Modelling & Simulation Projects

Liophant Simulation Club

MISS McLeod Institute of Simulation Science
Genoa Center

A.G. Bruzzone & Roberto Mosca
{agostino, roberto}@itim.unige.it
http://st.itim.unige.it

ITALY

DIP
University of Genoa

DIP - University of Genoa

DIP was founded in 1997 as evolution of the Institute of Technology and Industrial Management (ITIM) that was operative from ‘60.
DIP is composed by about 40 faculty members, 15 technicians and administrative, plus several PhD Students, external Researchers and Consultants.
DIP teachers are involved in Undergraduate, Postgraduate and Professional activities in Engineering, Management.
DIP active in R&D Projects for major Institutions, Companies and Governmental Organisations.
DIP co-operates actively with major Excellence Centers World-Wide.

University of Genoa: an Overview

The University of Genoa is one of the oldest in Italy and in the World (founded in 1471 AD), it is located in middle of Italian Riviera.
The students are about 40,000 (about 8,000 new entries), and the engineering departments has about 7,500 students (12% in Savona Branch Departments); in effect the Savona Campus Savona holds about 1,000 Engineering Students.
That campus is located about 2 km from Savona Downtown, in an old complex of barracks recently converted into new University Buildings (over an area of 200,000 m^2).

For further Information about the University of Genoa:

http://st.itim.unige.it
http://www.unige.it

Savona Campus & Facilities

The University of Genoa includes a new campus in Savona about 2 km outside Downtown; bus services and large parking areas guarantee easy access.
That structure has been obtained transforming Army barracks; today the campus includes a big park with facilities such as tennis courts and sport grounds.
The campus holds Dept. on Engineering and also Economical courses; new laboratories have been realised in Simulation, Logistics & Industrial Eng. (SAMS Project), Ecology and Chemical.
Facilities for Professional Congress Centres are available in the surroundings

Savona Campus

Congress Centre

Liophant Simulation Club

Email info@liophant.org

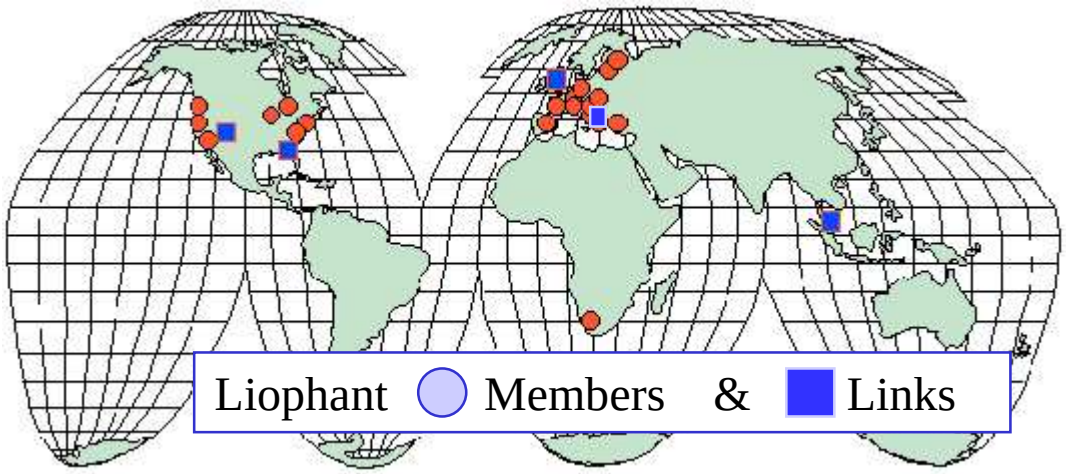
The *Liophant Simulation Club* involves World-Wide over 120 Scientists and Technicians working in Companies and Academia.

The *Liophant* develops Advanced Projects for Real Industrial Applications as:

- **VAED : Virtual Aided Engineering & Design (Gas Turbine Modeling)**
- **Safety First : Virtual Ship Handling Simulation in Harbor Environment**
- **Wolves: Warehouse Management & Logistics Simulation**
- **Health Care Survey**

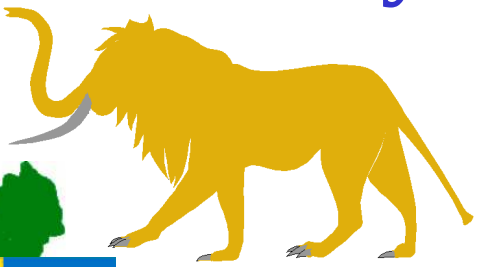
The *Liophant Simulation Club* promotes international Cooperations and exchanges with Excellence Centers World-Wide (i.e. NCS)

http://www.liophant.org



The International Activity of Liophant

ICAMES2002, Istanbul, May
CHARME & ROSES
S.Viazzo, O. Serindat,F.Bertone
Best Projects Award



Student Activity
PhD, Master, BS **2002**

Workshop HMS2002/MAS2002
Bergeggi, Oct.

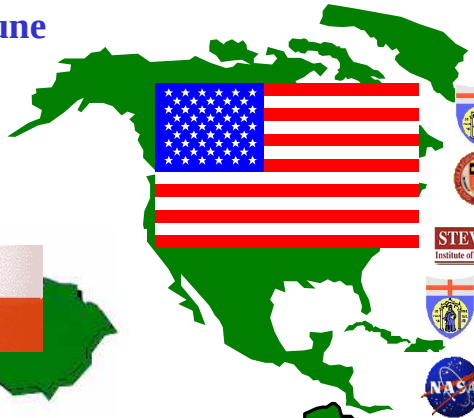
Sweden
December
S. Pozzi Cotto

IEPAL Genoa/Venice
E. Briano, E.M. Mantero,
S. Viazzo

CFLI
Consorzio Formazione Logistica Intermodale

CATE2002
Crete, June
A.Testa

AIS2000
Lisboa, June
A.Testa



Boston College &
Stevens Institute
Boston , January
M.Bonifacino

STEVENS
Institute of Technology

Orlando July-Sept.-Dec.
NCS & Nasa - IEPAL
E. Costa, E.M. Mantero

MIC00/AI00, Innsbruck, Feb
Automation & Simulation
E. Briano, S. Viazzo, O.Serindat

IASTED

BATCOS
W.Bohemia Univ.
December
S.Pozzicotto

WRV2002 UFRJ
Rio De Janeiro
December
S.Viazzi

UFRJ

ITEC2002
Lille April
O.Serindat
S.Viazzo

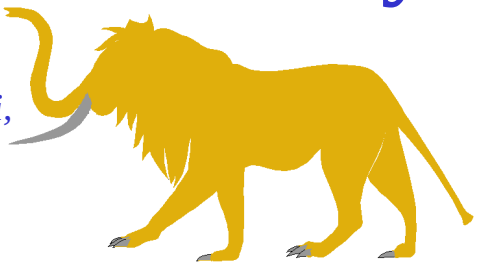
FAIM2002 &
ESS2002
Dresden
A.Testa
S.Pozzi Cotto

ESM2002
Darmstad
S.Viazzi

The International Activity of Liophant

Student Activity
PhD, Master, BS
2003

ICAMES2003, Istanbul, May
DIROMATIC, NERONE
F.Figini, M.Sanguinetti, G.Boero, C.Caballini, V.Barcucci, S.De Michelis
3rd Best Projects Award



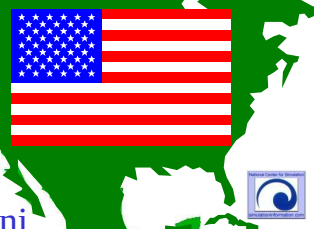
Workshop MAS2003
Bergeggi, Oct.

SCSC2003
Student Workshop
Montreal July
Over 10 students from USA, Canada

SportFest 2003, June
Liophant Football
Team 3rd Position

IEPAL/IEEE
Genoa/Novara
E.Mantero, D.Carini
Over 26 students from USA, Germany, France, Turkey & Italy

Boston College &
Stevens Institute
March-April
V.Bortoletto, G.Boero, M.Sanguinetti,C.Caballini
Over 10 students from Germany, France & Italy



SCS, ICT & Univ
Southern California
November
Danila Carini

Workshop VMASC,
Liophant MISS
Genoa, September
F.Figini, D.Carini

Universidad
Panamericana
Danila Carini December
Mexico City

Orlando March-April
NCS & UCF - IEPAL
V.Bortoletto, G.Boero, M.Sanguinetti,C.Caballini
Over 10 students from Germany, France & Italy

UFRJ
Rio De Janeiro
October-November
F.Figini

DS-RT2003, ESS2003
Deltf, October
P.Blomjous,,
.van Houten

MIC03, Innsbruck, Feb
Agent Driven Simulation
E. Briano

MISS - DIP
University of Genoa

Email: agostino@itim.unige.it URL: http://st.itim.unige.it

The research group of MISS-DIP of *Genoa University* is active from '60 in Simulation applied to Industrial Engineering.

The activities involve modeling, simulation, VV&A and analysis of Industrial Applications and Services (design, re-engineering, management, training etc.) as:

- Chemical Facilities
- Harbor Terminals
- Manufacturing
- Public Transportation
- Power Plants
- Public Services
- Assembling
- PM
- Environment
- Logistics

The Department staff is in touch world-wide with the simulation community and is present actively to conferences, exhibitions and working meetings with the major Associations, Agencies and Companies.

18 MISS Centers World-Wide & 5 Satellite Centers

MISS - DIP University of Genoa

The MISS-DIP of *Genoa University* carries out many industrial simulation projects in cooperation with the large corporations and small and medium sized Enterprises; some example of recent industrial simulation project are following:

ADtranz — ABB Daimler-Benz
On-Line Simulation for Distributed Production Management of Locomotives

Ansaldo
Distributed Synthetic Environment for Power Plant Design

Cetena
Fincantieri
Simulation & Virtual Project Management of Car Deck Construction for Fast Ferry

COOP
Simulation for Re-Engineering Supply Chain in a National Chain of Grocery Stores

Members of MISS are appointed in several positions in simulation community such as:

- Italian Point of Contact of ISAG (International Simulation Advisory Group)
- Associate Vice President of SCS and Chairman of Industrial Relations for Europe
- Member of NATO Industrial Advisory Group for Simulation & VV&A for Design

Project: PIOVRA

Polyfunctional Intelligent Operational Virtual Reality Agents

PIOVRA is developed for Italian and French MoDs in the frame of the EUCLID Program CEPA11. Project aims are:

- **To develop a new Generation of CGF able to simulate "Intelligent" behaviour, filling up the gap between user requirements and current available CGF performances**
- **To create PIOVRA intelligent CGF as effective models to be integrated in HLA Simulation for:**
  - **Training**
  - **Operation Planning**
  - **Operation Support**

- **To guarantee the possibility to Define/Configure PIOVRA CGF using Libraries and Effective Paradigms in order to guarantee Accreditation, Effectiveness and Usability of PIOVRA developments**

Project: POWERS

(Psychological Operations and Weapons: Evaluation by Robust Simulation)

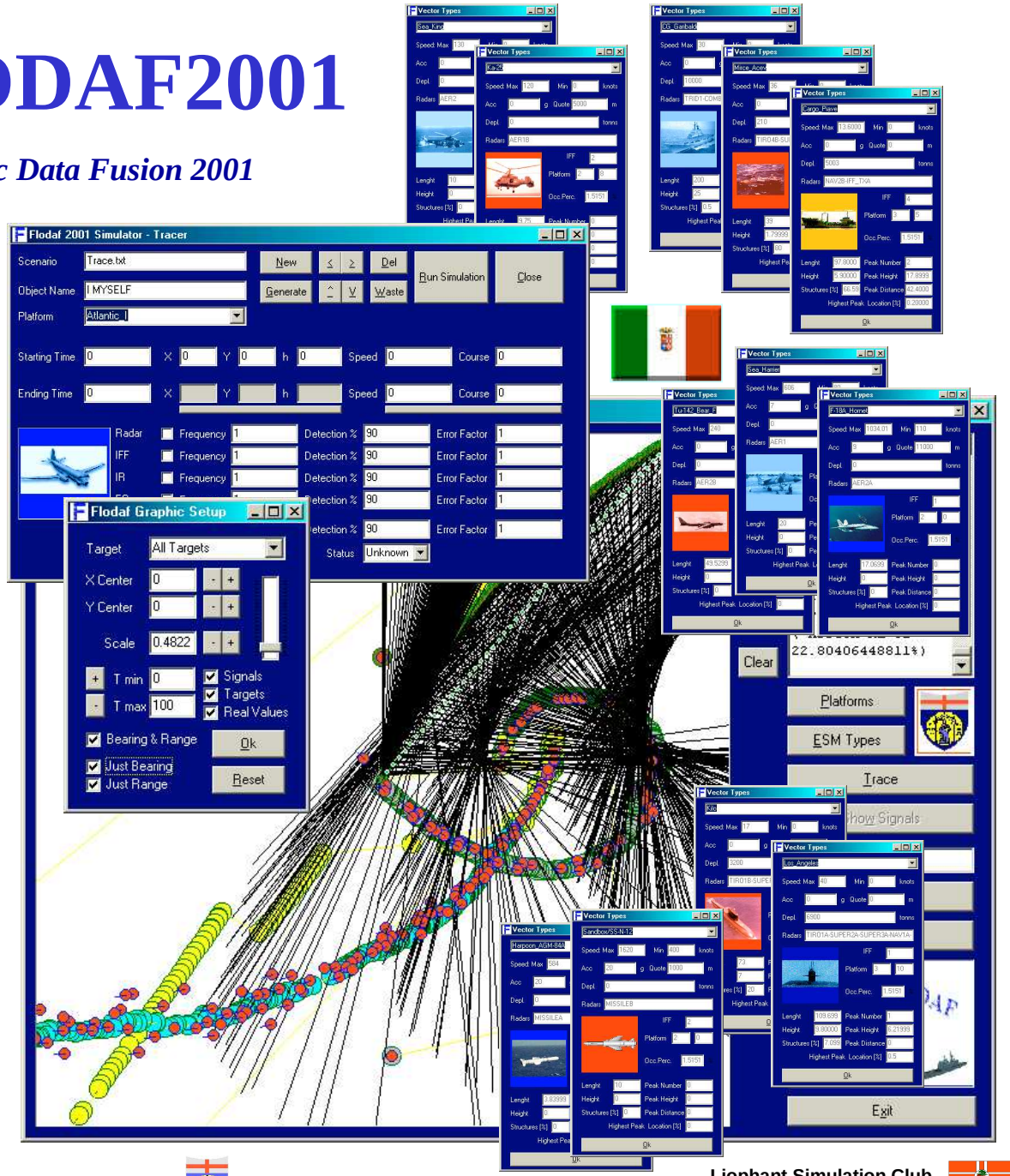
POWERS is a Project joining Italy, France and Turkey under an EUCLID CEPA11 Program

