**Web-Based Practical Exam Monitoring System (WPEMS)**


by


Aizat Bin Kamaruzaman


Dissertation submitted in partial fulfillment of

The requirements for the

Bachelor of Technology (Hons)

(Information Communication Technology)


JANUARY 2008


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CERTIFICATION OF APPROVAL


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A project dissertation submitted to the
Information Communication Technology Programme
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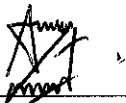(INFORMATION COMMUNICATION TECHNOLOGY)


Approved by,


(Hilmi Bin Hasan)


UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
January 2008

# CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the

original work is my own except as specified in the references and acknowledgements,

and that the original work contained herein have not been undertaken or done by

unspecified sources or persons.

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AIZAT BIN KAMARUZAMAN

# ABSTRACT

The purpose of this executive summary is to give a complete view of my developed project, which is the Web-based Practical Exam Monitoring System (WPEMS). I developed the project for the purpose to complete my Final Year Project 1 and Final Year project 2 requisite. Thus, WPEMS is created throughout the time period. Throughout the entire period of time, I have been exposed to a lot of new things ranging from various technological knowledge's, especially in manage and exploit some of the Simple Network Management Protocol (SNMP) functions available in Microsoft XP or Microsoft Windows 2003.

I undergo my Final Year Project 1 and 2 under the supervision of Mr. Hilmi Hasan, an ICT lecturer in Universiti Teknologi Petronas. Being a student under his supervision requires me to constantly work perfectly in order to ensure the success of my developed project, which is the WPEMS application.

WPEMS is a totally new system, where no one else in UTP has created it before, and thus it is unique in its own way. Generally, it is a web-based monitoring application for practical examination in the lab. Practical examination here is such programming examinations or tests, where students need to hard coded their own program in the lab, and thus the needs to constantly ensure the integrity of the examination is crucial. This is due to the availability of the Internet which can be used by students to cheat in the examination, because they can simply search for the examination answer or tips at the Internet during their practical examination time. WPEMS can solve that problem, by automatically monitoring the running examination, and any cheating attempt by students will be automatically logged. This can reduce number of personnel usage, and also minimize the efforts of the lecturers to constantly walking all around the lab to make sure nobody is cheating.

# Table of Contents

# 1.01.a. Acknowledgement

In this page, I would like to acknowledge my supervisor, Mr. Hilmi Hasan, who has been such a great helper and friend to me, giving the best supports he can offer throughout my entire Final Year Project period. He have been closed to me, and I regard him as teachers, friends, and helpers, who guide me and taught me many things which I don't know before, especially in making my Final Year Project a success.

I would like to take this special opportunity to express my sincere appreciation and gratitude towards my supervisor, who have guided me along the way for me to become an accomplished student in finishing my Final Year Project.

There are names that are not in the list; however they will always be in my mind. I also appreciate other lecturers and friends opinions, ideas, and thoughts that they gave to me regarding my project. I really appreciate them, and without their support and guides, I would not be able to complete my Final Year Project.

# 1.0.1.b. Introduction

The WPEMS provides a simple yet effective system for Practical Exam monitoring in UTP, especially in lab sessions where there are multiple workstations (personal computers) to be handled by a tutor or lecturer. By having WPEMS, there is no need for lecturer to have multiple assistants in order to secure the tests or exams from student's cheating (e.g; accessing the Internet) because the system will monitor every single workstations in the lab.

*The intelligence part* of the system is that it can provide an automatic warning message to the lecturer's (invigilator) pc during the test or examination sessions. WPEMS is free, simple and easy to use because it uses an open source language which is the PHP and is running on Apache web server plus the phpMyAdmin database system as the backend.

The system will use Simple Network Management Protocol (SNMP) where the PHP script will integrate with the SNMP function to query network and device traffic within the network environment (lab/classroom).

The lecturer can add or delete as many hosts as they for the lab. By having the WPEMS, there is a high percentage of securing the lab practical tests without the student dare to cheat by accessing the internet for test solutions or answers. This is due to the efficiency of the system that can automatically detect any attempts made by the students to by monitoring their current running Internet Browser applications.

Therefore the system objectives can be easily achieved by looking at the number of cheating attempted in future compared with number of cheating recorded in the past. Furthermore, by not having many invigilators anymore during a lab/exam sessions, WPEMS will fulfill its other objective which is to minimize staffs usage.

## 1.0.2 Overall Functionality

There will be 5 pages for lecturers to view; *Home, Monitor Status, Host Management, Log Management,* and *Help* section.

The *Home* page is the landing page of the system. It will provide:

- informations such as system requirements
- introduction

The *Monitor* page will have 2 sections. The first section is the overall status that will list all hosts registered in the system with these details:

- IP address
- Computer's Name
- Host Info
- System Status
- Uptime
- Cheat Status

 The second section which is the individual section provides information in dynamic graphical charts. It displays:

- IP Address
- Computer's Description
- System Uptime
- Network Statistic Details (in number of packets)

  - Sent TCP
  - Received TCP
  - Error TCP Received

- o   TCP Connection Reset
- o   Sent UDP
- o   Received UDP
- o   UDP errors
- o   Sent ICMP pings
- o   Sent ICMP pings replied
- o   ICMP errors received
- o   ICMP connection resets

The third page is the *Host Management* page. In this page, lecturer will be able to:

- Add hosts (IP address, friendly name, host description, OS)
- Delete hosts
- Edit hosts

The last page is the *Log Management* page. This section provides the ability of the system to query logs from database regarding successful detection, where it will displays:

- IP addresses
- Computer's name
- Detection date
- Detection time
- Browser type

In conclusion, by having WEPMS, lecturers can have the real time monitoring during the practical examination time. The system will subsequently reduce the number of cheating by the students. The system is also found to be effective, yet simple to operate by anyone.

The *Help* page will describe about system requirements and procedures that need to be fulfilled in order for WPEMS to run successfully. There are several simple steps for lecturer's or lab instructor to follows.

