Performance Analysis with Vampir

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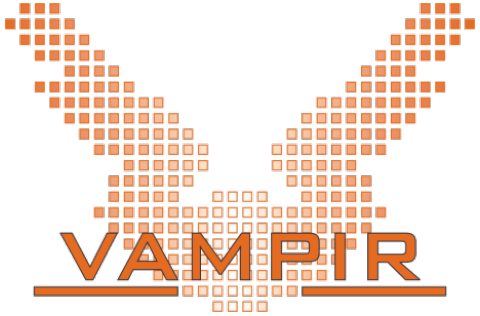
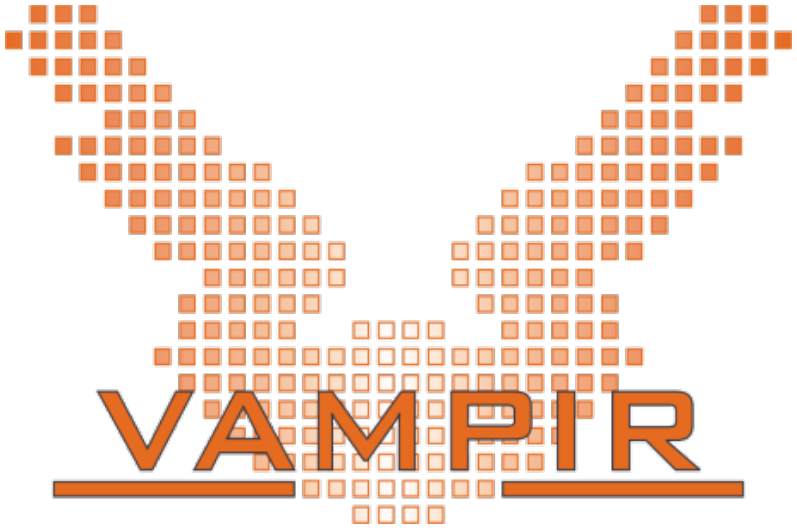


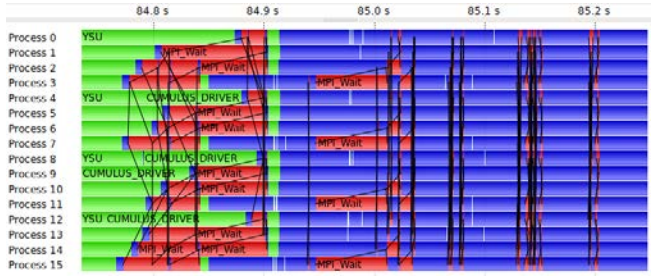
Outline

- **Part I: Welcome to the Vampir Tool Suite**
  - Mission
  - Event trace visualization
  - Vampir & VampirServer
  - The Vampir displays
- **Part II: Vampir hands-on**
  - Visualizing and analyzing NPB-MZ-MPI / BT

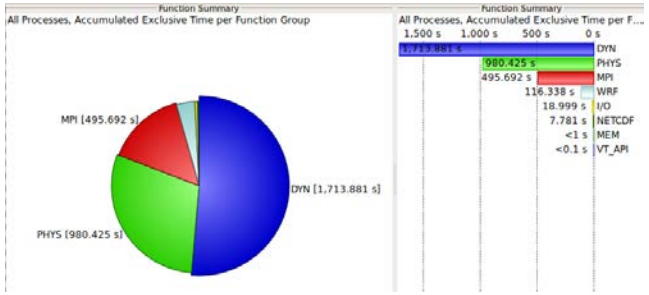


Event trace visualization with Vampir

- Alternative and supplement to automatic analysis
- Show dynamic run-time behavior graphically at any level of detail
- Provide statistics and performance metrics



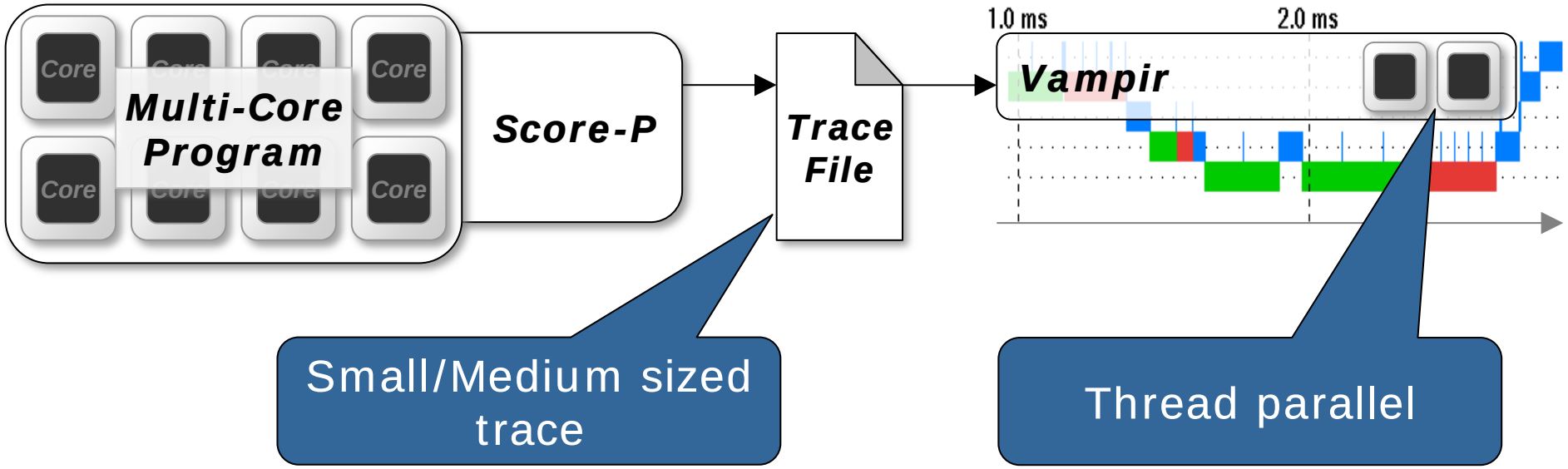
- **Timeline charts**
  - Show application activities and communication along a time axis



- **Summary charts**
  - Provide quantitative results for the currently selected time interval

Visualization modes (1)
Directly on front end or local machine

```
% module load vampir
% vampir
```

