

PROGRAMMING HANDHELD SYSTEMS

ADAM PORTER

APPLICATION FUNDAMENTALS

APPLICATION COMPONENTS

ACTIVITY

SERVICE

BROADCASTRECEIVER

CONTENTPROVIDER

APPLICATIONS

APPS ARE MADE FROM COMPONENTS

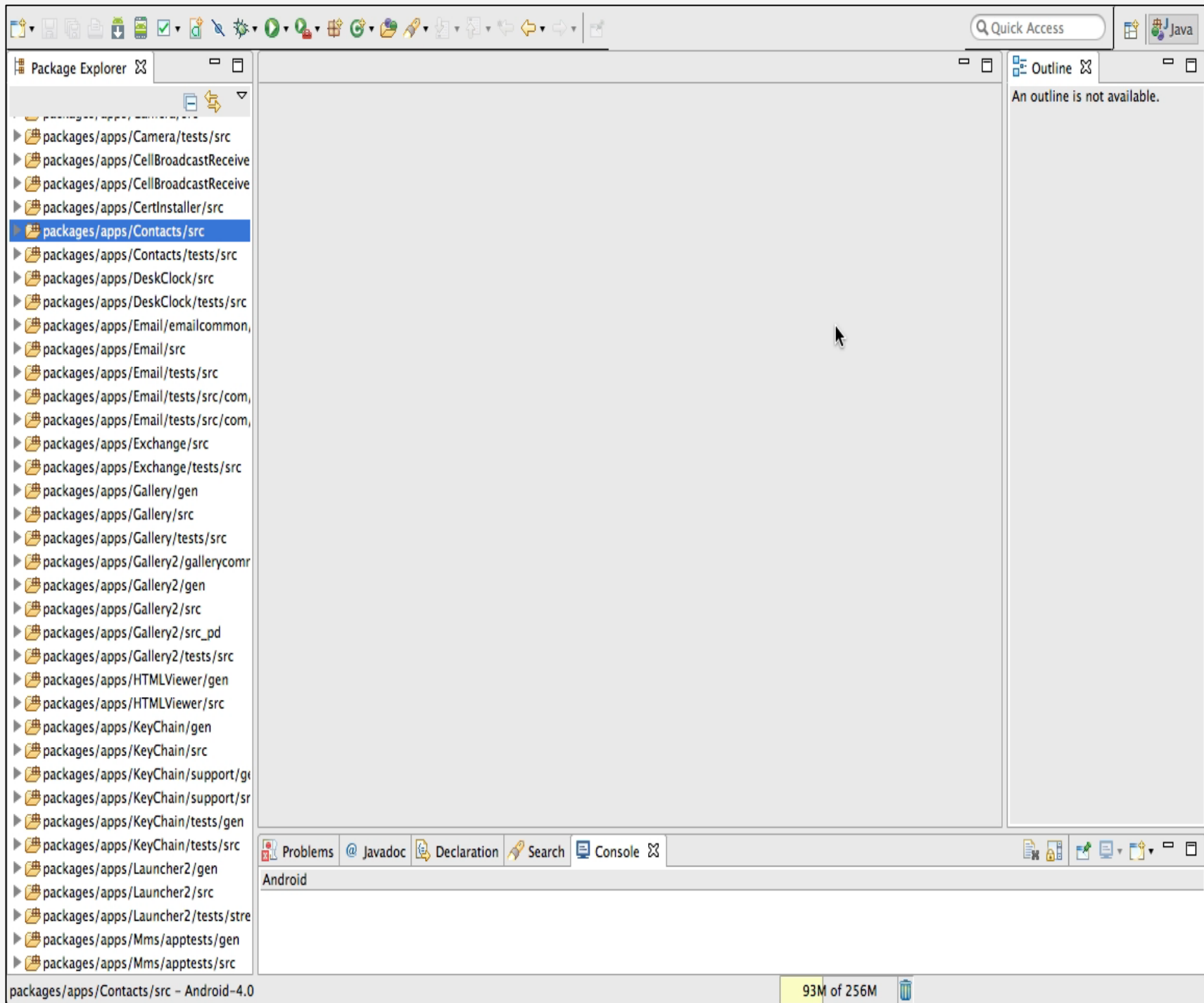
ANDROID INSTANTIATES AND RUNS THEM AS
NEEDED

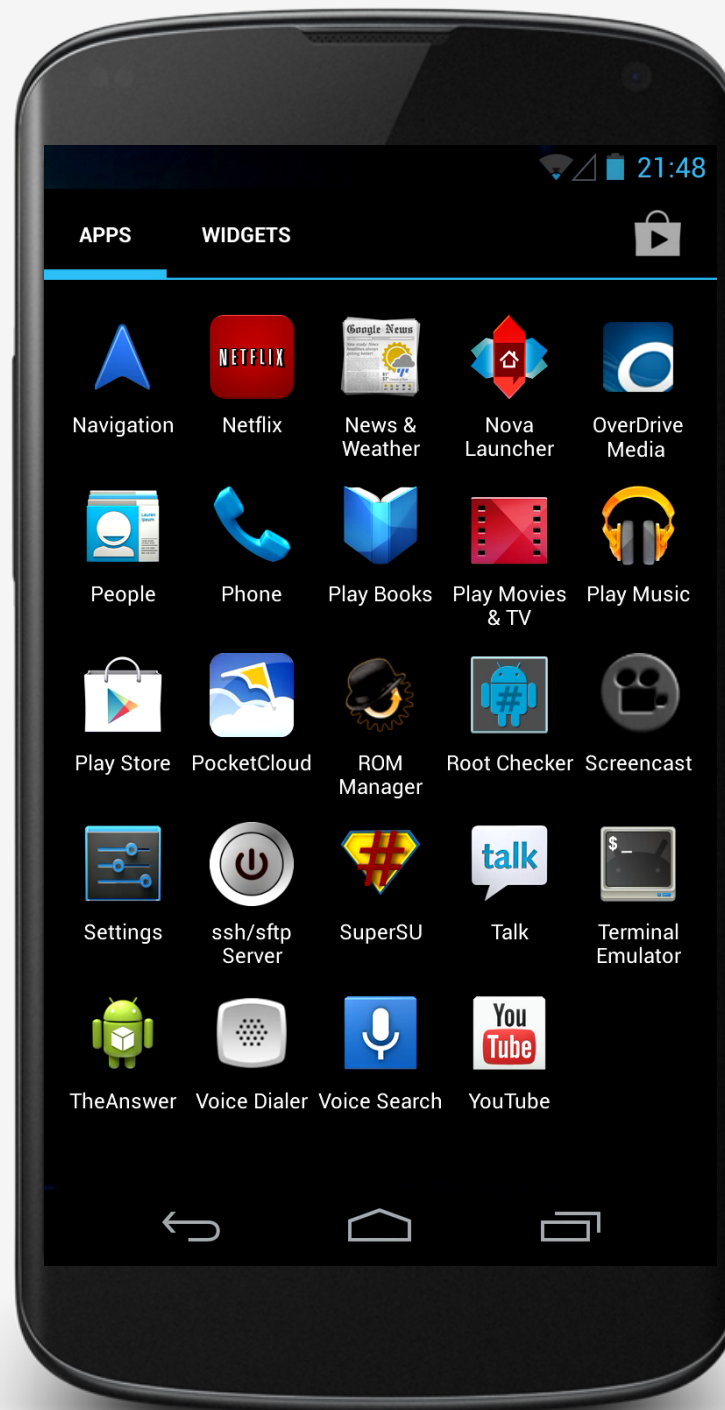
EACH COMPONENT HAS ITS OWN PURPOSE
AND APIs

