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ZIVIS: A City Computing Platform Based on Volunteer Computing

B. Antolí
A. Giner
J. M. Reynolds
S. Sangiao
R. Vallés
F. Castejón
G. Losilla
A. Rivero
F. Serrano
J. L. Velasco

Zaragoza AYUNTAMIENTO

MINISTERIO DE EDUCACIÓN Y CIENCIA

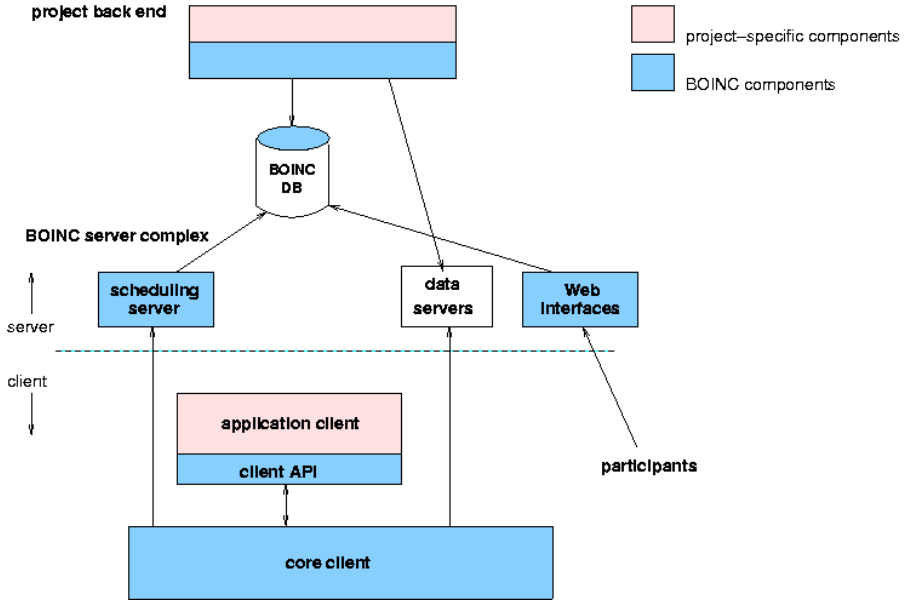
Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

Introduction

- Popularization of Information and Communication Technologies
- Oportunity: thousands of idle PCs
- First approach: Grid Computing
- Problems: complex grid middleware, unreliability of resources...
- Alternative: volunteer computing

BOINC

- “Berkeley Open Infrastructure for Network Computing”
- Popular open source framework for
  volunteer and desktop grid computing
- Two main components:
  - server:
    - scheduling & data servers
    - relational database
    - web interface
  - client:
    - boinc manager (GUI), core client
    - easy deployment (“3 clicks”)



ZIVIS

- Initiative which aims to establish in Zaragoza (Spain) the first “city-wide supercomputer”
- Project run by Zaragoza City Council, Ciemat and the Institute for Biocomputation and Physics of Complex Systems (BIFI)
- Based on BOINC

