A Measurement Study of Google Play

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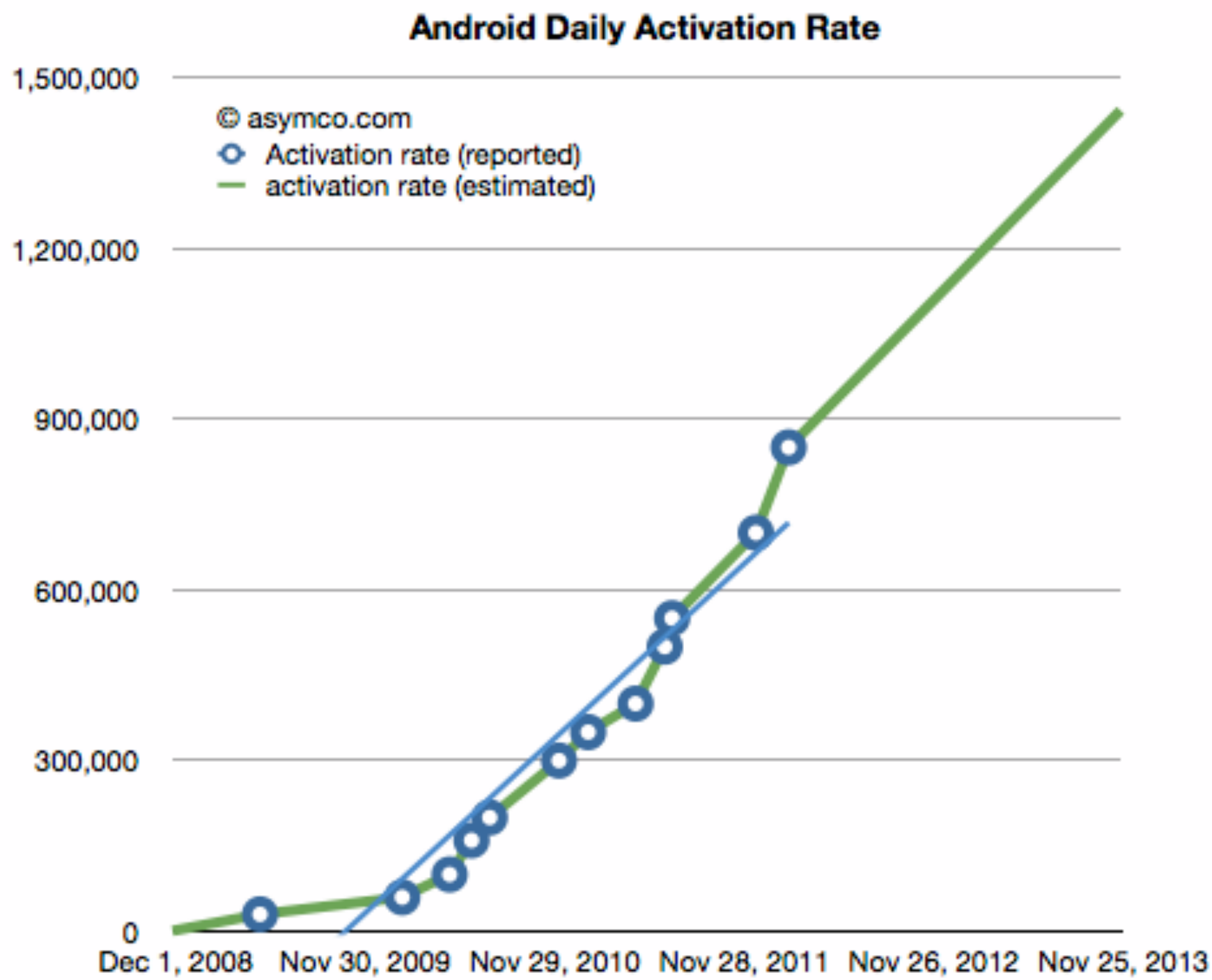
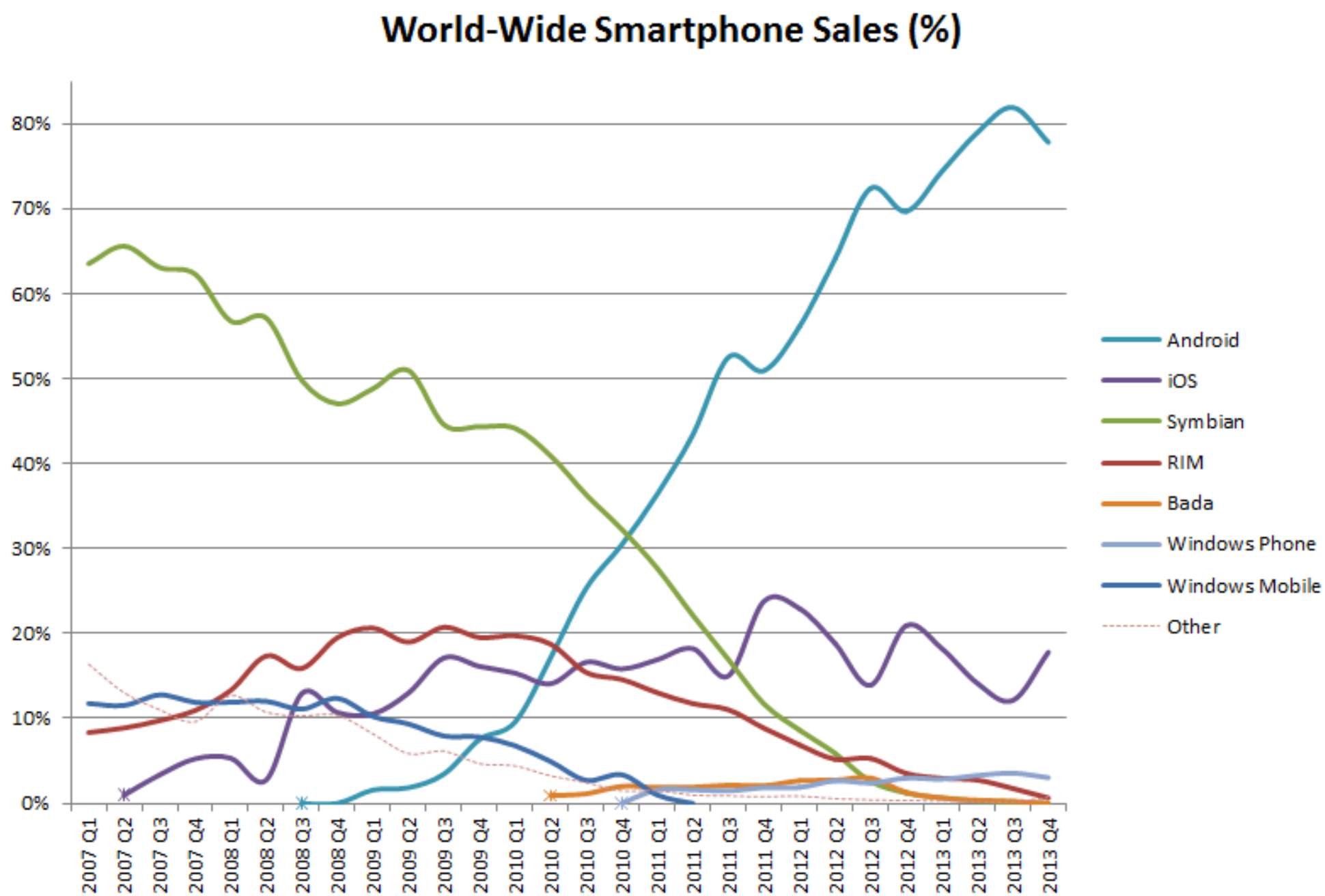
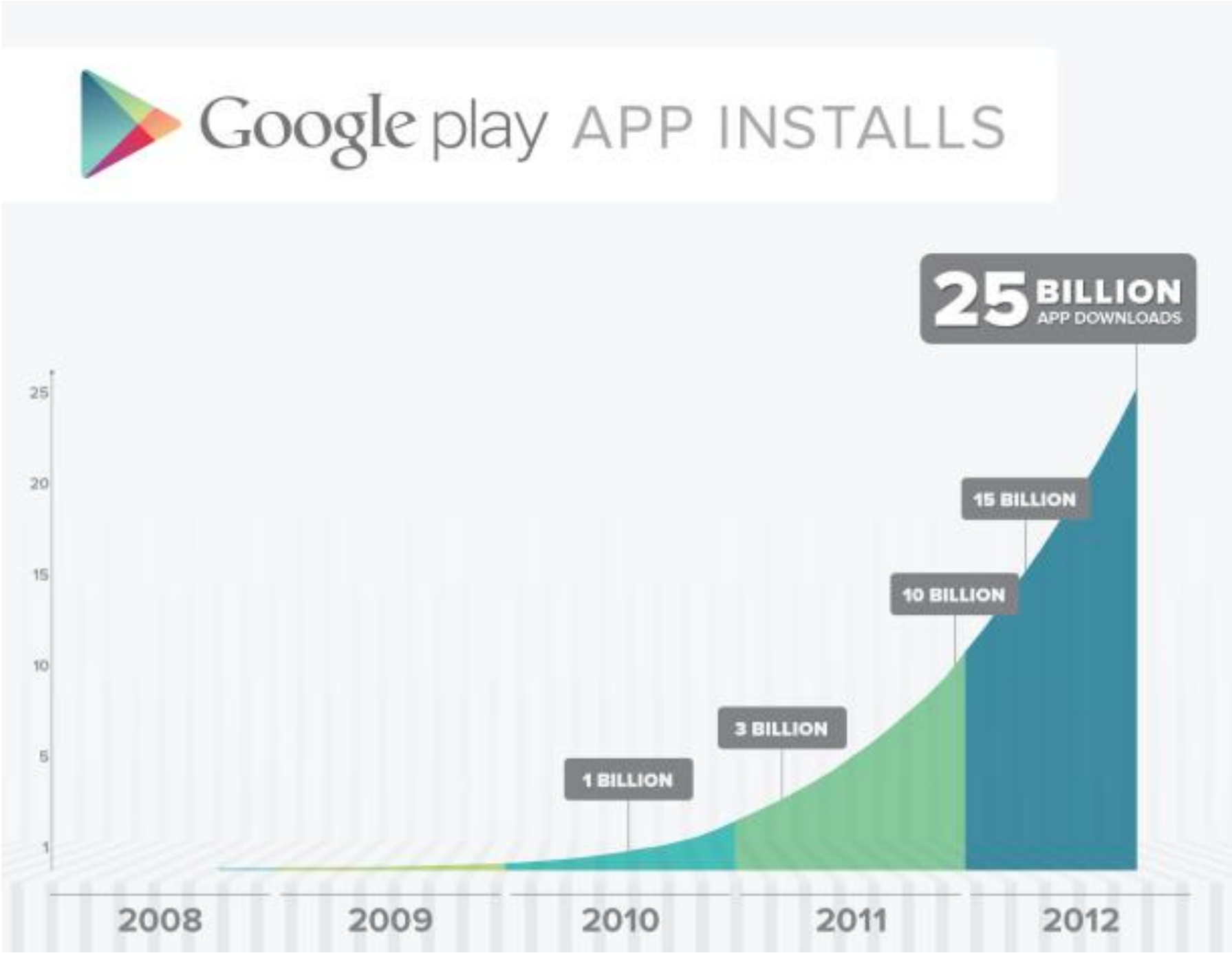
Android is increasingly popular



Android Dominates the Market



Google Play


Google play APP INSTALLS
25 BILLION APP DOWNLOADS
15 BILLION
10 BILLION
3 BILLION
1 BILLION
25
20
15
10
5
1
2008
2009
2010
2011
2012

Uploading Content to Google Play is Easy

- Very low barrier to entry:
  - $25 developer account
  - Upload as many apps as you want
  - Once uploaded, app is immediately available to a huge user base
  - No review process

Who Knows What is Really Uploaded?

