

Profile and reorder code execution in Geant4 to increase performance

A Google Summer of Code Project

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- **Profile** Geant4 to identify potential targets (first half of GSoC period)
- **Reorder code execution** for improving serial performance (2nd half)

In reality Goals are intermingled and alternating

- Ported Geant4 to **Solaris 11/amd64**
 - Instant access to **diverse powerful profiling tools**, most importantly **DTrace**
 - “D” stands for Dynamic- dynamically instrument a running program by modifying its instructions while it is running
 - Very sophisticated profiling with minimal overhead (i.e., it allows you to do some pretty crazy stuff)
 - (Alternatives exist for Linux)
- Tool to **compare 2 versions** of the same application and generate an HTML report
- Used **FullCMS**, **Simplified Calorimeter** and the examples/ as the basis of our tests

Particle “bunching”

- **Sort** particles by their type prior to processing them
 - e.g.: $\dots, e^-, e^-, \dots, e^-, \gamma, \gamma, \dots, \gamma, \dots$
- Better **cache utilisation**
- **4-5% speed up** in total execution time

In terms of **absolute** numbers, the benefit may not seem breathtaking

Real gain Designed, validated, and automated some very advanced profiling methods that will help us attack performance issues in Geant4

Thank you. Questions?