Collaborative Project using the Cave Framework

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Abstract

This paper addresses the need of collaborative work support for the Cave Design Framework [IND 98]. Several design tools [GRA 99] [IND 99] [HER 01][OST 01] are being implemented under the scope of this framework, and the support for collaborative work should be general enough to address all of them. The main focus of this work is to extend Pair Programming [WIL 00a] [WIL 00b] and CSCW, making possible the access and remote interaction among a design team members working on the same project.

1 Introduction

The technological improvements in the microelectronics domain have permitted the realization of complex systems which designs are still possible due to the raise of abstraction levels in the specification of such systems. Thus, the development of new tools to help the design is a determinant factor to the continuity of such process.

It can be observed that an IC designer need, several times, tools from different sources or implemented in distinct languages. This obligates a migration of the designer between different hardware/software platforms, making the workflow slower. The creation of platform-independent tools - and also platform-independent interfaces to existing tools - is needed to a more efficient workflow.

In the CAVE project it is considered a tools integration model based on an only World Wide Web based environment – framework [BAR 92] [IND 96]. One goal to accelerate a circuit design flow through the automation of tasks and excusing the designers from tasks such as distributed features administration and file storage, making tasks dynamic and transparent. This environment follows the Client/Server model [TAN 96], considering the development of Java written tools needing only a web browser. Thus, the application executes tasks also in the client side and communicating with the server just to eventual requisitions.

Concepts of computer networks applied to integrated circuits have motivated tools developers to continue working with implementations of distributed systems. Some advantages that can be numbered are the asynchronous/synchronous cooperative work and the use of distributed features [KON 99].

Although some tools are still in development, there is not yet a database that can store projects data in a persistent form and also providing to the designer the backup of his work in a safe and transparent way. There is not either a way to work together with other designers.

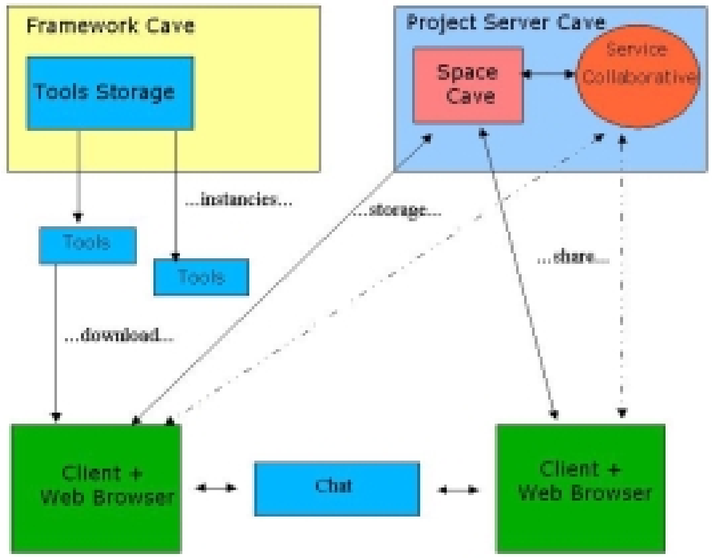

Figure 1 – Framework CAVE Architecture.

2 Proposal for a Design Flow

The World Wide Web is a platform independent environment qualified as a support to design, mainly if one intends to distribute resources in different platforms of hardware. Its architecture also allows the needed transparency.

Figure 1 shows the architecture proposed in [IND 98] to the distribution of resources. When a user requires a tool from the server by the URL, it will appear on the web browser screen. The browser will make the interface between the tool and the hardware/software system of client machine. New network connections can be established if configuration files, libraries or other files become necessary. The model allows project blocks in the client and also in the server and each block will have a cooperative session. When a project block is finished a notification will be send to the other designers. After the end of all block designs, they will be integrated, composing the whole project. The shared blocks are stored into a repository called *CavePersistenceSpace* that is implemented with the Jini/JavaSpaces technology [FRE 99] [EDW 99].

3 Case Study

Homero is a VHDL editor that is being implemented using JAVA with the objective of cooperative environment validation. This tool uses Pair Programming concepts [WIL 00a] [WIL 00b], a programming style where two people work side by side on the same computer, continuously collaborating in the same project, algorithm, code or test. Studies about Pair Programming demonstrate that programming results using this technique increase software productivity and quality. Homero extends these concepts and applies them to remote machines in CAVE context.

