Detector SimOOlation activities in ATLAS

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Aims of the CHAOS project

- Exploit Geant4 :)
- OO Analysis, design and implementation of the future Atlas detector simulation facilities
- Embark new people:
  - on Geant4
  - on C++
  - on OO

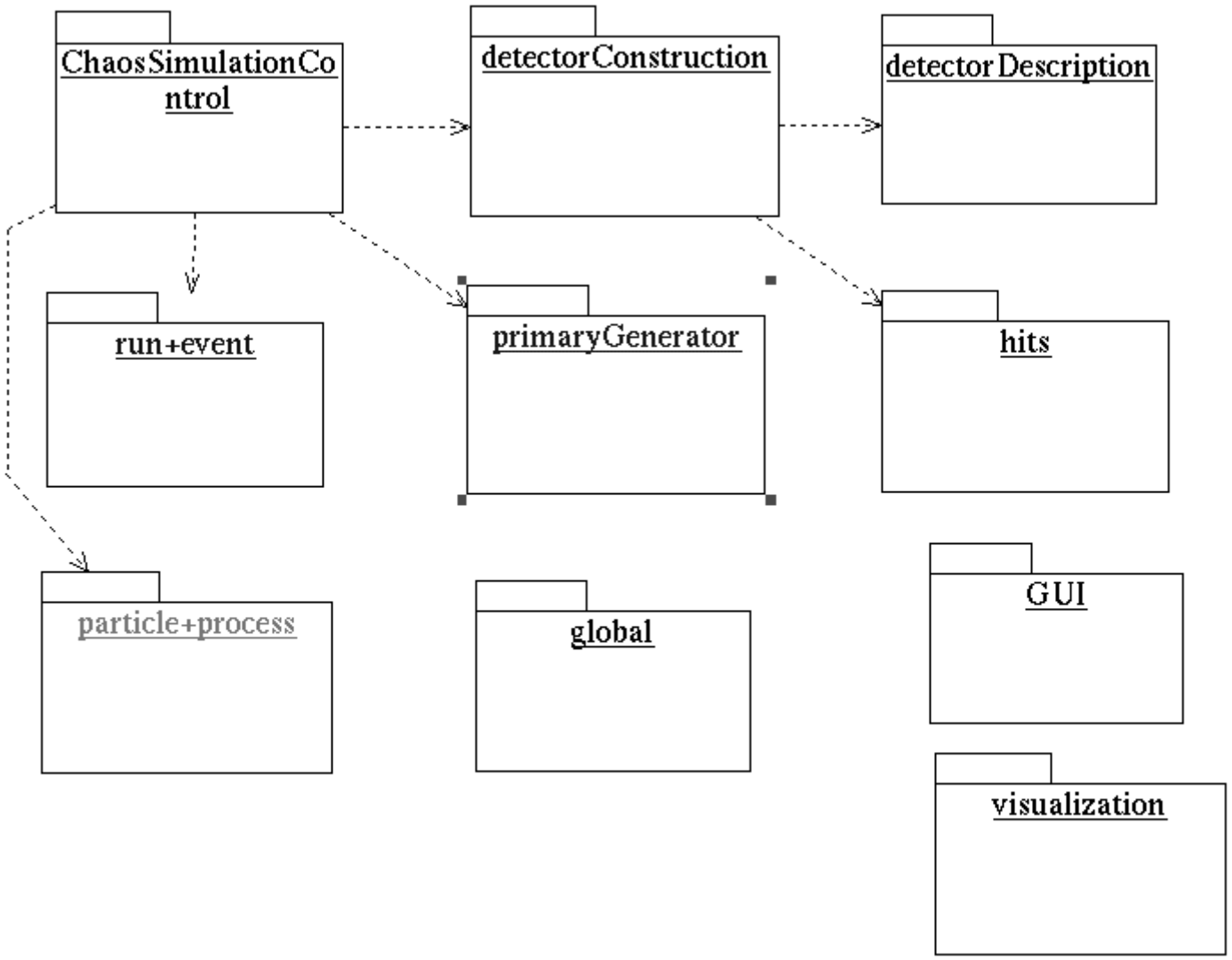
Is there order in Chaos?

