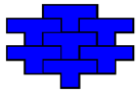
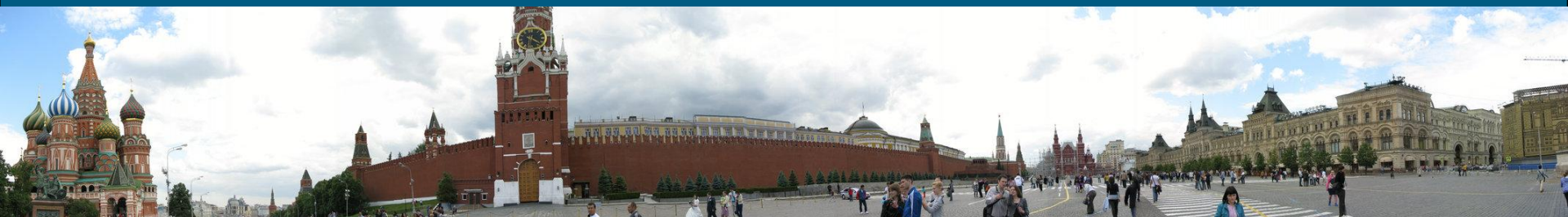






Profile Analysis with CUBE

Bernd Mohr, Jülich Supercomputing Centre

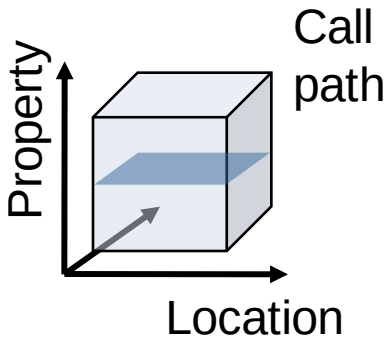


CUBE

- Parallel program analysis report exploration tools
  - Libraries for CUBE XML report reading & writing
  - Algebra utilities for report processing
  - GUI for interactive analysis exploration
    - requires Qt4
- Originally developed as part of Scalasca toolset
- Now available as a separate component
  - Can be installed independently of Score-P, e.g., on laptop or desktop
  - Latest release: CUBE 4.1.3 (November 2012)

Analysis presentation and exploration

- Representation of values (severity matrix) on three hierarchical axes
  - Performance property (metric)
  - Call-tree path (program location)
  - System location (process/thread)

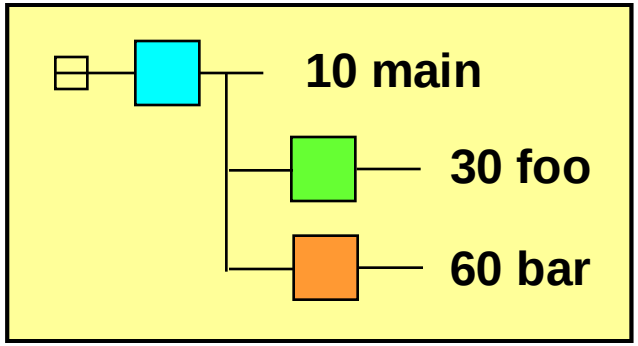


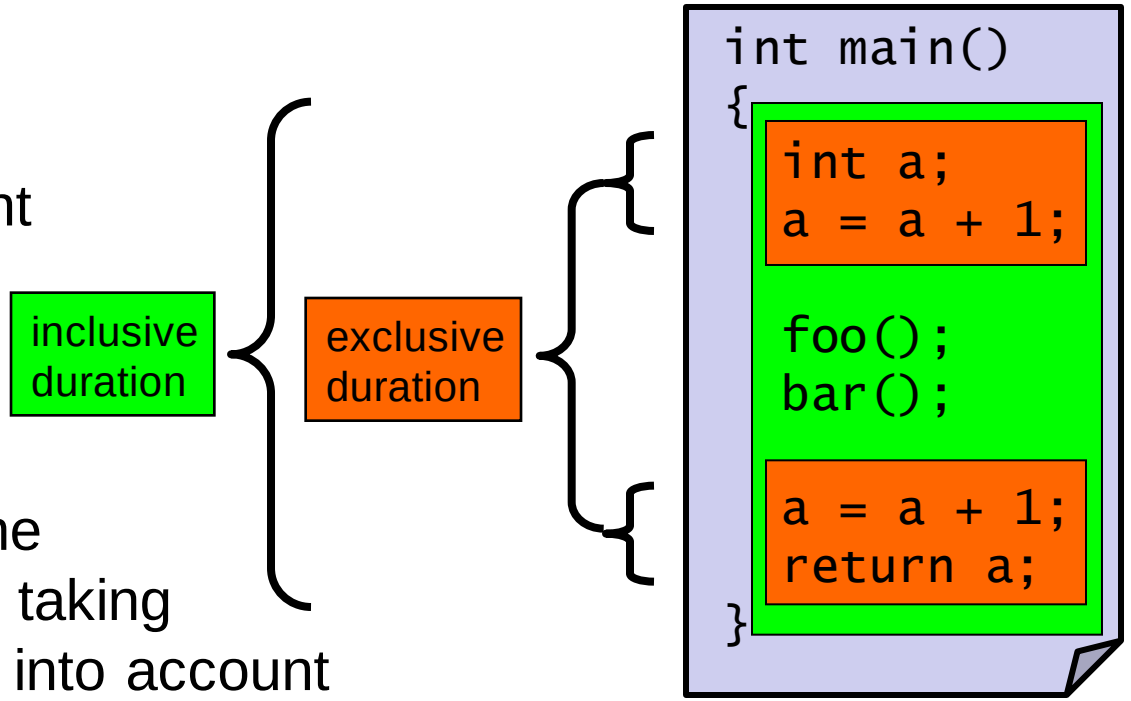
- Three coupled tree browsers

- CUBE displays severities
  - As value: for precise comparison
  - As colour: for easy identification of hotspots
  - Customizable via display mode
  - Inclusive value when closed & exclusive value when expanded

