

SPOT Tutorial Slides

2021 ECP Annual Meeting

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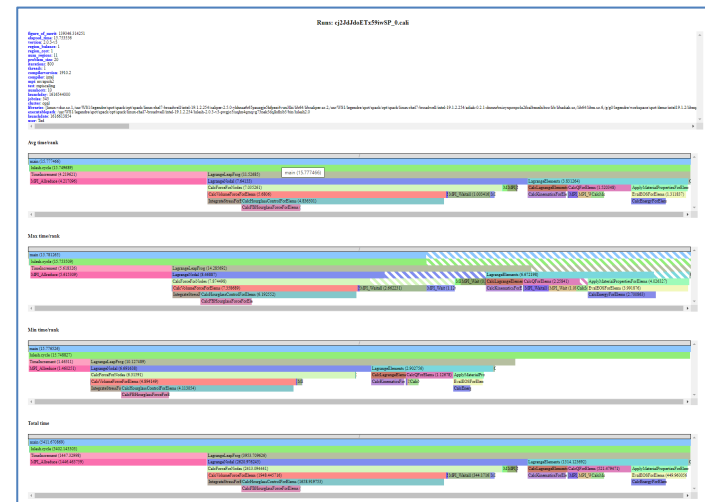
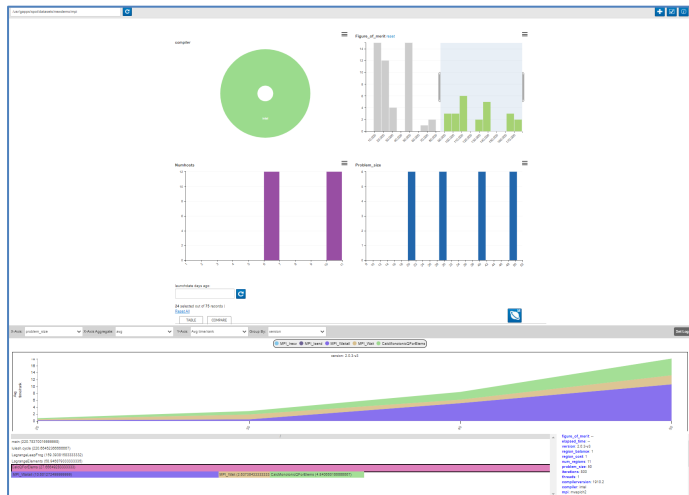


LLNL-PRES-XXXXXX

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC

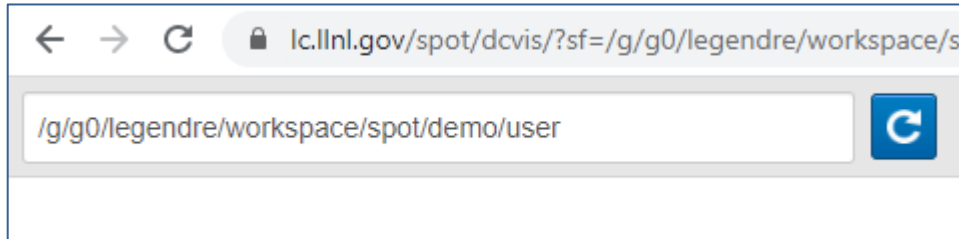
SPOT: Software Performance and Analysis Tracking

- SPOT is visualization for **collections of performance profiles**. Common uses cases are:
 - Performance comparison of nightly tests. Look for performance regressions.
 - Performance tracking of developer changes. Run an MPI scaling study.
 - Collect performance profiles from users. Understand how users run and hit performance issues.



