



Lab@Future

Moving Towards the Future of E-Learning

About the Project

▶ **Lab@Future**

- ◆ EU IST Research and development project
- ◆ 9 Partners from 8 Countries
- ◆ School LABORatory anticipating FUTURE needs of European Youth




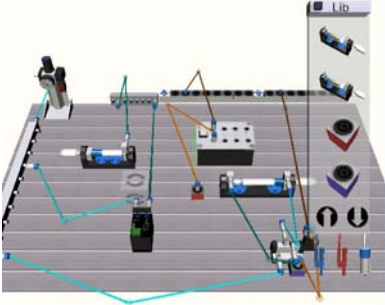
Aims of the Project

- ▶ **Application of different pedagogical approaches**
 - ◆ Social Constructivism
 - ◆ Activity Theory and Expansive Learning
- ▶ **Technology to support secondary school education**
- ▶ **Enhanced learning by mobility and flexibility**
- ▶ **Communication and collaboration platform for learning**
- ▶ **Use of new interaction spaces**
 - ◆ Mixed and augmented reality
 - ◆ Shared virtual environments
- ▶ **Evaluation of learning platform and progress**

Pedagogical Framework

- ▶ **Social Constructivism & Activity Theory**
- ▶ **Learning through collaborative interactions**
 - ◆ Collaboration between students (peers)
 - ◆ Collaboration between students and a teacher
- ▶ **Learning through contradictions**
- ▶ **Mediation by tools, cultural, and social context**
 - ◆ Activity Theory „for understanding how human activity is mediated by both tools and cultural context“
[<http://www.gamestudies.org/0102/squire>]
- ▶ **Moderated Exploration**

Matrix of Research Categories

Real Media	Virtual Media
 Local Users	 Remote Users

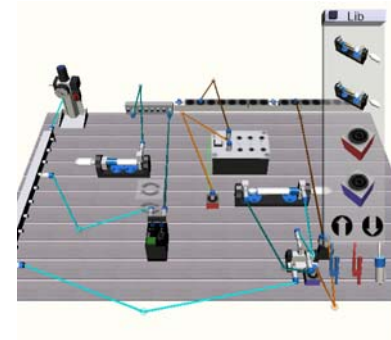
Reality vs. Simulation - Transitions - Collaboration - Social Interaction - Social Responsibility - Integrated Knowledge

