1. 系统应用 IDE 方案

关键字：系统应用 系统设置 android7.1 android stdio，settings

1.1.概述

1.1.1. 行业现状

芯片公司：MTK/RK/intel, ui 定制非常少，并且主要是处理系统底层，一般用 source insight 等文本工具

手机厂商：hw 目前只是用 AS 当文本工具看。Oppo/小米/酷派目前一般都用 AS，各种导入包/依赖/AAPT 编译问题，如何导入和解决相关的编译问题/网上参考资料较少。一般是专门的 sdk 团队负责搭建，主要编译 framework 各种 jar，暴露 hide 方法。

Settings 的依赖要比 SystemUI 复杂度类似，以 Settings 为例

1.1.2. 开发环境方案对比

直接把文件夹拖入 eclipse/android studio，本质和记事本效率其实差别不大, eclipse 目前已经很少用了，因此我们主要考虑 AS 下的搭建

生命周期	记事本环境方案	AS 环境方案
1.编码	工具：vi/sourceinsight/notepad/ 文档结构不合理：res 和 src 文档结构不合理，修改资源文件和代码文件非常不方便 语法助手：几乎没有	文档结构： 语法助手：自动：import，layout 实时预览，代码自动补全，代码语法检查，重构变量/方法等。
2.编译	linux 的 mm 命令 语法问题出错：回到 1	自动
3. 安装	com 控制台的 adb install	自动

（升级）		
4.运行	手动点击/或者脚本启动	自动
5.调试	业务逻辑问题：回到 1，插入 Log.d 代码，然后 2->3->4 Ui 问题：回到 1->2->3->4->5	直接依附进程，断点调试
效率指数	1	3
环境配置难度	0 不用任何配置	3d 1.比较复杂，Settings 为例，依赖 10 个左右的 jar 包，3 个其他工程，需要编译系统 sdk，消除 as 的 aapt 和系统源码的 aapt 差异；系统签名
系统覆盖率	100% 应用层，系统层，底层都 ok	20% 只支持部分 apk，framwork/native/kernel/driver 无法支持

目前我们对 settings 和 systemui ui 定制多，采用 as 符合当前业务和效率的需要

1.1.3. 方案目标

目前我们对 settings 和 systemui ui 定制多，采用 as 符合当前业务和效率的需要。结合目前的协作和工作环境，并且都是远程登陆到服务器工作。该方案需要实现以下目标。

- ➢ as 环境：在 as 环境下，可以正常编译，充分利用 ide 的高效功能，提取系统 class.jar，系统签名
- ➢ 兼容多种编译方式：支持 mk 和 as 模块编译，支持系统全量编译，尽量减少两种编译方式代码的差异性
- ➢ 便捷的 git 操作：团队协作，合理 gitignore，可以从服务器代码 git pull 到本地编写代码
- ➢ 可移植性强：便于从 android7.1 直接迁移到 android8.0，由于 android 系统更新频繁，应用定制必须考虑兼容性问题，做到强移植性，减少如 android7.0 迁移到 8.0 的工作

量。

1.1.1. 问题

迁移到 AS 环境下有一定的工作量：比如系统设置在 android7.0 又多依赖了 settingslib，然后 product 字段/资源重载机制 as 的 aapt 又不支持

要解决如何系统签名，不同的系统应用本身模块依赖负责，如何导入系统隐藏的方法？

举例一个最简单的应用：【系统设置】

product 字段/资源重载机制 as 的 aapt 又不支持

1.1.4. AS 说明

Android Studio 3.1.2
Build #AI-173.4720617, built on April 14, 2018
JRE: 1.8.0_152-release-1024-b02 amd64
JVM: OpenJDK 64-Bit Server VM by JetBrains s.r.o
Windows 7 6.1

1.2. AS 本地源码环境搭建-Settings 依赖分析

基本思想：mk 分析为线索，导入 jar 包和对应的源码工程

1.2.1. 查找 Settings 依赖库(Android.mk)

