CMSC436: Programming Handheld Systems

Fall 2017

The Fragment Class

Tablet UIs

Tablets have larger displays than phones do

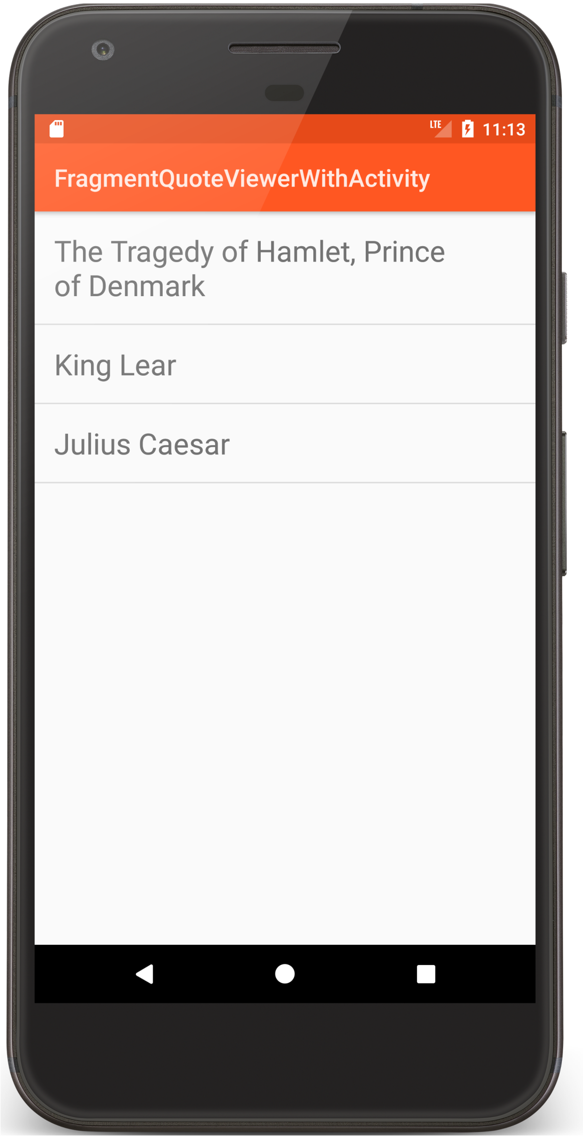
They can support multiple UI panes / user behaviors at the same time

- The “1 activity – 1 thing the user can do” heuristic may not make sense for larger devices

FragmentQuoteViewerWithActivity

Application uses two Activities

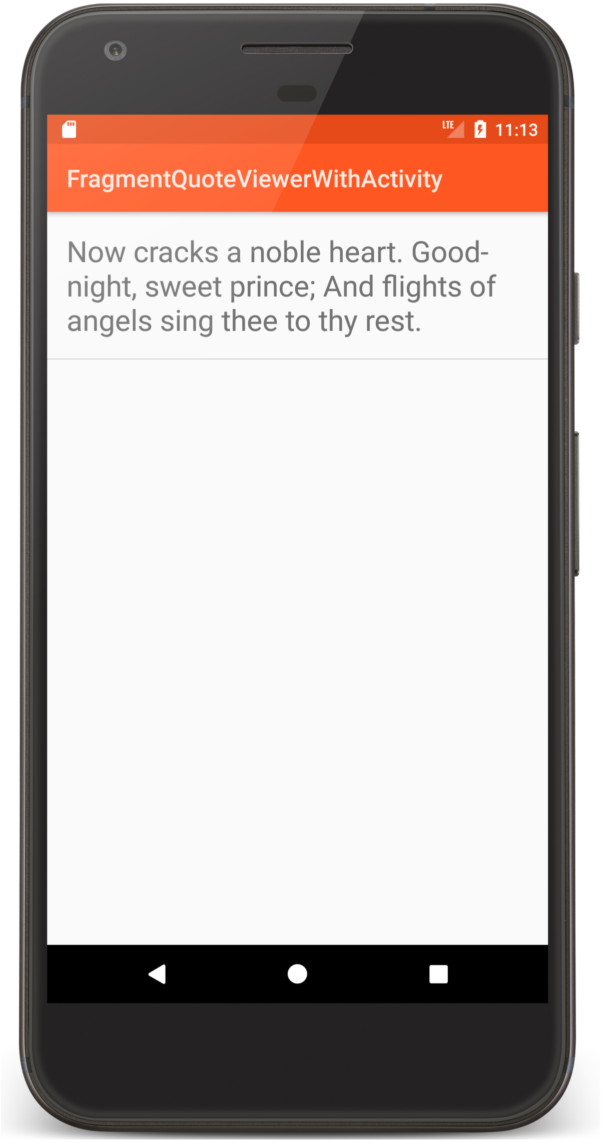
- Ones shows titles of Shakespeare plays & allows user to select one title
- The other shows a quote from the selected play



