Overview of on-line, virtual and remote laboratories

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Information and Communication Technology Section

ICTP

Conference on Open-source tools for enhancing teaching, learning and research in Science, Technology, Engineering and Mathematics (STEM).
UNAH, Tegucigalpa, Honduras – April 10th, 2014

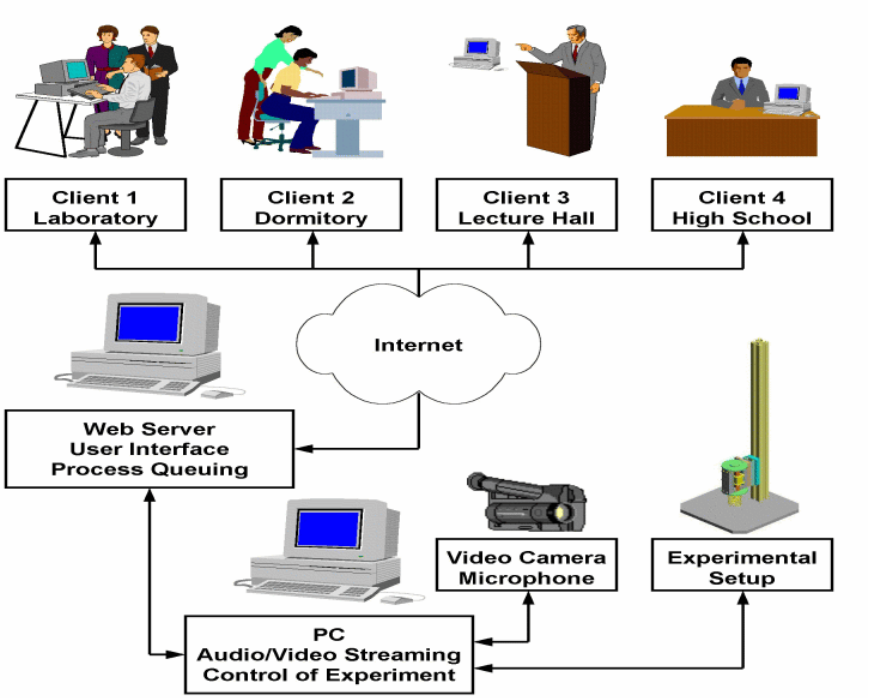
Overview

- Introduction
- Remote labs
- Virtual labs
- On-line labs
- Conclusion

Introduction

- Physical laboratories are needed in most Science and Engineering courses.
  - Limited in availability (time) and capacity
  - Limited in functionality
  - Running costs seems to grow with equipment age.

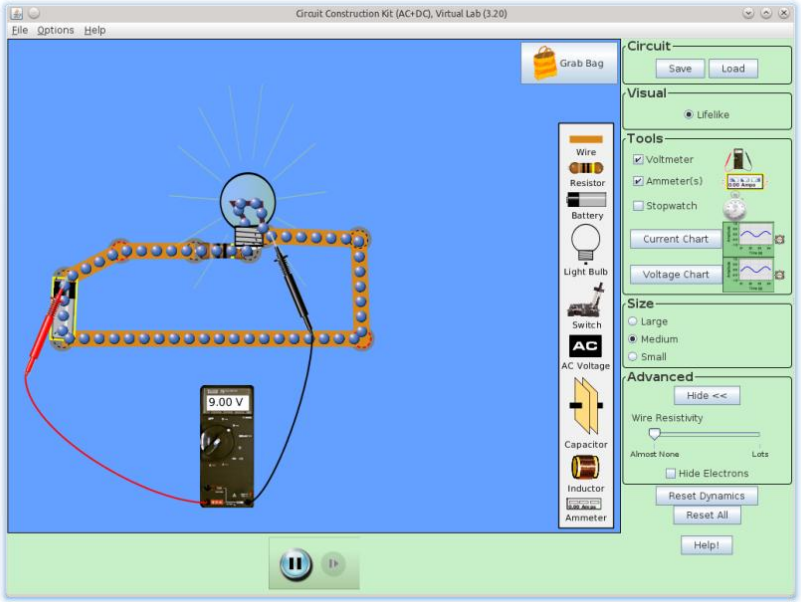
Remote laboratories



- Addressing availability
- Provides remote access to Laboratory apparatus
- Depends on ability to connect apparatus on-line
- May still require local human interventions.

iLab Project: http://icampus.mit.edu/projects/ilabs/

Virtual labs



- Accessible on-line
- Does not require access to real equipment
- Based completely on simulations and mathematical models.
- Interface could be quite abstract.

Example from University of Colorado
http://phet.colorado.edu/en/simulation/circuit-construction-kit-ac-virtual-lab

On-line labs

- Includes both remote and virtual laboratories and most simulation tools.
- Basic principle: Laboratories & experiments can be taught using the INTERNET or on-line.
  - Key benefits include
    - Cost
    - Access
    - Availability

Conclusion

- On-line labs such as remote and virtual labs provide advantages in the efficient and cost effective teaching using experiments.