§17. New CHS Data Acquisition and Analysis System

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I. In this fiscal year, the CHS data acquisition system (DAS) was moved to Toki site. The DAS could acquire experimental raw data of 37Mbytes/shot (3.7G bytes/day) in Higashiyama-site. The total raw data since 1989 was compressed into 280Gbytes and was stored in the large experimental data storage system (Optical juke box and raid system) of DAS. The database was made by DMG (Data base Management System, introduced from ORNL). It is easy for us to refer to this database from computer terminals in the institute, if one has an account of CHS. Fig.1 shows the DAS setting room at R&D building in Toki site. In the new site, it took 8 months to set up the DAS. Main tasks were as follows:

(1)Build up for new data acquisition and analysis system. See chapter II.

(2)Re-build the new network system.

The CHS/DAS has three network classes, which are DECnet, TCP/IP and the owner network of VME newly added. The computer devices on these networks have connecting channels to all CHS computers, however, owner network of the VME is used for data acquisition and it needs to keep the traffic and collisions low, then this VME network is of independent design of other computers in DAS .

(3)Wiring of the AC Power supplies.

All of the DAS computers are connected to un-interruptable power supplies (UPS), except for the AC220 Volt lines that are used for one large computer system.

(4)Wiring of the signal and control cables.

About one hundred signal coaxial cables and control cables were immediately required and wiring has been finished. In the future, the CHS/DAS will need more than three hundred cables.

(5)Tune the Computer system and CAMAC in the DAS .

We are developing the new data acquisition system and will use DAS, which has been used for 9 years in Higashiyama-site, as much as possible, because it has good reliability. New DAS has the fast data acquisition function of which characteristic is one of some specifications, accordingly we need to develop the program synchronizing new DAS with old one. This program can provide the synchronizing speed of output/input from/to DAS and new DAS via network.

II. The principle of DAS has been of fast data acquisition, of fast analysis and of fast storage. CHS experimental data here will be over 70Mbytes/shot, which is lager than that at Higashiyama-site. We have prepared new DAS (called CINOS which is the alias for CHS Integrated architecture with No Operating System.) which consists of VME computer architecture. CINOS has plural computers (32 bit computer × 2, 64 bit computer × 1, DSP × 1), CAMAC system, over 6 Ether-net ports, and referential memory system. It has some unique characteristics as follows:

1. Four computer modules are set in one VME crate, and each computer has independent operating systems (OS) that are UNIX and OS-9, and the No OS (No-OS) computer for CAMAC.

2. No-OS computer is a main core processor in CINOS and the idea "No-OS" is the most important principle. This principle of CINOS is to guarantee CAMAC data acquisition with substantially small time fluctuation. Traditional or modern data acquisition system , specifically multi task/user operating system or the network connected computer, must have redundancy in time, which makes a nonlinear time dependence between input/output. CINOS removed this nonlinear time dependence during the data acquisition time of CAMAC in old DAS. CINOS can execute the data acquisition by linear time process (LTP) by using the No-OS computer in CINOS. Fig.2. shows the LTP by CINOS. The computer system in recent years has a large OS, large application programs and is connected to the network, then the input/output data acquisition time is shifted by a few milli-seconds to more than hundred milli-seconds, but CINOS keeps the shift within only a few micro-seconds. This result shows the effectiveness of LTP execution, therefore, CINOS can process any jobs within an expected time, which is very important for fast and large data acquisition for future.

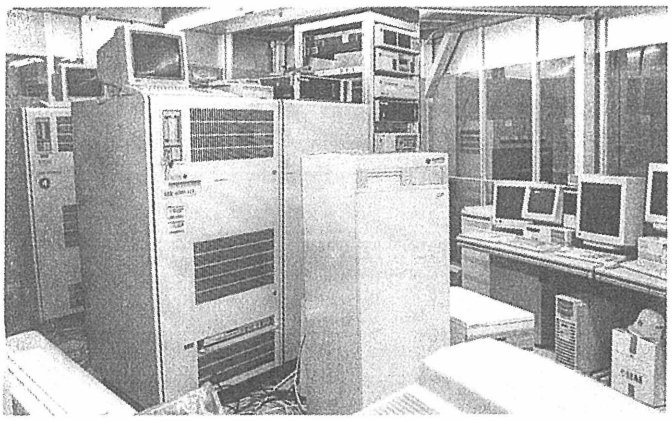

Figure 1. CHS data acquisition system in Toki-site.

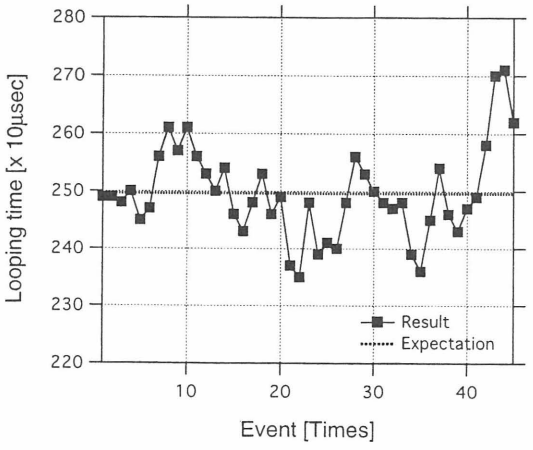

Figure 2. Through-put time by No-OS computer