CEF eHealth DSI

IHE and Gazelle: Test rational and strategy

OpenNCP Bootcamp event
Brussels, 24 – 26 January 2017
Outline

IHE: presentation
IHE Implementation Strategy
The Key concepts
Connectathons
Gazelle Platform
IHE: A Framework for Interoperability

“**IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information.**”

A common framework for harmonizing and implementing multiple standards

- Application-to-application
- System-to-system
- Setting-to-setting

=> harmonizing healthcare information exchange
Standards are
- 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 standard process for implementing multiple standards*
Standards Adoption Process

Identify available standards (e.g. HL7, DICOM, IETF, OASIS)

Develop technical specifications

Testing at Connectathons

Document Use Case Requirements

IHE Demonstrations

Timely access to information

Products with IHE

Easy to integrate products
Stakeholder Benefits

Healthcare providers and support staff
- Improved workflows
- Information whenever and wherever needed
- Fewer opportunities for errors
- Fewer tedious tasks/repeated work
- Improved report turnaround time

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

SDOs
- Quick feedback to adjust standards to real-world
- Establishment of critical mass and widespread adoption
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Today over **100 Profiles** for Interop. within the Enterprise & National-Regional Health Info Exchange

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**The IHE Development Domains**

19 Years of Steady Evolution 1998 – 2017

- **Radiology** since 1998
- **Cardiology** since 2004
- **Laboratory** (Healthcare) since 2004
- **Pathology** since 2006
- **Eye Care** since 2006
- **Quality Research & Public Health** since 2006
- **Patient Care Devices** since 2005
- **IT Infrastructure** since 2003
- **Radiation Oncology** since 2004
- **Pharmacy** since 2009
- **Patient Care Coordination** since 2004

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International Growth of IHE

- Local Deployment, National Extensions
- Promotional & Live Demonstration Events
- Over 500 Organizational Members
  (see www.ihe.net/governance)

Pragmatic global standards harmonization + best practices sharing
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Key IHE Concepts

Generalized Systems -> Actors
Interactions between Actors -> Transactions
Problem/Solution Scenarios -> Integration Profiles

For each Integration Profile:
the context is described (which real-world problem)
the actors are defined (what systems are involved)
the transactions are defined (what must they do)
The IHE World....
The Product World....

- Product X from Vendor XX
- Product Y from Vendor YY
- Product Z from Vendor ZZ
- Product V from Vendor VV
Mapping IHE to Products
IHE Technical Framework

Detailed implementation guide for standards recommended by IHE
Sorted by domains
Describes
- Integration profiles
- Actors
- Transaction
- Actor grouping
- Use cases ...
Available through different ways

– IHE website
  • Current versions
  • PDF files to download

– IHE FTP
  • Current and old versions of TF (doc and pdf)
  • Implementation material

– Gazelle Master Model
  • [http://gazelle.ihe.net/GMM](http://gazelle.ihe.net/GMM)
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Connectathons
  – Presentation
  – Process
Gazelle Plateform
What is a Connectathon?

- Open invitation to vendor and other implementers community
- Advanced testing tools (GAZELLE)
- Testing organized and supervised by project management team
- Thousands of cross-vendor tests performed
- Results recorded and published
Did you know...

The first Connectathon
- held in 1999 in Chicago
- 23 vendors, 47 applications tested, 1 Integration Profile

Today Connectathons are held annually in North America, Europe and Asia
- 80 to 100 vendors
- 120 to 160 applications tested
- > 100 integration profiles
IHE Connectathons

Massive yearly events:
- 80-120 vendors
- 300-400 engineers
- 100-140 systems
  integrated in 5 days

IHE Connectathons: Vendors do not pass... until an IHE Project Manager attest it!

Last Connectathon:
- Cleveland, USA, January, 2017
- Bochum, Germany, April, 2017

https://youtu.be/YxDpQD6qzwq
Connect-a-thon

Forum for exchange
- Participants are technicians
- Tests interoperability

Not a certification platform
- Participants are allowed to change code during the event
Connectathons in Europe

http://g.co/maps/ffmmg
Connectathon: how?

4 month of preparation
- Inscription
- Workshop
- Home testing with log return
- Exchange of configuration parameters

1 week of Face to Face testing (4 ½ days)
- Independent monitors to check the tests
- Hundreds of transactions verified among the thousands of possible transactions
How do we test?

- *Gazelle* is a testbed developed by IHE Europe ([www.ihe-europe.net](http://www.ihe-europe.net)).
- *Gazelle* allows testing the interoperability of medical systems as well as the conformance with standards of exchanged messages.
- *Gazelle* offers a Test Management Platform for testing the interoperability of eHealth software components.
What kind of tests?

Specifications/Standards

Conformance testing

Implementation A

Interoperability testing

Implementation B

Vendor A

Vendor B
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  - Process
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Connectathon Process

Registration

Resources

Post CAT

Logistics

Test cases

Monitors
Registration

- Registration is open to every one
- 6 weeks of registrations
- Local promotion of the event by local IHE
- No imposed profiles
  - Wishes from sponsors.
  - We test what vendors have registered for!
- Vendors have the last word.
How to register?

