

Android 资源管理机制



徐仙明



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友盟简介

- 1 专业的移动开发服务平台
- 2 统计分析、开发工具与应用联盟
- 3 数据报告
- 4 行业沙龙



Overview

- 什么是资源
- 资源种类、定义
- 系统(Framework)资源
- 应用资源
- 访问资源
- 换肤

什么是资源

- 描述UI
 - 图片
 - 布局
 - 字符串
 - Raw
 - Etc.
- XML
 - 界面(UI设计师)和逻辑(码农)分离
 - 前端工程师(html,css,js) v.s. 后端工程师(jsp, java,...)

资源种类

- Res
 - res/anim
 - res/drawable
 - res/layout
 - res/menu
 - res/raw
 - res/values-? (zh, etc. 语言/分辨率/版本等 qualifier name)
 - strings.xml
 - styles.xml
 - attrs.xml
 - colors.xml
 - arrays.xml
 - ...
 - res/xml
 - ...

定义资源(XML)

- 属性-值 (attr-value)
 - 定义属性
 - styleable (schema)
 - 赋值
 - Layout, Style
 - value type
 - int, boolean, float, String, reference
 - E.g. [TextView](#)

资源定义 - Case study

android.widget.TextView

platform_frameworks_base/core/res/res/values/attrs.xml

```
<declare-styleable name="TextView">
    <!-- Determines the minimum type that getText() will
    return.
    The default is "normal".
    Note that EditText and LogTextBox always return Editable,
    even if you specify something less powerful here. -->
    <attr name="bufferType">
        <!-- Can return any CharSequence, possibly a
        Spanned one if the source text was Spanned. -->
        <enum name="normal" value="0" />
        <!-- Can only return Spannable. -->
        <enum name="spannable" value="1" />
        <!-- Can only return Spannable and Editable. -->
        <enum name="editable" value="2" />
    </attr>
    <!-- Text to display. -->
    <attr name="text" format="string"
    localization="suggested" />
    <!-- Hint text to display when the text is empty. -->
    <attr name="hint" format="string" />
    <!-- Text color. -->
    <attr name="textColor" />
    <!-- Color of the text selection highlight. -->
    <attr name="textColorHighlight" />
    <!-- Color of the hint text. -->
    <attr name="textColorHint" />
```

