

BREAKTHROUGHS IN MANAGING MEDICAL IMAGES

Vendor-neutral Enterprise Image Management Archive
(EIMA) Solutions: The Cure for Healthcare's Image Storage
Deficit Syndrome



EIMA Solutions Needed STAT

Medical Images in Healthcare Today

Medical breakthroughs in imaging technology are saving countless lives, but the insatiable need to store medical images is the inconvenient truth of healthcare IT today. At medical imaging's current rate of growth, by 2015 more than 30 percent of all data storage available in the world will be filled with medical images, according to industry research.

Compounding the problem, the very Picture Archiving and Communications Systems (PACS) that support digital imaging have created silos of image data that now threaten to overwhelm the hugely complex digital ecology that is modern healthcare.

Finding images has become so difficult that it is easier and faster for doctors to order new tests rather than find and review existing ones. Some records are available only on film via courier. Others are on a CD brought in by the patient. Even if images are available online, doctors can't see the images unless the medical professionals happen to have, and be proficient in, the radiology, cardiology and nuclear medicine viewers provided by each vendor at each hospital or imaging clinic that the patient has used—an unlikely scenario.

IT departments are just now taking responsibility for data storage from radiology and the other clinical departments that generate digital images. The storage for each department's PACS, however, still exists in silos within the data center, and each PACS still requires time-consuming data migrations for every successive upgrade. At some point, the time that is required to migrate the data exceeds the life cycle of the imaging system and its storage.

The balance has already tipped at the largest healthcare systems. A typical migration of data required in the relentless cycle of PACS upgrades

proceeds at a maximum single-threaded migration rate of 100 GB of uncompressed study data per day. As healthcare systems accumulate multiple terabytes of digital images, data migrations can literally take years to complete.

Meanwhile, the "meaningful use" requirement, which is at the core of the national mandate for Electronic Health Records (EHR), will require IT departments to not only provide storage for digital images but also enable the sharing of those images across a wide community of health systems.

THAT'S A PROBLEM.

"Meaningful use, in terms of EHR, basically means interoperability," says Logicalis Storage Consultant Greg Murphy. "And today there is no interoperability in the PACS environment."

If you stare at the healthcare landscape long enough, all options for healthcare IT seem to disappear in the vanishing point where the ever-escalating volume of digital images stored in proprietary PACS converges with the politically driven mandate for sharing images between multiple heterogeneous healthcare systems.

New products may offer better features—even more storage, but none resolves the imaging dilemma. The answer, according to Murphy, is to "quit thinking product and start thinking solution."

VENDOR-NEUTRAL ARCHIVE

The solution that appears—once you quit thinking product—is a vendor-neutral image archive that can accept and store images from all of the modalities that generate images (i.e., X-ray machines, CT scans and MRIs) and, in turn, communicate usable images to all of the systems that view the images.

Admittedly, it's a long-term goal. To start thinking about a solution, healthcare organizations need to confront all of the contradictions, conflicting protocols and formats, clinical demands and IT requirements that got the organizations in this situation in the first place.

In addition to the complex technology issues involved, IT leaders must contend with entrenched PACS politics. Radiology departments are key revenue centers for healthcare systems struggling to maintain services while streamlining expenses. Radiology and other imaging disciplines have long had free rein to implement the latest life-saving image technologies without factoring in the IT support required to support them.

Nor has sharing images been part of the business model of the dominant PACS vendors. The use of vendor-defined headers on the images, including tags that are in some cases not visible to IT, effectively enforce customer loyalty by making it extremely difficult for hospitals to switch to a competing vendor's PACS format. That the dominant hospital information system (HIS) vendors are also the dominant PACS vendors compounds the dilemma facing IT departments.

