

VI-HPS

SOFTWARE



```
0.00 <<time step loop>>
  0.00 updatedt
  6.62 updatex
 372.85 updateien
  0.00 gene
  0.00 <<iteration loop>>
    293.65 genbc
```



FAST SOLUTIONS

- ☒ PAPI_L1_DCM
- ☒ PAPI_L1_ICM
- ☐ PAPI_L2_DCM
- ☒ PAPI_L2_ICM
- ☒ PAPI_L3_ICM
- ☐ PAPI_L2_TCM

PRODUCTIVITY

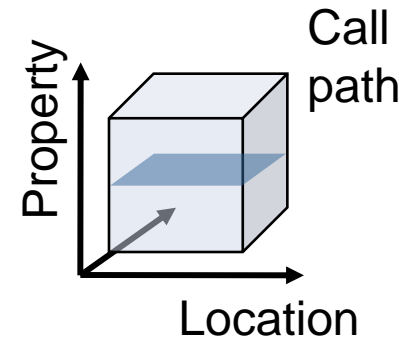
Profile examination with CUBE

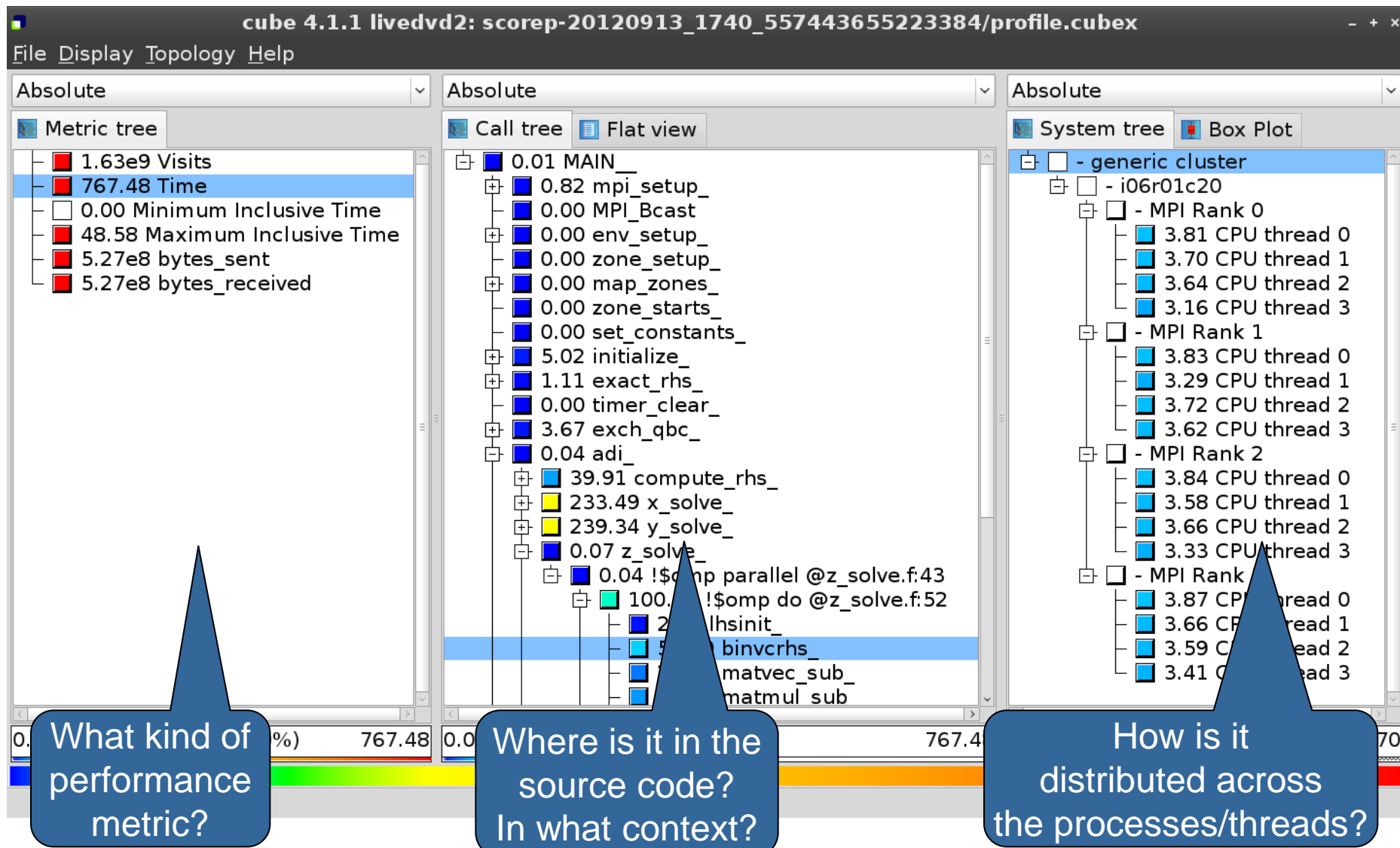
Markus Geimer
Jülich Supercomputing Centre



- 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 4.1.1 (September 2012)

