

Research Document

Inventory App

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Introduction

This research document will discuss a number of applications that provide inventory functionality that are currently available on the market at this present time that may compete with my Inventory app. I will be looking closely at various applications and discussing the features which they provide to their users.

Similar Apps

There are a couple similar apps that provide Inventory management on the Google Play store. Many of the app incorporate a barcode scanner to allow for easy capture of the barcode but I found only a small minority of apps that actually use the barcode scanner to its potential, i.e using the barcode to lookup information about the scanned item and directly pull the details from a website instead of manually typing it in each time.

1. Inventory

This app is very similar to what the spec of my project entails. It uses a barcode scanner that pulls data using the barcode from a specified website instead of manually inserting the data and also lists the price, although it only displays the price based on a website from Sweden, Norway and New Zealand. The price is also not displayed automatically and requires an extra press of a button to make it appear which opens up in a new screen on the android app.

Inserting of an item is fairly straight forward however I find the create screen to be a little unfriendly as a new user, with fields just feeling a bit messy.

The fields that you can enter when creating a new item are:

1. Name
2. State (e.g Want it, Have it, Lent it, Borrowed etc.)
3. Created and Changed fields for date of creation and editing
4. Note
5. Owner
6. Number of
7. Category
8. Tags
9. Loading of an image

This app does not include the barcode scanner as part of the app. It forces you to download an additional barcode app to use that part of the app. I find this to be a major downside of the app. Upon inserting a new item using the barcode scanner, if it is found on the online website and an image is present, the image will be pulled and associated with the item, or the camera can be used on the device to take a picture of the item then and there.

A search for items is also present along with listing items by categories.

Inventory 1.6.3

Inventory

Search (3)

Categories

Scan Barcode

Feedback

Help and Tips

List of everything (3)

D-Day: June 6, 1944: The Battle for the Normandy Beaches (Stephen E. Ambrose) 1
 Manufacturer: Pocket Books
 Want it 17 Oct 2014 09:13:47

The Elder Scrolls IV: Oblivion 1
 Want it 17 Oct 2014 08:52:24

Nivea Men Dry Impact Deo Spray 150ml 1
 Have it 17 Oct 2014 09:13:05

Create object

Name
 Object name

State Created:
 Want it Changed:

Note
 Object notes

Owner Numeral
 Myself 1

Category
 Book

New: Category name

Tags
 -

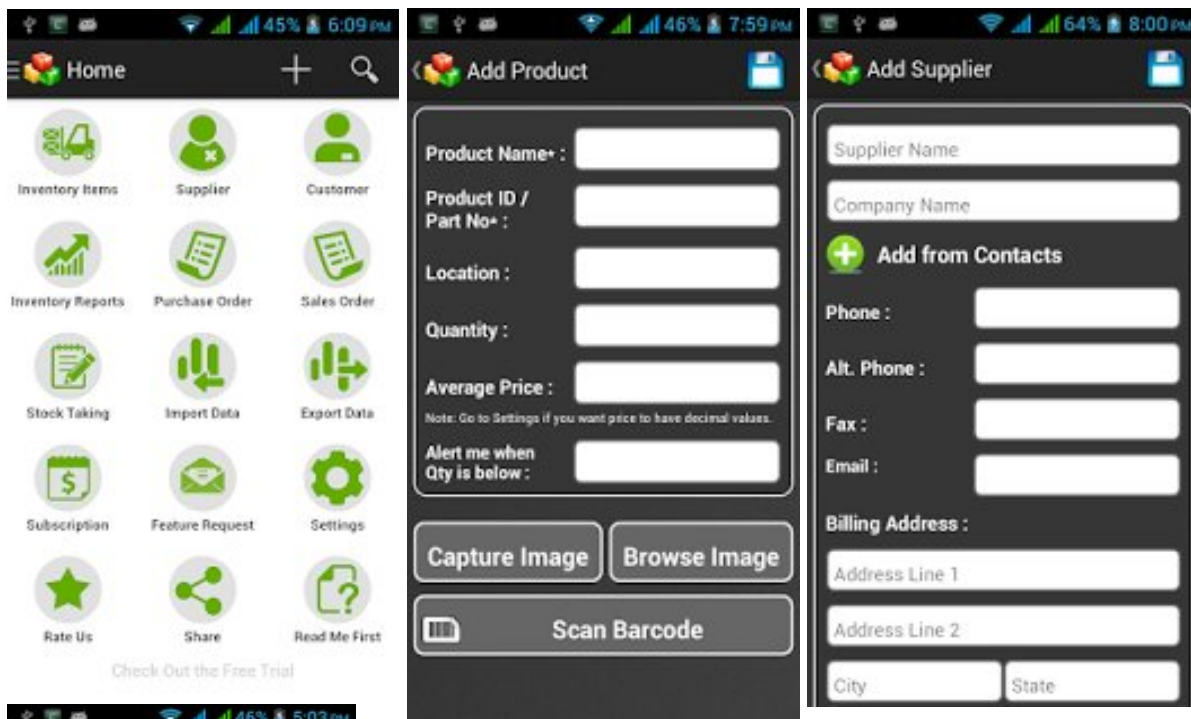
Image
 [Image icon] [Camera icon] [Pencil icon] [Eye icon]

