SEMOPS: Design of a New Payment Service

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Abstract

One of the most promising future applications in the domain of mCommerce is the mobile payment. Different approaches come to the market and try to address existing needs, but up to day no global solution exists. In this paper we take an insight on the SEMOPS project, analyse some of the requirements that have been its guiding force as well as the business model it supports.

1. Introduction

118 million Europeans, 145 million Asians and 22 million Americans intend to use their mobile phone for paying small purchases, according to research conducted by TowerGroup (www.towergroup.com). The United Nations Conference on Trade and Development predicts that the volume of mobile business will reach $225 Billion by 2005. Furthermore according to the m-payment report [4] published by Wireless World Forum (www.w2forum.com), the size of the mobile Internet based mobile payment market will grow from around 5 billion Euros in 2002 to nearly 55 billion Euros in 2006. 44% of 5,600 mobile phone users on four continents surveyed in the February 2002 global Mobinet study [5] would like to use their mobile phones for small cash transactions. It is obvious that the need for a universal payment system exists and current efforts have not yet addressed the area at adequate level. We present in this paper the approach that the SEMOPS (Secure Mobile Payment Service) [3] project is taking based on the current situation analysis and a future vision.

2. The mobile payment area today

Mobile phone based payments (mPay) have the potential to become the universal payment instrument of the future, that will boost all e- and m- commerce activities. New business models will be needed and most of all, the cooperation of the various actors within such a framework will have to define their roles and cooperate for its success. Nowadays it is still not clear which role the banks and mobile operators will play in the process. There have been mixed results from services launched so far, which have ranged from limited success to total failure. The mobile phone has the potential to be the payment device of the future since there are at least two strong arguments in favour of mPay: a) the number of users of mobile phones is already huge and still rising and b) in principle m-payments can be used for all types of payments.

Mobile operators and banks express the highest interest in mPay. These players are crucial for the proliferation and mass-market take-up of any mPay service. But as mPay is nothing else but a new form of payment, it is the buyer and seller, i.e. the mobile phone subscriber and the merchant, that seem to be the key links in the chain. A buyer needs to choose mPay over cash, cheque, credit, or whatever form of payment he currently prefers; and it is the merchant who needs to be ready and willing to accept this new form of payment. A critical mass is needed on both ends of the chain to make this happen.

It's clear that consumers and businesses will benefit from the proliferation of alternative payment methods. Merchants especially will enjoy a much lower cost of doing business if the credit card network fees are eliminated. Since these costs are largely hidden from the consumer, other factors will have to motivate him to adopt alternative payment methods in the marketplace e.g. security, friendliness, customisation etc. However, any alternative payment method will have to satisfy the needs of the consumer, the merchant and the financial institution(s) at the same time, for it to be widely adopted in the marketplace.

Banks have been in control of financial transactions for a long time, acting as issuing banks (owning customers' accounts), acquiring banks (owning merchants' accounts), and clearing houses (clearing and settling transactions between the issuing and acquiring banks). Mobile operators, on the other hand, are quite new to this business. Their billing systems have been used until today, for billing customers solely for the mobile services they offer within their network. That has been changing lately with pre-paid accounts and emerging data services, where content is produced and provided by third parties. In some cases these have involved revenue sharing agreements with the mobile operators, who handle service charging.

There is a large variety of mPay services in the market already, some of which are operated by Banks and Mobile Network Operators (MNO), while others are operated by third parties. A key advantage of the independent players is that they enable every mobile user to use the service upon registration, regardless of their mobile service provider or Bank. For a specific merchant intending to use an mPay solution, teaming up with such a player is more efficient than teaming up with three or more separate mobile operators. On the other hand, an independent player will need to build a user base, usually from scratch. Mobile operators and a banks, have already millions of customers who are

potential mPay users. A combination of key elements is required for mass take-up of mPay:

Simplicity and usability: Simplicity and usability largely determines whether users will use a service [2]. This includes not only a user-friendly interface, but also, the range of tangible or intangible goods and services one can purchase, the geographical availability of the service and the level of risk the user is taking while using it.

Universality: e-/m-commerce favours the logic of on-line universal payment services, integrating in a user-transparent fashion, person-to-person (P2P), business-to-consumer (B2C) and business-to-business (B2B), domestic, regional and global coverage, low and high value payments. Such universal services should operate on an event-driven basis.

Interoperability: In financial services, interoperability has always been a highly contentious topic and its progress has been uneven and in many cases rather slow. Standardisation around the payment service should make interconnection of networks and systems technically easy and cost-effective.

