The RITA Project technical details

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The RITA (Rete Italiana Trattamenti Adroterapici) approach is presented underlining the technical aspect of the intranet connections, the distributed data base developments and the World Wide Web client/server architecture. The RITA client-server system installation inside a medical facility must be done in function of the target after an accurate environment evaluation.
The RITA machine must be able to access the LAN and the internet at the same time; for this reason a great care on the security has been taken during the designing phase. A firewall has been realized at high level using proxy servers for different protocols and at low level through IP routing rules directly inside the operating system.
The system is designed to interact with the users in the easiest way from their point of view. The choice of an hypertext architecture was done to minimize the number of operations the user has to do to use the interface to the system. For the same reason Java was chosen as the ideal language to develop the active part of the interface at the client side.

Key words: Data bases; networking; Java; security; WWW applications

1 Introduction

RITA [1] was launched in the TERA Collaboration to carry out the feasibility of an intranet in order to connect the National Centre of Oncological Hadrontherapy (CNAO) [2] and the centers equipped with compact proton accelerator to the hospitals, University Departments and Research Centers involved in hadron treatments.

Actually two centers, the Genoa Istituto Scientifico per i Tumori (IST) and the Milan Istituto Nazionale per i Tumori (INT) have been connected to the network and the software for giving access to the intranet data is being tested by the involved physicians. Clinical data and images are stored and accessed through a distributed data base.

The realization of the RITA network can be divided in network connections (hardware configuration) and network services installation (software configuration) to give access to the following network services:

- MAIL: mailbox administration for centers not equipped with mail servers,
- World Wide Web: installation and administration of WWW servers in RITA and the related data base,
- NEWS: administration of NNTP server to realize discussion groups among the RITA collaboration,
- FTP: administration of ftp servers for files transmission.

The access to the RITA services is possible using the Netscape Navigator or Microsoft Explorer (version 3.0 or later). The user interface is very simple and not require an expert user.

The network interface is obtained through the WWW software and the data retrieval and storing has been implemented by the mSQL (Mini-SQL) relational data base which consists of a server daemon

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(msqld) and can be accessed either by a mSQL client or by specific programs developed using the API (Application Programming Interface) distributed with the software. The interface between the WWW server and the mSQL server consists of a set of programs written in C connecting the CGI (Common Gateway Interface) of the server with the database through the API's C library functions.

The RITA distributed data base allows the exchange of clinical data about patients distributed through the RITA network [3].

2 The RITA client-server system

The RITA client-server system installation inside a medical facility must be done in function of the target after an accurate evaluation of the pre-existing technical environment.

In a pre-existing machine the first problem that must be considered is the computation of the load caused by the use of the RITA system, having in mind the normal job which that machine is dedicated to. The whole system, formed by one or two http servers and one mSQL server, is normally waiting for an external call and in this state no valuable portion of CPU and bus time is used. When the right call comes, the http server, which is the real task manager of RITA, organizes the operations which must be done by all the components of the system to answer the request. This means that only in this case some resources of the host machine are used.

If the medical facility needs to transfer data obtained from programs for treatment planning, the most logical solution is to install the RITA system so that it can access directly them. This can occur in two ways: using the same machine or sharing the same file-system through NFS (Network File System). All these solutions assume that the machine which hosts RITA could access the medical data and the external WAN at the same time.

With a new and dedicated machine more advantages and services for the medical LAN can be obtained. Normally the computers inside a medical facility cannot access some typical services like e-mail and USENET, thought using TCP/IP. A machine dedicated to RITA could be therefore organized to act as a little internet server for the LAN.

The research and the tests done with the prototype have identified PC as the ideal hardware platform and LINUX as the ideal UNIX operating system. The same machine which hosts the RITA system can be configured as a mailbox and a USENET server for the users connected to the medical LAN. To access these services it's needed no other software but the one used to work with RITA, this means Netscape Navigator or Microsoft Explorer.

The choice of an hypertext architecture was done to minimize the number of operations the user has to do to use the interface to the system. For the same reason Java was chosen as the ideal language to develop the active part of the interface at the client side.

Java, really platform-independent, offers the advantage that at every connection with the RITA http server, the tools developed in Java are downloaded automatically on the client machine and there executed.

In RITA the first example of a tool realized in Java is the editor of the schematic images which are normally included inside a clinical folder. With this a user can choose the image corresponding to the desired part of the human body and then highlight a zone of interest drawing on it a geometric shape.

A typical request from physicians regards an higher degree of interaction among each others through the RITA system. This means having the possibility to discuss on-line while evaluating the same radiological picture. For this reason it's under development a blackboard in Java language specially conceived to allow the discussion of a picture through mSQL and http servers.

Tests are also performed to choose a reliable method to transmit voice to realize a complete tool for audio and graphic conferencing through the net.

3 System security

Security is the most important aspect which must be considered before opening a medical LAN to the world. At the software layer, RITA assures the security of medical data with identification passwords in sequence.

The whole software-hardware system is designed and configured to avoid unauthorized accesses to the medical data through the RITA machine. If the machine is the only one which can access the internet, using the so called multihomed-host configuration and some tools like a proxy server and a firewall at the kernel level a complete control of the traffic between the LAN and internet can be obtained.

References

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