

Transaction Document Management: Case Study of International Passenger Carrier

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Abstract: As m-commerce services availability is rapidly increasing, more solutions are required to support business processes. One field is a management of transaction documents that appear during payment transaction, such as transportation tickets, receipts, etc. This position paper address transaction document management issue with application of previously developed improvements of payment procedures using micropayment company payment processing procedures for case study of international passenger carrier. Introduced improvements include the document structure and versioning, the improved interaction setup for the involved parties and the definition of smartlet content management engine. Improvements were included in prototype that was successfully developed following the OSGI standard approach for modular development using the Apache ServiceMix software stack. The proposed transaction document management approach can be implemented in other logistics companies after testing with larger amount of transactions and considered for possible application for other business fields.

1 INTRODUCTION

Transaction document management is crucial component in m-commerce solutions and transaction document management is increasing (Oliveira T et al. 2016). Transaction document examples are bills, warranty cards, bank statements and insurance policies.

Transportation industry for multiple years are trying to substitute printed ticketing with e-tickets using different technologies typically including separate smartcards (Payeras-Capellà et al. 2015) and RFID technology (Sankarananrayanan and Hamilton 2014). Recently m-ticket technologies are developing, for example using m-ticket purchase using location services (Khan et al. 2016).

NFC and other m-commerce enhancing technologies support typically transaction document purchase (Ceipidor et al. 2013), but also can be used for further management during purchase transactions and possible unification of transportation flow for other parties (Vitols et al. 2017).

Transaction document management after purchase is fragmented and raises multiple issues, especially with documents that should be stored for longer periods, such as warranty cards and purchase receipts.

Previous research introduce concept of smartlet and role interaction for smartlet management (Vitols et al. 2015) that can be applied for transaction document management.

Aim of this research is to propose technological solution and application scenario for previously introduced solution for generation and transportation of transaction documents using payment infrastructure.

2 PROPOSED IMPROVED COMPONENTS FOR TRANSACTION DOCUMENT MANAGEMENT

Proposal of unified document structure and management components can be introduced to support scalable solution for transaction document management.

Introduced improvements are:

- Introduced document structure and versioning (Fig. 1, Fig. 2);
- Interaction setup for the involved parties (Fig. 3);

- Role of Smartlet content management engine (SCME) (Fig. 4).

The document includes type and class. Class has a version and version corresponds to the type. At the same time document has an original version and a snapshots. Original version is stored in the profile system while snapshots are transported between involved parties of the transaction.

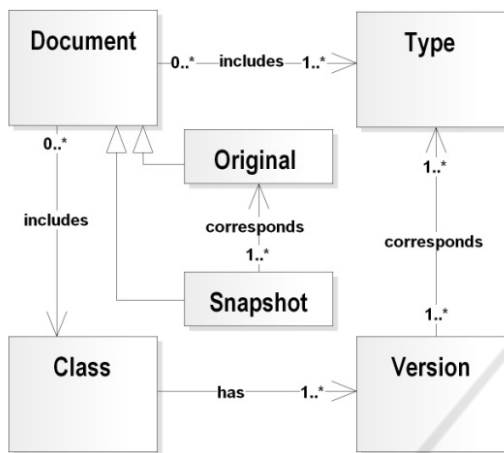


Figure 1: Proposed document class and type association.

Document is abstract distributed document object, which circulates between different integrated profiles systems. Document is built around five main components: Abstract, Class components, content, Mandates component and Access History component. Abstract contains unified data for the document package's identification. Class component defines document presentation that is formed using CSS and HTML5 or any required interpretation of XSLT with functioning elements, XML scheme for content validation and methods. Methods can either be realized on front-end or back-end, depending on class author's needs, and be implemented into mobile application and/or web page as end points. Documents content is stored in XML format that can be filtered according to class component's presentation specification. Mandates component is used to authorize initiation of Methods. Access History includes all the changes performed to the document, including usage of such method as view.

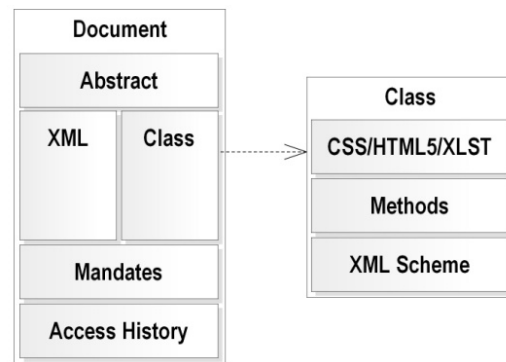


Figure 2: Proposed document architecture.

