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**Barcelona
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Centro Nacional de Supercomputación

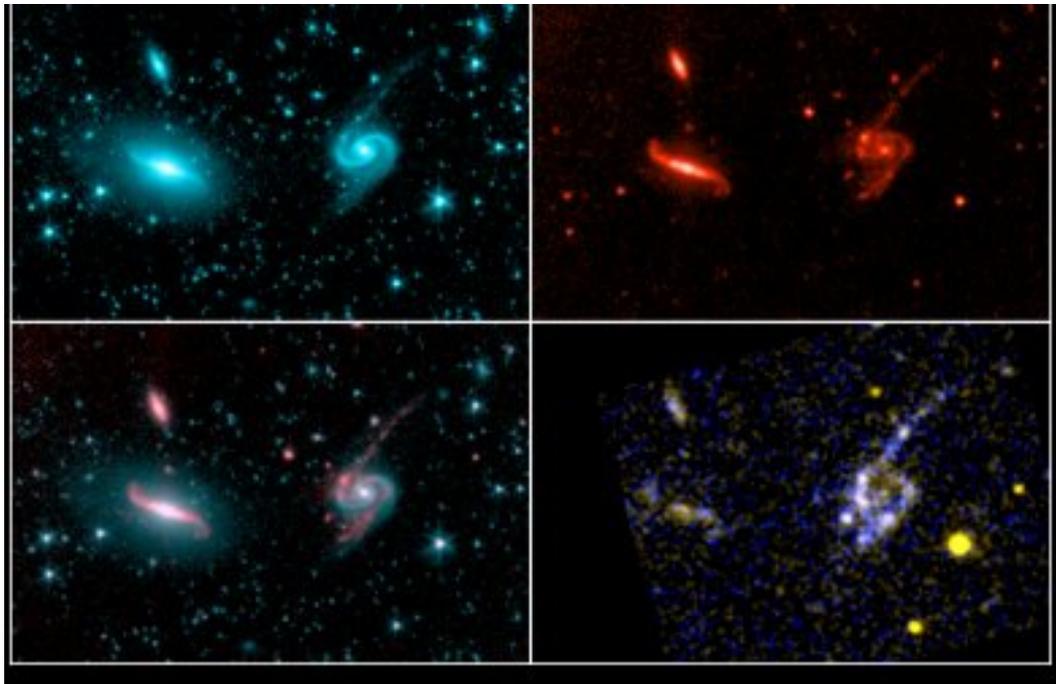
Understanding applications with Paraver

Judit Gimenez, Jesús Labarta

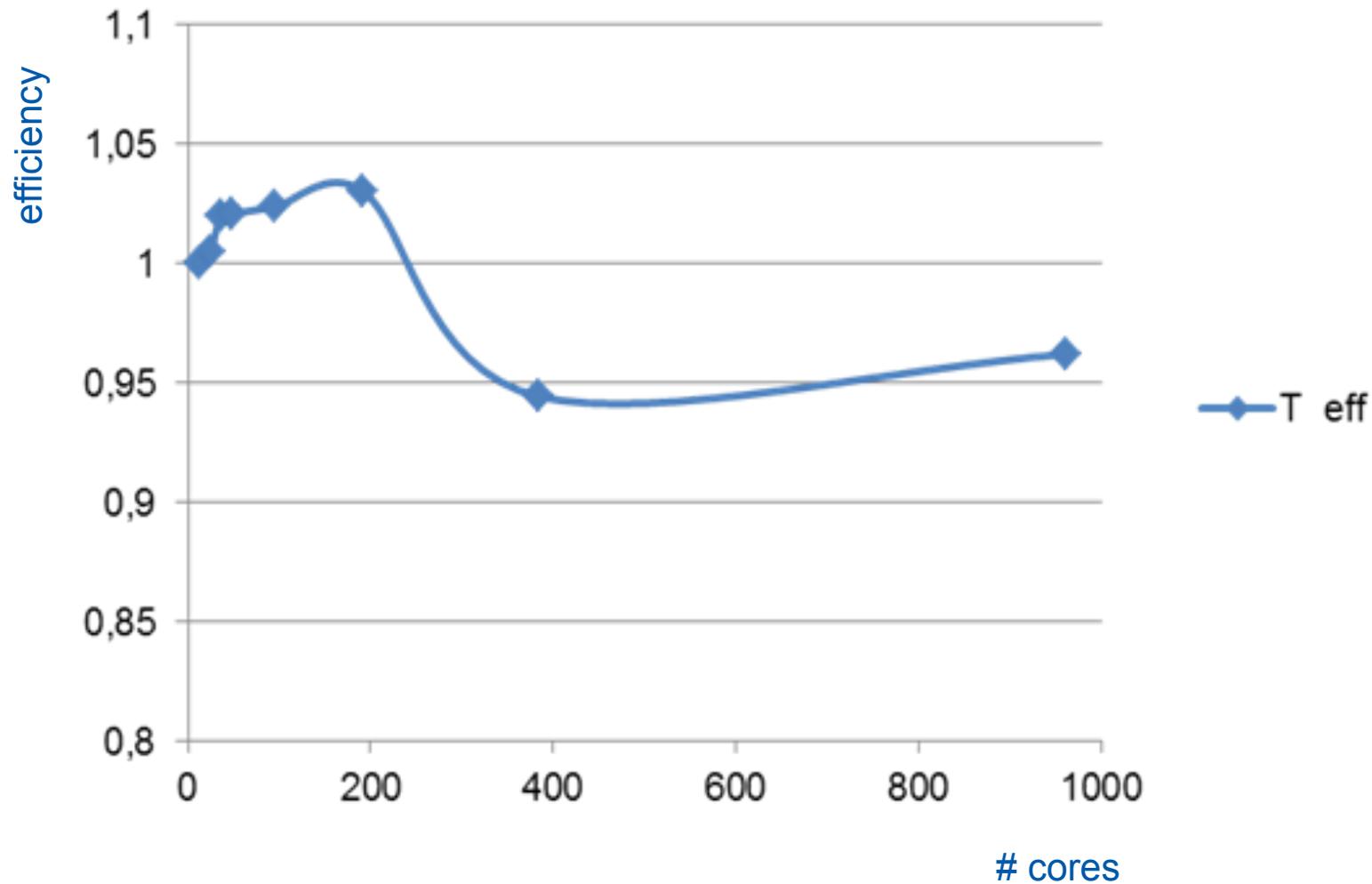
Joint European Exascale Projects Workshop

