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The RITHME Inter-Mediation Platform for data exchanges between Healthcare Professionals

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Abstract. Data Exchanges between Healthcare Professionals are always limited to paper. For letters, reports, results, the physicians and hospitals are yet using the classical post-office mailing system. With the growing development of Medical Informatics within the Hospital Information Systems and the GPs offices, the way to exchange medical data will be more and more oriented towards the Telematics procedures. If Tele-consultation, video-conferencing applications appear as routine procedures, a safe, protected, and rapid transmission of medical data and records through electronic mailing systems is not yet really available.The Rithme* Inter-mediation Platform is an experimental product, tested in the town of Armentières (in the City of Lille) in the North of France to allow a better, safer, more rapid electronic communication between all the professionals of a geographical sector. One of the mail component of this platform is the "Events Server" which collects and displays all the available information concerning a dedicated patient to the medical authorised correspondents. To realise this task the Rithme* Platform takes charge of 4 main functions: formatting the messages, assuring the security, managing the directories, notifying emergencies. Currently experimented with success in the City of Lille, this Platform will be soon customised and commercialised.

Key words : Healthcare Networks, Telemedicine, Intermediation, Communication platforms.

1 Introduction

New Information Technologies are introduced in all the dimensions of life: Tele-commerce, Tele-training, Tele- or video-conferencing, Electronic mails are today regularly used not only by computer scientists, or by information professionals, but by a growing part of the population. In the Healthcare domain, the electronic communication becomes a striking challenge for hospitals, organisations, doctors and patients. It is also a commercial challenge as the number of Healthcare professionals (3 million of people in France, more than 10 millions in Europe) is extremely high, and their communication flows increasing. Some countries try to apply Telecommunication policies in the Healthcare Sector; one characteristic example is the "Réseau Santé Social" in France, described as an Intranet for the communication between doctors and the Reimbursement system of the Social Security.

Too often, Telemedicine is considered only for co-diagnosis [1], Tele-education and Tele-training [2], Tel-radiology and Tele-treatment [3]. A new domain is emerging, concerning Tele-care networks for data exchanges between hospitals, between hospitals and

G.P.s, between laboratories and other Healthcare professionals...and for a better, more rapid transmission of information. This information includes administrative, medical, biological and therapeutic data of dedicated patients. This may also concern general information about the way to obtain appointments, facilities provided by the hospital as well as quality indicators. Some experiences demonstrate the possible benefits of such professional networks within a geographical sector or even a region: the Coco project and the Fyncom experience in Denmark, The Medibridge network in Belgium. But these experiences are not easily transferable as the technical solutions are mainly dependant upon the security procedures allowed by the legislation of the countries, and upon the organisation of the Healthcare system in the country.

We present here the experience of the Inter-Mediation Platform in the area of Lille in the North of France (1 million of people). This experience includes the University Hospital of Lille, and two general Hospitals: the Hospital of Tourcoing, and the Hospital of Armentières, in a small town (26 000 habitants), plus 55 G.P.s, 3 private biological laboratories, and the therapeutic accommodations for HIV-infected patients. This platform named RITHME* was designed to allow a better, best organized communication of information between all the medical actors of the sector. Currently under evaluation, the objective is the packaging and customisation of the product for a large dissemination in the region and throughout Europe.

2 Material and Methods

2.1 Objectives of the Project

A complete analysis of the Users Requirements involving all the parties was organised with General Practitioners, Specialist Physicians (cardiologists, dermatologists, radiologists), laboratories, hospitals physicians and administrative directors. At the end of this first phase, we obtained a rather complete description of the potential users needs and expectations that are summarised and ordered below:

GPs Requirements

Requirement 1: To inform the GP that a patient is hospitalised. The GP will receive relevant information concerning the patient's hospitalisation : entry (emergency or not), discharge, movements of the patient between different medical units, eventually death. For each GP, the complete list of the hospitalised patients he is responsible for, should be available.

Requirement 2 To receive as soon as possible a relevant information after the patient's discharge (liaison letter) including: diagnosis, prescribed treatments and therapies (order), instruction and recommendations for the follow-up

Requirement 3: Transmission of relevant information from the emergency unit : diagnosis, treatment, follow-up, surveillance ...

Requirement 4: To receive information from the hospital in case of significant event of change in the patient's status.

