CCP Participation in ESPRIT Project 9901 - NETCIM

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***Abstract* - ESPRIT Project 9901 - NETCIM (Cooperative Network for CIME Technologies in Europe) is a project that intends to carry out a set of collaborative actions related to CIME technologies and methodologies, solving in a cooperative way five Pilot cases as the first step to establish the best channel for technology transfer. The evaluation of this experience will allow the definition, design and experimental implementation of a Network. The objective of this paper is to give a brief description of the Project, emphasising the CCP participation.**

1. Introduction

The NETCIM project is dedicated to Small and Medium Industries all over Europe, especially for the ones located in less developed regions. These industries present a group of problems sufficiently common and general, to introduce a global solution. All these industries have the need to improve their technology, introducing new methodologies and new implementation guides, based for instance on CIM trends.

In most of these industries, the initiatives to implement CIM technologies do not get the best solution, because there are difficulties acceding to the products information and the correct guidelines on the technical implementation. This leads to a difficult acceptance of new industrial technologies in the SMEs environment.

In most countries there are particular solutions for these problems, based on local investigation and industrial centres, that gather experience in some CIME areas. This constitutes also a problem because not any of these centres is able to have the global solution, not even a global CIME knowledge, once they are restricted to local industries CIME vision.

It is in this global state of art that NETCIM project emerges, trying to solve all these problems, but also having the sense that the solutions should be improved with time.

NETCIM is a project which aggregates a set of collaborative actions related with CIME technologies and their implementation methodology. This technological exchange is first based upon the cooperation of five pilot cases, regarding that this is the easiest way to establish a channel for technological transference. The future objective of this project is to get the proper definition, design and implementation of a technology network.

The importance of this network remains on the possibility of creating a homogeneous structure gathering the different centres and the several kinds of specialisation they have. This possibility enables different industries from different countries to have a transparent access to the best information and the best help, since the distance, the different languages, and the lack of communication are in this way replaced by homogeneous communication and interaction procedures.

This global strategy and the underlying objectives must be preceded for a sequence of actions:

- The identification of SMEs real industrial needs;
- The definition and realisation of cooperative CIM applications;
- The evaluation and dissemination of the results, regarding the definition of a plan for network implementation.

The NETCIM first and immediate objectives are:

- to establish a global set of definitions and recommendations, always based on the critical evaluation of the developed cooperative actions;
- to promote the discussion for the design of the infrastructure and methodology for the network functionality;
- to share experiences and information;
- to establish an information interchange inside the network among the several centres and to the outside, exchanging information and technology with industrial companies and obtaining satisfying results on the resolution of SMEs problems.

The NETCIM and the subjacent network strategic objectives for the future are the contribution to the SMEs competitiveness, the dissemination of technological information, being an important help for the European Industry.

The NETCIM project is based upon the idea of the developing the European Industry, not in a country-based strategy, but on the global perspective of the network importance. This way of the achieving the NETCIM objectives is directly related with the network efficiency and reliability.

2. NETCIM specification and participants

As introduced above, NETCIM is directly related with specific implementation phases, what we call main implementation phases:

- Phase 1 - Preliminary phase
- Phase 2 - Implementation of pilot cases. Cooperative actions
- Phase 3 - Analysis phase, experiences evaluation and recommendations
- Phase 4 - Experimental implementation phase

The implementation of these four phases must be driven according to a workplan, subdivided in well-defined workpackages:

- Workpackage 0 - Project management and administration.
- Workpackage 1 - Preliminary work underlining industrial needs and establishing specialisation, activities and services on the nodes. This preliminary work will allow defining cooperative CIME applications in form of pilot cases.
- Workpackage 2 - Will be focused in the carrying out of five pilot cases, being the core of the project.

- Workpackage 3 - Includes the evaluation of pilot cases, mainly from the point of view of cooperation and technology transfer. As a result of this workpackage, a set of recommendations about organisation and design of a network will be done.
- Workpackage 4 - Will define means and tools for the implementation of the network, as well as the experimental implementation and plans for exploitation.

