



Global Collaborative Engineering Environment for Integrated Product Development using Internet 2

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UC MEXUS
The University of California
Institute for Mexico and United States



Workshop of I2 Research Projects - UC Riverside, February 9th, 2003

ITESM-Berkeley



Agenda



- **Project Objectives**
- **Expected results**
- **Methodologies**
- **Deliverables**
 - **Global Collaborative Environment**
 - **Web-based Applications: MAS, SMTAdvisor, SPEED**
 - **Course Berkeley-ITESM – Integrated Product Development**
- **Experiences and Discussion**



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Project Objectives



- **Global Collaborative Engineering Environment.** The environment integrates Web-based Applications which will support engineering activities for design and manufacturing of High Tech products. In order to support specific design activities CAD/CAM/CAE tools will be integrated; to coordinate activities of design and manufacturing engineers, process models, workflow and project management software will be used; to foster the collaboration between engineers, net-meeting, forums, chats, multicasting, e-mail and shared spaces applications will be included; and for Information/Knowledge management, product and manufacturing models will be developed.
- **Joint Course Berkeley-ITESM.** Demonstrate the use of the Global e-Engineering environment in a joint course offered by Berkeley and ITESM during Autumn term of 2002 (August - December).



Expected Results



- **Experience on how to set a Global Collaboration Environment for Research and Education.** The collaborative environment will be used for both, research and education. Experiences that will be drawn for these two activities will contribute to the fields of distant learning and research collaboration.
- **Evaluation of the impact of Global e-Engineering in Engineering Curricula.** The joint course to be offered by Berkeley and ITESM in the 2002 will evaluate the impact in the learning process and practical application of Web-based tools.
- **Exploration of the use of Internet 2 technologies to support Global e-Engineering.** Different aspects of services offered by Internet 2 (QoS, Multicast, Security and Network Storage) and also the Internet 2 applications (Learningware and virtual laboratories) will be used and proved in order to evaluate its benefits and impacts in future way of engineering work.



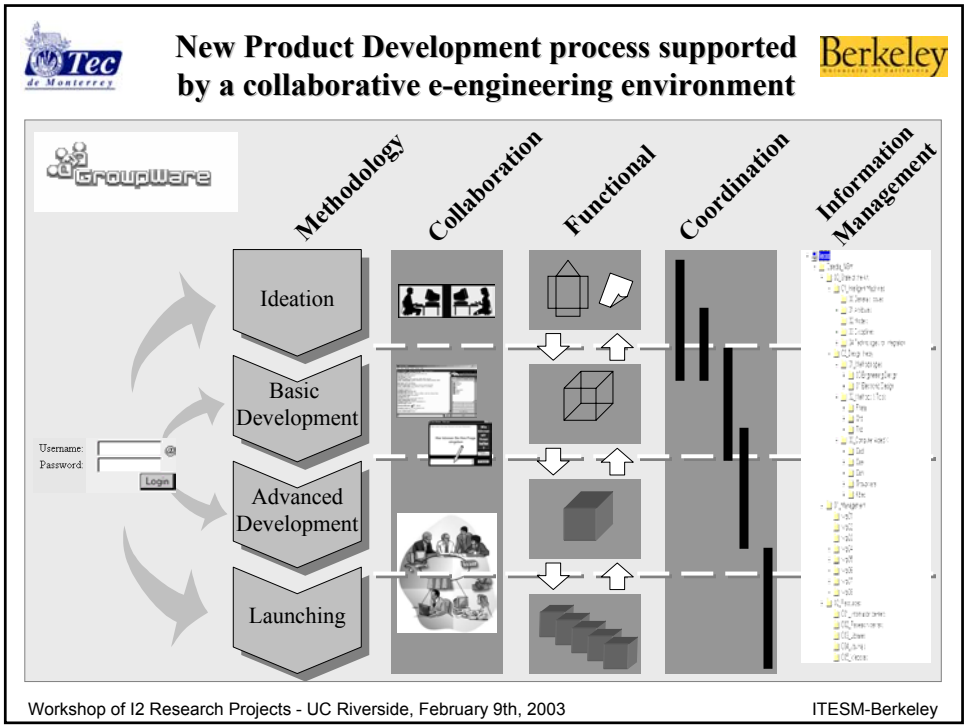
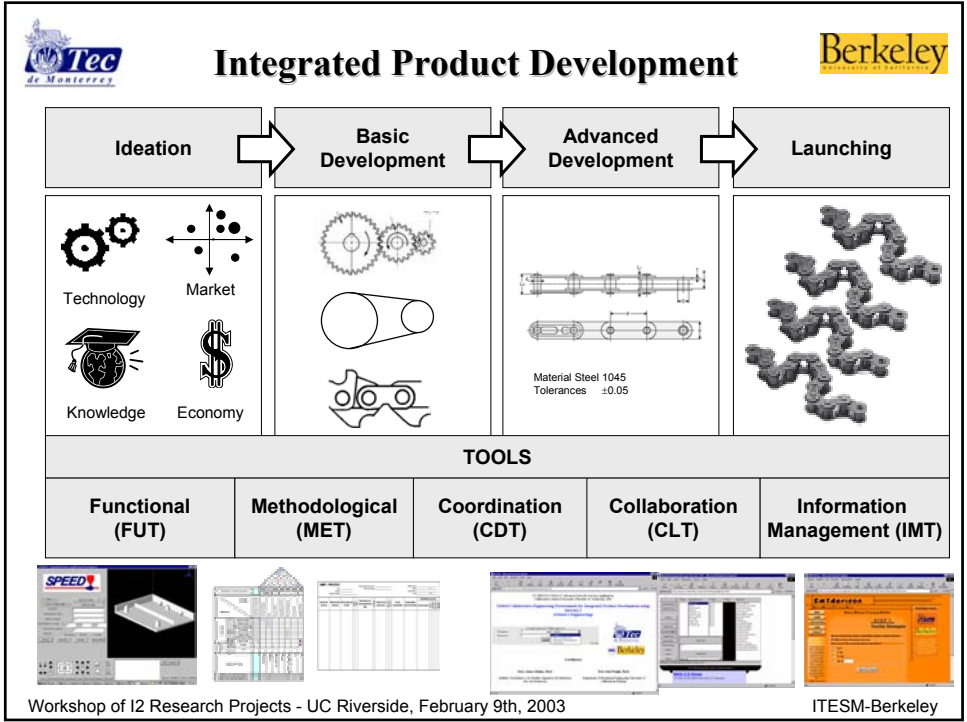
Methodologies and Tools