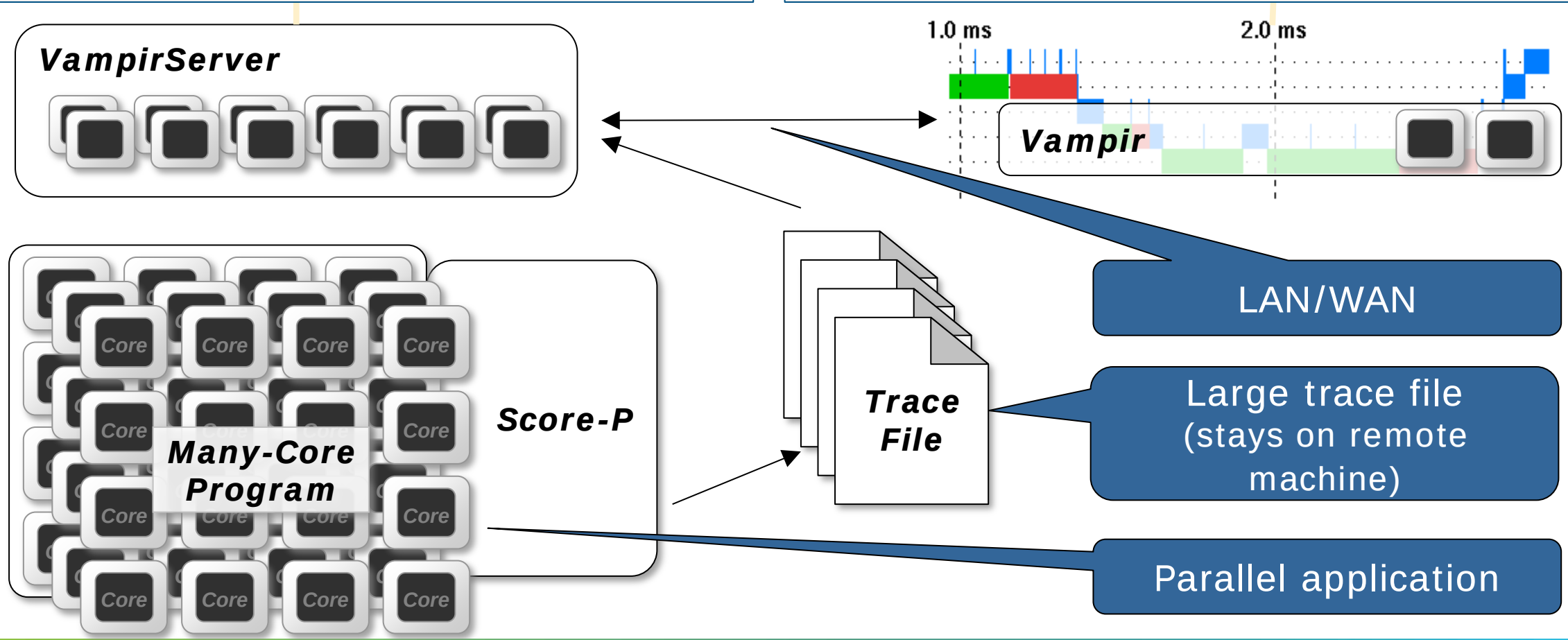


Visualization Modes (2)

On local machine with remote VampirServer

```
% module load vampir
% vampirserver start
```

```
% module load vampir
% vampir
```



The main displays of Vampir

- Timeline Charts:
  -  Master Timeline
  -  Process Timeline
  -  Counter Data Timeline
  -  Performance Radar
- Summary Charts:
  -  Function Summary
  -  Message Summary
  -  Process Summary
  -  Communication Matrix View

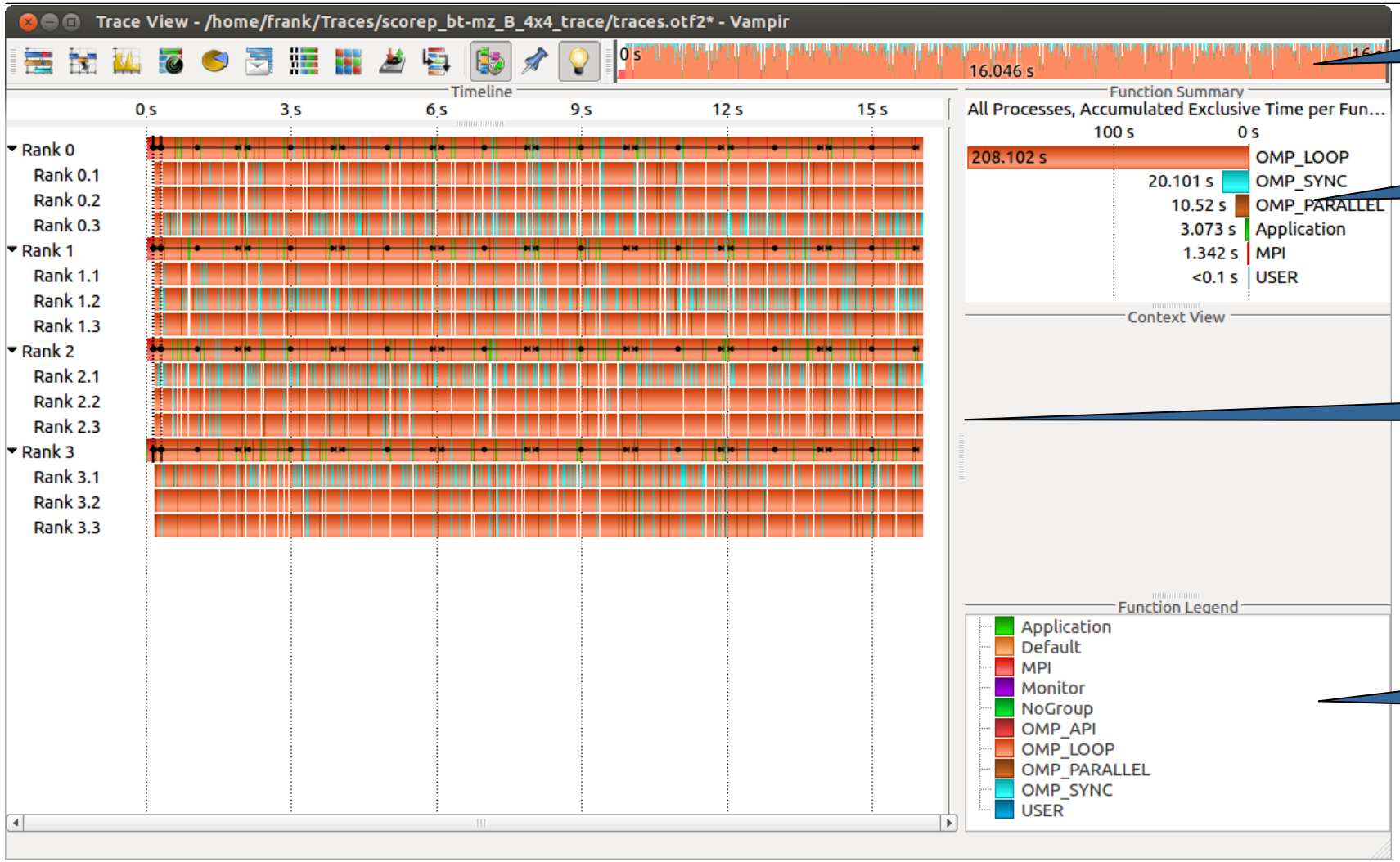
Reference hands-on[1]: Visualizing and analyzing NPB-MZ-MPI / BT

