

# DEVELOPMENT OF NETWORK BOOT THIN CLIENT TYPE SERVER APPLICATION LEARN ENVIRONMENT SYSTEM BASED ON HTTP-FUSE-KNOPPIX

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## ABSTRACT

The environment for learning server software and the development of Web applications on an individual basis is not fully prepared because of various factors. In this research, we solved these problems by offering the LAMP [1] environment, assuming that each student has access to a computer. The features of this system are the distribution unit switching function of the divided compression block files based on HTTP-FUSE-KNOPPIX [2] [3] [4], and the synchronization function of the distributing servers supporting various network environments.

## 1. INTRODUCTION

At present, learning on server software is mostly performed with documents, simulation software, and group exercises using a small number of dedicated servers. With the current learning infrastructure, although knowledge is accumulated, a question remains about retention, application of knowledge, and acquisition of experience. This is because each student cannot prepare for and review their lessons. An appropriate environment is not provided for each student to learn on an individual basis. Insufficient maintenance of the environment where each student learns server software individually is caused by a variety of problems with installation and management.

The purpose of this research is to develop a server software learning system making good use of a thin client system to solve the traditional problems of server software learning environments. This system realized a server software learning environment that can be used with various hardware, software, and network environments. We reduced the starting time of the thin client system and improved the operability of the software after start-up by developing a function to improve the efficiency of the distributing server in the thin client system. We also provided a function to install and set up new software easily by developing a synchronization function for the distributing servers. This article describes the design of the server software learning system using a thin client system. (Fig.1)

## 2. DESIGN OF SERVER OPERATING SYSTEM

To build this system, customization on the kernel level is required. The system also needs an environment that is often used for corporate network servers. We used the open source operating system, Linux, because this satisfies the above requirements. Furthermore, the following features are required: a server environment, excellent automatic recognition of devices for different hardware environments, many applications, excellent security (such as protection from computer viruses), a storage device is not required, and recovery from human errors. We adopted KNOPPIX [5] based on Debian as a distribution that meets these requirements. However, if KNOPPIX based on Debian is adopted as is, updating and management of software for a bootable OS [6] [7] [8] is a burden on the system administrator because this distribution provides few examples of customization for server software learning. To solve this problem, the system design used a customized KNOPPIX to realize the server software learning environment, and the network bootable thin client system distributed the client environments.

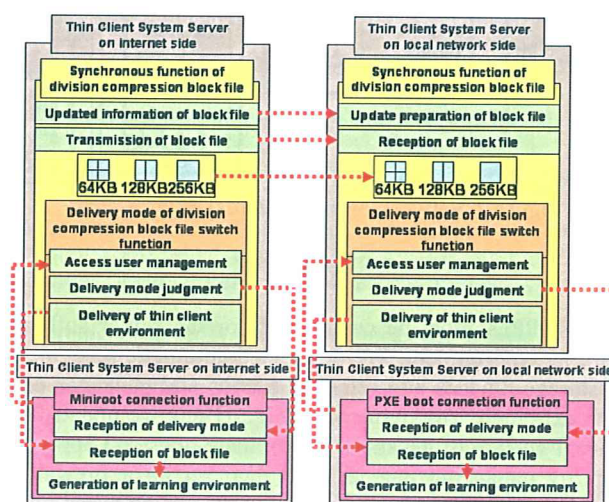


Figure 1 Function composition chart

## 3. DESIGN OF CLIENT ENVIRONMENT



KNOPPIX must be customized for the server software learning environment. We deselected automatic recognition of storage devices and removed menus and packages used with extremely low frequency. Then, we updated the current version of packages to eliminate bugs and apply the security enhancing patches, and then set up a firewall to improve security. This enabled us to provide the client environment where users can learn easily.

#### 4. DESIGN OF THIN CLIENT SYSTEM

In creating this system, it was required that the thin client system have an affinity for KNOPPIX, no need for unique protocols and dedicated ports [9] [10], a bootable network thin client system via HTTP communications, thin client system distributed blocks, and operability after start-up that was better than a bootable OS. We adopted the HTTP-FUSE-KNOPPIX mechanism, which met these requirements. If the HTTP-FUSE-KNOPPIX mechanism is adopted as is, depending on the start-up environment and distributing servers, it may take a long time to boot, and operations after start-up may be slow. And the distributed processing function of the distributing server is not provided.(Fig.2) Therefore, in this system design, we developed the distribution mode switching function for divided compression block files and a synchronization function for the distributing servers to solve these problems.

