



GRID-TLSE Project

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TEST FOR LARGE SYSTEMS OF EQUATIONS

OUTLINE

- Overview of the project
- Goal of GRID-TLSE site
 - Sharing test problems
 - Test environment & an example
- Platform layers
- Contribution to SOLSTICE project
 - Sharing test matrices
 - Experiments with sparse solvers
- On going work

The GRID-TLSE project has been initially funded by the French Ministry through ACI "Globalisation des Ressources Informatiques et des Données". It has started in 2003.

Currently, it is supported by the ANR (Agence National de la Recherche) through:

- › the **COOP** project (ANR-09-COSI-001) funded by the French ANR COSINUS program.
- › the **SOLSTICE** project (ANR-06-CIS6-010).

Previously, the GRID-TLSE project was part of other projects:

- › the ANR **LEGO** project 2005-2009 (ANR-CICG05-11).
- › the **ReDIMSoPS** project through the CNRS/JST (Japan) cooperation.



TEST FOR LARGE SYSTEMS OF EQUATIONS

TEST:

- ✓ It provides a test environment for expert and non-expert users of sparse linear algebra software
- ✓ It helps users in choosing the right solvers and its parameters for a given problem

LARGE SYSTEMS OF EQUATIONS:

- ✓ It gives facilities to share matrices



Sharing test problems

The GRID-TLSE web site provides facilities to:

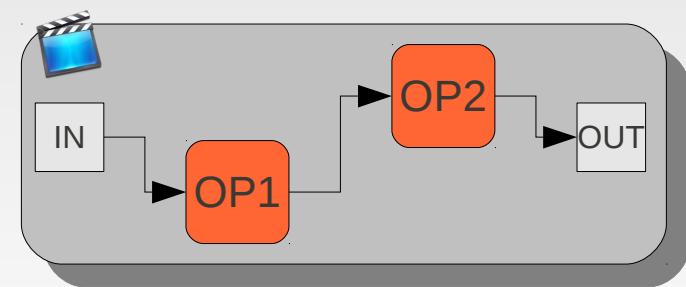
- Access to collections of public matrices
- Upload matrices
- Create private groups to share matrices

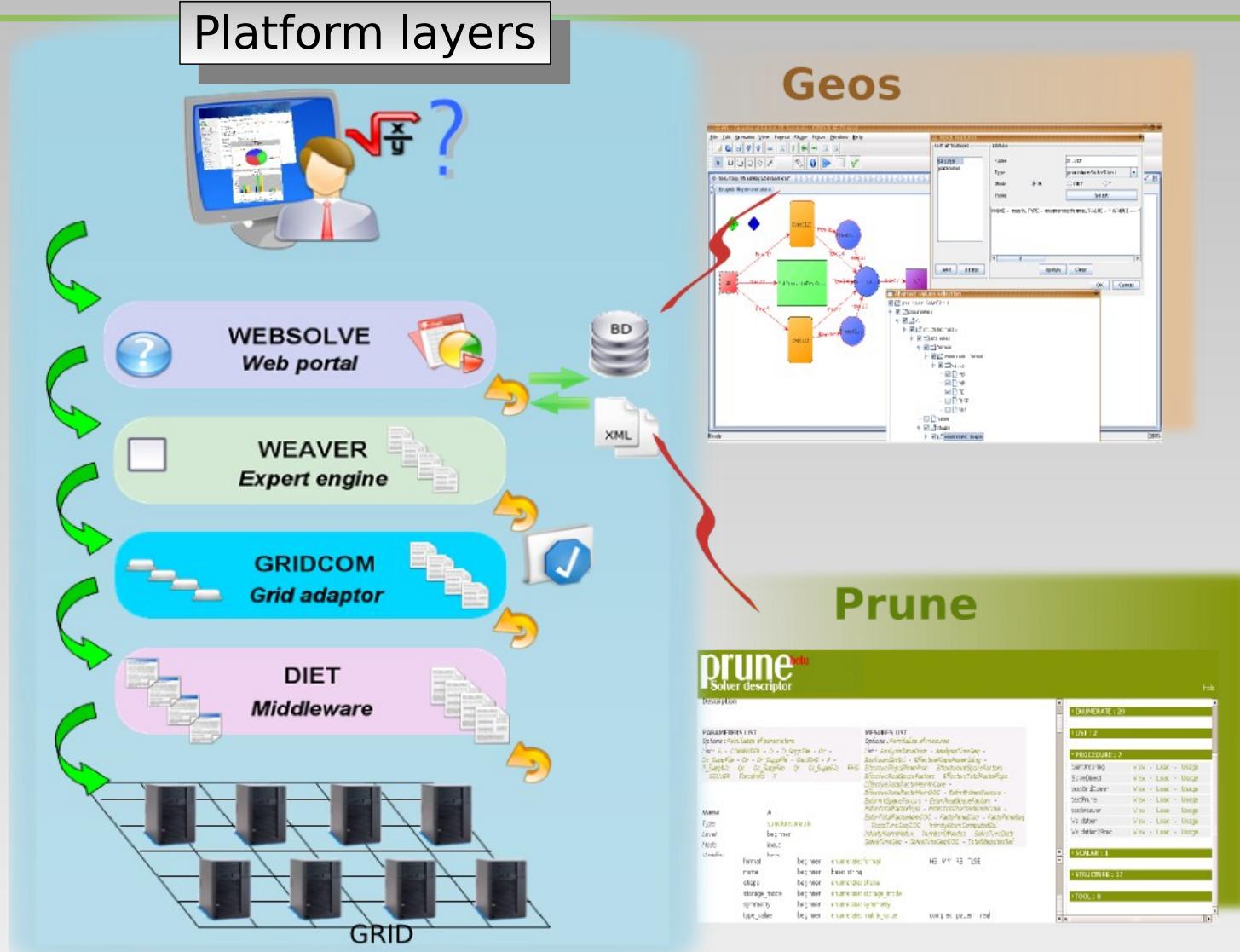
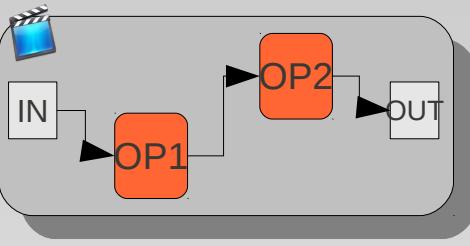
The GRID-TLSE web site allows an environmental testing