- **The POWERS project aim is to develop an innovative Simulator of PSYOPS (Psychological Operations) able to evaluate their effectiveness and consequences. POWERS is based on HLA (High Level Architecture) as framework for the model in order to guarantee the usability in HLA Federations and wargames.**
- **POWERS includes a stochastic simulator that reproduces PSYOPS by using AI (Artificial Intelligence) and integrating different models allowing to estimate the range of alternatives, so it becomes a DSS (Decision Support System) for evaluating the risks connected with PSYOPS in complex scenarios.**
- **POWERS creates a library of dynamics models for estimating the impact of the PSYOPS in different frameworks while POWERS Simulator provides estimation of the different possible scenario evolutions considering the stochastic factors.**
- **POWERS applies an advanced integration of methodologies based on AI in order to support the PSYOPS knowledge management; Fuzzy Logic is extensively applied for providing both understandable models and correct behaviour representation. The complex nature of the results provided by PSYOPS requires special analysis: for this reason POWERS uses Artificial Neural Networks as support for identification and correlation between causes and effects.**

Project: FLODAF2001

Fuzzy Logic Data Fusion 2001

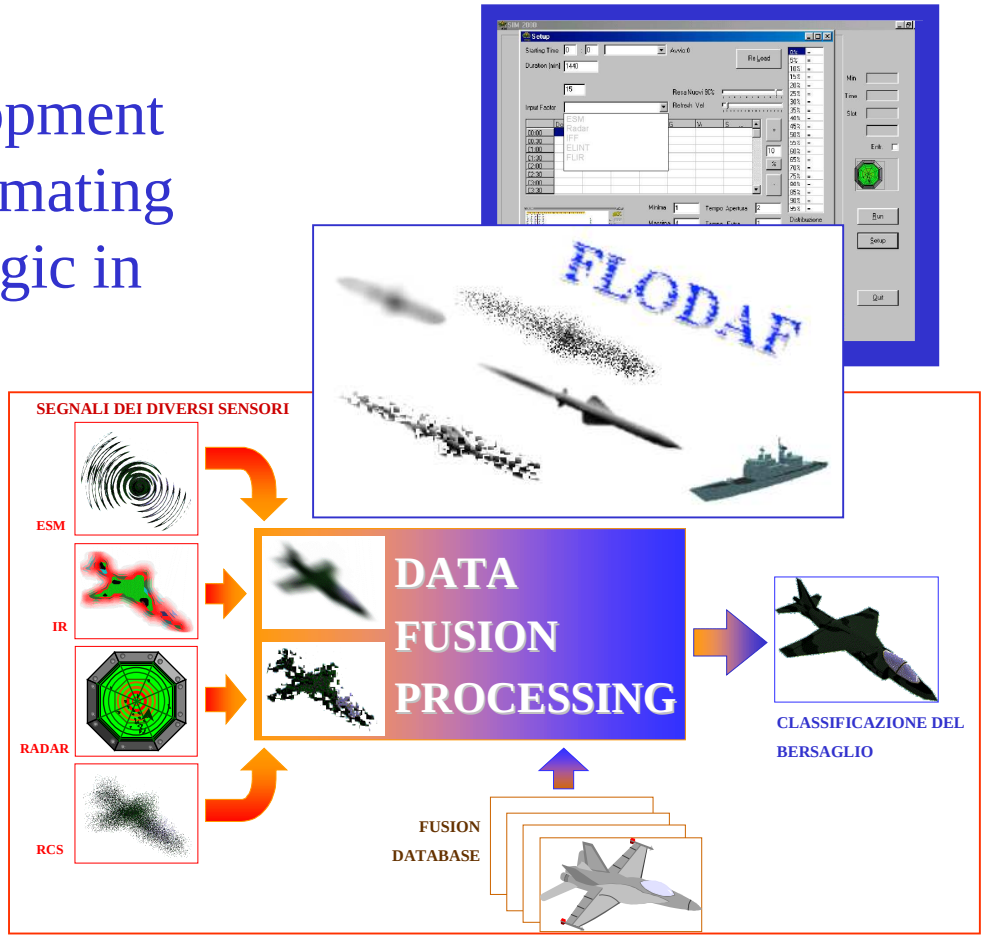
FLODAF 2001 is an evolution of FLODAF project; this suite includes a Scenario Generator and a Simulator for analyzing the Data Fusion performances over complex Air-Naval scenarios including ships, submarines, missiles, airplanes and helicopters.



Project: FLODAF

Fuzzy Logic Data Fusion

FLODAF involves the development of a Virtual Prototype for estimating the effectiveness of Fuzzy Logic in Data Fusion.
FLODAF focuses on Naval Sensors Applications involving Data Fusion of ESM, Radar, IFF and IR/EO for both surface and air detection, classification and identification.



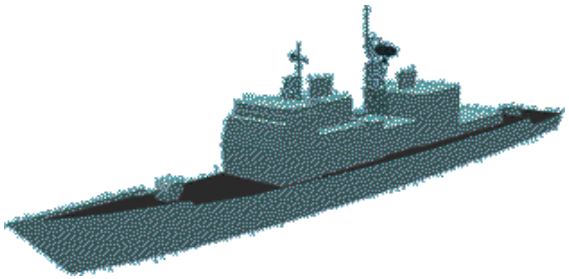
Project: WSS&S

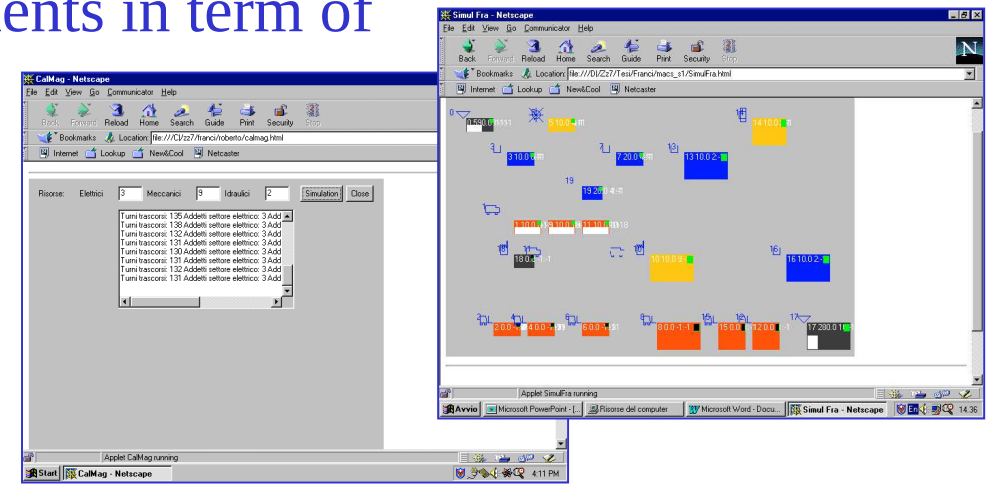
Weapon System Service & Simulation

This Simulator is devoted to re-engineer Weapon System Logistics and Service.

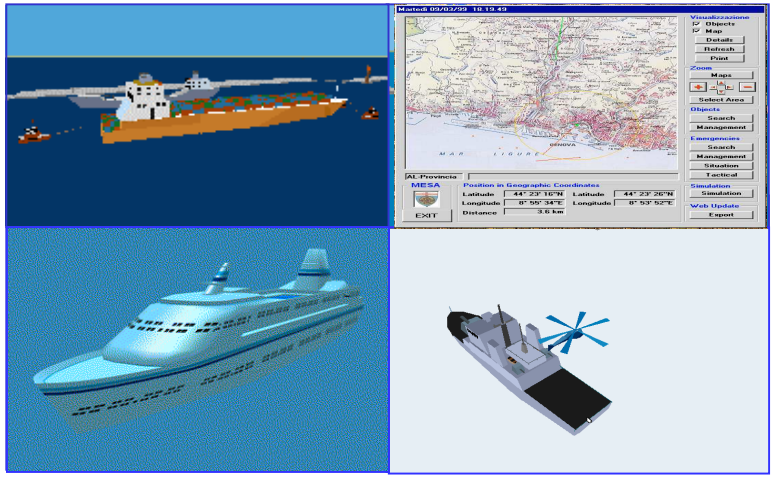
The Simulator is operating in Taranto Base to support the service planning of Torpedo, Missile, Rocket Launchers and Naval Gun Systems.

The simulator is a web-based stochastic simulator and supports the concurrent service management; the model is object-oriented and the implementation allows to operate directly with regular browsers without any special requirements in term of platform or plug-ins..





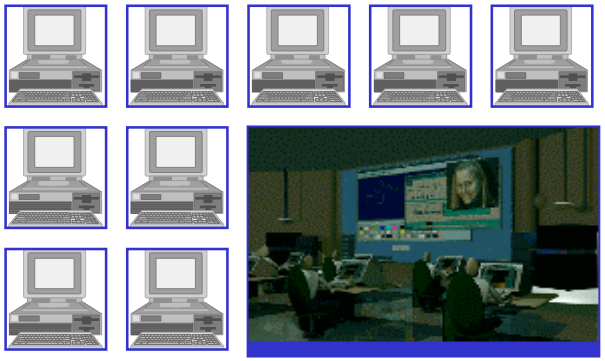
Distributed Virtual Maritime Environment

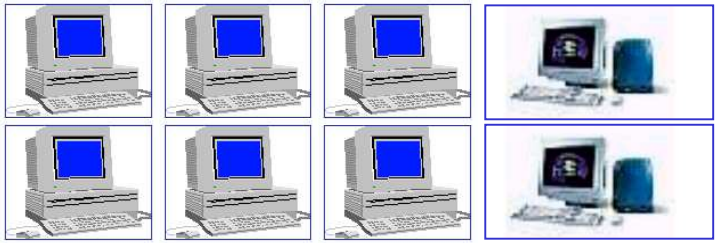


DIS
HLA

Procedure Design, Risk Analysis, Re-Engineering and Distributed Training

C/C++
Java





Distributed, Cooperative Planning and Management

Distributed Operation Control

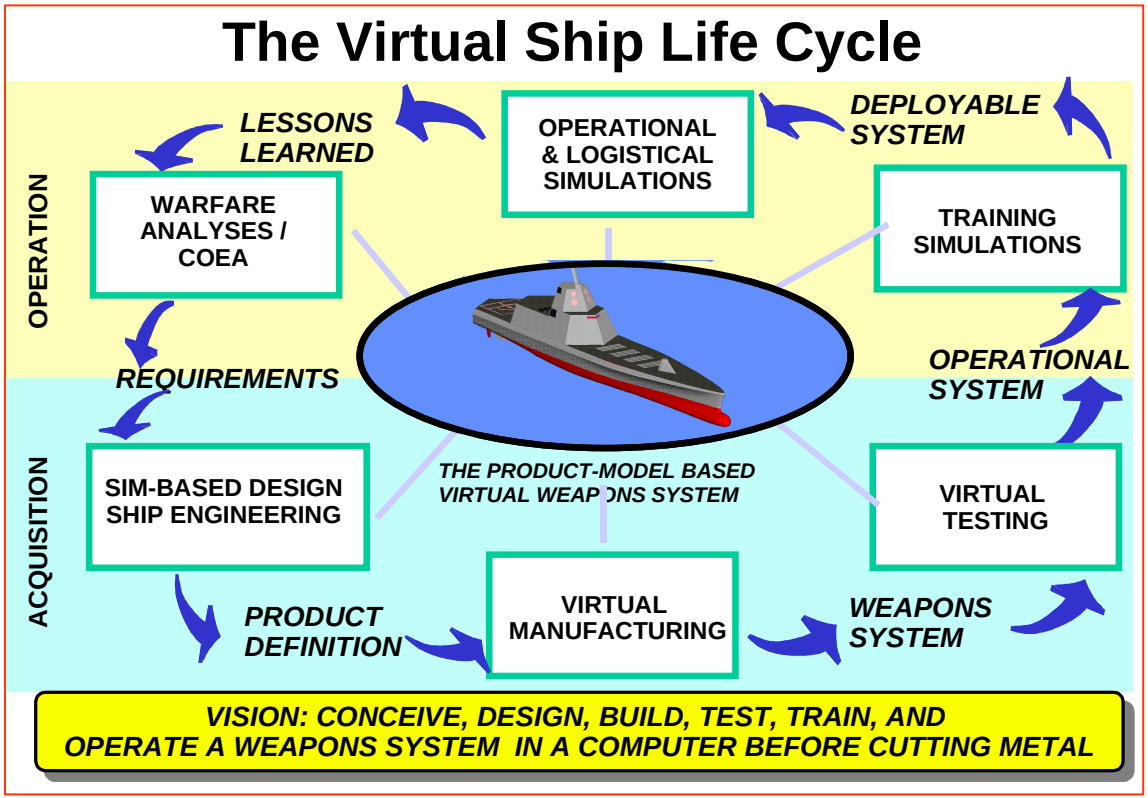
A Platform Independent Distributed Environment for Maritime Applications

Project: NIAG SG-60

Simulation Based Design And Virtual Prototyping (SBD & VP)

The NIAG SG-60 is devoted to evaluating the effectiveness of SBDVP on Ship Design

The results of the SG60 Study include analysis of Virtual Prototype VV&A procedures, Simulation Based Acquisition impact in terms of saving, costs, resources

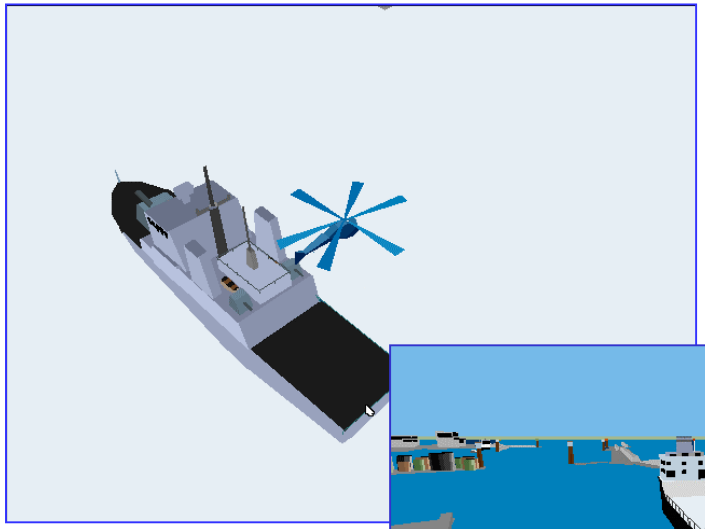


Project: SAFETY FIRST

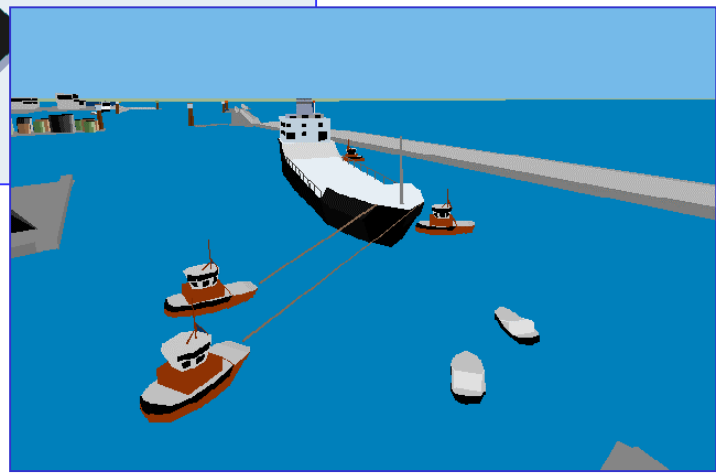
Training & Design for Ship Handling

The simulator includes a complete virtual reproduction of Genoa Harbor and it's devoted to the design and training of Harbor Technical Services Operators (Pilots, Tugs & Boat Men)

This simulation system is designed in order to be portable for cooperative training on web server just using regular browser with specific plug-in.



