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# Applications in EELA

*Rafael Mayo*

*CIEMAT*

*EGEE User Forum*

*Manchester, 9-11.05.2007*

[www.eu-eela.org](http://www.eu-eela.org)





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**Some of the slides have been taken from  
previous presentations made by  
Jesús Casado (CIEMAT)  
(EELA Project Coordinator)**

- **The EELA Project**
  
- **EELA Applications**
  - Biomed
  - HEP
  - E-Learning
  - Climate





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**AIMS**

**BUILD A BRIDGE BETWEEN  
CONSOLIDATED E-INFRASTRUCTURE  
INITIATIVES IN EUROPE AND  
EMERGING ONES IN LATIN AMERICA**

**REINFORCE COLLABORATION  
BETWEEN LATIN AMERICA AND  
EUROPE**

Italy: INFN  
 Portugal: LIP  
 Spain: **CIEMAT**, CSIC, Red.ES, UC, UPV  
 CERN



Argentina: UNLP  
 Brazil: CEDERJ, RNP, UFF, UFRJ  
 Chile: REUNA, UDEC, UTFSM  
 Cuba: CUBAENERGIA  
 Mexico: UNAM  
 Peru: SENAMHI  
 Venezuela: ULA  
 CLARA

- **10 Countries**
- **21 Partners**



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# MANAGEMENT STRUCTURE

- **4 WORK PACKAGES DIVIDED IN TASKS**
  - **WP1: PROJECT ADMINISTRATIVE AND TECHNICAL MANAGEMENT**
  - **WP2: PILOT TESTBED AND SUPPORT**
    - **Task 2.1: Coordination of e-Infrastructure**
    - **Task 2.2: Certification Authorities and Virtual Organizations**
    - **Task 2.3: Pilot Testbed Operations**
    - **Task 2.4: Network Support and Operation**
  - **WP3: IDENTIFICATION AND SUPPORT OF GRID ENHANCED APPLICATIONS**
    - **Task 3.1: Biomedical Applications**
    - **Task 3.2: High Energy Physics Applications**
    - **Task 3.3: Additional Applications (Education and Climate in the Grid Environment)**
  - **WP4: DISSEMINATION ACTIVITIES**
    - **Task 4.1: Dissemination**
    - **Task 4.2: Knowledge Dissemination**



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# THE EELA WEB SITE

<http://www.eu-eela.org>





# THE EELA e-INFRASTRUCTURE

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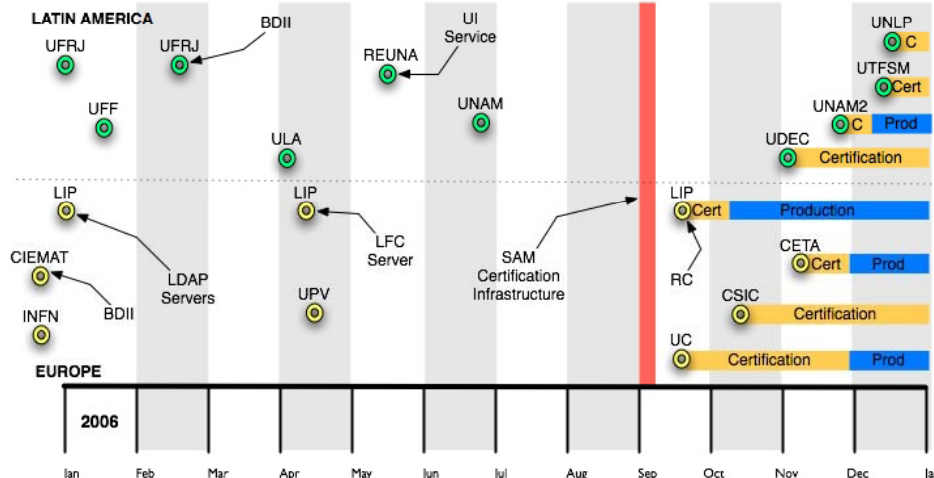
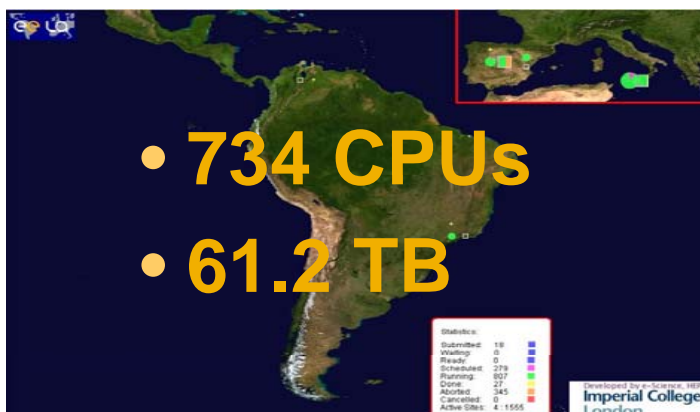
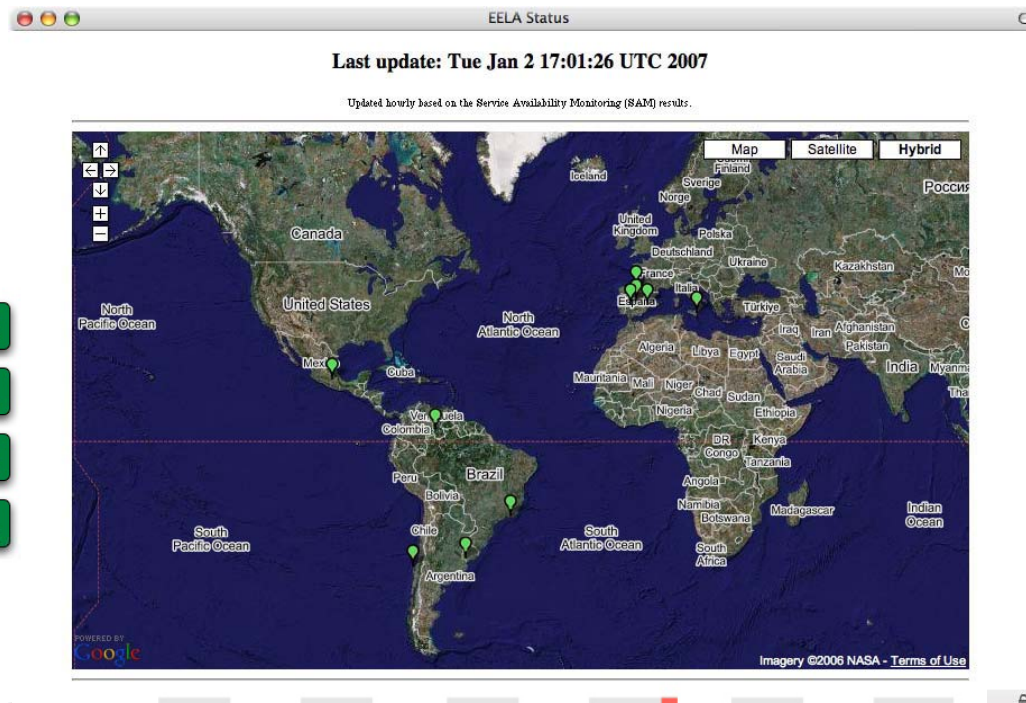
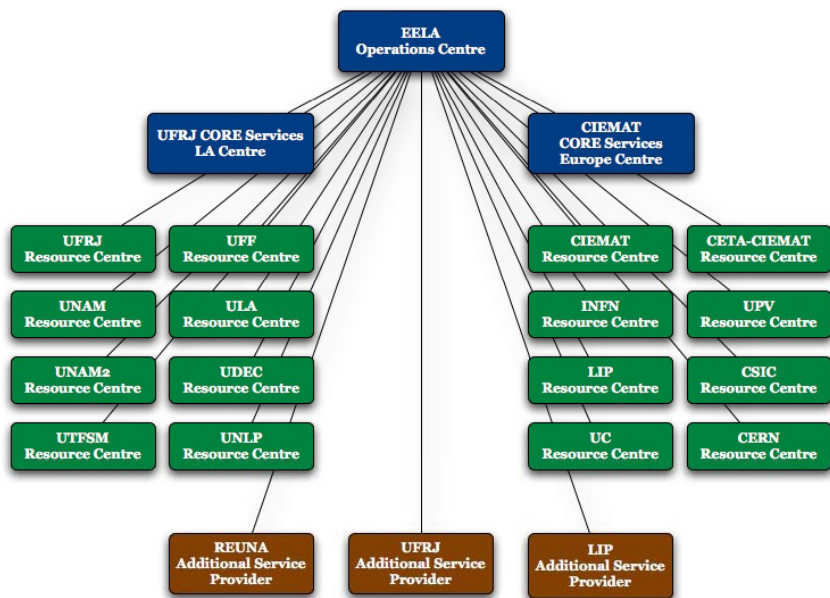