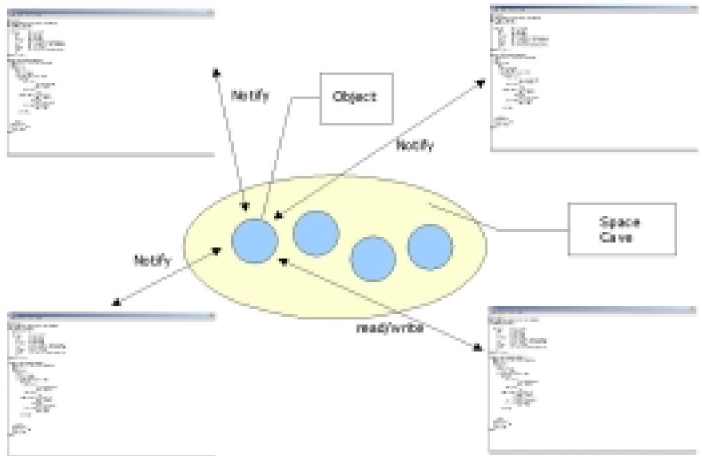

Figure 2 – CavePersistencySpace interaction using Homero.

The archetype also uses Jini/JavaSpaces technology and its actualization is based upon the *update/notify* concept. The project block is removed from the repository, updated and uploaded, inside a transaction. Exclusively one client called “writer” does this update and he talks with the others participants (“listeners”) through a chat. They all can interact during a project by using dialogs that will be useful to exchange ideas and to have a greater harmony among the users. The differentiation among the kind of user interaction in the project is easily seen in the program interface, where there is a two-color semaphore: green to writer and red to listeners. The participants can change their situation: the writer can give the “writing token” to one of the listeners. This can occur when he leaves a session or if he decides to. If someone else wants to write, they talk and decide to change positions.

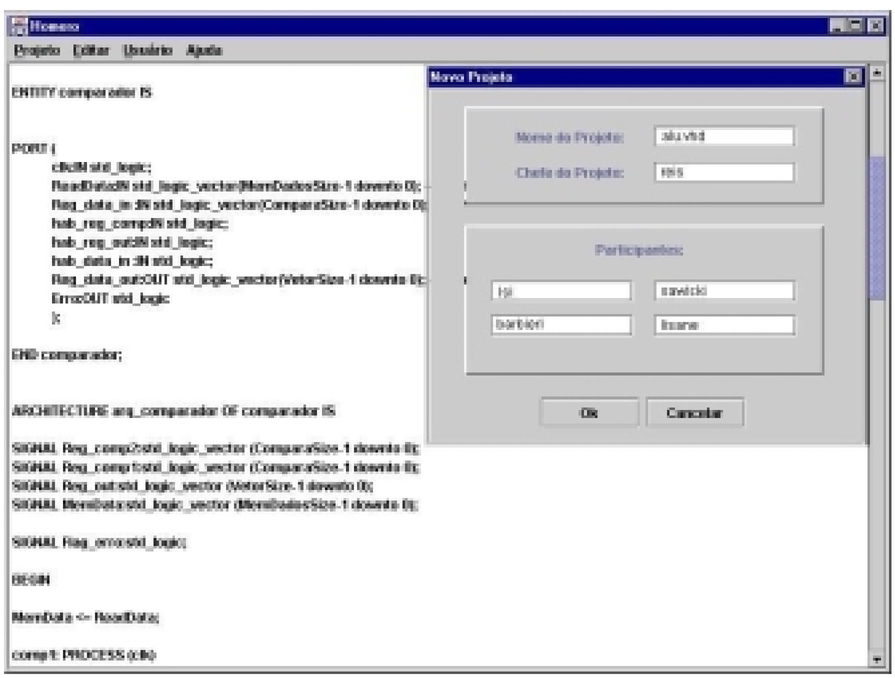

Figure 3 – Homero User Interface.

4 Conclusions

An integrated IC design environment using cooperative work is needed, because:

- Design teams can take better decisions: groups have more information and knowledge than one person, reducing the probability of mistakes;

- There is a higher harmony among designers and the project becomes more consistent, reducing bad information traffic within a team;
- Higher action efficiency: a group can make an efficient implementation when its members have part in the decisions, increasing the acceptance and understanding of the considered work;
- Designers can work in the same project at the same time, either if they are geographically far from each other;
- Costs of distributed team group shift become lower.

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