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A Novel Framework for Hybrid Mobile Application: Design & Development

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Abstract: ***The mobile applications development industry has been changed completely by using with different tools and technologies. The various tools and software are available in the market which is used to develop a single application which is compatible for all types of mobile operating systems including android, ios and windows. Hybrid platform mobile applications help in cost cutting and saving time as well as providing components for easier development of applications which provide a native feel to the user.However, there are some hybrid tools compatible with almost every operating system in term of designing user interface and user experience. Moreover, they have capability of creating programming codes and packaged them as a native-like mobile application regardless of mobile platform. This paper aims to help developers make the novel framework to design and develop a hybrid mobile application as well as give vital information about hybrid platform and mobile application approaches and their advantages and disadvantages.***
Keywords: Native, Internet, SDK, Mobile OS, HTML5, Web View, UI, Framework, APIs.

I. INTRODUCTION

Hybrid apps are sometimes described as the best of both worlds: they're built using web technologies like HTML and CSS, and they're also hosted inside a native application [1]. The app functions on a user's mobile device by using the platform's WebView (think of the Web View like a web browser.) A well-written hybrid app will perform exactly like a native app, and users won't be able to tell how the app was developed. Hybrid apps can even use the device's features, like the camera. There's also another major benefit to hybrid apps—generally, only a portion of code has to be re-written to make the app work across different platforms. A hybrid application (hybrid app) is one that combines elements of both native and Web applications [2]. Native applications are developed for a specific platform and installed on a computing device. Web applications are generalized for multiple platforms and not installed locally but made available over the Internet through a browser. Hybrid apps are often mentioned in the context of mobile computing.

II. FEATURES OF HYBRID MOBILE APPLICATION

Most applications could be considered hybrid apps. Web apps, such as online banking services, typically store some content locally; locally stored native apps, such as Microsoft Word, also interface to the Internet [3].

1) Created using powerful JS, HTML5 and CSS3 languages
2) Cross-platform/multi-platform development
3) Knowledge of open source platforms such as Phone Gap, Appcelerator, Sencha, Kendo UI, Adobe Air, QT and many others
4) Enhanced access to device features and capabilities
5) Download and install without browsing
6) High performance
7) Interactive interface

III. APPROACH TO BUILD HYBRID MOBILE APPLICATION

The Hybrid Approach may be seen as a bridge between Web and Native approaches. A Hybrid application is built using Html, CSS and JavaScript which are web technologies and are executed in the native Hybrid approach uses the browser engine of the device which renders and displays the HTML content in full screen Web view control. Even during the development of Hybrid applications on the desktop, we can view the application in the browser[4]. The device capabilities are exposed to the hybrid application through an abstraction layer. The abstraction layer exposes the device capabilities as JavaScript Application Programming Interface. Hybrid approach can take the advantage of both browser engine and device capabilities. Hybrid approach can be used for both server backed and standalone applications. Unlike web applications Hybrid applications needs to be downloaded and installed on the mobile device [3].

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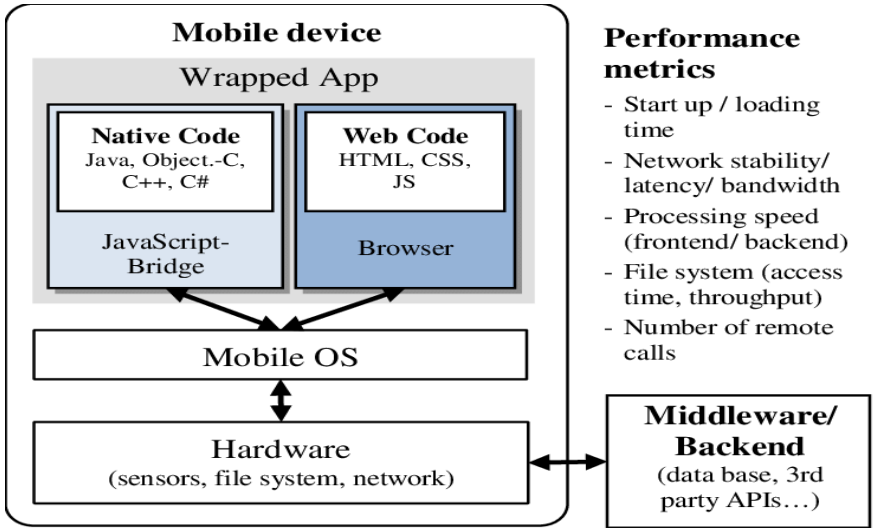


