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High Performance Data Analysis for Particle Physics using the Gfarm File System

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The Belle experiment operates at the KEKB accelerator, a high luminosity asymmetric energy e^+e^- collider. The Belle collaboration studies CP violation in decays of B meson to answer one of the fundamental questions of Nature, the matter-anti-matter asymmetry. Currently, Belle accumulates more than one million B Bbar meson pairs that correspond to about 1.2 TB of raw data in one day. The amount of raw data is expected to increase by 50 times after an upgrade of the KEKB accelerator.

The challenge is how to realize required high performance data access and scalable data computing. Our solution is the Gfarm file system. It is a commodity-based Grid-wide network shared file system that federates local storage of cluster nodes; moreover it provides scalable I/O performance with distributed data access. We constructed a Gfarm file system with 26 TB capacity and 52 GB/sec I/O bandwidth, integrating local disks of 1112 compute nodes in the KEKB computing facility, and measured scalability of disk I/O performance up to more than 1000 nodes. We also performed a real Belle data analysis program using more than 700 nodes at the speed of 24GB/s, reducing the Belle data analysis time by a factor of about 1,000.

Submitted on behalf of Collaboration (ex, BaBar, ATLAS)

Belle

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