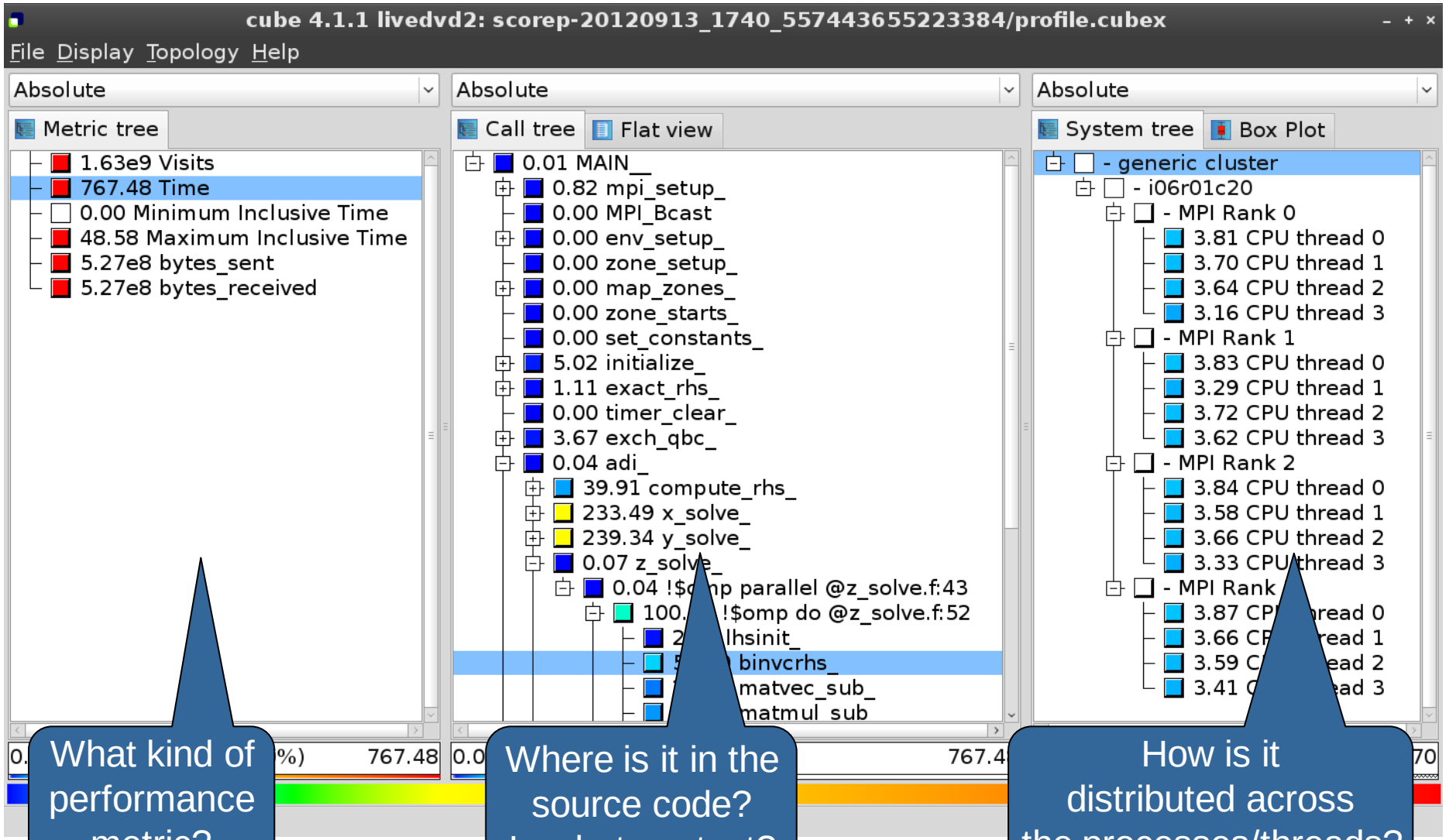
Analysis presentation and exploration (II)

- Each node displays severity
  - as colour
  - as value
- Dependent on state
  - ⊞ **Collapsed**
    - **Inclusive** time
    - Entire time spent in the function
  - ⊟ **Expanded**
    - **Exclusive** time
    - Time spent in the function without taking calls to children into account





Analysis presentation



BT-MZ Summary Analysis Report Examination

- Creates experiment directory ./scorep_bt-mz_B_4x4_sum containing
  - a record of the measurement configuration (scorep.cfg)
  - the analysis report that was collated after measurement (profile.cubex)

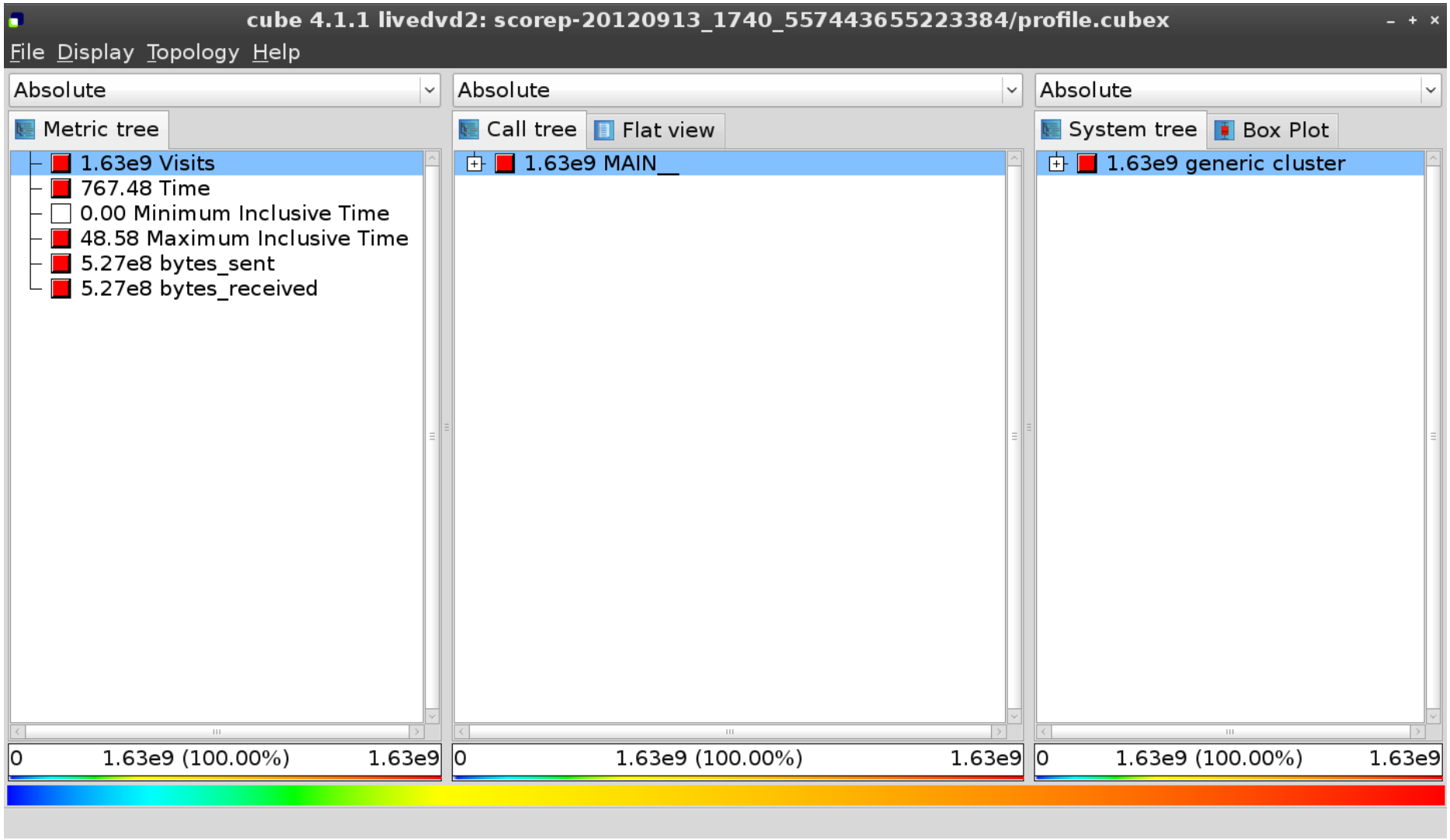
```
% ls
bt-mz_B.4  scorep_bt-mz_B_4x4_sum
% ls scorep_bt-mz_B_4x4_sum
profile.cubex  scorep.cfg
```

