Paraver Hands-On

✉ tools@bsc.es

DEEP-EST Early Access Programme

Install Paraver in your laptop / desktop

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

Pick your version

Install Paraver (II)

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

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
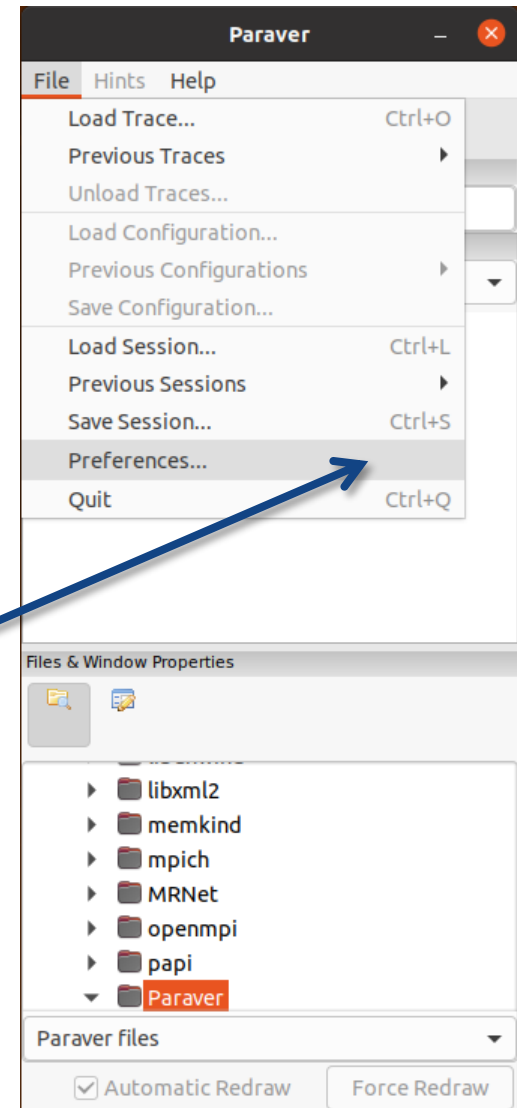
Install Paraver (IV)

- Setup the "Tutorials root" pointing to your folder "tutorials"
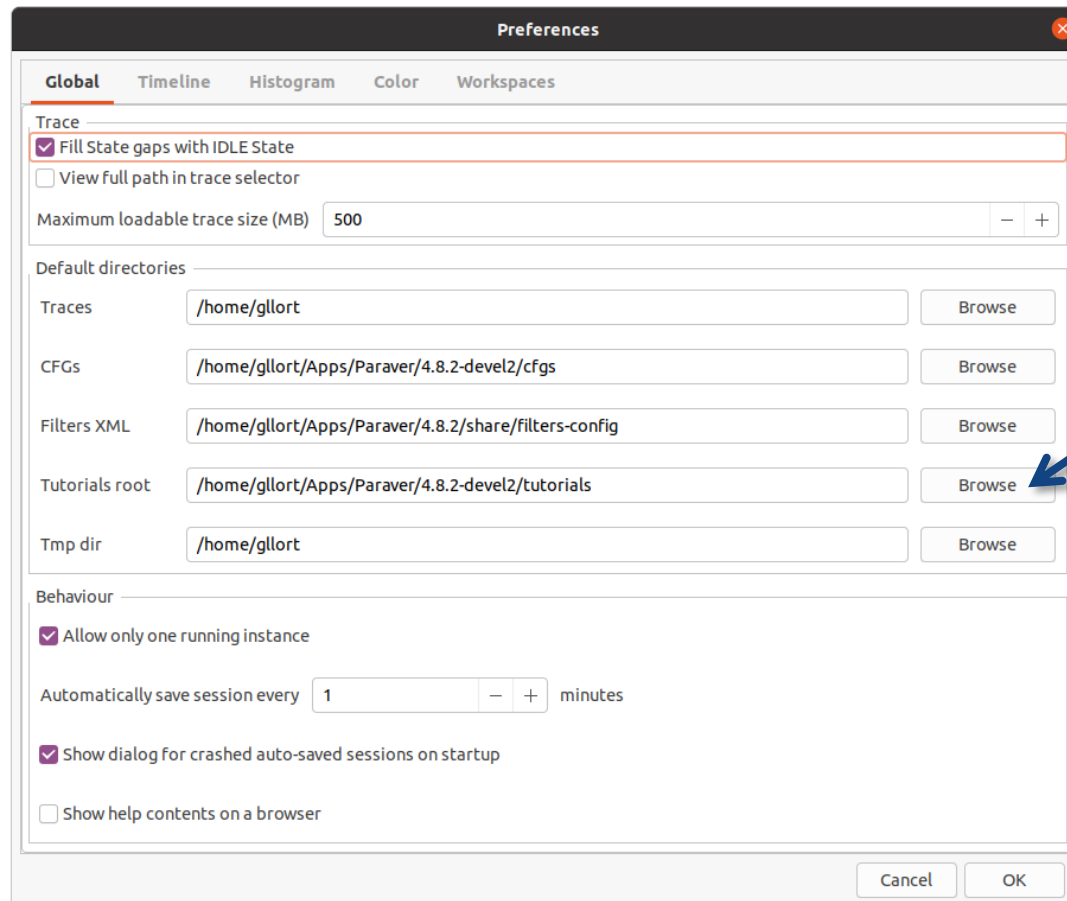
Click Browse and select your folder "tutorials"

