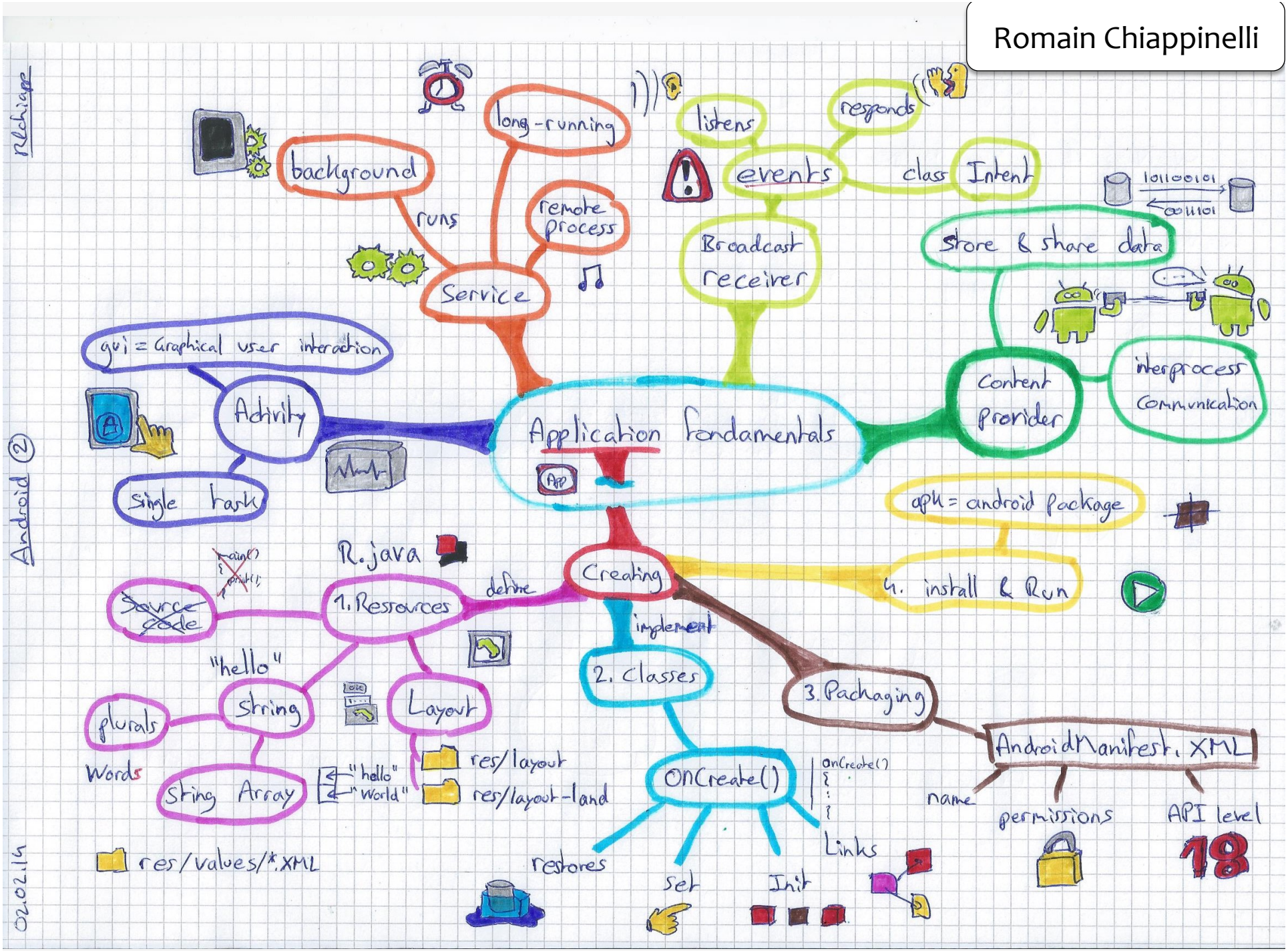
Romain Chiappinelli

Rechiape

Android ②

02.02.14



Programming Handheld systems

Adam Porter

Application Fundamentals

Application Components

- Activity 
- Service 
- BroadcastReceiver 
- ContentProvider 

Applications

Apps are made from components

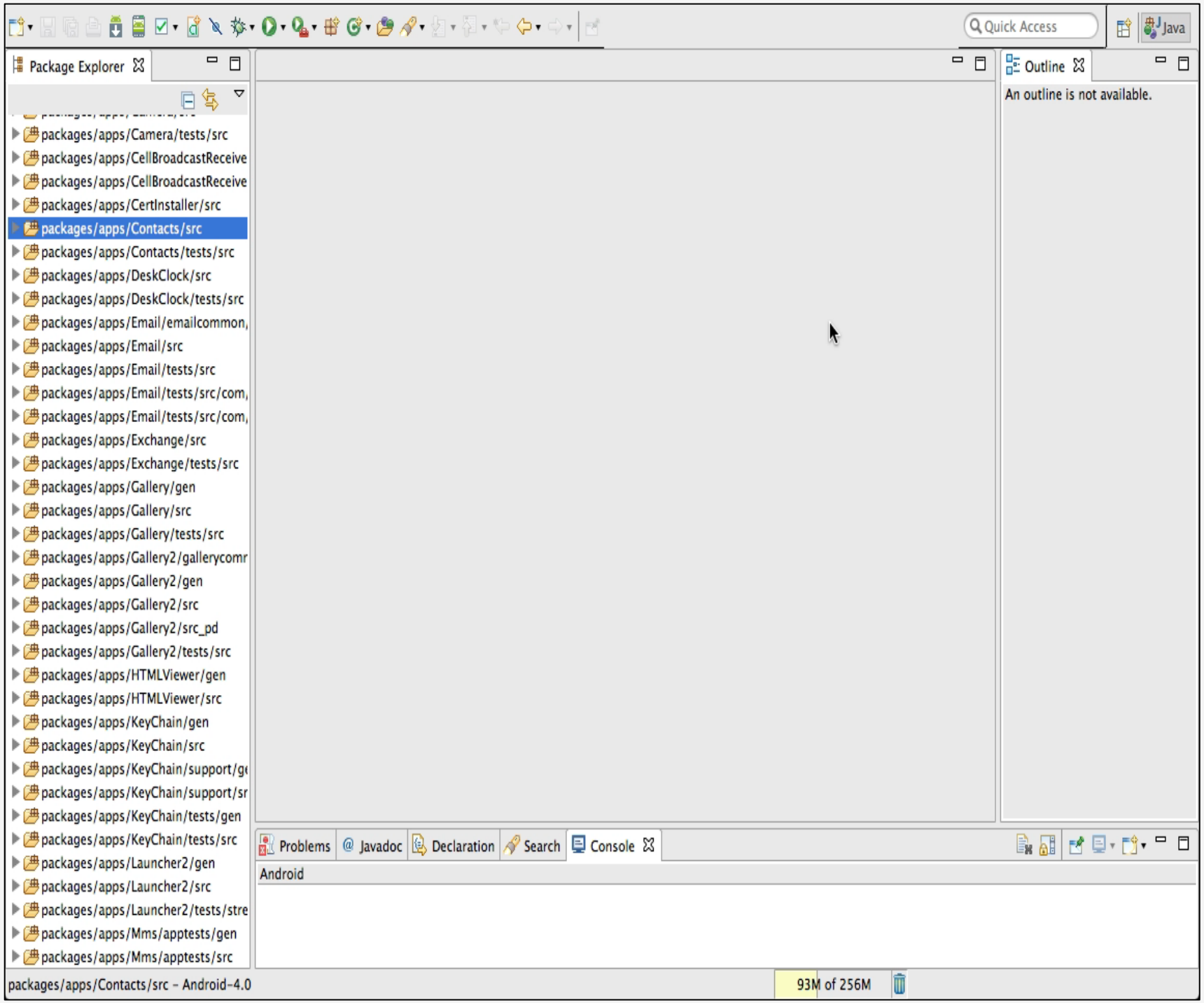
Android instantiates and runs them as needed

