



**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación



**EXCELENCIA
SEVERO
OCHOA**

Paraver Hands-On



tools@bsc.es

07/2020

DEEP-EST Early Access Programme

Install Paraver in your laptop / desktop

- Download from <https://tools.bsc.es/downloads>

Pick your version

The screenshot shows the BSC Downloads page. The navigation bar includes links for Home, Paraver, Dimemas, Extrae, Research, Documentation, Downloads, and Publications. The main content area is titled 'Downloads' and features a 'CORE TOOLS' section. Under 'CORE TOOLS', there are three tool cards: EXTRAE, PARAVAR, and DIMEMAS. The PARAVAR card is highlighted with a yellow border, and a blue arrow points from the 'Pick your version' text to the 'Get PARAVAR' button. The PARAVAR card shows version 4.6.3 (1.56 MB) and icons for 101, RAW, and various architectures (x86, x64, ARM, etc.). Below the 'CORE TOOLS' section is the 'PERFORMANCE ANALYTICS' section, which includes cards for CLUSTERING, TRACKING, FOLDING, SPECTRAL, and BASIC ANALYSIS. Each card has a 'Get' button and version information.

Tool	Version	Size	Icons
EXTRAE	Version 3.4.2	1.5 MB	101, RAW, x86, x64, ARM, etc.
PARAVAR	Version 4.6.3	1.56 MB	101, RAW, x86, x64, ARM, etc.
DIMEMAS	Version 5.2.12	1.09 MB	101, RAW, x86, x64, ARM, etc.
CLUSTERING	Version 2.6.6	2 MB	101, RAW, x86, x64, ARM, etc.
TRACKING	Version 2.6.5	1.9 MB	101, RAW, x86, x64, ARM, etc.
FOLDING	Version 1.0.2	11.06 MB	101, RAW, x86, x64, ARM, etc.
SPECTRAL	Version 3.4.0	0.31 MB	101, RAW, x86, x64, ARM, etc.
BASIC ANALYSIS	Version 0.2	10.89 MB	101, RAW, x86, x64, ARM, etc.

Install Paraver (II)

- Download tutorials from <https://tools.bsc.es/paraver-tutorials>

The screenshot shows the BSC website's navigation bar with links: Home, Paraver », Dimemas », Extrae, Research », Documentation », Downloads, and Publications. Below the navigation bar, a terminal-style prompt shows 'news@tools:~ > Paraver 4.7.2 avail'. The main content area is titled 'Home » Documentation » Paraver tutorials'. It contains a paragraph explaining that seven tutorials can be opened with wxParaver versions newer than 4.3.0. Below this is a list of seven tutorials, each with a folder icon and a brief description. A blue callout box labeled 'Download link' points to the download options at the bottom of the page. The download options are: '.tar.gz format (127 Mb)' and '.zip format (127 Mb)'. The '.tar.gz format' option is circled in blue.

Home » Documentation » Paraver tutorials

These seven tutorials can be opened with wxParaver versions newer than 4.3.0, and you'll be able to follow the steps within the tool. To install them, download and untar the package and follow the instructions of the Help/Tutorial option on the Paraver main window. Following there is a list of available tutorials:

Paraver introduction (MPI)	Start here to familiarize with Paraver basic commands and the first steps of a performance analysis.
Dimemas introduction	The basic steps to learn how to configure and run the Dimemas simulator and to start looking at the results.
Introduction to Paraver and Dimemas methodology	This tutorial presents different ways to analyze a MPI application through well-known rules, their diagnosis.
Methodology	This tutorial shows s configuration files.
Tutorial on HydroC analysis (MPI, Dimemas, CUDA)	One example of perf simulations with Dimemas.
Trace preparation	Look at this tutorial to select a representative region for a large trace that cannot be loaded into memory.
Trace alignment tutorial.	If you identify some unexpected unalignment or backwards communications, use this tutorial to learn how to correct shifts between processors.

