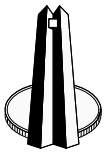

South African Reserve Bank
National Payment System Department

Position Paper-
Interbank Settlement Network

Position Paper number 01/2008
Date issued: 2008-05-15

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1. Executive summary

This document outlines the approach taken by the Reserve Bank to the establishment and deployment of the interbank settlement network component of the National Payment System.

Information Paper NPS 02 issued by this Office is hereby withdrawn and replaced by Position Paper NPS 01/2008. This step was taken to ensure that banks and other participants in the settlement system are in no doubt about which administrative directives apply at a particular time.

2. Introduction

Reforms to the National Payment System (NPS) required that the following information technology infrastructure components be established by the Reserve Bank:

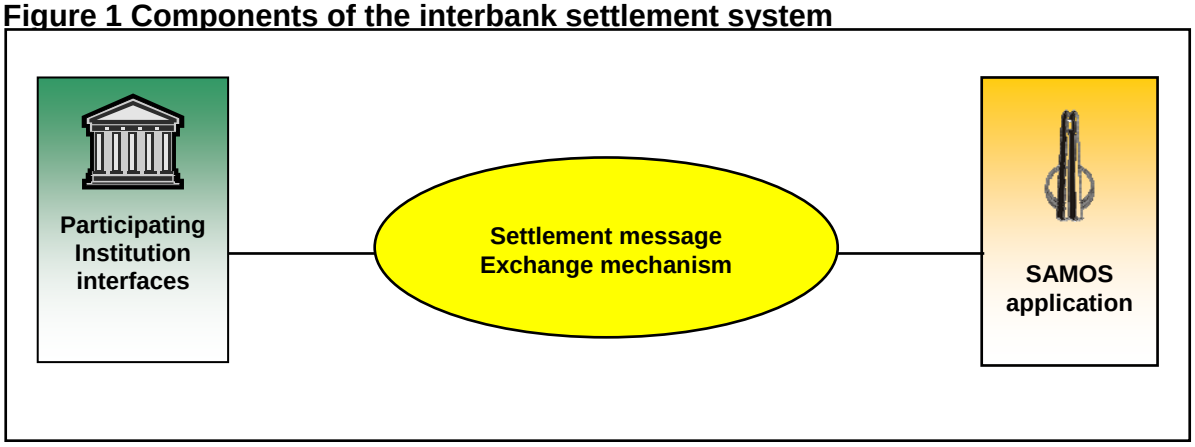
- The development and implementation of an interbank settlement system, known as the South African Multiple Option Settlement (SAMOS) system; and
- the establishment and implementation of a settlement message exchange service through which settlement instructions can be routed between the Reserve Bank and participating institutions, known as the SARB-Link network .

This document describes the architectural design of the network component of the interbank settlement system.

3. Components of the interbank settlement system

The interbank settlement system required that the following components be established:

Figure 1 Components of the interbank settlement system



3.1. SAMOS application

The SAMOS application through which instructions are processed to conclude the settlement of obligations between banks across their accounts at the Reserve Bank.

3.2. Participating institution interfaces

A set of user interfaces at every participant which provides for the following functionality:

- An Instruction Generation facility through which participants generate settlement instructions for submission to the SAMOS system;
- a Notification Receipt facility through which participants receive unsolicited notifications from the SAMOS system;
- an Enquiry facility through which participants enquire about various aspects and status of instructions and the SAMOS application system in general; and
- a facility through which participants monitor their current positions in the Reserve Bank accounts.

3.3. Settlement message exchange mechanism

An interbank message exchange mechanism which enables banks, as well as a number of other institutions (acting on behalf of the banks) involved in the exchange of interbank payments and settlement instructions, to link to the Reserve Bank.