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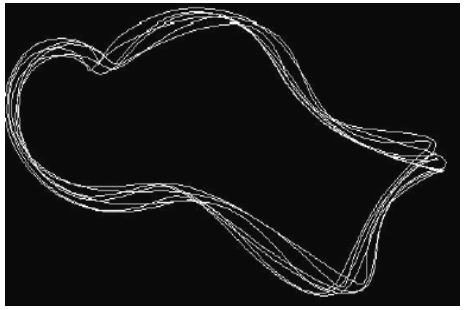
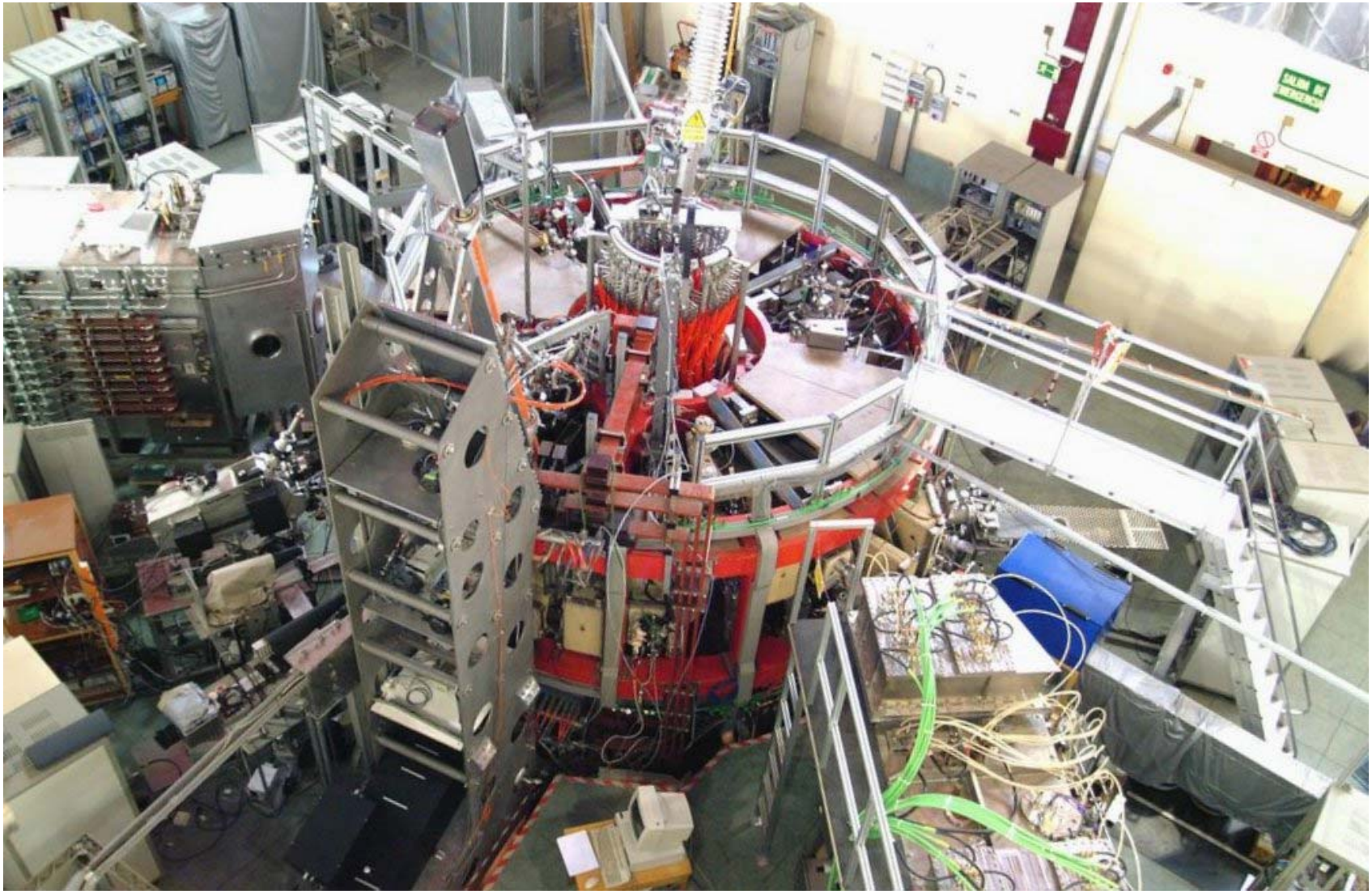
Pilot application: ISDEP

- ISDEP: “Integration of Stochastic Differential Equations in Plasmas”: fusion plasma application developed at BIFI
- Calculates trajectories of particles inside a fusion device (TJ-II, LNF-CIEMAT)
- This application has been chosen to involve the highest number of citizens in the project because research in alternative energy sources is viewed as interesting by the general public



