Cross-platform mobile client for business processess management

Denis Kruminsh
Peter the Great St.Petersburg Polytechnic University
Polytechnicheskaya, 29
St.Petersburg, Russia
ipsaer@gmail.com

***Abstract*— The document considers the development of a cross-platform mobile application - a client for the Camunda BPM business system. In the course of work analyzes the market of existing automation systems for business processes, their advantages and disadvantages, and tools for developing a cross-platform mobile application.**

***Index Terms*— mobile app, business system, camunda, xamarin, c#, cross-platform, mobile operating systems, android, ios, bpm**

I. INTRODUCTION

In any company, business processes automation provides a qualitative improvement in the level of the company's work. This improvement is provided by using systems built on **BPM**.

BPM (Business Process Management) is a concept of process management of an organization that considers business processes as special enterprise resources that are continuously adapted to permanent changes, and rely on clarity and visibility of business processes in the organization.

The main reasons for implementing the business process automation system are:

1) Increase the speed of processing and transfer of information between employees. All information on a process will be available in one place;
2) Every action in the business process is marked for a certain the user, subsequently what is achieved transparency of business processes for all participants;
3) Minimizing costs and errors;
4) The overall visibility of all processes in the company.

Work with most of these systems is going via a web-interface adapted for the desktop. This solution is often suitable for most tasks, but if mobility is required, this approach will somewhat slow down the system. The optimal solution in this case is to use a specially designed mobile application.

The goal of this work is to create a mobile application that provides speed and convenience to employees in the BPM system without binding to the workplace in the office, while retaining the full functionality of the desktop version.

The paper organize the follows:

1) Review of existing business systems, and their mobile applications;
2) Search for the optimal platform for developing a cross-platform mobile application;
3) Development of a cross-platform mobile application-client of the business process management system.

II. EXISTING BUSINESS SYSTEMS

The following is a comparison of business systems, which are primarily positioned as commercial systems. The comparison was made according to the basic properties available for each system.

	ELMA BPM	Terrasoft BPM	Docsvision
Not commercial version	✔	✘	✘
Mobile Client	✔	✔	✔
Cross-platform mobile client	✔	✔	✘
Support for BPMN 2.0	✔	✔	✔
Integration interface	✔	✔	✔
Portability between server platforms	✘	✘	✘

TABLE I: Comparison of business systems

The availability of a non-commercial version is one of the advantages , but at the same time such version has many limitations. For example, a similar version of **ELMA BPM** does not support an existing mobile client.

Despite the cost of commercial systems, recently created companies with a small staff, such solutions are

more suitable than freely distributed, because of the cost.

With the growth of the company, the number of employees in it also increases. This leads to a significant increase in the cost of a business system license. In this case, to save money, the choice remains for the use of freely distributed systems.

Among the systems distributed under a free license, the greatest potential is represented by **Camunda BPM**, for the following reasons:

1) Support for the latest versions of BPMN, CMMN, DMN;
2) Presence of tools for editing business processes, monitoring operations, personnel management;
3) Presence of objective experimental data [1], about the best performance of Camunda in comparison with other BPMN systems;
4) Speed of development, in comparison with other solutions;
5) Support of all blocks from Table I, except for the mobile client.

Many organizations around the world use Camunda for their tasks. For example, the **NASA Jet Propulsion Laboratory** has been using Camunda since 2014.

Camunda BPM does not have any native mobile application, opening the system in a mobile browser complicates the work for the user, due to the inability to display the necessary information.

As a result, Camunda BPM is a promising system, which needed the mobile application.

III. DEVELOPMENT PLATFORMS

When creating mobile software, it is necessary to take into account the fact that users have devices on various software platforms(Android, iOS). Thus, the support of more platforms, will give more coverage to users.

A. *Native*

Creating a native application for each of the platforms in the appropriate development environment has both advantages and disadvantages.

Advantages:

1) Better performance and ease of use of the final application;
2) Ability to use all platform-dependent features;
3) Ease of distribution (publication in the application store of the appropriate platform) application;
4) Good documentation of each platform.

The disadvantages include the cost and development time, the reasons for this are that each of the platforms uses its own programming language, which will make it difficult to transfer code from one system to another, especially when working with the appearance of the application.

B. *PhoneGap*

PhoneGap is an OpenSource platform that uses the capabilities of HTML5, but with the addition of support on its platform capabilities.

Advantages:

1) The browser API is expanded in comparison with HTML5, which gives access to native features;
2) Easy application distribution.

Disadvantages:

1) Not all native features are available;
2) Impossible to achieve native representation and adaptability of the user interface, since the visualization takes place using the built-in browser.

C. *Xamarin*

Xamarin is a framework for cross-platform development of mobile applications using the C# language.

Advantages:

1) All native opportunities;
2) The native view and adaptability of the user interface;
3) Applications on different systems will look very similar;
4) Easy application distribution.

Disadvantages:

1) The increased size of the destination application, due to the need to attach libraries to the application for its operations.

The final application when using Xamarin is almost inferior to native applications that were written for this platform at once, except for the increased application size, while substantially benefiting from the cost and time of development.

In terms of "price / quality", the best solution is Xamarin.

IV. DEVELOPMENT

To transfer to a mobile application, was choosen **Tasklist module** from Camunda. This module is necessary for providing work with tasks and business processes, in particular, the module allows:

- Create arbitrary tasks or start predefined business processes;
- Getting a list of current business processes or tasks, as well as their status and the ability to view more detailed information;
- Differentiation of tasks by users;
- Change the status and commenting on business processes or tasks.

