1204361 – Mobile Programming

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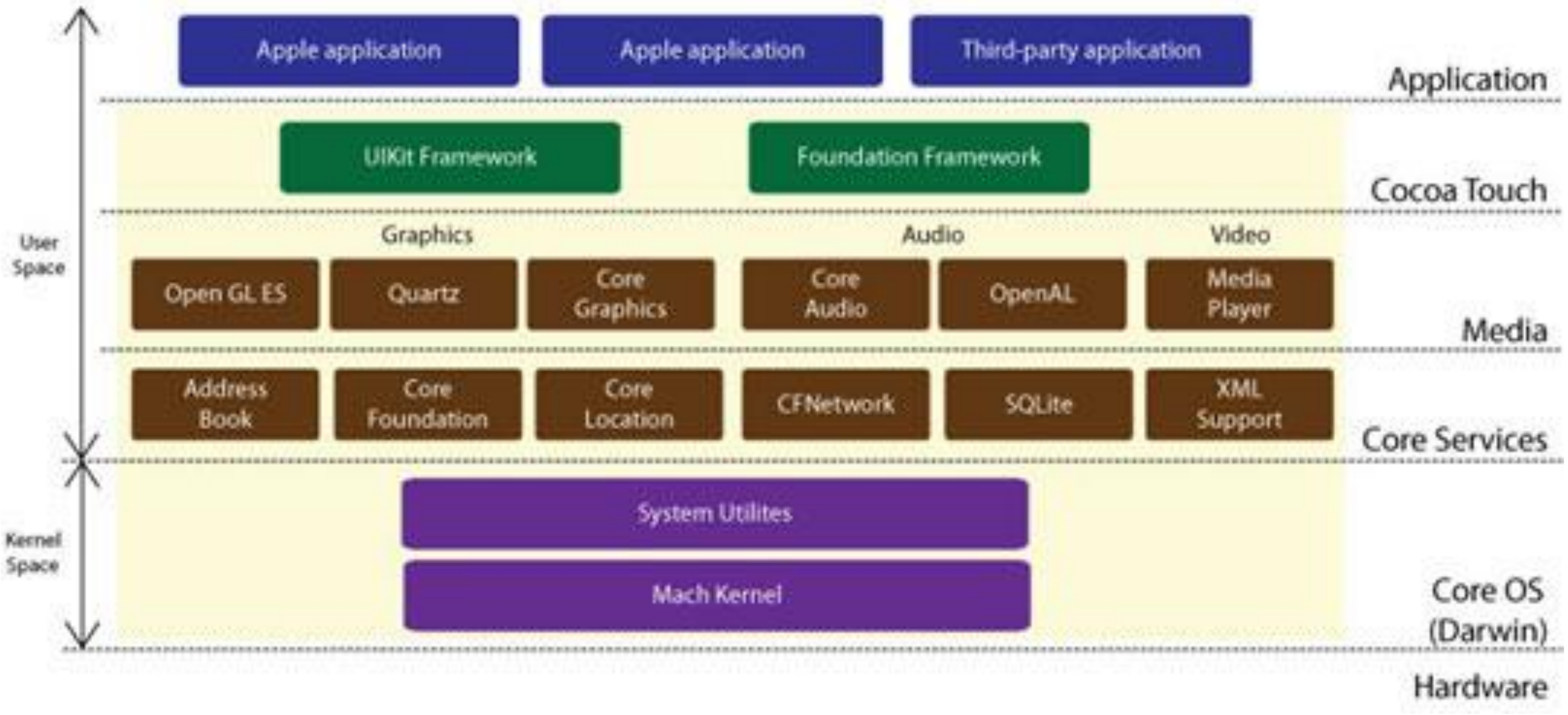
Mahasarakham University

Mobile Platforms

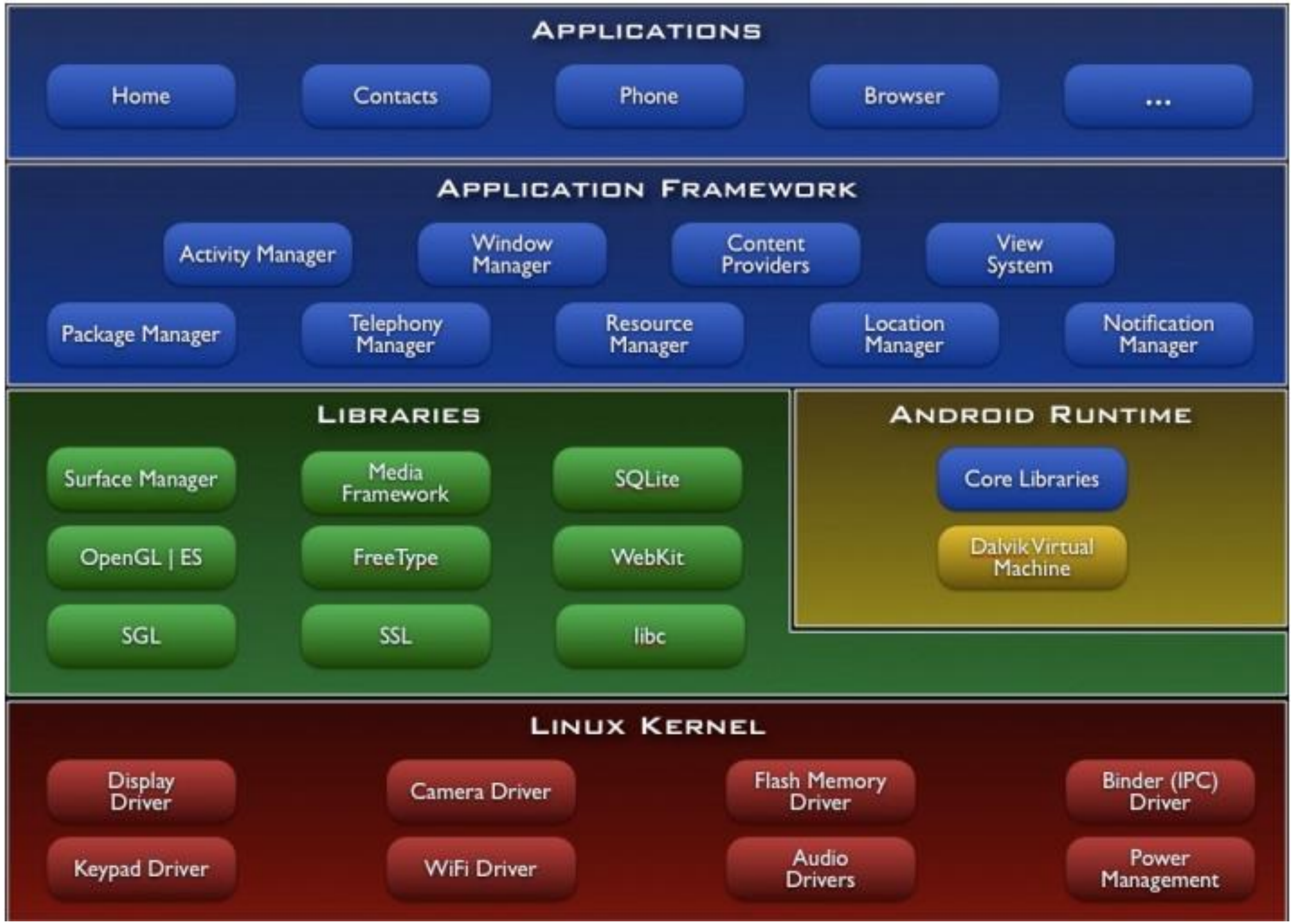
- iOS
- Andriods
- Windows
- Blackberry

iOS Architecture



http://blog.inf.ed.ac.uk/sapm/2014/02/26/response-to-article-architectural-patterns-for-mobile-application-development-by-s1014475/

Andriod Architecture



http://blog.inf.ed.ac.uk/sapm/2014/02/26/response-to-article-architectural-patterns-for-mobile-application-development-by-s1014475/

Mobile Application Development

APPROACHES TO MOBILE DEVELOPMENT

- Native
- Web
- Hybrid

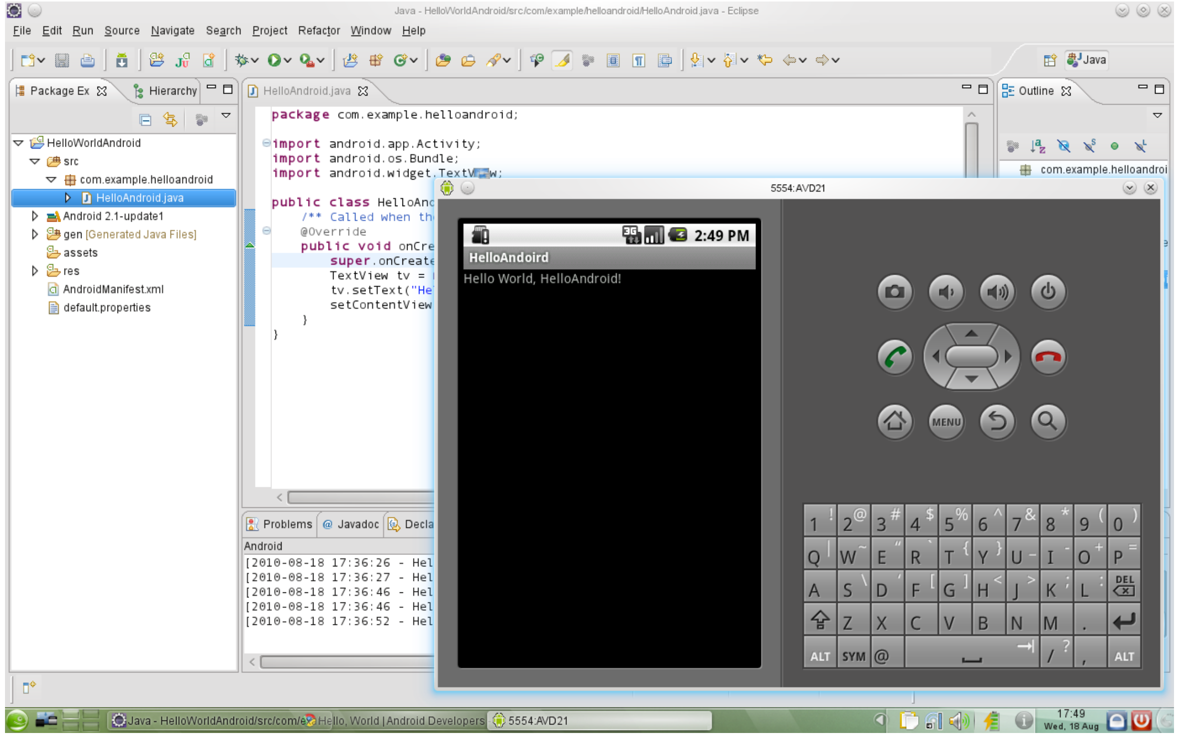
*http://www.simplisticsolutions.co.uk/images/icon/crossplatform.png

