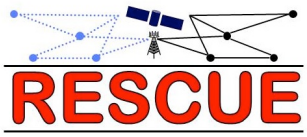

ICT- 619555 RESCUE

D5.4 Version 1.0

First Dissemination, Standardization and Exploitation Report

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Abstract:

This document presents our dissemination, standardization and exploitation results in the first half of RESCUE project period, i.e., internet dissemination activities, dissemination and training activities, demonstrations and workshops, clustering activities and standardization activities.

Keyword list:

Unpredictable environments, Decode-and-Forward, Erroneous Relay, Dissemination, Standardization, Exploitation

Disclaimer:

Executive Summary

This document describes all dissemination related actives of RESCUE project during the first half of project time period, i.e., internet dissemination activities, dissemination and training activities, demonstrations and workshops, clustering activities and standardization activities which disseminated and exploited the results and knowledge during this time period. RESCUE main objectives and expected impact are also summarised here to explain how the dissemination actives have fulfilled RESCUE project's global dissemination and exploitation plan.

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List of Acronyms and Abbreviations

Term	Description
3GPP	3rd Generation Partnership Project
AFI	Autonomic Future Internet
C-ACC	Cooperative Advanced Cruise Control
EC	European Commission
ETSI	European Telecommunications Standards Institute
EU	European Union
FP7	the Seventh Framework Programme
GANA	Generic Autonomic Network Architecture
GS	Group Specifications
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IPR	Intellectual Property Rights
M2M	Machine-to-Machine
MIMO	Multi-Input Multi-Output
NTECH	Working Group of the ETSI Network Technologies
PSN	Public Safety Networks
RESCUE	Links-on-the-fly Technology for Robust, Efficient and Smart communication in Unpredictable Environments
SVN	Subversion
V2V	Vehicular-to-Vehicular
WSN	Wireless Sensor Networks

1. Introduction

1.1 RESCUE Motivation

Wireless communications in some critical networks, such as public safety scenario or autonomous drive scenario, require robust, reliable, and extremely high spectral efficiency, not only in terms of point-to-point communication, but also in terms of the network as a whole. To approach this goal, careful planning, deployment and efficient operation of the infrastructure can deliver such means of communication. However, communication infrastructure itself might be severely destroyed during disasters. More problematically, the operation of the wireless communication network is attacked from two sides, the limited capacity provided by the remaining infrastructure and the increasing communication demand of users.

RESCUE addresses the above challenge through efficiently utilize the characteristics of future wireless networks, which are expected to be dense in terms of node and link populations and heterogeneous in terms of their built-in capabilities. A network design based on these principles is expected to be robust and flexible towards the destruction of infrastructure but also energy and spectral-efficient.

1.2 RESCUE Objectives

RESCUE aims to design, develop and test an innovative adaptive networking platform, and is striving to achieve the following measurable goals.

- Achieving the factor 10 capacity enhancement and factor 10 frequency efficiency increase required by the EU call. RESCUE project will establish the fundamental theory of links-on-the-fly paradigm (D1.2.1 & D1.2.2) and utilize it to enhance several key PHY layer technologies:
  1) Employing the links-on-the-fly concept in various toy scenarios of cooperative communications (D1.2.1 & D1.2.2). It will be shown that, by adopting an optimised way of erroneous forward (or called lossy forward), the RESCUE approach of cooperative communication can outperform the conventional fully decode-and-forward or the CRC-based selective-forward approach by around 5-10 dB gain. The maximal gain will be achieved when the frame size is maximised.
  2) Employing the links-on-the-fly concept in cooperative communications assisted with multi-input multi-output (MIMO) relay and other non-orthogonal multiple access techniques such as IDMA. (D1.3). It will be shown that the links-on-the-fly technology can largely improve the forwarding efficiency of MIMO-relay and IDMA-relay without need of all users' message to be correctly reconstructed at the relay node. By this means, the efficiency of multi-user cooperative communication can be increased almost linearly with the number of users, and this will contribute 10dB or more spectral efficiency gain in comparison with the fully decode-forward or the CRC-based selective-forward approach.

