Université Mohammed V Agdal جامعة محمد الخامس اكدال

Faculté des Sciences Rabat كلية العلوم الرباط

Status Report on some activities in the ES-ATLAS-T2 and Medical Physics (GRID & e-Science)

Presented by : José F. Salt Cairols

GRID & e-Science: G. Amorós, P. Briongos, F. Fassi, A. Fernández, S. González, M. Kaci, E. Oliver, J. Salt, J. Sánchez, V. Sánchez, M. Villaplana

26th-29th June 2012

Overview

1.- Introduction.

2.- Some present aspects of the Spanish ATLAS T2.

3.- Adaptation of Applications in MC Simulations in a GRID infrastructure.

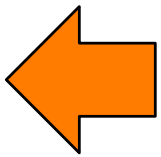
4.- Conclusions and perspectives.

1.- Introduction

- **Discussion of the Strategy in High Energy Physics and Computing**
- **E-Science framework**

… two aspects to report:

- **From the LHC Computing GRID point / Spanish ATLAS Tier-2 point of view**
  - **Effect of the new computing Model in ES-ATLAS-T2 (talk of S. González)**
- **Description of an Application in Medical Physics (complementary of the last shown in the last meeting in January)**
  - **Common features:**
    - Most of the problems are solved using sequential computing…
    - Some others (few) are solves by using parallel computing
    - Oriented to Data Storage and Data Management
    - High Experience in Monte Carlo calculations
  - **There are 2 posible contributions:**
    - Migrations of applications to GRID
    - New developments in e-Science
      - Example: HISP Platform (PARTNER)



Scientific Applications migrated/supported in GRID at IFIC

Astroparticle	Nuclear Physics	Theroetical Physics	Medical Physics	Experimental High Energy Physics
ANTARES	AGATA ADVANCED GAMMA TRACKING ARRAY	Lattice QCD	PARTNER	ATLAS TIER2 SPAIN
T2K		Beyond the Standard Model	Medical Image	ID Alignment
KM3NeT Opens a new window on our universe			Simulation In M.P. (GRID)	Physics Analysis
				international linear collider

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GOBIERNO DE ESPAÑA — MINISTERIO DE ASUNTOS EXTERIORES Y DE COOPERACIÓN — aecid

New perspectives

- In phase of contact and discussion: to give support to bioinformatics research/activities
  - Servicio Genética/Proteomica de la UV
  - data workflow similar to the LHC experiments

- Initiatives at different levels in the public system
  - VLC Campus: Communication Platform (UV,UPV, CSIC)
  - Spanish Network in e-Science

2.- Some present aspects of the ES ATLAS T2

2.-1 .-LHC Running Conditions and the LHC Computing GRID

- NOW:
  - LHC is running at 8 TeV
  - Pic : 5’5 4 x 10 ^33 cm -2 s -1
  - Integrated Luminosity
  - Data taking evolving very well

- Programme:
  - 2013-2014: Long Shutdown 1 (LS1) consolidate for 6’5/7 TeV
  - 2015-2017: Physics @ 6’5/7 TeV
  - 2018: LS2 to prepare for ‘ultimate LHC’ parameter set
  - 2019-2021: Physics with ‘Ultimate LHC’

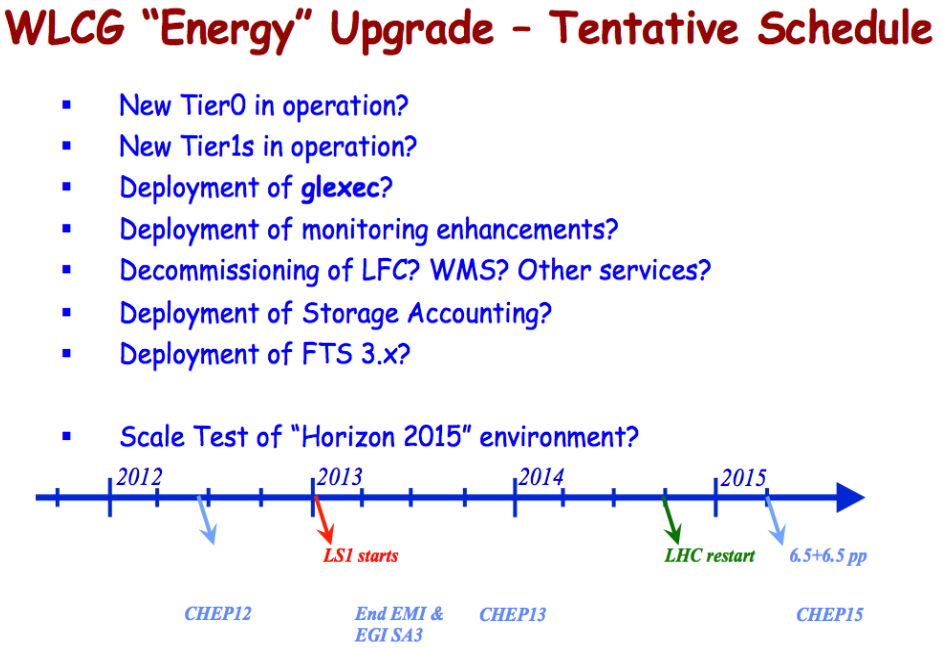
- Comments:
  - WLCG Meeting @ New York
    - Evolution of the Tier-0
  - New Tier-0 in Budapest