Developed in 1996

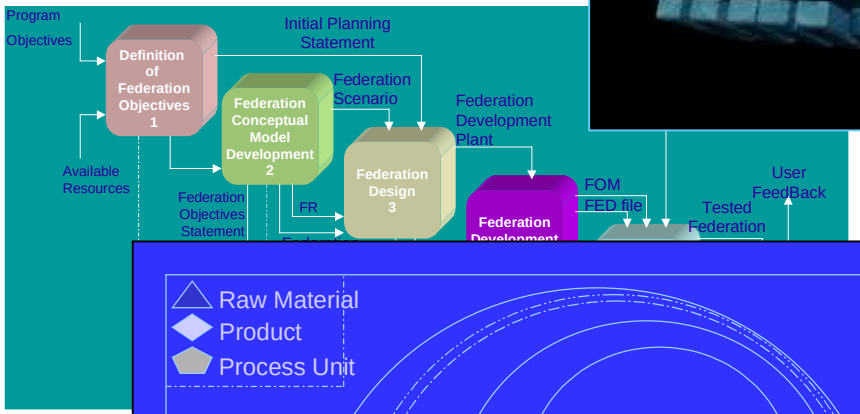


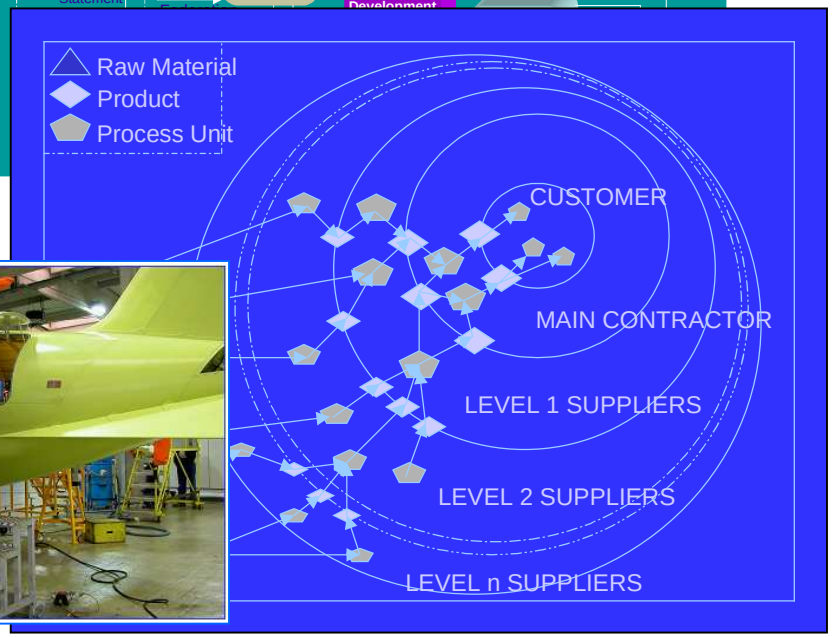
- *Full Interactive Real-Time for Training*
- *Faster than Reality for Procedure Design*
- *Virtual Environment of Genoa Port on a PC*

Project: WILD

Web Integrated Logistics Designer

The WILD project involves the development of a Federation composed by Simulators, Scheduling Systems and ERP.



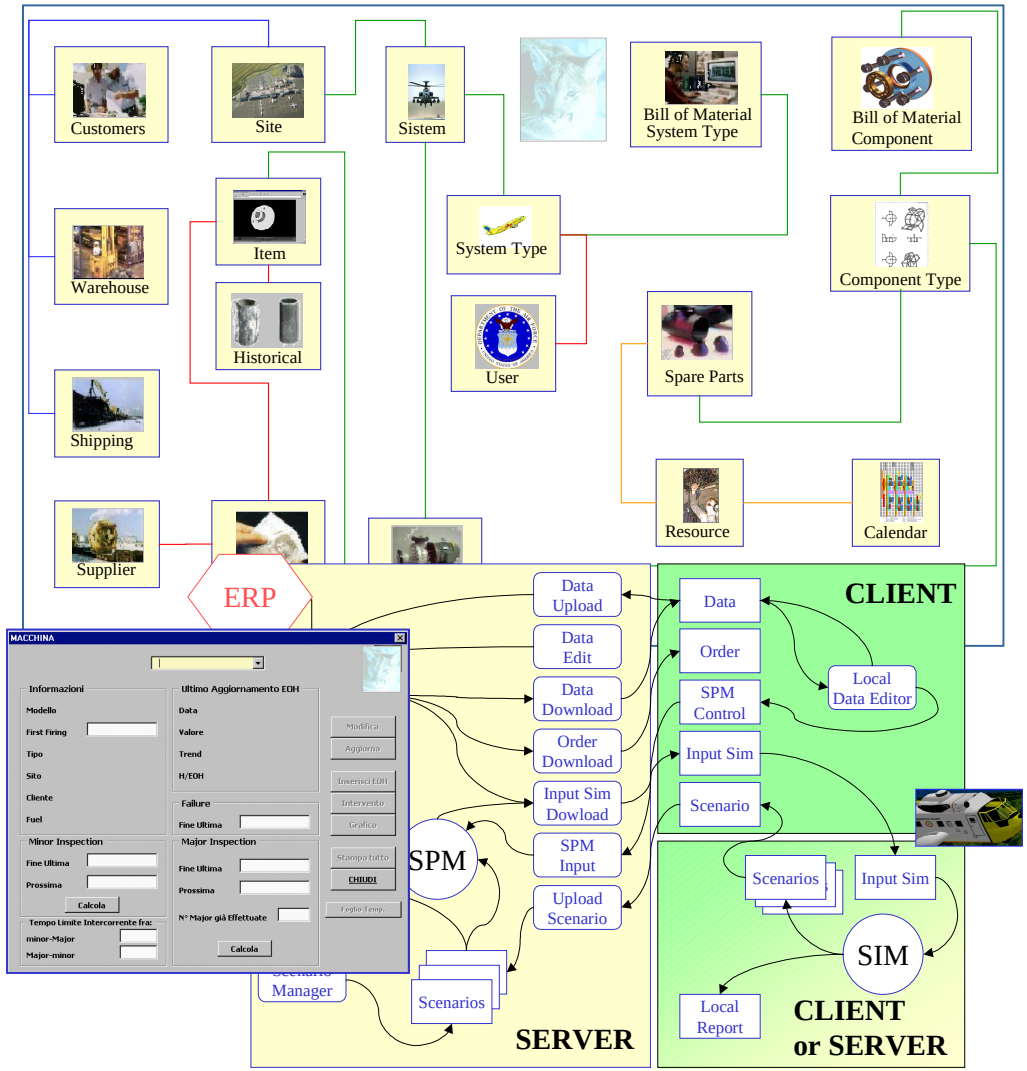


WILD Federation reproduces the supply chain and supports on-line distributed management and control among customers, main contractors, suppliers

Project: COUGAR

Controller & Organizer for Ultimate Government of Availability and Reliability

COUGAR is the innovative system for the Service and Maintenance of complex systems (i.e. Helicopters).
The system is designed to satisfy the requirements connected with the maintenance management of helicopters taking care of both pre-planned and emergency actions.



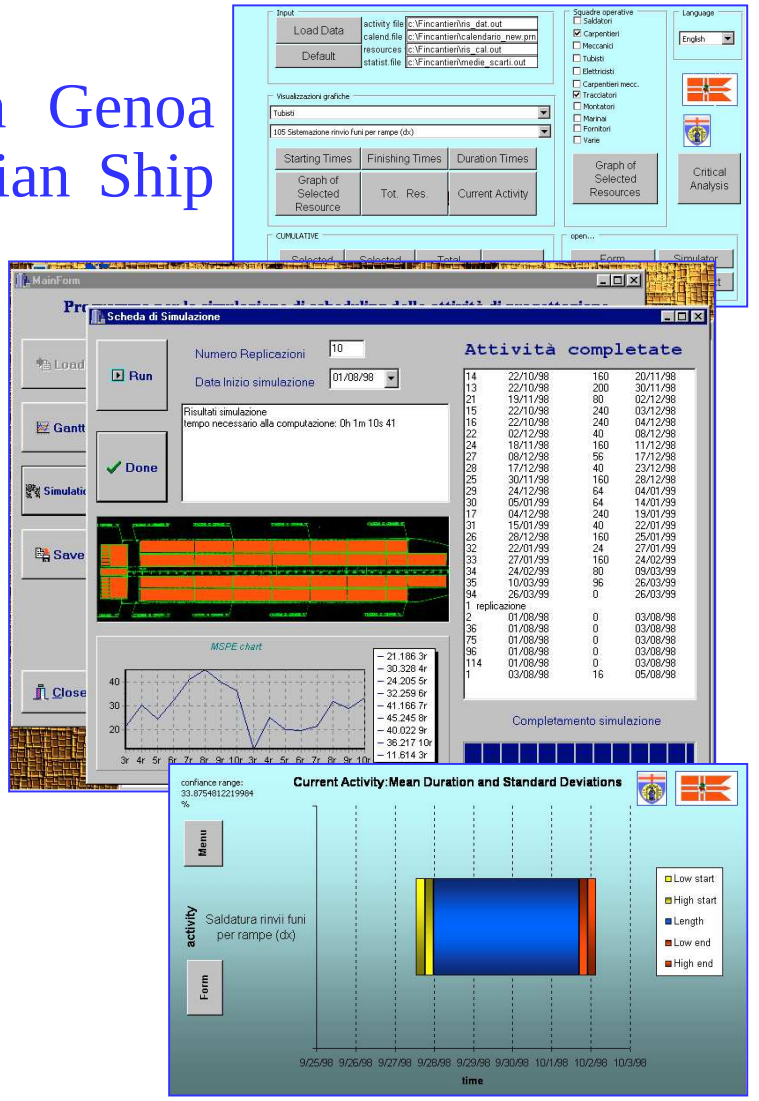
Project: ProSim 2000

Project Management Simulation System

The project is a joint venture between Genoa University and Fincantieri, the major Italian Ship Yard Construction Company.

The project was tested in relation to their new generation of commercial ships: fast ferries for the car deck systems involving impact of R&D and prototyping issues.

ProSim has been already successfully applied to traditional ship construction problems for military ships and now is fully integrated with existing Project Management Software



Project: SIREN
Professional Courses

The professional courses have been organized since 2000 for WorldWide professionists, in Italian, French and English, focusing on the following subjects:

- PM: Project Management in M&S Projects
- M&S: Modeling & Simulation
- HLA: High Level Architecture
- VV&A: Verification, Validation and Accreditation

The courses include lecturing and exercises; teachers are world-wide experts from major execellence centers (i.e. Boston College, Genoa University, NASA, DMSO, National Center for Simulation, SAIC, Aegis Technologies, California State University, Riga TU, UCF, McLeod Institute of Simulation Science).

Simulation Technology Transfer

Since 2000 MISS-DIP organises Simulation Professional Courses:

- **Project Management**
- **Modelling & Simulation**
- **High Level Architecture**
- **Verification, Validation & Accreditation**

The Lecturers included experts from major excellence centres (i.e. Boston College, University of Genoa, NASA, DMSO, National Center for Simulation, SAIC, Aegis , California State University., Riga TU, UCF , McLeod Institute of Simulation Science).

The course attendance (PM ~60, M&S 15, HLA 20, VV&A 10) included Companies (i.e. Piaggio Aero Industries, Alenia Aeronautica, Alenia Marconi, SIA, Fincantieri, COOP) and Academia (Pol.Torino, TU Delft, Univ.Marseille, Pol.Milano, Univ.Firenze, Univ.Bari, Univ.L'Aquila, etc.).

Course Location

Lecturing

Team Working & Exercises

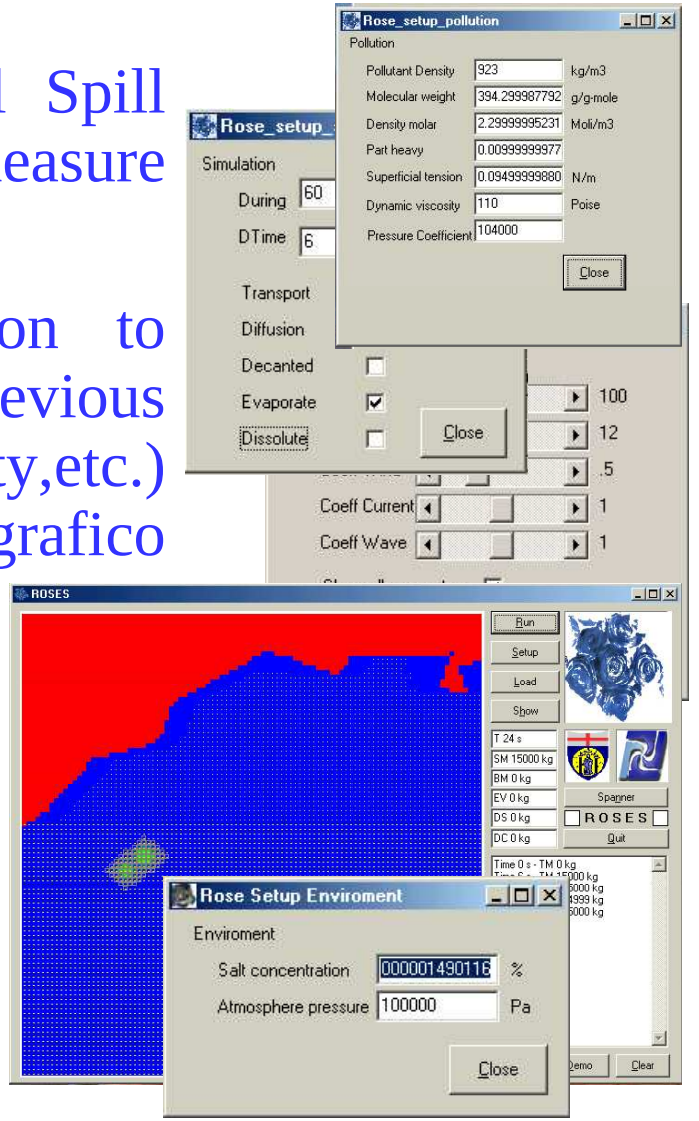
Project: ROSES

Reaction to Oil Spill Emergency and Simulation

The project is deveoted to create an Oil Spill Simulator for CETENA including countermeasure models.