- Very easy to upload anything, bad or good
- Once installed, apps have access to users' private life, permissions checks are ineffective
- Despite Google Play popularity, and the risks associated with downloading apps, **very little is known on an aggregate level.**

Our Study of Google Play

- First large scale measurement of Google Play
- We built PlayDrone to answer many questions

Questions

- How does Google Play content evolve over time?
  Quickly
- How many apps are clones of other apps?
  25%
- How do ratings correlate to popularity?
  Not necessarily as you would expect
- How does native experience correlate with popularity?
  Strongly
- Do developers protect their secrets?
  No
- How many apps have their code obfuscated?
  15%
- Many more in the paper

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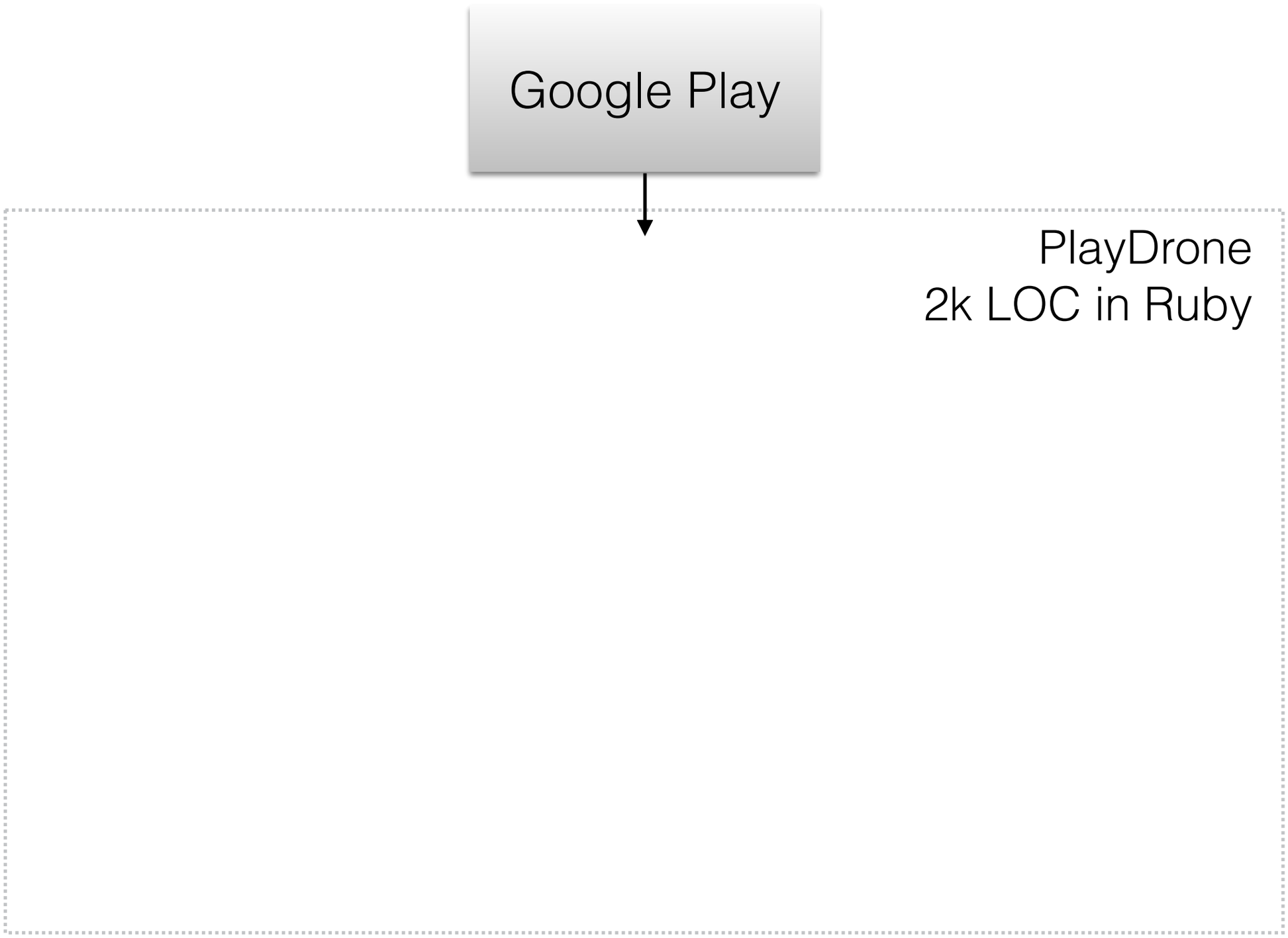
PlayDrone
Google Play Crawler

- Fast
  - Can crawl Google Play on a daily basis
  - Easily scales horizontally
- Simple - 2000 lines of Ruby
- Versatile
  - Extensible analysis framework and search engine
  - Decompilation and source code analysis
  - Tracks application changes over time

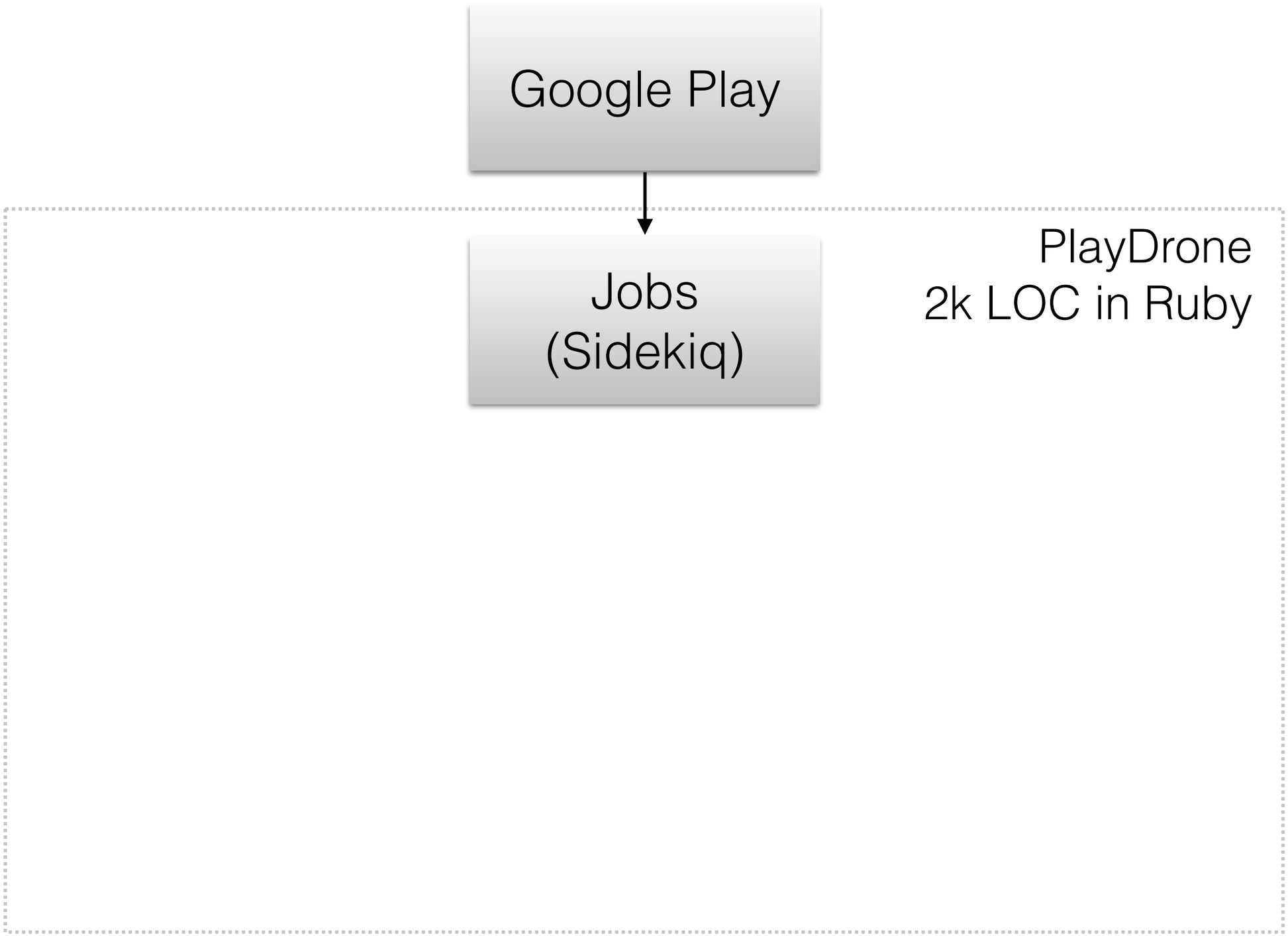
How does PlayDrone works?

- Interface with the Google Play API at scale
- Acquire content (apps metadata + APK)
- Process APKs
- Index all the results

