ICT- 248577 C2POWER

D8.3 Version 1.0

Standardization and Dissemination activity report (2nd Year Progress)

Contractual Date of Delivery to the CEC:	December 2011
Actual Date of Delivery to the CEC:	December 2011
Editor:	CNET
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Participant(s):	CREATE-NET, WCB, IT
Work-Package:	WP8
Est. person months:	
Security:	PU
Nature:	R
Version:	1.0
Total number of pages:	35

Abstract:

This deliverable summarizes the dissemination and standardization activities of C2POWER project for the second year of the project, more specifically from January 2011 to December 2011. The dissemination activities are presented in terms of the published scientific papers at international conferences and top quality journals, invited presentations, organized workshops and newsletters, etc. The standardization activities and initiatives are presented based on the projects contributions and plans towards standardizations like the IEEE DySPAN and the ETSI organizations. Furthermore, some of the collaboration and coordination activities with other projects and scientific forums are also summarised.

Keyword list: conference, journals, publications newsletter, workshop, standardization, ETSI-RRS, IEEE 1900.6, COST Action IC0902.

Executive Summary

Work package 8 is responsible for the dissemination and standardization activities within the C2POWER project. Two preceding deliverables were already presented during the months M3 and M12 for the work package 8 activities. Similarly to the previous deliverables, the present deliverable reports the dissemination and standardization activities performed in the C2POWER project for the second year of the project - from January 2011 (M13) to December 2011 (M24).

The dissemination activities are presented in terms of the published scientific papers, invited presentations, seminars, workshops organized related to the technical aspects of the project. The dissemination activities also include maintaining the project website and producing newsletters and brochures.

The standardization activities include contributions to various scientific and technical groups in standardization bodies such as ETSI, IEEE and scientific forums such as the WWRF, COST Action and other European projects on similar themes.

In detail, Section 2 describes the conducted dissemination activities listing the publications in journals and conferences and the C2POWER presentations delivered; describing the organization of special sessions and workshops and also showcasing the projects' constant dissemination channels: the website and the newsletter. Standardization activities are described in section 3, while section 4 highlights the relationships established with other European Projects and worldwide initiatives, such as WWRF.

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Date	Version	Status	Comments
28/10/2011	V 0.1	ToC	Initial Table of Contents
31/10/2011	V0.2	ToC	Modified Table of Contents
21/11/2011	V0.3	Draft	Contributions from Partners
05/12/2011	V0.4	Draft	Integrated and Edited version submitted to PTM
20/12/2011	V0.5	Draft	First Review by PTM
31/12/2011	V1.0	Final	Final Version

List of Abbreviations and Acronyms

Term	Description
C2POWER	Cognitive radio and cooperative strategies for power saving in multi-standard wireless devices
COST	European Cooperation in Science and Technology
ETSI	European telecommunications Standard Institution
ICT	Information and Communication Technologies
IEEE	The former Institute of Electrical and Electronic Engineers
PAR	Project Authorisation Request
RRS	Reconfigurable Radio Systems
TR	Technical Report
UWB	Ultra Wide-Band
WG	Work Group
WP	Work Package

1. Introduction

The C2POWER project dedicates WP8 towards the dissemination and standardization activities. According to the description of the work package there a several objective set to be met, given as follows;

- To disseminate C2POWER concepts, knowledge acquired during the project, and scientific results in academic journals and major international conferences;
- To demonstrate C2POWER system concept at industrial events and international exhibitions;
- To promote C2POWER technologies in appropriate standardisation bodies;
- To support the implementation roadmap of related C2POWER technologies in the commercial products by the industrial partners.

Based on the above objectives two tasks were defined in the work package to successfully achieve the above set goals. The two tasks are given by;

T8.1: Dissemination activities

T8.2: Standardization activities

In the first task T8.1, the main dissemination strategy is to focus on the publications of C2POWER research aim, concept, techniques, and the corresponding scientific results. The results are aimed at publishing on suitable scientific journals and magazines, as well as at international conferences, workshops, working groups in initiatives (e.g. WWRF, GREENTOUCH), participation in FP7 clusters and concentration meetings.

The second task T8.2 on the other hand complements the first one where the main objectives in this task is to ensure that the C2POWER outcomes are contributed to the working standardization bodies and various technical committees where appropriate. In particular the project consortium envisages strong contributions to the standardization bodies such as the IEEE P1900.6 working group and the ETSI Reconfigurable Radio Systems (RRS).

Similar to the previous deliverables D8.1 [1] and D8.2 [2] for WP8, the rest of this deliverable is organized by presenting the project achievements by grouping them according to the above two tasks (T8.1 and T8.2). We also elaborate on the collaborative efforts made with the other EU projects and research forums. Finally we provide some concluding remarks and the featured plan for the third year of the project.

2. Dissemination Activities

2.1 Publications in journals, conferences and workshops

This subsection summarizes the project publications from M13 to M24. Journal and magazine publications are listed in Table 2-1, while conference and workshop papers are presented in Table 2-2.
In what concerns 2011, 17 conference papers have been accepted and presented by the C2POWER consortium. 6 journal papers have been submitted and accepted this year, from which 4 have already been published and 2 are to be published in 2012.
Several other papers have been submitted to various high impact journals and conferences and are currently awaiting notification of acceptance.

Table 2-1. Published articles in journals

N	Title	Authors	Published in	Partners
1	Dealing with Non Uniformity in Data Centric Storage for Wireless Sensor Networks	M. Albano, S. Chessa, F. Nidito, S. Pelagatti	IEEE Transactions on Parallel and Distributed Systems	IT
2	Energy efficient and Scalable Routing Protocol for Extreme Emergency Ad Hoc Communications	T. A. Ramrekha, V. N. Talooki, J. Rodriguez, C. Politis	Mobile Networks and Applications (MONET)	IT
3	Distributed Point Coordination Function for IEEE 802.11 Wireless Ad hoc Networks	J. Alonso-Zárate,, C. Crespo, Ch. Skianis, L. Alonso, Ch. Verikoukis	Ad hoc Elsevier Journal	LAN
4	Development of wireless sensor network for combustible gas monitoring	A. Somov, A. Baranov, A. Savkin, D. Spirjakin, A. Spirjakin, and R. Passerone	Sensors and Actuators A: Physical, Elsevier Journal	CNET
5	Efficient Multi-Stage Load Modulation RF Power Amplifier for Green RF Front End	A.S. Hussaini, I.T.E. Elfergani, J. Rodriguez,	IET Science, Measurement & Technology (Accepted for publication)	IT
6	Business Model for Femtocells - Franchising for Energy Saving	T.C. Moreira, M. Albano, A. Radwan, J. Rodriguez, A. Gomes	Social Technologies (Accepted for publication).	IT

Table 2-2. Conference and workshop papers

N	Title	Authors	Conference/Workshop	Partners
1	An efficient flexible common operator for FFT and Viterbi algorithms	M. Naoues, D. Noguet, Y. Louët, K. Grati, A. Ghazel	2nd C2POWER Workshop - IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	CEA
2	Energy-Efficient Spectrum Sensing Using Cyclostationarity	Q. Thai, S. Reisenfeld, K. Sithamparanathan, G. M. Maggio	2nd C2POWER Workshop - IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	CNET
3	A Novel Relay Selection Game in Cooperative Wireless Networks based on Combinatorial Optimization	F. Saghezchi, A. Nascimento, M.Albano, A.Radwan, J. Rodriguez	2nd C2POWER Workshop - IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	IT
4	Novel cluster formation framework for energy efficient short-range cooperative strategies	J. Kibilda, K. Sithamparanathan, R. Piesiewicz	2nd C2POWER Workshop - IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	WCB, CNET
5	A Context-Aware Vertical Handover Framework towards Energy-Efficiency", by LantiQ to the 2nd IEEE C2POWER workshop.	D. Xenakis, N. Passas, L. Di Gregorio, C. Verikoukis	2nd C2POWER Workshop - IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	LANTIQ
6	Cooperative Iterative water-filling for two-user Gaussian frequency-selective interference channels	Na Yi, Yi Ma, Rahim Tafazolli	IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	US
7	Cluster Cooperation for Energy Saving in Wireless Personal Networks	A. Nascimento, J. Rodriguez	EUROCON 2011/CONFTELE 2011, Lisbon, Portugal.	IT
8	Incremental Decode-Forward Relaying over Asymmetric Fading Channels: outage probability and location-aided relay selection	N. Yi, Y. Ma and R. Tafazolli	IEEE SSP 2011, Nice	US
9	The Beyond 3G Energy Efficient Power Amplifier for Mobile Communications	A. S. Hussaini, B. A.L. Gwandu, R. Abd-Alhameed, J. Rodriguez	26th WWRF Meeting, Doha, Qatar	IT
10	Context aware node discovery for facilitating short-range cooperation	M. Albano, M. Alam, A. Radwan, J. Rodriguez	26th WWRF Meeting, Doha, Qatar	IT
11	Self-enforcement strategy for energy-efficient relaying in wireless ad-hoc networks	M. Kucharzak, J. Kibilda, M. Filo, R. Piesiewicz	Crowncom 2011	WCB
12	End-to-End Delay Analysis with Delay Constraints in Cognitive Radio Networks	S. Kandeepan et. Al	IEEE 73rd Vehicular Technology Conference (VTC-Spring 2011)	CNET, ETSI
13	Energy Saving through	A. Nascimento, J.	IEEE DCOSS 2011	IT