SPOT's Workflow

1. Point SPOT webpage at directory containing *.cali files.



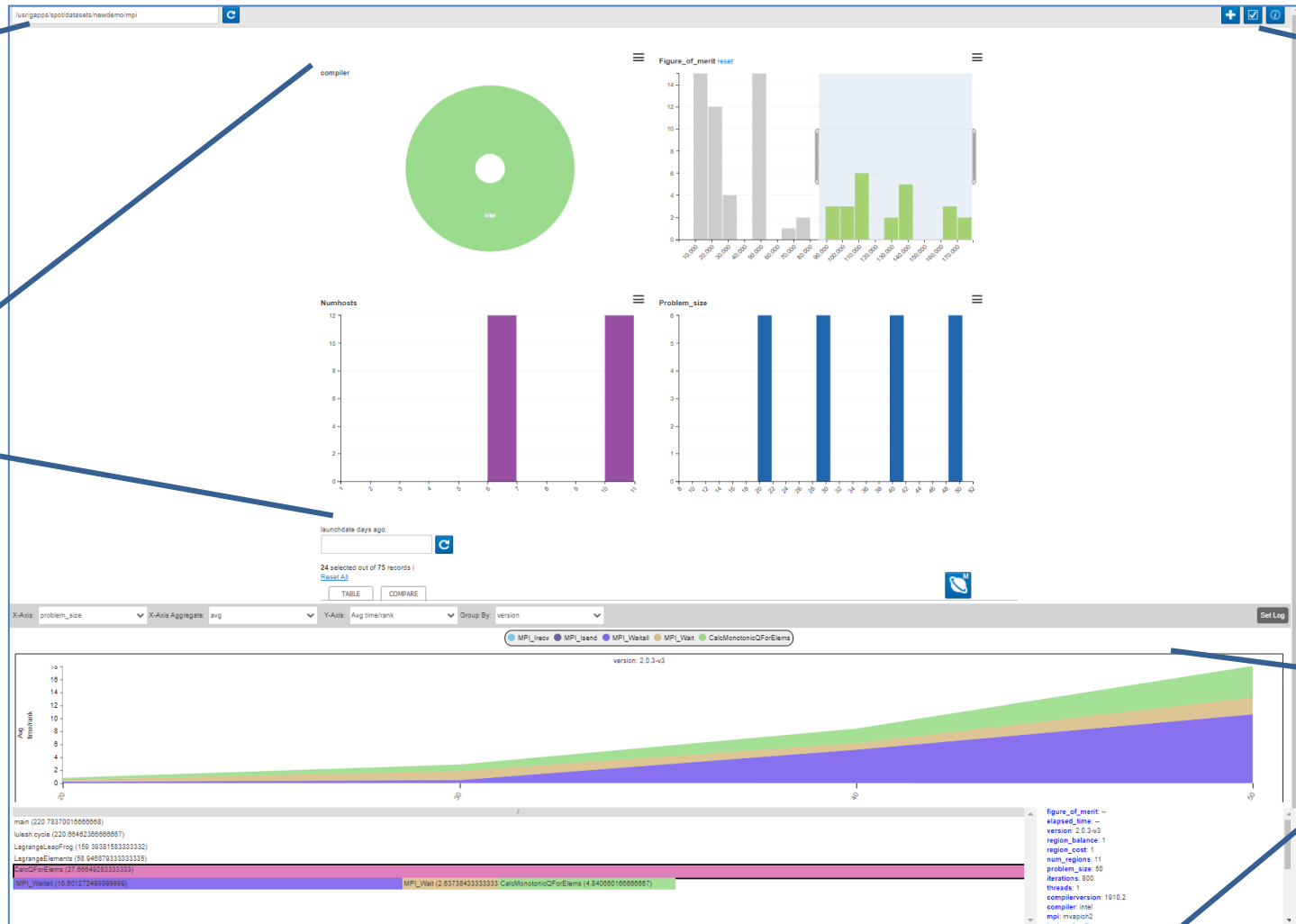
2. Select “interesting” sets of runs to analyze
 - Don’t compare performance of 1d test run. vs 3d multi-physics run.
3. Run common analysis with SPOT.
 - i.e., Graph history of performance changes
 - i.e., View performance context trees
4. Run advanced analysis with Hatchet.

