Profile analysis with CUBE

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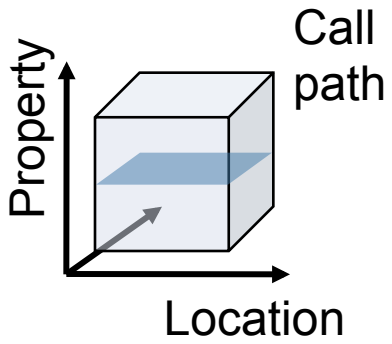
cube
scalasca

- Parallel program analysis report exploration tools
  - Libraries for 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 4.1.2 (October 2012)

Analysis presentation and exploration

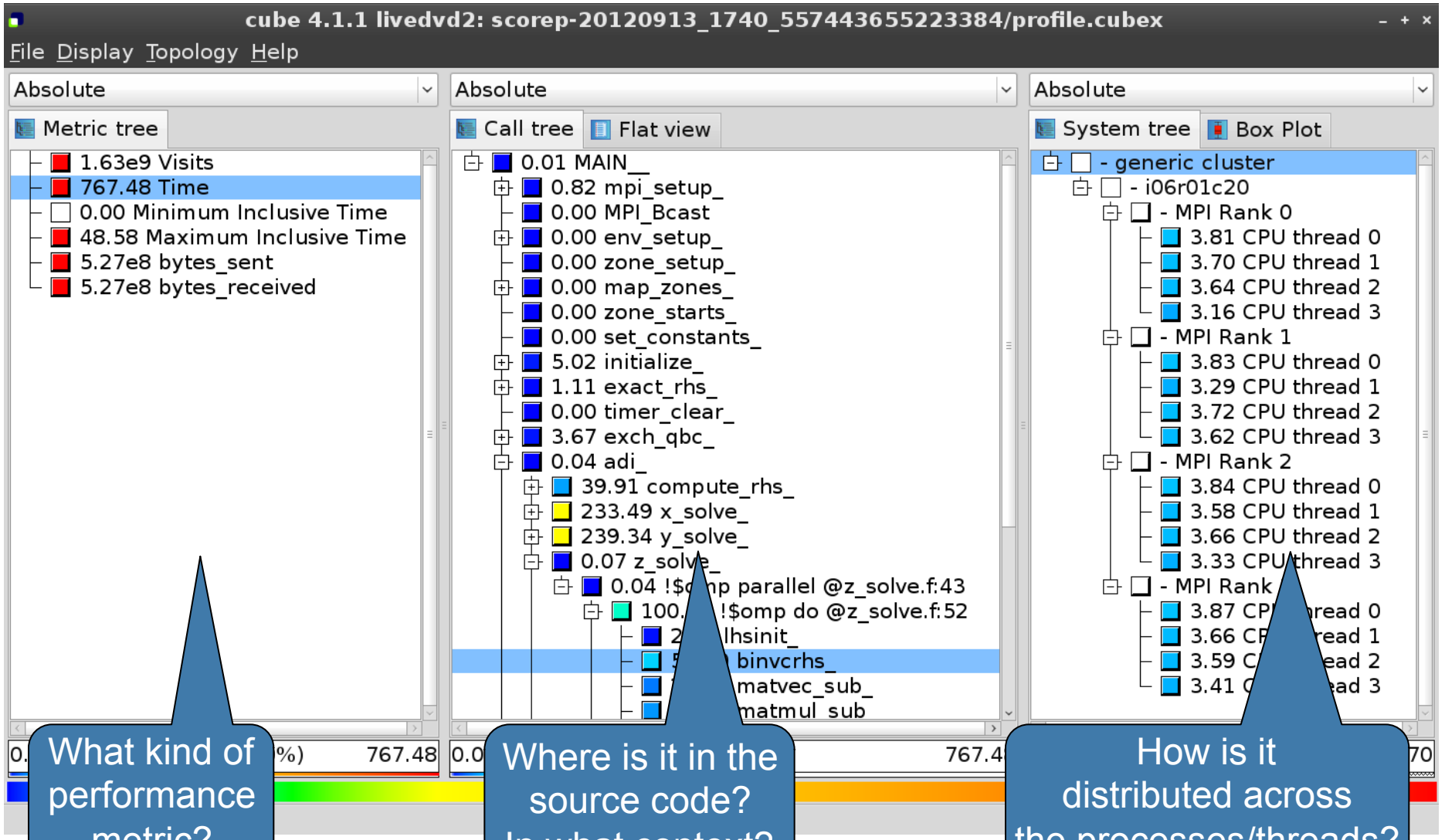
- Representation of values (severity matrix) on three hierarchical axes
  - Performance property (metric)
  - Call-tree path (program location)
  - System location (process/thread)



