PHPC-MOB3D

POWERFUL 3D INTERIOR DESIGN:
WEB FACILITIES AND VIRTUAL REALITY
THANKS TO PARALLEL PROCESSING

PUBLIC FINAL REPORT
OF
ESPRIT HPCN PST

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1∞ ABSTRACT

AGEMOB, the computer engineering company, has developed a CAD layout software applicable to all types of furniture. This software can be accessed via the Internet and calculates drawings, virtual reality pictures and estimates thanks to HPCN technology.

2∞ SYNOPSIS

The project essentially targets furniture manufacturers, especially those producing furniture in kit form.Their furniture retailers are often independent or grouped at the central purchasing agency with a common trade name (Mobilier de France, Monsieur Meuble, etc.). Very few retail outlets are associated exclusively with one manufacturer with a specific trade name (SCHMIDT, MOBALPA trade names, etc.). There are also international volume retailing chains (Conforama, Ikea, Habitat, etc.). Most furniture manufacturers (80%) are SMEs.

Generalization of furniture sold in elements has developed enormously, offering budgetary and layout possibilities with variable geometry in order to adapt better to consumers' needs. In order to represent projects graphically, kitchen sales representatives have started using computers, but:
- Sales staff need an attractive, realistic depiction of the furniture ;
- They need to be able to interact with project design: positioning furniture and specific equipment ;
- They need access to data bases specific to each manufacturer, identifying and pricing products perfectly ;

All this without any significant additional costs in relation to a standard computer

To meet this need, **AGEMOB, the CAD expert in furniture manufacture**, has designed a software of the same name, AGEMOB, meant to be used through networks such as **Internet and Intranet**. The sales representative can, through dynamic data management associated with a user-friendly interface, offer **a virtual-reality design** of the requested projects from any remote computer connected to the server.

Through the use of HPCN technology integrated in the AGEMOB CAD software, the server quickly calculates the layout projects. The time spent to calculate the computer-generated picture is reduced by half, and for some cases, reduced by even more through the use of parallel algorithms implemented on multiprocessor

computers or on networks of computers. The goal was to obtain a calculation time less than one minute for the most common projects, a calculation time that should correspond to an acceptable delay for consumers and sales people.

The modularity of the system allows for the adaptation of hardware selection (type and number of computers, number of processors) depending on the needs of each manufacturer. These needs depend, among others things, on the type of manufactured furniture. The manufacture partners for the project, BOONE (contemporary furniture), BIAIS (period furniture), and SONORMA/BURONOMIC (office furniture), can extend their sales through this server that is accessible from anywhere. This technique allows these partners to increase their market share throughout Europe and beyond, within the scope of e-commerce. The partners foresee a growth of 15 percent in the year following the implementation of the system.

This service is used to reinforce and enlarge the number of sales representatives by giving them more assurance through this added-value sales-help technique.

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3∞ EXECUTIVE SUMMARY

Within the framework of its development, combined with the strong desire to widen its offer by integrating Internet technology to meet the needs of industrialists wishing to find a solution adapted to their distributors, AGEMOB was faced with two major technical problems:
⟨ interactivity on Internet, and
⟨ the excessive calculation time required for computer-generated pictures.

In order to solve the problems linked with interactivity on Internet (moving around the graphics objects with the mouse), development and research works were undertaken mainly focusing on new programming languages during the year 1997. This work was backed by the ANVAR through an innovation aid.

Positive results were obtained which were implemented in SONORMA's project. SONORMA is a French manufacturer of office furniture sold under the BURONOMIC trade name.

The next challenge was to calculate the computer-generated pictures on the server. Integrating HPCN technology in the software coding was clearly the best solution. Such work was carried out successfully within the framework of the TTN project in co-operation with the ENSL and the results were officially presented for the first time to the public with SONORMA at ORGATEC.

In October 97, BIAIS met with the company AGEMOB which is specialized in CAD solutions for the furniture industry. AGEMOB proposed a data processing system which is adapted to automatic layout design for modular furniture. This system is coupled with an Intranet server which offers autonomy to the points of sale. The system was set up and presented to retailers at the Paris Furniture Exhibition in January 1998. At the same time, the company was also able to provide a factory based service and gradually connect retailers using ISDN connections. The limitations of the system lay in its inability to rapidly calculate computer-generated pictures and support a great number of users.

