CS378 - Mobile Computing

Audio

Android Audio

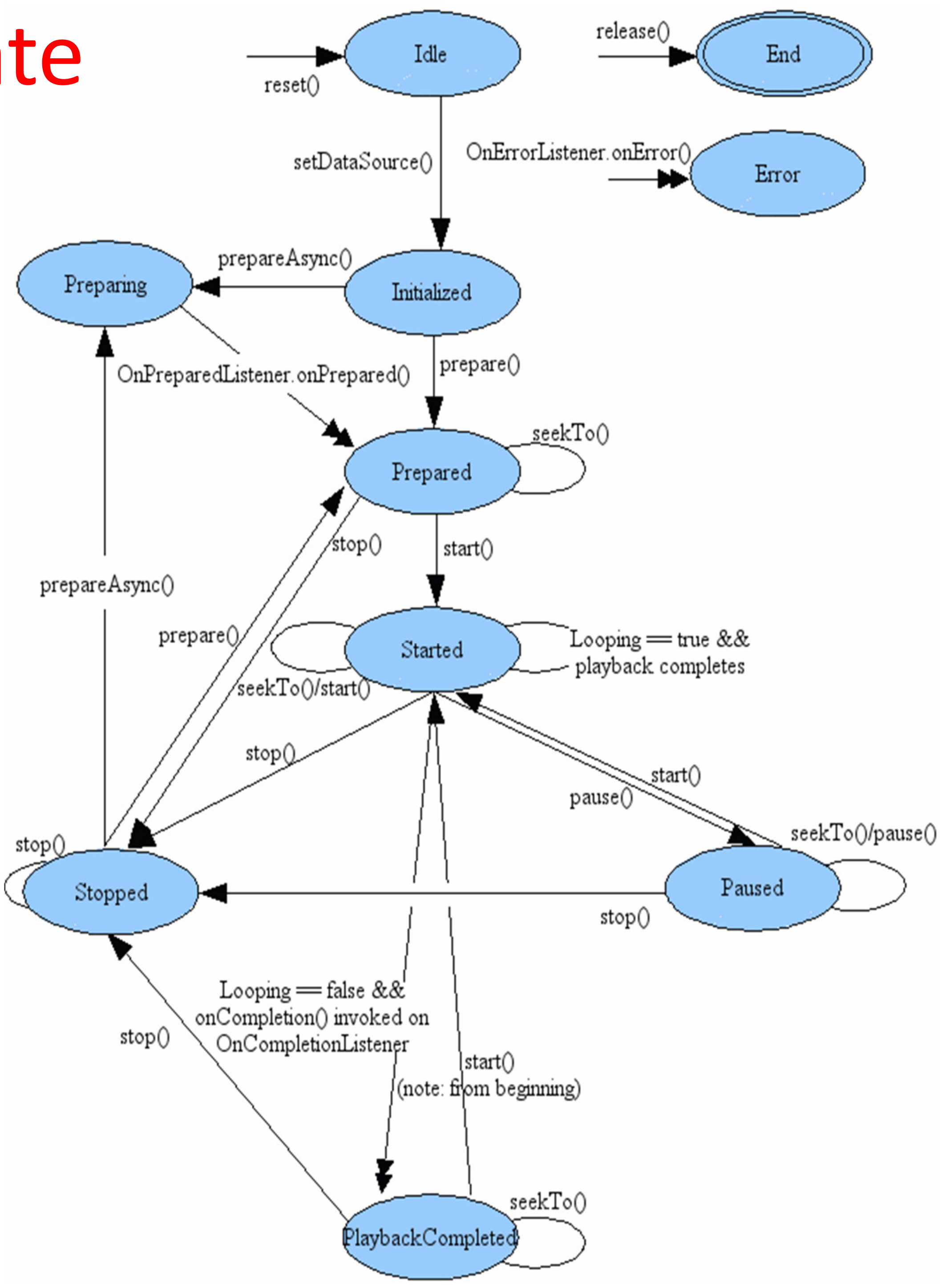
- Use the MediaPlayer class
- Common Audio Formats supported:
  - MP3, MIDI (.mid and others), Vorbis (.ogg), WAVE (.wav) and others
- Sources of audio
  - local resources (part of app)
  - internal URIs (Content Provider for other audio available)
  - External URLs (streaming)

MediaPlayer

- Playback control of MediaPlayer managed as a state machine
- Idle
- Initialized
- Preparing
- Prepared
- Started
- Paused
- Playback Complete
- Stopped
- End
- Invalid state transitions result in errors

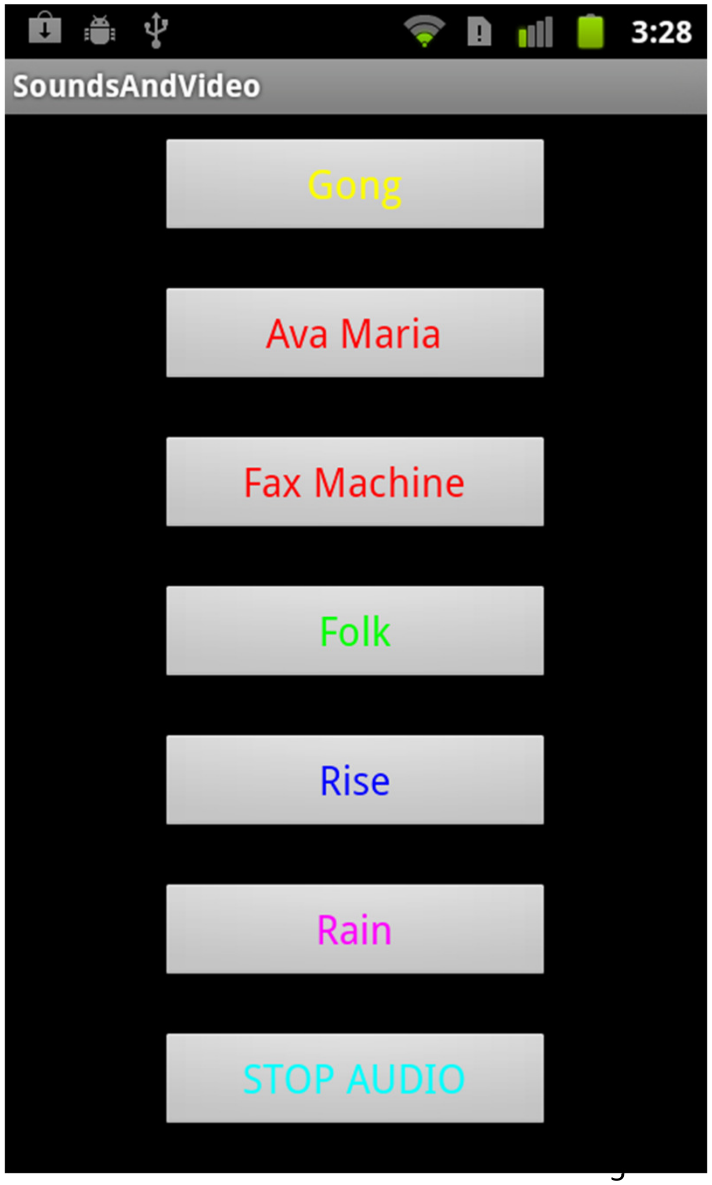
MediaPlayer State Diagram

- Single arrows are synchronous transitions
- Double arrows are asynchronous transitions



Simple Sound Demo App

- audio files local to app placed in res/raw
- CAUTION
  - large sound files difficult to install on emulator:
  - http://tinyurl.com/3pwljfj
  - better success with dev phones / actual devices