- **Process Modeling:** methodology for process modeling supported by IDEF0 to model the Integrated Product Development process
- **Information Modeling:** methodology for information modeling –Booch Object Oriented Methodology
- **Coordination tools (GroupWare tools):** working group supported by PHPgroupware.
- **Collaboration tools:** net meeting, forums, chats, multicasting, e-mail and shared spaces
- **Product Development - Best practices:** QFD (Quality Function Deployment), FMEA (Failure Mode Effect Analysis), DFM (Design for Manufacturing) and DFA (Design for Assembly).



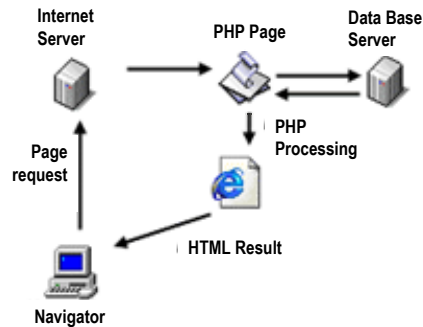
Global Collaborative Engineering Environment



A previous version was developed using technologies as Hypertext Preprocessor (PHP), MySQL and Apache Web Server.

Some limitations were:

- Difficulty to update
- not an open source
- Not standard coding



As a consequence, a new version was developed with the same architecture, but using open and freeware software.

<http://cen.mty.itesm.mx/catedra-phpgroupware/login.php>





Groupware characteristics



Collaboration tools, as:
Links to Chat, Forum, calendar, news, user directory, etc

Web-based

Product development stage

Detailed methodology (Instructives and formats)

Bookmarks:
Links to functional tools and other interesting sites

Working area

Phases	Activities	Toolgates	Record
Ideation	1 Competitive Intelligence FQA-01 doc IDA-01 doc	1 Inventory of Ideas FET-01 doc IDT-01 doc	IDA-01_0101
	2 Project Definition FQA-02 doc IDA-02 doc	2 Project Plan FET-02 doc IDT-02 doc	IDA-02_0102
	Basic Development		

