A study on operating heterogeneous data-farm services from the site administrator's perspective

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1. Introduction

For promoting data-based research experiment providing computing and storage resources GSDC (Global Science experimental Data hub Center) at KISTI has operated data-farms for a variety of experiments such as ALICE (A Large Ion Collider Experiment), Belle, CDF (Collider Detector at Fermilab), RENO (Reactor Experiment for Neutrino Oscillations), LIGO (Laser Interferometer Gravitational-Wave Observatory) and so on. However the situation that limited engineers should support for them makes one site administrator operate heterogeneous data-farm services and this is fraught with problems. For this reasons we aim at describing that the issues happen when one person operates several heterogeneous system services, and discussing how to deal with them practically from the site administrator's perspective. Specially, an explanation with concrete examples will focus on Belle II and LIGO.

2. The System for Belle II experiment

Belle & Belle II experiments are particle physics experiments to investigate CP-violation effects via the Belle detector, operating at the asymmetric electron positron collider KEKB at the High Energy Accelerator Research Organization (KEK) in Tsukuba, Ibaraki Prefecture, Japan [1][2]. These experimental tests culminated in the 2008 Nobel Prize for physics awarded to T. Maskawa and M. Kobayashi for their theory of CP violation [3].

GSDC based on MoU between KISTI and KEK has operated the system and served since 2009. At present 312 CPU cores and 157TB storages are served for Belle & Belle II. The grid middleware is the EMI2 (European Middleware Initiative) with is the TORQUE as the job scheduler on the SL (Scientific Linux) 5.8 [4]. Also CernVM-FS (CernVM File System) via squid, a caching proxy service, is served for the Belle II analysis tool [5][6]. Figure 1 shows the system diagram for Belle & Belle II.

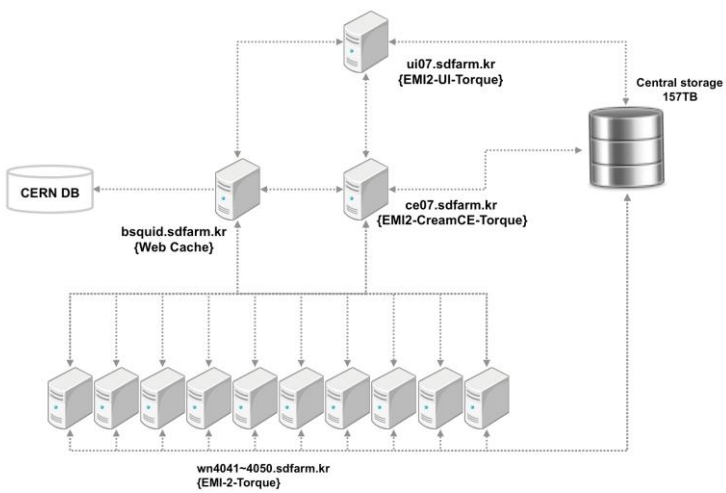

Figure 1. The system diagram for the Belle & Belle II experiment

3. The System for LIGO experiment

The LIGO experiment is a physics experiment to directly detect gravitational waves via detectors at Hanford, Washington and Livingston, Louisiana, USA [7]. GSDC based on MoU between KISTI and LSC(LIGO Scientific Collaboration) has operated the system and served since 2010. At present 420 CPU cores and 169TB storages are served for LIGO. The grid middleware is the OSG (Open Science Grid) with is the HTCondor as the job scheduler on the SL (Scientific Linux) 6.1 [8][9]. And Intel compiler for C/C++ for maximizing application performance is installed. Also the GridFTP server for the data transfer, and the web server based on SSL and Shibboleth web server for publishing research results operate independently. Figure 2 shows the system diagram for LIGO.

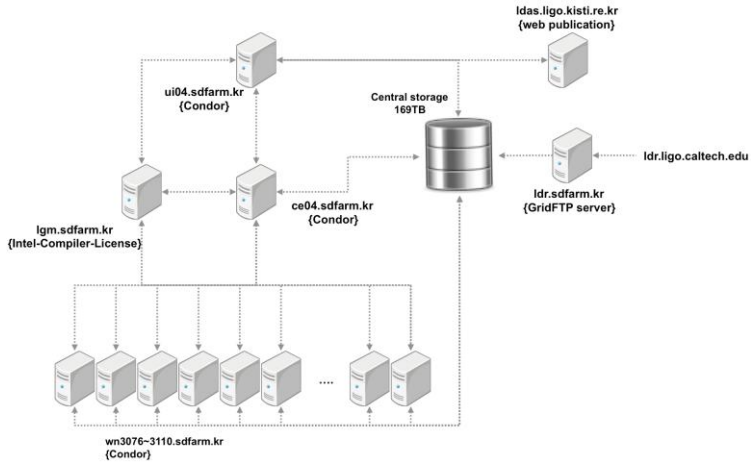

Figure 2. The system diagram for the LIGO experiment

4. Issues of operating heterogeneous data-farm services

When one site administrator operates two systems for different experiments, several issues happen. Table 1 shows a comparison of system components between Belle II and LIGO. As described on the table all core system components for services are different. Although there are many same SWs and libraries, even the version and ports of GridFTP are different. Undoubtedly TORQUE is able to be installed on LIGO, and HTCondor is able to installed on Belle II. Nonetheless, this installation instruction is not supported officially thus a site administrator should be expert in the system and scheduler. Also points that the site administrator investigates in system components are totally different when they malfunction.

As the above mentions, these differences may make a site administrator confused. Also they may prevent him or her from being an expert on each component of each experiment system. Therefore this is fraught with risks threatening stable and secure site operation.

[Table 1] Comparison of system components between Belle II and LIGO

System	Belle II	LIGO
Operation System	SL 5.8	SL 6.1
Grid Middleware	EMI2	OSG
Job Scheduler	TORQUE	HTCondor
Analysis SW	gBasf II	LAL Suite

5. Conclusion

In summary, site administrator operating heterogeneous data-farm services should be familiar with a wide variety of different system components and system configurations. But it is not easy to be conversant with every system components. Also even if one person is such an expert, that he or she operates different systems simultaneously would likely to make errors happen. Therefore we recommend that the site administrator operating heterogeneous systems with the same job scheduler or the same grid middleware, and the recommendation may help him or her work more efficiently unless one person operates.

6. References

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