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The Erlangen University Hospital Communication Hub - Proprietary and Standardised Communication

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Abstract

The University of Erlangen-Nuremberg contains 22 hospitals and 11 autonomous medical departments which are spread out over a large area in the city of Erlangen. The necessary connections of these units and their computer based subsystems to each other and to the medical computer centre via fibre optics cables is complete. The internal cabling of the individual units is largely completed.

Based on this network the Erlangen communication hub allows medical subsystems of the Erlangen university hospitals to exchange data by two completely different methods. Since 1995 a communication data base, which is implemented using the relational data base system ADABAS D, contains data from the most important hospital systems. This data can be accessed by other medical systems.

Thus the communication data base allows subsystems which do not have a standardised interface to implement proprietary system interconnections via access based on SQL. The capabilities of this interconnection are dependent on both the implementation and the data which is made available by the communication data base. This contains mainly basic patient data and the results of tests performed by various laboratory systems. In addition to this proprietary communication system we have since the end of 1996 a communication server which can also handle standardised message formats such as HL7, EDIFACT, DICOM3. Future subsystems which possess standard interfaces will be connected via this server. The connection of the patient management system IS-H and the central laboratory system to the database has been proceeding since the beginning of 1997.

Keywords

Hospital Communication System; Hospital Information System; Medical Network; Communication Server; Communication Standards

Introduction

The decentralised structure of the clinical and scientific facilities of the medical faculty of the University of Erlangen-Nuremberg has resulted in the data processing activities in the individual facilities being largely autonomous. The medical computer centre (IVMed) was set up in 1995 by combining the former computer centre of the medical faculty and two administrative groups. One of its main duties is the coordination and integration of the data processing activities of the clinical departments. The previously largely autonomous data processing activities of the clinical departments provided effective support for various parts of the hospitals but it was not easy to combine them to a general hospital communication system due to the lack of suitable interfaces to the subsystems. The desire for electronic interchange of data with other important units of the hospitals or the medical faculty, e.g. the patient administration system or the central laboratory, has existed for years.

Previously a proprietary file transfer with the mainframes on which the systems were installed was used. This proprietary method was used until 1996 and was gradually replaced by the introduction of the communication data base. A prerequisite for the electronic communication was the installation of cables connecting all parts of the medical faculty [1]. The provision of a fibre optic backbone network using FDDI technology was completed in 1995 [2]. The most important parts of the hospitals, though not all, were connected by the beginning of 1997 [3]. The introduction of the patient management system IS-H enabled data relating to diagnosis, treatment, and costing to be assigned to the individual patient via the admission number for any patient in one of the hospitals. The assignment is possible provided the subsystems which produce the data can access electronically the basic patient data which is contained in IS-H. Since the beginning of 1997 IS-H has been accessible in all inpatient departments, and most outpatient departments will have access to it by the end of 1997 [3].

Proprietary communication using a communication data base

Communication between the patient management system and the subsystems of the individual hospitals are necessary to prevent repeated entries of basic patient data for patients who have already been entered into the patient management system by administrative staff on admission. Also laboratory and other medical data are already stored in individual computers and can

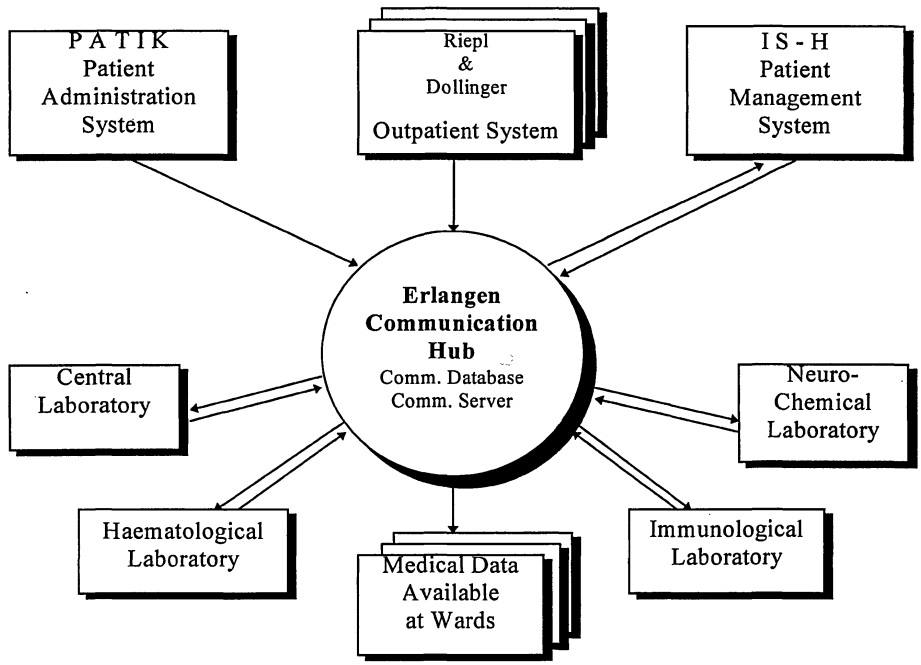

Figure 1 - Erlangen university hospital communication hub

be accessed by applications running on other computers if the necessary communication services and interfaces are available.