- Start with a core group
  - former Geant4 members, now working for ATLAS
  - follow a formal procedure (was it called software process?)
  - Categories, OO design, Implementation, iterate
- Prototypes
  - get people from the detector communities to work on their examples, make up experience
  - exploit Geant4 on a wide spectrum of activities
  - gradually introduce Chaos elements into people's programs
  - veer to OO

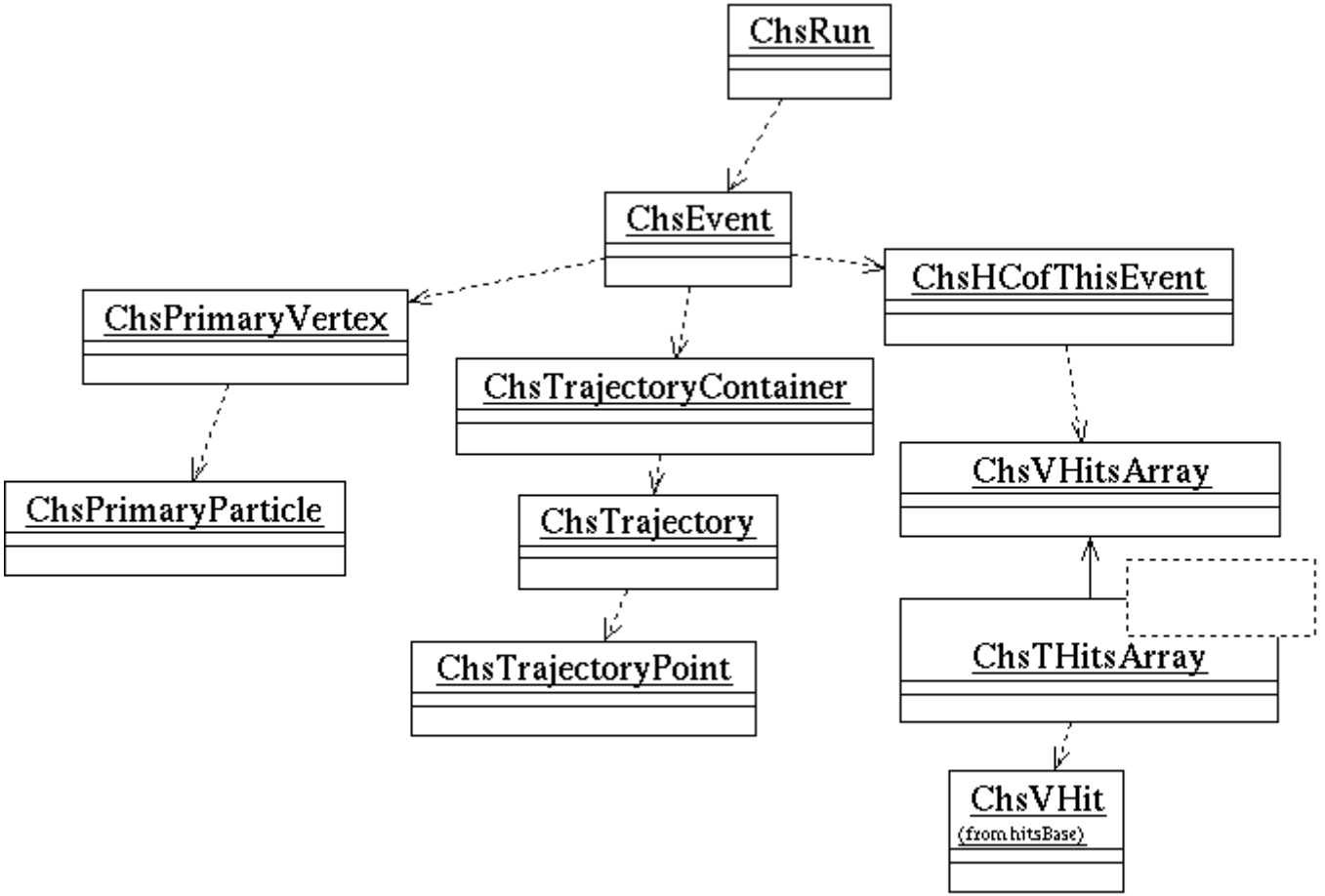
Is there order in Chaos? (2)