  - Interactive exploration with CUBE4

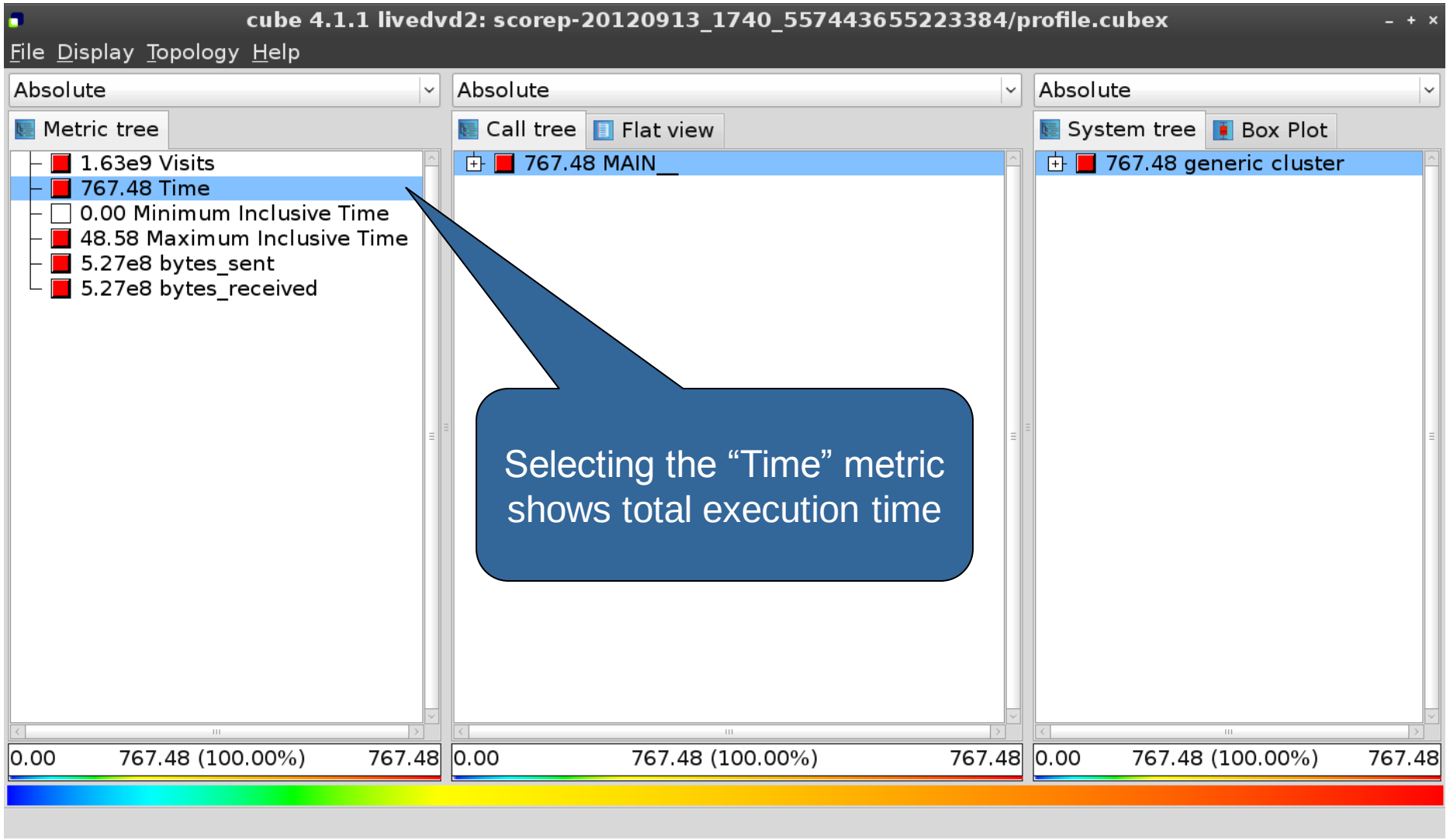
```
% cube scorep_bt-mz_B_4x4_sum/profile.cubex

              [CUBE GUI showing summary analysis report]
```

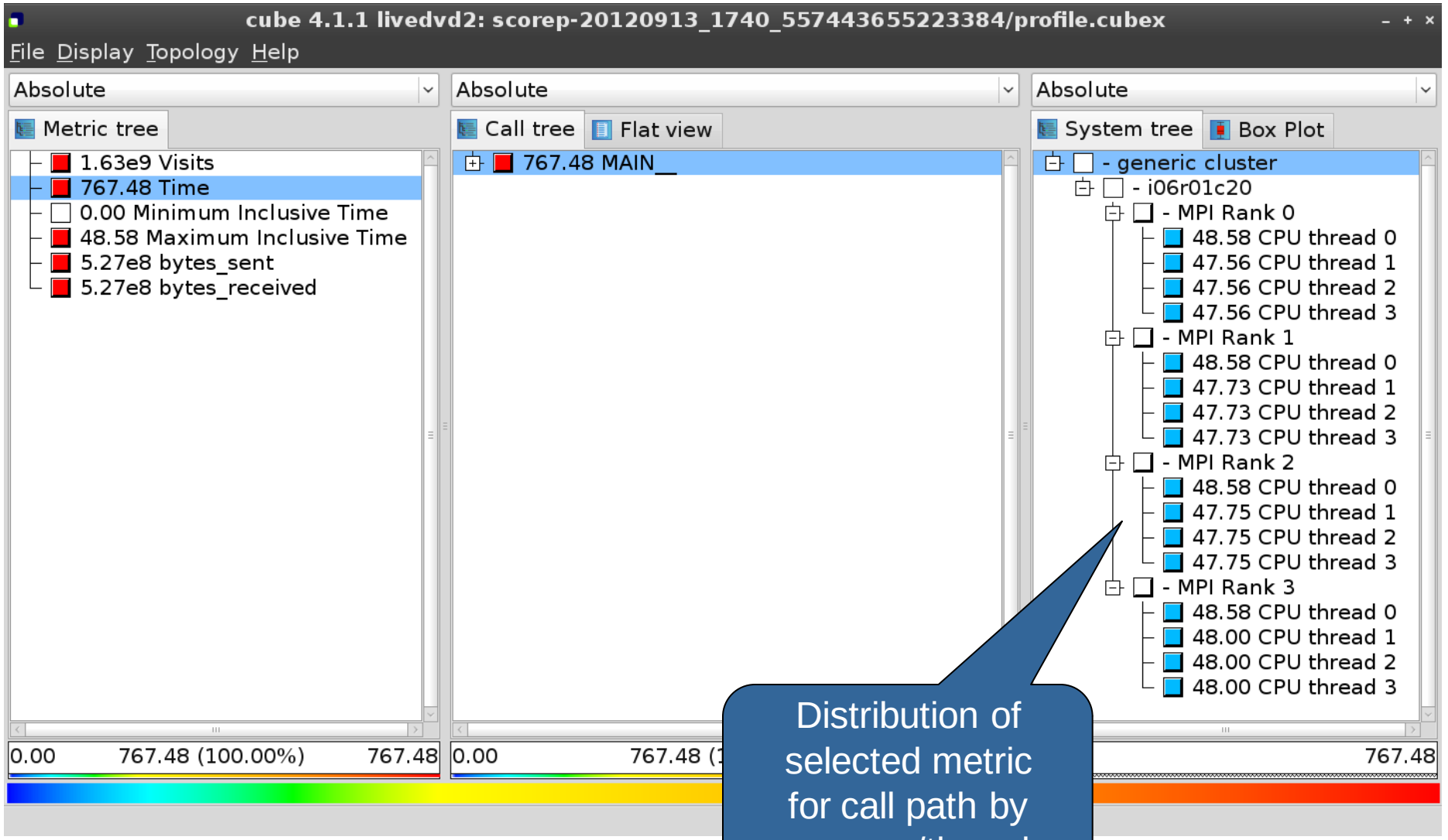
Analysis report exploration (opening view)