The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar

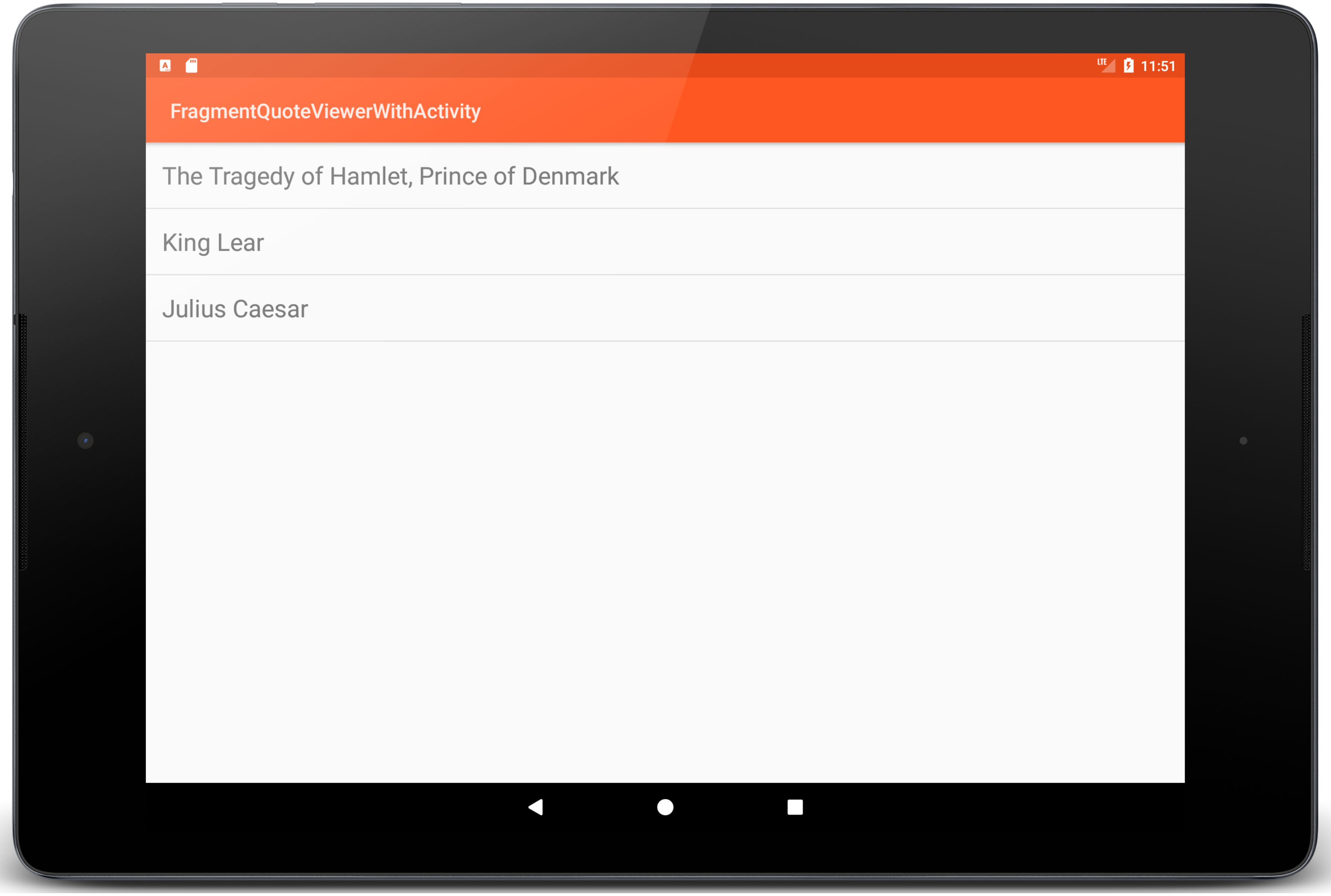


Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

FragmentQuoteViewerWithActivity UI

This layout is reasonable on a phone

But inefficient on a larger device



FragmentQuoteViewerWithActivity

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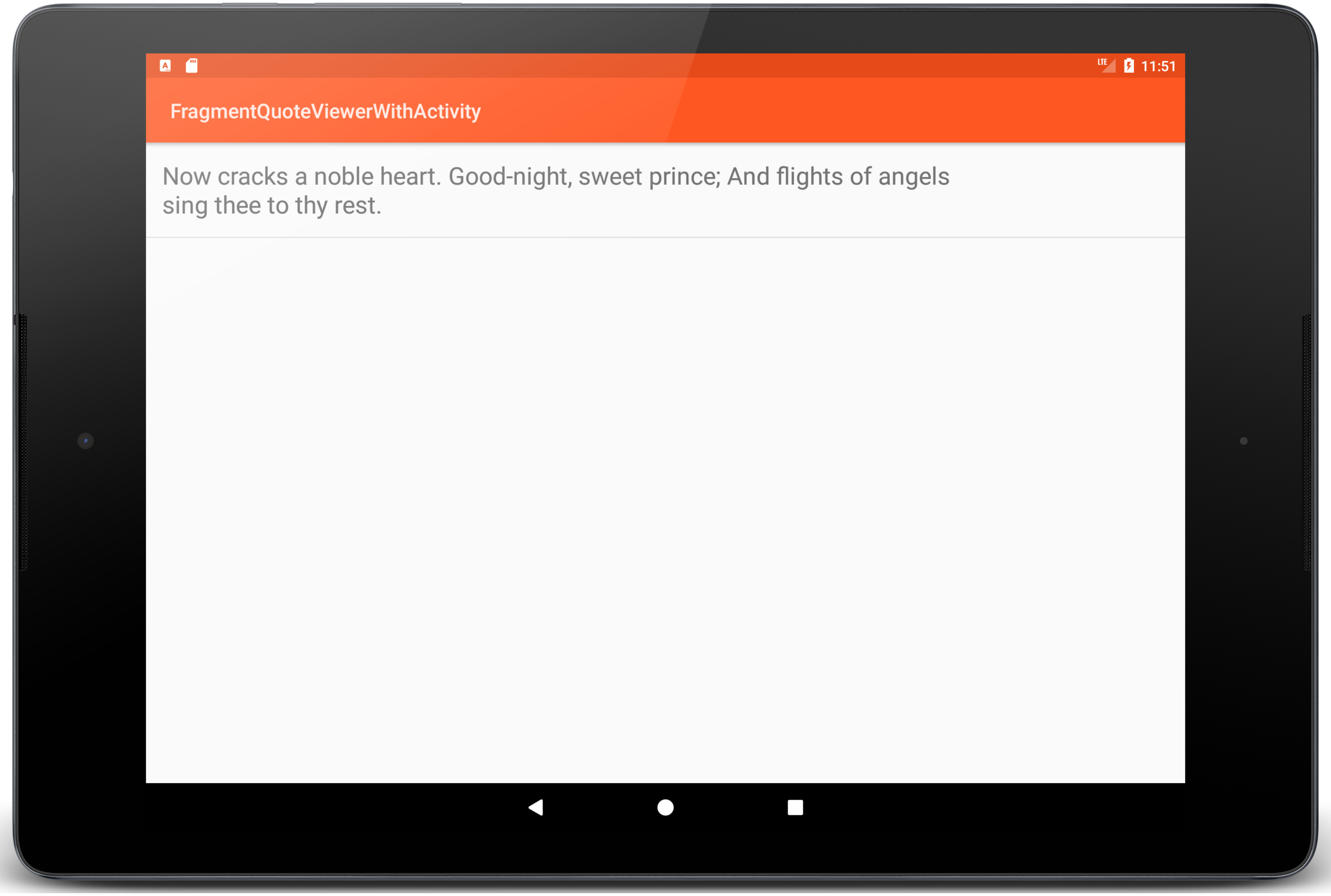
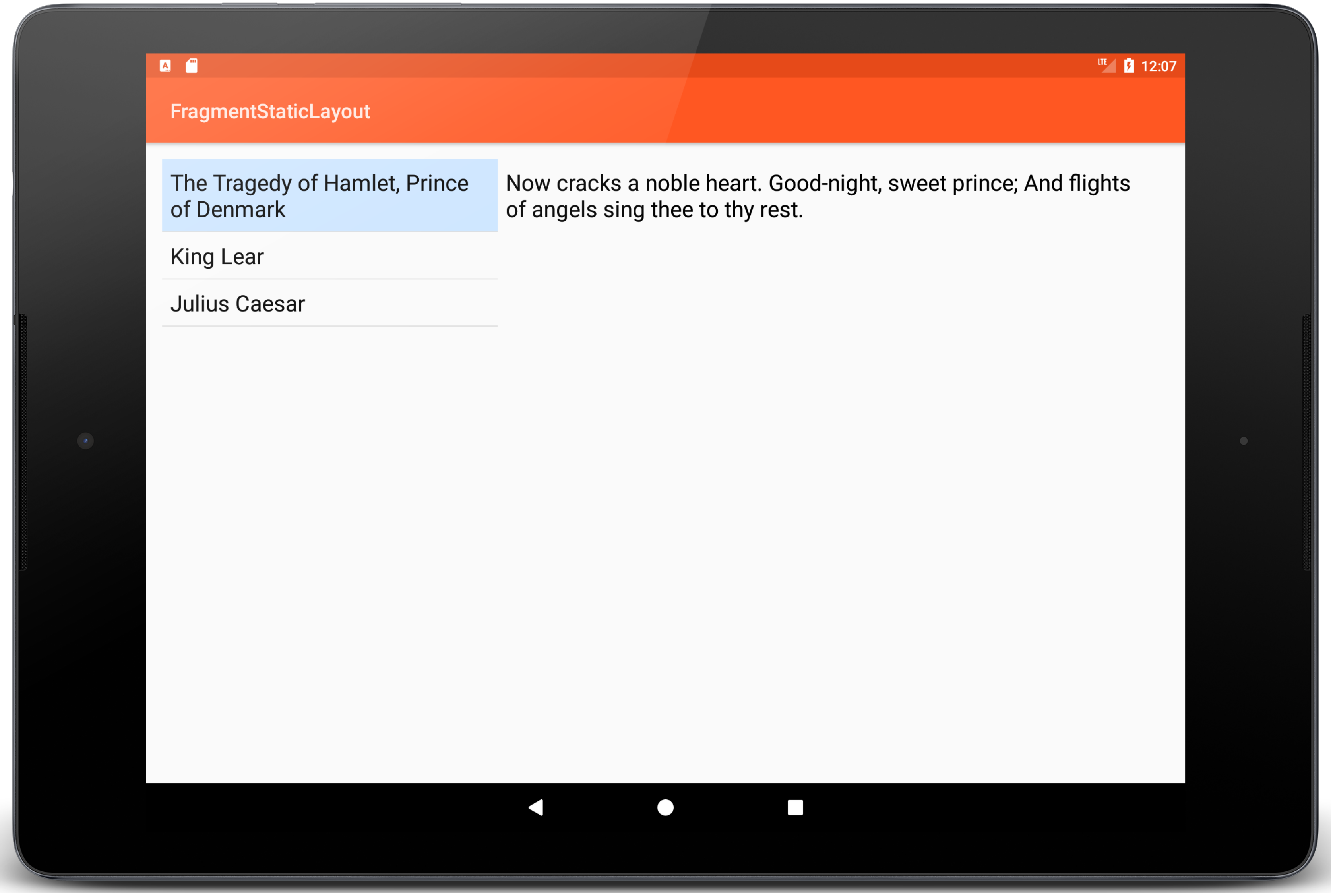


