

Integrating 3D Processing with PACS in the Clinical Environment

Advances in acquisition modalities are generating an exponentially increasing number of images, allowing for faster throughput and more detailed examinations. As modern scanners generate an ever-increasing number of slices per patient study, a fundamental paradigm shift in the radiology workflow for reviewing these enormous volume datasets has emerged. Advanced 3D post-processing tools can help Radiologists cope with this “slice overload”, but traditional workstation-based approaches have proven cumbersome and impractical because of their lack of simplicity and lack of integration with the radiology workflow. TeraRecon (San Mateo, CA) offers a unique solution to the challenge of managing and distributing large slice studies with its AquariusNET Server.

Slice studies were getting larger even as early PACS implementations were still maturing. PACS vendors sacrificed some of the compatibility of DICOM, at least for transfers between their own systems, in the interest of increasing performance to “acceptable” levels. Transfer protocols such as HTTP were adopted in preference to DICOM, which required proprietary interfacing between the DICOM server and the client PACS workstation, but which allowed for efficient transfer of the studies in question. This idea of a “web-based” PACS architecture held some appeal since it speaks to the generality of the commonplace web browser, but in truth, performance and targeted application support still tended to require software development on the part of the PACS vendors.

The importance of the web in PACS has also gained momentum over recent years. As fast as Radiology is moving to de-centralize and take advantage of technologies that allow for efficient distribution for remote reading, regulatory authorities are moving to control the storage and management of patient information with regulations such as HIPAA. Thus a two-tier approach has emerged, using fast protocols for full diagnostic-quality images within the hospital’s high-bandwidth network, and compression-based protocols for off-site distribution of images. Before long it was clear that all of these approaches had significant drawbacks. As fast as networks are, are they really fast enough to move large radiology studies efficiently? Today the answer is almost certainly not.

The performance and cost viability of the computer systems that are needed for review stations is somewhat keeping pace, but the sheer volume of data that needs to be managed is far outpacing the development of network infrastructure that is expected to support its distribution. This has driven the development by some vendors of systems which efficiently stream images from powerful, centralized servers, to relatively “thin” but intelligent clients that display the appropriate amount of detail based on the physician’s requirements (diagnostic or review), the time available, and the network bandwidth in operation. Using this approach, the network is used more efficiently, and in theory, there is a chance of a shorter time to first image, as images are streamed on demand, but realistically, what kind of server is required to really deliver the performance that radiology demands for multiple concurrent review sessions?

TeraRecon, Inc., San Mateo, CA (www.terarecon.com) offers a uniquely powerful 3D enterprise server / thin-client solution for integrating these advanced processing tools economically and efficiently into the clinical PACS workflow. The AquariusNET server provides workstation-like diagnostic 3D performance enterprise-wide thanks to TeraRecon’s patented real-time hardware rendering technology “VolumePro”. The AquariusNET 3D Server enables interactive, real-time 3D on a flat panel PC right next to the diagnostic PACS review monitors, or any other regular PC across the enterprise.

This low cost PC, sourced by the hospital, is empowered by the AquariusNET server to deliver real-time interactive 3D on modern MR and MDCT datasets, even cardiac or run-off studies with 2000-3000 slices, providing the radiologist with volumetric MIP, MPR and VR tools for diagnostic review. The large slice CT / MR studies reside on the server, and only image updates are streamed “on-demand” to the client PC based on incoming mouse commands. There is no software license fee, so any PC can operate as a client without cost or restriction.

The AquariusNET server is so powerful, a single server can run over 10 clients at the same time, and since it is a central server, datasets need only be routed to one location, unburdening the network from the task of transporting multi-gigabyte studies to various 3D workstations throughout the PACS enterprise. As such, it provides a sufficiently powerful, cost-effective, and software-based (from the radiologist point of view) solution to the need for 3D as an integrated part of the PACS enterprise.

As modern MDCT and MR become widespread, the integration of these advanced 3D tools into the clinical PACS workflow with sufficient rendering power behind them becomes a clinical necessity.