There has to be more:
iConnect® Blends XDS and Image Exchange

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The Challenge

You wouldn't buy a new home without seeing it. A mechanic wouldn't troubleshoot your car without first looking it over. A lawyer wouldn't sign a legal contract without first reviewing it. Then why do we allow EMR and EHR systems to only exchange partial patient information without providing a complete picture of the patient?

In 2010, an estimated five billion medical imaging studies were conducted, yet they are not included in health information exchanges and other interoperability initiatives[1]. Most of today's healthcare solutions are designed to provide document-centric, physician-to-physician communication. Physicians are exchanging discharge summary documents, cardiac evidence documents, lab reports, referral notes and other written documents or reports, but not images.

Why? Image exchange is challenging — images are large; image vendors do not adhere to a standard format; and institutions don't want to introduce an additional burden to their network, staff or systems. Additionally, there are challenges when you start to introduce the concept of bringing together documents and images within the same solution. These challenges include:

- Accurately indentifying the patient
- Locating documents or images associated with the patient
- Determining permission levels for access to a patient's documents or images
- Ensuring that a document or image is able to be viewed within a user's native system

In addition, it's not uncommon to have multiple products from multiple vendors installed within or across the organization. Each of these products was purchased by the healthcare organization to address a specific business or clinical problem and often work independently of any other product or solution. Information exchange between different systems is only accomplished if both systems and their vendors are able to agree upon messaging standards, application programmer interfaces or flat file exchanges and have dedicated connections via VPNs and file share access.

Today, this is not good enough. The Internet has changed users' expectations regarding access and display of information. The new expectation is that all systems can and should be connected and freely allow access to all information in an easy-to-use and easy-to-understand interface. Physicians and specialists expect to have immediate access to information about a patient and patients expect to have access to their records as well. How do you integrate these systems and provide an easy-to-use interface in a timely and cost-effective fashion?

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Meeting these challenges requires a modular, standards-based, comprehensive software solution that provides interoperability of people, processes and data across the healthcare ecosystem. Furthermore, the solution needs to be integrated, providing useful services for end users to access any information, any time, on any Web-enabled device while allowing providers to leverage existing technology investments.

IHE Facilitates Interoperability

This is where organizations like Integrating the Healthcare Enterprise (IHE) provide value. Essentially, IHE investigates business problems within the healthcare arena and then applies international standards in the form of a "guidebook" or interoperability profile. These profiles can be adopted by vendors, tested and then used to solve interoperability problems in the healthcare enterprise.

One such profile is the cross enterprise document sharing (XDS) profile. XDS, in many ways, can be considered a family of profiles,

as it has many flavors including cross enterprise document sharing for imaging (XDS-I), providing the ability to share images across the organization; and cross enterprise sharing of scanned documents (XDS SD).

To make each of these flavors of XDS work, there are a set of common sub-profiles like patient identity cross reference manager (PIX), used to resolve patient identity across the enterprise; patient demographic query supplier (PDQ), used to answer or find patient based on their demographics; cross enterprise document sharing registry (XDS registry), used to manage where a patient's sharable content resides; XDS repository, used to securely store shared content; and audit trail and node authentication (ATNA), used to provide security and track who accesses an XDS solution.

By adopting IHE profiles, organizations are able to choose vendors who provide interoperability solutions that will work seamlessly across vendors. As an example, there may be multiple vendors who provide the XDS Registry document location service. You may choose one vendor today, but at a later time, you may choose to use a different vendor. By choosing to adopt the IHE profiles in your business, you are theoretically able to simply replace one vendor with another and be assured that the new solution will work.

iConnect – Connecting Content Creators and Consumers

Merge Healthcare has adopted the IHE XDS profile and sub-profiles that enable the complete interoperability of documents and images across the healthcare ecosystem into a new solution, iConnect. iConnect is designed to facilitate the exchange of information from ANY content creators to ANY content consumers. It can also be used to share content from one content creator to any another content creator. Any system wishing to exchange or interoperate with iConnect is able to do so through IHE integration profiles or any other alternatives requirements.

The iConnect solution was designed to:
- Be modular or componentized
- Easily leverage a customer's current investments in technology
- Enable organizations to start small and grow into a full exchange
- Support international interoperability standards – including HL7, DICOM and web services
- Provide a completely integrated IHE XDS infrastructure suite
- Offer multiple points of entry to facilitate the migration to industry standards
- Support the rendering of images with multiple vendor tools
- Provide a true vendor neutral archive (VNA) for image management
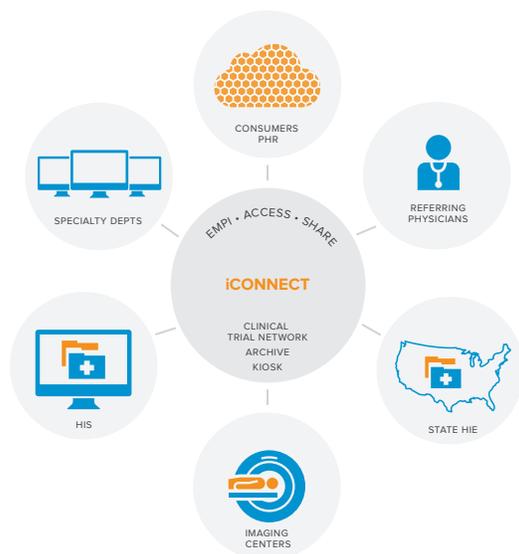
iConnect provides the connections and exchange of information between content creators and content consumers.

