

# Geant4 Threading



Status and Work Plan

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# Geant4 Threading → Migration to Tasking

- Geant4 internally does not have complex tasking requirements
  - Current G4MT ~= event-level tasking constrained to an enumeration
  - Migrating to track-level tasks internally would be overkill
- Event-level tasking → straight-forward
  - No API changes of any significance
  - Basically invisible to downstream apps
- Sub-event level parallelism will require a bit more work for reproducibility
  - e.g. TLS random number generators seeded at beginning of event
  - Issues with TLS expecting correlation b/t event and thread will likely arise:

```
static thread local int lastEvent = -1;  
if(anEvent->GetEventID() != lastEvent) { ... reset something ... }
```

# Tasking Work Plan

- Built-in tasking library for large majority of users
  - C++11 threads, packaged\_task, future, promise
- Generic user API for submitting tasks to queue
- Internally, API will submit tasks to generic, lightweight “task\_group” template object
  - Designed to be the interception point for executing the task via another parallelism framework
    - TBB is already supported
    - HPX, Kokkos, etc. can be supported
  - New frameworks → provide a specialization for their library that gets integrated into Geant4 source code