

平成 19 年度 情報工学コース卒業研究報告要旨

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卒業研究題目	NAREGI グリッドミドルウェア 2 を用いた Grid 環境の構築と性能評価 (NAREGI Grid Middleware β 2: Installation and Performance Evaluation)	

In recent years, a computing paradigm referred to as Grid Computing has been receiving increasing attention from both the public and the commercial sectors. **Grid Computing** is a technology that virtualizes resources such as computers, networks, storage devices, people and organizations to represent them as one or several seemingly massive computer systems. Drawing its name from the analogy to the electrical *Power Grid*, the Grid aims at allowing users to tap into resources off the Internet as easily as electrical power can be drawn from a wall socket. By using the Grid, a user can benefit from huge resources to perform not only scientific simulations, but also store, analyze and share immense amounts of data.

Grid Middleware, which is a group of components used to build a grid platform, have been developed under various projects in many countries. In Japan, NAREGI, the National Research Grid Initiative, was created in 2003 by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). From 2006, under the “Science Grid NAREGI” Program of the “Development and Application of Advanced High-performance Supercomputer” project being promoted by MEXT, research and development is continuing to build on previous results, while expanding in scope to include application environments for next-generation, peta-scale supercomputers.

The NAREGI Middleware software stack is a modular architecture comprised of multiple components such as PSE (Problem Solving Environment), WFT (Work Flow Tool), Visualization Tools, Programming Environments and Communication Libraries, among others. Without being aware of the complexity and structure of these components, users can access the Grid resources through a GUI interface known as the Portal. Presently in Japan, project contributors are beta testing the NAREGI Middleware toward the projected release of version 1.0 in April 2008. As of today, the latest beta version of the middleware is beta 2.0.1, which has been released on January 31th, 2008.

This study aims at contributing to the beta testing of the NAREGI Middleware software stack, by means of evaluating it from several aspects, including ease of installation, ease of administration, ease of use and performance analysis. To achieve this, 7 management nodes and 16 computation nodes, *ie.* a total of 23 computer nodes were used to build the Grid environment in order to run a series of numerical calculations for performance evaluation. The latest beta version of the middleware was used for this study.

To achieve the goals of this study, different numerical calculations were performed on the NAREGI platform. These calculations are the parallel versions of each of the Matrix Product-Sum Solver, the 2-Dimensional Diffusion Equation Solver, the Burgers Equation Solver and the N-Queen Problem Solver. Comparing the performance results obtained over the NAREGI platform to those obtained over a regular parallel environment based on a traditional PC clusters of the same hardware specification, NAREGI showed relative decrease in performance, which is due to the overhead of resource management, job scheduling, authentication etc. However, it is worth mentioning that the NAREGI platform was easier to use from a user standpoint, thanks to the Web-based GUI Portal.