Analyzing Performance Measurements with Paraprof

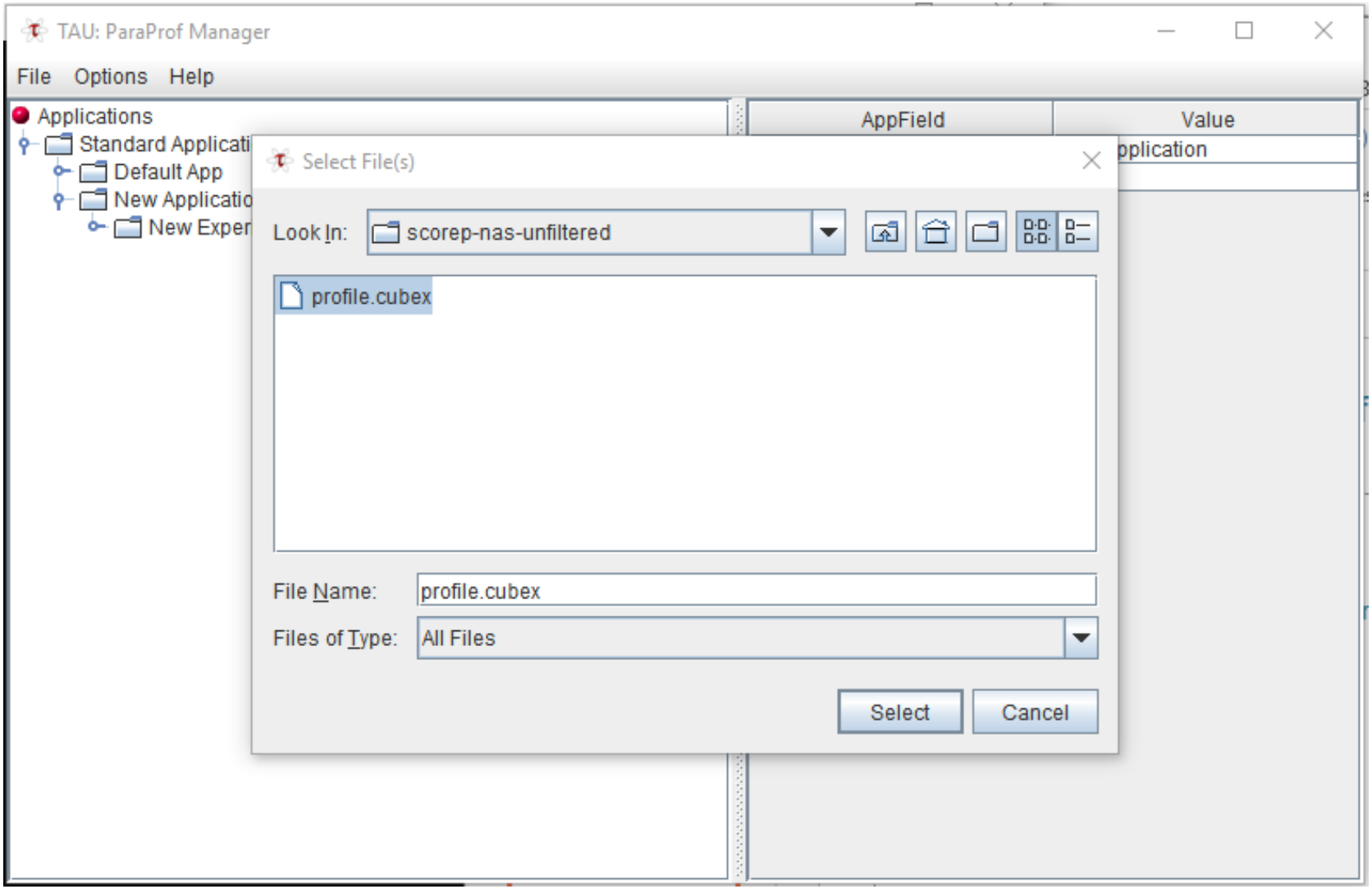
Paraprof Hands-on Outline

- Install Paraprof and Cube if you haven't already
- Copy your Score-P measurement file from Bridges
- Download PAPI-experiments file from Moodle
- Run Paraprof
- Open Bridges Score-P measurement file
- Examine
  - Time in key functions
  - Call Path
  - Parallel Load Imbalance
- Open Score-P file from PAPI experiment
  - Examine Hardware Counters and Derived Metrics

Open Score-P measurement file

In Paraprof Manager:

