

Geant4 VO report

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Use case

Geant4 is a physics simulation library

- used by LHC experiments, popular in HEP and other fields

Physics validation is a form of regression testing

- simulation results from specific Geant4 tests and application for each Geant4 version (internal, public, beta, patch)
- we compare these results for different version and with reference data sets

Simulation jobs on the GRID

For each new **Geant4** version we submit thousands of simulation (CPU bound) jobs.

- some simulation runs are very big due to high energies and big number of simulated events
- we need to split them in smaller fragments and later take care of merging the results

There is a central database where these results get registered (like LHCb's bookmarking system)

Previous work

DIANE: Distributed ANalysis Environment

- splitting was done before submitting the jobs
- merging was done manually, after all jobs were completed
- error-prone procedures involved
- **Lack of opportunistic use of GRID sites**
- **Not maintained**

DIRAC

DIRAC is maintained and used by many users (communities) in different scientific areas

- Good communication with LHCb
- Pilot-job model
- Opportunistic exploitation of available GRID resources
- Ability to ban sites while productions are running

Current status

Single DIRAC Server dedicated for Geant4

- workload management system for job submission, scheduling, pilot submissions, running, etc
- not frequently updated to newer versions (v6r9p9)
- Various GRID (LCG) sites
- **Groups:**
 - admin
 - Geant4 pilot
 - Geant4 user
- A few users

Current status

Geant4 jobs

- loading software and libraries from CernVM-FS
- each jobs appends it's results to the run results (when runs are split into smaller fragments)
- we split big runs (that would normally take a lot of time) by reducing number of simulated events (which are independent)
- results are registered (submitted) to our database through an HTTPs API

Systems tested

Data management system

- problems with SRM and EOS

File catalog

- wasn't really needed since we have only one SE

Transformation system

- seemed complicated at that time and we wanted a solution to the splitting/merging problem fast

Future

Geant4 is obviously a small (even the smaller) community

- would make sense to join forces with other small community in maintaining a single **shared server**?
- discussions (proposal) with ILC did not end positively due to time restrictions..

The splitting-merging-submitting processes could benefit from **transformation, workflow and bookmarking systems?**

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- **DIRAC forum**

Conclusion

- Small **Geant4** VO mostly for running physics validation jobs on the GRID.
- Monthly productions for testing new Geant4 versions.
- Previously orchestrated with DIANE.
- Use of DIRAC and DIRAC WMS system really beneficial for many reasons:
 - robust product
 - opportunistic exploitation of GRID resources
 - web and other UIs that ease the submission and monitoring of our jobs