

# VI-HPS



## Analysis report examination with CUBE

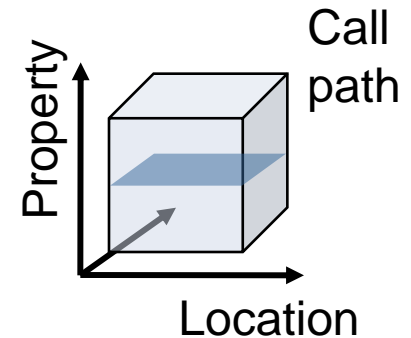
Markus Geimer

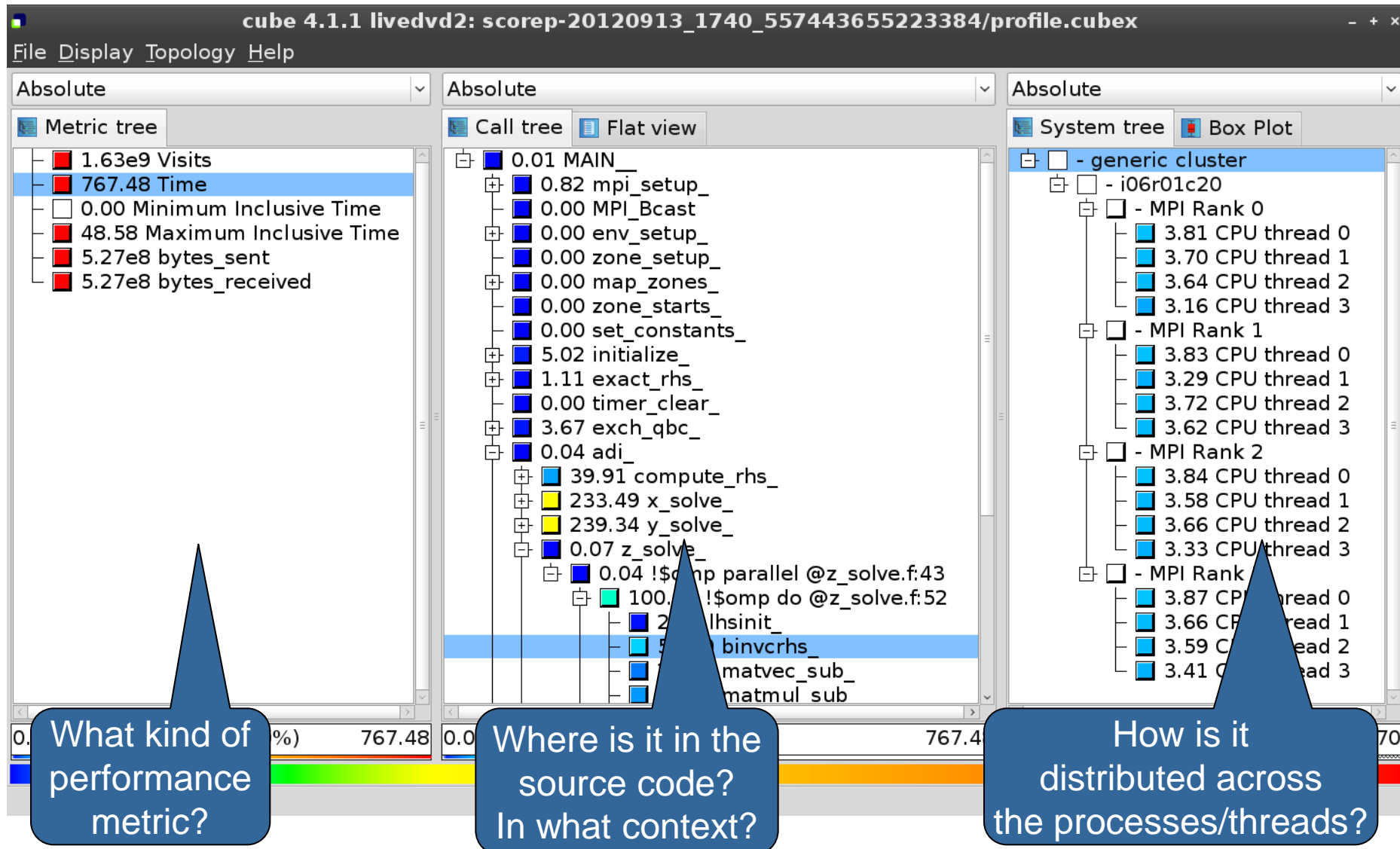
Jülich Supercomputing Centre



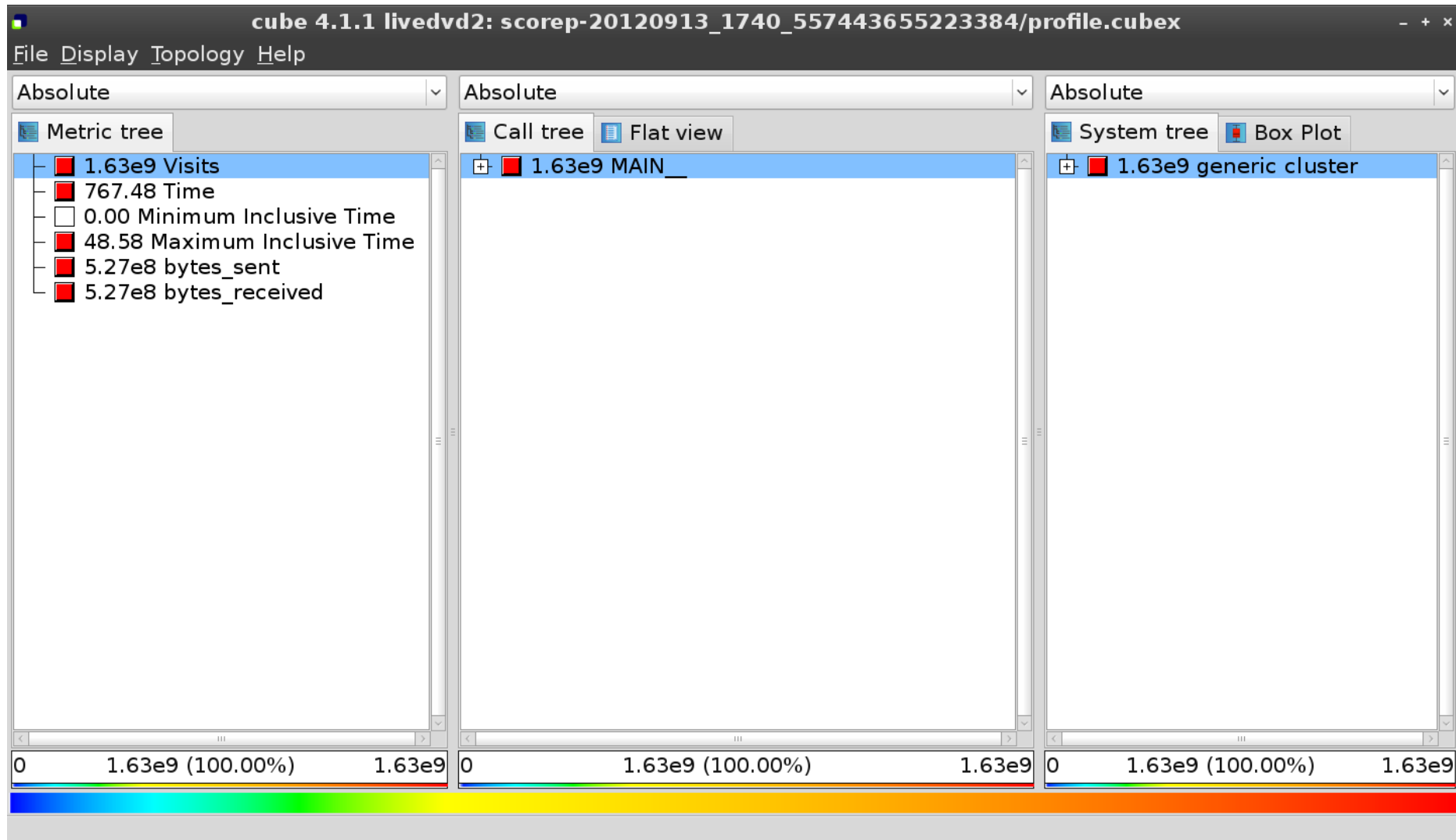
- Parallel program analysis report exploration tools
  - Libraries for XML report reading & writing
  - Algebra utilities for report processing
  - GUI for interactive analysis exploration
    - requires Qt4
- Originally developed as part of Scalasca toolset
- Now available as a separate component
