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by Massimiliano Renzetti,* Andrea Dimartina,* Riccardo Mancini,* Giovanni Sabelli,* Francesco Di Stasio,* Carlo Palmers,** Faisal Alhijawi,*** Erol Kaya,*** Christophe Piccarelle,**** Stuart Butler,**** Jwallant Vasani,***** Giancarlo Esposito,******Alberto Tiberino****** and Manfredi Caracausi******

Abstract

This paper presents the results of a joint experiment involving Banca d'Italia and the Arab Regional Payments Clearing and Settlement Organization (ARPSCO), focusing on the settlement of cross-currency instant payments across different technical platforms.

TIPS and Buna are the instant payment settlement platforms with multi-currency features operated by the two organizations respectively. Both platforms started with an initial investigative phase, in order to assess operational policies and the legal and technical implications of implementing a cross-currency instant payment settlement service, i.e. one in which the debtor and creditor accounts are denominated in two different currencies both eligible for settlement on the platform.

For the purpose of the Proof of Concept (PoC), two representatives of the abovementioned market communities, namely Intesa Sanpaolo and Jordan Ahli Bank, participated in their respective capacities of Originator PSP and ultimate Beneficiary PSP for the corresponding currencies, i.e. the euro and the Jordanian dinar.

In line with building blocks 13 and 17 of the G20 global roadmap for enhancing cross-border payments (concerning the interlinking of payment systems), the natural evolution of these investigations was to explore possible options for providing the same type of cross-currency service in a cross-platform scenario, i.e. through the interoperability of different instant payment platforms.

The PoC described in this paper relates to the implementation of a cross-platform scenario involving TIPS and Buna.

JEL Classification: E42.

Keywords: Payment Systems, Instant Payments, Market Infrastructures, Cross-Border Payments.

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* Banca d'Italia, Directorate General for Markets and Payment Systems

** SWIFT

*** Buna Payment Platform

**** DXC Technology

***** Jordan Ahli Bank

****** Intesa Sanpaolo

Sintesi

Il presente lavoro illustra i risultati di un esperimento congiunto che ha coinvolto la Banca d'Italia e la Arab Regional Payments Clearing and Settlement Organization (ARPSCO), incentrato sul regolamento di pagamenti istantanei *cross-currency* – ovvero pagamenti nei quali il conto del debitore e del creditore sono denominati in valute distinte – tra due diverse piattaforme tecniche.

TIPS e Buna sono le piattaforme tecniche multivalutarie per il regolamento di pagamenti istantanei coinvolte nella sperimentazione. Entrambe le piattaforme sono state precedentemente coinvolte in una fase di analisi avente l'obiettivo di valutare le implicazioni di policy, di natura legale e di carattere tecnico e operativo derivanti dalla eventuale realizzazione di un servizio di regolamento *cross-currency* intra-piattaforma. In linea con i *building block* 13 e 17 della *global roadmap* del G20 per il miglioramento dei pagamenti transfrontalieri – relativi all'interconnessione di sistemi di pagamento esistenti – la naturale prosecuzione di tali analisi è stata quella di esplorare possibili soluzioni per fornire lo stesso tipo di servizio di regolamento *cross-currency* in uno scenario inter-piattaforma, ovvero attraverso l'interoperabilità di diverse piattaforme tecniche.

Ai fini del *Proof of Concept*, due rappresentanti delle comunità bancarie coinvolte, ovvero Intesa Sanpaolo e Jordan Ahli Bank, hanno partecipato alla sperimentazione in qualità di *Originator PSP* e *Beneficiary PSP* per le valute corrispondenti, ovvero euro e dinaro giordano.

CONTENTS

Introduction[1]

During the 2020 Saudi Arabian Presidency, the Group of Twenty (G20) made enhancing cross-border payments a priority.[2] The Financial Stability Board (FSB) was asked, in coordination with the relevant stakeholders, to define a three-stage process and to develop a roadmap to make these payments faster, cheaper, more transparent and more inclusive. The roadmap[3] identifies five areas as focal points for action, ranging from implementing international guidance and principles of cross-border payments, to improving access to payment systems.