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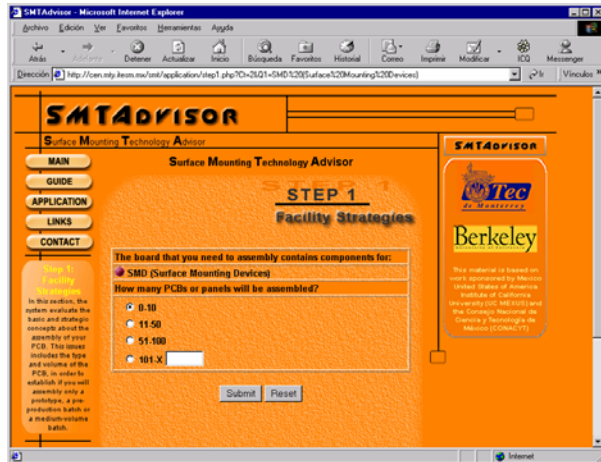
Web-based Applications using I2

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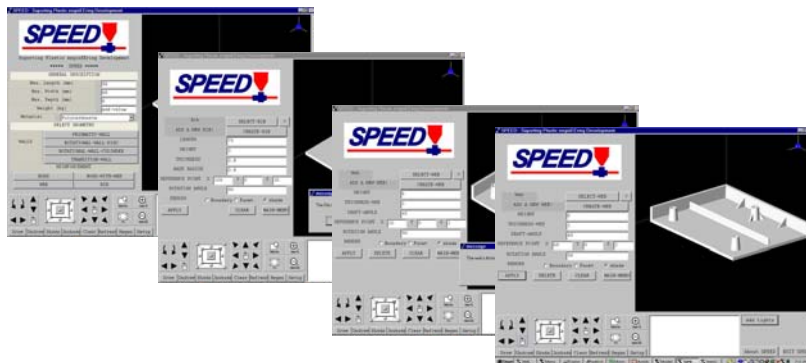
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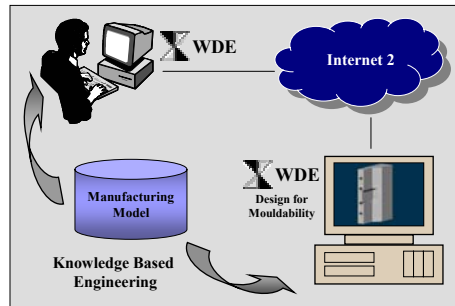
Help users to analyze the manufacturability of the PCB according to the capabilities from the SMT line at CSIM-ITESM.

The software prototype was developed in a web based platform (PHP programming) and supported by MySQL database.



“SPEED+” Prototype system is an application developed to support the case design for electronic devices, using “Design for Injection Moulding” (DFI) rules, trough an automated process based on a KBE system and Feature Based Design.





The use of AML systems over the Internet 2 is possible through Web Browsers but there is a need to have AML software local on the remote computers, using *WDE* and *Views* Modules (AML Internet modules). Therefore it is required to have one license in Berkeley and one in Monterrey

Course on Integrated Product Development for High Tech Products based on the Global e-Engineering Environment



ITESM and Berkeley Course program



- Berkeley -
"High-Tech Product Design
and Rapid Manufacturing"

Day	Chap.	Theoretical concepts		Monday	Wednesday	
6-Aug	1	Innovation & NPD				
13-Aug	2	Imagining				
20-Aug	2	Imagining				
27-Aug	3	Incubating (QFD)				
3-Sep	3	Incubating (Modelo de Producto)				
10-Sep	3	Incubating (Modelo de Producto)	9-Sep	2	Personal Server Demo. & Chicago Fire Dept Demo	
17-Sep	3	Incubating (AMEF de Producto)	16-Sep	-	Mote Hardware Handed Out	
24-Sep	3	Incubating (Modelo de Costeo de Componentes)	3/ App. 2	Design Reviews and Poster Show	Mote software Development and Bus Plan	
1-Oct	4	Demonstrating (DFM)				
8-Oct	4	Demonstrating (DFM)				
15-Oct	4	Demonstrating (AM)				
22-Oct	4	Demonstrating (Fabricación del Prototipo)		6	Computer Manufacturing	
29-Oct	5	Demonstrating (Fabricación del Prototipo)	Development	28-Oct	7	Mechanical Manufacturing 1
5-Nov	5	Demonstrating (Fabricación del Prototipo)		4-Nov	8-Jul	Design Review 2
12-Nov	5	Promoting				
19-Nov	5	Promoting				
26-Nov		Prototypes presented				