- 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





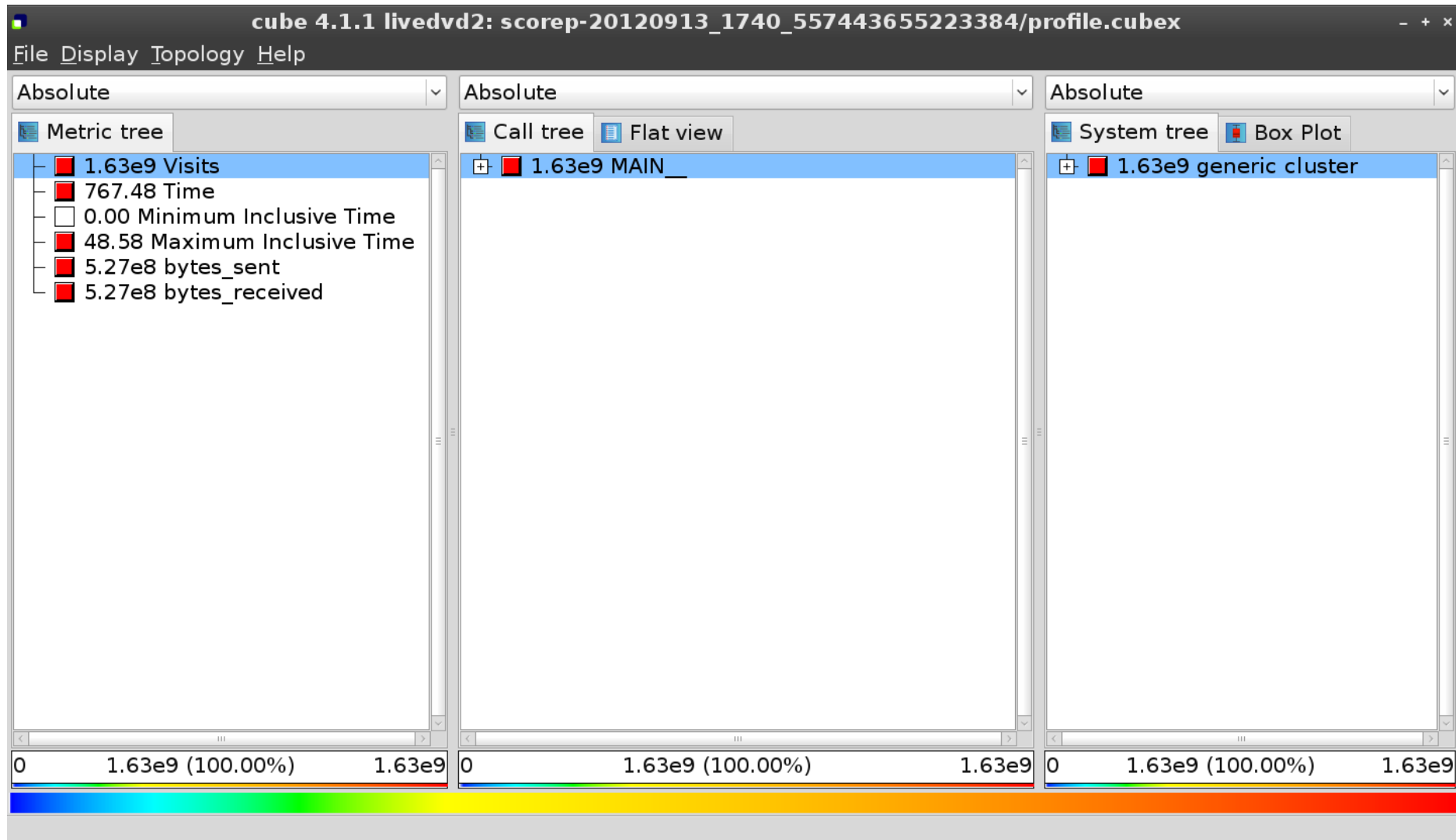
- The Live-DVD contains Score-P experiments of BT-MZ
 - Class “B”, 4 MPI processes with 4 OpenMP threads each
 - Collected on a dedicated node of the SuperMUC HPC system at Leibniz Rechenzentrum (LRZ), Munich, Germany

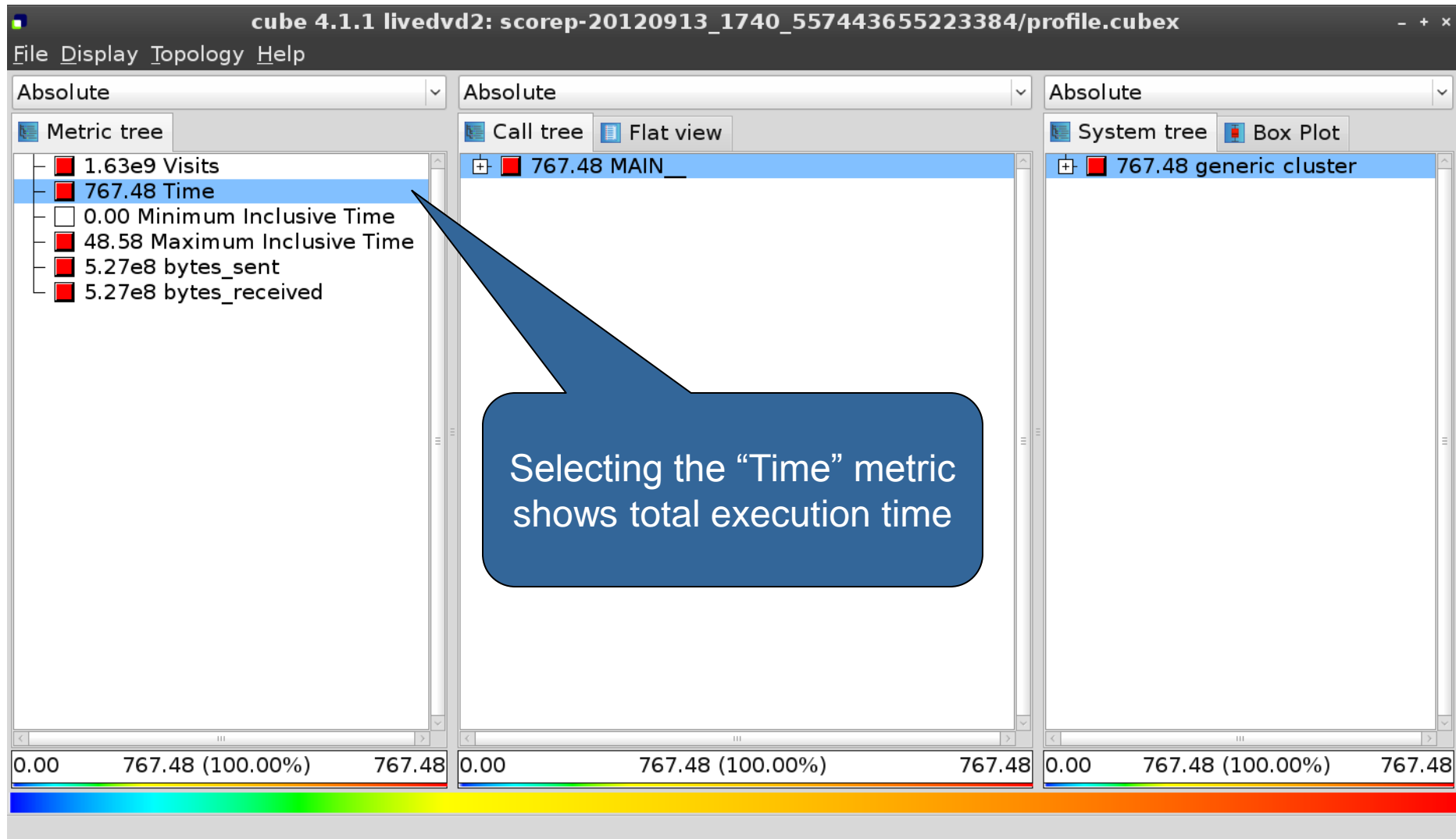
```
% cd
% cd workshop-vihps/supermuc_expts
% ls
periscope-1.5                scorep_bt-mz_B_4x4_sum
README                      scorep_bt-mz_B_4x4_sum+mets
run.out                     scorep_bt-mz_B_4x4_trace
scorep-20120913_1740_557443655223384
```