Save Revert

2. Instant Inventory

The Instant Inventory app is focused more towards the business side rather than the consumer. It allows for adding of suppliers and customers and the ability to generate inventory reports and sales orders and perform stock taking. It allows for the inventory of items and the scanning of a barcode. This app does not automatically generate the fields based on the barcode. It does allow the capture of screenshot but only using the in-built camera on the device.

This app would be more suited to a small business such as a small shop or a self employed individual rather than a casual user who wants to keep track of their personal inventory. This app does not include the barcode scanner as part of the app. It forces you to download an additional barcode app to use that part of the app. I find this to be a major downside of the app.

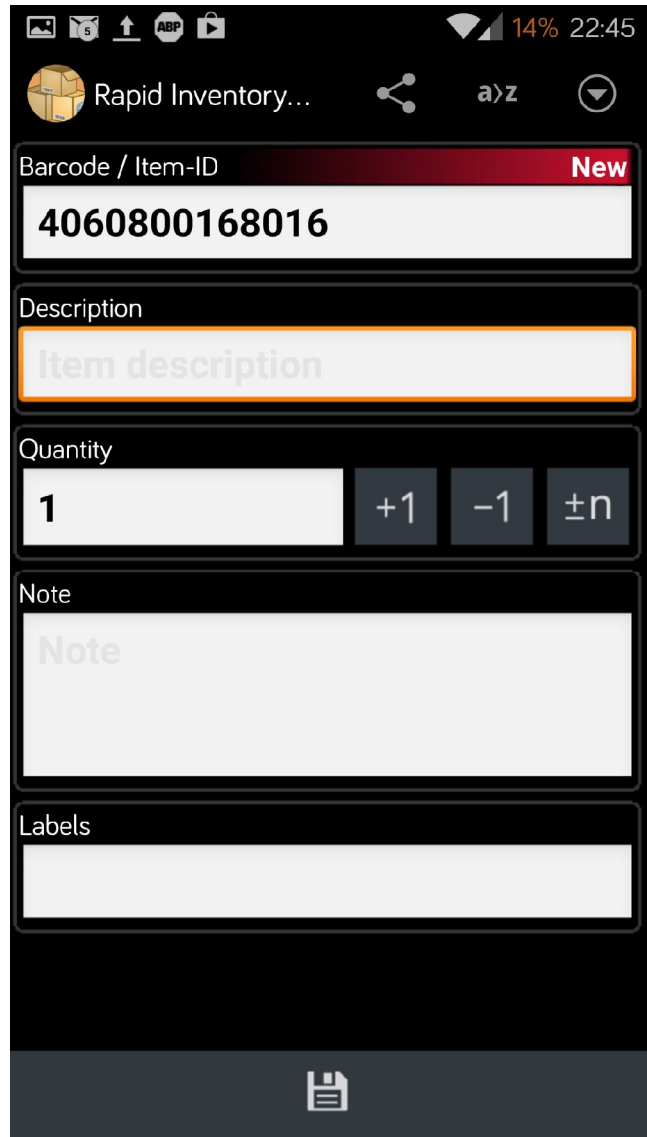
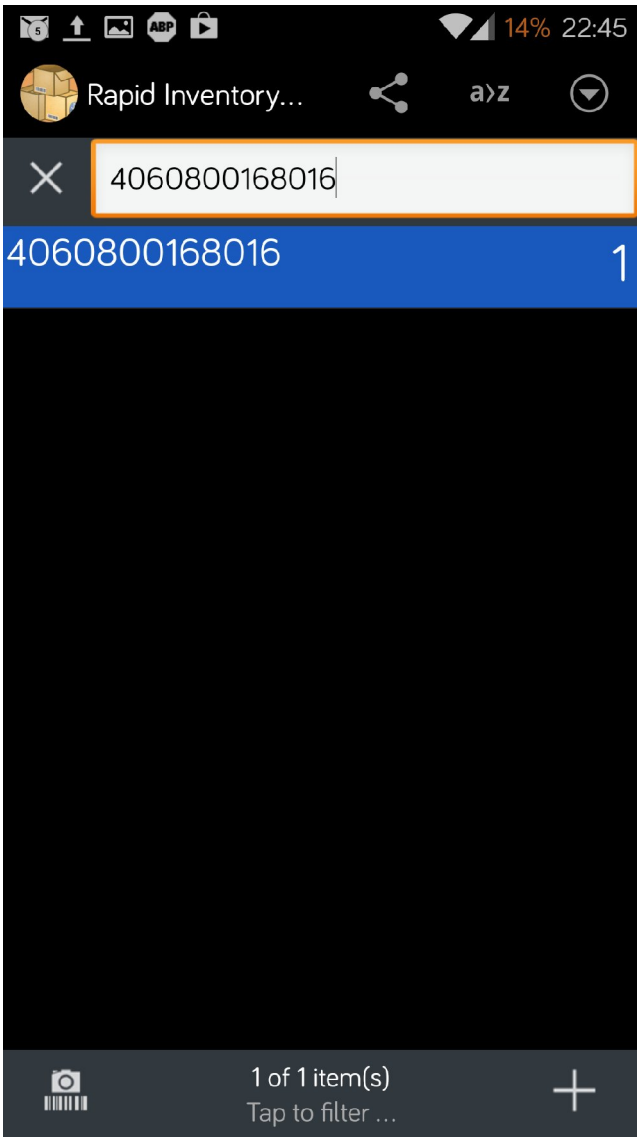


3. Rapid Inventory

This app is a small and simple app similar to the Inventory app described already. It allows the capture of a barcode but does not automatically generate the fields with data. Inserting of a new items on this app is fairly basic with the following fields present:

1. Barcode
2. Description
3. Quantity
4. Note
5. Label

The app keeps track of the inserted items and allows for an exporting of the data to a CSV file or XML file. The UI is simple and easy to use. This app includes a built in barcode scanner that does not require the addition of downloading a separate app to perform that activity.



Development

Integrated Development Environment (IDE)

Android / Eclipse ADT

Eclipse [1] is a very popular IDE (Integrated Development Environment) that is commonly used among Java developers. It is a free open source platform tool but it can also be used to develop in many other languages. There are plugins available for the Eclipse IDE that can provide additional functionalities and customisability to enhance the development of applications.