FragmentQuoteViewerWithActivity

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

Better Layout

Use two cooperating layout units on one screen



The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

The Fragment Class

Represents a behavior / portion of UI within an Activity

Multiple Fragments can be embedded in an Activity to create a multi-pane UI

A single Fragment can be reused across multiple Activities

Fragment Lifecycle

Fragment lifecycle is coordinated with the lifecycle of its containing/hosting Activity

Fragments have their own lifecycles and receive their own callbacks

Fragment Lifecycle States

- Resumed
  - Fragment is visible in the hosting Activity
- Paused
  - Another Activity is in the foreground and has focus, this Fragment’s hosting Activity is still visible
- Stopped
  - The Fragment is not visible

Lifecycle Callback Methods

onAttach()

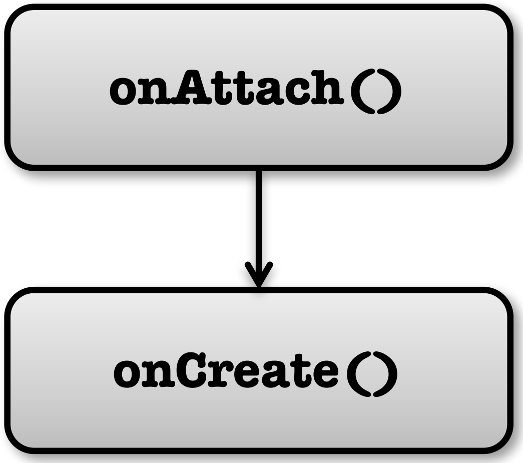
onAttach()

Activity is created

Fragment is first attached to its Activity

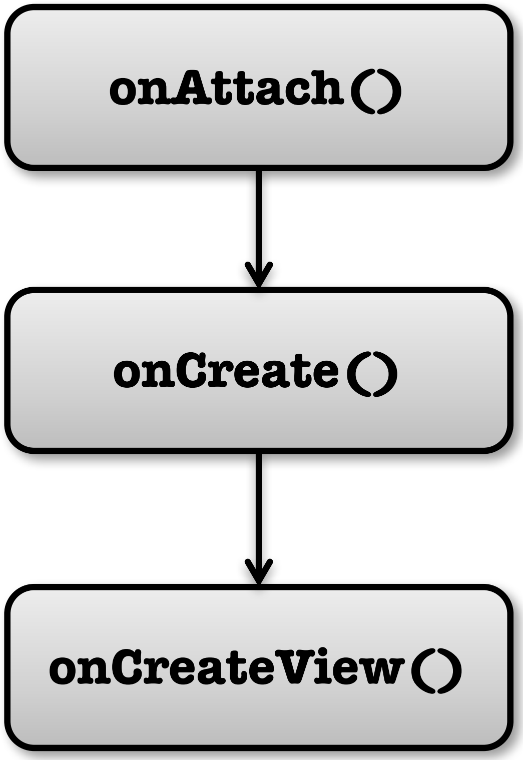
onCreate()

Initialize the Fragment



onCreateView()

