

# VI-HPS



## Analysis report examination with CUBE

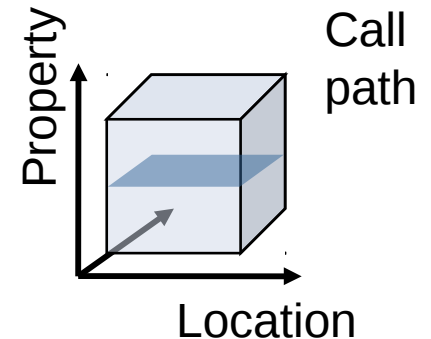
Brian Wylie

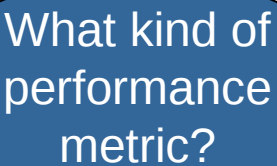
Julich Supercomputing Centre



- 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 4.1.6 (March 2013)

- 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

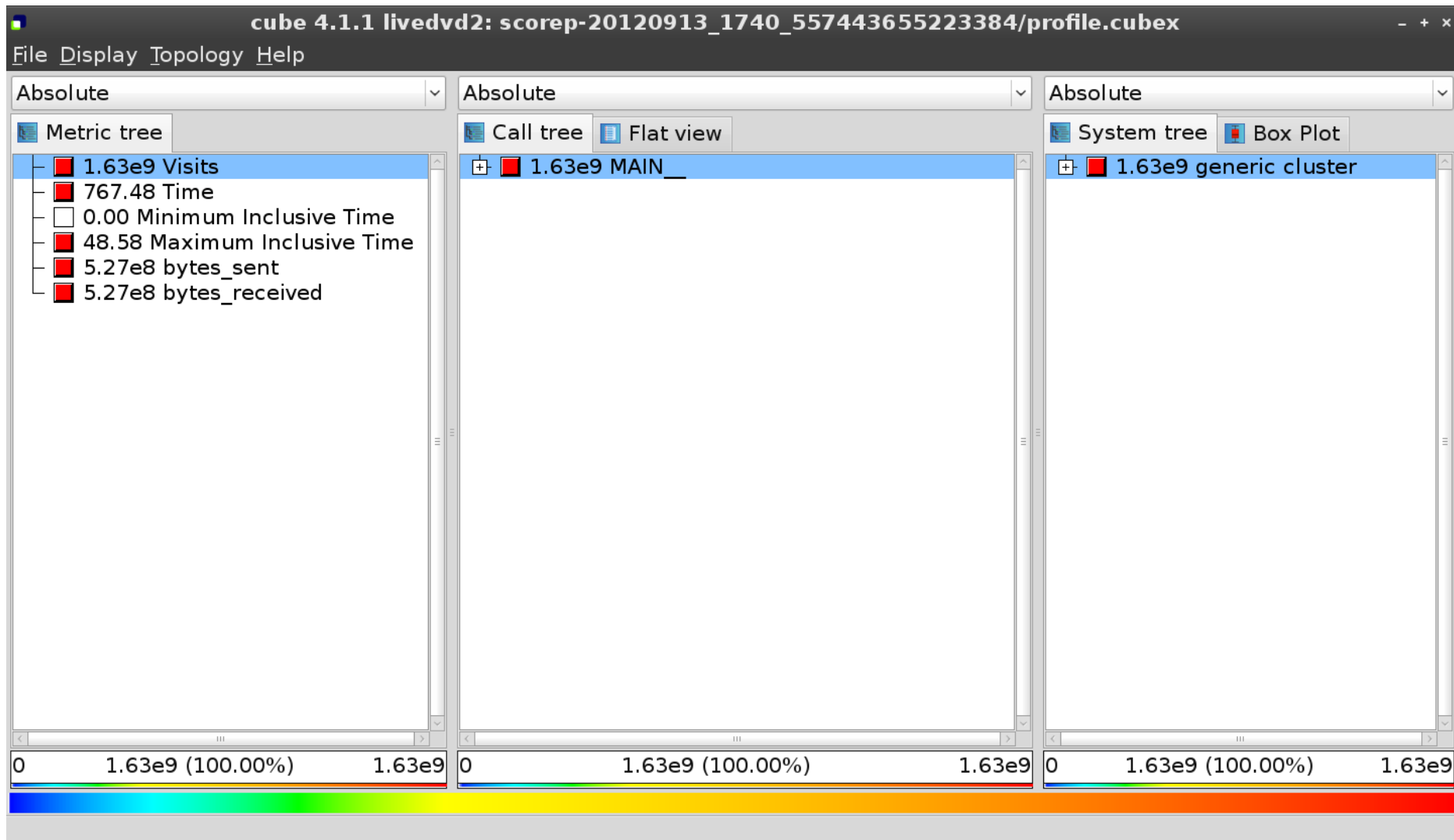


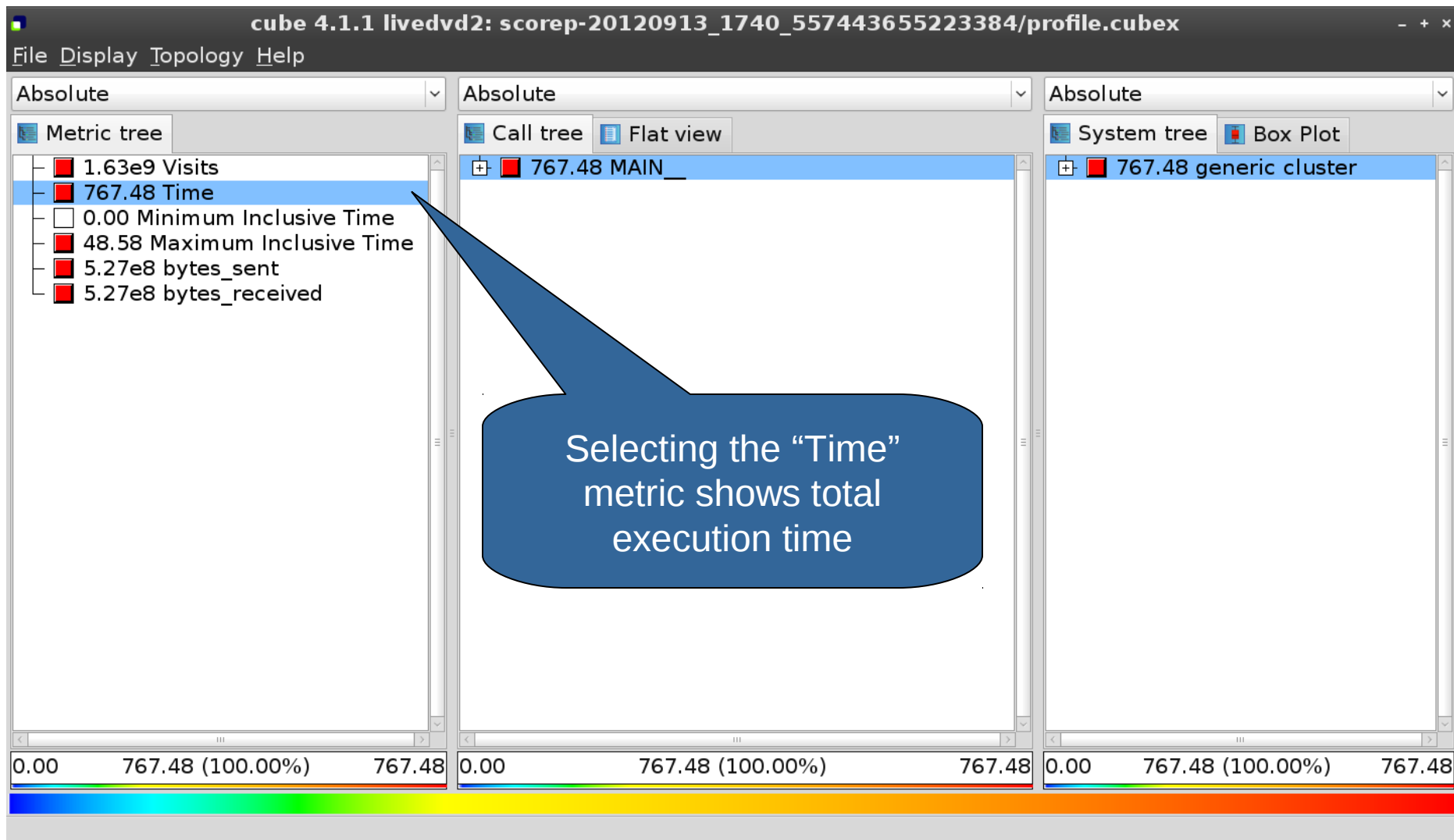


Where is it in the  
source code?  
In what context?