- Start CUBE GUI with default profile report

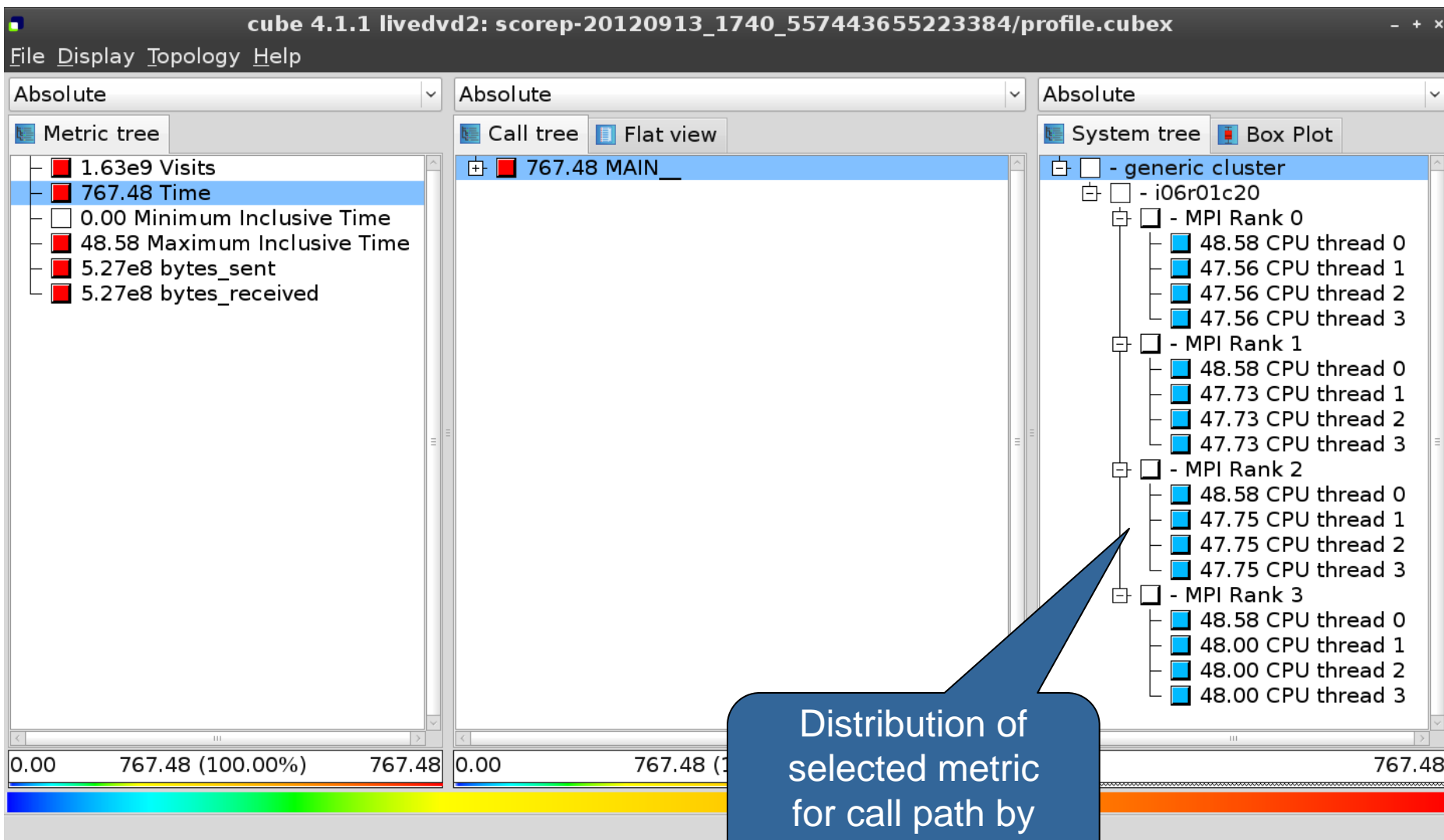
```
% cube scorep-20120913_1740_557443655223384/profile.cubex
```

Analysis report exploration (opening view)

