Project acronym: CONCERTO

Project full title: Content and cOntext aware delivery for iNteraCtive multimEdia
healthcaRe applications

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Deliverable 7.4

Update of the dissemination and standardisation plan

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Executive Summary

This deliverable summarizes the dissemination and standardisation activities carried out during 16 months of CONCERTO and gives the related plan for the remaining project life-time.

The dissemination is mainly related to the project web page (including some partner's sites references to the project), publications in journals and magazines and participation to conferences, workshops, symposiums, other ICT project meetings, as well as the organization of workshops about eHealth.

The web page is the primary way for collecting and disseminating the project information and outcomes. It publishes information about the main project objectives and the followed technical approach, but also reports the list of already published material.

Publications reported start from month 6 (previous publications are available on previous deliverable D7.2) and are comprehensive of those submitted and accepted and of those submitted but not yet accepted. Different conferences (e.g., Future Networks and Mobile Summit 2013, IEEE Wireless Commnications and Networking Conference, IEEE Globecom) and journals (e.g. IEEE Journal on Selected Topics in Signal Processing and Signal Processing: Image Communications or IEEE Transactions on Vehicular Technology) have been addressed, even a book chapter have been written. The participation of project members at different conferences, workshops, etc., for which a descriptive table has been included, reflects how the dissemination of the project has been carried out, in particular considering the scope of the related events and the reached audience.

Noticeably, the consortium decided to organize not only a third year workshop (as initially planned), but also a second year one, in conjunction with IEEE Healthcom 2013. This decision comes after the good feedbacks that were received after the first year workshop at the Mobihealth 2012 conference in November 2012. The involved audience (around 30 people) showed a great interest in the project and provided useful information for the project future work (for example additional issues to be addressed and use cases importance from experts' perspective).

In this year and half of project life-time, CONCERTO has planned and organized also meetings and collaborations with other European projects, with the objective to share results and approaches to address common issues. ITSSv6 project, ENVISION and COMUNE have been selected and the initial information exchange was done during some meetings. The planned activities are to continue the collaboration and organize other meetings while the work is progressively continuing.

Standardisation is the target of the industrial partners. NTUK is actively involved in 3GPP, where the project requirements have been taken into account in the definition of the requirements on the proximity services, which is going to be finalized in March 2013.

TCS is participating to Network Centric Operations Industry Consortium (NCOIC®) and in particular in the SAGM Real-Time Tactical Video Mobile Networking Technical Pattern that is devoted to the transmission of video over Private Mobile Radios for ambulances, fire fighters and police forces. However, these activities have been suspended due to scarcity of clients funding the work and the restarting date isn't available. TCS is going to monitor the situation in order to contribute as soon as the activities will start again. TCS also follows standardization activities in MPEG group.

SIEMENS is addressing MPEG and its sub-group JCT-VC (jointly with VCEG): Video compression and video streaming. It is actively involved in standardization body meetings and contributes in three standard documents on the video compression algorithms.

Moreover also Kingston University has recently started to collaborate with IEEE 1907.1 standardization group for "Network-Adaptive Quality of Experience (QoE) Management Scheme for Real-Time Mobile Video Communications".

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1 Introduction

This deliverable summarizes the dissemination and standardization carried out by CONCERTO in the months between M7 and M16 of the project life-time, and the so far planned related activities. It mainly gives information on the project web page (brief review), partner's web-site relevant references, publications (in books, journals, conference proceedings, workshops, etc.), (joint-)organization and planning of dedicated workshops, participation at conferences, clustering, concertation and standardization meetings, already achieved and foreseen contributions to standardization and project liaisons.

All partners have contributed and plan to pursuit dissemination and standardization initiatives. Typically, universities and research centres are more involved in the former, while industrial partners in the latter. However a contribution to almost all the listed activities is supported by several project members in collaboration, though direct individual involvement is reasonable for standardization, where actual inclusion in standardization body is required. Finally, project clustering and concertation meeting are more suitable for the project main contractor. Though, some attempts for triggering collaborations with other EU funded projects have taken place being led by different partners in the project consortium.

Noticeably, some project activities (such as the planned and already organized workshops) represent opportunity to carry out dissemination, collaboration and exploitation all together. This has demonstrated definitely helpful in acquiring feedbacks and suggestions for re-fining the project work (e.g. use-case detailed specification) in the first period of CONCERTO, when a higher degree of flexibility is present for tuning.

Last but not least, as the project activities progress it is more and more clear where contributions to state-of-the-art in the issued research fields, dissemination, exploitation and standardization are focused, and vice-versa how they should be driven as more relevant for the whole community.

2 Dissemination activities

A large number of research and technology institutes and organizations may be interested in the achievements of CONCERTO, which will be emphasized by dissemination activities. Moreover, CONCERTO benefits from the direct participation of the Clinical Engineering and Information Systems department of the hospital of Perugia and its visibility in the world of healthcare services: the presence of the end-user in the consortium will be exploited to directly disseminate the project results among the concerned professionals. Furthermore, test-bed or demos in the real-life, properly selected as addressing the more interesting use-cases, represent also a mean of further dissemination.

CONCERTO project dissemination is organized through different channels: publications, workshops, demonstrations, web page, collaborations and liaison with other projects, actions toward standardization and regulation. These activities are described below.

- A project home page has been opened. General information on CONCERTO scope, progress and partnership is given. Public project documents are published on this home page for dissemination purposes. In addition to such a home page, some partners have included general information about the project and links to their official web site.

- Most partners, especially universities, plan to publish their work in different scientific forums, books, conferences and journals. Publications will be written in the fields of telemedicine, video coding, joint source and channel coding, multimedia content adaptation, IP networking and Quality of Service, wireless transmissions and resource allocation. The scientific publications will be made in top press, journals and conferences of each of these fields to ensure that CONCERTO results will be well disseminated.

  - Articles in recognised journals, mainly IEEE journals, not neglecting other journals in the area of telemedicine and ICT for medical applications, such as the International Journal of Telemedicine and Applications.

  - Members of the consortium are journal editors and special issues on the topics of CONCERTO are envisaged. For instance Dr. Martini (Kingston University) is guest editor of a special issue series on "Healthcare Applications and Services in Converged Networking Environments" in the International Journal of Telemedicine and Applications, which appears a suitable dissemination vehicle for CONCERTO results. A special issue on the topics addressed by CONCERTO will be organised in the IEEE MMTC E-Letter.

  - International conferences, such as IEEE International Conference on Image Processing (ICIP), IEEE International Conference on Multimedia and Expo (ICME), IEEE GLOBECOM, IEEE ICC, IEEE International Conference of Engineering in Medicine and Biology (EMBC), IEEE International Symposium on Biomedical Imaging (ISBI), IEEE Healthcom, ICST Mobihealth, Computers in Cardiology, Future Network & MobileSummit, and many others.

  - Exhibitions, Workshops and Symposiums, such as Packet Video Workshop, Mobimedia, World of Health IT.

  - Workshops organized by the EC like the NEM summit and the ICT Future Network & Mobile Summit.

  - Press releases will be considered as well for the dissemination of the final results of the project to the general public.

- The results will also be included in Ph.D. thesis related to CONCERTO's work. All scientific publications will be reported on the homepage.

- The teaching, given by university partners, will be typically based on the latest research results. Consequently, results from this project will be reflected in the courses offered to students. The information will be typically first included in the postgraduate courses and, in the later phases, the key topics will be included in undergraduate courses.

Among the above mentioned activities, some of them have already been carried out and foreseen in the development of the project. Regarding web-site, publications and participation at (international) conferences/events, data are provided in this chapter in the following sections.

2.1   Project web site

The project website of CONCERTO is available under the domain *ict-concerto.eu*. This website is the primary tool to disseminate information about the project, its results and actual efforts publicly available to people all around the world, and also to exchange private information between the project partners. In order to support the above goals, a TWiki engine was applied as the basis of the website allowing users to create, collaboratively edit or even delete pages via a common web browser and supporting concurrent editing and enhanced versioning. Thanks to the efficient toolset of the TWiki system the CONCERTO project website is easy to operate and maintain, while also able to play its essential role both in dissemination and inside project communication.

2.1.1   Link for news distribution: Events and News

Under the link *http://ict-concerto.eu/twiki/bin/view/Concerto/EventsAndNews* we created a page for distributing project related news and advertisements of professional events like workshops, etc. in regard of our work within CONCERTO.

2.1.2   Link for useful resources outside of the webpage: Useful links

In order to collect useful resources outside of the project website, the page Useful links was created under the link *http://ict-concerto.eu/twiki/bin/view/Concerto/UsefulLinks*. Currently the webpage of the predecessor project of FP7 ICT CONCERTO called FP7 ICT OPTIMIX is listed together with the separate website created for CONCERTO's mobility management framework called mip6d-ng (*http://www.mip6d-ng.net/*). mip6d-ng is a new implementation of Mobile IPv6 for Linux, specifically designed for CONCERTO's requirements. Currently it is in development phase, but in the future mip6d-ng could be the next version after UMIP's mip6d[1]. The plugin-based modular design ensures easy extension, and the wide-range of extensions make it a good choice for various applications. The mip6d-ng website offers a development mailing list, download possibilities and a detailed documentation about the installation and usage of the framework. The website informs the leaders that initial development is ongoing, and in this phase CONCERTO does not plan to publish the results. After the initial phase completes, developers will publish releases for each bigger milestone under GPLv3.

2.2   Publications

2.2.1   Books or Book Chapter

[1] J. Kovacs, L. Bokor, Z. Kanizsai, and S. Imre. Intelligent Multimedia Technologies for Networking Applications: Techniques and Tools, chapter Review of Advanced Mobility Solutions for Multimedia Networking in IPv6, pages 25-47. Number Hershey, PA, USA. IGI Global, 2013.

Abstract: IPv6 is the new version of the Internet Protocol (IP), which is expected to be introduced for the wide audience in the forthcoming years. IPv6 comes with a huge amount of improvements compared to the currently widespread IP version (IPv4), while it keeps the same conceptual basics. For instance, IPv6 has a comprehensive and built-in scheme for mobility management with a great set of additional functionality, while IPv4 has only an extension for this purpose (and it is usually not implemented). Considering the evolution of telecommunication architectures toward a heterogeneous all-IP fixed-mobile convergent multimedia-provisioning system, it is now obvious that only the appearance of IPv6 could extend the infrastructure to cope with the emerging scenarios and use-cases. This chapter will provide a broad introduction of the advanced IPv6 features and will guide the readers from the basics of the new IP protocol family to its complex feature set and power to support multimedia communications in the mobility-centric Future Internet. Optimization techniques to further increase the adequacy of IPv6 for mobile multimedia are also presented along with the description of several research directions.
Relation with the project work: This work is related to WP5, as it studies different mobility management schemes built upon the Mobile IPv6 standards family in regard of their capabilities for advanced multimedia transmission and optimization.

2.2.2   Journals and magazines

[2] W. M. Gifford and A. Conti and M. Chiani and M. Z. Win, "On the SNR Penalties of Ideal and Non-ideal Subset Diversity Systems," IEEE Transactions on Information Theory, vol. 58, n. 6, pp.3708-3724, June 2012.

Abstract: Subset diversity (SSD) techniques, which select and combine the signals from a subset of the available diversity branches, are important for practical wireless systems. This paper characterizes the performance loss, or

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[1] http://www.umip.org/

signal-to-noise ratio (SNR) penalty, of one SSD system with respect to another. Both ideal and non-ideal channel estimation are considered, and the analysis is valid for the important case of arbitrary two-dimensional signal constellations. Expressions are given for the asymptotic SNR penalty, for both small and large SNR, for all the comparisons considered. Additionally, we develop bounds and approximations to quantify the performance of one system in terms of another for all SNRs of interest. Furthermore, for some signal constellations, we derive the exact SNR penalty of a non-ideal system with respect to an ideal system, as well as the exact penalty associated with two non-ideal systems with varying degrees of estimation energy. The SNR penalty enables the assessment of system sensitivity to channel estimation energy, combining architecture, and signal constellation.

Relation with the project work: This work is related to WP5, as it studies the impact of channel estimation accuracy on the performance of subset diversity systems, currently applied to modern wireless communication standards.

[3] S. Cicalò, A. Haseeb and V. Tralli, "Fairness-oriented multi-stream rate adaptation using scalable video coding," Signal Processing: Image Communication, Elsevier, vol. 7, n. 8, pp. 800-813, Sep. 2012.

Abstract: In the delivery of video services like video on-demand, IP-TV, sport broadcasting, as well as real-time streaming, the end-user expectation is to receive the best feasible quality independently of the particular video complexity, even in the presence of packet losses. In this scenario, rate adaptation is required to optimize the overall quality, whereas fairness is an important issue that has to be addressed. In this paper we propose a multi-stream rate adaptation framework with reference to the scalable video coding (SVC) extension of the H.264/AVC standard with medium grain scalability (MGS). We first define a general discrete multi-objective problem with the aim to maximize the sum of assigned rates, while minimizing the differences among the expected distortions, under a total bit-rate constraint. A single-objective problem formulation is then derived by applying a continuous relaxation. Finally, a simplified continuous semi-analytical model that accurately estimates the rate–distortion relationship for both error-free channel and packet-erasure channel is also proposed, which allows us to derive an optimal and low-complexity procedure to solve the relaxed problem. Unequal erasure protection (UXP) is also considered and designed to suitably shape the rate–distortion relationship for different values of RTP packet-loss rate. The numerical results show the goodness of our framework in terms of error gap between the relaxed and its related discrete solution, and the significant performance improvement achieved with respect to an equal-rate adaptation scheme.

Relation with the project work: This work is related to both WP4 and WP5, as it concerns the problem of rate adaptation for scalable video in the context of wireless transmission.

[4] A. Zanella and M. Chiani, "Reduced Complexity Power Allocation Strategies for MIMO systems with Singular Value Decomposition," Vehicular Technology, IEEE Transactions on, vol. 61, n. 9, pp. 4031-4041, Nov. 2012.