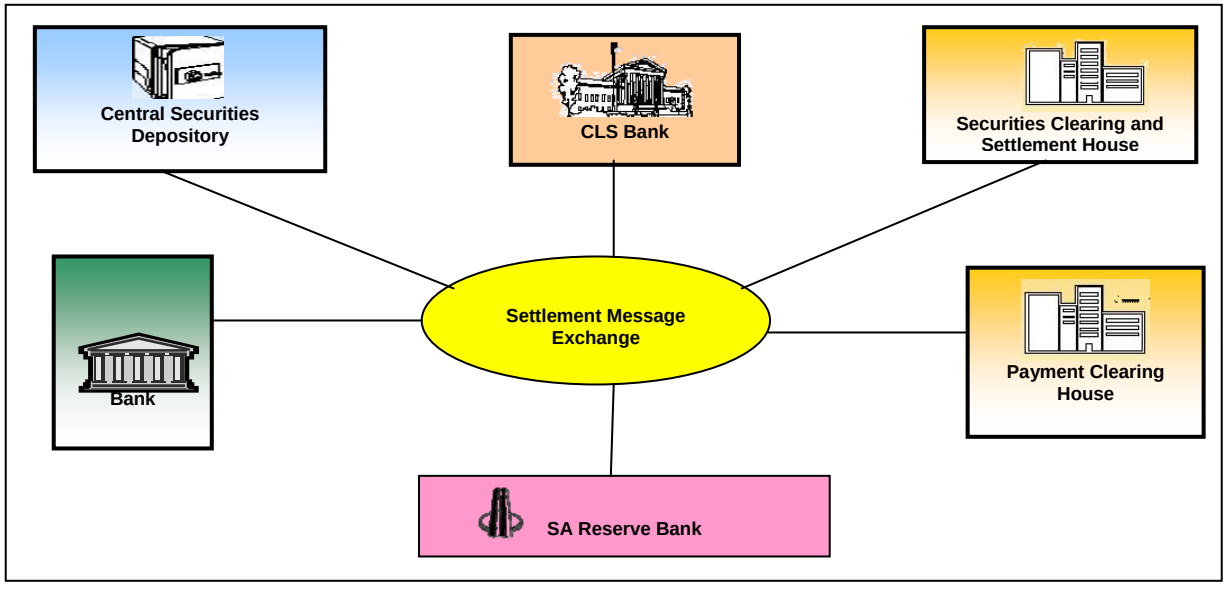
Associated with this message exchange mechanism is the physical connectivity from every participant to a message exchange service, as well as the communications protocols (or message-oriented middleware) which enables messages to be electronically exchanged.

Message carriers are defined as facilities through which the various messages can be submitted and routed to the SAMOS application and the appropriate participant destinations in a secure environment.

4. Participating Institutions

Every settlement instruction involves at least two institutions, in addition to the Reserve Bank. The following types of institutions are involved:

Figure 2 Participating institutions



4.1. Domestic banks

4.1.1. The Paying Bank

The Paying Bank is the initiator of payment transactions. The Paying Bank submits an instruction to the SAMOS application directly or through its agents (i.e. clearing houses, the Securities Clearing and Settlement House or central security depositories) for processing in terms of the business specification of SAMOS.

4.1.2. The Beneficiary Bank

The Beneficiary Bank receives unsolicited messages notifying it that it is the recipient of funds from a Paying Bank.

4.2. The Payment Clearing House Operator

The Payment Clearing House Operator forwards settlement instructions, on behalf of its participants, to the Reserve Bank.

4.3. Central Securities Depositories

Central Securities Depositories forward lists of securities reserved for SAMOS collateralisation purposes, to the Reserve Bank, on instruction from a bank.

Currently immobilised securities are kept in the Central Depository (CD).

4.3.1. Securities Clearing and Settlement House

The Securities Clearing and Settlement House forwards fund settlement positions to the Reserve Bank, on behalf of the banks responsible for payment settlement. In this context, the SAMOS system facilitates the settlement of securities

Currently, STRATE is the only registered Securities Clearing and Settlement House linked to the SAMOS system for delivery-versus-payment of securities settlements.