[1]to be used with the Live-DVD

Start Vampir

```
% vampir scorep_bt-mz_W_4x4_trace/traces.otf2
```

Visualization of the NPB-MZ-MPI / BT trace



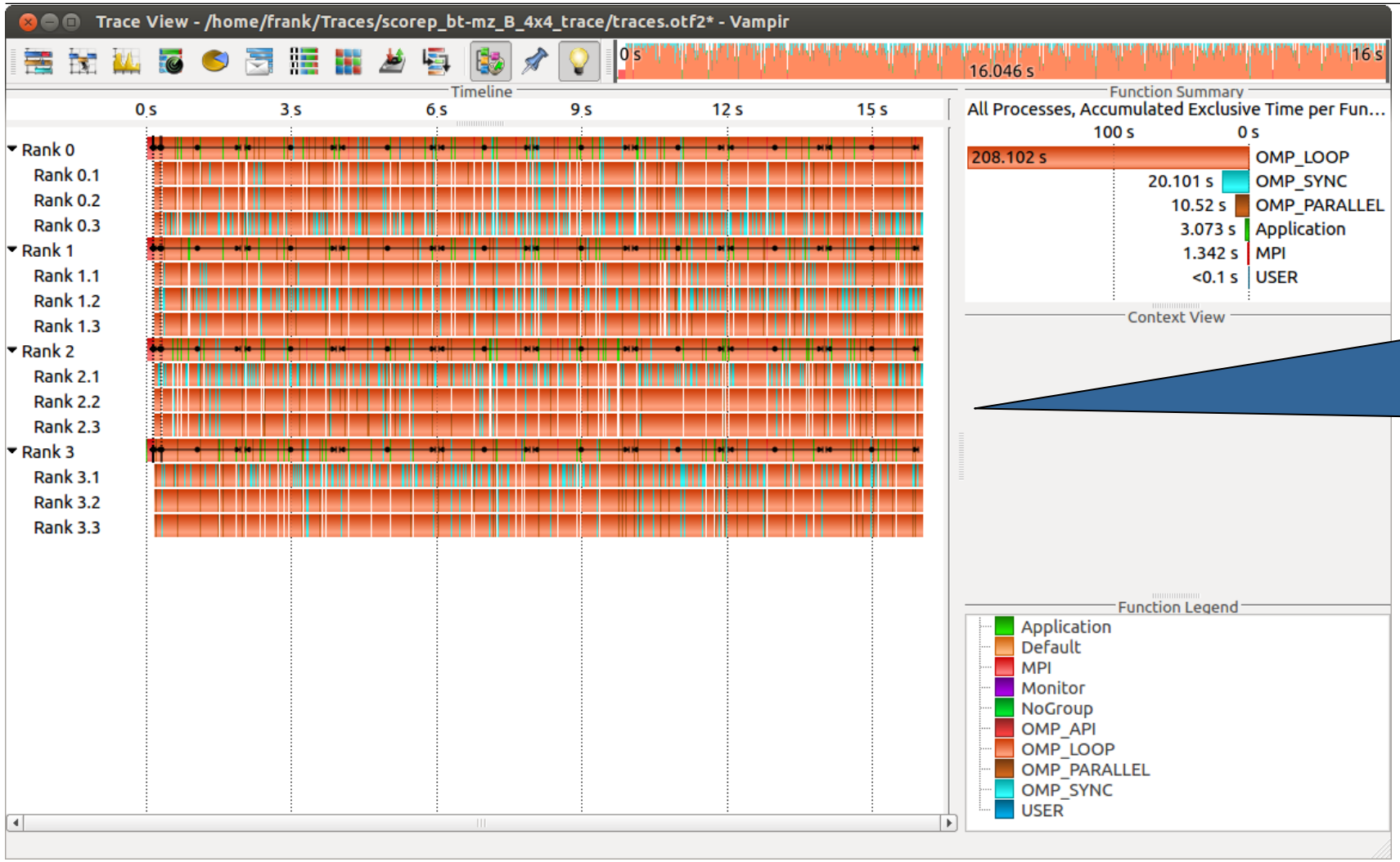
Navigation Toolbar

Function Summary

Master Timeline

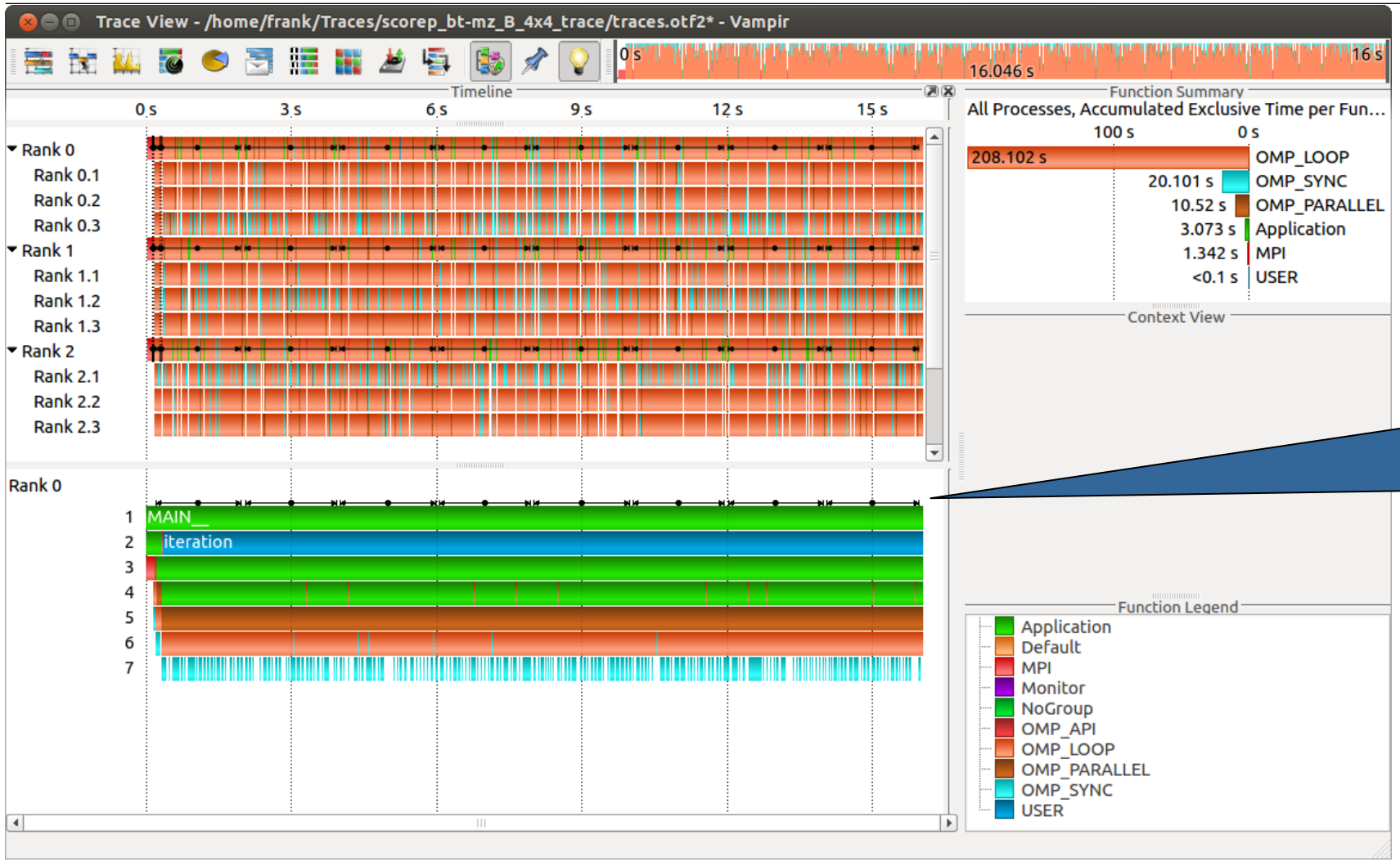
Function Legend

Visualization of the NPB-MZ-MPI / BT trace
