



Blue Communique: A Bluetooth Based College Information System

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Abstract

This technical report describes the design and implementation details of a wireless connection (Bluetooth) based college management system. It is mainly created to save time and to do a particular task with extreme ease and comfort, without any pre-requisite knowledge of its operation. Hence it can be used by any class of people of our society but this has been developed mainly for the colleges and schools. Also, its functions can be extended to professional field with little modifications as per the requirement. It is a multi-functional device. In school/college level, each student will be provided with this device having a unique Device Identification Code (D.I.C) stored in the server and each device will have a password corresponding to that particular device that will be known to the owner of the device only. It can function within the closed boundary of the institution. This idea is very much similar to the Bluetooth of our cell phones which have a unique Mac Address. Using that password, the device holder can login in to his/ her account when present within the institution and can work or view the things. It has mainly two functions-First function discusses about the implementation of this device in Library Management System where one can issue any book according to his/her subject choice and at the same time can return also. This can be done simply by just logging in to their respective account. Second function is based on accessing any particular information related to a particular year and department given by the institution. Anyone can login any time to check out any Notice regarding Fees, Exam Schedule or any event of the college/school. For this he/she is just needed to login from their respective device with a correct password. This invariably reduces a lot of time of taking the trouble of checking the notice board each and every day. A check on the security of the total system has been maintained with the help of cryptography. When information is transferred to the user then it is always in its encrypted form. When it reaches the user then it gets automatically decrypted by using a unique key. This is a system generated procedure. Data Encryption Standard (DES) algorithm and Advanced Encryption Standard (AES) algorithm have been used for encrypting and decrypting any information. The methodology and result sections show its functionality and output. We hope that the concept described in this paper will aid the developers' community in near future.

Keywords: Wireless networking and security, Bluetooth, Cryptography, Library Management System.

Introduction

Advantages of bluetooth: Bluetooth is a proprietary open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions in the ISM band from 2400-2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecoms vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

Wireless: There are many benefits and advantages of using wireless devices. Along with improving safety as a result of eliminating wires you don't need, wireless also offers you plenty of other advantages. When travelling with your laptop or other wireless devices, you'll no longer have to worry about bringing connection cables. Thus we achieve more mobility and flexibility by using wireless technologies.

Inexpensive: Bluetooth technology is cheap for companies to implement, which results in lower over-all manufacturing costs. These savings are then passed on to you, the consumer. The end result: Bluetooth devices are relatively inexpensive. The maintenance cost is also of one another, one just low for Bluetooth based systems.

Automatic: Bluetooth doesn't require you to think about setting up a connection by pushing too many buttons. When two or more Bluetooth devices enter a range (Up to 30 feet) needs to make the device discoverable and begin the communication with some simple steps, without you having to do anything extra.

Standardized protocol – Interoperability: Bluetooth is standardized wireless, meaning that a high level of compatibility among devices is guaranteed. Bluetooth will connect devices to each other, even if they aren't the same model.

Low Interference (If Any): Bluetooth devices avoid interference with other wireless devices by: Using a technique

known as spread-spectrum frequency hopping, and using low power wireless signals

Low energy consumption: As a result of Bluetooth using low power signals, the technology requires very little energy and will use less battery or electrical power as a result. This is an excellent benefit for mobile devices, as Bluetooth won't drain the battery¹.

Sharing voice and data: The standard for Bluetooth will allow compatible devices to share data and voice communications. This is great for mobile phones and headsets, as Bluetooth simplifies driving and talking on your cell phone.

Instant Personal Area Network (PAN): Up to seven compatible Bluetooth devices can connect to one another within proximity of up to 30 feet, forming a PAN or piconet. Multiple piconets can be automatically setup for a single room².

Upgradeable: The Bluetooth standard is upgradeable. A development group at the Bluetooth Special Interest Group (SIG) has been given the task of working on the new Bluetooth version 2, which offers several new advantages and is backward compatible with the older versions.

The Technology is here to Stay: Bluetooth is a universal, world-wide, wireless standard. Therefore, you can count on it being around for years to come. As more devices begin to use Bluetooth technology, electronics manufacturers will be increasingly eager to make their products compatible, using Bluetooth. A chain reaction is inevitable, in fact, it has already begun.

