



Enabling Grids for
E-science in Europe

www.eu-egee.org

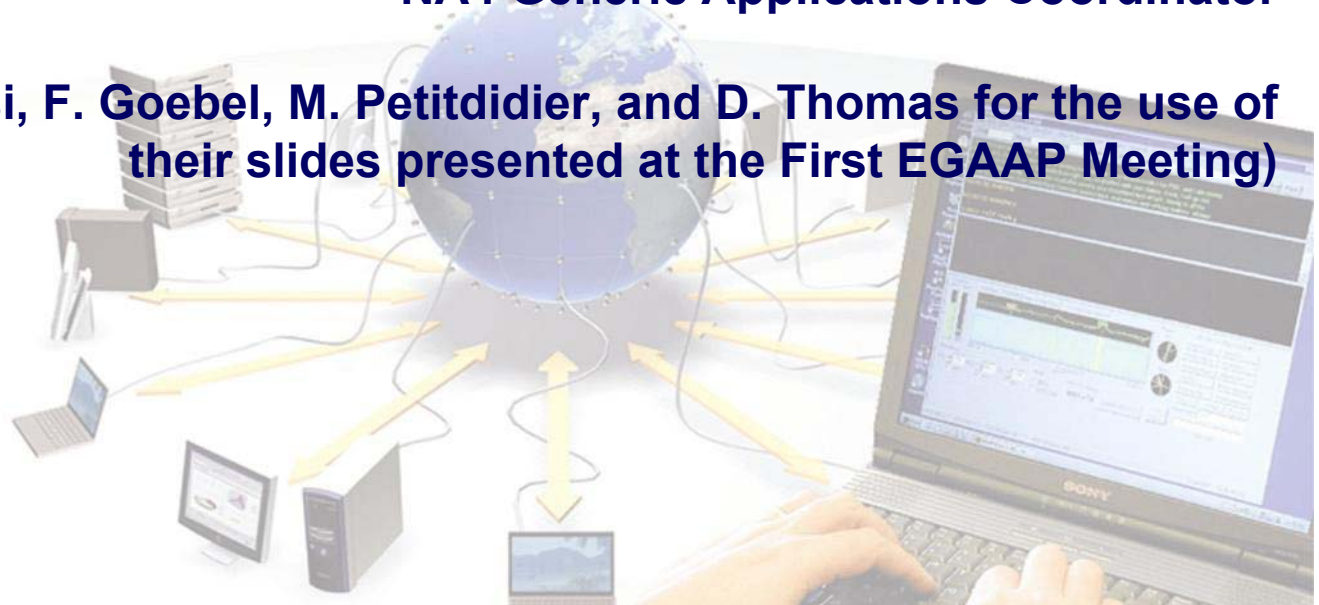
NA4 Open Meeting, Catania, 14-16.07.2004

Overview of “generic” work

Roberto Barbera

NA4 Generic Applications Coordinator

(Thanks to O. Gervasi, F. Goebel, M. Petitdidier, and D. Thomas for the use of their slides presented at the First EGAAP Meeting)

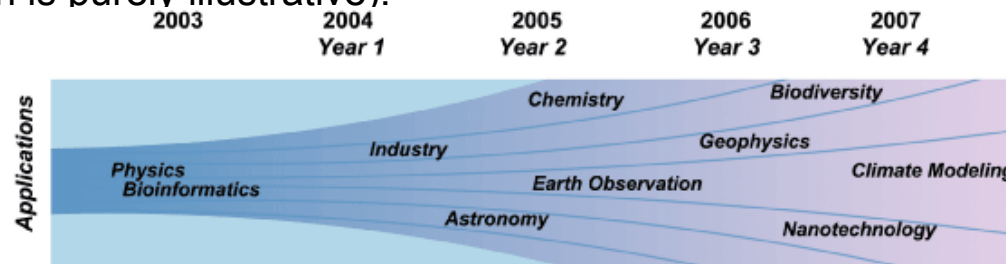


NA4 Generic Applications goals

Activity NA4 focuses on the identification and support of early-user and established applications for use on the EGEE infrastructure. It has the following objectives:

- **To identify through the dissemination partners and a well defined integration process a portfolio of early user applications from a broad range of application sectors from academia, industry and commerce.**
- **To support development and production use of all of these applications on the EGEE infrastructure and thereby establish a strong user base on which to build a broad EGEE user community.**
- To initially focus on two well-defined application areas – Particle Physics and Life sciences.

The expected outcome of the activity will be the establishment of a broad portfolio of applications across a wide range of sectors suited to execution on the EGEE infrastructure meeting the needs of a broad collection of user groups from many sectors across Europe as illustrated in Figure (note the timeline for the introduction of each application domain is purely illustrative).



The Generic Application questionnaire (contribution to MNA4.1)

- Questionnaire to get information and first requirements from new communities interested in using the EGEE Infrastructure (<http://alipc1.ct.infn.it/grid/egee/na4/questionnaire/na4-genapp-questionnaire.doc>)
- Feed-backs received so far (<http://alipc1.ct.infn.it/grid/egee/na4/questionnaire>):
 - **Astrophysics (EVO and Planck satellite)**
 - **Earth Observation (ozone maps, seismology, climate)**
 - **Digital Libraries (DILIGENT Project)**
 - **Grid Search Engines (GRACE Project)**
 - **Industrial applications (SIMDAT Project)**
- Interest also from Computational Chemistry (Italy and Czech Republic), Civil Engineering (Spain), and Geophysics (Switzerland and France) communities

The Gen. App. Selection process: the EGAAP (1/2)



1) The EGEE Generic Applications Advisory Panel (EGAAP)

Is in charge of facilitating the deployment of potential new applications on the EGEE infrastructure. It will advise the Application team in EGEE on the allocation of their resources to that effect. It will collect the necessary information about the application candidates, identify the needs to achieve this goal and make recommendations to that effect to:

- the NA4 management for allocation of the NA4 resources to the applications which need them
- the EGEE Project Execution Board where the technical consequences of this new deployment will be examined. In the case where the application impact is deemed very important for EGEE, the EGEE Project Management Board will be noticed.

