Title: Cyber-Labs - A Real-time, Interactive, Secure Laboratory Environment for Remote Students

Type of Session: Concise presentation - 60 minutes

Track: Managing New Technology Trends: Green Computing, Social Networking, Cyber Security and Virtualization

Joint Vendor Presentation: No

Presented on Topic Before: Yes, NSF CCLI/TUES conference

Session Abstract

Distance learning using internet as the communication medium has been successful for instructional education. The paradigm of instructional education deals with a real time interaction between a tutor and student/s. The next phase of internet powered distance education is to enable laboratory based education. This can be achieved by providing an interactive, collaborative experience control and monitoring of equipment in real-time while an experiment is being conducted. The key objective of this study is to provide remote access capability for engineering laboratories and create cyber-enabled, hands-on laboratory environments. The primary challenges for a cyber-enabled laboratory include: • Communication challenges Laboratory experiments require several communications paradigms be addressed: 1. one to many: broadcast where the lab instructor broadcasts to the students 2. one to one: collaboration between a group where the members of group are remote 3. many to many: collaboration within a group where the lab instructor moderates the experiment • Technological challenges : 1. Accessing equipment remotely a) The challenge of integrating laboratory equipment like oscilloscopes, signal generators which require special drivers for internet integration. b) The challenge of controlling laboratory equipment remotely. 2. Bandwidth profiling to sustain interaction in real-time 3. Secure access to cyber enabled equipment Based on these challenges, we have evaluated and developed software & hardware components to provide a streamlined, web-centric laboratory experience for remote access students. In this presentation, we present an evaluation of the proposed laboratory environment and discuss the student feedback & usability experience.

Discussion Questions

1. Why is distance learning important?
2. How can social networking tools help distance learning procedures?
3. Can distance learning be applied to laboratories?
4. What are the challenges for transforming laboratories to cyber-enabled status?
5. What are the infrastructure requirements?

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