- Training programme
- Re-constitute a simulation group
- Merge things together into a simulation program which must at least have the same functionality as DICE
  - … and be maintainable
  - … that we can develop
  - … which works a bit better

CHAOS categories



CHAOS design

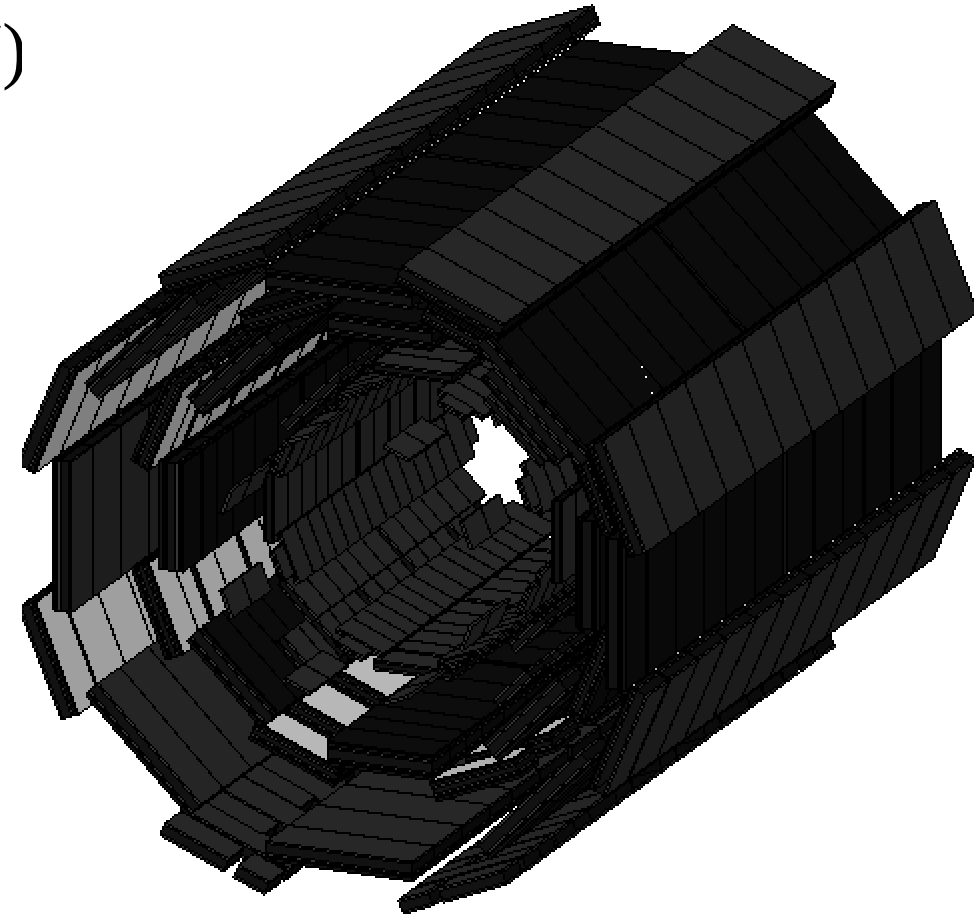


Prototyping

- Working practically on all sub-detector systems
- Exploiting new Geant4 features
- Finding bugs and problems
- Setting up test beam simulation facilities