# WORK PACKAGE 2 STATUS

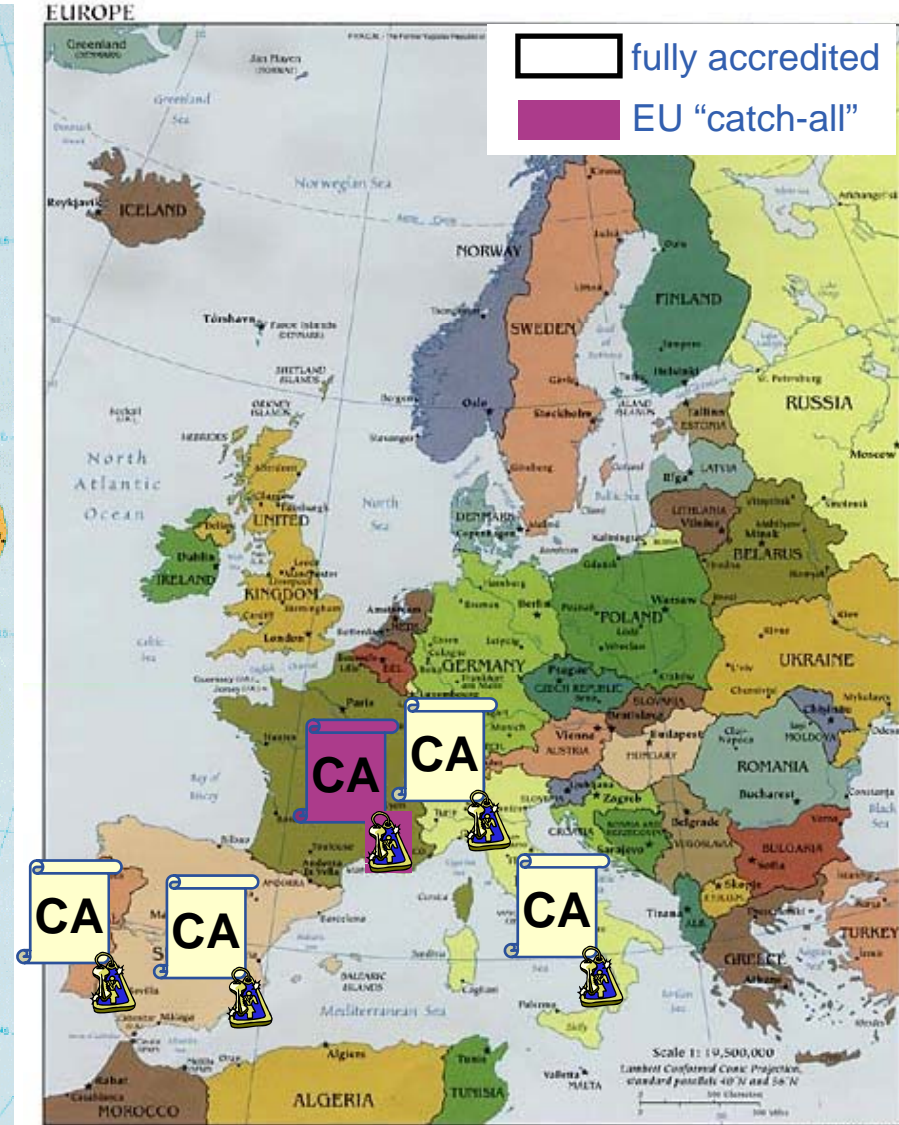
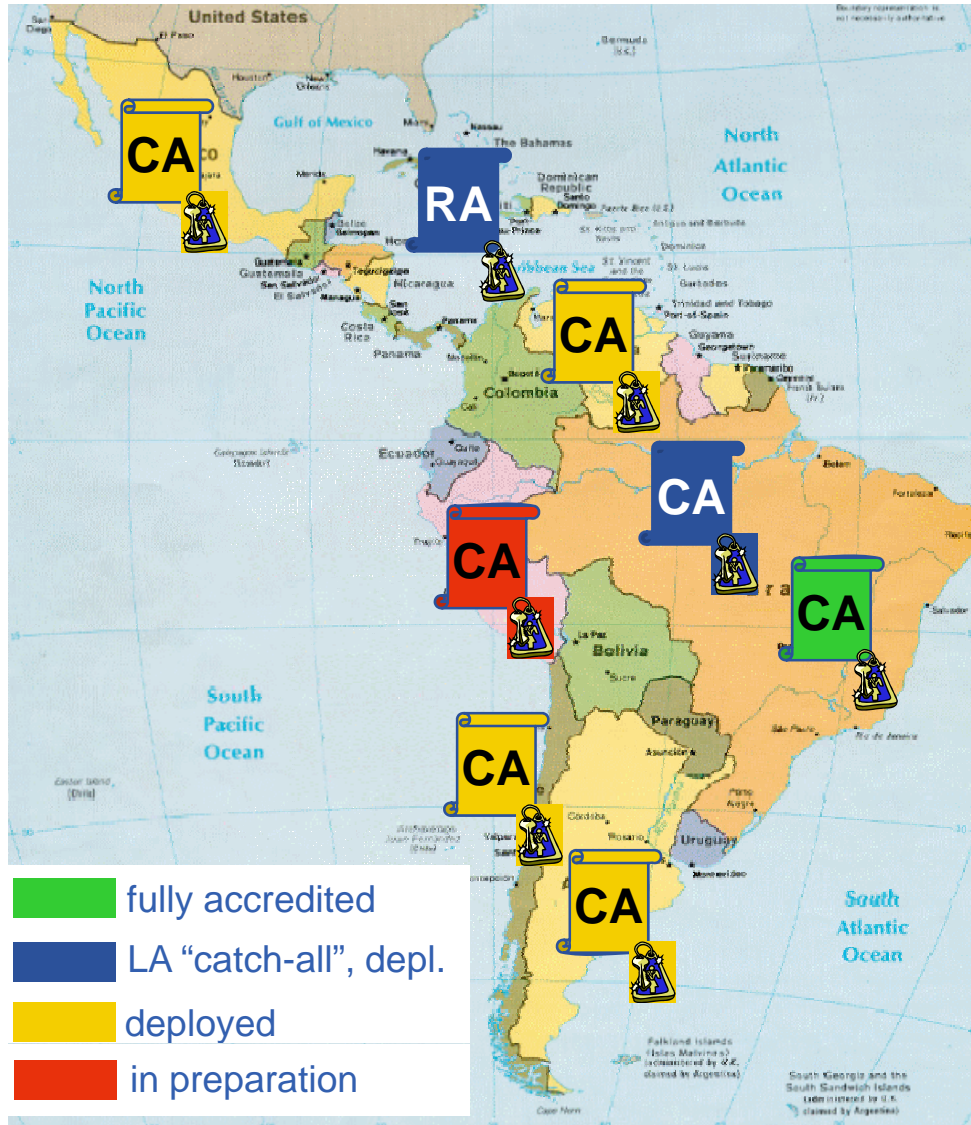
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# EELA CAs