The result was that only perspectives drawn using black and white lines could be produced. Moreover, the geometry of the BIAIS furniture is very complex because of its stylistic effect. The solution, which consisted in actually calculating the virtual perspective by using the raytracing technique, seemed fine if a computing time of approximately 1 minute could be assured so that the solution remains commercially acceptable. In addition, this objective was to be achieved with servers whose price is also acceptable to the company. Thanks to the TTN project, AGEMOB very quickly came up with the HPCN solution by linking the existing

HPUX server to two PC « 350 MHz NT workstations » to meet the stated objectives.

As of mid-1998, BIAIS was the first company to take advantage of HPCN technology. Thus, the company could comfortably offer the service required, and consequently could increase its sales while improving the working conditions of those working in the sales department, in the factory, and within the network of retailers. By the end of 1998, BIAIS had increased its modular furniture sales by 30% overall. These sales now account for 30% of its turnover. BIAIS is beginning to increase its business in Europe, particularly in England by taking part in an exhibition in Birmingham, and in Spain with an exhibition in Valencia. The server connection to the Internet network will enable it to comfortably offer its services outside France, with the image of a dynamic SME firm.

For BOONE and SONORMA, the system and the new services started at the beginning of the new year 1999 and they target increasing their activity thanks to the success they had during their own exhibitions in KHOLN and PARIS for SONORMA, and BRUSSELS and PARIS for BOONE.

4∞ FULL TECHNICAL TEXT

The goal of the MOB3D project is to provide new kind of services to the end-user companies (BOONE, BIAIS and SONORMA). These services consists in a set of software functionalities designed to be used by kitchen salesmen. The key idea is to better satisfy the customers' needs by creating a realistic depiction of their future kitchen in real-time. Thanks to a front-end PC located in the furniture warehouse, a salesman will interact with a web browser to enter the client's demands. The browser will transmit the orders to a remote server that will do the requested computations and will send back the results to the front-end computer. Typically, the computations will consist in automatically finding a global positioning of each furniture in a virtual kitchen (using an Artificial Intelligent approach) and computing a realistic graphic representation of the corresponding 3D scene.

4.1 STATE OF THE ART

The project essentially targets furniture manufacturers, especially those producing furniture in kit form. Furniture retailers are often independent or grouped at a central purchasing agency with a common trade name (Mobilier de France, Monsieur Meuble, etc.). Very few retail outlets are associated exclusively with one manufacturer with a specific trade name (SCHMIDT, MOBALPA trade

names, etc.). There are also international volume retailing chains (Conforama, Ikea, Habitat, etc.). Most furniture manufacturers (80%) are SMEs (small or mid-sized enterprises).

The trend in furniture sold in elements has developed enormously, offering budgetary and layout possibilities with variable geometry in order to adapt better to consumers' needs. In order to represent projects graphically, kitchen sales representatives have started using computers, but:

1) Sales staff need an attractive, realistic description of the furniture;
2) They need to be able to interact with project design: positioning furniture and specific equipment;
3) They need access to databases specific to each manufacturer, identifying and pricing products perfectly;
4) All this without any significant additional costs in relation to a standard computer.
5) End-users (Boone, Biais, Sonorma) require a low cost in terms of maintenance and release version (catalog and software).

Three end-users will provide their expertise as modular furniture manufacturers: BOONE, a confirmed exporter in Europe; **BIAIS, the French leader with a range of period furniture elements and No 2 user of automatic CAD on the ISDN Intranet network**; SONORMA, offering low-cost furniture with a very high marketing reactivity in terms of products and essential services and starting to export to Europe.

The CAD application dedicated to the design of furniture will be provided by AGEMOB. With the HPCN expert ENS Lyon, a demonstrator will be developed, allowing true virtual implementation of layout projects combined with remote use by means of a Web server.

All the partners will actively contribute to the European dissemination of the results.

The objectives of Boone, Sonorma, and Biais are to increase their own business through the development of a new sales method on the Web. A customer in a shop or at home will be offered the possibility of perfectly seeing what he or she wants. Using their personal computer, the customers will have the opportunity to realize a virtual reality project corresponding exactly to what they will buy, e.g. a set of furniture elements.