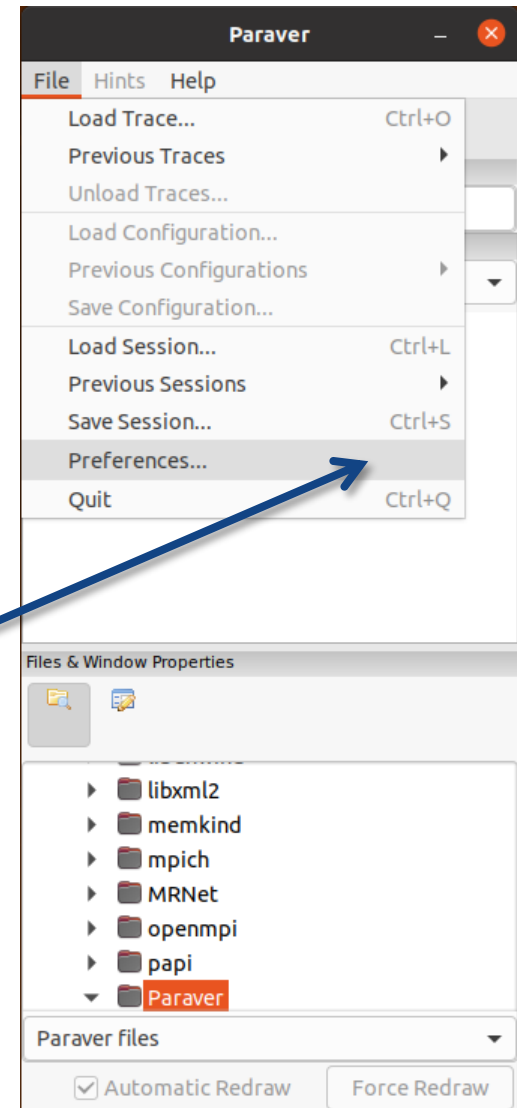
If you prefer you can download all of them together in a single package:

[.tar.gz format \(127 Mb\)](#) [.zip format \(127 Mb\)](#)

Install Paraver (III)

