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POLARIS RESPONSE TO RBA'S PAYMENT SYSTEM ARCHITECTURE INITIATIVE

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Synopsis of the RBA's Note on Innovation in Payment Systems

Reserve Bank of Australia has embarked on a mission to modernize its payments infrastructure so that retail payments can be executed in real-time. The reasons for this innovation initiative are:

a. Efficiency in Payments

b. Encouraging Healthy competition in the payment environment
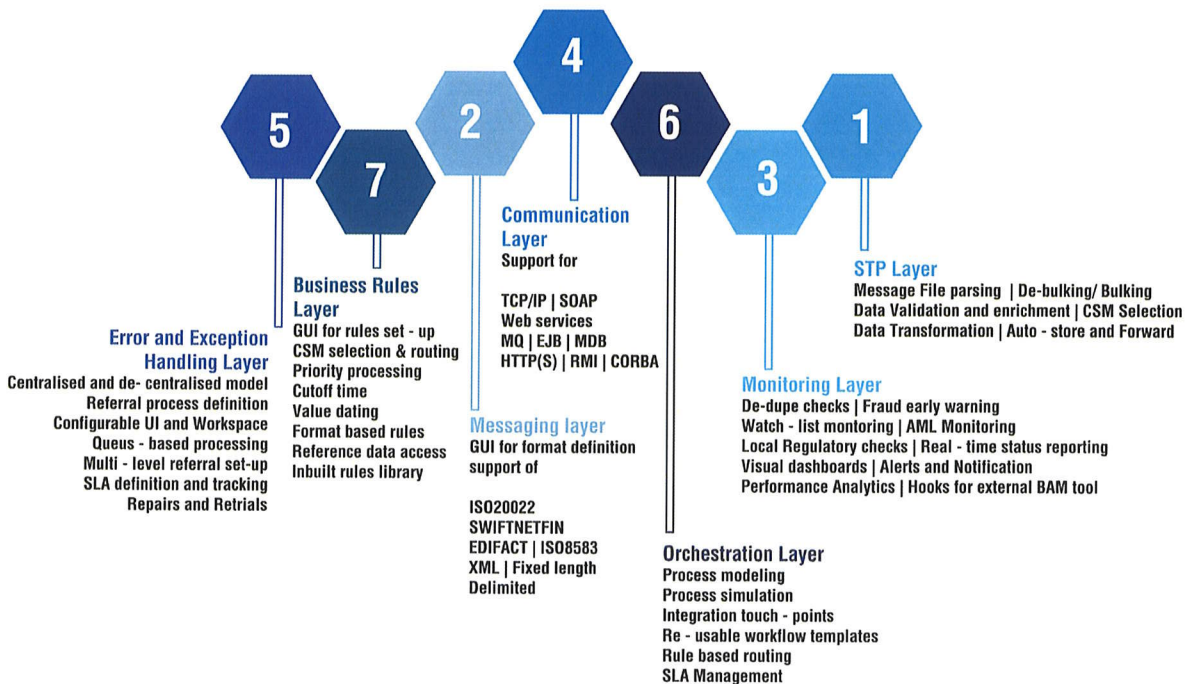
This note is primarily addressing point 'a' and the concept of 'Hub' that RBA wants to create. This note will delve deep into the various aspects of the payment hub and the way the essential elements of a hub as envisaged by RBA can be catered to i.e. the payment hub's ability to process 'real-time' payments (with focus on timing of clearing, timing of fund's availability and the timing of settlement), ability to process payment out of hours, data transmission with payments (through adoption of ISO 20022 amongst other things), easier addressing of payments, simpler access to participants, enable additional processing functions (splitting and distributing bulk files).

This note would go further to elaborate what RBA should consider as essential elements of a '7 Layered' Hub framework.

