GOAL AND STATUS OF THE TLSE PLATFORM

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http://gridtlse.org

Sparse Days Meeting 2007 at CERFACS

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Outline

- Overview of the GRID-TLSE Project
- Use of scenarios to generate dynamic workflows
- Available parts:
  - Matrix Storage
  - Bibliography
- Conclusion
- Demo of Matrices upload

GRID-TLSE Project: Tests for Large Systems of Equations

Sparse linear algebra Web expert site.

- GRID-TLSE Project: ACI GRID, 01/03 –> 01/06. Academic partners: CERFACS, IRIT, LaBRI, LIP-ENSL;
- Now:
  - ANR-CICG05-11 LEGO Project 2006- 2009. Academic partners: LIP, IRISA, INRIA Futurs, IRIT, CERFACS, CRAL.
  - ANR-06-CIS6-010 SOLSTICE Project 2007-2010. Partners: INRIA, CERFACS, IRIT, CEA-CESTA, EADS CCR, EDF, CNRS-CNRM-LA.
  - CNRS / JST REDIMPS Project 2007-2009. Partners: JAEA and academic partners of the TLSE Project (CERFACS, IRIT, LaBRi / INRIA Futurs, LIP ENS Lyon / INRIA)

Sparse Matrices Expert Site?

- Expert site: Help users in choosing the right solvers and its parameters for a given problem;
- Chosen approach: Expert scenarios which answer common user requests;
- Main goal: Provide a friendly test environment for expert and non-expert users of sparse linear algebra software;
- Easy access to:
  - Software and tools;
  - A wide range of computer architectures;
  - Matrix collections;
  - Expert Scenarios;
- Also : Provide a testbed for sparse linear algebra software.

Why do we use a Grid?

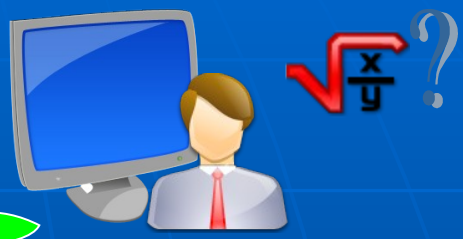
- Sparse linear algebra software uses sophisticated algorithms for (pre-/post-) processing the matrix;
- Multiple parameters interfere for efficient execution of a sparse direct solver:
  - Ordering;
  - Amount of memory;
  - Architecture of computer;
  - Libraries available;
  - Determining the best combination of parameter values is a multi-parametric problem.
- *Well-suited for execution over a Grid*.

Who can use TLSE Platform?

- *Two types of users:*
  - Standard users that want to proceed to some tests over their matrices;
  - Experts that deploy tools and specify what is the expert procedure.
- Examples of standard user request:
  - Memory required to factor a given matrix;
  - Error analysis as a function of the threshold pivoting value;
  - Minimum time on a given computer to factor a given unsymmetric matrix;
  - Which ordering heuristic is the best one for solving a given problem?