Master Timeline



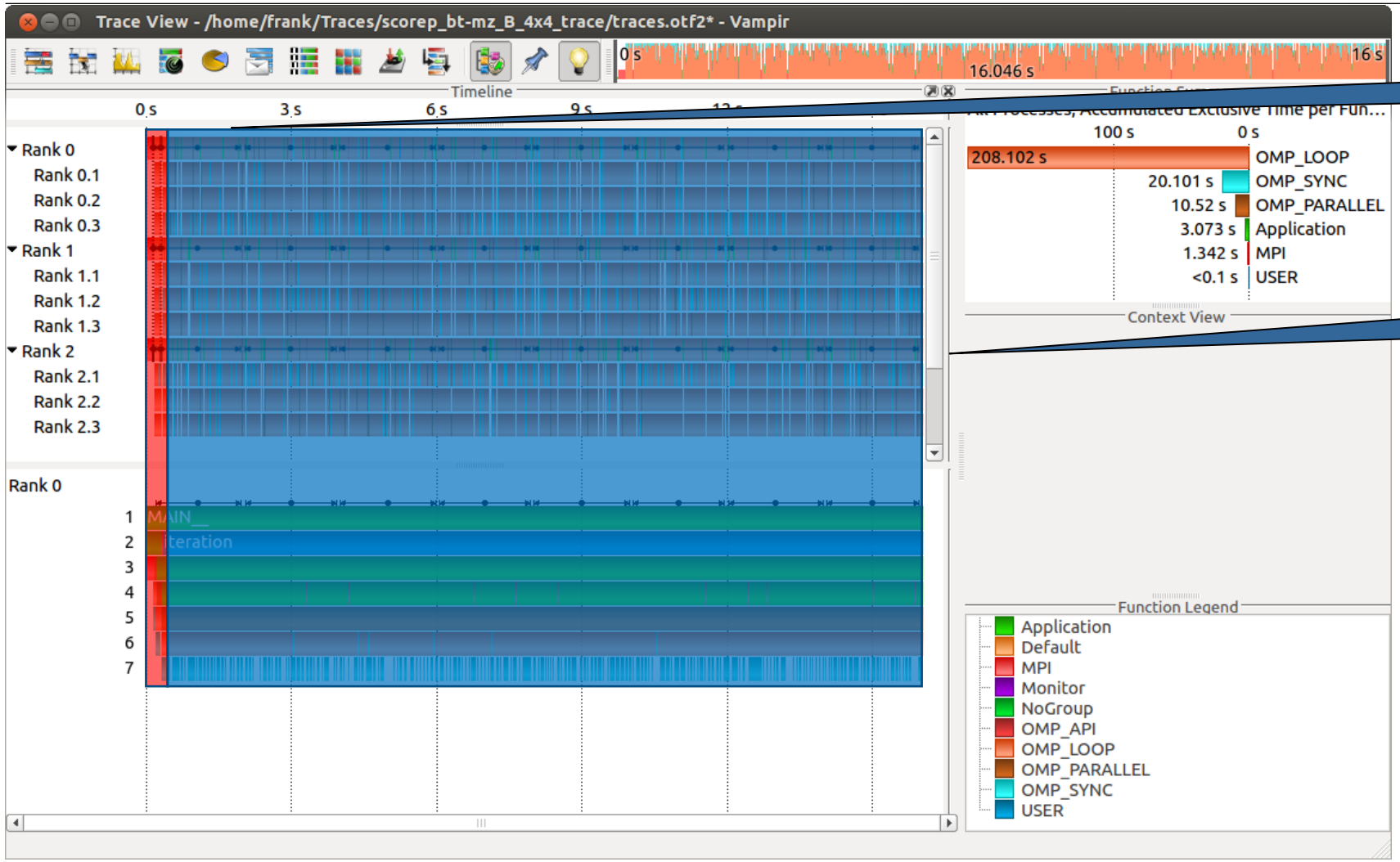
Detailed information about functions, communication and synchronization events for collection of processes.

Visualization of the NPB-MZ-MPI / BT trace
Process Timeline



Detailed information about different levels of function calls in a stacked bar chart for an individual process.