Timeline

- November 2011:
  - Last Presential meeting: XII workshop (@IFIC) 15 th -16th November 2011
- March 2012
  - Final report of FPA2007 project sent
  - Annual report of FPA2010 project sent
  - Computing & Software Week (12-15 March)
- April 2012:
  - Pledges 2012
  - 21st Meeting of the LHC Computing RRB (24th April)
- May 2012
  - CHEP2012 (NY)
  - WLCG Collaboration Meeting (NY)
- June 2012
  - XIII Presential Meeting (5th-6th June, UAM)
  - Computing & Software Week (11-15 June)
  - I PCI 2011 in Rabat (26-29 June)
- July 2012:
- September 2012
- November/December 2012: Ibergrid 2012 (Lisbon)
- November 2012:
  - Spanish GRID Computing meeting to discuss about the new projects (to be fixed)
  - XIV Presential Meeting

WLCG Collaboration Meeting

- Finalisation of Technical Evolution (TEG) reports
- Exciting new development in 'Feasibility Study on Common Analysis Framework



2.-3 .- Resource pledges

- Pledges of 2012 have been met
- Pledges of 2013: new inputs froms CRSG (C-RRB, April 2012)

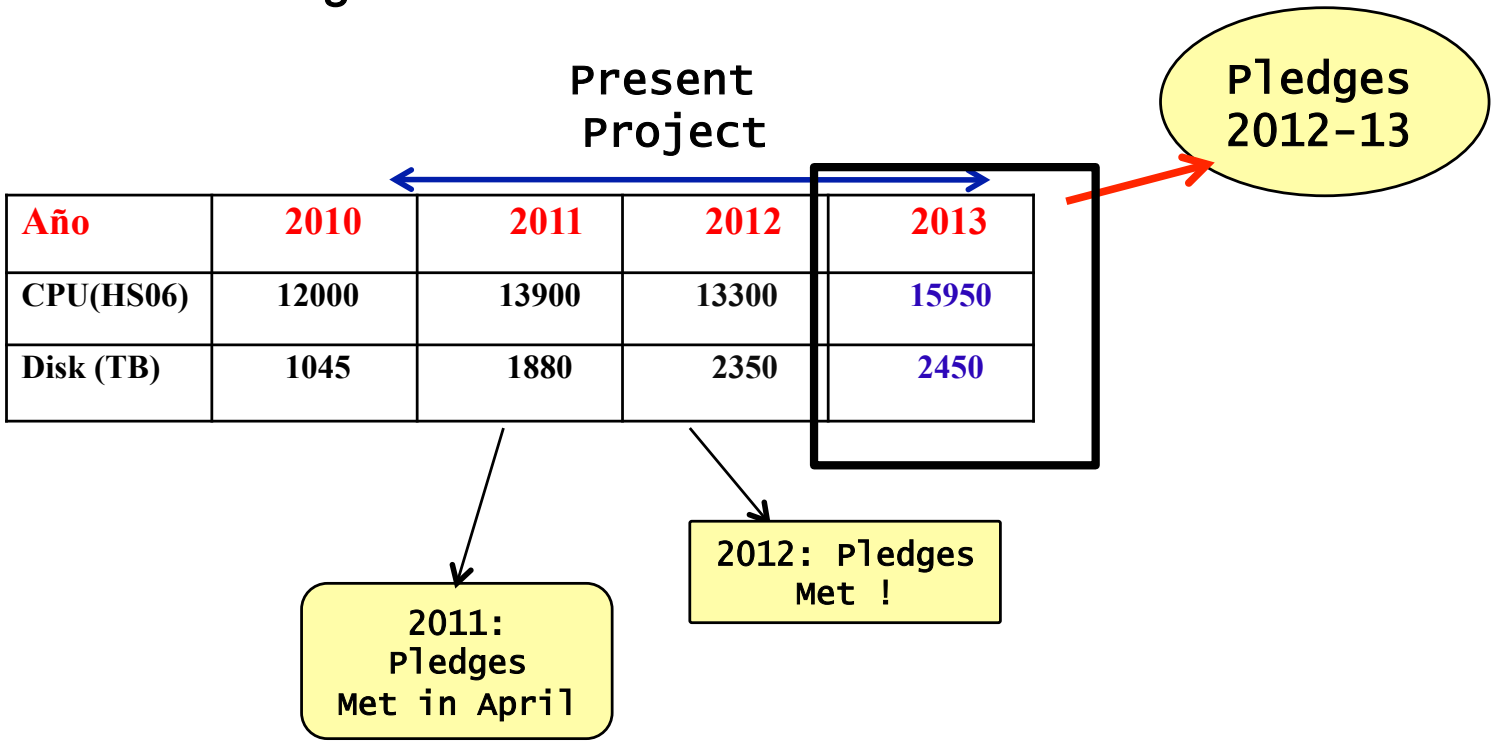
ATLAS

CPU [kHS06]	2013 (this scrutiny)	2013 (previous estimate)
CERN	*111*	*111*
Tier-1	*297*	*273*
Tier-2	*319*	*281*
Disk [PB]		
CERN	*10*	*10*
Tier-1	*29*	*30*
Tier-2	*49*	*53*
Tape [PB]		
CERN	*19*	*18*
Tier-1	*34*	*33*

Evolution of ALL ATLAS T-2 including the pledged already delivered plus the Estimated resources since 2011 onwards (numbers are cumulative):

