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A Virtual Laboratories for Computer Network

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Abstract: ***Virtual Lab is used for experimenting the real lab experiments with virtual components similar to the real Laboratory environment. This provides a path for engineering students to experiment and test their model through distance learning at a cost effective manner. This improves Student learning and ignite creative thinking. This paper is mainly focused on experimenting basic Network concept through interactive animation and linked Simulation tool thereby Students are exposed to use lab equipments and procedures similar to the real practice environment.***
Keywords: HTML, CSS, JS (Java script), Bootstrap

I. INTRODUCTION

The idea of virtual lab is to provide a chance to perform experiments using the internet and visual aids without having the equipments at their end. The experimental teaching is of great importance in computer networking. In this paper, we analyze the problems encountered in real-world laboratory, and proper a web based computer networking virtual laboratory to facilitate learning and teaching in the education of computer network. The design and implementation of such a system are analyzed in detail. Our experiences of using it in computer network teaching show that this laboratory enables students to share resources of physical and virtual equipments and understand the knowledge more clearly. By attending only theory classes is not helpful. For better understandings hands-on experiments are required but unfortunately we cannot perform hands-on experiments using this website we need to go laboratories for performing such experiments. In the paper we tried to overcome this problem by proposing new methods and implementation methods for creating virtual laboratories. Virtual laboratories for studying network security are making importance for students and faculties. Traditional physical laboratories require purchasing high cost equipments such as routers, switch, firewalls, host computers, etc. Reconfiguration and maintenance of these physical laboratories are very difficult and time consuming. For computer network education we require highly flexible, scalable and reconfigurable and isolated laboratories. Therefore our traditional physical laboratories are not suitable for doing such experiments.

In this paper we proposed a new technology for implementation the computer network virtual lab experiments. Using HTML for creating a programming platform and then we use the CSS(Cascading style sheets) and JS(JavaScript) for the style and a major components of this virtual lab.

Fig: 1.Basic idea of connection.

A network is a collection of computers and devices connected to each other. The network allows computers to communicate with each other and share resources

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II. COMPONENTS TOOLS

A. HTML

HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects such as interactive forms may be embedded into the redered page.HTML provides a means to create structured documents by denoting structure semantics for text such as headings, paragraph, lists, links, quotes and other item.

HTML elements are delineated by tags, written using angle brackets. Tags such as<img /> and <input /> directly introduce content into the page. Other tags such as … surround and provide information about documents text and may include other tags as sub-elements. Browser do not display the HTML tags, but use them to interpret the content of the page.HTML can embed program written in a scripting languages such as JavaScript which affect the behavior and content of web pages. Inclusion of CSS defines the look and layout of content. The world wide web consortium(W3C),maintainer of both the HTML and the CSS standards, has encouraged the use of CSS.

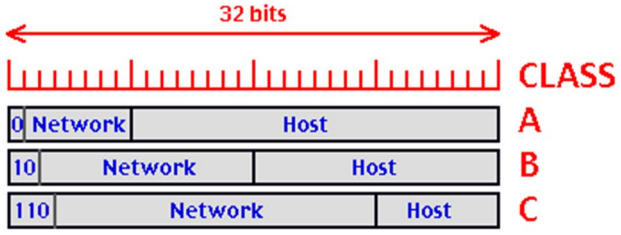
1) Java Script

It is a language which is also characterized as dynamic, prototype-based and multi-paradigm. It is used to make dynamic webpages interactive and provide online programs. Each of the many JavaScript engines represent a different implemention of JavaScript , all based on the ECMA Script specification, with some engines not supporting the spec fully and with many engines supporting additional features beyond ECMA.

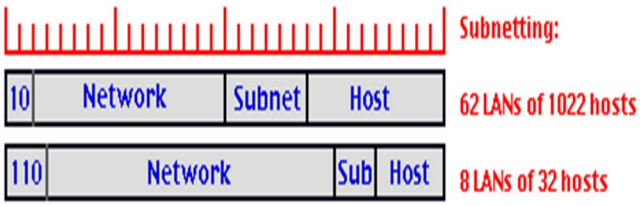
2) Subnet

Sub netting allow a network to be split into several parts for internal use but still act like a single one to the outside world.

