

Multi-payment Solution for Smartlet Applications

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Keywords: Mobile Payments, Smartcards, Payment Integration, Multi-payment.

Abstract: Organizations from different fields show more and more interest towards an effective solution, which would allow integrating and combining services and products from different providers into the single mobile or smartcard application for easy and comfortable usage by clients. For reaching these demands the need for certain service emerges, which would allow transformation of developer's knowledge to the technological solution in a form of application. We propose to solve these issues with smartlets, role distribution and integrated payment pool for business services. Proposed integrated payment pool was used to design Norvik Bank A-card product in Latvia where multiple payment applications were integrated into single smartcard.

1 INTRODUCTION

The results of researches performed in multiple countries lead to conclusion of rapidly growing market particularly in mobile application area. However the same researches show that many of applications become unused after they are installed on the mobile device. In Finland, for example, users who used their mobile device for internet access, on average, downloaded 17 mobile application, whereas only 35% of them were used in the last month period (Ipsos, 2012). On the other hand, research performed in USA shows that around 26% of application's users become loyal to it, and use it, on average, more than 10 times (Empson, 2011).

It can be explained as most of applications are aimed towards single product or service promotion and purchase. This method doesn't give the brand holder ability to combine his services and products with other services and products, which potentially could be used by the same client, but the source of which are other providers. The same problem persists in smartcards – it is rarely used as source for unifying multiple products and applications, even multiplication smartcards are becoming widely used.

One of the challenges lies in realization of possibility to use different payment methods for one or multiple applications in simplified way during e-commerce applications' development and usage

period. Existing solutions usually offer one payment method, or multiple payment methods that can be added manually, which requires time consuming procedures of integration (Information and Communication Technology Competence Center, 2014a).

The market is beginning to offer some solutions, for example, Apple Pay, which is meant to offer possibility to address this need. However, usually these solutions are closed or available only to particular company. Amazon, for example, tries to create new system of settlements, which would use digital currency, whereas mobile payments are exactly the ones rapidly growing (Melkis, 2014). Such companies as Apple, Google and PayPal consider the mobile payment options; however, there are no standards to perform such payments using smartphones (Melkis, 2014). Company named Weve in collaboration with MasterCard tries to create similar e-commerce solution in Great Britain. Weve tries to create system of settlements, which would unify bank cards with mobile devices' SIM cards. Even Asia seeks solution to such mobile commerce problems. In China, for example, this problem is being actively researched by countries biggest e-commerce companies (Melkis, 2014), such as Tencent, Baidu and Alibaba, with the aim of creation multitask mobile platforms for e-commerce.

Recently Apple presented Apple Pay, which is

system of mobile payments, and allows paying for purchases or services using mobile phone. At the moment, Apple Pay system is available only in USA, but implementation of the system in Europe is planned in 2015 (Kerris and Muller, 2014). Apple Pay system usage requires saving of bank cards into system. Card issuer must support Apple Pay system. Bank cards are saved into secure element's chip.

Today there are no commerce usage mobile payments in Baltic countries, and experts predict the implementation of such only in 2015 (Igaune, 2014). Also there are no solutions in literature, which would provide possibility to register in unified environment both smartlet and mobile applications.

Aim of this article is to propose integrated payment pool for business services solution in Latvia that allows registering various service distributors and providers into integrated system and offers clients to use various payment systems from single application.

Following tasks has been brought forward:

1. Identify typical role distribution in mobile and smartcard payment infrastructure.
2. Propose the solution for development of integrated payment pool for business services.
3. Evaluate concepts of the solution by implementing payment pool in Norvik A-card product.

2 ROLE DISTRIBUTION IN MOBILE PAYMENT INFRASTRUCTURE

Mobile payments can be divided into four groups (Bumanis et al., 2014). In the framework of the research new conceptual term was introduced - smartlet, which is union of main application types.

Roles, usually used in e-commerce solutions, can be proposed to use for mobile payments as well: client, service provider and service distributor. However, as there is a need for centralized solution, the role responsible for smartlet's management platform is required. In case of smartlet application this role is usually delegated to platform manager also known as Trusted Service Manager (TSM) (Akram et al., 2012; Madlmayr et al., 2009).

