

# Uses of Virtual Labs and Different Areas of Virtual Labs in India

Dr. Geetanjali Amarawat<sup>1</sup>, Mr. Hanuman<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Computer Science & Engineering, Madhav University, Abu Road.

<sup>2</sup>Research Scholar

Department of Computer Science & Engineering Madhav University, Abu Road.

## Abstract

Physical distances and the lack of resources make us unable to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. Web-based and video-based courses address the issue of teaching to some extent. Conducting joint experiments by two participating institutions and also sharing costly resources has always been a challenge. With the present day internet and computer technologies the above limitations can no more hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Web enabled experiments can be designed for remote operation and viewing so as to enthruse the curiosity and innovation into students. This would help in learning basic and advanced concepts through remote experimentation. Today most equipment has a computer interface for control and data storage. It is possible to design good experiments around some of this equipment which would enhance the learning of a student. Internet-based experimentation further permits use of resources, knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space (and possibly, time).

**Keywords:** *Cloud, Virtual Lab*

## Introduction

With the ubiquity of Cloud Computing, individuals turn out to be progressively worried about security issues, particularly the information security, which has turned into the greatest obstruction for the advancement of Cloud Computing. Distributed computing is an expansion of dispersed registering and matrix processing innovation, which is an assortment of administrations to clients through the system, for example, Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). It is extremely significant to give a sheltered and dependable information storage framework and security advances for Cloud Computing.

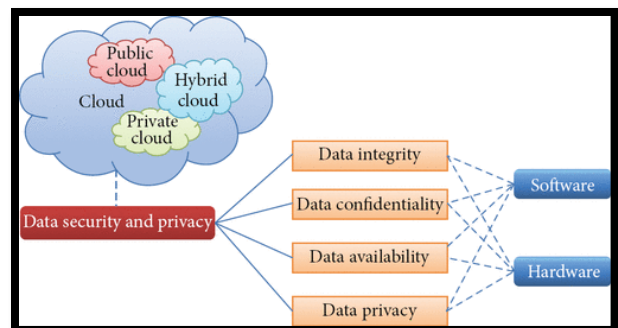


Figure 1 Organization of data security and privacy in cloud computing

## Objective of Virtual Labs

1. To provide remote-access to Labs in various disciplines of Science and Engineering. These Virtual Labs would cater to students at the undergraduate

level, post graduate level as well as to research scholars.

2. To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
3. To provide a complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.
4. To share costly equipment and resources, that are otherwise available to limited number of users due to constraints on time and geographical distances.

### Broad Areas of Virtual Labs

1. Electronics & Communication
2. Computer Science & Engineering
3. Electrical Engineering
4. Mechanical Engineering
5. Civil Engineering
6. Chemical Engineering
7. Biotechnology and Biomedical Engineering
8. Physical Sciences
9. Chemical Sciences

### List of Virtual Labs in India that are ready

1. Electronics & Communications
  - Virtual Advanced Lab for Interactive Design and Test in Electronics
  - Virtual Microwave Laboratory
  - Wireless Lab
  - Engineering Electro-magnetic Laboratory
  - Queuing Networks Modeling Lab
  - Hybrid electronics Lab
  - RF microwave characterization Lab
  - Transducer and instrumentation virtual lab

- Electronic design using DSP,FPGA,CPLD and Micro controllers through simulation and direct access of the hardware
- Digital Electronic Circuits Laboratory
- Digital Signal Processing Laboratory
- Fading Channels and Mobile Communications
- Basic Electronics
- Systems, communication and control laboratory
- Speech Signal Processing Laboratory
- Digital VLSI Design Virtual lab
- Signals and Systems Laboratory
- Electromagnetic Theory
- Virtual Electric Circuits

### 2. Computer Science & Engineering

- Advanced Network Technologies
- Software Engineering
- Data Structures
- FPGA & Embedded systems lab
- Problem Solving
- Computer Architecture & organization
- Computer Programming
- Data Mining  Databases
- Computer Organization
- VLSI  Digital Logic Design
- Speech Signal Processing
- Mobile Robotics
- Computer Graphics
- Image Processing
- Pattern Recognition
- Artificial Neural Networks
- Virtual Advanced VLSI Lab
- Cryptography Lab

