# CMSC436: Programming Handheld Systems

# Alarms

# Today’s Topics

Alarms

AlarmManager APIs

Alarm Types

Example Application

# Alarms

Mechanism for sending Intents at some point in the future

Allows one application to make code execute, even when that application is no longer running

# Alarms

Once registered, Alarms remain active even if the device is asleep

Can configure Alarms to wake a sleeping device

Alarms are canceled on device shutdown/restart

# Alarm Examples

MMS - Retry Scheduler

Settings - Bluetooth Discoverable timeout

Phone - User Info Cache

# AlarmManager

You create and manage Alarms by interacting with the AlarmManager

Get a reference to the AlarmManager by calling the Context class’

```
getSystemService(Context.ALARM_SERVICE)
```

# Creating Alarms

```
// One-shot Alarm with inexact timing. If there is already an alarm
// scheduled for the same IntentSender, that previous alarm will first
// be canceled

open fun set(type: Int, triggerAtMillis: Long,
                                        operation: PendingIntent!): Unit
```

# Creating Alarms

```
// One-shot Alarm with exact timing

open fun setExact(type: Int, triggerAtMillis: Long,
                                        operation: PendingIntent!): Unit
```

# Creating Alarms

```
// Repeating alarm with inexact timing

open fun setRepeating(type: Int, triggerAtMillis: Long,
                      intervalMillis: Long, operation: PendingIntent!): Unit
```

# Alarm Types

- Two degrees of configurability
  - How to interpret time
  - What to do if the device is sleeping when the Alarm fires

# Interpreting Time

Realtime - relative to system clock

Elapsed - relative to time since last boot up

# Sleeping Devices

When Alarm fires and device is asleep, can either

- Wake up device now & deliver Intent
- Wait to deliver Intent until device wakes up

# Alarm Type Constants

RTC_WAKEUP

RTC

ELAPSED_REALTIME

ELAPSED_REALTIME_WAKEUP

# PendingIntent

A description of an Intent and a target action to perform with it

Can be handed to other applications so that they can perform actions on your behalf at a later time

Key concern - proxy applications shouldn’t perform operations that originating application can’t

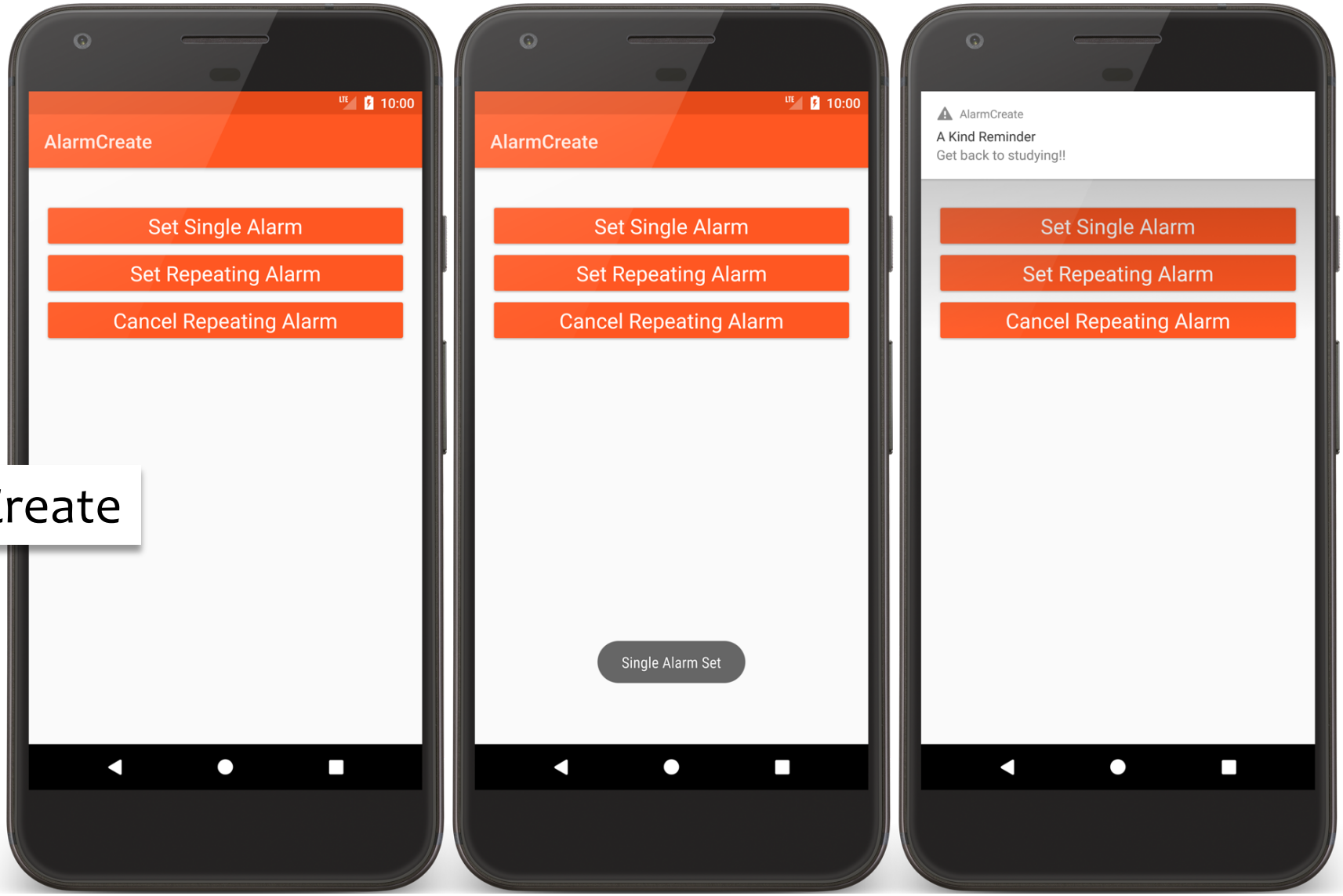
# PendingIntent

```
static fun getActivity(context: Context!, requestCode: Int,
                       intent: Intent!, flags: Int): PendingIntent!

static fun getBroadcast(context: Context!, requestCode: Int,
                        intent: Intent!, flags: Int): PendingIntent!

static fun getService(context: Context!, requestCode: Int,
                      intent: Intent, flags: Int): PendingIntent!
```

