IHE Essentials: The Path to Secure and Transparent Interoperability

An Introduction and Update - IHE 2016

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Objectives- Integrating the Healthcare Enterprise (IHE)

• What is IHE?
• How is it organized?
• IHE Profiles-The Product of IHE
  • Actors
  • Transactions
• Testing
• Conformity Assessment
Vision
Enable seamless and secure access to health information whenever and wherever needed.

Mission
IHE improves healthcare by providing specifications, tools and services for interoperability. IHE engages clinicians, health authorities, industry, and users to develop, test, and implement standards-based solutions to vital health information needs.

Established 1997
The problem- too many solutions!
IHE: A Framework for Interoperability

• A common framework for harmonizing and implementing multiple standards
  • Application-to-application
  • System-to-system
  • Setting-to-setting

• Enables seamless health information movement within and between enterprises, regions, nations

• Promotes unbiased selection and coordinated use of established healthcare and IT standards to address specific clinical needs
IHE: A Framework of Interoperability

- IHE uses an open, consensus-based process to engage users, providers and suppliers of health IT solutions to identify and solve interoperability problems
- an international SDO of users and vendors
- Profiles formally recognized by ISO though being Liaison A
- Sponsoring and fostering a robust interoperability testing ecosystem (cross-standards, open source tooling, process rigor across entire lifecycle)
- Directly supportive of eHealth projects (use cases, conformity assessment, projectathon, national certification)
Categories of Healthcare Communication Services

**Health Information Exchanges**
- e.g. access last 6 mo. historical labs & encounter summaries

**Document Sharing**
- Source persisted and attested health records

**Dynamic Information Access**
- Specific info snapshot provided on demand

**Workflow Management**
- 2 or more entities synchronize a task

**Hospitals**
- e.g. get current list of allergies or med list from source
- e.g. order lab test, track status and receive results

**Patient and Provider Identity Management**

**Security/Privacy**
IHE Technical Framework - The Road to Interoperability!!!

Base Standards

- OASIS
- IETF
- ISO
- W3C
- DICOM
- CEN
- IEEE
- HL7
- LOINC
- IHTSDO
- International Telecommunication Union

Profile Development

Profiling: Combine Standards & Constrains “optionality”

Project Specific Extensions

eHealth Projects
What is IHE?

- IHE is International
- Provides for local variation
- IHE includes participation from
  - Professional organizations
  - Vendors
  - End users
National/Regional Deployment Committees

Deployment committees based in a given country or group of countries promote the appropriate use within their respective geographic areas of the specifications defined in the IHE Technical Frameworks.

- USA
- Canada
- Japan
- Europe
  - Italy
  - Spain
  - Germany
  - Turkey
  - Switzerland
  - Austria
  - Luxembourg
  - Belgium
  - The Netherlands
  - UK
  - France
  - Finland
- Colombia
- Brazil
- China
- Korea
- Taiwan
- Australia
- Saudi Arabia
- Under formation
  - India
  - Adriatic (former Yugoslavia)
  - Greece
  - Sweden
  - Portugal
IHE Sponsors

• 1997: Founded in Radiology (RSNA) and IT (HIMSS)
• Many professional societies (stakeholder representation)
  • American Academy of Ophthalmology (AAO)
  • American College of Cardiology (ACC)
  • American College of Physicians (ACP)
  • American College of Clinical Engineering (ACCE)
  • American College of Emergency Physicians (ACEP)
  • American Society for Therapeutic Radiation Oncology (ASTRO)
  • GMSIH (IT France), JAHIS (IT Japan), SFIL (laboratory)
  • Healthcare Information Management Systems Society (HIMSS)
  • Radiological Society of North America (RSNA)
  • And many more…. 
Coordination of Deployment Activities

Global Deployment Coordination Committee (GDC)

Representatives from each Continental Mirror Committee Meet **regularly** by Tcon

Continental Mirror Committees

- IHE Americas
- IHE Europe
- IHE Asia
- Others …

**All** Deployment Committees are invited to an annual World Summit

IHE World Summit

rotating country/continent, e.g. aligned with another global event like ISO
• Healthcare providers and Health Authorities
  • Improved workflows
  • Information whenever and wherever needed
  • Reduced implementation costs

• Vendors
  • Align product interoperability with industry consensus
  • Decreased cost and complexity of interface installation and management
  • Focus competition on functionality/service not information transport