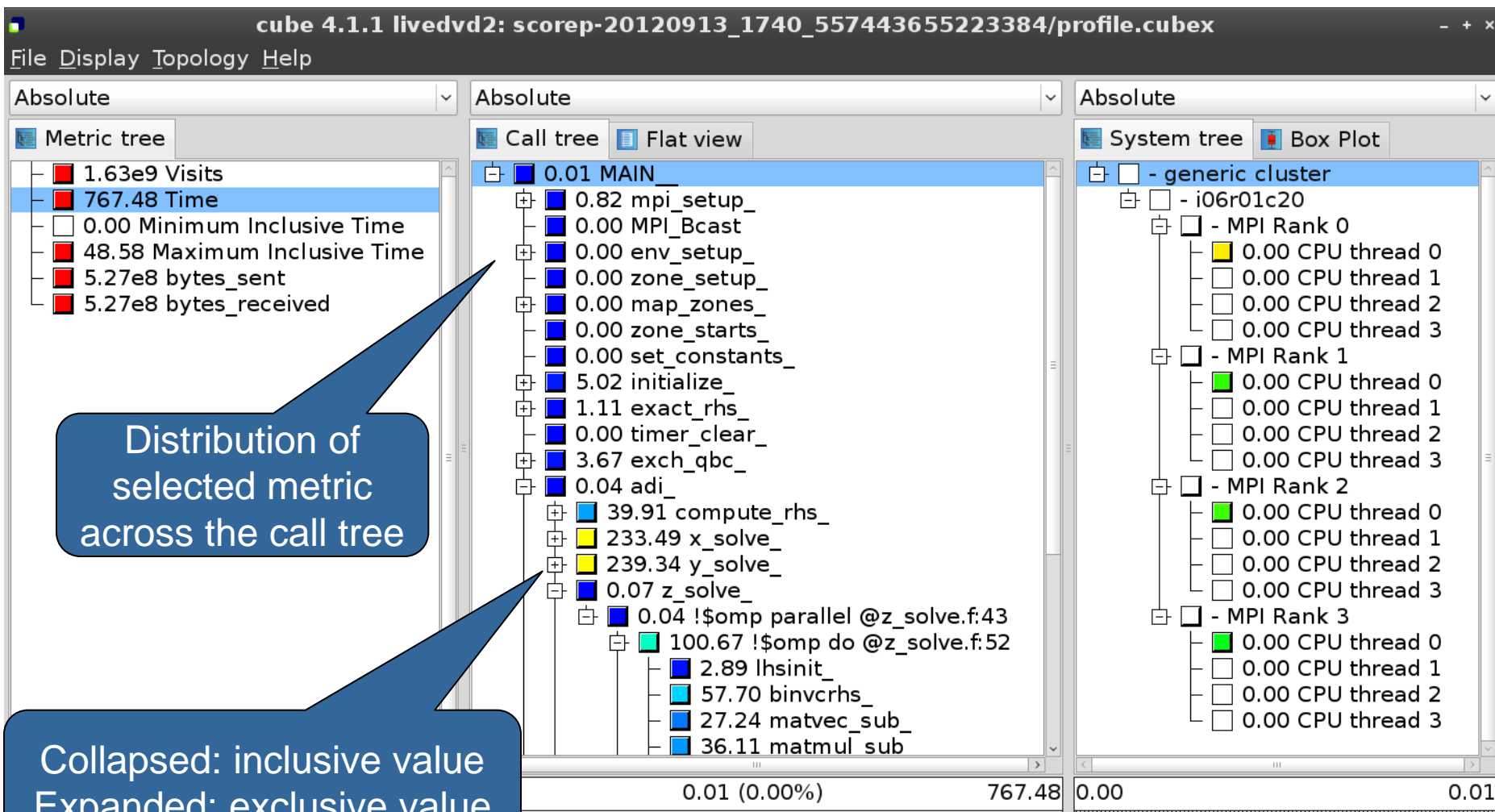




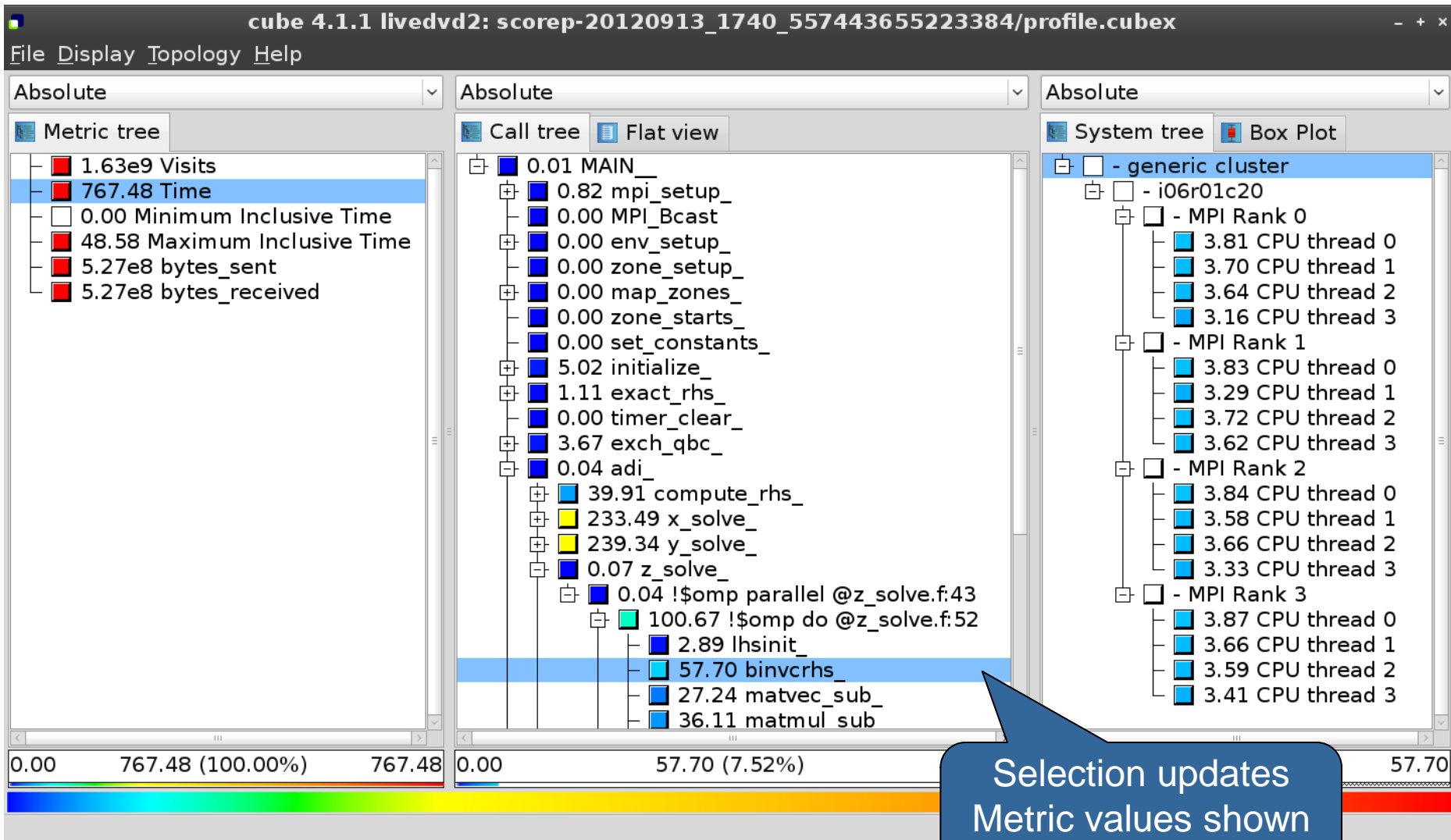
Expanding the system tree



Expanding the call tree



Selecting a call path

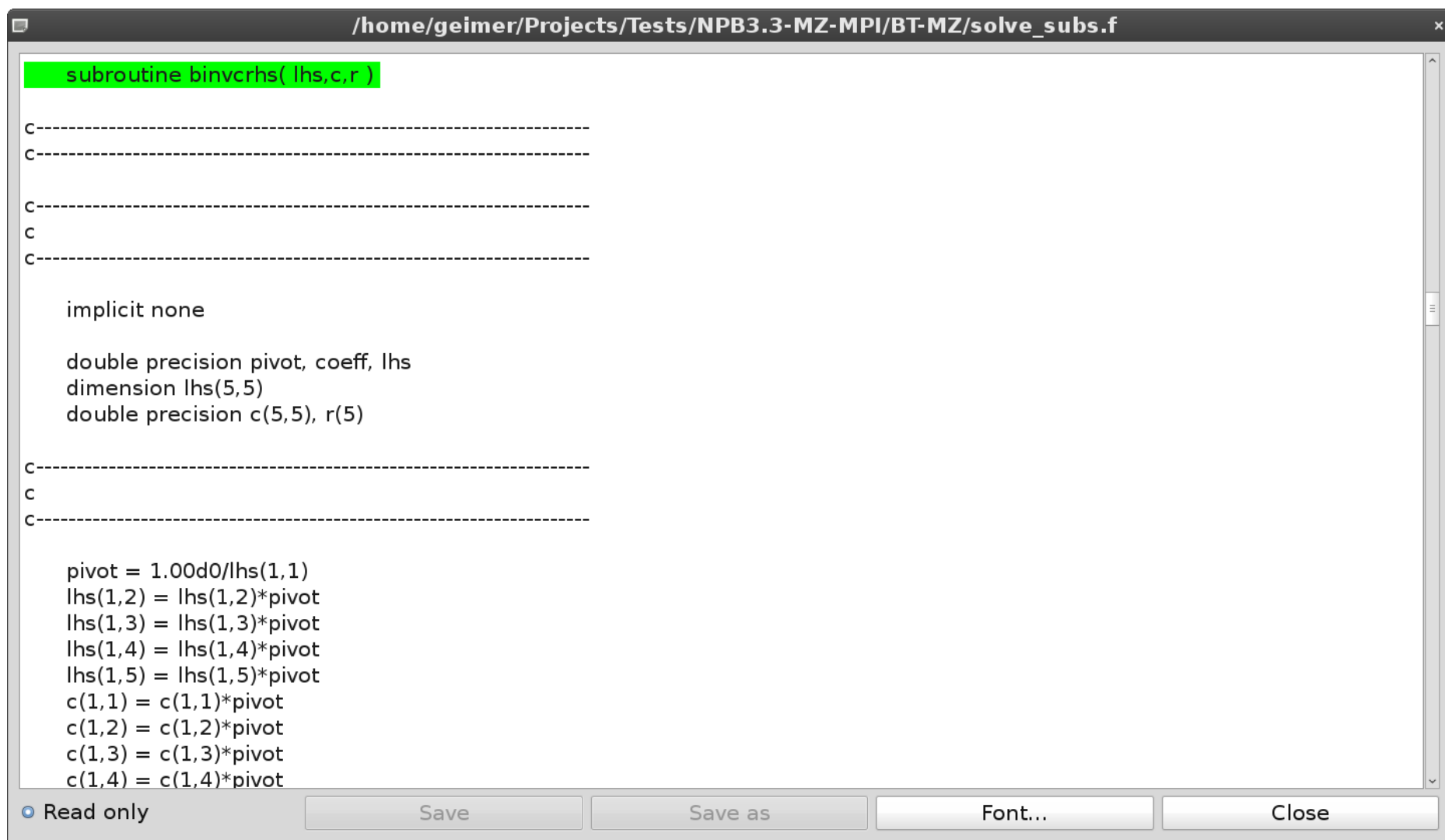


Source-code view via context menu

The screenshot displays the VI-HPS application window titled "cube 4.1.1 livedvd2: scorep-20120913_1740_557443655223384/profile.cubex". The interface is divided into three main panels, each with a dropdown menu set to "Absolute".