Año	2010	2011	2012	2013
CPU (HS06)	240000	278000	***266000***	***319000***
Disk (TB)	20900	37600	***47000***	***49000***

Spanish ATLAS T-2 assuming a contribution of a 5% to the whole effort:

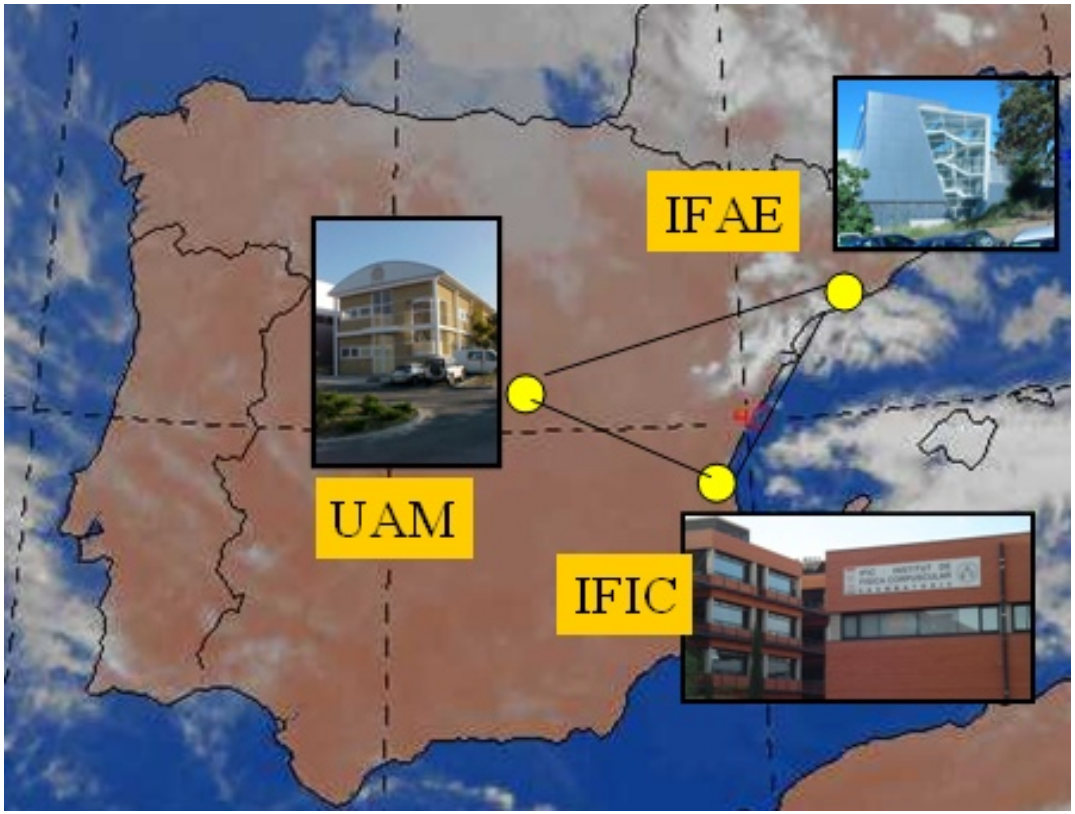


Universidad Autónoma de Madrid (Madrid) → 25%

Instituto de Física de Altas Energías (Barcelona) → 25%

Instituto de Física Corpuscular (Valencia) → 50%

– **The Spanish ATLAS Tier-2 is integrated in the WLCG Project (Worldwide LHC Computing GRID) and follows the ATLAS Computing Model**



Deployed Equipment (May 2012)

	UAM	IFAE	IFIC	TIER-2
CPU (HS06	3.686 (3.325)	4.950 (3.325)	6.950 (6.650)	15.586 (13.300)
Disk (TB)	432 (588)	775 (588)	1.175 (1.176)	2.382 (2.352)

Details given at the MB Meeting of 14 February

(collected by Gonzalo for the 3 experiments)