Each component has its own purpose and APIs

Activity

Primary class for user interaction

Usually implements a single, focused task that the user can do


Quick Access
Java
Package Explorer
packages/apps/Camera/tests/src
packages/apps/CellBroadcastReceive
packages/apps/CellBroadcastReceive
packages/apps/CertInstaller/src
packages/apps/Contacts/src
packages/apps/Contacts/tests/src
packages/apps/DeskClock/src
packages/apps/DeskClock/tests/src
packages/apps/Email/emailcommon,
packages/apps/Email/src
packages/apps/Email/tests/src
packages/apps/Email/tests/src/com,
packages/apps/Email/tests/src/com,
packages/apps/Exchange/src
packages/apps/Exchange/tests/src
packages/apps/Gallery/gen
packages/apps/Gallery/src
packages/apps/Gallery/tests/src
packages/apps/Gallery2/gallerycomr
packages/apps/Gallery2/gen
packages/apps/Gallery2/src
packages/apps/Gallery2/src_pd
packages/apps/Gallery2/tests/src
packages/apps/HTMLViewer/gen
packages/apps/HTMLViewer/src
packages/apps/KeyChain/gen
packages/apps/KeyChain/src
packages/apps/KeyChain/support/g
packages/apps/KeyChain/support/sr
packages/apps/KeyChain/tests/gen
packages/apps/KeyChain/tests/src
packages/apps/Launcher2/gen
packages/apps/Launcher2/src
packages/apps/Launcher2/tests/stre
packages/apps/Mms/apptests/gen
packages/apps/Mms/apptests/src
Outline
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Problems
Javadoc
Declaration
Search
Console
Android
packages/apps/Contacts/src - Android-4.0
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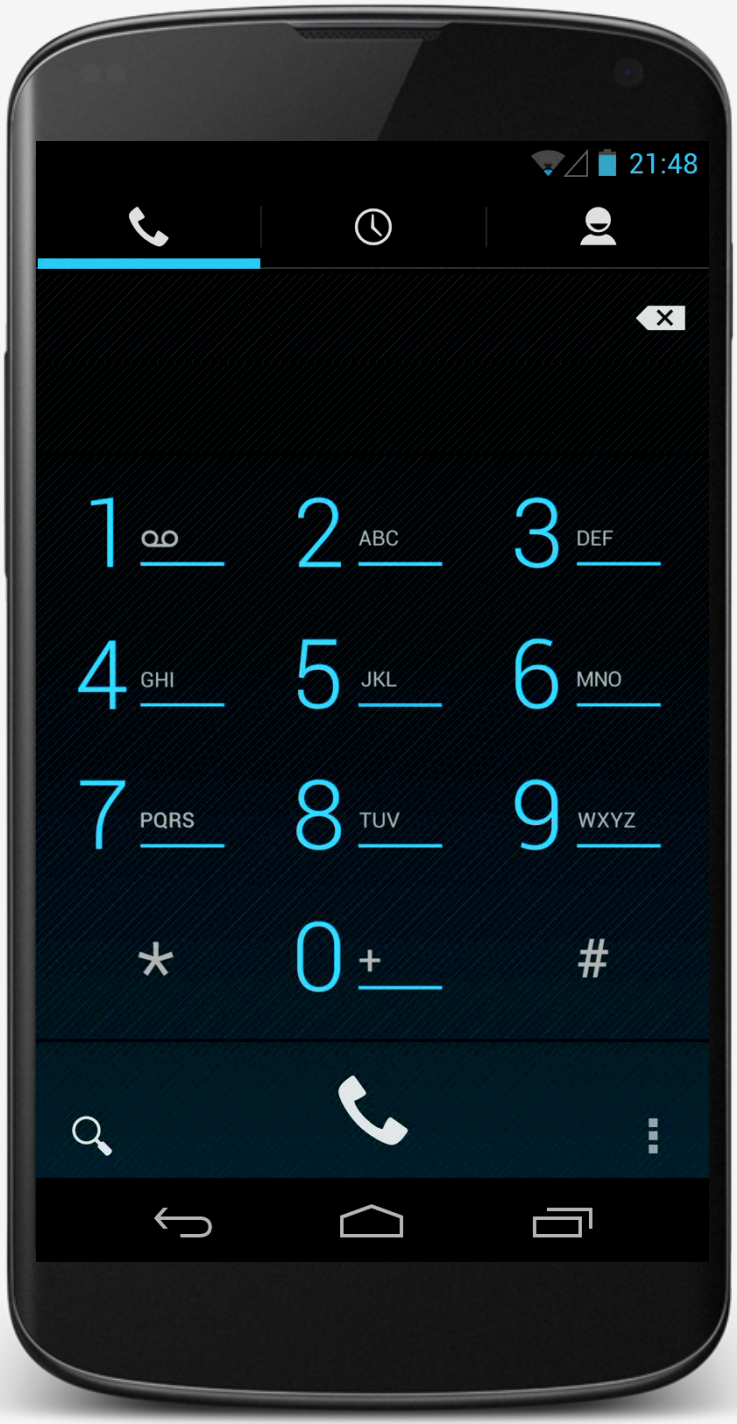
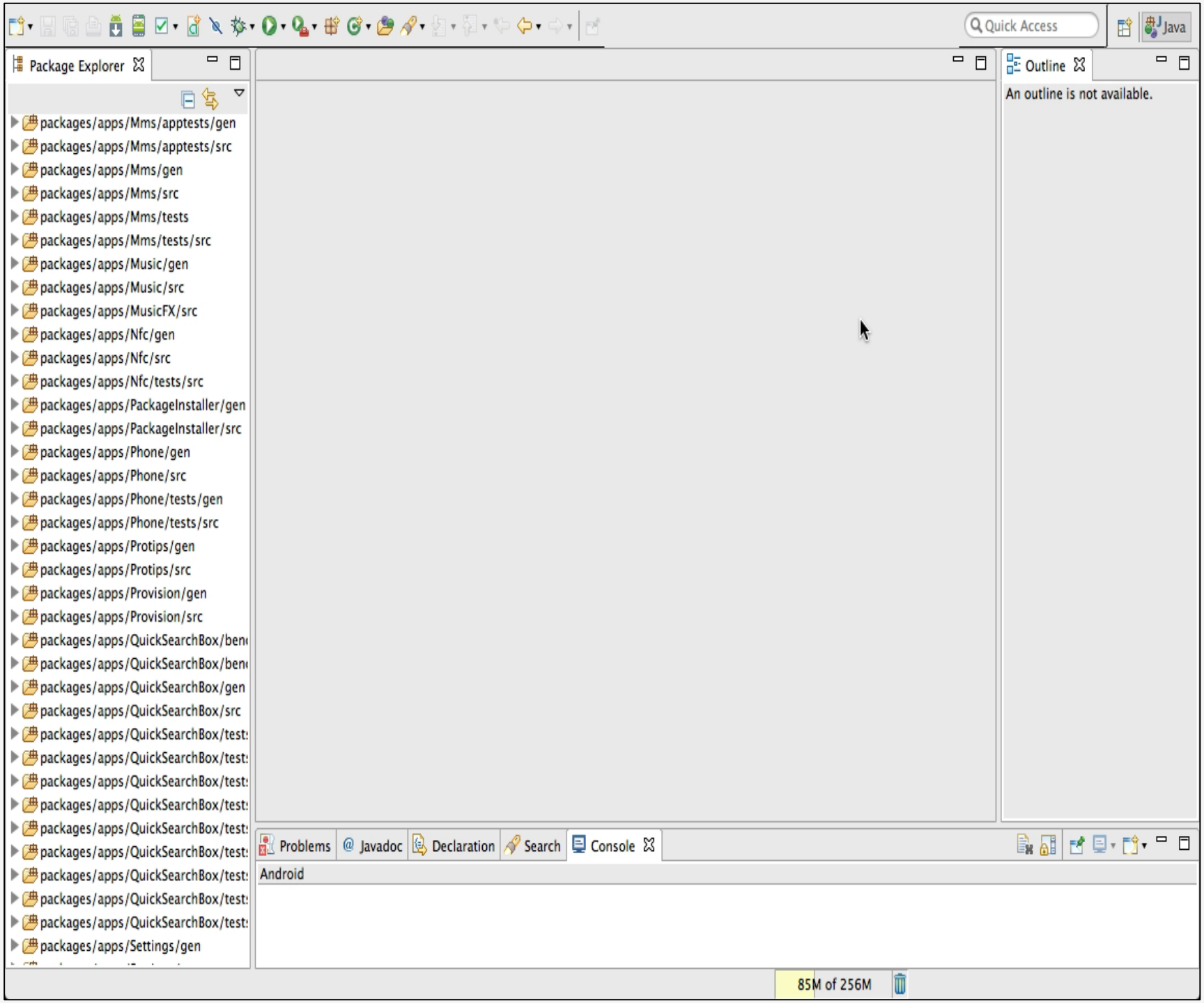

21:48
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*
0 +
#

Service

Runs in the background

to perform long-running operations

to support interaction with remote processes


Quick Access
Java
Package Explorer
packages/apps/Mms/apptests/gen
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packages/apps/Mms/tests
packages/apps/Mms/tests/src
packages/apps/Music/gen
packages/apps/Music/src
packages/apps/MusicFX/src
packages/apps/Nfc/gen
packages/apps/Nfc/src
packages/apps/Nfc/tests/src
packages/apps/PackageInstaller/gen
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packages/apps/Phone/tests/gen
packages/apps/Phone/tests/src
packages/apps/Protips/gen
packages/apps/Protips/src
packages/apps/Provision/gen
packages/apps/Provision/src
packages/apps/QuickSearchBox/ben
packages/apps/QuickSearchBox/ben
packages/apps/QuickSearchBox/gen
packages/apps/QuickSearchBox/src
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Outline
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Problems
Javadoc
Declaration
Search
Console
Android
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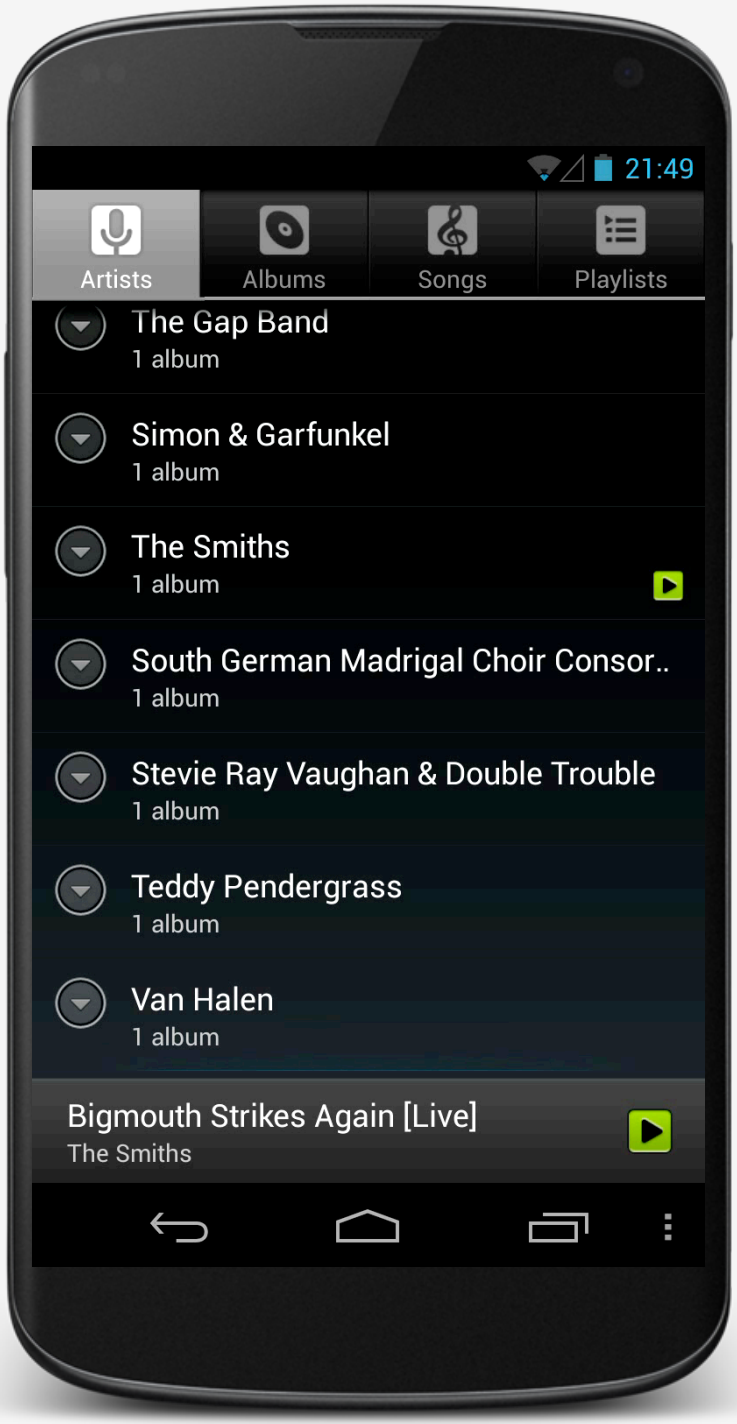
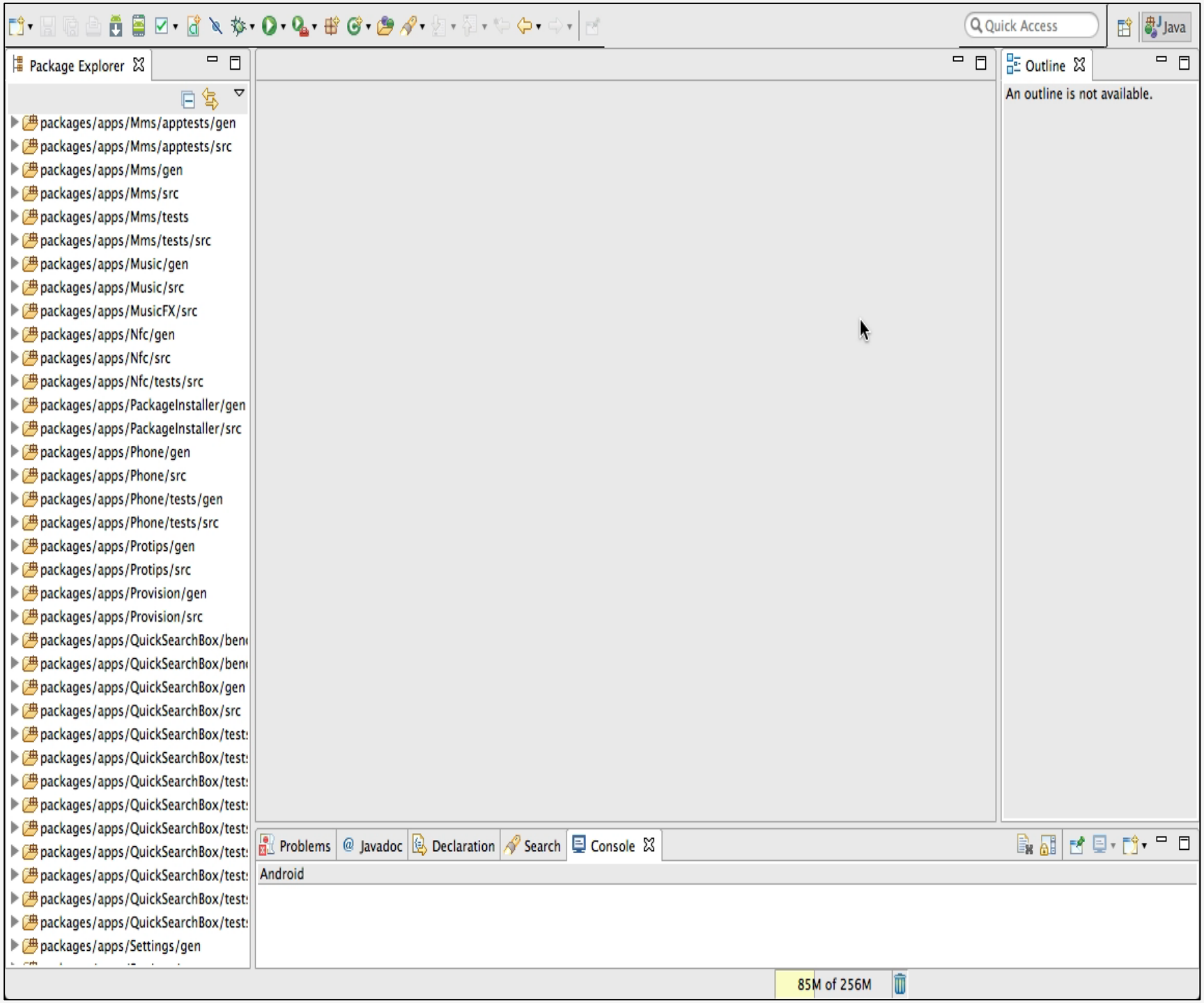