## 1.0.3 Problem Statements

1. Lecturers always have trouble monitoring their student's practical exam in lab session because of the quantity of students taking the test is too many, thus resulting in having 2 or 3 practical exam sessions to complete the test.

2. Students can always cheat by accessing the Internet while answering their practical exam test question.

3. Lecturers often need 1 or more staffs to help them monitor the practical exam session, resulting in more workforce needed.

## 1.0.4 Main Objectives

1. To authenticate the integrity of practical examination in the lab.

2. To automatically display a warning message to the lecturer's workstation/pc of which student's workstation/pc is accessing the Internet during practical examination.

3. To reduce workforce or staffs personnel usage that is required to monitor the practical examination session in the lab.

## *1.0.5 The scope of works.*

## 1.0.5.a WPEMS Portal Design

a. The scope of work for this part requires creativity and ideas as I need to design and construct a simple yet practical layout for the portal. The plan was to create frameset pages, where the main design for the portal will be divided into two sections, one for the navigational links, and the other one to display the content. By using frameset design, it will provide a good and effective navigation throughout the system layout and plus with an added security as people cannot alter the variables that is to be posted using the URL method. (PHP style).

## 1.0.5.b WPEMS System Design

a. This part is mainly about how is the structure of the WPEMS system looks like. WPEMS design was to provide simplicity towards lecturer or course instructor that handles the practical lab examination. The important part of the system will be the three sections, where it hosts the monitor page, the host management, and the logs management page.

    a. The monitor page will displays the list of table where it hosts the name of computers's, its ip addresses, description, and system status. The system status is a dynamic variable and it is depending on the condition of the usage of Internet Browser in client's computer (in this case, the student's computer). The system status field will change from OK to CHEATING.

    b. The host management page will have 3 functional pages inside it, where admin can add more hosts, delete hosts, and edit saved hosts directly from the portal without opening the system database.

    c. The log management page will provides the ability of the system to query logs from database regarding successful detection and displays it in html table for easy viewing. Thus, lecturers or lab instructors can have a better view, which students access the internet, during what date and time, plus the browser they are using.

# 1.0.5.c WPEMS System Design

a. The scope of work for this part is mainly about PHP programming and MySQL syntaxes including connection to database, query data from database, displaying it properly into HTML pages, and so on. But the tricky part is on how to configure the SNMP modules in the PHP.ini configuration files, and how to run it from Windows XP system. After SNMP module have been setup correctly, I can use the SNMP functions available in the library to access computer's devices details by using PHP. I can get the client's IP addresses, tcp or udp packets sent, ports' open, and many more.

# 2.0 Literature Review

## 2.0.1 Introduction

The Web-based Practical Exam Monitoring System is unique in terms of its network monitoring and management features. But the added features of dynamic charting to displays various network packets is not something that could be taken lightly, as it provides the most simple and practical way of displaying network data, plus the monitoring page. All this are design using PHP, which is totally free.

"The term **network monitoring** describes the use of a system that constantly monitors a computer network for slow or failing systems and that notifies the network administrator in case of outages via email, pager or other alarms. It is a subset of the functions involved in network management."- *The impact of WAN Optimization on NetFlow/IPFIX measurements.*

By using the WPEMS, students who attend the test in the lab and do practical examination, test, or quizzes by using lab's computers will have their Internet activity monitored throughout the test period automatically by lecturers. Any attempts to cheat by opening Internet Browsers will automatically be detected by the system, and a warning message will be displayed in lecturer's computers, plus a log will be created and saved into database. The advantage of this system is that it can capture any cheating attempt and logged it into the database with the details such as cheat attempt time, date, and browser type that students use.

By having this system, it is guaranteed that lecturers or course/lab instructors will not be having a hard time to monitor their class's practical examinations or tests. The simplicity of the systems can be found in the log section, where lecturer or course instructor can just leave the classroom and just need to check the log section for details on any cheating attempt.

## 2.0.3 Problem Statements

Based on the major problem statements I already mentioned above, I have done a little research on the Internet to find any papers or journal that have been written by researchers regarding the current issues that associates with practical exam monitoring system in every learning institution over the whole world. I have found several journals regarding the matter and cited it below.

"One of the major difficulties in instituting a laboratory exam of this kind is in administering it. The final administrative issue is security of the environment. Some lab finals at other schools are administered in a "clean" environment, where student access to the outside world is cut off and students are given special logins" ".- Mary Elaine Califf and Mary Goodwin. *Testing Skills and Knowledge. Introducing a Laboratory Exam in CSI.*

"We monitor students' access to the outside world only by the careful proctoring by the lab assistant and lab instructor, who have strict orders to report anyone using any program other than Visual C++ or accessing data not on a floppy or the student's network drive for the class.(Including the Internet)" ".- Mary Elaine Califf and Mary Goodwin. *Testing Skills and Knowledge. Introducing a Laboratory Exam in CSI..*

"Although administering an exam of this type can be a daunting task".- Mary Elaine Califf and Mary Goodwin. *Testing Skills and Knowledge. Introducing a Laboratory Exam in CSI.*

The above cited journals shows that with the use of current technological programming language, it can scare means for the students to not cheating during practical examination because they are automatically being monitored, especially in my WEPMS where constant monitoring is used for the practical exam monitoring system..

This will hugely impact student's life as they cannot trick the technology implemented in the project.

## 2.0.4 Current Implementation

There is some similiarity in several current networks monitoring in the market that actually do have graphical capability in displaying network traffic packets or dataflow. One of the famous one is Cacti.

"Cacti is a complete frontend to RRDTool, it stores all of the necessary information to create graphs and populate them with data in a MySQL database. The frontend is completely PHP driven. Along with being able to maintain Graphs, Data Sources, and Round Robin Archives in a database, cacti handle the data gathering. There is also SNMP support for those used to creating traffic graphs with MRTG." - http://www.cacti.net/what_is_cacti.php.

