Barcelona Supercomputing Center
Centro Nacional de Supercomputación

SUMMARY 2017

BSC-CNS gratefully acknowledges the support of

WHO WE ARE

Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC) is the leader in supercomputing in Spain and a reference center this field internationally.

We are specialized in High Performance Computing. Our mission is: to offer infrastructure and supercomputing services to Spanish and European scientists; to generate knowledge and technology in Computer Sciences, Life Sciences, Earth Sciences and Engineering, and to transfer this knowledge and technology to society.

We are a Severo Ochoa Center of Excellence, a Singular Scientific and Technical Infrastructure (ICTS), first-level members of the PRACE (Partnership for Advanced Computing in Europe) European research infrastructure, we manage the Spanish Supercomputing Network (Red Española de Supercomputación) and we support the biomedical community coordinating the Elixir and INB-ISCIII Infrastructure.

Created in 2005 from the experience of successful collaborations between public administrations and private companies, such as CEPBA and CIRI, we have grown rapidly from 60 to more than 500 staff members, thanks to our ability to attract competitive funds from institutions and companies, and we have already installed four consecutive versions of the MareNostrum supercomputer.

Nowadays, BSC is a public consortium made up of:

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD

Generalitat de Catalunya
Departament d'Empresa i Coneixement

UPC
UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Where **we are,** where **we are going**

For BSC, 2017 was a year in which we made great progress towards the major strategic challenges that mark the beginning of the second decade of our short but intense history.

We started the year by welcoming **Alfonso Valencia** as the **new director of our Life Sciences department**. His arrival confirmed our commitment to personalized medicine as an area for the future development of supercomputing and BSC itself. It is our ambition to turn the results of genomic research into the core of a new public health system.

We have reached a key milestone with **the installation of MareNostrum 4**. MN4 has been described by experts as "the world's most diverse supercomputer" due to the heterogeneity of its architecture, which will progressively incorporate cutting-edge technologies being developed in the United States and Japan. It has multiplied our computing capacity twelve-fold, made Spain the country that offers European researchers the most supercomputing hours and will be a key tool in researching future supercomputing technologies.

The quality of the service we offer users through the **Spanish Supercomputing Network** and the **European PRACE network** remains one of our priorities and a principal source of satisfaction.

2017 was a year in which **artificial intelligence** was promoted in all areas in which we conduct research. We also joined in research into **quantum computing**. These two research areas are led by Ulises Cortés and José Ignacio Latorre, respectively.

It was also a year of well-deserved recognition for our researchers, including **ERC awards for David Carrera, Francisco J. Cazorla and Carlos Pérez García-Pando**, and the **Ken Kennedy Award for Jesús Labarta**, the director of the Computer Sciences department.

It also gave us great satisfaction to celebrate one of the most important milestones in the field of supercomputing-related scientific policy: EuroHPC, the commitment made by seven European countries —thirteen at the end of the year— and the European Comission itself to promote the purchasing and development of **exascale supercomputers with European technology**. This agreement commits Europe, and us, to keep playing in the highest global league in supercomputing and opens the door to a project we have long been calling for: the development of European computing technologies (processors, accelerators, embedded chips) to reduce our continent's dependence on countries that produce these kinds of technologies. BSC is part of the academic-industrial group that will be elegible to apply for European grants for this research area and we will play a significant role in the research.

This year our staff surpassed the symbolic number of **500 employees and collaborators**, coming from 45 countries and we are persisting with the aim of attracting talent. The EC awarded us a COFUND program to hire 20 new post-docs over the next 5 years, which will help us achieve this goal. Our HRS4R seal of excellence for human resources has also been renewed.

The center's rapid growth has brought with it **management challenges**, such as continuing to balance the budget and providing space for a staff spread around various buildings. We have tackled the challenge of balancing the budget being the third Catalan institution and the eighth Spanish institution in terms of projects awarded under the European Commission's Horizon 2020 program. We are expanding the space we have available by building the new corporate building. The second phase was completed in 2017 and we expect it to be in operation at the beginning of 2020.

We would like to thank our sponsors for placing their trust in us and all the center's workers for their excellent work, which enables us to face new challenges every day. On the following pages we provide a brief summary of what BSC achieved in 2017 as we look forward to the challenges 2018 brings.

