

Recharge

Android ②

02.02.14



1. Resources (define)

- R.java
- Layout
 - res/layout
 - res/layout-land
- String
 - "hello"
 - plurals
 - String Array
 - "hello"
 - "world"
- res/values/*.XML

2. Classes (implement)

ONcreate()

```

onCreate()
{
  ...
}

```

restores

set

Init

Links

3. Packaging

AndroidManifest.xml

name

permissions

API level **18**

4. install & Run

apk = android package

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

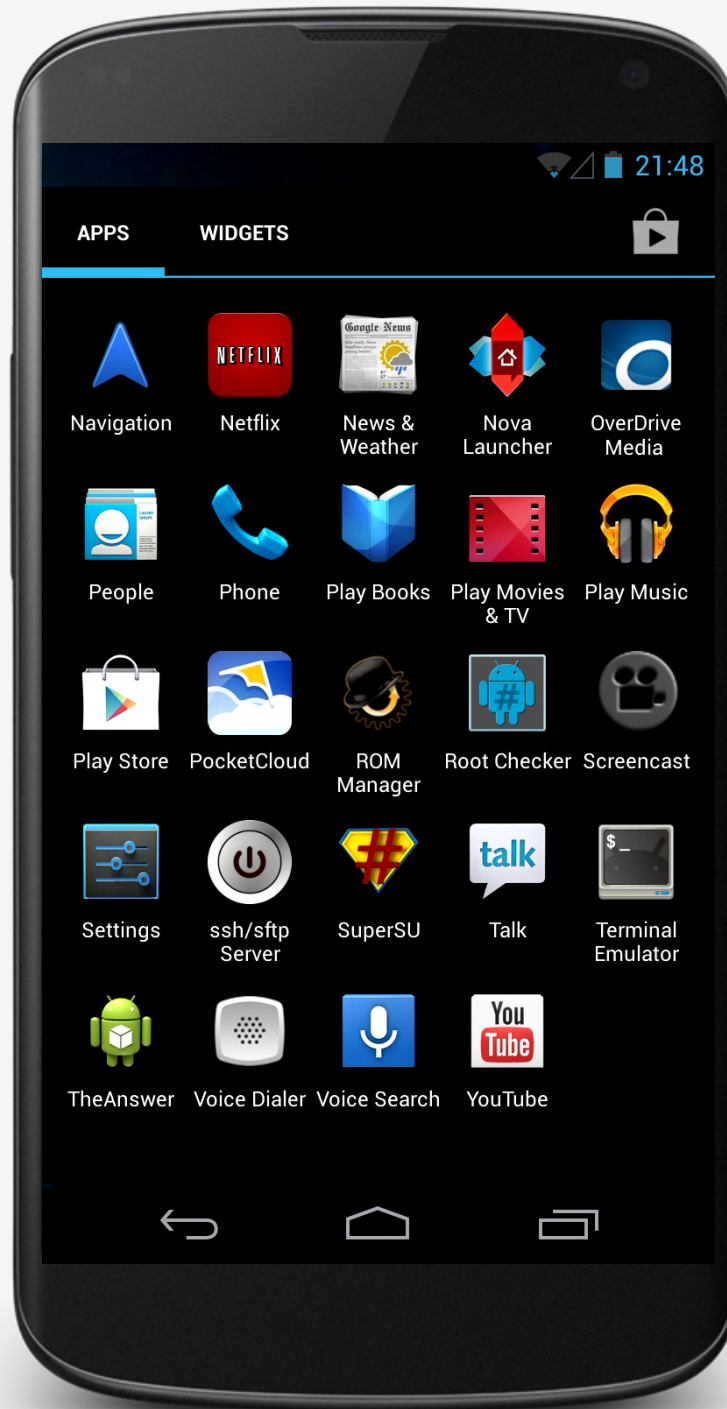
ACTIVITY

PRIMARY CLASS FOR USER INTERACTION

USUALLY IMPLEMENTS A SINGLE, FOCUSED
TASK THAT THE USER CAN DO

The image shows an IDE interface with the following components:

- Package Explorer:** A tree view on the left side showing a hierarchy of packages. The selected package is `packages/apps/Contacts/src`. Other visible packages include `packages/apps/Camera/tests/src`, `packages/apps/CellBroadcastReceive`, `packages/apps/CertInstaller/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/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`, and `packages/apps/Mms/apptests/src`.
- Main Editor:** A large central area that is currently empty.
- Outline:** A panel on the right side with the text "An outline is not available."
- Bottom Toolbar:** Contains tabs for `Problems`, `Javadoc`, `Declaration`, `Search`, and `Console`. The `Console` tab is active, showing the text "Android".
- Status Bar:** At the bottom, it displays "packages/apps/Contacts/src - Android-4.0" on the left, "93M of 256M" in the center, and a trash icon on the right.



