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Comparative Study on Mobile Platforms

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ABSTRACT: Developers can take advantage of native functionality across mobile devices. More than a smaller, web like interface, an Android, BlackBerry, WP7, or iOS device can make phone calls as well as record and transmit contextual information like geolocation.

KEYWORDS: Android, BlackBerry, WP7 and ios

I. INTRODUCTION

Currently Android holds the top spot in mobile device market share. Android development should be at the forefront of your mobile app strategy. This paper discusses what it takes to get started developing apps on the Android platform. From start to finish, it provides all the resources for a developer who has never developed on the Android platform to deploy an app. iPhones and iPads have become the devices that many people compare other mobile devices to. Apple devices helped launch the mobile trend, but many developers are hesitant to start developing for iOS because of the tools that Apple provides. This paper will help alleviate your worries, and provide clear examples of what it takes to develop an iOS app from start to finish and deploy to iTunes.

Windows Phone 7 is considered the new kid on the block when it comes to mobile platforms. Even though the market share is low, it is climbing fast, and is important to include within your mobile app strategy. This paper covers everything you need to create a Windows Phone 7 app from start to finish and deploy to the market. Even though BlackBerry has lost market share in recent years, it's still important to understand where BlackBerry fits within your mobile strategy.

II. COST OF DEVELOPMENT

There are many costs associated with mobile application development. Each developer will need hardware and software to develop the applications on. The team will need devices to test the software on. And if you want to deploy your application to any public market, then your company will need accounts on the various markets (these often renew annually).

Hardware

To develop good mobile apps, you'll need an Intel-based Mac because, simply put, you won't be able to physically build the iOS implementation of your application without one. The nice thing about the Intel versions of Mac is that you can run Windows on them either virtually (using something like Parallels, or VMWare Fusion) or on the bare metal (using Apple's BootCamp). Expect to spend between \$800 (for a refurbished machine) and \$1600 (for a brand-new machine).

- BlackBerry (6 or 7): BlackBerry Bold 9900
- Android 3.0 Tablet: Samsung Galaxy Tablet
- Apple iPod Touch: iPod Touch 3rd Generation

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Software

When developing mobile applications there are few overlaps when it comes to software. To develop for iOS you need a Mac, to develop for BlackBerry you need Windows, for Java-based frameworks use Eclipse. Building HTML for PhoneGap can be done in your text editor of choice.

TARGETED FRAMEWORK	SOFTWARE REQUIRED
Window Phone 7	Windows Phone SDK Visual Studio Express Expression Blend for Windows Phone (Windows only)
iOS	xCode 4, IOS SDK xCode 4.1, IOS SDK (on Mac OS X 107) (Mac Only)
Android	Eclipse, Android SDK
BlackBerry	Eclipse, BlackBerry Plugin, BlackBerry Simulator (only works on Windows)

Table 1: Software Needed for Development

Table 1 show to develop Window Phone 7 applications we required windows phone SDK, Visual Studio Express and Expression Blend Software. For IOS applications development required software are xCode 4, IOS SDK. For Android applications required software are Eclipse, Android SDK. For BlackBerry applications required software's are Eclipse, BlackBerry plug-in, and simulator.

Licenses and Developer Accounts

The following table contains information regarding all of the various accounts necessary to develop for each platform and costs associated with such. In most cases you can expect to pay roughly \$100 per platform annually for developer accounts

PLATFORM	URL	CAVEATS
BlackBerry	http://us.blackberry.com/developers/appworld/distribution.jsp	
Titanium	https://my.appcelerator.com/auth/signup/offer/community	
Windows Dev Marketplace	http://create.msdn.com/en-US/home/membership	Can submit unlimited paid apps, can submit only 100 free apps. Cut of Market Price to Store: 30%
Apple iOS Developer	http://developer.apple.com/programs/start/standard/create.php	Can only develop ad-hoc applications on up to 100 devices. Developers who publish their applications on the App Store will receive 70% of sales revenue, and will not have to pay any distribution costs for the application.
Android Developer	https://market.android.com/publish/signup	Application developers receive 70% of the application price, with the remaining 30% distributed among carriers and payment processors.

