# Wireless LAN Monitoring and Controlling using Android Mobile Technology

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*Abstract—* This paper shows remote experimentation using mobile technology for didactic purposes. Students using Wi-Fi enabled mobile devices, such as smartphones, tablets or PDAs can interact with physical laboratory hardware. Through a mobile device interface, in real time the user can verify what's happening on laboratory hardware when they change the system parameters. Additionally, the application provides the students a tool for taking advantage of their spare time at the University. Students can perform the lab practices even when the lab facilities are closed. All user activities are stored in a database for later analysis carry out by the professor. Also, students can store their experiments when is finished in order to make an off-line result analysis.
*Key words:* wireless communications, mobile devices, control engineering education, educational technology

## I. INTRODUCTION

The rapid technological development that has cellular experienced in recent years, has enabled cell phones have gone from being a luxury item to be a common tool. The increased popularity of this device has brought result that prices decline year after year allowing that are now in the hands of any user. Adults, youths and even children carry it with him like any garment.

Although the cellular telephone was originally conceived only to make and Receive phone calls, today it is may have access to email and to browse Internet from a cell phone. Current technology has turned this device on a real Computer pocket ([1], [2], [3]). Currently, there are models screens equipped with high-resolution color sensitive touch, with powerful processors and large capacity storage memory.

These smart phones have advanced systems implement programs that allow operating normally are used in a personal computer, for example, processors Word, spreadsheets, digital agenda, applications multimedia and more. In addition, using different wireless communication technologies such as Bluetooth and Wi-Fi. As can be seen, these devices have been become powerful computing tools and Communication.

These capabilities have smart phones coupled with its high popularity has caused more applications for these develop more devices. It is common to see people perform with them a lot of daily activities, for example, communicate with others, take pictures, check emails, read news, play games, do banking and more. All this makes for see also will become a powerful tool support for the teaching / learning. The use of mobile handheld devices to assist in the education, anywhere and at any time introduced the concept of mobile learning or m-learning ([4], [5]).

The number of conferences and seminars devoted to this area of education has also been increasing. By example, in 2002 began the "world conference on Mobile and Contextual Learning (mLearn) "and from that then it has been held annually. The "International Conference on Wireless, Mobile and Ubiquitous Technologies in Education (WMUTE / WMTE) "also started in the year 2002 and has been making every two years. The "International Conference Mobile Learning (ML) "had its first event in 2005 and is held annually. In 2005 he began to be held the annual conference "International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM)", etc. Similarly, in the most important congresses of education, technology and communications have been referred sessions including the m-learning.

Aware of this reality, the laboratory control Universidad Simón Bolívar, is proposed to incorporate the use of mobile handheld devices to support the process teaching / learning. This paper shows an application of low cost that allows students to manipulate equipment Laboratory from your Smartphone, your tablet or PDA via Wi-Fi communication using the TCP / IP protocol by an ad-hoc network. The purpose of this development is to provide student an alternative so you can make your practical experience in the schedule that best suits you. Because the wireless signal can pass through walls, student may use laboratory equipment even if the classroom doors are closed. In this way, the student in his spare time at the University, you can perform the practical activity of the subject without relying on schedule work of the technical staff of the laboratory.

## II. LITERATURE SURVEY

### A. Introduction:

A literature survey is a discussion of the literature in a given area of the study. It is concise overview of what has been studied, argued and established about a topic, and it is usually organized chronologically or thematically. It is not an annotated bibliography, because it groups related works together and discusses trends and developments rather than focusing on one item at a time. It is not a summary; rather it evaluates previous and current research in regard to how relevant and or useful it is.

### B. Technology Information:

### 1) (Google) Android:



Fig. 2.2: Android Logo

A Google supplied operating system designed for mobile computing devices. Architecture built on top of a slim Linux

kernel and using Java and C++ API's. An open source Operating System for Mobile application development

Android [20] is an operating system based on Linux with a Java programming interface. The Android Software Development Kit[20] (Android SDK) provides all necessary tools to develop Android applications. This includes a compiler, debugger and a device emulator, as well as its own virtual machine to run Android programs. Android is currently primarily developed by Google. Android allows background processing, provides a rich user interface library, supports 2-D and 3-D graphics using the OpenGL libraries, access to the file system and provides an embedded SQLite database. Android applications consist of different components and re-use components of other applications.