The NETCIM participants are:

Participants	**Country**	**Role**
FATRONIK SYSTEM, S.A.	E	C
DEMOCENTER	I	P
CCP - CENTRO DE CIM DO PORTO	P	P
I.T.C.C. S.A.	GR	P
I.A.I.	E	P
TEKNIKER	E	A
I.C.T.	E	A
AIMME	E	A
CETEMA	E	A
U.Z. (DIDYF/CPSUZ)	E	A
UNIVERSITY OF PATRAS	GR	A
I.M.T.	E	A

C - coordinator
P – partner
A - associate

3. Pilot cases description

The NETCIM project is based in the carrying out and implementation of a set of cooperative CIME applications, to be done under the form of pilot cases. Each pilot represents the expertise and knowledge of each centre applied to a real integration problem.

This leads to the necessity of demonstrating the benefits of a project like NETCIM in the fields of technological transference and in the dissemination, promotion, training and demonstration of the results obtained in the different areas, and in the different technologies studied.

During the project it will be implemented five different pilot cases, coordinated by Democenter, Centro de CIM do Porto, ITCC/University of Patras, Instituto de Automática Industrial and Fatronik, involving also the work and cooperation of the companies related with these centres.

3.1. Fatronik pilot case

Design of software integration, strategies and development in manufacturing environments at SMEs, in the metal-mechanics sector, and evaluation of ifs economical impact.

The motivation to the development of this pilot is that actually there are several technologies involved in CIM, some of them very well known in a high development level and available for companies at an adequate cost, but there is a problem finding the proper way to integrate this new technologies and to avoid the problems in achieving a good integration degree according to the business objectives and considering their actual automation level.

The main objective of this pilot case is to work in the domain of the SMEs, in the specific area of integration of the new technologies in the existing automation platform, searching and solving the problems involved in overlaying CIM on an existing Company.

Fatronik intends to find the solution for this problem integrating technologies and software packages between the design and the manufacturing areas (packages like CAD, CAPP, CAM, Resources Management, Planning and Simulation), having always in mind that this introduction must consider the software resources already available in the company.

From this study, and from the data collected from the inquired companies, will result several architectures and implementation strategies that must be appropriated for the biggest number of companies and for their greatest amount of different characteristics. To test the results, it will be done one or two real integration processes, together with the economic study of how the integration strategy can help to achieve better business strategies.

To achieve the networking and collaborating objectives the nodes will contribute with SMEs selection and economical evaluation of economical impact, to the coordinator work.

All the nodes will use this case to present a NETCIM service to SMEs in their own influence areas, through a real experience developed in other country, allowing the dissemination and demonstration policy, covering one of the most important objectives of this project.

To obtain these results, several subtasks will be done, involving not only Fatronik, but also the other partners.

3.2. Democenter pilot case

Diagnosis and simulation service to evaluate and improve the organisation processes at SMEs.

The problem that motivated this pilot case project, is that a large number of SMEs would like to analyse the variety and the level of standardisation of the products they offer, as well as their manufacturing organisation, in order to reduce the number of components, simplifying the definition of new versions, unifying the production processes and identifying inefficiencies and bottle-necks.

With the actual means this is impossible, because cheap softwares are not able to support this kind of self-investigations. To solve this problem Democenter project works on a diagnosis and simulation service based in a new approach to product and process modelling; this approach is based in ESPRIT Project. 8224 - RUMS (a Rule-based Manufacturing Modelling System). Using the NETCIM network this project intends to serve several SMEs in different countries.

The diagnosis activity to be done is carried out both on product representation and process organisation.

In what concerns to product diagnosis, the project will study information available from SMEs in form of Bills of Materials and product features and parameters, translating this data to the product model of the Democenter methodology, creating a kind of model able to isolate possible faults inconsistencies, redundancies, and suggesting also component simplification and standardisation.

In what concerns to process diagnosis, Democenter will use as input information, the product family schemes resulting from the previous product diagnosis, routings, constraints, milestones, operation alternatives and parallelisms, purchasing and operation costs. Output consists of operational family representation, lead time estimations, identification of modelling faults, inconsistencies and redundancies, economical evaluation of alternative processes and suggestions for process simplification and standardisation. The simulation main objectives are to create alternative solutions, able to improve the manufacturing process, removing constrictions and bottlenecks that imply introduction of new machines or reorganisation of batches, flows or even both.

These changes are proposed after the diagnosis analysis, being analysed by the SMEs or by external experts. These services can be done using the NETCIM network and its nodes.

Process simulation uses resources, flow descriptions, batches and constraints as input information, and makes a global analysis considering both the current conditions and the reorganisation hypotheses. As output we obtain resources workloads and queue sizes.

Simulation is in this way understood not as a form of giving the best solution, but as an easy way to analyse a lot of alternatives very quickly.

3.3. CCP pilot case

A Flexible Manufacturing System for Job Shop Production of Small Series.

The problem that should be solved and that motivated this pilot case project is that the industrial production of small series is one of the most demanding in what concerns to integration of conception/development with production processes. This problem occurs for example in the mouldmaking industry.

The cooperation between the end-product manufacturer, which is the customer from the mouldmaking industry and the mould supplier in the initial stage of production is a good step, allowing the reduction of the cycle and the improvement of the overall process of product development and the reduction in the time lost in remakes.

Concurrent and simultaneous engineering is a step through these objectives, reducing development times and improving mould and products quality.

To achieve a solution for this problem, CCP will use its flexible manufacturing cell to demonstrate the advantages of the CIME technologies to manufacture prototypes or small series.

CCP intends to subdivide this work in three main phases, which together will fulfil the proposed objectives:

- Data collection in a specific SME.
- Data study and analysis.
- Implementation of a production demonstration.

3.4. ITCC/U. Patras pilot case

Manufacturing planning and scheduling.

The motivation for this project study are the significant problems that industrialists have in terms of planning and scheduling their manufacturing operations, the solution for these problems is normally difficult to explain to the industrialist, that does not believe that CIM is the better way to do it. In this sense, the Greek node in spite of·showing a final solution will do all the work in cooperation with industry, creating an Intelligent Manufacturing Planning and ConTrol (IMPACT) CIM tool. This solution will be tested at Aluminum Attica, a local industry producing packaging materials.

The main problems to be solved are:

- high inventory cost and WIP;
- low machine and labour utilisation, and
- poor meeting of due dates

The solution that the Greek node visualises is based upon the installation of the software IMPACT in the company, analysing its performance with important inputs, like:

- facility information, specifying the attributes of the equipment (workers) and other resources that make up the manufacturing system to be planned and scheduled.
- workload information specifying the work to be scheduled through the manufacturing system. This includes both work arrival times and process planning information.
- operation policy information specifying which scheduling criteria, to consider when constructing a schedule, the relative importance of those criteria, as well as the desired trade-off between schedule quality and computational effort.

The system output will be:

- A schedule that specifies when each production task is to be performed and on what resource.
- Performance measurement of the manufacturing system, under the prescribed schedule.

3.5. IAI pilot case

Bottle Plant with Inspection and Control Integrated by Computer (ROBOPACK).

The motivation for this pilot case project is to introduce CIM concepts in an advanced plant for drink bottle, reaching improvements of flexibility, quality and efficiency, obtaining a higher add value in the production of traditional products such as wine, oil, etc.

There will be built a plant in cooperation with TECAM (a Spanish firm) in an appropriate centre.

The initial solution for this problem is that the pilot plant responds to some objectives, like research in CIM strategies, demonstration, dissemination and training in the studied methodologies.

The equipment of this plant is mainly dedicated to this specific kind of industry, machines for filling, labelling and taping, along with conveyor lines, building a plant appropriately controlled by inspection equipment and automatic integrated control systems.

As main cooperation objectives, we have the sharing of knowledge and experience, implementing an integrated factory.

4. Detailed description of the CCP pilot case

4.1. Title

A Flexible Manufacturing System for Job Shop Production of Small Series.

4.2. Identification of the problem

Industrial production of small series is one of the most demanding in what concerns integration of conception/development with production processes. Mouldmaking is an example of this type of industry.

Additionally, the co-operation between the end-product manufacturer (customer) and the mould supplier at an earlier stage in product development allows not only reducing the length of the cycle but also to improve the overall process of product development and reduce the need for remakes.

Iberomoldes S.A., an associate company of the CIM Centre of Porto, has developed an innovative system, based on simultaneous engineering technologies to substantially reduce the development times of plastic products through the intensive use of advanced information processing tools. Iberomoldes will endorse this pilot case contributing with its experience in the field. In spite of mouldmaking being a specific case, the addressed procedures can be easily extended to the general case of small series production.

