# Geant4 Task Force for R&Ds meeting

Witek Pokorski

14.04.2020

# Agenda

## Geant4 R&D meeting

📅 Tuesday 14 Apr 2020, 16:00 → 18:00 Europe/Zurich

📍 32/1-A24 (CERN)

👤 Jonathan Madsen (Lawrence Berkeley National Laboratory) , Witold Pokorski (CERN)

| Videoconference Rooms | 🔷 GEANT4_weekly_meeting | Join ⌄ |
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**16:00** → 16:05 **News** 🕐 5m
Speaker: Witold Pokorski (CERN)

**16:05** → 16:25 **Monte Carlo neutron transport in the ECP Coupled Monte Carlo Neutronics and Fluid Flow Simulation of Small Modular Reactor (ExaSMR) project** 🕐 20m
Speaker: Dr Thomas M. Evans (Oak Ridge National Laboratory)

**16:25** → 16:45 **Celeritas: toward GPU-based particle transport for detector simulations in HEP experiments** 🕐 20m
Speaker: Dr Thomas M. Evans (Oak Ridge National Laboratory)

**16:45** → 17:00 **Discussion** 🕐 15m

# Geant4 TF web page

- new content of the Geant4 TF for R&Ds web page
  - https://geant4.web.cern.ch/collaboration/task_force_rd

- list of R&D activities related to Geant4
  - sub page for each activity with description, people involved, links to repository, relevant material, etc

- still under construction but quite some content already there

- comments, suggestions welcome
  - let us know of other projects to be added

# Task Force for R&Ds

The role of Task Force for R&Ds is 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.

The Task Force has identified three development axis that should be followed in order to evolve Geant4 to meet the requirements of the forthcoming experiments:

- Improvement, optimization, modernization and refactoring of the existing Geant4 code
- Development and integration of fast simulation techniques
- Investigation of the potential use of accelerators

Several R&D activities have started exploring the potential evolution in those three areas and currently they include:

- Geant4 task-based prototype
- Stateless Geant4 prototype
- Single precision usage in simulation components
- Instruction and data cache optimizations
- Alternative e-/e+ and gamma transport simulation highly specialised for HEP detector simulations

- Electromagnetic shower parametrisation
- Machine Learning-based fast simulation tools
- Validation tools for fast simulation of electromagnetic showers

- GPU-based simplified simulation prototypes
- GPU vendor libraries in particle transport
- Portability frameworks for accelerator-based particle transport
- Celeritas - Exascale particle transport prototype
- Full integration of Opticks with Geant4

The meetings ⧉ of the Task Force are open to the public and contributions are welcome ✉.

Task Force coordinator: Witek Pokorski ✉ (CERN)
Deputy Task Force coordinator: Jonathan R. Madsen ✉ (NERSC/LBL)