

# 5COSC023W - MOBILE APPLICATION DEVELOPMENT

## Lecture 3: More on Activities and Intents: Lifecycle and Configuration Changes

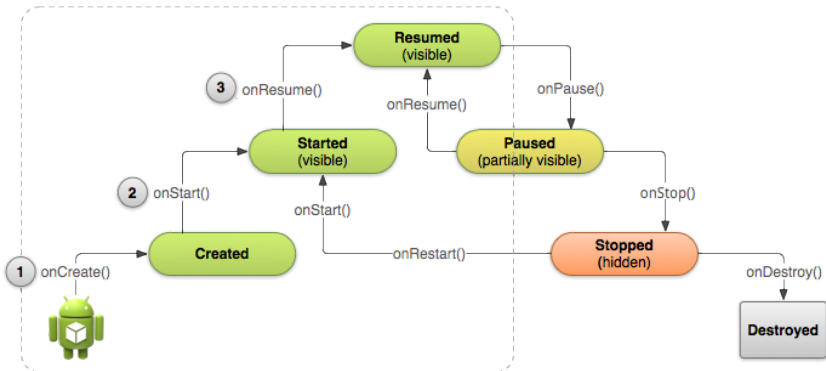
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# The Activity Lifecycle

- ▶ Created (not visible yet)
- ▶ Started (visible)
- ▶ Resume (visible)
- ▶ Paused (partially invisible)
- ▶ Stopped (hidden)
- ▶ Destroyed (gone from memory)

State changes are triggered by user action, configuration changes such as device rotation, or system action

# The Activity Lifecycle (cont'ed)



# When the Callbacks are Called?

- ▶ `onCreate(Bundle savedInstanceState)` — static initialization
  - ▶ `onStart()` — when Activity (screen) is becoming visible
  - ▶ `onRestart()` — called if Activity was stopped (calls `onStart()`)
    - ▶ `onResume()` — start to interact with user
    - ▶ `onPause()` — about to resume PREVIOUS Activity
  - ▶ `onStop()` — no longer visible, but still exists and all state info preserved
- ▶ `onDestroy()` — final call before Android system destroys Activity

# Implementing Callbacks

- ▶ Only onCreate() is required
- ▶ The other callbacks can be (optionally) overridden to change default behaviour

## The `onCreate(Bundle savedInstanceState)` method

- ▶ Called when the Activity is first created
- ▶ Does all static setup: create views, bind data to lists, ...
- ▶ Only called once during an activity's lifetime
- ▶ Accepts a `Bundle` argument with Activity's previously saved state (saved with `onSaveInstanceState()`), if there was one
- ▶ Created state is always followed by `onStart()`

# The onResume method

- ▶ Called when Activity will start interacting with user
- ▶ Activity has moved to top of the Activity stack
- ▶ The activity is both visible and interactive with the user
- ▶ This is Running state for the activity

## The onPause method

- ▶ Called when system is about to replace the current activity with another
- ▶ The Activity is partly visible but non-interactive with the user
- ▶ Used to save data, stop animations and anything that consumes resources
- ▶ Implementations must be fast (not too much data saved) because the next Activity is not displayed until this method returns
- ▶ Followed by either `onResume()` if the Activity returns back to the front, or `onStop()` if it becomes invisible to the user



## The `onStop()` method

- ▶ The activity is no more visible to the user
- ▶ Use to save data which take too long to save in `onPause`
- ▶ It is followed by either `onRestart()` if Activity is coming back to interact with user, or `onDestroy()` if Activity is going away

## The `onDestroy()` method

- ▶ Final call before Activity is destroyed
- ▶ The user navigates to another activity or there is a *configuration change*
- ▶ The activity is finishing or the system destroys it to save space (you can distinguish between the 2 by calling `isFinishing`)
- ▶ System may destroy Activity without calling this (by simply killing the process) , therefore use `onPause()` or `onStop()` to save data or state

# Configuration Changes

Configuration changes invalidate the current layout or other resources in your activity when the user:

- ▶ Rotates the device
- ▶ Chooses different system language, so locale changes
- ▶ Enter multi-window mode

On configuration change the operating system:

1. Destroys the activity calling:
  - 1.1 onPause()
  - 1.2 onStop()
  - 1.3 onDestroy()
2. Starts the activity again calling:
  - 2.1 onCreate()
  - 2.2 onStart()
  - 2.3 onResume()

# Activity Instance State

- ▶ State information is created while the Activity is running, such as a counter, user text, animation progression
- ▶ State is lost when device is rotated, language changes, back-button is pressed, or the system clears memory

# What the Operating System Saves

The OS saves automatically:

- ▶ State of views with unique ID (`android:id`) such as text entered into an `EditText`
  - ▶ The Intent that started the activity and data in its extras
- The developer is responsible for saving other activity and user progress data

## Saving instance state

Implement `onSaveInstanceState()` in the activity.

- ▶ Called by Android runtime when there is a possibility the Activity may be destroyed
- ▶ Saves data only for this instance of the Activity during the current session. If the application is restarted this cannot be used

→ `onSaveInstanceState` is not called when user explicitly closes the activity (e.g. presses the Back button) or when `finish()` is called. Use `onPause()` or `onStop()` instead

# Implementing onSaveInstanceState()

```
override fun onSaveInstanceState(outState: Bundle) {  
    super.onSaveInstanceState(outState)  
  
    outState.putInt("counter", counter)  
}
```

# Restoring Instance State

Two ways to retrieve the saved Bundle data:

- ▶ In `onCreate(Bundle mySavedState)`
- ▶ Implement callback `onRestoreInstanceState(Bundle mySavedState)` (this is called after `onStart()`)



## Example of Restoring State in onCreate()

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

    var tv = findViewById<TextView>(R.id.textView)

    if (savedInstanceState != null) {
        counter = savedInstanceState.getInt("counter", 0)
        tv.setText("" + counter)
    }
}
```

# What happens when an Application Restarts?

- ▶ When the user stops and restarts a new app session, the Activity instance states are lost and the activities will revert to their default appearance
- ▶ If you need to save user data between app sessions, use
  1. Shared preferences
  2. or a Database

# Sending Data from one Activity to Another

In the Sending Activity:

1. Create the Intent.
2. Set data or put extra data in the Intent.
3. Start the receiving (new activity) with `startActivity(intent)`.

In the Receiving Activity:

1. Get the Intent that created the Activity.
2. Retrieve the data or extras from the Intent.

# Examples

```
// Setting data and extras  
intent.setData(Uri.parse("http://www.google.co.uk"));  
intent.setData(Uri.parse("tel:02079115000"));  
intent.putExtra("Score", 56345);
```

```
// Retrieving data and extras  
Uri url = intent.getData();  
int score = intent.getIntExtra("score", 0);
```