12. Computer and Information Network Center

The Computer and Information Network Center was established in order to meet the various computational needs for numerical computations, simulation studies, data processing, and data access in the area of plasma physics, nuclear fusion research, and their related fields. Furthermore, the Center provides the network environment suitable for research life.

The Center has been mainly supporting the Large Helical Device (LHD) Experiment Project and its related Simulation Project, and the Research Collaboration with worldwide universities and institutes.

NIFS has two computer systems. One is "LHD Numerical Analysis System" which serves mainly for the LHD Experiment Project and is operated by the Center. The other is "Plasma Simulator", NEC SX-7/160M5, which serves mainly for the Large-Scale Computer Simulation Research Project and is primarily operated by Theory and Computer Simulation Center.

The main part of the LHD Numerical Analysis System consists of NEC SX-8/32M4 with 32 CPU, whose schematic view is shown in Figure 1.

Since the establishment of NIFS, the Center has also made significant improvements in the LAN and WAN. And now, the campus information network of NIFS serves as an infrastructure of information, and is becoming indispensable to the research life.

1. LHD Numerical Analysis System

The CPU server consisting of 5 nodes are working cooperatively as the main part of the system. Each node has eight vector-processing units, and the amount of the CPU memory and processing speed are 512GB and 512GFLOPS, respectively. Distributed parallelized computations using multiple nodes are possible as well as auto-parallelized computations in one node at this system.
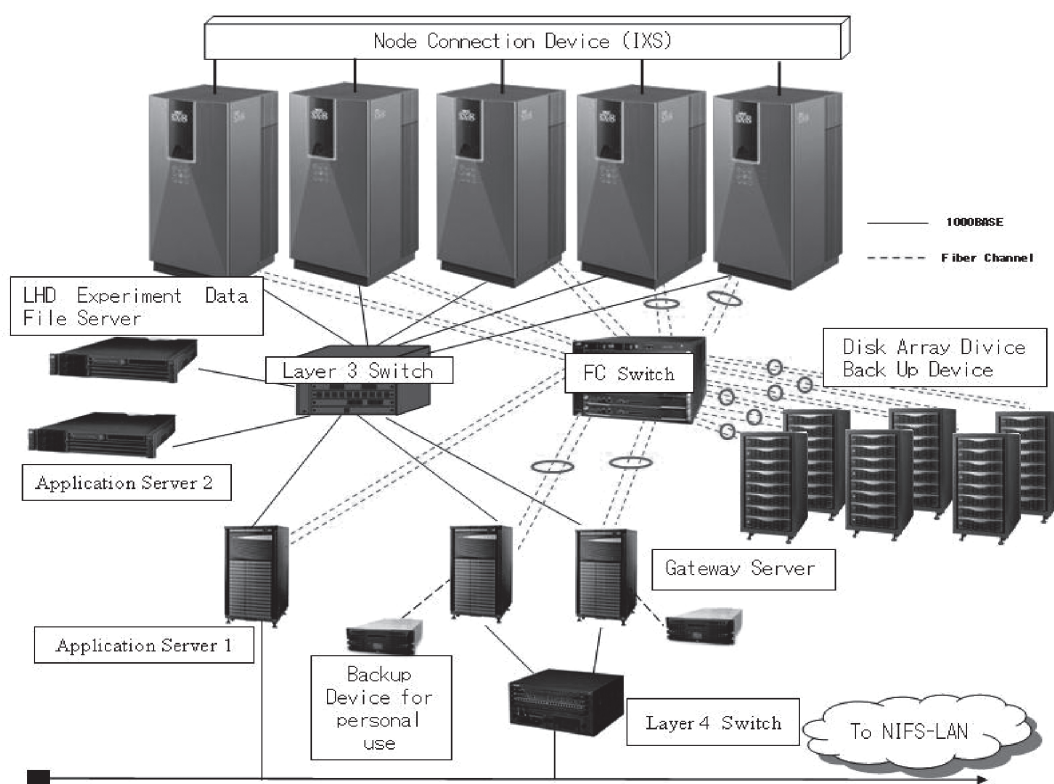

Fig. 1: Schematic View of LHD Numerical Analysis System

This architecture can provide a variety of que classes: 14 kinds of ques exist (D2 que was disused in January, 2007), in which users can use from 4GB and 1 CPU up to 512GB and 32 CPUs using 4 nodes. The CPU server is connected by Fiber Channel to the high-speed magnetic disk system (RAID) with 40TB storage. Two gateways as the front-end processor are provided so that the users can submit their batch jobs using NQSII through the NIFS-LAN from all over the world. The application servers and the LHD Experiment data file server are also provided for the analyses of the simulation results and for the data processing of LHD experiment, respectively. The local manual for the present computer system, FAQ (Frequently Asked Questions), and any other information associated with the system are presented on Web (http://ccweb.nifs.ac.jp).

