A&A Session Summary

- Six presentations reporting the work in progress to port astrphysical applications to the Grid
- One presentation about the effort in progress to make the Grid and the Virtual Observatory mutually interoperable
- Final discussion about the EGEE A&A cluster and the status/exploitation of the generic astrophysical VO created in EGEE

A&A Session/VO AUGER

VO AUGER Large Scale Monte Carlo Simulations using the EGEE Grid Environment

- *J. Schovancová[1,2], J. Chudoba[1,2], P. Trávníček[2]*

- *Job provenance team:*
- *F. Dvořák[1], J. Filipovič[1], J. Kmuníček[1], A. Křenek[1],*
- *L. Matyska[1], M. Mulač[1], M. Ruda[1], Z. Salvet[1],*
- *J. Sitera[1], Z. Šustr[1]*

- *[1] CESNET, Prague*
- *[2] FZU, Prague*

A&A Session/VO AUGER/ Pierre Auger Observatory

- **The Pierre Auger Cosmic Ray Observatory is studying ultra-high energy cosmic rays, the most energetic and rarest of particles in the universe. When these particles strike the earth's atmosphere, they produce extensive air showers made of billions of secondary particles.**

A&A Session/VO AUGER/ Production overview

Within 4 months (Oct 2007 – Jan 2008)

- successfully ran more than **9500 jobs**
- created libraries with more than **8400 showers**
- spent **170,000 hrs** of walltime
  - over 7,000 CPUdays, 60 CPUs at the same time 24/7
- showers took ca **4 TiB** of disk space on SEs

Production pain:

- **SE disk space!!!**

LOFAR@EGEE

Lofar Information System on GRID

A.Belikov, E.Valentjin, W.-J. Vriend, F.Djikstra

OmegaCEN, Kapteyn Institute
CIT, Universitet Groningen
the Netherlands

A&A Session/LOFAR & Astro-Wise

- LOFAR started as a new and innovative effort to force a breakthrough in sensitivity for astronomical observations at radio-frequencies below 250 MHz.
- Astro-WISE stands for Astronomical Wide-field Imaging System for Europe. Astro-WISE is an environment consisting of hardware and software which has been developed to be able to scientifically exploit the ever increasing avalanche of data produced by science experiments.

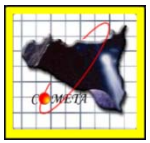
- Astro-WISE: EGEE interface realized
- Astro-WISE: EGEE as a computing grid
- Lofar: EGEE as a data storage grid

High Performance Computing on the GRID Infrastructure of *COMETA*

S. Orlando[1,2], G. Peres[3,1,2], F. Reale[3,1,2], F. Bocchino[1,2],

G. Sacco[2,1] and the COMETA Consortium

[1] INAF - Osservatorio Astronomico di Palermo
[2] COMETA consortium
[3] Dip.S.F.A., Univers ita' di Palermo




The COMETA Consortium

INAF/OAPa among the promoters of the constitution of *COMETA* consortium and of the definition of the *PI2S2* project

Scope: Implementation and development of an e-infrastructure in Sicily based on the GRID paradigm

Facility: A number of HPC poles constituted in Palermo, Catania and Messina (May-Dec 2007)

