蚂蚁聚宝Android秒级编译

—— Freeline

栾砚强
蚂蚁金服高级技术专家

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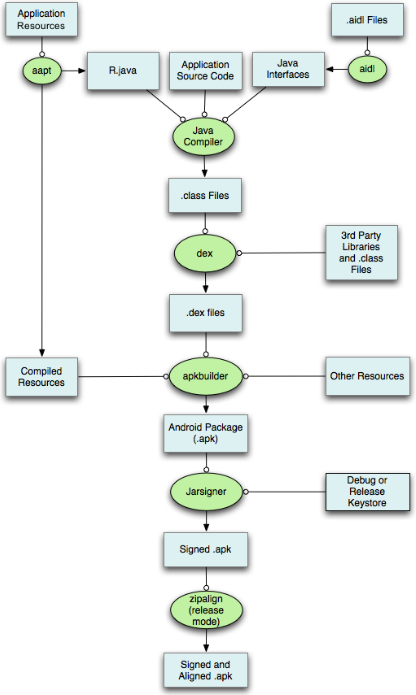
content

1. 技术背景
2. 原理解析
3. 适用场景
4. 前景展望

传统的Android应用构建

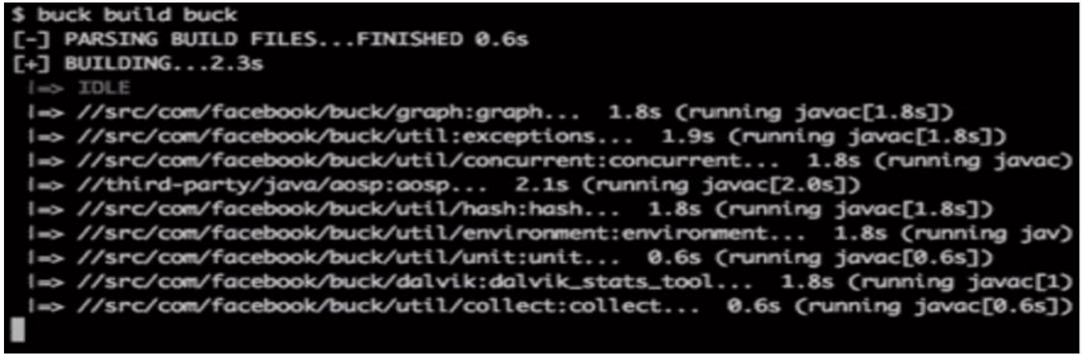


扫码观看大会视频

Buck

- Pros:
  多任务并发
  多级缓存
  全量构建利器

- Cons:
  入侵性强，接入成本高
  需要安装全量包
  以子任务为单位做增量



```
$ buck build buck
[-] PARSING BUILD FILES...FINISHED 0.6s
[+] BUILDING...2.3s
 |=> IDLE
 |=> //src/com/facebook/buck/graph:graph...  1.8s (running javac[1.8s])
 |=> //src/com/facebook/buck/util:exceptions...  1.9s (running javac[1.8s])
 |=> //src/com/facebook/buck/util/concurrent:concurrent...  1.8s (running javac)
 |=> //third-party/java/aosp:aosp...  2.1s (running javac[2.0s])
 |=> //src/com/facebook/buck/util/hash:hash...  1.8s (running javac[1.8s])
 |=> //src/com/facebook/buck/util/environment:environment...  1.8s (running jav)
 |=> //src/com/facebook/buck/util/unit:unit...  0.6s (running javac[0.6s])
 |=> //src/com/facebook/buck/dalvik:dalvik_stats_tool...  1.8s (running javac[1)
 |=> //src/com/facebook/buck/util/collect:collect...  0.6s (running javac[0.6s])
```

LayoutCast

- Pros:

  基于动态替换的开源编译方案
  支持DEX、Res动态替换生效

- Cons:

  资源全量替换，没有实现增量
  资源不支持新增
  没有利用缓存或者并发
  不支持4.x

Instant Run

- Pros:

  谷歌官方方案

  通过HACK Method 实现代码增量替换

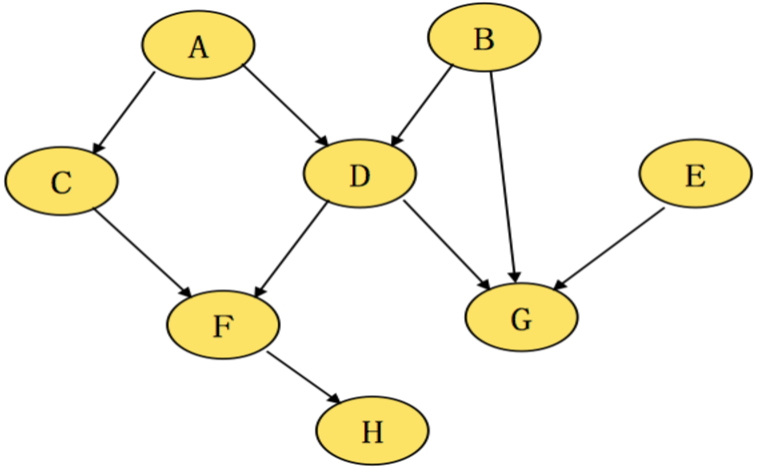
- Cons:

