



# Integrating the Healthcare Enterprise White Paper

## Purchasing using IHE Cardiology

This white paper provides information on how use IHE Profiles when writing Requests for Proposals (RFPs) to purchase or upgrade equipment. Because cardiology data integration requirements extend beyond the cardiology department, this document references IHE Profiles from Cardiology, Radiology, and IT Infrastructure. Portions of this document were taken from the IHE Radiology User's Handbook, 2005.

### **Problem Statement:**

Trying to communicate requirements unambiguously becomes more difficult as the variety and complexity of computer systems in hospitals continue to increase. Here are some sample "discussions" that someone in a Cardiology Department might have with a potential vendor:

**A Useless Conversation:** *"Can your system interface to our Hospital Information System (HIS)?" "Yes, it can."* This represents a common mistake that can easily be made by both sides. Simply "interfacing" only implies that electronic messages can be sent and received, but says nothing about the functionality of what needs to be accomplished. The vendor may have the best of intentions, but is only saying that communication is *possible*, not that it will be *useful*. Consider the scenario where patient demographics are typed into a vendor's clinical documentation system

and the information subsequently forwarded to the main Hospital Information System, (HIS). A significant percentage of these transactions will be rejected by the HIS due to typographical errors in the demographics (studies report that this exception rate may exceed 25%). Interfacing will be achieved, but this is not likely to produce a happy customer.

**A Better Conversation:** *"In order to win this contract, you will need to support Patient Information Reconciliation." "We are not quite sure what this means, but, we are pretty sure we can."* This represents definite progress compared to the previous example, as it is getting more specific. What happens when names or demographics don't match? What happens when the patient's name changes? Unfortunately, the details of how names will be reconciled have not been specified. Where will the corrections be made? How will the changes be propagated through the system? What electronic messages ("transactions") will be used to accomplish the functionality? The vendor may assure that such functionality is present, but sufficient detail has not yet been specified to assure that what the vendor supplies will match what the HIS expects.

**A Very Good Conversation:** *"The PACS shall support the Image Manager/Image Archive Actor in the following IHE Integration Profiles: Scheduled Workflow and Patient Information Reconciliation."* Now things are really getting very specific. By referencing specific IHE profiles, much of the ambiguity and room for "interpretation" of the requirements is removed.

**An Excellent Conversation:** *"We use the XYZ system (version 2.04) from Acme Medical Products for placing orders and handling Admission-Discharge-Transfer (ADT). This system is also used by the physician to review patients' lab results. Please describe in detail your PACs product's support of the **Image Manager/Image Archive Actor** in the following IHE Integration Profiles:*

- ✓ *Scheduled Workflow*
- ✓ *Patient Information Reconciliation*
- ✓ *Evidence Documents (including the "Echocardiography Option")*
- ✓ *Displayable Reports (using the option of sending our XYZ system the URL to the report using the "By Reference Option", but your PACs product being responsible for long-term storage of the reports acting as the Report Manager).*

*Please provide a copy of your IHE Integration Statement(s) and reference the appropriate sections in your responses to the above requirements. Please also provide the names of three (3) sites that have the reference software components installed and operational."* Notice that this starts off by describing the local environment, giving specific brand names and version numbers (in a real situation,

this description should be much more complete). Specific IHE functionality is called for, along with a request for the vendor's IHE Integration Statement. Asking for references of sites that are already using the software components that the vendor is trying to sell will help to distinguish existing products from futures and promises.

## IHE Profiles for Cardiology

The IHE Cardiology Years 1 and 2 Integration Profiles include:

1. Cardiac Catheterization Workflow (Cath)
2. Echocardiography Workflow (Echo)
3. Retrieve ECG for Display (ECG)
4. Displayable Reports (DRPT)
5. Evidence Documents (ED)

These Profiles are explained in more detail in white papers available at [www.ihe.net](http://www.ihe.net) or on the ACC 2006 IHE CD.

In addition to the IHE Cardiology Profiles, there are several other profiles from other domains (Radiology and IT Infrastructure) that are also useful:

1. **Consistent Time** provides a mechanism to synchronize time with accuracy better than 1/10<sup>th</sup> second across multiple computer systems. The full specification of the Consistent Time Integration Profile is found in the IHE IT Infrastructure Technical Framework. (This profile is required for all cath lab devices participating in the Cardiac Catheterization Workflow Profile.)
2. **Scheduled Workflow (SWF)** is the basic flow of patient demographic and order information. **Patient Information Reconciliation (PIR)** provides the ability to treat the patient first and reconcile patient demographics and order information afterwards. These two Profiles are adapted for cardiology in the Cardiac Catheterization Workflow and Echocardiography Workflow Profiles. However, SWF and PIR are still applicable to other modalities used in cardiology, such as Nuclear Medicine and CT or MR Angiography. The full specification of these Profiles is found in the Radiology Technical Framework.
3. **Retrieve Information for Display (RID)** provides basic document retrieval and display capabilities. It uses web services such as HTTP for systems to share their documents with an institution. RID has broad uses in cardiology, including getting access to reports held in systems outside the cardiology department, and providing cardiology reports to other departments. A specialization of the latter use is the provision of ECG waveforms and reports through the Retrieve ECG for Display Profile, which is based on RID. RID is also used for report access in the Displayable Reports

Profile. The full specification of the RID Profile is found in the IHE IT Infrastructure Technical Framework.

