Advanced Android Development

review of gReporter open-source project:
GPS, Audio / Photo Capture, SQLite, HTTP File Upload and more!

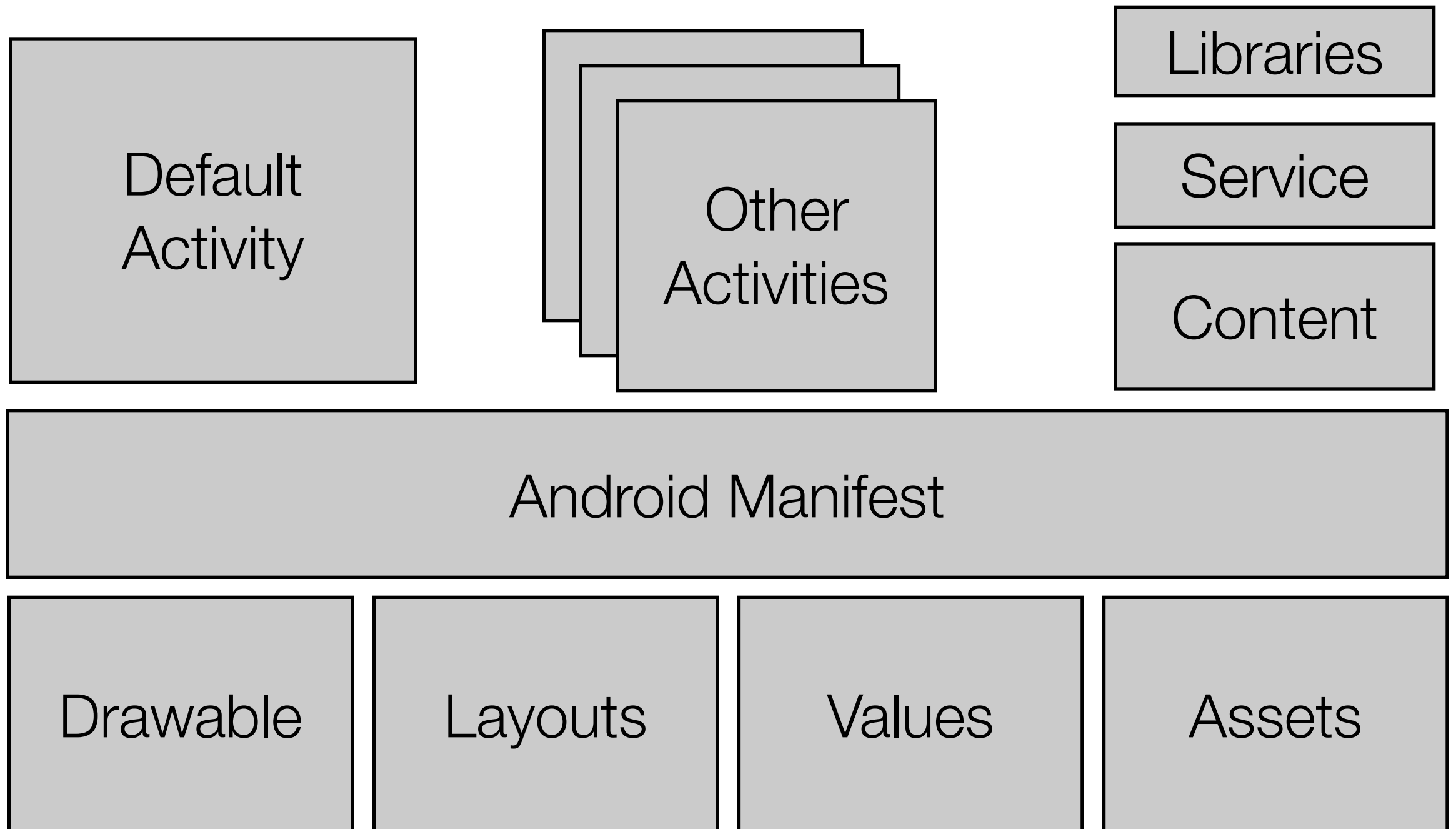Nathan Freitas, Oliver+Coady
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Android Platform Basics

Platform Features

- Application framework enabling reuse and replacement of components

- Dalvik virtual machine optimized for mobile devices

- Integrated browser based on the open source WebKit engine

- Optimized graphics powered by a custom 2D graphics library; 3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional)

- SQLite for structured data storage

- Media support for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)

- GSM Telephony (hardware dependent)

- Bluetooth, EDGE, 3G, and WiFi (hardware dependent)

- Camera, GPS, compass, and accelerometer (hardware dependent)

- Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE

What's in an App?

Default Activity

Other Activities

Libraries

Service

Content

Android Manifest

Drawable

Layouts

Values

Assets

Manifest

```xml
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.openideals.inaugreport"
    android:versionCode="1"
    android:versionName="1.0.0">

    <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />
    <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
    <uses-permission android:name="android.permission.INTERNET" />
    <uses-permission android:name="android.permission.READ_PHONE_STATE"/>


    <application android:icon="@drawable/icon" android:label="@string/app_name">
        <activity android:name=".InaugReportMainActivity"
                android:label="@string/app_name">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>

        <activity android:name="com.openideals.android.geo.LocationFinderActivity" android:label="@string/view_location_finder"/>
        <activity android:name=".ReportFormActivity" android:label="@string/view_report_form"/>
        <activity android:name="com.openideals.android.ui.InternalWebView" android:label="@string/internal_web_view" />
        <activity android:name="com.openideals.android.geo.GeoRSSMapView" android:label="@string/geo_map_view" />

        <uses-library android:name="com.google.android.maps" />


    </application>
</manifest>
```

Layout

```xml
<?xml version="1.0" encoding="utf-8"?>
<ScrollView
xmlns:android="http://schemas.android.com/apk/res/android"
android:id="@+id/scrollReportForm"
android:layout_width="fill_parent"
android:layout_height="fill_parent"
 android:background="@drawable/inaug_report_no_seal_">

<LinearLayout
android:id="@+id/layoutReportForm"
android:label="Text Report"
android:layout_width="fill_parent"
android:layout_height="wrap_content"
android:orientation="vertical" android:gravity="top"
android:padding="6.0sp">

    <TextView android:id="@+id/labelTitle"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Title:"/>

    <EditText android:id="@+id/entryTitle"
            android:layout_width="fill_parent"
            android:layout_height="wrap_content"
            android:background="@android:drawable/editbox_background"
            />

    <TextView android:id="@+id/labelReport"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
                android:paddingTop="10dp"
            android:text="Your Report:"/>

    <EditText android:id="@+id/entryReport"
            android:layout_width="fill_parent"
            android:layout_height="wrap_content"
            android:background="@android:drawable/editbox_background"
            android:lines="5"
            />
```
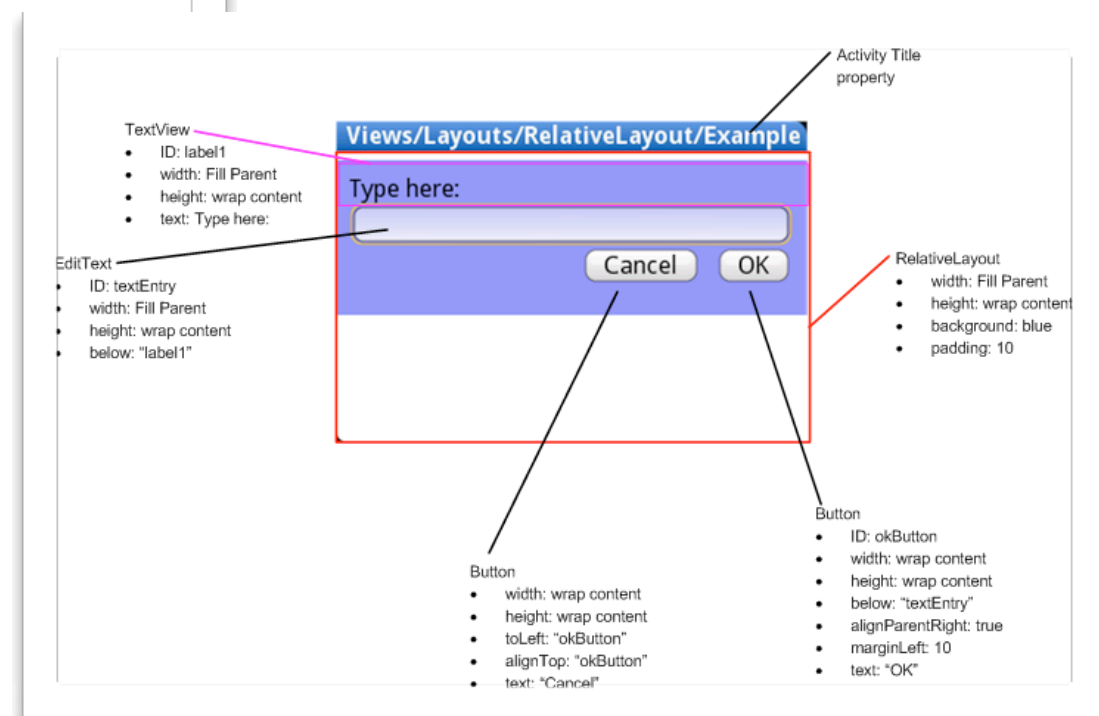
```xml
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent" android:layout_height="wrap_content"
    android:padding="10dp" android:layout_marginTop="10px" >

            <Button android:id="@+id/btnReportFormSubmit"
        android:layout_width="100px"
        android:layout_height="wrap_content"
          android:background="@drawable/submit"
          android:layout_margin="10sp"

     />

            <Button android:id="@+id/btnReportFormCancel"
        android:layout_width="100px"
        android:layout_height="wrap_content"
        android:background="@drawable/cancel"
        android:layout_toRightOf="@+id/btnReportFormSubmit"
        android:layout_margin="10sp"
     />
   </RelativeLayout>
```