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```
LOCAL_PATH:= $(call my-dir)
include $(CLEAR_VARS)

LOCAL_SRC_FILES := \
        $(call all-logtags-files-under, src)

LOCAL_MODULE := settings-logtags

include $(BUILD_STATIC_JAVA_LIBRARY)

# Build the Settings APK
include $(CLEAR_VARS)

LOCAL_JAVA_LIBRARIES := bouncycastle core-oj telephony-common ims-common
LOCAL_STATIC_JAVA_LIBRARIES := \
    android-support-v4 \
    android-support-v13 \
    android-support-v7-recyclerview \
    android-support-v7-preference \
    android-support-v7-appcompat \
    android-support-v14-preference \
    jsr305 \
    settings-logtags

LOCAL_MODULE_TAGS := optional

LOCAL_SRC_FILES := \
        $(call all-java-files-under, src) \
        $(call all-java-files-under, src-kpad)

LOCAL_RESOURCE_DIR := $(LOCAL_PATH)/res \
    $(LOCAL_PATH)/res-kpad \
    frameworks/support/v7/preference/res \
    frameworks/support/v14/preference/res \
    frameworks/support/v7/appcompat/res \
    frameworks/support/v7/recyclerview/res

LOCAL_PACKAGE_NAME := Settings
LOCAL_CERTIFICATE := platform
LOCAL_PRIVILEGED_MODULE := true

LOCAL_PROGUARD_FLAG_FILES := proguard.flags

LOCAL_AAPT_FLAGS := --auto-add-overlay \
    --extra-packages android.support.v7.preference:android.support.v14.preference:android.support.v17.preference:android.support.v7.appcompat:android.support.v7.recyclerview

ifneq ($(INCREMENTAL_BUILDS),)
    LOCAL_PROGUARD_ENABLED := disabled
    LOCAL_JACK_ENABLED := incremental
    LOCAL_DX_FLAGS := --multi-dex
    LOCAL_JACK_FLAGS := --multi-dex native
endif

include frameworks/opt/setupwizard/library/common-full-support.mk
include frameworks/base/packages/SettingsLib/common.mk

include $(BUILD_PACKAGE)

# Use the following include to make our test apk.
```

```
ifeq (,$(ONE_SHOT_MAKEFILE))
include $(call all-makefiles-under,$(LOCAL_PATH))
endif
```

1.2.1.1. LOCAL_STATIC_JAVA_LIBRARIES

静态库是需要编译进 apk 的

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```
LOCAL_STATIC_JAVA_LIBRARIES := \
    android-support-v4 \
    android-support-v13 \
    android-support-v7-recyclerview \
    android-support-v7-preference \
    android-support-v7-appcompat \
    android-support-v14-preference \
    jsr305 \
    settings-logtags
```

1.2.1.2. LOCAL_JAVA_LIBRARIES

非静态库(非静态库是 Android 系统自带的库)

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```
LOCAL_JAVA_LIBRARIES := bouncycastle core-oj telephony-common ims-common
```

1.2.1.3. Include 文件夹

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```
include frameworks/opt/setupwizard/library/common-full-support.mk
include frameworks/base/packages/SettingsLib/common.mk
```

其中 setupwizard/navigationbar 和 setupwizard/library/和 SettingsLib 是包含 res 的工程库,因此不能导入 jar 包

1.2.1.4. 小结

从 Android.mk 文件得出结论是:

Settings 依赖上述的三个工程 setupwizard/navigationbar 和 setupwizard/library/和 SettingsLib（带有 res 的工程）

静态库

```
    android-support-v4 \
     android-support-v13 \
    android-support-v7-recyclerview \
    android-support-v7-preference \
    android-support-v7-appcompat \
    android-support-v14-preference \
    jsr305 \
    settings-logtags
```