ACTIVITY

PRIMARY CLASS FOR USER INTERACTION

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





APPS

WIDGETS



Navigation



Netflix



News &
Weather



Nova
Launcher



OverDrive
Media



People



Phone



Play Books



Play Movies
& TV



Play Music



Play Store



PocketCloud



ROM
Manager



Root Checker



Screencast



Settings



ssh/sftp
Server



SuperSU



Talk



Terminal
Emulator



TheAnswer



Voice Dialer



Voice Search



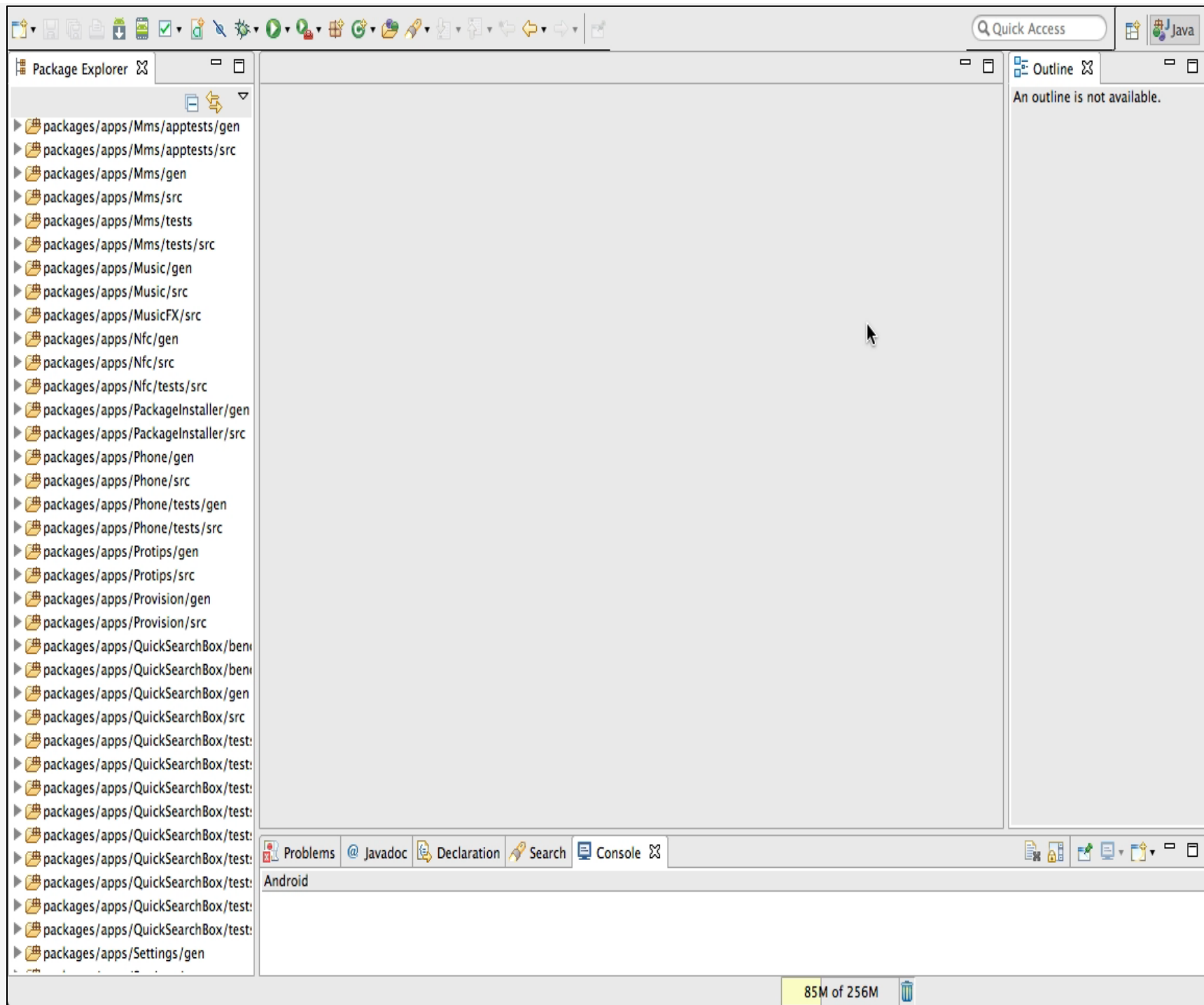
YouTube

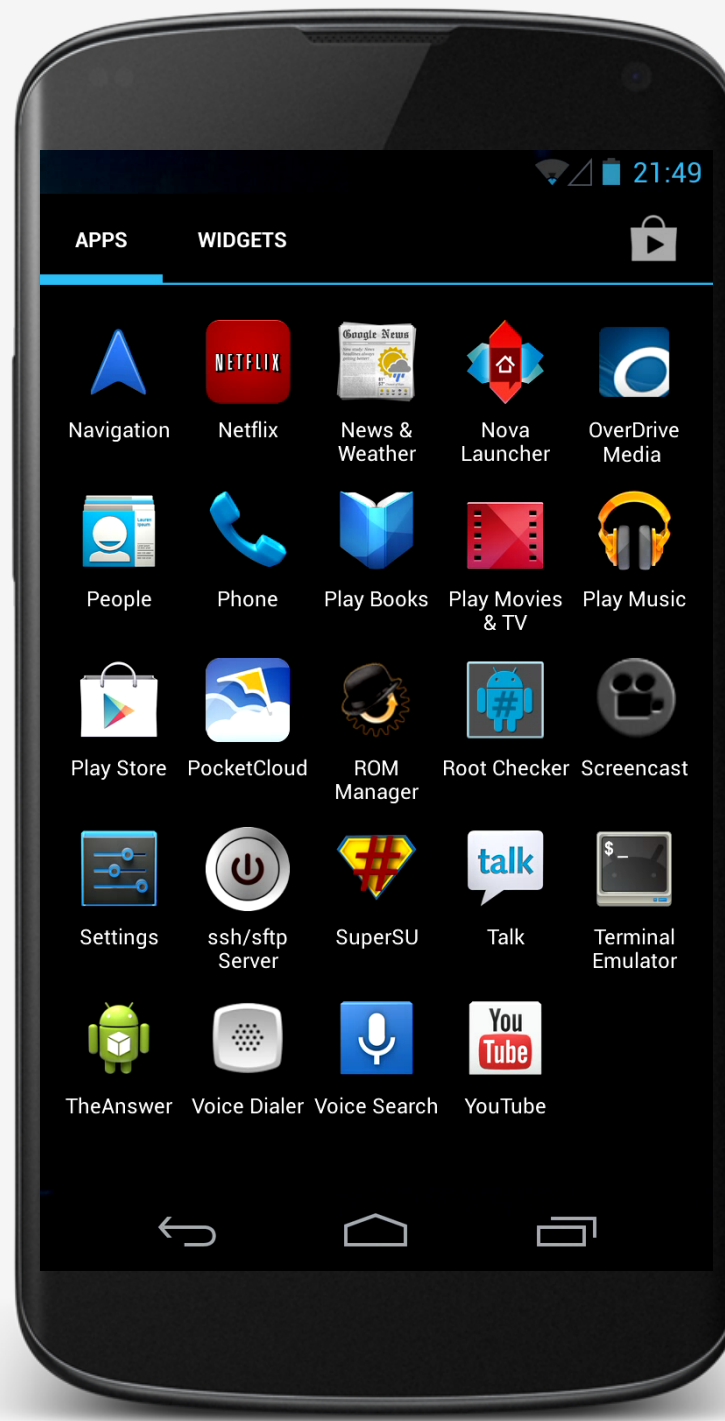
SERVICE

RUNS IN THE BACKGROUND

TO PERFORM LONG-RUNNING OPERATIONS

TO SUPPORT INTERACTION WITH REMOTE
PROCESSES





APPS

WIDGETS



Navigation



Netflix



News &
Weather



Nova
Launcher



OverDrive
Media



People



Phone



Play Books



Play Movies
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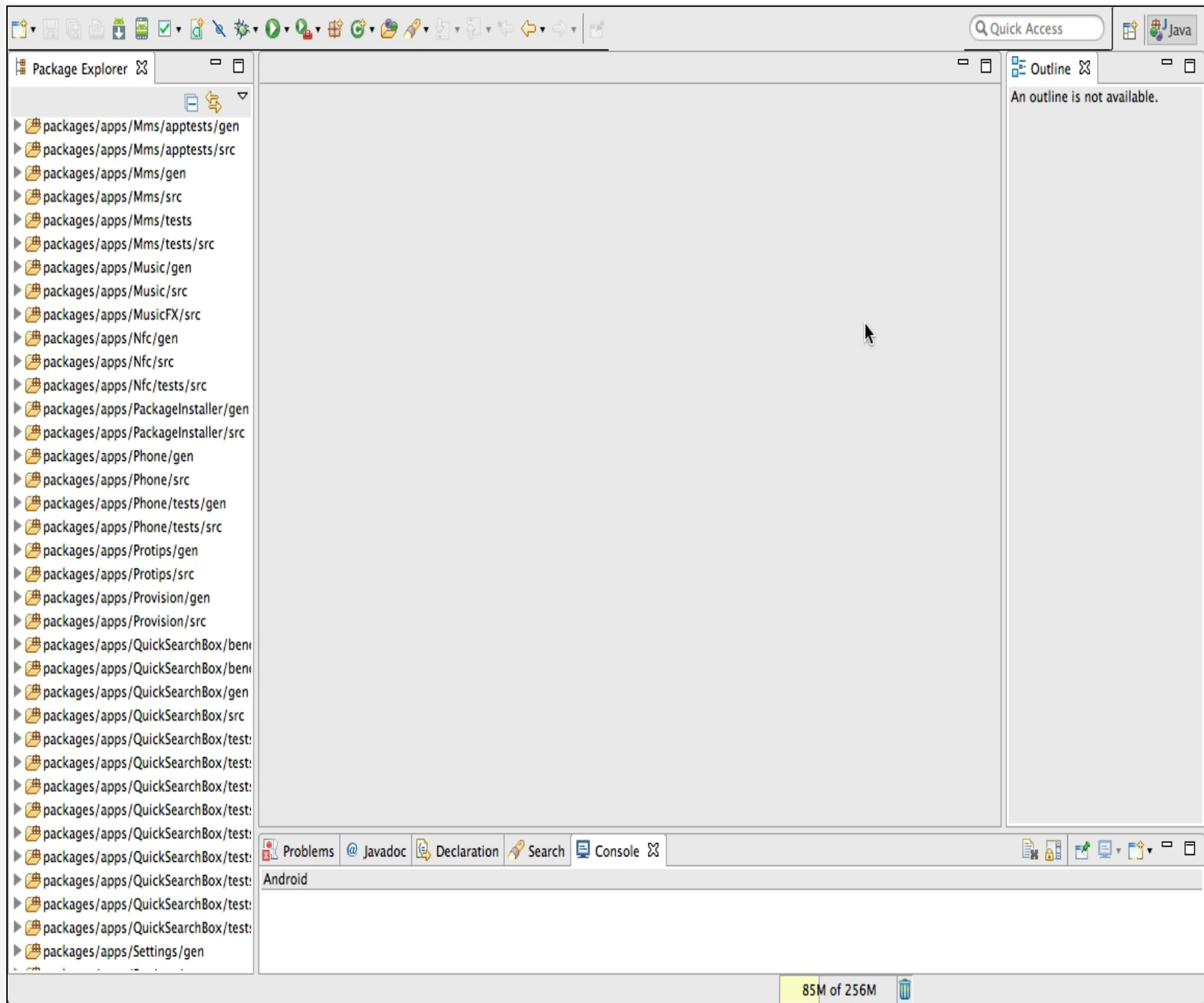
Voice Dialer