Activity

```
package com.openideals.inaugreport;

import android.app.Activity;
import android.app.ProgressDialog;
import android.content.Intent;
import android.location.Location;
import android.os.Bundle;
import android.os.Handler;
import android.util.Log;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.ArrayAdapter;
import android.widget.Button;
import android.widget.CheckBox;
import android.widget.Spinner;
import android.widget.TextView;
import android.widget.Toast;

import com.openideals.android.geo.LocationFinderActivity;
import com.openideals.android.ui.HorizontalSlider;
import com.openideals.android.ui.HorizontalSlider.OnProgressChangeListener;



}
```

```
/** Called when the activity is first created. */
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    setContentView(R.layout.reportform);

  ((Button)findViewById(R.id.btnReportFormSubmit)).setOnClickListener(this);
  ((Button)findViewById(R.id.btnReportFormCancel)).setOnClickListener(this);


}
```

```
                        Toast.makeText(getBaseContext(), "There was
a problem submitting your report. Wait a second, and then
try again!", Toast.LENGTH_LONG).show();
```

```
private void showMain ()
        {
                Intent iMain = new Intent(this, LocationFinderActivity.class);

        startActivity(iMain);
        }
```
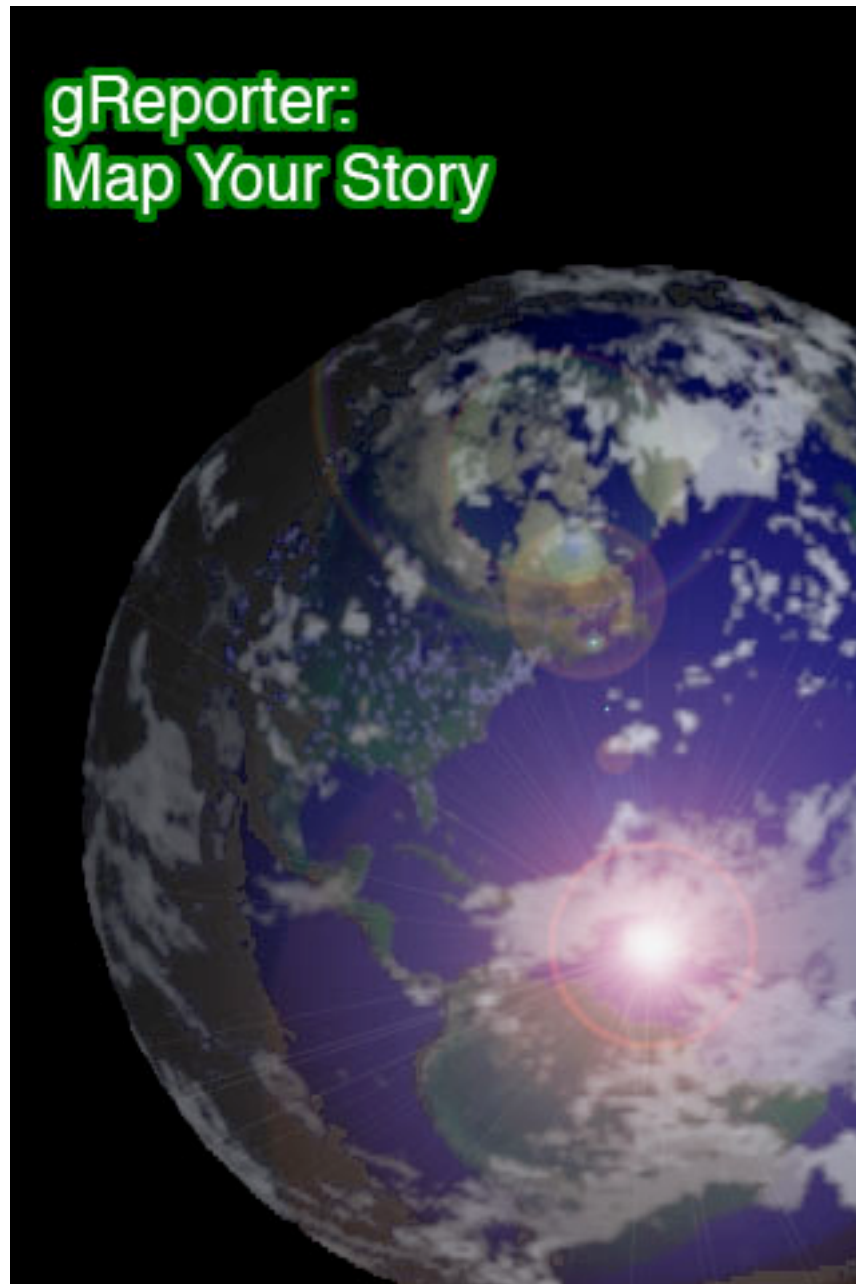
Android Application Examples

gReporter:
open-source
geotagging
media capture
report client

for the Android Platform

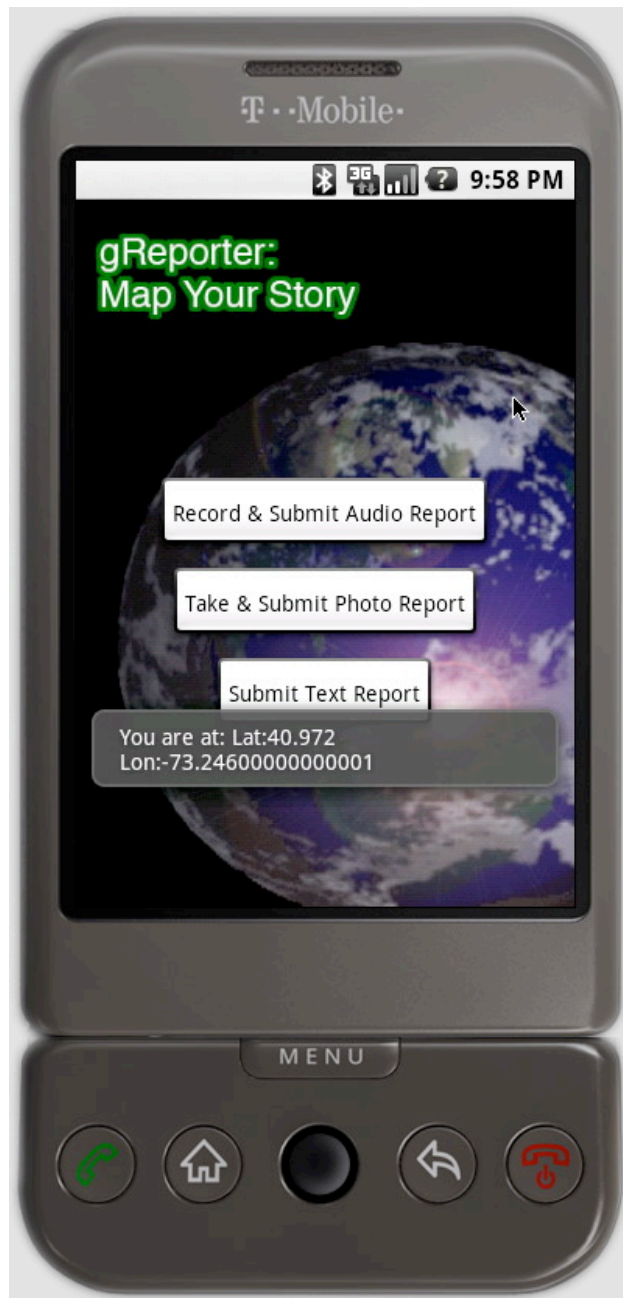http://openideals.com/greporter

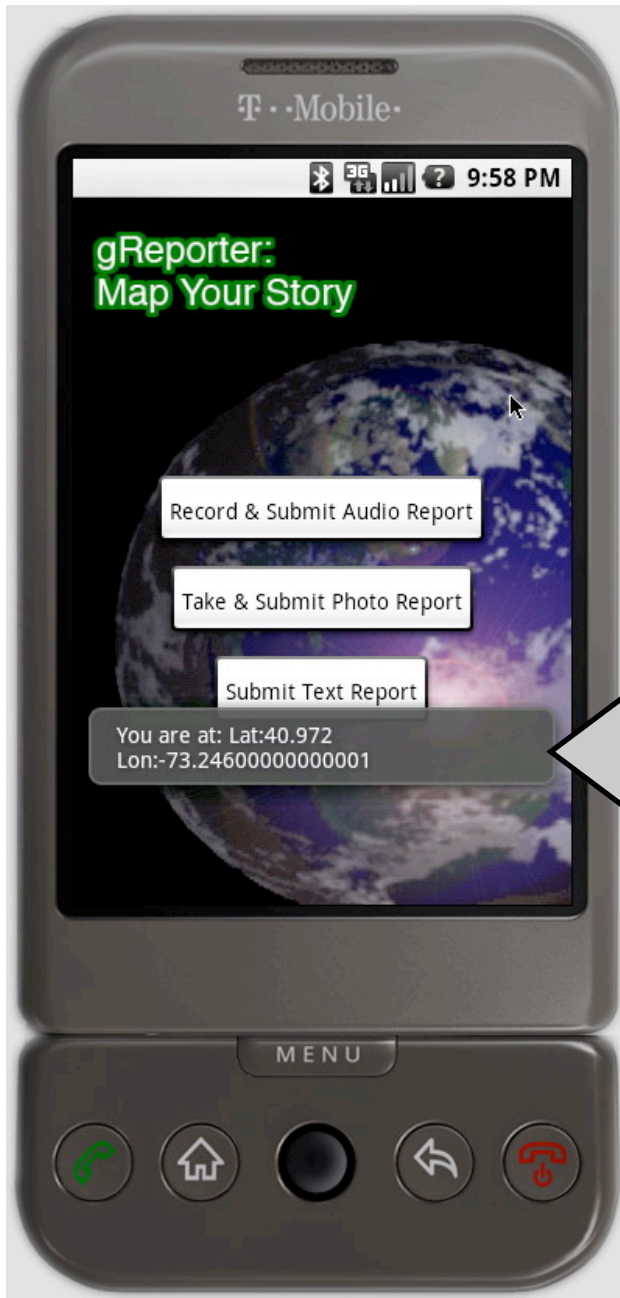# gReporter: what is it?

