

MONITORING AN INDUSTRIAL SYSTEM USING MOBILE PHONE APPLICATION

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We could talk today about mobility in monitoring and control of industrial system by using applications those are running on mobile phones. The "end user" is using the mobile phone device to connect to the application server, which is directly connected to the industrial system. To ensure data persistency for parameters those are measured and controlled, a Database server will be used.

Keywords: J2ME Java 2 Platform Micro Edition, JDBC Java Data Base Connectivity, OOP Object Oriented Programming

1. INTRODUCTION

The main advantage offered by the mobile phone device is mobility. With the help of applications those are developed and could run on such devices, we are able to monitor and why not, to control an industrial system anytime from anywhere.

Applications those could be implemented may start from the simple notification, which arrives as SMS (Short Message Service), when something has been changed into the system behavior, till accessing the help documentation of that system using WAP (Wireless Application Protocol) and last, but not least, developing applications those are able to interact in real time with the system by collecting parameters values or modifying the values using specific requests.

Due to the fact that mobile phones are limited devices regarding the memory size and data processing capacity, we have to think about a smart implementation, choosing such a way for application development, that the main tasks and functionally are performed by the server, which is directly connected to the industrial system, and at the mobile phone side we are just communicating with the server.

When we are thinking about how the server is connected to the industrial system, we can see that today there are so many possibilities those must be taken into consideration: serial connection, parallel connection, USB (Universal Serial Bus), Ethernet, Bluetooth, fiber optical, infrared or any other dedicated implementation. What to choose for communication setup channel, is just a matter of speed required for data collection and time reaction to changes, but at the same time the cost implied by implementing the solution that has been choose as best suitable for a specific case has to be explored.

To ensure persistence for the values of parameters those are measured, or to keep the track of modification those were requested by the user, we have to use a database server.

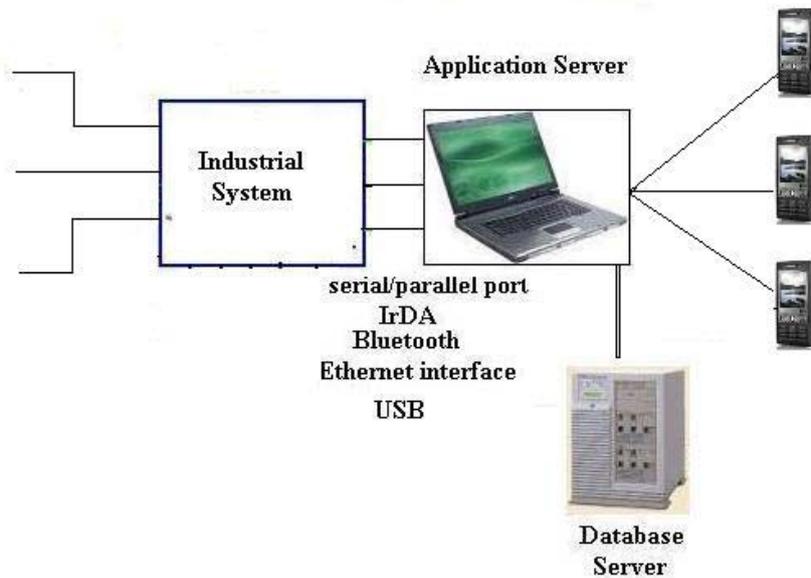


Fig. 1 Architecture of the system

2. CLIENT SIDE

The client side is represented by the application, which is running at the mobile phone and which is getting connected to the application server. This application is using CLDC or MIDP, depending on version supported by device. As we mention before, mobility is the main advantage for this case, but we have to take into consideration that the human operator could not be excluded from the system functionality. We have to admit that only the human operator is able to perform maintenance and update regarding the operating system under which the server is running, if we are taking into consideration, only such a simple example, where mobility is not enough to complete those operations.

Due to the fact that Java is used as programming language for application development, with restricted set of instructions for limited devices, we are still able to use the full advantages of object oriented programming language. We could design from the very beginning suitable application, which will support future requirements.

Depending on the resources those are available at the mobile device, which will be used to run the application on it, we can start from a simple let's named "text application", from where the user is only able to navigate into a text format application and we can reach that level at which, we are able to display graphics to mobile phone, those are corresponding to different interval of time selected by the user for measured parameters values.