2) Criteria used for recommendations

The EGEE Generic Applications Advisory Panel will use the following criteria to make its recommendations:

- scientific interest of the proposed work, with particular emphasis on the grid added-value,
- added value for EGEE to have such an application running on its infrastructure
- coordination of the corresponding community, grid-awareness of this community
- minimum requirement that a small team followed the EGEE training, dedication of the community to this application, agreement to the various EGEE policies and especially the security and resources allocation policies.

3) EGAAP will hear regularly reports from the deployed applications on the EGEE infrastructure

The Gen. App. Selection process: the EGAAP (2/2)



4) In the case of industrial applications, the EGEE Generic Applications Advisory Panel can require input from the EGEE Industry Forum

5) Membership

The selection panel is formed of 8 nominated members in addition to ex-officio members. 2 members designated by the NA4 team leader from within the EGEE project and 5 members designated by the NA4 team leader from a list of nominees outside the EGEE project suggested by members of the EGEE Project Management Board. The chair is chosen among these 8 members by the NA4 team leader, in consultation with the EGEE management. The membership term is one year, renewable once.

The ex-officio members are:

- NA4 team leader
- NA4 generic applications coordinator
- NA4 Industry Forum coordinator
- EGEE technical director
- EGEE project manager

6) The EGAAP will meet at least twice a year.

The First EGAAP Meeting

(<http://agenda.cern.ch/fullAgenda.php?ida=a042351>)

- Very badly attended by the EGAAP members
- Very well attended by the new applications:
 - Earth Sciences (Academy and Industry)
 - Computational Chemistry
 - Astro-particle Physics
 - SIMDAT Project



EO Applications in EGEE

Extend the Ozone experience:

Partners: [KNMI](#), [IPSL](#), [SRON](#), [RIVM](#), [Univ. TorVergata](#), [ESA](#),

Goals: Use of "operational Grid" by the Ozone community

- ⇒ To produce and/or store the retrieved Ozone profiles or columns on the Grid
- ⇒ To store on the Grid the Ozone databases, old and new ones
- ⇒ To extend the processing capabilities (assimilation, new parameters, short term prediction, climatology, process studies...), and **obtained new scientific results**
- ⇒ To facilitate the **collaboration and communication** among the community
- ⇒ Important for validation
- ⇒ to exchange data in the emerging large scale European projects (GMES)

Material Means devoted to Grid activity

Starting point:

- ❖ ESA: UI, CE (15 nodes), SE (1.4 TB)
- ❖ IPSL+IPGP at Paris University Computer Center : 4PC, SE (500Gb), UI
- ❖ IPGP: UI
- ❖ DKRZ: UI, CE (2nodes), SE up to several TB as a function of the application
- ❖ KNMI: UI + possibility to use VO NIKHEF and Sara facilities for the Research ES

According to the applications ported new material will be devoted to Grid

Added Value for EGEE and ES Communities



❖ EGEE

- ❖ Deployment of the Grid in Europe among research and operation (ESA)
- ❖ Dissemination of Grid expertise
- ❖ Interaction with DEISA via Climate applications

❖ ES Communities

- ❖ Exchange and Sharing of large sets of data
- ❖ Access to powerful computing and storage facilities
- ❖ Collaboration, Coordination and Communication among the community partners

Earth Sciences: Industry

❖ Community:

Virtual Organization to share IT resources and best-practices. Opened to all Research centers in environmental geophysics from both Industrial and Academic world, working on two critical issues: Energy for today and tomorrow and CO₂.

❖ Grid awareness

CGG: initial experience in Grid

Official partner of EGEE SA1 and Industry Forum

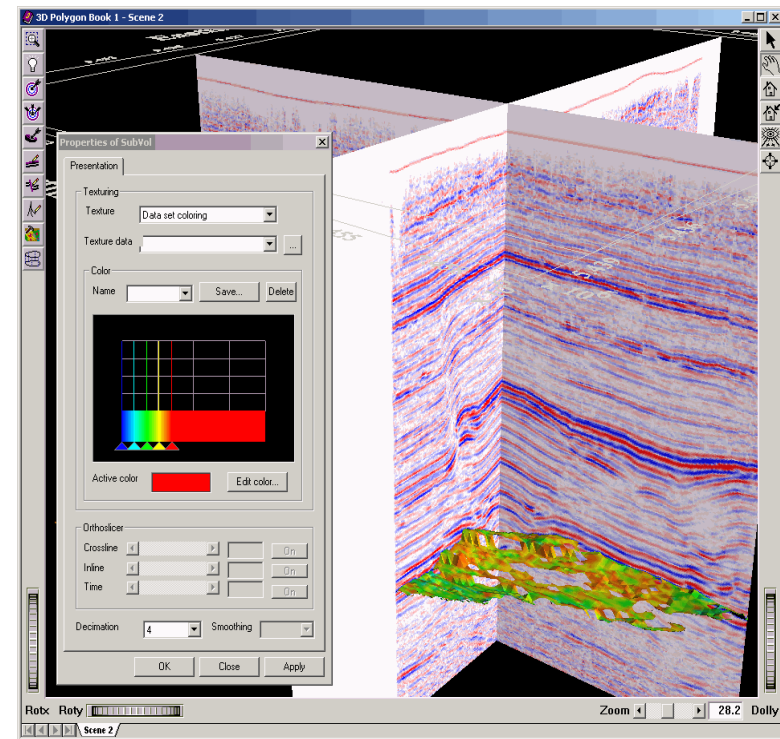
❖ Material Means

CE: 100 nodes, SE:100GB

Applications

Seismic processing Generic Platform:

- Based on *Geocluster*, an industrial application - to be a starter of the core member VO.
- Include several standard tools for signal processing, simulation and inversion.
- Opened: any user can write new algorithms in new modules (shared or not)
- Free for academic research
- Controlled by license keys (opportunity to explore license issue at a grid level)
- initial partners F, CH, UK, Russia, Norway



Added Value for for the EGEE and Geophysics Community



❖ EGEE

- ❖ Geophysics is a key technology for earth sciences, it shares and complements requirements of actual EGEE applications. "Geophysics" community is large (thousands of researchers across Europe) but very scattered. EGEE will benefit in enabling such a community to collaborate and progress on critical issues Energy and CO2.

