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Report on IST clustering and standardisation activities

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Abstract:

The purpose of this report is to summarize all the actions (publication of articles in Journals, PhD thesis, participation to conferences, organization of workshop, etc) which have been done in MuMoR to show the results of this project to the scientific community and to enhance contacts with other European projects. A section of this report is dedicated to standardization activities.

Keyword list:

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1 Introduction

The purpose of this report is to summarize all the actions (publication of articles in Journals, PhD thesis, participation to conferences, organization of workshop, etc) which have been done in MuMoR to show the results of this project to the scientific community and to enhance contacts with other European projects. A section of this report is dedicated to standardization activities.

2 Articles published in Journals or Proceedings of Conferences

The following list gives an overview of all the articles which have been published in scientific Journals or proceedings of conferences in the frame of MuMoR:

IEEE JOURNALS:

Adil Koukab, Kaustav Banerjee, Michel Declercq, Partner: EPFL, Modeling Techniques and Verification Methodologies for Substrate Coupling Effects in Mixed-Signal System-On-Chip Design, IEEE Transaction on Computer-Aided Design, June 2004.

N. Schlumpf, C. Dehollain, M. Declercq, Partner: EPFL, A fast modulator for dynamic supply linear RF power amplifier, IEEE Journal of Solid-State Circuits, July 2004.

CONFERENCES:

J. Brakensiek, Bernard Oelkrug, et. al., Partner: NOKIA, Software Radio Approach for Re-configurability Multi-Standard Radios, Conference PIMRC 2002, year 2002, Lisboa, Portugal.

A. Koukab, K. Banerjee, M. Declercq, Partner: EPFL, Analysis and optimization of substrate noise coupling in single-chip RF transceivers design, Conference ACM 2002, 11-15 November 2002, San-Jose, USA.

R. Hoshyar, K. Seo, S. Gultchew, G. Agapciuc, R. Tafazolli, Partner: University of Surrey, Software reconfigurability - algorithm level approach, Conference 3G, 25-27 July 2003, London, UK.

R. Atukula, R. Wittmann, R. Kakerow, M. Darianian, Partner: NOKIA, A new approach for accurate System Level RF-Transceiver Front-End Modeling, Conference ECCTD'03, 1-4 September 2003, Krakow, Poland.

N. Schlumpf, C. Dehollain, M. Declercq, Partner: EPFL, A fast modulator for dynamic supply linear RF power amplifier, ESSCIRC Conference, 16-18 September 2003, Lisboa, Portugal.

Peter Gray, David Hendry, Partner: University of Aberdeen, A Mixed Signal Frequency Synthesizer for Configurable Systems, Conference IEE DSP enabled Radio, 22-23 September 2003, Livingston, UK.

Frank Henkel, Dietmar Koether, Ralf Kakerow, Klaus Strohmenger, Partners: IMST and NOKIA, Re-Configuration Techniques for SDR Architectures, SDR Forum, November 2003, Orlando, Florida, USA.

U. Stehr, F.Henkel, L. Dallüge, Partner: IMST, A Fully Differential CMOS Integrated 4th Order Reconfigurable GM-C Lowpass Filter for Mobile Communication, Conference ICECS'03, December 2003, Arab. Emirates.

Klaus Strohmenger, Ralf Kakerow, Frank Henkel, Dietmar Koether, Partners: NOKIA and IMST, Re-configurable Multi-mode Radio Architectures for enhanced 3G Terminals, WWRF Meeting 2003, November 2003, New-York, USA.

Horst Fischer, Frank Henkel, Michael Engels, Peter Waldow, Partner IMST, UMTS/GSM Multi-Mode Receiver Design, Conference ISCAS'04, 23-26 May 2004, Vancouver, Canada.

K. Strohmenger, M. Laugeois, D. Noguét, B. Oelkrug, K. Seo, Partners: NOKIA, CEA-LETI, University of Surrey, Architecture for Digital Physical Layer implementation in Multi-mode 3G Terminals, IST Mobile Summit, June 2004, Lyon, France.

M. Engels, F. Henkel, H. Fischer, E. Chataigner, T. Nikolaidis, R. Kakerow, Partners: IMST, STM, ISD, NOKIA, Architectures and Techniques for Multi Mode RF Frontends, IST Mobile Summit, June 2004, Lyon, France.

F. Henkel, Partner: IMST, RF Frontend Architectures and Circuits for Multi Mode Operation, E2R workshop, will be presented in September 2004, Barcelona, Spain.

3 Organization of workshops

3.1 MuMoR workshop at EPFL

Dr. Catherine Dehollain of EPFL has organised the first MuMoR workshop entitled “Workshop on low power integrated circuits dedicated to 3G mobile phones” on 25th and 26th February 2004 at EPFL, Lausanne, Switzerland. Around 50 people have attended this workshop. It is recalled that the two main goals of this workshop were:

- Presentation of the MuMoR intermediate results to the scientific community
- Strengthen of relations with other European projects (e.g. IST projects, MEDEA projects), whose subjects is in close relation with MuMoR (e.g. reconfigurable building blocks, etc), in order to reinforce the cluster activities.