The Android Development Tools (ADT) is a plugin for the eclipse IDE that is designed to provide an environment where the creation of Android applications is possible. The plugin extends the capabilities of eclipse to let developers setup Android projects and create apk files (the native android file format for applications) for distribution of their application. The *SDK Tools* is a downloadable component for the *Android SDK*. It includes the complete set of development and debugging tools for the *Android SDK*.

Android Studio

Android Studio [2] is an integrated development environment that was developed by Google that is similar to Eclipse in that it is also open source. It is developed with android in mind that has all the required packages and tools unlike eclipse which requires the ADT plugin to develop for android. However the Android Studio is still in its beta stage at this time of writing, and so still has bugs and stability issues associated with it.

Conclusion

I'm going to develop my app with Eclipse and ADT plugin. My app has been developed from the start using Eclipse and switching over to Android Studio at this point in time may cause problems and delays. Eclipse has a solid grounding as it has been used for many years by many people in the creation of android applications and has great support when things go wrong. Also the fact that Eclipse is used as a Java IDE in the workplace adds more credit to using and learning it as a tool.

Technologies

Barcode Scanner

Barcode scanning [3] is a complex and non-trivial task. Luckily there is an open source project called the ZXing (Zebra Crossing) that helps with the task of barcode scanning. *The ZXing ("zebra crossing") is an open-source, multi-format 1D/2D barcode image processing library implemented in Java, with ports to other languages.*¹

The project has the majority of the core java programming already done to scan 1d or 2d barcodes. The ZXing project is free and open-source under the Apache licence so it is free to use without any restrictions.

The scanner can be implemented to prompt the user to install a barcode scanner app in the case there is not one present.

It can also be embedded into an app which doesn't require the installation of a separate app through the use of the library being integrated into the app.



Conclusion

After spending a while researching how to get the barcode scanner into my add and trying various different library projects,I found a demo application using the library and studied how it worked in the sample app and then integrated it into my application.

I will be implementing the ZXing barcode library into my application as it is one of the most popular overall android applications, as listed by the Google Play, with over 300,000 ratings and between 100,000,000 - 500,000,000 downloads as of February 2015.[²]

¹ <https://github.com/zxing/zxing>

² "Barcode scanner - Android Apps on Google Play." 2012. 29 Oct. 2014

<<https://play.google.com/store/apps/details?id=cn.menue.barcodescanner&hl=en>>

OCR

“Optical character recognition (OCR) [4] is the mechanical or electronic conversion of images of typewritten or printed text into machine-encoded text. It is widely used as a form of data entry from printed paper data records, whether passport documents, invoices, bank statements, computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation. It is a common method of digitizing printed texts so that it can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as machine translation, text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.”³

Tesseract is probably the most accurate open source OCR engine available. Combined with the Leptonica Image Processing Library it can read a wide variety of image formats and convert them to text in over 60 languages. It was one of the top 3 engines in the 1995 UNLV Accuracy test. Between 1995 and 2006 it had little work done on it, but since then it has been improved extensively by Google. It is released under the Apache License 2.0. [4]

There is a fork of Tesseract Tools for Android (tesseract-android-tools) called tess-two, that adds some additional functionality. Tesseract Tools for Android is a set of Android APIs and build files for the Tesseract OCR and Leptonica image processing libraries.

An application that uses the Tesseract library tess-two that I will integrate into my application is simply called android-ocr developed by Robert Theis a Software Engineer from California.

³ http://en.wikipedia.org/wiki/Optical_character_recognition

⁴ "tess-two | road to nerdvana." 2014. 29 Oct. 2014 <<http://roadtonerdvana.com/tag/tess-two/>>

It is an “experimental app for Android that performs optical character recognition (OCR) on images captured using the device camera.

Runs the Tesseract OCR engine using a fork of Tesseract Tools for Android.

