Applications Area Status and Progress

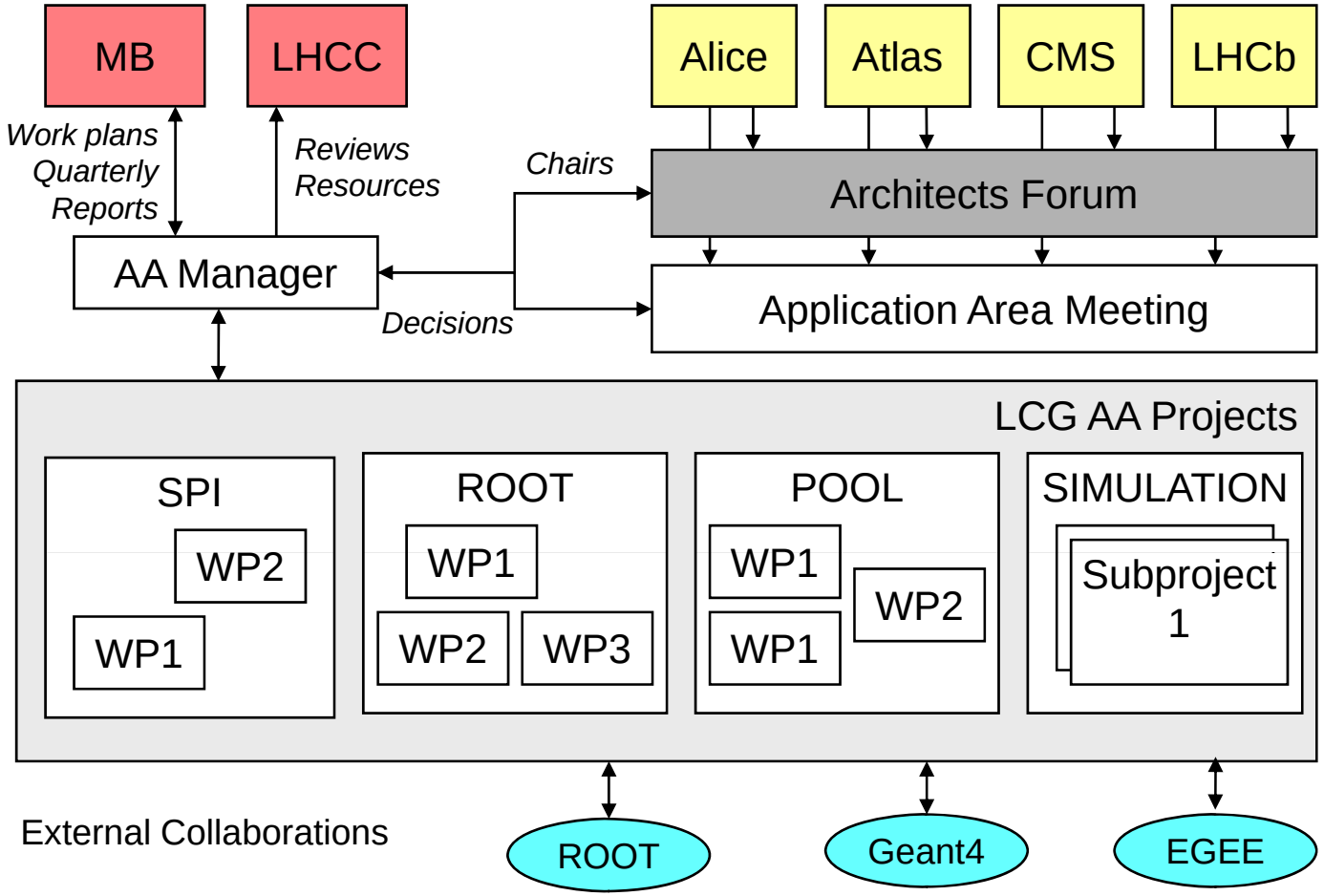
LCG-LHCC Referees Meeting

July 2 2007

P. Mato/CERN

Contents:

AA Organization



AA Projects

- SPI – Software process infrastructure (S. Roiser)
  - Software and development services: external libraries, savannah, software distribution, support for build, test, QA, etc.
- ROOT – Core Libraries and Services (R. Brun)
  - Foundation class libraries, math libraries, framework services, dictionaries, scripting, GUI, graphics, SEAL libraries, etc.
- POOL – Persistency Framework (D. Duellmann)
  - Storage manager, file catalogs, event collections, relational access layer, conditions database, etc.
- SIMU - Simulation project (G. Cosmo)
  - Simulation framework, physics validation studies, MC event generators, Garfield, participation in Geant4, Fluka.