- Three coupled tree browsers

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

Analysis presentation



Hands-on: Profile report exploration

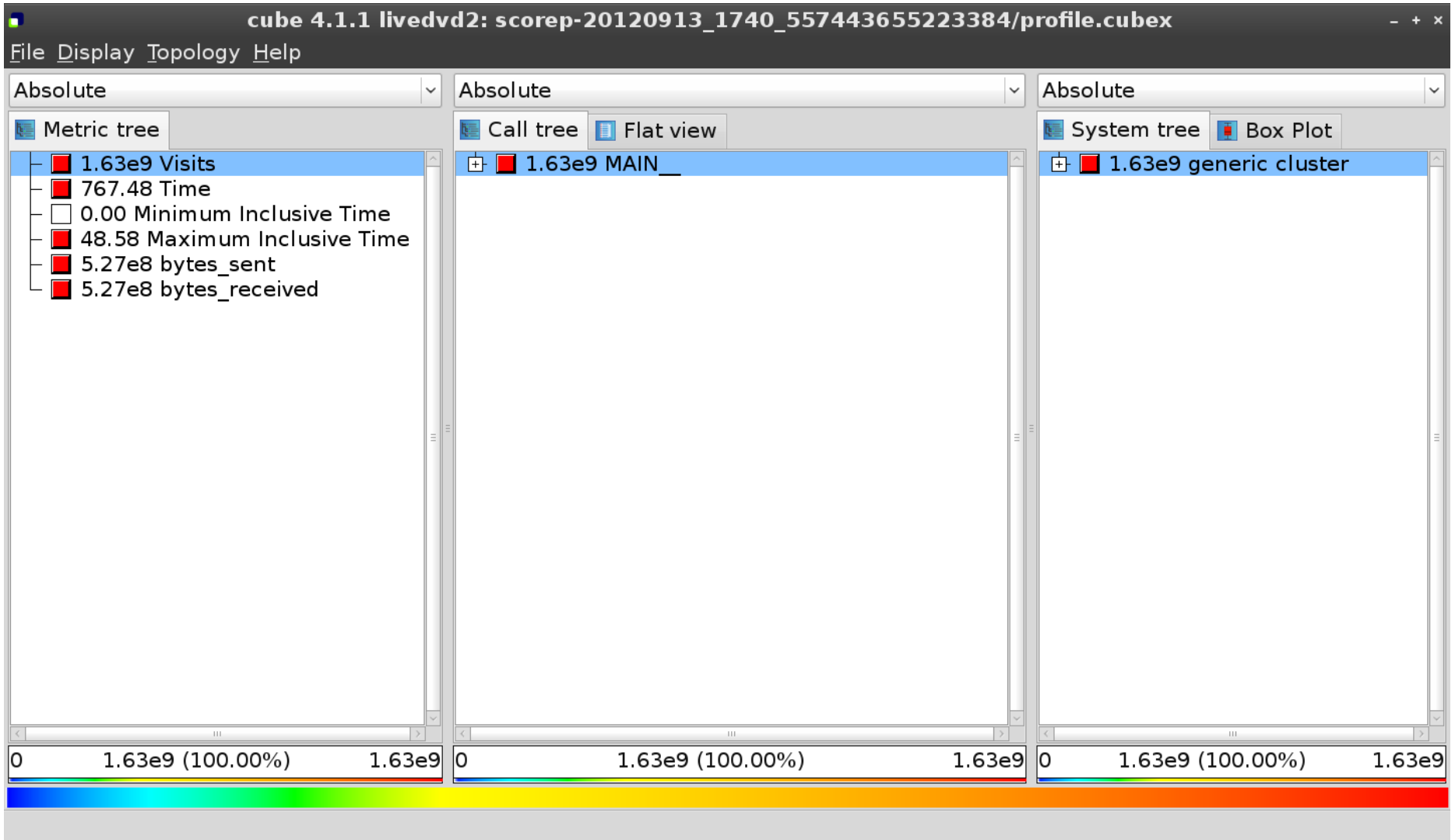
- The Live-DVD contains Score-P experiments of BT-MZ
  - class “B“, 4 processes with 4 OpenMP threads each
  - collected on a dedicated node of the SuperMUC HPC system at Leibniz Rechenzentrum (LRZ), Munich, Germany

```
% cd
% cd workshop-vihps/supermuc_expts
% ls
periscope-1.5                              scorep_bt-mz_B_4x4_sum
README                                     scorep_bt-mz_B_4x4_sum+mets
run.out                                    scorep_bt-mz_B_4x4_trace
scorep-20120913_1740_557443655223384
```

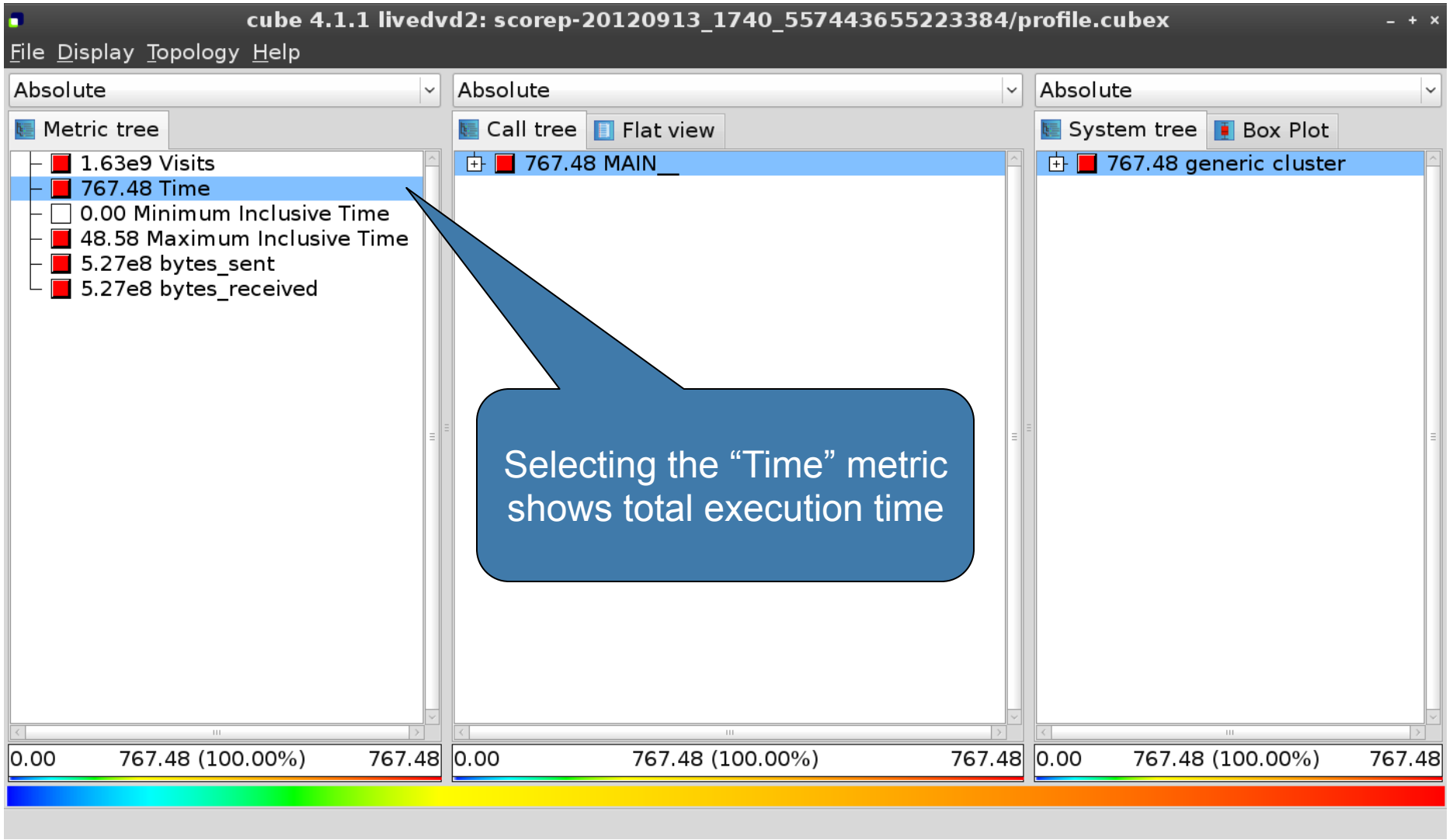
- Start CUBE GUI with default profile report

```
% cube scorep-20120913_1740_557443655223384/profile.cubex
```

