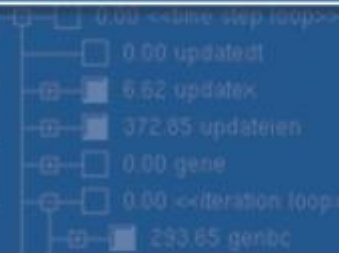


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SOFTWARE



FAST SOLUTIONS

- ☒ PAPL11.DCM
- ☒ PAPL11.JCM
- ☐ PAPL12.DCM
- ☒ PAPL12.JCM
- ☒ PAPL13.DCM
- ☐ PAPL13.JCM

PRODUCTIVITY

Performance Analysis with Vampir

Bert Wesarg, Ronny Tschüter, Andreas Knüpfer
ZIH, Technische Universität Dresden

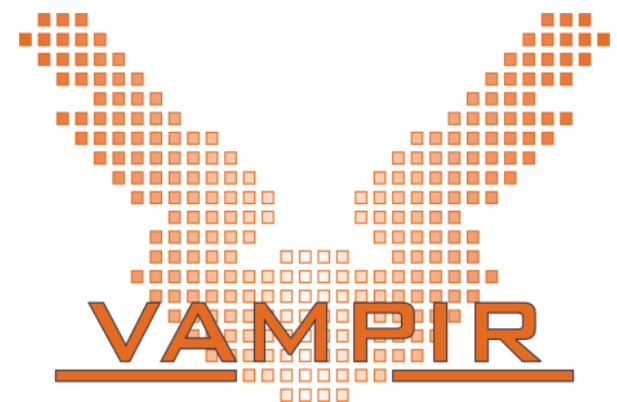
Part I: Welcome to the Vampir Tool Suite

- Mission
- Event Trace Visualization
- Vampir & VampirServer
- The Vampir Displays

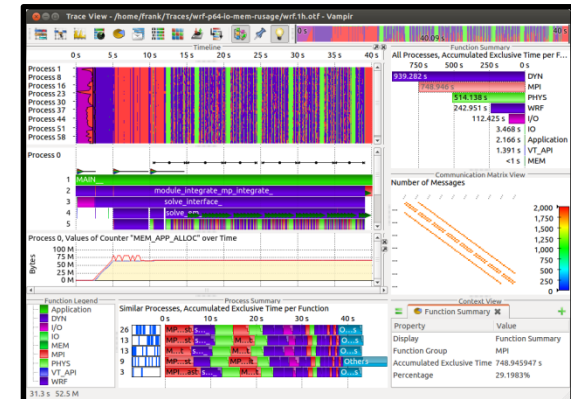
Part II: Vampir Hands On

- Visualizing and analyzing NPB-MZ-MPI / BT

Part III: Summary and Conclusion



- Visualization of dynamics of complex parallel processes
- Requires two components
 - Monitor/Collector (Score-P)
 - Charts/Browser (Vampir)



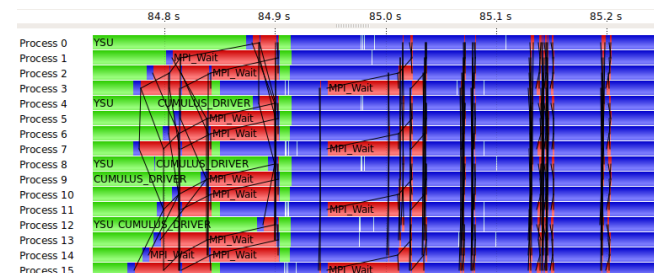
Typical questions that Vampir helps to answer:

- What happens in my application execution during a given time in a given process or thread?
- How do the communication patterns of my application execute on a real system?
- Are there any imbalances in computation, I/O or memory usage and how do they affect the parallel execution of my application?

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

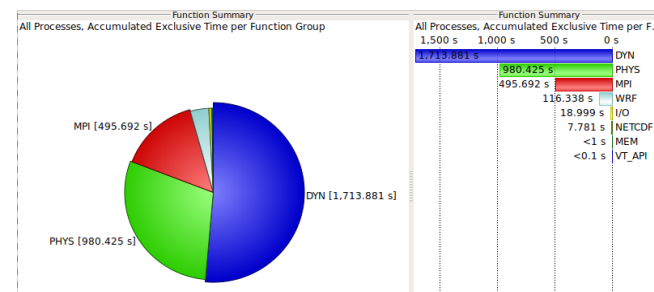
Timeline charts

- Show application activities and communication along a time axis



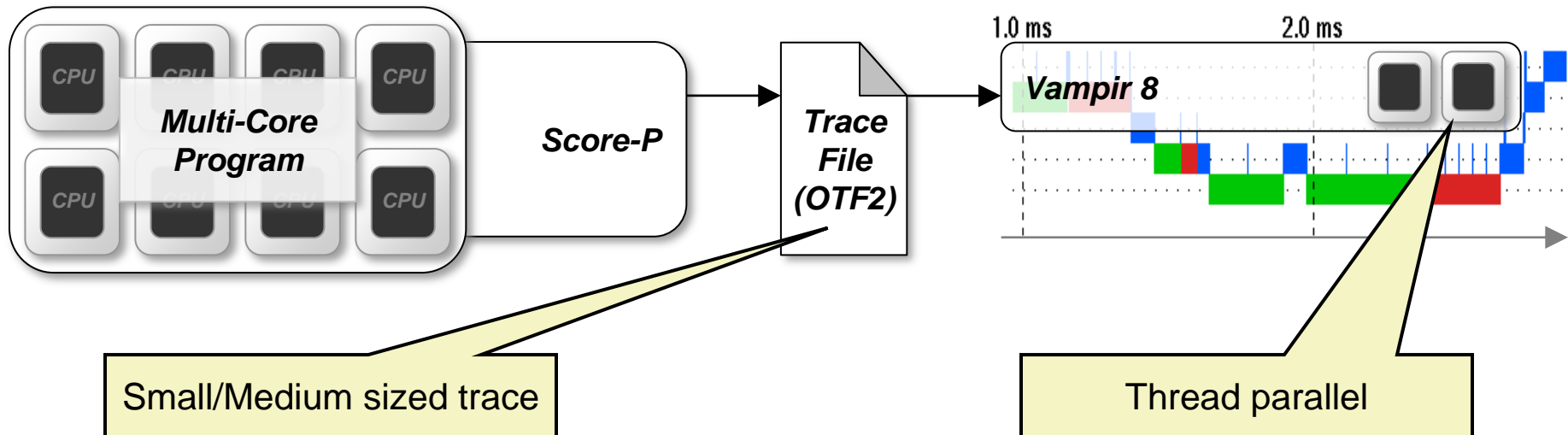
Summary charts

- Provide quantitative results for the currently selected time interval



- Directly on front end or local machine

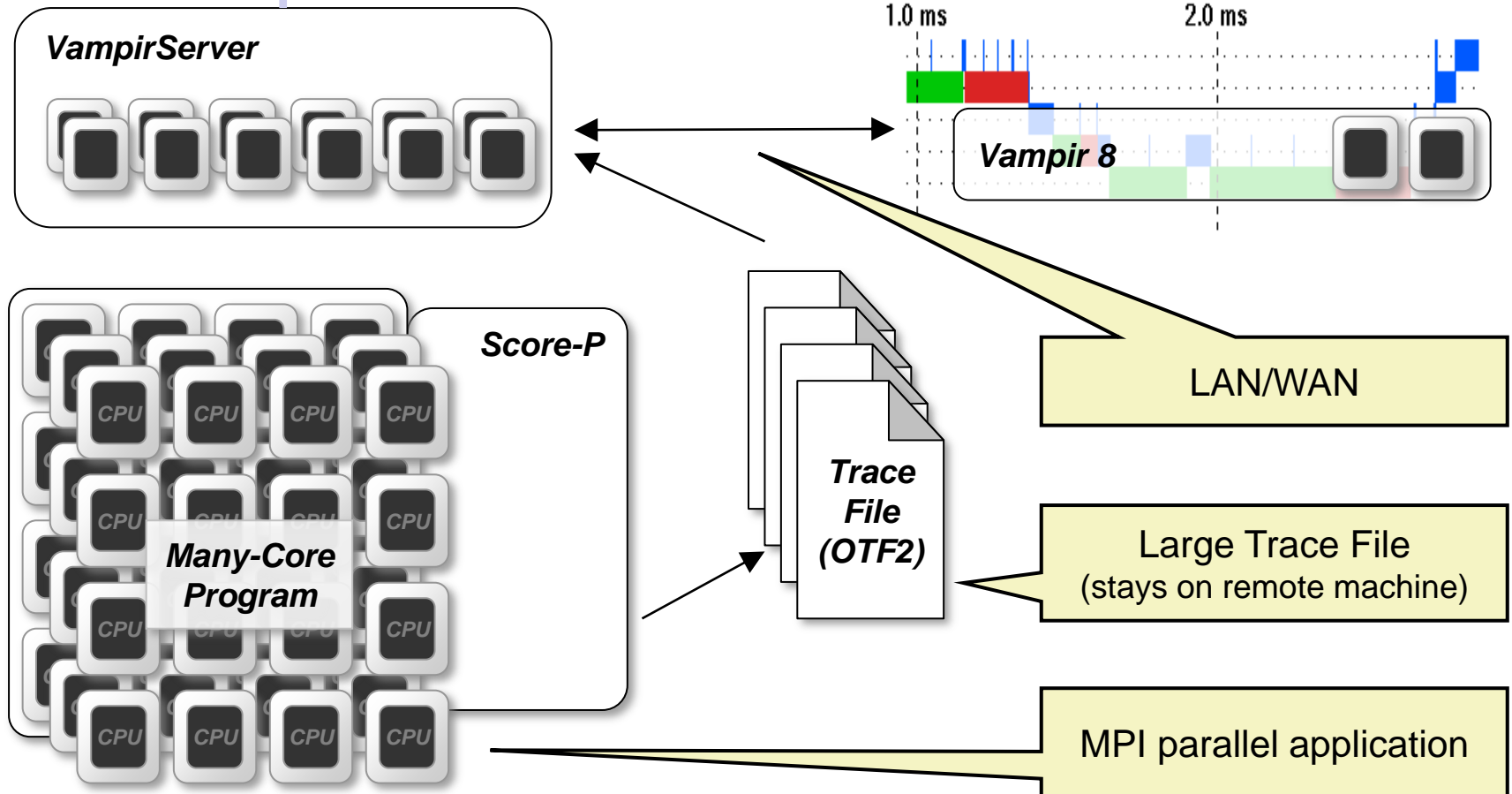
```
% vampir
```







- On local machine with remote VampirServer

```
% vampirserver start -n 12
```





```
% vampir
```