- ❖ One of the applications is an industrial application which will be a reference for other industries and will help to develop and support credibility of EGEE infrastructure.

❖ Geophysics Community

- ❖ Capability to solve complex problems and to validate innovative algorithms on real size data sets

- ❖ Close the gap between Research and Industrial environment

- ❖ Attract and keep brightest researchers

VO Coordination and Interaction Among ES partners

❖ VO Coordination

Research: Monique Petitdidier (IPSL)

- ❖ NIKHEF and KNMI to maintain the research VO

Industry : Dominique Thomas (CGG)

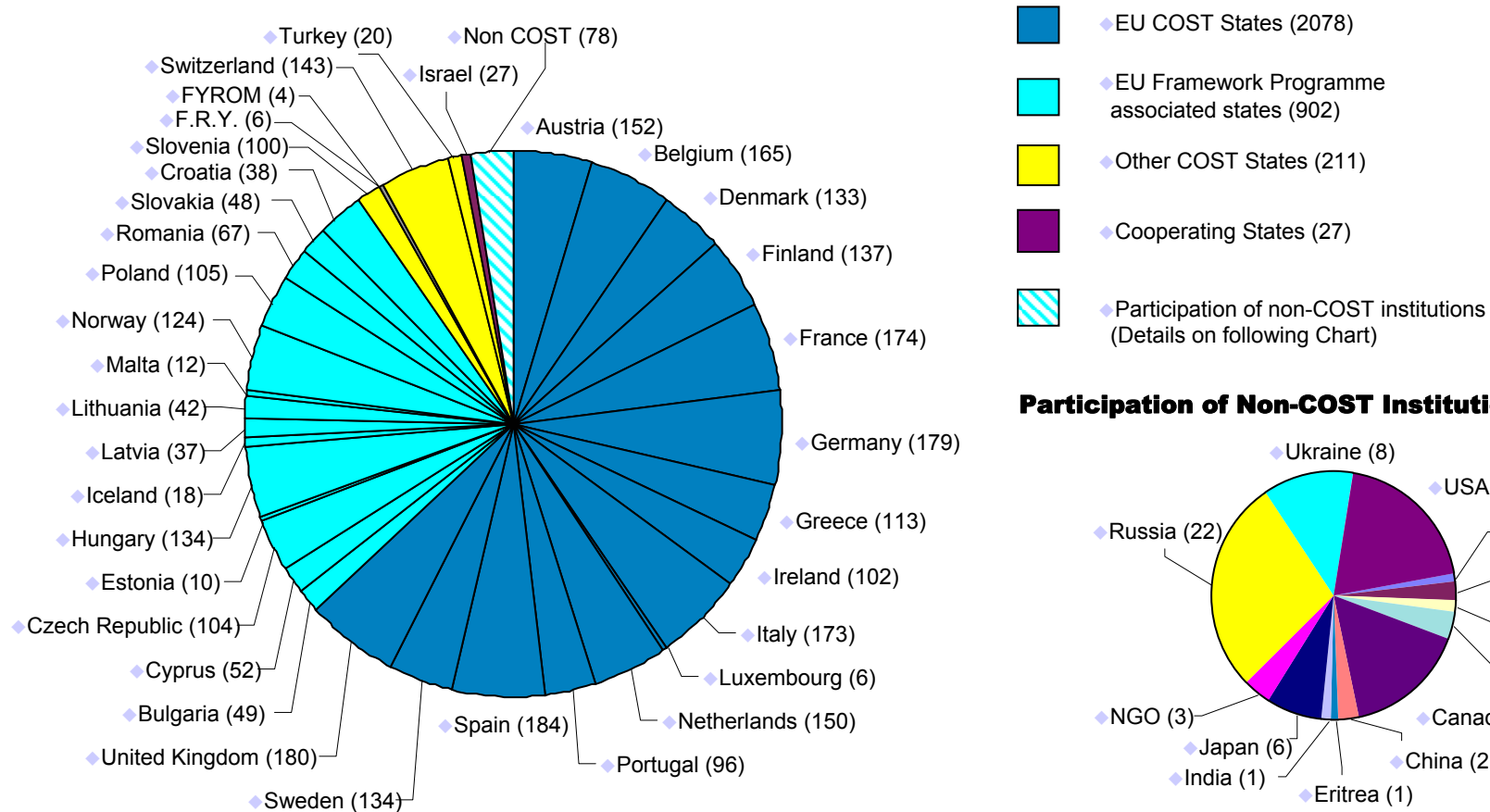
❖ Interaction between ES partners :

Sharing of Scientific, technical and Grid Expertise, Requirements

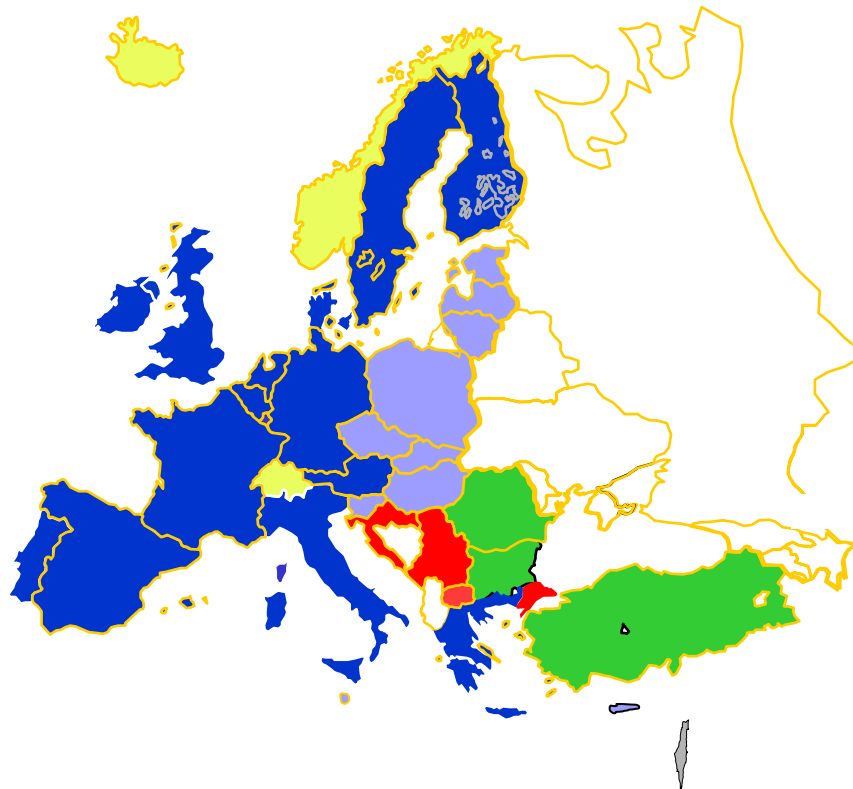
Meetings in Paris with IPSL, IPGP and CGG + other partners

