

NEWCOM NEWSLETTER

Project Extension Special Issue

Welcome!

[Michał Wódczak, PUT](#)

Dear Readers,

The first phase of NEWCOM is now finalised and we have just entered the extension period. For this reason we deliver to you another special issue of the NEWCOM Newsletter, which summarises the work performed thus far and outlines the plans concerning the nearest future.

While it was decided to keep the usual sectioning and include the current news, the contents of this issue is mostly focused on presenting NEWCOM's achievements, as well as supporting the discussion on the possible ways forward.

All the readers are especially encouraged to visit the opening section A, where more details regarding the future plans are given and the NEWCOM-ACoRN Workshop in Vienna is summarised.

This time Section B contains significantly extended reports provided by some of the Project and Department leaders or their representatives. I would like to thank all of them for their effort to present the most complete overview of the current state of the work progress in NEWCOM!

Then Section C follows, where the details regarding the current NEWCOM events are given.

Section D is especially appealing to those of us, who are looking for exchanges and position openings. Once again we kindly request all NEWCOM Partners to continue advertising in this section.

Finally, there is the closing Section E, which is aimed at serving as the project proposal incubator. Please read the description therein and contact us if you are willing to advertise a proposal.

Last but not least I would like to announce that although, according to the agreed time plan, all the contracted issues of the NEWCOM Newsletter have been already delivered, we have decided to continue reporting the ongoing activities at least until the end of the extension period.

Therefore, we plan to deliver two additional issues – one at the beginning of January 2007 and the final one at the beginning of March 2007. We are also considering to continue this activity even afterwards in order to foster the collaboration among the interested partners.

With kindest regards,

Michał Wódczak
NEWCOM Newsletter EiC

A. NEWCOM life

[Sergio Benedetto, ISMB](#), [Stephen Sadler, ISMB](#)

NEWCOM has reached a very crucial point of its life. So far, its community of researchers has achieved major results in terms of integration and spreading: successful, well attended summer/winter schools, PhD courses and invited talks broadcasted via web, special sessions and workshops at major international conferences, special issues of refereed journals, and, mostly important, an increasingly strong scientific cooperation substantiated in hundreds of co-authored papers.

On September 20-22, the joint NEWCOM-ACoRN Workshop has been very successful, both quantitatively (more than 120 attendees), qualitatively (high quality research papers), and socially (thanks to the great local organization). Below a picture is presented, which was taken during the plenary session about "Grand Challenges in Wireless Communications".



On occasion of the Workshop Banquet, the NEWCOM Best Paper and Young Investigator Awards have been assigned. The awarded paper, based on the unanimous choice of the Award Committee (Henry Bertoni, Rob Calderbank, Jim Massey), is: "A Theoretical Framework for Soft-Information-Based Synchronization in Iterative (Turbo) Receivers", by Nele Noels, Vincenzo Lottici, Antoine Dejonghe, Heidi Steendam, Marc Moeneclay, Marco Luise, Luc Vandendorpe, representing three different

NEWCOM partners. The Young NEWCOM Investigator Best Paper Award has been assigned to Nele Noels, from University of Ghent.

Let us have a look at a few additional pictures taken during this event. Prof. Marco Luise, on behalf of the seven coauthors, receives the NEWCOM Best Paper Award.



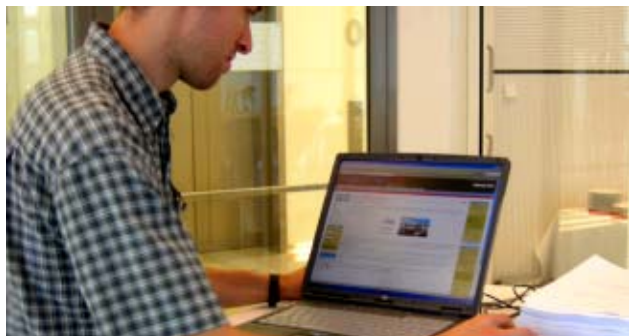
Alex Grant, Chair of the Technical program Committee, receives a Recognition Award from Lars Rasmussen (ACoRN Convenor) and Sergio Benedetto.



A similar award was also presented to Jossy Sayr, for the wonderful organisation of the Workshop.



During the workshop, at the venue's hall there was a 'DBKN corner', where participants could browse the DBKN website, take some HowTos and Guides about it, and take the latest Newsletter issue.



Following this event, we need to continue with this trend to the end of NEWCOM, and several milestones are still awaiting on the road to the final success: the continuation of the integration activities, the NEWCOM Dissemination Day, whose organization is under way by Hikmet Sari, and the preparation of the final scientific deliverables, whose quality need to be assured very carefully, coping with one of the major criticisms during the second EC reviews.

Another crucial point is to decide on NEWCOM future, based on the IST Work Programme of the seventh Framework Programme, which still envisions the NoEs as a reasonably funded tool. To this purpose, we announced in the last Newsletter issue the opening of a Forum on DBKN, which was started with the thoughts of the Executive Board emerged during Pisa last meeting. No one has taken advantage of this opportunity, and this is rather disappointing. On November 7-8, in Catania, the EB and the Dept./Proj. Heads will have to make a final decision on this, and it would be easier if the core of NEWCOM, i.e., its researchers, could let us hear their voices.

For everyone's convenience, we are repeating here the content of part of my message in the last issue:

"...The Workshop in Pisa has been held on June 28, 2006, with the participation of the EB members, and some Dept./Proj. Heads (Giorgio Vitetta, Guido Masera, Bernard Fleury, Susanne Godtmann and David Kammler representing Gerd Ascheid and Heinrich Meyr). After a wide discussion involving all participants, a general consensus was reached upon the following:

- *NEWCOM should continue through the submission of a new NoE proposal to FP7;*
- *The new NoE should contain a subset of present NEWCOM committed partners with the addition of a few, accurately chosen new partners based on their relevance to topics and REAL excellence/motivation;*
- *The new NoE should capitalize on NEWCOM achievements and heritage, including logo and brand name;*
- *The new NoE should be well distinguishable with respect to IPs/STREPs and existing NoEs, especially in terms of the approach to tackle research topics;*
- *There should be a declared and strong research connection with foreign (US NSF/DARPA initiative, as an example, ACoRN) networks involved in similar activities;*
- *Integration activities should take advantage of existing tools (DBKN, web site, teleconferencing,...), continue successful initiatives (summer/winter schools), improve the problematic ones (Doctoral school);*
- *Spreading of excellence should continue successful initiatives (Workshops, journal special issues, Newsletter etc.);*
- *Research should focus on a medium-long term, theoretically based and sound approach*

to basic, relevant problems in wireless communication;

- Common tools (design, models, simulation, ...) should be included in the proposal, and application/services should constitute a framework of reference and serve as test cases for the developed theory/algorithms.

Right after the meeting, a forum has been prepared by Mario and Monica on the NEWCOM DBKN web site (<https://dbkn.ismb.it>). All researchers from NEWCOM can access and participate to the Forum using the DBKN username and password they have received some time ago from Mario-Monica, click on the Forums, then on Public, and then on The Future of NEWCOM. There is an introduction to the forum written by Sergio. Please take part into the Forum, since it is important to know whether the Newcomers share the EB members' ideas on NEWCOM future or not...".

