CCJ operations in 2021

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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 USA.

Many analysis and simulation projects are being conducted at CCJ, which are listed on the web page `http://ccjsun.riken.jp/ccj/proposals/`. As of December 2021, CCJ has contributed to 46 published papers and 45 doctoral theses.

Computing hardware and software

The network configuration and computing hardware (nodes) and software (OS, batch queuing systems, database engine, *etc.*) are almost the same as described in the previous APR[3] and the number of servers are summarized in the Table 1. One of disk servers, which had a 13-TB built-in RAID, was replaced by one with 39 TB in November. The main server (users' home directory, NIS, DNS, and NTP) and SAS RAID will be replaced in March 2022. In 4Q 2021, Hewlett-Packerd hardware was in short supply, owing to the "semiconductor crisis." Thus, we gave up to purchase built-in RAID as the previous server had. In addition, we operate two dedicated servers for the RHICf group[4] and two servers for the J-PARC E16 group[5] in order to maintain their dedicated compilation and library environments along with some data.

Table 1. Number of servers and disk sizes.

	number	disk (TB)	(type)
main server	1	21 + 13	DL380eG8
login server	2	-	DL145G3/DL20G9
interactive server	3	-	-/DL320G6/DL160G9
calculation server 1	16	10	DL180G6
calculation server 2	8	20	DL180G6
work disk server (replaced in Nov.)	2	26 / 13 →39	DL180G9/DL180G6 →DL385G10
DB server	1	1	DL145G3
library(AFS) server	1	9	DL180G6
transfer server	2	12 / 39	DL180G9/DL380G10
docker test server	1	-	DL20G9

We operate 25 computing nodes, and 328 (= 8 × 17 nodes + 24 × 8 nodes) jobs can be processed simultaneously by these computing nodes using a batch queu-

ing system, LSF 9.1.3.[6] Table 2 lists the number of malfunctioning SATA or SAS disks in the HP servers, namely, computing nodes and NFS/AFS servers. The OS of nine calculation nodes and of one interactive server were upgraded to SL7.9 from SL5.3[7] in October, and the remainder will be upgraded in March 2022.

Three 10-KVA UPSs are operated as power supplies for these CCJ nodes and their batteries were replaced in March.

Table 2. Number of malfunctioning HDDs in HP servers during 2011–2021.

Type (TB)	total	21	20	19	18	17	16	15	14	13	12	11
SATA (1.0)	192	10	9	8	16	18	8	14	11	16	20	9
SATA (2.0)	120	9	5	10	2	10	2	10	0	2	5	4
SATA (4.0)	26	2	0	0	0	-	-	-	-	-	-	-
SATA (6.0)	20	0	0	0	0	-	-	-	-	-	-	-
SAS (0.15)	38	5	3	6	3	1	5	3	2	0	1	1
SAS (0.3)	26	2	1	2	0	1	0	1	1	0	0	1

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"[8] was launched by RIKEN Advanced Center for Computing and Communication (ACCC), and the joint operation with CCJ continued, with the inclusion of a new hierarchical archive system in which approximately 1060 TB of CCJ data were stored as of December 2021. A breakdown of the data is presented in Table 3. Data transfer from J-PARC was performed in February and June during an experiment of over 18 and 12 days, and 28 and 46 TB of raw data were transferred to CCJ, respectively. The data were archived in a tape device in Hokusai.[8]

Table 3. Tape usage in Hokusai as of December 2021.

user	total	PHENIX official	KEK/ J-PARC	RHICf	user-level archive
size (TB)	1059	749	171	8	130

References
1) `http://ccjsun.riken.jp/ccj/`.
2) `http://www.phenix.bnl.gov/`.
3) S. Yokkaichi *et al.*, RIKEN Accel. Prog. Rep. **54**, 121 (2021).
4) Y. Itow *et al.*, arXiv:1409.4860 (Proposal).
5) S. Yokkaichi, in this report.
6) `https://www.ibm.com/docs/en/spectrum-lsf/`.
7) `http://www.scientificlinux.org/`.
8) `https://i.riken.jp/en/supercom/`.

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