Abstract: We consider wireless multiple-input-multiple-output (MIMO) systems in fading environments, with frequency flat fading, channel state information at both transmitter and receiver sides, and linear precoding based on singular value decomposition (SVD). The optimal solution for these MIMO SVD systems, in terms of achievable rate, requires water filling to optimally allocate power to the different channel eigenmodes. Alternatively, reduced complexity power allocation methods can be employed. We propose two power allocation techniques that only require statistical knowledge of the channel matrix coefficients and do not need knowledge of the instantaneous values of the channel state. To study these power allocation methods, we introduce a new expression for the exact distribution of the eigenvalues of Wishart matrices, where the probability density function of the lth largest eigenvalue is given as a sum of terms of the form $x^\beta e^{-x} \delta$. The expression is here used, in the context of MIMO SVD systems, to obtain the achievable rate for both zero-outage and nonzero-outage strategies. We show that low-complexity methods have performance very similar to water-filling methods.

Relation with the project work: This work is related to WP5, as it studies low-complexity power allocation techniques for MIMO communication systems. Low-complexity terminals having just statistical information on the radio channel can benefit from such a power allocation strategy, since it allows to achieve quasi-optimal performance in terms of throughput.

[5] P. Pulini, G. Liva and M.Chiani, "On-Line Construction of Irregular Repeat Accumulate Codes for Packet Erasure Channels," IEEE Transactions on Wireless Communications, to appear in 2013.

Abstract: In many applications erasure correcting codes are used to recover packet losses at high protocol stack layers. The objects (e.g. files) to be transmitted often have variable sizes, resulting in a variable number of packets to be encoded by the packet-level encoder. In this paper, algorithms for the (on-line) flexible design of parity-check matrices

for irregular-repeat-accumulate codes are investigated. The proposed algorithms allow designing in fast manner parity-check matrices that are suitable for low-complexity maximum-likelihood decoding. The code ensembles generated by the algorithms are analyzed via extrinsic information transfer charts. Numerical results show how the designed codes can attain codeword error rates as low as 10^{-5} without appreciable losses w.r.t. the performance of idealized maximum-distance separable codes. Finally, we apply the proposed codes to the upcoming aeronautical communication standard, showing large performance improvements and proving the efficiency and the flexibility of the developed method.

Relations with the project work: This work is related to WP4 (T4.3), as it concerns packet-level protection techniques to be implemented at the upper layers of the communication stack to recover from packet losses. These techniques are particularly suitable in delay-sensitive applications where retransmissions are not appropriate.

[6] C. La Palombara, V. Tralli, B. Masini and A. Conti, "Relay-Assisted Diversity Communications," IEEE Transactions on Vehicular Technology, vol. 62, n. 1, pp. 415-421, Jan. 2013

Abstract: Relaying and diversity methods improve wireless communications by jointly exploiting the benefits of node cooperation, multiple-channel reception, and distributed processing. We develop a framework for design and analysis of relay-assisted diversity communications accounting for: 1) node positions; 2) link characterization; 3) diversity methods; 4) distributed coding and constellation signaling; and 5) power allocation. The framework is built on a simple model for assessing the frame error probability (FEP) as a function of radio-link characteristics, and it enables a clear understanding of how the aforementioned aspects affect the performance. A novel FEP-optimal power allocation is developed and compared with other allocation techniques such as uniform, destination-balanced (D-balanced), and relay-balanced (R-balanced) power allocations. Results show the effectiveness of the novel power allocation technique for various distributed codings and provide insights into the operation of relay-assisted diversity systems.

Relations with the project work: This work is related to WP5 (T.5.3), as it proposes an analytical framework to optimize the performance of MIMO wireless communications with relaying. Applications with strict requirements in terms of delay and throughput (e.g. real-time videos and interactive communications) can benefit from the proposed approach.

[7] Chao Xu, S. Sugiura, Soon Xin Ng and L. Hanzo, "Spatial Modulation and Space-Time Shift Keying: Optimal Performance at a Reduced Detection Complexity", in *IEEE Transactions on Communications,* vol.61, no.1, pp.206-216, January 2013.

Abstract: In this paper, we propose a comprehensive reduced-complexity detector both for hard-decision-aided as well as for the soft-decision-assisted Spatial Modulation (SM)/Space-Time Shift Keying (STSK). More explicitly, the detection of the SM scheme, which activates a single one out of M antennas to transmit a single LPSK/QAM symbol, may be carried out by detecting the antenna activation index m and the LPSK/QAM symbol s_t separately, so that the detection complexity may be reduced from the order of $O(M \cdot L)$ to the lower bound of $O(M + \log_2 L)$. However, the QAM aided STSK hard detection proposed in [1] results in a performance loss. Furthermore, the Max-Log-MAP algorithm proposed for soft STSK detection in [2] only takes into account the maximum a posteriori probabilities, which also imposed a performance degradation. Therefore, in this paper, we propose a novel solution for hard-decision-aided SM/STSK detection, which retains its optimal performance, despite its reduced detection complexity, when either LPSK or LQAM is employed. Furthermore, we propose the reduced-complexity Approx-Log-MAP algorithm conceived for the soft-decision-aided SM/STSK detector, in order to replace the suboptimal Max-Log-MAP algorithm.

Relation with the project work: This is related to the ongoing work on complexity reduction in WP5.

[8] J. Hu, L. Yang and L. Hanzo, "Maximum Average Service Rate and Optimal Queue Scheduling of Delay-Constrained Hybrid Cognitive Radio in Nakagami Fading Channels", IEEE Transactions on Vehicular Technology.

Abstract: As a promising technique of improving the achievable bandwidth efficiency, cognitive radio (CR) has attracted substantial research attention from both the academic and industrial communities. In order to improve the performance attained by the secondary user (SU), a novel hybrid CR system is proposed, which combines the conventional interweave and underlay paradigms for enhancing the chance of the SU to access the spectrum. Queuing theory is invoked in this paper for analysing the impact of the primary users (PU) maximum tolerable delay on the performance of the SU. Multiple queues are assumed for the SU, who is engaged in video communication. Apart from the Poisson traffic generation, we also model the classic Nakagamim fading channel as a Poisson service process by utilizing the outage probability in the presence of cochannel interference. We optimize both the hybrid interweave/underlay procedure for maximizing the average service rate ìS,max of the SU, and the queues scheduling

scheme, for the sake of minimizing the overall average delay. As a result, the overall average delay of the SU is reduced by up to 27% and 20% compared to the proportion and round-robin schemes, respectively.

Relation with the project work: This work is part of the recent developments in Cognitive Radio, which is being dealt within Task 5.3.

[9] Li Li, Li Wang and L. Hanzo, "Differential Interference Suppression Aided Three-Stage Concatenated Successive Relaying", IEEE Transactions on Communications, vol.60, no.8, pp.2146-2155, August 2012.

Abstract: Conventional single-relay aided two-phase cooperative networks employing coherent detection algorithms incur a significant 50% throughput loss. Furthermore, it is unrealistic to expect that in addition to the task of relaying, the relay-station would dedicate further precious resources to the estimation of the source-to-relay channel in support of coherent detection, which would consume extra energy expended in power-hungry channel estimation. In order to circumvent these problems, we propose successive relaying employing noncoherent detection schemes. A crucial challenge in this context is that of suppressing the successive relaying induced interference, despite dispensing with any channel state information (CSI). We overcome this challenge by introducing a novel adaptive Newton algorithm based multiple-symbol differential interference suppression (MS-DIS) scheme. We demonstrate that our system is capable of near-error-free transmissions at low signal-to-noise ratios.

Relation with the project work: This work is related to WP5. More specifically, it deals with the successive relaying schemes, which we are developing for cooperative networks in Task 5.3.

[10] L. Li, L. Wang and L. Hanzo, "Successive AF/DF Relaying in the Cooperative DS-CDMA Uplink: Capacity Analysis and Its System Architecture", in IEEE Transactions on Vehicular Technology, vol.62, no.2, pp.655-666, Feb. 2013.

Abstract: A successive-relaying-aided network (SRAN) is designed for a multiuser spread-spectrum scenario conceived for noncoherent (NC) detection to convert the typical 50% half-duplex relaying induced throughput loss to a potential user-load reduction of the code-division multiple-access (CDMA) system, where the NC allows us to avoid the extra power consumption imposed by channel estimation. We commence by evaluating the NC discrete-input–continuous-output memoryless channel (DCMC) capacity of both the amplify-and-forward-based (AF) and decode-and-forward-based (DF) SRANs in the direct-sequence CDMA (DS-CDMA) uplink (UL). While NC detection has the added benefit of eliminating both the pilot overhead and the power-hungry channel estimation, it tends to form an error floor at high Doppler frequencies. We mitigate this problem using multiple-symbol detection, which increases the detection complexity upon extending the detection window. Finally, a relay-aided soft-input–soft-output multiple-symbol differential sphere detection (SISO-MSDSD) CDMA regime is proposed, which significantly reduces the system's complexity without sacrificing its performance.

Relation with the project work: This is related to Task 5.3.

[11] Hoang Anh Ngo, Sohail Ahmed, Lie-Liang Yang, L. Hanzo, "Non-Coherent Cooperative Communications Dispensing with Channel Estimation Relying on Erasure Insertion Aided Reed-Solomon Coded SFH M-ary FSK Subjected to Partial-Band Interference and Rayleigh Fading", IEEE Transactions on Communications, vol.60, no.8, pp.2177-2186, August 2012.

Abstract: The rationale of our design is that although much of the literature of cooperative systems assumes perfect coherent detection, the assumption of having any channel estimates at the relays imposes an unreasonable burden on the relay station. Hence, non-coherently detected Reed-Solomon (ReS) coded Slow Frequency Hopping (SFH) assisted M-ary Frequency Shift Keying (FSK) is proposed for cooperative wireless networks, subjected to both partial-band interference and Rayleigh fading. Erasure insertion (EI) assisted ReS decoding based on the joint maximum output-ratio threshold test (MO-RTT) is investigated in order to evaluate the attainable system performance. Compared to the conventional error-correction-only decoder, the EI scheme may achieve an E_b/N_0 gain of approximately 3 dB at the Codeword Error Probability, P_w, of 10^{-4}, when employing the ReS(31,20) code combined with 32-FSK modulation. Additionally, we evaluated the system's performance, when either equal gain combining (EGC) or selection combining (SC) techniques are employed at the destination's receiver. The results demonstrated that in the presence of one and two assisting relays, the EGC scheme achieves gains of 1.5 dB and 1.0 dB at the P_w of 10^{-6}, respectively, compared to the SC arrangement. Furthermore, we demonstrated that for the same coding rate and packet size, the ReS(31,20) code using EI decoding is capable of outperforming convolutional coding, when 32-FSK modulation is considered, whilst LDPC coding had an edge over the above two schemes.

Relation with the project work: This is also part of the extensive work which we are conducting on cooperative communications under the framework of WP5, particularly Task 5.3.

[12] M.I. Kadir, S. Sugiura, Jiayi Zhang, Sheng Chen and L. Hanzo, "OFDMA/SC-FDMA Aided Space–Time Shift Keying for Dispersive Multiuser Scenarios", IEEE Transactions on Vehicular Technology, vol.62, no.1, pp.408-414, Jan. 2013.

Abstract: Motivated by the recent concept of space-time shift keying (STSK), which was developed for achieving a flexible diversity versus multiplexing gain tradeoff, we propose a novel orthogonal frequency-division multiple access (OFDMA)/single-carrier frequency-division multiple-access (SC-FDMA)-aided multiuser STSK scheme for frequency-selective channels. The proposed OFDMA/SC-FDMA STSK scheme can provide an improved performance in dispersive channels while supporting multiple users in a multiple-antenna-aided wireless system. Furthermore, the scheme has the inherent potential of benefitting from the low-complexity single-stream maximum-likelihood detector. Both an uncoded and a sophisticated near-capacity-coded OFDMA/SC-FDMA STSK scheme were studied, and their performances were compared in multiuser wideband multiple-input-multiple-output (MIMO) scenarios. Explicitly, OFDMA/SC-FDMA-aided STSK exhibits an excellent performance, even in the presence of channel impairments due to the frequency selectivity of wideband channels, and proves to be a beneficial choice for high-capacity multiuser MIMO systems.

Relation with the project work: This is related to WP5.

[13] Y. Huo, C. Zhu and L. Hanzo, "Spatio-Temporal Iterative Source-Channel Decoding Aided Video Transmission" IEEE Transactions on Vehicular Technology.

Abstract: Low-complexity uncompressed video transmission meets the requirements of home networking and quality/delay-sensitive medical applications. Hence it attracted research-attention in recent years. The redundancy inherent in the uncompressed video signals may be exploited by joint source-channel decoding for improving the attainable error resilience. Hence in this treatise we study the application of iterative joint source-channel decoding aided uncompressed video transmission, where correlation inherent in the video signals is modelled by a first-order Markov process. Firstly, we propose a spatio-temporal joint source-channel decoding system using a recursive systematic convolutional codec, where both the horizontal and the vertical intra-frame correlations as well as the inter-frame correlations are exploited by the receiver, hence relying on three-dimensional (3D) information exchange. This scheme may be combined with arbitrary channel codecs. Then we analyze the three-stage decoder's convergence behavior using 3D EXIT charts. Finally, we benchmark the attainable system performance against a couple of video communication systems, including our previously proposed 2D scheme, where only intra-frame correlations were exploited without invoking a channel codec. Our simulation results show that substantial Eb /N0 improvements are attainable by the proposed technique.

Relation with the project work: This study is a continuation of the ongoing work on ithe terative joint source-channel decoding aided uncompressed video transmission, which is part of Task 3.1.

[14] Chen Dong, Lie-Liang Yang and L. Hanzo, "Performance Analysis of Multi-Hop Diversity Aided Multi-Hop Links over Nakagami-m Fading Channels", in IEEE Transactions on Communications *(Submitted).*

Abstract: The concept of multi-hop diversity (MHD) exploits that all the nodes of a multi-hop link are assumed to have buffers for temporarily storing their received packets. During each time-slot, the hop having the best channel associated, for example, with the highest signal-to-noise ratio (SNR) is selected, and the corresponding node then transmits its stored packet over the best hop. Explicitly, this hop-selection procedure yields selection diversity. Following a discussion of the MAC layer protocol implementation, out attention is dedicated to the error probability, outage probability as well as to the capacity, when M-ary quadrature amplitude modulation (MQAM) and BPSK are employed. Both the error probability and the outage probability of the multi-hop links are investigated for transmission over Nakagami-m channels for demonstrating a significant diversity gain.*Relation with the project work:* This is related to WP5.