The communication data base was implemented in Erlangen after a suitable data model was defined in various research projects. After effective transfer mechanisms using proprietary communication processes had been implemented it was possible to include existing electronic patient data in a central data base. Access to the data base is possible via a proprietary data base interface using SQL (Structured Query Language). The dual nature of the communication data base expresses itself in the fact that the data base is used to collect data from various application areas and thus to make it available to other medical applications. In this way the data base performs part of the task of a communication server.

It can however also be regarded as a specialised medical application, which collects patient data and might in the future serve as a store of electronic patient data or a patient information service.

Thus the data base is already able to support the exchange of data via a central data pool as an intermediate solution during the migration of the medical and administrative subsystems to standardised communication.

It was also necessary to connect the patient management system IS-H to the communication data base in a proprietary manner via the HCM interface, which is specific to the system in order to maintain the status quo in the communication area. Additional attached systems are, e.g., the central laboratory system, the haematological laboratory, and some subsystems of the Erlangen head hospital, e.g. the neurochemical laboratory (see fig. 1).

Standardised communication using a communication server

Communication via a communication server using a standardised data exchange format is a widely favoured method for communication between medical subsystems. This method is currently being evaluated in several larger hospitals in Germany [4]. Message based data exchange via a communication server using the standard protocols HL7 and EDIFACT will also be used in the Erlangen hospitals [3].

The communication server DataGate of STC is being evaluated since the end of 1996. Existing systems, which do not have standardised interfaces, must normally be altered to use the new communication method. With the introduction of the new patient management system IS-H for inpatients at the beginning of 1997 the exchange of data via standardised interfaces could proceed. IS-H was connected during the middle of 1996 in a proprietary manner to perform the exchange of basic patient data with the previous patient administration system PATIK during the migration.

Fig. 2 shows the connections of particular subsystems via the communication server being implemented, focussing the communication of administrative patient data. The connection of the patient management system IS-H, the central laboratory system, and the microbiology system is being implemented since the

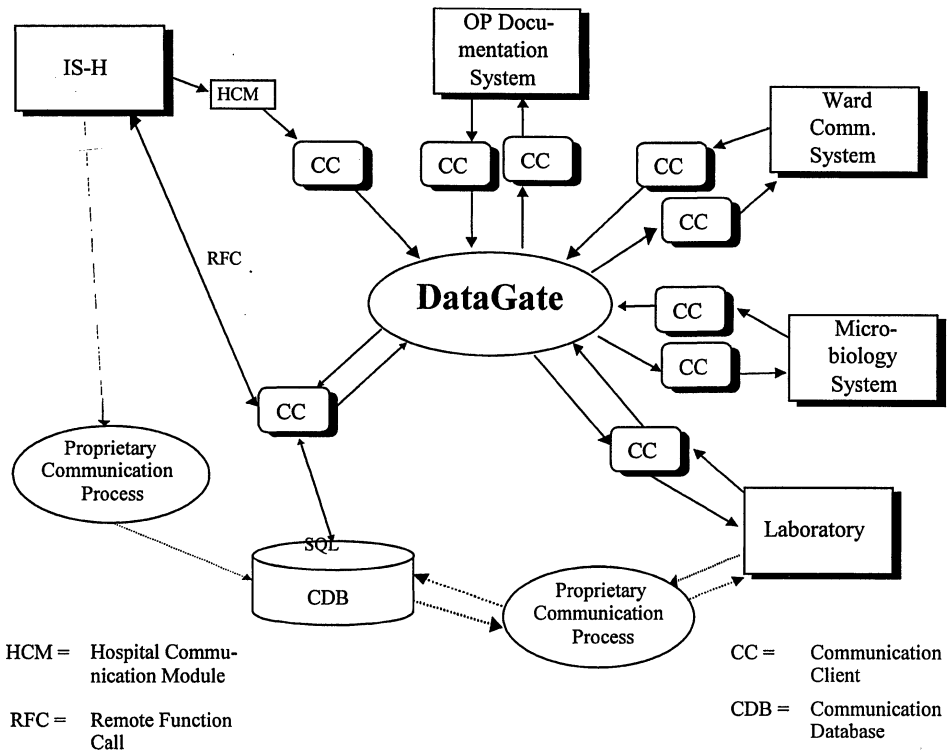

Figure 2 - Flow of administrative patient data between subsystems using a communication server

beginning of 1997 and being tested since the end of 1997, partly by student projects.