gReporter:
Map Your Story

- Android client application

- Captures text, audio and photo

- Finds device location via GPS or Network

- Submits captured data + location coordinates to any configured server via HTTP

- Displays page of submitted reports or other info

- Released under Apache License
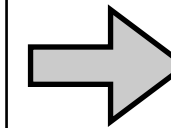
Main Menu / LocationManager

- Three Button Main Menu

- Activates LocationManager for GPS or Network-based location lookup

- Uses a single PNG background image

- Uses "toast" dialogs to display updated location information from callback

Main Menu / LocationManager

Locator.xml

```xml
<Button android:id="@+id/btnSubmitAudio"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignParentRight="true"
        android:layout_gravity="center"
    android:text="Record &amp; Submit Audio Report"
        android:padding="10sp"/>
```

```java
((Button)findViewById(R.id.btnSubmit
Audio)).setOnClickListener(this);
```

LocationFormActivity.java

```java
public void startGPS ()
    {
        //---use the LocationManager class to obtain GPS locations---
        if (lm == null)
        {
            lm = (LocationManager) getSystemService(Context.LOCATION_SERVICE);

            locationListener = new MyLocationListener();

            if (lm.isProviderEnabled(LocationManager.GPS_PROVIDER))
            {
                Log.i(TAG, "starting up GPS location provider...");
                lm.requestLocationUpdates(
                    LocationManager.GPS_PROVIDER,
                    LOCATION_UPDATE_TIME,  LOCATION_UPDATE_DISTANCE, locationListener);

                currentLocation = lm.getLastKnownLocation(LocationManager.GPS_PROVIDER);
                updateLocation (currentLocation);
            }

            if (lm.isProviderEnabled(LocationManager.NETWORK_PROVIDER))
            {
                ...
            }
        }
    }
```
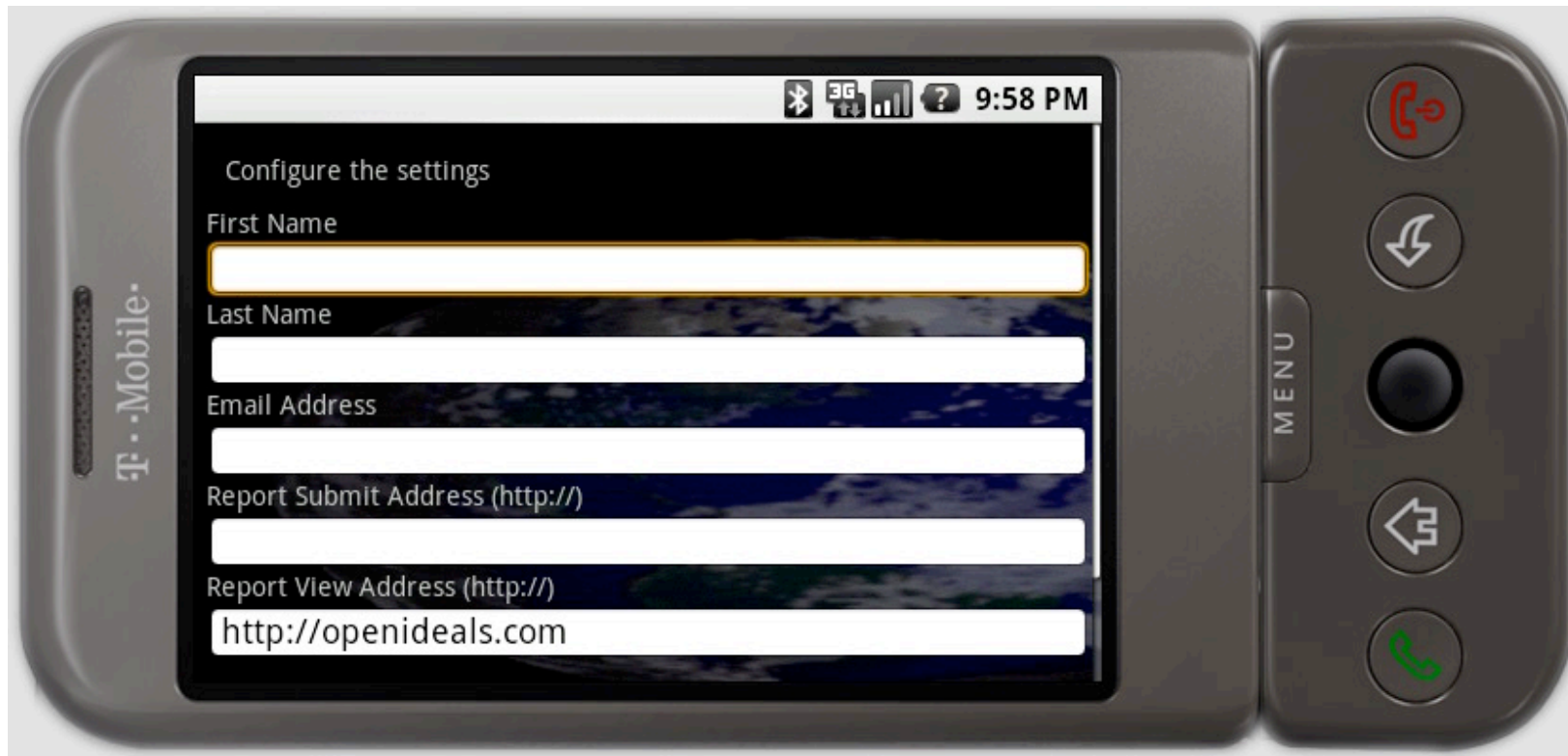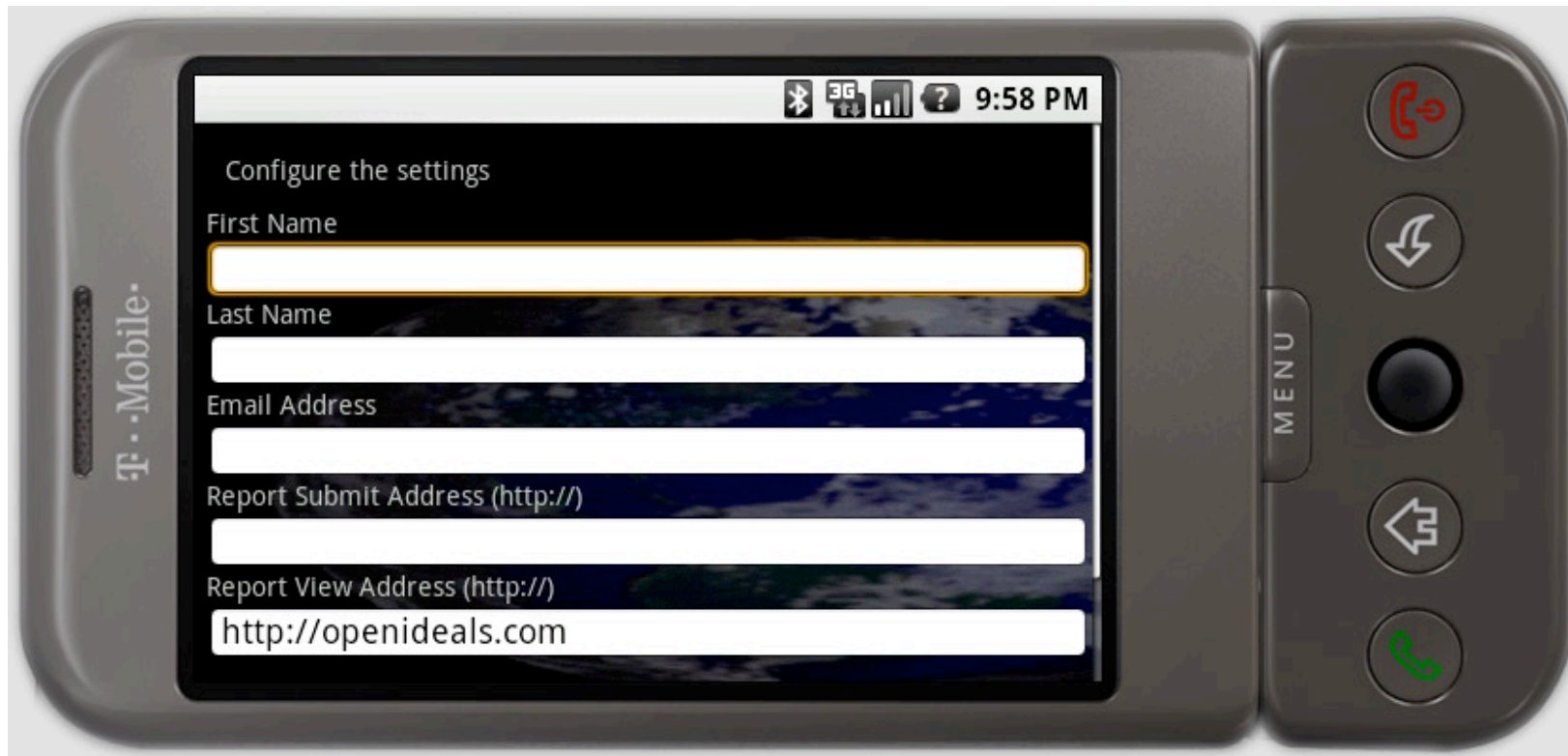
Settings and Text Report Forms

- Basic forms with text field, input boxes, drop-downs are all possible

- Values of forms are either stored in local sqlite database or submitted to the server

