



Title of the research item

End-to-End Reconfigurability (E²R)

Authors: Didier Bourse, Motorola Labs, France
Karim El-Khazen, Motorola Labs, France
Antoine Delautre, Thales Communications, France
Thomas Wiebke, Panasonic European Laboratories, Germany
Markus Dillinger, Siemens AG, Germany
Jorg Brakensiek, Nokia Research Center, Germany
Klaus Moessner, CCSR University of Surrey, United Kingdom
Guillaume Vivier, Motorola Labs, France
Nancy Alonistioti, University of Athens, Greece

Contact Name:

Didier Bourse
Motorola Labs - European Communications Research (ECR)
Parc des Algorithmes Saint-Aubin, 91193 Gif-sur-Yvette, France
Email: Didier.Bourse@motorola.com
Tel: + 33 1 6935 2558, Fax: + 33 1 6935 7701

Subject Area

WG6: Reconfigurability

(a) Objectives of the Required Research

The End-to-End Reconfigurability (E²R) [1] research aims at bringing the full benefits of the valuable diversity within the Radio Eco-Space, composed of a wide range of systems such as Cellular, Wireless Local Area and Broadcast. The European FP6 Integrated Project E²R has officially started on 01.01.04 and the key objective of the research is to devise, develop and trial architectural design of reconfigurable devices and supporting system functions to offer an expanded set of operational choices to the users, applications and service providers, operators, regulators in the context of heterogeneous mobile radio systems. Innovative research, development and proof of concept should be sought over six years in an end-to-end aspect, stretching from user device all the way up to Internet protocol, and services, and in reconfigurability support, intrinsic functionalities such as management and control, download support, spectrum management, regulatory framework and business models.

(b) State of the Art in the Area

Since the late nineteen eighties, several initiatives, projects and project frameworks pursuing SDR and reconfigurability research have been initiated (SDR Forum, MVCE, EU ACTS, ESPRIT, IST Projects) as detailed in [2] and represented in Figure 1.

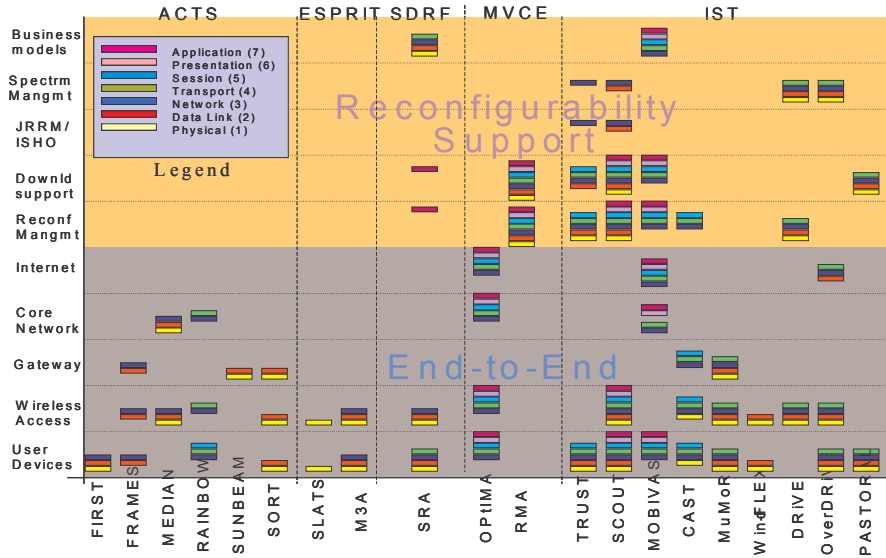


Figure 1: SDR and Reconfigurability SOTA

The E²R Project research scope is set to create opportunities across entire value chain. The provision of protocols stacks, applications and services which are flexible, sharable and adaptable in a heterogeneous radio network environment will bridge the gap between hardware/software technologies on one side and applications and services on the other side.

(c) Possible Approach

The approach adopted by the E²R project research is based on three principal components [2]:

1. E²R System Research, Business Path and Technology Roadmaps,
2. Core Technology Research, Design and Proof of Concept,
3. E²R Proof of Concept Evolutionary Platform.

