Layered Architecture for Mobile Web Based Application: A Case Study of FNU Student Registration System

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ABSTRACT

Mobile and other PDA devices allow us to access the World Wide Web anytime and anywhere using fully functional mobile web browsers. This study utilizes the mobile web to deliver services to register students for courses at Fiji National University (FNU). Developing dynamic web based applications for mobile devices is a challenging task, because these devices have limited processing power and physical memory. In order to overcome these limitations, the author proposed layered architecture for the development of this system. This paper describes the architecture, design and implementation of the new system. Experimental results demonstrate that proposed architecture can effectively reduce the client side resource utilization (processing power and physical memory) of dynamic mobile web based systems. Furthermore the author conclude this paper by outlining future work for research in this area.

KEYWORDS

Dynamic Content, Mobile Computing, Software Architecture, Student Registration System

INTRODUCTION

Mobile access among college and university students is increasing rapidly and now they are relying on these technologies to improve their services. Increasing student population at Fiji National University and hotspot facilities being setup at all the campuses allow students more rapid access to internet. This study utilizes mobile web to develop a new student registration system so that students can have faster and rapid access. Developing mobile web based student registration system will be a challenging task. The nature of mobile devices poses two major challenges such as limited processing power and physical memory. In order to address these challenges we proposed layered architecture for design and implementation of this system. This architecture will overcome limitations posed by these devices and provide a flexible and reusable solution.

Resource utilization of an application is an important factor for mobile devices because it can affect applications quality (Rawassizadeh, 2009). It is regarded as an important performance metric alongside response time, throughput, reliability and flexibility (Haines, 2006). Mobile devices require a simple architecture in order to work within the constraints imposed by the device hardware (Guthrie, 2009). Proposed registration system will be structured as multi-layered application consisting of user, business and data access layers. User Layer is separated into user display and content generation. Application processing is the most unpredictable part of the system therefore processing logic will be distributed between business and data manager classes as a result providing rapid client request.
This paper is organized as follows; it provides background on mobile computing with design and implementation details of layered architecture for mobile web based student registration applications using JEE. Finally, we provide experimental evaluation results and conclude with discussing future work for research in this area.

RESEARCH BACKGROUND

Software architecture of a computing system is the structure or structures of the system, which comprises software elements, the externally visible properties of those elements and the relationships among them (Bass et al., 2003). Like any other complex structure, software must be built on solid foundation. Failing to consider key scenarios, failing to design for common problems, or failing to appreciate the long-term consequences of key decisions can put your application at risk. Modern tools and platform helps you to simplify the task of building applications but they do not replace the need to design your application carefully, based on your specific scenario and requirements. The risks exposed by poor architecture include software that is unstable, is unable to support existing and future business requirements or is difficult to deploy and manage in the production environment (Chaudhary, 2009).

Layer can be defined as one of the two or more rows, levels or ranks arranged one above another, hence the definition for Multi-Layer being any number of levels arranged above another, each serving distinct and separate tasks (Ruzinoor, 2011). From the beginning of computer science, the industry has been practicing a simple form of client/server computing, since the inception of the mainframe with a configuration that had directly connected to the host an unintelligent terminal constituting the one-layer or monolithic system (Christian, 2010). The simplest client/server model involves only two layers interacting with each other called the 2-Layer architecture, varying from low scalability architectures with fat clients, handling transformations on data retrieved from a simple file or database server, to solutions with fat servers offering lightweight client modules in exchange for increased complexity on server-side. The successors of 2-Layer architectures, the 3-Layer architectures imply the insertion of an additional layer called the middle layer, morphing the other two entities from the 2-Layer architecture into the front end and backend. Front end mostly contains logic responsible for presentation, delivered as client side code, whereas the backend deals with access to dedicated services such as a database server to the middle layer. The philosophy is that direct access for the front end to the back-end without the middle layer acting as an intermediate is not permitted. Following the pattern, 3-Layer architectures can be extended with additional layers ending up obtaining the generalized structure of the multi-layer architecture.

Architectural style sometimes called an architectural pattern provides an abstract framework for a family of systems. It improves partitioning and promotes design reuse by providing solutions to frequently recurring problem (Guthrie, 2009). It is also set of patterns and principles that shape an application. The architecture of a software system is almost never limited to a single architectural style but is often combination of architectural styles that make up the complete system (Ahemad et al., 2010). Client/Server is a conventional representation for systems constituted of physically separated parts where entities called clients initiate contact with one or more servers in order to acquire access to a specific functionality (Anouncia, 2009). As can easily be noticed, the increase of simultaneous client requests to a given server can determine server overloads. N being a finite number, every server has a certain limit of possible to be served client requests at any given moment in time, besides network latency and other factors involved by communication between layers. Inherently care must be taken when adding new layers to the system since they affect the overall performance. Even there are situations when drawbacks are acceptable thanks to the gains in flexibility and scalability of the resulting software application. The most common type of multi layer application is the 3-Layer application. As its name suggests, the structure contains three layers: presentation, logic and data. In this case the client/server model is extended with an additional layer (Ahemad et al., 2010). Physically
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