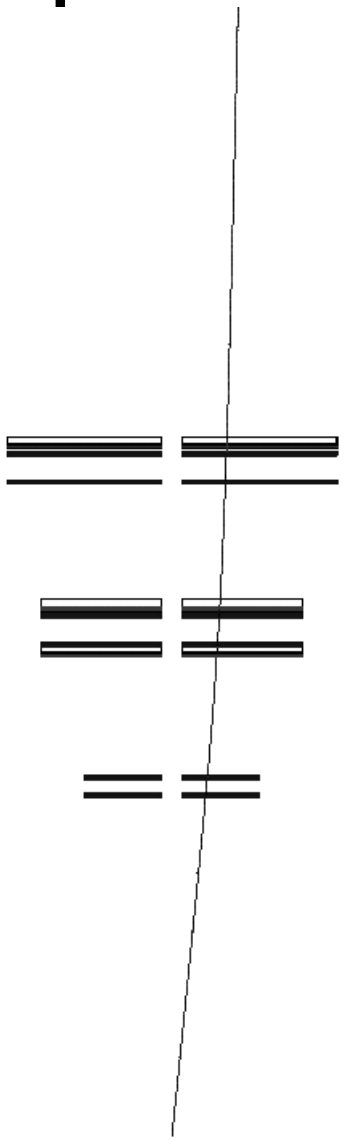
Muon system

- by A. Rimoldi (Pavia/CERN)
- Big chunk of the whole detector
- Detector description (from AMDB)
- Integration of the ATLAS field classes (from L.Chevalier)
- Tracking in magnetic field



Are muon chambers transparent?

- A bug in G4 has been stopping us for some time
  - muons were not going through the muon chambers
  - finally traced to a typo in a coordinate transformation
- now using a non-standard, fixed version of Geant4
- potential problems with the magnetic field

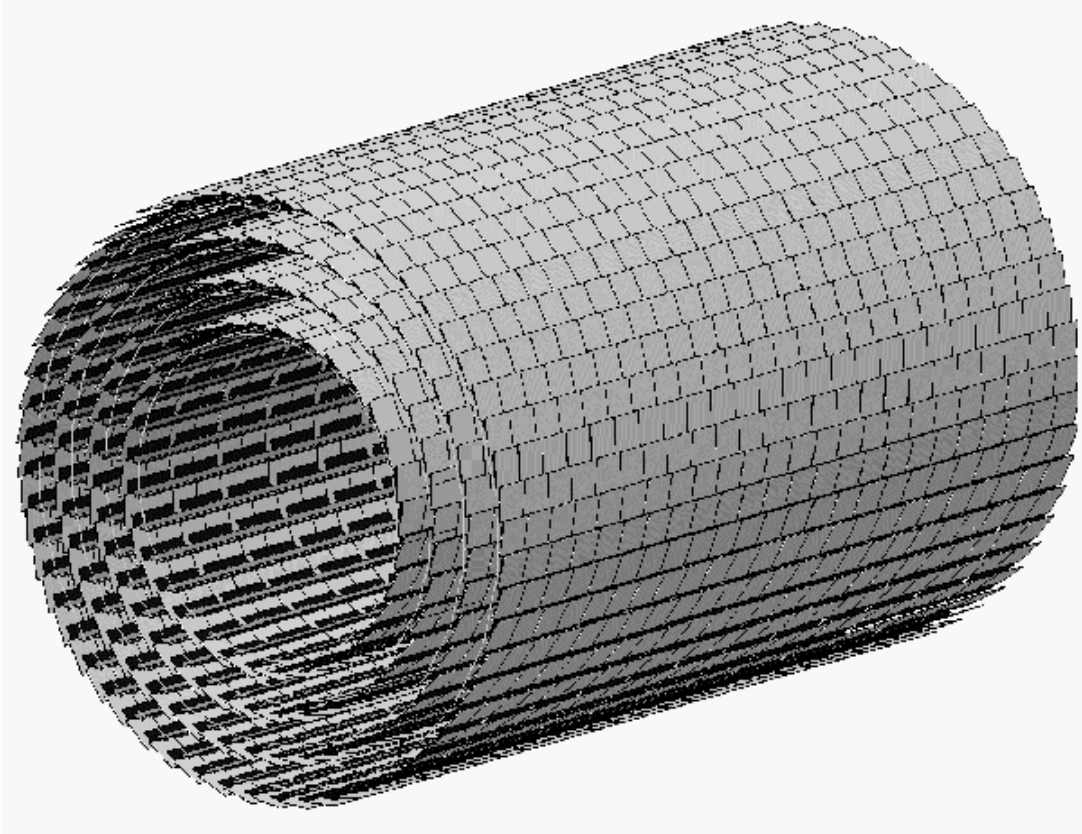


Muon system (2)