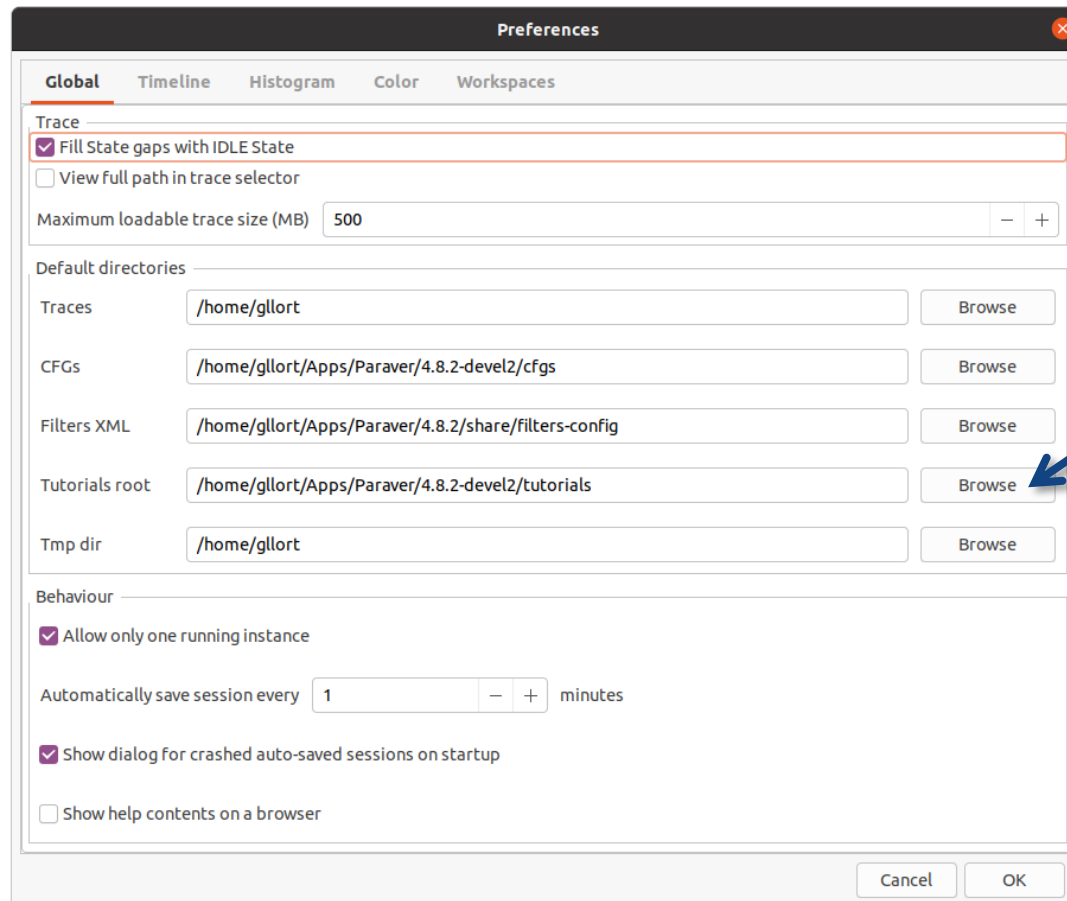
- Uncompress downloaded packages
- Rename the folders:
 - wxparaver-4.8.2-* → paraver
 - paraver-tutorials-20150526 → tutorials
- Start Paraver:
 - Linux: Run the command:

```
laptop$ paraver/bin/wxparaver
```
 - Windows: Double-click on paraver/wxparaver.exe
 - MAC: Double click on paraver/wxparaver.app
- Open File → Preferences



Install Paraver (IV)

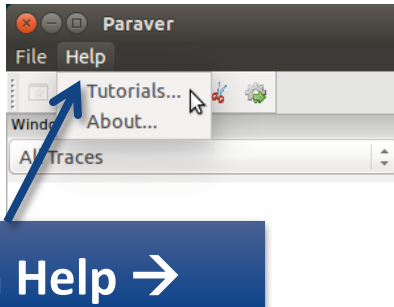
- Setup the “Tutorials root” pointing to your folder “tutorials”



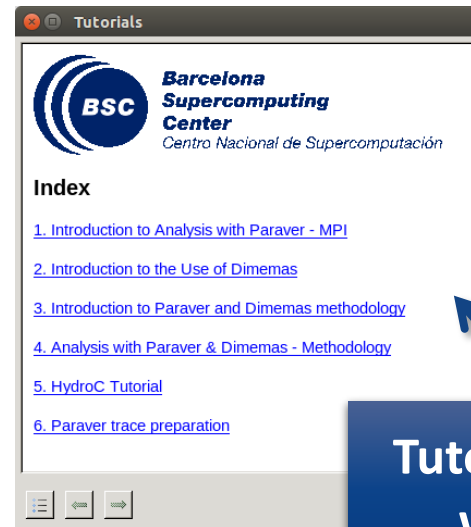
Click Browse and
select your folder
“tutorials”

Install Paraver (IV)