Table 2: Licenses and Developer Accounts

Table 2 shows Licenses and Developer Accounts for

BlackBerry platform in <http://us.blackberry.com/developers/appworld/distribution.jsp>, Titanium platform in <https://my.appcelerator.com/auth/signup/offer/community>, Windows Dev Marketplace in <http://create.msdn.com/en-US/home/membership>, Apple iOS Developer in <http://developer.apple.com/programs/start/standard/create.php>

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Android Developer in <https://market.android.com/publish/signup>.

III. INTERFACES AND ARCHITECTURE

Get started on Android application design with these hints:

- Android convention is to place view-control tabs across the top, and not the bottom, of the screen.
- Use the main application icon for temporal, hierarchical navigation, instead of a “back” button and main icon link to the home screen.
- Don’t mimic user interface elements or recycle icons from other platforms. For instance, list items should not use carets to indicate deeper content.
- Parallax scrolling is common in Android applications.
- Android development can extend to home-screen “widget” tools.

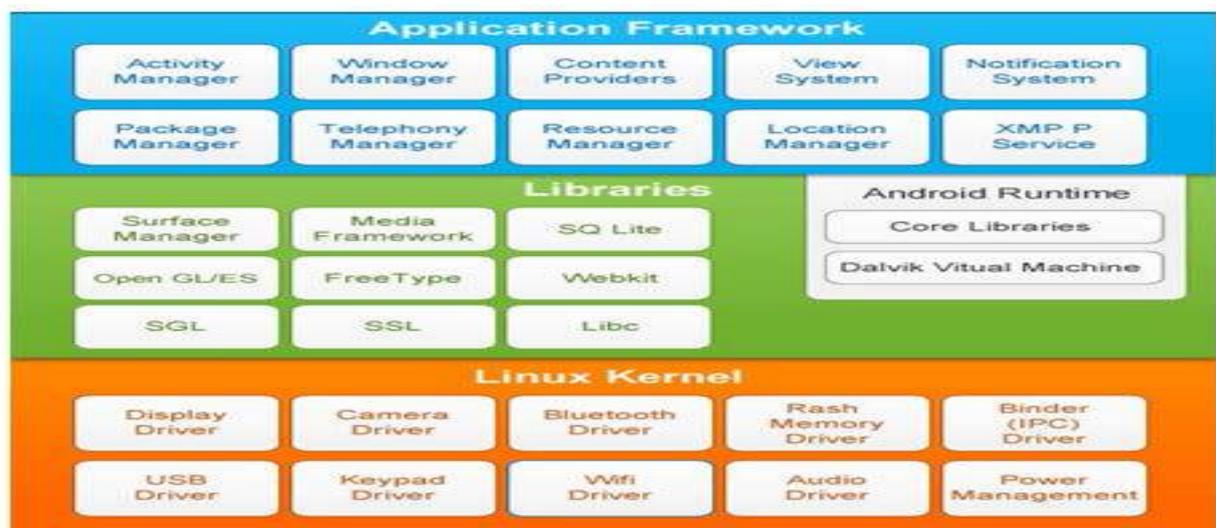


Figure 1: Google’s Android OS Architecture

Figure 1 shows the Android platform contains the following layers:

- i. **Linux Kernel:** Android relies on Linux for core system services such as security, memory management, process management and so on.
- ii. **Android Runtime:** it provides a set of core libraries which supports most of the functionality in the core libraries of Java. The Android Virtual Machine known as Dalvik VM relies on the Linux kernel for some underlying functionality.
- iii. **Libraries:** Android includes a set of C/C++ libraries. These libraries are exposed to developers through the Android application framework. They include media libraries, system C libraries, surface manager, 3D libraries, SQLite and so on.
- iv. **Application Framework:** it provides an access layer to the framework APIs used by the core applications. It allows components to be used by the developers.

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Apple can reject an application from the official App Store because of design problems. Follow the current guidelines closely, starting with these tips:

Windows Phone 7 interfaces are minimalist, using empty space to lend clarity to the application.