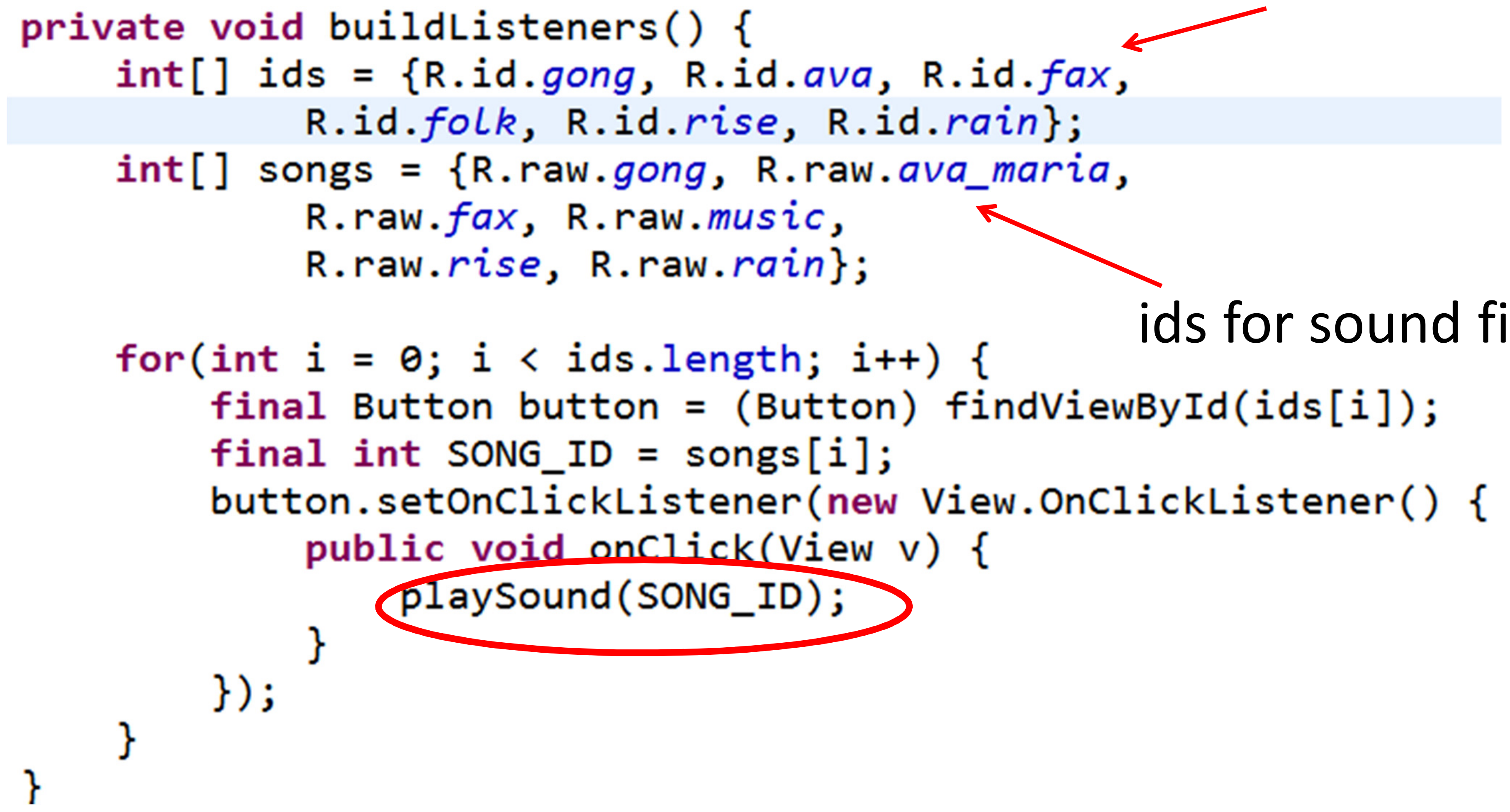


Playing Local Audio

- To play audio local to the app
- use the MediaPlayer.create convenience method
  - when complete MediaPlayer in the **prepared** state
- start MediaPlayer
- approach:
  - build listeners for each button to call the playSound method with appropriate song id when clicked

Simple Approach

button ids



```
private void buildListeners() {
    int[] ids = {R.id.gong, R.id.ava, R.id.fax,
            R.id.folk, R.id.rise, R.id.rain};
    int[] songs = {R.raw.gong, R.raw.ava_maria,
            R.raw.fax, R.raw.music,
            R.raw.rise, R.raw.rain};

    for(int i = 0; i < ids.length; i++) {
        final Button button = (Button) findViewById(ids[i]);
        final int SONG_ID = songs[i];
        button.setOnClickListener(new View.OnClickListener() {
            public void onClick(View v) {
                playSound(SONG_ID);
            }
        });
    }
}
```

ids for sound files

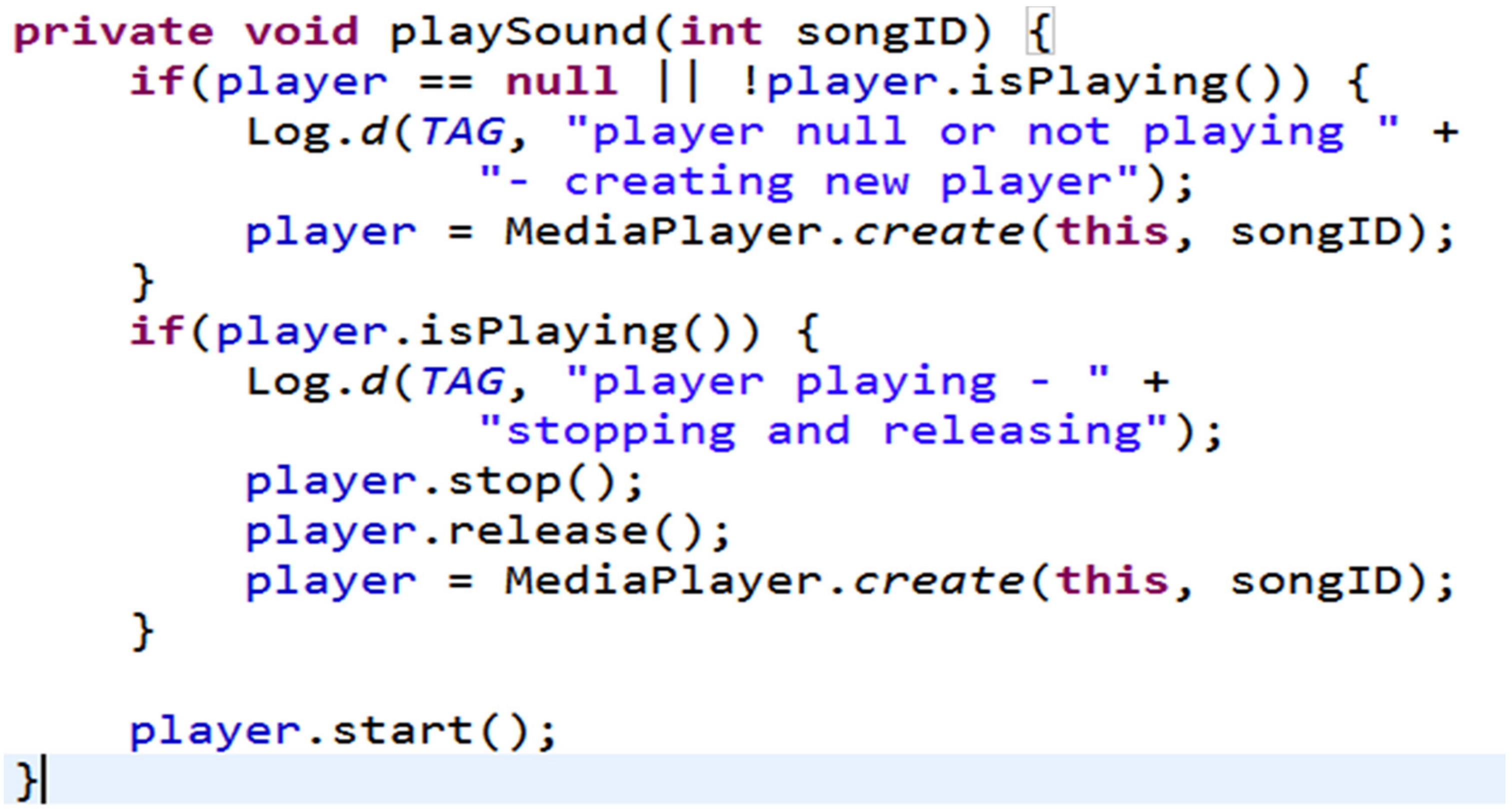
playSound method

```
private void playSound(int songID) {
    MediaPlayer mediaPlayer = MediaPlayer.create(this, songID);
    mediaPlayer.start();
    // no need to call prepare(); create() does that for you
}
```