	Cooperation in Wireless Personal Networks	Rodriguez		
14	Load Pull Characterization for High Power and High Energy Efficient Active Amplifying Devices	A.S. Hussaini, I.E. Elfergani, B. A.L. Gwandu, R. A. Abd-Alhameed, J. Rodriguez	ITA 2011	IT
15	Detect and Avoid Mechanism for Ultra Wide-Band WiMedia: Experimental Evaluation of Detection Capabilities (*Invited paper)*	A. Somov, S. Kandeepan, A. R. Biswas and A. Krause	ICUWB 2011	CNET
16	Energy Efficient Cooperative Strategies in Hybrid Aerial-Terrestrial Networks for Emergencies	S. Kandeepan, K. Gomez, T. Rasheed, and L. Renaud,	IEEE PIMRC 2011-Toronto, Canada	CNET
17	Business Model for Femtocell	T.C. Moreira, M. Albano, A. Radwan, J. Rodriguez, A. Gomes,	International Academic Conference Social Technologies '11: ICT for Social Transformations	IT, PTIN

2.2 Workshops and special sessions organisation

As part of C2POWER dissemination activities, the project has committed to the organization of an international workshop every year, both to publicise the C2POWER related technology to the scientific community at work in similar areas as well as to spark the discussion on power optimization techniques.
The first C2POWER workshop [2, 3] co-located with the ACM sponsored MOBIMEDIA 2010 conference in Lisbon, Portugal in September 2010 was, in this sense, a great success.
The second C2POWER workshop [4], co-located with the IEEE VTC conference in Budapest, Hungary, in May 2011 attracted an even higher interest from the research community, and included participants from other European Projects on the area of energy efficiency.
The third C2POWER workshop, organized in a similar fashion by promoting the participation of experts on the field of cooperative communications and energy efficiency, is planned to be co-located with the IEEE CAMAD 2012, in Barcelona.
In addition to the C2POWER own workshops, the project has also acted as technical sponsor of the 2nd International Workshop on Energy-Efficient and Reconfigurable Transceivers, a workshop which is directly linked to the research topics of WP4, and which took place in Wrexham, Wales, co-located with the ITA'11.
An additional special session, also on the topic of energy-efficient reconfigurable transceivers, was organized in the IEEE International Conference on Electronics, Circuits and Systems (ICECS 2011), which took place in Beirut, Lebanon, in December 2011.
Besides C2POWER organized events, the project consortium also collaborated with three other European funded projects on the topic of energy efficiency in the organization of a Workshop on Green Communications, which took place during the 8th Future Networks Concertation Meeting.
We further elaborate on the success of the second C2POWER workshop and the organization of the third workshop, as well as on the plans for the third edition of the EERT Workshop in 2012.

2.2.1 The 2nd C2POWER Workshop (IEEE VTC Spring 2011)

The second C2POWER workshop, which took place in Budapest, Hungary, was co-located with the IEEE Vehicular Technology Conference - IEEE VTC Spring 2011. The workshop program included a keynote speech from **Prof. Frank Fitzek** [Univ. Aalborg, Denmark], expert on cooperative communications, with more than 10 books, 40 book chapters, 45 journals and 18 patents authored, who presented the potential of Mobile Clouds to increase the battery life of the mobile device and to decrease the overall energy spent by the network providers.

Ten technical papers on the design of energy efficient communication techniques were presented, and the workshop also included a presentation of the Marie Curie ITN GREENET Project.

The workshop closed with an interesting panel discussion entitled *Energy Efficiency in Future Telecommunications: Technical Issues, Standardization Activities and Business Requirements*, animated by **Prof. Raffaele Bola** (representing the FP7-ECONET project), **Dr. Nancy Alonistioti** (on behalf of the EU-FP7 CONSERN), **Dr. István Gódorand** (representing the FP7-EARTH project) and **Dr. Ayman Radwan** (on behalf of the EU-FP7 C2POWER project).

The figure below depicts the technical program and the agenda of the Workshop followed by some photographs taken during the workshop itself.

Technical Program

8.30 – 9.00:	Registration
9.00 – 9.15:	**Welcome Speech from Workshop Chair**
9.15 – 10.15:	**Keynote Speech** **Title:** ***Green Mobile Clouds*** by Frank Fitzek [University of Aalborg, Denmark]
10.15 – 10.30:	Morning Coffee/Tea break
10.30 – 12.00:	**Technical paper presentations** 1. *Novel cluster formation framework for energy efficient short-range cooperative strategies* - Jacek Kibiłda [Wrocławskie Centrum Badań EIT+]; Kandeepan Sithamparanathan [CREATE-NET]; Radoslaw Piesiewicz [Wrocławskie Centrum Badań EIT] 2. *A Novel Relay Selection Game in Cooperative Wireless Networks based on Combinatorial Optimization* - Firooz Bashashi Saghezchi, Alberto Nascimento, Michele Albano, Ayman Radwan, Jonathan Rodriguez [Instituto de Telecomunicações] 3. *Multi-hop versus Overlay Networks: A Realistic Comparison Based on Energy Requirements and Latency* - Marcos Katz [Univ. Oulu]; Frank H.P. Fitzek, Janus Heide, Morten V. Pedersen [Aalborg Univ.]; Gregő Ertli [Budapest Univ. of Technology and Economics] 4. *Enablers for Energy-Aware Cooperative Decision and Control in Wireless Networks* - Georgios P. Koudouridis, Gunnar Hedby [Huawei Technologies Sweden AB]; Woon Hau Chin [Toshiba Research Europe Limited]; Andreas Merentitis, Makis Stamatelatos, Nancy Alonistioti, [Univ. of Athens]; Opher Yaron [Interdisciplinary Institute for Broadband Technology] 5. *Context-Aware Vertical Handover Framework Towards Energy-Efficiency* - Dionysis Xenakis, [Lantiq Deutschland GmbH/Univ. Athens]; Nikos Passas [Univ. Athens]; Lorenzo Di Gregorio [Lantiq Deutschland GmbH] 6. *A study of Energy Efficient Transparent Relay using Cooperative Strategy* - Haesik Kim, Tao Chen [VTT Technical Research Centre of Finland]
13.30– 15.00:	**Panel Discussion Session** **Topic:** ***Energy Efficiency in Future Telecommunications: Technical Issues, Standardization Activities and Business Requirements*** Panelist 1: Prof. Raffaele Bola [CNIT] – representing the EU-FP7 ECONET project Panelist 2: Dr. Nancy Alonistioti [Univ. Athens] – representing the EU-FP7 CONSERN project Panelist 3: Dr. István Gódor [Ericsson, Budapest] - representing the EU-FP7 EARTH project Panelist 4: Dr. Ayman Radwan [Instituto de Telecomunicações] - representing the EU-FP7 C2POWER project
15.00 – 15.15:	Afternoon Tea/Coffee break
15.15 – 15.45:	**GreeNet Project Technical presentation**
15.45– 16.45:	**Technical paper presentations** 7. *Energy-Efficient Spectrum Sensing Using Cyclostationarity* - Quang Thai, Sam Reisenfeld [Macquarie Univ.]; Kandeepan Sithamparanathan, Gian Mario Maggio [CREATE-NET] 8. *An Efficient Flexible Common Operator for FFT and Viterbi Algorithms* - Malek Naoues, Dominique Noguet, [Cea-Leti]; Yves Louët [Supelec]; Adel Ghazel [Sup'com]; Khaled Grati [Cirta'Com Laboratory] 9. *Dual-hop Spatial Modulation (Dh-SM)* - Nikola Serafimovski, Sinan Sinanovic [Univ. Edinburgh]; Marco Di Renzo [French National Center for Scientific Research (CNRS)]; Harald Haas [Univ. Edinburgh] 10. *Robust Cooperative Relaying in an Amplify-and-Forward Network* - Gubong Lim, Leonard J. Cimini, Jr. [Univ. Delaware]
16.45 – 17.00:	**Closing Speech – Workshop Chair**

Figure 2-1. The 2nd C2POWER Workshop, IEEE VTC Conference, Technical Program

Figure 2-2. The 2nd C2POWER Workshop, IEEE VTC Conference, Pictures of the Event

2.2.2 The 2nd International EERT Workshop (ITA'11)

The 2nd International Workshop in Energy-Efficient and Reconfigurable Transceivers took place in Wrexham, Wales, co-located with the ITA'11.
This workshop, which was technically sponsored by C2POWER, consisted of 10 papers on energy efficiency and 3 invited speeches (including one on C2POWER by Dr. Jonathan Rodriguez).
The workshop closed with an interesting panel discussion on *"Green Communications: Future Trends and Economical Aspects*" which had as participants:

- **Prof. John Gardiner** (University of Bradford, UK)
- **Prof. Raed Abd-Alhameed** (University of Bradford, UK)
- **Dr. Bashir Gwandu** (NCC, Nigeria)
- **Dr. Jonathan Rodriguez** (Instituto de Telecomunicações, Portugal)].

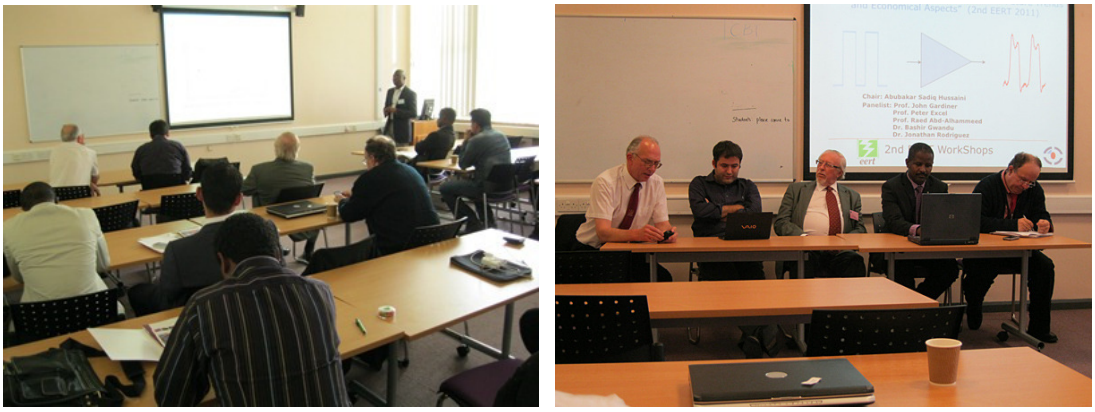


Figure 2-3. The 2nd International EERT Workshop, Pictures of the Event

2.2.3 Special Session on Energy Efficient and Reconfigurable Transceivers

In an effort related to the topics dealt with in WP4, IT was involved in the organization of a special session on Energy-Efficient Reconfigurable Transceivers at the IEEE International Conference on Electronics, Circuits and Systems (ICECS 2011).