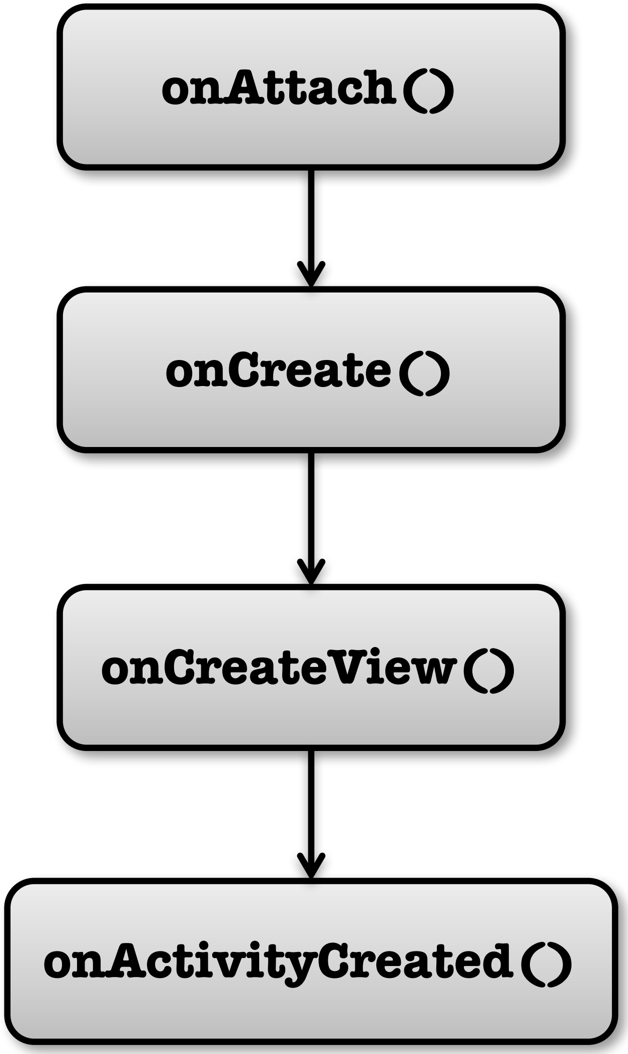
Fragment sets up & returns its user interface View



onActivityCreated()

Containing Activity has completed onCreate() and the Fragment has been installed

Can now access hosting Activity



onStart()

onStart ()

Activity is started

Hosting Activity about to become visible

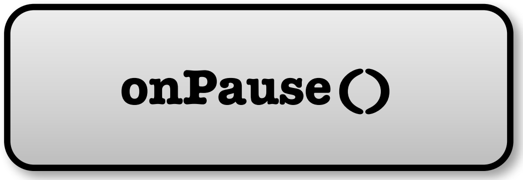
onResume()

onResume()

Activity is resumed

Hosting Activity is about to become visible and ready for user interaction

onPause()



Activity is paused

Hosting Activity is visible, but does not have focus

onStop()

onStop ()

Activity is stopped

Hosting Activity is no longer visible

onDestroyView()

onDestroyView()

Activity is destroyed

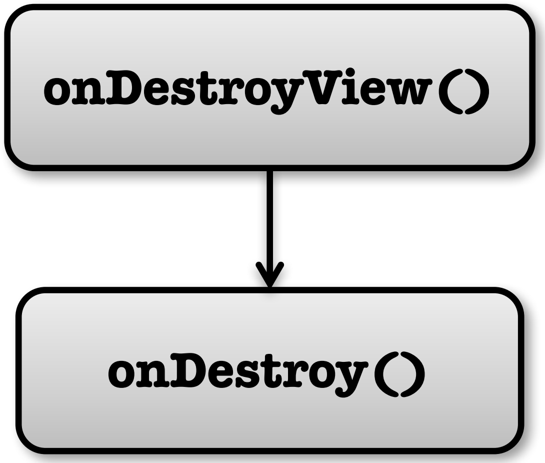
View previously created in onCreateView() has been detached from the Activity

Clean up view resources

onDestroy()

Fragment is no longer in use

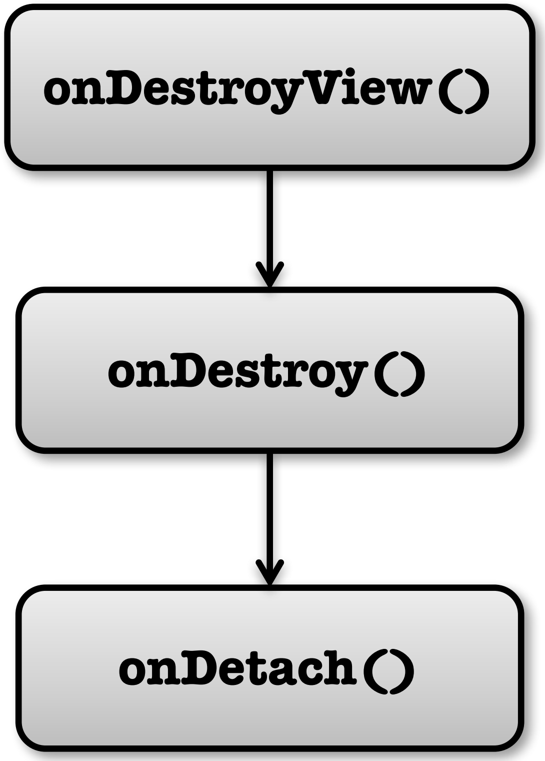
Clean up Fragment resources



onDetach()

Fragment no longer attached to its activity

Null out references to hosting Activity



Adding Fragments to Activities

Two general ways to add Fragments to an Activity’s layout

- Declare it statically in the Activity’s layout file
- Add it programmatically using the fragmentManager

Fragment Layout

Layout can be inflated/implemented in onCreateView()