- File → Open
  - Trial Type: Cube (Note how many different tools Paraprof supports)
  - Select File: profile.cubex
  - OK



Open Score-P Measurement File

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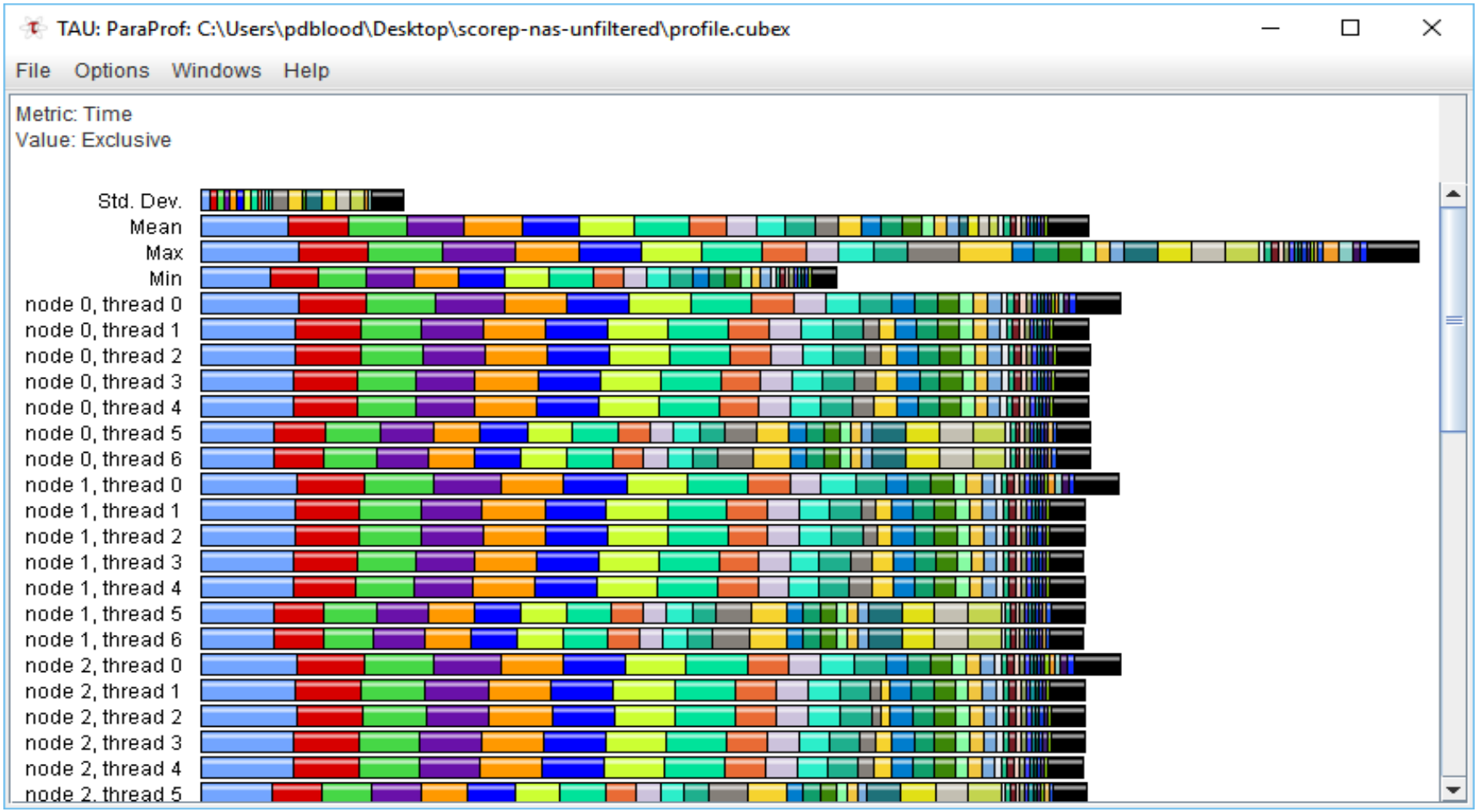
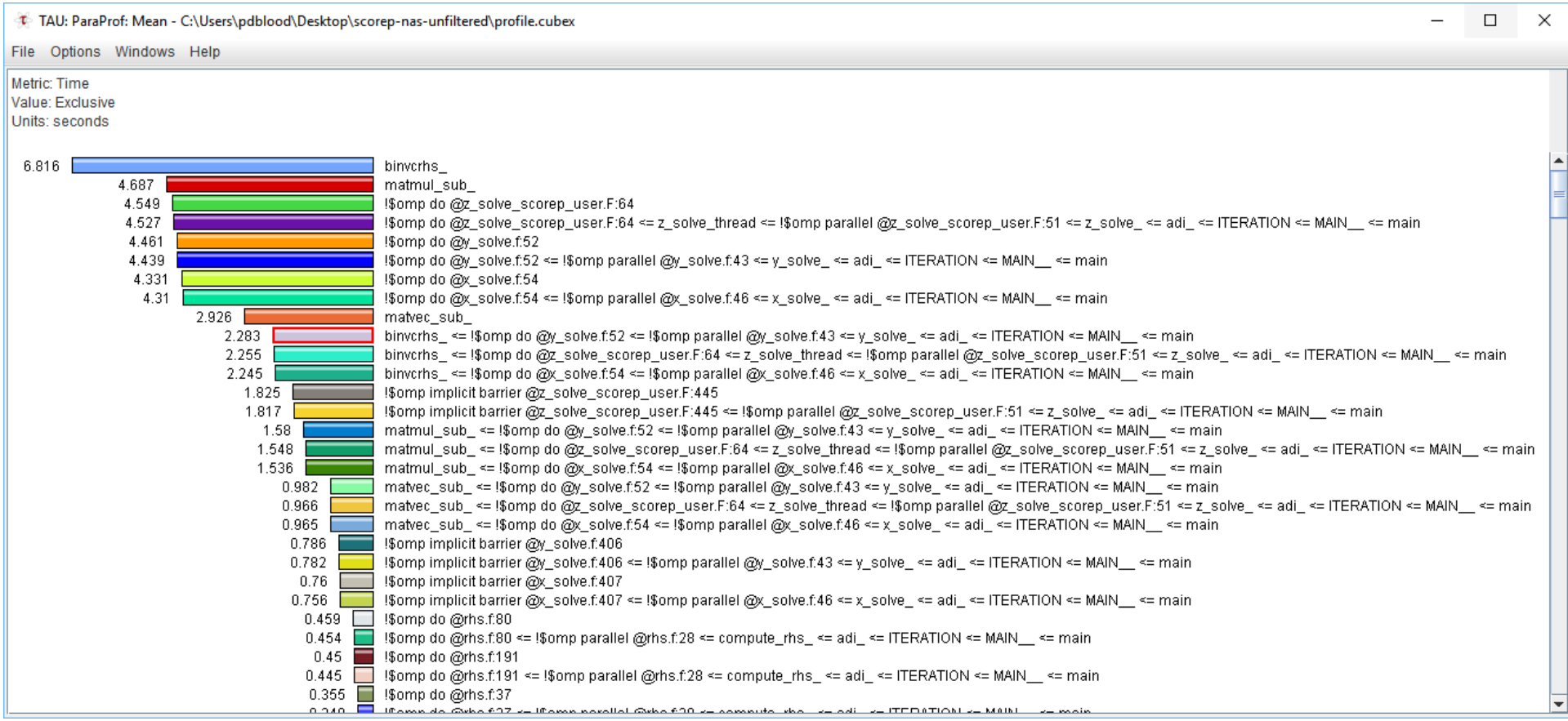
Examine Time in Key Functions