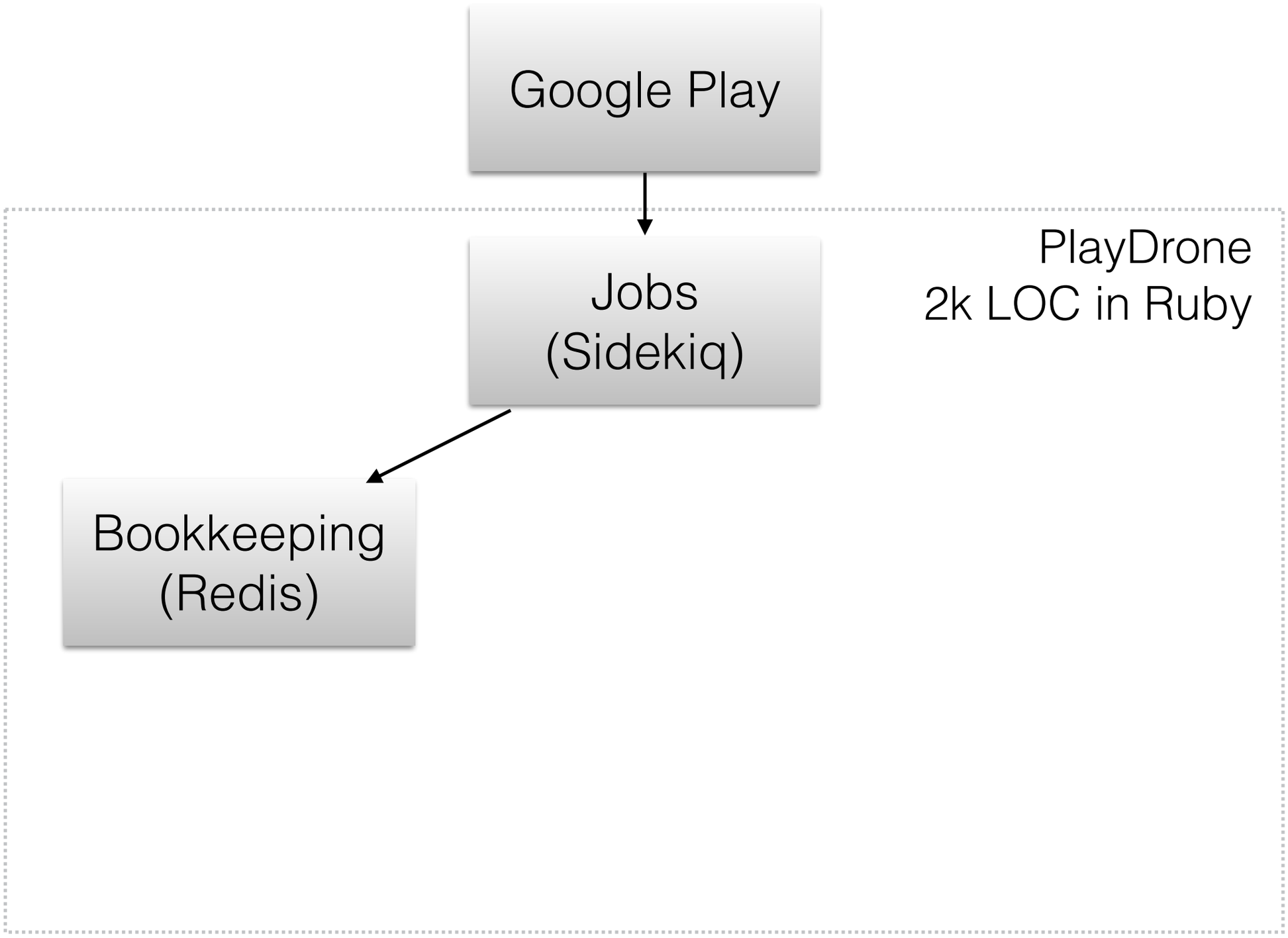
Architecture



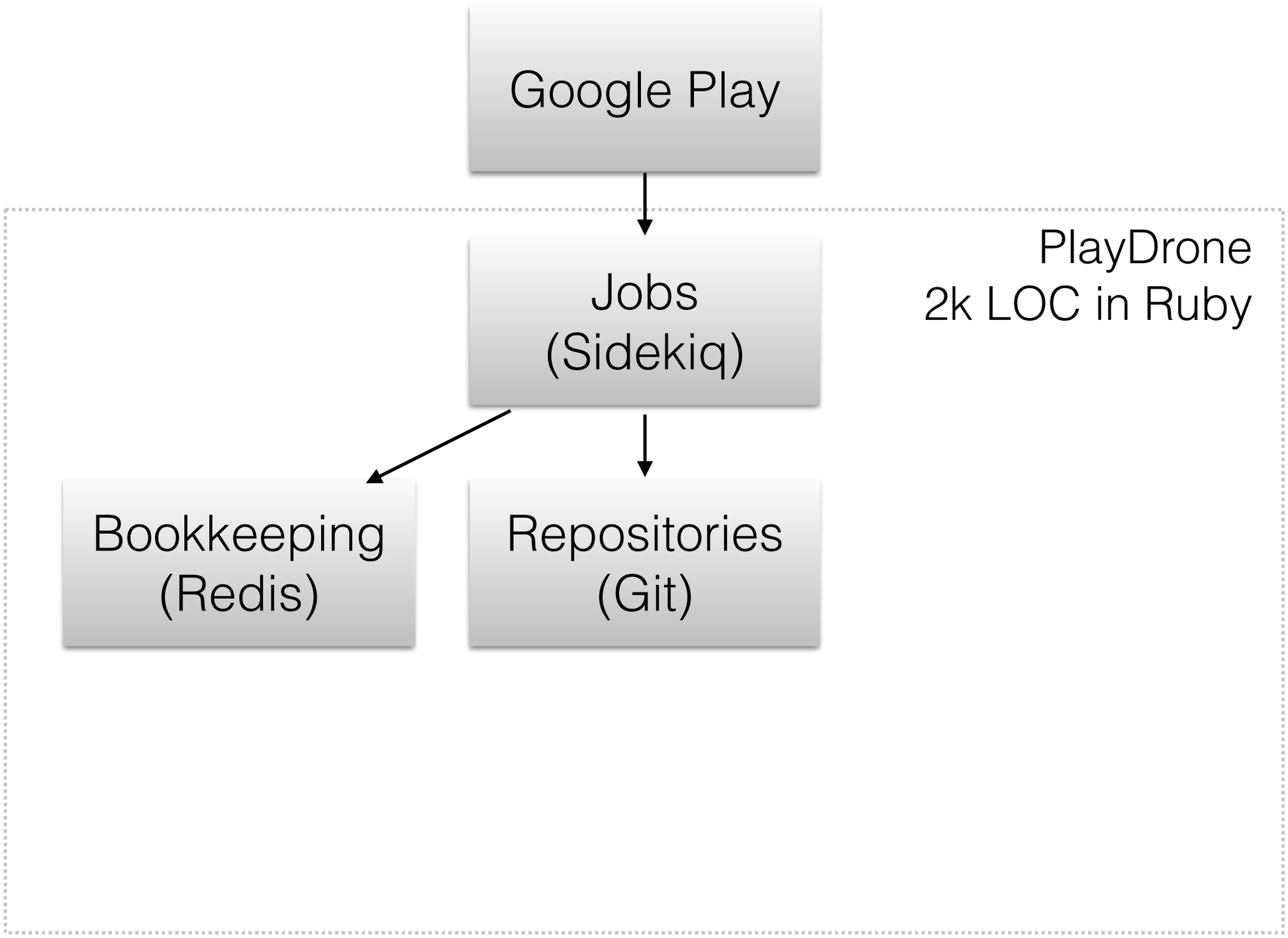
Architecture



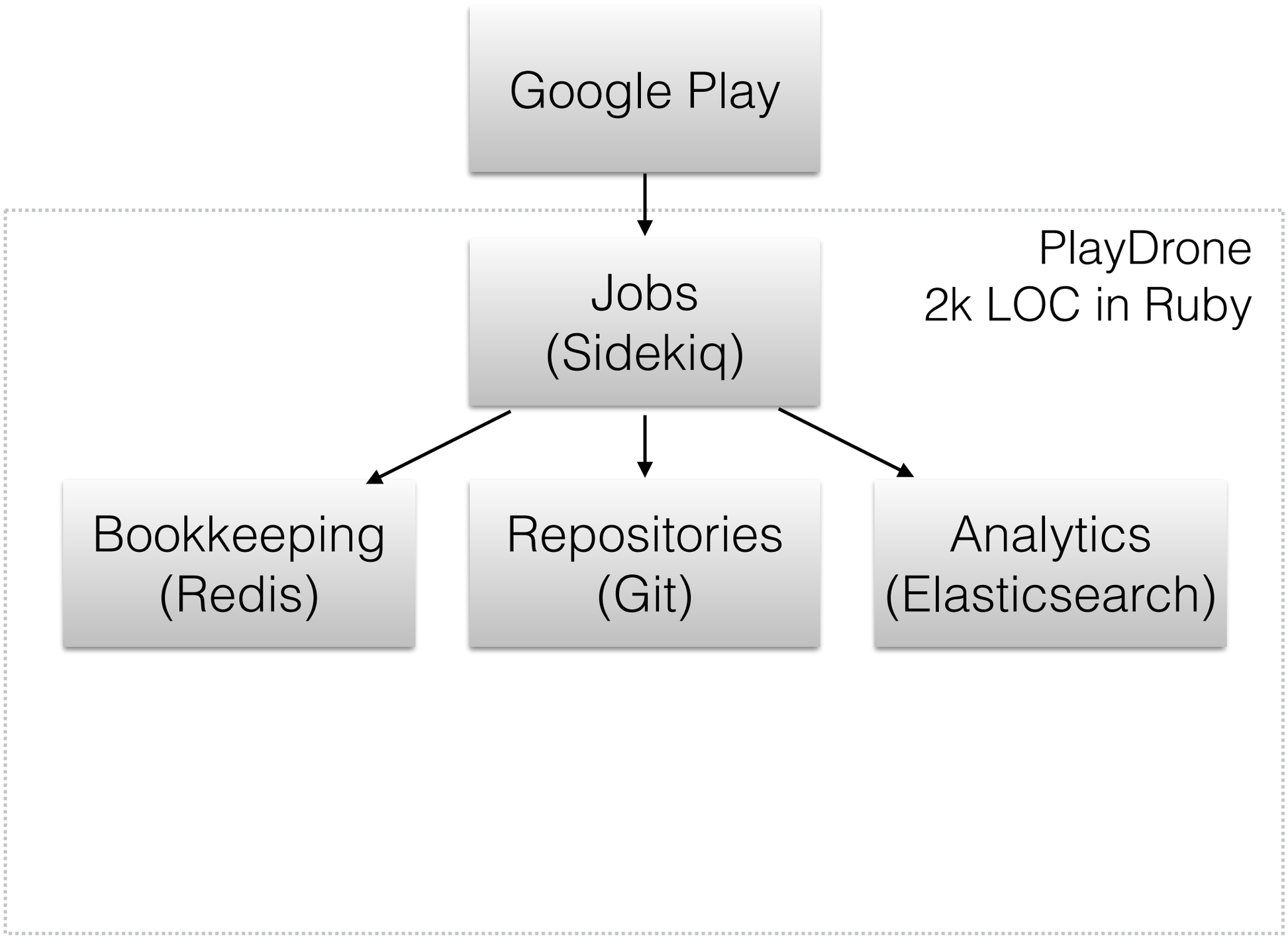
Architecture



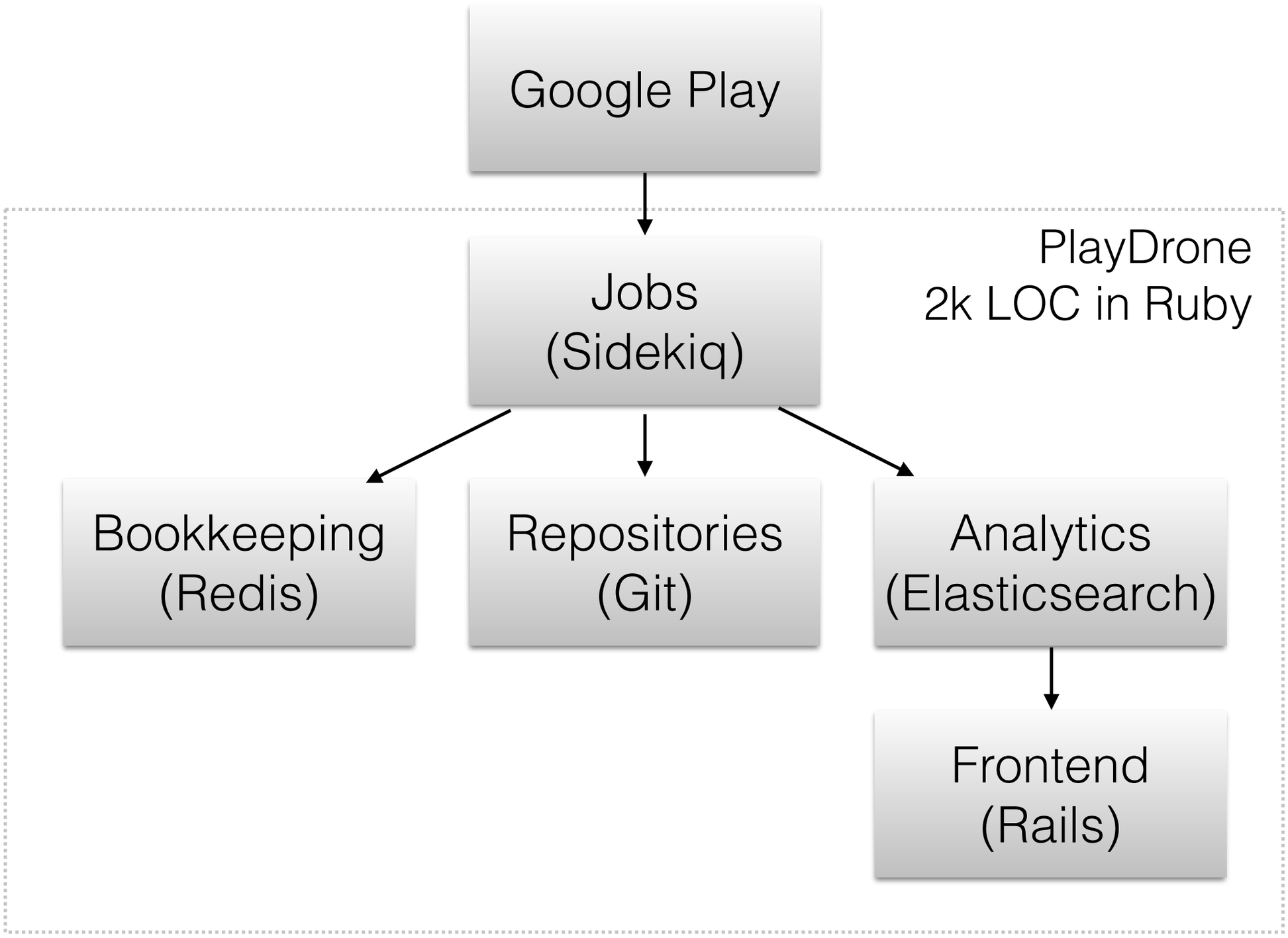
Architecture



Architecture



Architecture



Google Play With Me

playdrone.io/apps/com/google/android/gm

Gmail 4.5-694836

Git Repository

```
git clone git://node02.googleplaywith.me/com/google/android/gm.git com.google.android.g
```

What's New

• New inbox: if enabled, your mail will be grouped into categories so you can see what's new at a glance and decide which emails to read when
• Streamlined user interface including swipe-down to refresh and sliding drawer with labels and account switcher (phones and 7" tablets)
• Sender images shown alongside messages - tap on images to select multiple emails
• Improved readability for many emails
• Emptying trash now supported
• Bug fixes and speed-ups

Android 4.0 (Ice Cream Sandwich) and up.

What's Really New

```
commit d966374c190f50c46bc05388049c78360b3c6c46
Author: Google Inc. <crawler@googleplaywith.me>
Date:   Wed Jun 5 00:00:00 2013 -0400

    [DecompileApk] Processed v4.5-694836
    Version Code: 974
    752 files changed, 32847 insertions(+), 23213 deletions(-)

 src/com/android/mail/AccountSpinnerAdapter.java    |  389 ---------
 src/com/android/mail/ContactInfo.java              |   17 +
 src/com/android/mail/EmailAddress.java             |   98 +++
 src/com/android/mail/MailIntentService.java        |   39 +-
 src/com/android/mail/MailLogService.java           |  126 +++
```

Deployment

- 10 servers: quad-cores at 3.8Ghz, 32GB of RAM, and 2x2TB drives
- Two crawls: May/June 2013 and Nov 2013

