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Team Work Activities in Electronic Packaging

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Abstract - In order to reduce "the time to market" of the new electronic product, an integrated software environment it is a sine qua non condition. Such an environment it is possible to be realized using a Server Based Computing Technology solution. Starting with a metaframe application it was implemented an integrated environment witch includes several CAD/CAM/CAE programs distributed on a Server Farm. Working with a metaframe application, the design activities of a product can be done faster (the co-workers can simultaneously run an application on a powerful server, using "thin clients' resources").

Keywords: Integrated Environment, Server-based computing

I. INTRODUCTION

The unprecedented evolution of electronic industries on the last decade represents the reason for which economically advanced countries approach a particular strategy for switching to IT society. There is practically no domain in the real life on which electronic industry is not represented in a form or another.

Electronic packaging is the engineering discipline that combines the engineering and manufacturing technologies required converting an electrical circuit into a manufactured assembly. These include at least electrical, mechanical and material design and many functions such as engineering, manufacturing and quality control [1]. For this reason it is necessarily to gather various types of specialists in order to realize new electronic products and, the existence of an integrated software environment in public institutions represents a sine qua non condition. The implementation of such an environment is the purpose of this paper.

The integrated environment is focused on design and manufacturing of second level electronic packages.

Electronic package represents the electromechanical assembly resulting from electronic packaging design and manufacture. The level of an electronic package may range from the integrated circuit package assembly via the printed wiring board assembly to a subsystem or system package assembly.

Every product in today industry includes an electronic package and because electronic packaging is so important for the industry and so many abilities must be developed, the society must pay attention to the educational process of the future electronic packaging engineers.

II. HOW TO DEVELOP AN ELECTRONIC PACKAGE

To create an electronic module the following process flow has to be set: design, pre- layout simulation, layout, post- layout simulation, optimization, manufacturing, assembly, testing. In the design stage, some steps have to be accomplished.

First of all is the electrical design. The best designs balance cost, delivery, and performance - without compromising the functionality.

After the electrical design is finished, the pre- layout simulation phase is important because enormous time and money are spared.

Second, after the simulation follows the PCB design. The correct PCB layout has to be not only the best solution to interconnect components but also the best solution for various other criteria such as electromagnetic compatibility, thermal management and mechanical constraints.

These aspects must be verified closely and are directly linked to the PCB layout. Last, but not the least, the mechanical issue of the whole structure must be evaluated and eventually simulated in stress conditions as vibrations and shocks.

III. CAM/CAD/CAE PROGRAMS

A CAD software solution (Fig.1) for electronic packaging is complete when it covers all the items in a structure of an electronic package. Some CAD and CAE tools exist to support electronic package engineering. However, these tools address only part of the needs of the discipline. Many of these tools are merely adaptations of tools developed for other areas, such as printed circuit board design, and do not address the unique need of single- and multi-chip modules of high complexity based on advanced

packaging technologies now being available. The mandatory application of any CAD software package is the schematics, next other two applications solve the simulation part and the printed circuit board. These applications require much more computer resources than schematics. Simulation is a processor and memory consumer comparative with Schematics which is more graphical intensive. Hopefully, some new software technologies may help.

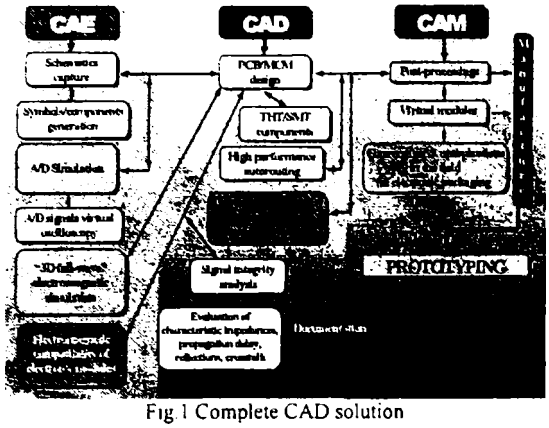


Fig.1 Complete CAD solution

In our university, during TIE laboratory, students use various demo, licensed or freeware programs for education in CAD-CAM systems: OrCad, PCGerber, Board Master, BetaSoft, CADStar, TXLine and CITS25. Students also use ANSYS, CircuitCAM and Flotherm for research purposes.