TypedArray

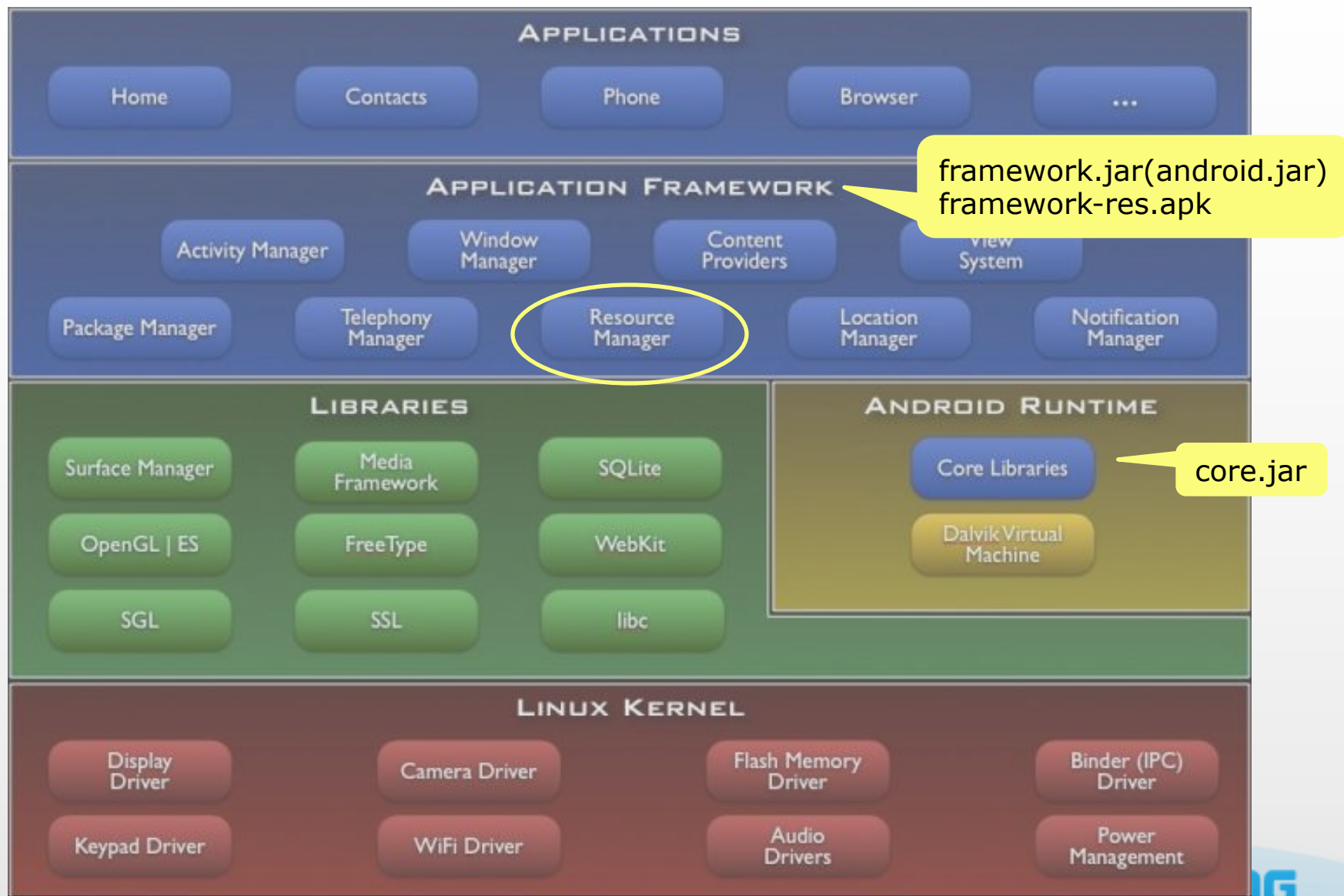
platform_frameworks_base/core/java/android/widget/
TextView.java

```
public TextView(Context context,
    AttributeSet attrs,
    int defStyle) {
    super(context, attrs, defStyle);
    ...
    a = theme.obtainStyledAttributes(
        attrs,
        com.android.internal.R.styleable.TextView, defStyle, 0);
    ....

    int n = a.getIndexCount();
    for (int i = 0; i < n; i++) {
        int attr = a.getIndex(i);
        switch (attr) {
            ...
            case com.android.internal.R.styleable.TextView_text:
                text = a.getText(attr);
            break;
            ....
        }
    }
    ....
    a.recycle();
}
```

AttributeSet

在Android架构中的位置



系统资源 - 追溯到源码中

android.content.pm
android.content.res
android.database
android.database.sqlite
android.drm
android.gesture
android.graphics

Interfaces

XmlResourceParser

Classes

AssetFileDescriptor
AssetFileDescriptor.AutoCloseInputStream
AssetFileDescriptor.AutoCloseOutputStream
AssetManager
AssetManager.AssetInputStream
ColorStateList
Configuration
ObbInfo
ObbScanner
Resources
Resources.Theme
TypedArray