APPS

WIDGETS



Navigation



Netflix



News &
Weather



Nova
Launcher



OverDrive
Media



People



Phone



Play Books



Play Movies
& TV



Play Music
& TV



Play Store



PocketCloud



ROM
Manager



Root Checker



Screencast



Settings



ssh/sftp
Server



SuperSU



Talk



Terminal
Emulator



TheAnswer



Voice Dialer



Voice Search



YouTube

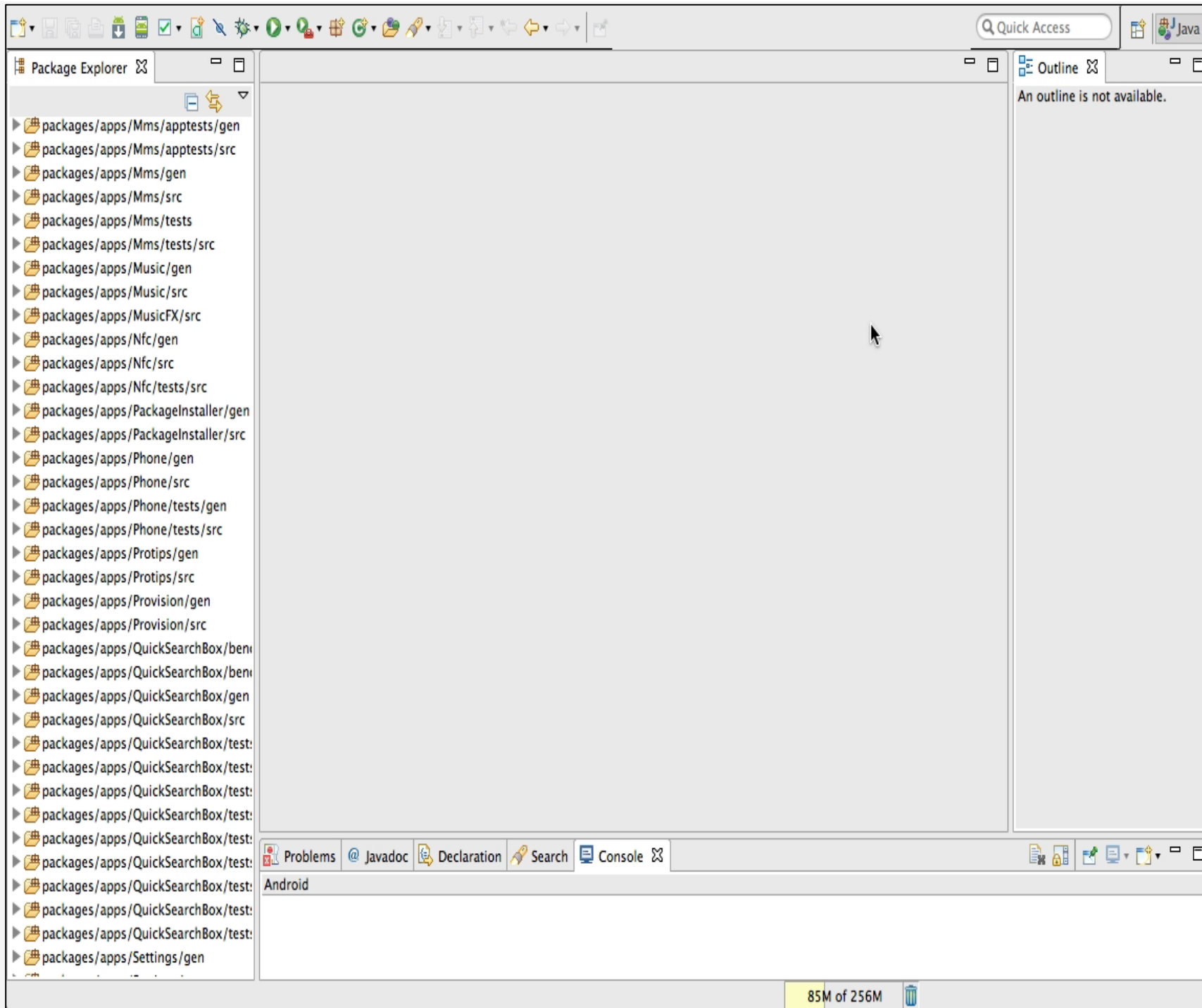