- **Timeline Charts:**

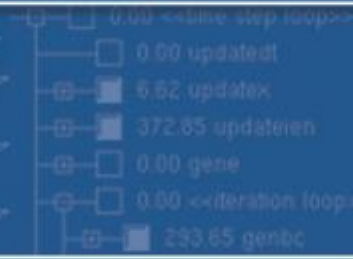
-  Master Timeline
-  Process Timeline
-  Counter Data Timeline
-  Performance Radar

- **Summary Charts:**

-  Function Summary
-  Message Summary
-  Process Summary
-  Communication Matrix View

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FAST SOLUTIONS

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- ☒ PAPL12.JCM
- ☒ PAPL13.DCM
- ☐ PAPL13.JCM

Vampir hands-on

Visualizing and analyzing NPB-MZ-MPI / BT

- Load modules

```
% module load UNITE
UNITE loaded

% module load vampirserver/8.1-be
vampirserver/8.1-be loaded
```

- Start a vampirserver job on the compute nodes

```
% vampirserver start -n 127 -t 600 -- --reservation=$LL_RES_ID
Launching VampirServer...
Submitting batch job (this might take a while)...
llsubmit: Processed command file through Submit Filter: "/bgdata/...
```

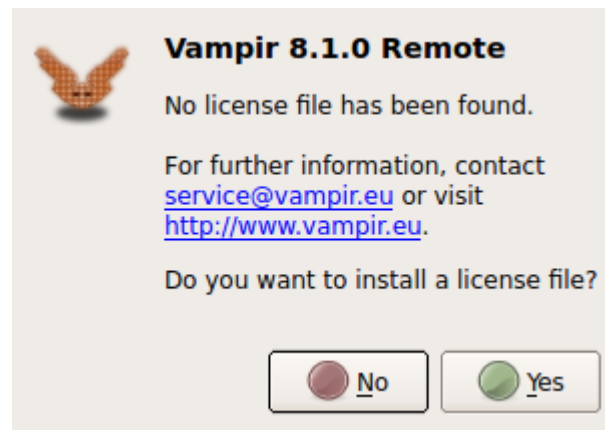
- Start a new shell on you laptop
- Copy the vampir-remote.zip package from JUQUEEN to your laptop

```
% scp juqueen.fz-juelich.de:~train001/vampir-remote.zip .
```

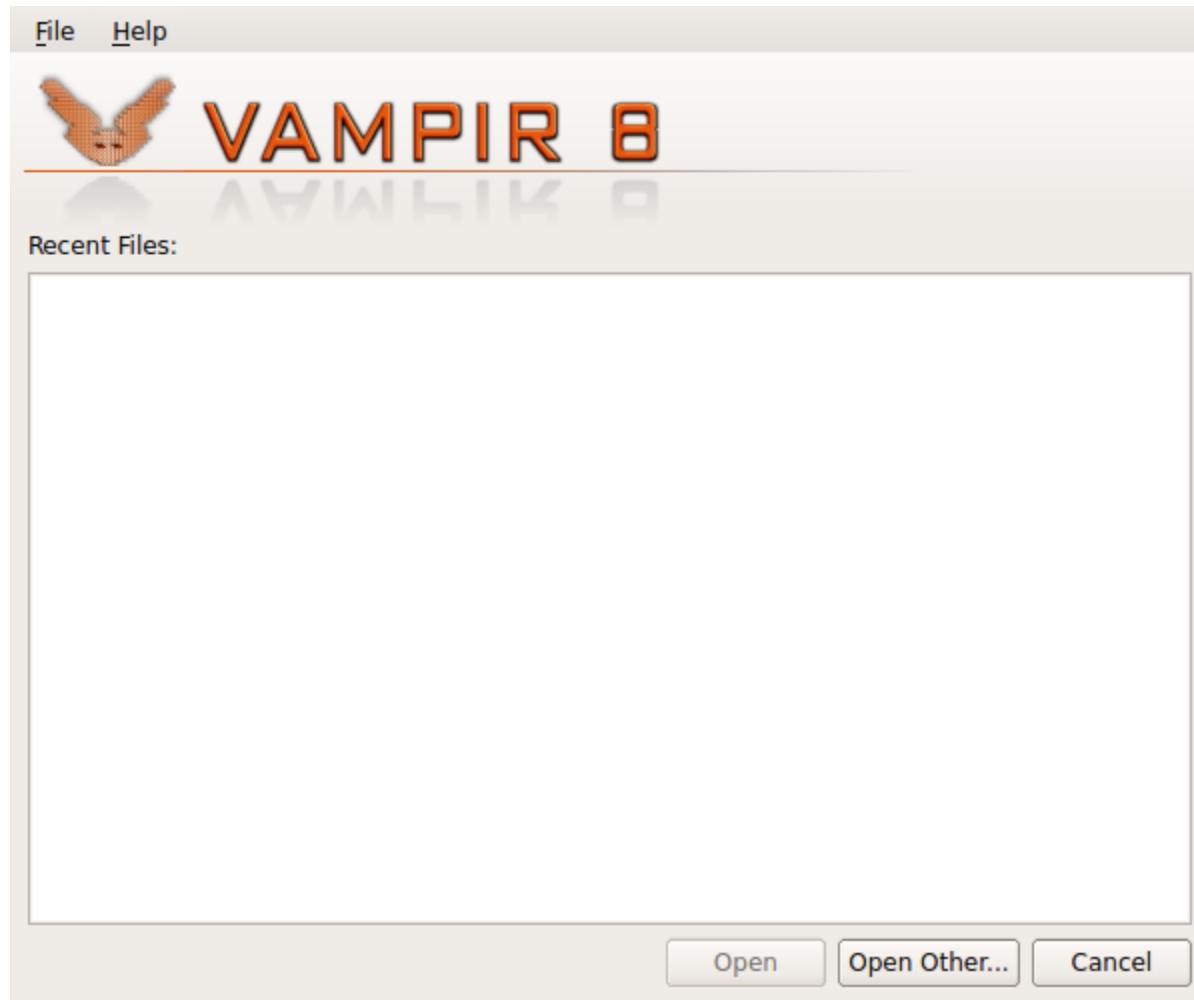
- Extract the archive and chose an appropriate package for your platform

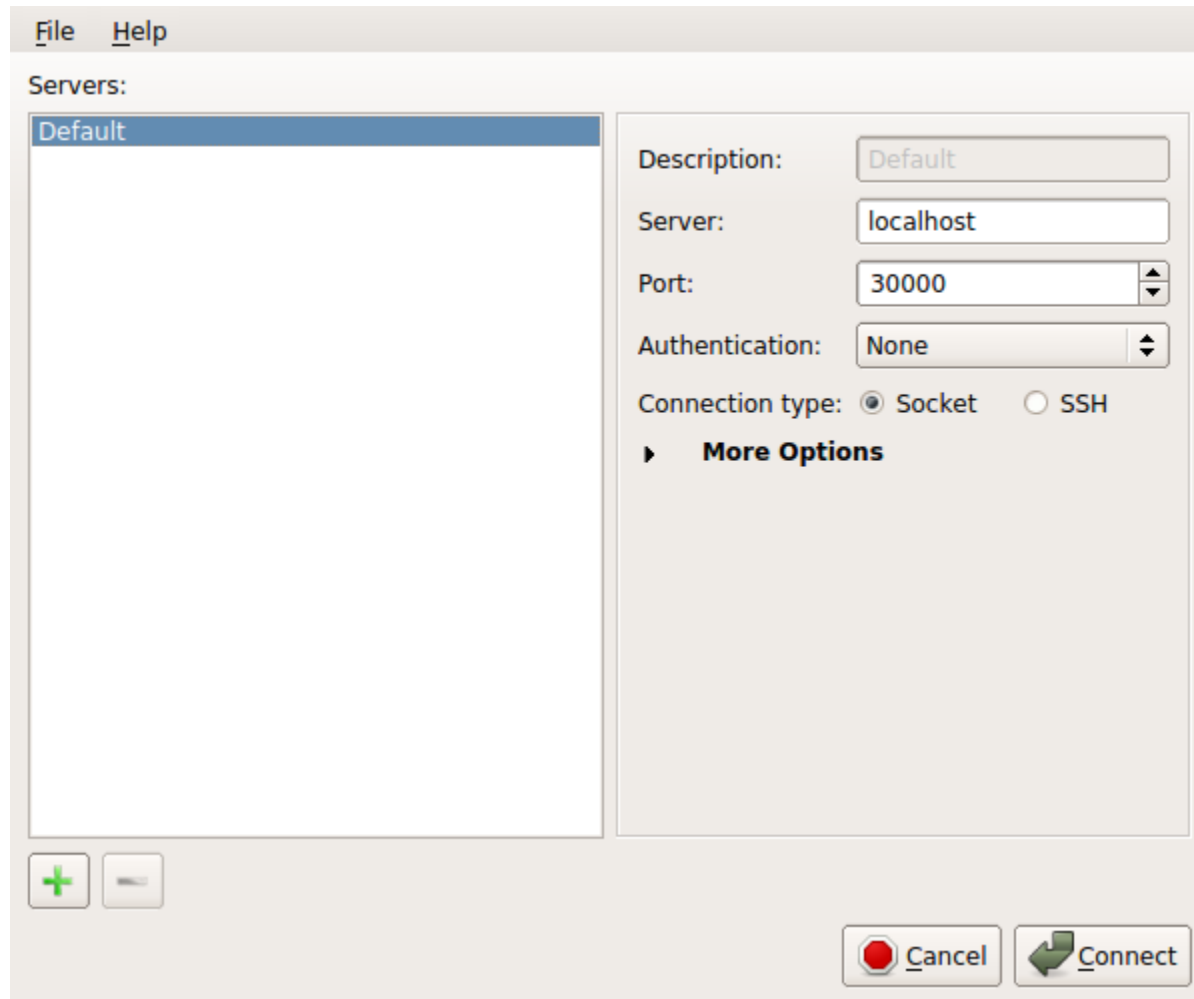
```
% unzip vampir-remote.zip
% cd vampir-remote
% ls
vampir-8.1.0-remote-linux-ia32-setup.bin
vampir-8.1.0-remote-linux-x86_64-setup.bin
Vampir-8.1.0-remote-mac.dmg
Vampir-8.1.0-Remote-x64-setup.exe
Vampir-8.1.0-Remote-x86-setup.exe
vampir-remote.license
```