动态库：

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```
bouncycastle core-oj telephony-common ims-common
```

1.2.2. SettingsLib

这个模块比较简单

1.2.2.1. comom

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```
LOCAL_DEX_PREOPT := true
ifeq ($(LOCAL_USE_AAPT2),true)
LOCAL_STATIC_ANDROID_LIBRARIES += \
    android-support-annotations \
    android-support-v4 \
    SettingsLib
else
LOCAL_RESOURCE_DIR += $(call my-dir)/res
LOCAL_AAPT_FLAGS += --auto-add-overlay --extra-packages com.android.settingslib
LOCAL_STATIC_JAVA_LIBRARIES += \
    android-support-annotations \
    android-support-v4 \
    SettingsLib
endif
```

1.2.2.2. android.mk

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```
LOCAL_PATH := $(call my-dir)
include $(CLEAR_VARS)
LOCAL_USE_AAPT2 := true
LOCAL_MODULE := SettingsLib
LOCAL_DEX_PREOPT := false
```

```
ANDROID_COMPILE_WITH_JACK := false
#WITH_DEXPREOPT := false
LOCAL_SHARED_ANDROID_LIBRARIES := \
    android-support-v4 \
    android-support-v7-recyclerview \
    android-support-v7-preference \
    android-support-v7-appcompat \
    android-support-v14-preference
LOCAL_RESOURCE_DIR := $(LOCAL_PATH)/res
LOCAL_JAR_EXCLUDE_FILES := none
LOCAL_SRC_FILES := $(call all-java-files-under, src)
include $(BUILD_STATIC_JAVA_LIBRARY)
```

1.2.3. 查找 Setupwizard 依赖库(Android.mk)

上文分析到还依赖于 setupwizard

```
include frameworks/opt/setupwizard/library/common-full-support.mk
```

具体文件如下：

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```
#
# Include this make file to build your application against this module.
#
# Make sure to include it after you've set all your desired LOCAL variables.
# Note that you must explicitly set your LOCAL_RESOURCE_DIR before including this file.
#
# For example:
#
#   LOCAL_RESOURCE_DIR := \
#        $(LOCAL_PATH)/res
#
#   include frameworks/opt/setupwizard/library/common-full-support.mk
#

# Check that LOCAL_RESOURCE_DIR is defined
ifeq (,$(LOCAL_RESOURCE_DIR))
$(error LOCAL_RESOURCE_DIR must be defined)
endif

# Add --auto-add-overlay flag if not present
ifeq (,$(findstring --auto-add-overlay, $(LOCAL_AAPT_FLAGS)))
LOCAL_AAPT_FLAGS += --auto-add-overlay
```

```
endif

# Include setup wizard library, if not already included
ifeq (,$(findstring setup-wizard-lib-full-support,$(LOCAL_STATIC_JAVA_LIBRARIES)))
LOCAL_RESOURCE_DIR += \
    $(call my-dir)/main/res \
    $(call my-dir)/eclair-mr1/res \
    $(call my-dir)/full-support/res
LOCAL_AAPT_FLAGS += --extra-packages com.android.setupwizardlib
LOCAL_STATIC_JAVA_LIBRARIES += setup-wizard-lib-full-support
endif

## Include transitive dependencies below

# Include support-v7-appcompat, if not already included
ifeq (,$(findstring android-support-v7-appcompat,$(LOCAL_STATIC_JAVA_LIBRARIES)))
LOCAL_RESOURCE_DIR += frameworks/support/v7/appcompat/res
LOCAL_AAPT_FLAGS += --extra-packages android.support.v7.appcompat
LOCAL_STATIC_JAVA_LIBRARIES += android-support-v7-appcompat
endif

# Include support-v7-recyclerview, if not already included
ifeq (,$(findstring android-support-v7-recyclerview,$(LOCAL_STATIC_JAVA_LIBRARIES)))
LOCAL_RESOURCE_DIR += frameworks/support/v7/recyclerview/res
LOCAL_AAPT_FLAGS += --extra-packages android.support.v7.recyclerview
LOCAL_STATIC_JAVA_LIBRARIES += android-support-v7-recyclerview
endif
```

