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## Writing a Reproducible Article

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# Writing a Reproducible Article

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- HPC applications nowadays use both multi-core CPUs and GPUs
- Managing efficiently computation execution and data transfer is extremely complex
- Need for portable performance  $\leadsto$  **Runtime** system

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Many configuration parameters:

- 1 Task granularity
- 2 Scheduling strategies
- 3 Application structure

Emerging challenges:

- 1 Finding optimal combination of parameters for a given machine
- 2 Evaluate configurations on a wide variety of platforms
- 3 Quickly identify performance issues (e.g., bottlenecks)

Possible solution: **Simulation**

## StarPU

Dynamic runtime for hybrid architectures. StarPU execution consists in scheduling a graph of tasks with data dependencies on the different computing resources

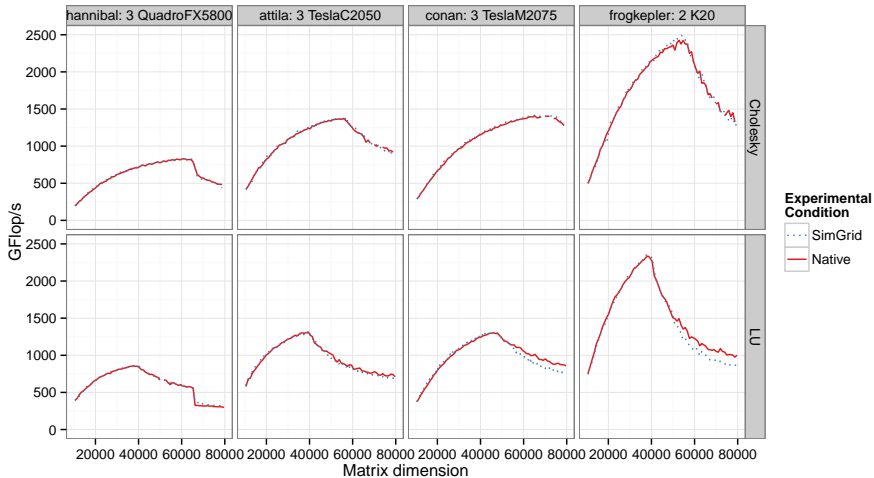
## Simgrid

Versatile simulator for distributed systems

Implementation:

- StarPU applications and runtime are **emulated**
- All operations related to thread synchronization, actual computations and data transfer are **simulated**
- Control part of StarPU is modified to dynamically inject computation and communication tasks into the simulator
- StarPU calibration and platform description is used by Simgrid

# Results





- Works fine **now**, but coming to this point was not easy
- We had to do many iterations of:
  - ① Running **complex beta** code on **several** not always **dedicated** machines
  - ② Comparing with simulations, **debugging**, **understanding**, **remodeling** and going back to step 1 until not satisfied
- With good results, we decided to make a reproducible article
  - ① From outside it looks like any other pdf paper
  - ② From inside . . .

I will try to convince you that our article is not only **reproducible** but also **readable** and **understandable**!

<http://dx.doi.org/10.6084/m9.figshare.928338>



article

analysis

data

experimentation

source code

article

analysis

data

Requires a **daily usage** of a labbook (org, git/svn, ...)

experimentation

source code