 684	This is to identify and study communication mechanisms in cognitive cellular networks: - for the coexistence and coordination of different cognitive radio networks and nodes, operating in unlicensed bands like the ISM band or as secondary users in TV White Spaces; - for the management of Opportunistic Networks, operating in the same bands as mentioned above. These mechanisms could be radio access technology (RAT) specific or/and be RAT-independent.
EN 303 144	Coordination in TVWS is an essential issue, bearing in mind the increased allowed transmission powers and better propagation in TVWS compared with "license-exempt" devices operating in other bands such as ISM 2.4 GHz. Coordination must inherently consider the potential for aggregation of resource by white space devices. Appropriate heuristics, rules, and associated functionalities for consideration of coordination in the presence of aggregation are therefore needed. Moreover, coordination requires that the different geolocation databases that are managing different sets of white space devices communicate, as is the topic of this standard. It must be ensured that such communication appropriately supports aggregation, and work on the guarantee of that represents a potential scope of contribution for SOLDER.
EN 303 387-1	The topic of this standard and ensuing standards in this series is the signaling protocols and information exchange for coordinated use of TVWS. Following the exact same arguments presented in the analysis for EN 303 144 above, consideration of aggregation in such coordinated usage is essential. The scope of SOLDER's possible contributions to EN 303 387-1 (and ensuing standards) would be to ensure that the standardized communication for coordinated white space usage takes into account aggregation. For example, the communication must

ETSI RRS WG activity	SOLDER standardization plan
	support information on how devices can aggregate TVWS (e.g., contiguous channels and number of them supported, non-contiguous channels and number of them supported, aggregation patterns), and the need to aggregate (which is inherently implied by the fact that the different white space devices are sharing the spectrum, hence, coordinated use is a trade-off between their needs), among others aspects.

We would like also to point out that the Table 2 lists possible contribution which is related to cognitive radio. SOLDER is mostly seeking for contributing to parts which are related to aggregation implicitly or explicitly in the overall mechanisms of a TR or specification. New advances in this topic will be described in the future yearly reports D5.3 and onwards.

Summarizing, ETSI RRS WG1 could potentially provide a document to accommodate the FDD-TDD CA scenario. Further, ISI and KCL members are in collaboration with NSN's key member (Michael Gundlach), among others, who are working on the LSA topic. Some additional possible working items for contributions here include: (1) Intra-operator sharing-related work that is taking into account extensions or parallels with TVWS-related databases (lesson learned, noting that similar such spectrum databases apply in the LSA case), and (2) sharing among "secondary users" facilitated by spectrum databases, taking into account the same issues existing in TVWS and similar solutions potentially be applicable. Regarding SOLDER's standardization plan to ETSI RRS WG1 in the particular scope of FDD-TDD CA, FDD-TDD CA will probably not be part of the requirements and LSA architecture specification considered in RRS WG1. This may change in Stage 3 in relation to works accomplished within 3GPP RAN. However, ISI is following up the discussions and to what extent carrier aggregation will be considered later, maybe in Stage 3. Thus, in order to not lose a chance for standardization contribution, ISI plans to investigate a cross layer design solution that will concern a MAC layer adaptation in order to aggregate TDD and FDD frame flows efficiently. ISI will research and propose a decision mechanism, which will choose and aggregate a proper TDD configuration with FDD frame, in order to meet instantaneous traffic conditions and boost UE throughput Possible presentation of such a solution is planned to be given in WG1 in case that the actual standardization plans of that group will not include the FDD-TDD CA scenario. As another potential input to WG1, it is noted that SOLDER is very active in TVWS related work, leading the participation in the Ofcom TVWS pilot and also inviting in a number of other projects to that. KCL is looking for the best opportunities to provide related input to standards, for example, "EN 303 144: Parameters and procedures for information exchange between different GLDBs", and "EN 303 387-1: Signalling Protocols and information exchange for coordinated use of TV White Spaces; Part 1: Interface between Cognitive Radio System (CRS) and Spectrum Coordinator (SC)". These match closely to SOLDER interests around issues such as sharing among secondary spectrum users, of course strongly overlapping with aggregation.