Each colored bar is a function or other defined region in the code. A “node” is a process. Hover for context information. Right click a node or bar for options. Left click node or bar to reveal detailed function info



Left click “Mean” to display this view of average time per function. Go to “Options → Select Metric” to change the metrics displayed.

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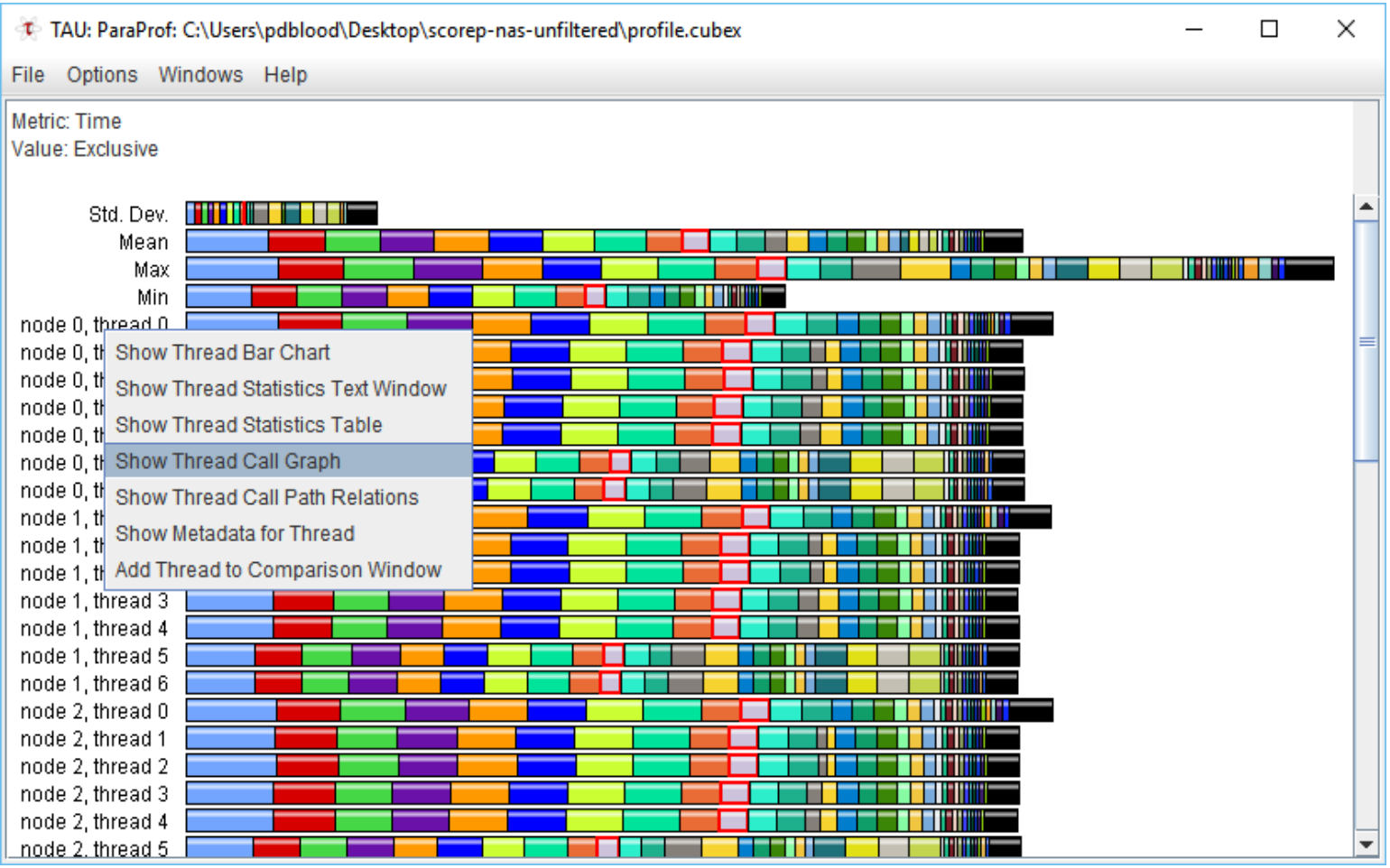
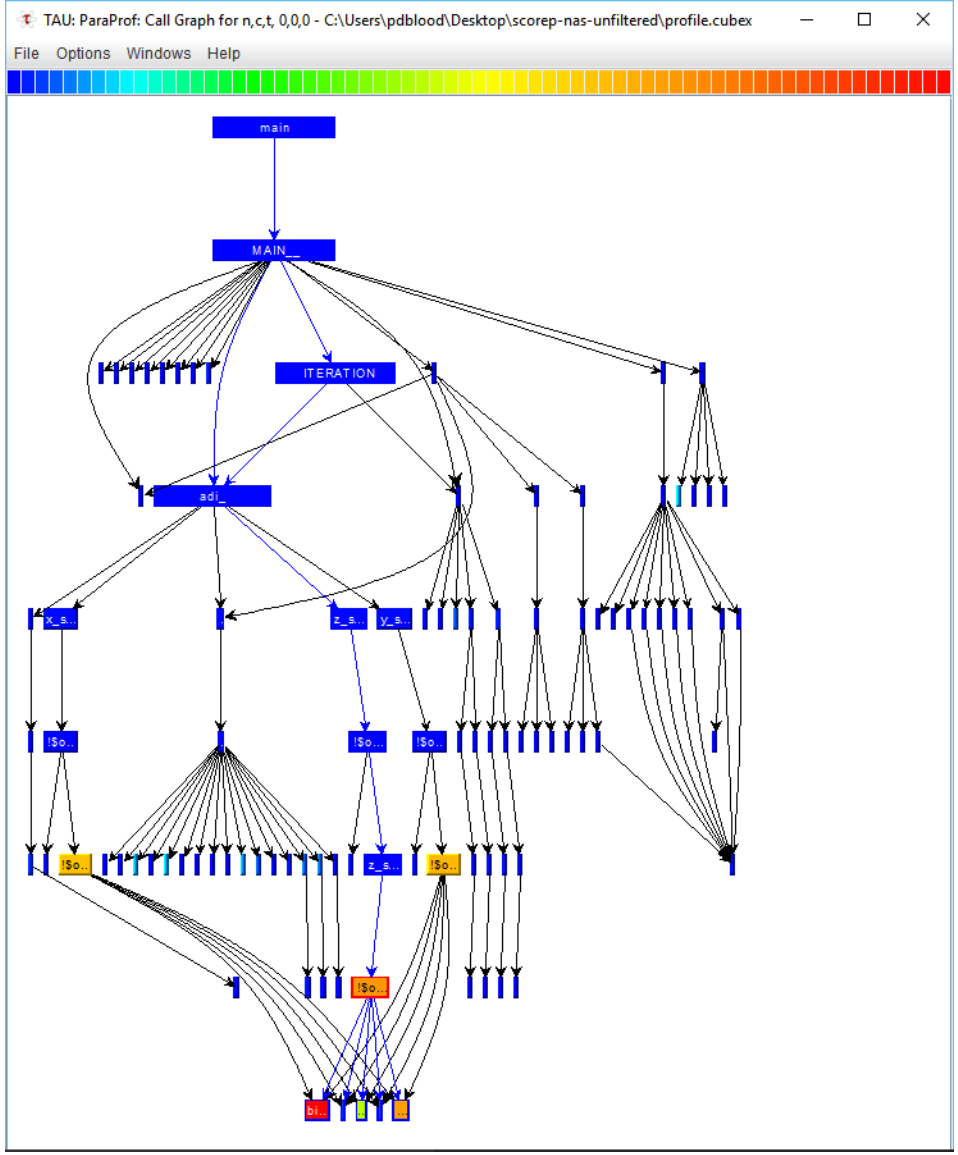
Getting Call Path Information