Mateo Valero and Josep M. Martorell
Director and Associate Director of BSC

BSC in **numbers**

RESEARCH

43 Research groups

5 ERC Projects in progress

7 ICREA researchers

71 Researchers with personal scholarships

80 Projects in progress

31 Projects begun in 2017

HORIZON 2020 — **#8** H2020 Funds Recipient

171 Articles in peer-reviewed journals — **89** In Q1

93 Articles in conference proceedings — **31** In A and A* conferences

13 Book chapters

234 Open access publications

23 Doctoral theses

66 Events organized

Conferences	Workshops	Severo Ochoa seminars	Other events
2	5	24	35

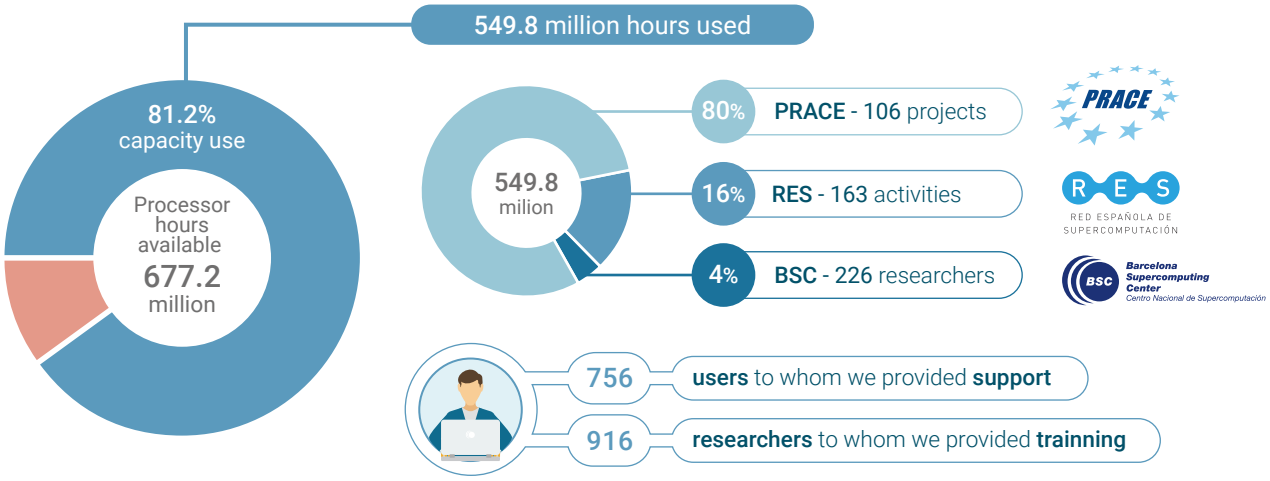
TECHNOLOGY TRANSFER

11 Patents approved or pending approval

5 Joint centers with companies

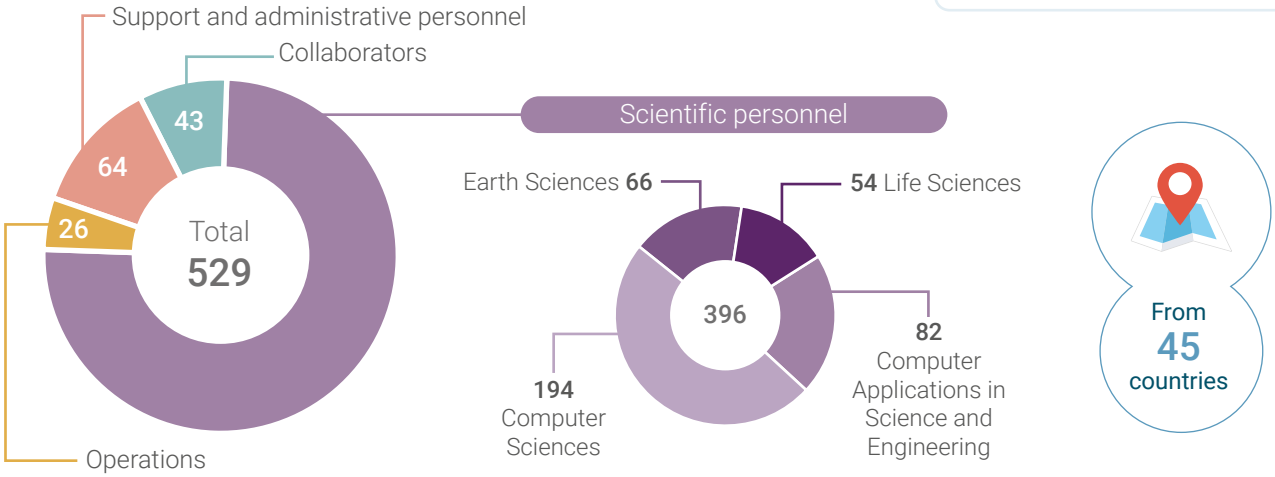
Bilateral collaboration with companies — **26** In progress — **16** Started in 2017