- Facilitate true image exchange from one vendor's system to another
- Provide connectivity even to "technology poor" users that are not able to move to a full XDS infrastructure or are globally dispersed

To address these design guidelines, iConnect leverages a number of core components provided by Merge Healthcare and third-party partners. Logically, the architecture is broken into three tiers:

1. The first tier allows systems to connect and exchange data with the iConnect solution via messaging and web service technology.

2. The second tier provides comprehensive image management, exchange, and rendering of DICOM images.

3. The third logical tier includes all of the XDS infrastructure components including cross community gateways as well as terminology services, radiation dosage registry services, provider managements services, and logging services.

Achieving Image Access and mage Interoperability

Accessing an image for display and accessing an image for interoperability are different requirements, but both are essential for proper care. Accessing an image for display should be achievable on any Web-enabled device without having to download the source system's client software. An example of accessing an image for display would be when a physician wants to review a historical image. iConnect provides the Merge referring viewer, which is a zero footprint client, requiring only a valid login and access to a browser.

Image interoperability requires that an image created on one system can be sent to a disparate system for viewing or storage. An example would be a radiologist that would like to send the image to a second radiologist for a second opinion. The first radiologist may use a PACS provided by one vendor, while the second radiologist uses a PACS

provided by another. The second radiologist also wants to use his or her own tools to provide a diagnostic opinion. This requires the image to be transferred from the original radiologist's PACS - to the second radiologist's PACS.

Not all modalities and PACS create images in a DICOM format the same way. So the challenge is to neutralize any vendor-specific DICOM information so that an image can be exchanged from one PACS to another. In this case, we need to have a solution that is able to morph the DICOM tags from a specific vendor into a neutral format for the exchange to occur.

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With the iConnect solution, the DICOM receiver/ morpher is responsible for mapping incoming DICOM image tags to a vendor neutral format so that the image can be exchanged. Optionally, these images can be stored and managed within the vendor neutral archive itself, for use by other systems, either with the Merge zero footprint client or with Merge diagnostic tools.

If specialists want to use their tools to provide a diagnostic opinion on a set of images that were captured in a different PACS, they can do so by utilizing a vendor neutral archive or intelligent DICOM or XDS-based prefetching. When reading studies, the priors are required, which may exist at multiple locations. Intelligent prefetching from multiple sources gets the priors to the reading physician's PACS prior to needing the image(s).

The Endgame – Better Patient Care

When you think about what is required today within an EMR or EHR solution to meet "meaningful use," image access and display is often an afterthought but it shouldn't be. Accessing a patient's current and prior images will provide the physician with valuable information about the effectiveness of the patient's treatment protocol. If the physician

does not have access to the images, they are left with simply interpreting the transcribed radiology reports. Without the ability to access and display images, it is difficult to deliver efficient and effective patient care.

The endgame is about providing the best possible care for patients. Patients move from provider to provider, hospital to hospital, and system to system. In the future, the only constant will be that we have patients. Patients will shop for healthcare and healthcare services using such criteria as who provides the best services and which hospitals provide the easiest and most informative solution. The patient is really the interoperable component of any solution and solutions should make it easy to obtain the patient's data or exchange the patient's data with other systems. Patient data must include any documents, transactional, or image information.

True interoperability is about how best an organization can share the people, processes, and the data no matter where the data comes from, how it was generated, the processes that invoked it, or the people that are using it. Merge iConnect enables this exchange through an integrated, modern, modular, and standards based approach. Merge iConnect allows customers to integrate their various systems while leveraging their current investments and protecting against future interoperability requirements.

About Merge Healthcare

Merge Healthcare is the leading provider of enterprise imaging and interoperability solutions. Merge solutions facilitate the sharing of images to create a more effective and efficient electronic healthcare experience for patients and physicians. Merge provides enterprise imaging solutions for radiology, cardiology and orthopedics; a suite of products for clinical trials; software for financial and pre-surgical management, and applications that fuel the largest modality vendors in the world. Merge's products have been used by healthcare providers, vendors and researchers worldwide to improve patient care for more than 20 years.

References:
1. *Roobottom CA, Mitchell G, Morgan-Hughes G (November 2010). "Radiation-reduction strategies in cardiac computed tomographic angiography". Clin Radiol 65 (11): 859–67. doi:10.1016/j.crad.2010.04.021. PMID 20933639.*

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