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## The Suranaree University of Technology – Mobile Examination Unit (SUT-MEU)

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## **Chansilp, S. Suranaree University of Technology, Thailand. The Suranaree University of Technology – Mobile Examination Unit (SUT-MEU)**

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### **ABSTRACT**

This paper presents an online testing tool that may help extend flexible delivery for quality education. The Suranaree University of Technology – Mobile Examination Unit (SUT-MEU) is an alternative tool which offers an online test unit previously not available to educational institutes. SUT-MEU can be used by teachers to compose exams and grade exams, test proctors to set up the test server and students to sit exams. Both strongly encrypted exam file and public-key encrypted exam result file can be stored and transferred safely when the test needs to be set up elsewhere off campus and thus is designed to facilitate extending flexible delivery of the test. Being a free, open source and LiveCD, it is useful in overcoming budgetary considerations for software and hardware costs. This paper discusses how SUT-MEU might be used and how it may help student to perform better on the test and how it works. SUT-MEU was awarded a grant by Princess Sirindhorn's Innovations and Inventions Fund 2005, in recognition of its combination of teaching expertise and technology to facilitate student learning outcomes.

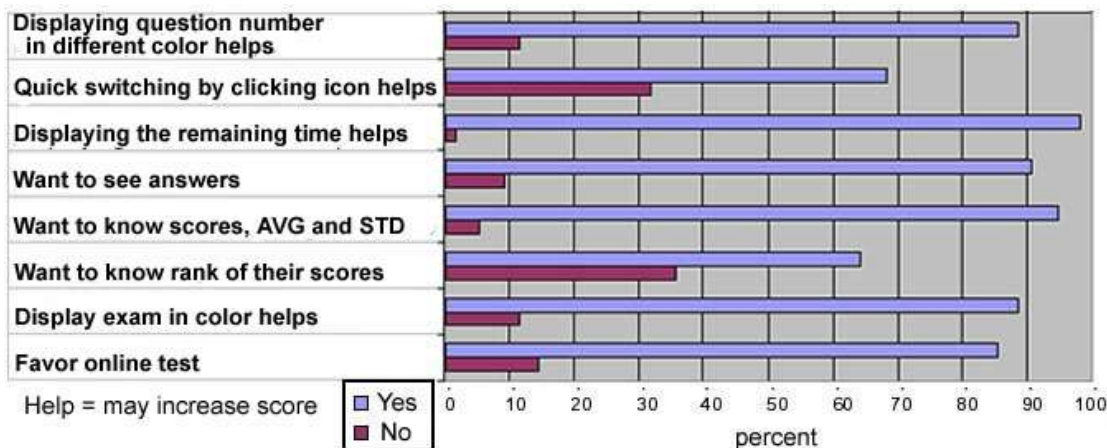
### **INTRODUCTION**

Computer Labs are becoming more widely available and the availability of SUT-MEU may speed up the use of online testing for the students to do the exam. Today, most schools in Thailand still use the traditional examination process: the exam is printed on paper and uses answer sheets. However, schools, universities and educational institutes have begun to invest in digital technology in teaching by providing computer rooms and having many computers connected to a network. Each room has many computers and more such rooms being made available. In the very near future, online examination is inevitable. Many educational institutes have thought of providing online tests although there are some problems, for example: What is the cost of providing a server with enough power for many students to take the test at the same time or how many servers will be needed? One server may cost 5,000 to 10,000 US\$. If the server is available, what is the cost of the software to provide the online test? It may cost about 2,000 to 5,000 US\$.