2.2.4 Green Networks Cross Cluster Meeting

C2POWER, EARTH, ECONET, TREND organized a **Workshop on Green Communications** at the 8th Future Networks Concertation Meeting on 6th October 2011, in an effort to share knowledge amongst the partners of the current European funded projects on energy efficiency, as well as to disseminate the ideas and results of each project to a broader audience.
C2POWER participated in this Cross Cluster initiative with two presentations on "*Business Models for cooperative networks in multi-standard wireless networks*" and "*Evaluation of Cooperative algorithms for energy savings*" and also a panelist on the final panel that addressed the matter of energy efficiency, answering the following question: "*Which are the most promising techniques being developed, and how much will they contribute to reduce energy consumption?*" and whose participants were:

- **Luis M. Correia** – Moderator
- **Raffaele Bolla** – representative of the ECONET Project
- **Ayman Radwan** – representative of the C2POWER Project
- **Adam Wolisz** - representative of the TREND Project
- **Dietrich Zeller** - representative of the EARTH Project

2.2.5 Workshops and special sessions planned for 2012

2.2.5.1 The 3rd International C2POWER Workshop

The third international C2POWER workshop is planned to be organized together with the IEEE CAMAD conference chaired by Dr. Christos Verikoukis (LantiQ) in September 2012 in Barcelona.
The organizing committee for the workshop is being currently formed and the call for papers is to be produced in a near future.

Figure 2-4. IEEE Camad 2012

2.2.5.2 The 3rd International EERT Workshop

C2POWER will once again technically sponsor the International Workshop on Energy-Efficient Reconfigurable Transceivers for its 2012 edition. This workshop is planned to be organized in conjunction with an IEEE conference in the last quarter of 2012.

2.2.5.3 The IEEE ICC 2012 - Workshop on Cognitive Radio and Cooperation for Green Networking

C2POWER will be one of the technical sponsors of an ICC 2012 Workshop related to the use of cooperation and cognition as disruptive strategies for energy management and conservation, which intends to bring together academic and industrial researchers to identify and discuss technical challenges and recent results related to energy efficiency from user devices through to the core infrastructure of the network and how these devices and equipment interact among each other.

2.3 Invited Presentations and Events

The project results and the related activities are presented to various institutions and organizations that work on similar technologies.

2.3.1 Chairing of a Panel Session on Green Issues

C2POWER, represented by IT, organized and chaired a focused RAS Cluster Panel Session on Green Issues, motivated by the interest of the projects currently working on energy efficient topics.

2.3.2 C2POWER Presentations at FP7 TREND Project Meetings

2.3.2.1 Trend Plenary Meeting – Paris, France – February 2011

C2POWER, whose coordinator – Dr. Jonathan Rodriguez - is a member of the TREND Advisory Board meeting, attended the projects' plenary meeting, held in Issy Moulineaux - Paris, at France Télécom R&D headquarters, presenting a global overview of the projects results and ongoing research.

2.3.2.2 Trend Plenary Meeting – Madrid, Spain – September 2011

C2POWER was once more invited to attend the TREND Project meeting, held in Madrid, Spain and to offer an updated global overview of the projects results and ongoing research.

Figure 2-5. FP7 Trend Project Meeting

2.3.3 C2POWER Presentation at 26th WWRF Meeting

C2POWER was invited to present a global overview of the projects results and ongoing research on energy saving techniques based on the cooperative and cognitive paradigms, in the WG4 session of the WWRF 26th meeting in Doha, Qatar. IT represented the C2POWER Consortium as invited speaker.

2.3.4 C2POWER Presentation at the Future Internet Workshop Cluster on "ICT and Sustainability"

A presentation entitled “C2POWER: Green Communication and Sustainability Impact” was given by IT, at the 4th Future Internet Cluster Workshop on ICT and Sustainability, initiative that was co-organized by the European Commission, Future Networks Unit, and the Network of Excellence Euro-NF, to address mutual impacts of ICT and sustainability with societal, ecological and economical aspects.

2.3.5 C2POWER Presentation at the Mobile VCE Workshop on Green Radio

Jonathan Rodriguez, as coordinator of the C2POWER Project, was invited to present a global overview of the projects results and ongoing research at the Mobile VCE Workshop on Green Radio, which was co-located with the Wireless Innovation Forum European Conference on Communications Technologies and Software Defined Radio, in Brussels, Belgium.

2.3.6 C2POWER Presentation and Panel Session Participation at the 2nd International Workshop on Energy Efficient and Reconfigurable Transceivers (EERT 2011)

Jonathan Rodriguez was invited to present a global overview of the projects results and ongoing research at the 2nd EERT Workshop, co-located with the 4th International Conference on Internet Technologies and Applications (ITA'11) - Wrexham, Wales, and to represent C2POWER view on a panel session entitled *"Green Communications: Future Trends and Economical Aspects*”.

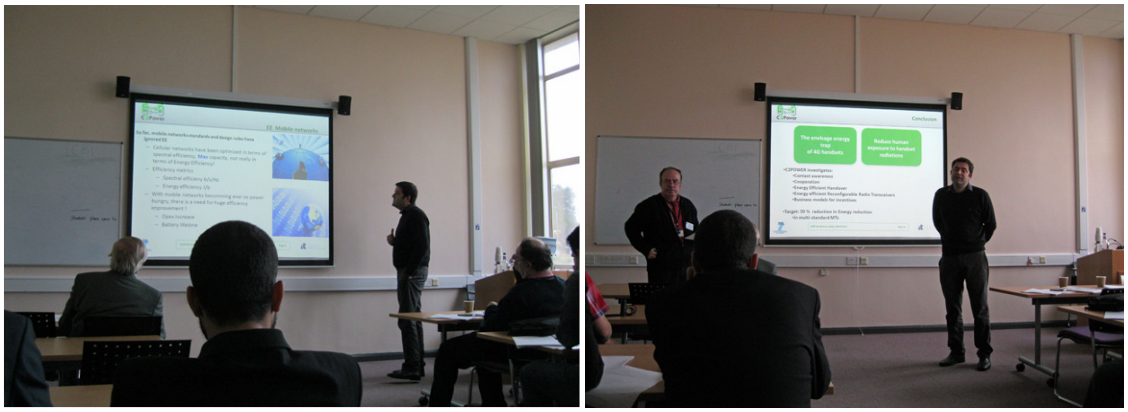


Figure 2-6. 2nd Int. EERT Workshop, Pictures of the event

2.3.7 C2POWER Presentations and Panel Session Participation at Workshop on Green Networks

C2POWER delivered two presentations: one on "*Business Models for cooperative networks in multi-standard wireless networks*" and another on "*Evaluation of Cooperative algorithms for energy savings*" and participated as a panelist on the workshop's panel on energy efficiency.

2.3.8 Panel session participation at the 25th Annual Computer Communications Workshop (CCW 2011)

C2POWER project was invited to present the view of the project and participate as a panel member in the session "Energy-efficient Networking: The views of Leaders of International Research Projects".
The CCW is the annual flagship workshop of the Technical Committee on Computer Communications (TCCC) of the IEEEE Communications Society. CCW provides a small, intimate setting and an easy-going atmosphere, where participants can take part in free-flowing technical discussions with colleagues.
C2POWER is considered one of the leading projects in Energy Efficiency in Communications Networks; hence was invited to participate in the Panel Session. The panel session included world leaders in Energy Efficiency research in Communications. The Panel members were:

- **Suresh Goyal:** representative of the Green Touch Initiative. He is the leader of the Green research Group in Alcatel-Lucent, USA.
- **Ayman Radwan:** representative of C2POWER
- **Idelfonso Tafur Monroy:** representative of CHRON project
- **Franco Davoli:** representative of ECONET project
- **Marco Ajmone Marsan:** moderator and representative of TREND project

The Session was organised as follows. Each representative provided a short presentation about his/her project, followed by a panel session, which involved questions from audience and discussion about different energy efficiency issues in mobile and fixed networks.

2.3.9 C2POWER Presentation at the Centre for Energy Efficient Telecommunications

In the second year of the project, CREATE-NET had the opportunity to present the C2POWER project, its related activities, and the achieved results so far to the 'Centre for Energy Efficient Telecommunications' research laboratory at the University of Melbourne, Australia, a lab sponsored by Alcatel Lucent Technologies Australia. The presentation was entitled "Cooperative and cognitive radio strategies for energy efficiency in wireless communications". The seminar was attended by 100 participants varying from PhD students, academics, researchers and directors from the University of Melbourne, the National ICT Australia (NICTA) and Alcatel Lucent, Australia.

2.3.10 C2POWER Presentation at 2nd International Cost Action IC0902 Workshop

C2POWER participated in the 2nd International Cost Action IC0902 (Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks) Workshop, in Castelldefels, Barcelona, in October, with a presentation entitled "Cooperative strategies for energy savings using context information".