Allocation of network and host



Allocation of network, host and sub net



3) Cascading Style Sheet(CSS)

CSS is a web page derived from multiple sources with a defined order of precedence where the definitions of any style element conflict.The

III. MODULE DESCRIPTION

The objective of this is to perform experiments in the basic labs virtual platform is focused on learning aspects as much as on performing the experiments. Students will get a feel of the real lab.The interactive animations are also provided at a lot of places to enable student learning.

A. Aim

The aim of a virtual lab is to represent in real time the behavior of a future construction, but instead of using the structural model an advanced visualization model which shows the design very realistically is included in the procedure.

B. Theory

Theory are about explaining the particular experiments briefly. So the students can easily understand them. We included theory in virtual lab to cover the experiments of engineering students. They can use this theory part to clarify the doubts. Exercise part in our virtual lab contains set of experiments the students need to perform. They have contents that students needs to perform it in order.

C. Pre Test

Pre test are the self evaluation of the students and to learn how the progress of learning the experiments for them. They used to know the standards of the student and to give a way to teach them in the specifics according to priority. In simple ways to term it assessment of the skills of student.

D. Procedure

It focuses on building the interactive method for learning hardware and software with real time simulation. Procedure should be easy to follow. It should have step-by-step directions for conducting the experiment.

E. Simulation

A computer simulation is an attempt to model a real life or hypothetical situation on a computer so that it can be studied to see how the system works.In this case we are going to apply the same in network lab of engineering students. This will help in reducing the time and errors happen in the duration of experiments in the lab. Students can creat their network as per requirements of the experiment, but these network are so realistic.

Simulation are purely based on cable connection and independent to actual hardware devices.By knowing about experiment and simulation is done using predefined algorithm.

F. Post Test

A test given to students after completion of an instruction program or segemts and often used in conjuction with a pretest to measure their achievements and the effectiveness of the exercise.

IV. RELATED WORK

In this section we will see few existing laboratories for performing hand-on experiments in networks. This section provides summarized existing work and their advantages and drawbacks.

1) This is our traditional laboratories in which organization or institution spend high amount on purchasing costly devices like routers, switches, hubs, firewalls and nodes,etc.
2) By using this labs students and researches can perform their hands-on experiments on these laboratories and will actual response from real hardware to the situation so more effective.
3) Cost is more. Reconfiguration and reconstruction is difficult. Maintenance cost is high.
4) Lab assistant is required for every setup.
5) Not flexible and scalable.
6) These laboratories are not sufficient for performing network connection because of reconfiguration and isolation capabilities.
7) Most of the network connection experiments are based on the multiple networks. So students are able to perform all experiments using these types of laboratories.

V. DESIGN OF VIRTUAL COMPUTER NETWORKS LAB

Virtual computer Network laboratory based on Java Script and HTML is mainly composed of two parts, the server and the client. The server contains the server program entry, and the remote invocation of cable simulator. The client contains the implementation of laboratory's virtual devices, the creation of simulation and the local invocation of visual tool.In other words networking can be defined as inter-connection of two or more computers for sharing the resources(hardware and software)and provide security on them. Networks are built with a combination of computer hardware and computer software.

VI. LABORATORY EXERCISES

The next step is creation of laboratory exercises for designed virtual laboratory. At this stage it is required to plan and design network topology for all exercises. Considering the lab exercises structure and course needs the most suitable virtual network topology. The network needed for exercises has routers, workststions and server.