Visualization of the NPB-MZ-MPI / BT trace
Typical program phases



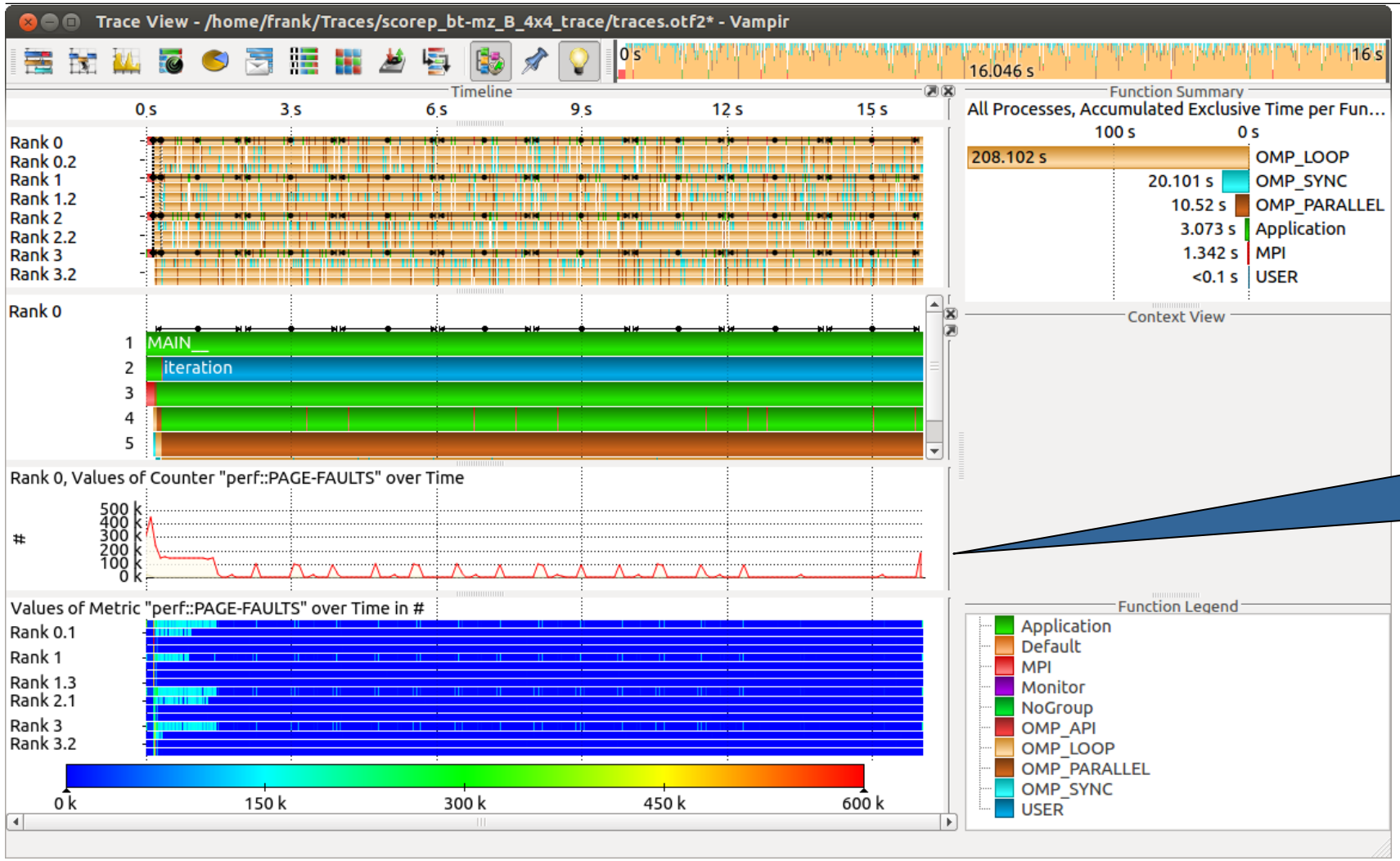
Initialisation Phase

Computation Phase

Visualization of the NPB-MZ-MPI / BT trace
Counter Data Timeline

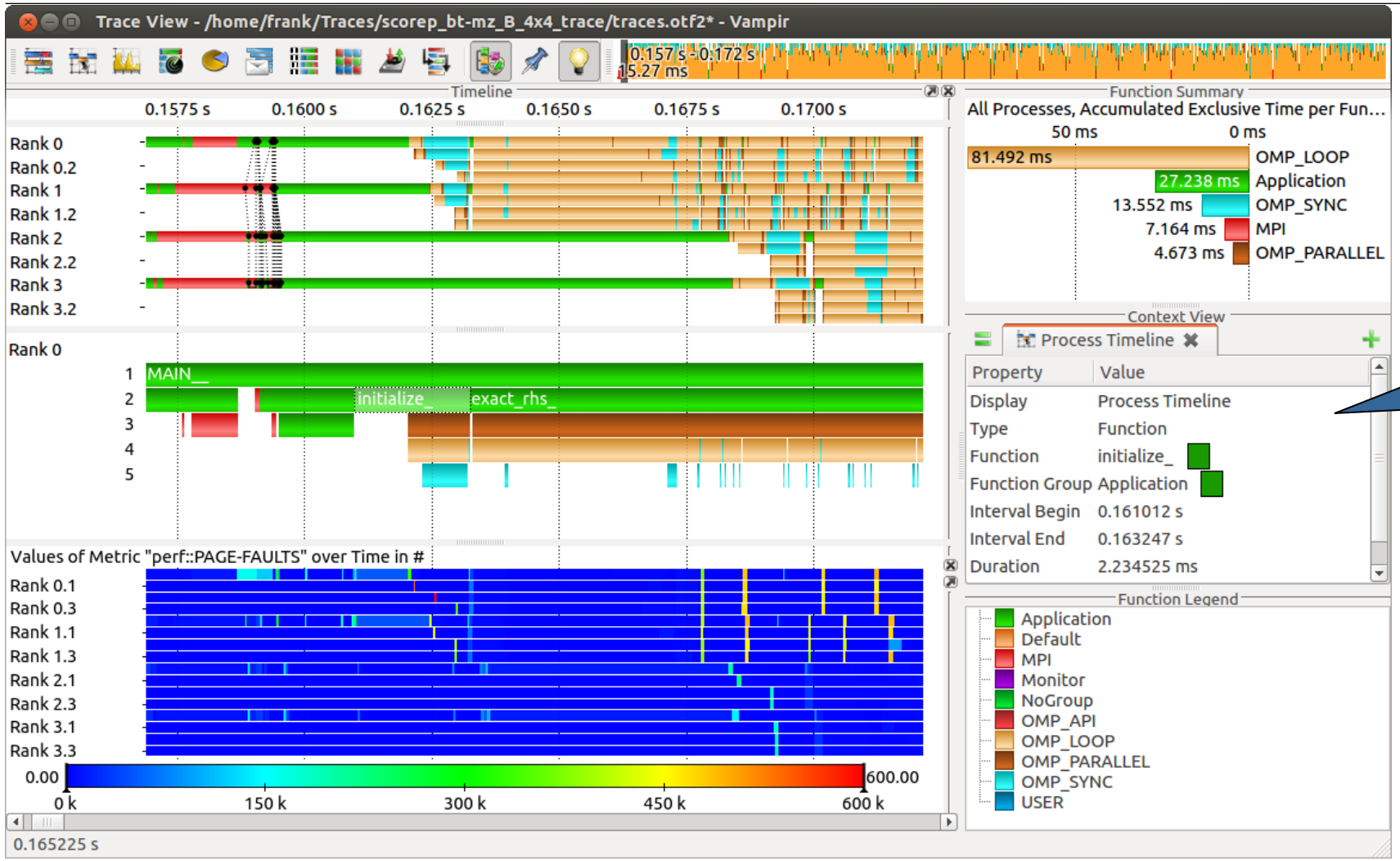
Detailed counter information over time for an individual process.

Visualization of the NPB-MZ-MPI / BT trace
Performance Radar



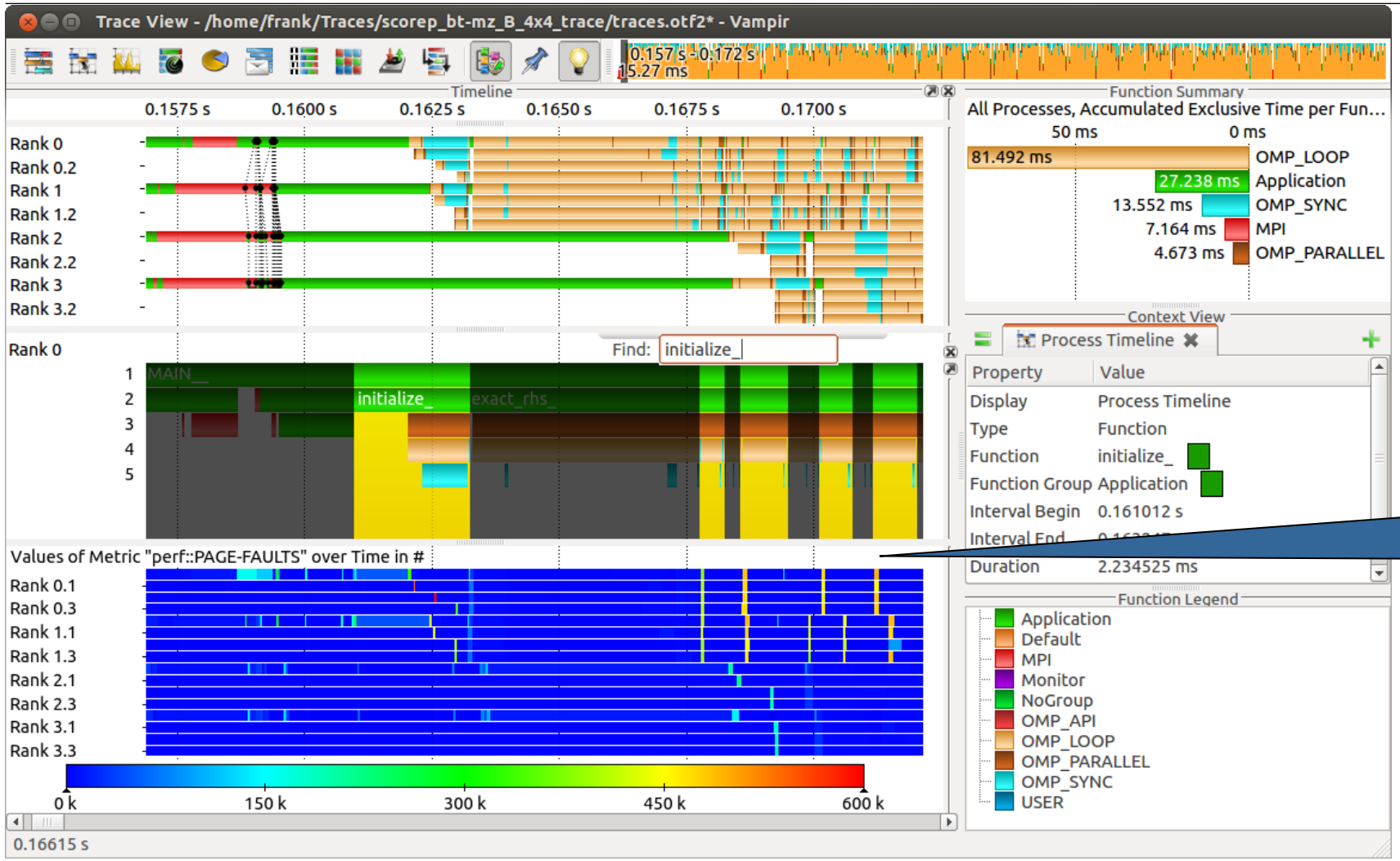
Detailed counter information over time for a collection of processes.