Install Paraver (IV)

- Check tutorials are properly installed
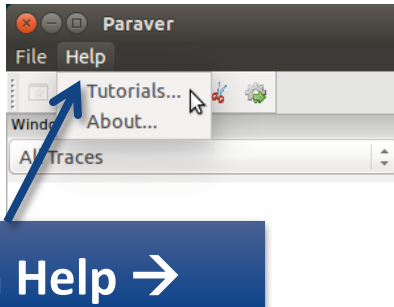
Click on Help → Tutorials
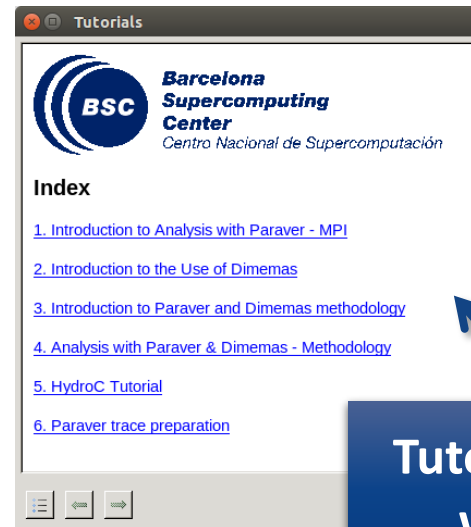
Tutorials window will pop-up

- 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) (vertical axis label)

MPI call @ lulesh2.0_27p.prv

THREAD 1.1.1
THREAD 1.10.1
THREAD 1.19.1
THREAD 1.27.1

1,414,561 us — 3,182,762 us
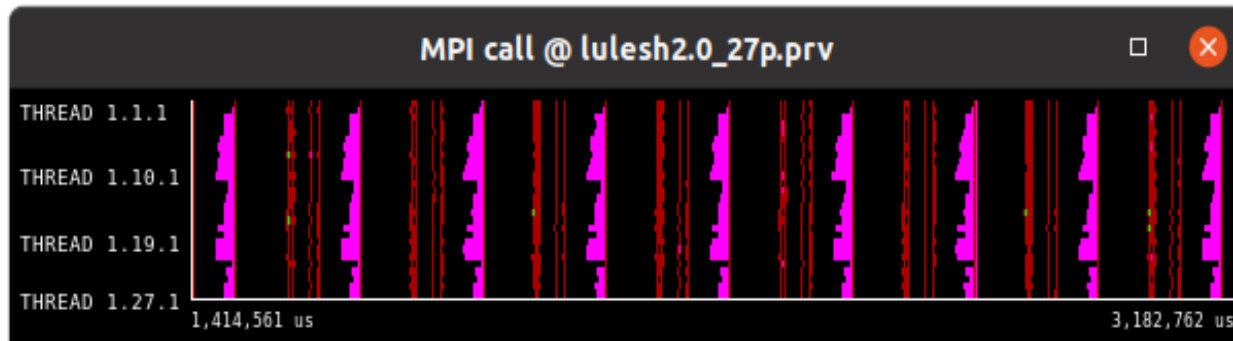
Code color (e.g. 1 color for each MPI call)

useful instructions 2DZoom range [1.47399e+08,4.25349e+08) @ lulesh2....