SPOT's Landing Page

Data Source

Meta-data

Config



Perf. Compare

SPOT's Landing Page

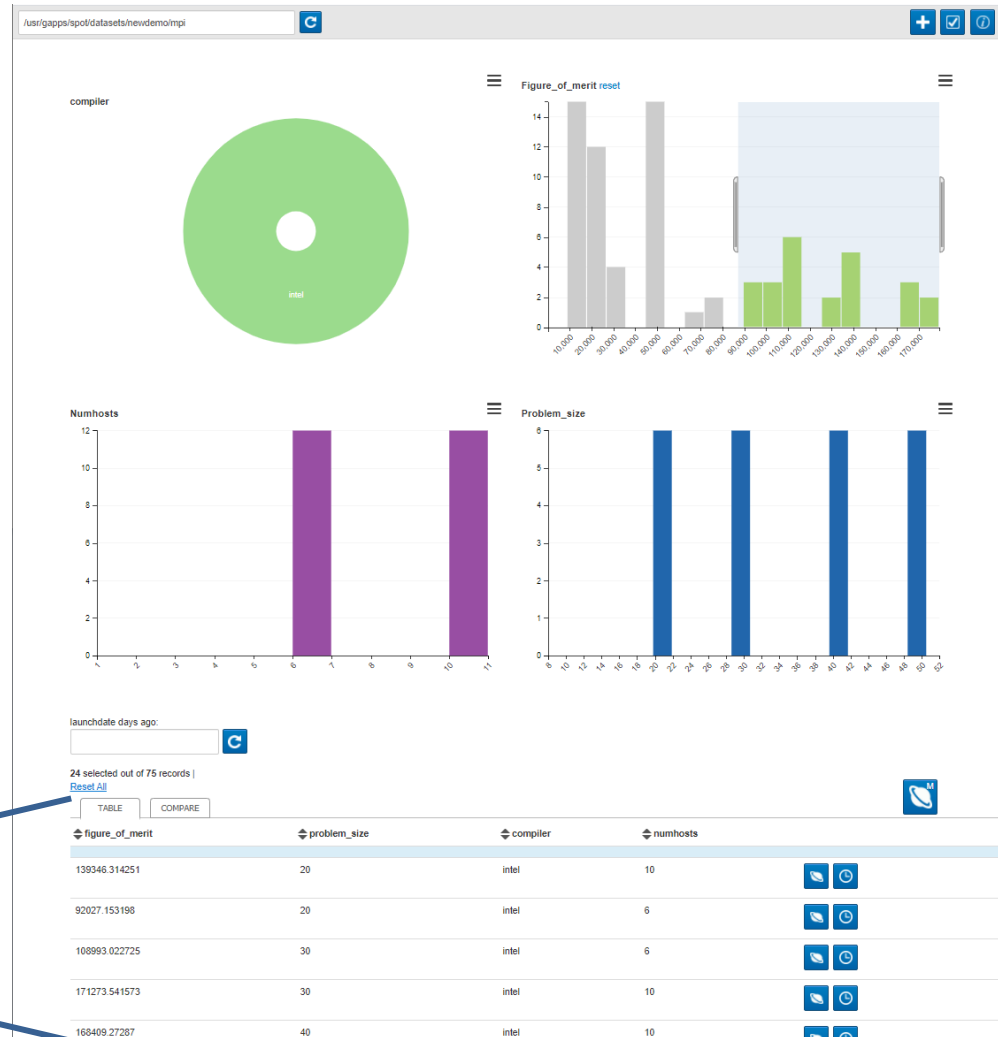




















Table
View

SPOT is Based on CrossFilter

TABLE

COMPARE

figure_of_merit	elapsed_time	version	problem_size	threads	numhosts	jobsize	launchdate	user		
9657.624636	2.60561	2.0.3-v1	10	1	2	27	2/3/21 8:11	bob		
24056.116646	39.672571	2.0.3-v1	40	1	2	64	2/20/21 8:11	alice		
10150.910684	10.306957	2.0.3-v3	50	1	1	27	2/18/21 8:11	alice		
24072.920076	24.671706	2.0.3-v1	40	1	2	64	2/14/21 8:11	alice		
23945.74189	36.081572	2.0.3-v3	50	1	2	64	3/4/21 8:11	alice		
23258.383892	39.211667	2.0.3-v2	50	1	2	64	2/16/21 8:11	alice		
15125.493765	10.264128	2.0.3-v3	50	1	2	27	2/19/21 8:11	alice		
