White Paper: Vendor Neutral Archive – A Perspective

Introduction

The Picture Archiving and Communication System (PACS) has been the gold standard for the archival, management, and access of medical images. However, constrained budgets, while maintaining high levels of patient care, have generated a growing need within Healthcare facilities to collaborate patient data across multiple departments and facilities. The PACS, therefore, needs to evolve from a largely department-centric endeavor to one that spans across multiple departments, specialties, and institutions.

The challenges engendered by such an evolution can be manifold and the solution must address these, so as to enable the growth of Healthcare facilities to proceed unimpeded. The Solution Architecture must conform to the business strategies of Healthcare facilities and not the other way around.

A Vendor Neutral Archive (VNA) is a solution designed to provide Healthcare facilities with the flexibility and scalability required for their growth, without being "locked-in" to the vendors that provide the solution. SoftLink's VNA solution allows for consolidation of all the Enterprise-level image data into a single repository that can then be accessed across departments and facilities. In addition to having all features of an Enterprise PACS, it also interfaces with other Information Systems for Orders, Schedules, Reports, and other forms of HL7 communication.

The Healthcare Industry Today

Archival of medical images along with their management for future access and distribution has always been the prerogative of the Picture Archiving and Communication System (PACS). With Radiology being the primary source of medical image generation, PACS traditionally originated as a radiology-centric endeavor. With technological advances and the need for continual improvement of the quality of patient care, more and more departments started using digital images for clinical diagnosis. The past decade has seen the proliferation of medical images into Cardiology, Radiation Therapy, Ophthalmology, Endoscopy, and other specialties that use Visible Light Imaging Modalities. This led to each department and specialty having its own isolated data silo for medical image storage and reporting. The ability to seamlessly share patient information has thus taken center stage through initiatives like the IHE (Integrating the Healthcare Enterprise) with the vision that the patient's Electronic Medical Record (EMR) be available to all departments across a facility.

In line with this vision and the pressure of cost reduction, the Healthcare Industry today shows an increasing demand to consolidate, centralize, and share data across departments within a facility as well as multiple facilities within an enterprise. This evolution spawns an environment of isolated data silos and custom formats which do not readily lend themselves to data sharing. Hospitals thus feel that they no longer retain control of their own data and are "locked-in" to the vendors that supplied the PACS. With fetters like these, business growth strategies are made to conform to the solution available rather than the other way around. As a result, Healthcare facilities do not enjoy the latitude of flexibility and scalability that is requisite for the growth they envision.

The Challenges of Multi-Department, Multi-Facility Integration

Integration of systems and workflow across departments and facilities has more than its share of challenges. The first set of challenges comes from the domain of medical images. As a Healthcare facility takes the leap towards integrating departments and merging with other facilities, it has to contend with a wide variety of image formats. The Digital Imaging and Communications in Medicine (DICOM) format was developed to mitigate this exact difficulty and most Original Equipment Manufacturers (OEMs) have adopted this format. However, there still exist a fair bit of specialties, like those that use Visible Light for Imaging, that are classified as Non-DICOM. Certain modalities also generate reports in PDF format and snapshots or videos in formats like JPEG, BMP, AVI, etc. which also fall under the Non-DICOM umbrella. Within the spread of DICOM itself there are numerous image "types" depending on the modality that generated them. For example: CTs, MRIs, are a stack of images, while X-ray Angiography and Ultrasound are in the form of video frames. A hospital may also inherit a legacy PACS during the acquisition of a facility, which contains legacy image data that needs to be migrated. It is therefore necessary that the Storage System that forms the backbone of a multi-facility integration of modalities is able to handle this range of medical images.

Moreover, such an integration, along with ongoing improvements in image quality, will engender an exponential growth in the number and size of the images that the Storage System is expected to handle. This implies not only that the images are stored securely and with enough redundancy to survive disasters but also that the future access of these images for clinical diagnosis happens without significant delays. The Storage System is expected to support this scalability and keep pace with the growth of the facility to seamlessly share the images across departments and facilities.

Another challenge of a multi-department, multi-facility integration is the patient's data that comes from Information Systems. As more departments, facilities, and modalities seek access to the Storage System, the identification of patients and exams needs to remain unique and accurate. Often, each department will have its own patient/exam requisition and scheduling system, different ways of generating Accession Numbers, and different mechanisms for assigning patient and study IDs. While storing medical images from different departments, the Storage System therefore needs to correctly combine them into the respective patient records. For this purpose the Storage System is expected to communicate to the Information Systems using the Health Level 7 (HL7) format.

These are the major challenges that a Vendor Neutral Archive (VNA) addresses. It provides a platform for aggregation of various medical image formats, reports, video clips, etc. while tying them all accurately to the respective patient records. It interacts with modalities via DICOM, Information Systems via HL7, and with sources of Non-DICOM data. It supports scalability and the ability to share and distribute data across facilities. It is thus a vendor neutral Image and Information Management System.

SoftLink's VNA Solution

A DICOM Archive or PACS is a subset of a VNA. SoftLink's VNA possesses, as its essentials, all features of an Enterprise-level PACS. It interfaces with disparate PACS and workstations across departments and facilities via the DICOM format. It has the ability to store and export the complete range of DICOM SOP (Service Object Pair) classes and supports, as a Service Class Provider, the DICOM Query/Retrieve specification for the information stored in its database. It provides secure storage and multiple levels of data redundancy to survive hardware failures and disasters thus maintaining high availability and almost 99.99% uptime. Its design architecture supports a wide variety of storage infrastructure solutions and allows for storage hardware upgrades and replacements to be made in line with the growth of a facility and with little impact on day-to-day operations. This also includes the ability of users being able to access patient images from several hundred thousand studies in the database in just a few seconds.

While the DICOM standard handles images very well, it remains inadequate in handling Information Systems' data, where the HL7 standard is more dominant. SoftLink's VNA interfaces seamlessly with the Information Systems within a department or facility for communication of Orders, Schedules, Results, and Reports. By combining the DICOM image data with the HL7 EMR data, SoftLink's VNA becomes a single-point clinical portal to the patients' complete medical record. It thus allows the facility to transcend from a department-centric model to a patient-centric model and provides access to the patient's entire record via a single-user interface and a single-access capability. SoftLink's VNA additionally supports custom formats and legacy data and it has successfully handled several PACS data migrations. It also provides for incorporation of Non-DICOM data like PDFs, screen captures and video clips into its database via DICOM encapsulation.

SoftLink's VNA supports Context Management via DICOM Tag Morphing. This is an important requirement for a VNA, so as to be able to resolve DICOM implementation incompatibilities within the PACS and workstations of various vendors. With SoftLink's VNA, the users' daily operations can proceed unimpeded in spite of the incongruity between systems. This feature also allows for modifications in the DICOM header information in order to standardize it, when received from systems that may not be adequately DICOM compliant. Automatic DICOM forwarding rules can be configured to auto-route images and data between requesting systems.

Conclusion

As Healthcare facilities evolve towards multi-department, multi-facility endeavors, they have to contend with the challenge of providing the highest quality patient care within the constraints of available budget. This evolution spawns an environment of disparate workflows, isolated data silos and custom formats, which do not readily lend themselves to data sharing. SoftLink's VNA solution empowers the user to seamlessly integrate, at a multi-Enterprise level, DICOM entities for medical image storage and communication, HL7 entities for clinical information, as well as custom formats and legacy data. By consolidating the DICOM image data with the HL7 EMR data, SoftLink's VNA becomes a single-point clinical portal to the patients' complete medical record.