SPI

- Project leader change
  - Andreas Pfeiffer moved to CMS and Stefan Roiser replaces him as SPI project leader
- Nightly build system
  - From AA internal review recommendation
  - Main goals
    - » to provide prompt feedback of integration and platform problems to AA developers
    - » to provide binary builds that the experiments can use directly from AFS to make test builds of experiment's applications
  - Projects had to adapt to CMT (build and configuration tool) and QmTest (test driver tool)
  - System is operational (build and test every day)
    - » 3 "slots" (latest development, bug fixes, tests)
    - » 7 "platforms" (architecture, OS , compiler, etc.) including Windows and MacOSX
  - Very useful for developers and for the release integration and validation

Nightly Build Status Page

Display Criteria

day: Wednesday slot: all project: all Browse

Wednesday Slot : dev ("preview") work going towards the next release

using LCGCMT-preview

Project	Version	slc3_ia32_gcc323_dbg (Wed Jun 27 05:48:36 2007)		slc4_ia32_gcc34 (Wed Jun 27 05:52:30 2007)		slc4_ia32_gcc34_dbg (Wed Jun 27 10:04:55 2007)		slc4_amd64_gcc34_dbg (Wed Jun 27 05:49:10 2007)		win32_vc (Wed Jun 2007)
ROOT	ROOT_today	build (17)	tests N/A	build (19)	tests (9)	build (18)	tests (7)	build (10)	tests N/A	build (21
SEAL	SEAL-preview	build	tests	build	tests (1)	build	tests (1)	build	tests	build (1
RELAX	RELAX-preview	build	tests	build	tests	build	tests	build	tests	build (1
CORAL	CORAL-preview	build (37)	tests	build (43)	tests	build (38)	tests	build (34)	tests (2)	build (1
COOL	COOL-preview	build	tests (3)	build	tests (3)	build	tests (4)	build	tests (3)	build (1
POOL	POOL-preview	build (47)	tests	build (44)	tests (1)	build (49)	tests (17)	build (48)	tests (2)	build (1
GAUDI	GAUDI_HEAD	build (9)	tests (22)	build (8)	tests (24)	build (8)	tests (22)	build (8)	tests (23)	build (1

SPI (2)

- External service
  - New versions of external packages are being made available in the external are on demand from the experiments
- HyperNews and Savannah
  - Both services are running successfully
  - Moving HN to more powerful servers in computing center
- Managing LCG Configurations
  - Regularly new configurations are decided by the AF and made available to the experiments

ROOT

- Two production releases per year
  - 5.14.00 (Dec 2006), 5.16.00 (Jun 2007)
  - A number of bug fix releases 5.14.00x in use by the experiments
- Progress in the CINT & Reflex merge
  - Slow progress taking longer than initially foreseen
  - The opportunity was taken to make more fundamental changes in CINT to support multi-threading
- Increased modularity
  - Repackaging of the core libraries to minimize the size of the ROOT executable module
  - The default root.exe went down from 56 MBytes virtual memory and 28 MBytes real memory to 17 and 7 MBytes respectively
- Extensions of the I/O library

ROOT (2)

- Developments in the GUI and remote client servers to
  - browse html pages containing ROOT files
  - execute one or more remote sessions and displaying the results on the client laptop
- Major developments in 2-D and 3-D graphics to visualize most 2-D and 3-D histograms with OpenGL
- Many developments in the MATH packages
  - introduction of the Unuran package for generating random numbers from multi-dimension distributions
  - several improvements and new classes in the vector package

PROOF

- Focus on providing the needed features for the ALICE analysis use cases in the CAF
- Major developments have been made in the areas of resource and priority scheduling
  - Resource scheduling takes care of assigning the nodes with enough free resources (CPU, memory) to PROOF jobs
    - » A prototype of resource scheduling has been delivered, but more work on the final solution is ongoing
  - Priority scheduling to assign users with different priorities has now been fully implemented
- The PROOF team has been working with some CMS US Tier 2 sites in setting up and running PROOF instances
  - The current PROOF feature set works for them at the moment
  - Most work is to make CMSSW work as "client" in the ROOT environment
- ATLAS is currently testing PROOF at BNL

POOL and CORAL

- Several releases of POOL and CORAL with significant functional extensions in particular on the database side
  - The LFC grid service can now be used to lookup database replicas in the grid environment and to control database access by grid certificate
  - Python interface for CORAL (in collaboration with RRCAT, India) allowing the experiments to directly access and manipulate database data in Oracle, MySQL, SQLight or FroNTier from their python environments
  - The list of build platforms has been extended to 64-bit SL4 and OSX
- The next major milestone will be to achieve full independence from the deprecated SEAL package
  - Simpler mechanism for loading component libraries for all Persistency Framework components and replacement for some utility classes
- Collecting requirements from CMS to support schema evolution for data stored via the POOL relational storage manager (C++ objects)
- Project will during the next months have to manage manpower replacements affecting a large fraction of the POOL and CORAL teams

