Improving the Performance and Reliability of Mobile Commerce in Developing Countries

Ibtehal Nafea¹ and Muhammad Younas²

¹ Computer Science College, Taibah University, Saudi Arabia
e.t.nafea@gmail.com
² Department of Computing and Communication Technologies, Oxford Brookes University, Oxford, UK
m.younas@brookes.ac.uk

Abstract. Mobile commerce (m-commerce) is currently more widely adapted in developed countries than the developing countries. Developing countries lag behind due to inappropriate technological infrastructure for the provisioning of m-commerce services. Though there exist various obstacles of adapting m-commerce services in developing countries, this paper addresses the performance and reliability issues. In particular, it considers the limited bandwidth of wireless networks and the capacity of underlying web servers involved in processing m-commerce requests. If m-commerce requests are not processed efficiently then they are more likely to be dropped wherever the network connection can be intermittent as in developing countries. This paper proposes an approach which is based on the class-based priority scheme that distinguishes m-commerce requests from other requests. The idea is to give high priority to the requests coming from mobile devices (over wireless networks) as compared to requests coming from standard PC/laptops (over standard Internet (wired) connections) as the later can tolerate longer delay and are less susceptible to connection failures. The proposed approach is formally specified and is implemented as a prototype tool. Experimental results demonstrate that the proposed approach significantly improves the performance and reliability m-commerce requests.

Keywords: E-commerce services, Mobile commerce, Priority scheduling, Performance.

1 Introduction

Mobile Commerce (or m-commerce) is defined as buying and selling of goods and services over the Internet using mobile devices such as mobile phones [15]. Mobile phones have been used for a variety of purposes ranging from voice calls to text messages through to social networking and online shopping. Increasingly, customers research products online via computers and mobile devices prior to making any purchase decision. It is anticipated that mobile phones would replace our wallets and the payment cards, e.g., using NFC (Near Field Communications) technology in the
near future. Mobile service provisioning and consumption is more common in developed countries. For example, 34% of mobile phone users have made a purchase using their mobile phone compared to 19 percent in 2011 (Source: DC Financial Insights, 2012). In addition, according to recent US Holiday Shopping Survey, results show that 33% of US shoppers use their smartphones when comparing prices while in a store and 13% using their mobile phone to receive mobile text reminders of sales (http://www.accenture.com/us-en/Pages/insight-holiday-2013-shopping-trends.aspx).

However, developing countries still lack appropriate technological infrastructure for m-commerce services. The authors in [16] identify various factors that have negative impact on the adoption of m-commerce in developing countries. These include, network infrastructure, service cost, hardware and handsets costs, trust and security, cultural and user acceptance. In terms of network infrastructure, 2G networks are common in developing countries which are sufficient for simple SMS communication but not for m-commerce services such as online shopping or online payment. Most of the m-commerce services need 3G networks but this requires large investment by the mobile network operators. For instance, authors in [17, 18] identify internet broadband in Saudi Arabia is more expensive than developed countries. This research also identifies security, trust and privacy issues related to online shopping and that small business lack appropriate online payment mechanisms in Saudi Arabia.

For the successful provisioning of m-commerce services tackling all such issues are equally important. But this paper addresses the performance and reliability issues of m-commerce services. In particular, it takes into account the limited bandwidth of wireless networks and the capacity of underlying web servers involved in processing the m-commerce requests. If m-commerce requests are not processed efficiently then they are more likely to be dropped wherever the network connection can be intermittent as in developing countries.

This paper proposes an approach which is based on the class-based priority scheme that distinguishes m-commerce requests from other requests. The idea is to give high priority to the requests coming from mobile devices (over wireless networks) as compared to requests coming from standard PC/laptops (over standard Internet (wired) connections) as the later can tolerate delay and are less susceptible to failure. The proposed approach is formally specified and is implemented as a prototype tool. Experimental results demonstrate that the proposed approach significantly improves the performance and reliability m-commerce requests.

These m-commerce applications process large number of users’ requests which incur excessive load on the underlying servers. Such excessive load generally results in performance degradation of the servers, i.e. response time of requests may increase or servers may drop requests. This paper focuses on the extremely important challenges to today’s mobile and e-commerce applications and the development of class-based priority scheme which classifies requests into high and low priority requests. Requests by paying customers should be favoured over others (e.g. search or browse). By assigning class-based priorities at multiple service levels, E-commerce web servers can perform better and can improve the performance of high priority requests without