Shared Action Space

Real Media



Virtual Media



Local Users



Remote Users

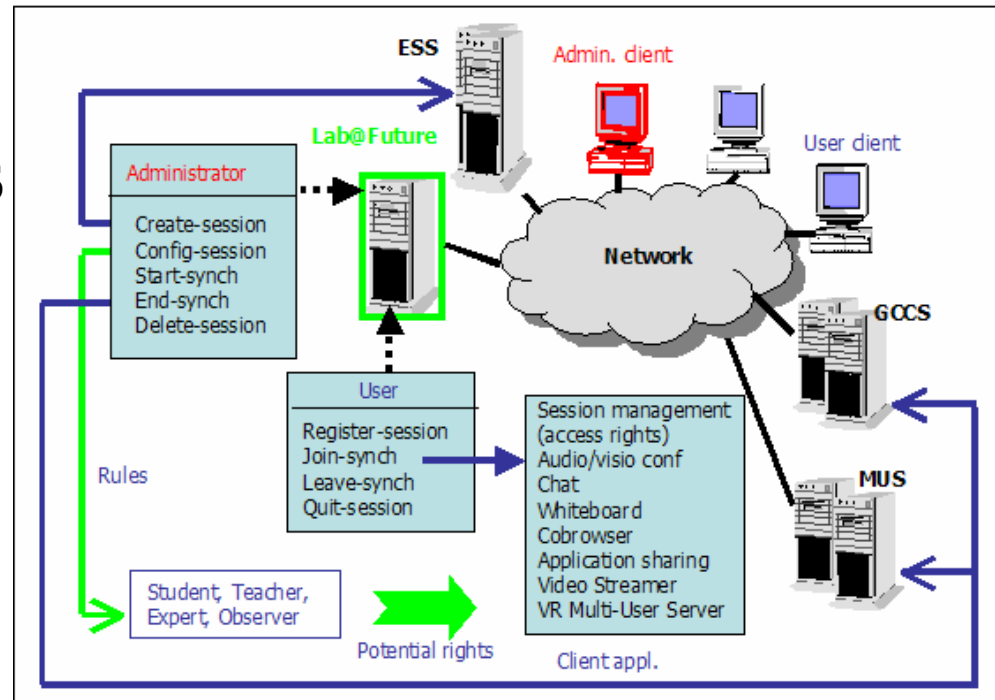


Lab@Future Innovations

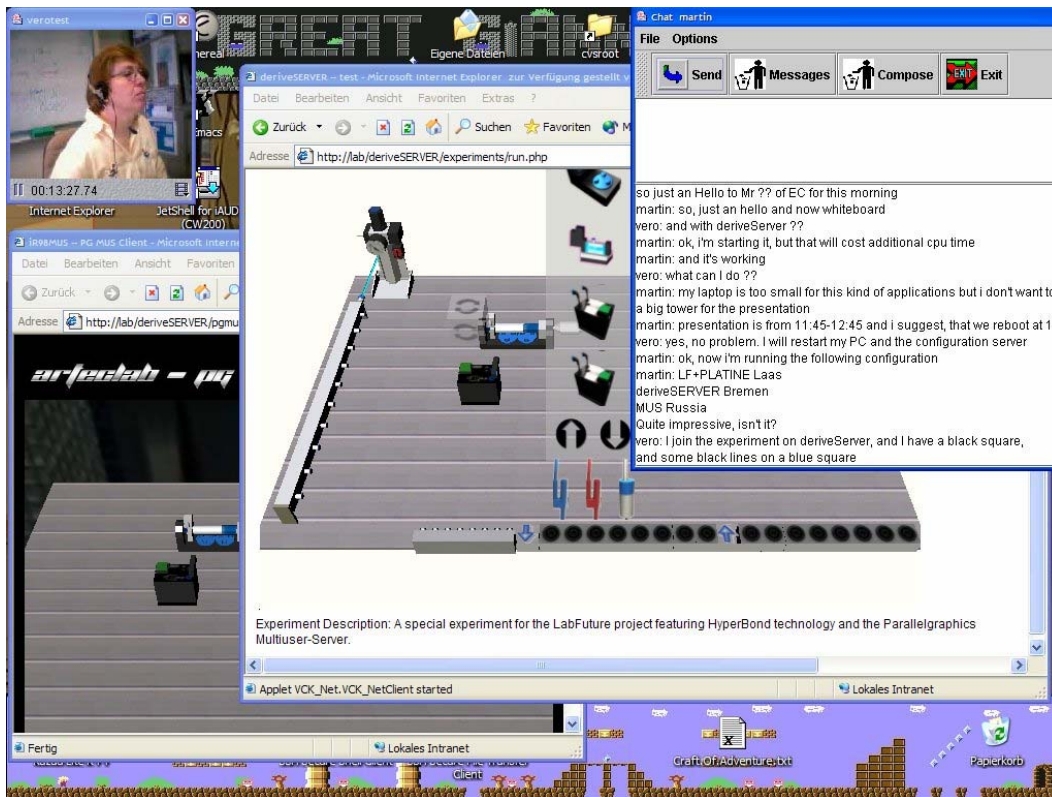
- ▶ **Distributed collaborative labwork**
- ▶ **No preset experiments with fixed equipment**
- ▶ **Instead open experiments linked to real life**
- ▶ **Modular Components used in a constructive way**
- ▶ **Common interface to experiments from different application areas**

Lab@Future Platform

- ▶ **Open, distributed network of components**
- ▶ **Communication and Collaboration**
 - ◆ Audio/Video
 - ◆ Chat, Whiteboard,
- ▶ **Experiment management**
 - ◆ Off-line preparation
 - ◆ On-line flow control
- ▶ **Experiment Servers ESS**
 - ◆ Content provider
- ▶ **3D Multiuser Worlds**