### C. *Emulator:*

A software package that mimics the hardware functionality of a given platform. Used for testing and development of solution applications

### D. *SQLite:*

SQLite[21], the most popular Open Source SQL database. SQLite[21] is a relational database management system contained in a small C programming library. In contrast to other database management systems, SQLite is not a separate process that is accessed from the client application, but an integral part of it

*1) Sdk:*

Software Development Kit - A set of development tools that enable a developer to create applications from a pre-designed software framework

*2) Java:*

Java[2] is a set of several computer software products and specifications from Sun Microsystems (which has since merged with Oracle Corporation), that together provide a system for developing application software and deploying it in a cross platform computing environment. Java is used in a wide variety of computing platforms from embedded devices and mobile phones on the low end, to enterprise servers and supercomputers on the high end. While less common, Java applets are sometimes used to provide improved and secure functions while browsing the World Wide Web on desktop computers

### III. SYSTEM IMPLEMENTATION

### A. *Implementation:*

Implementation is the stage in the project where the theoretical design of the project is turned into a working system. The implementation techniques of controlling and monitoring LAN through Cell phone. Mobile Based LAN Monitoring and Control is implemented by using android platform itself. The system is developed in a way that targeted LAN Network is controlled by the server machine. Mobile Based LAN Monitoring and Control is a tool used to monitor a LAN through a mobile device by the administrator when he is at a remote site.

This tool is installed on the node which has two independent parts. One is server application which works as a major process on the machine and offer the services to administrator for controlling and monitoring the LAN. The other is the client application which is the background

process on the machine and controls all the activities of the client. The server application can control through registered mobile device. Using the mobile the administrator can perform following actions-

1) Kill Process
2) Start Process
3) Net view
4) Shut down

The server keeps the list updated to check the live hosts working in the network. The server can contact with the particular client using his ID.

The basic flow of the system with MVC is given below:

1) Client submits login request to Android Activity.
2) Android Activity acts as controller.
3) Activity requests DB to verify whether the database is having the same user name and password, If found login operation is successful.
4) Controller then gives response back to Android Activity which displays the Android XML file on Mobile.
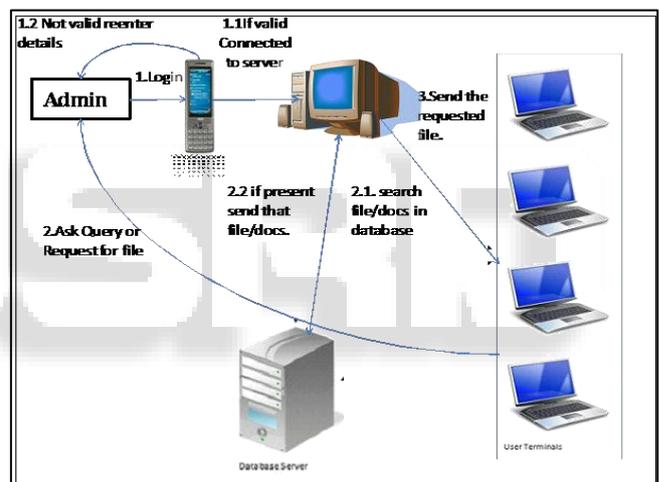5) It prepares presentation response on to the Mobile.

### B. *System Flow Diagram:*



Fig. 3.2: System Flow Diagram of the Application

### IV. PROPOSED SYSTEM

### A. *Android Based System:*

Objectives:- We are going to proposed a system in which the idea of network monitoring through the Android Phone is presented.
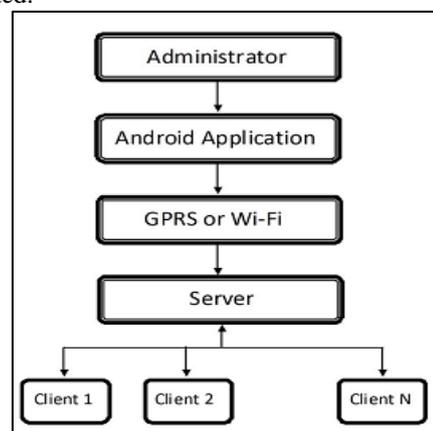


Fig. 4.1: Block Diagram for Android Based System.