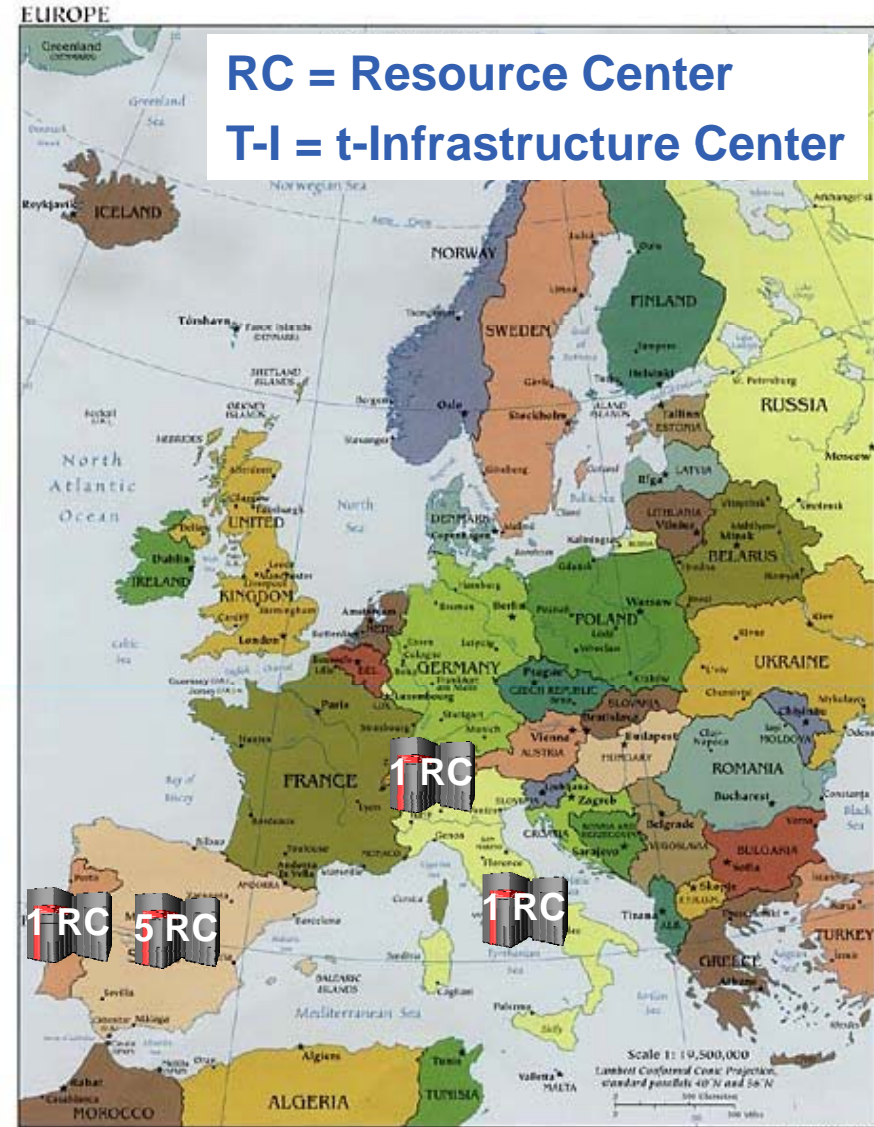






# THE EELA PILOT TEST-BED

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# WORK PACKAGE 4 STATUS

- **15 TUTORIALS: More than 1200 participants-days delivered so far in 2006!**
  - **For grid users (total # of participants: 300)**
    - *Madrid - Spain* (20-22 February 2006)
    - *Merida - Venezuela* (27-29 April 2006)
    - *Itacuruçá - Brazil* (26-28 June 2006)
    - *Mexico City - Mexico* (28-30 August 2006)
    - *Santiago de Chile* (6-7 September 2006)
    - *Madrid – Spain* (16-18 October 2006)
    - *Merida – Spain* (7-9 November 2006)
    - *La Plata – Argentina* (11-12 December 2006)
    - *Bogota – Colombia* (6-7 March 2007)
  - **For grid system administrators (total # of participants: 160)**
    - *Madrid - Spain* (20-24 February 2006)
    - *Itacuruçá - Brazil* (26-30 June 2006)
    - *Mexico City - Mexico* (28 August - 01 September 2006)
    - *Madrid – Spain* (19-20 October 2006)
    - *Itacuruçá - Brazil* (29 November-01 December 2006)
    - *Bogota – Colombia* (6-9 March 2007)



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# WORK PACKAGE 4 STATUS

- **1st EELA GRID SCHOOL. – Itacuruçá - Brazil (4 -15 December 2006)**
  - **Training for “gridification” of new applications to be run on EELA infrastructure (23 participants): 7/8 applications gridified**
    - *Climate applications, proposed by UC-SP, SENAMHI-PE and UDEC-CL (EELA applications)*
    - *Dist Simulation of Multiple Events, proposed by UNESP-BR, UNICAMP-BR and USP-BR (non-EELA application)*
    - *EMBOSS, proposed by UNAM-MX (non-EELA application)*
    - *LEMDist, proposed by UNAM-MX (EELA application)*
    - *LMS in Grid Env, EELA application proposed by CITMATEL-CU (non-EELA partner) and CUBAENERGIA-CU (EELA partner)*
    - *SATyrus, proposed by UFRJ-BR (EELA application)*
    - *SegHidro, proposed by UFCG-BR (non-EELA application)*
    - *VoD, proposed by UFRJ-BR and CEDERJ-BR (EELA application)*



- DISSEMINATION: 2 bulletins, 2 brochures, 4 posters, 17 press releases, 10 Inf. Sheets, 72 news