1.2.3.1. 资源 LOCAL_RESOURCE_DIR

依赖的资源文件如下

```
LOCAL_RESOURCE_DIR += \
    $(call my-dir)/main/res \
    $(call my-dir)/eclair-mr1/res \
    $(call my-dir)/full-support/res
= frameworks/support/v7/appcompat/res
frameworks/support/v7/recyclerview/res
```

1.2.3.2. LOCAL_STATIC_JAVA_LIBRARIES

setup-wizard-lib-full-support
android-support-v7-appcompat
android-support-v7-recyclerview

1.2.3.3. setup-wizard-lib-full-support 模块分析

setup-wizard-本身又依赖 setup-wizard-lib-full-support，这个在 android,mk 定义了该模块

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```
##
# Build the full-support library, which includes RecyclerView and any other support libraries as
# they are integrated.
#
include $(CLEAR_VARS)

LOCAL_AAPT_FLAGS := --auto-add-overlay \
    --extra-packages android.support.v7.appcompat \
    --extra-packages android.support.v7.recyclerview
LOCAL_MANIFEST_FILE := main/AndroidManifest.xml
LOCAL_MODULE := setup-wizard-lib-full-support
LOCAL_RESOURCE_DIR := \
    $(LOCAL_PATH)/main/res \
    $(LOCAL_PATH)/eclair-mr1/res \
    $(LOCAL_PATH)/full-support/res \
    frameworks/support/v7/appcompat/res \
    frameworks/support/v7/recyclerview/res
LOCAL_SDK_VERSION := current
LOCAL_SRC_FILES := $(call all-java-files-under, main/src eclair-mr1/src full-support/src)
LOCAL_STATIC_JAVA_LIBRARIES := \
    android-support-v4 \
    android-support-v7-appcompat \
    android-support-v7-recyclerview

include $(BUILD_STATIC_JAVA_LIBRARY)
```

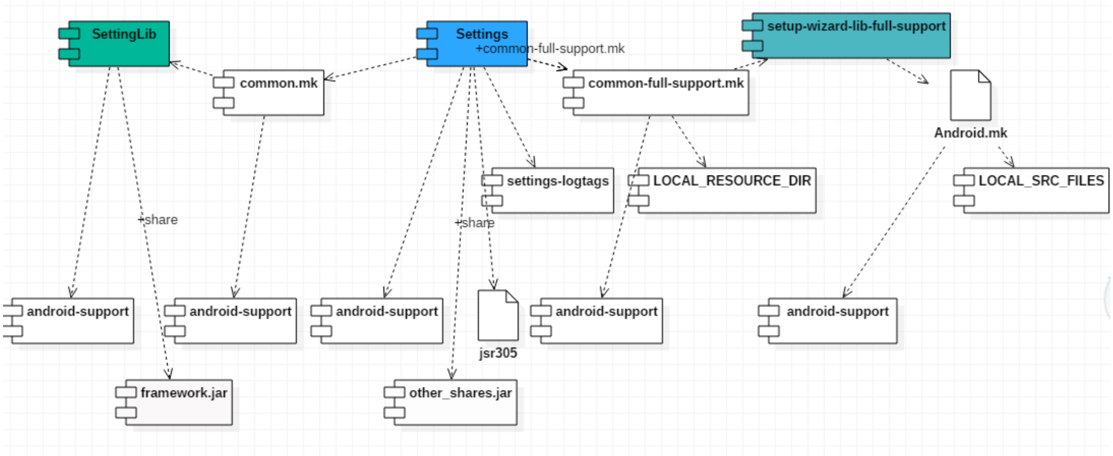
综上：setup-wizard-lib-full-support 的 AndroidManifest 是 main/AndroidManifest.xml，源码目录为 main/src eclair-mr1/src full-support/src，资源文件为 main/res /eclair-mr1/res full-support/res，依赖 jar 为

android-support-v4/android-support-v7-appcompat/android-support-v7-recyclerview

1.2.3.4. 小结

common-full-support 依赖 setup-wizard-lib-full-support

1.2.4. 依赖关系图



1.3. 导入对应的 jar 和源码

1.3.1. 关于 support.jar