  资源全量替换
  增量模式下对调试不友好
  多个子工程结构支持不够完善

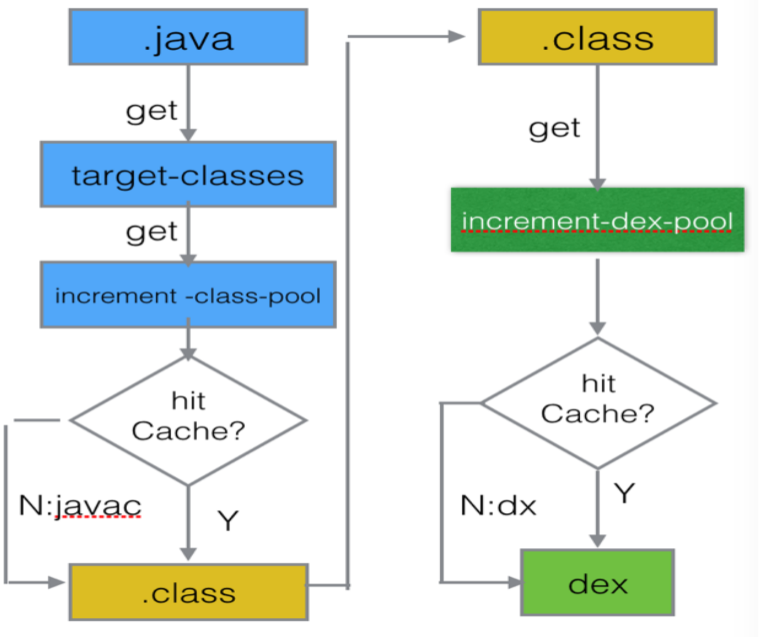
Freeline核心思想

- 多任务并发
- 多级缓存
- 增量范围最小化
- 基于长链接无安装式运行期动态替换
- 基线对齐触发机制
- 可调试
- 独立进程

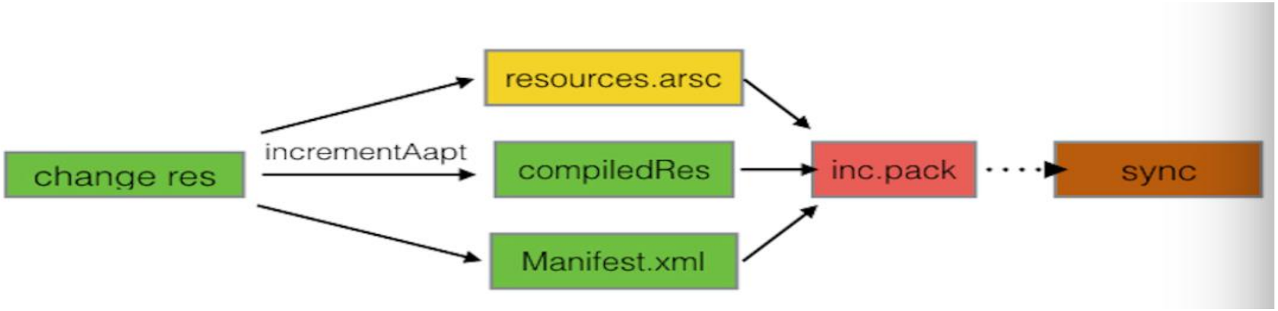
多任务并发



多级缓存-代码

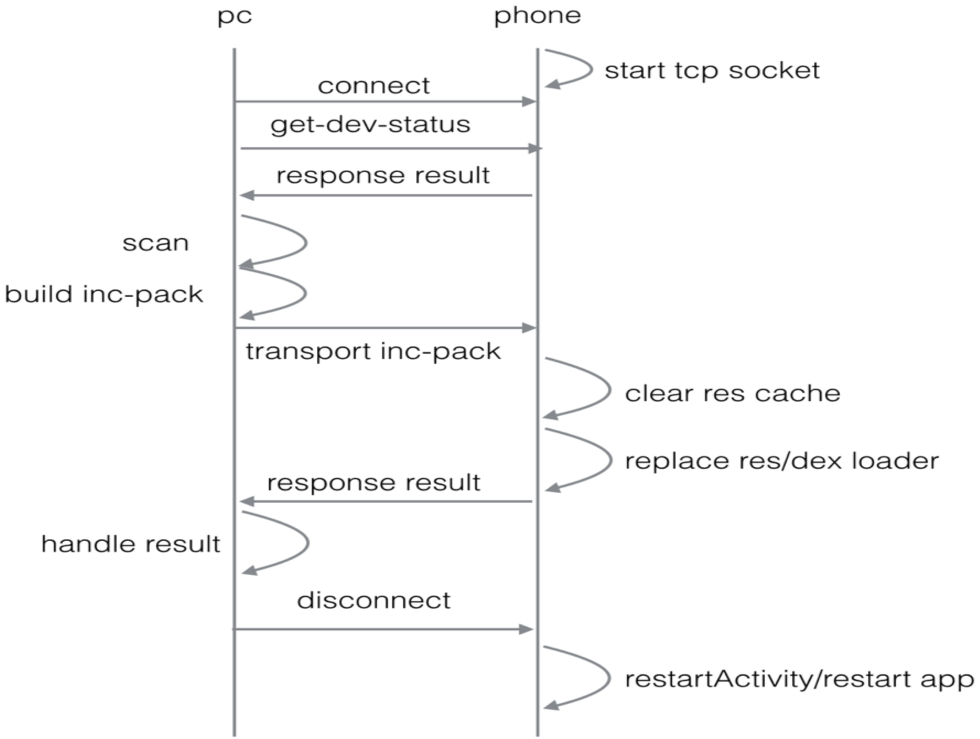

.java
get
target-classes
get
increment -class-pool
hit Cache?
N:javac
Y
.class
.class
get
increment-dex-pool
hit Cache?
N:dx
Y
dex

多级缓存-资源

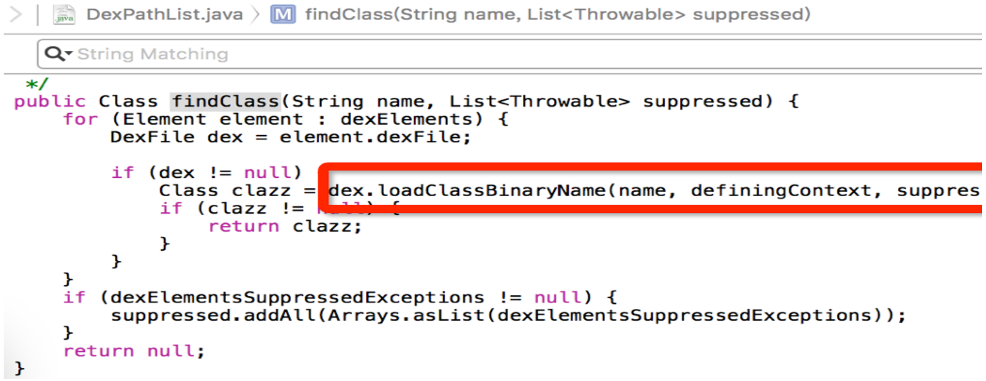

change res
incrementAapt
resources.arsc
compiledRes
Manifest.xml
inc.pack
sync

无安装式动态替换

- 基线包版本
- sdk版本号
- 资源增量支持
- Activity栈
- 独立进程长链接
- 基线对齐触发机制

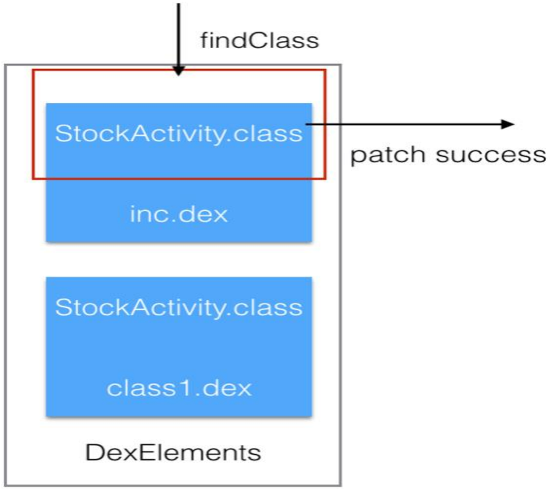


技术原理-代码增量生效


DexPathList.java 〉 M findClass(String name, List<Throwable> suppressed)
String Matching

```
 */
public Class findClass(String name, List<Throwable> suppressed) {
    for (Element element : dexElements) {
        DexFile dex = element.dexFile;

        if (dex != null) {
            Class clazz = dex.loadClassBinaryName(name, definingContext, suppres
            if (clazz != null) {
                return clazz;
            }
        }
    }
    if (dexElementsSuppressedExceptions != null) {
        suppressed.addAll(Arrays.asList(dexElementsSuppressedExceptions));
    }
    return null;
}
```