4.4. CLS Bank

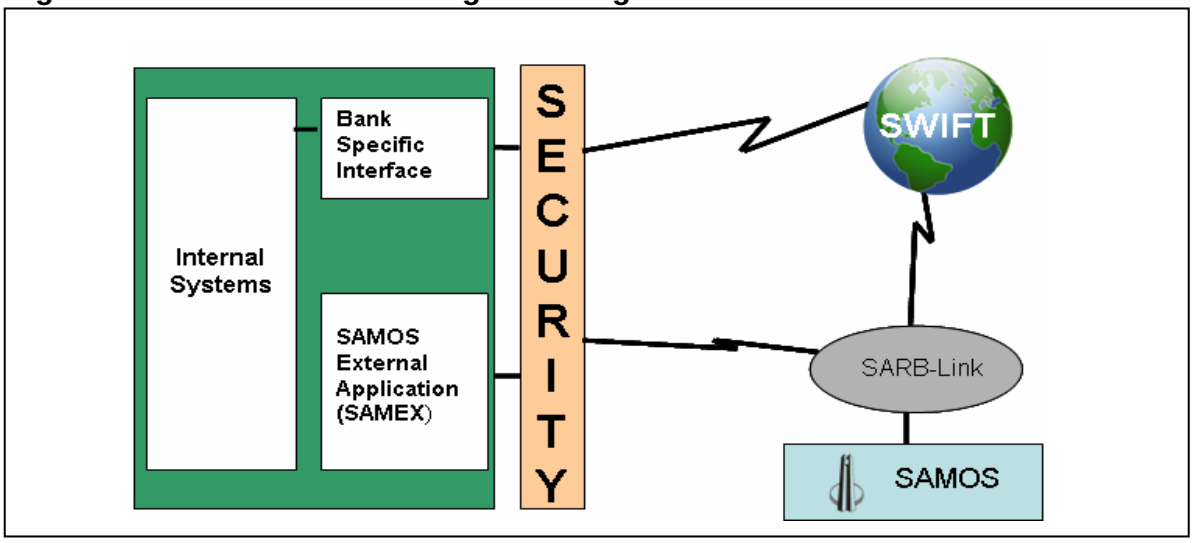
CLS Bank is a foreign settlement bank and has been designated as a participant in the SAMOS system. South African banks are able to fund Rand obligations resulting from foreign trades into the settlement account of the foreign exchange settlement bank in SAMOS. The foreign exchange settlement bank is also able to pay out Rand amounts to South African banks participating on SAMOS. This process facilitates simultaneous settlement of the domestic payment and the foreign currency leg of the transaction, thereby giving effect to payment-versus-payment practices.

5. Architecture of the Settlement Message Exchange mechanism

5.1. Components

The message exchange architecture consists of a number of components:

Figure 3 Settlement message exchange mechanism



5.1.1. Interbank settlement message exchange service (SARB-Link)

The core of the message exchange architecture is a message routing facility called SARB-Link. SARB-Link accepts messages through specified message carrier services and protocols, and routes these messages to the SAMOS application. On completing its processing, the SAMOS application passes messages back to SARB-Link which ensures that the messages are delivered to the correct destinations through the specific message carrier services nominated by the banks involved in the settlement instruction.

Although messages may be sent to SAMOS via SWIFT or MQ Series, the final routing will be effected through the SARB-Link facility.

SARB-Link isolates the SAMOS application from communication intricacies and ensures that the transmission and routing of settlement instructions are secure, auditable and reliable. Functions performed by SARB-Link include:

- Validation of instruction header information, including the logical and physical network addresses and message types;
- message authentication and encryption/decryption, as well as user and security key administration;
- secure routing of instructions based on routing rules and message types;
- logging and time stamping of messages, and maintenance of an audit trail of every message as well as enquiry facilities on the status of messages;
- intermediate safe storing of messages for delivery to the destination;
- the sequencing and queuing of messages from various sources;
- guaranteed once and once only delivery of messages;
- communication protocol conversion and communication gateway services for the predetermined protocols and communication software interfaces; and
- the provision of a standard communications interface common to all participants for communication with SARB-Link.

5.1.2. Connectivity to SARB-Link and Message Carriers

Participants are able to connect to the SARB-Link facility directly using MQSeries or by using the SWIFT service as a message carrier or both.

Every participant needs to establish a physical communication link with the message carrier service of their choice, i.e. directly to SARB-Link or to the SWIFT service or both.