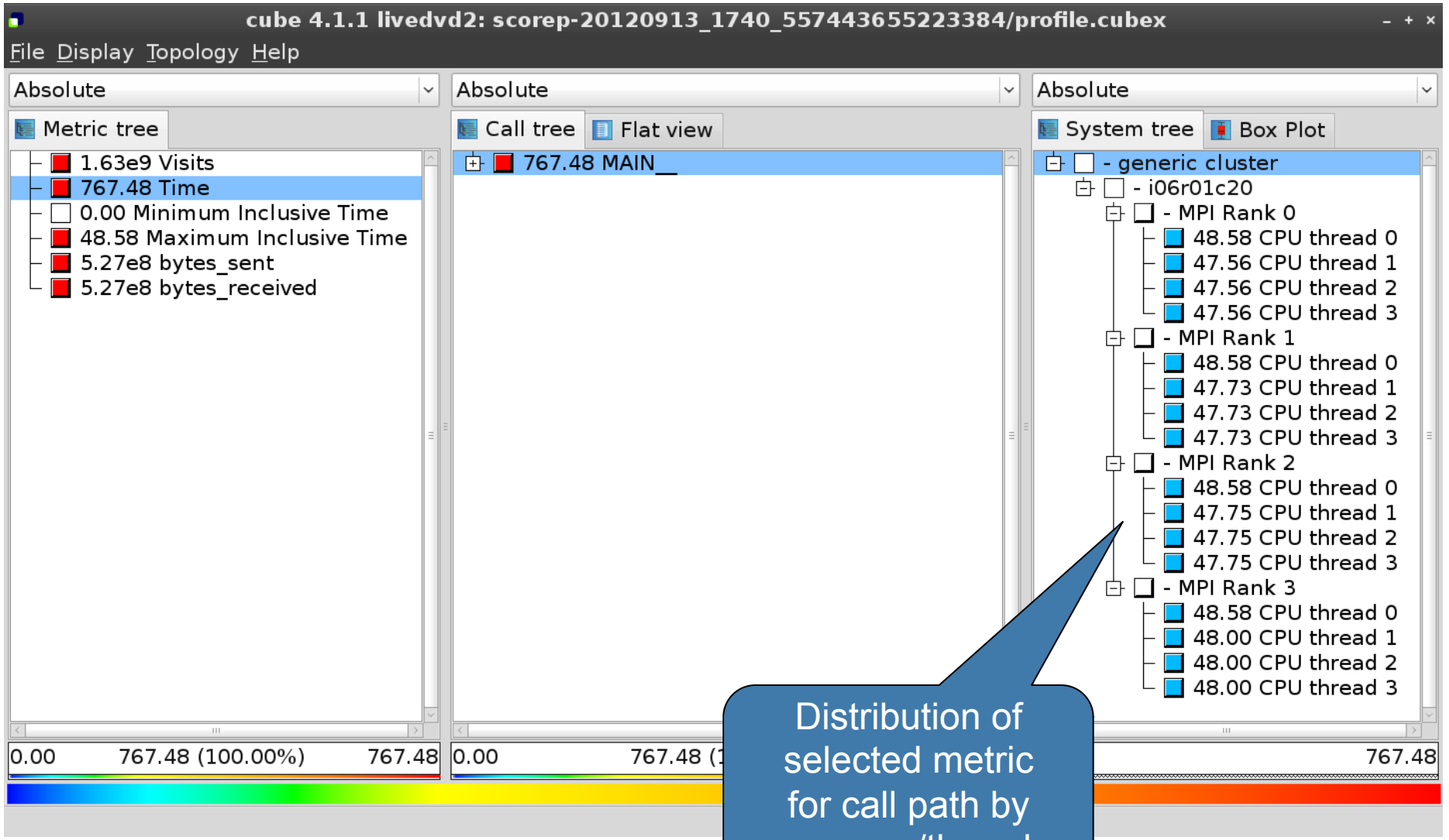
Analysis report exploration (opening view)