NATIVE APPS

- **Binary executable files on the device.**
- **Can access all API's made available by OS vendor.**
- **SDK's are platform-specific.**
- **Each mobile OS comes with its own unique tools and GUI toolkit.**

NATIVE APPS

- Xcode for iOS app
- Eclipse has Andriod SDK as a Plug in
- Visual Studio has windows phone emulator that is integrated into the IDE



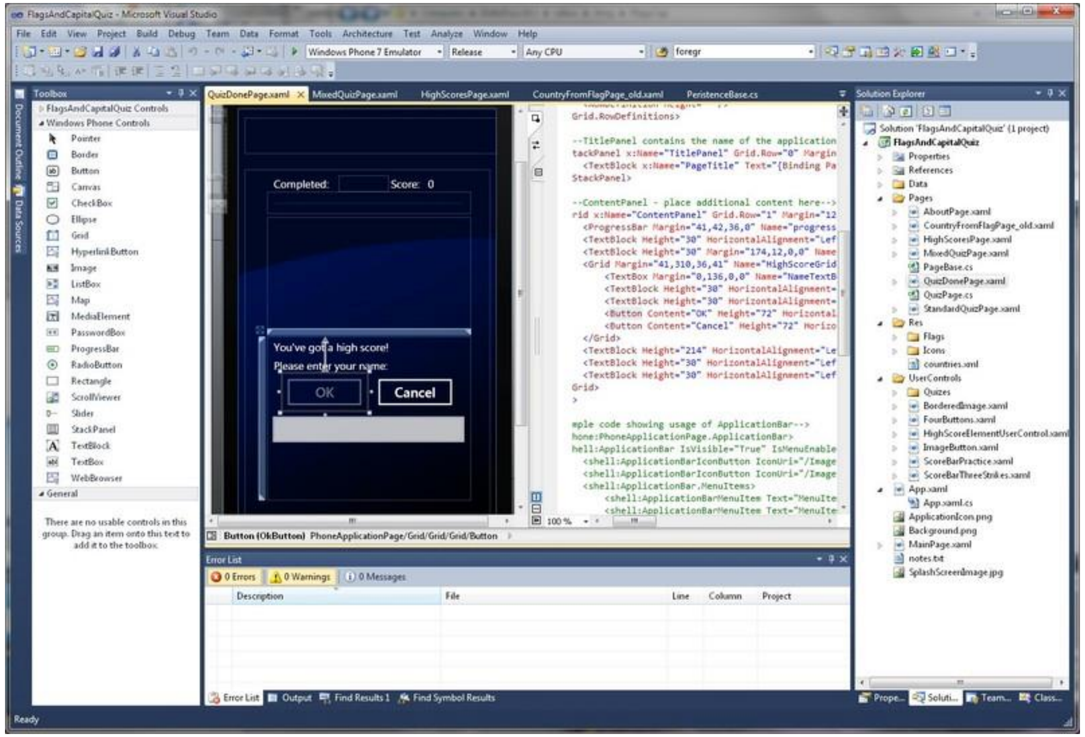
```
package com.example.helloandroid;

import android.app.Activity;
import android.os.Bundle;
import android.widget.TextVw;

public class HelloAnc
    /** Called when th
    @Override
    public void onCre
        super.onCreate
        TextView tv = 
        tv.setText("He
        setContentView
    }
}
```

```
[2010-08-18 17:36:26 - Hel
[2010-08-18 17:36:27 - Hel
[2010-08-18 17:36:46 - Hel
[2010-08-18 17:36:46 - Hel
[2010-08-18 17:36:52 - Hel
```

2:49 PM

HelloAndoird

Hello World, HelloAndroid!



There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

Completed: Score: 0

You've got a high score!

Please enter your name:

OK Cancel

Button (OkButton) PhoneApplicationPage/Grid/Grid/Grid/Button

```
Grid.RowDefinitions>

--TitlePanel contains the name of the application
tackPanel x:Name="TitlePanel" Grid.Row="0" Margin
  <TextBlock x:Name="PageTitle" Text="{Binding Pa
StackPanel>

--ContentPanel - place additional content here-->
rid x:Name="ContentPanel" Grid.Row="1" Margin="12
  <ProgressBar Margin="41,42,36,0" Name="progress
  <TextBlock Height="30" HorizontalAlignment="Lef
  <TextBlock Height="30" Margin="174,12,0,0" Name
  <Grid Margin="41,310,36,41" Name="HighScoreGrid
      <TextBox Margin="0,136,0,0" Name="NameTextB
      <TextBlock Height="30" HorizontalAlignment=
      <TextBlock Height="30" HorizontalAlignment=
      <Button Content="OK" Height="72" Horizontal
      <Button Content="Cancel" Height="72" Horizo
  </Grid>
  <TextBlock Height="214" HorizontalAlignment="Le
  <TextBlock Height="30" HorizontalAlignment="Lef
  <TextBlock Height="30" HorizontalAlignment="Lef
Grid>
>

mple code showing usage of ApplicationBar-->
hone:PhoneApplicationPage.ApplicationBar>
hell:ApplicationBar IsVisible="True" IsMenuEnable
  <shell:ApplicationBarIconButton IconUri="/Image
  <shell:ApplicationBarIconButton IconUri="/Image
  <shell:ApplicationBar.MenuItems>
      <shell:ApplicationBarMenuItem Text="MenuIte
      <shell:ApplicationBarMenuItem Text="MenuIte
```

NATIVE APPS

	iOS	Andriod	Windows	Blackberries
Languages	Swift, Objective-C, C, C++	Java (some C, C+)	C#, VB.NET and more	Java
Tools	Xcode	Andriod SDK, Eclipse Plug-in	Visual Studio, Windows Phone development tools	BB Java Eclipse Plug-in
Packaging Format	.app	.apk	.xap	.cod
App Store	Apple App Store	Google Play	Windows Phone Marketplace	Blackberry APP World
Developer account Fee	99 USD per year	25 USD registration fee charged for a Console account.	19 USD per year	No registration or submission fees

NATIVE APPS

PROS
Easy low-level hardware access services.
Easy access to high level services important to personal mobile experience.
Full use of all functionalities that modern mobile devices have to offer.
High usability.

CONS
Code Reusability : Low
Development & maintenance: Time-consuming & expensive.
Designers are required to be familiar with different UI components of each OS.
Upgrade flexibility: Low.

MOBILE WEB APPS

- Use standard web technologies such as HTML 5, CSS 3 & JavaScript.
- Features of HTML 5 - Advanced UI components, access to rich media types, geolocation services & offline availability.
- Increasing popularity of HTML 5 in rendering engines such as WebKit.
- Runs on a standalone mobile web browser.
- Installed shortcut, launched like a native app.
- UI logic resides locally; makes the app responsive and accessible offline.

Pros:

- Multiplatform support.
- Low development cost.
- Leverage existing knowledge.

Cons:

- Limited access to OS API's.

HYBRID APPS

- Combines native development with web technology.
- The web app runs inside a thin wrapper native app.
- The wrapper native app uses the OS API's to create an embedded HTML rendering engine which provides a bridge between the browser and device API's.
- The communication between web app and native app normally happens over JavaScript via custom built API's.

Pros:

- Flexibility of web apps combined with feature richness of native apps.
- Simplified deployment and immediate availability.
- Leverage existing knowledge.

Cons:

- Poorer user experience as compared to native apps.
- Access to advanced device capabilities normally restricted.

CROSS-COMPILATION

- Separates build environment from target environment.
- Platform-independent API using a mainstream programming language like JavaScript, Ruby or Java.
- The cross-compiler then transforms the code into platform-specific native apps.
- The software artifact generated can be deployed and executed natively on the device.

Pros:

- Improved performance and User Experience.
- Full access to functionalities of underlying mobile OS and device specific capabilities.

Cons:

- Highly complex as cross-compilers are difficult to program.
- Need to be kept consistent with fragmented mobile platforms and operating systems available.

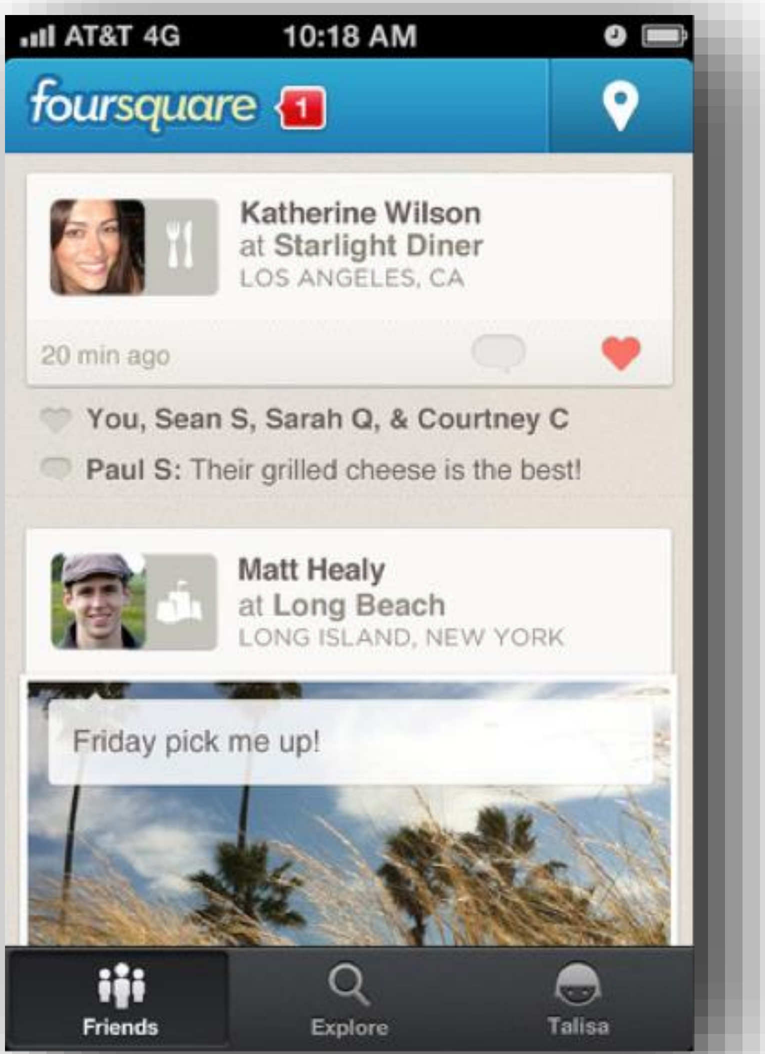
CROSS-PLATFORM FRAMEWORKS

PROS
Code Reusability
Plugins
Easy for web developers
Reduced development costs
Support for enterprise & cloud services
Easy Deployment