It is difficult to pursue a vendor-neutral approach to imaging when the imaging vendors are anything but neutral. PACS vendors, for example, typically offer to cover the cost of migrating data to their own next new version, making it doubly hard for a CIO to win approval from the board to break from precedent and invest in a vendor-neutral image archive. Re-enlisting for another PACS upgrade could solve a short-term problem of migrating to newer imaging technology, but doing so leaves your organization facing the same

problem (only much larger) a few years later. It also fails to address the need to share images across dissimilar systems that is mandated by the American Recovery and Reinvestment Act of 2009 (ARRA).

Clearly, the status quo has inertia on its side, but more healthcare CIOs are beginning to realize that simply committing to another PACS upgrade is an unsustainable strategy that puts them on a collision course with the national mandate for EHR records by the middle of the decade, if not sooner. At the same time, the technology necessary to accomplish a vendor-neutral archive is becoming both more compelling and more available.

THE BENEFITS OF EIMA

- Reduced cost to store and manage images
 - Freedom from costly data migrations
 - Centralized management tools, DR and security
 - Tiered storage by value of data
- Regulatory compliance
 - Secure PHI
 - Clinically aware retention rules
- Business continuity/data protection
- Image repository
 - Single source for image data
 - Simplify and reduce cost to integrate applications

THE ENTERPRISE IMAGE MANAGEMENT ARCHIVE

To help healthcare clients develop their own vendor-neutral archive, Logicalis offers an Enterprise Image Management Archive (EIMA) solution. A natural extension of Logicalis' strategic approach to storage in healthcare, EIMA provides the services and technologies required to develop an image archive that will liberate hospitals from the constricting cycle of PACS upgrades and enable the sharing of images between hospitals and clinics regardless of their internal systems.

EIMA does not replace PACS or back-end storage, explains Logicalis Storage Consultant Ben Shaevitz. EIMA communicates with all of the PACS systems and allows the interchange of images between the systems. EIMA also facilitates storage virtualization and consolidation, plus the migration of data between PACS systems. IT departments are spared the periodic gauntlet of PACS data migration because the data resides in the archive.

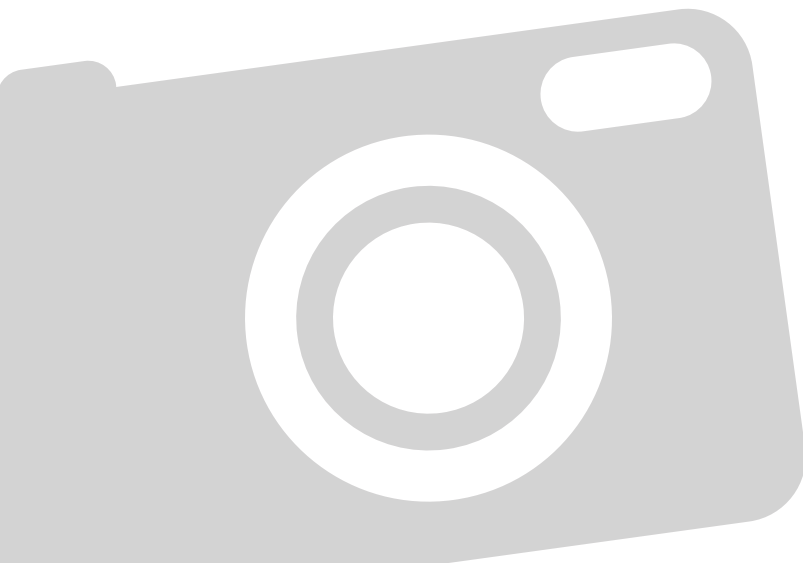
"The key benefit of EIMA for a healthcare organization is that it takes them from a siloed architecture to a unified storage and imaging environment," Shaevitz says. "EIMA makes it possible to provide the radiologists the latest technology and simplify access for doctors on the clinical side, while implementing what makes the most sense for IT on the storage side."

A healthcare organization can transition to a vendor-neutral image archive using the organization's existing storage infrastructure. A PACS, for example, can be connected by Fibre Channel to a small pool of high-availability storage for the critical first 30 to 60 days after an image is captured in its own format. Images older than 60 days can then be archived to longer-term storage on other tiers in an industry-standard format for most of the useful life of the data. Then, as the data ages and is less likely to be retrieved, it can be transferred to SAS drives, then to SATA drives and finally to tape.

