



Computer Engineering

Elixir Comp. Engg. 73 (2014) 26142-26145

Elixir
ISSN: 2229-712X

Student management system using Google cloud messaging service

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ARTICLE INFO

Article history:

Received: 2 June 2014;

Received in revised form:
20 July 2014;

Accepted: 4 August 2014;

Keywords

Peer to peer communication,
Asynchronous communication,
Asynchronous transfer mode,
Instant messaging, Cloud service.

ABSTRACT

Cloud computing is a paradigm from traditional computing, offers services over the Internet. The education system evolved in the culture, experiencing the paper maintained records for the report and all critical information of individual school management. In our research work, the system design for School management's information have been proposed and implemented through GCM methodology, where it has been molding as an application with the help of servers, to notify the student's information like academic progress and enable to track them online by the parents, with accurate results. The scheme makes a more reliable, flexible approach to deliver up to date information to the ward's parents.

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Introduction

Cloud Computing has the ability to transform the IT industry to the whole new level, by delivering Software as a Service by how it is designed and purchased. Developers with new and unique ideas need not rely on capital outlays to deploy their products so that everyone can use it. Tim O'Reilly believes that "the future belongs to services that respond in real time to information provided either by their users or by nonhuman sensors." These service must be accessible always 24/7 as these services require large datasets that are mostly hosted in huge data centers. This is most useful in case where we combine more than one sources and also other services. Since not all mobile devices are connected to the cloud services all the time, the problem has been addressed in some application domains, so it's not an significant obstacle to mobile applications.

Google Cloud Messaging for Android(GCM) is a messaging service provided by Google that allows data transfer between the application server and the users Android device. It also provide features like queueing of messages by delivering the message to the target device. It is a free service and no quotas for how large your needs are. It can be carried out with the following function as, School administration can send messages from Application server to parent's android mobile using unique Id generated by GCM Servers. Whenever the application receives the push notification from the server, it just makes the mobile application to sync the data with the server. In case if some events are about to happen, the school administration can send sync message which tells the application to sync the "events" data with the server. Using Cloud Connection Service (CCS), available with GCM, we can communicate any Android device over a persistent XMPP connection. The primary advantages of CCS are speed, and the ability to receive upstream messages (messages from a device to the cloud). It provides secure data transmission over cloud through XMPP protocol which guarantees high security. Strong security (via SASL and TLS) has been built into the core XMPP specifications. The application supports sending multiple push notification to different devices. It can send messages to 1000 client application at a time. So the administration can push notifications to almost all parents within seconds.

Every "message with payload" (non-collapsible message) is delivered, unlike a send-to-sync message. The payload, the message contains can be up to 4kb. It makes it possible to send revealing data to the client application. It manages a message queue when the user's device is not reachable, once reachable the message gets pushed to the user. When the school administration pushes the message to all parents, some devices may be off line. GCM supports message queuing which manages a queue for undelivered messages and push it to the specific client whenever he is online. The lifetime of message in a queue is 4weeks, though it can be manually changed from 0 to 4weeks. It refers to actively sampling the status of an external device by a client program as a synchronous activity. This leads to get better battery life. Client application need not be connected always to the server to synchronize the data. Whenever the data is updated on the server, it sends a tickle message to the client application, which can then sync data with the server.

All login details are stored in our application server, where the transmitting data is encrypted using bcrypt algorithm which heavily depends on "Eksblowfish" key setup algorithm. Student's records which are stored locally in the user's device are encrypted with "SQLCIPHER" It provides transparent 256-bit AES encryption of database files. The application also uses "proguard" feature which makes it impossible to reverse engineer the code and get access to the database.

Comparing GCM and Apple's Push Notifications (APN)

Google Cloud Messaging developed by Google has an advantage over Apple's Push Notification service the way it delivers message to the target device. GCM uses a queue concept which stores the message in a queue until it gets delivered whereas APN store only the most recent message which discards the one that is already present in the queue. Using collapse keys concept GCM is designed to use the queue way of delivering the message. Only the accepted message is stored in the GCM queue. APN has limited support to manipulate the message and interact with other services. The payload differs with GCM and APN by large size, GCM supports 4KB for payload while APN supports 256bytes for payload. So you have to be conservative while passing data

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through APN while in GCM it's not the case where 4KB is more than enough to send sufficient data.

Literature Survey

To manage student data, for education establishments, a student information system (SIS) is used. It is also known as student information management system (SIMS), student records system (SRS), student management system (SMS), campus management system (CMS) or school management system (SMS). These systems differ from each other in their scope, capability and features. In our application is designed for handling student records alone. With an IParent account parents can monitor their ward's progress, attendance, discipline biological records and grades once they have been entered[1].