Referring to the state of the art and more specifically to European FP5 projects on heterogeneous access network environment, huge amount of work has been done on the interworking and interoperability at the networking layer within an all-IP based framework as depicted in Figure 2. Moreover, within this pool of projects there are also specific projects, which have addressed:

- Interoperability issues at the networking layer,
- Reconfigurability issues linked to agile radio spectrum usage with assumption of either multimode or reconfigurable terminals,
- Versatility of terminal and network enabling new services and new billing schemes.

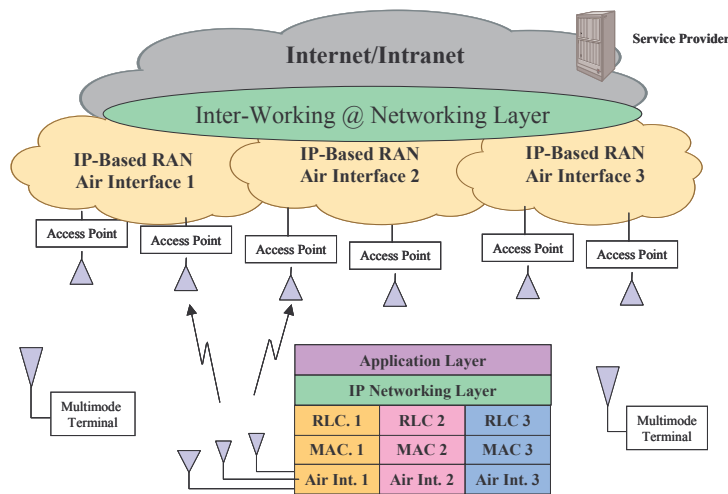


Figure 2: Short Term Architectural Perspective

In parallel, there have been also several projects, such as TRUST, SCOUT, MOBIVAS, CAST... addressing reconfigurability issues from SDR enabling technologies (radio modem) and also initial software architectures for terminals and their support for reconfiguration from the network.

In medium term architecture, it is envisaged that several capabilities in dynamically reconfiguring the radio access systems will be amenable. The radio access network topology could be dynamically reconfigured with equipment - such as reconfigurable terminals, base stations/node Bs, gateways - and related reconfiguration support entities in the core network and internet/intranet.

E²R project expects that the topology presented in Figure 3 will correspond to the transition from multi-mode to smart reconfigurable equipments and related reconfiguration support. Several extrinsic important aspects to this vision will also be investigated, such as dynamic spectrum allocation, regulatory issues, and business models.

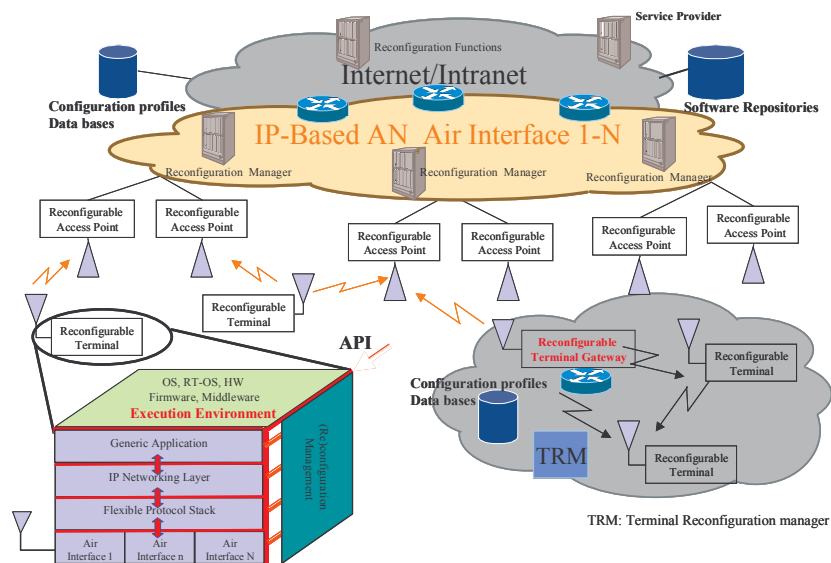


Figure 3: E²R Architectural Vision

(d) Work Plan

The E²R Project is structured in six technical workpackages (WP), corresponding to six main research fields. Two additional workpackages are dedicated to project management and dissemination, standardization and training.