Security and Trust: Upon subscribing to a mPay system, users are expected to place inherent trust on the system. Giving access to a checking or savings account to a software company is not the same thing—in most users' minds—as giving that same access to a bank. Unless the basis for electronic payment systems is based on tried and true secure banking practices, it is unlikely that users will adopt it. Needless to say that all steps should be secured from a technology as well as social point of view.

Fragmentation/ consolidation: The marketplace of payment systems is fragmented, due to historical reasons or non-business constraints. This results in a decrease of the effectiveness of payments. Moreover economic forces favour consolidation around a very limited number of global systems.

Cross-border payments: The European Union requires a cross-border electronic payment system as efficient as any domestic system. According to the European Central Bank, positive results have recently been obtained in the implementation of standards. Furthermore, the payments regulatory burden has been reduced, and therefore should no longer serve as an excuse for high costs and delays.

Market understanding: When trying to identify the key to a successful mPay scheme, it is difficult to predict in advance the kind of benefits a user will find in using such a service. Most of the customers are very used to existing payment methods and need an incentive to use anything new. The ability to use the mobile phone, usually a personal accessory today, as a payment tool, in itself might not be enough. Users and merchants should see additional benefits such as reduced transaction time, reduced transaction cost, etc. Systems that wish to be sustainable must either improve their functionality and usability, or be creative in making users and merchants perceive it as beneficial.

3. The SEMOPS approach

SEMOPS is a two-year European Union funded project that was initiated in November 2002 with the aim to address effectively most of the matters mentioned above, and develop an open, cross-border secure service. SEMOPS has fifteen participants from four countries and brings the cooperation of Banks and international MNOs.

The service concept is built on the credit push concept. In order to complete the actual purchase the customer notifies the merchant that he intends to pay using the SEMOPS method. Depending on the transaction type this communication can either be verbal, or electronically signalled. As depicted in Figure 1, the interworkings of the approach are:

- The merchant (in general any POS/VirtualPOS) provides to the customer the necessary transaction details. The data includes certain static and dynamic elements that identify the merchant and the individual transaction. During the whole payment process, the customer does not identify itself to the merchant, does not provide any information about itself, its bank, or any other sensitive data.

- The customer receives the transaction data from the merchant, combines them with information that identifies himself and a standard format payment request is prepared. Then he selects the account manager, where the payment request is to be processed. This payment processor is the trusted partner of the customer, can either be its bank or mobile network operator. When the payment request ready for dispatch, the customer checks its content, authorises it (e.g. via PIN or other authentication means) and sends the payment request to its account manager.

- The customer's account manager receives the payment request, identifies the customer and processes the payment request. Processing means the verification of the availability of the necessary funds, and reservation of the required amount. When the processing is completed a payment notice is prepared by the account manager and is forwarded to the Data Center of the payment service. The Data Center identifies the addressee bank of the payment notice and forwards the message to merchant's trusted payment processor, who again can be either its bank or mobile operator. The data center handles the message delivery. In case of an international transaction however a second data center is also involved, namely the local data center of the foreign merchant's country. In general one Data Center per country is envisaged, but more than one could also exist.

- The merchant's payment processor receives the payment notice and identifies the merchant. The payment processor advises the merchant in real
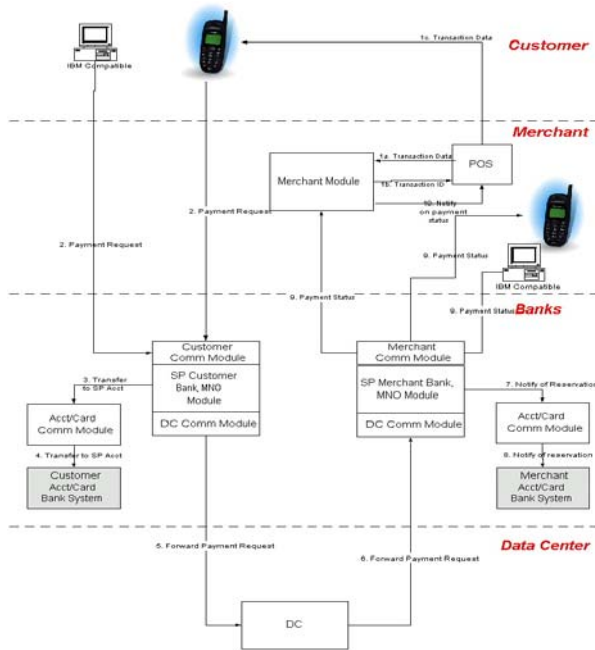
Figure 1 – SEMOPS general Architecture

time about the payment by forwarding the payment notice. The merchant has the chance to control the content of the payment notice and can decide, whether to approve or reject the transaction. By confirming the transaction to its payment processor, a confirmation through the data center to customer's trusted partner is forwarded.