If both the server and the software are available, how much more has to be spent on training teachers to use the system? This depends on the training cost and the number of teachers. Such budgetary problems have a direct impact on the use of online test. Until the availability of SUT-MEU, such problems have been difficult to overcome. SUT-MEU is a CD containing an open source operating system (Open\_source, 2006) and an online test application. It is considered to be a LiveCD (KNOPPIX Linux Live CD, 2006; Linux4all LiveCD, 2006) because it can be run from the CD without being installed. It is free of charge and suitable for Thai characters because it is developed from TLE 7.0 (Linux TLE, 2006) and SUTLinux (Suranaree University of Technology - Open Source Research and Development Unit, 2006). The idea behind it is to set up one of the computers in a testing room to be a test server and use other computers for students to take a test by using a web browser program to connect to the test server. The availability of SUT-MEU may be a turning point in the development of online testing.

## Interesting Features of SUT-MEU

The online test software on the SUT-MEU CD has some features that may help test takers to improve their scores. The results of a survey conducted on August and September 2006 of 174 senior and junior students are shown in figure 1. According to the graph, most students want to see the answers and scores with mean and standard deviation while more than half want to see a ranking of the scores obtained. According to the answers, some features of the SUT-MEU such as displaying the remaining time on the screen, displaying the exam in colour, showing question number with different colours to distinguish between answered with sure, answered with not sure and unanswered questions and the capability to switch between questions quickly may result in students getting higher scores while more than 80 percent of students favour the online test over the normal paper test.



A Survey of 174 senior and junior students on August 28 and September 2, 2006

Figure 1: A survey of 174 students

### SUT-MEU Main Features

SUT-MEU can be used by teachers, test proctors and students. It is an open source Linux server LiveCD. Both the operating system and the application software can be used by running directly from the CD without installation on the hard disk but running from the CD is slow and will not be suitable when it is used to set up a test server. There is a unique feature to detect the hard disk first and then allow the installation of the system to one of the FAT32 drives by pressing a key, i.e. pressing a Y key. Teachers may install it on to any computer to use it to compose the exam and to evaluate the test results after the test. The test proctor may install it on to one of the computers in a test room to make it a test server. Also, computer technician may install it on to each computer in the test room for students to use the web browser on it to do the test. However, students can also use any operating system that connects to the network and that has a web browser. For example, students can use IE on Windows XP. Figure 2 is a window showing the teacher writing an exam. The exam may contain html tag and pictures or graphics.

1. (ch8)Looking at <font color="#0000">Figure 8.1(a)</font> p.292, which is <font color="#0000">true</font>?

☐ a. Only a child process can be created at the same period time

☐ b. Many child processes can be created at the same period time

☐ c. There will be concurrency among the parent and all of its child processes

☐ d. There are more than one answer

☐ e. No correct answer<br>

Picture  Browse...

Picture  Browse...

Picture  Browse...

Picture  Browse...

Picture  Browse...

Picture  Browse...

Delete all Delete Insert Submit Add new

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20  
21 22 23 24 25

Figure 2: Teacher creating a question

Figure 3 displays an example of a program generated announcement that can be posted in front of the test room. The distribution paper that can be cut into small parts and distributed to each tester to inform them login username and password and a paper for the test taker to sign of having taking the test are also generated by the program but they are not shown here.

List of eligible examinees in room: LabCom1  
Testing on 423302 Operating System  
2 September 2006  
Start time: 9:00 Test time: 2 hours 30 minutes.  
Instruction: Open book exam.  
All examinees must know seat number before entering the exam room.

No.	Id and name	Room	Seat number
1	B4404248 นายพิพัฒน์พงษ์ แคมฟ้า	LabCom1	4
2	B4601104 นายจักรี ศรีเมฆ	LabCom1	18
3	B4700074 นางสาวกรรณิพย์ กล้าพญ	LabCom1	3
4	B4700258 นางสาวกัญญา ชูณนอม	LabCom1	8
5	B4700319 นางสาวกัญญา สีขาวทอง	LabCom1	37
6	B4700869 นายชัยพงษ์ ศรีตะ	LabCom1	11
7	B4701033 นายไชยยุทธ เพชรโพธิ์	LabCom1	13
8	B4701514 นายธราธิป แสงพิณ	LabCom1	21
9	B4701712 นายณพพร พรหมเจริญ	LabCom1	30

Figure 3: List of examinees

An exam prepared by the teacher and ready to hand over to the proctor is available as an exam file as shown in figure 4. This file is strongly encrypted with 160 bit password blowfish algorithms. When the test is over, the exam result will be placed in a file and be encrypted using public-key algorithms. Therefore, it is secure to conduct the exam off campus.

