



# The MARVEL Project – Aims and Objectives

Dieter Müller

University of Bremen  
Research Centre artec



## Table of Contents



- Project data
- Consortium structure
- The vision behind MARVEL
- Objectives
- Target groups and teaching subjects
- Expected results
- Learning scenarios and use cases
- Dimensions of research and development

# Project Data



- Full title:  
**Virtual Laboratory in Mechatronics: Access to Remote and Virtual e-Learning**
- Start of work: November 1st, 2002
- Duration: 30 month
- Programme: Leonardo da Vinci II
- Priority: 5 (New Technologies)
- Ref.Nr. D/02/B/F/PP 112 615

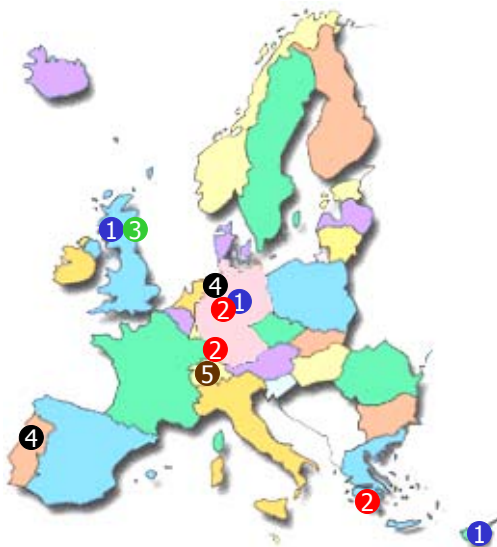


Education and Culture

**Leonardo da Vinci**  
Pilot projects



# Project partners



## 1 Vocational/Technical colleges

- DEL (Germany)
- HTI (Cyprus)
- WLC (Scotland)

## 2 Enterprises

- ZENON (Greece)
- FESTO (Germany)
- BNW (Germany)

## 3 Qualification authority

- SQA (Scotland)

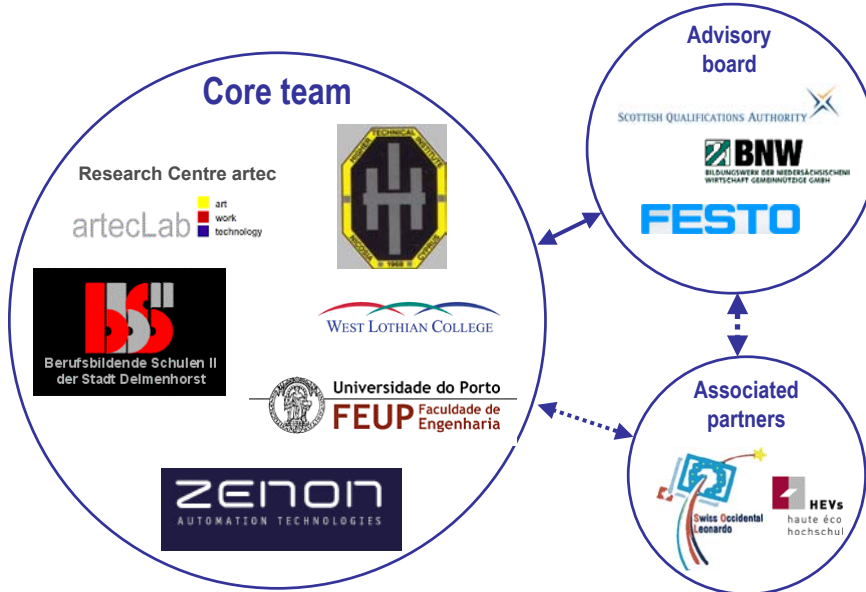
## 4 Universities

- FEUP (Portugal)
- Uni Bremen/artec (Germany)

## 5 Associated partner

- FEUP (Switzerland)
- HEV (Switzerland)

## Consortium structure



V.1.3

MARVEL - Aims and Objectives

## The idea behind MARVEL



- To develop and evaluate a training concept that supports a 'mix' of virtual in combination with practical learning
- Integration of different...
  - virtual and real learning media and tools
  - learning places (school, laboratory, work place, home, ...)
  - learning activities based on experiential and collaborative learning



**Mixed Reality Learning and Working Environment**

V.1.3

MARVEL - Aims and Objectives

# Objectives



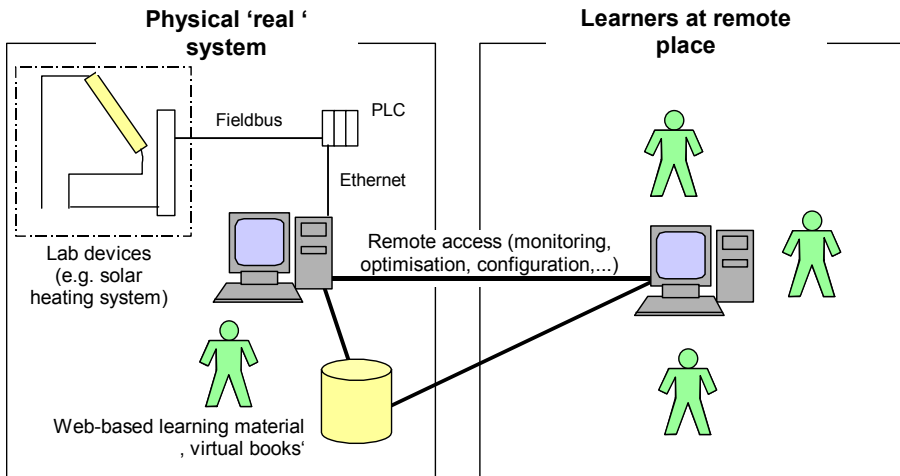
- **Development of a conceptual framework (pedagogical, technical)**
- **Design of courses and development of e-learning content**
- **Creation of learning scenarios, environments and implementation of courses**
- **Application of project evaluation and dissemination of project result**