To develop solution and describe interaction for transaction document management, we introduced 4 concept interactions (Fig.3):

- Point of interaction (POI) (example, mobile device);
- Smartlet (example, mobile application, smartcard application);
- Payment interaction object (PIO) (example, payment application, payment method);
- Service interactions object (SIO) (example, service or service order module in application).

To describe introduced role of Smartlet content management engine, parking payment and transaction document management can be explained. When service interaction object (SIO) initiate order (parking payment), check is performed if there is a class (instructions how to process) that can process this order. If the class (i.e. order execution template) exists, the order is executed using template description.

Otherwise if SIO does not have the class description for particular order, SIO interact with service provider's SCME to get the class for execution of initiated order. Service provider's SCME can get the class from another role's SCME which is the class author (Fig.4).

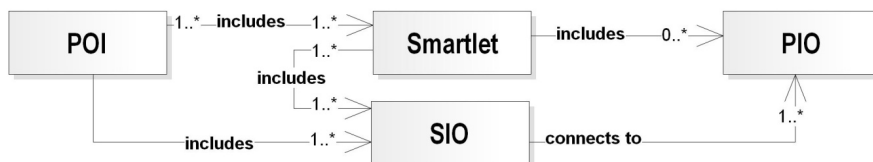


Figure 3: Interaction setup for the involved parties.

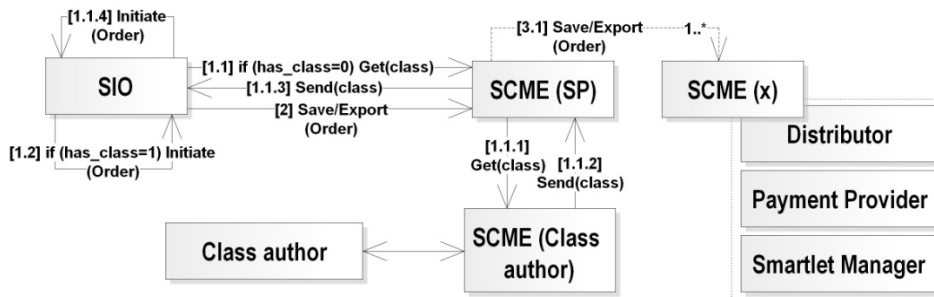


Figure 4: Role of Smartlet content management engine.

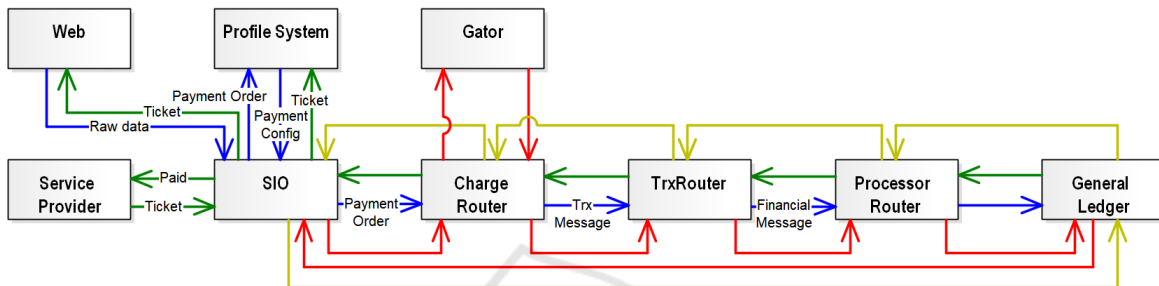


Figure 5: Role of Smartlet content management engine.

3 APPLICATION OF PROPOSED PROTOTYPE FOR INTERNATIONAL PASSENGER CARRIER

For concepts approbation prototype was developed and applied in the information system of international passenger carrier that operates in Latvia. Prototype is introduced in ticket sales business process.

Involved parties for application of developed prototype include:

- Service provider provides PIO which provides e-ticket purchase function. Executed by LLC Mobilly (micropayment company);
- Profile system provided by national level ICT company that holds large profile database from all municipalities of Latvia;
- Transaction messaging and payment processing using profile system is performed by LLC Mobilly (Payment method and Processing Method role);
- E-ticket writing (POI interaction) to the smartcard is performed by international passenger carrier (Smartlet manager role).

Proposed prototype execution is described in Figure 5.

Described scenario includes ticket purchase and profile modification procedures. Blue arrows describe purchase execution, green arrows - response, red arrows describe profile modification, and yellow arrows response from these modification.