B. Technical sections

Michał Wódczak, PUT

WPR.2 MIMO Radio Channel Modelling for Design Optimisation and Performance Assessment of Next Generation Communication Systems

TECHNICAL REPORT

The 3rd Department 2 Workshop took place on Sept. 21-22 at the premises of ftw. in Vienna in parallel to the NEWCOM-ACORN Workshop. Two technical meetings and a management one were held.

Several technical talks presented the on-going work. The list of participants, the programme of the technical sessions, and the slides of the talks can be downloaded from DBKN [\[link\]](#).

The minutes of the management meeting are available on DBKN as well [\[link\]](#).

PUBLICATIONS

- Xuefeng Yin, Troels Pedersen, Nicolai Czink, and Bernard H. Fleury, "Parametric characterization and estimation of bi-azimuth and delay dispersion of path components", in Proceedings of the 1st European Conference on Antennas and Propagation (EuCAP), Nice, France, 2006.
- Nicolai Czink, Giovanni Del Galdo, Christoph Mecklenbräuker, "A novel automatic cluster tracking algorithm", IEEE PIMRC 2006, Helsinki, Finland, September 2006.
- C. Oestges, M. Guillaud and M. Debbah, "Multi-Polarized MIMO Communications: Channel Model, Mutual Information and Array Optimization", submitted to The IEEE Wireless and Communications Conference (WCNC 2007), Hong Kong.
- M. Guillaud, M. Debbah and A. Moustakas, "Maximum Entropy Characterization of Spatially Correlated MIMO Wireless Channels", submitted to The IEEE Wireless and Communications Conference (WCNC 2007), Hong Kong.
- A. Renaux, L. N. Atallah, Ph. Forster, and P. Larzabal, "A useful form of the Abel bound and its application to estimator threshold prediction", to appear in IEEE Transactions on Signal Processing.
- A. Renaux, Ph. Forster, E. Boyer, and P. Larzabal, "Unconditional maximum likelihood performance at finite number of samples and high signal to noise ratio", to appear in IEEE Transaction on Signal Processing.
- A. Renaux, "Weiss-Weinstein bound for data aided carrier estimation", to appear in IEEE Signal Processing Letters.
- Nicolai Czink, Pierluigi Cera, Jari Salo, Ernst Bonek, Jukka-Pekka Nuutinen, Juha Ylitalo, "A framework for automatic clustering of parametric MIMO channel data including path powers", to be presented at IEEE VTC 2006 Fall, Montreal, Canada, September 2006.
- Nicolai Czink, Ernst Bonek, Lassi Hentilä, Pekka Kyösti, Jukka-Pekka Nuutinen, Juha Ylitalo, "The interdependence of cluster parameters in MIMO channel modeling", to be presented at EuCAP'06, Nice, France, November 2006.
- Helmut Hofstetter, Andreas F. Molisch, Nicolai Czink, "A Twin-Cluster MIMO Channel Model", to be presented at EuCAP'06, Nice, France, November 2006.

- Nicolai Czink, Ernst Bonek, Lassi Hentilä, Jukka-Pekka Nuutinen, Juha Ylitalo, "Cluster-Based MIMO Channel Model Parameters Extracted from Indoor Time-Variant Measurements", to be presented at IEEE Globecom 2006, San Francisco, USA, November 2006.

- P. Almers, E. Bonek, A. Burr, N. Czink, M. Debbah, V. Degli-Esposti, H. Hofstetter, P. Kyosti, D. Laurenson, G. Matz, A. F. Molisch, C. Oestges, and H. Özcelik, "Survey of Channel and Radio Propagation Models for Wireless MIMO Systems", accepted for publication in EURASIP Journal on Wireless Communications and Networking, Special Issue on Space-Time Channel Modeling for Wireless Communications, to appear in 2007.

WPR.4 Analysis, Design and Implementation of Digital Architectures and Circuits

TECHNICAL REPORT

Joint research on architectures for channel decoders

WPR4.2 addresses the implementation of high performance flexible channel decoders, where throughput and reconfigurability must be obtained with a limited impact on the energy efficiency. Main results are the following:

- Algorithms for the design of parallel prunable interleavers have been made available by ISMB to all partners, together with a C model for simulation tests. Both the algorithms and the C code have been also presented and described to the partners and the related material is now available on the Dep. 4 web pages.

- Known and published solutions for the implementation of parallel flexible architectures for turbo codes have been studied and discussed by the partners in order to reach a

common understanding of this issue. The obtained results have been reported in deliverable DR4.5.

- A design team has been formed with the purpose of designing multi-ASIP architecture for high performance flexible turbo decoders ("versatile turbo decoder"). The team, including ISMB, BILKENT, GET, POLITO and TUA, organized a one week meeting in December, with the purpose of making the main design decision and splitting the work among people. The second meeting was organized as a side event at the DATE 2006 conference scheduled on 6-10 March, in Munich, Germany. Designers are currently working at different parts of the decoders and they will meet periodically to exchange results and coordinate efforts. GET designed an ASIP processor that supports the double binary case and that was presented at DATE 2006 conference ("ASIP-Based Multiprocessor SoC Design for Simple and Double Binary Turbo Decoding"). Main following steps in the development of the full decoder are:

- System level validation in ConvergenSC
- Partitioned interleaver for MP-SOC

- Also for LDPC codes, all known approaches to the implementation of fast and flexible decoders have been studied and compared by involved partners (POLITO, UoP, FTW). The results are reported in DR4.5. Joint work of ISMB and POLITO was presented at DATE2006 and submitted to TCAS-II ("Interconnect Framework for High-Throughput, Flexible LDPC Decoders"). The work deals with a fully flexible LDPC decoder, supporting a wide range of codes and based on a novel formulation of the Belief-Propagation algorithm, which strongly reduces the internal communication effort. A second work jointly carried on by ISMB and POLITO was published in the August issue of the Electronics Letters ("ASIP design for partially structured LDPC codes") on the subject of LDPC codes characterized by a partially structured parity

check matrix. The structured and regular part of the code is handled by the dedicated hardware that take advantage of the regularly placed ones to simplify internal structure. The irregular ones are processed by a specialized ASIP processor.

- The need for studying the finite precision effects in different decoding implementations has been recognized and this kind of activity is currently ongoing. Although the development of a complete LDPC decoder is not one of the Department's objectives, new solutions will be proposed and characterized at the architecture level. Joint work of POLITO and UoP on this subject was presented at the IST Conference, 2006: "On the Decoding of LDPC Codes in Finite-Precision Arithmetic".

- An international Workshop on VLSI Architectures for LDPC Decoders has been organized by UoP in Pisa on October, Friday 6th, 2006. The workshop, which follows the Department 4 meeting held in Pisa the day before, provides an international forum for scientists to share their research results and discuss problems, as well as the new developments of the architectures and the implementations of LDPC decoders. The invited speakers are from:

- ST Microelectronics Agrate, Milano, Italy,
- Politecnico di Torino, Italy,
- Ecole Nationale Supérieure des Télécommunications, ENST, France,
- Université de Bretagne Sud, France,
- Philips Eindhoven, The Netherlands,
- Technische Universität Kaiserslautern, Germany,
- European Space Agency, ESA/ESTEC, The Netherlands,
- University of Pisa, Italy,
- Turbo Concept, France.