23189.230912	25.529092	2.0.3-v3	50	1	2	64	2/22/21 8:11	alice		
24863.815433	35.418538	2.0.3-v2	40	1	2	64	2/12/21 8:11	alice		
23622.598644	33.527217	2.0.3-v3	50	1	2	64	2/24/21 8:11	alice		

SPOT's Crossfilter: <https://dc-js.github.io/dc.js/>

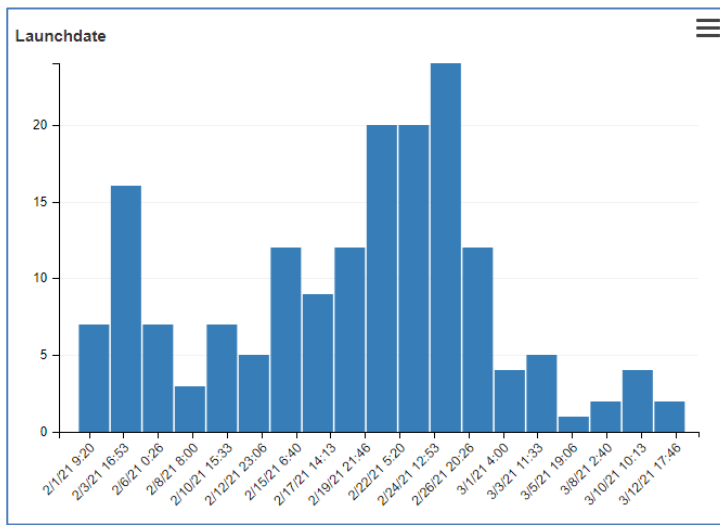
D3-Based Crossfilter: <https://square.github.io/crossfilter/>

- CrossFilter is good at finding correlations in data.
- Crossfilter helps you manage/slice your data to make interesting comparisons.

Each App Run has Two Types of Data

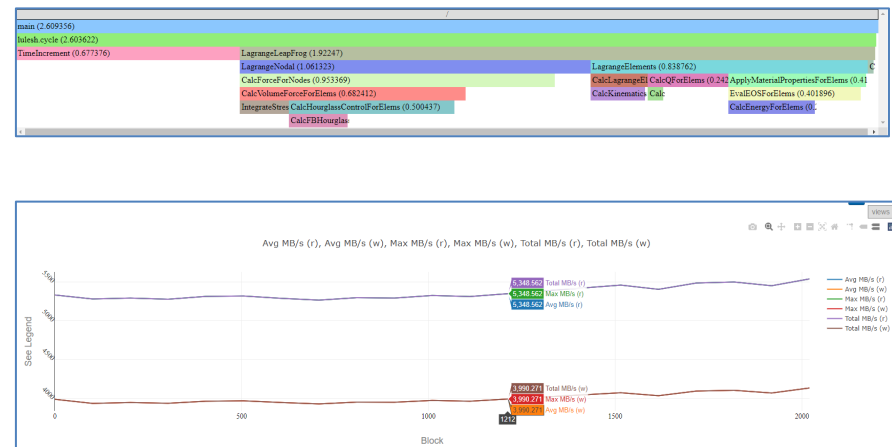
- **Metadata**

- Name/value data about job.
 - User, host, FOM, input parameters, ...
- Displayed as histograms