OrCAD Capture provides system and schematic design procedures and OrCAD Layout provides all the capabilities you need from netlist, to place and route, to final output. With Orcad Capture we can create the electrical board and generate the transfer file. Then, the transfer file is imported in OrCad Layout where we make the board layout, with all steps till manufacturing. PcGerber is a program which allows, besides specific CAM activities of checking and edit, the generation of interconnecting structures of a very good quality. BetaSoft, a thermal management software application, is used for generating thermal maps for PCB modules, offering also important reliability information. It has a wire frame 3D view of the board and some color map views.

With the ANSYS Software Suite, we can determine real-world structural, thermal, electromagnetic and fluid-flow behavior of 3-D product designs, including the effects of multiple physics when they are coupled together for added accuracy and reliability.

TX-Line is easy-to-use, Windows-based, interactive transmission line calculator for the analysis and synthesis of transmission line structures. TXline lets users enter either physical characteristics or electrical characteristic for common transmission medium such as: Microstrip, Stripline, Coplanar Waveguide and Grounded Coplanar WG Slotline. CITS25 are very similar to TXLine, offering in addition a larger number of geometrics.

IV. INTRODUCING METAFRAME SOFTWARE

In order to integrate various CAD software system in an integrated environment, an innovative model was introduced, model which is based on a powerful server and many work- stations with much lower resources.

Server-based computing is a model, in which applications are deployed, managed, supported and executed 100% on server offering manageability, access, performance and security. This model requires a multi-user operating system that allows multiple concurrent users to log on and run application in separate, protected sessions. Server-based computing also requires a remote presentation services protocol, capable of separating the application's logic from its user interface, thus allowing only key stokes, mouse click and screen updates to travel the network.

From the server- base computing models sets present Citrix the father of this technology [2].

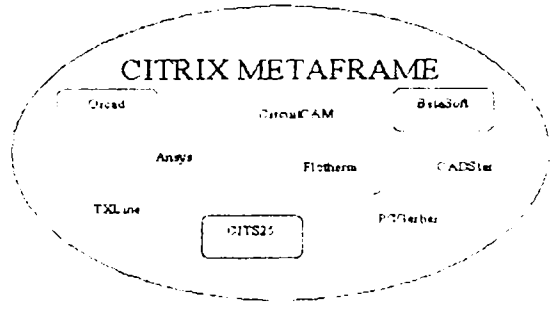


Fig 2. Integrated CAD environments

The Metaframe extends the terminal server by providing access to any device, to any location over any connection with any application [3]. The Independent Computing Architecture is a Citrix technology that on the server has the ability to separate the application logic from the user interface and transport it to the client over standard network protocols. And, on the client, ICA enables the user to see and work with the application interface, while all the application logic is executed on the server. The Metaframe introduces the concepts of server farm, load balancing and license pool. The server farm concept allows grouping multiple Metaframe servers into a scalable entity in which users are dynamically routed to the least-busy server to deliver the best application performance and server resource utilization. The license pool concept allows to globally manage the numbers if users logged on the farm.

V. INTEGRATED CAD ENVIRONMENT

LAN network in CETTI contains about 50 computers, and it is structured to assure an optimum speed on application zones, and server farm composed of three or four servers (figure 3), which will allow simultaneous running of applications in Server Based Computing and Load Balancing conditions. Server Farm is represented by a master browser (dual Intel Pentium III at 1266 MHz , 654 Mb RAM, RAID 5) and 3 other servers (Intel Pentium III at 500 MHz, 256 Mb RAM).Workstations has processors with frequencies between 133-350 MHz and 64-128 Mb RAM. On workstation are installed Windows 98, ME, 2000, XP, Linux operating system and Citrix Client. The LAN provides 100 Mb/s bandwidth.

