§6. CHS Data Acquisition and Analysis System

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The CHS experimental data analysis and storage server has been working continuously. It is used for experimental data analysis and re-interpretation of the old data based on new knowledge. Number of access to this server from outside NIFS has been increasing, because usefulness of re-examination of old CHS data has been recognized. The increased access sometimes causes degradation of computer performance. One reason comes from the complex protocol of computer communication with SSH2. It is useful for computer communication, but not for its simple use as a calculation machine. Another problem is that the old computer system suffers troubles so often, which is increasing year by year. There is also a system risk due to aged components.

The CHS original raw data are stored in the magnetized optical disk (MO) cartridges. Three stage back-up copies are stored in separate media for safety. One copy is in the storage server for daily access by the users. When a parity error is observed in one of these copies, we have to refer the original data in MO cartridges and confirm the error source. Only the MO drive that was used in data writing can read the data in the MO cartridges. If this drive device is out of order, the MO data cannot be read anymore. Maintenance of the device is serious. So far it was not easy to find the proper MO cartridge to be referred among many cartridges, because the data set is managed with only by shot numbers. We have developed search map software. Now we can find the MO cartridge quickly that stores the requested original data set.

The CHS data acquisition and analysis system has used two types of data management and display soft wares, DMG (developed in ORNL) and MDSplus (developed in MIT). The LHD LABCOM group invited a person in charge of MDSplus in MIT. We asked him for installation and tuning of the new version of MDSplus. It is now installed in the two server computers, "int" and "inm". The speed of data analysis and the scalability of data storage space have been improved. In the new system, two independent server computers, "int" and "inm", are in operation, which has improved the security against troubles or disasters. Figure 1 show the "int" and "inm" data analysis and storage system.

The VAX6310 computer named "invax" has been used for the data acquisition and storage since 1989. It was the second-generation computer for the CHS data acquisition system. This computer is still indispensable for verification and correction of numerical precision in 16-bit or 32-bit calculation. A serious trouble occurred in "invax" system this year for the first time since its first installation in 1989. The CPU board stopped working. Finally it was fixed by replacing the CPU board with new one, but it took ten days to find this new CPU board, because such old type CPU boards are not stored in the maker storage anymore. Such trouble will occur again in future. An effective risk management will be required if we continue these services in future.

The only one method for the CHS collaborators to access the data analysis and storage servers from outside NIFS is to login via SSH2 protocol. This is the NIFS's rule. The SSH2 is the superior encryption method, but it is not suitable for handling data from outside NIFS. If we adapt the public key, it takes time to send the key with encryption and slows down data analysis. If we adapt the common key, meaning of encryption will be less. We will have to think about a new method of encryption communication that is suitable for the system of data acquisition and analysis.

Fig.1. DS20E Tru64/VMS data storage and analysis system

[1] Takahashi, C. et al., Annual report of NIFS, April 2004-March 2005 300(2005)

[2] Takahashi, C. et al., Annual report of NIFS, April 2005-March 2006 324(2006)

[3] Takahashi, C. et al., Annual report of NIFS, April 2006-March 2007 314(2007)

[4] Takahashi, C. et al., Annual report of NIFS, April 2008-March 2009 282(2009)