- on G1 form editing is always in landscape / horizontal mode
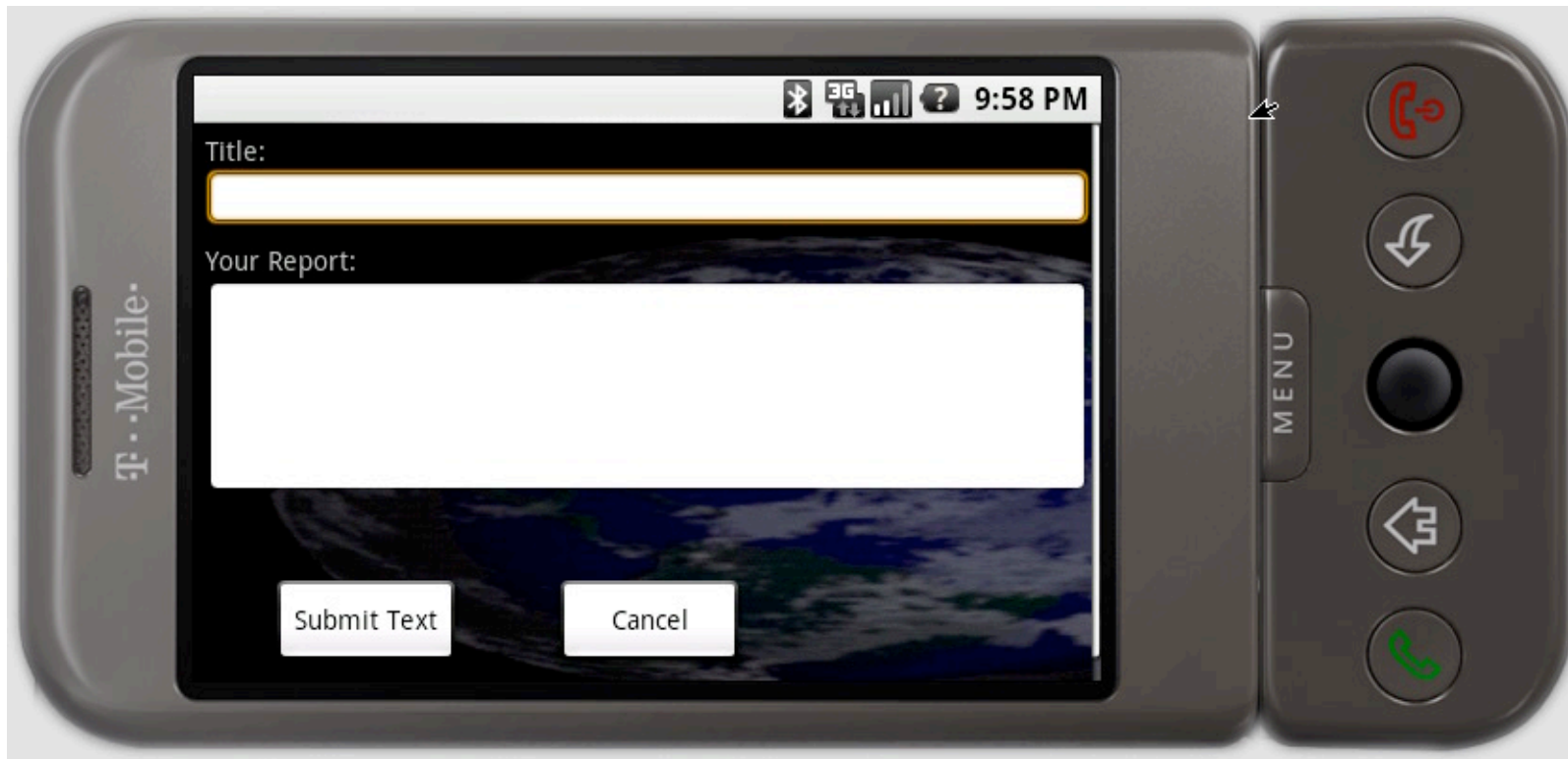
Settings "Person" Form

personform.xml

```xml
<TextView android:id="@+id/labelFirstName"

android:layout_width="wrap_content"

android:layout_height="wrap_content"
          android:text="First Name"/>

    <EditText android:id="@+id/entryFirstName"

android:layout_width="fill_parent"

android:layout_height="wrap_content"

android:background="@android:drawable/
editbox_background"
              />
```

PersonFormActivity.java

```java
if (event.getId()==R.id.btnReportFormSubmit)
        {
String firstname = ((TextView)findViewById(R.id.entryFirstName)).getText().toString();
String lastname = ((TextView)findViewById(R.id.entryLastName)).getText().toString();
String email = ((TextView)findViewById(R.id.entryEmail)).getText().toString();
String submitUrl = ((TextView)findViewById(R.id.entrySubmitUrl)).getText().toString();
String displayUrl = ((TextView)findViewById(R.id.entryViewUrl)).getText().toString();
        }
```

Text Report

reportform.xml

```xml
<TextView android:id="@+id/labelReport"
          android:layout_width="wrap_content"
          android:layout_height="wrap_content"
          android:paddingTop="10dp"
          android:text="Your Report:"/>

<EditText android:id="@+id/entryReport"
          android:layout_width="fill_parent"
          android:layout_height="wrap_content"
          android:background="@android:drawable/
editbox_background"
          android:lines="5"
          />
```

ReportFormActivity.java

```java
public void onClick(View v) {
    if (v.getId()==R.id.btnReportFormSubmit)
    {
        progressDialog = ProgressDialog.show(ReportFormActivity.this,
                        "Submitting Report",
                        "Please wait...",
                        true);

        Handler handler = new Handler();

        handler.postDelayed(this, 1000);

    }
    else if (v.getId()==R.id.btnReportFormCancel)
    {
        showMain ();
    }
}
```
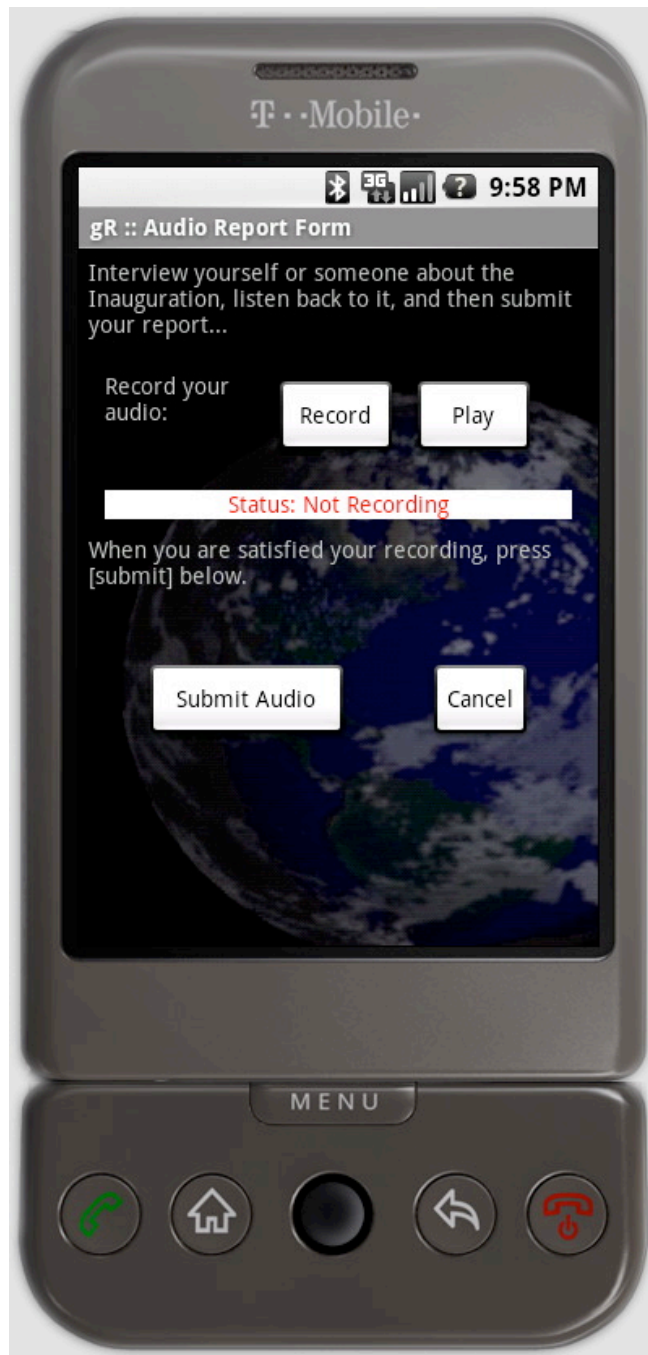
```java
String reportTitle =
((TextView)findViewById(R.id.entryTitle)).getText().toString();
        String reportText =
((TextView)findViewById(R.id.entryReport)).getText().toString();

        boolean reportAccepted =
Reporter.submitTextReport(reportTitle, reportText);
```
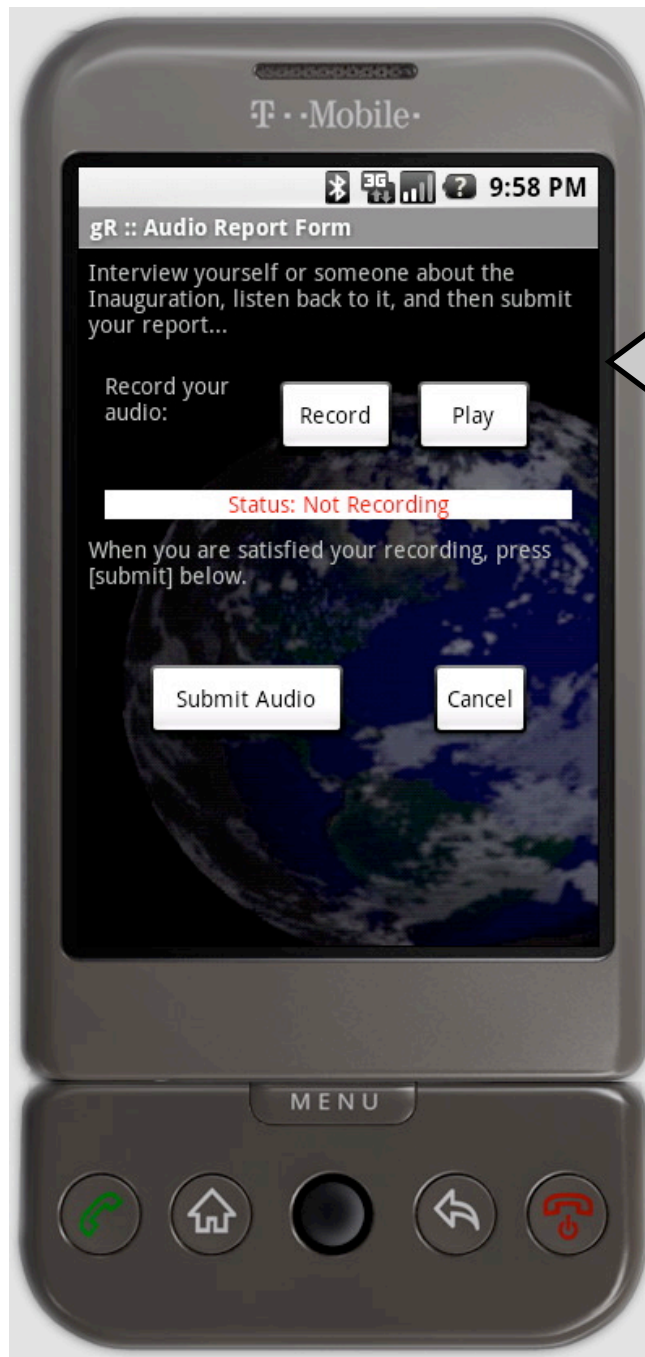
Audio Recording / File System

