

SWIFT-HEP

Introduction

29 March 2023

Welcome to the SWIFT-HEP#5 GridPP#49 workshop

Second joint meeting, really useful to get together

Layer	Responsible	Experiment 1	Exp. 2	Exp. 3	
6	Experiment physicist end users	Selecting data, running analysis code.	Community Projects (e.g. SwiftHEP, HSF, and WLCG working Groups) Moving code down the stack to the common layer Essential Development of WLCG for the future (GridPP7 WP-D)
5	Experiment physics programmers and software engineers	Analysis frameworks, reconstruction code, calibration code...	
4	Experiment computing teams	'Production' computing operations and software	
3	WLCG/GridPP	Middleware interface to experiments, and experiment 'customer' support (GridPP7 WP-C)			
2	WLCG/GridPP	Software infrastructure running on physical hardware infrastructure and WLCG Federal responsibilities (GridPP7 WP-A and B)			
1	WLCG/GridPP	Physical Hardware (GridPP7 WP-A)			

(diagram from GridPP7 proposal)

Project timeline - SWIFT-HEP

WPs roughly on time

- WP3 making steady progress
 - Simulation on GPUs
- WP2 in great shape
 - Event generators, see example
- WP4 delayed, but moving
 - Update tomorrow
- WP5 now underway
- WP1 tracking on time
 - Details of an analysis challenge are emerging. Details today

We are now fully staffed!

New posts started/starting

WP0: Management

- Proj leader
- Dep proj leader
- D0.1: TDR Contributions
- D0.2: Define Phase-2

WP1: Data Management

- D1.1: Setup UK data lake
- D1.2: Implement QoS info
- D1.3: Rec on data access
- D1.4: Analysis Facility
- D1.5: Pilot log system
- D1.6: Middle size VOs
- D1.7: DIRAC load manag
- D1.7: DIRAC high lvl cmds

WP2: Event Generators

- D2.1: Profiling report
- D2.2: Optimise LHAPDF
- D2.3: Gen code optimisation
- D2.4: Pythia8 biased hadr
- D2.5: Pythia8 color recon
- D2.6: EvtGen modernisation

