



Monitoring software performance with LHCbPR

Maciej Szymański
University of Chinese Academy of Sciences

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LHCb Performance and Regression framework

- **LHCbPR** is a framework for systematic monitoring of the LHCb software
- Provides performance baseline in **controlled conditions**
- Enables to **inspect any changes** due to e.g. MC generators, physics of Geant4, new external libraries, new MRs, DDDDB tags, ...
- **Compare results** across different compilers and architectures
- Not only to monitor resource consumption, but also to **measure the physics performance**
- Cf. nightly tests: larger statistics and more than boolean value

Infrastructure

▶ TWiki

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 - ▶ Configuration of Jenkins job
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- Machines that tests are currently running on

- 1b1hcbpr1 with CC7 dedicated for timing tests (single executor in Jenkins), label: perf-centos7-timing

- 1b1hcbpr4 with CC7 (8 executors), labels: perf-centos7, perf

- vo1hcb05 with SLC6 (8 executors), labels: perf-slc6, perf

- hltperf-quanta01-e52630v4 for HLT throughput test

- 1bhltperf01 for upgrade tests



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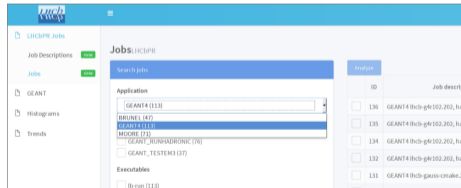
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- **Web front-end** ▶ lblhcbpr.cern.ch
 - ▶ LHCbPR2FE
 - generic ROOT files viewer
 - trend analysis
 - custom modules



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 - **LHCbPR2BE**
- **Web front-end** lblhcbpr.cern.ch
 - **LHCbPR2FE**
 - generic ROOT files viewer
 - trend analysis
 - custom modules
- Flexibility to push the results as HTML to EOS (at the level of LHCbPR2HD)
 - HLT rate and throughput tests
 - upgrade benchmarking

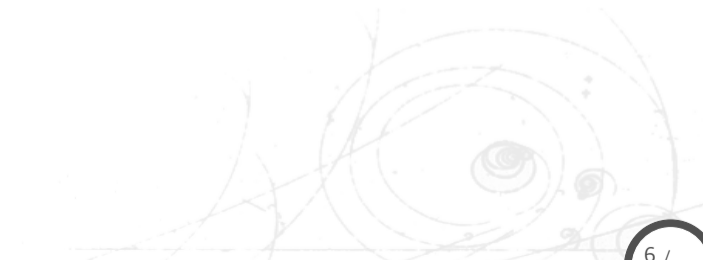


Some statistics as of today

- 5 applications
 - Brunel
 - Gauss
 - Geant4
 - Moore
 - MooreOnline
- 67 option files
- 128 tests (running on several slots and platforms)
- ~50 tests daily
- ~20 tests dedicated for timing (thus running only on lb1hcbpr1 machine)
- Single tests run from several minutes up to 10 hours