  - Can be installed independently of Score-P, e.g., on laptop or desktop
  - Latest release: CUBE 4.2 (August 2013)

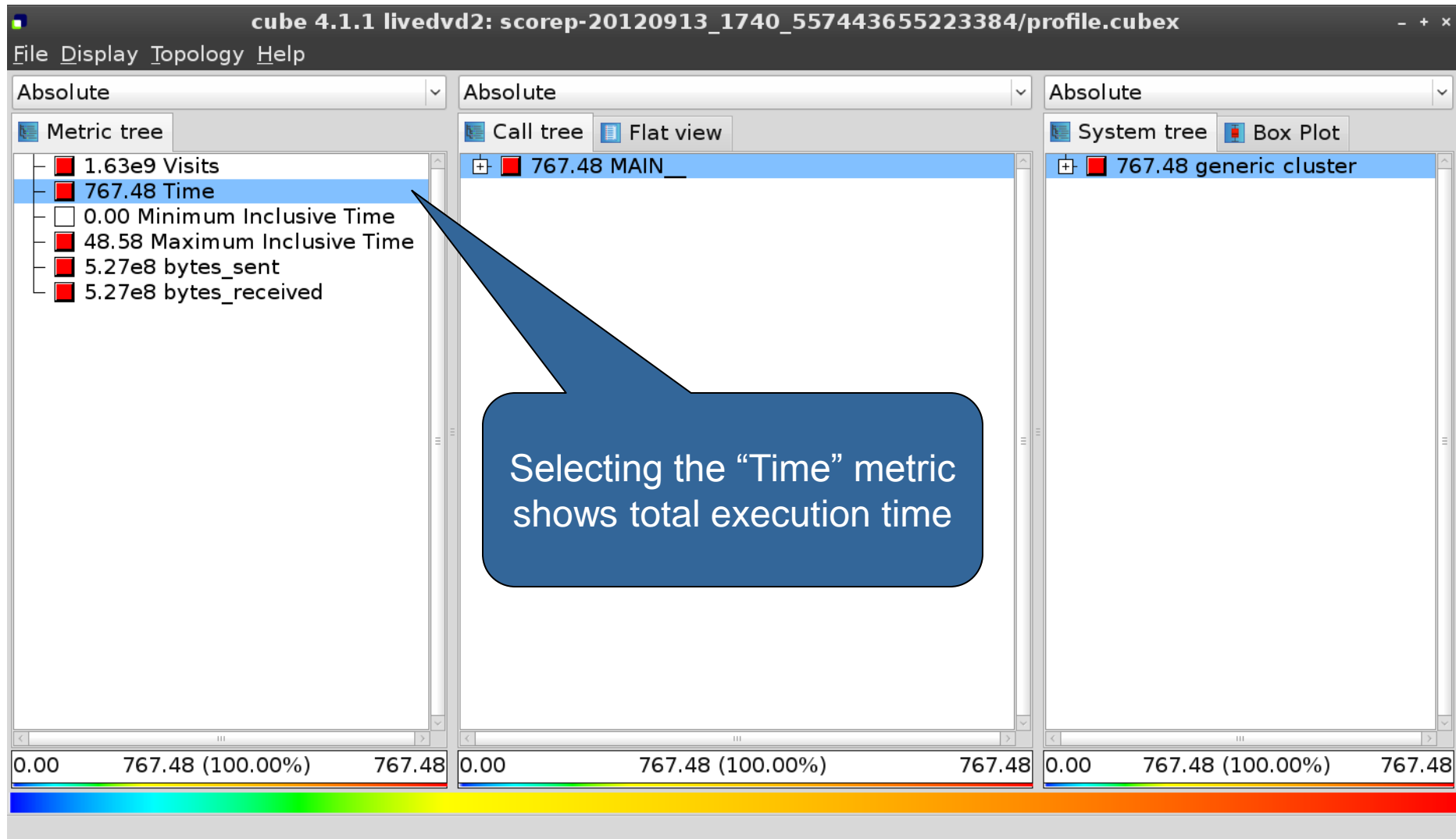
- Representation of values (severity matrix) on three hierarchical axes
  - Performance property (metric)
  - Call path (program location)
  - System location (process/thread)
- Three coupled tree browsers
- CUBE displays severities
  - As value: for precise comparison
  - As colour: for easy identification of hotspots
  - Inclusive value when closed & exclusive value when expanded
  - Customizable via display modes