The monthly used CPU time from April 2006 to March 2007 are shown in Figure 2. The total operation time, the total used CPU time, the ratio of CPU time to the operation time, and the numbers of executed jobs for the same period as Figure 2 are summarized in Table 1. The averaged ratio of CPU time to the operation time is 64.1% in 2006 FY, which is higher than the one in the previous year.

The numbers of the collaboration projects and registered users in the 2006 FY are 63 and 179, respectively.

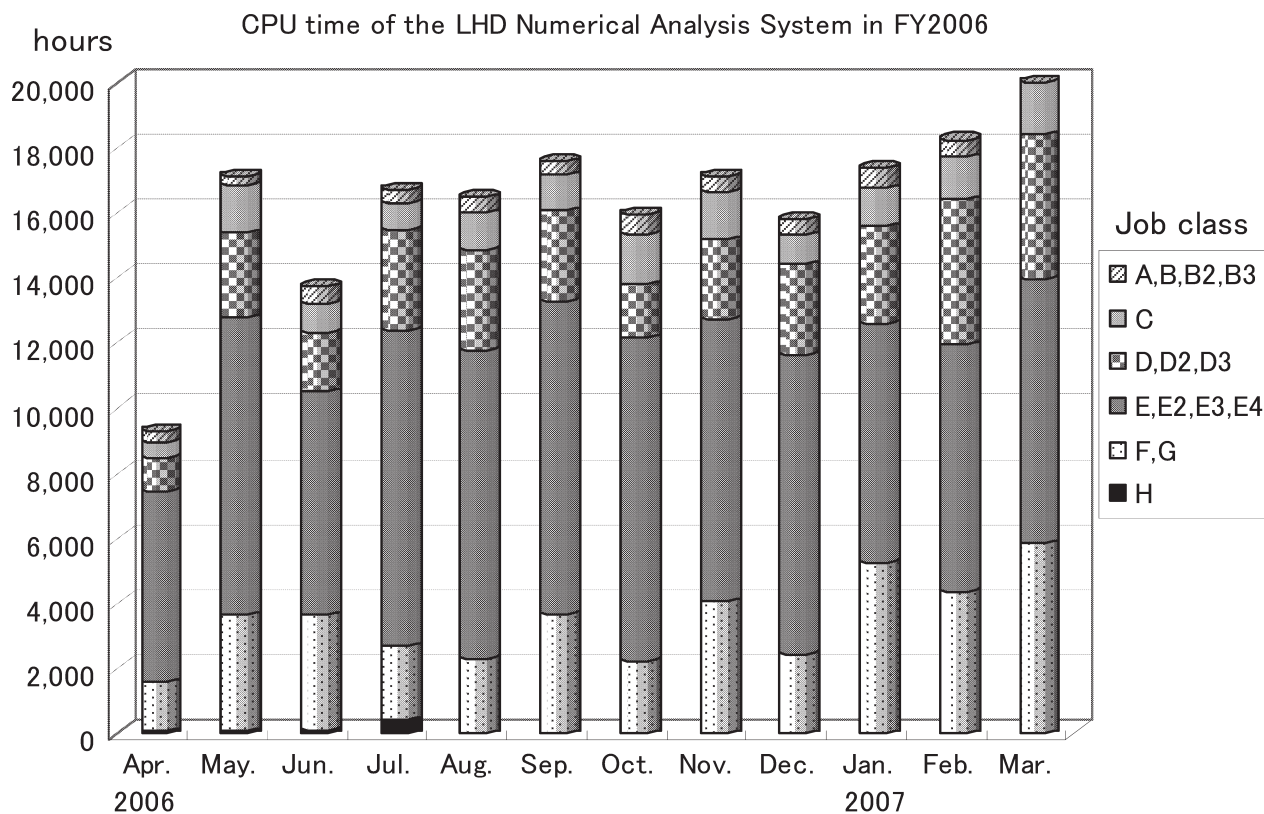| A: operation	B: cpu time	Ratio :B/A	Number of jobs
306,692:24	196,551:38	64.1%	78,714

Table 1: Summary of SX-8 Operation in FY 2006

Fig.2: Operation Overview of SX-8 in FY 2006

2. NIFS Campus Information Network

The advanced NIFS campus information network named "NIFS-LAN" is the information infrastructure which is contributed to development of nuclear fusion research. NIFS-LAN consists of three autonomous clusters which have their own purpose and usage as follows;

1. *Research Information Cluster* is the network of general use, and covers the campus whole region.

