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Mobile Application Development Tools and Frameworks

Introduction

Within the field of software development, mobile applications are effective ways to make a service available through many platforms at once. The first mobile applications were simple games like Pong, Tetris, and Tetris on Nokia phones in the 1970s stored locally on phones [1]. However, modern mobile software development is focused on making complex, real-time cross-platform products that are accessible through multiple devices. This paper will review the different development tools and platforms used to create mobile applications; in addition, it will compare the popular operating systems and programming languages these platforms use as the base of mobile applications.

Types and Platforms of Mobile Applications

Current day mobile applications are split into two main formats – native and web. Native applications are made using a higher level programming languages like Java, Objective C, and Swift. The advantage of native applications is the ability to use specialized hardware from a specific operating system [2]. However, a different version of the application has to be developed for each operating system, which incurs more maintenance costs [2].

On the other hand, web applications use HyperText Markup Langauge (HTML) as the base and are accessible from any browser, as all browsers read HTML. Hence, they are naturally cross-platform. HTML forms the base of all web pages, while different languages like Cascading Style Sheets (CSS), Ruby/Ruby on Rails, or Javascript can be used to add additional features [2]. The disadvantage of mobile apps is that the functionality of web browsers is limited due to mobile web browser software having less features than personal computer versions of the same software [2]. Mobile browsers cannot perform the same functionality because they have less processing power and RAM than computers.

To develop either type of mobile application, a platform must be used to write code in the proper format, provide a platform to build the code, and provide testing utilities to the developer. Google and Apple have provided open source languages for their systems and platforms that can compile and run on any machine. Google's Android operating system provides the Android Studio Integrated Development Environment (IDE) and open source Application Program Interfaces (APIs) [3]. Apple has released Swift, is own open source language with APIs that can run on any UNIX based system [4].

In addition to free platforms where developers can create applications from scratch, companies sell environments to create complex web applications for a monthly fee. One popular niche platforms is Unity, which is used to create cross-platform games, and costs 75 dollars per month for a single user [5]. Xamarin provides C# tools shareable across multiple devices to develop both native and web apps at 25-258$ a month [5]. Appcelerator is another tool that harnesses a Javascript base to create native and web apps with additional support for real-time analytics; it costs between 39 to 259 dollars depending on features requested [5]. The paid applications have element templates so the developer can create quicker, but once an app is designed on a paid platform a monthly payment is required for the app to keep running.

Operating Systems and Programming Languages Behind Mobile Applications

The base for all development on mobile applications are the operating systems and programming languages that together transform human readable code into a visual graphical user interface (GUI) with intractable elements that the customer sees. The two most popular operating systems are Android, with 87.6% market share, and iOS, with 11.7% market share [6]. Other competitors like Windows exist but Android and iOS together control more than 99% of the market share as of Q2 2016.

Web Applications run on any operating system using HTML as the base language to structure all the webpage components. To add style and artistic elements, CSS needs to be embedded into the HTML so it can define how the webpage looks [2]. Javascript allows to user to interact with dynamic content on webpages [2]. Most of these languages are lightweight and load quickly, but Javascript does not because it is not a static typed language [7]. One way to improve Javascript performance is to offload some processing to the cloud or programs based in other programming languages [7].

The Android operating system is based on the Linux kernel and is developed by Google. All documentation is open source, but the primary software development language used is Java, as that is officially supported by developer documentation and APIs [3]. It is integrated in most non-Android smartphones through an embedded lightweight version of Java [1]. One advantage of Java is that it is not platform-dependent because code runs on the Java Virtual Machine (JVM) rather than compiling on the host operating system. Hence, Java can run on both Android machines, where Java is integrated into the OS, and other machines without built-in Java functionality.

The iOS operating system is based on the Darwin kernel, a UNIX based kernel [4]. The iOS operating system has a strong focus on visual design, with buttons, switches, views, and other GUI elements built as core components of the operating system. Developers use Objective C for lower level operations like memory management while using Swift, Apple’s open source language to create design and higher level features.

References

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