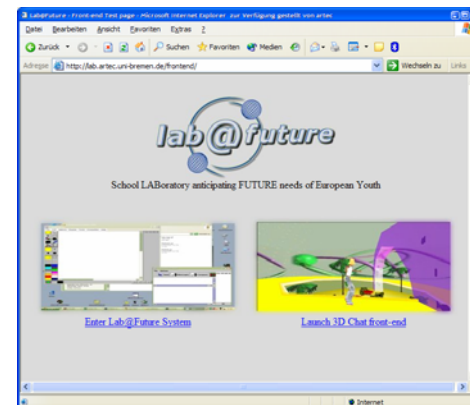
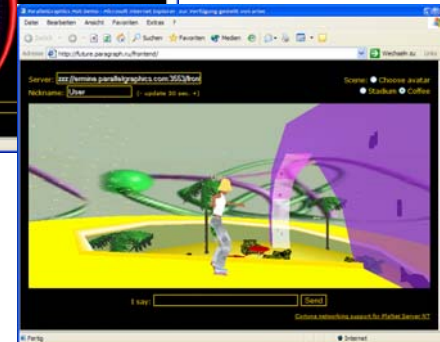
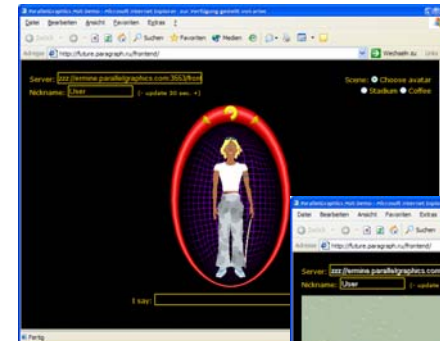
Lab@Future Platform Impressions



so just an Hello to Mr ?? of EC for this morning
 martin: so, just an hello and now whiteboard
 vero: and with deriveServer ??
 martin: ok, i'm starting it, but that will cost additional cpu time
 martin: and it's working
 vero: what can i do ??
 martin: my laptop is too small for this kind of applications but i dont want to c
 a big tower for the presentation
 martin: presentation is from 11:45-12:45 and i suggest, that we reboot at 11:
 vero: yes, no problem. I will restart my PC and the configuration server
 martin: ok, now i'm running the following configuration
 martin: LF+PLATINE Laas
 deriveSERVER Bremen
 MUS Russia
 Quite impressive, isn't it?
 vero: I join the experiment on deriveServer, and I have a black square,
 and some black lines on a blue square

Experiment Description: A special experiment for the LabFuture project featuring HyperBond technology and the Parallelgraphics Multiuser-Server.

Applet VCK_Net.VCK_NetClient started



The logo for 'lab@future' features the text 'lab@future' in a stylized, blue, 3D-effect font. The '@' symbol is a large, blue, wireframe sphere. To the right of the text, there are three blue wireframe spheres of varying sizes, connected by thin blue lines, suggesting a network or molecular structure.

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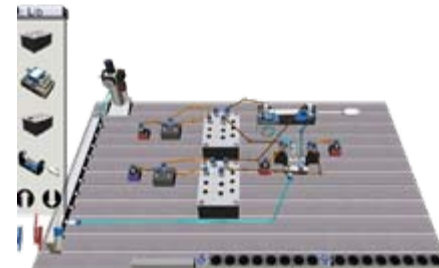
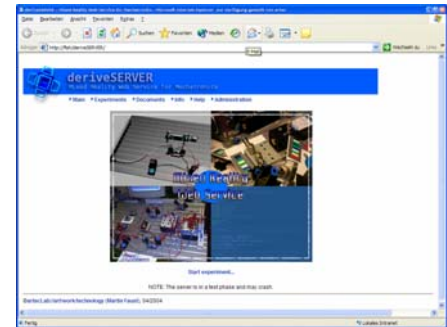
Application Areas

- ▶ **Fluid Dynamics**
- ▶ **Mathematics**
- ▶ **Arts & Humanities**
 - ◆ History
 - ◆ Environmental Awareness

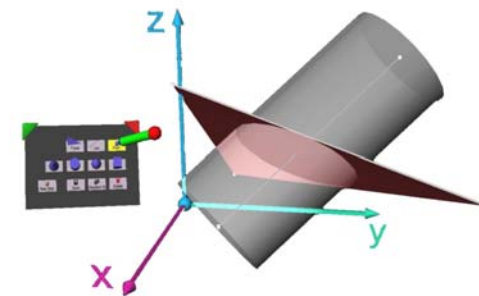
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Fluid Dynamics