- Reducing the required transmit power by 1/4 per-bit and 10 times the outage probability as the measure of the network flexibility and robustness in the time-varying topology environments in future wireless networks. These objectives will be achieved by combining the following research contributions
  1) RESCUE will develop reliable estimation algorithm for the destination to understand the decoding error-ratio at relays. By this means, the destination can largely improve the efficiency of multi-link diversity combining without increasing the signaling overhead between the relays and destination. As a consequence, the RESCUE approach can largely reduce the transmit power of decode-forward protocols, which were mainly paid for inefficient diversity combine as well as unnecessary signaling (D2.1.1 and D2.1.2). Moreover, efficient diversity combine at the destination can largely improve the end-to-end reliability, which will be reflected in terms of BER or outage probability.
  2) Transmit power optimization for the links-on-the-fly technology can help RESCUE

sub-system to optimally allocate transmit-power to a number of carefully selected relays or a number of frames/symbols sent by a relay. It will be shown that a carefully design distributed power allocation approach can largely improve the transmit energy efficiency in unit of J/bit (D2.2.1 and D2.2.2). Conversely, given the constraint of transmit-power, the end-to-end link reliability will be largely improved. Again the improvement of link reliability will be reflected in terms of BER or outage probability.

- Achieving the performance curves 2-3 dB away from the theoretical limits identified by WP1, both in static and time-varying scenarios. This result relies on the efficiency of the MAC and routing protocols capable with limited overhead to achieve performance close to the theoretical physical layer bounds. These protocols will be developed in WP3 (D3.1 and D3.2) and their performance assessed through simulations (D3.2), and with test-bed experiments (D3.3 and D4.4).

Moreover, RESCUE aims at building a functioning test platform for performance verification and demonstration its exploitation in a public safety and Vehicular-to-Vehicular (V2V) user cases. It targets not only the extension and development of new techniques and algorithms, but most importantly its real world evaluation and validation user realistic constraints.

1.3 RESCUE Impacts

The RESCUE project address "Future Networks" objective, in ICT Work Programme ICT-2011.1.1 Future Networks, aiming to maintain application (i.e., public safety scenario or autonomous drive scenario) specific performance represented by distortion achieved even through links of dense multi-hop/mesh networks are partially lossy (errors are inserted before encoding). Therefore the expected impacts are listed below as:

- Strengthened positioning of European safety industry and vehicle industry in the field of Future Network technologies and reinforced European leadership in wireless networks, public safety technologies, and autonomous car technologies;
- Increased economic efficiency of access/transport infrastructures;
- Global standards, interoperability and European IPRs reflecting federated and coherent roadmaps;
- Wider market opportunities from new classes of applications taking advantage of convergence;
- Accelerated uptake of the next generation of network and service infrastructures.

To deliver all the expected impacts, we have planned various types of activities in dissemination, standardization and exploitation. The achieved results within RESCUE for the first half have been summarized in the rest of this deliverable.

2. RESCUE Dissemination Activities

Highly innovative approaches to super dense and heterogeneous networks are embraced by the RESCUE project, extending considerably current state-of-the-art. Thus it is expected that important scientific and technological research results are obtained within RESCUE. Raising awareness among the public will strengthen the impact of the proposed technology. An essential goal is to communicate and explain the results and achievements of this project within the European Framework Programme. Furthermore, publications are considered as an indispensable method for dissemination. The results achieved within this project in the first half have been made available to the research community in several ways:

- Establishing and maintaining internet dissemination activities, i.e., a dedicated internet public project website, various types of social network profiles
- Publication at international communications, public safety and vehicle technology conferences;
- Publication in relevant journals;
- Contributions to research forums and platforms, like EUCNC;
- Cooperation with other EU ICT projects;
- Demonstration events, which show applicability and improvements of RESCUE technology;

- Press releases about objectives and achievements within the project

Many of the consortium members are internationally well-known for their high quality and world leading contributions in mobile radio communication systems and positioning. This is also an excellent basis for the promotion of RESRUCE results with scientific literature.

At the same time, it is also the purpose of RESCUE to generate sufficient interest and acceptance among the non-technical public. In particular press releases and articles, demonstrations and internet presentations in dedicated format targeting especially this audience, are also considered as appropriate ways of dissemination among a broader public.