*Most of the code making up the core structure of this project has been adapted from the ZXing Barcode Scanner. Along with Tesseract-OCR and Tesseract Tools for Android (tesseract-android-tools), several open source projects have been used in this project, including leptonica, google-api-translate-java, microsoft-translator-java-api, and jtar.”*⁵

The tess-two library is “A fork of Tesseract Tools for Android ([tesseract-android-tools](#)) that adds some additional functions. Tesseract Tools for Android is a set of Android APIs and build files for the [Tesseract OCR](#) and [Leptonica](#) image processing libraries.”⁶

Conclusion

As with the zxing barcode scanner library, I spent a bit of time researching and trying various different sample apps that use the ocr library. The first version i tried called “Simple android OCR” was a very basic working example and did not give good enough results.

I then found an application that was developed by Robert Theis that provided a more accurate result. Upon studying how the application used the engine i then integrated his project into my own with good results.

I will be using the Tesseract OCR fork, Tess-Two along with the sample app provided by Robert Theis for my Android OCR as it is highly regarded as one of the best OCR libraries for Android according to a question asked on the StackOverflow website with almost 34000 views.⁷

⁵ <https://github.com/rmtheis/android-ocr>

⁶ <https://github.com/rmtheis/tess-two>

⁷ <http://stackoverflow.com/questions/19533273/best-ocr-optical-character-recognition-example-in-android>

Price / Item Lookup

As part of my project, upon scanning an item, the automatic retrieval of those items details from a product comparison / product market website was crucial. It would save the user time from having to manually enter those details into the app.

PriceSpy

As the barcode of an item is scanned the details of the item can be retrieved automatically. There are several websites that provide this functionality. Pricespy [5] offers several localised variants of its website, an Irish, UK and New Zealand. This website doesn't offer much in the way of products as many are missing. It would work for newer items but most older items would not be found. It also doesn't provide an API to use to query items.

Amazon

Amazon can be used to lookup items, either barcode numbers or ISBN numbers as part of the Product Advertising API [6] . With the massive size of amazon, finding a product, no matter the age of the item, should be easily available. You must sign up for an **AWSAccessKeyID** from the AWS website. Then you can implement the API call to retrieve the details of the item.

From Amazon AWS Documentation: *"Given an Item identifier, the ItemLookup operation returns some or all of the item attributes, depending on the response group specified in the request. By default, ItemLookup returns an item's ASIN, Manufacturer, ProductGroup, and Title of the item."*

A sample response from the ItemLookup is:

```
<Items>
  <Request>
    <IsValid>True</IsValid>
    <ItemLookupRequest>
      <ItemId>B00008OE6I</ItemId>
    </ItemLookupRequest>
  </Request>
  <Item>
    <ASIN>B00008OE6I</ASIN>
    <ItemAttributes>
      <Manufacturer>Canon</Manufacturer>
      <ProductGroup>Photography</ProductGroup>
      <Title>Canon PowerShot S400 4MP Digital Camera w/ 3x Optical Zoom</Title>
    </ItemAttributes>
```

```
</Item>  
</Items>
```

Which give us the details of the item.

Conclusion

I will use the Amazon API for the item lookup as pretty much every sort of DVD/Book/CD is available on Amazon, also Pricedspys does not offer an API to allow a query of its items, whereas Amazon provides their own.

Programming Languages

Programming languages is a constructed language designed to communicate instructions to a machine. These languages are used to create programs that a computer can run. Writing programs or applications for computers allows the developer to manipulate it to perform tasks for them.

There are many different types of programming languages that have been developed but the choice of a programming language may be limited to the hardware such as C or C++ which when compiled, will only run on windows based machines and not Mac OSX.

Java

Java [7] is an object orientated programming language, released in 1995, that is platform independant. That means that code will run on a Windows, Linux, Mac or even smart phones with very little modification to the code. Java uses a variation of the language as the main programming language for the Android operating system. Java code is not as fast as C or C++ due to it being a high level language. High level languages prefer human readability over low level languages such as C or Assembly where there is no abstraction from the computer's instruction architecture or machine code.