Trusted service manager is intermediary, which manages business relations and technical solutions, for example, between mobile operators, between mobile device developers or in other infrastructure (GlobalPlatform, 2010; The Role of the Trusted Service Manager in Mobile Commerce, 2013). For example, trusted service manager role can be executed by certain IT company; however, for deals using bank cards, other role can be proposed – smartlet manager. TSM term is widely used by organizations like GMS Association and Global Platform. However, proposed solution requires a role, which has different expertise compared to TSM, and would be able to maintain payment pool, as well as collaboration between distributor and provider.

Therefore, for providing the management of proposed roles the role of concentrator was

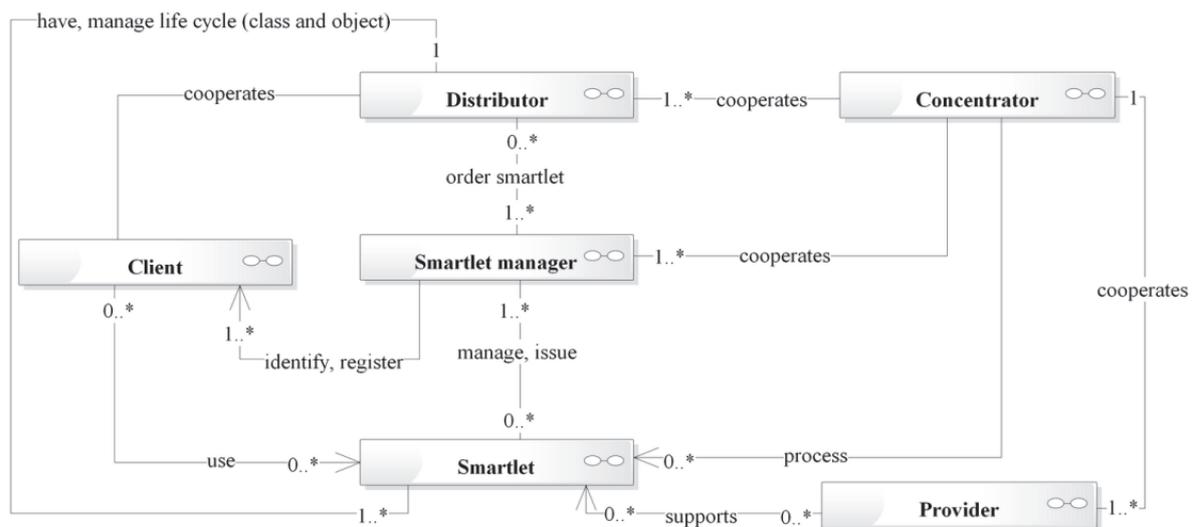


Figure 1: Proposed role distribution in mobile and smartcard payment infrastructure.

introduced (see Fig. 1). Concentrator is responsible for maintaining collaboration between distributor and services' provider, as well as smartlet management, but without particular TSM duties, because it does not perform, for example, payment processing. Payment processing and payment application management is performed by implemented smartlet manager role, which, in addition, is able to develop application, contrary to TSM, which doesn't have such expertise. Smartlet manager's role for standard smartcard applications typically execute banks; however, mobile applications can be managed, for example, by certain IT company. If concentrator complies with particular payment processing requirements, for example, it has PCI/DSS certificate, then it can provide payment gateway functions. Payment gateway functions can be provided by separate service provider as well. The task of payment gateways is to provide payment in multiple different networks. Usage of payment gateway helps to integrate payment solution into application and to increase security of payment process.

3 MULTI-PAYMENT SOLUTION DEVELOPMENT FOR BUSINESS SERVICES

Smartlet concept describes the united functionality of midlet, smartcard, point of interaction and weblet applications (see Fig. 2). The development of midlet's and smartcard's applications is performed at the same time using electronic wallet technology (Ma and Wei, 2014).