2.4 Project Web Site

C2POWER keeps an active up-to-date website, which is available:

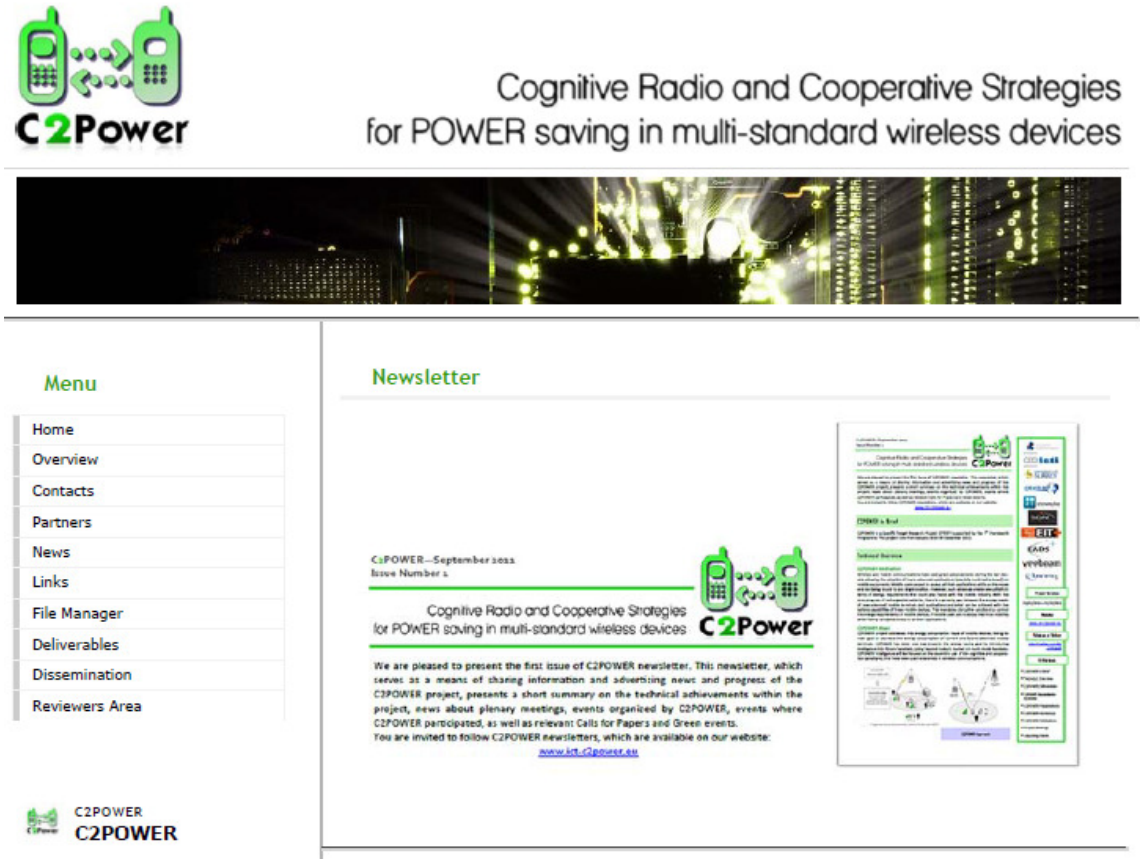
http://www.ict-c2power.eu

The website's public part is available to any web user to fulfil the following roles:

- It delivers the general information about the project, namely list of participants, objectives and technical approach, among others, acknowledging EC contribution and linking to other related and relevant sites.
- It is a complete repository of all information delivered by the project, including deliverables, publications, organized events and dissemination and standardization activities
- It acts as a unified contact point for the project and will aggregate interest in it.

The website also includes a private area, in the form of a file manager, which contains electronic versions of released private deliverables and other relevant information, in order to facilitate the communication inside the project and the follow-up of the project by the Commission services.

The URLs are kept up to date showing all the relevant data of the project, including technical descriptions and dissemination events. The home page of C2POWER website is shown in Figure 2-7.



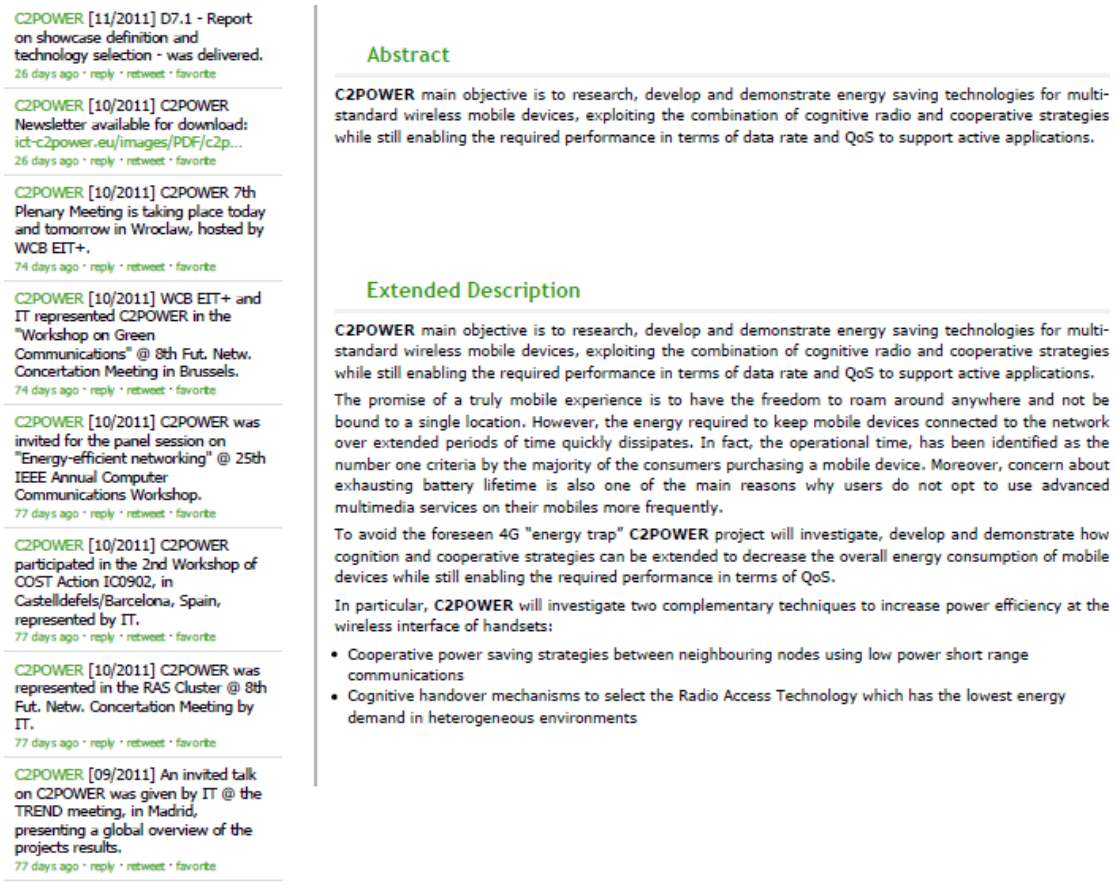


Figure 2-7. C2POWER Website Home Page

Furthermore, the C2POWER project has a Twitter account, currently also incorporated on the Website, which is being used as a fast dissemination tool of the events related to the project.

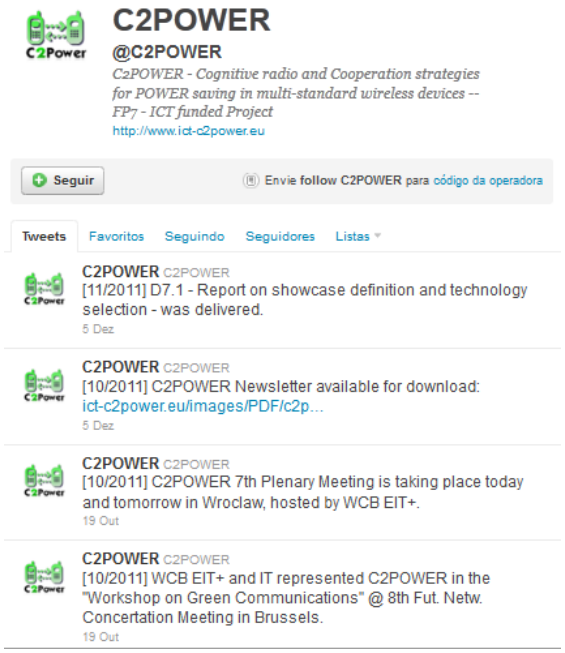


Figure 2-8. C2POWER Twitter

The website has a tracker tool installed that monitors the C2POWER website visits, providing the total number of hits, and more detailed information such as the geolocation of the visitors, the search path leading to the website, hits per period, among other important statistics. Examples of usage statistics for the period from January to December 2011 are given below.

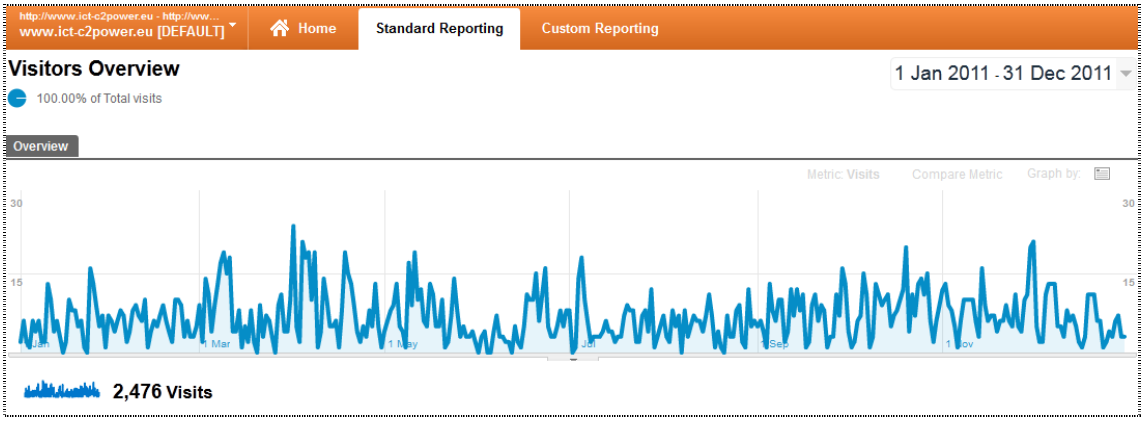


Figure 2-9. C2POWER Website Tracking Tool – Number of Visitors
Period: January 2011 to December 2011