3.2 3GPP

3GPP is the body in charge of standardization of LTE, LTE-Advanced and its evolution. As such, it is important for the SOLDER project to stay informed of the evolution of the standardization to steer the technical work aligned with the main stream.
Consequently, the project monitors on a continuous manner the progress of the work, especially with respect to carrier aggregation as e.g. represented by technical report 36.850 or 36.851. We are monitoring on a quarterly basis the progress in the RAN (RAN plenary, RAN1, RAN2, RAN4) with sometimes direct attendance to the meeting.
Similarly, the project attended to a specific workshop on 21-22/01/2014 held in Paris about the use of LTE in unlicensed spectrum. This initial workshop was not endorsed by 3GPP, although organized by the people attending regularly to the 3GPP meetings. Indeed, at that time, the LTE-U was not (yet) an official study item.
Then, a second workshop has been organized jointly to a RAN plenary meeting, in June 2014. The project attended too to this meeting to see how the standardisation world would like to progress on the LTE-U topic.
A study item was opened, LAA: Licence Assisted Access in September 2014, with a target date for completion in June 2015. It means that there are only few opportunities to contribute since the next RAN1 meetings will occur: in Feb 2015, in April 2015 and in May 2015.

3.2.1 Standardization plan

It should be noted that due to the pace of 3GPP and the size of the SOLDER consortium, it is almost impossible for the project to effectively contribute to the standard.

3.3 IEEE DySPAN-SC and IEEE 1900 Working Groups

IEEE Dynamic Spectrum Access Networks Standards Committee (DySPAN-SC) and IEEE 1900 standards working groups will be monitored and extensively contributed to by SOLDER. SOLDER members have a number of key leadership roles in these standards, including acting as Treasurer and on the leadership of IEEE DySPAN-SC, as Chair of IEEE 1900.1, and Acting Chair (at the time of writing) of IEEE 1900.6, and as Vice-Chair of IEEE 1900.7.

All of the IEEE 1900 standards, as well as IEEE DySPAN-SC, are of some relevance to SOLDER. In particular, the Dynamic Spectrum Access solutions worked on within these standards twin well with spectrum aggregation schemes in order to achieve users demand, and it is noted that SOLDER also considers such spectrum opportunities (e.g., white spaces) in the resources that it aims to aggregate.

The IEEE DySPAN-SC is developing standards in the areas of DSA, CR, interference management, coordination of wireless systems, advanced spectrum management, and policy languages for next generation radio systems [1]. IEEE DySPAN-SC and its predecessors have thus-far considered 7 Working Groups (WGs), one of which is disbanded (IEEE 1900.3) and one of which has completed its standard and is current in hibernation (IEEE 1900.2). The full list and descriptions of IEEE 1900 standards is as follows:

- IEEE 1900.1 Working Group on “Definitions and Concepts for Dynamic Spectrum Access: Terminology Relating to Emerging Wireless Networks, System Functionality, and Spectrum Management” [2]: This standard provides terms and definitions in the field of DSA and related technologies. It also aims to set an understanding of the relationships between the various concepts in the field of dynamic spectrum access

through the creation of content such as a representative taxonomy of the various concepts.

- IEEE 1900.2 Working Group on “Recommended Practice for the Analysis of In-Band and Adjacent Band Interference and Coexistence Between Radio System” [3]: This standard provides guidance for the analysis of coexistence and interference between various radio services in the specific context of spectrum management, policy-defined radio, adaptive radio, and software-defined radio.
- IEEE 1900.3 Working Group on “Recommended Practice for Conformance Evaluation of Software Defined Radio (SDR) Software Modules” [4]: IEEE 1900.3 WG has been disbanded.
- IEEE 1900.4 Working Group on “Architectural Building Blocks Enabling Network-Device Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Access Networks” [5]: This standard provides solutions for Architectural Building Blocks Enabling Network-Device Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Access Networks; IEEE 1900.4a is an amendment providing an architecture and interfaces for DSA in White Space Frequency bands; IEEE 1900.4.1 is a Standard for Interfaces and Protocols Enabling Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Networks.
- IEEE 1900.5 Working Group on “Policy Language and Policy Architectures for Managing Cognitive Radio for Dynamic Spectrum Access Applications” [6]: This standard defines a vendor-independent set of policy-based control architectures and corresponding policy language requirements for man-aging the functionality and behaviour of DSA networks.
- IEEE 1900.6 Working Group on “Spectrum Sensing Interfaces and Data Structures for Dynamic Spectrum Access and other Advanced Radio Communication Systems” [7]: This standard defines the interfaces and data structures required to exchange sensing-related information in order to increase interoperability between sensors and their clients developed by different manufacturers; 1900.6a is an amendment providing procedures, protocols and message format specifications for the exchange of sensing related data, control data and configuration data between spectrum sensors and their clients. In addition, it adds specifications for the exchange of sensing related and other relevant data and specifies related interfaces between the data archive and other data sources.
- IEEE 1900.7 White Space Radio Working Group [8]: This standards working group is working on a new radio interface standard for white space DSA radio systems supporting fixed and mobile operation. An intention for 1900.7 from the outset is to be broadly applicable to a range of use cases and scenarios, including alternative white space spectrum bands to TV white space. However, as TV bands are the only white space opportunities currently, 1900.7 has for the meantime constrained itself to the consideration of those. Use cases that 1900.7 consider are extremely wide-ranging, from sensor network and machine-to-machine communications at one end of the scale, to wireless broadband at the other end of the scale. This is in contract to the IEEE 802 standards covering the scope of TV white space, which are all limited to very particular use cases and scenarios. For example, 802.11af covers WLANs in TV white space, and 802.22 covers Wireless Regional Area Networks (WRANs) using TV white space, and 802.15.4m covers Low Rate (LR) Wireless Personal Area Networks (WPANs) in TV white space.

