

# INTERFACING OF LARGE SCALE SPECIMEN TESTING MACHINES IN BIG HOSPITALS TO HMS SOFTWARE USING RS 232

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**Abstract**— This paper provides an overview of importance of automation in the field of providing specimen test results to doctors in an efficient and real time manner for ensuring effective treatment in big hospitals. The relation between treatment and investigation results is proportional to each other. That is, when the time taken to obtain the investigation results is delayed then the effective treatment to a patient is also delayed. Effective methods of queue management to minimize patient waiting time and overcrowding of patients are the big challenges faced by major hospitals. Unnecessary and unwanted waits for long time will result in substantial decrease of human resource and wastage of time and sudden increase in the frustration feel by patients. The primary aim of the project is to decrease the time between the investigation results receiving phase and effective treatment phase and thus decrease the patient consulting queue, patient waiting time for investigation and overcrowding. This work explains the importance of automation in hospital laboratory procedure to increase the speed of providing specimen test results of the patients. The scope of this paper is to provide an interfacing method of the large scale testing machines used in big hospital having RS232 or network socket connectivity with any of the hospital management software using java socket methods. This process decrease the treatment delay, thus it derives the base of populate the concept of Big Data for Good Health. This method of providing fastest test results of the investigations is more helpful towards the infections and diseases control in a time bound fashion. Automation in the field of fast and efficient health care achieve a high rate of growth by using web services, M-governance, Cloud service technologies. This type of information having high availability is very helpful to the users in a real time manner and any time. This paper discusses some of the existing activities and future opportunities related to automation of Hospital laboratory.

**Index Terms**— Big data and big hospitals, overcrowding, patient queue, RS 232, java socket methods, automation, Interfacing PC, Hospital laboratory procedures, effective treatment, healthcare, diseases control.

## 1. INTRODUCTION

Patient waiting queue for consultation, patients sample specimen testing queue, and patient overcrowding are the three major challenges faced by big hospitals. Unnecessary waits for long period of time result in reducing human resource wastage. In the existing system, there is no provision for automatic movement of data from testing

machines to Hospital Management Software. The objective of the work is to implement automatic movement of data from large testing machines to Hospital Management Software database and also to the cloud for data mining, data warehousing and research applications.

The large specimen testing machines used in Govt. Medical Colleges are EM 360 series with RS 232 and network socket connectivity manufactured by Transasia Biomedical Ltd. The system consist of a hardware unit to perform the specimen analysis and a local computer to feed the tests parameters into the analyzer machine and a monitor to display the results after the completion of analyzing. A typical EM 360 Clinical Analyzing machines are shown in the figure section. The basic concept of data transfer in this interface is the exchange of data and control frames between the host system and the analyzer. The existing system consist of manually entering of all the clinical laboratory test results into local monitoring software and take the printout locally and issue to patients or to the accompanied through results counter. And also the results is manually entering into Hospital Management System(HMS) and verify the same before send it to data analysis in medical field. Proposed work consist of automatic movement of data from testing machines to HMS software in a two and fro method. These methods of collecting big data have the following aspects in treatment care.

## 2. RELATED WORK

Nowadays, most of big hospitals are in environment of overcrowded treatment and consist of lack of patient queue management system. The mechanisms used for patient management to avoid queuing and waiting time slot prediction is a big and complicated task because each patient might require different phases of treatment viz. checkup, perform various specimen tests etc.

Average number of patients need blood test, X-rays, CT scan, minor surgeries, during treatment. We call each of stages as treatment tasks or tasks in this paper. Each treatment process consist of different time requirements to complete with respect each patient, which makes in results