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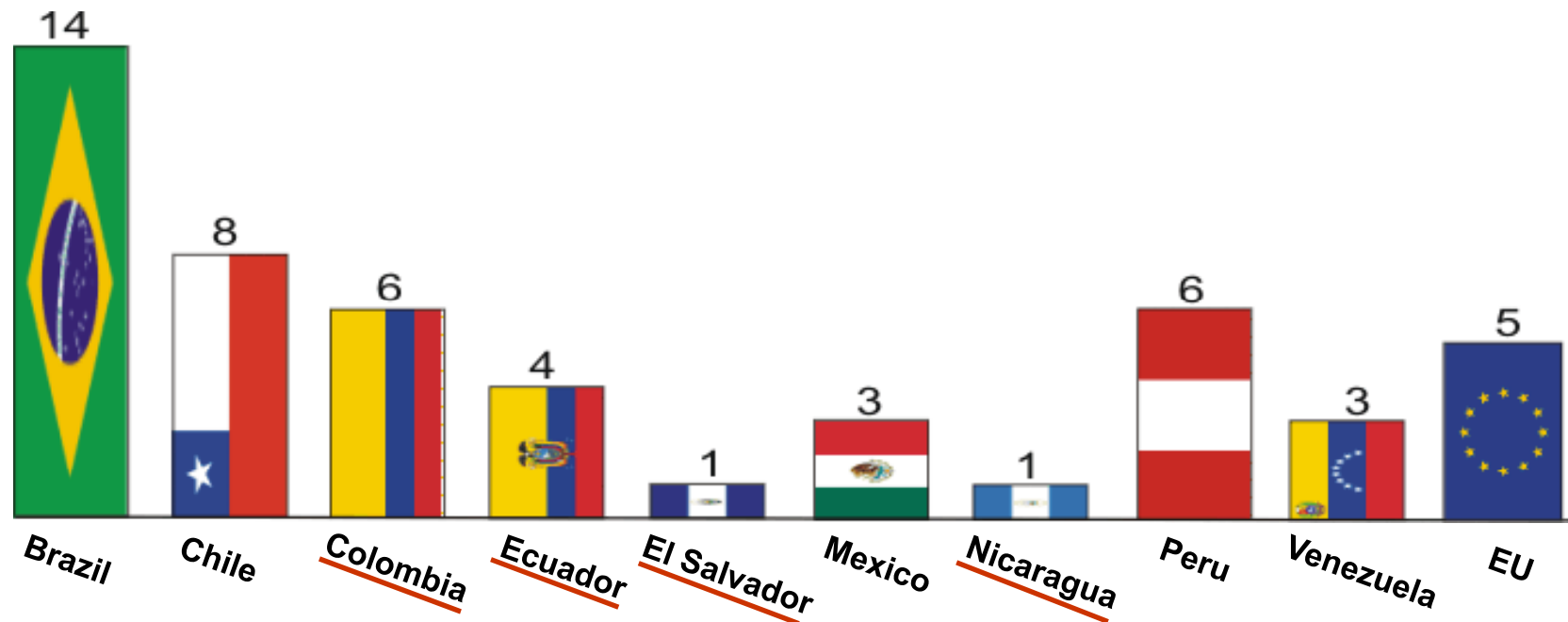
# WORK PACKAGE 4 STATUS

- **5 WORKSHOPS**
- **1 CONFERENCE**
- **Future events:**
  - **2 WORKSHOPS (Cuba – Mexico)**
  - **1 CONFERENCE (with BELIEF – Brazil)**
- **Potential new EELA collaborators or partners: 51**



- **Survey of Communities: results**

- **46** LA communities
- **5** European communities from France, Luxembourg, Spain, UK



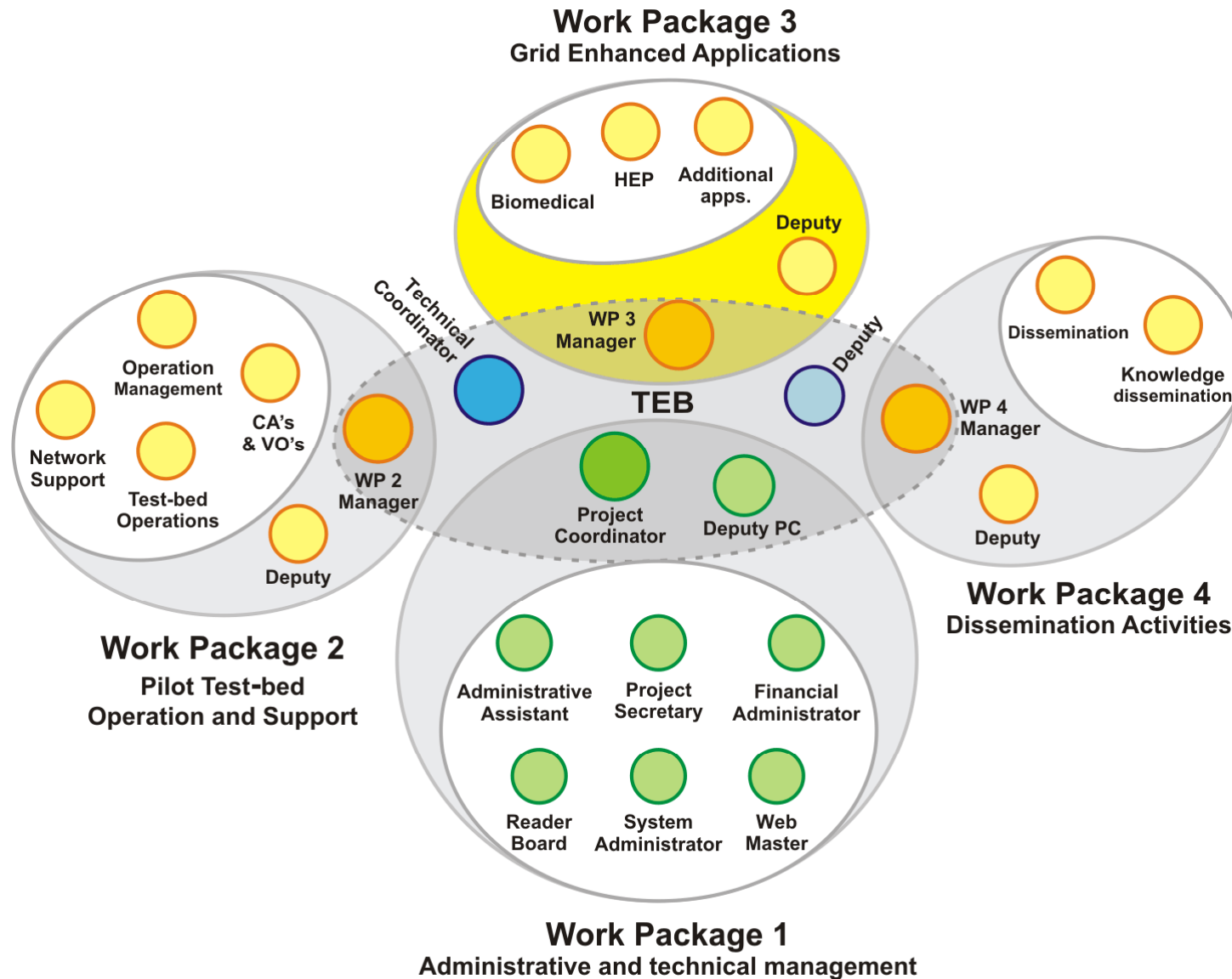


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# The Applications



- **WP3: Identification and support of Grid enhanced applications**
  - Coordinated by CIEMAT
  - Identifies, selects and customizes relevant applications and tools suitable for the Grid dissemination process in:
    - T3.1 Biomedicine (CUBAENERGIA, ULA, UPV)
    - T3.2 High Energy Physics (CERN, CIEMAT, UFRJ, UNAM, UNLP, UTFSM)
    - T3.3 Additional Applications
      - *e-Education (CECIERJ/CEDERJ, CIEMAT, CUBAENERGIA, UFRJ, UNAM)*
      - *Climate (UC, UDEC, SENAMHI)*
  - Aims at being the place of information exchange between already gridified applications and future ones.