Smartcard, POI and weblet applications are executed using smartcard reader and smartcard API.

There are no evidence of unified smartlet application description in literature, however separate group of application, for example, mobile applications can be described using visual components, such as buttons, text entry fields, etc. (Lengheimer et al., 2014).

In case of smartlet description it is necessary to choose the most common applications' description methods, for example, using visual component method would not be appropriate for smartcard or POI applications' description.

In proposed novel solution each application type is described using packages and documents. Packages include obligatory services, for example, messaging and user authorization services. Usage of packages allows realization of interaction between

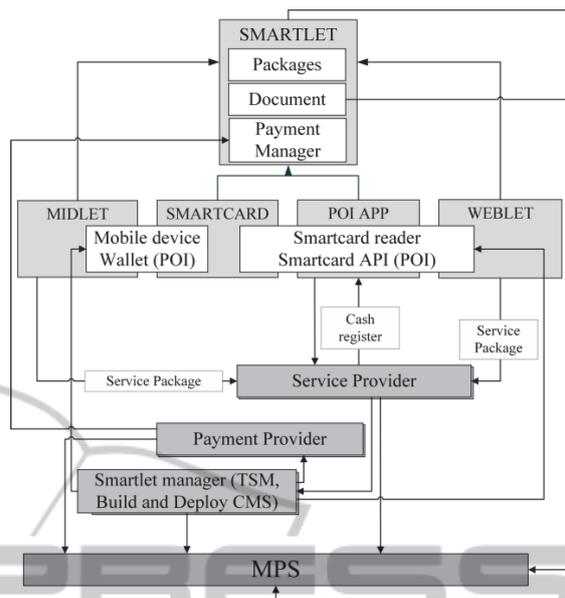


Figure 2: Proposed architecture for smartlet management.

application types. It is possible for packages to include fully functional application; however it can lead to particular integration problems and necessity of package modification. Electronic wallet technology implementation into mobile devices requires integration of payment packages which allow using EMV interfaces, for example, MasterCard Debit, which uses of magnetic stripe reader and contact interface (EMVCo, 2011).

Documents, used in the solution, can be binary or structured, where structured documents are all documents describing the application content. Messaging service's final product - message itself, is considered as structured document as well. An M/Chip advance platform envelopes are one of binary document examples, and are used in payment packages. Service provider is responsible for service package processing, where service packages of particular service provider may be contained in midlet and weblet applications. In case of POI APP the cash register of service provider is used.

Payment provider is responsible for every payment transaction secure operation. Multiple payment managers can be assigned to particular smartlet, whereas only one, chosen by user, will be used to process the request of purchase/order.

Smartlet manager fulfils the role of TSM, providing connection between service provider's service packages and payment provider's processing system. Smartlet manager also deploys midlets to application stores.

MPS is concentrator's processing system,

responsible for overall collaboration between each and every links. MPS stores, validates, authorizes and verifies service providers' service packages, payment providers' assignments to service packages, smartlet managers' requests for any smartlet status and content change, as well as all final products. To develop multi-payment pool for business services, we designed 5 models (Information and Communication Technology Competence Center, 2014b), which includes:

- Unified mobile and smartcard application model.
- External service integration into mobile application systems model.
- Smartcard data and application management model.
- Unified mobile application's data synchronization model.
- Smartcard application's data synchronization model.

4 PROPOSED SOLUTION APPLICATION FOR DEVELOPING A-CARD

This research is based on approach presented in previous studies (Information and Communication Technology Competence Center, 2014; Zacepins et al., 2014). Proposed solution was successfully integrated in Norvik bank A-card project in Latvia. In this project there is following role distribution:

- Service provider: Norvik Bank, JSC;
- Distributor: Jelgava City Council;
- Concentrator: Complete Payment Systems, JSC;
- Smartlet manager: Norvik Bank, JSC;
- Client: client who apply for receiving Norvik A-card;
- Smartlet: Norvik A-card.