The main purpose of the system is to obtain maximum information about the network to admin on the Android Phone, whenever the admin is not present in the server room. In this system we are going to use number of protocols to control the network. These are as follows:

*1) Simple Network Management Protocol (SNMP):*

It is standard protocol for managing devices on IP networks. The following devices support the SNMP protocol these are as follows. Routers, Switches, servers, workstations, printer and more. SNMP protocol operates in the 7layer of OSI model that is Application layer. It receives request at UDP port 161 and the response is sent back to the port 162.

*2) Session Initiation Protocol (SIP):*

It is used in the application to easily set we the incoming and outgoing voice calls without having transport level communication. All the features controlled by the GSM based system and email based system are also controlled by the android phone system very conveniently because the android phone system provide the very good user interface to carry out operations. It improves the speed of the operation and save many times which is required for login in email to used system. Command typing time also saved in this system. Where use in this system we can perform operation just by starting the application. There are many reason of developing new android phone based system these are. In SMS based we cannot ensure the delivery of SMS. Also cost of SMS is high.

## V. COMPONENT OF SYSTEM

All applications of m-lab have been elaborated using Lab VIEW 8.2 [15]. This environment development is widely used in measuring programs and control. This is due to its ease of use and the large amount functions and modules that have built-related: Virtual instrumentation systems drivers data acquisition, creating wireless applications and remote applications. Its ease of use makes both expert programmers and people with few programming skills, they can develop relatively complex, difficult applications do with traditional languages. In Fig. 2 the different actions performed are shown each of the applications that make up the system.
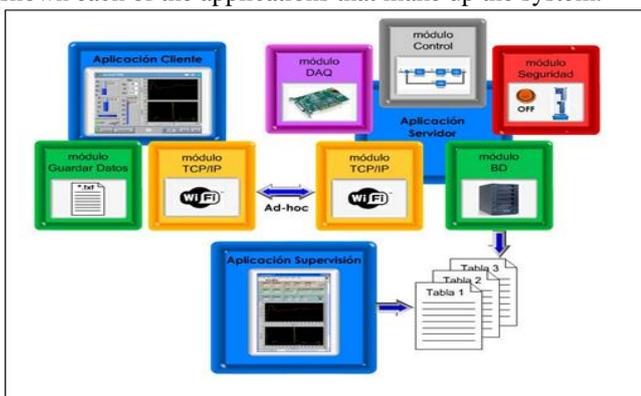


Fig. 5.1: Components and system tasks.

### A. Application Server:

In the server application five tasks are performed. The TCP / IP module are designed to establish the customer communication and process orders sent the user through the mobile device. Likewise, responsible for transmitting to the client, the value of the variables process (signal output and control applied to the plant). To establish communication, both teams (client and server) must be connected through an ad-hoc network. The DAQ module is responsible for communication with the through pilot plant data acquisition system. From the server is sent to the actuator signal plant control and received from it at every moment of sampling, value of the process variable or output. These tasks carried out by these two modules, are carried out continuously at a constant time interval defined by the developer system. For most laboratory processes control of the University, 50 ms is an acceptable period as sampling time / control and data exchange. This is not an acquisition system requires high benefits for the implementation of remote laboratory. The BD is responsible for task management database.

All the activity performed by the student in the m-lab is saved for later analysis by the teacher. The database is comprised of three tables related. The first of which contains the identification information students of the course, this includes your name, surname, passport number, etc. When a student attempts connect to the server, your card is validated against those stored in this table. If you are there, authorizing you uses the system and the user interface is enabled to act on the ground. If not, the connection is refused. The second table stores for each connection: the user that connects, date, time of entry and exit to system. In the last board all the information produced by the student during the time you are connected to the system is saved. Parameters: For each test it to perform the following data is stored in this table controller used and values of reference signals, control output obtained during the execution of experiment. A test is considered everything that happens since the user turns the plant laboratory to off. During the same connection, the student can perform several tests to achieve the result that most suits you. However, every of the tests they carry will be stored in this table for further analysis by the teacher. By the security module prevents the use Wrong laboratory equipment by the user. This can occur, for example, by bad design driver by the student. When the output of system reaches a maximum value, the signal is suppressed voltage control or sent to the actuator, the register alarm condition in the third table of the database and disables the ignition switch equipment on UI. The student cannot start another experiment until the output variable returns to its initial condition. The control module represents the controller itself. Form-lab course, a PID is used. However, this can be replaced by any other controller depending on what you want to evaluate. For example, networks / gain, state feedback, etc. Like other laboratories remote, the calculation of the control signal is performed on the server and not on the mobile device. Thus are prevented stability problems associated with some delay in the communication. The control signal is limited to the range obtained maximum allowed by the actuator, it avoids sending a signal high voltage can damage the equipment.