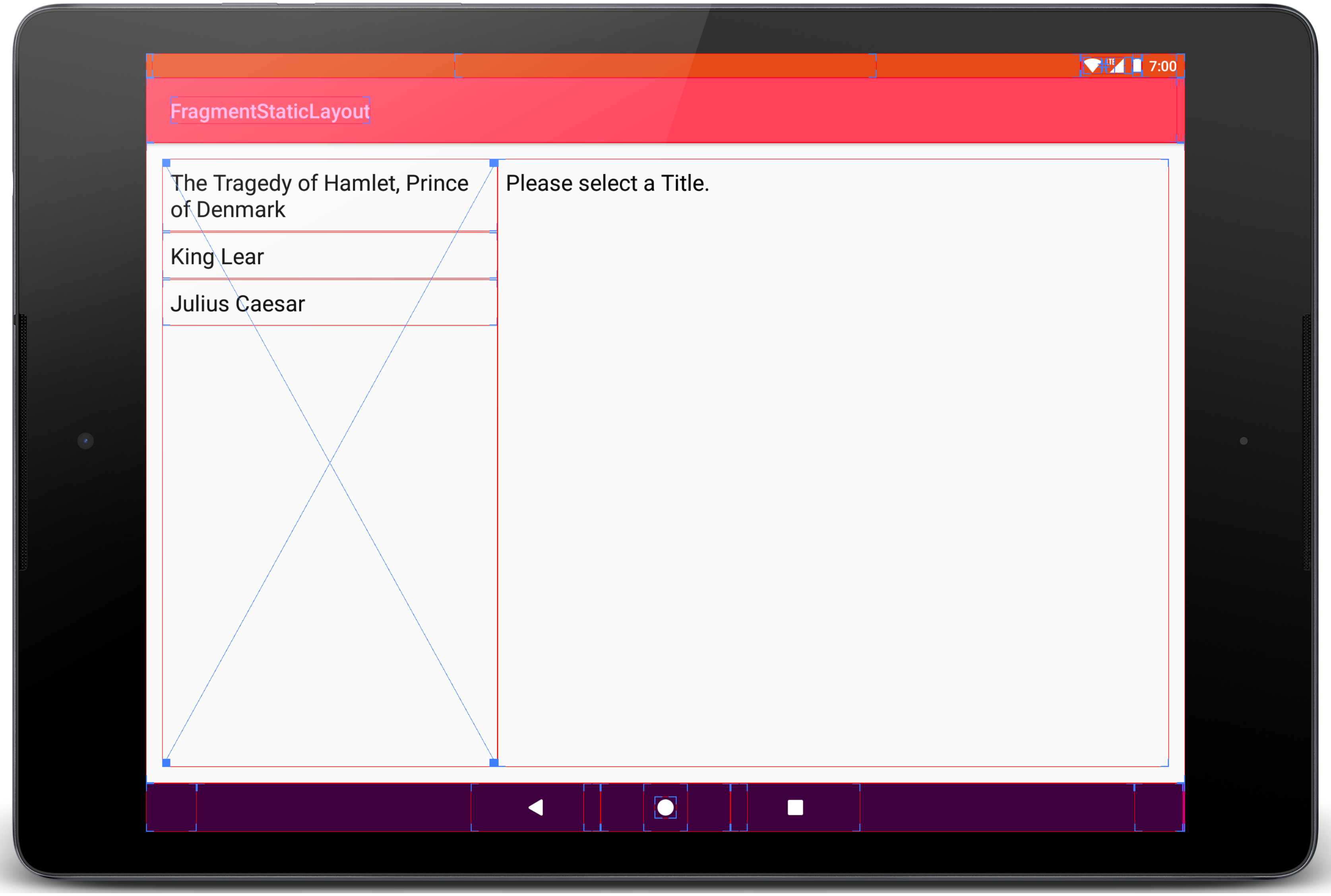
onCreateView() must return the View at the root of the Fragment’s layout

This View is added to the containing Activity

FragmentStaticLayout

Display titles and quotes side-by-side in two Fragments

Fragments are statically added based on a layout file



The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar

Please select a Title.

```
public class QuoteViewerActivity extends Activity implements ListSelectionListener {
    ...
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        ...
        setContentView(R.layout.quote_activity);

    ...
    }
```

```xml
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
   android:layout_width="match_parent"
   android:layout_height="match_parent"
   android:baselineAligned="false"
   android:orientation="horizontal"
   android:padding="@dimen/activity_margin">
   <fragment
      android:id="@+id/titles"
      class="course.examples.fragments.staticlayout.TitlesFragment"
      android:layout_width="0px"
      android:layout_height="match_parent"
      android:layout_weight="1" />
   <fragment
      android:id="@+id/details"
      class="course.examples.fragments.staticlayout.QuotesFragment"
      android:layout_width="0px"
      android:layout_height="match_parent"
      android:layout_weight="2" />
</LinearLayout>
```

Adding Fragments Programmatically

While an Activity's running you can add Fragments to its layout

Four-step process

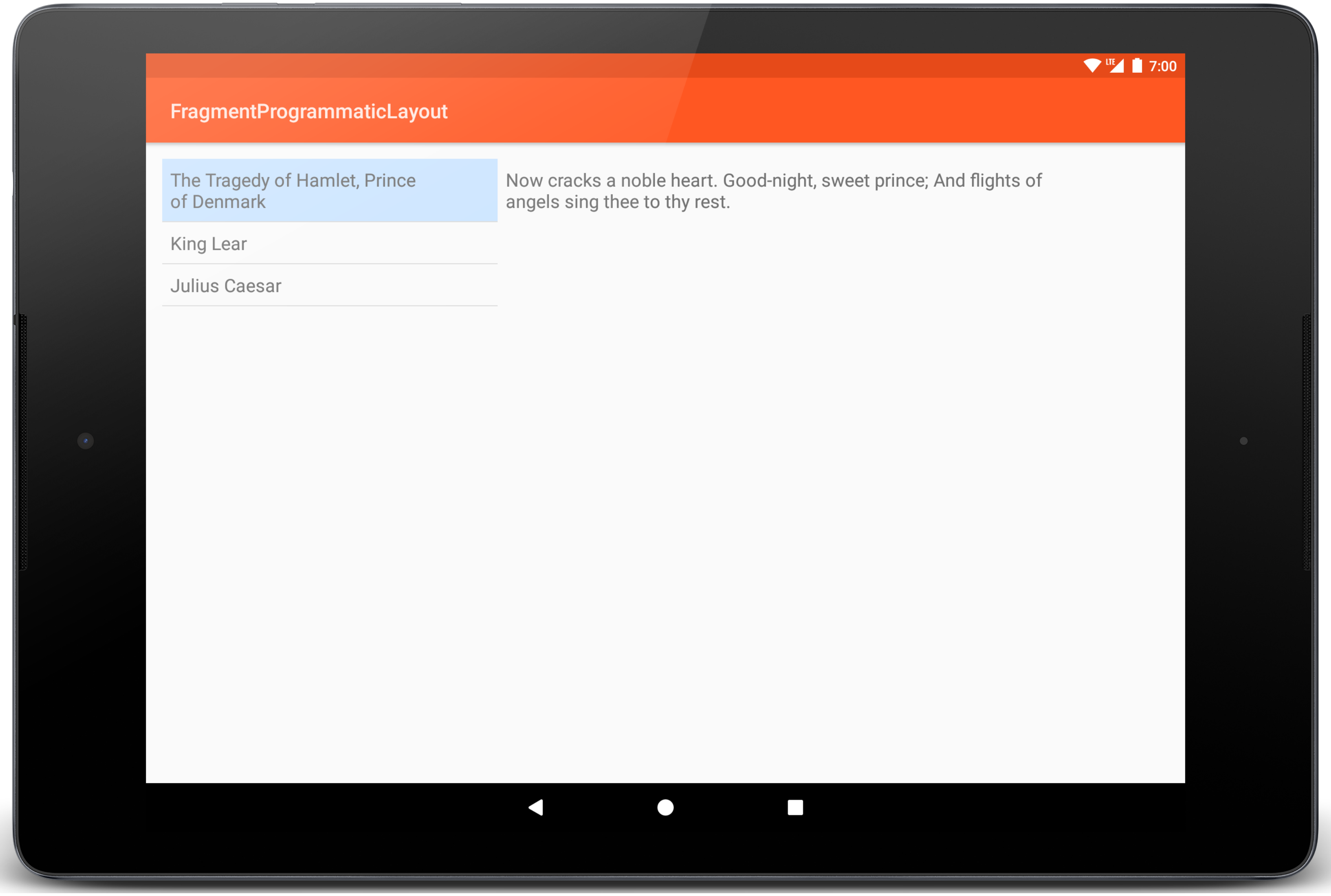
1. Get reference to the FragmentManager
2. Begin a FragmentTransaction
3. Add the Fragment
4. Commit the FragmentTransaction

