Ultra Scalable Simulation with SimGrid

Program Systèmes Embarqués et Grandes Infrastructures 2008-2011

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AGENCE NATIONALE DE LA RECHERCHE ANR

Outcomes

Faster

- Simulation kernel orders of magnitude faster in 3.7 than in 3.3
- 10x slowdown only to simulate 1M Chord hosts on a single machine

Larger

- Simulate millions of small P2P processes on a single machine
- Simulate hundreds of large MPI processes using memory folding

Stronger

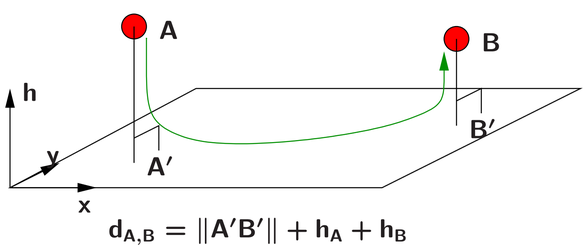
- Nightly builds on PIPOL (200+ tests, 10+ archs., 75% code coverage)
- Less corner cases in TCP model validation

Wider

- Specific models and concepts for P2P simulations
- Various communication actions to enlarge the user base

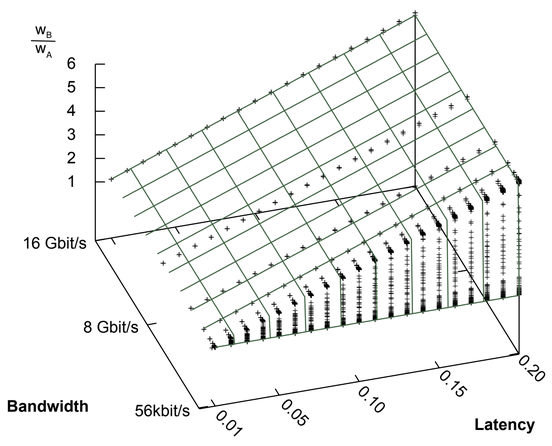
SimGrid is now ready to be the LEADER in simulation of Large-Scale Distributed Computing Systems

Highlight from WP1 Models

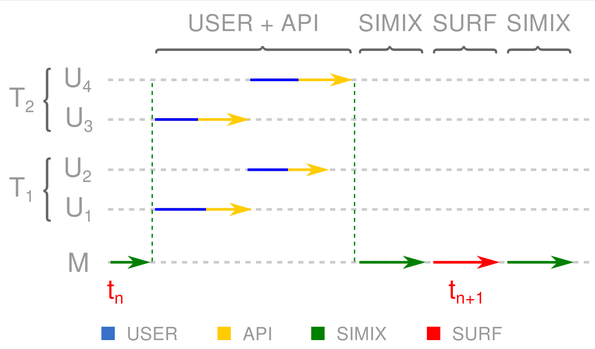


- Vivaldi + Last Mile model

- More validated network models

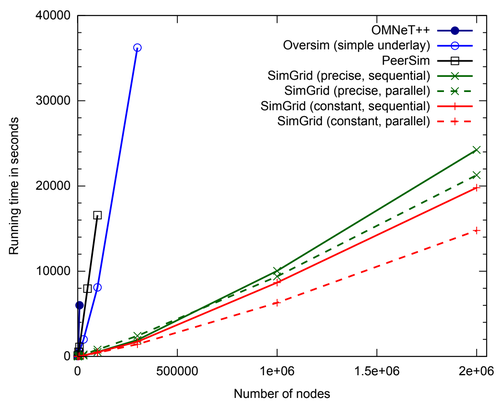


Highlight from WP5 Parallelization

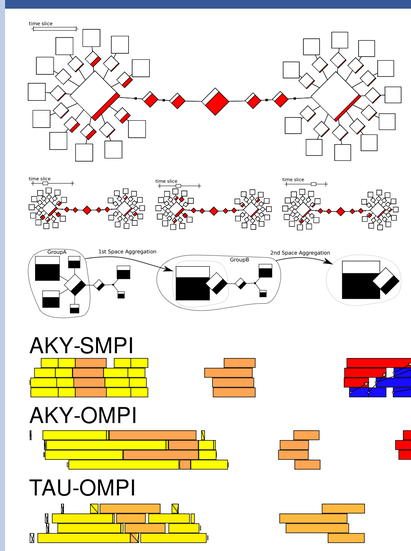


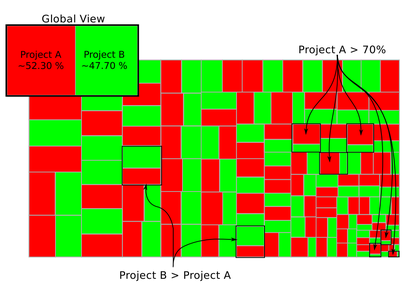
- User process concurrent execution

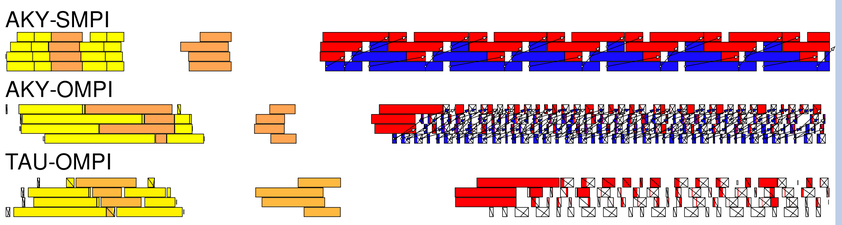
- Simulate Chord faster than P2P simulators



