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 Reactor Research Project that aims at the ultimate realization of the helical numerical test reactor.

The Plasma Simulator consists of the large-scale, parallel-type processing server, FUJITSU FX100 (Main System) and Sub System. The total peak performance and the total main memory of the Main System are 2.62PF and 81TB, respectively. The CPU of the Main System is SPARC64XIfx with clock speed 1.95GHz. The inter-node connection speed is 50GB/s per one link (bi-direction). The properties of the Main System are listed in Table 1.

The Sub System consists of the Data Analysis Server that is composed of four nodes of FUJITSU RX4770 M2. The RX4770 M2 has 36 CPU cores and 1TB memory and some other servers. Both the Main System and the Sub System support program languages, Fortran 90, C/C++, OpenMP, and MPI. The visualization software AVS/Express Developer, AVS/Express PCE, IDL and ParaView are installed on the Visualization Server. The manuals for the Plasma Simulator, FAQ, and information associated with the system were presented on the web (https://www.ps.nifs.ac.jp/).

The Plasma Simulator was ranked as the 27th in the world on the TOP500 List (http://www.top500.org/list/2015/06/) of the high-performance computers, and as the 12th in the HPCG benchmark (http://hpcg-benchmark.org).

The CPU time of the Main System used from June 2015 to March 2016 is shown in Fig. 1. The Main System has four classes, "small", "medium", "large1h", and "large". The large class is for the jobs that use nodes from 1921 to 2160 with elapse time limit 10 hours, while the medium class jobs run on nodes from 25 to 1152 within 5 hours. Another job class, "largeP", which is a collection of ten sequential execution of "large1h" job, was also added as a tentative job class. 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 2015 were 60 and 166, respectively.

Computer	FX100
Total Peak Performance	2.62PFlops
Total Main Memory	81TB
Number of Nodes	2592
Number of cores / node	32
Peak Performance / node	1011GFlops
Main Memory / node	32GB
Inter-node Network Speed (bi-direction)	50GB/s
Capacity of Storage System	10.0PB

Table 1. Properties of the Main System.

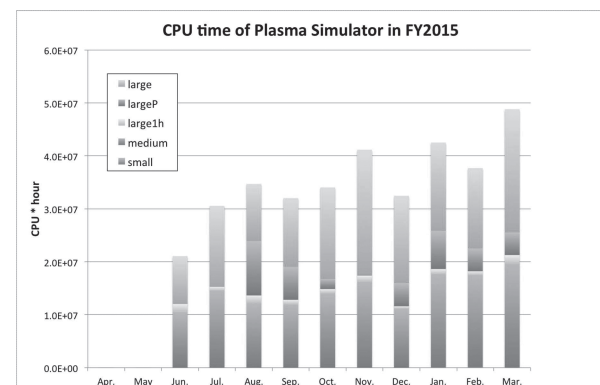| A: operation time (10^7 CPU hours)	B: CPU time (10^7 CPU hours)	B/A	Jobs
8.5359	7.6763	89.93%	70,995

Table 2. Operation summary of the Main System in FY2014.

Fig. 1 Operation overview of the Main System in FY 2015.