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An application for fundamental computer programming learning

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Abstract

Applied computer laboratory lessons could be unproductive because of many students in there. Correcting students' mistakes one by one is wasting lesson time. Especially for beginners, most of these mistakes caused by complex integrated development environments. In this study, we develop a client server application for computer laboratories. Developed application is able to compile programming language source code remotely. Thus, students don't need to make something out of the writing source code. Furthermore, instructors don't need to install compiler to the each computer in laboratory. For start lesson, it is enough that server has just been configured.

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1. Introduction

Computers are used almost in all business areas. Therefore, it is inevitable that computer courses become parts of the school curriculum (Mayer, 2013). These courses are at the level of the computer operator for social classes while the technical classes need to be more specific and detailed. Most of these courses are consist of computer programming courses. Computer programming is a difficult and challenging subject area which places a heavy cognitive load on students (Mow, 2008).

It is obvious that programming courses done in the computer laboratory. Conventional way of teaching computer programming is installing compiler and integrated development environment (IDE) to all students' computers. While this is not a problem here for engineering students, but there are some difficulties for vocational school students

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because of they don't have any enough background knowledge about computer programming (Ismail, Ngah, & Umar, 2010).

One of the challenges faced by students is complexity of IDE. Spending time for configuring IDE for every new project and correcting issues caused by project creation mistakes in the limited time of lesson is wastes lesson time. By the number of computers in the lab this problem being more complicated.

In this study, we predict that an application for providing very simple interface for single file source code writing and simply compiling and running may help to students to concentrate writing code rather than configuring IDE. Therefore we developed an application using laboratory network infrastructure to achieve this goal. This application was designed for client / server structure. This design is consistent with laboratory network infrastructure. Teacher's computer implies the server while students' ones are clients. Client side of developed application does not need any installation; it is simply executable file like notepad application coming with Windows™ operating system. Server side of this application needs that preferred compiler tool path has been configured. Once server application is configured, it is ready to compiling. A typical laboratory network infrastructure is shown as Figure 1.

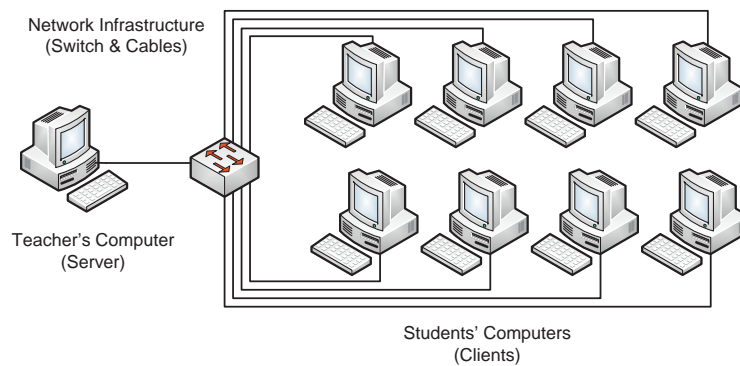


Figure 1 A Typical computer laboratory network infrastructure

2. Available programming environments

There are many programming languages available today. Many popular programming languages like C++, C#, Java, web scripting languages like PHP have same syntax notation with C for fundamental statements. Also almost all embedded chip manufacturers have C compilers for embedded development. Arduino is most popular example for this (Arduino, 2014). So we prefer C language for teaching to students. Therefore students can easily migrate own knowledge to many sections in programming like step up to advanced programming languages or drill down to embedded programming.

Every programming language needs a suitable compiler. Compiler translates the source code to the executable binary code for specific platform or processor. Compilers are an executable command line tool that takes source codes as input files and generates output files.

Source codes are simply text files. Writing source code does not need any specific tools. Basically a text file editor is enough for writing it. But many projects consist of multiple source codes that cause complicated compile sequence. For helping programmers to writing source code there are many advanced editors have been developed called as IDEs.

IDEs are designed for programmers and/or engineers that profession is computer programming. These IDEs contains advanced editor, compilers, tools and helpers. Table 1 shows available IDEs that suitable for using for education in laboratories.

IDEs showed in Table 1 are selected with these criteria: a) Designed for Windows platform. b) Supporting at least C / C++ language c) Having at least C / C++ compiler internally or externally. d) Usable for free without any license issue. These IDEs are tested on a single core CPU, 512MB RAM computer with Windows XP SP3 clean installation. This computer had a 16 Mbps internet connection. Previously installed components have been uninstalled and

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