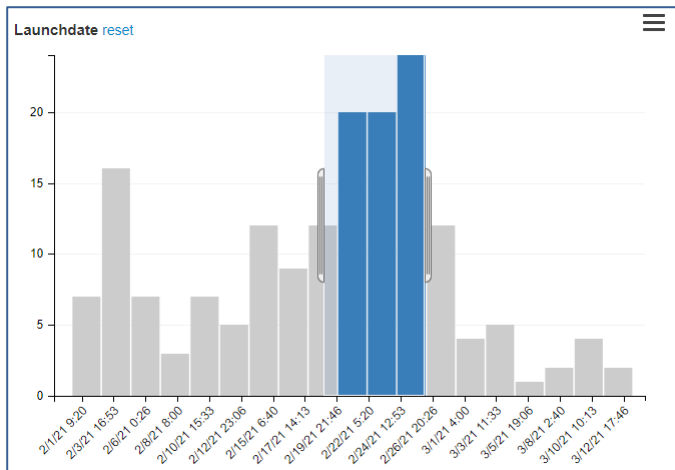
- **Performance Data**

- Can be different metrics.
 - Avg Time/Rank, Max Time/Rank, bandwidth, ...
- Displayed as a flame graph or timeseries.



Metadata Can be Filtered

- Select regions of metadata histograms to filter.
 - Filtering in one histogram updates all histograms range.
 - E.g., Filtering Launchdate to 'Feb 19-Feb26' will update the 'Users' histogram to only show users who ran between those dates.
 - While filtered, comparisons and Jupyter notebooks will operate on the filtered data.



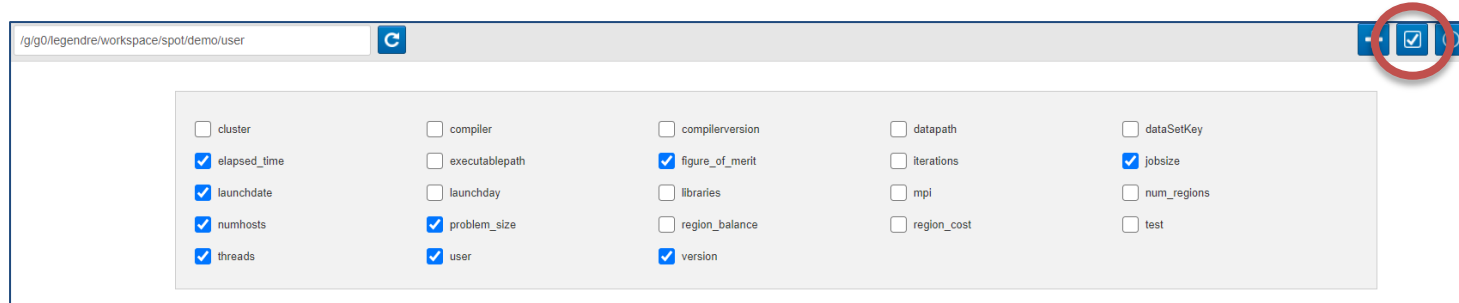
62 selected out of 172 records | [Reset All](#)

TABLE COMPARE

figure_of_merit	elapsed_time	version	problem_size
24056.116646	39.672571	2.0.3-v1	40
15125.493765	10.264128	2.0.3-v3	50