THREAD 1.1.1
THREAD 1.10.1
THREAD 1.19.1
THREAD 1.27.1

504,200 us — 4,867,465 us
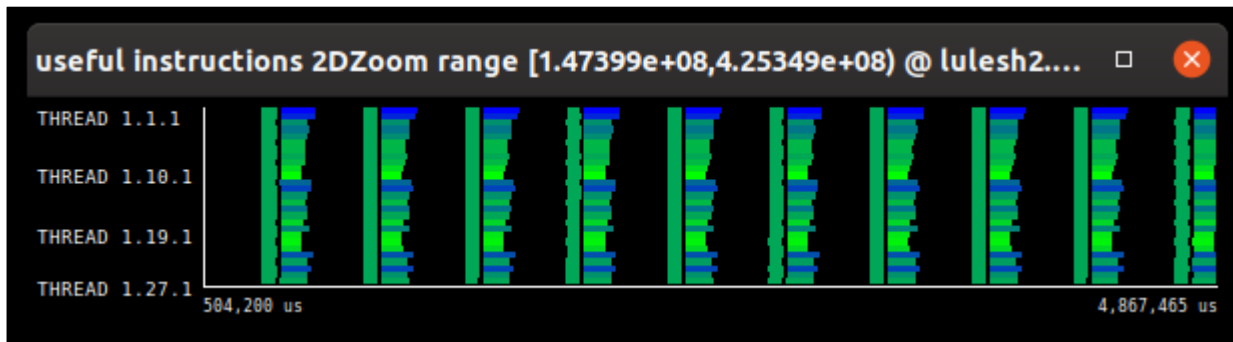
Gradient color (e.g. from low #instructions to high #instructions)

Time

Barcelona Supercomputing Center
Centro Nacional de Supercomputación
BSC

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)

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 %	0.09 %	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	

Summary

Barcelona
Supercomputing
Center
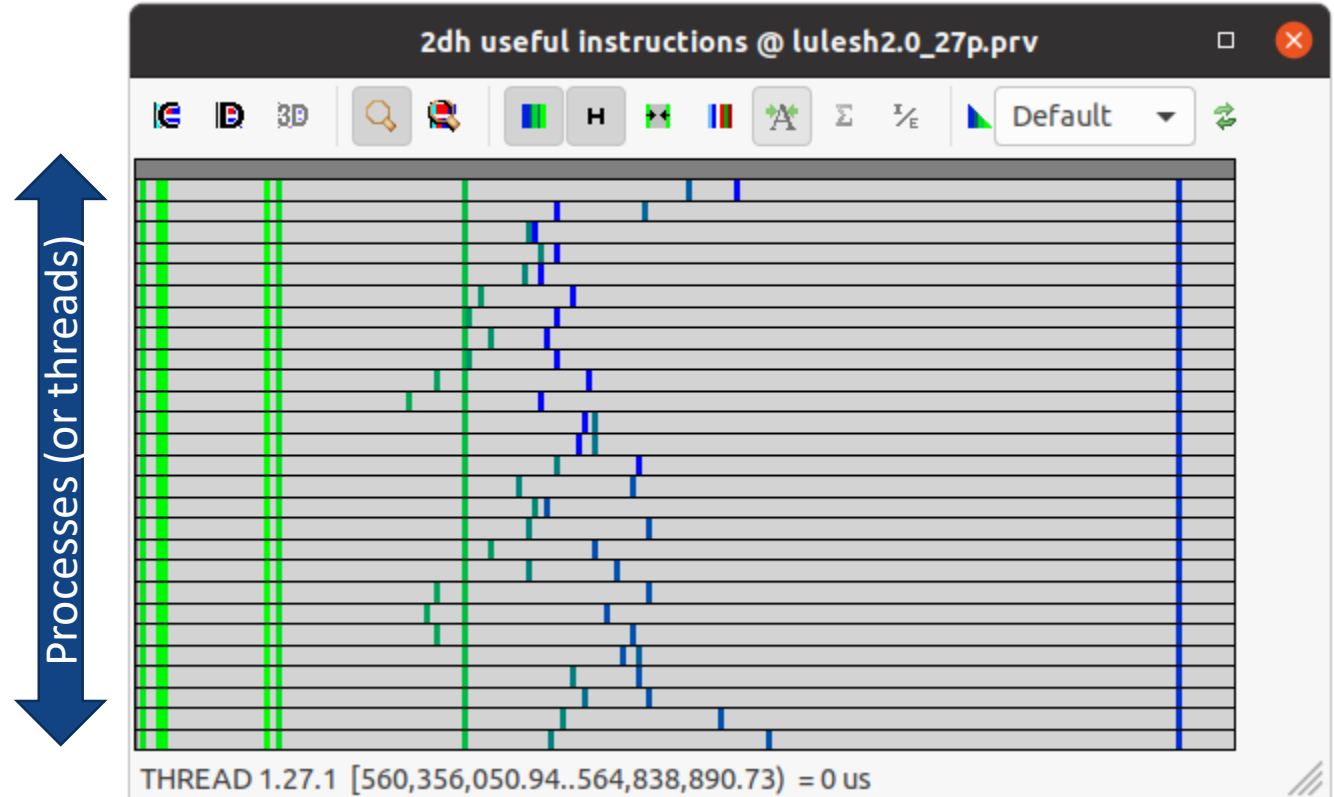Centro Nacional de Supercomputación