The Simulator was validated in relation to historical data available from previous cooperations (i.e. MESA, Kuwait University,etc.) and existing databases (i.e. Istituto Idrografico Italian Navy) in order to guarantee the result fidelity.

Roses reproduces both the oil spill physical phenomena and the countermeasures actions in order to provide estimations about risks, policy effectiveness and standing operating procedures.



Project: SITRANET

SImulation for TRAiniNg & Education in Transportation

SITRANET is a project sponsored by EC, devoted to creating three simulators as training equipment for crane operators based on Virtual Reality.

The Simulators includes:

- Special Crane Simulator
- Contstacker Simulator
- Truck Simulator

The project technology leadership is assumed by DIP, while the overall coordination of courses is directed by CFLI

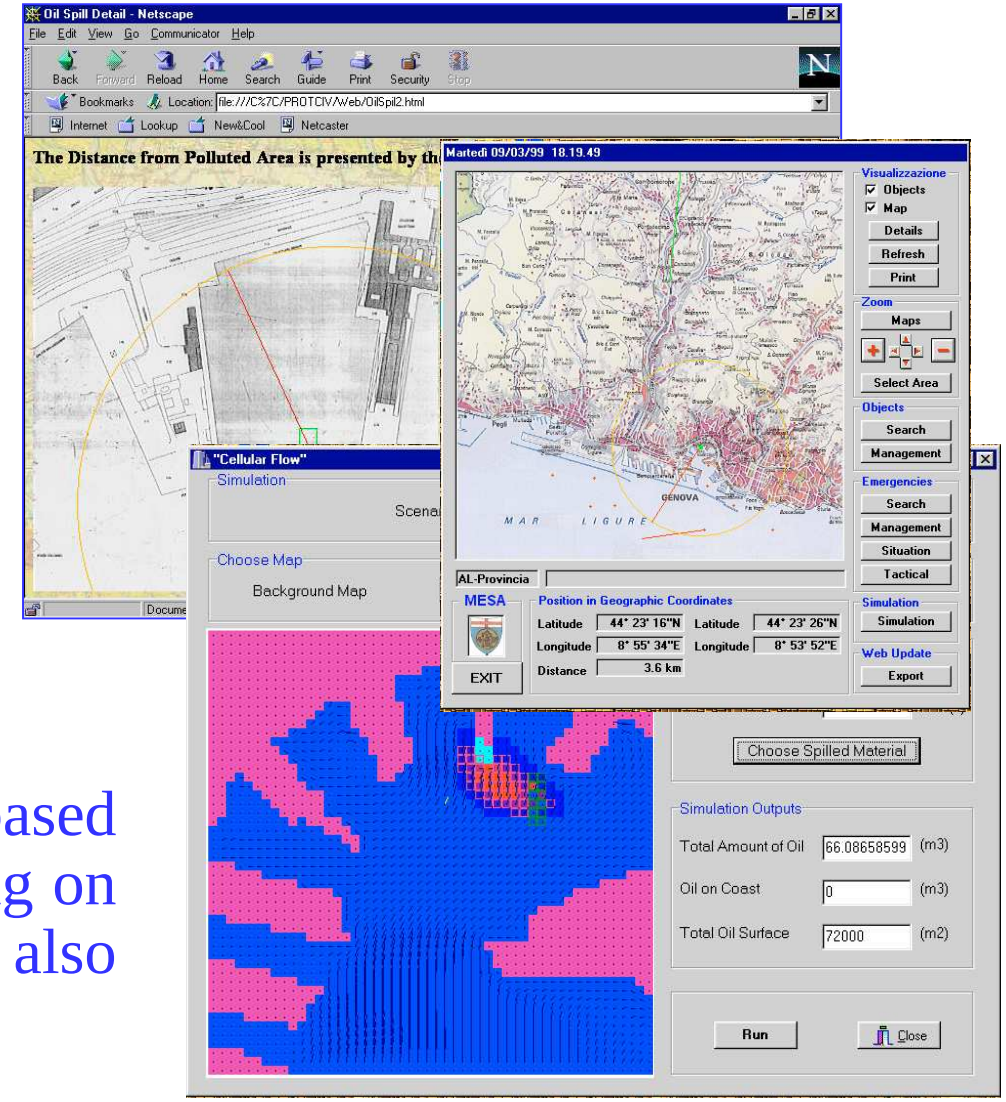
Project: MESA

Maritime Environment for Simulation & Analysis

MESA is an integrated environment to perform simulation and risk analysis in ports and maritime sector.

The package is devoted to support port organizations, entities and operators in Emergency & Environmental Management.

MESA is a modular system based on combined simulators running on PC and providing direct output also on WWW servers.

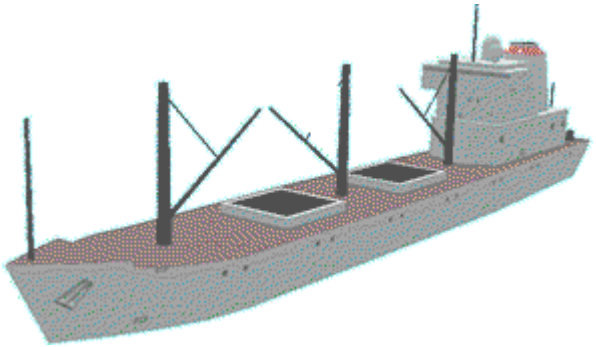


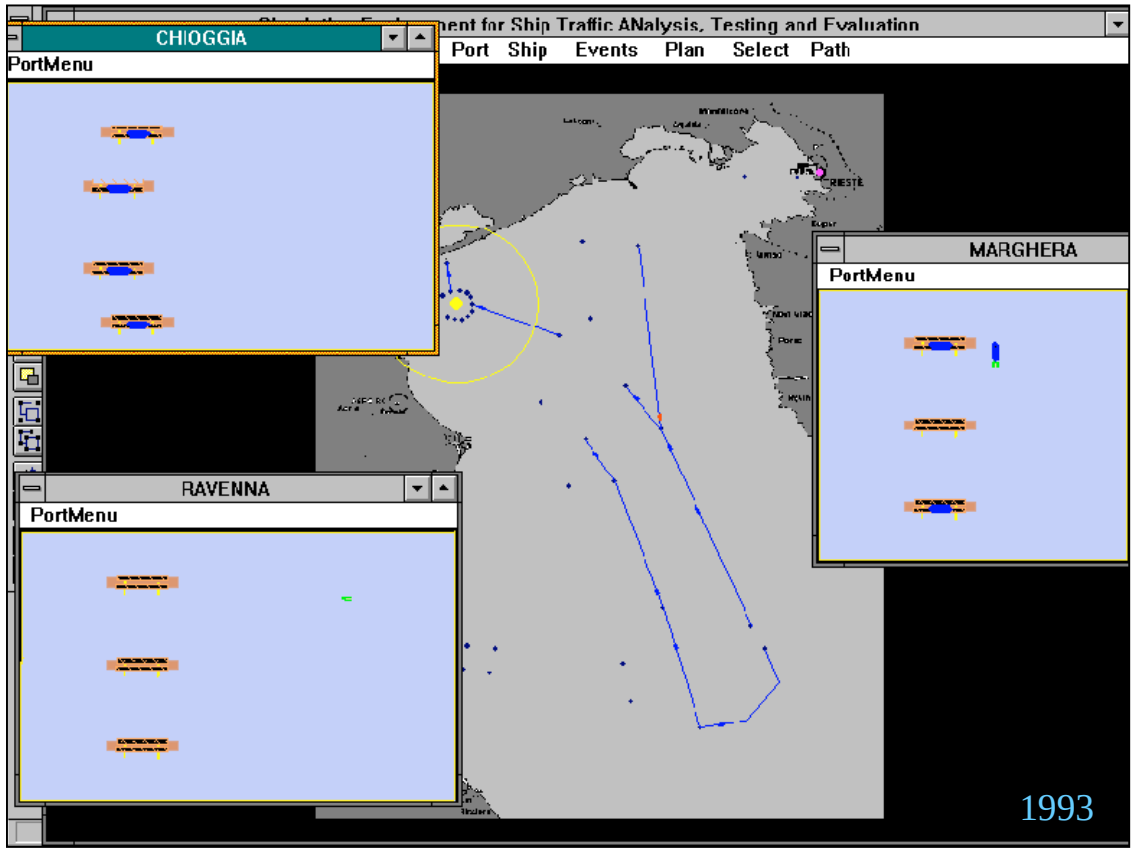
Project: SESTANTE

Simulation Environment for Ship Traffic Analysis, Testing & Evaluation

The project supports the simulation of Maritime traffic in a wide area (i.e. Mediterranean Sea) by using Object Oriented Models.

SESTANTE allows to compute the flows and delays related to strategic investments over ports or maritime lines.





Project: POSEIDON

POrt Simulation Environment for Design of Operation and Network

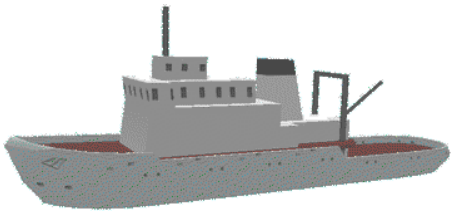
This Project involves a web based, stochastic & combined (discrete & continuous) simulator.

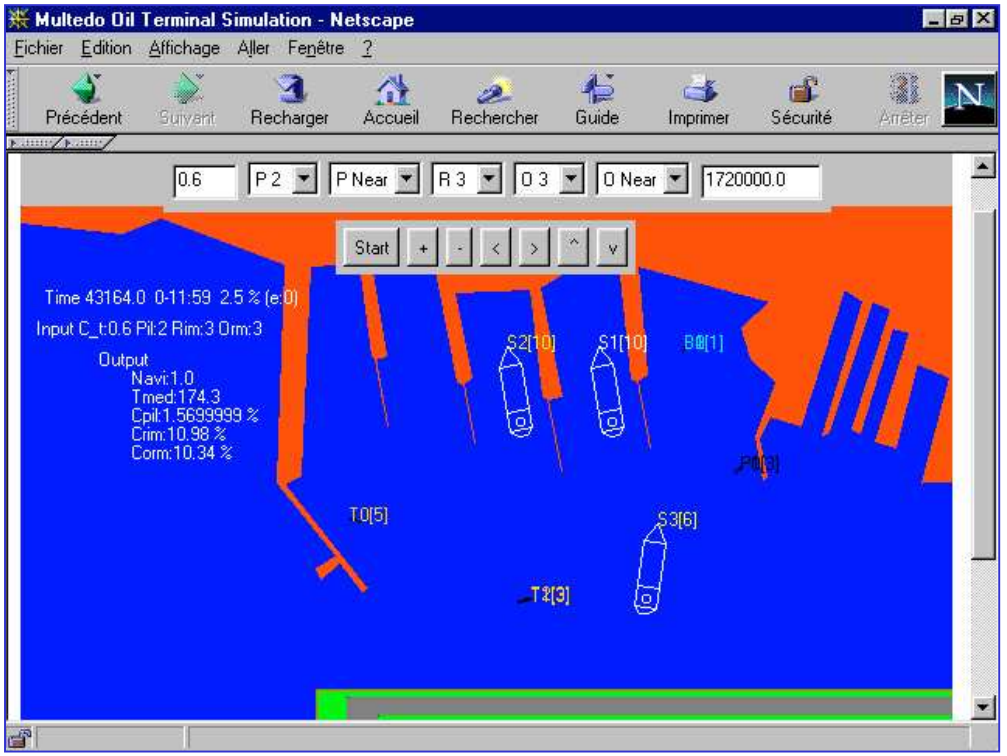
The implementation is made by using Java, the demo is available at:

http://st.itim.unige.it/liophant/projects/poseidon

Multedo Oil Terminal - Genoa

- **Vessel Traffic System**
- **Tankers**
- **Docks**
- **Pilot Boat**
- **Tugs**
- **Mooring Men Boats**



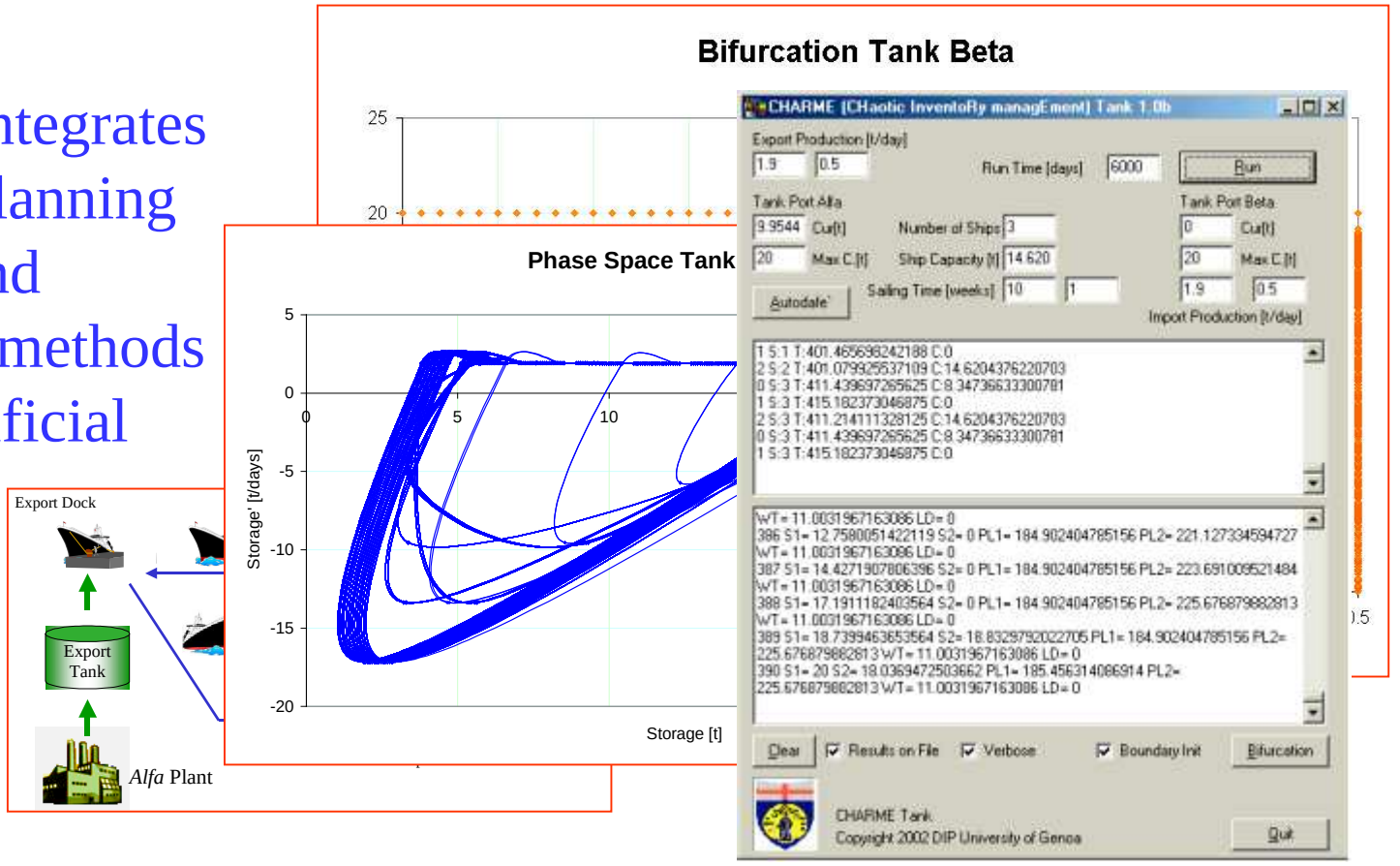


Project: LOGOS

Logistics Optimisation System

The project is devoted to optimize the fleet management of ships for chemical products in a wide geographic area.