Multispectral imaging

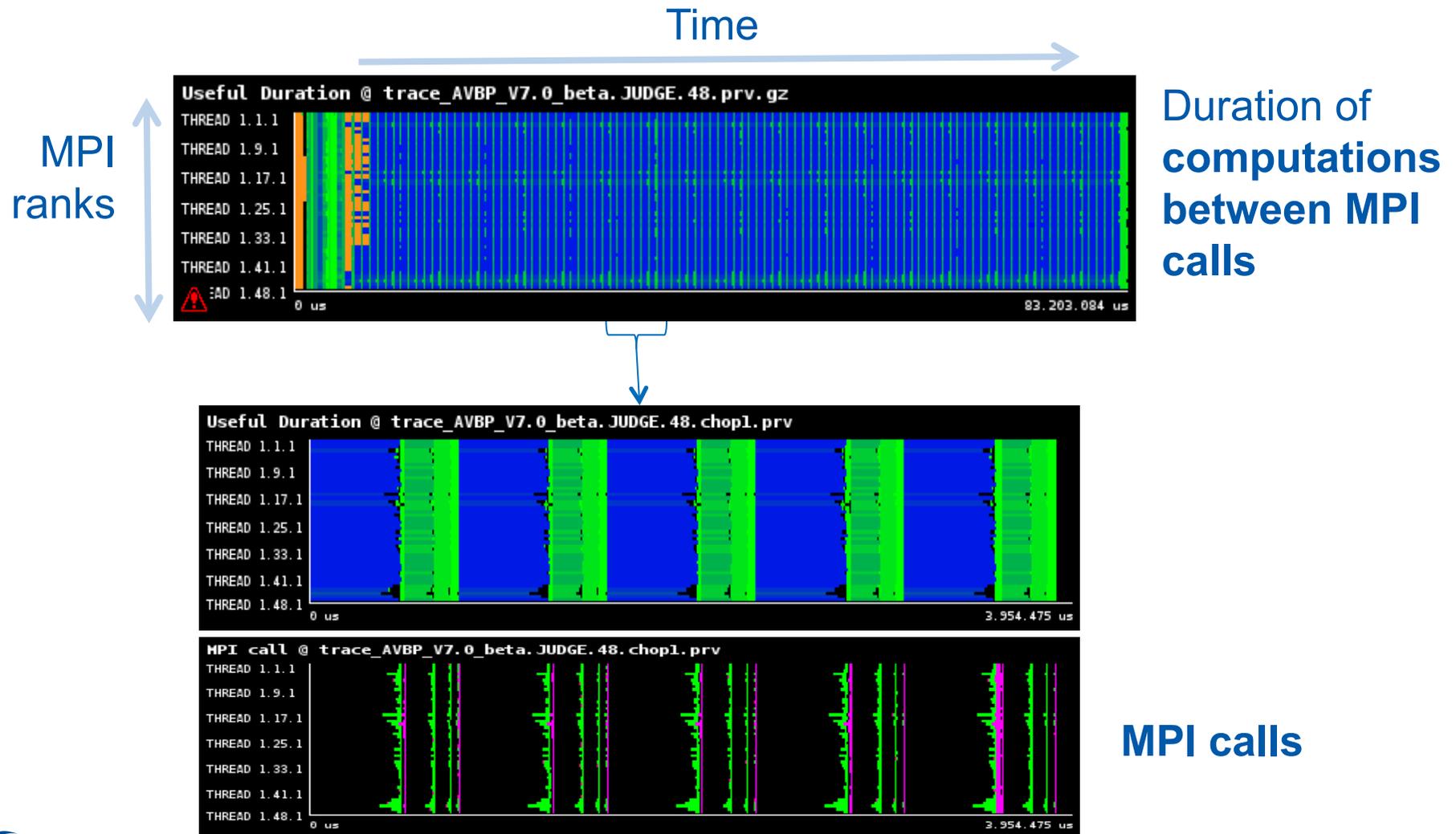
- ⌋ Different looks at one reality
 - Different spectral bands (light sources and filters)
- ⌋ Highlight different aspects
 - Can combine into false colored but highly informative images