SUPERCOMPUTING



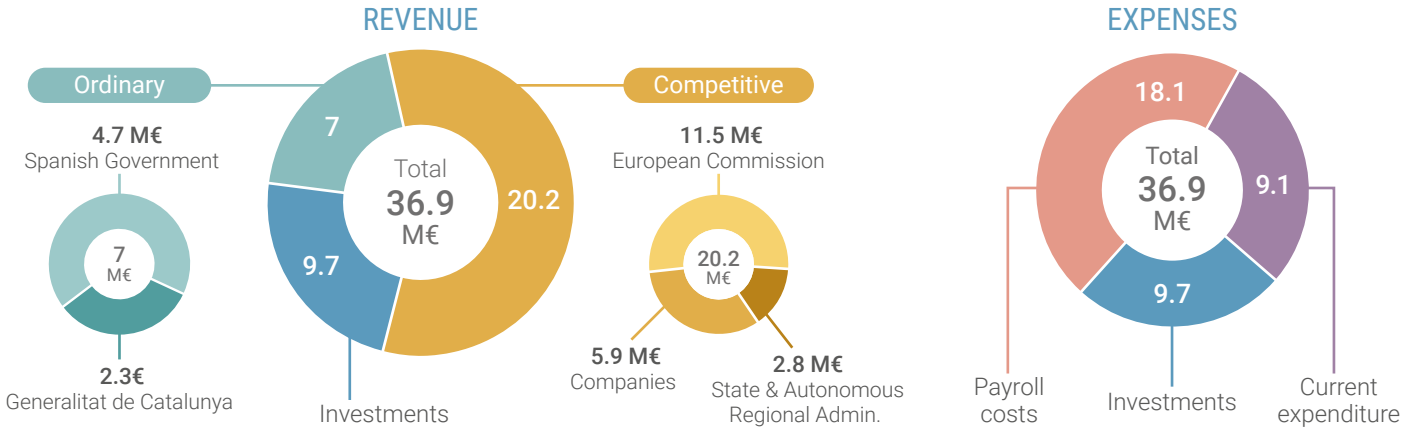
PEOPLE

Data as of December 31, 2017



RESOURCES

2017 executed budget



UPC contributes, in terms of assigned staff and room space, the equivalent of 10% of regular income

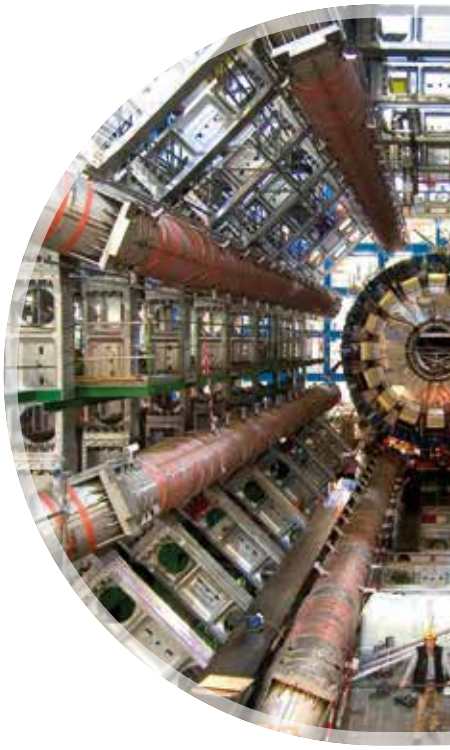
Infrastructure and services

From the handcrafted telescopes used by Galileo to the particle accelerator in Geneva, scientific instruments have undergone huge technological advances.

As a consequence, the types of questions that science tries to answer have also changed. We want answers to questions about phenomena that can no longer be observed by a simple view nor with the help of optical instruments.

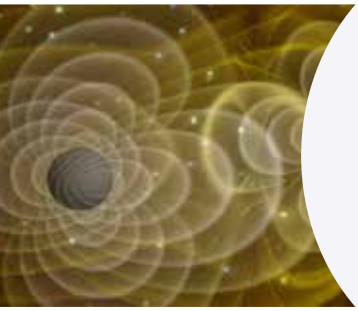
What is supercomputing?

Supercomputing enables scientific experiments by simulating "in silico" the behaviour of the object under study. Bringing together all the knowledge about the object of a computer simulation and experimenting with it can reduce costs, avoid suffering and enable experiments to be conducted that could not be performed in the real world, because they would be too expensive, too dangerous or simply impossible.



Supercomputers are also needed to analyze large amounts of data, such as those provided by scientific instruments (e.g. particle accelerators, large telescopes, interferometers or genome sequencing platforms) and the ever-growing number of devices that make up the Internet of Things.

High-performance computing has already become a great accelerator of science and engineering. It is used, and is increasingly being considered essential by the majority of scientific disciplines.