4. **Cross-Enterprise Document Sharing (XDS)** provides a mechanism to share patient clinical documents between multiple organizations, from private physician offices, to clinics, to acute care in-patient facilities. XDS thus specifies a fundamental capability for a Regional Health Information Organization (RHIO), and is critical to quality patient care in cardiology where a patient may be seen in many care settings. Associated with XDS are additional Profiles for security in the cross-enterprise environment, such as the Audit Trail and Node Authentication (ATNA) Profile. The full specification of the XDS Integration Profile is found the IHE IT Infrastructure Technical Framework.
5. Two particular "Content Profiles" based on XDS provide additional details on specific types of documents to be shared. **XDS Medical Summary (XDS-MS)** defines the content of care record summaries, i.e., the most relevant clinical information for a patient when care is transferred, e.g., on referral or on discharge; this Profile is specified in the IHE Patient Care Coordination Technical Framework. **XDS Imaging (XDS-I)** defines an imaging study manifest, i.e., the list of images produced in an imaging study, and the network access addresses to retrieve those images (via DICOM or Web network transfers); this Profile is specified in the IHE Radiology Technical Framework.

These Profiles should be considered when writing an RFP.

## A Description of IHE "Actors"

An "Actor" is an abstraction of a real world product. You have probably never seen an "Order Filler" advertised for sale. IHE uses "Actors" because IHE does not want to dictate or assume what the contents of a real world product should be. Actors are information systems or components of information systems that produce, manage, or act on information associated with operational activities in the enterprise. The following are the Actors defined by IHE and referenced throughout the rest of this document.

It is acknowledged that some of the terms used as modifiers for the Actor names are not used consistently (e.g., Image Manager, which also manages non-image objects). At this point, the benefit in doing extensive renaming to gain consistency is outweighed by the risk of introducing significant confusion that would result from renaming many of the existing actors that are shared across multiple domains. Therefore, the Actor names will remain as defined below.

Typically, any one Profile only uses two to five Actors, however, the complete list of all Actors used in Cardiology Profiles is given below:

**Acquisition Modality** – A system that acquires and creates medical images or waveforms while a patient is present, e.g., an X-ray angiography or hemodynamic measurement system. A modality may also create other evidence objects such as Structured Report Documents containing measurements.

**ADT** – A system responsible for adding and/or updating patient demographic and encounter information (Admission/Discharge/Transfer). In particular, it registers a new patient with the Order Placer and Department System.

**Department System Scheduler/Order Filler** – A department-based (for instance, Cardiology or Radiology) information system that provides functions related to the management of orders received from external systems or through the department system's user interface.

**Evidence Creator** – A system that creates additional evidence objects such as derived images or measurements (Evidence Documents), and transmits them to an Image Archive.

**Image Archive** – A system that provides long term storage of evidence objects such as images, presentation states, Key Image Notes and Evidence Documents.

**Image Display** – A system that offers browsing of patients' imaging studies. In addition, it may support the retrieval and display of selected evidence objects including sets of images, presentation states, Key Image Notes, and/or Evidence Documents.

**Image Manager** – A system that provides functions related to safe storage and management of evidence objects. It supplies availability information for those objects to the Department System Scheduler.

**Order Placer** – A hospital or enterprise-wide system that generates orders for various departments and distributes those orders to the correct department.

**Performed Procedure Step Manager** – A function that re-distributes the status information from Acquisition Modalities to the Department System Scheduler/Order Filler and Image Manager.

**Report Creator** – A system that generates and transmits clinical reports.

**Report Manager** – A system that manages the status of reports (i.e., signature and release), and distributes reports to report repositories.

**Report Reader** – A system that can query/retrieve and view reports encoded as DICOM objects.

**Report Repository** – A departmental system that receives reports and stores them for long-term access.

**Enterprise Report Repository** – A system that receives reports and/or references (pointers) to reports, and stores them for access throughout the healthcare enterprise.

**Time Client** – A system unit that synchronizes its time of day clock to the correct time provided by a time server.

**Display** – A system that can request and display preformatted (“presentation-ready”) data using Web technologies.

**Information Source** – A system that responds to requests for patient-related data by encoding it in a presentation-ready format using Web technologies.