WP3: Simulation

- D3.1: EMCuda prototype
- D3.2: EMCuda validation
- D3.3: Geant4 Optiks exmpl

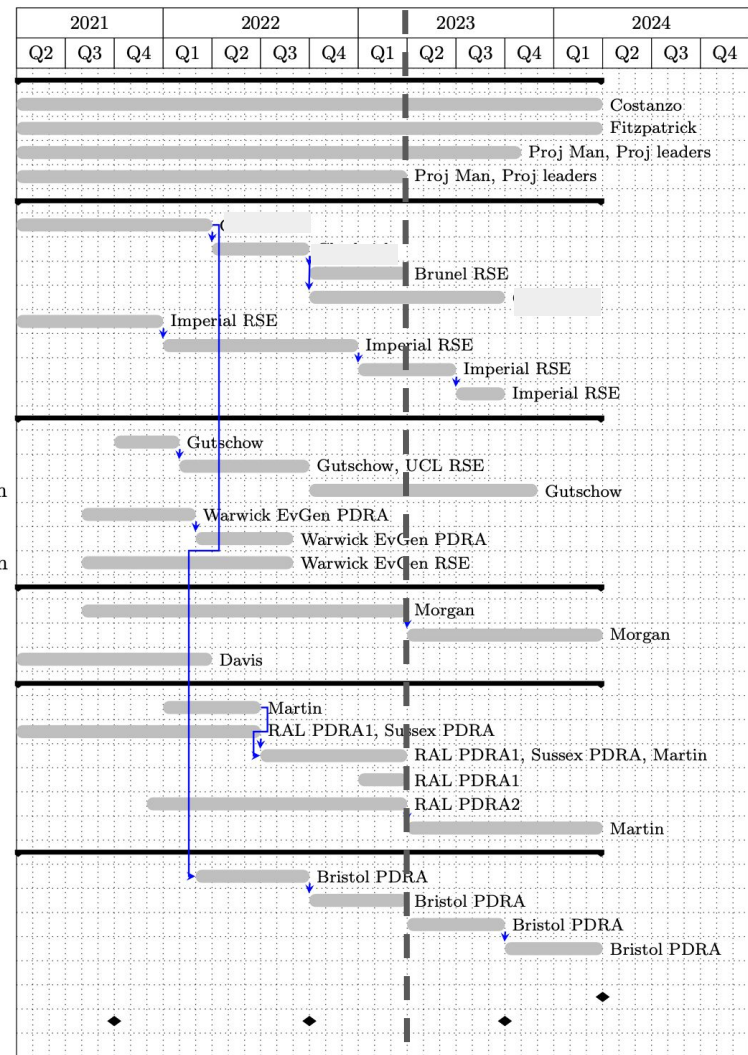
WP4: Reco Trigger

- D4.1: Report on benchm
- D4.2: FPGA prot deploy
- D4.3: FPGA prot benchm
- D4.4: OneAPI report
- D4.5: FasTras in OneAPI
- D4.6: FasTras benchm

WP5: Analysis Systems

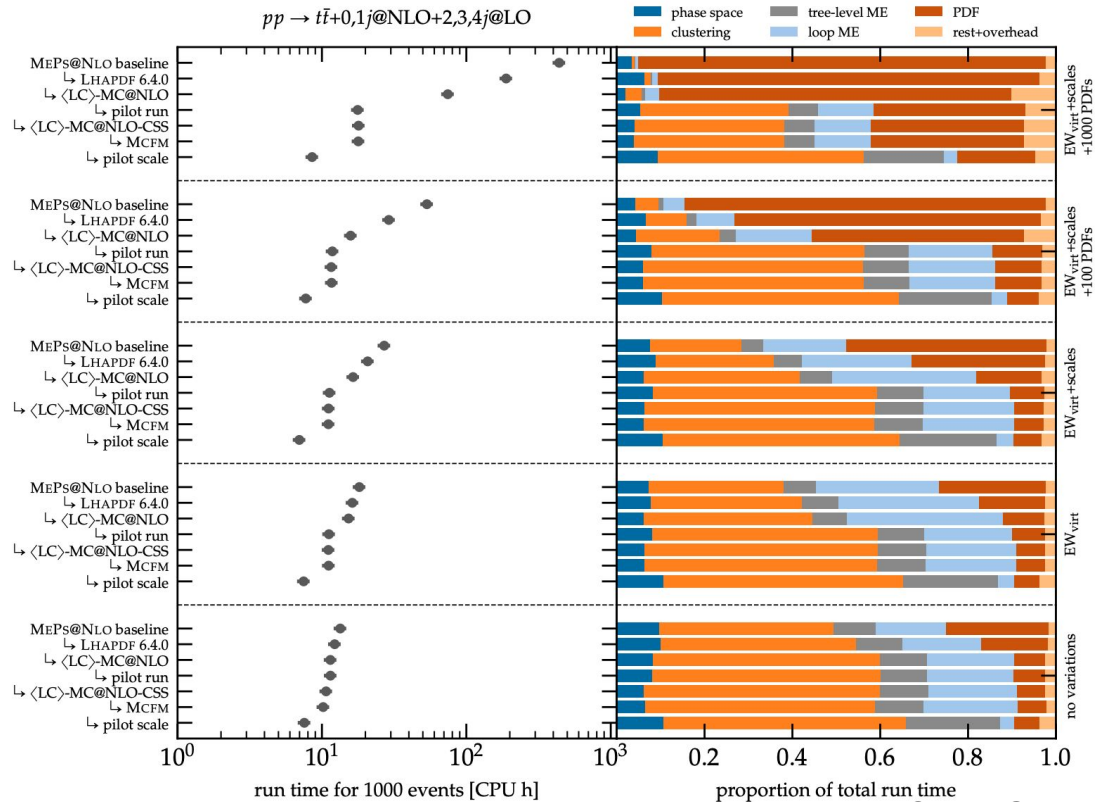
- D5.1: Oper UK data lake
- D5.2: Caching mechanism
- D5.3: Per-site Optim
- D5.4: Workload schedule