2.1 RESCUE Internet Dissemination Activities

In this section, the RESCUE internet dissemination activities results during the first half are summarised as below.

2.1.1 RESCUE project website

As planned, a public website has been setup (http://www.ict-rescue.eu), contributing towards the visibility of the RESCUE project, including the dissemination of its achievements and results, attracting the attention of a broad public audience to this project. With growing knowledge and results from the project, the RESCUE website will become a valuable tool, as well as an important source of information for service providers, manufacturers and end users, enhancing public awareness for the topic. The website, which is regularly updating in accordance with the evolution of the project, contains a description of the key issues, technical approaches, expected impacts of the project, and actual news and announcements from RESCUE, in appropriately indexed web pages. Press releases, public deliverables (approved by all project partners and the EC), and papers which have been presented at relevant conference or workshops, of have been published in international or national journals, are available in this website. For copyright reasons, full paper are not always be straightforwardly downloaded directly from the website. The RESCUE website is maintained by UBITECH.

Furthermore, an internal SVN server (enhanced functional FTP server with version control etc.), managed by AGH, acts as an internal exchange platform, providing all consortium partners with the most up-to-date documentation, representing a valuable tool in RESCUE, particularly in the shared edition of documents.

2.1.2 Social network profiles management

A dedicated twitter account (https://twitter.com/ict_rescue) and Linkedin group (https://www.linkedin.com/groups/RESCUE-7429219?home=&gid=7429219&trk=groups_management_participants-h-logo) have also been set up to synergy with the RESCUE dedicated website. The main purpose is to distribute RESCUE through professional networks of consortium members.

2.2 RESCUE Dissemination and Training Activities

At the time of edition of this deliverable, several RESCUE papers have been published or accepted for publication in various journals or conference proceedings. Talks and tutorials have been given in various international conference and workshop. A summer school is under preparing and will be held in August, 2015.

2.2.1 Publications

2.2.1.1 Journal publications

IEEE Transactions on Vehicular Technology

- H. Chen, R. G. Maunder, Y. Ma, R. Tafazolli, L. Hanzo, "**Hybrid ARQ aided short Fountain Codes designed for block-fading channels**," IEEE Trans. Veh. Tech., To appear in 2015 issues.
    - This work will contribute to D 1.3

IEEE Transactions on Wireless Communications

- X. Zhou, M. Cheng, X. He, and T. Matsumoto, "**Exact and Approximated Outage Probability Analyses for Decode-and-Forward Relaying System Allowing Intra-link Errors**", IEEE Trans. Wireless Commun., vol. 13., no. 12, pp. 7062-7071, Dec. 2014.
    - This work has been contributed to D1.2.1

IEEE Wireless Communications Letters

- J. Hou, Y. Ma, N. Yi, R. Tafazolli, "**Reduced-Complexity Coordinated Beamforming for Multicell Downlink Max–Min SINR Problem**," IEEE Wireless Communications Letters, vol. 3, no. 4, pp. 353-356, Aug. 2014.
    - This work has been contributed to D1.4.

IEEE Communication Letters

- M. Matthé, L. L. Mendes, and G. Fettweis, "**GFDM in a Gabor Transform Setting**," IEEE Commun. Lett., vol. 18, no. 8, pp 1379-1382, Aug. 2014.
    - This work has been contributed to D1.4

EURASIP Journal on Wireless Communications and Networking

- M. Matthé, L. Mendes, I. Gaspar, N. Michailow, and G. Fettweis, "**Multi-User Time-Reversal STC-GFDM for 5G Networks**," EURASIP J. Wirel. Commun. Netw., 2015.
    - This work will be contributed to D1.4

IEICE Transaction on Communications

- K. Wu, K. Anwar, and T. Matsumoto, "**BICM-ID-Based IDMA: Convergence and Rate Region Analyses**", IEICE Trans. Commun., vol. E97-B, no. 7, July 2014.
    - This work has been contributed to D1.4 and D2.1.1