Examples of experiments:

- 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?

Each question corresponds to a «scenario»





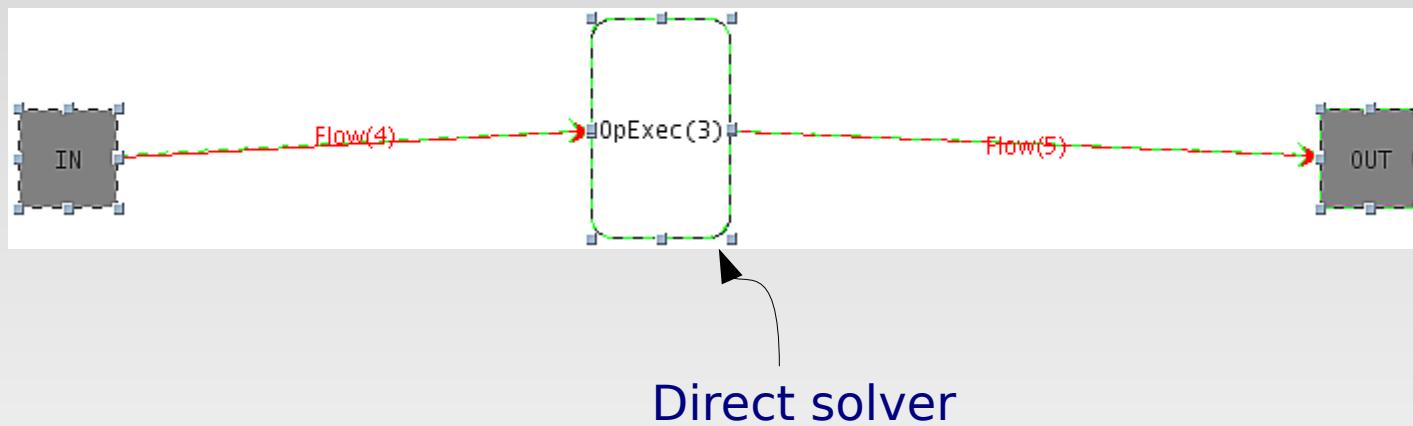
GRID-TLSE website gives access to a scientific software expertise platform via its Web portal (**WEBSOLVE**). Once the software is described (interface **PRUNE**), scenarios (defined with **GEOS**) express the request of the users.