Agemob, which designs and develops such a system including CAD facilities and a Web server, sees this project as the opportunity to offer new and better services to manufacturers of furniture components.

4.2 Approach

No matter what system is used, furniture sales help-solutions incorporate the following:
 (i).   A textual database (references, descriptions, tariffs, constraints, etc.);
 (ii).   A graphics database (3D and/or 2D data);
(iii).   An interactive software system for retrieval of sales information (estimate, order, etc.) and graphics (pictures: drawing and/or picture representing the project).

In this chapter we describe the current solutions; then we will explain the approach we have selected.

When we analyze current solutions, we find two types of applications:
- local (software + local data);
- remote (data from a server).

4.21   Local applications

These applications represent the major share of the market. The main advantage with these solutions is that their local use gives rapid access to all application, as well as resource (data), levels.

Their inconveniences involve two different aspects: maintenance and standardization of software.

Maintenance encompasses updating the software itself, as well as the necessary databases. In fact, sales catalogs are modified at least once a year (e.g.: pricing updates). Furthermore, in furniture sales, "fashion" becomes a decisive factor in changes to the manufacturer's style and, consequently, in his 2D/3D graphics presentations.

 Hence, upgrading requires major, even tedious logistics to keep an often very large software population up to date. Expanding to "international" solutions further exacerbates this inconvenience.

Today, in the realm of mainstream informatics, there is only one alternative when choosing a computer. Due to this, software programs are supported by a single platform with proprietary techniques which may cause considerable problems when updating an entire system (software + operating system).

With regard to picture generation, realistic rendering algorithms are old-hat and most solutions integrate computer-generated picture calculation (raytracing/radiosity). The only limit is having the calculating power required to generate realistic pictures in a reasonable amount of time.

4.22 Remote applications

Customer-server applications are not new to the market, but the availability of low-priced terminals and the advent of the Internet made customer-server solutions available to everyone. Several companies soon began broadcasting information via this media. The next step was ordering via on-line catalogs.

The main advantage of this solution is that data is centralized, making it possible to broadcast reliable information to everyone, all the time. Query screen, photos, texts, etc. are also distributed by the server.

The main disadvantage is the poor friendliness of the system, coupled with insufficiently personalized purchasing options. Although this aspect is not of prime importance when purchasing of a simple item (computers, shoes, etc.), it takes on greater importance when purchasing furniture, where space and taste constraints have to be considered.

4.23 Our approach

Our approach was based on incorporating the advantages of each type of solution, as summarized in the following table:

| *Local application*	*Remote applications*
Project personalization	Easy updating of the installed software population
Friendliness	Easy updating of accessible data
Computer-generated picture calculation (assuming sufficient calculating power is available)	Availability of powerful computers for customer stations

In a preliminary study carried out by Agemob, the following prototype was used:
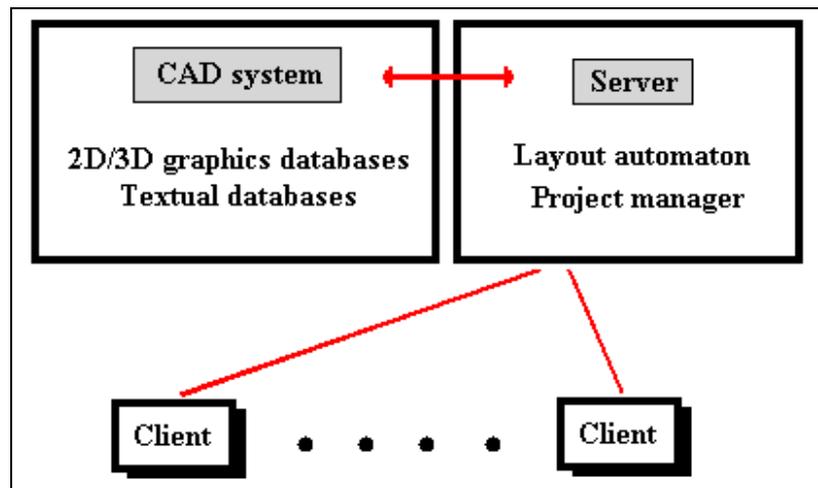
Generic diagram