A smart implementation at the user side could be, by sending the suitable application to the mobile phone, by reading device characteristics after the first request addressed to the server.

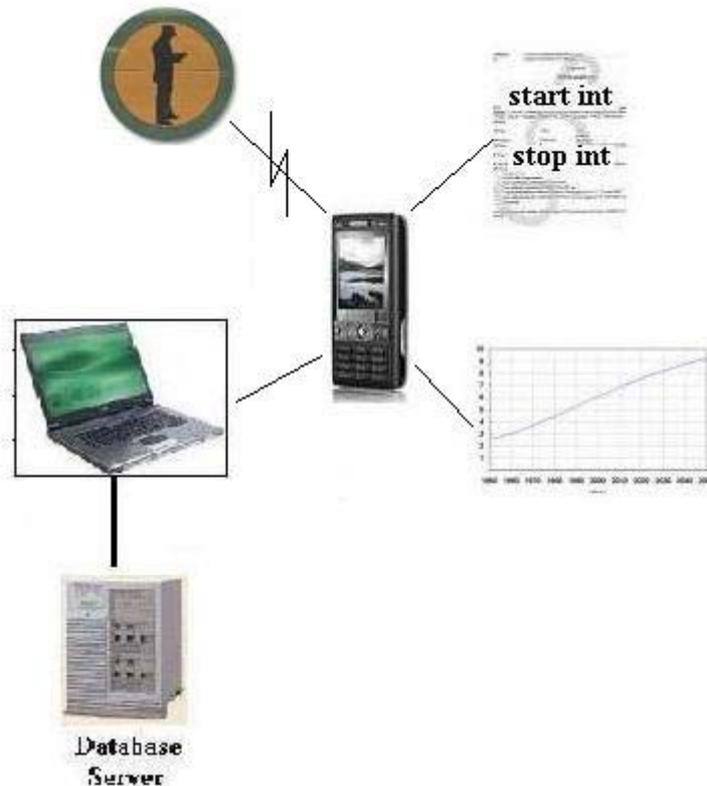


Fig. 2 Different usage of mobile

Because database server is used to ensure persistence for parameters values and to be able to have a history of system behavior, we can implement the user application from mobile side, in such a way that through the application server, stored procedure are triggered by the user at database and all the steps are done at the other side, due to the fact that we are using a limited resources device to monitor a complex system.

3. APPLICATION SERVER SIDE

Application server is designed in such a way that it represents the core of the system. It is:

- communicating with the end user (mobile phone) and proceeding requests
- storing and retrieving information from Database
- sending requests and commands to the industrial system

We have to admit that it is a major risk to have any damage at this component and we have to take this into account, if we must ensure a very high percentage of availability. Only redundancy could reduce the risk of outage period of time, but at the other hand the cost solution will be increased.

If we want to implement such a basic intelligence for our system, then we need as more as possible values into the database for key parameters those must be taken into

consideration, when the application server is evaluating the status of the system at predefined moment of time and trying to get a decision regarding parameter modification by reference values those are stored at starting point (when system has been putted into operation) and comparing the evolution of values during operation live cycle.