- okay for *short* sounds
- downsides:
  - plays to completion
  - multiple sounds play at same time (desirable in some cases)
  - audio continues to play when app paused

Changing Behavior

- Add instance variable for MediaPlayer
- If playing stop and release before creating new Player



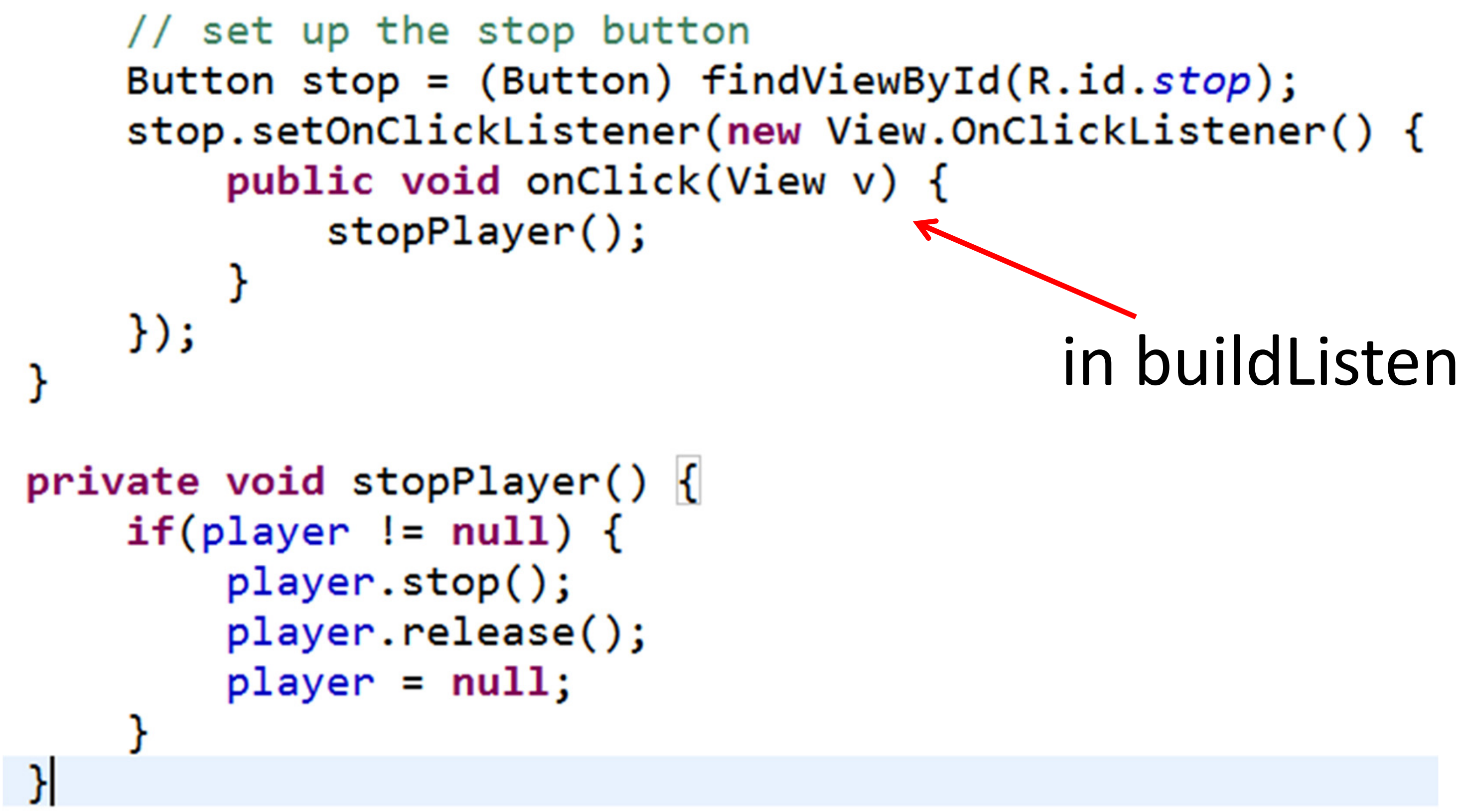
```
private void playSound(int songID) {
    if(player == null || !player.isPlaying()) {
        Log.d(TAG, "player null or not playing " +
                "- creating new player");
        player = MediaPlayer.create(this, songID);
    }
    if(player.isPlaying()) {
        Log.d(TAG, "player playing - " +
                "stopping and releasing");
        player.stop();
        player.release();
        player = MediaPlayer.create(this, songID);
    }

    player.start();
}
```

Cleaning Up

- Current version does not end well
- Audio continues to play if back button pressed and even if home button pressed!
- Activity Life Cycle
- on pause we should stop MediaPlayer and release

stopPlayer method

- Connect app stop button to stopPlayer
  - could use XML onClick and add View parameter or set up listener ourselves



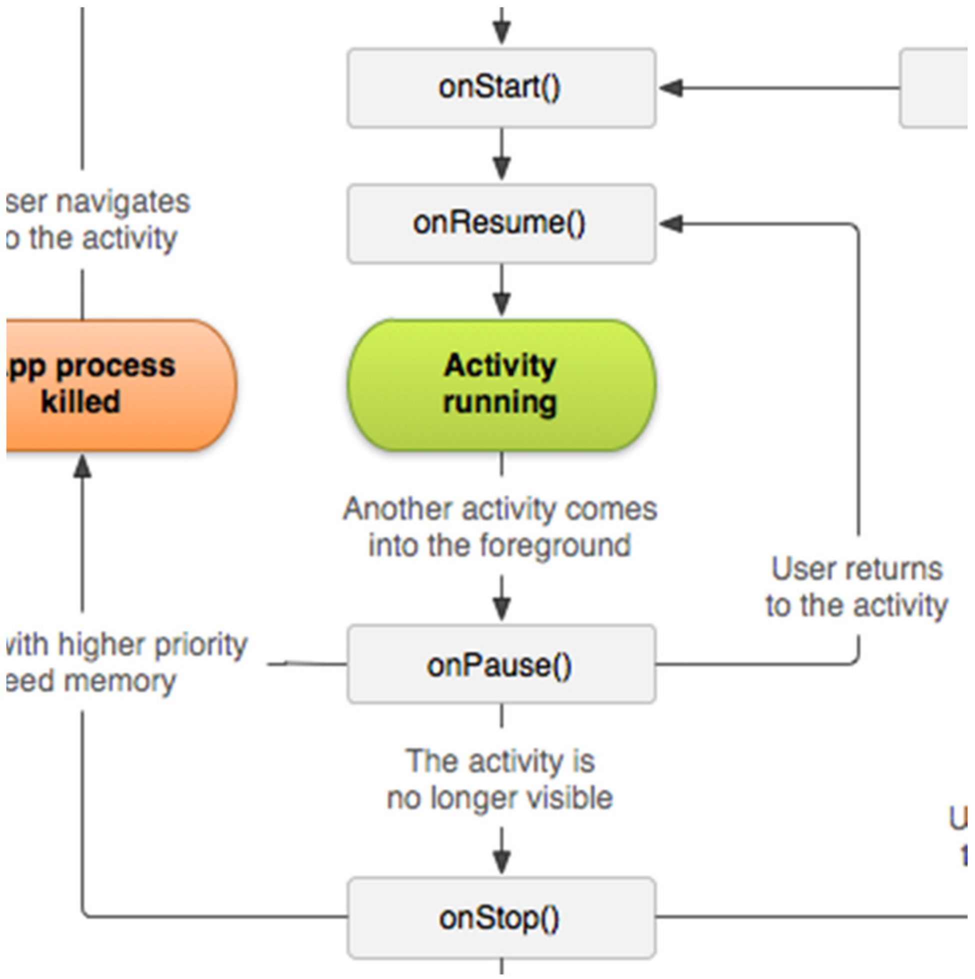
```
    // set up the stop button
    Button stop = (Button) findViewById(R.id.stop);
    stop.setOnClickListener(new View.OnClickListener() {
        public void onClick(View v) {
            stopPlayer();
        }
    });
}

private void stopPlayer() {
    if(player != null) {
        player.stop();
        player.release();
        player = null;
    }
}
```

