Software Summary

M.Ellis - CM26 - 25th March 2010
Don’t Shoot The Messenger!

• Yagmur very kindly agreed to present these slides for me as I was unable to come to Riverside in person.

• He didn’t write them and has had no say in the content.

• If there is anything here that you dislike or disagree with, do not take it up with Yagmur!
Outline

• What won’t be covered:
  ♦ Database – see David’s talk.
  ♦ DATE reader – see Vassil’s talk.
  ♦ TOF – see talks by Mark and Yordan.
  ♦ Cherenkov – talk by Vassil.
  ♦ Diffuser in G4MICE – talk by Victoria.

• What will be covered:
  ♦ Some definitions
  ♦ Releases since CM25.
  ♦ MICE Hall geometry in G4MICE.
  ♦ KL Software update.
  ♦ Simulation and Optics updates.
  ♦ Future work.
An Important Definition

• “Software” in the context of this report means G4MICE.

• It does not mean:
  ◆ Most things online (that are handled by the MOG group).
  ◆ G4BeamLine
  ◆ TURTLE
  ◆ ICOOL
  ◆ Excel, Powerpoint, Word, etc...
  ◆ Anything else to do with a computer, just because computers run software...
Releases since CM25

Thanks to Chris Rogers, there have been several releases which have included numerous improvements including:

- Ability of the MiceModules definition files to contain expressions that will be evaluated. (Useful for defining magnet currents)
- Improved weighting and beam transfer algorithms.
- Check for GEANT4 volume overlaps.
- Additional functionality added to Virtual planes.
- Fixed some bugs in module rotations.
- Fixed the random seed handling.
- Substantial improvements in the way the code handles input beams.
Second attempt to create an accurate model of the MICE hall for use by the offline and online software.

Approval to restart process was granted at the end of CM25.

Matthew Littlefield - new PhD student at Brunel.

- Completed a Masters in Mechanical Engineering last year.
- Has finished the particle and accelerator physics coursework recently.
- Just started to work on the CAD drawings provided by Tim Hayler with the aim of putting the relevant objects in G4MICE with the correct positions, orientations, shapes and materials.
- Detectors still remain the responsibility of the detector experts!
CURRENT G4MICE Model – Matt Littlefield

VERY Preliminary Work In Progress etc...

M. Ellis - CM26 - 25th March 2010
KL code for data reconstruction is separated from EmCal.
It is in the head of G4MICE and its first software release is 2.3.0.
KL code for simulation of kl hits is ready and is available too.
KL Digitization is almost complete and should be committed very soon.
EmCal keeps its functionality

- KLMonitor Application now exists, example output on the next slide.
An example of application output:

- **ADC Spectra, left-right, all cells**
- **ADC Product, all cells**
- **Beam profile**
- **Multiplicity**
New flags were added to Virtual planes to enable users to set how the planes handle multiple passes and backwards-going particles.

G4MICE writes the particle as generated to Sim.out.gz as a PrimaryGenHit. Particle data is stored together with event number, random number seed and statistical weight.

Major improvements were made to the way G4MICE handles beams:
- Using a beam file from datacards remains the same, all other beam options are changed.
- The reference particle is, by default, generated along the z-axis with parameters controlled by datacards
Simulation Update continued

- G4MICE now produces a pencil beam by default, with zero transverse and longitudinal spread.
- More complex beams, with arbitrary rotation and displacement, can be defined in MiceModules.
- MiceModule BeamType Random now accepts Twiss parameters or Penn parameters.
- MiceModule BeamType Random has a switch to make the first particle with no random distribution (so that it can be used as a reference particle).
- An additional file type, "G4MICE_PrimaryGenHit" was added. This enables users to read from a G4MICE file and generate an identical beam to that found in the G4MICE file (as PrimaryGenHits).
- It is now possible to input Turtle beams into G4MICE using MiceModules, to give them an arbitrary displacement and rotation.
It is possible to define an arbitrary PID in the Optics application. Previously only muons were supported.

An inline optimiser was added to the optics package, enabling users to search for periodic Twiss parameters or optimise parameters of the fields.

Phase advance was added to the ROOT output.

Properties to set the text output file name were added.

An additional long text output was added.

Slight changes were made to some property names.

See picture on title slide of this talk.
Future Work

- A number of important changes that have been constantly postponed still need to be achieved.
- These include:
  - Addition of the MICESpill object, which will impact the existing MICEEvent and MICERun and the way information is passed within G4MICE.
  - A first version of some sort of “DST” type of output for analysis. This still requires a specification from whoever will want to actually use it for analysis.
  - Various other more “minor” changes that are becoming more and more difficult due to the fact that we are stuck with a “temporary” design that is now over 6 years old.
- Most of this work will be of a sufficiently serious nature that it will require written approval from MICE management (TB?).
Other Things I've Not Mentioned

- **Testing**
  - Given up on attempts to update and improve on the existing tests.

- **GRID**
  - Henry and David are still the only people doing anything serious with the GRID as far as I'm aware.
  - Vassil, has however, agreed to become a GRID software manager for MICE!
  - I first announced the need for GRID certificates and membership of the MICE VO in April 2005.
  - It is the official means for storing and accessing MICE data.

- **Software schools**
  - If there is genuine interest from people, I can consider updating and running a new school, however I won't initiate it.
Thanks!

• To the dedicated band of programmers who are keeping things running in my absence:
  ♦ David Adey, Victoria Blackmore, Mariyan Bogomilov, Linda Coney, Adam Dobbs, Aron Fish, Ben Freemire, David Forrest, Yordan Karadzhov, Matthew Littlefield, Henry Nebrensky, Mark Rayner, Chris Rogers, Vassil Verguilov.
  ♦ And apologies to anyone else I've forgotten!
Two Closing Observations

- They don't apply just to the software, but I'm not there in person to make them in a more appropriate forum:
  - MICE, as with most collaborations of this kind, depends heavily on the hard work and dedication of our students. We should repay that effort by looking after them and supporting them in their work, not blaming them for the outcome of a task that they were told to do and which they carried out correctly.
  - For those who have an interest in such things, perusing a few NTSB accident reports can be quite an education when it comes to the correct design and use of checklists, operating procedures, and how failure to follow such procedures, including short cuts, disabling safety systems, etc, can have a less than happy ending: