Research Facility Development Division
Research Instruments Group
Computing and Network Team

1. Abstract

This team is in charge of development, management and operation of the computing and network environment, mail and information servers and data acquisition system and management of the information security of the RIKEN Nishina Center.

2. Major Research Subjects

(1) Development, management and operation of the general computing servers
(2) Development, management and operation of the mail and information servers
(3) Development, management and operation of the data acquisition system
(4) Development, management and operation of the network environment
(5) Management of the information security

3. Summary of Research Activity

This team is in charge of development, management and operation of the computing and network environment, mail and information servers and data acquisition system and management of the information security. The details are described elsewhere in this progress report.

(1) Development, management and operation of the general computing servers

We are operating Linux/Unix NIS/NFS cluster system for the data analysis of the experiments and general computing. This cluster system consists of eight computing servers with 64 CPU cores and totally 200 TB RAID of highly-reliable Fibre-channel interconnection. There are approximately 300 active user accounts on this cluster system (a total of about 800 accounts were registered so far). We are adopting the latest version of the Scientific Linux (X86 64) as the primary operating system, which is widely used in the accelerator research facilities, nuclear physics and high-energy physics communities in the world.

(2) Development, management and operation of the mail and information servers

We are operating RIBF.RIKEN.JP server as a mail/NFS/NIS server. This server is a core server of RIBF Linux cluster system. Postfix has been used for mail transport software and dovecot has been used for imap and pop services. These software packages enable secure and reliable mail delivery. Sophos Email Security and Control (PMX) installed on the mail front-end servers which tags spam mails and isolates virus-infected mails. The probability to identify the spam is approximately 95–99%. We are operating several information servers such as Web servers, Integrated Digital Conference (INDICO) server, Wiki servers, Groupware servers, Wowza streaming servers. We have been operating approximately 70 units of wireless LAN access points in RNC. Almost the entire radiation-controlled area of the East Area of RIKEN Wako campus is covered by wireless LAN for the convenience of experiments and daily work.

(3) Development, management and operation of the data acquisition system

We have developed the standard data-acquisition system named as RIBFDAQ. This system can process up to 40 MB/s data. By using crate-parallel readout from front-end systems such as CAMAC and VME, the dead time could be minimized. To synchronize the independent DAQ systems, the time stamping system has been developed. The resolution and depth of the time stamp are 10 ns and 48 bits, respectively. This time stamping system is very useful for beta decay experiments such as EURICA, BRIKEN and VANDLE projects. One of the important tasks is the DAQ coupling, because detector systems with dedicated DAQ systems are transported to RIBF from foreign facilities. In case of SAMURAI Silicon (NSCL/TUM/WUSTL), the readout system is integrated into RIBFDAQ. The projects of MUST2 (GANIL), MINOS (CEA Saclay), NeuLAND (GSI) and TRB3 (TUM) cases, data from their DAQ systems are transferred to RIBFDAQ and merged online. For SPIRIT (RIKEN/GANIL/CEA Saclay/NSCL), RIBFDAQ is controlled from the NARVAL-GET system that is a large-scale signal processing system for the time projection chamber. EURICA (GSI), BRIKEN (GSI/Univ. Liverpool/IFIC), VANDLE (UTK) and OTPC (U. Warsaw) projects, we adopt the time stamping system to apply individual trigger for each detector system. In this case, data are merged in offline. In addition, we are developing intelligent circuits based on FPGA. General Trigger Operator (GTO) is an intelligent triggering NIM module. The trigger system in BigRIPS DAQ is managed by 5 GTO modules. To improve the data readout speed of VME system, we have successfully developed the MPV system which is a parallel readout extension of the VME system. Data readout sequence is completely parallelized that helps to improve the DAQ deadtime. Thanks to the MPV system, now the DAQ system in RIBF is 10 times faster than in 2007. Toward to the next generation DAQ system, we have started to develop a real-time data processing unit based on Xilinx RFSoC that includes FPGA and 4 GHz FADC for TOF measurements of plastic scintillators. For gaseous detectors like PPAC and drift chamber, the development of FPGA-based dead-time free TDC is now in progress.

(4) Development, management and operation of the network environment

We have been managing the network environment collaborating with Information Systems Division in RIKEN. All the Ethernet ports of the information wall sockets are capable of the Gigabit Ethernet connection (10/100/1000 bps). In addition, some 10 Gbps networks port has been introduced to RIBF experimental area. Approximately 100 units of wireless LAN access points have been

installed to cover the almost entire area of Nishina Center.

(5) Management of the information security

It is essential to take proper information security measures for information assets. We are managing the information security of Nishina Center collaborating with Information Systems Division in RIKEN.

Members

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List of Publications & Presentations

Publication

[Original Paper]

H. Baba, T. Ichihara, T. Isobe, T. Ohnishi, K. Yoshida, Y. Watanabe, S. Ota, H. Shimizu, S. Shimoura, S. Takeuchi, D. Nishimura, J. Zenihiro, A. O. Tokiyasu, and R. Yokoyama, "MPV—Parallel readout architecture for the VME data acquisition system," IEEE Trans. Nucl. Sci. **68**, 1841 (2021).

Presentations

[Domestic Conferences/Workshops]

馬場秀忠 (口頭発表), 「RIBFDAQ のアップグレード計画」, 日本物理学会第 77 回年次大会, オンライン, 2022 年 3 月 15–19 日.

武重祥子 (口頭発表), 馬場秀忠, 栗田和好, 栂野泰宏, 銭廣十三, 土方佑斗, 「RFSoC 波形処理システムの RI ビーム実験への実装」, 日本物理学会第 77 回年次大会, オンライン, 2022 年 3 月 15–19 日.