



GEOM – Status and developments

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ROOT 2005

ROOT Workshop
28 September 2005

GEOM – Status and
developments

Outline

- Package functionality
- New shapes
- Assemblies of volumes
- New developments for navigation
- I/O improvements
- Graphics
- To-do list

Package functionality

- Geometry model description
 - Independent on simulation code
- Navigation functionality
 - Interfaced with transport MC's via VMC (simulation)
 - GEANT3 – in production, available in ROOT repository
 - GEANT4 – navigation interface under development
 - Preliminary version expected by end '05
 - FLUKA – Geometry interface validated against FLUKA examples, available in AliRoot repository
 - Consolidation for latest FLUKA release ongoing
 - API usable by track propagation algorithms (reconstruction)
- Geometry checking tools
 - Overlap checking
 - Raytracing + other built-in checking methods testing how tracking works in a given setup
- Visualization
 - Event display
 - Support for objects like: tracks, hits, digits, clusters will be soon added at TViewer3D level

Sha

- Currently: 21 basic shapes implemented

- “Basic” = implements all *TGeoShape* functionality for navigation and visualization

- Additions: *TGeoHype*, *TGeoHalfSpace*

- Hyperboloids defined by: inner/outer minimum radii and stereo angles, half-length in Z

- Half-spaces defined by: a point (x, y, z) and the normal vector in this point (n_x, n_y, n_z) pointing outside the half space

- To be used ONLY in the definition of composites

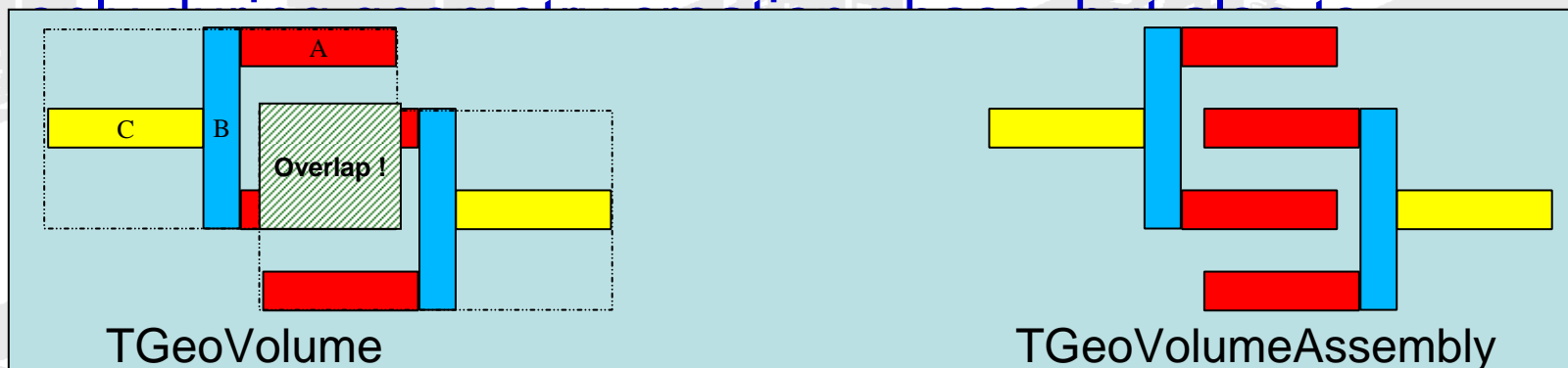


Scaled shapes

- Possibility to scale geometry requested by users
 - Not many use cases for hierarchical scaling
 - Except enlarging/shrinking uniformly a structure
 - Hard to implement navigation in general case (non-conservation of distances)
 - More useful and easy to implement at shape level
- Scaled shapes available in October release