[15] Li Li, Li Wang and L. Hanzo, "Generalized Adaptive Network Coding Aided Successive Relaying Based Noncoherent Cooperation", *in* IEEE Transactions on Communications *(Accepted).*

Abstract: A generalized adaptive network coding (GANC) scheme is conceived for a multi-user, multi-relay scenario, where the multiple users transmit independent information streams to a common destination with the aid of multiple relays. The proposed GANC scheme is developed from adaptive network coded cooperation (ANCC), which aims for a

high flexibility in order to: 1) allow arbitrary channel coding schemes to serve as the cross-layer network coding regime; 2) provide any arbitrary trade-off between the throughput and reliability by adjusting the ratio of the source nodes and the cooperating relay nodes. Furthermore, we incorporate the proposed GANC scheme in a novel successive relaying aided network (SRAN) in order to recover the typical 50% half-duplex relaying-induced throughput loss. However, it is unrealistic to expect that in addition to carrying out all the relaying functions, the relays could additionally estimate the source-to-relay channels. Hence noncoherent detection is employed in order to obviate the power-hungry channel estimation. Finally, we intrinsically amalgamate our GANC scheme with the joint network-channel coding (JNCC) concept into a powerful three-stage concatenated architecture relying on iterative detection, which is specifically designed for the destination node (DN). The proposed scheme is also capable of adapting to rapidly time-varying network topologies, while relying on energy-efficient detection.

Relation with the project work: A generalized adaptive networking coding scheme was designed for a multi-user and multi-relay scenario, which lies under the framework of WP5.

[16] Shaoshi Yang, Tiejun Lv, Robert G Maunder and L. Hanzo, "From Nominal APPs to True APPs: An Exact Bayesian Theorem Based PDA Approach for Iterative Detection and Decoding Over Fading MIMO Channels", *IEEE Transactions on Communications (Accepted).*

Abstract: It was conventionally regarded that the existing probabilistic data association (PDA) algorithms output the estimated symbol-wise a posteriori probabilities (APPs) as soft information. In this paper, however, we demonstrate that these probabilities are not the true APPs in the rigorous mathematicasense, but a type of nominal APPs, which are unsuitable for the classic architecture of iterative detection and decoding (IDD) aided receivers. To circumvent this predicament, we propose an exact Bayesian theorem based logarithmic domain PDA (EB-Log-PDA) method, whose output has similar characteristics to the true APPs, and hence it is readily applicable to the classic IDD architecture of multiple-input multiple-output (MIMO) systems using the general M-ary modulation. Furthermore, we investigate the impact of the PDA algorithms' inner iteration on the design of PDA-aided IDD receivers. We demonstrate that introducing inner iterations into PDAs, which is common practice in PDA-aided uncoded MIMO systems, would actually degrade the IDD receiver's performance, despite significantly increasing the overall computational complexity of the IDD receiver. Finally, we investigate the relationship between the extrinsic log-likelihood ratio (LLRs) of the proposed EB-Log-PDA and of the approximate Bayesian theorem based logarithmic domain PDA (AB-Log-PDA) reported in our previous work. We also show that the IDD scheme employing the EB-Log-PDA without incorporating any inner PDA iterations has an achievable performance close to that of the optimal maximum a posteriori (MAP) detector based IDD receiver, while imposing a significantly lower computational complexity in the scenarios considered.

Relation with the project work: This work is related to WP5.

[17] C.T. Hewage and M.G. Martini, "Quality of Experience for 3D video streaming," *IEEE Communications Magazine*, May 2011.

Abstract: In this article we present and discuss in detail how artefacts introduced during 3D video streaming affect the end user perception and how we could use real-time quality evaluation methodologies to overcome these effects. The observations presented can underpin the design of future QoE-aware 3D video streaming systems.

Relation with the project work: This work is related to WP3.

[18] C.T. Hewage and M.G. Martini, "Edge based Reduced-Reference Quality Metric for 3D Video Compression and Transmission," *IEEE Journal of Selected Topics in Signal Processing*, vol. 6, no. 5, pp. 471-482, 2012.

Abstract: 3-D video applications are delivered over a range of different transmission systems. In order to provide demanding customers with a better service over unreliable communication channels, compression and transmission system parameters can be changed "on the fly." For interactive 3-D video services, video compression can be adapted (e.g., it can be made more robust and/or rate adaptive) based on the quality measured at the receiver. It has been shown that measuring the (3-D) video quality at the receiver-side, and using this information as a feedback to fine tune the system parameters result in improved performance in such systems. However, measuring 3-D video quality using Full-Reference (FR) quality metrics is not feasible due to the need of the original 3-D video sequence at the receiver-side for comparison. Therefore, this paper proposes a Reduced-Reference (RR) quality metric for color plus depth 3-D video compression and transmission, using the extracted edge information of color plus depth map 3-D video. This work is motivated by the fact that the edges/contours of the depth map can represent different depth levels and this can be considered for measuring structural degradations. Since depth map boundaries are also coincident with the corresponding color image object boundaries, edge information of the color image and of the depth map is compared to

obtain a quality index (structural degradation) for the corresponding color image sequence. The performance of the method is evaluated for different compression ratios and network conditions. The proposed method achieves good results compared to its counterpart FR quality metric, with a lower overhead for side-information.

Relation with the project work: This work is related to WP3. Note that this work started prior to CONCERTO kick-off.

[19] M.G. Martini, B. Villarini and F. Fiorucci, "A reduced-reference perceptual image and video quality metric based on edge preservation," *Eurasip Journal on Advances in Signal Processing*, vol. 66, 2012.

Abstract: Objective image/video quality metrics which accurately represent the subjective quality of processed images are of paramount importance for the design and assessment of an image compression and transmission system. In some scenarios, it is also important to evaluate the quality of the received image with minimal reference to the transmitted one. For instance, for closed-loop optimization of a transmission system, the image quality measure can be evaluated at the receiver and provided as feedback information to the system controller. The original image – prior to compression and transmission – is not usually available at the receiver side, and it is important to rely at the receiver side on an objective quality metric that does not need reference or needs minimal reference to the original image. The observation that the human eye is very sensitive to edge and contour information of an image underpins the proposal of our reduced reference (RR) quality metric, which compares edge information between the distorted and the original image. Results highlight that the metric correlates well with subjective observations, also in comparison with commonly used full-reference metrics and with a state-of-the-art reduced reference metric.

Relation with the project work: This work is related to WP3.

[20] M.G. Martini, C.T. Hewage and B. Villarini, "Image Quality Assessment based on Edge Preservation," *Signal Processing: Image Communication*, vol. 27, no. 8, pp. 875–882, Sep 2012.

Abstract: This work presents an alternative to the video quality metric designed in [19] where the displacement of edges in the corrupted images is considered. This metric provides better performance than [19] at the cost of a slightly higher complexity. Results highlight that the metric correlates well with subjective observations for the different image databases considered, also in comparison with commonly used full-reference metrics and with a state-of-the-art reduced reference metric.

Relation with the project work: This work is related to WP3.

2.2.3   Conference, symposium or workshop proceedings

[21] G. Panza and S. Grilli, "An IP cross-layer scheduler for QoS provisioning in NGNs", submitted in Future Networks and Mobile Summit 2013.

Abstract: Next-Generation Networks (NGNs) will support Quality of Service (QoS) over a mixed wired and wireless IP-based infrastructure. A relative model of service differentiation in Differentiated Services architecture is a scalable solution for delivering multimedia traffic. However, the dynamic nature of radio channels makes it difficult to achieve the target quality provisioning working at the IP and lower layers separately as in the classical approach.
In this work, an IP cross-layer scheduler able to support a Proportional Differentiation Model (PDM) for delay guarantees also over wireless is described. The key idea is to leverage feedbacks from the lower layers about the actual delays experienced by packets in order to tune at run-time the priority of the IP queues with the objective of supporting a PDM at the network node on the whole across multiple layers.
A simulation analysis demonstrates the reliability and robustness of the proposal in achieving consistent results even with highly time-variant performance of the MAC and PHY layers, differently from the classical approach. Furthermore, considerations on the required additional functionality and likely deployment scenarios highlight the scalability and backward compatibility of the designed solution.

Relations with the project work: the article reports the results achieved in the first year of the project within the framework of WP5, about the design and development of an IP content-aware cross-layer scheduler. It gives a complete vision of the work done, because it contains a complete description of the adopted models, of the made assumptions and the complete report of the achieved results, including a comparison with the IP scheduler without the cross layer solution. It is a work in progress and is going to be included in D5.2. Providing QoS guarantees in a reliable, robust, scalable and backward compatible way on the basis of media content to be delivered is key to the project.

[22] G. Panza and S. Grilli, "An IP cross-layer scheduler for relative QoS support in NGNs", submitted in Globecom 2013.

Abstract: Next-Generation Networks (NGNs) will support Quality of Service (QoS) over a mixed wired and wireless IP-based infrastructure. A relative model of service differentiation in Differentiated Services architecture is a scalable solution for delivering multimedia traffic. However, considering the dynamic nature of radio channels specifically, it is difficult to achieve the target quality provisioning working at the IP and lower layers separately as in the classical approach. In this work, an IP cross-layer scheduler able to support a Proportional Differentiation Model (PDM) for delay guarantees also over wireless is described. The key idea is to leverage feedbacks from the lower layers about the actual delays experienced by packets in order to tune at run-time the priority of the IP service classes with the objective of supporting a PDM at the network node on the whole across multiple layers. A simulation analysis demonstrates the prominent improvements in reliability and robustness of the proposal in the case of highly time-variant performance of the MAC and PHY layers with respect to the classical approach. Furthermore, considerations on the required functionality and likely deployment scenarios highlight the scalability and backward compatibility of the designed solution.

Relations with the project work: This article reports a subset of results achieved in the first year of the project within the framework of WP5, about the design and development of an IP content-aware cross-layer scheduler. It describes only the main results in terms of reliability and robustness of the provided solution. Together with the previous article it will become a section in the upcoming deliverable D5.2, where the above mentioned results will be enhanced with further simulations, which aims to verify the performance of the IP content-aware cross-layer scheduler with different configurations.

[23] S. Cicalò and V. Tralli, "Cross-Layer Algorithms for Distortion-Fair Scalable Video Delivery over OFDMA Wireless Systems," in Proc. of IEEE Globecom Workshop on Quality of Experience for Multimedia Communications 2012, Anaheim, California (USA), Dec. 2012

Abstract: Optimizing video delivery to multiple users over OFDMA wireless systems is a challenging task, especially when the objective of maximizing the spectral efficiency has to be jointly considered with the objective of providing a fair video quality. In this paper a novel cross-layer optimization framework is proposed. It jointly addresses rate adaptation and resource allocation, aiming at maximizing the sum of the achievable rates while minimizing the distortion difference among multiple videos. After having discussed its feasibility, the optimization problem is vertically decomposed into two sub-problems, and a novel efficient Iterative Local Approximation (ILA) algorithm is proposed to evaluate the global solution. ILA algorithm requires a limited information exchange between the application and the MAC layers, which independently run algorithms that handle parameters and constraints characteristic of a single layer. The numerical evaluations show the fast convergence of the ILA algorithm and demonstrate the significant video quality improvement of the proposed strategy with respect to other optimization frameworks.

Relations with the project work: This work is related to WP5, as it deals with a cross-layer iterative technique for transmission of scalable video over OFDMA wireless links. The objective of the rate adaptation and radio resource allocation is to deliver different video contents to different users, while guaranteeing fairness in terms of video distortion.

[24] M. Chiani, G. Liva and E. Paolini, "The Marriage Between Random Access and Codes on Graphs: Coded Slotted Aloha," in Proc. of the IEEE First European Conference on Satellite Telecommunications (AESS) 2012, Rome (Italy), Oct. 2012.

Abstract: We present some recent results on a scheme, named Coded Slotted Aloha, where the theory of codes on graphs is used to obtain a random access protocol that does not require retransmissions. The scheme is based on the use of erasure correcting codes for the recovery of packet segments that are lost in collisions, and on successive interference subtraction for resolving collisions. The proposed protocol achieves reliable communication in the asymptotic setting and attains capacities close to 1 packet/slot. Some remarks and results for practical implementation of the access scheme are presented.

Relations with the project work: This work is related to WP4 (T4.3) and WP5, as it concerns an uncoordinated multiple access scheme that can be useful, e.g., in emergency areas where multiple data and video streams are transmitted toward a unique destination.

[25] G. Liva, B. Matuz, E. Paolini and M. Chiani, "Short Low-Rate Non-Binary Turbo Codes," IEEE 7th International Symposium on Turbo Codes & Iterative Information Processing (ISTC), Gothenburg (Sweden), Aug. 2012.

Abstract: A serial concatenation of an outer non-binary turbo code with different inner binary codes is introduced and analyzed. The turbo code is based on memory-1 time-variant recursive convolutional codes over high order fields. The resulting codes possess low rates and capacity-approaching performance, thus representing an appealing solution for spread spectrum communications. The performance of the scheme is investigated on the additive white Gaussian noise channel with coherent and noncoherent detection via density evolution analysis. The proposed codes compare favorably w.r.t. other low rate constructions in terms of complexity/performance trade-off. Low error floors and performances close to the sphere packing bound are achieved down to small block sizes (k=192 information bits).

Relations with the project work: This work is mainly related to WP5, as it concerns the design of forward error correction schemes for low-delay applications, e.g. real-time video transmission over wireless networks.

[26] E. Paolini, G. Liva and M. Chiani, "Random Access on Graphs: A Survey and New Results," Proc. of 46th Annual Asilomar Conference on Signals, Systems, and Computers, Pacific Groove, CA (USA), Nov. 2012.

Abstract: This paper overviews the recently proposed coded slotted ALOHA (CSA) random access scheme and illustrates some new results in this area. In CSA, a randomly picked linear block code is employed by each user to encode segments of its bursts prior to transmission, where the choice of the code is performed with no coordination with the other users. On the receiver side iterative interference cancellation combined with decoding of the local codes is performed to recover from collisions. This process may be represented as an iterative decoding algorithm over a sparse bipartite graph.

Relations with the project work: This work is related to WP4 (T4.3) and WP5, as it concerns an uncoordinated multiple access scheme that can be useful, e.g., in emergency areas where multiple data and video streams are transmitted toward a unique destination.