CONS
Might not support every feature of OS
Cannot use own tools/IDE
Slower.
High end graphics & 3D support limited
Vendor lock-in

UI DESIGN CONSIDERATION

iOS



AT&T 4G 10:18 AM

foursquare 1

Katherine Wilson
at Starlight Diner
LOS ANGELES, CA

20 min ago

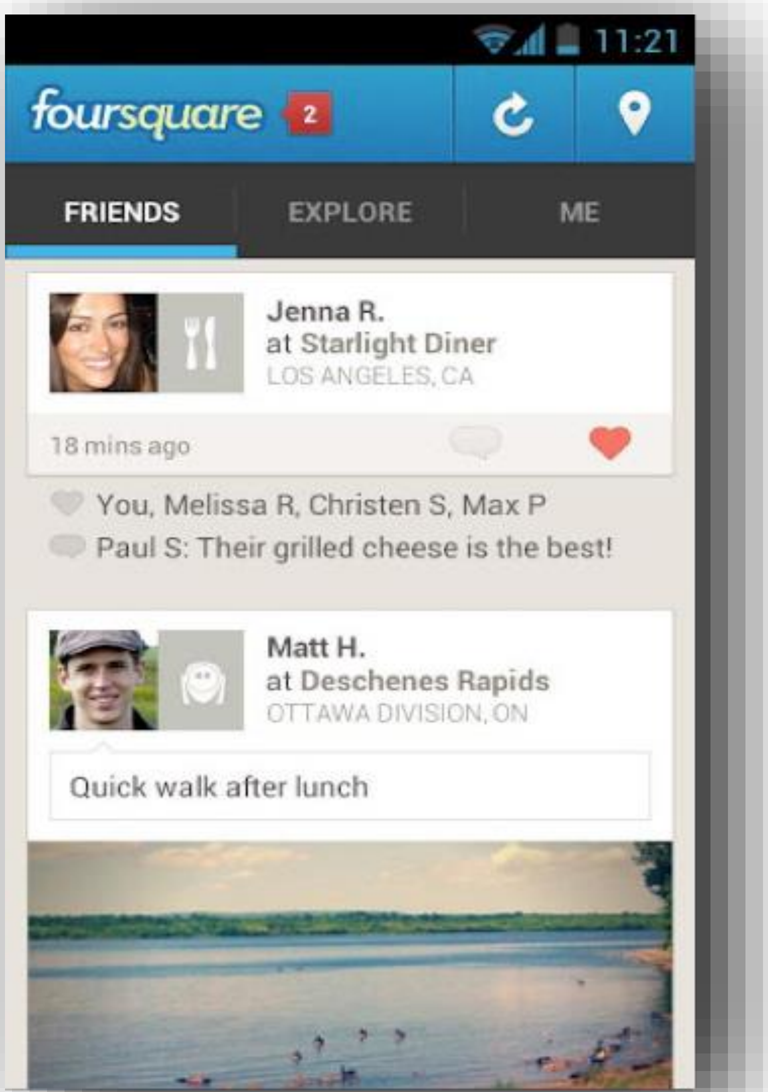
You, Sean S, Sarah Q, & Courtney C

Paul S: Their grilled cheese is the best!

Matt Healy
at Long Beach
LONG ISLAND, NEW YORK

Friday pick me up!

Android



11:21

foursquare 2

Jenna R.
at Starlight Diner
LOS ANGELES, CA

18 mins ago

You, Melissa R, Christen S, Max P

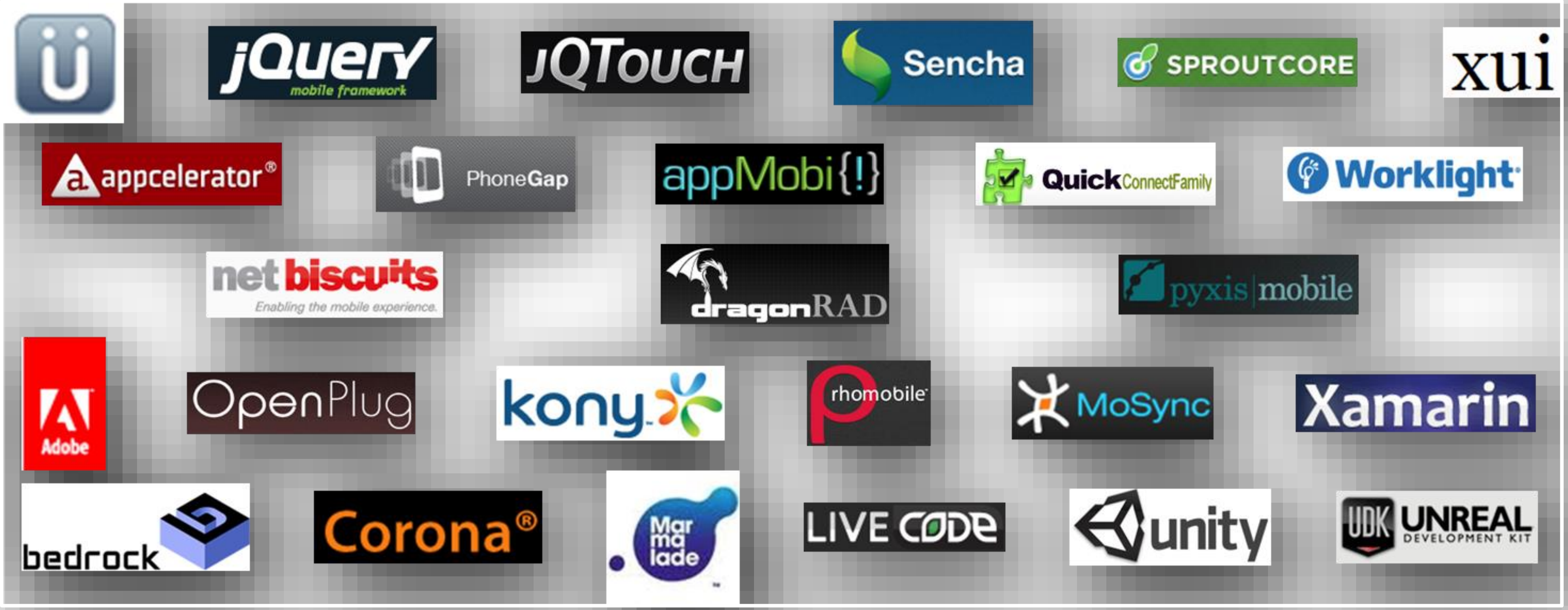
Paul S: Their grilled cheese is the best!

Matt H.
at Deschenes Rapids
OTTAWA DIVISION, ON

Quick walk after lunch

* http://www.adobe.com/devnet/phonegap/articles/creating-apps-with-phonegap-lessons.html

CROSS-PLATFORM FRAMEWORKS



[* http://setandbma.files.wordpress.com/2011/12/wora-platforms.png](http://setandbma.files.wordpress.com/2011/12/wora-platforms.png)

RhoElements – RhoMobile Suite From Motorola Solutions

TECHNICAL ARCHITECTURE:

- **Cross compilation using Virtual Machine.**
- **Single source codebase written in Ruby and UI constructed using HTML 5, CSS 3, JavaScript running on Ruby interpreter on the device.**
- **Support for SQLite enables the local storage of relational data, enabling offline capabilities for both hybrid and native HTML 5 applications.**

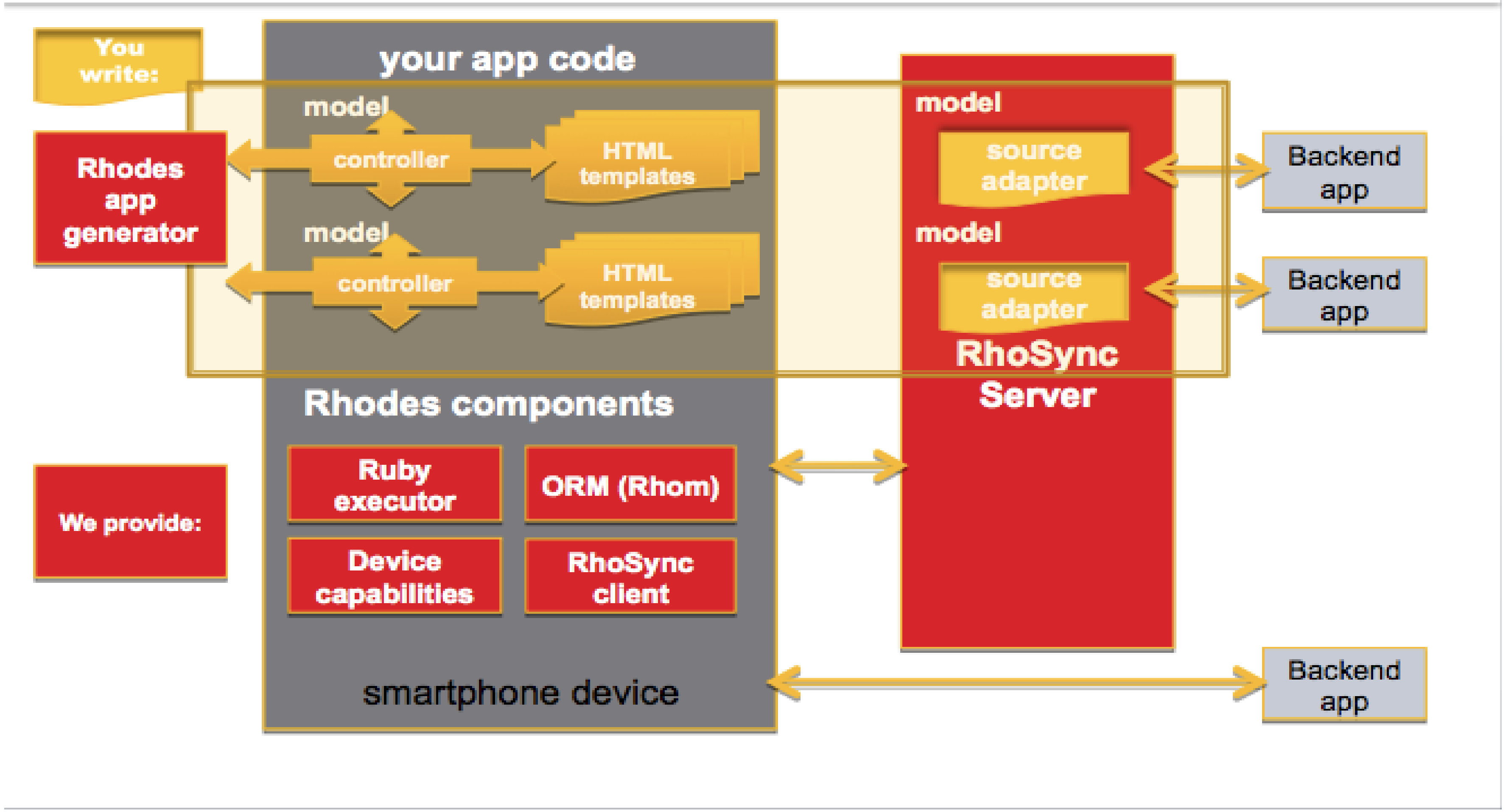
DESIGN PATTERNS:

