

Geant4 Performance Monitoring Report

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27th Geant4 Collaboration Meeting, Sep 26 2022

Geant4 Performance Monitor Report

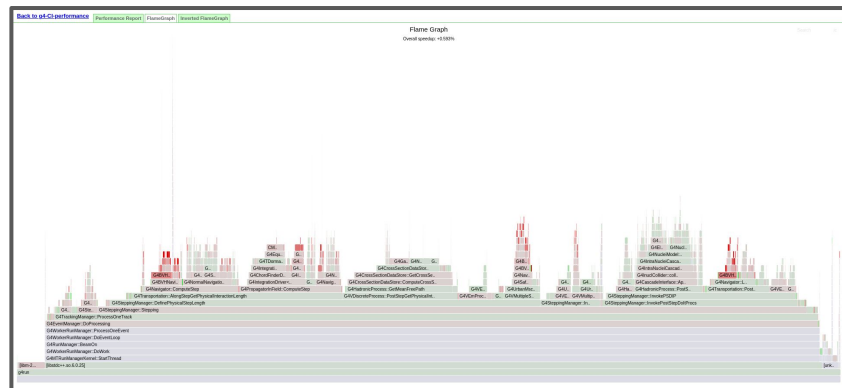
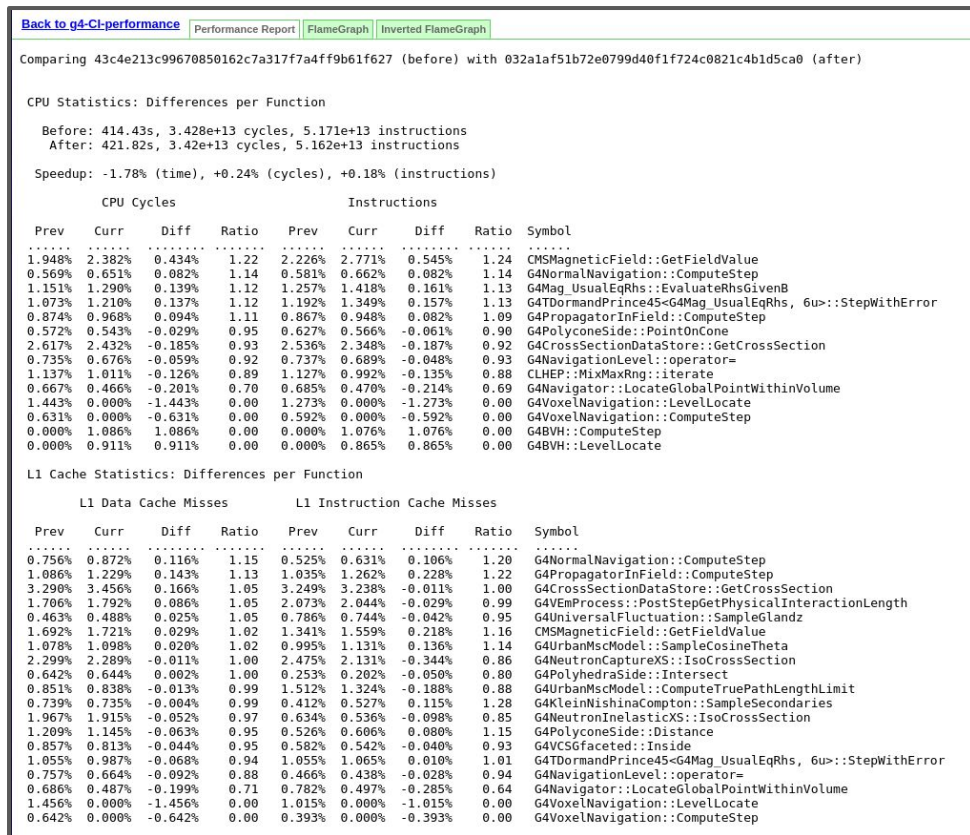
► Motivation

- Make performance analysis accessible for developers
- Quickly identify performance regressions as they happen

► Automatic performance report integrated into Jenkins

- Runs for each merge request opened for Geant4
- Records performance data for Geant4 application similar to CMSExp from FNAL
- Initial version provided summary in textual format and difference flamegraphs
- New HTML-based report (GSoC 2022 project) provides interactivity and more visualizations
 - ▷ HTML tables with data per symbol
 - ▷ Flamegraphs, Treemaps, Scatter Plots, etc
 - ▷ View differences between two versions and metrics for current version

Old Performance Report



Google Summer of Code 2022 Project

[Geant4 - Performance Data Visualization using d3.js](#)

See [presentation by Harshil Jani](#) on Sep 29th.