Joint research on design methodologies and tools

A few ASIP developments have been planned in Department 4 as specific cases of implementation for channel decoders, processing units of OFDM based receivers und multimedia applications. Within work package WPR4.1, support was given during the design phases of these developments. In particular, these designs included the following: a Flexible LDPC Decoder, four different FFT Processors, and a Flexible Retinex Processor. So far, four papers presenting the results of these case studies have been accepted for publication or published at different conferences. Activities have been reported in detail in DR4.3 "First report on ASIP design methodologies". The last mentioned case study on ASIP design, accomplished by TUA and UoP, is briefly introduced in the following. Image sensors based on CMOS technology are becoming very common in portable devices, although they typically imply reduced quality of the image details, especially if the image has been acquired in critical illumination conditions. The scope of the research is to devise algorithms and implementation architectures able to compensate pictures while enhancing scene details. Conventional linear filters provide poor results in terms of visual quality. Instead a promising solution is based on the Retinex theory and the class of polynomial non-linear filters. Since this class of filters can address different application scenarios (luminance correction, camera noise removal, reduction of blocking artefacts in video codec, image detail enhancement) the possibility of designing a low-power processor with application specific instructions has to be considered.

Joint research on hardware-software platforms

A common design of a SoC is proposed to define a methodology between UPC, TUA and SUPELEC approaches. This design will integrate aspects of the approach of each partner:

- P-HAL for UPC,
- LISA tool for TUA,
- Common operator parameterization in a hierarchical configuration management for SUPELEC.

The main goal of this activity is to exploit a simple implementation to compare the viewpoints of the partners and extract complementarities on reconfiguration at the level of design flows or run-time management. The selected case of study is a parameterized turbo encoder.

WPR.6 Protocols and Architectures, and Traffic Modeling for (Reconfigurable/Adaptive) Wireless Networks

TECHNICAL REPORT

The fifth Dept. 6 meeting was held in Toulouse on September 13-14. At the meeting the work within the department during the last stage of NEWCOM was planned. The final deliverable of the Department will contain the proceedings of the Fourth NEWCOM Department 6 Technical Workshop that was held in conjunction with the meeting. All previous deliverables have been completed. The identified resources, suitable for E-MORANS in DR6.5, will be integrated into E-MORANS and the documents of the Department will be inserted into the DBKN. A jointly developed emulation environment is proposed for presentation at the NEWCOM Dissemination Day. The Department's view on NEWCOM 2 and possible suitable topics for investigation in a next phase were discussed. A short document will be prepared summarizing the input from the Department on these issues. A video conference was planned for January next year to follow up on the activities and a physical meeting was planned for the late spring to maintain the good contacts and continue the integration also after the formal end of NEWCOM. The final activities for the ongoing integrated research

activities and their goals were also discussed. A summary of the status and the plans for each of the Department's three areas (transport protocols, architectures/cross layer aspects and modeling) are provided below.

Within the transport protocol area the work has focused on the use of SCTP in wireless networks. Work on a modified version of SCTP, Westwood SCTP, that supports load sharing has been jointly investigated by ISMB and PoliTO resulting in several joint papers. Based on the performance of the standard SCTP failover mechanism, transport mobility with SCTP has been jointly studied by UPC and KaU. The use of SCTP in ad-hoc networks has been investigated by CNRS. During the last phase of NEWCOM a joint paper that includes the results from several of the partners will be prepared and submitted to a journal. The joint work between UPC and KaU will be documented in two joint publications and plans for continued cooperation will be discussed. This is supported by a two month research visit from UPC to KaU during August and September.

Work in relation to the architectures has focused on cross-layer concepts to optimize application or transport protocol performance. Related to how physical layer information can aid multimedia encoding and decoding an analytical model of a rate-controlled MPEG video source in a UMTS network has been jointly developed between UoC, UPC and Bilkent. A first joint report on this work has been prepared and will be refined for journal submission during the last stage. Several aspects of cross layer concepts to optimize transport protocol performance have also been considered. The effect of UMTS RRM strategies on TCP has been jointly studied by UPF and UPC. This work is completed and has been reported in several joint articles. The impact of link layer ARQ design for 4G multi-hop wireless networks has been jointly studied by KaU and UPF. Due to the main investigator being on maternity leave this activ-

ity is temporarily stalled and will continue after the end of NEWCOM.

The use of routing protocol information to optimize TCP performance in ad hoc networks has been studied by CNRS.

Work on modelling has included modelling of adaptive multimedia traffic in wireless networks as well as work on network emulation. An analytical MPEG-4 video source model with adaptive FEC capability has been jointly developed by UoC and UoS. It was presented at the NEWCOM-ACoRN Joint Workshop in Vienna. Ideas for continuing the cooperation after the end of NEWCOM are under consideration. The integration of research between CNRS and KaU has resulted in the joint SWINE/NINE/KauNet emulation platform and a joint publication. The emulation platform will be further refined and another joint publication will be prepared. A funding application for the continued joint work after the end of NEWCOM will also be prepared. A short research visit from KaU to CNRS will be performed as a part of the work.

PUBLICATIONS

- Lukasz Budzisz, Ramon Ferrús, Ferran Casadevall, "SCTP multihoming performance in dynamically changing channels with the influence of link-layer retransmissions", VTC-Fall 2006.
- Chee Hock Liew, "Resource Allocation Framework for Video Streaming Over Wireless OFDMA Systems", Proceedings of the NEWCOM-ACoRN Joint Workshop, 20 - 22 September 2006.
- Mario Barbera; Ahmet Konoz; Chee Hock Liew; Giovanni Schembra, "An Analytical Model for MPEG4 Transmission in Wireless Networks", Proceedings of the NEWCOM-ACoRN Joint Workshop, 20 - 22 September 2006.

WPR.7 QoS Provision in Wireless Networks: Mobility, Security and Radio Resource Management

TECHNICAL REPORT

The main achievements resulting from the activities carried out jointly by the different partners (UPC, UPF, POLITO, GET, Eurecom, LNT-TUM, CNIT, BUTE, UGent, KaU, IMCO2-UPV, IST-TUL), as well as the planned work for the next months, are summarised below.

Activity 1 - Definition of reference scenarios for the evaluation of radio resource allocation algorithms

With respect to the work in the activity scenario definitions for the evaluation of radio resource allocation schemes, the first contribution was the definition of the recommendations for the reference scenarios defined in E-MORANS, included in the deliverable DR7.3, and resulting from the compilation of answers from the different partners to the E-MORANS questionnaire. The second contribution has been the joint definition of three reference scenarios to be used in the future activities. They are available in the NEWCOM DBKN to all NEWCOM partners, in both text format (available at [\[link\]](#)) and XML format, which can easily be viewed with a browser (available at [\[link\]](#)) These scenarios are denoted as:

- S1: Single-Cell Heterogeneous RANs Scenario, defined by CNIT, IMCO2-UPV, IST-TUL, LNT-TUM and UPC. It is a simple reference scenario for evaluation of common radio resource management strategies. A basic scenario has been defined considering three concentric cells (each cell corresponding to one RAT), with increasing cell radii. Four different Radio Access Technologies have been taken into account: UMTS and its evolution HSDPA, GPRS-EDGE, WLAN 802.11 b and g and finally MC-CDMA. Dynamic simulations are required since they are able to

model movement, call set-up and release, service demand variations and quality changes in received signal. Service demanding mobiles are generated according to a certain traffic distribution and they move throughout the whole zone. As mobile units wander within the described scenario, they receive data packets, perform power control if needed, undergo inter-system handover and may be dropped if quality falls beyond a limit.