# Target groups and teaching subjects



- **Target groups of MARVEL**
  - Students in vocational education and training in mechatronics
  - Teachers / instructors in colleges and companies
  - Developers and providers of learning media, tools and environments
  - ...
- **Main teaching subjects**
  - system control,
  - maintenance,
  - process monitoring and
  - automation technology of networked mechatronic plants and machinery on the basis of remote techniques

# Example learning scenario: Remote process control and maintenance of a full-scale solar plant



V.1.3

MARVEL - Aims and Objectives

## Use cases (1)



### ■ Remote data acquisition

- Students download data from a remote solar system lab and compare the results with their own solar system
- Typical data are global radiation from the sun, daily temperature, wind-forces, measuring of rain, daily produce energy power in regard to different collector systems, efficiency of different collector types etc

### ■ Data exchange

- Students in distributed colleges in Europe exchange data of solar systems which are installed in their lab or somewhere near the college
- Communication tools (learning platform) can support a continuing exchange of information between two learning groups

### ■ Data analysis

- Students analyse and filter out typical characteristics of thermal solar systems by analysing data of many different installation from various European countries
- The result will be published in the internet. There are tools and training material available which could help to solve this learning task

V.1.3

MARVEL - Aims and Objectives

## Use cases (2)



- **Remote monitoring and process control:**
  - Student access remote solar system devices via Internet and read or modify system parameters
  - In order to solve this task the students must be able to programme and/or configure correctly a distributed control system which is at a remote place. For safety the modification of parameters in a remote system is limited. It is also possible to use simulation models or small mock-ups for this learning tasks
- **Presentation of the results:**
  - The result will be published in the internet
- ....

## Learning objectives



- **Theoretical knowledge and operational competence to monitor complex solar systems from remote (using IT-tools for process monitoring and control)**
- **Theoretical knowledge and operational competence to find out the efficiency of different collector systems (using IT-tools for data Acquisition, control, monitoring, collaboration etc)**
- **Competence to maintain complex system systems (e. g. finding faults) with IT tools and adequate methods**
- **Ability for collaboration between technicians with different language, cultural and professional background (e. g. in a company with several branch offices all over Europe).**

## Expected results of the project



- Evaluated working examples of remotely accessed practical learning environments
- e-learning and assessment material in different application fields (mechatronics)
- Implementation of actual demonstration models in partner institutions and industry for evaluation purposes.

## Three types of products (1)



### 1. Pedagogical concept (guidelines for best practice)

- Learning concepts
  - distance-learning
  - co-operative learning
  - action-oriented learning
- Specification of qualification needs
- Learning arrangements, and user scenarios etc

### 2. Technical concept (guidelines for best practice)

- Analysis of remote techniques in industry
- Specification of state of the art concepts, technologies and tools
  - remote/ telemedia/multimedia techniques
  - data networks, field buses etc.
- Recommendations for standards, conceptual models and guidelines for web-based workshop and lab assignments.
- Recommendations for technical solutions: internet based real/virtual workshop, lab experiments, media

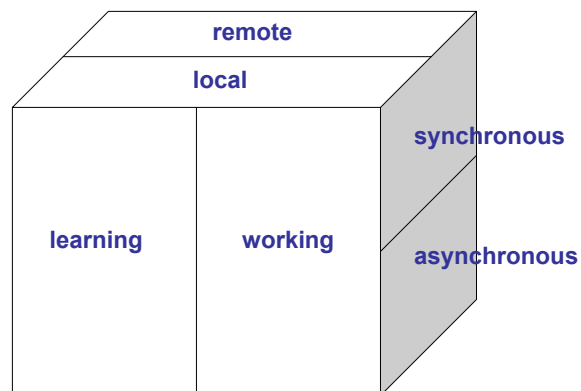
## Three types of products (2)



### 3. Teaching modules:

- Creation of demonstration models in partner institutions (and industry)
- Didactical and methodical background information
  - goals, tasks, student activities, time structure, ...
- Learning aids
  - slides, worksheets, exercises, examination material, ...
- Documentation of held course (teaching experiences and results)

## Dimensions of research and development





# Project Home page



Microsoft Internet Explorer

Home | print | login | page info | disclaimer

## MARVEL



Virtual Laboratory in Mechatronics: Access to Remote and Virtual e-Learning

- Home
- Project
- Partners
- Project Documents
- Links
- Contact
- News & Events

### Summary

The aim of the pilot project MARVEL is to implement and evaluate learning environments for Mechatronics in Vocational Training, that allow students ubiquitous access to physical workshops and laboratory facilities from remote places. The project will cover concepts that merge real and virtual as well as local and remote worlds in real time. This will support teleactions and remote laboratory experiments in mixed reality work environments.

MARVEL will produce evaluated working examples of remotely accessible practical environments together with supporting e-learning and student assessment material for the following application fields: robotics, modular production systems and process control. This includes the creation of actual demonstration models (learning scenarios and environments) in partner institutions and industry for evaluation purposes.



Education and Culture

### Leonardo da Vinci Pilot projects

- University of Bremen
- artecLab
- Research Centre
- artec

MARVEL - Virtual Laboratory in Mechatronics: Access to Remote and Virtual e-Learning

Contact:

[www.marvel.uni-bremen.de](http://www.marvel.uni-bremen.de)  
[mueller@artec.uni-bremen.de](mailto:mueller@artec.uni-bremen.de)