New Performance Report

- ▶ HTML-based
- ▶ Using IBS sampling
- ▶ Interactive and colorful
 - Sortable tables
 - Colored by various metrics
- ▶ Flamegraphs maintained
- ▶ Treemaps added
 - Better visual comparison between two Geant4 versions

Geant4 Performance Difference Report

Comparing version geant4-10-06-patch-03 (before) and geant4-11-00-patch-03 (after)

Home

Flamegraphs

Treemaps

Metrics Report

Metric	Before	After	Speedup
Cycles	21042695129717	20392656016587	+3.09%
Samples	5589753	5422644	+2.99%
Time [s]	401.4	386.7	+3.68%

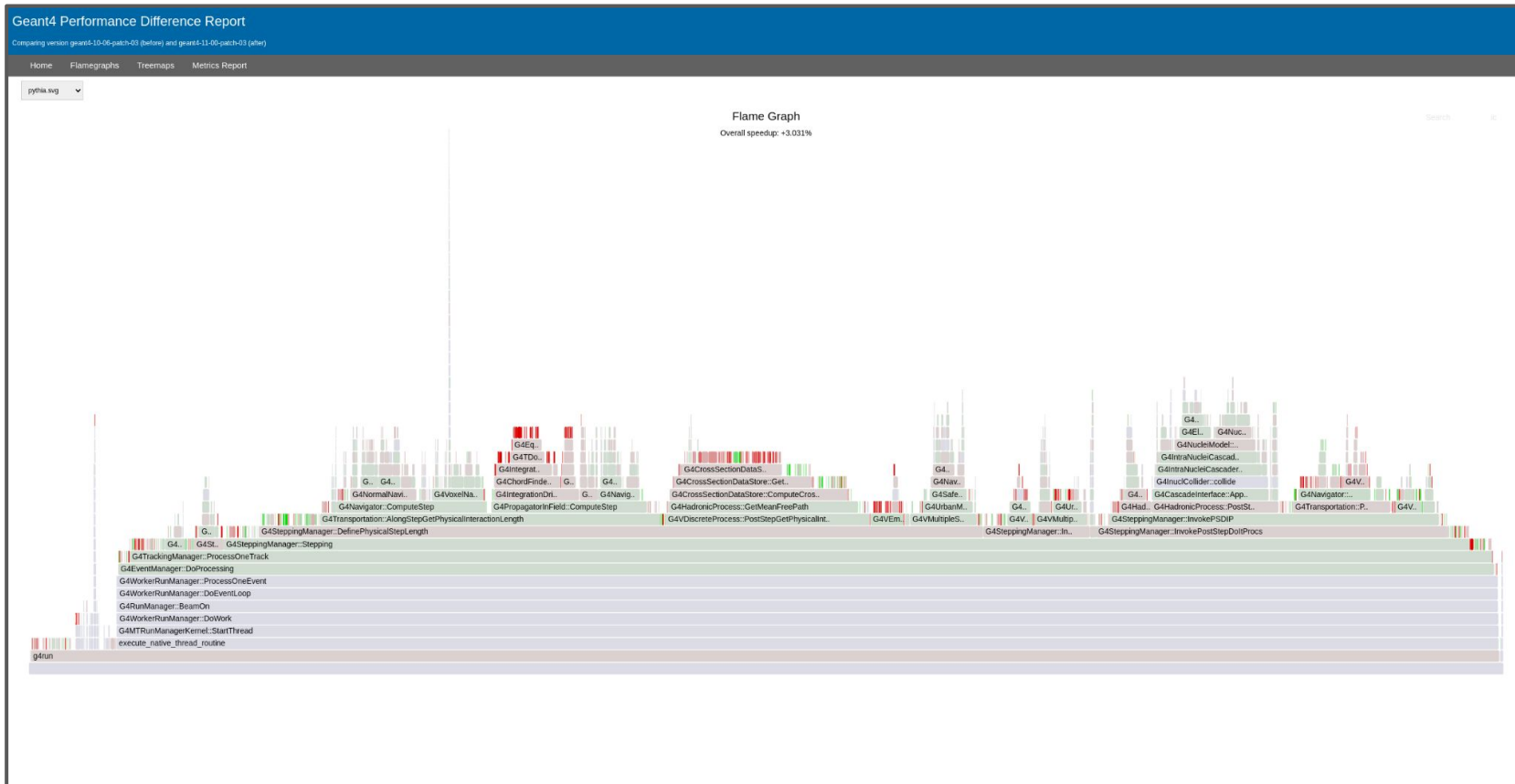
python

Download CSV

CYCLES

Old	New	Diff	Ratio	Comm	DSO	Symbol
4.29%	5.05%	+0.72%	1.167	g4run	libG4processes.so	G4CrossSectionDataStore::GetCrossSection
2.43%	1.46%	-0.98%	0.595	g4run	libG4processes.so	G4VEmProcess::PostStepGetPhysicalInteractionLength
1.60%	0.93%	-0.67%	0.578	g4run	libG4geometry.so	G4Navigator::LocateGlobalPointAndSetup
1.15%	0.23%	-0.92%	0.201	g4run	libG4processes.so	G4UniversalF fluctuation::SampleFluctuations
1.13%	0.71%	-0.43%	0.616	g4run	libG4processes.so	G4NeutronCaptureXS::IsCrossSection
0.99%	0.00%	-0.99%	0.000	g4run	libG4processes.so	G4NeutronElasticXS::IsCrossSection
0.87%	1.19%	+0.31%	1.358	g4run	libG4processes.so	G4CrossSectionDataStore::ComputeCrossSection
0.84%	0.45%	-0.39%	0.538	g4run	libG4processes.so	G4UrbanMacModel::ComputeTruePathLengthLimit
0.65%	0.00%	-0.65%	0.000	g4run	libG4geometry.so	G4IntegrationDriver<G4DmandPrince745>::AdvanceChordLimited