Phone Conference

COST- Countries (2002) Participating Institutions



COST Member States



◆ **The twentyfive EU Member States**

◆ **EFTA Member States**

- ↗ Iceland
- ↗ Norway
- ↗ Switzerland*

◆ **Candidate Counties**

- ↗ Bulgaria
- ↗ Romania
- ↗ Turkey *

◆ **Other Countries**

- ↗ Federal Republic of Yugoslavia*
- ↗ Former Yugoslav Republic of Macedonia*
- ↗ Croatia *

◆ **Co-operating State**

- ↗ Israel

* Not Associated to FP

The COST Chemistry domain

- **Created in 1992**
- **34 Actions launched since 1992 (12 completed with final evaluation)**
- **22 running (10 had the mid term evaluation)**
- **Research Chemists from 31 COST Countries**
- **Associated Institutions from Australia, Japan, Russia, Ukraine and the USA**

Metachem: Matalaboratories for Complex Applications in Chemistry

- **MURQM**: Multireference Quantum Chemical Methods
- **DIRAC**: Four Component Relativistic Quantum Chemical Calculations
- **SIMBEX**: Simulation of Molecular Beam Experiments
- **DYSTS**: Dynamics and Spectroscopy of Systems : Relevant to Environment and Applied Chemistry
- **ELCHEM**: E-learning Technologies for Chemistry
- **ICAB**: Integration of Codes for Ab Initio Methods
- **COMOVIT**: Collaborative Molecular and Electronic Structure Visualization tools