'7 Layered' Hub Framework

The hub technology has evolved over the past 5 years and developed into a '7 Layered' Hub framework on the bedrock of which we are witnessing some of the most innovative solutions in this space. The 7 layers are – Messaging layer, STP layer, Orchestration layer, Business Rules layer, Monitoring layer, Error and Exception handling layer, Communication layer. Various domain specific flavors have been built on this bedrock. The payment hub is one such manifestation. The depiction of a payment hub through these layers has been given in the following graphic:

Error and Exception Handling Layer
Centralised and de-centralised model
Referral process definition
Configurable UI and Workspace
Queus - based processing
Multi - level referral set-up
SLA definition and tracking
Repairs and Retrials

Business Rules Layer
GUI for rules set - up
CSM selection & routing
Priority processing
Cutoff time
Value dating
Format based rules
Reference data access
Inbuilt rules library

Communication Layer
Support for

TCP/IP | SOAP
Web services
MQ | EJB | MDB
HTTP(S) | RMI | CORBA

Messaging layer
GUI for format definition
support of

ISO20022
SWIFTNETFIN
EDIFACT | ISO8583
XML | Fixed length
Delimited

Orchestration Layer
Process modeling
Process simulation
Integration touch - points
Re - usable workflow templates
Rule based routing
SLA Management

Monitoring Layer
De-dupe checks | Fraud early warning
Watch - list montoring | AML Monitoring
Local Regulatory checks | Real - time status reporting
Visual dashboards | Alerts and Notification
Performance Analytics | Hooks for external BAM tool

STP Layer
Message File parsing | De-bulking/ Bulking
Data Validation and enrichment | CSM Selection
Data Transformation | Auto - store and Forward

This paper elucidates how the core requirements of RBA can be met through this framework

Choosing a Payment Hub - Some Additional Thoughts

- Choosing a payment hub is not going to be just about how feature rich the hub is today, but how the hub will scale in the context of a dynamic and ever changing regulatory and technology environment. The heart of any hub has to be a combination of powerful business rules and workflow. While globally we have organizations that have built business rules engines and likewise workflow engines as silos, the cost of integrating them to deliver a configurable hub in itself is generally quite prohibitive. A true hub should deliver the power of the two (business rules engine and workflow engine) in one single solution. The hub should be aimed at realizing the dream of 'configurable integration'. On top of this framework it should also deliver feature rich payment hub functionalities.

- Payment innovation of such a scale can never be a big bang monolithic replacement. It will have to be through 'Progressive Modernization'. This means that the hub technology will naturally have to be amenable to innovation in phases and one block at a time.

- One important consideration for any 'HUB' solution should be to see live implementations of the same as standalone that is independent of a payment product processor. Lot of products in the market place today are claiming to be a 'Payment Hub' but are extensions of monolithic but highly feature rich payment products. A true payment hub solution should be able to demonstrate an implementation, where a hub sits on top of more than one product processor.

- Of utmost consideration should also be the experience of the 'HUB' partner in working with central banks. It has direct implications around objectives, culture, and business paradigm and change management.

In short we believe that the 4 tenets mentioned above should also be applied while choosing the 'Payment Hub' of the future
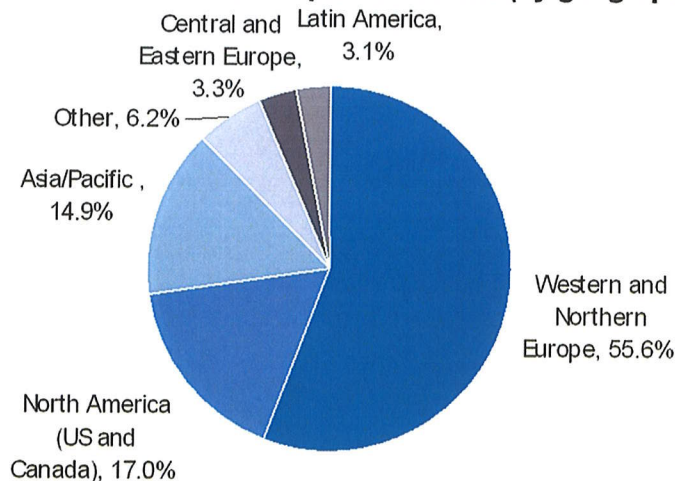
EXAMPLES OF LESSONS LEARNT (CELENT 2011)

- Assemble the right team (internal and external) and align all parties

  - Agree common language and clarify terminology

  - Ensure the right mix of skills and don't under estimate the importance of the "can-do" attitude

  - Ensure clarify of roles - who is responsible for what

  - Align incentives

- Establish governance with authority not just over the PSH project, but over any payments-related projects within the bank to make sure that all projects go through an ROI prioritisation and nothing is launched which might contradict the architectural vision and overall roadmap

- Don't go for a "big bag" approach. Have the long term vision, but migrate in stages, building scalability and extensibility

  - Consider developing a Proof of Concept

  - Each step of the transformation should deliver ROI and tangible business benefit

- Develop a retirement plan for legacy payments applications. Again, no "big bang" approach