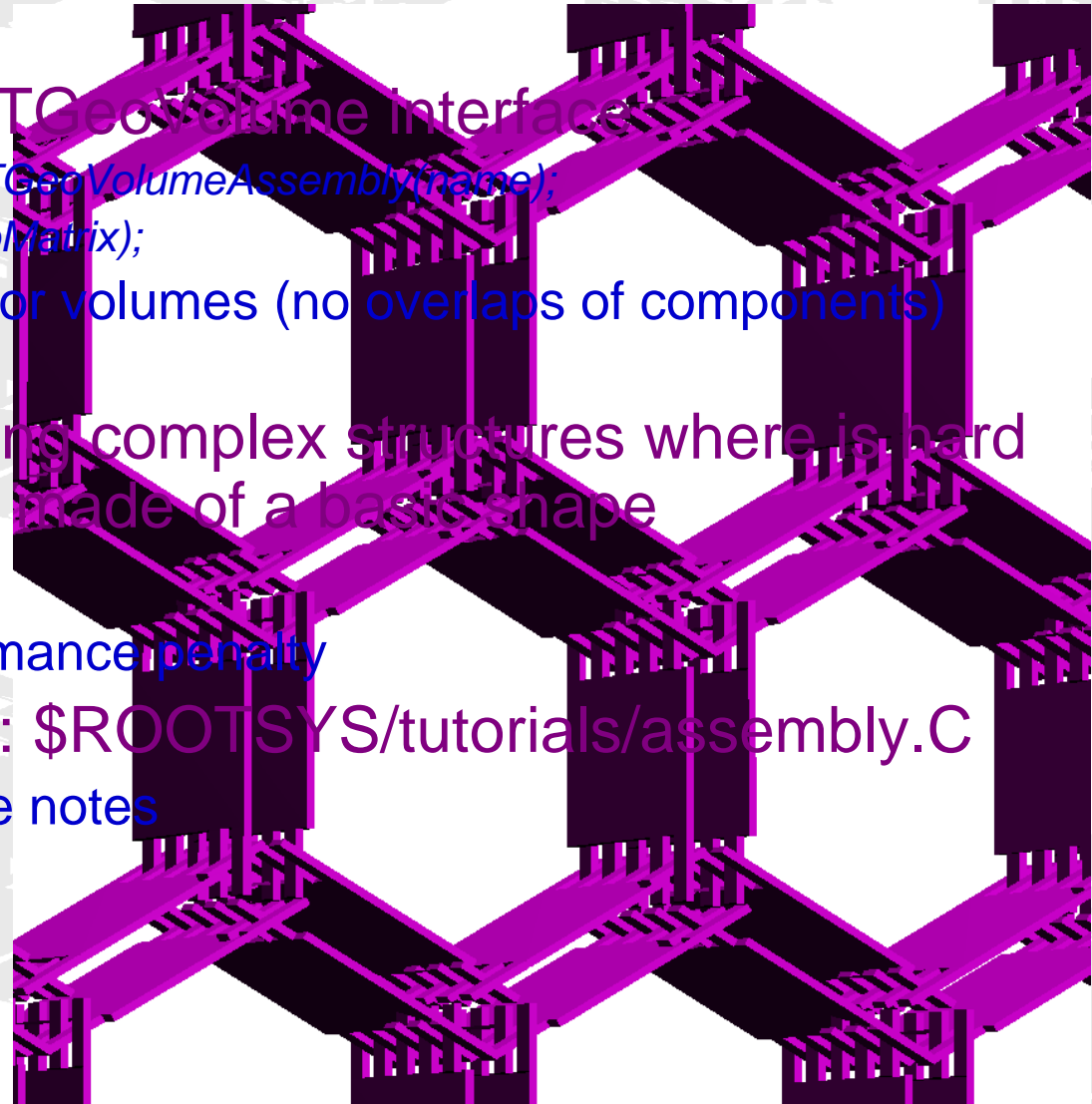
Volume assemblies

- Union of several different volumes positioned with respect to a common local frame
 - An assembly is just a volume having no shape container
 - No medium/material needed: a point INSIDE the assembly is always in one of the components
 - The assembly provides a logical grouping used not



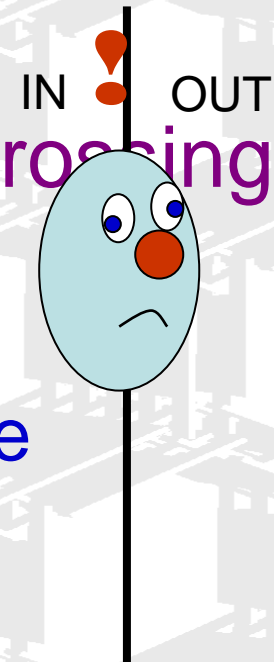
Usage of assemblies

- Easy creation using TGeoVolume interface
 - `TGeoVolume *vol = new TGeoVolumeAssembly(frame);`
 - `vol->AddNode(pVol1, id, pMatrix);`
 - Same constraints as for volumes (no overlaps of components) except extrusion
- Very useful for defining complex structures where is hard to define a container made of a basic shape
 - Nesting allowed
 - No navigation performance penalty
- Example of usage in: `$ROOTSYS/tutorials/assembly.C`
 - Description in release notes



Navigation

- Consistent behavior when track is crossing boundaries
 - Boundary tolerance implemented in DistFromInside/DistFromOutside shape algorithms
- New navigation method
 - TGeoManager::FindNextBoundaryAndStep
 - Consistent “ON boundary” flagging
- Several minor fixes and improvements



I/O

- TGeoManager::Export("geom.root")
 - .root I/O
 - Minor fixes since last workshop
- TGeoManager::Export("geom.C")
 - Exports geometry as a C++ file
 - Algorithmic part of geometry building lost, but very useful for developing new geometry code from existing geometry
 - Saving just a part of the geometry possible
 - TGeoVolume::SaveAs("volume.C")
- TGeoManager::Export("geom.cad")
 - On the wish list

