Organizational management system in an heterogeneous environment - A WWW case study

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1 THE W3 COMPUTATIONAL MODEL

W3 follows basically the client-server model that uses a simple stateless protocol (HTTP) over the current TCP/IP stack. This protocol is very adequate for the retrieval of hypermedia information but presents some drawbacks when used to simulate interactive connections, or when the clients need to handle some event notification occurred at the server side.

Servers answer client requests by returning HTML pages retrieved from the file system or by forwarding the data received from the CGI.

The CGI provides a mechanism to extend the basic functionality of an HTTP server by connecting it to other specific processes, called "gateways", invoked at run time. It is important to note that those gateways are completely independent processes that are launched by the HTTP server process. The way the data is communicated between the server and the gateway is conditioned by the CGI specification.

Gateways are specific applications that can interact with several data repositories (e.g. relational data bases systems, file systems, X.500 distributed directories, etc.) or even with other specialised processes. However all the CGI gateways are "short life" processes, this means that they are not interactive processes.

2 THE INESC CASE STUDY

INESC is a relatively complex and particular organization of the Portuguese academic and entrepreneurial society with some similar aspects to a services' organization. The information system of INESC is very complex. It has very heterogeneous environments, either at the software or hardware level. It has machines from different manufacturers with different operating systems. Happily, the majority of its machines are connected to Internet (TCP/IP) and, consequently, they can share information and other resources using the W3 technology.

Using the data bases and W3 technologies it was developed an information and administrative support service, called "INESC In the Web" ("InInWeb"), to be used by people from and outside the organization. The InInWeb service has currently the following functionalities: A generic information service about INESC, that gives access to a well structured set of public information about INESC in an easy way (from or outside the organization); and two administrative services, one called "Timecards", which is a service to manage and control the labour distribution, by each person, for activities and for work units; and other called "Project Management", which intends to give support to the management and control of the projects developed by different groups.

The information handled by the InInWeb service is stored in a file system and in a relational data base system (SQL Server from Sybase [Sybase 94]). The information saved in the file system is mainly text and image information, e.g. histories, objectives, photos or other pictures from people. All the other information is organized in a relational way.

3 THE GENESIS LIBRARY

GENESIS is a C++ library developed to help the authoring of W3 services. It brings the details of the construction of W3 gateways and HTML pages to a higher level, so that the programmer doesn't have to be a "W3 expert".

Distributed services (gateways on different machines) using heterogeneous repositories of information (such as Relational Data Bases and HTML or even non-HTML files) are supported.

A service that intends to use GENESIS must be conceived from two perspectives: action perspective: a service is structured as a web of actions (or sub-services); and state perspective: the state of the service is represented by the state of its resources.

A request to the service is an action to change and/or access resources. Actions are performed by a special kind of objects, named agents. The main function of a gateway receives a request, parses the CGI parameters, discovers the class of the requested agent and creates it. The agent gets the remaining parameters from the CGI and performs the request accessing to the resources, which are encapsulated in a special kind of classes named entities. In the end it is generated an HTML page as answer.

4 SOME RAISED QUESTIONS

The experience realized raise some questions that were taken during the analysis phase. The first problem found was: how to implement interactive application over a HTTP connectionless protocol? The solution is the use of state variables, this means variables that are created and passed in the URL, in the form name/value pair, whose values indicate the actual state. So, the gateway behaves itself as a state transition machine.

Other important question was about the concept of a cooperative gateways pool. If the InInWeb gateway presents three integrated functionalities would it be divided in three cooperative gateways? One specialized on the Organizational Folder service, other in the Timecards and the third on the Project Management service? This solution apparently has the advantage to be lighter, but presents the drawback of the mutual interface knowledge between all the cooperative gateways. This question needs to be better analysed and detailed in future work.

5 FUTURE WORK

The work described in this summary, although interesting to the operation of the organization where it was developed, was mainly a case study to try out the emerging W3 technology. Future developments include:

- New administrative services.
- Continue with the design and implementation of new GENESIS library functionalities.

- Authentication and security mechanisms to be analyzed and thought out at the level of the definition of user profiles and concession of associated privileges, in a coherent and normalized way for an increasing number of services.

- Start the design of an authoring environment to help the W3 services development.

- Follow W3 and telematics technology tendencies, namely the Http-New Generation protocol and its specifications in the field of security, distribution and client-server interaction.