INRIA

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team IHE Development

Integrating the Healthcare Enterprise (IHE) Development

Rennes - Bretagne Atlantique

THEME BIO

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1. Team

Head of the team
Eric Poiseau [Research Engineer (IR) Inria]

Assistante de projet
Céline Ammoniaux [TR Cnrs, shared with Lagadic, Visages and IHE]

Engineer
David Monteau [Research Engineer (IR) Inria]
Joela Francisco [Associate Engineer (IA) Inria]
Jean-Renan Chatel [Expert Engineer (IE) Inria]
Abdallah Miladi [Expert Engineer (IE) Inria]

2. Overall Objectives

2.1. Presentation

IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinates use of established standards such as DICOM and HL7 to address specific clinical need in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement, and enable care providers to use information more effectively.

IHE publishes integration profiles that define how to implement standards to achieve interoperability in clinical care. These integration profiles address a range of information sharing issues within and accross care settings.

IHE publishes integration profiles but it also offers vendors to test their implementation of the integration profiles.

The IHE testing process provides coordination, tools and an opportunity for face-to-face interoperability testing for vendors of imaging and information systems who wish to implement IHE integration capabilities.

The centerpiece of the IHE testing process is the Connectathon, a week-long interoperability testing event. The Connectathon allows participating companies to test their implementation of IHE capabilities with corresponding systems from industry peers. During the event their systems exchange information with systems from multiple vendors, performing all of the transactions required for the roles they have selected, called IHE Actors, in support of defined clinical functions, called IHE Integration Profiles.

Another important element of the IHE testing process is the set of software tools. Tools are designed for use by participating companies in implementing IHE capabilities in their systems and preparing for the Connectathon. Their purpose is to provide communication partners, test data and test plans to allow organizations to provide a baseline level of testing as they implement the IHE Technical Framework. These tools are made available to participants during the period of an IHE demonstration year and are then released into the public domain at the end of that cycle.

The objectives and mission of the IHE Development team are multiple

- Organize and manage the yearly European Connectathon
- Contribute to the development of the IHE testing tool platform
- Contribute to the structuration/organization of IHE in Europe as well as at the worldwide level
- Provide a gateway between industry and the Inria research project

IHE Development is a project of INRIA Rennes.

2.2. Highlights

This year 2007 is the really the first year of the IHE project.

- 2 Expert engineers recruited
- 1 Associated engineer recruited in October 2006, a second one to start on November 1st 2007,
- Successful organization of the Berlin 2007 Connectathon.

3. Scientific Foundations

3.1. Fondements of the team

Keywords: *DICOM Conformance Testing*, *HL7*, *Interoperability Testing*.

Participant: Eric Poiseau.

IHE is a development project and not research project. So the title "Scientific Foundation" may not be appropriate.

DICOM A standard for the communication of medical images.

GMSIH GIP Groupement pour la Modernisation du Système d'Information Hospitalier.

HL7 Health Level 7 : a standard for message exchange between medical systems.

IHE Integrating the Healthcare Enterprise.

SFR Société Française de Radiology

3.1.1. History

IHE development has been created in August 2006 as a development project. Eric Poiseau acts as the IHE European Technical project manager since IHE Europe started in 2001. He was then part of the IDM Laboratory at the University of Rennes 1 under the responsability of Bernard Gibaud.

He joined INRIA at the time of the creation of the Visages Team. INRIA decided then to contribute to the promotion and development of IHE and created a development project.

As mentioned in the previous section the objectives and missions of the team are multiple :

- Organize and manage the yearly European Connectathon
- Contribute to the development of the IHE testing tool platform
- Contribute to the structuration/organization of IHE in Europe as well as at the worldwide level
- Provide a gateway between industry and the Inria research project

3.1.2. Connectathon

3.1.2.1. Background

The IHE Connectathon is a week long testing event managed by sponsoring organizations. Currently there are events annually in North America, Europe and Asia. The major goal of the Connectathon is to promote the adoption in commercially available healthcare IT systems of the standards-based interoperability solutions defined by IHE. The Connectathon serves as an industry-wide testing event where participants can test their implementations with those of other vendors. Successful completion of Connectathon testing is a requirement for participation in IHE demonstrations. By signing up for an IHE demonstration, the company is accepting the part of the IHE process that is the Connectathon testing. Many vendors participate in the Connectathon without any direct plans to participate in a demonstration. Even in cases where vendors are participating in preparation for a demonstration, the major goal of the Connectathon is to refine the implementation of IHE Actors and Integration Profiles in the systems being tested.