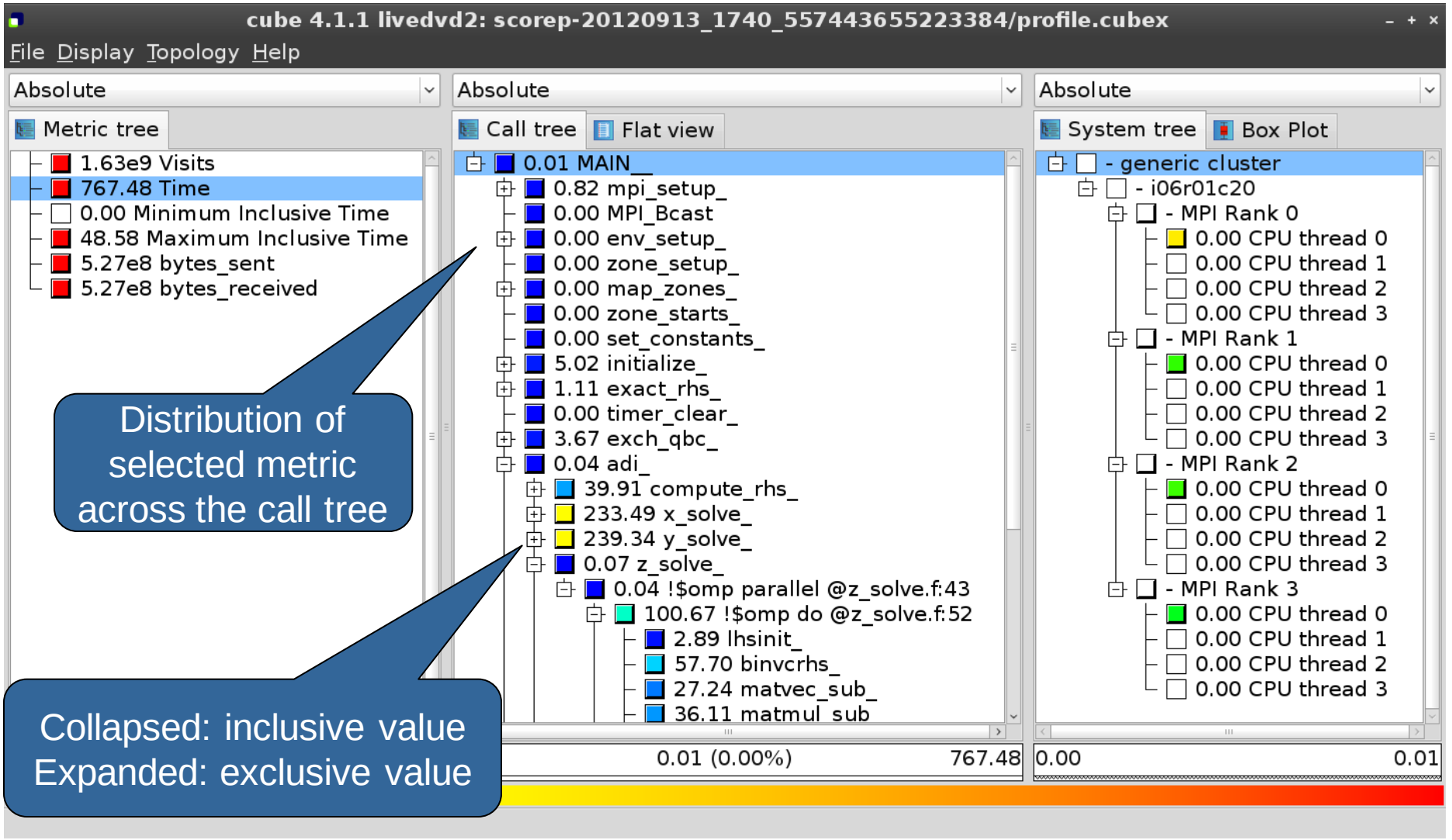
Metric selection



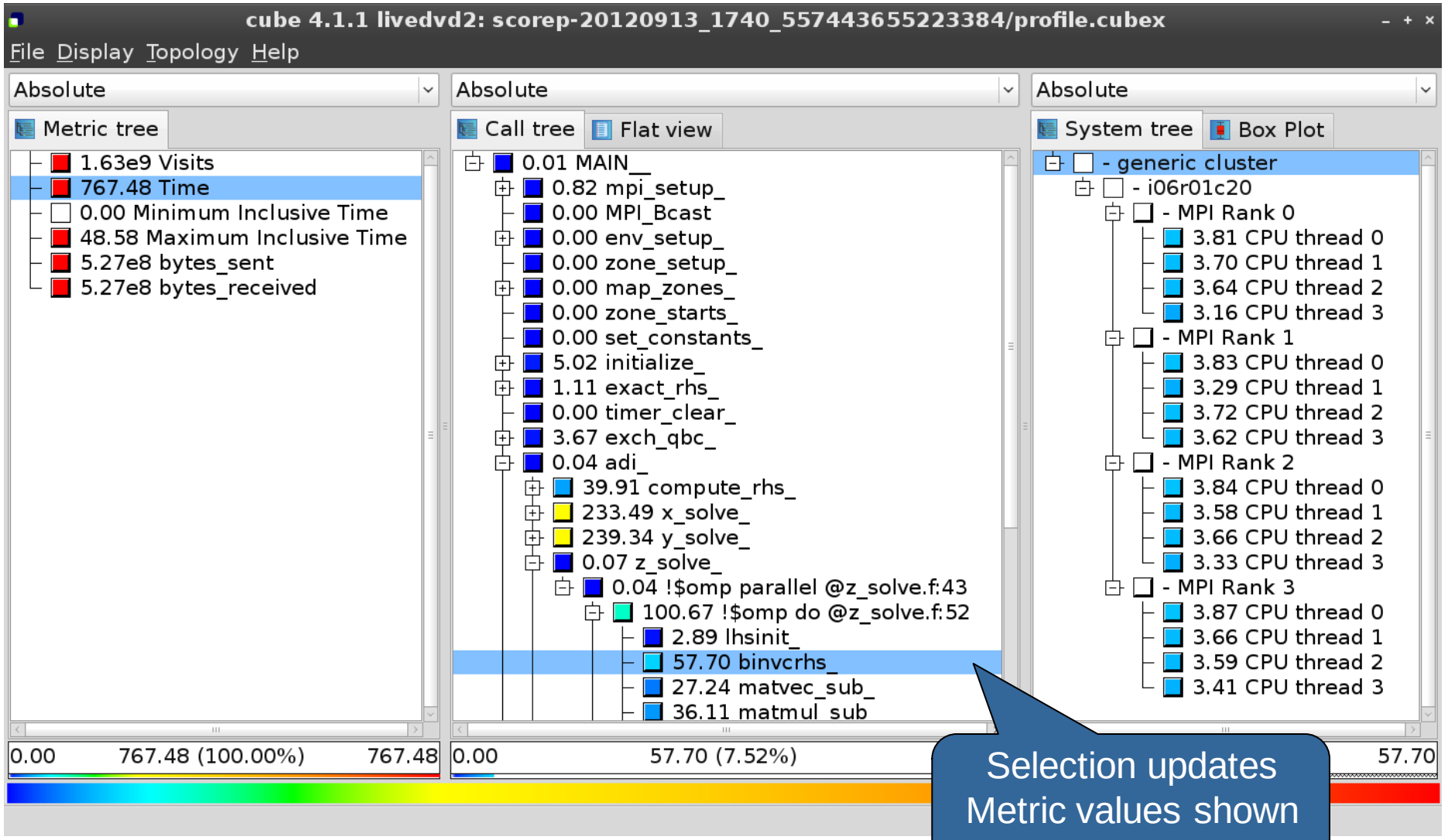
Expanding the system tree



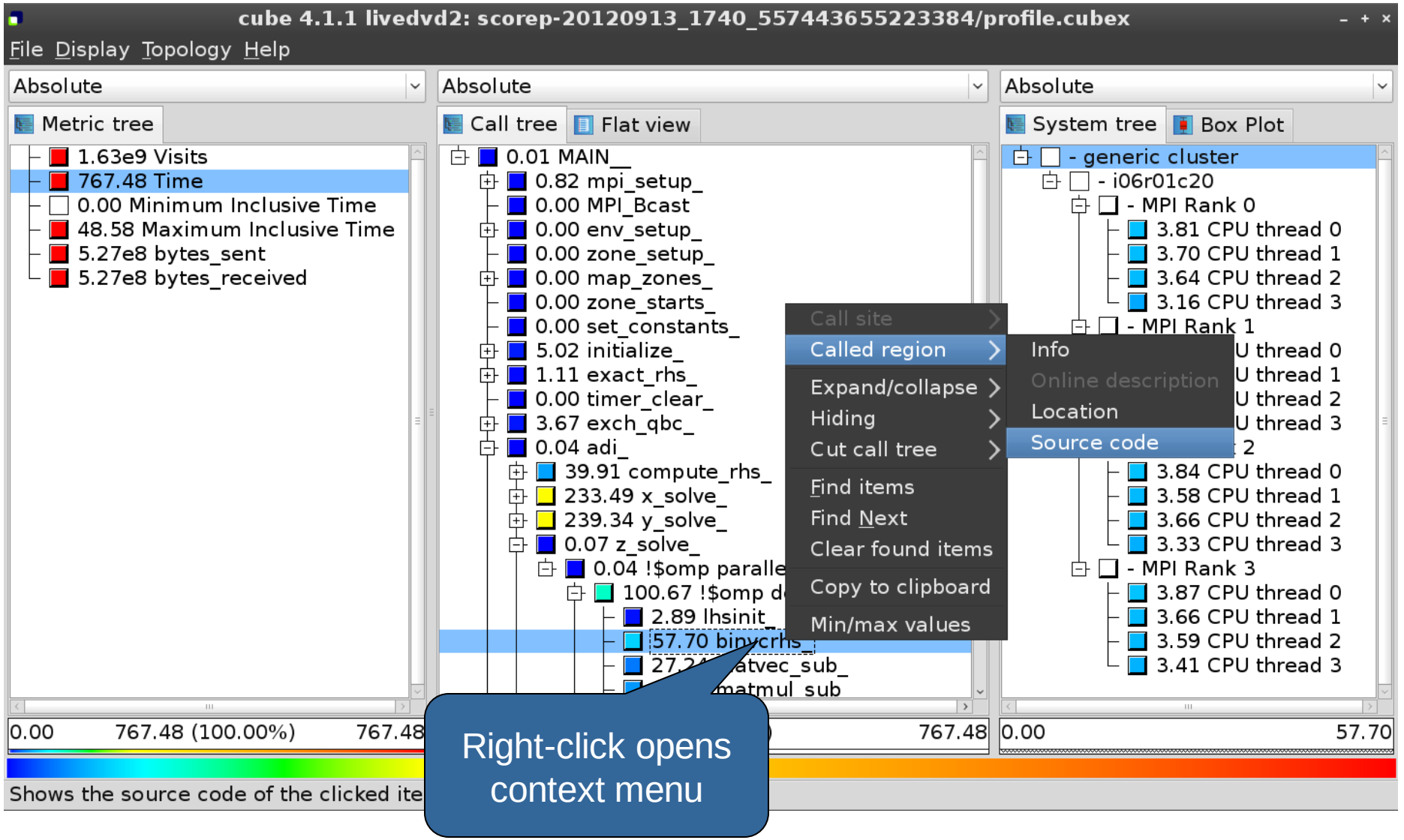
Expanding the call tree



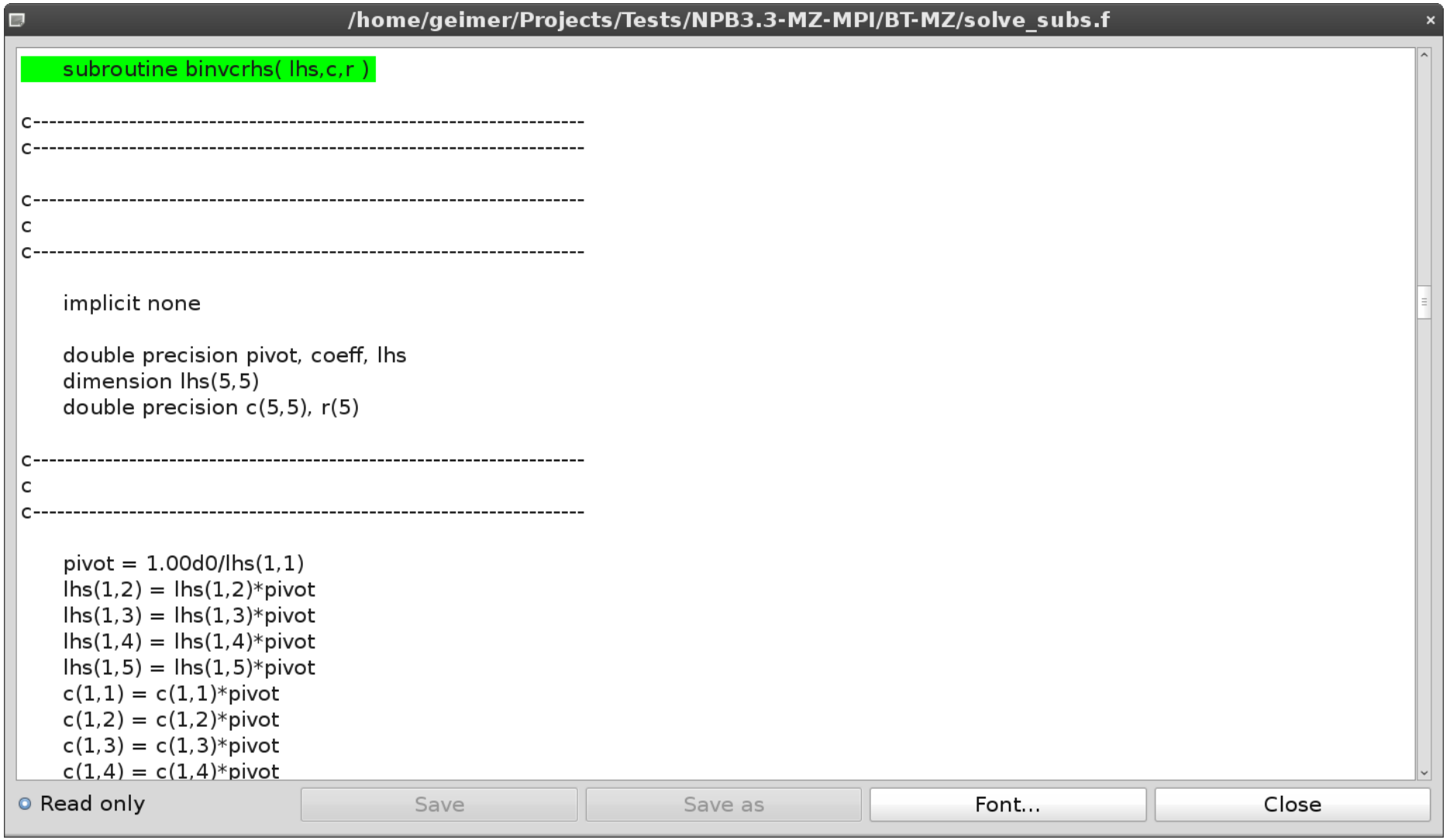
Selecting a call path



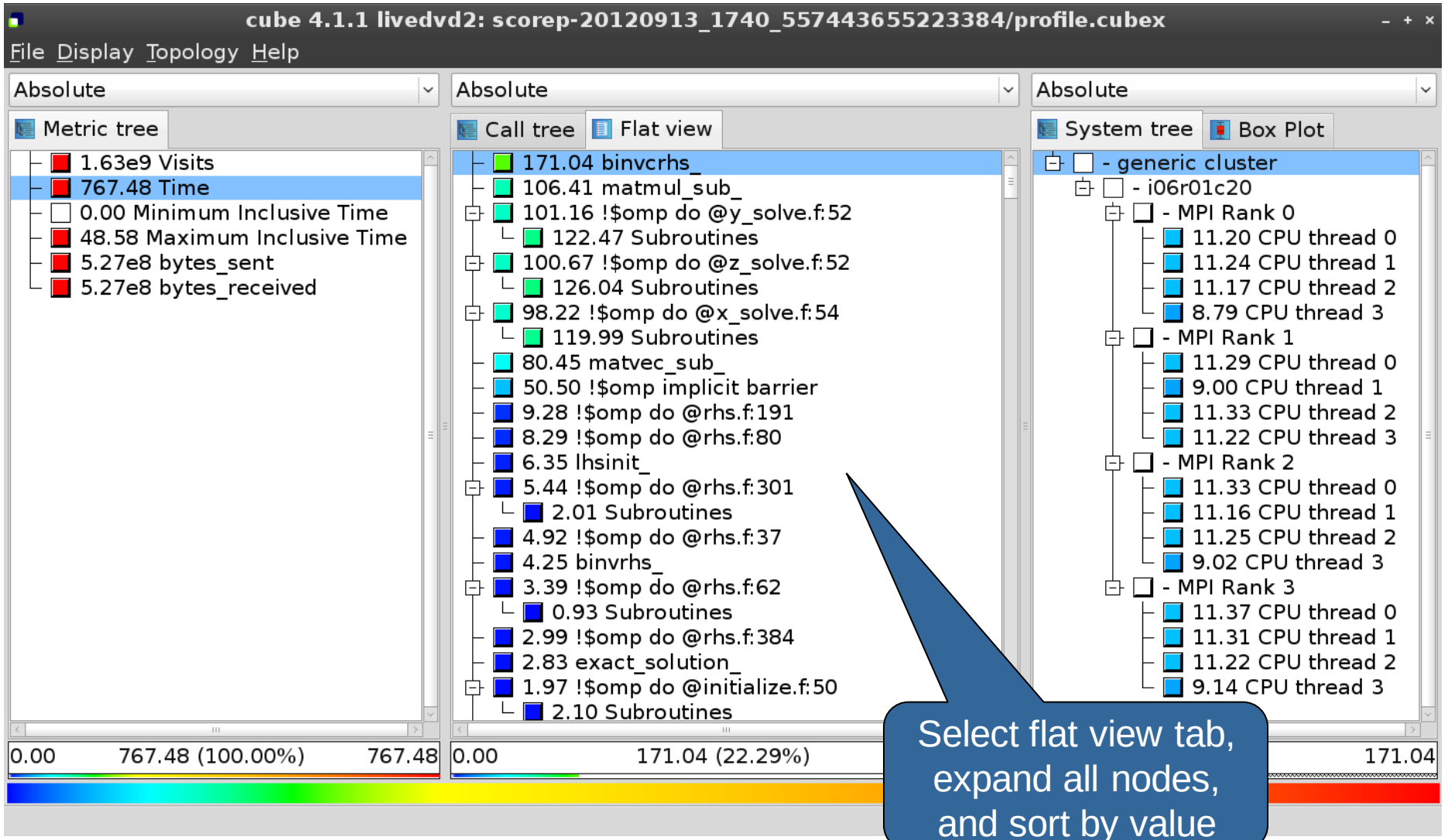
Source-code view via context menu



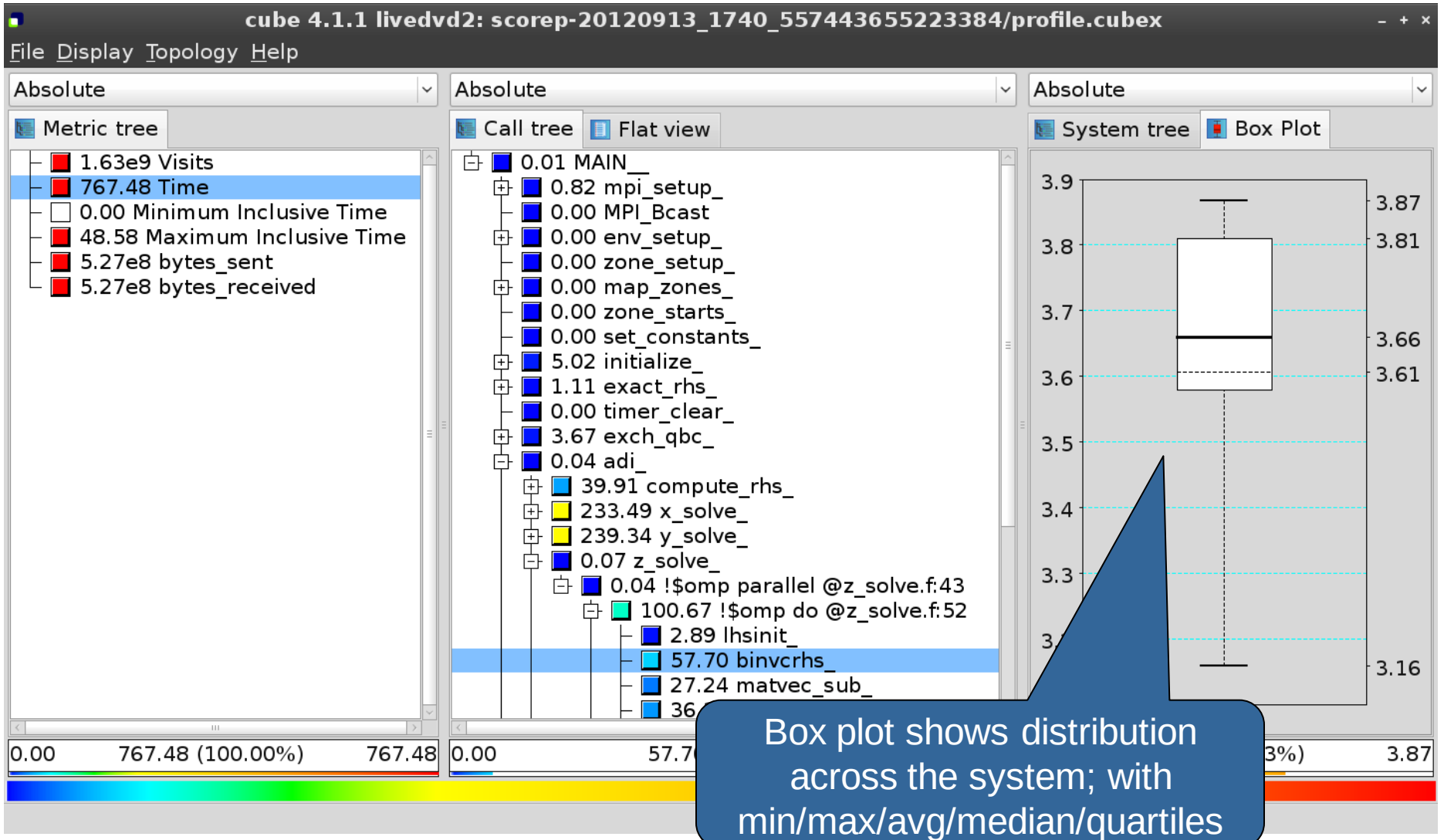