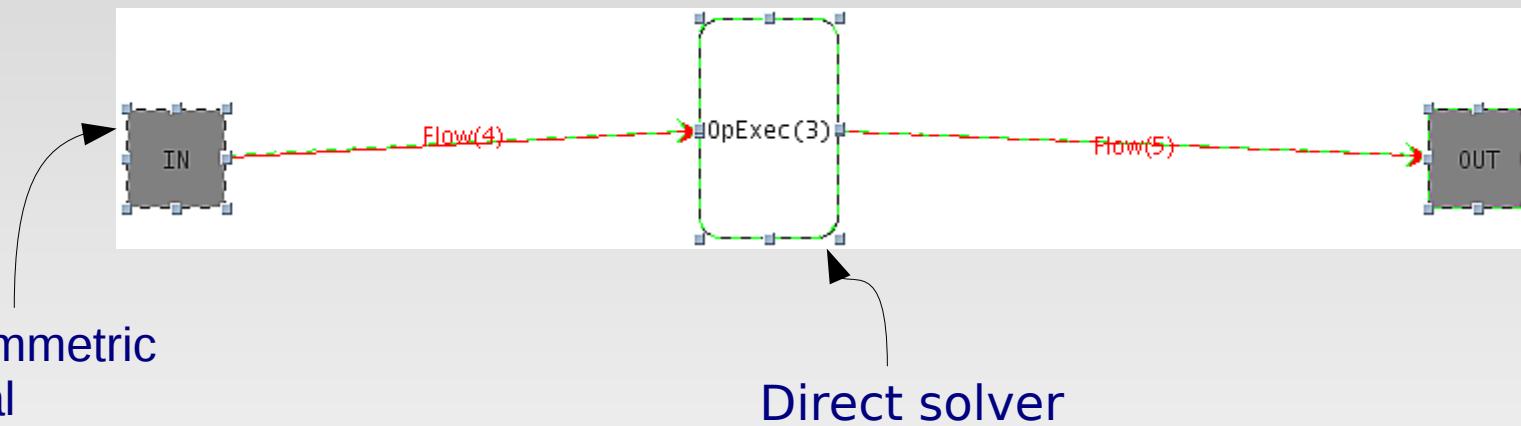
The analysis and deployment of scenarios (expertise engine **WEAVER**) leads to the utilization of computational grids; the middleware **DIET** (GRAAL project, INRIA-ENS-LYON) is used to find the software on the grid.

An example of scenario



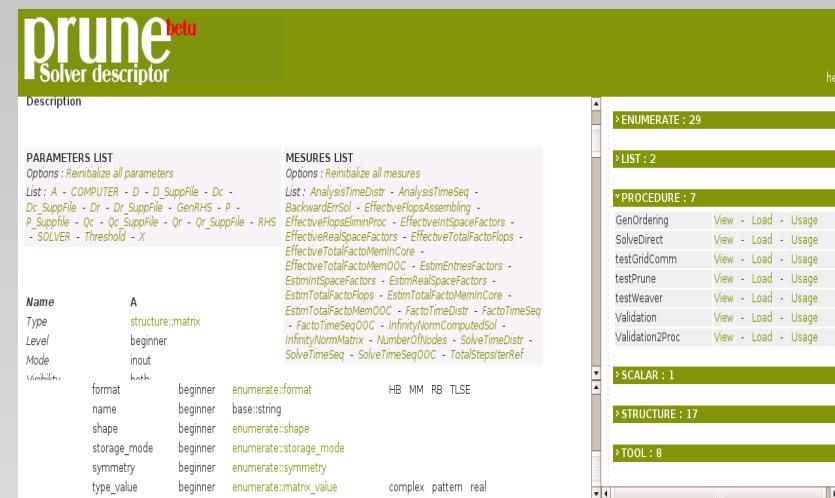
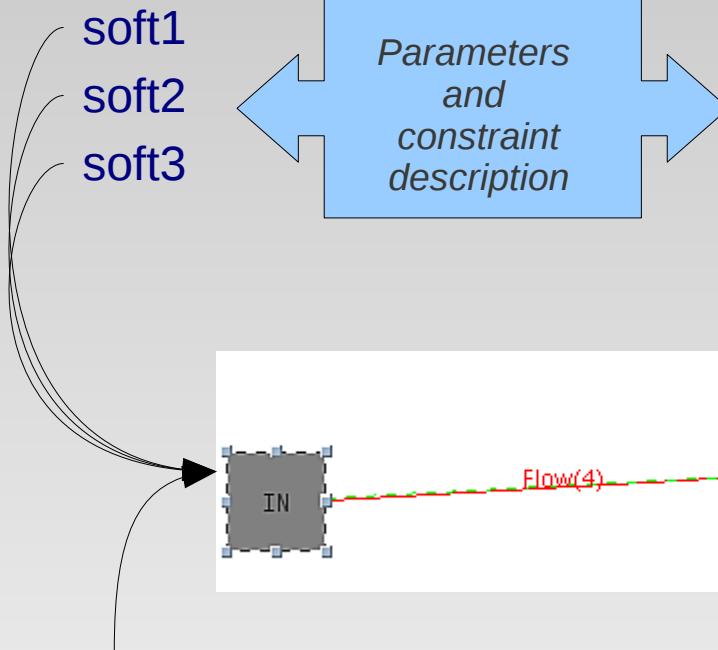
Comparison of direct solvers with their default parameters