1.1. Enhancing cross-border payments – the roadmap

The G20 made enhancing cross-border payments a priority during the Saudi Arabian Presidency. The FSB, in coordination with the Committee on Payments and Market Infrastructures (CPMI), developed a roadmap to address the key challenges often faced by cross-border payments and the frictions in existing processes that contribute to these challenges. It builds on the FSB's Stage 1 report,[4] setting out the challenges, and the CPMI's Stage 2 report,[5] describing the necessary elements of a response, in the form of a set of 19 building blocks.

The building blocks are arranged into the following five focus areas:

Committing to a joint public and private sector vision to enhance cross-border payments;
Coordinating on regulatory, supervisory and oversight frameworks;
Improving existing payment infrastructures and arrangements to support the requirements of the cross-border payments market;
Increasing data quality and straight-through processing by enhancing data and market practices;
Exploring the potential role of new payment infrastructures and arrangements.

The roadmap provides a high-level plan, setting out actions and indicative timelines for each building block. The building blocks in focus area C articulate the technical and operational improvements to existing domestic and international payment infrastructures that cross-border payments depend on. One of these building blocks (building block 13) seeks to enhance the existing payments ecosystem by pursuing the interlinking of payment systems for cross-border payments. According to the roadmap, the first action that FSB member authorities and international organizations have agreed to undertake is to conduct an analysis of existing and potential interlinking models and to evaluate the risks and benefits of each one.

[1] The views expressed in this paper are those of the authors and do not necessarily reflect the views of the institutions with which the authors are affiliated. The authors wish to thank Dario ARMENI, Rosario LA ROCCA, Giuseppe MARINO, Pierfrancesco MOLINA, Marco PIERONI, Fabrizio VERGARI (Banca d'Italia), Bilal BADER, Ahmed EL HEFNAWY, Manuel IGLESIAS, Mehdi MANAA, Erol KAYA (Buna), Abbas HOUMOOD AL ZAWWAD, Yousef MILHEM, Monika SALACH (DXC), Rami DANA (Jordan Ahli Bank), Tania AWADA, Abdallah HUSSEIN (AEG), Nikolay EFIMOV, Igor KOZINTSEV, Vladimir TARABRIN (CMA), Giuliano CASTELTRIONE, Adele LOPREIATO (Intesa Sanpaolo), Alhaa ALROUSAN, Elie LASKER, Isabelle OLIVIER and Thomas RAMADAN (SWIFT) who, in various capacities, actively contributed to the success of this experiment.
[2] Promoting cross-border payments is also in the agenda of the European Union. The European Commission is highlighting the importance of both cross-border settlement and payments in its Capital Market Union action plan [11], and its Retail Payments Strategy [12].
[3] For the report on the existing arrangements and challenges, see [16].
[4] For the building blocks, see [17].
[5] For the roadmap, see [18].

It is against this background that Banca d'Italia decided to conduct a Proof of Concept for interlinking the Eurosystem's TARGET Instant Payment Infrastructure (TIPS) with Buna IPS, the cross-border and multi-currency payment system owned by the Arab Monetary Fund. The findings of the Proof of Concept are reported in this document.

1.2. Italy's G20 Presidency

Italy took on the Presidency of the G20 on 1 December 2020. The Italian G20 Presidency remains committed to delivering more effective and secure international payment systems in accordance with the initiatives planned in the Roadmap agreed under the previous G20 Presidency. It will do so by targeting the focus areas where digitalization is posing challenges. One of these areas concerns the technical and operational improvements to the existing domestic and international payment infrastructures needed for cross-border payments. TIPS has the potential to support the business cases and the minimum requirements that shared or interoperable infrastructures will have to meet to provide the settlement of cross-border payments.