- Check tutorials are properly installed



Click on Help →
Tutorials



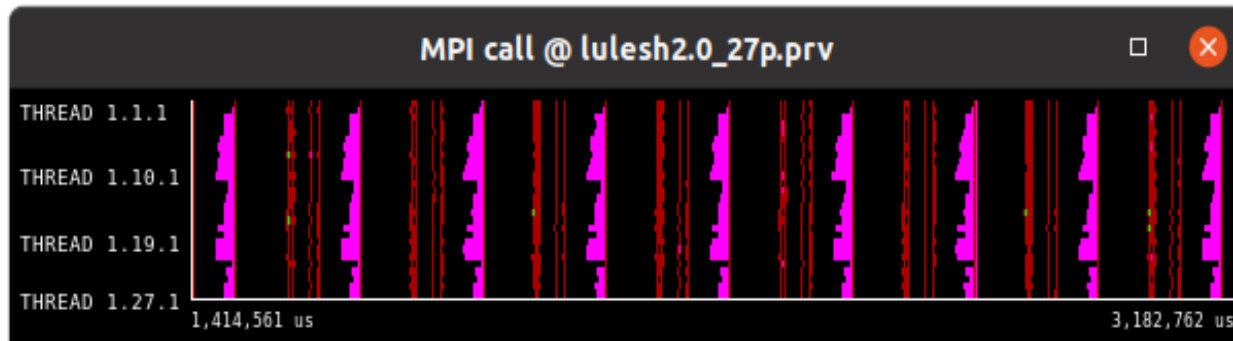
Tutorials window
will pop-up

- Follow these tutorials by clicking on the hyperlinks and reading the explanations. When you click on a link, different views will open.

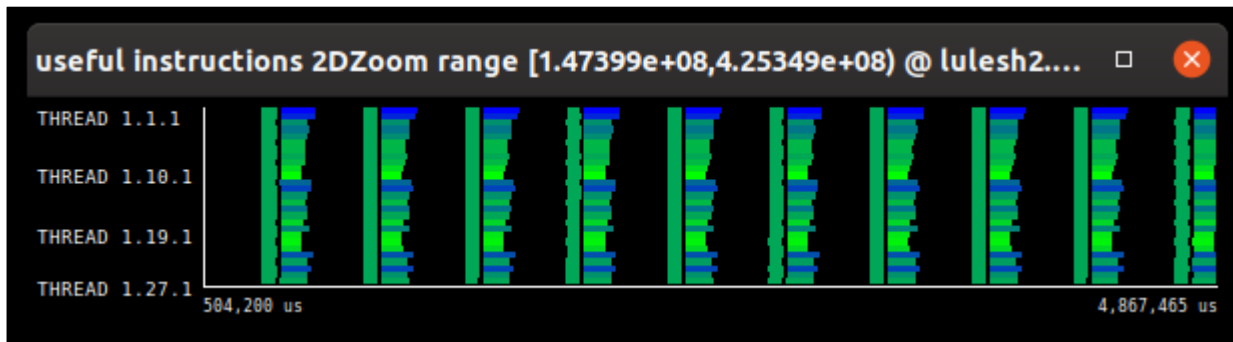
3 main views of Paraver (I)

- Timeline

Processes (or threads)



Code color
(e.g. 1 color
for each MPI
call)



Gradient color
(e.g. from low
#instructions
to high
#instructions)

Time

3 main views of Paraver (II)

- Table (Profile)

← Categories (e.g. MPI calls) →

The table can display a variety of statistics (e.g. % of time, # of calls, etc.) with gradient coloring showing from low values to high values

