

# OPEN CALL

## Theme

International contest searching for scientific proposals to be developed in the Janus supercomputer.

## Candidates

Scientists, Research groups in Science and Technology, Research Centers, Universities ...

# 2013

## “Janus Supercomputer Open”

### Origins

The supercomputer Janus, a modular massively parallel and reconfigurable FPGA (Field Programmable Gate Array)-based computing system, represents the successful outcome of a collaboration project driven by a recognized scientific team including members from BIFI and the Universities of Zaragoza, Madrid, Extremadura, Roma and Ferrara in 2007. This supercomputer was designed to solve specific theoretical problems in physics, which demand of an enormous computational power to perform simulations with a very concrete kind of calculations.

### Janus Overview

The core of the Special Purpose Computer Janus is compounded by a 4x4 array of FPGA based processing elements (simulation processors, SP) which are connected with their nearest neighbors obeying periodic boundary conditions. In the middle of the board there is another processing unit acting like a cross-bar, which is in charge of setting all the internal and external connections of Janus (so called IOP = Input/Output processor). A bank of staging memory is available, and the main communication channel uses 2 Gigabit-Ethernet links. The IOP and all SP's are FPGA's based on Xilinx Virtex4-LX200. Janus uses its own operating system compatible with any Linux-based platform that comprises JOSlib (libraries in Perl and C to control IOP devices), josd (multiuser environment for resource abstraction and concurrent jobs management) and jlib (set of SP firmware modules for scientific applications and C libraries to control them via the josd). All FPGAs are reprogramed using the VHDL language.

In short, the hardware and the software of the Janus machine allows high flexibility in designing applications by scientists to solve different theoretical or practical problems, and reaches an ultra-high speed in processing: for instance, in spin glass simulations each FPGA processor has the same performance for selected applications as 100 or even 1000 high-end conventional computers.

A more detailed information is given at <http://bifi.es/janus>.

### Outcome

Janus has made possible to obtain very interesting scientific results. Most of them were published in some of the most important journals in computing and physics, as Physical Review Letters, Computing in Science & Technology, Computer Physics Communications or Journal of Statistical Physics. More recently, the Janus collaboration work deserved a remarkable publication in the Proceedings of the National Academy of Sciences in 2012. In addition, because of the impact of the Janus project in the international sphere the researchers defend in 2008 their candidature to the Gordon Bell Prize.

### Your research

Janus FPGA based architecture system is the most suitable choice for many scientific projects demanding massive core processing for simulations. The entire machine can be programmed with the specific requirements of every project in order to obtain very powerful and high-speed results. You can benefit from using Janus giving to your research a powerful computational tool that will help you to save time and money. In order to achieve the eventual aims, some support will be given from the Janus Collaboration.

## Proposals

Send your research proposal for using Janus to [janus.2013call@bifi.es](mailto:janus.2013call@bifi.es) in no more than 5 sheets in PDF format. In the first page must only appear:

**Author(s), Institution/Area, Contact details (Phone number, E-mail, website), Project title, Brief abstract. Most relevant related scientific results in the last five years.**

**Deadline is January 31<sup>st</sup>, 2014.**

## Evaluation

All the proposals will be assessed by a scientific and technical committee composed by researchers from the Janus consortium.

This committee will select the 3 most appropriated proposals to obtain a fine exploitation of Janus machine. Evaluation criteria include novelty of the proposal, scientific impact, performance and feasibility, HDL programming background, porting applications to special hardware experience ...

**Selected candidates will be notified by email before 1st April, 2014.**

The selected proposal will dispose of a total of 512 computing simulation hours of the whole machine\* or its equivalent. According to the fine development of the project and the availability of computing time, the three winner proposals will be performed in Janus in the selected order. In case of any researcher from the Janus Collaboration participates in the work, any future scientific publication derived from the simulations will be also signed by that researcher. According to the fine development of the project and the availability of computing time, the three winner proposals will be performed in Janus in the selected order.

**Notice that no funds will be required for using Janus.**

\* Proposals willing to go beyond that time should be very well motivated, and would require a negotiation with the Janus consortium on a case by case basis.