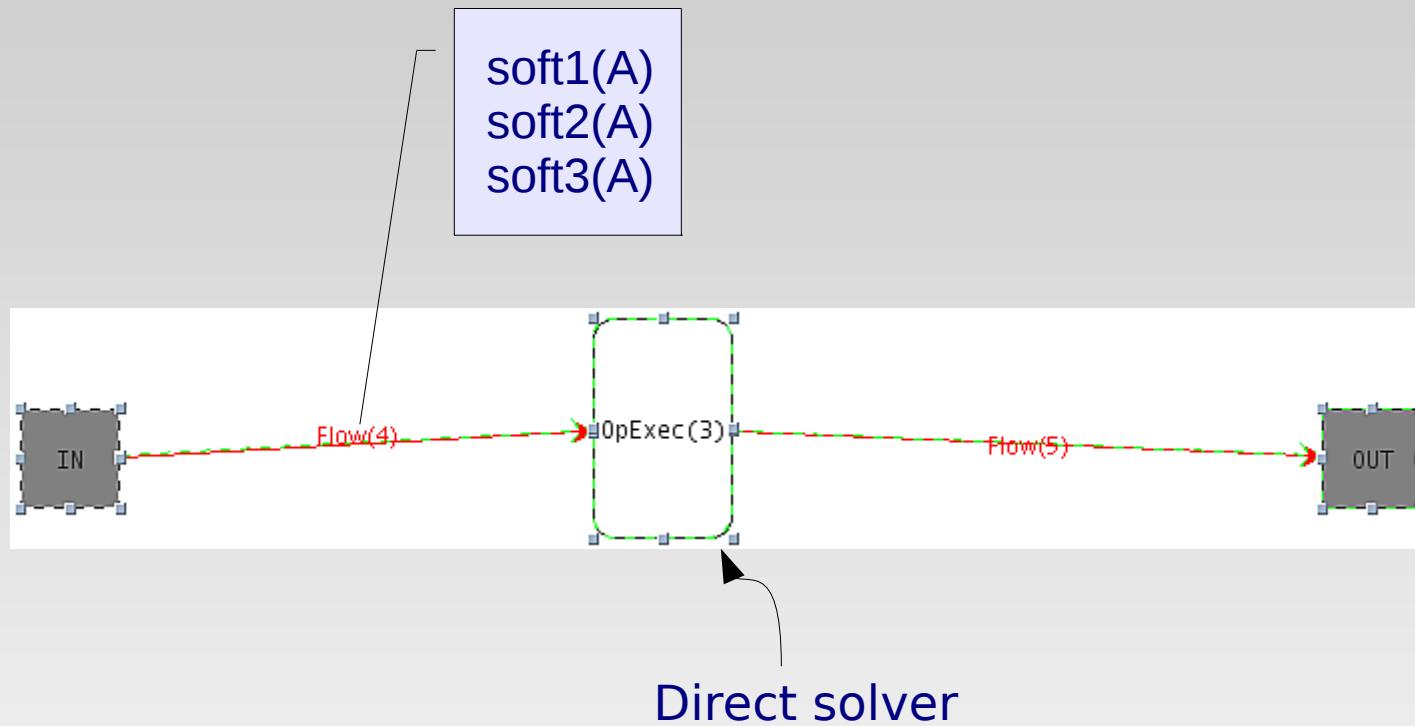




A : symmetric
real

Direct solver





Results

[Get the CSV file](#)

Parameters

name	value	
Experiment number	1	2
Computer	tolosa.enseeiht.fr	tolosa.enseeiht.fr
Matrix	barre11_2	barre11_2
Solver	PASTIX 	PASTIX 
Solver version	v1789	v2995