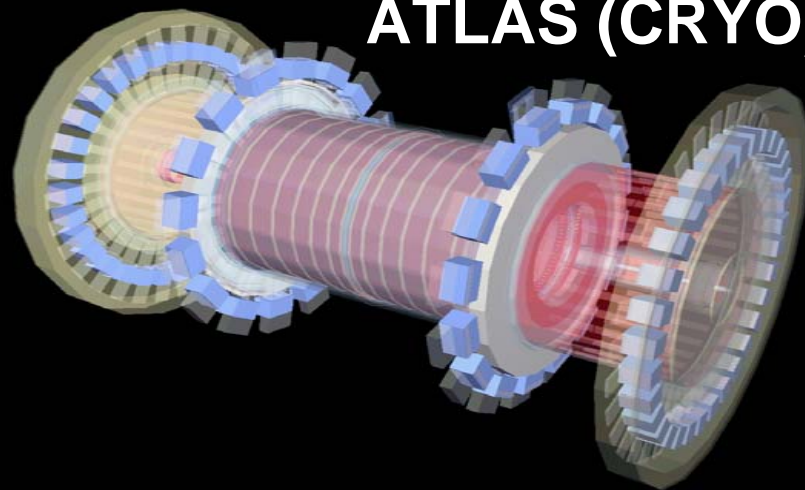
Graphics

- Great work and b

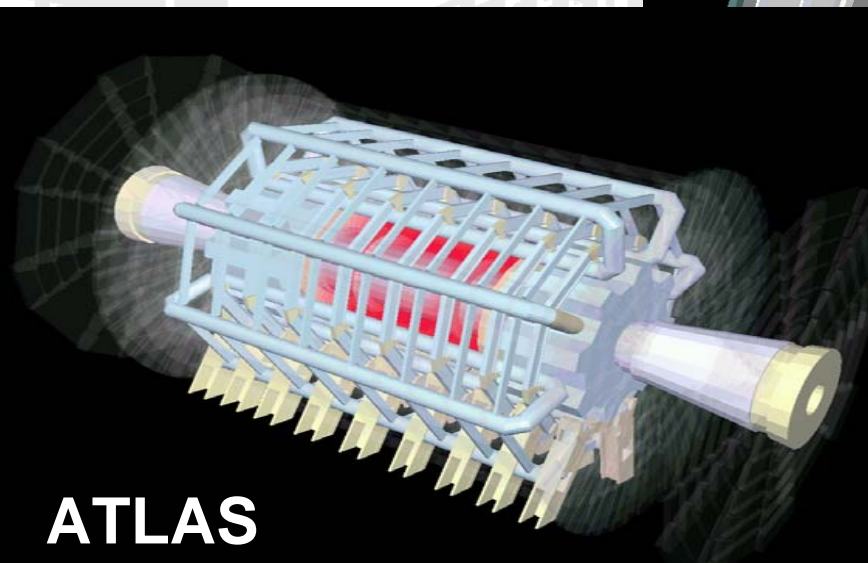
ALICE (ITSD)



ATLAS (CRYO)



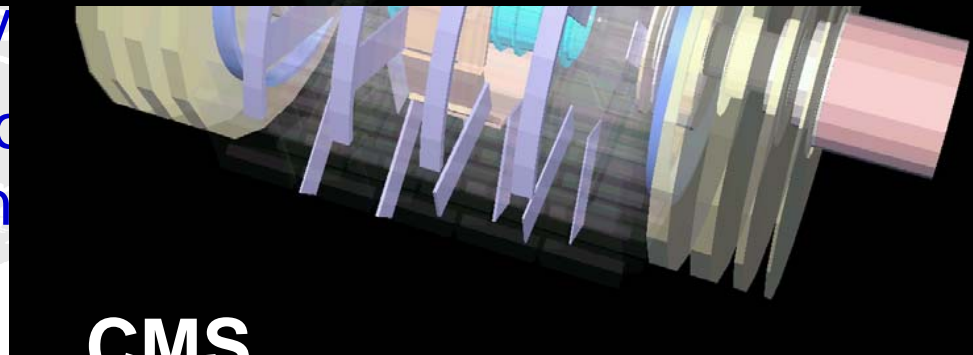
ATLAS



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Richard's

CMS



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To-do list

- Short & medium term
 - Work on TGeo-G4 interface
 - Support for scaling transformations (October release)
 - Support for parameterized shapes (December)
- Medium to long term
 - CAD I/O
 - Geometry builder GUI

Conclusions

- Existing functionality and API of GEOM classes quite stable
 - Mostly small fixes
- Navigation interfaces with transport engines validated
 - GEANT3 and FLUKA
- GEANT4 – TGeo interface under development
 - Preliminary version this year, but a more complete one in the next
- New features already in or scheduled
 - New shapes, assemblies of volumes, I/O, builder GUI
 - Most on user demands