0.47%	0.00%	-0.47%	0.000	g4run	libG4track.so	G4VelocityTable::Value
0.41%	0.00%	-0.41%	0.000	g4run	libG4global.so	G4PhysicsVector::Value
0.26%	0.00%	-0.26%	0.000	g4run	libG4geometry.so	G4DmandPrince745::DistChord
0.05%	0.89%	+0.83%	18.184	g4run	libG4processes.so	G4VEmProcess::ComputeIntegralLambda
0.02%	0.42%	+0.40%	18.530	g4run	libG4processes.so	G4NeutronElasticXS::GetElementCrossSection
0.00%	0.43%	+0.43%	6268.323	g4run	libG4processes.so	G4ProcessManager::GetAttribute
0.00%	1.17%	+1.18%	Infinity	g4run	libG4processes.so	G4GammaNuclearXS::GetCrossSection
0.00%	0.64%	+0.63%	Infinity	g4run	libG4processes.so	G4UniversalF fluctuation::SampleGiantz
0.00%	0.31%	+0.31%	Infinity	g4run	libG4geometry.so	G4DmandPrince45<G4Mag_UsualEqRhs, 6u>::DistChord
0.00%	1.62%	+1.60%	Infinity	g4run	libG4geometry.so	G4DmandPrince45<G4Mag_UsualEqRhs, 6u>::StepWithError
0.00%	0.29%	+0.29%	Infinity	g4run	libG4geometry.so	G4IntegrationDriver<G4DmandPrince45<G4Mag_UsualEqRhs, 6u> >::AdvanceChordLimited
0.00%	0.80%	+0.79%	Infinity	g4run	libG4geometry.so	G4EquationOfMotion::RightHandSide
0.00%	0.60%	+0.60%	Infinity	g4run	libG4geometry.so	G4ChordFinderDelegate<G4IntegrationDriver<G4DmandPrince45<G4Mag_UsualEqRhs, 6u> > >::FindNextChord
0.00%	0.35%	+0.34%	Infinity	g4run	libG4geometry.so	G4IntegrationDriver<G4DmandPrince45<G4Mag_UsualEqRhs, 6u> >::QuickAdvance
0.00%	0.75%	+0.75%	Infinity	g4run	libG4geometry.so	G4VoxelNavigation::LevelLocate