Control parameters

Metrics

name	value	
Analysis_Time_CPU	0.119669	0.044028
Analysis_Time_Elapsed	0.12	0.05
Factorisation_Flops_Total_Actual	9.87143e+07	9.87143e+07
Factorisation_Time_CPU	0.238783	0.126742
Factorisation_Time_Elapsed	0.23	0.12
Factors_Memory_Total_Actual	na	0
Factors_NbEntries_Actual	0	369793
Flops/Second	4.13406e+08	7.7886e+08
Iter_Ref_NbSteps	8	250
Solve_Time_CPU	0.114011	2.48909
Solve_Time_Elapsed	0.11	2.49
Total_Time_CPU	0.472463	2.65986
Total_Time_Elapsed	0.46	2.66

Contribution to SOLSTICE project

- Sharing ressources
- Testing of the solvers developed / involved in the project



Sharing SOLSTICE resources

gridtlse.org - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils Aide

http://gridtlse.org/ Google

TEST FOR LARGE SYSTEMS OF EQUATIONS

GROUP OF USERS

features | options

Group Features

Group Name	SOLSTICE
Group Creator	ANR-CIS07
Created On	2007-06-21 @ 10:45:23
You Joined	2007-06-21 @ 10:45:23
Group Activity	share_matrix
Comment	Group to share

Options

[View / Send Group Message](#)

Group Users (26)

TLSE id	ANR-CIS07
tlse	
Fred	
Chiara	
giraud	
amestoy	
jylexcel	
vasseur	
hleberre	
gsylvand	
afevre	
mumps	
guermouc	

Terminé

GROUP : SOLSTICE - ANR-CIS07 (87)

Storage mode : assembled

Matrix Name	Rows	Columns	Entries	Type	Frmt
10millions	10423737	10423737	89072871	ps	mm
23millions	23114004	23114004	198800133	ps	mm
Amende	6994683	6994683	58477383	cs	mm
arlequin_1	20806	20806	192817	rs	mm
arlequin_2	23968	23968	406208	rs	mm
arlequin_3	11322	11322	105623	rs	mm
Aster	504012	504012	17262024	rs	mm
AUDI	943695	943695	39297771	rs	rb
barre1_1	2650	2650	53880	rs	mm
barre11_1	2650	2650	53880	rs	mm
barre11_2	2650	2650	53601	rs	mm
barre11_3	4015	4015	77454	rs	mm
barre1_2	2650	2650	53601	rs	mm
barre1_3	4015	4015	77526	rs	mm
barre2_1	2650	2650	53880	rs	mm
barre2_2	2650	2650	53601	rs	mm
barre2_3	4015	4015	77526	rs	mm
boxcav_100x68x12.mtx	544932	544932	3661960	rs	mm
boxcav_120x82x14.mtx	926532	926532	6209773	rs	mm
boxcav_140x96x16.mtx	1453884	1453884	9690431	rs	mm
boxcav_16x10x3.mtx	2675	2675	15953	rs	mm
boxcav_20x13x3.mtx	4419	4419	26129	rs	mm
boxcav_30x20x4.mtx	14454	14454	89185	rs	mm
boxcav_40x27x5.mtx	33627	33627	212883	rs	mm
boxcav_50x34x6.mtx	64878	64878	425127	rs	mm
boxcav_60x41x7.mtx	111147	111147	724722	rs	mm
boxcav_70x48x8.mtx	175374	175374	1140324	rs	mm
boxcav_88x56x13.mtx	428205	428205	2895727	rs	mm
boxcav_8x5x3.mtx	619	619	3471	rs	mm
boyd2.rsa	466316	466316	890091	rs	hb
BRGM	3699643	3699643	155640019	ps	mm
carter_subd_10.mtx	53712	53712	938718	rs	mm

The GRID-TLSE web site provided facilities to share SOLSTICE matrices

Task 1.4: Development of a parallel scaling (B.Uçar & D.Ruiz)

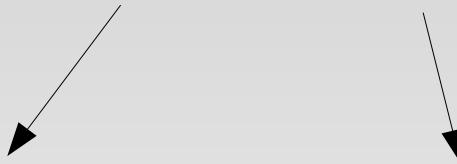
We want to compare the behaviour of a solver on:

- a matrix **A**
- the scaled matrix **B = Dr A Dc**

matrix **A**

scaled matrix **B** = $D_r A D_c$

Scaling Ordering

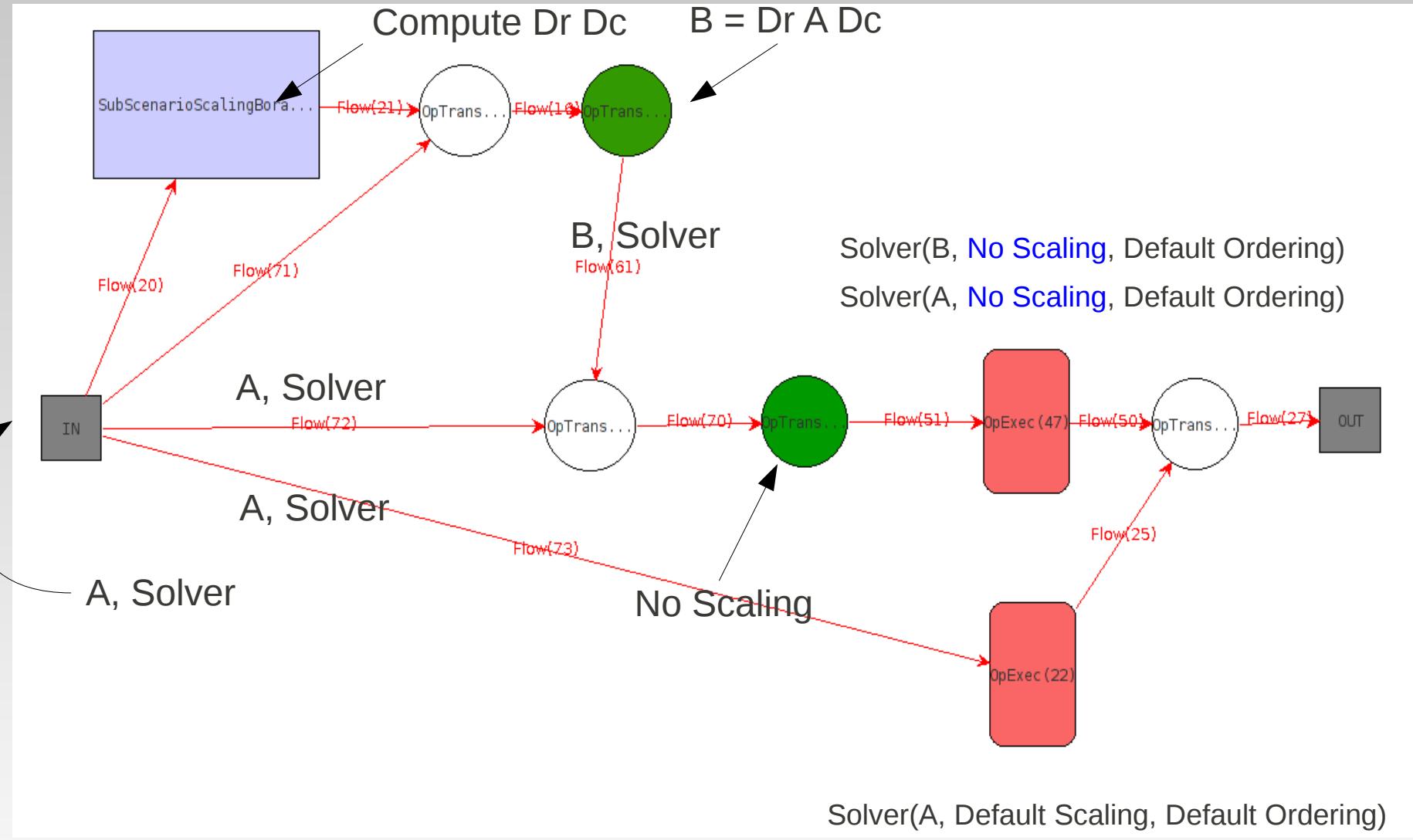


Solver(**B**, No Scaling, Default Ordering)

Solver(**A**, Default Scaling, Default Ordering)

Solver(**A**, No Scaling, Default Ordering)

