PERF012 – Performances of elementary computations in 3D

Summarized:

The purpose of this benchmark is to 3D measure the performances of elementary computations for a nonlinear behavior “simple” (VMIS_ISOT_TRAC).
The mesh 6400 HEXA8 contain.

The command carried out is DYNA_NON_LINE for 400 time step. There is only one factorization of the matrix. Time is primarily spent in elementary computations and assemblies of the second member.

One can compare the execution time with that obtained by Europlexus.

There is only one modelization (A) corresponding to a sequential computation.

1 Problem of reference

1.1 Geometry

the problem is that of a square plate 1×1 directed according to Ox and Oy.
Its thickness is of 0.1 according to Oz.

The face $x=0$ is FAC1
the face $x=1$ is FAC2.

1.2 Properties of the material

$E=2.1e11$	Modulus Young,
$nu=0.3$	Poisson's ratio,
$RHO=7800.$	Density,
Curve of tension (VMIS_ISOT_TRAC)	7.14286e4, 1.5e8 1.00143 , 3.0e8

1.3 Boundary conditions and loadings

imposed Displacement:

On face FAC1 : $DX=0$
Moreover, one blocks degrees of freedom of 2 points of FAC1 to avoid any rigid body motion.

One imposes a pressure $P=2.e6$ on face FAC2 (opposed to FAC1). The plate is compressed.

1.4 Discretization in time

the initial state is the rest. One calculates the solution until $tf=75.e-6s$ into 400 time step of $0.1875e-6s$ each one.

2 Reference solution

2.1 Method of calculating

the results of reference were got with the Europlexus code.
Displacement according to Ox 2 points of FAC2 is printed in the course of time. At the end of simulation (tf), the displacement of these 2 points is worth -3.931011e-6.

2.2 Uncertainties

the object of the test is not to validate DYNA_NON_LINE, but to measure the performances of Aster (in comparison with those of Europlexus. One simply seeks to carry out same dynamic computation with the 2 codes.

The solutions Aster and Europlexus differ from less than 0,02% what shows that with the problem dealt by the two codes is well the same one.

3 Modelization A

3.1 Characteristic of the modelization A

Number of processor: 1

Modelization 3D : 6400 HEXA8

DYNA_NON_LINE : 400 time step

3.2 Results

Quantity	Reference	Tolerance (%)
DEPL DX Not A2	-3.931011e-6	0,02
DEPL DX Not A4	-3.931011e-6	0,02

4 Summary of the results

Machine	Version	(Mo) Memory		Number DDL	Time execution (DYNA_NON_LINE) (dry)			
		Allocated	Used		USER	SYSTEM	USER+ SYS	ELAPSED
Linux 64 bits “aster4”	10.04	200.187		25215	115.05	0.19	115.24	115.35