- Audio recording through built-in device microphone in 3GP format

- Captured to SD card storage

- Playback review / re-record overwrite

- Audio upload to server via HTTP Post

Audio Recording / File System

reportaudioform.xml

```xml
<ScrollView xmlns:android="http://schemas.android.com/apk/res/android"
android:id="@+id/scrollReportForm" android:layout_width="fill_parent"
android:layout_height="fill_parent"
 android:background="@drawable/bg">

<LinearLayout android:id="@+id/layoutReportForm" android:label="Text Report"
android:layout_width="fill_parent" android:layout_height="wrap_content"
android:orientation="vertical" android:gravity="top" android:padding="6.0sp">

  <TextView android:id="@+id/labelPhotoHeader" android:layout_width="fill_parent"
android:layout_height="wrap_content" android:text="..."/>

  <RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent" android:layout_height="wrap_content"
    android:padding="10dp" android:layout_marginTop="10px">
```
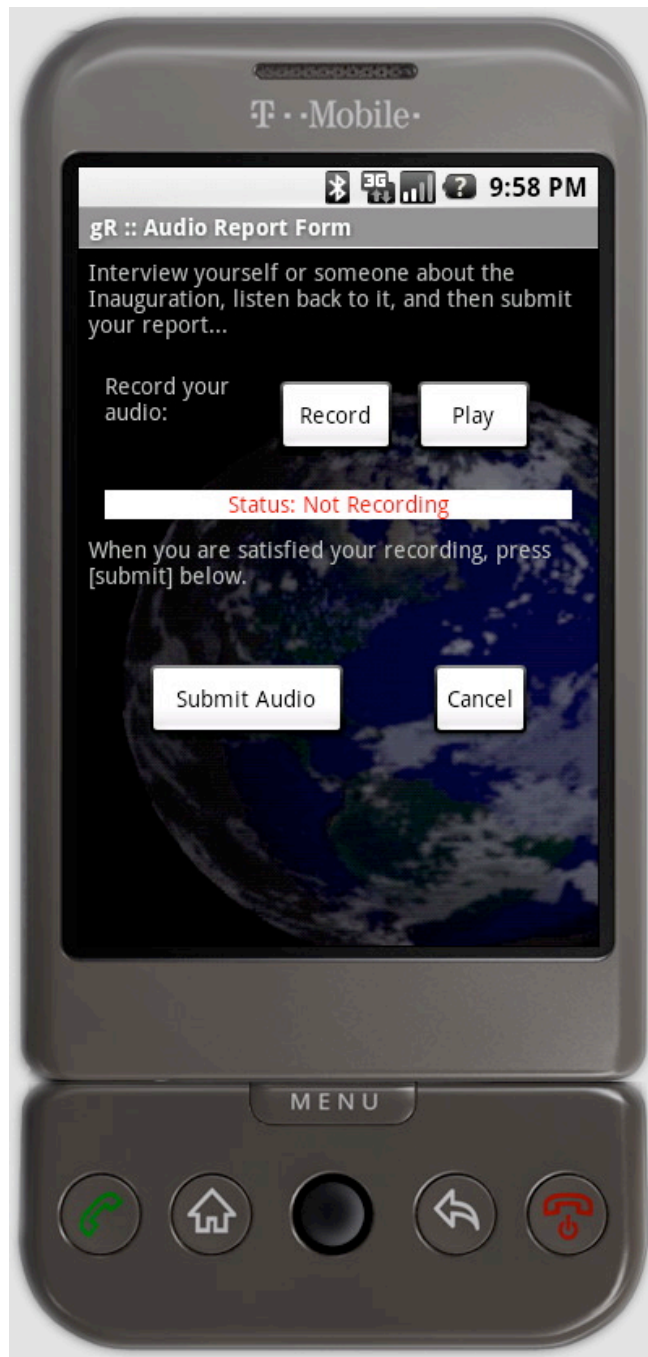
```java
private void setStatus (String status)
        {
                ((TextView)findViewById(R.id.labelAudioStatus)).setText(status);

        }
```

```java
    Toast.makeText(getBaseContext(), "Thank you. Your report has been accepted!",
Toast.LENGTH_LONG).show();
```

Audio Recording / File System (cont'd)


```java
private String startRecording (String filename)
    {
            setStatus ("Recording...");

            ((TextView)findViewById(R.id.btnRecordAudio)).setText("Stop");

            String path = null;

            if (currentAudioFile != null)
            {
                    path = currentAudioFile;
            }
            else
            {
                    path = "/sdcard/" + filename + file_ext;
            }

            mRecorder = new MediaRecorder();
            mRecorder.setAudioSource(MediaRecorder.AudioSource.MIC);
            mRecorder.setOutputFormat(MediaRecorder.OutputFormat.THREE_GPP);
            mRecorder.setAudioEncoder(MediaRecorder.AudioEncoder.AMR_NB);
            mRecorder.setOutputFile(path);
            mRecorder.prepare();
            mRecorder.start();

            return path;

    }
```
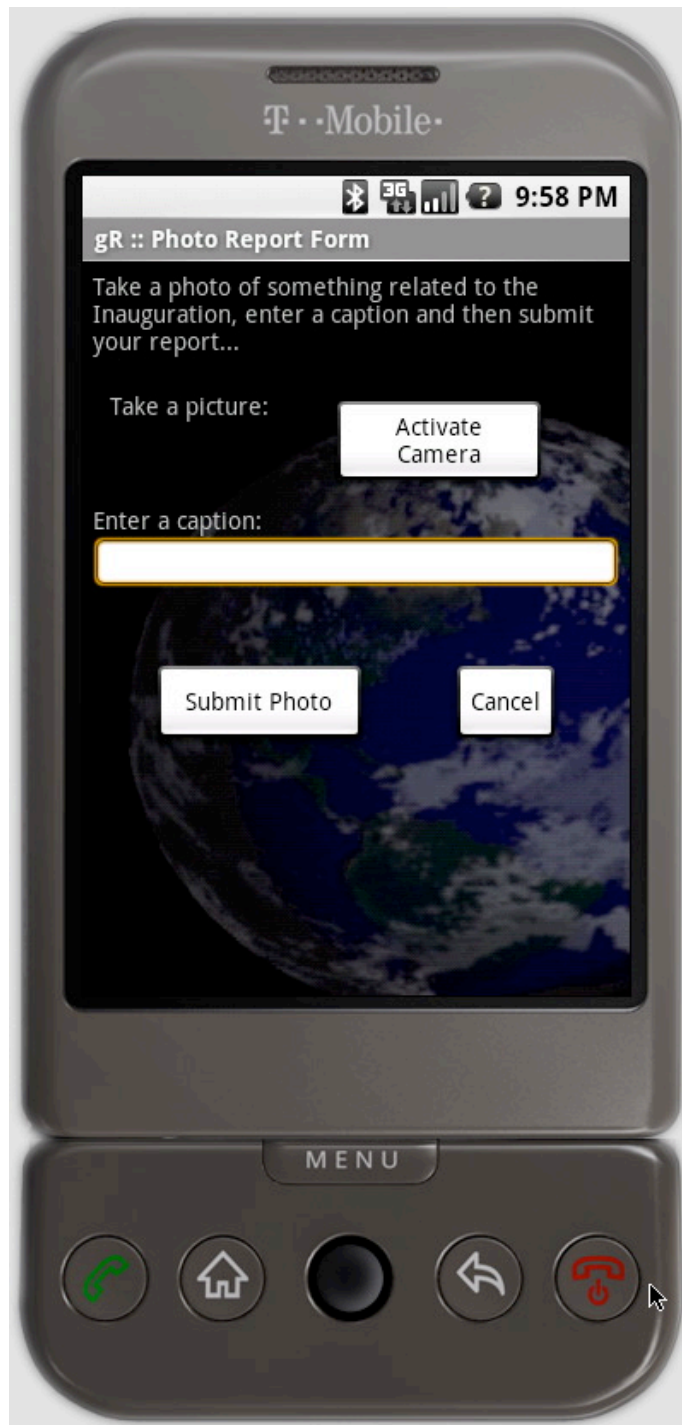
```java
private void playRecording (String path)
    {
            setStatus ("Playing...");

            try
            {
                    mMediaPlayer = new MediaPlayer();
            mMediaPlayer.setDataSource(path);
            mMediaPlayer.prepare();
            mMediaPlayer.start();
            }
            catch (IOException e)
            {
                    e.printStackTrace();
            }
    }
```
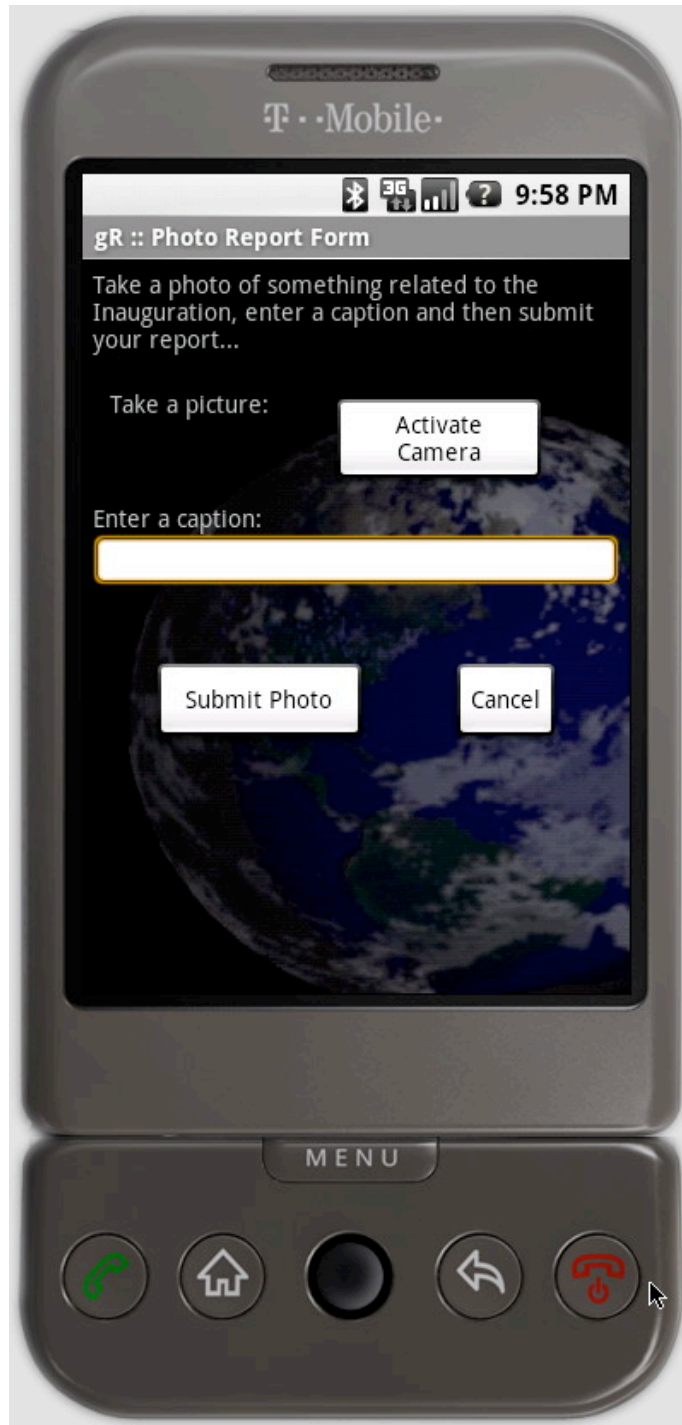
Photo Capture & Display