The GRID-TLSE Platform

Execution of a straightforward scenario



User expert request

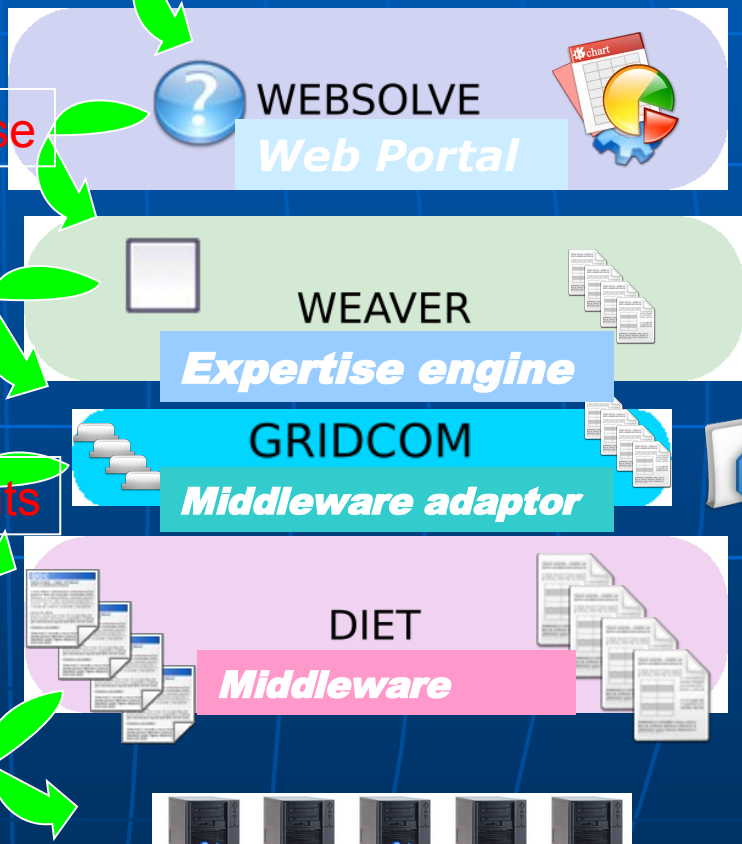
Request for expertise

Workflow (set of experiments in WEAVER format)

XML description of experiments

Solvers

Matrices



Key ideas in describing expert procedures

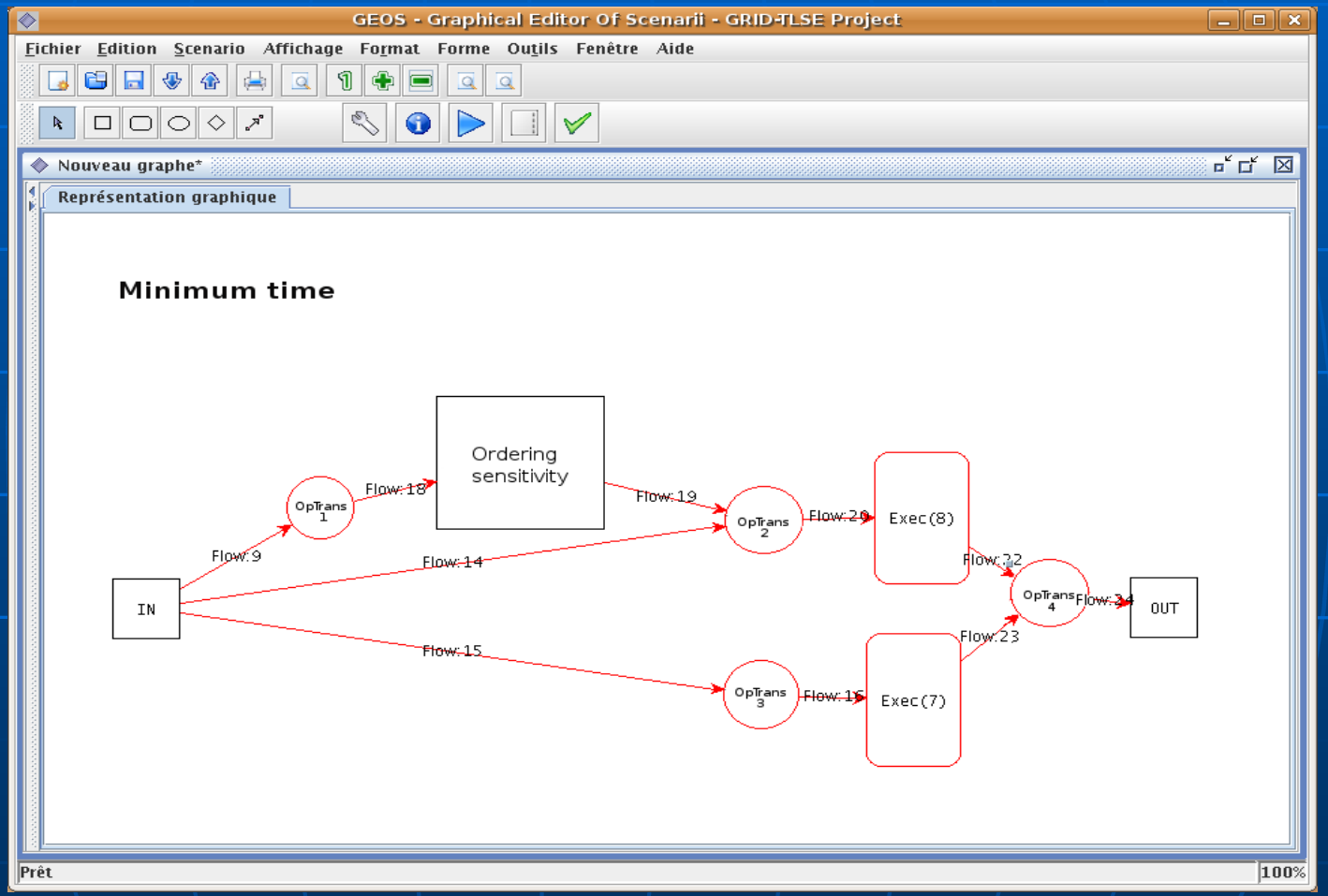
- We do not want to ask an expert in sparse linear algebra to deploy services over the grid at the usual level i.e. interfaces description, GridRPC calls, . . .
- We have specified and developed:
  - a high level - graphical - description of the expert process that we call scenarios (GEOS);
  - a semantic based description of software, control parameters, results and matrices based on meta-data (PRUNE).