HTML5

HTML [8] stands for Hyper Text Markup Language and is the standard programming language for creating web pages and displaying content in web browsers. HTML was the first version and it was developed in the 1990's. Since then there has been 5 revisions of the language.

HTML5 is the latest version of HTML. HTML5 has been developed to handle the latest multimedia applications while also trying to keep the language readable by humans and to make the language compatible across all types of devices and computers no matter which company makes them.

PHP

PHP [9] is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP code can be simply mixed with HTML code, or it can be used in combination with various templating engines and web frameworks. PHP code is usually processed by a PHP interpreter, which is usually implemented as a web server's native module or a Common Gateway Interface (CGI) executable. After the PHP code is interpreted and executed, the web server sends resulting output to its client, usually in form of a part of the generated web page; for example, PHP code can generate a web page's HTML code, an image, or some other data.

Platform

Android

Android [10] is an open source operating system developed for touchscreen devices such as smartphones and tablets.

It is one of the most popular mobile platforms in use today, only being surpassed by Apple iOS. The platform is constantly evolving, offering more features and a nice, fluid interface. Google provides major incremental updates every six to nine months with the latest being Android 4.4 KitKat, released on October 31 2013. Android L, the newest version of Android was unveiled on June 25th 2014. One of the most noticeable changes in the new release is a redesigned user interface.

As big companies like Samsung, HTC, LG etc. continue releasing their new flagship phones Android is attracting more attention e.g. Samsung S3/S4, HTC One, LG G2 and the flagship killer of 2014, the OnePlus One.

Android has a large community of developers writing applications ("apps") that extend the functionality of devices, written primarily in a customized version of the Java programming language. One of the largest and most well renowned communities for Android development is the XDA Developers forum, which has over 5 millions members. Android continues to dominate the global smartphone market, with over 255 million units shipped and nearly 85% of the market share in the second quarter of 2014.

(<http://www.idc.com/prodserv/smartphone-os-market-share.jsp>)

Earlier versions are becoming outdated as people continue to upgrade their devices. Android 2.3 still exists on a reasonable percentage of devices but this figure will only get smaller. Most devices are using version 4.0 onwards so these remain the biggest target audience in the Google Play Store.

Version	Codename	API	Distribution
2.2	Froyo	8	0.7%
2.3.3 - 2.3.7	Gingerbread	10	11.4%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	9.6%
4.1.x	Jelly Bean	16	25.1%
4.2.x		17	20.7%
4.3		18	8.0%
4.4	KitKat	19	24.5%

(<https://developer.android.com/about/dashboards/index.html>)

iOS

The iOS is an operating system developed by Apple. The iOS was originally developed only for the iPhone but since more devices have been created by Apple, now runs on the iPad and AppleTV. iOS was first released in 2007 and today the current version is iOS 8.3. [11]

iOS development requires a Macintosh computer or Laptop with the iOS SDK and Xcode IDE installed.

Xcode is the official Apple IDE for developing application for Apple platforms, much like Eclipse is the official IDE for developing Android apps.

Developers can create and develop apps using a free copy of Xcode however they cannot test their app on a physical device or publish them to the app store until they pay the yearly iPhone Developer fee of \$99.00.

iOS apps are written in Objective-C, which is a superset of the C programming language and inherits the syntax ,primitive types and flow control statements of C.

Phonegap

Phonegap is different to how Android development works as it is a non native app, meaning that it is platform independent and can be developed for several different platforms from the very beginning. It allows developers to build apps for mobile devices using HTML5, JavaScript and CSS. The resulting apps are hybrid meaning that they are a mix of native and web app. The entire layout is done via web views instead of the a native UI, much like how web apps work, but they can still be signed as the native platforms application file and deployed to the Google Play Store and Apple App Store. They can still access all the native device APIs and allow the app to interact with the GPS, camera etc.

Webapps were very common in the early days of iOS before Apple allows developers create native apps for their device, and although their popularity has declined in recent years, every so often you will discover an app developed using this framework.