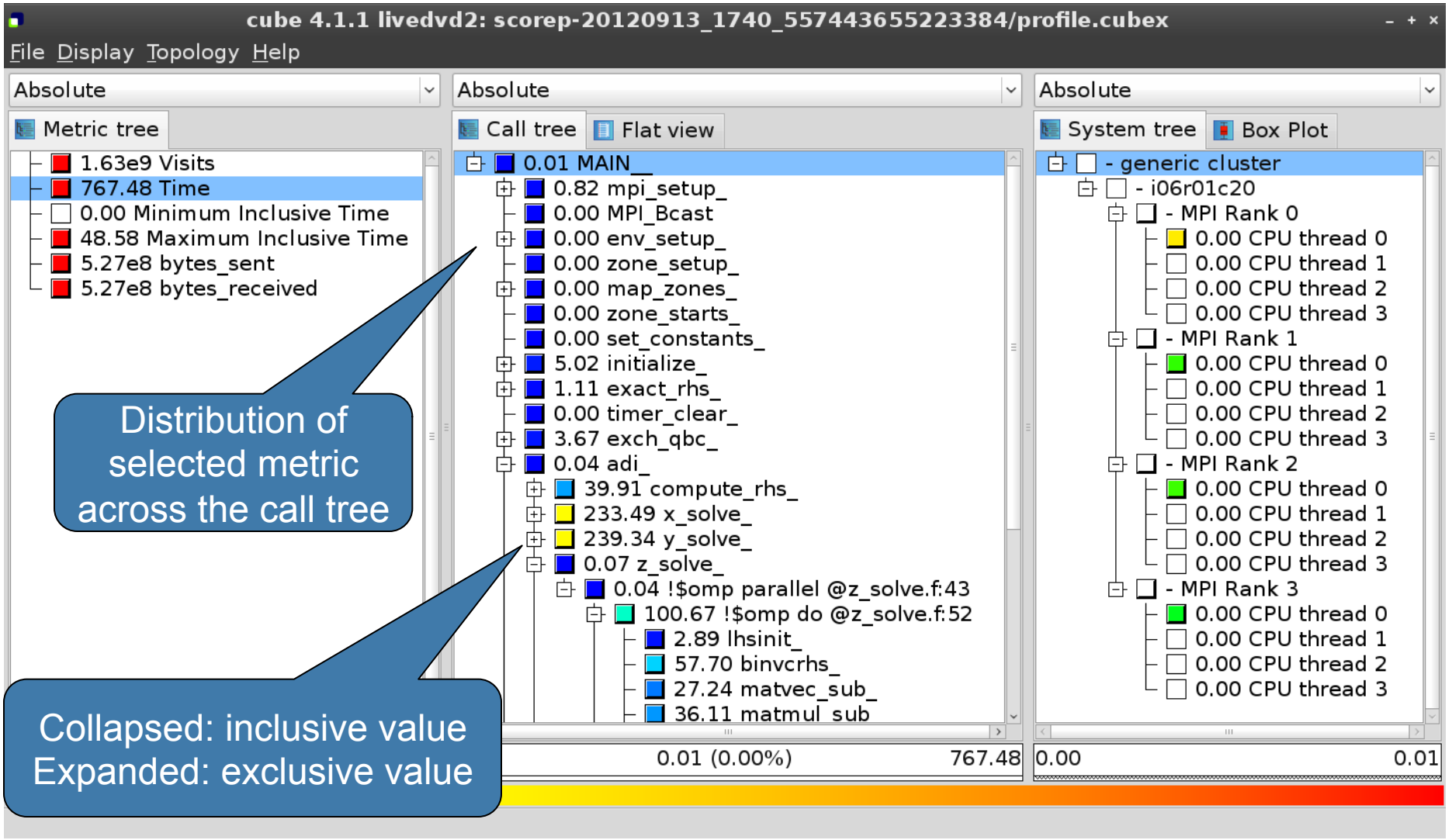
Metric selection



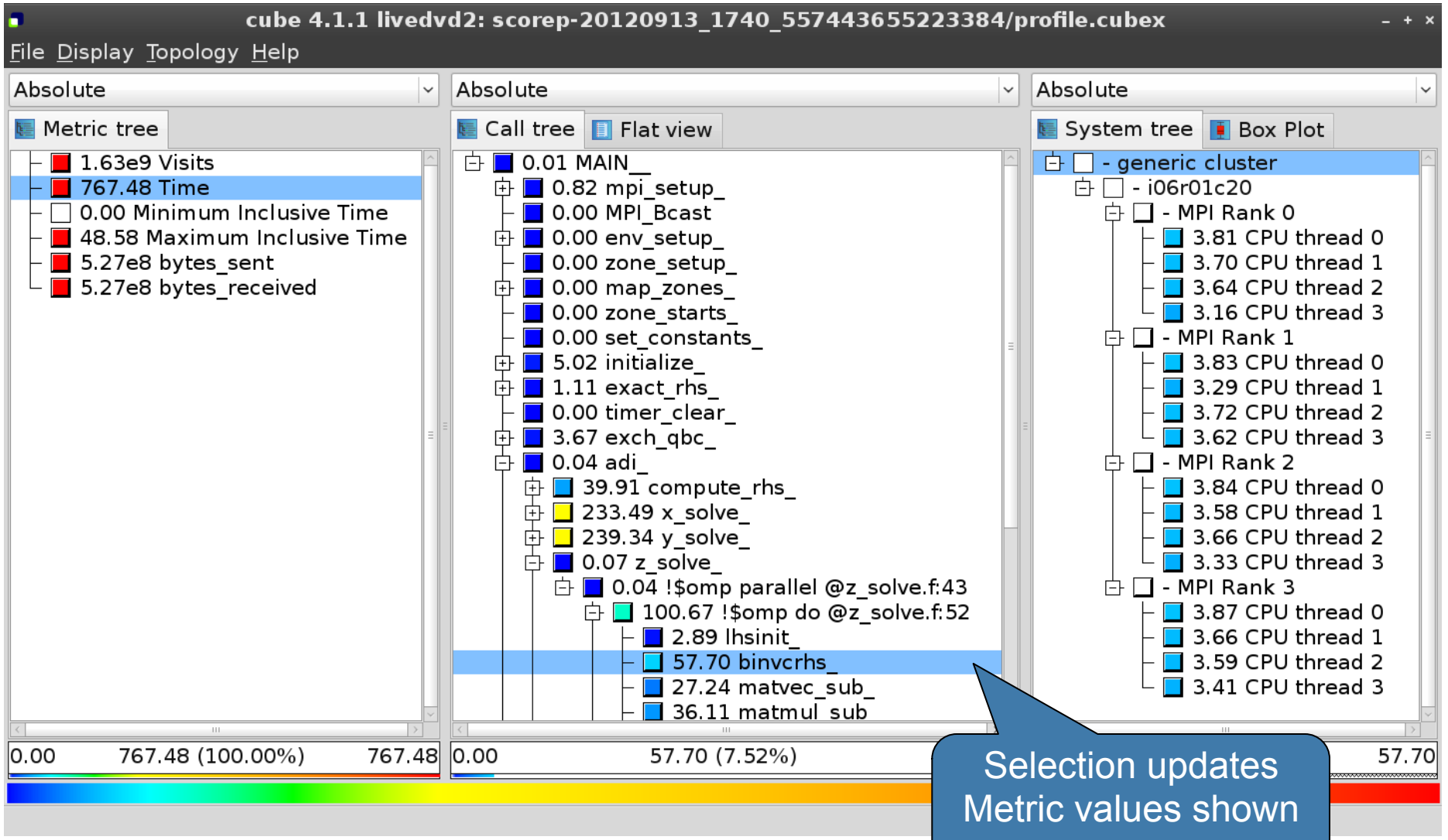
Expanding the system tree



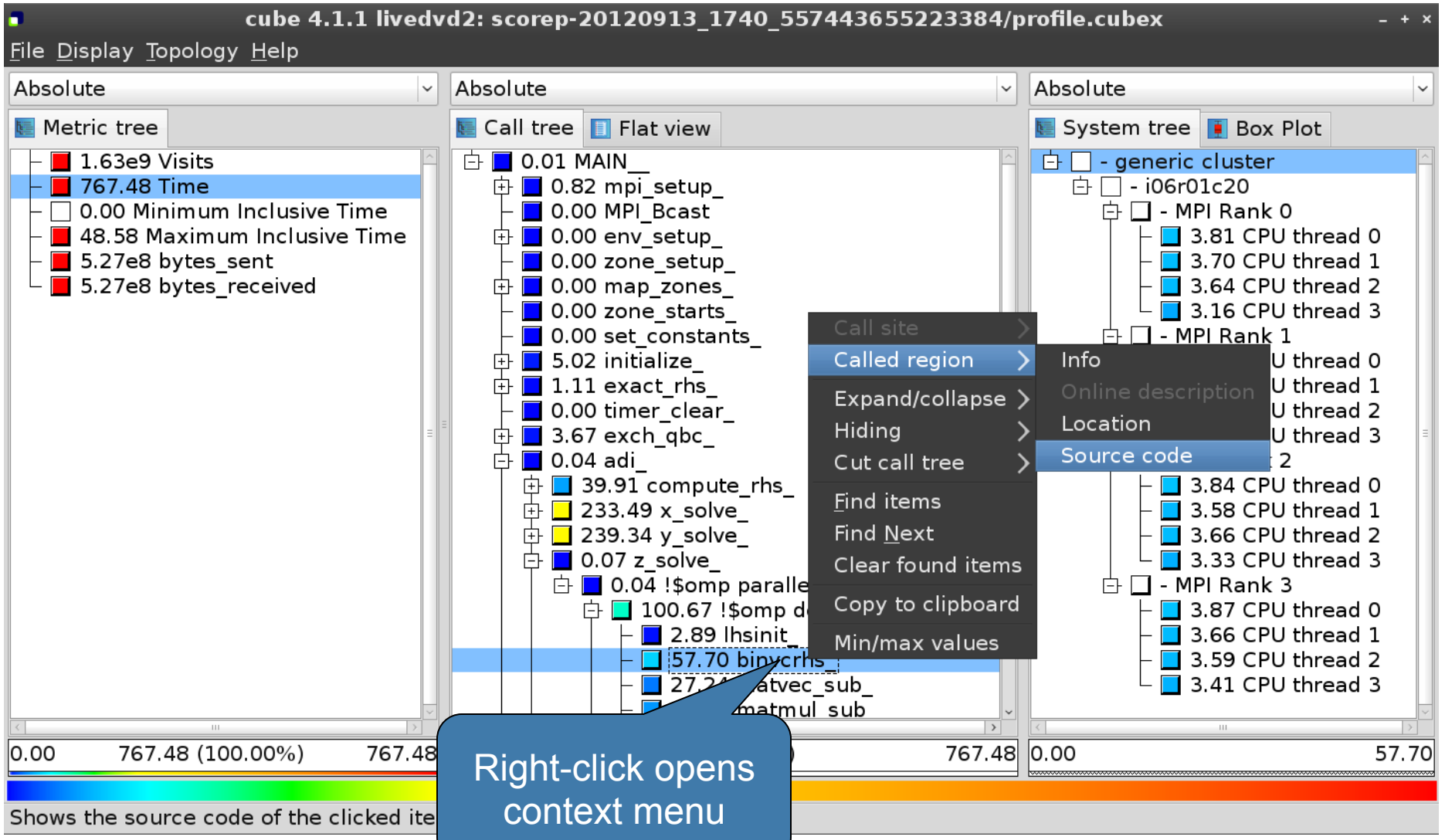
Expanding the call tree



Selecting a call path



Source-code view via context menu



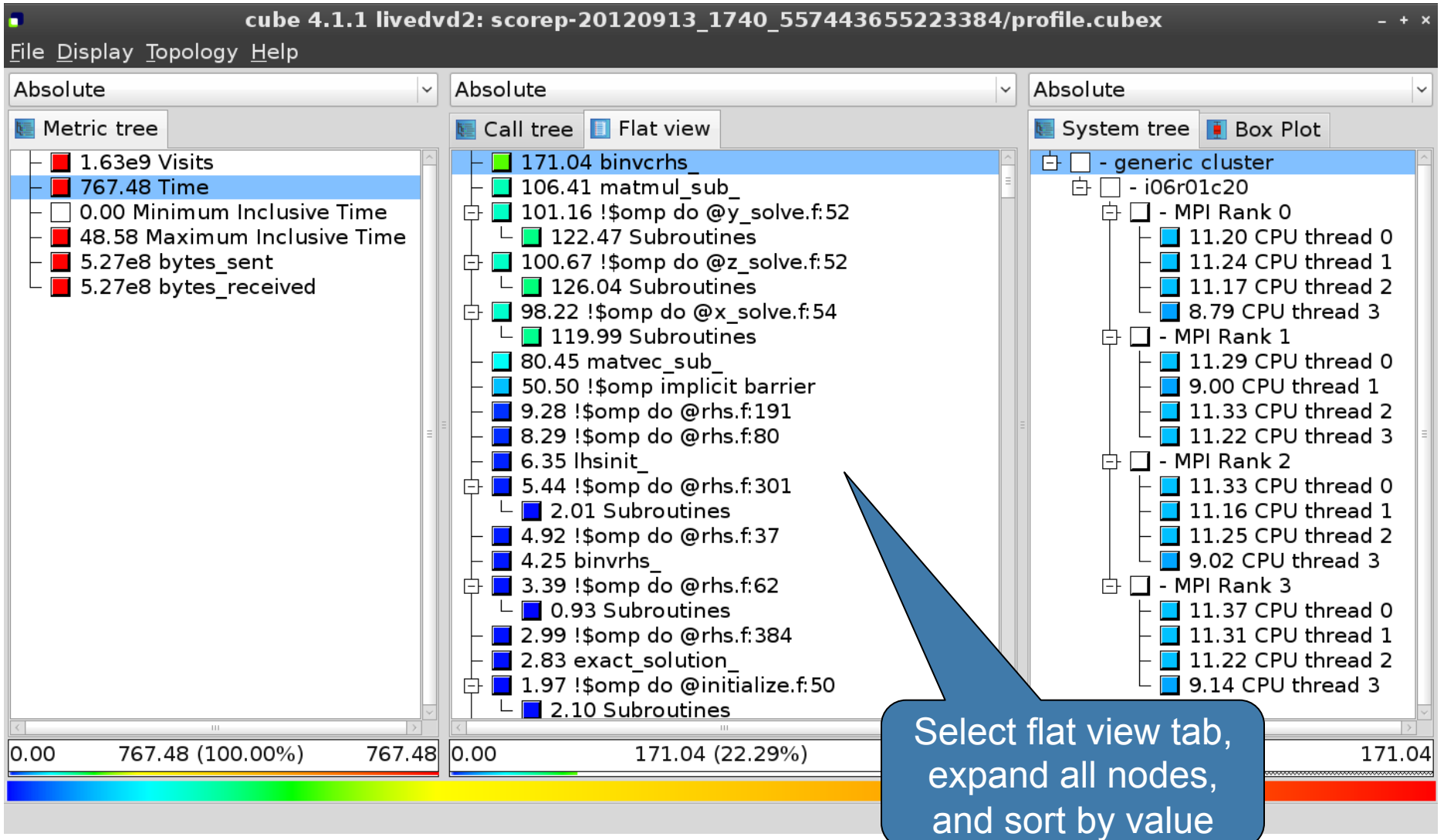
Source-code view

/home/geimer/Projects/Tests/NPB3.3-MZ-MPI/BT-MZ/solve_subs.f

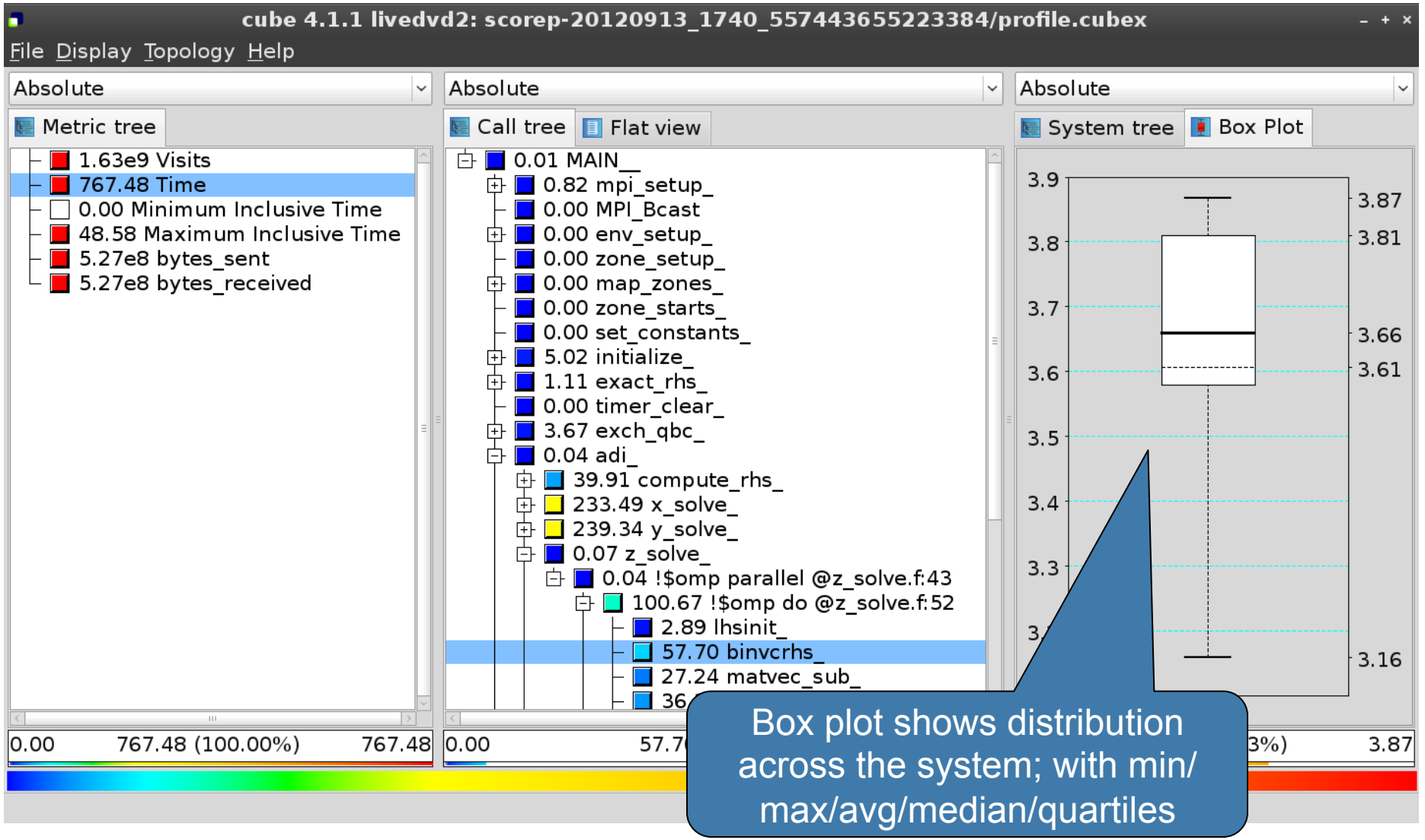
```
      subroutine binvcrhs( lhs,c,r )

c---------------------------------------------------------------------
c---------------------------------------------------------------------

c---------------------------------------------------------------------
c
c---------------------------------------------------------------------

      implicit none

      double precision pivot, coeff, lhs
      dimension lhs(5,5)
      double precision c(5,5), r(5)

c---------------------------------------------------------------------
c
c---------------------------------------------------------------------

      pivot = 1.00d0/lhs(1,1)
      lhs(1,2) = lhs(1,2)*pivot
      lhs(1,3) = lhs(1,3)*pivot
      lhs(1,4) = lhs(1,4)*pivot
      lhs(1,5) = lhs(1,5)*pivot
      c(1,1) = c(1,1)*pivot
      c(1,2) = c(1,2)*pivot
      c(1,3) = c(1,3)*pivot
      c(1,4) = c(1,4)*pivot
```