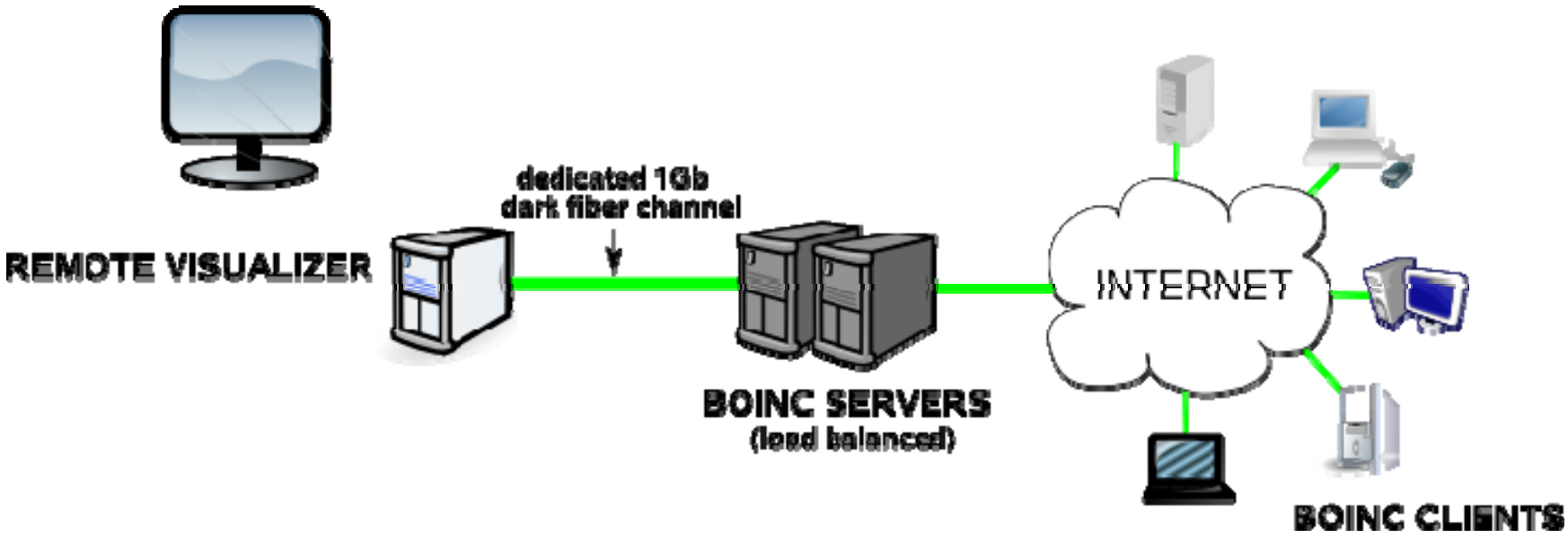
Pilot application: ISDEP



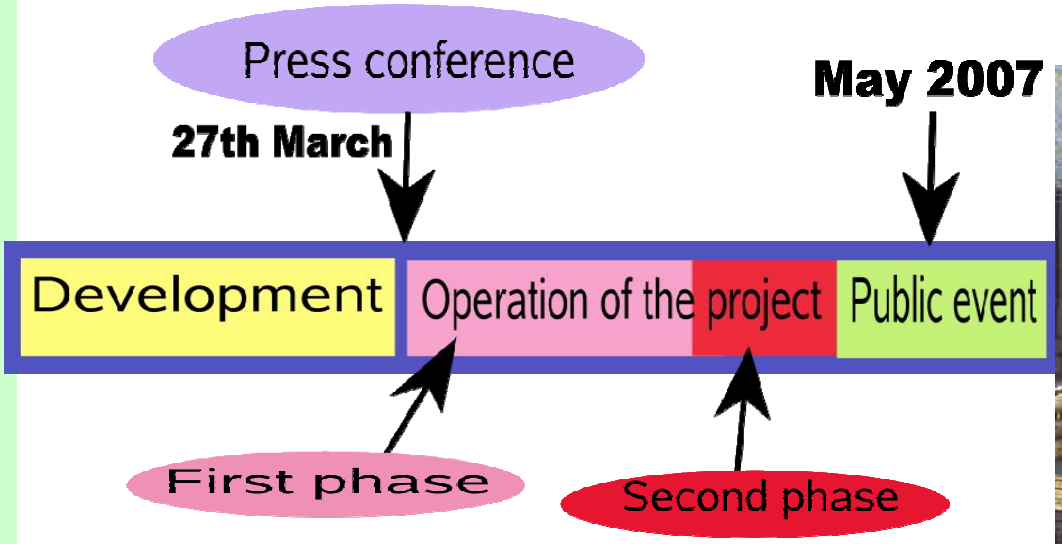
ISDEP: Integration in BOINC

- BOINC software provides an API which includes file access, initialization, “fraction done”…
- Applications must also incorporate some interaction with the BOINC client.
- Dealing with erroneous results: redundancy mechanism already provided by BOINC
- Generation of workunits in two phases