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 - see whether it's already defined: [▶ lblhcpr.cern.ch/api/executables](https://lblhcpr.cern.ch/api/executables), if not, we'll add it

```
"name": "lb-run-gaudirun",
"content": "lb-run -c {platform} --user-area={build} {app_name}/{app_version}
           gaudirun.py {options}"

"name": "lb-run-callgrind",
"content": "( lb-run -c {platform} --user-area={build} {app_name}/{app_version} gaudirun.py
           --printsequence {options} ; lb-run -c {platform} --user-area={build}
           {app_name}/{app_version} valgrind --tool=callgrind --dump-instr=yes
           --instr-atstart=no --cache-sim=yes --branch-sim=yes python
           $(lb-run -c {platform} --user-area={build} {app_name}/{app_version}
           which gaudirun.py) {options} )"

"name": "perf-lb-run-gaudirun",
"content": "( perf record --call-graph=lbr -o perf.log lb-run -c {platform}
           --user-area={build} {app_name}/{app_version} gaudirun.py {options} ;
           perf report -i perf.log > perf.lbr.txt )"

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- Create the **handler** to parse the output
 - many handlers already there, e.g. to parse TimingAuditor, output of perf, etc.
 - see README on: [▶ LHCbPR2HD](#)

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```
<periodictest>
  <schedule type="week" time="10:00">Mon,Tue,Wed,Thu,Fri</schedule>
  <slot>lhcb-future</slot>
  <project>Brunel</project>
  <platform>x86_64-slc6-gcc62-opt</platform>
  <test runner="lhcbpr" group="MiniBrunel" env="lb-run-gaudirun|TimeLineHandler"/>
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machine label

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- (Optionally) create custom **analysis module** ▶ LHCbPR2FE
 - or re-use existing one ...

Trend module with predefined parameters

Plot last 10 measurements for a given algorithm

The screenshot displays the Trend module interface. On the left is a navigation sidebar with categories like LHCbPR Jobs, Gauss, GEANT, Histograms, Trends, HLT Test Results, and Brunel. The main content area is titled "MiniBrunel centos7 trend" and includes a search bar with "BRUNEL (9521)" entered. Below the search bar are sections for "Options" (MiniBrunel (1559) is checked), "Executables" (several options are unchecked), "Platforms" (x86_64-centos7-gcc62-opt (4849) is checked), and "Hosts" (several options are unchecked). At the bottom of the search panel, there is a "Show Nightly versions" checkbox and a "Number of nightly versions to show" input field set to 10.

On the right, the "Filter Attributes" section contains a table with 10 rows of attributes. Each row has an ID, a Name, and a "Show" button.

ID	Name	Show
8176	min_RichPhotonRecoDown	Show
8177	max_RichPhotonRecoDown	Show
8178	mean_RichPhotonRecoDown	Show
8179	sigma_RichPhotonRecoDown	Show
8180	min_RichTrackGloPointsDown	Show
8181	max_RichTrackGloPointsDown	Show
8182	mean_RichTrackGloPointsDown	Show
8183	sigma_RichTrackGloPointsDown	Show
8184	min_PrStoreFTHit	Show
8185	max_PrStoreFTHit	Show

At the bottom of the table, there is a pagination control showing page 1 of 2127, and a "Number of items per page" dropdown menu with options 10, 25, 50, and 100.

Using trend analysis

Plot the time spent by EVENT LOOP in Brunel test as a function of the software version

The screenshot shows the LHCbPR web interface. The left sidebar has a 'Trends' tab selected, indicated by a blue arrow. The main content area shows a search for 'BRUNEL (8006)' and a list of test results. The 'Filter Attributes' section is empty, displaying 'No data was found!'. A blue arrow points from the 'Trends' tab to the 'Trends' section in the main content area.

go to Trends/Trends tab

Using trend analysis

Plot the time spent by EVENT LOOP in Brunel test as a function of the software version

The screenshot shows the LHCbPR web application interface. On the left, a sidebar contains navigation options: LHCbPR Jobs, Gauss, GEANT, Histograms, Trends (highlighted), and HLT Test Results. The main content area is titled 'Search Jobs' and features a search bar and a list of filter attributes. The 'Application' filter is set to 'BRUNEL (8006)'. Below this, there are several categories of filters: Options, Executables, Platforms, and Hosts. A blue arrow points from the 'BRUNEL (8006)' dropdown menu to the text 'select Brunel from the list of applications' located in the lower right quadrant of the image. The 'Options' section includes 'PRTEST-COLLISION15-1000 (3965)' which is checked. The 'Hosts' section includes 'lblhcbpr4.cern.ch (404)' which is checked. The right side of the interface shows a 'Filter Attributes' search bar and a message 'No data was found!'.

select Brunel from the list of applications

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Plot the time spent by EVENT LOOP in Brunel test as a function of the software version