Using this prototype, we were able to define the different modules and the various operations these modules have to perform. The documents obtained were:

. An estimate for a project

. A 2D picture of the project (drawing)

. A 3D picture of the project calculated in wire-frame (perspective), illustrated in the following figure:
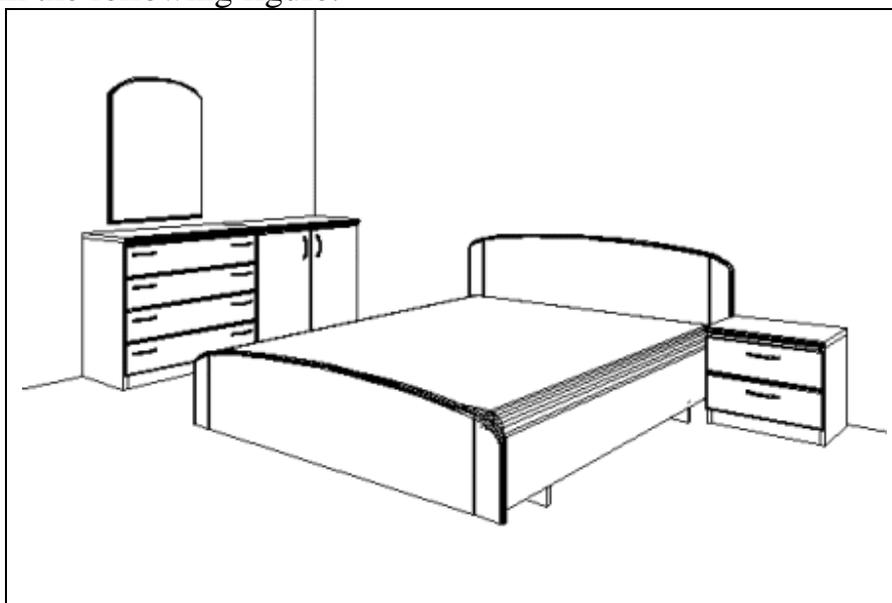
Wire-frame picture

The future of this solution depended on its ability to generate a truly representative picture of the project.

Computer-generated picture (Raytracing)

The use of a sequential computer-generated picture module would lead to server breakdown. Taking this factor into account, the goal of our approach was to produce computer-generated pictures in a relatively short time frame, thus making the solution viable.

This led to the definition of the final solution:

To incorporate the possibility of producing computer-generated pictures, it was necessary to limit the calculation time. This limit was set at 1 minute. This limit is purely theoretical since the calculation time depends directly on the number of faces making up the 3D scene.

Obviously, the computer-generated picture module is not the only module in this type of application. This module is integrated in an more complex processing system.

Our technological choices were guided by economic considerations, keeping in mind that our end-users are SME furniture manufacturers with no real desire to purchase one or more costly computers. The solutions studied are based on their overall feasibility.

4.24 Final prototyping

The customer-server application is based on Internet/Intranet related technologies. This was the natural choice since these are standard technologies. This established a normalized framework for all network exchanges.

We are now going to discuss all the modules contained in the final application.

4.24.1 Customer station

We chose not to set strict limits to customer stations for financial cost reasons. Consequently, the customer station must include an Internet connection as well as a navigator that can interpret JAVA.