[27] B. Matuz, G. Liva, E. Paolini, M. Chiani and G. Bauch, "Blockwise Noncoherent AWGN Channel: Concatenated Codes and Composite Capacity," 9th International ITG Conference on Systems, Communications and Coding (SCC2013), Munich, Germany, Jan. 2013.

Abstract: We consider binary phase shift keying (BPSK) over an additive white Gaussian noise (AWGN) channel with constant, but unknown carrier phase over blocks of nI channel symbols and a concatenated coding scheme. The composite capacity of the channel constrained to specific binary inner codes, i.e. codes with good minimum distance properties, is derived. The outer code is chosen from the ensemble of non-binary regular $(2, d_c)$ low-density parity-check (LDPC) codes with fixed variable node degree of 2 and check node degree d_c. Iterative decoding thresholds obtained by means of density evolution are provided for several concatenations of inner and outer codes and are compared with capacity results.

Relations with the project work: This work is mainly related to WP5, as it concerns the design of forward error correction schemes for low-delay applications, e.g. real-time video transmission over wireless networks.

[28] B. Matuz, G. Liva, E. Paolini and M. Chiani, "Verification-Based Decoding with MAP Erasure Recovery," 9th International ITG Conference on Systems, Communications and Coding (SCC2013), Munich, Germany, Jan. 2013.

Abstract: Verification-based decoding (VBD) is a simple yet powerful iterative (IT) decoding technique for codes operating on packets (vector-symbols) and channels that introduce packet-wise errors. An example is given by the q-ary symmetric channel (qSC) for which a simple improvement of the VBD algorithm is proposed. It consists of performing a Gaussian elimination (GE)-based erasure decoding stage whenever VBD fails, i.e., whenever $\beta > 0$ packets remain unverified. The modified decoder may recover the β unverified packets with a complexity of $O(\beta^3)$ by making use of the inherent code structure. Numerical results on low-density parity-check (LDPC) codes and analytical expressions for the block error probability of linear random block codes show the benefit of the proposed algorithm.

Relations with the project work: This work is related to WP4 (T4.3), as it concerns packet-level protection techniques to be implemented at the upper layers of the communication stack to recover from packet losses. These techniques are particularly suitable in delay-sensitive applications where retransmissions are not appropriate.

[29] Li Li, Li Wang and L. Hanzo, "Successive DF relaying: MS-DIS aided interference suppression and three-stage concatenated architecture design", in 2012 *IEEE International Conference on Communications (ICC), Ottawa, Canada*, 10-15 June 2012.

Abstract: Conventional single-relay aided two-phase cooperative networks employing coherent detection algorithms incur a significant 50% throughput loss. Furthermore, it is unrealistic to expect that in addition to the task of relaying, the relay-station would dedicate further precious resources to the estimation of the source-relay channel in support of coherent detection. In order to circumvent these problems, we propose decode-and-forward (DF) based successive relaying employing noncoherent detection schemes. A crucial challenge in this context is that of suppressing the successive relaying induced interference, despite dispensing with any channel state information (CSI). We overcome this challenge by introducing a novel adaptive Newton algorithm based multiple-symbol differential interference suppression (MS-DIS) scheme. Correspondingly, a three-stage concatenated transceiver architecture is devised. We demonstrate that our proposed system is capable of near-error-free transmissions at low signal-to-noise ratios.

Relations with the project work: In this work, a decode-and-forward based successive relaying scheme has been proposed for cooperative networks, which is related to Task 5.3.

[30] Chao Xu, Dandan Liang, S. Sugiura, Soon Xin Ng and L. Hanzo, "Reduced-Complexity Soft-Decision Aided PSK Detection", in 2012 IEEE *Vehicular Technology Conference (VTC Fall)*, Quebec, Canada, 3-6 Sept. 2012

Abstract: In this paper, we propose to reduce the complexity of both the Approx-Log-MAP algorithm as well as of the Max-Log-MAP algorithm, which were designed for soft-decision aided PSK detectors. First of all, we extend the shown a posteriori PSK symbol probability formula and streamline it by eliminating its unnecessary calculations in the context of the Approx-Log-MAP algorithm. Secondly, we reduce the complexity of the Max-Log-MAP algorithm, where the maximum a posteriori symbol probability may be obtained without evaluating and comparing all the candidate symbol probabilities. Furthermore, we apply our new soft detection arrangement to a variety of coded systems. Our simulation results demonstrate that a significant detection complexity reduction was achieved by our design without any performance loss. For example, a factor two complexity reduction was achieved by the proposed Max-Log-MAP algorithm, when it was invoked for detecting QPSK symbols, which is expected to be significantly higher, when invoked for 16QAM.

Relations with the project work: This is related to WP5, focussing primarily on Task 5.3.

[31] M. Driusso, F. Babich, M.I. Kadir and L. Hanzo, "OFDM Aided Space-Time Shift Keying for Dispersive Downlink Channels", in 2012 IEEE *Vehicular Technology Conference (VTC Fall), Quebec, Canada,* 3-6 Sept. 2012.

Abstract: The performance of a Space-Time Shift Keying (STSK) scheme was shown to degrade in frequency-selective fading channels. Hence, we propose Orthogonal Frequency Division Multiplexing (OFDM) combined with STSK for frequency-selective broadband channels. Furthermore, we consider both an uncoded and a near-capacity coded scenario. Our results show that a STSK system combined with OFDM is capable of overcoming the impairments of dispersive channels, hence approaching the same performance as in a flat- fading channel.

Relation with the project work: This work deals with WP5.

[32] Hua Sun, Soon Xin Ng, and L. Hanzo, "Superposition Coded Modulation for Cooperative Communications," in 2012 IEEE *Vehicular Technology Conference (VTC Fall), Quebec, Canada,* 3-6 Sept. 2012.

Abstract: A Turbo Trellis-Coded Modulation (TTCM) aided superposition modulation scheme is conceived for a Decode-and-Forward (DAF) based cooperative communication system. More specifically, two source nodes communicate simultaneously with the same destination node via a relay node. Superposition modulation is invoked at the relay node in order to combine and simultaneously transmit the two source signals to the destination node. Hence two timeslots are used to transmit two source signals. Extrinsic Information Transfer (EXIT) charts and power sharing techniques are employed in our design. The performance of the proposed scheme is investigated for transmission over uncorrelated Rayleigh fading channels, which is within about 2 dB of the corresponding capacity.

Relation with the project work: In this work, a TTCM-aided superposition modualtion scheme has been proposed for DAF-based cooperative communications, which is related to WP5.

[33] Chao Xu, Dandan Liang, S. Sugiura, Ng, Soon Xin Ng, and L. Hanzo, "Reduced-complexity soft STBC detection", in *2012 IEEE Global Communications Conference, Anaheim, US, 03 - 07 Dec 2012.*

Abstract: In this paper, we propose to reduce the complexity of both the Approx-Log-MAP algorithm as well as of the Max-Log-MAP algorithm, which were designed for soft-decision-aided Space-Time Block Code (STBC) detectors. First of all, we review the STBC design, which enables regular L-PSK/QAM detectors to be invoked in order to detect STBCs on a symbol-by-symbol basis. Secondly, we propose to operate the L-PSK/QAM aided STBC detection on a bit-by-bit basis, so that the complexity may be reduced from the order of O(L) to O(BPS). Our simulation results demonstrate that a near-capacity performance may be achieved by the proposed detectors at a substantially reduced detection complexity. For example, a factor six complexity reduction was achieved by the proposed algorithms, when they were invoked for detecting Alamouti's Square 16QAM aided G2 scheme.

Relation with the project work: This work is related to WP5.

[34] Shaoshi Yang and L. Hanzo, "Iterative detection and decoding using approximate Bayesian theorem based PDA method over MIMO Nakagami-m fading channels", in *2012 IEEE Global Communications Conference (IEEE GLOBECOM 2012), Anaheim, US, 03 - 07 Dec 2012*.

Abstract: In this paper, the design of iterative detection and decoding (IDD) schemes relying on a low-complexity probabilistic data association (PDA) aided method is conceived for turbo-coded multiple-input multiple-output (MIMO) systems communicating over Nakagami-m fading channels. The known PDA based MIMO detectors typically operate purely in the probability-domain. We show that the classic relationship where the extrinsic LLRs are given by subtracting the a priori LLRs from the a posteriori LLRs does not hold for the existing PDA based MIMO detectors. Therefore, the PDA method is not readily applicable to the IDD receiver. To overcome this predicament, we propose an approximate Bayesian theorem based log-domain PDA (AB-Log-PDA) detector, as well as a novel simple approach of calculating the bit-wise extrinsic LLRs for the AB-Log-PDA, which makes the AB-Log-PDA well-suited for employment in IDD receivers. It is shown that the proposed AB-Log-PDA based IDD scheme is capable of achieving a comparable performance to that of the optimal maximum a posteriori (MAP) detector based IDD receiver, while imposing a much lower computational complexity in the scenarios considered.

Relation with the project work: This paper falls under the on-going work of WP5.

[35] Jie Hu, Lie-Liang Yang and L. Hanzo, Lajos, "Optimal Queue Scheduling for Hybrid Cognitive Radio Maintaining Maximum Average Service Rate Under Delay Constraints", in, *2012 IEEE Global Communications Conference (GLOBECOM), Anaheim, US, 03 - 07 Dec 2012*.

Abstract: As a promising technique of improving the attainable bandwidth e□ciency, cognitive radio (CR) has attracted substantial attention from both the academic and industrial communities. In order to improve the performance of the secondary user (SU), a novel hybrid CR system is introduced, which combines the conventional interweave and underlay paradigms for enhancing the chances of the SU to access the spectrum. Queuing theory is invoked in this paper for analysing the impact of the primary user's (PU) delay tolerance on the performance of the SU. Multiple queues are assumed for the SU engaging in video communication. Besides the Poisson tra□c generation, we model a Rayleigh fading channel as a Poisson service process with the aid of the outage probability in the presence of cochannel interferences. Two valuable goals are achieved, namely that of maximizing the average service rate and minimizing the overall average delay of the SU's multiple queues. As our numerical results demonstrate, the overall average delay of the SU becomes 27% and 34% lower than that of the Proportional as well as that of the Round-Robin schemes respectively.

Relation with the project work: This work addresses the issue of improving the performance of secondary users cognitive radio; thus, addressing Task 5.3.

[36] Dandan Linag, Xinyi Xu, Soon Xin Ng and L. Hanzo, "Turbo-coded star-QAM for cooperative wireless and optical-fiber communications", in *3rd International Conference on Photonics, Penang, Malaysia, 01 - 03 Oct 2012*.

Abstract: A low-complexity cooperative wireless and optical-fiber communication scheme is proposed for uplink communication in a Fractional Frequency Reuse (FFR) based multicell, multiuser system. The FFR principle is invoked for improving the cell-edge performance without reducing the throughput of the cell-center. Each cell is illuminated with the aid of six Remote Antennas (RAs), which are connected to the central base-station with the aid of realistically modelled imperfect optical-fiber links. When a Mobile Station (MS) is located at the cell-edge, the two nearest RAs can be invoked to detect and forward the user's signal to the base-station, based on the Single-Input Multiple-Output (SIMO) principle. Furthermore, we design a Turbo Coded (TC) 16-level Star-Quadrature Amplitude Modulation (StQAM) scheme for supporting optical-fiber-aided cooperative wireless transmission, where the receiver does not have

to estimate the channel state information. Hence, a lower detection complexity can be achieved when compared to coherently detected schemes, albeit naturally, at a 3 dB power-loss. We also investigated the effect of phase-rotation imposed by imperfect optical-fiber links. We found that our noncoherent TC-StQAM scheme is robust to both wireless and optical-fiber imperfections

Relation with the project work: This work is part of the ongoing work on WP5. Here a novel cooperative wireless and optical-fiber communication scheme has been developed for the uplink transmission.

[37] J. Nagler, P. Amon, and L. Demaret. Hybrid downscaling of DCT-compressed images, in *Proc. of IEEE Germany Student Conference (GSC) 2012*, Passau, Germany, Nov. 2012.

Abstract: We introduce an efficient downscaling methods with arbitrary downscaling factors for images that are transformed to DCT blocks as in the compression standard JPEG. Our hybrid approach combines the low complexity of DCT domain downscaling with the high image quality of B-spline based downscaling methods. A scalable parameter allows to adjust the trade-off between computational costs and image quality. Results from numerical experiments demonstrate the superiority of the new method in terms of efficiency compared to the existing methods. Furthermore, our method results in a scalable trade-off between the image quality and the computational costs.

Relation with the project work: This work is part of WP 3, Task 3.1. In some medical applications, multiple image streams (e.g., ultrasound streams) need to be transmitted to and displayed by a client device simultaneously. Therefore, efficient downscaling algorithms are needed, e.g., to be applied on server-side.

[38] A. Weinlich, P. Amon, A. Hutter, and A. Kaup. Edge modeling prediction for computed tomography images, in *Proc. of Visual Communications and Image Processing (VCIP) 2012*, San Diego, CA, USA, Nov. 2012.

Abstract: Predictive coding is applied in many state-of-the-art lossless image compression algorithms like JPEG-LS, CALIC, or least-squares-based methods. We propose a new approach for accurate intensity prediction in pixel-predictive coding of computed tomography (CT) images. Exploiting their particular edge characteristic, the method only relies on a small twelve-pixel context. It does neither require adaptation to larger-region image characteristics nor the transmission of side-information and therefore may be particularly suitable for compression of small images like in region-of interest coding. While applying simple linear prediction with fixed weights in homogeneous regions, a Gauss error model function is fit to given contexts in edge regions and then sampled at the position corresponding to the pixel to be predicted in order to obtain prediction values. By the example of CALIC, it is shown that for CT data the edge modeling prediction (EMP) approach can yield an even smaller prediction error than other methods relying on context modeling.

Relation with the project work: This work is part of WP 3, Task 3.1, related to high-quality (i.e., lossless) compression of medical image data (i.e., computed tomography images).

[39] A. Weinlich, P. Amon, A. Hutter, A. Kaup, "Near-lossless compression of computed tomography images using predictive coding with distortion optimization", in *Proceedings of SPIE Medical Imaging 2013*, Orlando, Florida, FL, USA, February 2013.

