

# Bluetooth Based Notification System for Blind People Using JSON Technology

Rani R. Aher, Neha A. Gupta, Amruta G. Khairnar<sup>\*</sup>, Khushbu B. Thanki, A. R. Gaidhani

Department of Computer Science Engineering, SIEM, Nashik, India

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## Abstract

As we know, new generation smart mobile phone are releasing and also Android and global 3G network into operation, the communications between smart phone and database server become more and more important. But there are some constraints of the mobile phone such as memory capacity, friendly interface and cost of transmission. Due to these constraints communication mechanism will require more stringent requirements. The communication mechanism, which we are going to study here, uses the light-weight type JSON (Java Script Object Notation) data format as the transmission medium. Then the mobile phone client will be a user interface to interact with the users and all the data processing will be done in the server, so that the communication mechanism will be optimized. Using this JSON technology we will create an application which will help blind people or visually impaired people standing at the bus stop to identify which bus is coming and the route of that bus.

## 1. Introduction

As information technology is developing, modern enterprise requires constructing information platform. At present, part of enterprise's information platform has been realized and we can do the corresponding operation on the logistics information in PC (personal computer) clients. But following the development of information industry, the kind of information operations which only use the computer terminals are unable to satisfy the enterprise and the needs of the customers. As a result, it leads to the development of the information platform on mobile phone clients. And due to the wide application of the Android system, this makes it necessarily to be applied on the development of enterprise information platform [2].

The Android applications are developing towards the direction of the enterprise intelligence platform, but because the limit of Android platform, such as memory, interfaces, communications efficiency. So, if we want to apply the Android platform to information construction, the interaction between Android application and enterprise database becomes a key Problem [2].

### Corresponding Author,

**E-mail address:** amrutakhairnar16@gmail.com

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In this paper we are going to study about the theory of data exchange between Android application and database and how to improve the efficiency of data query. First, we will find a data format to exchange the data between android and web service. Second, we will use this to achieve the entire communication framework. At last, we will optimise improved the framework.

## 2. Literature Survey

### 2.1 A Brief Introduction of XML

Extensible mark-up language is used to mark the electronic document, to make it structural. It is also used for defining the data types and flag the data. It is the original language that helpful for the user to define their own mark-up language. XML is subset of standard generalized mark-up language (SGML) and it is suitable for web transmission. It is used to exchange the structured data independent of the application program and the structured data provider [4].

XML is evolved as result of the complexity of the SGML. It is considered as the 'holy grail' of computing due to its universal data representation

format. The fundamental design considerations of the XML are simplicity and human readability. "XML shall be straightforwardly usable over the internet" and "XML documents should be human-legible and reasonably clear", that specifies the W3C according to the design goals of the XML. The primary uses of the XML are Remote Procedure Calls(RPC) and object serialization for transfer of data between the applications. It is the language used for encoding schemes. It does not have the predefined tag sets and each valid tag is defined by the user or through the automated scheme. It is a user defined data format[4].

#### Example

```
<person>
<firstName>Rohan</firstName>
<lastName>Kulkarni</lastName>
<age>27</age>
<address>
<streetAddress>21 2nd Street</streetAddress>
<city>Nagpur</city>
<state>Maharashtra</state>
<postalCode>422132</postalCode>
</address>
</person>
```

## 2.2 A Brief Introduction of YAML

YAML is a human readable data serialization format that takes concepts from programming languages such as C, Perl and Python and ideas from XML. It is available for several programming languages. YAML is a recursive acronym for "YAML Ain't Markup Language". In the early development, YAML was said to mean "Yet Another Mark-up Language", but it was then reinterpreted to distinguish its purpose as data-oriented, rather than document mark-up[4].

Its syntax was easily mapped to the data types common to the most high-level languages. It is well suited for the hierarchical data representation. Its line and white space delimiters make it friendly to ad-hoc operations. A major part of YAML is use of enclosures like quotations marks, brackets braces, and open/close -tags, which can be hard for the human eye to balance in nested hierarchies[4].

#### Example

```
firstName: Rohan
lastName: Kulkarni
age: 27
address:
streetAddress: 21 2nd Street
```

```
city: Nagpur
state: Maharashtra
```

## 2.3 A Brief Introduction of SGML

The Standard Generalized Mark-up Language is an ISO Standard technology for defining the generalized the documents [6].