- S2: Single-Cell WLAN Scenario, defined by EURECOM, POLITO and UPF. This scenario consists of a single cell IEEE 802.11e-based wireless local area network (HotSpot WLAN). It provides a common framework, where different RRM algorithms such as Admission and Rate Control schemes can be evaluated.

- S3: Multi-Cell Scenario, defined by BUTE, IST-TUL and UGENT. The multicell scenario aims at defining a reference system for the purpose of evaluating algorithms and procedures applied in mobile networks to support terminal mobility (mobility management, handover, location management, etc.). The scenario is based on an area of 10×10 km², covered by macro- and microcells. The middle part of the area is dense urban, covered by both micro- and macrocells, whereas the outer part represents a suburban area, covered by macrocells only. The street network of the area is considered to be of a Manhattan grid type and the applied mobility model allows the users to move along this street network.

During the next periods it is expected that the algorithms proposed in the different activities, as detailed in the following, are evaluated in the common scenarios.

Activity 2 - Advanced RRM and CRRM algorithms for wireless networks

The joint work performed by UPC, UPF and UPV has led to the analysis and evaluation of Hop-

field Neural Networks (HNN) used as a resource allocation methodology for data services both in scenarios with a single access technology (i.e. CDMA in both uplink and downlink) and in heterogeneous networks scenarios with several access technologies (i.e. as a Common Radio Resource Management scheme). In the first case, a two dimensional HNN is used to select the appropriate bit rate to be allocated to each user while in the second case an additional dimension is required to incorporate the different access technologies. The convergence issues in the HNN have been analysed as well as the performance under different types of traffic, resulting in a good performance with respect to other reference schemes.

Another achievement within this activity has resulted from the work carried out jointly by UPC and GET (UPC was visited by a researcher from GET). A novel methodology for frequency management in WCDMA systems was developed with the use of the analytical and second order statistics to design compatibility or coupling matrices that reflect the interaction among different cells, and including an heuristic algorithm for deciding the proper frequency allocation. The proposed methodology has provided good results when compared to other classical approaches like the frequency assignment according to hierarchical cell structures (i.e. macrocells and microcells with different carrier frequencies).

Another joint work has been related to the QoS provision in WLANs, resulting from the cooperation between POLITO and UPF. The work has dealt with IEEE802.11 Medium Access Protocol (MAC) modelling in different load conditions with regards to the definition of admission control and RRM strategies.

Finally, another work in this activity, carried out jointly by GET and UPV, was related to the analysis and simulation of the radio resource management strategies for the TDD component

of UMTS. In the framework of this activity a simulation model has been defined and a new shadowing model, which takes into account both the autocorrelation and the cross-correlation of shadowing factors, has been developed.

During the next months it is expected that the on-going work in these activities is completed, including the evaluation in the reference scenarios, and the dissemination in conferences, workshops and journals.

Activity 3 - Advanced scheduling techniques based on cross-layer approach

The work in this joint activity involving CNIT and LNT-TUM has been focused on the definition of scheduling algorithms by making use of advanced techniques available at the different layers of the protocol architecture. This includes the use of e.g. smart antennas at the PHY layer or the consideration of multimedia applications characteristics during the scheduling process. As a first contribution, a common simulation platform for the evaluation of the different scheduling algorithms under different air interfaces like MC-CDMA and SDMA has been developed. A multi-cell scenario with interference has been implemented and is now under testing with the first results. The HSDPA radio interface is under construction. Also, specific scheduling algorithms for the uplink of a cellular network with MC-CDMA air interface have been investigated.

During the next months it is expected to exploit the potentials of the joint tools, integrated software, common libraries and model to develop novel research.

Activity 4 - End-to-End QoS provision through Mobility Management in wireless IP networks and enhancements

This work is focused on the development and evaluation of different mobility management methods in order to enhance the network's performance by means of reducing handover signalling traffic. Within this activity a joint work, entitled "A network planning tool for location area forming in next generation mobile access", has been carried out by UGent and BUTE. It introduces a new methodology for the proper definition of location areas to cope with the trade-off between paging and location updates using a very realistic mobility model simulator. Another work that has been carried out is the definition of a methodology that is capable of quantitatively evaluating the effect of terminal mobility on the packet-level QoS of a mobile customer, focusing on the increase of packet delay and packet loss measures during handover.

Activity 5 - Security in Mobile Adhoc Networks

The work in this activity has been focusing on the following topics:

- Security in the networking layer: The following approaches have been analysed. S-AODV (Secure AODV), which provides a key management system that makes it possible for each ad-hoc node to obtain public keys from the other nodes in the network. Further, each ad-hoc node is capable of securely verifying the association between the identity of a given ad-hoc node and the public key of that node. Two mechanisms are used to secure AODV messages: digital signatures to authenticate the non-mutable information in the messages and hash-chains to secure the hop count information. A second approach has been the use of Short-Cut Detections - in order to avoid the performance loss due to the problem that routing protocol do not always use the shortest

path, a technique has been proposed to periodically discover shortcuts to the active routes that can be used with any destination vector routing protocol.

- Key Management for MANET networks

One of the most important consequences of the nature of the MANET networks is that one cannot assume that a node that is part of a network will be always reachable by all the other nodes. This implies that there cannot be servers in the conventional meaning of the fixed networks.

- Sensor networks: They are a very specific type of wireless ad-hoc networks where both security and performance problems have to be solved efficiently in order to avoid undesirable data manipulation, false personality, etc., and at the same time minimize the battery power consumption and/or increase the throughput. The use of the routing protocols designed for Mobile Ad hoc Networks (MANET) and using the standard IP forwarding methods to transmit the sensed data is not the most efficient way to operate. Therefore, mechanisms which join both security and performance issues have been developed. The work has been focused on proposing an efficient way of performing data collection in sensor networks. Different security mechanisms to secure data transmission depending on the needs of the sensor network and the capability of the nodes have been researched.

Activity 6 - Security as a QoS parameter in Wireless Networks

The work in this joint activity between KaU and BUTE has been carried out around the topic of security in wireless communications standards, tuneable security services, performance and security metrics. The work has involved several visits of staff in the two involved institutions. Some of the achievements involve the network latency estimation for security services and the

elaboration of a user interface for combining the security and performance requirements.

Integration and dissemination

The activities of the department 7 have involved the following integration and dissemination means:

- 6 plenary meetings have been carried out up to the end of August 2006 with participation of all the involved institutions. Apart from this, 13 internal meetings and 3 phone conferences between some of the institutions have been held.

- 32 joint papers corresponding to the different activities have been prepared by the different partners of the department.

- A special NEWCOM session was organised during the Workshop "Trends on RRM", organised in Barcelona, 16th November, 2005.

- A special NEWCOM Dept. 7 session has been organised at the International Symposium on Wireless Communications Systems (ISWCS'06), Valencia, Spain on September 5-8, 2006, where five papers were presented.