Figure 1: Structure of Hybrid Mobile Application

IV. CHALLENGES IN HYBRID APPS

1) *Performance:* The Android web view performance is not at par with iOS web view. So there may be instances where some parts of the app will work smoothly on iOS but lag on Android [4].
2) *Animation:* All of the animations, supported by JavaScript and CSS, can be implemented in hybrid apps. But, they aren't as smooth as they are in native apps.
3) *Gestures:* Handling multiple gestures at the same time can be tedious sometimes. As hybrid apps are partially web apps, it takes time (a few hundred milliseconds) to identify a particular gesture. This requires the gestures to be handled programmatically, which is not preferable.
4) *Scrolling:* Instead of using native scrolling, Ionic provides its own scrolling, which is not as effective.
5) *Other Challenges:* In Ionic, the view takes some time to render, so sometimes scrolling and setting the focus on text fields has a noticeable performance difference when compared to a native app.

V. FRAMEWORKS OF HYBRID MOBILE APPLICATION DEVELOPMENT

Due to the increasing demand of mobile applications, the tendency of people towards desktop applications has decreased. Entrepreneurs and new startups around the world are implementing the right apps development strategies to run their businesses online[5]. While, most enterprises are switching from desktop websites to mobile applications to make their reach wider to the targeted audiences. However, the mobile app industry is also going through a tough competitive phase, which is making the selection of framework a bit daunting.

For developers, Mobile Hybrid App Development has come as a breather. These types of mobile apps are developed easily and don't take much effort and time.Hybrid apps mean developers only have to write code once and runs on multiple platforms. Also, it lets the developer reuse the code for developing web apps without any extra efforts.

But for building amazing hybrid apps with native app feel and look, you need the best frameworks. With so many frameworks available in the market, it is hard to choose the right one.

Phone Gap is not the kind of frameworks that can help you with creating UIs. Use it to pack and release a previously created application. This tool wraps your code in a native application. We talked about this concept earlier. This framework can be used along with any JavaScript or UI frameworks (Jquery Mobile or Angular JS, for example) [6]. With Phone Gap, you can get access to device's hardware and use its accelerometer or camera. The Ionic framework, in its turn, provides you with the wide variety of available UI components. It's extremely popular library with the great community. And that's why you should pay attention to this framework [7]. It's quite a good choice for beginner developers. It uses Angular JS that supports two-way data binding, and interaction with backend services and APIs. There's even such thing as Ionic Creator, an online tool with drag-and-drop support. Such tools are always helpful for getting started with development.

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Mobile Angular UI was created by using Bootstrap and AngularJS, so you can take the best from them to realize your passion for the HTML5 mobile development. It's some kind of extension to Bootstrap 3, but it does not depends on jQuery or Bootstrap JS and uses FastClick.js and Overthrow.js. Such approach makes it more lightweight and, as a result, everything works pretty smooth[7]. You can build UI components like sidebars, switches, scrollable areas and many others. They don't bounce on scroll providing a user with better mobile experience. Framework 7 is a so-called framework agnostic which means that there are no extra dependencies like Angular JS or React. But yet you can combine it with your favorite JavaScript framework. In the case of hybrid mobile applications, this framework holds a leading position in the world of iOS mobile application development. And it's probably the best option for a web developer who intends to create a mobile application since it relies on HTML, CSS, and JavaScript. Applications made with Framework 7 look and behave like native iOS apps. But it has its weakness. There are no tools for packaging the created applications, so you should combine this framework with Phone Gap or Cordova. Sencha Touch is mostly used for enterprises. The application created with this framework works on several platforms including iOS, Android, Windows Phone, and BlackBerry. And on every platform, hybrid apps look and feel like the native ones. These are only five development tools that were chosen as an example. Of course, there are many others: Onsen UI, React Native, Native Script. Invest some time in your research and you'll certainly find the hybrid mobile app framework that meets your needs. Take a look at your favorite app, make a research, and find out what framework was used for its creation. Sounds like a good start.