FragmentProgrammaticLayout

Display titles and quotes side-by-side in two Fragments

Layout file reserves space for Fragments

Fragments are programmatically added to layout at runtime


7:00
FragmentProgrammaticLayout
The Tragedy of Hamlet, Prince of Denmark
King Lear
Julius Caesar

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

```
protected void onCreate(Bundle savedInstanceState) {
 …
   // Get a reference to the FragmentManager
   FragmentManager fragmentManager = getFragmentManager();
   if (null == fragmentManager.findFragmentById(R.id.title_frame)) {
       // Begin a new FragmentTransaction
       FragmentTransaction fragmentTransaction = fragmentManager.beginTransaction();
       // Add the TitleFragment
       fragmentTransaction.add(R.id.title_frame, new TitlesFragment());
       // Add the QuoteFragment
       mQuoteFragment = new QuotesFragment();
       fragmentTransaction.add(R.id.quote_frame, mQuoteFragment);
       // Commit the FragmentTransaction
       fragmentTransaction.commit();
   } else {
     mQuoteFragment = (QuotesFragment) fragmentManager.findFragmentById(R.id.quote_frame);
   }
}
```

```xml
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
   android:id="@+id/activityFrame"
   android:layout_width="match_parent"
   android:layout_height="match_parent"
   android:baselineAligned="false"
   android:orientation="horizontal"
   android:padding="@dimen/activity_margin">
   <FrameLayout
      android:id="@+id/title_frame"
      android:layout_width="0dp"
      android:layout_height="match_parent"
      android:layout_weight="1" />
   <FrameLayout
      android:id="@+id/quote_frame"
      android:layout_width="0dp"
      android:layout_height="match_parent"
      android:layout_weight="2" />
</LinearLayout>
```

Dynamic Layout

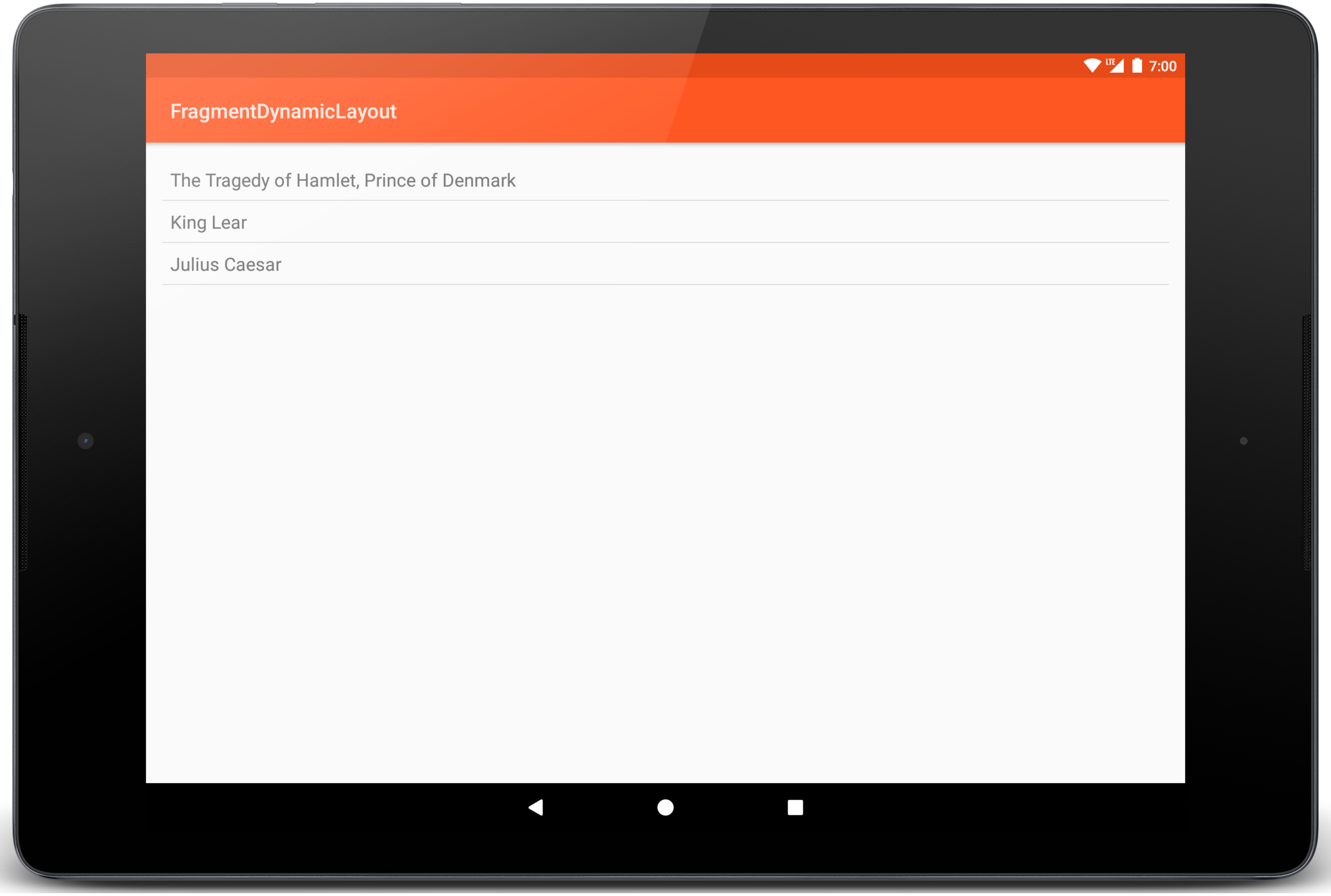
Fragment transactions allow you to dynamically change your app’s user interface

Can make the interface more fluid & take better advantage of available screen space