• SDOs
  • Rapid feedback to adjust standards to real-world
  • Establishment of critical mass and widespread adoption
Development – IHE Domains

- Cardiology
- Eye Care
- Endoscopy
- IT Infrastructure
- Patient Care Coordination
- Patient Care Devices
- Pathology and Laboratory Medicine
- Pharmacy
- Quality, Research and Public Health
- Radiation Oncology
- Radiology
  - Mammography
- Surgery
IHE—the Nuts and Bolts

The Process

• Identify Interoperability issues
• Develop Integration Profiles
  • Actors and Transactions
  • Workflow
  • Gather relevant standards
• Connectathon Testing
• Publish Integration Statements
  • Vendors list tested profiles

Terminology

• Integration Profiles
  • Describe workflow use cases, standards and the overall relationships to achieve transparent interoperability
• Technical Frameworks
  • The documents for each “domain” that specify the Integration Profiles and the associated systems (actors) and transactions.
• Integration Statements
  • Tell customers the IHE Profiles supported by a specific release of a specific product.
• Connectathons
  • Testing events
  • ? Certification
Standards: Necessary…Not Sufficient

• Foundational - to interoperability and communications
• Broad - varying interpretations and implementations
• Narrow - may not consider relationships between standards domains
• Plentiful - often redundant or disjointed
• Focused - standards implementation guides focus only on a single standard

*IHE provides a process to implement an integrated solution based upon multiple standards*
Ages and Transactions
Profiles - composed of Actors and Transactions

- (XDS & XDS-I.b)
- DICOMweb
• XDS, XDS-I  Cross Enterprise Document Sharing
• XCA, XCA-I  Cross Community Access
• XDR, XDR-I  Cross-Enterprise Document Reliable Interchange
  • Document sharing in the absence of a registry and repository
• XDM  Cross-enterprise Document Media Interchange
• XUA  Cross Enterprise User Assertion Integration Profile
• XDS-SD  Cross-Enterprise Sharing of Scanned Documents

• BPPC  Basic Patient Privacy Consents
• ATNA  Audit Trail and Node Authentication
ITI - Trial implementation

• Cross-Community Fetch (XCF) – Published
• Cross-Community Patient Discovery (XCPD)
• Cross-Enterprise Document Workflow (XDW)
• Mobile Health Documents (MHD)
Interoperability Profiles - Radiology specific

• PDI Portable Documents for Imaging
• IRWF Import Reconciliation Workflow
• TCE Teaching File and Clinical Trial Export

Trial Implementation
• IOCM Imaging Object Change Management
• MIMA Multiple Image Manager/Archive
• IID Invoke Image Display

Development
• Mobile Access to Health Documents - Imaging
Eye Care Technical Framework

Comments and implementer feedback on all documents can be submitted at [Eye Care Public Comments](www.ihe.net/Technical_Frameworks/).

**Current Technical Framework - Revision 3.7**

February 16, 2010  
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Final Text

- Volume 1: Integration Profiles
- Volume 2: Transactions

These volumes provide specification of the following profiles:

- Eye Care Workflow (EYECARE)
- Charge Posting (CHG)
- Eye Care Evidence Documents (ECED)
- Eye Care Displayable Report (ECDR)

**Supplements for Trial Implementation**

The IHE Eye Care Technical Committee invites organizations to begin development work based on the following supplements to the IHE Eye Care Technical Framework. These trial implementation profiles are eligible for testing at subsequent IHE Eye Care Connectathons.

- Basic Eye Care Workflow (B-EYECARE) - Published 2012-04-16
- C-CDA Based General Eye Evaluation (GEE) - Revised 2014-10-03
- Core Eye Care Workflow (C-EYECARE) - Published 2014-10-03
- Eye Care Appointment Scheduling (ECAS) - Published 2010-05-03
- Eye Care Summary Record (EC-Summary) - Published 2015-07-14
- Unified Eye Care Workflow (U-EYECARE) - Published 2015-07-14

**Eye Care Archives**

The archive page contains deprecated supplements and superseded versions of the Technical Framework Volumes, white papers and handbooks. As of July 2012, it also contains:
Technical Framework

IHE Radiology Technical Framework
Volume 1
(IHE RAD TF-1)
Integration Profiles
Revision 11.0 – Final Text
July 24, 2012

IHE Radiology Technical Framework
Volume 2
(IHE RAD TF-2)
Transactions
Revision 11.0 Final Text
July 24, 2012
2.1 Integration Profiles Overview

In this document, each IHE Integration Profile is defined by:

- The IHE Actors involved
- The specific set of IHE Transactions required for each IHE Actor.