- Start the Vampir GUI



- Select the [vampir-remote.licence](#) from the archive file when asked





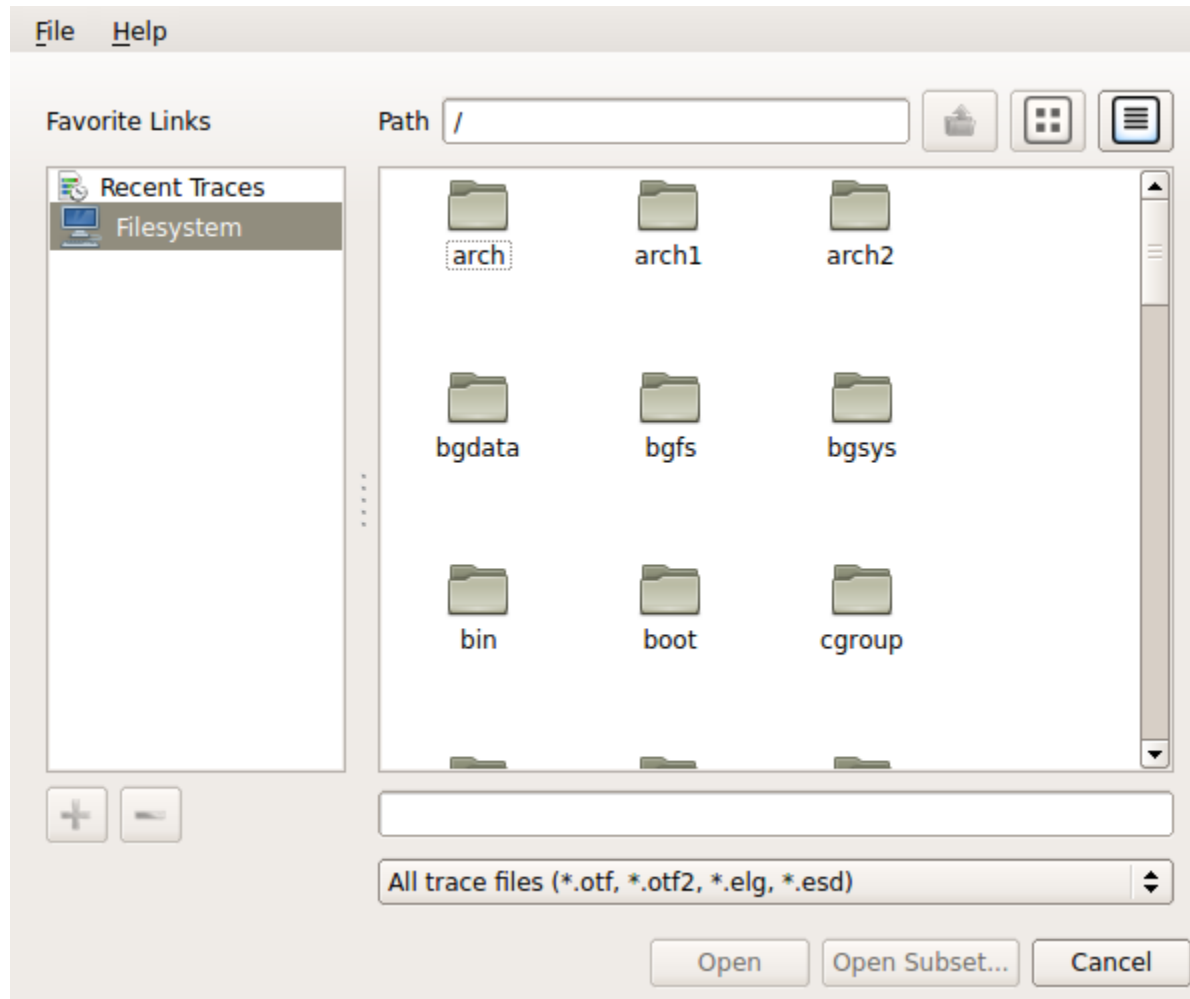
- Write down the host on which the server runs

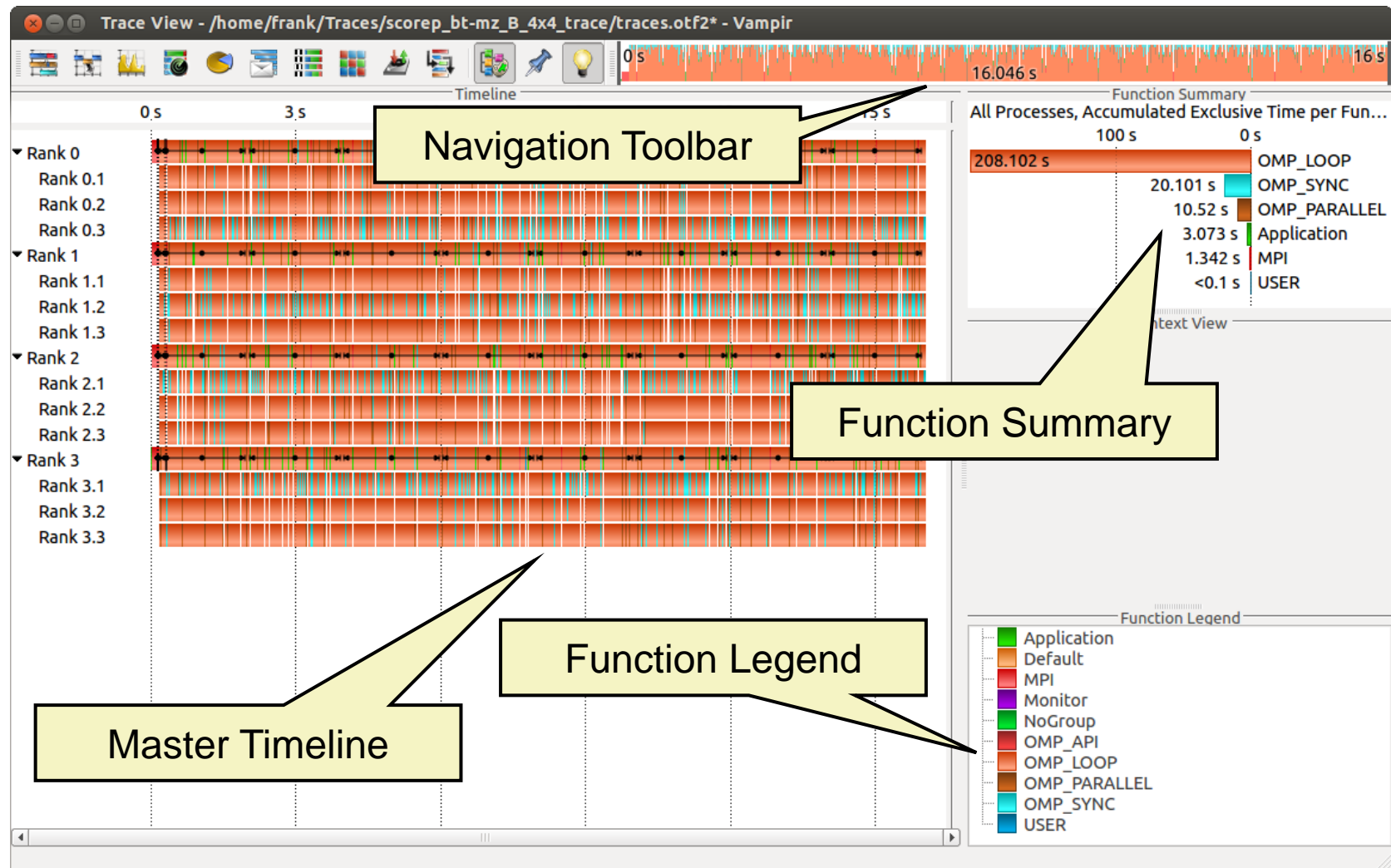
```
% vampirserver start -n 127 -t 600 -- --reservation=$LL_RES_ID
Launching VampirServer...
Submitting batch job (this might take a while)...
llsubmit: Processed command file through Submit Filter: "/bgdata/...
VampirServer 8.1.0 (r8451)
Licensed to JSC
Running 31 analysis processes... (abort with vampirserver stop 743)
VampirServer <743> listens on: R63-ID-J02.zam.kfa-juelich.de:30003
```

- Establish Port Forwarding from your local machine to JUQUEEN

```
% ssh \
  -L 30000:R63-ID-J02.zam.kfa-juelich.de:30003 \
  juqueen.fz-juelich.de
```