of time prediction and further recommendation of medicine and treatment highly complicated. More strictly a patient undergoes different treatment process like Doctors consultation, investigation etc. In this case, a patient with born fracture require both the consultation of Orthopaedics and Surgery doctor, but each Doctor require different specimen tests. That is, the Orthopaedics Doctor require X-Ray but Surgery Doctor require blood routine, urine routine etc. Now we go through the history behind the problem. Almost all peoples in Kerala depends Government Medical Colleges for medical treatments for critical situations. Number of patients on an average consulted in Government. Medical College in Thrissur district, Kerala is about 2500. Among these, 2000 people were need clinical investigation on Blood, Urine etc. The delay in obtaining lab results in proper timing affect the proper treatment of the patients. It is the time to check how this problem interesting. Even if the testing machines have interfacing capability, all big hospitals follow manual processing of patient's sample. The question of whether the problem already solved or not. From a wage survey, the hospitals have lake of technical expertise to solve and implement this solution even if they have Hospital Management System exist. As a result the problem is not solved yet. On enquiry, it is found that the delay of obtaining investigation results from the clinical labs is due to manual processing. Serving congested areas in medical treatment using this solution, the main delay especially in clinical laboratories can be avoided.

### 3. PROPOSED WORK

The idea of serial data communication is widely implemented in all aspects if, the machine have interfacing capability. The machine consist of serial port, USB port etc. Almost all programming languages built in functions for reading and writing through serial port. Even many of the latest network devices consist of RS-232. Because of the technology is so widely implemented and available, together with many software tools, it is also relatively good work to develop cheap equipment. The proposed work flow mainly consists of following important stages. The first step consist of establish a physical layer for communication between the analyzer machine and interfacing computer. The physical layer for RS 232 communication and pin configuration is showed in table provided. The second stage consist of develop a frame structure for separate the row data received from clinical analyzer machine into eight bit data. The row data is the results obtaining after tthe specimen analyzing of patients. The third step consist of storing the data into MySql database using JDBC connection between socket listening java module and Apache web server. The fourth step consist of moving data from interfacing PC to the actual web server which consist of Hospital Management System. The fifth step is the accessing of these results from Operation Theater, doctors PC located in the consulting room, ICU, result providing counter etc.

### 3.1 Interfacing using RS232

Rs 232 Sockets play a vital role in the field of communication and application development. This work introduces elements of RS 232 socket and interface programming and concepts involved in creating JAVA modules for reading, writing, parity checking and hand shaking between clinical analyzer and interfacing PC. One of the most basic tasks to be faced by a java programmer is managing the socket functions. Basically, socket performs four type of operations. It is listed as , connecting to hardware which may be a clinical analyzer or a machine which need to be controlled. Send data to a hardware or a machine which need to be controlled, Retrieve data from a hardware or a machine which need to be controlled and finally close the communication between the interfacing PC and the hardware. However, a socket like RS 232 may be used for both send data to a machine and retrieve data from the machine that establish connections. The java.Socket class consist of number of built in functions to interface to a RS 232 socket and allows you to perform all above fundamental operations on socket.

#### Rs 232 Communication Specification

Transmission Method	RS232C asynchronous,
Transmission Rate	1200, 2400, 4800, <u>9600</u> ,
Transmission Code	ASCII
Data Length	7 bits, <u>8 bits</u>
Parity	Even, Odd, <u>None</u>
Stop Bit	<b>1 bit</b> , 2 bit