- Capture of photo from built-in camera

- Captured in JPEG format at screen-size resolution (480x320)

- Compressed from 3MP format on capture

- Stored on local SD card (also accessible via USB mount or card reader)

- Upload to server via HTTP Post

Photo Capture & Display

reportphotoform.xml

```xml
<ImageView android:id="@+id/previewphoto" android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_gravity="top"/>
```

PhotoFormActivity

```java
/** Called when the activity is first created. */
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    currentPhotoPath = this.getIntent().getStringExtra("photofile");

    setContentView(R.layout.reportphotoform);

    ((Button)findViewById(R.id.btnTakePicture)).setOnClickListener(this);
      ((Button)findViewById(R.id.btnReportFormSubmit)).setOnClickListener(this);
    ((Button)findViewById(R.id.btnReportFormCancel)).setOnClickListener(this);

    if (currentPhotoPath != null)
    {
        Toast.makeText(getBaseContext(), "Ready to send photo: " + currentPhotoPath,
Toast.LENGTH_LONG).show();


((ImageView)findViewById(R.id.previewphoto)).setImageURI(Uri.parse(currentPhotoPath));

    }
  }
```
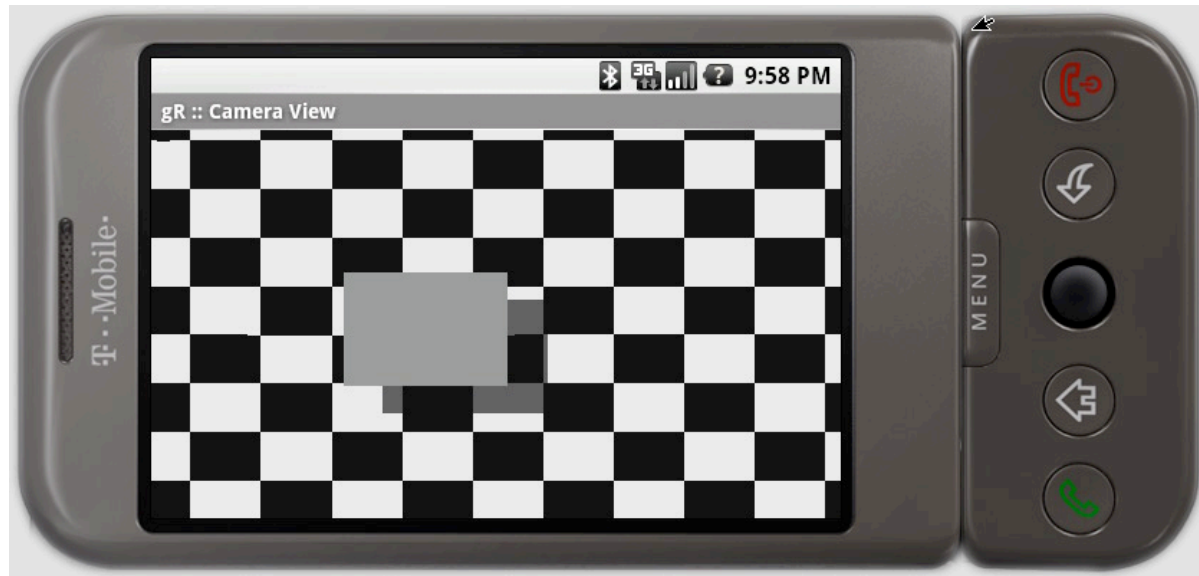
Photo Capture & Display (cont'd)

camera.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:background="@drawable/bg">
<SurfaceView android:id="@+id/surface"
    android:layout_width="fill_parent" android:layout_height="10dip"
    android:layout_weight="1">
</SurfaceView>
</LinearLayout>
```

ImageCaptureActivity:

preview setup

```java
public void surfaceChanged(SurfaceHolder holder, int
format, int w, int h)
{
Log.e(getClass().getSimpleName(), "surfaceChanged");
if (isPreviewRunning) {
  camera.stopPreview();
}

camera.setPreviewDisplay(holder);
camera.startPreview();
isPreviewRunning = true;
}
```

photo capture

```java
public void onPreviewFrame(byte[] data, Camera c) {

    if (!sizeSet)
    {
        Log.i(getClass().getSimpleName(), "preview frame
RAW: " + data);

        Camera.Parameters params = c.getParameters();
        params.setPictureFormat(PixelFormat.JPEG);
        params.setPictureSize(PHOTO_WIDTH,PHOTO_HEIGHT);
        c.setParameters(params);

        sizeSet = true;
    }
}
```
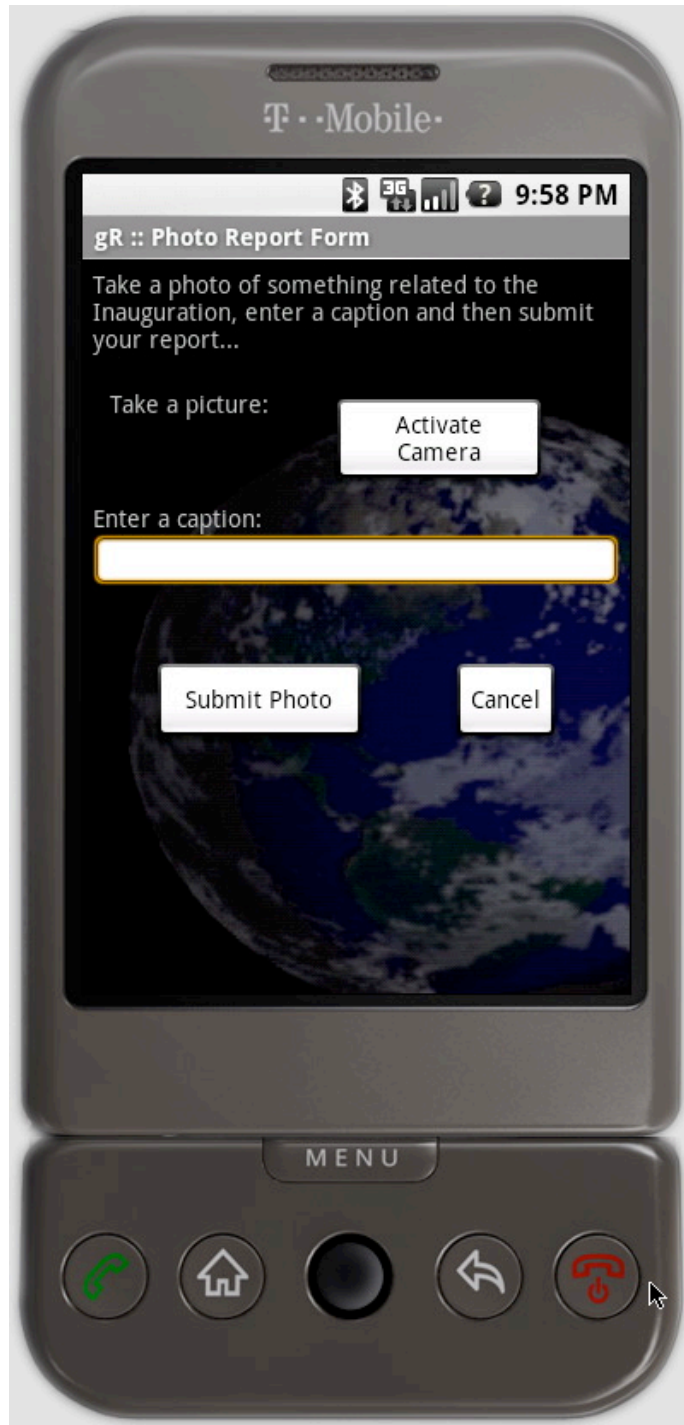
Photo Capture & Display (cont'd)