For connecting a subsystem with the DataGate server separate Communication Clients have to be implemented for each direction of communication flow. A Communication Client provides the interface to the subsystem using different interface methods. In Erlangen two methods are used: TCP/IP based socket communication and file based data transfer.

The connection of ward communication systems which can be used between different hospitals and a system for documenting operations to be used in as many hospitals in the Erlangen hospital communication system as possible depends on a decision which is to be taken by the working groups of the Bavarian universities. It is assumed that unifying the systems used in the Bavarian university hospitals will save resources.

Conclusion

The proprietary connection of the various subsystems was certainly a suitable mechanism during the migration to the patient management system IS-H. The use of the communication server should initially be regarded as an addendum, i.e. the existing proprietary connections which took a lot of effort to implement will remain in use until the subsystems have been converted to new implementations.

New subsystems can gradually be connected to the communication server. Figure 3 shows near future plans for connecting subsystems using the Erlangen communication hub in order to establish the data flow of medical observation reports.

As a result of the increasing standardisation of the subsystem interfaces there is a strong trend to standardised communication via communication servers and this method will increase in importance [5]. The advantages of a standardised solution are the reduced effort to connect subsystems, the unified method of connection, and the possibility of defining the conversion performed by the communication server via input data [6].

The implementation of proprietary communication interfaces should only be considered when the use of standardised interfaces, for example for existing systems, requires a disproportionate amount of effort and therefore involves high costs, or when the future tasks and performance of the connection require it. The hospitals would obviously prefer to use the standards which are recommended by the medical computer centre. However, there are certainly cases where existing subsystems are not able to use a standardised communication.

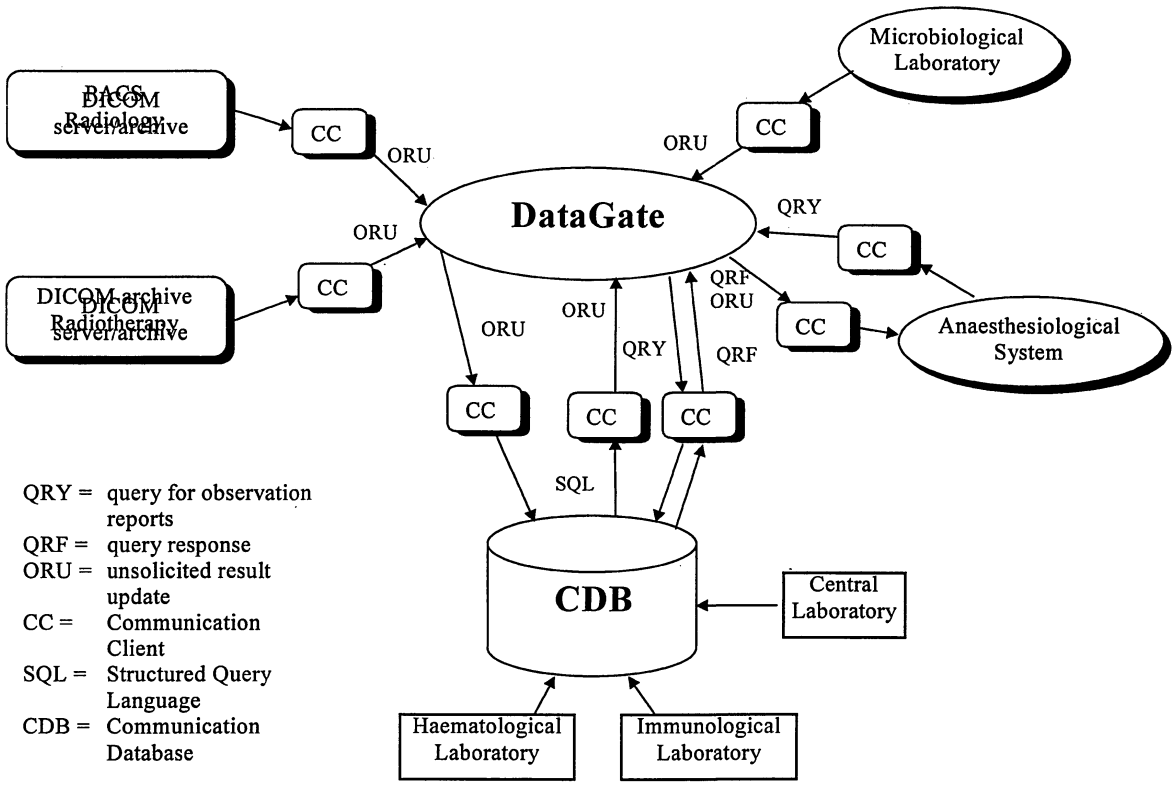

Figure 3 - Data flow of medical observation reports between subsystems using the communication hub

Thus the solution of the Erlangen hospitals shows that it is certainly possible to use proprietary and standardised communication methods in parallel.

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