↑ Processes (or threads) ↓

Summary

MPI call profile @ lulesh2.0_27p.prv

	Outside MPI	MPI_Isend	MPI_Irecv	MPI_Wait	MPI_Waitall	MPI_Barrier	MPI_Reduce	MPI
THREAD 1.1.1	99.04 %	0.05 %	0.06 %	0.35 %	0.30 %	0.03 %	0.00 %	
THREAD 1.2.1	97.37 %	0.07 %	0.08 %	0.20 %	0.82 %	0.03 %	0.00 %	
THREAD 1.3.1	93.79 %	0.05 %	0.05 %	0.22 %	0.52 %	0.03 %	0.02 %	
THREAD 1.4.1	93.93 %	0.07 %	0.08 %	0.17 %	0.61 %	0.03 %	0.00 %	
THREAD 1.5.1	93.75 %	0.11 %	0.11 %	0.38 %	0.19 %	0.01 %	0.00 %	
THREAD 1.6.1	91.64 %	0.08 %	0.08 %	0.10 %	0.74 %	0.02 %	0.00 %	
THREAD 1.7.1	91.24 %	0.06 %	0.05 %	0.16 %	0.42 %	0.03 %	0.11 %	
THREAD 1.8.1	91.93 %	0.08 %	0.08 %	0.16 %	0.76 %	0.03 %	0.00 %	
THREAD 1.9.1	91.20 %	0.06 %	0.05 %	0.14 %	0.59 %	0.02 %	0.50 %	
THREAD 1.10.1	90.47 %	0.08 %	0.07 %	0.33 %	0.37 %	0.03 %	0.00 %	
THREAD 1.11.1	89.19 %	0.12 %	0.11 %	0.35 %	0.30 %	0.01 %	0.70 %	
THREAD 1.12.1	95.80 %	0.09 %	0.07 %	0.19 %	0.83 %	0.03 %	0.00 %	
THREAD 1.13.1	96.04 %	0.12 %	0.10 %	0.41 %	0.33 %	0.01 %	0.00 %	
THREAD 1.14.1	94.61 %	0.18 %	0.15 %	0.15 %	0.35 %	0.00 %	0.00 %	
THREAD 1.15.1	93.28 %	0.13 %	0.10 %	0.10 %	1.21 %	0.01 %	0.00 %	
THREAD 1.16.1	91.67 %	0.09 %	0.07 %	0.26 %	2.01 %	0.03 %	0.00 %	
THREAD 1.17.1	93.28 %	0.13 %	0.10 %	0.11 %	1.06 %	0.01 %	0.45 %	
THREAD 1.18.1	89.56 %	0.09 %	0.07 %	0.16 %	1.72 %	0.03 %	0.00 %	
THREAD 1.19.1	94.06 %	0.06 %	0.04 %	0.13 %	0.47 %	0.03 %	0.00 %	
THREAD 1.20.1	89.39 %	0.10 %	0.06 %	0.25 %	1.05 %	0.03 %	0.00 %	
THREAD 1.21.1	89.62 %	0.07 %	0.04 %	0.22 %	0.30 %	0.03 %	0.90 %	
THREAD 1.22.1	88.08 %	0.09 %	0.06 %	0.26 %	2.02 %	0.03 %	0.00 %	
THREAD 1.23.1	98.19 %	0.14 %	0.10 %	0.16 %	0.62 %	0.01 %	0.00 %	
THREAD 1.24.1	94.10 %	0.10 %	0.06 %	0.12 %	1.24 %	0.02 %	0.00 %	
THREAD 1.25.1	96.05 %	0.07 %	0.04 %	0.29 %	0.26 %	0.02 %	0.00 %	
THREAD 1.26.1	93.10 %	0.10 %	0.06 %	0.13 %	1.13 %	0.03 %	0.00 %	
THREAD 1.27.1	94.24 %	0.08 %	0.04 %	0.18 %	0.39 %	0.02 %	0.00 %	
Total	2,514.62 %	2.44 %	1.99 %	5.69 %	20.63 %	0.60 %	2.72 %	
Average	93.13 %	0.09 %	0.07 %	0.21 %	0.76 %	0.02 %	0.10 %	
Maximum	99.04 %	0.18 %	0.15 %	0.41 %	2.02 %	0.03 %	0.90 %	
Minimum	88.08 %	0.05 %	0.04 %	0.10 %	0.19 %	0.00 %	0.00 %	
StDev	2.79 %	0.03 %	0.03 %	0.09 %	0.51 %	0.01 %	0.24 %	
Avg/Max	0.94	0.50	0.49	0.52	0.38	0.72	0.11	