Read only | Save | Save as | Font... | Close

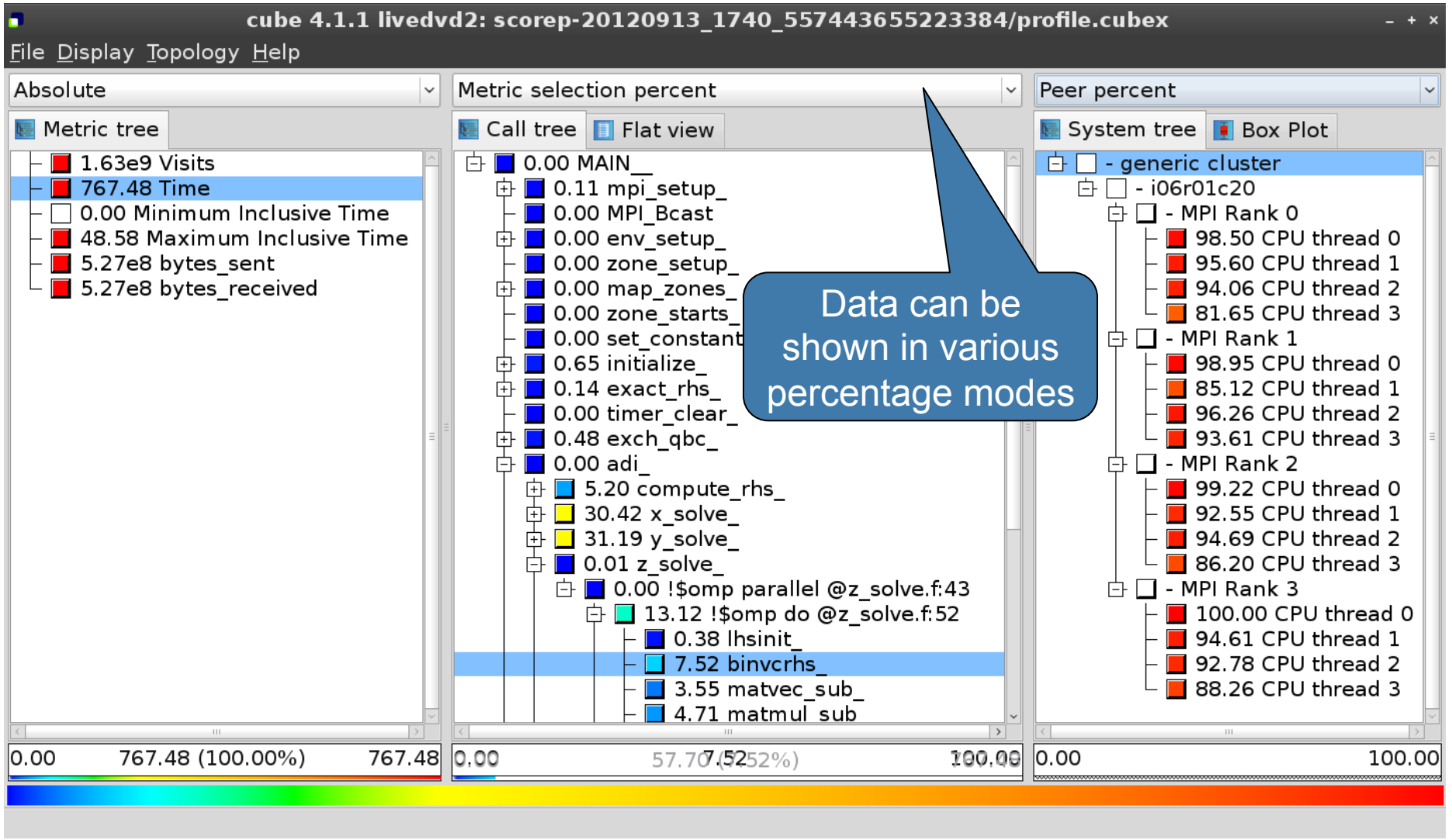
Flat profile view



Box plot view



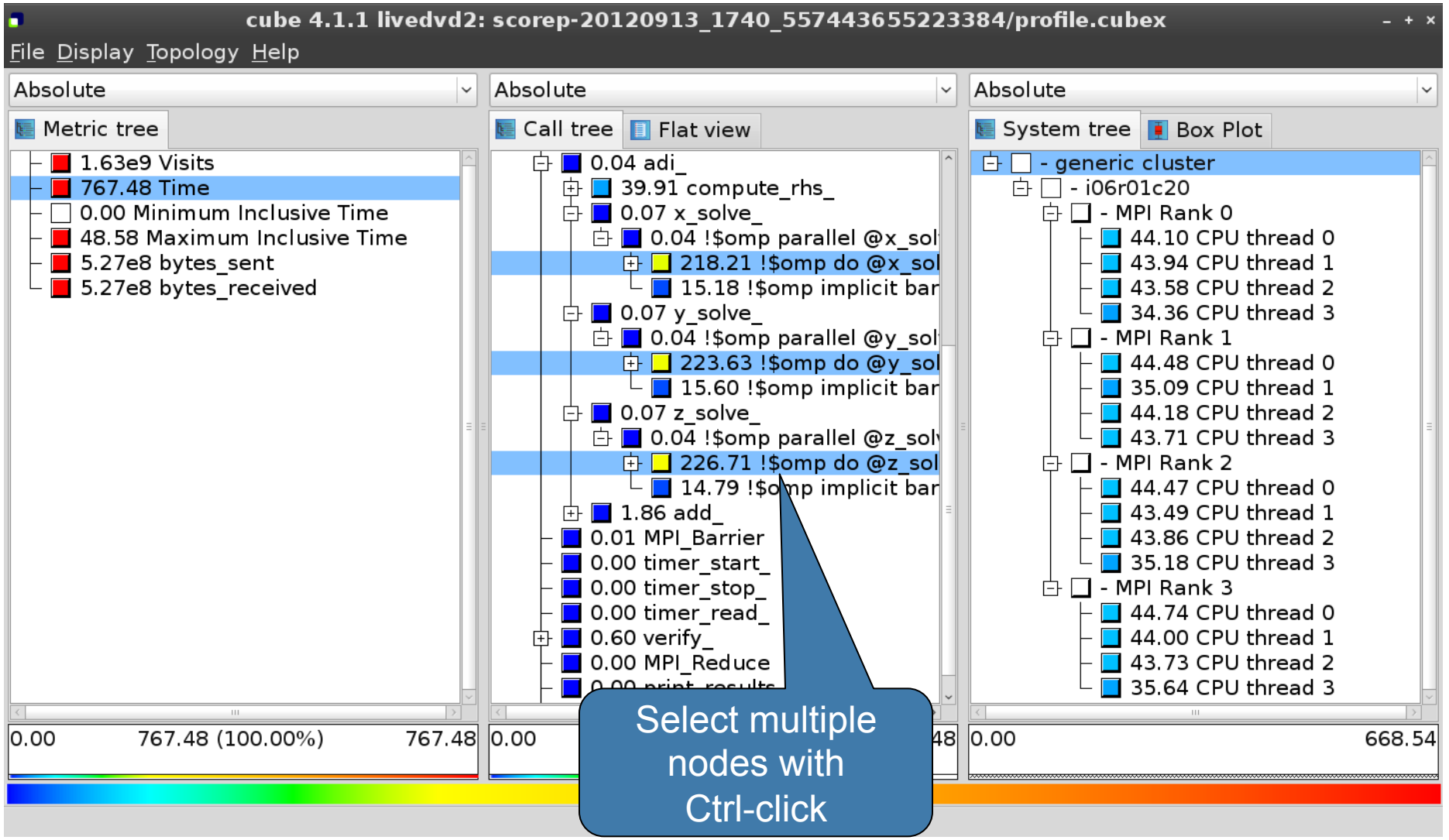
Alternative display modes