in buildListeners method

onPause

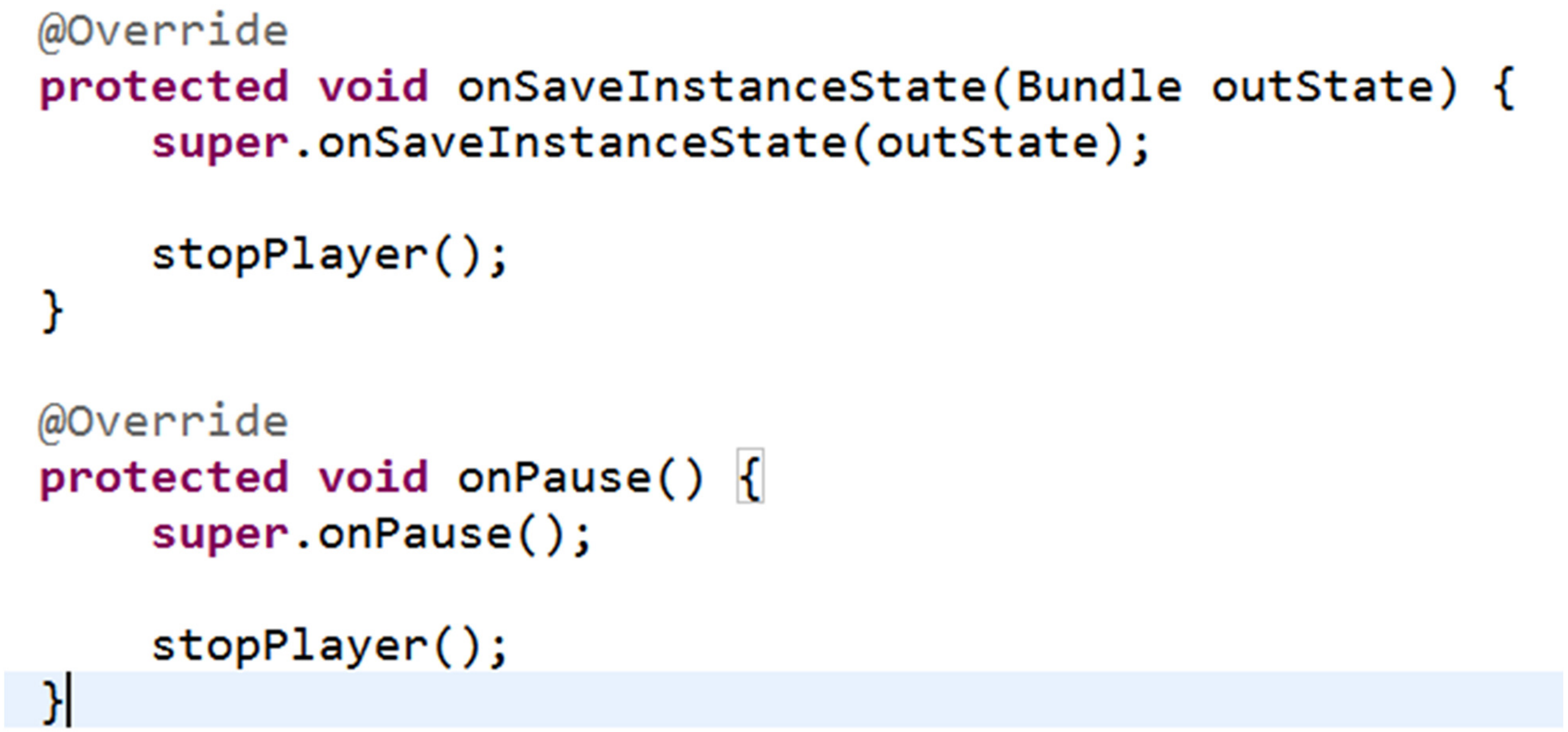
- onPause() should call the stopPlayer method
- what happens if activity resumed?

```
@Override
protected void onPause() {
    super.onPause();
    // stop the music!!
    stopPlayer();
}
```



Saving State

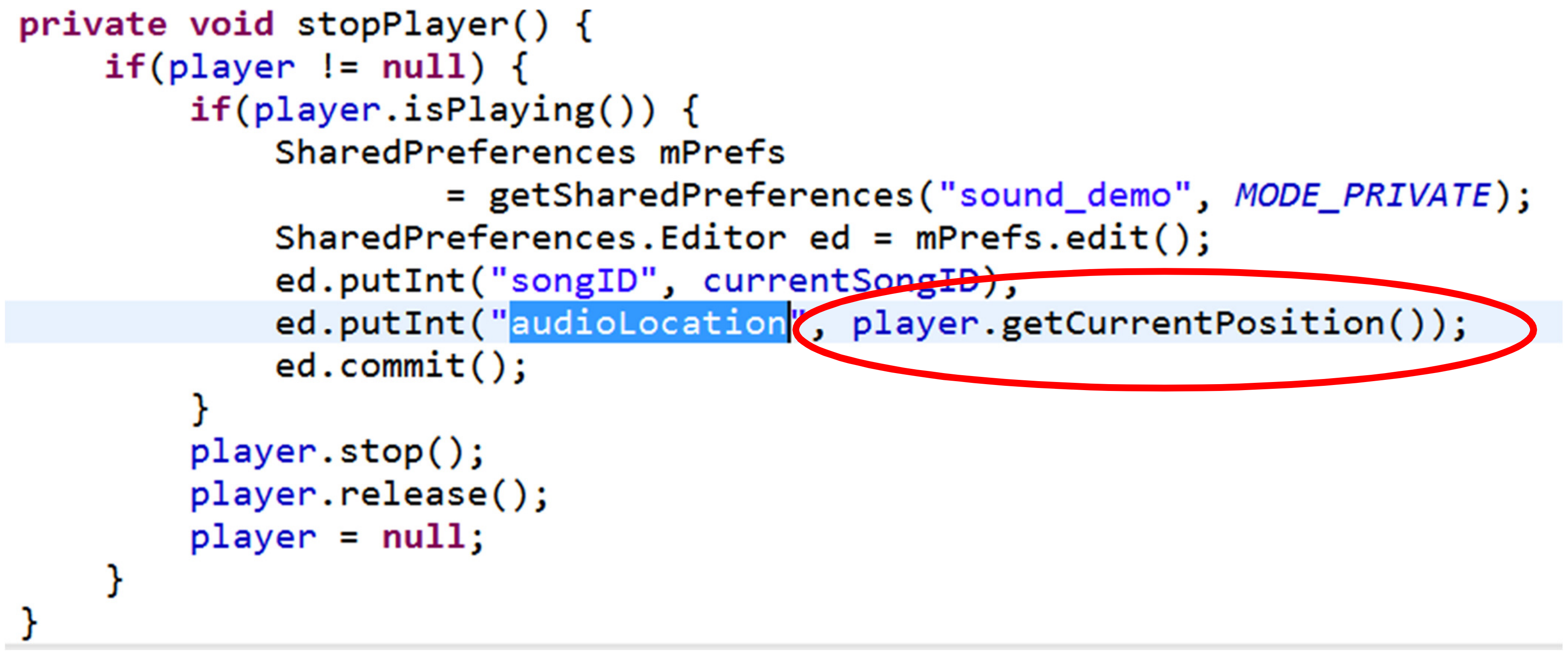
- Resume music where we left off if paused or activity destroyed due to orientation change



```
@Override
protected void onSaveInstanceState(Bundle outState) {
    super.onSaveInstanceState(outState);

    stopPlayer();
}

@Override
protected void onPause() {
    super.onPause();

    stopPlayer();
}
```