Validate Product acceptance
(Ethnography and QFD)

MAS and SMTAdvisor

Prototype Fabrication
FDM

- ITESM -
"Course of design for
electronic manufacturing"

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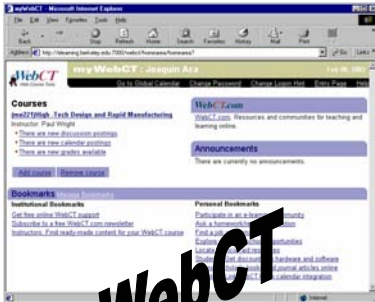


"Educational" environments that uses I2

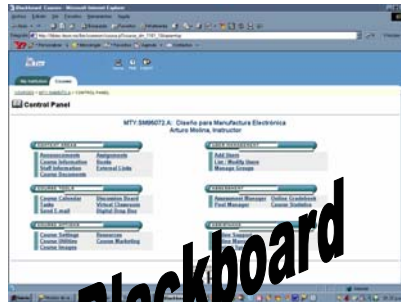


Educational Environment
- Berkeley -

Educational Environment
- ITESM -



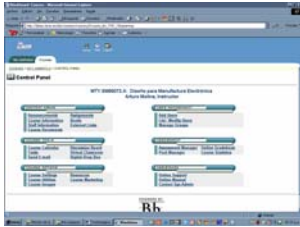
WebCT



Blackboard

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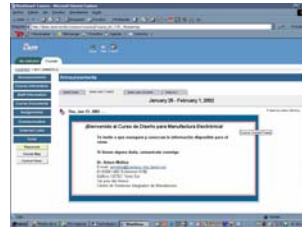
System Entrance



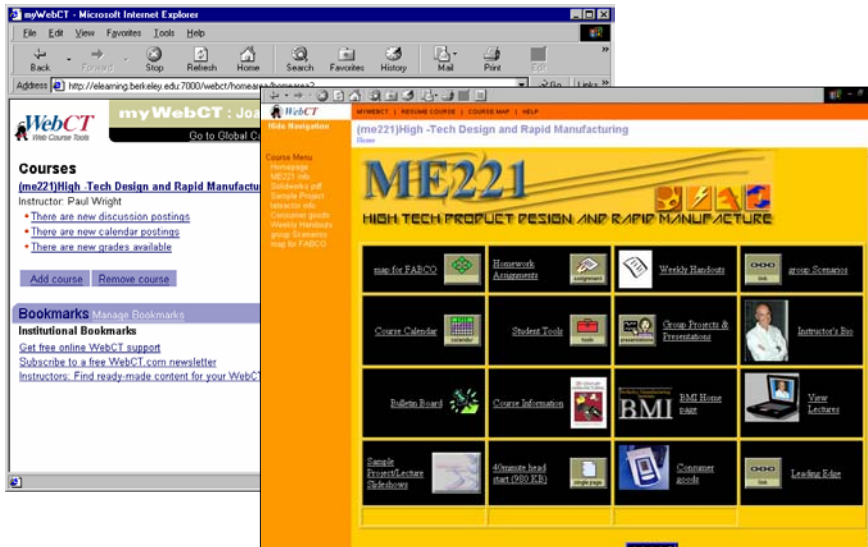
Control Panel for Course Administrator



Announcements



Conceptual Course Map





Webcast using I2



The screenshot shows a Microsoft Internet Explorer window titled "Webcast Lecture: Advanced Manufacturing Systems". The address bar contains the URL: <http://webcast.berkeley.edu/courses/archive.html?prog=42&group=50>. The page content includes a "Recent Webcasts" section with a list of dates and titles, and an "All Courses Webc" section with a table of dates and titles. A RealOne Player window is overlaid on the page, displaying a video of a man speaking in front of a greenboard. The video player shows a progress bar at 0:00 / 1:05:10.

