Chapter VIII

Customer Perceptions of a Thin-Client Micro-Payment System:
Issues and Experiences

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ABSTRACT

Two fundamental payment methods exist for online information purchase: macro-payment and micro-payment. Traditional macro-payment methods, like credit and charge cards and digital currency, are suitable for large-value, low-volume transactions. However, large-volume, low-value commodities, such as discrete units of information from a website, better suit a micro-payment model. In micro-payment, customers pay for large numbers of small value goods (e.g., per-web page view) with "e-coins", typically of very small value each. We have carried out an empirical assessment of micro-payment and macro-payment purchasing models for an online newspaper application. We report on the design of our experiment, the two kinds of micro-payment (client and server-side e-wallets) used, and customer feedback. We also carried out an assessment of customer effort and economic trade-off when using these services, and compared the results of this assessment to a survey of customers using each system. We present directions for further online payment research aiming to improve the overall satisfaction and efficiency of payment models for end users.

INTRODUCTION

Most current e-tailing systems adopt a macro-payment model and architecture. A user makes a small number of online purchases that have a reasonably high purchase price. In order to pay for these purchases, a "heavy-weight" interaction between the vendor of the product or service and an authorization agent (bank, credit-card company, etc.) system is carried out. This typically involves the user supplying credit card details or "digital money" certificates, which are communicated to the authorization system using complex encryption algorithms. Business processing logic and database updates are performed by the authorizer before the purchase is approved. The vendor system waits for approval before providing the customer with goods or services. This approach works well for relatively small numbers of transactions and relatively high purchase prices (to offset the cost of authorization) (Dai et al., 2001). However, in some e-commerce scenarios this approach has a number of fundamental flaws. It requires the authorization system to always be online. High numbers of transactions or low-price purchase items are infeasible, due to bottle-necking or prohibitive cost per-transaction. In addition, with most approaches the customer's identity cannot generally be hidden from the vendor. For example, when using a subscription-based approach, i.e., a single macro-payment for on-going supply of services, the vendor must be supplied with customer-identifying information. In addition, if the customer only makes use of a small fraction of subscribed services, they spend a comparatively high amount of money for what they use. Most subscriptions are to a single vendor's service and don't cover the purchase of low-value commodities from multiple vendors.

We describe the NetPay micro-payment model and architecture we have been developing. NetPay provides an off-line micro-payment model using lightweight hashing-based encryption. A customer buys a collection of "e-coins" using a macro-payment from a broker. These coins are cached in an "e-wallet" (stored either on the customer's machine or on broker and vendor server machines). The customer, when buying many small-cost items from a vendor, pays for these transparently by the passing of e-coins to the vendor. Periodically the vendor redeems the e-coins with the broker for "real" money. E-coins can be transparently exchanged between vendors when the customer moves to another site.

In this chapter, we give an overview of the concept of micro-payment vs. macro-payment models of e-payment. We outline our research methodology of assessing the perceptions of customers of micro-payment vs. macro-payment models for e-tailing systems. We present the software architecture and design for NetPay, a new micro-payment system we have prototyped, for deployment with thin-client vendor interfaces for customers. We describe three kinds of experiments we have done on our NetPay prototype to assess micro-payment vs. macro-payment usability, performance and overall qualitative characteristics for e-tailing systems payment. We compared two kinds of NetPay-based micro-payment systems (client-side wallet and server-side wallet) and a subscription-based macro-payment system. We conclude with an outline of our further plans for research and development in this area.

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