Section B

Integrating the Health Care Enterprise
The IHE initiative

- Why IHE?
- Stakeholders
- Relationship to standards
- Domains
- Integration profiles
Why IHE?

- HL7, DICOM, other standards were largely confined to their own domains

- On one side, recognition of need to integrate
  - For example, demographic information into clinical systems

- On another side, NIH (“not-invented-here”) syndrome

- On another side, many legacy proprietary interfaces still running
Why IHE?

- “If you want a job done right, you have to do it yourself”

- Erasmus, Dutch philosopher, ca. 1500: “If you want a thing well done, you must do it yourself, and not trust in the diligence of others”
IHE: Integrating the Health Care Enterprise

- Goal
  - Stimulate the integration of the information systems that support modern health care institutions

- Primary objective
  - Ensure that in the care of patients all required information is both correct and available to health care professionals
Stakeholders in IHE

- **Sponsors**
    - IHE secretariat: ihe@rsna.org

- **Builders**
  - Vendors, usually of:
    - Radiology information systems
    - Hospital information systems
Stakeholders in IHE

- **Audience**
  - Technical staff of vendors planning to participate in the IHE initiative
  - IT departments of health care institutions
  - Experts involved in standards development
  - Anyone interested in the technical aspects of integrating health care information systems
IHE in Relation to Standards

- What IHE is *not*
  - Not a standard
    - Inappropriate to state that an interface is “IHE-compliant”
    - Compliance claims must reference specific standards
  - Not a conformance statement
    - Incomplete to state that an interface is “IHE-conformant”
    - Conformance claims must reference specific use cases and artifacts
IHE in Relation to Standards

- What IHE is
  - A framework for the implementation of standards
    - Appropriate to state that an interface is “implemented in accordance with the IHE Technical Framework”
IHE Integration Profiles

- A common language for communicating integration requirements

- Describes real-world scenarios—or specific sets of capabilities of integrated systems
  - Applies to a specified set of actors
  - For each actor, specifies the transactions necessary to support those capabilities
<table>
<thead>
<tr>
<th>IHE Domains</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Radiology</td>
<td>Radiation oncology</td>
</tr>
<tr>
<td>IT infrastructure</td>
<td>Patient care coordination</td>
</tr>
<tr>
<td>Cardiology</td>
<td>Patient care devices</td>
</tr>
<tr>
<td>Laboratory</td>
<td>Quality</td>
</tr>
<tr>
<td>Eye care</td>
<td></td>
</tr>
</tbody>
</table>
IHE Profile Development Process

- Administered by IHE International
  - Formerly RSNA and HIMSS

- Domain planning and technical committees meet several times each year
  - Planning committee roadmaps suggested changes
  - Technical committee authors change proposals and edits technical framework documents
IHE Profile Development Process

- Participants: volunteers from subject matter domain
  - Typically vendors
  - More recently, also consultants and users

- Change proposals and new profiles are published for comment and trial implementation

- Ballot-approved proposals are included in the next annual edition of the domain technical framework
Messaging Architectures for Radiology Integration

- HL7 architectures and interactions
- DICOM architectures and interactions
- IHE transaction model
- Example transactions in IHE
Point-to-Point, Original Mode Acknowledgment

Order entry system

Order (ORM)

Order response (ORR)

Laboratory information system
Networked, Enhanced Acknowledgment

Order entry system

Interface engine

Laboratory information system

Exception remediation

Order (ORM) → Acknowledgment (ACK)

Order response (ORR) → Acknowledgment (ACK)

Order (ORM) → Acknowledgment (ACK)

Order response (ORR) → Acknowledgment (ACK)

Exception reports

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Generic DICOM Model

DICOM Application Entity

- DICOM Session/Transport Network (STN)
- DICOM Data link
- DICOM Physical (50-pin)
- DICOM Upper layer protocol for TCP/IP
- OSI Association Control Service Element (ACSE)
- OSI Presentation Kernel
- OSI Session Kernel
- OSI Transport
- OSI Network
- LLC

OSI Upper Layer Service Boundary

Static Model of DICOM Interactions


IHE Radiology Integration Profiles

Scheduled Workflow
Admit, order, schedule, acquire images, notify of completed steps

Patient Information Reconciliation
Unknown patients and unscheduled orders

Consistent Presentation of Images
Hardcopy and softcopy grayscale and presentation state

Access to Radiology Information
Consistent access to images and reports

Key Image Notes
Exchange flagging significant images

Presentation of Grouped Procedures
Viewing procedure based image subsets in a single acquisition

Simple Image and Numeric Reports
Exchange simple reports with image links and, optionally, measurements

Relationship between integration profiles:
- Feature enhancement
- Feature enhancement
Generic IHE Use Case Model

