

A Proposal of NSC activity to OECD/NEA
for
Performance Evaluation of Computer Codes in Nuclear Fields
on
Parallel Architectures

1. Introduction

The Working Party on Advanced Computing was set up in 1991 as an activity of NSC (Nuclear Science Committee) with a focus on four areas of work relating to hardware and software in the nuclear industry. Three of the task forces, namely "Task Force on Scientific Applications Software", "Task Force on Standards and Quality Assurance" and "Task Force on Process Control Systems" have terminated their initial tasks and the only Task Force on Supercomputing is on going.

The Task Force on Supercomputing will have prepared a state-of-the-art report on adaptation of computer codes in nuclear applications to parallel architectures by early 1996. This report will include i) an identification of "Grand Challenge Problems" in nuclear applications based on the present and future needs, and ii) an assessment of high performance computing such as indications as to which type of computer architecture is best suited for the different applications, and the cost/benefit for development of new algorithms taking advantage of the special features of the emerging high performance computers. The following application areas are being reviewed:

- i) Monte Carlo Radiation Transport
- ii) Deterministic Radiation Transport
- iii) Computational Mechanics and Fluid Dynamics
- iv) Reactor Safety Analysis
- v) Waste Management
- vi) Atmospheric Dispersion

The proposed activity intends to follow the results of the present task force, namely the performance evaluation of representative computer codes in nuclear applications, running on various types of parallel computers. The representative codes may be selected from those to be pointed out by the Task Force Report as best suited ones to parallel architectures.

2. Objective of Proposed Activity

To provide the information concerning cost/benefit of high performance computing for NEA member countries, the performance of representative nuclear codes to be suited to parallel architectures are evaluated by running on various types of parallel computers including workstation clusters.

The evaluation should be performed from the two points of view, namely "Speedup Performance" and "Scalability".

3. Working Method

Setting up a new task force, in two or three year-span, the task force will manage the followings:

- i) Selection of Existing Representative Codes to be Parallelized
- ii) Arrangement of Available Parallel Computer Resources
At JAERI, five types of parallel computers will be installed in the end of March, '96, in addition to the present two types of parallel computers, Fujitsu VPP500/42 and Intel Paragon, XP/S15-256. The computers to be newly installed are Fujitsu VPP300/16, Cray T94/4, NEC SX-4/2x3, Hitachi SR2201/64 and IBM SP2/48.
- iii) Using Available Parallel Computer Resources,
 - Parallelization of Selected Codes by Participating Countries
 - Test-run and Parallelization Tuning
 - Running for Performance Evaluation
- iv) Analysis of Running Results
- v) Preparation of Report