```java
Camera.PictureCallback mPictureCallbackJpeg= new Camera.PictureCallback() {

public void onPictureTaken(byte[] data, Camera c) {

    Log.e(getClass().getSimpleName(), "PICTURE CALLBACK JPEG: data.length = " + data.length);
    String filename = timeStampFormat.format(new Date());

    String baseDir = "/sdcard/";

    if (new File("/sdcard/dcim/Camera/").exists())
    {
            baseDir = "/sdcard/dcim/Camera/";
    }

    currentPhotoFile = baseDir + filename + ".jpg";

    try
    {
            FileOutputStream file = new FileOutputStream(new File(currentPhotoFile));
            file.write(data);

            sendPicture();
    }
    catch (Exception e){
            e.printStackTrace();
    }
}
};

Camera.ShutterCallback mShutterCallback = new Camera.ShutterCallback() {
public void onShutter() {
Log.e(getClass().getSimpleName(), "SHUTTER CALLBACK");

Camera.Parameters params = camera.getParameters();
params.setPictureFormat(PixelFormat.JPEG);
params.setPictureSize(PHOTO_WIDTH,PHOTO_HEIGHT);
camera.setParameters(params);

} };
```
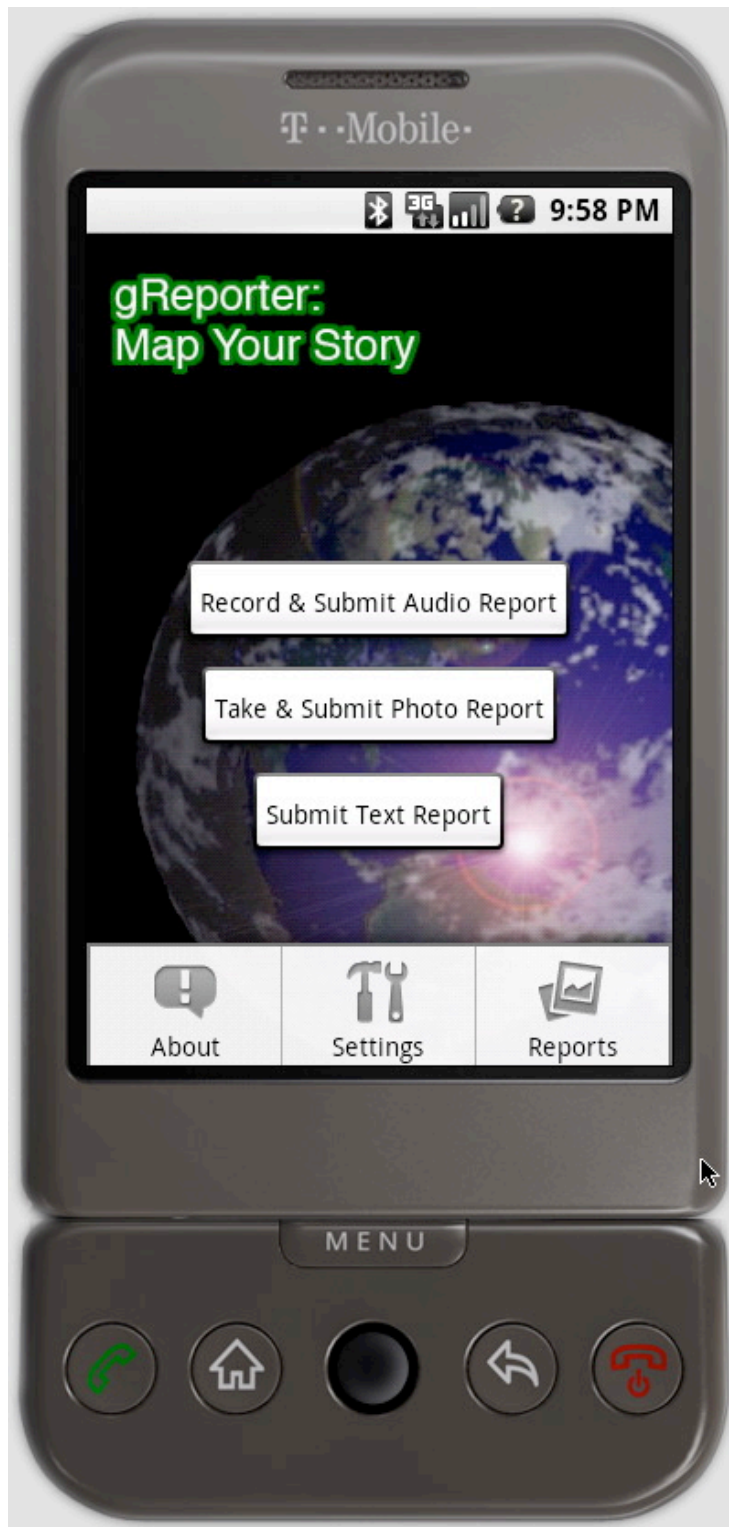
Menu Dialog Options


```java
@Override
    public boolean onCreateOptionsMenu(Menu menu) {
     super.onCreateOptionsMenu(menu);

     MenuItem mItem = menu.add(0, 1, Menu.NONE, "About");
     MenuItem mItem2 = menu.add(0, 2, Menu.NONE, "Settings");
    MenuItem mItem3 = menu.add(0, 3, Menu.NONE, "Reports");

    mItem.setIcon(R.drawable.ic_menu_about);
    mItem2.setIcon(R.drawable.ic_menu_register);
    mItem3.setIcon(R.drawable.ic_menu_reports);

     return true;
    }
```

```java
public boolean onMenuItemSelected(int featureId, MenuItem item) {

        super.onMenuItemSelected(featureId, item);

        if (item.getItemId() == 1)
            showCredits();
        else if (item.getItemId() == 2)
            showRegistration();
        else if (item.getItemId() == 3)
        {

            showWebView ();

        }

     return true;
    }
```
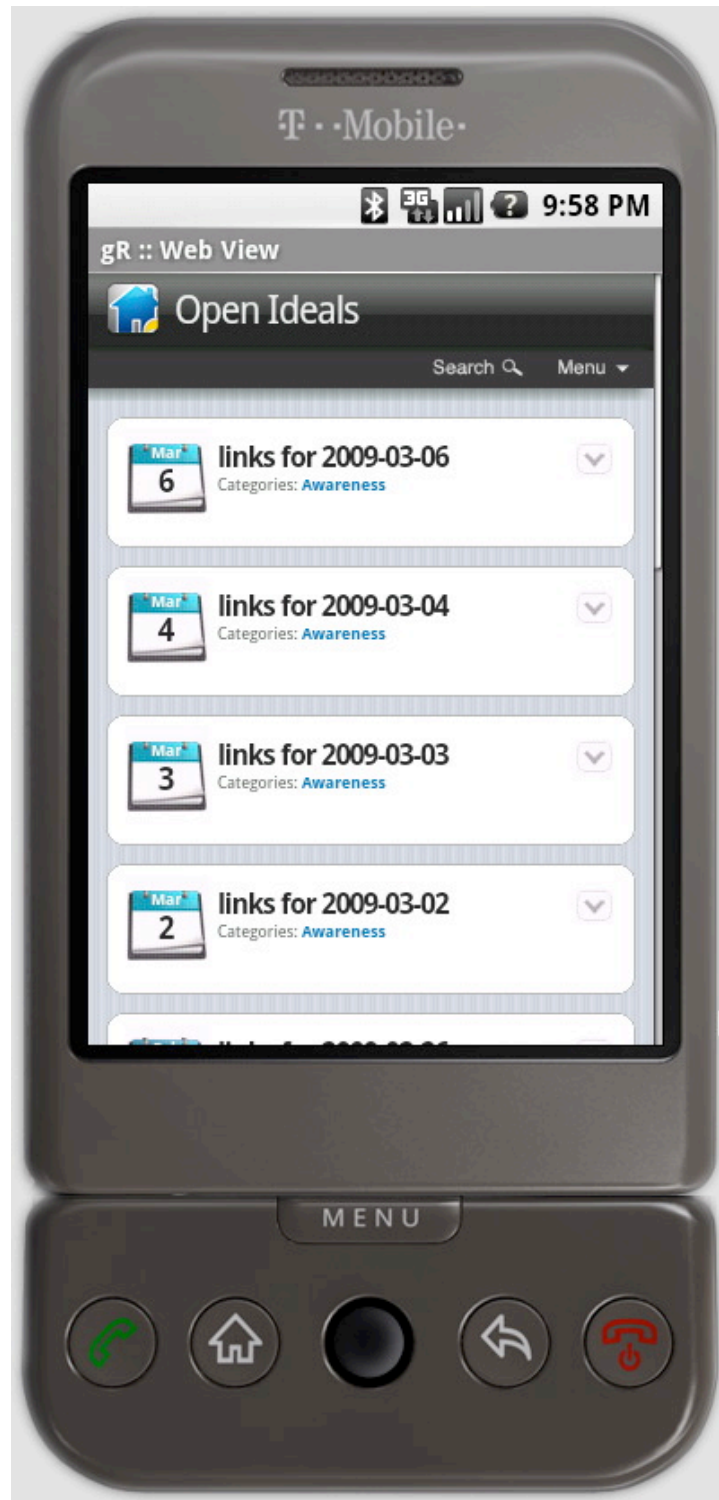
Embedded Web "Reports" View


```java
private void showWebView ()
    {
        Intent iReportForm = new Intent(this, InternalWebView.class);

        String reportDisplayUrl =
PreferenceDB.getInstance(this).getPref(GReporterConstants.PREFKEY_REPORT_DISPLAY_URL);

        iReportForm.putExtra("url", reportDisplayUrl);

         startActivity(iReportForm);

    }
```

```xml
<WebView
      android:id="@+id/webview"
      android:layout_width="fill_parent"
      android:layout_height="fill_parent"
      android:layout_weight="1"
      />
```