SOLDER will also look for opportunities for contributing to the other IEEE standards considering TV white space, dynamic spectrum access and related issues such as coexistence, particularly IEEE 802.22, IEEE 802.11af, IEEE 802.15.4m, and IEEE 802.19, and IEEE 802.19.1. It is very unclear, however, whether contributions to these groups will be possible, so further detail on them is not provided here.

3.3.1 Standardization plan for IEEE 1900 Working Groups

First assessed is the potential for standardisation inputs to the IEEE 1900 working groups by SOLDER, and the possible topics of those contributions:

- Contributions to 1900.1 are possible, for example, aiming to capture aggregation concepts within the terms and definitions covered in 1900.1, and in associated content such as representative taxonomies. A good understanding of aggregation achieved by such contributions increases the prospects for realisation of aggregation in technologies such as DSA, hence the capabilities of those technologies *per se*.
- Contributions to 1900.4 regarding architectures to support aggregation within the scope of heterogeneous networks (including DSA-capable networks) would be highly relevant. It is noted, however, that 1900.4 is an entity-based working group, hence, this makes contribution to 1900.4 very difficult.
- Contributions to 1900.5 regarding policy frameworks supporting aggregation in the scope of DSA would also be relevant; however, SOLDER members currently have a very limited participation in IEEE 1900.5.
- Contributions to 1900.6 are possible on a number of topics, such as the enhancement to the collaborative/cooperative spectrum sensing mechanisms covered in that standard to support the realisation of aggregation opportunities, as well as others such as support for database-assisted aggregation.
- Finally, contributions to 1900.7 are possible regarding the support of the 1900.7 white space radio interface for aggregation of white space opportunities, as well as the provision of “cognitive plane” capabilities that would better manage aggregation.

Given the analysis above, we concentrate particularly on IEEE 1900.1, IEEE 1900.6, and IEEE 1900.7 as key targets for contributions from SOLDER. A more detailed analysis of potential contribution to those working groups is presented as follows.

3.3.1.1 IEEE 1900.1

Regarding contributions to IEEE 1900.1, the current anticipated timescale that IEEE 1900.1 is working to is as in Figure 1.