Requirement 5: When a patient leaves the hospital on Saturday , the GP or the Homecare Nurse must be informed before the discharge

Requirement 6: When a patient leaves the hospital, the labs results, liaison letters and discharge letters are available.

Hospital Doctors Requirements

Requirement 1: Hospitals must be equipped with Hospital Information Systems for : Medical record, Integration of results (labs, consultations, hospitalisations), Connection with other hospitals and GPs.

Requirement 2: To receive short, relevant, and concise patients' information from the GPs (as the GPs can afford short summary of their computerised medical record.)

Requirement 3: Appointment Systems : To share agendas between different hospitals.

*2.2 The Inter-Mediation platform: Rithme**

The platform provides basic and specific services to make possible the data exchanges between Hospitals, GPs and other practitioners (labs, specialists...).

Basic services.

The platform provides four main functions to permit the connection of Healthcare actors. These basic services are described below:

- Directory of the physicians, organisations, laboratories, and hospitals included in the network
- Security of the transactions. To make safe the transmission of data, we encipher the messages with a "tunnelling" procedure.
- Formatting the messages. As there is no standardisation of the documents the platform receives documents and messages under different formats (Word6, Word97, RTF, Hprim, ...). To send the documents in a format understandable by the receiver's application, it is necessary to translate the document in a comprehensible format. To do so, each received message is deciphered and then re-formatted in XML. And the XML format is re-translated under the receiver's format according to a table contained in the directory.
- Notification. In case of a doctor's absence, or network disturbances, or machine unavailability, it is indispensable to route the messages under different ways. In case of emergency, a message can be displayed on the phone of the doctor or even on his portable phone if available.

Specific Services. The Inter-Mediation Platform Rithme* is not only a secure E-Mail. It organises the communication between physicians to make it safer productive and more efficient. Based on a data Base (Oracle*), the main component of the Platform is the "Events Server"

- The "Events Server" is the most original part of the Rithme* Inter-Mediation platform.. For one patient i, the platform can receive several documents from diverse origins and directed towards one unique address: Labs Results LR(i), Report R(i), Letter L(i), or administrative information A(i). In case of an hospitalised patient, movements, reports, letters are provided within a common short period of time. The Events server packages the different documents LR(i), R(i), L(i), A(i) in a common "Event" Event (i) for the patient i.). So, for one patient, this database collects, gathers and organises the data in the relevant format,

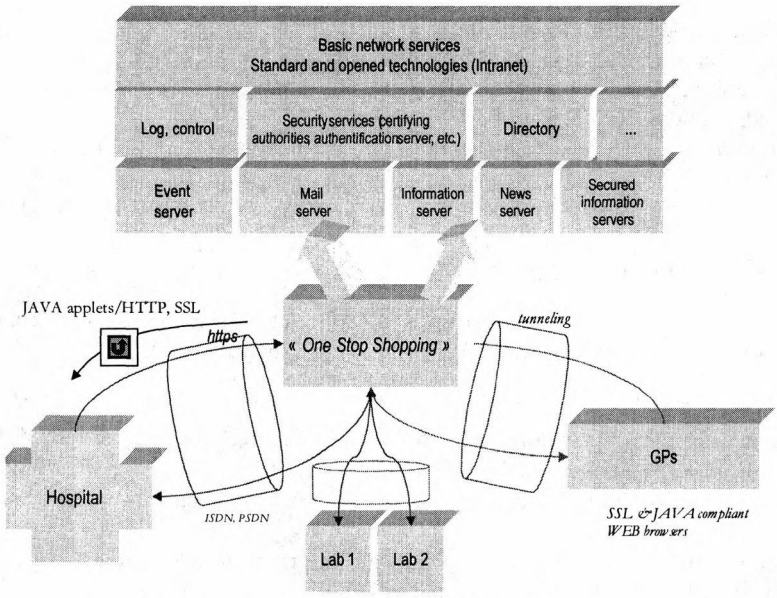

Figure 1. General functions of the Inter-Mediation Platform

in one "event". In the database, for one patient, there are as many events as packages. For the moment, these events are destroyed when read by the receiver but in the next future it could be possible to aggregate these events under a comprehensible format for statistical analysis or to keep archives on the patient's history.

- Access to medical databases and medical Internet services.
- Protected E-Mail throughout the network for the actors participating to the experiment.

