

# Smartphone Application for Healthcare Management

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**ABSTRACT-** Inexhaustible development in portable based IoT stages replaces the need of traditional PC conditions. Users like to schedule and complete the tasks on the requirements. Due to the hectic schedules in cosmopolitan way of living, users need to be constantly remained of priority tasks. Healthcare is an ultimate priority system, in which various levels of scheduling and commitment keeping is required. In research work attempts an ambitious mobile application to cover all the health related solutions. The extent of this venture work is differed from, fixing appointment scheduling to outstanding patients to solution in endorsed interims. Many factors affect the performance of systems which include arrival and service time variability, patient and provider preferences, available information technology and the experience level of the scheduling doctors. Consequently an appropriate scheduling framework must be produced by considering every one of the elements which will build tolerant fulfillment, in which turn expands benefit. The web-based mobile application system allows individuals to conveniently and securely fix their appointments. The mobile application provides excellent security of data at every level of user-system interaction and also provides robust, reliable storage and backup facilities.

**KEYWORDS:** IoT, Android, HMAC – SHA, application, SQLite, OTP, HTTP

## ACRONYMS

API	Application Program Interface
GUI	Graphical User Interface
HMAC-	Hash Message Authentication Code-Secure
SHA	Hash Algorithm
HTTP	Hyper Text Transfer Protocol
IoT	Internet of Things
OTP	One Time Password
PIN	Personal Identification Number
RTSP	Real-Time Streaming Protocol
SQL	Structured Query Language
TTL	Time To Live
UI	User Interface
Xml	Extended markup language

## I. INTRODUCTION

Time is a widespread asset to all men. The utilization of time is characterized by exercises, assignments and strategies. Time is limited and in this way constrained for the achievement of exercises, assignments and methodology. People have composed a few approaches to follow along, handle and deal with the utilization of time. Such designs include clocks, wrist watch, sand dial, diary, and appointment book.

Any device that can be embedded with electronics, software, sensors to communication with other device is “Things”. A Thing, in the Internet of Things, can be a man with a heart screen embed, a homestead creature with a

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Vol. 6, Issue 5, May 2017

biochip transponder, a vehicle that has worked in sensors to alarm the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

As the data period of the computerized age advances, time gadgets are being made an interpretation of into software applications to encourage time administration.

Time Management refers to planning, organizing, allocating, using and controlling time effectively so that all identified activities, tasks and procedures are executed at the right time. It is likewise making the best utilization of time in order to build adequacy, effectiveness or efficiency. People relegate particular schedule openings to exercises in view of their significance this is called an arrangement. Arrangements were generally overseen utilizing journals and arrangement books, however in the data age; versatile programming programs called applications are being utilized. Various such arrangement supervisors exist yet with restricted elements and usefulness. This is an online application that beats the issue of overseeing and booking arrangements as indicated by client's decision or requests. Hence this work offers an effective solution where users can view various booking slots available and select the preferred date and time.

The already booked space will be marked yellow and will not available for anyone else for the specifies. The system provides an additional feature of calculating monthly earnings of doctor has to just feed the system regularly with daily earnings and the system automatically generates a report of total amount earned at the end of the month. This system helps to reduce the waiting time if the patient. Accessible and booked openings are appeared in compelling graphical UI.

The organized administration of information under very much characterized heads helps in the consistent game plan of information so that any data can be recovered effortlessly. Remedies, restorative history of patient, customary registration discoveries and all pertinent data can be looked for and discovered effectively with a straightforward inquiry and a couple clicks.

The point of this venture is to build up a period administration application for cell phone clients on the android stage. The targets of the venture are: to incorporate material Google APIs, outline the UI to work the Google APIs; and sending of the versatile application to an android cell phone.