# AlarmCreate



# AlarmCreateActivity.kt

```
public override fun onCreate(savedInstanceState: Bundle?) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.main)

    // Get the AlarmManager Service
    mAlarmManager =
        getSystemService(Context.ALARM_SERVICE) as AlarmManager

    // Create an Intent to broadcast to the AlarmNotificationReceiver
    val mNotificationReceiverIntent = Intent(this@AlarmCreateActivity,
                                             AlarmNotificationReceiver::class.java)

    // Create an PendingIntent that holds theNotificationReceiverIntent
    mNotificationReceiverPendingIntent = PendingIntent.getBroadcast(
            this@AlarmCreateActivity, 0, mNotificationReceiverIntent, 0)
```

# AlarmCreateActivity.kt

```
// Create an Intent to broadcast to the AlarmLoggerReceiver
val mLoggerReceiverIntent = Intent(this@AlarmCreateActivity,
                                   AlarmLoggerReceiver::class.java)

// Create PendingIntent that holds the mLoggerReceiverPendingIntent
mLoggerReceiverPendingIntent = PendingIntent.getBroadcast(
                this@AlarmCreateActivity, 0, mLoggerReceiverIntent,0)
}
```

# AlarmCreateActivity.kt

```
fun onClickCancelRepAlarmButton(v: View) {

  // Cancel all alarms using mNotificationReceiverPendingIntent
  mAlarmManager.cancel(mNotificationReceiverPendingIntent)

  // Cancel all alarms using mLoggerReceiverPendingIntent
  mAlarmManager.cancel(mLoggerReceiverPendingIntent)

  // Show Toast message
  Toast.makeText(applicationContext, "Repeating Alarms Cancelled",
                                                    Toast.LENGTH_LONG).show()
  }
```

# AlarmLoggerReceiver.kt

```
class AlarmLoggerReceiver : BroadcastReceiver() {
    companion object {
        private const val TAG = "AlarmLoggerReceiver"
    }

    override fun onReceive(context: Context, intent: Intent) {
        // Log receipt of the Intent with timestamp
        Log.i(TAG, context.getString(R.string.logging_at_string) +
                DateFormat.getDateTimeInstance().format(Date()))
    }
}
```

# AlarmCreateActivity.kt

```
fun onClickSetSingleAlarmButton(v: View) {

    // Set single alarm
    mAlarmManager.set( AlarmManager.RTC_WAKEUP,
         System.currentTimeMillis(), mNotificationReceiverPendingIntent)

    // Set single alarm to fire shortly after previous alarm
    mAlarmManager.set(AlarmManager.RTC_WAKEUP,
         System.currentTimeMillis() + JITTER, mLoggerReceiverPendingIntent)

        // Show Toast message
        Toast.makeText(applicationContext, "Single Alarm Set",
            Toast.LENGTH_LONG).show()
    }
```

# AlarmCreateActivity.kt

```
fun onClickSetRepAlarmButton(v: View) {

    // Set repeating alarm
    mAlarmManager.setRepeating(AlarmManager.ELAPSED_REALTIME,
     SystemClock.elapsedRealtime(),REPEAT_INTERVAL,
         mNotificationReceiverPendingIntent)

        // Set repeating alarm to fire shortly after previous alarm
        mAlarmManager.setRepeating(AlarmManager.ELAPSED_REALTIME,
            SystemClock.elapsedRealtime() + JITTER, REPEAT_INTERVAL,
            mLoggerReceiverPendingIntent)

        // Show Toast message
        Toast.makeText(applicationContext, "Repeating Alarm Set",
            Toast.LENGTH_LONG).show()
    }
```

# Next Time

Threads, Messages and Handlers

# Example Applications

AlarmCreate