VI. DEVELOPMENT PROCESS OF HYBRID MOBILE APPLICATION

A. Planning & Specification

We'll kick off the development process by learning about your vision for your hybrid mobile application. Together, we'll determine the exact functionalities that you need. After listening and researching our development team will create a specification document that describes the parameters of the project.

B. App Specification and Finalization

The next step is all about client interaction and approval. Active Media will use the specification document to develop the overall project plan [8]. We want your hybrid mobile app to function just as you envisioned, so you'll get to review and approve everything before we start. Final costs are also calculated at this point. Thanks to the thorough planning phase, there won't be any surprises at the end!

C. Mobile Application Development

Now, it's time for our team to work their coding magic. Your job? Just sit back and relax.

D. Quality Assurance & Testing

A thorough quality assurance (QA) procedure and robust testing are essential parts of the development process, and we never cut corners on this important step. Our team will test the hybrid app on different devices in a variety of situations, and also on different platforms. You can feel confident knowing your mobile application will function flawlessly.

E. Publishing

Now, it's time for the most exciting part of the development process! After everything is finalized, your native app will be published in the appropriate places, like Google Play's app store or Apple's App Store.

VII. TIPS FOR DEVELOPING HYBRID MOBILE APPLICATION

To design and develope Hybrid Mobile Application, we explained different approaches for the design and development of mobile application. But despite the chosen way, there are always trends and tendencies dictated by common sense. We gathered together some tips that you may find helpful. The hybrid mobile app has become a major factor in mobile app development. By enabling developers to use web technologies (HTML, CSS, and JavaScript) to target multiple mobile platforms from a single code base, rather than writing native code (Objective-C, Swift, Java, C#) for each platform separately, hybrid mobile apps can significantly reduce the time and cost of mobile app development.

1) Prepare your graphics. Use graphics optimizers that provide you with the possibility of lossy compression. There are a lot of them all over the Internet.

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2) Using HTML5 for complex apps may be a bad idea. In the case of a complex hybrid application that covers a wide variety of purposes, you can face the reduction of performance. The clean and simple concept is what should be your aim. At least, if you're not experienced enough to use all available advantages of HTML5 at full capacity. This warning is based on the fact that Facebook has faced some performance issues while trying to use HTML5 for building hybrid apps. Since then, "to use or not to use" is a moot point. But you can always try [9].

3) Don't forget about the performance testing. It's unlikely that you'll get a second chance if a user faces unexpected troubles when he decides to test your application. If you use Phone Gap or Cordova, you can try built-in testing tools like Browser-perf. In another case, there is a lot of third-party solutions.

4) Choosing the correct hybrid framework: Native apps have a very well-established and (mostly) well-documented technology stack. Android apps are almost always written using Java and are built in a very similar way. iOS apps can be written in either Objective-C or Swift, but there is a large community of developers and large knowledge base surrounding both. Alternatively, hybrid apps are built with the help of numerous app frameworks. These are usually similar, but it would be non-trivial to take a hybrid app built with one framework and rebuild it with another. For that reason, you want to be sure you make an informed decision when choosing your project's framework

5) Consider current and future app functionality: If you read the above section, consulted your version one requirements document, and found no native features, please don't stop there! You also need to consider the future and potential scope of your app. There is an app graveyard full of abandoned hybrid apps that worked as minimum viable products (MVPs), but failed as more robust applications.

6) If the developer does consider all these approaches then he can easy to design hybrid mobile application with minimum amount of time and efforts. In this paper, we only try to make a novel framework for hybrid mobile application development. This framework may be useful for those developers who have no idea about the Java and Android Studio but they can still design and develop hybrid mobile application easily. The hybrid approach is worthwhile considering the emerging framework and all it has to offer the competition in market competitions for the top three mobile platforms if widely accepted. We believe the design will support all platforms equally on phones and tablet.