Below link is the exam file to be downloaded and saved in appropriate device.  
This file will be used by the proctor to setup the test server.

Exam file: /livecd/var/www/html/neu/temp/EXAM-for-423302\_2006-09-26.tar.gz.nc [size 8.473 bytes]

After the file is downloaded, click menu below to delete the file from the server.

Delete file from the server

Figure 4: Producing an exam file

Figure 5 is an example of the screen when a student takes a multiple choice test. The testing time remaining will be shown in the upper right hand corner. Also in the middle of the upper part of the window, there will be a display showing the student's progress in answering the exam. At the bottom of the question there are selections, "Sure" and "Not sure", for students to choose from.

The “Not sure” answered question numbers, i.e., question number 3, 5, 9 and 10, will be displayed by yellow icons where as the “Sure” answered question numbers, i.e., question number 1, 2, 6, 7 and 8, will be displayed by green icon and unanswered question numbers by red. The default is “Sure” selection.

Figure 5: An example of taking a multiple choice test

Figure 6 is an example of matching questions where the number of choices may be more than the number of questions.

Choose	Question	Choice
3	1. (ch8)mutex	1. Hoare and Brinch Hansen
2	2. (ch13)VFS	2. Mutual exclusion
7	3. (ch8)Waiting for semaphore	3. Three-level page mapping
4	4. (ch12)Linux address using	4. Reset the computer
3	5. (ch12)For working set = 3	5. P(s)
9	6. (ch11)Internal fragmentation	6. Fixed-partition memory strategy
10	7. (ch9)Monitor is credited to	7. Process will be loaded into memory no more than 3 frames at a time
3	8. (ch10)Manual deadlock management	8. V(s)
5	9. (ch11)Linux memory manager uses	9. Swapping technique
11	10. (ch9)Pipe is available on	10. Windows and Linux
		11. Technique to handle heterogeneous file systems used by Linux

Figure 6: An example of taking matching questions

Figure 7 is an example of displaying the answer to a true/false question as seen by the students after the exam is over and the proctor allows the students to see the answers.



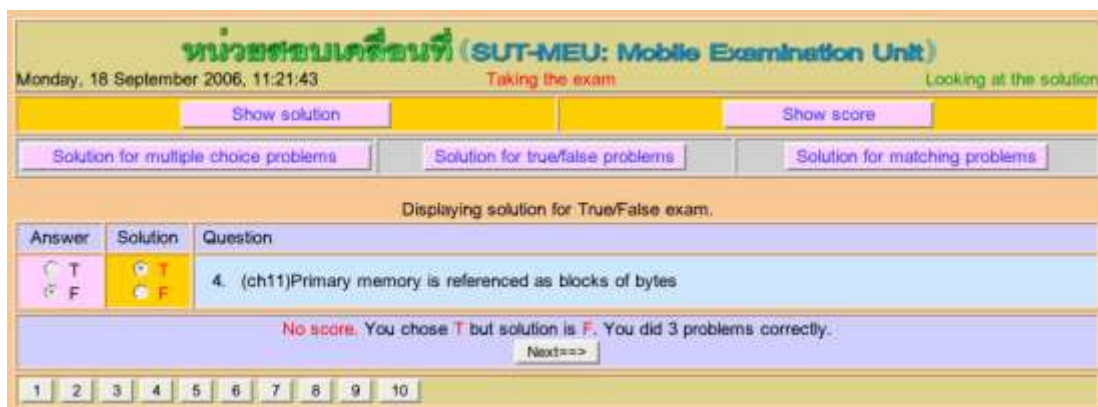


Figure 7: An example of the answer to a true/false question

When students click on “Show score” menu at the top of the “see solution” screen, the result may be shown as in figure 8.

