Architecture TaskForce

Stephen Haywood (ATLAS/RAL)

- **Mandate**
- **Illustrations from Gaudi (LHCb)**
- **Meetings + Work Plan**
- **Key Areas + Output from ATF**
- **Report**

ATF

• Katsuya Amako (KEK)	GEANT4
• Laurent Chevalier (CEA)	Muons, F77 code
• Andrea Dell'Acqua (CERN)	Simulation
• Fabiola Gianotti (CERN)	Physics Coordinator
• Stephen Haywood (RAL)	Chair
• Norman McCubbin (RAL)	Computing Coordinator
• Helge Meinhard (CERN)	Former DIG
• David Quarrie (LBL)	BaBar Database
• RD Schaffer (LAL)	Database
• Marjorie Shapiro (LBL)	CDF S/w Coordinator
• Valerio Vercesi (Pavia)	Event Filter

- Ex officio: ATLAS Management

Mandate

The taskforce should specify the global architecture of ATLAS computing in a way that provides a unified execution framework for data access, reconstruction, simulation, analysis and event display.

It should allow as much as possible for partitioning of the s/w effort into institutional commitments,

and a database interface making ATLAS independent of database supplier.

Full attention should be given to implementations already carried out in previous and up-coming experiments to profit fully from efforts already made.

The suggested framework should handle wrapping of existing Fortran programs to ensure uninterrupted availability of a full ATLAS s/w chain, and gradual transformation to full C++/OO software.

A first version of the architecture document should be made available to the collaboration at the latest three months after the launch of the taskforce.

ATLAS needs a Direction. We must make Decisions. Don't have to be the best decisions, but they must be made and they must be good.

Our Understanding

A model for our work has been provided by Gaudi - from LHCb. Their designs are very abstract.

Architecture The Design of the Software - a piece of paper.

Framework "A collection of classes that provide a set of services for particular application domain; a framework thus provide a number of individual functionalities and mechanisms that the user can use or adapt to build an application software. Frameworks may actually be domain-neutral, meaning that they apply to a wide variety of applications." (*Booch* ≈ *Gamma*). A Framework enables the realisation of the core features of the Architecture in code.

In particular, Global Architecture: the general structure of the Software, with special attention to common aspects (services) required by all Domains - the Infrastructure.

While the Architecture is independent of the implementation, the Framework will not be, for example consider Persistency Mechanism.

In addition, the Community is looking for suggestions and decisions related to code development - a large remit (QC Group).

We would like to produce a Report by end-October which contains our "Vision", in particular, the outline of the proposed Architecture. Inevitably, this will leave some issues unresolved and will require continued studies / prototyping.

Then the Framework will need to be implemented. Hope it could be ready for use by Easter 2000. With the Infrastructure sketched out, it will be appropriate to look at the Design of the individual Domains (can start earlier).

Meetings

ATF Meeting #1

- Mandate, Aims, Time-scales
- First thoughts of ATF
- Decisions proposed by DIG Working Group
- How to proceed

ATF Meeting #2

- Gaudi - Harvey + Mato
- Use-cases
- Standard Libraries
- Prototyping for the Subsystems

ATF Meeting #3

- Event Filter and DAQ
- Architecture: CDF + BaBar
- Event Data Model: CDF, BaBar, D0 - Marc Paterno
- (Graphics - Hrivnac)

ATF Meeting #4

- Object Networks - Tuura
- ATLAS EDM, Data Model + Dbase
- Comparison between Gaudi + AC++
- Work Plan

Key Observations

- Separate Data and Algorithms - Data Objects are passed between Algorithms.
- Separate Persistent (stored) Data and Transient Data (used by Algorithms) - given in Mandate.
- The 'Event' Class (and Event Data Model) are vitally important.
- Use-cases essential to understand Community's needs, stimulate Design process and test it.
- Consideration of Event Filter needs.
- Possibility of migration to Java.
- Value of Scripting Languages to create Applications.
- Need a Working Group with a Chief Architect when ATF finish.
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- (Dbase, Detector Model)

Work Plan

Examination of existing designs has helped clarify issues and provided useful pointers.

Now:

- Interact with Users; collect Use-cases (started).
- Pursue OO Analysis / Design.
- Compare our Architecture Design with those produced by other groups.
- → Design.
- → Implementation.
- → Iteration.

This work will be spear-headed by Katsuya with support from Andrea, Laurent, RD, Valerio and hopefully David Rousseau and Craig Tull.

See Katsuya's talk.

Control (≈ Application Manager ~ steering) has been identified as a critical area. LBL group will look will prototype and compare Object Networks with more traditional approaches (Gaudi, AC++).

Output So Far

Standard Libraries

Basic Classes: For collections, iterators, algorithms, strings, iostreams, function objects, adaptors.

Propose Standard C++ Library.

HEP specific Class Library: For random numbers, vectors etc, units.

Propose CLHEP.

Numerical Calculations

Propose NAG C and Gemini.

Prototyping for Reconstruction/Simulation

Short-term, NOT *the* ATLAS Framework. For testing Subsystem Code.

Not our main objective ... but cannot leave Community in limbo.

Simulation: use CHAOS - Andrea dell'Acqua

Reconstruction: use PASO - see David Candlin's talk

- Derived from TestEvent / GetGraphicsEvent (Schaffer / Hrivnac)
- Provide something quick with minimal functionality
- Allows Reconstruction Team to play and understand their needs

(Helge will oversee this project.)

Report

1. Workings of ATF
2. Architecture Proposal.
   Will try to come to Decisions, but may need to set out alternatives, stimulating further study, in particular, Prototyping.
3. Associated Guidelines to provide a clear direction.
   For example: Libraries, Tools, ...
4. - Set scene for identification of Work Packages.

The Report must provide a "vision" which all Collaborators can embrace - therefore it must be explained in language which is intelligible to Physicists. For example, should illustrate the Architecture with specific examples corresponding to Objects identified by Analysis of Use-cases.

It is equally important that it must contain substance which will create a solid foundation for the ATLAS Software.

The work of the ATF will need to be pursued by a Working Group committed to developing the Design and Implementing it.

... and Finally

We have a lot to do and a lot to digest, but feedback from the Community is valuable and welcome.

However, note that our focus is on the Infrastructure.