3-3. Computer Systems for Promoting NIFS Collaborations

§1. Plasma Simulator

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Plasma Simulator is a massively parallel super computer utilized for the large-scale numerical simulations of fusion plasmas in order to promote the Numerical Simulation Research Project that aims at the ultimate realization of the helical numerical test reactor.

The main system of the Plasma Simulator is the Large-Scale, parallel-type Processing Server. The main system in Phase 1 (March 2009 to August 2012) was HITACHI SR16000 model L2, and was upgraded in Phase 2 to HITACHI SR16000 model M1. The total peak performance jumped up from 77 TFlops to 315 TFlops. The new Plasma Simulator was ranked as the 95th in the world on the TOP500 List (http://www.top500.org/list/2012/11/) of the high-performance computers. The operation of Phase 2 starts in October 2012 and continues to March 2015. The properties of the main system in Phases 1 and 2 are listed in Table 1.

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. Both the main system and the sub system 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 CPU time of the main system used from April 2012 to March 2013 is shown in Fig. 1. The main system has three job classes, "small", "small128", and "large" in Phase 1, and four classes, "small", "medium", "large1h", and "large" in Phase 2. In Phase 2, the large class is for the jobs that use nodes from 256 to 320 with elapse time limit 10 hours, while the medium class jobs run on nodes from 8 to 128 within 5 hours. 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 2.

The numbers of the collaboration projects and the registered users of the fiscal year 2012 were 56 and 169, respectively.

Large-Scale, parallel type Processing Server		
	Phase 1	Phase 2
Computer	SR16000 L2	SR16000 M1
Total Peak Performance	77TFlops	315TFlops
Total Main Memory	16TB	40.25TB
Number of Nodes	128	322
Number of cores / node	32	32
Peak Performance / node	601.6GFlops	980.48GFlops
Main Memory / node	128GB	128GB
Inter-node Network Speed (bi-direction)	32GB/s	192GB/s
Capacity of Storage System	0.5PB	2.0PB

Table 1. Properties of the Main System.

	A	B	B/A	Jobs
Apr. – Aug.	1.4306	1.3395	93.63%	4,188
Oct. – Mar.	4.7901	4.0102	83.72%	12,496

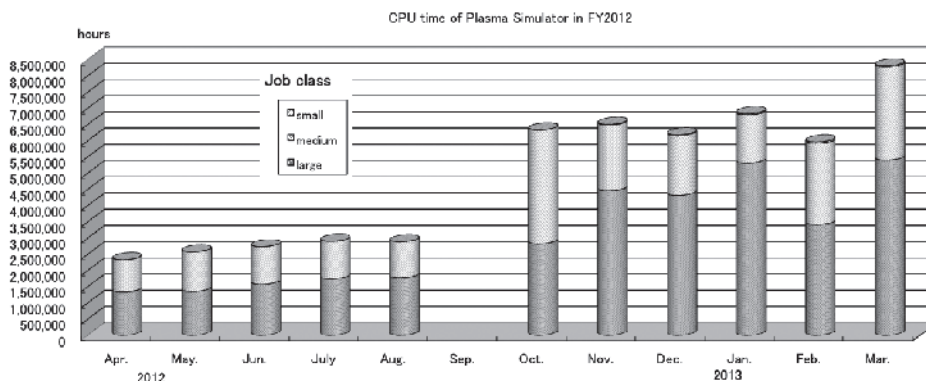Table 2. Operation summary of the Main System in FY2012. A: operation time (10^7 CPU hours), B: CPU time (10^7 CPU hours).

Fig. 1. Operation overview of the Main System in FY 2012.