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# Biomed

- **The interest of the LA community is leaded by CUBAENERGÍA**
  - It is focused towards two main oncological problems:
    - Thyroid Cancer.
    - Treatment of Metastasis with  $P^{32}$ .
  - 9 centers in Cuba are interested (*5 Hospitals and 4 Oncological Centers and Institutions*)
  
- **Installed in several EELA sites, including Cuba with a local grid**

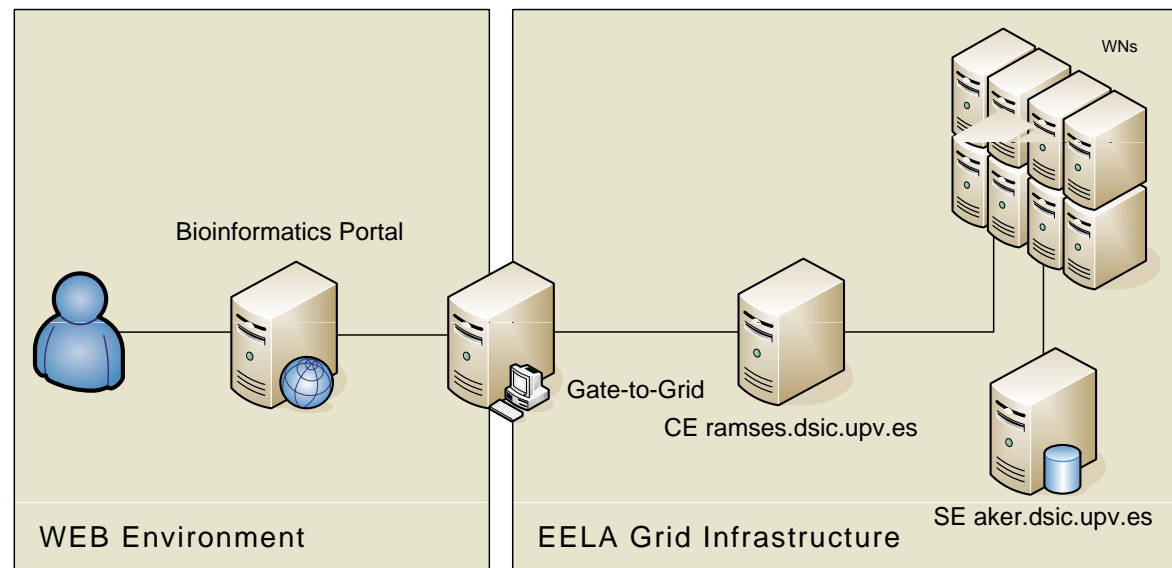


- **WISDOM can be executed on the EELA grid infrastructure.**
  - UPV already participated in previous data challenge on Malaria and Avian Flu.
- ***An Experiment was prepared jointly by UPV and ULA.***
  - Two targets were accepted in *Plasmodium vivax Malaria* in the WISDOM data challenge-II
  - One has been completely docked (100%) in the EELA infrastructure
- ***Next Steps will be:***
  - Dock the second target
  - Analyze the first target
  - Inclusion of new targets in new data challenges.

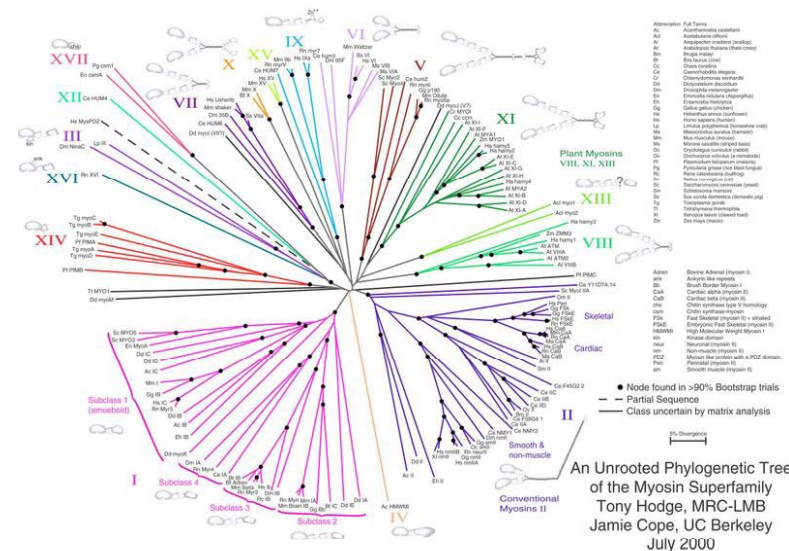




- Users access the service through a Web Portal (CeCalcULA)
- Access to the EELA Grid is performed through the *Gate-to-Grid*.
- *Gate-to-Grid* is an EELA Grid Node which provides a WSRF-Based Web Interface.
- Security with MyProxy server
- Study on the complete genome of the *Plasmodium falciparum* for the identification of DHFR antigenic proteins



- A Phylogeny is a Reconstruction of the Evolutionary History of a Group of Organisms.
- *Applications: Gene Function Prediction, Drug Discovery and Conservation Biology.*
- Interest of the LA Community
  - ULA is Leading the Interest in the LA.
  - A Grid Service is being Developed to Run a Parallel Version of MrBayes from the Bioinformatics Portal.
- Successful tests with a parallel MrBayes version in a Grid-service





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# EMBOSS

## EMBOSS (European Molecular Biology Open Software Suite)

nearly ready (MoU)



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# HEP

## – Initial applications

- **ALICE**

*To study the physics of strongly interacting matter at extreme energy densities, where the formation of a new phase of matter, the quark-gluon plasma, is expected.*





Usage info

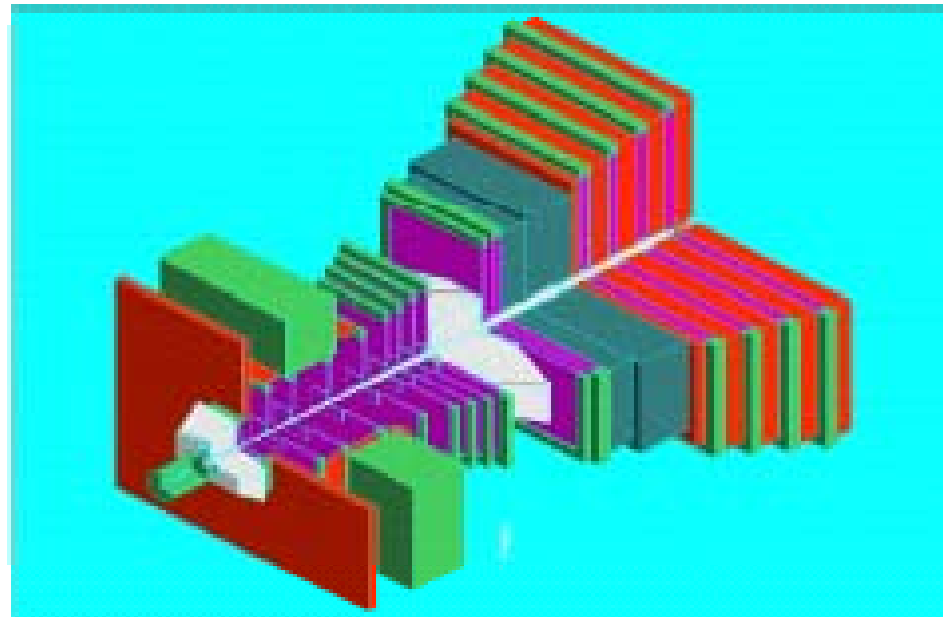
Job parameters			Application software			Details			
Run#	PID	Owner	Events	ROOT	ALIROOT	GEANT	Date	Output dir	
		podesta (15)					last year		
7	1711466	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/007/	test pro
6	1711465	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/006/	test pro
5	1711443	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/005/	test pro
4	1711433	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/004/	test pro
3	1711432	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/003/	test pro
3	1797427	podesta		v5-13-02	v4-04-Rev-08	v1-6-1	25.01.2007 20:06	/alice/cern.ch/user/p/podesta/pp_900GeV/03/	MC simu
2	1711421	podesta					19.01.2007 03:10	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/002/	test pro
2	1794911	podesta		v5-13-02	v4-04-Rev-08	v1-6-1	25.01.2007 20:06	/alice/cern.ch/user/p/podesta/pp_900GeV/02/	MC simu
1	673395	podesta					06.09.2006 21:08	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/001/	test pro
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1	1794908	podesta		v5-13-02	v4-04-Rev-08	v1-6-1	25.01.2007 20:06	/alice/cern.ch/user/p/podesta/pp_900GeV/1/	MC simu
	1769912	podesta					23.01.2007 20:37	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/test/	test eve
	1771607	podesta					23.01.2007 21:36	/alice/cern.ch/user/p/podesta/demo/flow/output_nc/test/	test eve
	1771617	podesta					23.01.2007 21:36	/alice/cern.ch/user/p/podesta/demo/	test eve
	1771691	podesta					23.01.2007 23:39	/alice/cern.ch/user/p/podesta/demo/	test eve
<b>TOTAL : 15 jobs</b>			<b>0</b>						<b>Export folders</b>