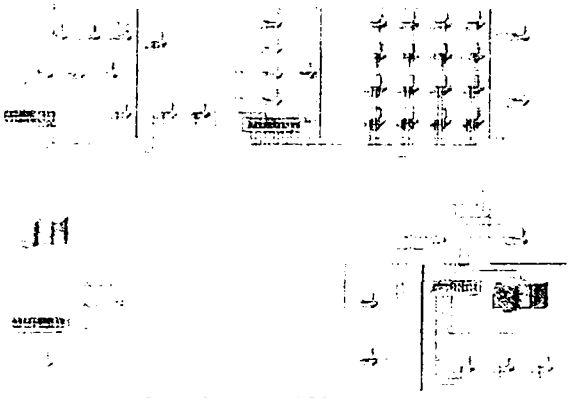


Fig. 3 Diagram of CETTI LAN

To run an application with Citrix, we need firstly to publish the application, and after establishing the application path and working directory we specify servers and finally, users which can access the application. After publishing all the application presented, the programs where tested both separately and simultaneously.

OrCad works very well with Citrix and users don't see any difference between the local and remote working.

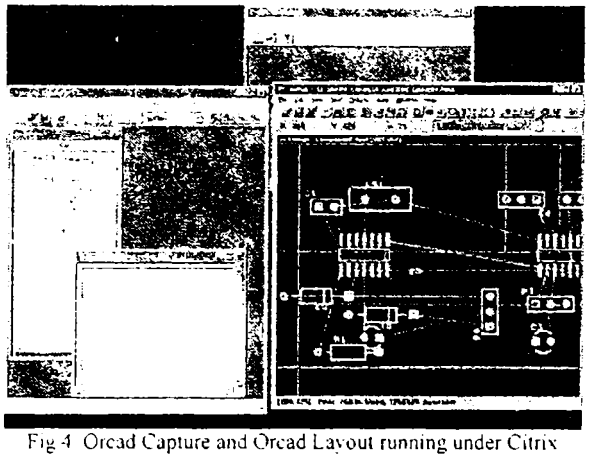


Fig.4 Orcad Capture and Orcad Layout running under Citrix

About PCGerber, we can say that because of its base operating system (MS-DOS) there are some troubles in running it. The first is that MS-DOS programs running under Windows 2000 takes a lot of CPU resources: an instance of PCGerber used 50% the two processors resources; with two instances the processors were used at 100% of their capacity (Fig.5). Another problem was that the program couldn't be run in full-screen mode. That caused the inability of displaying the electrical board. PCGerber doesn't starts if another Citrix session is already open, because it looks for some files in the working directory, which is set to be the one of the first Citrix session opened. The solution is to introduce in the environment a Windows based CAM system, first tests being successfully done with Gerbtool.

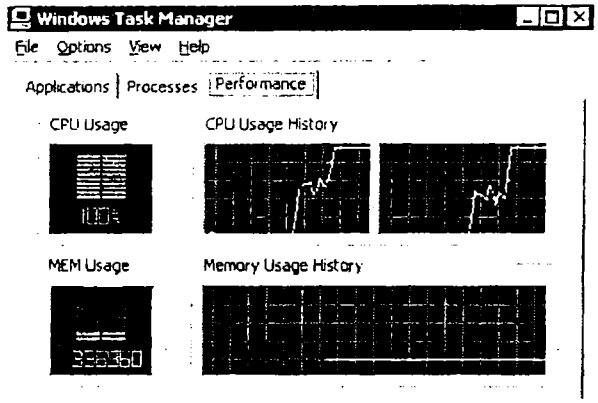


Fig. 5 Server's processors usage when running one and two instances of PCGerber

BetaSoft has a library error when it is launched, if it was started when another Citrix session is already running. The 3D view is useable; also sometimes it has some displaying delays especially when the server resources are low. The color maps takes between one and two seconds to get draw when BetaSoft is the only application which runs on the server. The best solution is to up- grade the license to a newer one, the new revisions (Fig.6) offering both and excellent GUI and good working conditions under Citix Metaframe.