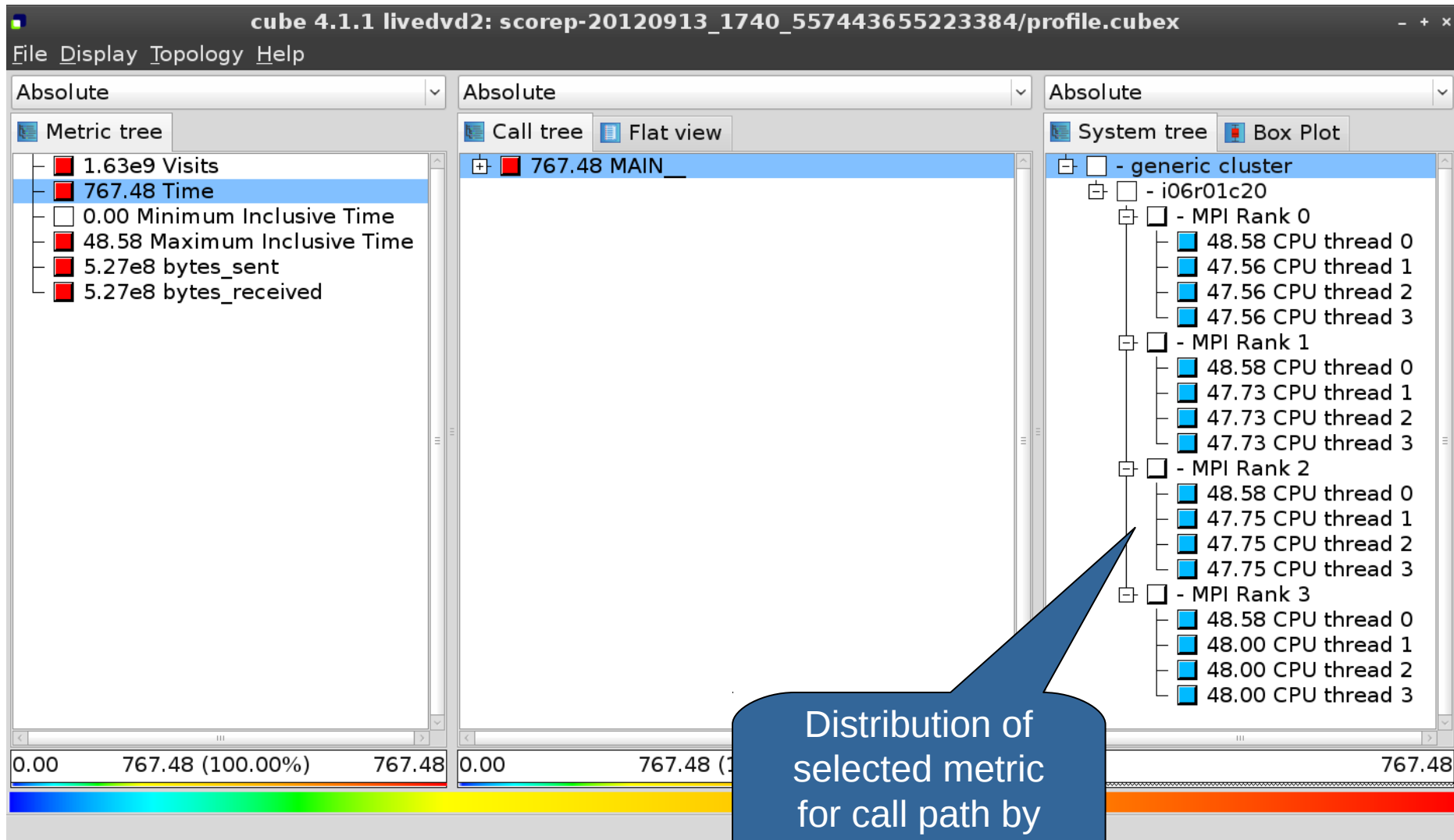
How is it distributed across the processes/threads?

