slic:
Status and Plans

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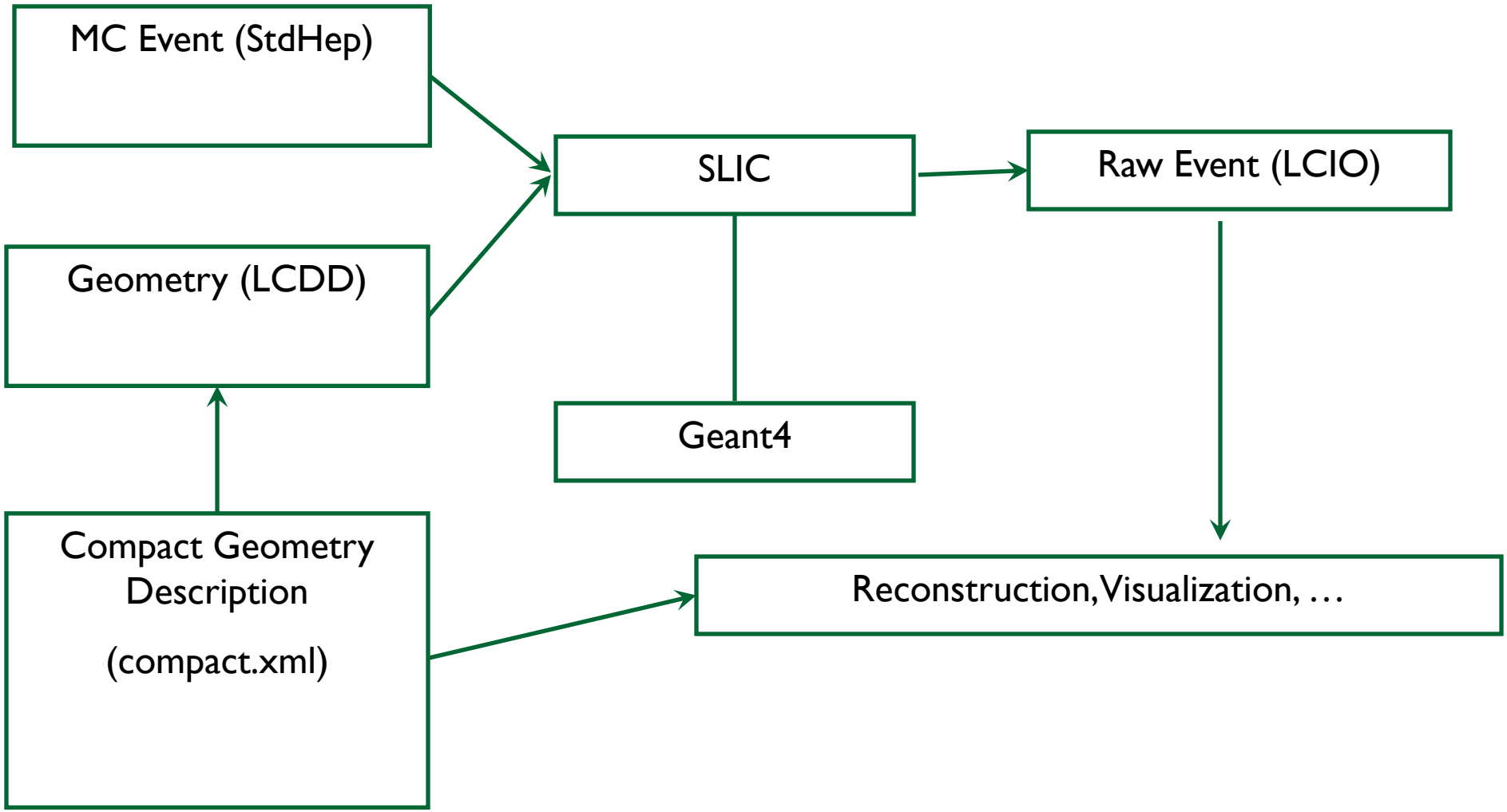
LC Detector Full Simulation



slic

- Simulator for the LInear Collider
- Full detector simulation
  - 4π collider detectors
  - test beams
  - other custom detector setups
- Integration
  - Geant4
  - GDML / LCDD
  - HEP PDT
  - LCIO
  - StdHep
- Minimal runtime dependencies
  - No database
  - No user code for geometry description

Recent Features

- Full 3D magnetic field map support
  - Grid => (x, y, z, Bx, By, Bz)
- Option to store step information for all energy depositions in CalorimeterHits.
  - Turn on via macro option.
  - Useful for detailed analysis of detector reponse
- Z smearing of generated event vertices
  - Gaussian smearing
- Geant4 version was updated to 9.5.1

SimDist

- Since compiling SLIC from scratch is complicated, a build kit is provided.
- Based on well-worn and understood GNU tools
  - Autoconf, Make, GCC, etc.
- Works on many flavors of Linux, OSX
  - Windows support is deprecated.
- Options for different run modes
  - visualization
  - debugging
  - batch
- Binaries distributed on lcsim.org

lcdd and GDML

- XML geometry description
  - avoid completely user-defined geometry in code
- GDML
  - constants and definitions
  - materials
  - shapes
  - volumes
  - hierarchical geometry structure
- LCDD
  - sensitive detectors
  - identifiers
  - magnetic fields
  - visualization
  - physics limits
  - regions