## II. APPLICATION BACKGROUND

### A. Android Web Server

The primary goals of our system are to bring a web server to Smartphone and to make a web server running on a mobile phone accessible from the Internet using any web browser. Giving access to a cell phone from the Internet is not clear, as administrators ordinarily utilize firewalls that keep access from the Internet to telephones inside that firewall. By actualizing a custom portal we could dodge that constraint and we are currently ready to give a web server on a cell phone with a worldwide URL than can be accessed from any browser. One might say, the cell phone has now at last turn into a full individual from the Internet. The components that enable this application are the following:

1. An android server which will allow users to host web-sites.
2. An android application which will be in charge of HTTP protocol
3. An usage of the Real-time Streaming Protocol (RTSP) server that depended on the RFC 2326 details keeping in mind the end goal to exchange the Real-time Transfer Protocol to viewing clients.
4. An Android Device Communications Server was made to send and get directions between the website page and the Android gadget.
5. A web interface was intended for adaptability; SQL database explanations were actualized for association and simplicity of information access between interfaces.

That will undoubtedly have some effect on how cell phones are seen as well as on how the web develops.

### B. Client Server Interactions

The following are the regular co-operations amongst customer and web server amid texting correspondences.

- Authentication

An enrolled client must be checked at the server before it can have the capacity to connect with alternate clients enlisted on the server. After the client more likely than not wrote its enrolled client name and secret key, the framework

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guarantees that the watchword entered by the client matches with the one that was saved money on the database when the user was registering on the instant messaging service. The md5 hash inversion capacity is a standout amongst the most secure medium to verify clients amid signing into a texting framework. This function creates a value by hashing the user password and the session ID.

- Establishing of a session

Before sessions are established in client/server architecture, some conditions like Stream Authentication and Resource Binding are to be met and after then the client tries to initiate a contact with the web server. Once reached, the customer server sends a Session Request message (XML configuration) to the server. The extensible dialect increase stream stays open amid the TTL (time to live) of the session. The attachment will fill in as a medium for the transmission of messages.

- Transmission of Messages between customers.

At the point when an association has been built up, transmission of messages between other enrolled customers. The sender creates a XML message (extensible increase dialect) and locations it to the collector. The sender's server is capable of conveying the message to the collector.

## C. Security

Customer/server design security of a texting application has never been simple. Albeit texting correspondences can be delicate in nature, the vast majority of the administrations that runs texts lack the messages exchanged on their administrations encoded, making those messages inclined to modification, network snooping, hijacking, and impersonation attacks. Support floods, disavowal of administration assaults and upheaval of worms postures as a major test to the helpless texting suppliers. These has a tendency to permit programmers to ready to take Users passwords from the databases straightforwardly, get the chance to catch corporate information that are been exchanged over a system, get to private systems, or even send large amounts of SPAM through a compromised instant messaging system.

One of the best way to ensure security over an instant messaging architecture is by encrypting the messages as they are been sent between clients for e.g. at the point when customer A sends off a message meaning to customer B, the message ought to be scrambled until they touch base at the collectors end where they will be unscrambled to its unique nature. However, the number of worms that affects the client/server architecture is increasing greatly and with the rate of that instant messaging architecture tends to be exposed to different types of threats. Despite the fact that this element are regularly asked for and used by a few organizations running a texting design, they are also hazardous on the grounds that when a programmer can screen an instant messaging session, the logged data can be discovered and their securities might be compromised.

## D. SQLite

SQLite is an embedded relational database engine. Its developers call it a self-contained, server less, zero-configuration and transactional SQL database engine. It is exceptionally famous and there are many millions duplicates worldwide being used today. SQLite is utilized as a part of the Solaris 10 and Mac OS working frameworks and by iPhone and Skype. The Qt4 library has worked in support for SQLite and also the Python and PHP dialects. Numerous well known applications utilize SQLite inside, for example, Firefox, Google Chrome, or Amarak.