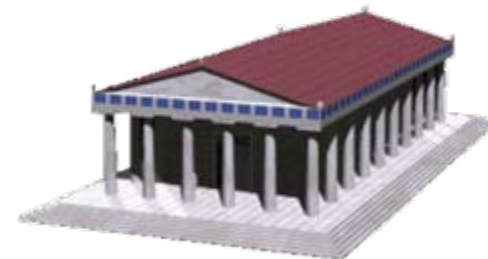
- ▶ **artecLab, Germany**
- ▶ **Remote Laboratory for Fluid Dynamics**
 - ◆ Expand basic theory to practical applications and vice versa
 - ◆ Explore the world of Mechatronics
 - ◆ Virtual Reality and/or Mixed Reality setting
 - ◆ Embedded Simulation (real and virtual components)
 - ◆ Accessible from the Internet 24h a day
- ▶ **Experiments are integrated into social and working context**
 - ◆ e.g. Industrial Safety Circuit for a press
 - Reduction to the Double Acting Cylinder
 - Solution with work context
- ▶ **Mixed Reality Web Service**
 - ◆ Try it yourself at <http://lab.artec.uni-bremen.de>



- ▶ **Technical University of Vienna, Austria**
- ▶ **Construct3D**
 - ◆ A three dimensional geometric construction tool specifically designed for mathematics and geometry education
 - ◆ Multiuser working together
 - ◆ Features: e.g. boolean operations, normals,...
- ▶ **Augmented 3D stereoscopic environment**
 - ◆ Head-Mounted-Displays
 - ◆ Projection, Monitor
 - ◆ Mobile version
- ▶ **Mathematical problems**
 - ◆ e.g. Tschupik cube, conic sections

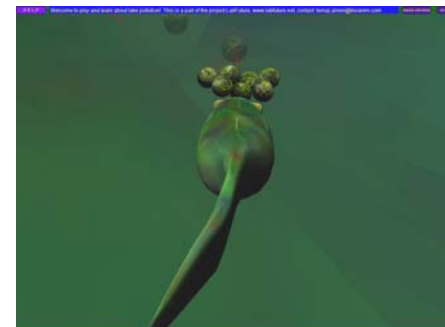


- ▶ **Systema Technologies, Greece**
- ▶ **History**
 - ◆ Present the breadth of history by taking advantage of the different “modalities of learning”, including music, artwork, audio and video, as well as text.
- ▶ **Use mobile technology to**
 - ◆ Connect to distant classmates
 - ◆ Enrich educational visits with missing information
 - ◆ Bring „life“ to ancient places



Environmental Awareness

- ▶ **Center for Scientific Visualisation, Slovenia**
- ▶ **Environmental Awareness**
 - ◆ Purity and pollution of a particular environment
 - ◆ Practical investigations into topics relating to everyday issues
- ▶ **Experiment**
 - ◆ Simulation of pollution in freshwater lakes
 - ◆ Educational game with different roles



Integration of the Experiments

▶ **Challenge:**

- ◆ How to integrate the different experiment/platforms ?
- ◆ Provide a common interface to the e-Learning platform

▶ **How we've done it**

- ◆ XML Exchange protocol for remote control of Experiment Specific Servers
- ◆ Independent of actual experiment
- ◆ Java Front-end for administration and communication
- ◆ Requirement: ESS Front-end must be loadable through Web Browser

The logo for Lab@future features a stylized '@' symbol in the center, surrounded by three blue spheres of varying sizes and a blue circular path. The text 'lab@future' is written in a blue, italicized, sans-serif font, with the '@' symbol being larger and more prominent.

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Conclusion

▶ **Lab@Future**

- ◆ Research & develop innovative ICT for teaching and learning
- ◆ Integration of Physical and Virtual Reality
- ◆ Mobile and Wireless Technology

▶ **Pedagogical concepts**

- ◆ Constructivist theory in combination and dialogue with expansive learning

▶ **Shared Action Space**

- ◆ Easy bridges between real, virtual, local and remote media

▶ **Platform**

- ◆ Provide general communication and collaboration facilities
- ◆ Integration of experiment specific servers under a common interface