COOL

- The Conditions Database (COOL) version 2.0.0 was released in January
  - New API for user payload specification and the port to the AMD64 architecture
- More recent version COOL 2.1.0, released in March
  - New 'tag locking' and 'dynamic replication' functionalities and examples on how to use the CORAL LFC Replica Service
  - Automatic builds, and tests against all supported backends (CMT and QmTest)
- Additional bug fixes and performance improvements are included in the latest April release COOL 2.1.1.
- Since then, ongoing developments are mainly concentrating on further performance optimizations

Generator Services

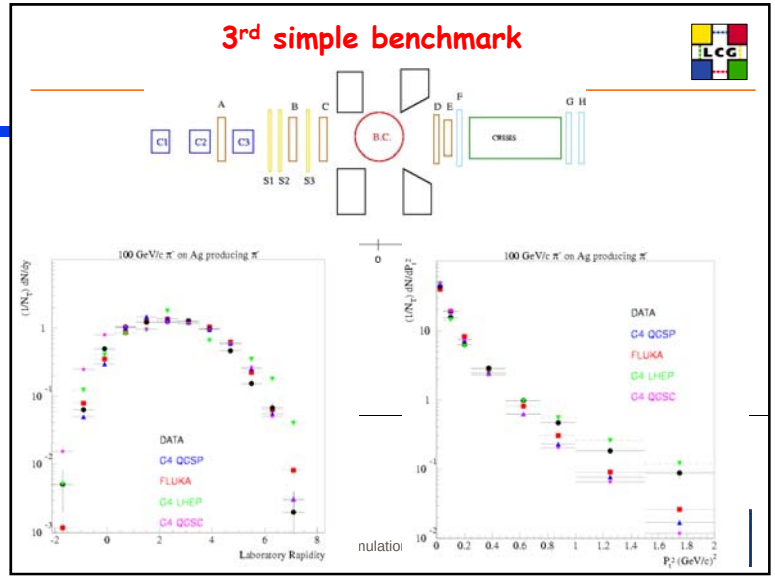
- New organization since October last year
  - Planning meetings twice per year with representatives of LHC experiments as well as generators authors
- New technical approach for the generators repository
  - move away from SCRAM, increase modularity, minimize changes in the original generators code
  - more focus on validation and testing
- Generators repository (GENSER)
  - 17 generators installed (34 versions in total)
  - Binaries for 3 platforms
  - new GENSER already used by experiments
- Generators validation
  - a number of new tests added
  - collaboration with Rivet (CEDAR) project

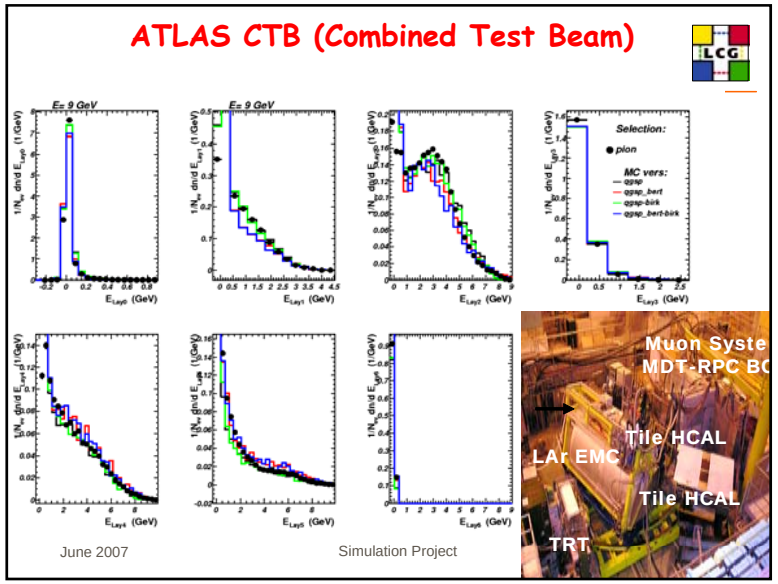
Generator Services (2)

- HepMC event record
  - package stable and used by experiments
  - standalone version (no dependency on CLHEP) ready to use
    - » all experiments plan to migrate by end of 2007
- Monte Carlo Data Base (MCDB)
  - system ready to use
  - no further development requested by experiments

