CCJ operations in 2020

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Overview

The RIKEN Computing Center in Japan (CCJ)[1] commenced operations in June 2000 as the largest off-site computing center for the PHENIX[2] experiment being conducted at RHIC. Since then, CCJ has been providing numerous services as a regional computing center in Asia. We have transferred several hundred terabytes of raw data files and nDST[a] files from the RHIC Computing Facility (RCF)[3] to CCJ.

Many analysis and simulation projects are being conducted at CCJ, which are listed on the web page `http://ccjsun.riken.go.jp/ccj/proposals/`. As of December 2020, CCJ has contributed to 44 published papers and 45 doctoral theses.

Computing hardware and software

The network configuration and the computing hardware (nodes) and software (OS, batch queuing systems, database engine, *etc.*) are almost the same as described in the previous APR.[4] We have two login servers, one main server (users' home directory, NIS, DNS, and NTP), and two disk servers, the disk sizes of which are 13 and 26 TB. The main server has an external SAS RAID (21 TB) for the home and work regions of users as well as system usage. Moreover, the server has a RAID with built-in disks (13 TB) that can be used temporarily by users and the system.

We operate 25 computing nodes, of which 16 nodes were purchased in March 2009 and 9 nodes were purchased in March 2011. Thus, in total, 344 ($= 8 \times 16$ nodes $+ 24 \times 9$ nodes) jobs can be processed simultaneously by these computing nodes using a batch queuing system, LSF 9.1.3.[5] Upgrade to LSF 10 is planned in JFY 2021. Table 1 lists the number of malfunctioning SATA or SAS disks in the HP servers, namely, computing nodes and NFS/AFS servers.

One database (postgreSQL[6]) server and one AFS[7] server are operated in order to share the PHENIX computing environment. It should be noted that only the SL5[8] environment is shared by the computing nodes, which have approximately 0.9 TB of library files. We operated two data-transfer servers, which have a 12 TB SATA RAID with built-in disks. This year, another data-transfer server, which has a capacity of 39 TB, was deployed. Data transfer from J-PARC was performed in June during an experiment over 16 days, and 33 TB of raw data were transferred to CCJ. The data were archived in a tape device in Hokusai.[9] In addition, we operate two dedicated servers for the RHICf group[10] and two servers for the J-PARC E16 group[11]

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a) Term for a type of summary data files in PHENIX

Table 1. Number of malfunctioning HDDs in HP servers during 2011–2020.

Type (Size)	total	20	19	18	17	16	15	14	13	12	11
SATA (1 TB)	192	9	8	16	18	8	14	11	16	20	9
SATA (2 TB)	120	5	10	2	10	2	10	0	2	5	4
SATA (4 TB)	10	0	0	0	–	–	–	–	–	–	–
SAS (146 GB)	38	3	6	3	1	5	3	2	0	1	1
SAS (300 GB)	26	1	2	0	1	0	1	1	0	0	1

Table 2. Tape usage in Hokusai as of December 2020.

user	total	PHENIX official	KEK/ J-PARC	RHICf	user-level archive
size (TB)	921	749	60	3	109

in order to keep their dedicated compilation and library environments along with some data.

A server for the test of Docker[12] was deployed to support the sPHENIX/EIC users as well as to develop an OS-independent job submission scheme.

Joint operation with ACCC/HOKUSAI

CCJ and the RIKEN Integrated Cluster of Clusters (RICC) have been jointly operated since July 2009. In April 2015, a new system named "HOKUSAI Greatwave"[13] was launched by RIKEN ACCC,[9] and the joint operation with CCJ continued, with the inclusion of a new hierarchical archive system in which approximately 900 TB of CCJ data are stored. A breakdown of the data is presented in Table 2.

In autumn 2020, ACCC started a system of charging users for their usage of CPU time and storage capacity. Tape usage is not yet charged as of 2020, and a charging policy for the future has not yet been fixed. We are in discussiions with ACCC to set a reasonable fee.

References
1) `http://ccjsun.riken.jp/ccj/`.
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4) S. Yokkaichi *et al.*, RIKEN Accel. Prog. Rep. **53**, 137 (2020).
5) `https://www.ibm.com/docs/en/spectrum-lsf/`.
6) `http://www.postgresql.org/`.
7) `http://www.openafs.org/`.
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10) Y. Itow *et al.*, arXiv:1409.4860 (Proposal).
11) S. Yokkaichi, in this report.
12) `https://www.docker.com/`.
13) `https://i.riken.jp/supercom/`.