2. *LHD Experiment Cluster* is provided for LHD experiment, and covers the building relevant to LHD experiment.

3. *Large-scale Computer Simulation Research Cluster* is provided the efficient network environment for the large-scale computer simulation research.

NIFS-LAN is connected to Super Science Information Network (Super-SINET), managed by National Institute for Informatics. The block diagram of NIFS-LAN is shown in Fig. 3.

1) Security improvements

To keep the high-level security, NIFS-LAN is introduced the firewall and other security equipments. In FY 2006, the following activities were performed to maintain the network security.

a) The security information, such as Windows Update for Microsoft OS and virus information, and the advices were provided by e-mail and Web.

b) The quarantine network room was offered for security check of user's PC and the supports of quarantine processing were provided for the users including visitors.

2) New activity in FY 2006

a) Wireless LAN is available for visitors.

The wireless LAN was installed on Exterior-LAN for visitors. The visitors is not required any preparation before connecting to the network. To avoid connecting the wireless LAN without any awareness, the confirmation server was installed between the wireless LAN and the Internet. This server shows the user the information about the policy of wireless LAN when the user opens the Web browser at the first time. If the user accepts the policy and push the "OK" button on the browser, then the PC can connect to the Internet.

b) SSL-VPN operation was begun.

Secure Socket Layer-Virtual Private Network (SSL-VPN) is a kind of VPN which uses Web browser as a client's software. The SSL-VPN in the NIFS has also the function to check the security level of the client before the VPN connection. For example, if the client has no anti-virus software, then SSL-VPN server notices the warning message and denies the login request. The procedure for obtaining the account for remote access was established. All of SSL-VPN user should use the One-Time Password (OTP) token as the authentication.

c) AntiSpam appliance was installed.

The information exchange with the e-mail is very important for researchers. The Center has operated the mail server for NIFS without any major trouble long years. However, the unsolicited e-mails which is called spam is growing up, and more than half of the e-mail received by the mail server for NIFS might be spam. The mail server had own anti-spam filter, the cost of picking up the normal mail from spam folder was still high.

The AntiSpam appliance (Symantec Mail Security 8160) was installed to reduce this user's cost. This appliance classifies the IP address of servers which is connected to the mail server for NIFS by the possibility of spam. If the server is identified as the spam server, then the appliance interrupts the session between the spam server and the mail server of NIFS, and forces the spam server to re-send later. Many of the spam servers never re-send the same message, the volume of the spam that the user receives would be decrease.

d) Special mail delivery system was tested.

To suppress the work on out of office hours, the special mail system was developed. This system prevents the mail delivering; if the mail was sent from NIFS staff to NIFS staff and the time is out of office hours. The tags which are used in the *subject* line were prepared to emergency delivery. This system was constructed with the mail appliance server and UNIX server. The system was on the test phase in FY 2006.

e) Gigabit network on the Building of Computer Center and Simulation Laboratories.

The network cable in the Building of Computer Center and Simulation Laboratories, which is renamed to Simulation Science Research Laboratories on April 2007, was *yellow cable* (10BASE-5), so the user on this building had felt too slow to exchange the large file with each other. Before the movement of the researchers of Theory and Computer Simulation Center to this building, the high quality network cable (Category 6) which is guaranteed the Gigabit network (1000BASE-T for all wire, 10G BASE-T for the short wire) were installed. The layer 2 (L2) gigabit switches were also installed to provide the bandwidth of 1 Gbps to the information sockets on the building.