Infrastructure



Project planning

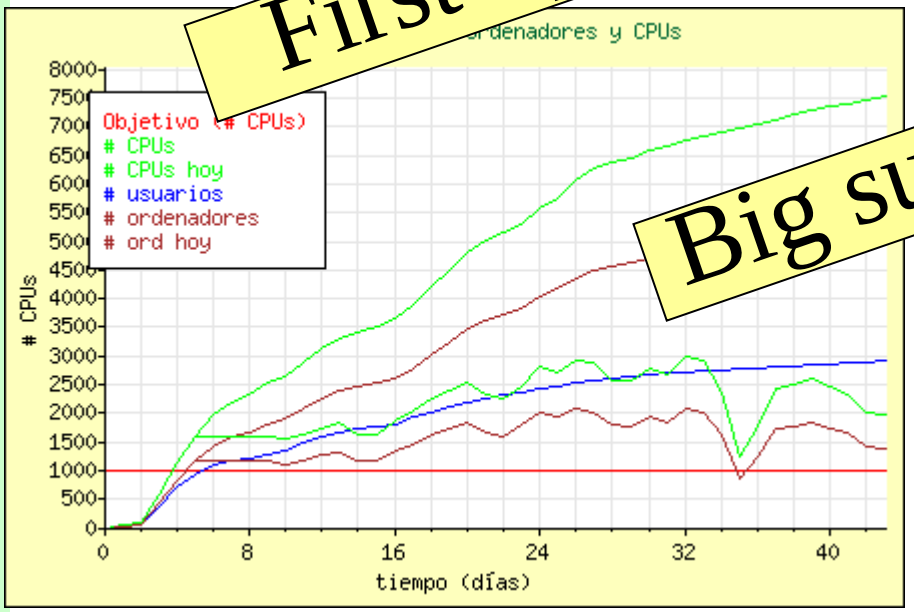


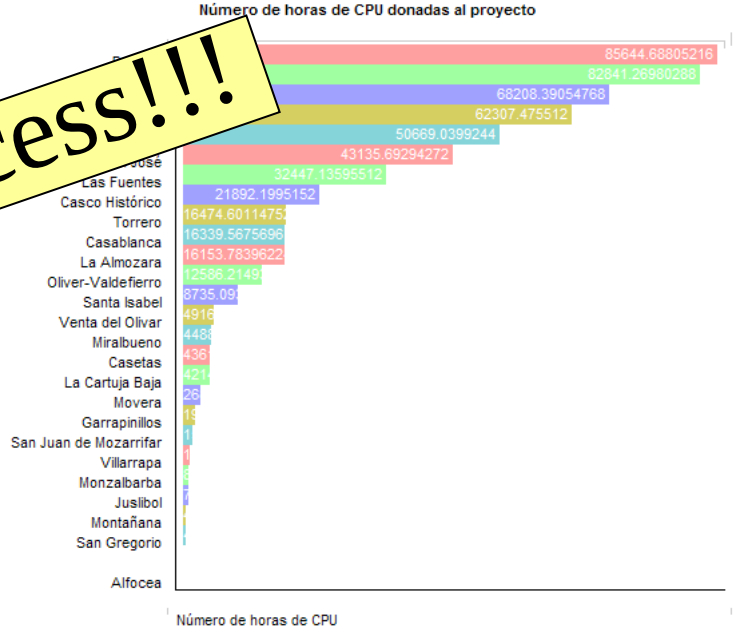
Participation

- Users: 2800
- Computers:
- CPUs: 7200
- Delivered time: 750k hours

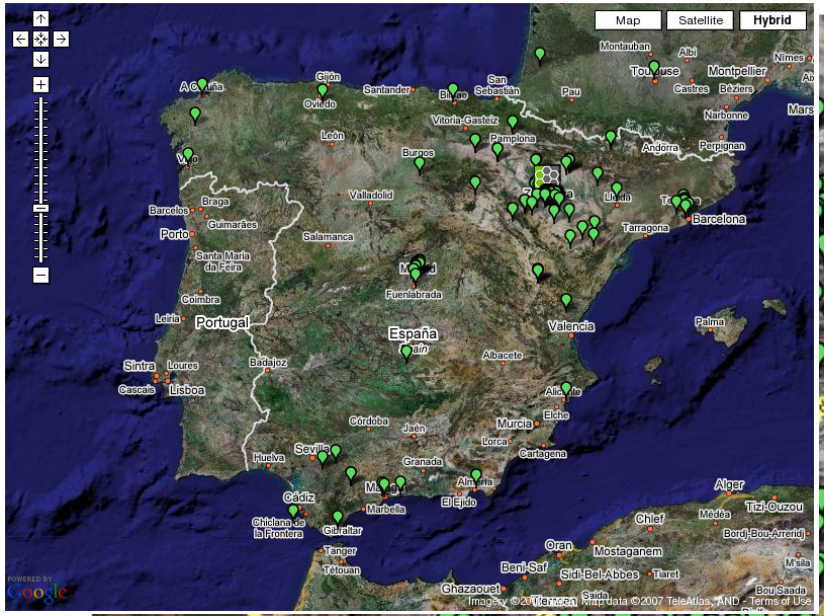
First Spanish BOINC project

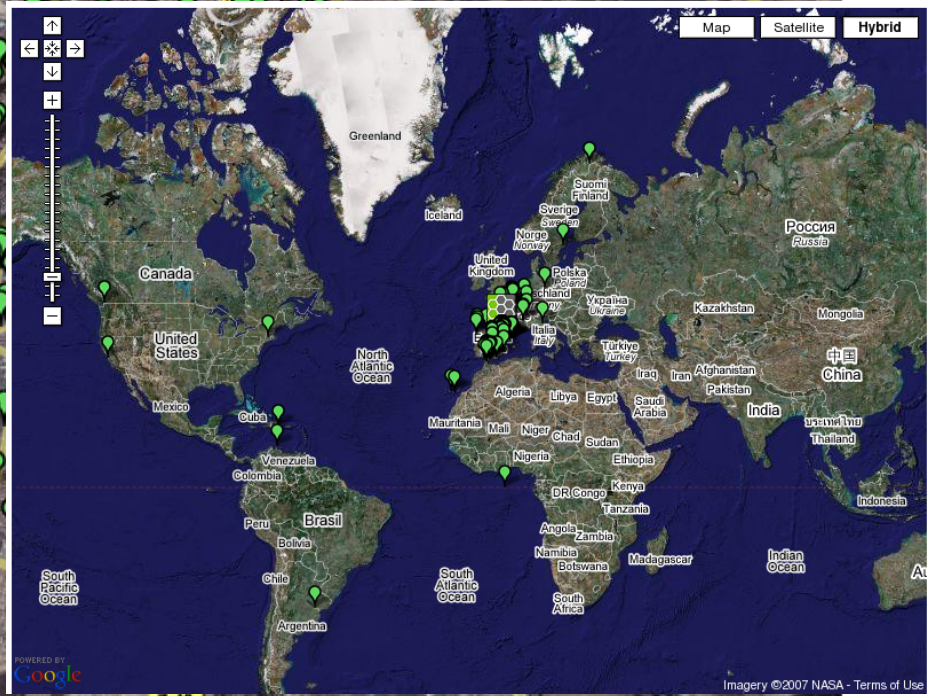
Big success!!!