A total of 21 speakers have participated to this workshop (14 MuMoR speakers and 7 external speakers). The MEDEA+ A107 European project 4G Radio and the French project ASTURIES have given a talk during this workshop. A detailed program of this workshop is available on the web site: <http://www.mumor.org>

3.2 MuMoR workshop in connection with ESSCIRC

Dr. Catherine Dehollain has established the program of the second MuMoR workshop which will take place in Leuven, Belgium, on Friday 24th September 2004. This workshop will be linked to ESSCIRC04 Conference. It will be dedicated to multi-mode multi-band reconfigurable systems for 3rd enhanced generation mobile phones. The aim of this one day workshop will be to present the main results of the IST European project MuMoR to the scientific community. A total of 12 speakers will participate to this workshop (10 MuMoR speakers and 2 external speakers). The detailed program is available on the two following web pages:

- http://www.imec.be/ovinter/static_general/ESSDERC-ESSCIRC.shtml
- <http://www.mumor.org>

4 PhD thesis

Mr. Nicolas Schlumpf of EPFL has written in French language his PhD thesis entitled « Adaptation dynamique de la compression d'un amplificateur RF pour des signaux modulés en amplitude et en phase » (English translation: dynamic matching of the compression of an RF amplifier for phase and amplitude modulated signals); PhD thesis No 3020. This work has been done in the frame of MuMoR. More precisely, the subject of his thesis is the design and measurements of the bias adaptation system applied to the Power Amplifier (PA).

On the same subject, Mr. Schlumpf has written the two following publications:

- N. Schlumpf, C. Dehollain, M. Declercq, A fast modulator for dynamic supply linear RF power amplifier, IEEE Journal of Solid-State Circuits, Vol. 39, n° 7, July 2004, pp. 1015-1025.
- N. Schlumpf, C. Dehollain, M. Declercq, A fast modulator for dynamic supply linear RF power amplifier, ESSCIRC Conference, 16-18 September 2003, Lisboa, Portugal, pp. 429-432.

On the same subject, Mr. Schlumpf has participated to Deliverable D2.2 (Chapter 6); Deliverable D2.3 (Sub-chapter 3.5); Deliverable D2.4 (Sub-chapter 3.4).

On the same subject, Mr. Schlumpf has given a talk, on 21st October 2003 in STM at Catania, entitled “A fast modulator for dynamic supply linear RF power amplifier” during the workshop organised by the MEDEA+ A107 European project 4G Radio. This participation will help to reinforce the relations between the 4G Radio project and the MuMoR project.

On the same subject, Mr. Schlumpf has given a talk, on 25th February 2004 at EPFL, Lausanne, during the 1st MuMoR workshop organised by Dr. Catherine Dehollain of EPFL. He will also give a talk, on 24th September 2004 in Leuven, during the 2nd MuMoR workshop organised by the same person.

5 Standardisation activities

In 1990's and before, regional standardisation bodies developed telecommunications standards. For example, ETSI SMG developed the GSM standards. The other regional standardisation bodies, e.g., ARIB and TTC in Japan, and Committee T1 and TIA in US, developed standards for use within their region.

With the ever increasing popularity of cellular systems, and the importance of globally deployable systems, triggered by the introduction of WCDMA technology for UMTS, it became clear that also the standardisation environment has to support the global markets. It was realised early that a global organisation has to be created for the 3G standardisation. Nokia had a considerable role in 1997 and 1998, in the creation of the 3GPP (3rd Generation Partnership Project). 3GPP is the global leader in developing the 3G specifications. 3GPP has been very useful for Nokia in many ways, especially in rationalising the resource utilisation. Before 3GPP, it was necessary to drive the WCDMA issues in several forums, e.g., ARIB and TTC in Japan, ETSI in Europe and TTA in Korea. Also, the core network solutions and standards were different between regions, requiring separate standardisation activities.

Because the establishment of 3GPP increased the efficiency of standardisation, Nokia also promoted the transfer of the GSM/EDGE work to 3GPP. This move was to increase the coordination between the GSM/EDGE and WCDMA radio interfaces, connected to a common core network. 3GPP Partners approved transfer of the GSM/EDGE work to 3GPP in July 2000.

Another important global partnership is 3GPP2. It is modeled after 3GPP, but focusing on cdma2000 3G specifications. Some of the regional standardisation bodies that participate in 3GPP also participate in 3GPP2, including ARIB and TTC from Japan, TTA from Korea, and CWTS from China.

In addition to 3GPP, Nokia participates and contributes to wide range of standardisation organisations, like the IETF and ITU, and still continues the activities in regional standardisation organisations like ETSI, TTC, ARIB, TIA and T1 on topics not related to 3G. During the last couple of years several standardisation support and lobbying groups with clear agendas appeared, like MWIF and 3G.IP. These groups are led by the operator community, but invite also manufacturers as members. It was very useful for Nokia to contribute to the work of these groups as well, because there the views of the operator community can be better understood before the issues are taken to the actual standardisation bodies, such as, 3GPP. Lately their role and importance has diminished, and they may be closed down.