Voice Search



YouTube



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

IDE interface showing the Package Explorer on the left, the main editor area in the center, and the Outline view on the right. The Package Explorer lists various packages under the 'packages/apps' directory, with 'packages/apps/Mms/src' selected. The Outline view displays the message: "An outline is not available." The bottom status bar shows the current package: 'packages/apps/Mms/src - Android-4.0' and the memory usage: '82M of 256M'.

Quick Access

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
- 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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- packages/apps/QuickSearchBox/
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- packages/apps/QuickSearchBox/

Outline

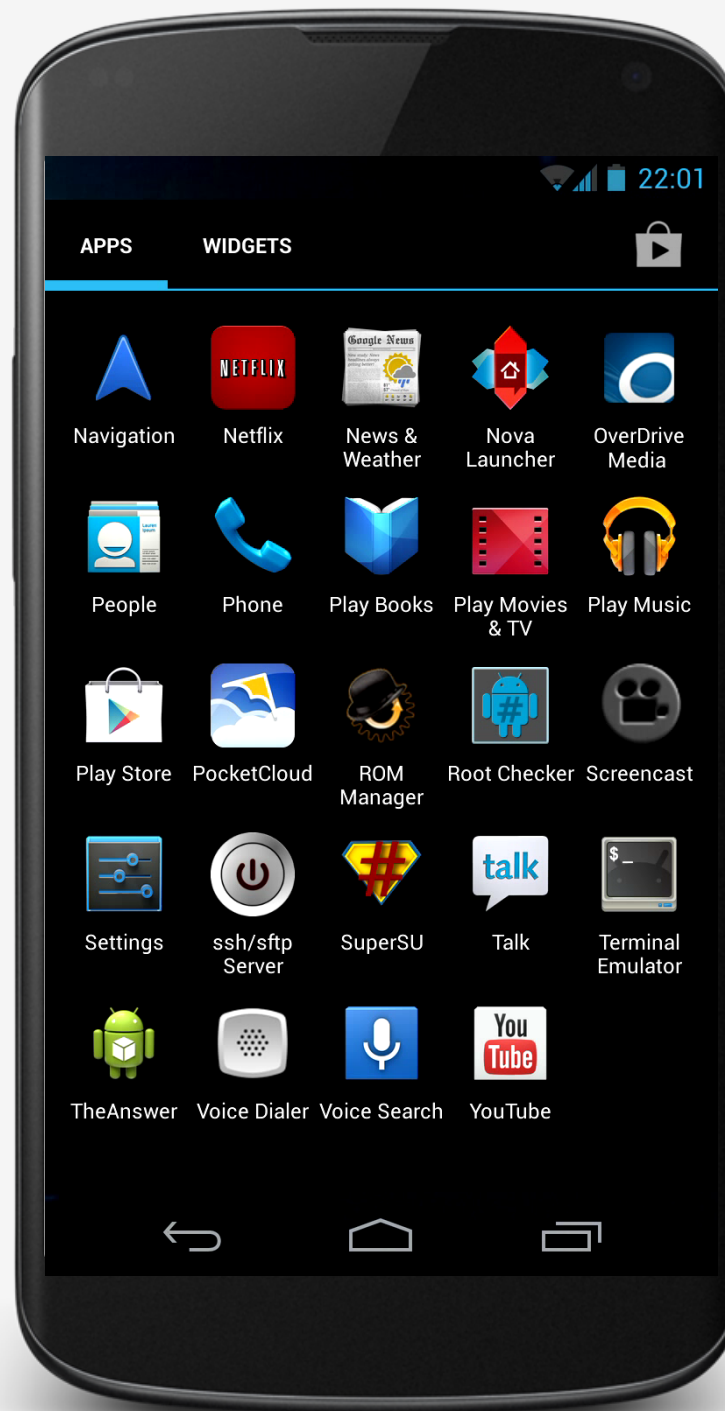
An outline is not available.

Problems Javadoc Declaration Search Console

Android

packages/apps/Mms/src - Android-4.0

82M of 256M



IDE interface showing the Package Explorer on the left, the main editor area in the center, and the Outline view on the right. The Package Explorer lists various packages under the 'packages/apps' directory, with 'packages/apps/Mms/src' selected. The Outline view displays the message: "An outline is not available." The bottom status bar shows the current package: 'packages/apps/Mms/src - Android-4.0' and the memory usage: '82M of 256M'.

Quick Access

Package Explorer

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- 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/
- 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