WPR.A Ad Hoc and Sensor Networks

TECHNICAL REPORT

Achievements

Within the initial thirty-one months of activity, WPR.A has focussed on a significant subset of joint activities related to the following research tracks:

- Fundamentals and theoretical bounds for ad-hoc and sensor networks.
- Cross-layer design of sensor networks.
- Protocols and techniques for inter-vehicular networks and automotive applications.

- Simulation models and architectures for cross-layered ad-hoc and sensor networks.

The first research track aims to fill the current shortage of theoretical paradigms to determine the fundamental limitations on the performance of ad-hoc and sensor networks. The main achievements in this field are related to the introduction of a novel methodology that, starting from the seminal approach introduced by Gupta and Kumar, has been already applied in several joint works by several participating partners and has given some encouraging results which, consequently, have been included in the published articles.

The research track on cross-layer design of sensor networks intends to deal with the problem of introducing and assessing some general guidelines for the development of the integrated protocol stacks for sensor systems. The main achievements of this integrated research activity are related to the determination of new models and methods to further optimise cross-layer protocol design under the paradigms of self-organisation, energy efficiency and scalability.

The research track dealing with communication between vehicles intends to provide new architectural and protocol solutions to the many multidisciplinary challenges recently posed by automotive services and applications. The main objectives of this integrated activity have been, until now, the investigation of how already established technologies for routing and medium access control (MAC) in ad-hoc networks can be effectively adapted to inter-vehicular networks and optimised in an overall cross-layer design.

A crucial objective of WPR.A activities is related to the design of models and architectures for the simulation of ad-hoc and sensor networks. WPR.A intends to overcome the limits of the currently available tools, which definitely fail in capturing the sharing of vertical information typically occurring in cross-layered designed

ad-hoc and sensor networks. Until now, several tools improving the simulation of a real sensor network have been developed. They constitute the basis of a close cooperation with E-MORANS and related WPs, which has been established in order to make them available to all the NEWCOM partners. Particular emphasis has been given to the integration of these modules in a common software library, as well as on the collection of modules and tools developed by the participating partners in the first three research tracks. The outcome of this activity was reported in the deliverable DRA.8.

Future plans

In the next 5 months, the work will focus on the finalisation of the integrated research activities along the four tracks mentioned above. This will be done by taking special account of the integration indicators already established in NEWCOM.

To achieve the objectives described in the previous section, the partners participating in the integrated research activities will keep on meeting regularly via the videoconference network and, only occasionally, through face-to-face meetings. The outcome of all the integrated research activities is expected to be disseminated through joint papers submitted to international conferences and journals. Further exchange of student/faculty members will also be encouraged to finalize the research integration. To this end, WPR.A has been involved in the organisation of the NEWCOM Summer School held in Santorini, Greece during Sept. 25-29, 2006.

The software library released with DRA.8, will be integrated with any modules developed in the last period of the project. Any new modules will be then integrated in the identified cross layer architecture, which constitutes the basis for the software library itself. The library will be integrated in the DBKN and recommendations for its usage will be provided and will constitute

the deliverable DRA.9 "Recommendations for the usage of Project A's software library".

The cooperation with E-MORANS and related WPs will be finalised. This aims to integrate the WPR.A's definition of reference scenarios in a universal format such as XML, which has been chosen by E-MORANS itself. Relevant resources will be made available for the NEWCOM partners and for public use through the coordination with WP1.3 (SW library) and WPS.6 (Data Base for Knowledge Networking).

The sharing of information and results will be facilitated through meetings, seminars and workshops and through email and web interaction. The second "Project A technical workshop" was just held in Wien (Austria) and the Project A web site has been, and will be in the future, used for information exchange.

WPR.B Ultra-wide Band Communication Systems

TECHNICAL REPORT

Achievements and plans for the near future

WPRB research is devoted to the study of various aspects of Ultra Wideband (UWB) communication systems. Initially, the work had been organized according to 4 distinct workpackages (WPRB.1-WPRB.4), each covering different areas of UWB research and envisaging various integration activities. In November 2005, however, WPRB.3 has been merged with WPRB.1. The most relevant achievements of the different workpackages and the plans for the near future can be summarized as follows:

- WPRB.1 (Channel Modeling)

The activities in WPRB.1 have been organized according to 3 distinct tasks. In Task 1 (entitled "UWB channel modeling") Eurecom and CNIT have prepared a survey of existing UWB channel models [1], [2]. This study has evidenced that

the proposed models apply narrowband methods to UWB channel modeling and usually do not investigate the UWB propagation mechanisms. A different approach, based on a physical analysis of UWB propagation, has been adopted by Eurecom, and has led to the proposal for a new UWB channel model [3]. This study has provided an improved understanding of UWB propagation and some new tools for the investigation of UWB channel capacity and multiple access issues [4], [5]. Moreover, in task 1 some joint activities on UWB channel characterization and modeling (involving Eurecom, Aalborg University and Thales Communication) have led to further contributions [6], [7]. The plans for the nearest future include the development of UWB statistical channel models. In Task 2 (entitled "UWB channel model simulators") Eurecom, CNIT and Supelec have worked jointly on the preparation of a first deliverable on UWB simulation platforms [8], which provides the state of the art with regard to the existing platforms implementing UWB channel models within the NEWCOM community and offers some links to UWB measurements databases and channel modeling software. In the near future a cooperation between Eurecom and Supelec should allow to develop an IT++ version of the Eurecom UWB channel model. In Task 3 (entitled "MIMO/UWB channel model platform") the Technical University of Ilmenau (TUI) has developed a MIMO/UWB platform. In the near future Eurecom and TUI are expected to accomplish joint MIMO/UWB measurements to analyse UWB/MIMO capacity issues.

- WPRB.2 (Physical Layer Algorithms)

The activities in WPRB.2 have been organized according to 5 distinct tasks. The main achievements of WPRB.2 have been summarized in the deliverables [9]-[13] that will be available soon. Moreover, some of the significant results have been recently presented in a NEWCOM special session on UWB organized on Sept. 14, 2006 at the international conference PIMRC

2006. In particular, it is worth remembering that:

- A new signalling schemes for UWB signals and new receiver structures have been developed [14].
- An interesting investigation about equalization algorithms, both in the time and in the frequency domains, has been accomplished [12].
- Eigen-mode/singular-mode characteristics and capacity of UWB channels have been analysed [6].
- An efficient software simulator, based on the IT++ library, has been prepared, which was written in C++ using the class structure with the advantage of an efficient modularity.

In the near future the work on coexistence and interference, currently being accomplished by TUI and TUA, will benefit from the NEWCOM extension for its conclusion. Moreover, a last deliverable will be prepared by the end of the extension period, in order to gather all the main results emerging from the different tasks. Finally, the above mentioned software simulator will be upgraded with some additional functionality and should be made publicly available thanks to its integration in IT++.