Source-code view



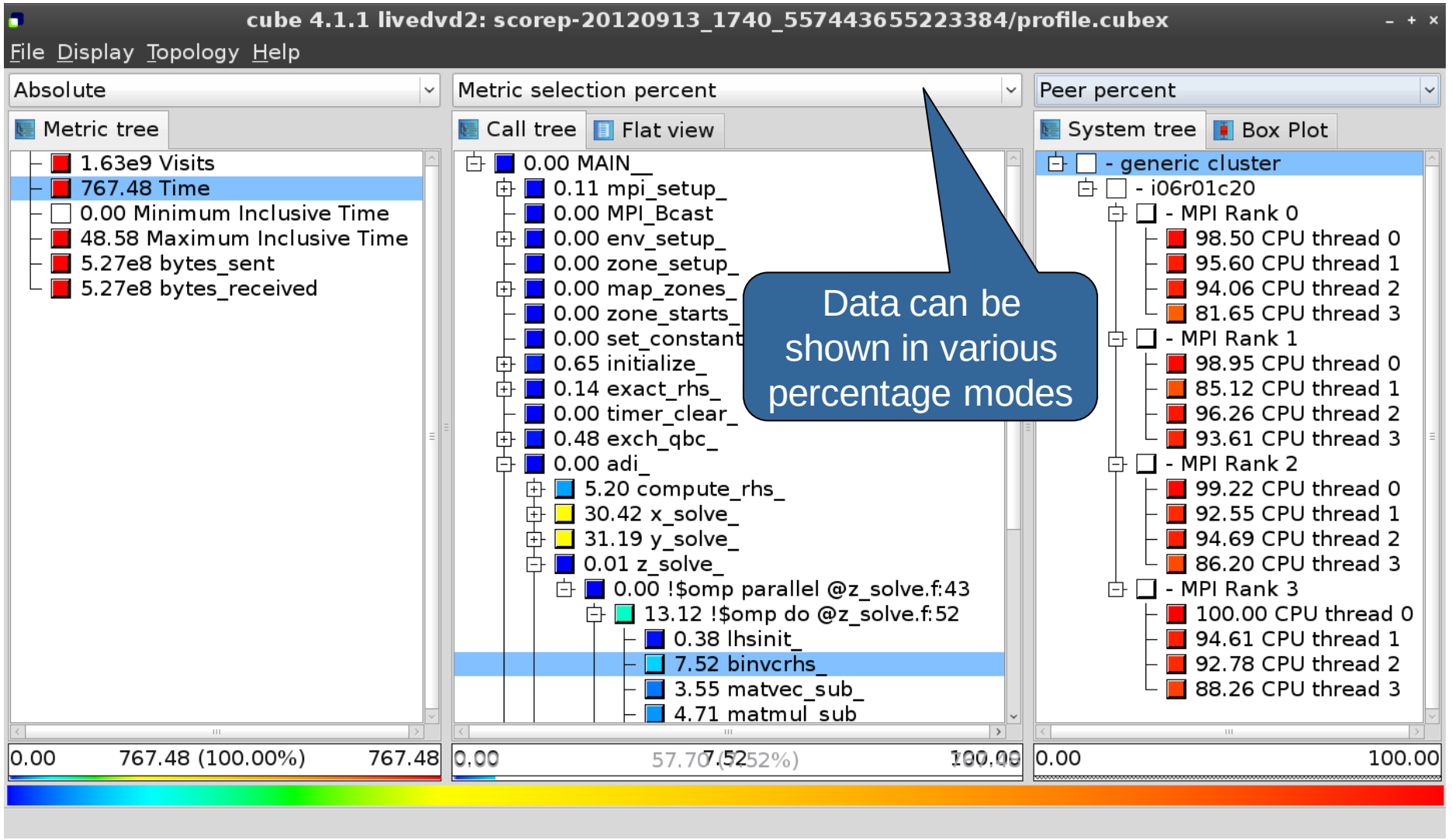
Flat profile view



Box plot view



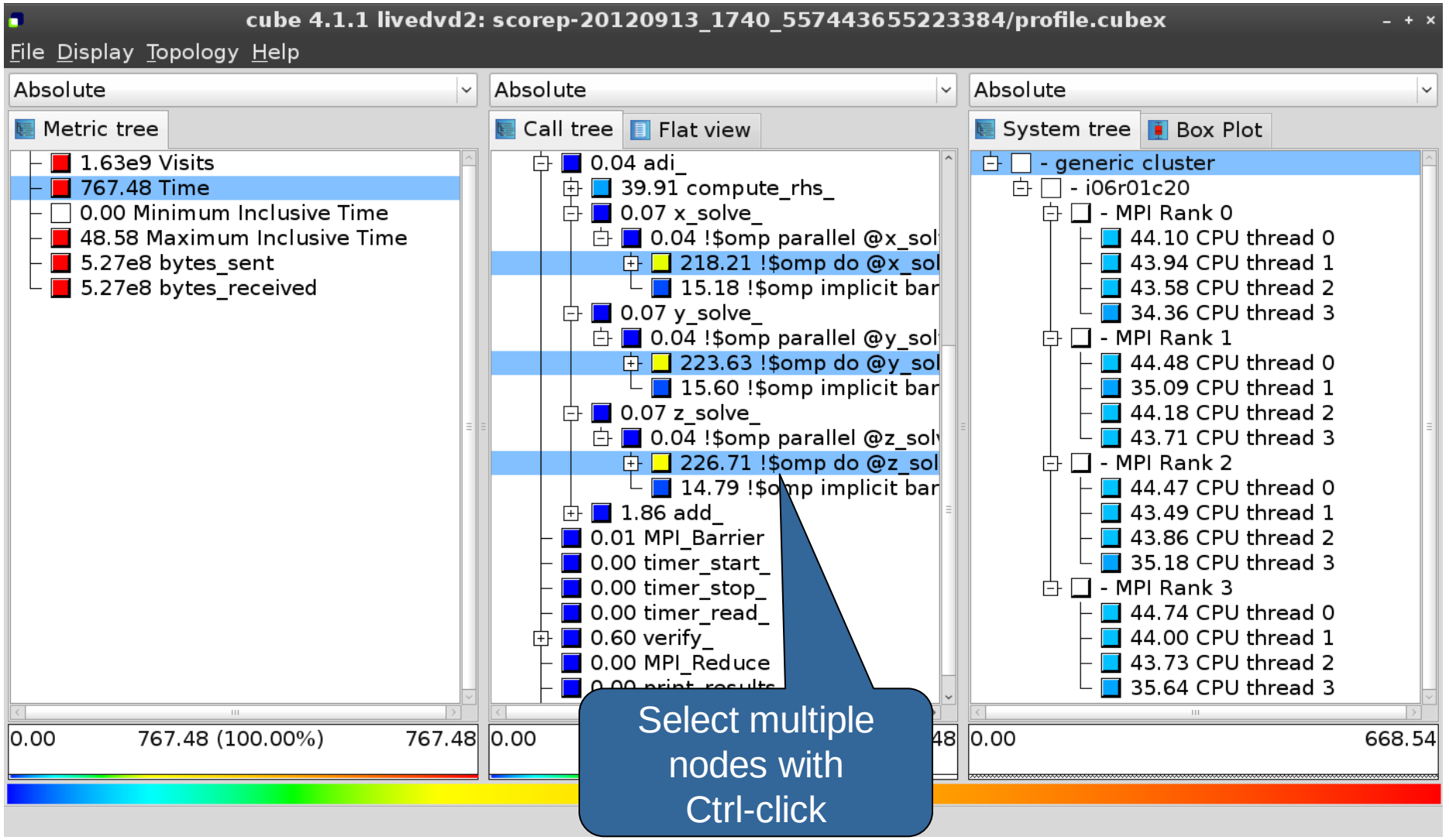
Alternative display modes



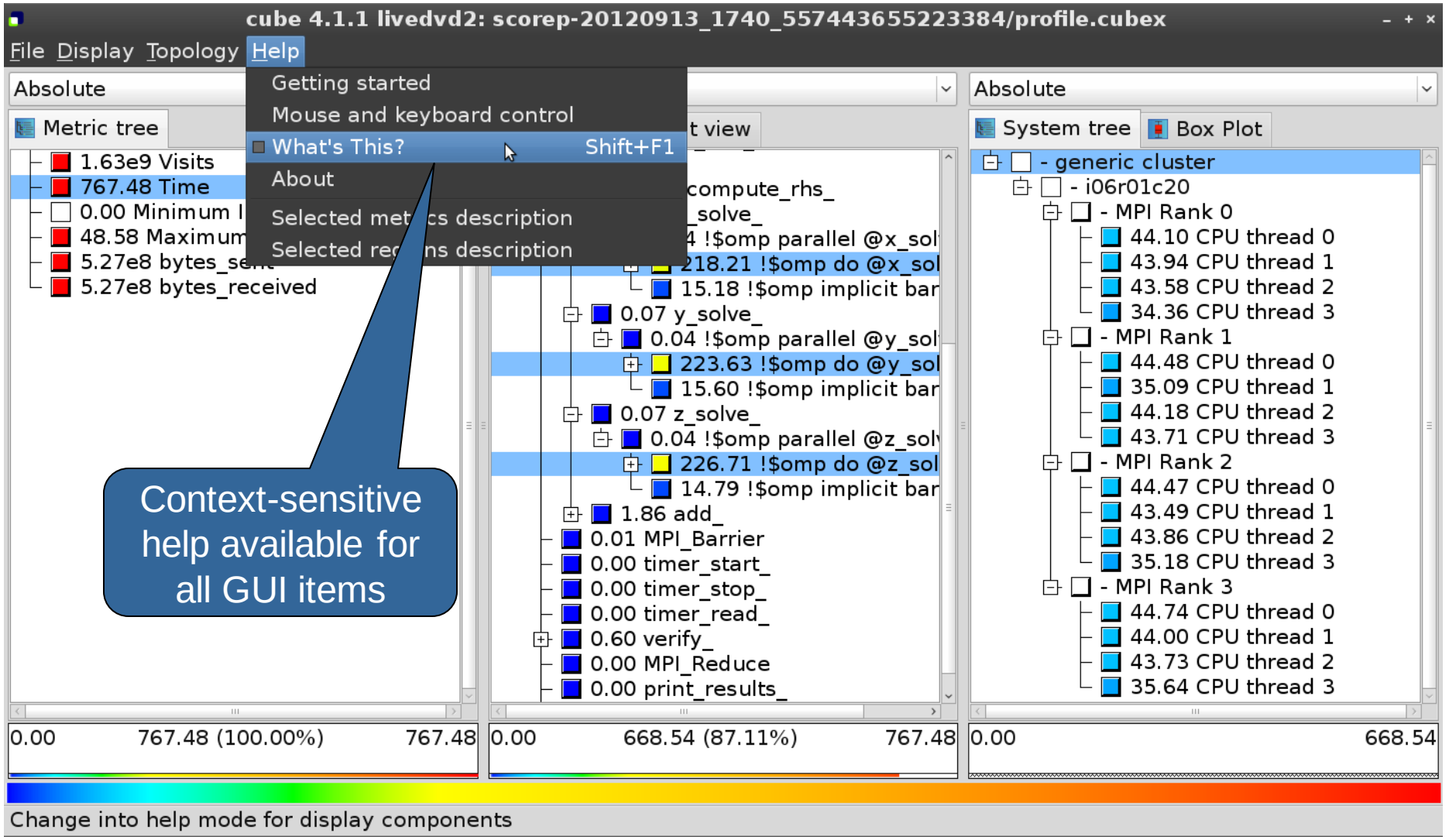
Important display modes

- Absolute
  - Absolute value shown in seconds/bytes/occurances
- Selection percent
  - Value shown as percentage of the value of the selected node “on the left“ (metric/call path)
- Peer percent (system tree only)
  - Value shown as percentage relative to the maximum peer value

Multiple selection



Context-sensitive help



CUBE algebra utilities

- Extracting solver sub-tree from analysis report

```
% cube_cut  -r '<<SMG.Solve>>'  scorep_smg2000/profile.cubex
Writing cut.cubex... done.
```

- Calculating difference of two reports

```
% cube_diff  scorep_smg2000/profile.cubex  cut.cubex
Writing diff.cubex... done.
```

- Additional utilities for merging, calculating mean, etc.
  - Default output of cube_*utility* is a new report *utility*.cubex
- Further utilities for report scoring & statistics
- Run utility with “-h” (or no arguments) for brief usage info

Further information

CUBE

- Parallel program analysis report exploration tools
  - Libraries for XML report reading & writing
  - Algebra utilities for report processing
  - GUI for interactive analysis exploration
- Available under New BSD open-source license
- Documentation & Sources:
  - http://www.score-p.org
- User guide also part of installation:
  - `cube-config --cube-dir`/share/doc/CubeGuide.pdf
- Contact:
  - mailto: scalasca@fz-juelich.de

Questions?