Abstract: This paper presents a method for iterative minimization of combined residual and prediction error for near-lossless compression of medical computed tomography acquisitions using pixel-wise least-squares prediction. While most other lossy state-of-the-art image compression systems like JPEG 2000 make use of transform-based coding, in lossless coding higher compression ratios can be achieved with plain predictive algorithms like JPEG-LS because of their non-linear data adaptive energy reduction. Yet, applying these algorithms in lossy coding, simple quantization usually leads to error propagation and therefore serious quality loss or rate increase, as prediction accuracy of a pixel value and thus data rate depends on the previously reconstructed image region. The proposed minimization approach modifies the original image to be coded in a way such that the edge-directed prediction method from literature may achieve better predictions while introducing only a minimum amount of distortion. Compared to transform-based coding methods, the distortion introduced by the proposed scheme mostly consists in noise reduction instead of blurring or the introduction of artificial structures. The method also prevents error propagation due to the consideration of all pixel dependencies of the prediction. It is shown that, combined with a context-adaptive arithmetic coder, in high-fidelity coding (i. e., PSNR higher than 55 dB) the proposed method can achieve higher compression ratios than the transform-based approaches JPEG 2000, H.264/AVC, and HEVC intra coding.

Relation with the project work: This work is part of WP 3, Task 3.1, related to high-quality compression (i.e., near-lossless) of medical image data (i.e., computed tomography images).

[40] Andreas Weinlich, Johannes Rehm, Andreas Hutter, André Kaup, "Massively parallel lossless compression of medical images using least-squares prediction and arithmetic coding", submitted to *IEEE International Conference on Image Processing (ICIP) 2013*, Melbourne, Australia, September 2013.

Abstract: Medical imaging in hospitals requires fast and efficient image compression to support the clinical work flow and to save costs. Least-squares autoregressive pixel prediction methods combined with arithmetic coding constitutes the state of the art in lossless image compression. However, a high computational complexity of both prevents the application of respective CPU implementations in practice. We present a massively parallel compression system for medical volume images which runs on graphics cards. Image blocks are processed independently by own processing threads. After pixel prediction with specialized border treatment, prediction errors are entropy coded with an adaptive binary arithmetic coder. Both steps are designed to match particular demands of the parallel hardware architecture. Comparisons with current image and video coders show efficiency gains of 3.3–13.6% while compression times can be reduced to a few seconds.

Relation with the project work: This work is part of WP 3, Task 3.1. This work is based on the previously developed lossless image coding algorithm. It provides a parallel design of this algorithm for practical hardware-supported (GPU-accelerated) implementations.

[41] Eugen Wige, Peter Amon, Andreas Hutter, André Kaup, "Pixel-based averaging predictor for HEVC lossless coding", submitted to IEEE International Conference on Image Processing (ICIP) 2013, Melbourne, Australia, September 2013.

Abstract: This paper presents an intra-frame prediction scheme designed for lossless coding using HEVC. The proposed coding method comprises a pixel-wise prediction based on original samples. It is realized as a separate intra prediction mode, which replaces the PLANAR mode. In order to perform the prediction, a four-sample template around the pixel that is to be predicted is compared to the respective template of a four-pixel neighborhood. For each reference template, the sum of absolute differences (SAD) is determined. A table look-up of the SAD value gives the respective weighting factor for each neighborhood pixel. The predictor for the current pixel is calculated as the weighted average of the neighborhood pixels. In comparison to the unmodified HEVC Test Model HM-9.1 configured for lossless coding by disabling/bypassing transformation, quantization, and in-loop filters, the proposed method provides average bitrate savings up to 10.88% for intra-only coding at similar computational complexity.

Relation with the project work: This work is part of WP 3, Task 3.1, related to generic lossless coding of images and video sequences. This work is the basis for a standardization contribution to the Joint Collaborative Team on Video Coding (JCT-VC), a joint working group of ISO//IEC MPEG and ITU-T VCEG.

[42] A.Takacs and L. Bokor. A distributed dynamic mobility architecture with integral cross-layered and context-aware interface for reliable provision of high bitrate mhealth services. In Proc. of 3rd International Conference on Wireless Mobile Communication and Healthcare (MobiHealth 2012), Paris, France, Nov. 2012.

Abstract: Mobile health (mHealth) has been receiving more and more attention recently as an emerging paradigm that brings together the evolution of advanced mobile and wireless communication technologies with the vision of "connected health" aiming to deliver the right care in the right place at the right time. However, there are several cardinal problems hampering the successful and widespread deployment of mHealth services from the mobile networking perspective. On one hand, issues of continuous wireless connectivity and mobility management must be solved in future heterogeneous mobile Internet architectures with ever growing traffic demands. On the other hand, Quality of Service (QoS) and Quality of Experience (QoE) must be guaranteed in a reliable, robust and diagnostically acceptable way. In this paper we propose a context- and content-aware, jointly optimized, distributed dynamic mobility management architecture to cope with the future traffic explosion and meet the medical QoS/QoE requirements in varying environments.

Relation with the project work: This work is part of WP2, WP5, related to the architecture (as it defines the components for advanced and scalable mobility management) and to the network layered multi-flow multimedia transmission supporting schemes aiming to transmit layered media content to the end users over heterogenuous networks.

[43] P.A. Kara, L. Bokor, and S. Imre. Distortions in qoe measurements of ubiquitous mobile video services caused by the preconceptions of test subjects. In Applications and the Internet (SAINT), 2012 IEEE/IPSJ 12th International Symposium on, pages 409 -413, july 2012.

Abstract: In telecommunication services, alongside QoS, QoE provision has become essential, thus performance and quality evaluation measurement results need to reflect reality as much as possible. Our goal is to enhance QoE evaluation schemes and enable improved QoE provision for video applications and services anytime and anywhere. In order to eliminate potential erroneous conclusions of QoE assessment techniques, our paper reveals a novel topic of distortions caused by preconceptions based on prior technical knowledge of QoE measurement test subjects. In our analysis we introduce the differences from genuine QoE measurement results in 3G ubiquitous mobile video service scenarios where test subjects were aware of the service parameters during measurements. We show how subjects' evaluations were affected and investigate the identified phenomenon in terms of Mean Opinion Score deviations and the overall QoE result distortion.

Relation with the project work: This work is part of WP 3, related to the studies of Quality of Experience evaluation methods for image/video (medical) applications.

[44] Gabor Feher, "The Price of Secure Mobile Streaming", accepted to 8th IEEE International Workshop on the Performance Analysis and Enhancement of Wireless Networks, March 25-28, 2013, Barcelona, Spain

Abstract: The cryptographic algorithms providing unquestionable security are usually complex. From this point of view, it is reasonable that high bitrate secure live video streams require significant processing power from the end devices. To cope with the demands, there are many publications suggesting a kind of selective video encryption that reduce the burden by ciphering only a part of the video stream. As a tradeoff, the security level decreases. On the other hand, recently the retail price of the efficient hardware based cryptographic chips is dropped and devices became more and more resourceful. This is true for the mobile sector as well. In this article, based on measurements, we prove that the fully encrypted high bitrate mobile video streaming is possible today, moreover there are certain scenarios where it is advised to be used. The resource barrier is no longer the processing capacity, but the network link.

Relation with the project work: This work summarizes the results of the security related work carried out in WP3.

[45] C.T. Hewage, M.G. Martini, M. B. Brandas and D.V.S.X. De Silva, "A Study on the Perceived Quality of 3-D Video subject to Packet Losses" in *IEEE International Conference on Communications 2013 - Workshop on Immersive & Interactive Multimedia Communications over the Future Internet*, Budapest Hungary, June 9-13 2013.

Abstract: 3D video quality evaluation received much attention from researchers due to the demand from the industry and to the complex nature of true 3D video perception. The availability of public 3D video databases provides an opportunity for researchers and developers to evaluate novel objective 3D video quality evaluation metrics. In this paper, a stereoscopic 3D video database for the evaluation of visual quality assessment metrics is described. The effects of random packet losses on the overall 3D perception (i.e., distortions due to different packet loss rates) are considered in this research. The database presented here contains 54 test stimuli from 9 reference test video sequences corresponding to 6 different packet loss rates, including the uncorrupted 3D video sequence. In order to obtain true 3D video perception, about 1730 individual human quality observations (Opinion Scores (OS) of subjects) are considered for this database. The obtained Differential Mean Opinion Scores (DMOS) can be effectively used for evaluating 3D video quality metrics, as well as for designing new 3D video quality evaluation methods. Together with DMOS values, we provide the corresponding objective quality measurements using several objective quality metrics. The designed 3D video database will be freely available for download and use in scientific research.

Relation with the project work: This work is related to WP3.

[46] M. M. Nasralla, O. Ognenoski and M.G. Martini, "Bandwidth Scalability and Efficient 2D and 3D Video Transmission over LTE Networks" in *IEEE ICC'13 - Workshop on Immersive & Interactive Multimedia Communications over the Future Internet* , Budapest, Hungary, June 9-13 2013.

Abstract: The recent Long-Term Evolution (LTE) standard, thanks to the provision of high data rates, will enable future immersive and interactive multimedia applications over wireless.
In this paper, we study the performance of 2D and 3D video transmission over LTE networks. The LTE standard bandwidth ranges are considered in order to explore the impact of the LTE bandwidth scalability on the transmission of 2D and 3D video traffic to the end users. This dependency is investigated through the packet loss ratio (PLR) and average throughput as user-oriented metrics, and the cell spectral efficiency as a system-oriented metric. Furthermore, a PLR-based Admission Control (AC) strategy is introduced in the system for which the achieved trade-off between the system resource utilization and the quality level provided to the different users is investigated. The simulation results

provide guidelines for combining bandwidth scalability and admission control strategies in LTE networks in order to achieve high system resource utilization and video quality for the LTE users.

Relation with the project work: This work is related to WP5.

[47] A. Haseeb, M.G. Martini, V. Tralli and S. Cicalo', "Rate and Distortion Modeling for Real-time MGS Coding and Adaptation" in *IEEE Wireless Advanced (WiAd 2012)*, London, June 25-27 2012.

Abstract: Scalable Video Coding (SVC) is the extension of the Advanced Video Coding standard (H.264/AVC) providing video compression with spatial, temporal and quality scalability. Scalability can be exploited in order to provide a better video quality for the end user in video transmission over wireless networks. In this paper we develop a parametric Rate Distortion (R-D) model for Medium Grain Scalability (MGS) SVC depending only on two indexes describing the spatial and temporal complexity of video sequences. The two indexes can be easily obtained from the original raw video, thus enabling real time video adaptation for transmission over channels with variable bandwidth such as wireless channels. The results from simulations show that the use of the proposed model for rate adaptation of multiple-videos sharing a common channel results in an end user video quality comparable to that obtained by using a more accurate non-real time rate distortion model

Relation with the project work: This work is related to WP5.

[48] H. Appuhami Ralalage, M.G. Martini and C.T. Hewage, "Channel and Content aware 3D Video Scheduling with Prioritized Queuing" in *IEEE Wireless Advanced (Formerly SPWC) 2012*, London, UK, Jun 25-27 2012.

Abstract: In this paper we address 3D video delivery over wireless systems based on Orthogonal Frequency Division Multiple Access (OFDMA), by considering a medium access control (MAC) layer scheduling method combined with a prioritized queuing mechanism to prioritize the most important video components/layers with the goal of improving the perceived quality of 3D video at the receiver. We consider colour plus depth 3D video and we exploit its properties in terms of importance of the different components for the perceived quality. The priority values of the scalable video coding (SVC) encoded 3D video are signalled from the Application Layer to the MAC layer via cross-layer signalling. All the users attached to a Base Station feedback their sub-channel gain to the Base Station periodically via partial channel state information (CSI) and this information is used in the sub-channel allocation process at the scheduler. Thereby, the proposed scheduler always guarantees that the most important layers are scheduled over the sub channels with higher gain at each time slot of an OFDMA frame. Furthermore, we have established a Packet Loss Ratio (PLR) threshold which is used by the scheduler to drop video layers too much affected by packet losses to save scarce radio resources. Simulation results show that the MAC layer Packet Drop Ratio (PDR) is improved in the prioritized colour/depth layers at the cost of slight increase in PDR in the low prioritized layers. This results in a global quality improvement for the prioritized case

Relation with the project work: This work is related to WP4.

2.3   Participation at conferences, symposiums and workshops

The following table lists the dissemination events, i.e. conferences, symposiums and workshops, in which the above mentioned topics were or will be presented, detailing also the audience type and scale.

Dates	Conference, symposium, or workshop	Type of audience	Countries addressed	Size of audience	Partner(s) involved
July 2012	Future Networks and Mobile Summit 2012	Research and Business	World	~1500	CEFRIEL
June 2012	IEEE International Conference on Communications 2012 (IEEE ICC'12)	Research and Business	World	~2000	UOS
June 2012	IEEE Wireless Advanced 2012	Research and Business	London, UK	~150	KU
June 2012	Dagstuhl seminar on Future Internet for eHealth	Research, Business, End users	Dagstuhl, Germany	~50	KU
Aug 2012	IEEE 7th International Symposium on Turbo Codes & Iterative Information Processing (ISTC)	Research and Business	World	~500	CNIT

Dates	Conference, symposium, or workshop	Type of audience	Countries addressed	Size of audience	Partner(s) involved
Sep 2012	2012 IEEE 76th Vehicular Technology Conference (VTC2012-Fall)	Research and Business	World	~1500	UOS
Oct 2012	IEEE 3rd International Conference on Photonics		World	~800	UOS
Oct 2012	IEEE First European Conference on Satellite Telecommunications (AESS) 2012	Research and Business	World	~200	CNIT
Nov 2012	46th Annual Asilomar Conference on Signals, Systems, and Computers	Research and Business	World	~500	CNIT
Nov 2012	IEEE Germany Student Conference (GSC)	Research	Germany	~100	Siemens
Nov 2012	Visual Communications and Image Processing (VCIP)	Research	World	~150	Siemens
Dec 2012	IEEE 2012 Global Communications Conference	Research and Business	World	~2000	UOS, CNIT
Jan 2013	9th International ITG Conference on Systems, Communications and Coding (SCC2013)	Research and Business	World	~150	CNIT
Feb 2013	SPIE Medical Imaging	Research and Business	World	~1100	Siemens
Dic 2013	GLOBECOM 2013	Research and Business	World	~2000	CEFRIEL

3   Standardization Activities

3.1   3GPP

3GPP stand for "3rd Generation Partnership". It unites 6 key telecom standards bodies of Asia, Europe and USA. 3GPP was created at the end of 1998, with the aim of building from the GSM standards a 3rd Generation of wireless network system. Following the development of wireless technologies as W-CDMA, HDPA and LTE and its associated core network, 3GPP has defined in its Release 10, the main technologies that are recognised by the ITU as "4G" or IMT-Advanced Technologies.