SQLite actualizes the greater part of the SQL-92 standard for SQL. The SQLite motor is not an independent procedure. Rather, it is statically or progressively connected into the application. The SQLite library is little. It can require under 300 KiB. It is a cross stage document. It can be utilized on different working frameworks, both 32 and 64 bit models. SQLite was composed in the C programming dialect. It has bindings for many languages, including C++, Java, C#, Python, Perl, Ruby, Visual Basic, and Tcl. The source code of SQLite is in broad daylight space.

## III. PROBLEM STATEMENT

The U<sup>+</sup> Healthcare mobile application system is very important to maintain the error-free patient details in the hospital. This application provides a way to store and retrieve the information, to access it in a simple way. E-healthcare application has the facility to give a unique id for every patient and stores the details of every patient; doctor's automatically .It includes a search facility to know the current status of each doctor. User can search the availability of the doctor and the details of the patient using this id.

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Vol. 6, Issue 5, May 2017

The framework which gives enlistment of patients, putting away their points of interest into the framework and furthermore electronic charging in the drug store. A mobile application system can be entered using a username and password.

Accessible is either by the doctor or the patient. They can store and retrieve the data into the database. The information can be recovered effectively. The interface is extremely easy to understand. The data are well protected for personal use which makes the data processing very fast.

Anyplace, at whatever time medical checkup booking framework is of awesome accommodation for the wellbeing searchers as they can book an arrangement whenever just by looking and browsing the openings accessible. All further correspondence, for example, installment affirmation, arrangement affirmation and updates and so forth occur through the cell phone that a wellbeing searcher utilizes for booking arrangements. The usage of this framework at healing facilities and centres likewise facilitates the charging procedure and patient line is overseen adequately. The nearness of Electronic Medical Reports permits the patients to visit for the subsequent arrangements whenever they can locate an accessible space regardless of whether they have the reports and previous prescriptions with them or not.

Electronically put away wellbeing and medicinal records are free from any sort of mistakes since it is through a protected and validated framework through which all significant patient information is gone into his profile. In the event that any of the underlying data is mistaken, the framework will demonstrate blunder which obviously shows that the information can be trusted. This precision of put away records gets rid of patient questions of misunderstanding the treatment for an issue. Besides, since all meds and measurements is written by the specialist, the odds of misreading by the scientist are diminished and in this manner, getting incorrectly solution is out of question.

## IV. EXISTING SYSTEM

The existing system provides the basic functionalities needed to be handled in a mobile application environment. There is no intelligence of the application in such cases. In the existing system all the patient details, doctor availability details and regarding the test done to the patients prescribed by the doctor is maintained manually by the receptionist.

If a patient has to admit we need to check the availability of the bed which consumes lots of time if done manually. Additionally there is no legitimate hunt procedure to check the patient data. It is the difficult task to maintain all the finance management system, the records which maintain doctor details, of the hospital by using this existing system. There are additionally numerous escape clauses when we take a gander at the security of the framework.

These are the fundamental burdens of the current frameworks that are overcome in the proposed demonstrate

## V. PROPOSED SYSTEM

In our proposed system, we are going to provide solutions to all the above mentioned problems by automating the whole mobile application system by using integrated software that handles the whole system. The proposed framework gives one coordinated view to patients for charging, gathering, release detail, understanding restorative history.

Simple question taking care of for immediate arrangement of bed designation for patients, ask for bed exchanges. Compelling inquiry office to seek any kind of data identified with patient history. Certain activities are computerized, for instance, the date require not be entered unequivocally by the client but rather the framework includes it consequently while putting away the information.

- The salient features are
- Security for the data is done easily.
- Validation is done to enter rectify information.
- Memory utilization is less and the preparing pace is quick