Physics Validation

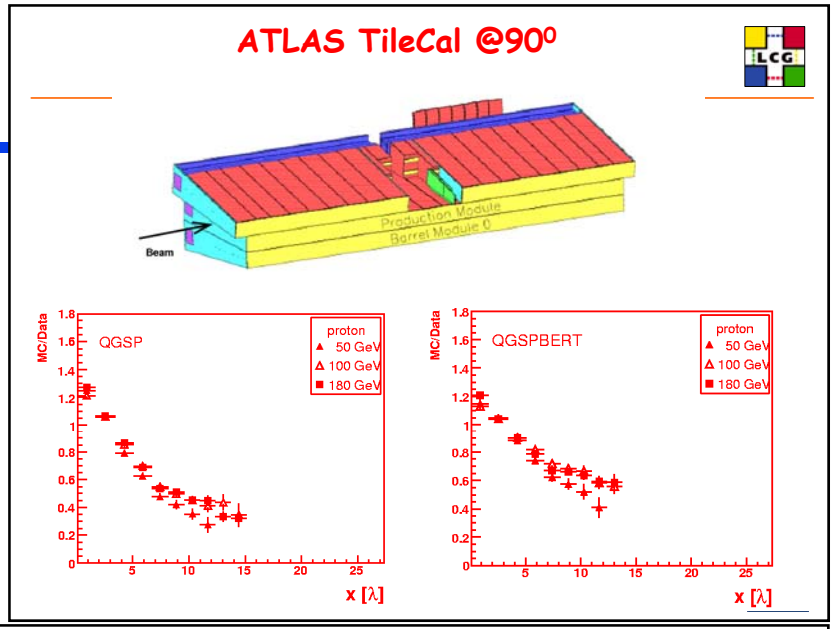
- Introduced third simple benchmark
  - 100 GeV/c pion+, pion-, kaon+, proton, and antiproton beams, or 320 GeV/c pion- beam, on thin target of Mg, Ag, Au
- ATLAS combined Test Beam, 2004
  - Comparisons between data and different Physics Lists of Geant4
  - Geant4 8.2.p01 version is used.

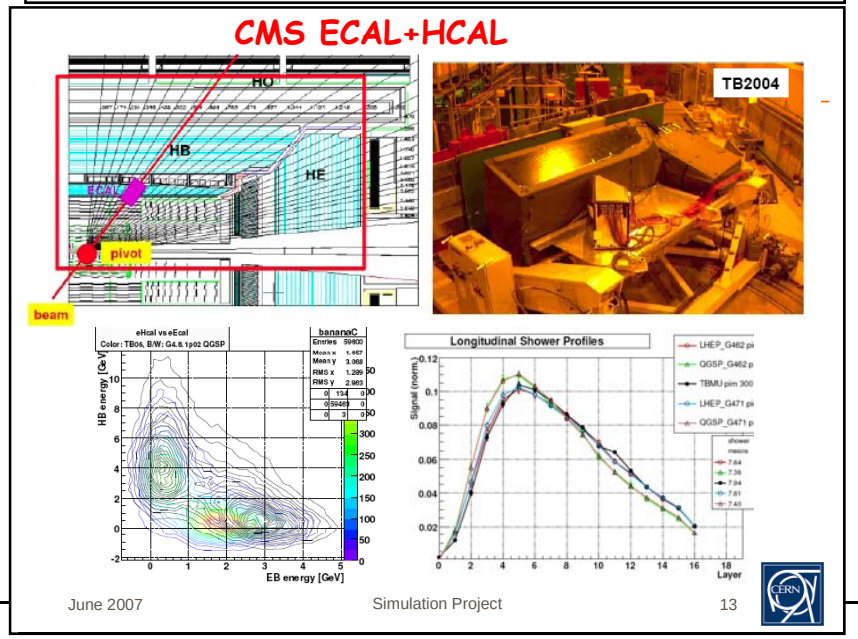




Physics Validation (2)

- ATLAS TileCal 2002 test-beam, in the 90 degrees configuration
  - Useful to study the shower profile for a very long calorimeter, about 20 lambdas
- CMS ECAL+HCAL test-beam (2004 and 2006)