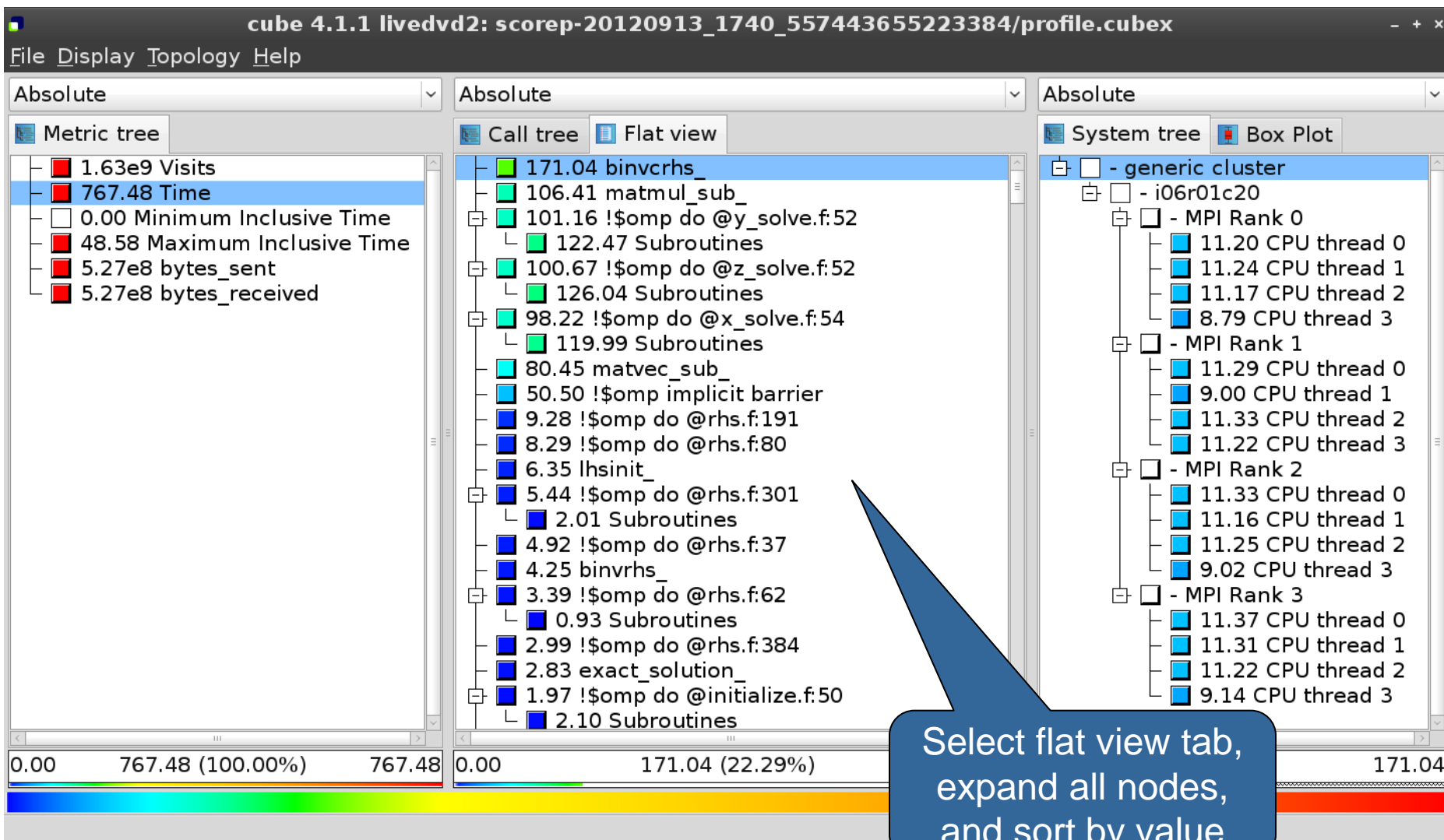
- Metric tree:** Shows a list of performance metrics. The "767.48 Time" metric is highlighted in blue.
- Call tree:** Displays a hierarchical tree of function calls. The "57.70 binvcrhs" node is highlighted in blue. A context menu is open over this node, listing options: "Call site", "Called region", "Expand/collapse", "Hiding", "Cut call tree", "Find items", "Find Next", "Clear found items", "Copy to clipboard", and "Min/max values". The "Source code" option is highlighted in blue.
- System tree:** Shows a hierarchical tree of system components. The "3.16 CPU thread 3" node is highlighted in blue.