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Vol. 6, Issue 5, May 2017

## A. System Architecture

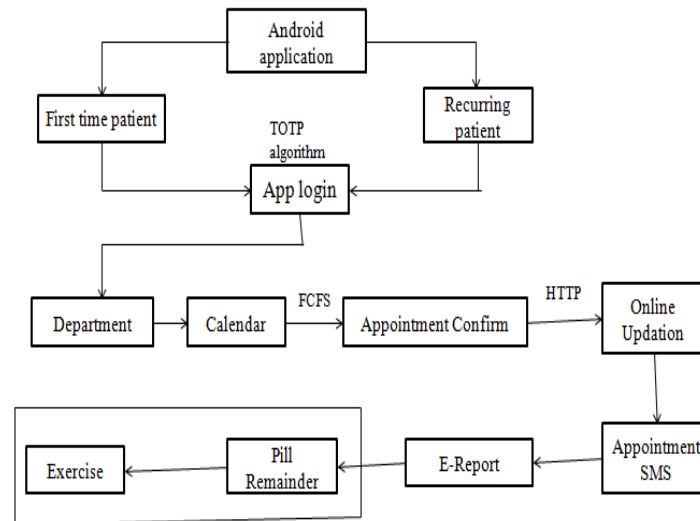


Figure 1.1: System Architecture

The module descriptions are as follows,

### B. Registration Module

Registration involves the regular process of either login a registered user or Register a new user, in our case the patient is the client user. The flow diagram clearly implies the process involved. After OTP verification the registered use database will be created in SQL Lite DB. SQL DB will be queried to verify the login user. Planning, rescheduling and controlling of arrangements should be possible effortlessly from our enrollment module. Overseeing of patient records can likewise be dealt with easily.

### C. One Time Password Module

This OTP is based on the very popular algorithm HMAC SHA. he HMAC SHA is a calculation for the most part used to perform verification by test reaction. It is not an encryption calculation but rather a hashing calculation that changes arrangement of bytes to another arrangement of bytes. This calculation is not reversible which implies that you can't utilize the outcome to backpedal to the source.

A HMAC - SHA utilizes a key to change an info cluster of bytes. The key is the mystery that must never be open to a programmer and the information is the test. This implies OTP is a test reaction verification.

The mystery key must be 20 bytes at any rate; the test is generally a counter of 8 bytes which leaves a long while before the esteem is depleted.

The calculation takes the 20 bytes key and the 8 bytes counter to make a 8 digits number. This implies there will clearly be copies amid the life time of the OTP generator however this doesn't make a difference as no copy can happen sequentially and an OTP is as it were valid for a couple of minutes.

OTP is a very strong authentication method:

- The key is 6 to 20 digits
- A password is a couple counter/password, only valid once and a very short time
- The algorithm that generates each password is not reversible
- With an OTP token, the key is hardware protected
- If the OTP is received on your phone, the key always stays at the server

Those few characteristics make the OTP a strong authentication protocol. It is hard to recall numerous unpredictable passwords, so clients frequently utilize a similar one the whole way across the web and not so much a solid one. With

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Vol. 6, Issue 5, May 2017

an OTP, you don't need to recollect a secret word, the most you would need to recall would be PIN code (4 to 8 digits) if the OTP token is PIN ensured. On account of an OTP sent by a cell phone, it is ensured by your telephone security.

A PIN is short yet you can't for the most part attempt it more than 3 times before the token is bolted. The shortcoming of an OTP if there is one, is the media used to create or get the OTP. On the off chance that the client loses it, then the confirmation could be traded off. A conceivable arrangement is ensure this gadget with a biometric certification, making it basically absolutely sheltered.

### ALGORITHM FOR GENERATING OTP VALUE:

```
Step 1: Generate an HMAC-SHA-1 value Let HS = HMAC-SHA-1(K, C) // HS is a 20-  
byte string  
Step 2: Generate a 4-byte string (Dynamic Truncation) Let Sbits =  
DT(HS) // returns a  
31-bit string  
Step 3: Compute an HOTP value  
Let Snum = StToNum (Sbits) // Convert S to a number in  
private static int checksum(int Code_Digits) 0...2^{31}-1  
{  
int d1 = (Code_Digits/1000000) % 10;  
int d2 = (Code_Digits/100000) % 10;  
int d3 = (Code_Digits/10000) % 10;  
int d4 = (Code_Digits/1000) % 10;  
int d5 = (Code_Digits/100) % 10;  
int d6 = (Code_Digits/10) % 10;  
int d7 = Code_Digits % 10;  
return (10 - ((dd[d1]+d2+dd[d3]+d4+dd[d5]+d6+dd[d7]) % 10) ) % 10; }  
private static string FormatOTP(byte[] hmac) {  
int offset = hmac[19] & 0xf ;  
int bin_code = (hmac[offset] & 0x7f) << 24  
| (hmac[offset+1] & 0xff) << 16  
| (hmac[offset+2] & 0xff) << 8  
| (hmac[offset+3] & 0xff) ;
```