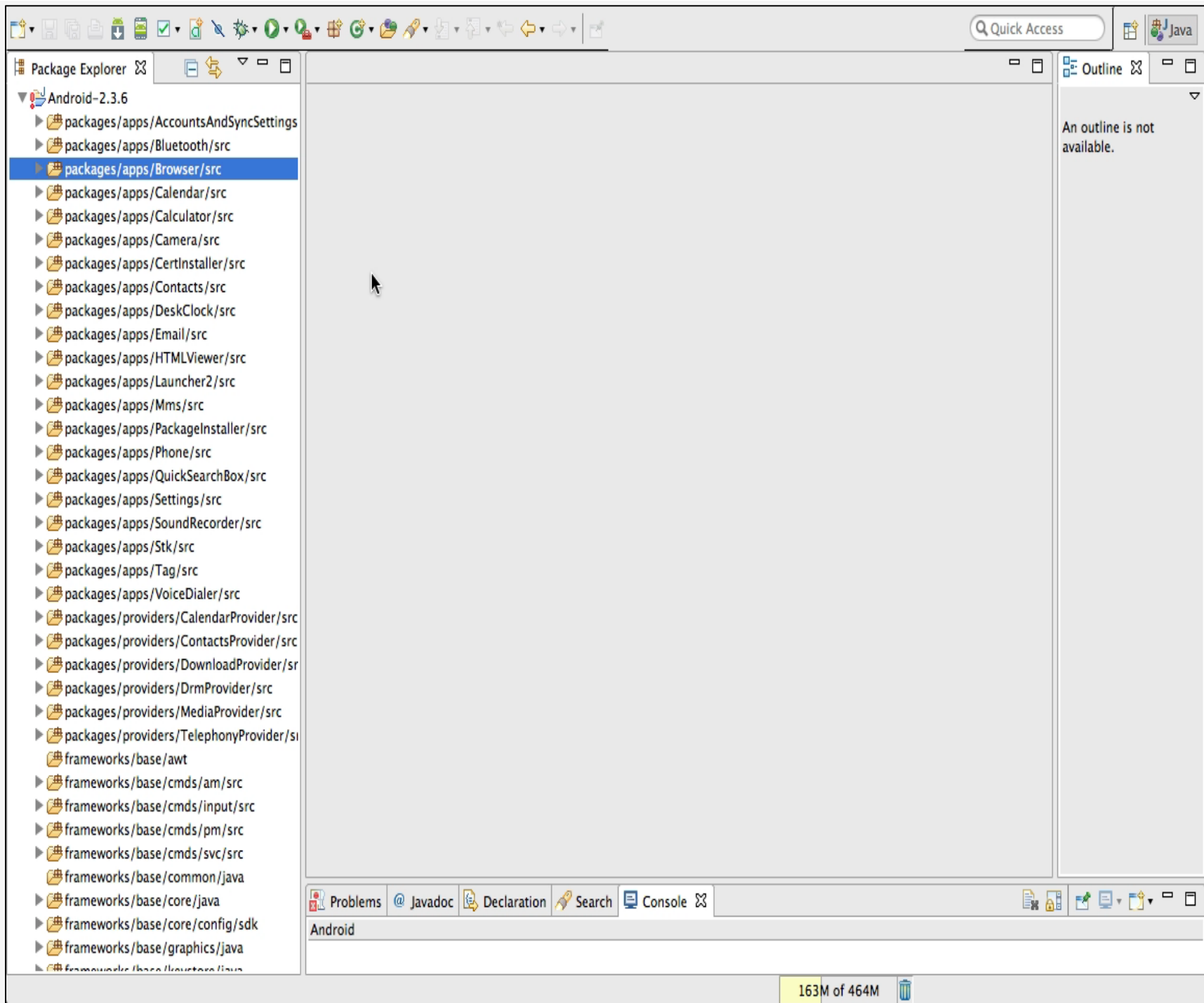
82M of 256M

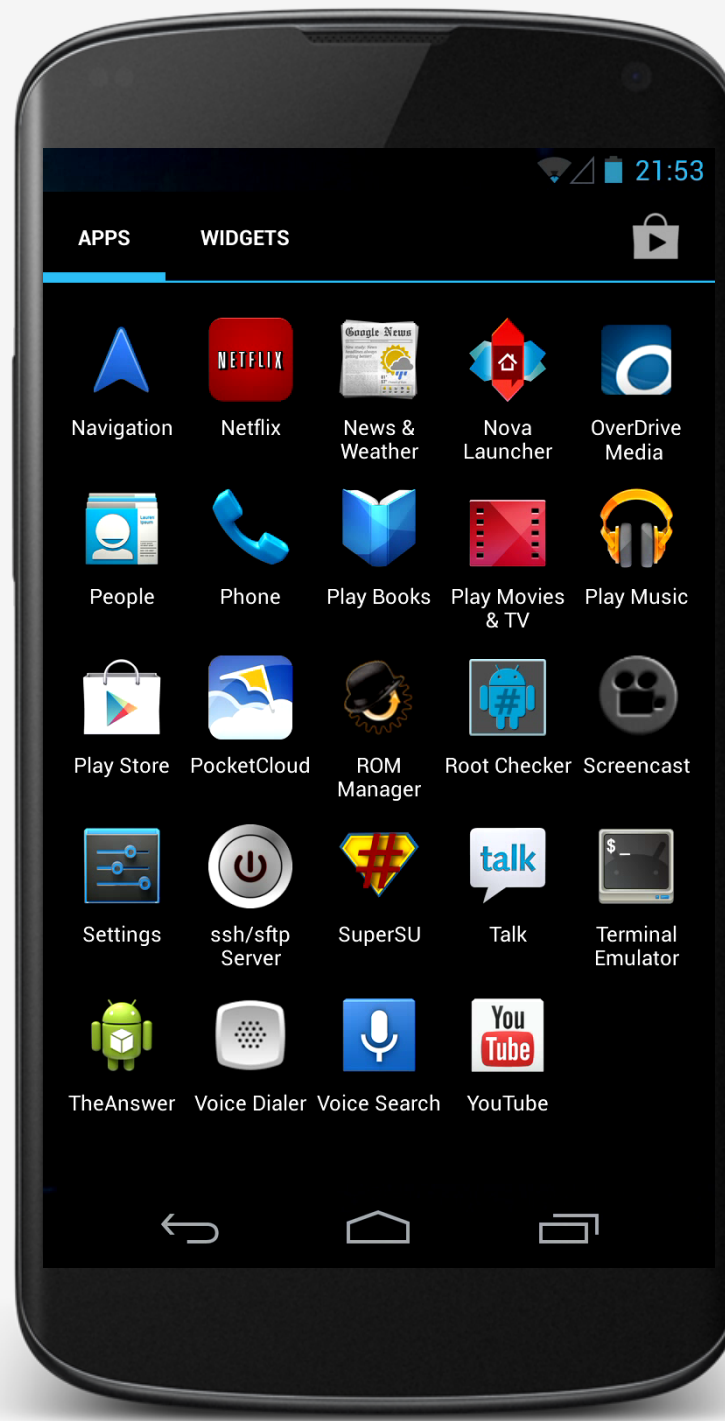
CONTENT PROVIDERS

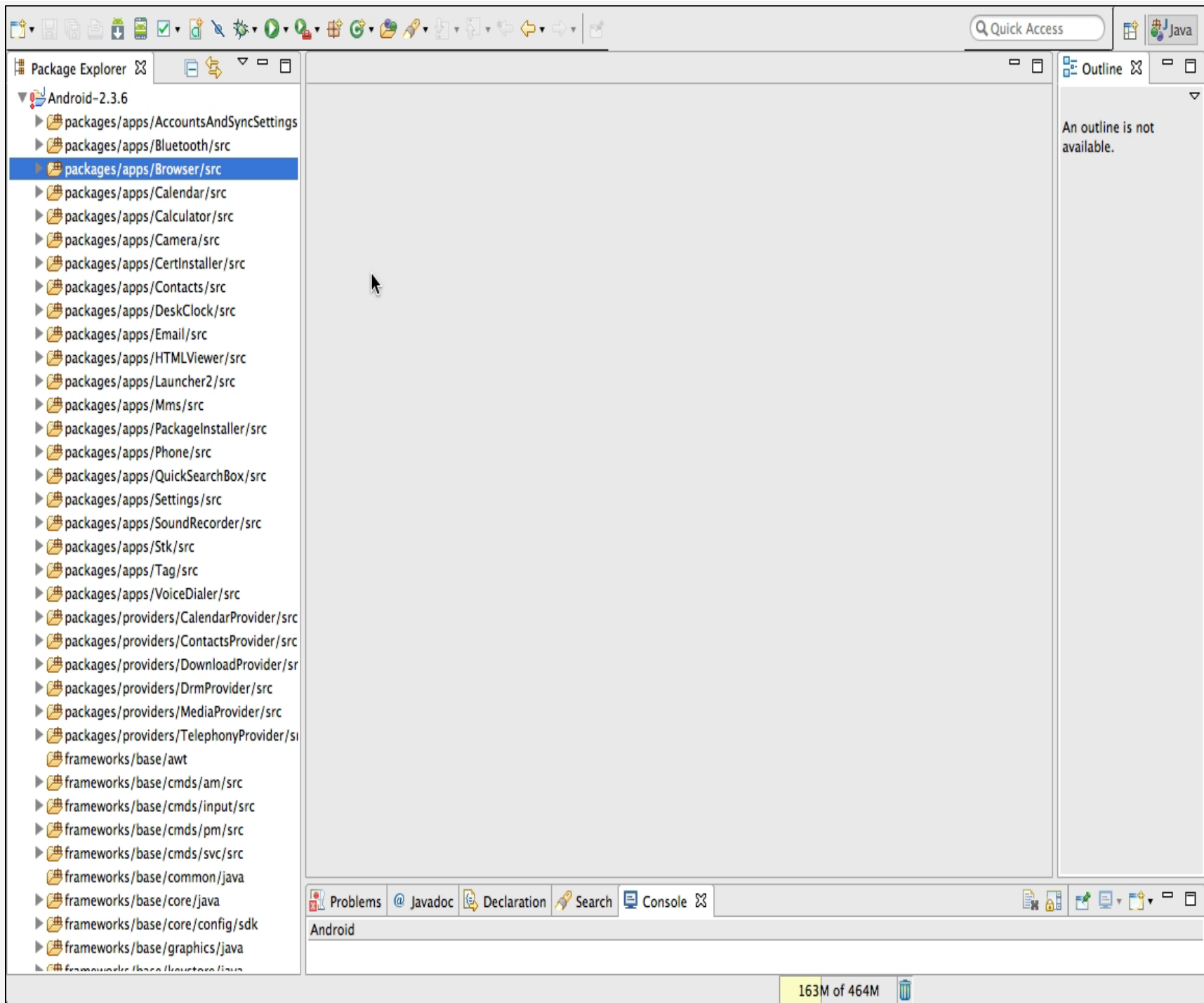
STORE & SHARE DATA ACROSS APPLICATIONS

USES DATABASE-STYLE INTERFACE

HANDLES INTERPROCESS COMMUNICATION



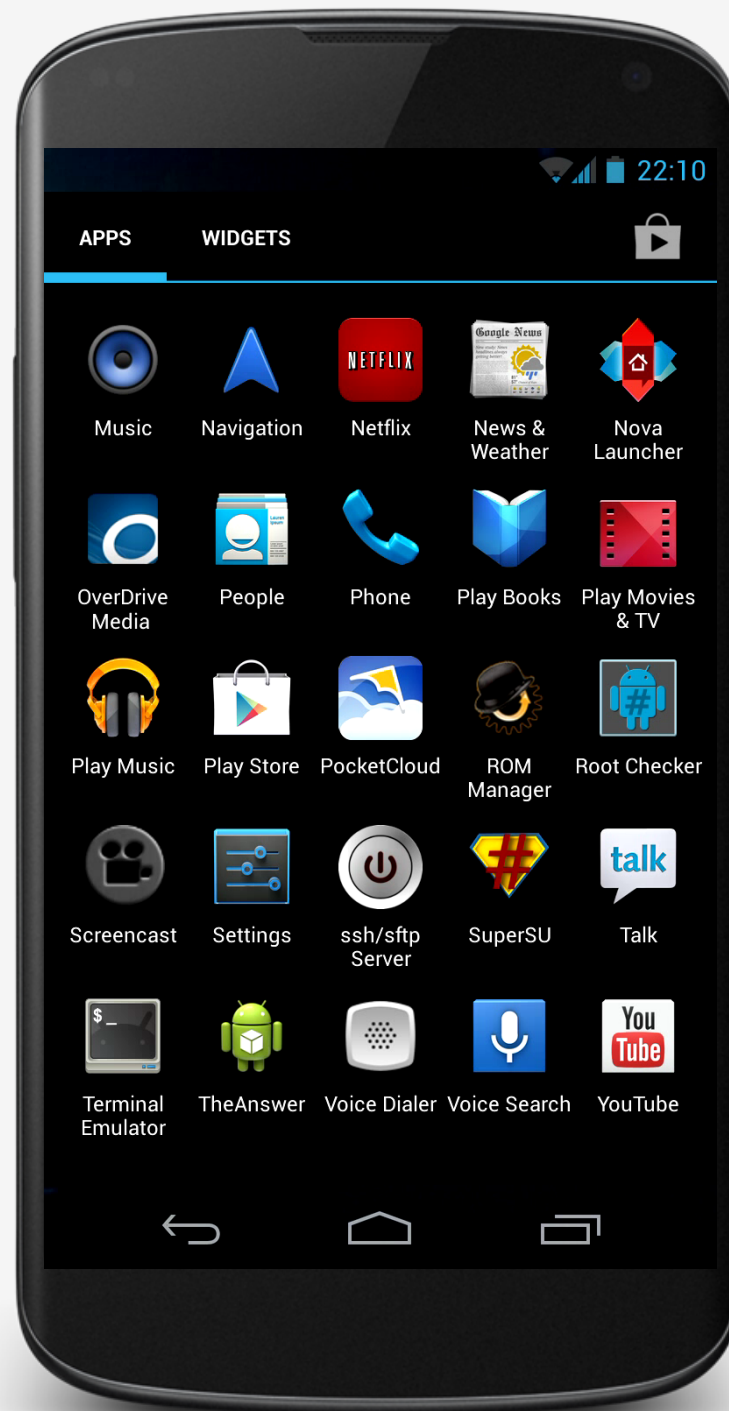