Conclusion

Android has a market share of over 80% so it seems the best platform to develop for.

4.x is the most popular, having a share of 78% on all android devices so developing my app to support those versions lower than 4.x will be not viable.

Website

There will be a companion website available alongside the App where users can login and view, modify the fields of the captured item or delete them. This website will not be a standalone application and is to be used in conjunction with the app which is the main focus. Users will not be allowed to register on the website and login will be disabled until they are registered through the app.

Cloud Platforms

Google App Engine

Google app Engine (GAE) [11] is a PaaS development environment that was created by Google to allow developers to build web applications and run them on Google's infrastructure. It allows for easy to maintain and provides data storage for queries and transactions. It allows for several different languages such as Java, Python and PHP.

It has a free package when users sign up with a fixed amount of bandwidth and computing power.

It provides the following:

- Data storage, queries and transactions
- Automatic scaling
- App configuration and management
- Process management

Mobile Backend-as-a-Service (MBaaS)

The Mobile BaaS [12] is a service that is a mix of the services of Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). It includes the software modules needed to run the backend of mobile applications. The idea behind MBaaS is to reduce the amount of time which developers spend in configuring and managing the IaaS and PaaS while developing the backend for the applications.

There are several MBaaS to choose from and here I will list a handful: [13]

1.

Parse

Parse was founded in 2011 by Kevin Lacker, Tikhon Bernstam, James Yu, and Ilya Sukhar. It was incubated as a Y Combinator startup, where it initially raised \$1.5 million. In November 2011, it closed a Series-A funding round of \$5.5 million. Initially, Parse called itself "Heroku for mobile" aiming to becoming the defacto MBaaS platform.

In 2013, Facebook acquired Parse for a whopping \$85 million. With this move, Parse customers were worried about the future of the platform. Even after the acquisition, Parse continued to innovate and kept adding new features. With the comprehensive feature set that covers the key mobile capabilities to custom hosting and analytics, Parse continues to be the choice of the mobile developer community. With a solid backing from Facebook, Parse is expected to add more capabilities to become a strong mobile platform.

Pricing : Free – \$199/mth

2.

Kinvey

Kinvey, a startup based in Boston, claims to be the “ridiculously” easy cloud Backend as a Service. Founded by Sravish Sridhar, Kinvey caught the attention of the media from the day it was announced. It started with \$18,000 in seed funding and recently raised a Series A funding of \$5 million.

Kinvey aims at the enterprise market by clearly differentiating its offerings. It has strong partnerships with Google and Red Hat to bring full-blown platform support for hosting custom code and business logic.

Kinvey has matured to become an enterprise mobile backend platform.

Pricing : Free – \$200/mth

3.

Backendless

Backendless is a development and a run-time platform. It helps software developers to create mobile and desktop applications while removing the need for server-side coding. The platform consists of six core backend services which developers typically spend time implementing for each new applications.

Pricing : Free - \$99

4.

Amazon AWS

Officially launched in 2006, Amazon Web Services provides online services for other web sites and client-side applications. The list of services is quite large, providing everything from computing, networking, content delivery, storage, deployment and management.

It supports a large variety of platforms such as Java, PHP, Python, Ruby and more. AWS provides hosted apps with a free tier of usage similar to GAE. This free tier provides more than enough resources for the purpose of this project.

AWS also allows for automated scaling to make it easier to cope with high traffic. Extra instances are created and an Elastic Load Balancing service distributes the traffic load across these instances. This is useful when paying for any additional usage as it saves money by shutting down any idle instances. AWS is used by a large number of websites and companies around the world such as Nokia, Vodafone, Ericsson, Reddit, Spotify, Netflix and SAP.

Conclusion

I went with Parse solely based on the reason that after glancing through their documentation it looked the easiest to use and provided SDK's for the platforms I was going to work on such as Android SDK and PHP / Javascript SDK for the website application.

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