EU partners of D23 WGs

Simbex

Murqm

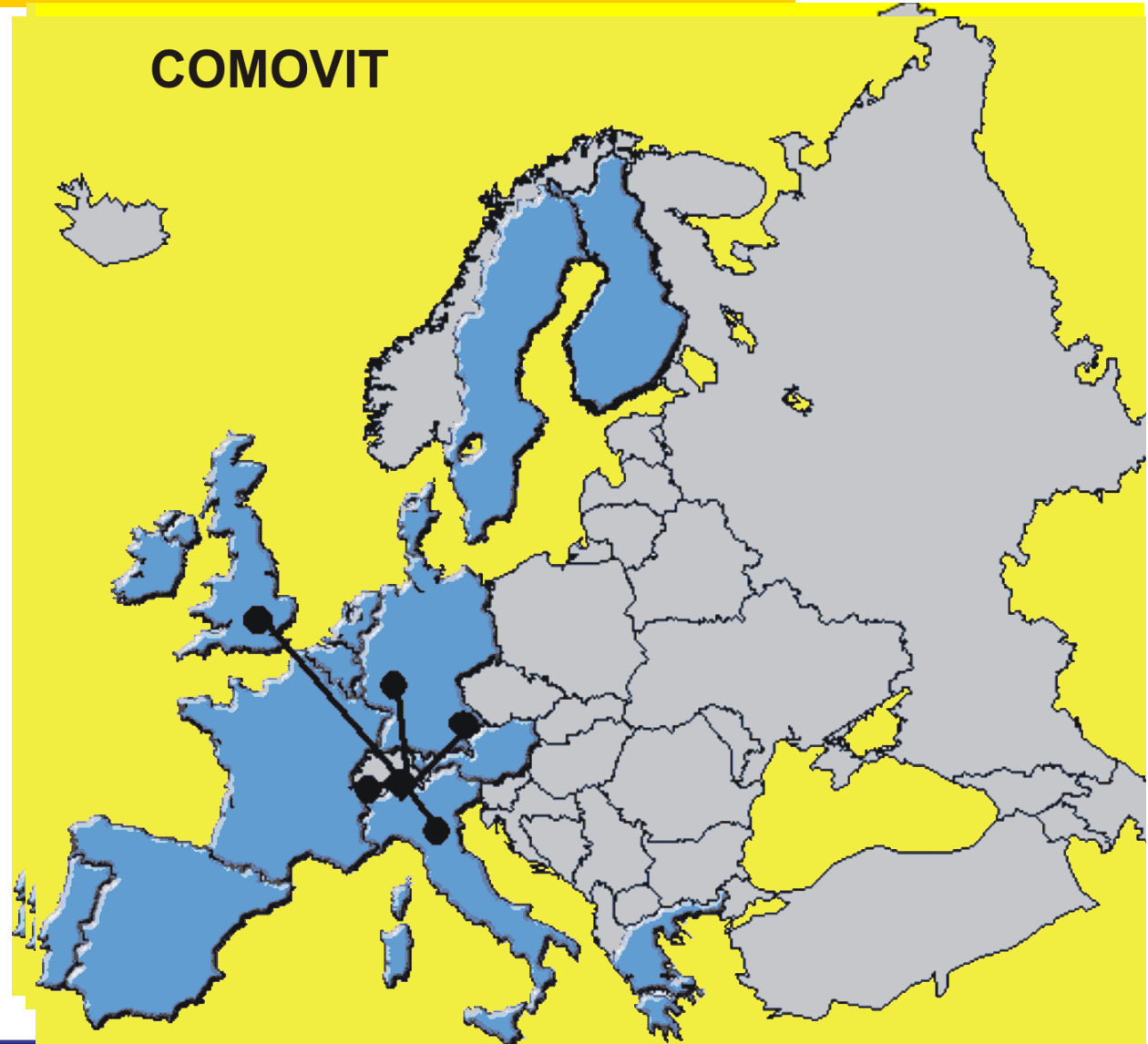
Dirac

Elchem

Icab

Dysts

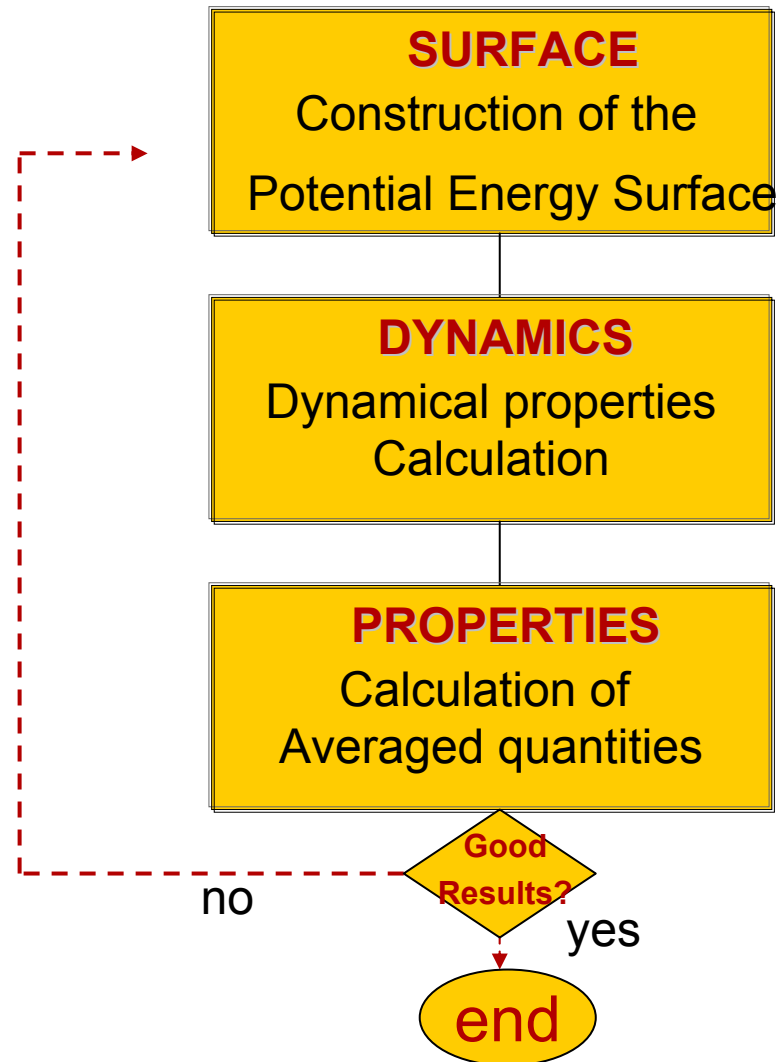
Comovit



Labs per nationality

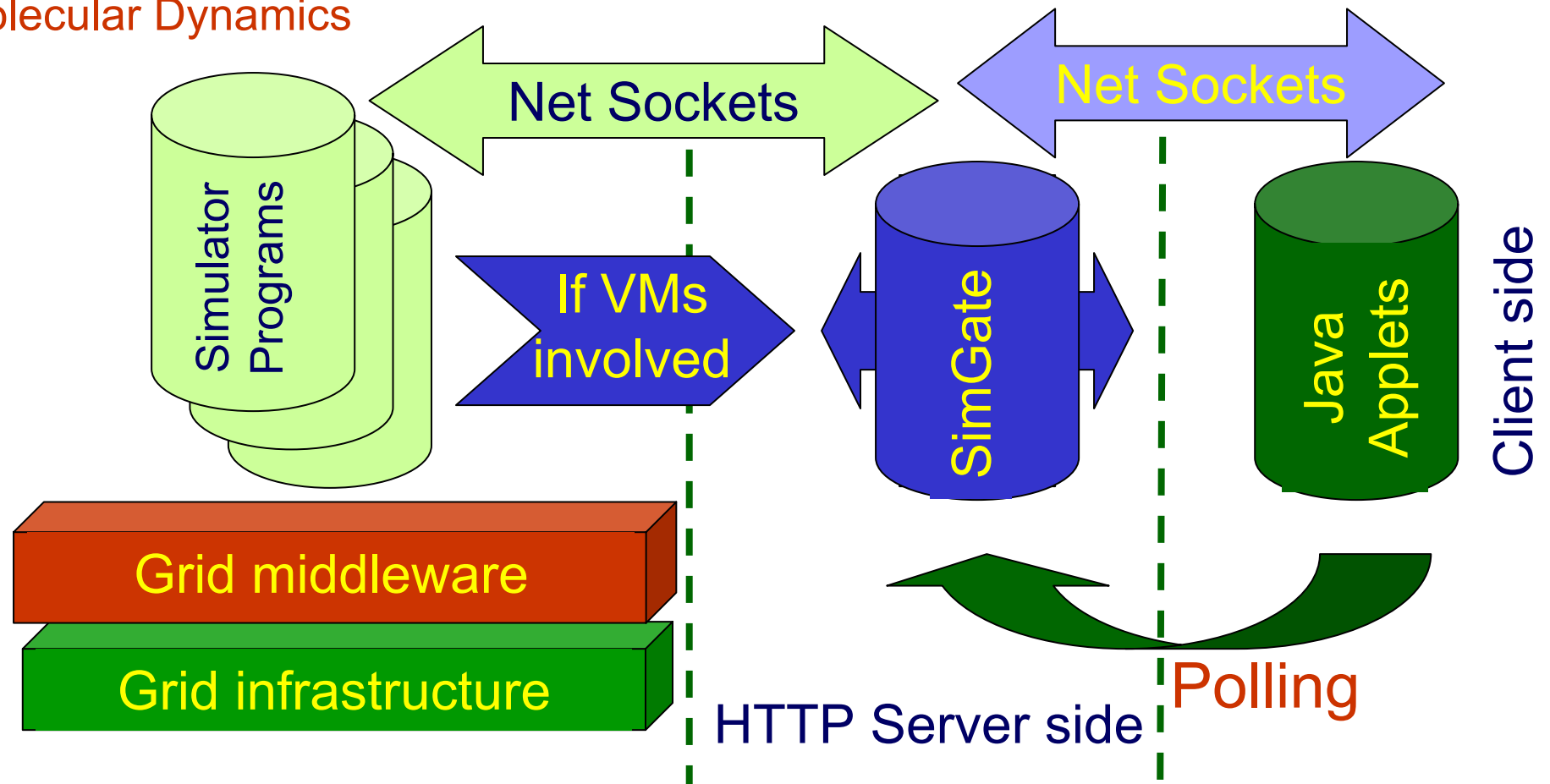
- 1 Isr,Pl,Sk,NI
- 2 Cz,Ch, Fr, Dk, A, Sw, No
- 3 Hu
- 4 Gr
- 5 E
- 6 D, Uk,
- 9 I