- WP7 uses movement over gradients for on-screen elements to immerse users in the application experience.
- Users will enter a WP7 application from a “tile,” which can display dynamic and real-time information. Tile images should be in the PNG format, 173 pixels _ 173 pixels at 256 dpi.
- Do not use a “back” button to navigate back the page stack. All WP7 devices have a dedicated hardware button that should always be used instead.
- Give users a distinctly WP7 experience. Panorama controls slide horizontally through panes, and pivot controls list panes users can visit. Uniform Page Shuffle presents nonhierarchical information users can shuffle through; “leaf-blowing turn” flips content area into focus, scattering and tilting tiles leaving focus.

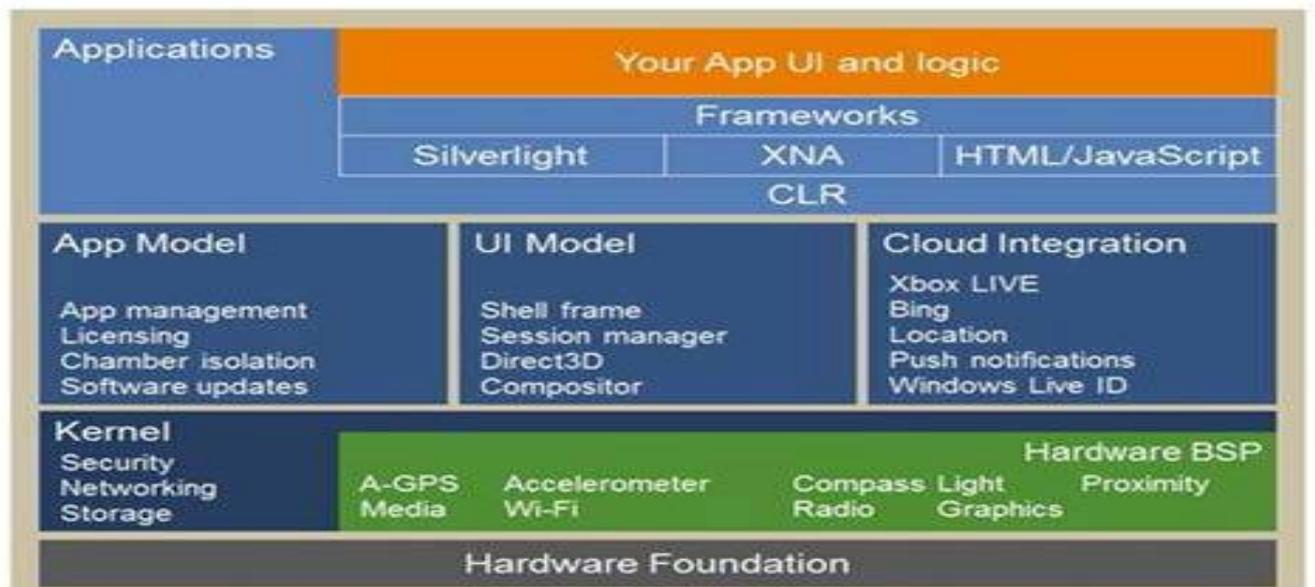


Figure 2: Microsoft's Windows Phone Architecture

Figure 2 shows: Windows Phone 7's architecture required a hardware layer that meets Microsoft's minimum system requirements: an ARM7 CPU, a DirectX 9-capable GPU, 256MB RAM and 8GB of flash memory, a 5-megapixel camera, a multi-touch capacitive display, an A-GPS, an accelerometer, a compass, proximity and light sensors, and six physical buttons: back, start, and search; camera, power/sleep. The Windows Phone kernel handles low - level device driver access as well as basic security, networking, and storage. Three libraries: an App Model for application management, a UI model for user-interface management, and a Cloud Integration module for web search via Bing, location services, push notifications, and so on sit above the kernel. Application-facing APIs include Sliverlight, XNA, HTML/JavaScript and the Common Language Runtime (CLR) that supports C# or VB .Net applications. The kernel itself is a proprietary Windows OS design for embedded devices that combines Windows Embedded CE 6.0 R3 and Windows Embedded Compact 77.

