移动应用开发

张昕

zhangxin@cust.edu.cn

2022

Message, Notification, Broadcast, Alarm

Message, Notification, Broadcast, Alarm

Toast displays message tips

AlertDialog provides dialogs

Notification displays notifications on status bar

BroadcastReceiver

AlarmManager sets alarms

Toast class displaying messages

- **Features**
  - ☐ **No control buttons**
  - ☐ **Not obtain focus**
  - ☐ **Long/Short duration**

- **Steps**

  Toast toast = new Toast(this);
  OR
  Toast toast = Toast.makeText(this, "Content", Toast.LENGTH_SHORT);

  - ☐ **Create Toast object**

  - ☐ **Call member methods to configure styles**

    setDuration(int duration) //Toast.LENGTH_LONG Toast.LENGTH_SHORT
    setGravity(int gravity, int xOffset, int yOffset)
    setMargin(float horizontalMargin, float verticalMargin)
    setText(CharSequence s)
    setView(View view)

  - ☐ **Call show() method of Toast class to display message**

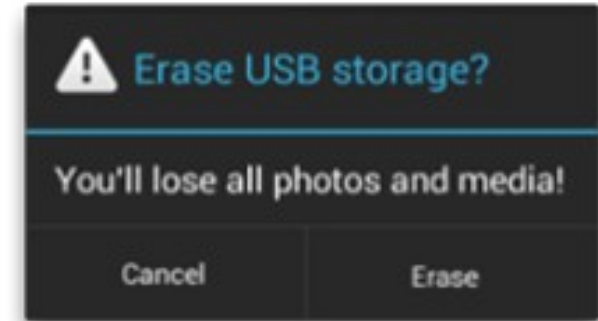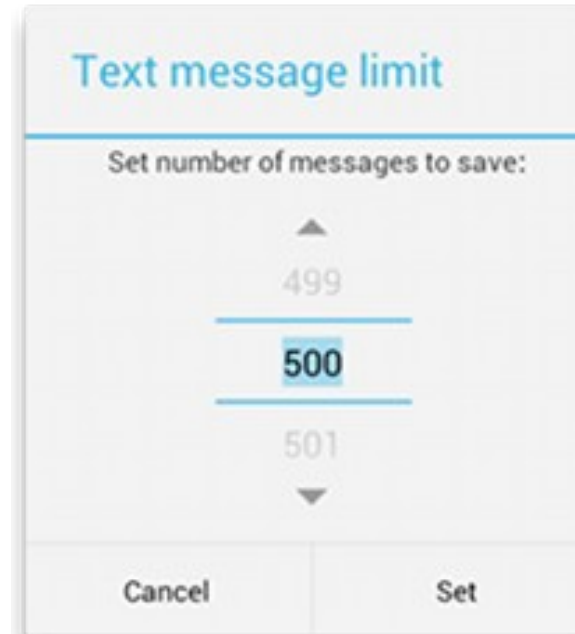# AlertDialog class creating dialogs

■ **AlertDialog cannot be directly created**
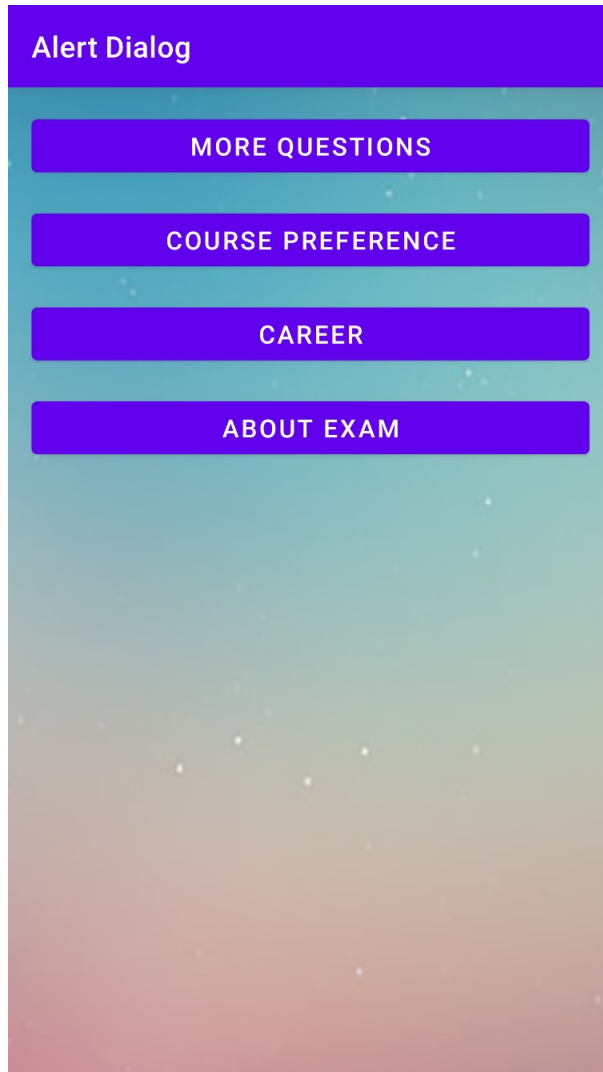
  ☐ **AlertDialog.Builder class is responsible for creating dialogs**

    ☐ **Including title, buttons, action handling**

    setTitle(CharSequence title)
    setIcon(Drawable icon) | setIcon(int resId)
    setMessage(CharSequence message)
    setPositiveButton()
    setNegativeButton()
    setNeutralButton()
    setItems()
    setSingleChoiceItems()