Visualization of the NPB-MZ-MPI / BT trace
Zoom in: Inititialisation Phase



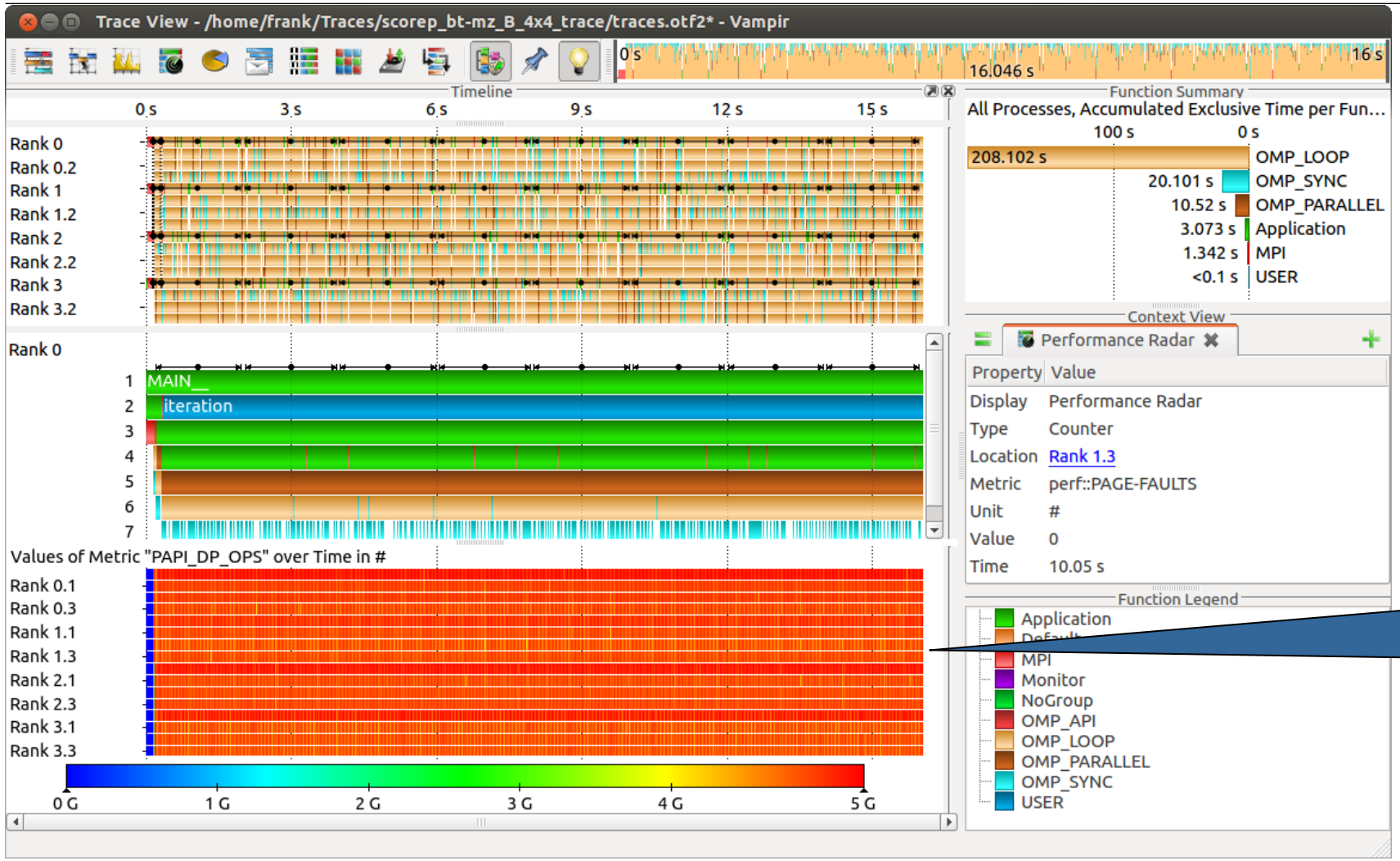
Context View: Detailed information about function “initialize_”.

Visualization of the NPB-MZ-MPI / BT trace
Find Function



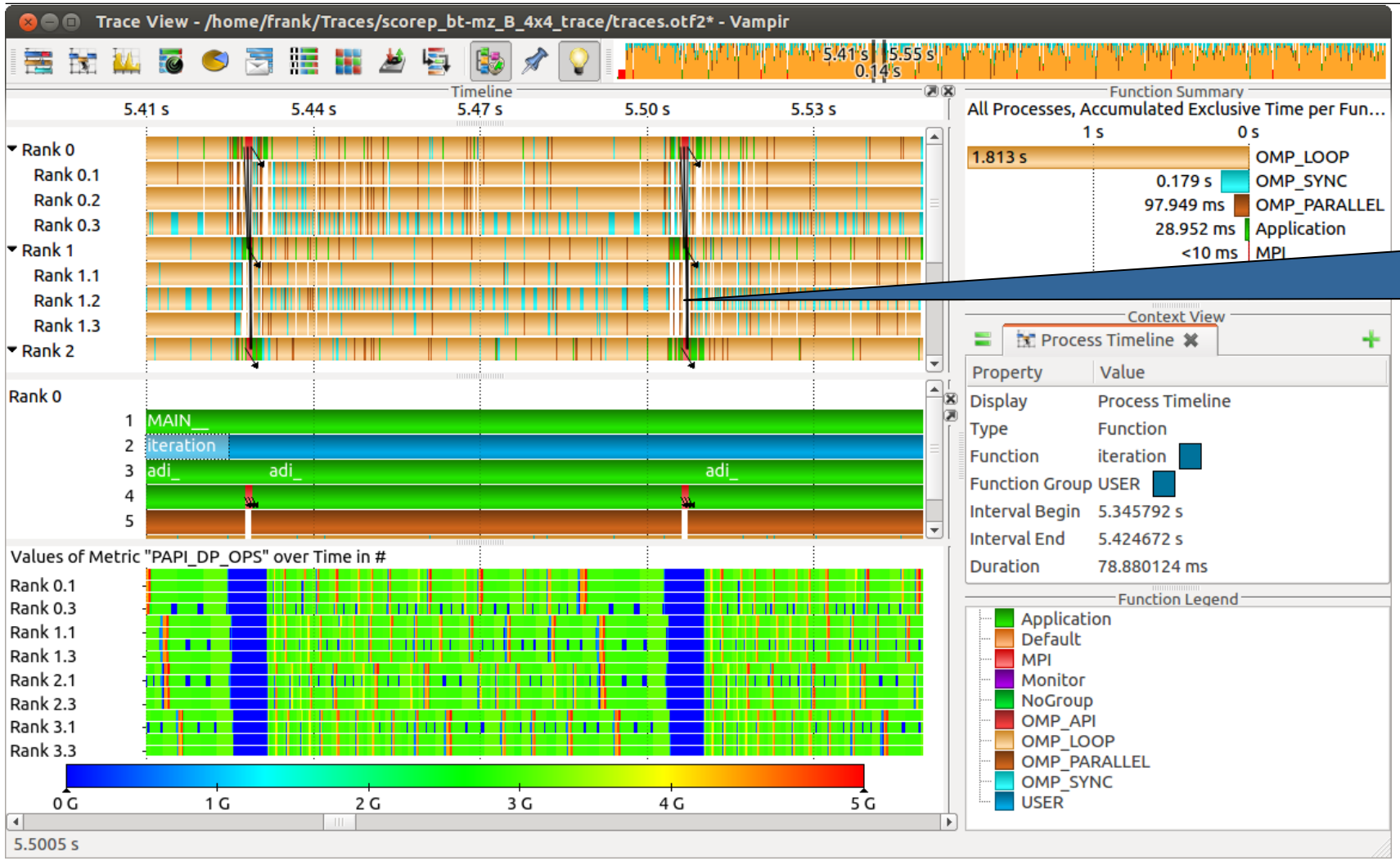
Execution of function “initialize_” results in higher page fault rates.