- **Physical communication links between participants and SARB-Link.**

  Participants provide for their own access to SARB-Link, either directly or indirectly via SWIFT. This includes the procurement, installation and management of its interfaces to SARB-Link as well as the infrastructure to carry the messages from their premises to the SARB-LINK or SWIFT entry point. This infrastructure includes facilities for the authentication and encryption/decryption of messages before transmission to or from SARB-Link.

  The Reserve Bank provides connectivity from the SWIFT service to SARB-Link.

- **Direct connectivity to SARB-Link via MQSeries**

  SARB-Link allows participants to connect directly to SARB-Link through a platform independent, industry standard communications application programming interface (API). This common communications API is provided by the message-oriented middleware software product MQSeries, which is integrated with the SARB-Link technical infrastructure. It provides the environment for the safe, secure and guaranteed delivery of electronic messages, for those participants who prefer not to make use of the SWIFT services.

  The common MQSeries communications API, including message structure and flow, is available in the User Interface Technical Specification and the Message Template Model.

- **Connectivity to SARB-Link through SWIFT**

  SWIFT is widely recognised as the *de facto* message carrier for international funds transfer. Due to the utilisation of SWIFT by a large number of South African banks and the sizeable investment made by local banks in back-office systems based on SWIFT mechanisms and standards, the SWIFT service forms an integral part of the settlement message exchange architecture. This means that banks which have access to SWIFT are able to utilise the same interface to pass instructions on to the SAMOS system.

The full functionality of the SAMOS application is still not available through the SWIFT service, as defined below. As in the past, participants may wish to connect to SARB-Link via other communication interfaces. The development of such communications interfaces will continue to be considered, based on the agreement that the participants involved will carry all development costs associated with the establishment of such interfaces.

5.1.3. Security

The security of the system is based on the RSA public/private key pair approach. For this purpose and potential broader applications, the Reserve Bank has established a certification authority and manages the certification process in terms of the Certification Practice Statement (CPS). A Trusted Infrastructure Provider has been appointed as the party tasked with providing the infrastructure necessary for the issuing, revocation and management of certificates and public/private keys.

The security system provides for the

- authentication of participants
- encryption of messages;
- digital signing of messages to ensure authenticity; and
- Non-repudiation of messages.

For those banks connecting indirectly via SWIFT, the standard authentication and encryption security measures integrated with the SWIFT service provide the required levels of security.

The security for banks connecting directly to SARB-Link is provided by a security solution provided by the Reserve Bank and integrated with the standard communications interface.

5.1.4. Participating institution interfaces

As mentioned above participants require a set of user interfaces through which the SAMOS application can be accessed, and provides for the following functionality:

- Instruction Generation - this function enables the banks to create and send settlement instructions to the SAMOS application;
- Confirmation and Notification - this function processes the messages received from the SAMOS application, be they either solicited or unsolicited messages;
- Enquiries - this function is required to enable the banks to perform the range of enquiries available in the SAMOS application ranging from account details to settlement instruction status/history; and
- Monitoring - this function enables the banks to monitor their positions at the Reserve Bank on a continuous basis, with automated position refresh messages sent to the bank as its account position changes

The SAMOS application can be accessed via SARB-Link using one or more different user interface approaches (as depicted in Appendix 1). These approaches are as follows:

- The Standard Interface provides for all four functional categories described above and utilises the MQSeries communication interface.
- An Information Exchange Interface, based on the Standard Interface and provides for Enquiry and Monitoring functionality only, utilising the MQSeries communications interface.
- A SWIFT Interface developed by participants to integrate their internal applications with SAMOS through predetermined message layouts based on the communications interface supported by the SWIFT service. This user interface provides for Instruction Generation, Confirmation and Notification, and a subset of the Enquiry functions and the Monitoring function.
- A participant Proprietary Interface developed by participants to integrate their internal applications with SAMOS through predetermined message layouts based on a communications interface other than MQ Series or SWIFT.

As these interfaces are not mutually exclusive, participants are able to use any combination of the above interfaces to meet their individual business requirements.