What is Python?: Python is an interpreted, high-level programming language, pure object-oriented and powerful server-side scripting language for the Web. Like all scripting languages, Python code resembles pseudo code. Its syntax's rules and elegant design make it readable even among multi-programmer development teams. The language doesn't provide a rich syntax, which is really helpful. The idea behind that is to keep you thinking about the business rules of your application and not to spend time trying to figure out what command you should use.

It is also true that Python is interactive, portable, easy to learn, easy to use, and a serious language. Furthermore, it provides dynamic semantics and rapid prototyping capabilities.

Why Python?: Python is simple: Python has clear and simple rules, and is closer to English than any of the languages we use. Creating Python programming is so straightforward that it's been called "programming at the speed of thought."

Statements are terminated by end of line, and block structure is indicated by indentation. Python programs look like executable pseudo-code. This eliminates a host of troublesome errors for

beginning programmers, especially placement of semi-colons, bracketing and indentation.

The simplicity of Python makes it easy to learn. In addition to the list (dynamic array) data structure, Python provides tuples (immutable lists) and dictionaries (hash tables). Together with the class mechanism, these can be used to quickly build sophisticated data structures for interesting projects. The absence of type declarations makes for less code and more flexible programming³.

Python is self adjustable: Python provides full dynamic run-time type checking and bounds checking on array subscripts⁴. Python employs garbage collection so there is no problem with dangling pointers or memory leaks. It is impossible for user code in Python to produce a segmentation violation. In this respect Python is similar to Java, and both are much safer than C++.

Python supports object-oriented programming: Languages like C#, Java, and Python are all object-oriented. But Python does them one better. In C# and Java, OOP is not optional. This makes short programs unnecessarily complex, and it requires a bunch of explanation before a new programmer can do anything significant. Python takes a different approach. In Python, using OOP techniques is optional. You have all of OOP's power at your disposal, but you can use it when you need it. Got a short program that doesn't really require OOP? No problem. Got a large project with a team of programmers that demands OOP? That'll work too. Python gives you power and flexibility.

Python Runs Everywhere: Python programs are *platform independent*, which means that regardless of the operating system you use to create your program, it'll run on any other computer with Python. So if you write a game on your PC, you can e-mail a copy to your friend who runs Linux or to your aunt who has a Mac and the program will work.

Python is Open Source: Python is free. You can install it on your computer and never pay a penny. But Python's license lets you do much more than that. You can copy or modify Python. You can even resell Python if you want (but don't quit your day job just yet). Embracing open-source ideals like this is part of what makes Python so popular and successful. Python is a programming language that lets you work more quickly and integrate your systems more effectively. You can learn to use Python and see almost immediate gains in productivity and lower maintenance costs.

Motivation: The two main facets of this project are firstly, the scope of the given project after substantial consideration is found to be really wide, that is, this is not only a so called 'laboratory based' project. Primarily we can weld this concept to materialize a virtual notice board which will convey important notices to the students of the corresponding departments. This technique is much more radical than the

prevalent paper based system since many students may not visit the notice board regularly. So many students remain unaware of important notices and this propensity in students is proliferating day by day. So if we can scheme out a technique properly that will not only reduce the drudgery but also the students will rib the benefit of it. Besides on a large scale, this method can be implemented to run the system smoothly.

The Library implementation is another technique to advocate the use of contemporary technology to bring in a commendable shift in a way the traditional library operates. A method adhering Bluetooth technology will incorporate a less monotonous procedure for both the students and the staffs. Now the students need to stand in queues and wait for their turn after submitting the requisition slip. There is no way that they can know whether he/she will be allotted a book even after going through such a cumbersome procedure. But a successful implementation of this project will provide a smoother and a far less mechanical experience for the students. This meritorious system will successfully enable students to know whether a book is available or not by just typing the name of the book and

the author and automatically a copy of the book, if present, will be allotted against that person along with the return date. This method also ensures that the librarian will get aware of the demands of the different books because this system also comes with a radical statistical data representing the above. And hence it becomes easier for the authorities to stock the books of high demand. The collection of fines can also be performed effortlessly.

To impart security to this scheme the concept of encryption and decryption can be infused⁵. When the sender will be dispatching any information to the receiver, the contents will be presented in encrypted format which will require decryption at the receiver end. This decryption can be accomplished with a “key” obtained dynamically by different methods.

