

## Portability Improvement of LABCOM Data Acquisition System for the Next-Generation Fusion Experiments

Hideya Nakanishi(1), Masaki Ohsuna(1), Mamoru Kojima(1), Setsuo Imazu(2), Noriharu Kuroda(1), Yoshio Nagayama(1), Kazuo Kawahata(1)

1. National Institute for Fusion Science Oroshi, 322-6 5025292 Toki Japan
2. Pretech Corp. 1-19-13 Kanayama-cho, Atsuta-ku 456-0002 Nagoya Japan

The LABCOM data acquisition system (DAQ) has been operated for the LHD plasma diagnostics in nine years. It has set up a new world record of acquired data amount of 90 GB/shot in 2006. Its ultra-wideband DAQ based on the CompactPCI digitizers has enabled about 80 MB/s real-time data acquisition for each plasma measurement. Actually proved bandwidth of 80 MB/s could easily reach the essential requirement for the next-generation fusion experiments, such as ITER. The basic performance of a DAQ unit has good prospects toward them, however, the subsidiary utilities are not fully equipped yet.

The increasing number of parallel DAQ units has made the operational and maintaining burden too heavy, and the data migration procedures between multi-tier distributed storages also need much closer attention. Therefore, "more distributed acquisition and centralized operations" would be indispensable to cope with both high-efficiency I/O throughputs and much enlarged data volume. In this study, DAQ front-end that consists of some digitizer chassis and an acquisition computer has been entirely re-designed to realize a lower-cost and maintenance-free "DAQ Box" for fusion plasma measurements.

To satisfy those necessary conditions, Linux OS and its free drivers for digitizers, such as CAMAC and CompactPCI, have been adopted. Network-bootable diskless computers are desirable for reducing the possibility of hardware troubles against the bad noise environment. To wire it adjacently to the digitizer controller could get rid of the cost for electrically isolating uplinks. In addition, it would involve that the first-tier data storage become extinct, and therefore, could reduce the migration cost and time.

Another functional extension is to cope with multiple sites and experiments, in which remote participation mechanisms and utilities would be essential. So-called the "DataGrid" network structure, which will be provided by the specific middleware such as Globus toolkit or ITBL, should be introduced into the LABCOM data system.

These conceptual re-design for the DAQ framework would provide the universal data accessing environments among multiple sites and experiments. Simultaneously, users could obtain the proper access controlling functionality for data and system security.