MareNostrum allocated 32 million core hours to the Nobel Prize for Physics

The LiGO project, which was awarded the Nobel Prize for detecting gravitational waves as predicted by Einstein, has been conducting research using MareNostrum for many years through Dr. Sascha Husa, Theoretical Physics Professor at the University of the Balearic Islands and member of the project. Dr. Husa and his team access MareNostrum through different public calls held periodically by PRACE and RES.

MareNostrum 4 Supercomputer

More than 13 x (10^{15}) floating-point operations per second (13.7 petaflops)

80%

PRACE

Access: prace-ri.eu/hpc-access

16%

RES

RED ESPAÑOLA DE SUPERCOMPUTACIÓN

Access: bsc.es/res-intranet

4%

BSC Barcelona Supercomputing Center
Centro Nacional de Supercomputación

13.7 petaflops are 13.700 trillion floating-point operations per second

Visit us and learn more about MareNostrum - Book your visit: visits@bsc.es

10,436 visitors from schools, universities, research centers and companies in 2017.

GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD · UNIÓN EUROPEA
Infraestructura cofinanciada por el Fondo Europeo de Desarrollo Regional "Una manera de hacer Europa"

Infraestructuras Científicas y Técnicas Singulares

MareNostrum is the generic name that BSC uses to refer to the different updates made to its most emblematic supercomputer.

MareNostrum 4 begins operation

In July 2017, MareNostrum 4 began operation and started executing scientific research applications. MareNostrum 4 has been qualified the most interesting supercomputer in the world due to the heterogeneity of its architecture.

The supercomputer includes two separate parts: a general-purpose block and a block featuring emerging technologies. It also has 6 storage racks with capacity to store 14 petabytes of data. A high-speed Omnipath network connects all the components in the supercomputer to one another.

Total performance: 13.7 petaflops

General Purpose, for BSC workload

- 11.15 petaflops
- 3,456 nodes
- 48 SKL cores 96/384 GB, 2.1GHz
- 32 flops per cycle/core

Three Emerging Technologies for evaluation of 2020 Exascale Systems

1: Power9 + Volta GPUs
1.6 petaflops

2: ARM v8 64-bit
0.5 petaflops

3: To be determined
0.5 petaflops

14 PB of GPFS Elastic Storage System

OPA Full-Fat tree and Ethernet network

SUSE Operating System

Other BSC infrastructure

MinoTauro supercomputer

Heterogeneous cluster with NVIDIA GPUs. 343.74 teraflops top speed.

Big Data infrastructure

Total capacity of 24.6 petabytes of storage of scientific data.

Highlights

EuroHPC: European commitment to acquire and deploy exascale supercomputers

In March 2017, seven European countries announced a joint initiative to acquire and deploy world-class high-performance computers, a project the European Commission says is comparable to the size of Airbus or the Galileo projects. BSC will play an active role.
The challenge is for states to work in coordination with the EC to prepare a roadmap to deploy European exascale supercomputing infrastructure. The target is to have two pre-exascale computers by 2021 and reach full exascale performance by 2024. The objective is also to develop European technology, including processors and test-beds for HPC and big data applications for scientific, public and industrial purposes. By the end of 2017, thirteen countries had joined the initiative.

Spain becomes the country that allocates the most core hours to European science

Spain has allocated 475 million core hours of its MareNostrum supercomputer to 17 projects led by scientists from seven European countries selected in 2017 in the last call by PRACE (Partnership for Advanced Computing in Europe). This made Barcelona Supercomputing Center's supercomputer the largest contributor of hours to European research.
In the same call, Spanish scientists were allocated more than 400 million core hours for 11 different projects.

BSC and MareNostrum in Dan Brown's latest book *Origin*

The MareNostrum supercomputer, the BSC and our director, Mateo Valero, play outstanding roles in the popular writer Dan Brown's latest book *Origin*. Brown is famous for writing leading best-sellers such as *The Da Vinci Code* and *Angels and Demons* and our center was the inspiration for some of the chapters in his latest book, which takes place entirely in Spain, mainly in Barcelona. As part of his research for *Origin*, the writer visited the BSC and talked at length with some of the center's directors.

MareNostrum, the most beautiful data center in the world

MareNostrum won the Most Beautiful Data Center in the World Prize, awarded by Datacenter Dynamics (DCD).
There are 15 prizes in different categories, plus the prize for the most beautiful data center, which is selected by popular vote. MareNostrum competed with such impressive facilities as the Switch Pyramid in Michigan, the Bahnhof Pionen in Stockholm and the Norwegian Green Mountain. It was selected by popular vote for its unique location inside the Torre Girona chapel. The awards ceremony took place on December 7 in London and both Mateo Valero, BSC Director, and Sergi Girona, Operations Department Director, went to receive the prize.