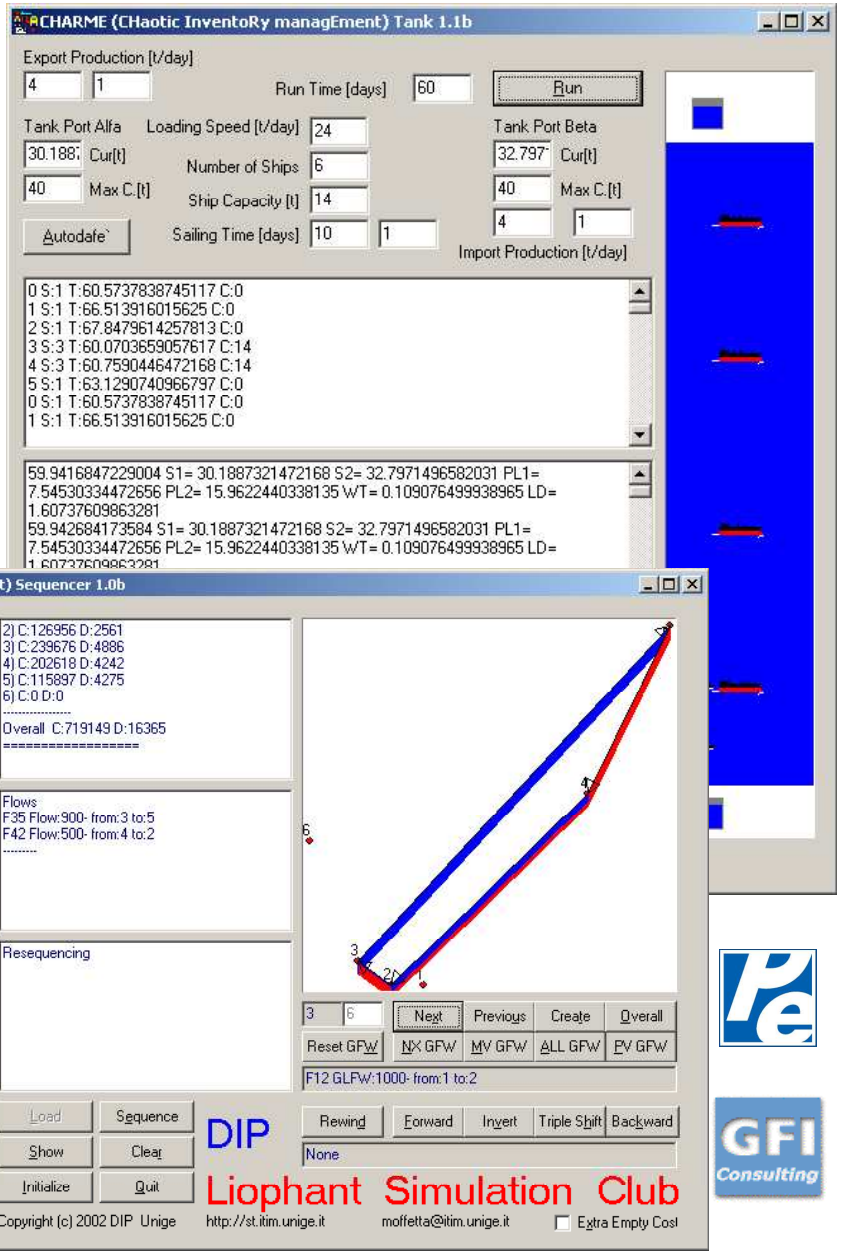
The project integrates simulation, planning scheduling and optimization methods based on Artificial Intelligence Techniques.

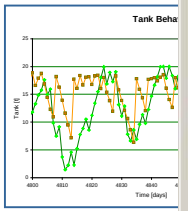


Project: CHARME

CHAotic inventoRy ManagEment

CHARME is a set of modules developed by DIP/Liophant as dynamic reference for VV&A (Verification, Validation and Accreditation) of LOGOS Decision Support System for Fleet Management (Planning, Scheduling & Simulation) in large chemical industries. CHARME uses chaos theory approach in application to real stochastic logistics networks.





Eni GROUP

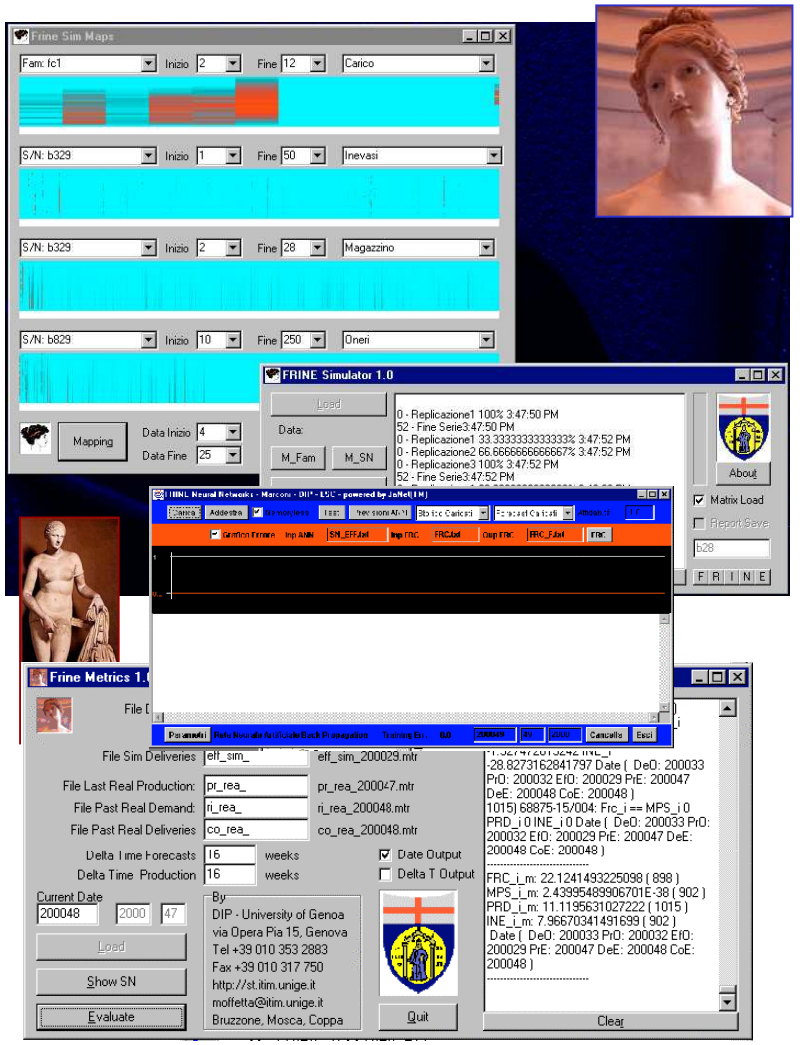
EniChem

Project: Frine

Forecasts Robust INtelligent Evaluator

FRINE is a modular approach for supporting inventory management, purchasing and outsourcing planning in telecommunication production industry.

FRINE includes: Frine Sim a detailed simulator for evaluating different scenarios, Frine ANN an intelligent forecast system based on Artificial Neural Networks and Commercial Data Fusion and a Frine Metrics for on-line performances measuring and controlling.

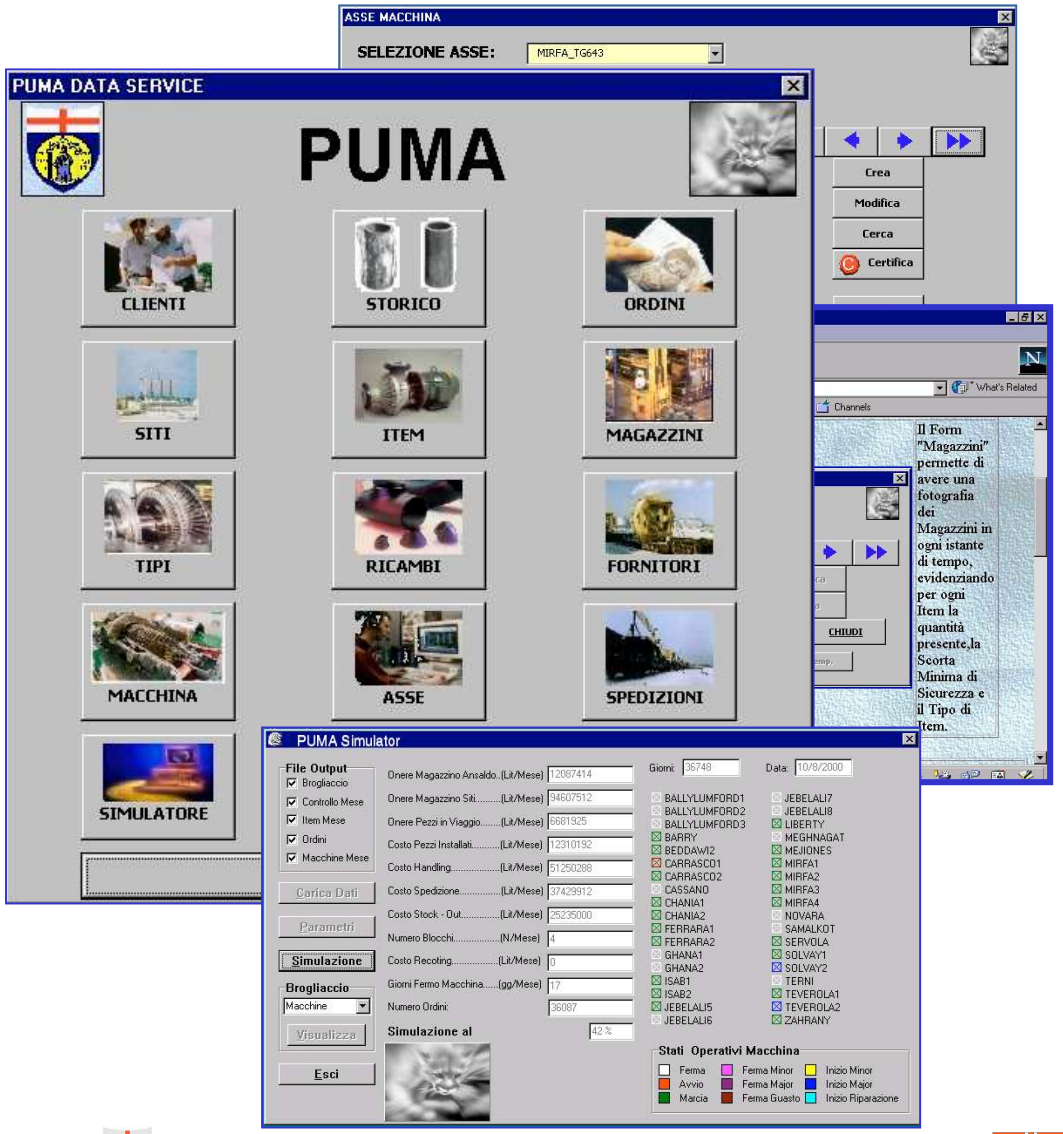


Project: PUMA

ANSALDO

Project for Ultimate Maintenance in Ansaldo

PUMA is the innovative system for re-organizing Gas Turbine Service in Ansaldo Energia.
The system allows to manage resources, spare parts, internal/external warehouses, shipping and scheduling of all the maintenance operation for over 50 power plants distributed world-wide.