2.2.1.2 Conference, event and publications in specialized media

EuCNC 2014, Bologna, Italy, 23-16 June 2014

- K. Anwar, R. Datta, A. Festag, G. Fettweis, G. Del Galdo, S. Gurgul, M. Juntti**,** H. Khalifé, P. Komulainen**,** Y. Ma, F. Mariani, M. Matthe, T. Matsumoto, G. Millar, M. Natkaniec, C. Schneider, S. Szott, R. Tafazolli, R. Thomä, J. Wszolek, P. Xiao, and N. Yi, "**RESCUE: Links-on-the-fly Technology for Robust, Efficient and Smart Communication in Unpredictable Environments**," EuCNC, Bologna, Italy, 23-16 June 2014.
    - This is the joint publication of the whole consortium.

EW 2014, Barcelona, Spain, 14-16 May 2014

- M. Matthé, L. L. Mendes, and G. Fettweis, "**Space-Time Coding for Generalized Frequency Division Multiplexing**," in European Wireless 2014, Barcelona, Spain, 14-16 May 2014.
    - This work has been contributed to D1.4

- X. Zhou, M. Cheng, X. He, K. Anwar, and T. Matsumoto, "**Outage Analysis of Decode-and-Forward Relaying System Allowing Intra-link Errors**", in European Wireless 2014, Barcelona, Spain, 14-16 May 2014.
    - This work has been contributed to D1.2.1

ISITA 2014, Melbourne, Australia, October 26-29, 2014

- K. Wu, K. Anwar and T. Matsumoto, "**Joint Turbo Equalization and BICM-ID-based IDMA over Frequency Selective Fading Channel**", IEEE International Symposium on Information Theory and Its Application (ISITA) October 26-29, 2014, Melbourne, Australia.
    - This work has been contributed to both D1.4 and D2.1.1

VTC 2015, Glasgow, Scotland, 11-14 May, 2015

- Sebastian Kühlmorgen, Ignacio Llatser, Andreas Festag, Gerhard Fettweis, "**Performance Evaluation of ETSI GeoNetworking for Vehicular Ad hoc Networks**", IEEE 81st Vehicular Technology Conference (VTC2015-Spring), Glasgow, Scotland, 11-14 May 2015.

IWSDN-ICC 2015, London, UK, 8-12 June, 2015

- S. Qian, M. Cheng, T. Matsumoto, "**Outage based Power Allocation for a Lossy-Forwarding Relaying System**", in International Workshop on Advanced PHY and MAC Techniques for Super Dense Wireless Networks (IWSDN) in Conjunction with ICC, London, UK, 8-12 June, 2015.
    - This work has been contributed to D2.2.1
- M. Matthé, L. L. Mendes, and G. P. Fettweis, "**Asynchronous Multi-User Uplink Transmission with Generalized Frequency Division Multiplexing**," in International Workshop on Advanced PHY and MAC Techniques for Super Dense Wireless Networks (IWSDN) in Conjunction with ICC, London, UK, 8-12 June, 2015.
- M. Nur Hasan and K. Anwar, "**Massive Uncoordinated Multi-way Relay Networks with Simul- taneous Detections**," in International Workshop on Advanced PHY and MAC Techniques for Super Dense Wireless Networks (IWSDN) in Conjunction with ICC, London, UK, 8-12 June, 2015.

EuCAP 2015, Lisbon, Portugal, 12-17 April, 2015

- M. Kaeske and R.S. Thomae, "**Maximum-Likelihood based estimation of angular parameters of Dense-Multipath-Components**", in Antennas and Propagation (EuCAP), 2015 9th European Conference on, Lisbon, Portugal, 12-17 April 2015.
    - This work will be contributed to D4.3 and D4.5
- M. Narandzic, C. Schneider, W. Kotterman, R.S. Thomae," **Required Number of Propagation Scenarios for Acceptable Reproduction of Spectral Efficiency Distribution in (Heterogeneous) Network Simulations**", in Antennas and Propagation (EuCAP), 2015 9th European Conference on, Lisbon, Portugal, 12-17 April 2015.
    - This work will be contributed to D4.3 and D4.5

SPAWC 2015, Stockholm, Sweden, 28 June -1 July 2015

- X. Zhou, X. He, M. Juntti, and T. Matsumoto, "**Outage Probability of Correlated Binary Source Transmission over Fading Multiple Access Channels**", in IEEE 16th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Stockholm, Sweden, June 28- July 1, 2015.
- X. He, X. Zhou, M. Juntti, and T. Matsumoto, "**Data and Error Rate Bounds for Binary Data Gathering Wireless Sensor Networks**", in IEEE 16th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Stockholm, Sweden, June 28- July 1, 2015.