- **Model-View-Controller pattern for maintainability and best practices.**
- **Object Relational Mapper design for easy data manipulation.**

SUPPORTED PLATFORMS:

- **WM /WEHH , WinCE5.0+, Android 2.1+, iOS 3.0+, BB 4.6+, WP7**

Rhodes Architecture



*http://leckylao.files.wordpress.com/2010/06/screen-shot-2010-06-12-at-3-28-30-pm.png

RhoElements – RhoMobile Suite From Motorola Solutions

HTML 5 FEATURES:

- **App Caching, WebSockets, WebWorkers, Local & Session Storage, SQLite, Semantic Elements, Form Attributes**

IDE USED:

- **RhoStudio – An Eclipse based IDE**

STRENGTHS:

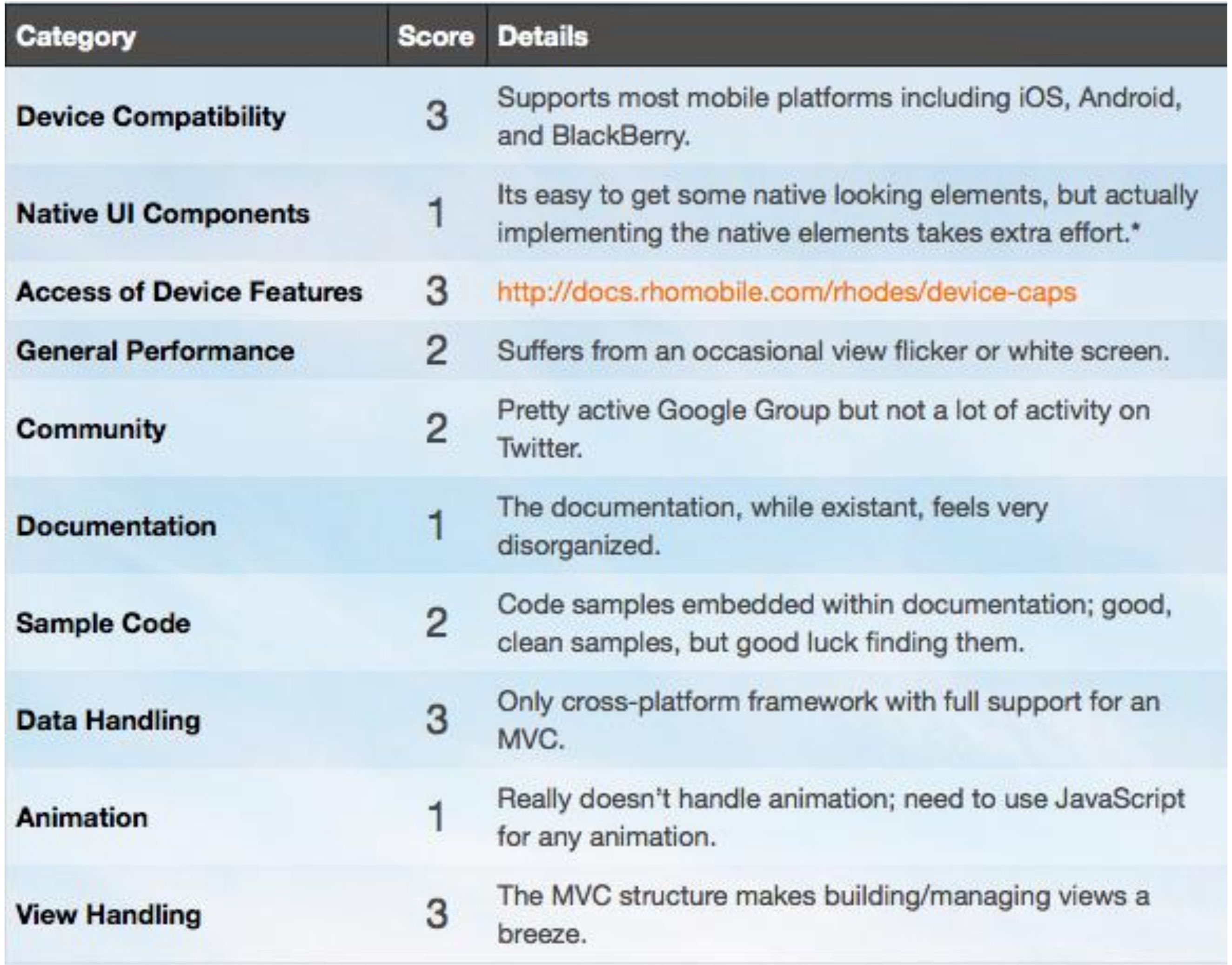
- **Design patterns used.**
- **Applications look and behave identically on all devices.**

WEAKNESSES:

- **Updating HTML/JavaScript code needs a complete rebuild.**
- **Need to know Ruby well, which is not as popular as other programming languages.**
- **Doesn’t generate source code, only native package which can restrict any further tweaking of the app.**

RhoElements – RhoMobile Suite From Motorola Solutions

SCORE (OUT OF 3)



Category	Score	Details
Device Compatibility	3	Supports most mobile platforms including iOS, Android, and BlackBerry.
Native UI Components	1	Its easy to get some native looking elements, but actually implementing the native elements takes extra effort.*
Access of Device Features	3	http://docs.rhomobile.com/rhodes/device-caps
General Performance	2	Suffers from an occasional view flicker or white screen.
Community	2	Pretty active Google Group but not a lot of activity on Twitter.
Documentation	1	The documentation, while existant, feels very disorganized.
Sample Code	2	Code samples embedded within documentation; good, clean samples, but good luck finding them.
Data Handling	3	Only cross-platform framework with full support for an MVC.
Animation	1	Really doesn't handle animation; need to use JavaScript for any animation.
View Handling	3	The MVC structure makes building/managing views a breeze.

[* http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/](http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/)

PHONEGAP
From Nitobi now acquired by Adobe

TECHNICAL ARCHITECTURE:

- **Web approach using hybrid model.**
- **Single source codebase written HTML 5, CSS 3, JavaScript running on a mobile browser embedded in a native app wrapper.**
- **Device capabilities accessed through device-independent JavaScript API.**

SUPPORTED PLATFORMS:

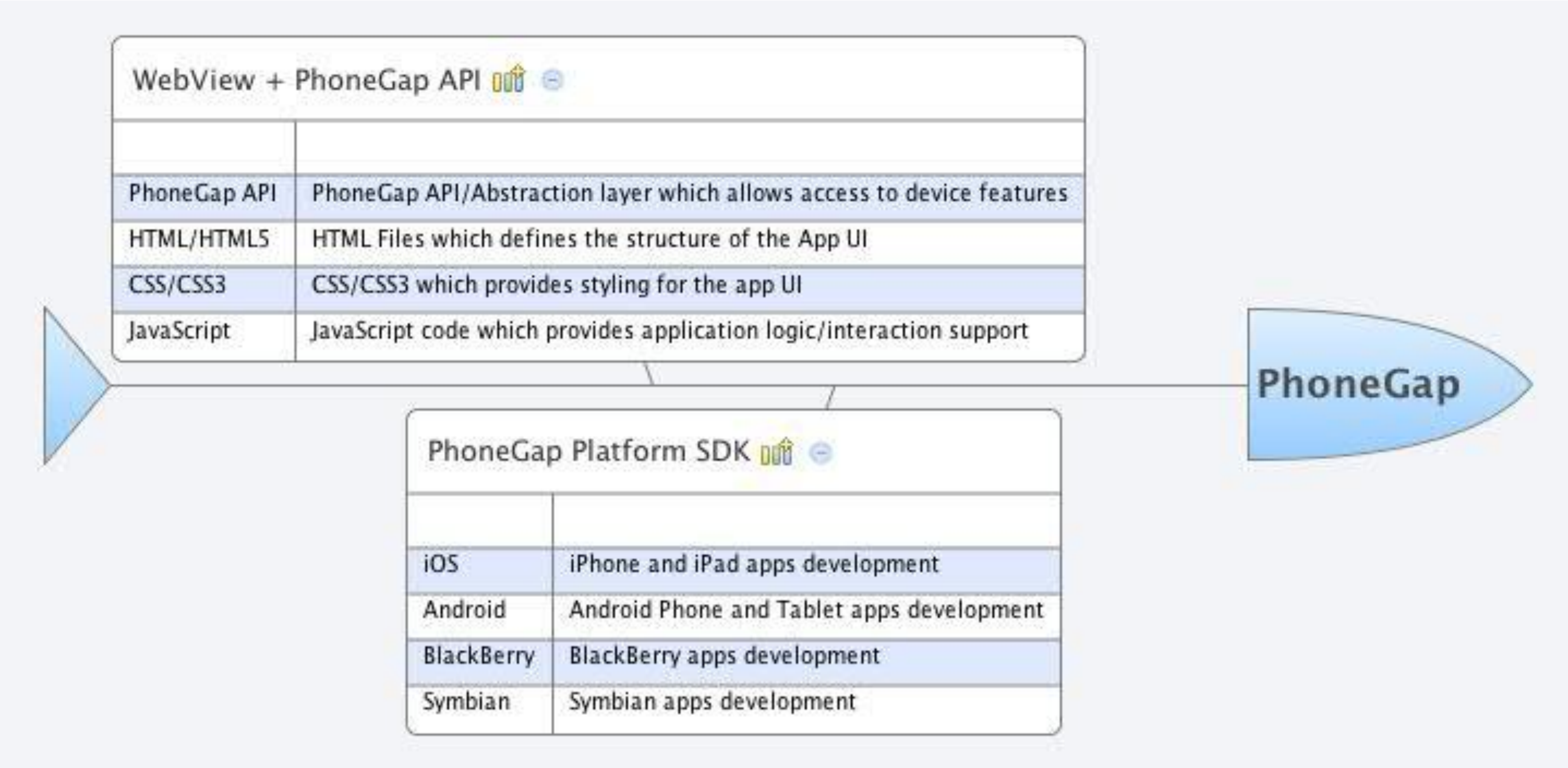
- **iOS, Android, Blackberry, WP7, Symbian, Palm, Samsung Bada**

IDE USED:

- **MAC OS X & XCODE for iPhone & iPad.**
- **Google Android SDK, Eclipse ADT Plugin, Ant as well as Eclipse IDE for Android.**

PHONEGAP
From Nitobi now acquired by Adobe

ARCHITECTURE:



WebView + PhoneGap API

PhoneGap API	PhoneGap API/Abstraction layer which allows access to device features
HTML/HTML5	HTML Files which defines the structure of the App UI
CSS/CSS3	CSS/CSS3 which provides styling for the app UI
JavaScript	JavaScript code which provides application logic/interaction support

PhoneGap Platform SDK

iOS	iPhone and iPad apps development
Android	Android Phone and Tablet apps development
BlackBerry	BlackBerry apps development
Symbian	Symbian apps development

* http://arnab.ch/images/phonegap-architecture.jpg

PHONEGAP
From Nitobi now acquired by Adobe

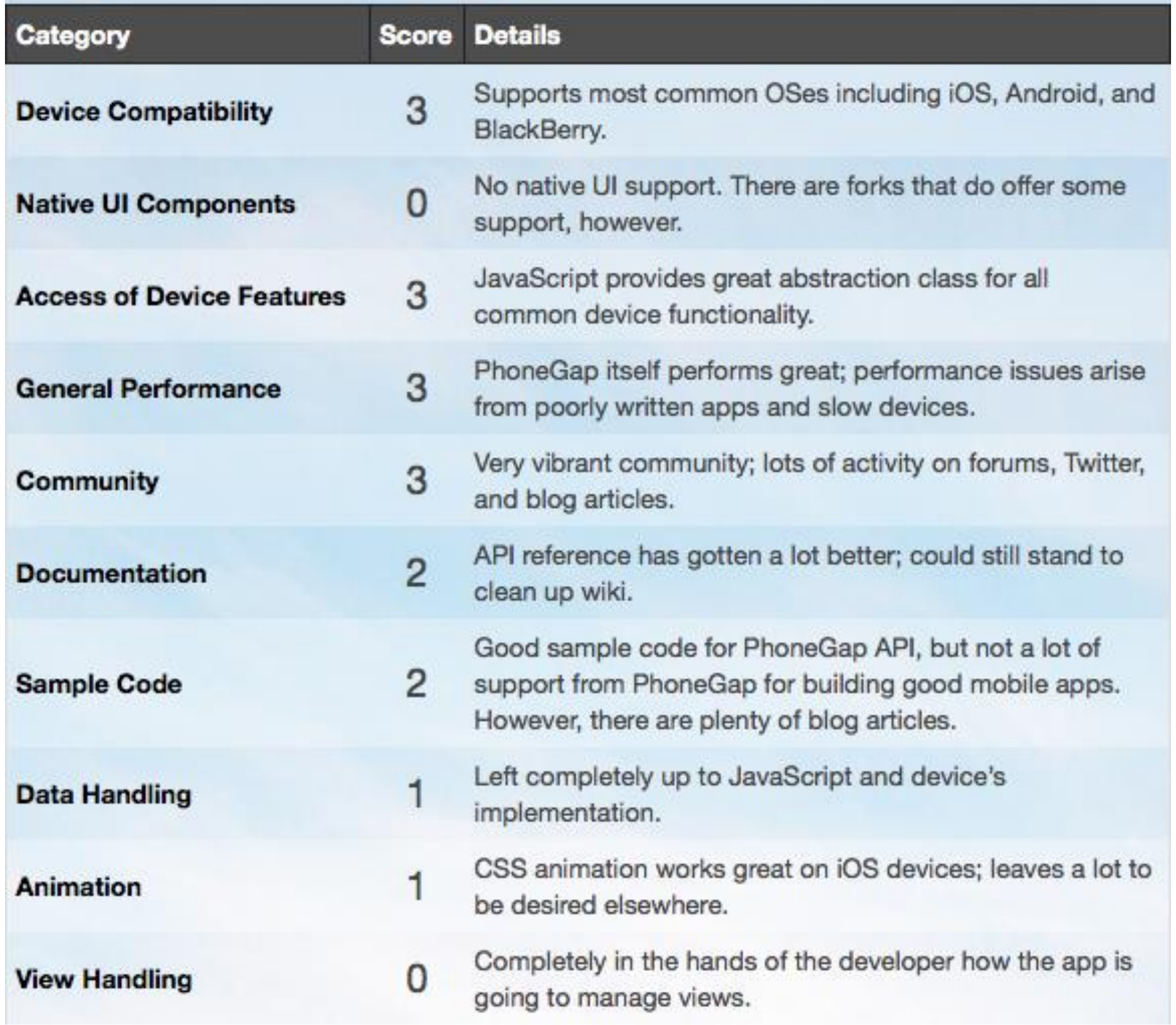
STRENGTHS:

- Native wrapper source code is provided so it can be customized further.
- Simple 'drop-in libraries' concept makes it easier to develop.
- Lowers barriers of adoption for web developers.

WEAKNESSES:

- Lack of support for native UI components, design patterns & development tools.
- The capabilities offered by the framework is limited to what a "WebView" can do.
- Different projects for different platforms
- Different JavaScript files on each platform for PhoneGap itself and plugins
- No native UI support
- Java, Objective-C or C# requirement to create new plugins
- No built-in support for push notifications

PHONEGAP
From Nitobi now acquired by Adobe
SCORE (OUT OF 3)



Category	Score	Details
Device Compatibility	3	Supports most common OSes including iOS, Android, and BlackBerry.
Native UI Components	0	No native UI support. There are forks that do offer some support, however.
Access of Device Features	3	JavaScript provides great abstraction class for all common device functionality.
General Performance	3	PhoneGap itself performs great; performance issues arise from poorly written apps and slow devices.
Community	3	Very vibrant community; lots of activity on forums, Twitter, and blog articles.
Documentation	2	API reference has gotten a lot better; could still stand to clean up wiki.
Sample Code	2	Good sample code for PhoneGap API, but not a lot of support from PhoneGap for building good mobile apps. However, there are plenty of blog articles.
Data Handling	1	Left completely up to JavaScript and device's implementation.
Animation	1	CSS animation works great on iOS devices; leaves a lot to be desired elsewhere.
View Handling	0	Completely in the hands of the developer how the app is going to manage views.

* http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/

TITANIUM
From Appcelerator Inc.

TECHNICAL ARCHITECTURE:

- **Cross compilation technique – Pre-compilation, front-end compilation, platform & package compilation.**
- **Single source codebase written in JavaScript, compiled into native code and packaged for different target platforms.**
- **Does not use browser engine to render user interface on mobile devices.**
- **Instead the UI elements are converted to true native UI elements when deployed to the phone.**

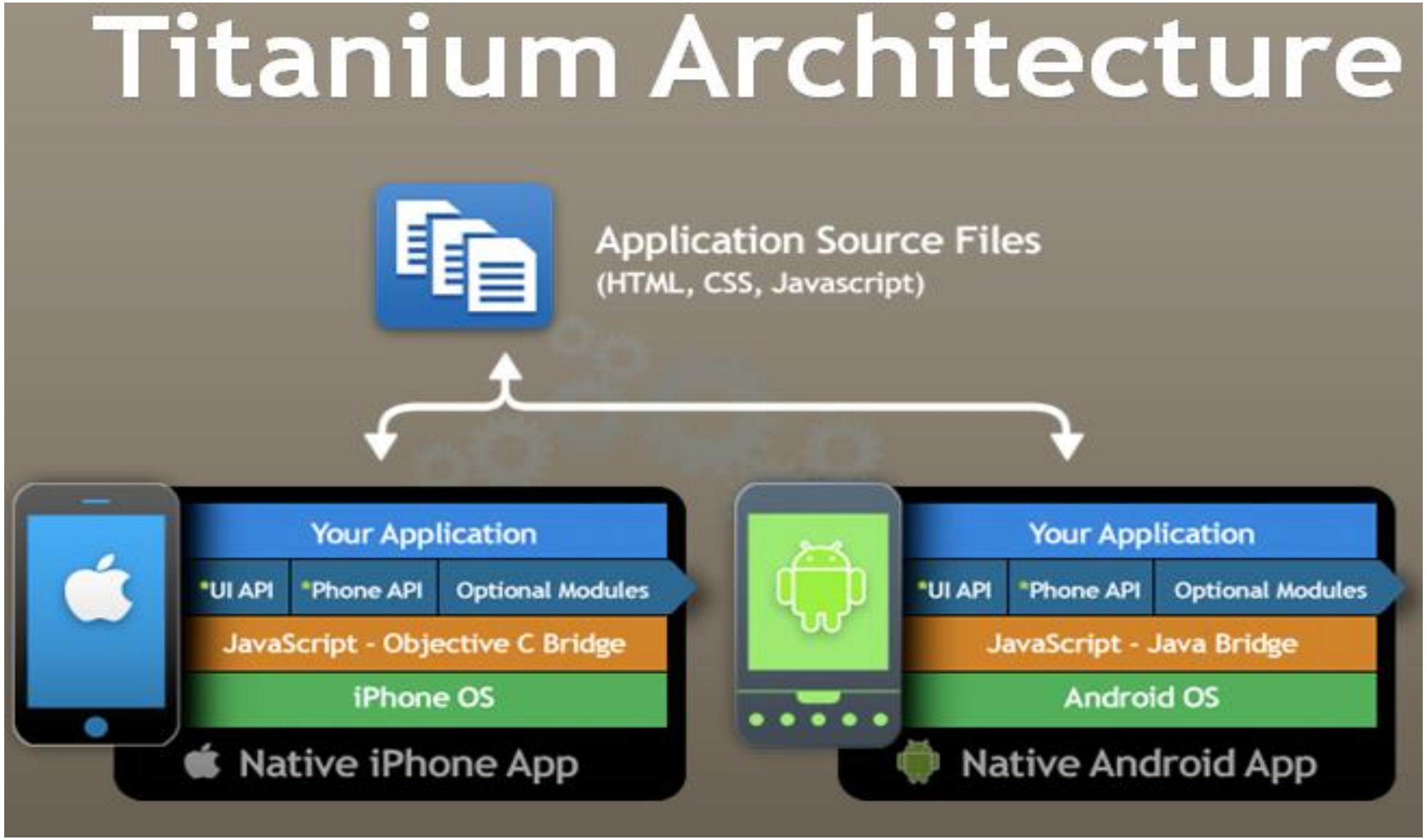
SUPPORTED PLATFORMS:

- **iOS, Android, Windows & Blackberry**

IDE USED:

- **Studio, an Eclipse-based IDE**

TITANIUM
From Appcelerator Inc.



* http://www.linux-mag.com/s/i/articles/7719/architecture1.png

TITANIUM
From Appcelerator Inc.