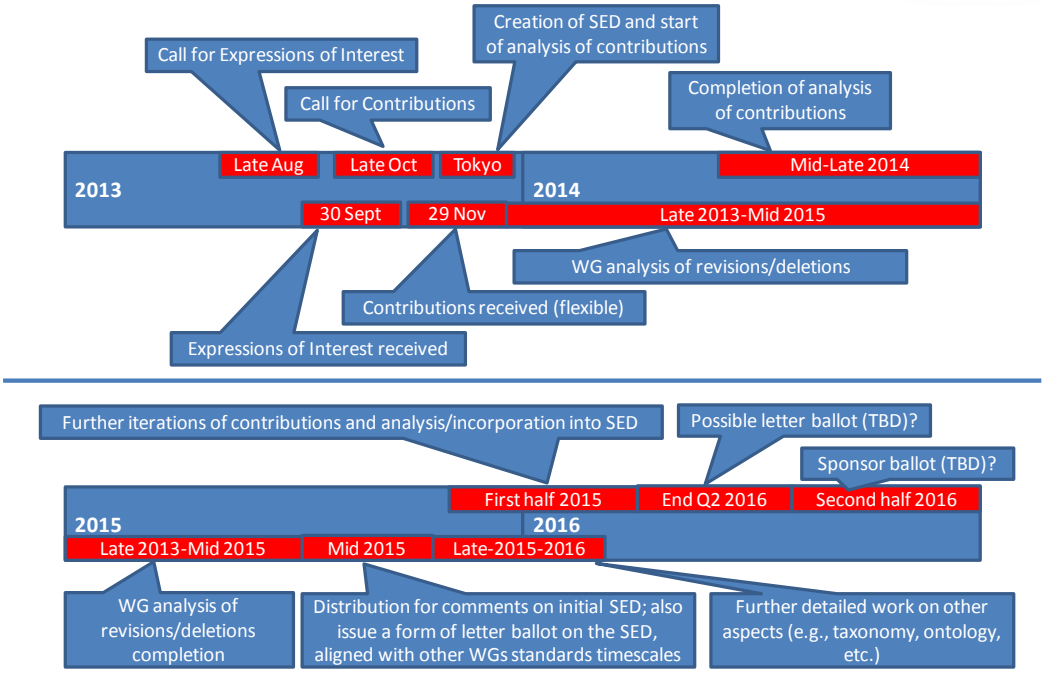

Figure 1: Current time plan for IEEE 1900.1 as on 6 February 2015.

At the time of writing, SOLDER has already brought forward two contributions to IEEE 1900.1, in April 2014 and December 2014. Both were on the topic of spectrum aggregation-related terms and definitions. SOLDER aims to continue such a path for its contributions to 1900.1, bearing in mind that spectrum aggregation must play a key role in many DySPAN-related technologies such as TV white space, for example. Indeed, SOLDER-supported work within the Ofcom TV white spaces pilot has emphasised the need for aggregation of resources to achieve certain use-cases for TV white space deployments [9].

It is noted that contributions to terms/definitions in IEEE 1900.1 can continue until at least 2016, whereas contributions on other related aspects, such as the taxonomy of terms (including aggregation-related terms) are currently anticipated towards the end of 2015 and the beginning of 2016. SOLDER will work to that timescale, as illustrated in Figure 1.

3.3.1.2 IEEE 1900.6

Having recently completed IEEE 1900.6a, IEEE 1900.6 has, since August 2014, been in the process of building up its work on the IEEE 1900.6b standard. IEEE 1900.6 currently expects to follow a similar staged procedure as was followed in IEEE 1900.6a for preparation of contributions, and incorporation of those contributions into the 1900.6b draft standard. However, the specifics of this procedure are being discussed, and the precise timescale that IEEE 1900.6 will work to in preparing IEEE 1900.6b is currently being defined. One likely possibility for the contributions procedure to IEEE 1900.6b is illustrated in Figure 2.

