Wireless networking with a PDA: the Ward-In_Hand project

G.Dodero, V.Gianuzzi
DISI, Universita' di Genova, Genova, Italy

E.Coscia, S.Virtuoso
TXT e-Solutions, Milano, Italy

Extended Abstract

The paper briefly describes Ward-In-Hand, a project aiming to support the day-by-day activities of doctors and nurses within an hospital ward by providing a tool for workgroup collaboration and wireless access to the patient's clinical records. The project, which is at present experiencing its first prototype, is based on accessing the information system from the patients bedside, with a wireless connection through a PDA client.

Ward-In-Hand aims to provide the healthcare professionals with a handy IT tool to get assistance during their daily activities. The projects starts from the consideration that most often doctors and nurses do not have easy and timely access to the patient's information when they work at the "bedside". Information is often recorded on paper and subsequently transcribed on paper for further processing. The solution sought is to replace the current procedures based on manual transcription and transmissions of data, using wireless connectivity to complement conventional data entry to the hospital existing information system (called "the legacy system").

Ward In Hand is an international project co-funded by the European Commission within the IST (Information Society Technologies) Work programme, and it is being developed by a consortium made up of 4 industrial and academic partners and 3 pilot users (Hospitals) representing 5 European countries. Development started in January 2000; the final deliverable, planned for release in mid-2002, will be a complete system ready for commercial exploitation. At the time of the preparation of the present extended abstract, users in a real hospital environment are installing a first prototype at the pilot sites for validation.

The WardInHand acronym stands for Mobile Workflow support and InformAtion distribution in hospitals via voice-opeRateD, wIreless-Networked HANDheld PCs. The architecture is modular, designed to serve a single ward where doctors and nurses are equipped with a mobile device (currently a Compaq Ipaq 3630 is being tested) connected to a ward server through an IEEE 802.11 wireless LAN. The server in turn communicates with the hospital's legacy system.

Though the architecture (shown in Figure 1) allows to access the application through any terminal (including desktops) connected to the LAN, its main purpose is to support doctors and nurses while they operate "at the bedside", where timely and up to date information availability is most required.

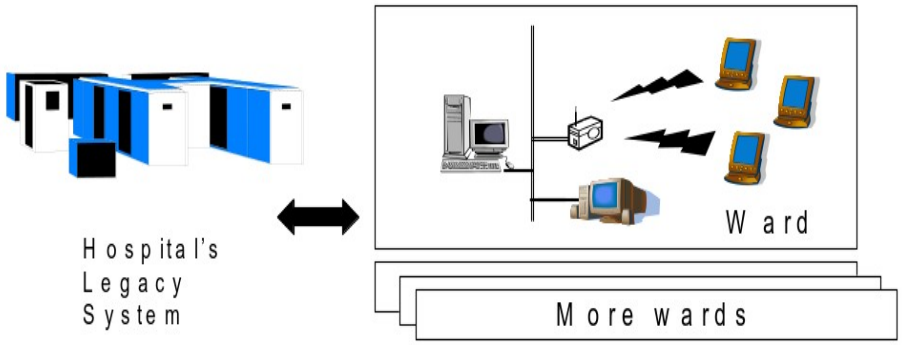

Figure 1: The WARD-IN-HAND system

The main features of the system are:

- the ability to maintain a “personal organizer” that provides the actors with a real time list of tasks to be executed; once performed, a task can require scheduling of new tasks according to “workflows” that have been configured for that particular installation. A typical example is a drug prescription by a doctor, which will trigger a new task (or perhaps a repeated series of tasks) for the nurse to give the patient that particular drug.
- the capability to display on the mobile unit the relevant information contained in the patient’s clinical records, and update these data

The rationale for such a system is quality improvement (higher quality of the healthcare services, elimination of errors, better security and safety standards enforcements); and increased efficiency of the process (improved synchronisation, reduced wastes of time and materials).

The novelty of Ward-In-Hand with respect to other hospital information systems lies in the use of wireless networking through PDAs: these devices can be operated at patients bedside and will soon be equipped with voice interfacing features, thus giving the medical personnel the possibility of hands-free operation. However, the new features may hardly be useful, unless they are fully integrated within the existing hospital information systems.

Let us consider in more details the underlying ward architecture: it is a client- server one, where mobile clients on a PDA interact via a web-based interface, communicating with the ward server by means of XML documents. The Electronic Patient Record itself is kept as an XML document, divided into three different parts: Personal Data, Clinical History, Stay. The first part is taken from the administrative databases, that is the "legacy systems" of the hospitals; the medical information contained in the second and third part of such a document may originate from a medical database (another legacy system, possibly different from the administrative one), or may be internal data, originated inside the ward, and stored in the Ward-In-Hand server only.

The choice of XML is motivated by the need of being able to interface with existing databases, of various types. The existence of standardization efforts in Electronic Patient Record representation (such as the XML-EDI project) has enforced such a choice and has been kept as a reference.

Data exchange between data collected in the ward and the legacy systems takes place through a Web Application, which is implemented by a Legacy System Server Agent (which is responsible of data interchange with the legacy system) and a Web server (interchanging data with the ward server). Any customization with respect to the actual legacy databases may require a different Legacy Systems Server Agent: in the three pilot wards, different solutions have been exploited, and others have been investigated for further extensions. For instance, the Legacy Systems Agent may be a PHP script, using ODBC to connect to a SQL Server database: or a Java Servlet to interface to an ORACLE database. In the more general case, the legacy system should be accessed by means of messages in some standard format like HL7, and the Legacy Systems Agent shall translate it into the XML document used within Ward_In-Hand.