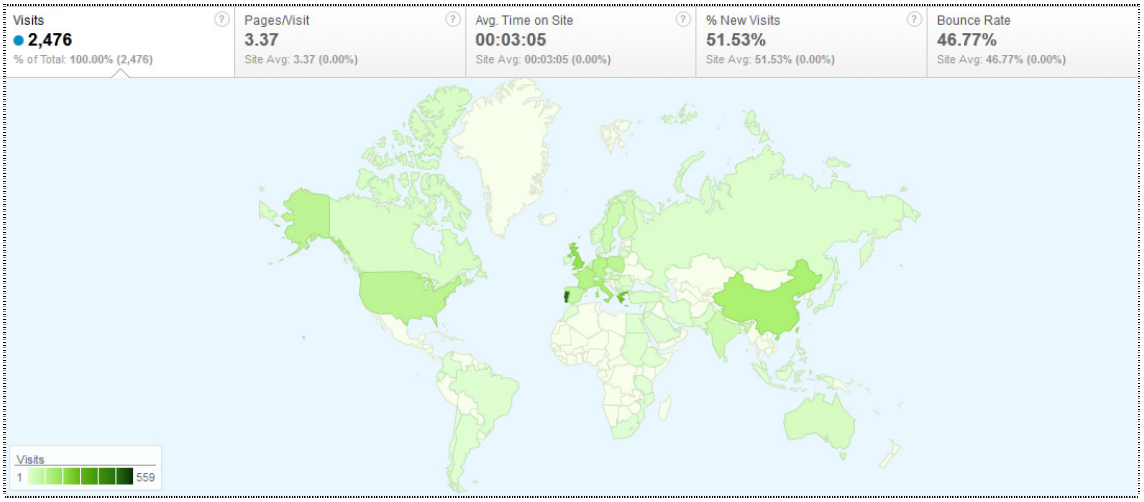
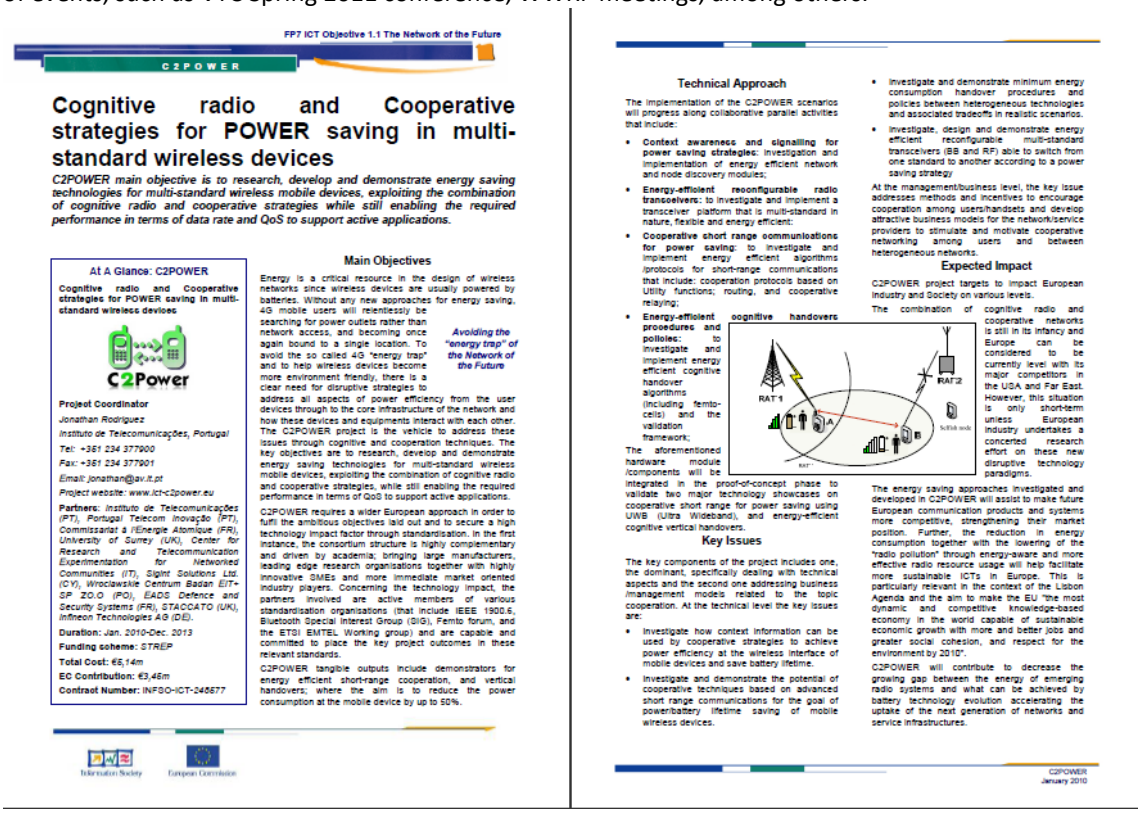


Figure 2-10. C2POWER Website Tracking Tool results – Geolocation of visits
Period: January 2011 to December 2011

2.5 C2POWER Leaflet

The C2POWER leaflet that was produced for the publicity and visibility of the project, is available for download on the C2POWER Website and has been distributed by the C2POWER consortium in a number of events, such as VTC Spring 2011 conference, WWRF meetings, among others.



FP7 ICT Objective 1.1 The Network of the Future

C2POWER

Cognitive radio and Cooperative strategies for POWER saving in multi-standard wireless devices

C2POWER main objective is to research, develop and demonstrate energy saving technologies for multi-standard wireless mobile devices, exploiting the combination of cognitive radio and cooperative strategies while still enabling the required performance in terms of data rate and QoS to support active applications.

At A Glance: C2POWER

Cognitive radio and Cooperative strategies for POWER saving in multi-standard wireless devices

C2Power

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Project website: www.ict-c2power.eu

Partners: Instituto de Telecomunicações (PT), Portugal Telecom Inovação (PT), Commissariat a l'Energie Atomique (FR), University of Surrey (UK), Center for Research and Telecommunication Experimentation for Networked Communities (IT), Sigint Solutions Ltd. (CY), Wroclawskie Centrum Badan EIT+ SP Z.O.O (PO), EADS Defence and Security Systems (FR), STACCATO (UK), Infineon Technologies AG (DE).

Duration: Jan. 2010-Dec. 2013
Funding scheme: STREP
Total Cost: €6,14m
EC Contribution: €3,46m
Contract Number: INFSO-ICT-248677

Main Objectives

Energy is a critical resource in the design of wireless networks since wireless devices are usually powered by batteries. Without any new approaches for energy saving, 4G mobile users will relentlessly be searching for power outlets rather than network access, and becoming once again bound to a single location. To avoid the so called 4G "energy trap" and to help wireless devices become more environment friendly, there is a clear need for disruptive strategies to address all aspects of power efficiency from the user devices through to the core infrastructure of the network and how these devices and equipments interact with each other. The C2POWER project is the vehicle to address these issues through cognitive and cooperation techniques. The key objectives are to research, develop and demonstrate energy saving technologies for multi-standard wireless mobile devices, exploiting the combination of cognitive radio and cooperative strategies, while still enabling the required performance in terms of QoS to support active applications.

Avoiding the "energy trap" of the Network of the Future

C2POWER requires a wider European approach in order to fulfil the ambitious objectives laid out and to secure a high technology impact factor through standardisation. In the first instance, the consortium structure is highly complementary and driven by academia; bringing large manufacturers, leading edge research organisations together with highly innovative SMEs and more immediate market oriented industry players. Concerning the technology impact, the partners involved are active members of various standardisation organisations (that include IEEE 1900.6, Bluetooth Special Interest Group (SIG), Femto forum, and the ETSI EMTEL Working group) and are capable and committed to place the key project outcomes in these relevant standards.

C2POWER tangible outputs include demonstrators for energy efficient short-range cooperation, and vertical handovers; where the aim is to reduce the power consumption at the mobile device by up to 50%.

Information Society | European Commission

Technical Approach

The implementation of the C2POWER scenarios will progress along collaborative parallel activities that include:

- **Context awareness and signalling for power saving strategies:** investigation and implementation of energy efficient network and node discovery modules;
- **Energy-efficient reconfigurable radio transceivers:** to investigate and implement a transceiver platform that is multi-standard in nature, flexible and energy efficient;
- **Cooperative short range communications for power saving:** to investigate and implement energy efficient algorithms /protocols for short-range communications that include: cooperation protocols based on Utility functions; routing, and cooperative relaying;
- **Energy-efficient cognitive handovers procedures and policies:** to investigate and implement energy efficient cognitive handover algorithms (including femto-cells) and the validation framework;

The aforementioned hardware module /components will be integrated in the proof-of-concept phase to validate two major technology showcases on cooperative short range for power saving using UWB (Ultra Wideband), and energy-efficient cognitive vertical handovers.

Key Issues

The key components of the project includes one, the dominant, specifically dealing with technical aspects and the second one addressing business /management models related to the topic cooperation. At the technical level the key issues are:

- Investigate how context information can be used by cooperative strategies to achieve power efficiency at the wireless interface of mobile devices and save battery lifetime.
- Investigate and demonstrate the potential of cooperative techniques based on advanced short range communications for the goal of power/battery lifetime saving of mobile wireless devices.
- Investigate and demonstrate minimum energy consumption handover procedures and policies between heterogeneous technologies and associated tradeoffs in realistic scenarios.
- Investigate, design and demonstrate energy efficient reconfigurable multi-standard transceivers (BB and RF) able to switch from one standard to another according to a power saving strategy

At the management/business level, the key issue addresses methods and incentives to encourage cooperation among users/handsets and develop attractive business models for the network/service providers to stimulate and motivate cooperative networking among users and between heterogeneous networks.

Expected Impact

C2POWER project targets to impact European Industry and Society on various levels.

