Mobile Payment Solution

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Executive Summary

This paper provides a background of the mobile payment and proposes a phased approach for a Telecom operator to roll out pre-paid payment instrument. Finally the Solution and Technology Architecture is outlined.

Background

RBI has issued guidelines for [pre-paid payment instrument](), under the [Payment and Settlement Act 2007](). As of date only one Telecom operator, Airtel, has been issued license for pre-paid payment instrument. But, soon every Telecom operator will go for a license.

In its guidelines [document](), RBI defines four categories of pre-paid instruments:
- Closed: These are the pre-paid charge cards issues by Telcos, commonly known as top-up cards.
- Semin Closed: These instruments allows for paying for goods in pre-defined establishments having explicit agreement to accept the card with the Telco.
- Semi Open: These instruments can be used in any establishment accepting Credit or Debit Cards. But no cash can be withdrawn from ATM.
- Open: These cards can be used in any establishment as well as cash can be withdrawn from ATM.

The Telecom operators can only apply for Closed and Semi-Closed payment instruments. Thus [Telcos are forming 51-49 Joint Ventures with Banking Institutions]() to overcome this limitation. In near future, all Telecom operators will have Open payment instruments

Telco Offering Phases:

A Telecom Operator can offer these services in three phases:
Phase-I : Semi-Closed Payment Instrument.
Phase-II : Semi-Open and Open Payment Instrument
Phase-III: Financial Transaction Switch

Phase-I : Semi-Closed Payment Instrument

For Closed and Semi Closed Payment Instrument, the Telecom operator needs a license from RBI and can operate in isolation, that is, without connecting to Finacial Switches like NPCI [National Financial Switch]() (NFS).

Use Case:
In this phase, the Telco operator provides payment transactions through specific shops and establishments. A Telco subscriber shops in a shop displaying the Telco Pre-paid Payment Instrument Brand. In the checkout counter she presents her either her mobile number or a 16 digit number embossed in a magnetic card or a contact less RF-SIM card embedded in her mobile. The PoS sends the message using either ISO8583 or SFMS protocol. The Telecom operator's payment system sends a

confirmation SMS to the subscriber and on receipt of an SMS confirmation, deducts the transacted amount from the subscriber's pre-paid account and credits this amount minus 2% to the merchant's account. A SMS confirmation of the transaction is sent to the subscriber as well as the merchant. Also, a confirmation message is sent back to the PoS.

Phase-II : Semi-Open and Open Payment Instrument

For Semi Open and Open Payment Instrument connecting to NPCI NFS using SFMS and Bank Net using ISO8583 are required.

The Telecom operator has to form a 51-49 joint venture (JV) with a Scheduled Bank to offer a Semi-Open or Open Payment instrument. Airtel has formed JV with SBI and Vodaphone has formed a JV with ICICI Bank.

In the second phase a Parlay-X based payment gateway interface is provided to other Internet web sites.

Phase-III: Financial Transaction Switch (FTS)

This phase leverages the Phase-II license and JV. The operator offers a full service financial transactions processing, including Financial Inclusion and credit card transaction.
Use Case:
The RF-SIM card can contain a mobile-wallet Applet has an embedded private key correspondent to each mobile-wallet. This wallet can store cash, as well as credit card information. The user can choose to pay in cash, stored in her wallet or through one of the credit cards stored in her mobile-wallet Application.
In case of cash, a digitally signed cash token is generated by the mobile-wallet and the stored value is deducted. The mobile-wallet and the PoS communicates through a secured NFC (Near Field Communication) protocol. The PoS then uses this digitally signed token and sends it to the Telecom FTS and receives a confirmation. The FTS deducts the amount from the users account and credits the merchant account.
In case of Credit Card, a digitally signed transaction authorization is generated by the mobile-wallet and the packet is encrypted using the Public Key of the FTS. Thus the merchant PoS cannot find out the credit card details. The FTS receives the encrypted packet containing a SFMS or ISO8583 transaction and it routes the message to the respective credit card network and on receiving a payment confirmation, acknowledges the payment receipt to the Merchant PoS. Due to secured communication , the fraud risk insurance charges are lowered and thus more margin are available per transaction to the payment system operator.