4.24.2 Server

The server is a Hewlett-Packard UNIX platform. The technological choices concerning computer-generated picture calculation will be discussed in the next chapter. The following diagram shows all the functional components of the server:
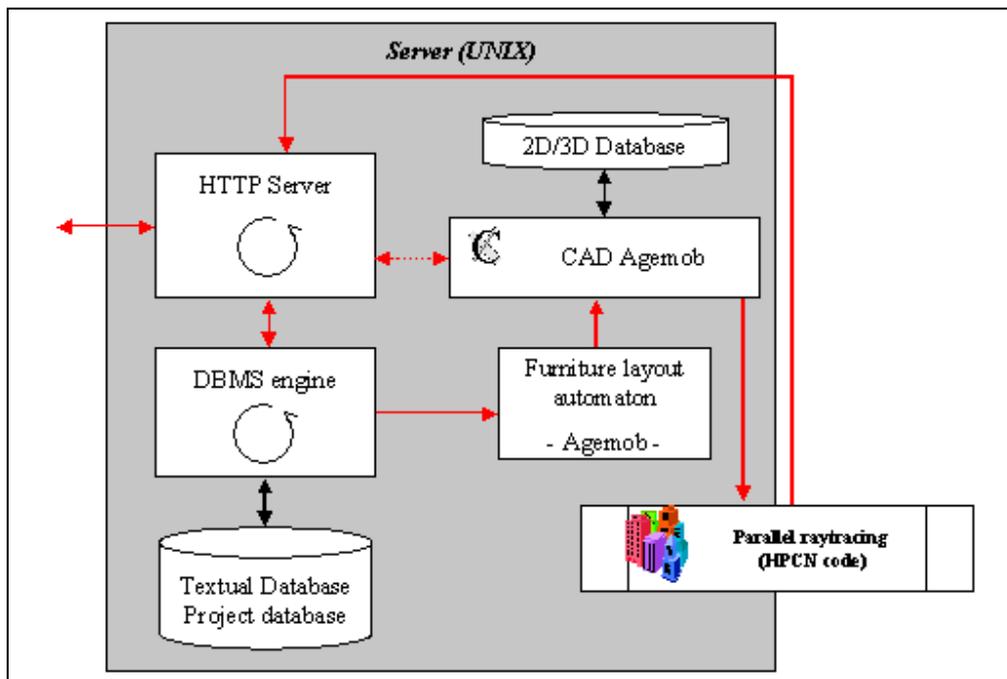
Server functional diagram

Two possibilities may be foreseen with this type of architecture:
- A very powerful machine to manage system tasks (network and database management + calculation of computer-generated pictures);
- A hybrid architecture where picture calculation is handled by a machine other than the server.

We have eliminated the first solution for two main reasons. The first reason is that it is impossible to accurately calibrate a system as connections are random and we do not have a reasonable model to use as a base. In addition, all simulations led to overestimating the power of the machine required.
The second reason is of a financial nature. In fact, the cost of a powerful server (multiprocessor) is prohibitive given the initial financial goal.

The second possible architecture offers advantages from several standpoints. The first is that it is possible to allocate the two main tasks, system management and

picture calculation, to two separate machines. The server itself does not have to be very powerful and computer-generated picture calculation can be carried out on different systems, making the final application more flexible.

The solution we chose to use was a UNIX server associated with a machine cluster. The programming package we selected consists of PVM (Parallel Virtual Machine) and POVRAY 3.01 (raytracing).

As the POVRAY source files were available, we were able to use the basic raytracing algorithms and concentrate on code parallelising. The code is written in standard C-language, which should ensure problem-free portability.

PVM is a set of functions making it possible to consider a heterogeneous machine cluster as one, and the same, machine. The main advantage of PVM is the possibility of creating a parallel machine from a pre-existing network of computers. This package is available for numerous platforms and operating systems. Furthermore, the machine cluster can be dynamically modified.

As each code is run locally, it is possible to optimize each version for a given machine and an operating system.

PVM was created 1989 and its current version is reliable and stable.

Agemob's goal is to offer adaptable and open-ended solutions in function of the end-user's requirements. In the long run, this is only possible thanks to the use of PVM and 32-bit Windows computers. In fact, the choice is not governed by technology, but by the market.

The results presented in the next chapter are based on this postulate.

4.3 *Results, Achievements and benefits*

4.31 Current state of development and achievements

The « parallel calculation of computer-generated pictures » module cannot be separated from the application. For this reason, we are going to briefly explain all the aspects of our work.

4.31.1 Databases

Catalogs consists of two types of data: textual data and 2D/3D graphics data. Today, the end-user catalogs (Boone, Biais and Sonorma) are entirely completed. They were produced using Agemob CAD.

SGBD, developed by the Canadian company Speedware, has been installed and all management programs written in L4G (4th generation language). This module is the customer station-server interface.

The basic administration tools have been installed, making it possible to manage internationalization, updates, etc.