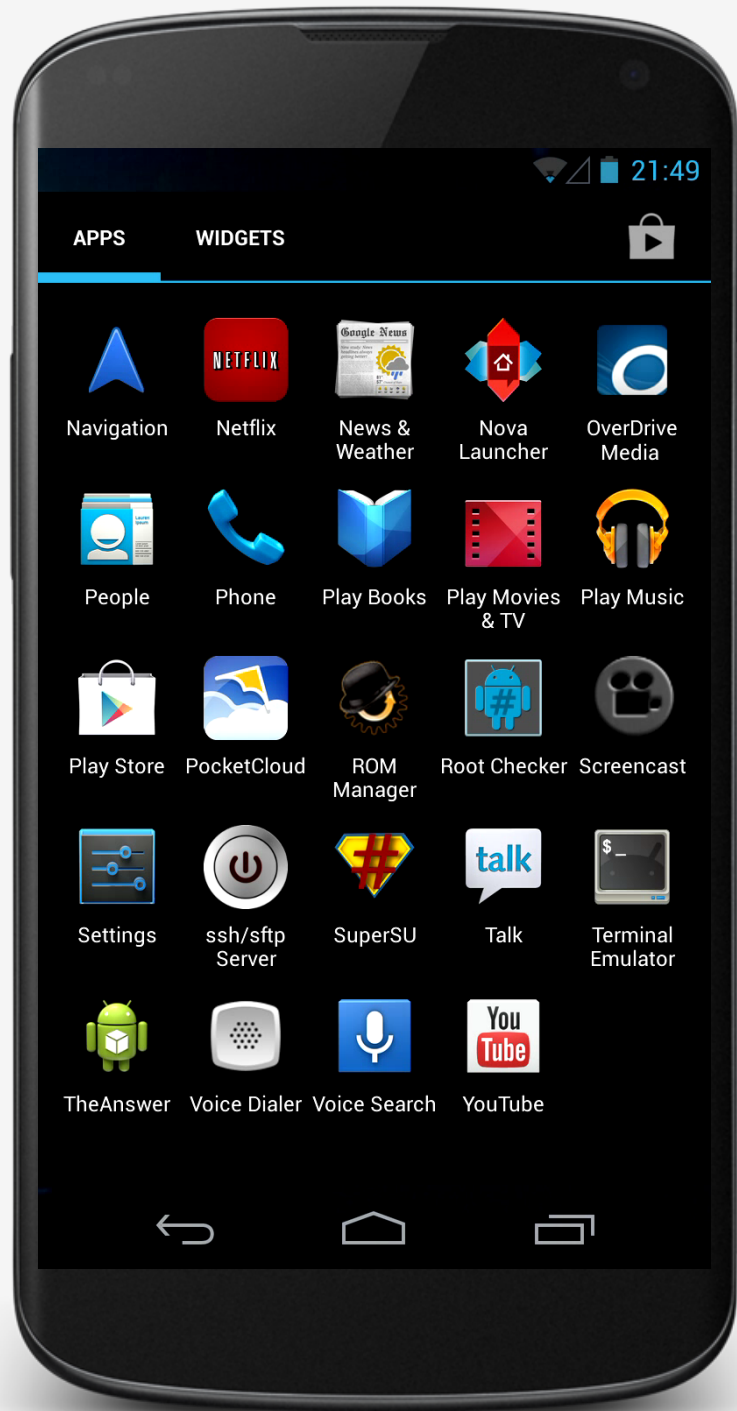
SERVICE

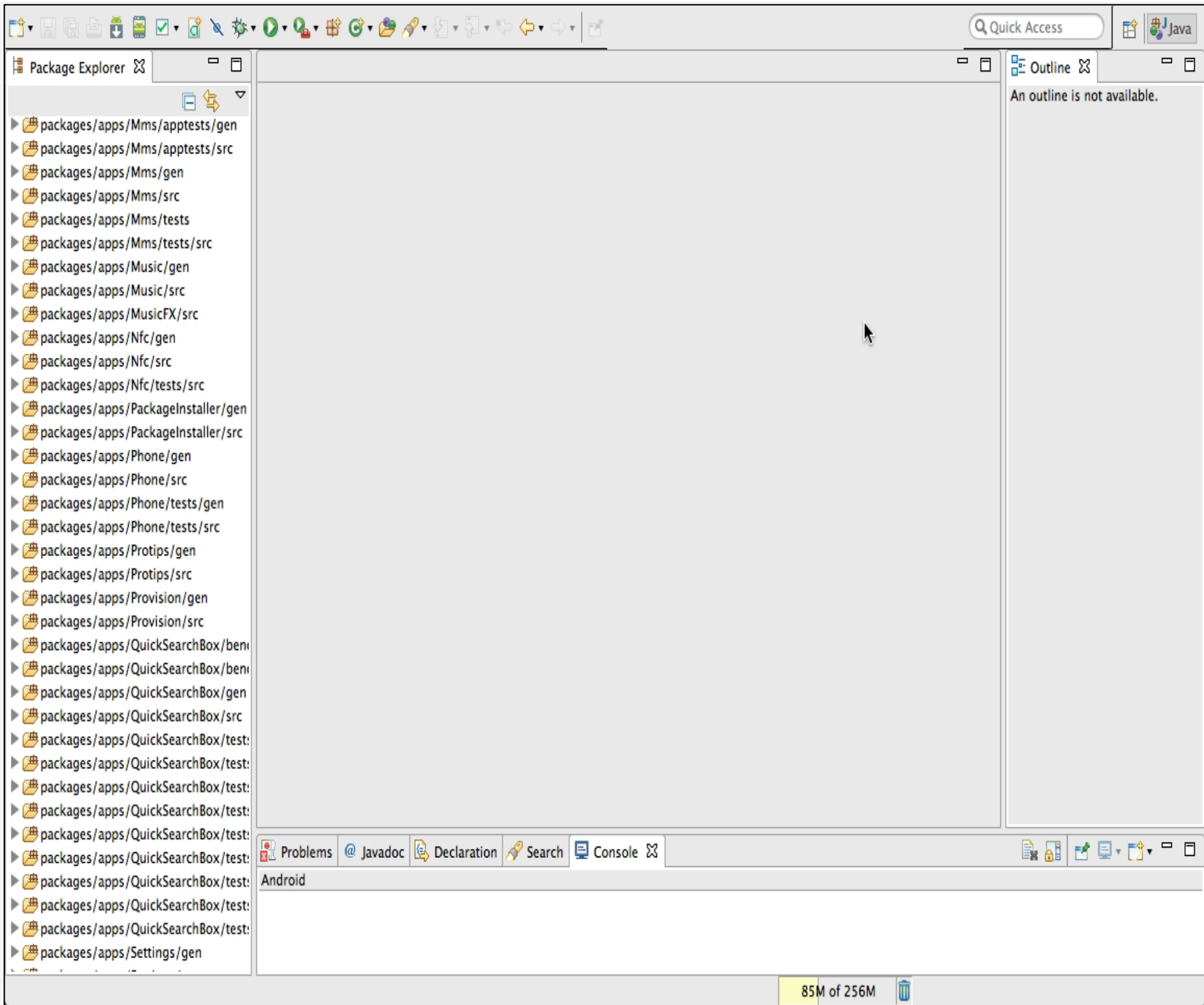
RUNS IN THE BACKGROUND

TO PERFORM LONG-RUNNING OPERATIONS

TO SUPPORT INTERACTION WITH REMOTE
PROCESSES







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
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EVENTS REPRESENTED BY THE INTENT CLASS
AND THEN BROADCAST