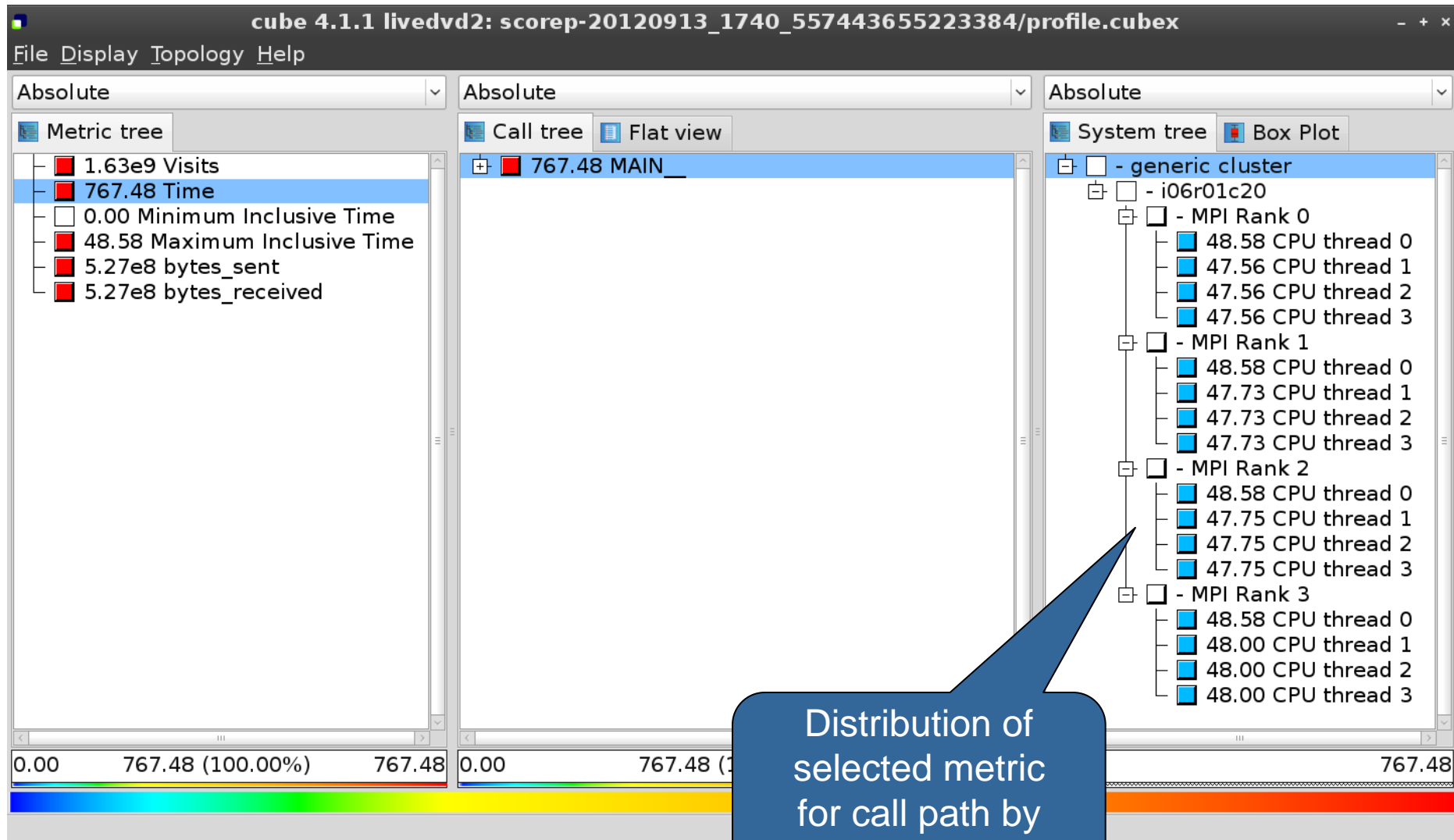


# Analysis report exploration (opening view)

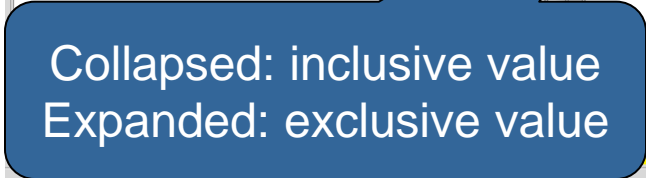




# Expanding the system tree

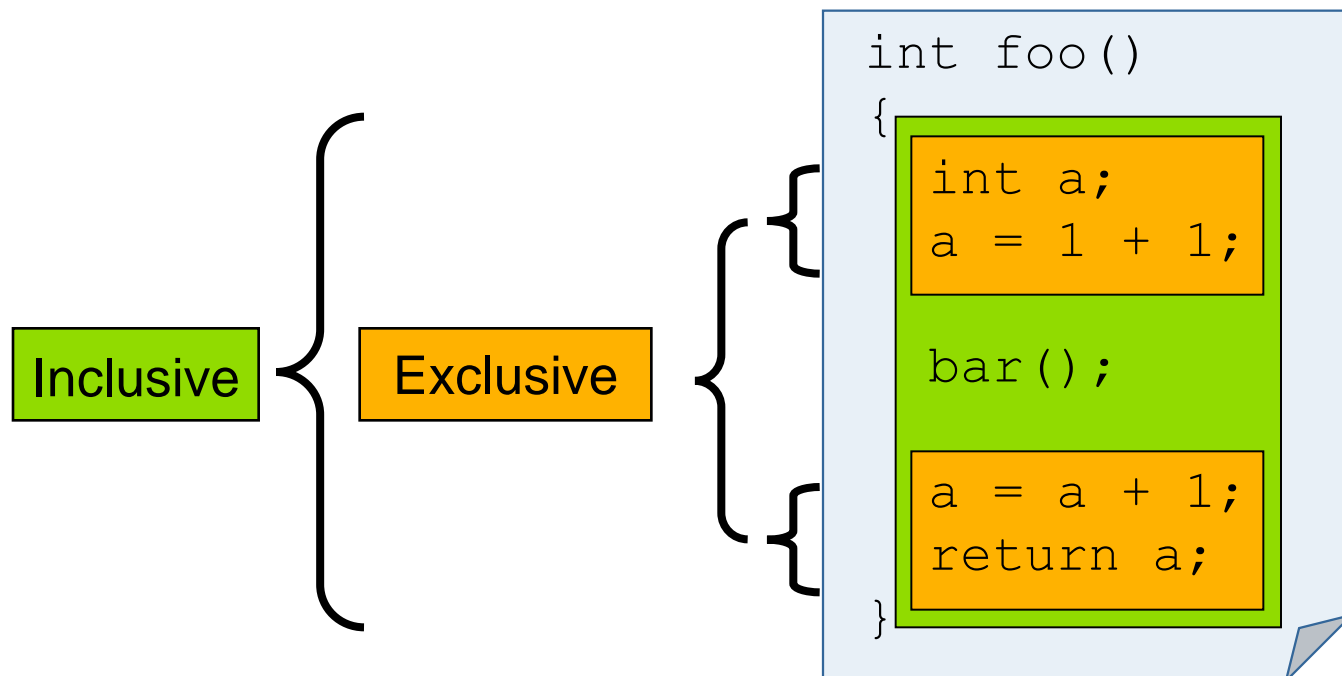


# Ví-HPS

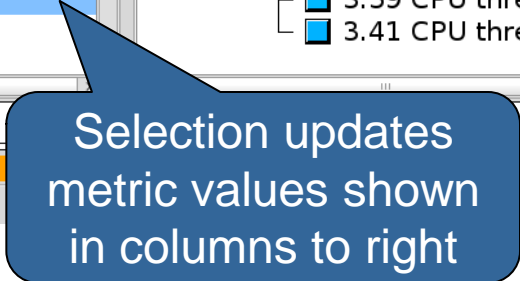




- Inclusive
  - Information of all sub-elements aggregated into single value
- Exclusive
  - Information cannot be subdivided further