In a nutshell we can conclude that a successful manifestation of these two versatile techniques does have a huge scope in many sectors ushering in a vibrant change in the prevalent systems making it more users friendly.

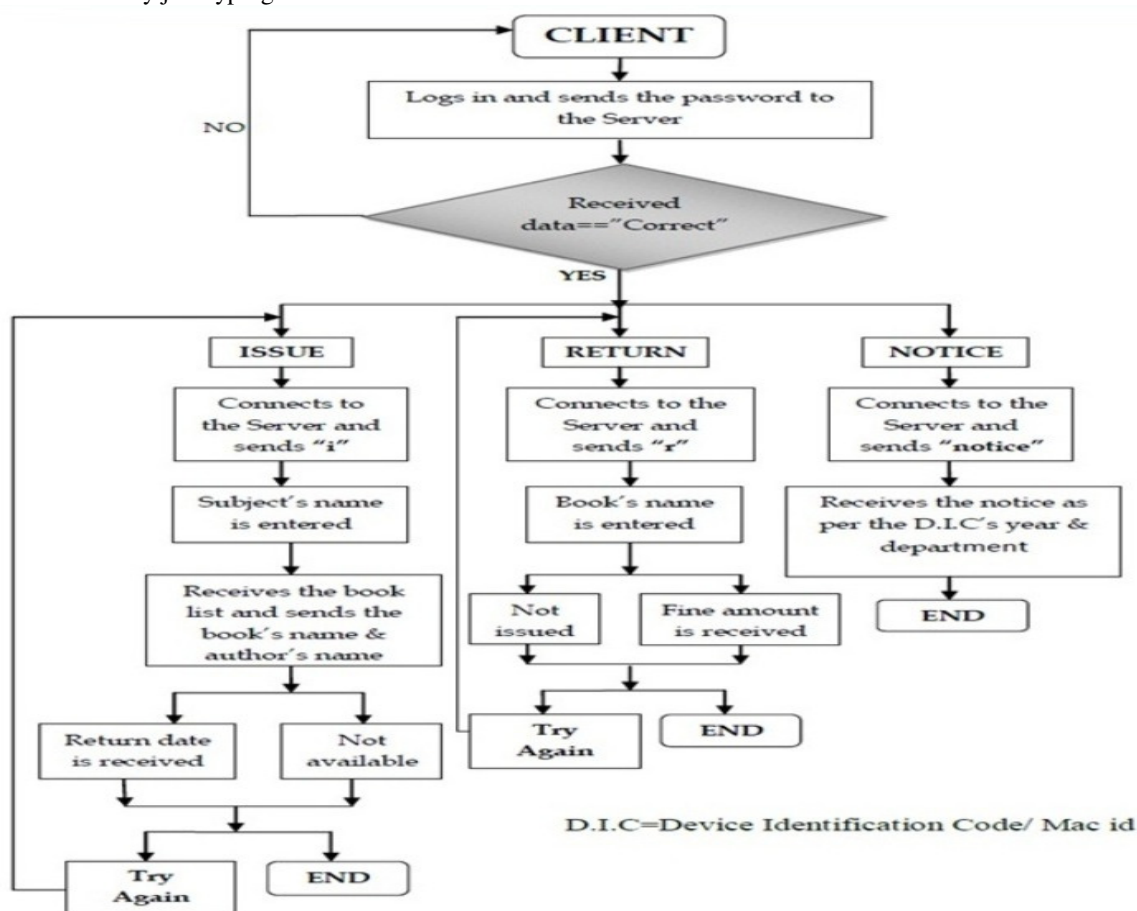


Figure-1
Flow of path in Client

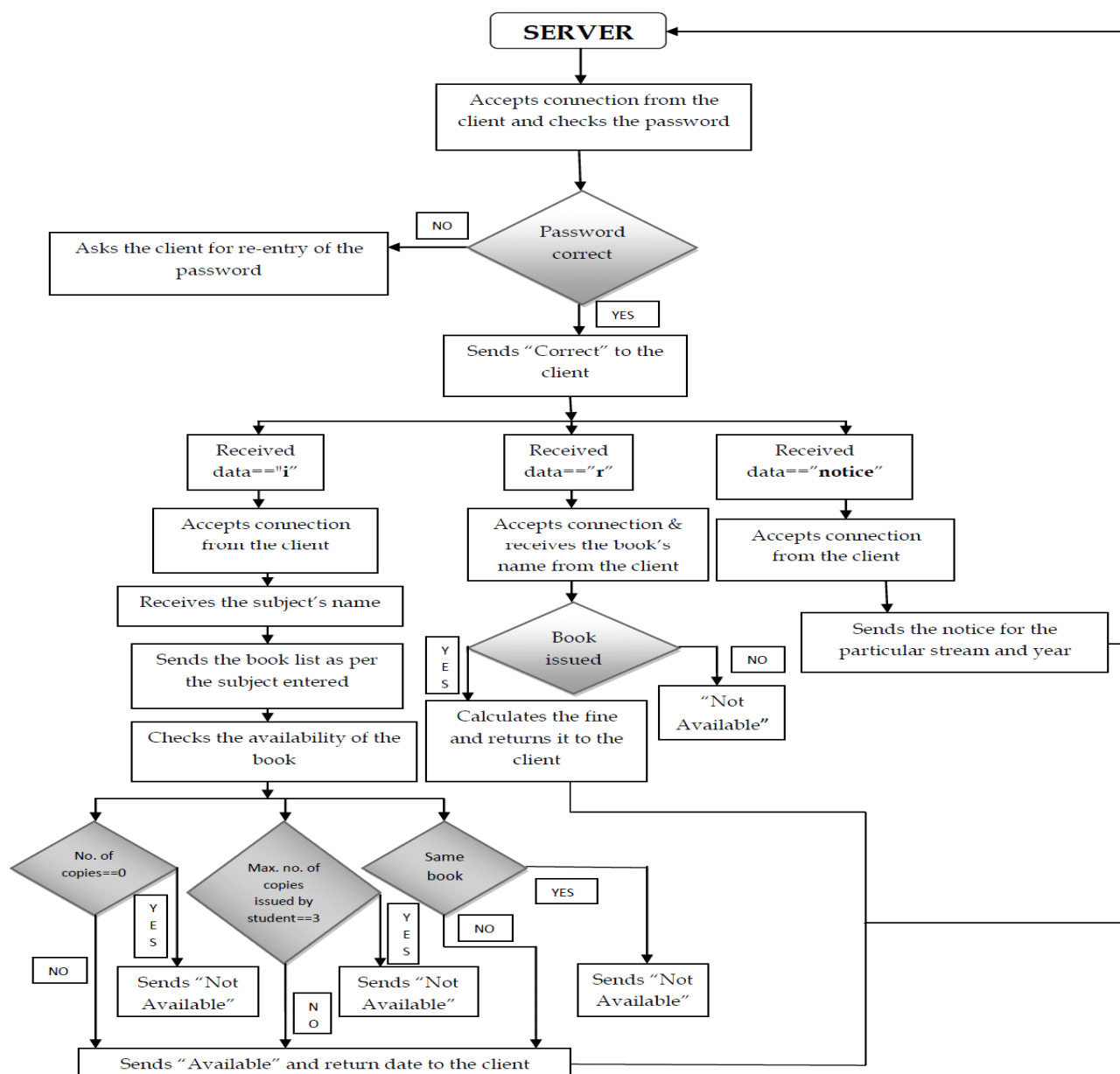


Figure-2
Flow of path in Server

Methodology

step algorithm: client: start the program. a window opens where one has to log in with his/her password. The password is send to the server. If the data received is "Correct", then a window containing following three options pops up:-"Issue", "Return", "Notice".

If "Issue" is chosen then the client sends 'i' to the server and connects to it. Subject's name is entered. Receives the book list from the server and the selected book and author's name is send to the server. If the requested book is present then the return date is displayed else "Not available" message is displayed.

Again two options "Try Again" and "End" appears. If "Try Again" is selected then follow the steps where "Correct" was received else Exit.

If "Return" is chosen then the client sends 'r' to the server and connects to it. Book to be returned is entered and send to the server. If that book is present in the student account then message "Returned Successfully" along with the Fine is displayed. Else "Not Available" is displayed. If "Try Again" is selected then follow the steps where "Correct" was received else Exit.

Then it sends the Notice to the client as per his/her Department and Year.

