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 services 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 services and data acquisition system and management of the information security of the RIKEN Nishina Center.The details are described elsewhere in this progress report.

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

We are operating Linux cluster system for the data analysis of the experiments and general computing. This cluster system consists of eight computing servers with 74 CPU cores and totally 500 TB RAID of highly-reliable Fibre-channel interconnection. There are approximately 100 active user accounts on this cluster system. We are adopting the latest version of the Linux operating system. In addition to the cluster system, we have constructed analysis environment on the private could system of HOKUSAI Sailing Ship operated by Information Systems Division in RIKEN. As computational resources for data analysis of RIBF experiments, 80 core and 150 TB diskspace are reserved. These resources are dynamically allocated to several experimental projects.

**(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. We are operating several information servers such as Web servers, Integrated Digital Conference (INDICO) server, Wiki servers, Groupware servers, Wowza streaming servers.

**(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 other 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. 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. 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. For Silicon semiconductor detectors, waveform digitizer based front-end electronics is commissioned. From 2022, Signal processing and data acquisition infrastructure (SPADI) alliance is launched to advance collaborative DAQ development in Japanese nuclear physics community. This team participates as one of the core members of the SPADI alliance.

**(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. 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. In 2022, wireless LAN system (including Guest and Eduroam network) operated by

RIKEN Information Systems Division is additionally introduced in the measurement rooms in RIBF B1F and B3F.

**(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

**Team Leader**
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## List of Presentations

**Presentations**

**[International Conference/Workshop]**

S. Takeshige, H. Baba *et al.* (poster), "Time determination method using digital waveform processing with RFSoC for RI beam experiments," 23rd Virtual IEEE Real Time Conference, Online, August 1–5, 2022.

**[Domestic Conference/Workshop]**

馬場秀忠 (口頭発表),「WG2(時刻同期・通信)報告と展望」, 原子核実験の先端データ収集システム—標準化と将来—, 茨木市 (大阪大学 RCNP), 2022 年 5 月 17 日.