Telecom infrastructure is the prime enabler of the Financial Inclusion and Mobile Banking platforms. While the Telcos are already playing a passive role of providing the connectivity and bandwidth. They can provide a secured bandwidth and VPN that is not routed through Internet, that is a Value Added Network.

They can also play an active role in the Financial Inclusion by becoming the Business Correspondent and enabling their distribution and customer service points to act as CSP (Customer Service Point) for affecting transactions. They are ideally placed to provide the multi-lateral secured Financial Transaction Switch.

For example, Airtel has formed a joint venture with SBI, where Rs 100 Cr will be invested and 51%

will be owned by SBI. This joint venture (JV) will target the 150 million Airtel customer base, leveraging its 1.5 million retail distribution outlets for providing financial inclusion and banking & financial services. The JV targets to get 2 million customers per year. Vodaphone and ICICI has formed a JV on similar business model.

As per Economic Times, 17 Jan 2011, Government panel on Mobile banking has recommended that a 2% commission will be charged by the banks from its customers transacting through their mobile phones. Banks, in turn, will share a part of this revenue with the Telco; that is a minimum of Rs 2.25 or 1.4% of the transaction value. Also, if the Telco operates a Micro ATM, as per the UIDAI specification, then the banks will pay the Telco a minimum fee of Rs 3 or 2.25% of the transacted amount, which ever is more.

Architecture

The backbone of the technical architecture is message level security and ESB (Enterprise Service Bus).

The Business Processes are composed using BPMN (Business Process Modelling Notation) and executed within the BPM 11g process engine.

Events are generated based on various transaction flows and these events are processed in near real-time for triggering alters, related to system health, business processes as well as flagging AML (Anti Money Laundering) and fraud detection.

The messages are signed and encrypted whenever the external system support them. VPN, TLS/SSL security are applied to the message communication channels if the external interacting system does not support message level encryption.

Financial Inclusion Transaction Switch : Architecture Blocks
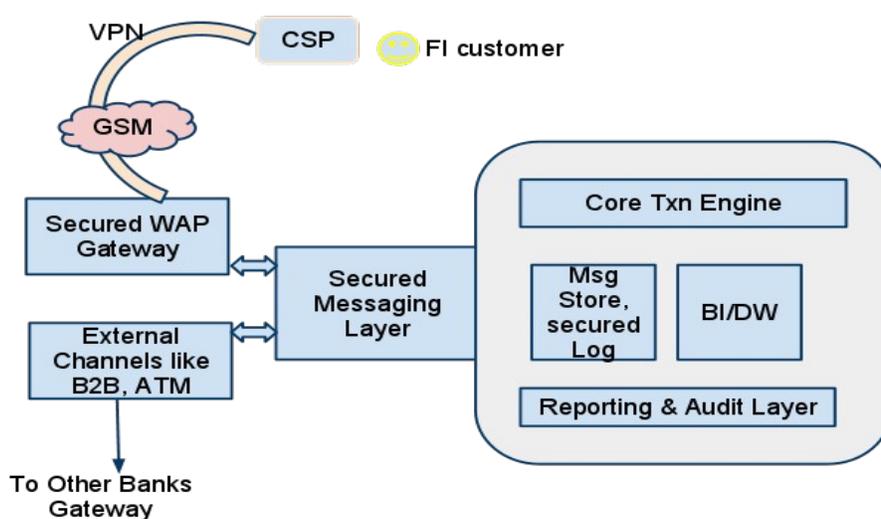
The CSP (Customer Service Point) or PoS (Point of Sale)

The CSP or PoS device is a multi-function device that has capability of accepting a magnetic card

as well as has Smart Card reader and a finger print reader. It has a printer for printing receipt. The PoS communicates to the Telecom network.

For stored value smart card based solution, The CSP device should be capable of operating in offline mode and should synchronize transactions, when connectivity is established. There are two different specifications for CSP devices. The MicroATM specification IBA and UIDAI . Also, The Open Standards specification for Financial Inclusion Terminal by IBA IDRBT specification. The main difference between the two standards are that the Micro-ATM specification does not make the smart card reader mandatory whereas, the IBA-IDRBY Terminal specification makes the Indian open standard smart card SCOSTA support mandatory.