Flamegraphs



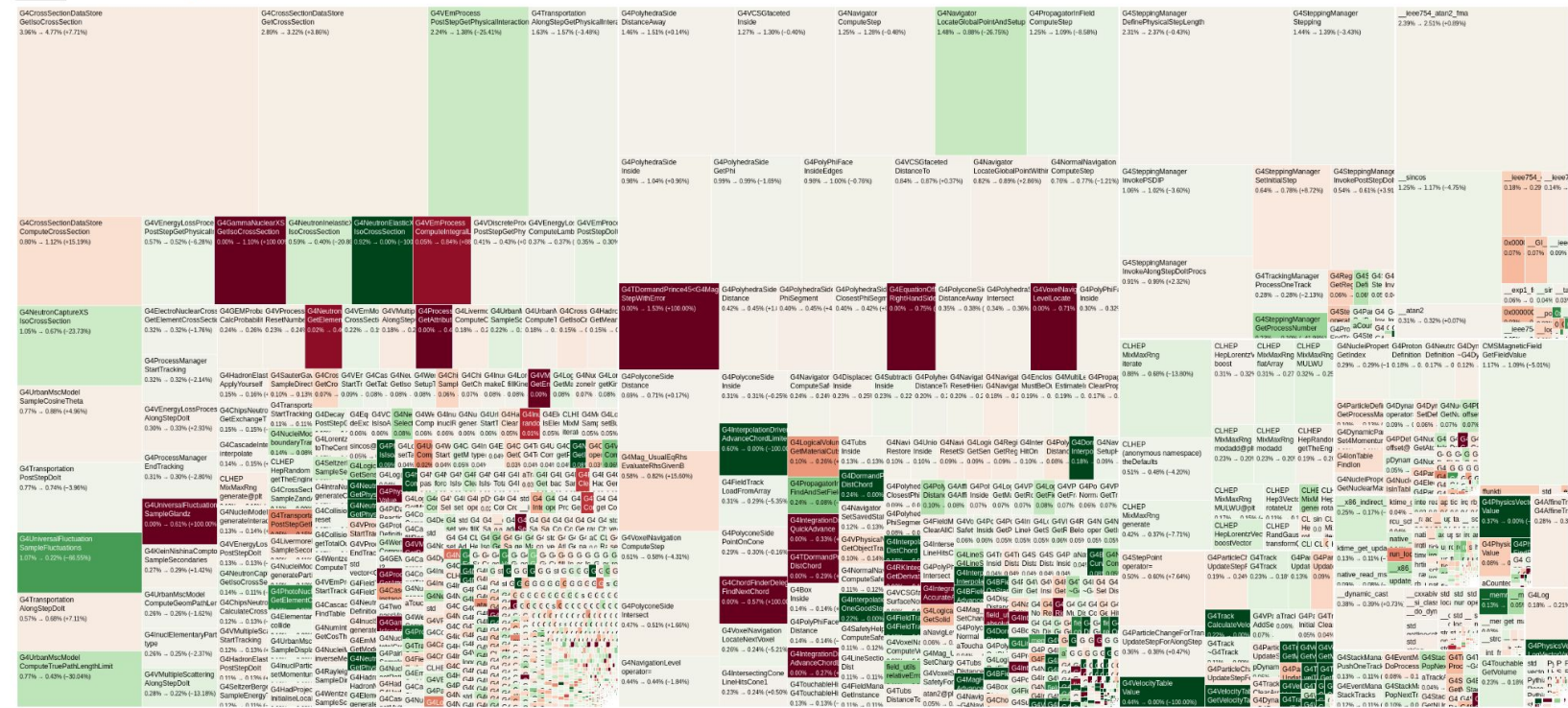
Treemaps

Geant4 Performance Difference Report

Comparing version geant4-10-06-patch-03 (before) and geant4-11-00-patch-03 (after)

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pythia Color by Absolute Change Relative Change



Live Demo