§32. Plasma Simulator

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Plasma Simulator is a high-performance computer system to support the studies in confinement physics of fusion plasmas and the theoretical systematization of the studies, the exploration of science of complexity as the basic research, 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 of the main system has the fat-tree topology 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 two nodes of 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 other any information associated with the system are presented on the web (http://www.ps.nifs.ac.jp/).

The new Plasma Simulator was ranked as the 65th in the world (7th in Japan) on the TOP500 List (http://www.top500.org/list/2009/06/100) of the high-performance computers.

The monthly used CPU time of the main system from April 2009 to March 2010 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 for the same period as Fig. 1 are summarized in Table 3. The ratio of the CPU time to the operation time is 86.6%. The numbers of the collaboration projects and the registered users of the fiscal year 2009 were 56 and 135, 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	32TB
Capacity of Storage System	2.0PB

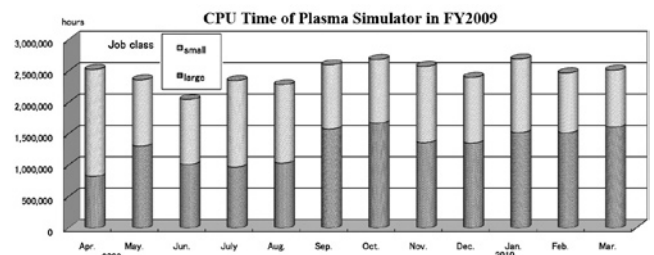Table 2: Properties of Large-Scale, parallel type Processing Server (October 2012-March 2015)

Fig. 1: Operation overview of the Large-Scale, parallel type Processing Server in FY 2009

A: operation time (hour)	B: CPU time (hour)	Ratio: B/A	Number of jobs
34,156,165.87	29,569,950.26	86.57%	11,332

Table 3: Operation summary of the Large-Scale, parallel type Processing Server in FY 2009