

# High Performance Computing on the GRID infrastructure of COMETA

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FLASH is a parallel MHD code based on Message-Passing Interface (MPI) library and designed to be executed on HPC systems. The simulations performed required a substantial amount of distributed computational resources made available through the GRID infrastructure of COMETA.

## 3. Impact

FLASH is a modular multi-D parallel code designed to allow users to configure initial and boundary conditions, change algorithms, and add new physics modules. Since the code is based on the MPI library, MPI and MPI2 libraries are distributed on the GRID infrastructure. Also, each cluster of the infrastructure is equipped with a fast interconnection network with low communication latency to allow the best performance of HPC applications. The execution of our application is particularly time-consuming and requires many processors (> 32); to check the produced files and/or to estimate the status of the job, we use a watchdog utility that checks for changes in logfiles and production files, reporting their content to the storage element, and registering their names into the file catalog (LFC).

## URL for further information:

<http://flash.uchicago.edu>  
<http://www.astropa.unipa.it/FLASH/>

## 4. Conclusions / Future plans

GRID infrastructures can be used to execute HPC applications if the following requirements are satisfied: distribution of MPI and MPI2 libraries on the infrastructure; clusters equipped with a fast interconnection network with low communication latency; queue dedicated to HPC applications with preemption capability on the other queues; use of watchdog utility for job monitoring during execution; long term proxy to allow the running of jobs whose execution is particularly time-consuming.

## Provide a set of generic keywords that define your contribution (e.g. Data Management, Workflows, High Energy Physics)

High Performance Computing, Astrophysics, Hydrodynamics, Magnetohydrodynamics

## 1. Short overview

We report about our experience regarding the porting of High Performance Computing (HPC) applications to the GRID. In particular, we ported FLASH, a multi-dimensional, adaptive-mesh, parallel code capable of handling general flow problems in astrophysical environments. The HPC simulations performed using FLASH require a substantial amount of computational resources made available through the GRID infrastructure of the COMETA consortium.

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