Another example of network monitoring application or software that I have researched in the Internet is ManageEngine OpManager, where it can also do application monitoring.

" ManageEngine® OpManager is a complete network monitoring software that offers combined WAN, Server, Applications monitoring with integrated help desk, asset management & WAN traffic analysis functionality. OpManager automates several network monitoring tasks and removes the complexity associated with network management. This network monitoring software will help you in, aligning your IT to business, visualize & manage your WAN, manage your entire datacenter infrastructure and enabling you to be the first to know in case of any deviations so that you can feel assured that you are in control of your entire Network infrastructure." - http://manageengine.adventnet.com/products/opmanager/index.html?gclid=COyw09WpuZECFRYbewodix zS6A

Another similar application that provides network monitoring and application controls is AdRem NetCrunch 4.3. The application is the type of Network Monitoring System (NMS) and its function is basically the same with the rest of available applications in the market.

"NetCrunch is an easy to deploy, agentless monitoring solution, which covers all areas critical to network monitoring. Among common NMS features, NetCrunch offers robust monitoring performance, advanced presentation of physical network topology and easy system and application monitoring. With its intuitive interface, the product makes system management straightforward for administrators of midsize and large networks."- http://www.adremsoft.com/netcrunch/

The last example of similar applications I found on the Internet is Network Eagle. "Network Eagle Monitor is a powerful network monitoring software. It can continuously monitor the state of your servers, various network services, databases and more over the network 24 hours per day. In case the state of monitored object has changed, Network Eagle Monitor is able to send various notification events or perform some actions." - http://www.network-eagle.com/index.php

Network Monitoring System (NMS) applications are available in the market for quite sometime now, but their cost is too costly to be implemented in our University, thus I hard coded my own NMS using PHP, which is free to be use in University lab, particularly for practical exam uses. The system however needs to be integrated with Windows SNMP functions, and I will explain that later on in the discussion section.

## 2.0.5 Journal that support my idea

Another article that I cited below shows the importance and the situations that we need to analyze everyday or monitor. It is true that for any LAN network, we need tools to monitor the running applications across the workstations available in the LAN, so that everything is in our eyes to see.

"Reading network traffic is essential for system administrators, network engineers, and security analysts. At some point there will be a need to read the network traffic directly instead of monitoring application level details. Examples of situations that might require monitoring network traffic are, auditing network security, debugging network configurations, and analyzing usage patterns. For this task we use network monitoring software, or network sniffers, that sniff the traffic your computer is able to see on the network. What exactly your computer can see really depends on how the network is laid out, but the easiest way to figure out what it can see is just start sniffing"- *Monitoring Network Traffic* by: LearnSecurityOnline, 06/08/2005.
http://www.securitydocs.com/library/3357

I can conclude that if I were to gather all the necessity of having a continuous network monitoring system especially for practical examination involving programming and etc, we can see that the importance of having such tools is very much more than a necessity. It is a must requirement for every school or Universities around the world, because students have a tendency to cheat during examinations or test, especially when doing practical examinations like C/C++ programming, Java, and many more.

# 3.0 Discussion and Conclusion

## 3.0.1 Discussion General

In this section, I will discuss about the advantage and disadvantages of having WPEMS or manual monitoring using person (lecturers or tutors).

| WPEMS | Manual Monitoring |
|---|---|
| **A**: Prove the integrity of the practical exam/test. | **A**: Easy to implement |
| **D**: Troublesome during implementation phase. Different version of PHP or Mysql might have trouble with the existing codes. | **D**: Doesn't prove the integrity of the practical exam/test. Students may still cheat without the lecturer/tutor notice. |
| **A**: More reliable and dependable system, as students will be monitored every seconds in the period of the practical exam/test. | **D**: May lead to cheating in practical exam/test.<br>**D**: Not a reliable way of monitoring, as it involves and waste human effort and time. |
| **D**: The system will ease human's effort with an easy user-interface to use. | **A**: Will always run without the use of computers, but with flaws. |

Table 2: Comparison between WPEMS and manual monitoring system.

Legend: **A: Advantage**

Legend: **D: Disadvantage**

## 3.0.2 Discussion Specific

There are several considerations need to be taken care of. First, the importance of having an SNMP-enabled workstations for all computers that involve in the practical examinations/tests. SNMP is a Windows component that is required in order for the system to monitor the cheating attempt.

Other important matters need to be addressed are the PHP scripting was done in PHP 4 environment, thus in order for WPEMS to work correctly, it need to be parse using PHP 4 engine too, and not PHP 4 or above. (Such as PHP 5, etc).

There are several commands list need to be added in the PHP configuration files and compiled it. The file is php.ini and it can be found inside the php installation folder. The commands that need to be added are:

```
[Sockets]
; Use the system read() function instead of the php_read()
wrapper.
    sockets.use_system_read = On
    extension=php_sockets.dll
    extension=php_snmp.dll
    extension=php_pgsql.dll
    extension=php_mbstring.dll
    extension=php_ldap.dll
    extension=php_imap.dll
    extension=php_gd2.dll

; Default timeout for socket based streams (seconds)
default_socket_timeout = 60

enable_dl = On
```