Research News

European processor on the way

A consortium with BSC as scientific lead and Bull as industrial lead won the "Framework Partnership Agreement (FPA) in European low-power microprocessor technologies" contract. The consortium, called European Processor Initiative, will be responsible for submitting proposals valued at €120 million (2018-2020) to perform research on European computing technologies. This research will be conducted in the framework of the EuroHPC initiative, whose goals include “creating a European microprocessor, to be independent from US and Chinese microprocessors, to be used for HPC, big data and AI”.

Alfonso Valencia joins the BSC as Life Sciences director

The biologist Alfonso Valencia joined the BSC at the beginning of 2017 as director of the Life Sciences Department, **with the support of ICREA**. Alfonso Valencia is the director of the National Institute of Bioinformatics (an Instituto de Salud Carlos III platform and European Infrastructure of Bioinformatics ELIXIR node), the founder and president of the International Society for Computational Biology and co-executive director of the leading journal in the field (Bioinformatics, Oxford University Press).
The addition of Valencia to the BSC confirms the center's commitment to personalized medicine as an area for the future development of supercomputing.

Carlos Pérez García-Pando receives an ERC Consolidator Grant

The Atmospheric Composition group leader and AXA Professor at BSC obtained this grant for his FRAGMENT project, which aims to understand and constrain the global mineralogical composition of dust and its effects on the climate. Pérez García-Pando was also awarded the Agustín de Betancourt y Molina prize for young researchers by the Spanish Royal Academy of Engineering in recognition for his contributions to the field of environmental risks, and in particular, the field of mineral aerosols.

Francisco J. Cazorla receives an ERC Consolidator Grant

His SuPerCom project seeks to ensure high and sustained performance of embedded systems (such as those in the latest cars, aircraft, satellites and trains). Francisco J. Cazorla is the CAOS research group leader at the BSC and a CSIC researcher.

David Carrera receives an ERC Proof of Concept Grant

Carrera’s PoC involves exploring the commercial potential of Hi-OMICS, a software solution designed to efficiently manage Computational Genomics workloads on SDI platforms in order to significantly improve the infrastructure’s cost-efficiency.

Mateo Valero receives the Charles Babbage Award and an Honorary Doctorate from Cinvestav

The BSC's director, Mateo Valero, was awarded the 2017 IEEE Computer Society Charles Babbage Award for his "contributions to parallel computation through brilliant technical work, mentoring PhD students, and building an incredibly productive European research environment." The Mexican Center for Research and Advanced Studies at the National Polytechnic Institute (Cinvestav) awarded him an honorary doctorate in recognition of his excellent work in all aspects of supercomputing development and research, in particular his collaboration in driving forward supercomputing in Mexico.

Jesús Labarta, the first European researcher to receive the Ken Kennedy Award

Jesús Labarta, Computer Sciences Department Director at BSC, was awarded the Ken Kennedy Award from the ACM and IEEE Computer Society. Labarta, the first non-American researcher to receive this recognition, won the award for his seminal contributions to programming models and performance analysis tools for HPC.

Antonio Peña, winner of the Award for Excellence for Early Career Researchers in HPC

BSC researcher Antonio Peña is the first European researcher to receive an IEEE Computer Society Technical Consortium on High Performance Computing (TCHPC) Award for Excellence for Early Career Researchers in High Performance Computing.

BSC participates in the Atlantic International Research Center

BSC will be part of the Atlantic International Research Center (AIR Center), whose headquarters are in the Azores. The center will conduct research in scientific areas such as climate change, oceans, supercomputing, atmosphere, space and energy, carrying out studies with data obtained from the Atlantic Ocean.

Launch of the "Alliance of Severo Ochoa Centers and María de Maeztu Units of Excellence"

The 25 centers and 16 research units accredited with "Severo Ochoa" and "María de Maeztu" excellence distinctions have formally created the Severo Ochoa and María de Maeztu Alliance (SOMMa). SOMMa aims to raise the profile of science in Spain; promote the exchange of knowledge, technology and best practices; cooperate with other research centers; and have a voice in Spanish and European science policy.

New lines of research

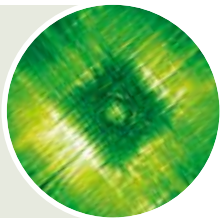
We are a very active center in updating our lines of research, organized in four major departments: Computer Sciences, Life Sciences, Earth Sciences and Computational Applications in Science and Engineering.

In 2017, the most relevant news were:

High Performance Artificial Intelligence Group

We created a group that focuses on the research and application of AI techniques using HPC tools and infrastructure. Typically, HPC requirements come from computationally expensive AI methods (e.g. deep learning) and/or large-scale datasets (e.g., massive networks). In this context, the group does pure AI research trying to advance the current state-of-the-art, but also seeks to apply AI methods to solve societal and scientific challenges identified within and outside of BSC.