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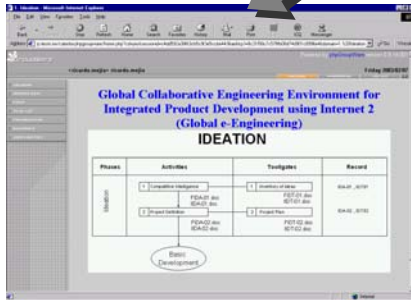


Test Case

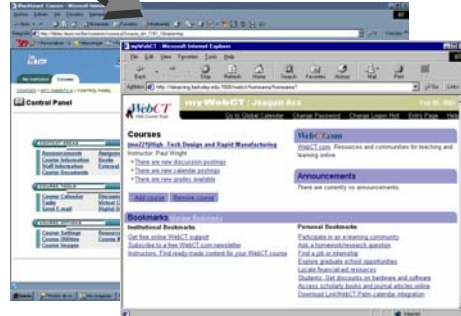
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The Design of Collaborative Environment for Research and Education, gives as a result, the creation of two different environments:



Collaboration
- Phpgroupware -



Educational
- Blackboard and WebCT-

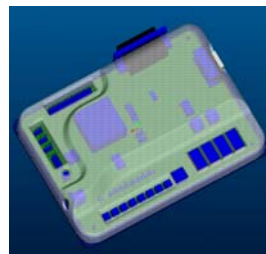
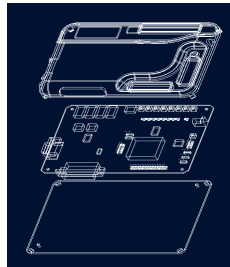
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Case Study: Design of Case for Xceter PCB

- Xceter is a Printed Circuit Board (PCB) developed by the Electronic and Telecommunications Center (CET) from ITESM, Campus Monterrey. The objective of this PCB is that students from Electronic Systems can practice and run their electronic programs on this PCB.

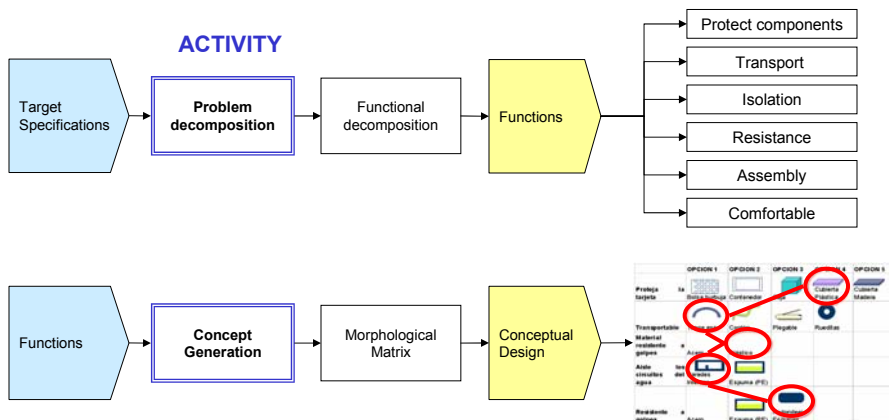
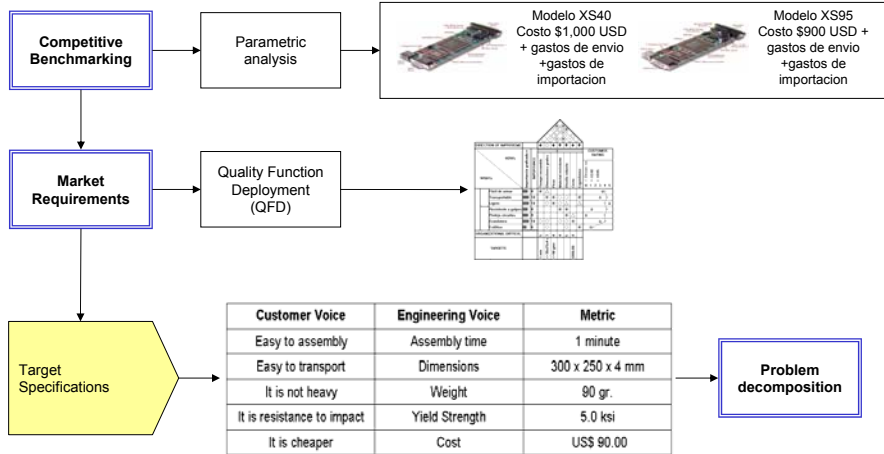
- Actually, in United States exist PCB with same characteristics, however, it has two disadvantages: they are too expensive and it does not have a case for protection. Also the PCB is not easy to transport because the absence of case and that normally the student is not careful and the consequence is short life useful of PCB.