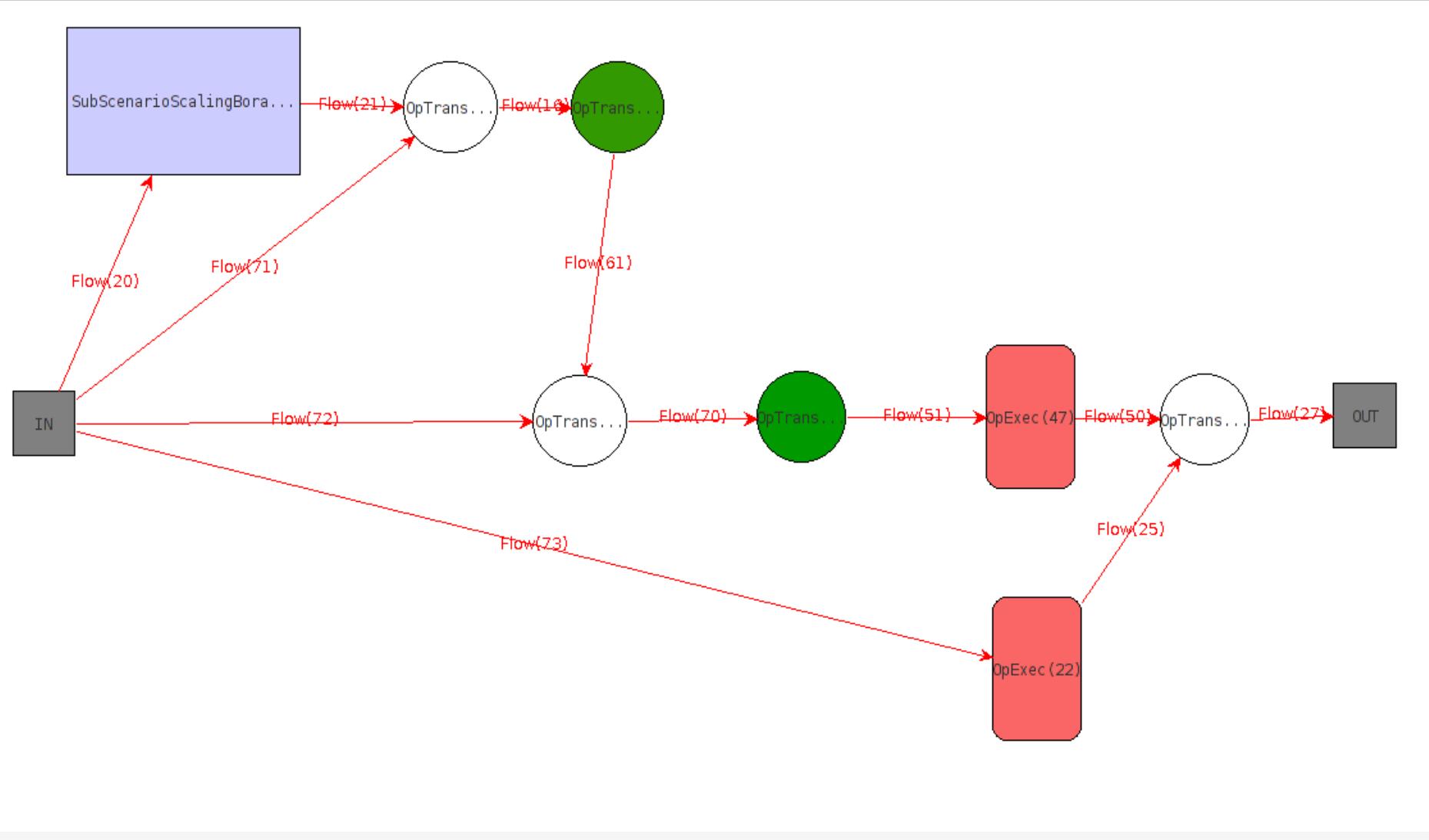
SCENARIO: STUDY_OF_A_SCALING



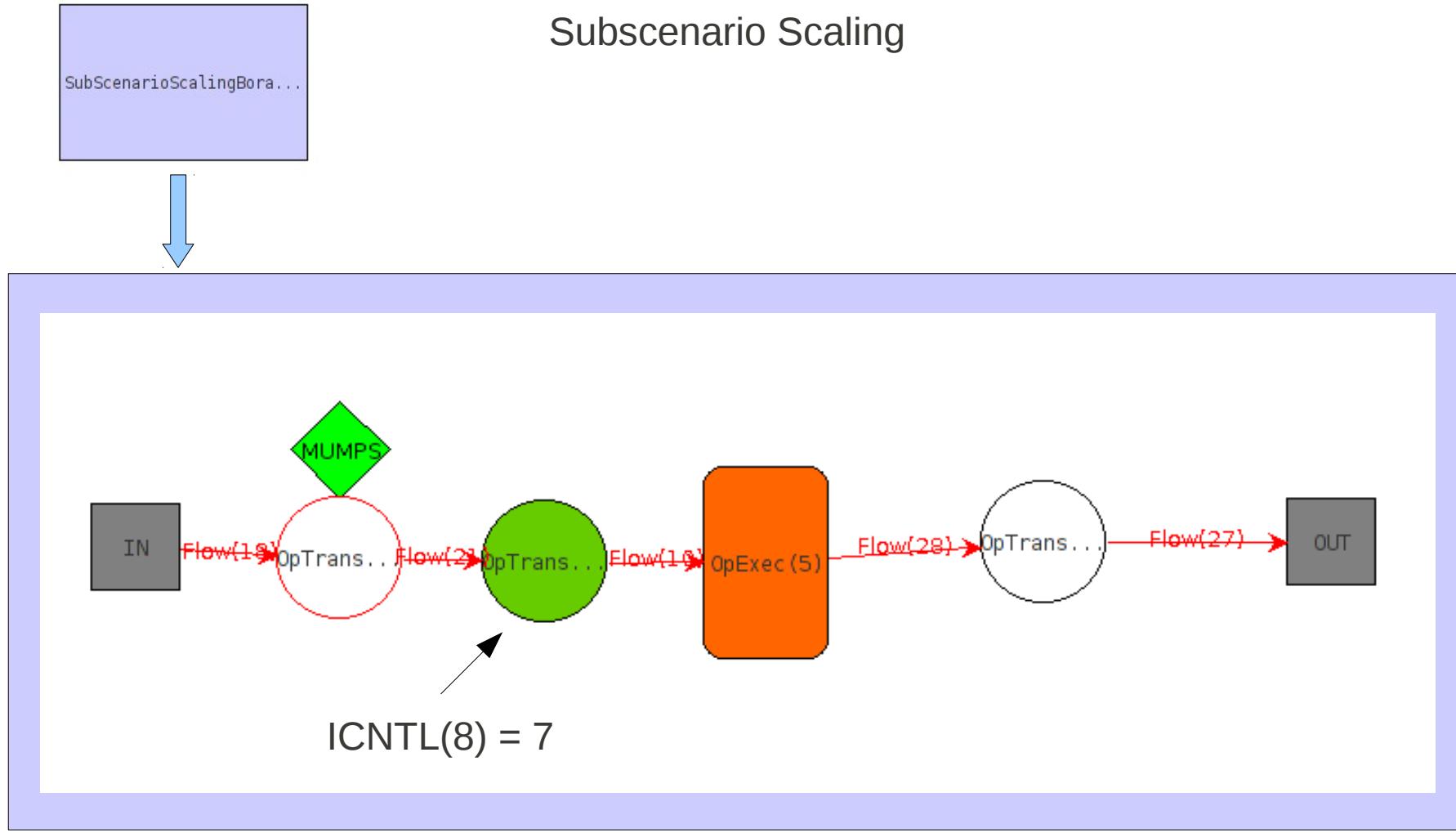
Results

SuperLU version 3.0

	A, Default	A, No Scaling	B, No Scaling
Lnsp3937, 3937x3937, 25407			
Flops during Factorization	3.51829e+07	2.76039e+07	2.58092e+07
Memory for Factors	4.68036e+06	4.08842e+06	3.93339e+06
Nnc1374, 1374x1374, 8606			
Flops during Factorization	4.50047e+06	4.48171e+06	3.98045e+06
Memory for Factors	1.08795e+06	1.07904e+06	998644
adder_dcop_06, 1813x1813, 11224			
Flops during Factorization	63550	98405	63445
Memory for Factors	225072	352556	224796
West2021, 2021x2021, 7353			
Flops during Factorization	93925	101455	93453
Memory for Factors	252672	262076	250988



Subscenario Scaling



- The scaling is computed through MUMPS: we can exploit the internal features of the solvers
- After having wrapped a solver we can play with its features through the scenarios

- › We are testing new complex scenarios and adding new operators to the GEOS layer
- › We are adding new solvers / versions
- › The upload and « decontamination » of matrices in the public group goes on
 - ✓ New access to public matrices (no login)
 - ✓ Direct link to a public matrix
 - ✓ Improvement of matrix search

We will be happy to have your test matrices on our site :
<http://gridtlse.org>