

# HSF Reconstruction and Software Triggers

## Status & plans

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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!

# CWP: Reconstruction and Software Trigger

- CWP Reconstruction and Software Trigger: [link](#)  
Research and Development Roadmap:
  - ■ 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
  - Precision physics-object reconstruction, identification and measurement techniques
  - ■ Fast software trigger and reconstruction algorithms for high-density environments
- ■ Enhanced collaboration / discussion with neutrino and astroparticle communities

*WG meetings so far  
+ JLab workshop  
+ planned meetings*

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

# Future plans & tentative dates

- Next week (July 17th): joint discussion on partial event building for real-time analysis within Institut Pascal “[Learning To Discover](#)” workshop (agenda tba)
- July 31st: [joint ACTS meeting](#)
- 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)

Extra material

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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](https://docs.google.com/document/d/1IcvpsgOPpVfaBeZpSCcKD6i1y4HesA-VJopOYV4S_7c/edit)

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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

