Reconstruction Opens the Door to Data Intensive Studies

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Image reconstruction for MRI has evolved from relatively simple 2D Fourier transforms to highly complex signal processing algorithms. The hardware used for reconstruction has also evolved to high-performance systems capable of implementing advanced algorithms.

GE Healthcare has led the industry in using general-purpose servers for reconstruction with the 2006 introduction of the Volume Reconstruction Engine (VRE) for the Signa® HDx MR. With the introduction of Signa MR750, GE again delivers significant platform enhancements with the VRE 2.0 reconstruction technology, which builds on the VRE foundation to leverage current and future improvements in computer hardware.

Computation challenge and scalability

Signa MR systems have always provided the capability to simultaneously acquire, reconstruct and display images. Continued advances in parallel imaging, namely higher acceleration factors and new algorithms, and acquisition techniques have led to a rapid growth in data size that stretches the limitations of CPU processing power and computational complexity.

Signa MR750 expands the usable memory by executing the reconstruction software on a 64-bit processor in 64-bit mode. Enabling 64-bit computation in reconstruction along with the increase in bulk acquisition memory (BAM) expands computational capabilities and improves reconstruction speed.

By using multiple threads within the VRE 2.0 reconstruction software, Signa MR750 takes advantage of both multiple cores and multiple processors within one computer. With parallel processing, VRE 2.0 reconstruction software can use multiple computers to deliver a ten-fold improvement in network speed between the ICNs with the InfiniBand technology, doubling BAM for high-resolution applications that require more BAM. Signa MR750 leverages the high-reliability and high-speed serial attached SCSI (SAS) technology used in both ICN hard disks.

Acquisition-to-Disk and raw data support

The new Acquisition-to-Disk feature automatically manages the data when the reconstruction is ready for processing, thus intelligently utilizing BAM and extending it beyond conventional limits. Data is loaded into memory only when the reconstruction is ready for processing, thereby enabling the number of phases for a data intensive acquisition such as VIBRANT-Flex to extend beyond the physical limit imposed by memory and effectively creating a virtual 41 GB BAM (Figure 1).

To further support advanced MR reconstruction development research efforts, the Raw Data Server provides unsorted, un-NEXed views of data and control information in real-time through a simple TCP/IP socket interface. At the client end, a new object-oriented template for raw data client provides an easy-to-use interface for research applications to communicate with incoming raw data.

For research support, Signa MR750 expands existing capabilities for saving raw data to Pfiles beyond previous limits. The size of the disk partition on the host computer has also been increased to 15.7 GB to accommodate the largest possible single-pass Pfile as well as increase the number of available Pfiles.

Conclusion

The amount of data stored and processed continues to increase with the advances in MR system technology. Signa MR750 meets that challenge with reconstruction innovations that take full advantage of computing power by leveraging software and hardware technology for faster acquisition time, higher resolution and a larger number of phases. ■

For the complete white paper, please visit www.gehealthcare.com/signapulse.

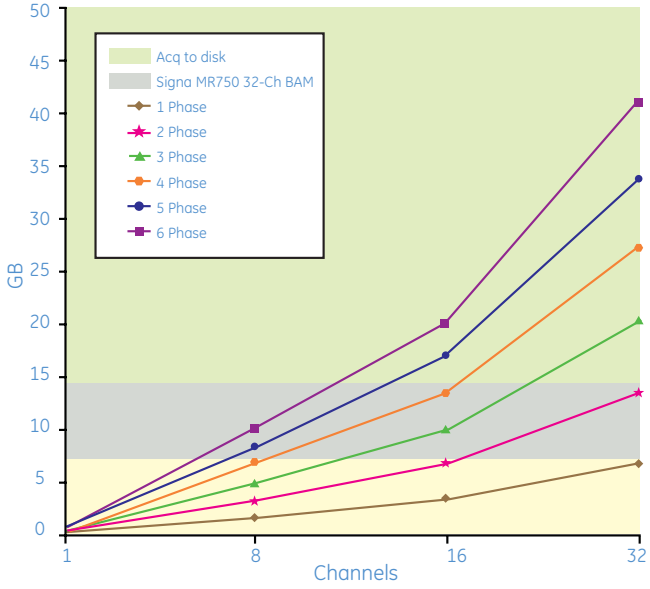

Figure 1. VIBRANT-Flex BAM usage.