The screenshot shows the LHCbPR web interface. On the left sidebar, the 'Trends' menu is selected. The main content area is divided into three sections: 'Search Jobs', 'Filter Attributes', and a results area. In the 'Search Jobs' section, the 'Application' dropdown is set to 'BRUNEL (8006)'. Under the 'Options' section, the checkbox for 'PRTEST-COLLISION15-1000 (3965)' is checked, and a blue arrow points to it from the text below. Other options include MiniBrunel variants and collision-related tests. The 'Executables', 'Platforms', and 'Hosts' sections are also visible, with 'Hosts' showing 'lblhcbpr4.cern.ch (404)' selected. The 'Filter Attributes' section is empty, displaying 'No data was found!'. The browser's address bar shows the URL: <https://lhcpr.cern.ch/#app?end7app=1&options=6&hosts=39&versions=1926&versions=1679&versions=1862&versions=1853&versions=1638&versions=1614&withNightly&checkSpecPr&nightlyVersionNumber=10>

select the option, platform and host you are interested in

Using trend analysis

Plot the time spent by EVENT LOOP in Brunel test as a function of the software version

The screenshot shows the LHCbPR web interface. The left sidebar contains navigation options: LHCbPR Jobs, Gauss, GEANT, Histograms, Trends (selected), and HLT Test Results. The main content area is titled 'Versions' and includes the following sections:

- Show Nightly versions
- Number of nightly versions to show:
- Select latest versions
- Select specific versions
- Releases
 - v43r2 (1)
- lhcb-future
 - lhcb-future.600 (1)
 - lhcb-future.597 (1)
 - lhcb-future.596 (1)
 - lhcb-future.582 (14)
 - lhcb-future.579 (11)
 - lhcb-future.578 (8)
 - lhcb-future.575 (1)
 - lhcb-future.572 (11)
 - lhcb-future.571 (11)
 - lhcb-future.570 (11)
- lhcb-gaudi-head
 - lhcb-gaudi-head.1657 (5)
 - lhcb-gaudi-head.1653 (15)
 - lhcb-gaudi-head.1652 (10)
 - lhcb-gaudi-head.1651 (5)
 - lhcb-gaudi-head.1643 (1,8)
 - lhcb-gaudi-head.1642 (15)
 - lhcb-gaudi-head.1641 (15)
 - lhcb-gaudi-head.1638 (15)
 - lhcb-gaudi-head.1637 (6)
 - lhcb-gaudi-head.1636 (1)

A blue arrow points from the text 'choose versions' to the 'Number of nightly versions to show' input field.

Using trend analysis

Plot the time spent by EVENT LOOP in Brunel test as a function of the software version

The screenshot shows the LHCbPR Trends web application. The left sidebar contains navigation options: LHCbPR Jobs, Gauss, GEANT, Histograms, Trends (selected), and HLT Test Results. The main content area is titled 'Trends' and 'Attributes values by version'. It features a search bar with 'eve' entered, a list of application options (with 'PRETEST-COLLISION15-1000 (3965)' selected), and a list of executables. The right side displays a table of jobs filtered by 'eve'.

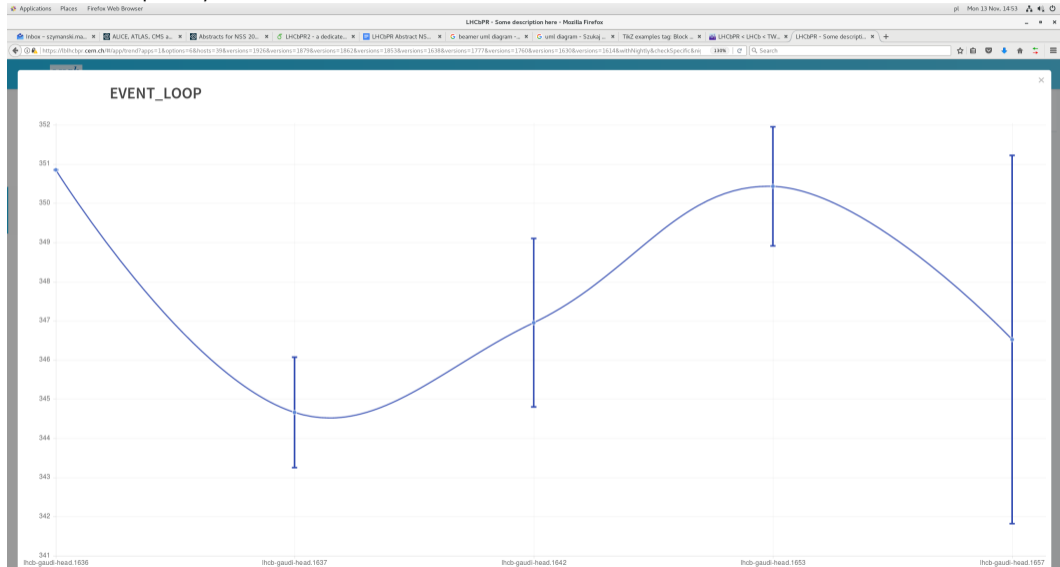
Filter Attributes: eve

ID	Name	
5	EVENT_LOOP	Show
1952	BrunelEventCount	Show
2387	EVENT_LOOP_count	Show
2388	EVENT_LOOP_rank	Show
2390	EVENT_LOOP_id	Show
2407	BrunelEventCount_count	Show
2408	BrunelEventCount_rank	Show
2410	BrunelEventCount_id	Show
2512	EventAccount	Show
2513	EventAccount_count	Show

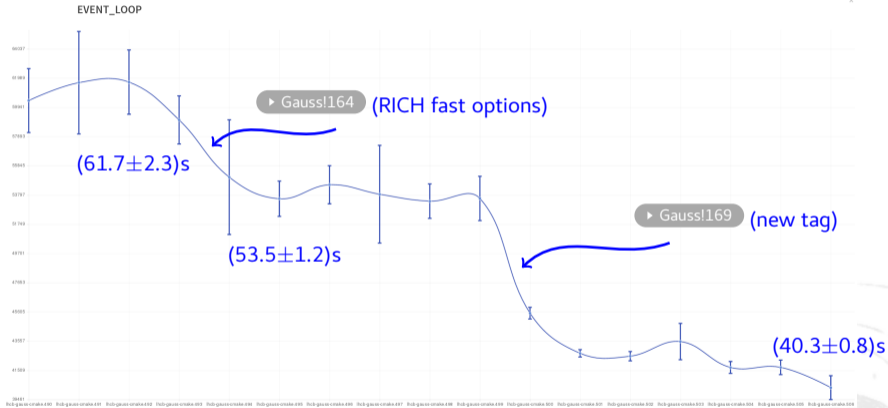
type the name of the algorithm

Using trend analysis

Plot the time spent by EVENT LOOP in Brunel test as a function of the software version



Event loop timing in Gauss vs. SW version



Using ROOT file viewer

Applications Places Firefox Web Browser

LHCbPR - Some description here - Mozilla Firefox

Inbox - szymanski.ma... AUICE, ATLAS, CMS a... Abstracts for NSS 20... LHCbPR2 - a dedicate... LHCbPR Abstract NS... boamer umil diagram... umil diagram - Szukaj... TIK2 examples tag Block... LHCbPR < LHCb < TW... LHCbPR - Some descrip...

https://lhcpr.com.ch/lhcprrootfileviewer

128%

Search

LHCbPR Jobs

Job Descriptions

Jobs

ROOT file viewer

Gauss

GEANT

Histograms

Trends

HLT Test Results

ROOT file viewer

No jobs selected

No plots selected!

Select jobs

Search jobs

Application

No data was found!

Show debug info

© 2017 - LHCbPR

1/7

go to LHCbPR Jobs/ROOT file viewer tab

Using ROOT file viewer

The screenshot shows the ROOT file viewer interface. On the left, there is a sidebar with navigation options: LHCbPR Jobs, Job Descriptions, Jobs, ROOT file viewer, Gauss, GEANT, Histograms, Trends, and HLT Test Results. The main content area is titled "ROOT file viewer" and includes a message "No plots selected!". Below this, there is a "Select plots" button and a "Select jobs" button. The "Select jobs" section contains a search bar and several filter categories: Applications (with "GEANT4 (306)" selected), Options (with "GEANT_TESTEM5 (9)" selected), Executables (with "lb-run (508)" selected), Platforms (with "x86_64-centos7-gcc62-opt (24)" selected), Hosts (with "796f23726d01 (1)" selected), and Versions. To the right, there is a table of job listings with columns for ID, Job description, Host, and Start/End. The table shows several jobs, with the first two (IDs 19733 and 19734) selected. A blue arrow points from the text "select applications, filter options etc" to the search bar in the "Select jobs" section.

select applications, filter options etc

ID	Job description	Host	Start/End
<input checked="" type="checkbox"/>	19733 GEANT4 lhc-sim09.557, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 05:06:00+0100 / 2017-11-12 09:58:53+0100
<input checked="" type="checkbox"/>	19734 GEANT4 lhc-g4r103.162, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 05:00:42+0100 / 2017-11-12 09:53:03+0100