**Submission of ALICE  
Grid jobs from Latin  
America**

## – Initial applications

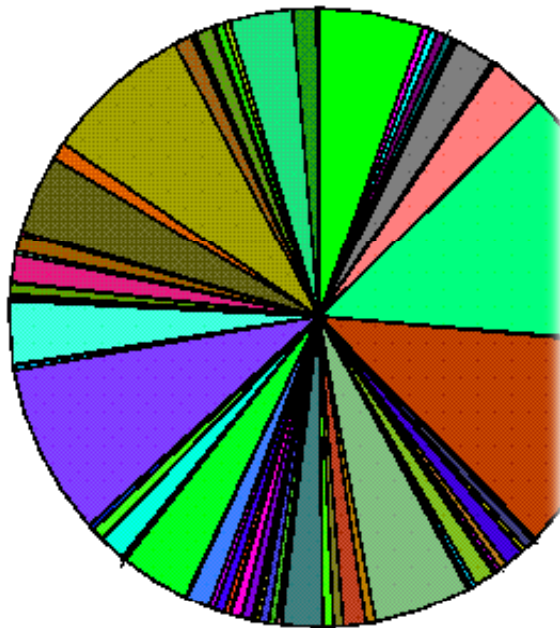
- **LHCb**

*To full investigate the CP violation in the Bd and Bs systems,  
to possibly renew the new physics beyond the standard model.*





CPU time 15773343 h



DIRAC.LHCBOONLINE.ch	0.00%
DIRAC.Lyon.fr	5.49%
DIRAC.NIPNE.ro	0.00%
DIRAC.UCD.ie	0.00%
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DIRAC.joel.ch	0.00%
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LCG.Brunel.uk	2.93%
LCG.CERN.ch	13.67%
LCG.CESGA.es	0.00%
LCG.CGG.fr	0.04%
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LCG.CNAF.it	11.21%
LCG.CNB.es	0.20%
LCG.CPPM.fr	0.52%
LCG.CSCS.ch	0.26%
LCG.CY01.cy	0.03%
LCG.Cagliari.it	0.00%
LCG.Cambridge.uk	0.00%
LCG.Catania.it	0.01%
LCG.Dortmund.de	0.98%
LCG.Durham.uk	0.40%
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LCG.Edinburgh.uk	0.06%
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LCG.FORTH.gr	1.06%
LCG.Ferrara.it	0.02%
LCG.Firenze.it	0.26%
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LCG.GR-01.gr	0.04%
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LCG.IHEP.su	0.38%
LCG.IN2P3.fr	0.47%
LCG.INR.ru	0.22%
LCG.IPP.bg	0.06%
LCG.IPSI-IPGP.fr	0.04%
LCG.IRB.hr	0.10%
LCG.ITEP.ru	0.51%
LCG.ITWM.de	0.03%
LCG.Imperial.uk	0.55%
LCG.Iowa.us	0.00%
LCG.JINR.ru	0.09%
LCG.KFKI.hu	0.29%
LCG.KIAE.ru	0.52%
LCG.KIAM.ru	0.31%
LCG.Krakow.pl	1.22%
LCG.LAL.fr	0.08%
LCG.LAPP.fr	0.01%
LCG.LISA.nl	0.00%
LCG.LPC.fr	3.64%
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LCG.LPN.fr	0.19%
LCG.Lancashire.uk	1.34%
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LCG.Legnaro.it	0.66%
LCG.Liverpool.uk	0.29%
LCG.Manchester.uk	8.93%
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LCG.NIPNE.ro	0.13%
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LCG.Napoli.it	0.08%
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LCG.PDC.se	0.06%
LCG.PIC.es	1.43%
LCG.PNPI.ru	0.21%
LCG.Padova.it	0.90%
LCG.Pisa.it	0.20%
LCG.QMUL.uk	4.11%
LCG.RAL-HEP.uk	0.91%
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LCG.TAU.il	0.10%
LCG.TCD.ie	0.02%
LCG.Torino.it	0.49%
LCG.UCL-CCC.uk	0.00%
LCG.ULAKBIM.tr	0.32%
LCG.USC.es	3.30%
LCG.WARSAW.pl	1.25%
LCG.WCSS.pl	0.04%
LCG.WEIZMANN.il	0.05%



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# NEW HEP APPLICATIONS

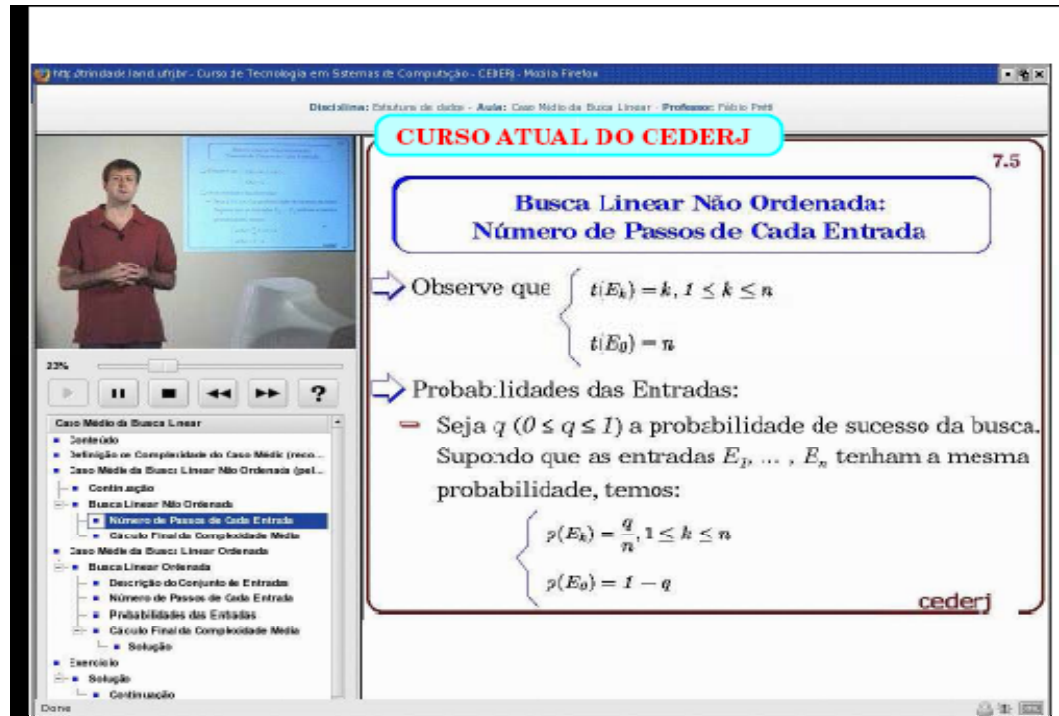
- **Applications of interest to EELA partners and other communities in Latin America**
  - Other LHC applications
    - ATLAS
      - *CIEMAT, UFRJ, UNLP and UTFSM*
    - CMS
      - *CIEMAT and LA participants in EELA member countries, but no EELA partner from LA...*
  - New projects
    - Pierre Auger Observatory
      - *INFN-Catania, LIP, UFRJ, UNAM, and UNLP*



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# e-Learning

- Storage servers are running on the storage elements
- Multimedia server continues to manage requests
- Video streams continues to be sent to clients (UDP)
- Backup of classes stored on the grid



7.5

**Busca Linear Não Ordenada:  
Número de Passos de Cada Entrada**

⇒ Observe que 
$$\begin{cases} t(E_k) = k, 1 \leq k \leq n \\ t(E_0) = n \end{cases}$$

⇒ Probabilidades das Entradas:

— Seja  $q$  ( $0 \leq q \leq 1$ ) a probabilidade de sucesso da busca. Supondo que as entradas  $E_1, \dots, E_n$  tenham a mesma probabilidade, temos:

$$\begin{cases} p(E_k) = \frac{q}{n}, 1 \leq k \leq n \\ p(E_0) = 1 - q \end{cases}$$

cederj

- **Planned Services**

- Access to distributed computer enhanced instrumentation
- Remote access to simulation and modelation capabilities with high performance computing support
- Interactive visualization
- Distributed data analysis with access to data base systems
- Experiment repository system.