# VI-HPS

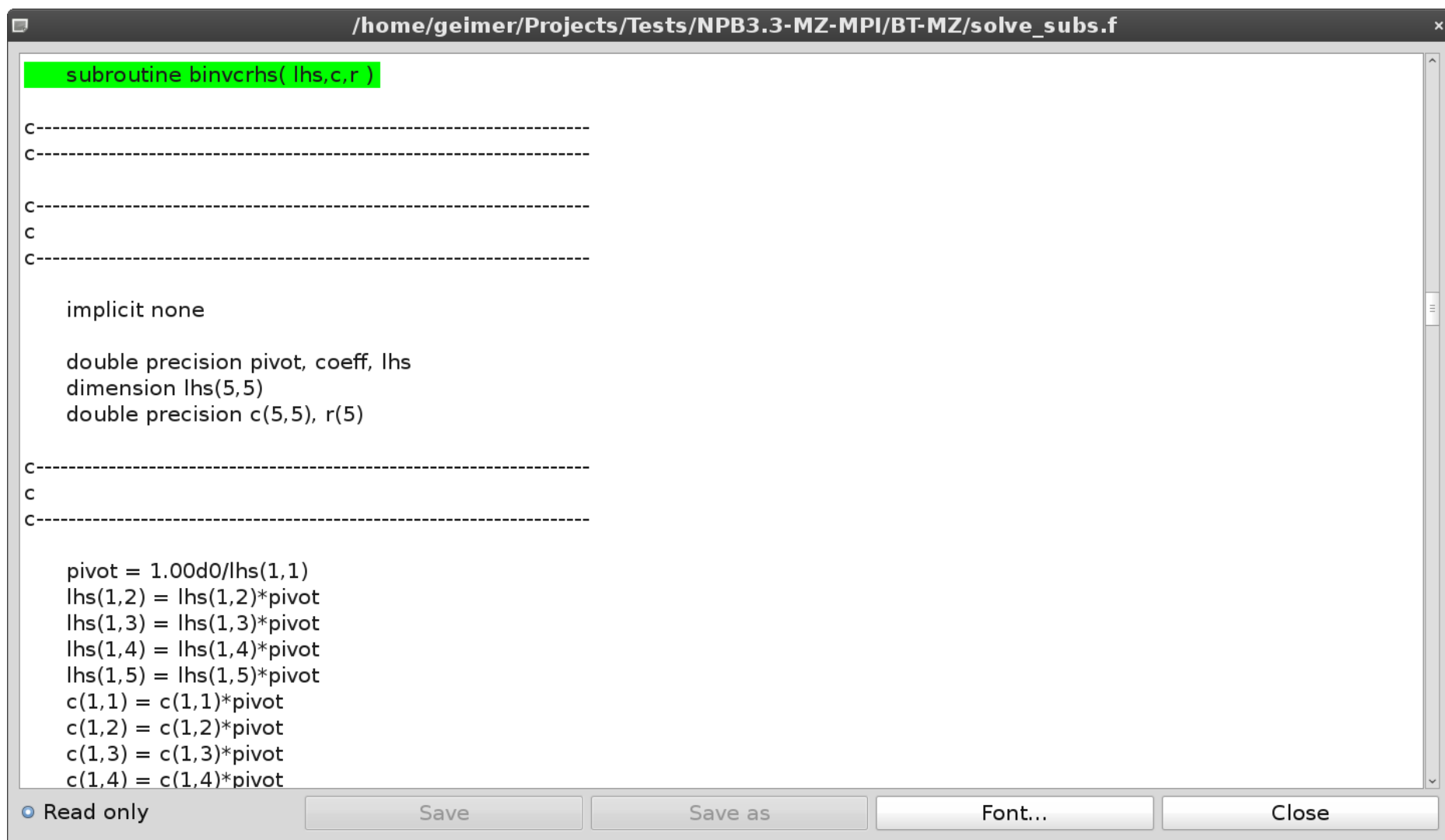


# Source-code view via context menu

The screenshot displays the 'cube 4.1.1 livedvd2: scorep-20120913\_1740\_557443655223384/profile.cubex' application. It features three main panels:

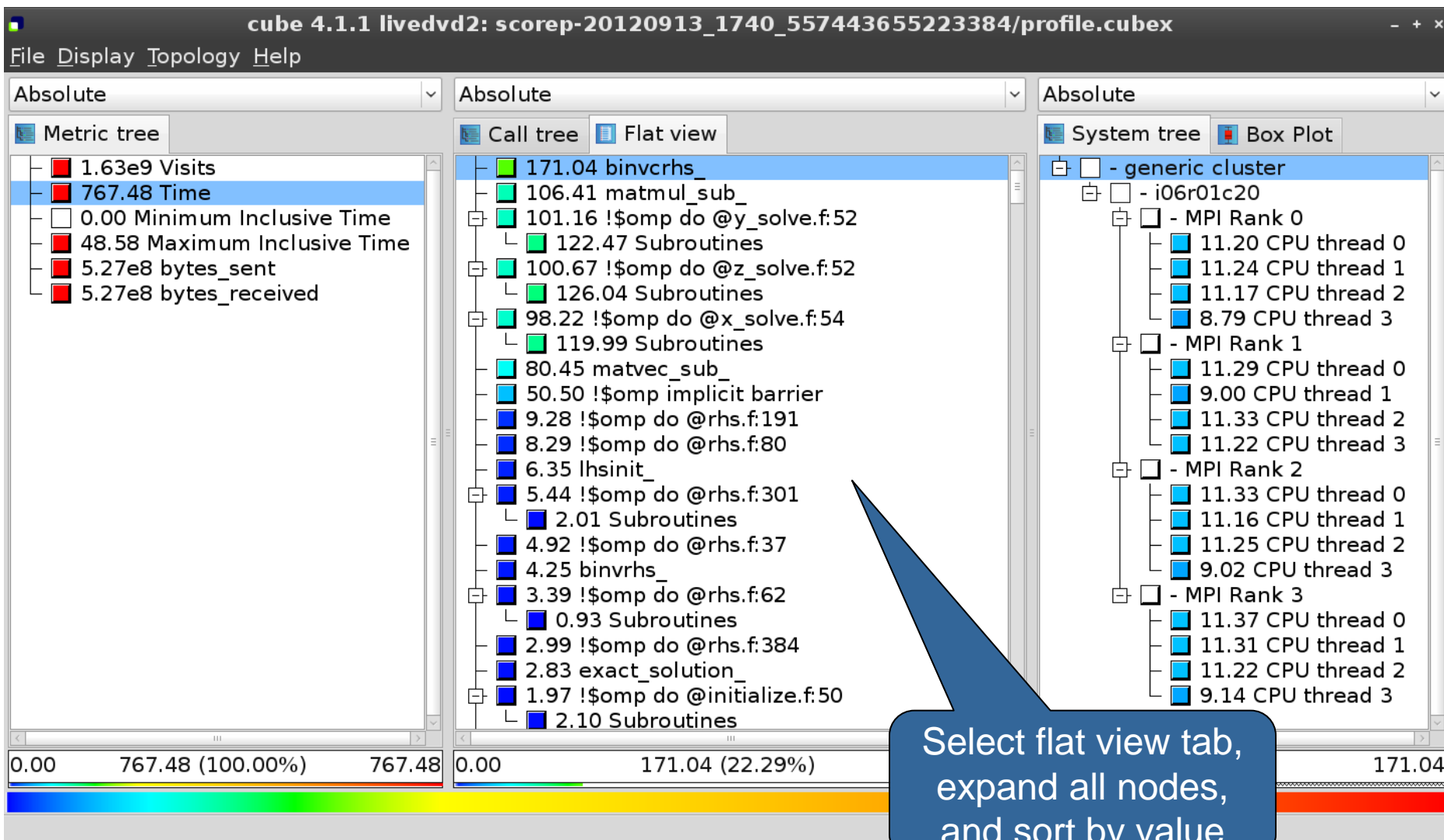
- Metric tree:** Shows various performance metrics such as '1.63e9 Visits', '767.48 Time', and '5.27e8 bytes\_received'.
- Call tree:** Displays a hierarchical view of function calls. The '57.70 binvcrhs' node is highlighted, and a context menu is open over it, listing options like 'Call site', 'Called 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 selected.
- System tree:** Shows the system configuration, including 'generic cluster', 'i06r01c20', and 'MPI Rank 0' through 'MPI Rank 3'.