# Analysis report exploration (opening view)



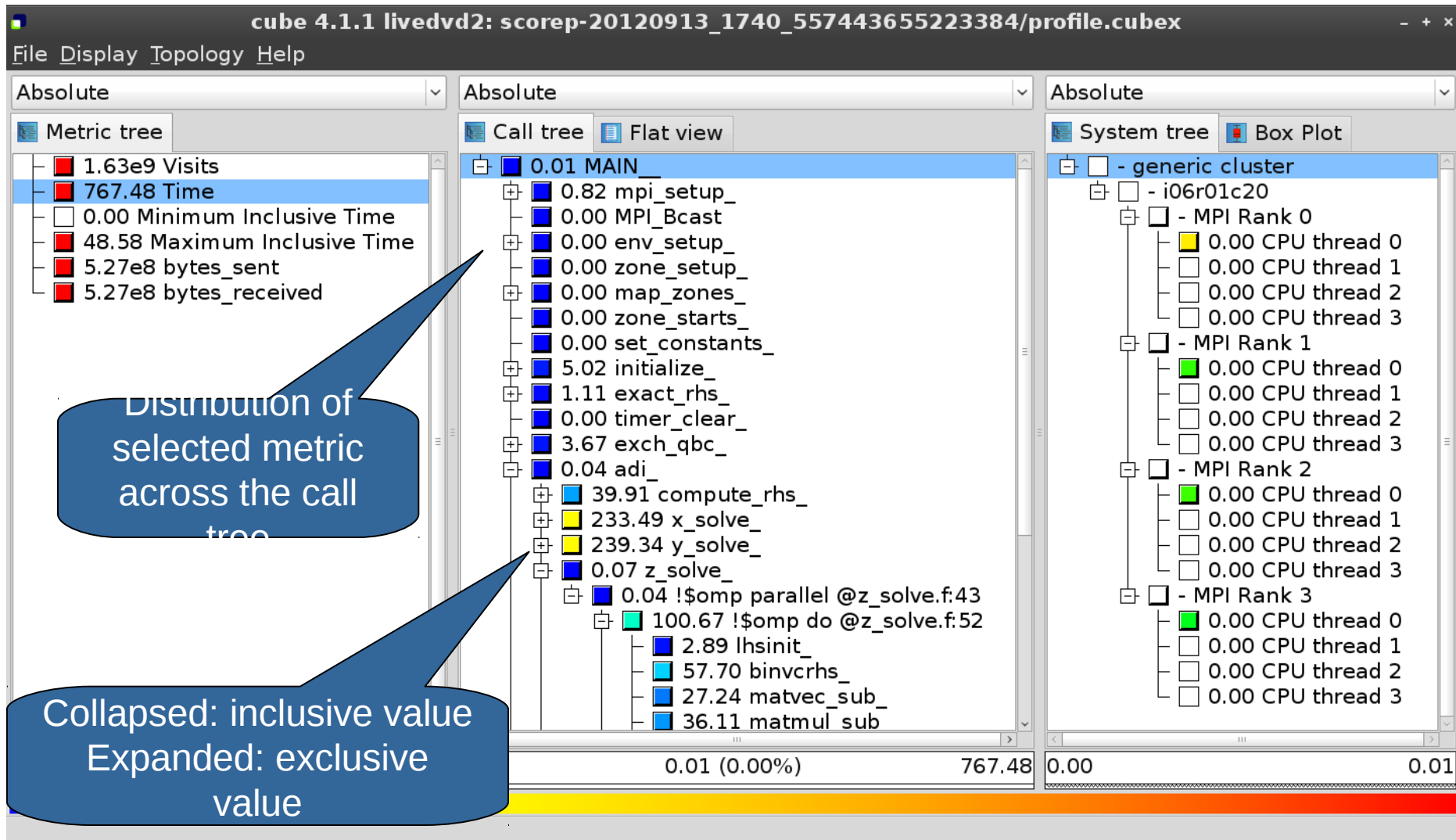


# Expanding the system tree



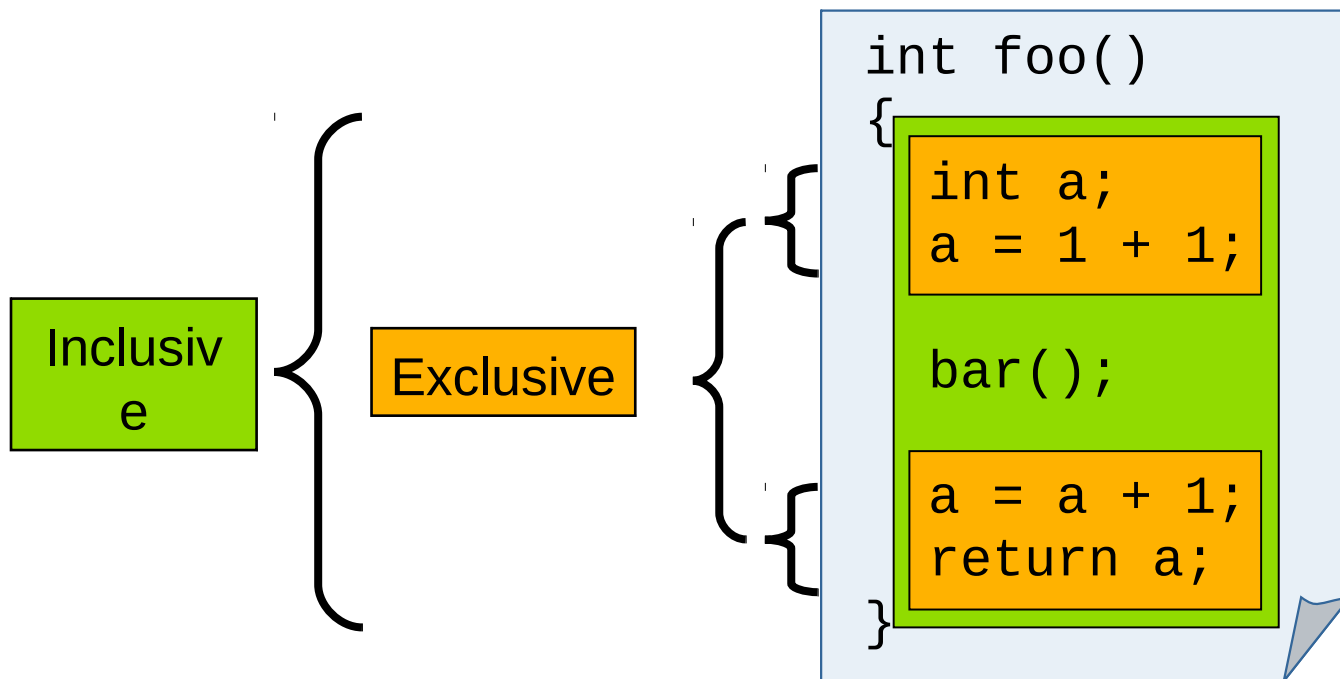


# Expanding the call tree

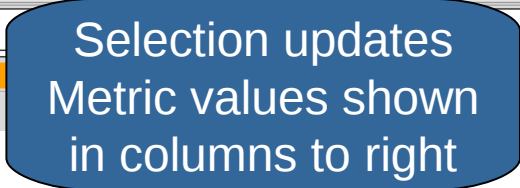




- Inclusive
  - Information of all sub-elements aggregated into single value
- Exclusive
  - Information cannot be subdivided further