- **GRID infrastructure (about 2000 AMD Opteron)**

Porting HPC Applications to GRID

Porting HPC applications to GRID is one of the aims of COMETA

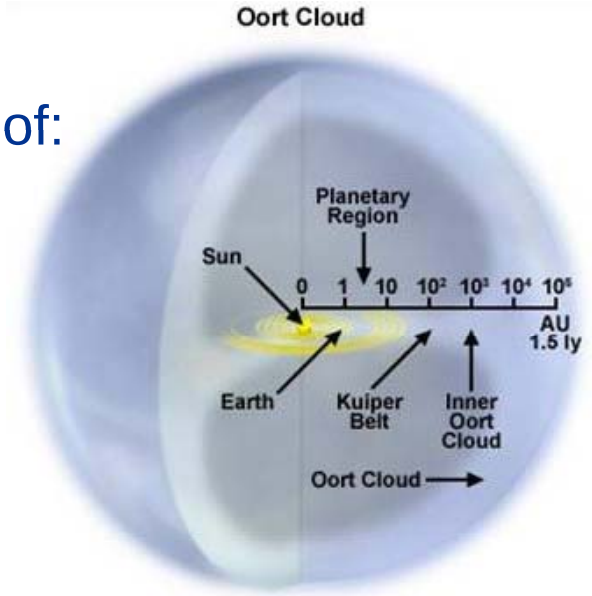
- Each cluster of the infrastructure equipped with low latency communication network (InfiniBand)
- MPI-1 and MPI-2 libraries distributed on the GRID infrastructure
- Test site: the largest HPC cluster of COMETA (hosted in Palermo)
- Additional requirements:
  - Job monitoring during run ➡ use of watchdog
  - CPU time required > 5000 h ➡ long term proxy: 21 days
  - run on > 32 procs ➡ HPC queue with preemption

The unified theory of Kuiper-belt and Oort-cloud formation:
experiences from porting to EGEE

Jan Astalos
Institute of Informatics
Slovak Academy of Sciences

Application details

- **Collaboration**
  - Slovakia: Astronomical institute, Slovak Academy of Sciences
  - Italy: INAF-Catania Astrophysical Observatory
  - Poland: Astronomical Observatory of the A.Mickiewicz University
- **Main goal**
  - Working out unified theory of the formation of:
    - Kuiper belt and Scattered Disc
      - *populations of small bodies beyond the Neptune's orbit*
    - Oort cloud
      - *very distant cometary reservoir*



Running in Grid

- **Demands for CPU time**
  - If a single 2.8GHz CPU was used, the computation of the orbits of 4 giant planets and 10038 test particles for 1 Gyr would last about 21 years
- **Running in Grid**
  - Tasks of each sub-simulation divided among 4 users and run in two Grids
    - EGEE: Virtual Organisation for Central Europe - 3/4
    - TriGrid (Trinacria Grid Virtual Laboratory) - 1/4
  - Simulation of 1Gyr was finished in ~ 5 months

A&A Planck Simulations

UNIVERSITY OF CAMBRIDGE

IFCA Instituto de Física de Cantabria

CSIC

EGEE Astrophysics: ESA Planck Mission

Cosmological application in the Grid environment: Detection of SZ Clusters of Galaxies in data from the ESA Planck satellite mission

Marcos López-Caniego [1,2] and Diego Herranz [2]

(1) Cavendish Laboratory - University of Cambridge, UK
(2) Instituto de Física de Cantabria (IFCA-CSIC), Spain

Information Society and Media

A&A Session/Planck Simulations/ Grid: detection of SZ Clusters

At this stage the application can only deal with patches previously written disk. In the PS detection application all the process is done at once, but the process of reading and dividing 9 Planck maps at full resolution into patches involves several GB´s of RAM memory.

Therefore, the process involves two steps:

- Producing the patches for the 9 maps:
  - Each map is 200 MB
  - 371 patches x 9 frequencies = 3339 patches (5 MB each)
  - Aprox. 1/3 minutes to produce each patch => 18 hours CPU time
  - Total disk space aprox. 20 GB.

- Analyzing the patches
  - For each set of coordinates (of a total of 371), read in the nine patches and produce the filtered weighted sum of them.

A&A Session/Planck Simulations/ Grid: detection of SZ Clusters

- Iteratively find the scale of the cluster and amplitude trying different core radius, from r=0, point like cluster, to r=50 arcmin.

This whole iterative analysis lasts from a few minutes if we only iterate for 1 size of the core radius, up to 6 hours, if we test several radius trying to estimate in a proper way the point like clusters as well as the extended clusters.

Therefore, the total analysis of the 371 regions of the sky lasts about 2200 hours, or aprox. 92 days on a single cpu.

We have done this test a few weeks ago in aprox. 18-20 hours using 120 nodes in the Planck VO, and we are now repeating it with a different set of parameters.