The architecture of the Simulator



The model architecture of a Simulator

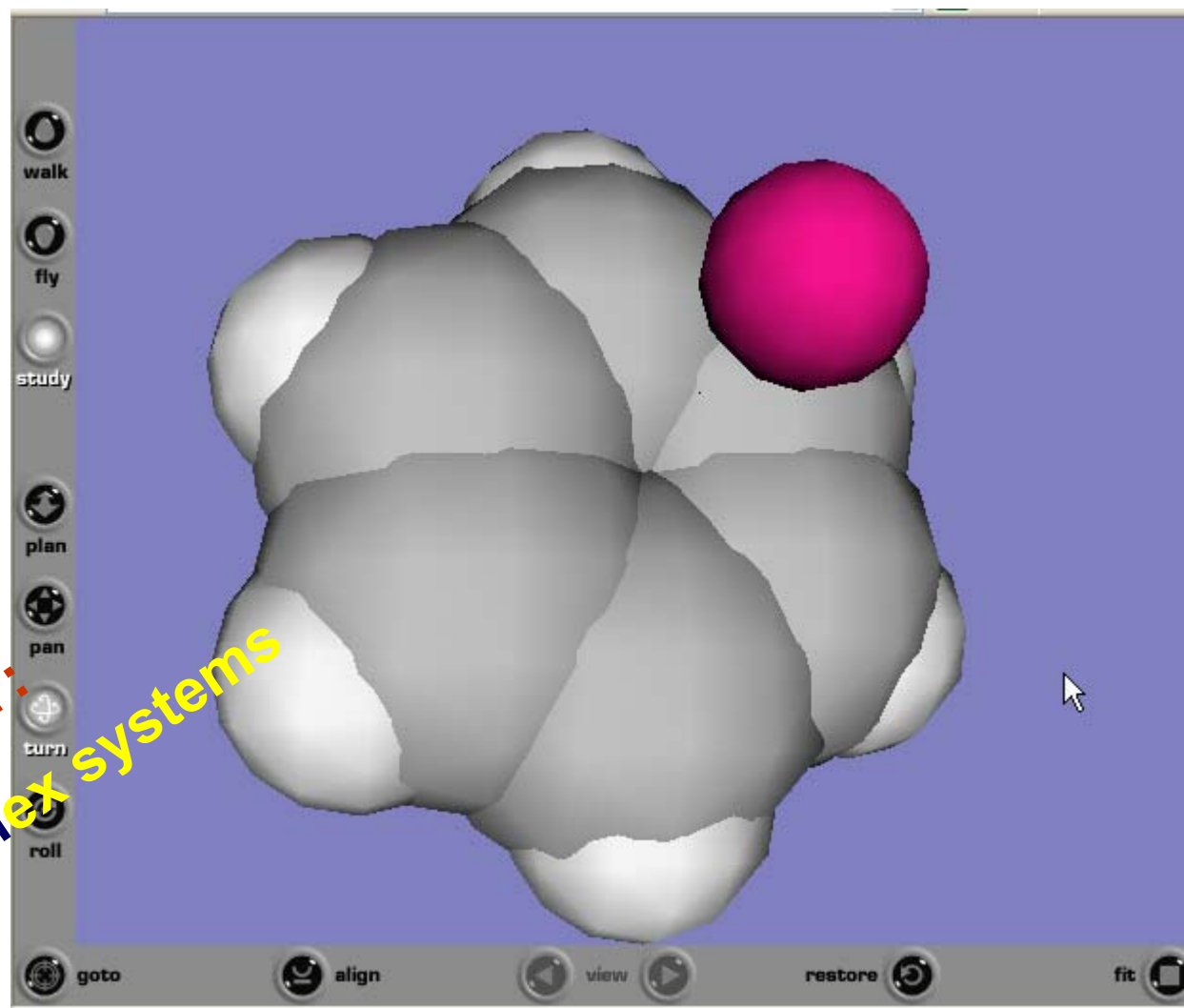
Ab-initio techniques,
PES fitting,
Molecular Dynamics



Local Platforms

- Several workstations (IBM, Sun, SG, HP, ..)
- Clusters of PC
- Parallel machines (IBM SP, Origin, Sun multiprocessor, ...)
- Supercomputer centers (CINECA, EPCC, CESSA, ..)

Virtual Monitor of $Ar+C_6H_6$



The MAGIC Collaboration

Major Atmospheric Gamma-Ray Imaging Cherenkov Telescope

Barcelona IFAE, Barcelona UAB, Crimean Observatory, U.C. Davis, U. Lodz,
UCM Madrid, INR Moscow, MPI München, INFN/ U. Padua, INFN/ U. Siena,
U. Siegen / U. Berlin, Tuorla Observatory, Yerevan Phys. Institute, INFN/ U. Udine, U. Würzburg, ETH Zürich

- International collaboration of
- > 100 physicists
- 16 institutes
- 11 countries

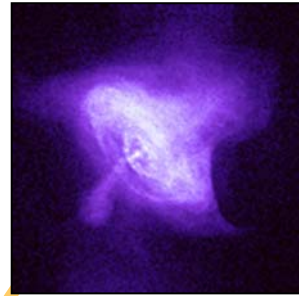


The MAGIC telescope

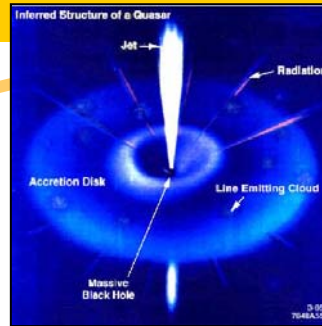
- **Largest Imaging Air Cherenkov Telescope**
(17 m mirror dish)
- Located on Canary Island **La Palma** (@ 2200 m asl)
- Lowest **energy threshold** ever obtained with a Cherenkov telescope
- Aim: detect **γ -ray sources** in the unexplored energy range:
30 (10)-> 300 GeV