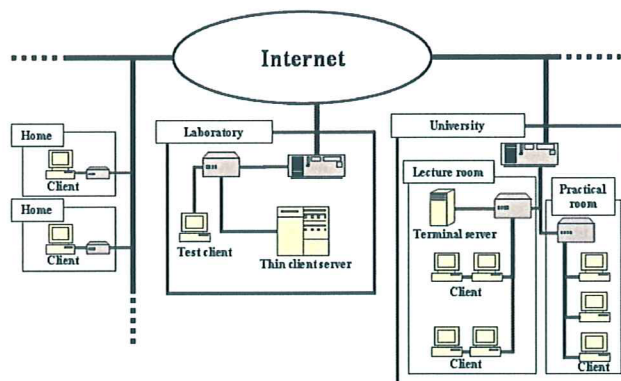


Figure 2 Network of experimental environment

#### 5. SUMMARY

KNOPPIX must be customized for the server software learning environment. We deselected automatic recognition of storage devices and removed menus and packages used with extremely low frequency. (Fig.3)Then, we updated the current version of packages to eliminate bugs and apply the security enhancing patches, and then set up a firewall to improve security. This enabled us to provide the client environment where users can learn easily. (Fig.4)

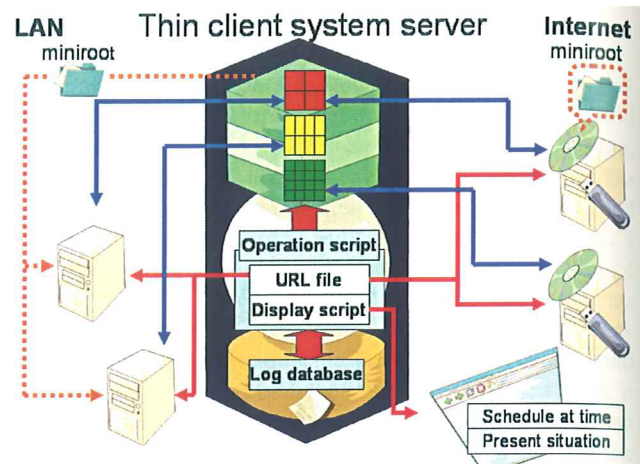


Figure 3 Client environment delivery system



Figure 4 Appearance of start experiment

#### 6. REFERENCES

- [1] LAMP, <http://e-words.jp/w/LAMP.html>
- [2] Kuniyasu SUZAKI, Toshiki YAGI, Kengo IJIMA, Hideyuki Tan:"HTTP-FUSE KNOPPIX",Linux Conference 2005.6.1
- [3] Megumi NAKAMURA, Seiji MUNETOH, Kuniyasu SUZAKI, Kengo IJIMA, Toshiki YAGI:"Security Enhancement of HTTP-FUSE KNOPPIX Client by Trusted Computing",Vol.2006,No.81,2006-CSEC-034,2006.7
- [4]Jun Kanai, Kuniyasu Suzaki, Toshiki Yagi, Mitaro Namiki:"Performance Improvement and Evaluation of HTTP-FUSE-KNOPPIX-BOX by Cache Servers", Vol.2006, No.44, 2006-OS-102, 2006.5
- [5] KNOPPIX, <http://unit.aist.go.jp/itri/knoppix/>
- [6] VMware, <http://www.vmware.com/jp/>
- [7] Berry Linux, <http://yui.mine.nu/>
- [8] ADIOS live linux boot CD, <http://dc.qut.edu.au/adios/>
- [9]V.M. Glushkov Inst. of Cybern., Acad. Of Sci, Kiev, Ukraine:"Interoperable thin client separation from GUI applications", IEEE, Software Maintenance and Reengineering, 2002. Proceedings. ixth European Conference on Publication Date: 11-13 March 2002
- [10] Sheng Feng Li Stafford-Fraser, Q. Hopper, A. "Integrating synchronous and asynchronous collaboration with virtual network computing" IEEE, Internet Computing May-June 2000