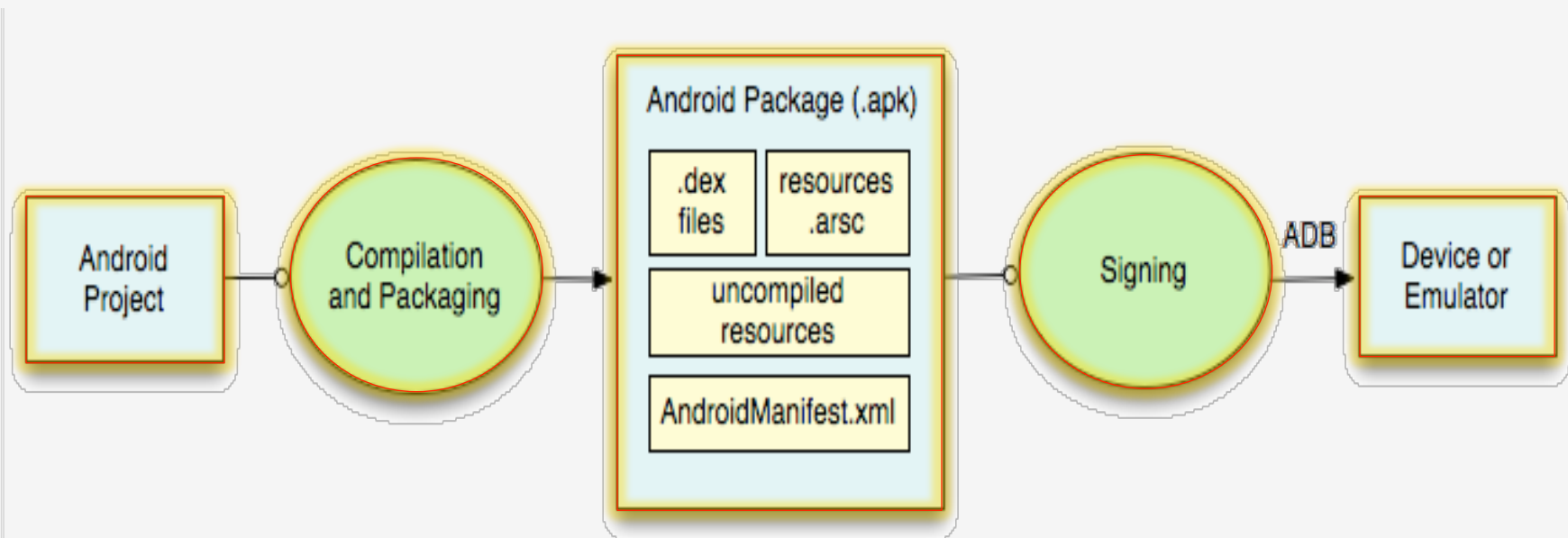
MAPLOCATION

USER ENTERS AN ADDRESS

APP DISPLAYS A MAP OF AREA AROUND THE
ADDRESS



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

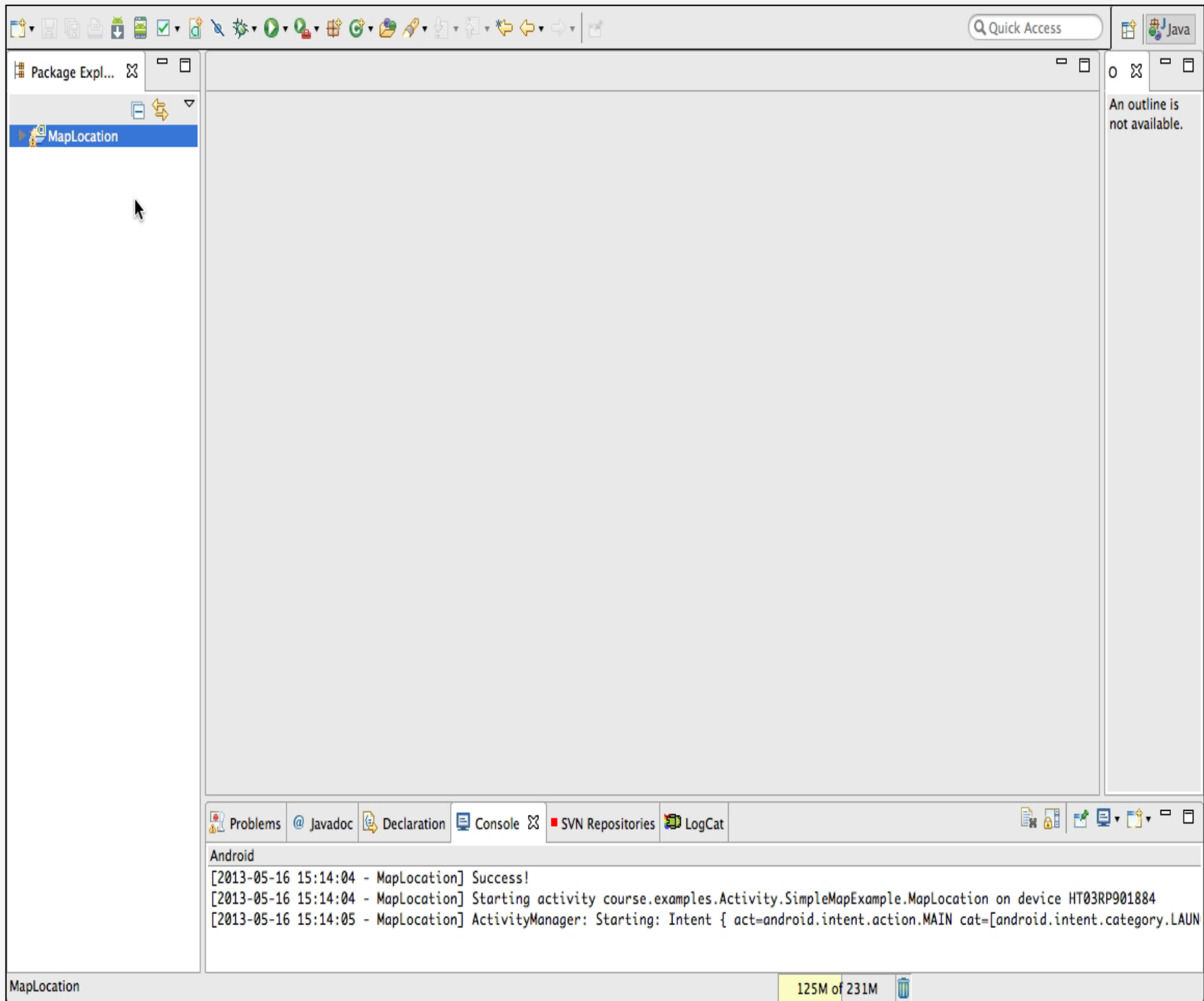
STRINGS

ACCESSED BY OTHER RESOURCES AS:

`@string/string_name`

ACCESSED IN JAVA AS:

`R.string.string_name`



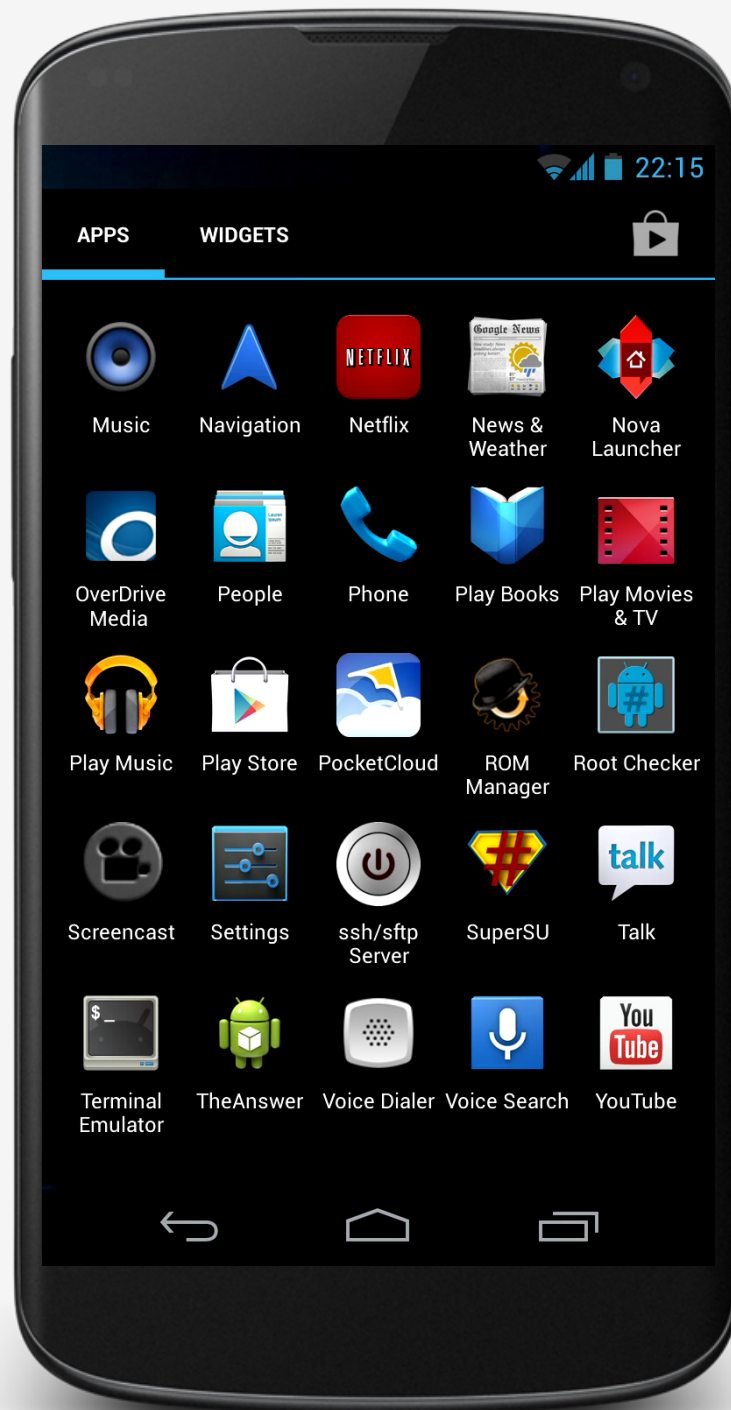
CUSTOMIZING STRINGS

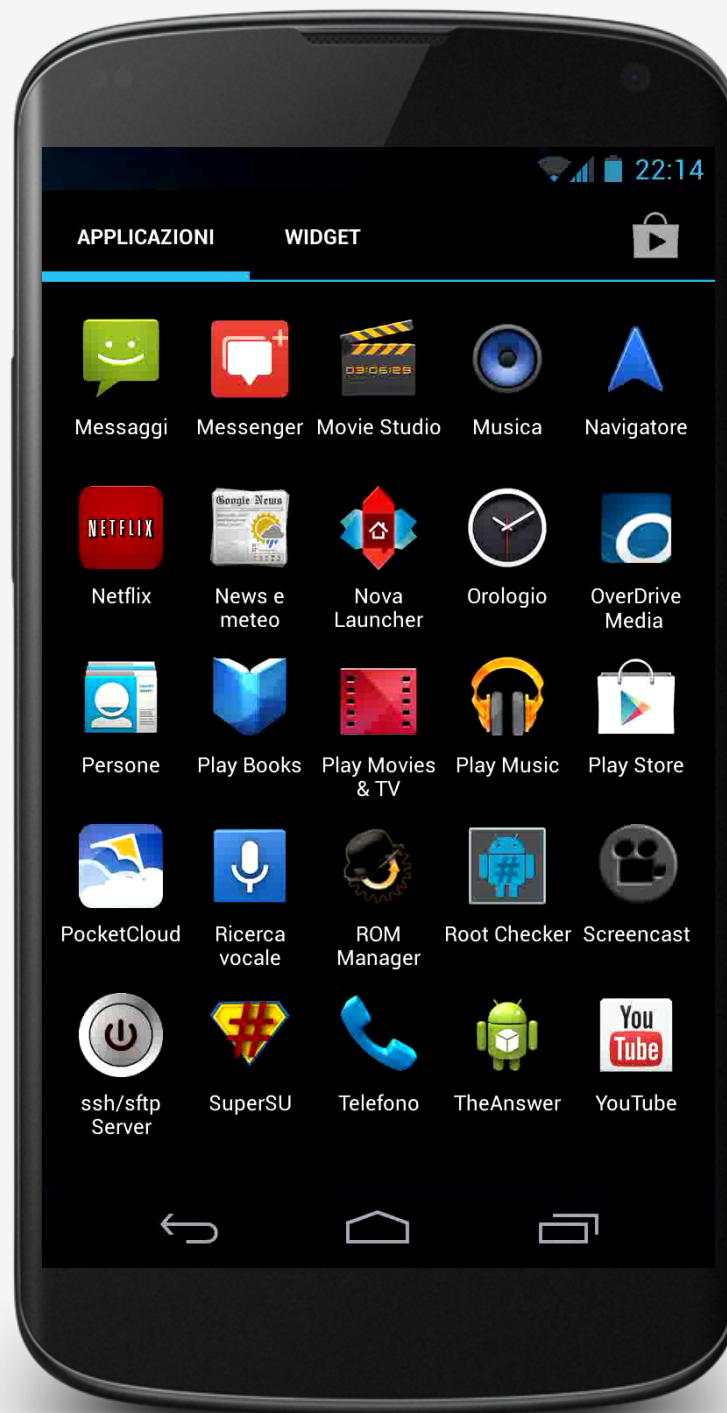
IF YOUR DEFAULT LANGUAGE IS ITALIAN,
`@string/location_string` IS

“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:

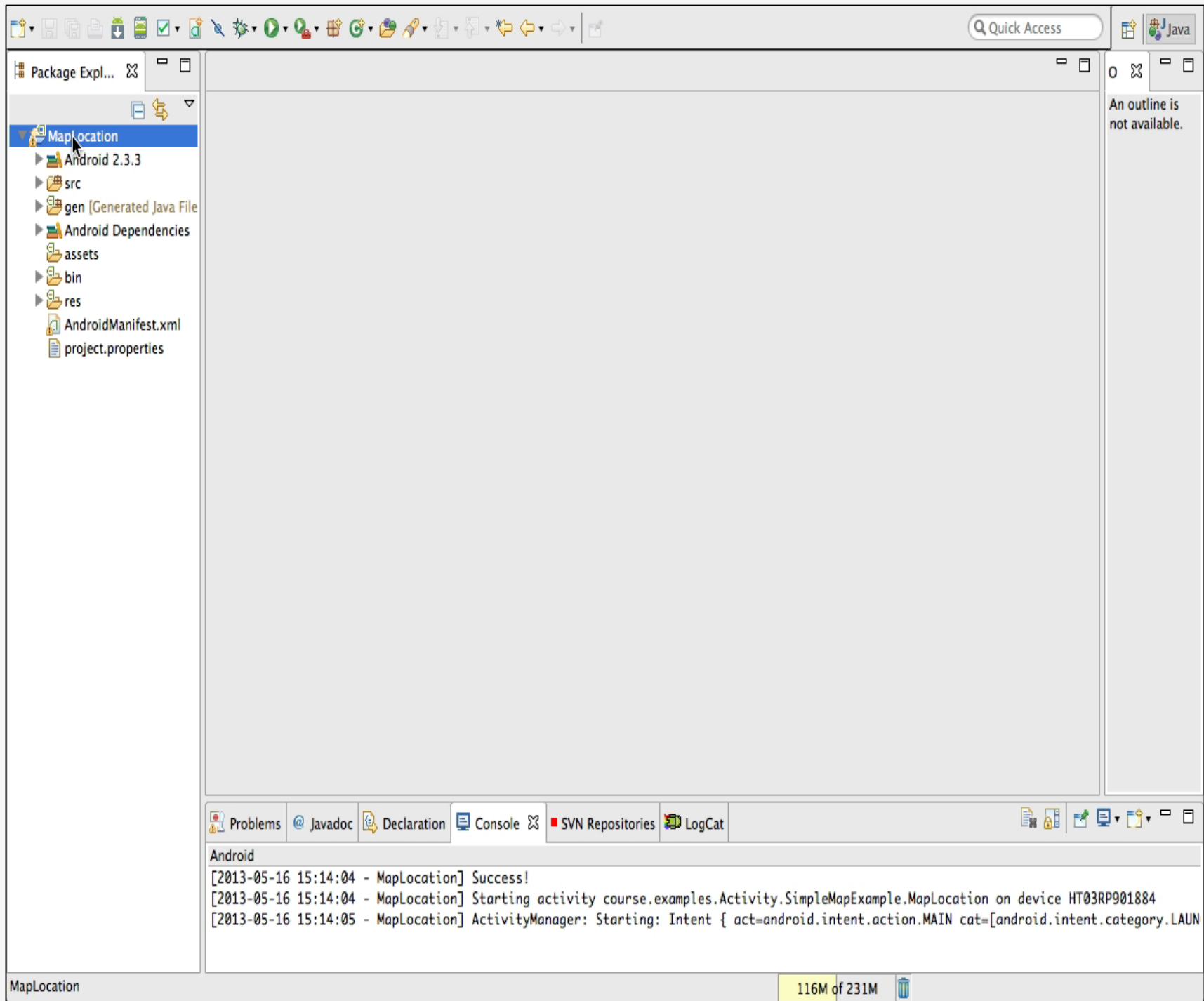
R.layout.layout_name

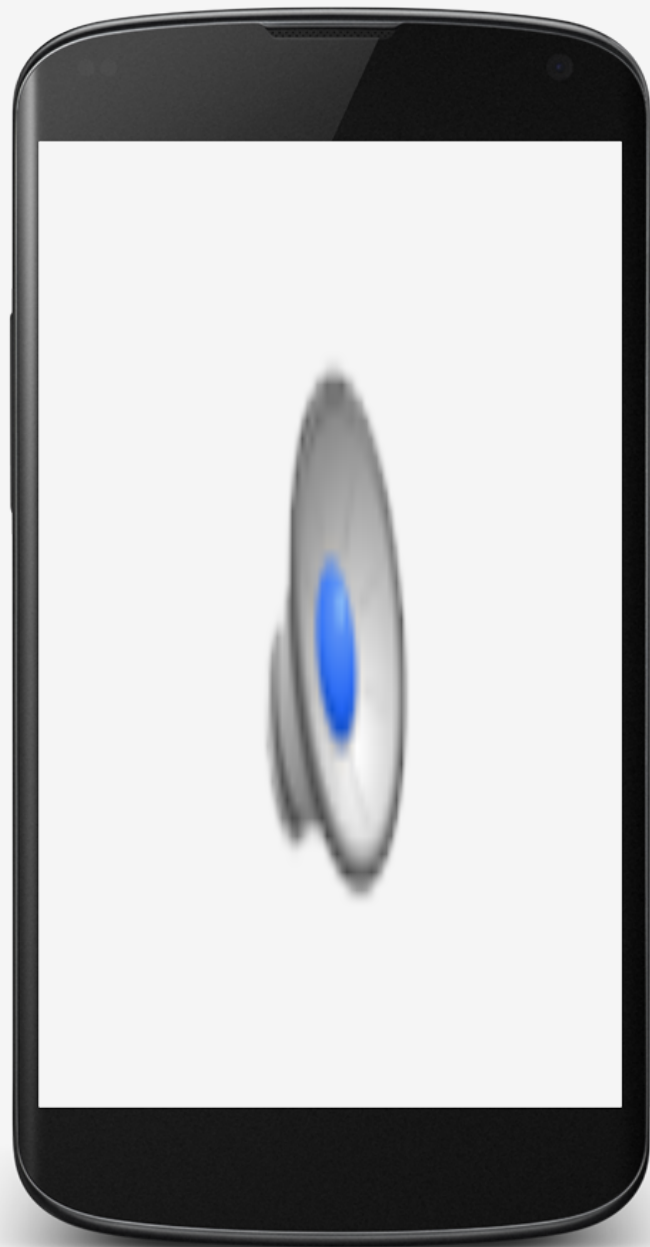
ACCESSED BY OTHER RESOURCES AS:

@layout/layout_name

USING MULTIPLE LAYOUT FILES

CAN SPECIFY DIFFERENT LAYOUT FILES BASED ON YOUR DEVICE'S ORIENTATION, SCREEN SIZE, ETC.



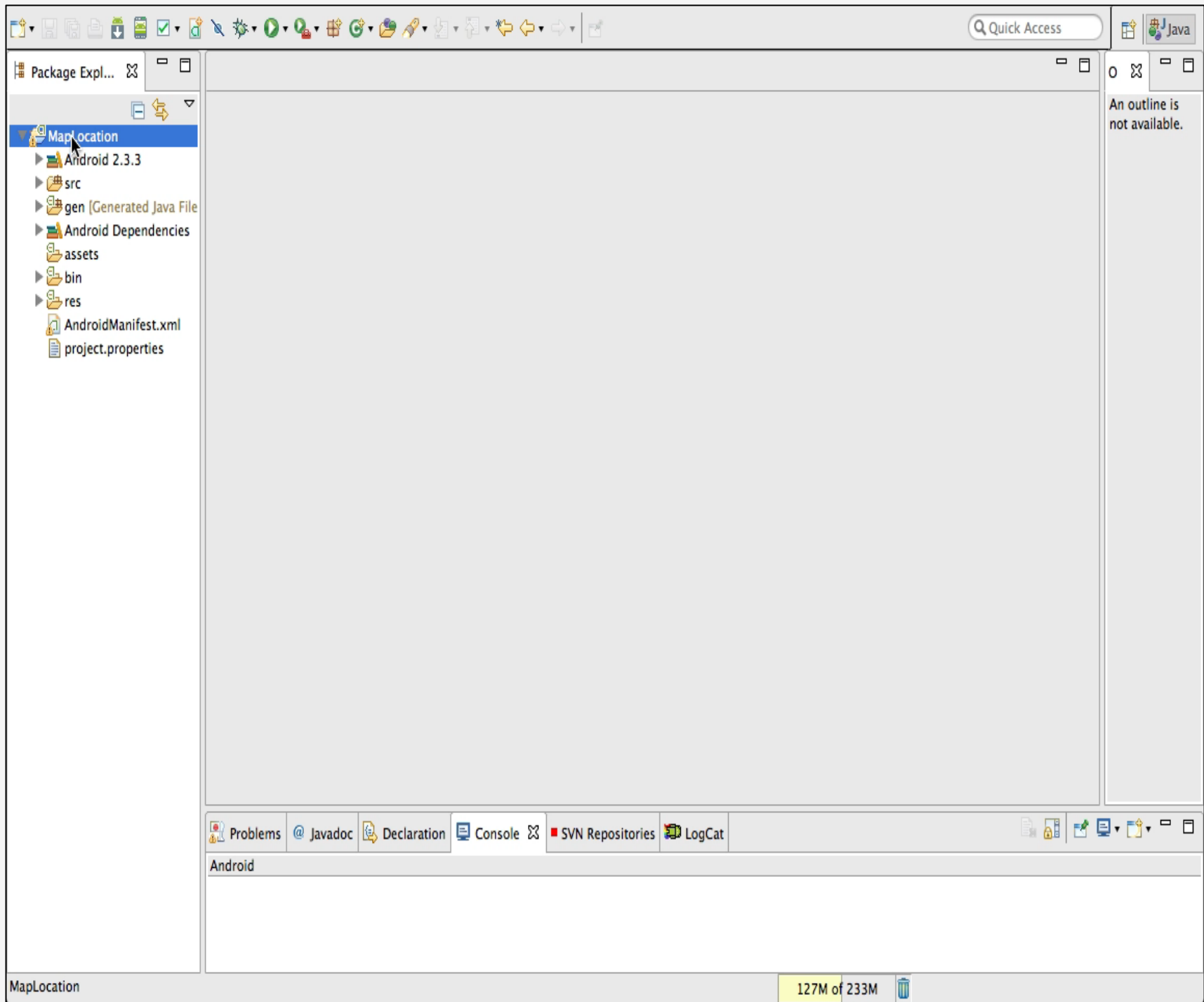




R.JAVA

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

JAVA CODE USES THE R CLASS TO ACCESS
RESOURCES



2. IMPLEMENT CLASSES

USUALLY INVOLVES AT LEAST ONE ACTIVITY

ACTIVITY INITIALIZATION CODE USUALLY IN
ONCREATE()