2. Settlement models for cross-currency instant payments

The purpose of this section is to describe the previous steps of Banca d'Italia's analysis, i.e. cross-currency settlement in a Multi-Currency Clearing and Settlement Mechanism (CSM) where the settlement of both currencies involved in the cross-currency transaction occurs in the same CSM. By extending the scope to a scenario where two CSMs are involved, this PoC is the natural follow-up to the former analysis.[6]

2.1. Terminology

This section provides a number of definitions that will be used in the remainder of this paper.

A Multi-Currency Clearing and Settlement Mechanism (CSM) is a system implementing the processes underlying all payment transactions between two Payment Service Providers (PSP) in a multi-currency scenario, i.e. a scenario where payments take place in different currencies even though, for each payment, the debited and credited accounts are denominated in the same currency.

The two PSPs involved in a payment are the Originator PSP (on the debit or sender side) and the Beneficiary PSP (on the credit or receiver side). A cross-currency payment refers to the entire transactions chain which results in the debiting of an account in one currency and the crediting of an account in another currency. The Originator PSP sends a cross-currency payment message to instruct an instant payment in which debited and credited accounts are in different currencies. The Beneficiary PSP returns a cross-currency payment confirmation message to accept a previously received cross-currency payment message. A mono-currency payment refers to the entire transactions chain which results in the debiting of an account in one currency and the crediting of an account in the same

[6] For more information on cross-border and cross-currency payments see also the analysis performed under the aegis of the Bank of International Settlement [5][3][2][6] and the BIS Innovation Hub.[4]

currency. The Multi-Currency CSM sends a cross-currency settlement confirmation message to notify the settlement of a previously received cross-currency payment message.

The Originator PSP sends a mono-currency payment message to instruct an instant payment which debits and credits two accounts in the same currency. The Beneficiary PSP returns a mono-currency payment confirmation message to accept a previously received mono-currency payment message.

The Multi-Currency CSM sends a mono-currency settlement confirmation message to notify the settlement of a previously received mono-currency payment message. The Originator PSP sends a linked payment message to instruct a (cross-currency or mono-currency) instant payment that the Multi-Currency CSM may only settle simultaneously with another linked payment message.

Payment versus payment is a settlement mechanism that ensures that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency takes place.

A Cross-Currency PSP is a PSP holding account in multiple currencies in the Multi-Currency CSM. This implies that a Cross-Currency PSP has to be set up as multiple parties in the Multi-Currency CSM, one for each currency. For example, a Cross-Currency PSP settling in euro and SEK has to be set up as two parties, one with an account in euro in the book of a euro central bank and one with an account in SEK in the book of the Sveriges Riksbank.

2.2. Processing layers

The following diagram shows the three nested layers according to which the processing of a cross-currency payment has been modelled and analyzed in [22].

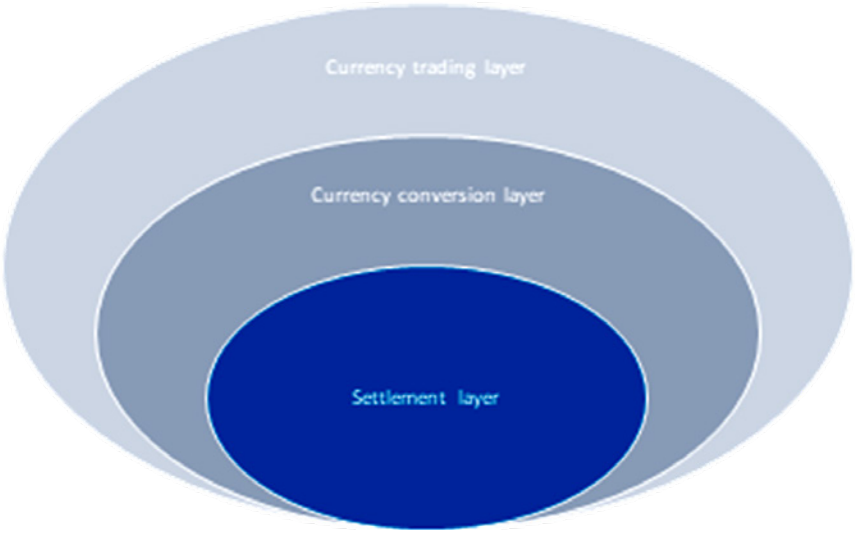

Figure 1 - Processing layers

The following sub-sections define in detail the settlement model layer that was analyzed in the context of cross-currency settlement in a Multi-Currency CSM.