VIII. A NOVEL FRAMEWORK FOR HYBRID MOBILE APPLICATION

To design and develop hybrid mobile application, we proposed a novel framework for the hybrid mobile application development. The need to propose this framework for developing hybrid mobile applications will offer simplicity and flexibility in user communication experience. It will be a beneficial for those developers who want to develop application without using Android Studio and Java programming language. Hybrid applications allow users to access faster than web pages to the services and products of your company.
Users can install your application on their phone or tablet and, thus, will have a much more direct access to your business. This framework/proposed system is built on HTML/CSS Website and easy to convert into hybrid mobile application.

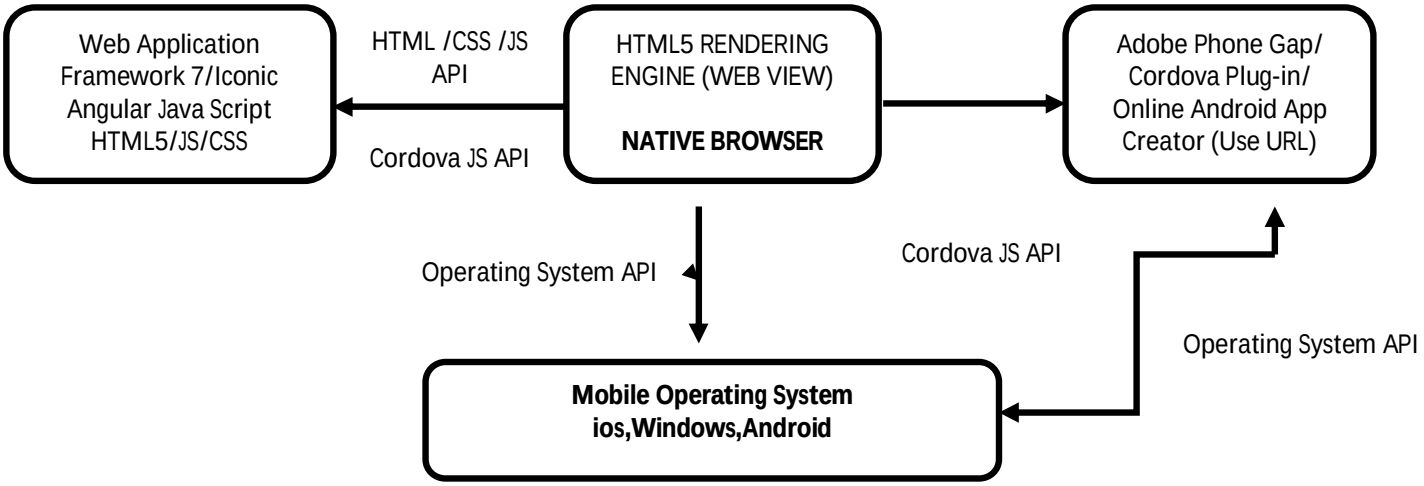


Figure 2 : Novel Framework for Hybrid Mobile Application Development

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In this framework, we use HTML5 with Iconic/Framework 7 for designing and developing hybrid mobile interface. After that we use HTML/CSS APIs for implementing hybrid framework with Cordova API. This hybrid application is enable for native browser of the mobile. We use Adobe Phone Gap/Cordova for making android and i-phone mobile application package. We can also use Web based interface for making application package of the android as well as i-phone. This hybrid application is now compatible with all type of modern mobile web browser.

IX. CONCLUSION

In this paper, we explained the comparison between native and hybrid mobile applications are discussed. Also, the various tools for mobile app development are summarized. Going hybrid can be a great approach to mobile app development, but can also end up costing you more than you initially saved [10]. Before deciding to go hybrid, you need to fully understand the associated limitations and risks. We also explained the novel framework including all the required tools and techniques which are very useful for the hybrid mobile application development. It is exciting to have this new and more cost-effect method for app development, but as with all things, there is more to consider than just the price tag. Any developer who wish to develop Hybrid Mobile Application then he can easy to develop using with JavaScript, Hybrid Mobile Framework and CSS/HTML.