Visualization of the NPB-MZ-MPI / BT trace
Computation Phase



Computation phase results in higher floating point operations.

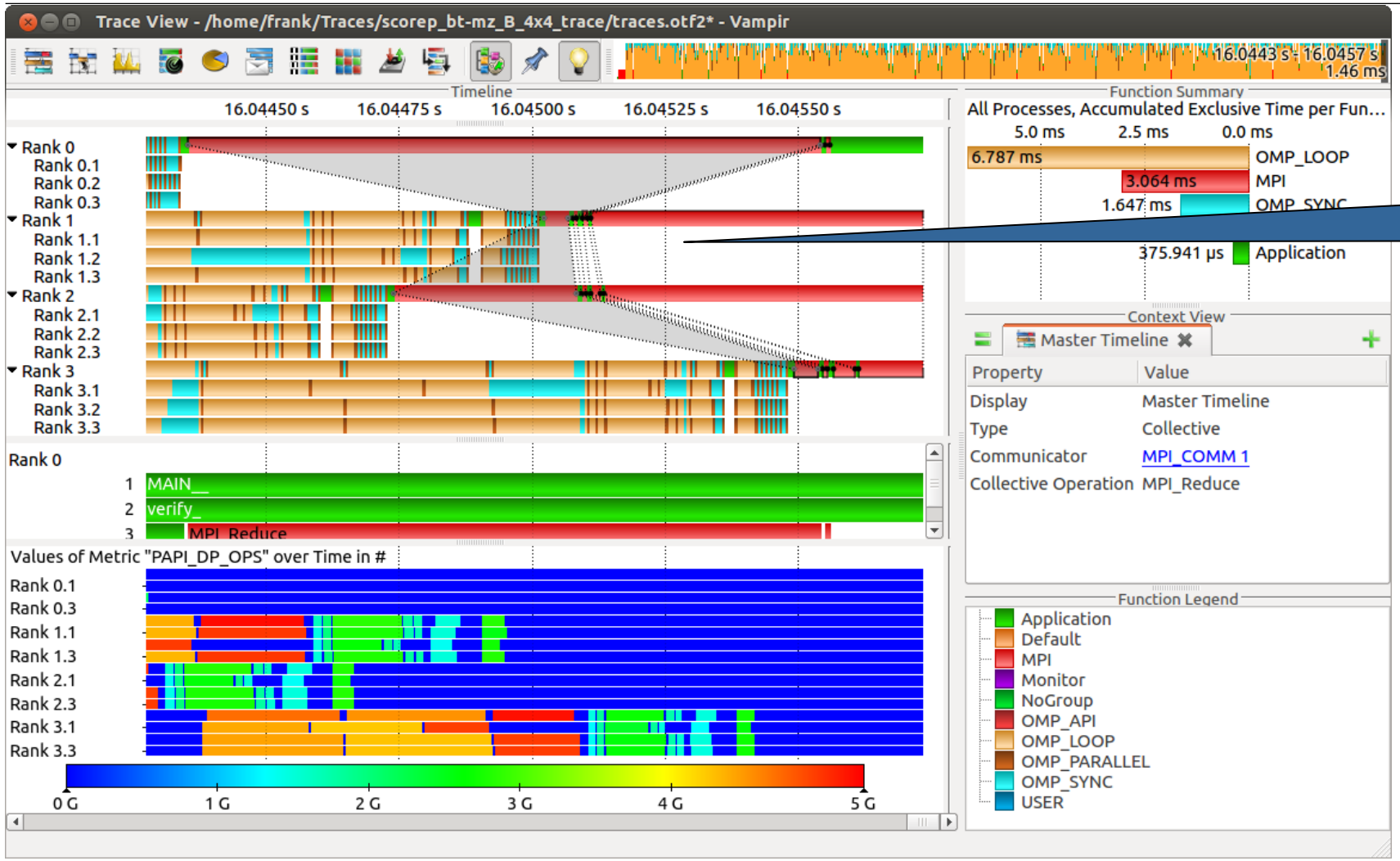
Visualization of the NPB-MZ-MPI / BT trace
Zoom in: Computation Phase



MPI communication results in lower floating point operations.

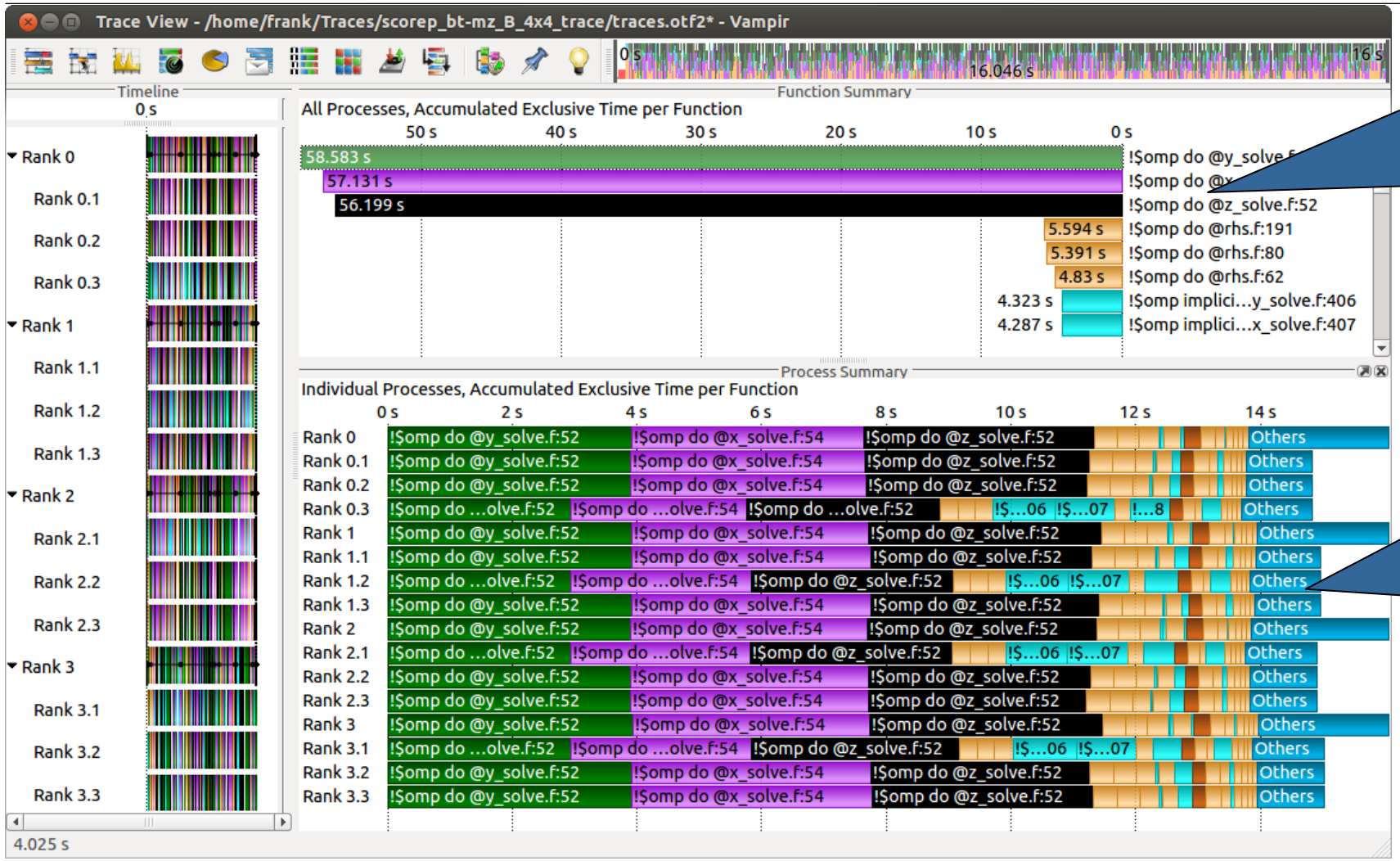
Visualization of the NPB-MZ-MPI / BT trace