Metadata is Configurable

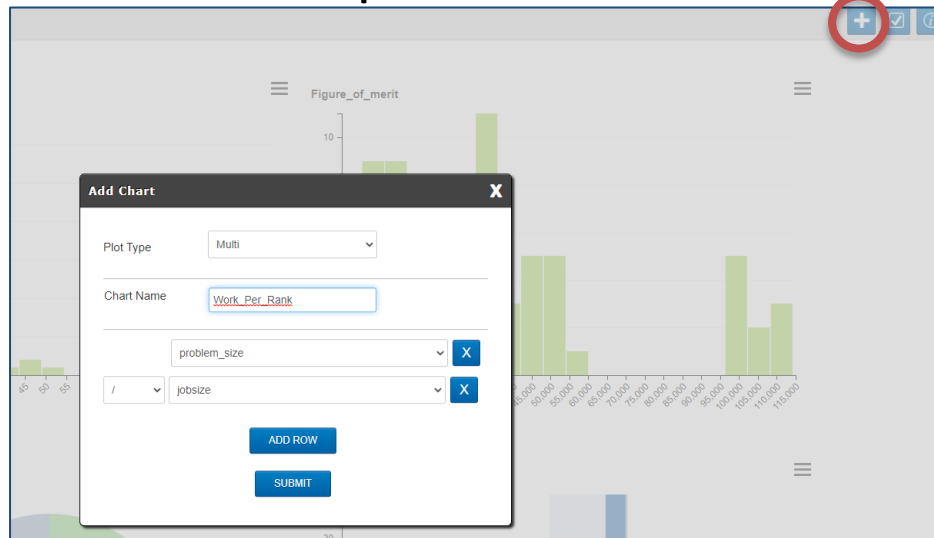
- Can show/hide metadata:



/g/g0/legendre/workspace/spot/demo/user

<input type="checkbox"/> cluster	<input type="checkbox"/> compiler	<input type="checkbox"/> compilerversion	<input type="checkbox"/> datapath	<input type="checkbox"/> dataSetKey
<input checked="" type="checkbox"/> elapsed_time	<input type="checkbox"/> executablepath	<input checked="" type="checkbox"/> figure_of_merit	<input type="checkbox"/> iterations	<input checked="" type="checkbox"/> jobsize
<input checked="" type="checkbox"/> launchdate	<input type="checkbox"/> launchday	<input type="checkbox"/> libraries	<input type="checkbox"/> mpi	<input type="checkbox"/> num_regions
<input checked="" type="checkbox"/> numhosts	<input checked="" type="checkbox"/> problem_size	<input type="checkbox"/> region_balance	<input type="checkbox"/> region_cost	<input type="checkbox"/> test
<input checked="" type="checkbox"/> threads	<input checked="" type="checkbox"/> user	<input checked="" type="checkbox"/> version		

- Can create composite metadata:



Figure_of_merit

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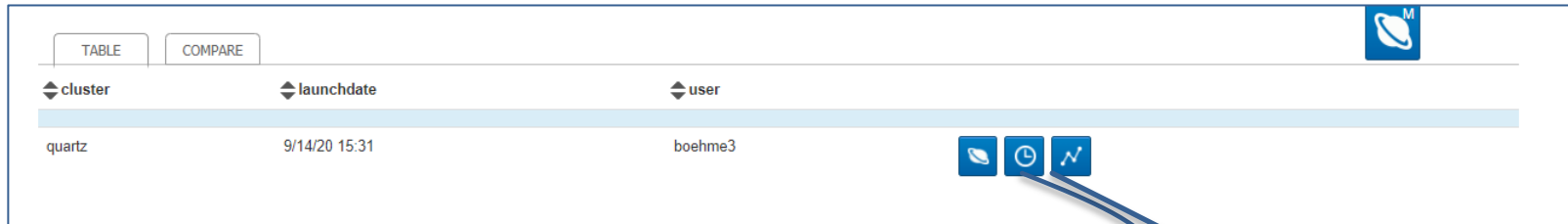
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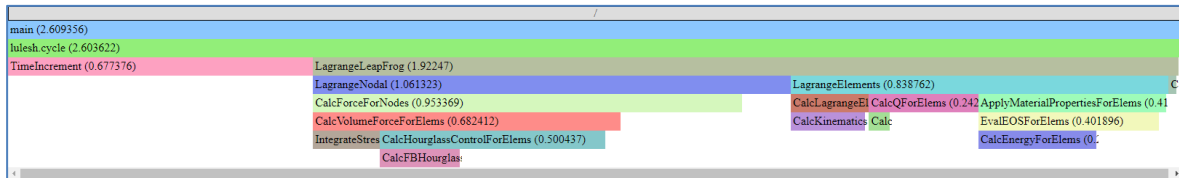
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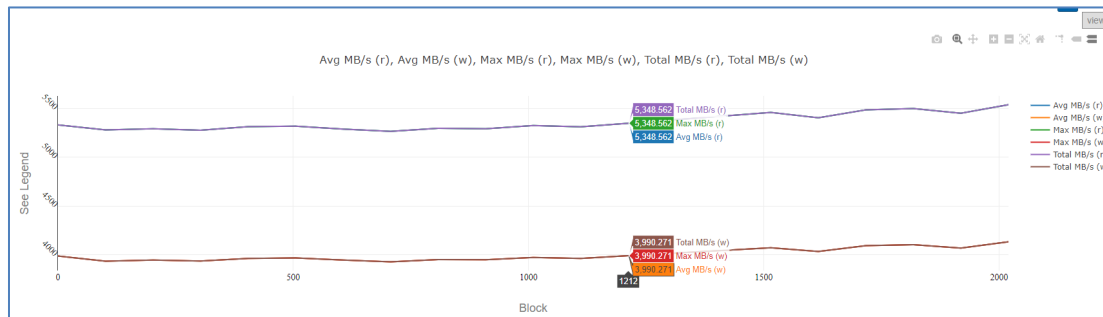
Performance Data can be Visualized Per-Run