## 3.03 Methodology and Current Progress

I use waterfall model for this project, and there are several phases that will be covered in order to fully develop a functional system of WPEMS.
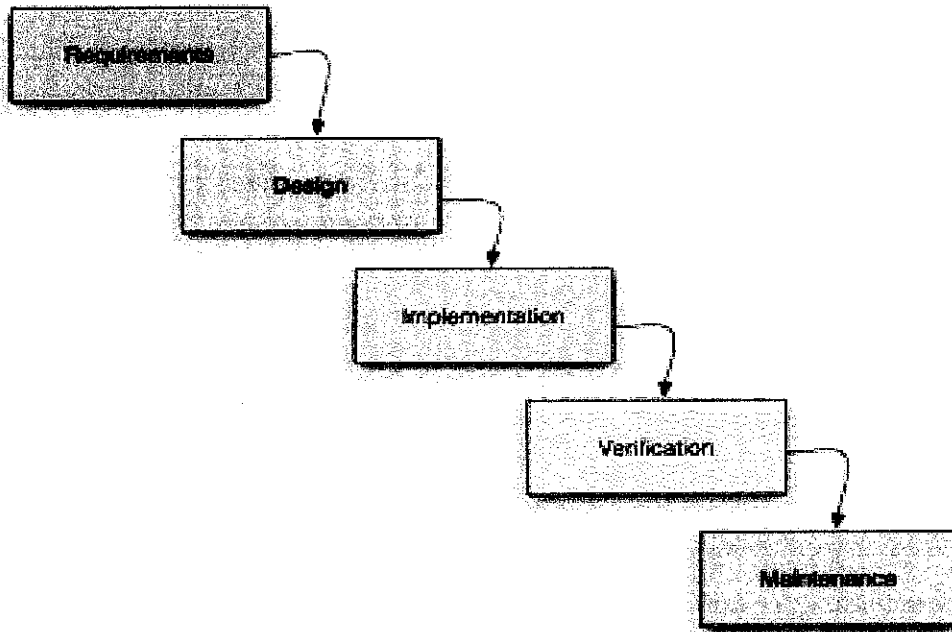


The phases in the waterfall methodology are requirements, design, implementation, verification, and maintenance. So far, in current progress, I have done 3 phases, which is requirements, design, and also implementation phase.

1. I have done requirement phase for this project and had gathered several information and requirement that is needed in order to fully understand on how to build this system well.

   a. Studied different products and devices to be used later in the development and implementation phase.
   b. Data gathering by asking lecturers problem of current practical exam/test monitoring.
   c. System & software needed to built the project was identified.

2. In design phase, I have done the early design prototype of the system. Things that are covered in the design phase are such:

    a. Identify color scheme and portal layout
    b. Build each module based on the scope of work

        i. Monitoring system
        ii. Host Management section
        iii. Log Management Section
        iv. Portal Development

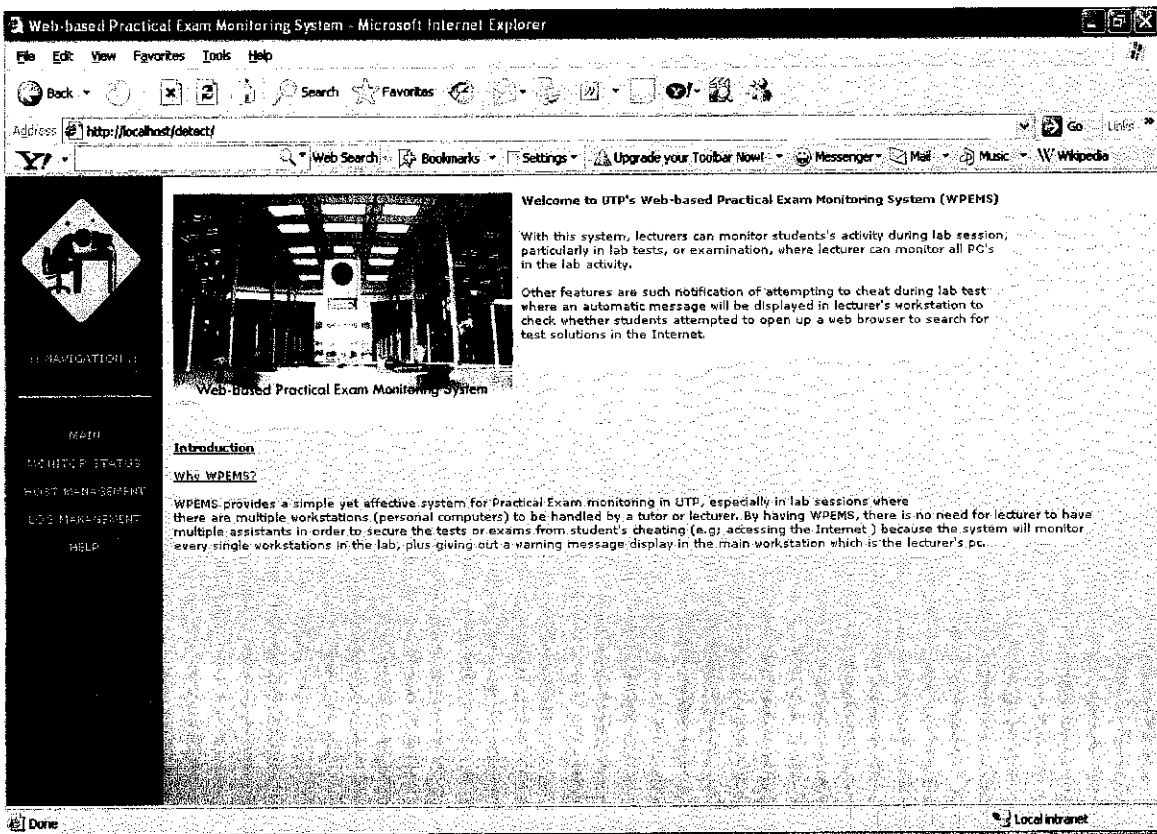    c. Develop a prototype of the system.

3. In Implementation phase, I have tried to implement it in LAN environment, and the applications work correctly, according to the requirements of the project, which is to monitor and deter any kind of cheating attempts by students during practical test/exam.

4. In verification phase, constant integration and verification of the implemented code is necessary to ensure that implementation remains on track. Verification phase is required to validate the phases preceding them. Among verification task that have been done including to make sure that WPEMS can be run perfectly in various lab environment because different labs may have different computers setting, and necessary services such as SNMP agent are not installed, thus preventing WPEMS from running perfectly. Moreover, verification of the objectives is done too, to make sure that the project successfully achieve its objectives by measuring how effective the result of using the product.