Saving MediaPlayer State

- Not a lot of data so used the SharedPreferences



```
private void stopPlayer() {
    if(player != null) {
        if(player.isPlaying()) {
            SharedPreferences mPrefs
                    = getSharedPreferences("sound_demo", MODE_PRIVATE);
            SharedPreferences.Editor ed = mPrefs.edit();
            ed.putInt("songID", currentSongID);
            ed.putInt("audioLocation", player.getCurrentPosition());
            ed.commit();
        }
        player.stop();
        player.release();
        player = null;
    }
}
```

Restarting Audio

- In onCreate check if audio was interrupted recreate player with same id and move to correct position
- Can write data to shared preferences or bundle (onSaveInstanceState) and pull out in onCreate
- Possible fix for orientation changes
  - in app manifest file under activity field

    android:configChanges=*"orientation"*

    - But now we are responsible for orientation changes
    - http://developer.android.com/guide/topics/resources/runtime-changes.html#HandlingTheChange

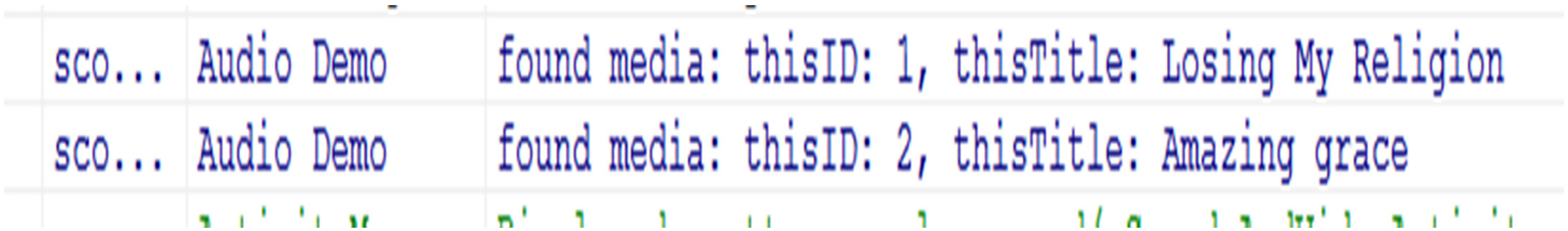
Playing Audio from Phone

- If audio is on device / system, but not local to app use a URI
- Obtain URIs of Music via a Content resolver
- Example of simply listing URIs to the logcat

Retrieving Music URIs

```java
private void showContent() {
    ContentResolver contentResolver = getContentResolver();
    Uri uri = android.provider.MediaStore.Audio.Media.EXTERNAL_CONTENT_URI;
    Cursor cursor = contentResolver.query(uri, null, null, null, null);
    if (cursor == null) {
        Log.d(TAG, "cursor == null, query falied");
    } else if (!cursor.moveToFirst()) {
        Log.d(TAG, "no media on the device");
    } else {
        int titleColumn
            = cursor.getColumnIndex(android.provider.MediaStore.Audio.Media.TITLE);
        int idColumn
            = cursor.getColumnIndex(android.provider.MediaStore.Audio.Media._ID);
        do {
           long thisId = cursor.getLong(idColumn);
           String thisTitle = cursor.getString(titleColumn);
           Log.d(TAG, "found media: thisID: "
                   + thisId + ", thisTitle: " + thisTitle);
        } while (cursor.moveToNext());
    }
}
```

MediaPlayer and System Audio

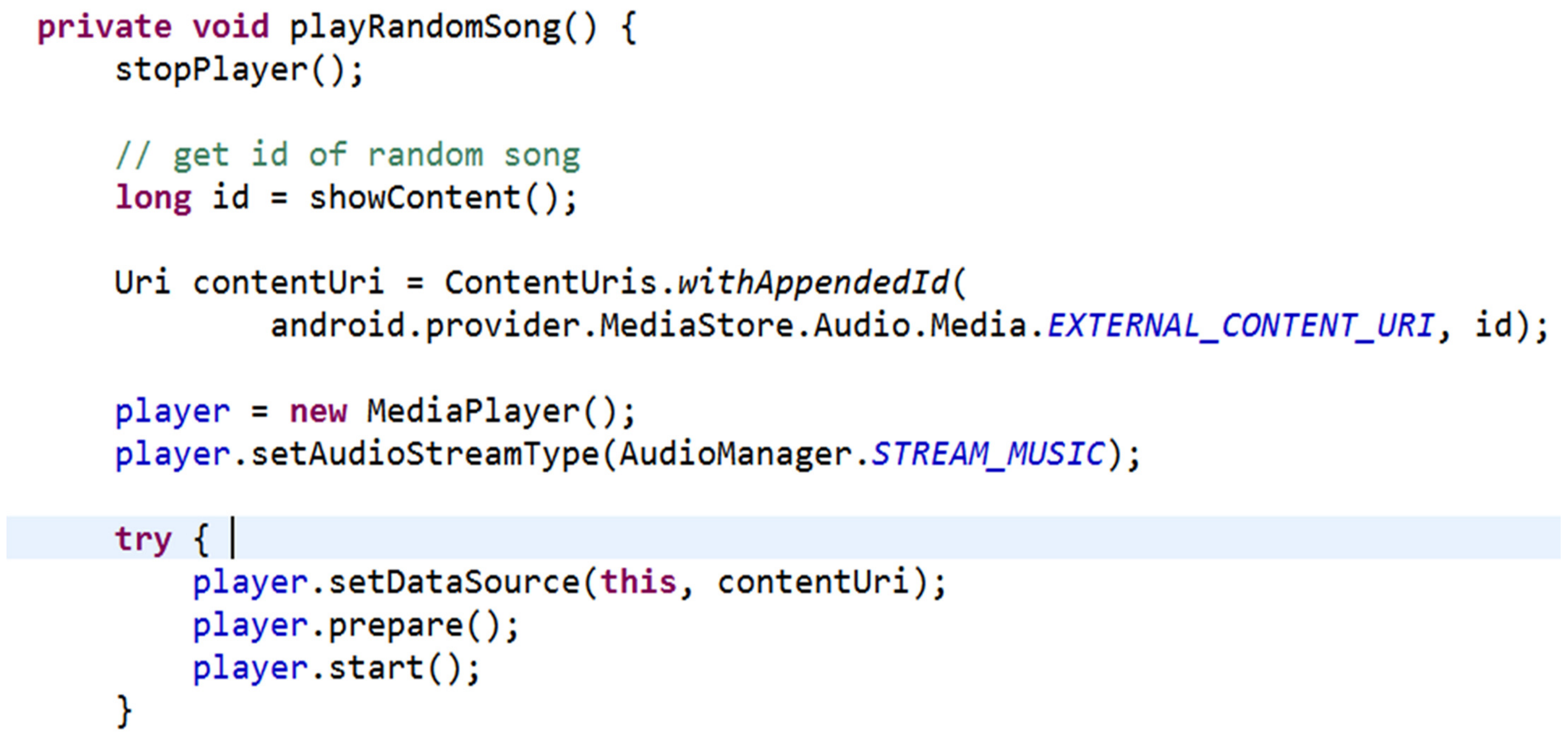


```
sco... Audio Demo    found media: thisID: 1, thisTitle: Losing My Religion
sco... Audio Demo    found media: thisID: 2, thisTitle: Amazing grace
```

- After URI retrieved can play audio with MediaPlayer
- this approach requires calling prepare yourself
  - no convenience method