SIMS-It is a management information system which is being used by more than 22,000 schools across United Kingdom[2]. CAPITA-SIMS independent, its is a trusted world-class management system used by 650 international schools. It provides a way to manage student and staff information such as registration, assessment, progress tracking, finance and payroll and communication across the school[3]. Web based Student Information Management System, this method maintains information specific to students in schools/universities in a web portal. And able to access their own information [4]. Fedena is a free open source ERP school management system which offers additional functionalities than a basic SIMS. It offers efficient management of students, teachers, employees, courses & all the data related to institution. It is a open source system based on Ruby on Rails. It is ideal for easy management of records in schools and campuses[5,6,7]. DigitalEdu is a Web based solution that provides dedicated service to Educational institutions to acquire the competitive edge necessary for growth and survival. They provide school management system, student management system, and discipline management system in schools, employee and materials management system [8,9].

access based on the grade level of management. They access the information by authorities associated Unique Id to the parents to track the student's progress, attendance..etc from the developed application. The parents need to install the application and get logged into always to get notification from the server. Here , the school portal acts a middle ware to the GCM and parent's node server and when the child is gets into the transportation with the help GPRS of each bus number parents will get to know about the arrival to the school as a push text. The application has been implemented with the attendance report, academic marks, and calendars along with much functionality.

Proposed Work

The project focuses on three phases. First phase comprises of web portal for faculties and administrator dashboard. The dashboard is used to send messages to parents by their register number or by their department. The second phase is the middle ware between the first phase and third phase. It is used to network the message from web server to the mobile devices. This is done with the help of GCM. The messages are embedded with GCM headers that consists of the target GCM Id's and GCM server URL. The embedded message is sent with the help CURL PHP command. The third phase comprises of Android mobile service features. The mobile service will receive the notifications sent by GCM. The notification is manipulated to get the data using JSON decoding. The message is then sent to an activity from where, an notification is displayed. The messages received are stored in the a dynamic list view. The user can click on the respective message and read further. The mobile service will get activated only when the student register number and ID are validated along with successful GCM registration ID. The mobile service pings the GCM server with the sender KEY to register and receive a GCM ID. This ID is sent to the web portal server to register it under the student database.

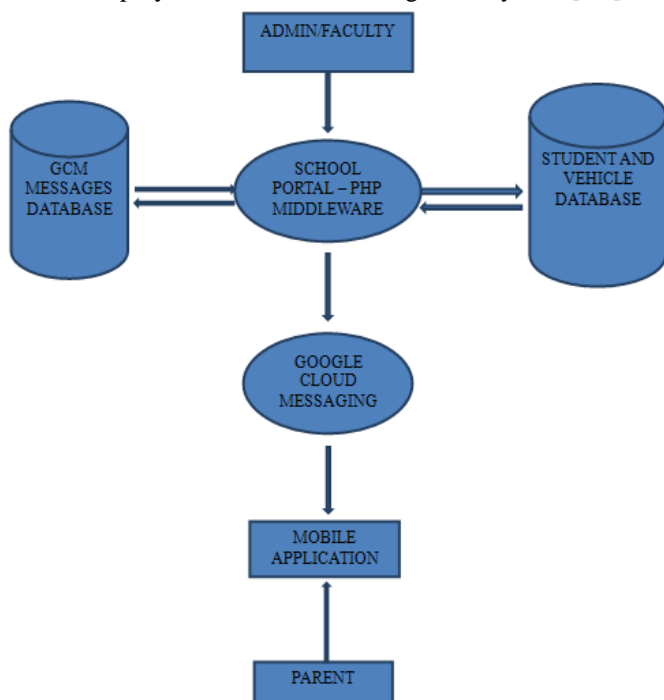


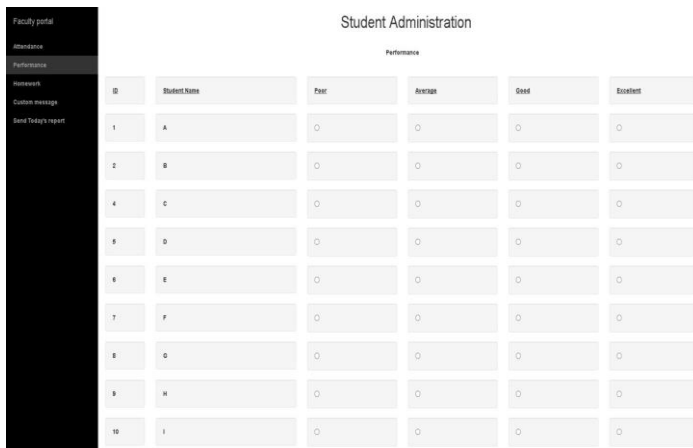
Fig 1. System Architecture

System Design

The overall architecture of the school management application, to manipulate the student's information is shown in the diagram. Initially, the enrollment phase of each student, faculty, admin and all involved members of the school are stored in GCM database. They are provided with privileges on data for

The figure shows two screenshots of the web portal. The top screenshot is titled 'Student Administration' and shows a table with columns for ID, Student Name, Present, and Absent. The bottom screenshot is titled 'Assignment' and shows a form with fields for Class no, Subject, and Assignment, along with a Submit button.