Payment pool that is managed by concentrator includes various integrated payment services, such as mobile application services "Bilesu Serviss" and "Mobilly" and multiple smartcard payment services. In case of Norvik A-card, two payment service providers are registered and provide smartcard payment services. Mainly CPS payment services are used that process local payments and subsidy payments. Norvik A-card contains three applications: CPS payment, MasterCard Debit payment and CPS identification (see Fig. 3).

Norvik A-card payment card is specific product

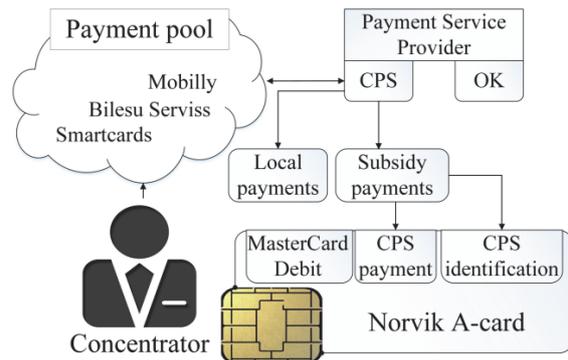


Figure 3: Norvik A-card interaction with multi-payment solutions payment pool.

of A-card (see Fig. 4), where A-card is a smartlet meant to be used for payment operations, including subsidy administration in public transport.

A-card is a union of multiple applications building components, used in every smartlet application in different combinations, as well as internationally approved smartcard application and physical unit's standards. A-card is based on GlobalPlatform, Java and DI platforms.

A-card Content describes card's application's content and stores it as binary document – m-Advance envelope. A-card may contain multiple applications, whereas Norvik A-card's main application is used for subsidy administration (Zacepins et al., 2014). A-card, in addition, may be used as an average banking card in any store supporting MasterCard standard, because of integrated MasterCard Debit application (see Fig 3.).

A-card design describes the visual look of the card. Visual design is stored as image files in base64Binary format. The advertisement image is seen as row style banner on the card, and is not obligatory component.

There are three roles distributed in authentication settings – registration provider, identification provider and authentication provider. Registration of a client accordingly to issuing institution is performed by registration provider, and in case of A-card, by A-card distributor. Norvik A-card clients are registered by Jelgava City Council, whereas information about clients may come from schools. Identification is performed when an issuing institution receive registration information about a client. Identification is common process for Issuer bank. Authentication is performed when a client receives his card. A-card is constructed around three main packages responsible for payment operations and safety of these operations. MasterCard Debit package relies on international EMV standard of