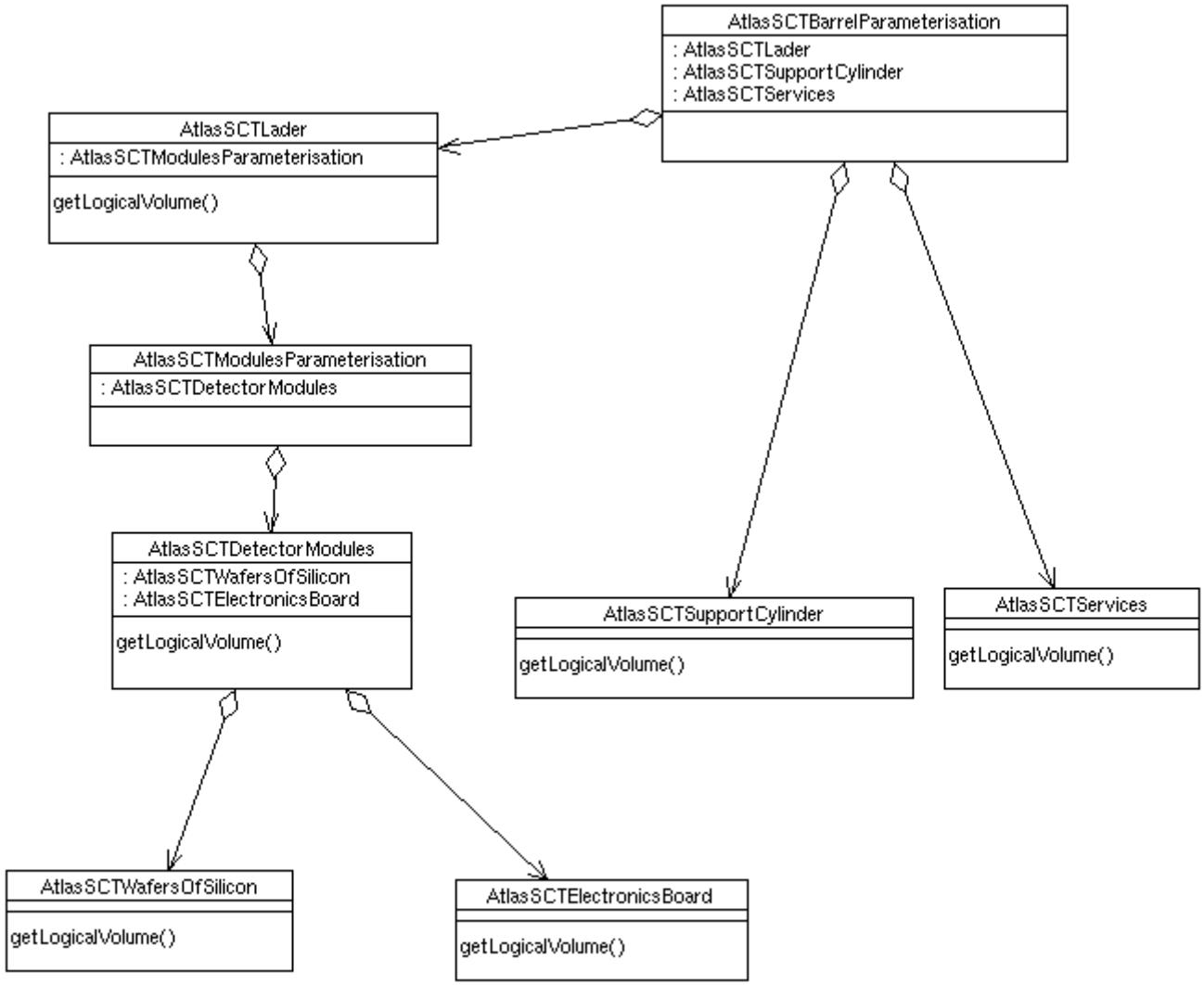
- Geometry almost complete (no TGCs yet, toroids being worked on)
- Hits being implemented
- Try RD Schaffer's Detector Description Scheme (whenever ready)
- Implement direct reading of AMDB
- Acceptance studies
- Interface to the reconstruction (medium term)