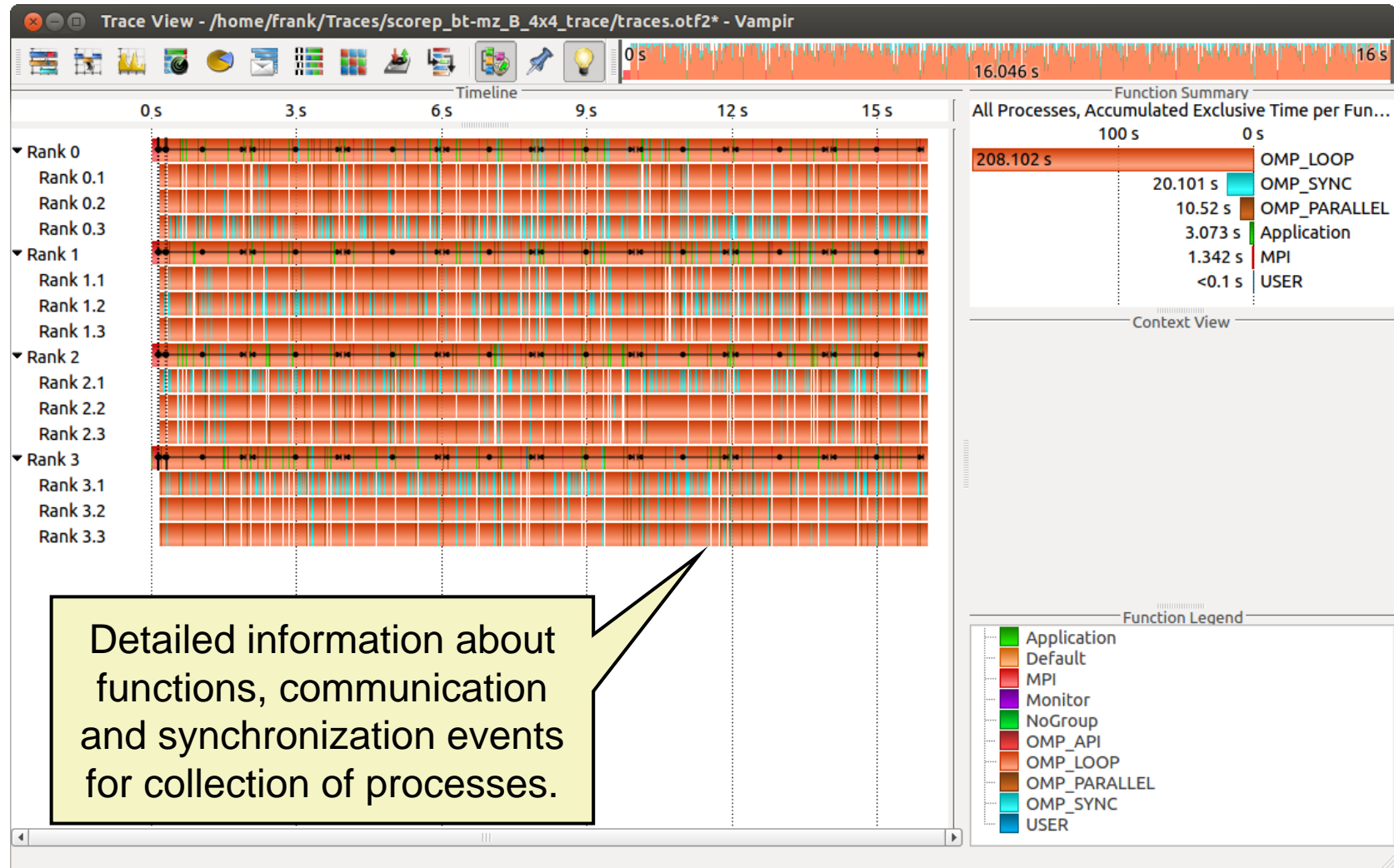
Select trace to open from remote Server





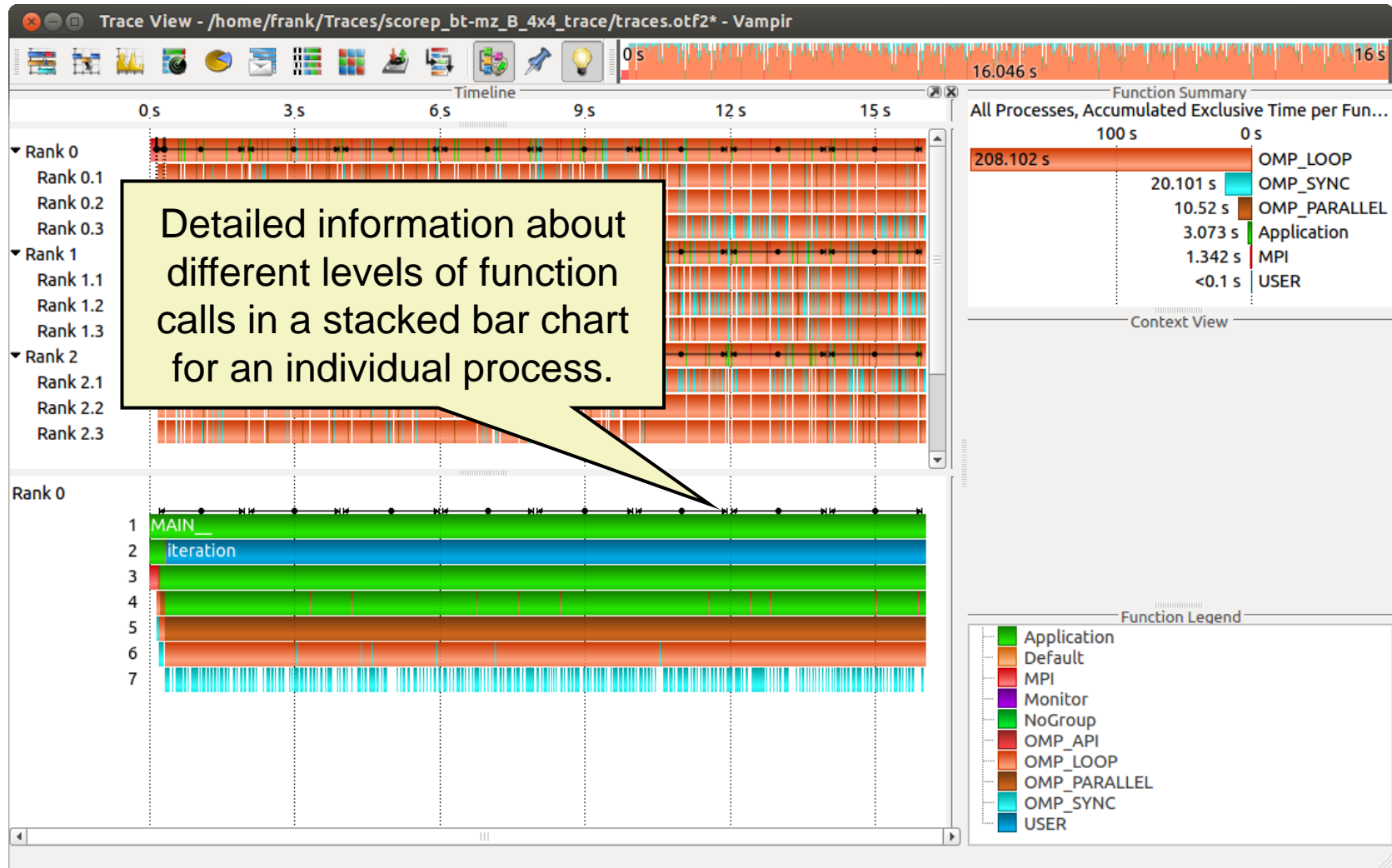


Master Timeline

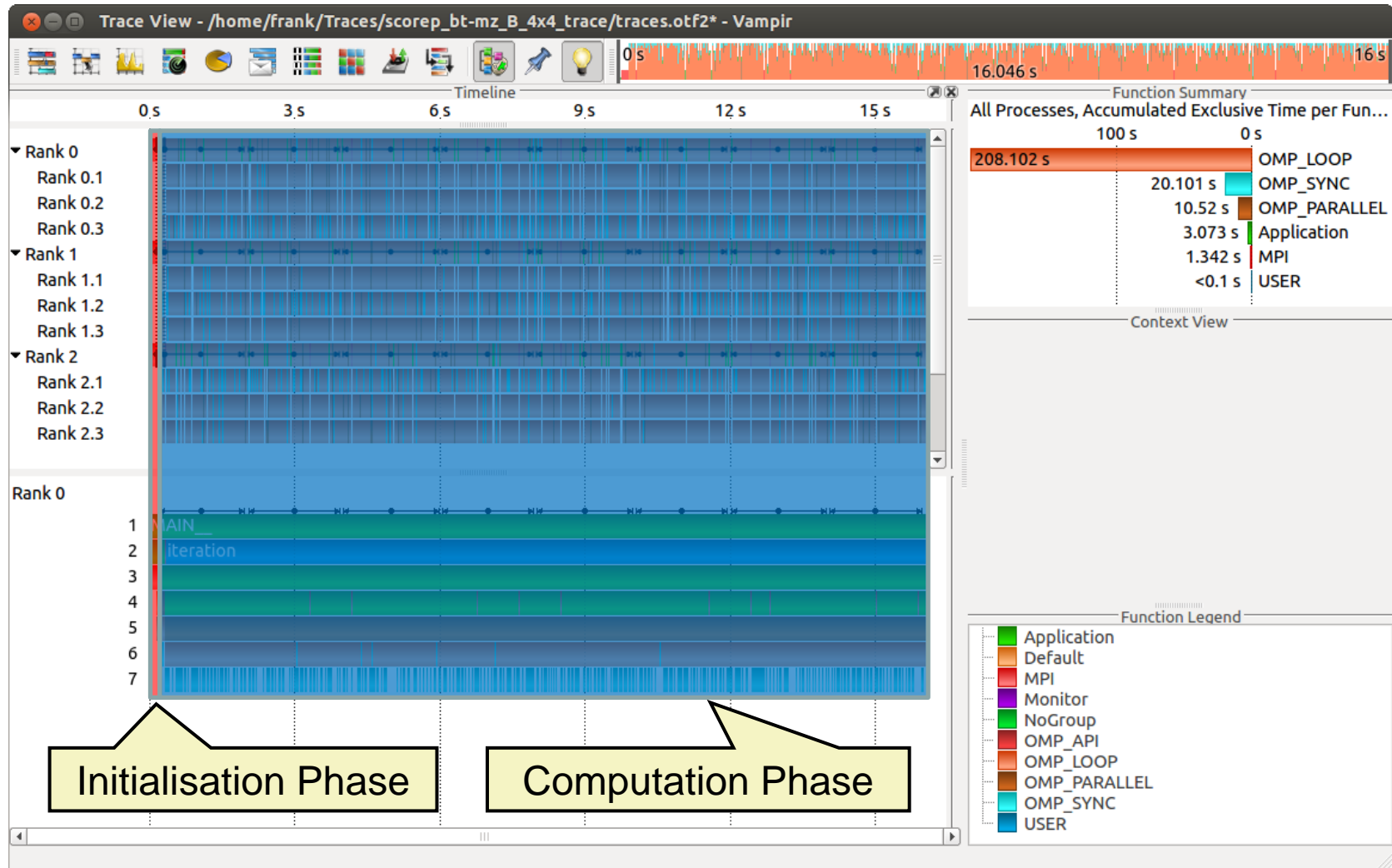




Process Timeline

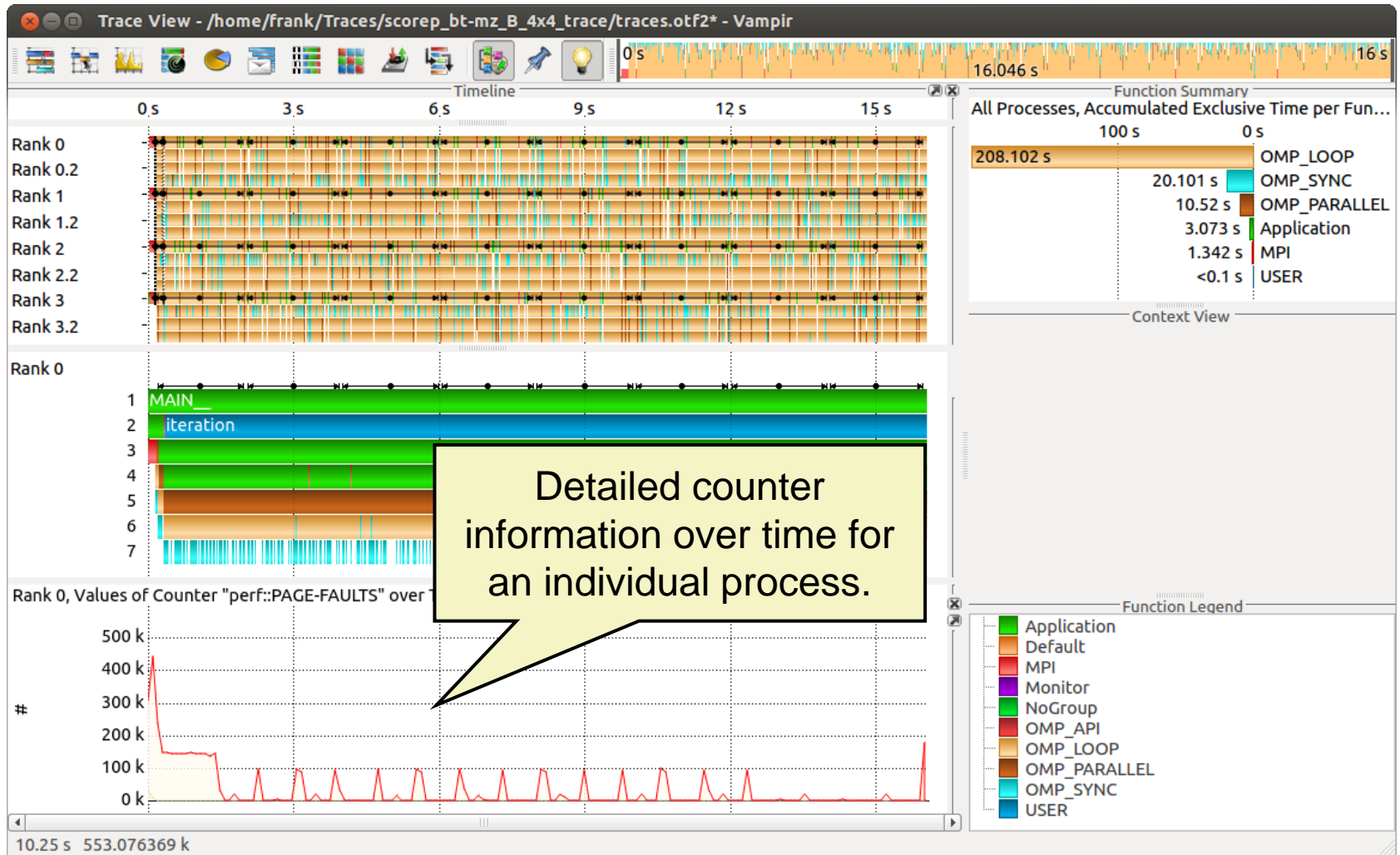


Typical program phases



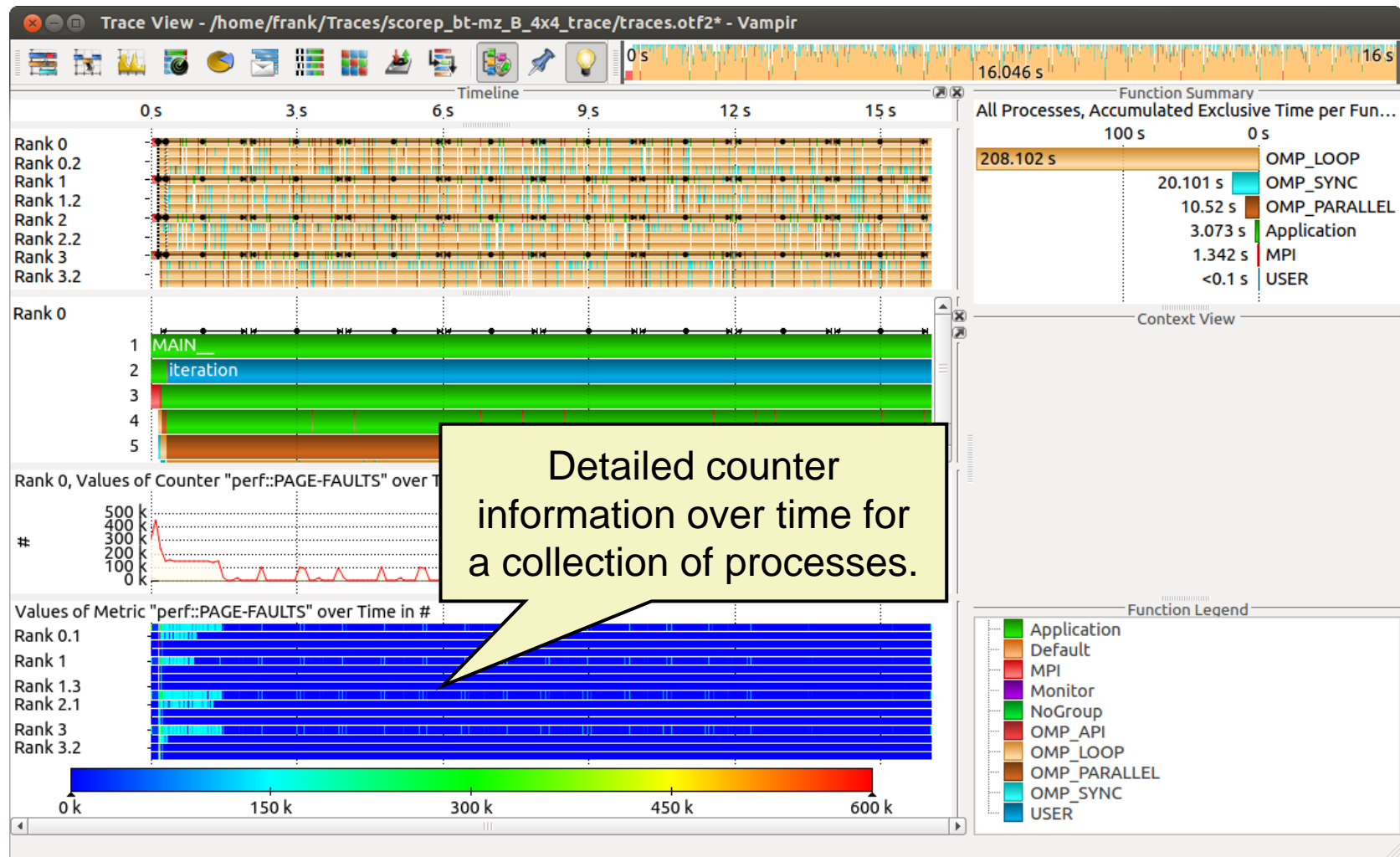


Counter Data Timeline

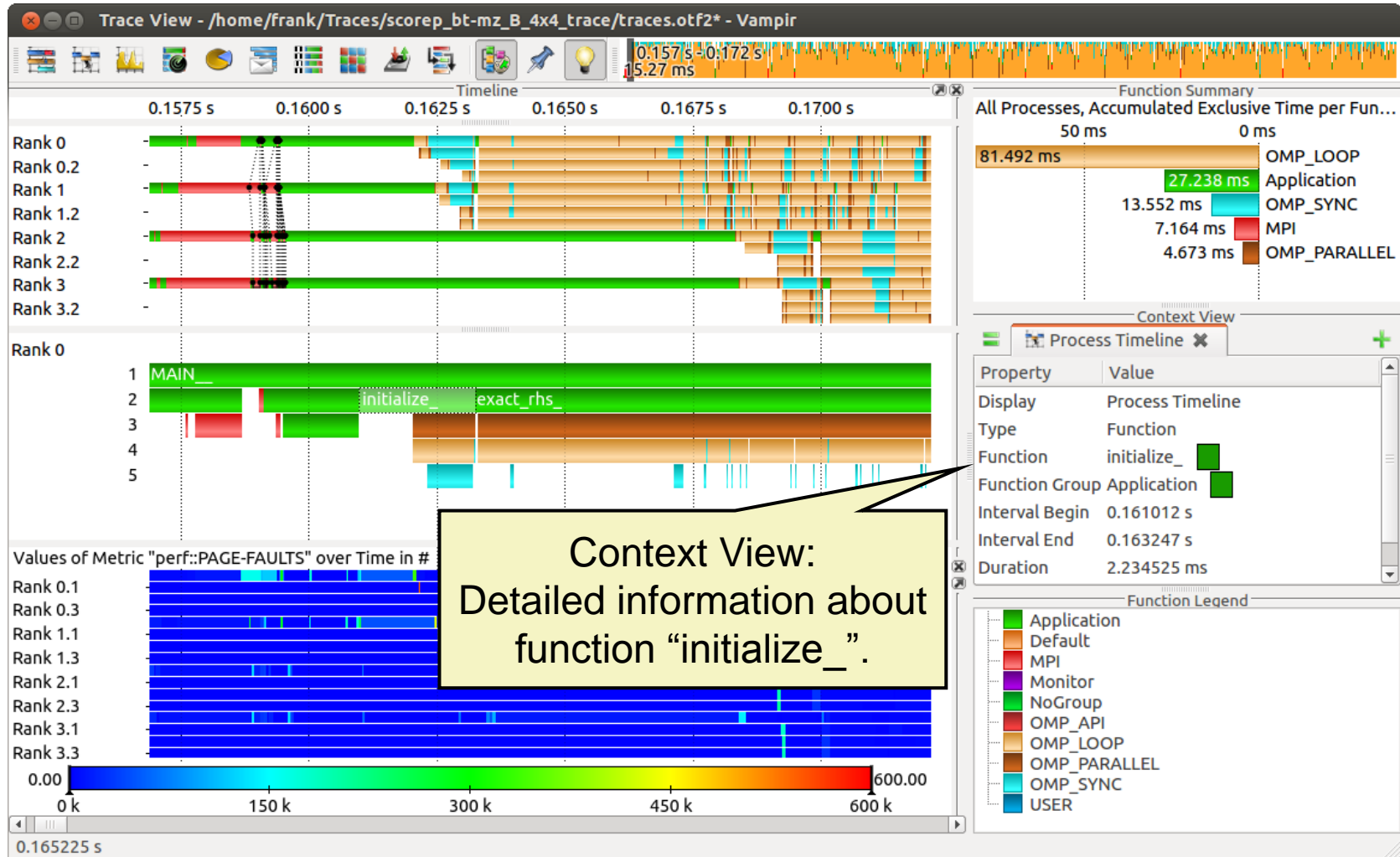




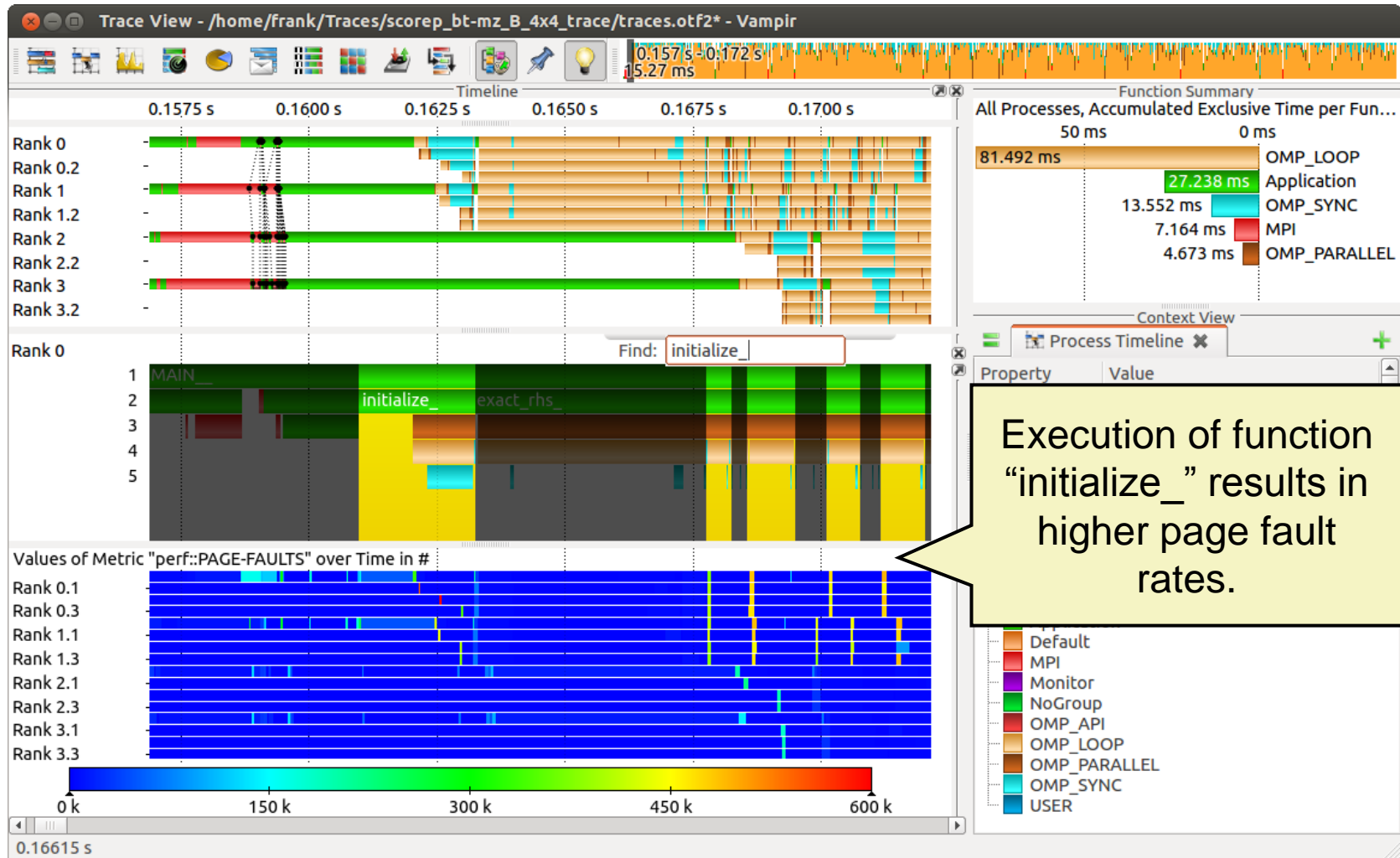
