Status of the Geant4 simulation productions in ATLAS

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and…
The ATLAS simulation core team
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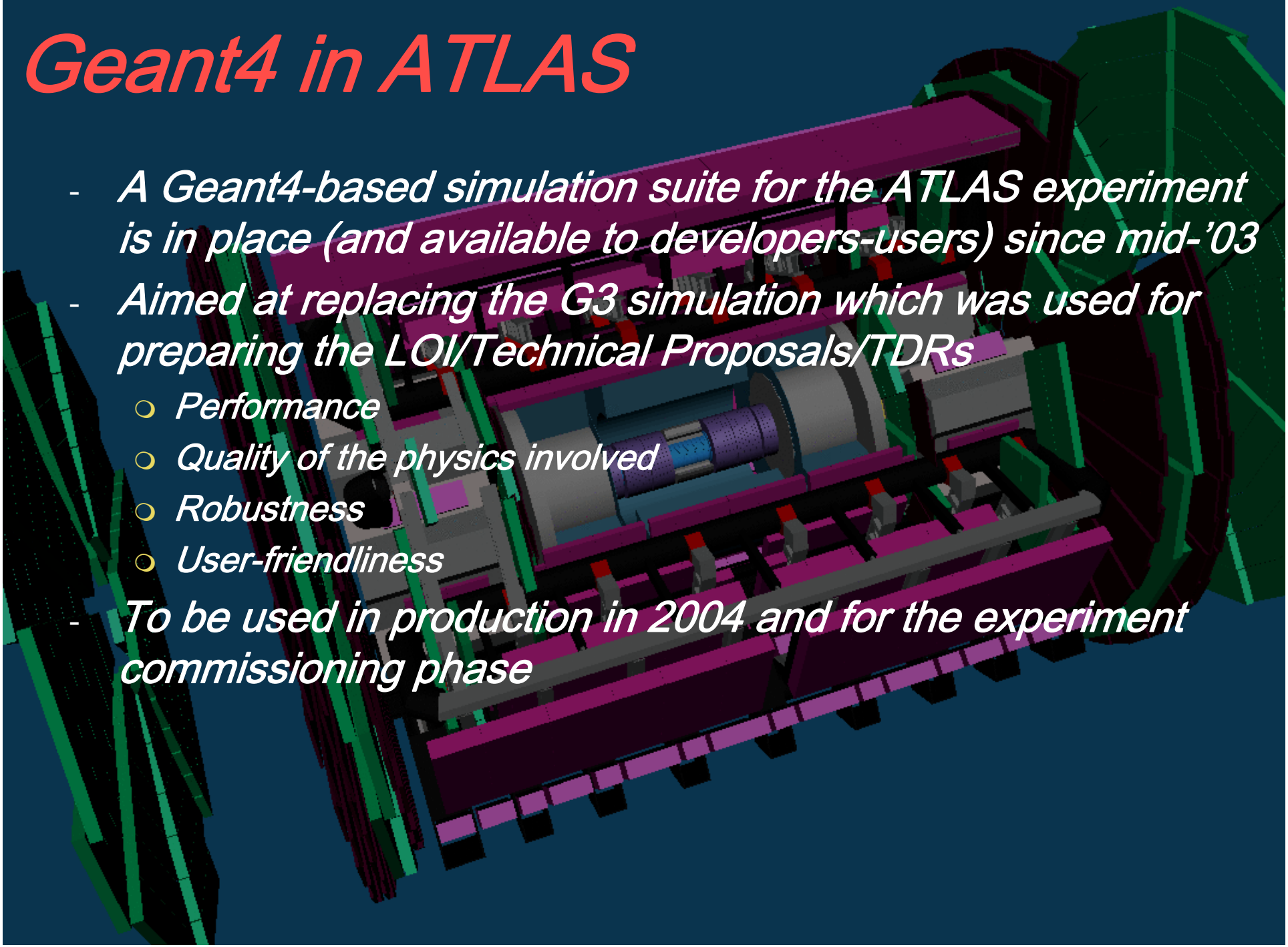
and…
lots of other developers