5. Maintenance phase consist of maintenance work to make sure that no errors or bugs appears during the running period of WPEMS during implementation.

# 4.0 Project Screenshots



Main Page of the WPEMS system.

Intelligence Monitoring System

File   Edit   View   Favorites   Tools   Help

Back  •   •   ×   •   •   Search   •  Favorites   •   •   •   •   •   •   •   •

Address  http://localhost/detect/                                                    Go   Links »

**Hosts Management Page**

Add Host          Delete Host          Edit Host

| IP Address | Computer's Name | Host Info |
|---|---|---|
| 165.0.5.23 | mahen pc | mahen01 |
| 192.100.100.1 | my workstation | pc01 |
| 192.100.100.107 | another pc | pc09 |
| 192.100.100.22 | hells gate ku | pc rosak |
| 192.100.100.7 | laptop workstation | pc02 |

NAVIGATION

MAIN

MONITOR STATUS

HOST MANAGEMENT

LOG MANAGEMENT

HELP

Done                                                                   Local intranet

**Host Management Page**

**Add Host into Database**

| Details | Input Form |
|---|---|
| Host IP Address | |
| Computer's Name | |
| Computer's Info | |
| | Reset   Save |

<< Back <<

MAIN

MONITOR STATUS

HOST MANAGEMENT

LOG MANAGEMENT

HELP

**Add Host Page (This page comes under Host Management category).**

**Log Management Page**

| IP Address | Computer's Name | Detection Date | Detection Time | Browser Type |
|---|---|---|---|---|
| 192.100.100.1 | my workstation | 2008-01-17 | 10:36:57 | Mozilla Firefox |
| 192.100.100.7 | laptop workstation | 2008-01-17 | 10:36:57 | Internet Explorer |

*Logs are logged on the first/earliest detection only.

Clear Logs | Download Logs

MAIN
MONITOR STATUS
HOST MANAGEMENT
LOG MANAGEMENT
HELP

Done                                                                                    Local intranet

## Logs Management Page

**Requirements**

-Web browser, Internet Explorer or Mozilla Firefox
-SNMP module enabled in PHP configuration (php.ini)
-Apache WebServer
-phpMyAdmin database
-LAN environment

**Instructions**

**How to add workstations/hosts:**

* Click on Host Management Page
* There are 3 sections, Add, Delete, or Edit
* Click Add to add hosts into the database
* Click Del to delete hosts from the database
* Click Edit to modify data saved from the database

**How to monitor practical test:**

* Click on Monitor Status
* View the overall status for each hosts in the LAN
* Click on particular host's link to view details in depth
* Cheating by students will be displayed on screen with a message

MAIN
MONITOR STATUS
HOST MANAGEMENT
LOG MANAGEMENT
HELP

Done                                                                    Local intranet

## Help Page (For requirements and self-help tutorial of using WPEMS).

**Log Management Page**

| IP Address | Computer's Name | Detection Date | Detection Time | Browser Type |
|---|---|---|---|---|
| 192.100.100.1 | my workstation | 2008-01-17 | 10:36:57 | Mozilla Firefox |
| 192.100.100.7 | laptop workstation | 2008-01-17 | 10:36:57 | Internet Explorer |

*Logs are based on the first/earliest detection only.*

| Download Logs

**File Download**

Do you want to open or save this file?

Name: WEPMS_Logged.xls
Type: Microsoft Excel Worksheet
From: localhost

[ Open ]  [ Save ]  [ Cancel ]

While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not open or save this file. What's the risk?

**Extra added functions. Lecturer can now download the logs in Excel format.**

File   Edit   View   Favorites   Tools   Help

Back ▾   [x] [2]   Search   Favorites

Address ☐ http://localhost/detect_e_asel/   ☐ Go   Links »

Y! ▾   Q ▾ Web Search   Bookmarks ▾   Settings ▾   Upgrade your Toolbar Now!   ▾   Messenger ▾   Mail   ▾   Music   ▾   W Wikipedia

**PC Individual Details**

| IP Address | Computer's Description | System Uptime |
|---|---|---|
| 165.0.5.66 | Hardware: x86 Family 15 Model 3 Stepping 3 AT/AT COMPATIBLE - Software: Windows 2000 Version 5.1 (Build 2600 Multiprocessor Free) | 2:50:02.09 |

Network Statistic Details

**FusionCharts Evaluation - An InfoSoft Global Creation**

Network Statistics

No. of Packets: 30K, 24K, 18K, 12K, 6K, 0

Sent TCP   Received TCP   Error received   TCP connection reset   Sent UDP   Received UDP   UDP errors   Sent ICMP pings   Sent ICMP pings replied   ICMP errors received   ICMP connection resets

Done   Local intranet

<u>Dynamic Chart Generation: To display real time network packets transfer of the computer.</u>

## 5.0 System Architecture

## Introduction about SNMP.

**Simple Network Management Protocol (SNMP)** is a popular protocol for network management. It is used for collecting information from, and configuring, network devices, such as servers, printers, hubs, switches, and routers on an Internet Protocol (IP) network. Microsoft Windows Server 2003 provides SNMP agent software that works with third-party SNMP management software to monitor the status of managed devices and applications.

## Automating Network Management

Large networks with hundreds or thousands of nodes are difficult to manage without a large staff to monitor every computer. SNMP, which is widely used in local area networks (LANs), lets you monitor network nodes from a management host. You can monitor network devices such as servers, workstations, printers, routers, bridges, and hubs, as well as services such as Dynamic Host Configuration Protocol (DHCP) or Windows Internet Name Service (WINS).

Use SNMP management software to monitor any network device on which you install SNMP agent software. The SNMP agent, which is an optional component of Windows Server 2003, interacts with third-party SNMP management software to enable the sharing of network status information between monitored devices and applications and the SNMP management system that monitors them. The following figure shows this process.