Crawl Day in May 2013

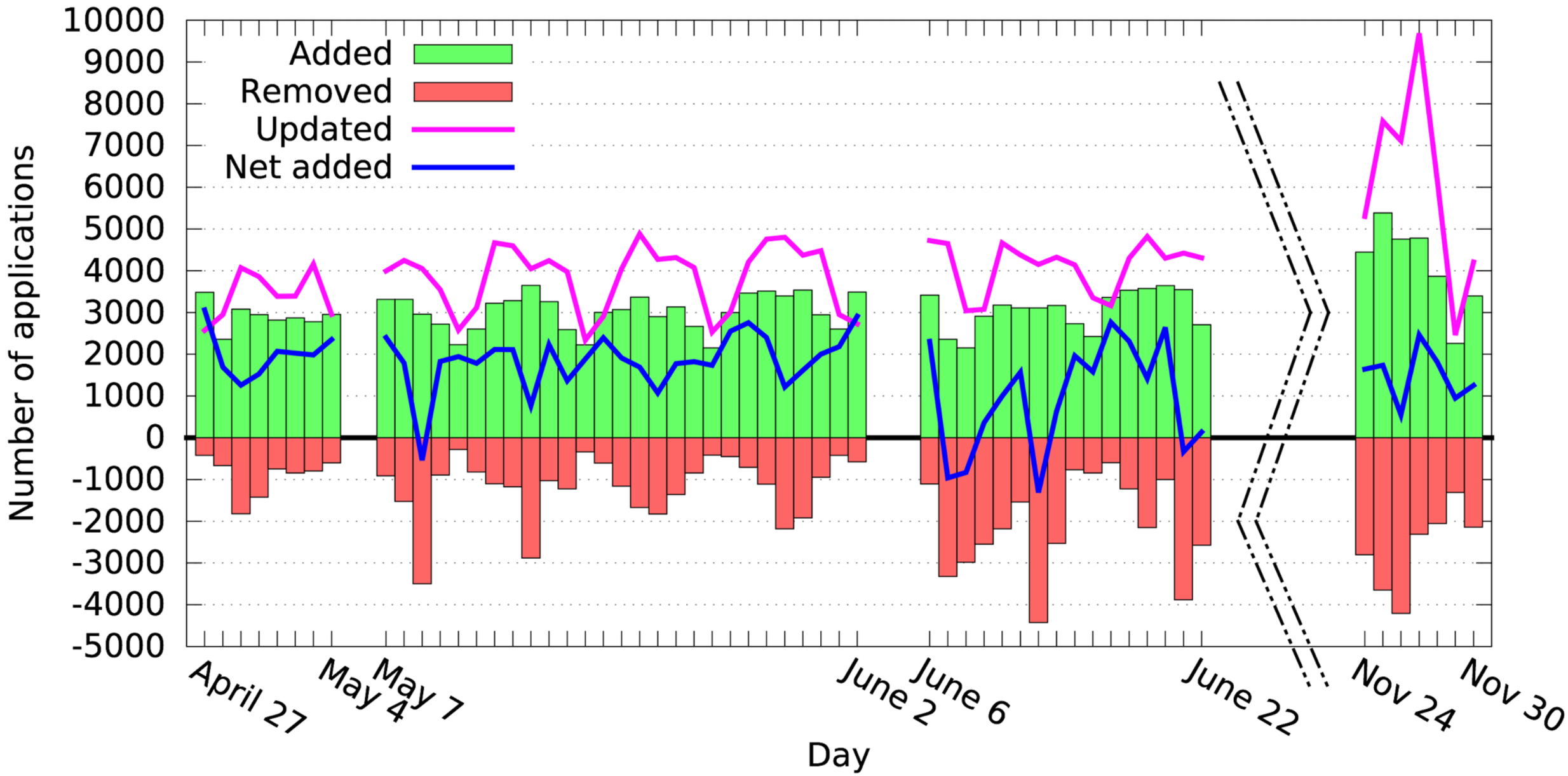
Question #1

How does Google Play content evolve over time?

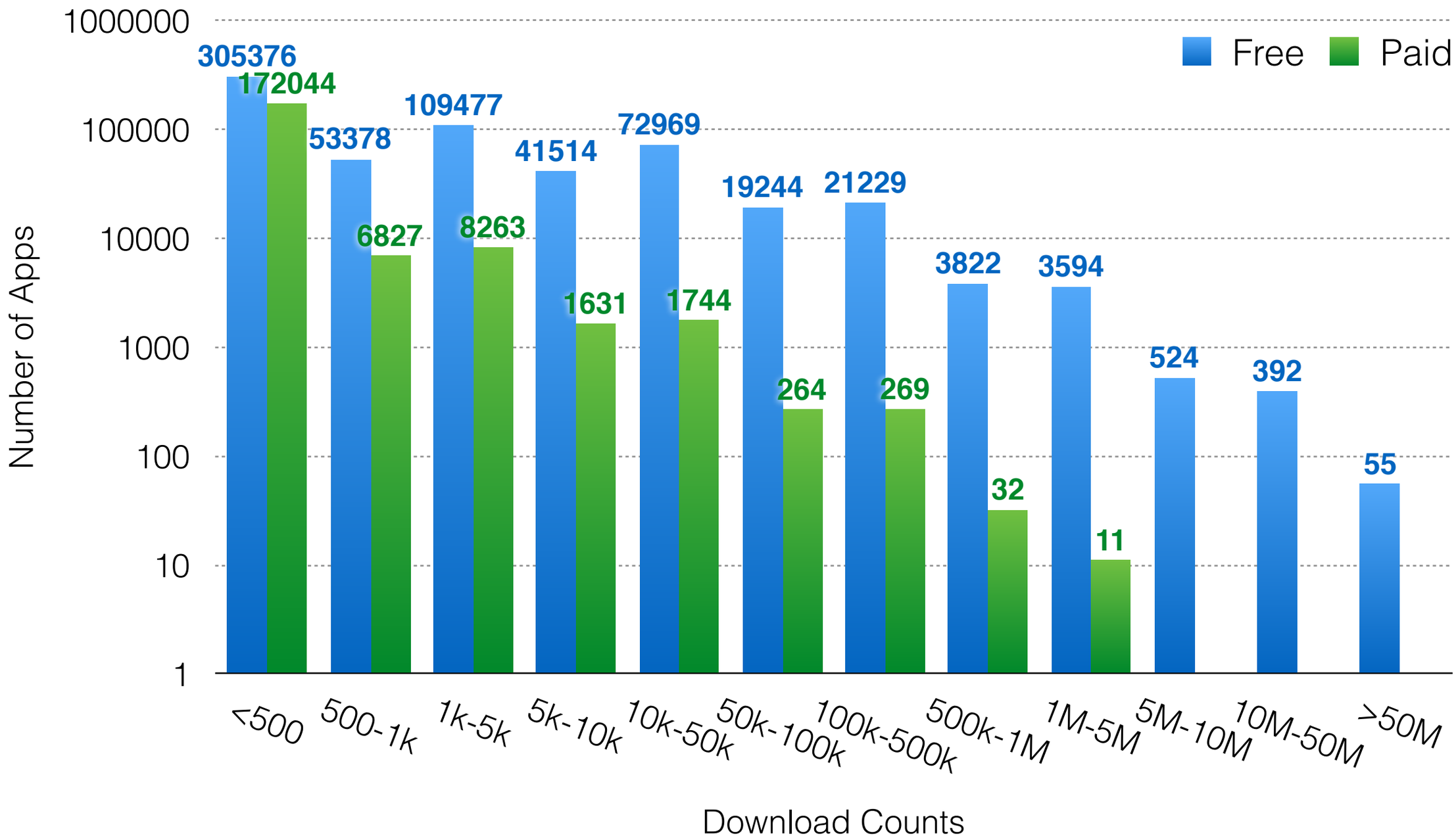
Number of Applications 5-Month Evolution

	June 22, 2013	Nov. 30, 2013
Free Apps	691,517	884,217 (+28%)
Paid Apps	192,703	223,259 (+14%)
All Apps	887,220	1,107,476 (+25%)

Evolution of Google Play



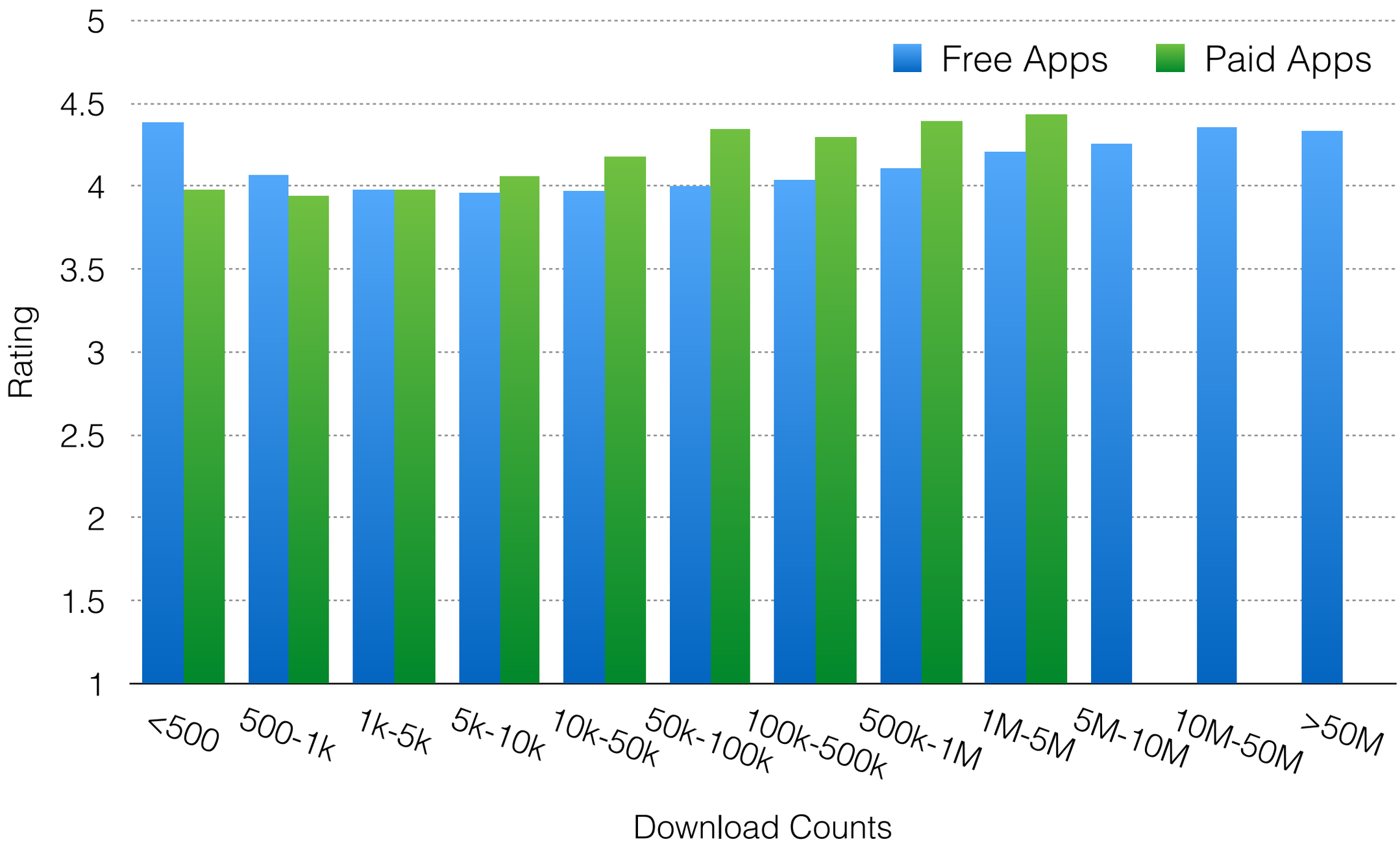
Apps Breakdown with Download Counts



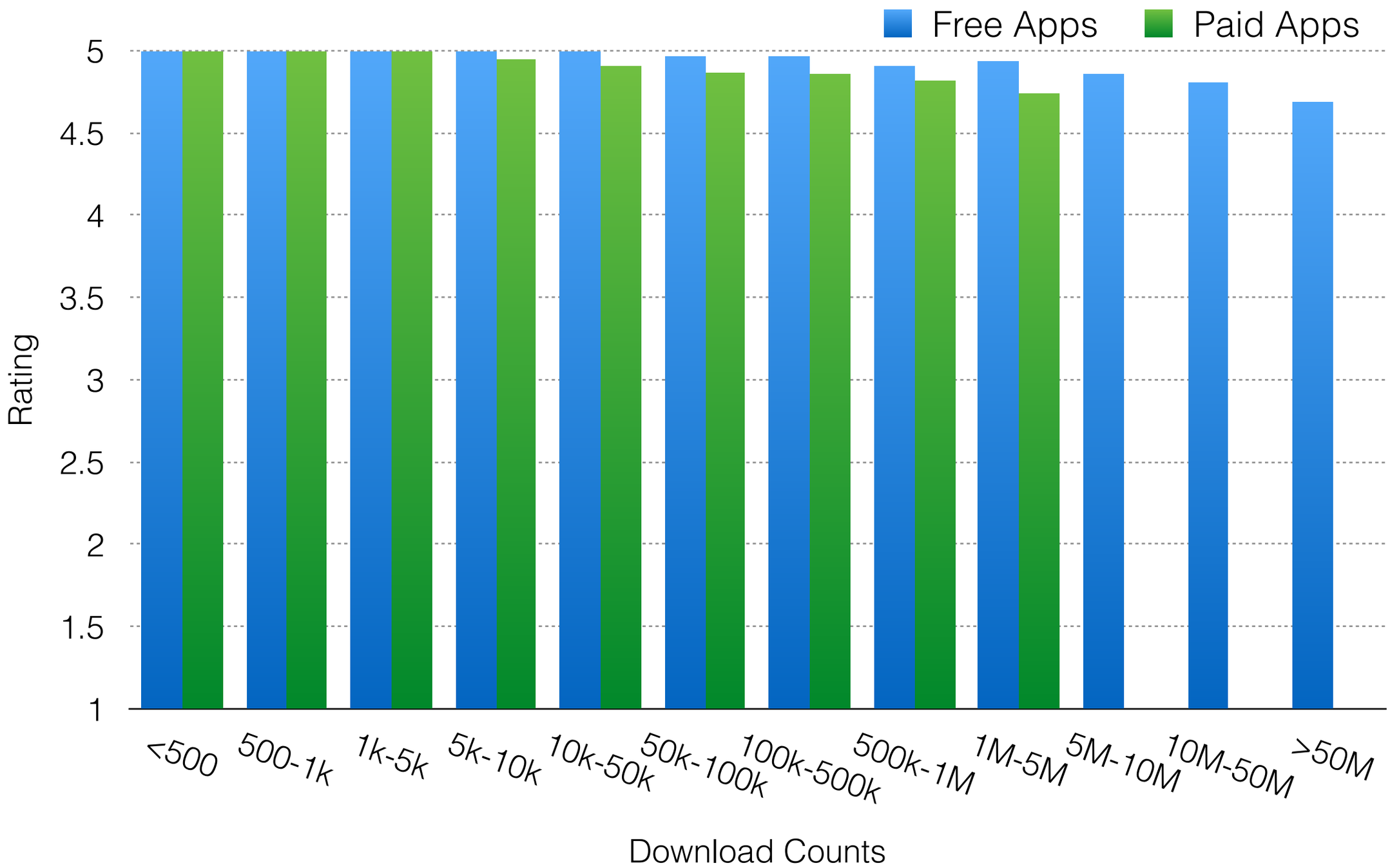
Question #2

How do ratings correlate to popularity?