In Android, you can use SmsManager API or devices Built-in SMS application to send SMS's.

#### Smsmanager API

```
Smsmanager smsManager = SmsManager.getDefault();  
smsManager.sendTextMessage("phoneno",null,"sms message",null,null);
```

#### Built-in SMS application

```
Intent sendIntent = new Intent(Intent.ACTION_VIEW);  
sendIntent.putExtra("sms_body","default content");  
sendIntent.setType("vnd.android-dir/mms=sms");  
startActivity(sendIntent);
```

Apart from the above method, there are few other important functions available in SmsManager class.

#### D. Appointment Booking Module

Mobile registration and scheduling appointment has been one of the options next thought for the patients to avoid the hassle of queuing and filling out registration forms. It also inherently gives an advantage for the administrator towards monitoring and easy searching of any medical records or personal information as they are available online. However, it becomes inefficient as the transfer of data can be filtered as accessible online, and hence, the risk of online hacking has been very huge. In addition, even in the online registration and appointment scheduling, there has been no advancement in the technique towards providing any prioritization facility and so there is still a delay in entertaining patients before they are being called for outpatient consultation. Lastly there is no reminder system on any platforms for appointments which has been confirmed by the healthcare administrators.

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Vol. 6, Issue 5, May 2017

Recently there has been a tremendous development in smart phones particularly in the hardware and software utilised, which enabled the Mobile users through B3G (Beyond 3G) to roam freely through heterogeneous networks on all-IP platforms leading to implementation of Mobile health care.

Based on the above mentioned developments in mobile technology research was carried towards developing an intelligent agent based Hospital appointment scheduling using Android Enabled Mobile handset. The System so developed eliminates the need of staffs in performing the similar tasks and admission activities which would eventually improve the speed of processing of any unscheduled appointment. The system takes into account the type of patient in prioritizing towards making appointment which is based on fuzzy rules and constraints. The system also possesses facility for seeing the list of appointments from doctor’s handset and patient’s handset. In addition, systems also possess facility for sending appointment confirmation.

### FCFS Priority Algorithm”

FCFS based Priority Scheduling Algorithm is used. In which each process that have similar priority is executed on the basis of burst time, i.e. the process which have least burst time will execute first. The FCFS based priority algorithm results in reduced average waiting time and turnaround time.

**Step 1:** Assign the process to ready queue.

**Step2:** Assign the process to the CPU according to the priority, higher priority process will get the CPU first than lower priority process.

**Step 3:** If two processes have similar priority then FCFS is used to break the tie.

**Step 4:** Repeat the step 1 to 3 until ready queue is empty.

**Step 5:** Calculate Waiting time and Turnaround time of individual Process.

Step 6: Calculate Average waiting time and Average Turnaround time.

process pid	Burst Time	Priority	Waiting Time	Turnaround Time
p 4	84	1	0	84
p 6	26	1	84	110
p 2	112	2	110	222
p 7	123	3	222	345
p 1	183	4	345	528
p 8	132	4	528	660
p 3	190	5	660	850
p 5	245	6	850	1095
p 9	197	6	1095	1292
p 10	256	7	1292	1548

Average waiting Time is 518.600000  
Average Turnaround Time is 673.400000

**Figure 1.2: FCFS based Priority Scheduling**

However, system application was inconclusive whereby there was no reminder sending possibility for patients or doctors towards the upcoming appointment. Also prioritized scheduling was suited for mobile patient appointment only and not for walk-in patients which again puts a lot of waiting time and delay for patients. The developed system however lacked intelligence usage towards prioritizing the appointment automatically and also no timing constraint towards making appointment. In addition no automatic call by the system based on list of scheduled appointment.