# Computer Running SNMP Manager Requests Status Information from Devices Running SNMP Agent
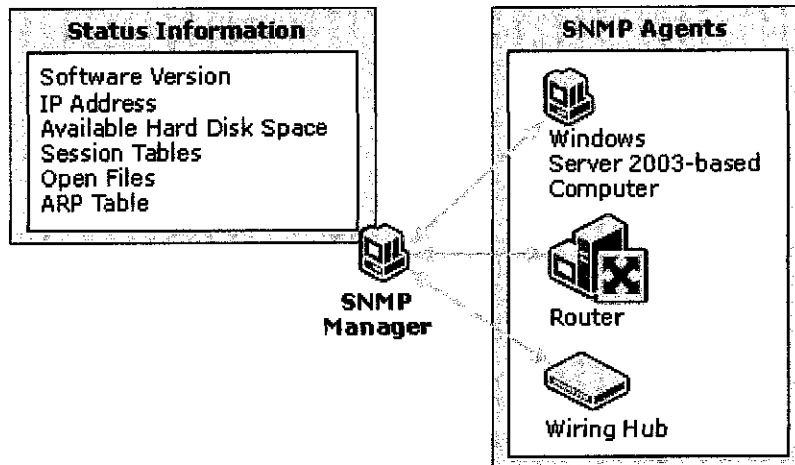


Using SNMP, you can monitor network performance, audit network usage, detect network faults or inappropriate access, and in some cases configure remote devices. SNMP is designed to be deployed on the largest possible number of network devices, to have minimal impact on the managed nodes, to have minimal transport requirements, and to continue working when most other network applications fail.

**Definition of SNMP sources**: http://technet2.microsoft.com/windowsserver/en/library/2a4711d6-2e0a-48a0-b4c4-d03c1b43c6901033.mspx?mfr=true

**Services That Can Be Monitored or Configured Using SNMP Agent**

| Service | Monitor | Configure | Windows Operating Systems That Provide SNMP Support for This Service Version |
|---|---|---|---|
| WINS | • | • | Windows Server 2003, Windows XP, and Windows 2000. |
| DHCP | • | | Windows Server 2003, Windows XP, Windows 2000, and Windows NT-based Dynamic Host Configuration Protocol (DHCP). |
| IIS | • | | Windows Server 2003, Windows XP, Windows 2000, and Windows NT-based Microsoft Internet Information Services (IIS). |
| LAN Manager | • | • | Microsoft LAN Manager. |
| Routing and Remote Access | • | | Windows Server 2003, and Windows 2000 Routing and Remote Access service. |
| IAS | • | • | Windows Server 2003, and Windows 2000 Internet Authentication Service (IAS). |
| System Monitor counters | • | | Windows Server 2003, Windows XP, and Windows 2000 System Monitor counters. You can use SNMP to monitor all performance counters related to System Monitor TCP/IP, including ICMP, IP, Network Interface, TCP, UDP, DHCP, File Transfer Protocol (FTP), WINS, and IIS performance counters. |

**Diagram: Services That Can Be Monitored or Configured Using SNMP Agent.**

Source: http://technet2.microsoft.com/windowsserver/en/library/2a4711d6-2e0a-48a0-b4c4-
d03c1b43c6901033.mspx?mfr=true

## SNMP On Linux/Unix Environment

Another extra information I found during my research about SNMP is that it can be used even in Linux or Unix environment. The special agent needed for SNMP to run in Linux is AdventNet SNMP Agent.

AdventNet SNMP Agent For Linux is a product that facilitates monitoring of linux nodes in a network. It gives very useful information about the linux nodes based on two standard mibs HOST-RESOURCES-MIB and RFC1213-MIB and AdventNet specific mib ADVENTNET-LINUX-MIB. It supports two protocols SNMP and HTTP.

The agent can be queried by snmp get, get next, get bulk and walk operations from a Mib Browser or from any SNMP Manager like AdventNet OpManager, AdventNet WebNMS, IBM Tivoli and HP OpenView. It can also be queried through a HTTP console ie from a web browser.

## WPEMS System Structural Design.

Now I will discuss about how I manipulate SNMP into my system. There are several SNMP functions that I use in order to monitor remote workstations in the prescribe LAN environment (in this context, the lab where the practical exam/test is conducted).

For the SNMP snmpget is the function that I use most in order to query data packets, or network statistics. Snmpget function is use to fetch an SNMP object.

<u>Here is an example.</u>

string **snmpget** ( string `$hostname` , string `$community` , string `$object_id` [, int `$timeout` [, int `$retries` ]] )

The **snmpget()** function is used to read the value of an SNMP object specified by the *object_id* .

## How do I monitor the practical test for cheating?

Basically, students will try to cheat in practical examinations or test by using Internet search engine to browse for codes or answers on the Internet. Thus I uses the power and capabilities of SNMP functions, and put it in a series of conditional scripting using PHP.

Here how it works. By quering the hrSWRunPath node in the remote system using the HOST-RESOURCES-MIB I can know the path of the softwares running presently in that particular system, hence I can be aware of the software applications that are running in remote system. But in WPEMS, I query hrSWRunName to query each running program names, so that I can capture the browser names like firefox, or iexplorer easily.

But the most important thing is that the Agent is UP in the SNMP properties. Thus I make a loop condition and filter any running processes in the remote workstations for processes that is a web browser. Hence if any web browser specified in my coding is detected running, WPEMS will notice it and logged it in the database, plus with a warning message to the lecturers or tutors in the main workstation in the lab.