The relationship between the mobile application and the server is implemented with **REST API**, that included by default in Camunda.

Figure 1 shows the architecture of the application being developed. The user, through the GUI interface, interacts with the corresponding application classes that implement the capabilities of the Tasklist module. Based

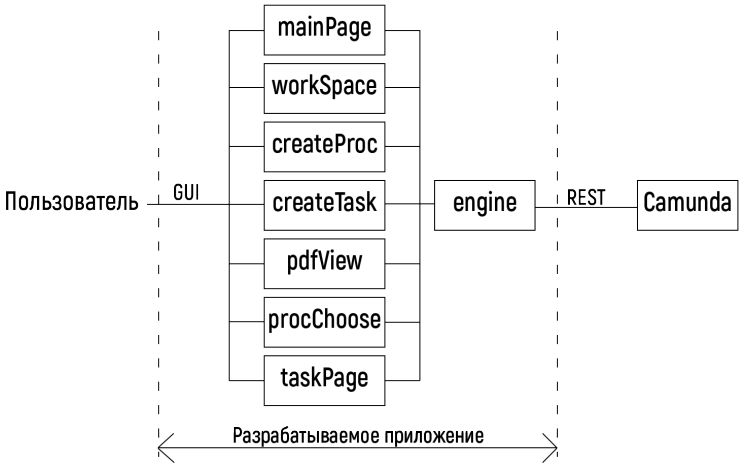

Fig. 1. Architecture of the developed application

on the results of the interaction, appropriate methods are called from the engine class, which already interacts with the Camunda system via the REST interface.

A. *Cross-platform components*

Most of the code is cross-platform, but part of the design and work with the files required the use of platform-independent code.

Business process can contain files with the extension .pdf, so it must be downloaded to the device before opening the file. And the download process for android and ios platforms must be written separately.

Another part when working with files was the opening of the downloaded file using the **pdf.js** library, which requires native execution for each of the platforms.

B. *GUI*

When designing the interface, the following goals were set:

1) User-friendly interface;
2) Maintaining all the functionality features of the desktop version.

Result GUI of iOS and Android is very similar to each other.

V. CONCLUSIONS

In this paper, systems for automating business processes were investigated. The analysis showed that it is more reasonable for large companies to use free software, since the cost of a license, commercial systems, directly depends on the number of users. Among the freely distributed systems, the most promising is **Camunda BPM**, however this system did not have a mobile client, which is typical for all commercial systems.

The Camunda BPM system has several modules, the task of this work was to transfer all the capabilities of the **Tasklist module** to the mobile device in the form of a client application. It should be taken into account that for the greater coverage of users, the final mobile

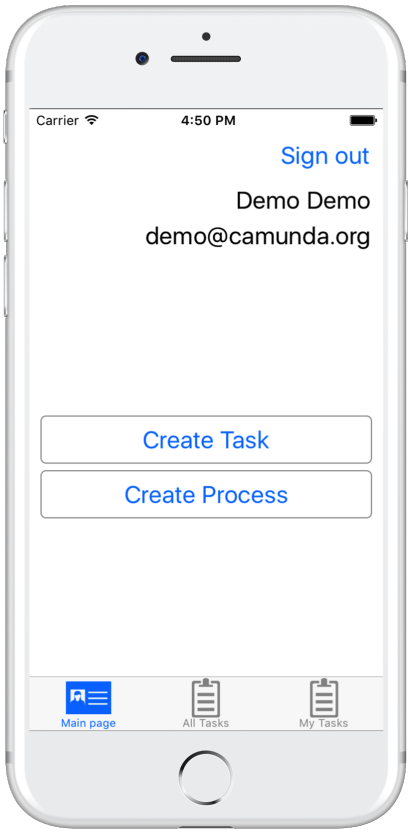

Fig. 2. IOS. Main menu

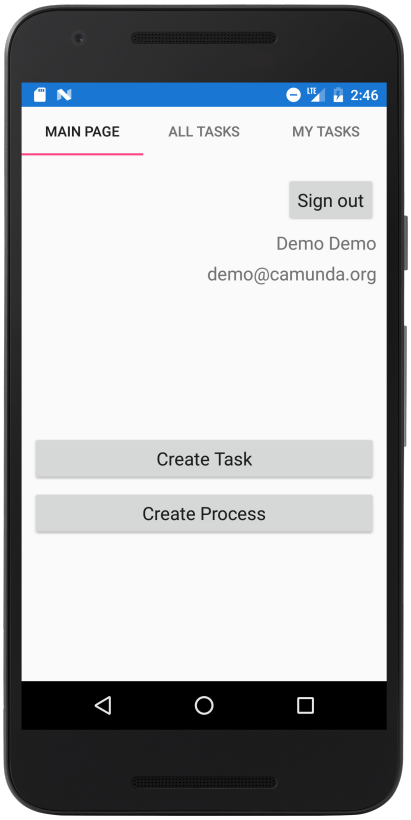

Fig. 3. Android. Main menu

application must be cross-platform. The most optimal, in terms of "price / quality", was chosen **Xamarin** framework. Its use has significantly reduced the amount of code required for writing, while at the same time retaining the full potential of the capabilities of the ultimate platform.

The developed cross-platform mobile application fully provides the functionality of the Tasklist module of the Camunda BPM system. Thus, it is possible to automate the work with this system, via mobile devices.

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