Generalized mark-up is based on two novel postulates:

1. Mark-up should be declarative: This postulates should describe the document structure and other attributes rather than the processing is to be performed on it.
2. Mark-up should be rigorous: Mark up should be rigorous so that the techniques available for processing rigorously-defined objects like programs and databases can be used for sing documents as well[6].

#### Example

```
<anthology>
<poem><title>The SICK ROSE</title>
<stanza>
<line>O Rose thou art sick.</line>
<line>The invisible worm,</line>
<line>That flies in the night</line>
<line>In the howling storm:</line>
</stanza>
</poem>
</anthology>
```

## 2.4 A Brief Introduction of JSON

JSON is a light weight format for exchange of data. It is a subset of Java Script. Light-weight means as compared to XML, the ratio of mark-up to content with JSON is for less. It uses a format, independent of language completely. It is derived from Java Script Scripting Language for representing simple data structures and arrays called objects. JSON data is as simple as Java Script variables holding name/value pairs or arrays of name/value pairs for larger data sets. But it also uses a format which is similar to C language including C++, Java, Java Script, C #, Perl, Python etc. Due to these properties JSON has become an ideal format to exchange data which can be read and written easily. It is human readable and easy for computers to parse and use.

#### Example

```
{
  "firstName": "Rohan",
```

```

"lastName": "Kulkarni",
"age": 27,
"address":
{
  "streetAddress": "21 2nd Street",
  "city": "Nagpur",
  "state": "Maharashtra",
  "postalCode": "422132"
}
}

```

JSON schema defines the format of JSON for representing the structure of JSON data for validation, documentation and interaction. However, JSON is schema less. Although there is benefit of using the schema-less structure such as it brings flexibility in the representation of the data but it can become a problem when consuming and integrating data from different JSON services since developers need to be aware of the structure of the schema-less data. Schema-less data is used in cases dealing with non-uniform data (e.g., non-uniform types or custom fields) or in schema migration, however, it can become a burden in data integration scenarios where it becomes necessary to discover at least partially the underlying structure in order to properly process the data[5].

When we are designing the system, then according to the principle of JSON data transmission, it is necessary that the mobile phone client and Web server cooperate with each other. So the overall framework consists of two parts: the phones client and the Web server.

The implementation of android application using JSON will achieve the following three objectives:

1. As we are using lightweight JSON data format for data exchange and it will be better to update and query the data and then the limitations of android platforms for data storage will be solved.
2. Establishing a remote database server for android platform will be easy and it will provide a solid background framework.
3. By using the object-oriented programming mechanism, we can complete the operation on the android client and the data model through the control among the classes [2].

The System which we are developing is a android based application executing on a web server and connected to a database server. Its job procedure is as follows:

1. User input some data to the android application and the application assembles this data in JSON Request and sends it to the Web server.
2. After the Web server received JSON Request it then interacts with the database server and gets the result. It assembles this result into JSON Response and then sends this response to the Android Application.
3. After Android application received JSON Response from the Web server, it shows the result to the users by using the existing JSON analytical tools[2].

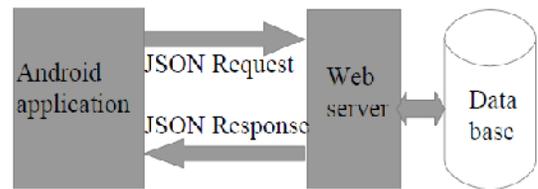


Fig. 1. Android database interaction

### 3. Overall System Architecture

#### 3.1 Android Architecture



Fig. 2. Android system architecture

The Android software stack can be subdivided into five layers: The kernel and low level tools, native libraries, the Android runtime, the framework layer and on the top all the applications [3].

The kernel used is a Linux 2.6 series kernel, modified for special needs in power management, memory management and the runtime environment. Above the kernel run some Linux typical libraries like bluez for Bluetooth support and wpa supplicant for Wifi encryption. As Android is running on devices with little main memory and low powered CPUs, the libraries for CPU and GPU intensive tasks are compiled to device optimized native code. The libraries like the libc or libm were developed especially for low memory consumption. The surface manager handles screen access for the window manager from the framework layer. Media framework includes audio and video codecs that have to be heavily optimized. The Android Runtime consists of the virtual machine and the Java core libraries. The virtual machine is an interpreter for byte code that has been transformed from Java byte code. Frameworks in the Application Framework layer are written in Java and provide abstractions for the underlying native libraries. Android applications run in their own sand boxed VM and consist of multiple components: Activities, services, broadcast receivers and content providers. Components can interact with other components of the same or a different application via intents [3].