Expert Scenarios

- Scenarios described in a data-flow like way;
- Structured hierarchically: a scenario may call existing ones;
- Analysis / execution of a scenario may have several steps;
- We have introduced:
  - Characteristics: number of flops, memory, . . .
  - Operators: Transformation, Filtering, Generation;
  - . . .

Graphical Interface for Describing Expertise Scenarios (GEOS)

Figure: Example of description of an expert scenario (Minimum Time Scenario)



Goal: identify the combination of orderings and factorizations that provides the minimal execution time.

Status of the TLSE Platform

- link: http://gridtlse.org
- Complete version : ongoing assembling and tests;
- Integration of sparse solvers;
- Parts of the Web site are available
  - Upload of matrices including validation;
  - Bibliography tool.

Matrix Storage

- Accept the classical storage formats: MM, HB, RB;
- 2 kinds of storage:
  - Public Matrices
    - visible;
    - strict respect of the specification of the format.
  - Matrices for a work group
    - private, only visible for the members of the group;
    - users can take some liberties with the format.

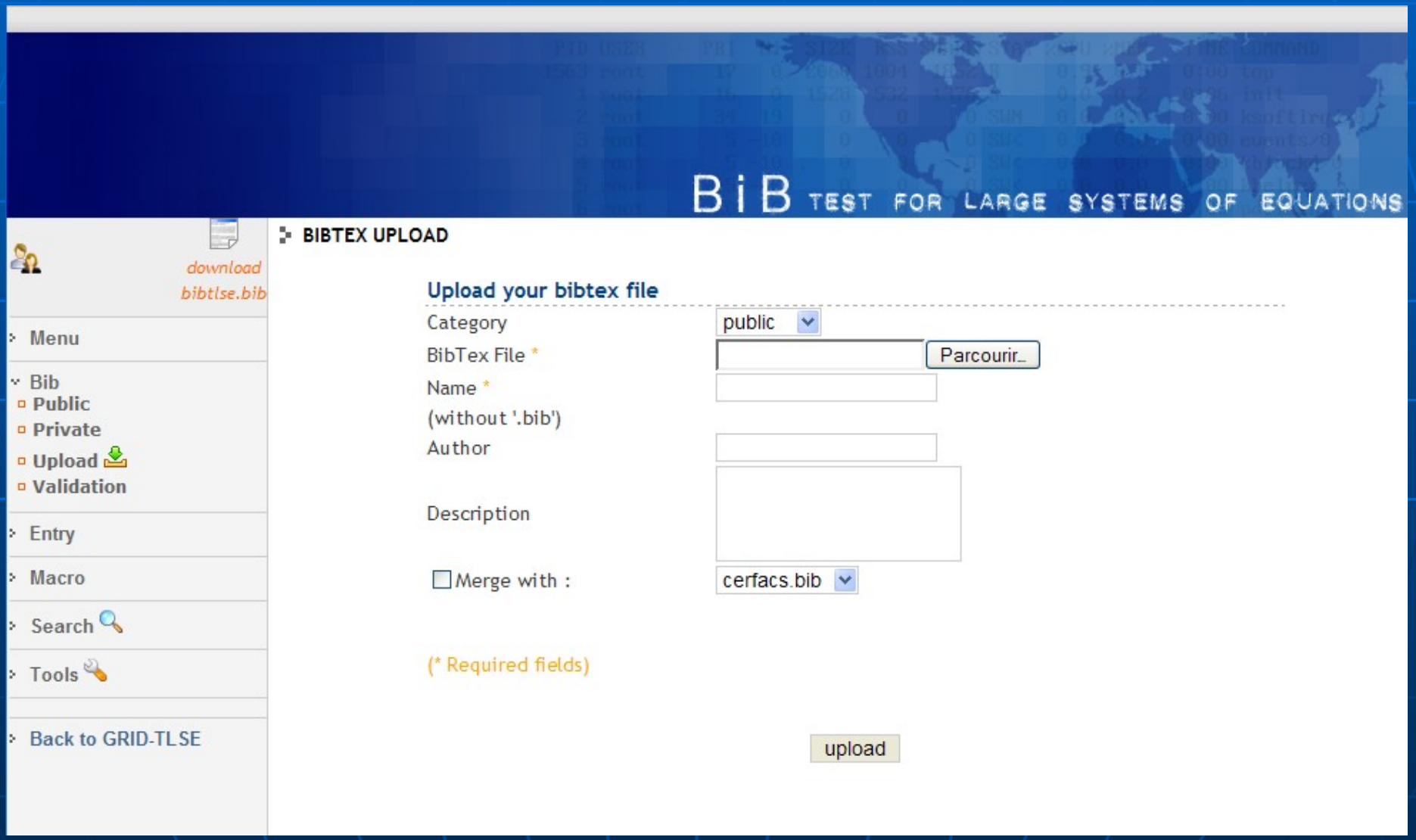
Upload / Validation

- Upload via a web interface
  - user is asked to fill information fields (format, type of values, symmetry, ...);
  - compressed/uncompressed file accepted.
- Validation of the matrix:consistency between
  - information given by the user;
  - header, values.
- Decontamination for a public matrix
  - strict verification of the format;
  - example: HB format, first line : title on 72 char, key on 8 char.