```
/* implementation files('framework-libs/android-support-design.jar')

 implementation files('framework-libs/android-support-v4.jar')

 implementation files('framework-libs/android-support-v7-appcompat.jar')

 implementation files('framework-libs/android-support-v7-recyclerview.jar')

 implementation files('framework-libs/android-support-v13.jar')*/



 //for we need res ,must
```

```
compile ’com.android.support:design:25.4.0’

compile ’com.android.support:support-v4:25.4.0’

compile ’com.android.support:appcompat-v7:25.4.0’

compile ’com.android.support:recyclerview-v7:25.4.0’

compile ’com.android.support:support-v13:25.4.0’
```

1.3.2. 导入 SettingsLib 源码

源码位置：frameworks/base/packages/SettingsLib/
然后设置 jdk1.7
根据 import 报错解决问题：
1. framework 方法缺失：需要 framework.jar,通过 Use Libraries 方式导入 framework.jar(同时需要配置优先使用这个库)。
2.根据报错 libcore/icu：找到对应源码,导入 core-libart-classes.jar （也是通过系统 make 模块编译方式得到）
配置 Gradle 脚本

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```
provided files('../framework_libs/core-libart-classes.jar')
```

1.3.3. 导入 setupwizard/navigationbar 源码

源码路径: /frameworks/opt/setupwizard/navigationbar
并设置成 Is Library

1.3.4. 导入 setupwizard/library 源码

源码路径：frameworks/opt/setupwizard/library

1.3.5. Settings

1.3.5.1. 导入 framework.jar

同上

1.3.5.2. 导入静态库

android-support 直接在 AS 下用远程仓库获得，注意版本号和系统保持一致

```
LOCAL_STATIC_JAVA_LIBRARIES := \
    android-support-v4 \
    android-support-v13 \
    android-support-v7-recyclerview \
    android-support-v7-preference \
    android-support-v7-appcompat \
    android-support-v14-preference \
    jsr305 \
```

jsr305.jar 通过系统 make 得到，

settings-logtags

1.3.5.3. 导入动态库

以下库都需要通过系统编译得到，源码目录不做展开了

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```
LOCAL_JAVA_LIBRARIES := bouncycastle core-oj telephony-common ims-common
```

telephony-common.jar 主要是基带相关的包，导入包含了 hide 的 jar，否则会如下报错：

错误：找不到符号符号： 变量 BEARER_BITMASK 位置：类 Carriers

错误：找不到符号符号： 变量 EXTRA_KEY_ALERT_TITLE 位置：接口 Phone

1.4. 编译

这里描述 AS 编译过程产生的问题

1.4.1. AS 下的特殊配置

1.4.1.1. Found item String more than one time

字符串资源不支持 product 字段，根据错误提示的字段，使用 py 脚本自动扫描删除

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```
 //dpad-settings\fixStringRes.py
 # -*- coding: utf-8 -*-
import glob
import os,shutil