3.1.2.2. Realisations

So far

- 2001 : Charenton Le Pont (France)
- 2002 : Paris (France)
- 2003 : Aachen (Germany)
- 2004 : Padova (Italy)
- 2005 : Noordwijkerhoud (The Netherlands)
- 2006 : Barcelona (Spain)

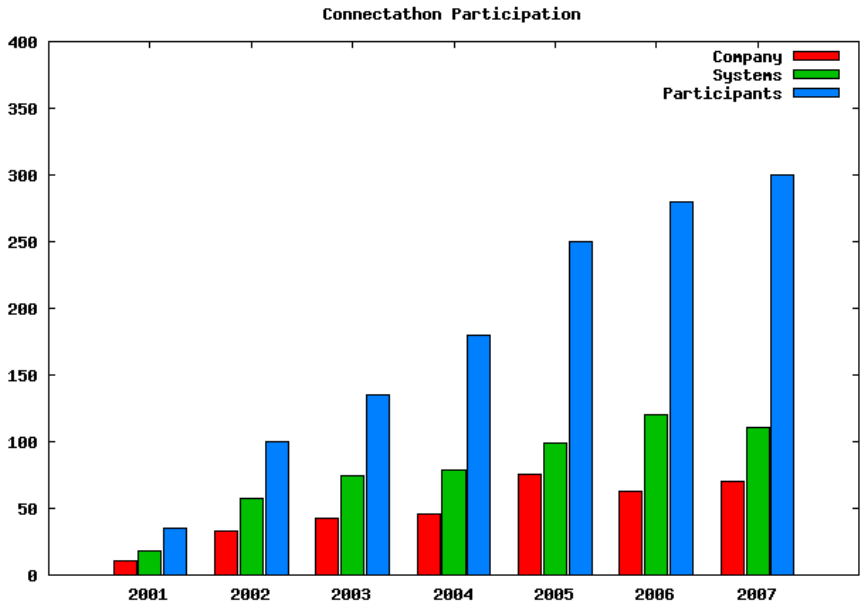

Figure 1. Connectathon Participation Review over the past years

4. Software

4.1. Kudu Software

Keywords: *configuration management*, *interoperability*, *testing*.
Participant: Eric Poiseau [correspondant].

4.1.1. Abstract

Kudu is a "peer matching" software for systems participating to the connectathon testing event. It enables participants to enter the configuration parameter of the systems they are presenting. Ahead of the connectathon participants provide information about their configuration, they return logs of the in-house tests performed on their systems. During the connectathon it helps participants finding test partners based on the features they are implementing. It also allow to keep track of the tests to be performed and performed by each of the participating systems.

Kudu is used by IHE Europe, IHE North America, IHE Japan and IHE China for the management of their connectathon

4.1.2. Description

The first IHE connectathons were managed using an excel spreadsheet and printed out test scripts. As the number of participating system increased, the need for better tool arouse. Kudu is the answer to that need.

