

Issue: **June 2007: Patching Your PACS**

Patching Your PACS

by Lin Muschlitz

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Imaging centers create their own interface solutions

Whether it's creating communication between disparate systems, correcting human error in a hospital or imaging center's records, or improving workflow and efficiency, PACS patches have found their niche. Although PACS have addressed many facilities' previous imaging woes, the technology is not the great panacea that some envisioned. A patchwork of software and hardware solutions has found its place in the PACS environment. And some believe there are no signs of abandoning patches anytime soon.

Ideally, PACS vendors could meet some of the needs that challenge end users. Until that happens, patches are filling the breach and will probably continue to do so until vendors deliver their own solutions to meet PACS-related problems and customer needs.

"It's often the case where when one problem is solved, five more occur," said Keith Dreyer, DO, PhD, vice chairman of radiology informatics at Massachusetts General Hospital (MGH), Boston. "What I think the PACS companies are starting to see in the range of implementation is the concept that they can't solve every problem, and so rather than [try], they're creating interfaces that make it far easier for others to solve these problems, either the customers themselves, professional service consultants, or even small companies that have more directed solutions."



Recognizing that many systems are remiss in their ability to have real-time diagnostics online, MGH created its own system called PACSWatch, which monitors the health of the system so it can intervene before the user finds it problematic. It took about 6 months to create the first version of that product, which was installed in the late 1990s.

MGH is currently in the evaluation phase of a product offered by DeJarnette Research Systems, Towson, Md, that automatically splits a whole CT study from a trauma patient, for example, into head, neck, chest, abdomen, and pelvis. It sends those images in different packets inside the PACS system, enabling the various specialists to view only the anatomical regions they are interested in. MGH also worked with AGFA Corp, Ridgefield Park, NJ, to develop a similar manual system several years ago.

Listen Up

A common radiology desktop independent of RIS and PACS is a big issue for facilities, but most PACS systems lack that functionality. MGH uses RadWhere from Commissure Inc, New York City. "It is essentially a radiologist's desktop, controlling workflow and what cases need to be read with integrated voice recognition," Dreyer said. "It can launch various PACS systems where your images may reside and connects to various RISs to show exactly the status of all cases. It then launches the appropriate visualization system whenever you need to see that case. When the physician dictates, it sends the reports to the correct RIS. It manages data from multiple RISs, PACS, or visualization systems so that the radiologist doesn't have to keep track of these workflow details."

A common Workflow Orchestrator enables the radiologist's common view of anything: teleradiology, multiple hospitals, imaging centers, etc, even if they're running different RISs and different PACS systems.

With approximately 10 different visualization tools, MGH relies on RadWhere to enable working from one common worklist to read cases from any of the visualization tools. If one PACS system is unable to perform good 3D visualizations, the software provides the capability of launching another visualization tool, using its features for primary interpretation of those specific examinations.

"We use the common Workflow Orchestrator to allow us to use one computer," Dreyer said. "It eliminates having to control different transcription systems and working with different keyboards and worklists."

Another addition, Commissure's RadCube, mines the entire database on the hospital's PACS and RIS systems, enabling intelligent real-time queries, visual queries, or visual data mining of all the PACS and RIS data.

"I can look for all of the clinical outcomes for all of the patients that had a CT of the head that demonstrated white matter disease," Dreyer said. "It can be done instantaneously and is a completely separate system. No PACS system today has that capability. That was a patch we [installed] because we need to be able to query on data other than just the patient's last name or medical record number. That was a big advantage to us."

A Dashboard

When Scottsdale Medical Imaging, Scottsdale, Ariz, looked for a way to improve efficiency, it partnered with PACSHealth, Scottsdale, whose fully interactive browser-based dashboard application met the needs of the enterprise. The imaging center uses the Centricity

PACS, from General Electric Medical Systems (GEMS), Waukesha, Wis.

"The PACSHealth application is a bolt-on solution that connects to the PACS database via a separate server," said Michael Battin, principal for PACSHealth. "[It] then provides an interactive dashboard of information to the end user about the health of the system and the quality of the data that's inside."

PACSHealth looks for inconsistencies in the data and for duplicates, exams that have been put into the system incorrectly, exams that have been merged incorrectly, or unspecified exams. If the data from the RIS and the PACS systems are not consistent, errors occur. "Typically, that can be undetected until the radiologist is presented with the wrong data or incomplete data," Battin said. "So we maximize the ability of the radiologist to get good, clean workflow and reduce noise in the system."

PACSHealth has affected the PACS administrator's efficiency at Scottsdale Medical Imaging. Part of the administrator's job is to look at all exceptions, as well as the archive, print, and retrieve queues. (The dashboard functionality looks at seven to 10 different queues at one time.) The process before the software was installed was not efficient. "One of the things PACSHealth does for us is present a unified dashboard [by letting] me look at one screen to see all of our daily maintenance tasks, as well as which areas need attention," said Jim Whitfill, MD, CIO.

PACSHealth also has assisted in connecting the various clinical data-bases. With four or more different places across the enterprise containing information about patients or clinical events, the need to ensure that all of the information was synchronized was evident. "Traditionally, [that wasn't possible] unless you [had] some sort of massive all-in-one product that does everything within one database—and for institutions our size, I don't even think that exists, or it's very rare," Whitfill said. Scottsdale Medical Imaging does approximately 250,000 studies per year.