Exceptions

Resources.NotFoundException

platform_frameworks_base / core / res / res

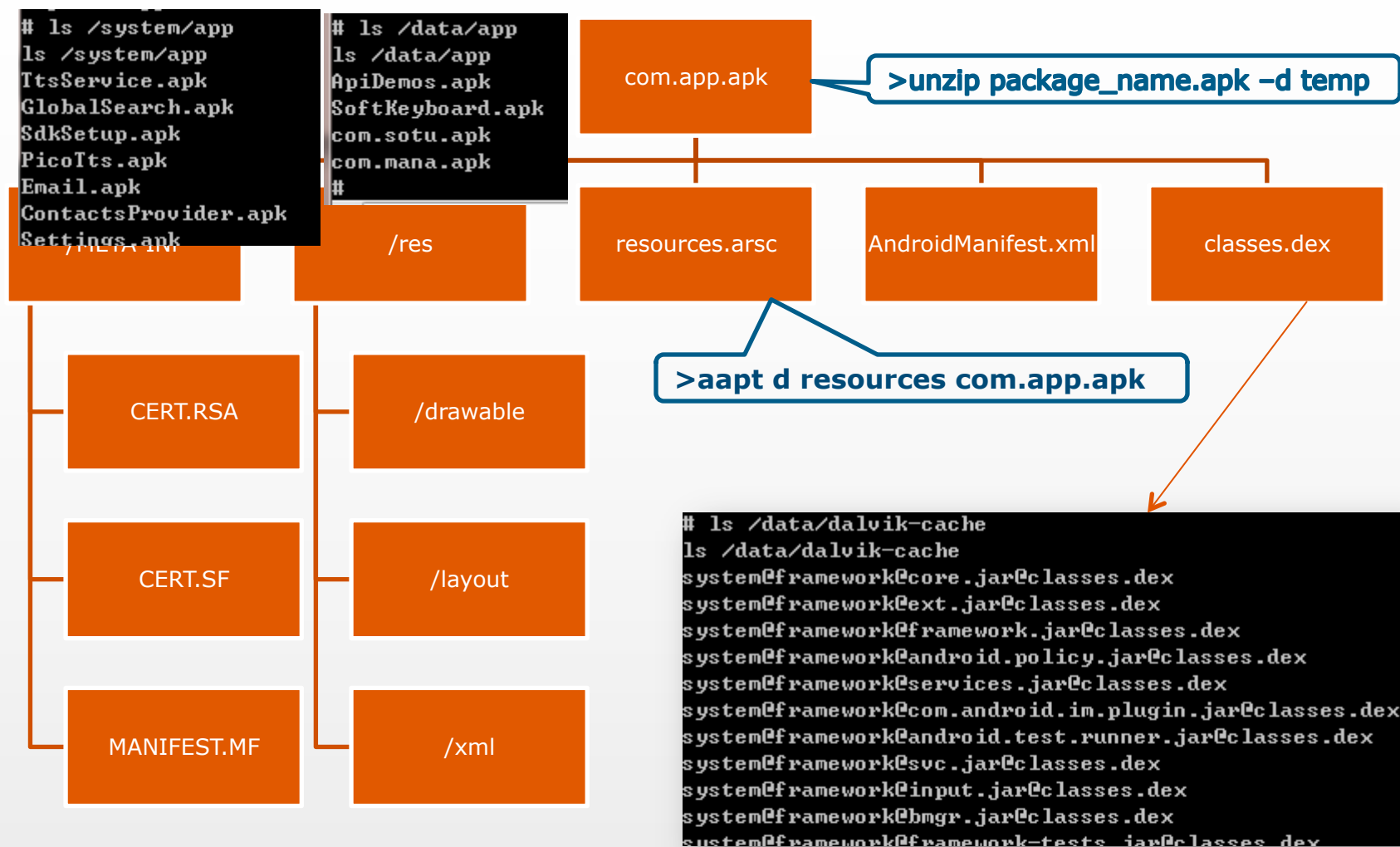
name	age	message
..		
anim	3 months ago	Fix
animator	a year ago	Fix
color	a year ago	Ref
drawable-en-hdpi	2 years ago	Mov
drawable-en-ldpi	a year ago	ldpi
drawable-en-mdpi	2 years ago	Fix
values-xlarge	9 months ago	mov
values-zh-rCN	3 months ago	Imp
values-zh-rTW	3 months ago	Imp
values-zu-rZA	8 months ago	Add
values-zu	3 months ago	Import revised trans
values	3 months ago	Merge "Fix system
xml-en	3 years ago	auto import from //d

```
# ls /system/framework
ls /system/framework
svc.jar
input.jar
core.jar
bmgr.jar
framework-tests.jar
android.policy.jar
ext.jar
am.jar
monkey.jar
android.test.runner.jar
com.android.im.plugin.jar
framework.jar
ime.jar
framework-res.apk
services.jar
pm.jar
#
```

platform_frameworks_base/core/java/android/content/res/

Reference: https://github.com/android/platform_frameworks_base/tree/master/core/res/res