Comparison ATLAS-CMS

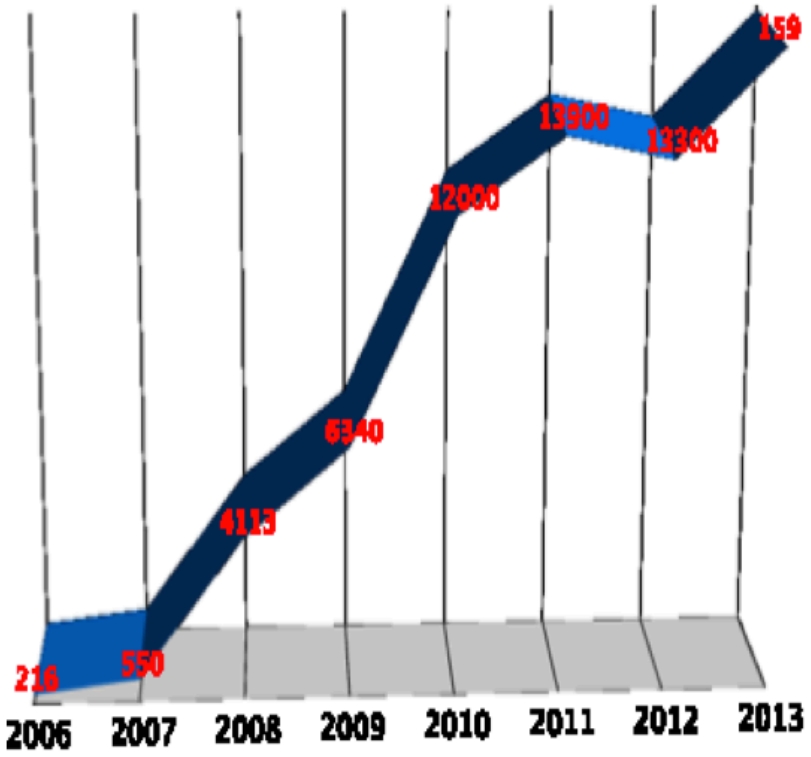
CMS

CPU [kHS06]	2013 (this scrutiny)	2013 (previous estimate)
CERN	*121*	*120*
Tier-1	*145*	*145*
Tier-2	*350*	*306*
Disk [PB]		
CERN	*7*	*7*
Tier-1	*26*	*27*
Tier-2	*26*	*26*
Tape [PB]		
CERN (including HI)	*23*	*23*
Tier-1	*45*	*59*

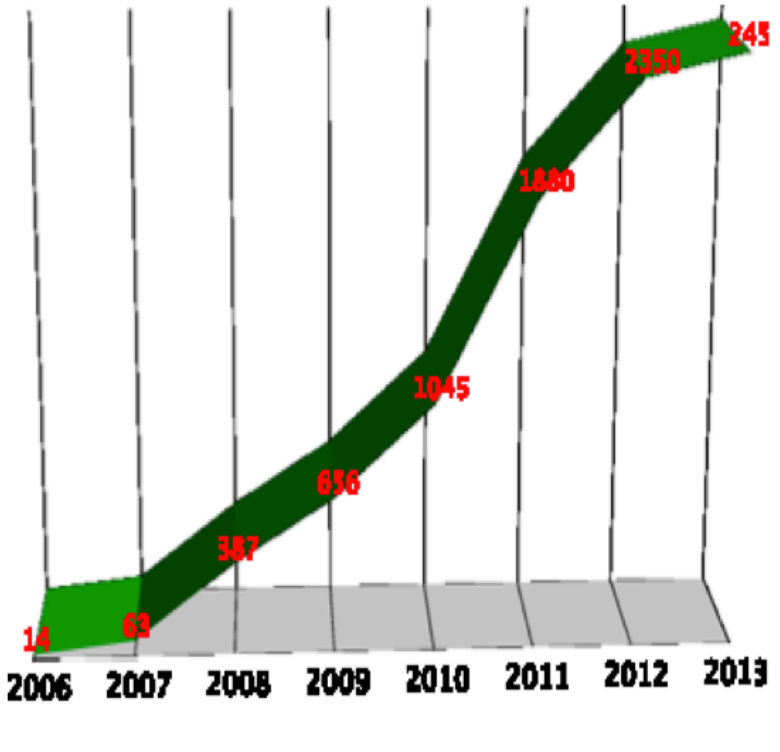
DISk-CPU –Tape proportions are different in ATLAS/CMS:
T1 role is becoming less important than T2 role (in comparison with ATLAS)

- **Plot with the resource Evolution in ES-ATLAS-T2**

CPU (HS06)



Disk (TB)



Renewal/Incremental

Equipment

Description	Justification of use	CPU (HS06)/ Disk(TB)
Linux Cluster Computer GRID for Calculation of Distributed Tier-2 for 6802 HEPSpec2006 for the years 2011, 2012 and 2013. Changes for 2010 also included.	Incremental Acquisition of Computing equipment for the period 2011-2013 for Distributed Tier-2. Absorb the calculation is carried out in simulated data d Production and Analysis Data	6.802 HS06
Cluster of disk servers in GRID for the computing of the Distributed Tier-2 with a total capacity of 2197 TB for years 2011-2012-2013. Changes for 2010 also included	Incremental Acquisition of Stotrage equipment for the period 2011-2013 for the distributed Tier-2 . To absorb data storage associated with the production of simulated data and data analysis	2.197 TB
Group of computers to be added to the Distributed Tier-2 with a Total CPU of 12.000 HEPSpec2006	Renewal of the computing equipment due to the depreciation to 3 years: 2008.2009 and 2010	12.000 HS06
Group of disk servers to be added to the Distributed Tier-2 with a capacity of 1045 TB	Renewal of the disk servers (storage) due to the depreciation to 3 years: 2008.2009 and 2010	1045 TB