扫码观看大会视频

技术原理-资源增量-技术难点

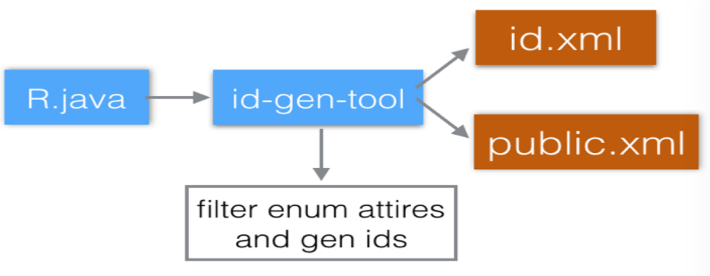
- 增量包资源id怎么兼容基线包资源id？

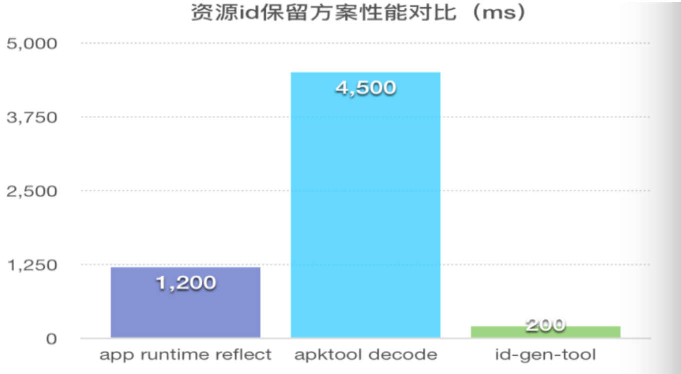
- 怎么样高效构建出仅仅包含变更集合的资源包?

- 怎么样在手机端让上面构建的增量包生效？

技术原理-资源增量

增量包资源id怎么兼容基线包资源id？

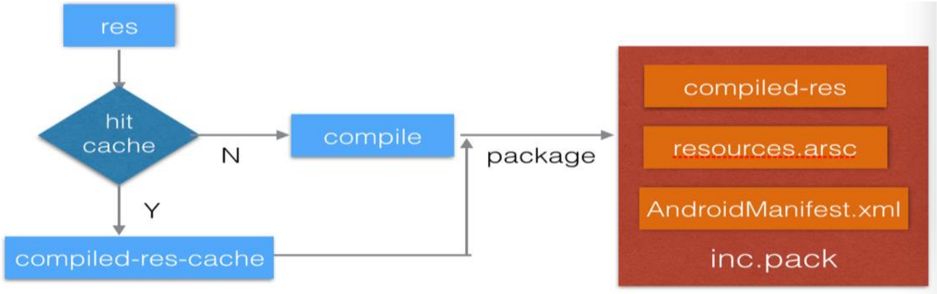




扫码观看大会视频

技术原理-资源增量

怎么样高效构建出仅仅包含变更集合的资源包?



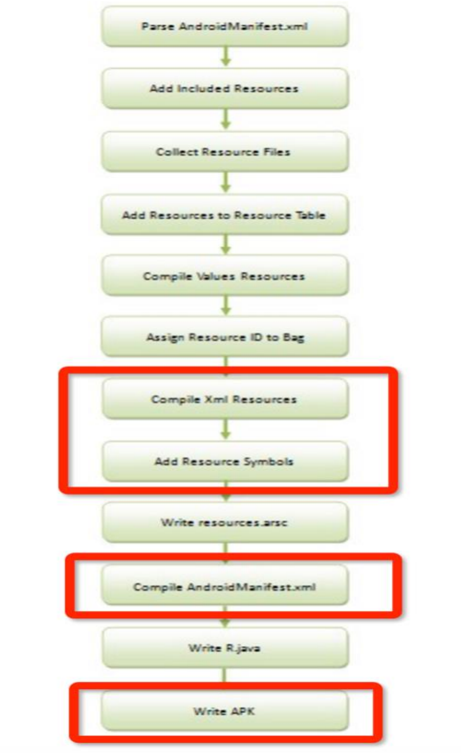
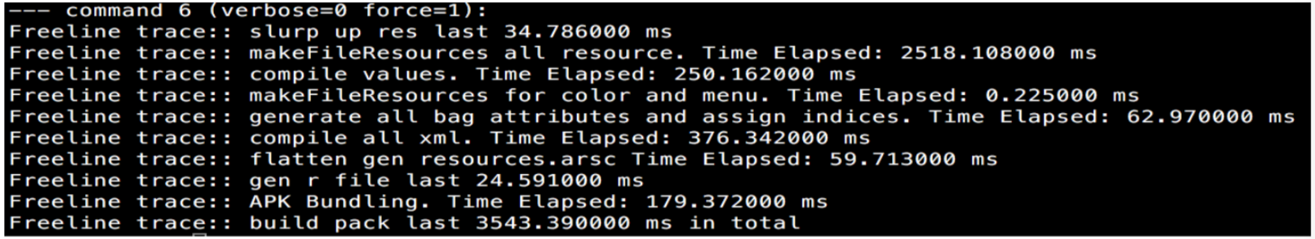


