HSF Reconstruction and Software Triggers

Introduction

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HSF Reconstruction and Software Trigger

Goals of the Reconstruction & Software Trigger Working Group:

- **address common challenges across HEP** in the area of event reconstruction and software triggering,

- **targets challenges identified during the CWP** process as well as new ones arising in R&D,

- **foster collaboration** on design and implementation challenges, the adoption of common approaches

- **raise awareness of existing solutions known to the community.**

- (recent discussions) wherever useful, **collaborate with communities beyond HEP** (e.g. astro, neutrino)

Website: link, Mailing list (google groups): https://groups.google.com/forum/#!forum/hsf-recotrigger

Discussions proceed with **general and topical meetings**: two topical meetings so far
Meetings will generally be cross-collaborations, but want to keep them to max 1.5h → multiple meeting instances on similar topics!

Goal: increasing awareness of existing solutions

- Cross-talks about the trigger systems among different experiments:
  - Previous meeting: Summary of ATLAS / CMS trigger April/May cross-talks
    - Indico: https://indico.cern.ch/event/815233/
    - Live notes: https://docs.google.com/document/d/1sjPazZzVTy6aPyznCokC2gcYmS1kigorPdW8DIqGOoE/edit
  - Today:
    - Overview of the LHCb trigger system - Mika Vesterinem
    - Overview of the ALICE trigger system - Roman Lietava
  - Future:
    - non LHC experiments
- Talks should be be suitable for the PhD students
- To keep people focused: we aim for 1-1.5h per session.

CWP: Reconstruction and Software Trigger

- Community White Paper Reconstruction and Software Trigger: link
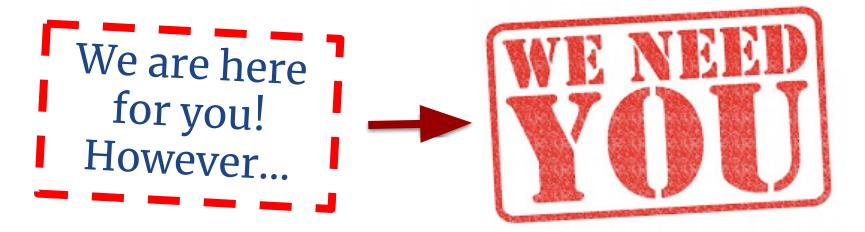 Key topics in Research and Development Roadmap, matched to meetings

  - Enhanced vectorization programming techniques
  - Algorithms and data structures to efficiently exploit many-core architectures
  - Algorithms and data structures for non-x86 computing architectures (e.g., GPUs, FPGAs)
  - Enhanced quality assurance (QA) and quality control (QC) for reconstruction techniques
  - **Real-time analysis and continuous read-out [today's meeting]**
  - Precision physics-object reconstruction, identification and measurement techniques
  - **Fast software trigger** and reconstruction algorithms for high-density environments **[today]**
- Enhanced collaboration / discussion with neutrino and astroparticle communities

Mailing list: calls to the community for ideas (volunteered talks for JLab workshop)

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Possible topics for future meetings:

- Meaningful benchmarking for different architectures (FPGA, CPU, GPU)
- How to ensure the same reconstruction when running on different architectures (CPU, GPU), Data Quality
- Packages that help go from cuda-->CPU or c++-> GPU (eg, alpaka, raja)
- Algorithms and data structures for GPU, FPGA
- Benefits from using the timing information in the reconstruction
- Enhanced QA/QC for reconstruction techniques
- Fast software trigger and reconstruction algorithms for high-density environments
- Precision physics-object reconstruction, identification and measurement techniques
- Trainings for FPGA, GPU
- Cross-talks from different experiments
- …
- and many more: let us know!

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We are here for you! However...

→ WE NEED YOU

Please **get in touch** with us,
if you would like to present your work
in our meetings

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Meetings so far:

- Summary of ATLAS / CMS trigger April/May cross-talks
  - Indico: https://indico.cern.ch/event/815233/
  - Live notes: https://docs.google.com/document/d/1sjPazZzVTy6aPyznCokC2gcYmS1kigorPdW8DIqGOoE/edit
- Algorithms and data structures to efficiently exploit many-core architectures
  - Indico: https://indico.cern.ch/event/823263/
  - (Some) live notes:
    https://docs.google.com/document/d/1IcvpsgOPpVfaBeZpSCcKD6i1y4HesA-VJopOYV4S_7c/edit
- Joint discussion on partial event building for real-time analysis within Institut Pascal "Learning To Discover" workshop:
  - indico: https://indico.cern.ch/event/835074/
  - live slidenotes:
    https://docs.google.com/presentation/d/1pAQWRg00tBQ-Im9ZYEvC5-meZLTMfz_1MKp1dlbLPVE/edit?usp=sharing
- Joint ACTS meeting: A common Track Software (ACTS) Project:
  - indico: https://indico.cern.ch/event/830160/

Extra material

Future plans & tentative dates

- August 28th (tbc): second part of trigger and real-time analysis meeting with LHCb & ALICE
- October 2nd (tbc): second part of software optimization meeting, with ATLAS, CMS and ALICE
- October 16th (tbc): joint discussion with neutrino and astroparticle community, after JENAS workshop
- November/December:
  - Meeting focused on reconstruction techniques
  - Hands-on tutorial on FPGAs

Going beyond: gather concrete problems and organize solution
(e.g. through joint funding proposals for travel/workshop)