Playing Audio Via Local URI

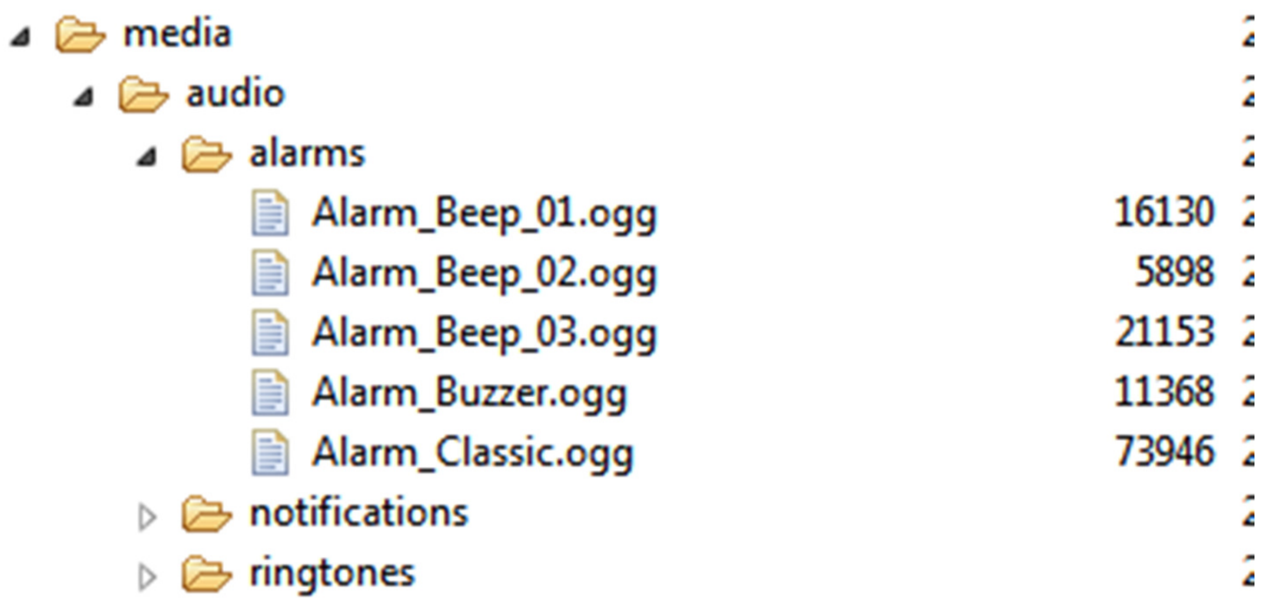
- id obtained via approach from showContent method



```java
private void playRandomSong() {
    stopPlayer();

    // get id of random song
    long id = showContent();

    Uri contentUri = ContentUris.withAppendedId(
            android.provider.MediaStore.Audio.Media.EXTERNAL_CONTENT_URI, id);

    player = new MediaPlayer();
    player.setAudioStreamType(AudioManager.STREAM_MUSIC);

    try {
        player.setDataSource(this, contentUri);
        player.prepare();
        player.start();
    }
```

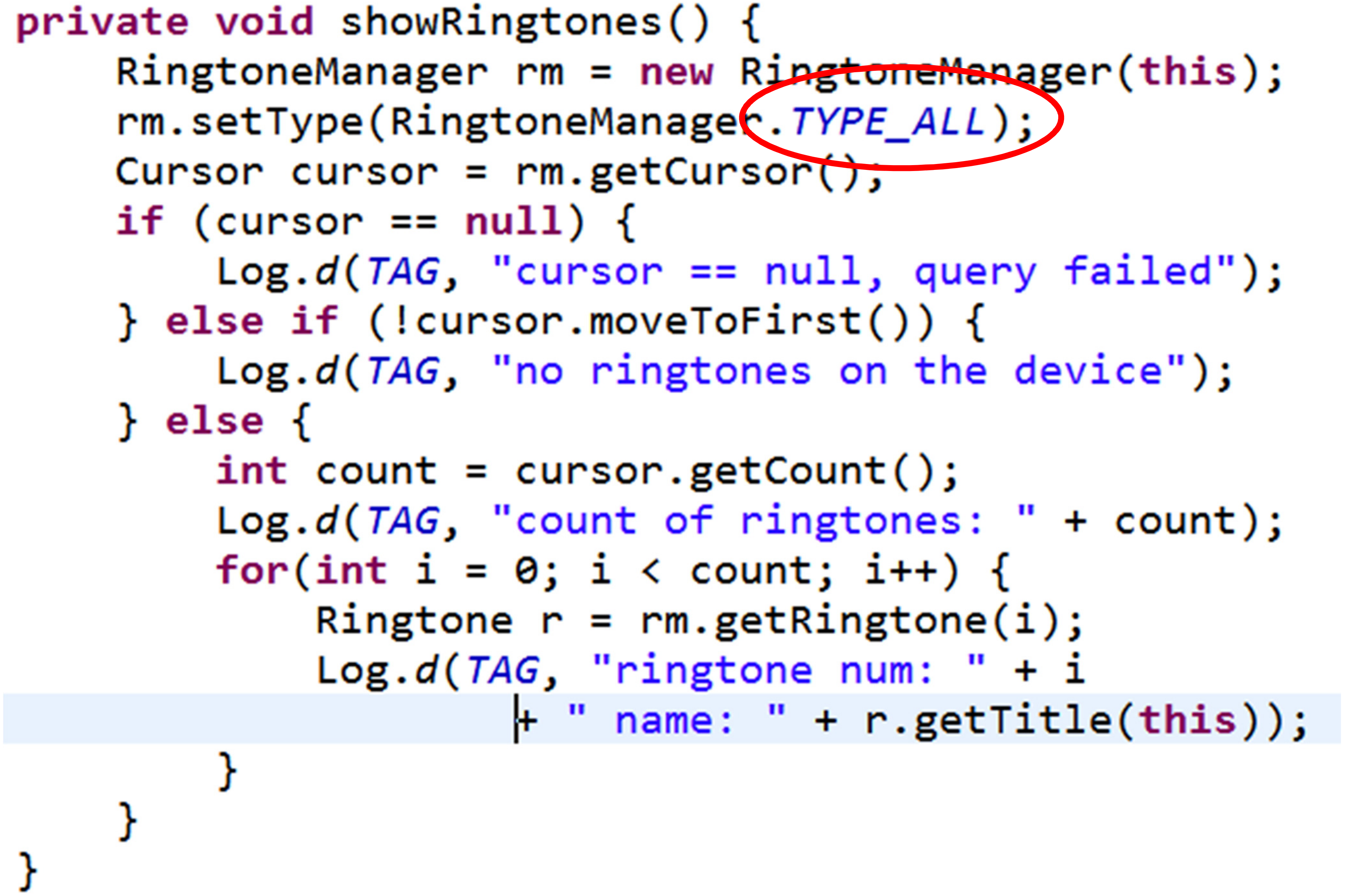
Other Audio

- Other audio for ringtones, notifications, and alarms can be accessed via a RingtoneManager
- Obtain URIs and play with media player
- from DDMS:



```
◢ media
   ◢ audio
      ◢ alarms
            Alarm_Beep_01.ogg     16130
            Alarm_Beep_02.ogg      5898
            Alarm_Beep_03.ogg     21153
            Alarm_Buzzer.ogg      11368
            Alarm_Classic.ogg     73946
      ▷ notifications
      ▷ ringtones
```