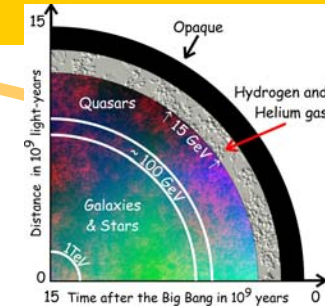
The MAGIC Physics Program



■ Pulsars



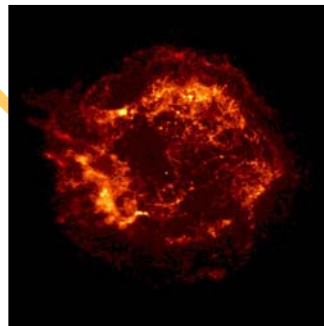
■ AGNs



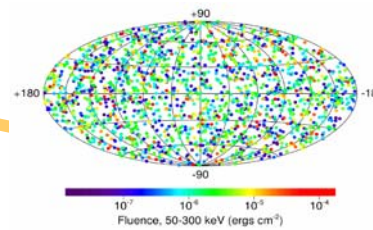
■ Cosmological γ -Ray Horizon

■ Origin of Cosmic Rays

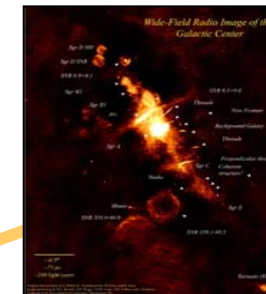
■ Tests of Quantum Gravity effects



■ SNRs



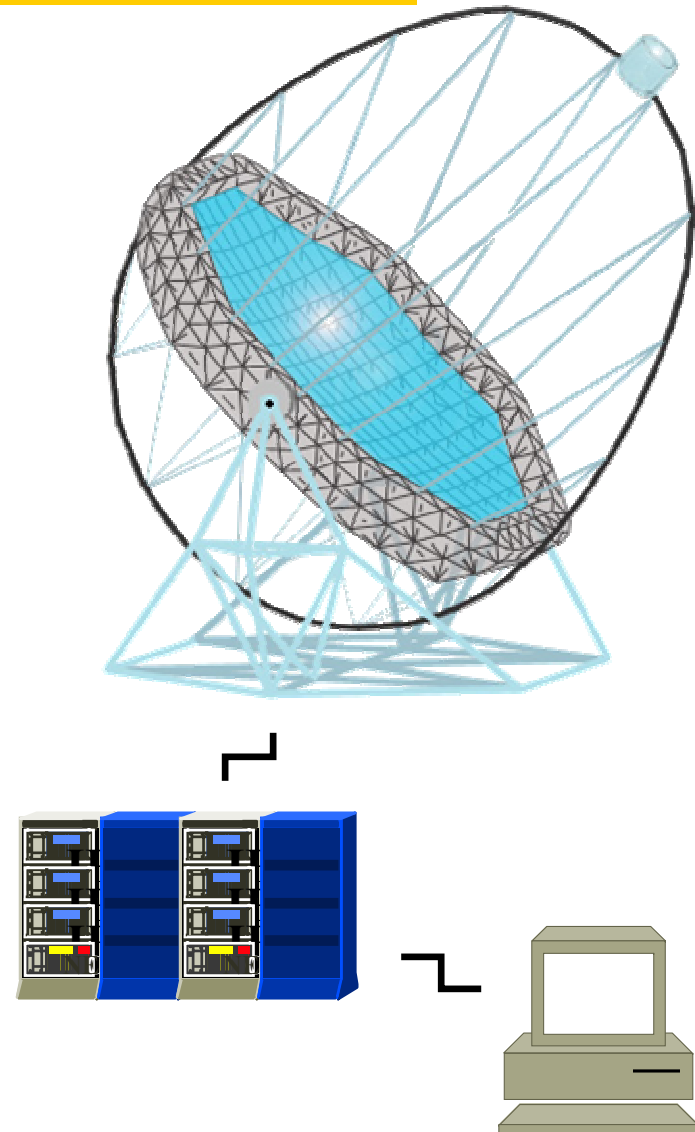
■ GRBs



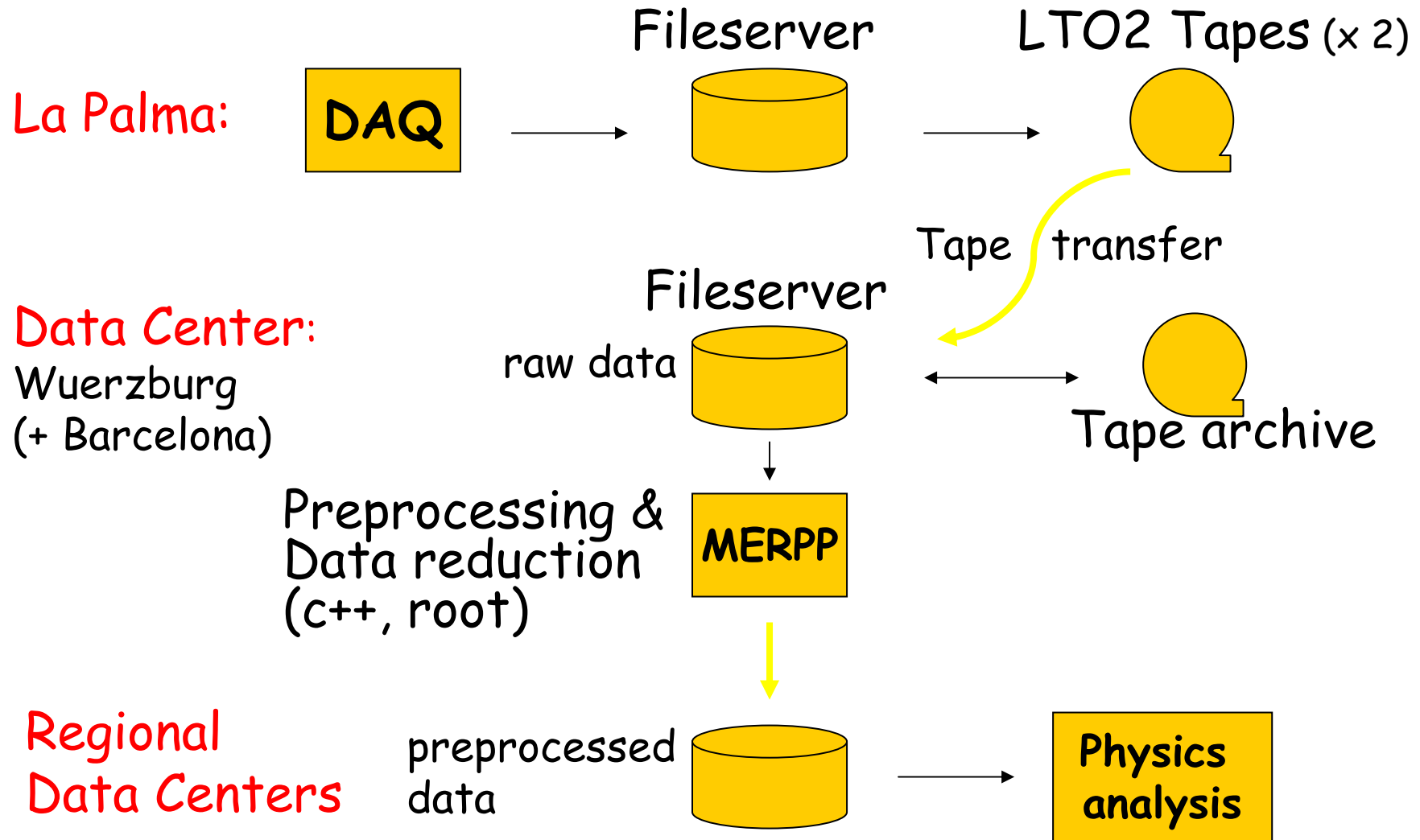
■ Cold Dark Matter

Data Acquisition Rate & Storage

- Event Size:
 - 577 PM x 1 Byte x 30 samples
⇒ ~ 20 kByte/event
- Data Acquisition Rate:
 - 500 Hz typical trigger rate
⇒ ~ 10 MByte/sec
- Data Storage Requirements:
 - ~ 1000 h / year
useful moonless observation time
⇒ ~ 36 TByte/year



Data Flux Scheme



MC generation

Shower development in atmosphere



Atmospheric absorption &
Reflection on mirror



Detector response

CORSIKA (f77)

Reflector (c)

Camera (c++)

- Events needed:
 - Signal (gamma) events: $> 1 \times \text{data}$ $\Rightarrow \sim 3 \text{ M events}$
 - Background events: $> 1/100 \times \text{data}$ $\Rightarrow \sim 16 \text{ M events}$

MC CPU requirements

- Gammas (Signal)
 - Trigger efficiency: 7%
 - 3 M events => generate: **43 M events**
- Hadrons (background):
 - Trigger efficiency: 0.15 %
 - 16 M events => generate: **10 G events**
- **Production rate (Xeon 3GHz):**
 - Shower simulation: **900 events/h/CPU**
 - (x ~100) reuse event for various impact parameters
 - Mirror & detector simulation: **60 kevents/h/CPU**
- **CPU power needed:**
 - 10 Gevents/year / 60 kevents/h/CPU => **need 50 CPU**

MC storage requirements

	<i>Gammas</i>	<i>Hadrons</i>
• Corsika output:	28kB/event	10.8kB/event
• Reflector output:	7.6kB/event	1.3kB/event

Keep only Reflector output

Gammas: 45 M events => 320 GB
Hadrons: 11 G events => 13 TB

MAGIC Summary

MAGIC:

- is a new generation gamma ray Cherenkov telescope
- has **large discovery** potential both in **astrophysics** and **fundamental physics**
- just started data taking
