Forum on Concurrent Programming Models and Frameworks

Welcome and Introduction P. Mato, CERN

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

- Investigate moving data objects between processes
- Multi-process management tools
 - Investigate better tools to manage processes and inter-process communication in Athena
- Performance tools
 - Report on tools for measuring multi-core application performance and debugging them
- Data locality in G4 detector simulation
 - Investigate the effect of improved data locality in a realistic case in the context of Geant4 detector simulation
- Scheduling work
 - 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
 - This includes investigation of 2D Hough transforms and waveform compression algorithms.
- 'Whiteboard' service
 - Design and implementation of a 'service' able to schedule algorithms/modules based on their data dependencies

C. Jones at al. (FNAL/CMS-CET)

P. Calafiura et al. (ATLAS)

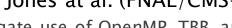
L. Tuura, C. Jones (FNAL/CMS)

P. Calafiura et al. (ATLAS)

Ph. Canal (FNAL/CET)

B. Hegner at al. (CERN/SFT)

J. Kowalkowski et al. (FNAL/CET)



Demonstrators (2)

- Histograms
 - Address concurrent building of histograms, and TFileService.
- Detector simulation
 - Study data locality and vector processing in geometry, particle transport etc.
- **Evaluation of frameworks**
 - Define standard set of modules timings and configurations, data samples, and set of module 0 dependencies. Define torture tests that will help determine performance limits.
- Multithreaded I/O
 - 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

- 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 0 context and in longer term investigate possible use of GPU/MIC from VM environment.
- Scheduling with 'Go'
 - The goal is investigate task parallelism at the event and sub-event level by coding the top-level 0 steering of the framework in Go

C. Jones at al. (FNAL/CMS)

Ph. Canal, F. Carminati

C. Jones (FNAL/CMS)

V. Innocente, T. Hauth (CERN)

S. Binet (ATLAS)

L. Tuura at al. (FNAL/CMS)

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