The development of EIMA is also an excellent time to consider grid-based medical archiving solutions (MAS). Both IBM and HP offer MAS tailored specifically to the healthcare environment. Beyond offering infinitely scalable amounts of storage, the grid technology provides many benefits that complement those offered by a vendor-neutral archive. For example:

- Adding storage and data migrations can happen in the background so it is easy to expand and extend the life of the system. Changing storage as new technology becomes available no longer triggers a PACS migration.
- Business continuity features, like site-to-site replication, encryption, digital signatures and failover, are built into the grid system.

The best-case scenario is a MAS with an EIMA software layer that ensures all images are stored in a Digital Imaging and Communications in Medicine (DICOM) format so they can be accessed from a Web browser viewer even if the PACS is offline. (A MAS without the EIMA layer just provides more storage for non-DICOM images.)



SOFTWARE SOLUTION

The most critical component of EIMA is the software level, which provides interfaces for all of the dissimilar systems that will communicate through it, ensures images are stored in a standards-based format and provides the clinical information management. Industry standards are still evolving for imaging disciplines, and each imaging vendor adheres to those standards with varying degrees of discipline in three overlapping spheres: digital images generated by clinical departments, internal healthcare information systems and the larger community of diverse medical applications. The primary standards involved today are as follows:

- The DICOM standard—developed by the National Electrical Manufacturers Association and the American College of Radiology for handling, storing, printing and transmitting information in medical imaging—enables the integration of scanners, servers, workstations, printers and network hardware from multiple manufacturers into a PACS. PACS vendors' adaptations of DICOM over the years has rendered it less than universal—kind of like what happened to Unix; every vendor has its own version.
- Health Level Seven (HL7) is a not-for-profit organization that provides a standard for HIS. This standard application interface provides patient and healthcare database information associated with each image.
- Cross-Enterprise Document Sharing (XDS), developed by Integrating the Healthcare Enterprise, provides a standards-based specification for managing the sharing of documents between healthcare enterprises, including a private physician's office, a clinic, an acute care in-patient facility and personal health record systems.

The primary task of EIMA is developing the interfaces required to enable all of the different devices involved on both the imaging and patient record sides of healthcare to communicate with each other and a network of associated medical facilities. "Depending on which set of systems you have and what functionality they support, some may integrate better than others. It is not something to enter into lightly," Logicalis' Shaevitz says with intended understatement. Shaevitz estimates it could take six months to a year to complete an EIMA initiative, depending on the complexity of the healthcare environment. The cost savings and benefits in maintaining a single point of interface and eliminating data migrations, however, more than justify the effort.



ILM...FINALLY

One of the key benefits of EIMA is that once all of the interfaces are in place, it is possible to perform Information Lifecycle Management (ILM) for medical images and finally be in a position to purge images when they are no longer required for medical purposes or regulatory compliance.

Retention rates for images are set by many different entities, including federal rules set by Medicare and state rules set by Medicaid. The minimum retention period is seven years, with different rules for specific tests or patients. As long as the retention period is for many images, in most cases it does have an end date. The end date, however, is impossible to find with most current PACS systems.

Other applications, such as HIS and EHR systems, and order entry systems used to schedule imaging tests usually include all of the information necessary to establish a retention period (i.e., whether the patient is covered by Medicare or Medicaid, or whether the test is for a child or an adult) or the specific type of test itself (i.e., a mammography is stored for the life of the patient).

Images stored in PACS, however, do not include the same information as what appears on the patient record and can therefore be categorized only by date of last viewing. As a result, every time an image is viewed for any reason, the retention date rolls forward. The net effect is that images end up being stored forever.