# V-HPS

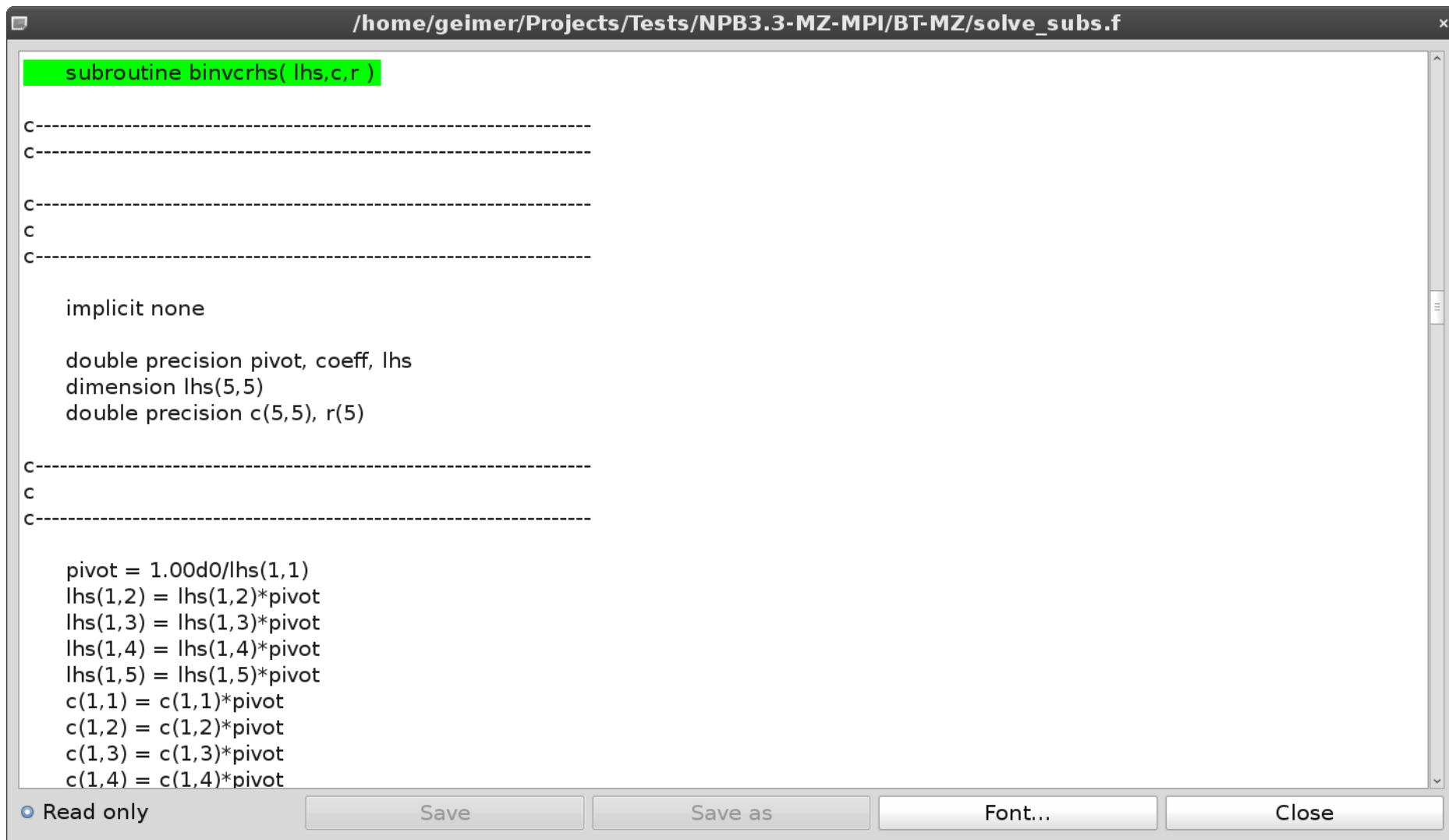


# Source-code view via context menu

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 metrics including "1.63e9 Visits", "767.48 Time", "0.00 Minimum Inclusive Time", "48.58 Maximum Inclusive Time", "5.27e8 bytes\_sent", and "5.27e8 bytes\_received".
- Call tree:** Displays a hierarchical view of function calls. The "binvcrhs" node is highlighted, and a context menu is open over it. The menu options are: "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 the menu.
- System tree:** Shows a hierarchical view of the system components, including "generic cluster", "i06r01c20", and "MPI Rank 0" through "MPI Rank 3".