SCC 2015, Germany, February 2015

- K. Anwar and M. Nur Hasan, "Uncoordinated Transmission in Multiway Relaying Systems," in International ITG Conference on System, Communications and Coding (SCC), Germany, Feb. 2015.

2.2.1.3 Poster

BMW Summer School 2014, July 2014

- P1. S. Kühlmorgen. "Improving Vehicular Communication by "**Links-on-the-Fly" Technology**" BMW Summer School 2014 Autonomous Driving in the Internet of Cars, July 2014

2.2.2 Tutorials, talks, short courses

EuCNC 2014, Bologna, Italy, 23-16 June 2014

- Yi Ma, presentation on "**RESCUE: Links-on-the-fly Technology for Robust, Efficient and Smart communication in Unpredictable Environments**," EuCNC 2014**,** Bologna, Italy, 23-16 June 2014.

COST IC 1004, Ferrara, Italy, 5-7 February, 2014

- Xin He, "**Performance Analysis of A Binary CEO Problem**" 9th MC Meeting of COST IC 1004, University of Ferrara, Ferrara, Italy, 5-7 February, 2014

- Kun Wu, "**Joint Turbo Equalization and BICM-ID-based IDMA over Frequency Selective Fading Channels**" 9th MC Meeting of COST IC 1004, University of Ferrara, Ferrara, Italy, 5-7 February, 2014

IWWMC 2014, London, UK, 25 April, 2014

- Tad Matsumoto, "**Links-on-the-fly technology for Robust, Efficient and Smart Communication in Unpredictable Environment (RESCUE)**", International Workshop on Weightless Machine Communications, London, UK, 25 April, 2014.

EW2014, Barcelona, Spain, 14-16 May, 2014

- Xiaobo Zhou, "Outage Analysis of Decode-and-Forward Relaying System Allowing Intra-link Errors", European Wireless Conference 2014, Barcelona, Spain, 14-16 May, 2014.

COST IC 1004, Krakow, Poland, 23 Spetember, 2014

- Hicham Khalife, Tad Matsumoto, Christian Schneider, "**Links-on-the-fly technologies: from the correlated source coding theorem viewpoint**", 11th MC Meeting of COST IC1004, AGH University of Science and Technology, Krakow, Poland.

TU Dresden 2014, Dresden, Germany, 12 September, 2014

- Tad Matsumoto: "**Unified Concept for Designing and Analyzing DF-based Wireless Cooperative Communications Networks Allowing Intra-link Errors based on Network Information Theory**", Seminar, Technical University Dresden, Germany, 2014

JAIST 2015, Nomi, Japan, 20 March, 2015

- Valtteri Tervo: "**EU FP7 RESCUE Project: General Introduction, achievements during the first year, and my impression of working as a work package leader of an EU project**", Seminar, Japan Advanced Institute of Science and Technology, 2015.

2.2.3 International Summer School

An international summer school organized by RESCUE will be held on 24-28, August, 2015 in UOULU, Finland. A tentative schedule includes basic theory lectures on distributed source coding (and the necessary basics) on 24-26 of August by Professor Gerhard Kramer. The basic theory part will be

followed by two-day project result specific part on 27-28 of August. UNIS will also contribute a lecture "Towards Terabits per second wireless communications". More details of this summer school will be available in the next deliverable once the workshop is hosted in June.

2.3 RESCUE Demonstrations and Workshops

2.3.1 RESCUE workshop

The rescue project will organise workshop during the project lifetime to disseminate the scientific achievements and results to relevant parties. Beside dissemination this activities are used to ask for feedback and input, especially from stakeholders' side. Organisation of workshops will presumably be done in conjunction with:

- "International Workshop on Advanced PHY & MAC Techniques for Super Dense Wireless Networks (IWSDN)", at ICC 2015 8-12 June 2015.
- http://info.ee.surrey.ac.uk/CCSR/IWSDN/

This joint workshop is jointly organized by RESCUE/DIWINE and 5GIC, and chaired by UNIS.

