COMPUTING FOR ASTROPARTICLE PHYSICS

Aspera workshop in CC-IN2P3 Lyon 7-8 October 2010

Astroparticle physics studies high energy phenomena using new cosmic messengers (high energy photons, cosmic rays, neutrinos and gravitational waves), the nature of dark matter and energy, the form of matter and interactions at the highest energies (proton lifetime, neutrino properties).

The large infrastructures proposed in the ASPERA Roadmap will face challenging problems of data collection, data storage and data mining.

In the Lyon workshop these issues will be addressed and will be confronted with data storage and analysis models developed in particle physics and astrophysics.

Issues of intelligent distributed data gathering and heterogeneous data fusion will also be addressed, as well as the availability of environmental data collected by these observatories to geosciences and the education network (outreach).

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CCIN2P3   ASPERA

*Computing
for
Astroparticle Physics*

1ˢᵗ Workshop

Lyon 7-8 Oct.

Some issues

✓ **Computing intensity**

✓ **Access intensity (image I/O)**

✓ **Signal processing methods (gravitational wave antennas)**

✓ **Fusion of heterogeneous data (multi-messenger)**

✓ **Data-quality/type for public access (noisy picture)**

✓ **Insertion in EGI, Virtual observatories**

✓ **Distributed data capture (smart grids)**

✓ **Remote monitoring and control**

✓ **Environmental/geoscience data availability**

✓ **Outreach**

What would we like to obtain from this workshop:

✓ *Identify problems*
✓ *Assess opportunities*
✓ *Explore possibilities of European (global?) scale coordination*

On the practical side:

- We would like to aim a written document
  - 20 page document exists.

- Findings, ACTION LIST 1st workshop
  - Hardware: Impact of GPU
- Middleware: Grid and/or Cloud? (theme for next workshop)
  - 3 types of computing examples: Event, Survey, Signal processing
  - 4 types of communities we need to interface with Astroparticle Computing in an organised way
    - EGI,   ACTION: ASPERA meetings Tier1/Projects
    - IVOA,   ACTION: ASPERA meetings Tier1/Projects
  - Invent a computing model for astroparticle… (Theme for next workshop)
  - Two examples of regional centres, HEAVENS, ARAGO.
    - How do we network them, nationally and internationally?
    - How do we interface to the teams ? (Simlabs ?)
  - Monitoring and control through the grid….   (Theme for next workshop?).
- What was missing:
  - Software optimality considerations, databases , software frameworks?
  - More examples from other fields? (Neptune, outreach)
- Astroparticle and Computing in Lyon the first of a meeting:
  - 2 more to come:
    - First in Barcelona   March 2011
    - Second in Hannover   March 2012
  - 10-15 pages summary with pictures.

Not a summary, but the Dog/Cat test:

Or what an agency person understands when technologists and modellers discuss

Mode/Technology I challenges

Astroparticle experiments in a verys short time enter from medium scale to large scale, need to adapt, specific scientific constrains but also « budgetary » constraints

1. How precise are the models and the set of requirements? Storage amount? ,CPU? distribution level?, I/O problems?, concurrent jobs? These have to be more precise.
    1. ACTION : Template and census for next workshop
        1. First the projects then sent to Tier1 for their comments
        2. Use the 2005 LHC projections to renormalize
2. Current database usage is quite different among experiments but traditional.
    1. Can we go towards the merging of database and a file system DBFS?
    2. What are the extra constraints of the public access?
    3. « Intelligent » and distributed databases?
3. Which hierarchy for computing?
    1. Centralised or distributed ?
    2. Hardware specific (eg GPU) or Virtual ?
    A MESSAGE FROM THE SPONSOR: Distributed system important for funding ...(LSST, GRID)
4. PUBLIC ACCES need to understand the constraints on the models .
    1. ACTION : Working group ?

Mode/Technology II challenges

1. In the distributed case is the GRID usefull for astroparticle ?
   1. Against what ? Need to define. GRID 10 years old technology but alternative depends on our horizon projects claim new data for 2015 .
   2. Commercial cloud still too expensive no I/O
   3. Virtualisation looks quite promising
   4. GRID as a Cloud hypervisor ?
   5. Portals for common GRID submission?

2. Software side, is there a commonality ? A CERN library ? Can we have one for astroparticle.? HEAPNET.
   1. Do we need a common set of professionals to create repository (along the 3 axes)
   2. Classification of applications need to be developped
   3. Need accumulation of debugged software (20 years in LHC)
   4. ACTION: More detailed discussion for next workshop ?

3. Hardware side: How should we model thinking about new technology, GPUs, multicore type of computing, 86 cores, etc, new computing models, massive parallel scale,
   1. ACTION: More detailed discussion next workshop

•The small group organizing the workshop will prepare a document for 2012 (after the Hannover workshop, a few pages from workshop 1 already exist)

•They should poke, help the projects to enter in the definition of needs mode and concrete and coordinated propositions towards the agencies

Thank you :

Manuel and collaborators and attendants for a very lively workshop

See you next year (May 2012?)
In Hannover