Ulises Cortés



Quantum Information Group

This new research group is organized in two research lines: **Quantum Algorithms**, designs novel quantum algorithms for quantum computation, quantum simulation and quantum annealing. The algorithms are specifically aimed at small-sized quantum processors that do not require error correcting protocols. **Superconducting Quantum Processors** develops superconducting quantum circuits for quantum information applications using Josephson junction technology. Its focus is on designing and fabricating circuits with the goal of implementing quantum algorithms and quantum simulations.

José Ignacio Latorre

Personalized Medicine Initiative

The BSC initiative is part of the global movement to improve well-being and health care based on the systematic use of massive amounts of individual information.
Personalized Medicine represents a unique opportunity but it also poses a massive scientific and technical challenge.
In collaboration with hospitals, research infrastructures, companies and international consortia, we will develop models to interpret genomic, molecular, physiological and organismic information, implementing the most advanced techniques in computational biology, data mining, machine learning and molecular simulations in the BSC world class High Performance Computing environment.

Alfonso Valencia

Featured publications

"Topology-aware GPU scheduling for learning workloads in cloud environments"

Presenting a novel placement algorithm to orchestrate several multi-GPU deep learning workloads on clusters of nodes, taking GPU interconnect topologies into consideration to optimize performance.

M. Amaral, J. Polo, D. Carrera, S. Seelam, M. Steinder. *(SC '17)*

"Design and Implementation of a Time Predictable Processor: Evaluation with a Space Case Study"

In this joint work between Airbus Defence and Space, Cobham Gaisler and BSC, the authors show how randomization and probabilistic analysis helps Worst-Case Execution Time (WCET) estimation.

C. Hernández, J. Abella, F. J. Cazorla, A. Bardizbanyan, J. Andersson, Fabrice Cros, Franck Wartel. (ECRTS, 2017)

"An Integrated Vector-Scalar Design on an In-order ARM Core"

A classic paper on microarchitecture design for a low-power vector processor. It was interesting in that it predated ARM extensions on vectors and developed the idea of extending a normal core to support vector ISA, thereby reducing energy consumption.

M. Stanic, O. Palomar, T. Hayes, I. Ratkovic, O. S. Unsal, A. Cristal, M. Valero. (ACM Transactions on Architecture and Code Optimization, April 2017)

"Efficient generation of energetic ions in multi-ion plasmas through radio-frequency heating"

A new technique, which has opened up new ways of heating fusion reactor plasmas such as those at ITER and DEMO to the high temperatures needed for fusion to occur.

Ye. O. Kazakov, J. Ongena, J. C. Wright, S. J. Wukitch, E. Lerche, M. Mantsinen et al. (Nature Physics, June 2017)

"Subdividing triangular and quadrilateral meshes in parallel to approximate curved geometries"

A new approach to refine a mesh while preserving the curvature of a target geometry to parallel compute steady-state flow solutions on real topographies.

A. Gargallo-Peiró, G. Houzeaux, X. Roca. (Procedia Engineering, 2017)

"Potential ash impact from Antarctic volcanoes: insights from Deception Island's most recent eruption"

Simulations highlighting how ash clouds entrapped in circumpolar upper-level winds have the potential to reach lower latitudes and disrupt southern hemisphere air traffic.

A. Geyer, A. Martí, S. Giralt, A. Folch. (Scientific Reports, Nov. 2017)

Featured publications

Nucleic Acids Research

"Automatic identification of informative regions with epigenomic changes associated to hematopoiesis"

This paper presents initial steps in the decoding of the epigenomics language of blood cellular components formation.

E. Carrillo de Santa Pau, D. Juan, V. Pancaldi, F. Were, I. Martin-Subero, D. Rico, A. Valencia. BLUEPRINT Consortium. *(Nucleic Acids Research, 2017 Sep 19)*

CHEMICAL REVIEWS

"Information Retrieval and Text Mining Technologies for Chemistry"

Summary of the work of the community in the identification of chemical compounds in text.

M. Krallinger, O. Rabal, A. Lourenço, J. Oyarzabal, A. Valencia. (Chemical Reviews, 2017 Jun 28)

SCIENTIFIC REPORTS

"A molecular hypothesis to explain direct and inverse co-morbidities between Alzheimer's Disease, Glioblastoma and Lung cancer"

This paper delves into the relationship between Alzheimer's disease and brain tumours (glioblastoma, in particular), using lung cancer data as a reference and applying a new meta-analytical method explicitly developed for this case.

