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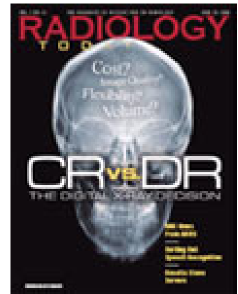

Rosetta Stone Servers — An Approach to Enterprisewide PACS/RIS/HIS Integration

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Attempts to make imaging data available when, where, and how it's most needed impact workflow and decision making across the organization. While IT works to align the equipment in every area into a seamless, often single-vendor network, PACS too often exists like an independent island, outside a healthcare organization's information stream.

The goal is no longer just giving other departments access to view radiology images. Today, large organizations want to make sure imaging data is readily available—and usable—at every possible location, whether that's inside the hospital walls, at affiliated stand-alone clinics, at referring physician offices, or even on doctors' various portable computers.

Larger facilities have long tried growing their own integrated systems, with the eventual goal of hooking up to the hospital and/or clinical information system (HIS/CIS). Most often, they move from the PACS outward as new modalities are added. For many radiology administrators, this building-block scenario remains the first choice for executing enterprisewide PACS access because it enables them to control each stage of the implementation, including budgeting and training as well as equipment installation and use.

However, in most cases when the PACS is extended out to the HIS, the system simply enables the PACS workstation to receive, send, and back up DICOM files manually. They almost never support full communication with the rest of the administrative and clinical patient databases. In particular, getting different vendors' equipment to communicate can be extremely tricky, even when a Web server or other Internet connection is configured to support access to image archives.

EMR, Eventually

Of course, the ultimate goal behind uniting imaging data with other medical information is to create an entirely electronic medical record (EMR) for every individual. Theoretically, such an EMR would be capable of being transmitted anywhere and stored on virtually any media. Historically, the sticking point to such enterprisewide networking and data integration has always been getting DICOM-based PACS to recognize and accept data from Health Level 7 (HL7)-based HIS/CIS.

Many vendors address the problem with a full range of interconnectable equipment, which usually means replacing everything you already have. That can entail more than just junking hardware, of course, since you'll likely also have to

reformat some images and reports, as well as retrain virtually everybody. And sometimes you may find you can't get exactly what you want until you've replaced everything and then upgraded the entire setup to the vendor's latest product line. And while the largest players say they will work with virtually anyone else's existing system, the reality is that translating PACS data from one system to another nearly always means losing some of the vendor-proprietary features for manipulating and using the data. Many users wonder why they paid for high-end tools that still tie them to a single location.

Server Power
In the past few years, vendors on both sides of the PACS-HIS fence have begun devising various software-based modules that essentially mediate between different systems. One method many favor is enabling two foreign PACS to exchange image data temporarily, as described in the accompanying box on page 25. But an emerging solution is to insert an additional dedicated server to negotiate incoming and outgoing data messages between the PACS server and any workstation. Such broker interfaces typically reconcile incompatible commands between the databases by reformatting information as needed to handle queries from either system. Image data resides in the server, which uses a dedicated protocol for communications with multiple workstations running different applications programs at once, including a number of multipurpose PC-based stations. Adding storage, workstations, and communication hubs can be done incrementally, virtually device by device. That's a distinct plus for many smaller users who prefer to grow at their own pace by purchasing best-of-breed components.

Compressus MEDxConnect
Unveiled at this year's annual meeting of the Society for Imaging Informatics in Medicine (formerly the Society for Computer Applications in Radiology), the Compressus, Inc. MEDxConnect system for making PACS-archived data accessible across the entire hospital network comprises four modules—server, diagnostic workstation, Web-based workstation, and archival storage unit—that can be configured and combined as needed to work with nearly all existing PACS and information systems. The MEDxConnect connectServer (cServer) acts as a virtual archive, almost like a buffer memory, for DICOM image data, to provide transient storage and management for data created in different vendors' proprietary formats. Currently, the MEDxConnect data exchange methodology has several patents pending.

The cServer can be configured to either pull images from the PACS by initiating requests, or can push images to workstations in response to requests. However, rather than translating the data before forwarding it, the cServer adds a software "wrapper" of the other system's proprietary formatting rules, allowing access not only to the DICOM image but the RIS and other available data, too. "We found that, typically, doctors could look at images anywhere, but to get the [accompanying] report, they'd have to go in the next morning and dictate the study all over again at the hospital. We've eliminated the need to do that," explains Janine M. Broda, vice president and general manager of medical solutions at Compressus. "What's unique in our approach is that we're able to correlate the corresponding RIS or HIS system for reports."

