

# Preface

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The objective of the European research programme in Information and Communication Technologies (ICT) is to improve the competitiveness of European industry and enable Europe to master and shape future developments in ICT. ICT is at the very core of the knowledge based society. EU research funding has as target to strengthen Europe's scientific and technology base and to ensure European leadership in ICT, help drive and stimulate product, service and process innovation and creativity through ICT use and value creation in Europe, and ensure that ICT progress is rapidly transformed into benefits for Europe's citizens, businesses, industry and governments.

Over the past years, the European Commission has constantly increased the amount of funding going to research in computing architectures and tools through the European research programme in Information and Communication Technologies. In this context, the European Commission has funded a number of European research projects in the area of reconfigurable computing. Results from these projects are being presented in this book providing a valuable reference point, which describes the efforts of several international research teams.

Reconfigurable Computing is a fascinating alternative to mainstream computing. But is it always going to remain just an alternative occupying a market niche? The potential for reconfigurable computing has not yet been fully unleashed although there have been notable successes – mostly for 'fine-grain' reconfigurability. Now there are technological developments and market opportunities that suggest breakthroughs in the future for coarse-grain reconfigurability – a field in which Europe has particular strengths. As a matter of fact, the 'coarse-grain' market is showing increasing potential. Tile-based architectures, for example, offer a balance of flexibility and ease of programming, drawing on libraries of pre-defined functionality. Europe has a considerable track-record in research into coarse-grained reconfigurability, and this offers a re-entry route for Europe into the Reconfigurable Computing market, based upon an integrated approach of hardware together with development systems for specific application domains.

In reconfigurable computing, one important observation – that is also becoming reality in mainstream computing with the advent of multicore architectures – is that parallelism is omnipresent. Most reconfigurable computing exploits the potential for parallel processing as much as possible using different “flavours” of parallelism. The exploding interest in parallelism presents another opportunity for reconfigurable computing.

If it is to be effective, any European strategy for RTD in Reconfigurable Computing *must* be set in the context of its potential use by applications developers and systems designers. It must take account of the market – the market for supply of Reconfigurable Computing technologies; the evolution of the general purpose computing market; and the markets of the users. And for embedded systems applications, it must also take account of the evolution of the methodologies and requirements of the users. Technology is not enough.

The markets for Reconfigurable Computing may be divided into two – High Performance Computing and Embedded Systems. These markets – and the technological solutions appropriate to them – are quite different. However, they share one very important property: the fundamental obstacle to take-up of Reconfigurable Computing is the difficulty of programming. While localised solutions might be devised for specific technologies, such solutions are generally not viable, given their limited markets.

The highest priority need for RTD is therefore to enable commercially viable programmability of Reconfigurable Computing technology. This requires coherent, integrated (or “integrable”) suites of processes, methods and tools spanning:

- application level support for reconfigurability that supplements existing design methodologies, including support for verification and validation of reconfigurable behaviour and reconfigurability properties of the system so as to satisfy qualification requirements;
- mapping from the output of application design to reconfigurable hardware via intermediate layer(s) of abstraction with standard libraries of functions based on open and widely accepted standards; and
- run-time support for reconfiguration, typically through OS extensions for resource allocation, scheduling, and discovery; debugging and monitoring; and fast re-layout of reconfigurable units.

Future European RTD in these topics must recognise the need for compatibility with development paradigms and processes, methods and tools in the applications sectors. Indeed, RTD in Reconfigurable Computing should be application-driven. Application sectors where Europe could gain particular advantage include embedded healthcare, (multi)physical system modeling, biomedical, cognitive radio, portable consumer devices, automotive/avionics, infotainment, and user-driven reconfigurable products.

The book that you have in your hands will give you a glimpse of the future: research results that will be coming out of labs towards market introduction; unresolved issues and new research challenges that need to be solved; relentless efforts

to produce the last missing piece of magic that will make everything work.... but above all, I am sure, you will feel the enthusiasm and passion of the researchers and engineers that make all this happen.

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Disclaimer: The views expressed are those of the author and do not necessarily represent the official view of the European Commission on the subject.





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