HPC Astrophysics with the INAF-CINECA MoU 2017-2020

Editors
Ugo Becciani (INAF - Osservatorio Astrofisico di Catania),
Giacomo Mulas (INAF - Osservatorio Astronomico di Cagliari),
Giuseppe Murante (INAF - Osservatorio Astronomico di Trieste),
Paola Rossi (INAF - Osservatorio Astrofisico di Torino),
Maurizio Santo Cremonesi (CINECA),
Massimiliano Guarrasi (CINECA),
Cristiano Padrin (CINECA),
Fabio Pitari (CINECA)

Foreword

At the beginning of 2017 INAF (Italian National Institute of Astrophysics) sealed an agreement with CINECA (National Supercomputing Center)[1]. This was driven by two main needs: to meet, in a quick and flexible way, the increasing request of computing resources from the theoretical community, on a scale that could not be achieved by small, "private" computer clusters in local INAF institutes, providing specialised, high-level technical support; and, on the other side, to encourage and foster the development of data reduction pipelines requiring HPC resources, as well as big data analysis, in the perspective of observational projects as SKA, EUCLID, LOFAR, and so on, involving huge data streams. The agreement established that for a two year period the INAF researchers had reserved a certain amount of computational time on Cineca machines. A management committee, composed by INAF researchers and CINECA personnel, was appointed in order to allocate resources, on the basis of competitive calls, and to monitor the proper usage of the allocated computing time. More over, a fellowship was funded to hire a dedicated reference person, collaborating with INAF researchers to tackle problems of porting code to new architectures, to improve their efficiency and, more generally, to troubleshoot nontrivial technical issues with effective use of CINECA machines and/or their scheduling system.

In this volume (Vol.1) are collected the reports of all the projects approved in the four calls already concluded. The projects whose reports are given belong to two different classes (A and B), depending on the scale of the allocated resources (A ranging from 125000 to 750000 CINECA standard hours, B up to 125000 CINECA standard hours). These span a wide range of astrophysical topics, from planets to cosmology, covering many physical processes of astrophysical relevance. In many cases, the projects were proposed and carried out in the framework of large international collaborations. This collection of reports show that the usage of HPC resources is necessary to INAF community to achieve excellence in many areas of astrophysics, producing high level scientific results, which have been, and are being, published in peer-reviewed, specialised journals. In some cases, actually, a technical report could not be produced due to embargo conditions posed by the scientific publication.

This INAF action has thus been very timely, considering that these years represent a transition towards exascale computing, with new computer architectures involving new programming paradigms, enabling many groups to port their codes to the new machines. Calls for proposals were frequent, in the case of class B projects always open, projects swiftly processed and, when eligible, resources were allocated quickly and made available to researchers in a matter of weeks. In addition to production-level projects, smaller "test" projects were also always accepted for evaluation and, if eligible, granted within days, to enable researchers to access CINECA machines and see if they were technically suitable for their scientific needs. We also remark that this INAF-CINECA agreement was complementary with the standard channels to obtain HPC resources via ISCRA calls and applications, offering INAF researchers a way to access CINECA resources via smaller projects that were in some cases also instrumental to the preparation of larger ISCRA proposals. In this sense, this initiative was therefore one of the pieces, an important and very successful one, of the overall comprehensive strategy for INAF HPC.

The Management Committee:
U. Becciani, G Mulas, G. Murante, P. Rossi (INAF)
M. Cremonesi, M. Guarrasi, F. Pitari, C. Padrin (CINECA)

[1] https://www.ict.inaf.it/computing/wp-content/uploads/2020/05/mou_inaf_cineca-2017-2021.pdf