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

2dh useful instructions @ lulesh2.0_27p.prv

Default

Processes (or threads)

THREAD 1.27.1 [560,356,050.94..564,838,890.73] = 0 us

Bins

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)

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

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.

2dh useful instructions @ lulesh2.0_27p.prv

Default

THREAD 1.27.1 [560,356,050.94..564,838,890.73) = 0 us

Processes (or threads)

Bins
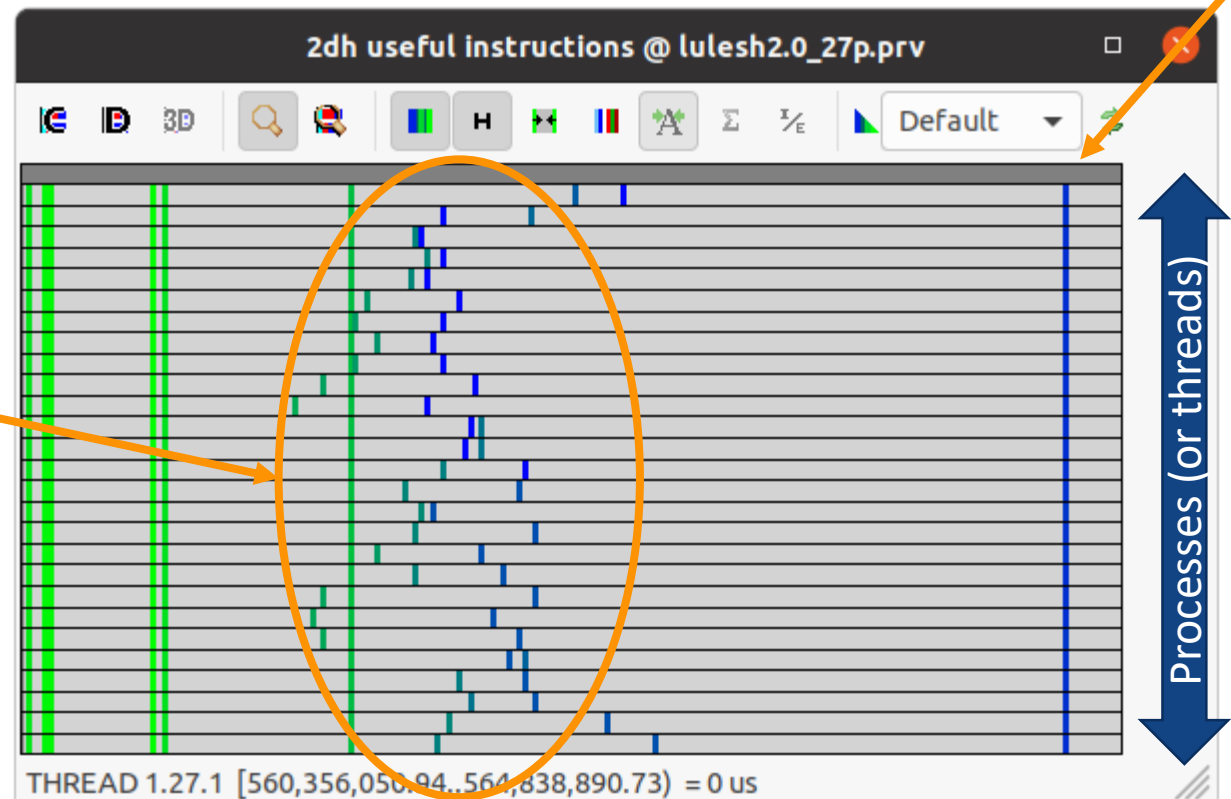
First steps with Paraver

- 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