Call Recording Mobile Application on Android

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Abstract—Android is a most widely used mobile operating system which has been developed by Google. It is being used by various smartphones, such as the Motorola Droid, the Samsung Galaxy, and Google's own Nexus One. Android programs are generally written in Java and run through Google's "Dalvik" virtual machine, which is optimized for mobile devices. Users may download Android "apps" from the online Android Market such as Google play store. Call Recorder is an Android based mobile application for any type of user for general purpose. Its use is to record the phone calls whether calls are incoming or outgoing. This would be helping for investigation purpose a lot because a user will be recording every call he/she receives or makes.

Keyword— Android, Android architecture, Android component, Call Recorder Application,Services.

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1   INTRODUCTION

There has been a great increase today in mobile phone technology. Likewise Food, Shelter and Cloth, Mobile Phone has also become a basic need for everyone. As the number of users have been increased, facilities are also need to be increased. Starting with simple regular handsets which had been used just for making phone calls, mobiles have advanced our lives and have turn out to be part of it. Now they are not being used just for making calls but they have many uses and can be benefited as a Camera , Music player, Online T.V. ,Web browser etc . And with the increase of new technologies, new software and operating systems are being required.

The most trending OS these days is Android which is a software bundle that consists of not only operating system but also middleware services and key applications.

Android was founded in Palo Alto of California, U.S. by Andy Rubin, Rich miner, Nick sears and Chris White in year 2003. Later Android was taken over by Google in year 2005. Since the time it was released originally, there have been number of updates in the version of android OS till now.

The up-to-date major Android update is Android 6.0

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"Marshmallow", which was released in October 2015. Since April 2009 to till now, Android versions have been evolved under a confectionery-themed code name and turned out in alphabetical order, beginning with its version Android 1.5

"Cupcake"; the earlier versions that were 1.0 and 1.1 were not released under specific code names:

- Cupcake (1.5)
- Donut (1.6)
- Eclair(2.0–2.1)
- Froyo (2.2–2.2.3)
- Gingerbread (2.3–2.3.7)
- Honeycomb (3.0–3.2.6)
- Ice Cream Sandwich(4.0–4.0.4)
- Jelly Bean (4.1–4.3.1)
- KitKat (4.4–4.4.4, 4.4W–4.4W.2)
- Lollipop (5.0–5.1.1)
- Marshmallow(6.0)

Android Mobile Application Development has been based on Java language codes, as it allows developers to create codes in the Java language. These codes can curb mobile devices via Google-enabled Java libraries. It is a crucial platform to develop mobile applications using the software bunch implemented in the Google Android SDK. Android mobile OS implements an adjustable environment for Android Mobile Application Development as the developers can not only make benefit of Android Java Libraries but it is also accessible to use normal Java IDEs.

We have decided to use the Java language, the Eclipse platform, android ADT and the android SDK to develop the mobile application. This system has a flexible interface and smooth operation.

 In this paper, Section2 describes the ANDROID ARCHITECTURE,Section3 explains ANDROID APPLICATION COMPONENT. Section4tells about the CALL RECORDING APPLICATION.Section 5 contains the

screenshots of application. Last section is about the conclusion of paper.

2   ANDROID ARCHITECTURE

Android system is a Linux- based system which helps the software bunch architecture design patterns. As shown in Figure 1, the android architecture subsists of four layers: Linux kernel, Libraries and android runtime, Application framework and Applications. A sort of encapsulation is implemented by each lower layer, while implementing call interface to the upper layers.[3]

2.1 Linux Kernel

Located at the last of the Android software stack, the Linux Kernel implements a level of abstraction between the device hardware and the higher layers of the Android software stack. On the basis of Linux version 2.6, the kernel provides preemptive multitasking, bottom-level core system services such as memory, process and power management in inclusion to provide a network stack and device drivers for hardware for e.g. device display, Wi-Fi and audio.

2.2 Android Runtime

DVM--The Dalvik virtual machine was created by Google and depends on the underlying Linux kernel for bottom-level functionality. It is more productive than the standard Java VM on the basis of memory usage, and specifically designed to allow multiple instances to run smoothly within the resource constraints of a mobile device.

In order to run within a Dalvik VM, application code should be reconstructed from standard Java class files to the Dalvik executable (.dex) format, which has basically a 50% smaller memory footprint than standard Java bytecode. Standard Java class files can basically (though not always) be transformed to Dex format using the dx tool combined with the Android SDK.