图4 Android资源打包工具的执行过程

扫码观看大会视频

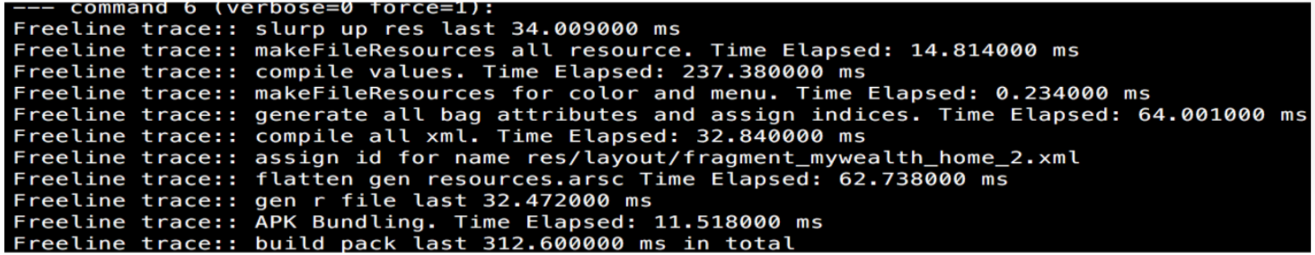
技术原理-资源增量-Aapt流程优化

full-build



```
--- command 6 (verbose=0 force=1):
Freeline trace:: slurp up res last 34.786000 ms
Freeline trace:: makeFileResources all resource. Time Elapsed: 2518.108000 ms
Freeline trace:: compile values. Time Elapsed: 250.162000 ms
Freeline trace:: makeFileResources for color and menu. Time Elapsed: 0.225000 ms
Freeline trace:: generate all bag attributes and assign indices. Time Elapsed: 62.970000 ms
Freeline trace:: compile all xml. Time Elapsed: 376.342000 ms
Freeline trace:: flatten gen resources.arsc Time Elapsed: 59.713000 ms
Freeline trace:: gen r file last 24.591000 ms
Freeline trace:: APK Bundling. Time Elapsed: 179.372000 ms
Freeline trace:: build pack last 3543.390000 ms in total
```

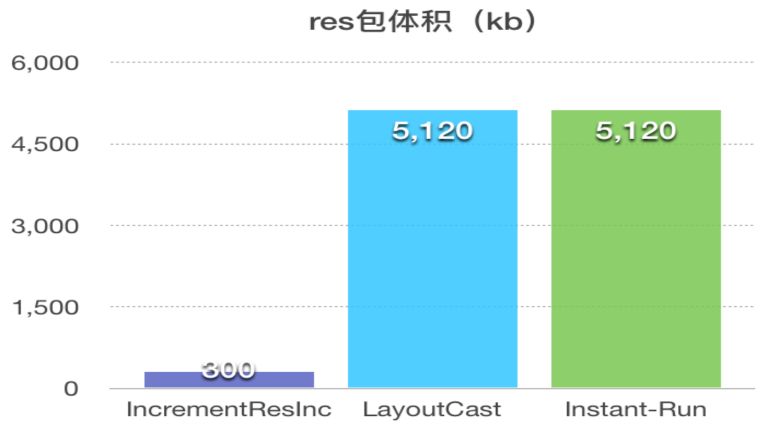
inc-build

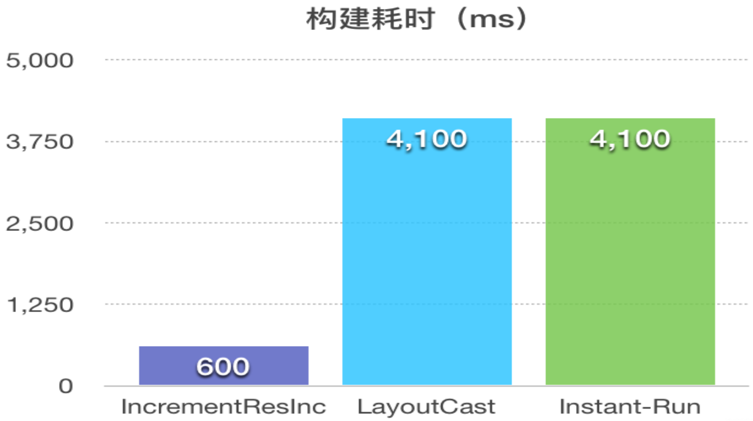


```
--- command 6 (verbose=0 force=1):
Freeline trace:: slurp up res last 34.009000 ms
Freeline trace:: makeFileResources all resource. Time Elapsed: 14.814000 ms
Freeline trace:: compile values. Time Elapsed: 237.380000 ms
Freeline trace:: makeFileResources for color and menu. Time Elapsed: 0.234000 ms
Freeline trace:: generate all bag attributes and assign indices. Time Elapsed: 64.001000 ms
Freeline trace:: compile all xml. Time Elapsed: 32.840000 ms
Freeline trace:: assign id for name res/layout/fragment_mywealth_home_2.xml
Freeline trace:: flatten gen resources.arsc Time Elapsed: 62.738000 ms
Freeline trace:: gen r file last 32.472000 ms
Freeline trace:: APK Bundling. Time Elapsed: 11.518000 ms
Freeline trace:: build pack last 312.600000 ms in total
```