AVBP (CFD) – Strong scale efficiency (12 – 960)



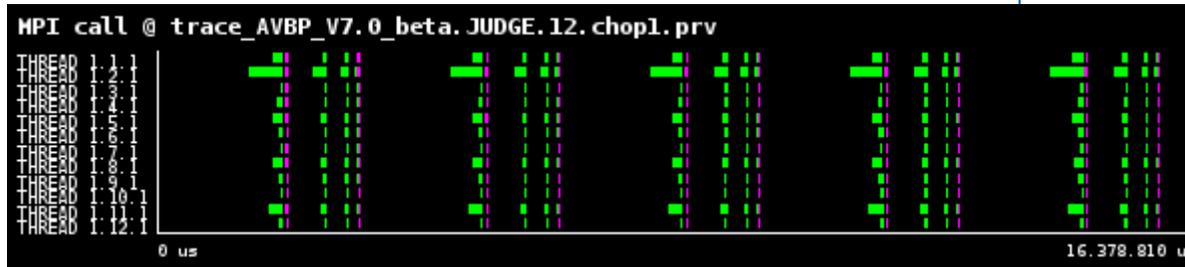
Identifying iterations



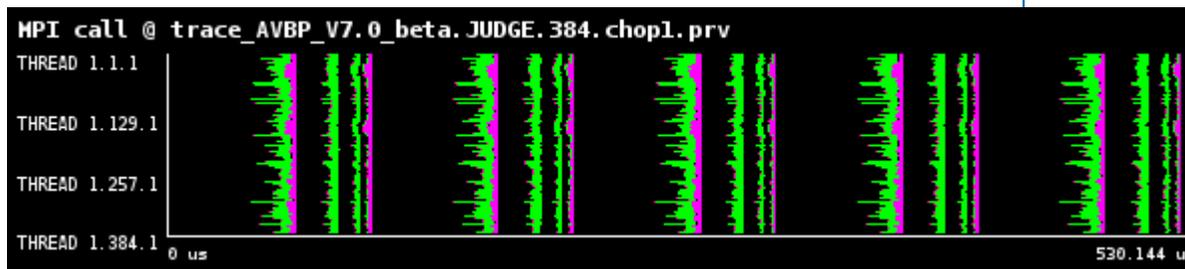
Comparing different core counts

5 iterations

12 ranks

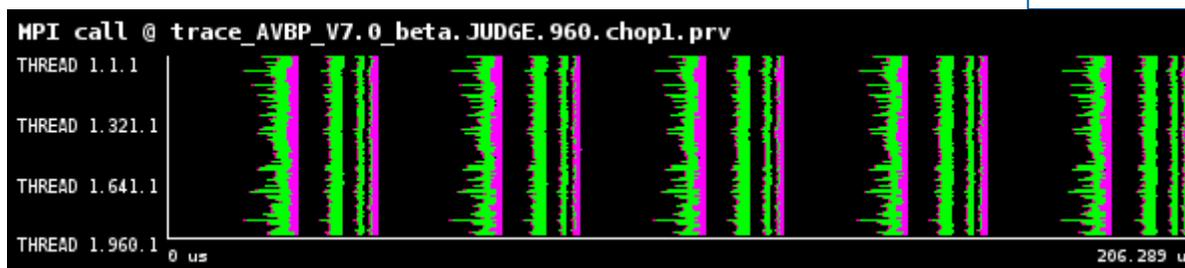


384 ranks



Different time scale

960 ranks



Measuring Parallel efficiency

Parallel Efficiency:

- $\eta_{||} = LB * Ser * Trf$

– Load Balance:

- $LB = \frac{\sum_i t_{li}}{P * \max_i(t_{li})}$

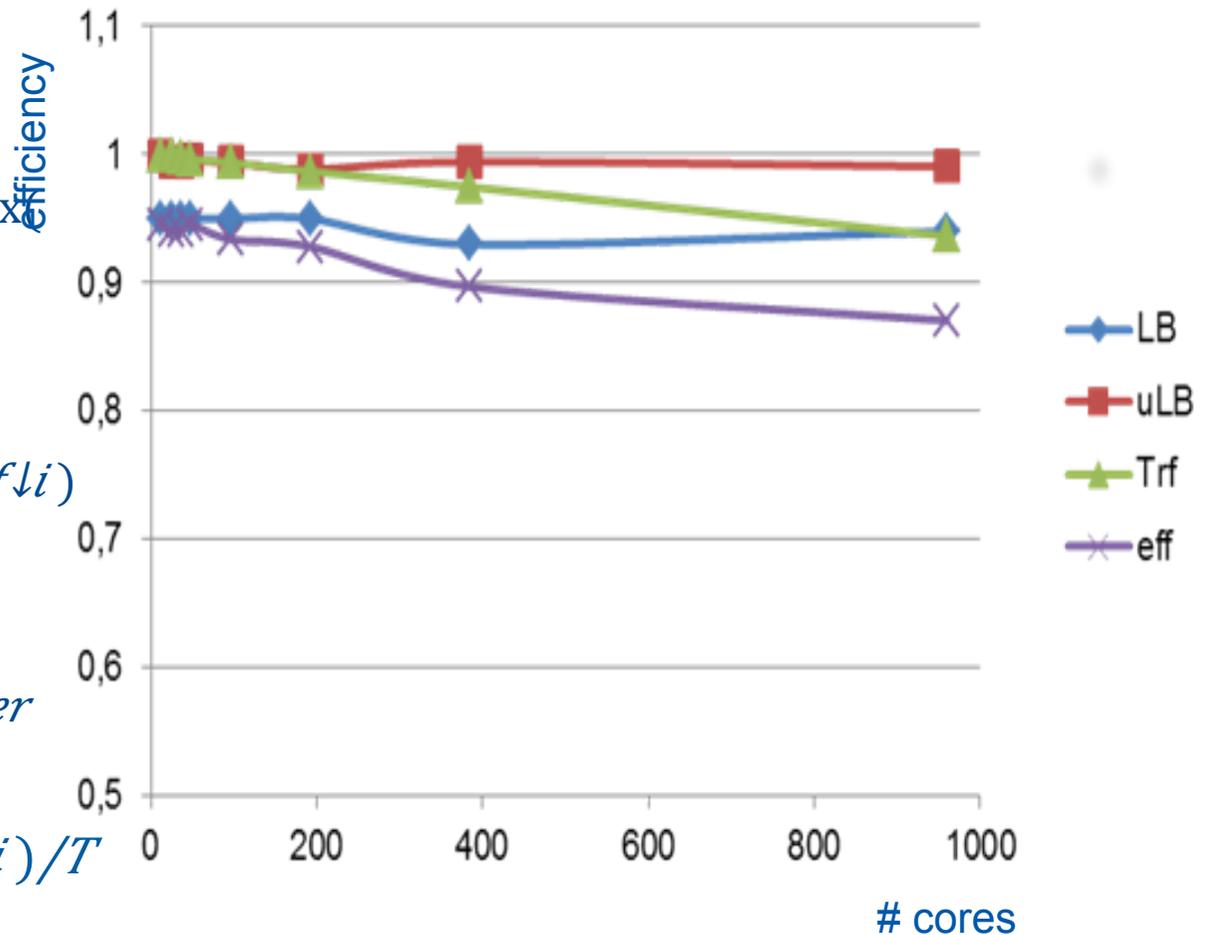
– Serialization:

- $uLB = \max(ideal(t_{li}))$

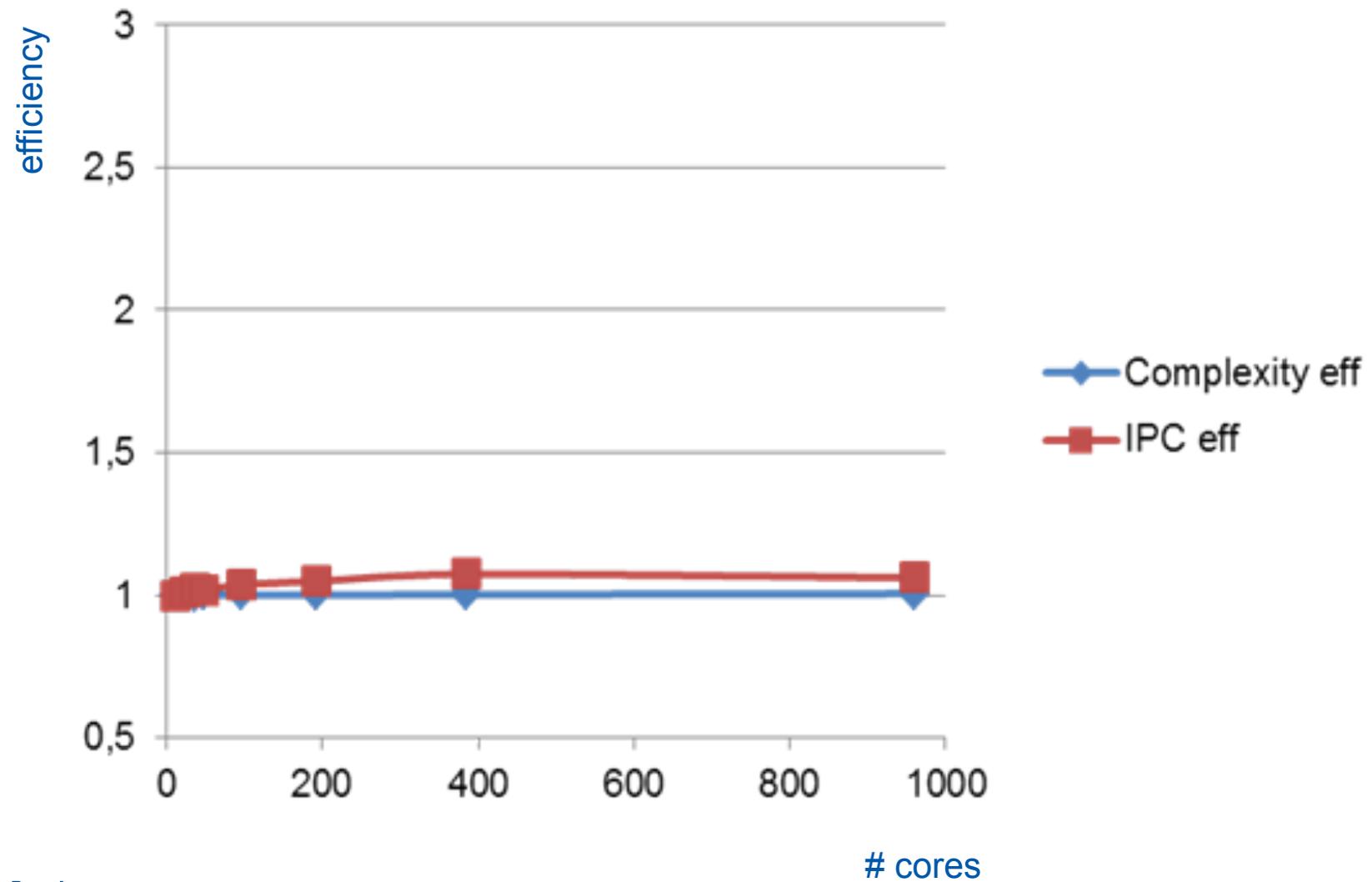
– Transfer:

- $Trf = Comm_{eff} / Ser$

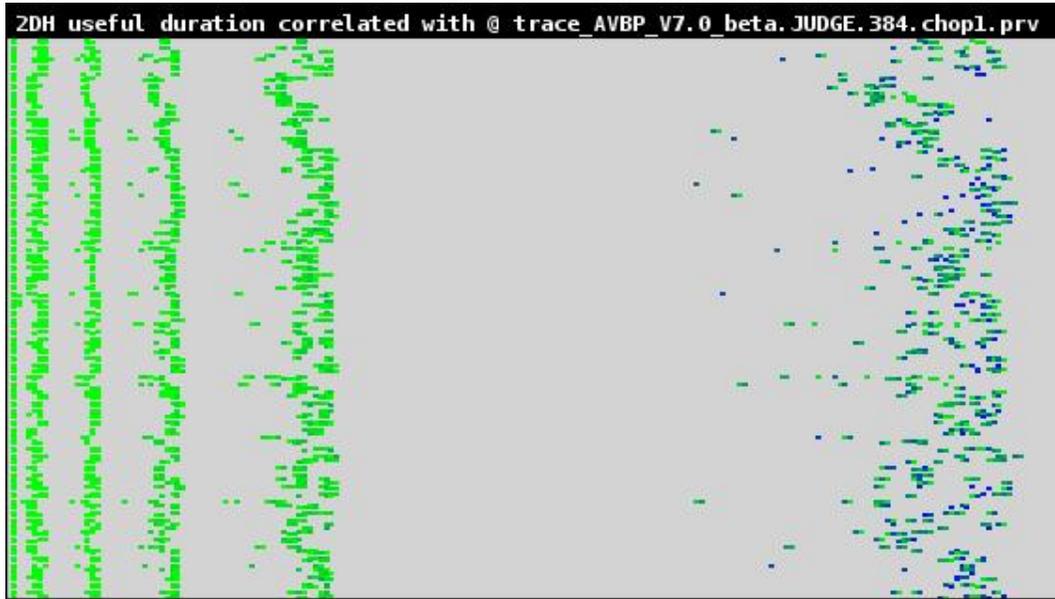
$$Comm_{eff} = \max(t_{li}) / T$$



Checking Computation efficiency



Looking at the variability

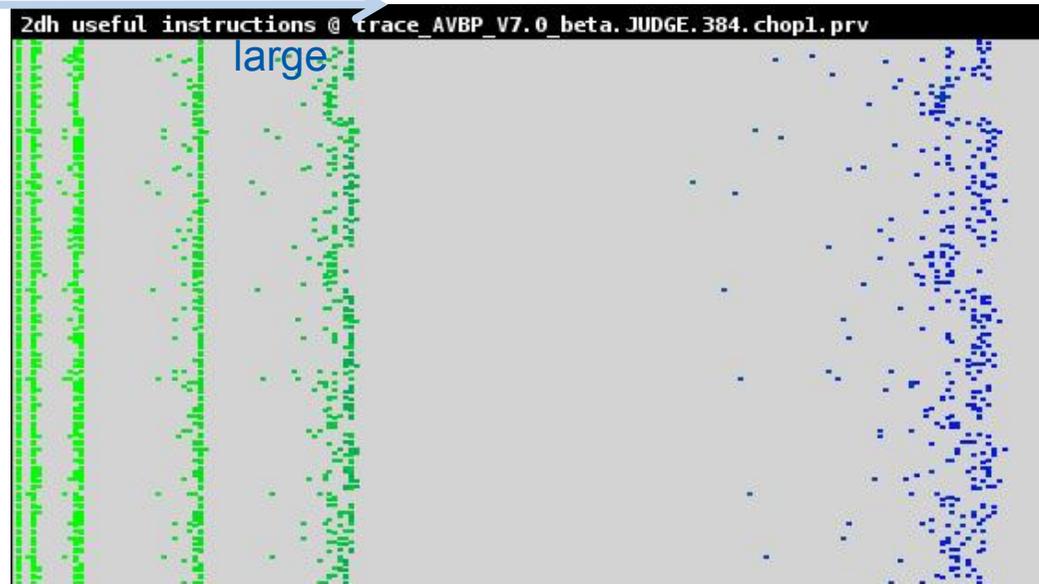


AVBP 384 tasks

MPI ranks

Computing burts duration

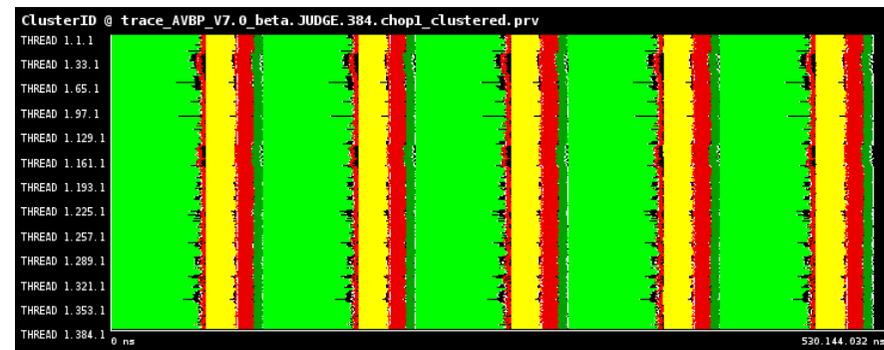
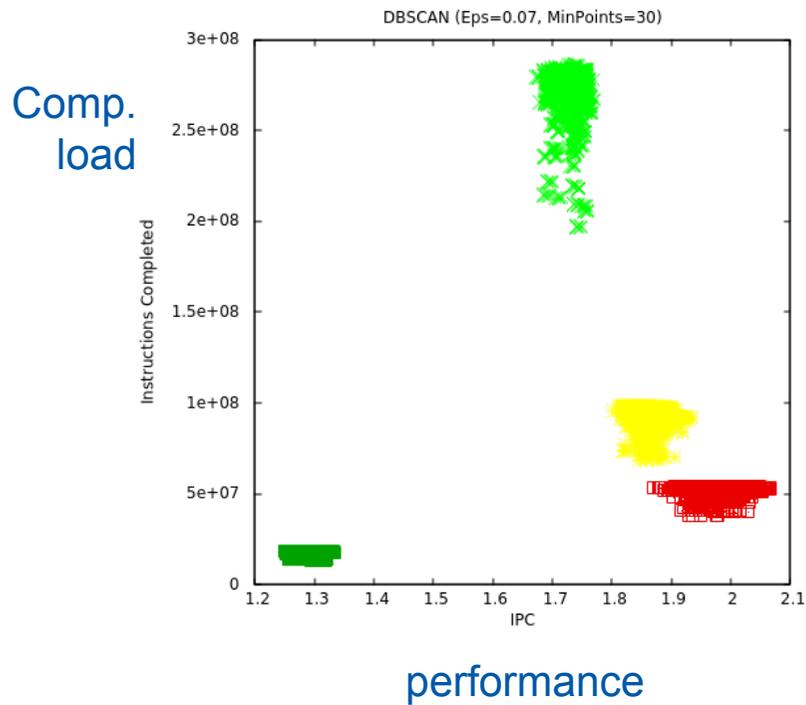
small



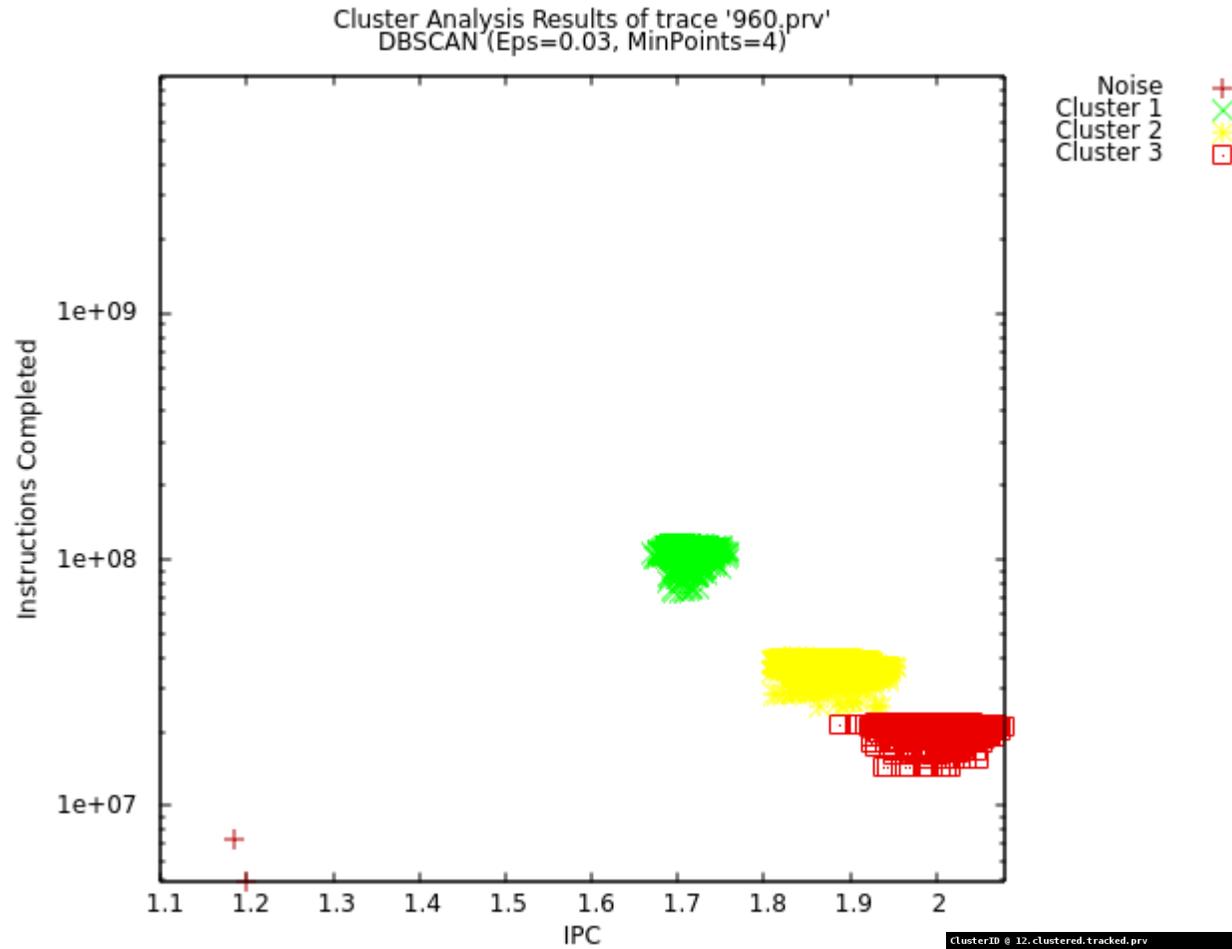
Instructions

Identifying structure (Clustering analysis)

AVBP 384 tasks

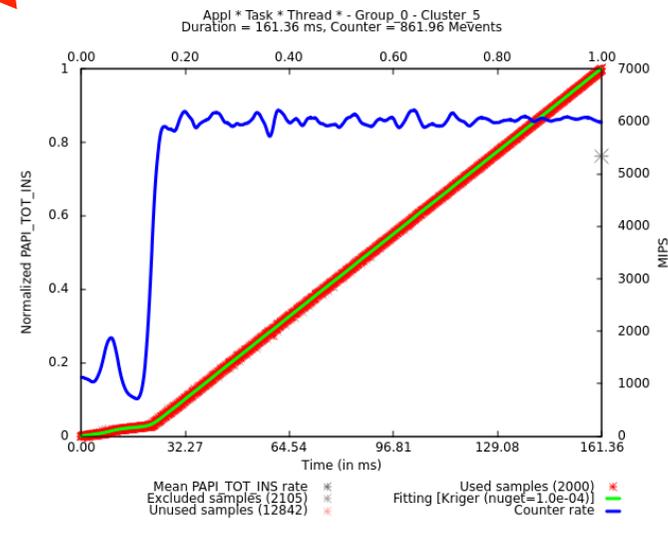