```

```
'''
line='<string name="imei_information_title">IMEI information</string>'
key = 'storage_type_external'
pos = line.find('<string name="')
v =  RepeatString.get(key, -1)
'''

def fixStringRes(f):
    reg0 = 'product="'
    regs1=['product="tablet"','product="emulator"','product="nosdcard"','product="device"']
    endTag = "</string>"
    filename= "strings.xml"
    RepeatString={'imei_information_title':0
              ,'storage_summary_format':0
              ,'storage_type_internal':0
              ,'storage_type_external':0}

    tmp = open(filename, "w")
    file = open(f)
    needWrite=True
    for line in file:
        pos = line.find('<string name="')
        if pos >= 0:
            key = line[pos + len('<string name="') : line.find('" ')]
            v =  RepeatString.get(key, -1)
            if v >= 0:
                print "find  RepeatString obj"
                RepeatString[key] = v + 1
            if v >= 1:
                print "rm RepeatString"
                continue

        if needWrite == False:
            print "rm cur line=%s,[needWrite]=" % line, needWrite
            needWrite =  line.find(endTag) >= 0
            continue
        needWrite = True
        if line.find(reg0) >= 0:
            for reg in regs1:
              if line.find(reg) >= 0:
                  print "find it!!"
                  needWrite =  False
                  break

        if needWrite == False:
            needWrite = line.find(endTag) >= 0
            print "rm cur line=%s,[needWrite]=" % line, needWrite
            continue
        '''print "save line=%s[needWrite]=" % line, needWrite '''
        tmp.write(line)

    tmp.close()
    file.close()
    if os.path.isfile(f):
        os.remove(f)
    else:
        print "error: %s" %f

    f = f[:len(f)-len(filename)]
    shutil.move(filename, f)


files = glob.glob(r'.\settings\res\values*\\strings.xml')
for f in files:
     print "handle File at %s" % f
     fixStringRes(f);





```

1.4.1.2. gesture_fingerprint_swipe 是空文件异常

这个是手势定义，都是空文件，另外还有 gesture_ambient_lift 等

在 make 环境 ok，但是 as 不行。
解决办法：重名为.png

1.4.1.3. 如何保证系统自带的 api 优先识别

比如要添加 framework.jar 和 core.jar。在项目的 build.gradle 最后添加上面这段代码，options.compilerArgs.add （），在括号中填写真实的路径，有多个 jar 包就用分号隔开。

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```
allprojects {
    repositories {
        jcenter()
    }
    gradle.projectsEvaluated {
        tasks.withType(JavaCompile) {
            options.compilerArgs << "-Xlint:unchecked" << "-Xlint:deprecation"
            options.compilerArgs.add('-Xbootclasspath/p:framework_libs/telephony-common.jar;framework_libs/core.jar')
        }
    }
}
```

1.4.1.4. android 自带的属性规范

AS 不支持@*,会提示
<item name="@*android: not found
'@*android:attr/regularColor' not found 等

因为已经不支持@开头使用 android 自带的属性，我们只要把@符号删掉就可以了

https://www.niwoxuexi.com/blog/android/article/310.html
https://stackoverflow.com/questions/47033594/android-studio-3-0-error-style-attribute-android attr-windowenteranimation-n

1.4.2. Jdk8 格式

Android7 采用的 java1.8 编译，不少代码是 1.8 规范的，AS 默认是 1.7 的。
修改有两个办法
方法一：让 AS 支持 java1.8（推荐）：在 gradle 下配置：

```
 compileOptions {
      sourceCompatibility JavaVersion.VERSION_1_8
      targetCompatibility JavaVersion.VERSION_1_8
}
```

方法二：把 1.8 的代码改为 1.7 规范

1.4.3. buildToolsVersion 异常

报错：Execution failed for task ':app:transformClassesWithDesugarForDebug'
解决办法：Open your build.gradle and use below

```
android {
    compileSdkVersion 26
    buildToolsVersion "26.0.1"
```

Then `Clean-Rebuild-Run` .MORE

1.4.4. preferenceStyle 不支持

删除

```
<item name="@android:preferenceStyle">@style/Preference</item>

<item name="@android:editTextPreferenceStyle">@style/EditTextPreference</item>

<item name="@android:dropdownPreferenceStyle">@style/Preference.DropDown.Material</item>

<item name="@android:preferenceFragmentStyle">@style/PreferenceFragmentStyle</item>
```

1.4.5. EventLogTags 找不到

Make 编译这个 class 吧

1.4.6. Gradle 异常

异常打印：DexArchiveMergerException: r8.errors.CompilationError: Program type already present:android.Manifest

解决办法：clean your project；then rebuild。

https://stackoverflow.com/questions/47079710/dexarchivemergerexception-with-android-studio-3-0