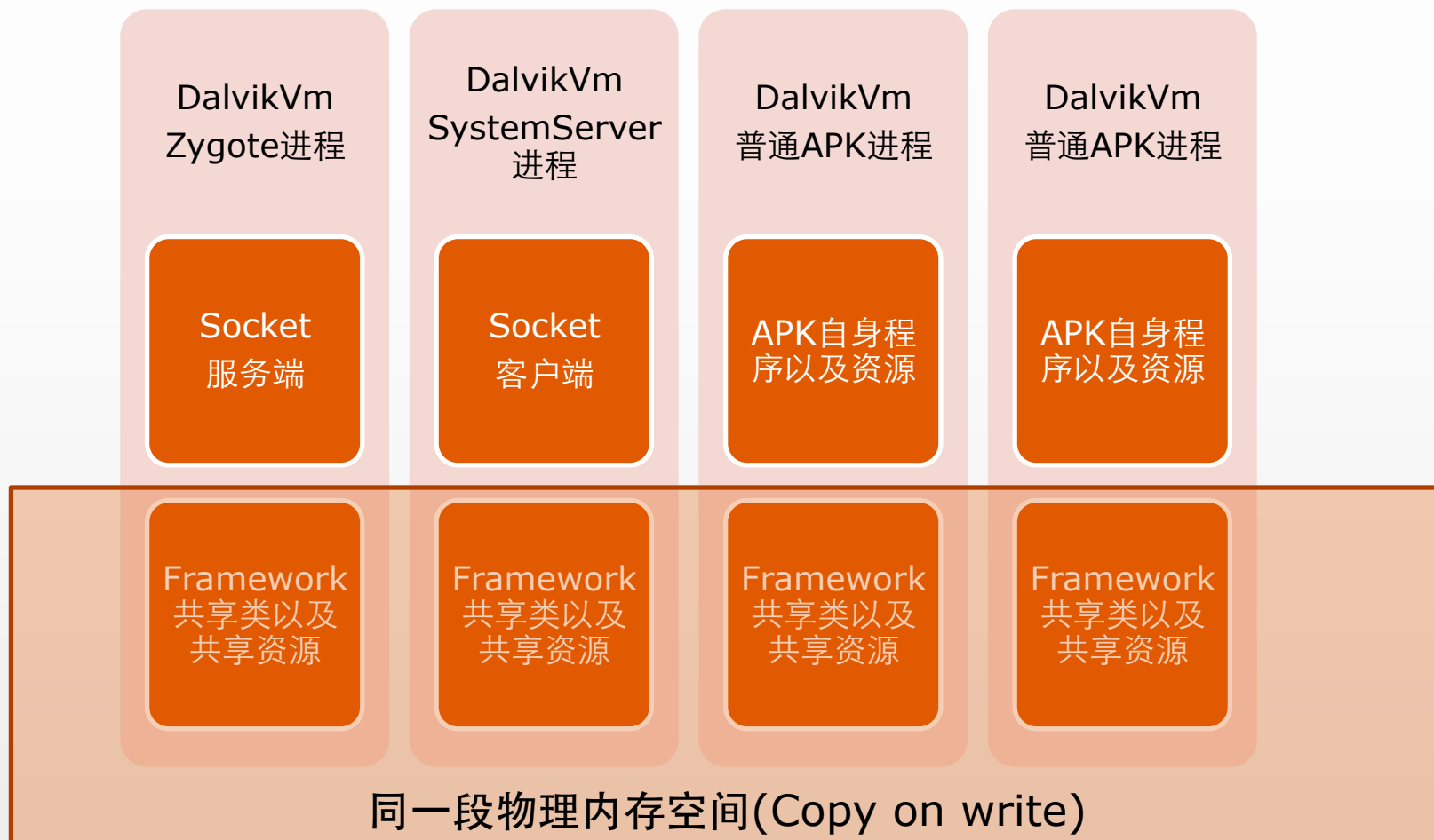
应用资源



Dalvik 共享资源

- 创建 Zygote (app_process)进程(init.rc)
- Zygote fork出 SystemServer 进程
- Zygote加载类 (preloadClasses())
 - frameworks/base/preload-classes
- Zygote加载资源(preloadResources())
 - frameworks/base/core/res/res/values/arrays.xml
- Zygote fork创建app进程

Dalvik 共享资源



Reference: [Android 内核剖析](#)

创建应用进程

```
211
212         pid = Zygote.forkAndSpecialize(parsedArgs.uid, parsedArgs.gid,
213             parsedArgs.gids, parsedArgs.debugFlags, rlimits);
214     } catch (IllegalArgumentException ex) {
215         // ...
216     }
217
218     try {
219         if (pid == 0) {
220             // in child
221             IoUtils.closeQuietly(serverPipeFd);
222             serverPipeFd = null;
223             handleChildProc(parsedArgs, descriptors, childPipeFd, newStderr);
224
225             // should never get here, the child is expected to either
226             // throw ZygoteInit.MethodAndArgsCaller or exec().
227             return true;
228         } else {
229             // in parent...pid of < 0 means failure
230             IoUtils.closeQuietly(childPipeFd);
231             childPipeFd = null;
232             return handleParentProc(pid, descriptors, serverPipeFd, parsedArgs);
233         }
234     }
235
236     try {
237         ZygoteInit.invokeStaticMain(cloader, className, mainArgs);
238     } catch (RuntimeException ex) {
239         logAndPrintError(newStderr, "Error starting. ", ex);
240     }
```