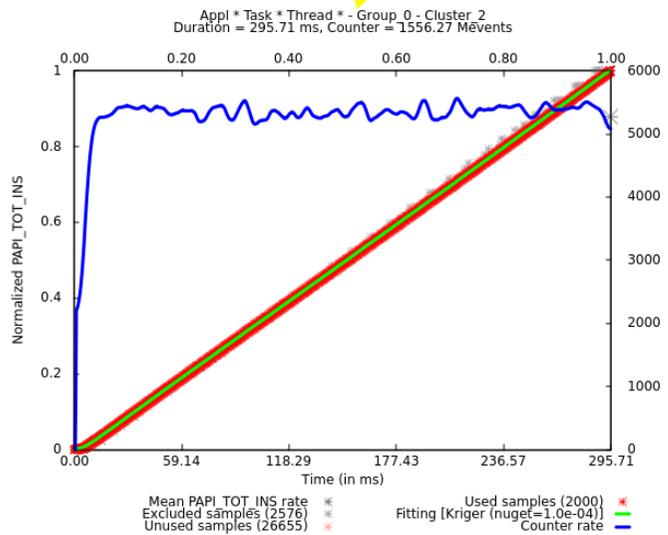
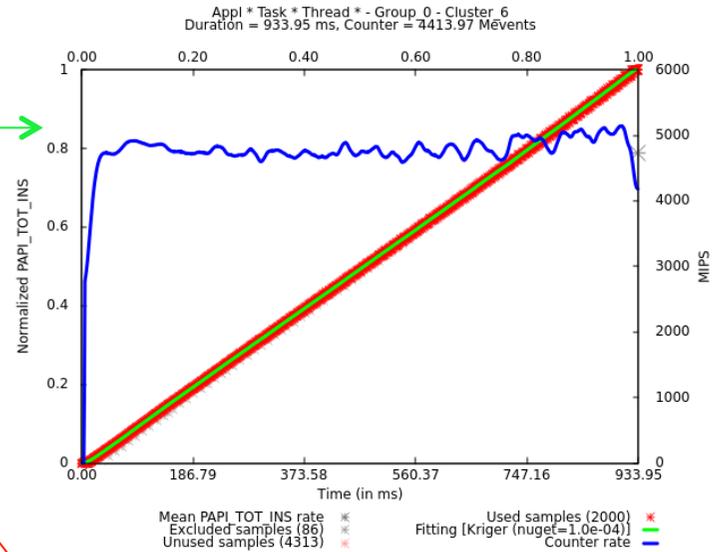
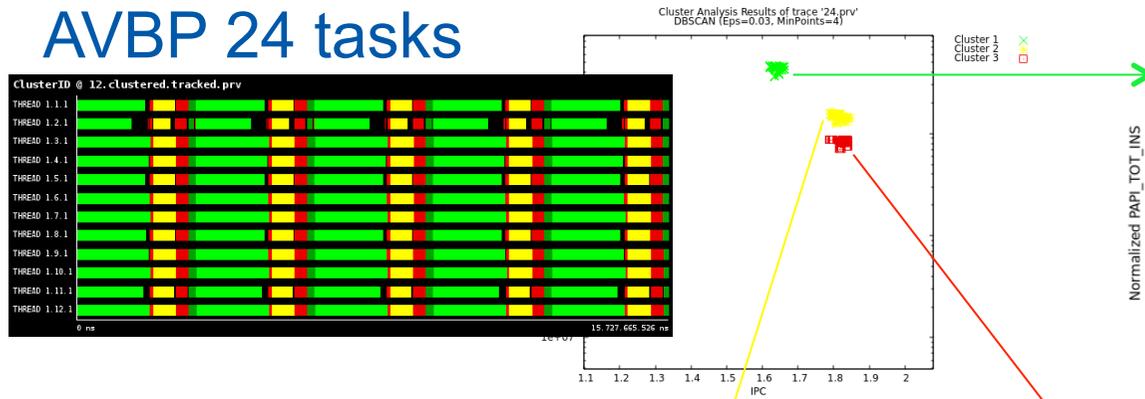