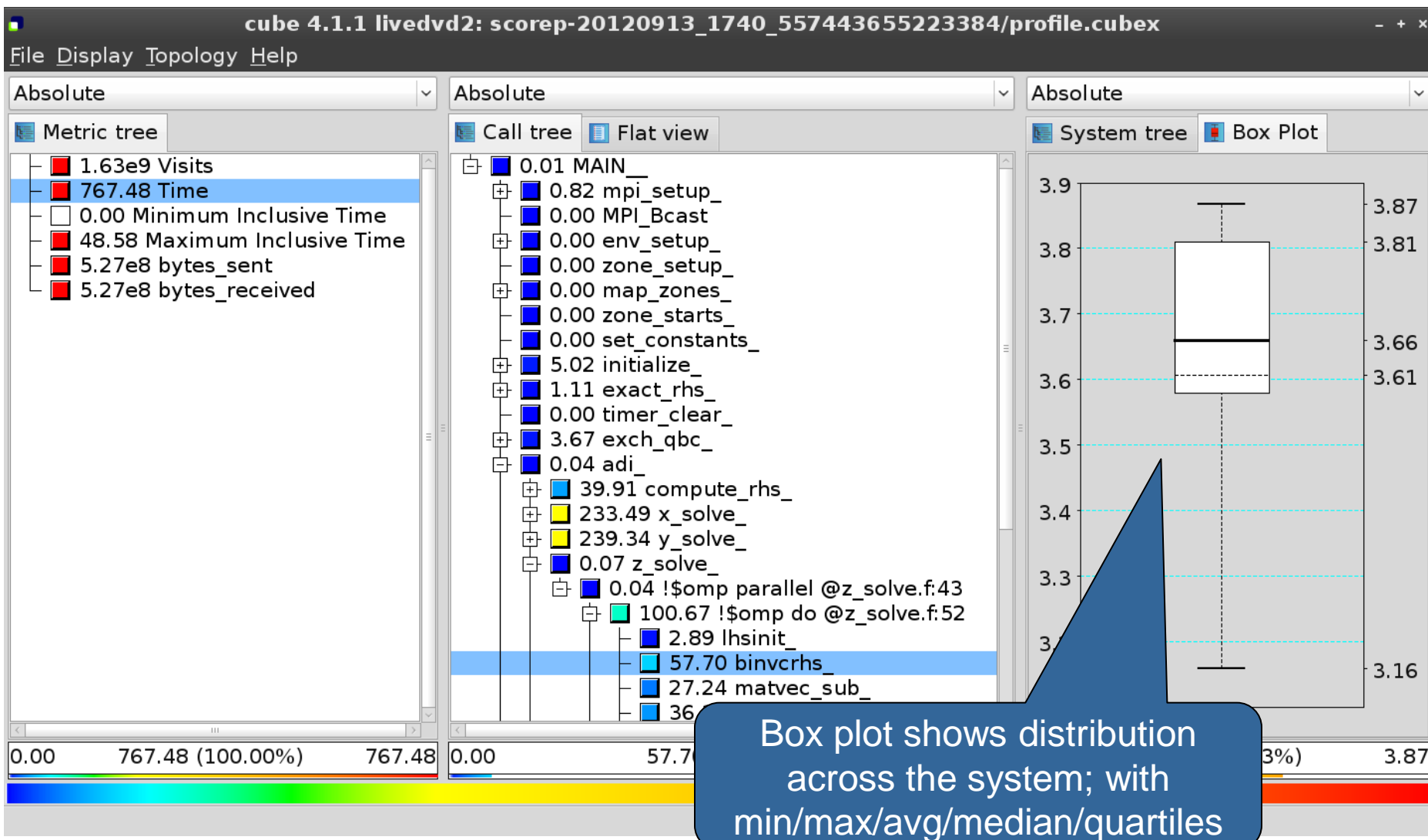
A blue callout bubble with the text 'Right-click opens context menu' points to the context menu. At the bottom, a status bar shows '0.00 767.48 (100.00%) 767.48' and 'Shows the source code of the clicked item'.