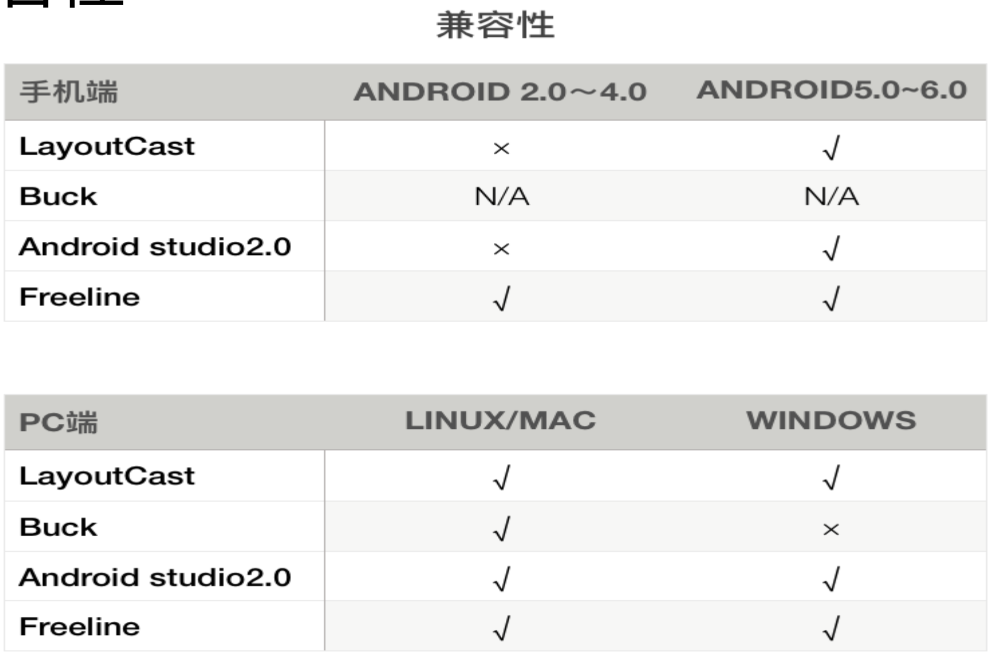
扫码观看大会视频

技术原理-资源增量-手机端生效-数据对比





数据对比-兼容性

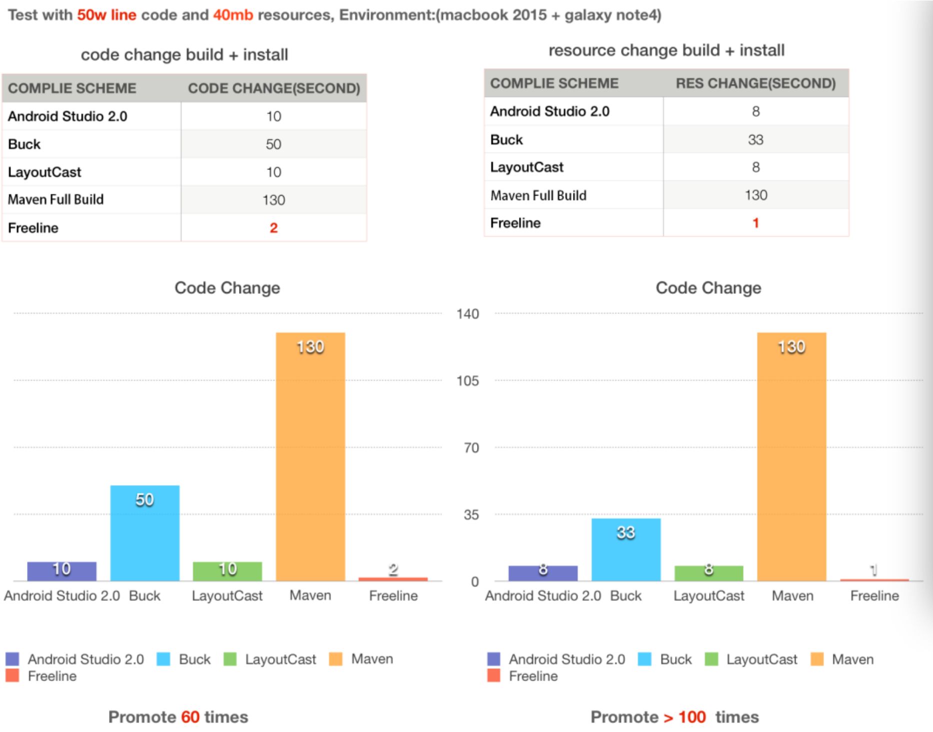


兼容性

手机端	ANDROID 2.0～4.0	ANDROID5.0~6.0
LayoutCast	×	√
Buck	N/A	N/A
Android studio2.0	×	√
Freeline	√	√

