MVC architectural pattern in mobile web applications

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Abstract
Recently, the web applications are created in both desktop and mobile versions due to significant increase of mobile devices. This paper describes advantages of using MVC architectural pattern when building applications available on different devices. There are included theoretical analysis about development speed and quality as well as potential business implications of mobile version for the web-based applications.

Introduction
Since creating Wireless Application Protocol (WAP) and Wireless Markup Language in the late 90’s, wireless internet devices, especially mobile phones, are becoming significantly increasing in number and percentage of web agents share [10]. As those devices are different than desktop machines, e.g. are mostly with small screens, low computation power etc., there is a trend now for creating special version of websites designed especially for mobile devices. Many of today “Web 2.0” websites have already own mobile versions (including Facebook or Twitter, the most popular social networking sites by now) and many other companies are thinking about delivering their website contents to mobile users [8].

This paper is trying to answer the following question: “if the mobile web sites are important, what is the fastest way to implement them?” using the MVC architectural pattern, which is a fast and efficient way of creating different end-user sites without the need of redeveloping the core application.

This article will be concentrating on handheld mobile devices, especially next-generation smartphones with a modern web browser – but it’s still a small device, not a full-blown desktop computer.

Web applications in general
Since “Web 2.0” trend started in 2004, most of today newest IT companies are concentrating on creating web applications. Web applications, also called “Software as a Service” (SaaS), are accessible using desktop web browser anywhere in the world. The notable examples of large, business scale web applications are of course Google’s Gmail, the free e-mail system which is used even by large business or government divisions; Google Docs, a web-based office suite; Basecamp, project management application by 37signals; or Facebook, Twitter or any other “social networking” websites which are increasing in number and popularity.
Web applications have advantages – for the users, this type of application is available anywhere on the world, or any computer, only if the internet connection and web browser is available. For the IT departments, there is no need for application deployment over the company, there is no need for anti-virus or anti-malware applications on clients’ machines and finally – most of upgrade and maintenance of applications can be done by 3rd party, SaaS provider. There is of course also a possibility for creating internal, intranet web applications by the company itself which can be only hosted by the offshore company.

Web applications are using standard HTTP protocol for communication and HTML language for creating user interface and offer similar user experience to any other web site. For creation of web applications there is a possibility of using any server-side language or platform, the most popular are free software PHP (PHP: Hypertext preprocessor), ASP.NET by Microsoft, or Java Server Pages now owned by Oracle. Popularity of those platforms and popularity of developers who are familiar with them trends to lower costs of development and maintenance of web applications [1].

**Mobile applications in general**

As there are many types of mobile devices, there are many ways of presenting website content to them. In 1997 there was a WAP Forum established and one year later there was introduced WAP 1.0 standard, which described complete software stack for mobile internet access. WAP was widely criticized for being too simple and completely incompatible with “desktop” internet standards, like HTTP and HTML language – in WAP 1.0 there was used specific dialect of XML, called WML [7].

In 2002 there was WAP 2.0 released. Completely reengineered, using traditional XHTML (but cut-down – XHTML-MP [3][5]), HTTP, dropping custom protocol suite and gateways. Since about 2004 WAP disappeared from handsets as there is now support for full HTML even in low-end market phones. Before WAP in Europe there were similar technologies, most notable is Japanese i-Mode which also used cut-down version of HTML back in late 90’.

**Literature**

There are several positions in the popular literature about mobile web application development, most published this year and concentrating on the newest mobile devices available at the moment - describing XHTML Mobile Profile and CSS styling for mobile devices [5][8], not only mobile web applications, but also Widgets and SMS [4] and of course talking about Geolocation or mapping [3], sometimes even potential business opportunities. On the other hand, there is no book position for now about fast and efficient building web applications which has to available on mobile as well as traditional “desktop” browsers.

This article is trying to point out that this goal is possible to achieve using MVC architecture, but we are not describing in details neither mobile development nor MVC itself.

**Differences between desktop and mobile applications**

Mobile web applications are different in nature of the mobile devices to their desktop equivalents. First of all, designer needs to create completely new user interface, usually fitted for smaller screens and resolutions. Then, designer have to have in mind that mobile devices will be accessing network without broadband connections – despite increasing popularity of HSDPA (High Speed Downlink
Packet Access) and other 3G connections, some users still can use just old plain packet connection like GPRS (General Packet Radio Service) where connection speed is as low as 192 kb/s.