Security Measures: In wireless networking system if we don't take proper security measures the system can become vulnerable to hacking and other such risks. Hence to overcome such problems we have used the concept of cryptography (encryption and decryption). When the sender will be dispatching any information to the receiver, the contents will be presented in encrypted format which will require decryption at the receiver end. This decryption can be accomplished with a "key" obtained dynamically by different methods. The first bit of the information send will contain the length of the key, the next few bits will contain the key and the remaining bits will contain the encrypted information or cipher text.

Results and Discussion

The results are explained in Figure 3 to 13. Figure 3 shows the login window through which the user has to enter into his/her account. Figure 4 shows the screen when the password is entered. Figure 5 shows the screen which says that the connection is accepted as the password has been matched. Figure 6 shows the option screen when the data received is “correct”. There are three options “Issue,” “Return” and “Notice”. Figure 7 shows the screen which appears as the “Issue” button is selected. The name of the subject is entered. Figure 8 shows the screen which displays the book list from which the user selects and enters the name of the book and the author as per his/her requirement. Figure 9 shows the screen which displays the return date as the books are selected. Figure 10 shows the screen which displays the server has been updated with the current number of copies of a particular subject and the return date is also stored in the server. Figure 11 shows the screen when the “Return” button is selected. The name of the book to be returned is entered and the fine (if any) is shown instantly. Figure 12 shows the screen when the “Notice” button is selected. Figure 13 shows the screen in which the notice is displayed to the user/client..

Else data received is “notice” then it accepts connection from the client. The server then scans the Mac id of the client and finds out the Department and Year corresponding to the Mac id.



