7. SNET Collaborate Research

NIFS is promoting the “Fusion Virtual Laboratory Initiative” to integrate fusion experiments and research environments in Japan using SNET, and is remotely collecting and storing data from plasma experiment devices such as the QUEST at Kyushu University, the GAMMA10 at Tsukuba University, and the TST-2 at the University of Tokyo.

In addition, NIFS is working with the ITER Remote Experimentation Center (REC) on the ITER project, which is an international collaboration, on the demonstration of the remote participation, storage of large amounts of data, and with the National Institute of Informatics (NII) on research related to the transfer of large amounts of data over long distances across national boundaries.

Research Highlights

The TST-2 is a pulse discharge device, and noise is generated around it. To suppress this noise, an isolation amplifier is required. Four types of isolation amplifier modules were tested: the AD215, the ISO122, the ISO124, and the TLP7920. As a result, we concluded that the ISO124 is suitable.

In FY2021, 2228 plasma experiments were conducted using the GAMMA10 device. The data are stored on a Linux server and transferred in the LABCOM data format. A direct transfer system from the GAMMA10 to NIFS by the PXI system is also in use. Last year, 16 channels of Doppler reflectometer data were fully operational in this system and are being used stably for experimental data analysis. This data can be easily retrieved using the LabView program. In addition, the microwave interferometer data previously collected by the CAMAC system is now also collected by the Compact DAC, allowing the data to be checked immediately after the plasma discharge.

The REC is promoting the Fusion Information Science Center (FISC) concept as an infrastructure to promote data-driven modeling for DEMO reactors. In this study, network storage, which plays a central role in the FISC, was investigated. The conceptual design of a storage system that satisfies both of these requirements was developed. As a result, we have concluded that a combination of all-flash storage for short-term storage of relatively small data, long-term and high-speed storage such as Data Warehouse for storing structured data for efficient machine learning and other applications is effective (Fig. 1). Detailed technical design will be conducted according to this framework in the future.

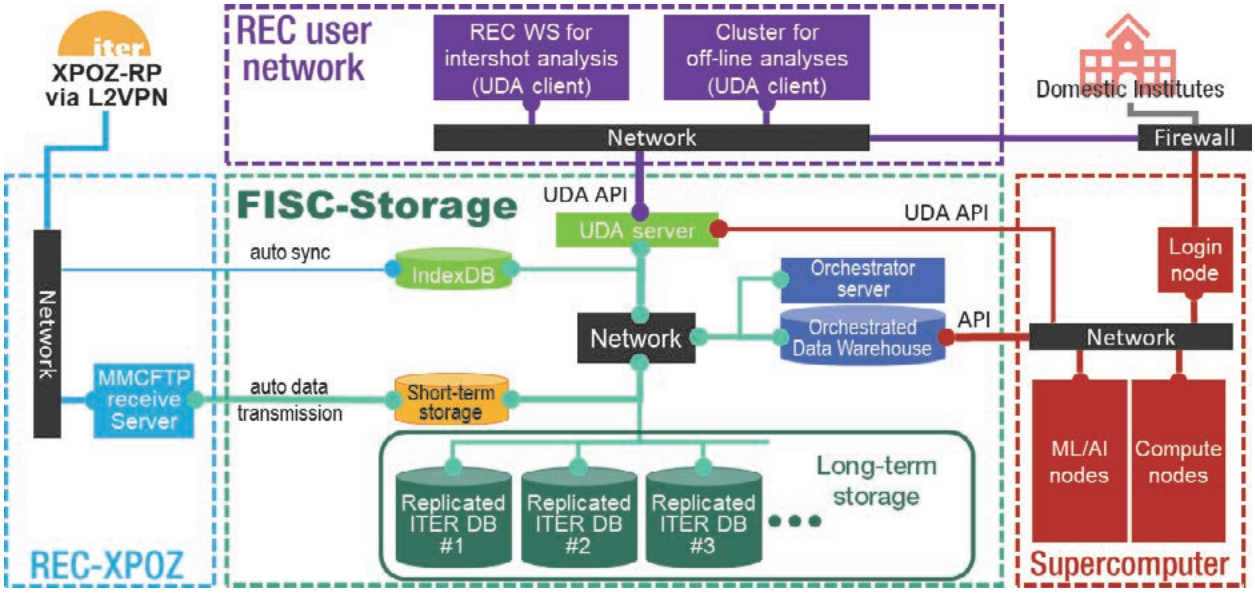

Fig. 1 Conceptual design of FISC storage network

In this term's research, we evaluated the ITER Dashboard, a web-based system for displaying ITER measurement and monitoring information as a live data display system, and conducted research and development to address issues with the file transfer tool MMCFTP that were pointed out in the previous year's joint research.

MMFCTP, a high-speed file transfer tool, divides a group of files to be transferred into several parts, archives them sequentially, sends them one after another, starting with the archived ones, and decompresses them after completion of reception at the receiving end. However, a problem was pointed out that the longer the distance, the greater the time between archive-to-archive transfers. As a solution to this problem, it was decided to use the TCP connection, once established. In addition, we studied and began implementation of a database to enable efficient transfer.

(M. Emoto)