J. Sánchez-Valle, H. Tejero, K. Ibáñez, J. L. Portero, M. Krallinger, F. Al-Shahrour, R. Tabarés-Seisdedos, A. Baudot, A. Valencia. (Scientific Reports, 2017 Jun 30)

ERL

"Uncertainty in recent near-surface wind speed trends: a global reanalysis intercomparison"

Assessment of the ability of atmospheric reanalysis to reproduce wind speed trends and meet wind energy users' information requirements.

V. Torralba, F. J. Doblas-Reyes, N. González-Reviriego. (Environmental Research Letters, 2017)

GMD EGU

"Description and evaluation of the Multiscale Online Nonhydrostatic AtmospheRe CHemistry model (NMMB-MONARCH) version 1.0: gas-phase chemistry at global scale"

A comprehensive description and benchmark evaluation of the tropospheric gas-phase chemistry component of this model, developed at BSC.

A. Badia, O. Jorba, A. Voulgarakis, D. Dabdub, C. Pérez García-Pando, A. Hilboll, M. Gonçalves, Z. Janjic. (Geosciences Model Development, Feb 2017)

Remote Sensing of the Environment

"Uncertainty propagation in observational references to climate model scales"

This paper presents an approach to deriving propagation of observational reference uncertainty to different climate model simulations' space-time scales, one of the current challenges in climate prediction.

O. Bellprat, F. Massonnet, S. Siegert, C. Prodhomme, D. Macias-Gómez, V. Guemas, F. J. Doblas-Reyes. (Remote Sensing of the Environment, Dec 2017)

Applied Research & Innovation

BSC and Repsol renew their collaboration to deploy the BSIT as an everyday platform for geophysical exploration

BSC and Repsol renewed their collaboration to deploy the BSIT software platform on the company's hardware so it can be used in everyday production. The BSC-Repsol collaboration began in 2007 and since 2011 they have cooperated through the Repsol-BSC Research Center. Barcelona Subsurface Imaging Tools (BSIT) is a platform developed by BSC to work with the vast computational resource needs required for geophysical exploration, including different types of processing workflows running on a wide range of HPC architectures.

BSC and Micron explore the use cases for PIM in HPC

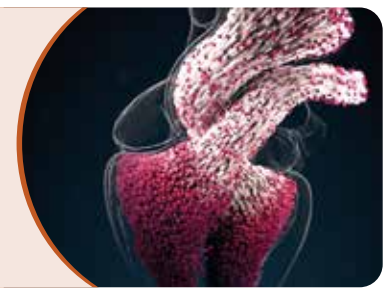
Processing in memory (PIM) is a well-known concept for mitigating the performance impact of high memory latency and limited bandwidth. With new memory devices that combine DRAM with logic, PIM is reaching the market. BSC and Micron are exploring together the use cases for PIM in HPC. In particular, we analyze whether address management techniques in DRAM devices could be used to address problems such as sorting, and what the impact of an advanced and low-overhead sort on various HPC algorithms would be. The analysis is performed on PIM-enabled prototypes provided by Micron.

BSC extends its collaboration with IT sector to carry out research on the future of supercomputing

BSC extended its collaboration with companies in the IT sector, such as Fujitsu, IBM and Lenovo to carry out joint research on the future of supercomputing. Projects with these companies include analyzing the requirements that supercomputers must meet to respond to challenges from different scientific areas, such as those posed by personalized medicine or artificial intelligence. These challenges are addressed both from the field of computer architecture and the programmability of machines.

BSC and Ikergune/PlethoraIIoT extend their collaboration targeting the convergence of HPC towards embedded industrial compute-intensive use cases

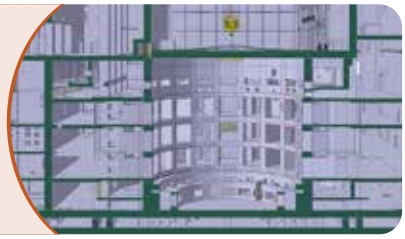
BSC has been collaborating since August 2016 with Ikergune/PlethoraIIoT, the R&D department of the Etxe-tar industrial group, a leader in machining systems and smart manufacturing. The contract was extended for two more years in 2017 to continue the joint research effort targeting the convergence of HPC towards embedded industrial compute-intensive use cases. The collaboration focuses on three main pillars: i) efficient and simplified data sensing using advanced FPGA techniques, ii) parallelization and optimization of algorithms for analysis of industrial processes and iii) advanced visualization tools for easy inspection of large datasets of industrial data.



Collaboration with Medtronic to advance cardiac simulation as an alternative to animal testing or human clinical trials

BSC and Medtronic signed a collaboration agreement to advance cardiac simulation as an alternative to animal testing or human clinical trials. The simulation tool is Alya, the multi-physics parallel code, developed at BSC. This joint research will focus on the cardiovascular system for more realistic analysis with potential impact on medical devices such as pacemakers, cardiac valves and stents. The project will boost the potential of the Alya Cardiac Computational Model as a virtual heart specifically designed for supercomputers.