### 3.2 Android Bluetooth

An Android Bluetooth API's allows application to search for other devices which are on, pair with them and exchange data. An application needs to have the Bluetooth or Bluetooth admin permission in it's manifest file granted to use the Bluetooth capabilities. In an Android Bluetooth package the Bluetooth API is located [3].

The Android platform supports the Bluetooth network stack, which allows a device to exchange data wirelessly with other Bluetooth devices which are on. The application framework provides access to the Bluetooth API's allows application to connect with other devices [4].

An Android application can perform the following activities using the Bluetooth API's.

1. Scan for other bluetooth devices.
2. Query the local Bluetooth adapter for paired Bluetooth devices.
3. Connect with other bluetooth devices through service discovery.
4. Data transfer to and from other devices.
5. To manage multiple connections [3].

### 3.3 Application Lifetime and States

The state an Android application is in, is determined by the state of its components, most

importantly it's activities. On an application starts the individual components get started. The diagram shows the states through which the application passes.

1. **OnCreate():** This method is called for initialization and some static set purposes. This method is called only once in an activity lifetime. The next method is always onStart().
2. **OnStart():** In this method the application process type changes to visible and the activity is visible to the user, but it is not in the foreground. This hook can be called more than one times in an activity lifetime.
3. **OnResume():** The activity has a focus and can get the user input. The activity comes to the foreground.
4. **OnPause():** If the application loses the focus then this method can be called and the application process type is set to visible. After running this method the system is allowed to kill the process at any time. All the operations of CPU should be stopped and unsaved data should be saved. The activity may get resumed or stopped.
5. **OnStop():** The activity bis no longer visible to the user and the process type is set to the background. After running this hook, the system is allowed to kill the application at any time to regain memory. The activity may get destroyed or restarted.
6. **OnDestroy():** Before deleting an activity it's onDestroy method is run which ends the activity lifetime. When the system keeps the process for caching purposes, the application process can be set to empty.
7. **OnRestart():** When activity is stopped and we want to start it again, this hook is called and after it onStart().

As the onResume(), onPause() and onStop() hooks do not exist, the lifetime is simple than one of an activity foe a service. For interactive services, onBind(), onUnbind() and onRebind() hooks are called to start, stop and restart a service. If an activity needs to save it's state then onSaveInstanceState() method can be used and if an activity needs to restore it's state then onRestoreInstanceState() method can be used[3].

### 3.4 Working of System

First when the user will turn on the application the Bluetooth of the mobile device gets automatically on and it will start searching for the Bluetooth devices which are on and it will start searching for other bluetooth devices which are on. It will get the bluetooth name of all the devices.