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When designing a BlackBerry mobile application, keep these standards in mind:

- Use standard interaction behaviors for an intuitive experience.
- Link common tasks to the BlackBerry track pad according to standard actions:
- Press the track pad: Default option, like revealing the menu
- Press and hold track pad: Activate available pop-up box
- Press track pad and select Shift: Highlight content
- Press track pad and select Alt: Zoom
- Move finger along track pad: Cursor or mouse will move accordingly

IV. ACCESSIBILITY

Google provides guidelines and recommendations, such as testing with the often-preinstalled and always-free TalkBack. Accessibility design guidelines are listed on the Android Developer website (<http://developer.android.com/guide/topics/ui/accessibility/index.html>), and further discussed by the Google “Eyes Free” project (http://eyes-free.googlecode.com/svn/trunk/documentation/android_access/index.html)

See Apple’s Accessibility Programming Guide

(http://developer.apple.com/library/ios/#documentation/UserExperience/Conceptual/iPhoneAccessibility/Accessibility_on_iPhone/Accessibility_on_iPhone.html) for detailed guidelines on VoiceControl, Speech Synthesis, and VoiceOver. Accessible touch and gestural controls are available on the iPad and later generation iPhones; screen magnification and color contrast adjustments are also available.

BlackBerry mobile devices include text-based push-delivery messages, closed captions on multimedia content, and hearing-aid compatibility for hearing accessibility issues. Low-vision users can use the Clarity theme and other screen adjustments, and benefit from tactile keyboards. Predictive text and AutoText aid users with mobility and cognitive issues. Best practices and device capabilities are maintained online at http://docs.blackberry.com/en/developers/deliverables/17965/Accessibility_825872_11.jsp.

WP7 devices include many standard accessibility features, such as color and contrast adjustment to themes for low-vision users. Many, but not all, devices are compatible with TTY, TDD, and hearing aids.

Learn more about the basics of WP7 accessibility at

<http://www.microsoft.com/windowsphone/en-us/howto/wp7/basics/ease-of-access-on-my-phone.aspx>.

The full Accessibility and Ergonomic Guidelines for Windows Phone 6.5 are a good in-depth start, and are available at <http://msdn.microsoft.com/en-us/library/bb158589.aspx>.

V. CONCLUSION

Recent years have witnessed the emergence of a number of competing technological platforms for mobile communication devices where device manufacturers go beyond the terminal market and take share in the value creation at services and content level. The paper has been able to review and compare the major mobile operating systems and user interface toolkits from technological and developers’ standpoints. With respect to mobile operating systems, Symbian has for long time been the dominating technology, however, it seems that in the transition to the smart phones other operating systems like Android, iOS, BlackBerry OS and Windows phone are in the lead presently. Specifically, the Google’s Android initiative of developing an OS which can run on all mobile devices has many made the Android the most used and popular mobile operating the world over. With respect to software platforms, Java ME has been the far dominating platform for mobile devices. However, it has been heavy and slow to work with. In the recent years Qt is getting more attention and focus as it is highly platform agnostic and does not have the extra layer of complexity.

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An analysis of the various mobile operating systems reviewed with their corresponding business models and the deployed software development platform is depicted in Table 3 below.

	Android OS	iOS	Windows Phone	Blackberry OS
Deployed Software Development	Java, C/C++ Python, Lua	Objective-C, C/C++	.NET Languages (C#, VB.NET, F#, etc.), VB, C++, JScript	Java
Market Size	Very High	High	Medium	Low
SDK Platform	Windows XP, Vista and 7; Linux, Mac OS X	Mac OS X Snow Leopard 10.6.4	Windows Vista & 7	32-bit Windows XP, Vista and 7
Openness to Application Developers	Very High	Very Low	Medium	Low
OS Family	Linux	Darwin	Windows CE 7 Windows NT 8	QNX
Supported CPU Architecture	ARM, MIPS, x86	ARM	ARM	ARM
Application Store	Android Market	iPhone App Store	Windows Market Place	Blackberry App World
Future Prospect	Very High	High	Medium	Low

Table 3: Comparison of Major Mobile Operating Systems

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