CREDIT CARD AND MOBILE PAYMENTS FOR SRI LANKA'S E-GOVERNMENT INITIATIVES

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Abstract: The ICT Agency of Sri Lanka is running the 'Lanka Gate' initiative, a framework to integrate government and related non-government organizations together. We implemented a 'thin-slice' of major Lanka Gate projects to demonstrate its end-to-end functionality, and validate technologies involved. In the present context, we discuss technical and non-technical findings on combining payment systems into Lanka Gate.

1. Introduction

In November 2002, the Government of Sri Lanka (GoSL), launched e-Sri Lanka as a national development initiative, with the objective of using Information and Communication Technology (ICT) to foster social integration, peace, economic growth and poverty reduction. The Information and Communication Technology Agency of Sri Lanka (ICTA), which became operational in July 2003 under the Information and Communication Technology Act (Act number 27 of July 2003), is the implementing organization for the e-Sri Lanka initiative.

It is envisioned that practically all the electronic services and information in Sri Lanka will be delivered via a comprehensive integration platform and collections of portals and applications. This wide collection of software infrastructure and systems which is envisioned to be the gateway for electronic information and electronic interactions in Sri Lanka, is generally referred to as the 'Lanka Gate' initiative.

As a preclude to the Lanka Gate implementation, we designed and implemented an 'end-to-end thin slice' by selecting functionality from some of its key components. In the present context, we present some of our findings related to credit card and mobile payment infrastructure.

2. Thin Slice Scenario

The thin slice scenario consists of:

- Registration of persons with the *population registry*.
- Registration of vehicles and driving licenses using personal data from the *population registry*.
- Registration of traffic fines using a virtual mobile device.
- Verification of vehicle and license data using a mobile device.
- Payment of a traffic fine over various channels; this includes using a mobile phone to pay.

To complete the scenario, we also implemented fictional but drastically cut-down versions of an SMS gateway and a payment processor at a mobile provider, bank, government services, police control unit, UI and communication components of the mobile device used by the policeman.

3. Thin Slice Architecture

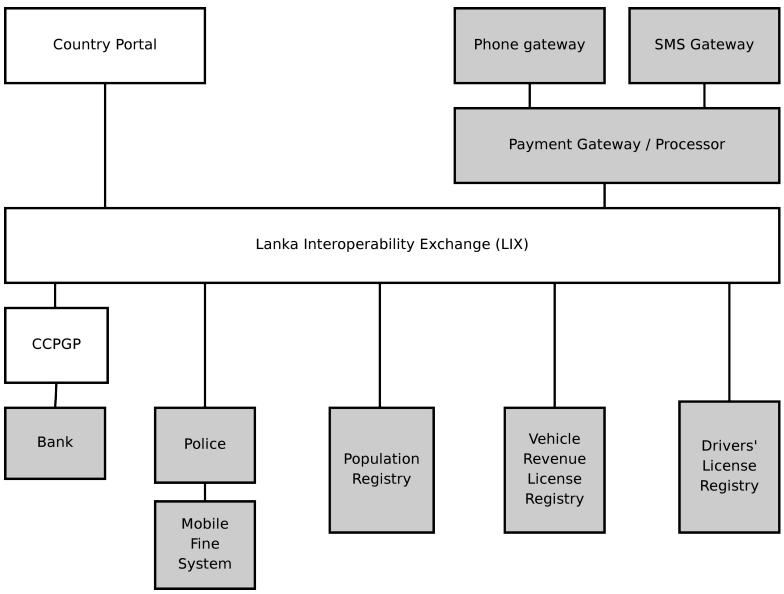

Figure 1: This slice architecture

The high level architecture of the thin slice implementation is shown in Figure 1. Only the components coloured

white will be parts of Lanka Gate initiative. Components marked in grey are to be implemented by other connected organizations.

Components of the thin slice were selected to cover different aspects of Lanka Gate from front-end interfaces to back-end services.

We use the words ‘organization’ and ‘component’ interchangeably when it is unambiguous.

4. Service Oriented Architecture

Different organizations have their data organized differently. Although it is possible to bring uniformity to some extent by enforcing standards (e.g.: date formats), a complete uniform data structure across the government and connected government organizations is a very unrealistic goal.

Therefore, a better alternative is for each organization not to depend on other organizations’ data structures, formats and policies.

Here is an analogy: when an individual reports his financials to the Income Tax Department, he may submit bank statements. Although different banks have different policies on their data and run different systems, the bank statements are likely to be more or less uniform in terms of information.

This is a good example of a loosely coupled scenario: different organizations operate independently, and communicate with each other only when necessary.

Unlike a bank statement read and interpreted by a human, electronic communications parsed and interpreted by computers need to be precisely defined. When organizations operate independently, and expose well defined services to the outside world, it is known as a Service Oriented Architecture (SOA).

4.1. Open Standards

When implementing Lanka Gate as an SOA, it is not possible to force different organizations to run uniform technologies, as historical, circumstantial and other reasons may make them do otherwise. As such, interoperability would be challenging.

However, if well tested open standards are used when implementing services, not only would it be easier to achieve interoperability, but it will also be much simpler to plug into new systems not anticipated presently.

4.2. Web Services

Arguably, Web Services (WS) is the de-facto data exchange mechanism in a heterogeneous SOA environment. As most major technology implementers keenly take part in interoperability testing sessions to make their technologies seamlessly work with each other, WS is likely to pose minimum interoperability difficulties.