21:49
Artists
Albums
Songs
Playlists
The Gap Band
1 album
Simon & Garfunkel
1 album
The Smiths
1 album
South German Madrigal Choir Consor..
1 album
Stevie Ray Vaughan & Double Trouble
1 album
Teddy Pendergrass
1 album
Van Halen
1 album
Bigmouth Strikes Again [Live]
The Smiths


Quick Access
Java
Package Explorer
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packages/apps/Mms/apptests/src
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packages/apps/Mms/tests
packages/apps/Mms/tests/src
packages/apps/Music/gen
packages/apps/Music/src
packages/apps/MusicFX/src
packages/apps/Nfc/gen
packages/apps/Nfc/src
packages/apps/Nfc/tests/src
packages/apps/PackageInstaller/gen
packages/apps/PackageInstaller/src
packages/apps/Phone/gen
packages/apps/Phone/src
packages/apps/Phone/tests/gen
packages/apps/Phone/tests/src
packages/apps/Protips/gen
packages/apps/Protips/src
packages/apps/Provision/gen
packages/apps/Provision/src
packages/apps/QuickSearchBox/ben
packages/apps/QuickSearchBox/ben
packages/apps/QuickSearchBox/gen
packages/apps/QuickSearchBox/src
packages/apps/QuickSearchBox/test
packages/apps/QuickSearchBox/test
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packages/apps/QuickSearchBox/test
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Outline
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Problems
Javadoc
Declaration
Search
Console
Android
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BroadcastReceiver

Component that listens for and responds to events

The subscriber in publish/subscribe pattern

Events represented by the Intent class and then Broadcast

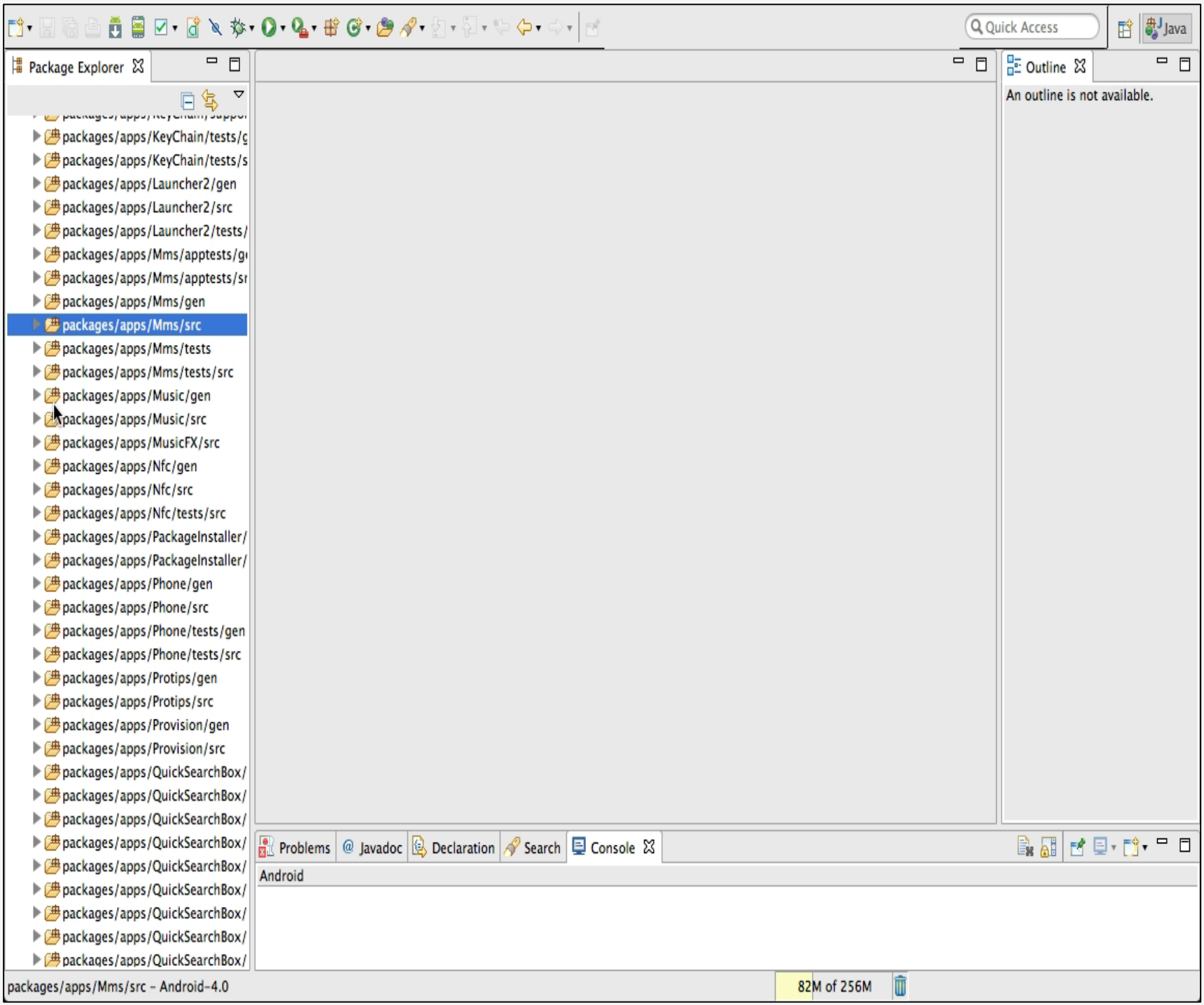
BroadcastReceiver

Component that listens for and responds to events

The subscriber in publish/subscribe pattern

Events represented by the Intent class and then Broadcast

BroadcastReceiver receives and responds to broadcast event


Quick Access
Java
Package Explorer
packages/apps/KeyChain/tests/g
packages/apps/KeyChain/tests/s
packages/apps/Launcher2/gen
packages/apps/Launcher2/src
packages/apps/Launcher2/tests/
packages/apps/Mms/apptests/g
packages/apps/Mms/apptests/sr
packages/apps/Mms/gen
packages/apps/Mms/src
packages/apps/Mms/tests
packages/apps/Mms/tests/src
packages/apps/Music/gen
packages/apps/Music/src
packages/apps/MusicFX/src
packages/apps/Nfc/gen
packages/apps/Nfc/src
packages/apps/Nfc/tests/src
packages/apps/PackageInstaller/
packages/apps/PackageInstaller/
packages/apps/Phone/gen
packages/apps/Phone/src
packages/apps/Phone/tests/gen
packages/apps/Phone/tests/src
packages/apps/Protips/gen
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Outline
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Problems
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Declaration
Search
Console
Android
packages/apps/Mms/src - Android-4.0
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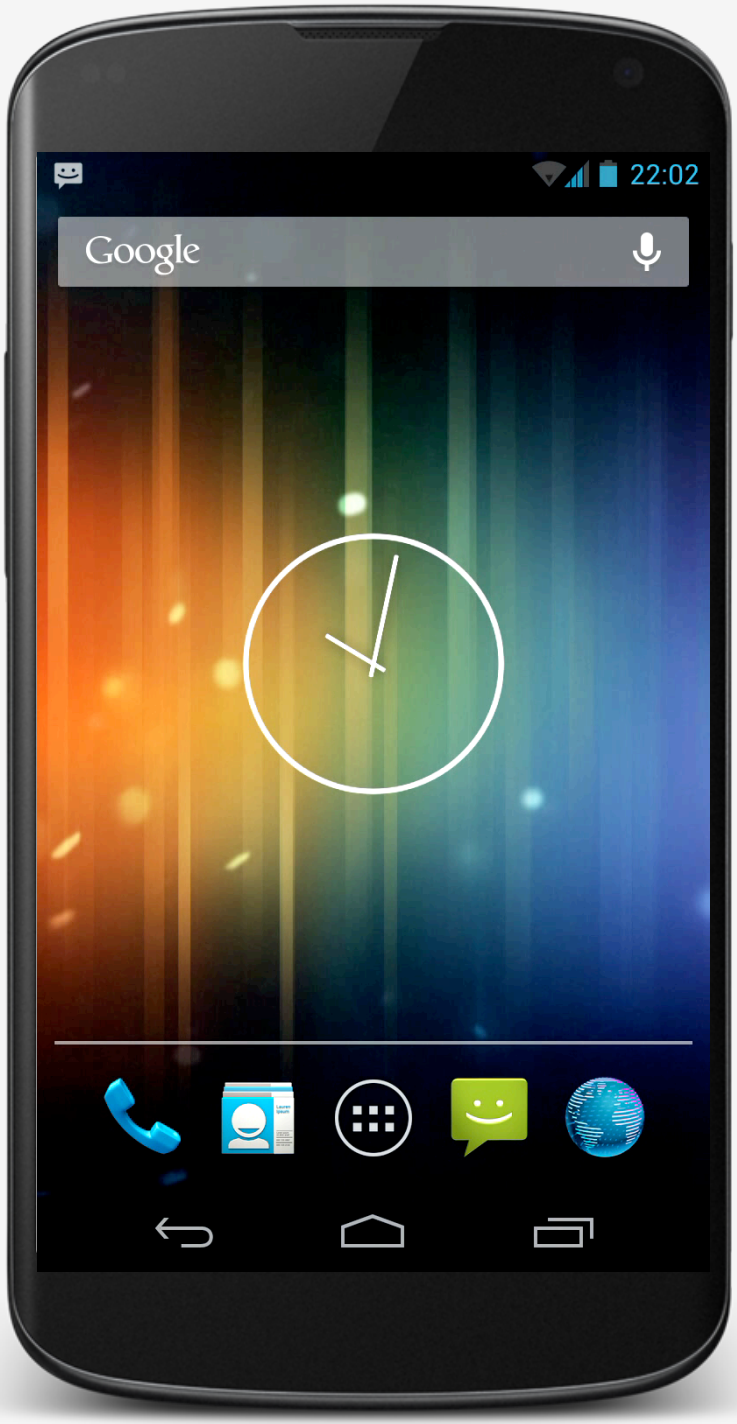
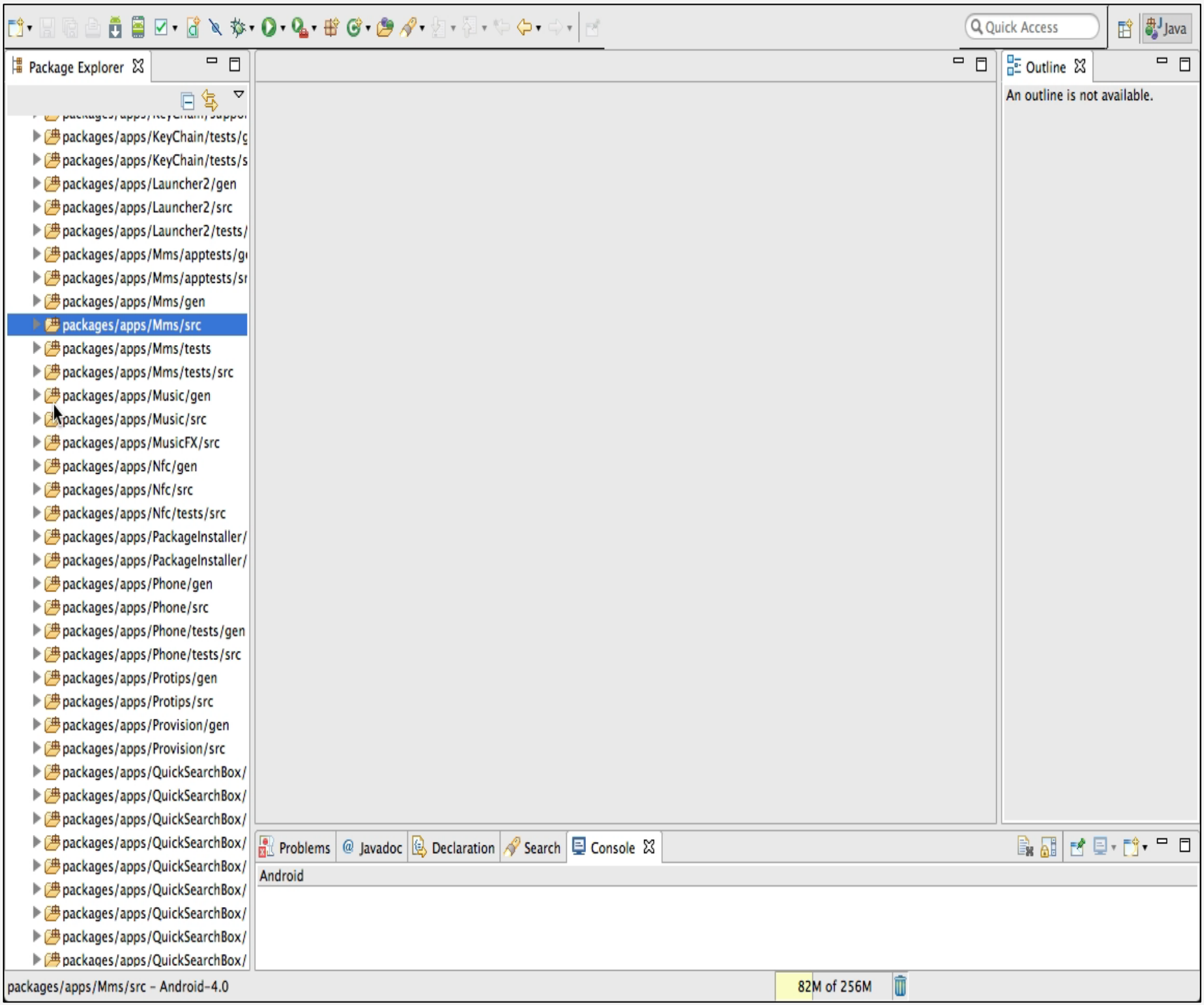