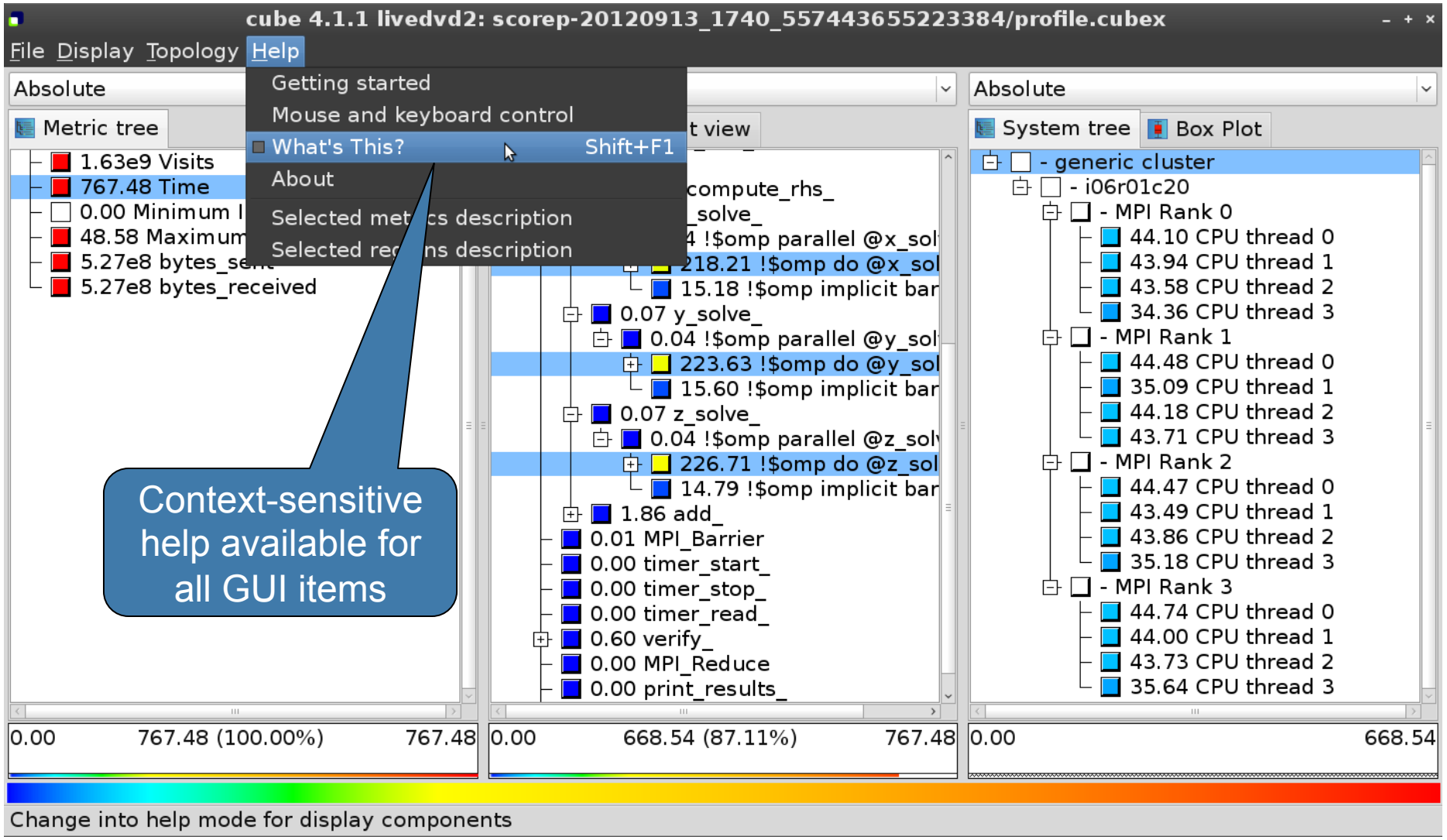
Important display modes

- 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

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