```
provided files('../framework_libs/classes-jarjar.jar')
classes-jarjar.jar 和 supprot-v14 重合了？
```

1.5. 安装

1.5.1. PARSE_FAILED_MANIFEST_MALFORMED

可以编译出 apk 了，但是此时无法安装。配置文件有异常

C:\Users\key.guan\Desktop>adb install -r -d F:\K\1-src\3399\test\dpad-settings\build\outputs\apk\debug\dpad-settings-debug.apk

adb: failed to install F:\K\1-src\3399\test\dpad-settings\build\outputs\apk\debug\dpad-settings-debug.apk: Failure

[INSTALL_PARSE_FAILED_MANIFEST_MALFORMED: Fai
led parse during installPackageLI: /data/app/vmdl360143393.tmp/base.apk (at Binary XML file line #153): <meta-data> requires an android:value or android:resource attribute]

Failure [INSTALL_PARSE_FAILED_MANIFEST_MALFORMED: Failed parse during installPackageLI: /data/app/vmdl566395868.tmp/base.apk (at Binary XML file line #3421): <meta-data> requires an android:value or android:resource attribute]

INSTALL_PARSE_FAILED_MANIFEST_MALFORMED meta-data android:resource

1.5.2. signatures do not match

问题：Failure [INSTALL_FAILED_UPDATE_INCOMPATIBLE: Package com.android.settings signatures do not match the previously installed version; ignoring!]
分析：没有系统签名！
解决：系统签名

1.1.2. Adb Failure [INSTALL_FAILED_TEST_ONLY

adb install –t –r

1.5.3. base.apk code is missing

问题：Failure [INSTALL_FAILED_INVALID_APK: Package couldn't be installed in /data/app/com.android.settings-1: Package /data/app/com.android.settings-1/base.apk code is missing]
分析：AS 的编译机制，系统可能 PMS 对于 apk 的解析处于一个错误的状态
解决：$ adb shell pm uninstall com.android.settings
DELETE_FAILED_INTERNAL_ERROR
Error while Installing APK
重启系统就好！

1.6.运行

1.6.1. DrawerLayout MeasureSpec.EXACTLY

DrawerLayout must be measured with MeasureSpec.EXACTLY.错误
引用 android.support.v4 包中的 drawerlayout 时经常出现这种错误
drawerlayout 必须给一个确定的大小不能用 wrap_content
触发方法： 系统设置->关于手机

类似地方：Settings$SimStatusActivity/Settings$ImeiInformationActivity

问题分析

发生在 DeviceInfoSettingsActivity，其他 Activity 不会发生该问题原因在于风格，之前由于 AS 下面有些风格不支持，删除了之后，引起的 bug。
解决办法：

```
android:layout_width="match_parent"

android:layout_height="match_parent"
```

1. 设死长宽，修改为 1920*1080 可以规避，不会报错，但是异常
2. DeviceInfoSettingsActivity 成弹窗风格，`android:theme="@style/Theme.SubSettingsDialogWhenLarge"`

在使用 ToolBar+DrawerLayout 的时候，总是报如下的错误：

```
android:layout_width="match_parent"

android:layout_height="match_parent"
```

https://blog.csdn.net/qq_38859786/article/details/72852950

问题解决

直接删除修改风格
，但是此时

SeekBar$OnSeekBarChangeListener)' on a null object reference

为何原生的没有？NPE

SecurityException: Package com.android.settings is currently frozen!

```
adb shell am broadcast -a android.intent.action.MASTER_CLEAR
```

显示异常。

Must specify preferenceTheme in theme

@android:attr/preferenceFragmentStyle' not found

```
getActivity().getTheme().resolveAttribute(

        android.support.v7.preference.R.attr.preferenceTheme, tv, true);
```