3.1.1   Standardisation strategy

The project expectation is to influence the standardisation with project outcomes. The timescale of the 3GPP standardisation is defined by the 3GPP itself and it is not necessarily aligned with the project. The standardisation process is built over three stages: the definition of the requirements (Stage 1), the definition of the architecture (Stage 2) and the definition of the protocols (Stage 3). At the beginning of the CONCERTO, it was identified that the introduction of public safety features in the 3GPP standard, and in particular the proximity services, was an opportunity for disseminating some project outcomes. A regular tracking of the standardization progress is necessary in order to influence the standard based on the project results. The proximity services, introduced for supporting public safety services, and the RAN user plane congestion management were identified to be relevant for CONCERTO and could offer opportunity to promote some project results. A tracking of the SA4 group in charge of the codec and multimedia is also performed.

3.1.2   Standardisation results

During the first year of the project, the tracking of the 3GPP standardization progress, related to public safety features, and more specifically on the proximity services, and related to the user plane congestion and multimedia, has allowed to identify a forecast plan on the standardization activities for the timescale of the project. The next main release of the 3GPP, (release 12) is expected to be completed by mid-2014. Most of the requirements (Stage 1) are to be finalized by March 2013, with some possible exceptions in particular for the public safety features. In 2014, the main activity will be to progress the network architecture changes (Stage2).

During the whole year 2012, 3GPP has progress the identification of the requirements on the proximity services. The tracking allowed ensuring that the requirements identified by CONCERTO were taken into account. Based on the requirements for the ambulance and emergency area scenario, a contribution was done to extend the usability of network during local absence of network infrastructure by introducing a traffic relay capabilities in mobile devices. Since the end of 2012, NTUK is participating directly to the 3GPP meetings with a specific focus on the public safety features.

Dates	Meeting	Partner(s) involved
November 2012	3GPP SA1#59 Ad hoc on Public Safety	NTUK
January 2013	3GPP SA1#60 & 3GPP SA2#95	NTUK

3.2   ISO/IEC MPEG AND ITU-T VCEG

The JCT-VC is a joint working group of ISO/IEC MPEG and ITU-T VCEG. The JCT-VC was established in April 2010, when it had its first meeting in Dresden. The JCT-VC is working on the standardization project on High Efficiency Video Coding (HEVC). HEVC can be seen as the successor of the H.264/AVC standard. The goal for HEVC is the improvement of compression efficiency by 50%. A first version of the standard (FDIS status, Final Draft International Standard) has been completed in January 2013.

3.2.1   Standardisation strategy

Within image/video coding, CONCERTO focuses on the standardization of high-quality compression, i.e., lossless and near-lossless coding, as already described in the DoW. Therefore, especially the co-called "Range Extension" work as part of version 2 of High Efficiency Video Coding (HEVC/H.265) is relevant. A first proposal to this work item in the JVT-VC has been made (see below).

3.2.2   Standardization results

Siemens actively participates at the standardisation meetings of MPEG, VCEG, and JCT-VC as can be seen from the table below (reporting period M8 through M16). TCS as well attended some MPEG meeting

Dates	Meeting	Partner(s) involved
July 2012	JCT-VC#10, MPEG#101, and VCEG#45 standardization meetings (Stockholm, Sweden)	Siemens, TCS
October 2012	JCT-VC#11, MPEG#102, and VCEG#46 standardization meetings (Shanghai, China)	Siemens
January 2013	JCT-VC#12 and SG16/VCEG standardization meetings (Geneva, Switzerland)	Siemens

The following contributions were made to the MPEG Systems and JCT-VC working groups, respectively.

Partner		Title of contribution and standardisation group	Date	Location	Concerned technical domain (Task, WP)
2	Siemens	G. Bäse, "Editors input on 23000-10 2nd edition PDAM1 Conformance and reference software", ISO/IEC JTC1/SC29/WG1 (MPEG), document M27007	Oct. 2012	Shanghai, China	WP3, Task 3.1 on file format
2	Siemens	P. Amon, A. Hutter, E. Wige, A. Kaup, "Intra prediction for lossless coding" (proposal, document JCTVC-L0161/M27497)	Jan. 2013	Geneva, Switzerland	WP3, Task 3.1 on video compression
2	Siemens	W. Gao, M. Zhou, P. Amon, S. Lee, "HEVC Range Extensions Core Experiment 2 (RCE2): Intra Prediction for Lossless Coding" (CE description, document JCTVC-L1122/M28403)	Jan. 2013	Geneva, Switzerland	WP3, Task 3.1 on video compression

Although presented for the first time at the JCT-VC, the technology contained in proposal JCTVC-L0161 managed to meet the requirements for inclusion into a Core Experiment (CE). The CE description is contained in document JCTVC-L1122. In this core experiment, four different approaches for lossless coding (and combinations thereof) are compared against each other. The evaluation will be done at the 13th JCT-VC meeting in April 2013.

3.3   NCOIC

The Network Centric Operations Industry Consortium (NCOIC®) is a not-for-profit international corporation established in August 2004, with the aim of integrating existing and emerging open standards into a common global framework for the global deployment of network-centric applications. Defense companies, educational institutions, government agencies, information technology providers, service providers, etc compose this consortium.

Several teams and working groups have been established, lists on NCOIC web-site:
- **Building Blocks Team**: Identifies a wide variety of elements that help enable interoperability.
- **Integrated Project Teams (IPTs)**: these are customer teams whose role is to aggregate the NCOIC technical deliverables in support of specific customer domains.
- **Network Centric Attributes Functional Team**: Develops tools used by systems engineers to determine the level of net centricity that has been achieved in systems.
- **NIF® Architecture Concepts Functional Team**: Develops enabling guidance that systems engineers may use to develop systems-of-systems capabilities.
- **Requirements Validation Functional Team**: Develops and promotes models and practices useful to customers and member companies for validating requirements in a network centric environment.
- **Systems Engineering and Integration Functional Team**: Integrates the efforts and promote the deliverables of NCOIC Functional Teams for the accomplishment of NCOIC goals and objectives. The team recommends and supports the application of systems engineering and education methodologies and develops tools such as an integrated technical roadmap and a lexicon.

NOIC products are: analyses, lexicon of Terms, an Interoperability Framework (NIF), a Network Centric Analysis Tool, Frameworks Recommendations, Systems Engineering Best Practices and Processes, Training and Educational Materials.

3.3.1   Mobile Networks Working Group (MNWG)

The Mobile Networks Working Group (MNWG) is evaluating and recommending mobile networking solutions for network centric systems.

The MNWG has focused on issues with mobile and transportable nodes and networks, their interactions with fixed network infrastructure, and scenarios with mobile infrastructure. Impacts of wireless links including satellite links are considered. A wide range of use cases exist, including humanitarian disasters ranging from 9/11 to routine first aide level emergency events.

3.3.1.1   SAGM Real-Time Tactical Video Mobile Networking Technical Pattern

The SAGM Real-Time Tactical Video Mobile Networking Technical Pattern is devoted to the transmission of video over Private Mobile Radios for ambulances, fire fighters and police forces.

3.3.2   Contribution and participation to standardisation bodies

Contribution to the SAGM Real-Time Tactical Video Mobile Networking Technical Pattern is TCS goal. Indeed, activities on video adaptation realised in WP4 could be effectively applied to video transmission over Private Mobile Radios, which is one of the main TCS exploitation plan.

TCS is already involved in this pattern development. A second edition, including more interoperability details, as well as new formats in particular for metadata handling, is foreseen and TCS plans to actively contribute.

However, these activities have been suspended due to scarcity of clients funding the work and at the moment a certain date in which the activities will start again is not available. Hence, no contribution was possible so far, but TCS keeps monitoring the situation expecting activities to restart before the end of CONCERTO.

3.4   IEEE 1907.1

Kingston University has recently been involved in the IEEE 1907.1 standardization group for **"Network-Adaptive Quality of Experience (QoE) Management Scheme for Real-Time Mobile Video Communications".** KU will participate in next meeting in June.

4 Workshops

To meet broader knowledge of the achieved results and addressed challenges by CONCERTO, as well as to foster collaboration activities, the project has already (jointly) organized and planned dedicated open workshops. In the third year of the project the main event of this type will be arranged with the purpose of publically disseminating information on the CONCERTO outcomes about some of the fields mentioned above. Moreover this workshop will illustrate and promote the CONCERTO concept through the demonstration of real implementations. Personnel using healthcare equipment (e.g., doctors) will be invited to this workshop, in order to further validate the achievements of the project.

Meanwhile, CONCERTO partners also organized a workshop at the end of the first year, while yet evaluating some possible targets for the second year of the project life-time. The main objectives and follow-up of such events are properly tuned according to the level of project advances and type of participants (as detailed below).

4.1 First Year Workshop

4.1.1 Objectives and strategies

The goal of the first year workshop was to obtain a further validation and possible refinement of CONCERTO use cases and requirements, in order to assure the relevance of the CONCERTO work for healthcare professionals, as well as to put light on the most interesting ehealth applications for the medical staff and technical communities. There was also the chance of presenting first technical results and the standardization activities being carried out during the project by industrial partners, just to consolidate the relevance of CONCERTO outcomes by key organizations, such as ISO and 3GPP (see Chap. 3).

4.1.2 CONCERTO at ICT solutions for rehabilitation

Thanks to the support and the effective involvement of CONCERTO's Project Officer (PO), Mr. Loukianos Gatzoulis, PO of projects involved in ICT for eHealth, has been contacted: CONCERTO's flyer has been sent in January 2012 to our PO and, through him, to Mr. Gatzoulis. Mr. Gatzoulis answered in February 2012 by proposing one of the two following concertation meetings in autumn on specific application areas:

- Management of mental disorders (e.g. depression, bipolar disorder, stress). Target time for this: end of September
- ICT solutions for rehabilitation (e.g. stroke rehabilitation). Target time: around mid-October.

CONCERTO fits better the 2nd proposed concertation meeting since there is the common element of remote care or in-hospital care for the rehabilitation of the patients using ICT solutions, which is also one of the use cases considered in CONCERTO.

However, due to a reorganization of the structure of the clusters, the above planned workshop wasn't held and the workshop was reorganized during a special session at the MobiHealth 2012 conference, as explained in the section below.

4.1.3 CONCERTO at Mobihealth 2012

4.1.3.1 Event and participants

The 3rd International Conference on Wireless Mobile Communication and Helathcare (MobiHealth 2012[2]) was organised by the European Alliance for Innovation the 22nd and 23rd of November 2012 in Paris, France. Since the topics of the conference were in line with CONCERTO interests, the consortium contacted the organizers and discussed the possibility to organize the first CONCERTO workshop during MobiHealth 2012. The organizers – strongly interested in CONCERTO project – agreed with the CONCERTO consortium to have a special session dedicated to the first CONCERTO workshop.

A panel of five participants form the project animated the session (Figure 1):
- Dr. Maria Martini (Kingston University, UK): chair of the session,
- Lorenzo Iacobelli (Thales Communications and Security, France);
- Benoit Lecroart (Nec Technologies, UK);
- Simone Moretti (Consorzio Nationale Interuniversitario per le Telecomunicazioni, Italy);

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[2] http://mobihealth.name/2012/show/home

- András Takács (Budapest University of Technology and Economic, Hungary).

The agreed objective of the workshop was to present CONCERTO project and to discuss with participants and have feedbacks mainly on the requirements and use cases identified. The program of the workshop included the following six presentations:
- "Introduction of the panel and presentation of CONCERTO project", Dr. Maria Martini, Kingston University, UK
- "Use cases: challenges and business opportunities", Lorenzo Iacobelli, Thales Communications and Security, France
- "Secure QoE-aware image/video coding", Dr. Maria Martini, Kingston University
- "Content-awareness: wireless network support for media transmission", Benoit Lecroart, Nec Technologies, UK
- "Context-awareness: media adaptation, fusion and protection", Simone Moretti, Consorzio Nationale Interuniversitario per le Telecomunicazioni, Italy
- "Standardization", Benoit Lecroart, Nec Technologies, UK

The idea was to have short presentations (with the exception of the one on use cases) in order to have enough time to discuss with the attendance.

The first presentation was just a short introduction of the project. The second one was the central presentation of the workshop (around 20 minutes) and intended to introduce CONCERTO use cases and to stimulate the discussion.

The last presentations were short presentations (5-10 minutes) on the main subjects and preliminary results of technical workpackages (WP3, WP4 and WP5) and on current activities in standardization (WP7). The technical subjects presented were strictly related to the use cases in order, once again, to facilitate the exchanges on scenarios.

A feedback form (included in Annex) was also distributed to the participants in order to foster the exchanges and to collect the impressions of the participants.

Figure 1 - Picture from CONCERTO first year workshop.

Moreover, András Takács, the lead programmer of CONCERTO's Distributed and Dynamic Mobility Management framework, presented[3] the necessity of a DMM architecture for mHealth services, and proposed a nomadic system for it based on content- and context awareness, and strongly relying on cross-layer interoperation during the Advances in Personalized Healthcare Services, Wearable Mobile Monitoring, and Social Media Pervasive Technologies (APHS 2012) workshop that was held on the last day of MobiHealth 2012.

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[3] http://ict-concerto.eu/twiki/pub/Concerto/Publications/TakacsBokorMobiHealth2012.pdf

4.1.3.2   Results and exploitation

Around 30 people, mainly researchers involved in telemedicine-related activities, attended the CONCERTO session at MobiHealth 2012 conference.

At the end of the session six feedback forms completed were collected. Despite the low number of written feedbacks, the discussion during the workshop was really reach and fruitful with several questions and comments from the audience that helped to better identify the key challenges for each use case and to clarify some of them. As example, a discussion about required information at medical side helped to better clarify the problems related to the transmission of medical images and videos. In fact, for these data, the received quality cannot be evaluated only with classical metrics, but also specific medical needs should be taken into account. Another interesting point discussed was the security issues related to the use of caching for data that can become critical when dealing with medical data.