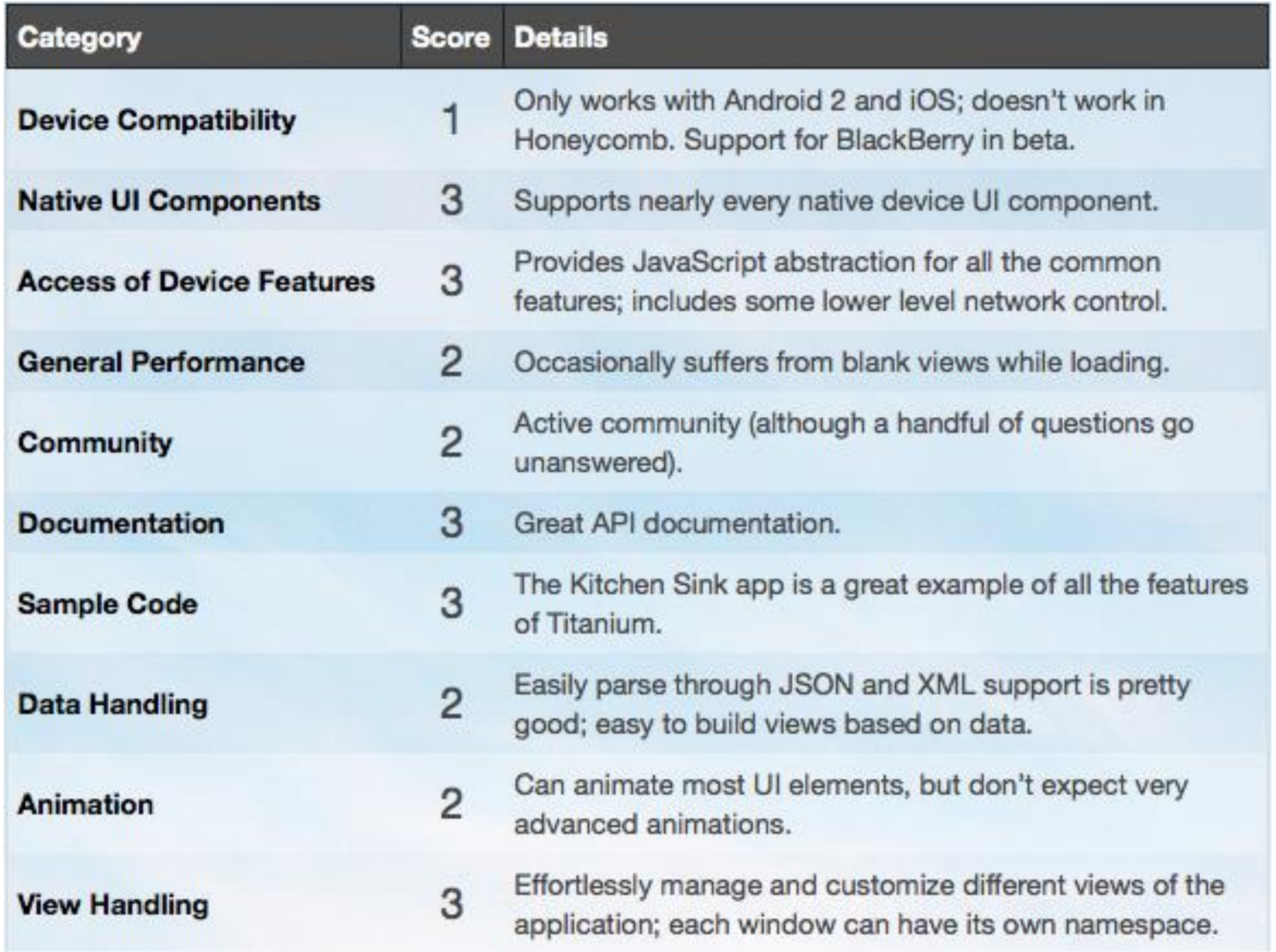
STRENGTHS:

- **Native code output very quick and fluid on the phone.**
- **Easy setup and startup for developers.**
- **Excellent documentation & examples.**
- **Strong community forum to find out answers.**
- **Intuitive app management environment.**
- **Support for desktop and tablet development**

WEAKNESSES:

- **Potentially restrictive API's**
- **Tries to solve too many problems in one shot supporting phones, tablets & desktops.**

TITANIUM
From Appcelerator Inc.
SCORE (OUT OF 3)



Category	Score	Details
Device Compatibility	1	Only works with Android 2 and iOS; doesn't work in Honeycomb. Support for BlackBerry in beta.
Native UI Components	3	Supports nearly every native device UI component.
Access of Device Features	3	Provides JavaScript abstraction for all the common features; includes some lower level network control.
General Performance	2	Occasionally suffers from blank views while loading.
Community	2	Active community (although a handful of questions go unanswered).
Documentation	3	Great API documentation.
Sample Code	3	The Kitchen Sink app is a great example of all the features of Titanium.
Data Handling	2	Easily parse through JSON and XML support is pretty good; easy to build views based on data.
Animation	2	Can animate most UI elements, but don't expect very advanced animations.
View Handling	3	Effortlessly manage and customize different views of the application; each window can have its own namespace.

* http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/

MoSync
From MoSync AB

TECHNICAL ARCHITECTURE:

- **Cross compilation using Virtual Machine.**
- **Single source codebase written in C/C++ or HTML/JavaScript or a combination of both.**
- **C++ source code → platform-independent intermediate code → application package**

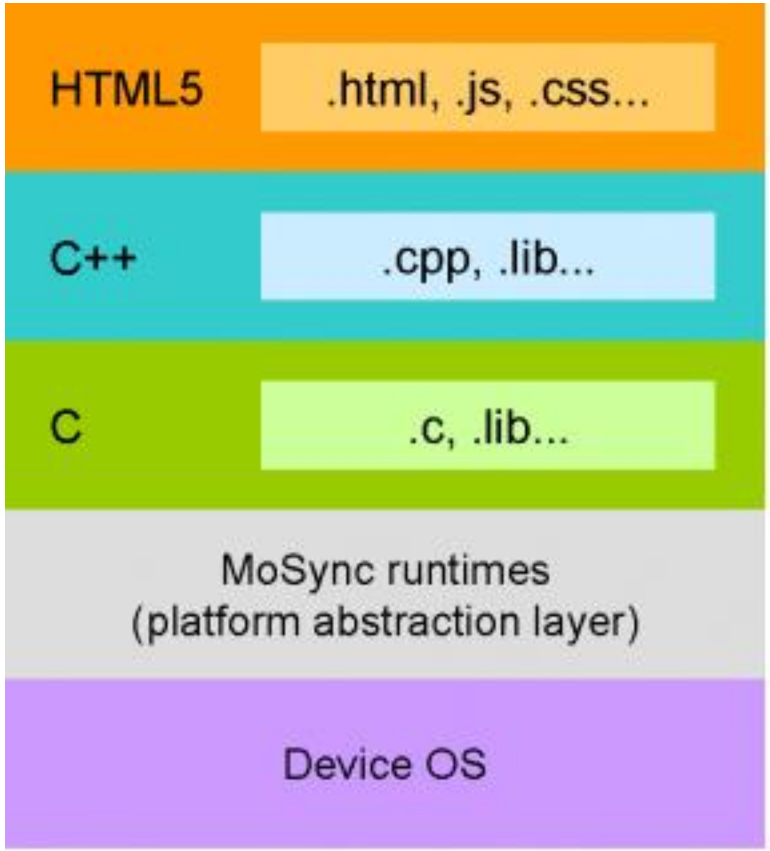
SUPPORTED PLATFORMS:

- **iOS, Android, Windows Mobile, Moblin/MeeGo, Symbian & Blackberry**

IDE USED:

- **MoSync IDE based on Eclipse.**

MoSync
From MoSync AB



MoSync mobile App layers

http://www.straightforward.se/storyserver/sites/straightforward.se.storyserver/files/images/MoSyncAppArchitecture.preview.png

MoSync From MoSync AB

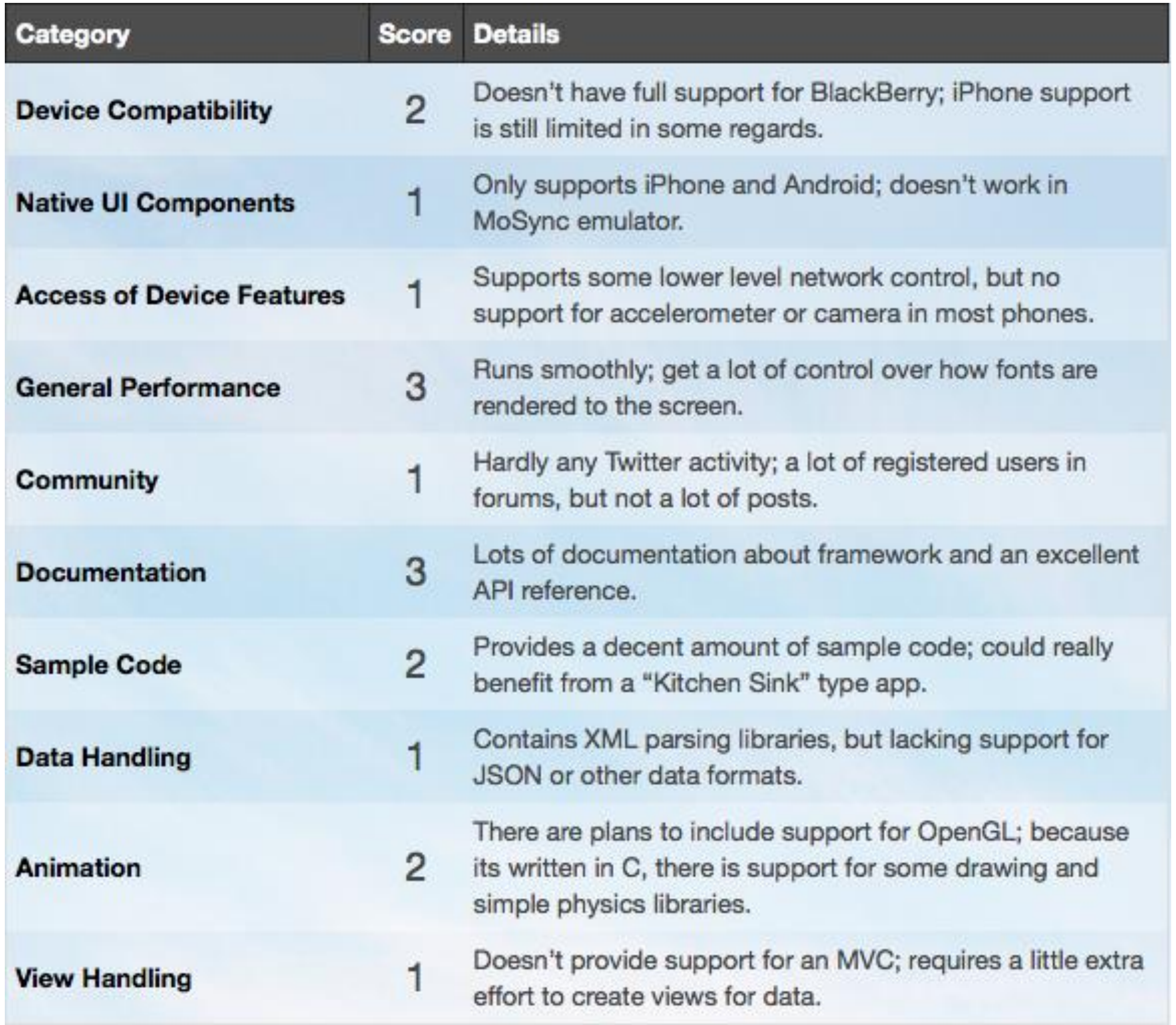
STRENGTHS:

