AN OPEN-SOURCE TELE-REPORTING SYSTEM
BASED ON RAILS

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ABSTRACT

“MIRO ON RAILS” is a broker-based architecture for medical telereporting activities over the Internet. The realization of the infrastructure is completely based on RAILS framework, an open source software infrastructure. “MIRO ON RAILS” is also a step towards our vision of a worldwide Virtual Health_Care Agency.

INTRODUCTION

The keyword with MIRO is “telereporting”: advanced solution in telemedicine field. The operational definition of telemedicine underlines the “involving of informatics tools for the management of clinical information finalized to support diagnosis, treatment plans and rehabilitation”.

In a very schematic way we can consider six development areas in telemedicine:
- the transmission of simple signals;
- the transmission of images;
- multimedia documents transmission;
- the unidirectional interaction human machine;
- the bidirectional interaction user professional;
- the bidirectional interaction professional professional.

Let's think of the third world populations, those that most suffer from the difficulties in connections, because of poverty and for the lack of right medical services.

In these ambiental context, possibilities offered by telemedicine, can restrict uneasiness, leading to bring the service exploiting telematic ways and the flexibility of informatics equipment pushing the service towards humans and not vice-versa.

MIRO is especially thought for helping third world populations, thus the circuit of use is worldwide.

ARCHITECTURE

Telereporting systems let move data instead of patients. The specific object of our project is the realization of an experimental software offering a medical telereporting service: medical analysis transmission (like ECG ecc...) and related reports in electronic format via Internet. The assumed Tele-Reporting System is a system for clinical use, composed by medical analysis tools (for instance electrocardiograph), by web connected computers, a central unit (telereporting “Server”) where every identifying and clinical data about patients and every health checkup acquired by equipment is stored, the whole system is managed by MIRO ON RAILS (figure 1).

From any of the NODES, the doctor can explore and consult all the data stored in the System and accomplish to the reporting. This system allows to automatically control all the work flow of a clinic checkup. In this way it is no longer necessary to physically move the printed checkup paper from a location to another and the whole clinic fold: via Internet the information are transmitted in electronic format unto the specialist and then they return back to the patient with the diagnosis.

The checkup can take place by any laboratory in any region of the world and, if necessary, directly by the patient (figure 2):
1. The laboratory’s operator, through MIRO interface, inserts the patient's data (identifying data can be submitted when the checkup is booked) and the information about the accomplished one and eventually with the data about the diagnosis quality (for instance the ECG), the software will store all the data on the database of the central server.
2. The specialist should be able, through the appropriate dotation HW/SW, to remotely consult the patient's clinic fold and the event the opinion is requested for.
3. Eventually specialist might be able to draw up the report in electronic format.
4. The consult is made directly through the application interface.
5. Eventually operator close the event.

The advantage is that the report will be available to doctors via web through MIRO: access restricted dedicated website consultable in anonymous way from any NODES connected the Internet.
The patient's clinic folder with the report realased by the specialist (digitally signed and eventually made accesible) will be consult on the appropriately build website.
The patient's clinic folder will be available, exclusively for the authorized users,, in anonymous way, directly by the patient in case of need.

Figure 1: General Architecture

Figure 2: Flow Diagram

**WHY RUBY ON RAILS?**

**Rails**: is a full-stack web application framework, written in Ruby.
- **Ruby** is an open source, object oriented scripting language that Yukihiro Matsumoto invented in the early 1990s.

Ruby makes programming flexible and intuitive, and with it, we can write code that’s readable by both humans and machines.
- **Web application** is a software application that’s accessed using a web browser over a network.
- **Framework** can be viewed as the foundation of a web application. It takes care of many of the low-level details that can become repetitive and boring to code, allowing the developer to focus on building the application’s functionality.

A framework gives the developer classes that implement common functions used in every web application, including: database abstraction, templating, management of user sessions, generation of “clean” URLs.
- **Full-stack**: ruby on rails is a “full-stack” framework, the components are integrated in such way that connections between them must not manually be plan. For example, using Active Record (package of Ruby on Rails), the developer does not need to specify database column names in class definitions. Instead, Ruby can retrieve this information from the database.

**Ruby on Rails Benefits:**
- **Fast development time:**
  One of the founding principles for Ruby on Rails is agile development. Agile development "is a conceptual framework for undertaking software
engineering projects that embraces and promotes evolutionary change throughout the entire life-cycle of the project.”

Since Ruby on Rails promotes and allows for easy changes to architecture as well as database migrations.

- **Web 2.0 features:**
  Clients don’t respond to Asynchronous JavaScript and XML, but they all have heard of buzzwords like AJAX. Ruby on Rails features built in Prototype and script.aculo.us support, allowing for powerful features out of the box.

- **Fast prototypes:**
  Ruby on Rails is based on scaffolding: is a meta-programming method of building database-backed software applications. Developers can autogenerate a basic Create, Read, Update and Delete architecture while spending their time on the features the customer desires.

Tim Bray, Director of Web Technologies at Sun Microsystems, outlines the basic advantages of each of these three platforms. His idea is to rate your priorities of: 1) Scalability, 2) Dev Speed, 3) Dev Tools, and 4) Maintainability (Intrinsics).

**WHY OPEN SOURCE?**

Telemedicine was formerly utilized in: space studies, combat situations or telesurgery which requires extensive use of high end.

Today technology brings good quality medical services to rural and remote areas mainly in developing regions with scarce resources. Different requirements and solutions must exist for these two different scenarios. Open source software development is gaining more acceptance as a cost effective approach for later scenario.

Some of the advantages of open source over proprietary software are as follows:

- software development requires little or no initial investment and since most of the code is developed collaboratively the actual costs per party are very low compared to closed source;
- lets users to spend their resources on their exact requirements rather than the proprietary companies market priorities;
- functional excellence, innovation, and potential for evolution are generally easier with open source software;
- interoperability and standards compliance are therefore critical to success since open source development is most of the time done by more than one party of developers and used by many more.

Most widely known disadvantages of open source software are the lack of official support (open source software companies often base their business model on support to the software systems) and harder installation and configuration processes.

But this advantages are not significant in MIRO’s scenario because it is thought as widely-used mass technologies. MIRO can be used for second opinions, so there are low responsibilities.

**CONCLUSIONS**

All the data are filed in the central server, in this way it’s possible to realize a virtual health-care agency. Infact SW MIRO’s innovation is the management of patient’s clinical folder in any territory.

The advantage of this solution is the possibility to cancel the distances. This is an advantage especially in the regions in which miss sanitary resources.

**REFERENCES**

1. Dave Thomas, David Heinemeier Hansson; *Agile Web Development with Rails*, The Pragmatic Bookshelf.