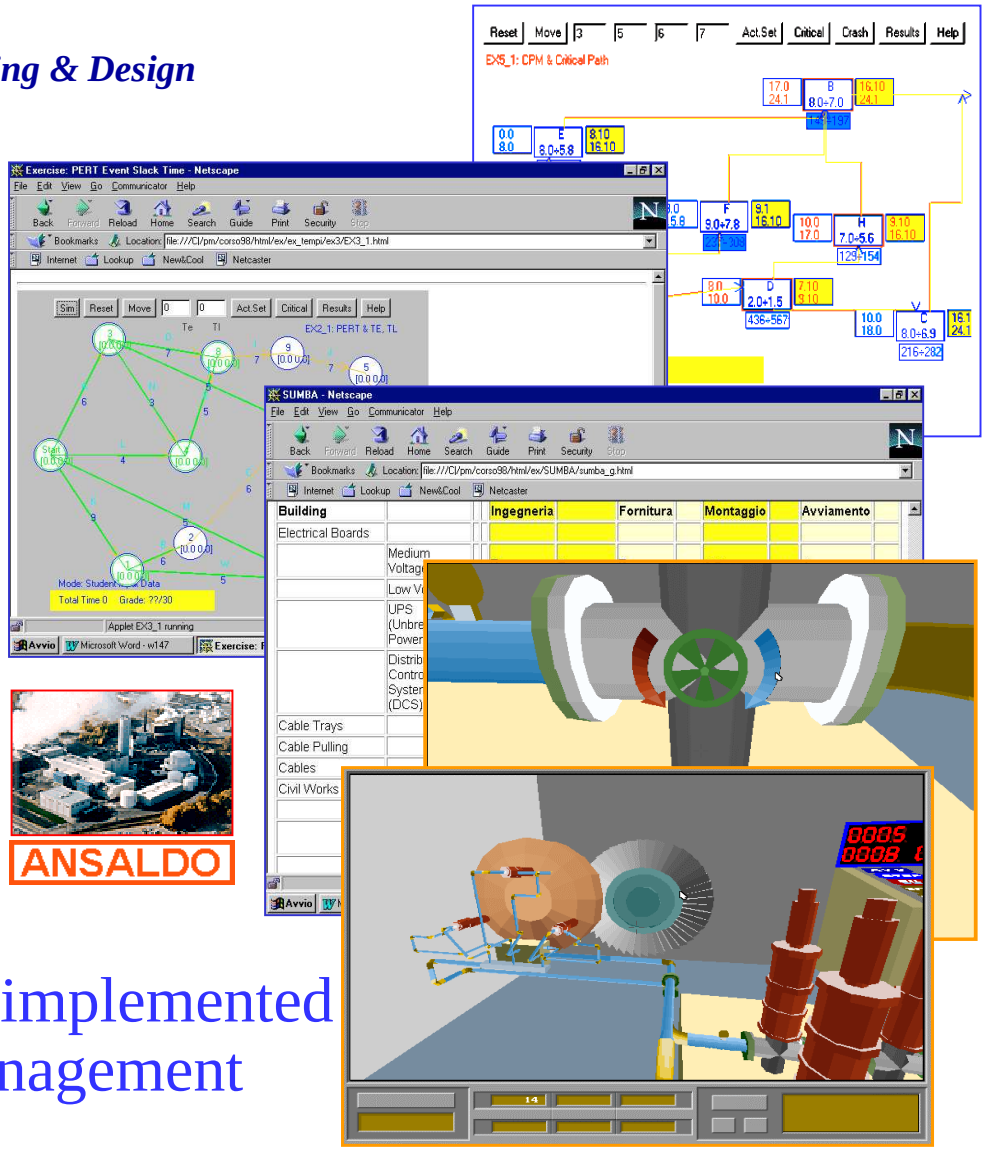
Project: VAED

Virtual Aided Engineering & Design

VAED is a joint cooperation between Genoa University and Ansaldo for the development of Distributed Synthetic Environment for Power Plant Design.

A prototype has been developed and used for supporting design of Burners, Piping, DCS of a Gas Turbine in joint project with Siemens.

A set of demonstrators has been implemented and tested to support Project Management applied to these projects.

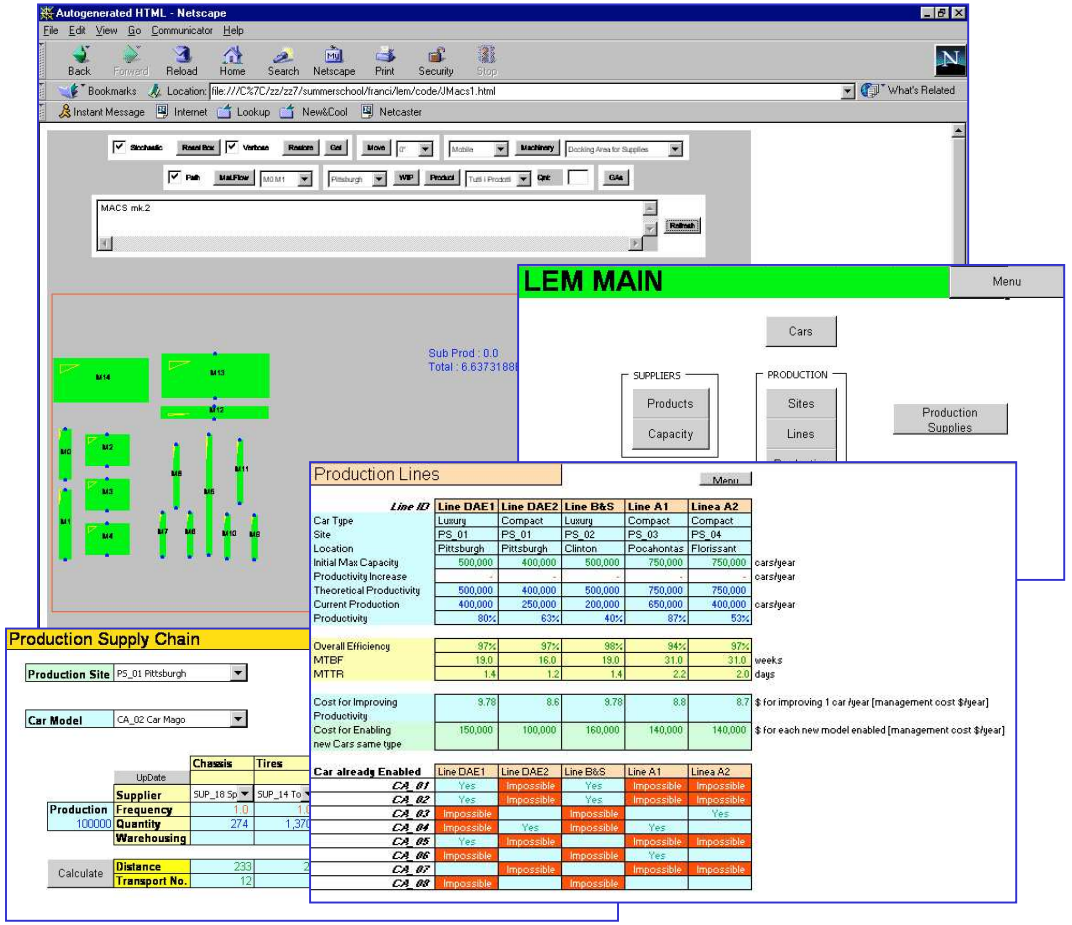


Project: LEM

Logistics Evaluation Model

LEM Project is a joint venture among Ford, Boston College, LSC & Genoa University for Developing a Web Based Support System for Supply Chain management.

Tests using LEM beta_modules have been carried out successfully on over 70 logistics centers.

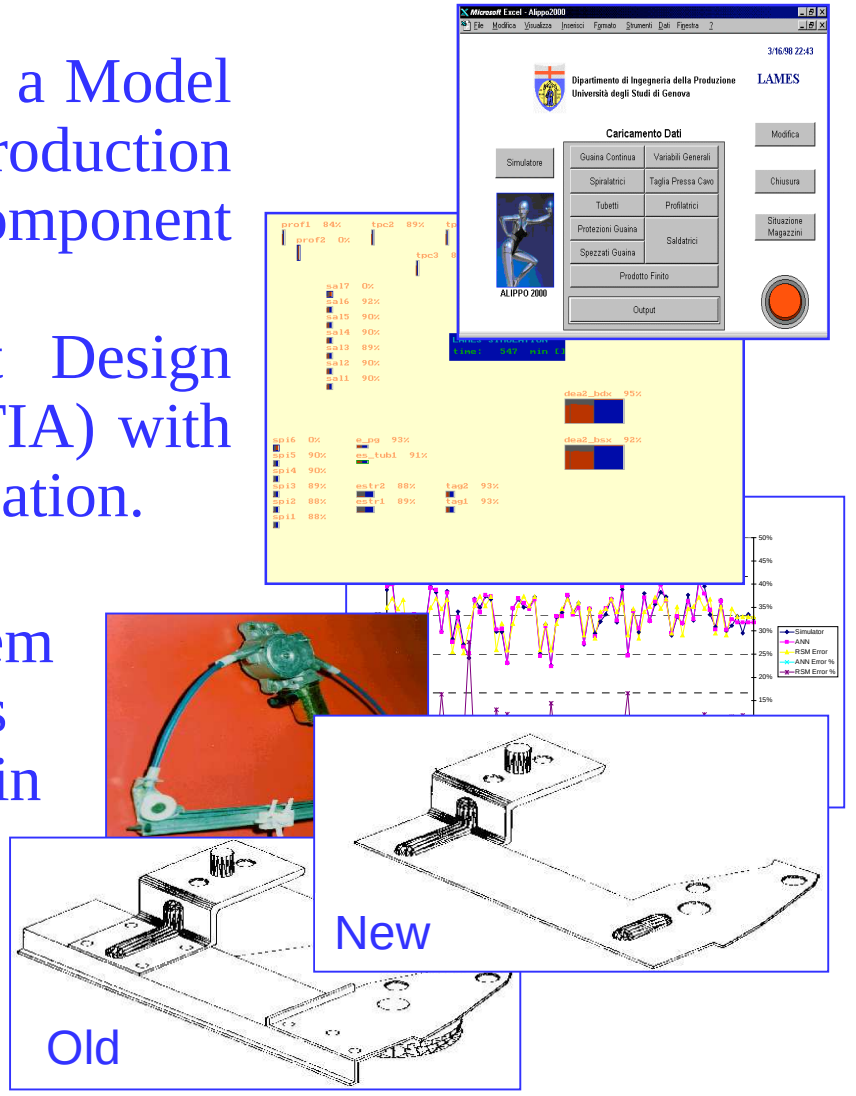


Project: Alippo 2000/2001

Virtual Prototyping for Automotive Production & Design

Alippo Project is the development of a Model for integrating Design and Production Environment in Automotive Component Industry.
The system connects the Product Design provided by CAD systems (i.e. CATIA) with the Production Processes using Simulation.

Alippo simulates the production system considering the changes and valorizes the design changes in terms of Work in Process, Warehouse Saturation, Effective Productivity etc.



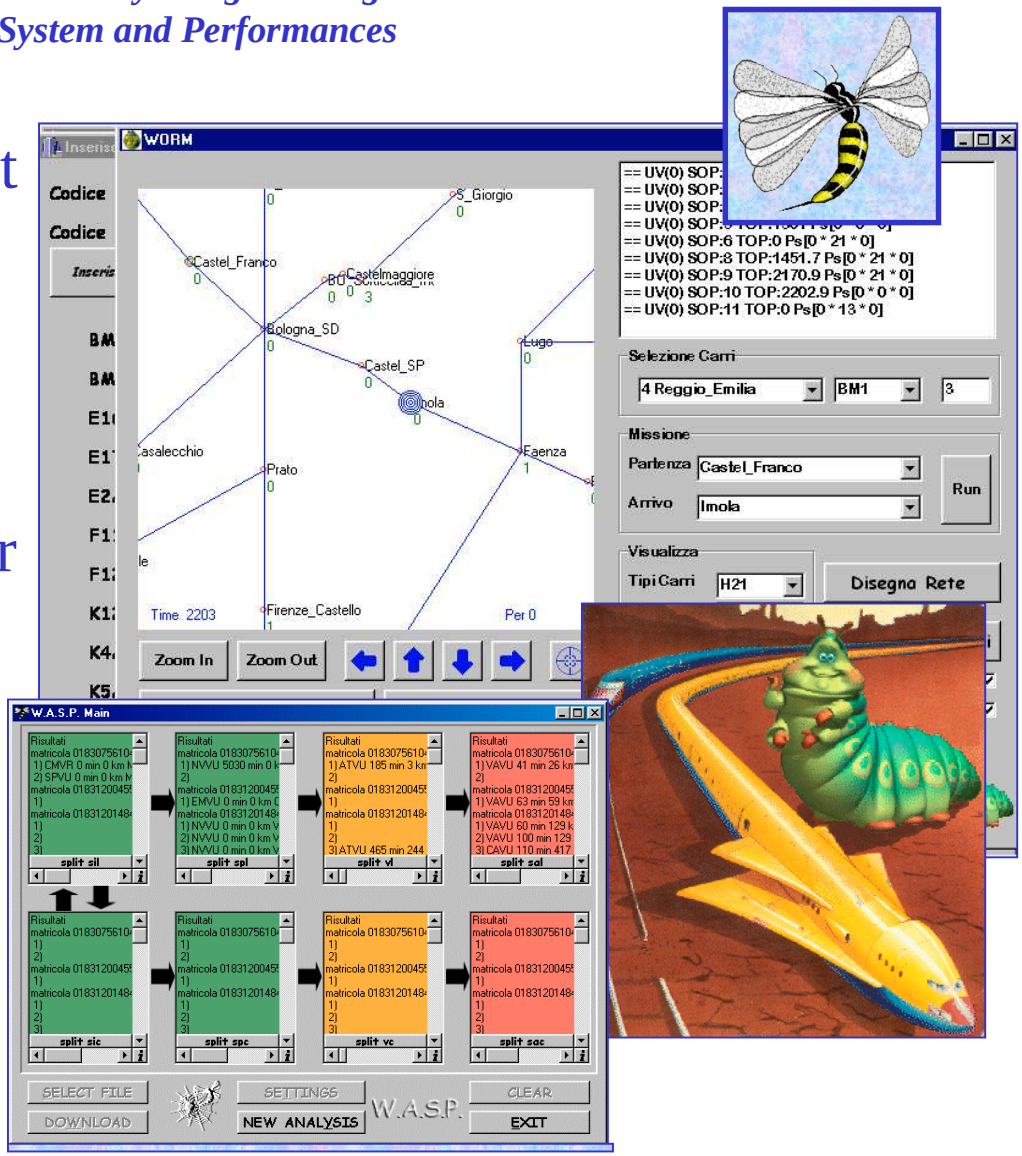
Project: WORM & WASP

Work Organization for Railways cargo Management
Wide Analysis of rail System and Performances

WORM is a simulator of freight rail operations for estimating service quality and costs.

WASP is a data mining system and smart performance analyzer directly integrated in railways information system.

WASP & WORM are integrated to operate as DSS for ASA Logistics Div. in Italian Railways



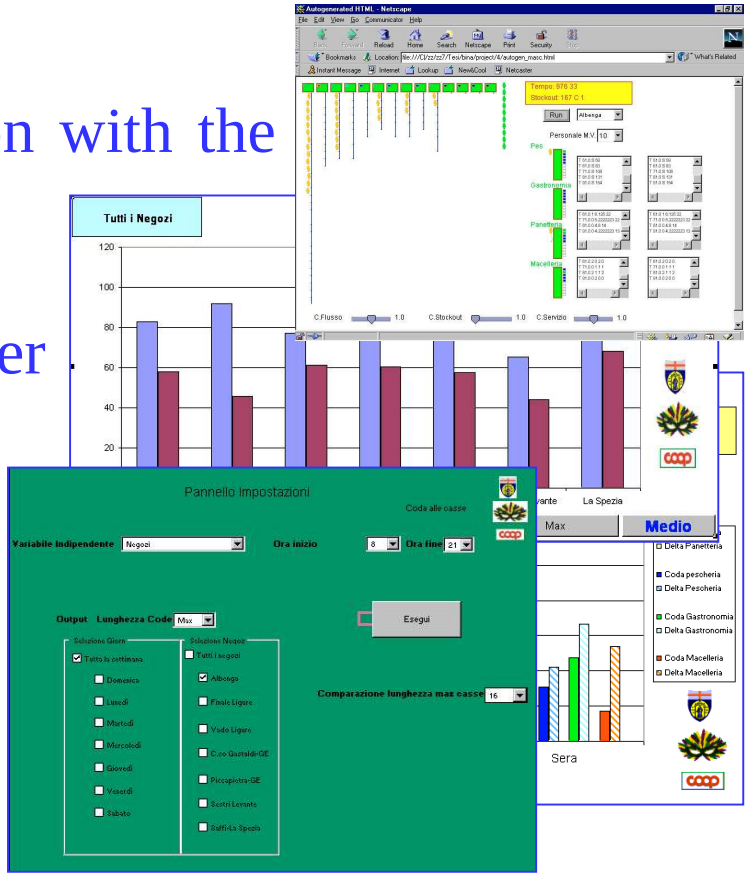
Project: MASC & DICO-SAP

Modeling & Analysis for Satisfaction of Customers
DIP-COOP SAP

MASC is a system for Statistical Analysis, Modeling & Simulation applied to big-distribution chains.