### B. Application to the Client:

For the preparation of the application running in the mobile, development module using Lab VIEW mobile 8.2. This tool lets you easily create, programs for mobile devices and Smartphone possess operating system Windows Mobile 5.0 or later. The application is designed and compiled into a personal computer. Then you download a program to your device executable. Any bookstore or special program is

required to run the application on the mobile device. TCP/IP and save data.

The TCP/IP module is responsible for managing communication between the mobile device and the server m laboratories. The customer is the one who initiates communication using the protocol TCP/IP. Has scheduled the IP address of the server and the communication port. These two parameters are fixed and not can be modified. In addition, this module is responsible for sending the server all actions performed by the user in the interface, for example, start / stop the experiment, modify the controller parameters and the value of the signal reference. Additionally, he is responsible for receiving the server data signals from testing equipment, these are: the value of the control signal and the output variable system. This task communication is continuously performed to a rate of 50 ms and is configurable by the developer system. This constant exchange of Information between the client and server allows changing parameters online driver or modifying the value of the reference.

The data storage module allows the student store in the mobile type text file with the results of experiment. This consists of four columns contain data for: simulation time, control signal, reference signal and output signal. One time that the student gets the desired results after have done several tests, proceed to save data experiment. Subsequently, exports this file to a computer where you can discuss it with an appropriate application for this, for example, Matlab.

### C. User Interface:

Fig. 3 shows the user interface The goal is to display the information in a manner acceptable to the small size of the screen of the mobile device.
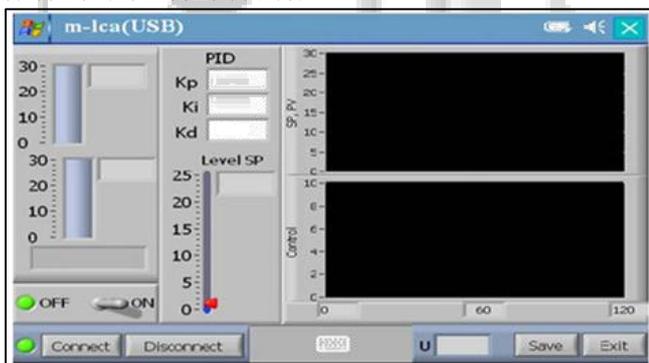


Fig. 5.3: User Interface

The interface contains only the essential components communication, operation and display laboratories. This allows the display of the mobile device easily visualize each of the elements make up the interface.

On the right side of the screen of the mobile device is the plot area. In this there is a window where you can display in real time and on the same graph, behavior of the output signal or the process variable and reference signal. In a plotter is shown the corresponding control signal. In the central part of the interface are the main controls that allow the user interact with the system. Clicking directly on the controls that appear in this area, you can modify the value of the reference signal and the parameters of the controller. Finally, on the left side of the interface, is the Experiment

animated graphic showing the visual user interaction with laboratory equipment.

Both icons representing the system as boxes numerically reflect the value of the process variables, updated in real time according to the values obtained from equipment. Once the user has assigned the value of controller parameters and reference, you can start experiment displacing the position (ON) the switch located on the bottom right. When you want to finish the experiment (remove the voltage to the actuator) you must put the switch in the off position (OFF). To store in the server data for the experiment (data represented in the plotters), should be press the "Save" button.

### D. Application of Supervision of the Student:

All activity performed by the user using the laboratories' stored in a database in the server system. From any computer connected to the network, course teacher can access this information. Then it is used to assess student performance in the laboratory and to assess their learning process. Interface Tool that allows you to review this information.