<input type="checkbox"/>	19690 GEANT4 lhc-sim09-upgrade.536, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 00:55:22+0100 / 2017-11-12 05:59:31+0100
<input type="checkbox"/>	19602 GEANT4 lhc-sim09-cmake.69, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 00:55:22+0100 / 2017-11-12 05:59:24+0100
<input type="checkbox"/>	18515 GEANT4 lhc-sim09-cmake.62, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:57:23+0100 / 2017-11-05 05:46:46+0100
<input type="checkbox"/>	18514 GEANT4 lhc-sim09.550, G4MScinThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:56:51+0100 / 2017-11-05 05:46:07+0100
<input type="checkbox"/>	16704 GEANT4 lhc-sim09-cmake.53, G4MScinThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:56+0200 / 2017-10-29 02:59:14+0200
<input type="checkbox"/>	16705 GEANT4 lhc-sim09.541, G4MScinThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:57+0200 / 2017-10-29 02:59:12+0200
<input type="checkbox"/>	14982 GEANT4 lhc-sim09-cmake.46, G4MScinThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:06+0200 / 2017-10-22 03:11:46+0200
<input type="checkbox"/>	14983 GEANT4 lhc-sim09.534, G4MScinThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:03+0200 / 2017-10-22 03:11:00+0200

Using ROOT file viewer

No plots selected!

Use the 'Select plots' tab to choose plots to view

Select jobs Select plots

Search jobs

Application

GEANT4 (306)

Options

GEANT_RUNHADRONIC (269)

GEANT_RichTbSim+Test (9)

GEANT_TESTEM5 (90)

GEANT_TESTEM3 (140)

Executables

lb-run (508)

Platforms

x86_64-centos7-gcc62-opt (24)

x86_64-slc6-gcc48-opt (115)

x86_64-slc6-gcc49-opt (310)

x86_64-slc6-gcc62-opt (23)

Hosts

796f23726d01 (1)

lbhcbpr3.cern.ch (2)

lbhcbpr4.cern.ch (43)

volhcb05.cern.ch (462)

Versions

ERoots/GeoHk/... (2)

Analyze

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<input type="checkbox"/>	191692 GEANT4 lhc-sim09-cmake.69, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 00:55:22+0100 / 2017-11-12 05:59:24+0100
<input type="checkbox"/>	18515 GEANT4 lhc-sim09-cmake.62, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:57:23+0100 / 2017-11-05 05:46:46+0100
<input type="checkbox"/>	18514 GEANT4 lhc-sim09.550, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:56:51+0100 / 2017-11-05 05:46:07+0100
<input type="checkbox"/>	16704 GEANT4 lhc-sim09-cmake.53, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:56+0200 / 2017-10-29 02:59:14+0200
<input type="checkbox"/>	16705 GEANT4 lhc-sim09.541, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:57+0200 / 2017-10-29 02:59:12+0200
<input type="checkbox"/>	14982 GEANT4 lhc-sim09-cmake.46, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:06+0200 / 2017-10-22 03:11:46+0200
<input type="checkbox"/>	14983 GEANT4 lhc-sim09.534, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:03+0200 / 2017-10-22 03:11:00+0200

1 2 3 4 5 6 7 8 9 »

10 25 50 100

select jobs to analyze and click Analyze

Using ROOT file viewer

The screenshot shows the ROOT file viewer interface. On the left, there is a sidebar with navigation options: LHCbPR Jobs, Job Descriptions, Jobs, ROOT file viewer, Gauss, GEANT, Histograms, Trends, and HLT Test Results. The main content area is titled 'ROOT file viewer' and includes a 'No plots selected!' message and a 'Select plots' button. Below this, there is a search filter for 'GEANT4 (306)' and a list of jobs. A blue arrow points to the 'Select plots' button, with the text 'click on Select plots' next to it.

ID	Job description	Host	Start/End
<input checked="" type="checkbox"/>	19733 GEANT4 lhc-sim09.557, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 05:06:00+0100 / 2017-11-12 09:58:53+0100
<input checked="" type="checkbox"/>	19734 GEANT4 lhc-g4r103.162, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 05:00:42+0100 / 2017-11-12 09:53:03+0100
<input type="checkbox"/>	19690 GEANT4 lhc-sim09-upgrade.536, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 00:55:22+0100 / 2017-11-12 05:59:31+0100
<input type="checkbox"/>	19602 GEANT4 lhc-sim09-cmake.69, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-12 00:55:22+0100 / 2017-11-12 05:59:24+0100
<input type="checkbox"/>	18515 GEANT4 lhc-sim09-cmake.62, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:57:23+0100 / 2017-11-05 05:46:46+0100
<input type="checkbox"/>	18514 GEANT4 lhc-sim09.550, G4MScInThinLayerTest.py	lbhcbpr4.cern.ch, x86_64-slc6-gcc49-opt	2017-11-05 00:56:51+0100 / 2017-11-05 05:46:07+0100
<input type="checkbox"/>	16704 GEANT4 lhc-sim09-cmake.53, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:56+0200 / 2017-10-29 02:59:14+0200
<input type="checkbox"/>	16705 GEANT4 lhc-sim09.541, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-29 00:57:57+0200 / 2017-10-29 02:59:12+0200
<input type="checkbox"/>	14982 GEANT4 lhc-sim09-cmake.46, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:06+0200 / 2017-10-22 03:11:46+0200
<input type="checkbox"/>	14983 GEANT4 lhc-sim09.534, G4MScInThinLayerTest.py	volhcb05.cern.ch, x86_64-slc6-gcc49-opt	2017-10-22 00:58:03+0200 / 2017-10-22 03:11:00+0200

Using ROOT file viewer

ROOT file viewer
LHCbPR

No plots selected!

Use the 'Select plots' tab to choose plots to view

Select jobs Select plots