- WPRB.4 (Synchronization in UWB Impulse Radio Systems)

The activities in WPRB.4 have been organized according to 3 distinct tasks. The work in Task 1 (entitled "Multi-cell scenario definition and SW platform implementation") has led to the definition of network scenarios and channel models (from IEEE 802.15.3a for high data rate and from IEEE 802.15.4a for low data rate) [15]. In Task 2 (entitled "Acquisition techniques and their performance in static conditions") analytical results for the acquisition performance in several scenarios (with multi-user interference) and channel models have been derived [16]. Moreover, novel acquisition techniques based on hybrid parallel/serial solutions have been

analyzed. Findings have been compared with simulated results and the limits of the analysis in the case of realistic multipath channel models (IEEE 802.15.4a) have been verified. A further contribution of this task concerns the proposal of a different receiver front-end providing improved performance in the case of non-Gaussian multi-user interference (joint activity involving CNIT and Supelec) [17]. The continuation of the work on this topic during the extension period will aim at understanding more precisely the potential applications and performance of the modified receiver. In Task 3 (entitled "Acquisition and tracking techniques and their impact on localization algorithms") efforts have concentrated on both tracking and localization algorithms. In particular, a modified version of the early-late gate algorithm for simple tracking in UWB impulse radio networks has been derived (system performance is currently being tested). Additionally, in a joint activity (involving CNIT and Chalmers University), a novel algorithm for estimating the first path arrival has been devised. The features of this estimator match the characteristics of a promising class of positioning algorithms for wireless sensor networks. In task 3 the plans for the near future are: (a) continuing the cooperation in the last joint activity (CNIT, Chalmers), since the numerical results are promising, but there is still the need for some tuning of system parameters; (b) writing an overview of the Cramer Rao bounds for acquisition in UWB impulse radio transmission (such bounds will be illustrated in deliverable DRB4.3).

PUBLICATIONS

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WPR. C : Functional Design Aspects of Future Generation Wireless Systems

TECHNICAL REPORT

To satisfy the quality of service (QoS) requirement in dynamically changing conditions, beyond third generation (B3G) communication systems have to adapt their characteristics at different layers (e.g., modulation and coding schemes, scheduling algorithms, etc.) following channel, traffic and, in general, network conditions. In fact, B3G wireless networks introduce important challenges in designing radio resource management (RRM) schemes, due to the issues and limitations involved such as: user

mobility, frequent link failure for dynamic channel conditions, limited link capacity, and limited allowable power consumption and processing capability of user terminals along with the variable QoS requirements for the envisaged multimedia applications.

Traditionally, the design of wireless network protocols has been based on a layered approach in which each layer of the protocol stack is designed independently of all the others and their related constraints. However, proper exploration of some cross-layer functionalities can yield better performance, especially in wireless networks, where user speeds, traffic intensity, coverage, etc. change dynamically making the QoS requirements of applications even more difficult to fulfill. Cross-layer protocol design allows the interplay among layers in the following basic ways: creation of new interfaces, merging the adjacent layers, design coupling without new interfaces, vertical calibration across layers. The aim of the work has been to evaluate the impact of the interaction between the physical and access layers to develop reliable packet scheduling algorithms regulating the high data rate reception of multiple users.

The goal is to compare the performance of different standards for packet transmission based wireless networks (GPRS/EDGE [1], UMTS/HSDPA [2], WLAN [3]) that have different characteristics in all layers, but employing similar cross-layer resource allocation algorithms. Although these standards operate in different ways, we aim at extracting some general rules, when adaptivity at both physical and upper layers is adopted. As an example, it is of general interest to verify if some common rules can be obtained in the joint usage of adaptivity of modulation and coding schemes at the physical layers with the adaptivity in scheduling algorithms. Basically, the following questions need to be answered for adaptive RRM in future generation wireless systems:

- Does adaptation at the physical layer (that requires in general the estimation of the wireless channel conditions) impact significantly the performance at upper layers when also adaptive scheduling is performed?
- Is the answer to the previous question system dependent or is there a general rule to be derived and thus considered for future generation wireless systems?

With this in mind, we evaluate the performance of both WLAN IEEE802.11a and UMTS/HSDPA cellular systems when cross-layer adaptation is implemented. In particular, adaptation of modulation and coding schemes following standard specifications in conjunction with the following scheduling algorithms have been addressed:

- FIFO
- Maximum SINR (MS)
- Fair Time (FT)
- Proportional Fair (PF)
- Delay-based Modified Proportional Fair (DPF)
- Queue- and Delay-based Modified Proportional Fair (QPF)
- Code Multiplexing-based Modified Proportional Fair (CPF)

To extract the previously mentioned general rules and directly compare the performance of these heterogeneous systems, it is very important to properly define the common metrics. When link-adaptation of modulation and coding schemes is implemented together with adaptive scheduling, the main common metrics of interest are the average achieved throughput per user and the fairness of scheduling algorithms. Two metrics are then defined and investigated in order to highlight weaknesses and strengths of all the investigated algorithms:

Normalized average perceived throughput NAT:

It is defined as the ratio between the average

perceived throughput (AT) and the maximum nominal bit rate:

$$NAT = \frac{AT}{MT}$$

$$AT = \sum_{i=1..N} T_i / N$$

where N is the number of users, user i ($i = 1, \dots, N$) perceives a throughput equal to T_i , and MT is the specific maximum throughput for the considered system.

Fairness parameter F :

It is defined as one minus the ratio between the average distance from the average throughput

$$F = 1 - \frac{AD}{AT} \cdot \frac{N}{2(N-1)}$$

$$AD = \sum_{i=1..N} |T_i - AT| / N$$

and the average throughput itself, multiplied by a proper normalization factor:

It must be noticed that F ranges from 0 to 1, where 1 means all users perceive the same throughput ($AD = 0$), and 0 means that all resources are dedicated to the same user.

Numerical results have been obtained by integrating outputs of independent simulation platforms carefully taking into account physical, as well as upper layers characteristics, developed at the Wireless Communications Laboratory (WiLAB) [4] Bologna, Italy, and the National Kapodistrian University of Athens (NKUA) in Greece. Technical details on the simulation platforms are given in the WPR.C deliverables. Here, we briefly recall that at wireless communication laboratory (WiLab, www.wilab.org) the platform SHINE has been developed, which allows to evaluate the performance at both lower and upper layers for several technologies, traffic conditions and scenarios. SHINE is constituted, in particular, by a server-core simulator

(hereafter called Upper Layers Simulator, ULS) and one or more client simulators (Lower Layers Simulators, LLS) (see Figure 1). The ULS takes care of users-related information, such as their position and movements, and of the end-to-end aspects of each connection, such as the TCP or UDP dynamics and the generation of the application-level traffic.

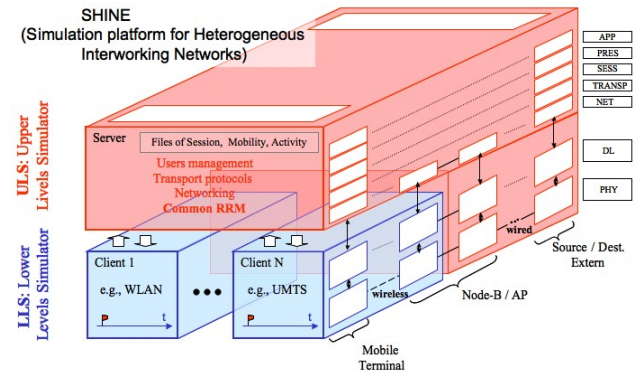


Fig. 1. Simulation platform architecture developed at WiLab, CNIT-Bologna, Italy, [\[link\]](#).