- Re-use - don't build what you already have, especially for common services, which are used by other applications, not just for payments (e.g. FX)

- Document thoroughly; also make sure to have training manuals / instruction documents to be used either for clients or internally

- Where PSH scope and benefits include improved corporate integration, train the internal people for customer on-boarding to minimise reliance on the vendor

- Don't forget to align operating mode changes, espeically in key areas of payment operations and risk management

GLOBAL ADOPTION OF PAYMENT HUB (CELENT-2011)

Market share of PSH implementations (by geography)

- Central and Eastern Europe, 3.3%
- Latin America, 3.1%
- Other, 6.2%
- Asia/Pacific, 14.9%
- Western and Northern Europe, 55.6%
- North America (US and Canada), 17.0%

Our experience is that, when fully implemented, a payment hub should be able to deliver on the following business benefits:

- Should deliver on faster time-to-market of 15-20%, through easy-to-change / implement architecture for compliance, regulatory or business enhancements

- Standardization of Internal Processing should lead to reduced internal costs by 15-20% through no duplication of functionality, operation knowledge, business rules for different payment types

- Should improvement STP by 15-20% thereby resulting in reduction of Unit transaction Costs

- High level of configurable should allow new participants to be added easily. Timelines for on-boarding of a new participant should improve by 20-30 percent.

- Operational risks reduction by 15-20% because of distributed access and centralized control of global payments operations

Essential Elements of a Payment Hub that Address the Requirements of RBA

In this section we will delve deep into how the payment hub concept (as alluded by RBA) is an ideal solution to the payment system recommendations. We would like to begin with a brief introduction to the concept of a payment hub:
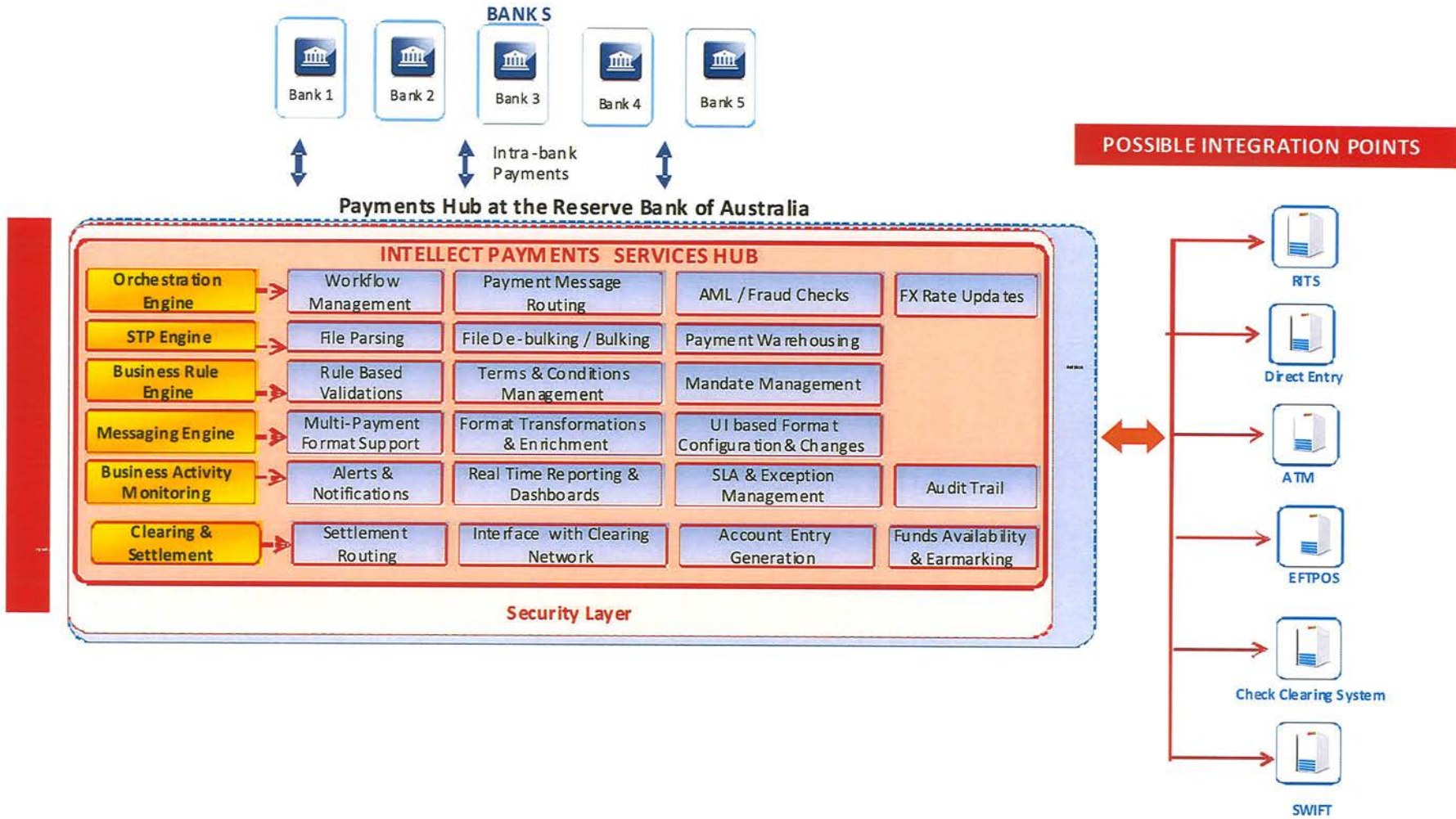
The payment hub, in our opinion, is an intelligent application that orchestrates payment messages through a configurable Business Process Model (BPM) which seamlessly integrates with multiple systems, enables STP of individual / bulk payments through rule based processing, manages payment exceptions and provides real time Business Activity Monitoring. The following, we believe, should be integral to a payment hub:

- Ready adaptors for Industry Payment formats like EDIFACT, SAP iDOC, ISO20022 XML, SWIFT Net (Fin & FileAct) etc help in direct integration to disparate systems. Customized adaptors can be built through simple configuration

- High degree of STP and Lower operational costs achieved through rule driven data validation / enrichment

- Seamless Payment orchestration across multiple systems

- Flexible enough to cater to changing Payment standards & schemes, regulatory and compliance needs

- Reduced Operation Risk through configurable Exception Management Framework with complete audit and control

- Value added services (Most economical mode of Payment, Rush Payments, Hold and Reprocess, E-Credit facility, Payment repairs and retrials etc) that would ensure new revenue generation streams

Solution Architecture

Based upon a thorough read of the RBA document titled 'Strategic Review of Innovation in the Payments System: Conclusions' and our extensive experience in this space, the architecture of an ideal hub is shown below.

Solution Architecture

BANK S

Bank 1   Bank 2   Bank 3   Bank 4   Bank 5

Intra-bank
Payments

POSSIBLE INTEGRATION POINTS

Payments Hub at the Reserve Bank of Australia

INTELLECT PAYMENTS SERVICES HUB

Orchestration Engine	Workflow Management	Payment Message Routing	AML / Fraud Checks	FX Rate Updates
STP Engine	File Parsing	File De-bulking / Bulking	Payment Warehousing	
Business Rule Engine	Rule Based Validations	Terms & Conditions Management	Mandate Management	
Messaging Engine	Multi-Payment Format Support	Format Transformations & Enrichment	UI based Format Configuration & Changes	
Business Activity Monitoring	Alerts & Notifications	Real Time Reporting & Dashboards	SLA & Exception Management	Audit Trail
Clearing & Settlement	Settlement Routing	Interface with Clearing Network	Account Entry Generation	Funds Availability & Earmarking

Security Layer

RITS

Direct Entry

ATM

EFTPOS

Check Clearing System

SWIFT

The key elements of the futuristic hub solution will require:

1) For Real-time payment processing (with focus on timing of clearing, timing of fund's availability and the timing of settlement) – The orchestration Engine, STP Engine and Business Rule Engine of the hub solution should enable real time processing of payment instructions.

2) For the ability to process payments out-of-hours- The system should have the ability to process out-of-hours payments. The Business Rule Engine of the hub should have support for out-of-hours payments. Any payment that is sent out-of-hours should be routed to a queue and settled online.

3) For the data transmission with payments (ability to carry additional remittance information through adoption of ISO 200022 and through referencing of data)-The messaging engine of the hub should have a configurable UI that allows bank users to enrich payment messages in the optional fields.

4) For easier addressing of payments- Payment messages that are received by RBA should have the capability to be processed in STP mode. The message lifecycle that includes splitting, validation, application of business rules and real time business monitoring should be achieved using the hub. The system should have the ability to identify payment messages based on the header details like reference number, client name etc. This should be achieved by the hub using a configurable business rules framework. The business rules should provide for identification of the specific fields of the payer and payee information like the BSB details, account number etc. All the payment formats that are mapped to the system should be automatically processed.