Some Actors have “Options” associated with them. The intent of an “Option” is to provide an additional level of functionality. These Options must be specifically requested, otherwise they are assumed to be “not required”.

The following table shows which Actors are used in which IHE Cardiology Integration Profiles and identifies any related Options.

**Table 1: Integration Profile Actors and Options**

Integration Profile \ Actor	CATH	ECHO	ECG	DRPT	ED
Acquisition Modality	X (Options 1 and 3)	X (Options 1, 3, and 4)			X (Options 8 and 9)
ADT Patient Registration	X	X			
Department System Scheduler/Order Filler	X (Options 1 and 2)	X (Options 1 and 2)			
Evidence Creator	X	X			X (Options 8 and 9)
Image Archive	X	X			X
Image Display	X	X			X (Options 8 and 9)
Image Manager	X (Options 1 and 2)	X (Options 1 and 2)			X
Order Placer	X	X			
Performed Procedure Step Manager	X	X			
Report Creator				X	X
Report Manager				X (Option 5)	
Report Reader				X	

Integration Profile / Actor	CATH	ECHO	ECG	DRPT	ED
Report Repository				X (Option 5)	
Enterprise Report Repository				X (Options 6 and 7)	
Time Client	(Note 1)				
Display			X		
Information Source			X	(Note 2)	

Options:

1. PPS Exception Management Option – This option provides a mechanism to give detailed status for the reasons for the discontinuation of an imaging procedure in progress. This may assist in better workflow or charge posting.
2. Availability of PPS-Referenced Instances – This option specifies that the Image Manager notifies the Department System Scheduler that all objects (images) created at the Acquisition Modality have been received in the archive, and that the exam may be eligible to be read.
3. Patient Based Worklist Query – This option provides the ability to query for scheduled procedures based on patient name, id, accession number, or requested procedure id. This is in addition to the required “Broad Query”, which is typically used in queries such as “all procedures for modality X, for date range Y-Z”.
4. Stress Echo – This option specifies image labeling requirements that are unique to Stress echo images, specifically image views and protocol stages.
5. DRPT DICOM Storage Option – This option provides the ability to use a DICOM Image Archive as a Report Repository actor. If this option is not supported, the report storage may be a proprietary mechanism within the Report Manager.
6. DRPT Encapsulated Report Option – This option provides the report to another system such as an electronic healthcare record system (EHR) as a complete, intact, encapsulated object, as opposed to a referenced link to another device.
7. DRPT By Reference Report Option - This option provides the report to another system such as an electronic healthcare record system (EHR) as a referenced link to another device, as opposed to a complete, intact, encapsulated object.
8. Evidence Documents Cath Option – This option defines support for DICOM Structured Reporting Templates used in the cath lab, such as Ventricular Analysis, Hemodynamics, etc.
9. Evidence Documents Echo Option - This option defines support for DICOM Structured Reporting Templates used in Echocardiography and Vascular Ultrasound.

Notes:

1. The Time Client actor is not formally part of the Cath Workflow Profile, but it must be grouped with certain actors in that Profile.
2. The Information Source actor is not formally part of the Displayable Reports Profile, but must be grouped with the Report Repository actor in that Profile.

## Putting Integration Requirements in Your RFP

Requiring IHE support in your RFP is as simple as stating which IHE Integration Profiles (and options) you want the system to support and which IHE Actor roles the system should play in each Profile. You should make up a list of “Must-have” features and things that are “Like-to-haves”.

For your Must-haves and perhaps your Like-to-haves, use “shall” terminology in your RFP, as shown in the following examples.

For your Like-to-haves and especially for newer Integration Profiles, vendors may not yet be able to comply with shall language, as they may not currently provide that functionality in their product offering. Decide how you will include promissory components of a contract negotiation to include future roadmaps. You are putting unrealistic expectations on a vendor to deliver functionality if it is not incorporated in the contract.

The following are sample statements to specify the Profiles and Actors for an acquisition modality:

- *“The modality system shall support the IHE Echocardiography Workflow Integration Profile as the Acquisition Modality and Image Display Actors.”*
- *“The modality system shall support the Exception Management Option in IHE Scheduled Workflow as the Acquisition Modality Actor.”*
- *“The modality system shall support the IHE Portable Data for Imaging Integration Profile as the Media Creator Actor.”*
- *“The modality system shall support the IHE Evidence Documents with the Echo Option Integration Profile as the Acquisition Modality Actor.”*

The following are sample statements to specify Profiles and Actors for a departmental cardiology information system (CIS):

- *“The CIS shall support the Echocardiography Workflow, Cardiac Catheterization Workflow, Scheduled Workflow, and Patient Information Reconciliation Profiles as the Department System Scheduler/Order Filler Actor.”*