Moreover, the discussions during the workshop and the comments received through the feedback forms helped the consortium to improve our evaluation of business opportunities for each use case and to better identify the more interesting ones from a business perspective. In particular the "ubiquitous tele-consultation" use case emerged as the more interesting from a short term, economic perspective, while the emergency area use cases appeared to be more long term use cases, but also more interesting considering their potential medical impact. These feedbacks helped in the choice of the use cases to focus on for the simulator.

In addition to the useful feedbacks received, attendants demonstrated to be really interested in the project and discussions started with people form three different research centres to evaluate possible future collaborations.

4.2   Second Year Workshop

Even if in the initial planning of CONCERTO project was decided to organize only one workshop during the first year of the project and one almost at the end, the success of the first year workshop and the useful feedbacks received, convinced the consortium to organize a workshop also during the second year of the project.

4.2.1   Objectives, strategies and possible options

Concerto consortium is currently evaluating the best option for the second year workshop. Again, the event offers the opportunity of disseminating the project results and establishing new collaboration activities, as well as of collecting feedbacks about tuning the future work, especially on the addressed use-cases and evaluation process.

Among the available and suitable options, IEEE HealthCom, in Lisbon on 9-12 October, appeared as the most prominent one.

4.2.2   Event and participants

A workshop on "Service Science for e-Health" (SSH 2013) will be organised in conjunction with IEEE Healthcom 2013. The workshop will be organized by Katarzyna Wac, Pawel Swiatek and Maria Martini, and it will include representatives of the different CONCERTO partners as members of the programme committee.

5   Project liaisons

5.1   Project collaborations and interactions

5.1.1   FP7 project for intelligent transportation systems (ITSSv6)

The ITSSv6 project[4] has been started to deploy a stable, standardised, reliable and secure IPv6 framework to the Field Operation Test (FOT) projects for Intelligent Transport Systems (ITS) across Europe. It is led by INRIA, and Bluetechnix, Institut Telecom, IPTE, Lesswire, Mines Paris tech, MTA SZTAKI and UMU are involved as partners. The current issues and limitations of the Mobile IPv6 architecture are the same for ITS and mHealth services as well, which ensures the common interests. András Takács is involved in both projects, which has been generated the possibility of the cooperation. The leaders of the Hungarian partner organizations in ITSSv6 and CONCERTO projects have been organised an informal workshop to harmonise their vision about possible cooperation (please see Appendix A2 for the meeting minutes). Unfortunately, strong partnership could not be initiated, mostly because some crucial differences in the roadmaps of the two projects. The mip6d-ng development[5], hosted by CONCERTO could produce its first results before the end of the development tasks in ITSSv6. Even so, both of the projects are looking forward to further, more loose cooperation and relationship, e.g. in forms of consultation, organizing joint workshops, and continuously follow the efforts and results of each other.

5.1.2   FP7 Enriched Network---aware Video Services over Internet Overlay Networks (ENVISION)

A workshop between CONCERTO and the FP7 ICT project ENVISION was organised in June 2012. During this workshop D. Griffin (coordinator of ENVISION) gave a presentation of the ENVISION project and of its main results, while R. Fracchia presented the CONCERTO project, its objectives, its planned work and the use cases defined.
Three main topics of common interest have been identified:
- The discovery of the best caching/transcoding server: some work, done by ENVISION and presented in D3.1, could be a starting point for CONCERTO,
- Novel video quality metrics are defined by CONCERTO and could be used by ENVISION for the final validation phase,
- SVC video adaptation is done in both projects and a discussion between the involved partners could be beneficial.

Since then, some information exchanges between partners of the two projects went on.
For instance in November M. Martini (KU) was invited in UCL to give a seminar on the topics identified above (in particular on novel video quality metrics and their usage for video adaptation). A detailed discussion followed.

5.1.3   Celtic-Plus project COgnitive network ManageMent under UNcErtainty (COMMUNE)

VTT organized an internal collaboration and cooperation event between CONCERTO and Celtic-Plus COMMUNE (http://projects.celtic-initiative.org/commune/) projects in Oulu, Finland, 14th of December 2012. The focus was to find possible topics for collaboration between the projects. The COMMUNE project aims to build an innovative solution for cognitive network management under uncertainty. COMMUNE will seek to mitigate the practical effects of uncertainty by exploring the latest advances in knowledge based reasoning and other relevant cognitive methods. This approach is chosen due to the intuitive applicability of these models and their computational efficiency. The developed COMMUNE Management System shall be thoroughly tested through a combination of network trials (a proper mix of current wireless and wireline Internet technologies) and simulation campaigns. Special attention will be paid to access networks, focusing on two relevant scenarios: LTE and FTTH.

The event had more than 15 participants from both projects and also from outside the projects. Some topics which are in the interest of both projects are adaptive video streaming, QoS/QoE metrics to help decision making, information signalling and novel network architectures. The main shared topic could be the adaptation decision making and network management which is developed in both projects. Further discussion will be done between the projects during 2013 and especially if some developed software modules such as adaptive HTTP streaming and adaptation decision making module could be shared between the projects.

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[4] https://project.inria.fr/itssv6
[5] http://www.mip6d-ng.net/

5.2   Dissemination in European and international fora and organised events

5.2.1   Future Internet for eHealth (Dagstuhl)

http://www.dagstuhl.de/en/program/calendar/semhp/?semnr=12231

The design of emerging eHealth applications can only be tackled in a multi-disciplinary way. The goal of this seminar was to cluster together experts from healthcare, elderly care, insurance, together with experts from domains such as human-computer interaction, interactive application design, telecommunications, networking and economy to understand and support each other in designing and deploying future-proof eHealth services and applications based on Future Internet technology.

At large, the seminar addressed the following questions:

1.   Which will be the key eHealth applications and services in the Future Internet?

2.   Which are current and future quality requirements of eHealth applications and services?

3.   Which business models are viable for future eHealth applications?

4.   Which methodological support is required to design economically sustainable network-supported eHealth services?

Question 1 teamed up the participants around relevant use cases and facilitated discussions on the technical question 2 and the economical question 3, respectively. Question 4 addressed research needs from different domains and fertilized corresponding activities for advancing the topic of Future Internet for eHealth.

The event was held at Schloss Dagstuhl - Leibniz Center for Informatics. Dagstuhl Seminars and the Dagstuhl Perspectives Workshops bring together internationally renowned leading scientists for the purpose of exploring a cutting-edge informatics topic. The friendly and open climate at the conference center promotes a culture of communication and exchange among the seminar participants.

Dr. Maria Martini (Kingston University) presented her research and the CONCERTO project and approach in the event (Figure 2).

Figure 2 - Picture from Future Internet for eHealth.

6   Conclusion

The work in the OPTIMIX project on dissemination and standardization is continuing according to planning. At this stage, in the middle of the project, forty eight publications have been made, considering also those submitted but not already accepted, both by each partner individually and also with joint collaboration between partners. The consortium has been able to publish project results in many important scientific journals and magazines, but also in some of the most important workshops and conferences of the involved sectors, enlarging the public to which disseminate the project outcomes.

The industry partners NTUK, TCS and Siemens are continuing their involvement in standardization consortiums and bodies. More specifically, NTUK is involved in 3GPP, TCS in NCOIC and MPEG and SIEMENS in MPEG, VCEG, and JCT-VC. Moreover Kingston University has started its collaboration with IEEE 1907.1 standardization group for **"Network-Adaptive Quality of Experience (QoE) Management Scheme for Real-Time Mobile Video Communications".**

CONCERTO organized a first year workshop at the Mobihealth 2012 conference in November 2012, with around 30 people attendance. This workshop was extremely important for the received feedbacks, questions and comments: each use case's key challenges have been pointed out and some other issues to be taken into account emerged (like the need of some specific metrics for medical videos or the security issues when dealing with medical data). At the end of the workshop the project consortium selected the "ubiquitous tele-consultation" use case as the more interesting from a short term, economic perspective, while the emergency area use cases are selected to be more long term use cases and more interesting considering their potential medical impact.
Despite this wasn't initially planned, CONCERTO decided to organize also a second year workshop on "Service Science for e-Health" (SSH 2013) with IEEE Healthcom 2013.

CONCERTO organized also some meetings in order to exchange information and results with other European projects: ITSSv6 project, ENVISION and COMUNE. CONCERTO shares with ITSSv6 project the issues on the use of Mobile IPv6, while with ENVISION has some points of contacts (like the discovery of the best caching/transcoding server, novel video quality metrics and the SVC video adaptation). Eventually COMUNE has in common with CONCERTO many items, like the adaptive video streaming, QoS/QoE metrics to help decision making and network management, which will be developed in both projects. At the moment this collaboration is at the initial stage, but more information exchanges have been planned in the future.

Deliverables D7.6 due by M36 will enlarge for sure this listing of dissemination and standardisation items by activities planned and performed in the final part of CONCERTO.

Appendix A1

First year workshop: CONCERTO Special Session - Feedback form

- What is your main domain of expertise?

…………………………………………………………………………………………

- Please, rate each one of the use cases listed below according to how interesting and how relevant from a business perspective you consider it (from 1 to 5, where 1 is not interesting/relevant at all and 5 very interesting/relevant). What is the main medical/economic/social benefit that you can see for each of them?

CONCERTO use cases	Level of interest (1–5)	Business relevance (1–5)	Potential benefits
1) Ambulance and emergency area 2) Emergency area with multiple casualties 3) Emergency room 4) Ubiquitous tele-consultation 5) Surgical assistance 6) Additional in-hospital scenarios 7) Medical education			

- Which use case do you consider as the most relevant from a business (economic and medical advantages) point of view? Why?

………
……………………………………………………………………

- Have you in mind a use case or a business opportunity that we did not consider?

………
……………………………………………………………………

- Any further considerations?

………
……………………………………………………………………

Appendix A2: FP7-ITSSv6 – FP7-CONCERTO Informal Meeting

Logistics

Date:	July 12. 2012 15:00-16:00
Host:	SZTAKI
Contact:	András Edelmayer
Venue:	MTA SZTAKI, Kende u. 13-17. , Budapest, H-1111
Partners:	SZTAKI, BME
Guests:	n/a
Status Agenda:	V0.1

Participants

BME	László Bokor
SZTAKI	József Kovács, András Takács, László Virág, András Edelmayer

Agenda

Time	Agenda items	Responsible
15:00	*Open discussion*	

Minutes

CONCERTO (Content and cOntext aware delivery for iNteraCtive multimedia healthcaRe applications) is an FP7 STREP project aiming at designing and validating several critical building blocks of telemedicine applications. These include network-aware applications that rely on content-aware codecs and storage formats, carried over an application-aware network. The ultimate aim of CONCERTO is to provide high a Quality of Experience (QoE) for medics, which is a necessary condition for providing flawless medical diagnosing of the highest reliability. (http://ict-CONCERTO.eu/)

- Network protocol used by CONCERTO applications is IPv6. The same Mobile IPv6 architecture is used as starting point of development (http://umip.org)

- Almost identical issues were found during their initial review of the implementation as we found during the first year.

- As part of their work, by the end of this year they are comitted to re-implement mip6d, including Mobile IPv6, NEMO, MCoA, Flow Binding functionalities

- Some of the technical details (XFRM tunneling) match our Class-2 goals, in which we modify the existing mip6d implementation to fix tunneling and IKEv2 compatibility.

Most important concept and features of the re-implementation:

- Implementation of wide spectrum of Mobile IPv6 protocol(s)

- Modular design (mostly based on different protocol segments)

- Separation of communication, data storage (binding cache, binding update list, …), control, and environment management (xfrm, addresses, routes, ...)

- Powerful API for runtime management

- Detailed Doxygen documentation

- Open source (GPLv3)

The following collaboration ideas surfaced during the discussions:

- CONCERTO (WP5) and ITSSv6 (WP3) develop the new version of mip6d together

- CONCERTO develops the software framework, and manages the development of NEMO/MCoA

- ITSSv6 provides new tunneling mechanism, IKEv2 and flow binding.

Notes:

- CONCERTO will likely proceed with the new implementation regardless of our decision. Some of the efforts will be redundant if we stay separated

- CONCERTO was launched in December 2011, the deadline for the above listed implementation tasks is December 2012. Two months before our deadlines.

- Development lead of the task from CONCERTO is Andras Takacs (contractor at BME)

- If the development work is well synchronized, the extra work should not cause any details in ITSSv6

Benefits:

- The new implementation is modular and comes with a generic adaptation module, so new functions and SAPs can be easily implemented with its API

- CONCERTO can keep the implementation alive after ITSSv6 is finished (until December, 2014)

- EC will appreciate the collaboration between two running FP7 projects.

- Aligns with our longterm plan to maintain the mobility implementations independently of the projects.

Drawbacks:

- It might cause delays if the development work is stalled.

- Wors case scenario: ITSSv6 will have to implement the IKEv2 compatible new tunneling mechanism in current mip6d.

Safest approach:

- The tunneling mechanism and flow binding is implemented in a way that it can be used in both new and old implementations.

7 References and glossary

7.1 References

[1] J. Kovacs, L. Bokor, Z. Kanizsai, and S. Imre. Intelligent Multimedia Technologies for Networking Applications: Techniques and Tools, chapter Review of Advanced Mobility Solutions for Multimedia Networking in IPv6, pages 25-47. Number Hershey, PA, USA. IGI Global, 2013.

[2] W. M. Gifford and A. Conti and M. Chiani and M. Z. Win, "On the SNR Penalties of Ideal and Non-ideal Subset Diversity Systems," IEEE Transactions on Information Theory, vol. 58, n. 6, pp.3708-3724, June 2012.

[3] S. Cicalò, A. Haseeb and V. Tralli, "Fairness-oriented multi-stream rate adaptation using scalable video coding," Signal Processing: Image Communication, Elsevier, vol. 7, n. 8, pp. 800-813, Sep. 2012.

[4] A. Zanella and M. Chiani, "Reduced Complexity Power Allocation Strategies for MIMO systems with Singular Value Decomposition," Vehicular Technology, IEEE Transactions on, vol. 61, n. 9, pp. 4031-4041, Nov. 2012.