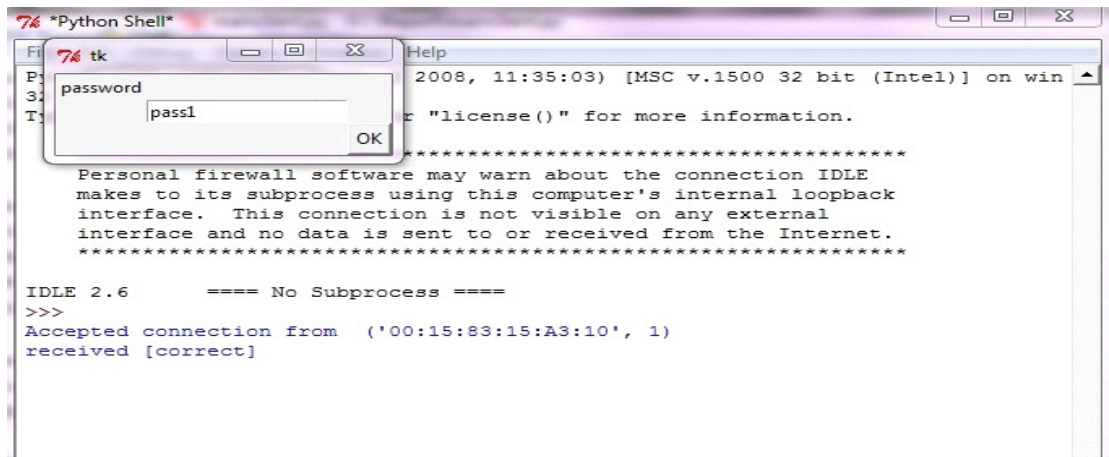


Figure-4
Password is entered

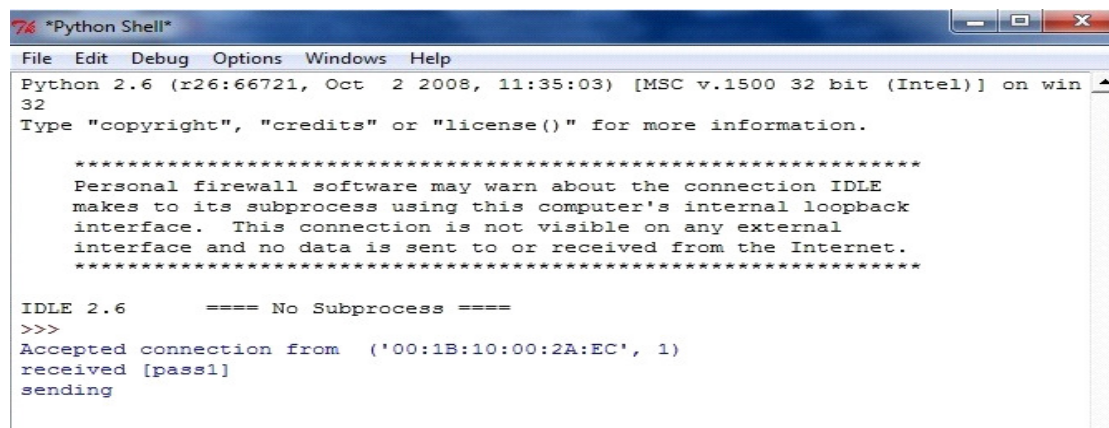


Figure-5
Connection Accepted

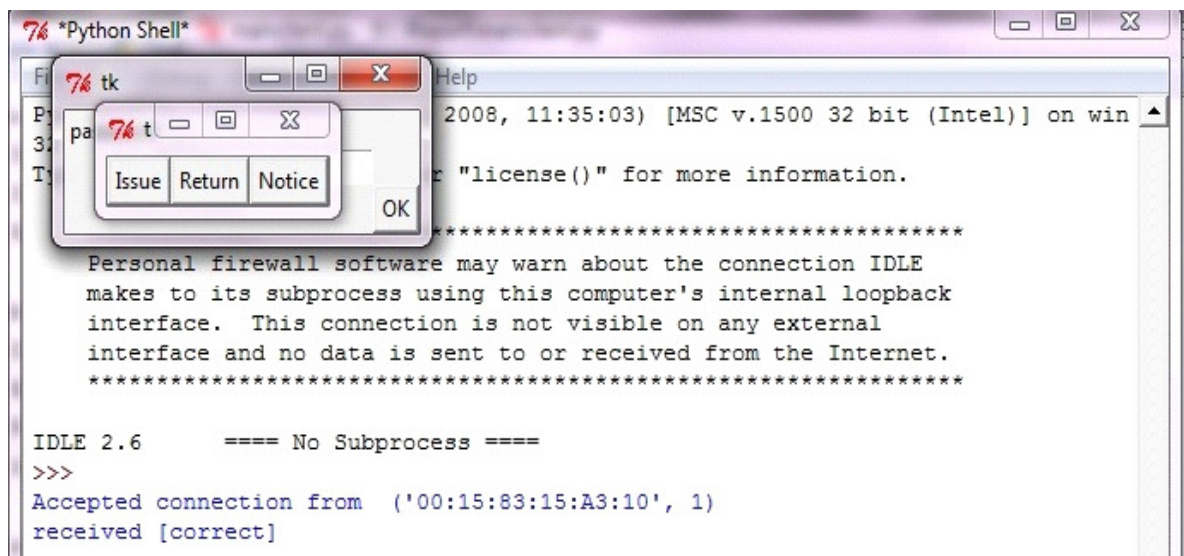


Figure-6
Data=="correct" received and option window pops up

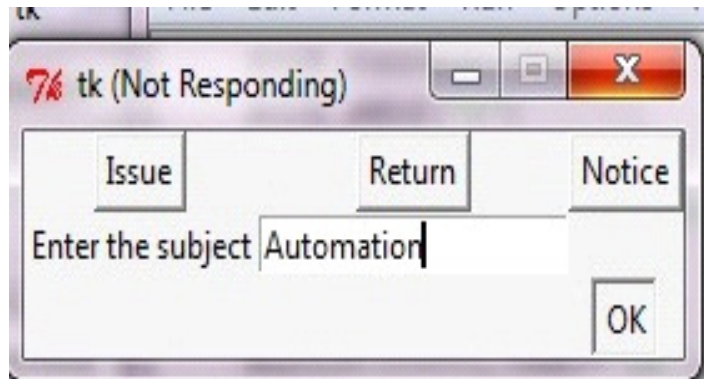


Figure-7
Issue button is selected and Subject's name is entered

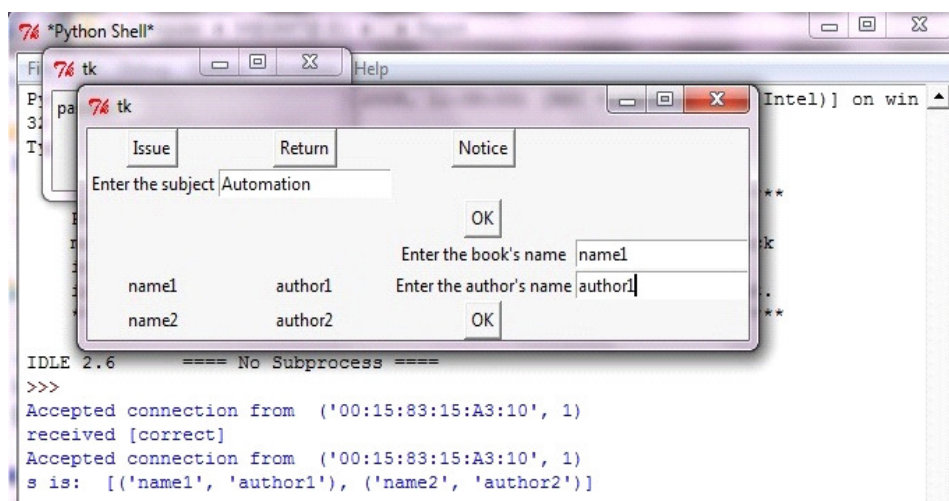


Figure-8
Book List is received

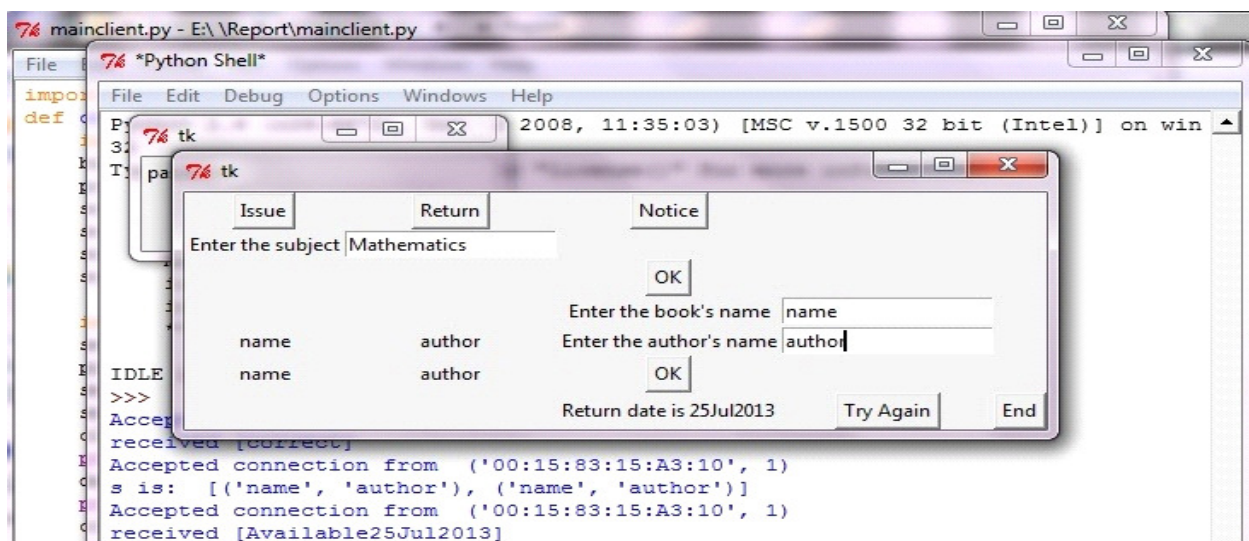


Figure-9
Book is selected and issued and return date appears to the Client