Performance Radar



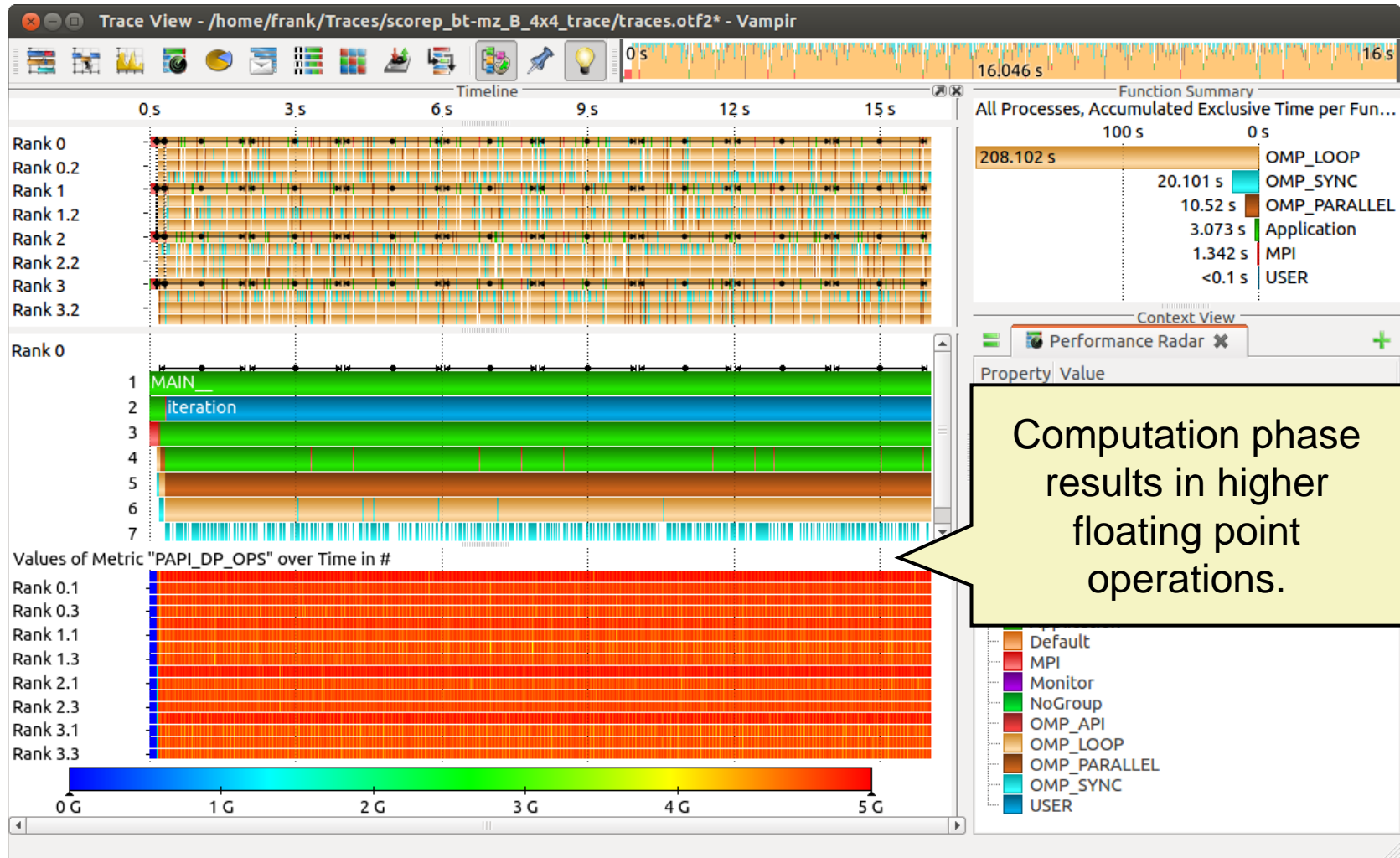
Zoom in: Initialisation Phase



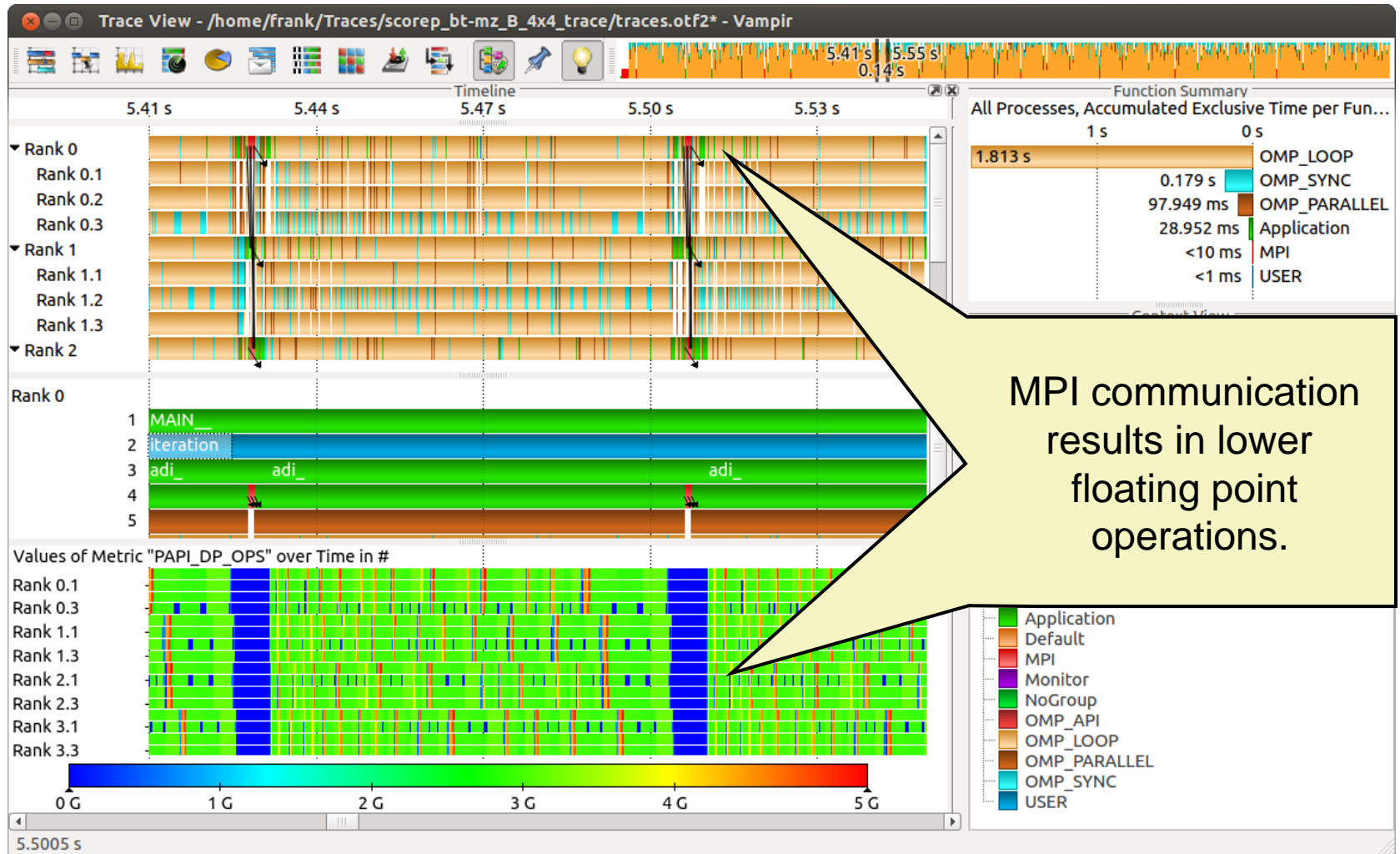
Feature: Find Function



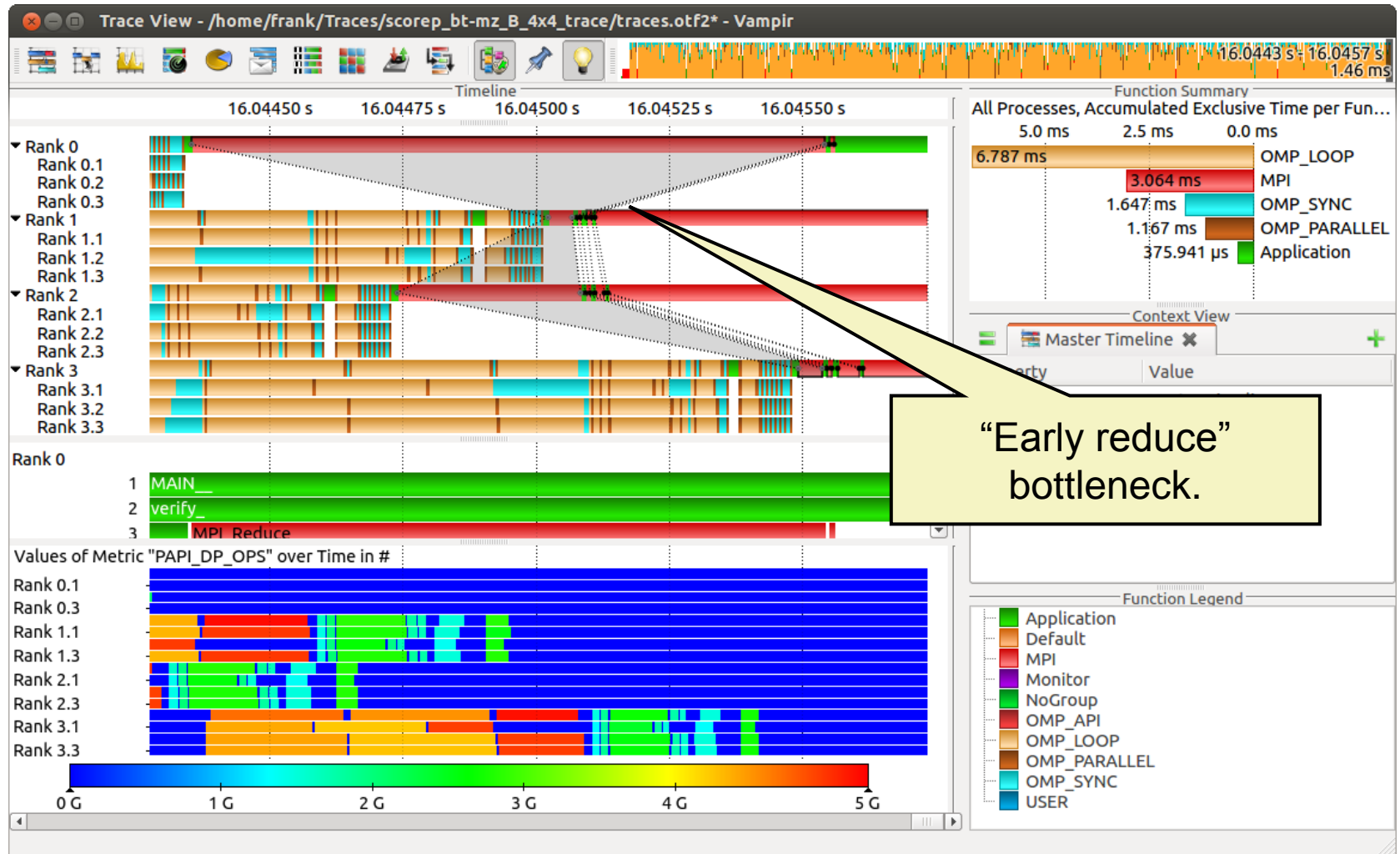
Computation Phase



Zoom in: Computation Phase

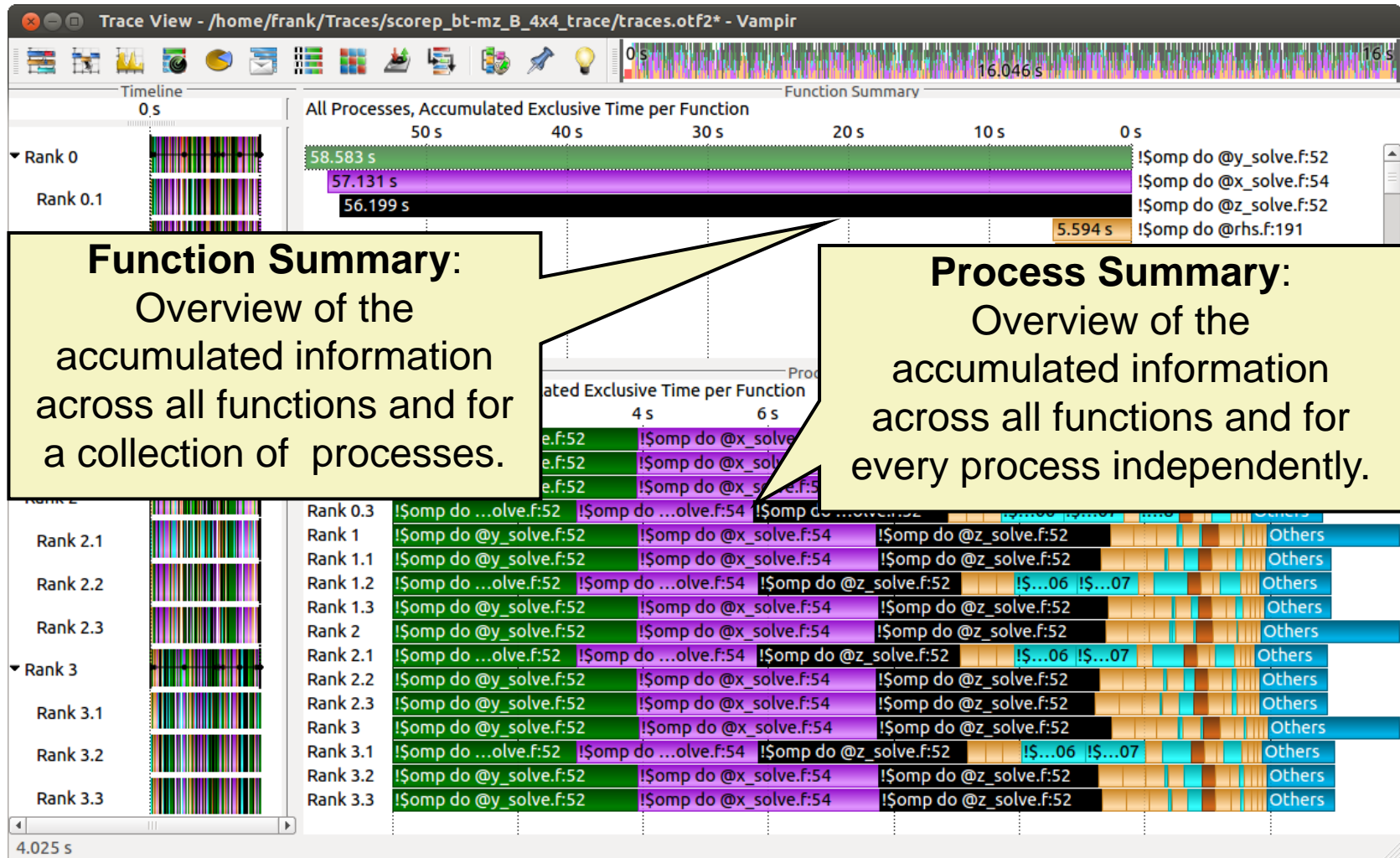


Zoom in: Finalisation Phase



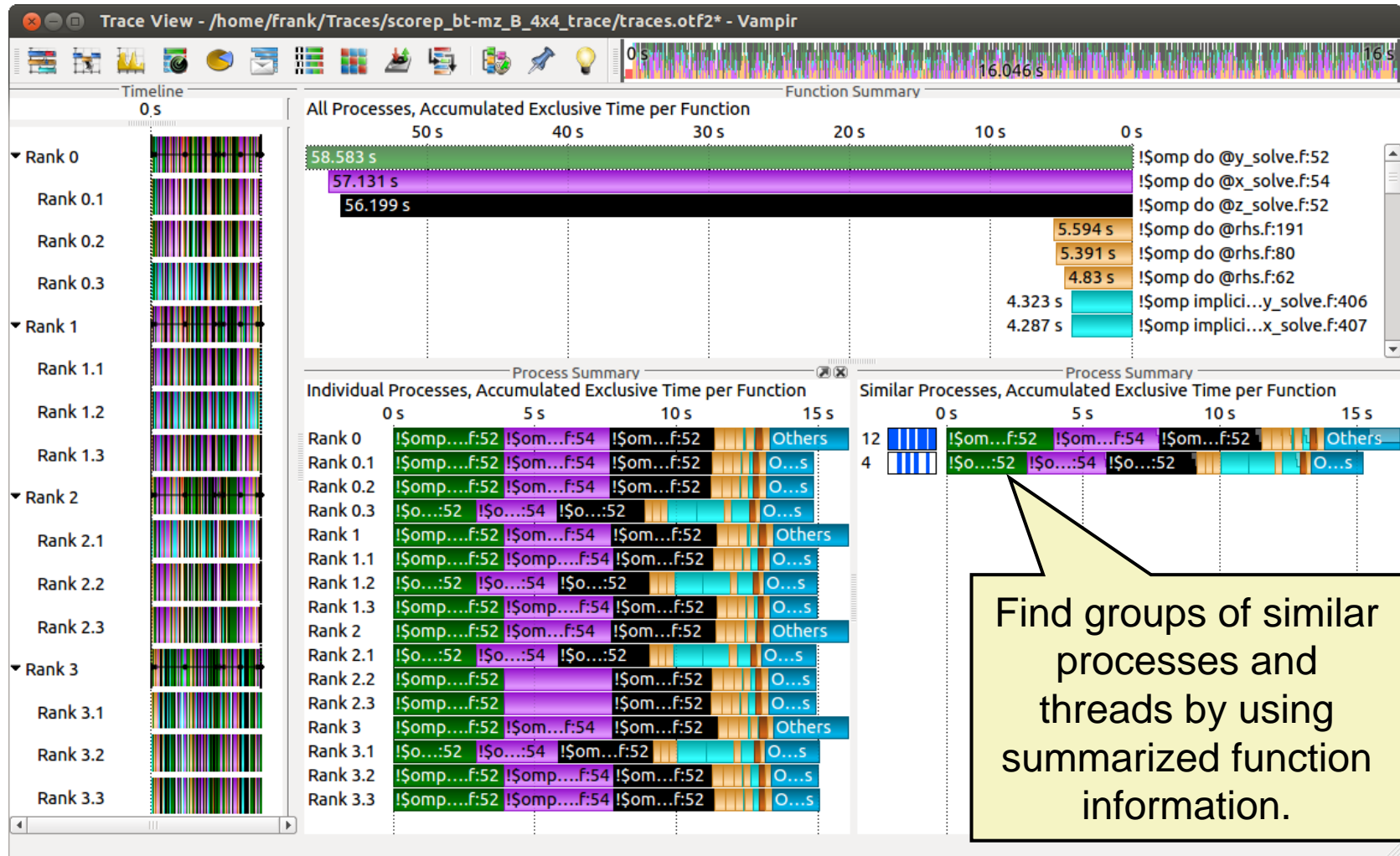


Process Summary