CPU Renewal = 2 x CPU Incremental

Disk Renewal = = 0.5 x Disk Incremental

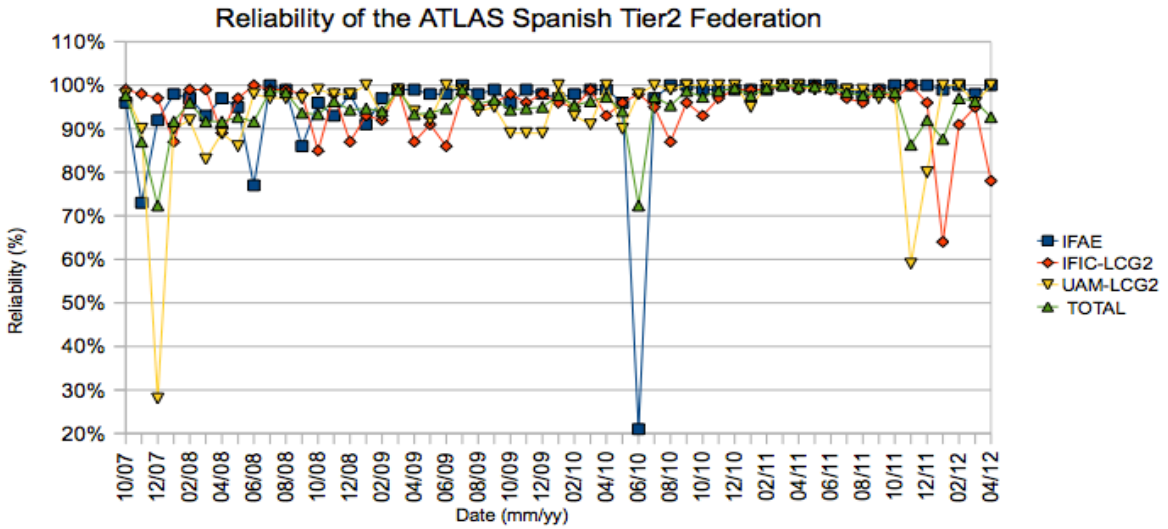
ATLAS

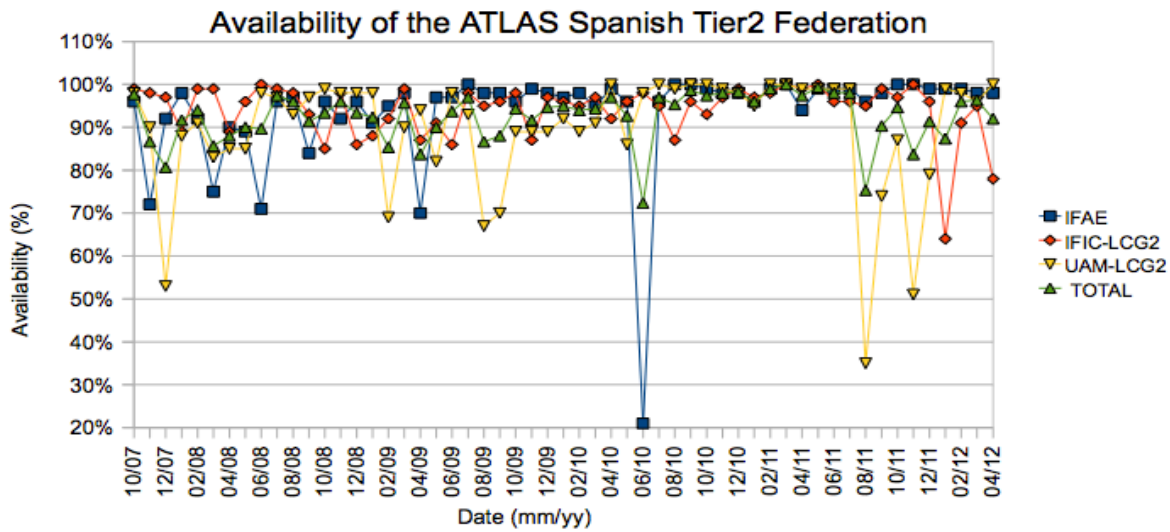
- Plans to record data @400 Hz and ‘park’ the less relevant part for later analysis,
- Plans to make intensive use of the DAQ farm and T0 resources.
- Makes an intensive use of al resources available
- 2012 is being very similar to 2011 as data taking is concerned, except that pile-up will increase
- In October 2012, at C-RRB the present estimate scan be revised if deemed necessary

2.4 - ES-ATLAS-T2 Reliability/Availability

Reliability/ Availability

- Tier-2 Operations Meting and cloud meeting every 2 weeks
  - Review of the status of sites and cloud coordination
- Tier-2 Reliability has suffered some inestabilities





Status in May 2012

Availability for analysis in ES-Cloud 4/2012

Historic view for "panda_queues_all"
from 00:00 01.05.2012 to 00:00 01.06.2012

Show 100 entries Search:

PANDA queue	SITE Name	TIER	CLOUD	History plot time bin = 62 hours	offline		brokeroff		online		NoQueue		test	
					%	count	%	count	%	count	%	count	%	count
ANALY_IFAE	ifae	T2D	ES		0	0	0	0	92.54	7	0	0	7.46	6
ANALY_IFIC	IFIC-LCG2	T2D	ES		1.88	1	0.54	1	95.09	3	0	0	2.49	2
ANALY_LIP-Coimbra	LIP-Coimbra	T2	ES		0	0	0	0	100	1	0	0	0	0
ANALY_LIP-Lisbon	LIP-Lisbon	T2D	ES		10.14	2	10.18	2	50.94	13	0	0	28.74	14
ANALY_NCG-INGRID-PT	NCG-INGRID-PT	T2D	ES		7.94	1	1.81	2	85.06	3	0	0	5.16	2
ANALY_PIC	pic	T1	ES		0	0	0	0	97.49	5	0	0	2.51	4
ANALY_UAM	UAM-LCG2	T2D	ES		0	0	0	0	100	1	0	0	0	0

- **Alpha**: IFAE, IFIC, UAM, NCG-INGRID-PT
- **Beta**: LIP-COIMBRA
- **Charlie**:
- **Delta**: LIP-LISBON

- **LIP-LISBON**: There was a big issue with accidental deletion of DATADISK http://savannah.cern.ch/support/?128608 . Recovery of the data went smoothly, and the site is running stable again since. We are not planning to repeat this type of exercise, so hopefully back to Alpha next month...
- **NCG-INGRID:** There was a three day DT for migration from LCG to CREAM CE, 23 May 10:00 until 25 May, 19:00 = 57 hours. Considering this, we get an availability of 0.8506*744/(744-57)=0.9214.