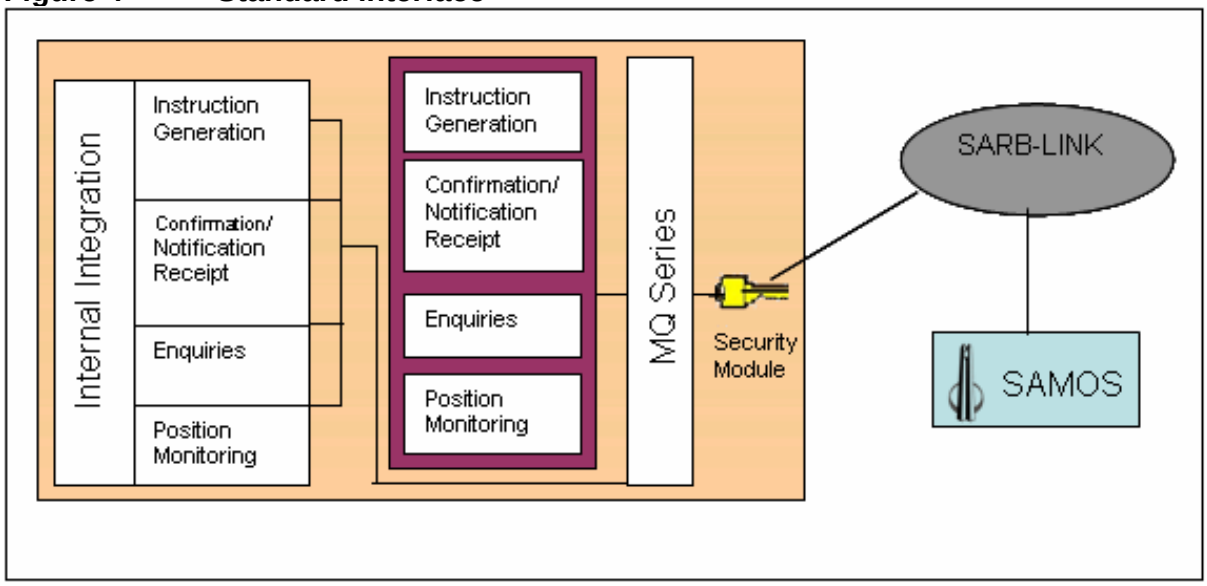
5.1.4.1. Standard interface

The Reserve Bank developed a Standard Interface application, which is a PC-based application on Windows NT operating system platform, using the standard MQSeries-based communications interface. This application, which is known as SAMEX, provides the full functionality required to access the SAMOS application, and is made available to all participants who wish to use it as an alternative to the development of their own internal interface.

The application provides for all functions to reside on a single PC, as well as the distribution of these functions across a number of PCs connected through a participant's internal LAN. Any participant using this Standard Interface is able to utilise this application on condition that the participant has the prescribed PC configuration.

Participants can develop their own Standard Interface to access the SAMOS application from their own applications by using the standard, documented MQSeries communications interface API and incorporating the security components**.**

Figure 4 Standard interface



Responsibilities

The SA Reserve Bank is responsible for the

- development and provision of SAMEX; and
- development and provision of SAMOS interface specifications.