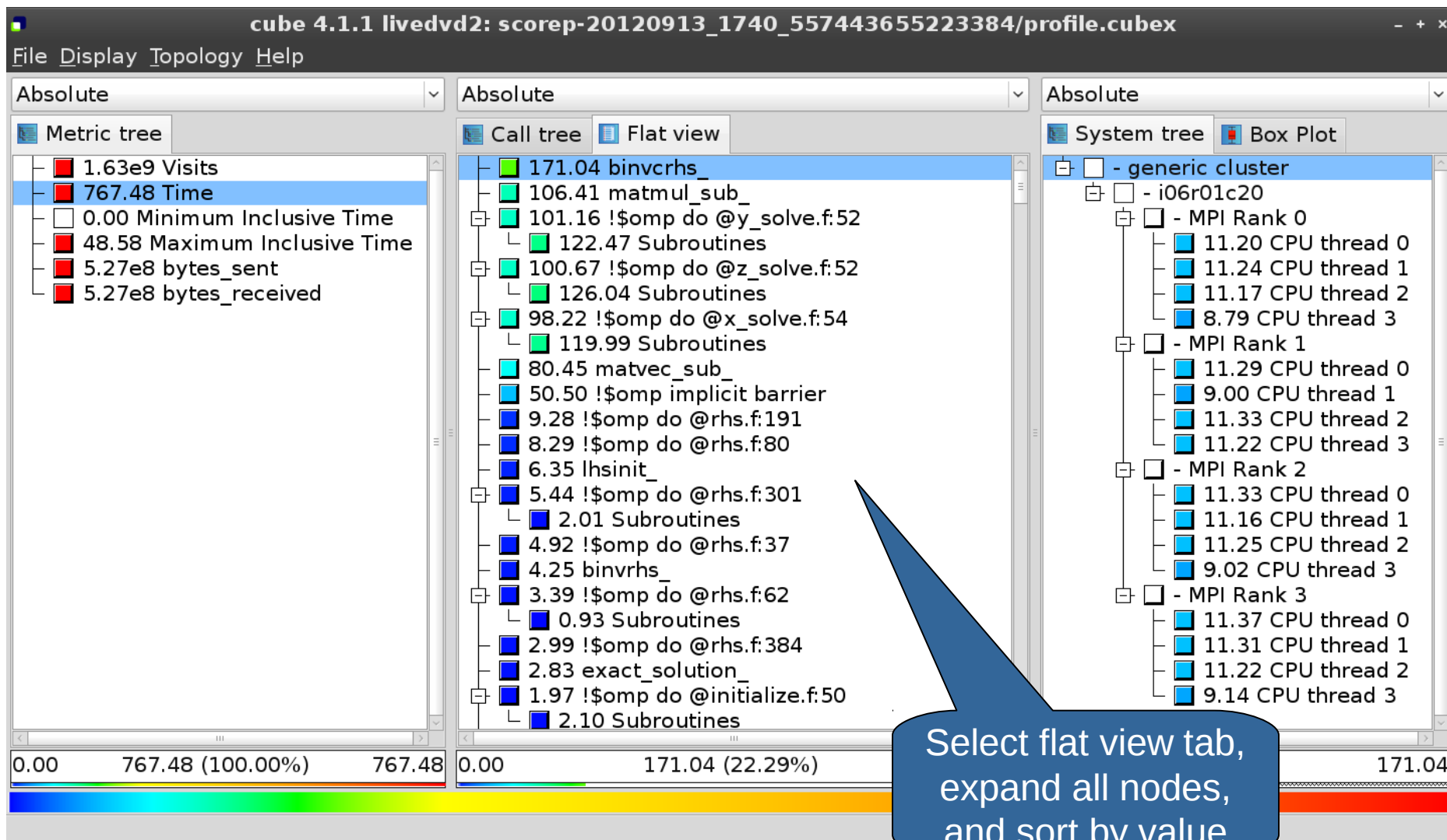
A blue callout bubble with the text "Right-click opens context menu" points to the context menu. At the bottom of the window, a status bar shows the time "767.48 (100.00%) 767.48" and a color-coded progress bar. A text box at the bottom left states "Shows the source code of the clicked item".