Link used: http://dashb-atlas-ssb.cern.ch/dashboard/request.py/siteviewhistorywithstatistics?columnid=562

2.-5.- Production of Simulated Data

JOBS MONTECARLO PRODUCTION : since May/ 2011 upto May/ 2012

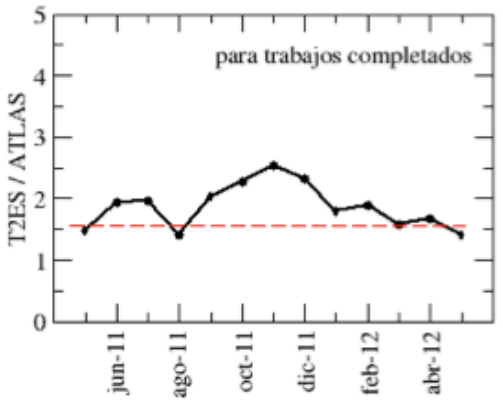
Total of jobs :

ATLAS : 97 217 592
T2ES : 1 844 001 **contrib.= 1.90 %**

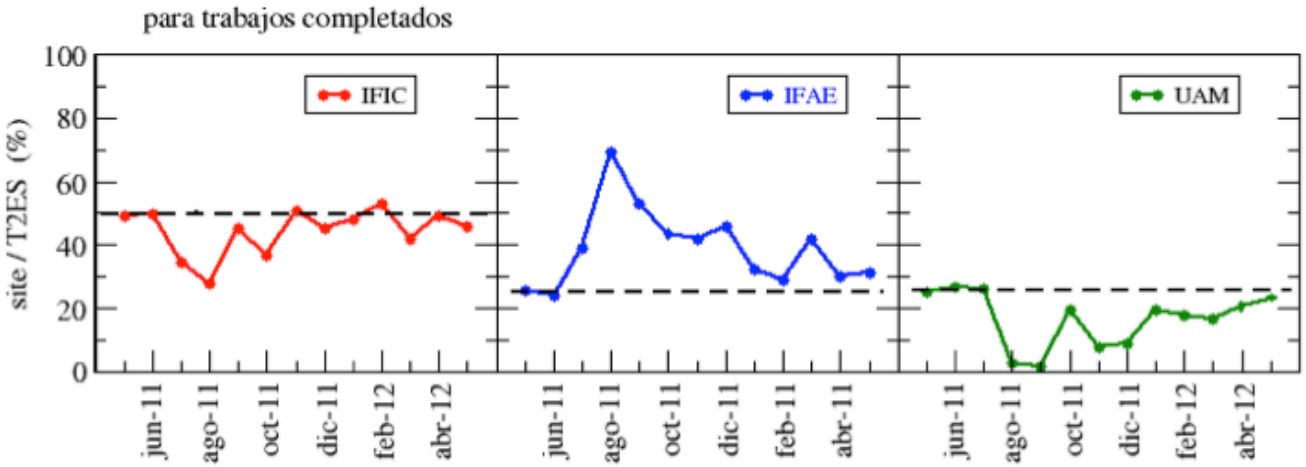
During 2012 :

ATLAS : 31 608 341
T2ES : 520 530 **contrib.= 1.65 %**

Contribution above 1.5 % habitual.
Production Efficiency of the T2ES : 94.2% > 92.8% of ATLAS



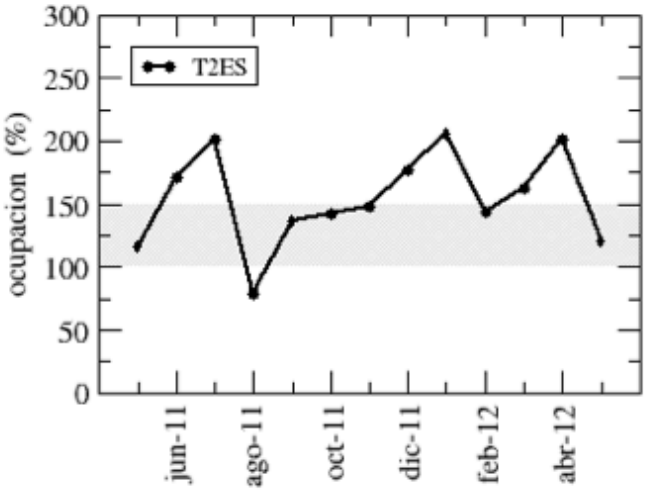
Contributions of the T2Es sites :



