CCJ operations in 2022

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Overview

The RIKEN Computing Center in Japan (CCJ)[1] commenced operations in June 2000 as the largest offsite 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 2022, CCJ has contributed to 47 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 nearly the same as described in the previous APR,[3] and the number of servers are summarized in Table 1. The main server (users' home directory, NIS, DNS, and NTP), SAS RAID for the server (15.5 TB), and one login server were replaced, and a new interactive server was deployed in Oct. 2022. Interactive servers are used for the compilation and test runs for the jobs before the submission to the computing nodes. Two spare machines for interactive and login servers were prepared.

Table 1. Number of servers and disk sizes, as of 2022 Dec. Dagger(†) shows replacement and newly deploying in this year (detail is in the text).

	number	disk size (TB/node)	type
main server	1	6(built-in) + 15.5(RAID)	DL360G10†
login server	2	-	DL20G9/DL20G10†
interactive server	4	-	-/DL320G6/ DL160G9/DL20G10†
calculation node 1	16	10	DL180G6
calculation node 2	8	20	DL180G6
work disk server	2	26 / 39	DL180G9/DL385G10
DB server	1	1	DL145G3
library(AFS) server	1	9	DL180G6
transfer server	2	12 / 39	DL180G9/DL380G10
docker test server	1	-	DL20G9

In addition, we operate one dedicated server 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.

We operate 26 computing nodes, and 352 (= 8 × 17 nodes + 24 × 9 nodes) jobs can be processed simultaneously via these computing nodes using a batch queuing 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 two interactive servers operated in SL7.9[7] and the rest are still old. Two old interactive servers will be shutdown following the upgrade of the computing nodes.

Table 2. Number of malfunctioning HDDs in HP servers during 2011–2022.

Type (TB)	total	11	12	13	14	15	16	17	18	19	20	21	22
SATA (1.0)	192	9	20	16	11	14	8	18	16	8	9	10	5
SATA (2.0)	120	4	5	2	0	10	2	10	2	10	5	9	7
SATA (4.0)	26	-	-	-	-	-	-	-	0	0	0	2	0
SATA (6.0)	20	-	-	-	-	-	-	-	0	0	0	0	0
SAS (0.15)	38	1	1	0	2	3	5	1	3	6	3	5	2
SAS (0.3)	26	1	0	0	1	1	0	1	0	2	1	2	1

Three 10-KVA UPSs are operated as power supplies for these CCJ nodes. The next replacement is planned in Mar. 2026 considering the 5-year battery life. Rearrangement of AC power lines for the nodes from these UPSs was performed for the re-balancing of load, immediately after the deployment of new servers, during the planned power outage in Wako Campus.

The replacement of the main switch is planned in 2023, to support the 10 GBASE-T network for servers, while 10 GBASE-LR and SR are used now only for the uplink to RIKEN-LAN and for the downlink to edge switches for the calculation nodes, respectively.

Joint operation with ACCC/HOKUSAI

CCJ and the RIKEN IT division have been jointly operated since July 2009. In April 2015, "HOKUSAI Greatwave"[8] system was launched and the joint operation with CCJ continued, with the inclusion of a new hierarchical archive system wherein approximately 1070 TB of CCJ data were stored as of December 2022. A breakdown of the data is presented in Table 3.

Table 3. Tape usage in Hokusai as of December 2022.

user	total	PHENIX official	KEK/ J-PARC	RHICf	user-level archive
size (TB)	1068	749	173	8	137

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

References

1) `http://ccjsun.riken.jp/ccj/`.
2) `http://www.phenix.bnl.gov/`.
3) S. Yokkaichi *et al.*, RIKEN Accel. Prog. Rep. **55**, 103 (2022).
4) Y. Itow *et al.*, arXiv:1409.4860.
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/supercom/`.