The participant is responsible for the

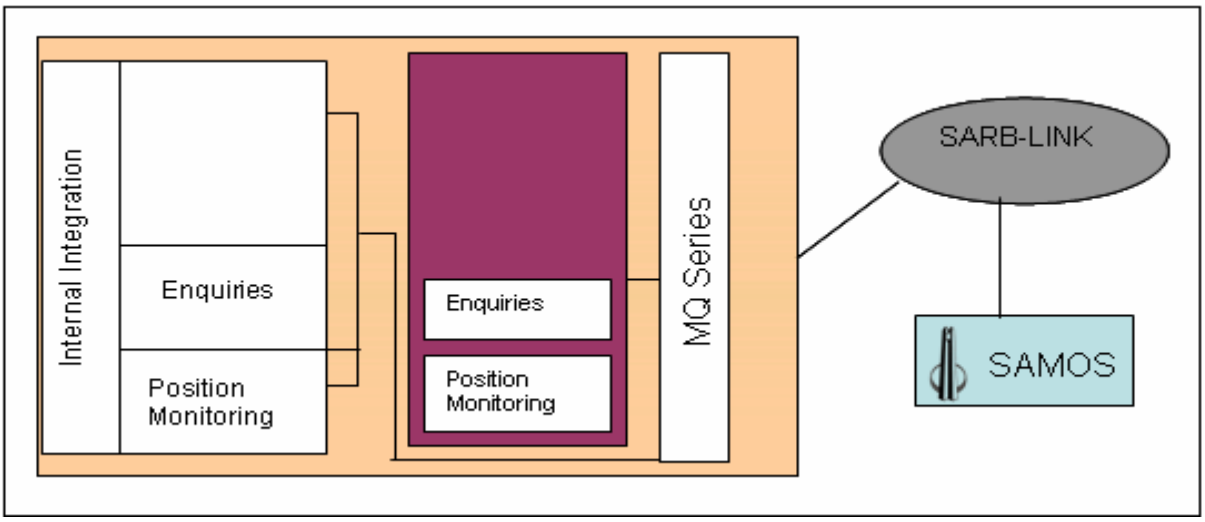
- establishment and management of connection from its own institution to SARB-LINK;
- procurement and installation of MQSeries and Security Modules;
- provision of a PC according to the prescribed configuration if they wish to utilise the application (SAMEX) provided by the Reserve Bank; and
- development of their own application interface to SAMOS using the MQSeries communications interface.

5.1.4.2. Information exchange interface

The Reserve Bank has developed an Information Exchange Interface application, which provides the participant with access to the Enquiries and Monitoring SAMOS functions only.

The Information Exchange Interface is based on the standard MQSeries communications interface.

Figure 5 Information exchange interface



These functions are provided as part of the SAMEX application, which provides for these functions to reside on a single PC, as well as the distribution of these functions across a number of PCs connected through a participant's internal LAN. Any participant using this Information Exchange Interface will be able to utilise this application on condition that the participant has the prescribed PC configuration.

Responsibilities

The Reserve Bank is responsible for the

- development and provision of SAMEX; and
- development and provision of SAMOS interface specifications.

The participant is responsible for the

- establishment and management of connection from its own institution to SARB-LINK;
- procurement and installation of MQSeries and Security Modules(if required);
- provision of a PC according to the prescribed configuration if they wish to utilise the application (SAMEX) provided by the Reserve Bank; and
- development of their own application interface to SAMOS using the MQSeries communications interface.

5.1.4.3. SWIFT User Interface

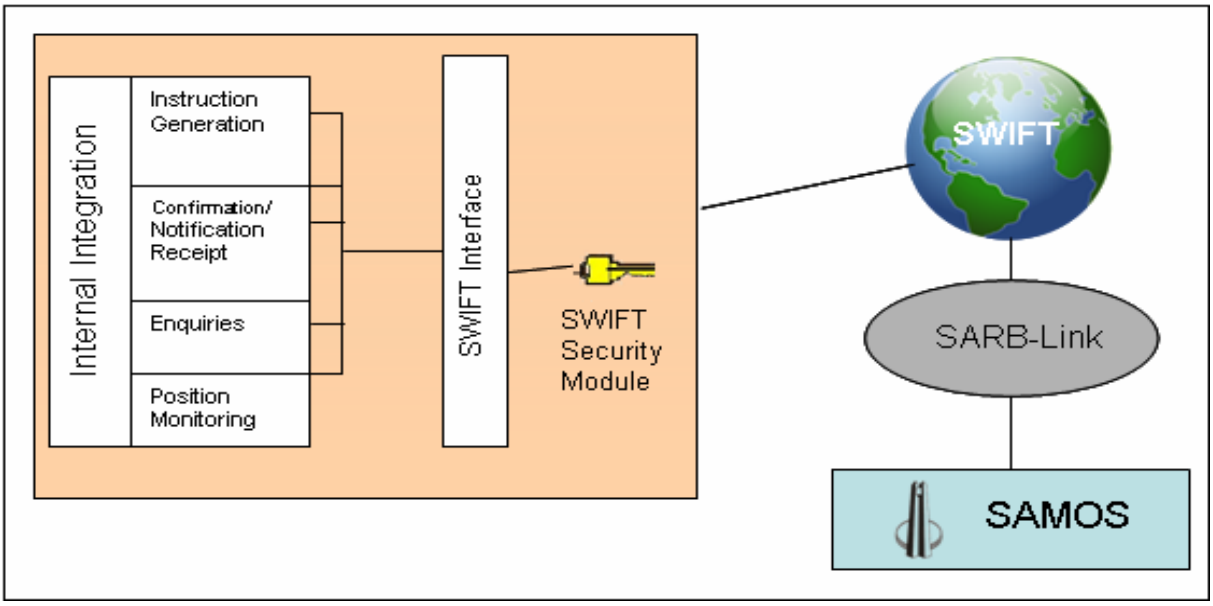
The SWIFT-based proprietary user interface provides access to a subset of the SAMOS functions from participants' SWIFT-based applications. The standard communications interface and security specifications supported by SWIFT are used to access the SAMOS application.