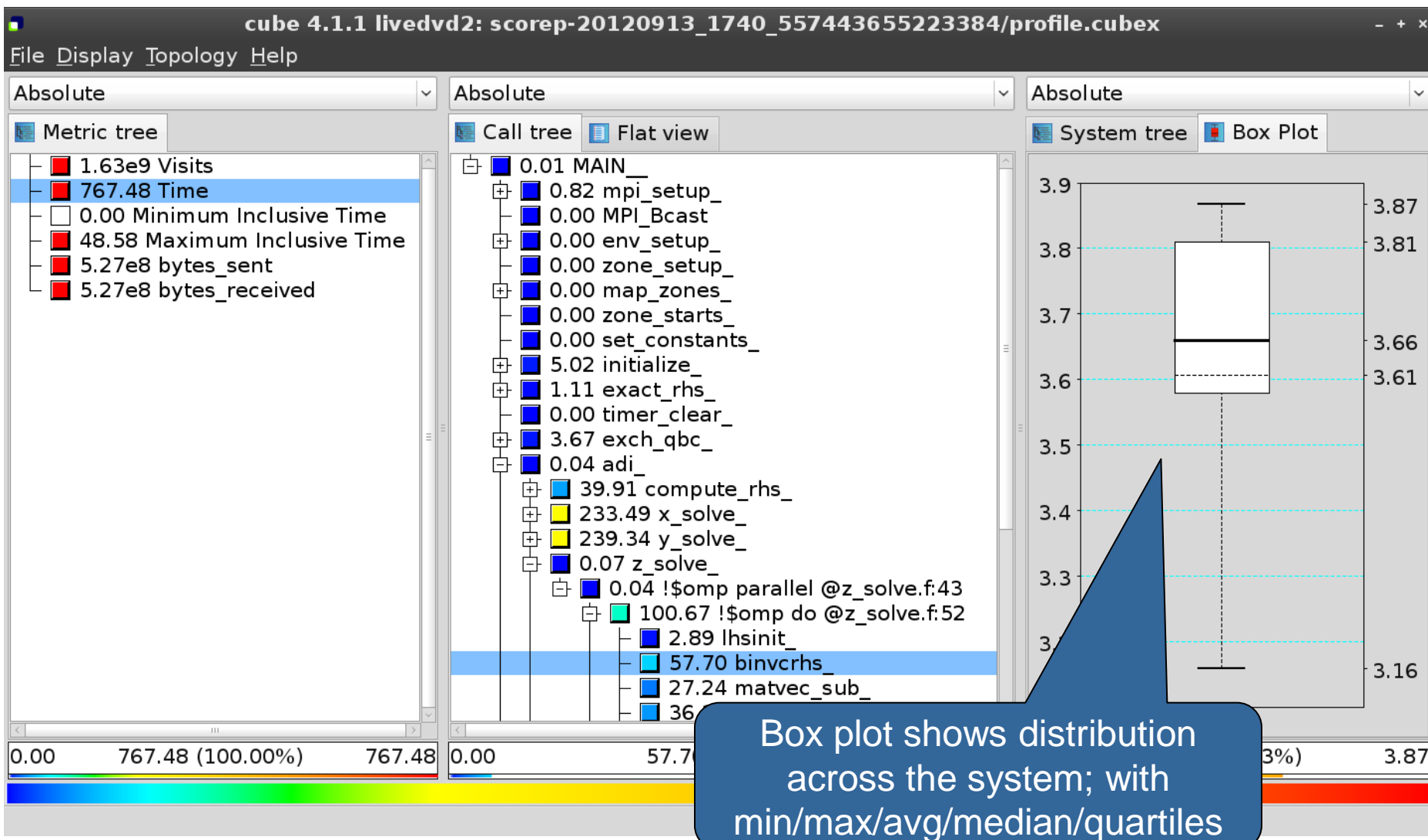
A blue callout bubble with the text "Right-click opens context menu" points to the context menu. At the bottom of the interface, a status bar shows the time "767.48 (100.00%) 767.48" and a color-coded progress bar. Below the status bar, the text "Shows the source code of the clicked item" is visible.