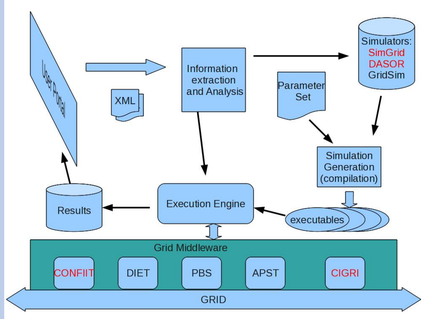
Highlight from WP3 Simulation Analysis



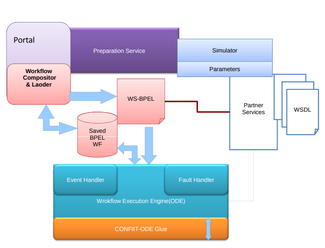




Highlight from WP4 Campaign Management



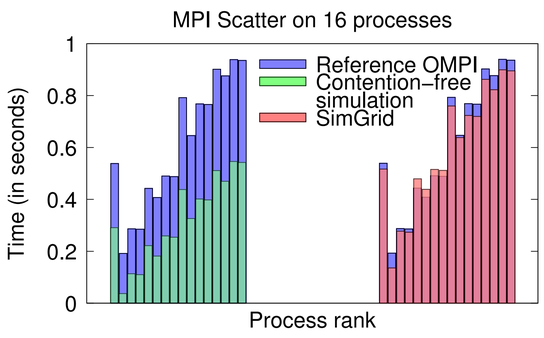
- Simulation grid engine

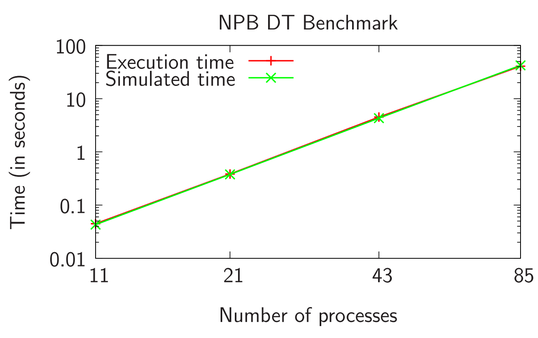


- Web service based worflow

Highlight from WP6 Applicability

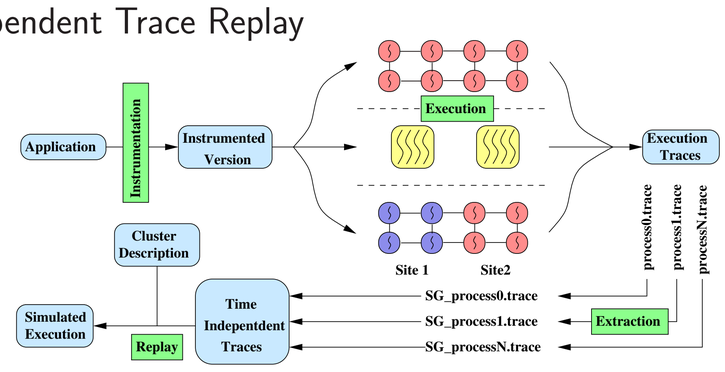
- Online and offline MPI simulation





Highlight from WP2 Model Instantiation

- Time Independent Trace Replay



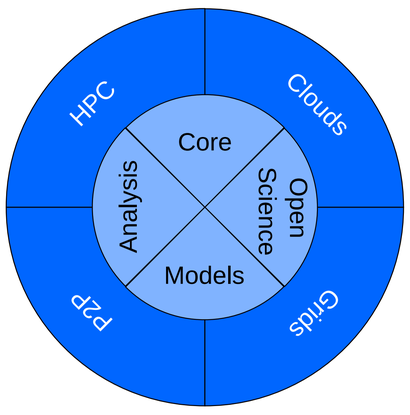
Partners

- LORIA - Nancy Université
- LIG - CNRS
- INRIA Bordeaux Sud Ouest
- INRIA Grenoble Rhône Alpes
- INRIA Sophia Antipolis Méditerranée
- CRESTIC - Université de Reims Champagne Ardenne
- Centre de Calcul de l'IN2P3 - CNRS
- University of Hawai'i at Manoa

And the story continues . . . with the INFRA SONGS project

Application Domains

- Data Grids
  - Distributed Data mgnt for LHC; Hierarchical Storage System
- Peer-to-Peer and Volunteer Computing
  - Replica Placement in VOD, Affinities in VC
- Cloud
  - Study from client or provider POV, other metrics (energy)
- High Performance Computing
  - Exascale, memory and energy models



Simulation Pillars

- Efficient Simulation Kernel
  - Optimization and standardization
- Concepts and Models
  - Storage, memory, energy, HPN and volatility
- Analysis and Visualization
  - Scalable visualization and trace comparison
- Support to Simulation Methodology
  - DoE, campaign management, and Open Science

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