4.31.2 Customer station: Man-Machine interface

The customer station interface has been developed using the current Internet resources: HTML, JavaScript and Java.

This makes it possible to provide the end-user with a friendly Man-Machine interface.

4.31.3 Layout automaton and CAD

The layout automaton is the module used to build the 3D description of a scene based on the project data. This automaton takes into account the typology of the furniture in the scene. Two layout modes are taken into account: linear and freehand.

Linear (Boone/Biais):

Using a list of furniture, the automaton builds the 3D scene depending on the type of furniture (low or high furniture, etc.)

Freehand (Sonorma):

No rule is applicable for office furniture. The user, via the Man-Machine interface of the customer station (developed in JAVA), positions the elements where he wants. In this case, the automaton only dispatches the data, without changing it.

In both cases, the automaton provides a 3D description in the following form:

REFERENCE: Furniture element reference

X,Y,Z: Furniture element spatial coordinates

etc.

The system builds the 3D scene based on the data in the 3D graphics database. This scene is then calculated by the raytracing algorithm.

4.31.4 Parallel raytracing

Agemob has developed an initial version which is currently being used.

The 3D scene is dispatched to each PVM node and each node analyzes it independently (*Parsing* step). Then the rendering calculation is performed in parallel.

4.31.5 Final application

The final application is operational for the three industrial partners (Biais/Boone/Sonorma).

4.32 Experimental results
4.32.1 Experimental conditions

The results presented were obtained with our own machine network. The resources used are summarized in the following table:

PVM	PVM V3.3.11
Network	Ethernet fin 10 MB
Server	Hewlett-Packard C100 – 128 Mb RAM – (HP-UX 9.07)
PC 1	Pentium Pro 200 MHz – 64 Mb RAM (Windows NT 4p3– Terminal server)
PC 2	Pentium II 266 MHz – 64 Mb (Windows NT4p3–Workstation)

The results were obtained using a set of data from the server itself. The number of faces represents the number of equivalent triangles required to describe the scene. Actually, the scenes consist of polygons (at least 4 angles) and triangles. The number of equivalent faces is obtained by calculating the number of triangles required to describe a polygon.

The test scenes are shown below:

	Partner: **Biais** Name: *CHANTILLY2* 3D Scene File Size: 2.2 Mo Number of faces: 54948 Calculation parameters: Picture size: 640 x 480 (307200 pixels) Anti-aliasing: No Number of lights: 3

	Partner: **Boone** Name: *BOONE1* 3D Scene File Size: 160 Ko Number of faces: 3127 Calculation parameters: Picture size: 640 x 480 (307200 pixels) Anti-aliasing: No Number of lights: 3
	Partner: **Sonorma** Name: *SONORMA1* 3D Scene File Size: 1.4 Mo Number of faces: 28277 Calculation parameters: Picture size: 640 x 480 (307200 pixels) Anti-aliasing: No Number of lights: 3

4.32.2 Task scheduling in the PVM

Scheduling is defined as follows in the current version of the application:
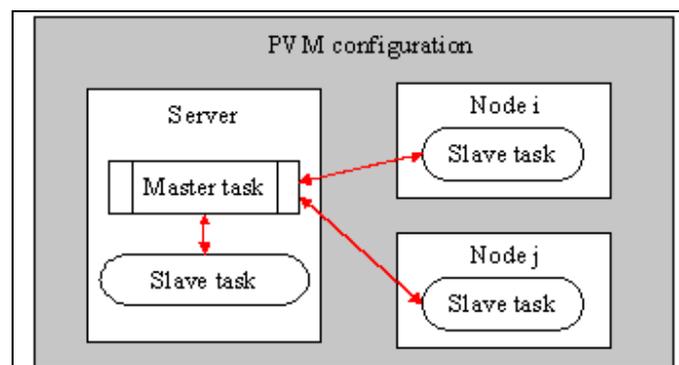
PVM scheduling

The *master* task is executed on the server and the *slave* tasks are then run on each node of the PVM. Running a slave task on the server makes the application more

rugged. For financial reasons, the machines we propose using in the PVM chain are PCs running under Windows NT4. Objectively, these systems need to be restarted very often. System administration, although not technically complex, requires some care when enrolling supplementary nodes following a system error. Due to this, we chose to run a slave task on the server, making it possible to ensure minimum computer-generated picture calculation even in the extreme situation where all machine nodes (other than the server) are down.
We will return to this aspect in the conclusion to this chapter.

