Generator Interfaces group report

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Project

- Ian Hinchliffe and the Berkley group gave up responsibility for the Generator packages to DESY group starting with release 14 (13.X),
- Responsibility include new development, maintenance, technical validation and user support for all generator related issues
- Generators core group at DESY: Cano Ay (Goettingen), Judith Katzy, Sergey Levonian, Ewelina Lobodzinska, Harald Vogt, Zhong Hua Qin

Software environment

- LCG project GENSER (MC Event Generators Libraries Repository) to technically validated LCG compliant code
  - Most commonly used generators available (Pythia, Herwig, …)
  - Currently not available in GENSER:
    - MadGraph, AcerMC, TopRex, PythiaB, CompHep, MC@NLO

- Atlas policy:
  - Use genser version of generator code wherever possible and interface to the GENSER version

Short term goals

1. Upgrade to GENSER HepMC version
2. Interface to Herwig++
3. Include Phojet
4. Include and validate CASCADE
5. Documentation
6. RTT

HepMC

(Cano Ay)

- Status:
  - Atlas uses a Atlas specific version of HepMC
  - HepMC available in GENSER
  - Upgrade to GENSER version started
  - Successfully tested with Pythia

BUT...

  - ~124 client packages needs change the requirements file
  - Some client packages need changes at the API level
    - (call to CLHEP::LorentzVector() replaced by FourVector())

- Plan:
  - Migration will be done in the 13.X.0-MIG0 nighties

New generators (1)
Cascade

- Full hadron level MC generator using the CCFM evolution equation for initial state cascade and off-shell matrix elements for hard scattering (H.Jung, DESY)
- Physics assets:
  - Only generator using CCFM evolution important for low x physics
  - W,Z production via quasi DY implemented in newest version -> impact on pt spectra?
- Distributions:
  - Used for forward jets in LHCb
  - Heavily used for forward jets, heavy quarks at HERA

New generators (1)
Cascade

- Code status:
  - Interface exist in athena to GENSER version (1.2.10) ,
  - Newest version from authors is 1.2.12 will come into GENSER soon

- Plans:
  - Migrate to the new version as soon as it's available in GENSER (~2 weeks)
  - Validate cascade for LHC in DESY group
    - Validation for CMS done by K.Lipka (Uni Hamburg)

New generators (2)
Herwig++

- C++ version of HERWIG
  - ready for hadron collisions (according to authors, see Moriond QCD, 3/07)
  - Will be used for future development (fortran version development stopped)
  - Available in GENSER
- Athena status:
  - Interface to athena started (Zhong Hua Qin, DESY, Cano Ay, Goettingen)
- Plans:
  - Validation for Atlas (Zhong Hua Qin)

New generators(3)
Phojet

- MC programm for minimum bias (double, semi - and non-diffractive) and for underlying events
- Status:
  - Sofar not been used much in Atlas, currently restart of activity
  - Older version available (1.10.2) in GENSER and linked from Athena, but new version (1.12) should be used according to authors
  - Interface with limited functionality exist in Athena
- Plans & people:
  - Upgrade to phojet version (1.12) in Athena/Genser
  - Study Phojet for minbias events & interface improvements with close contact to Ralf Engel (Matthias Meyer, Klaus Moenig, Zeuthen)
  - Phojet for underleying events & interface improvements (Martin Jankowiak, Tim Barklow, SLAC)

Documentation

- Doxygen class documentation:
  - Exist partially - will be completed (E.Lobodzinska)
- TWiki of Generators and their Athena interfaces
  - good documentation exist for some generators, missing generators will be added
- Timescale: Major step in upgrade of documentation foreseen until 12/07

Minor projects

TruthHelper classes

(Tom Doherty, Glasgow, Ewelina Lobodzinka)

- Some duplicated code for MC helper tools exist in Atlfast and Generators/TruthHelper classes
- All will be moved into Generators/TruthHelper classes transparent to the user
- Add some tools to Atlfast

Inclusion of additional processes to Pythia

RTT

- 7 jobs are run for RTT generating events with Alpgen, Herwig, Pythia, Jimmy, Charybdis
- RTT job output is regulary checked (and mostly successful)
- Extension of RTT to more generators and/or different processes planned (but lower priority)

Sherpa

- Generator for full simulation of high energetic particle production in e+e-, ep, pp and pp collistions using tree-level matrix elements and CKKW prescription for parton showers and hadronization
- Status:
  - Used in the Atlas (e.g. b-associated production, Higgs group)
  - Sherpa 1.0.9 linked via GENSER to Athena
  - Bug fix for VBF in Sherpa release 1.0.11
  - Wolfgang Marder, Marek Schoenherr (Dresden) took over responsibility for all technical and physics related issues on Sherpa - please contact them for user support and bug reports
- Plans:
  - Move to version 1.0.11 as soon as it is released in GENSER
  - Update of documentation
  - Further physics validation

Summary

- New generator group started with new development, bug fixes and user support for release 14
- Strong effort in development to use LCG validated generator code wherever possible
- Plans to validate generators for physics analysis