# *MPI test automation framework*

*Technical presentation*

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# Background / Motivation: MPI

- Inter-process communication API
- Language-independent
- Just a specification
- MPI implementations
  - OpenMPI
    - Used on Grid'5000
  - MPICH

# Background / Motivation: Simulation

- Algorithmic abstraction of a real-world system
- Performance analysis can be conducted
- It has multiple advantages...
- SimGrid
  - Generic simulation framework
    - Grids, Clouds, HPC, P2P systems
  - Scalable, extensible engine
  - Very active project
  - Favored by researchers

# Background / Motivation: SMPI

- Single-node MPI simulation
- Part of the SimGrid project
- Accurate, scalable and fast
  - Validated via a large set of experiments
- Actively developed
  - Continuous validation is necessary

# *Background / Motivation: Developing a network model*

- Generic network models for SMPI
  - Ongoing effort
  - Needs a lot of verification and feedback → Testing
- Testing
  - SMPI and RL tests
  - Repetitive, error-prone
  - No universal guide
- Need for a framework

# Goals

- As much automation as possible
- Remove the tedious, repetitive steps
- Construction of workflows
- Modularity
  - Independent “blocks”
- Reusability
  - Interchangeable “blocks”

# *Implementation*

- XPflow
  - Experimentation engine
  - New project
    - Top-down approach, taken from Business Process Management
      - Understand the problem
      - Model it as a workflow
      - Execution and monitoring
      - Improve activities and processes

# *Implementation: XPflow*

- 2 main concepts
  - Processes
    - High-level description of an experiment
    - Orchestrate other processes and activities
    - Written in a DSL
  - Activities
    - Low-level building blocks
    - “Real” work
    - Written in Ruby

# *Progress: Preparation*

- Testing “by hand”
  - Both on Astral and on Grid'5000
  - Configuration
  - Post-processing
  - Visualization
  - “Examples”: how testing is done

# Progress: Implementation

- Various features are implemented
  - Node reservation
  - Image deployment
  - Broadcast of runnables
- Multiple methods under development
  - Actual execution of the experiment
  - Post-processing
  - Problems on Grid'5000 ...
- Current implementation is fairly Grid'5000-specific

# *Plans for the remaining time*

- Finish implementation
  - Execution
  - Post-processing
    - Gathering of traces
    - Conversion
- Thorough testing
- Maybe introduce a few other features
  - Metadata collection
  - As time allows...
- Finish documentation

# Summary

- SMPI
  - Huge amount of testing needed
  - Conducting tests is tedious
    - A repetitive, multiple-step process
    - Error-prone
- Test automation framework
  - Real-life MPI tests
  - SMPI tests
  - Grid'5000-specific
  - A lot of possible directions for development
    - Time constraints ...