



INTRODUCTION

54th Technical Forum, 11th March 2021

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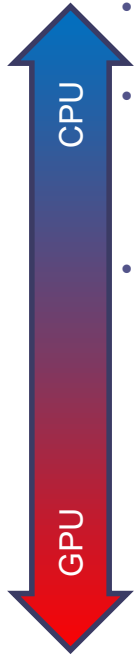
Overview of developers' part

- This TF meeting developers' part is focused on discussing the Geant4 2021 work plan and R&D activities
- The work plan has been published on the Geant4 page:
 - https://cern.ch/geant4/support/planned_features
- It describes the content of this year major release, Geant4 version 11.0
 - Beta release : 25 June 2021
 - Public release : 10 December 2021
 - Remember that the last major release was 10.0 in 2013, with the MT model introduction
- The work plan details will be covered by presentations by Gabriele, Vladimir and Alberto
 - Information will also be given about patch01 for release 10.7, published on February 5th in these presentations
- R&D activities will be reported and discussed too
 - Presentations by Mihaly (G4EmHep) and Witek (ongoing activities under the G4 R&D Task Force)
- **In this presentation:**
 - Some highlights of release 11.0
 - Some highlights of 2021 R&D activities
 - Announcement about "HL-LHC Computing Review Stage-2: Common Software Projects" preparation

Some highlights of 11.0 release

- New tasking model will become the default one
 - In replacement of the MT scheme
 - Basis for sub-event parallelism
 - We will take care it makes it easier to use hybrid computing
- Improvements and developments regarding EM and Hadronic Physics
 - Many items, see Vladimir's and Alberto's presentations
 - Physics extension to transport light hyper-nuclei and anti-hyper-nuclei is one of these
- Available shapes in the VecGeom library will become the default one for the solids
- Adoption of C++17 as minimum standard
- Improvement of the data library handling
- Processes taking care of production thresholds
 - Estimate what performance gain if offloading the tracking from verifying conformance of secondaries with cuts

Some highlights of R&D activities



- **From CPU to GPU:**

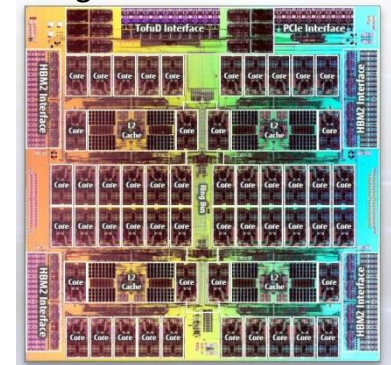
- New tasking model
 - Easier exploitation of hybrid architecture.
- G4EmHep CPU/GPU library
 - Compact code, with efficient memory layout
 - Runnable on both CPU & GPU
 - Provides physics calculations for e^+ , e^- and γ
- R&D projects, GPU-based
 - Pilot projects to estimate the performances that can be achieved using accelerators
 - First answers expected for this year !
 - AdePT project :
 - CERN based
 - EM shower demonstrator in calorimeter
 - G4EmHep used for the physics
 - VecGeom for the geometry
 - Similar effort made by the Celeritas project in the US.

- **Fast simulation:**

- Classical shower simulation improvements
- ML-based shower simulation developments

- **Performance tests on A64FX:**

- Very low memory latency could be promising !
- The Geant4 KEK team already performed tests on ARM architectures
 - For medical application needs
 - With energy consumption as figure of merit
- KEK ordered one server
 - should be delivered soon
- Tests anticipated:
 - Throughput with EM, HAD, and CMS-test
 - Energy efficiency for medical
 - Time-scale : this year



HL-LHC Computing Review Stage-2: Common Software Projects

- Review process extending from 2020 to 2024.
- This review stage will take place during first week of November
 - Detector Simulation will be part of it
 - Together with Event Generators, Foundation and Core Tools, Analysis, DOMA
- For each item, a ~30 pages document should be produced by 1st of October.
 - Geant4 asked to contribute to the Detector Simulation one
- Should be covered:
 - Description of the project
 - Describe how the project is managed
 - Status of the development teams
 - Describe any major risks
- Early interaction with stakeholders –experiments, computing resource providers, ...- is needed to ensure
 - We well understand each others
 - We agree on targetted functionality and performance
 - We share views on risks, risk mitigations, etc.
- TF meeting is one place for such discussion
- **But we wish to organize a dedicated mini-workshop by late April**
 - **More details on this will be circulated soon !**

Thanks !