Fig 2. Student Management Portal-Attendance(top), Assignment(bottom)



ID	Student Name	Poor	Average	Good	Excellent
1	A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	E	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	F	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	G	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	H	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	I	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fig 3. Student Management Portal-Performance

In the school management portal it maintains the above application in the server, where it stores the information. The attendance has been updated to the parent's by send today's report with the performance notification. The performance deals how the student interacts in the class and push text as an entire day. In addition, the homeworks given by the teacher to the students are notified to the parents every day. If any particular student has a problem it can be intimated to them through an application as custom and compliant features. It has secure live track features of the school to ensure the child has got into school safely with the help of GPS of each bus of the school as it reaches the notification is updated to the parents on time.

Efficiency of the system

Whenever the student database gets updated in the application server, a message is pushed to the device as a notification. Faculties can upload student's attendance, everyday performance, homework, complaints if any etc.. All these messages can be sent to the client application via GCM. Launcher activity appears:

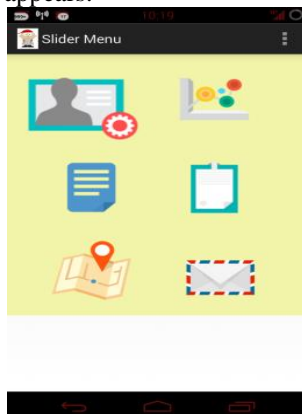


Fig 4. Home Screen

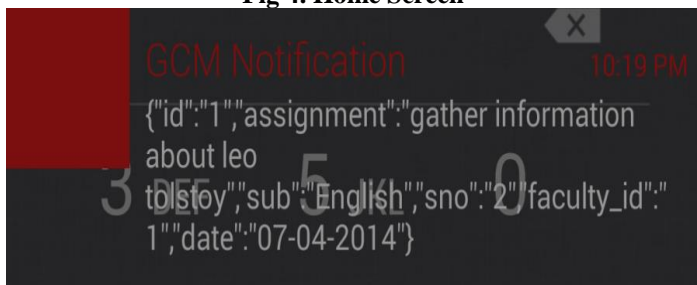


Fig 5. Notification of GCM Response

On clicking the notification, the user is taken to specific activity based on the inputs received in JSON format.

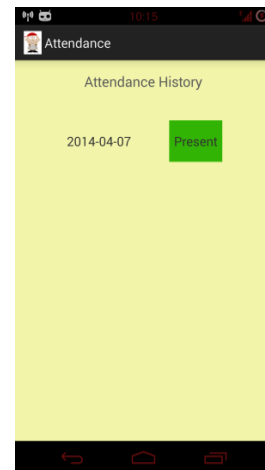
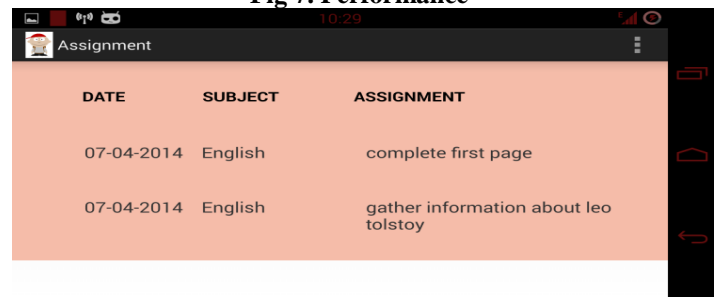


Fig 6. Attendance



Fig 7. Performance



DATE	SUBJECT	ASSIGNMENT
07-04-2014	English	complete first page
07-04-2014	English	gather information about leo tolstoy

Fig 8. Assignment

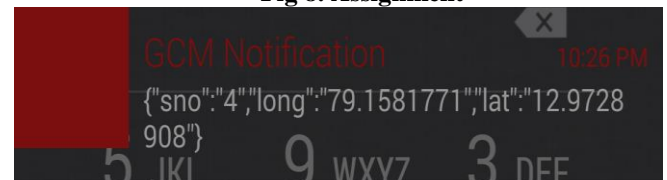


Fig 9. Location details via GCM Response

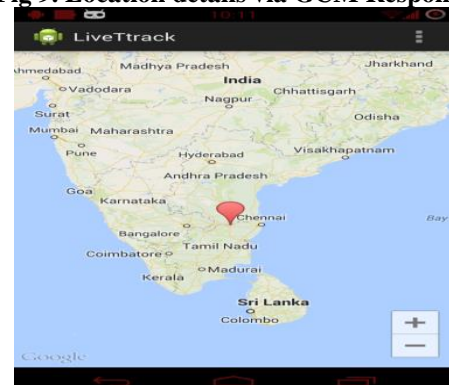


Fig 10. Live Tracking

Since GCM offers Payload data of 4KB, it is enough to send detailed information to the application. Whereas in Apple's Push notification it offers only 256bytes of payload, in that 70-100 bytes is occupied by formatting headers. Android GCM is more reliable and efficient in the process described above.

Conclusion

This application mainly aims at delivering entire academic information and students everyday activities to their parents. It update parents about their wards academic performance during their busy e schedule and also provides live tracking of the school vehicle. In future, we are trying to make this cross platform by developing it for windows phone using WNS(Windows Push Notification Service) which works very similar to Android's GCM, along for IOS by sending lightweight messages to the client application and implement to do some extra tasks on the client side, due to inefficient payload data size (256bytes). Additionally, various feasible features like updated traffic information on time taken for the bus to reach home or school.

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