- has large computing requirements
 - **> 100 CPU**
 - **> 50 TB / year**
- is **well suited to join and test GRID** technology with 16 participating institutions over all Europe (and beyond) some with strong links to mayor GRID sites (Bologna, Barcelona)

Activity plan

- A template workplan to be agreed between the new community and the EGEE Project will be prepared
- It will contain:
 - Objectives and strategy
 - Milestones
 - Commiments (resources and person-power)
- It is now up to the PEB and PMB to endorse the EGAAP recommendations and start the full procedure to get the new Generic Applications on-board.

Other contacts/interests in view of the Second EGAAP Meeting



- GRACE Project (already running on the GILDA testbed)
- European Space Agency (GAIA satellite simulations)
- Planck satellite astrophysics community
- ITC-IRST (Trento, Italy)
- CSP (Torino, Italy, business applications)
- SIMDAT Project (industrial applications)

News about GILDA

- New sites in the GILDA Testbed
 - Telecom Italia Lab
 - GL2006
- More sites to come shortly
 - Sheffield University (UK)
 - University of Vienna (Austria)
 - FZK (Germany)
 - GCC (France)
 - ESA (International)
 - University of Merida (Venezuela)
 - University of Perugia (Italy)
 - ITC Trento (Italy)
- New scientific and “commercial” applications
 - GRACE
 - Drug Discovery
 - hadronTherapy
 - Video-on-demand

Tutorials and events

- Grid video tutorials done or under realization and publicly available from the GILDA home page (<http://gilda.ct.infn.it>)
- Past/present events:
 - GILDA/GENIUS tutorial, Catania, 24-25.05.2004
 - GRACE official EU Review, Bruxelles, 10.06.2004
 - Russian Grid, Dubna, 29.06-02.07.2004
 - FZK, Karlsruhe, 06.07.2004
 - NeSC, Edinburgh, 06.07.2004
 - NA4 Open Meeting, Catania, 14.07.2004
- Future events:
 - Grid School, Vico Equense, 19-20.07.2004
 - FZK, Karlsruhe, 09.2004 (dates not yet fixed)
 - Grid School, Merida, 22-26.11.2004
 - SEE-Grid, Istanbul, 09-10.12.2004