DESIGNING A VIRTUAL ENTERPRISE
as a part of the

GLOBEMAN ‘21
“Enterprise Integration for Global Manufacturing Towards the 2’st Century”
Project
THE GLOBEMAN ‘21 PROJECT

THE GM ‘21 CONSORTIUM CONSISTS OF

- 30 Companies
- 20 Academic and Research Establishments

THE PEOPLE RESOURCE

- Equivalent to about 136 person years, for each year.
- Representing an expenditure of some $ US 13,6 million, pa.
- $US 40 million for 3 years.
THE GLOBEMAN STRATEGY

BUSINESS PROCESSES

- PG1 Product Life Cycle Management
- PG2 Global Manufacturing Management

TECHNOLOGICAL AREAS

- TG1 Modelling Technologies
- TG2 Technologies for Information Access & Control
- TG3 Technologies for Scheduling and Coordination
- TG4 Technologies for Business Process Analysis & Design
MANAGEMENT STRUCTURE

Steering Board

IPR Support Group

Executive Director

Communication Facilitator

Technical Committee

Modelling

IT tools

Coordination

BP A&D

Product lifecycles

Production lifecycles

Availability: Public
WORK PACKAGES

- Because of the wide scope of the Process Groups and Technology Groups, it is necessary to form smaller cooperating units to undertake the detailed studies, industrial trials and research that go to achieve the GLOBEMAN objectives.
- Each Process and Technology Group will have between 4 and 8 Work Packages.
- The Work Packages are the operating units which will have clearly defined mandates and specified task areas for each Partner to perform.
DEMONSTRATORS

PRACTICAL EMBODIMENTS OF NEW BUSINESS PROCESSORS OR OF NEW TECHNOLOGIES

- In most cases Demonstrators will overlap more than one Process Group or Technology Group. While this will add to the complexity of managing the GLOBEMAN activity, it will considerably enhance the practical benefits from the work and bring about enhanced cooperation between all Partners.
THE “VRIDGE” DEMONSTRATOR

“Virtual and Real Information Driven Global Enterprise”

THE OBJECTIVE OF THE WORK IS:

- TO TEST THE ENTERPRISE DESIGN METHODS AND TOOLS though
- AN INDUSTRIAL EXAMPLE
THE PARTNERS

- **JAPAN**
  - Toyo Engineering
  - Yokogawa Electric
  - Takenaka Construction

- **AUSTRALIA**
  - CSIRO
  - Griffith University

- **EUROPE**
  - Ahlstrom Machinery

Working in cooperation
- Workshops
- Tele meetings
- WEB based tools
- Regional conferences
VIRTUAL ENTERPRISE DESIGN

Local (Real) Enterprises ➔ Global (Virtual) Enterprise

Enterprise Integration

Enterprise Design Methodologies and Technologies

Enabling Information and Engineering Technologies
CONCEPT OF THE VRIDGE DEMO

Visualisation Support System

Plant 2D/3D Modelling System

Implemented Working Model

Replica Control Panel

Visualisation of Process & Operation

2D Human Interface

3D Human Interface

Plant Data Model

Design Data

Topology Data

Operating Data

Design Procedures

Operating Procedure

Unit Operation Model

Equipment Model

Instrument Model

Plant Steady State Model

Plant Dynamic Model

Semantics

Conceptual Working Model

Application

Application

Application

Application
BUSINESS PROCESS OF VRIDGE Inc.

Requirements:
- Reasonable Cost & Size
- Evidence for verification of models
- Demonstration use
- Lifecycle use

Models:
- Enterprise Model
- Product Model
- Process Model
- Facility Model

Enterprise Model
- Concepts
- Requirements
- Design
- Implementation
- Build
- Operation

Integration
- Concepts
- Requirements
- Design
- Implementation
- Build
- Operation

STEP Product Model
LIFE CYCLE DIAGRAM IN VRIDGE

PARTICIPANTS:
- Engineering company
- Machine building company
- Electrical company
- Constructions company
- University
- CSIRO

Availability: Public
MODELS FOR THE DEMONSTRATOR

Enterprise Model
- Function Structure Analysis
- Decision Making Flow
- Supply Chain
- Procurement Plan
- Construction Plan

Facility Model
- Stream Data
- Plot Plan
- Plant 3D Model
- Visualisation Model

Product Life Cycle Model

Process Model
- Process & Ontology Description
- Process Control Strategy
- Operation & Maintenance Support
- Dynamic Simulation

Availability: Public
VRIDGE LIFE-CYCLE DIAGRAM

Life-cycle of Xylene as a Product

Life-cycle of the Vridge Inc.