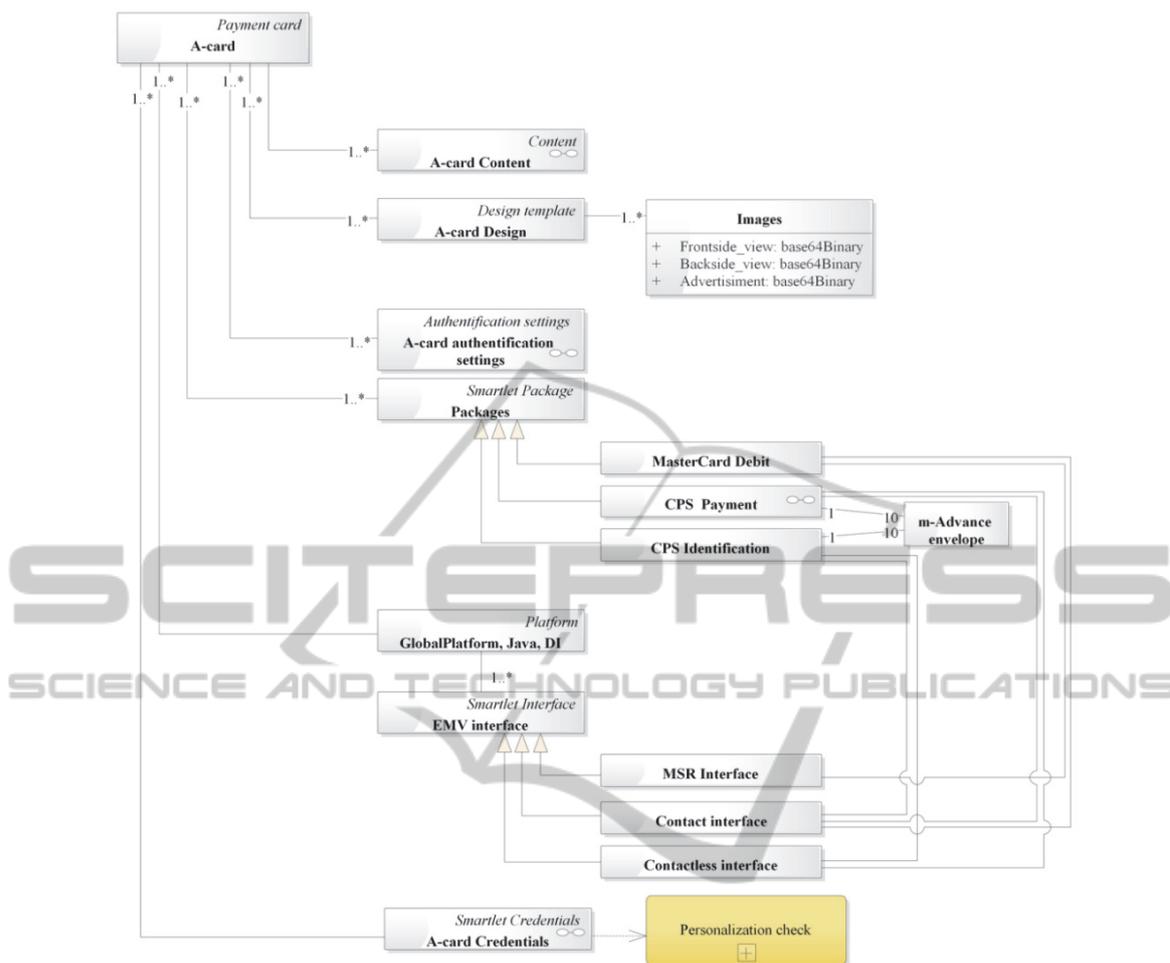


Figure 4: Developed A-card model.

MasterCard credit cards, and allow using A-card as everyday payment card. CPS Payment package is based on Latvia’s local payment processor system organization called Complete Payment Systems. The difference between the first is usability of contactless interface in union with contact interface depending on the receiving systems specification, whereas MasterCard uses either Magnetic stripe reader or contact interface. CPS Payment consists of ten m-Advance envelopes – card info, list of custom EMV configuration IDs and custom EMV configuration parameters, where all of envelopes are used in subsidy calculation and administration.

A-card credentials describe the credential information about cards user, be it personal, containing forename, surname, personal id and photo, or employment, department, etc. A-card may be constructed using either both personal and employment information, or only one of them, when in case of using only employment information

A-card is considered anonymous.

5 CONCLUSIONS

Offered multi-payment solution for smartlet application is simplified and unified way to register multiple payment service providers and distributors. In result, for example, users can perform multiple service use from a single application, such as buying a ticket to theatre and paying parking fee in a single application. Centralized solution also allows unified smartlet processing.

Smartlet concept includes four application types which can be managed with five roles. Proposed solution includes two new roles: concentrator and smartlet manager.

Proposed solution concept was successfully integrated in Norvik bank A-card project in Latvia. Three payment services in form of smartcard

applications were integrated into Norvik A-card from payment pool, including CPS payment, identification and MasterCard Debit.

Norvik A-card is based on GlobalPlatform, Java and DI platforms and use proposed role distribution in management. In A-card solution smartlet manager role is executed by Norvik Bank, but concentrator role is executed by Complete Payment Systems, JSC.

ACKNOWLEDGEMENTS

This research is part of a project "Competence Centre of Information and Communication Technologies" run by IT Competence Centre, contract No. L-KC-11-0003, co-financed by European Regional Development Fund. More information at <http://www.itkc.lv/?lang=en>.

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