Transaction

Actor

Actor
Generic IHE Interaction Model

IHE Radiology Administration and Procedure

- Performance process flow

Performance process flow

- Order Placer
- Department System Scheduler/Order Filler
- Image Manager
- Acquisition Modality/
- Print Composer
- Image Archive
- Print Server

IHE Transaction 1: Patient Registration

- Use case

Use Case Roles

- Actor: ADT
  - Role: adds and modifies patient demographic and encounter information

- Actor: order placer
  - Role: receives patient and encounter information for use in order entry

- Actor: department system
  - Role: receives and stores patient and encounter information for use in fulfilling orders by the department system scheduler

- Actor: MPI
  - Role: receives patient and encounter information from multiple ADT systems; maintains unique enterprise-wide identifier for a patient
IHE Transaction 1: Patient Registration

- Interactions

ADT Patient Registration

Order Placer

Department System

MPI

HL7 ADT^*

HL7 ADT^*

HL7 ADT^*

* - A01, A04, A05, A11, A38

# IHE Transaction 1: Patient Registration

## Abstract syntax of HL7 message

<table>
<thead>
<tr>
<th>ADT^A01</th>
<th>ADT Message</th>
<th>Chapter</th>
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</thead>
<tbody>
<tr>
<td>MSH</td>
<td>Message Header</td>
<td>2</td>
</tr>
<tr>
<td>EVN</td>
<td>Event Type</td>
<td>3</td>
</tr>
<tr>
<td>PID</td>
<td>Patient Identification</td>
<td>3</td>
</tr>
<tr>
<td>[PD1]</td>
<td>Additional Demographics</td>
<td>3</td>
</tr>
<tr>
<td>[ { NK1 } ]</td>
<td>Next of Kin /Associated Parties</td>
<td>3</td>
</tr>
<tr>
<td>FV1</td>
<td>Patient Visit</td>
<td>3</td>
</tr>
<tr>
<td>[ FV2 ]</td>
<td>Patient Visit - Additional Info.</td>
<td>3</td>
</tr>
<tr>
<td>[ { DB1 } ]</td>
<td>Disability Information</td>
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</tr>
<tr>
<td>[ { OBX } ]</td>
<td>Observation/Result</td>
<td>7</td>
</tr>
<tr>
<td>[ { AL1 } ]</td>
<td>Allergy Information</td>
<td>3</td>
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<tr>
<td>[ { DG1 } ]</td>
<td>Diagnosis Information</td>
<td>6</td>
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<tr>
<td>[ DRG ]</td>
<td>Diagnosis Related Group</td>
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<tr>
<td>[ { PR1 }</td>
<td>Procedures</td>
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<td>Role</td>
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</tr>
<tr>
<td>[ { GT1 } ]</td>
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</tr>
<tr>
<td>[ { IN1 }</td>
<td>Insurance</td>
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</tr>
<tr>
<td>[ IN2 ]</td>
<td>Insurance Additional Info.</td>
<td>6</td>
</tr>
<tr>
<td>[ { IN3 } ]</td>
<td>Insurance Add’l Info - Cert.</td>
<td>6</td>
</tr>
<tr>
<td>[ ACC ]</td>
<td>Accident Information</td>
<td>6</td>
</tr>
<tr>
<td>[ UB1 ]</td>
<td>Universal Bill Information</td>
<td>6</td>
</tr>
<tr>
<td>[ UB2 ]</td>
<td>Universal Bill 92 Information</td>
<td>6</td>
</tr>
</tbody>
</table>

IHE Transaction 1: Patient Registration

- **Message semantics as constrained by IHE**

<table>
<thead>
<tr>
<th>ADT</th>
<th>Patient Administration Message</th>
<th>Chapter in HL7 2.3.1</th>
</tr>
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<tbody>
<tr>
<td>MSH</td>
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</tr>
</tbody>
</table>
Message Example

MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|
   20010529090131-0500||ADT^A01|01052901|P|2.3.1

E VN | A01 | 200105290900 || || 200105290900

PID | || 56782445^^^UAR eg^PI~999855750^^^USSSA^SS||
   KLEINSAMPLE^BARRY^Q^JR||19620910|M||6^^HL70005^R-11030^^SNM3|
   260 GOODWIN CREST DRIVE^^BIRMINGHAM^AL^35209^^H||| | ||
   0105130001

PV1 || || W^389^1 ^UABH^^^3 || || 12345^MORGAN^REX^J^MD^UAMC^L||
   67890^GRAINGER^LUCY^X^MD^UAMC^L|MED||| ||A0||
   13579^POTTER^SHERMAN^T^MD^UAMC^L

OBX | 1 | NM | HT HEIGHT^99LOC1 || 71 | in | inches | ANSI+|| | || F

OBX | 2 | NM | WT WEIGHT^99LOC1 || 175 | lb | pounds | ANSI+|| | || F

AL1 | 1 | DA | ASP ASPIRIN^99LOC2 | MO Moderate^HL70128 | GI DISTRESS