Physics and Detector Simulations

A First Look at Geant4 for
LCD Full Simulations

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Full Simulations

Detailed, realistic descriptions of the detector elements.

  Including support material, cracks, etc.

Complete accounting of physics processes, track swimming, particle showering, etc.

Essential for detector development and derivation of fast simulation parameterizations.

Full Simulations

LCD Full Sim BRAHMS JIM

GISMO GEANT3 GEANT3

C++ FORTRAN FORTRAN

Common GEANT4

Object-Oriented

Approach

Geant4

+ Will become the de facto standard, supplanting Geant3.
  +Will have a large user base.
  +Will be debugged by many communities
  +Will have centralized support

- Not yet ready for prime time
  - Not many experiments using it yet
  - Has not been certified, to my knowledge

Current Status

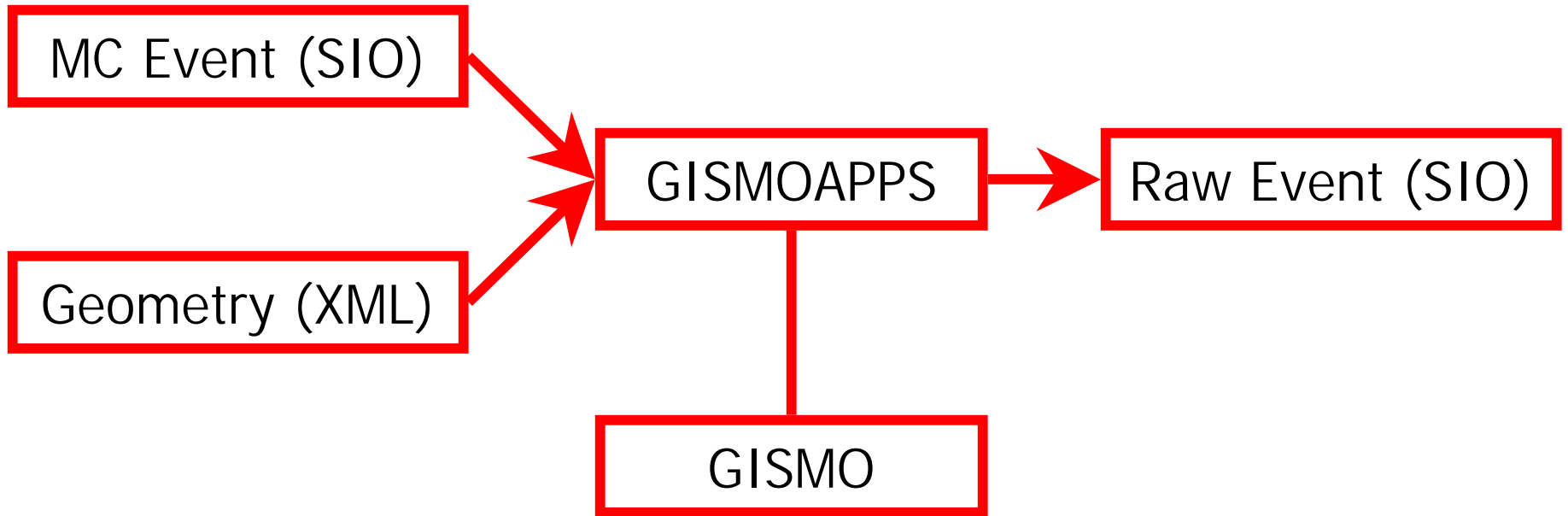The LCD full simulation is currently undertaken within the GISMO framework.

Adopted before Geant4 was available.