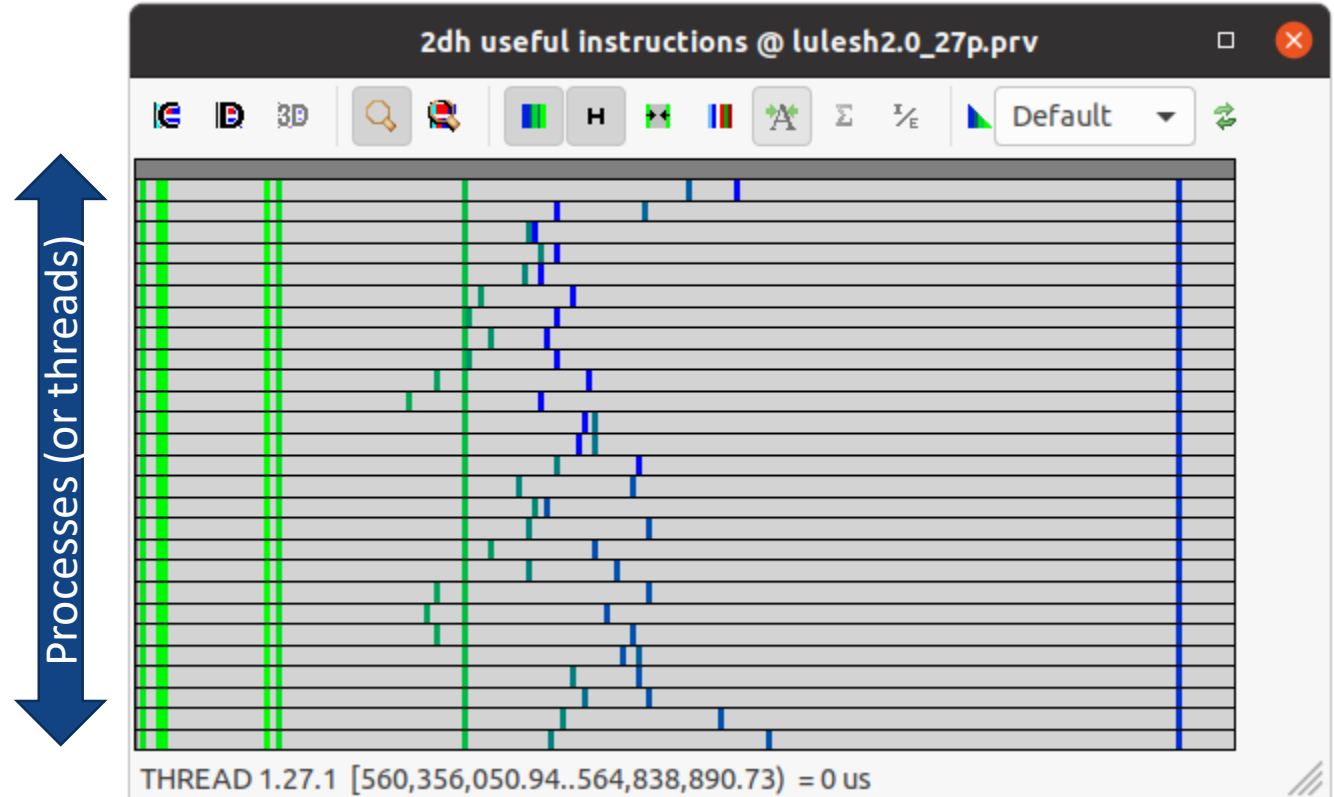
3 main views of Paraver (III)

- Histogram

Displays continuous metrics (e.g. **instructions executed**, duration of computations, bytes sent/received, etc.)