[5] P. Pulini, G. Liva and M.Chiani, "On-Line Construction of Irregular Repeat Accumulate Codes for Packet Erasure Channels," IEEE Transactions on Wireless Communications, to appear in 2013.

[6] C. La Palombara, V. Tralli, B. Masini and A. Conti, "Relay-Assisted Diversity Communications," IEEE Transactions on Vehicular Technology, vol. 62, n. 1, pp. 415-421, Jan. 2013

[7] Chao Xu, S. Sugiura, Soon Xin Ng and L. Hanzo, "Spatial Modulation and Space-Time Shift Keying: Optimal Performance at a Reduced Detection Complexity", in *IEEE Transactions on Communications,* vol.61, no.1, pp.206-216, January 2013.

[8] J. Hu, L. Yang and L. Hanzo, "Maximum Average Service Rate and Optimal Queue Scheduling of Delay-Constrained Hybrid Cognitive Radio in Nakagami Fading Channels", IEEE Transactions on Vehicular Technology.

[9] Li Li, Li Wang and L. Hanzo, "Differential Interference Suppression Aided Three-Stage Concatenated Successive Relaying", IEEE Transactions on Communications, vol.60, no.8, pp.2146-2155, August 2012.[9] Li Li, Li Wang and L. Hanzo, "Differential Interference Suppression Aided Three-Stage Concatenated Successive Relaying", IEEE Transactions on Communications, vol.60, no.8, pp.2146-2155, August 2012.

[10] L. Li, L. Wang and L. Hanzo, "Successive AF/DF Relaying in the Cooperative DS-CDMA Uplink: Capacity Analysis and Its System Architecture", in IEEE Transactions on Vehicular Technology, vol.62, no.2, pp.655-666, Feb. 2013.

[11] Hoang Anh Ngo, Sohail Ahmed, Lie-Liang Yang, L. Hanzo, "Non-Coherent Cooperative Communications Dispensing with Channel Estimation Relying on Erasure Insertion Aided Reed-Solomon Coded SFH M-ary FSK Subjected to Partial-Band Interference and Rayleigh Fading", IEEE Transactions on Communications, vol.60, no.8, pp.2177-2186, August 2012.

[12] M.I. Kadir, S. Sugiura, Jiayi Zhang, Sheng Chen and L. Hanzo, "OFDMA/SC-FDMA Aided Space–Time Shift Keying for Dispersive Multiuser Scenarios", IEEE Transactions on Vehicular Technology, vol.62, no.1, pp.408-414, Jan. 2013.

[13] Y. Huo, C. Zhu and L. Hanzo, "Spatio-Temporal Iterative Source-Channel Decoding Aided Video Transmission" IEEE Transactions on Vehicular Technology.

[14] Chen Dong, Lie-Liang Yang and L. Hanzo, "Performance Analysis of Multi-Hop Diversity Aided Multi-Hop Links over Nakagami-m Fading Channels", in IEEE Transactions on Communications *(Submitted).*

[15] Li Li, Li Wang and L. Hanzo, "Generalized Adaptive Network Coding Aided Successive Relaying Based Noncoherent Cooperation", *in* IEEE Transactions on Communications *(Accepted).*

[16] Shaoshi Yang, Tiejun Lv, Robert G Maunder and L. Hanzo, "From Nominal APPs to True APPs: An Exact Bayesian Theorem Based PDA Approach for Iterative Detection and Decoding Over Fading MIMO Channels", *IEEE Transactions on Communications (Accepted).*

[17] C.T. Hewage and M.G. Martini, "Quality of Experience for 3D video streaming," *IEEE Communications Magazine*, May 2011.

[18] C.T. Hewage and M.G. Martini, "Edge based Reduced-Reference Quality Metric for 3D Video Compression and Transmission," *IEEE Journal of Selected Topics in Signal Processing*, vol. 6, no. 5, pp. 471-482, 2012.

[19] M.G. Martini, B. Villarini and F. Fiorucci, "A reduced-reference perceptual image and video quality metric based on edge preservation," *Eurasip Journal on Advances in Signal Processing*, vol. 66, 2012.

[20] M.G. Martini, C.T. Hewage and B. Villarini, "Image Quality Assessment based on Edge Preservation," *Signal Processing: Image Communication*, vol. 27, no. 8, pp. 875–882, Sep 2012.

[21] G. Panza and S. Grilli, "An IP cross-layer scheduler for QoS provisioning in NGNs", submitted in Future Networks and Mobile Summit 2013.

[22] G. Panza and S. Grilli, "An IP cross-layer scheduler for relative QoS support in NGNs", submitted in Globecom 2013.

[23] S. Cicalò and V. Tralli, "Cross-Layer Algorithms for Distortion-Fair Scalable Video Delivery over OFDMA Wireless Systems," in Proc. of IEEE Globecom Workshop on Quality of Experience for Multimedia Communications 2012, Anaheim, California (USA), Dec. 2012

[24] M. Chiani, G. Liva and E. Paolini, "The Marriage Between Random Access and Codes on Graphs: Coded Slotted Aloha," in Proc. of the IEEE First European Conference on Satellite Telecommunications (AESS) 2012, Rome (Italy), Oct. 2012.

[25] G. Liva, B. Matuz, E. Paolini and M. Chiani, "Short Low-Rate Non-Binary Turbo Codes," IEEE 7th International Symposium on Turbo Codes & Iterative Information Processing (ISTC), Gothenburg (Sweden), Aug. 2012.

[26] E. Paolini, G. Liva and M. Chiani, "Random Access on Graphs: A Survey and New Results," Proc. of 46th Annual Asilomar Conference on Signals, Systems, and Computers, Pacific Groove, CA (USA), Nov. 2012.

[27] B. Matuz, G. Liva, E. Paolini, M. Chiani and G. Bauch, "Blockwise Noncoherent AWGN Channel: Concatenated Codes and Composite Capacity," 9th International ITG Conference on Systems, Communications and Coding (SCC2013), Munich, Germany, Jan. 2013.

[28] B. Matuz, G. Liva, E. Paolini and M. Chiani, "Verification-Based Decoding with MAP Erasure Recovery," 9th International ITG Conference on Systems, Communications and Coding (SCC2013), Munich, Germany, Jan. 2013.

[29] Li Li, Li Wang and L. Hanzo, "Successive DF relaying: MS-DIS aided interference suppression and three-stage concatenated architecture design", in 2012 *IEEE International Conference on Communications (ICC), Ottawa, Canada*, 10-15 June 2012.

[30] Chao Xu, Dandan Liang, S. Sugiura, Soon Xin Ng and L. Hanzo, "Reduced-Complexity Soft-Decision Aided PSK Detection", in 2012 IEEE *Vehicular Technology Conference (VTC Fall)*, Quebec, Canada, 3-6 Sept. 2012.

[31] M. Driusso, F. Babich, M.I. Kadir and L. Hanzo, "OFDM Aided Space-Time Shift Keying for Dispersive Downlink Channels", in 2012 IEEE *Vehicular Technology Conference (VTC Fall), Quebec, Canada,* 3-6 Sept. 2012.

[32] Hua Sun, Soon Xin Ng, and L. Hanzo, "Superposition Coded Modulation for Cooperative Communications," in 2012 IEEE *Vehicular Technology Conference (VTC Fall), Quebec, Canada,* 3-6 Sept. 2012.

[33] Chao Xu, Dandan Liang, S. Sugiura, Ng, Soon Xin Ng, and L. Hanzo, "Reduced-complexity soft STBC detection", in *2012 IEEE Global Communications Conference, Anaheim, US, 03 - 07 Dec 2012.*

[34] Shaoshi Yang and L. Hanzo, "Iterative detection and decoding using approximate Bayesian theorem based PDA method over MIMO Nakagami-m fading channels", in *2012 IEEE Global Communications Conference (IEEE GLOBECOM 2012), Anaheim, US, 03 - 07 Dec 2012.*

[35] Jie Hu, Lie-Liang Yang and L. Hanzo, Lajos, "Optimal Queue Scheduling for Hybrid Cognitive Radio Maintaining Maximum Average Service Rate Under Delay Constraints", in, *2012 IEEE Global Communications Conference (GLOBECOM), Anaheim, US, 03 - 07 Dec 2012.*

[36] Dandan Linag, Xinyi Xu, Soon Xin Ng and L. Hanzo, "Turbo-coded star-QAM for cooperative wireless and optical-fiber communications", in *3rd International Conference on Photonics, Penang, Malaysia, 01 - 03 Oct 2012.*

[37] J. Nagler, P. Amon, and L. Demaret. Hybrid downscaling of DCT-compressed images, in *Proc. of IEEE Germany Student Conference (GSC) 2012*, Passau, Germany, Nov. 2012.

[38] A. Weinlich, P. Amon, A. Hutter, and A. Kaup. Edge modeling prediction for computed tomography images, in *Proc. of Visual Communications and Image Processing (VCIP) 2012*, San Diego, CA, USA, Nov. 2012.

[39] A. Weinlich, P. Amon, A. Hutter, A. Kaup, "Near-lossless compression of computed tomography images using predictive coding with distortion optimization", in *Proceedings of SPIE Medical Imaging 2013*, Orlando, Florida, FL, USA, February 2013.

[40] Andreas Weinlich, Johannes Rehm, Andreas Hutter, André Kaup, "Massively parallel lossless compression of medical images using least-squares prediction and arithmetic coding", submitted to *IEEE International Conference on Image Processing (ICIP) 2013*, Melbourne, Australia, September 2013.

[41] Eugen Wige, Peter Amon, Andreas Hutter, André Kaup, "Pixel-based averaging predictor for HEVC lossless coding", submitted to IEEE International Conference on Image Processing (ICIP) 2013, Melbourne, Australia, September 2013.

[42] A.Takacs and L. Bokor. A distributed dynamic mobility architecture with integral cross-layered and context-aware interface for reliable provision of high bitrate mhealth services. In Proc. of 3rd International Conference on Wireless Mobile Communication and Healthcare (MobiHealth 2012), Paris, France, Nov. 2012.

[43] P.A. Kara, L. Bokor, and S. Imre. Distortions in qoe measurements of ubiquitous mobile video services caused by the preconceptions of test subjects. In Applications and the Internet (SAINT), 2012 IEEE/IPSJ 12th International Symposium on, pages 409 -413, july 2012.

[44] Gabor Feher, "The Price of Secure Mobile Streaming", accepted to 8th IEEE International Workshop on the Performance Analysis and Enhancement of Wireless Networks, March 25-28, 2013, Barcelona, Spain

[45] C.T. Hewage, M.G. Martini, M. B. Brandas and D.V.S.X. De Silva, "A Study on the Perceived Quality of 3-D Video subject to Packet Losses" in *IEEE International Conference on Communications 2013 - Workshop on Immersive & Interactive Multimedia Communications over the Future Internet*, Budapest Hungary, June 9-13 2013.

[46] M. M. Nasralla, O. Ognenoski and M.G. Martini, "Bandwidth Scalability and Efficient 2D and 3D Video Transmission over LTE Networks" in *IEEE ICC'13 - Workshop on Immersive & Interactive Multimedia Communications over the Future Internet* , Budapest, Hungary, June 9-13 2013.

[47] A. Haseeb, M.G. Martini, V. Tralli and S. Cicalo', "Rate and Distortion Modeling for Real-time MGS Coding and Adaptation" in *IEEE Wireless Advanced (WiAd 2012)*, London, June 25-27 2012.

[48] H. Appuhami Ralalage, M.G. Martini and C.T. Hewage, "Channel and Content aware 3D Video Scheduling with Prioritized Queuing" in *IEEE Wireless Advanced (Formerly SPWC) 2012*, London, UK, Jun 25-27 2012.

7.2   Glossary

AF	Amplify-and-Forward-based	
ANCC	Adaptive Network Coded ooperation	
APPs	A Posteriori Probabilities	
AWGN	Additive White Gaussian Noise	
BPSK	Binary Phase Shift Keying	
CDMA	Code-Division Multiple-Access	
CR	Cognitive Radio	
CSI	Channel State Information	
CT	Computed Tomography	
DAF	Decode-and-Forward	
D-balanced	Destination-balanced	
DF	Decode-and-Forward-based	
DMOS	Differential Mean Opinion Scores	
EGC	Equal Gain Combining	
EMP	Edge Modeling Prediction	
EXIT	Extrinsic Information Transfer	
FEP	Frame Error Probability	
FFR	Fractional Frequency Reuse	
FR	Full-Reference	
FSK	Frequency Shift Keying	
GANC	Generalized Adaptive Network Coding	
ILA	Iterative Local Approximation	
JNCC	Joint Network-Channel Coding	
JSCC	Joint Source and Channel Coding	
LDPC	Low-Density Parity-Check	
LTE	Long-Term Evolution	
MAP	Maximum A Posteriori	
MGS	Medium Grain Scalability	
MHD	Multi-Hop Diversity	
MIMO	Multiple-Input-Multiple-Output	
MO-RTT	Maximum Output-Ratio Threshold Test	
MQAM	M-ary Quadrature Amplitude Modulation	
MS-DIS	Multiple-Symbol Differential Interference Suppression	
NGNs	Next-Generation Networks	
OFDMA	Orthogonal Frequency-Division Multiple Access	
OS	Opinion Scores	
PDA	Probabilistic Data Association	
PDM	Proportional Differentiation Model	
PLR	Packet Loss Ratio	
PU	Primary Users	
QoS	Quality of Service	
R-balanced	Relay-balanced	
ReS	Reed-Solomon	
RR	Reduced-Reference	
SAD	Sum of Absolute Differences	
SC	Selection Combining	
SC-FDMA	Single-Carrier Frequency-Division Multiple-Access	
SFH	Slow Frequency Hopping	
SISO-MSDSD	Soft-Input–Soft-Output Multiple-Symbol Differential Sphere Detection	
SM	Spatial Modulation	
SNR	Signal-to-Noise Ratio	
SRAN	Successive-Relaying-Aided Network	
SSD	Subset diversity	

STBC	Space-Time Block Code	
STSK	Space-Time Shift Keying	
SU	Secondary User	
SVC	Scalable Video Coding	
SVD	Singular Value Decomposition	
TTCM	Turbo Trellis-Coded Modulation	
UXP	Unequal Erasure Protection	
VBD	Verification-Based Decoding	
WLAN	Wireless local area network	