

Abstract

Open Source Integration Engines for Safer Hospitals. A Case Study.

Outline: the paper describes a case study of a software integration engine based on open-source tools running in the biggest hospital of Sardinia, one of Italian regions: the implemented application is focused on ADT, Radiology and Laboratory data exchange. The general objective of the project is to enforce patient security through the use of integrated software products, the availability of homogeneous clinical data and an easier access to medical records for administrative and medical personnel involved in the entire care process.

Background: information system integration and data exchange is a crucial need in modern hospitals for the patient safety and for a better data management and accessibility between wards and hospitals. The use of standards like HL7 and of the international guidelines such as IHE can help in building efficient communication systems but only through a correct analysis of the care processes involved and a strong synergy between the clinical components we can achieve the result of a safer modus operandi.

Objective: the main objective is to drastically reduce human errors in repetitive processes through the use of modern integration engines and international standards. We considered a typical integration use case, involving different actors inside an Hospital Information System: ADT, Radiology and Laboratory. The objective is achieved through the use of Mirth Connect, one of the most known open-source integration software and through the combination of a complete redundant and secure hardware and software stack. The proposed system supports the thousand transactions produced by the care processes considered and can handle the most common hardware and software failures. Mirth reliability has been improved with redundancy at physical, operating system, network and application layers, through the use of virtual machines and clustering technologies. In this way we can obtain a unique, large and scalable integration gateway, capable to trace and register what happens at every point of care processes, to prevent data loss and failures and to reduce the chances of clinical errors due to insufficient or erroneous information data, increasing care quality.

Methods: the project started with the analysis of the hospital domains considered: ADT, Radiology and Laboratory. The analysis brought to the identification of two main points of failure: absence of a federal demographic administration system and lack of an integration between clinical domains. These main problems led to safety risks because clinicians and nurses were forced to manually do high risk operations, such as inserting the same information on two or more software applications, or labeling tubes for Laboratory tests, making difficult to trace back what has happened to a patient. To solve and prevent the problem, we used Mirth as an integration engine along with the state-of-the-art technologies for virtual clustering.

Results: since October 2007 there is a stable production version installed in the main hospital in Sardinia. In about 3 years the system managed 90.000 demographics merges and 250.000 Radiology order entry transactions.

The system avoided double patient data entry and improved the accessibility of clinical information achieving the important result of streamlining the processes of patient admittance, order entry and medical reporting.

From a technical point of view, the most important result shown is that, at every point of the ISO-OSI stack level we have a system that increases reliability and considerably limits network and data failures based on an entire open-source infrastructure.

Conclusion: the proposed solution is an easy, efficient and cost effective way for clinical software integration inside a Hospital Information System. The combined use of available healthcare standards and guidelines along with open-source software applications can lead the way to a safer and more efficient patient management in the hospitals.

Learning Objectives

- 1) Understand the importance of integration and its standards (HL7,IHE) for a modern Hospital Information System through the description of a concrete implementation in a production environment
- 2) Identify the main systems and processes involved for an integration case study and all risk factors related to a well-defined integration process chain, focused on Radiology and Laboratory services.
- 3) Enforce and stimulate the use of Open Source tools as valid solution for healthcare integration problems solving

Proposal content (30-word abstract of presentation description)

It will be presented an implementation running in 3 different hospital wards of an open-source integration system based on the standard HL7 and the IHE framework for increased patient security.

Short Biography

Dr. Triunfo is the coordinator of the Healthcare Flow Research Program at CRS4 (Centre for Advanced Studies, Research and Development in Sardinia). In his professional career he has matured a deep knowledge in clinical engineering, telemedicine and biomedical applications, through the development of several projects in the healthcare field. Currently he is still working in digital medicine, focusing the attention on three main areas:

- telemedicine applications, with a particular attention towards connecting clinical institutions through low cost technologies;
- heterogeneous data integration, devoted to the creation of models easy to use for clinical and research aims;
- traceability in healthcare, mainly related to patient security in the laboratory environment.

Many lines of activities are directly funded by the local government and companies of the sector: in particular the work in traceability is object of a collaboration with an international firm specialized in laboratory automation and robotics.

Thanks to his group activities and research interests, CRS4 is among the organizations members of IHE, Integrating the Healthcare Enterprise, the international organism devoted to the creation of a framework for standard utilization common for all the healthcare actors.

His works have been published and presented on specialized journals and conferences (i.e.

[http://www.ncbi.nlm.nih.gov/pubmed?term=Triunfo,%20Riccardo\[Full%20Author%20Name\]&cmd=DetailsSearch](http://www.ncbi.nlm.nih.gov/pubmed?term=Triunfo,%20Riccardo[Full%20Author%20Name]&cmd=DetailsSearch))

Public Speaking Experience

Dr. Riccardo Triunfo during his research activity has been promoter, chairman and presenter for several conferences related to digital medicine themes, like clinical informatics, telemedicine, research and development in healthcare; among the most important events we can point out the following:

1. 10th Annual Congress of AITIM (Italian Association for Telemedicine and Medical Informatics): organizer, chairman of the congress and presenter of the work “COTS Technologies for Telemedicine Applications”. The congress was held in Cagliari, in November 2009.
<http://bc.crs4.it/index.php/it/aitim-2009>
2. International conference Toward the Electronic Health Record: organizer and chairman of the conference. The conference was held at the Scientific and Technologic Park managed by Sardegna Ricerche, in Pula (CA), Italy in October 2008.
<http://www.sardegna ricerche.it/index.php?xsl=370&s=93861&v=2&c=3134&nc=&sc=&qr=&qp=&fa=&o=&t=3&bsc=&vd=2>
3. WOHIT 2011: presenter in the session “Equipping health IT infrastructure to deal with legal demands, Portals, privacy, security” with the contribute “Open Source Integration Engines for Safer Hospitals. A Case Study”.