2.3. Settlement models

This section describes three possible settlement models that can be applied for the processing and settlement of cross-currency payments in the Multi-Currency CSM. The details of each model, including the list of steps, can be found in the above-mentioned article. [22]

2.3.1. Single Transaction model

The Single Transaction (ST) model processes a cross-currency payment with one transaction only, which debits the Originator PSP account and credits (in a different currency) the Beneficiary PSP account.

2.3.2. Two Transactions model

The Two Transactions (2T) model processes a cross-currency payment with two transactions, the former between the Originator PSP and a Cross-Currency PSP (in the currency of the originator), the latter between the same Cross-Currency PSP and the Beneficiary PSP (in the currency of the beneficiary).

2.3.3. Linked Transactions model

Like the 2T model, the Linked Transactions (LT) model processes a cross-currency payment with two transactions, the former between the Originator PSP and a Cross-Currency PSP (in the currency of the originator), the latter between the same Cross-Currency PSP and the Beneficiary PSP (in the currency of the beneficiary). However, unlike the 2T model, with the LT model the Multi-Currency CSM ensures that the two transactions are settled at the same time.

3. Moving to a cross-platform context: *a Proof of Concept*

As stated in the stage 2 report to the G20, 'Faster, cheaper, more transparent and more inclusive cross-border payment services would deliver widespread benefits for citizens and economies worldwide, supporting economic growth, international trade, global development and financial inclusion.' In this context, a cross-border and cross-currency remittance payment appears to be a good candidate for this Proof of Concept. Speed is also clearly an important criterion for reducing the frictions on cross-border payments. This is why the decision was made to connect instant payment infrastructures for processing a cross-border and cross-currency remittance payment.

The TARGET Instant Payment Settlement (TIPS) system and Buna Instant Payment System (IPS) work in a similar way. Hence, at a high level, their interconnection seems feasible by spreading in a Multi-CSM scenario the Two Transactions settlement model presented in Section 2.3.2.

Moreover, the geographical context here adds a material relevance to this Proof of Concept, as both regions (Europe for TIPS and the Arab region for Buna) are home to several key markets that hold substantial global market shares in trade, remittances, and e-commerce flows, such as Italy, France,

Germany, Saudi Arabia, Morocco and Egypt, among several others. In fact, the combination of corridors in the remittances use case, in particular falling within the two territories, provides an additional context that can pave the way for this Proof of Concept to be expanded into a live operation.

3.1. TIPS – TARGET Instant Payment Settlement

On 30 November 2018, Banca d'Italia delivered TIPS (TARGET Instant Payment Settlement) [21][7], a new service for the settlement of instant payments in central bank money, which was also compliant with the SCT-Inst scheme.[7] Conceived as a multi-currency settlement platform, TIPS was developed with the goal, among other things, of fostering the integration of retail payment services offered by the European financial community and of eliminating barriers due to a lack of interoperability between different settlement platforms.

TIPS is active every day of the year, twenty-four hours a day. Its primary aim is to offer instant settlement services in euro to its participants, extending the services offered by TARGET2. TIPS is designed to be currency-agnostic in order to provide settlement in non-euro Central Bank Money, if requested, by connecting to any RTGS System. TIPS Dedicated Cash Accounts (DCA) in euro are legally opened in TARGET2 [8] by the central bank responsible. TIPS accounts in other currencies are legally opened in the relevant RTGS system by the central bank responsible and must be dedicated to the settlement of Instant Payments transactions in TIPS in the given currency.

TIPS, as well as the other Eurosystem market infrastructures (TARGET2 and TARGET2-Securities [20][9]), interacts with a set of common components to centralize the management of:

- reference data (Common Reference Data Management, CRDM);
- billing processes (Billing component, BILL);
- data archiving (Legal Archiving, LeA);
- access to all the services provided by the Eurosystem's infrastructures through a single entry point (Eurosystem Single Market Infrastructure Gateway, ESMIG).