- When customer's payment processor receives the positive confirmation it initiates a regular bank transfer to merchant's bank. This transfer is based on the regular interbank procedures, however with the involvement of a clearing house the process could be better optimised. In case of successful money transfer, the Merchant's bank sends a notification to the Merchant, and Customer's account Manager sends a notification to the Customer. Should for whatever reason the merchant reject the transaction, the customer's payment processor releases the funds it has reserved for the purchase.

4. Business Model

The new payment solution only has a chance to be accepted on the market if it makes good economic sense for the key players to promote the service. All the features, offered to the end users, the security, the comfort, the wide reach may be in vain if there is no economic incentives for the service providers. However it is obvious also that the service providers alone cannot make a success story of the service if the users are dissatisfied with either the service or the terms of the usage.

The SEMOPS approach is based on decentralization. In each country where the service is introduced there is a local entity, the license holder, who organizes the

service, contracts with the banks and mobile operators, contracts with the local service providers, ensures that local regulations are complied with, makes sure that the general service requirements are followed. This license holder has substantial initial investment, and running expenses. The revenue streams have to be designed with the goal to provide adequate returns for this person.

4.1 Actors

Key actors in the business model of the payment service are: initiators (investors), license holders, banks, mobile operators, customers, merchants, developers, service providers and suppliers. The business model has to take into account several aspects. The banks involved in the new service have already existing payment services, and while the new service may offer increased market presence and new transaction channels it may also encroach into present business lines – the new service has to be more profitable than existing solutions. MNOs are already involved in a number of payment initiatives, or are completely disinterested in this line of business. The business model has to offer increased potential for the mobile operators either in terms of customer reach, product scope, but most importantly value added new revenue channels. Customers should have the full spectrum of services and products to buy with the new payment service and these capabilities have tangible value for the shoppers, but the level of this value differs according at each transaction type. Many of the merchants are already active in electronic commerce, but for many the associated expenses are purely prohibitive. The simple consequence the business model has to draw is that the overall transaction costs (including set up expenses) have to be below existing levels.

4.2 The business concept

Basic principle of the business model is that it is based on the cooperation of banks and MNOs. This situation has two consequences a) actors' resources can be combined and b) revenue has to be shared. This is quite a challenge but SEMOPS is determined to prove that this is a win-win situation for all participants.

Based on the complexity of the service and the market strength of the two key partners (group of banks, group of MNOs) the service will follow a revenue maximization strategy and it is not going for niche markets. This statement does not mean that every solution, in every payment situation will be introduced simultaneously, but the full service will target the whole potential scope. There is not going to be a global strategy; each local market has to follow its individual concept that best fits the local circumstances, or the strategy of the key players involved.

The revenue maximization policy is based on the following factors e.g. combination of customer base of the banks and mobile operators (customers, merchants),

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combination of transaction potential of different transaction channels (mobile, internet, traditional POS/P2M), combination of transaction potential of different transaction types (B2C, B2B, P2P), combination of transaction potential of different value levels (micro, mini, macro) and combination of transaction potential of large geographical coverage (domestic, cross border).

On the cost side the business model utilizes all the potential that the complexity of the service provides in terms of scale and efficiency. The new service has a relatively low cost structure due to several factors such as: fully automated infrastructure via end-to-end electronic processing, reuse of existing infrastructure (integration of resources), usage of standardized processes, and technology and middleware integration for gluing existing systems.

4.3 Revenue Streams

Value added services and new revenue generators are also a driving force for the industry. We focus here on Banks and MNOs but it is understandable that once such a service is widely accepted, several entities will benefit directly or indirectly e.g. application developers etc.

MNO revenues: MNOs may individually decide, which of the potential sources will be addressed by them based on market situation and their strategy. The model allows individual variations and does not require a unified approach at global or country level. The MNO is the issuer of the SIM card and will charge not only for the usage of the card (via connectivity) but can also request participation to the mobile payment earnings in a cooperation with a bank. There are several business models and cases to be applied in SEMOPS' model, and what is the best will need to be decided on a per context basis. It is clear that by pushing this kind of payment method, MNOs will benefit from more subscribers, more air-time, usage of their data network services, new business collaborations with banks, mobile device operators and possibly new applications that will increase customer loyalty.

Bank revenues: In the SEMOPS payment service banks are involved in various payment processing activities. They are processing mobile and internet transactions both for customers and merchants. The activity is practically the same however the fee level may vary based on transaction type, transaction channel and whether the service is provided for the customer or the merchant. Banks can now enter the micro/mini payment market (via the MNOs) and generate new revenues from new channels. While mini payments may be possible for banks, micro payments can be easier done at the MNO side (prepaid or postpaid accounts) and the whole approach will increase customer loyalty and new services can arise.