Tracking computations evolution



Instantaneous performance (Folding analysis)

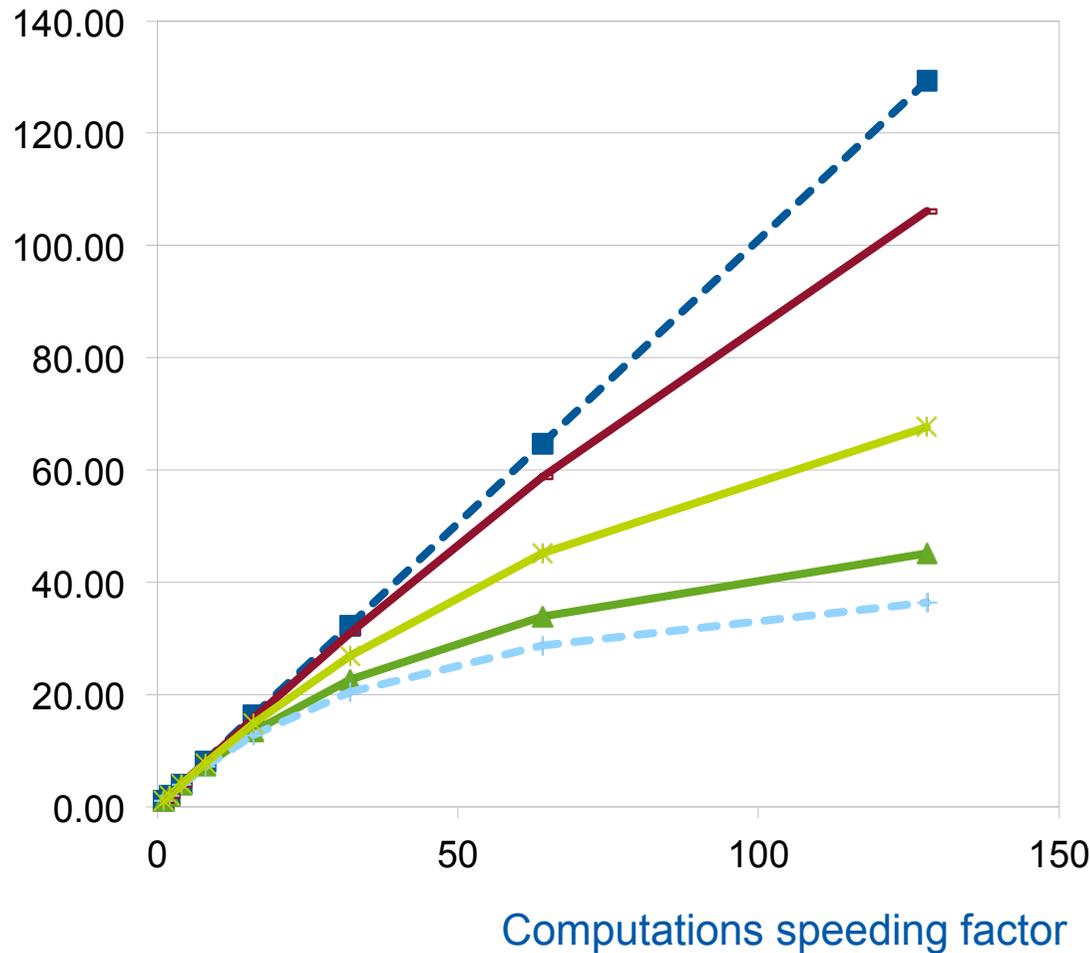
AVBP 24 tasks



Analysing network sensitivity (Dimemas)

Speed w.r.t JUDGE run

AVBP 384 tasks



- L=0us, Bw=unlimited
- ▲- L=4us, Bw=16Gb/s
- L=0.5us, Bw=16Gb/s
- + - L=4us, Bw=1Gb/s
- * - L=0.5us, Bw=8Gb/s

Conclusions

- « Astrophysics enjoy their work :)
- « No need to run large core counts to detect problems at large scale
- « Look at your codes!

www.bsc.es/paraver