4.32.3 Results

The results for each node of the PVM machine are presented separately. The purpose of this table is to position the reference values, and not to compare the individual machines, which are totally different in their design and, especially, their intended use. The second part of the table shows the various possible PVM configurations in order to emphasize the advantages gained by adding new machines. The base used to assess increased performance is the server.

	CHANTILLY2	*BOONE1*	*SONORMA1*
HP-C100 server	210 s	109 s	150 s
PC1 (Pentium Pro)	84 s	45 s	57 s
PC2 (Pentium II)	60 s	31 s	40 s
C100 + PC1	89 s (Speed up: **2.36**)	43 s (Speed up: **2.53**)	60 s (Speed up: **2.50**)
C100 + PC2	78 s (Speed up: **2.69**)	37 s (Speed up: **2.95**)	50 s (Speed up: **3.00**)
C100 + PC1 +PC2	55 s (Speed up: **3.82**)	26 s (Speed up: **4.19**)	39 s (Speed up: **3.85**)

4.32.4 Conclusion

The initial computer-generated picture calculation time goals have been attained. Even the most unfavorable cases (Period furniture – Biais), the calculation time **is less than one minute**. Furthermore, the machines used for the test are not the most recent. If more recent machines are included in the PVM system, the calculation times will surely be improved.
Based on these solid results, we were able to include anti-aliasing and a few textures to improve picture quality.

As our application was based on the Internet, some results are lacking with regard to its normal use: number of simultaneous connections, overall wait time for a project (Estimate + Drawing + Perspective).

So that the service does not break down, computer-generated picture calculation queries are serialized (spooled). Given some supplementary data on connection statistics, we could envisage other strategies (Distribution of tokens depending on node load, etc.).

4.4 DISSEMINATION

The dissemination action was essentially concentrated on the exhibitions of each industrial partners.

A European tour was programmed to show the new INTERNET HPCN 3D CAD SYSTEM.

Each exhibition corresponded for each partner to his market and his type of furniture.

SONORMA:

The system was presented for the first time on October 20th to 28th 1998, in its very first version. This presentation took place at ORGATEC, the Cologne bi-annual international exhibition in Germany for professional office furniture. This system was highly appreciated by customers, especially foreign customers, for whom this solution improves their business relationship with Sonorma.

Approximately 50 test projects were carried out on the stand, with certain projects leading to firm business deals. This dynamic sales approach on the stand has made it possible for Sonorma to establish new contacts and develop business in Europe.

Following this exhibition, around 10 test customers (in Europe and the United States) have used the system and contributed their suggestions, all of which have been taken into account.

The improved and commercially operational version was presented at the PARIS annual International Furniture Exhibition held January 12-18, 1999.

This exhibition (which is not an office furniture exhibition) was the opportunity for Sonorma to happily welcome customers from the Paris area.

Approximately 50 projects were completed with highly motivated customers eager to acquire this equipment. Because of this success which reinforces the company's

marketing strategy, Sonorma forecasts a 15% turnover increase for office furniture, in spite of a launching phase during which customers will set up their connections and become familiar with the system.

BOONE

The system was much appreciated when shown to customers at the BRUSSELS furniture exhibition on November 5th to 10th, 1998. It was possible to use the system in test, and it only needed to be completed with its entire database (several thousands of references) to become entirely operational for the beginning of the year 1999 for presentation at the PARIS international furniture exhibition (January 12th to 18th, 1999).
During the exhibition in BRUSSELS, a meeting was held between Messrs. Max LINKE, Yan Van HECKE (BOONE), Pierre Dominique Henry (SONORMA) GÈrard Aubourg (AGEMOB) and a journalist from ''LE COURRIER DU MEUBLE'' to present the partners and the system. The meeting took place on the BOONE stand and full explanations and answers to everyone's questions were provided. The journalist accompanied Mr. Henry from France to get the scoop and prepare a long article which was published the week before the opening of the PARIS exhibition on January 14th.
''LE COURRIER DU MEUBLE'' is published regularly in 6,000 copies and distributed to manufacturers and retailers throughout the sector. For the PARIS exhibition, its circulation was doubled and distributed free to visitors.
The ''LE COURRIER DU MEUBLE'' article is appended.
Fifty demonstrations were performed for enthusiastic customers at Brussels, all of them eager to use such as system as soon as possible.