The Project is carried out in cooperation with the major Italian company in this area

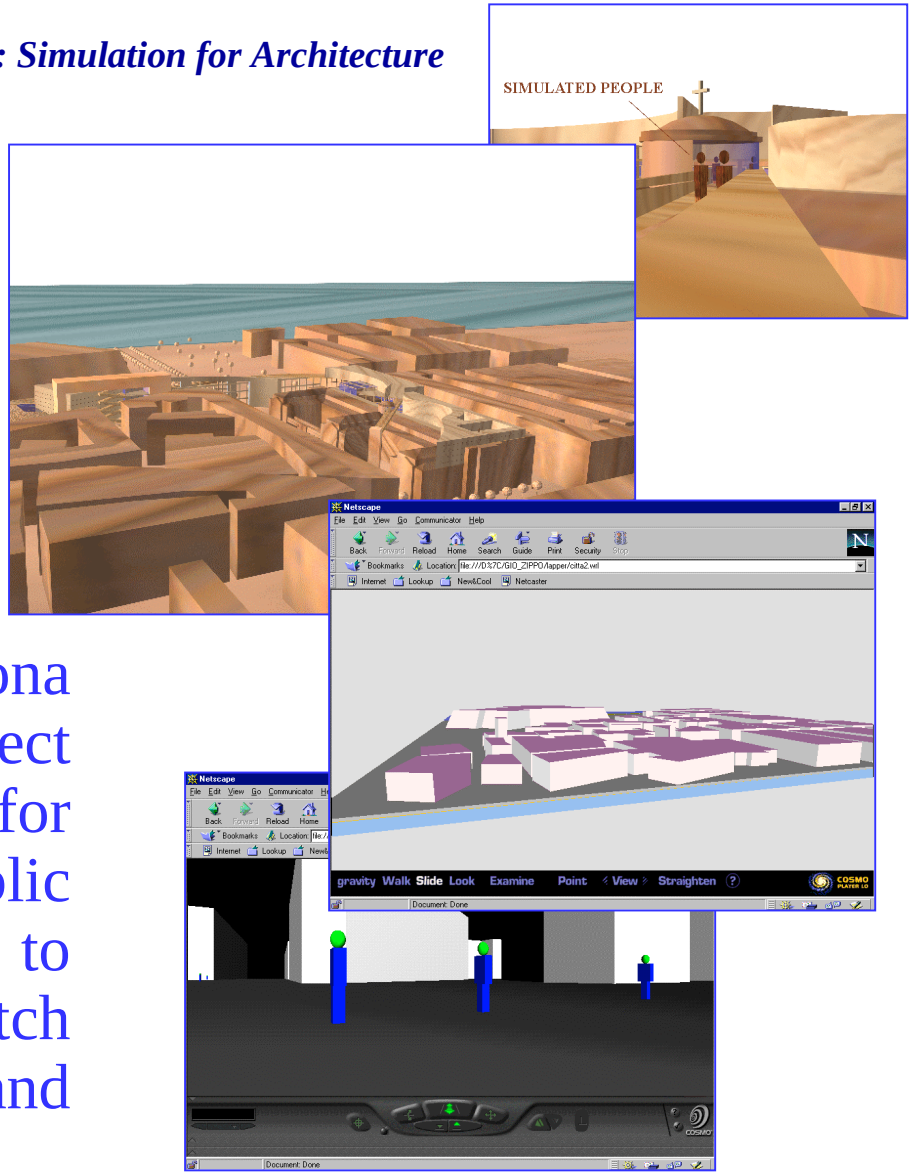
The final target is to improve the customer satisfaction acting on policies, operating procedures, resources & equipment; the system is fully integrated with company ERP (SAP R/3) and benefits of similar experiences carried out other companies (i.e. Genoa Mass Transportation Company).



Project: San Paolo 2000

San Paolo Hospital in Savona: Simulation for Architecture

San Paolo 2000 is the integration of simulation with architectural techniques for functional design and analysis of urban areas and buildings.



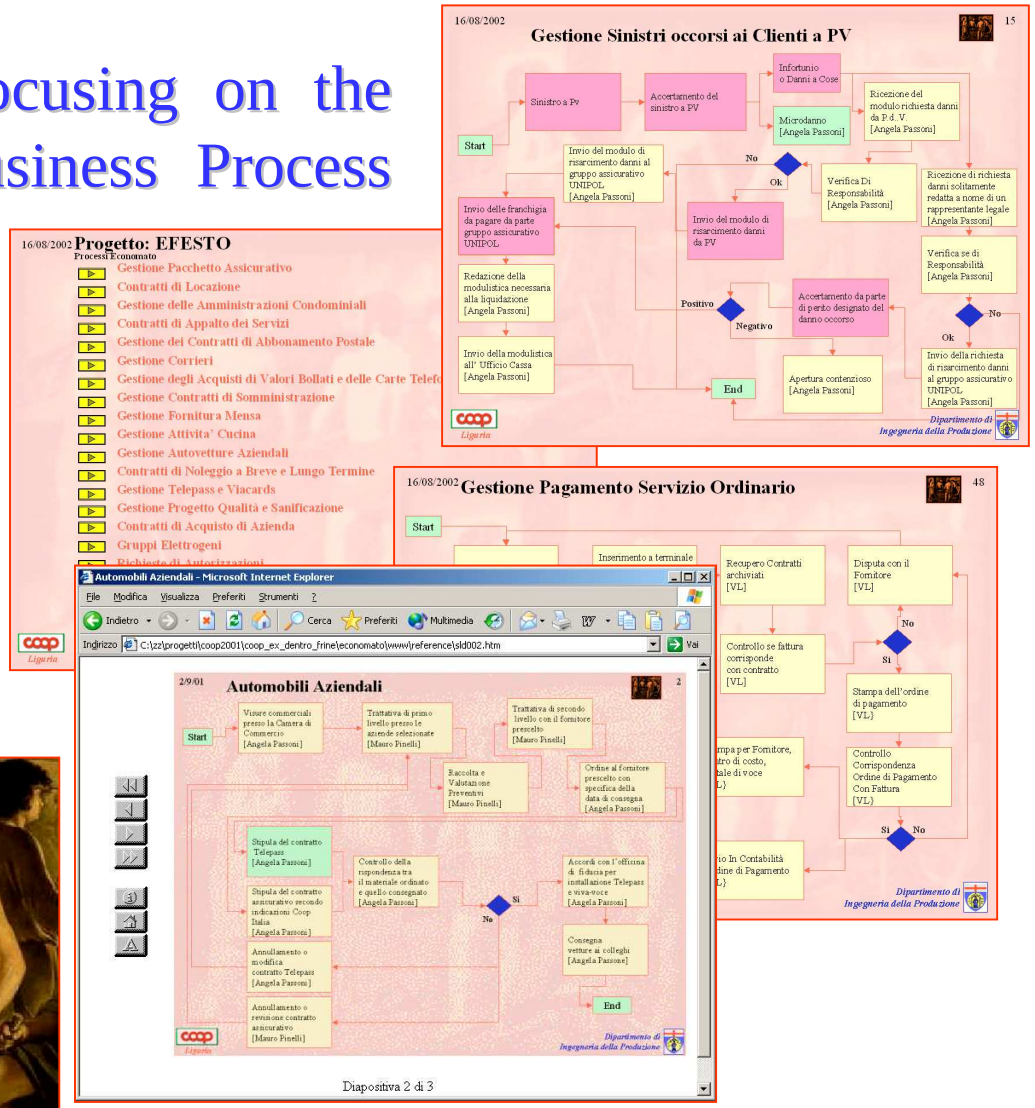
The system reproduce the Savona Downtown with the restoring project of this building using VRML 2.0 for exploitation of the results in the public community by WWW; it's possible to navigate in the scenario and to watch the interactions of simulated cars and people

Project: EFESTO

Liguria

Elaborazione Flussi Economato Sistemi, Tecniche & Organizzazione

The EFESTO project is focusing on the creation of models for Business Process Re-Engineering integrating simulation techniques.
The system allows to integrate PowerPoint™, Access™ and Excel™ with simulation and to distributed the results directly in HTML format in Intranet managing hierarchical process structure.

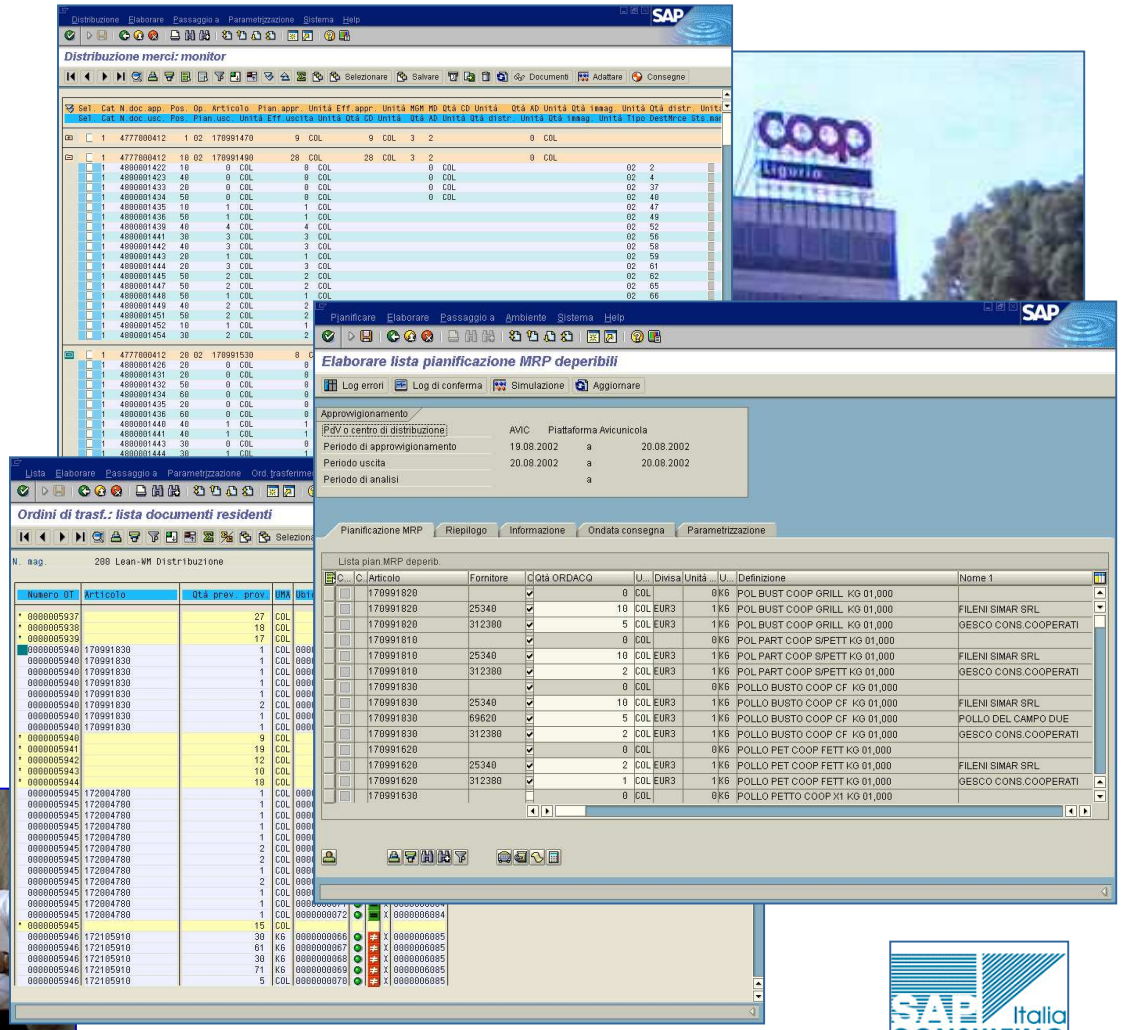


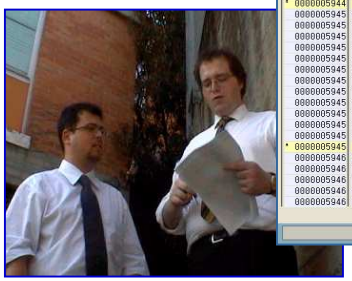
Project: AVICUNICOLO

Liguria

Project for Logistic Platform devoted to White Meat Fresh Products

The project is devoted to the architecture definition, system development and testing for a new logistics platform integrated in a large supermarket supply chain. The system was implemented in SAP R/3 Retail 4.6tm