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VII. CONCLUSION

According to the test above, it is possible to create laboratory exercises based on virtualization technology to teach networking concepts. Basic tool for virtual network laboratory was user virtualization application. Windows is used as the virtual machine operating system. All other software used in virtual laboratory is open-source software.
Hardware requirement were not so high and it is possible to creat virtual labortatory usable

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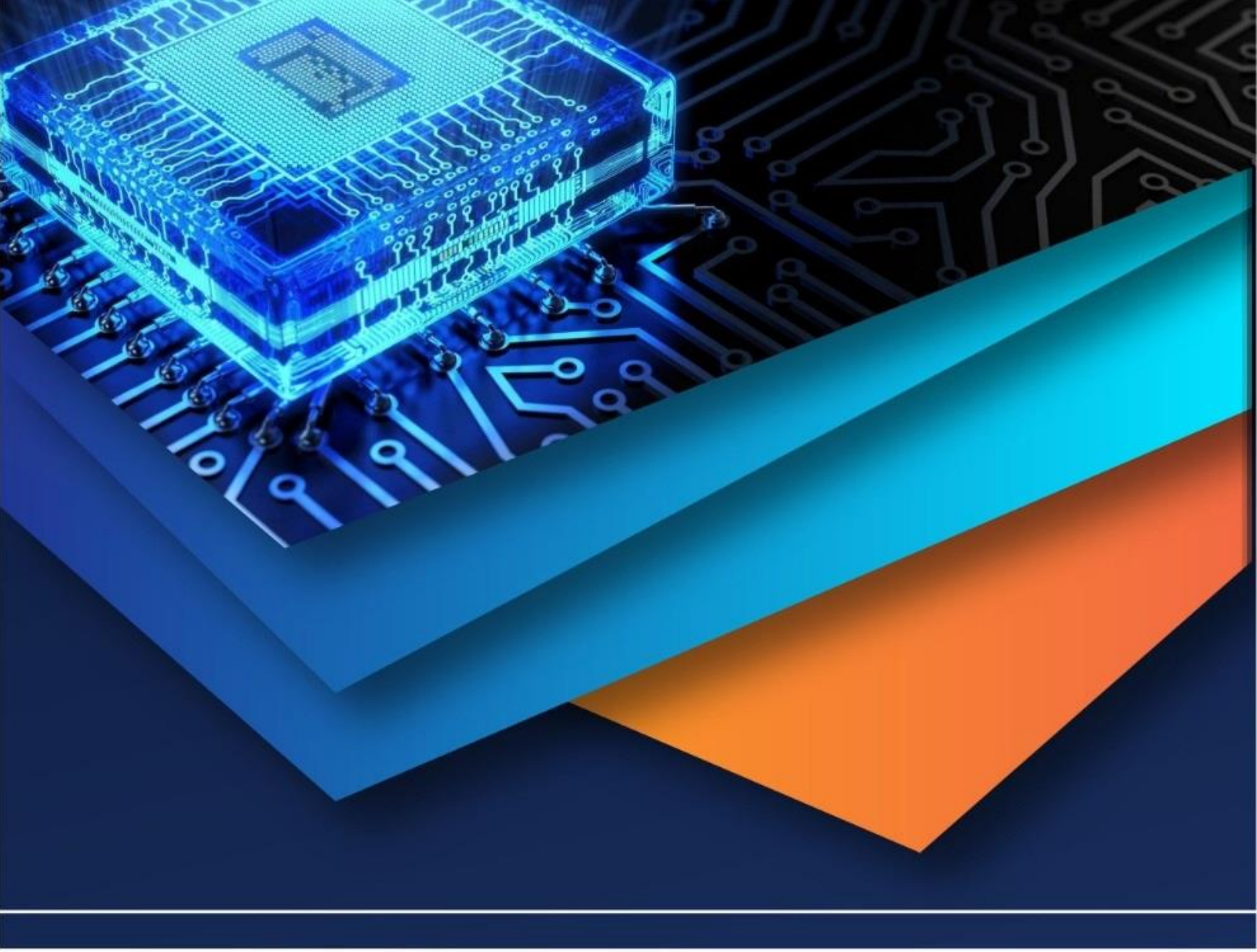

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