Geant4 in ATLAS



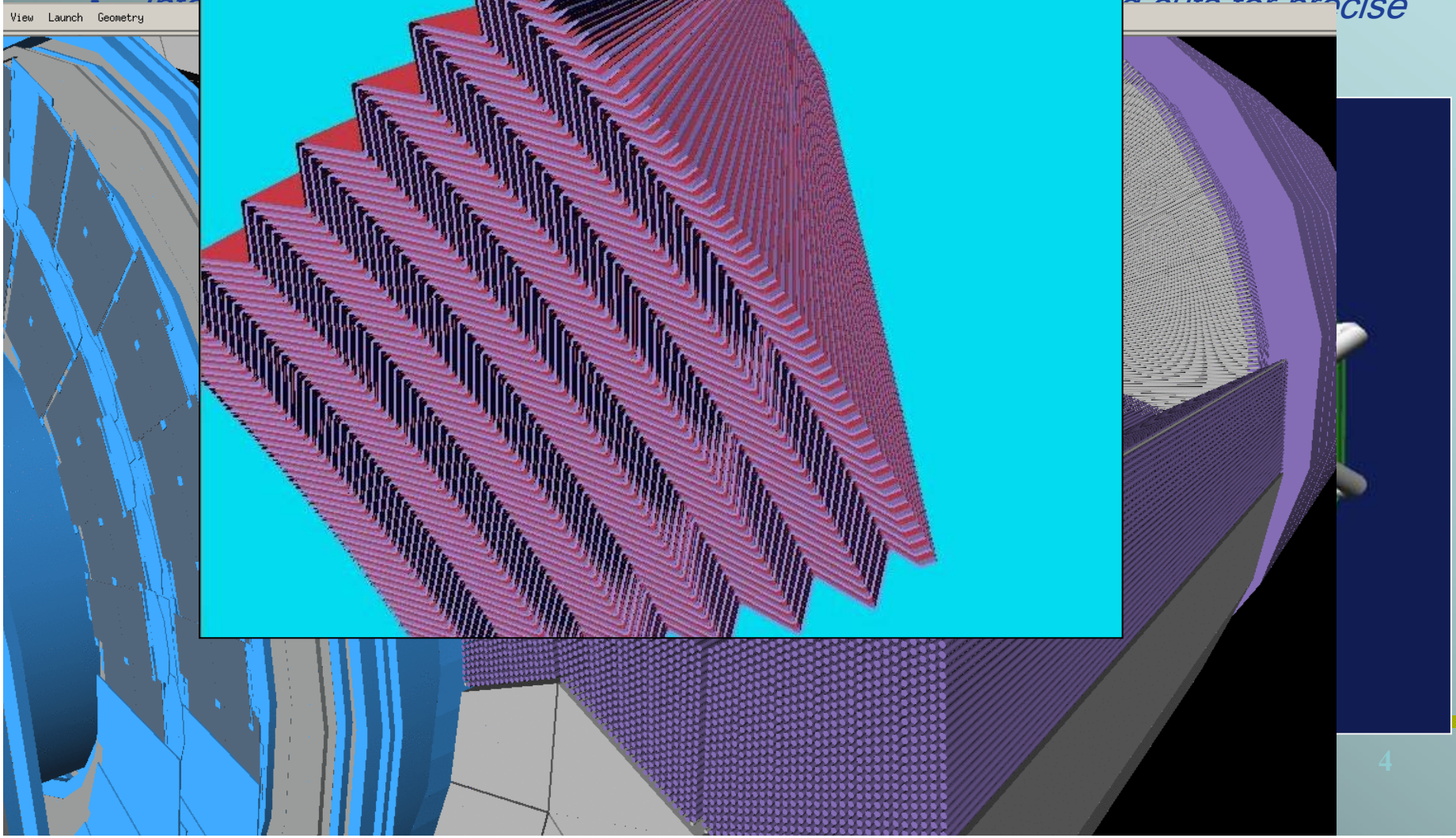
- A Geant4-based simulation suite for the ATLAS experiment is in place (and available to developers-users) since mid-'03
- Aimed at replacing the G3 simulation which was used for preparing the LOI/Technical Proposals/TDRs
  - Performance
  - Quality of the physics involved
  - Robustness
  - User-friendliness
- To be used in production in 2004 and for the experiment commissioning phase

The ATLAS Data Challenges

- DC-0 (end 2001)
  - G3-based, used for setting up production system
  - First G4 tests with simplified geometry, standalone version
- DC-1 (2002-2003)
  - G3-based, ~10M events
  - Use of G4 foreseen, never materialized as reconstruction could not cope
- DC-2 (summer 2004) ☜ We are here!
  - G4-based, ~12M events (leap of faith)
  - Tests of the ATLAS computing model, distributed production
  - Running right now!
- DC-3
  - Last chance before data taking