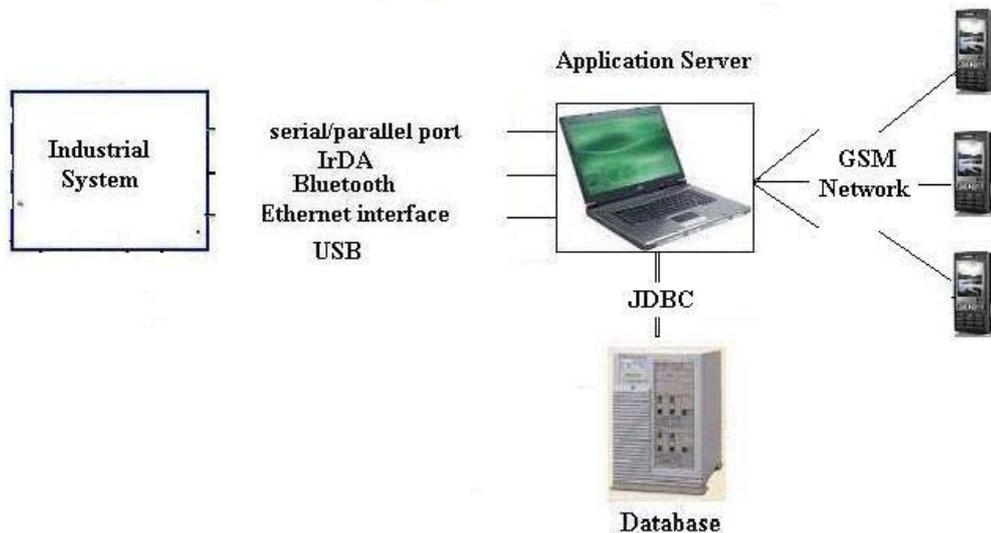


Fig. 3 Server communication

JDBC is used between application server and database server. This is a nice and simple way to fulfill any requirements regarding communication between those two servers and at the same time to use already predefined and easy to use classes those are supporting almost all kind of operation to a database.

4. DATABASE SERVER

We have to use a database server if we want to have a history regarding system behavior and functionality. At predefined interval of time, the content of the database should be updated with fresh values of parameters; those are requested from industrial system by the application server.

When we are choosing the database server we need to respect some criteria:

- open source or license protected one
- availability (offered backup solution) and representation of data
- how many concurrent connections are supported
- what kind of security settings could be enabled
- supported drivers for connection and transaction rollback implementation

If we have to choose between most commonly used, then we have to enumerate:

- Postgress
- MySql

- Oracle
- Microsoft SQL Server

It is to be taken into consideration for which type of customer is to be implemented the solution, what segment do we want to address. There are always customers willing to pay as much as necessary to have the best implementation or at the other side we could find the one which is always appreciating the open source solutions.

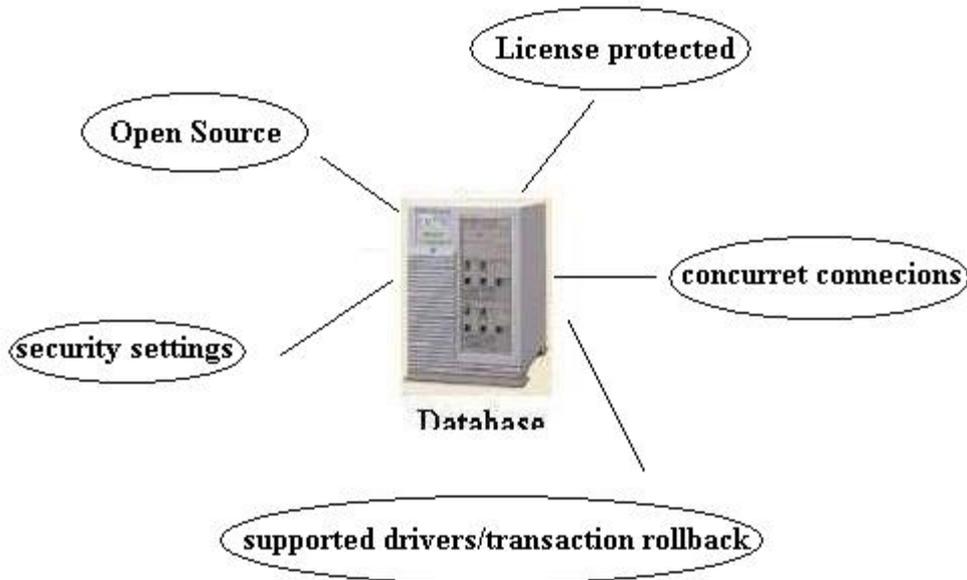


Fig. 4 Database server

Depending on what kind of performances does the database server has to support, we can choose to install it at the same machine as the application server is running or we can decide to put it at a separate one.

5. CONCLUSIONS

Using application developed for mobile phone devices we are able to talk about mobility concept when monitoring an industrial system – anytime and anywhere. Limited resources from such a device is not really an impediment if we are implementing as much as possible of proceeding tasks at application server side.

The key component, which is designed as core device is the application server. It is communicating with all other involved parts:

- end user represented by the mobile phone device
- database server, which is storing the information
- the industrial system, which one could be seen as a black box, but it has a known protocol implemented, that must be used to communicate with.

Looking at, as a standalone component, database server is a key factor when we want to give intelligence to the system for decision making criteria. It should support as much data as possible.

Taken a look and forming the general overview, we can conclude that the implementation will make the difference only taken into consideration the performance, which should be respected by physical devices those will be selected.

6. REFERENCES

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