1. Identify the list of actors and profiles that you wish to test.
2. Create an account on Gazelle
3. Update/Register organization information
4. Register system information
5. Print and send the contract.
Resources (estimation)

Engineers:  > 24 md
- CAT : 14 md
- Webinars: 3 md
- Test tools : 5 md
- Configuration : 2 md

Travel costs:
- Round trips to CAT location: >= 2
- Hotel nights : >= 12
Communication

We establish a dedicated communication channel with and within the participants

– Mailing List
  • Google group EU_Connectathon: registering to the mailing list does not register you to the CAT
  • https://groups.google.com/forum/#!forum/eu_connectathon
  • Web Site
  • http://gazelle.ihe.net

– Google group establish a knowledge history
  – Vendors reply to some vendors
  – Building a community
Connectathon Process

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Test Cases

- Test Cases are made available to the participants through the Gazelle GUI
- Possibility to review cases before the connectathon
- Possibility to request for corrections in the test cases
Test Cases

No peer tests
  • Calibration, data sharing, scrutiny tests

Peer to peer
  • You chose your partner among the available ones.
  • Gazelle helps you find out the possible partners
  • Matching based on registration
Test Plan

Test Plan are generated per system

Participating systems are free to chose test partners

- Among the one that are available
- Each test case need to be perform with a predefined number of partners (ie : 3 )
- Partners chose when to execute the test cases
Connectathon Process

- Registration
- Resources
- Test cases
- Monitors
- Post CAT
- Logistics
Monitors

- Recruit monitors for the verification of the tests
- Train monitors through webinar
- Assign test cases to monitor
- Ensure all test will have a monitor for verification and prevent bottle neck
- ~ 12 to 15 % of participants are monitors
Test Grading by monitor

Use of work list
Monitors are assigned tests based on competencies
Monitors visit participants to grade test.
Participants shall prove that the test was performed successfully.
Monitors may review more than one test at a time to optimize their time.
Network

Infrastructure
- Example: Bern: 2 km of cables, 600 m fiber

Assign fixed IP Addresses
- Sometimes need for Public IP

Provide DNS Server

Install supportive tools
- TLS tools, Order Manager, Simulators,…
Interoperability Testing

Participants need to show interoperability (goal)

Tools are available to support grading

- Proxy for capturing exchanged messages
- Conformance checking tools
Connectathon Process

- Post CAT
- Registration
- Resources
- Logistics
- Monitors
- Test cases
Post - Connectathon

- Grading of results
- Report to IHE Europe
- Report to vendors
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Gazelle

Gazelle Test Platform

- Validator
- Simulators

CDA Models
- HL7 Message Profiles
- Value Sets

TF Model

Test Plan

EVS Front End

Simulators

Test Mgt

Proxy

Conformity testing

Interoperability testing

Testing process management
Validation tools (1)

Conformity Testing
- XML messages, documents provided by systems
- Based on healthcare standards
- Based on IHE specifications

Services web (SOAP) for system validation, available all the years

GUI Portal for validation (EVSClient):
- Unique access to all validation service
- Database of samples
- [http://gazelle.ihe.net/EVSClient](http://gazelle.ihe.net/EVSClient)
Validation tools (2)

Available services

- HL7v2.x messages
- CDA documents
- Workflow documents (XDW)
- XDS metadata (and related profiles)
- DICOM objects
- Messages exchanged in the context of HPD, SVS, PDQv3, XCPD
- Audit messages (ATNA)

https://gazelle.ihe.net/EVSClient/
Validation tools (3)
Simulators (1)

Interoperability testing
- An implementation for an actor(s)/profile(s)
- Coupled with validation service
- Send/receive messages
- Treating messages received
- Are not reference of implementation!

Web Applications
- Available all the year
- Free for use
Simulators (2)

Example of simulated profiles:
- Cross-Enterprise Document Sharing (XDS) and related profiles (eg. XDS-I, XCA, XDR)
- Hospital Medication Workflow (HMW)
- Laboratory Analytical Workflow (LAW)
- Laboratory Barcode Labeling (LBL)
- Laboratory Testing Workflow (LTW)
- Patient Administration Management (PAM)
- Patient Demographics Query (PDQ)
- Patient Identity Cross-Reference (PIX)
- Radiology Scheduled Workflow (SWF)
- Sharing Value Set (SVS)
Simulators (3)
Test Management

Management of tests:
- Technical Framework IHE
- Test plans

Management of the connectathon:
- Registration of systems/participants
- Management of systems configuration
- Management of testing session
- Management of test plan executions
- Registration of testing evidence
- Upgrading of tests
- Generation of report of test

For Europe: [http://gazelle.ihe.net/EU-CAT](http://gazelle.ihe.net/EU-CAT)
Other tools

Proxy
- Man in the middle
- Capture of messages between SUT
- Coupled with EVSClient for the validation
- http://gazelle.ihe.net/proxy

SVS Simulator
- Simulator for SVS profile (value sets exchange profile)
- http://gazelle.ihe.net/SVSSimulator
Interoperability & Conformance Testing

- Configure
- Interacts

- Checks Evidences
- Verifies test performs as planned
- Grades

- Get Test Plan
- Find Test Partner
- Log Evidences
- Get Test Report

Gazelle Test Platform
Gazelle in Numbers

4 Running instances for CAT
✓ USA, Europe, Japan, Korea

25 FTE invested
500 simultaneous users
900 organizations
1000 test cases
3000 users
40000 test instances executed
Tools availability

Software licensing

- Apache 2.0
- Re-usable even for commercial purposes
- Non-viral