The combination of cognitive radio and cooperative networks is still in its infancy and Europe can be considered to be currently level with its major competitors in the USA and Far East. However, this situation is only short-term unless European industry undertakes a concerted research effort on these new disruptive technology paradigms.

The energy saving approaches investigated and developed in C2POWER will assist to make future European communication products and systems more competitive, strengthening their market position. Further, the reduction in energy consumption together with the lowering of the "radio pollution" through energy-aware and more effective radio resource usage will help facilitate more sustainable ICTs in Europe. This is particularly relevant in the context of the Lisbon Agenda and the aim to make the EU "the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010".

C2POWER will contribute to decrease the growing gap between the energy of emerging radio systems and what can be achieved by battery technology evolution accelerating the uptake of the next generation of networks and service infrastructures.

C2POWER January 2010

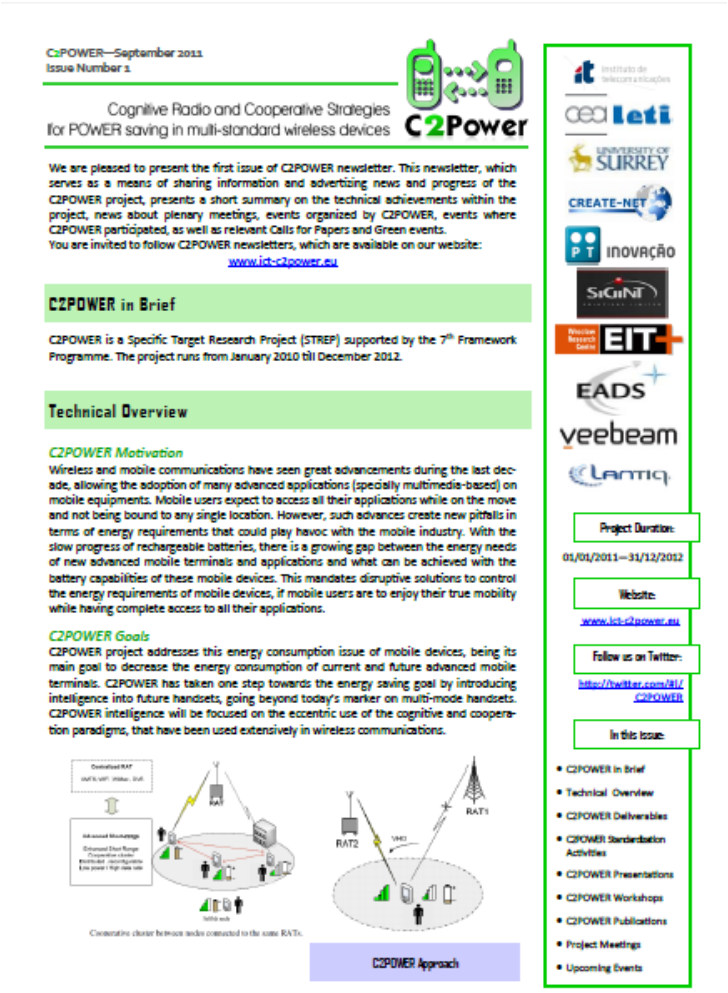
Figure 2-11. C2POWER Leaflet

2.6 C2POWER Newsletter

The C2POWER Newsletter, whose first issue dates from September 2011, contains information pertaining the first 21 months of the project.
In an attempt to cover several aspects of the project, the newsletter is organized as follows:

- C2POWER in Brief
- Technical Overview
- C2POWER Deliverables
- C2POWER Standardization Activities
- C2POWER Presentations
- C2POWER Workshops
- C2POWER Publications
- Project Meetings
- Upcoming Events

This newsletter, which can be found annexed to this deliverable, is available for download on the C2POWER Website and has been disseminated through several channels and mailing lists.


C2POWER—September 2011
Issue Number 1

Cognitive Radio and Cooperative Strategies for POwER saving in multi-standard wireless devices

C2Power

We are pleased to present the first issue of C2POWER newsletter. This newsletter, which serves as a means of sharing information and advertizing news and progress of the C2POWER project, presents a short summary on the technical achievements within the project, news about plenary meetings, events organized by C2POWER, events where C2POWER participated, as well as relevant Calls for Papers and Green events.
You are invited to follow C2POWER newsletters, which are available on our website:
www.ict-c2power.eu

C2POWER in Brief

C2POWER is a Specific Target Research Project (STREP) supported by the 7th Framework Programme. The project runs from January 2010 till December 2012.

Technical Overview

C2POWER Motivation

Wireless and mobile communications have seen great advancements during the last decade, allowing the adoption of many advanced applications (specially multimedia-based) on mobile equipments. Mobile users expect to access all their applications while on the move and not being bound to any single location. However, such advances create new pitfalls in terms of energy requirements that could play havoc with the mobile industry. With the slow progress of rechargeable batteries, there is a growing gap between the energy needs of new advanced mobile terminals and applications and what can be achieved with the battery capabilities of these mobile devices. This mandates disruptive solutions to control the energy requirements of mobile devices, if mobile users are to enjoy their true mobility while having complete access to all their applications.

C2POWER Goals

C2POWER project addresses this energy consumption issue of mobile devices, being its main goal to decrease the energy consumption of current and future advanced mobile terminals. C2POWER has taken one step towards the energy saving goal by introducing intelligence into future handsets, going beyond today's marker on multi-mode handsets. C2POWER intelligence will be focused on the eccentric use of the cognitive and cooperation paradigms, that have been used extensively in wireless communications.

C2POWER Approach

Project Duration:
01/01/2011—31/12/2012

Website:
www.ict-c2power.eu

Follow us on Twitter:
http://twitter.com/#!/C2POWER

In this issue:

- C2POWER in Brief
- Technical Overview
- C2POWER Deliverables
- C2POWER Standardization Activities
- C2POWER Presentations
- C2POWER Workshops
- C2POWER Publications
- Project Meetings
- Upcoming Events

Figure 2-12. C2POWER Newsletter

2.7 Other dissemination activities

C2POWER contributed with the article “C2POWER: Extending and Enhancing the Wireless Experience in Europe” to the Future Networks Technology Briefs.

The Future Networks Technology briefs were published by Future Networks to disseminate the most interesting and important results of Future Networks EU FP7 projects. The Technology briefs target an audience beyond the research community, with the aim to enable less technical audience to understand and appreciate how the future networks research will have an impact on the general public in the future.

3. Standardization Activities

In the standardization activities for the C2POWER project we mainly target the IEEE 1900.6 working group and the ETSI Technical Committee on Reconfigurable Radio Systems (RRS).

3.1 IEEE P1900.6

DySPAN P1900.6a [12] is the project currently followed by the IEEE DySPAN working group 6 (Interfaces and data structures for advanced radio systems). The work at the moment concentrates on amending the current standard to increase its relevance and the buy in from industry. The proposal (the project authorisation request (PAR)) for the amendment (i.e. 1900.6a) was approved in early 2011 and work started in June 2011. The first step was to define and agree on the mode of work, actual technical contributions started in the middle of summer. The contributions/technical input collection is scheduled to last until the end of March 2012, but additional input will very likely be taken into account beyond that date. The project is an amendment to the current IEEE 1900.6 standard (published in April 2011) and this amendment aims at extending the initial interface definitions and to provide concrete use cases that are attractive to industry (i.e. the aim is to make the standard as attractive as possible for wider industry pick-up).

This current situation opens a number of possibilities for C2POWER; the project has a system architecture and message sequences have been defined in the WPs2, 3 and 5 work. The 1900.6 interfaces, as defined in the original standard, mainly deal with information on spectrum usage, interference power levels, and have aimed mainly at information necessary to increase spectrum efficiency; energy efficiency was not taken into account.

The same applies for the use cases and for the corresponding message exchange; C2POWER can make a case to extend the scope of 1900.6 towards including energy efficiency. C2POWER already provided input, during a presentation at the December 2010 meeting in Florida, where the principles and the proposal for inclusion of energy efficiency aspects into the sensing/data interfaces was proposed and this has influenced the definition of the current standards project (i.e. P1900.6a).

For C2POWER there is a window of opportunity to provide input, and this should help to exploit the work done so far. To secure contribution, there will be no need for additional technical work, but it will be necessary to review the current 1900.6 standard, to analyse the interfaces and then to identify those interfaces from the C2POWER system architecture that are not represented in the 1900.6 model. The same applies for the use cases and message sequences. CREATE-NET assisted by University of Surrey will drive this standardization effort in 2012.

3.2 Femto-Forum

C2POWER aims to have scientific impact by promoting energy efficiency as a key driver for initiating/triggering handovers in femto cell based scenarios. Today´s vision adopts femtocell technology as a means of improving coverage for indoor environment to support broadband services. However, C2POWER targets to shift the vision within the forum to towards energy-efficient as a complementary driver towards femto for indoors, and to promote business cases for energy saving. Key manufacturers and operators play a pivotal role in this forum, and thus C2POWER foresees the forum as important means of influencing technology trends towards energy saving and a bridge towards influencing 3GPP standardization. C2POWER aims to address “how energy efficient technology works” based on using contextual information, and we will address white papers targeting these issues. PTIN and LANTIQ will be the responsible partners for liaisons with the FemtoForum [5], and are ready to promote their first contribution at the next plenary meeting in 2012.

3.3 ETSI-RRS (Reconfigurable Radio Systems)

C2POWER follows ETSI RRS [6] meetings and phone conferences on a regular basis, monitoring current affairs as well as contributing to any potentially related study items. At the moment C2POWER partners are involved in the development of technical report TR 102.684 on *Reconfigurable Radio Systems Feasibility Study on Control Channels for Cognitive Radio Systems*. Within the report C2POWER partners are supporting architectural solutions for cognitive control channels that shall resemble the technical solution proposed for cooperative relaying in deliverables D2.1 and D2.2 of C2POWER. In the scope of cognitive control channel definition C2POWER has taken part also in the development of two Change Requests (CR) through which C2POWER promotes utilization of short-range cooperative networking. The CRs evaluate Bluetooth and WiMedia technologies as potential options for implementation of cognitive control channels for reconfigurable radio systems, the corresponding CRs are: RRSWG3(11)0036 *WiMedia UWB based implementation option* and RRSWG3(11)0030r1 *Bluetooth based implementation option*.