Small Demo

Alert Dialog

MORE QUESTIONS

COURSE PREFERENCE

CAREER

ABOUT EXAM

```xml
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:gravity="center_horizontal"
    android:background="@drawable/bg"
    tools:context="com.example.messagenotificationbroadcastalarmclock.MainActivity">
    <Button
        android:id="@+id/button1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:textColor="@color/word"
        android:background="#38cfd1"
        android:textSize="@dimen/textSize"
        android:layout_marginBottom="@dimen/activity_horizontal_margin"
        android:text="@string/button1" />
    <Button
        android:id="@+id/button2"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:textColor="@color/word"
        android:background="#3961b7"
        android:textSize="@dimen/textSize"
        android:layout_marginBottom="@dimen/activity_horizontal_margin"
        android:text="@string/button2" />
    <Button
        android:id="@+id/button3"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:textColor="@color/word"
        android:background="#43b243"
        android:textSize="@dimen/textSize"
        android:layout_marginBottom="@dimen/activity_horizontal_margin"
        android:text="@string/button3" />
    <Button
        android:id="@+id/button4"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:textColor="@color/word"
        android:background="#f9671e"
        android:textSize="@dimen/textSize"
        android:text="@string/button4" />
</LinearLayout>
```
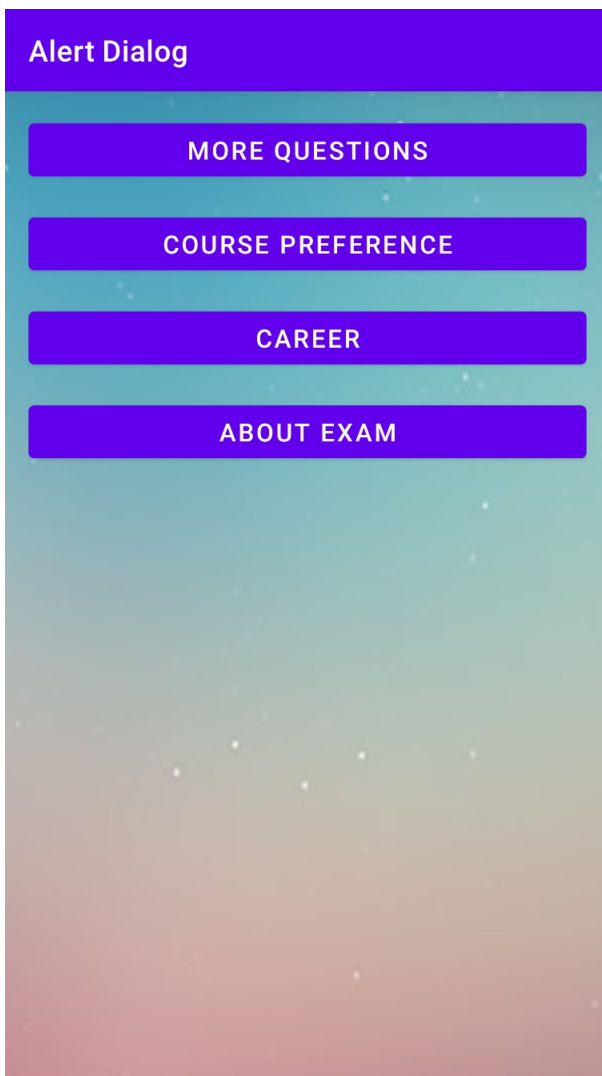
Small Demo