CORE LIBRARIES--
Provides the service of the JAVA Programming Language

2.3 Libraries

Android system library's aim is to guide the application framework; it is also a significant link bridging between application framework and Linux Kernel. This system library has been created in C or C++ language. These libraries are also utilized by the different components in the android system. They provide functionality for the developers through the application framework.

Android's native libraries:-

1) *Libc: c standard lib.*
2) *SSL: Secure Socket Layer*
3) *SGL: 2D image engine*
4) *OpenGL|ES: 3D image engine*
5) *Media Framework: media codecs*
6) *SQLite: Database engine*
7) *WebKit: Kernel of web browser*
8) *FreeType: Bitmap and Vector*
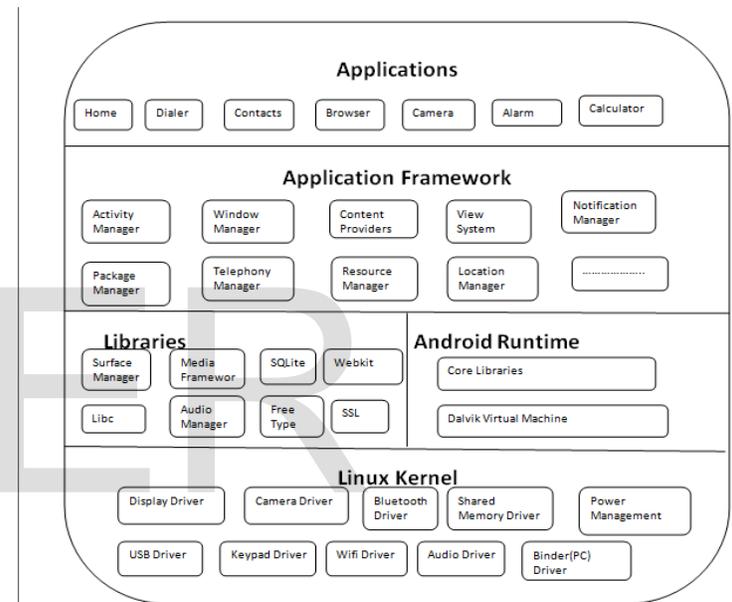9) *SufraceManager: Compose window manager with off-screen buffering.*

Fig. 1. Android Architecture

2.4 Application Framework

The Application Framework is a bunch of services and functions that collectively form the environment in which Android applications are run and are managed.

The Android framework consists of the following key services:

1) *Activity Manager* – all aspects of the application lifecycle and activity stack are managed by Activity Manager.
2) *Content Providers* – applications to publish and share data with other applications are allowed by Content Providers.
3) *Resource Manager* – access to non-code embedded resources such as strings, color settings and user

interface layouts are provided by Resource Manager.

4) *Notifications Manager* – applications to show alerts and notifications to the user are allowed by Notifications Manager.

5) *View System*– An expandable set of views that are used to develop application user interfaces.

6) *Package Manager* – The system by which applications are capable of finding out information about other applications that are currently installed on the device.

7) *Telephony Manager* – information to the application about the telephony services available on the device such as status and subscriber information are provided by Telephony Manager.

8) *Location Manager* – access to the location services allowing an application to receive updates about location changes are provided by Location Manager.

2.5 Application

Android provides a bundle of core applications combining of client, SMS programs, calendar, maps, browser, contacts, and so on, all have been developed in Java.

3   ANDROID-APPLICATION COMPONENT

Main building blocks of an Android application are Application components of Android. These components are coupled loosely by the application manifest file i.e. *AndroidManifest.xml* that describes each and every component of an application and how do they interact.[4]

3.1 Activity

A single screen with a user interface is represented by an activity , in-short Activity functions actions on the screen.

When the application launches, only one activity (known as *main*) is chosen to be executed first.

Life cycle of an activity-

3.2 Broadcast Receivers

Respond to broadcast messages from some other applications or from the other system is usually done by the Broadcast Receivers. For example, applications may also begin broadcasts to let other application know that some