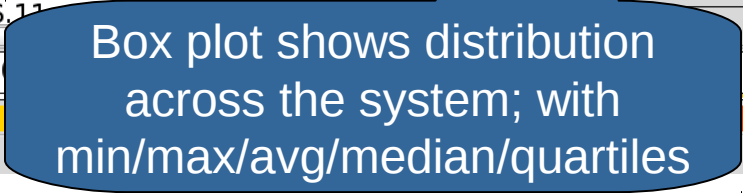
```
subroutine binvrhs( lhs,c,r )  
  
C-----  
C-----  
  
C-----  
C  
C-----  
  
implicit none  
  
double precision pivot, coeff, lhs  
dimension lhs(5,5)  
double precision c(5,5), r(5)  
  
C-----  
C  
C-----  
  
pivot = 1.00d0/lhs(1,1)  
lhs(1,2) = lhs(1,2)*pivot  
lhs(1,3) = lhs(1,3)*pivot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

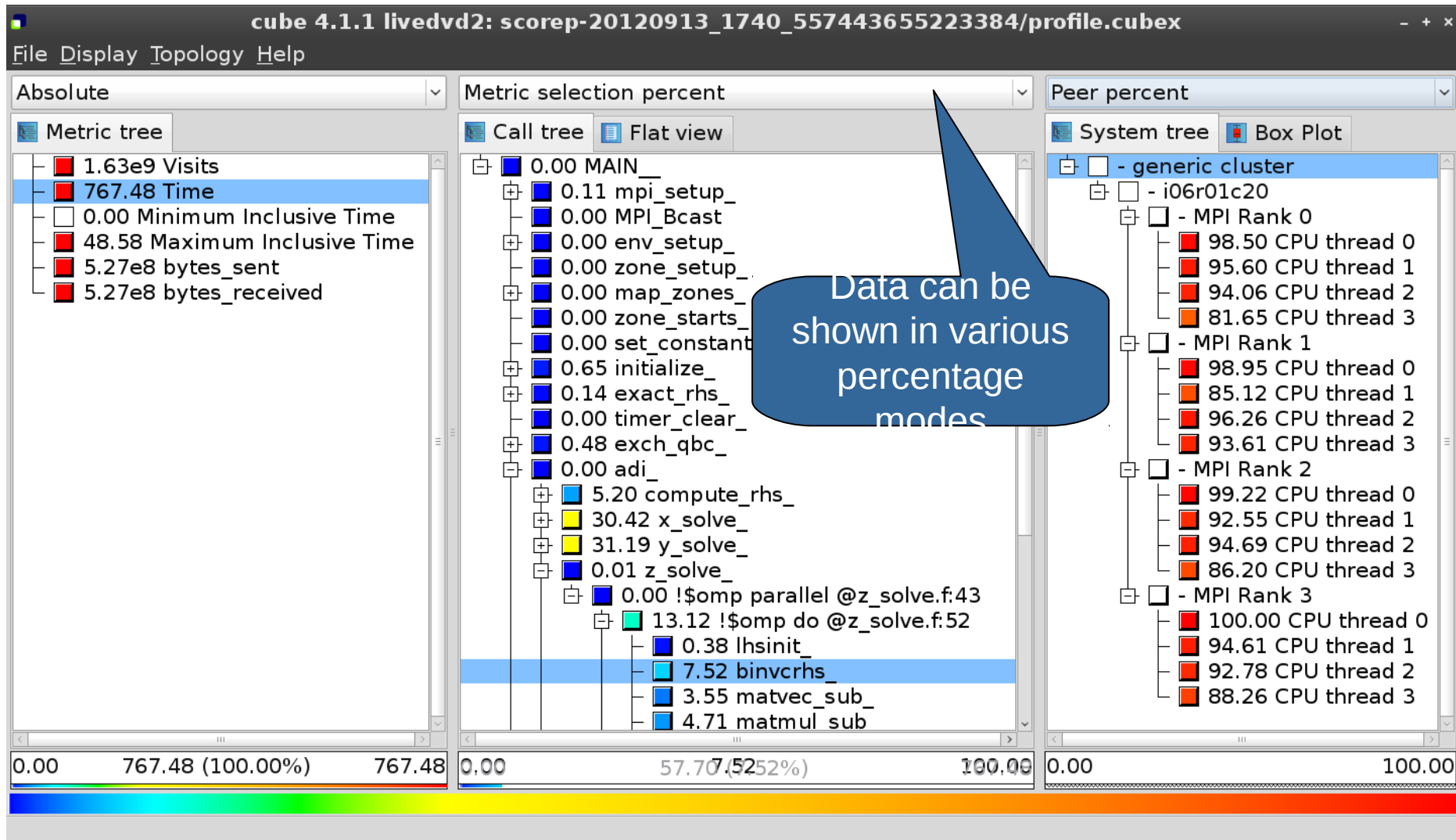
Read only Save Save as Font... Close

# Flat profile view



# VI-HPS

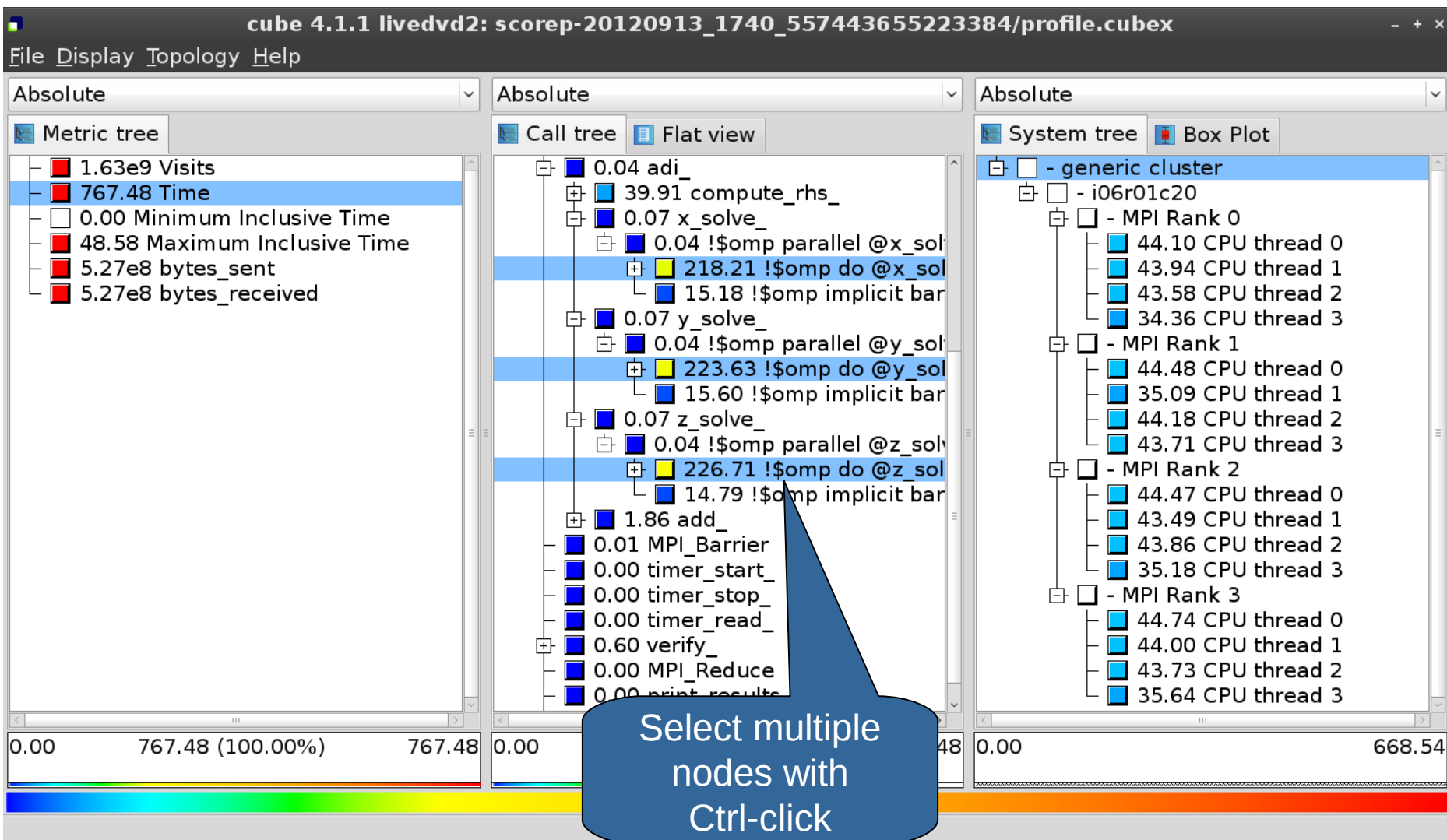






- Absolute
  - Absolute value shown in seconds/bytes/occurrences
- Selection percent
  - Value shown as percentage of the value of the selected node “on the left” (metric/call path)
- Peer percent (system tree only)
  - Value shown as percentage relative to the maximum peer value

# Multiple selection



The screenshot displays the cube 4.1.1 application window titled "cube 4.1.1 livedvd2: scorep-20120913\_1740\_557443655223384/profile.cubex". The "Help" menu is open, showing 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, containing 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 a color-coded bar at the bottom. The bar is divided into segments of blue, green, yellow, and red, representing different performance ranges. The metrics listed are: 1.63e9 Visits (red), 767.48 Time (red), 0.00 Minimum I (white), 48.58 Maximum I (red), 5.27e8 bytes\_sent (red), and 5.27e8 bytes\_received (red).
- System tree (right):** Shows a hierarchical view of the system components. The tree is expanded to show the "generic cluster" and its sub-components, including MPI Ranks 0, 1, 2, and 3, each with a list of CPU threads and their respective values.
- Bottom panel:** Displays three progress bars with numerical values and percentages. The first bar shows 0.00, 767.48 (100.00%), and 767.48. The second bar shows 0.00, 668.54 (87.11%), and 767.48. The third bar shows 0.00 and 668.54.

At the bottom of the window, a status bar reads: "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](mailto:scalasca@fz-juelich.de)

