
Status of GAUDI

Computing meeting at LHCb week

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Outline

- ◆ Architecture post review
 - US Trip report
 - ATLAS Architecture & LCB architecture working group
- ◆ Planning and status
 - Framework
 - Geant4
 - Event Model and I/O
 - Detector description
 - Visualization
 - Java Evaluation
- ◆ Summary

GAUDI Abroad

- ◆ Visited SLAC, FermiLab and BNL (16-20th August 1999)
 - Given a seminar about GAUDI architecture
 - Discussions with experts from: BABAR, ATLAS, D0, CDF, STAR
- ◆ The goals:
 - Receive feedback on the architecture and implementation choices
 - Know what others are doing
 - Get information on products that we can (re-)use
- ◆ Very well received in all places
- ◆ In general, the GAUDI architecture has been well appreciated



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SLAC

- ◆ The Babar architecture is not very different from ours
 - The same basic design choices (split of data & algorithms, transient & persistent, etc.)
 - Reverse temporal direction of data pointers (“new” points to “old”)
 - They do not use “smart pointers” for event data associations. The data needs to be loaded a priori.
- ◆ Their system in terms of numbers of packages is getting to the limit
- ◆ GAUDI feedback:
 - The concept of *Manipulator* between “Data” and “Algorithm” is needed.
 - Recommend use of *Decorators* to perform timing, debugging, testing,...
- ◆ How to control that the code conforms to the architecture?

FermiLab

- ◆ Presentations of D0 and CDF
- ◆ DO infrastructure software:
 - Flat structure of “data chunks”. Smart pointers.
 - Emphasis in a sophisticated “control framework” (controllers).
 - Persistency based on D0OM (DSPACK and CINT)
 - Data Analysis and Management (SAM).
- ◆ CDF Framework (AC++):
 - Based on Babar’s. Modules, sequences and paths.
 - Persistency based on ROOT I/O. Fortran support.
- ◆ GAUDI feedback:
 - Need a way to tag each piece of data which allowing to retrieve the value of all parameters that configured the algorithm. (RCP)
 - Something similar to SAM is also needed



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BNL

- ◆ The STAR framework:
 - It is mainly based on ROOT.
 - MySQL is used for configuration and catalog database
 - Pressed to get something running
- ◆ NOVA (Networked Object-Based EnVironment for Analysis)
 - Remote data access with versioning.
 - Ideas based on CORBA and WWW.
 - Similar idea of a converter (broker).
- ◆ GAUDI feedback:
 - Should not separate transient from persistent (ROOT view). Handling many converters could be a problem.

GAUDI at Home

- ◆ A lot of interest of ATLAS about GAUDI
 - Invited to present GAUDI to the Architecture Task Force
 - Lengthy discussions
 - Answering questions from the members
 - Comparisons of GAUDI with other alternatives
- ◆ Architecture working group for the preparation of the LCB workshop in Marseille.
 - Rapporteur presentation at workshop
 - Presentations and discussions of all known architectures
 - Discussions by topic



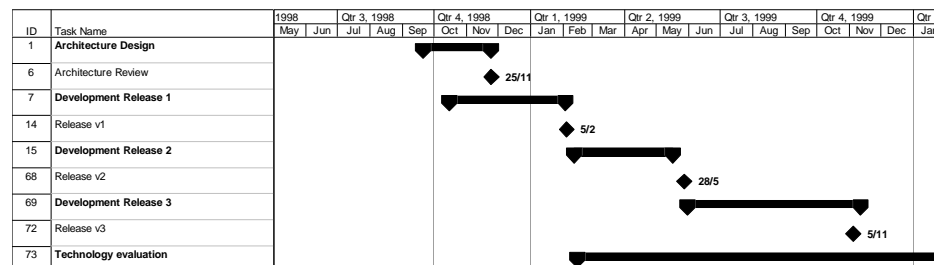
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GAUDI Planning

- ◆ Currently activities:
 - Development of the release 3 of the Framework
 - Integration of Geant4
 - Evaluation of Java



Framework

- ◆ Support for shareable libraries by *M. Frank & P. Mato*
 - The goal is simplification of usage of GAUDI
 - Dynamic loading of libraries. The concrete services, algorithms and converters will be selected at run time (typically using the JobOptions file)
 - The main program becomes trivial.
 - Configuration problem shifted from build time to run time.
- ◆ Histograms based on HTL by *P. Binko*
 - The histogram service has been re-implemented using the recently released HTL (Histogram Template Library) from LHC++.
 - The old functionality unchanged.
 - New type of histograms.



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Event Model and I/O

- ◆ Strategy for resolving event data links to support loading on demand by *M. Frank*
 - The strategy is to use “smart pointers”
 - When de-referenced the corresponding pointed object is loaded if not in the transient data store.
- ◆ The event model has been updated using “smart pointers” by *P. Binko*
- ◆ Added new classes for VELO clusters by *M. Boulianov*
- ◆ No yet decided interface and implementation of n-tuples

Detector Description

- ◆ Continuation on the work started in release 2
- ◆ Description of materials by *R. Chytracsek*
 - Elements, Isotopes and Mixtures
 - Transient and persistent models.
 - Persistent model based on text files (.cdf files like)
 - Sufficient for Geant3 and Geant4 descriptions
- ◆ Next priority is to model the geometry in general
 - Shapes, logical and physical volumes, etc.
 - System of reference. Transformations.
- ◆ For the next release the goal is to have a complete model of small detector.



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Visualization

- ◆ Integration of OPACS (Open Scientist) by *P. Maley & G. Barrand*
 - Simple event display based on OPACS
 - Implemented as a Display service, an Conversion service and a number of Converters.
 - Proof of concept.
 - Few problems to be solved. Working on UNIX only.
- ◆ Using XML and WIRED by *E. van Herwijnen*
 - Prototype of a Event display by producing XML with the event data and sending it to WIRED.

Geant4

- ◆ Rejuvenating Geant4 by *G. Gracia*
 - Adapting it to native STL, namespaces, etc.
 - Needed mainly for the NT platform
 - Contribution of LHCb to Geant4 collaboration
- ◆ Integrating Geant4 with GAUDI by *I. Belyaev*
 - Installation in Linux
 - Geant4 as a GAUDI service (Geant4Svc)
 - Providing and retrieving events and hits from the service
 - Crude example with the whole chain
 - It works



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Java Evaluation

- ◆ Conversion of GAUDI C++ code into Java by *S. Probst*
- ◆ The idea is to perform an evaluation of Java using more or less realistic code: a GAUDI application including a typical algorithm.
- ◆ Evaluation criteria
 - Performance
 - Easy of use
 - Identification of difficulties
 - Interface with C++. In particular with Geant4.
- ◆ Proof that the GAUDI architecture can also be implemented in Java.

Summary

- ◆ The GAUDI architecture is known and is scrutinized outside the LHCb collaboration.
- ◆ Visit to SLAC, FermiLab & BNL very positive
- ◆ Preparation of release 3 of the GAUDI framework
 - Shareable libraries, HTL histograms, improved event model, detector description, visualization, etc.
- ◆ Started work with Geant4
 - Adaptation to STL and namespaces
 - Integration with GAUDI. Small example to proof the concept.
- ◆ Evaluation of Java
 - Work started in August.