5) For simpler access to participants- The participants in the payment clearing cycle (banks and the clearing networks would have easier access to the system). The hub should be easily able to integrate with all the existing clearing streams and any new that may emerge going forward.

6) For ease of integration- The payment hub should be able to integrate with a range of currently installed applications and settlement channels to clear the payments. The payment hub should support a wide range of communication protocols including HTTP, SOAP, TCP/IP, MQ, FTP, SMTP, LU, CASIMAP, POP3 and JMS and provide an interface which allows communication with almost all systems.

7) For Safety and reliability of payments- The payment hub should support various security features and operate with the bank's firewall and security infrastructure. Access to the hub should be password protected by a secured shell that acts as a SSO. It should be able to integrate with third party SSO like Siteminder that may be currently implemented at RBA. The Payment Hub should also have functionalities like Payments Monitoring and Business Activity Monitoring that should allow users to monitor payments in real-time and also get a snapshot view of the payments that have been processed.

8) For achieving cost effectiveness through Hub- The payment hub should provide Reserve Bank of Australia with efficient processing of payments in STP mode thereby reducing the cost of processing payments. The hub should have the ability to scale significantly beyond the current requirements of RBA thereby defraying the costs across larger volumes.

Detailed descriptions of the various components of a mature hub are given below.

A Typical Payment Hub Domain Architecture

The functionalities of the payment hub are captured in the L0 architecture shown below. The payment hub should be a SOA based solution where every component executes a specific set of functionalities. The L0 architecture of the payment hub is a diagrammatic representation of every component and their functionalities.

While the section titled 'Solution architecture' above, provides a brief coverage of the various components of a hub, the section below is a more detailed representation of the same. The idea is to bring to life through detailed screenshots and component descriptions, how the solution requirements of the RBA can be achieved. The reader, therefore, see this as a mere repetition of the stated section.

L0 Architecture

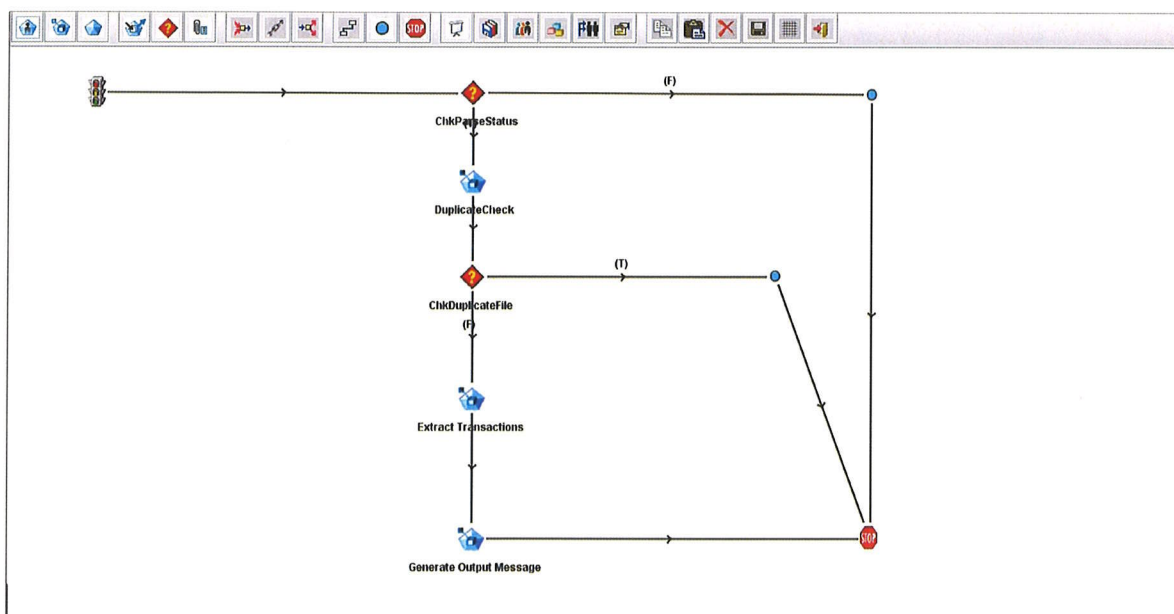| ERP Integration	Messaging Engine	Payment Consolidation	STP Accelerator	Orchestration Engine	Business Rules	Payments Monitoring	Business Activity Monitoring	Exceptions & Investigation	Communication Protocols
Host 2 Host Connectivity	Format Definition GUI	Single	MESSAGE/FILE Parsing	Process Modeling	GUI for Rules Setup	Dedupe Checks	Real-time Status Reporting	Centralized / Decentralized Model	TCP / IP
Third Party Client Support	SWIFTNET FIN	Single DR – Multiple CR	File Debulking/ Rebulking	Process Simulation	CSM Selection & Routing	Fraud Early Warning	Visual Dashboards	Referral Process Definition	SOAP
Real-time Gross Settlement	SWIFTNET FileACT	Single CR – Multiple DR	Data Validation & Enrichment	Integration Touchpoints	Priority Processing	Watchlist Monitoring	Transactions View	Configurable UI & Workspace	Web Services
SSO Authentication	ISO20022	Multiple DR Multiple CR	CSM Selection	Re-usable Workflow Templates	Cutoff Time	AML Monitoring	File View	Queue-based Processing	MQ
Managed File Transfer	EDIFACT	Multi-Entity	Orchestration	Rules based Routing	Value Dating	Local Regulatory Checks	MI Reports	Multi-level Referral Setup	EJB
Corporate Admin	SAP, ORACLE Financials	Multi-Country	Data Transformation	SLA Management	Format based Rules		Audit Trail	SLA Definition & Tracking	MDB
Corporate Dashboard	RITS	Multi-Currency	Auto Store & Forward		Reference Data Access		Alerts & Notifications	Repairs & Retrials	HTTP(S)
Data Compression	BPAY	Multiple Payment Types			Inbuilt Rules Library (eg. IBAN,BIC)		Email/SMS/Fax Support		RMI
Data Encryption	Direct Entry						Performance Analytics		SFTP
Reconciliation Reports	ISO8583						Hooks for external BAM Tools		CORBA
	RTGS, ACH (LOCAL, REGIONAL)								NDM
	XML								
	Fixed Length								
	Tagged								