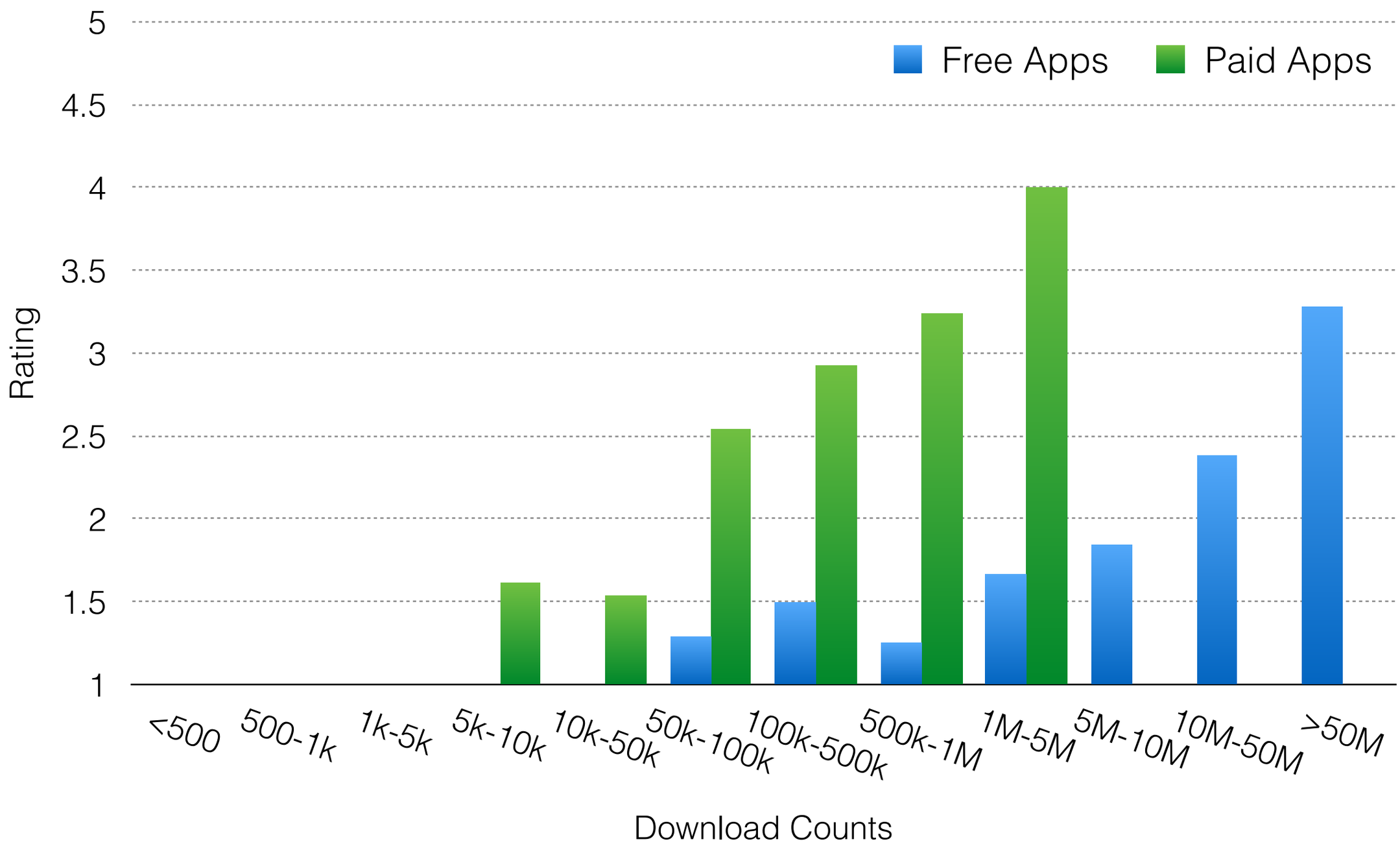
Average Average Rating vs Downloads



Maximum Average Rating vs Downloads



Minimum Average Rating vs Downloads



Top5 Best Rated Apps with >1M Downloads

	Downloads	#Ratings	Rating
TvQuran	1M-5M	13,675	4.93
Билеты ПДД 2013 РФ	1M-5M	15,738	4.92
Holy Quran Maher Moagely	1M-5M	6,341	4.91
Slots Deluxe - Slot Machines	1M-5M	108,431	4.90
أدعية وأذكار حصن المسلم	1M-5M	19,567	4.89

Top5 Worse Rated Apps with >1M Downloads

	Downloads	#Ratings	Rating
Wet Lesbian	1M-5M	2,865	2.23
Ameba	1M-5M	35,933	2.21
HRS App	1M-5M	5,778	1.99
T-Mobile More For Me	5M-10M	1,763	1.84
DroidScale	1M-5M	5,450	1.67

DroidScale

DroidMob Technologies - December 21, 2009
Tools

Install | Add to Wishlist

This app is compatible with all of your devices.

★★☆☆☆ (6,022)

g+1 +1155 Recommend this on Google

Description

OVER 1 MILLION DOWNLOADS!!!!! AD FREE PRO VERSION ALSO AVAILABLE!
This dynamic app turns your phone into a digital scale that you can take with you wherever you go!

Weigh normal household items with your friends, and see who can get the closest guess! Weighs in grams or ounces!

Follow the in-app instructions for use.

Note: DroidScale does not guarantee exact measurements.

DroidScale Code Sample

```
/tmp/droidscale/
▾ assets/
  ▾ fonts/
      digital-7.ttf
▾ res/
  ▾ drawable/
      blue_grad.jpg
      blue_grad_test.gif
      icon.png
      metal_plate_template.jpeg
      rounded.xml
  ▾ layout/
      main.xml
  ▾ values/
      attrs.xml
      ids.xml
      public.xml
      strings.xml
▾ src/
  ▾ com/
    ▾ admob/
      ▾ android/
        ▾ ads/
            Ad.java
            AdContainer.java
            AdManager.java
            AdMobLocalizer.java
            AdRequester.java
            AdView.java
            Rotate3dAnimation.»
    ▾ application/
      ▾ droidscale/
          DroidScale.java
          R.java
  AndroidManifest.xml
  apktool.yml
NERD_tree_1
```

```
153   public void onCreate(Bundle paramBundle)
154   {
155     super.onCreate(paramBundle);
156     rgen = new Random();
157     curr = 0.0D;
158     conversion = 28.3495231D;
159     new AlertDialog.Builder(this).setMessage("Warning: DroidScale is intended for lightweight ob
      jects and will not accurately display heavy weights. Do not place too much weight on the scale f
      or the safety of your screen! \n \nPlace a finger on the scale and place the object you desire t
      o weigh on top of your finger.").setPositiveButton("OK", null).setTitle("Instructions").setIcon(
      0).show();
160     TextView localTextView = (TextView)findViewById(R.id.units);
161     localView.setOnTouchListener(new View.OnTouchListener()
162     {
163       public boolean onTouch(View paramAnonymousView, MotionEvent paramAnonymousMotionEvent)
164       {
165         if (paramAnonymousMotionEvent.getAction() == 1)
166         {
167           touchDown = false;
168           curr = 0.0D;
169           masterTextView.setText("0.0000");
170           return true;
171         }
172         for (curr = rgen.nextDouble();; curr = rgen.nextDouble()) {
173           if (curr >= 0.2D)
174           {
175             if (inGrams)
176             {
177               DroidScale localDroidScale = DroidScale.this;
178               curr *= conversion;
179             }
180             String str = Double.toString(curr).substring(0, 6);
181             masterTextView.setText(str);
182             touchDown = true;
183             fluctuateWeights();
184             return true;
⚡ src  src/com/application/droidscale/DroidScale.java +   76% ❮ ⁋ 172:38
```

DroidScale Code Sample

```
/tmp/droidscale/
▾ assets/
  ▾ fonts/
      digital-7.ttf
▾ res/
  ▾ drawable/
      blue_grad.jpg
      blue_grad_test.gif
      icon.png
      metal_plate_template.jpeg
      rounded.xml
  ▾ layout/
      main.xml
  ▾ values/
      attrs.xml
      ids.xml
      public.xml
      strings.xml
▾ src/
  ▾ com/
    ▾ admob/
      ▾ android/
        ▾ ads/
            Ad.java
            AdContainer.java
            AdManager.java
            AdMobLocalizer.java
            AdRequester.java
            AdView.java
            Rotate3dAnimation.»
    ▾ application/
      ▾ droidscale/
          DroidScale.java
          R.java
  AndroidManifest.xml
  apktool.yml
NERD_tree_1
```

```
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158     conversion = 28.3495231D;
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      0).show();
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178               curr *= conversion;
179             }
180             String str = Double.toString(curr).substring(0, 6);
181             masterTextView.setText(str);
182             touchDown = true;
183             fluctuateWeights();
184             return true;
```

src/com/application/droidscale/**DroidScale.java** + 76% ❮ ⁋ **172**:38

Question #3

Do developers protect their secrets?

Auth Tokens

- Used to authenticate a 3rd party app (e.g. AirBnB) to a service provider (e.g. Facebook)
- With a root level Amazon AWS token, you may access and launch EC2 servers.
- With a Facebook token, you may access users' private information, write on their walls.