22:02
Google


Quick Access
Java
Package Explorer
packages/apps/KeyChain/tests/g
packages/apps/KeyChain/tests/s
packages/apps/Launcher2/gen
packages/apps/Launcher2/src
packages/apps/Launcher2/tests/
packages/apps/Mms/apptests/g
packages/apps/Mms/apptests/sr
packages/apps/Mms/gen
packages/apps/Mms/src
packages/apps/Mms/tests
packages/apps/Mms/tests/src
packages/apps/Music/gen
packages/apps/Music/src
packages/apps/MusicFX/src
packages/apps/Nfc/gen
packages/apps/Nfc/src
packages/apps/Nfc/tests/src
packages/apps/PackageInstaller/
packages/apps/PackageInstaller/
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Outline
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Problems
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Declaration
Search
Console
Android
packages/apps/Mms/src - Android-4.0
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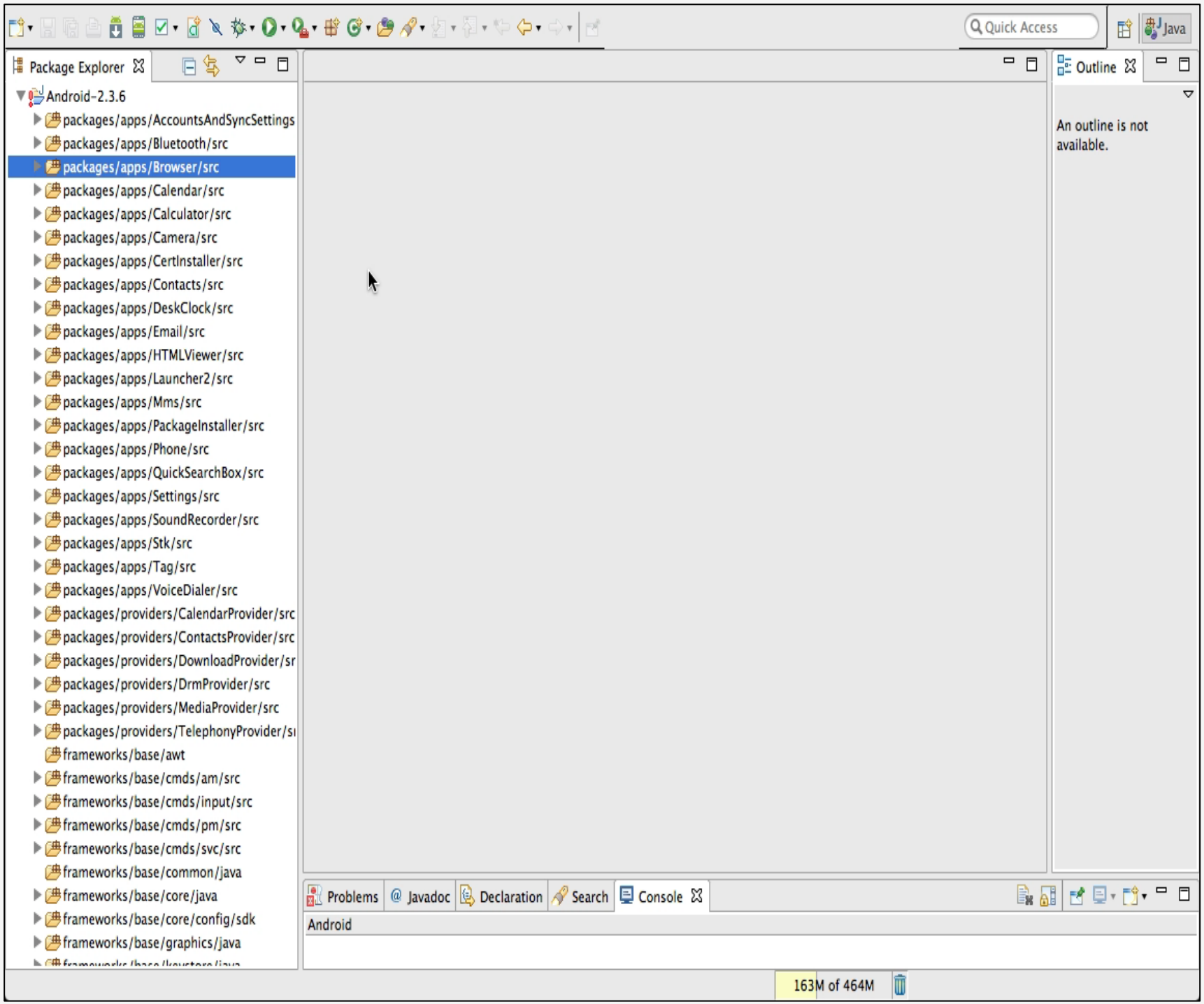
Content Providers

- Store & share data across applications
  - Uses database-style interface
  - Handles interprocess communication


Quick Access
Java
Package Explorer
Android-2.3.6
packages/apps/AccountsAndSyncSettings
packages/apps/Bluetooth/src
packages/apps/Browser/src
packages/apps/Calendar/src
packages/apps/Calculator/src
packages/apps/Camera/src
packages/apps/CertInstaller/src
packages/apps/Contacts/src
packages/apps/DeskClock/src
packages/apps/Email/src
packages/apps/HTMLViewer/src
packages/apps/Launcher2/src
packages/apps/Mms/src
packages/apps/PackageInstaller/src
packages/apps/Phone/src
packages/apps/QuickSearchBox/src
packages/apps/Settings/src
packages/apps/SoundRecorder/src
packages/apps/Stk/src
packages/apps/Tag/src
packages/apps/VoiceDialer/src
packages/providers/CalendarProvider/src
packages/providers/ContactsProvider/src
packages/providers/DownloadProvider/sr
packages/providers/DrmProvider/src
packages/providers/MediaProvider/src
packages/providers/TelephonyProvider/s
frameworks/base/awt
frameworks/base/cmds/am/src
frameworks/base/cmds/input/src
frameworks/base/cmds/pm/src
frameworks/base/cmds/svc/src
frameworks/base/common/java
frameworks/base/core/java
frameworks/base/core/config/sdk
frameworks/base/graphics/java
Outline
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Problems
Javadoc
Declaration
Search
Console
Android
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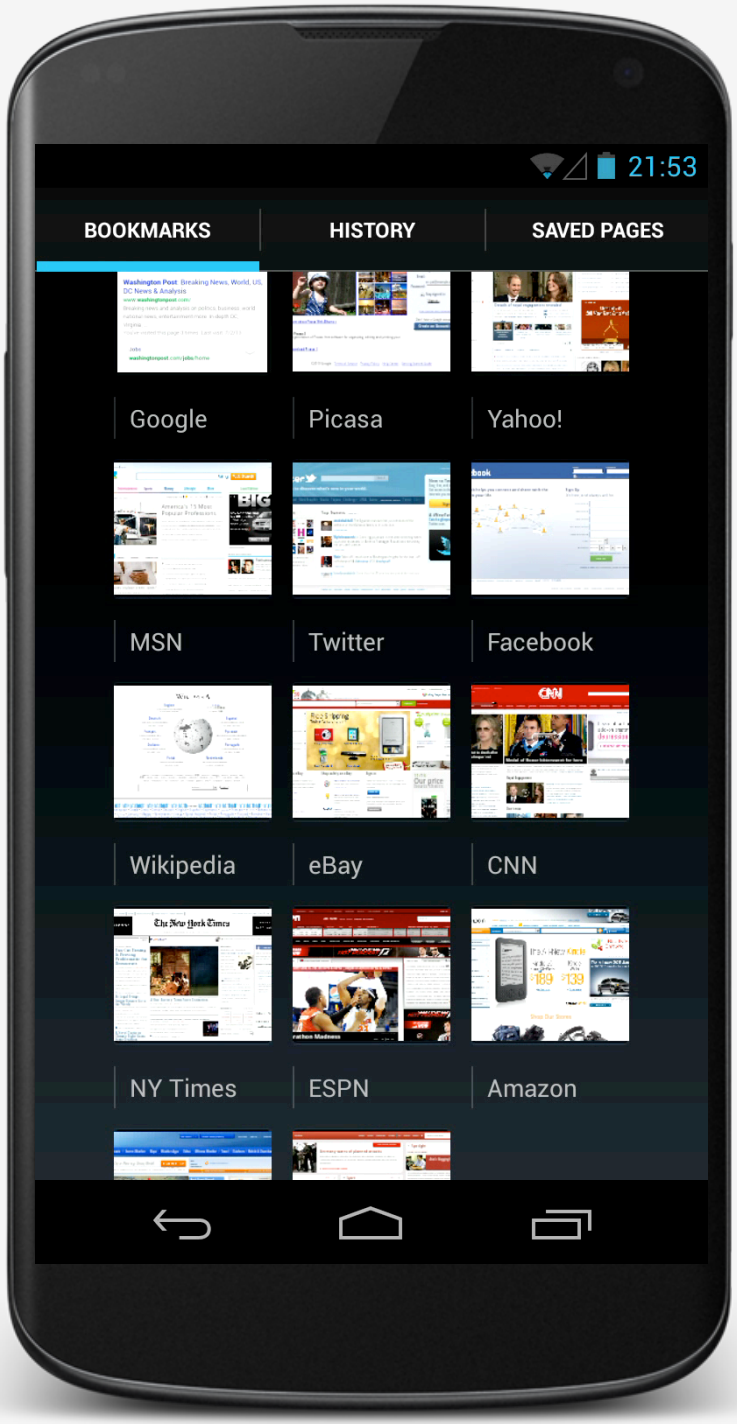
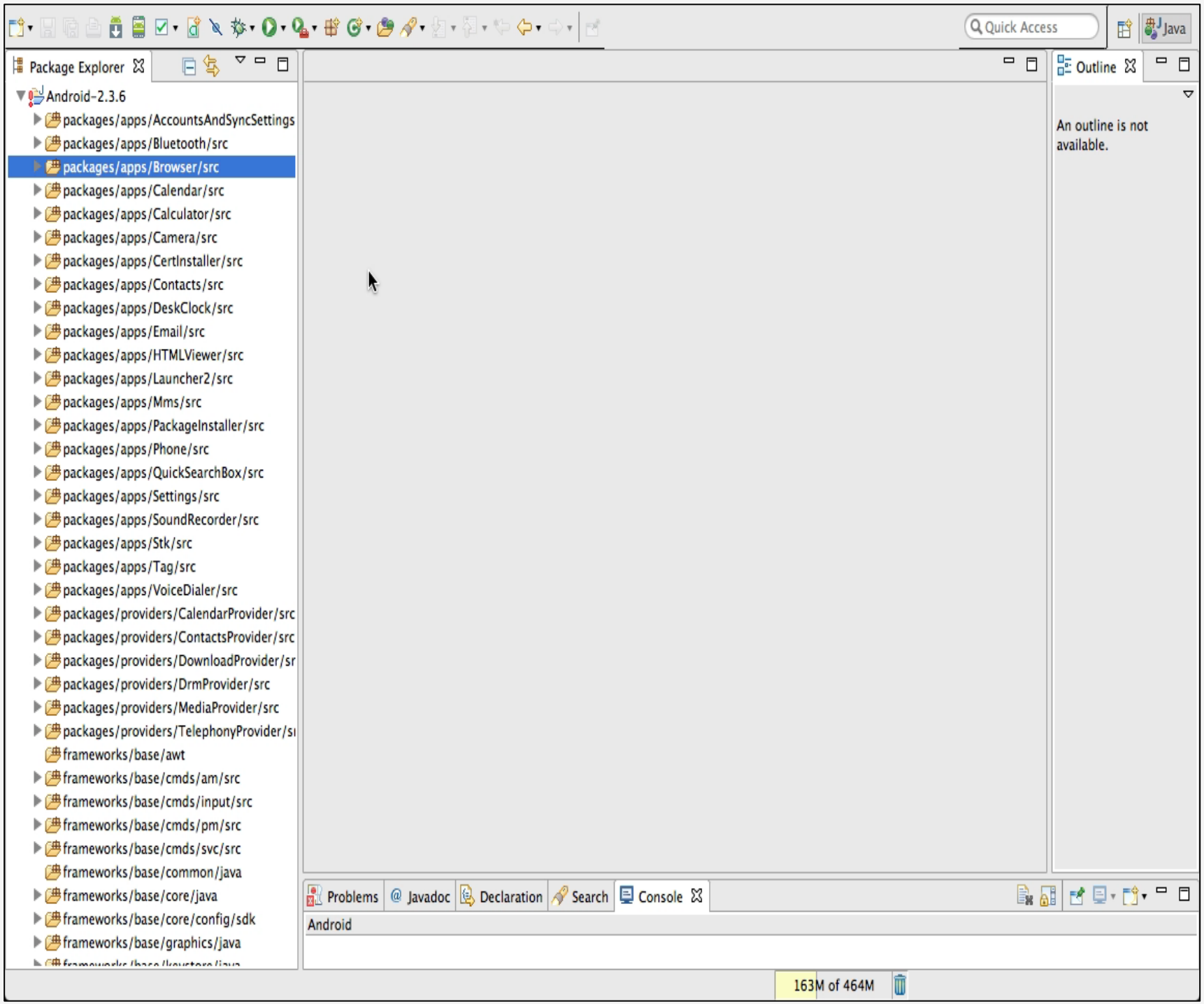