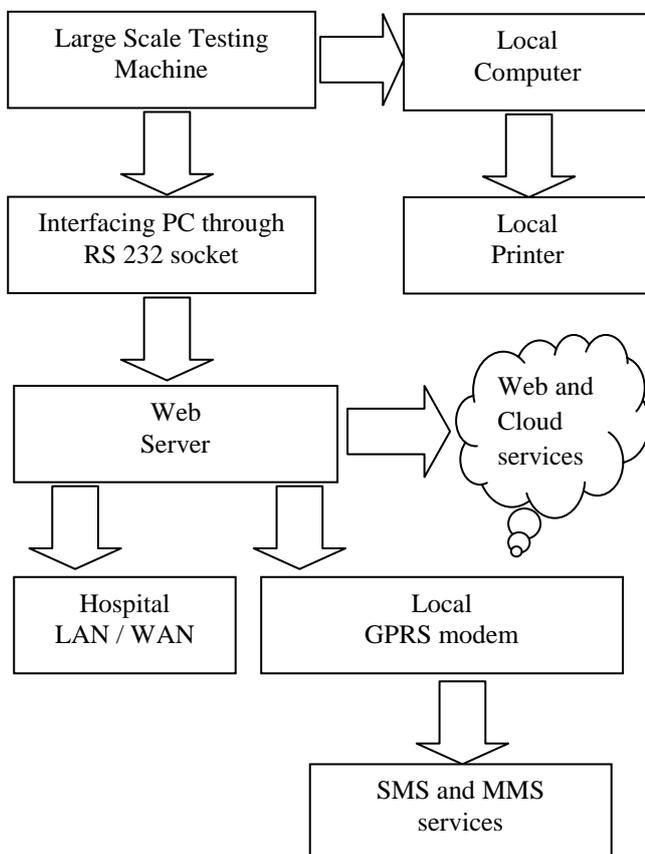
#### Rs 232 pin out diagram

D-SUB 9-Pin			D-SUB 9-Pin	
Frame GND	1	↔	1	Frame GND
Receive Data	2	←	3	Transmit Data
Transmit Data	3	⇒	2	Receive Data
Data Terminal OK	4	←	6	Data Set Ready
Signal GND	5	↔	5	Signal GND
Data Set Ready	6	⇒	4	Data Terminal OK
Request to Send	7	⇒	8	Data Set Ready
Data Set Ready	8	←	7	Request to Send
NC	9	↔	9	NC

### 3.2 Programming in Java for RS 232 interfacing

Using the concept of inter process communication (IPC), Java has provided the ultimate facility to manage RS232 sockets. For including the java socket methods, every java source code must start with java socket package. The java socket package in the Java development platform provides a class. A class Server Socket that implements. The

interfacing analyzer side connection is handled by the built in socket functions available with the machine. Server Socket on the interfacing PC initialize the method called 'binding' which ensure to fix to a specific port number. 'listening' to wait for data request on the binding port and 'accept' data. Upon acceptance, the interfacing PC obtain a new socket bound to the local port. So the clinical analyzer perform series of handshake with interfacing PC RS 232 The clinical analyzer and the interfacing machine is now communicate with each other after the first hand shake signal obtained. The listening process is now enter into a continuous loop and continuously read read data and write data into database. If the analyser machine uncouneted any hardware failure or out of stock of any re-agent used, it send a stop signal to the interfacing PC. In this way this work, suggest a solution for automatic data movement between the specimen sample testing machine analyzer and hospital management system software using the RS232 interface and socket programming. This avoids increase accuracy of results provided by the hospital laboratory, avoid manual entry of results, avoid delay in result publishing, only verification process is needed since the results of the patient's specimen tests is automatically feed into the Hospital Management Software, the manpower requirement is less, previous results can be accessed easily from the data bank, rare dieses can be find out easily analyzing the data bank.



*Lower Level Communication Methodology*

Item	Method	Explanation
<b>Frame Configurations</b>	For Middle Frame <STX> FN text <ETB> C1 C2 <CR><LF>	Control character (characters enclosed in <>): <STX> is control character (HEX 02) <ETB> is control character (HEX 17) <CR> is control character (HEX 0D) <LF> is control character (HEX 0A) <ETX> is control character (HEX 03)
	For Last Frame <STX> FN text <ETX> C1 C2 <CR><LF>	

*Handshake between Analyzer and Interfacing PC*

Analyzer	Function	Interfacing PC
NEUTRAL Establishment	ENQ → ENQ ACK ← Interval	NEUTRAL Establishment
Transfer	ACK ← Transmit	Transfer
Transmit	ContinueSending next frame ← →	Receive
Termination NEUTRAL	→	Termination NEUTRAL

**4. CONCLUSION**

The collection of clinical data received from big clinical machines using the interfacing methods will be stored in HMS system and make it available for various requirements so it can be helpful in making valuable medical decisions. It also discuss about the limitations in hospital automation. A better use of medical investigations by means of interfacing can lead to well-optimized health services that can overcome the challenges faced by hospitals due increased population rate. The policy adopted by government in IT industry required to ensure privacy during storage and transmission process as well as in the field of future data analysis tasks. This work focus on helping patients complete their treatment tasks in a predictable time and helping hospital authority to enhance treatment tasks and avoid patients queues overcrowding environment.

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