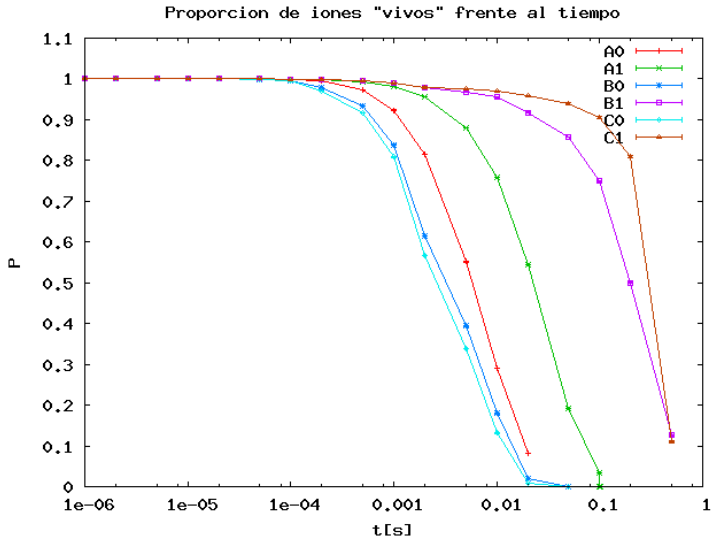
Participation

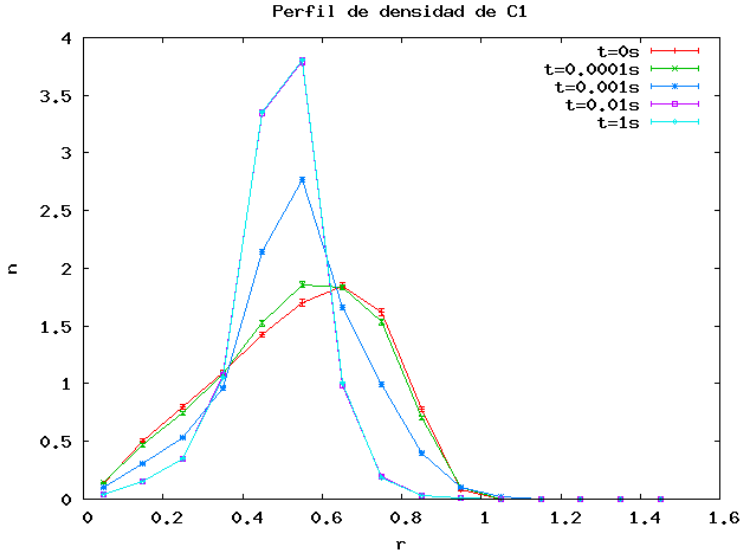




Scientific Results

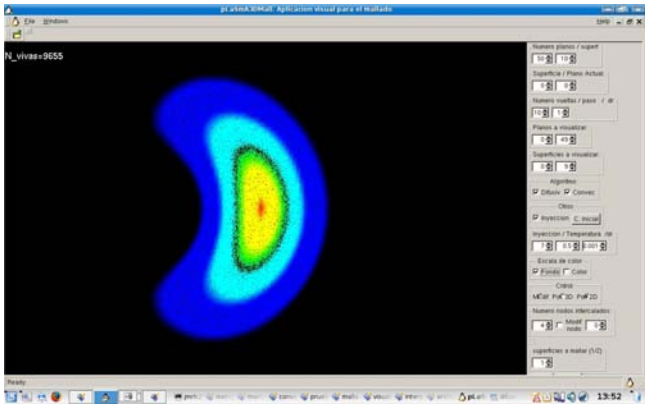
- Zivis calculated 4M particle trajectories
- tested 8 configurations on TJ-II





Confinement time (in seconds)