Kudu provide the following features :

- IHE concepts Browser : Kudu needs to be aware of the IHE concepts in order to be able to manage connectathon testing. The concepts defined in the IHE Technical Framework are modelized into the Kudu underlying database. This module allow the kudu users to browse the content of concept within the database. It also allow the connectathon manager to verify the content of the database in a friendly manner.
- Connectathon preparatory workshop participants registration : Helps managing the catering for the event and badges preparation
- Connectathon participants registration : Helps managing the catering for the event and badges preparation
- Connectathon participating system registration : This is a complete registration system. Companies create a login, enter their contact information. They provide the list of systems they wish to test during the event. For each system they provide the features to be tested. The registration module creates the registration form based on the provided information. It also computes the fees to be paid and creates the invoice. This feature is only used by IHE in Europe.
- Management of participating system configuration : Kudu automatically determines the configuration parameters that the companies need to provide for each of the participating systems. The exchange of configuration parameters ahead of the connectathon week is essential as it allows participants to configure their systems in advance and save time during the connectathon week.
- Management of pre-connectathon testing log return : Each connectathon participating system is required to perform in house testing ahead of the connectathon. Kudu provides the systems manager with the list of test they have to perform. It also allows the managers to upload the logs through the web interface. A worklist of logs to be reviewed by the connectathon management team is automatically created.
- Management of connectathon test scenarii : Kudu provides an editor of scenario test scripts. A connectathon test scripts is characterized by a set of potential participants and a series of messages to be exchanged. The tool generates a sequence diagram of the transaction to be exchanged.
- Management of connectathon testing : This is the "peer matching" part of the tool. During the connectathon systems managers need to find systems with matching features in order to perform specific test. This part of the tool provides the engineers participating to the connectathon with the list of possible testing partners. The status, the configuration and the location of the partner on the connectathon floor is also provided by the tool.
- Management of connectathon results : Connectathon test are verified by neutral monitors. The monitors are assigned a set of test categories to verify based on their specialty. The tool allows them to query a worklist of test that need to be verified. This part of the tool also allows the connectathon management team to grade the system and mark each of the tested features are passed or failed.

4.1.3. Technical Description

- Database
- PHP
- Apache2
- jpgraph

4.2. Gazelle Software

Keywords: *configuration management*, *interoperability*, *testing*.

Participants: Eric Poiseau [correspondant], Joela Francisco, Jean-Renan Chatel, Abdallah Miladi.

4.2.1. Introduction

The purpose of the gazelle software is to replace Kudu (developed in Rennes) and the the pre-connectathon testing tools, known as the Mesa Tools (mainly developped by the Mallinckrodt Institute of Radiology in Saint Louis, USA).

The objective is to combine the Mesa Tools and Kudu in a tool that could be used to

- manage the IHE connectathon
- provide vendors with a test plateform that they could use internally in order to test their products
- provide healthcare entreprises with a test plateform for internal testing.
- provide a plateform for virtual connectathon testing.

4.2.2. Status

The gazelle project is a collaborative project among the 3 IHE regions. IHE North America, IHE Japan and IHE Europe.

Steve Moore (MIR) and Eric Poiseau (INRIA) are leading the project.

The group is making extensive use of collaborative tools with a bi-weekly 90 minutes conference call

A discussion group, containing more that participants and an average of XXX message exchanged per month

A Document management system (http://www.ihe-europe.org/myDMS) is available for the group to share documents.

Finally a project on the INRIA forge where source code can be exchange.

The main task of the group so far was to agree on the general architecture of the gazelle system. There are still many open question and design details to complete.

The group is still working on design and implementation of some of those details. Specifically, the group has define a model for access (INRIA) to the database, a model for the database layout (INRIA) that is based on the existing Kudu model, and a mechanism for outsourcing some of the validation requirements to third parties.

The group has ongoing collaborations with the DVTK group (Rick Busbridge) and NIST (Rob Snelick) on the detailed design and implementation of those validation services. We expect prototypes some time in the first quarter of 2008

Discussions started with Lisa Carnahan (CCHIT) and MITRE about collaboration on testing tools. We have a short term agreement that we will work with them on CDA and CCD validation (they will provide tools)

We are in the process of designing a test engine that will run the test plans for each system. Umberto Cappellini of Tiani-Spirit is taking a major role in that definition and producing a prototype. The goal is to have a prototype some time after the January north american Connectathon.

Our short term goal is to be able to use the validation software (3 or 4) at the Connectathon. This will depend on whether our volunteers have the time to complete things. The paid staff at INRIA and MIR will be working on integrating the tools provided by the volunteers so that the Connectathon participants have a simple process to follow.