The SWIFT-based proprietary user interface does not provide access to the full complement of SAMOS functions. It supports Instruction Generation, Confirmation and Notification, Statement Enquiries and Position Monitoring. The balance of the Enquiry functions is currently not available through this user interface.

The Position Refresh function is provided through the SWIFT interface. Participants are able to obtain position information through standard SWIFT statement enquiries or notifications, from which they can maintain their own monitoring information systems.

Alternatively, the Information Exchange Interface provided by the Reserve Bank could be used, or an in-house Enquiry and Monitoring facility can be developed by utilising the standard MQSeries communications interface.

Figure 6 SWIFT User Interface



Responsibilities

The Reserve Bank is responsible for the following:

- Establishment of the connection from the Reserve Bank to SWIFT network partners;
- establishment and maintenance of the SWIFT interface in SARB-LINK, including compliance with the SWIFT standards as revised from time to time; and
- processing of the instructions received via SWIFT in accordance with the agreed service levels.

The participant is responsible for the following:

- Establishment and maintenance of connections from its own institution to the SWIFT network partners; and
- ensuring that the level of security implemented on the SWIFT connection complies with the agreed minimum standard.

SWIFT is responsible for the

- delivery of instructions to and from SARB-LINK in accordance with the service levels agreed upon between the Reserve Bank and SWIFT.

Constraints

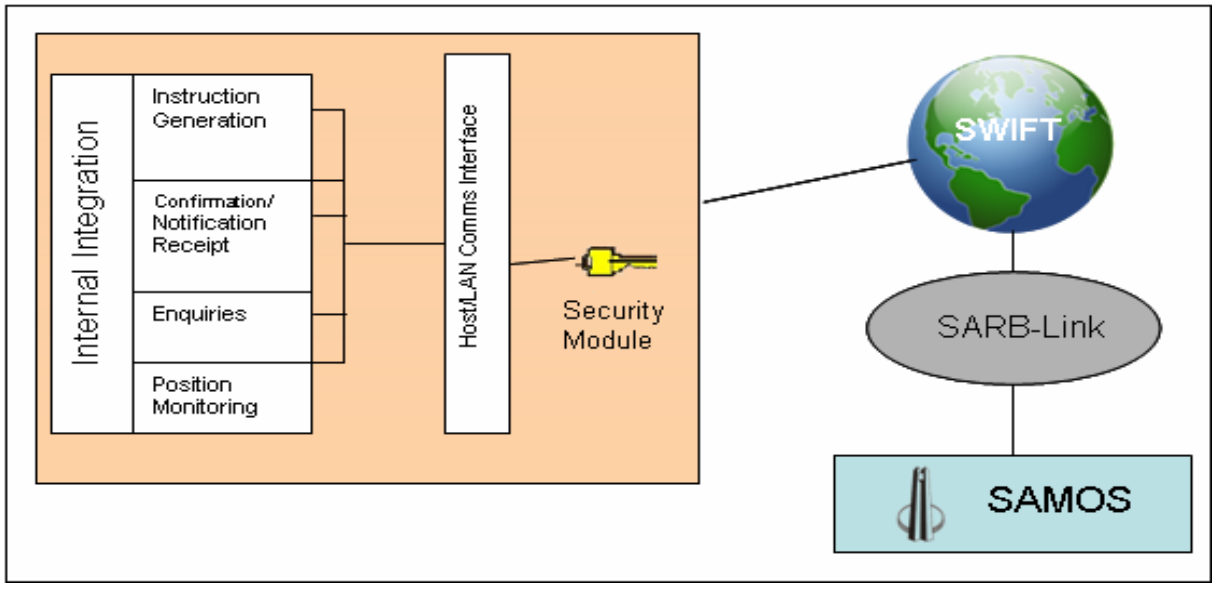
SARB-LINK service levels are dependent on the level of service provided by SWIFT.

