Employing intelligent peripherals to improve computational performance

While continued developments in processing speeds and disk densities improve computing over time, the most fundamental advances come from changing the ways in which components interact. A research group at the Ohio Supercomputer Center is investigating ways to dramatically increase computational performance using object-based storage devices (OSDs) to augment the processing ability of a parallel file system.

Delegating responsibility for some operations from the host processor to intelligent peripherals such as OSDs can improve application performance. Traditional storage technology is based on simple fixed-size accesses with little assistance from disk drives; however, OSDs offer improvements in performance, scalability, and management by permitting clients to securely and directly access storage.

Yet, OSDs do not provide all the functionality needed by a parallel file system.

"We are examining multiple aspects of the mismatch between the needs of a parallel file system, in particular PVFS2, and the capabilities of OSD," said Pete Wyckoff, Ph.D., a research scientist with OSC. "Our work will examine techniques to accommodate this high performance usage model."

The Parallel Virtual File System (PVFS) provides an open-source, scalable input/output subsystem for machines ranging from small cluster computers to the largest peta-scale supercomputers and allows communication over various devices at high speeds.

Object-based storage devices are expected as commodity items in the near future, but no physical devices are yet available. At present, researchers use a software emulator to enable a storage server to behave as an object-based disk.

If the research is successful, OSDs will result in computers that can process data and produce results faster. Consequently, problems that hinge on the use of massive amounts of data, such as energy exploration, environmental modeling, and patient safety, will be easier to solve.

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