Clustered Data Storage for Multi-site Fusion Experiments

H. Nakanishi, M. Kojima, M. Ohsuna, S. Imazu, M. Nonomura, T. Yamamoto, M. Emoto,
Y. Nagayama, K. Kawahata, LHD exp. group, M. Hasegawa[a], A. Higashijima[a], K. Nakamura[a],
M. Yoshikawa[b]

National Institute for Fusion Science, 322-6 Oroshi-cho, Toki 509-5292, Japan
[a] RIAM, Kyushu Univ., 6-1 Kasuga-kouen, Kasuga 816-8580, Japan
[b] PRC, Tsukuba Univ., Tsukuba 305-8577, Japan

nakanishi.hideya@lhd.nifs.ac.jp

Remote participation technology is one of the most important fundamentals for modern fusion experiments. It is usually based on over 10 Gbps networks, in which many Giga-bytes or sometimes Tera-bytes experimental data are shared by distributed users. On the other hand, the amount of experimental data which keeps growing continuously often causes the management burden to be overloaded for a limited number of staffs. Such the increasing costs of data management will possibly be optimized by a concentration of the data storage system using the ultra-wideband networks.

LABCOM data system can already provide full functions in both the local and remote participations for the LHD fusion experiments [1,2]. In this study, we have added a new function to deal with acquired raw data not only in one experimental device but also from multiple distant sites. As the LABCOM/X system has originally a distributed structure in which data acquisition and storage units are completely separated on fast network, this multi-site modification was realized with a minimum change mainly on the data location indexing database.

In addition to sharing the clustered storage volumes with different experimental sites, a clear distinction should be given to the access permission and restriction for data and users of each site. These access controls are also implemented on the indexing database. The network security is intrinsically provided by using the SINET3 Layer-2/-3 Virtual Private Network (VPN) served by NII.

The multiple sites' data handling has already been operated since September 2008, under bilateral collaboration of LHD in NIFS, QUEST in RIAM, Kyushu Univ., and GAMMA10 in PRC, Tsukuba Univ. We will further advance this "Fusion Virtual Laboratory" environment to become a good prototype of coming ITER/ITER-BA remote experiment.

[1] H. Nakanishi, et al., Fusion Eng. Design **82** (2007) 1203.
[2] M. Ohsuna, et al., Fusion Eng. Design **81** (2006) 1753.