Secured Mobile Gateway

The secured Mobile Gateway is the mobile (CDMA/EDGE/GPRS/EVDO) network gateway to Internet. The mobile operator provides the gateway service, like GGSN (GPRS Gateway Service Node) for GPRS that maps the mobile protocol stack to the Internet Protocol stack. Though, WAP gateways were employed previously, but now-a-days any Web Application Server supporting SSL/TLS security, like Glassfish or WebLogic Server can be deployed.

Since SSL/TLS are point-to-point security protocols; As per RBI guidelines on Internet & Mobile banking, the gateway application server must be in the same data center as the other core components. Also, the gateway control should be in control of the transaction switch provider.

Secured Messaging Layer

Internationally, there are multiple Finnacial Messaging standards like IFX for retail banking, TWIST standard for bank to Bank and Bank to Corporate messaging, ISO8583 for card based transactions lead by Base24 , EDIFACT for business banking and card settlement, old SWIFT (ISO15022) , new XML based SWIFT (ISO20022).

While the older messaging systems like EDIFACT, ISO8583 and ISO15022 were non-XML, the newer IFX, TWIST and ISO20022 are XML based. ISO20022 is also called UNIFI as all the diverse standards are converging towards UNIFI.

Based on RBI report on security and messaging layer for banking, IDRBT has formulated SFMS (Structured Financial Messaging System), which is based on an old SWIFT messaging structure (ISO15022) and employs PKI as message level security. MPFI (Mobile Payment Forum of India) also recommends SFMS for mobile based banking transactions.

Thus the secured messaging layer must have PKI based message encryption/decryption and digital signature and verification capability. It should also have the ability handle different messaging formats,

at the least it must support ISO8583 and SFMS formats.

Transaction Core

Transaction core is the most critical and complex part of the system. At its heart being a [high performance OLTP](#) database engine. Its primary function is to affect STP (Straight Through Processing) as much as possible and with least human intervention requirement. Also, it needs to conform with the RBI's procedural requirements of [Prevention of Money Laundering Act 2009](#), as well as fraud detection.

External Channel Gateway

The external channel gateway handles B2B gateways, third party payment gateways like m-chek, VISA and MASTER networks . ATM networks like [INFINET](#) and [FSS](#) based on ISO8583. And, [RTGS](#) and [NEFT](#) gateways. Both NEFT and RTGS use SFMS for messaging and MQ for transport. Also, SMS and e-mail channels must be supported for transaction alerts.

Use of an ESB (Enterprise Service Bus) for implementing the External Channels will significantly reduce the technical complexity while increasing process flexibility and business agility.

# Implementing a High Velocity Payment Infrastructure

A high speed payment infrastructure is required for providing a STP (Straight Through Processing) in a multi channel Financial Supply chain ecosystem.

The payments needs to be processed at a high speed without compromising checks & balances like AML (Anti Money Laundering) regulatory compliance and Fraud detection.

A blueprint of a high velocity payment infrastructure is outlined in this document, that manages straight through processing, throttling and controlling for meeting customer specific SLA (Service Level Agreement) and QoS (Quality of Service) requirements.

A balance needs to be maintained between the need for high speed processing and regulatory compliance and risk management. A high volume of transaction with low latency and lower risk is attained by scrutinizing the transactions early in the processing cycle, and bifurcating them into different speed lanes.