```java
mWebView = (WebView) findViewById(R.id.webview);

        WebSettings webSettings = mWebView.getSettings();
        webSettings.setSavePassword(false);
        webSettings.setSaveFormData(false);
        webSettings.setJavaScriptEnabled(true);
        webSettings.setSupportZoom(false);

        mWebView.setWebChromeClient(new MyWebChromeClient());

        mWebView.loadUrl(url);
```

PreferencesDB - SQLite

```java
public class PreferenceDB  {

        private static final String CREATE_TABLE_PREFS = "create table prefs (pref_id integer primary key autoincrement, "
                        + "prefkey text not null, prefval text not null);";


        private static final String PREFS_TABLE = "prefs";
        private static final String DATABASE_NAME = "prefsdb";
        private static final int DATABASE_VERSION = 2;
```

```java
@Override
        public void onCreate(SQLiteDatabase db) {
            try
            {
                    db.execSQL(CREATE_TABLE_PREFS);
            }
            catch (Exception e)
            {
                    Log.i(DATABASE_NAME,"tables already exist");
            }
        }
```
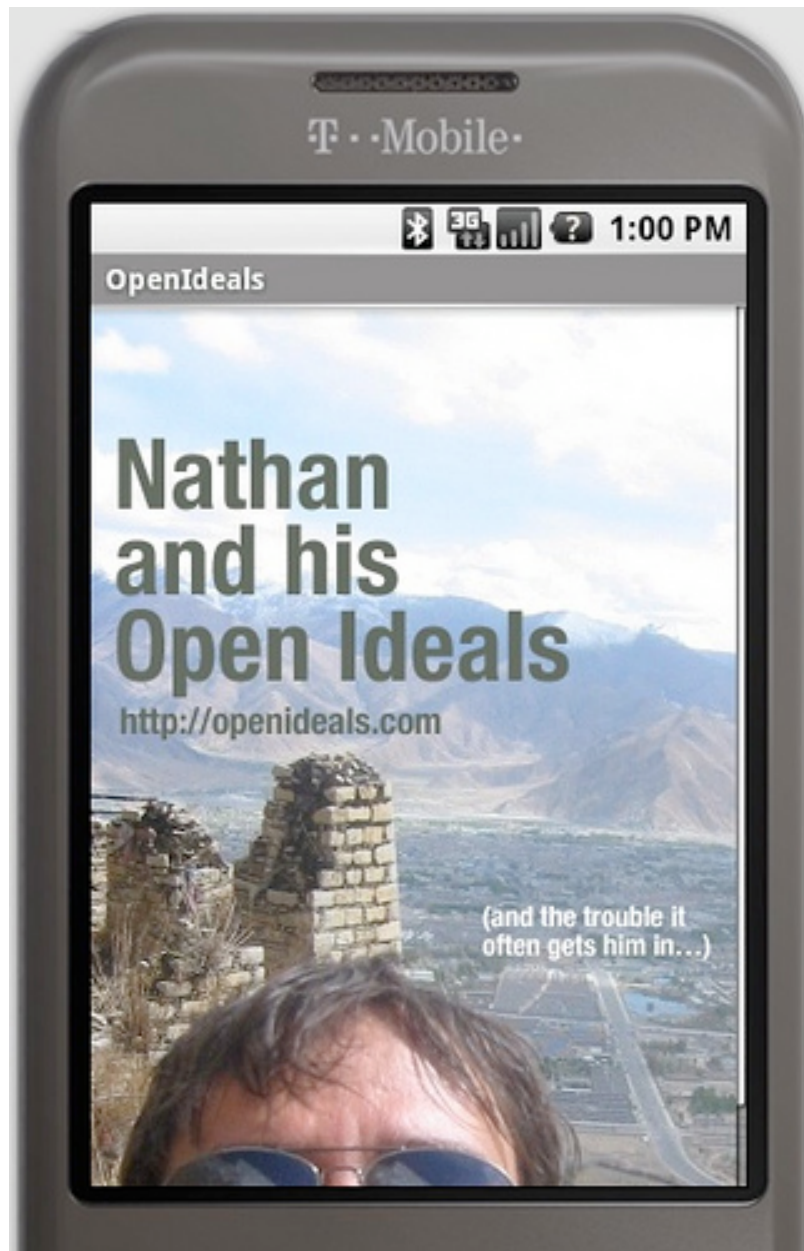
```java
public boolean insertPref(String key, String value) {

                deletePref(key);

                SQLiteDatabase db = mOpenHelper.getWritableDatabase();

                ContentValues values = new ContentValues();
                values.put("prefkey", key);
                values.put("prefval", value);


                boolean resp = (db.insert(PREFS_TABLE, null, values) > 0);

                return resp;
        }
```

```java
Cursor c = db.query(PREFS_TABLE, new String[] {"prefval"  }, "prefkey=?", new String[] {key}, null, null, null);

                    int numRows = c.getCount();

                    if (numRows > 0)
                    {
                    c.moveToFirst();
                    result = c.getString(0);
                    }

                    c.close();
```
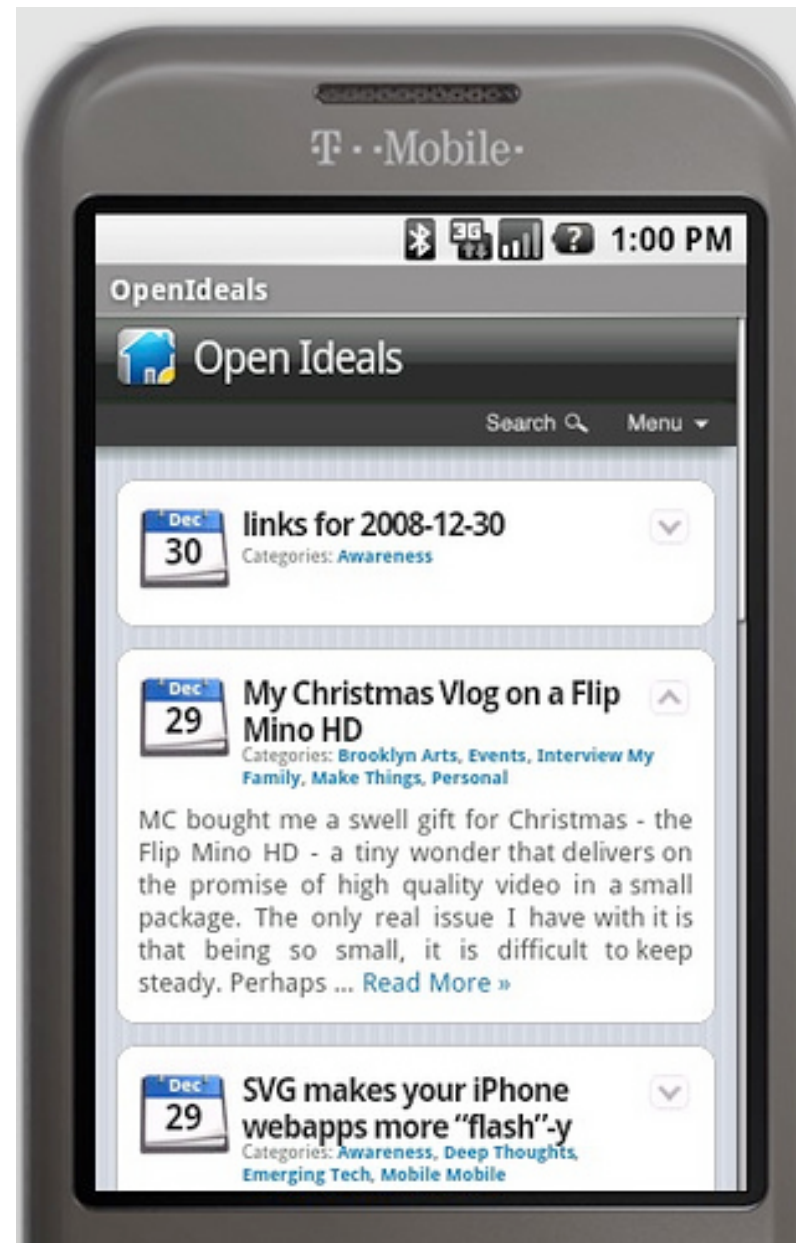
PhoneGap: Browser-based Apps

PhoneGap Sample

Splash Screen

WORDPRESS MOBILE

FANCY MENUS!

PhoneGap


```xml
<resources>
    <string name="hello">Hello World, PhoneGap</string>
    <string name="app_name">OpenIdeals</string>
<string name="url">file:///android_asset/index.html</string>
</resources>
```

```xml
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    >
            <WebView android:id="@+id/appView"
            android:layout_height="wrap_content"
            android:layout_width="fill_parent"
            />
</LinearLayout>
```

```html
<meta http-equiv="refresh" content="3;url=http://openideals.com/">
</head>
<body>
<a href="http://openideals.com/"><img src="default.png" id="splash"></a>
</body>
</html>
```

Other Development Resources

OpenIntents.org

Title ▼	Provides action	Provides URI	Uses action	Uses URI	Description
Barcode Scanner - ZXing library	Encode Main Scan Search book contents Share (through QR code)				Multi-format 1D/2D barcode reader.
Browser	View data	Web address	View data	Atom feed RSS feed Web address	Web browser.
Connectbot	Connect host Create shortcut Edit data Pick data View data	SSH SSH hosts			SSH client.
Convert CSV	View data	File URI	Pick file	File URI	Extension that imports and exports OI Notepad notes or OI Shopping lists.
Gmail	Send a message to the given uri Send data to someone				Mail application connected to gmail server
	Google				Google Streetview

http://www.openintents.org

PhoneGap.com

- PhoneGap is a development tool that allows web developers to take advantage of the core features in the iPhone, Android, and Blackberry SDK using JavaScript.

Supported Features

	IPHONE	ANDROID	BLACKBERRY
GEO LOCATION	✓ yes	✓ yes	✓ yes
VIBRATION	✓ yes	✓ yes	pending
ACCELEROMETER	✓ yes	✓ yes	NA