I need to know the OID or object-id of things that I require to query. In this case, I query the running processes for each of the workstations in the lab.
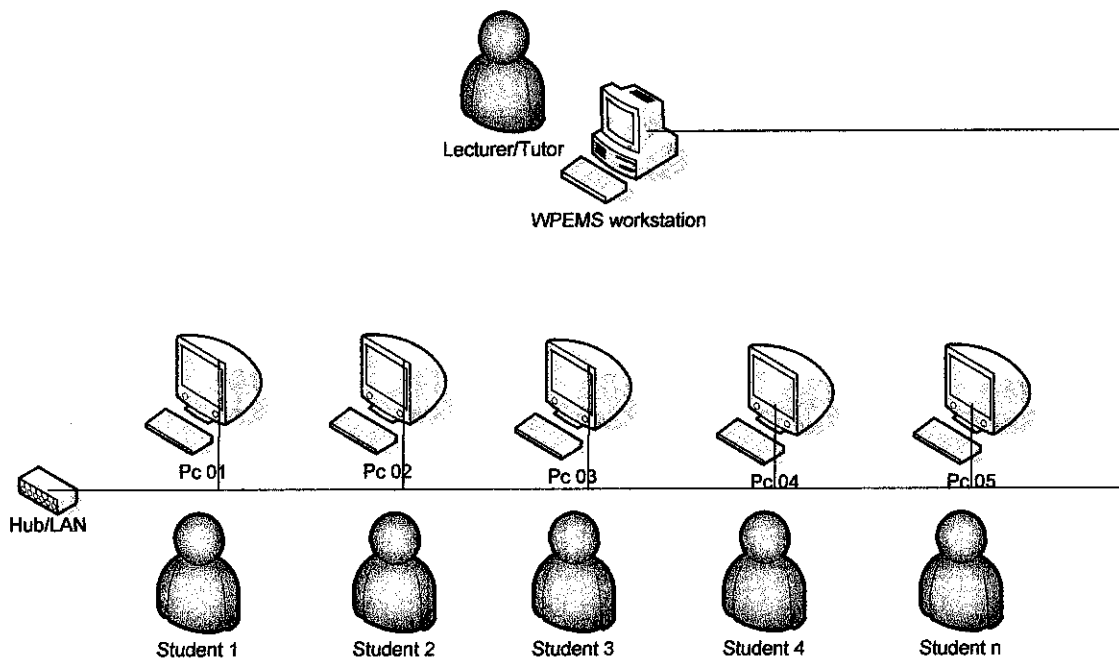
For example, this is the codes to listed out all running processes in remote workstations, coded using PHP scripting.

```
$detection = @ snmpwalk($ip_add, "public", ".1.3.6.1.2.1.25.4.2.1.2",
"");
```

For more details on lists of MIB/OID numbers, here is the resource website for it.

1. **Resource**: http://www.oidview.com/mibs/0/HOST-RESOURCES-V2-MIB.html
2. **Resource**: http://www.mnlab.cs.depaul.edu/cgi-bin/sbrowser.cgi?HOST=&OID=HOST-RESOURCES-MIB!host

## 6.0 Overall WPEMS Architecture Diagram



### How it works:

1. Lecturer register hosts of each workstations in the lab by adding IP address, computer name, and descriptions in the logs management page.

2. Practical tests or exam started.

3. Lecturer click the monitor page to activate monitoring of practical exam/test to detect cheating.

4. Detection are done in real-time, and any kind of cheating attempt by student to open Internet Browser will be notified immediately in the monitor page.

5. Logs of detection date, time, and type of browser will be saved in the database.

6. Lecturer can print out the logs at the end of practical tests.

7. For every new practical test, lecturer should always empty the logs page, so that all previous logged detection will be cleared, to allow new logs to be saved. (This is to avoid confusion).