Applied Research & Innovation

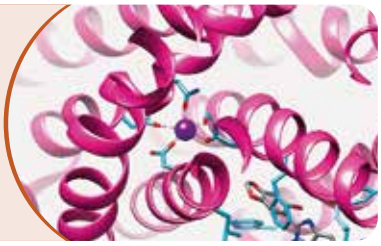


ITER and BSC engage in closer collaboration to simulate fusion power generation

The ITER Organization and BSC went a step further in their collaboration to simulate the process of fusion power generation. The two parties signed a Memorandum of Understanding (MoU) to promote and further academic and scientific cooperation. ITER and BSC already collaborate in the area of numerical modelling to assess the design of the ITER pellet injector. These computer simulations are based on non-linear 3D magnetohydrodynamic (MHD) methods.

BSC and Mexico City to develop tools for the evaluation of policies to combat air pollution

Mexico City's Department of the Environment (SEDEMA) and BSC signed an agreement to develop modelling tools that will make it possible to evaluate both management and air quality improvement policies in the city. This agreement is a new step in the collaboration between BSC and SEDEMA, which already cooperated on developing and launching a weather forecasting system for Mexico City and its metropolitan area based on the CALIOPE system.



AstraZeneca accelerates drug discovery with PELE technology

AstraZeneca, in collaboration with Heptares Therapeutic, made significant progress with the new target called PAR2, using PELE simulation software, as reported in Nature. PAR2 has applications for the generation of new drugs in the inflammatory pain field. This drug is considered a highly promising target for the treatment of osteoarthritic pain. PELE is a technology developed at BSC and the BSC spin-off Nostrum Biodiscovery (NBD) owns the exploitation rights.

BSC to develop climate prediction applications to support the European Commission's food security decisions

The BSC signed a collaboration agreement with the European Commission Joint Research Center to make decadal climate prediction applications to support food security decisions by the European Commission. The Joint Research Center is the European Commission's science and knowledge service, which employs scientists to carry out research in order to provide independent scientific advice and support for EU policy.

NOMAD launches the NOMAD Encyclopedia on materials properties

The Novel Materials Discovery (NOMAD) Laboratory Centre of Excellence, of which BSC is a consortium member, launched a freely accessible knowledge base on the computed properties of materials. The NOMAD Encyclopedia acts as a user-friendly interface to access the project's extensive data collection, and is the largest database of computed materials data worldwide.

BSC and Barcelona City Council join forces to develop projects aligned with the "Barcelona Digital City" strategic plan

Barcelona City Council's Municipal I.T. Institute (IMI) and the BSC signed an agreement to collaborate on developing highly technological projects of common interest aligned with the Barcelona Digital City 2017-2020 strategic plan, which aims to facilitate a more diverse digital economy and a new model of urban innovation. The alliance revolves around work areas related to the municipal strategy, such as city digitalization, air quality in urban environments, and the contribution of technology to urban mobility.

BSC and Aigües de Barcelona to collaborate on developing advanced solutions in data analysis for the water sector

BSC and Aigües de Barcelona signed a collaboration agreement to develop analysis tools to simplify the process of prioritizing the water company's investments in its domestic supply network. Aigües de Barcelona needs advanced tools to transform its vast volume of water supply data into knowledge so that the best maintenance decisions can be made. BSC will contribute with its know-how in machine learning, big data, neural networks and artificial intelligence tools.

BSC promotes business innovation through supercomputing with PIMEC and Foment del Treball

In 2017, BSC signed agreements with the employers' organizations Foment del Treball Nacional and PIMEC to promote innovation in companies through supercomputing. The goals are to boost competitiveness using information sciences applied to economic, industrial and service activities, promote technology transfer from supercomputing research to the business environment, and encourage knowledge flow.

BSC and the Spanish Foundations Association will collaborate to highlight the impact of foundations on society

The BSC and the Spanish Foundations Association will work jointly to highlight the impact of foundations on society. The two organizations signed an agreement committing them to carrying out joint research providing relevant information about foundations' activities to add value to their work. BSC and AEF will identify and establish data sources about foundations and their field, and will develop data analysis of data packages using modern techniques (cognitive algorithms and machine learning).

BSC to collaborate with the Catalan Agency for Health Quality and Evaluation to make browseable Catalan health system indicators

BSC will collaborate with the Catalan Agency for Health Quality and Evaluation (AQuAS) to produce more user-friendly health outcome and quality indicators for the Catalan health system. BSC has developed a pilot to present the health system's data graphically in a geolocalized and browseable way, making it possible to relate different indicators and assistance parameters and view their progress over the years. It is mainly aimed at doctors and specialized journalists.

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