Alert Dialog

MORE QUESTIONS

COURSE PREFERENCE

CAREER

ABOUT EXAM

```xml
<resources>
    <string name="app_name">Alert Dialog</string>
    <string name="button1">More questions</string>
    <string name="button2">Course preference</string>
    <string name="button3">Career</string>
    <string name="button4">About exam</string>
</resources>


<resources>
    <color name="purple_200">#FFBB86FC</color>
    <color name="purple_500">#FF6200EE</color>
    <color name="purple_700">#FF3700B3</color>
    <color name="teal_200">#FF03DAC5</color>
    <color name="teal_700">#FF018786</color>
    <color name="black">#FF000000</color>
    <color name="white">#FFFFFFFF</color>
    <color name="colorPrimary">#3F51B5</color>
    <color name="colorPrimaryDark">#303F9F</color>
    <color name="colorAccent">#FF4081</color>
    <color name="word">#FFFFFF</color>
</resources>


<resources>
    <!-- Default screen margins, per the Android Design guidelines. -->
    <dimen name="activity_horizontal_margin">16dp</dimen>
    <dimen name="activity_vertical_margin">16dp</dimen>
    <dimen name="textSize">17sp</dimen>
</resources>
```
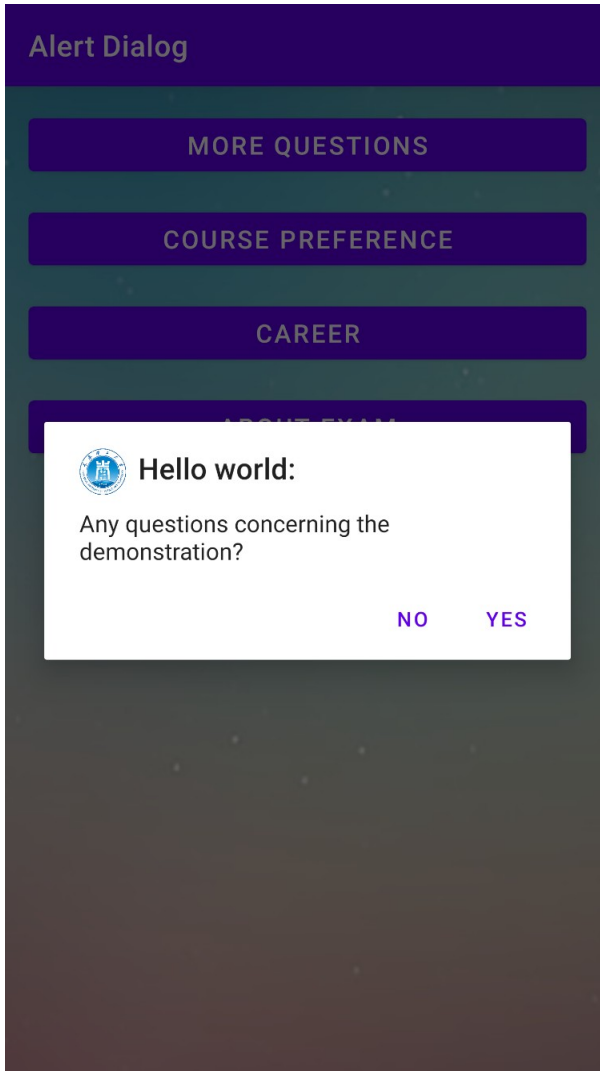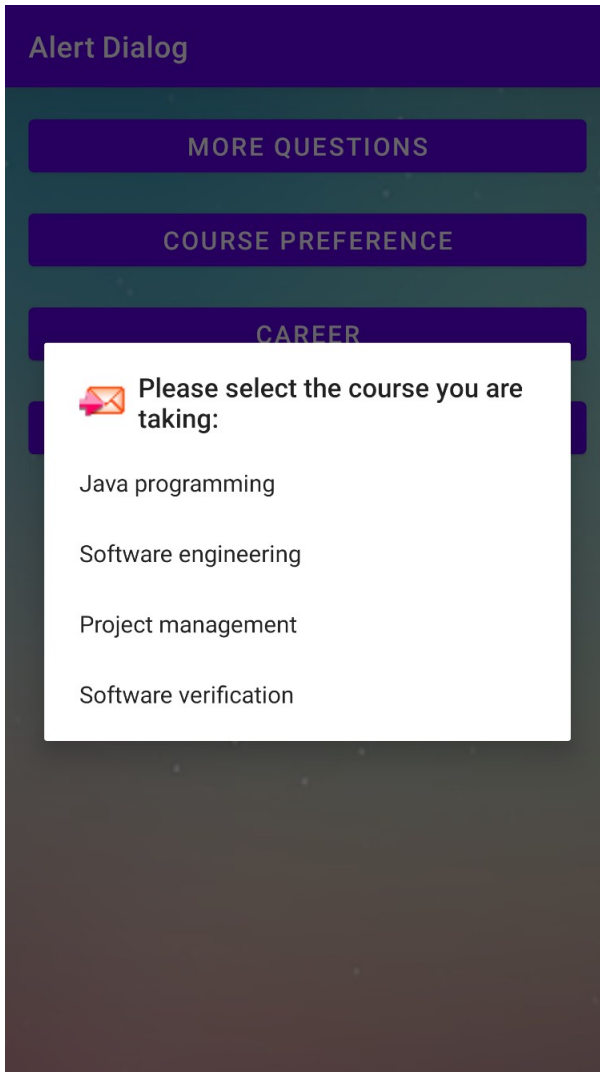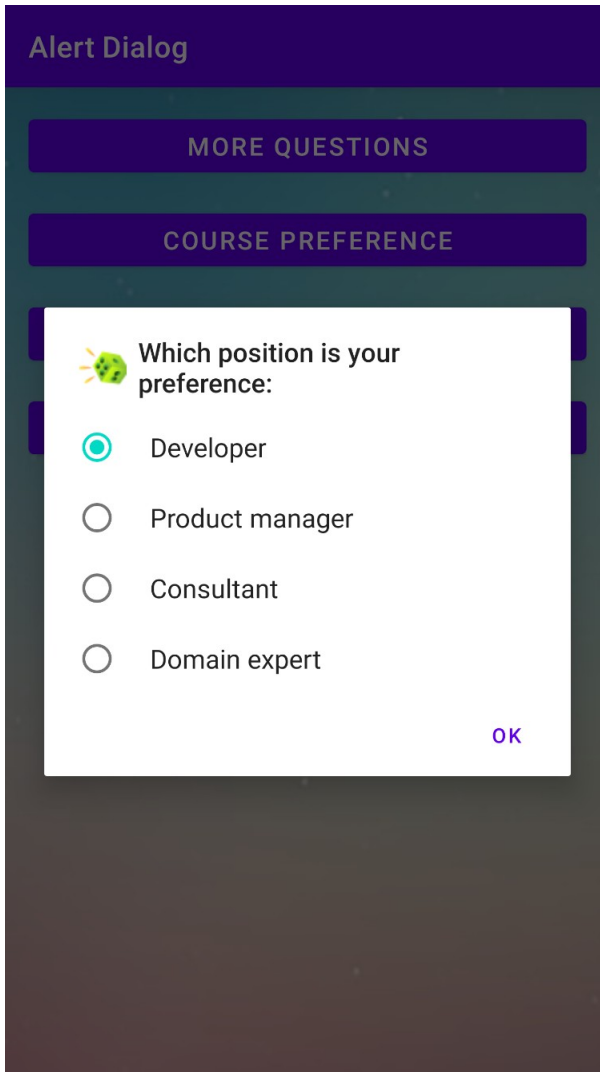
Small Demo

Alert Dialog

MORE QUESTIONS

COURSE PREFERENCE

CAREER

Hello world:

Any questions concerning the demonstration?