Furthermore, C2POWER plans to submit Work Item (WI) proposal Study on Use Cases related to Improvement of Energy Efficiency in operating Heterogeneous Wireless Networks. The effort initially started within the FP7 project CONSERN is now planned to be continued by C2POWER partners involved in ETSI RRS. In case the WI will be approved by the ETSI RRS technical committee then C2POWER partners will provide a detailed description of C2POWER scenarios for energy efficiency of reconfigurable radio terminals to the newly opened study item.

3.4 ETSI EMTEL Working group

Cassidian role in ETSI EMTEL [7] is much reduced since internal resources allocated towards this effort have left the company.

3.5 PSCE Forum (Public Safety Communication Europe Forum)

The Public Safety Communication Europe Forum (PSCE) [13] is a permanent autonomous organisation aiming at improving provision of public safety communications and information management systems and the safety of the citizens during crisis and emergency situations. The PSCE provides a unique common platform for researchers, industry and users enabling regular exchange of ideas, information, experiences and best practices.

The PSCE Forum was launched in 2006 (for an initial duration of three years) under the aegis of the European Commission's Directorate-General for Information Society and Media (DG INFSO). In 2009 it became an autonomous and non-profit organization, which has been steadily growing in its membership and scope over the past years.

PSCE regularly organizes biannual conferences traditionally attracting over 100 international participants from more than 20 countries. They aim at bringing together top-level policymakers, academic researchers, industrial experts and other interested stakeholders to discuss the new developments in the area of public safety communications and reach out to a wider European audience. PSCE is an expert in provision of enhanced and well elaborated communication. PSCE delivers a range of regular publications offering news and information towards its constituency and stakeholders. It provides a tailored made dissemination support and communication services also to external research projects in order to promote their results and increase the awareness of targeted audience.

Cassidian is an institutional member of PSCE since its establishment. Currently, the chairmanship of the Industry Committee is hold by Cassidian. This offers a good opportunity to present the achievements of C2POWER during PSCE annual conferences. Moreover, Cassidian has the possibility to suggest articles in PSCE Newsletter which are issued 4 times a year. Public safety powers saving requirements are tremendously more demanding than the typical 3G/4G public cellular perspective, due to its safety

criticality. Hence, C2POWER optimization results in year 3 are key for future standard evolutions dedicated to public safety communications.

PTIN will also officially target their efforts towards the ETSI group as a C2POWER standardization commitment, where they have been already monitoring progress within the ETSI RSS group.

3.6 (ETSI) European Telecommunications Standards Institute

The ETSI (European Telecommunications Standards Institute) is an independent, non-profit, standardization organization in the telecommunications industry (equipment makers and network operators) in Europe, with worldwide projection. ETSI produces standards and specifications supporting EU and EFTA policy issues such as the New Approach, other EU legislation (e.g. Electronic Fee Collection, the interoperability regulation under the Single European Sky (SES) initiative, the Electronic Communication Network and Services Framework Directives), mandated activity and other EU initiatives (e.g. Strategy 2020 and Digital Agenda).

In terms of C2POWER impact, we are currently investigating the results of the use case scenario in WP6, which targets energy efficient handovers between macro and femto-cell, that could be relevant for influencing standards. Specifically, the scenario we are targeting focuses on femto equipment's that are usually installed by home users to get better indoor voice and data coverage promising high capacity then the macro cell coverage. However, there are still some technical challenges to solve such as integration with the macro cell layer and interference management that can be a drawback towards the full adoption of this technology. The C2POWER architecture provides a context information workframe that increases significantly the accuracy and performance of any cognitive approaches and can be used to solve the above mentioned femto drawbacks. The standardization of mechanisms, that guarantees a perfect integration of the femto technology and minimize interference issues, in the context of ETSI are of vital importance for a full adoption of the femto technology. PTIN are active in ETSI, and are responsible for promoting the visibility of C2POWER results within the working groups.

4. Relationship with initiatives and other projects

Relationships with other projects and initiatives sharing the same topic of interests are also of importance for the C2POWER project. The objective is to strengthen the C2POWER position in standardization activities and to exploit the synergies between European projects.

4.1 Initiatives

C2POWER intended to contribute via tutorial presentations and White Papers to international research organizations, forums and initiatives.

4.1.1 GREENTOUCH

GreenTouch [10] is a consortium of leading Information and Communications Technology (ICT) industry, academic and non-governmental research experts dedicated to fundamentally transforming communications and data networks, including the Internet, and significantly reducing the carbon footprint of ICT devices, platforms and networks.
PTIN is a member of the influential GREENTOUCH initiative, and will be committed to promote the visibility of C2POWER results throughout 2012 in this forum. This is commitment had been formally identified as part of their activities in T8.1 on dissemination.

4.1.2 WWRF

Wireless World Research Forum (WWRF) [11] is a global organisation, which was founded in 2001. The forum has over 140 members from all over the world, representing all sectors of the communications industry and research community.

The objective of the forum is to formulate visions on strategic future research directions in the wireless field and to generate, identify, and promote research areas and technical trends for mobile and wireless system technologies.

The forum is developing a common global vision for the future of wireless technologies to derive research and standardizations. Moreover, WWRF members contribute to the work done within ITU, UMTS Forum, ETSI, 3GPP, 3GPP2, IETF, among other bodies regarding standardisation issues.

The forum brings together strong industrial and academic members from across the globe in an active discussion of new concepts, algorithms and techniques.

Working Groups

The forum has 8 active Working Groups (WGs) in addition to a new starting one, as follows:

- WG1: Human Perspective and future service concepts
- WG2: Services and Service Architectures
- WG3: Communication Architectures
- WG4: New Air Interfaces, Relay-based Systems and Smart Antennas
- WG5: Short Range Communications Systems
- WG6: Cognitive Networks and Systems for a Wireless Future Internet
- WG7: Security and Trust
- WG8: Spectrum Issues

and the new WG:

- WG ad hoc: Wireless for Emerging Economics

Each WG concentrates on a group of issues related to one topic or several close topics. Members working within each working group usually collaborate to produce white papers on the relative topics. When enough materials are available, WGs assemble the produced white papers into a book. On the hand, papers with the highest quality presented at the WWRF meetings, are also invited for submitting

an extended version to IEEE WWRF VTC joint journals. A list of WWRF published books can be found on WWRF website, along with the IEEE WWRF VTC journal published issues.

4.1.2.1 C2POWER Goal

C2POWER consortium (represented by WWRF members IT and LANTIQ) is planning to be involved in WWRF meetings and activities. C2POWER partners will be involved in submitting papers for the periodic meetings of WWRF, as well as contributing to the white papers within the relative WGs.
The targeted WGs are mainly WG4 “New Air Interfaces, Relay-based Systems and Smart Antennas” and WG5 “Short Range Communications Systems”, with possible future contributions to WG6 “Cognitive Networks and Systems for Wireless Future Internet”.
From attending the meetings, C2POWER consortium expects to establish good connections with strong industrial and academic representatives for future collaborations and further visibility of the project globe wise. On the other hand, C2POWER partners will monitor and contribute to the relative white papers with the potential of contributing to future WWRF books.

4.1.2.2 C2POWER Activities

IT was active during the year 2010. C2POWER has attended WWRF meetings, represented by IT in April 2010 and by IT and LANTIQ in November 2010.
In April 2010 meeting, IT was an invited speaker at WG8 to represent the C2POWER project, which was almost starting at the time.
In November 2010 meeting, IT participated in two WGs (WG4 and WG5) with two papers. The two papers are published in the proceedings of the WWRF meetings.

In 2011, C2POWER stayed active in the forum, represented by IT.
IT attended WWRF meetings in Qatar, in April 2011, representing C2POWER Project. IT was invited as a guest speaker in the working group WG4. During the meeting, IT presented two papers in addition to a general presentation on the C2POWER project. The first paper focused on energy efficient power amplifier designed for mobile terminals, while the second paper covered energy efficient node discovery algorithms.

4.1.3 COST IC0902

During the year 2010 a new opportunity arouse for C2POWER to disseminate its results and establish new collaborative links through IC0902 COST action [15]. Due to the popularity of the action and potential collaborative opportunities C2POWER decided to follow the action and the section contains general description of the action as well as up-to-date C2POWER efforts within the action.

The IC0902 Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks action is funded by the inter-governmental framework for European Cooperation in Science and Technology (COST) in the Information and Communication Technologies (ICT) domain. The action involves ICT researchers from almost 30 countries inside and outside Europe.

The action’s main objective is to integrate cognitive radio research efforts from all layers of digital communication system design to form and define pan-European platform for cognitive radio and networks. The cognitive radio concept popularized by the action assumes cross-layered approach towards problems of coexistence between heterogeneous wireless devices and networks. The coexistence issues shall be resolved by means of spectrum sensing-based link adaptation, intelligent resource allocation and resource efficient selection between multiple available radio networks. The action’s objectives are realized through a convergence of wide-range of both scientific and industrial expertize provided by over 30 academic and industrial partners.

Duration of the action: December 2009 – December 2013

C2POWER consortium is represented within the COST IC0902 action by WCB, which is highly involved in the action affairs also as a part of the action's Management Committee.

4.1.3.1 C2POWER activities

C2POWER has started its activities within the action with a presentation on "Novel clustering framework for energy efficient short-range cooperative networking" during the first joint workshop of the action in November 2010. The presentation involved enough attention to encourage C2POWER consortium into higher involvement in the action. As a result during the second workshop of the action in October 2011, C2POWER has presented its cooperative solutions along with the intermediate results in the speech entitled "Cooperative strategies for energy savings using context information". The presentation received a positive feedback from the audience and follow up presentations on the status of WP5 common simulator are further planned.