GeomConverter

- LCDD is too low-level for most users to hand code.
- Compact description provided for writing a high-level description of the geometry.
  - detector names, number of layers, layer thicknesses/materials, readout identifiers, B-fields
- Java program converts from compact to different formats.
  - LCDD
  - HepRep
  - Runtime Geometry (Java objects)
  - XML for Pandora
  - HTML
  - SVG (experimental)
- Focus on data formats as different applications have different required levels of detail
- Data interchange

Short-term Plans

- Implement “position sensitive” Sensitive Detector for calorimeter cells
  - handle charge-sharing, cross-talk in RPC
  - handle non-uniformity of response for scintillators
- Implement "black hole" (in)sensitive detector to kill tracking of particles outside of timing window or leaving detector.
- Dual-readout calorimetry
  - implement optical properties within compact → lcdd
  - implement optical readout (scintillation & cherenkov) sensitive detectors
  - implement fast dual readout calorimeter simulation
- Additional Sensitive Detector types as needed.

Longer-term

- Support compact → lcdd pathway for additional detector types.
  - e.g. recently implemented pointing crystal calorimeter array for HPS Ecal and scintillator hodoscope array for HPS muon system.
  - implemented tapered endcap calorimeters to support MuC detectors with tungsten shielding cone
- Implement “parallel geometry” to model complicated detector regions
  - e.g. cryo chimney in flux-return iron
- Implement improved handling of magnetic fields
  - caching or results with region of validity
  - polynomial decomposition of field values

Detector Description

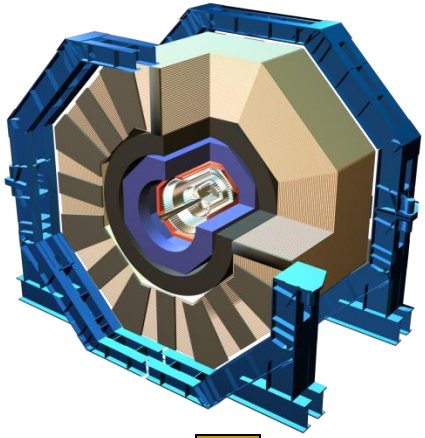
- lcdd completely encapsulates the detector description.
- Currently provide a compact.xml description from which one can build the full Geant4 environment
- Can generate lcdd however you want, but it is complicated, prone to errors and does not connect to reconstruction, etc.
- Can also be augmented by inclusion of ~arbitrary gdml snippets e.g. for complex geometry
  - mesh2gdml provides access to CAD geometries
- However, this breaks binding to reconstruction, visualization, etc.
- Do not want to give up single point of geometry!

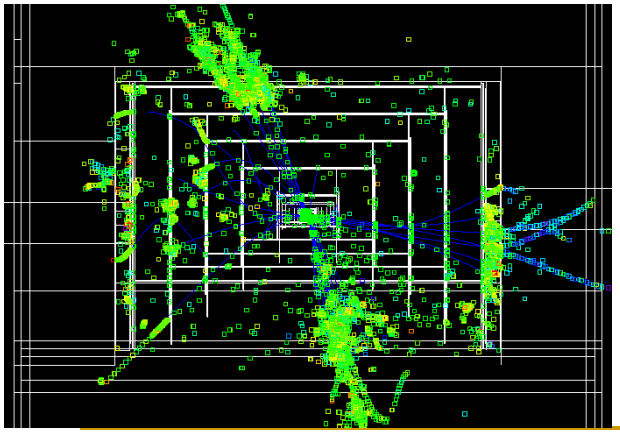
slic going forward

- Believe that slic + GeomConverter provide a viable solution for LC full detector simulations
- System was designed to be flexible to support detector optimizations via easy construction of many detectors.
- Current detector types are somewhat simplified
  - due to lack of support manpower, not to any intrinsic limitations in the system
- Support for the level of detail in the Mokka model of ILD would require significant effort, but believe it would be worthwhile to explore.

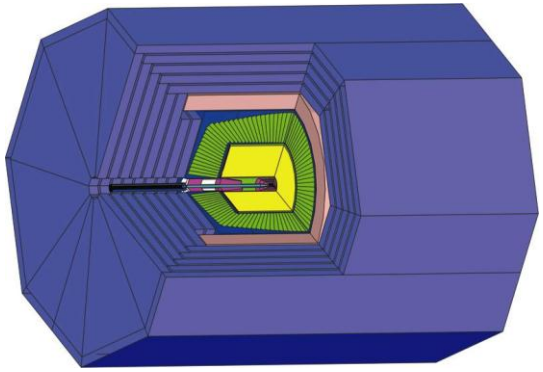
ILC Detector Concepts

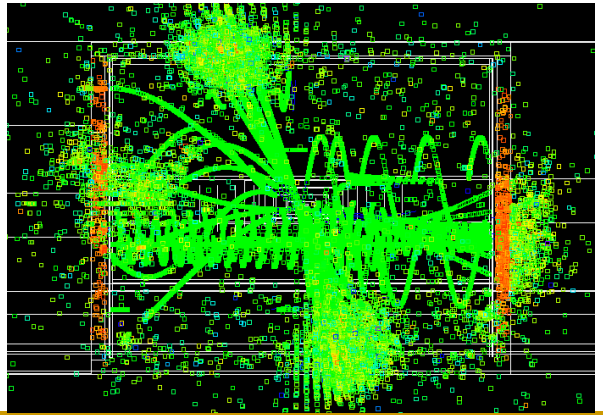
SiD





GLD





LDC