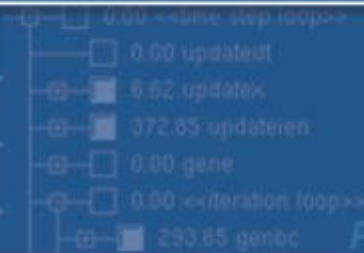


Process Summary



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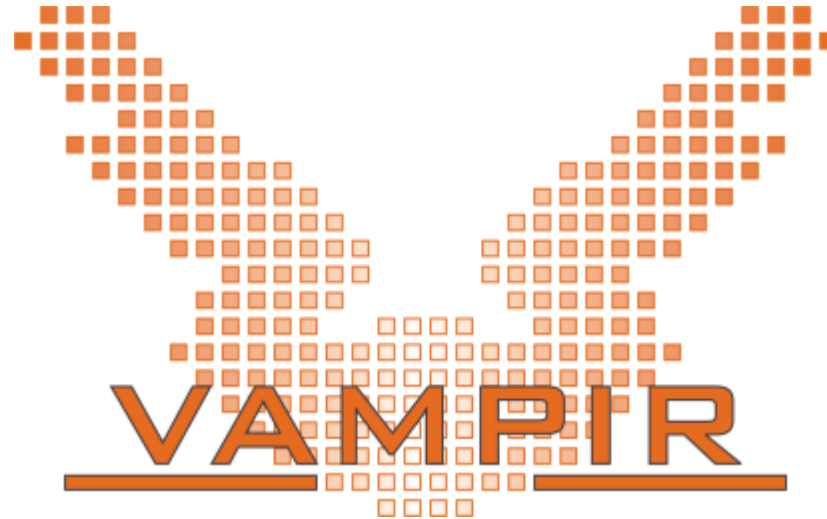
- ☒ PAPL11.DCM
- ☒ PAPL11.JCM
- ☐ PAPL12.DCM
- ☒ PAPL12.JCM
- ☒ PAPL13.JCM
- ☐ PAPL12.TCM

PRODUCTIVITY

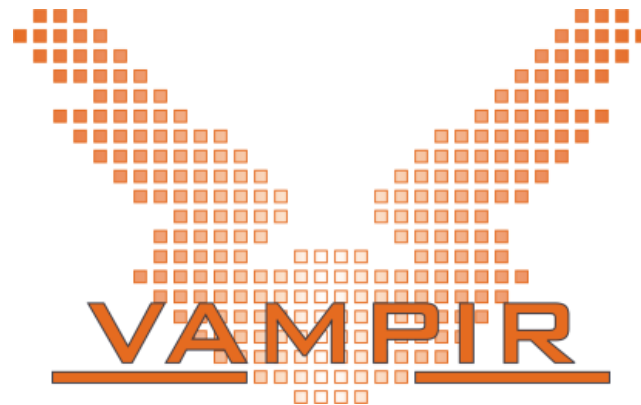
Summary and Conclusion

- Vampir & VampirServer
 - Interactive trace visualization and analysis
 - Intuitive browsing and zooming
 - Scalable to large trace data sizes (20 TByte)
 - Scalable to high parallelism (200000 processes)
- Vampir for Linux, Windows and Mac OS X
- **Note:** Vampir does neither solve your problems automatically nor point you directly at them. It does, however, give you FULL insight into the execution of your application.

- Performance analysis very important in HPC
- Use performance analysis tools for profiling and tracing
- Do not spend effort in DIY solutions,
e.g. like printf-debugging
- Use tracing tools with some precautions
 - Overhead
 - Data volume
- Let us know about problems and about feature wishes
- vampirsupport@zih.tu-dresden.de



Vampir is available at <http://www.vampir.eu>,
get support via vampirsupport@zih.tu-dresden.de



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