Auth Tokens Code Sample

```
public class OAuthUtil
{
  public static final String FACEBOOK_ACCESS_URL = "https://graph.facebook.com/oauth/access_token";
  public static final String FACEBOOK_AUTHORIZE_URL = "https://graph.facebook.com/oauth/authorize?scope=offline_access,read_stream,pu
  public static final String FACEBOOK_CONSUMER_KEY = "6398b84e0cab5449d0b96ee3edaa83cf";
  public static final String FACEBOOK_CONSUMER_SECRET = "70bbded68c14c17b9e1129a6c0754298";
  public static final String FACEBOOK_REDIRECT_URI = "http://www.taptu.com/streams/oauth";
  public static final String GOOGLE_READER_ACCESS_URL = "https://accounts.google.com/o/oauth2/token";
  public static final String GOOGLE_READER_AUTHORIZE_URL = "https://accounts.google.com/o/oauth2/auth?scope=http://www.google.com/rea
  public static final String GOOGLE_READER_CONSUMER_KEY = "67865137267-u52e2pdomdgur3j0v9tq9ihh1cbdvro2.apps.googleusercontent.com";
  public static final String GOOGLE_READER_CONSUMER_SECRET = "6JTT2C99jaXOzwIReZuTugQW";
  public static final String GOOGLE_READER_REDIRECT_URI = "https://www.taptu.com/oauth/google";
  public static final String GPLUS_ACCESS_URL = "https://accounts.google.com/o/oauth2/token";
  public static final String GPLUS_AUTHORIZE_URL = "https://accounts.google.com/o/oauth2/auth?response_type=code&scope=https://www.go
  public static final String GPLUS_CONSUMER_KEY = "843467224689-t71lab1n8tfp5i3ejftf26aa657jontt.apps.googleusercontent.com";
  public static final String GPLUS_CONSUMER_SECRET = "HBIE-XzMz8PD-JDxANqvKLeY";
  public static final String GPLUS_REDIRECT_URI = "http://localhost/";
  public static final String LINKEDIN_ACCESS_URL = "https://api.linkedin.com/uas/oauth/accessToken";
  public static final String LINKEDIN_AUTHORIZE_URL = "https://api.linkedin.com/uas/oauth/authorize";
  public static final String LINKEDIN_CONSUMER_KEY = "loCS0NhUHtflQTgF4_iQD10jSH3zQ9tyLSzy_OeEADHpt3VlalmLa_Ylzz_qyG38";
  public static final String LINKEDIN_CONSUMER_SECRET = "vu26Y2K-67b2EBVQYmIpQGfq7soCNhV6dUZgwWj5zRc2IcxZU_vz3xVRvlY1qc4X";
  public static final String LINKEDIN_REQUEST_URL = "https://api.linkedin.com/uas/oauth/requestToken";
  public static final String NETEASEWEIBO_ACCESS_URL = "";
  public static final String NETEASEWEIBO_AUTHORIZE_URL = "";
  public static final String NETEASEWEIBO_CONSUMER_KEY = "rmRqIgt1qznKFA6l";
  public static final String NETEASEWEIBO_CONSUMER_SECRET = "foKTh82TGwEExfI9YfQEfDTJ9ohbV8hf";
  public static final String NETEASEWEIBO_REDIRECT_URI = "http://www.taptu.com/";
  public static final String RENREN_ACCESS_URL = "https://graph.renren.com/oauth/token";
  public static final String RENREN_AUTHORIZE_URL = "https://graph.renren.com/oauth/authorize?scope=read_user_feed read_user_status p
  public static final String RENREN_CONSUMER_KEY = "aa803dbb7b4141ab9da0f6985d353e9c";
  public static final String RENREN_CONSUMER_SECRET = "269de9489344489aae4a0f34fad7c94a";
  public static final String RENREN_REDIRECT_URI = "http://www.taptu.com/";
  public static final String SINAWEIBO_ACCESS_URL = "https://api.weibo.com/oauth2/access_token";
  public static final String SINAWEIBO_AUTHORIZE_URL = "https://api.weibo.com/oauth2/authorize?display=mobile&scope=statuses_to_me_re
  public static final String SINAWEIBO_CONSUMER_KEY = "384815873";
  public static final String SINAWEIBO_CONSUMER_SECRET = "2ac91e387fd7b4995eab65a53d02a654";
  public static final String SINAWEIBO_REDIRECT_URI = "http://www.taptu.com/";
  public static final String TENCENTWEIBO_ACCESS_URL = "https://open.t.qq.com/cgi-bin/oauth2/access_token";
  public static final String TENCENTWEIBO_AUTHORIZE_URL = "https://open.t.qq.com/cgi-bin/oauth2/authorize";
  public static final String TENCENTWEIBO_CONSUMER_KEY = "801253265";
  public static final String TENCENTWEIBO_CONSUMER_SECRET = "b734c468488ae93fbb30bdb3db255d5d";
  public static final String TENCENTWEIBO_REDIRECT_URI = "http://www.taptu.com/";
  public static final String TWITTER_ACCESS_URL = "http://api.twitter.com/oauth/access_token";
  public static final String TWITTER_AUTHORIZE_URL = "https://api.twitter.com/oauth/authorize";
  public static final String TWITTER_CONSUMER_KEY = "m47rQne7OijU7aq6jSjhQ";
  public static final String TWITTER_CONSUMER_SECRET = "HxXXBPjJD8OAXnO38HmoT5xuFNxxzXebVxw4oQg9e8";
  public static final String TWITTER_REQUEST_URL = "http://api.twitter.com/oauth/request_token";
```

Regular Expressions

	Client ID	Secret Key
Amazon AWS	`AKIA[0-9A-Z]{16}`	`[0-9a-zA-Z/+]{40}`
Bitly	`[0-9a-zA-Z_]{5,31}`	`R_[0-9a-f]{32}`
Facebook	`[0-9]{13,17}`	`[0-9a-f]{32}`
Flickr	`[0-9a-f]{32}`	`[0-9a-f]{16}`
Foursquare	`[0-9A-Z]{48}`	`[0-9A-Z]{48}`
Google	`[0-9a-zA-Z._-]*?`	`[0-9a-zA-Z_-]{24}`
LinkedIn	`[0-9a-z]{12}`	`[0-9a-zA-Z]{16}`
Twitter	`[0-9a-zA-Z]{18,25}`	`[0-9a-zA-Z]{35,44}`

Note: Additional criteria apply to reduce false positives

Auth Tokens

	Total Candidates	Unique Candidates	Unique % Valid
Amazon	1,241	308	93.5%
Facebook	1,477	460	71.7%
Twitter	28,235	6,228	95.2%
Bitly	3,132	616	88.8%
Flickr	159	89	100%
Foursquare	326	177	97.7%
Google	414	225	96.0%
LinkedIn	1,434	181	97.2%
Titanium	1,914	1,783	99.8%

Tokens found June 2013, validated Nov 2013

Facebook and Twitter

	Facebook	Twitter
Tokens Found	460	6,228
Corresponding Library Found	92,495	6,990

Facebook relies on their SDK to authenticate 3rd party applications through their Facebook app with Android Intents.

Twitter Official Docs

Implementing the Twitt ×

https://dev.twitter.com/docs/implementing-twitter-oauth-flow-android

Developers API Health Blog Discussions Documentation Search

Create a place to store our constants Right-click the "src", "com.example.twittertutorial" package and select "Class". In the "Name" field, enter "Constants". In this file, we'll add constants that we'll reference in various aspects of our demo.

```
package com.example.twittertutorial;

public class Constants {
    public final static String CONSUMER_KEY = "";
    public final static String CONSUMER_SECRET = "";
    public final static String OAUTH_TOKEN = "oauth_token";
    public final static String OAUTH_VERIFIER = "oauth_verifier";
    public final static String OAUTH_DENIED = "denied";
    public final static String OAUTH_CALLBACK = "twittertutorial://oauth";
}

```

This documentation page is no longer accessible, but can be seen on archive.org

Notified all service providers

- Service providers have since disabled all tokens that were security risks
- Various approaches for resolving security issue
  - Amazon - notify and work with customers directly
  - Facebook - immediately revoke access

Making Google Play Safer

- Notified and worked with Google
- Provided Google with PlayDrone token finder mechanism
- Google has integrated mechanism into Bouncer to automatically scan for tokens and notify developers

Google Email

From: Google Play <googleplay-noreply@google.com>
Subject: ACTION REQUIRED: Exposed Credentials Preview
Date: May 27, 2014 at 9:09:32 PM EDT

Hello,

If you embed Amazon Web Services (AWS) credentials in your applications, those credentials become publicly available. This exposure of your credentials could lead to unauthorized access to your AWS account, which may include associated excessive charges, and potentially unauthorized access to your data and your users' data.

Please see this AWS post on what to do if your AWS Access Key is exposed.

This post will give you guidance on what to do next, including:

1. Rotate your credentials, in order to invalidate your publicly exposed credentials.
2. Review your AWS account for unauthorized access.
3. Review Amazon's tutorials for using short term credentials and/or identity providers, such as Amazon, Google, or Facebook.

If you have questions or require assistance, please contact Amazon support.

Regards,
Google Play Team

Conclusion

- First large scale study of Google Play
- PlayDrone provides answers to many questions
- Made Google Play safer

Source Code

http://github.com/nviennot/playdrone

Contact

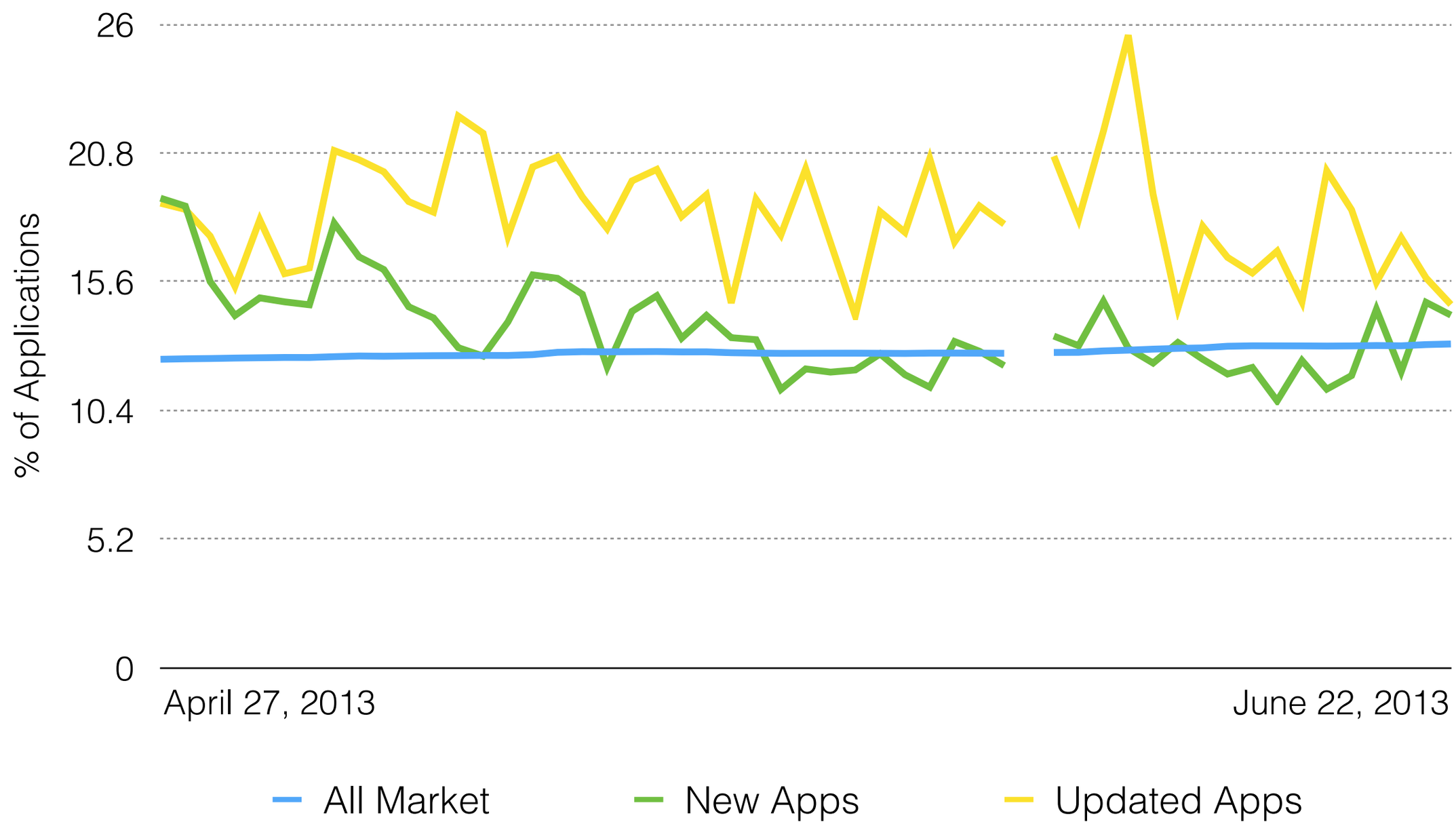
twitter: @nviennot
email: nicolas@viennot.com

Questions?

Backup Slides

How many apps obfuscate their sources?

Obfuscation Rate over Time



How many apps are clones of other apps?

Detecting Clones

- Existing approaches do complicated things with code analysis
- We take a simple approach:
- Similar apps have similar assets (images, sounds)
- Hash them to build app signatures: 45M signatures
- Reject common signatures (seen in >300 apps)
- 5% of false positives (sample of 400 apps)

App Screenshots

CATEGORY:
Social

INSTALLS:
50,000 - 100,000

last 30 days

SIZE:
122k

PRICE:
Free

CONTENT RATING:
Low Maturity

App Screenshots

CATEGORY:
Social

INSTALLS:
10,000 - 50,000

last 30 days

SIZE:
235k

PRICE:
Free

CONTENT RATING:
Everyone


10:19
Home
News
Videos
Photos
Scanner
Crime Maps
Report Crimes
Alerts
Twitter
Facebook
WORCESTER POLICE


11:25
Home
News
Videos
Photos
Events
Crime Maps
Submit a Tip
Alerts
Twitter
Facebook
MESA POLICE


PM 4:08
Isten Temploma,
Amely Megvilágosítja az Egész Világot
약동하는 큰 빛, 세계 속의 하나님의 교회
BEMUTATÓ VIDEÓ
Bemutatás
Központ és Kisegítő Felszerlések
Isten Temploma a Világon
Tengerentúli Tagok Látogatása
Hozzájárulás Társadalomhoz
Isten Temploma Története
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PM 4:08
약동하는 큰 빛
세계 속의 하나님의 교회
Church of God Shines the Light on the Whole World
하나님의교회 세계복음선교협회 소개 영상
하나님의 교회 소개
INTRODUCTION
총회 및 산하기관
HEADQUARTERS AND AUXILIARY FACILITIES
세계 속의 하나님의 교회
CHURCH OF GOD IN THE WORLD
해외교회 성도들의 한국방문
OVERSEAS VISITING GROUP
사회공헌
CONTRIBUTION TO SOCIETY
하나님의 교회 역사
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Clone Study Result

At least **25%** of apps are clones of other apps

How does native experience correlate with popularity?