2.3 Other services and applications

This project was developed to be integrated in the French national medical network dedicated to the Healthcare professionals and organisations. This network called "Réseau Santé Social" (RSS) is under construction and will provide the actors of the domain with a professional Extranet assuring three main functions for routage, security, and directory maintenance, plus a safe access to Internet.

3 Results

3.1 Usage of the Inter-mediation Platform

After a first experimental phase in summer 98, all the physicians are currently connected to the Platform to receive messages and data from the Hospitals as well as from the labs. In this validation phase we register all the comments, remarks and suggestions of the GPs and of the Hospital to provide a better and more efficient service.

A recent statistical analysis of the logs gives us interesting elements on the way the server is used by the partners. (Table 1). The maximum number of messages are rather short messages of 100 bytes to 100 Kbytes, corresponding to administrative messages (movements of the patients) or short letters or reports (cardiology reports, X-Ray reports, liaison letters). Large messages greater than 100 kbytes are quite unusual.

Table 1. Length of the messages transmitted through the platform.

Size of the message	Percentage of messages	Percentage of Bytes
0-1b	0,9	-
1b - 10b	1.7	-
11b – 100b	5.5	0.16%
101b – 1kb	48.4	7.61%
1kb – 10kb	39.2	38.84%
11kb – 100kb	4.1	42.45%
101kb – 1Mb	0.2	10.94%

As the use of the Platform is growing, the number of calls and connected physicians is also growing rapidly. 29/55 physicians use daily the platform, only one month after installation. Nevertheless, the real success of the network will be confirmed only after several months of utilisation.

3.2 Qualitative Results

The Inter-Mediation Platform RITHME has proven to be a safe means for communication between the Healthcare Professional of a geographic area. It allows a real-time communication system, a service availability 24 hours per day, and the possibility of transferring all types of documents daily used by the Healthcare professionals: texts, labs numerical results, schemas, even images.

But the service is also providing other services that are useful for every actor in the network: a safe E-Mail system allowing the transmission of confidential messages concerning patients or Public Health, and an access to information services and servers, epidemiological alert systems.

The most positive aspects of the contribution of hospitals physicians and GPs can be summarized as: increasing benefits in time and travels (most efficient visits to the hospital), easy access to a rich source of relevant data concerning the commonly followed patients, and a renewed quality of the presentation of the documents.

4 Discussion

The Inter-Mediation Platform named Rithme* was designed during the ISAR-Telematics project of the European Union Fourth Framework Program. It was finalised and experienced during the IRISI Project of the European Union Programme for the development of the Information Society in the European regions.

This platform is currently running in the town of Armentières in the Region Nord-Pas-de-Calais in France. The main exchanges concern administrative information (entry/ outcome / movements/ death of a patient) and medical information as letters, results of biological tests, reports from different sources. The current follow-up of the rates of exchanges indicates a rapid growth of the number of regular users and of the number of messages.

Organisational and human constraints [4] are important to take into account for estimating the success of such applications. On one hand, the majority of the healthcare professionals of the area must have computers, and moreover software applications to manage their patients records. Even if the use of computers is growing in all the regions of Europe, only a limited percentage of them utilise the capabilities of the electronic patients records. On the other hand, if the labs are all equipped, it is not the case for the hospitals where Hospital Information Systems are not in routine use everywhere. As a consequence, the installation of Inter-mediation Platforms will require the equipment, training,

maintenance of many professionals. This new way of working will introduce new methods for treating documents and letters and will have huge organisational impacts [5].

The management of such a platform focuses also on security procedures, confidentiality respect, identification, authentication and signature procedures. Some of these problems can be technically solved but the technicians and the physicians must stay aware that it is an essential point for the success of Telematics in healthcare.

The platform is currently installed in a limited geographical sector. One question is the dimension of the area that must be covered to optimise the size and costs of the material. From Health Geography studies, it appears that the exchanges are mainly concentrated in a sanitary sector (400 000 to 1 million people). Inter-regional exchanges are rare and concern a small population of patients, if we exclude the holidays seasons.

5 Conclusion

Asynchronous communication between physicians, hospitals and other professionals is an important factor of quality of care as this quality is depending upon a good communication of the relevant information between all the parties. Health Telematics can improve this communication by improving the rapidity, the security and the availability of the right data in the right place at the right time.

The Inter-mediation Platform RITHME* allows the safe transmission of data and messages within the network of participating professionals. The success of these applications will also depend upon organisational changes in the work process and improvement of Human Computer Interfaces to improve their utilisation by the end-users.

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