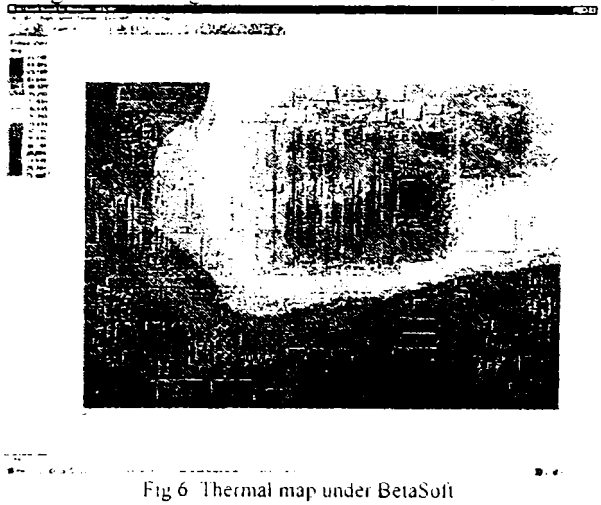


Fig 6 Thermal map under BetaSoft

Under tests, ANSYS was hardly useable because of its 3D nature (Fig.7). Citrix can not handle 3D content especially when images are generated based on OpenGL or Direct3D instructions set because the

client might not have a video card which supports this.

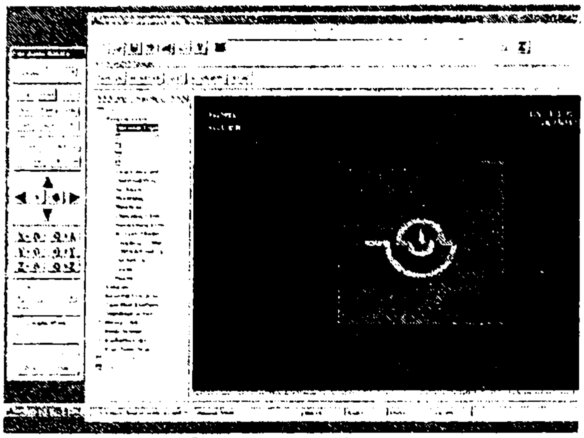
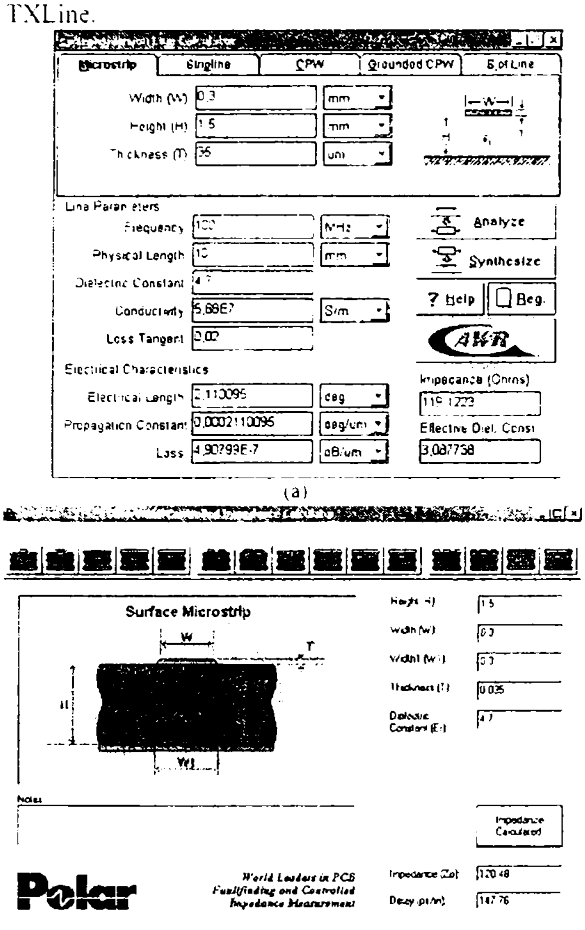


Fig. 7 Ansys simulation

Because TX-Line (Fig.8a) is a simple designed program, it has no issues when running over Citrix. For CITS25 (Fig.8b), in our tests we used the same values as for the TXLine program. The program runs smoothly over Citrix and is better as usability then TXLine.



(a)

(b)

Fig. 8 (a) Screen shot of TXLine. (b) Screen shot of CITS25

VI. CONCLUSIONS

The Citrix MetaFrame represents for education a cost efficient networking solution. On a powerful server are running simultaneously software applications for thin clients. Integrated CAD Environment supports concurrent engineering design approach. Using ICADE in training, the students gain easier the skills for developing electronic products. Founds spent for p[illegible]f[illegible]rm[illegible] [illegible] [illegible]lloc[illegible] [illegible] [illegible]uy particular software for electronic packaging.

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