The ZEN project

A. Tilquin

Centre de Physique des Particules de Marseille

Determination of cosmological parameters

- **Scientific Goal:**

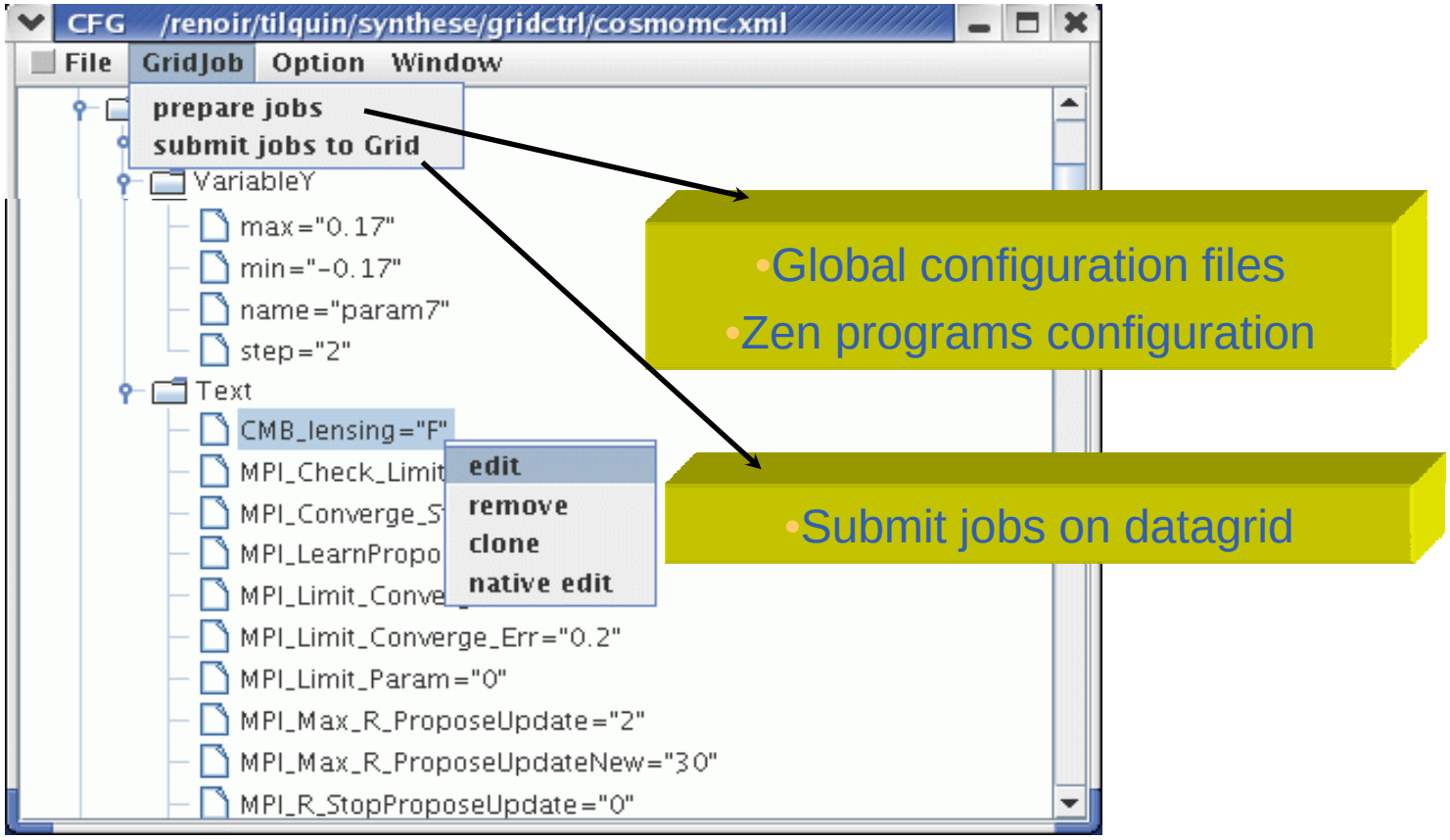
  Address open questions of fundamental cosmology:

  dark matter/dark energy sector and primordial universe

- **First results using datagrid within:**
  - ESR (Earth Science Research) VO (thanks to M. Petit-Didier) and Euchina Virtual organization