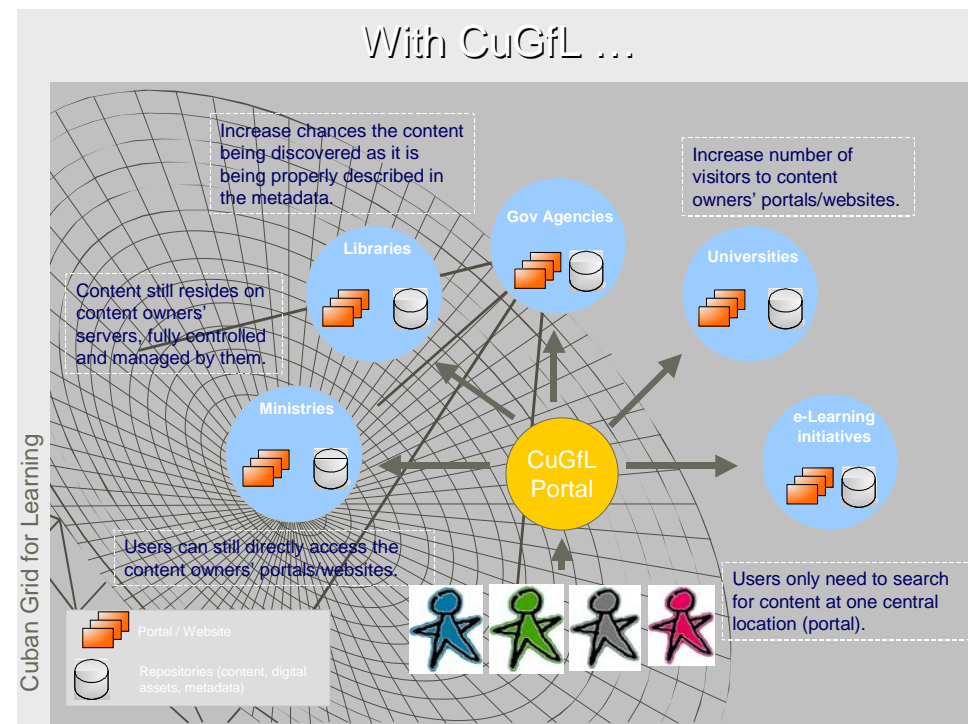
Food Engineering

NMR

Electrophoresis

cns\_solve

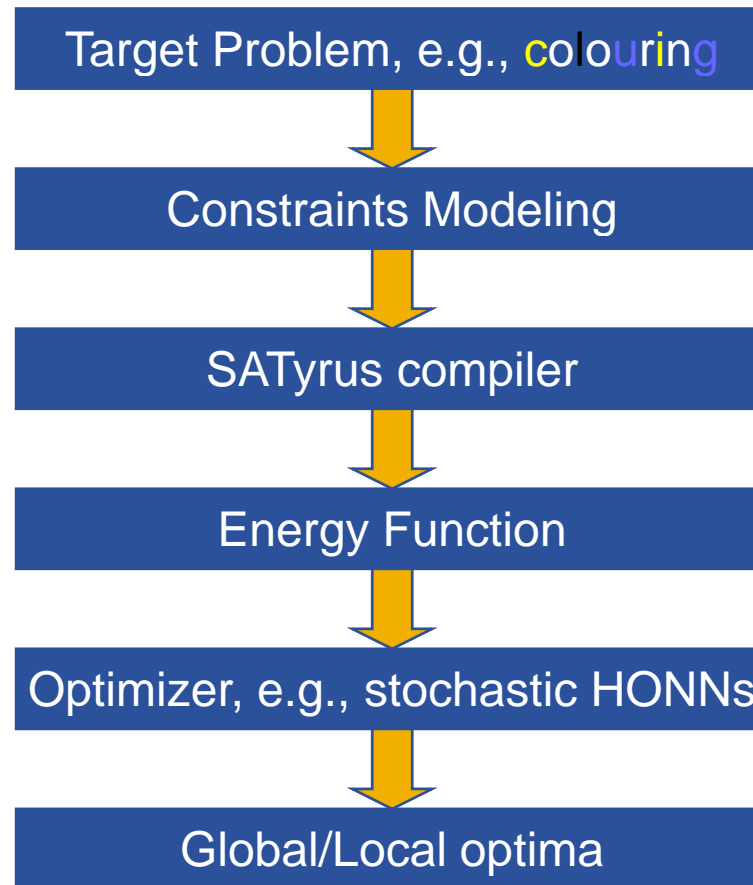
- Based on Moodle
- Course management system to produce web-based courses that support a social constructionist framework of education



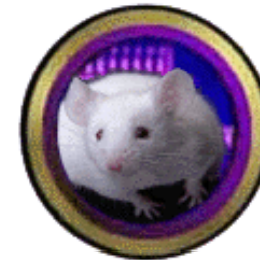
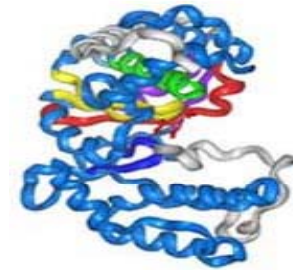
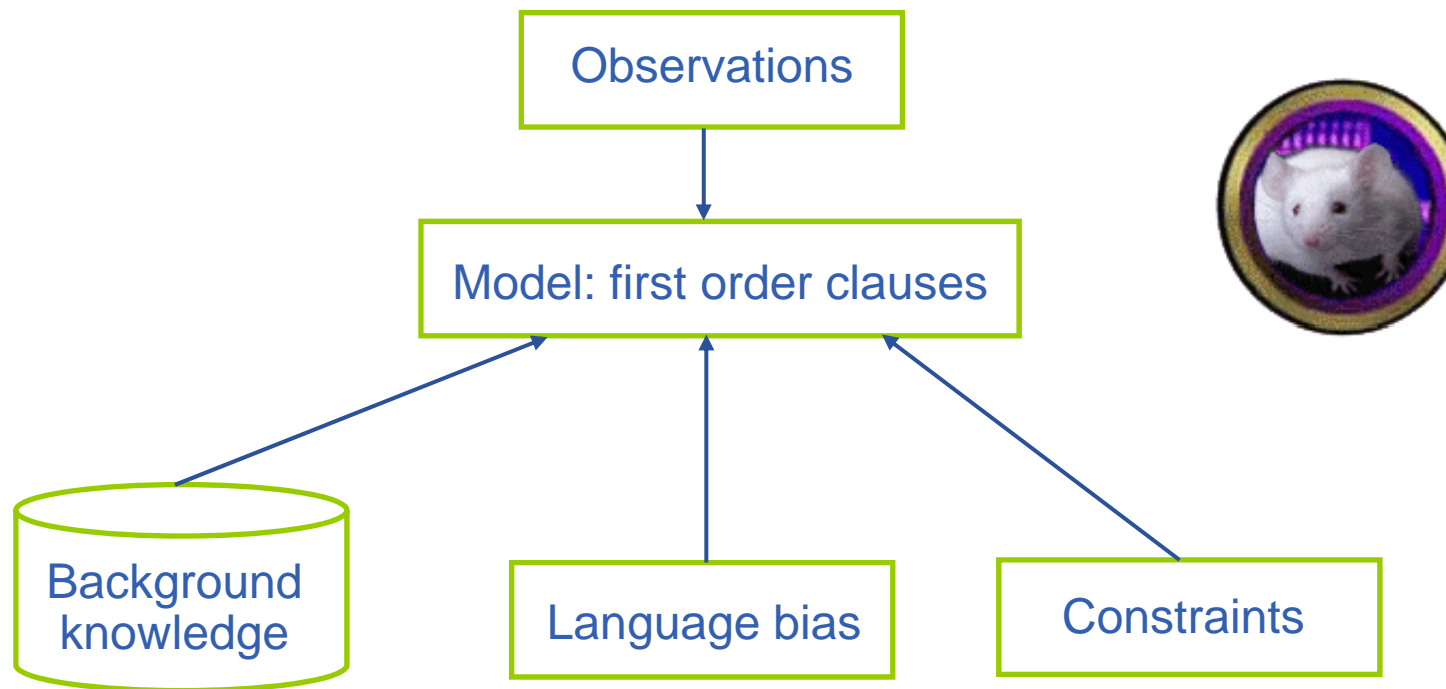