BROADCASTRECEIVER RECEIVES AND
RESPONDS TO BROADCAST EVENT

Quick Access Java

Package Explorer

- packages/apps/KeyChain/support
- 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
- packages/apps/Protips/src
- packages/apps/Provision/gen
- packages/apps/Provision/src
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
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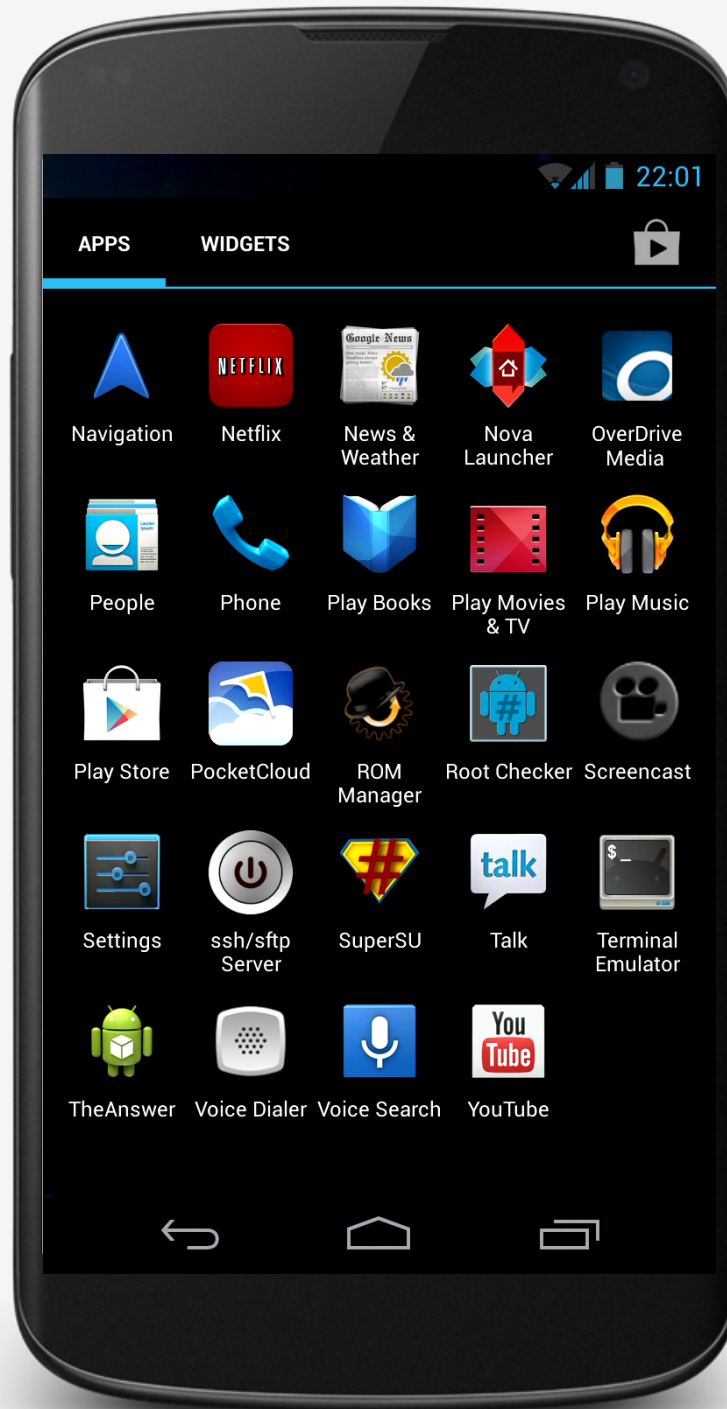
Outline

An outline is not available.

Problems Javadoc Declaration Search Console

Android

packages/apps/Mms/src - Android-4.0 82M of 256M



APPS

WIDGETS



Navigation



Netflix



News &
Weather



Nova
Launcher



OverDrive
Media



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Play Books



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TheAnswer



Voice Dialer



Voice Search



YouTube



Quick Access Java

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- 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
- packages/apps/Protips/src
- packages/apps/Provision/gen
- packages/apps/Provision/src
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
- packages/apps/QuickSearchBox/
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Android

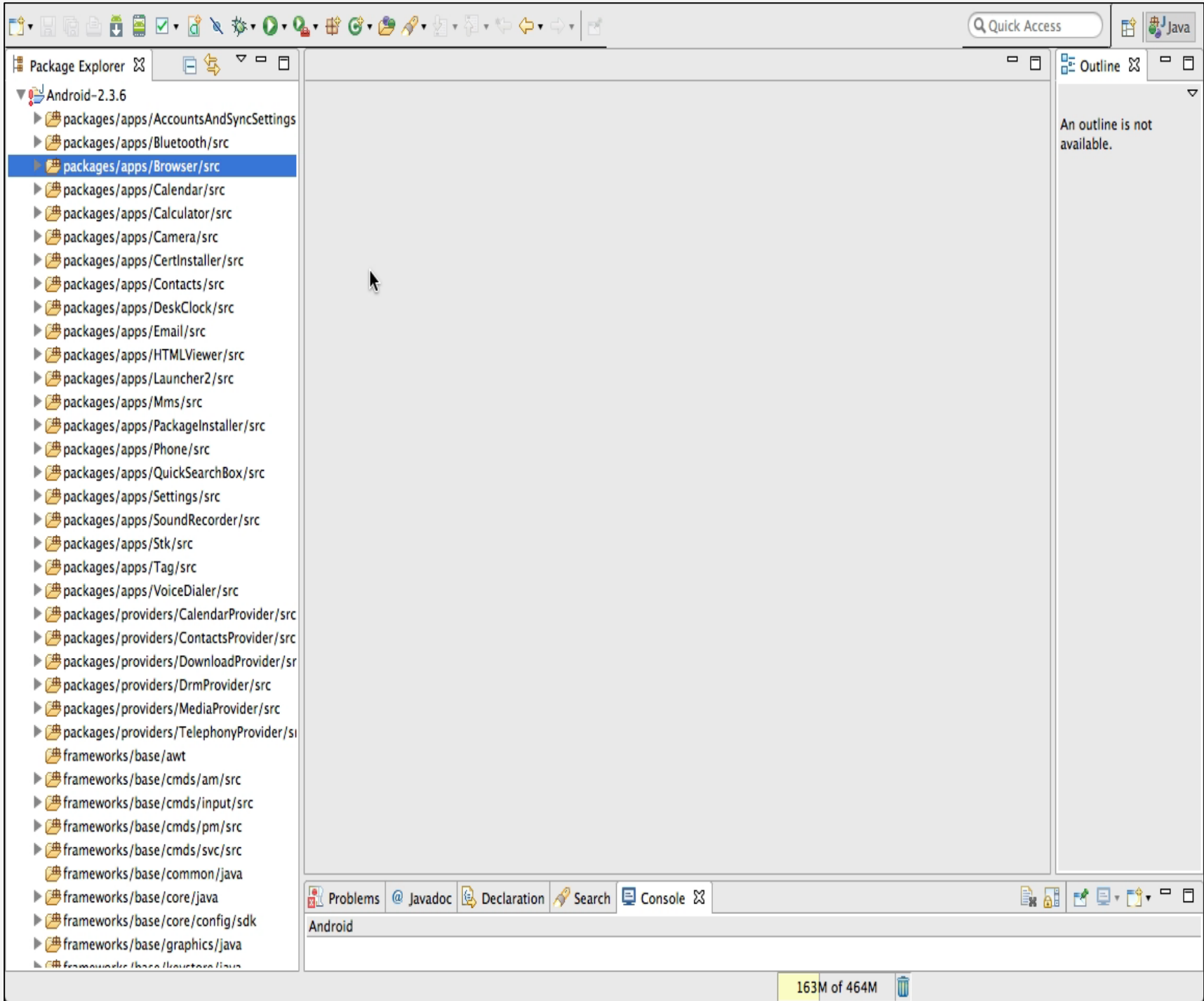
packages/apps/Mms/src - Android-4.0 82M of 256M