Right click desired label on left and select “Show Thread Call Graph”.

Can also explore call graph in tabular form under “Show Thread Statistics Table”



Default: Width of box is inclusive time and color of box is exclusive time. Change meaning of width and color of boxes under “Options”

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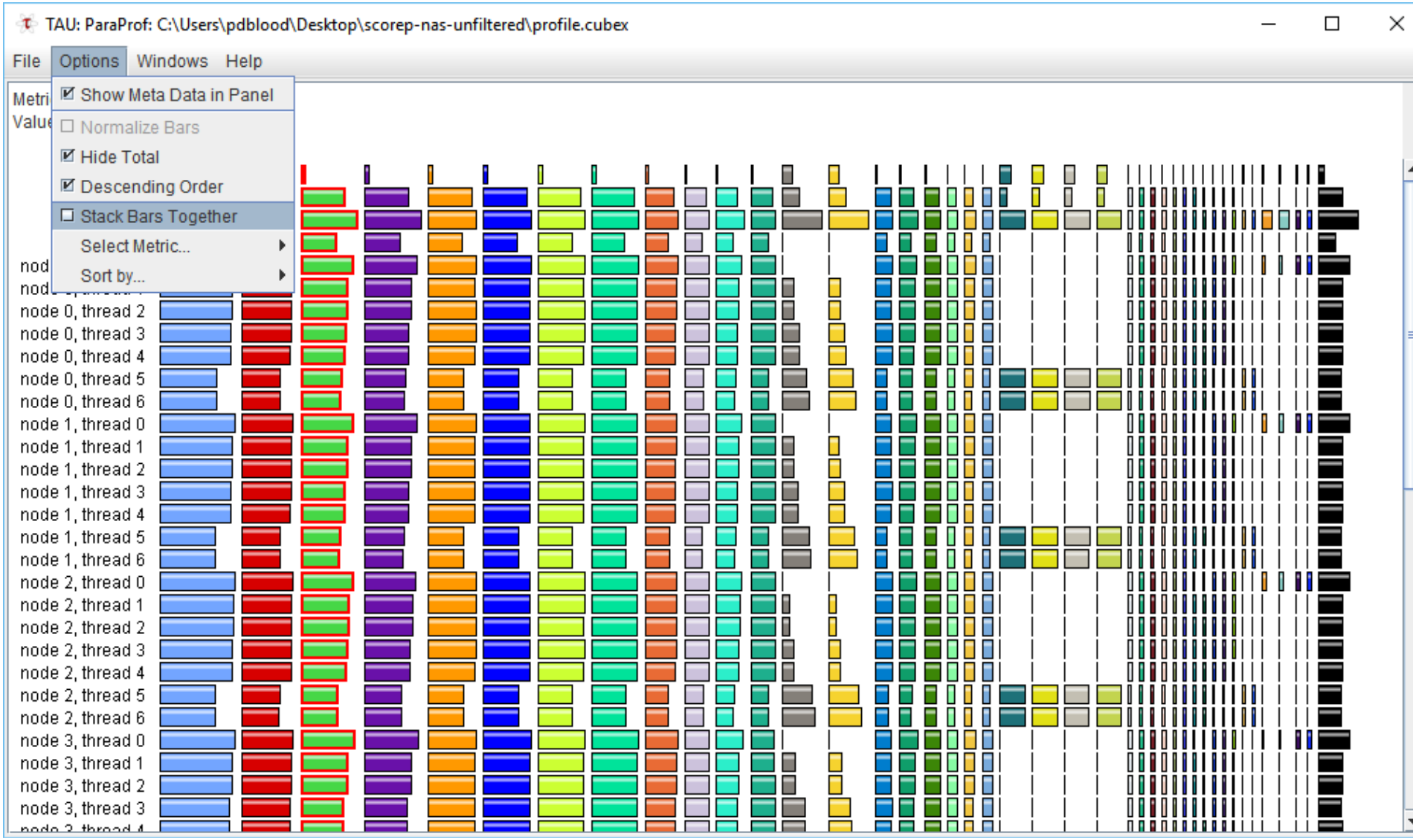
Detecting Parallel Load Imbalance