The application extracts the information stored in the base system data and displays it graphically. In top of the screen in the first row is the user information that contains the table number one database. The #Resistor field indicates the total number of Course students or users authorized to use the system. The button to increase/decrease of Register No. is possible to visit the different lines of the table and display the information for each Student: their identification, name and surname. The second row shows the interface information table number two database, relating to connections made by the user lab server. Field #Entradas is refers to the number of times the student has been connected to the system. By registering Entry No. is obtains information on each connection, that is, date, time of entry and departure time to the system. The third row of interface, displays the information stored in the table number three in the database, related data tests or experiments made by the user. Each time a student logs into the system, you can perform one or more tests depending on the success of its design. The #Pruebas field specifies the number of trial she made in particular connection. By registering Test No. Experiment information is reviewed corresponding to each of the tests. For each trial shows the parameters of the driver used (Kp, Ki, Kd) and at the bottom interface, the graph of behavior of the output variables / reference signal control.

Finally, there is a light signal alarm shown on if during testing the output variable reached the maximum allowed value. This allows the teacher study the condition that produced this error.

## VI. FEASIBILITY

### A. Introduction:

The purpose of this document is to control and monitor the LAN network from our wireless handheld device i.e. cell phone from anywhere irrespective of distance. Say, you have a LAN setup at your office and you are sitting at home. Now, you want to know or check the LAN status in your office, you can do it by the help of Mobile based LAN

monitoring system. For this, you need to store this application in your cell phone and execute it.

In the era of mobile devices, wireless devices are widely used and it has penetrated every part of our life, but remote monitoring of networks through mobile device is still a mirage, this application based project is an effort to make this mirage a reality, and this is where the genesis of this of this project lies.

*1) Purpose:*

Feasibility study determines whether the new proposed android application for Mobile Based LAN Monitoring Control can be mapped to real world. This feasibility report defines the parameters for testing and validating the project and deciding standards against which the project was verified. The use of various methodologies in the study make clear the features, scopes and performance features of the project under the constraints or the financial feasibility and time.

*2) Methodology:*

The following methodologies will be followed:

We will take existing environment used by Mobile Based LAN Monitoring and Control via mobile phones with different scopes, different nature and different implementation so that larger perspective can be covered. For each of the environment intensive research will be carried out and flaws report and model will be generated for each of them. Then the important part of the model will be studied and pattern like user authentication, data encryption and other data security will be notated. This will help us to create new environment for providing better image processing so that the next time someone wants to work on similar project, the project manager can use existing algorithm to work with.

*B. General Information:*

This section describes the current algorithms being used for securing the Android application, objectives for the proposed system; issues that remain to be resolved; and general assumptions and constraints that were required for performing the feasibility study.

*1) Current System and Processes:*

Current system's limited features:

– It does not offer the wireless connection.
– It uses contemporary GSM modem that increases the cost of the product.
– The Area covered is limited for GSM modem.
– It is time consuming because it requires 15-40 sec. to establish data connection.
– The maintenance of the GSM modem is expensive to its users.

Working system providing the following feature:

– Offers valuable wireless connection.
– There is no need of GSM modem in our application so it is cost effective.
– The area of covered services is more than current system.
– It requires lesser time to establish data connection than current system.
– The maintenance of the product will be less than current system.

*2) Issues:*

   a)      Port or Firewall Forwarding Issue:

Since both the LAN server and the PC have IP addresses and both are within the same domain, there are either firewall or port forwarding issues.

   b)      Storage Issue:

The Wireless Media Stick has virtual memory. The memory or storage capacity actually resides on your home network and not on the Wireless Media Stick.

*C. Feasibility:*

The feasibility [22] study involved in the conception of the project requires a study of the environment as well as the risks involved in the development of the project. Proper estimation has to be carried out to ensure timely delivery of components as well as the cost effective solutions.

*1) Cost Feasibility:*

The costing feasibility of the project can be estimated using current estimation models such as lines of code, which allows us to estimate cost as a function of size. Thus, this also allows us to estimate and analyze the feasibility of competition of the system in the given time frame. This allows us to have a realistic estimate as well as a continuous evaluative perspective of the progress of the project.

*2) Technical feasibility;*

A large part of determining resources has to do with assessing technical feasibility. It considers the technical requirements of the proposed system. The technical requirements are then compared to the technical capability of the organization. The systems project is considered technically feasible if the internal technical capability is sufficient to support the project requirements.