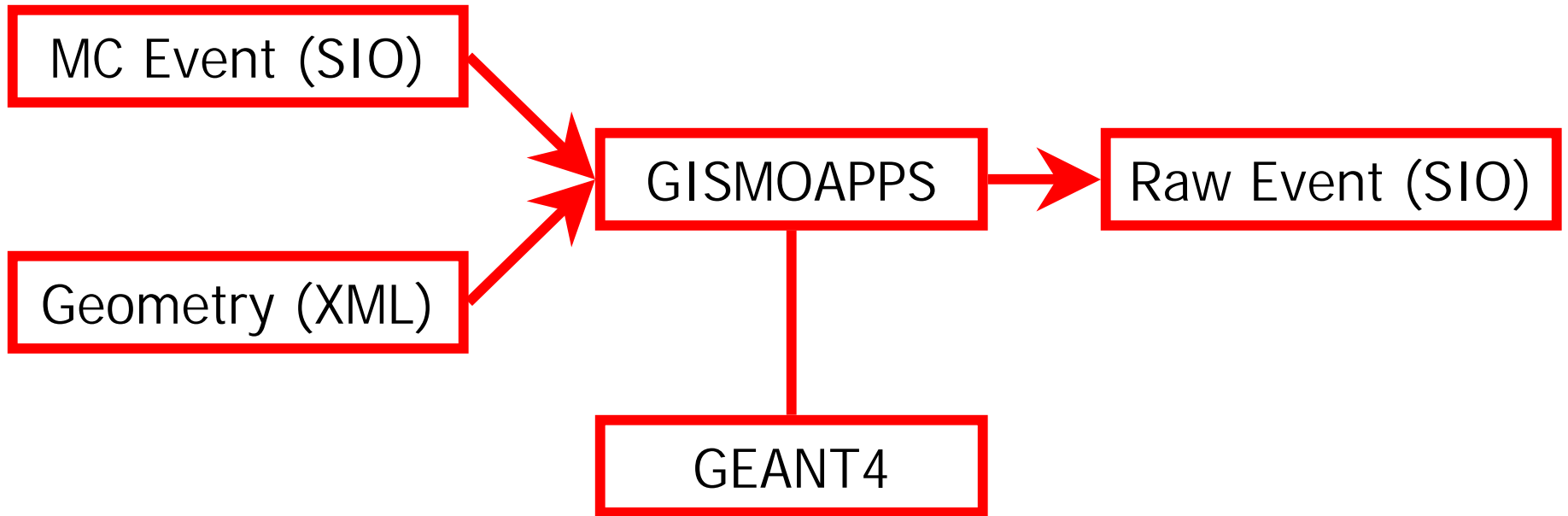Adequate for current needs, but not a long-term solution.

No longer supported.

Would like to collaborate with other Linear Collider groups

LCD Full Simulation Overview

LCD Full Simulation Plan

Development Environment +

Microsoft's Visual C++ Integrated Development Environment (IDE) provides a very user-friendly framework in which to develop code.

Editor
Compiler
Debugger   Fully Integrated
Profiler
Memory Leak Checker

Most-used development platform for C++

Development Environment -

Compiler lacks several features, making it standards non-compliant.

But I don't know of any fully compliant compiler.

It's a Microsoft product, therefore anathema to physicists.

Although claimed to be a supported GEANT4 framework, in reality it takes a lot of work.

Geant4 on NT

Prescription is:

1. **Make your NT platform look like UNIX.**
   Install CYGWIN and associated products
2. **Follow the UNIX install procedure.**
   Modify and run the makefiles

As most physicist-generated documentation, it is terse, not always commensurate, and often out-of-date.

Geant4 on NT

Very few developers using Geant4/NT

Even though supported in principle, in practice difficult to find expertise

Not always up-to-date

Current release does not fully compile under VC++ 6.0

Default visualization (OpenGL) not ported yet.

Need to rely on other products.

Geant4 and MSVC++

Geant4 is not supported within MSVC++

Use command-line environment with make.

Plan to generate libraries using cygwin environment and makefiles once, in a central, controlled location.

Distribute libraries and include files.

Generate and distribute VC++ workspaces and project files, within which development will take place.

Geant4 Distribution

CMT allows project files and makefiles to be generated for target platforms from a common list of requirements.

LCD does not currently utilize CMT.

Might be a good test case, providing experience for the possible later use for simulation and reconstruction code.

Good opportunity to collaborate with GLAST.

Current Status

Geant4 libraries built and include files collected into central location.

Workspace and Project files built for the novice examples.

Currently resident on Z disk, being tried by two alpha testers.

Ryan Smith   LCD

Thomas Lindner   GLAST

Current Status

Ryan is investigating how much of the current GISMOApps thin-layer of code can be preserved.

Will be investigating approaches taken by the JLC and TESLA collaborations.

Will attempt to arrive at a common solution to the GEANT4 interface.

Trial licenses being obtained to get visualization tools.

Absolutely critical for development!

Other Users

BaBar uses only UNIX.

GLAST is also migrating from GISMO to GEANT4, plan to keep in touch with their efforts if not outright collaboration.