An Introduction to Geant4
and this workshop

CERN Geant4 User’s Workshop
November 2002
Goals of Geant4

- Detector simulation toolkit for HEP
- World-wide collaboration
- Requirements from physicists in:
  - LHC, heavy ion and CP violation experiments
  - Cosmic rays, medical and space science applications
- Software Engineering and OO technology

Since RD44 1994
Geant4 production releases

- Dec ’98 - Geant4.0.0 release
  ...
- Dec ’00 – Geant4 3.0 release
  - Jun ’01 – Geant4 3.2 release
- Dec ’01 – Geant4 4.0 release
  - Jun ’02 – Geant4 4.1 release
- Dec ’02 – Geant4 5.0 release (scheduled)

Scheduled public releases: two per year.
Development releases: every one/two months.
Patches & minor releases with fixes, improvements: as required.
Workplan: methodology

- Software Engineering
  - User Requirement Document: PSS-05
  - OOA&D: Booch/UML (CASE tool: Rose)

- Testing
  - Unit tests (per class), sub-system tests
  - System integration tests

- Standards:
  - C++, RW/STL, STEP, ODMG, OpenGL, VRML, CVS,

- Assumptions on external dependencies:
  - Contribute to and use CLHEP.
  - Use of abstract interface for visualisation & persistency

Evolution since 1996/7
Class Category Diagram (1998)

RUN

EVENT manag.

EV.GENER.

UI_GUI

DIGI

HIT

CAD int.

GEOM

TRACK

TRACKING

FIELDS

MATERIAL

PHYSICS

PARTICLE

Persistency

Visualization

Intercoms, global
The last major release of Geant4 was 4.0, a major release in December 2001 included:

- **New theoretical hadronic models, including**
  - CHIPS for gamma-Nucleus, $\pi$ capture and intra-nuclear transport

- **Ability to reduce initialisation time**
  - By saving/retrieving physics processes’ table

- **A field can now be set to any volume or volume tree**
  - Overriding a potential global ‘default’ field
    - Note that, for now, all fields must be addressed in global coordinates
Collaborators also from non-member institutions, including:

- Budker Inst. of Physics
- IHEP Protvino
- MEPHI Moscow
- Pittsburg University
Platforms supported:

- **Linux**: g++ 2.95.2, egcs 1.1.2 (to be replaced by gcc 3.2)
- **SUN**: CC 5.2
- **Windows NT/2000**: Visual C++ 6.0 SP6, g++
- **Note**: all platforms use native STL

Not supported

- **DEC, HP** – Geant4 4.0 worked
- **MacOS X**: user-provided configuration file only.
- **AIX, SGI** – status unknown
Quality assurance

- Insure++ and Logiscope for software reliability and metrics
- CASE Rose (also with reverse engineering) for design reviews
- Coding guidelines automatic checking
- Code inspections within subdomains
- Code and design inspection for categories interfaces