General Ledger is an accounting system, which contains all client's data - account numbers, balances, limits, etc. General Ledger is also responsible for deal's processing, where each deal is processed according to particular accounting scheme that is defined with business rules, such as when to execute transaction, which profiles are used, how commissions are deducted, how to deduct and process subsidies (discounts, special conditions), if there are defined subsidies from government or other organizations. Transaction processing schema (i.e. template) can be stopped any time and calls for external system procedures can be performed such as profile update, adding funds, requesting for calculations of subsidies or other checks. System also allows to dynamically processing various types of reservation (one time reservation, reoccurring reservation).

Profile System stores user information - personal data and client's profile numbers, payment configuration such as payment sources (e.g. payment

cards, virtual wallets, digital currency, etc.), service access rights and other information.

Mobilly SIO is virtual cash register. It is entrance point for prototype. Transaction initiation starts with request for Payment Order object. After request, access to profile system is performed to retrieve needed configuration for payment order. Based on this configuration further transaction processing step is determined. Usually next step includes interaction with Charge Router entity.

Charge router is virtual POS that based on Payment Order configuration calls Gator to perform payment using bank payment card or external profile. Charge router also creates Transaction Message object and transports this object to Transaction Router entity.

Gator works as transaction processor (interface with bank). Gator receives request for cash transaction and connects to correct bank, after that it performs transaction and sends processing result back to requester.

Transaction (TRX) Router based on Message object content determine format in which forward message for further processing. Developed prototype sends Financial Message data object to Processing Router.

Processing Router based on Transaction Message content determines which accounting system, if there is multiple, has to execute transaction. This prototype is developed with one profile system, therefore Processing Router forwards Transaction Message to this system.

Accounting system is developed following OSGI standard approach for modular development. Modules use Apache ServiceMix software stack (Karaf module containers, Jetty web server, etc.) (Fig. 6).

Accounting system is divided into multiple OSGI modules (Fig. 7) responsible for main functionality.

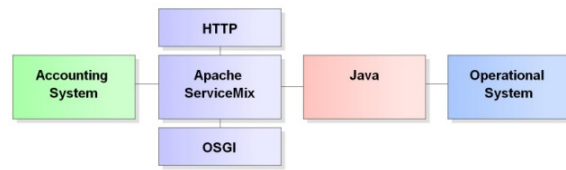


Figure 6: Overall architecture for profile system of proposed prototype.

Module that is responsible with ActiveMQ profile calls is also included. Module allows establishing communication between ActiveMQ supporting systems. HTTP REST interface is used to call profile systems from other systems.

Accounts charting module perform profile schema management and choose transaction processing template according to accounting systems calls. Modules also include and store schemas for accounting for various financial organisations.

Prototype introduction was successful as the proposed improvements (Fig. 1.-4.) were successfully implemented which allows to expand involved parties list and apply proposal for other business processes that involve generation and manipulation of transaction documents.

4 CONCLUSIONS

Unified document concept allows systematical creation of dependent and traceable documents that allows furthering connecting processing points of integrated systems.

Proposed improvements of mobile payment infrastructure support creation and management of transaction documents using unified document concepts.

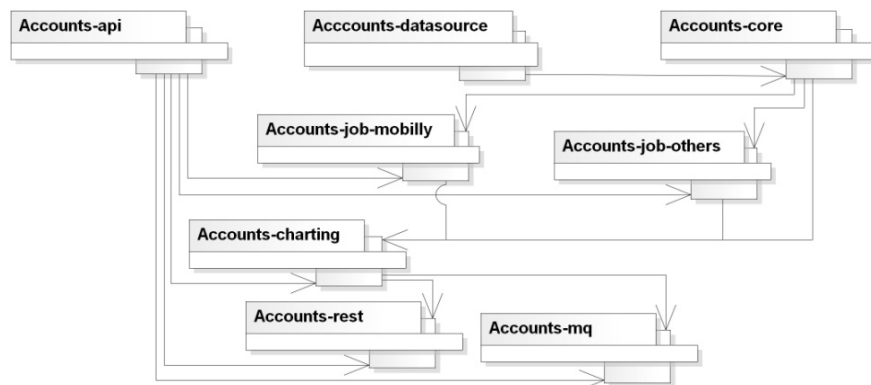


Figure 7: Developed prototype system modules.

Proposed improvements of mobile payment infrastructure support creation and management of transaction documents using unified document concepts.

Profile system can be successfully developed following OSGI standard approach for modular development using Apache ServiceMix software stack.

Proposed transaction document management prototype is scalable and can support collaboration with multiple companies and organizations for unified transaction document management.

Further research involves in full integration of proposal into transportation transaction document management in Baltics and development and testing with increased flow of transactions and parties interactions.

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