Being related to the end-to-end aspects of communications, the ULS structure is independent on the particular technology adopted to establish the user connection. All aspects related to the technologies adopted, hence related to the MAC and physical layers, are managed by the client simulator LLS, which is technology specific. This way our simulation platform can easily manage different access technologies by simply changing the LLS. The ULS and the LLSs are separate executables that can run independently on different personal computers and communicate each other through sockets, thus simulating vertical communications among adjacent protocol layers. What is really remarkable is that, given this structure, any change in the technology investigated requires only to write the related LLS simulator (that is, the data-link and physical level simulators of the technology), which obviously have to be provided with the standardized communication interface among ULS and LLS.

For what concern the UMTS-HSDPA system-

level simulator, it has been developed in the Wireless Systems Group in Athens, and encompasses the effects of the wireless propagation channel, the transceiver adaptation in terms of modulation and coding, the user mobility and the interference generated within the same and adjacent cells. The propagation channel and rate adaptation according to the instantaneous link conditions have been considered. It has been assumed that at each TTI a user that is granted access can have a download bit rate that corresponds to the terminal's average received SNIR. The bit rate is calculated using Shannon's channel capacity formula, upper bounded by the maximum achievable throughput per spreading code. For both WLAN and UMTS/HSDPA networks, the considered scenarios have been defined in Proj. C deliverables.

As example results, in this summary the performance in terms of the normalized average throughput are given in properly defined scenarios: Fig.2 is related to IEEE802.11a and Fig.3 is related to HSDPA.

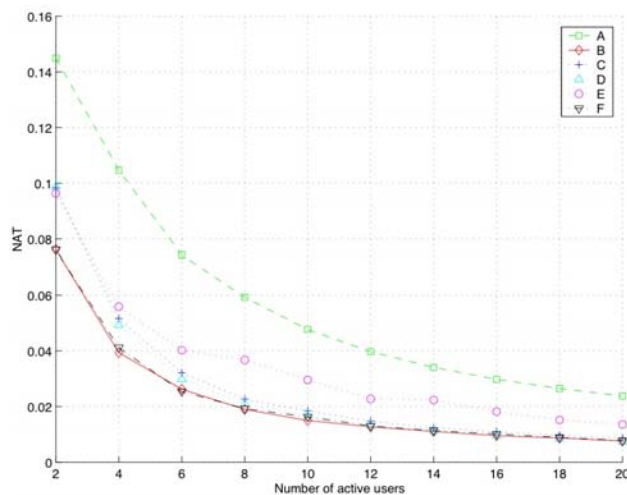


Fig. 2. WLAN: NAT vs. number of users with dynamic Link Adaptation; (A: MS, B: FT, C: PF, D: DPF, E: QPF, F: FIFO)

The work summarized here has been presented also in the NEWCOM Workshop at IEEE ICC2006, Istanbul. Current activities are related to consolidate other results on the fairness and the impact of link adaptation and will be given in

WPR.C deliverables.

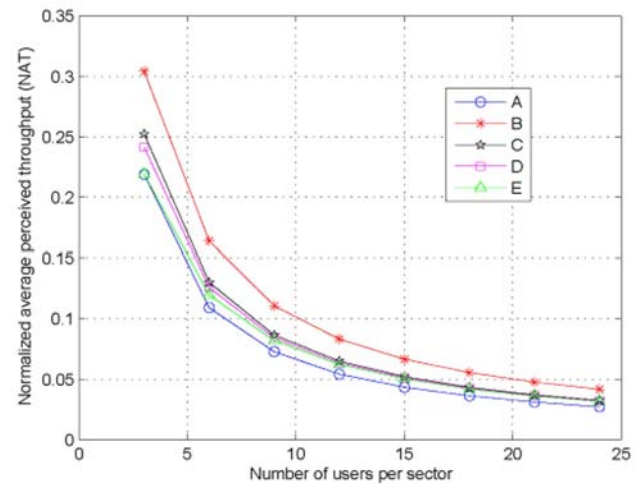


Fig. 3. UMTS/HSDPA: NAT vs. number of users per sector (A: FT, B: MS, C: PF, D: DPF, E: CPF)

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WPR. E : Cross Layer Optimisation TECHNICAL REPORT

Project E work is organized along four axes. The main achievements within the distinct tasks are outlined below.

TASK 1 - Advanced medium access methods for wireless networks employing smart antennas

- MAC/DLC protocols with multi-packet transmission/reception capabilities: protocols with multi-packet transmission and reception capabilities were designed and adjusted to the needs of cross-layer interaction. Protocols that define interaction between DLC-layer mechanisms such as ARQ and physical layer parameter adaptation were designed and evaluated.

- Antenna selection protocols and their interaction with PHY-layer parameters: the method of adaptive selection of one or more antennas for transmission was evaluated especially in comparison with more classical forms of antenna control such as beam-forming. Also the specific methods for controlling transmission were presented and evaluated. The impact of PHY-layer parameters such as power control, modulation and coding was quantified.

- Channel access protocols for wireless ad-hoc networks with directive antennas: a fundamental component of this activity was the design of MAC protocols with directional antennas. This task was accomplished both as standalone entity and in conjunction with existing standards. In this activity the role of smart antennas and the impact on higher layers was exemplified and analyzed. The implications of the use of smart antennas in the wireless ad-hoc network setting were studied. Also traditional problems that arise in that setting such as that of intra-beam interference were ameliorated through higher layer mechanisms, such as channel allocation. A particular issue that at-

tracted attention was that of user - peer discovery and its facilitation with the help of directive antennas even in the presence of mobility scenarios. Reference scenarios were identified and performance metrics that quantify the use of adaptive antennas were defined. More specifically, particular problems were solved so as to optimize the PCF and DCF coordination function when directional antennas are utilized.

- Mobility considerations in directional-antenna assisted protocols: mechanisms were devised for coping with such mobility scenarios in order to alleviate the potentially large delays that are anticipated in user mobility scenarios. The first scheme is based on location caching at the AP, namely maintaining the most recent location of each user at a cache memory at the AP, so that in a future time the AP selects an appropriate sector to start the search from. The second alternative indirectly attempts to reduce the required time by employing multiple transceivers. These alternatives were numerically evaluated and the significant performance benefits for these schemes was shown.

TASK 2 - Optimum resource allocation and scheduling functions at the data-link layer in the presence of smart antennas

- Multi-user diversity and its implications on cross-layer design: advanced resource allocation techniques such as multi-user diversity were studied and compared to existing techniques. Techniques for obtaining channel state information and issues related to the degree of its accuracy were addressed. The implications of multi-user diversity on advanced signaling and access methods such as OFDM were identified and studied. Novel meaningful QoS metrics such as fairness and their degree of provisioning were studied in that context as well.

- Scheduling and beam-forming in single- and multi-cell smart antenna-based systems: a cross-layer based channel allocation and scheduling methods were identified and compared. Novel directions with respect to optimization of higher layer mechanisms were considered (such as channel allocation, memory buffer management, etc.). Optimum resource allocation and scheduling functions for the data-link layer in the case were considered, where smart antennas (either with MISO beam-forming or in MIMO) are available at the physical layer. A more generalized view was also solicited, where the higher layer performance was studied as a function of the PHY-layer technique (beamforming or other antenna precoding strategy). Common models that capture system dynamics with packet arrival patterns, transmission and channel quality were defined. Stability and good operation of the system and ways of guaranteeing it were addressed.