NO   YES

```java
Button button1 = (Button)findViewById(R.id.button1);
button1.setOnClickListener(new View.OnClickListener(){
    @Override
    public void onClick(View v) {
        AlertDialog alertDialog = new AlertDialog.Builder(MainActivity.this).create();
        alertDialog.setIcon(R.drawable.advise);
        alertDialog.setTitle("Hello world:");
        alertDialog.setMessage("Any questions concerning the demonstration?");
        alertDialog.setButton(DialogInterface.BUTTON_NEGATIVE, "No", new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                Toast.makeText(MainActivity.this, "No question", Toast.LENGTH_SHORT).show();
            }
        });
        alertDialog.setButton(DialogInterface.BUTTON_POSITIVE, "Yes", new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                Toast.makeText(MainActivity.this, "Some question", Toast.LENGTH_SHORT).show();
            }
        });
        alertDialog.show();
    }
});
```
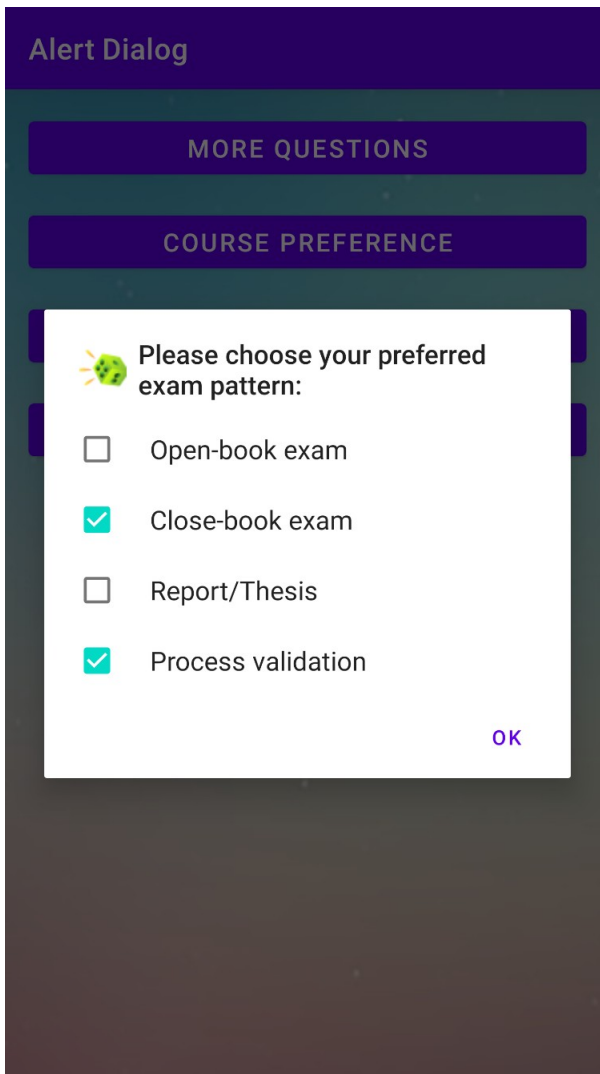
Small Demo


```java
Button button2 = (Button)findViewById(R.id.button2);
button2.setOnClickListener(new View.OnClickListener(){
    @Override
    public void onClick(View v) {
        final String[] items = new String[]{"Java programming", "Software engineering","Project management",
"Software verification"};
        AlertDialog.Builder builder = new AlertDialog.Builder(MainActivity.this);
        builder.setIcon(R.drawable.advise1);
        builder.setTitle("Please select the course you are taking:");
        builder.setItems(items, new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                Toast.makeText(MainActivity.this,"You have chosen "+items[which], Toast.LENGTH_SHORT).show();
            }
        });
        builder.create().show();
    }
});
```

Small Demo


```java
Button button3 = (Button)findViewById(R.id.button3);
button3.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        final String[] items = new String[]{"Developer","Product manager","Consultant","Domain expert"};
        AlertDialog.Builder builder = new AlertDialog.Builder(MainActivity.this);
        builder.setIcon(R.drawable.advise2);
        builder.setTitle("Which position is your preference:");
        builder.setSingleChoiceItems(items, 0, new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                Toast.makeText(MainActivity.this,"You have chosen "+items[which], Toast.LENGTH_SHORT).show();
            }
        });
        builder.setPositiveButton("Ok", null);
        builder.create().show();
    }
});
```

Small Demo

Alert Dialog

MORE QUESTIONS

COURSE PREFERENCE

☀️🐢 Please choose your preferred exam pattern:

☐ Open-book exam

☑ Close-book exam

☐ Report/Thesis

☑ Process validation

OK

```java
Button button4 = (Button)findViewById(R.id.button4);
button4.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        checkItems = new boolean[]{false, true, false, true, false};
        items = new String[]{"Open-book exam", "Close-book exam", "Report/Thesis", "Process validation"};
        AlertDialog.Builder builder = new AlertDialog.Builder(MainActivity.this);
        builder.setIcon(R.drawable.advise2);
        builder.setTitle("Please choose your preferred exam pattern:");
        builder.setMultiChoiceItems(items, checkItems, new DialogInterface.OnMultiChoiceClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which, boolean isChecked) {
                checkItems[which] = isChecked;
            }
        });
        builder.setPositiveButton("Ok", new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {
                String result="";
                for(int i = 0; i < checkItems.length; i++){
                    if(checkItems[i]){
                        result += items[i]+", ";
                    }
                }
                if(!"".equals(result)){
                    result = result.substring(0, result.length()-1);
                    Toast.makeText(MainActivity.this, "You have chosen ["+result+"] ", Toast.LENGTH_SHORT).show();
                }
            }
        });
        builder.create().show();
    }
});
```