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Vol. 6, Issue 5, May 2017

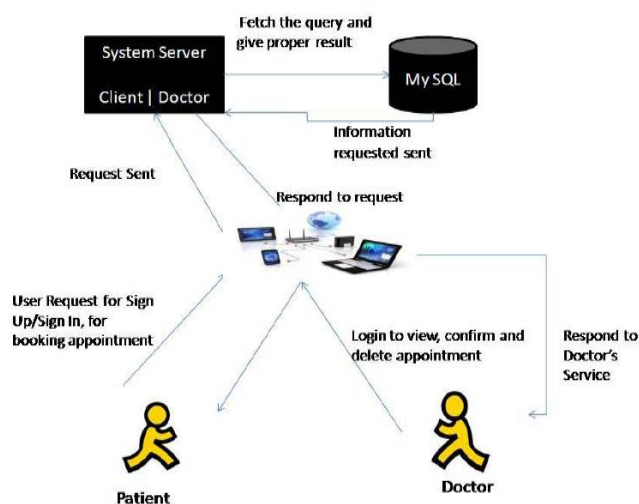


Figure 1.3: Appointment Booking

## VI. APPLICATION TEMPLATE

A partial API design of Doctor patient pre appointment booking app is designed using Android studio as unified tool and Java Xml are GUI and processing languages. SQLite is utilized for low memory fast database applications, which is utilized for putting away Patient Records in Hospital Server.

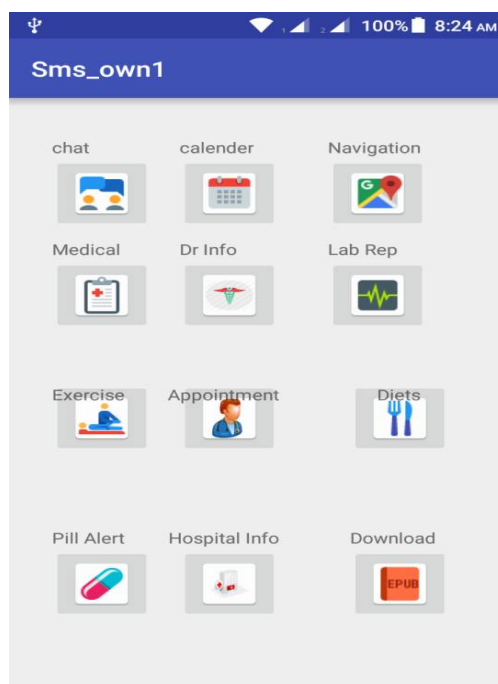


Figure 1.4: U+ Mobile Application



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Vol. 6, Issue 5, May 2017

## VII. CONCLUSION

The application which takes care of all the requirements of an average hospital and is capable to provide easy and effective storage of information related to patients that come up to mobile apps.

It generates test reports and also provides the facility for searching the details of the patient. It also provides billing facility on the basis of patient's status whether it is an indoor or outdoor patient. This application which allows the facility for backup as per the requirement.

## VIII. FUTURE ENHANCEMENT

The mobile application avoids the manual work and the problems concern with it. It is an easy way to obtain the information regarding various travel services that are present in our application.

The enhancement of this application by including more facilities like pharmacy system for stock details of medicines in the pharmacy. It will include pill reminder also. Providing such features enables the users to include more comments into the application.

- Mapped with Insurance Companies for claim processing
- Billing of patients
- Blood Bank Information Management
- Producing ECG using connected device
- Video Conferencing facility for remote areas for treatments
- Hangout for different doctors and patients at different locations
- 

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