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Hybrid Mobile Application Frameworks

Introduction

Developing modular mobile applications that have a user friendly interface and are accessible to billions of people via multiple mobile operating systems is in demand. Unlike Native Mobile Applications, which are designed for one mobile operating system, Hybrid Mobile Applications (HMA) are made using cross-compatible web technologies, allowing for the compatibility with multiple operating systems [1]. This paper reviews HMA frameworks that can deploy an application in both Android and Apple mobile operating systems, communicate with cloud based web services and embedded systems, and have a user interface that is intuitive, simple, and modern.

Applications of Hybrid Mobile Application Frameworks

Overview

Currently there are three prevalent HMA frameworks: Ionic, Onsen UI, and React Native [2]. Ionic is an open source Software Development Kit (SDK) that lets web developers build applications using AngularJS, which is a JavaScript framework developed by Google. Some of the features that Ionic provides to developers include a library consisting of many pre-built UI components, a command line interface with features like Live Reload and integrated logging, and integrated emulators to display and test the app pre-deployment [3]. Onsen UI is also an open source framework that uses JavaScript to build applications. Unlike Ionic, Onsen UI is framework agnostic, which allows users to use any JavaScript framework or plain JavaScript to build applications. Onsen UI also provides developers a command line interface and a library of pre-built UI components, but also adds the functionality of building and debugging applications in the Cloud [4]. React Native is a HMA framework developed by Facebook that allows developers to build native mobile applications using ReactJS, which is a JavaScript framework developed by Facebook. React Native also provides developers libraries of UI components and a command line interface; however, it also allows developers the ability to integrate Native Code, Java for Android applications and Swift for iOS applications, directly into their HMA [5]. Lastly, all three frameworks are free and open source, which has helped generate a large community of users and resources.

Current Applications using Hybrid Mobile Applications

In 2015, there were at least 12,000 HMA in the Google Play Store [6]. This number has continually increased as HMA are continuing to gain popularity. Some of the most popular applications by downloads and reviews are Uber, Evernote, Yelp, and Instagram [7].

Technology of Hybrid Mobile Applications

Performance

In terms of speed and efficiency, HMA are generally inefficient when compared to Native Applications due to the fact that HMA are targeted for multiple operating systems whereas Native Applications are only targeted for one operating system. However, recent advancements in technology have helped bridge this gap. In fact, React Native has been advertised by Facebook as having achieved 60 frames per second, which is similar to that of typical Native Applications [8].

Communication

Similar to Native Applications, HMA are integrated frequently with Cloud Web Services like Microsoft Azure and Amazon Web Services (AWS). Azure and AWS provide both Native Applications and HMA with SDKs that allow for developers to connect and integrate these services in their applications [9]. Additionally, Azure and AWS offer services, like machine learning and lambda functions, designed specifically for HMA. Many HMA frameworks also have Bluetooth modules that allows for the sending and sharing of data from other phones or embedded devices connected with Bluetooth modules [1].

UI/UX Design Components

HMA have attempted to emulate Native Applications in design and aesthetics. Unfortunately due to limitations in the current technologies, there are noticeable differences in the user interface of a Native Application and a HMA. Although the aesthetics are different, many HMA frameworks have provided libraries with design components that have a modern, simple, and clean design [10]. Additionally, these design components are able to be further customized using CSS and other JavaScript libraries, which can lead to more dynamic and complex UI designs [10].

Implementation of Hybrid Mobile Applications

HMA are developed entirely in Software. The most important aspect of HMA is to choose a framework based on the constraints and requirements of your problem. The software can be developed on either a text editor or an IDE provided by the framework. Information on the frameworks and their capabilities can be found via APIs and examples provided by the framework [2]. Lastly, with the popularity of HMA, the community support has risen. Consequently, there are many resources available for developers to utilize in their applications.

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