Final report
Workshops



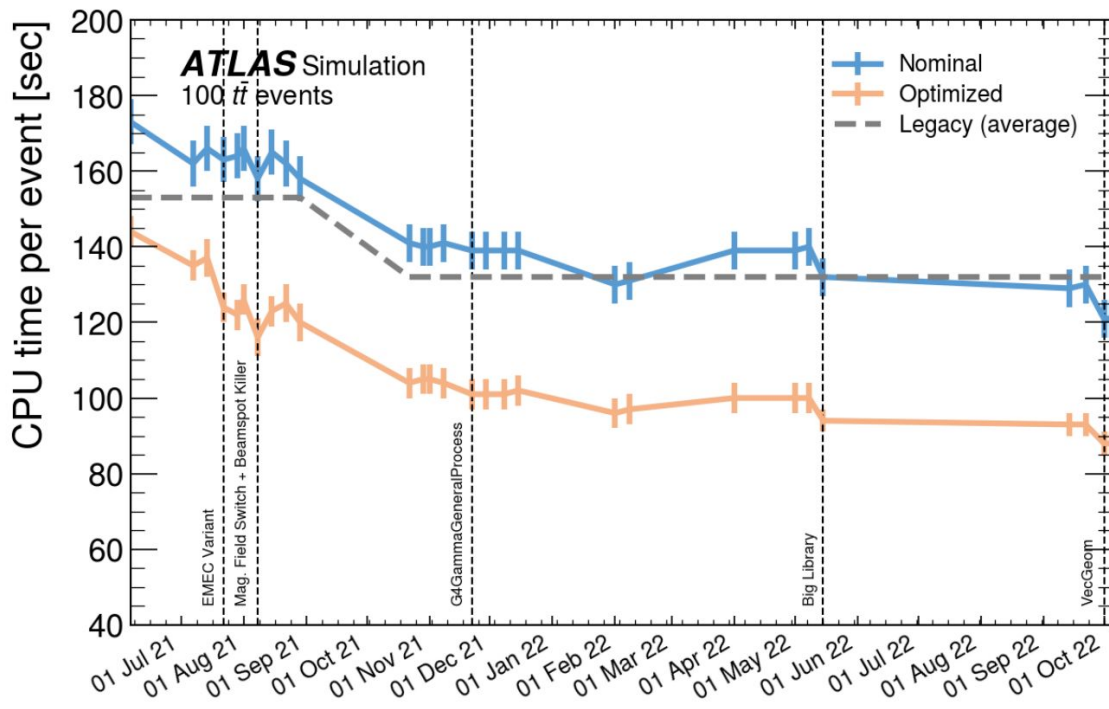
Improvements in software - Example from EvGen

Breakdown of CPU budget in $t\bar{t}$ +jets



The fruit is not hanging that low

- SWIFT-HEP operates on “common” software
- The experiments have a very important role to play
 - Most CPU time on WLCG spent on Simulation
 - Example from ACAT [talk](#)



SWIFT-HEP #1.5 will need to be prepared

- STFC says they would like us to bid for a 1-year costed extension
- Really important to keep the staff levels we have now
- April 24 to March 25 (call it phase-1.5)
- Budget envelope a bit tight - Fully staffed + cost increase
- Very little review expected (??)

SWIFT-HEP #2 we need to keep growing

- Continue the work we are doing
- Add more projects that are experiment independent
- Think beyond the LHC, we need to start thinking about future collider (discussion ongoing on how to fund R&D for the construction)
- Expertise in the UK on frameworks (“online” to use an old word), particle flow, tracking, simulation, event generators, ...

A joint bid with the Lattice Field Theory group funded starting last December

- ExaTEPP (Exascale for Theoretical and Experimental Particle Physics)
- About £700k over 2 years.
- Smaller than the phase 1b bid we submitted e.g. we lost data management and FPGA work

Interesting for the experimental PP community:

- GPU simulation, work on optimisation of AdePT/Celeritas. In particular VecGeom and optimisation
(1 FTE of RSE shared between Warwick and Sheffield)
- Training. 0.4 FTE at Hartree. This will hopefully boost our training programme
- Collaboration with industry (e.g. NVIDIA, Intel, etc) with more use cases to present

- This was not really easy in the “covid” world
 - We did manage a school on parallel programming, online in 2021
- C++ essentials to be delivered at the end of August
 - Caterina organising it in Manchester
 - We are sorting out the final details before announcing it
- More training to be organised by ExCALIBUR
 - E.g. kokkos this summer (?)
- Probably needs a more organised initiative for particle physics in the UK
 - Eg a school of computing (?)