Plot Selected (1) Select Defaults Clear All

- TESTEM5_RMSresults.root
 - Distribution for Energy 1000
 - Distribution for Energy 2000
 - Distribution for Energy 3000
 - Distribution for Energy 4000
 - Distribution for Energy 5000
 - Distribution for Energy 7000
 - Distribution for Energy 9000
 - Distribution for Energy 12000
 - Distribution for Energy 15000
 - Distribution for Energy 20000
 - Distribution for Energy 25000
 - Distribution for Energy 30000
 - Distribution for Energy 40000
 - Fitted Distribution for Energy 1000
 - Fitted Distribution for Energy 2000
 - Fitted Distribution for Energy 3000
 - Fitted Distribution for Energy 4000
 - Fitted Distribution for Energy 5000
 - Fitted Distribution for Energy 7000
 - Fitted Distribution for Energy 9000
 - Fitted Distribution for Energy 12000
 - Fitted Distribution for Energy 15000

select your histogram

Using ROOT file viewer

Applications Places Firefox Web Browser

LHCbPR - Some description here - Mozilla Firefox

Inbox - szymanski.ma... ALICE, ATLAS, CMS a... Abstracts for NSS 20... LHCbPR2 - a dedicate... LHCbPR Abstract NS... boamer umi diagram... umi diagram - Szukaj... T&Z examples tag Block... LHCbPR < LHCb < TW... LHCbPR - Some descrip...

https://lhcbpr.com.ch/ROOTfileviewer?apps=2&options=4&withNightly=false&checkSpecfic=false&withNightlyVersionNumber=10&jobs=19733&jobs=19734

lhcb ROOT file viewer

LHCbPR Jobs

Job Descriptions

Jobs

ROOT file viewer

Gauss

GEANT

Histograms

Trends

HLT Test Results

ROOT file viewer

LHCbPR

No plots selected!

Use the 'Select plots' tab to choose plots to view

Select jobs Select plots

Plot selected Select Defaults Clear all

- TESTEM5_RMSresults.root
 - Distribution for Energy 1000
 - Distribution for Energy 2000
 - Distribution for Energy 3000
 - Distribution for Energy 4000
 - Distribution for Energy 5000
 - Distribution for Energy 7000
 - Distribution for Energy 9000
 - Distribution for Energy 12000
 - Distribution for Energy 15000
 - Distribution for Energy 20000
 - Distribution for Energy 25000
 - Distribution for Energy 30000
 - Distribution for Energy 40000
 - Fitted Distribution for Energy 1000
 - Fitted Distribution for Energy 2000
 - Fitted Distribution for Energy 3000
 - Fitted Distribution for Energy 4000
 - Fitted Distribution for Energy 5000
 - Fitted Distribution for Energy 7000
 - Fitted Distribution for Energy 9000
 - Fitted Distribution for Energy 12000
 - Fitted Distribution for Energy 15000

click on *Plot selected*

Using ROOT file viewer

The screenshot displays the ROOT file viewer interface within a Mozilla Firefox browser. The browser's address bar shows the URL: `https://lhcbpr.cern.ch/lhcbrootviewer?apps=2&options=4&withNightly=false&checkSpecfic=false&withNightlyVersionNumber=10&jobs=1973&jobs=19734`. The interface features a sidebar on the left with navigation options: LHCbPR Jobs, Job Descriptions, Jobs, ROOT file viewer, Gauss, GEANT, Histograms, Trends, and HLT Test Results. The main content area is titled "ROOT file viewer" and displays a histogram plot titled "Distribution for Energy 1000". The plot shows a distribution of data points with a smooth curve overlaid. Below the plot, there is a control panel with a "Select jobs" tab and a "Select plots" tab. The "Select plots" tab is active, showing a list of plots with checkboxes. The "Distribution for Energy 1000" plot is selected, indicated by a blue checkmark. Other plots in the list include "Distribution for Energy 2000", "Distribution for Energy 3000", "Distribution for Energy 4000", "Distribution for Energy 5000", "Distribution for Energy 7000", "Distribution for Energy 9000", "Distribution for Energy 12000", "Distribution for Energy 15000", "Distribution for Energy 20000", "Distribution for Energy 25000", and "Distribution for Energy 30000". A blue arrow points from the text "choose the way of display" to the "Superimposed" option in the plot control panel.

ROOT file viewer

Distribution for Energy 1000

Split Superimposed Supersuperimposed Ratio (with JSROOT) Ratio (with d3) Difference (with d3)

Select jobs Select plots

Plot Selected [1] Select Defaults Clear All

- TESTEM_RMSresults.root
- Distribution for Energy 1000
- Distribution for Energy 2000
- Distribution for Energy 3000
- Distribution for Energy 4000
- Distribution for Energy 5000
- Distribution for Energy 7000
- Distribution for Energy 9000
- Distribution for Energy 12000
- Distribution for Energy 15000
- Distribution for Energy 20000
- Distribution for Energy 25000
- Distribution for Energy 30000

choose the way of display

Upgrade benchmarking

- Special case for the upgrade studies
- Tests results pushed to eos website:
<https://cern.ch/lhcbpr-hlt/PerfTests/UpgradeVelo>
- Throughput test (Velo only and best performance)
- PrChecker (Velo only)
- Running on lhcb-tdr-test (HEAD of everything)
- Notifications when results available sent to mattermost private channel (please let us know if you're interested)
- More tests to come

Perf test for Gauss

- Linux tool integrated in the kernel to (see [tutorial by Hadrien](#)):

- measure CPU statistics
- investigate where the program spends time
- produce call graphs

- Test runs with command:

```
perf record --call-graph=lbr -o perf.log lb-run -c {platform}  
--user-area={build} {app_name}/{app_version} gaudirun.py {options}  
perf report -i perf.log > perf.lbr.txt
```

- Using lhcb-sim09-upgrade and
\$PRCONFIGOPTS/Gauss/PRTEST-2016-SIM-P8-10000000-100evts.py
- Scheduled to run weekly in LHCbPR
- Example of results:

```
https://1blhcbpr.cern.ch/#/app/jobs/list?apps=4&executables=13&withNightly=false&checkSpecific=false&nightlyVersionNumber=10&jobs=47746&ssf=false
```

time spent by the function and its children

time spent by the function itself

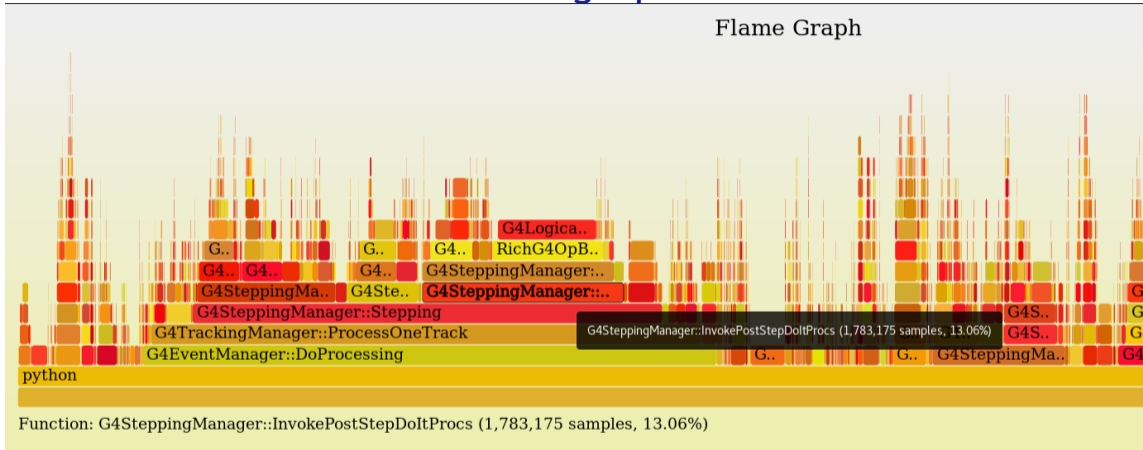


name of the function

call graph

Flame graph

Flame Graph



Igprof test for Gauss

- Performance and memory profiling tool, here just focus on:

- memory that hasn't be freed
- total memory allocated by any function

- Test runs with command:

```
igprof_env="lb-run -c {platform} --ext igprof --user-area={build}  
{app_name}/{app_version}"
```

```
$igprof_env igprof -d -mp -z -o igout.mp.gz gaudirun.py {options}
```

```
$igprof_env igprof-analyse -v -g -r MEM_LIVE igout.mp.gz >
```

```
igout.mp.live.txt
```

```
$igprof_env igprof-analyse -v -g -r MEM_TOTAL igout.mp.gz >
```

```
igout.mp.total.txt
```

- Using lhcb-sim09-upgrade and `$PRCONFIGOPTS/Gauss/PRTEST-2016-SIM-P8-10000000-100evts.py`
- Scheduled to run weekly in LHCbPR
- Example of the results:

```
https://lblhcbpr.cern.ch/#/app/jobs/list?apps=4&executables=14&withNightly=false&checkSpecific=false&nightlyVersionNumber=10&jobs=30204&ssf=false
```

memory leaked by the function and its children

Flat profile (cumulative >= 1%)

% total	Total	Calls	Function
100.0	213'831'173	457'234	<spontaneous> [1]
99.5	212'809'583	449'213	_start [2]
99.5	212'809'583	449'213	__libc_start_main [3]

memory leaked by the function itself

Flat profile (self >= 0.01%)

% total	Self	Calls	Function
19.32	41'314'528	968	_ZN9RichHpdQE12setAnHpdQEenEiRKSt6vectorIdSaIdEES4_ [81]
18.71	40'004'657	240	_ZnwmRKSt9nothrow_t [82]
7.84	16'769'024	408	_ZN5clang4DeclnwEmRKNS_10ASTContextEjm [295]
7.17	15'326'496	1	_ZNSt6vectorI5Vec4fSaIS0_EE14_M_fill_insertEN9_gnu_cxx17_normal_iteratorIPS0_S2_EE8RKSO_ [310]
3.53	7'548'672	2'457	dictresize [398]
2.81	6'002'703	232	_ZN4llvm20BumpPtrAllocatorImplINS_15MallocAllocatorELm4096ELm4096EE8AllocateEmm [478]
2.67	5'712'424	1	_ZNSt6vectorIPNS5clang4DeclE5aIS2_EE6resizeEm [484]
2.62	5'605'472	20'178	_ZNSt6vectorIdSaIdEE6insertEN9_gnu_cxx17_normal_iteratorIPKdS1_EERS4_ [491]
2.26	4'835'656	1	_ZNSt6vectorINS5clang8QualTypeESaIS1_EE6resizeEm [512]
1.92	4'106'288	71'608	_ZN5s4_Rep9_S_createEmmRKSaIcE [552]
1.63	3'479'968	6'397	_ZN7EvtPhsp5cloneEv [577]
1.45	3'104'768	53	_ZN5clang20TemplateArgumentList10CreateCopyERN5_10ASTContextEN4llvm8ArrayRefINS_16TemplateArgumentEEE [601]
1.20	2'555'912	316	_ZN5clang11FileManager7getFileEN4llvm9StringRefEbb [547]
1.07	2'278'520	3'963	_ZN4llvm15SmallVectorBase8grow_podEPvmm [685]
1.01	2'159'016	17'618	_ZN14MCTruthManager11AddParticleERN5HepMC10FourVectorES2_S2_iiibiPN4LHCb10MCParticleEbb [645]

call graph

in bytes

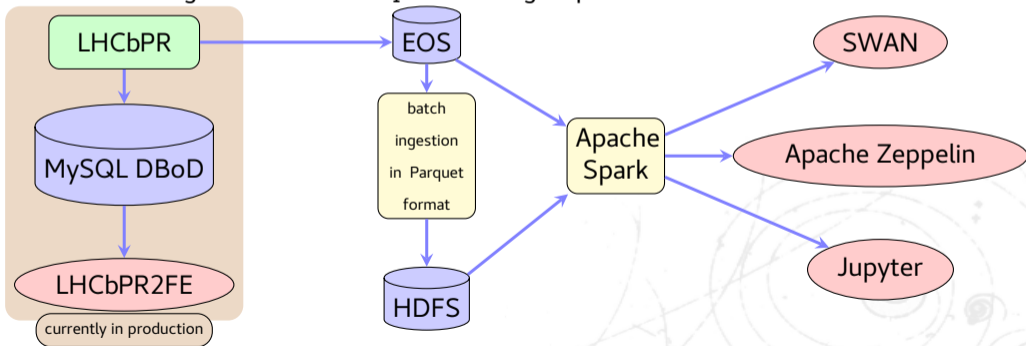
[80]	19.3	.....	41'357'120 / 41'545'661	1'452 / 4'737	_ZN17RichHpdProperties23InitializeHpdPropertiesEv [79]
	19.3	.....	42'592 / 41'314'528	1'452	_ZN17RichHpdProperties21FillHpdQETablesAtInitEP16IDataProviderSvcP11IMessageSvc
	19.3	.....	41'314'528 / 41'314'528	968 / 968	_ZN9RichHpdQE12setAnHpdQEenEiRKSt6vectorIdSaIdEES4_ [81]
Rank	% total	Self	Self / Children	Calls / Total	Function
[81]	19.3	.....	41'314'528 / 41'357'120	968 / 1'452	_ZN17RichHpdProperties21FillHpdQETablesAtInitEP16IDataProviderSvcP11IMessageSvc [80]
	19.3	41'314'528	41'314'528 / 0	968	_ZN9RichHpdQE12setAnHpdQEenEiRKSt6vectorIdSaIdEES4_

callers

callees

Big data tools for LHCbPR

- Data from tests pushed to Hadoop Distributed File System
- Possibility to use Spark connector in SWAN notebooks to read those data
- **Interactive** exploration, **collaboration** on tests reports
- Needs to belong to the ai-hadoop-users e-group



SWAN notebooks for the analysis of tests results

Query