FragmentDynamicLayout

Starts with a single Fragment

Changes to two-Fragment layout when user selects a title

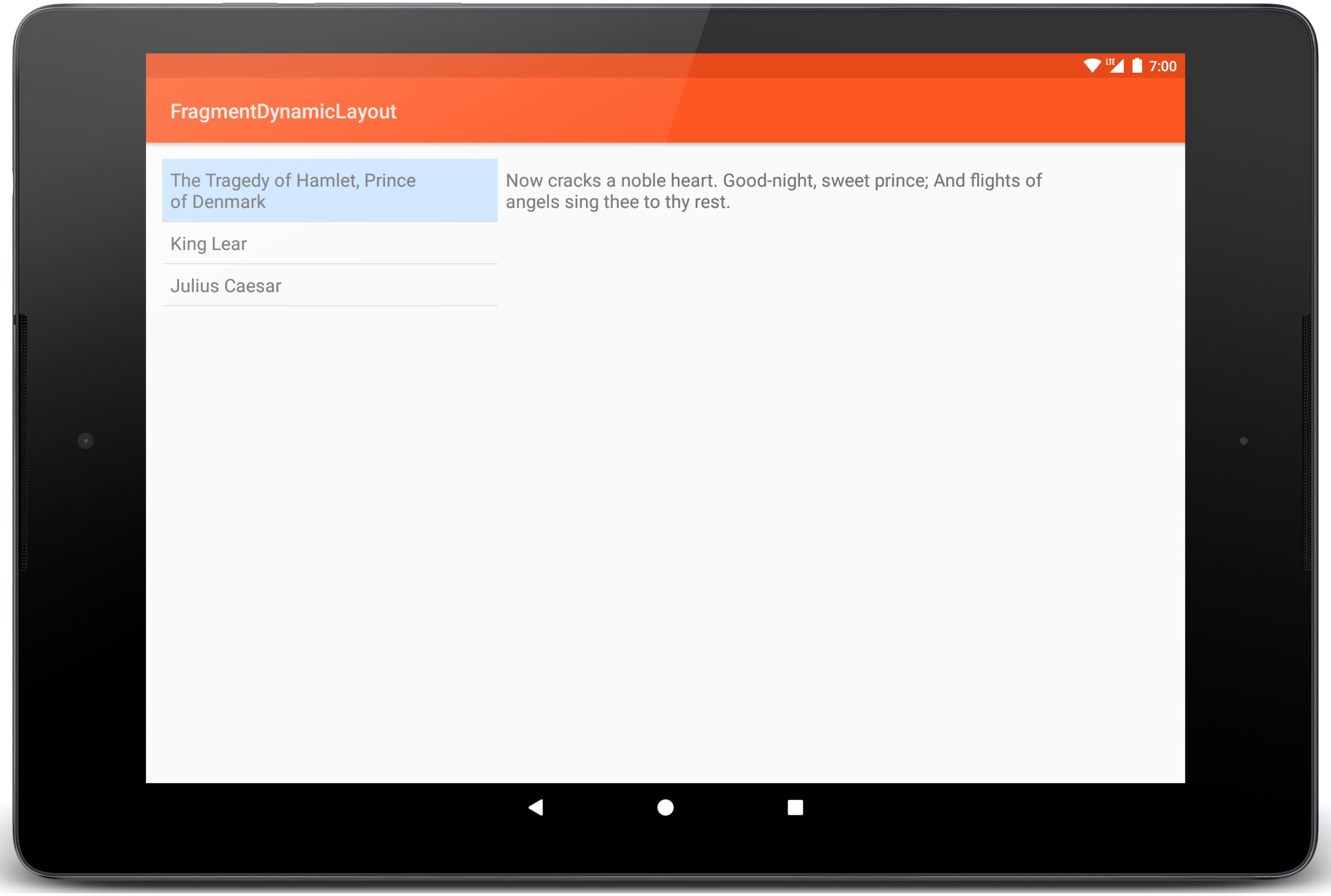


FragmentDynamicLayout

The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar



The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

```
protected void onCreate(Bundle savedInstanceState) {
  …
  // Get a reference to the FragmentManager
  mFragmentManager = getFragmentManager();
  mQuoteFragment =
     (QuotesFragment) mFragmentManager.findFragmentById(R.id.quote_fragment_container);
  mTitleFragment =
    ( TitlesFragment) mFragmentManager.findFragmentById(R.id.title_fragment_container);
  if (null == mFragmentManager.findFragmentById(R.id.title_fragment_container)) {
    // Start a new FragmentTransaction
    FragmentTransaction fragmentTransaction = mFragmentManager .beginTransaction();
    mTitleFragment = new TitlesFragment();
    // Add the TitleFragment to the layout
    fragmentTransaction.add(R.id.title_fragment_container, mTitleFragment);
    // Commit the FragmentTransaction
    fragmentTransaction.commit();
  }
```

```
public void onListSelection(int index) {

  // If the QuoteFragment has not been created, create and add it now
  if (null == mFragmentManager.findFragmentById(R.id.quote_fragment_container)) {

    // Start a new FragmentTransaction
    FragmentTransaction fragmentTransaction = mFragmentManager
        .beginTransaction();
…
```

```
        …
        mQuoteFragment = new QuotesFragment();
        // Add the QuoteFragment to the layout
        fragmentTransaction.add(R.id.quote_fragment_container,
                mQuoteFragment);
        // Add this FragmentTransaction to the backstack
        fragmentTransaction.addToBackStack(null);
        // Commit the FragmentTransaction
        fragmentTransaction.commit();
        // Force Android to execute the committed FragmentTransaction
        mFragmentManager.executePendingTransactions();
    }
    // Tell the QuoteFragment to show the quote string at position index
    mQuoteFragment.showQuoteAtIndex(index);

}
```

Configuration Changes

If you call setRetainInstance(true) on Fragment, Android won’t destroy the Fragment on configuration changes