Silicon tracker

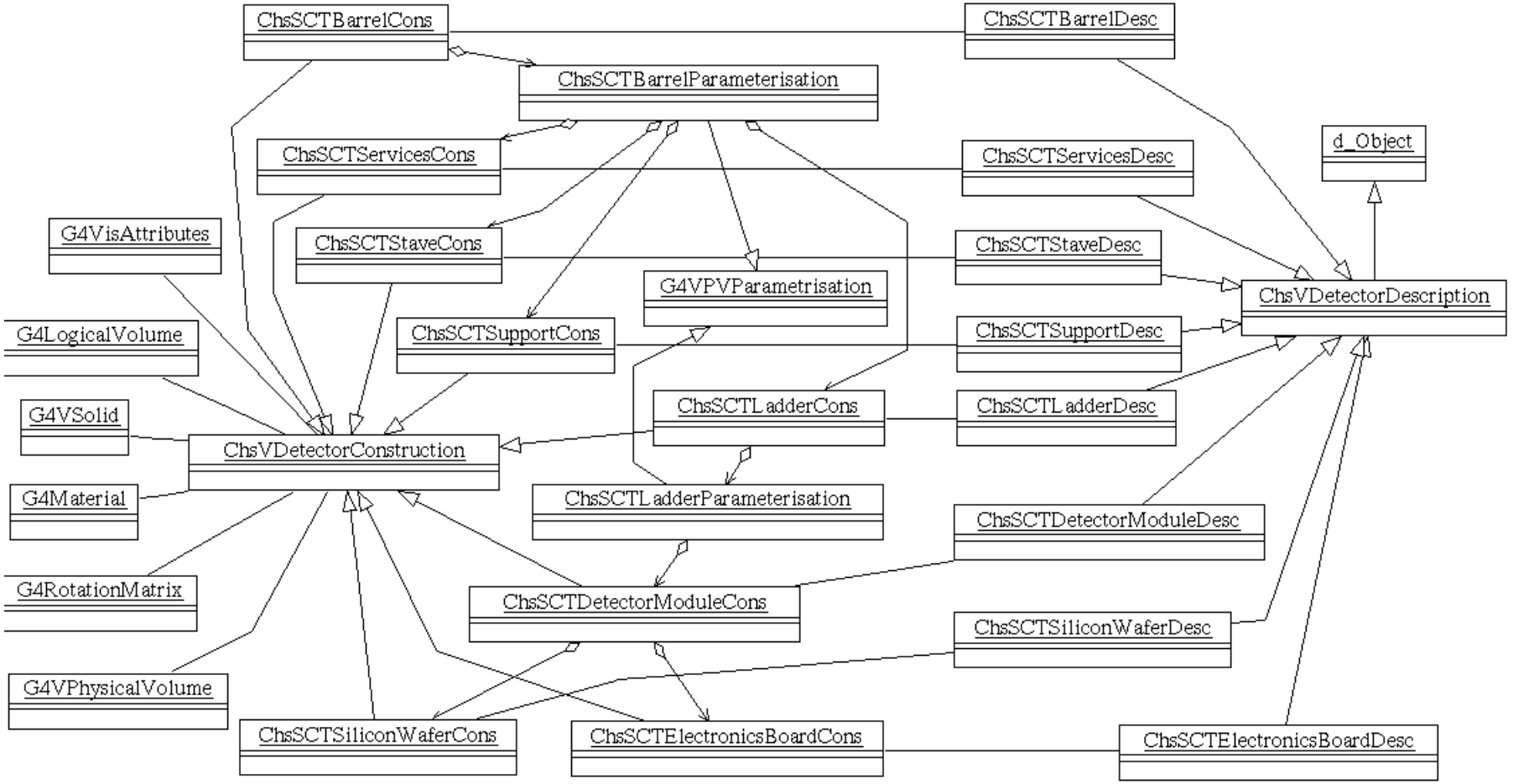
- by Makoto Asai (Hiroshima)
- Following a formal approach (OO design)
- Exploiting G4 parameterisation to its limits