Developing an App

- App generator (a few clicks)
- Cross platform frameworks (html/javascript)
- Use the regular Android SDK (java)
- With native libraries (compiled down to ARM)

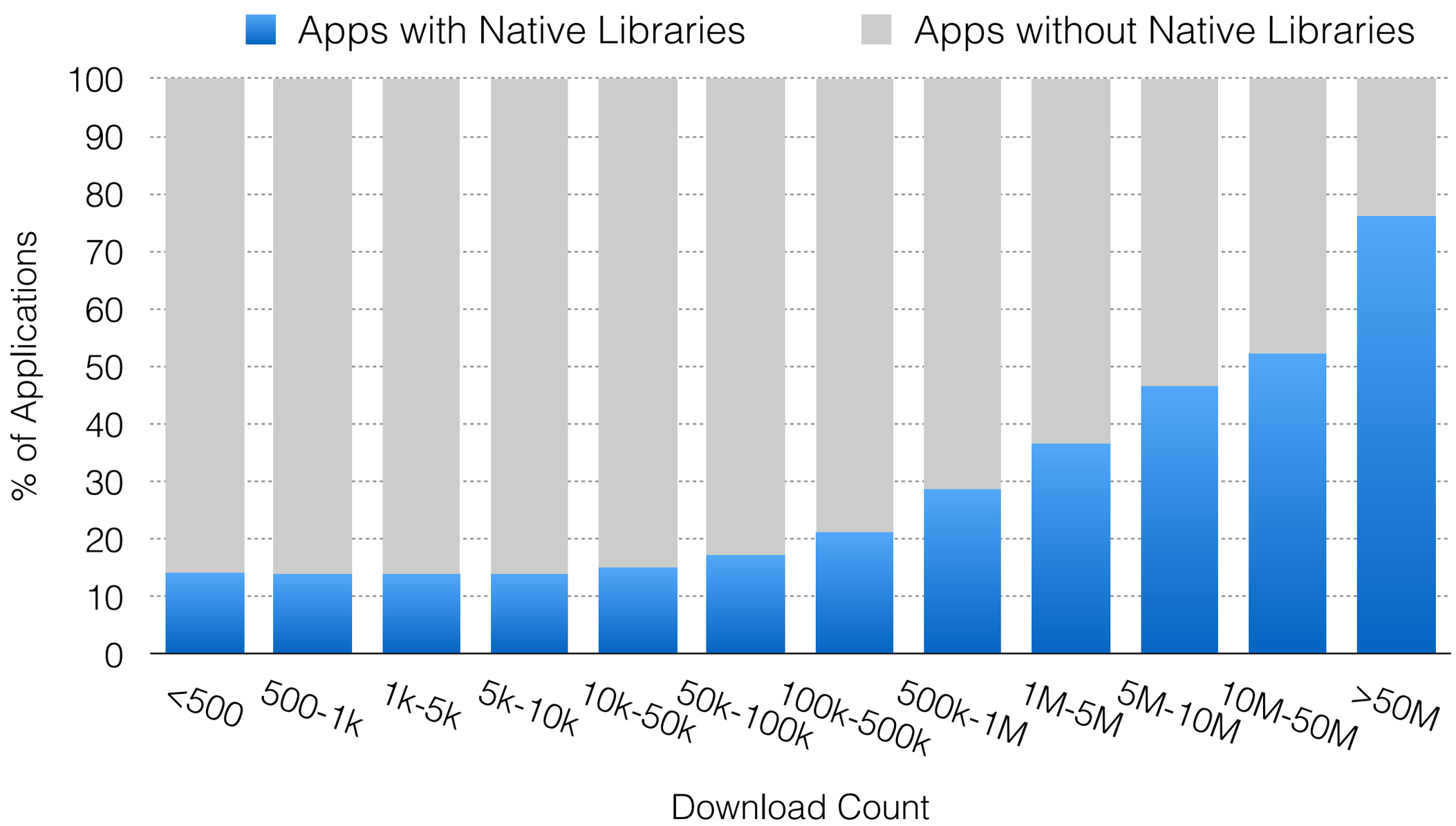
App Generators

App Generators	Non-popular Apps (<50k downloads)	Popular Apps (>50k downloads)
Business Apps	10,011 (1.59%)	3 (0.01%)
App Inventor	9,560 (1.52%)	152 (0.29%)
Andromo	6,294 (1.00%)	156 (0.30%)
iBuildApp	4,149 (0.66%)	25 (0.05%)
Mobile by Conduit	3,989 (0.63%)	21 (0.04%)
Total	34,003 (5.39%)	357 (0.68%)

Cross-platform Frameworks

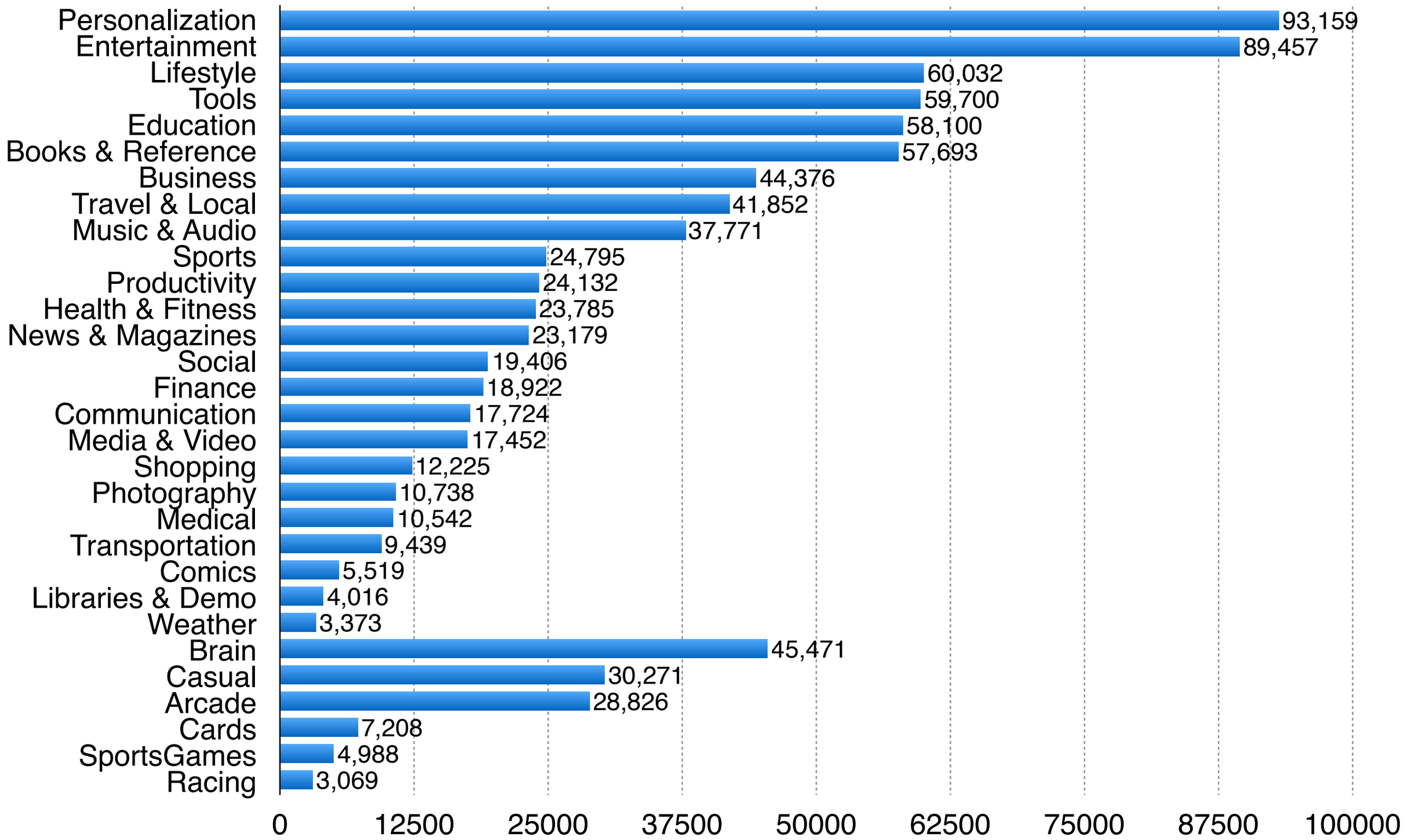
Frameworks	Non-popular Apps (<50k downloads)	Popular Apps (>50k downloads)
PhoneGap	36,915 (5.85%)	606 (1.16%)
Adobe Air	12,761 (2.02%)	619 (1.18%)
Titanium	8,316 (1.32%)	138 (0.26%)
Total	57,991 (9.20%)	1,363 (2.60%)

Native Libraries

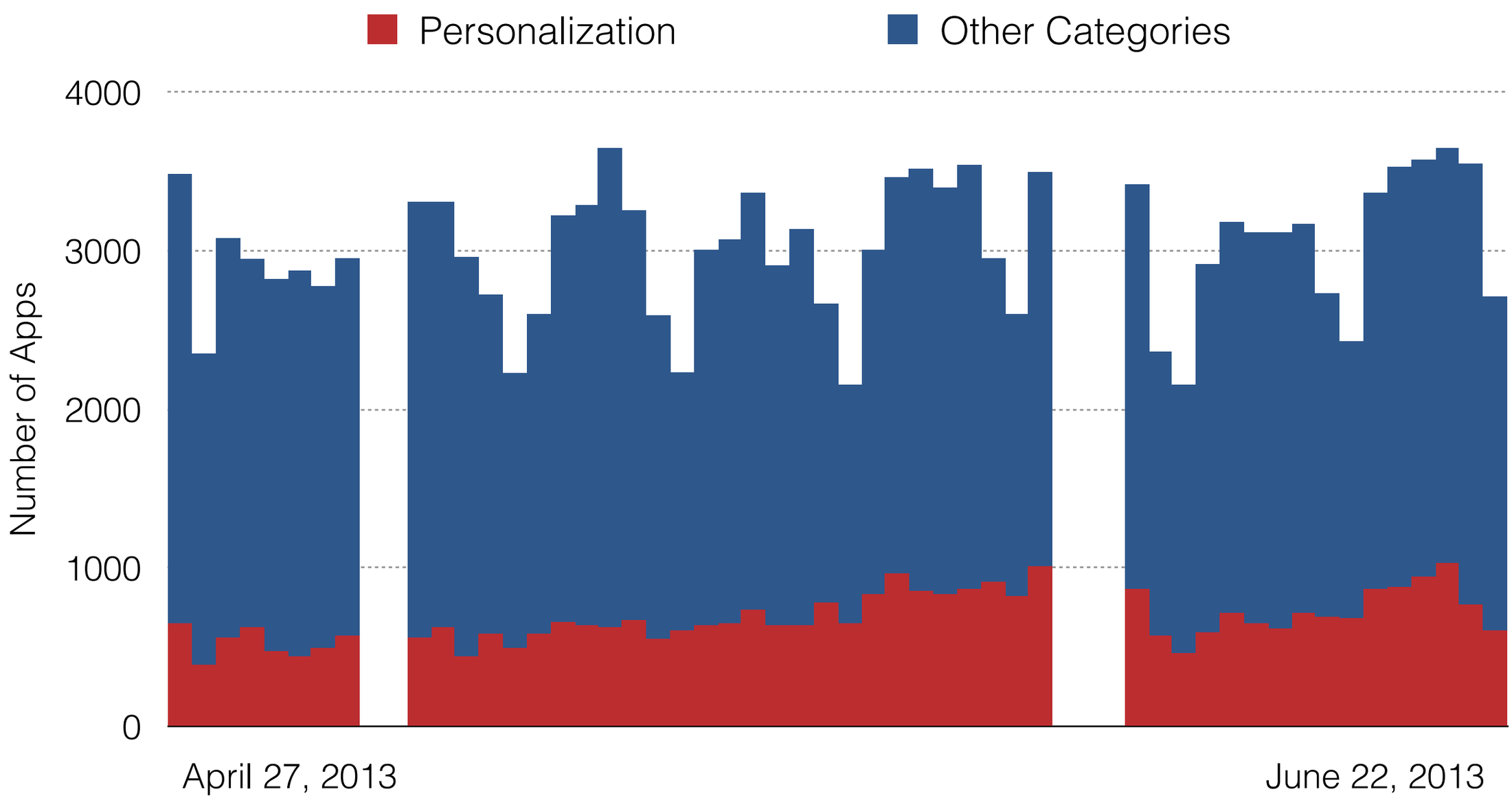


What’s up with the removal of apps?

