



Press kit

Joint BSC – Microsoft Research Centre



www.bscmsrc.eu

What is the Joint BSC – Microsoft Research Centre?

In April 2006, the Barcelona Supercomputing Center and Microsoft started research collaboration in the field of Computer Architecture and Programming Languages. The success of this collaboration and the scientific results obtained by both teams has led to the creation of a joint research centre in Barcelona.

Two years later, on January, 18th 2008, the Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC) and Microsoft Corp announced in Barcelona the creation of the BSC-Microsoft Research Centre, which is focusing on the way microprocessors and software for the mobile and desktop market segments will be designed and interact over the next 10 years and beyond.

The advent of many- and multi-core processor computing architectures will make it possible to deliver enormous computational power on a single chip, with profound implications for the way software is developed. Optimizing the design and interaction of hardware and software architectures to take advantage of the new computing power will require tight integration across the industry.

Computer architecture experts at the BSC have teamed up with computer scientists at Microsoft Research Cambridge (MSRC) in the United Kingdom to look for innovative solutions to the challenges and opportunities that massively parallel processing represents. The vision of the centre is of a top-down computer architecture approach in which software requirements drive the hardware innovation forward rather than letting the hardware design condition software development. In addition to fundamental and applied research in transactional memories, a promising technology that facilitates the writing of parallel programs for multi-core processors and hardware support for managed runtimes will be conducted in the initial research projects.

Managers' quotes on the new joint centre

Mateo Valero, BSC's Director:

“Two years after the initial agreement, we are reaffirming our research commitment by establishing a research centre in Barcelona, building upon the successful collaboration of a group of researchers from the Computer Architecture team in BSC and Microsoft Research. To optimize the designs and interactions of multi-core processors and software, we need to start from parallel programming. The way to deal with this multi-core architecture challenge is to bring together computer architects and programming language experts.”



Tony Hey, Corporate Vice President of External Research, Microsoft Research:

“We are pleased to partner with the Barcelona Supercomputing Center to create this new research centre,” said Tony Hey, corporate vice president of External Research in Microsoft Research. “Partnerships like this help us to reach our goal of supporting the global research community and ultimately assisting researchers and scientists to address some of the toughest, most urgent societal and technological challenges worldwide. Microsoft Research has a strong track record of collaboration with public research centres and academic institutes to advance the state of the art in computing. The BSC-Microsoft Research Centre is our most recent step, combining our respective areas of expertise to address the challenges of writing trustworthy software for multi-core processors.”



Fabrizio Gagliardi, Europe, Middle East and Africa Director of External Research, Microsoft Research:

“The establishment of the joint institute for parallel computing at BSC earlier this year is the confirmation of the common interest between Microsoft Research and BSC in pursuing research in parallel computing for the support of new demanding applications in biology, energy and other critical domains for society. This institute builds on previous successful collaboration between Microsoft scientists at the Cambridge Microsoft Research laboratory in the UK and Mateo Valero's team in Barcelona.”



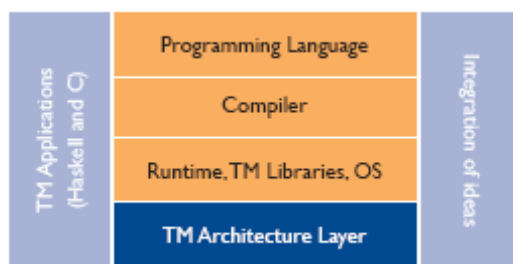
Areas of research

Combining their expertise in the fields of computer architecture and programming languages, the researchers of this centre are focused especially in the following main areas:

- Hardware and software Transactional Memory (TM)
- Hardware support for runtimes

These areas were selected after analyzing past developments and future trends in high-performance processors. Looking at the last 10 years, there has been a shift towards multi- and many-core processors. In the 1990s, processor manufacturers were designing monolithic single-core processors and were struggling to increase the performance of this core through extracting more Instruction-Level Parallelism (ILP). However, the cost of extracting more ILP became prohibitively expensive: typically doubling the power consumption for a 20-30% increase in performance. Over time, chip power-density became such a big problem that entertaining web videos appeared of users cooking their eggs sunny side up on their processors.

Unfortunately, processor manufacturers realized that they hit this power-wall a bit late; there were several well-publicized product delays and cancellations. The industry then executed a “right-hand” turn and concentrated on extracting Thread-Level Parallelism (TLP) which is more power-efficient than ILP. To be effective, TLP relies on simpler, lower-power multiple processing cores on a chip executing parallel programs. Therefore, processor manufacturers started putting more cores on chip with each new technology generation doubling the number of cores. To realize the potential of these additional cores requires experts; since it is very-difficult to program these multiple processors using current hardware and software. This problem led many to ponder if a programmer-productivity wall is looming in the future. How to design multi-core processors to make them more effective and easier to program is a challenge for computer architects.



Guided by this challenge, the vision of the centre is of a top-down computer architecture approach in which software programming requirements drive the hardware computer architecture innovation forward rather than letting the hardware design drive software development. Initial projects conducted at the centre will include fundamental and applied research in Transactional Memory (TM),

writing of parallel programs for multi-core processors, and hardware support for managed runtimes. The centre developed several TM applications as well as compiler and runtime tools and architectural simulators for TM. Among the products developed at the centre are Atomic Quake, the first TM-application that was developed for the gaming market as well as the first design that combined OpenMP and TM programming models.

The BSC welcomes the synergistic environment provided by the Centre which brings together BSC Computer Architects with Microsoft Programming Language and Runtime experts.

Partnerships like this assist Microsoft Research in supporting the global research community and ultimately assisting researchers and scientists to address some of the toughest, most urgent societal and technological challenges worldwide.

A young scientific team

Mateo Valero, the BSC's Director, Andrew Herbert, Managing Director of Microsoft Research Cambridge, and Fabrizio Gagliardi, Europe, Middle East and Africa Director for External Research at Microsoft Research, are the senior leaders of the BSC-Microsoft Research Centre, located in the North Campus of the Politechnical University of Catalonia. Furthermore, this centre has one Research Director, Mateo Valero, and four Project Leaders: Osman Unsal and Adrián Cristal, both focused on Computer Architecture, and Tim Harris and Satnam Singh (both from Microsoft Research Cambridge), for Programming Languages. Under their responsibility there is a team of around 15 PhD students, whose research interests focus on computer architecture and programming languages. One of the biggest advantages for students completing a Ph.D. with the BSC-MSR Joint Research Centre (over completing a University Ph.D.), is that they are provided with the opportunity to participate in internships at Microsoft Research Cambridge, where they can share ideas with other Microsoft scientists.



Some scientists of the BSC- Microsoft Research Centre's team based in Barcelona

Press contact

If you need further information or would like to arrange an interview (via telephone, email or face to face) with anyone from the centre, please do not hesitate to get in touch with either of the following contacts:

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Links of interest

BSC: www.bsc.es

Microsoft Research Cambridge: <http://research.microsoft.com/cambridge>

Microsoft Research Redmond: <http://research.microsoft.com>

CoSBI (Microsoft Research - University of Trento Centre for Computational and Systems Biology): <http://www.cosbi.eu>

Microsoft Research-INRIA Joint Centre: <http://www.msr-inria.inria.fr>