PC端	LINUX/MAC	WINDOWS
LayoutCast	√	√
Buck	√	×
Android studio2.0	√	√
Freeline	√	√

数据对比-性能



Test with 50w line code and 40mb resources, Environment:(macbook 2015 + galaxy note4)

code change build + install

COMPLIE SCHEME	CODE CHANGE(SECOND)
Android Studio 2.0	10
Buck	50
LayoutCast	10
Maven Full Build	130
Freeline	2

resource change build + install

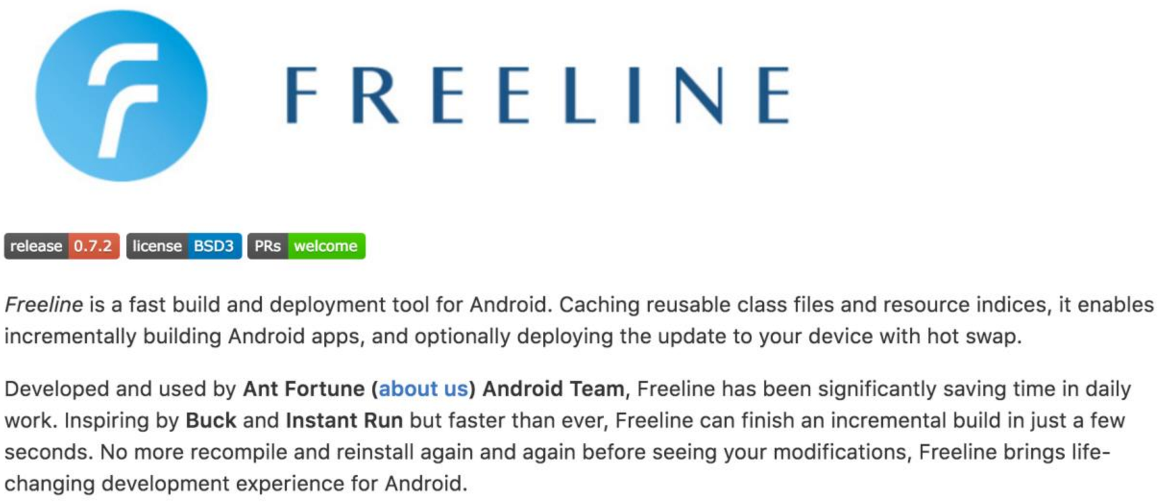
COMPLIE SCHEME	RES CHANGE(SECOND)
Android Studio 2.0	8
Buck	33
LayoutCast	8
Maven Full Build	130
Freeline	1