By associating each image with the information in the patient record, however, EIMA makes it possible for the first time to establish fixed retention dates so that stored images can finally be purged altogether in compliance with all applicable regulations or, at the very least, transferred to inexpensive, offline media or stored like paper and film records.

KEY FEATURES OF A VENDOR-NEUTRAL IMAGE ARCHIVE

- Open storage solution supporting multiple media vendors and multiple storage solutions
- Dynamic DICOM Tag Morphing providing on-the-fly conversion of data formats in support of data exchange between disparate PACS
- Methodology for accepting and managing both DICOM and non-DICOM data objects
- HL7 interface support
- Prefetching and auto-routing support
- Automated and manual QA/QC support for interfaces with non-PACS data sources
- Intelligent ILM overseeing data movements internally and externally to the system based on metadata
- Automated data purge with manual supervision
- Set of integrated display applications, one for simple viewing, the other for advanced viewing of the image data through the EMR portal
- Pseudo Master Patient Indexing capabilities and optional full-featured MPI
- Creation of XDS-I manifest and optional XDS-I Registry and Repository applications
- Integrated remote system monitoring application capable of tracking hardware and software operations

Source: www.graycons.com/consulting

STRATEGIC APPROACH

Accomplishing EIMA requires a systematic and strategic approach that engages every facet of a healthcare organization from operational and clinical to technical and financial. It is not something IT can accomplish on its own.

The first step is recognizing that a PACS or product-driven approach to imaging is not only headed for a collision with the federal mandate for EHR but also will eventually become completely unsustainable as storage requirements grow. The incentives that are available to help organizations realize EHR come with a requirement for “meaningful use” through the sharing of patient information that the proprietary PACS environment cannot deliver. The never-ending cycle of data migrations that has become the status quo in healthcare organizations today will never result in true imaging interoperability.

Once an organization has decided to change course and move in the direction of a vendor-neutral archive solution, it is possible to take incremental steps determined by the organization’s unique situation. The first step is very liberating; the other steps can be taken as resources allow—within the time frame for EHR stipulated by the ARRA.

The incentives for meeting ARRA deadlines include a carrot and a stick. Qualifying hospitals, for example, can collect as much as \$13 million per facility depending on the volume of discharged patients. (Varying amounts are available to other healthcare organizations.) That’s the carrot.

On the other hand, hospitals that don’t provide EHR not only risk missing out on the first year of funding, but also, beginning in 2015, if they don’t meet the federal requirements for EHR, they will be penalized 1 percent of their Medicaid and Medicare reimbursement per year for three years to a maximum of 3 percent. That’s the stick.

The sharing of images is not actually required as part of EHR until 2015, but there is escalating pressure to require that critical capability earlier to realize the full intent of meaningful use. Reducing the cost of duplicated tests—a major component of meaningful use—is directly addressed when doctors can see prior test results and images for the patient, instead of having to order those same tests again. Whether the regulation is changed to require sharing images earlier, the writing is clearly on the wall.



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The Infrastructure Imperative”

www.us.logicalis.com/EHR-Best-Practices/

THE ULTIMATE GOAL

During the course of the next several years, healthcare in America is being asked to transform itself from a largely paper-based records system with photographic medical images stored in towering racks of filing cabinets to an electronic system of digital records and images that is both impenetrably secure and immediately accessible. Needless to say, downtime is not an option in an electronic environment where there are no longer paper records and photographic images to fall back on.

The technology exists to accomplish such a transformation, but it cannot be accomplished by continuing to operate in ways that don’t take your healthcare organization toward that goal.

Logicalis’ Murphy recalls a recent conversation he had with the CIO of a major healthcare organization in the mid-Atlantic region. The discussion

began about the pros and cons of switching from one storage system to another to accommodate the increasing volume of images being captured by PACS in the hospital's clinical departments. The current storage capacity was running out, and something needed to be done soon. It was a recurring problem. A storage consultant with more than 20 years of experience in healthcare, Murphy has been focused on selling storage products, but in this case he shifted the conversation's course away from a product sale to the longer-term goals of the hospital. "Why not consider developing a vendor-neutral image archive as part of your strategy so we're not

sitting here five years from now having the same conversation?" he asked. Good question.