21:53
BOOKMARKS
HISTORY
SAVED PAGES
Google
Picasa
Yahoo!
MSN
Twitter
Facebook
Wikipedia
eBay
CNN
NY Times
ESPN
Amazon


Quick Access
Java
Package Explorer
Android-2.3.6
packages/apps/AccountsAndSyncSettings
packages/apps/Bluetooth/src
packages/apps/Browser/src
packages/apps/Calendar/src
packages/apps/Calculator/src
packages/apps/Camera/src
packages/apps/CertInstaller/src
packages/apps/Contacts/src
packages/apps/DeskClock/src
packages/apps/Email/src
packages/apps/HTMLViewer/src
packages/apps/Launcher2/src
packages/apps/Mms/src
packages/apps/PackageInstaller/src
packages/apps/Phone/src
packages/apps/QuickSearchBox/src
packages/apps/Settings/src
packages/apps/SoundRecorder/src
packages/apps/Stk/src
packages/apps/Tag/src
packages/apps/VoiceDialer/src
packages/providers/CalendarProvider/src
packages/providers/ContactsProvider/src
packages/providers/DownloadProvider/sr
packages/providers/DrmProvider/src
packages/providers/MediaProvider/src
packages/providers/TelephonyProvider/s
frameworks/base/awt
frameworks/base/cmds/am/src
frameworks/base/cmds/input/src
frameworks/base/cmds/pm/src
frameworks/base/cmds/svc/src
frameworks/base/common/java
frameworks/base/core/java
frameworks/base/core/config/sdk
frameworks/base/graphics/java
Outline
An outline is not available.
Problems
Javadoc
Declaration
Search
Console
Android
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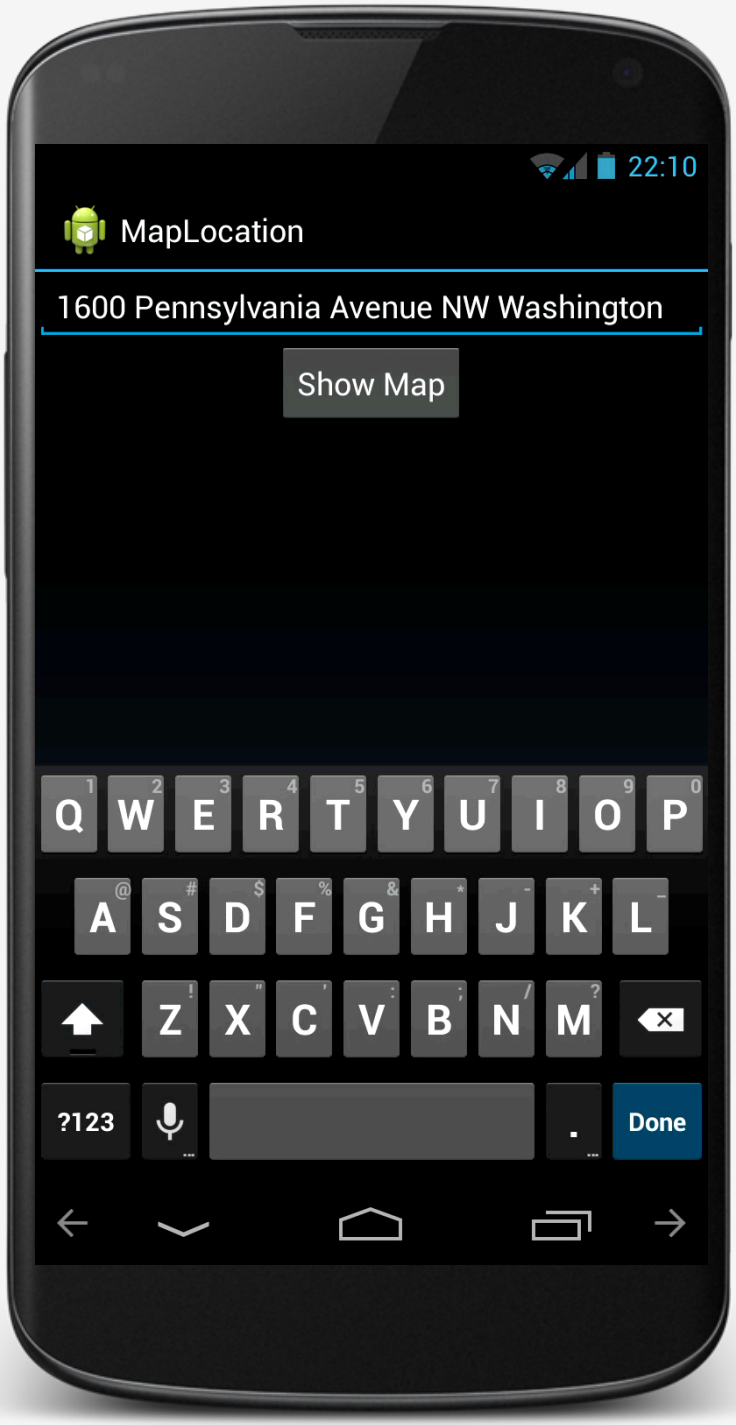
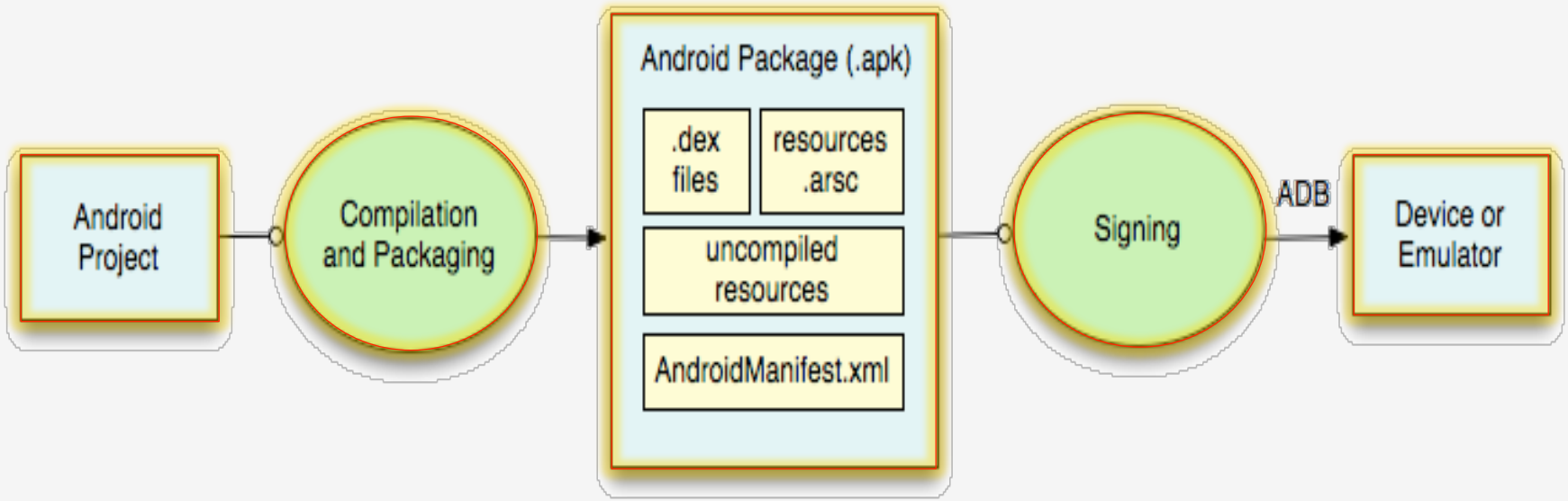
MapLocation

User enters an address

App displays a map of area around the address


22:10
MapLocation
1600 Pennsylvania Avenue NW Washington
Show Map
Done

Building an Application



See:

http://developer.android.com/guide/developing/building

Creating an Android App

1. Define resources
2. Implement application classes
3. Package application
4. Install & run application

1. Defining Resources

Resources are non-source code entities

Many different resource types, such as

- Layout, Strings, Images, Menus, & animations

Allows apps to be customized for different devices and users

See:

http://developer.android.com/guide/topics/resources

Strings

Types: String, String Array, Plurals

Strings

Types: String, String Array, Plurals

Typically stored in res/values/*.xml

Specified in XML, e.g.,

```
<string name="hello">Hello World!</string>
```

Can include formatting and styling

Strings

Accessed by other resources as:

@string/string_name

Accessed in Java as:

R.string.string_name

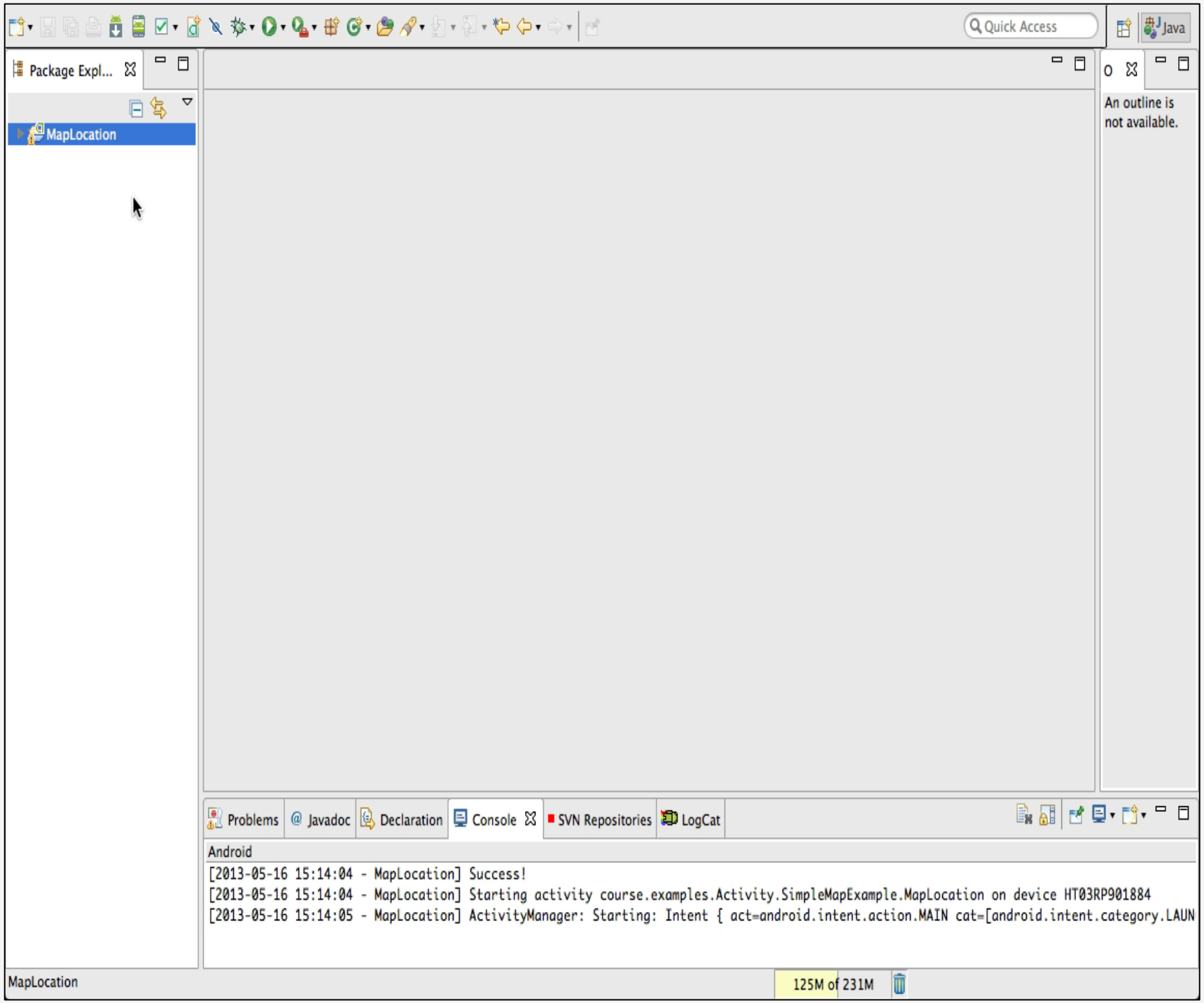
MapLocation

strings.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="show_map_string">Show Map</string>
    <string name="location_string">Enter Location</string>
</resources>
```

strings.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="show_map_string">Mostra la mappa</string>
    <string name="location_string">Digita l\'indirizzo</string>
</resources>
```


Quick Access
Java
Package Expl...
MapLocation
An outline is not available.
Problems
Javadoc
Declaration
Console
SVN Repositories
LogCat
Android
[2013-05-16 15:14:04 - MapLocation] Success!
[2013-05-16 15:14:04 - MapLocation] Starting activity course.examples.Activity.SimpleMapExample.MapLocation on device HT03RP901884
[2013-05-16 15:14:05 - MapLocation] ActivityManager: Starting: Intent { act=android.intent.action.MAIN cat=[android.intent.category.LAUN
MapLocation
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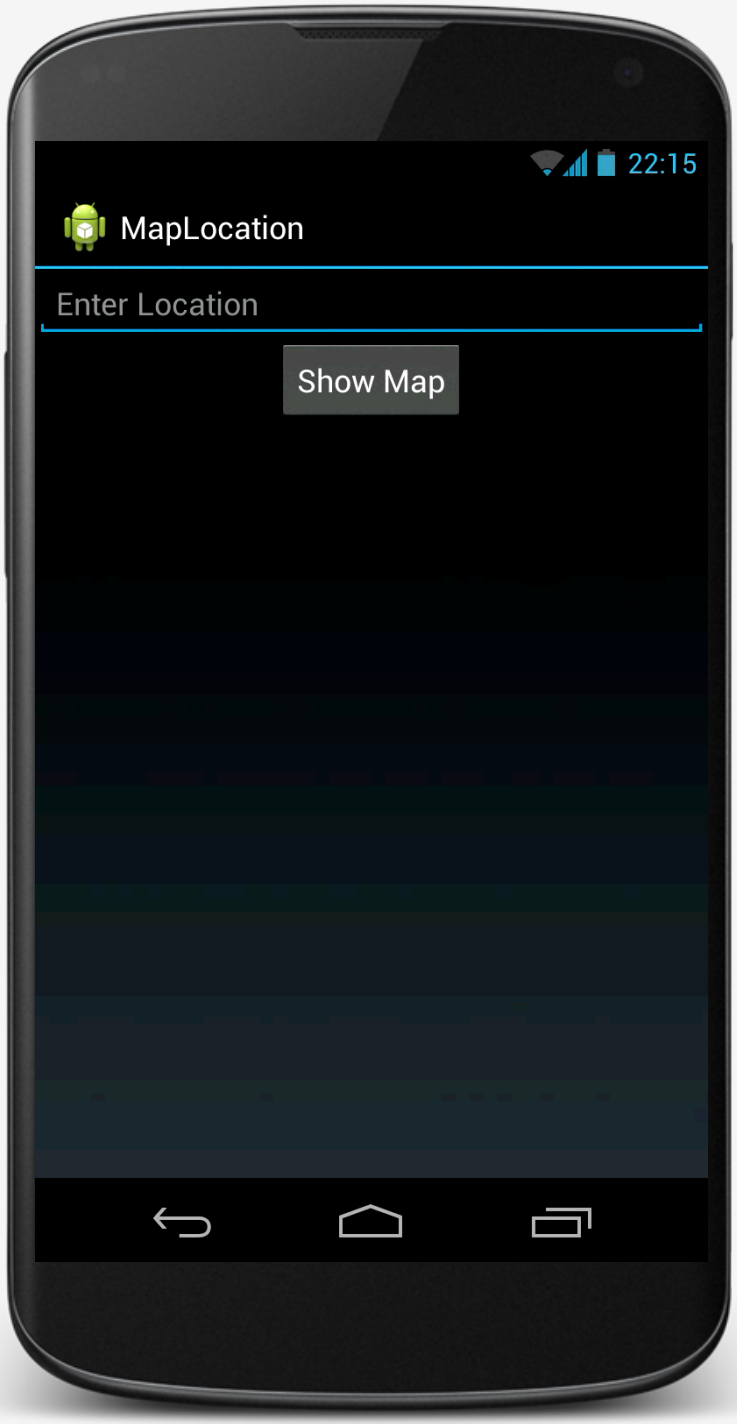
Customizing Strings

If your default language is Italian,
@string/location_string is

"Digita l'indirizzo"

Otherwise,

"Enter Location"


22:15
MapLocation
Enter Location
Show Map


22:14
MapLocation
Digita l'indirizzo
Mostra la mappa

User Interface Layout

UI layout specified in XML files

- Some tools allow visual layout

XML files typically stored in

- res/layout/*.xml

Accessed in Java as:

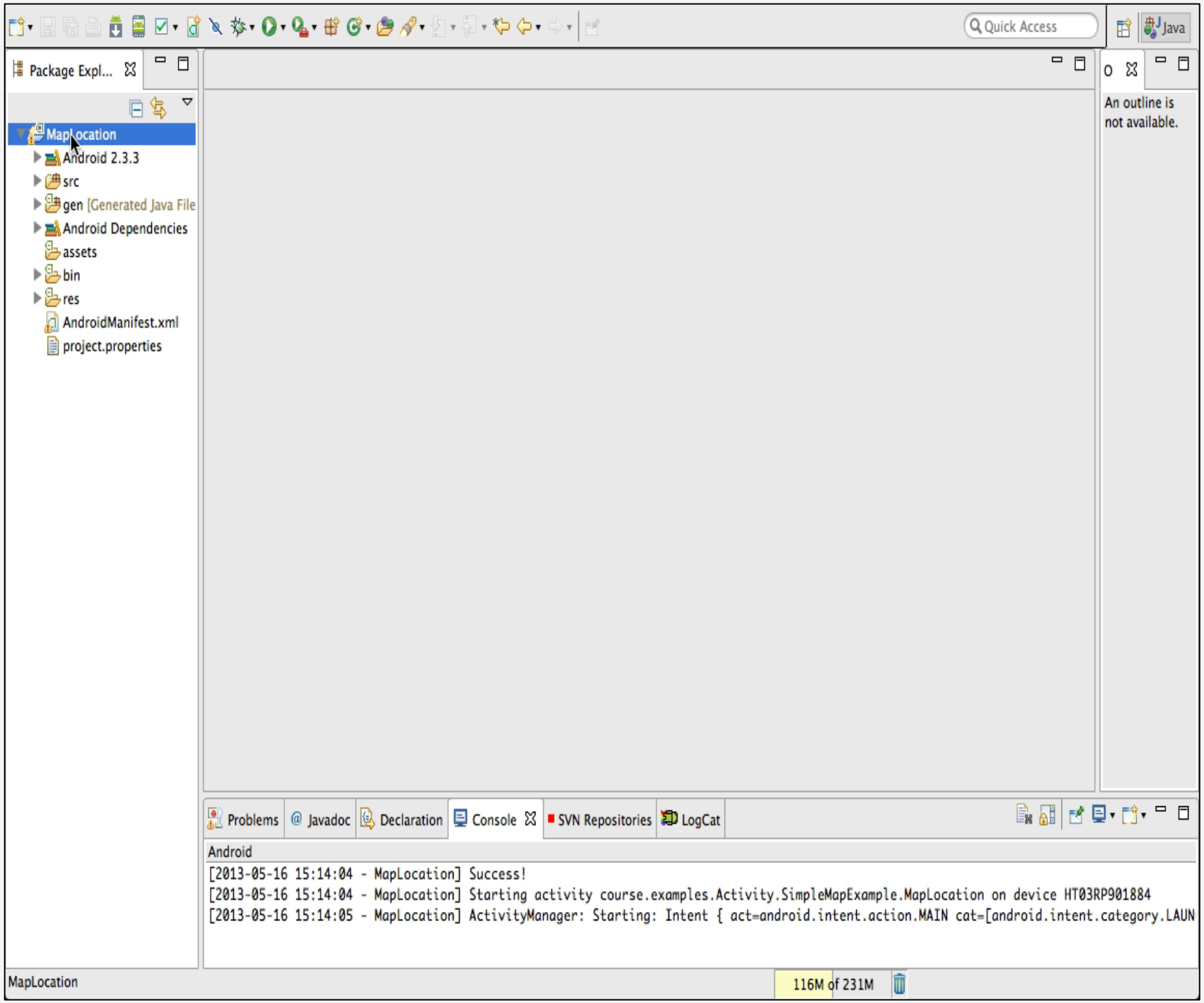
- R.layout. layout_name

Accessed by other resources as:

- @layout/layout_name

Using Multiple layout files

Can specify different Layout files based on your device's orientation, screen size, etc.