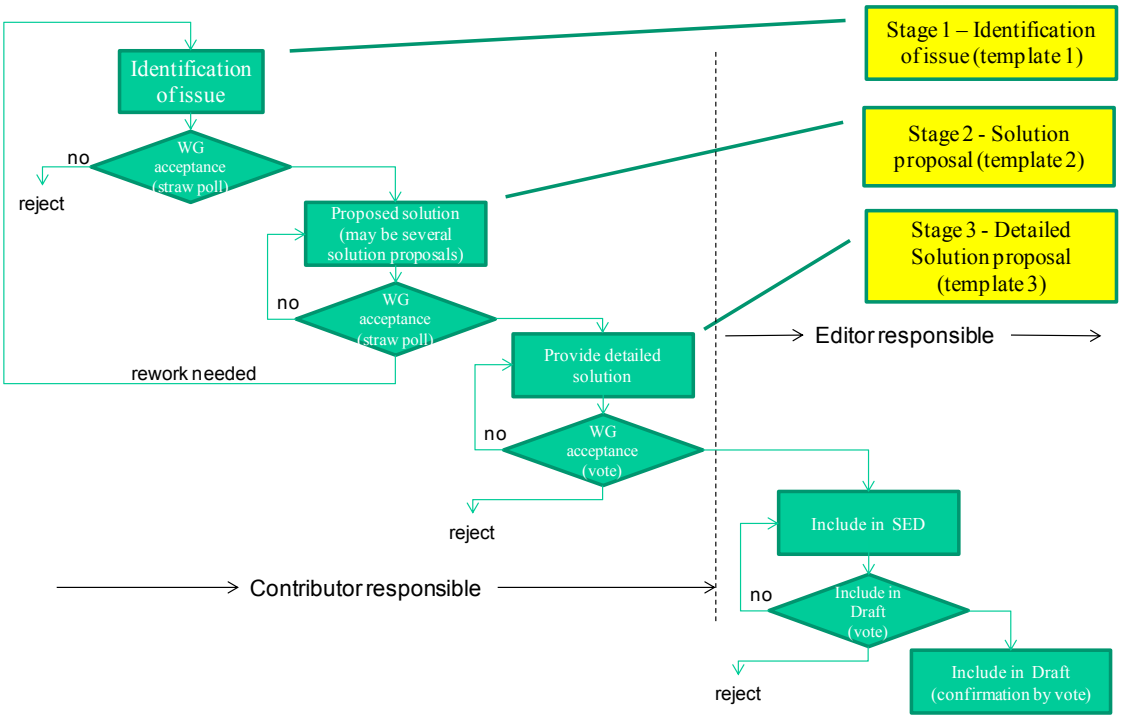

Figure 2: Possible IEEE 1900.6 staged procedure for contributions (under consideration within IEEE 1900.6) [10].

At the time of writing, SOLDER has already brought forward two contributions to IEEE 1900.6, both on the topic of the use of spectrum databases to support aggregation decisions. These were presented in August 2014, and December 2014. SOLDER has kept in mind the intended procedure as indicated in the above flow chart in presenting its contributions, which can be seen as linked to Stage 1 and Stage 2 contributions.

SOLDER will continue the current topic of spectrum database support for aggregation in presenting contributions to 1900.6, and it will also strive to look at how the 1900.6 spectrum sensing subsystem can support aggregation, likely bringing forward contributions on this topic too. Further, it will continue to look for appropriate topics for contributions as IEEE 1900.6 progresses. Indeed, SOLDER contributions to 1900.6 seem likely to be possible throughout the entire duration of the project, given the timescale to which 1900.6 will likely undertake its work.

3.3.1.3 IEEE 1900.7

The time plan for IEEE 1900.7 is as in Figure 3, noting that the vast majority of the technical work of IEEE 1900.7 is already completed so this figure only represents a very small fraction of what has been actually done.

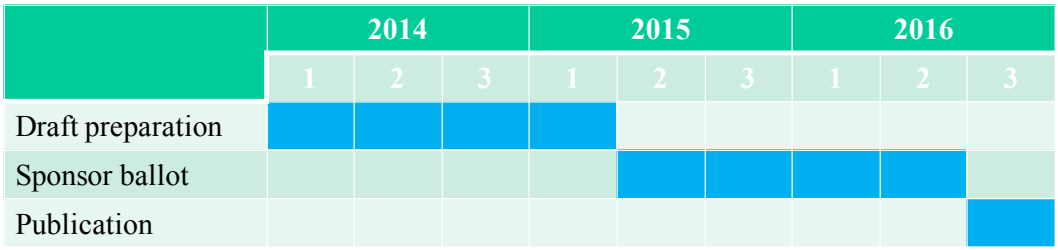

Figure 3: Current time-plan for IEEE 1900.7 [11].

At the time of writing, SOLDER has already internally within the project encouraged two forms of technical contribution to IEEE 1900.7, namely, contributions on the support of the 1900.7 radio interface for aggregation, and on support for management of aggregation by the 1900.7 cognitive plane. No contribution from SOLDER has been forthcoming on the former topic of the radio interface supporting aggregation, hence, it seems likely that only the second form of contribution on the cognitive plane will materialise.

In line with the timescale illustrated in Figure 3 and given that contributions have thus-far not been materialising from the project, SOLDER aims to achieve a one-off contribution to IEEE 1900.7 on the topic of cognitive plane support for aggregation, in early 2015. Contributions to a standard once the standard has progressed to sponsor ballot are not possible.

4. Plan for Interaction with Regulators

SOLDER's members have contacts and collaboration with regulators, such as the UK's Ofcom, as well as some interactions with regulatory groupings such as the CEPT and ITU. SOLDER will attempt to influence aspects of regulations in a safe and viable way, but in a way that assists the realisation of heterogeneous multi-band spectrum aggregation. SOLDER contributions to regulators and related groupings, such as Ofcom, and as much as possible the CEPT and ITU will be in the form of presentations, suggestions, meetings, etc., in order to enhance the prospects of spectrum and carrier aggregation.

At least one meeting with regulators or regulatory groupings per year will be targeted to facilitate the SOLDER technologies from a spectrum regulatory point of view. Considering the UK's Ofcom, for example, a number of meetings with them were held in the first reporting period of the project, particularly on the topic of the Ofcom TV White Spaces Pilot and progress within our trials, including very high profile presentations such as [12].