Gradient color represents if that behavior is **unfrequent** or **very frequent**

General tip: straight lines are good (all processes show same behavior), while variabilities usually indicate imbalances



Data on the left-side → Program shows low values of the metric (e.g. low instructions executed)

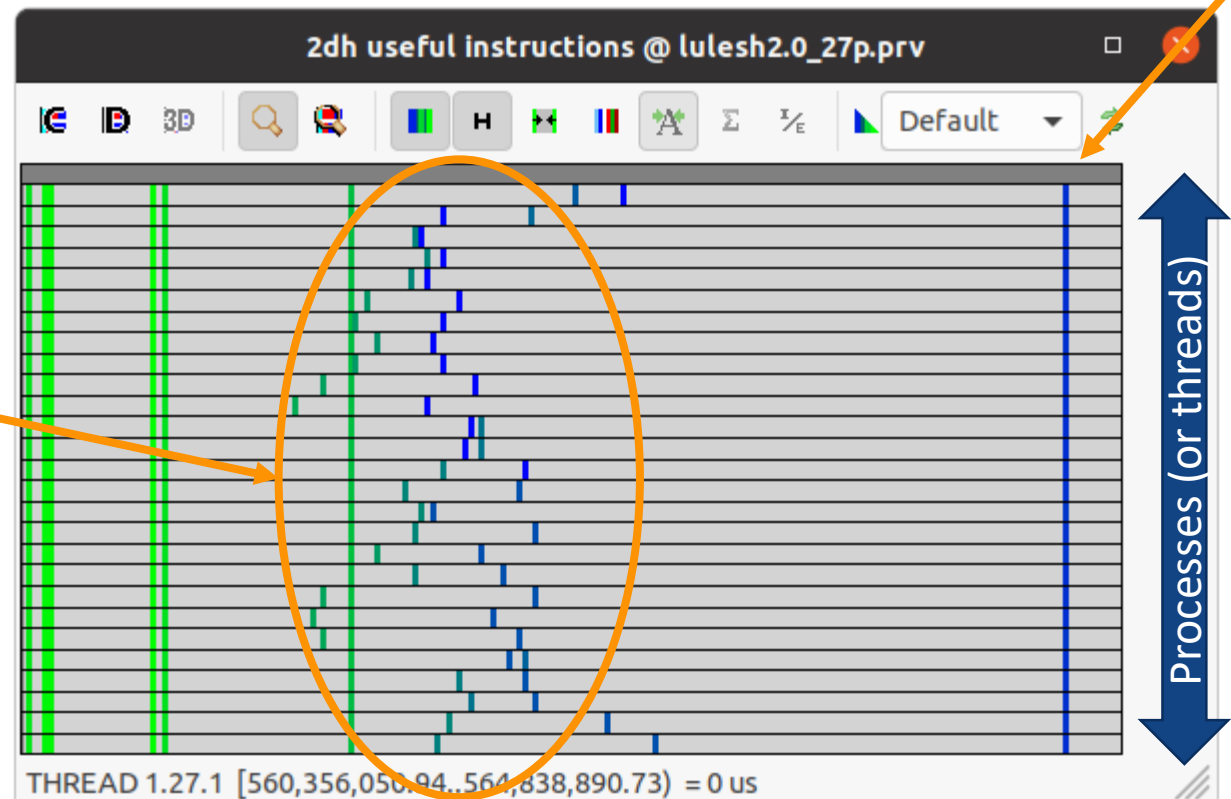
Data on the right-side → Program shows high values of the metric (e.g. high instructions executed)

3 main views of Paraver (III)

- Histogram

This straight line on the right of the X-axis indicates that the program executed a very high number of instructions, and all processes did the same amount of work as there are no variations along the Y-axis. This behavior is very frequent, thus is drawn in **dark blue**.

This cloud of points in the middle of the X-axis indicates that the program executed a medium-number of instructions, but different processes (Y-axis) do different amounts of work (more work when data is more to the right; less work when data is more to the left). Doing less work is a less frequent behaviour, thus is drawn in **green**.



First steps with Paraver

- Follow tutorial number...
 - 1 → Explains basic navigation with the tool
 - 3 → Basic analysis methodology (first 4 bullets, Clustering and Dimemas part not covered)
 - 5 → For advanced users, this is an example of a real analysis