- *“The CIS shall support the **Displayable Reports Profile** as the **Report Manager Actor** with the **DICOM Storage Option**.”*

The following are sample statements to specify Profiles and Actors for a PACS:

- *“The PACS shall support the **Image Manager/Image Archive Actor** in the following IHE Integration Profiles: **Echocardiography Workflow, Cardiac Catheterization Workflow, Scheduled Workflow, Patient Information Reconciliation, Evidence Documents, Nuclear Medicine Image, and the Radiology Option of Audit Trail and Node Authentication**.”*
- *“The PACS shall support the **Evidence Creator Actor** and the **Image Display Actor** in the following IHE Integration Profiles: **Echocardiography Workflow with Stress Option, Cardiac Catheterization Workflow, Scheduled Workflow, Evidence Documents with Cath and Echo Options, and Nuclear Medicine Image**.”*
- *“The PACS shall support the **Portable Media Creator, Portable Media Importer, Image Display and Report Reader actors** in the **IHE Portable Data for Imaging Integration Profile**.”*
- *“The PACS shall support the **Report Repository and Report Reader Actors** in the **IHE Displayable Reports Profile**.”*

## Writing Integration Capabilities into an RFP

Integration Profiles provide precise shorthand communication between purchasers and vendors of medical equipment. A purchaser can include a requirement for a particular Profile, and IHE provides several hundred pages documenting what the vendor needs to do to claim conformance to that requirement. Referencing an IHE Profile has the advantage of being both brief and precise. When using IHE Integration Profiles to express your requirements, you may want to reference the IHE Cardiology, Radiology, and IT Infrastructure Technical Frameworks, and include a link to [www.ihe.net/Technical\\_Framework/index.cfm](http://www.ihe.net/Technical_Framework/index.cfm) in your RFP. The simplification of using IHE leaves the details in the Technical Frameworks for the vendors to implement in their products. You may want to specifically request that vendors provide the IHE Integration Statement for applicable products either before or in response to the RFP.

### RFI versus an RFP

A Request for Information (“RFI”) asks a vendor to describe their technology and how it would solve your problems. A Request for Proposal (“RFP”) is a description of what you plan on doing and includes a project schedule, budget, and statement

of need. To make this RFI into an RFP, your timetable and budget will be added to the RFI.

### Methodology for Ranking Vendors on Integration

Integration is key for evaluating and ranking competing systems. For each area of integration, the buyer will need to determine their “LIMits”: Like to have, Intend to have, and Must have. For each IHE Integration Profile, identify the integration problem it solves for you and internally assign a rating of how important this integration is for you to accomplish successful implementation in your facility. For example, assign a value of 1 for Like to have, 3 for Intend to have, and 5 for Must have.

Perform this task internally and then decide if you want to share this prioritization of integration features with your vendors. For each Integration Profile, provide a brief description of what you intend to accomplish through integration and ask how the vendor’s solution can solve that problem. Rate the answers from the vendors on the following scale: 0 points if they cannot perform that integration, 1 point if they integrate through proprietary methodologies, 3 points if they integrate through DICOM/HL7 but not according to IHE specifications, 4 points if they use IHE but not with all the options you want, and 5 points if they integrate fully through IHE methodologies. An evaluation of integration features might look like the following example for a PACS:

<b>Integration Profile</b>	<b>Problem</b>	<b>Internal Rating</b>	<b>Vendor Capability</b>	<b>Rank*</b>
Cardiac Catheterization Workflow (SWF)	Integration of orders into scheduling and acquisition process, providing a MWL on the modality and procedure status information back on the CIS and or PACS.	5	4	20
Evidence Documents – with Cath Option	Exchange of Cath Measurements with specialized research workstation	5	3	15
Portable Data for Imaging	Exchange media with patient’s cardiac record with any variety of consulting or referring institutions	3	0	0
<b>Total</b>			<b>35</b>	

Summing the total product of the all the ranks together with their respective vendor capability will provide an objective metric for the vendor’s ability to integrate to your individual needs.

## Summary

IHE is designed to provide definitive language which providers and vendors can use to communicate. However, it still takes effort on the part of the providers to understand the Profiles, Actors, and Options. Becoming educated on IHE Profiles, Actors, and Options, however, is significantly easier than providing interface specifications from "scratch". IHE also has the advantage of providing inter-vendor testing forums.

Consider joining the "IHE Cardiology Users' Group" which provides web seminars, teleconferences, and other educational opportunities on an informal basis. For more information, send an email to [ihe@acc.org](mailto:ihe@acc.org).

It is worth your time to learn more about IHE and it is time to demand IHE Profiles from your vendors. See [www.ihe.net](http://www.ihe.net) or [www.acc.org/ihe.htm](http://www.acc.org/ihe.htm) .