- **Only one project structure for all the platforms.**
- **The same JavaScript file.**
- **Extend JavaScript functionality using C++ or Java and Objective-C**
- **Native UI support**
- **Built-in support for push notifications**
- **Target group: Both web developers looking to enter the mobile space, as well as the ordinary PC/Mac desktop developer with knowledge of C/C++.**

WEAKNESSES:

- **No support for accelerometer or camera in most phones.**
- **Contains XML parsing libraries but lacking support for JSON or other data formats.**
- **Doesn’t provide support for MVC; requires little extra effort to create views for data.**

MoSync
From MoSync AB
SCORE (OUT OF 3)

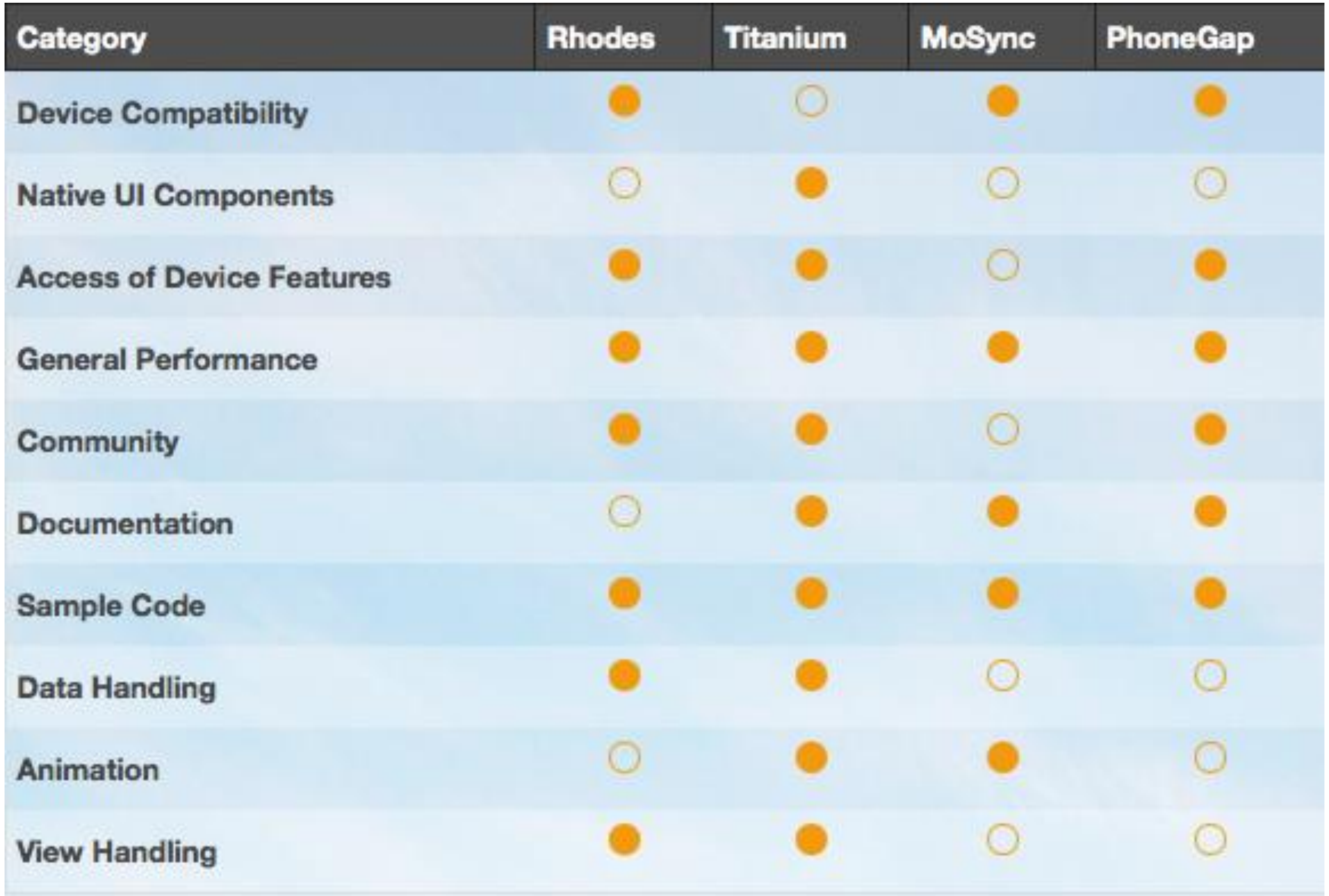


Category	Score	Details
Device Compatibility	2	Doesn't have full support for BlackBerry; iPhone support is still limited in some regards.
Native UI Components	1	Only supports iPhone and Android; doesn't work in MoSync emulator.
Access of Device Features	1	Supports some lower level network control, but no support for accelerometer or camera in most phones.
General Performance	3	Runs smoothly; get a lot of control over how fonts are rendered to the screen.
Community	1	Hardly any Twitter activity; a lot of registered users in forums, but not a lot of posts.
Documentation	3	Lots of documentation about framework and an excellent API reference.
Sample Code	2	Provides a decent amount of sample code; could really benefit from a "Kitchen Sink" type app.
Data Handling	1	Contains XML parsing libraries, but lacking support for JSON or other data formats.
Animation	2	There are plans to include support for OpenGL; because its written in C, there is support for some drawing and simple physics libraries.
View Handling	1	Doesn't provide support for an MVC; requires a little extra effort to create views for data.

* http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/

COMPARISON OVERVIEW

Below is a summary of each platform and whether it offers adequate support for a given area. (Scored 2 or better in that criteria)

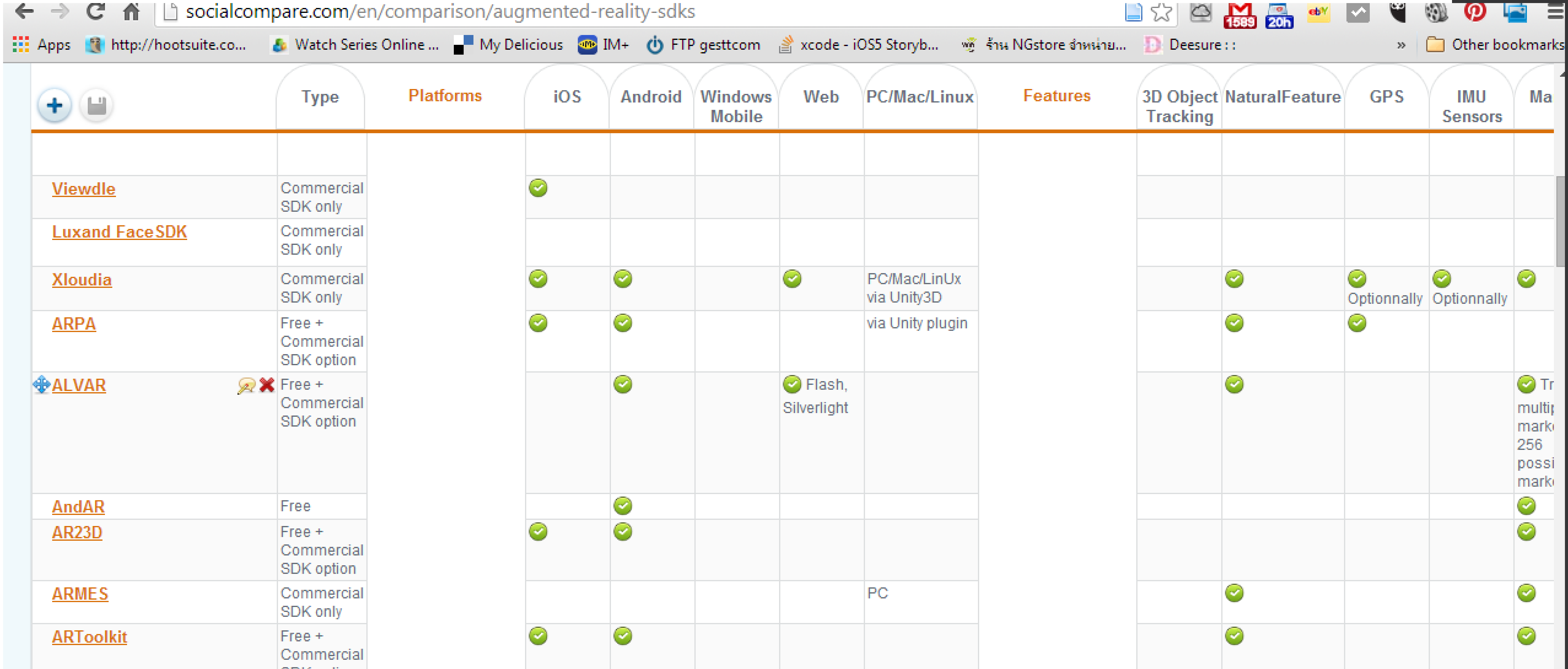


Category	Rhodes	Titanium	MoSync	PhoneGap
Device Compatibility	●	○	●	●
Native UI Components	○	●	○	○
Access of Device Features	●	●	○	●
General Performance	●	●	●	●
Community	●	●	○	●
Documentation	○	●	●	●
Sample Code	●	●	●	●
Data Handling	●	●	○	○
Animation	○	●	●	○
View Handling	●	●	○	○

* http://floatlearning.com/2011/07/which-cross-platform-framework-is-right-for-me/