Participants in TIPS can benefit from TIPS functionalities by:

- sending and receiving instant payments;
- handling the recall of instant payment transactions (recall requests) and the return of funds previously settled;
- initiating liquidity transfers from accounts owned in TIPS to accounts opened in RTGS systems denominated in the same currency, during RTGS opening hours;
- querying the system to get real-time information on instant payments, liquidity transfers, account balances and statuses;
- receiving reports and notifications to support reconciliation activities.

[7] See SEPA Instant Credit Transfer – Scheme Rulebook, (2019) Version 1.2, European Payments Council (EPC).

3.1.1. Access to TIPS

TIPS actors access the platform through the ESMIG component. They must enter into an agreement with a Network Service Provider[8] (NSP) for connecting with the system. TIPS actors can access the platform at application level (Application-to-Application channel, A2A) and through a graphical user interface (User-to-Application channel, U2A). A2A communication relies on ISO 20022 standard XML messages and all the exchanges of messages are executed through a real-time transfer service.

3.1.2. Participation model and account structure

The TIPS participation model is based on a hierarchical three-level structure. Banca d'Italia is the party operating the system (TIPS Operator) and is located on the top level of the hierarchy. Central banks in TIPS belong to the second level of the hierarchical structure. Banks represent the third and last level of the hierarchy and can be configured as owners of one or many TIPS DCAs (TIPS Participant) or as participants reachable in TIPS without holding TIPS accounts (Reachable Party). Central banks as well as TIPS Participants and Reachable Parties are identified in TIPS by a BIC11. As it cannot hold accounts, a Reachable Party has to rely on a TIPS Participant's account to settle payments in TIPS. Finally, by configuring Instructing Party roles,[9] TIPS Participants and Reachable Parties can allow third parties to send and receive instructions to/from TIPS on their behalf.

3.1.3. The settlement of instant payments

TIPS supports the different process flows foreseen in the SCT-Inst scheme, i.e. instant payments, recalls and investigations. Moreover, TIPS supports two additional process flows for instant payment processing:

- Non-euro settlement scheme;
- Single Instructing Party (SIP) settlement model.

The settlement process of an instant payment under the SCT-Inst and a Non-euro settlement scheme is known as a standard settlement model and comprises the following steps:

1) Upon receiving an SCT-Inst instruction from one of its customers and originator of the payment, the originator bank sends an instant payment transaction message to TIPS including the time stamp that marks the starting point of the execution process of the transaction;

2) TIPS validates the message and checks if sufficient funds are available on the participant's account. If no errors are detected, TIPS reserves the amount to be debited;

3) TIPS forwards the instant payment transaction to the bank of the beneficiary;

4) Once the beneficiary bank accepts the payment, TIPS settles the reserved amount by debiting the account of the originator bank and crediting the account of the beneficiary bank;
   TIPS notifies the beneficiary bank of successful settlement;

[8] The list of NSPs authorized to provide the service is available on the ECB's website.
[9] Third parties, which are not a TIPS Participant or a Reachable Party (e.g. ACHs), can be authorized to act as an Instructing Party. Unlike TIPS central banks, TIPS Participants and Reachable Parties, the hierarchical party model does not cover the role of Instructing Party. An Instructing Party is identified by digital certificates (and not by BICs) that each participant can authorize to send and receive instant payments and to receive notifications and reports sent by TIPS.

TIPS forwards the confirmation message received from the bank of the beneficiary to the originator bank;

5) If the beneficiary bank rejects the payment, the reserved amount is released and can then be once again used for settlement;

TIPS forwards the rejection message received from the beneficiary bank to the originator bank.

The platform allows the finalization of instant payments in a maximum time of 10 seconds from the moment the payment order is forwarded by the debtor bank to the moment the same bank receives confirmation of the payment settlement.

