

# Forum on Concurrent Programming Models and Frameworks

Welcome and Introduction  
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# Introduction

- ▶ **Outcome of the FNAL workshop**
  - Interest for common effort to make rapid progress on exploratory R&D activities during 2012
  - Aiming to share a common concurrency model
  - Identified a number of ‘demonstrators’ to exercise different capabilities in a small scale with clear deliverables and metrics, and work in short cycles a few months long
  - Setup regular meetings (this forum!)
- ▶ **Forum meeting goals:**
  - Understanding common requirements and constraints
  - Share knowledge and learn from each other
  - As a community, identify what tool/library/model works and what does not for our applications

# Demonstrators

- ▶ **Object sharing** P. Calafiura et al. (ATLAS)
  - Investigate moving data objects between processes
- ▶ **Multi-process management tools** P. Calafiura et al. (ATLAS)
  - Investigate better tools to manage processes and inter-process communication in Athena
- ▶ **Performance tools** L. Tuura, C. Jones (FNAL/CMS)
  - Report on tools for measuring multi-core application performance and debugging them
- ▶ **Data locality in G4 detector simulation** Ph. Canal (FNAL/CET)
  - Investigate the effect of improved data locality in a realistic case in the context of Geant4 detector simulation
- ▶ **Scheduling work** C. Jones et al. (FNAL/CMS-CET)
  - Further investigate use of libdispatch (GCD). Investigate use of OpenMP, TBB, and CnC for task parallelism at the event and sub-event level.
- ▶ **Parallelization within modules** J. Kowalkowski et al. (FNAL/CET)
  - This includes investigation of 2D Hough transforms and waveform compression algorithms.
- ▶ **'Whiteboard' service** B. Hegner et al. (CERN/SFT)
  - Design and implementation of a 'service' able to schedule algorithms/modules based on their data dependencies

# Demonstrators (2)

- ▶ **Histograms** L. Tuura et al. (FNAL/CMS)
  - Address concurrent building of histograms, and TFileService.
- ▶ **Detector simulation** Ph. Canal, F. Carminati
  - Study data locality and vector processing in geometry, particle transport etc.
- ▶ **Evaluation of frameworks** C. Jones et al. (FNAL/CMS)
  - Define standard set of modules timings and configurations, data samples, and set of module dependencies. Define torture tests that will help determine performance limits.
- ▶ **Multithreaded I/O** C. Jones (FNAL/CMS)
  - Continue the investigation on performance improvement of the ROOT I/O sub-system by scheduling the different operations (disk I/O, compression, object serialization) concurrently
- ▶ **Tracking reconstruction using GPU** V. Innocente, T. Hauth (CERN)
- ▶ **Solutions using of virtualisation technologies** P. Buncic (CERN/SFT)
  - Develop a test suite to continuously monitor the performance of selected LHC applications in a VM context and in longer term investigate possible use of GPU/MIC from VM environment.
- ▶ **Scheduling with 'Go'** S. Binet (ATLAS)
  - The goal is investigate task parallelism at the event and sub-event level by coding the top-level steering of the framework in Go

# Agendas

- ▶ We will devote the next 1–2 meetings to go through the plans for all ‘known demonstrators’
  - What is the ‘demonstrator’ about?
  - Who will be working on it? Can people join?
  - What tools /libraries /models are going to be exercised?
  - What are the measurable goals for in a time scale of 2–3 months
- ▶ Later we will devote the meetings to specific domains (simulation, reconstruction, framework)
  - With status reports from the demonstrators related to a given domain
  - Discussion on specific issues