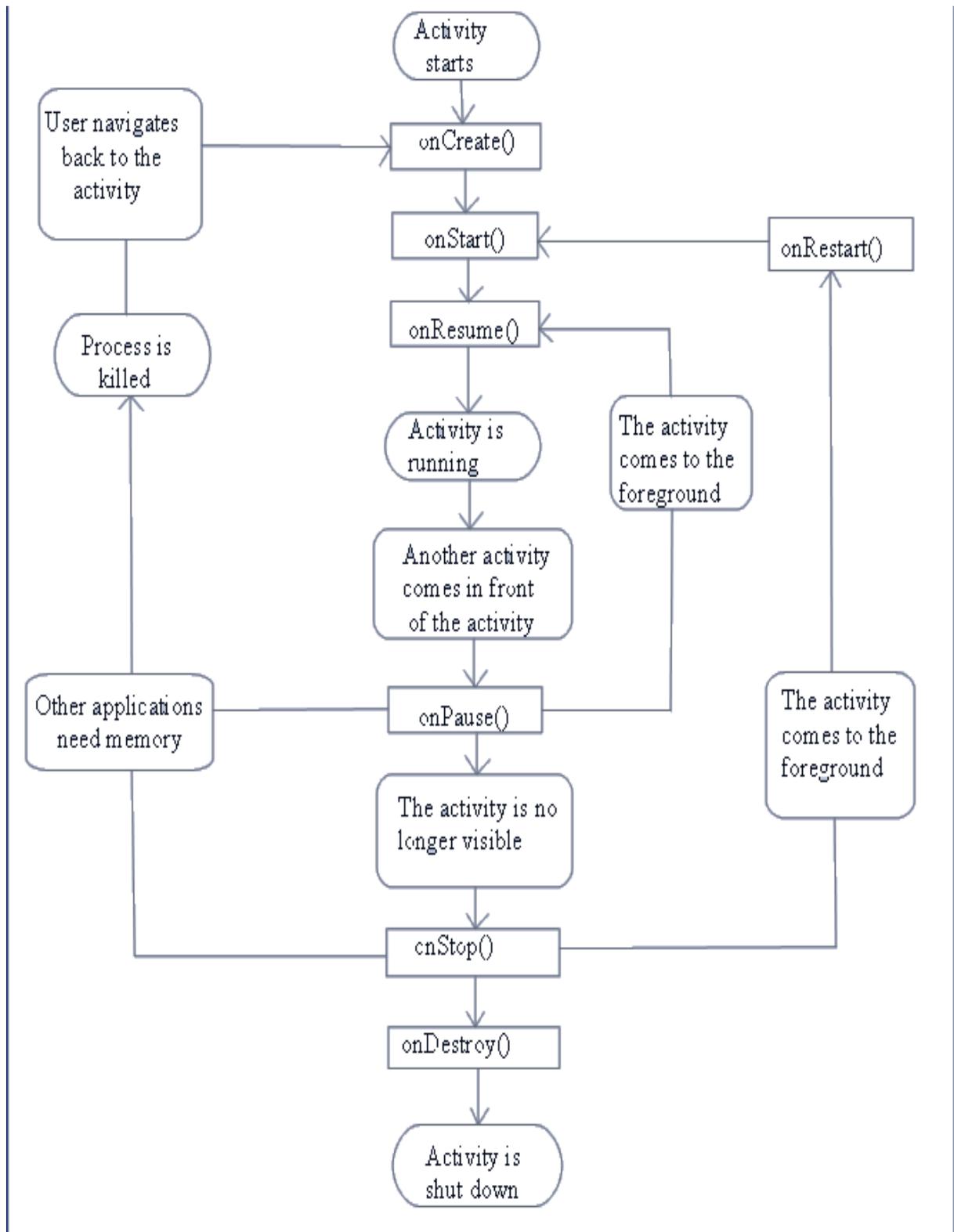


Fig. 3. Lifecycle graph of an activity

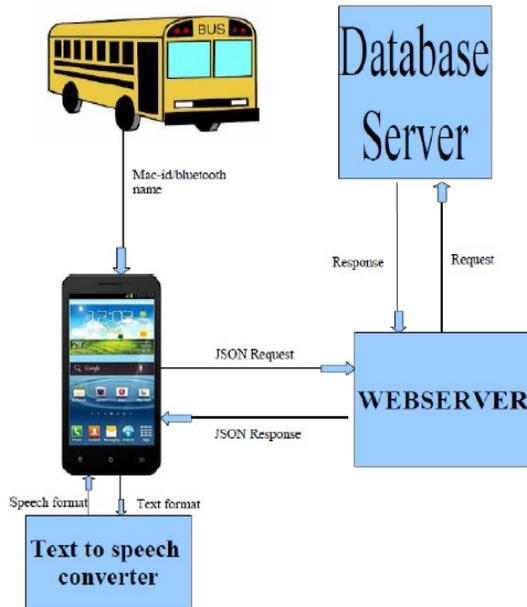


Fig: 4. Working of System

Application will assemble this into the JSON request and send it to the web server. Web server will get actual data using JSON analytical tools and send it to the database server. Database server will search for corresponding bus route and send it to the web server. Web server will get data if it is present into the database. Then web server will assemble this into JSON response and send it to the application. This data is in text format, it will be converted into speech using text to speech converter, so that the blind person can listen and he will come to know that which bus is coming and route of that bus.

#### 4. Conclusion

Thus we have seen how we can develop an interaction mechanism and exchange the data efficiently between android application in database server by using JSON technology and also the other technologies which are available to cater the same concept. By using JSON technology and JSON analytical tools we have reached the purpose of data interaction between android application and database.

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