## SATyrus:

- SATisfiability-based, neuro-symbolic architecture;
- Exact formulation synthesizer.
- Airport Management (surface)



- Use of Inductive Logic Programming to extract relevant knowledge from structured data





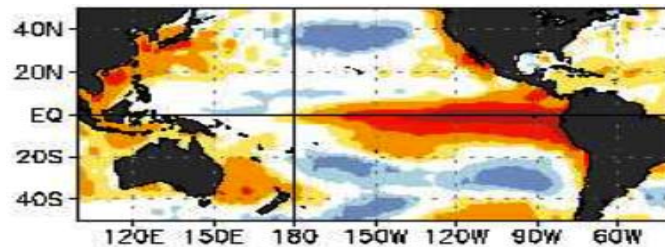
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# Climate

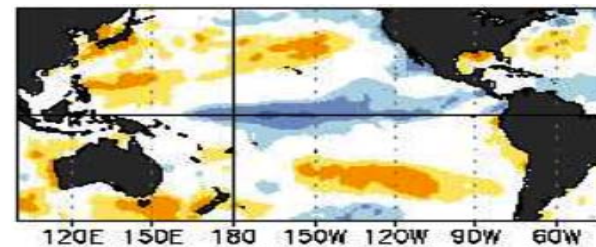
- **Goal: Predict Local Impacts of “El Niño” in Latin America**

A challenging problem for the climate community, with **huge** socio-economical impact in Latin America.

Anomalous heating



Anomalous cooling



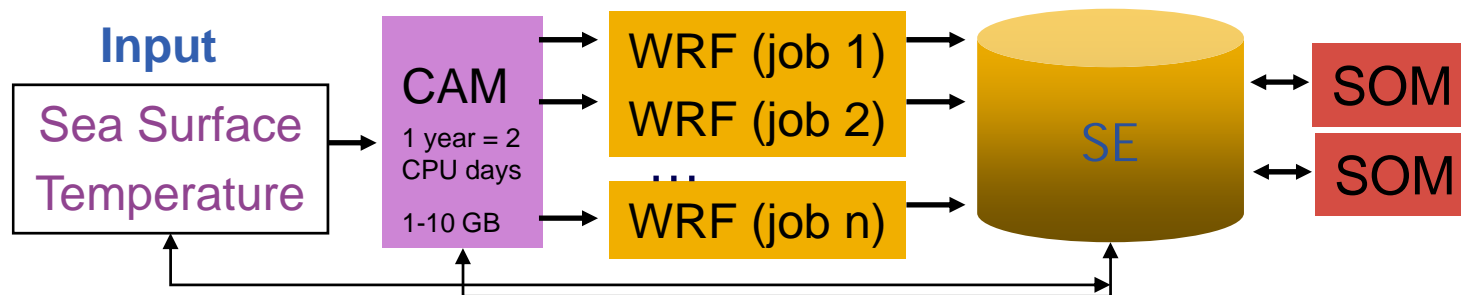
- **GRID helps to** share computing resources, heterogeneous data, as well as know-how in a user-friendly form.
- **A new integrated climate application** developed in EELA from the scratch, with no similar counterpart in any other Earth Science/Climate EU Project.

Three applications have been identified (climate sequence):

- Global atmospheric circulation model (**CAM**) ..... **Deployed !**
- Regional weather model (**WRF**) ..... **Deployed !**
- Datamining clustering tools (**SOM**) ..... **Work in progress**

This sequence poses several computational challenges

Nontrivial dependent relationships among the applications.



This sequence of jobs demands middleware solutions for:

- Preparing and submitting dependent jobs / data sharing (workflow).
- Restarting interrupted experiments.
- Manage metadata (for datasets and application status).



# CURRENT STATUS

- Using GENIUS to interact with the applications (CAM+WRF)
- In the future a climate specific portal will be developed (JSR168) to run and track scientific experiments.

The screenshot displays the GENIUS Grid Portal interface. On the left, a navigation menu includes 'CAM' and 'WRF' sections. The main content area features a 'WRF JOBS STATE' table with the following data:

caseid	status	Start Time	jobID
Peru3	Running	2007-02-22 16:10:39	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>
Peru2	Aborted	2007-02-22 16:07:36	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>
Peru	Done(Success)	2007-02-22 15:48:07	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>
concepcion	Done(Success)	2007-02-22 11:28:31	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>
ConcepcionFloodings	Done(Success)	2007-02-22 11:09:54	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>
kyrill_GB2	Done(Success)	2007-02-22 10:01:30	<a href="https://rb-eela.ciem">https://rb-eela.ciem</a>

Below the table, a climate plot titled 'Plot de nino97.cam2.h0.1997-10-25-00000.nc' is shown, displaying a global map with a color scale from 0 to 900. The plot shows a significant area of high values (red/yellow) in the central Pacific Ocean, characteristic of an El Niño event.





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## Other Applications

# Volcano Sonifications

- **Currently no definitive method to predict the eruption of a volcano has been discovered or implemented (yet)**
- **Some of the calculations have been performed in the EELA e-Infrastructure.**





T3.3 Applications have been ported to the Grid in  
**EGRIS-1 Itacuruça (Brazil) 04-16/12/2006**

But also new ones:

**EMBOSS**

**SegHidro**

**Distributed Simulation of Multiple  
Failure Events on Optical Networks**

**GENECODIS**



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# EGRIS-2

## **EGRIS-2 Mérida (Venezuela)**

**30/07-10/08/2007**

**THE CALL IS OPEN!**

<http://indico.eu-eela.org/conferenceDisplay.py?confId=90>

**Or just look for “egris-2” in Google...**



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# Useful Information

**WP3 web page:**

**[http://www.eu-eela.org/eela\\_wp3.php](http://www.eu-eela.org/eela_wp3.php)**

**WP3 documents:**

**<http://documents.eu-eela.org>**



## WP3 contacts

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**Thanks for your attention!**