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Real-time Payment Processing

The hub should enable real time processing of Payments. The system components such as "STP Accelerator",

"Orchestration Engine" along with the inbuilt "Business Rules engine" should ensure that payments are processed in real time and without any manual intervention. A mature hub should have a 'Business Process Modeler' which should be the back-bone of the Hub.
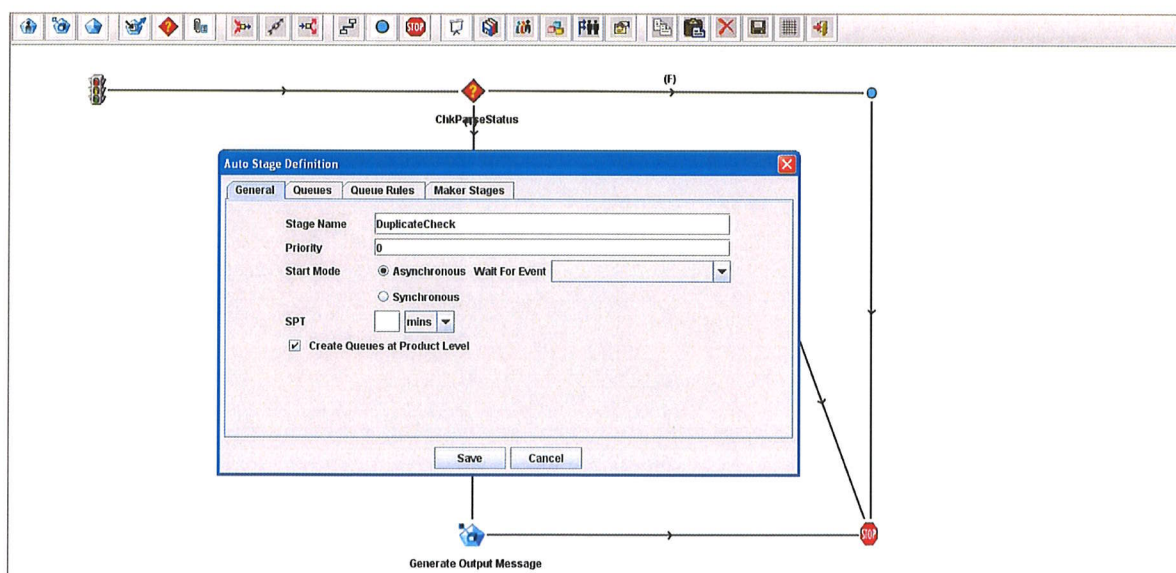
This modeler should orchestrate the payment transactions across the payment lifecycles thereby enabling STP. The Process Definition should be amenable to set-up, using interactive GUI of the solution. Further, the Modeler should be able to generate payment process models through easy 'Drag and Drop' features. A snapshot of the Business Process Modeler is shown below.
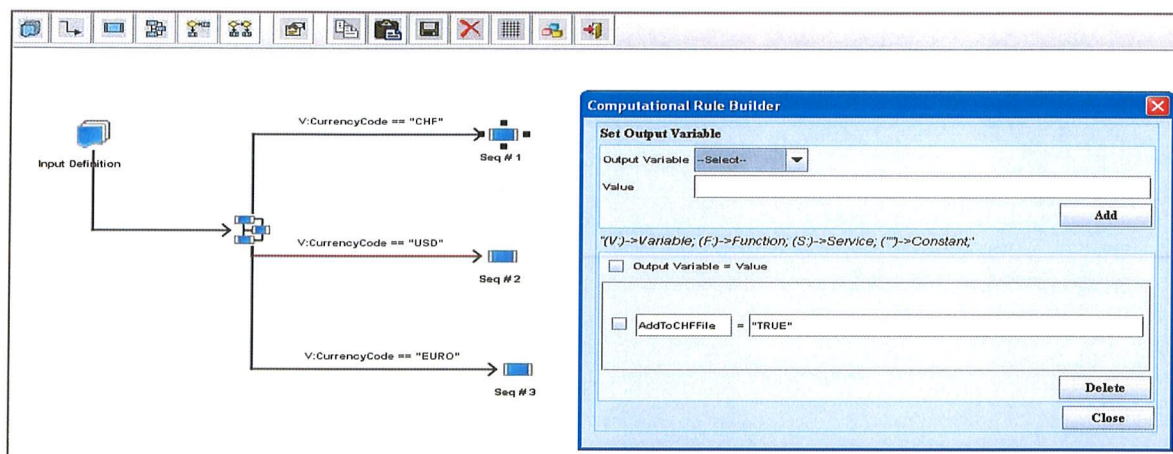

The automated rules execution ensures that transactions that pass the business rules are processed without any manual intervention and routed to the destination. A snapshot of the Business Rules configuration screens are given below:

The business rules engine should support a wide range of rules that include Transformational Rules (for transforming message formats), duplicate check rule, validation rule, complex nested rule, conditional rule, multi conditional computational rule, iterative rules, Canned arithmetic, logical, string functions, Cut-off time rules and Value Dating, Built-in rules for IBAN, BIC and other standard validations related to Payments Transactions. These rules when applied to the business process should enable execution of payments in real time mode.

Real Time Payment processing should be the core functionality of the payment hub. The STP Accelerator, Orchestration Engine and Business Rule Engine work in tandem to execute payments in real time. The functionality of each of these components is elaborated below.

STP Accelerator