CONTENT PROVIDERS

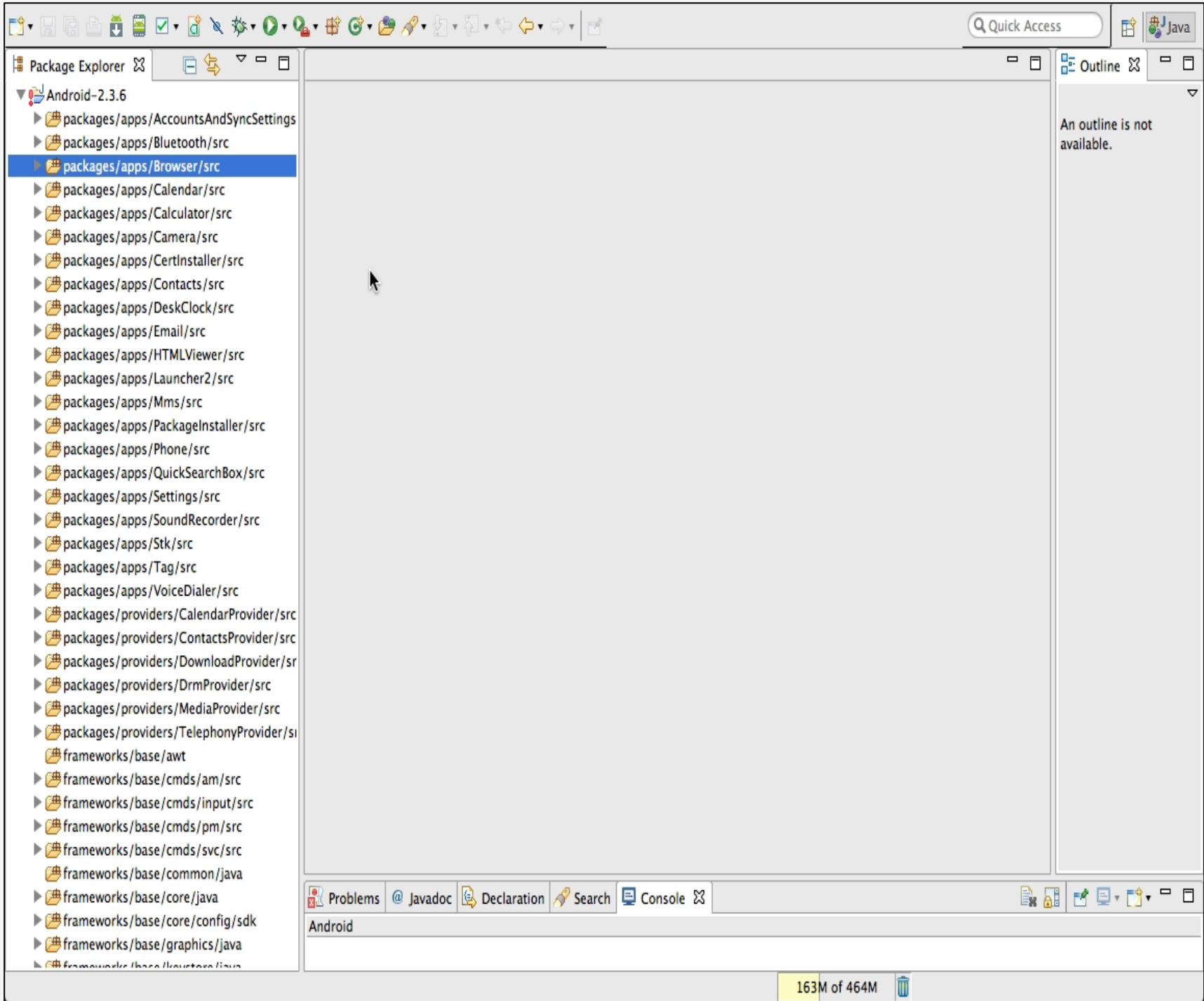
STORE & SHARE DATA ACROSS APPLICATIONS

USES DATABASE-STYLE INTERFACE

HANDLES INTERPROCESS COMMUNICATION



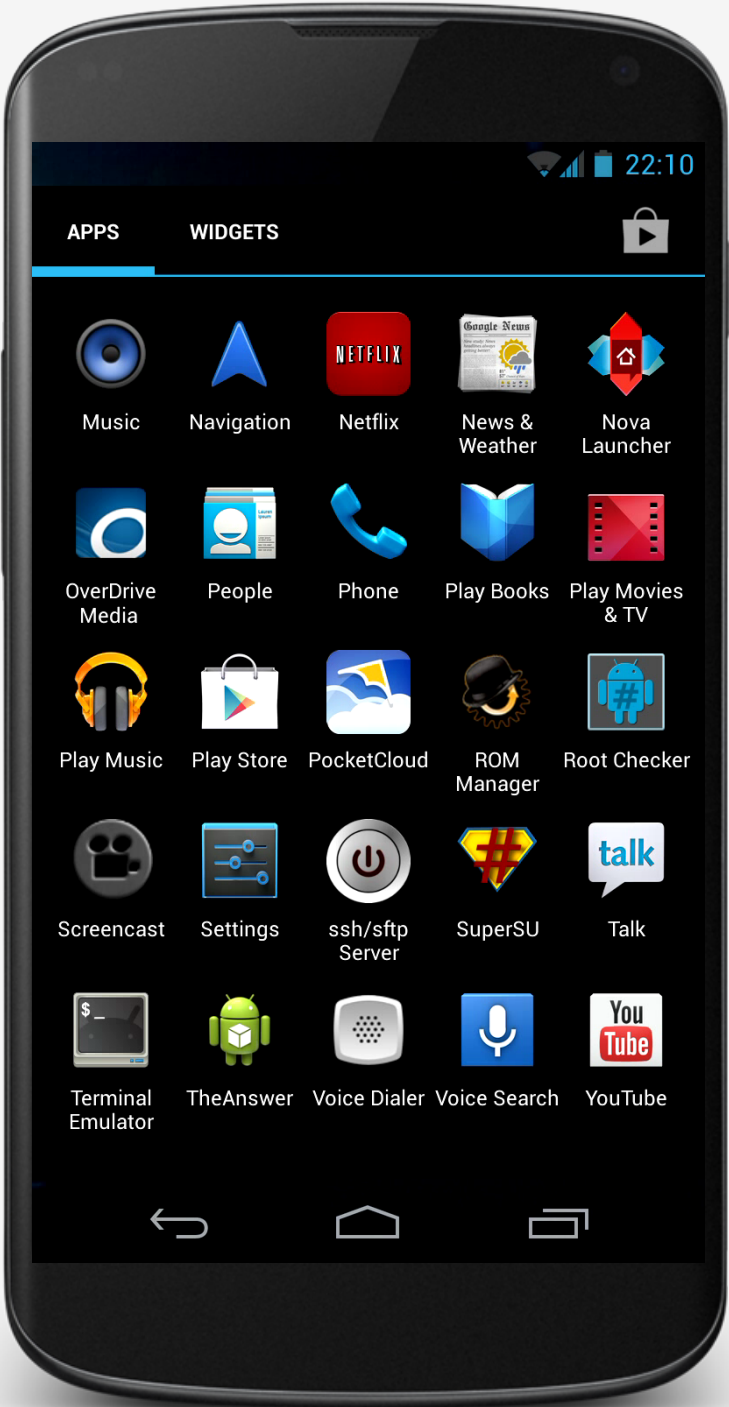




MAPLOCATION

USER ENTERS AN ADDRESS

APP DISPLAYS A MAP OF AREA AROUND THE
ADDRESS



22:10

APPS

WIDGETS



Music



Navigation



Netflix