A0	0.0083
A1	0.0320
B0	0.0052
B1	0.27
C0	0.0044
C1	0.36



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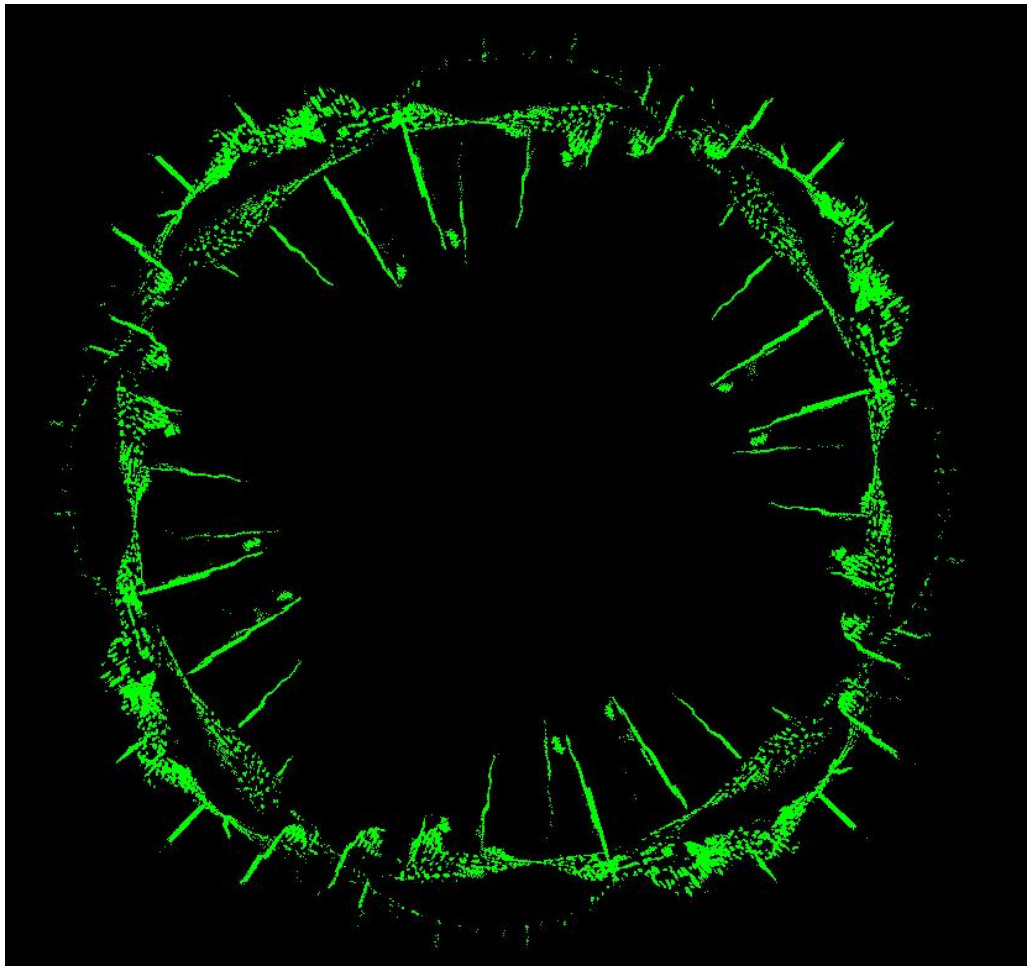

Escape points

Demo event

2 days with conferences, talks, demos, prizes...

Demo event

- ZIVIS generated 2TB of information
- During the demo event we used a Graphical interface for ISDEP to perform a remote visualization of the data
- Output data stored in the remote BOINC servers
- Data access using GridFTP: standard grid protocol which provides secure, robust, fast and efficient transfer of data

Conclusions

- Zivis demonstrated volunteer computing is a real option to deploy a production-level computing infrastructure
- Introduces a new and very important aspect: science divulgation and people involvement in scientific research
- Some limitations (range of suitable applications) and disadvantages (work is exposed to the general public: need for support, complains when failures happen...)
- Future of the project is still under discussion (meanwhile we are still delivering workunits to clients)

”Zivis is funny, but it is not a game”

More info:

http://zivis.zaragoza.es