STP Accelerator should be a logical set of business components which handles the key end to end STP operations of a payment message or a file or both. These components should perform the task of configuring message formats, parsing messages and files, transforming them from one format to another, validation and enrichments (automated), while also taking care of other STP operations like File Bulking/De-Bulking, Parallel processing etc.

Orchestration Engine

Orchestration engine should be the backbone of the payment hub, which should define the process flow of the payment messages and files and orchestrate through the STP components and the manual intervention stages. All the processes should get defined and executed in this engine. This should have the capability to create manual action stages, automatic action stages, time triggered actions, loop back mechanism and events & notifications.

Business Rules

The Business Rules Engine should provide the capability to configure different types of rules for various requirements regarding message routing, data validation/enrichment, and transformation to name a few. Business Rules should be amenable to configuration based on IBAN, BIC code, and cut-

off time of the Payment message. For example, if a BIC validation fails, the system should throw up warning/error messages; determine error handling workflow, based on business rules.

The business rules component of the hub should have the capability to process out-of-hours payment. Payments that are received out-of-hours should be moved to a separate queue and processed online or the next working day.

Data Transmission with Payments

Additional data with the payment message should be processed in the hub. The payment files that are expected from the clearing networks can be mapped / configured in the application. When the application receives these files, it should read the payment messages, validate them and pass them on for further processing. The mapping of additional information/enrichment data should be possible using the messaging engine.