The C2POWER consortium constantly monitors the current state of affairs within the action by taking part in the Management Committee meetings as well as in any corresponding teleconferences. The action is anticipated as a potential source of new collaborative initiatives and dissemination activities. For the forthcoming year, apart from submitting update on C2POWER WP5 common simulator, C2POWER plans to participate with a lecture in the IC0902 Summer School on Cognitive Radio.

4.1.4 FP7 Clusters and Concertation meetings

The driver for the Concertation meeting is to bring together the ongoing FP7 projects funded under the Network of the Future objective, facilitate exchange of results and achievements, and to build consensus. The event is organised by the Future Networks Unit within the Information Society and Media Directorate General (DG INFSO) of the European Commission. The Network of the Future projects are organised into three clusters: Future Internet Technologies (FI Cluster), Radio Access and Spectrum (RAS Cluster) and Converged and Optical Networks (CaON Cluster). The key objectives include:

- To support the ongoing FP7 projects in sharing their latest research achievements
- To enhance the project cooperation activities, share best practices and opportunities for (pre-) standardisation
- To set future activities and topics of common interest for each cluster
- To facilitate networking and discussion among the participants

4.1.4.1 C2POWER Activities

C2POWER belongs to the RAS (Radio Access & Spectrum) Cluster and the project coordinator has attended two Concertation meetings in 2010, as stated earlier in Deliverable D8.2

In 2011, C2POWER became even more active in the Concertation Meetings and within the cluster. C2POWER, represented by IT, attended the two Concertation Meeting organized in 2011, as follows:

- **7th FP7 Concertation meeting (Feb 2011):** C2POWER attended this cluster meeting and was a key player in the RAS cluster meeting. C2POWER initiated and organised a Green Communication Special Session. The Special session included a panel of European experts on Green Communications, representing different EU projects, which deal with energy efficiency and savings in current networks including mobile, wireless and fixed networks. The panel consisted of Ayman Radwan, the Technical Manager of C2POWER as a representative of C2POWER and panel moderator; Dietrich Zeller, the Coordinator of EARTH; Kostas Tsagkari, a representative of OneFIT project; and Fabio Neri, the late coordinator of TREND.
  Each panel member presented their perspective project. A panel session was conducted which had very productive conversation about the main contributors to energy consumption in communication networks. The panel was well received by the Cluster and the members of the Cluster encouraged more sessions similar to the Green Special Session.

- **8th FP7 Concertation meeting (Oct. 2011): Cross-Cluster Green Networks Workshop**
  After the success of the previous Green Session and the panel session in the 2nd C2POWER workshop, more projects addressing Green Communications got interested and involved in participating in a common workshop and panel sessions with Green Projects. The meetings between different projects involved in energy efficiency really enriched the conversations and opened new fields and topics for discussion and research. As a result, the initiative of organising a workshop co-located with the Concertation meeting came along. The initiative started as a combined effort between several projects, with EARTH being the main organizer of the workshop. Alongside C2POWER, the two EU projects TREND and ECONET joined the workshop. The workshop consisted of two papers from each involved project, in addition to a panel session consisting of representatives of all projects. C2POWER had a good presentation with two representatives, namely Ayman Radwan (from IT) – the Project Technical Manager – and Jacek Kibilda (from WCB). Each C2POWER representative presented a paper as follows:
    - **Ayman Radwan:** "Evaluation of Cooperative algorithms for energy savings," Michele Albano, Ayman Radwan, and Jonathan Rodriguez.
    - **Jacek Kibilda:** "Business Models for cooperative networks in multi-standard wireless networks," Jacek Kibilda, Ayman Radwan, and Jonathan Rodriguez.

  The two papers represented two different C2POWER WPs, namely WP5 on Cooperative algorithms in Homogeneous Networks and WP2 on Business Models, respectively. The workshop involved only oral presentations without publications.

  The workshop was concluded by an exciting panel session, which consisted of the following panellists:
    - **Luis M. Correia,** representing EARTH as the moderator
    - **Raffaele Bolla,** representing ECONET
    - **Ayman Radwan,** representing C2POWER
    - **Adam Wolisz,** representing TREND
    - **Dietrich Zeller,** representing EARTH

  The workshop addressed the question "Which are the most promising techniques being developed, and how much they will contribute to reduce energy consumption?". The discussion was a very interesting one, with debates between different panel members about which energy saving technique is the most efficient and which part of the network needs the most attention with regards to energy efficiency. The conclusion was that most techniques will add to the energy savings, with a very important point raised about the importance of decreasing the transferred data, which would result in a big amount of energy savings. All Panel members also agreed that despite that energy consumption in mobile terminals do not contribute with a high percentage to the total energy consumption of the network, it is still a very important topic to tackle due to the falling behind of the battery industry in respect to the energy requirements of the current advanced mobile devices.

- **8th FP7 Concertation meeting (Oct. 2011):** Within the agenda of the RAS Cluster meeting, a C2POWER presentation was also scheduled to present the progress of the project during the last year. Due to some earlier sessions running longer than scheduled, Ayman Radwan, as the representative of C2POWER, was not able to present C2POWER progress in the RAS cluster meeting, because he had to join the Cross Cluster Green Workshop.

4.2 FP7 projects

4.2.1 TREND

C2POWER has established close collaborative ties with other EU projects addressing Green Networks and Energy Efficiency. One of these collaborating projects is the project TREND [8], with whom C2POWER collaborated in the organization of a number of events and workshops. Being a member of TREND Advisory Board, C2POWER was invited regularly to attend TREND meetings and present C2POWER ideas and progress. Up to date, C2POWER has attended the following TREND Plenary Meetings:

- **TREND Plenary meeting, 1-2 March 2011, Paris, France**
  C2POWER attended the TREND Advisory Board meeting, held in Paris, France, presenting a global overview of the projects results and ongoing research. C2POWER was represented by IT.

- **TREND Plenary meeting, 26-27 September 2011, Madrid Spain**
  In this meeting, Ayman Radwan (Project Technical Manager) attended the TREND Plenary meeting. The meeting included presentations from different projects and collaborating institutes. Ayman presented an overview of C2POWER to introduce new audience to C2POWER project, then proceeded to provide some progress and results from different WPs.

In addition, C2POWER and trend collaborated in other activities. TREND was one of the invited projects to attend the Green Special Session in RAS Cluster meeting, in February 2011.
Moreover, C2POWER was invited by the TREND Coordinator to participate in the Panel Session organized by Marco Ajmone Marsan within the 25th Annual Computer Communications Workshop (CCW), which is the Annual Flagship workshop of the Technical Committee on Computer Communications (TCCC) of the IEEE Communications Society.
Further joint activities, again in form of workshop support and submission of joint publications are foreseen for the forthcoming reporting period. This may include but not limited to invitation to the Third C2POWER workshop, a co-organized workshop between different Green projects and invited talks during plenary meetings.

4.2.2 EARTH

C2POWER and EARTH [9] have an active relationship, mainly implemented through one of the partners who is member of both consortia. This enables a clear separation and alignment of work while at the same time it helps ensuring that topics are covered without generating undue overlaps.
So far, there were a number of joint activities, including the joint submission of papers as well as the participation and support from C2POWER of a workshop on green communication that was organised by the EARTH project, as stated earlier in Section 4.1.4.
EARTH was also one of the invited projects as a panellist during the Second C2POWER Workshop.

Further joint activities, again in form of workshop support and submission of joint publications are foreseen for the forthcoming reporting period. This may include but not limited to invitation to the Third C2POWER workshop, a co-organized workshop between different Green projects and invited talks during plenary meetings.

4.2.3 GREENET

The coordinators of the Marie Curie Project GREENET were invited to do a presentation on the project in the 2nd C2POWER Workshop.
GREENET is an Initial Training Network (ITN) Marie Curie project that is focused on the analysis, design, and optimization of energy efficient wireless communication systems and networks.
Further joint activities, for the upcoming year, are in planning, which may include the common organization of events and other research collaboration possibilities.

4.2.4 SACRA

SACRA is another EU project, with which C2POWER has plans of collaboration. SACRA is an FP7 project targeting energy efficiency and flexibility in the use of radio spectrum. There have been talks and plans for future collaboration during 2011.
C2POWER project has been invited to present at the coming SACRA workshop, which is scheduled for 23rd February 2012 in the “Centre International de Communication Avancee”, France.
C2POWER will be attending the workshop to present its latest results and achievements.

5. Conclusions and Future Work

The C2POWER project, as reported in this deliverable, has had an excellent year during the period of 2011 (M13-M24). The excellences are achieved in terms of the published C2POWER scientific results in high quality journals and international conferences, presenting C2POWER technologies and reputed institutes, organizing high quality Workshop at a reputed international conference, and moreover contributing towards well known standardization committees and groups.

The objectives of the work package were well met with excellence and further goals and plans are to be set for the final year of the project.

In the final year of the project, in addition to the current activities, the consortium is targeting mainly the standardization groups to contribute towards their technical activities by producing technical documents as a result of the C2POWER research work. Furthermore, a technology exploitation plan is also to be set in order to commercialize and publicise the technical achievements generated within the lifetime of the C2POWER project.

6. References

[1] C2POWER WP8 Deliverable-1, D8.1: C2POWER Dissemination Plan, M3, March 2010

[2] C2POWER WP8 Deliverable-2, D8.2: Standardization and Dissemination Activity Report, M12, December 2010

[3] The 1st International C2POWER Workshop, ICST MOBIMEDIA Conference, 8 September 2010, Lisbon: http://www.mobimedia.org/2010/ws_c2power.shtml

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[5] http://www.femtoforum.org/femto/

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[12] http://standards.ieee.org/develop/wg/DYSPAN-P1900.6.html

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[14] http://acts.ing.uniroma1.it/IC0902/