Many challenges are associated with the development and implementation of a vendor-neutral image archive, but at least all of the effort and investments required to accomplish it take you incrementally toward the ultimate goal of providing PACS interoperability and the ability to share information throughout the larger medical community. Any other decision just leads you back in a circular course to the same problem still waiting for a solution. Time is running out to run that course again.

"Why not consider developing a vendor-neutral image archive as part of your strategy so we're not sitting here five years from now having the same conversation?"



EIMA PARTNERS

An Enterprise Image Management Archive (EIMA) is a solution, not an individual product, and needs to be designed and developed to meet the unique needs and resources of each healthcare organization.

Logicalis' broad portfolio of skills spans the healthcare enterprise, including comprehensive data center, storage, networking and application development services.

To complement its own skills and experience, Logicalis partners with four imaging software leaders with the skills to focus specifically on the vendor-neutral archive at the center of the solution. They are the following:

TeraMedica

TeraMedica Healthcare Technology was formed in 2001 to advance a research project initiated at the Mayo Clinic in Rochester, Minn. The challenge was to develop a clinical image archive that could accommodate the size of Mayo's practice—one of the largest in the country—and provide access to images for clinicians wherever and whenever it was needed. The result was Evercore® - Clinical Enterprise Suite, which manages the storage and distribution of all types of clinical content, including digital medical images across healthcare and hospital systems.

DeJarnette

Founded in 1985, DeJarnette Research Systems is a developer, manufacturer and marketer of PACS software and hardware components used by nearly everyone in the industry for data migration, including major PACS vendors HP and IBM. An EIMA developed by DeJarnette

now serves two-thirds of the Quebec province, including 94 medical treatment facilities. The project involves two large data centers, sophisticated database synchronization technology, a storage GRID architecture and interfaces with PACS, RIS and dictation system vendors. It supports image and report distribution to nearly 10,000 referring physicians.

ScImage

Founded in 1993, ScImage is a global leader in the development of advanced medical imaging and workflow solutions for radiology, cardiology and electronic medical record content management. At the center of the ScImage's technology is PICOM, a Web service technology that works independently of data types, modalities and departments to seamlessly deliver multimodality image and information management, multi-PACS archiving, off-site disaster recovery and telemedicine functionality. Customers include Strong Memorial Hospital, Rochester, N.Y.; St. Luke's Hospital, St. Louis, Mo.; Lake Regional Health System, Osage Beach, Mo.; Blessing Hospital, Quincy, Ill.; and Alton Memorial Hospital, Alton, Ill.

Acuo Technologies

Acuo Technologies, founded in 2000, developed the first enterprise-wide collaborative asset management solution for medical DICOM images residing in a PACS. Acuo's DICOM Services Grid software suite offers image management, archiving and migration solutions that are extensible and collaborative. More than 475 system implementations around the world have deployed DICOM Services Grid™ software solutions.

ABOUT LOGICALIS

Logicalis is an international provider of integrated information and communications technology (ICT) solutions and services founded on a superior breadth of knowledge and expertise in communications and collaboration, data center optimization, application development and integration, and outsourcing and managed services.

With its international headquarters in the UK, Logicalis Group employs more than 1,900 people worldwide, including highly trained service specialists who design, specify, deploy, and manage complex ICT infrastructures to meet the needs of more than 6,500 corporate and public sector customers. To achieve this, Logicalis maintains strong partnerships with technology leaders such as Cisco, HP, IBM, and Microsoft.

The Logicalis Group has annualized revenues in excess of \$1 billion from operations in the UK, the US, Germany, Latin America, and Asia Pacific, and is fast establishing itself as one of the leading IT and communications service providers, specializing in the areas of advanced technologies and services.

For more information, visit www.us.logicalis.com
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