OPTIDIS

## Optimisation d'un code de dynamique des dislocations

ON GOING PROJECT

The materials used in the nuclear industry undergo various and complex constraints. Modeling efforts offers the opportunity to understand the mechanisms leading to the ageing of these materials.

Dislocations are linear defects which are quite abundant in crystalline metals. They are responsible for their plastic behavior. Irradiation induced defects strongly interact with dislocations, therefore modifying the mechanical properties of these materials. Understanding these mechanisms is therefore crucial.

Dislocation dynamics is a simulation technique suite to follow the motion of a large number of dislocations along time. Taking full advantage of HPC is critically needed to simulate to simulate representative volume elements. The goal of OPTIDIS, is to optimize such a code within a team including CEA, INRIA and CNRS.

TECHNOLOGICAL OR SCIENTIFIC INNOVATIONS

- The goal of OPTIDIS is to optimize a dislocation dynamics code named NU- MODIS enabling large scale simulations of scientific interest. This goal requires the development of three specific algorithms:

  ○ optimized calculation of the interactions between dislocations using multipole approach;

  ○ optimized linear and nonlinear solvers taking full advantage of the topological structure of dislocations;

  ○ development of new load-balancing strategies as the spatial distribution of dislocations tends to be extremely heterogeneous. Each of these three tasks will be addressed using a combination of advanced High-Performance Computation schemes (MPI and POSIX threads) and the development of new algorithms. As a final "grand challenge", NUMODIS will be used to address a problem of major scientific and industrial interest: the channeling of deformation in irradiated zirconium cladding.

Image: 56 — aNUMODIS
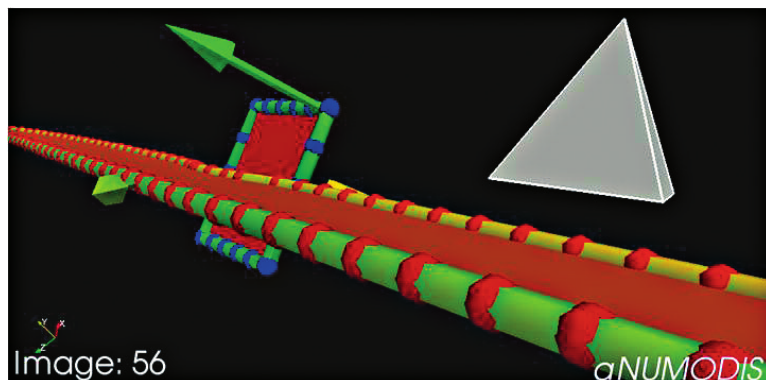
STATUS - MAIN PROJECT OUTCOMES

This project started 6 months ago. The first meetings were held to define more precisely the different tasks. Several trainees and one PhD student were recruited by the different partners.

CONTACT

Laurent DUPUY
CEA
laurent.dupuy@cea.fr
+33 (0)1 69 08 53 45

PARTNERS

Research institutes, universities:
CEA, HIEPACS, INP GRENOBLE, INRIA BORDEAUX, UNIVERSITE PARIS EST MARNE LA VALLEE

PROJECT DATA

Coordinator:
CEA

Call:
ANR COSINUS

Start date:
October 2010

Duration:
48 months

Global budget (M€):
1.5

Funding (M€):
0.4