### 3. Electrical Engineering

- Sensors Modeling & Simulation
- Industrial Automation Laboratory
- PLC

- Analog Signals, Network and Measurement Laboratory
  - Real Time Embedded Systems Laboratory
  - Electrical Machines Laboratory
  - Creative Design, Prototyping & Experiential Simulation Lab
  - Ergonomics Lab for Assessing Physical Aspects of Design
  - Virtual English and Communication
  - Virtual Anthropology Lab
4. Mechanical Engineering
- Metal Forming Lab
  - Vibration and Acoustics
  - Micromachining laboratory
  - Kinematics & Dynamics of Mechanisms
  - Mine Automation and Virtual Reality
5. Chemical Engineering
- Process control, reaction engineering and unit operations lab
  - Chemical Engineering
  - Simulation of Control of Magnetic Levitation System
  - Virtual Lab for Mass Transfer
6. Biotechnology and Biomedical Engineering
- Bioreactor Modeling & Simulation lab
  - Biomedical and Signal processing Laboratory
  - Virtual Proteomics Laboratory
  - Neurophysiology (pilot)
  - Neuron Simulation Lab (pilot)
  - Biochemistry Virtual Lab I
  - Biochemistry Virtual Lab II
  - Population Ecology I
  - Population Ecology II
  - Immunology Virtual Lab I
  - Immunology Virtual Lab II
  - Microbiology Virtual Lab I
  - Microbiology Virtual Lab II
- Molecular biology Virtual Lab I
  - Molecular biology Virtual Lab II
  - Cell biology Virtual Lab I
  - Cell biology Virtual Lab II
7. Civil Engineering
- Strength of Materials Lab
  - Fluid Mechanics Lab
  - Soil Mechanics Lab
  - Basic Structural Analysis Lab
  - Surveying Lab
8. Physical Sciences
- Physical sciences
  - Virtual Advanced Mechanics Lab
  - Virtual Optics Lab
  - Virtual Electricity & Magnetism Lab
  - Virtual Heat & Thermodynamics Lab
  - Virtual Modern Physics Lab
  - Virtual Harmonic Motion and Waves Lab
9. Chemical Sciences
- Analytical Lab
  - Virtual Chemistry Lab
  - Virtual Lab in “Charge and Particle size Determination in Colloidal Systems”
  - Virtual Lab in “Absorption Spectroscopy”
  - Virtual Lab in “CD Spectroscopy”
  - Physics of Bimolecular Chemistry  Physical
  - Inorganic Chemistry  Organic Chemistry

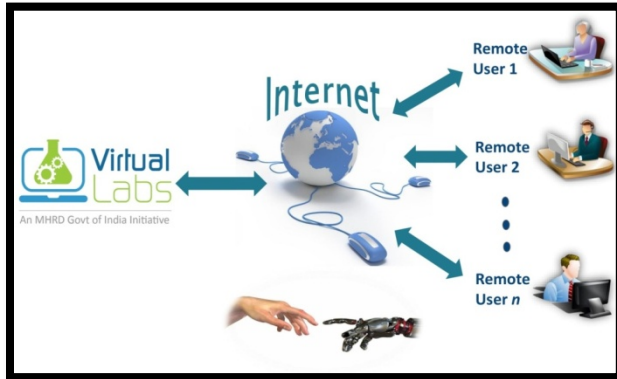


Figure: 2 Structure of Virtual Lab (Image

Source <http://vlab.co.in/about-us>)

## Conclusion

Virtual labs provide handy and cheap way for supporting laboratory education. Some use virtual labs as replacement of hands-on labs, but this has been reported to be unsatisfactory for students and in some cases it left a negative impact. However, virtual labs can be an important supplement of hands-on labs. The approach proved to be effective in enhancing the students learning outcomes during the hands-on session. Virtual learning environments like Virtual Labs have played a catalytic role in improving conceptual learning across the higher education landscape.

## References

1. <http://vlab.co.in/about-us>
2. [https://en.wikipedia.org/wiki/Virtual\\_Labs\\_\(India\)](https://en.wikipedia.org/wiki/Virtual_Labs_(India))
3. <https://vlab.amrita.edu/>