Notification class displaying notifications

- **With Notification class and NotificationManager class**

  - **Steps**

    - **Call getSystemService() method to get NotificationManager service**

    - **Create a Notification object**

    - **Set attributes of Notification object**
      setDefaults()
      setAutoCancel()
      setContentTitle()
      setContentText()
      setSmallIcon()
      setLargeIcon()
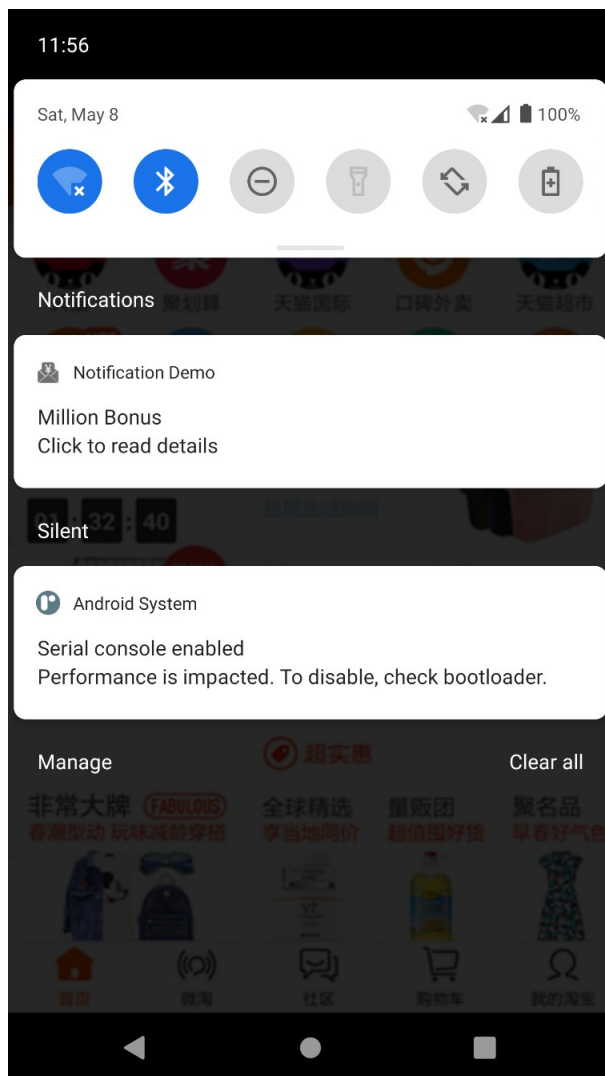   setContentIntent()

    - **Call notify() method of NotificationManager class to send out notification**

Small Demo


```xml
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="@drawable/background"
    tools:context="com.example.menuresource.MainActivity">
</RelativeLayout>
```

Small Demo


```java
public class MainActivity extends AppCompatActivity {
    final int NOTIFYID = 0x123;
    @RequiresApi(api = Build.VERSION_CODES.O)
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        final NotificationManager notificationManager = (NotificationManager)getSystemService(NOTIFICATION_SERVICE);
        Notification.Builder notification = new Notification.Builder(this);
        NotificationChannel channel = new NotificationChannel("1","my_channel", NotificationManager.IMPORTANCE_DEFAULT);
        channel.enableLights(true);
        channel.setLightColor(Color.BLUE);
        channel.setShowBadge(true);
        notificationManager.createNotificationChannel(channel);
        notification.setChannelId("1");
        notification.setAutoCancel(true);
        notification.setSmallIcon(R.drawable.packet);
        notification.setContentTitle("Million Bonus");
        notification.setContentText("Click to read details");
        notification.setDefaults(Notification.DEFAULT_SOUND|Notification.DEFAULT_VIBRATE);
        notification.setWhen(System.currentTimeMillis());
        Intent intent = new Intent(MainActivity.this, DetailActivity.class);
        PendingIntent pi = PendingIntent.getActivities(MainActivity.this, 0, new Intent[]{intent}, 0);
        notification.setContentIntent(pi);
        notificationManager.notify(NOTIFYID, notification.build());
    }
}
```
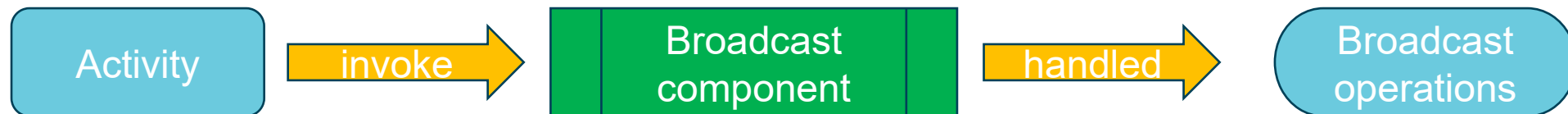
Small Demo


```xml
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="@drawable/img"
    tools:context="com.example.menuresource.DetailActivity">
</RelativeLayout>
```

```java
public class DetailActivity extends AppCompatActivity {
    @Override
    protected void onCreate(@Nullable Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_detail);
    }
}
```

BroadcastReceiver class

- **Broadcast makes multiple objects notified with messages**

  - **System broadcast**

    - **e.g., Open camera, low battery, new installation, etc.**

  - **Application broadcast**

    - **e.g., invoke new thread, file download completed, etc.**

- **BroadcastReceiver is the abstract base class for all the receivers**

  - **The implementation class equipped with filter to receive particular messages**

  - **When a message arrives,**

    - **BroadcastReceiver instance calls onReceive() method**

    - **After onReceive() method execution, the BroadcastReceiver instance expires**

| Activity | → invoke → | Broadcast component | → handled → | Broadcast operations |