BIAIS

BIAIS has benefited from an operational system for a year now, beefed up by HPCN technology for the last six months. Mr. Jean-Pierre BIAIS was very proud to announce his increasing business: These sales now account for 30% of its turnover.
BIAIS has several hundred retailers now progressively asking to be connected. For most of them, it is the first time they will be connected to the Internet.
During the exhibitions, fifteen retailers asked to be connected to the server.

AGEMOB

For AGEMOB, the technological breakthrough is essential. The solution offered to our industrial partners is already a very important and concrete milestone in their own activities, and in those of AGEMOB which will manage the distribution networks through subscriptions.

The use made of this system by our customer BIAIS (3rd partner) - who has already gained a 30% profit with this service even before benefiting from HPCN - is eloquent. What's good for its customers is good for AGEMOB!

Following the installation of three servers on our industrial partners' premises, which have been introduced during our European tour, we have received projects from other specialists in modular and office furniture, in particular for mail order sales and kitchens in kit to be ordered via Internet.

We cannot divulge the names of our near future clients in this report. But, we can say that two new projects involve electronic trading and will revolutionize traditional business methods.

4.6 CONCLUSIONS

- Sales staff need an attractive, realistic depiction of the furniture ;
- They need to be able to interact with project design : positioning furniture and specific equipment ;
- They need access to data bases specific to each manufacturer, identifying and pricing products perfectly ;
- All this without any significant additional costs in relation to a standard computer.

Therefore, HPCN (ray-tracing optimisation and Networking technology) could fulfil some requirements of the furniture vendors :

- This makes it possible to set up, on thousands of sales points, standard computers which are nonetheless well-equipped in terms of memory and disk space, which have become cheap ;
- Economise on the multiplication of software licence agreements for the various sites : system software maintenance is centralised ;
- It is very easy to maintain and develop a single data base on a server accessible by all ;
- The economic stakes make it possible to equip each sales representative, who can thus fulfil his/her task efficiently and gains value in the eyes of the consumer.

We could imagine that in the future the manufactures will sell directly to the customers via the web instead of exposition sites.

SONORMA

The solution implemented at Sonorma is a very innovative one. This solution fits perfectly into the company's strategic development oriented towards exports. Moreover, an added advantage is that the Internet solution makes it possible to include complementary services, such as the possibility of checking delivery lead times, placing orders and sending correspondence.

BOONE

Thanks to this data-processing system perfectly suited to its business activity, BOONE has found a concrete means to boost the sales process and thus profitability. At the same time, the company sees new marketing opportunities to offer to reticent distributors and the possibility of easily extending its territory by using Internet.

BIAIS

BIAIS was pleased with the results achieved at the Paris Furniture Exhibition, as well as with the high level of recognition for of its products, its services and its increasing market share.

AGEMOB

Technically, the overall processing system has been entirely completed. Thanks to the HPCN technology, the most critical module, the computer-generated picture calculation module is on line.
This technology is not related to Agemob CAD. The code part used to calculate perspectives is not tied to Agemob CAD. This makes it possible to use these techniques in all applications requiring rapid, realistic 3D pictures, with low-cost equipment.
Picture calculation has been considerably speeded-up. Lastly, in order to improve overall performance even further, Agemob must improve the performance of the intermediate modules.
Demand combined with several complementary techniques (each one necessary and convergent to the realization of a project in a practical time frame) can lead to quite a few surprises. The HPCN technology came at the right moment to allow a truly commercial use.

Thanks to a buoyant activity, AGEMOB should be able to rebalance the very high investments it has made over the last three years. AGEMOB counts on a 30% progression due to companies' strong involvement in e-commerce. AGEMOB's highly technical solution has a notable technological advance which also generates a lot of work to prepare the databases.

5° WEB PAGE

http://www.agemob-france.com

6° APPENDIX

Press article
Flyers
Reduce poster