SCIENTIFIC AND TECHNICAL CONTEXT

Strongly coupled dynamic systems under extreme loadings
- Consequences of reference accidental situations in the framework of nuclear safety
- Consequences of impacts and explosions for aeronautics or protection of the citizens
- Complex structures and constitutive laws, Fluid-Structure Interaction

CONSIDERED COUPLED MECHANICS

General framework
Explicit time integration for fluid-structure dynamics

RePDyn actions and achievements

Main objective
Parallel algorithms and methods for coupled fluid-structure simulations on massively parallel supercomputers (http://www.repdyn.fr)

Application to the proposed mechanics
- Scalable solver for Lagrange Multipliers with domain decomposition for Distributed Memory Processing
- Dynamic weighted domain decomposition for load-balancing issues

2012 major achievement
PRACE Preparatory Access on TGCC/Curie supercomputer
- Experimental scalable fluid-structure simulations performed using 1024 cores with hybrid solver

ONGOING AND FUTURE WORK

Consolidation of the algorithmic and implementation strategies and deployment towards engineering units
- Consolidate the communication strategy for the global link solver
- Finalize the generic SMP implementation of KAAPI to cope with Amdhal’s law
- Auto-tuning for the optimal adaptation of the software to the available hardware

Core Disruptive Accident (CDA) in a IVth Generation Sodium Fast Reactor

Blast loading on a 20-ft steel ISO container (courtesy of EC/JRC & NTNU, Norway)

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LES RENCONTRES DU NUMÉRIQUE
17 et 18 avril 2013