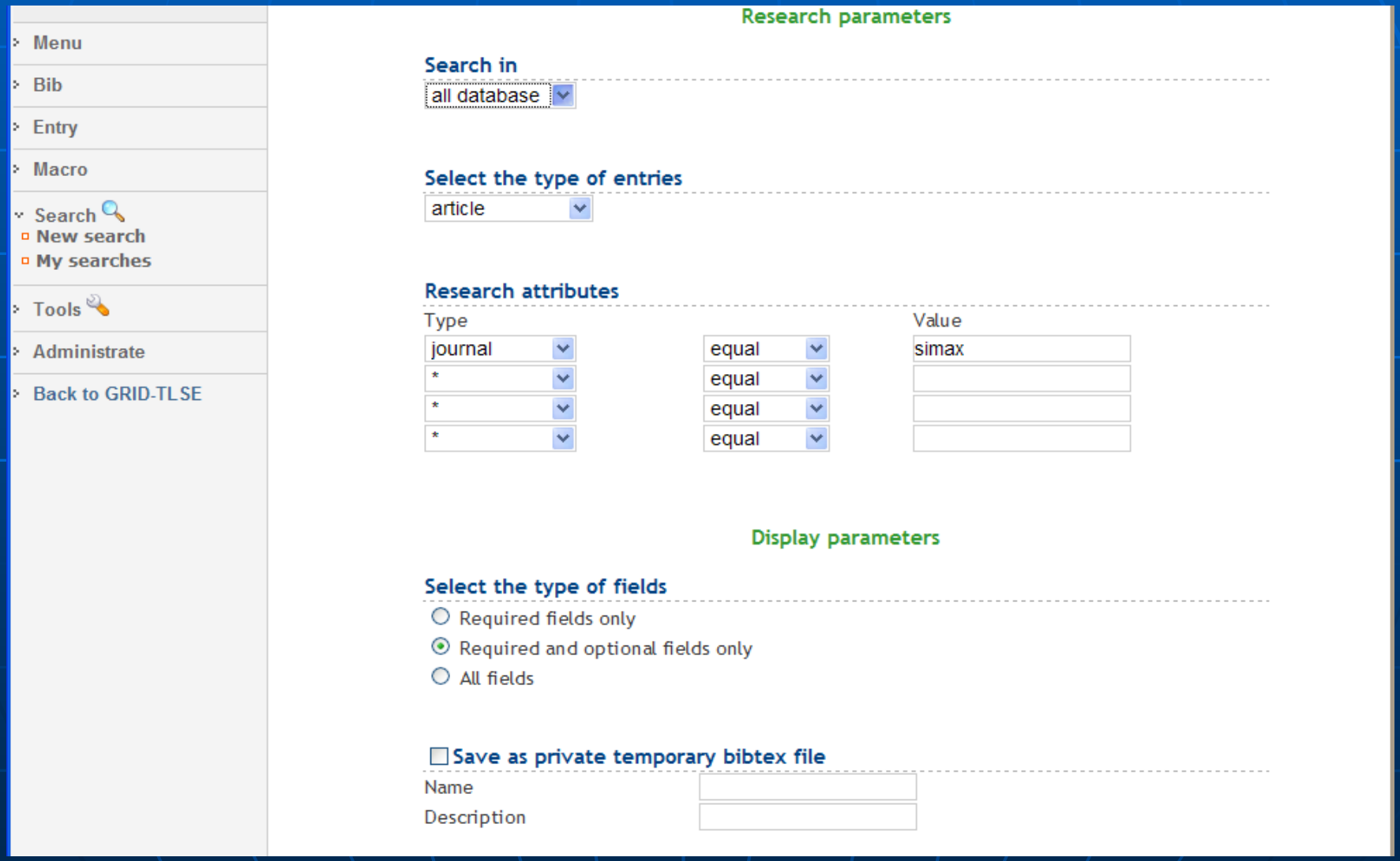
Bibliography tool

- Advanced tools for managing bibliography (bibtex files, single reference, …);
- Allowing:
  - Share bibliographies;
  - Commit of references;
  - Management of bibtex and indexes;
  - Checking for duplicated references.

Bibliography tool



Bibliography tool



Conclusion

- Key points: high level description of scientific software and use of scenarios for generating dynamic workflows;
- Practical consequences:
  - Adding / removing solvers does not require to update scenarios (it will be automatically discovered);
  - Introduction of new scenarios make use of deployed software;
  - The approach described is intended to be generic: we explore the use of this approach in other areas.

Some features of Matrix Upload

- functionalities illustrated in the forthcoming demo:
  - creation of a work group;
  - upload of matrices (validation: success, warnings, ...);
  - importation of matrices;
  - entering a group.