G4Atlas in a nutshell

- Bas… …scribed to a very infr… …ail
- In… …g cuts for precise



Production setup

- Physics validation programme helped debugging the sub-detectors in an independent way
- Sub-detector integration took several months (2003)
  - Make sure there are no overlaps and check detector layout
  - Move to new detector description scheme
  - Implement missing bits &pieces (services, dead material etc.)
  - Optimize performance
- Running long tests since Sept. 03
  - Continuous monitoring helps maintaining the program functional
- Set up production environment in the meantime

Geant4 versions

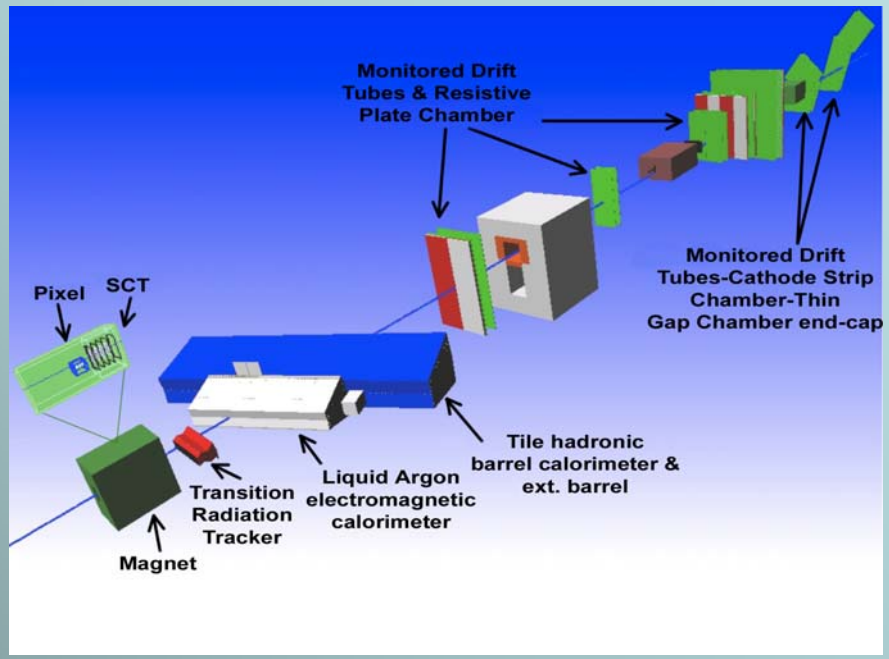
- Started production tests with G4 5.2
  - Rather reliable
- Moved to G4 6.0 as soon as it became available
  - Initial failure rate of 10% for single particle jobs (>30% for full events) due to bugs in the hadronics and geometry problems
  - Once fixed (exceptional response from G4 team) we did not manage to crash a job…
- Tried G4 6.1
  - Nasty bug in MuPairProduction (irreproducible) convinced us to stick to 6.0 for bulk production
- Currently running G4 6.2 for development work and CTB simulation
  - Problems with MSC (fixed)
  - Increased sensitivity to geometry inaccuracies led to slowdown of CTB simulation (now fixed)

DC-2 production

- Slowed down by instability of the production tools (GRID middleware?)
- Simulation part done (12M events)
- Exceptional G4 performance and robustness
  - Only two jobs crashed b/c of G4 problems, as far as I'm aware (log file examination pending)
  - NorduGrid sample (3.5M events) completed with no job failure!
    - 35K jobs!
    - 1M $Z \rightarrow e^+e^-$ events without any problem!
- Continuing now with further tests (Tier-0 production…) which are not relevant to G4

What's next?

- *Production for the ATLAS CTB (ongoing)*
- *Continous production (starting in Dec.) for the physics community (Physics Workshop in Rome, May '05)*
- *Commissioning*
- *DC-3*



- *ATLAS "initial" layout*
- *"GeoModel-ization" of the LAr calorimeters*
- *Implementation of missing bits (shielding, support structures…)*
- *python*
- *General refurbishing*

Summary

- *DC-2 was a tremendous success of which we are quite proud…*
  - *It took some time but we did it on the first attempt!*
  - *Many thanks to the Geant4 team for their continuous and dedicated support!*
- *Geant4 is currently THE standard in ATLAS*
  - *Not under discussion anymore*
  - *G4Atlas currently used for productions AND by normal users*
- *Now moving towards more physics-oriented productions*
  - *"A user community of 2K people, will soon make this one of the most scrutinized computer programs in HEP, checked with real data in every corner of phase space"*
- *Still some development work in front of us but the tunnel is past..*