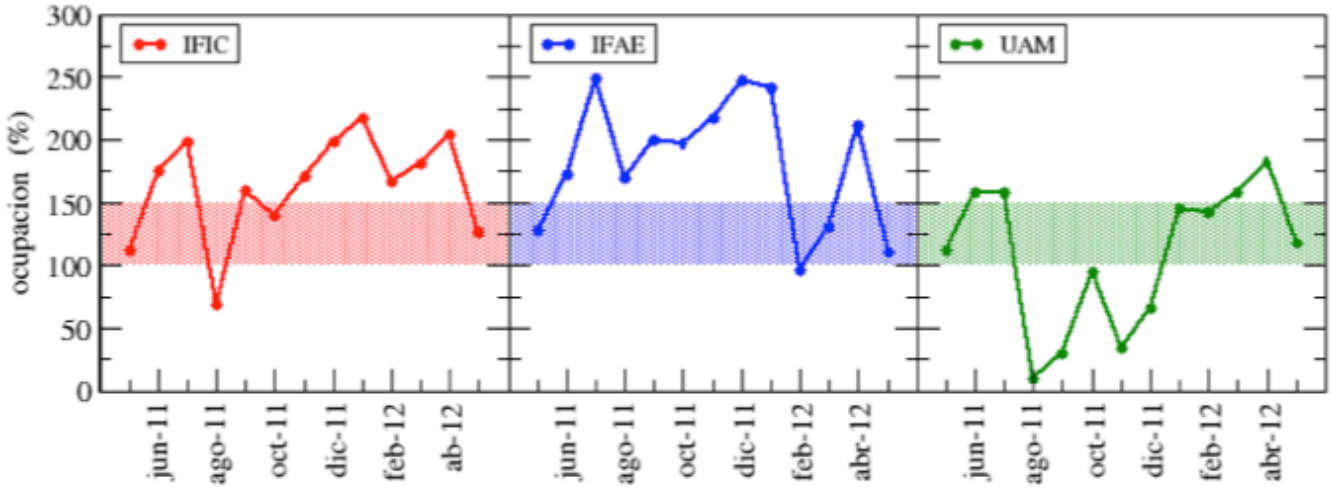
CPU Occupancy : since May/ 2011 upto May /2012

Ocup < 100 % :
CPU resources used, below the pledge
100 % <= Ocup <= 150 % :
CPU resources used, within the pledge
Ocup > 150 % :
CPU resoeurces used, on top of the pledge

Taking into account an efficiency of 67% on the CPU Fot the Tier-2's



CPU Occupancy of each T2ES site :



2.-6.- Computing Upgrade

- Upgrade of infrastructures
- Upgrade organization

- **Plan from now -> Phase II (2020), including Phase I**
- **Detailed planning document from now to 2020 in August**
- **LoI in the Automn**

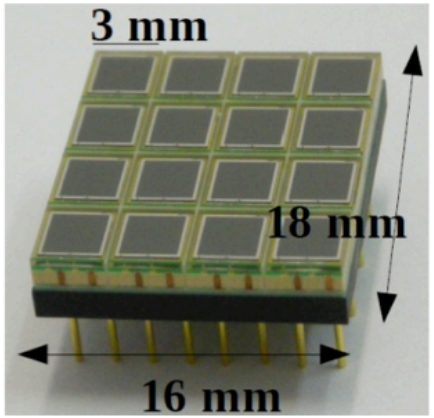
- **DATA PRESERVATION**
  - **Preserve the data + capability to do analysis**
- **DISTRIBUTED COMPUTING EVOLUTION**
  - **ADC&GRID is doing very very well**
  - **But at the same time, we are sarting to hit some limits**
    - **Scaling up, elastic resource usage, global access to data**

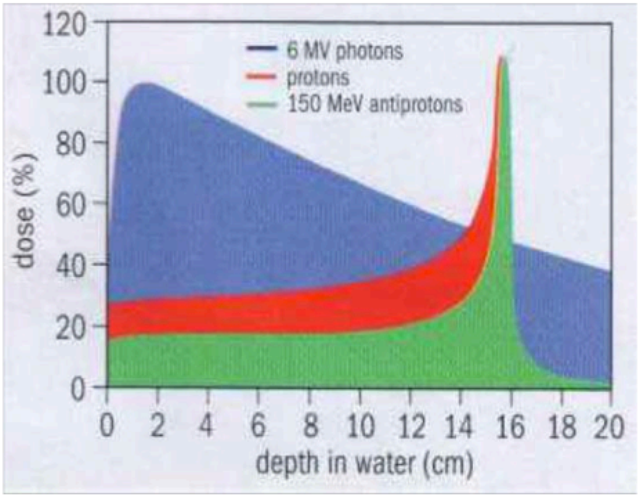
3.- Adaptation of applications in MC (Medical Physics) using GRID Computing

The work in the context:

Study of design and viability about image and accelerators

ESTUDIO DE DISEÑO Y VIABILIDAD SOBRE IMAGEN Y ACELERADORES
(ICTS 2009-19)





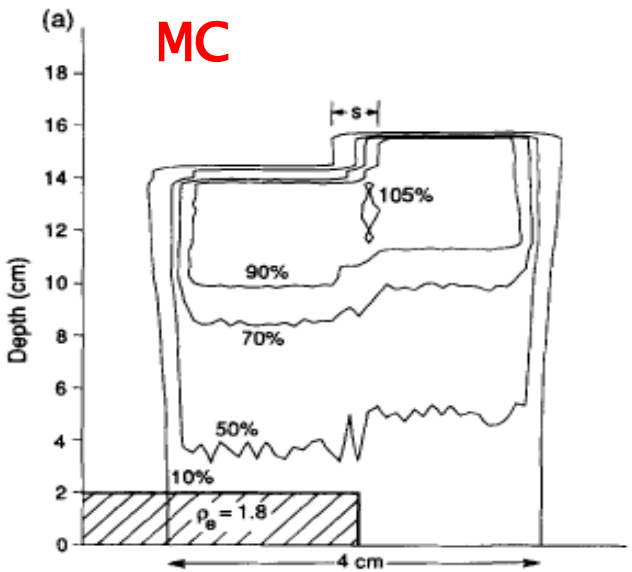
ACTIVIDAD EN :
-Aceleradores para Física Médica
-Detectores
-Ciencia de Imagen
-Simulación MonteCarlo en GRID