Life-cycle of the Xylene Plant

Product (Production Firm)

Production System (Engineering Firm)
PERA ENTERPRISE MODEL

PERA: Purdue Enterprise Reference Architecture

Availability: Public
| Identification | | |
|----------------|-----------------------------|
| 0. Feasibility Study and Identification of the EBE | | |

| Concept | | |
|----------------|-----------------------------|
| 1. Definition of Business Entity’s, Mission Statement, Goals etc. | 2. VRIDGE Inc’s Service Policies | 3. VRIDGE Inc’s Project Management Policies |

| Definition (Functional Requirements) | | |
|--------------------------------------|-----------------------------|
| 4. Requirements of VRIDGE Inc’s Service | 5. Requirements of VRIDGE Inc’s Project Management |
| 6. Functions of the VRIDGE Inc. | 7. Project Management Functions |

| Specification (Functional Design) | | |
|-----------------------------------|-----------------------------|

| Detailed Design | | |
|----------------|-----------------------------|

| Manifestation (Build) | | |
|-----------------------|-----------------------------|
| 16. Procure or hire, implement and test VRIDGE Inc. Equipment (sw/hw) | 17. Staffing, Training of VRIDGE Inc. personnel | 18. Procure or hire, implement and test VRIDGE Inc.’s Project MIS (sw/hw) |

| Operation | | |
|----------------|-----------------------------|
SELECTION OF SUPPORTING TOOLS

- Business process modelling tools:
  - KBSI/Pro-cap, FirstSTEP, Metis, etc.
- Information modelling tools:
  - ST-Developer, AP-Factory, DataProbe
- CASE tools
  - CASE*Method, Ptech, etc.
- Engineering tools
- DBMS/Communication tools
THE PROPOSED METHODOLOGY

- Global Enterprise Model
- Product Life-cycle Model
- VRIDGE Demonstrator Activity Model
- VRIDGE Demonstrator Requirement Model
- VRIDGE Demonstrator Data Model Definition
- VRIDGE Demonstrator Implementation
- STEP AP AAMs
- STEP AP ARMss
- STEP Resources (IRs, AIMs)
A SUMMARY OF THE METHODOLOGY

- Model the business process of the Vridge Inc.
- Identify the information flows within the Vridge Inc.
- Prioritise the needs for product information A&C

**For each need:**
- Develop a Vridge specific AAM & ARM
- Integrate with applicable STEP APs
- Develop a STEP-compliant Vridge AP
- Procuring/develop tools for supporting the V-AP
- Demonstrate with a case study
VRIDGE PRODUCT LIFE-CYCLE MODEL

Bidding and Contracting → Invitation for Bidding

→ Contract Award

→ Initial Specification and Design

→ Initial Schematic Design (PFD?)

Plant(s) Design → Operator Training & Documentation

→ Conceptual Schematic, and Spatial Design Data

→ Procurement construction, Installation & Testing

→ Trained Operators, Plant, Plant Data, Operation Manuals, Maintenance Manuals
PRODUCT INFORMATION SHARING USING STEP

AP221: Functional data & their schematic representation for process plant
AP227: Plant Spatial Configuration
AP231: Process Engineering Data

Availability: Public
INFORMATION TECHNOLOGIES

Access and Control
- MIME based E-Mail
- SGML document exchange on Internet
- Video Conference on ISDN/Internet
- Integration of synchronous/asynchronous collaboration tools
- Integration of WWW and CAD/DB/CSCW
- Document management using WWW
- Script exchange using CORBA/OZ/Java
- Behaviour(Animation) using VRML 2.x

Modelling
- CAD Viewer
- 3D Modeller and Visualiser
- VR software and peripherals
- STEP enhancement software
- PDM software
- Enterprise modelling methodology/tool
- Conventional IDEF0/IDEF1X
- Object oriented business modelling
- Workflow software
SPECIFIC OUTCOMES

RESULTS WILL INCLUDE:

- Increased understanding of the key business processes in global manufacturing.
- New management tools to operate in a world of global virtual enterprises.
- New technologies and new applications in fields such as: modelling, simulation, control.
- Architecture for more efficient production in all domains of manufacture, but particularly in small batch or one-off production.
THE TEAM

- Toyo Engineering
  - Masashi Shinonome
  - Hidehisa Hashimoto
  - Atsuyoshi Fuse
- Yokogawa
  - Michiaki Yamagata
- Takeneka
  - Tetsuya Miyagawa
- Ahlstrom
  - Matti Uusitalo
- CSIRO
  - Dr Laszlo Nemes
  - Dr Mingwei Zhou
  - Dr John Mo
  - Angela Williams
  - Michael Kovacek
- Griffith University
  - Dr Peter Bernus
  - Greg Uppington
  - Raymond Woo