4.3. Solution

CCP will use its flexible manufacturing cell to demonstrate advantages of the use of CIME technologies to manufacture prototypes or small series. The pilot will be completed in a 12 month period during which the following three main phases are fulfilled.

4.3.1. Data collection in a specific SME

Iberomoldes will contribute with its knowledge in the field of small series production, since moulds is a typical case.

Data collection will be: performed accordingly to the requirements of the following phase.

4.3.2. Data study and analysis

The data collection in the previous phase is used to provide a study platform regarding the CIME needs in this type of industry. The survey of the SME regarding product representation and process organisation will provide a base to the diagnostic of general problems concerning the prototype and small series industry.

The results obtained during this phase, especially those concerning production, will be used in the next phase to demonstrate the difference between CIME environment production and that used by the SME.

4.3.3. Implementation of a production demonstration

For the demonstration of a small series production in a CIME environment, CCP will use its production facilities, a flexible manufacturing cell, with the following composition:

- Manufacturing infrastructure
- Design centre
- Industrial communications infrastructure
- Shop-floor control and production planning and management

Manufacturing infrastructure

The manufacturing facility consists of the following cells:

- machining cell, consisting of
  - CNC turning centre
  - CNC machining centre
  - load / unload robot
  - two transfer tables
- assembly cell, consisting of
  - SCARA robot
  - vision system

  - three transfer tables
- palletising and tools measurement cell, consisting of
  - tools measurement centre
  - transfer table
- materials handling system, consisting of
  - automatic warehouse
  - automatic guided vehicle
  - transfer table.

The fig. 1 represents the CCP plant layout.

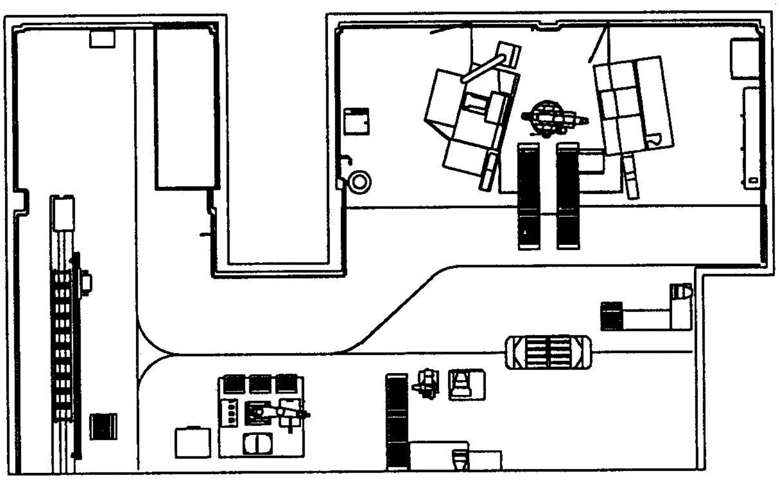


Fig. 1 - Manufacturing Infrastructure

The machining cell

This cell is intended to produce, from raw materials (in plastic, aluminium or steel), the end pieces to be delivered by CCP manufacturing system or the components to be assembled.

This cell is composed by a CNC turning centre /Lealde TCN-10 with Sinumerik 880T controller), a CNC machine centre (Kondia B 500 with Fanuc 16 MA controller) and a load/unload 6-axes arm robot (Kuka IR 163/30.1, with Kuka RC 30/51 controller and an automated grip change system).

This cell will also be supplied by two motorised transfer tables, and with a Sun Sparcstation 10 as cell controller. To establish the communications between the cell controller and the corresponding machines, will be used a MMS (SISCO MMS-EASE); the communications between the cell controller and the shop floor will be made upon TCP/IP.

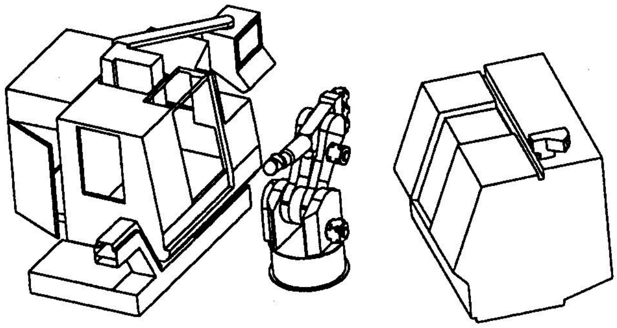


Fig. 2 - Machining Cell

The Assembling Cell

This cell will be used only if there are some assembling operations made upon the pieces produced by the Manufacturing Cell. It is composed by a SCARA robot (Adept Three with Adept CC controller) with an artificial vision system (Cognex 4200 EX, with 1 camera).