Silicon tracker design

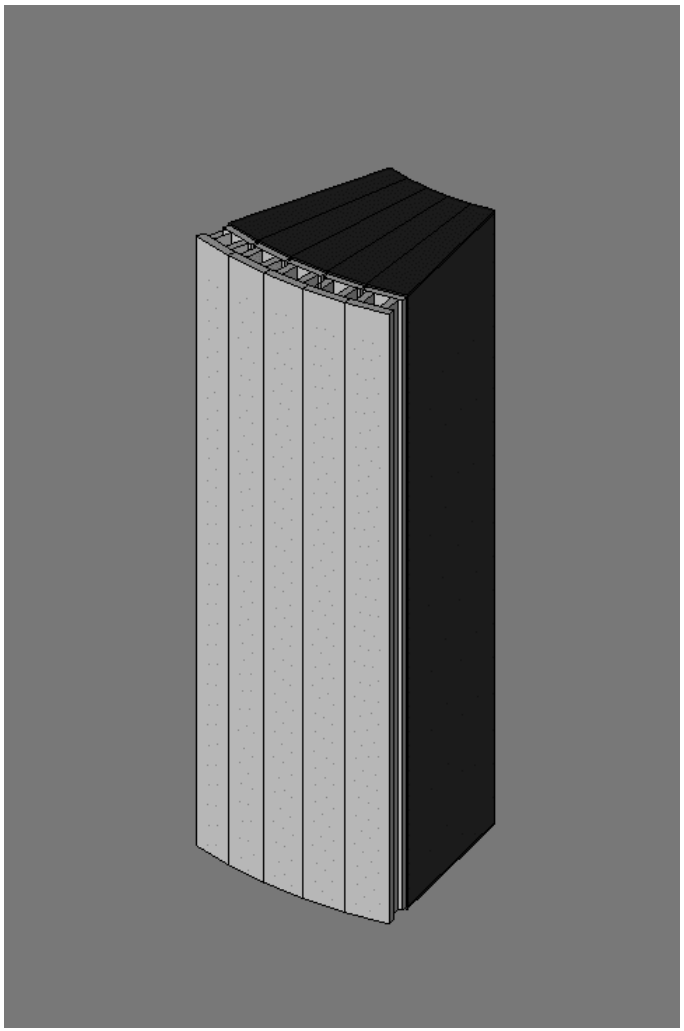


… but life is tough (sometimes)



Tile calorimeter

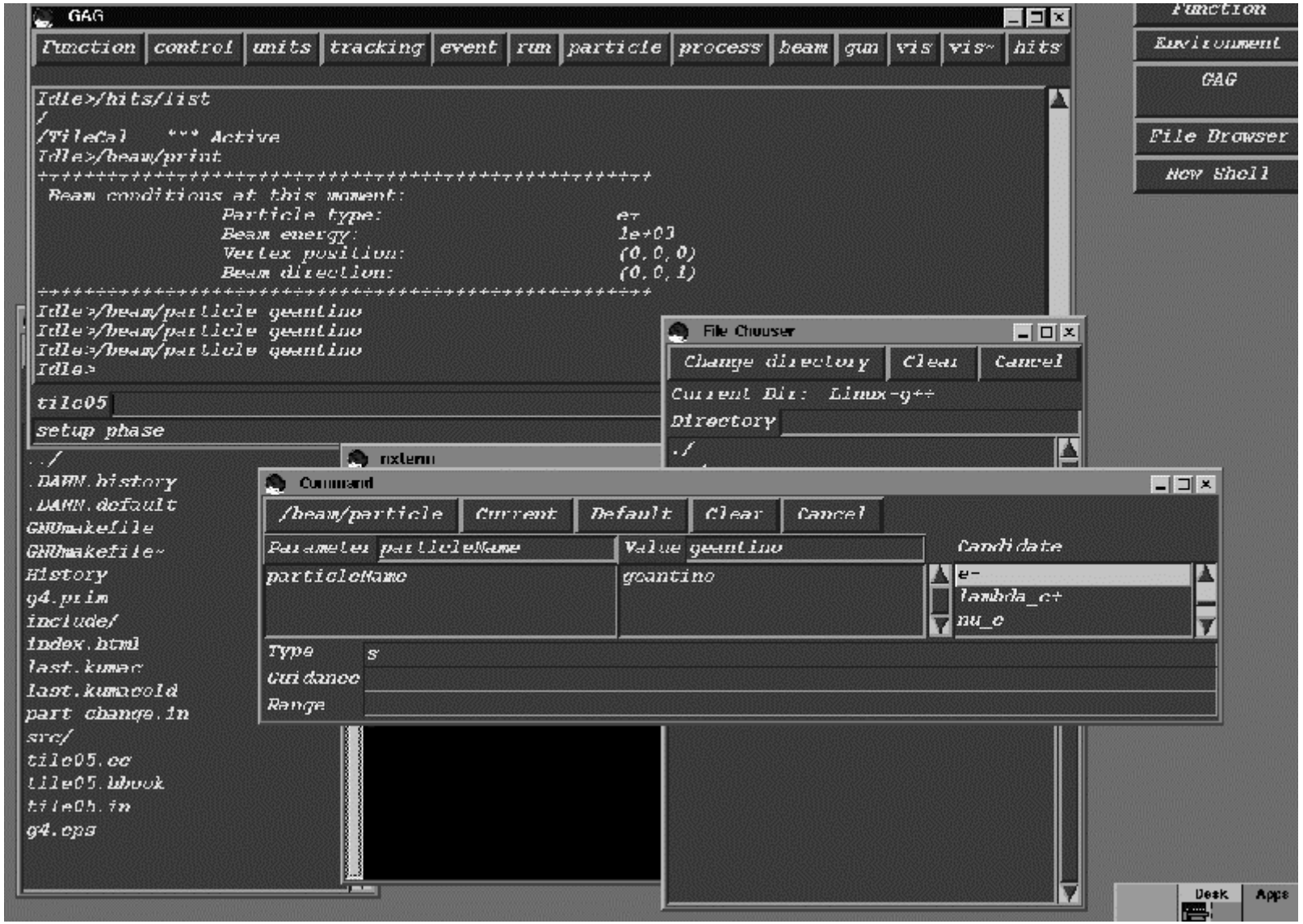
- Code written for the Tile G4 course
  - not very well structured
  - somewhat simplified geometry
  - missing facilities
- Now being transformed into the module-0 testbeam simulation program



