Geant4 assessment of simulation R&D projects: AdePT and Celeritas

Geant4 Task Force for R&Ds

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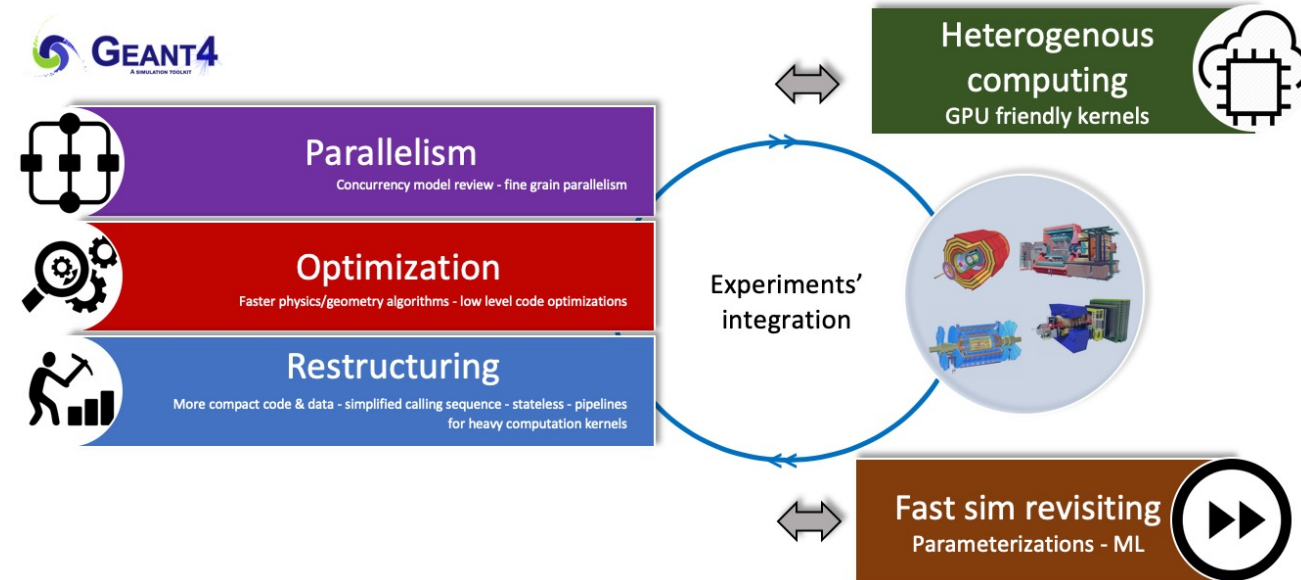
Geant4 Task Force for R&Ds

- Created in 2021 in order to

  - Promote longer-term R&D efforts on the exploitation of emerging technologies, computing architectures or software architectural revisions, and new or better physics ideas that would be beneficial to Geant4.

  - Make timely assessments on these R&Ds for their feasibility, benefits and required efforts.

Three Main Axes of Development

- **Improve, optimise and modernise** the existing Geant4 code to gain in performance for the detailed simulation
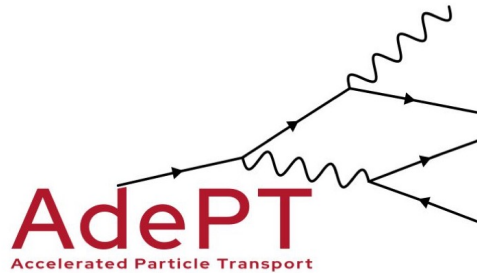

- Trade precision for performance using **fast simulation techniques** both with parameterisations and with ML methods, and integrate them seamlessly in Geant4

- Investigate the **use of accelerators** such as GPUs
  - With novel approaches for organising the computational work

Assessment of AdePT and Celeritas R&D project

- This assessment focusing on two R&D projects

  - AdePT

  - Celeritas

- Both addressing the problem of general HEP particle transport on GPUs

Assessment process

- The assessment consists in a presentation + discussion + report

  - The Assessment Team attends and drives the discussion

- Within two weeks, the Assessment Team establishes a report (~2 pages) and submit it to the SB for iteration and approval

- Together with the report, the Assessment Team establishes and submits to the SB a summary list of key points (few bullet lines) for iteration and approval

Assessment team

- Makoto Asai   Geant4/EIC/JLab   (in person)
- John Chapman   ATLAS/CERN/Cambridge U.   (in person)
- Gloria Corti   LHCb/CERN   (in person)
- Ivana Hrivnacova   Geant4/ALICE/IJCLab   (in person)
- Vincenzo Innocente   CMS/CERN   (in person)
- Matti Kortelainen   CMS/Fermilab   (remote)
- Andrea Valassi   CERN IT   (in person)
- Sandro Wenzel   ALICE/CERN   (in person)
- Ben Wynne   ATLAS/Edinburg U.   (remote)
- Marc Verderi (chair) Geant4/LLR   (in person)

Publicity of report

- The SB, Assessment Team and project team have access to the report

- The report is not published on the web by default

- The report can be given to anyone making the request, informing the Assessment Team and project team of that request

- The project team is free to publish the report on the web

- The summary list of key points is put on the web

Agenda

Final remarks

- Goal of the assessment :

  - not a review of the projects, just a checkpoint of the status of the projects, and discussion of possible integration into Geant4

- The assessment is public, but to ease the job of the assessment team, questions and comments should be limited to the assessment team

  - at the end of each session, if time permits, a few questions and comments from the audience might be possible.