Quick Access
Java
Package Expl...
MapLocation
Android 2.3.3
src
gen [Generated Java File
Android Dependencies
assets
bin
res
AndroidManifest.xml
project.properties
An outline is not available.
Problems
Javadoc
Declaration
Console
SVN Repositories
LogCat
Android
[2013-05-16 15:14:04 - MapLocation] Success!
[2013-05-16 15:14:04 - MapLocation] Starting activity course.examples.Activity.SimpleMapExample.MapLocation on device HT03RP901884
[2013-05-16 15:14:05 - MapLocation] ActivityManager: Starting: Intent { act=android.intent.action.MAIN cat=[android.intent.category.LAUN
MapLocation
116M of 231M

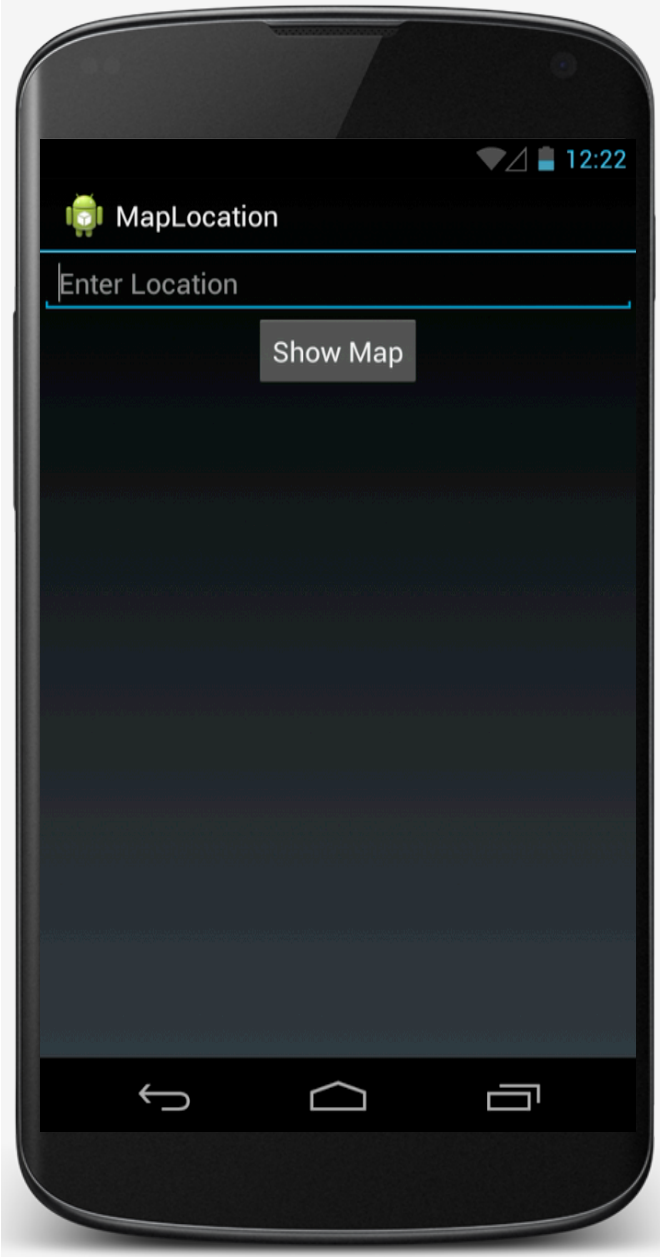
MapLocation

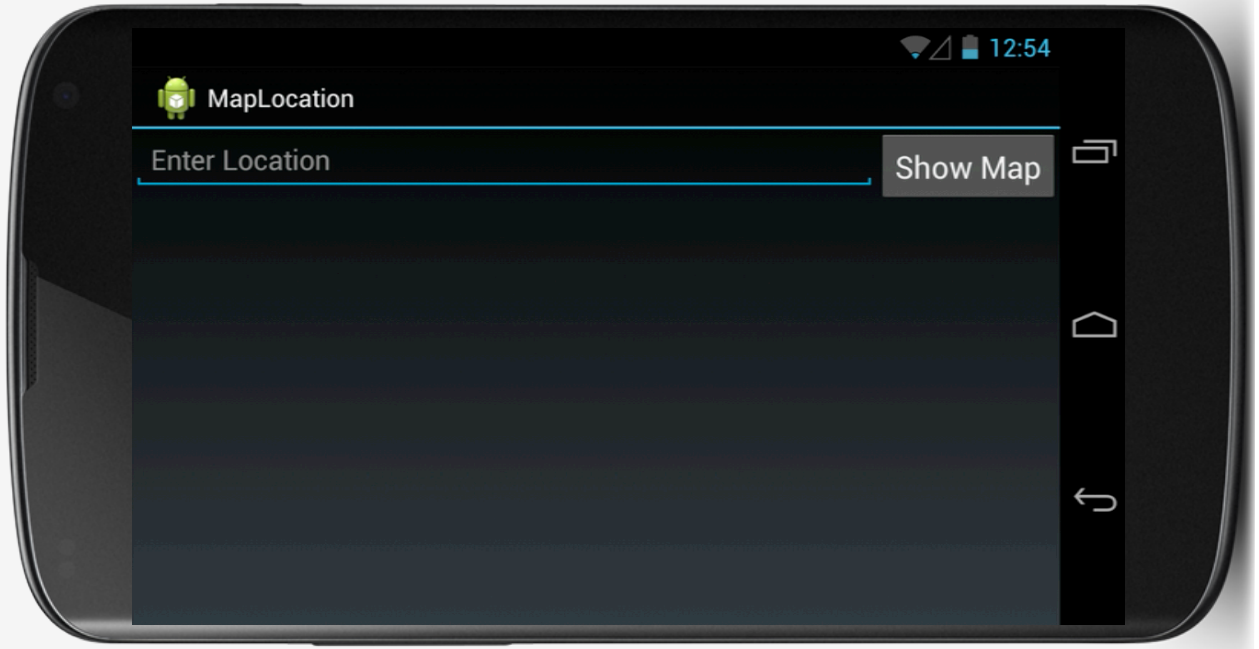
strings.xml

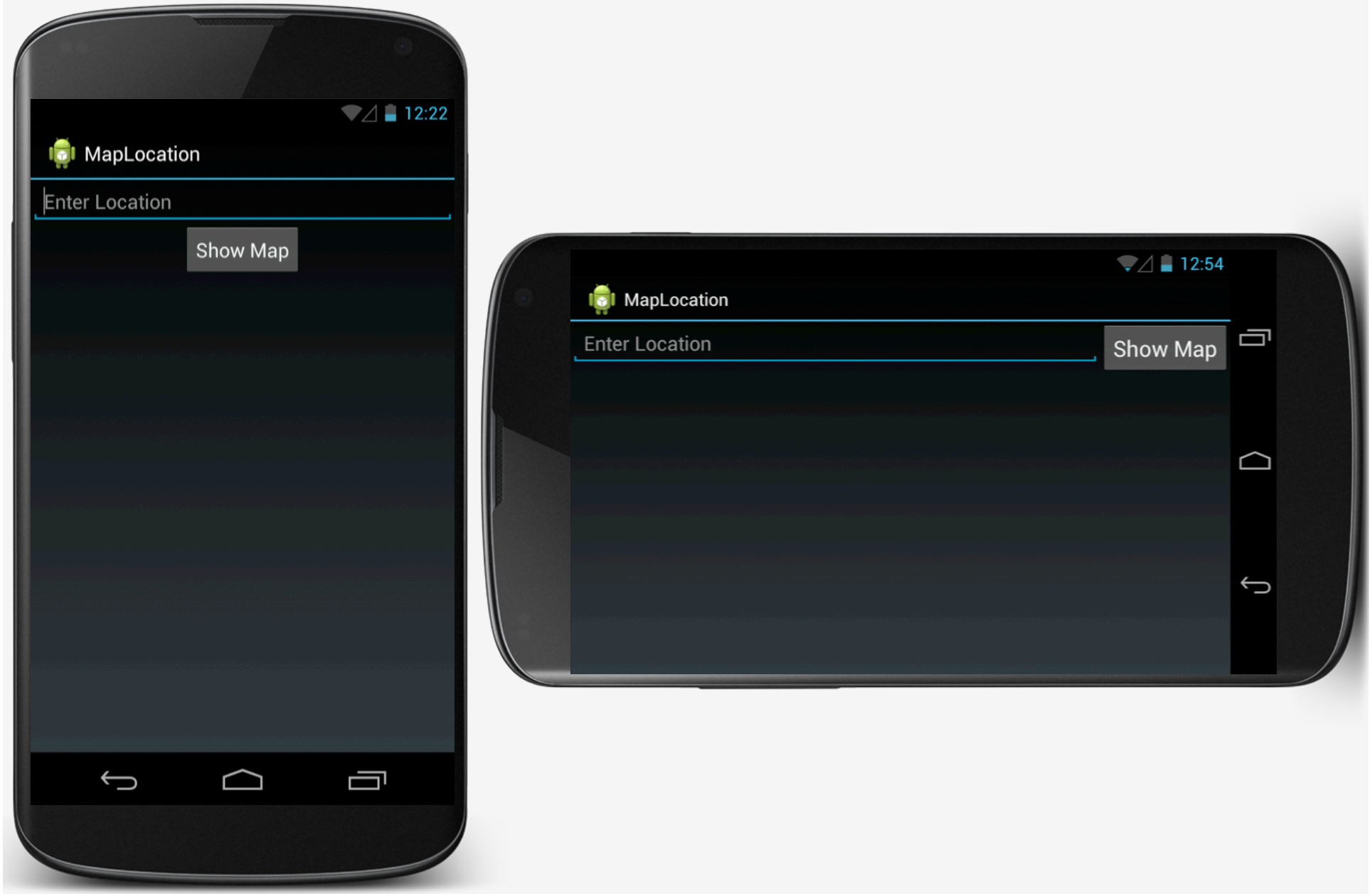
```xml
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="show_map_string">Show Map</string>
    <string name="location_string">Enter Location</string>
</resources>
```

strings.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="show_map_string">Mostra la mappa</string>
    <string name="location_string">Digita l\'indirizzo</string>
</resources>
```


12:22
MapLocation
Enter Location
Show Map

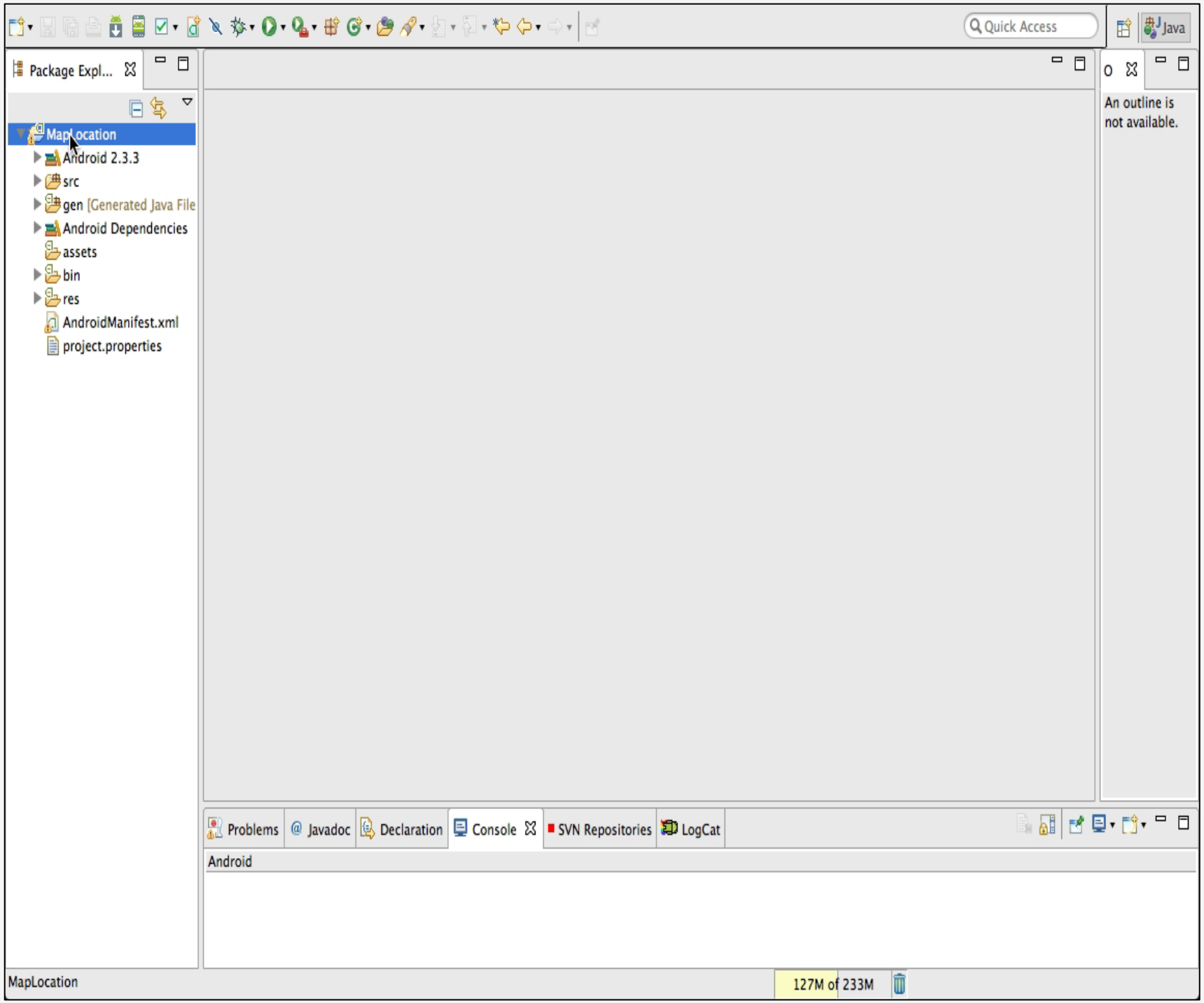

12:54
MapLocation
Enter Location
Show Map


12:22
MapLocation
Enter Location
Show Map
12:54
MapLocation
Enter Location
Show Map

R.java

At compilation time, resources are used to generate the R.java class

Java code uses the R class to access resources


Quick Access
Java
Package Expl...
MapLocation
Android 2.3.3
src
gen [Generated Java File
Android Dependencies
assets
bin
res
AndroidManifest.xml
project.properties
An outline is not available.
Problems
Javadoc
Declaration
Console
SVN Repositories
LogCat
Android
MapLocation
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MapLocation