Small Demo


```xml
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:background="@color/colorPrimaryDark"
    tools:context="com.example.broadcastreceiver.MainActivity">
    <Button
        android:id="@+id/Broadcast1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_centerInParent="true"
        android:text="@string/Broadcast1"/>
    <Button
        android:id="@+id/Broadcast2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_above="@id/Broadcast1"
        android:layout_centerHorizontal="true"
        android:text="@string/Broadcast2"/>
</RelativeLayout>
```
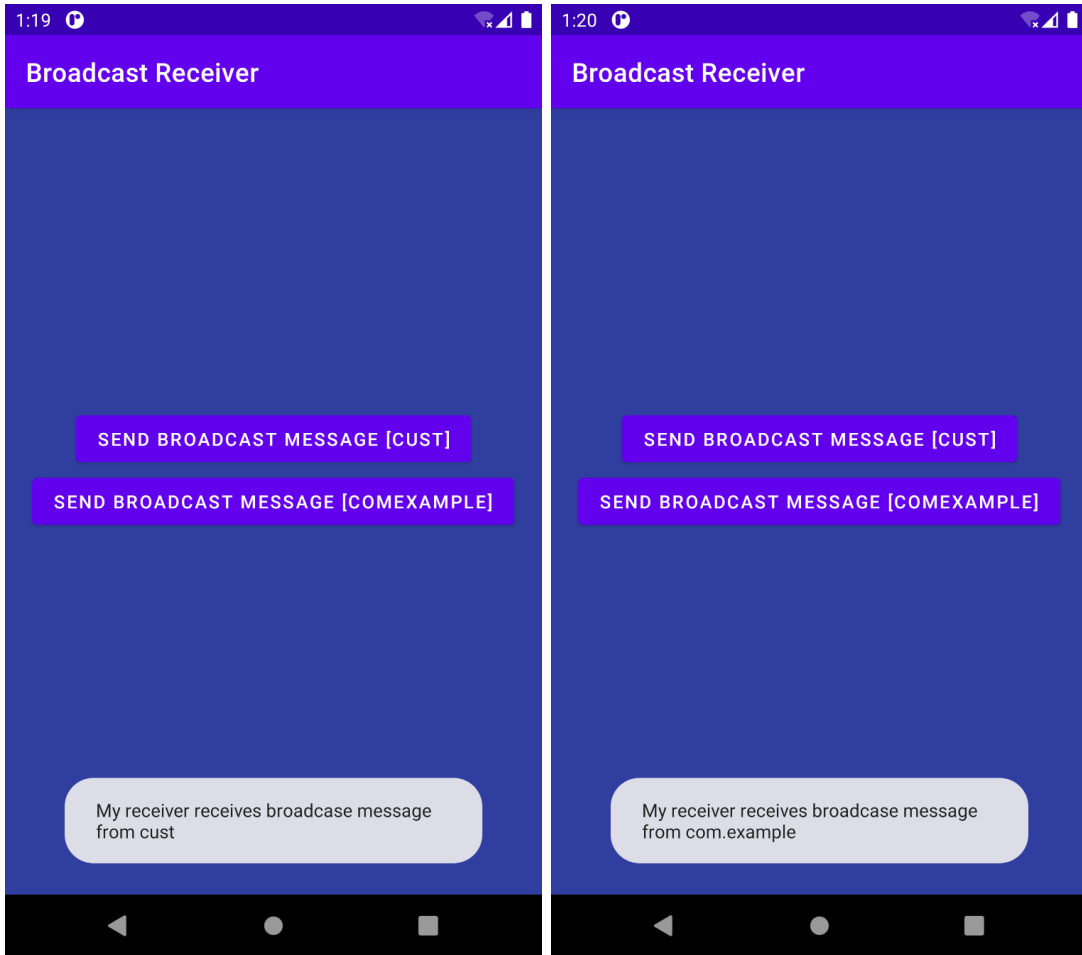
Small Demo


```java
public class MainActivity extends AppCompatActivity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        Button button1 = (Button)findViewById(R.id.Broadcast1);
        Button button2 = (Button)findViewById(R.id.Broadcast2);
        button1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent();
                intent.setAction("comexample");
                intent.setPackage(getPackageName());
                sendBroadcast(intent);
            }
        });
        button2.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent();
                intent.setAction("cust");
                intent.setPackage(getPackageName());
                sendBroadcast(intent);
            }
        });
    }
}
```

Small Demo

```xml
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.broadcastreceiver">
    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/Theme.ServiceApplication">
        <receiver
            android:name=".MyReceiver"
            android:enabled="true"
            android:exported="true">
            <intent-filter>
                <action android:name="comexample"></action>
                <action android:name="cust"></action>
            </intent-filter>
        </receiver>
        <activity android:name=".MainActivity">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

1:13

Broadcast Receiver

SEND BROADCAST MESSAGE [CUST]

SEND BROADCAST MESSAGE [COMEXAMPLE]

Small Demo