- Go back to original Paraprof window showing all function times for all processes and threads

- To look at load imbalance across **all** functions:
  - In Paraprof window go to ‘Options’
  - Uncheck ‘Normalize’ and ‘Stack Bars Together’

- To look at load imbalance in a **particular** function:
  - Left-click on function name (colored bar) to look at timings across all processors



Unstacking bars reveals parallel imbalance across functions

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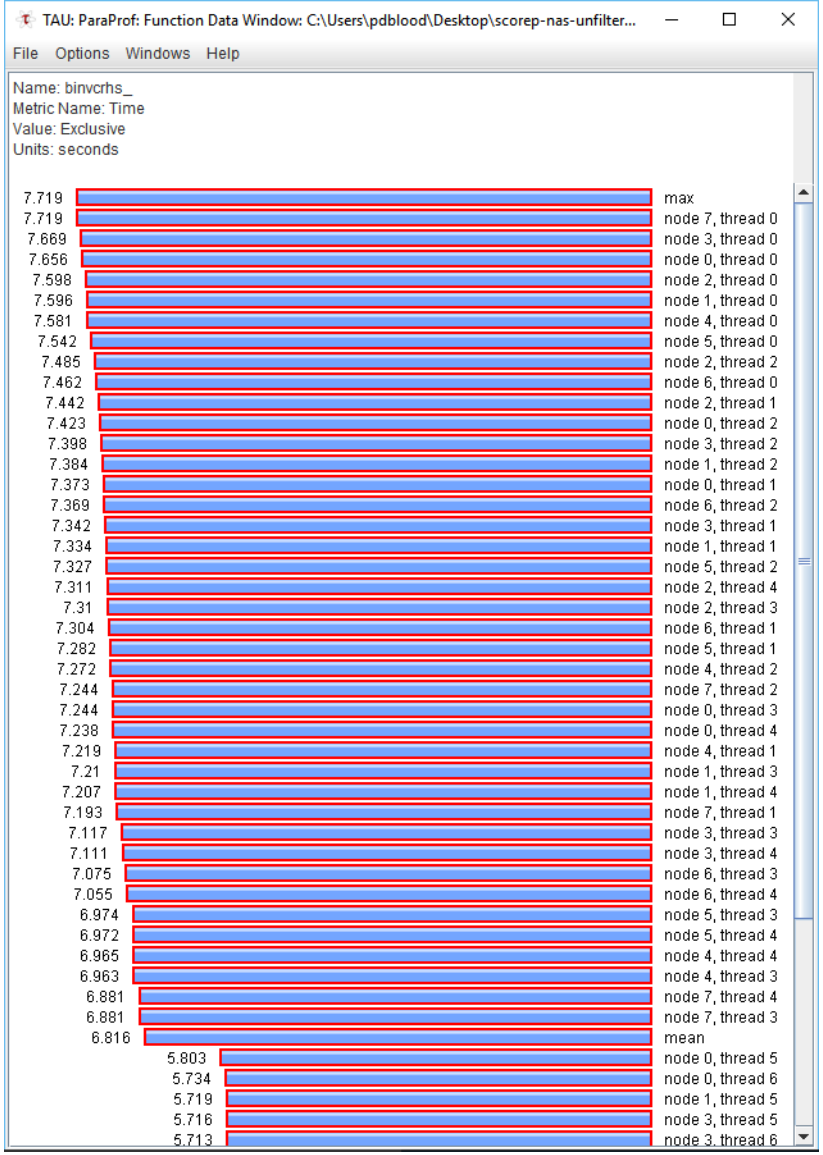