5.1.4.4. Proprietary Interface

Access to SARB-LINK through communications interfaces other than MQSeries or SWIFT will be considered when put forward by participants. The development of such communications interfaces will be considered, based on the agreement that the participants involved will bear all the development costs associated with the establishment of the interfaces.

The full SAMOS application functionality will be available to the participants via proprietary user interfaces using the standard message formats and rules.

Figure 7 Proprietary Interface



Responsibilities

The Reserve Bank is responsible for the development and provision of SAMOS interface specifications.

The participant is responsible for the following:

- Procurement and installation of proprietary communications interface software;
- Establishment and management of connection from own institution to SARBLink; and
- All development costs (within their own organisations and also the changes required in SARB-Link).

6. Service Level Agreements

SARB-Link forms an integral part of the total service of the SAMOS system, and is subject to and supportive of the service levels for SAMOS. In addition, the continuity of SARB-Link is designed to provide for the service levels demanded by and agreed upon for the SAMOS system.

Service levels are agreed upon with participants on an individual basis, and the participant access interfaces are influenced by the required service level.

7. Usage Costs

SARB-Link is managed by the Reserve Bank. The cost of providing the SARB-Link service is recovered from the participants on a monthly basis.

8. Benefits of the Message Exchange Architecture Adopted

The SARB-Link design approach provides the following important benefits:

8.1. SWIFT service

The selection of SWIFT as a message carrier service exploits the benefits for the existing SWIFT user base. These include:

- containment of cost;
- protecting the participant's investment in SWIFT and associated applications, and minimising the impact on system development;

- providing for the cross-border and domestic payment legs of settlement instructions on the same message carrier service; and
- through the proven reliability of SWIFT, adhering to the availability levels demanded by the National Payment System.

8.2. SAMEX application

The SAMEX application complements the SWIFT option by

- providing an affordable cost of entry to the SAMOS system;
- providing platform-independent, *de facto* standard application and communication interfaces to the SAMOS system;
- enabling event-driven position refresh and monitor facilities for participants;
- enabling the development of real-time "credit-push" payment instruments by providing superior throughput and response-time service levels; and
- providing a locally controlled and managed settlement message exchange.

8.3. Multiple choice

Participants have a choice of message carrier and access path, and can use either one of the services or both depending on the service required and message types to be processed.
Participants have the opportunity to migrate between the message carriers in a planned manner without affecting the existing applications.

9. Conclusion

The SARB-Link architecture has supported the reform of the National Payment System. It has ensured that the stakeholders' interests are optimally served, not only for the initial implementation of the SAMOS system, but also for future developments related to the National Payment System through the provision of the following:

- An affordable and cost-effective means for participants to interface with SAMOS via SARB-Link.
- A technology solution which does not exclude any participant on technological grounds. A solution based on the *de facto* standards for processing financial transactions.

- A modular approach which is easily adapted or expanded to satisfy future business needs.
- The isolation and protection of the applications resident at the various participants from one another and the SARB-Link through the use of a message-based instruction flow.
- The message-queue approach that introduces time independence, as opposed to the traditional peer-to-peer approach which required all participants involved to be online for an instruction to be transacted