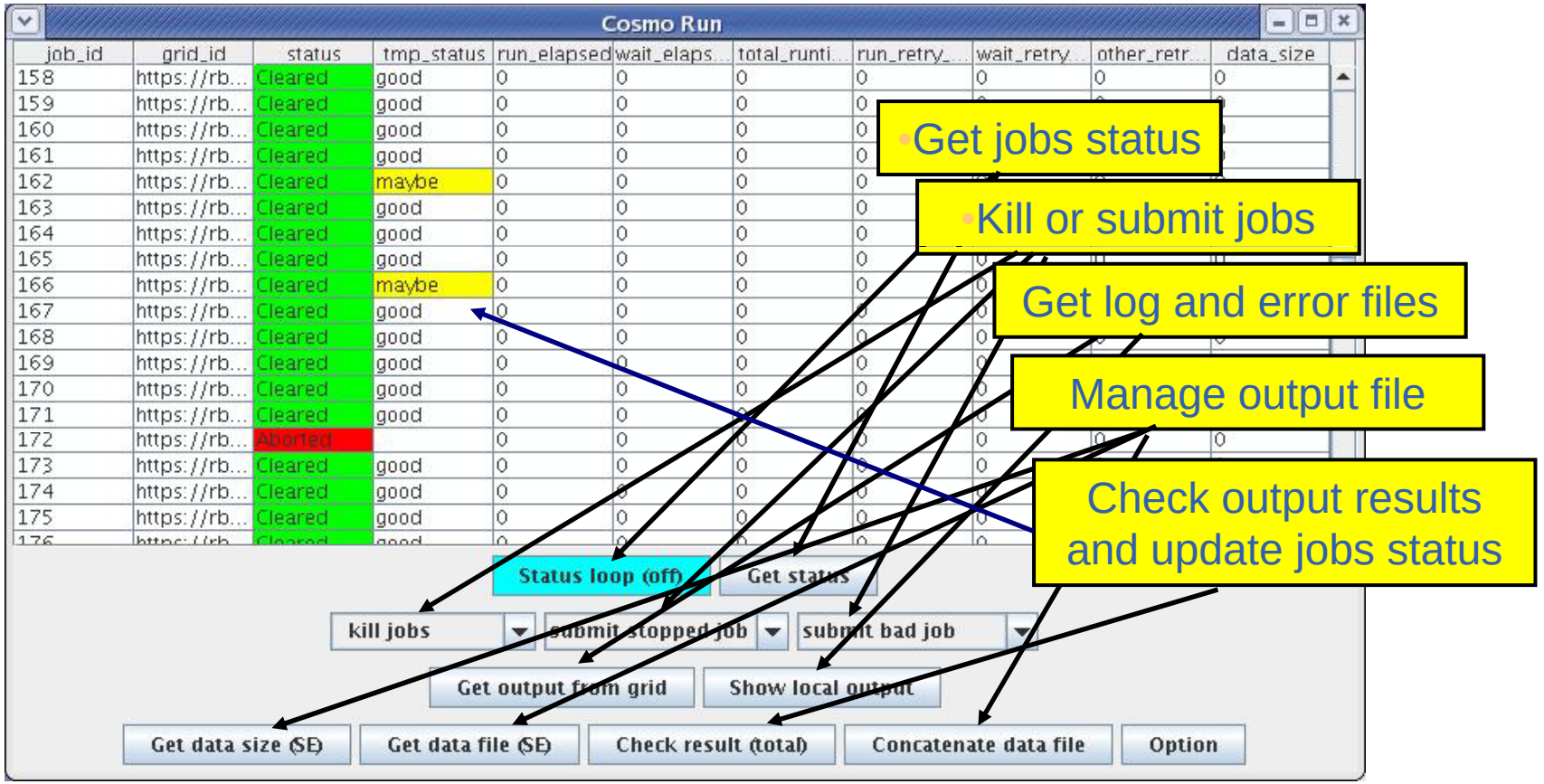
Submission graphical interface

- **A run is a set of n*n jobs (400) send in parallel. A graphical interface has been developed (thanks to Zuxuan Qian) to construct and submit them.**