The transaction speed lane is chosen by a dynamic rules based routing engine, implemented using Oracle Rules Engine.
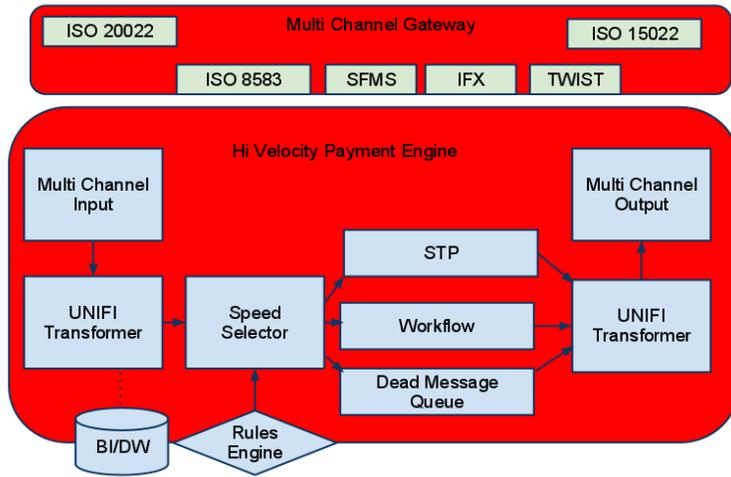
The protocol layer can be easily implemented using Financial Message Designer, which is a part of the Oracle SOA Suite. The diagram below, is a screen-shot of the message designer. The message designer wizard generates a jar file, which is deployed on the Oracle Service Bus.
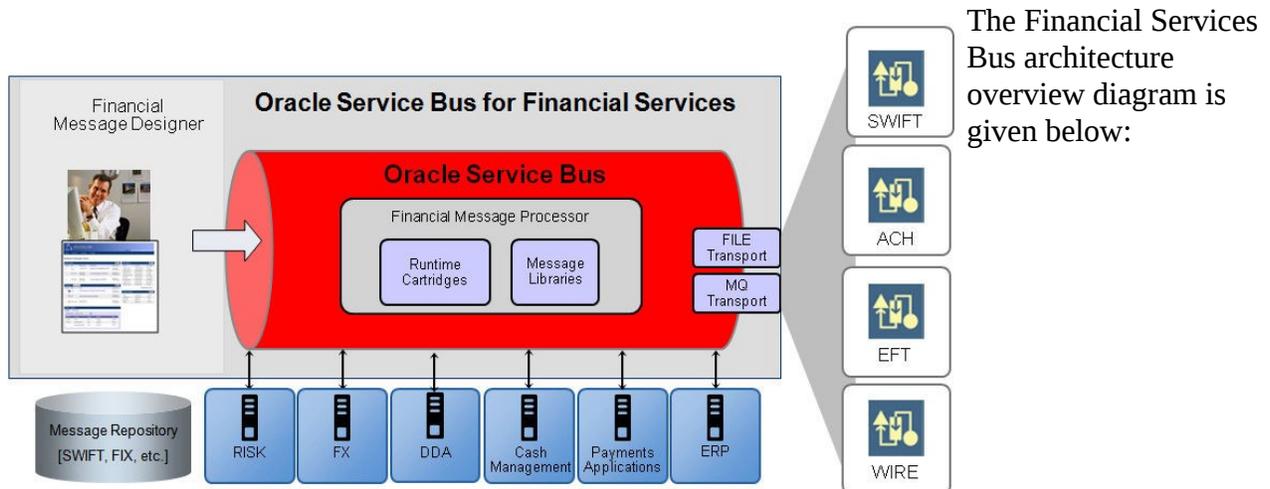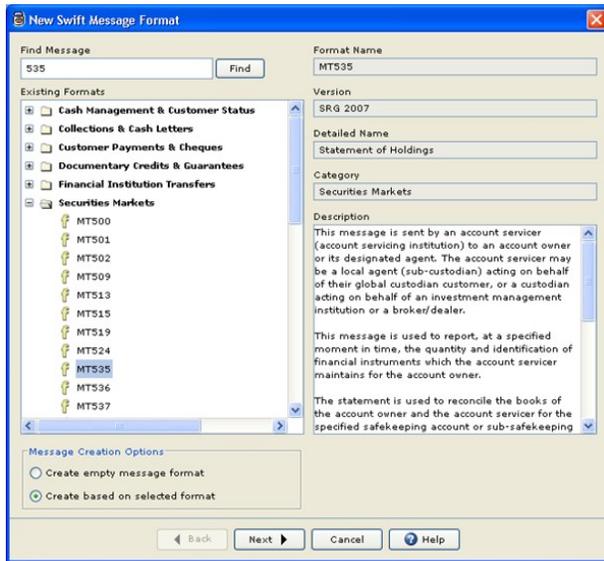
The Financial Services Bus architecture overview diagram is given below:

The Oracle Service Bus and Mediator can be used for implementing the Multi Channel Gateway, Multi Channel Input, UNIFI Transformer, Speed Selector, STP, UNIFI Transformer and Muti Channel Output.

While BPM can be used for implementing the Workflow and Dead Message Queue.