data is being downloaded to the device and is available for them to use, so this is broadcast receiver who is going to intercept this communication.
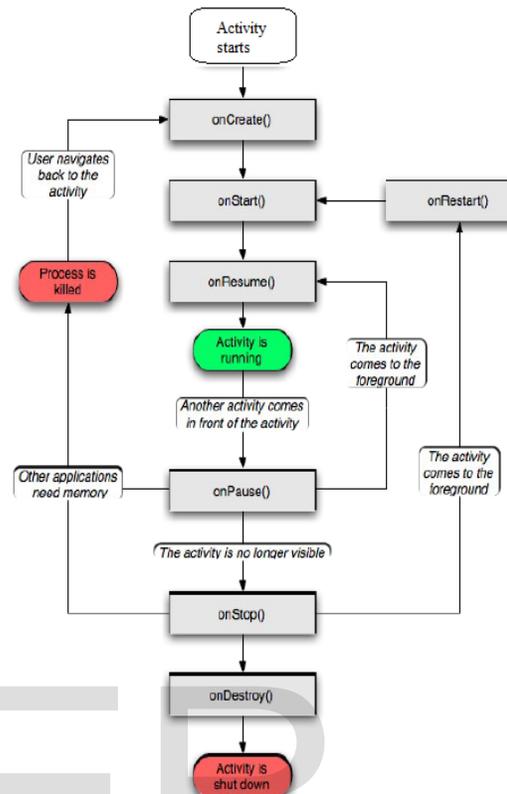

Fig. 2. Life cycle of an activity

3.3 Services

A significant type of activity that does not have a visual user interface is known as Service.
Services are usually run in the background for an indefinite period of time.
Applications start their own services or connect to services that are already active.

3.4 Content Providers

A component that is used for supplying data from one application to others on request called Content Provider. Such requests are held by the methods of the ContentResolver class. The data might be saved in the file system, the database or somewhere else entirely.
E.g.-address book, photo gallery ,etc.

4   CALL RECORDER APPLICATION

4.1 Existing System

Earlier phones were only used for making calls and sending messages, but the emergence of smart phones have changed the world into a new tech world. Call recording software is used to record telephone conversations over PSTN or VoIP in a digital audio file format. Call recording is different from call logging and tracking, which only records details about the call but not the conversation; however, software may include both recording and logging functionality. So, in Call Recorder Application developed in android may not only record conservations but there are preferences for a user to record the calls in their choice of format i.e. .amr, .m4a etc.

4.2 Limitations of Existing System

The present system contains certain drawbacks and limitations as listed below:--
For recording calls,user needs to install a separate application.
In future,we will be adding feature of call recording in the call settings only instead of
developing a separate application for that.

4.3 Proposed System

Call Recorder Application is divided into following modules and sub modules-

1) *Main*-Whenever the app is opened, it has an option of recording all calls using broadcast receiver call services. When recorded, it will be automatically to sd card in a folder named call recorder.

2) *Call Recorder*- Whenever a call will be made or received, it will automatically turn on the call recorder and the recording will be saved to SD card and can also be shown in the call recorder application.It has a benefit that it has an option of saving the file in particular format i.e. mpeg4, aac, amr formats etc.

3) *Permissions used in the application are as follows-*

PROCESS_OUTGOING-CALLS: Allows an application to view the number that is being dialed during an outgoing call with an option to redirect the call to different number or abort the call together.

READ_PHONE_STATE: Allows read only access to the phone state.

RECORD_AUDIO: Allows an application to record audio.

WRITE_EXTERNAL_STORAGE: Allows an application to write i.e. store to external storage.

4) *Services used in the application-*

RECORDSERVICE: This service manages audio resources for application to record audio from input hardware. Upon creation, an AudioRecord object initializes its associated audio buffer that it will fill with the new audio data.

PLAYSERVICE: This service includes support for playing variety of common media types, so that you can easily integrate audio, video and images into your applications. You can play audio or video from media files stored in your application's resources , from standalone files in the file system, or from a data stream arriving over a network connection, all using MediaPlayerAPIs.

5) *Classes that are used in the application are as follows-*

AudioPlayerControl Class: This class is used for controlling the audio player i.e. for displaying the duration of recording, its buffer percentage, displaying current position of audio, controlling seek, and stopping the recording.

CallBroadCastReceiver Class: This class is used for changing the state of the phone whenever a person makes a call or receive a call i.e. for starting the recording as soon as the call is made or received.

Call Log Class: This class is used for displaying the call records from a certain contact.

CallPlayer Class: This class basically is used for playing the call records.
CallRecorder Class: This is the main and important class that is used for recording all the calls.

PhoneListener Class: This class is used for changing the states of phone whenever call is made or received.

PlayService Class: This class is used for playing variety of common media types, so that you can easily integrate audio, video and images into your applications.
Preferences Class: This class is used for displaying the options or preferences to the users for their choice of the media type for recording.

RecordingProvider Class: This class is used for storing the recordings into database.

