((Parallel)Sparse) Solvers @ HiePACS

C2S@Exa IPL technical meeting, September 23 2013, INRIA Paris

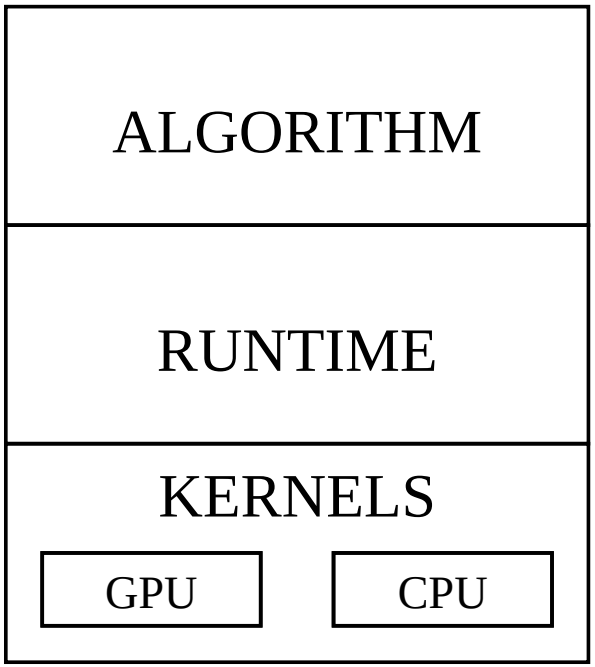
HiePACS

BACCHUS CEPAGE
HIEPACS MANAO
RUNTIME

INRIA Bordeaux Sud-Ouest

September 23, 2013

Multiple layers approach

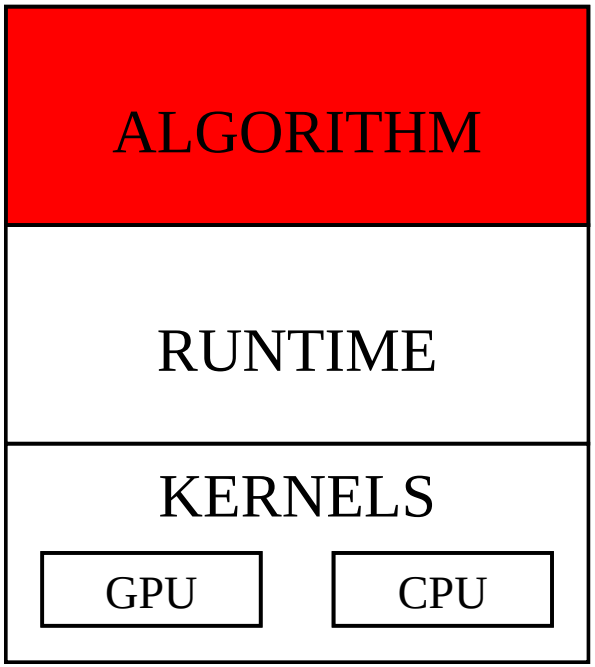


Governing ideas: Enable advanced numerical algorithms to be executed on a scalable unified runtime system for exploiting the full potential of future exascale machines.

Basics:

- Graph of tasks
- Out-of-order scheduling
- Fine granularity

Algorithms



Governing ideas: Design high-level algorithms

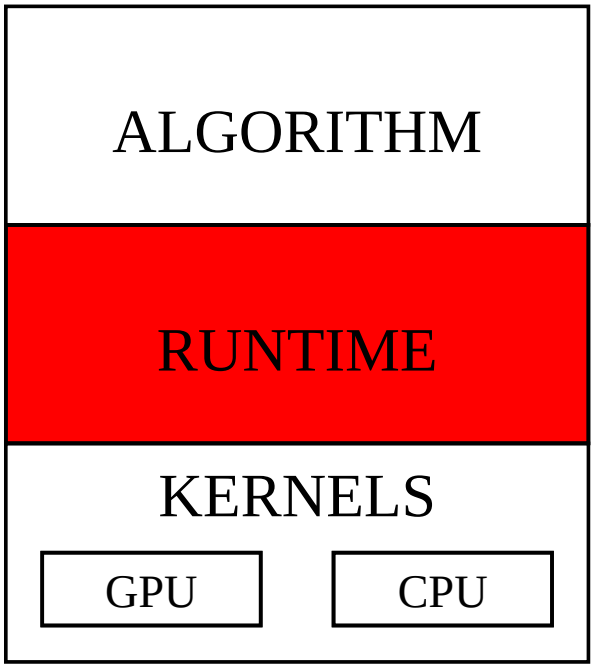
Main challenges:

- Increase concurrency
- Control granularity of tasks
- Trade off numerical accuracy and stability with performance

Fundings and collaborations:

- National: Total, ANR-PETALH, Region Aquitaine, ANR-SOLHAR
- International: AT-FastLA, AT-MORSE

Runtimes (from the solvers community perspectives)



Governing ideas: Enable fine interaction between solvers and runtime systems

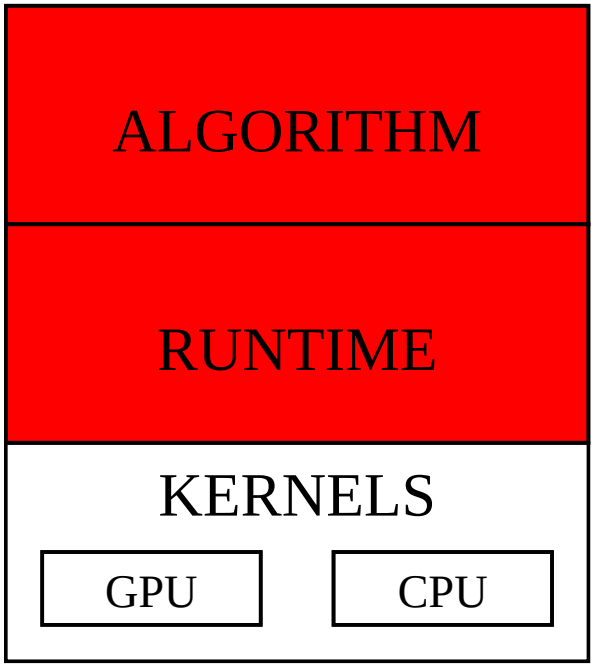
Main challenges:

- Expression of tasks and dependencies
- Exchange information between algorithm and runtime
- Scalability

Fundings and collaborations:

- INRIA Bordeaux: Runtime
- National: Region Aquitaine, ANR-SOLHAR
- International: AT-MORSE

Schedulers (from the solvers community perspectives)



Governing ideas: Advanced scheduling algorithms required for ensuring high performance

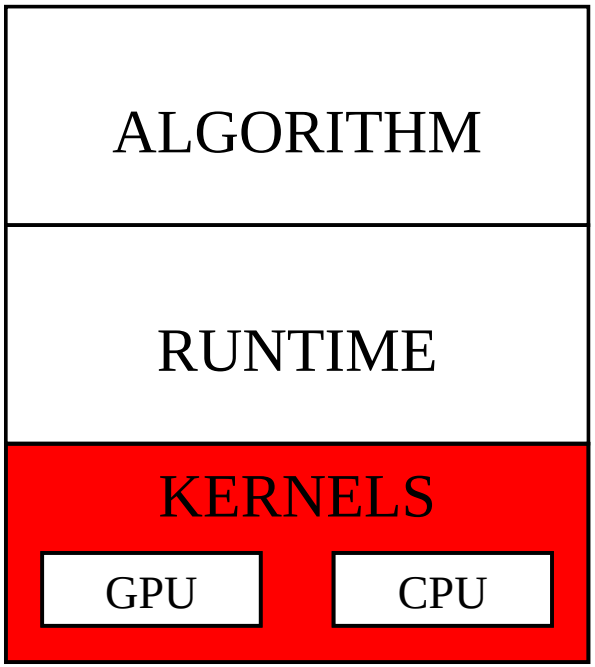
Main challenges:

- Heterogeneous platforms
- Scheduling on millions of cores
- Adjust with feedback from runtime

Collaboration:

- INRIA Bordeaux: Cepage, Runtime
- National: Region Aquitaine, ANR-SOLHAR

Kernels



Governing ideas: Use optimized low-level kernels

Main challenges:

- Possibly use existing kernels
- Otherwise design new kernels for complex hardware
- Automatic generation

Projects and collaborations:

- INRIA Bordeaux: Manao
- National: ANR-PETALH, ANR-SOLHAR
- International: AT-FastLA, AT-MORSE

Tentative on-going HiePACS software unification (1/2)

ADT Centre

- Florent Pruvost (Sep. 2013 - Aug. 2016)
- HiePACS Software: hips, magma-morse (with UTK), maphys, pastix, scalfmm
- Other sofware: dplasma (UTK), h-matrix (EADS), qr-mumps (CNRS/IRIT)
- Main unification tasks:
  - installation and distribution
  - API
  - interaction with runtime systems
  - environment (non-regression, testing, i/o, ...)

Tentative on-going HiePACS software unification (2/2)

ADT AE

- Julien Pedron (Jan. 2013 - Dec. 2014)
- Hybrid solvers
- Software: MAPHYS, HIPS

ADT Centre

- Cyrille Piacibello (Oct. 2013 - Sep. 2014)
- FMM
- Software: ScalFMM

QUESTIONS ?

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RUNTIME