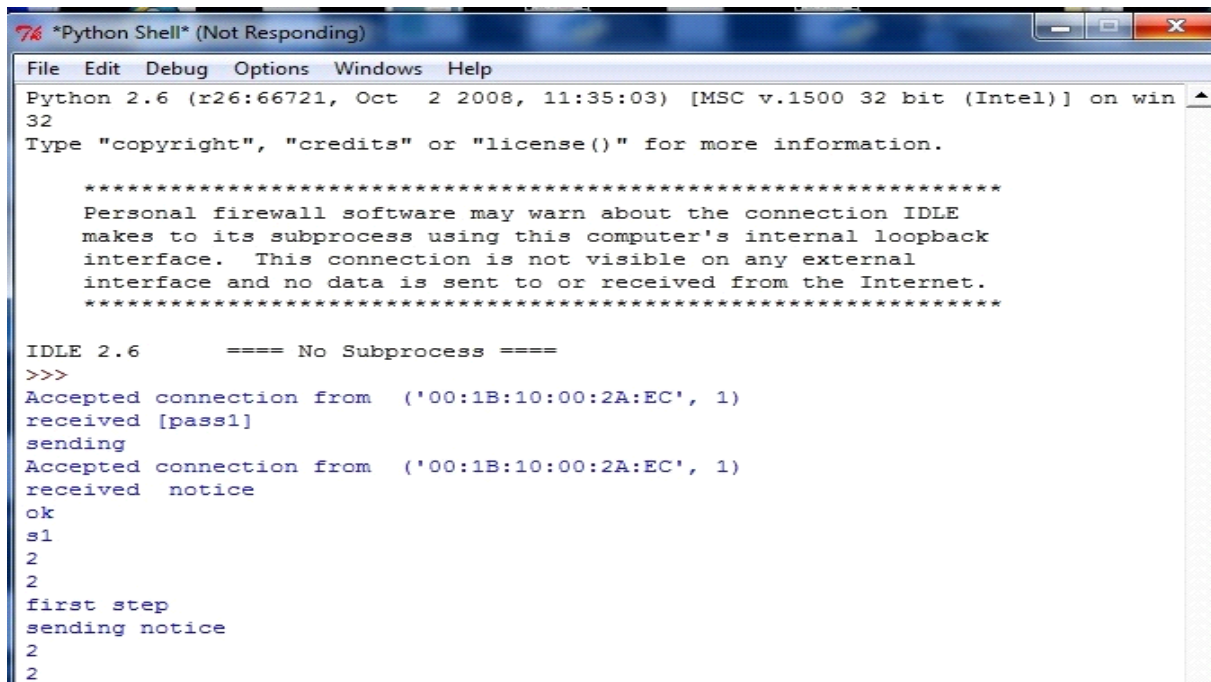


Figure-12
Notice option is selected by the client

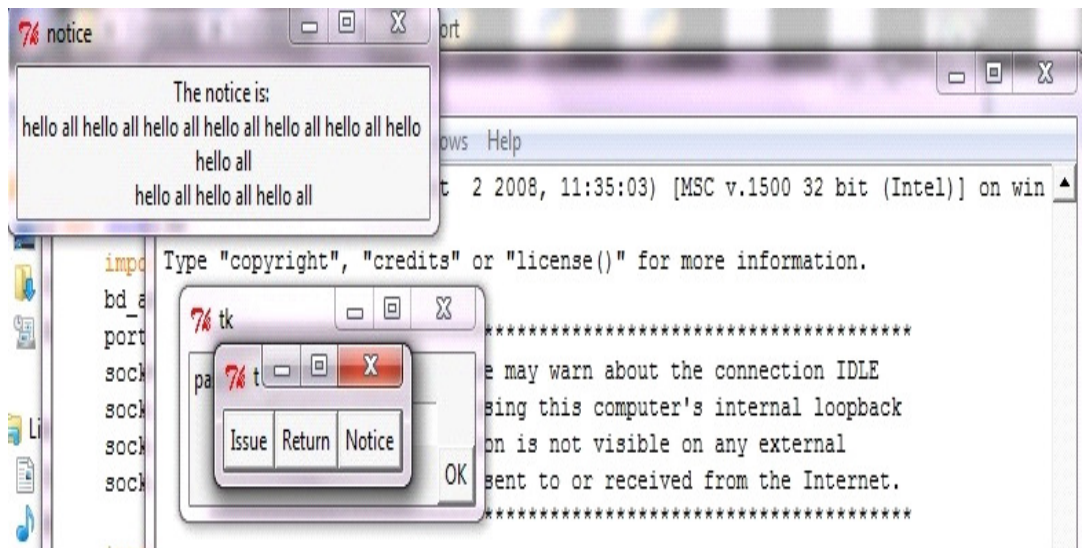


Figure-13
Notice is displayed to the client

Conclusion

So as to conclude we can say that if the idea of this project is implemented at an educational level then a huge amount of people specifically the students will be highly benefitted. Library Management System and Checking Notice are two of the most significant functions that are of predominant importance to the students. The working of this entire system takes very little time hence contributes in saving our valuable

time and along with that it helps us a lot in avoiding the long queues.

We apply the “Encryption” and “Decryption” system while transferring information from one device to the other and hence this “System” will be immensely significant for the general mankind and also increases the efficiency of the system. We hope that the design and implementation of the project that is laid here will aid the developers’ community in near future.

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