Tile Calorimeter (2)

- Have been running the program intensively in the last couple of months
  - lots of problems with Geant4
  - am I cursed or what?
- Adding Hits, Digits, N-tuple facilities etc…
- G4 framework, MOMO GUI, some Chaos add-ons
- To be released asap
  - Vs. 00.-01
  - to be confronted with the existing G3 simulation program
  - Start improving it...

Tile/Module0 and MOMO



… and more

- Maya and co. working on TRT simulation
  - New TR facilities in G4
  - Test beam setup (actually producing results)
  - Parameterised physics
- Rachid Mazini working on Hadron Endcap and forward calorimeter
  - comparison with test beams
  - Full geometry
- Hisaya Kurasige working on TGCs
  - trigger simulation

What are we missing?

- er… the EM calorimeters, of course…
  - the (two) tricks we were using for building the accordion geometry in DICE would not work in G4
  - we must explore new routes (boolean operations between solids, parameterised geometries) and see if they are suitable (essentially in terms of performance)
  - ask for new concepts to be implemented in G4 asap (“capsule”)
- We badly need people from the EM community

Training

- First course on G4 given on Feb. 16th-19th
  - 3.5 days
  - Limited to the Tile community
  - ~20 people (a couple of “outsiders”)
  - Examples tailored on the tile calorimeter
  - no C++, OOA&D experience requested
- Rather positive feedback
  - the course was too short!!!
- Loads of experience gathered by the teacher (yours truly…)

Training (2)

- Second course will take place at CERN at the end of June
  - Organized by A. Rimoldi for the Muon community
  - Open to Inner Detector people
  - List of participants is filling up
- More general examples (still tailored on the audience, though)
- Aiming for a 5-day course this time
- Other courses will be given (on request!)

Future plans

- All bits and pieces are falling in place (IMHO)
- we can start assembling a mock-up geometry for the whole detector quite soon
- we must push for more test beam simulations (that’s where the physics models will be exploited)
- we must give Lassi Tuura’s Component Model a try
- we must set up a web page (mea culpa…)

Future plans (2)

- Interface with other categories of the ATLAS OO software
  - Event, database
- Detector Description (and DDDB) is becoming out 1st priority!!!
  - Please, get the newly appointed coordinators to work on this very item!!!
- Work on generators (fortran wrapping) needed, changes in TruthEvent
- Hope to have a simulation Jamboree sometime in summer (with the new coordinators)