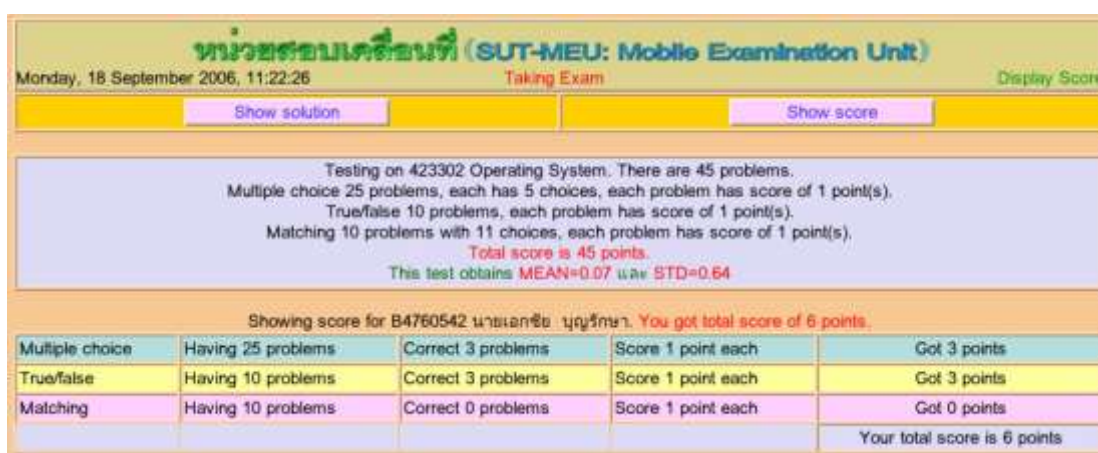


Figure 8: An example of displaying obtained scores

### Exam Pool and Testing Security

The teacher may compose the exam as many questions as needed and then may randomize them. The test will pick only the number of problems that is specified on the test information. The teacher may also specify whether the question be randomly arranged for each student. Effectively, if the exam contains 10 questions, each student will take the same 10 questions but they may be in different order, i.e., question one for each students may not be the same. For more advanced security considerations, a client using Windows XP and using SUT-MEU may download the generated scripts from the test server to be used to set up a firewall on the client machines in order to prevent students communicate with each other by using special programs to cheating the exam.

### Results and Discussion

SUT-MEU has been used for actual tests (midterm and final tests) many times and found to be functioning well. Also on September 2006, two training sessions on how to use the program were conducted with almost a hundred teachers of both university and high school level. The feedback was that it was still complicated when trying to import an exam composed on Windows to the SUT-MEU system which had to be improved in the next version. Also this version is still intended for Thai native speakers, so it may not be suitable for English native speakers to use it at present because most of the menus are displaying in Thai.

## CONCLUSION

SUT-MEU is a free open source online test system that is ready to use. The test begins with the teacher writing an exam and producing an exam file which has to be handed over to a proctor. The proctor set ups the test server by using one normal computer in the testing room and inserts the exam file. When the exam finishes, the result of the exam will be in a result file which the proctor will send back to the teacher to evaluate later. Students take the exam using a web browser. The exam appears as a web page where sound, graphics and colours may be used. According to the survey, students seem to like online test more than the normal paper test because the availability of some features such as displaying the remaining time, displaying questions and question numbers in different colours, quick switching between questions and showing the progress in the test may help students to perform better in the exam. Also the online test may easily show the answer, displaying the obtained scores and the rank of the scores if the teacher chooses to do so. SUT-MEU makes online test possible by overcoming budgetary problems. The encryption mechanism on the exam file and the exam result file will allow the online test to be conducted off campus. For some subjects for which a pre-test and post-test is required, SUT-MEU has a direct impact by reducing time for preparing the test on the paper and for grading the result and this will allow a flexible delivery for quality education.

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