As Broda describes it, the cServer accepts DICOM data from any PACS and maps the data messages between the respective systems. It also creates a software "wrapper" that mediates vendor differences between acquisition devices, diagnostic workstations, and existing legacy PACS/RIS. This mediation allows one vendor's workstation to receive the image data to take advantage of most of another vendor's proprietary features. "The system seeks out what that message looks like coming from the transmitting system, determines what the message needs to look like for the receiving system, and provides the necessary semantics for the two, or more, systems to interoperate," Broda says.

"For example, data is received from a Siemens PACS and an IDX RIS," Broda continues. "Dictation is done either with the dictation system on site or with the dStation voice recognition system from a remote site or at home. When the study is complete, the image data is handled according to IHE requirements and correspondingly the cServer maps the data messaging for the reports from wherever they are received to the respective system, in this case, IDX.… The cServer could also sniff out standards base data from a lab system, say HL7. Assuming that the CIS needed that data in XML, the server takes the [HL7] lab data and 'wrap' XML around it so that the CIS can implement the information."

For end users, this means greater freedom about where they work. For example, at a site using multiple PACS and multiple review stations, the radiologist usually has to physically move among the systems if he or she wants to get the maximum output from each one. With the cServer, however, a virtual worklist enables reading any PACS study at any workstation, and using the tools supported by the originating PACS. "It doesn't matter whose system is connected, or whether [the connected systems are] Web-based or PC-based," says Broda. "A doctor can now pick his [or her] favorite workstation to do the work off of whatever PACS happens to be installed or select a PACS where he [or she] prefers the archive system. Or if he [or she] really likes one workstation better than any of the others, he [or she] can do all his [or her] work there."

Flexible Scalability

Another innovation on the cServer automates the process by which it detects and converts data formats, which greatly simplifies adding more systems after the initial setup. According to Broda, “We’ve cut the typical customized software installation down from a two-week or month-long process. It usually takes only about two to three hours to fine-tune the messaging after the formalized process and testing.”

That flexibility is equally important outside the imaging department, she adds. Making radiology-specific information more accessible “is opening the doors into other departments.… A lot of physicians have systems they just are not going to part with, no matter what the IT department wants—say a cardiologist who has a heart lab he thinks is just the best system in the world. So [MEDxConnect] is a low-cost way to get his [existing] system integrated—and, frankly, with a heck of a lot less grief for administration.”

Perhaps most important to administrators is the system’s price point: a cServer with the first few interfaces lists for $60,000. “Even though most of the time the hospital system is getting the most benefit [from a network], we don’t want to make it cost-prohibitive for individual doctors to connect, so it interfaces into the system cost and the end user only the integration fee,” says Broda. And since the interface generation process is nearly automated, adding new connections is relatively inexpensive, at least compared with typical custom solutions.

External Integration

One huge advantage of being able to freely share and exchange PACS files is remote use. While giving nonradiology specialists easy and equal access to clinical images may be the ultimate goal, many organizations just want to make the most efficient use of the few radiologists they have. A radiologist who reads for six facilities should be able to access any of those facilities’ patient records needed from any location, at any time, regardless of modality.

This tactic simplifies integrating non–image-based data, as well as making image-based applications friendlier to nonradiologists. Because it can support both RIS/HIS/CIS and PACS functions, often from remote locations, many radiologists and other specialists consider this approach closer to their ultimate vision of an integrated network. From the point of view of the end user, having a single data entry interface to create a single workflow—as well as a single point of accountability—seems to resolve virtually all the traditional issues of interoperability.

The idea that radiology—specifically, PACS—may become the hub of the medical enterprise would have seemed outlandish just a few years ago, but the current trend in technology seems to point to that possibility. As the centralized repository for all imaging data, PACS seems the logical control point for making those images available anywhere, including outside the imaging department. Configuring virtual archive servers as needs arise can ease data exchange among all network functions, regardless of format—including DICOM-free zones such as human resources, payroll, purchasing, demographics, etc.

Says Broda, “We’re seeing a great deal of interest from the regional hospital information organizations [RHIOs]—even those places that are trying to create a one-size-fits-all integrated network solution. The reality is that as RHIOs are developed, there’s no way that a whole state or even one large region is going to have one system, whether it’s a PACS, a hospital information system, EMR, or a lab system—it’ll just never happen.”

She adds, “Administrators say to me all the time, ‘When the standards finally hit, there won’t be a need for these [in-between] products’—but, of course, that’s what we said about DICOM.”

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