访问资源

- Context
 - 应用内资源
 - Context.getResources
 - AssetManager
- PackageManager
 - 其他应用的资源

```
static void android_content_AssetManager_init(JNIEnv* env, jobject
clazz)
{
    AssetManager* am = new AssetManager();
    if (am == NULL) {
        jniThrowException(env, "java/lang/OutOfMemoryError", "");
        return;
    }

    am->addDefaultAssets();

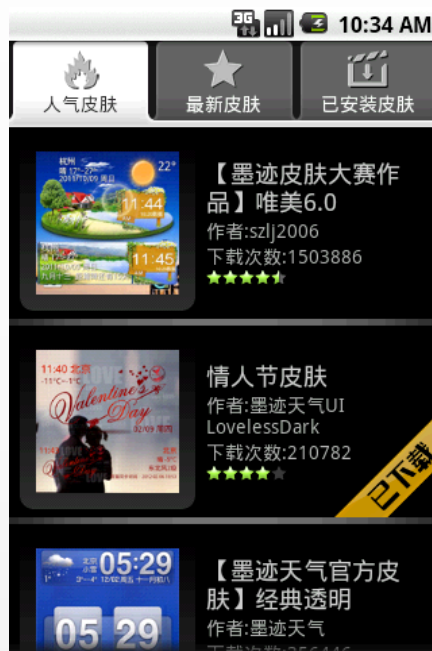
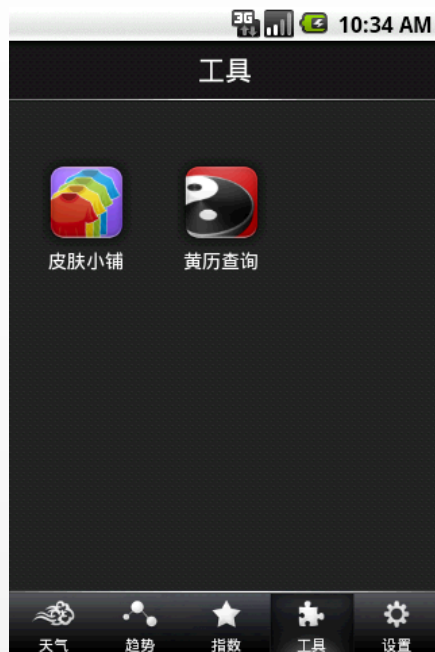
    LOGV("Created AssetManager %p for Java object %p\n", am,
clazz);
    env->SetIntField(clazz, gAssetManagerOffsets.mObject, (jint)am);
}
```

(/system/framework/framework-res.apk)

应用换肤

- 内置
 - if(skin1) png1... else png2...
 - 外置
 - 可下载
 - Apk
 - 将皮肤apk和应用放在同一进程中
 - 有同样的签名，配置AndroidManifest.xml文件中android:sharedUserId属性值相同
- ```
Context context = Context.createPackageContext("packagename.customskin",
Context.CONTEXT_IGNORE_SECURITY);
Drawable drawable = context.getResources().getDrawable(R.drawable.icon);
```
- E.g. AdwLauncher
  - zip
    - 把皮肤文件解压缩到/data/data/[package name]/skin路径下
    - E.g. 墨迹(mja), 搜狗输入法(sga)

## 应用换肤 - Case Study



```
ls /sdcard/moji/temp
103.zip
ls /sdcard/moji/skin103
colon_b.png
colon_w.png
n0.png
n1.png
n2.png
n3.png
n4.png
n5.png
n6.png
n7.png
n8.png
n9.png
preview.jpg
setting.xml
widget_4x1_bkg.png
widget_4x2_bkg.png
logo.jpg
skininfo.txt
#
```



## 系统换肤

- 修改AssetManager.cpp 初始化提供framework-res.apk路径(C++)
- 修改Resources.java(Java)

Q & A