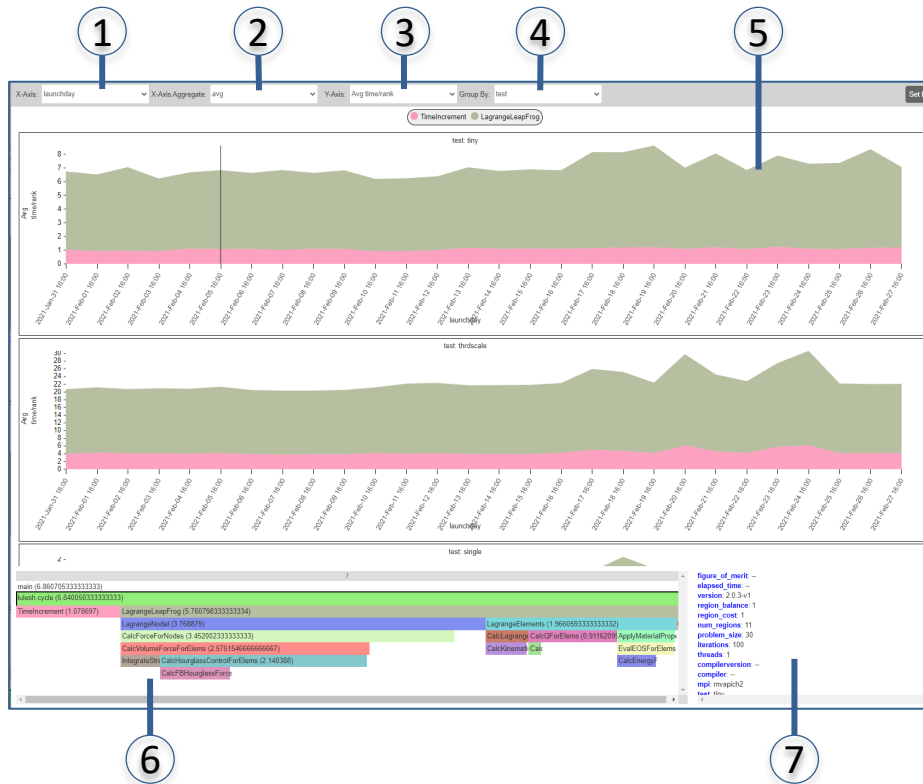
- FlameGraph: performance against code



- Timeseries: performance against time



Performance Data can be Compared Across Runs



1. Metadata value on x-axis
2. Aggregation (min/max/avg...) if multiple runs at same point.
3. Metric to graph on y-axis.
4. Grouping metadata. Each unique value is a graph.
5. Stacked performance graph. Click to drill-down.
6. Flame graph for runs currently under cursor.
7. Metadata for runs currently under cursor.

Live Demo





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