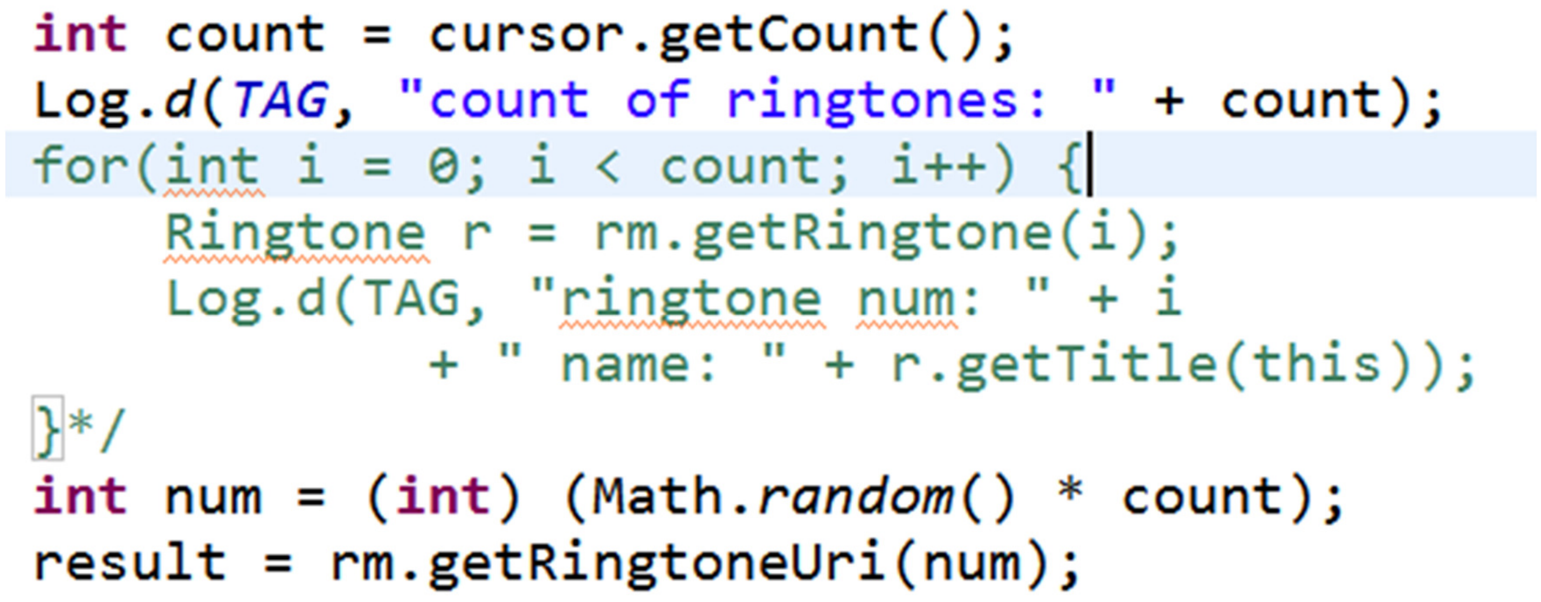
Listing Other Audio



```
private void showRingtones() {
    RingtoneManager rm = new RingtoneManager(this);
    rm.setType(RingtoneManager.TYPE_ALL);
    Cursor cursor = rm.getCursor();
    if (cursor == null) {
        Log.d(TAG, "cursor == null, query failed");
    } else if (!cursor.moveToFirst()) {
        Log.d(TAG, "no ringtones on the device");
    } else {
        int count = cursor.getCount();
        Log.d(TAG, "count of ringtones: " + count);
        for(int i = 0; i < count; i++) {
            Ringtone r = rm.getRingtone(i);
            Log.d(TAG, "ringtone num: " + i
                    + " name: " + r.getTitle(this));
        }
    }
}
```

Playing Other Audio

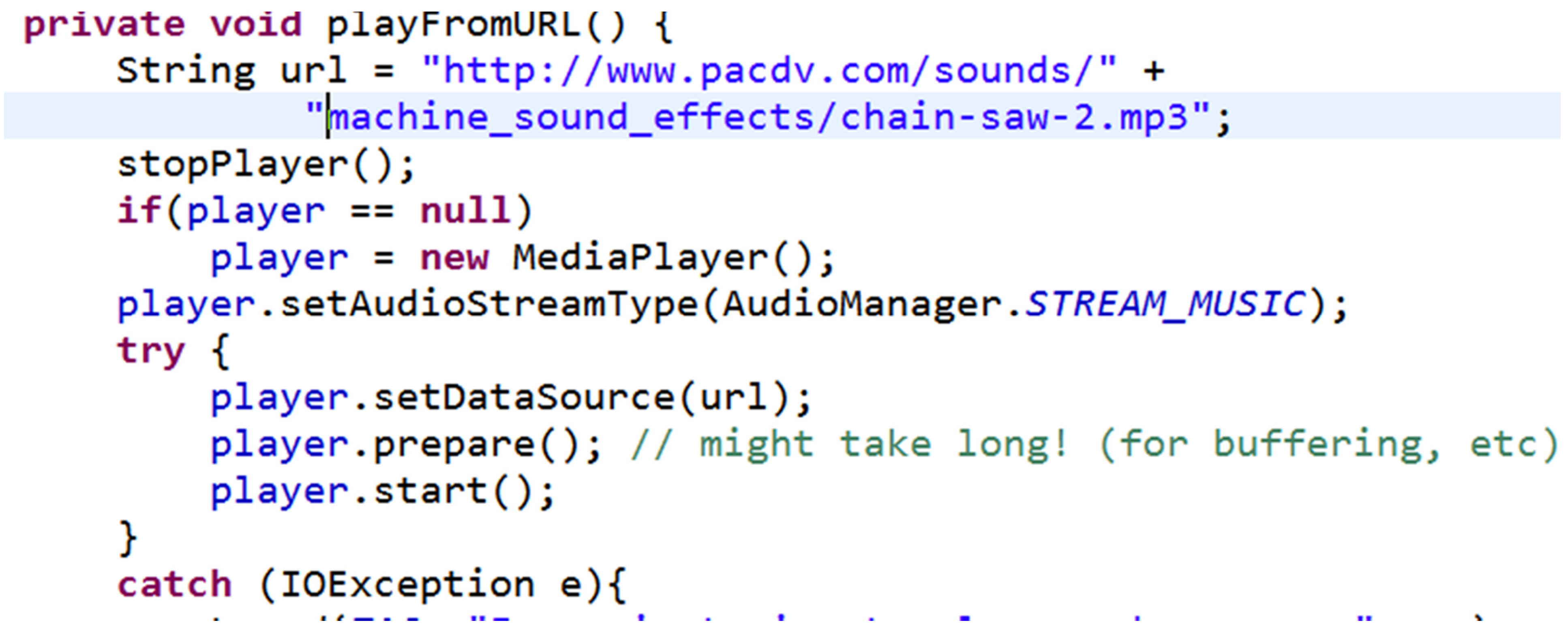
- Once the URI is obtained, playing other audio is same as playing song



```
int count = cursor.getCount();
Log.d(TAG, "count of ringtones: " + count);
for(int i = 0; i < count; i++) {
    Ringtone r = rm.getRingtone(i);
    Log.d(TAG, "ringtone num: " + i
            + " name: " + r.getTitle(this));
}*/
int num = (int) (Math.random() * count);
result = rm.getRingtoneUri(num);
```

Playing Audio from Remote URL

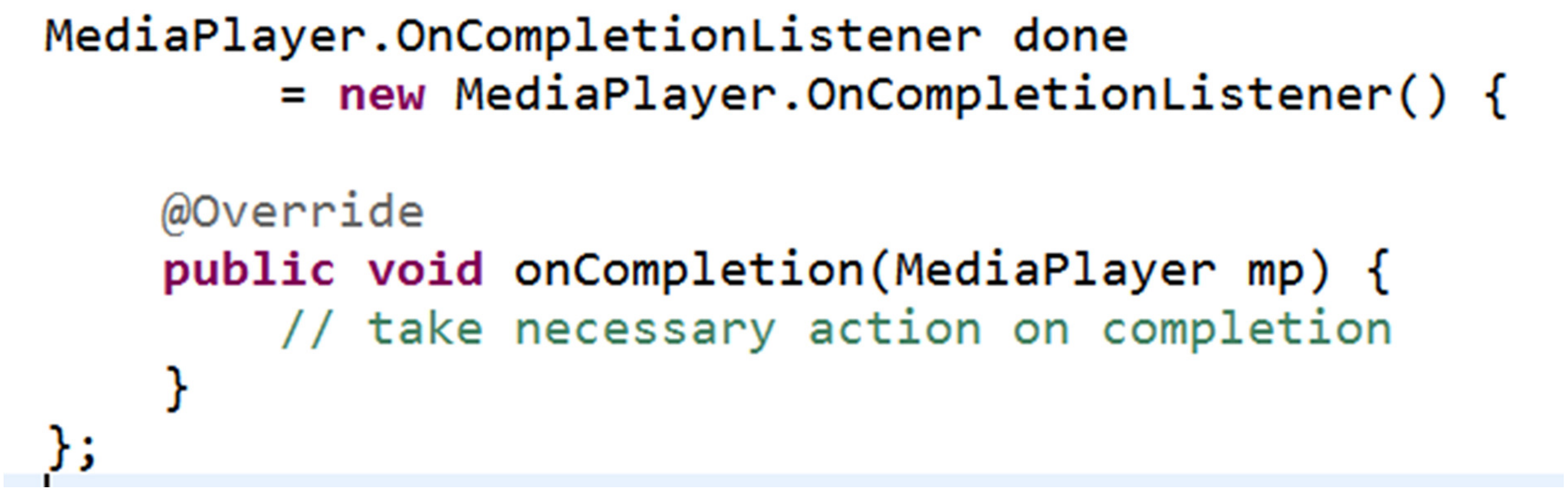
- Straightforward given the URL



```
private void playFromURL() {
    String url = "http://www.pacdv.com/sounds/" +
            "machine_sound_effects/chain-saw-2.mp3";
    stopPlayer();
    if(player == null)
        player = new MediaPlayer();
    player.setAudioStreamType(AudioManager.STREAM_MUSIC);
    try {
        player.setDataSource(url);
        player.prepare(); // might take long! (for buffering, etc)
        player.start();
    }
    catch (IOException e){
```