These requirements are presented in the form of a table of transactions required for each actor supporting the Integration Profile. Actors supporting multiple Integration Profiles are required to support all the required transactions of each Integration Profile supported. When an Integration Profile depends upon another Integration Profile, all transactions required for the dependent Integration Profile have been included in the table.

As mentioned earlier, there is a class of Profiles that deal primarily with data content. Most types of content belong to the family of Evidence Objects. Currently this means Images, Presentation States, Key Image Notes and Evidence Documents. Evidence Objects are generated as a result of performing procedure steps on systems in the radiology department. These objects are used by the Radiologist in the process of creating a Radiological Diagnostic Report and are managed inside the Radiology Department. Evidence Documents represent the interpreted information that is primarily managed and used inside Radiology, although distribution outside Radiology is not precluded. In contrast, the diagnostic reports described in the Simple Image and Numeric Reports Profile represent the interpreted information which is the primary output of the Radiology department and are available for wide distribution.

Note that IHE Integration Profiles are not statements of conformance to standards, and IHE is not a certifying body. Users should continue to request that vendors provide statements of their conformance to relevant standards, such as DICOM and HL7. Standards conformance is a prerequisite for vendors adopting IHE Integration Profiles.

Also note that there are critical needs for any successful integration project that IHE cannot address. Successfully integrating systems still requires a project plan that minimizes disruptions and describes fail-safe strategies, specific and mutually understood performance expectations, well-defined user interface requirements, clearly identified systems limitations, and detailed post-objectives, plans for maintenance and support, etc.

2.1.1 Scheduled Workflow (SWF)

The Scheduled Workflow Integration Profile establishes the continuity and integrity of basic departmental imaging data acquired in an environment where examinations are generally being ordered. It specifies a number of transactions that maintain the consistency of patient and ordering information as well as defining the scheduling and imaging acquisition procedure steps.

This profile also makes it possible to determine whether images and other evidence objects associated with a particular performed procedure step have been stored (archived) and are available to enable subsequent workflow steps, such as reporting. It may also provide central

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IHE Connectathon - Testing

- How does the end user know that a system is compliant?
- Vendor develops a solution following the specifications of a profile
- Vendors test their solutions with one another at a Connectathon
- “Monitors” judge success
- Modules are tested
- Vendors that pass testing can then implement these modules as part of larger systems
- Connectathons are run by deployment committees - not IHE international
- Connectathons employ testing tool sets developed for IHE by contractors
  - Gazelle
IHE Connectathon

- Connectathons are run by deployment committees - not IHE international
- It is a structured test event, driving a culture of interoperability (much more than a hackathon).
- Process refined and automated since 1998
- Open invitation to vendor and other implementers community
- Connectathons employ testing tool sets developed for IHE by contractors
- Advanced open source testing tools (GAZELLE) with support services
- Testing organized and supervised by neutral project management team
- Thousands of cross-vendor tests performed
- Results recorded and published
- Opens the way to Product Conformity Assessment
Gazelle general information

Mission Statement.
Gazelle is a suite of tools developed by IHE Europe. Gazelle tools allow testing the interoperability of medical systems as well as the compliance with standards of the messages and documents produced by those systems. Gazelle also offers a Test Management Solution for testing the interoperability of eHealth software components.

Management
The Gazelle project is led by Steve Moore from the Mallinckrodt Institute of Technology and Eric Polisou from INRIA.

The IHE Testing & Tools committee supervises and coordinates the testing activities conducted by National and Regional Deployment Committees and the development of testing software and other tools used in the testing process.

The Gazelle project is using a set of project management tools. The tools and the link to the tools used by the project are listed below:

- Sources are available on the INRIA forge
- Continuous integration Tool (jenkins) compiles sources and run tests twice a day
- Issue tracker is available there
- We use testlink for QC of our applications

Architecture
The following diagram shows the architecture of the gazelle testbed.
IHE Connectathons

Each year:
• USA, January
• China, March
• Europe, April
• Japan, October
• Other:
  • Korea
  • Australia

Massive yearly events:
……..tested in 5 days

IHE NA Connectathon Week 2016 Recap

537 registered participants
98 participating organizations
120 Health IT Systems
## IHE Connectathon 2011