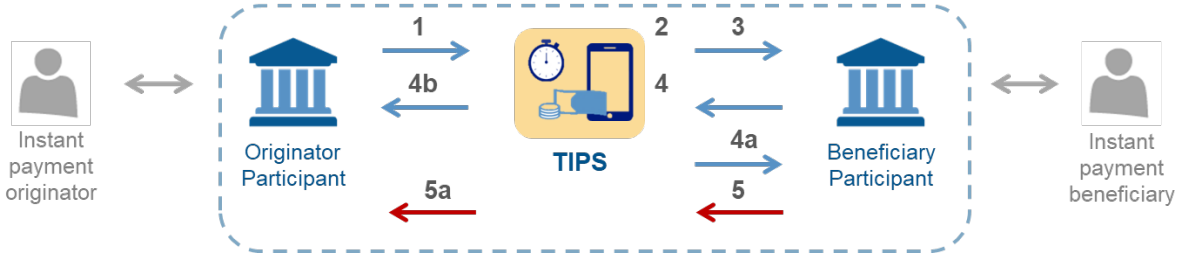

Figure 2 - The standard settlement model

Contrary to the process described above, the SIP settlement model does not reserve any funds when TIPS receives a payment, since in this scenario the Single Instructing Party already knows that the payment has been accepted by the beneficiary's bank. The settlement process, therefore, is simplified compared to the standard settlement model and takes place according to the following steps:

1) The Single Instructing Party sends the payment to TIPS;

2) TIPS settles the payment immediately;

3) TIPS sends the settlement confirmation to the Single Instructing Party.

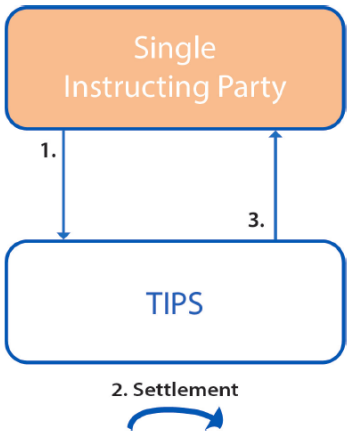

Figure 3 - The SIP settlement model

3.1.4. Liquidity management

The liquidity on TIPS DCAs is deposited from RTGS accounts denominated in the same currency. All liquidity transfers are settled by moving the liquidity through Transit Accounts. The latter, one for each currency settled in TIPS, are opened and maintained by the Operator on behalf of the competent

central banks of the relevant RTGS systems. At close of business, an RTGS system interacting with TIPS receives from the platform a file containing, for all accounts denominated in the relevant currency, the balances available at the closing time of the RTGS system.

In order to help the banks in monitor the liquidity on their TIPS DCAs, TIPS offers to their participants the possibility of receiving credit and debit notifications every time a liquidity transfer is settled on their own accounts.

3.1.5. Technical features

From a technical point of view [1], TIPS must be able to guarantee the following:

Low latency: the time required to make the funds available to the creditor (with confirmation to the debtor) must not exceed 5 seconds;
High volumes: TIPS can process up to 43.2 million transactions per day, with an average of 500 operations per second, peaking at 2,000 transactions per second;
High availability and resilience: the service must be active 24 hours a day, every day of the year, with 99.9% availability;
Scalability: it must be possible, by adapting the TIPS infrastructure, to enable it to support a doubling of the maximum volume currently envisaged (43.2 million operations per day) within one year from the time of the Eurosystem's request.

3.1.6. Monitoring and operations

The operations management of TIPS has three levels of responsibility. On the lowest level are the participants, whose scope extends only as far as the data under their direct control; they are the only operators authorized to issue support requests to the higher levels. On the next level are the national service desks of the central banks; they are the entry point for all support requests from the participants. On the top level is the TIPS Service Desk, located in Banca d'Italia, whose operators have visibility across the whole platform. The TIPS Service Desk plays two key roles: (1) as apex of the support structure, it assists the central banks as an escalation point for managing the participants' requests and it offers direct support to the participants on connectivity issues; (2) the TIPS Service Desk monitors the system and ensures the regular running of the business operations.