- E²R System Research (WP1) aims to build and develop the system research for end-to-end reconfigurability, with the aim of aggregating the technical, business and regulatory visions from the different actors of the project (from user to service provider) and this, across the project WPs,
- Equipment Management (WP2) addresses the reconfiguration issues related to equipment, e.g. terminals and base-stations/access-points, which are capable of being reconfigured securely, reliably and seamlessly,
- Network Support for Reconfiguration (WP3) concentrates on the support of reconfigurability of network entities and terminals by network functions for secure download, reconfiguration management and validation,
- Radio Modem Reconfigurability (WP4) focuses on the development of local configuration control concepts and mechanisms for the physical layer resources, reconfiguration strategies and the development of the reconfigurable physical resources,
- Evolution of Radio Resource and Spectrum Management (WP5) aims at developing the mechanisms for dynamic allocation of radio resources, combining reconfigurable technology and support structures (from pure terminal perspectives, e.g. Cognitive Radio, to network oriented perspectives, e.g. JRRM and flexible network planning) with novel resource management techniques that are capable to control the complete spectrum in a local area,
- E²R Proof of Concept Evolutionary Environment (WP6) aims at integrating the results of the different E²R research fields, and validating the vision of the reconfigurability developed in the overall E²R project. The main expected outcome of WP6 is the development of an experimental proof of concept environment capable of demonstrating end-to-end reconfigurability features in an all-IP network architecture, where different radio access technologies and multi-mode equipment are available.

(e) Expected Results

As already detailed in [2], the E²R impact on standards, industry and users will encompass:

- Efficient, advanced and flexible end-user service provision,
- Efficient spectrum, radio and equipment resources utilization,
- Reduced cost to upgrade fielded systems,
- Multi-standard platforms,
- Better support for customized solutions,
- Reduced standards risk.

The foreseen standardization and regulation opportunities for E²R contributions are depicted in Figure 4.

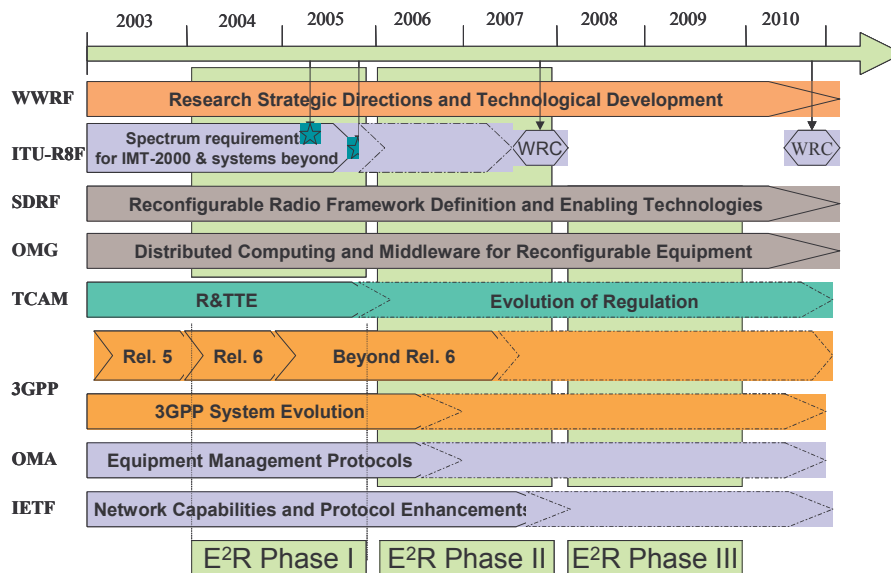


Figure 4: E²R Standardization and Regulation Contributions

(f) Time Frame to get the Expected Results

The E²R Integrated Project is a 6 years initiative, built in three phases on 2 years. Contract for Phase 1 (01.04-12.05) is planning 44 deliverables and 77 internal milestones.

(g) Acknowledgment

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(h) References

- [1] FP6 End-to-End Reconfigurability (E²R) www.e2r.motlabs.com
- [2] Didier Bourse and al "The End-to-End Reconfigurability (E²R) Research", WWRF10 New-York Meeting – WG6.