Job control graphical interface

- **Jobs monitoring and output data manager**



Summary

- **The ZEN program is now running on datagrid**
  - Thanks to ESR virtual organization
- **The two graphical interfaces are very powerful tools to submit jobs and to debug.**

Making the Grid and the Virtual Observatory Interoperable

Dr. Giuliano Taffoni (INAF Trieste, Italy)

A&A Session/Grid and the Virtual Observatory

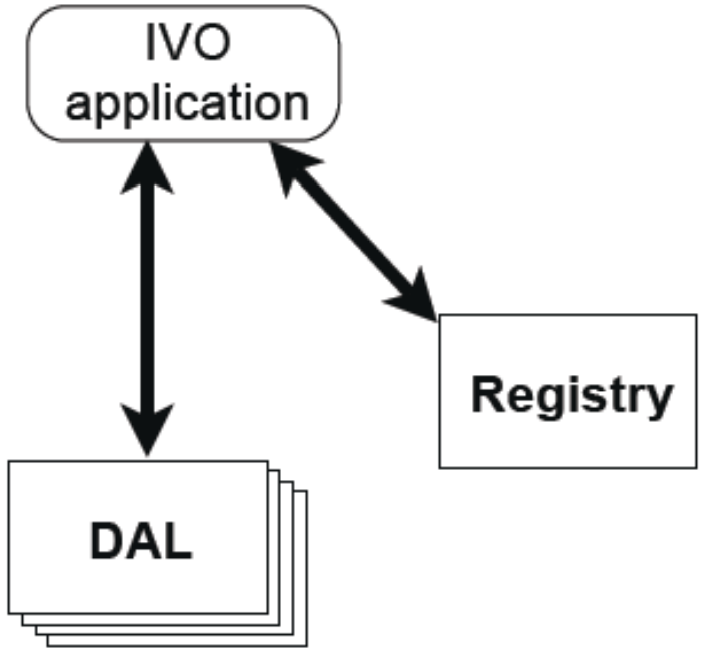
- Understanding of Complex Astrophysical Phenomena Requires Complex and Information-Rich Data Sets, and the Tools to Explore them...
- This will lead to a change in the nature of the Astronomical Discovery Process...
- which requires a novel research environment for Astronomy

The Virtual Observatory

- What is a Virtual Observatory?
  - Dynamic collection of hardware, data and software working in harmony to solve arbitrarily large and complex astronomical problems. The VObs is the middleware and tools for Astronomers.

A&A Session/Grid and the Virtual Observatory

- [x] Commodity
- [x] Discovery
- [x] Middleware
- [ ] Computational resources
- [ ] Supercomputers



A&A Session/Grid and the Virtual Observatory

EuroVO and Grid workshop

9-11 April 2008 Garching (Munich)

http://wwwas.si.inaf.it/eurovow2008

A&A Session Outcomes

- **Strong interest by the A&A community to approach the Grid for their challenging applications**
- **Until early 2007**
  - A&A groups interested in approaching the Grid asked support to other communities
- **Current status**
  - Many A&A applications now run on local/regional Grids

A&A Session Outcomes

- **A&A and EGEE**
  - A&A Gropus having big project-related applications are interested to port them to EGEE
  - Very often this process is pushed (and driven) by local/regional Grid strategies with respect to EGEE
  - This interest clearly emerged by the A&A session

A&A Session Outcomes

- **And what about A&A individuals and small groups that want to approach the Grid for the first time?**
  - An EGEE A&A cluster now exists and a generic A&A VO has been created
    - **astro.vo**.eu-**egee**.org
  - The VO is now operative. Users can register to it and use the available resources.

A&A Session Outcomes

- **But…the VO needs to grow in terms of**
  - Users who register to it
  - Available resources
    - New resources will be shortly contributed to it by Grid sites like INAF (Italy), Cometa (Italy), IFCA (Spain) and others
- **Training and dissemination of information play a key role**
  - We are now planning training events for A&A groups that are currently carrying out their grid-related activities with no funds