

Did we accidentally build a compiler for HEP workflows? FAST-HEP Flow from declarative workflows to executable plans

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Modern high-energy physics analyses rely on complex software workflows that must evolve alongside changing libraries, data formats, execution environments, and computing technologies. Experience with FAST-HEP has shown that declarative analysis descriptions improve readability, but do not by themselves make the complete analysis unambiguous, replaceable, or reproducible.

This talk introduces Flow, a workflow system that applies compiler techniques to scientific analyses. Flow consolidates author-facing inputs into a normalized workflow, constructs a logical graph, validates dependencies, and produces a backend-independent execution plan before execution begins. This enables earlier error detection, interchangeable implementations and execution environments, and traceable production of analysis artifacts.

Focusing on a small number of architectural examples, the talk will discuss why compilation was introduced, what it enables in practice, and the lessons learned from nearly a decade of developing and modernising FAST-HEP.

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