(Horiuchi, R.)

to Super-SINET

Collaboration using Super-SINET   Collaboration using Super-SINET

GSW Router

Security System

Servers   LHD Numerical
           Analyzer

Internet Connection   DeMilitarized Zone

G/W

L2 Switch   Gigabit L3 Switch

Plasma Simulator

L2 Switch   L2 Switch   L2 Switch   L2 Switch

L2 Switch   L2 Switch

Large-Scale Computer Simulation Cluster   Gigabit L3   LHD Experiment Cluster
                                               Switch

L2 Switch   L2 Switch

L2 Switch   L2 Switch   L2 Switch
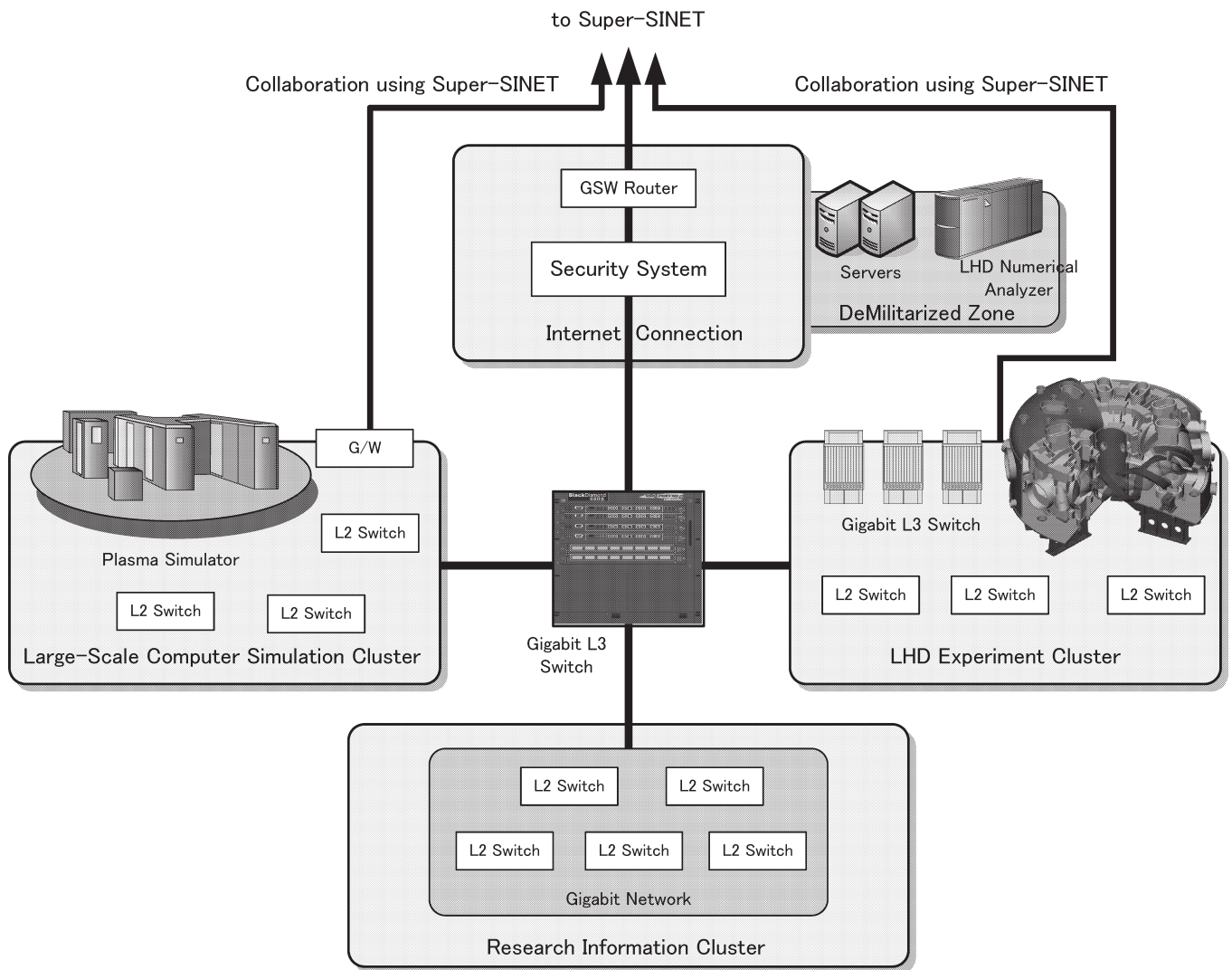
Gigabit Network

Research Information Cluster

Fig.3: Block Diagram of NIFS Campus Information Network (NIFS-LAN)