This cell also includes an assembling table, a gripper magazine and a component table all mounted in the same platform, together with three identical motorised transfer tables.

The control of this cell will be implemented in a Pentium personal computer or a Sun Spare Workstation. Inside the cell the communications will be performed via RS-232; the communications between this cell controller and the shop floor controller will use TCP/IP protocol.

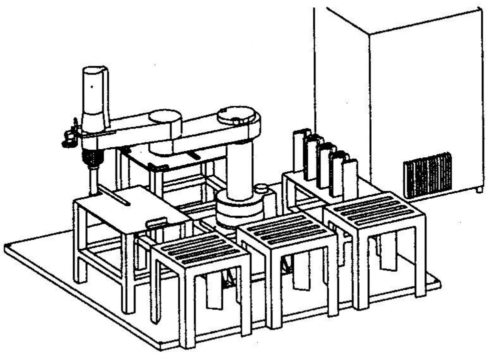


Fig. 3 - Assembly Cell

The palletising and tools measurement cell

This cell is intended to prepare all the tools sets for the CNC machines, the robots grips and the raw materials pallets required for the machining centre proper operation.

It is composed by a palletising table and a tool pre-setting machine (Elbo Controlli 2000 DBELL/GA with tool measurement database, tool information read/write interfaces and PC post processing for CNC facilities).

This cell will be supplied by a motorised transfer table.

During normal operation, this cell will have a human operator to perform the tool measurements and preparation and also to perform all the palletising activities needed by the manufacturing process, this operator will also perform the pre-setting of the manufacturing machines al Manufacturing Cell.

This cell uses an X terminal to communicate with the shopfloor controller.

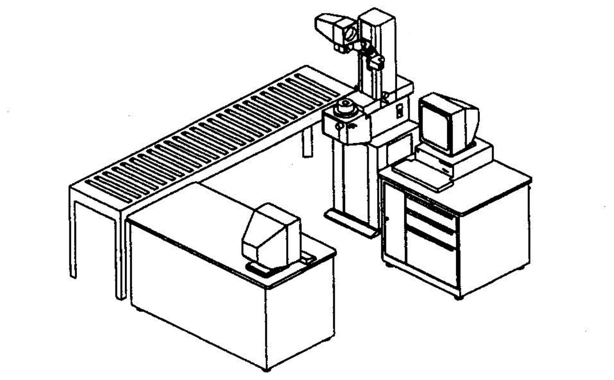


Fig. 4 - Palletising and tools measurement cell

The materials handling system

This cell is responsible for all the materials transportation and their automated stocking. This cell is built upon a bi-directional AGV (EFAGV-200R-B, with twin motorised tables, inductive guidance and communication systems, and automated static battery charger) together with an automated warehouse (from EFACEC, with 50 stocking positions, an X-Y stocking machine type and an Omron PLC controller).

The automated warehouse will be served by a motorised transfer table, with bar code reader.

The cell controller is a micro VAX 3100, mod. 40, and the corresponding software are able to control not only the AGV plus warehouse operations, but also the communications between the AGV and all the transfer tables (besides the transfer tables yet listed, there will be also an I/O motorised table, interfacing CCP with suppliers/clients, including a human operator and an MicroVAX terminal).

Except for the warehouse transfer table (controlled by the corresponding Omron PLC), all the other ones are controlled by a dedicated Siemens Simatic S5 PLC and they will only communicate with the remaining equipment via the AGV system.

To store the amount of information that will circulate through this cell, it will be supported by a proper database (Digital Rdb).

The communications between the materials handling system and the shop floor controller will be performed using TCP/IP.

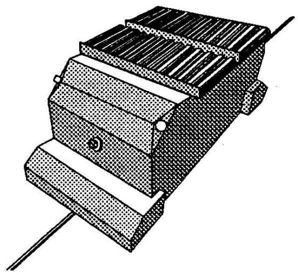


Fig. 5 - Efacec AGV

Design centre

The functions to be performed by this department are the design of pieces to be produced at the shop floor, the building up of the corresponding manufacturing procedures, and the appropriate tool choice and for the designing of the convenient manufacturing pallets and grips.