# 7.0 UML Diagrams – Use Case
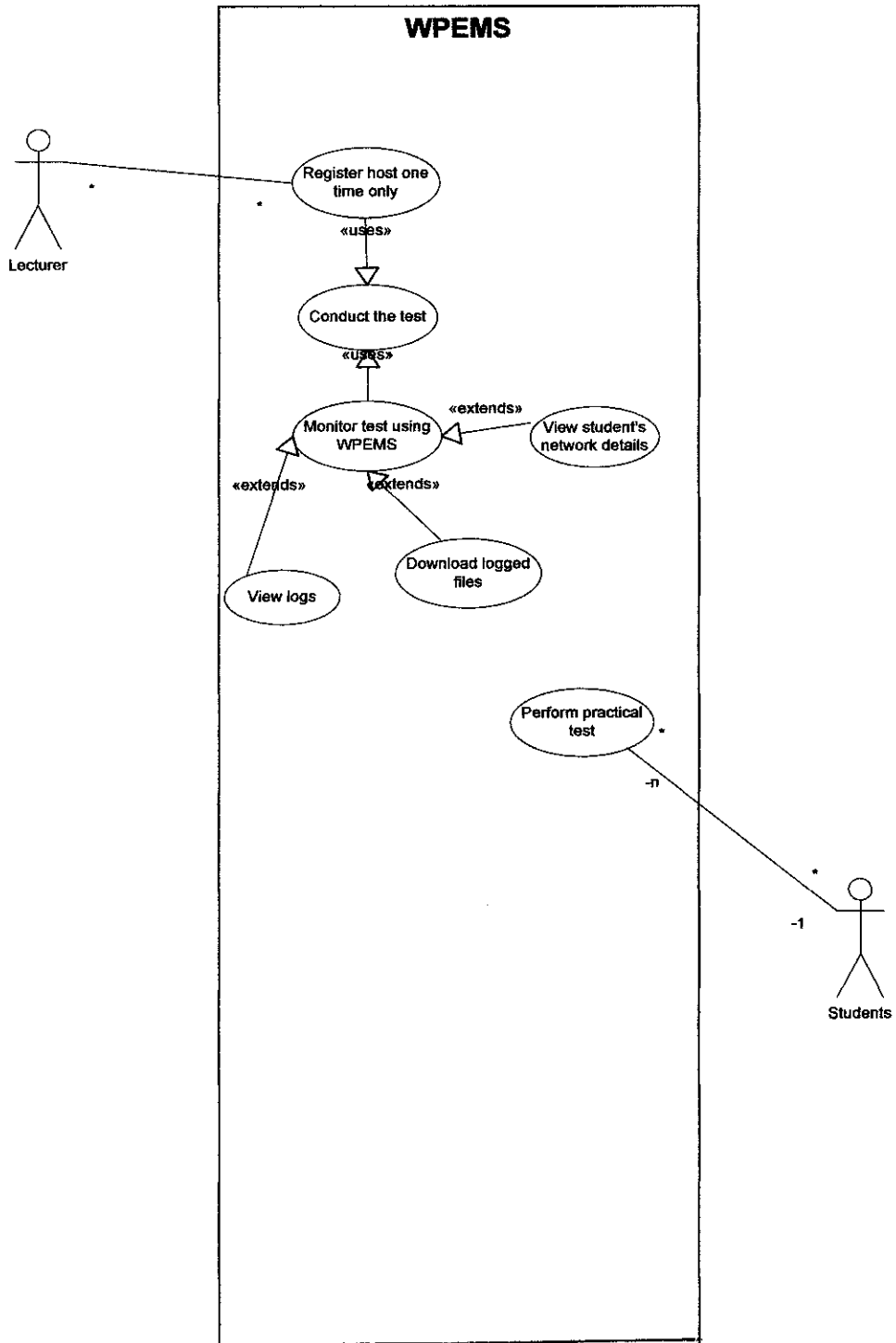
# 7.0.1 UML Diagrams – Activity Diagram
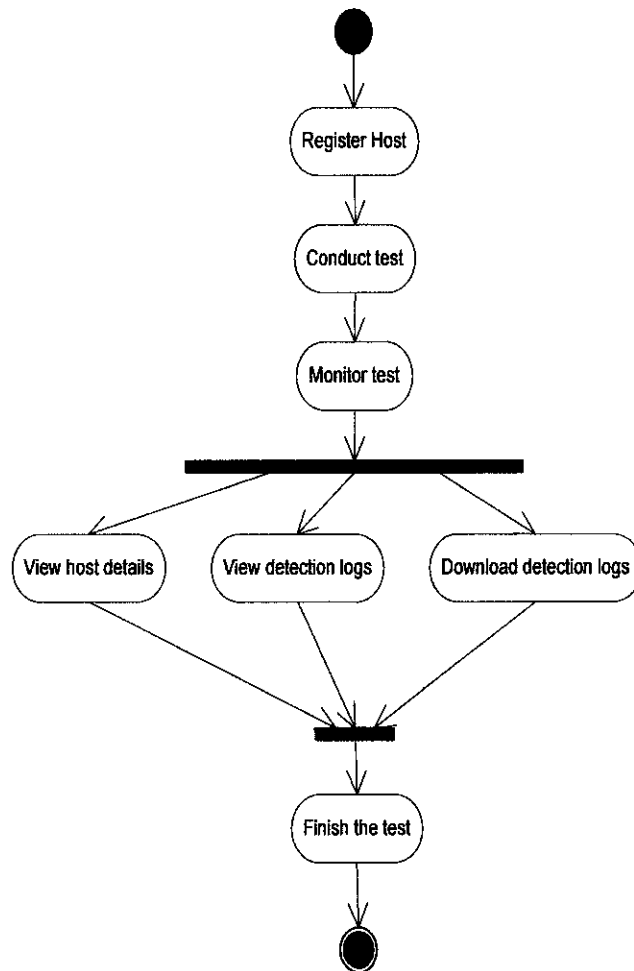
# Future Works That Can Be Implemented.

WPEMS is a web-based application that boasts vast options to be enhance to in the future, since it uses SNMP as its main core function. In addition to that, with SNMP major capabilities in having multiple functions in handling hardware or devices across the LAN environment, I have a few ideas that can be use for the project to be enhanced in the future.

- To have a function for the lecturer/lab tutor to automatically shut down the computers that have been detected as cheating.

- To automatically generate an email and is send to lecturer's email at a prescribe date and time.

- To have the capabilities to control or restrict certain applications that students can access or open, such as calculators applications in Windows, and etc.

- To create a counter of how many times the web browser has been opened.

WPEMS coding is flexible enough for future enhancement, because it doesn't involve very complicated codes, since the use of database and logic is very minimal, as we have the benefits of using many of SNMP great capabilities by integrating its function into the PHP codes of WPEMS.

## Cost Considerations

The cost to develop WPEMS is free, because it doesn't uses any type of special hardware to run. Plus, it is using all free languages and even free software. All in all, WPEMS is very practical, and with no cost it all, it just make this an application that is worth to try in every higher learning instituitions.

# 8.0 Conclusion

As a conclusion, I can say that the Web-based Practical Exam Monitoring System (WPEMS) is the best practical monitoring system that can detect any cheating attempt by students who wish to access the Internet looking for answers. It provides the best of both, the practical exam/test integrities, and also the convenience of reporting towards the lecturers. This system also benefits the students as well, as they might be well informed that they are being constantly monitored throughout the entire test/exam period, eventhough lecturers/lab tutors are sitting in front of the lab.

For many years, lecturers or course instructors have been bugged with this kind of problems, where practical exam or test for programming courses such as Java, Javscript, PHP, HTML, PHP, ABAP, C/C++, and many more other programming languages needs a careful administration and monitoring throughout the period of test or exam. This is because; students can simply access the Internet looking for answers, and without the knowing of the lecturers. To prevent this problems, lecturers will always have to have a lot of companies in order to monitor the practical exam, and it will requires a lot of staffs effort. WPEMS will solve these problems 100%.

To summarize it all, this WPEMS is an intelligent practical exam monitoring system that can be used in the various types of learning institutions, and with addition to the downloadable logs in Microsoft Excel format; this system will definitely change the practical exam/test method that we are using right now. Cheating percentage will definitely decreases, as no students could deceive the system in order to cheat the lecturers or lab tutors.

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