Messaging Engine

The messaging engine of the payment hub should enable definition of range of Payment formats. The engine should support UI based configuration of payment messages. The users should be able to define the formats and add any optional fields that may be required for enriching a payment message. More details about a mature messaging engine are given below.

The messaging engine of the payment hub should support multiple Data formats – both pre-canned industry standard and proprietary formats (XML, CSV, XLS, Fixed Length, Tagged and Delimited value). The industry standard formats that are supported should be SWIFT MT (MT1xx, 2xx, 3xx, 4xx, 5xx, 6xx, 7xx and 9xx), SAP iDOC, EDIFACT, EDI, ISO8583 and ISO20022 XML. The core feature of the Messaging engine should include configurable format GUI screens that help to define message and file formats in a tree structured definition. Using the Format GUI screens bank users should be able to configure and implement different flavours of the payment formats.

Easier Addressing of Payments

The payment messages / files that are received by the system should be identified by the header parameters such as a unique reference number, payer details and so on. The payee details, amount, and any other additional details of the payment should be identified by the Hub and routed through the appropriate network for processing.

Simpler Access to Participants with Ease of Integration

The hub should allow for easy access for participants (banks, FIs and clearing networks) to access the RBA system. The payment hub should act as a single point of interface between the RBA and the participants. It should have support for multiple integration protocols which should make it easy to onboard the participants to the RBA. More details about protocol support are mentioned below.

Communication Protocols

The payment hub should be able to integrate with multiple applications and settlement channels to clear the payments. The hub should support a wide range of communication protocols including HTTP, SOAP, TCP/IP, MQ, FTP, SMTP, LU, CASIMAP, POP3 and JMS and provide an interface which should allow communication with almost all systems. Communication Engine should provide with the networking capability to talk to different hosts. The communication could be asynchronous and synchronous. The communication component should support a variety of communication channels.

Safety and Reliability of Payments

The safety and reliability of messages is a primary functionality of the payments hub. The hub should have various features like checksum algorithms that should ensure that data that is received from the networks is accurate and not tampered with. The hub should also support Single Sign-on (SSO) that should be able to integrate with any SSO engine. Users should be able to monitor payments in real time and flag-off payments that fail business rules. The exception management and investigation capability of the system should enable users to investigate these payments and take appropriate action. Detailed information on the Payments Monitoring, Business Activity Monitoring and Exception Management capabilities of a mature hub are given below.

Payments Monitoring

Transaction data residing in the hub should get analyzed and the information should be provided to the users in list views and graphical forms with the necessary details and audit trails embedded in it. The payment hub should come with a wide array of Payment Monitoring Services that include Dedupe checks, Fraud Early warning, Watch list Monitoring, AML and Local Regulatory checks.

Business Activity Monitoring

The payment hub should have extensive functionality around Business Activity Monitoring that should allow users to have a drilled down view of the transactions. The results should also be available in graphical forms with the transaction details and audit trails embedded in them. The Monitoring services should include the following key features:

- Real Time Monitoring of Payments throughout its life cycle
- Visual Dashboards
- Configurable Management Information and Regulatory Reports
- Event based Alerts and Notifications

Exceptions and Investigations

The exception management feature of the hub should enable the bank users to handle exceptions using the dashboard feature. They should be able to view the transactions for which exceptions have been raised and take remedial actions on them. The exception management features of a hub include a configurable UI using which a user should be able to

- Investigate transactions
- Initiate multi-level authorization, Referrals, Retries and Repair of payment transactions
- Generate alerts and notifications to operational users and audit trail of every manual action.

Exception workflow should also be automated and processed without any manual intervention based on configurable exception rules.

Enablement of Additional Processing Functions

The Payments Hub should act as an enabler of payment processing. It should support a wide array of payment processing capabilities like splitting, validation, application of business rules and real time business monitoring as explained above. The hub should have various components like file/message parsing, file bulking/de-bulking, data validation and process modeling that should enable payment processing.

In Conclusion

The payment system innovation as envisaged by RBA is a commendable move that will bring substantial improvements in the payment processing space. The payment hub is definitely the way forward as is evident from its rapid adoption by leading banks around the world. Through this paper we have attempted to highlight the essential elements that comprise a payment hub and we hope that RBA finds some value in the observations made in it.

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