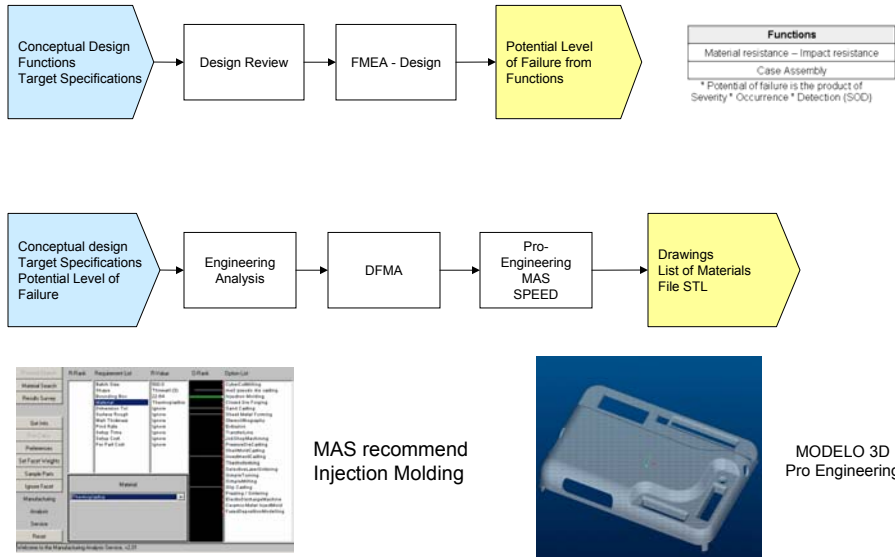


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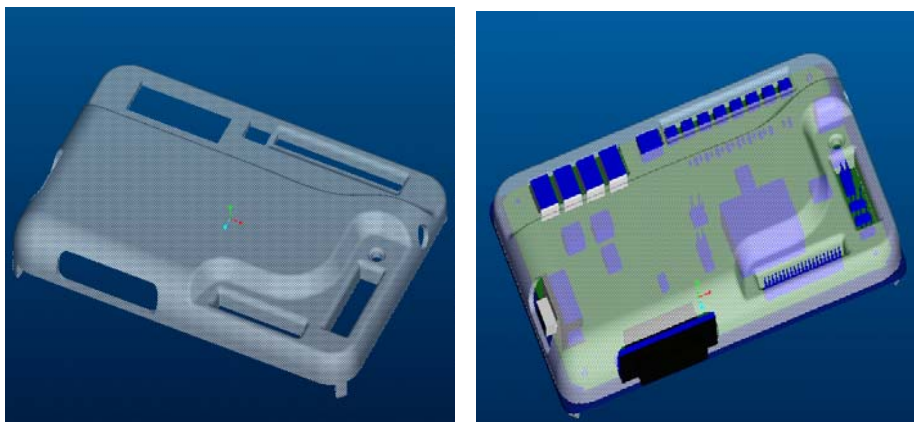
ACTIVITY





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- We have set the basis for working under the concept of e-Engineering, the tools developed by Berkeley and ITESM will continue to be used to train students on how this tools can improve their activities in product development, or to demonstrate how difficult is to work globally.
- The collaboration between research groups is very important because allows us to improve our expertise in common research topics, our area is Engineering, and how collaborative Product Development can be undertaken.
- We have seen the I2 technology as a media to improve our interactions, but not the final objective of our research work.



Results and Future



- **Publications:**
 - Desarrollo de un Ambiente Colaborativo de Ingeniería para el Desarrollo Integrado de Productos utilizando Internet 2 (Global e-Engineering) presented at XXXIII Congreso de Investigación y Extensión del Sistema ITESM, January 2003
 - Web-based Applications for Integrated Product Development, submitted to PROVE 2003 Conference, Switzerland.
- **Concurrent Grants:**
 - E-HUBS (e-Engineering enabled by Holonomic and Universal Broker services) - IST-2001-34031
- **Future Collaboration:**
 - Sabbatical Residency of Prof. Arturo Molina at UC-Berkeley, Hosted by Prof. Paul Wright, proposal to be submitted to UC-MEXUS-CONACyT