```
public final class R {
    public static final class attr {
    }
    public static final class drawable {
        public static final int ic_launcher=0x7f020000;
    }
    public static final class id {
        public static final int RelativeLayout1=0x7f050000;
        public static final int location=0x7f050001;
        public static final int mapButton=0x7f050002;
    }
    public static final class layout {
        public static final int main=0x7f030000;
    }
    public static final class string {
        public static final int location_string=0x7f040001;
        public static final int show_map_string=0x7f040000;
    }
}
```

2. Implement Classes

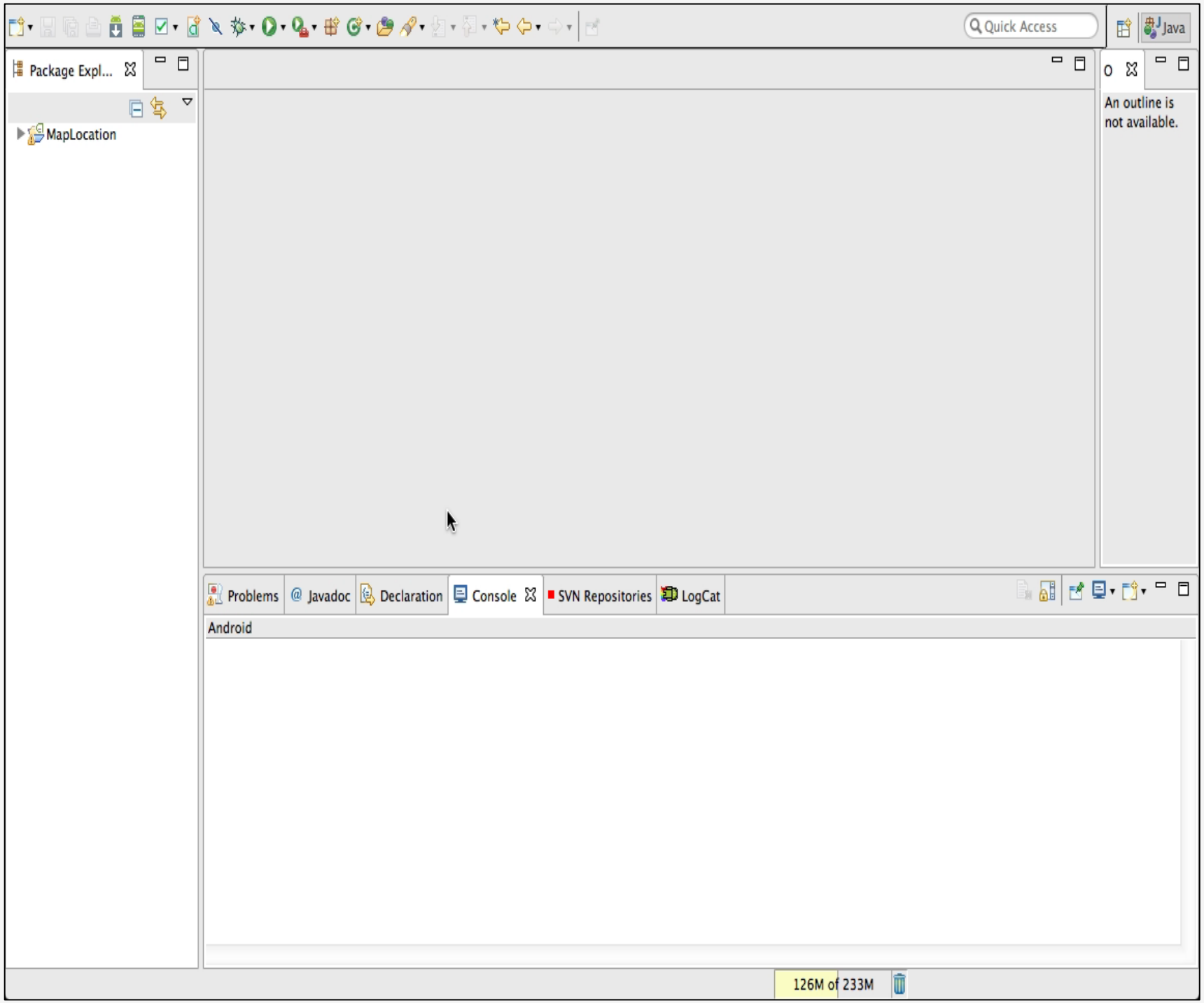
Usually involves at least one Activity

Activity initialization code usually in onCreate()

2. Implement Classes

Typical onCreate() workflow

- Restore saved state
- Set content view
- Initialize UI elements
- Link UI elements to code actions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An outline is not available.
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MapLocation

```java
@Override
protected void onCreate(Bundle savedInstanceState) {

    // Required call through to Activity.onCreate()
    // Restore any saved instance state
    super.onCreate(savedInstanceState);

    // Set content view
    setContentView(R.layout.main);

    // Initialize UI elements
    final EditText addrText = (EditText) findViewById(R.id.location);
    final Button button = (Button) findViewById(R.id.mapButton);
```

MapLocation

```
    // Initialize UI elements
    final EditText addrText = (EditText) findViewById(R.id.location);
    final Button button = (Button) findViewById(R.id.mapButton);

    // Link UI elements to actions in code
    button.setOnClickListener(new OnClickListener() {

        // Called when user clicks the Show Map button
        public void onClick(View v) {
            try {

                // Process text for network transmission
                String address = addrText.getText().toString();
                address = address.replace(' ', '+');

                // Create Intent object for starting Google Maps application
                Intent geoIntent = new Intent(
                        android.content.Intent.ACTION_VIEW, Uri
                                .parse("geo:0,0?q=" + address));

                // Use the Intent to start Google Maps application using Activity.startActivity()
                startActivity(geoIntent);

            } catch (Exception e) {
                // Log any error messages to LogCat using Log.e()
                Log.e(TAG, e.toString());
            }
        }
    });
}
```

3. Package Application

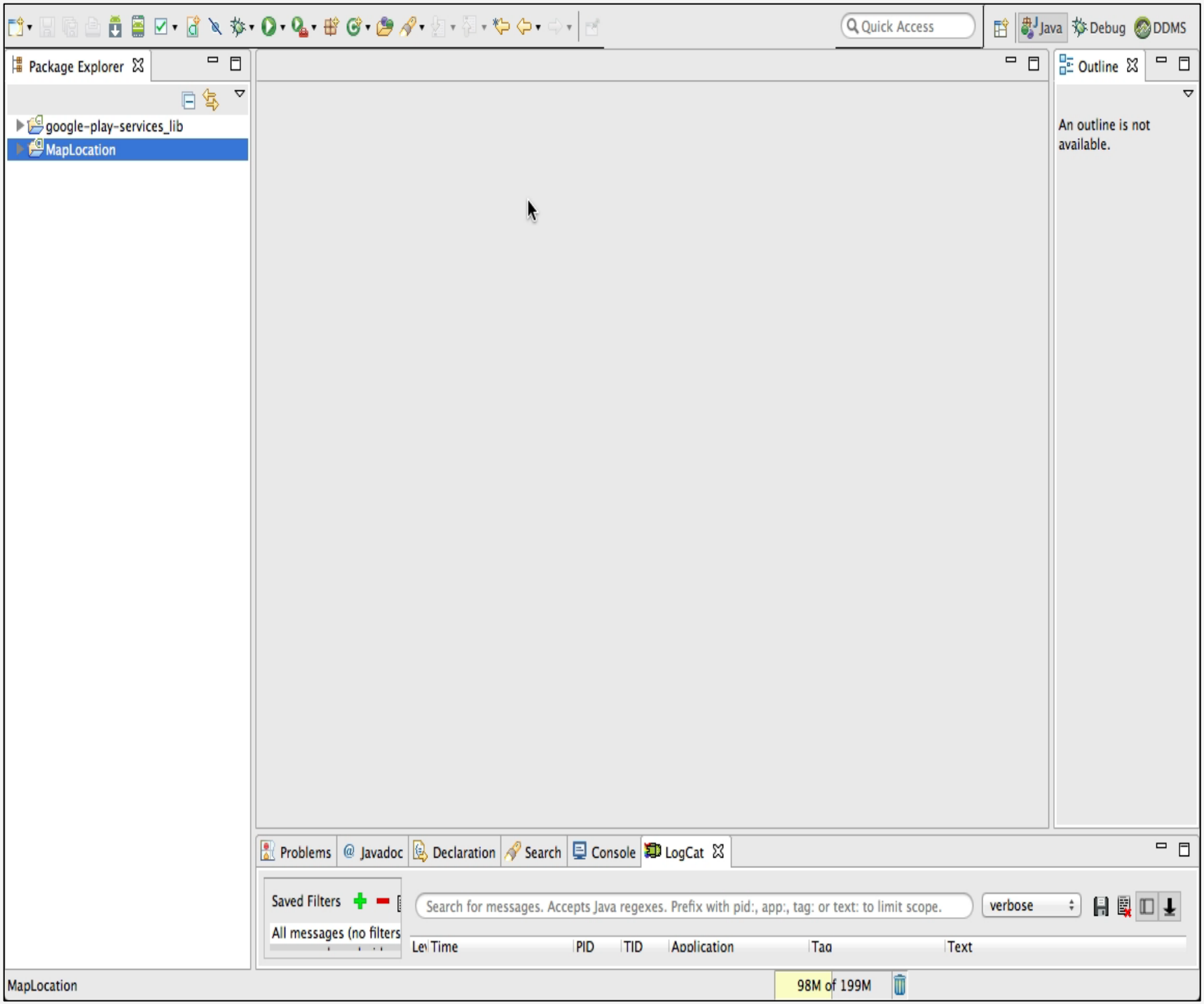
System packages application components & resources into a .apk file

Developers specify required application information in a file called AndroidManifest.xml

AndroidManifest.xml

Information includes:

- Application Name
- Components
- Other
  - Required permissions
  - Application features
  - Minimum API level


Quick Access
Java
Debug
DDMS
Package Explorer
google-play-services_lib
MapLocation
Outline
An outline is not available.
Problems
Javadoc
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Search
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LogCat
Saved Filters
All messages (no filters)
Search for messages. Accepts Java regexes. Prefix with pid:, app:, tag: or text: to limit scope.
verbose
Lev
Time
PID
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Application
Tag
Text
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MapLocation

```xml
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="course.examples.MapLocation"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk
        android:minSdkVersion="13"
        android:targetSdkVersion="19" />

    <application
        android:allowBackup="false"
        android:icon="@drawable/ic_launcher"
        android:label="MapLocation" >
        <activity android:name="course.examples.MapLocation.MapLocation" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

4. Install & Run

From Eclipse run in the emulator or device

From command line

- Enable USB Debugging on the device
  - Settings > Applications > Development > USB debugging
- % adb install <path_to_apk>

Next Time

The Activity Class