5. Evaluation of the payment model

The payment solution currently under development by SEMOPS is unique from a number of perspectives. The service follows one overall principle; the independence:

- *from banks:* should a customers or merchant need to change bank it should not result in loosing access to the service. Potentially all banks should be able to offer the service
- *from MNOs:* should a customer need to change MNO it should not result in loosing access to the service or to certain merchants
- *from handset technology:* all traditional handsets should be well suited to provide access to the service. This independence does not mean however that all optional features are also available in all phones. Some designs and types will provide more functionality than others.
- *from STK:* all different kind of SIMToolkit cards should be able to store and run the customer modules. Certain minimum criteria apply as memory capacity and cryptographic functionality.
- *from network technology:* the service should be available irrespective of the service provided by the mobile operators. It should be running on GSM (limited capability), GPRS, and 3G technology.
- *from IT platform and connecting infrastructure:* some of the modules need to operate the service and necessary to communicate with external systems will be built on various IT platforms, and will be based on middleware and interface technology.

The payment service is based on the cooperation of banks and MNOs. The SEMOPS consortium includes among its members several banks and MNOs that prove that cooperation is feasible and both of them will benefit. The banks are processing the macro transactions, which is their core business, while the mobile operators are involved in the micro payment transaction, which has been targeted by them for a long time, and where banks are not efficient enough. For the mobile operators there is built in flexibility in the model as they can define the level of their involvement based on their strategy or other considerations. It is important to keep in mind that the mBusiness players reposition themselves constantly on the market, as they adjust to new opportunities and threats brought by rapid technological developments [1].

By involving the key participants in the mobile and financial services industries and offering a universal payment solution to the public, the potential clientele of the service is huge. All customers of all the banks and mobile operators, partners to the service, are potential users of the service. This market potential is further increased by the openness of the transaction flow. The customers and merchants transacting with each other do not have to know each other in advance, do not have to authenticate each other, do not have to belong to one

common service provider. Any client of any of the member banks or mobile operators can perform a transaction with a client of any other member banks or MNOs. This decentralized structure allows quick market penetration and the strong growth of transaction volumes.

The payment service will be based on standard technology and homogenous rules and regulations. This means that local services in different countries will be able to interact with each other. As a result even cross-border transactions are possible further increasing the reach of the service. Key feature of the service is its inverse transaction flow, therefore all users (customers and merchants) are in direct relationship with their own trusted partners (banks and mobile operators). Sensitive information is not leaked to anyone else except from the customer's trusted partner, while payment guarantee is provided by the merchant's trusted partner its bank. This trust based model provides very high, but at the same time very flexible security level and solutions.

The lack of traceable information (from the user's/merchant's side) allows the customers to retain their anonymity if they wish. Except their trusted partner no-one else knows their identity during the payment process (however it is very well possible that during the purchase transaction some personal information are provided to the merchant). In order to comply with money laundering directives, the solution allows lawful interception if necessary by selective authorised entities.

The new payment solution is end to end automated. All payment notices and acknowledgements are sent and processed real time allowing application of the service also for time sensitive purchases, like POS payments and payment for digital content. The payment service has another extra real time feature as well, as it is not only possible to authorize payments real time, but the payment settlement can also be sped up and the merchants can also be credited practically real time. This extra feature depends on the participating banks, whether they want to offer this service to their customers. The introduction of the real time settlement function does not require any modifications in the present interbank clearing processes.

The service is designed with the prime concept of allowing easy, quick and cheap implementation for all partners involved. With the exception of the new software application, traditional banking infrastructure and processes are utilized. The same holds true for the merchants. They also have only a simple integration task, while service can be offered in very flexible structure. The merchants are further assisted with the added comfort features of the service, of the merchant module that provides access, and on line information to the merchant's back office systems.

With this approach the payment service to be developed by SEMOPS will realize the concept of a homogeneous concept and service anywhere in any situation.

6.   Conclusions

We have presented ongoing work within the EU SEMOPS project. Having analysed the requirements for a successful payment service we have drawn the guiding lines for our approach and presented its architecture, with the main components and its interworkings. The SEMOPS business model is general and flexible enough to integrate future needs. Its key driving force relies on the cooperation between MNOs and Banks as well as the social sense of trust (where each user makes business with his trusted MNO/Bank). We aim at fully developing in a prototype the approach described here and demonstrate it in a crossborder trial as an EU project result at the project's end in 2004. Commercialisation of the service is planned after the end of EU finance.

7.   References

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