Configuration Changes

Results in some changes to lifecycle callback sequence

onDestroy() will not be called

onCreate() will not be called

FragmentStaticConfigLayout

Essentially the same as FragmentStaticLayout

Focus here is on how Fragments are saved and restored on configuration changes

FragmentStaticConfigLayout

In landscape mode

Both Fragments use a large font

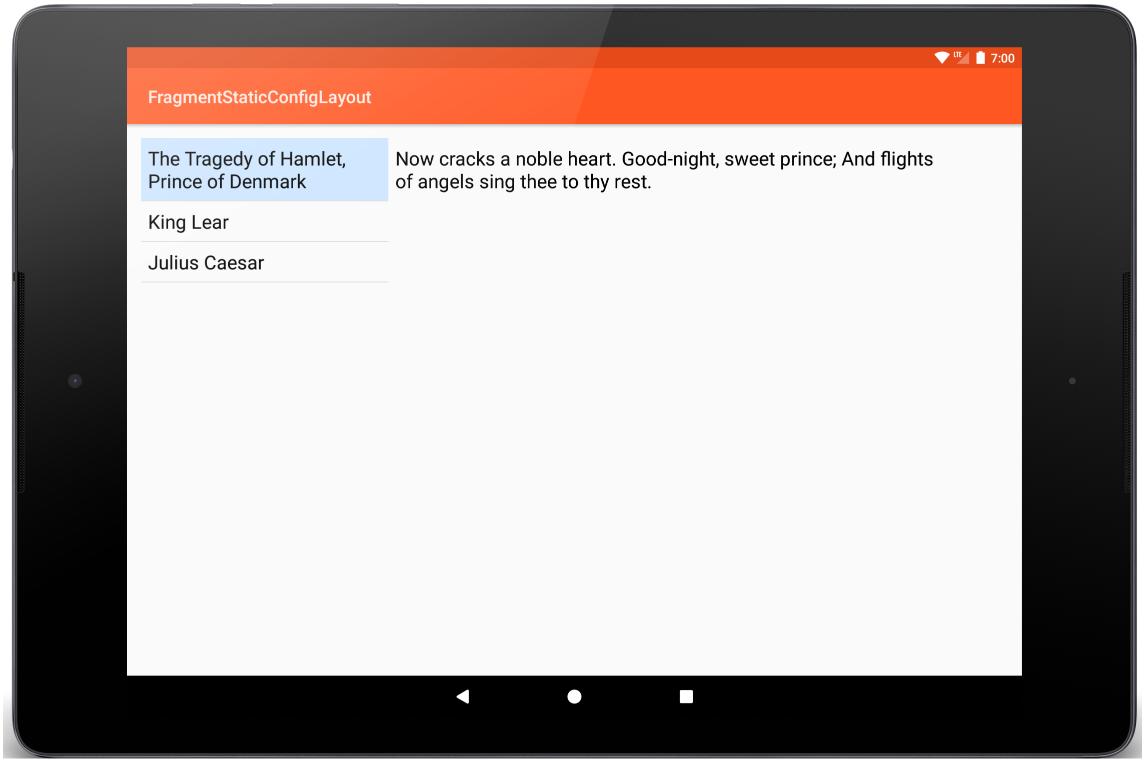
TitleFragment takes more horizontal space & allows long titles to span multiple lines

FragmentStaticConfigLayout

In portrait mode

Both Fragments use a smaller font

TitleFragment will use less space and will ellipsize long titles, limiting them to a single line



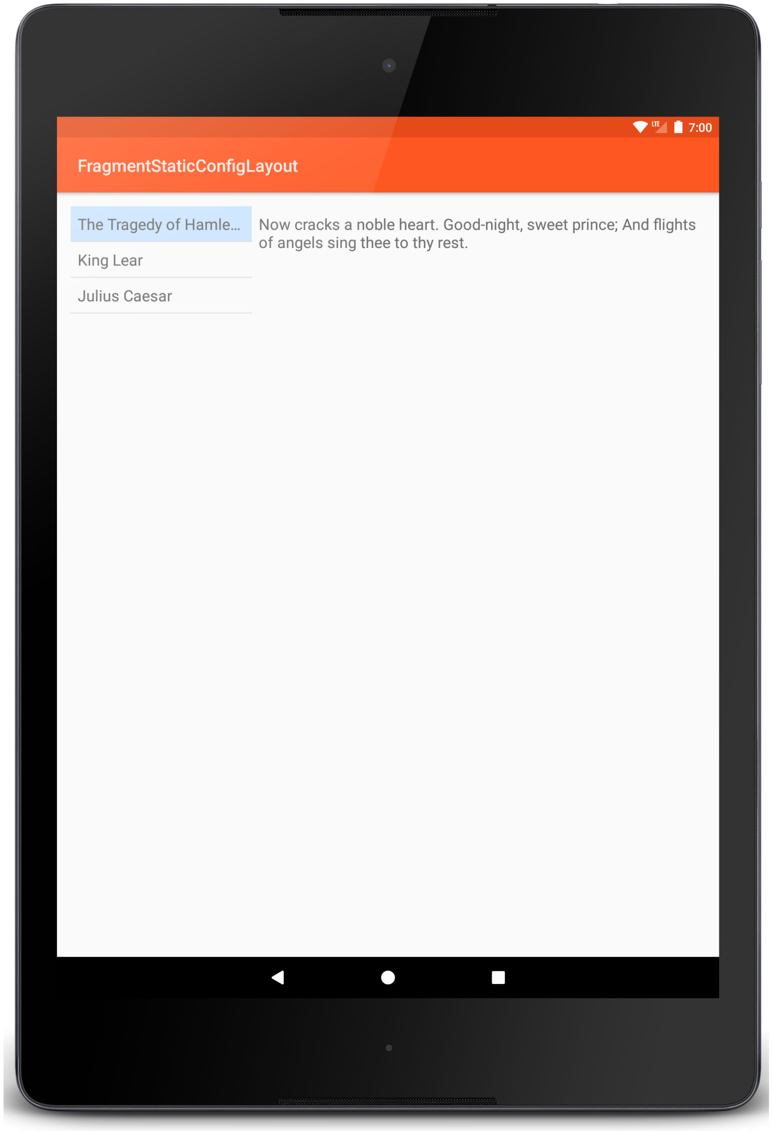
FragmentStaticConfigLayout

The Tragedy of Hamlet, Prince of Denmark

King Lear

Julius Caesar

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.



FragmentStaticConfigLayout

The Tragedy of Hamle...

King Lear

Julius Caesar

Now cracks a noble heart. Good-night, sweet prince; And flights of angels sing thee to thy rest.

```
public class QuotesFragment extends Fragment {
   ...
  @Override
  public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    // Retain this Fragment across Activity reconfigurations
    setRetainInstance(true);
  }
  // Called to create the content view for this Fragment
  @Override
  public View onCreateView(LayoutInflater inflater, ViewGroup container,
      Bundle savedInstanceState) {
    // Inflate the layout defined in quote_fragment.xml. The last parameter is false because the returned
    //view does not need to be attached to the container ViewGroup
    return inflater.inflate(R.layout.quote_fragment, container, false);
  }
```

```
// Set up some information about the mQuoteView TextView
@Override
public void onActivityCreated(Bundle savedInstanceState) {
  Log.i(TAG, getClass().getSimpleName() + ":onActivityCreated()");
  super.onActivityCreated(savedInstanceState);

    mQuoteView = getActivity().findViewById(R.id.quoteView);
    mQuoteArrayLen = QuoteViewerActivity.mQuoteArray.length;

    showQuoteAtIndex(mCurrIdx);

 }
```

Next

User Interface classes