
Providing Best-of-Breed User Experiences Across Pervasive Systems

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Abstract

In a new world of ubiquitous computing devices, porting applications for each mobile platform can be an economically infeasible task. The usual solution to this problem has been to develop Web applications that can be run in every platform, or to use platform-abstraction frameworks, such as Qt, Titanium or PhoneGap. However most mobile devices suffer from limited processing power which will amplify those solutions' multi-layer architectures' Achilles' heel: poor interface responsiveness. In this extended abstract we present beginning research that is trying to validate a solution to this problem.

Author Keywords

User Experience, UX, User Interface, GUI, Pervasive Systems, Mobile Frameworks, Mobile Platforms, Enterprise

ACM Classification Keywords

H.5.2 [Information interfaces and presentation (e.g., HCI)]: Graphical user interfaces (GUI).

Introduction

Computing is becoming more and more ubiquitous. We update online social networks on the bus, read the latest news at work and tweet with our friends at the restaurant.

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This ubiquity also translates to the workplace. According to Gordon Thomson [8], Cisco, a leading Internet equipment manufacturer, reports that the current workforce trend is to demand access to corporate data from the user's own device. Organizations are adapting to these demands by instating Bring Your Own Device (BYOD) policies and porting their applications to multiple platforms.

Professional developers doing these ports typically want:

- Their application to be high-quality – i.e., to have an excellent user-experience,
- Anyone to be able to use the application, from anywhere – i.e., to be cross-platform, ubiquitous,
- The development cost to be low – i.e., to develop once and deploy many.

As a result, they need a cross-platform development framework that achieves these goals in order to avoid having to handle multiple incompatible development SDKs that drive costs up, as reported by Charland and Leroux [1].

The market has responded rapidly with multiple solutions. Unfortunately, these solutions frequently compromise user experience particularly in terms of response to touch input. Tolia's et al. [9] research states that the the most critical performance measure for thin-client computing (such as most enterprise mobile applications) is the crispness of interactive response and it is this measure that determines whether a thin-client approach is satisfactory for an organization.

The Problems

*Current cross-platform **mobile** development frameworks do not provide a native experience*

We define a native application user experience (or *native experience* for short) as providing:

- Crisp interactive response,
- Best device battery time,
- Look-and-feel similar to other platform applications:
 - First class citizen feel in the platform (i.e., the application feels like it “belongs” in the device; the same application should look differently in iOS 5, iOS 6 and iOS 7 for instance)
 - Reduced learning curve in using the application, including access to device features (sensors, contacts, etc.)
- Immediate upgrade to new look-and-feel upon host OS upgrade,
- Doesn't use the network at all whenever possible (i.e., disconnected operation capability [6, 9]).

*Current cross-platform **mobile** development frameworks do not extend over to the **desktop and Web***

We define “extending over to the desktop and Web” as:

- Single source-code for all platforms
- Native experience on all platforms

A few frameworks come close to providing these goals, but, amongst other problems, their breadth (allowing developers to draw randomly on a blank canvas) makes true single-source-code multi-platform development very hard:

- Designing a user-interface for portrait orientation is very different from landscape orientation,

- Different screen sizes and pixel densities, and different input methods greatly affect the user-interface design,
- Resulting code becomes bloated with many conditional branches to handle all possible cases, if a single-source-code is desired.

Research focus

If a “universal” (mobile, desktop and Web) framework is computationally lightweight for mobile devices, it will likely also be lightweight for desktop and Web

Therefore, our focus is to study computational load on mobile devices only.

Portrait vs. landscape layout has been solved with Master-Detail application templates

iOS and Android both support these templates (e.g.: iPad’s Settings app) and they are known models on desktop and Web platforms.

Reduce the breadth of the “universal” framework

We will focus on enterprise applications (i.e., forms, similar to iPad’s Settings app).

Planned Research

Research Questions

What are the factors of high computational load on cross-platform mobile development frameworks?

1. How do those loads differ from a custom application developed natively for each platform?
2. Are there techniques to close the gap and minimize such loads while retaining cross-platform compatibility?
 - (a) Would data caching (or disconnected operation capability) be better/worse when

using such techniques?

(b) What are the relevant security issues for such techniques?

(c) How easy is it to develop code using such techniques?

Over-arching question:

What are the best techniques that ensure low computational load on cross-platform mobile, desktop and Web development frameworks, in order to ensure the best user experience?

Research Progress and Activities

All of the state-of-the-art survey has been completed including comparison of similar surveys [7, 2, 5, 3, 4]. We have skeleton mobile client applications for iOS and Android, as well as a skeleton data source server in PHP. It is our intention to compare the user interface computational load and development complexity of representative user interface elements using objective metrics, which may require the development of a cross-platform framework itself. We also want to survey users and their opinions in using applications with different frameworks. Results will be submitted to relevant conferences and journals.

Biographies

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