RecordService Class: This class manages audio resources for application to record audio from input hardware.

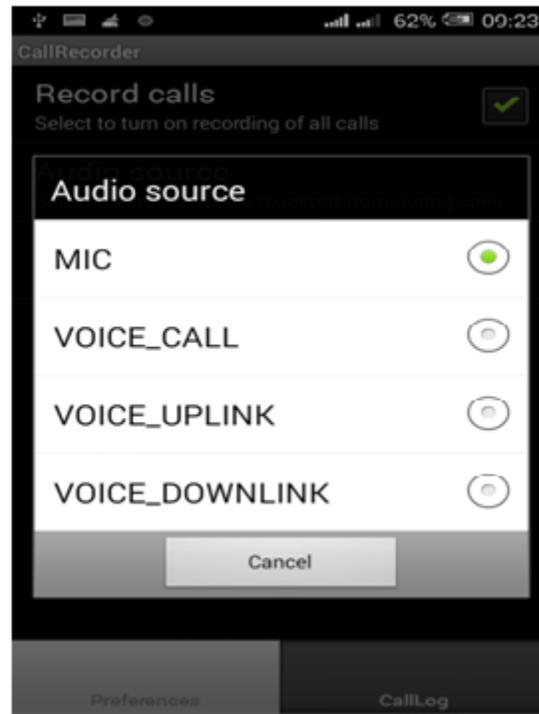## 5   SCREENSHOTS

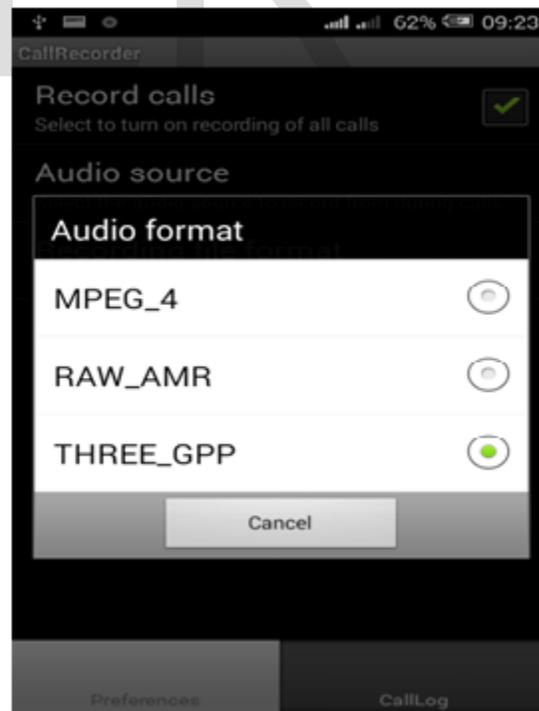Fig. 3. Call Recorder App

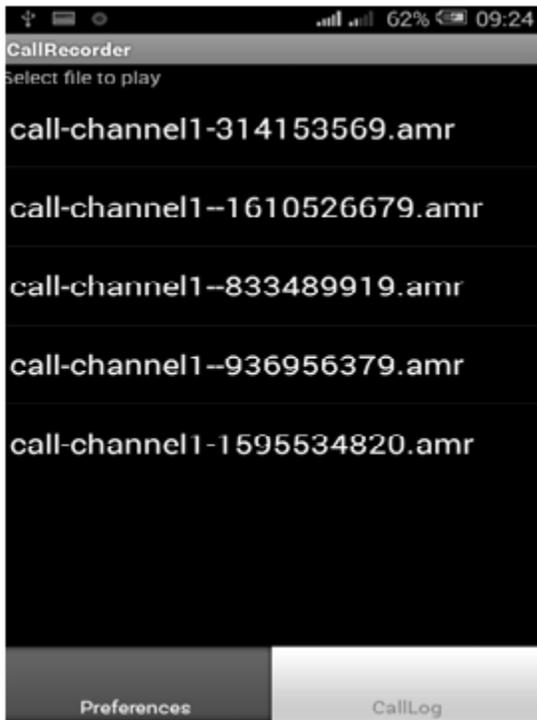Fig. 4. Select Audio source

Fig. 5. Select Audio format

Fig. 6. Recorded calls

6   CONCLUSION

Android which is a demand for today's world is increasing rapidly day by day. This paper gives an overview of how with the help of android, we are able to create an application for call recording which may be used for various purposes such as for customer care services, investigation purposes, voice quality purposes etc. The experience of creating an android application is quite challenging yet motivating and satisfying.

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