2.3.2 RESCUE special session at conference and workshop

A RESCUE special session has been planned during the first half of the project and jointly organized with DIWINE and 5GIC

- RESCUE session together with DIWINE and 5GIC at IEEE CAMAD, in Guildford, Surrey, UK, 7-9 September, 2015 (http://www.ieee-camad.org/);

2.4 RESCUE Clustering activities

Several ongoing European projects have potentially shared topics with RESCUE. It is therefore of interest, for this project, to follow its activities and achieved results. Moreover, a framework of possible cooperation between RESCUE and other ICT projects has been identified, and some joint activities are organizing at the time of edition of this deliverable.

RESCUE is also actively taking part in Commission consultation and dissemination activities. Indeed, as a part of the RAS cluster, RESCUE is being regularly presented in RAS cluster meetings. In particular we can cite the following events

- Participation in the RAS cluster meeting and the FIA event organized by the commission in Athens in March 2014
- Participation in the RAS cluster meeting and the NETFutures event organized by the commission in Brussels in March 2015
- An accepted invitation for presenting RESCUE project main contributions during the RAS cluster meeting in conjunction with EUCNC 2015 planned in Paris in June 2015

2.4.1 Joint RESCUE/DIWINE/5GIC workshop

Our International Workshop on Advanced PHY and MAC Techniques for Super Dense Wireless Networks (IWSDN) will be held on 12th June in London, UK, which is in conjunction with IEEE ICC 2015 [1]. It is jointly organised by ICT-RESCUE [2] project partners, DIWINE [3] partners and 5GIC [4] partners which are supported by the European Commission under the Seventh Framework Programme (FP7). The motivation and scope of this workshop is introduced here. More detail of the workshop will be available in the next deliverable once the workshop is hosted in June.

Densely deployed wireless networks provide one of the most important and sustainable solutions to improve the area spectral efficiency, and to handle the spectrum crunch expected by 2020. They are expected to have a huge economic impact, contributing to 5G small-cell technology, wireless sensor networks (WSN), machine-to-machine communications (M2M), V2V communications, and to public

safety networks (PSN). However there are many serious technical issues identified in the implementation of these networks:

- Densely deployed wireless networks are inherently interference limited communication environments, and for conventional network approaches the overall system throughput does not increase linearly with the size of the network. This effect has also been observed for the energy efficiency of conventional dense wireless networks.
- In some dense wireless networks such as M2M, V2V, and PSN, it is not always feasible to have accurate network planning and/or accurate link budget allocation due to their high demand to signalling overhead. In such cases reliable communications over unplanned dense networks becomes a significant technical issue to investigate.
- Security is an increasingly important issue in wireless networks, where increased density implies increased opportunities for overhearing and interception.

One potential solution to these problems is node cooperation with distributed/centralized data fusion, which takes advantage of the existence of multi-route diversity in dense networks. In particular wireless physical layer network coding exploits this route diversity and avoids the congestion that arises in conventional networks. Moreover distributed self-organisation methods are currently being intensively investigated, promising to allow robust and flexible distributed network optimisation. Recent work on physical layer security also provides an opportunity to enhance security in dense wireless networks. These concepts open a broad spectrum of research directions, standardization paths, and market opportunities, which will involve the relevant communities in both academia and industry in the next decade.