The design centre is also able to off-line programming of involved robots and to simulate the necessary industrial processes.

The technological means involved in this functions performing are the Pro/ENGINEER Parametric Technology Corporation CAD/CAM/CAE system, plus Automation Intelligence INTELLIPOST module; at this department there are also available the QUEST (process simulation) and the IGRIP (robots off-line programming) software packages, both from Deneb Robotics, Inc.

For the Hardware support of these software means, the design centre has at it disposal two Sun Sparcstations (1 20 and a 10 ones) for the CAD/CAM/CAE system and a Silicon graphics Indigo 2 workstation for QUEST plus IGRIP packages.

Besides the possibility of producing workpieces drawings (using AO-AI plotter), the design centre will also store manufacturing programs in a central file server (these program references will be passed by the shop floor controller to the involved cells, so that they can download them to the corresponding CNC machines).

The design database is an Oracle 7.

The design centre only communicates with the production, planning & management department.

Industrial communications infrastructure

The communications infrastructure available at CCP consists of the three types of CNMA networks - 8802.3, 8802.4 Broad Band and 8802.4 Carrier Band.

Specifically, CCP is equipped with:

- 8802.3 segment in 10BaseS technology
- Broad Band segment in CATV technology with frequency channels for
  - Status Monitoring
  - 8802.3 10Broad36

   - 8802.4 BroadBand
   - PAL Video equipment
   - point to point Modems
- 8802.4 CarrierBand segment.

The 8802.4 BroadBand network extends to the conference room and a multimedia intelligent concentrator is used to provide 8802.3 10BaseT connections to the offices area from the 8802.3 10Broad36 segment.

A bridge connects the 8802.3 10BaseS segment to the 802.4 BroadBand and another bridge connects the 8802.4 BroadBand to the 8802.4 CarrierBand segment.

Network analysers for the three types of networks are also available.

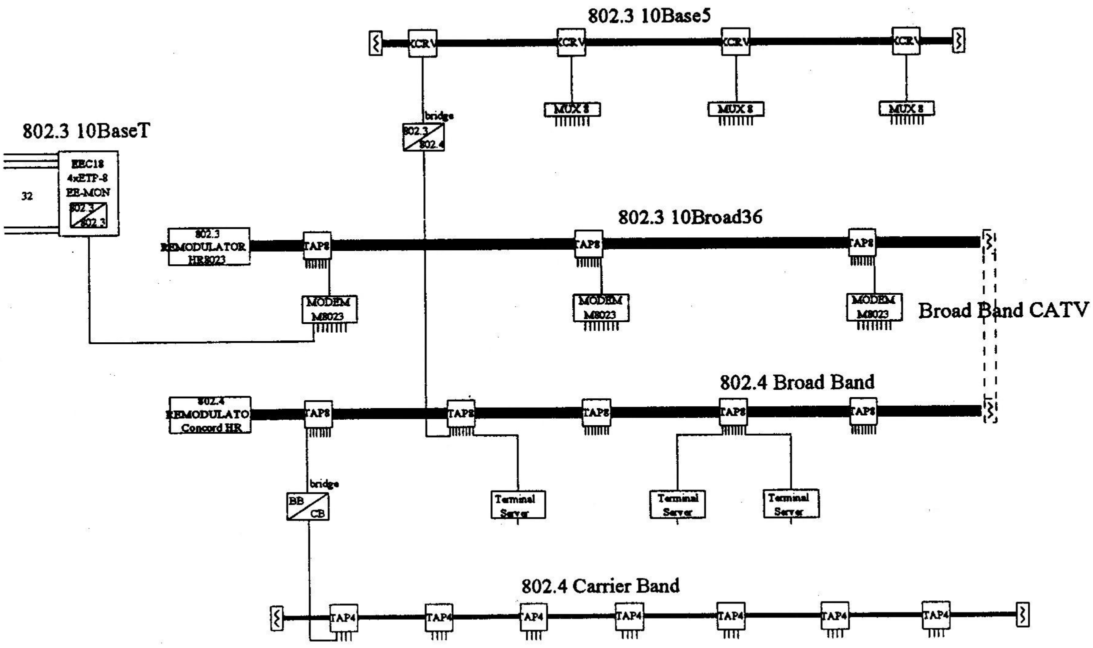


Fig. 6 - Communications Infrastructure

<u>Shop-floor control and production planning and management</u>

Production planning and management communicates, on one side, with the design centre, and, on the other, with the shop-floor control. Shop-floor control communicates, on its side, with the three cells, which do not communicate between each other.