The contributors are

- in Europe
  - INRIA
  - DVTK
  - Offis

  - Tiani-Spirit
- in North America
  - MIR
  - David Clunie
  - NIST
- in Japan
  - Yoshimura Hitoshi (Konica-Minolta)
  - Takeshi Oozeki (Toshiba)

4.2.3. Intelectual property

INRIA, through the work of David Monteau, is leading the discussion around the intellectual property and the licensing of gazelle. Based on a proposal made by INRIA the IHE community decided that Gazelle should be an opensource project.

The exact nature of the license is not yet define and it remains the task of the IHE development project at INRIA to make some licensing propositions. The choice of the license shall be friendly for all actors in the IHE community : vendors, users and developpers

A charter for the contributor to the project is also to be defined by INRIA.

5. Contracts and Grants with Industry

5.1. COCIR

Participants: Eric Poiseau, Joela Francisco, Jean-Renan Chatel, Abdallah Miladi.

COCIR is the voice of the European Radiological, Electromedical and Healthcare IT Industry. COCIR is a non-profit trade association, founded in 1959, representing the medical technology industry in Europe.

COCIR performs the role of secretariat and accounting for IHE Europe

The contract with the COCIR covers the organization of the connectathon by the IHE development project as well as the participation to the development of the Gazelle project.

5.2. GMSIH

Participants: Eric Poiseau, Jean-Renan Chatel.

The purpose of the contract with the GMSIH is to support IHE-France in its activity of promoting IHE in France. This includes education of users and vendors in France through the 2 days teaching sessions organized at the GMSIH in Paris or within University Hospitals in the regions.

In 2007, two sessions including vendors and users took place in Paris, completed by 2 day training at the CHU of Tours and .the CHU of Nantes.

Promotion during congresses is also included in the contract. The team provided support for the organization of HIT in May and the JFR in October. Support includes booth staffing, presentations and realisation of posters. Some logistics is also included.

Both education and promotion are essentials to the project in order to keep in touch with the needs of the users and vendors in terms of tools.

6. Other Grants and Activities

6.1. Actions nationales

6.1.1. Contact with the GIP DMP

Participant: Eric Poiseau.

GIP DMP, or the Groupement d'intérêt Public Dossier Médical Personel, is working on the specification and the deployement of the french Electronic Health Record. The specifications produced by the GIP DMP references the IHE publications. In 2007, the GIP DMP increased its involvement into IHE with the participation of Manuel Metz and Ana Esterlich to the Berlin connectathon. Ana and Manuel participated as monitor, verifying the test performed by the vendors. In addition, Manuel Metz is now co-chairing the IHE IT-Infrastructure technical committee.

Our team is also in discussion with Alain Espinoux on the process for the certification of the general practitioner software in the context of the DMP.

6.1.2. Contact with ARMOR Team (César Viho)

Participant: Eric Poiseau.

A meeting with the research team ARMO (Project Leader César Viho) took place in order to present the domain of interest of both teams. The objective was to find possibilities of collaboration in the domain of interoperability and conformance testing. IHE could provide a new field of application for the methodology developped within ARMOR.

6.1.3. Contact with ETSI

Participant: Eric Poiseau.

ETSI is the European Telecommunications Standards Institute. ETSI produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies. ETSI organize plugtest sessions for interoperability and conformance testing that are similar to the IHE connectathon event. Contact were made with Philippe Cousin from ETSI. Introduction of IHE activities and presentation of the Kudu tool to the Philippe Cousin. Following the meeting Philippe Cousin send 2 persons (Gaby Lenhart and François Fisher) to visit the IHE European Connectathon in Berlin.

6.1.4. Projet Bionorm

Participant: Eric Poiseau.

Bionorm is a project of LORIA to experiment the interoperability of

6.2. European actions

6.2.1. Projet iMAPS

The team took part to STREP proposal under the lead of Prof . Dr. Asuman Dogac The project name "Identity Management, Privacy and Security Platform with Applications in Networked eHealth". The project was refused by the commission.