KCL will mobilise its expertise on regulation to assist in achieve the SOLDER impact, particularly through interaction with Ofcom and aspirationally (where opportunity exists) interactions with the CEPT, ITU and others. These interactions will take the form of meetings, and participation and presentation in major Ofcom events (invited). Although not being directly and regularly involved with regulators, Sequans will try to promote SOLDER outcomes towards French regulation, e.g. answering to ARCEP or ANFR polls.

In addition, SOLDER could approach regulators in open events in which they participate such as concertation meetings in Brussels. Participation in Net Futures events, the Radio Access and Spectrum cluster (http://www.ict-ras.eu), and related activities will also be relevant. Further, interactions with ACROPOLIS and COST-TERRA have already occurred regarding regulatory aspects (see, e.g., references [12]-[14]), and interactions with other projects will be sought where possible.

5. Conclusion

The project communication and dissemination plan has been given in this deliverable. Through communication and dissemination actions in major scientific conferences and meetings, standardization efforts in ETSI RRS, 3GPP, IEEE DySPAN-SC, IEEE 1900 WGs, and regulation efforts in Ofcom, CEPT, ITU, etc. the project results will be given the proper visibility. The major objectives of the dissemination and the planned dissemination actions have been set by:

1) Designing, implementing and maintaining a **project external website** "http://ict-solder.eu" and a LinkedIn group "https://www.linkedin.com/groups/SOLDER-7422259".
2) Creating and updating regularly a detailed **calendar of events**, containing all relevant scientific journals, international and national conferences, exhibitions and events.
3) Designing a "**communication kit**", including a leaflet and a poster to disseminate the project concept and objectives.
4) Proposing exhibitions and **workshops** with the objectives to receive a feedback on SOLDER study and promote SOLDER technology for future adoption. Already a SOLDER workshop will be organized for the 11th IEEE ISWCS 2014, August 26-29, Barcelona, Spain.
5) Communicating via **newsletter** every 6 months, presenting the most recent project achievements.
6) Communicating with relevant **European projects and European network operators**.
7) Attempting to harmonise industrial progress and common understanding through direct inputs to **standardisation bodies**, particularly the IEEE DySPAN-SC and IEEE 1900 WGs, likely ETSI RRS, but aspirationally also the 3GPP. SOLDER has been included and will participate to the RAS cluster "http://www.ict-ras.eu".
8) Addressing **regulators** and regulatory groupings as potential stakeholders, particularly Ofcom, CEPT and ITU, to facilitate the SOLDER technologies from a spectrum regulatory point of view.

This above project communication and dissemination plan will lead to the appropriate visibility of the SOLDER project and will reach the required level of the project impact.

List of Acronyms

Acronym	Meaning
3GPP	3rd Generation Partnership Project.
CEPT	European Conference of Postal and Telecommunications administrations (Conférence Européenne des administrations des Postes et Télécommunications).
CFP	Call For Papers.
CR	Cognitive Radio.
CRS	Cognitive Radio System.
DSA	Dynamic Spectrum Access.
EC	European Commission.
ECC	Electronic Communications Committee.
ETSI	European Telecommunications Standard Institute.
EuCNC	European Conference on Networks and Communications.
EuMW	European Microwave Week.
FM	Frequency Management.
GLDB	Geo-Location DataBase.
ICC	International Conference on Communications.
ISWCS	International Symposium on Wireless Communication Systems.
ITU	International Telecommunication Union.
ITU-R	ITU Radiocommunication sector.
LAA	Licence Assisted Access.
LTE	Long-Term Evolution.
MNO	Mobile Network Operator.
MRC	MultiRadio Controller.
NEM	Network & Electronic Media.
OSS	Open Source Software.
PIMRC	Personal, Indoor and Mobile Radio Communications.
RAS	Radio Access and Spectrum.
RAT	Radio Access Technology.
RCM	Radio Connection Manager.
Rel.	Release.
REM	Radio Environment Map.
RF	Radio Frequency.
RM	Resource Manager.
RRS	Reconfigurable Radio Systems.
SDR	Software Defined Radio.
SE	Spectrum Engineering.
SOLDER	Spectrum OverLay through aggregation of heterogeneous DispERsed bands.
TC	Technical Committee.
TCOM	Transactions on Communications.
TMTT	Transactions on Microwave Theory and Techniques.
TWC	Transactions on Wireless Communications.
VTC	Vehicular Technology Conference.
WCNC	Wireless Communication and Networks Conference.
WG	Working Group.
WRAN	Wireless Regional Area Network.
WSD	White Space Device.

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