Clicking on a particular function reveals detailed timing (and imbalance) for a given function across all threads

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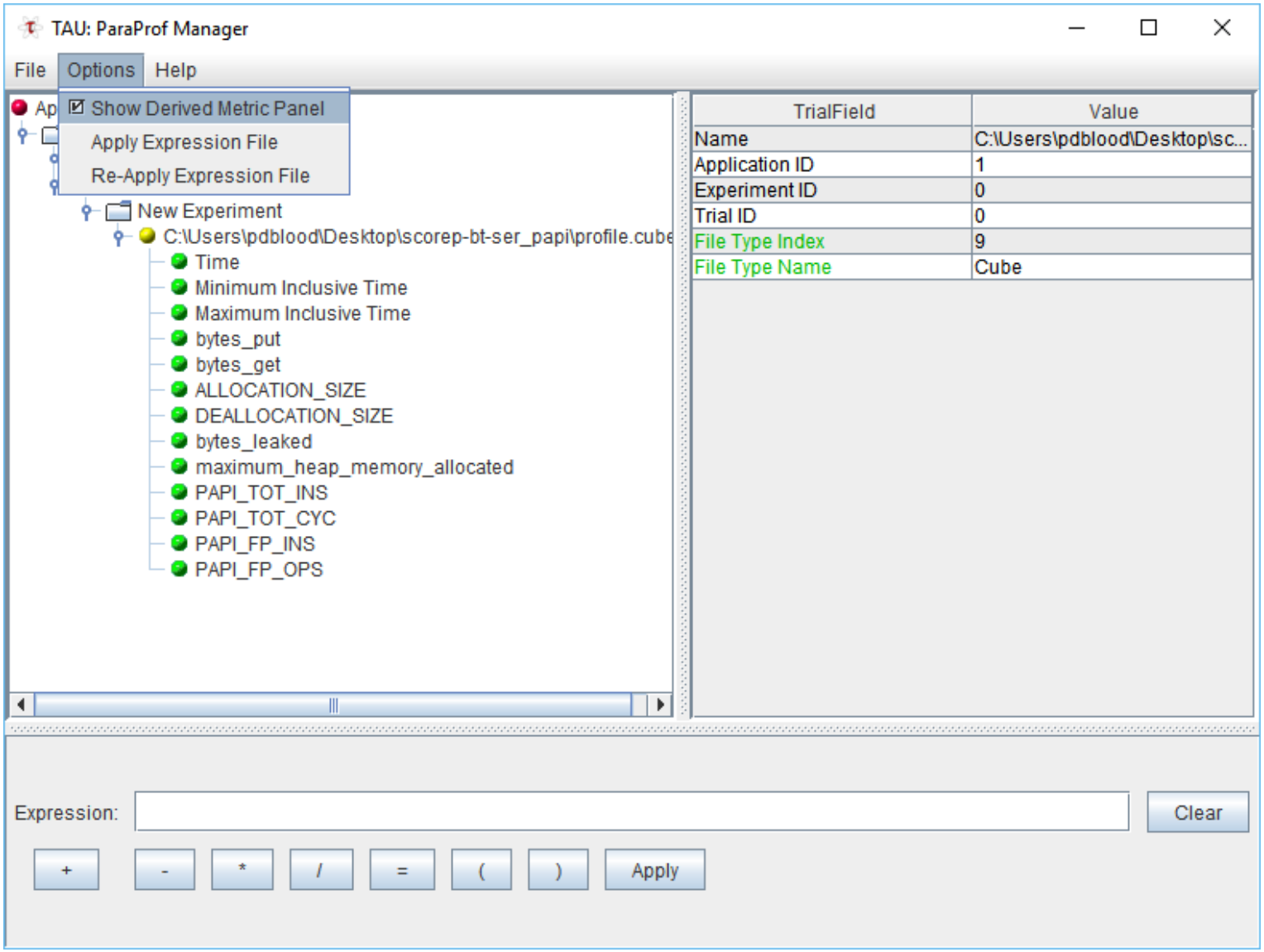
Hardware Counters and Derived Metrics