4.3. Enterprise Service Bus

Matters can be greatly simplified by introducing a mediator to the core of any complex SOA system. In the industry, such a mediator is known as an Enterprise Service Bus (ESB). In Lanka Gate Initiative, we call this the Lanka Interoperability Exchange (LIX).

4.4. Security

With Lanka Gate facilitating extensive electronic communication between different organizations, including payments, we have very carefully considered security. Apart from data encryption, we have recommended the use of two way Secure Socket Layer (SSL) authentication to make sure that both parties involved in a communication can trust each other. As an SSL certificate also specifies the endpoint address (e.g.: IP address), a stolen certificate cannot be used to directly breach security.

A separate Certificate Authority (CA) will come to operate who will be in charge in issuing SSL certificates to government organizations.

5. Credit Card Payments

Credit card payment systems facilitate transfer of money from a customer’s credit card account to a recipient’s (known as the merchant) bank account (known as the acquiring bank). Technical and legal frameworks for such

transactions are well established and any deviations from the present concepts would require substantial changes in areas we may not have control over (e.g.: international credit card networks).

We considered two options for credit card payments.

The first option is simply to let individual organizations to act as merchants, and for LIX to act as a mediator by providing a uniform interface. Administration overhead in LIX is minimal, and the advantage is the simplified interface which makes it easy to switch between banks, or to operate multiple merchant accounts in different banks. However, this option doesn't drastically reduce work, as organizations would still have to obtain merchant accounts.

The second option is to establish a front organization to act as a merchant for all government organizations connected to Lanka Gate.

If creating such an organization is a viable option, certain policies will have to be made. For example, it would be highly unfair to select one bank as the sole acquiring bank of this organization, so a policy such as "acquiring bank is the same as the payer's bank to avoid overheads" would have to be formed.

As forming new organizations was beyond the technical scope of our exercise, we went ahead with the assumption that it does not exist. Therefore, the thin slice implementation has only the first option.

6. Mobile Payments

As mobile devices are getting more and more accessible to the general public, Lanka Gate systems should be able to accept payments from mobile devices. We have extensively explored avenues with mobile providers to facilitate such payments from simple transfer of funds from one phone account to another, to using a phone to authorize transfer of money from one bank account to another.

Please note that some of these transaction can be carried out by phone banking systems. However, we are looking at alternate systems that are simpler and do not require any preparations beforehand.

6.1. Using the Mobile Phone Account

Transferring credit from one mobile phone account to another is already implemented by existing mobile providers. However, it can be made useful for cash payments only if money can be withdrawn. Unfortunately, there are serious business concerns, especially when it comes to pre-paid connections.

- When a pre-paid connection is 'charged', the mobile provider earns less than the nominal value, because it has to pay commissions to the re-seller, in addition to other overheads. Therefore, it can't allow transferring and subsequently withdrawing the full amount back.
- When a pre-paid customer has charged a connection, the provider has earned the money and has only to provide the service. However, if withdrawal is allowed, this assurance goes away, where money will be earned only *after* providing the service.
- Mobile Phone account becomes closer to a bank account, hence the provider will have to consider extra legal aspects, and may even be subjected to the Central Bank audits like a bank.
- Transferring money from one provider to another is not very compelling in business terms.

Therefore, we think that this option is not be viable, at least in the near future.

6.2. Using Mobile Phone as an Identity

This is identical to Internet payment systems such as PayPal and MoneyBookers. In such systems, people are identified by their email addresses. These systems exploit the fact that only the valid recipients can receive verification messages and prove his identity.

A similar system can be implemented for phones. When money is transferred, recipient is identified only by a phone number. To withdraw, he has to prove his identity by using a validation code sent to his phone as a text message.

Notice that this system is not limited to mobile phones, but usable by any phone that supports receiving messages.

This system has several advantages.

- It depends on the mobile provider only for communication.
- Can be used across different vendors.

- Mobile provider does not get involved in the money transfer.
- Recipient does not need a merchant account to receive money.

However, the major drawback is that this system also requires creating a new organization to handle money transfers and maintain accounts. Unlike a credit card front-end organization, this organization doesn't need to be affiliated to the government. Also, there can be multiple organizations.

6.3. Using a Bank Account

In this scenario, the mobile provider ties up with one or more banks. The customer 'binds' the bank account with the phone, and authorize a payment by sending an authenticated message to the mobile provider, who will initiate a fund transfer at the bank.

This scheme does not involve the mobile provider for financial transactions, hence avoiding any additional legal requirements and audits. Also, similar systems have been fully or partly implemented by some providers.

In the thin slice, we have shown how to plug in such existing and possible future systems to Lanka Gate by implementing only a couple of simple services. This mechanism also allows the phone provider to dynamically decide payee information, hence allowing any new organization to easily start accepting payments only by joining Lanka Gate. This modification also removes the necessity of a special merchant account.

7. Conclusion

As we have demonstrated in the thin slice implementation, it is possible to integrate payment systems to LIX using few well defined electronic services.

Unlike credit card payments where infrastructure and concepts are well established and tested, mobile payments are relatively novel. Therefore, we any architecture that uses such payments must have room for future developments.

A loosely coupled SOA makes sure that various organizations can continue to operate using arbitrary technologies, and interoperate using interfaces and open standards.