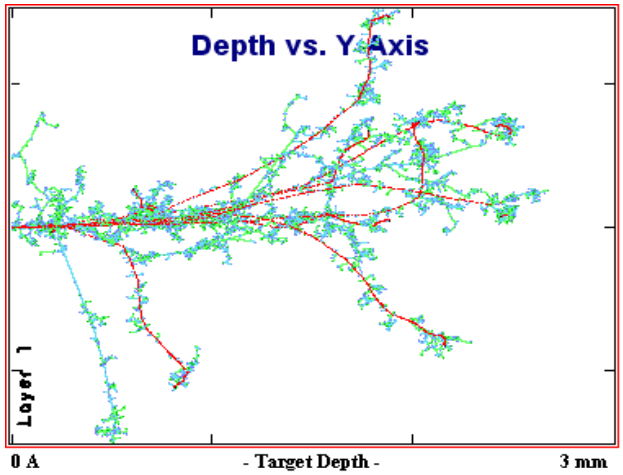


Geant4

- Geant4 8.3 (4th May 2007):
  - New Quasi-elastic channel, replacing part of cross section of QGS model (E>12 GeV)
    - » as G4 QGS only models deep inelastic interactions
  - Improved model for muon capture (in QGSC)
  - Significantly revised FTF model (diffractive string model)
- Geant4 9.0 (29th June 2007)
  - CPU improvement of few % from EM revision
  - New Error Propagation module
  - Extension of FTF model down to 4-5 GeV

Activation and Gas-based detectors

- Activation at LHC:
  - EM crystal:
    - » verification of decay chains;
  - CMS geometry:
    - » converted to run *entirely* within Fluka;
    - » Si updated;
  - 1st CMS application:
    - » beam conditions monitor, in progress.
- Gas-based detectors
  - SRIM interface: stopping nuclei
  - Running long Atlas jobs on GRID

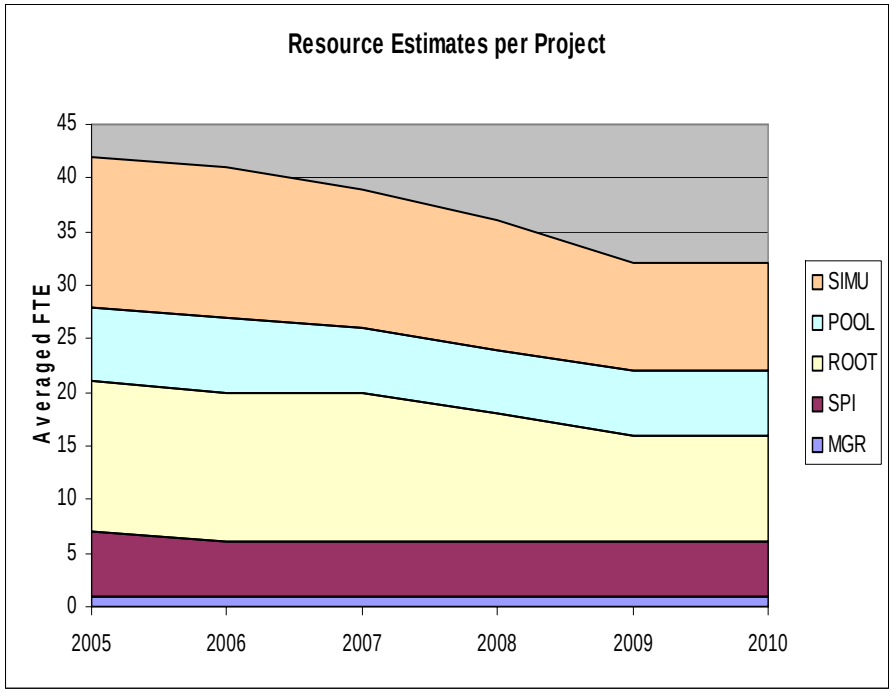


Applications Area and Grid Deployment

- Application software has a number of contact points with middleware or fabric software
  - File catalogues, mass storage interface, etc.
  - Client libraries of these packages are needed for building the AA software
- Communications improved very much between AA and GD
  - Permanent GD contact in Architects Forum meetings
  - Ad hoc meetings with GD, AA and Experiments to solve concrete problems
- The Grid client libraries has been installed in LCG external Area
  - ROOT and POOL plugins can be built using these libraries with full control on the versioning
  - Experiments can deploy them in case of necessity (newer versions)

Resources

- The level of resources has been maintained since last comprehensive review
- Reduction of manpower as anticipated for 2007
- Major reduction was expected in 2008
  - The recently approved extra founds will allow us to survive
- Need to cope with replacements of non-converted LD to IC



Summary

- The organization of the Applications Area is mature and works well
  - Detailed planning (e.g. scheduling bug fix releases, configuration changes, etc.) discussed and agreed at Architects Forum meetings
- Improved the coordination of software releases with other areas (middleware, deployment)
- The projects in AA has made substantial progress in many aspects
  - Only covered a fraction of them in this presentation
- Reduction of manpower as anticipated
  - The big worry about 2008 attenuated by recent approval of extra funds