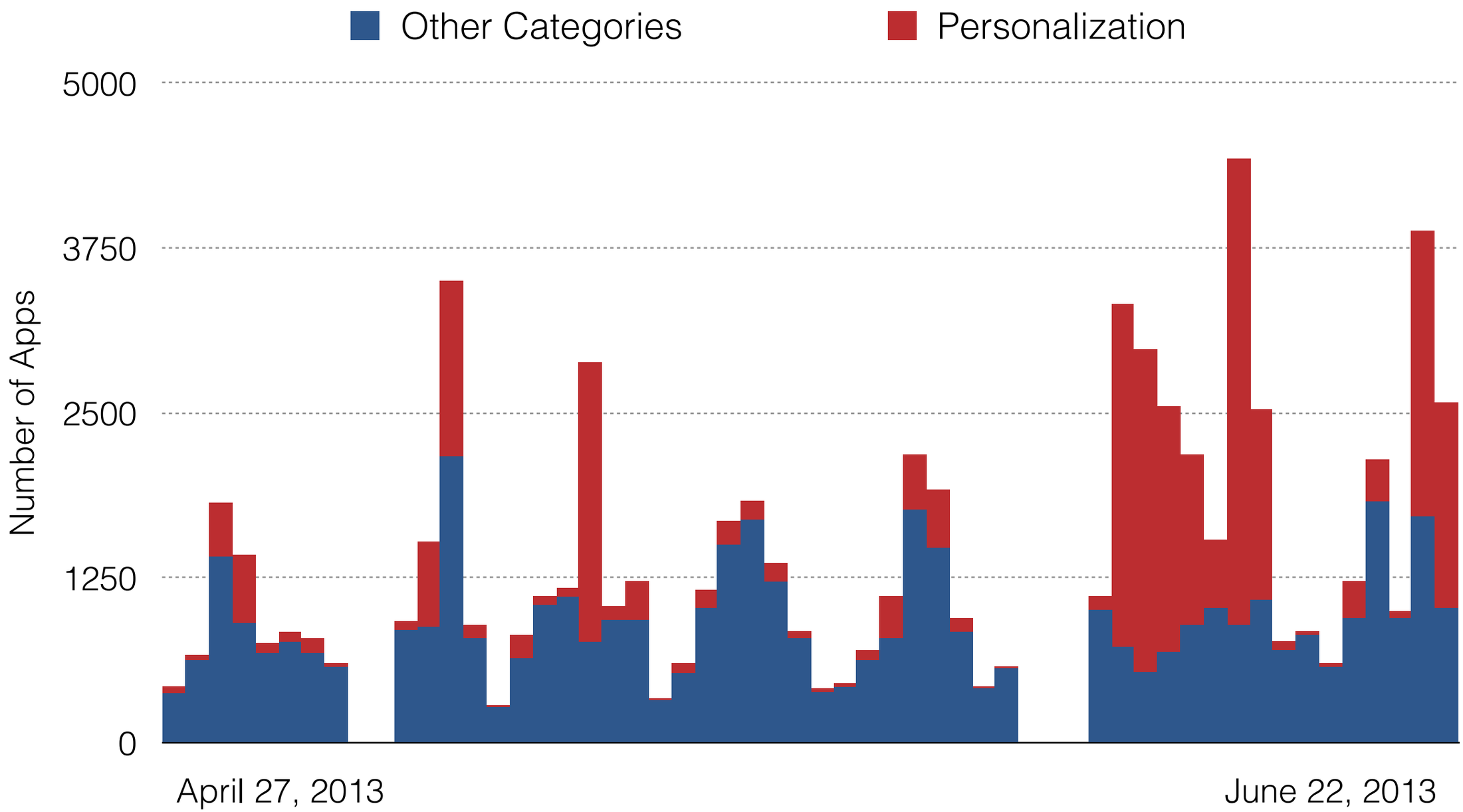
Categories


Personalization 93,159
Entertainment 89,457
Lifestyle 60,032
Tools 59,700
Education 58,100
Books & Reference 57,693
Business 44,376
Travel & Local 41,852
Music & Audio 37,771
Sports 24,795
Productivity 24,132
Health & Fitness 23,785
News & Magazines 23,179
Social 19,406
Finance 18,922
Communication 17,724
Media & Video 17,452
Shopping 12,225
Photography 10,738
Medical 10,542
Transportation 9,439
Comics 5,519
Libraries & Demo 4,016
Weather 3,373
Brain 45,471
Casual 30,271
Arcade 28,826
Cards 7,208
SportsGames 4,988
Racing 3,069
0
12500
25000
37500
50000
62500
75000
87500
100000

Added Apps vs Time



Removed Apps vs Time

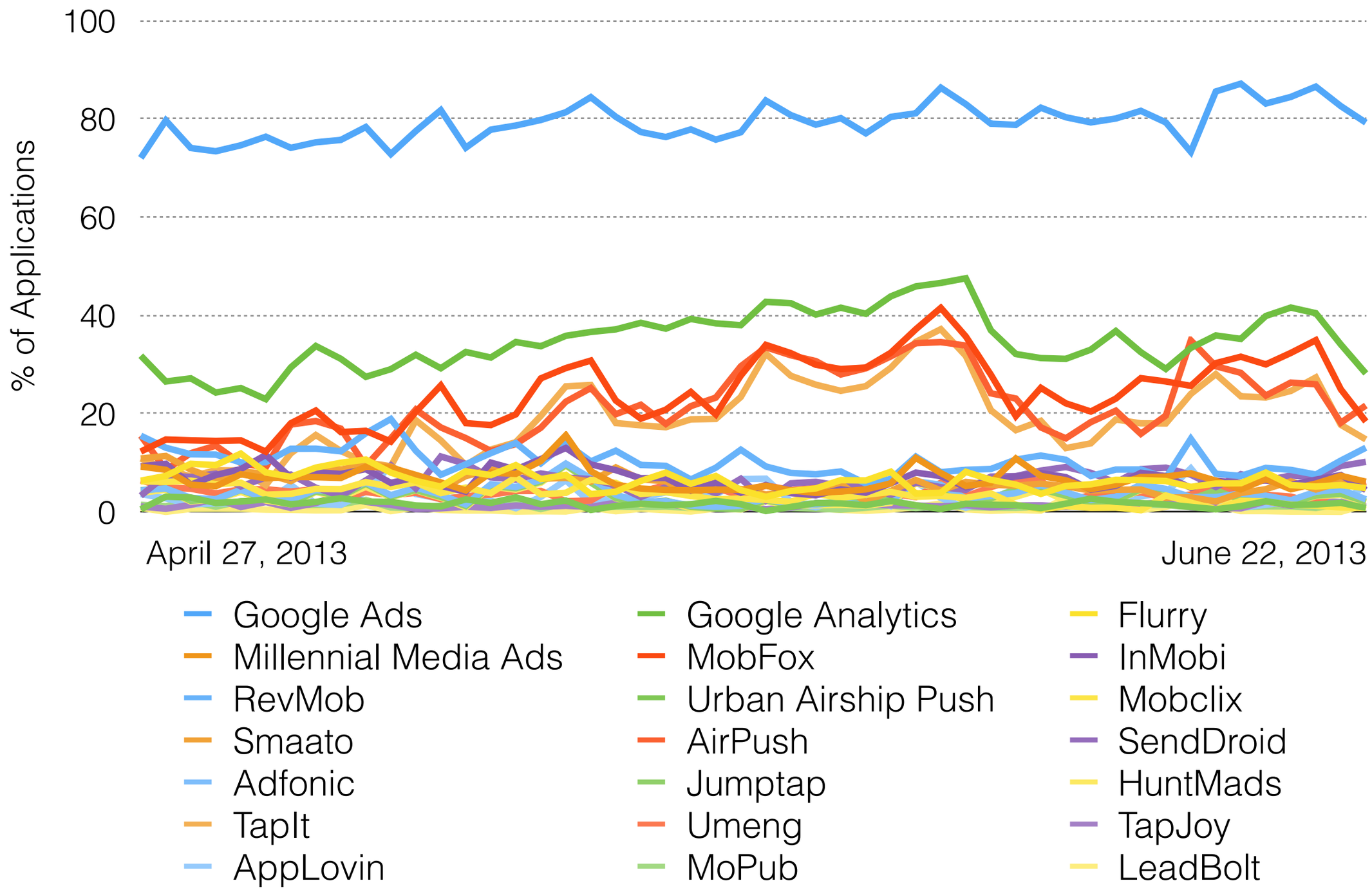


Top Occurring Words in the Personalization Category

Word	Personalization Category	Rest of the Market
wallpaper	69%	4%
please	39%	12%
like	29%	12%

Who leads the Ads market?

Advertising Platforms Market Share over Time (Among Apps with Ads Libs)



How to discover apps?

Discover Applications

- There is no way to get an exhaustive list of apps
- Results are capped to 500 apps (cannot “click on next” indefinitely when browsing the market)
- Dictionary based exploration: do a search for each of the 1,000,000 words from 10 languages.
  - ***search*** API endpoint
- We also look at the *related apps* of each app

Crawl Day in May 2013

How to search in sources?

Playdrone

AKIA* | Line filter (Ruby regex), optional | 10 files per page | Search

416 Files / 8.98 MB (ES took 0.131s)

← Previous 1 2 3 4 5 6 7 8 9 … 41 42 Next →

Android Package	Path	Line
[illegible]	[illegible]/AppConst.java	`public static final String AMAZON_KEY_ID = "AKIA[illegible]";`
[illegible]	[illegible]/SongManager.java	`BasicAWSCredentials localBasicAWSCredentials = new BasicAWSCredentials("AKIA[illegible]", "zc3/1lb`
[illegible]	[illegible]/Shoutcast.java	`("AWSAccessKeyId=AKIA[illegible]")).append("AssociateTag=mariuiorda-20&").toString())).append("ItemPage=1&").toString())).append("Keywords=").append(str2).append("&").toSt`
[illegible]	[illegible]/Shoutcast.java	`("AWSAccessKeyId=AKIA[illegible]")).append("AssociateTag=mariuiorda-20&").toString())).append("ItemPage=1&").toString())).append("Keywords=").append(str2).append("&").toSt`
[illegible]	[illegible]/FluDataReaderSimpleDBImpl.java	`final String accessKeyId = "AKIA[illegible]";`
[illegible]	[illegible]/FluDataReaderSimpleDBImpl.java	`private SimpleDB simpleDBClient = new SimpleDB("AKIA[illegible]", "25FJvKg5ilbLnmBrSqGw00DwgoJ0baN`
[illegible]	[illegible]/TrigonometryDefinition.java	`8akIa8bJ/2m1pdLWyqTbNPFkeNN533CAvtug4dRLPDo5ZtckU/JF8RAVoi/HxGSE9jpJj3skccxk75t0gUJr/sJX18nV+TxPMH8lAgQ` `/Bk1BIFB+Af4KyZtpkKPz9+cVL8jIDAAKjRkjjaKAAAAAAAAAAAAUk4u6RWY2ZQ6hoeHh5XP5zU0NKRXXnmFIwUQA4cPH9ahQ4fU3d1`
[illegible]	[illegible]/ohiapp13.java	`String str1 = work03(paramString, "", "AKIAJ[illegible]", "ecs.amazonaws.jp", "AtxeExfJ7HIbQhDlb4mc`
[illegible]	[illegible]/AmazonScoreRegistry.java	`protected AmazonSimpleDBClient sdbClient = new AmazonSimpleDBClient(new BasicAWSCredentials("AKIAJ[illegible]`
[illegible]	[illegible]/signedRequestsHelper.java	`private String awsAccessKeyId = "AKIA[illegible]";`
[illegible]	[illegible]/signedRequestsHelper.java	`private String awsAccessKeyId = "AKIA[illegible]";`

← Previous 1 2 3 4 5 6 7 8 9 … 41 42 Next →

Figure 9: PlayDrone's web interface to search decompiled sources showing Amazon Web Service tokens found in 130 ms.

Regular Expressions

```
tokens :amazon, :access_key_id     => '[="](AKIA[0-9A-Z]{16})[&"]',
                :secret_access_key => '[="]([0-9a-zA-Z/+]{40})[&"]',
                :proximity         => 5

tokens :facebook, :app_id     => {:matcher => '[="]([0-9]{13,17})[&"]', :line_must_have => /facebook/i },
                  :app_secret => {:matcher => '[="]([0-9a-f]{32})[&"]', :line_must_have => /facebook/i }

tokens :flickr, :api_key => {:matcher => '[="]([0-9a-f]{32})[&"]', :line_must_have => /flickr/i },
                :api_sec => {:matcher => '[="]([0-9a-f]{16})[&"]', :line_must_have => /flickr/i }

tokens :foursquare, :client_id         => '(?:id|ID|token|TOKEN).*?[="]+([0-9A-Z]{48})[&"]',
                    :client_secret     => '(?:secret|SECRET).*?[="]+([0-9A-Z]{48})[&"]',
                    :random_threshold  => 0.2

tokens :google_oauth, :client_id     => '[="]([0-9a-zA-Z._-]*?\.apps\.googleusercontent\.com)[&"]',
                      :client_secret => '[="]([0-9a-zA-Z_-]{24})["&]'

tokens :linkedin, :api_key           => '[="]([0-9a-z]{12})[&"]',
                  :secret_key        => { :matcher => '[="]([0-9a-zA-Z]{16})[&"]', :must_have => /[g-zG-Z]/ },
                  :random_threshold  => 0.6

tokens :twitter, :consumer_key     => { :matcher => '[="]([0-9a-zA-Z]{18,25})[&"]', :line_must_have => /twitter/i },
                 :consumer_secret  => { :matcher => '[="]([0-9a-zA-Z]{35,44})[&"]', :line_must_have => /twitter/i }


tokens :bitlyv1, :login   => { :matcher  => '[="]([0-9a-zA-Z_]{5,31})[&"]', :must_have  => /[a-z]/ },
                 :api_key => '[="](R_[0-9a-f]{32})[&"]'
```