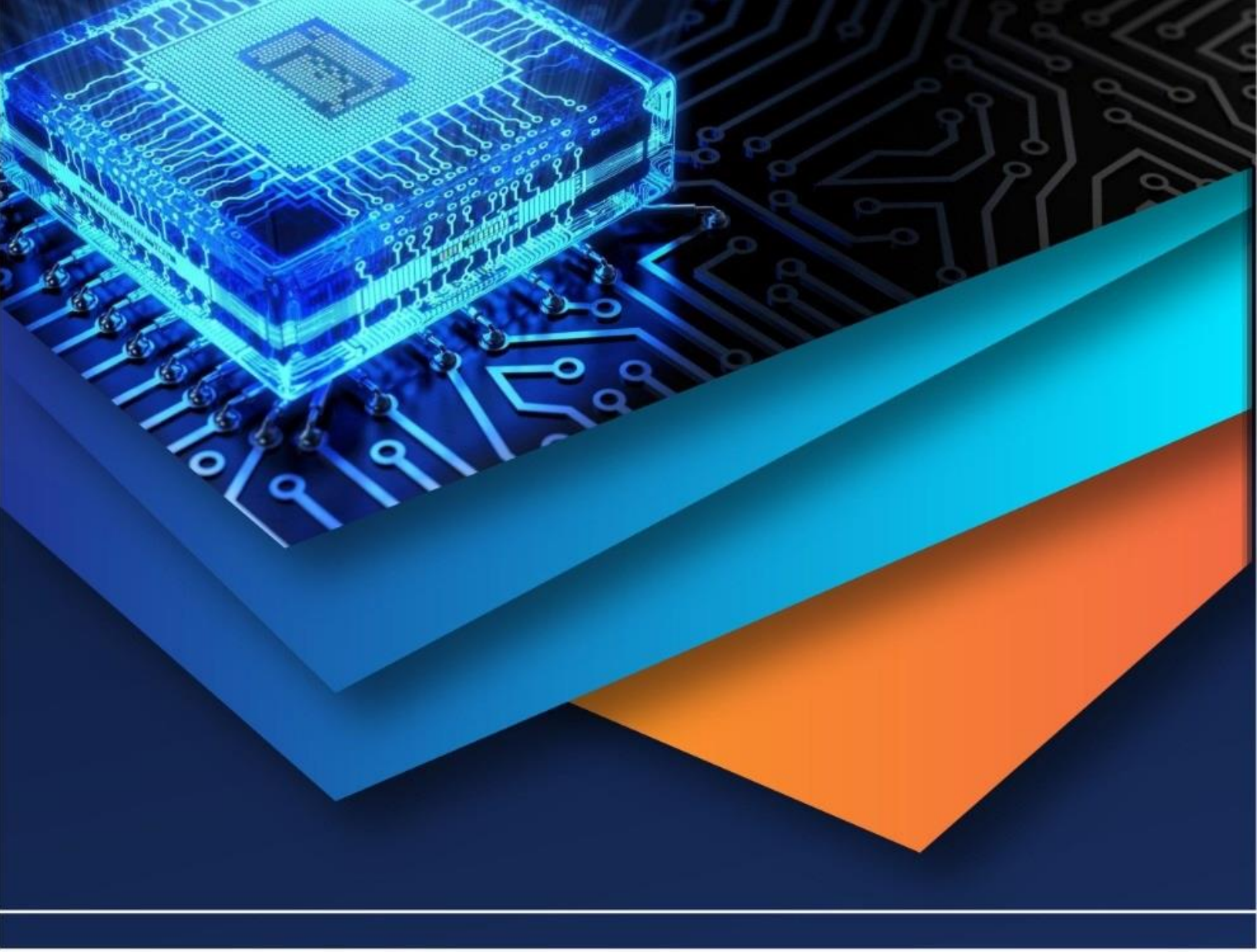
X. FUTURE WORK

The hybrid approach can be used across several mobile browsers. However, the hybrid approach allows a single code base work for different platforms (Windows, iOS and android). As a result, it saves cost time for developers. Hybrid apps and native app to deploy a native platforms. The Hybrid Mobile Application will be rapidly increase in the mobile application development. Native mobile applications without doubt provide the best user experience however, hybrid platform mobile applications will be preferred when the application is to be made for multiple platforms and time and cost are the primary factors. A further improvement in performance needed. The hybrid mobile application must have features all advance features like native mobile application including device permission, hardware interaction and web service integration etc.

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