Promote 60 times

Promote > 100 times

开源 与技术极客共创

https://github.com/alibaba/freeline



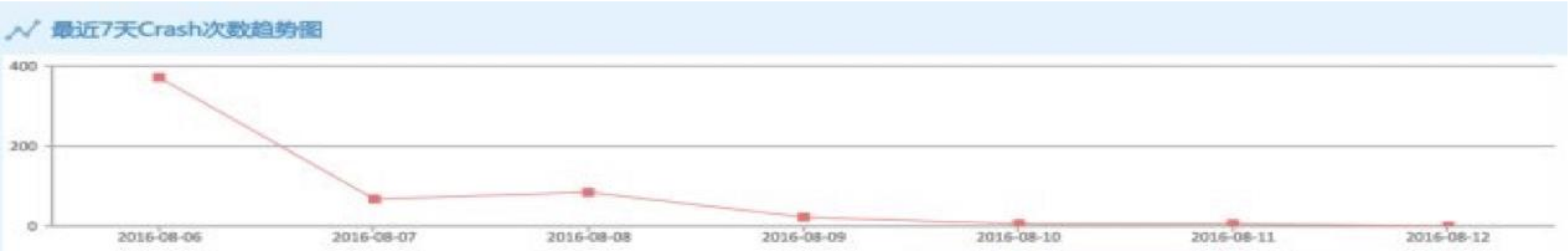
FREELINE

release 0.7.2 license BSD3 PRs welcome

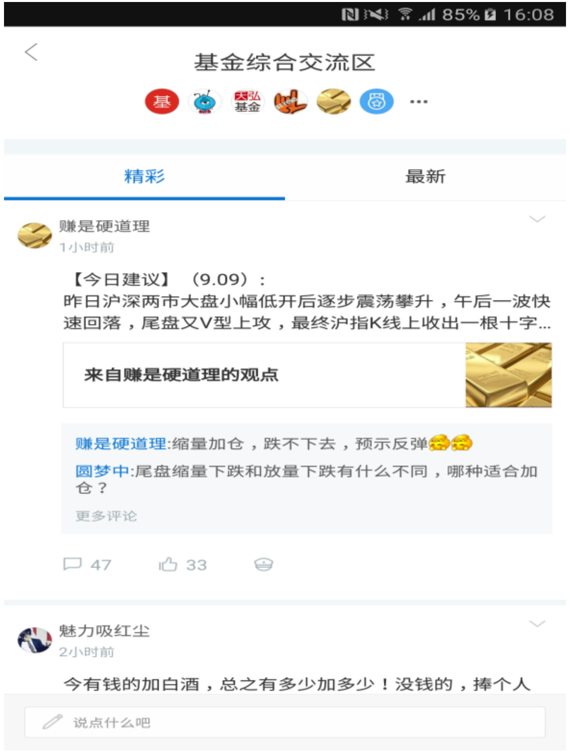
Freeline is a fast build and deployment tool for Android. Caching reusable class files and resource indices, it enables incrementally building Android apps, and optionally deploying the update to your device with hot swap.

Developed and used by **Ant Fortune (about us) Android Team**, Freeline has been significantly saving time in daily work. Inspiring by **Buck** and **Instant Run** but faster than ever, Freeline can finish an incremental build in just a few seconds. No more recompile and reinstall again and again before seeing your modifications, Freeline brings life-changing development experience for Android.

应用场景-线上热修复


最近7天Crash次数趋势图
400
200
0
2016-08-06
2016-08-07
2016-08-08
2016-08-09
2016-08-10
2016-08-11
2016-08-12

应用场景-业务A/B-Test-实际案例



基金综合交流区

赚是硬道理
1小时前

【今日建议】（9.09）：
昨日沪深两市大盘小幅低开后逐步震荡攀升，午后一波快速回落，尾盘又V型上攻，最终沪指K线上收出一根十字...

来自赚是硬道理的观点

赚是硬道理:缩量加仓，跌不下去，预示反弹

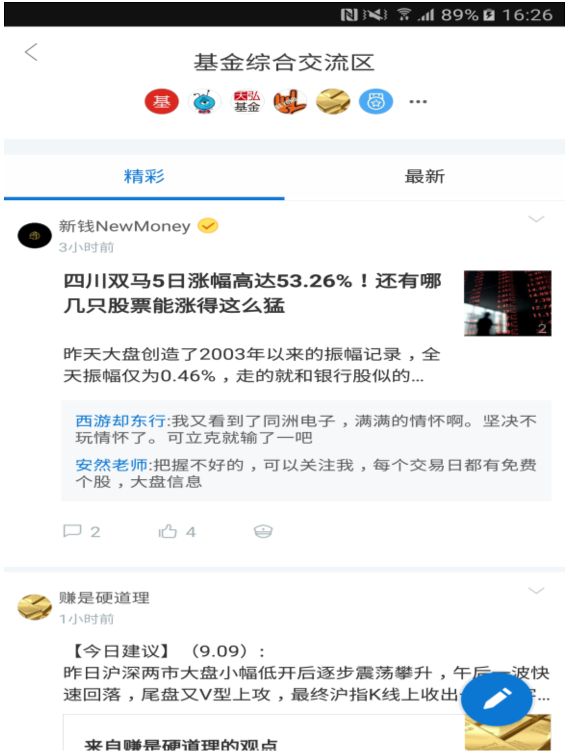
圆梦中:尾盘缩量下跌和放量下跌有什么不同，哪种适合加仓？

更多评论

魅力吸红尘
2小时前

今有钱的加白酒，总之有多少加多少！没钱的，捧个人

说点什么吧



基金综合交流区

新钱NewMoney
3小时前

四川双马5日涨幅高达53.26%！还有哪几只股票能涨得这么猛

昨天大盘创造了2003年以来的振幅记录，全天振幅仅为0.46%，走的就和银行股似的...

西游却东行:我又看到了同洲电子，满满的情怀啊。坚决不玩情怀了。可立克就输了一吧

安然老师:把握不好的，可以关注我，每个交易日都有免费个股，大盘信息

赚是硬道理
1小时前

【今日建议】（9.09）：
昨日沪深两市大盘小幅低开后逐步震荡攀升，午后一波快速回落，尾盘又V型上攻，最终沪指K线上收出字...

来自赚是硬道理的观点

背景

将提问和发布观点按钮独立开来，看看是否能提高提问内容数量。如果提问内容数量增加，是否会对交流区互动产生比较大的影响

前瞻规划

- 注解的支持

  databinding ButterKnife etc

- 多设备支持

- 稳定性提升

- AAPT2

云栖社区
yq.aliyun.com

2016 The Computing Conference

THANKS

https://github.com/alibaba/freeline

2016 杭州·云栖大会
THE COMPUTING CONFERENCE

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