Super dense wireless networks have received tremendous attention worldwide. This workshop aims to gather researchers, regulators, and users to present and debate advanced PHY and MAC techniques for super dense wireless networks and applications, with the perspective of current cellular, M2M, and V2V standardization activities in 3GPP, ETSI, IEEE and IETF. Specifically, but not exclusively, the workshop proposes to address the following issues related to super dense wireless network:

- Information theoretic limits
- Channel and traffic models
- Advanced modulation and coding schemes
- Advanced relaying and cooperative communications
- Centralized/distributed signal processing
- Physical layer network coding
- Asynchronous multiple access design
- Non-orthogonal waveforms
- Distributed self-organizing methods
- Resource allocation
- Routine and re-transmission protocols
- Mobility management
- Security, trust and privacy issues
- Field Trials / Test-beds / Regulatory issues

2.4.2 Joint RESCUE/DIWINE/5GIC Special Session

Our Advanced PHY and MAC Design for Ultra Dense Wireless Networks will be held on 7-9 September in Guildford, UK, which is in conjunction with IEEE CAMAD 2015 [5]. It is jointly organised by RESCUE, DIWINE and 5GIC partners and chaired by UNIS. The subject of this workshop is introduced here. More detail of the special session will be available in the next deliverable once the special session is hosted in September.

The subject of this special session is directly linked to research topics covered by several European projects and 5GIC, which is an indicator that it may attract the attention of many active researchers. We

list below two European projects and 5GIC which are directly related to the proposed special session on Advanced PHY and MAC Techniques for Super Dense Wireless Networks:

- **RESCUE**: The vision of the project ***Links-on-the-fly Technology for Robust, Efficient and Smart Communication in Unpredictable Environments*** is to establish a theatrical, technological, and practical basis for a novel communications technology design that efficiently utilize the characteristics of future wireless networks, which are expected to be dense in terms of node and link populations, and heterogeneous in terms of their built-in capabilities [2].
- **DIWINE**: The project ***Dense Cooperative Wireless Cloud Network*** considers wireless communication in a dense relay/node scenario where wireless network coding messages are flooded via dense air-interface between the terminals (source/destinations) and the cloud is simple and uniform. A complex infrastructure cloud creates an equivalent air-interface to the terminal, which is as simple as possible. Source and destination air-interfaces are completely blind to the cloud network structure. The cloud has its own self-contained organising and processing capability [3].
- **5GIC**: Research in the ***5G Innovation Centre*** will drive the delivery of a mobile communications network capable of meeting the needs of tomorrow. The focus will be on developing intelligent systems that work together to give the impression of unlimited data capacity, providing a network that is far faster than today's 4G system, with greater energy-efficiency and reduced end user costs [4].

This special session comes as a way to promote a general discussion on the common open issues and future challenges on Advanced PHY and MAC Techniques for Super Dense Wireless Networks

3. RESCUE Standardization Activities

The RESCUE concept will be introduced to the relevant European and international standardisation bodies in order to make it well-known within the communication society and to prepare for a later standardisation. The RESCUE contribution to standards has be directly through RESCUE partners who are active in standardisation bodies (TUD and AGH) and indirectly by planned cooperation activities.

RESCUE disseminates its project results to the European Telecommunications Standards Institute (ETSI) which is recognised by the European Union as an official European Standards Organisation. The standardization activities are performed with respect to two aspects: vehicular communication and network autonomicity.

3.1 ETSI TC ITS Standardization Activities

TUD regularly participates in ETSI standardization on Cooperative Intelligent Transportation Systems and vehicular communication, for which a dedicated technical committee, i.e. ETSI TC ITS exists. Even though the scope of technical committee is on any type of transport, i.e. road, air, rail, etc. it focuses on vehicular communication. In fact, the TC has completed a release 1 of standard in 2014 and slowly starts on a release 2. Currently, the TC is in a transition phase, where major efforts are still on completion and maintenance of release 1. First activities for release 2 have been started; these activities address use cases beyond those of release 1 in three main directions, i.e. cooperative advanced cruise control (C-ACC), platooning and vulnerable road user protection.

For the RESCUE project, vehicular communication is one of the two major use cases. Therefore, the standardization in ETSI TC ITS is regarded as relevant. However, the current standardization activities related to release 1 are considered for the expected deployment of Car-2-X systems in Europe in the next years and therefore the impact on it is rather limited. Nevertheless, for the starting standardization activities in release 2, the research and prototyping activities in RESCUE are of interest. It is planned to provide contributions related to RESCUE technologies to the technical committee as soon as results of the project are available.