The specification of application software for shop-floor control and production planning and management has been left to the end of the set-up phase, to take advantage of the insights provided by the implementation of the cell.

However, communications protocols have already been defined, in principle. Within the flexible manufacturing cell, MAP/MMS over a network will be used for the communications between the cell controller and the two CNCs and the RC, while within the other two cells proprietary protocols over RS232 will be used. Messages between the shop-floor control and the cell controllers will be based on RPCs.

The factory database and file server will be hosted by the shop-floor control. Both the materials handling controller and the tool measurements centre will have their own databases, to keep data that is relevant for their operation, as it happens with the design centre.

The specification of the software needs of CCP will be produced, using market surveys carried out previously.

The needs of CCP are much wider than the needs of its manufacturing cell, and probably a single package will not respond to all of them: training, demonstration and manufacturing, in SMEs and in larger companies. As a result, several integrated solutions must be available in the future, running in UNIX and in Windows platforms.

The initial selection will probably be the software packages CIMITAR and TRITON, because they will provide a modular solution including a large choice of building blocks.

Other products, including the use of results of ESPRIT and other European projects and possible developments of CCP satisfying the requirements of SMEs, will be examined after the completion of the project, as a part of the strategy of CCP to contribute to the development of Portuguese industry.

The manufacturing management will be supplied partially or totally by either the CCP or/and a collaborating partner.

The Cell controller will be designed and implemented by CCP assisted by a collaborating partner.

The remaining needs will be fulfilled by CCP.

4.4. Objectives

The objectives of the pilot case fit into one of the objectives of NETCIM: to show how a cooperative network of multinational CIM nodes can operate in order to solve a particular problem raised by one of its nodes. Pilot case has therefore to be selected according to three levels of operation: industrial partner, CIM node and CIM network.

For the CIM node, it is a typical case of integration in manufacturing, involving CAD/CAM, concurrent engineering, information management, and efficient communications among sectors and between customer and manufacturer, monitoring and diagnosis, inspection and quality control and management decision support systems.

For the cooperative network, it is a real example of a problem raised by one of the nodes, which is analysed using tools provided by another node, in order to define the best solution, which is then implemented using application software provided by yet another node or nodes of the network.

4.5. Expected benefits

The industrial partners expect an improved performance of its manufacturing facility, that is, better productivity and competitiveness, which will be achieved through the identification of critical points of the current processes.

CCP will also benefit from the project, increasing its knowledge in integration, which will then be used in its normal activity. The links between CCP and the University of Porto will allow the experience gained from the project to be reflected at the curricula level of the engineering courses and in the definition of student projects.

By participating in this pilot the collaborating partners can expect to validate their methodologies and products. Finally, NETCIM will evaluate the network from the point of view of know-how transfer and receive feedback for future improvements.

4.6. Work to be done by the conducting and collaborating partners

CCP will be responsible for the global Pilot Case co-ordination, in particular for those aspects concerning the integration of the different equipment and software products, industrial communications and global database management.

Fatronik will collaborate with CCP in the definition of the cell control architecture and will provide the software test tools for this area of the pilot. Democenter will use its RUMS system to evaluate the manufacturing process and to assist in the identification of critical points.

ITCC/Univ. Patras will collaborate with CCP at the factory management level, by evaluating the pilot requirements and providing the software applications to satisfy those requirements, and the training for software customisation, which will be performed by CCP. This collaboration will be shared with IAI, since pilot #5 has similar needs. In this manner, mutual economy of resources and better results can be achieved.

Partner	Collaboration Areas	Subtasks
CCP	CAD/CAM Integration Materials Handling Industrial Communications Manufacturing Databases	All
Iberomoldes	Industrial Know-how	
Fatronik/Tekniker	Cell Control Architecture Definition and Integration Shop Floor Monitoring and Diagnosis	2.3.3, 2.3.5 and 2.3.6
Democenter	Process and Product Diagnosis	2.3.3
ITCC/U. Patras and IAI	Management Decision Manufacturing Resource Planning	2.3.4, 2.3.5 and 2.3.6

4.7. Subtasks and deliverables

Subtask 2.3.1: Industrial Process Identification

To identify and understand the different phases in a typical SME. The different processes involved, materials used, machining operations, types of tests are to be addressed in this task.