News & Weather



Nova Launcher



OverDrive Media



People



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Screencast



Settings



ssh/sftp Server



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Terminal Emulator



TheAnswer



Voice Dialer

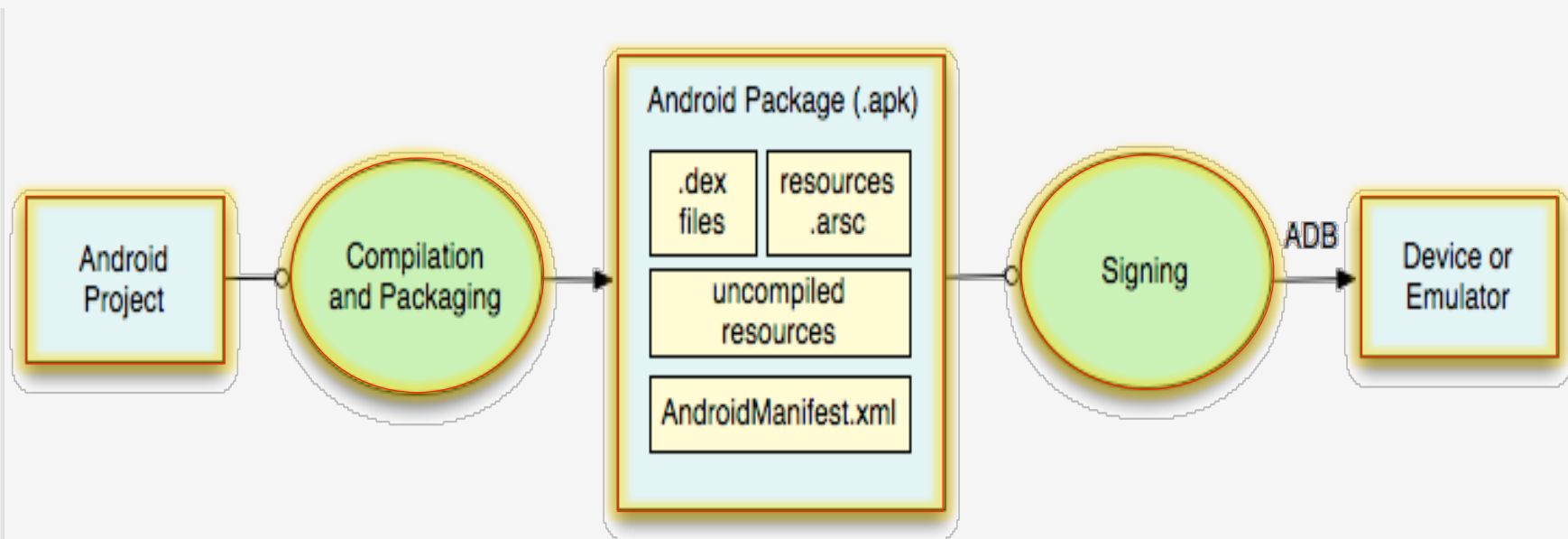


Voice Search



YouTube

BUILDING AN APPLICATION



SEE:

[http://developer.android.com/guide/
developing/building](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](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 ✕



strings.xml

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

strings.xml



strings.xml ✕

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

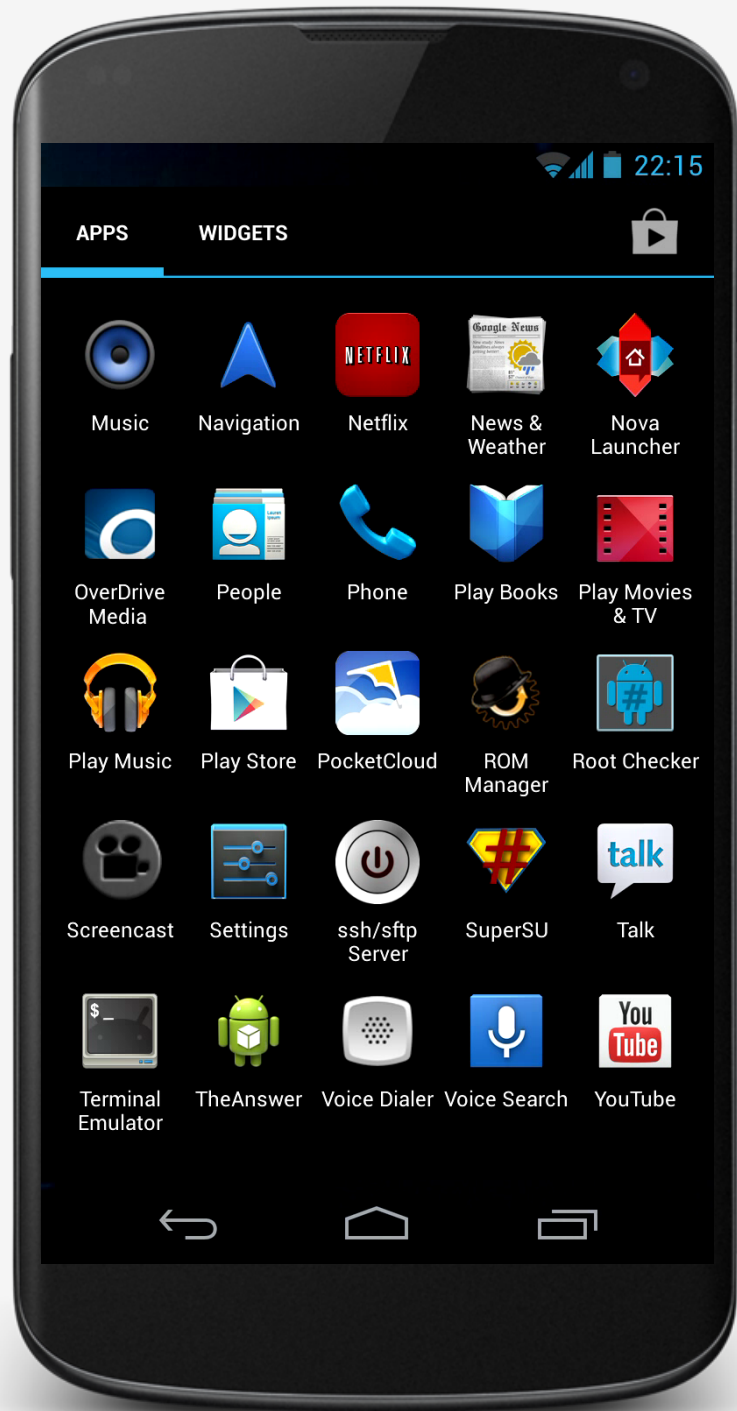
CUSTOMIZING STRINGS

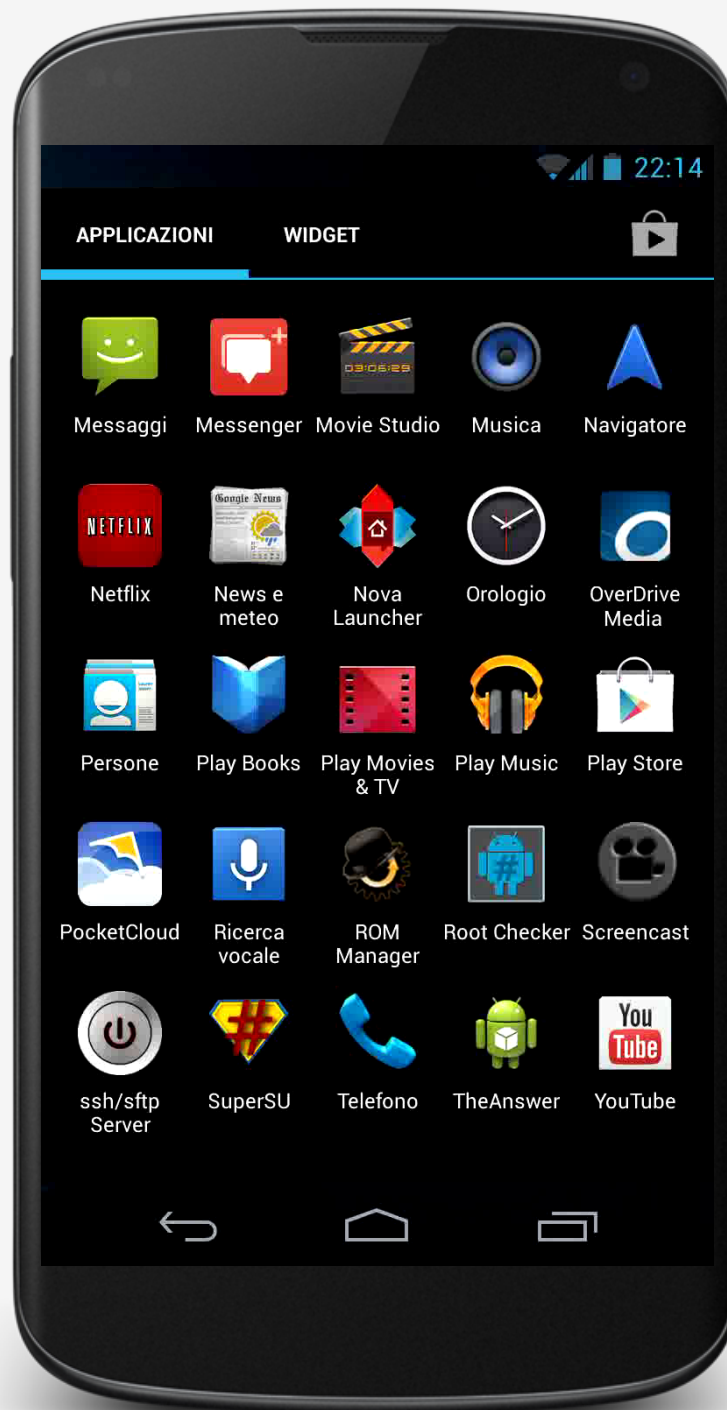
IF YOUR DEFAULT LANGUAGE IS ITALIAN,
`@string/location_string` IS

“DIGITA L’INDIRIZZO”

OTHERWISE,

“ENTER LOCATION”





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.