<table>
<thead>
<tr>
<th>Profiles</th>
<th>Tested</th>
<th>Not tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiology</td>
<td>60</td>
<td>44</td>
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<tr>
<td>IT Infrastructure</td>
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<td>6</td>
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<tr>
<td>Lab</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Pathology</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Patient Care Coordination</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Patient Care Devices</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Quality Research and Public Health</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Radiology</td>
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<td>13</td>
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</table>

<table>
<thead>
<tr>
<th>Test Status</th>
<th>2011</th>
<th>2010</th>
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</thead>
<tbody>
<tr>
<td>Organizations</td>
<td>98</td>
<td>92</td>
</tr>
<tr>
<td>Systems</td>
<td>154</td>
<td>150</td>
</tr>
<tr>
<td>Verified</td>
<td>4101</td>
<td>3763</td>
</tr>
<tr>
<td>Completed / not verified</td>
<td>99</td>
<td>448</td>
</tr>
<tr>
<td>Partially verified</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Failed</td>
<td>A small number</td>
<td></td>
</tr>
</tbody>
</table>

| Monitors                        | 53     | 50         |
| Total Attendees                 | 449    | 480        |
The first Connectathon was held in 1999 in Chicago, IL, within the basement of the Radiological Society of North America's (RSNA) parking garage.

- 23 vendors
- 47 applications tested
- 1 IHE Integration Profile tested

IHE NA Connectathon Week 2016 Recap

- 537 registered participants
- 98 participating organizations
- 120 Health IT Systems

IHE Europe Connectathon 2016 in Bochum, Germany

- System registration is up 10% from 2015
- Events include IHE Symposium (50 attendees) and an Interoperability Day for Germany (80 attendees)
Deployment – After the Connectathon

• Vendor may publish an “Integration Statement”
• IHE maintains a product registry
• End Users can use this information when evaluating an RFP response
• Regional
  • Process to modify Profiles to address local needs
• Education
## Integration Statement

<table>
<thead>
<tr>
<th>Integration Profiles Implemented</th>
<th>Actors Implemented</th>
<th>Options Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit Trail and Node Authentication (ATNA)</td>
<td>Secure Application</td>
<td>Encryption Option</td>
</tr>
<tr>
<td>Consistent Time (CT)</td>
<td>Time Client</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Document Consumer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Document Consumer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Imaging Document Consumer</td>
<td></td>
</tr>
</tbody>
</table>
IHE Product Registry

Welcome to IHE Product Registry: Integrating the Healthcare Enterprise

What is IHE Product Registry? IHE Product Registry is a way to register and search products supporting IHE Profiles with published IHE Integration Statements.

IHE Integration Statements are documents prepared and published by vendors to describe the conformance of their products with the IHE Technical Framework. They identify the specific IHE capabilities a given product supports in terms of the culture and integration profiles.

Quick Start Guide

I want to search an Integration Statement within IHE Product Registry

Click to start a search

I am a vendor and I want to manage my company's integration statements

I don't have an account... Create an account

I have an account... Sign In

http://product-registry.ihe.net/
IHE - an Ecosystem

**Requirements**

- Identify available standards (e.g. HL7, DICOM, IETF, OASIS)
- Develop technical specifications
- Document Use Case Requirements
- Timely access to information
- Easy to integrate products

**Testing at Connectathons**

**IHE Demonstrations**

**Products with IHE**
International Deployment

- Lower Austria region, US States (Vermont, New York, Texas, Pennsylvania, etc.), Nagoya city, Dutch regions, US eHealth Exchange, France, Austria, Italian Regions, US Meaningful Use Stage 3, Denmark Regions, Switzerland, Luxembourg, etc.

- Adopted by several national programs world-wide in deployment: Finland, Denmark (PHR), US Interop Standards Advisory, etc.

- US- 60 HIE, 167 hospitals or health systems, and 7 interoperability initiatives that have verbally stated their organization has adopted IHE Profiles.
  - The Sequoia Project
  - 7 interoperability initiatives include: Care Connectivity Consortium, CareQuality, CommonWell Health Alliance, ConCert by HIMSS, eHealth Exchange, RSNA Image Share Validation and ONC S&I Framework.
International Deployment

• This is part of Europe 2020 strategy for “Smart, sustainable and inclusive growth”.

• The European Commission stated that the 27 IHE Profiles have the potential to increase interoperability of eHealth services and applications to the benefit of patients and the medical community leading to their recognition in referencing in public procurement throughout the European Union.

