Upgrade of server systems for RIBF control

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The RIBF control system is composed of many server for various services. Generally, in order to use them stably without having any serious machine trouble, they should be replaced by new ones appropriately. In this progress report, we will report on the technology used in the upgraded server systems of the RIBF control system. For the accelerator control system, various kinds of data related to the accelerator components and beams accelerated by them, such as vacuum pressures and beam currents, are stored regularly into a data archive system. The archived data is useful for troubleshooting and checking the accelerator condition during daily operations. In the RIBF control system, RIBFCAS has been utilized since 2009.[1)] It is a PostgreSQL-based data archive system and the data is acquired from the database and visualized as a GUI chart. NVMe SSD (NVM Express Solid State Drive) was installed as the main storage of the RIBFCAS to realize fast data accessing performance. On the other hand, high redundancy was not available for RIBFCAS. Although RAID 1/5/6/10, which are constructed using multiple physical disk drives, are widely used as the data storage virtualization technology to realize redundant storage systems, RAID was not adopted in the RIBFCAS main storage system, because RAID with NVMe SSD increases the cost and has a finite writing life. Therefore, in the previous system, when a disk failure occurred in the NVMe SSD, the services of RIBFCAS were not available until the NVMe SSD was recovered from the failure. In order to secure redundancy of RIBFCAS with the use of NVMe SSD, we have newly designed a database cluster for RIBFCAS in that we have constructed the PostgreSQL cluster consisting of a master server and a slave server (See Fig. 1). As the main storage of the database, the master server is based on RAID 10 with Serial Attached SCSI disks, and NVMe SSDs manufactured by Memblaze[2)] (PBlaze4) are installed in the slave server. Utilizing the replication function, the data stored in the master server is synchronized to the slave server. Since RIBFCAS clients always access the synchronized data of NVMe SSDs in the slave server, it is possible to search and acquire data in a short time. Even when a hardware trouble happens for NVMe SSDs, the RIBFCAS clients can access the archived data stored in the master server by assigning the master server's IP address to the slave server's host name through DNS. As a result, we have succeeded in securing redundancy in RIBFCAS and improving the data response by more than 2 times compared with the previous RIBFCAS.

Since the updating of RIBFCAS has been successfully completed, we have also updated a MyDAQ2[3)] system, which is another data archive system based on MySQL and uses a similar technique as that of RIBFCAS with NVMe SSDs. The MyDAQ2 system obtains data from each device through an Ethernet and stores them in a MySQL-based database such that users can retrieve the stored data by using an associated Web application. In the case of RIBF control system, the updated MyDAQ2 system adopts MySQL 5.1; it consists of a writing database (master server) and a reading database (slave server), and performs a database replication function similar to that of PostgreSQL for RIBFCAS cluster. The Apache HTTP server is deployed on the same NVMe SSDs as the MyDAQ2 database is stored, and it provides HTTP service. As a result, when 30 days of data is displayed by the MyDAQ2 Web application, the display speed is improved by about two times compared with the conventional system.

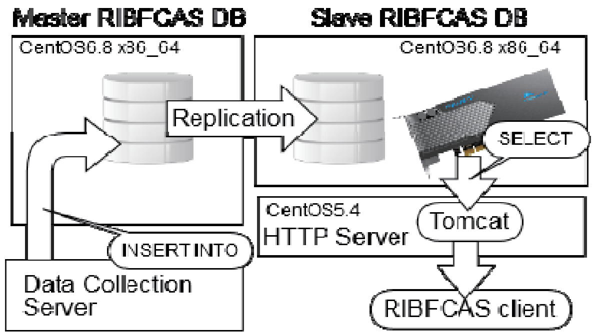

Fig. 1. System chart of the RIBFCAS DB cluster.

We updated the database cluster for RIBFCAS and MyDAQ2 successfully in 2017. We plan to update a cluster of the virtual machines in Apr. 2018. About 40 virtual machines, which are constructed using VMware vSphere, are currently running on three physical servers of the RIBF control system.[4)] To manage the image files for the virtual machines, NetApp FAS2240 is adopteda as a network attached storage (NAS) and the physical servers utilize the image file via network file system (NFS). We will upgrade the memory and CPU of the physical server,and also replace the existing FAS2240 with NetApp FAS2620A to further integrate services other than databases. Additionally, since a backup task consumes a large amount of network resources in the RIBF control system, it is difficult to run the task everyday except during maintenance periods each year. In order to solve these inconveniences, we will newly install a 10 Gbps network for backup purposes and shorten the backup time.

References

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