

# Modernizing the ATLAS Simulation Infrastructure

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The ATLAS Simulation infrastructure has been used to produce upwards of 50 billion proton-proton collision events for analyses ranging from detailed Standard Model measurements to searches for exotic new phenomena. In the last several years, the infrastructure has been heavily revised to allow intuitive multithreading and significantly improved maintainability. Such a massive update of a legacy code base requires careful choices about what pieces of code to completely rewrite and what to wrap or revise. The initialization of the complex geometry was generalized to allow new tools and geometry description languages, popular in some detector groups. The addition of multithreading requires Geant4 MT and GaudiHive, two frameworks with fundamentally different approaches to multithreading, to work together. It also required enforcing thread safety throughout a large code base, which required the redesign of several aspects of the simulation, including “truth,” the record of particle interactions with the detector during the simulation. These advances were possible thanks to close interactions with the Geant4 developers.

## Secondary Keyword (Optional)

Software development process and tools

## Primary Keyword (Mandatory)

Simulation

## Tertiary Keyword (Optional)

**Author:** MARSHALL, Zachary Louis (Lawrence Berkeley National Lab. (US))

**Co-author:** DI SIMONE, Andrea (Albert-Ludwigs-Universitaet Freiburg (DE))

**Presenter:** DI SIMONE, Andrea (Albert-Ludwigs-Universitaet Freiburg (DE))

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