```java
public class MyReceiver extends BroadcastReceiver {
    private static final String action1 = "comexample";
    private static final String action2 = "cust";
    @Override
    public void onReceive(Context context, Intent intent) {
        // TODO: This method is called when the BroadcastReceiver is receiving
        // an Intent broadcast.
        if(intent.getAction().equals(action1)){
            Toast.makeText(context, "My receiver receives broadcase message from com.example", Toast.LENGTH_SHORT).show();
        }else if(intent.getAction().equals(action2)){
            Toast.makeText(context, "My receiver receives broadcase message from cust", Toast.LENGTH_SHORT).show();
        }
    }
}
```

AlarmManager class setting alarms

- **Used to popup a reminder in particular period or act particular operation**
  - ☐ **Provides a global timer to invoke Activity, Service and BroadcastRecever in particular moment or period**

- **With Context class obtaining getSystemService()**
  Context.getSystemService(Context.ALARM_SERVICE)

  - ☐ **After obtaining AlarmManager object, call the methods to configure the alarm for triggering it even though device is then hibernating or off**

  cancel(PendingIntent operation)
  set(int type, long triggerAtTime, PendingIntent operation)
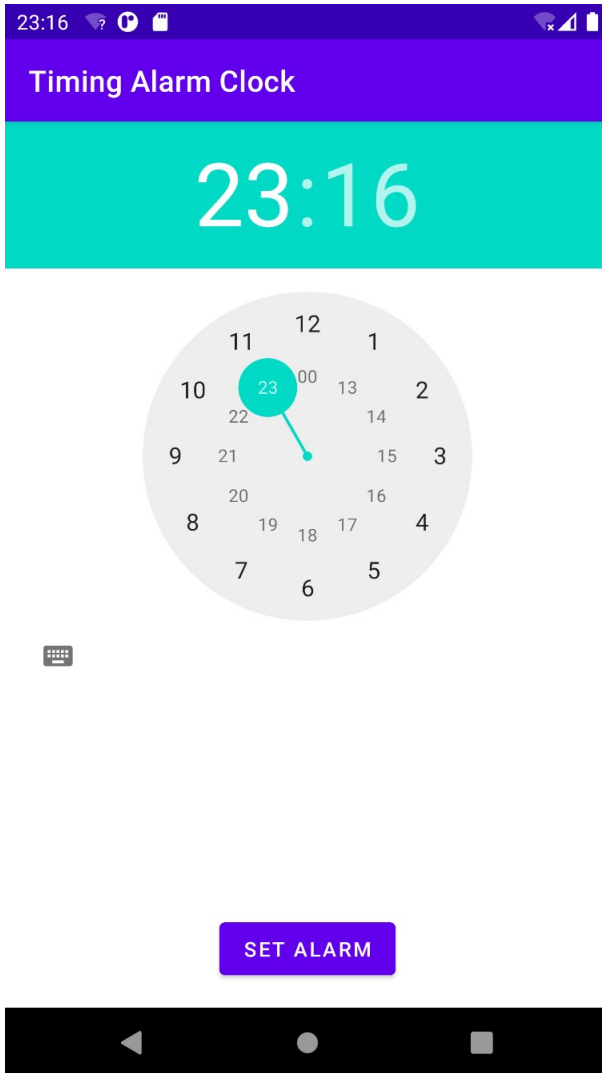 setInexactRepeating(int type, long triggerAtTime, long interval, PendingIntent operation)
  setRepeating(int type, long triggerAtTime, long interval, PendingIntent operation)
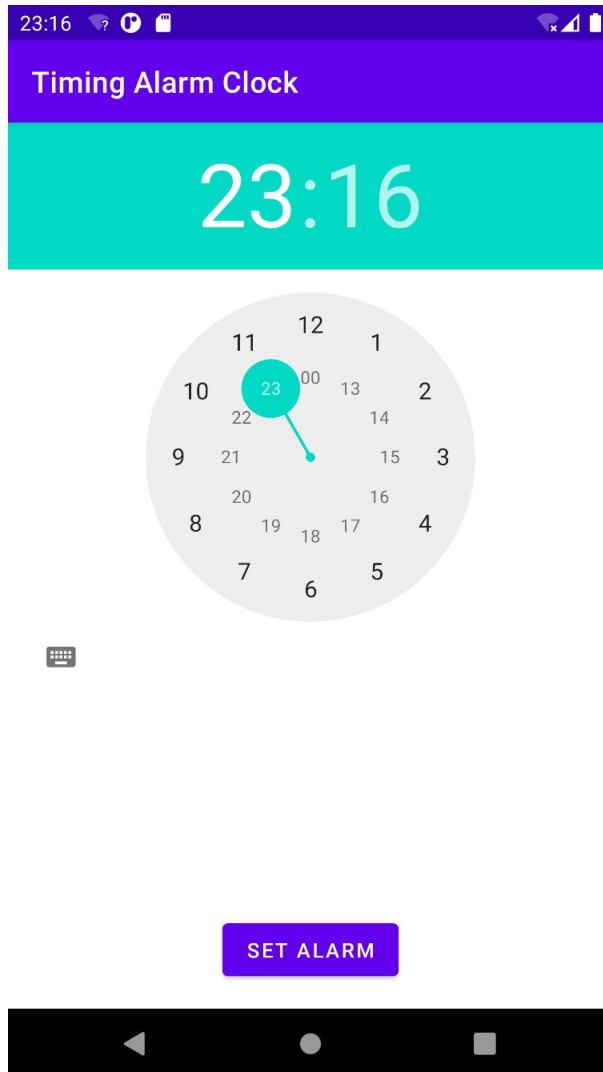 setTime(long millis)
  setTimeZone(String timeZone)

Type	Description
ELAPSED_REALTIME	✓ Trigger reminder in the preset period ✓ Does not disturb hibernation ✓ Call SystemClock.elapsedRealtime()
ELAPSED_REALTIME_WAKEUP	✓ Trigger reminder in the preset period ✓ Do disturb hibernation ✓ Call SystemClock.elapsedRealtime()
RTC	✓ Trigger reminder when System.currentTimeMillis() equaling to tiggerAtTime ✓ Does not disturb hibernation ✓ Call System.currentTimeMillis()
RTC_WAKEUP	✓ Trigger reminder when System.currentTimeMillis() equaling to tiggerAtTime ✓ Do disturb hibernation ✓ Call System.currentTimeMillis()

Small Demo