MAPLOCATION

strings.xml



strings.xml

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

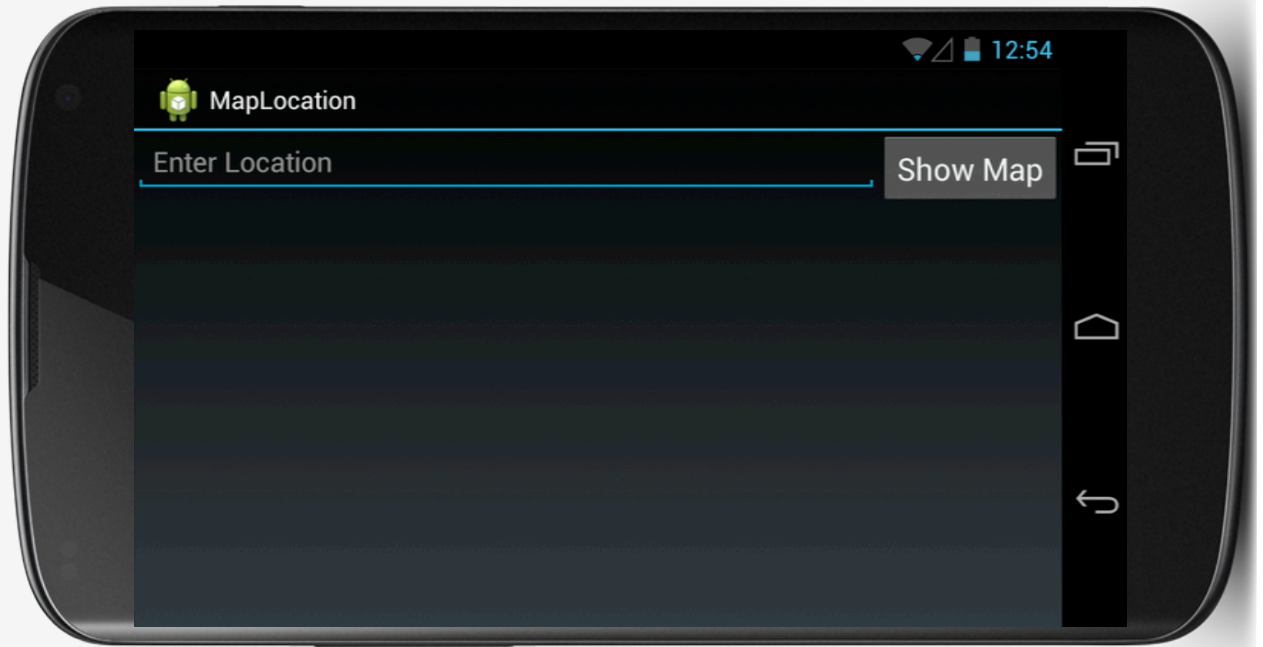
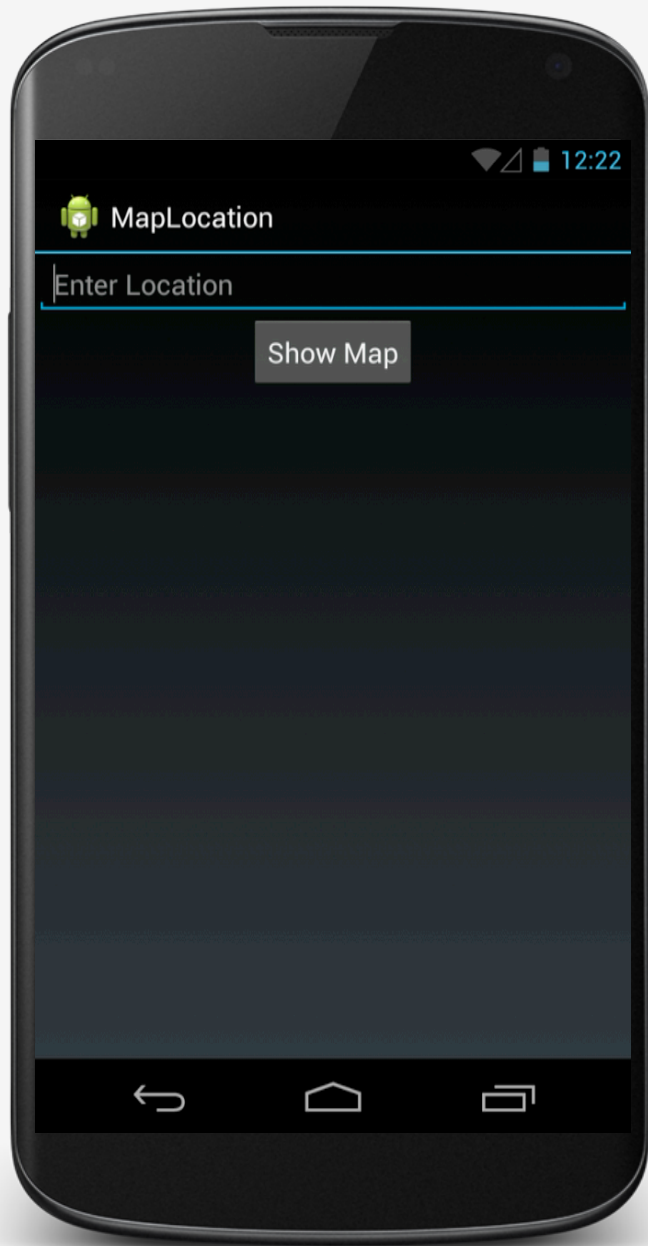
strings.xml



strings.xml



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



R.JAVA

AT COMPILATION TIME, RESOURCES ARE USED
TO GENERATE THE R.JAVA CLASS

JAVA CODE USES THE R CLASS TO ACCESS
RESOURCES

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

MAPLOCATION

```
@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

MAPLOCATION

```
<?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