2. IMPLEMENT CLASSES

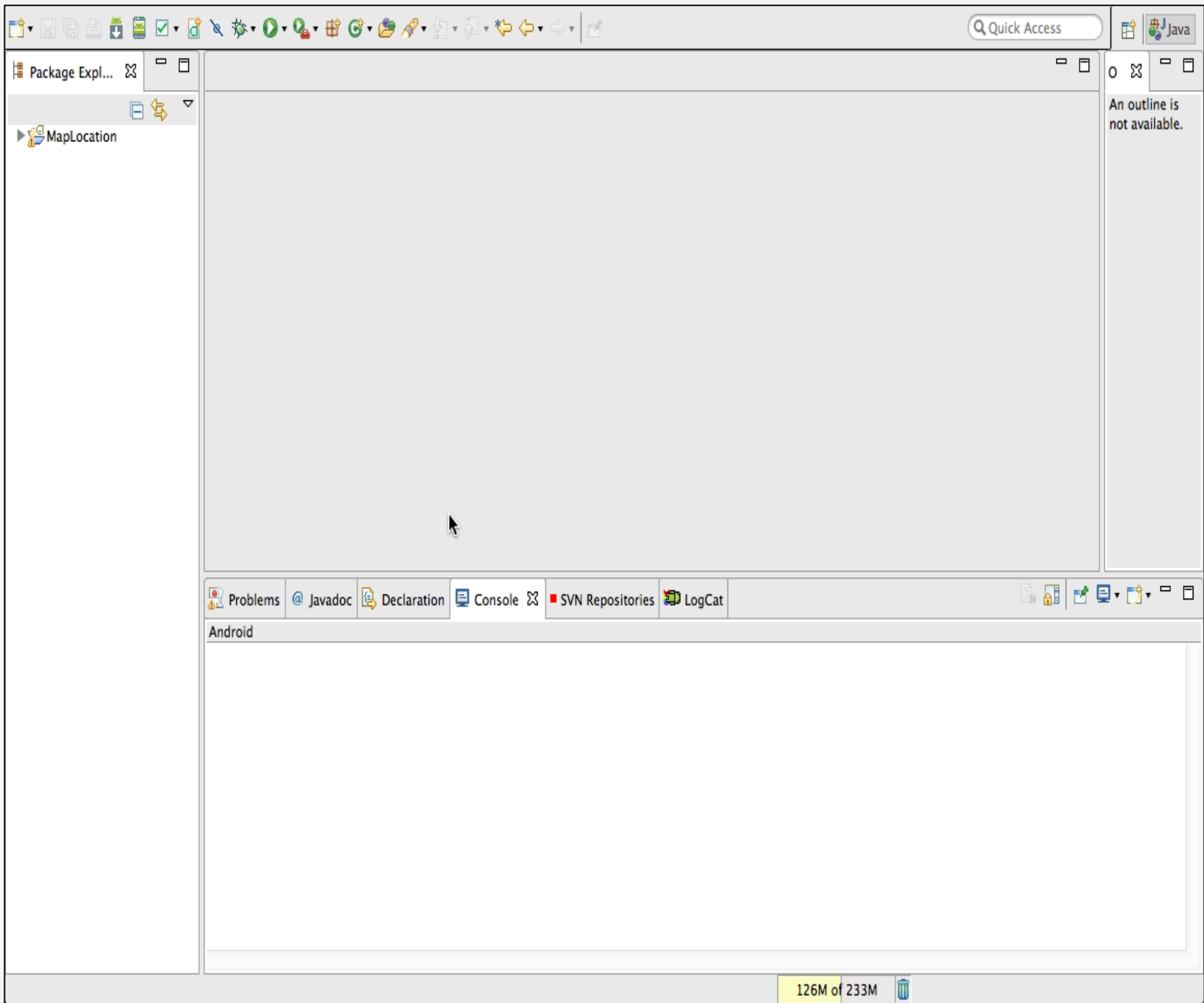
TYPICAL ONCREATE() WORKFLOW

RESTORE SAVED STATE

SET CONTENT VIEW

INITIALIZE UI ELEMENTS

LINK UI ELEMENTS TO CODE ACTIONS



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

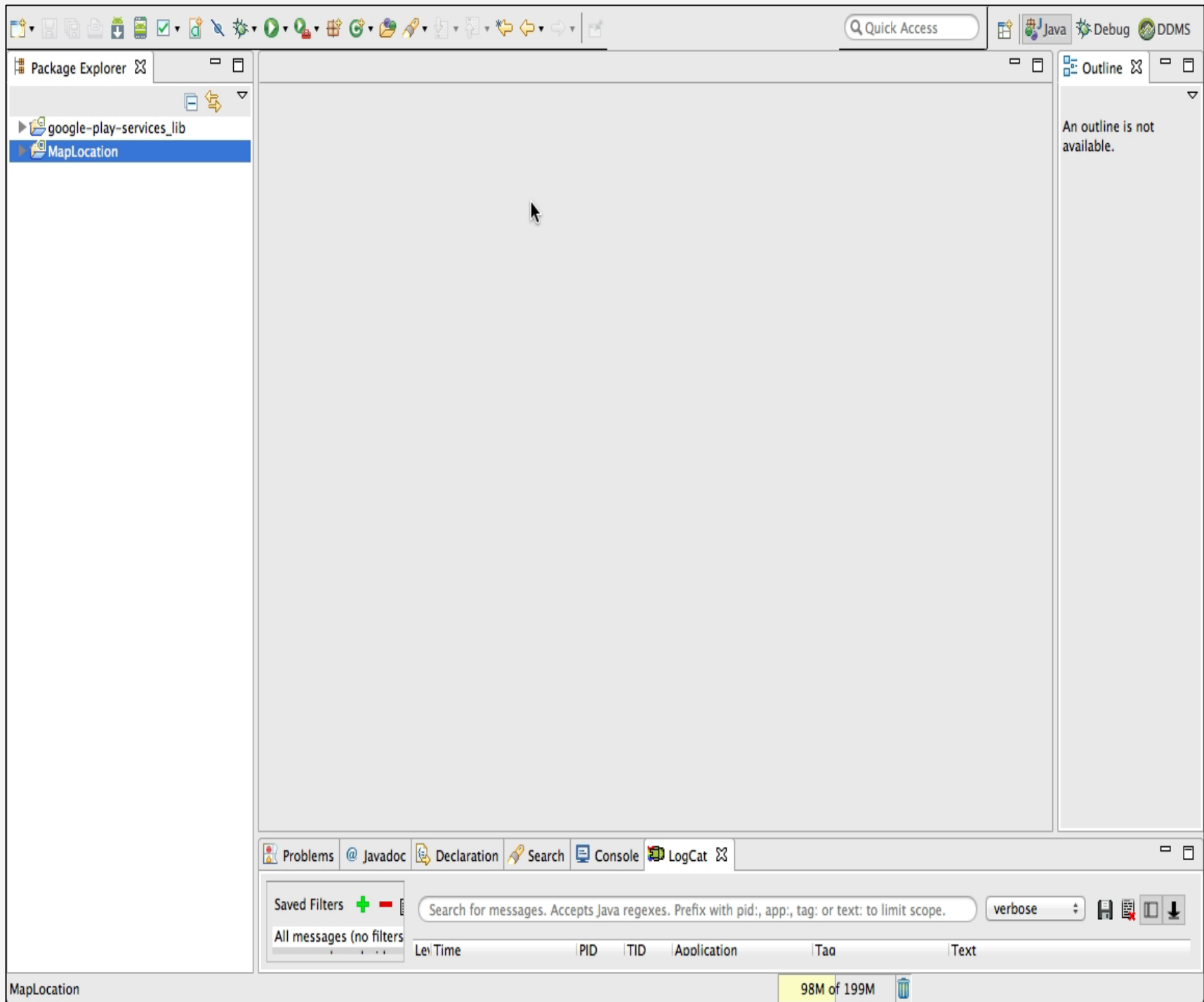
COMPONENTS

OTHER

- REQUIRED PERMISSIONS

- APPLICATION FEATURES

- MINIMUM API LEVEL



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