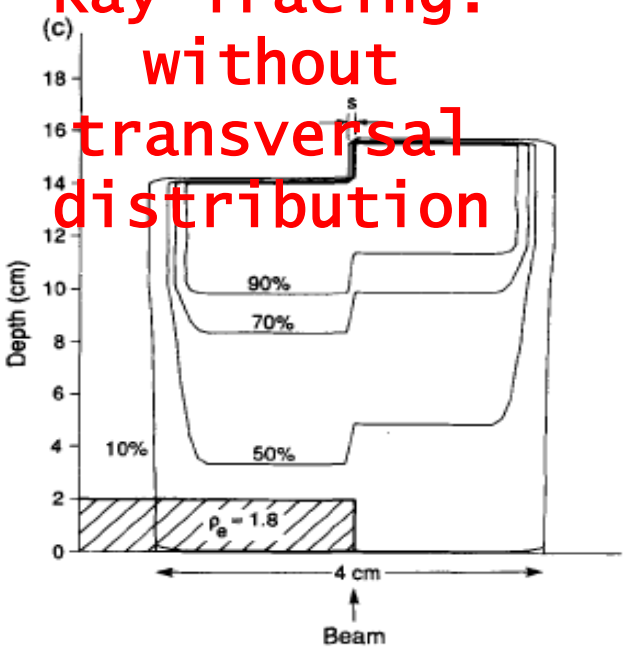
José Bernabéu - IFIC Valencia
2 abril 2012

Monte Carlo Simulation in GRID

- Migration of applications to GRID
- Main objective: to adapt Geant4 examples to comput the deposited doses in a voxelized phantom.
- From the GRID Computing point of view: tools created for the obtention of automatic simulations of deposed energies for different beam energies and using equal regular bins in the deepth of a water tank with cilindrical symmetry.
- Created the first components for the inclusion of simulations and measurements in a pencilbeam algorithm in order to speed-up the computing time of the dose
- Team: Gabriel Amorós*, Francisco Albiol, Javier Ors, José Salt
  - Gabriel has got a position in the Spanish Meteo. Agengy but he will continue linked to the group

Why Monte Carlo?





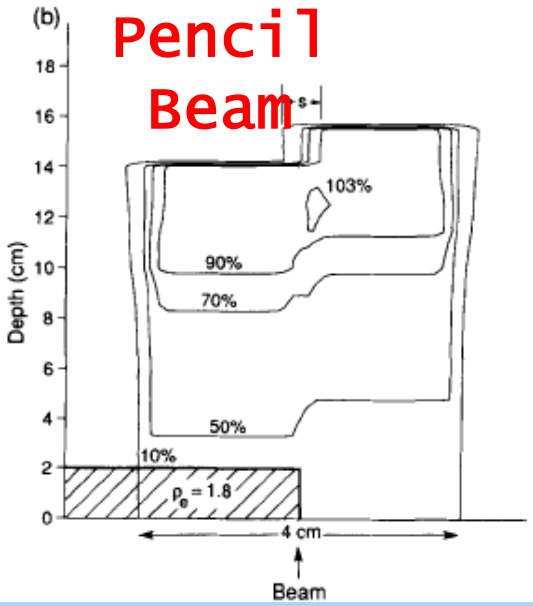


FIG. 8. Comparison of (a) Monte Carlo, (b) differential-pencil beam, and (c) ray-tracing calculations in phantom #1 (Fig. 1) without a compensating bolus for a 4-cm modulated beam of protons (4 cm in diameter). The position of the heterogeneity is as shown in Fig. 1, with its center at a depth of 1 cm.

Figures from *Petti, Med.Phys.19(1), 1992*

GRID: scripts written to use GEANT4 in 'stand-alone' process and in intercommunicated processes (MPI).
Steps towards MPI/GRID:

- To obtain weights for different beams (GRID/MPI is NOT needed).
- To obtain transversal doses at regular distances from the beam and at different energies(GRID/MPI is needed). (Finished) .
- To obtain doses in voxels for different beams (GRID/MPI is needed). (Finished).
- To add-up the doses of different beams (GRID/MPI is needed). (in prototype)
- Additional: optimization tools in the GRID execution (In progress)

Infraestructure used at IFIC:

- MPI: 48 nodes (384 cores) 2xQuad Core Xeon E5420 @ 2.50GHz, OpenMPI/MPICH
- SW packages: GEANT4 (G4), G4 MPI extension, (Analysis) AIDA, ROOT

4.- Conclusions and Perspectives

- TIER-2 Part:
  - Follow-up of project: from IFIC and Global point of view
  - Incremental resources + resource renewal
  - Upgrade computing & new trends (long shutdown)
  - Strategy in Computing: very important issue in the global strategy ine HEP

- Scientifical Applications:
  - Collaboration between GRID & computing group and the Medical Physics groups at IFIC : Monte Carlo Simulation in GRID for Hadrontherapy
  - Complementary activity in Monte Carlo Simulation (Geant 4) using GRID Technologies
    - Within the e-Science research line : with PARTNER activities n Data Base and Data Mining
    - Within the IFIMED/ Medical Physics research lines of IFIC

Backup Slides