Year 2002 has witnessed the creation of Open Mobile Alliance (OMA). It started as a joint effort between Nokia's Open Mobile Architecture and WAP Forum. In late 2002, also other standardisation

fora, such as, SyncML, Location Interoperability Forum, MMS IOP, and Wireless Village, have joined. It will play a significant role in application and application enabler related standardisation. The exact roles and responsibilities between 3GPP and OMA will be settled in early 2003. Nokia has been active in OMA since its creation.

The use of IETF protocols in the core of the 3GPP system started with 3GPP Rel5. Nokia participates in all key IETF groups, driving the cellular specific features to the IETF protocols.

5.1 3GPP activities

Nokia contributes to the work of all the TSGs (Technical Specification Groups), WGs (Working Groups) and ad-hocs of 3GPP. Until July 2000 3GPP included four TSGs: TSG-SA, TSG-CN, TSG-RAN, TSG-T, and 17 permanent working groups under these TSGs. In addition, there are several SWGs (Sub Working Groups and Ad-Hocs focusing on specific technical areas. In all the groups, Nokia's delegates participate actively to progress the work. When the GSM/EDGE work was included in 3GPP scope, a new TSG, TSG-GERAN and its 5 WGs were added to the 3GPP structure.

In 3GPP Nokia holds several leadership positions:

- Mr. Ed Erlich is the Vice Chair of TSG-T and thus a member of the PCG
- Mr. Kari Lång is ETSI representative in PCG
- Mr. Antti Toskala is the Chair of TSG-RAN WG1, developing the L1 of the radio interface
- Mr. Mikko Puuskari is the Chair of TSG-SA WG2, developing the system architecture and coordinating the whole standardisation project
- Mr. Hannu Hietalahti is the Chair of TSG-CN WG1 developing the signalling between the terminal and the core network, including the SIP protocol
- Mr. Keijo Palviainen is the Chair of TSG-CN WG2 developing the CAMEL standards
- Mr. Kari Järvinen is the Chair of TSG-SA WG4 developing the speech and video coding

Additionally, Nokia holds several Vice Chairs in the WGs (e.g. services and security) and SWGs

In order to be effective in the standardisation bodies, Nokia has a large team of delegates participating in the WG meetings. It is common that 5 to 10 delegates, experts of different domains, are present in each of the WG meetings. The WGs typically meet 6 to 10 times a year. Additionally there are Ad Hoc meetings and joint meetings. The total number of Nokia persons to participate in the 3GPP work is over 150. In addition to spending annually 6 to 10 weeks in meetings, the Nokia delegates use the remaining time for preparation of contributions, editing the specifications as well as coordinating between standardisation, internal standards related research projects and product implementation. Most of Nokia delegates have their base close to product implementation, turning innovations into standards as needed, and also allowing best information sharing.

The number of Nokia contributions to one WG during a year has been about 100 in the busiest groups. The total number of Nokia contributions to the work of 3GPP during one single year is estimated to be over one thousand.

Due to the strong contribution of Nokia, not forgetting other major players, it has been possible to create the 3GPP specifications for the WCDMA radio access network in little over a year in 3GPP.

Activities in the specification of 3G enhancements attain a special importance. Nokia has driven High Speed Downlink Packet Access (HSDPA) to Rel5, allowing downlink peak bit rates of above 10 Mbit/s. This contributes for better system throughput and makes high quality content download more widely accessible. HSDPA standardization activities are continued towards Rel6 with items like Fast Cell Selection (FCS) and multi antenna systems (MIMO).

It is vital for the success of the whole industry that the speed and efficiency of the work in 3GPP can be continued, and that the technical work is not blocked by political debates. Technical investigations on research level like in MuMoR are essential for contributions to standardisation partnerships, as they offer the possibility to find best solutions without the pressure of development that is driven by time schedules. Nevertheless, HSDPA standardization is a highly distributed effort in a very challenging environment. For this reason parallel research is ongoing inside Nokia at several locations, covering different HSDPA receiver architectures and different implementation variants. The results of these single activities are monitored, compared and discussed to drive standardization into the right direction. The investigations in MuMoR project will contribute to this activity. This way MuMoR provides important input to the requirements and constraints of the technical implementations to the standardization group and receives the latest informations about standardisation activities.

5.2 Conclusion

Even though the first phase of the 3GPP standards has been finalized, the need for contribution to standardisation work is rather increasing than decreasing. It is vital for the industry as a whole, and for the MuMoR consortium and our customers to develop good quality open standards, providing well-defined interfaces between network elements also in the future. One simple, global and uniform set of standards is envisioned instead of a plethora of complex specifications with different variations and competing alternatives. For that purpose Nokia is actively shaping the standardisation environment to provide more efficient tools for development of standards as well as contributing heavily in the actual work in the standardisation groups.

6 Conclusion

The purpose of this report was to summarize all the actions which have been done in MuMoR to show the results of this project to the scientific community and to enhance contacts with other European projects:

- Publication of two articles in IEEE Journals.
- Participation to 13 conferences.
- Organization of 2 workshop.
- Redaction of one PhD thesis.

The last section of this report has been dedicated to standardization activities.