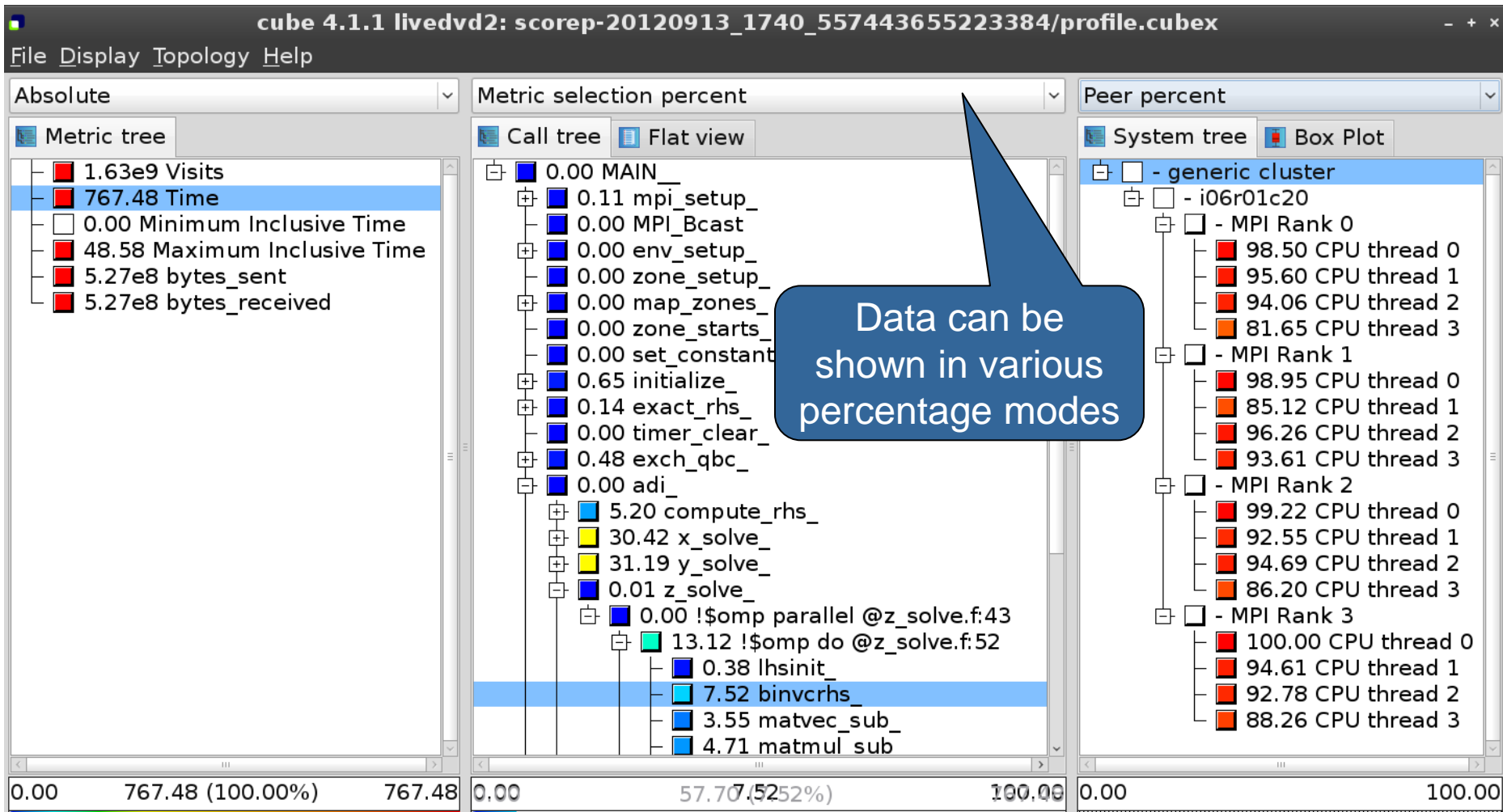


```
subroutine binvrhs( lhs,c,r )  
  
C-----  
C-----  
  
C-----  
C  
C-----  
  
implicit none  
  
double precision pivot, coeff, lhs  
dimension lhs(5,5)  
double precision c(5,5), r(5)  
  
C-----  
C  
C-----  
  
pivot = 1.00d0/lhs(1,1)  
lhs(1,2) = lhs(1,2)*pivot  
lhs(1,3) = lhs(1,3)*pivot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



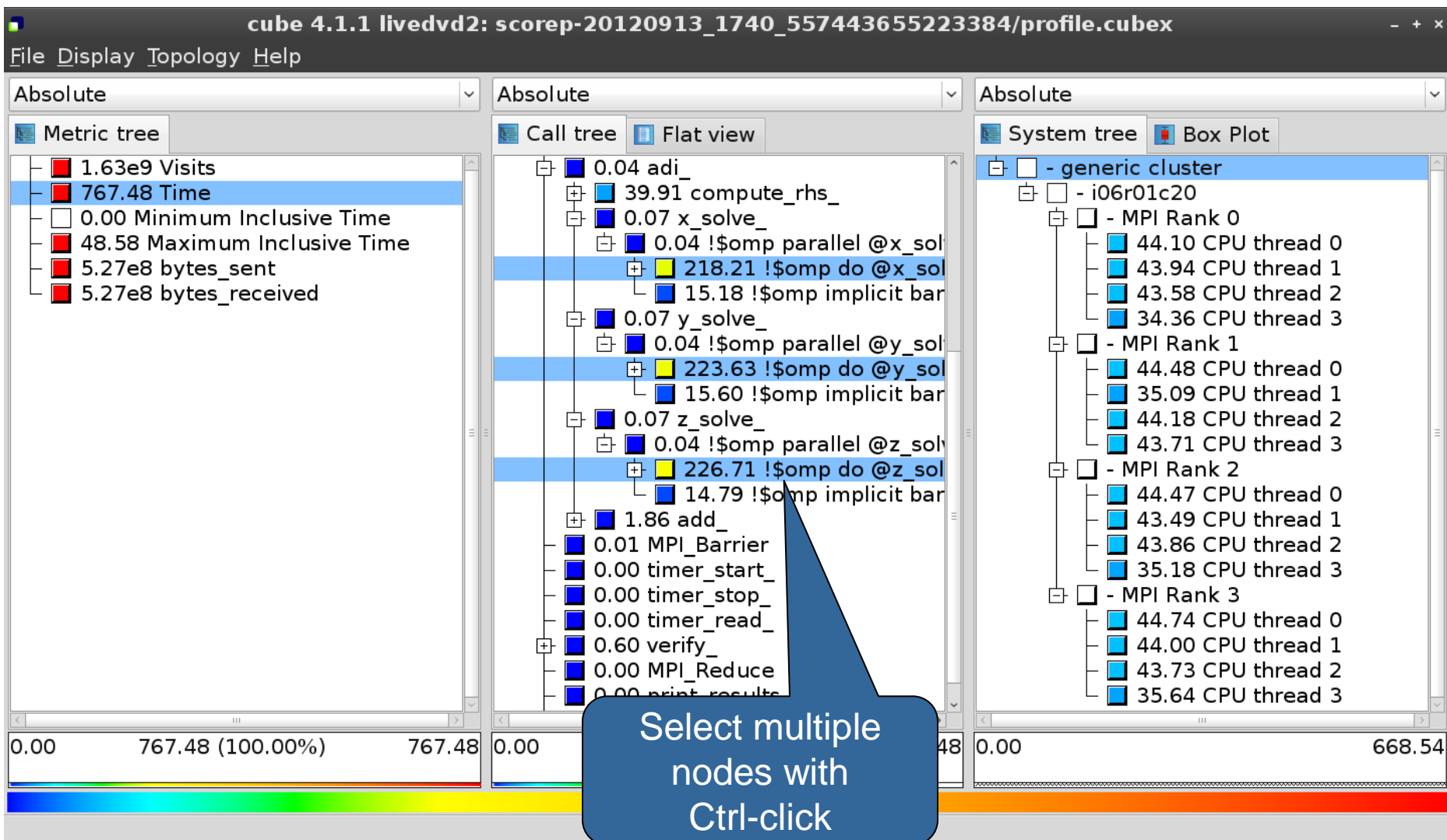




- Absolute
  - Absolute value shown in seconds/bytes/counts
- Selection percent
  - Value shown as percentage w.r.t. the selected node “on the left” (metric/call path)
- Peer percent (system tree only)
  - Value shown as percentage relative to the maximum peer value



# Multiple selection



The screenshot shows the cube 4.1.1 GUI 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, containing the text "Context-sensitive help available for all GUI items". The main window displays three panels: "Metric tree" on the left, "System tree" on the right, and a central "t view" panel. The "Metric tree" shows metrics like "1.63e9 Visits", "767.48 Time", and "0.00 Minimum". The "System tree" shows a hierarchy of components including "generic cluster", "i06r01c20", and "MPI Rank 0" through "MPI Rank 3". The "t view" panel shows a detailed view of the selected component, displaying various metrics and their values. At the bottom, there are three progress bars and a status bar that reads "Change into help mode for display components".