```xml
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="@dimen/activity_vertical_margin"
    tools:context="com.example.timingalarmclock.MainActivity">
    <TimePicker
        android:id="@+id/timePicker1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />
    <Button
        android:id="@+id/button1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignParentBottom="true"
        android:layout_centerHorizontal="true"
        android:text="Set Alarm" />
</RelativeLayout>
```
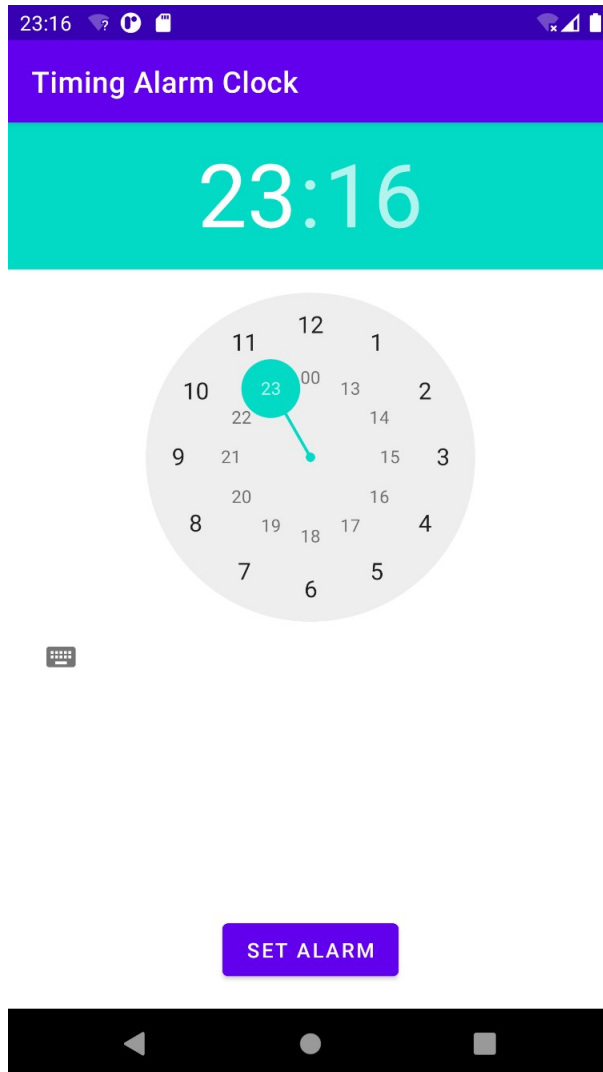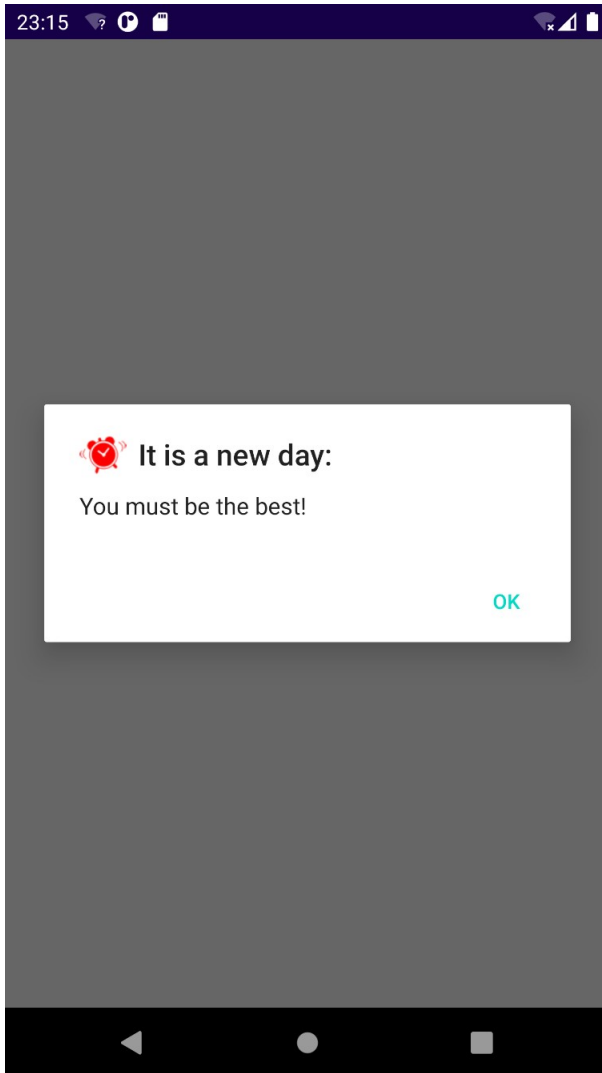
Small Demo


```java
public class MainActivity extends AppCompatActivity {
    TimePicker timePicker;
    Calendar c;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        c = Calendar.getInstance();
        timePicker = (TimePicker)findViewById(R.id.timePicker1);
        timePicker.setIs24HourView(true);
        Button button = (Button)findViewById(R.id.button1);
        button.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(MainActivity.this, AlarmActivity.class);
                PendingIntent pendingIntent = PendingIntent.getActivity(MainActivity.this, 0, intent,0);
                AlarmManager alarmManager = (AlarmManager)getSystemService(Context.ALARM_SERVICE);
                c.set(Calendar.HOUR_OF_DAY, timePicker.getCurrentHour());
                c.set(Calendar.MINUTE, timePicker.getCurrentMinute());
                c.set(Calendar.SECOND, 0);
                alarmManager.set(AlarmManager.RTC_WAKEUP, c.getTimeInMillis(), pendingIntent);
                Toast.makeText(MainActivity.this,"Successfully set alarm", Toast.LENGTH_SHORT).show();
            }
        });
    }
}
```

Small Demo

```java
public class MainActivity extends AppCompatActivity {
    TimePicker timePicker;
    Calendar c;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        c = Calendar.getInstance();
        timePicker = (TimePicker)findViewById(R.id.timePicker1);
        timePicker.setIs24HourView(true);
        Button button = (Button)findViewById(R.id.button1);
        button.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(MainActivity.this, AlarmActivity.class);
                PendingIntent pendingIntent = PendingIntent.getActivity(MainActivity.this, 0, intent,0);
                AlarmManager alarmManager = (AlarmManager)getSystemService(Context.ALARM_SERVICE);
                c.set(Calendar.HOUR_OF_DAY, timePicker.getCurrentHour());
                c.set(Calendar.MINUTE, timePicker.getCurrentMinute());
                c.set(Calendar.SECOND, 0);
                alarmManager.set(AlarmManager.RTC_WAKEUP, c.getTimeInMillis(), pendingIntent);
                Toast.makeText(MainActivity.this,"Successfully set alarm", Toast.LENGTH_SHORT).show();
            }
        });
    }
}
```

Small Demo

```java
public class AlarmActivity extends Activity {
    @Override
    protected void onCreate(@Nullable Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        AlertDialog alertDialog = new AlertDialog.Builder(this).create();
        alertDialog.setIcon(R.drawable.alarm);
        alertDialog.setTitle("It is a new day: ");
        alertDialog.setMessage("You must be the best!");
        alertDialog.setButton(DialogInterface.BUTTON_POSITIVE, "OK", new DialogInterface.OnClickListener() {
            @Override
            public void onClick(DialogInterface dialog, int which) {

            }
        });
        alertDialog.show();
    }
}
```

```xml
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
        package="com.example.timingalarmclock">
        <application
            android:allowBackup="true"
            android:icon="@mipmap/ic_launcher"
            android:label="@string/app_name"
            android:roundIcon="@mipmap/ic_launcher_round"
            android:supportsRtl="true"
            android:theme="@style/Theme.ServiceApplication">
            <activity android:name=".MainActivity">
                <intent-filter>
                    <action android:name="android.intent.action.MAIN" />

                    <category android:name="android.intent.category.LAUNCHER" />
                </intent-filter>
            </activity>
            <activity android:name=".AlarmActivity"
                android:label="@string/clock"></activity>
        </application>
</manifest>
```