- Open new Score-P PAPI measurement file in Paraprof (downloaded from Moodle)
- Go to the Paraprof Manager window
- Select “Options → Show Derived Metric Panel”
- Select “PAPI_FP_OPS”
- Click division symbol in bottom panel
- Select “Time”
- Click “Apply”



Create a new “PAPI_FP_OPS/Time” metric and double click on it

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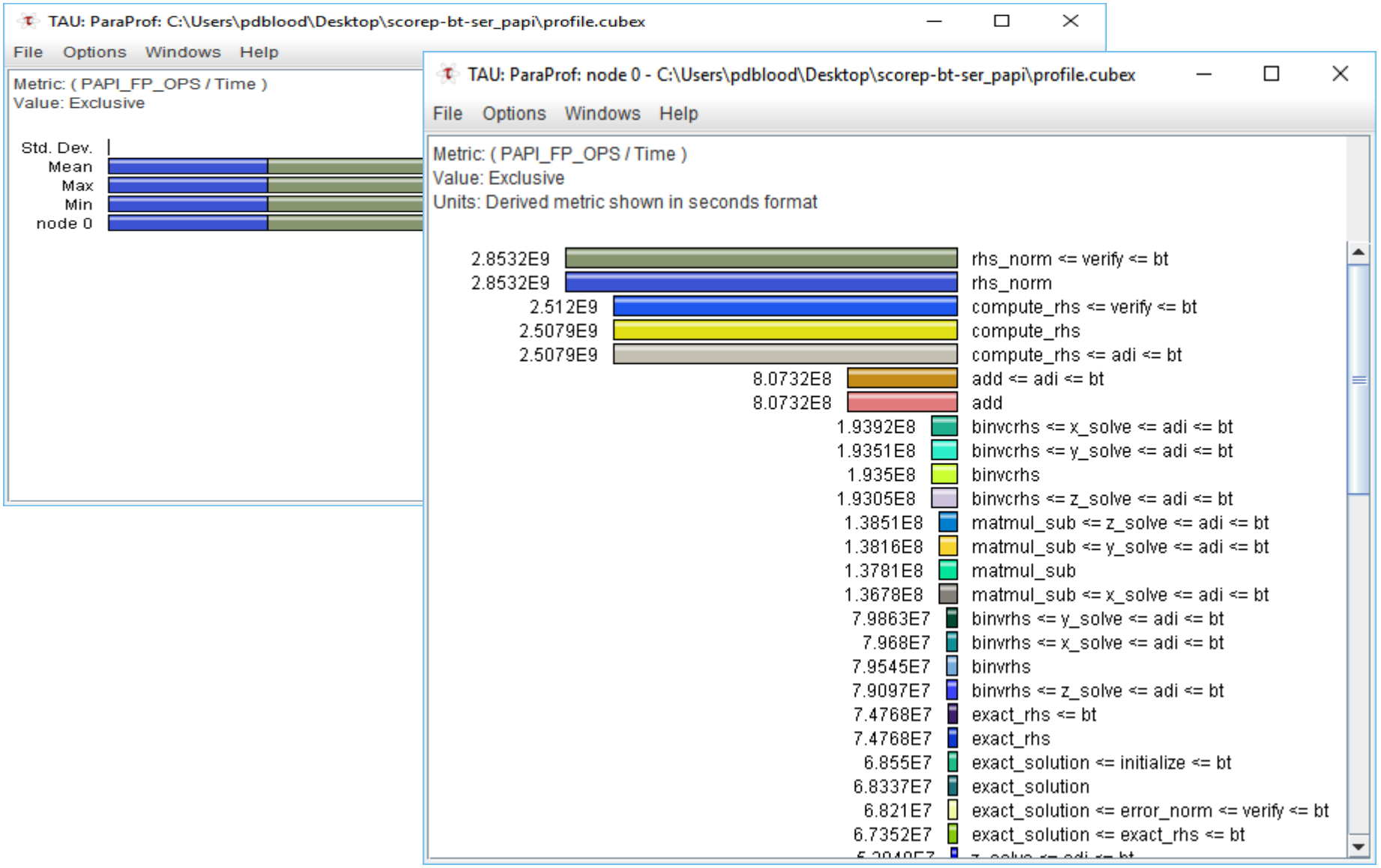

Click on “node 0” to reveal FLOPs/sec in each function

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