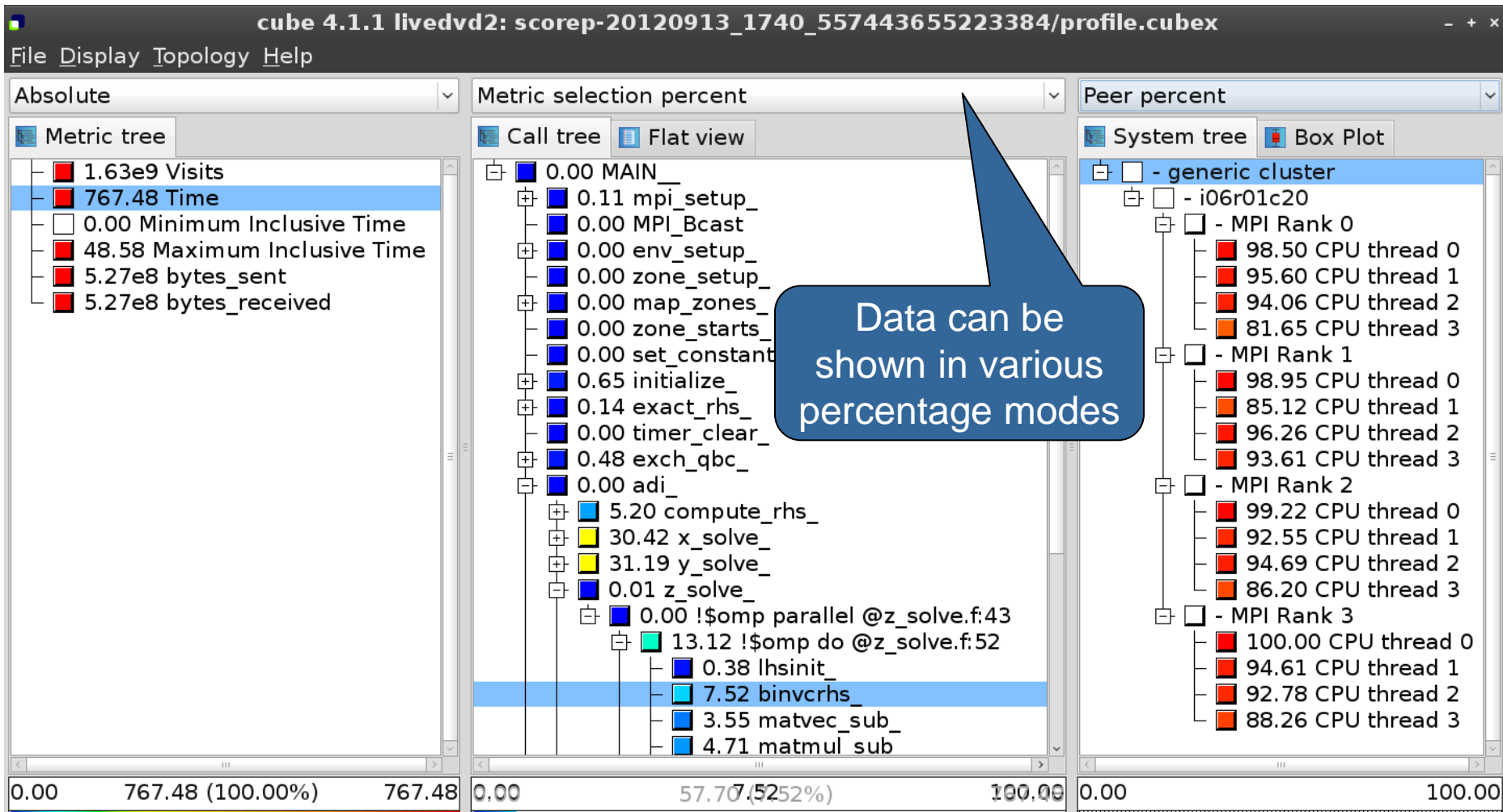


```
subroutine binvrhs( lhs,c,r )  
  
C-----  
C-----  
  
C-----  
C  
C-----  
  
implicit none  
  
double precision pivot, coeff, lhs  
dimension lhs(5,5)  
double precision c(5,5), r(5)  
  
C-----  
C  
C-----  
  
pivot = 1.00d0/lhs(1,1)  
lhs(1,2) = lhs(1,2)*pivot  
lhs(1,3) = lhs(1,3)*pivot  
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

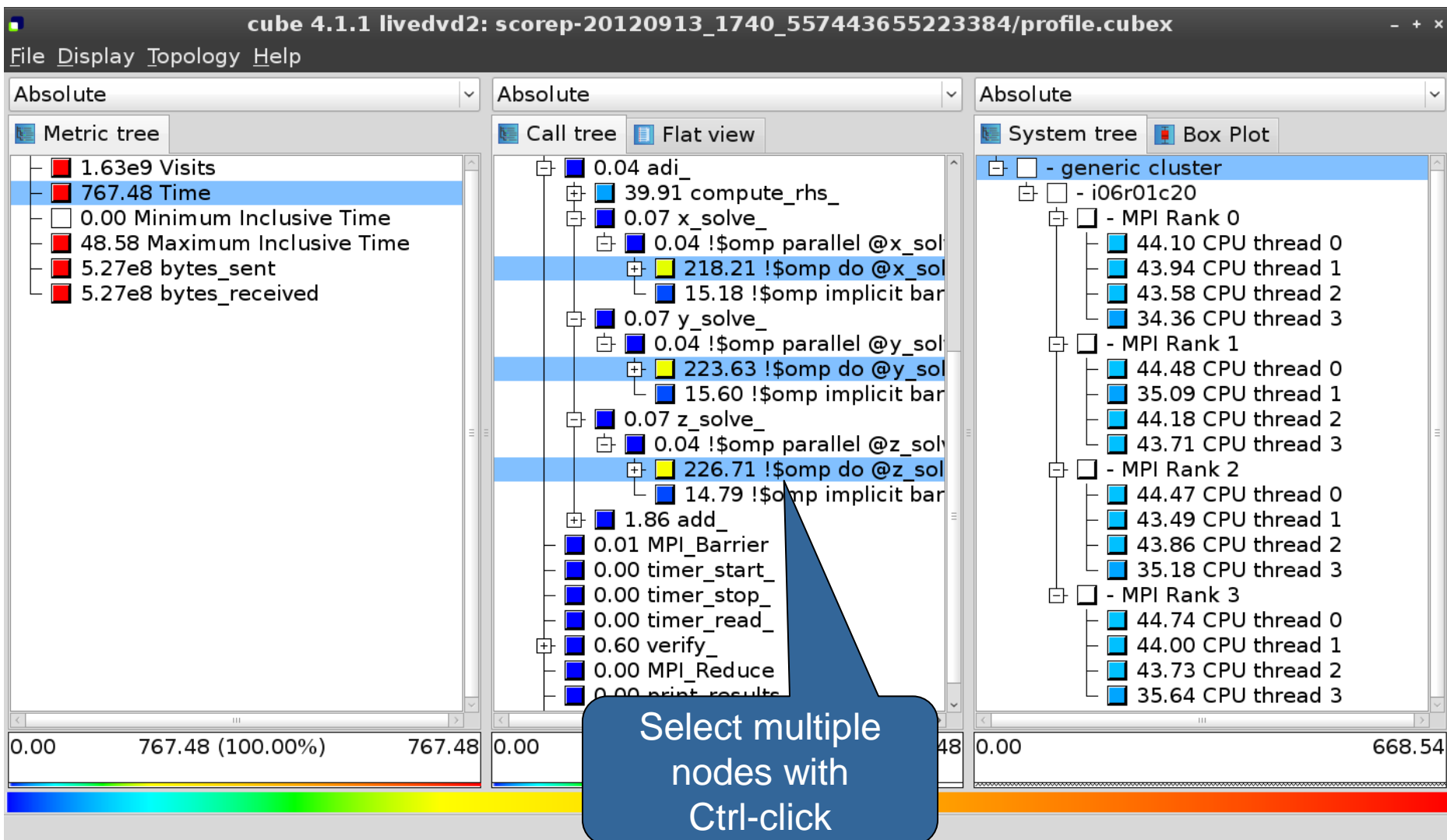






- Absolute
 - Absolute value shown in seconds/bytes/occurrences
- Selection percent
 - Value shown as percentage of the value of the selected node “on the left” (metric/call path)
- Peer percent (system tree only)
 - Value shown as percentage relative to the maximum peer value

Multiple selection



The screenshot shows the 'cube 4.1.1' application window with the title bar 'cube 4.1.1 livedvd2: scorep-20120913_1740_557443655223384/profile.cubex'. The 'Help' menu is open, displaying options: 'Getting started', 'Mouse and keyboard control', 'What's This? (Shift+F1)', 'About', 'Selected metrics description', and 'Selected regions description'. A blue callout bubble points to the 'What's This?' option with the text: 'Context-sensitive help available for all GUI items'.

The main window is divided into three panels:

- Metric tree (Left):** Shows a list of metrics with color-coded bars. The '767.48 Time' metric is highlighted in blue. Below the tree is a progress bar showing '0.00 767.48 (100.00%) 767.48'.
- System tree (Right):** Shows a hierarchical view of the system components. The 'generic cluster' is expanded, showing 'i06r01c20' and its four MPI Ranks. Each rank lists its CPU threads and their respective times. Below the tree is a progress bar showing '0.00 668.54 (87.11%) 767.48'.
- Bottom Panel:** A color-coded progress bar spanning the width of the window, with a label 'Change into help mode for display components'.

- 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`