The software offers the ability to mine the data from all these different components and then to cross-reference it to make visible in that dashboard format any duplicate events in some of the systems, or events in one system that are not referenced in another. "[It gives us] a proactive view [to ensure] everything is in sync and clean across the entire enterprise," Whitfill said.

The imaging center estimates that through the PACSHealth patch, the PACS administrator saves approximately 2 hours per day by accessing all the information in one spot, rather than by hunting through numerous components of the applications to look for problems. Within the PACSHealth component, the center also built a series of automatic checks so that every week it looks for examples of problems. "We might get surprised once by some sort of bizarre workflow situation or technical situation that can cause a failure, but once we've encountered it, that's the last time we see it because now we check for it [weekly]," Whitfill said.

The software also has instilled a very high degree of confidence that every study coming into the PACS is getting archived directly into the long-term archive, and that the information across the different areas is reliable. For a period of time, the center had to make sure it had as much spinning disk in its short-term archive as its long-term archive to ensure no loss of studies in the archiving process. "Today we're able to say much more confidently that we know the studies are being archived correctly," Whitfill said. The center is comfortable with 10 terabytes for the short-term archive, saving \$20,000 to \$40,000 in potential storage costs.

The imaging center also uses PACSCube from DatCard Systems Inc, Irvine, Calif, which enables the center to distribute studies to those outside the PACS system. The PACSCube takes DICOM images and results and seamlessly records them on CD/DVD. Images can be viewed from any Windows-based PC. The PACSCube automates the process of putting the information on CD and distributing it anywhere in the enterprise with the push of a button.

PacsScan from PACSGear Inc, Pleasanton, Calif, allows the center to take any type of paper information and scan it directly into the PACS, where it is linked to the exam. If a clinical piece of paper is needed to go with a study for the radiologist to interpret, PacsScan imports it into the PACS system, assisting the push for a paperless environment.

An Alternative

The ImageGrid PACS appliance from Candelis Inc, Irvine, Calif, offers features of larger, more expensive systems, and has concentrated on the back end of PACS: the archiving and PACS engine. ImageGrid leverages Candelis' 20-year history in archiving and storage, an area often outsourced by other PACS vendors. The ImageGrid, a completely scalable solution, is a Web-based PACS appliance with the ability to receive and archive DICOM studies from multiple modalities. It also automatically routes images to multiple on-site or off-site destinations, such as workstations or other PACS solutions. ImageGrid has proven interoperability with many leading workstations, including 3D volume rendering workstations. The ImageGrid initially targeted smaller facilities because of the price point.

"The features were [those] you would find in very expensive PACS systems, which is the ability to route multiple large studies to multiple destinations [and] the ability to receive images from multiple different modalities," said Hossein Pourmand, vice president, business development. But larger facilities, such as the University of California's Irvine Medical Center, chose ImageGrid from Toshiba America MedicalSystems Inc, Tustin, Calif, as a "dedicated" PACS for its 64-slice CT, which generates a large amount of data.

The facility determined that if it wanted to send its 64-slice CT studies to the enterprise PACS, it would have to add storage very quickly and at a greater cost than it could manage. Instead, it chose the ImageGrid, a fully integrated, cost-effective, and scalable

PACS appliance.

"ImageGrid is able to receive very large studies from its 64-slice CT (Toshiba America Medical Systems Inc [TAMS], Tustin, Calif) and has the ability to communicate with the three-dimensional volume rendering Vitrea workstations from VITAL Images, Minnetonka, Minn, that they're using at UC Irvine," Pourmand said.

ImageGrid is a standards-based solution and has found "excellent interoperability with modalities from pretty much every known vendor out there," according to Pourmand.

Translating Information

Washington, DC-based Compressus Inc's answers to PACS challenges are MedxConnect Enterprise Integration software solutions, offering seamless connectivity and interoperability between PACS, HIS, RIS, and their related information systems. The system includes the Virtual Worklist, the Systems Management Dashboard (SMD), and the standards-based Medical Message Mediator (M3), which is the centerpiece.

"We say the M3 mediates, translates, and routes information," said Janine Broda, vice president and general manager of the Medical Solutions Division. "What we created basically is a translator that sits in the middle of all the disparate systems and doesn't care if you speak Spanish, French, or German. We put it into English if that's what the reading system needs it to be, or we'll convert it to Spanish if it's coming out German, and the workstation is speaking Spanish, so that all the data can work seamlessly for those physicians."

Recognizing that images are only a part of needed information, the M3 includes reports from prior studies, patient history, demographics, and other important data for diagnosis and treatment planning between disparate systems. "We're using that M3 as a translator for anything that's coming off the HIS or the RIS as well," said Broda.

When looking at a worklist from any connected workstation, a physician sees any of the patient data relevant to the current study that is being performed. It goes to all connected facilities, the different databases, and the different HISs and PACS, and says what other studies the patient has had.

"We give [the physician] this virtual view of everything that's taking place in his enterprise," Broda said. "We get the information that is pertinent for the physician to do his work, so our solution is really physician centric. We're going for the workflow component for radiology."

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