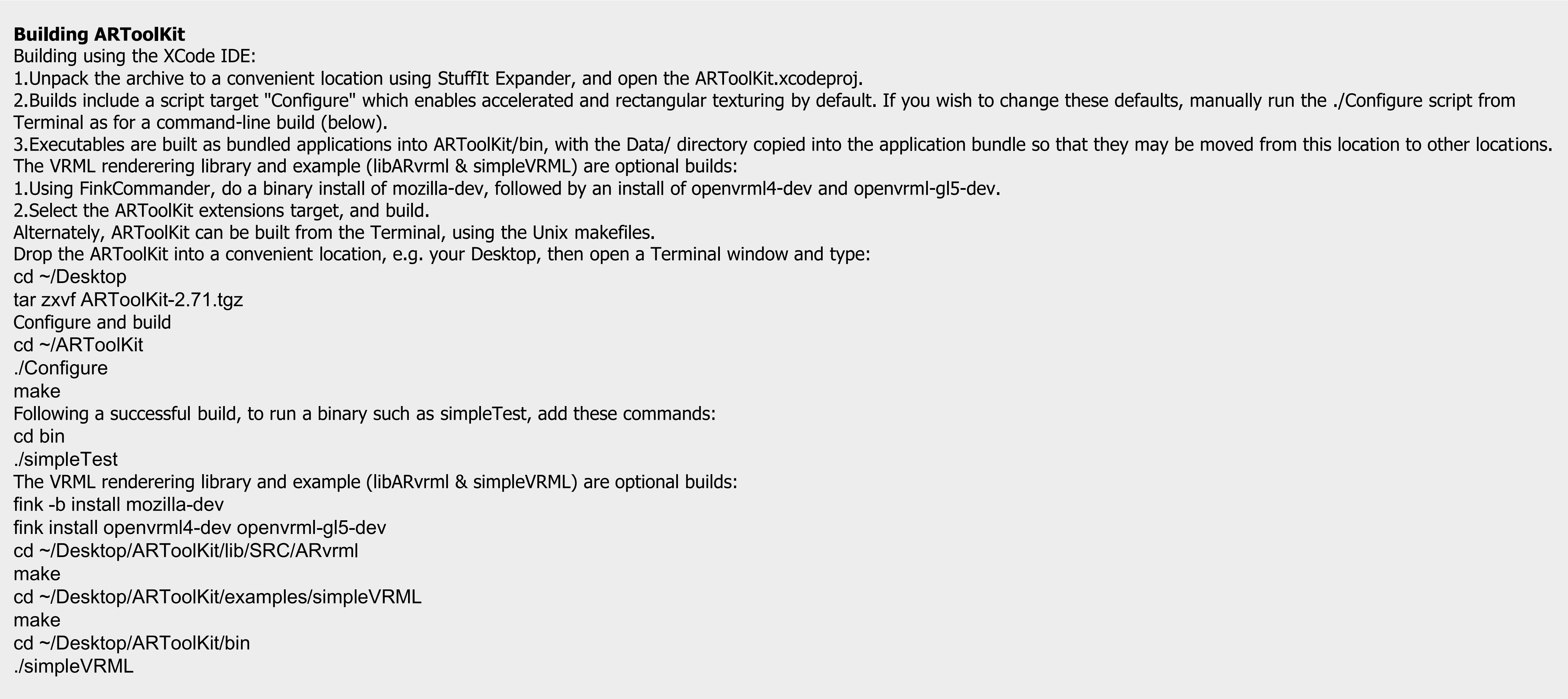
http://socialcompare.com/en/comparison/augmented-reality-sdks

Augmented Reality on mobile



	Type	Platforms	iOS	Android	Windows Mobile	Web	PC/Mac/Linux	Features	3D Object Tracking	NaturalFeature	GPS	IMU Sensors	Ma
Viewdle	Commercial SDK only		✓										
Luxand FaceSDK	Commercial SDK only												
Xloudia	Commercial SDK only		✓	✓		✓	PC/Mac/LinUx via Unity3D			✓	✓ Optionnally	✓ Optionnally	✓
ARPA	Free + Commercial SDK option		✓	✓			via Unity plugin			✓	✓		
ALVAR	Free + Commercial SDK option			✓		✓ Flash, Silverlight				✓			✓ Tr multi marke 256 possi marke
AndAR	Free			✓									✓
AR23D	Free + Commercial SDK option		✓	✓									✓
ARMES	Commercial SDK only						PC			✓			✓
ARToolkit	Free + Commercial		✓	✓						✓			✓

Augmented Reality on mobile



Building ARToolKit

Building using the XCode IDE:

1.Unpack the archive to a convenient location using StuffIt Expander, and open the ARToolKit.xcodeproj.

2.Builds include a script target "Configure" which enables accelerated and rectangular texturing by default. If you wish to change these defaults, manually run the ./Configure script from Terminal as for a command-line build (below).

3.Executables are built as bundled applications into ARToolKit/bin, with the Data/ directory copied into the application bundle so that they may be moved from this location to other locations.

The VRML renderering library and example (libARvrml & simpleVRML) are optional builds:

1.Using FinkCommander, do a binary install of mozilla-dev, followed by an install of openvrml4-dev and openvrml-gl5-dev.

2.Select the ARToolKit extensions target, and build.

Alternately, ARToolKit can be built from the Terminal, using the Unix makefiles.

Drop the ARToolKit into a convenient location, e.g. your Desktop, then open a Terminal window and type:

```
cd ~/Desktop
tar zxvf ARToolKit-2.71.tgz
```

Configure and build

```
cd ~/ARToolKit
./Configure
make
```

Following a successful build, to run a binary such as simpleTest, add these commands:

```
cd bin
./simpleTest
```

The VRML renderering library and example (libARvrml & simpleVRML) are optional builds:

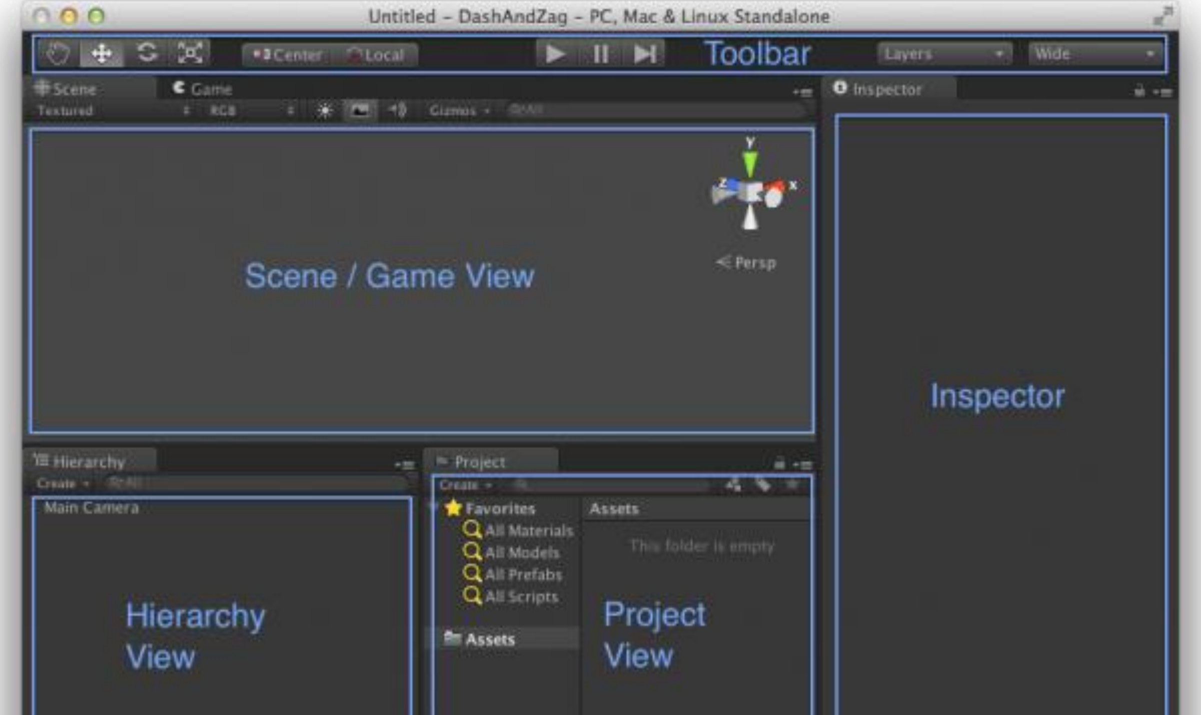
```
fink -b install mozilla-dev
fink install openvrml4-dev openvrml-gl5-dev
cd ~/Desktop/ARToolKit/lib/SRC/ARvrml
make
cd ~/Desktop/ARToolKit/examples/simpleVRML
make
cd ~/Desktop/ARToolKit/bin
./simpleVRML
```

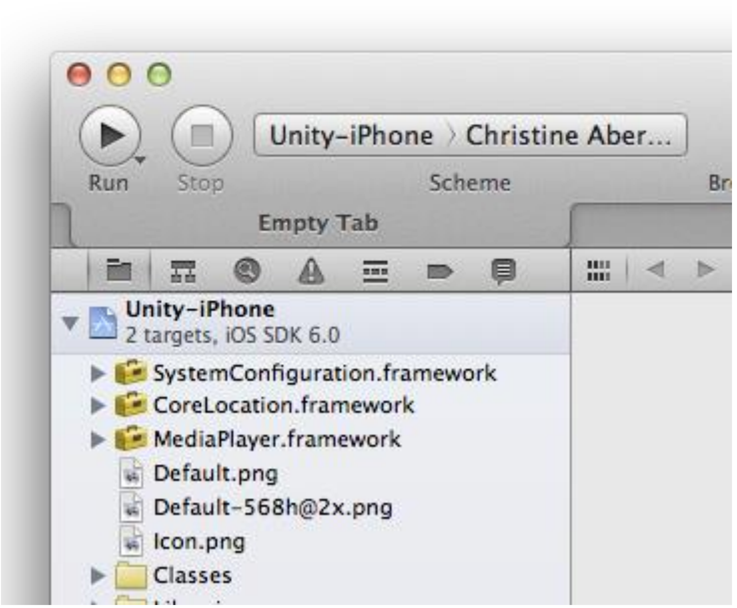
http://www.hitl.washington.edu/artoolkit/documentation/usersetup.htm

http://www.artoolworks.com/support/library/ARToolKit_for_iOS

Unity

- http://www.artoolworks.com/support/library/Getting_Started_with_ARToolKit_for_Unity
- http://www.raywenderlich.com/25205/beginning-unity-3d-for-ios-part-13
- http://docs.unity3d.com/Manual/StructureOfXcodeProject.html





- Unity-iPhone
  2 targets, iOS SDK 6.0
  - SystemConfiguration.framework
  - CoreLocation.framework
  - MediaPlayer.framework
  - Default.png
  - Default-568h@2x.png
  - Icon.png
  - Classes

References:

CROSS-PLATFORM MOBILE APPLICATION DEVELOPMENT Lecture

Note by Ramya Balaraman

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