Subtask 2.3.2: Requirements Study

The requirements of the SME regarding, for example, quality and delivery times are to be evaluated. Besides, the impact of these requirements onto informatic systems and production equipment must be studied out.

Subtask 2.3.3: Identification of Critical Points

To identify the procedures which can deny the achievement of the manufacturer or customer objectives. The manufacturing system in use at Iberomoldes is to be taken as reference. Using the information previously collected, software tools made available by partners will be used to identify the critical points of the manufacturing processes, and to design a solution.

Subtask 2.3.4: Provision of Equipment and Software

Taking as input the results from the previous subtasks, a small series manufacturing system will be set up at CCP. This system will simulate a real system, obviously with restrictions in number of subsystems. Nonetheless, the implementation will address all the objectives pointed out in subtask 2.3.3. CCP will offer its complete FMS. Software to perform production planning, manufacturing decision, CAE, etc., will be provided by CCP and other NETCIM partners.

Subtask 2.3.5: Integration

In this subtask the global integration of the equipment and software in order to have a fully integrated small series manufacturing facility will be carried out.

Subtask 2.3.6: Test

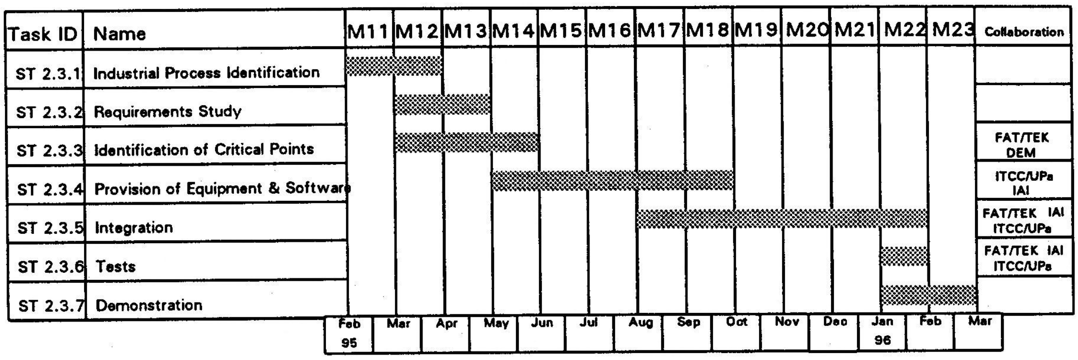
In this subtask tests of the infrastructure will be performed.

Subtask 2.3.7: Demonstration

CCP will organise a public event, where industrialists will have the opportunity to evaluate project results and to hear from the NETCIM partners their own views on the advantages of the NETCIM model.

A deliverable, concerning the report of all the activities carried out, both in terms of technical and methodological developments, and mainly in terms of collaboration, will be produced. Also the results of the pilot concerning data, developed software, implemented equipments and so on will be included in the deliverable. Finally, a report about dissemination actions will complete the deliverable.

CCP Pilot Case - Subtasks GANTT Chart



5. Conclusions

The objectives and scope of ESPRIT Project 9901 - NETCIM (Cooperative Network for CIME Technologies in Europe) have been briefly described.

CCP participates on this project with several foreign partners and will be responsible by a pilot case to be carried out in its facilities. The description of this pilot case has been detailed as well as the resources that CCP intends to make available for this project.

The CCP participation on NETCIM will contribute to improve the Portuguese SMEs technology, introducing new methodologies and new implementation guides. The technology network to be implemented will facilitate their access to the best information and the best help.

The relationship established by CCP with the different centres that integrate the NETCIM consortium has already led to new proposals of collaboration in different international R&D programmes.

6. Acknowledgements

The authors wish to thank the CCP researchers working in ESPRIT Project 5629 for their collaboration concerning the details of the CCP flexible manufacturing cell description. Acknowledgement is also due to the NETCIM consortium since the definition of ESPRIT Project 9901 is a result of the joint efforts of all the partners.