Besides potential contributions of the project to ETSI TC ITS, the research work in the RESCUE project benefits considerably from the standardization work. In fact, the work in [6] is strongly aligned to the ETSI TC ITS standards and serves as a reference case for comparing the RESCUE approach against the state-of-the-art. This document has been contributed to ETSI TC ITS WG3 "Networking and Transport" for discussion.

3.2 ETSI NTECH AFI Standardization Activities

AGH as an ETSI member is disseminating RESCUE results by providing contributions to the Evolution of Management towards Autonomic Future Internet (AFI) Working Group of the ETSI Network Technologies (NTECH) Technical Committee. These contributions initially focus on outcomes from WP3, where the designed MAC and routing layer protocols adopt autonomic principles and exhibit self-managing behaviour. The study of such functionality is the focus of AFI, which has thus far published two ETSI Group Specifications (GSs). The first is related to scenarios/use cases where network autonomicity can be applied [7], while the second presents a generic architectural reference model for autonomic networking, cognitive networking and self-management [8]. A third GS, currently being drafted, describes the instantiation of the aforementioned model onto ad-hoc/mesh networks.

AGH regularly participates in meetings of the NTECH AFI group. During the NTECH#06 meeting, which took place in Rome, Italy between March 25th and 27th 2014, Szymon Szott (AGH) delivered a presentation on the RESCUE project describing how it could contribute to the standardization process. Based on the discussion among the group members, the following points were made regarding such contributions. Within the RESCUE project, AGH will consider the incorporation of autonomic design principles as specified by AFI, provide use-cases & scenarios for AFI's Work Item #1 Technical Specification [7], and provide an example of a Generic Autonomic Network Architecture (GANA) Reference Model [8] instantiation for Work Item #3 (Ad-hoc/mesh branch).

During the NTECH#09 meeting, which took place in Issy Les Moulineaux, France between December 16th and 18th 2014, Szymon Szott (AGH) delivered a presentation about the RESCUE message transfer design ("Autonomic Aspects in Lossy-Link Ad Hoc Network Design"). The presentation was met with a positive outcome and AFI looks forward to further developments and results from RESCUE.

3.3 Possible IEEE 802.11 Standardization Activities

Szymon Szott (AGH) has participated in the plenary sessions of the IEEE 802.11 Working Group in San Antonio, USA (November 2014) and in Berlin, Germany (March 2015) assessing the possibility of disseminating RESCUE results. The Wireless Next-Generation (WNG) session would be the place for a presentation of the advantages of the RESCUE approach. Such a presentation will be possible once the first WP3 results are available, in particular those in which the RESCUE system is compared with IEEE 802.11 – the WP3 MAC baseline. However, it must be noted that any standardization efforts in 802.11 should be considered in a long-term horizon due to the low technology readiness level of the RESCUE activities and the lengthy standardization process within 802.11.

4. Conclusion

In this deliverable, all dissemination related activities of RESCUE project during the first half of project time period have been summarised, i.e., internet dissemination activities, dissemination and training activities, demonstrations and workshops, clustering activities and standardization activities. These activities disseminated and exploited the results and knowledge achieved in the first half of project. The main objectives and expected impact are also summarised in this deliverable to explain how the dissemination activities have fulfil the RESCUE project's global dissemination and exploitation plan.

5. References

[1] http://icc2015.ieee-icc.org/

[2] http://www.ict-rescue.eu

[3] http://diwine-project.eu

[4] http://www.surrey.ac.uk/5gic

[5] http://www.ieee-camad.org/

[6] S. Kühlmorgen, S. Llatser, A. Festag, and G. Fettweiss: "Performance Evaluation of ETSI GeoNetworking for Vehicular Ad hoc Networks", accepted for VTC Spring 2015, Glasgow, Scotland, May 2015

[7] Tayeb Ben Meriem et al., "Autonomic network engineering for the self-managing Future Internet (AFI): Scenarios, Use Cases and Requirements for Autonomic/Self-Managing Future Internet", ETSI Group Specification AFI 001, June 2011.

[8] Laurent Ciavaglia et al., "Autonomic network engineering for the self-managing Future Internet (AFI): Generic Autonomic Network Architecture (An Architectural Reference Model for Autonomic Networking, Cognitive Networking and Self-Management)", ETSI Group Specification AFI 002, April 2013.