6.2.2. Abstract of the iMAPS project

Information technologies are becoming pervasive and powerful which is putting privacy of citizens at risk. iMAPS project addresses this challenge to:

- Develop a fully automated policy based authorization mechanism
- Allow fine-grained sensitivity levels for private data and functional roles for the requestors as the basis of citizen-controlled attributes in privacy consents;
- Develop mechanisms for enforcing citizen requested obligations for privacy consents and handling citizen and requestor context;
- Asses risks and damages through novel federated audit mechanisms;
- Provide consent policy composition necessary in networked environments;
- Develop mechanisms for establishing trust among the actors through registry based policy sharing tools.

Furthermore, for all these technologies to function effectively, it is crucial that there will be semantic interoperability between security and dependability technologies and the involved applications. iMAPS Project will provide an open, standards based framework through a set of interoperability profiles and then will develop the platform implementing the iMAPS Framework based on a Service Oriented Architecture to address platform independence and for the reusability of the components. iMAPS technologies will be demonstrated by addressing the stronger privacy and security needs of the emerging networked eHealth applications. Sharing the Electronic Healthcare Records (EHRs) of patients and empowering the patients with access to their Personal Healthcare Records have become global priorities in eHealth since effective use of EHRs has the potential to positively influence both the quality and the cost of health care. iMAPS technologies will be demonstrated with two concrete applications from eHealth domain, one in Austria and the other in Turkey.

6.3. World actions

6.3.1. IHE in China

The team is contributing to the deployement of IHE in China.

Dr Zheng Jian-Li, Department of Medical Instrumentation, University of Shanghai for Science and Technology visited our team in september in order to learn how to organize a connectathon. We have transfered Kudu to IHE-China, teaching Dr Zheng how to translate the content in chinese. Dr Jian-li also learn how to use the Kudu tool. Following his stay in Rennes, Dr Jian-li will organize the first connectathon of IHE China. The connectathon will take place in Shanghai.

David Monteau and Eric Poiseau also met with Dr Jiwu Zhang from Carestream China. Dr Jiwu is involved in the promotion of IHE in China

The LIAMA, the joint laboratory between INRIA and the Chinese academy of Science could play a role in the developement of IHE in China. Contact with Pr Tianzi Jiang are in progress.

6.3.2. IHE in Japan

7. Dissemination

7.1. Animation

The project is in close contact with vendors in France

7.2. Teaching

Teaching on IHE Generalities. Organization of IHE, the IHE process, the testing process, presentation of the solutions proposed by IHE in the covered domains :HL7, Dicom, XDS, CDA

- Master "Méthodes de traitement de l'information biomédicale", University of Rennes I : 6h, Octobre 2006 (E. Poiseau)
- Master "Traitement de l'Information Médicale et Hospitalière", University of Rennes I : 3h Octobre 2007 (E. Poiseau)
- Teaching in the context of the contract with GMSIH. Participants to this IHE Education session are vendors and users. More than 50 persons attended the sessions this year.
  - Paris, January 24th 2007 (E. Poiseau)
  - Tours University Hospital, May 3 and 4th 2007 (E. Poiseau)
  - Paris, October 2nd and 3rd 2007 (E. Poiseau)
  - Nantes, November 12th and 13th 2007 (E. Poiseau)
- Ehealth Conference 2007, Berlin April 2007 : "IHE - Changing the Way Healthcare Connects: Connect-a-thon: Proof for the Quality of the IHE Process"
- JFR 2007, Paris, October 2007: speaker in the session "IHE : standardisation des échanges en radiologie" organized by the SRF4i and the GMSIH.

7.3. Leadership within the community

Member of diverse IHE Committees :

- Member of IHE France
- Member of IHE Europe
- Member of IHE International
- Member of IHE Testing and Tool
- Member of IHE Laboratory

Member of other working groups

- Member of the SFR4i : Société Française de Radiologie Image, Informatique, Information et Intégration. Groupe de travail de la SFR se consacrant à la problèmatique des systèmes d'information de santé.
- Member of HL7-Hprim France

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