This means that the mobile application have to be smaller in size and display than the regular version, without rich presentation elements (images, animations etc.), and sometimes cut-down in functionality. There are also still devices without touch screen, what means that all hyperlinks needs to be clearly visible.

From listed problems with mobile web applications follows that the best solution for the application is to write it completely from scratch just for the mobile devices, which is time- and cost-inefficient.

**MVC, different views and mobile devices**

**MVC in general**
MVC stands for Model-View-Controller. It is architectural pattern created in 1979. MVC, previously created for user interfaces in desktop applications is now becoming popular in web application development via different frameworks [1]. MVC is changing application into three separate parts – Model, which is data access layer, View which is presentation layer and Controller, the main system receiving incoming requests and responding to them by sending back different Views using the data given by the Model [6].

**MVC and different views**
MVC specific behavior could be programmed as sending different views to different types of user-agents. This is the most important advantage of using MVC pattern for mobile web applications. The system can determine user agent capabilities (touch support, screen size and resolution, language settings or even geographic coordinates from internal GPS receiver) and prepare special View, which will be suitable for the specific device.

Using different Views without changing any other part of the system (Model and/or Controller) is faster and more efficient than creating completely new application just for the mobile devices. This technique is also more flexible than just creating a special “mobile” CSS (Cascading Styles Sheet) which is responsible only for data presentation.

While creating new Views, designer can have in mind specific devices or specific group of devices – e.g. with touch screen and without it. The new presentation layer could be created based on desktop version but just without complex styles, advertisements and images. Different Views could be made even in the different technology than the desktop application – like WML or XHTML Mobile Profile as they are independent than the any presentation part of the system.

**MVC mobile web application in practice**
The research work was based on the previous work about comparing MVC frameworks [1]. For the experimental mobile site was chosen an application made using ASP.NET MVC framework, created by Microsoft in 2008. ASP.NET MVC is a different approach for web development than the “traditional” ASP.NET WebForms [2]. WebForms is not so good for building mobile applications, as it is not allowing developers full control over generated HTML markup.
The application build was a simple blog (internet journal) system allowing mobile users to browse and comment entries inserted by desktop users. That approach means that it was needed to create a special, mobile version of the entry, landing page, entry view page and comments.

The desktop web application Views was made using HTML 5 language when mobile version used XHTML Mobile Profile. During creation of the mobile application, the only modification to the Controller was introduction of View switching mechanism. This simple system was detecting mobile devices based on HTTP user-agent header sent by the mobile browser and in that case, different View was served for the device. Besides that little modification, any new View designed for mobile version was independent from the Controller or any other Views.

**Business implications**

Mobile web applications can have serious business implications. From the Opera survey published in November, the most important news is that the most 18-27 year-old users are saying that they are using mobile browser in their cell phones. In the Nigeria, South Africa and Indonesia, 9 of 10 respondents said they browse the Internet using mobile device even more frequently than its desktop counterpart [9].

What information are mobile users looking for? From the “State of the mobile Web” September 2010 report by Opera Software the most popular sites visited by mobile users in Poland are nk.pl (Polish social networking website), onet.pl and wp.pl (popular information sites), allegro.pl (Polish eBay counterpart) and – of course – Facebook [10]. Opera Mini, one of the popular mobile browsers had over 71 million users worldwide.

71 million people visiting the web using the mobile device, plus additional users not included in the Opera Mini reports (using other browsers) are the big consumer group, so creating a mobile application just for them could be serious business move. Especially if the company is internet-based or the internet services are essential part of the business.

**Summary**

MVC architecture has a number of advantages, the most important being ability to create a different views for the different devices (desktop and mobile for example) without a need to modify any other element of the application. The research made proved this sentence is nearly absolute true as well as creating mobile web based on the existing desktop application can be a lot faster than creating the mobile version from start.

The mobile devices market is increasing and probably will be increasing in the next years, so knowing method for easy transferring existing applications into the new market will be very valuable.

**Sources**