Completion of Audio

- If action required when audio done playing implement the MediaPlayer.onCompletionListener interface



```java
MediaPlayer.OnCompletionListener done
        = new MediaPlayer.OnCompletionListener() {

    @Override
    public void onCompletion(MediaPlayer mp) {
        // take necessary action on completion
    }
};
```

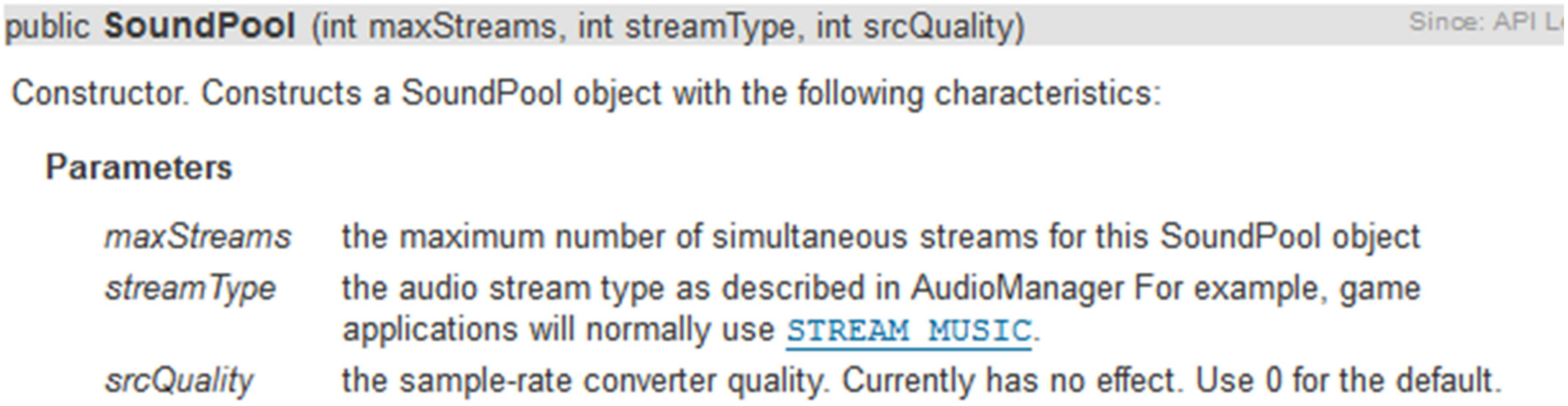
- could make activity the listener

Looping

- to loop sound (play over and over) simply set the isLooping method of the MediaPlayer to true

SoundPool

- Another Android class


public **SoundPool** (int maxStreams, int streamType, int srcQuality) Since: API L

Constructor. Constructs a SoundPool object with the following characteristics:

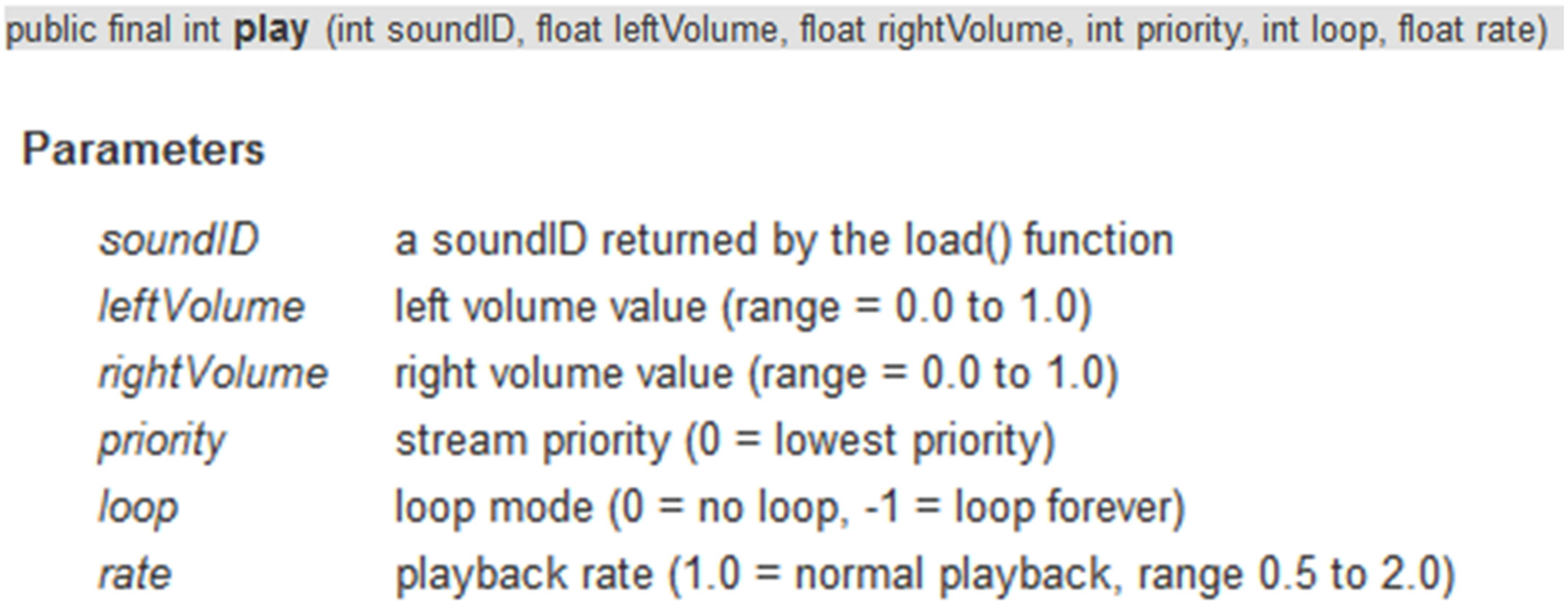
Parameters

maxStreams	the maximum number of simultaneous streams for this SoundPool object
streamType	the audio stream type as described in AudioManager For example, game applications will normally use `STREAM_MUSIC`.
srcQuality	the sample-rate converter quality. Currently has no effect. Use 0 for the default.

Using SoundPool

- Great for applications with a number of short sound samples
- maxStreams parameter sets maximum number of sounds that can be played at once via this SoundPool
- If max is exceeded stream with lowest priority stopped
  - and then by age (oldest) with lowest priority

SoundPool play



public final int **play** (int soundID, float leftVolume, float rightVolume, int priority, int loop, float rate)

Parameters

soundID	a soundID returned by the load() function
leftVolume	left volume value (range = 0.0 to 1.0)
rightVolume	right volume value (range = 0.0 to 1.0)
priority	stream priority (0 = lowest priority)
loop	loop mode (0 = no loop, -1 = loop forever)
rate	playback rate (1.0 = normal playback, range 0.5 to 2.0)

Using SoundPool

- Looping of sounds:
  - 0 no looping
  - -1 loop forever
  - >0, play that many times
- frequency (speed) can be changed
  - range from 0.5 to 2.0
  - 0.5 twice as long to play
  - 2.0 half as long to play