```
In [54]: app="Gauss"
opt="PRTEST-2016-SIM-P8-1000000-100evts"
plat="x86_64-slc6-gcc49-opt"
slot="lhcb-sim09-upgrade"
host="lb1hcbpr1.cern.ch"
attrname="EVENT_LOOP"
lastn=10

from pyspark.sql.functions import rank, col, avg, stddev_pop

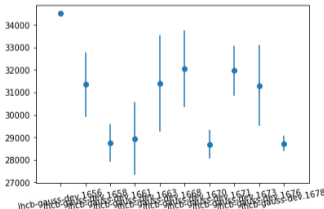
results=flattened.select("app_version","JobAttributes.data")\
    .filter("app_name = '"+app+"'")\
    .filter("opt_name = '"+opt+"'")\
    .filter("JobAttributes.name='"+attrname+"'")\
    .filter("HOST.hostname='"+host+"'")\
    .filter("app_version like '"+slot+%'"")\
    .filter("CMTCONFIG.platform='"+plat+"'")\
    .orderBy(flattened["app_version"].desc())\
    .groupBy("app_version")\
    .agg(avg(col("data")))\
    .limit(int(lastn))

results_unc=flattened.select("app_version","JobAttributes.data")\
    .filter("app_name = '"+app+"'")\
    .filter("opt_name = '"+opt+"'")\
    .filter("JobAttributes.name='"+attrname+"'")\
    .filter("HOST.hostname='"+host+"'")\
    .filter("app_version like '"+slot+%'"")\
    .filter("CMTCONFIG.platform='"+plat+"'")\
    .orderBy(["app_version"], ascending=[0])\
    .groupBy("app_version")\
    .agg(stddev_pop(col("data")))\
    .limit(int(lastn))
```

```
import matplotlib.pyplot as plt
x_val = [x[0] for x in reversed(results.collect())]
y_val = [float(x[1]) for x in reversed(results.collect())]
yerr = [float(x[1]) for x in reversed(results_unc.collect())]
print(x_val)
print(y_val)
print(yerr)
plt.xticks(list(range(len(x_val))), x_val)
plt.xticks(rotation=10)
plt.xlim([-1,len(x_val)])
plt.errorbar(range(len(y_val)), y_val, yerr=yerr, fmt='o')
plt.show()
```

▶ Apache Spark: 2 EXECUTORS 4 CORES Jobs: 11 COMPLETED

```
['u'lhcb-gauss-dev.1656', 'u'lhcb-gauss-dev.1658', 'u'lhcb-gauss-dev.1661', 'u'lhcb-gauss-dev.1676', 'u'lhcb-gauss-dev.1678']
[34509.898, 31345.9206, 28751.5598, 28947.599599999998, 31394.860399999998,
[0.0, 1447.5902695502755, 838.1198149096348, 1604.3968748786074, 2133.645968
```



Thank you!
Please give feedback on our [▶ mattermost channel](#)

LHCbPR - Resources

- Web application:
<https://lblhcbpr.cern.ch>
<https://lblhcbpr.cern.ch/api/>
<https://gitlab.cern.ch/lhcb-core/LHCbPR2FE>
- API service:
<https://gitlab.cern.ch/lhcb-core/LHCbPR2BE>
- ROOT HTTP service:
<https://gitlab.cern.ch/lhcb-core/LHCbPR2ROOT>
- Tests' output handlers:
<https://gitlab.cern.ch/lhcb-core/LHCbPR2HD>
- Project builder:
<https://gitlab.cern.ch/lhcb-core/LHCbPR2>
- Jenkins configuration
<https://gitlab.cern.ch/lhcb-core/LbNightlyTools>
- Configuration of the periodic tests
<https://gitlab.cern.ch/lhcb-core/LHCbNightlyConf/>