The analyst must find out whether current technical resources can be upgraded or added to in a manner that fulfills the request under consideration. This is where the expertise of system analysts is beneficial.

This feasibility study studies a few parameters:

– Is the proposed technology or solution practical?
– Do we currently possess the necessary technology?
– To implement this project we have used Eclipse IDE for Java Developers Version: Helios Service Release 1 which is freely downloadable from http://eclipse.org/.
– We also have used Android Software Development Kit 2.3 which is also freely download able http://developer.android.com/sdk/android-2.3.html.
– For database we have used SQLite which is embedded in android in eclipse.
– Do we possess the necessary technical expertise?
– Coding for Android requires basic knowledge of Java and C languages which the team possesses.
– For some typical features of Android example help is available on the net especially on the website http://developer.android.com/.

*3) Economic Feasibility:*

– Cost-benefit analysis all the software's needed to develop this application are freely downloadable. Hence the development cost is nil.
– The hardware cost is the cost of the Android Smart phone on which this software needs to be deployed; the cheapest android phone which can support this

application is Samsung Galaxy tab .It is priced for '15000-25000'.

– Once this application is completely developed millions of company's and colleges administrator can easy to control the LAN hence its benefit ratio if high.

*4) Operational Feasibility:*

The system is designed keeping in mind the user requirements and can be implemented with existing personnel. Implementing the system is not a major concern as system is user friendly and easy to work.

*5) Financial Feasibility:*

The minimum hardware and software equipment required for running the system is already available. The only cost incurred is that of developing and maintenance of the system. Hence system is cost effective and economically feasible.

*6) Schedule Feasibility:*

Our product will take 8 months to be completed before it is useful. Our product timetable is reasonable as it takes 3 months to be study requirements, to develop analysis model and to develop a design and 5 months to implement a product with the given specification. A project deadline is month end of March and it is reasonable, mandatory as well.

## VII. RESULT AND DISCUSSION

*A. Result:*

Whatever the objective of our project was mentioned in our abstract was followed in following sequence to get the specified result. The different steps followed are as follows:

– To monitor and control the LAN through mobile phone of administrator which is connected to the server through wireless media.

– To provide access to the client in a LAN through Wi-Fi.

– This is achieved using *WAP Protocol.*

– To provide easy searching of clients have stored their details (Name with IP Address) in Database (SQLite).

– We have provided User Friendly GUI.

– We have achieved security by providing login window with proper authentication and hence only registered user in database can log on.

Finally we suggest that a full implementation of the proposed system is performed, which implementation will allow us to test the complete concepts in particular the idea of profiling users and thus having more specific controlling and monitoring LAN. Further through investigation can also be performed on implementing an effective scoring mechanism to the working system. This will be capable of giving meaning to the results achieved through the use of monitoring and controlling LAN.

*B. Discussion:*

In the international conference the judges asked us about the working of the project and what differentiates our project from the current implementations present in the market. They also asked that how to handle the database crashes. To that we have come up with direct IP setting analogy in our project. The other question asked was which platform was used for developing the project. Another question asked was whether the performance of application was checked using available tools in market.

We tested our project with different virtualization software's which gave us the results on its working and speed. We tested the program with regards to unit testing and gathered the difficulties in handling the program. We worked on it to improve the user interface and made it easier to operate. We tested our project with different users to check its handling and then made the appropriate changes to make it more user-friendly.

*C. Future Scope:*

– Provide scalability.
– Provide parallelism.
– Integration with schools and colleges.
– Provide more security

## VIII. CONCLUSIONS

The available techniques for monitoring and controlling are perfect in themselves. But to improve the accuracy, more efforts need to be taken. In the proposed technique, we have used the Wi-Fi network and LAN.

The system will provided a low cost, secure, accessible, remotely monitored and controlled solution for LAN monitoring using wireless media is been introduced. The use of a mobile, wireless media, Server provides exciting possibilities. However as far as the industrial applications are concerned this can be viewed as a low cost, customized wireless LAN monitoring system. Thus this solution can be customized to suit any other industrial requirement related to monitoring and controlling LAN network. The target to control LAN network remotely using the wireless media for satisfying user needs and requirements. Wireless technology capable solution has proved to be controlled remotely, provide security and is cost-effective as compared to the previously existing systems. Hence we can conclude that the required goals and objectives of the system have been achieved, by working system.

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