SAP Italia CONSULTING

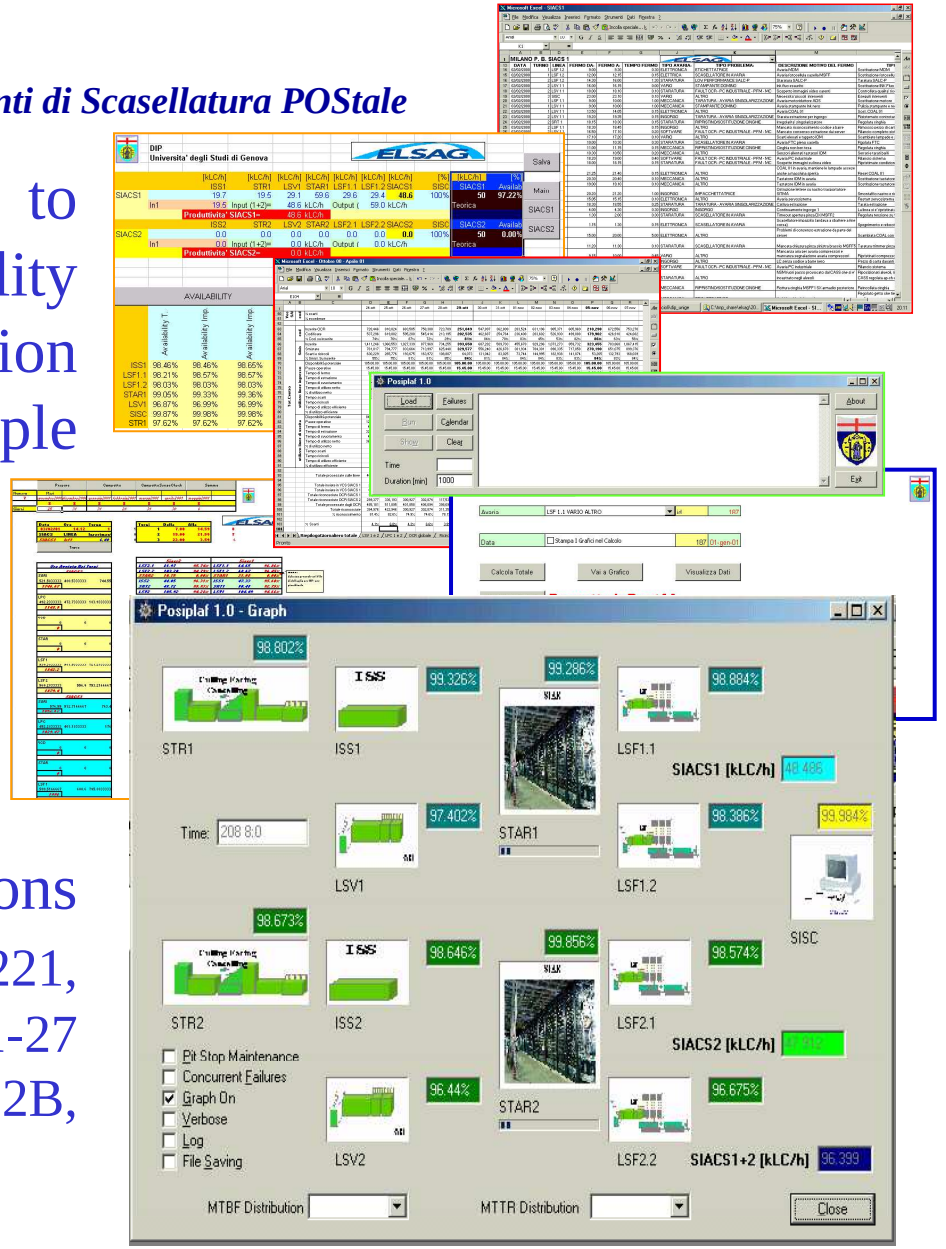
Project: DISPOS

Disponibilità di Impianti di Scasellatura POStale

DISPOS is a suite devoted to certify availability and reliability in complex postal Production Lines characterized by multiple operative configuration.

DISPOS integrates historical data with *a priori* analysis based on simulation.

The systems include references to the international regulations (i.e. CQA UNI 9910, FEM 9.221, NASA TM4628A, DR01-3 DR01-27 NASA LeRC r4, MIL-STD-1388-2B, MIL-STD-49506)



Project: HOSSIAN

Hospital Simulation Analyzer

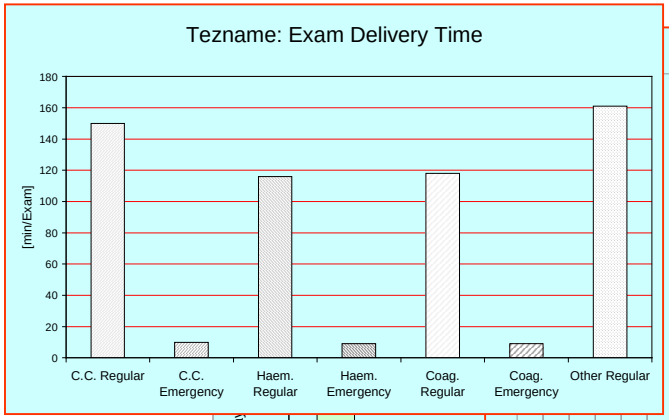
HOSSIAN is a tool developed to support resource planning in Hospital by integrating simulation and AI (Artificial Intelligence). The system has been successfully applied to the personnel and equipment scheduling in a Surgery Division composed by 6 operative rooms.

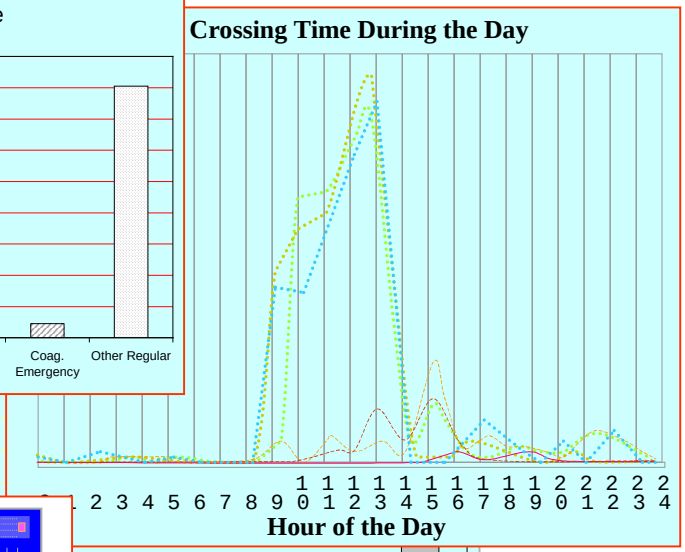
Project: TEZNAME

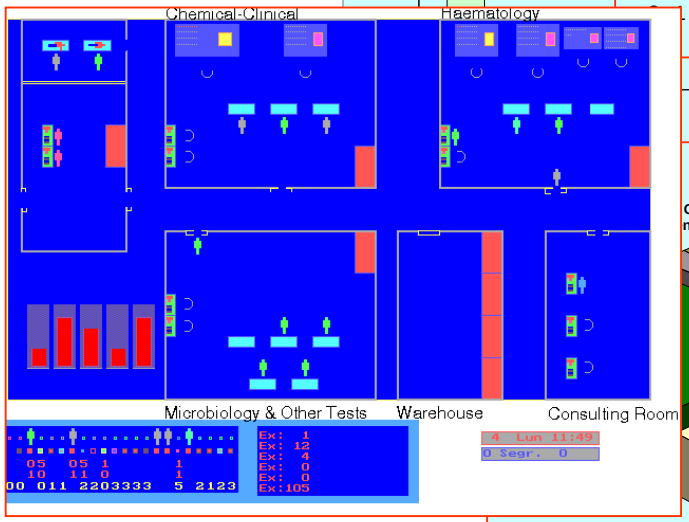
Tactics Evaluation & optimiZatioN for Analysis in Medical Environment

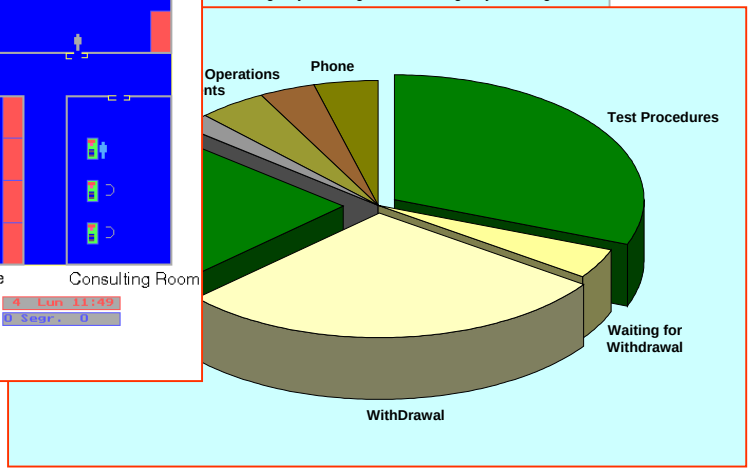
TEZNAME is a tool for analyzing Hospital Departments Management considering the detail of each resource, individual and/or procedure.

The system has been successfully applied to Laboratory Re-engineering to compare different investments and policy/organization alternatives.









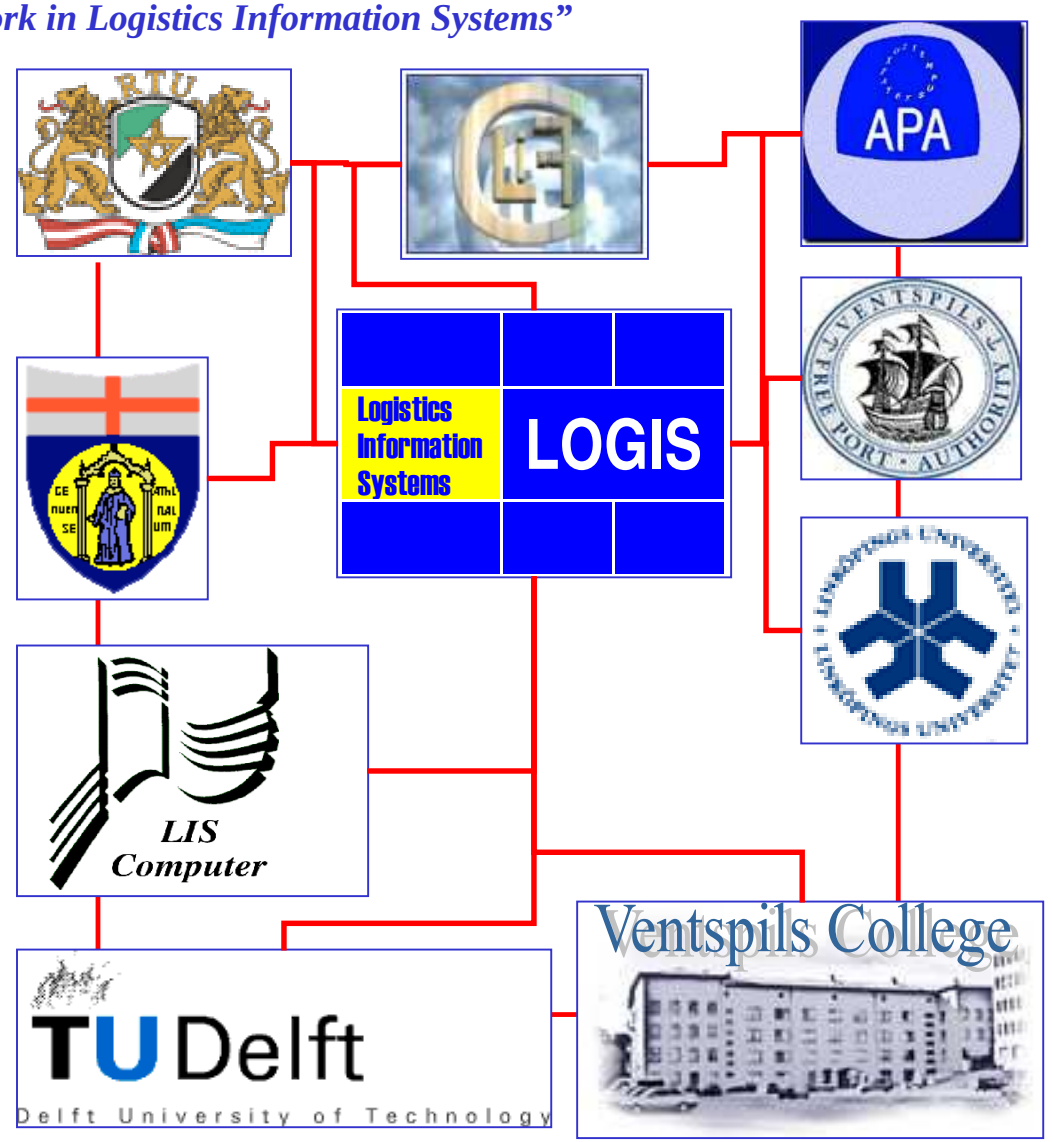
Project: LOGIS

Sponsored by

European Community

"Long-distance tutorial network in Logistics Information Systems"

LOGIS is a *Leonardo* project sponsored by European Community in order to develop Long Distance Tutorial Network in "Logistics Information System", Based on WEB Technologies. Besides the training, an interesting exploitation of the results of the research is related to the transfer of these techniques to Small - Medium size Enterprises.



Project: IEPAL

Sponsored by:

FIPSE, US Department of Education

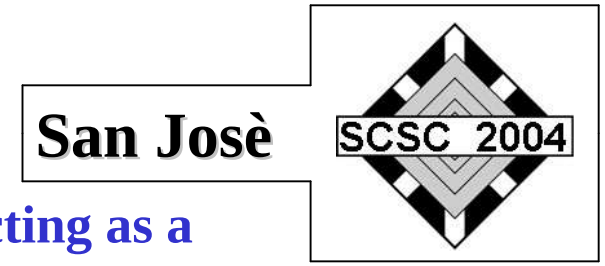
European Community, DGEAC

Intensive Educational Program in Advanced Logistics

IEPAL is a Co-funded project sponsored by European Community and US Department of Education, to live an academic & industrial training, to compare European and US way of living and working. A goal of this project will be the integration & exchange of different culture, the application of Web instrument and mobility to learn to cooperate. It is a Great Opportunity for engineering students and their curriculum to experiment in the new millennium Transatlantic Experiences in Enterprises and Universities working on Projects in **World-Wide Distributed Teams** focusing on the **Advances in Modeling & Simulation for Logistics and Supply Chain Management.**

- University of Central Florida
- Boston College
- Stevens Institute
- Dip-Unige
- LSIS - Marseille University
- Magdeburg University
- Consorzio di Formazione Logistica Intermodale
- National Center for Simulation

Conclusions



The Liophant Simulation Club and DIP-MISS are acting as a reference point between users and providers in simulation area. The integration of experts, technicians is providing very good results on real case studies and complex projects.

A new active area of development is related to distributed simulation and web-based modeling for extending the impact and exploitation of these proposed systems.

Every year DIP-MISS organizes Conferences and International Workshops focusing on application of Modelling & Simulation; for instance, this year: Summer Simulation in California HMS2004 in Rio de Janeiro and MAS/I3M on the Italian Riviera.

There is a constant interest in fostering joint cooperation and exchanges with international Excellence Centers working on simulation.

References

MISS Genoa
DIP University of Genoa

Headquarters & Genoa Labs

via Opera Pia 15
16145 Genova, Italy

Tel **+39 010 353 2275**
Fax **+39 010 317 750**

Email moffetta@itim.unige.it

MISS Genoa
DIP University of Genoa

Savona Campus & Savona Labs

via Cadorna 2
17100 Savona, Italy

Tel **+39 019 264 555**
Fax **+39 019 264 558**

URL st.itim.unige.it