

3-3. Computer Systems for Promoting NIFS Collaborations

§1. Plasma Simulator

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Plasma Simulator is a high-performance computer system to support physics studies of fusion plasma confinement and theoretical systematization of the studies, exploration of complexity science, and other collaborative researches to advance and establish simulation science.

The main system of the Plasma Simulator is the Large-Scale, parallel-type Processing Server. The main system consists of 128 nodes of Hitachi SR16000 model L2. The properties of the main system are presented in Table 1. The total peak performance is 77TFlops and the total main memory is 16TB. The CPU of the model L2 is POWER6 with clock speed 4.7GHz. The inter-node connection speed of the main system is 32GB/s implemented with the Infiniband. The main system will be upgraded in October 2012. The properties of the upgraded main system are shown in Table 2.

The sub system is the Program Development Support Server that is composed of one node of SR16000 VL1 and two nodes of SR16000 L2. The model VL1 has 64 CPU cores and 1TB memory. Each of the model L2 has 32 CPU cores and 256GB memory. The Large-Scale, parallel type Processing Server and the Program Development Support Server support program languages, Fortran 90, C/C++, OpenMP, and MPI. The visualization software AVS/Express and IDL are installed on the visualization server. The manuals for the Plasma Simulator, FAQ, and information associated with the system are presented on the web (<http://www.ps.nifs.ac.jp/>).

The new Plasma Simulator was ranked as the 197th in the world on the TOP500 List (<http://www.top500.org/list/2011/06/200>) of the high-performance computers.

The CPU time of the main system used from April 2011 to March 2012 is shown in Fig. 1. The main system has two job classes, “small” and “large”. The large class is for the jobs that use all the 128 nodes with elapse time limit of 10 hours, while the small class jobs run on nodes not

greater than 64 within 5 hours or on 128 nodes within 1 hour. The total operation time, the total used CPU time, the ratio of CPU time to the operation time, and the numbers of the executed jobs are summarized in Table 3 for the same period as Fig. 1. The ratio of the CPU time to the operation time is 90.25%. The numbers of the collaboration projects and the registered users of the fiscal year 2011 were 58 and 195, respectively.

Large-Scale, parallel type Processing Server Hitachi SR16000 model L2 (March 2009-August 2012)	
Total Peak Performance	77TFlops
Total Main Memory	16TB
Number of Nodes	128
Number of cores / node	32
Peak Performance / node	601.6GFlops
Main Memory / node	128GB
Inter-node Network Speed (bi-direction)	32GB/s
Capacity of Storage System	0.5PB

Table 1. Properties of Large-Scale, parallel type Processing Server (March 2009-August 2012)

Large-Scale, parallel type Processing Server (October 2012-March 2015)	
Total Peak Performance	315TFlops
Total Main Memory	40TB
Capacity of Storage System	2.0PB

Table 2. Properties of Large-Scale, parallel type Processing Server (October 2012-March 2015)

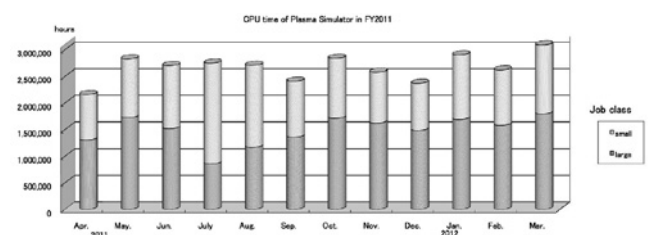


Fig. 1. Operation overview of the Large-Scale, parallel type Processing Server in FY 2011

A: operation time (hour)	B: CPU time (hour)	Ratio: B/A	Number of jobs
35,376,578.13	31,927,093.56	90.25%	10,815

Table 3. Operation summary of the Large-Scale, parallel type Processing Server in FY 2011