

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 is HITACHI SR16000 model M1. The total peak performance is 315TF and the total main memory is 40TB. The CPU of the model M1 is POWER7 with clock speed 3.83GHz. The inter-node connection speed is 192GB/s. The properties of the Main System 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 (<https://www.ps.nifs.ac.jp/>).

The Plasma Simulator was ranked as the 118th in the world on the TOP500 List (<http://www.top500.org/list/2013/06/>) of the high-

performance computers.

The CPU time of the Main System used from April 2013 to March 2014 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 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 2013 were 53 and 158, respectively.

| Computer | SR16000 M1 |
|-----------------------------------------|--------------|
| Total Peak Performance | 315TFlops |
| Total Main Memory | 40.25TB |
| Number of Nodes | 322 |
| Number of cores / node | 32 |
| Peak Performance / node | 980.48GFlops |
| Main Memory / node | 128GB |
| Inter-node Network Speed (bi-direction) | 192GB/s |
| Capacity of Storage System | 2.0PB |

Table 1. Properties of the Main System.

| A: operation time (10^7 CPU hours) | B: CPU time (10^7 CPU hours) | B/A | Jobs |
|---------------------------------------|---------------------------------|--------|--------|
| 8.7457 | 7.5770 | 86.64% | 19,548 |

Table 2. Operation summary of the Main System in FY2013.

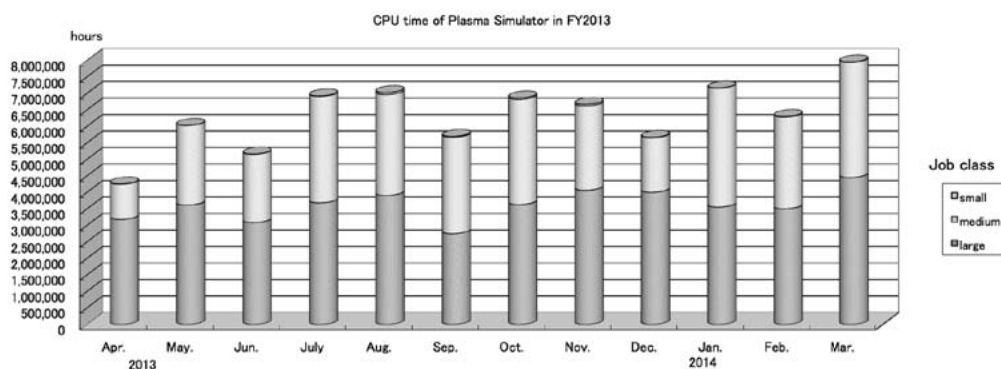


Fig. 1 Operation overview of the Main System in FY 2013.