cube 4.1.1 livedvd2: scorep-20120913\_1740\_557443655223384/profile.cubex

File Display Topology Help

Absolute

Metric tree

- 1.63e9 Visits
- 767.48 Time
- 0.00 Minimum
- 48.58 Maximum
- 5.27e8 bytes\_sent
- 5.27e8 bytes\_received

Getting started

Mouse and keyboard control

What's This? Shift+F1

About

Selected metrics description

Selected regions description

t view

Absolute

System tree

Box Plot

- generic cluster
  - i06r01c20
    - MPI Rank 0
      - 44.10 CPU thread 0
      - 43.94 CPU thread 1
      - 43.58 CPU thread 2
      - 34.36 CPU thread 3
    - MPI Rank 1
      - 44.48 CPU thread 0
      - 35.09 CPU thread 1
      - 44.18 CPU thread 2
      - 43.71 CPU thread 3
    - MPI Rank 2
      - 44.47 CPU thread 0
      - 43.49 CPU thread 1
      - 43.86 CPU thread 2
      - 35.18 CPU thread 3
    - MPI Rank 3
      - 44.74 CPU thread 0
      - 44.00 CPU thread 1
      - 43.73 CPU thread 2
      - 35.64 CPU thread 3

0.00 767.48 (100.00%) 767.48

0.00 668.54 (87.11%) 767.48

0.00 668.54

Change into help mode for display components

- Extracting solver sub-tree from analysis report

```
% cube_cut -r '<<ITERATION>>' scorep_bt-mz_W_4x4_sum/profile.cubex  
Writing cut.cubex... done.
```

- Calculating difference of two reports

```
% cube_diff scorep_bt-mz_W_4x4_sum/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.scalasca.org>
  - User guide also part of installation:
    - ``cube-config --cube-dir`/share/doc/CubeGuide.pdf`
  - Contact:
    - `mailto:scalasca@fz-juelich.de`

