INRIA

Project-Team IHE Development

Integrating the Healthcare Enterprise (IHE) Development

Rennes - Bretagne-Atlantique

THEME BIO

Activity Report

2008

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1. Team

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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

2008 is the year of delivery of the first tools.

- 1 Expert engineers recruited. Jean-Baptiste Meyer was recruited by the team. Jean-Baptiste used to work at the NIST in Washington DC. Jean-Baptiste was working with Bill Majurski on the development of tools for IHE and his recruitment is very valuable for the team. He was directly operational, already aware of the problematic of our team.

- Successful organization of the Oxford 2008 Connectathon. This is the first time a proxy was used to capture HL7 V2 messages exchanged between test partners during the connectathon. The role of the proxy was to capture the messages and to send them for validation by External Validation web services developped by the IHE Team at Rennes and/or the NIST team in Washington, USA.

- Opening of the IHE Europe 2009 Connectathon using the Gazelle tool. This opening shows that the tool as reach a production maturity and that the team has learned how to master the technology.

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 :

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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)
- 2007 : Berlin (Germany)
- 2008 : Oxford (United-Kingdom)

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.

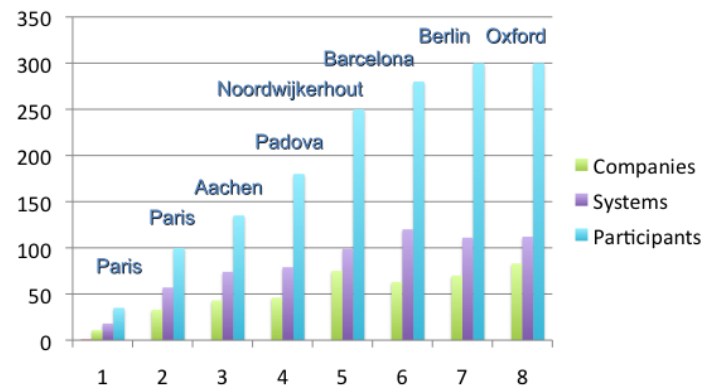# C.A.T Participation in Europe

Figure 1. Connectathon Participation Review over the past years

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

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- 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, Anne-Sophie Cardin, Jean-Baptiste Meyer, 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 Document management system (http://www.ihe-europe.net/) is available for the group to share documents.

The project is hosted on the INRIA forge where source code can be exchange. We use Hudson as continuous integration tool and Jira as issue reporting tool.

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.

Major progress in 2008 was the developpement of the HL7 External Validation Service(EVS). A tool that performs validation of HL7 messages using an XML description of the syntaxe of the message (HL7 Message Profile)

A proxy was also developed in order to call the HL7 External Validation Service. The role of the proxy is to capture the HL7 messages exchanged by connectathon participants. The proxy captures the messages, store them in the database for review and call the validation tool.

A GUI was developed on Swing to help end-users make use of the different EVS developed in the context of Gazelle.

The contributors to the Gazelle project 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

In 2008, INRIA and IHE Europe found an agreement on the choice of the Licence for the Gazelle project. The project will be release under the Apache2 licence.

A charter for the contributor to the project was also written by INRIA.

5. Contracts and Grants with Industry

5.1. COCIR

Participants: Eric Poiseau, Joela Francisco, Anne-Sophie Cardin, Jean-Baptiste Meyer, 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.

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 connectathon both in Europe and North America. 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 commitee.

6.1.2. 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 Our team is working with Philippe Cousin on a response to the FP7 Call 4 on ICT.

6.2. European actions

6.2.1. Projet Hitch

Our team is working on a response to a CSA in the context of the FP7 Call 4 to ICT. INRIA will coordinate the project. Partner to the project are IHE Europe, ETSI, Offis, Medcom and Eurorec. More details about this EU Project will be given in the report of 2009.

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 2007 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.

6.3.2. IHE in Japan

IHE in Japan is using the Kudu tool. Support to the IHE organization in Japan are regular.

6.3.3. IHE in Australia

IHE Australia performed its first connectathon during the summer of 2008. Our team supported IHE Australia through training of the organization in Australia and through the service of Kudu used remotly from Rennes during the connectathon. This event provided us contact with HL7 specialists in Australia at the Australian Healthcare Messaging Laboratory (AHML) at the University of Ballarat.

7. Dissemination

7.1. Animation

The project is in close contact with vendors in France and Europe. Every year about 60 to 70 companies participate to the European Connectathon and work with the IHE development team to get their systems ready for the test session.

The team participated to the IRISATECH session on Interoperability with César Viho (INRIA), Emmanuel Cordonnier (ETIAM) and Philippe Cousin (ETSI) (http://www.irisa.fr/centredoc/videos/irisatech).

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.
- IHIC 2008, Heraklion, October 2008: Workshop on IHE : 3 hours of presentation on IHE Tools.
- JFR 2008, Paris, October 2008: speaker in the session "IHE : standardisation des échanges en radiologie" organized by the SRF4i and the GMSIH.
- Master "Traitement de l'Information Médicale et Hospitalière", University of Rennes I : 6h November 2008 (E. Poiseau)

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

8. Bibliography

Year Publications