• Details of the 28 July 2015 announcement in the Official Journal of the European Union can be found at:
  
IHE 2016 – What’s New?

• Evolve IHE Profiles – Standards evolve
  • MOUs with SDO
    • HL7, Continua. Etc….
• Paid membership model
• Conformity Assessment
IHE Membership

• Participate in Profile development
  • Planning Committees
  • Technical Committees
• Influence the selection and deployment of Interoperability solutions in your nation / region

- Vendors, for-profit providers and other for-profit organizations:
  • Large Organizations (more than 250 employees): $1,500
  • Medium-sized Organizations (4 to 250 employees): $500
  • Smaller Organizations (less than 4 employees): $250

- Not-for-profit organizations and government agencies: $500
  • Humanitarian non-profit organizations and government agencies in low- and middle-income countries (as classified by WHO): $250

- Provider Organizations (direct provider of healthcare to patients):
  • Small provider organizations (less than 4,000 staff members): $250
  • Large provider organizations (more than 4,000 staff members): $500

- Standards Development Organizations (SDOs): free reciprocal membership
Does the Community require more than passing a Connectathon?

• Currently Connectathon testing results in a vendor being able to state they are compliant
• Widespread adoption of IHE Profiles by national, regional and hospital eHealth projects
• Many ehealth projects explicitly leverage Connectathon results in their product tenders/acquisition.
• Projects report un-even compliance to IHE profiles across products and discrepancies between commercial products IHE features and vendor connectathon results
• Increasing number of national/regional ehealth projects that establish their own conformity testing. Expected for project specific extensions, but duplicative for IHE profile conformity.
• Vendor and ehealth projects interested to avoid duplicative testing of generic IHE Profile conformity
Conformity Assessment

The interoperability of healthcare information systems is one of most important challenges facing both users and suppliers of healthcare solutions. To meet these challenges, IHE International is introducing IHE Conformity Assessment program.

The IHE Conformity Assessment testing is based on an ISO 17025 quality system in accordance with the IHE Conformity Assessment Scheme published by IHE. A specific set of IHE Profiles used for sharing health records is available for testing in accordance with requests from projects users and the industry (to learn more please visit the link at the bottom of the page).

Products submitted must be either market released products or a planned product expected to be released within 6 months of the Conformity Assessment test session. To engage in Conformity Assessment testing, the vendor must have passed the IHE Connectathon tests within the prior 2 years for the appropriate IHE Profiles targeted for Conformity Assessment. The ISO 17025 Accredited Testing Laboratory, authorized by IHE International, will deliver the Conformity Assessment Report that is published on the IHE International website on successful completion of testing. See: http://conformity.ihe.net/summary-reports

Vendor has passed IHE Connectathon for IHE Profiles

Vendor applies for IHE Conformity Assessment testing for specific IHE Profiles

Accredited laboratories tests each product for Conformity

Conformity Assessment Test Report issued to vendor and published on IHE.net
Conformity Assessment Program – in development

• **Focus on Testing (not certification)**
  ➔ deliver a trusted test report

• Enable countries/projects to require and recognize these test reports and perform any additional project specific testing (they may also add a certification process on top of the testing process).

• **Ensure international equivalency of test reports and recognition of these test reports of their trustworthiness:****
  • A single process ➔ conformity assessment scheme
  • The same test tooling ➔ provided by IHE International
  • Test report published ➔ by IHE International

• Allow multiple testing laboratories across the world to be accredited and authorized by IHE International
Concepts of IHE Conformity Assessment

IHE International

IHE International
Conformity Assessment Scheme Holder

Common Test Tools and Plans

International Conformity Assessment
Oversight

Vendor

Conformity Assessment/Testing by an Accredited Laboratory

Accreditation Body

Accredits to operate per ISO17025

Testing Report

Testing Report

Application

IHE Regional & National

International Consistency, Local Testing laboratories, Trust and Rigor.
Enhancing testing rigor and reducing costs and risks on an on-going basis
IHE – An Introduction; Summary

• IHE provides workflow driven standards based interoperability solutions
• Easier to implement
• Promotes transparent interoperability between disparate systems
• Diminishes costs
• Promotes quality
The right information for the right patient, quickly, safely and securely delivered wherever and whenever its needed!

Become a member of IHE!

Enjoy eHealthweek!

www.ihe.net
wiki.ihe.net