- QoS provisioning in multiple-antenna systems with opportunistic beam-forming: the advantages of opportunistic beam-forming that operates under limited channel state information were exploited and leveraged. They were also combined with intelligent scheduling methods. Objectives such as single-hop and multi-hop throughput optimization, deadline constraint satisfaction for message delivery, etc. were addressed

TASK 3 - Multimedia quality of service and cross-layer integration

- Application-layer perspective of adaptive multi-media transmission over wireless channels: multi-media transmission over volatile, error-prone wireless channels has direct implications on perceived quality at application layer. After elaborating on metrics that capture QoS at the application layer, the focus was on the impact of the wireless channel on application-layer rate and quality. This was addressed by devising adaptive compression and coding

algorithms. Novel approaches and system aspects that stem from the nature of multi-media traffic (streaming or real-time audio/video), as well as the specific and diverse QoS requirements for different multi-media applications were considered. Finally, methods for multi-media content adaptation were studied.

- Synergy of DLC, transport and application layers for wireless multi-media transmission: this task served the purpose of defining appropriate co-ordination between the DLC and transport layers with particular emphasis on retransmission regimes and their impact on perceived delivery delay and time jitter. Methods for identification of packets that deserve to be treated with different priority based on the effect of the desired perceived quality of service at the user layer were solicited. The issue of cross-layer interaction and appropriate/minimal information exchange between DLC, transport and application layers and higher (e.g. transport) layer was studied.

TASK 4 – Energy-awareness in cross-layer design

- Energy-aware resource allocation and optimization: the relation and tradeoffs between energy consumption and QoS provisioning were addressed. In particular, resource allocation techniques that span the physical and access layers were identified and the performance benefits of cross-layer interaction were quantified. Particular emphasis was laid on the impact of advanced transceiver structures, such as smart antennas, on energy efficiency.

- System-level energy-awareness at higher layers: a system-level approach was followed with the objective to quantify system scalability, as well as to perform energy-efficient error protection and detection. In addition, the impact of higher-layer methods such as compression and encryption on energy efficiency was considered.

FUTURE PERSPECTIVES

The following research directions can constitute future directions of Project E:

- Maximum throughput scheduling and routing in wireless networks.
- Formulation and solution of network optimization problems with convex optimization theory.
- Cross-layer design for cooperative transmission and reception regimes.
- Impact of network parameters on network stability.
- Advanced spatial pre-processing and post-processing techniques for optimized cross-layer interaction.
- Implications of smart antennas and beamforming on PHY-layer multi-casting.

The final Deliverable DRE.6 entitled “Final report on Cross-layer Optimization” to be submitted by February 2007.

C. Newcom events

Philippe Ciblat, Telecom Paris

This section is devoted to all the meetings (seminars, schools, workshops) that are organized on behalf of NEWCOM or by the members of NEWCOM.

The contributions should be send in ASCII (text) to [email](#). Since the beginning of the NEWCOM Newsletter, this section has received mainly school and workshops announcements. One can especially notice that the winter/summer schools meet a growing success.

SEMINARS, DOCTORAL SCHOOLS AND COURSES ANNOUNCEMENTS

- TITLE: "Space-Time Coding"

This course will be held in Politecnico di Torino, Turin, Italy between October 9-12, 2006.

The purpose of this school is to provide the standard and new tools of the space-time coding used in wireless communications. We will focus on the well-known block coding (Alamouti and BLAST schemes), as well as on the most recent and powerful coding such as Golden codes. Decoding and information-theoretic aspects will be also treated. As for applications, we will concentrate on the WiMaX.

This school is organized by academic staffs of Politecnico di Torino (Polito, Turin, Italy) and of Ecole Nationale Supérieure des Télécommunications (ENST, Paris, France): Emanuele Viterbo, Jean-Cladue Belfiroe and Philippe Ciblat.

The registration deadline is September 22, 2006. In order to register, please just send an email to Philippe Ciblat ([email](#)). For further information, see the web site at [\[link\]](#).

MEETING MINUTES

The fifth Dept. 6 meeting was held in Toulouse on September 13-14. At the meeting the work within the department during the last stage of NEWCOM was planned. The Fourth NEWCOM Department 6 Technical Workshop was held in conjunction with the meeting and contained the following presentations:

- P2P Video Transmission over Heterogeneous wired/wireless networks: a starting point for integrated research, Giovanni Schembra (UoC),
- DCCP, Giulio Galante (ISMB),
- Analytical Estimation of SCTP Failover Time, Lukasz Budzisz (UPC),
- Improving end to end goodput of ad-hoc network with SCTP multihoming, Sakuna Charoenpanyasak and Beatrice Paillassa (CNRS),
- SCTP Survey, Johan Garcia (KaU),
- Integrating KauNet and SWINE, Tanguy Perennou and Emmanuel Conchon (CNRS).

WORKSHOP ANNOUNCEMENTS

- 6th International Workshop on Multi-Carrier Spread Spectrum, MC-SS 2007, will be held on May 07-09, 2007 in Oberpfaffenhofen, nearby Munich. CFP deadline: November 26, 2006, [\[link\]](#).

- LDPC Codes @ Work - International Workshop on VLSI Architectures for LDPC Decoders. The workshop provides an international forum for scientists to share their research results, and discuss problems and new developments about architectures and implementations of LDPC codes decoders.

The workshop will take place at the Department of Information Engineering of Pisa University ([\[link\]](#)), Pisa, Italy.

The workshop is open to all the research and industrial communities. So, please feel free to forward this announcement to any people who might be interested in the event. In order to learn more, please visit [\[link\]](#).

D. Exchanges and position openings

[Charlotte Langlais, ENST Bretagne](#)

In this section, any NEWCOM member and partner has the possibility to advertise for exchanges and position openings. The contributions should be send in ASCII (text) to [email](#) according to the format proposed below. The author should provide a detailed version of the proposal on his own laboratory website. The NEWCOM forum web site is also an efficient tool to post such a message.

This section provides a simple means to advertise for research or academic positions within the NEWCOM community. In the past issues, more than 15 announcements have been proposed from PhD position to Professor position. Announcements came from several parts of Europe, such as Norway, France or Spain reflecting the dynamism and the efficient working of the network. We may regret that the visiting researchers opportunities section has not been fully utilized. This kind of exchanges probably does not need any specific advertisement.

In the future, we hope that proposing open positions to the section D of this newsletter will become an intuitive step for all the partners.

E. Project proposal incubators

[Hakan Cirpan, Istanbul University](#)

This section is devoted to including proposal incubators to strengthen capabilities of NEWCOM to attract partners. It aims at forming consortia for the next EC Calls and therefore NEWCOM is seeking project proposal incubators not only from the NEWCOM partners, but also from another organizations, provided that at least one NEWCOM partner will participate in such a consortium.

Proposal incubators should be mailed to the editor of the section. It is recommended that a proposal incubator should address the issues highlighted below:

- Organization information: contact information, role and type of contribution.
- Goal and objectives: provide a clear and concise summary of the proposal, capturing the main goal and specific objectives.

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