Zoom in: Finalisation Phase



"Early reduce" bottleneck.

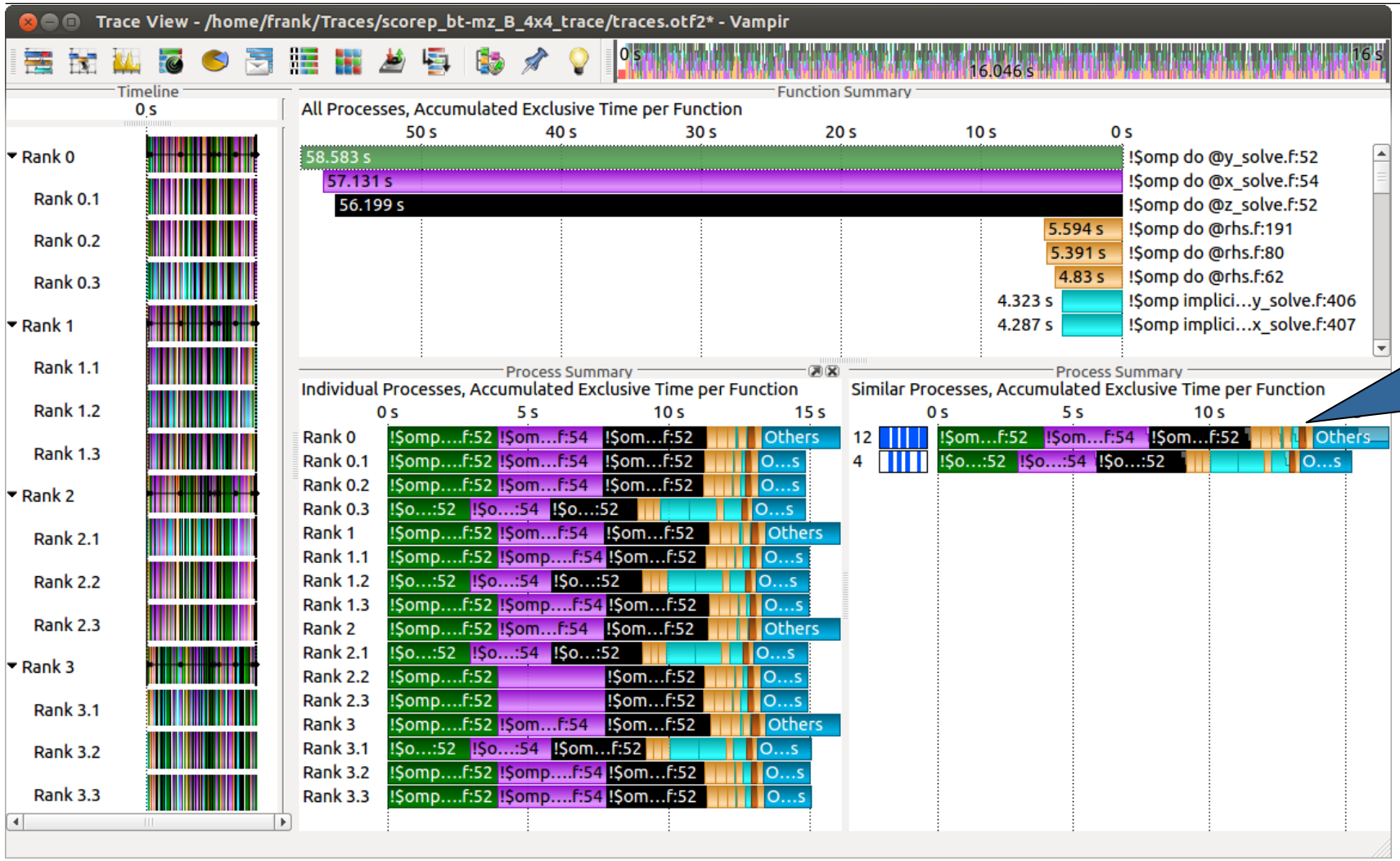
Visualization of the NPB-MZ-MPI / BT trace
Process Summary



Function Summary: Overview of the accumulated information across all functions and for a collection of processes.

Process Summary: Overview of the accumulated information across all functions and for every process independently.

Visualization of the NPB-MZ-MPI / BT trace
Process Summary



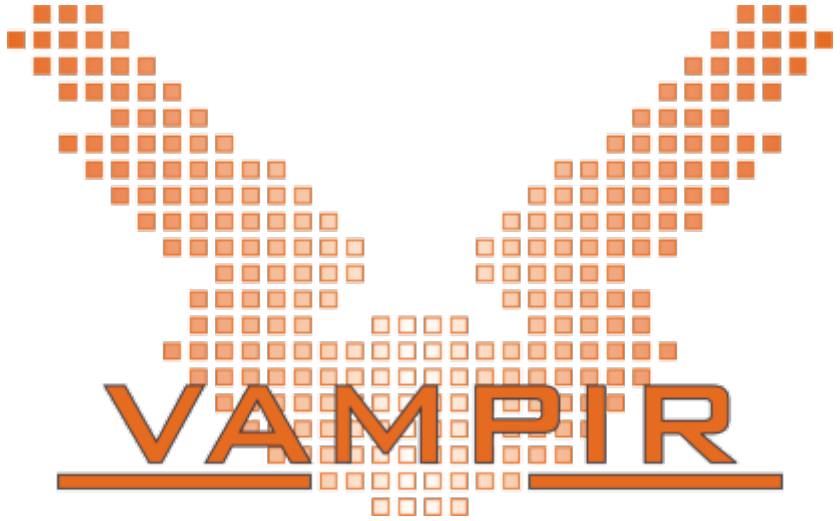
Find groups of similar processes and threads by using summarized function information.

Summary and Conclusion

Summary

- Vampir & VampirServer
  - Interactive trace visualization and analysis
  - Intuitive browsing and zooming
  - Scalable to large trace data sizes (20 TiB)
  - Scalable to high parallelism (200,000 processes)

- Vampir is available for Linux, Windows, and Mac OS X



Vampir is available at http://www.vampir.eu

Get support via vampirsupport@zih.tu-dresden.de