3.2. Buna IPS

3.2.1. Background

The Arab Regional Payments Clearing and Settlement Organization (ARPCSO) was founded in 2021 as an independent entity, fully owned by the Arab Monetary Fund (AMF) and operating a centralized cross-border multicurrency payment system named 'Buna'.

Buna operates two processing engines: a Real Time Gross Settlement system (RTGS) and an Instant Payment System (IPS).

Buna enables financial institutions and central banks in the Arab region and beyond to send and receive cross-border payments throughout the day in real time in all eligible Arab and International currencies,

serving as a single entry point to the region's financial systems for global financial institutions, as well as a multi-currency and multi-instrument system for local ones.

The diagram below illustrates Buna's conceptual architecture.

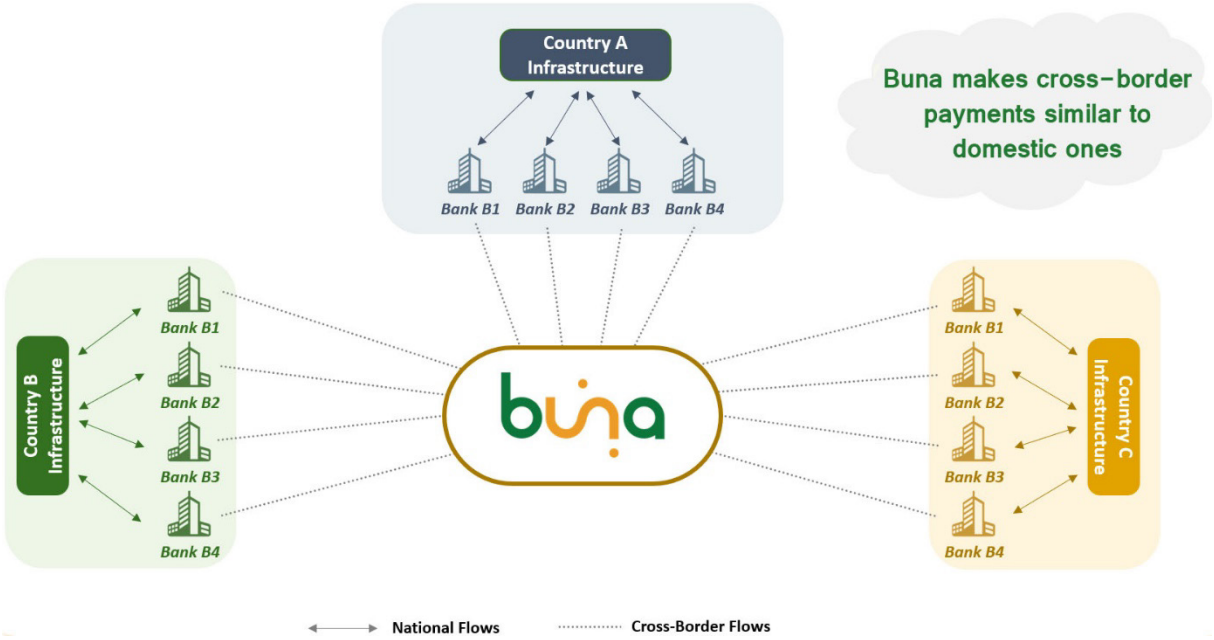

Figure 4 - Buna conceptual architecture

3.2.2. Liquidity management

Buna holds a single account in each eligible currency at a Fund Holding Institution (FHI). These accounts are maintained at the central bank of issuance or commercial banks may be utilized to hold Buna's settlement account where applicable. In both cases, final clearing and settlement is conducted in Buna, in line with CPMI-IOSCO PFMIs principle 8.

The participants' accounts are maintained in Buna. Each participant is required to open an account in the system for each eligible currency in which that participant wishes to settle payment transactions. Participants in the system include central banks, commercial banks, or any other institution that meets the participation criteria and submits their cross-border transactions directly to the system. To eliminate credit risk and ensure the system's stability, participants are required to pre-fund their accounts.

The diagram below illustrates the Buna funding model.

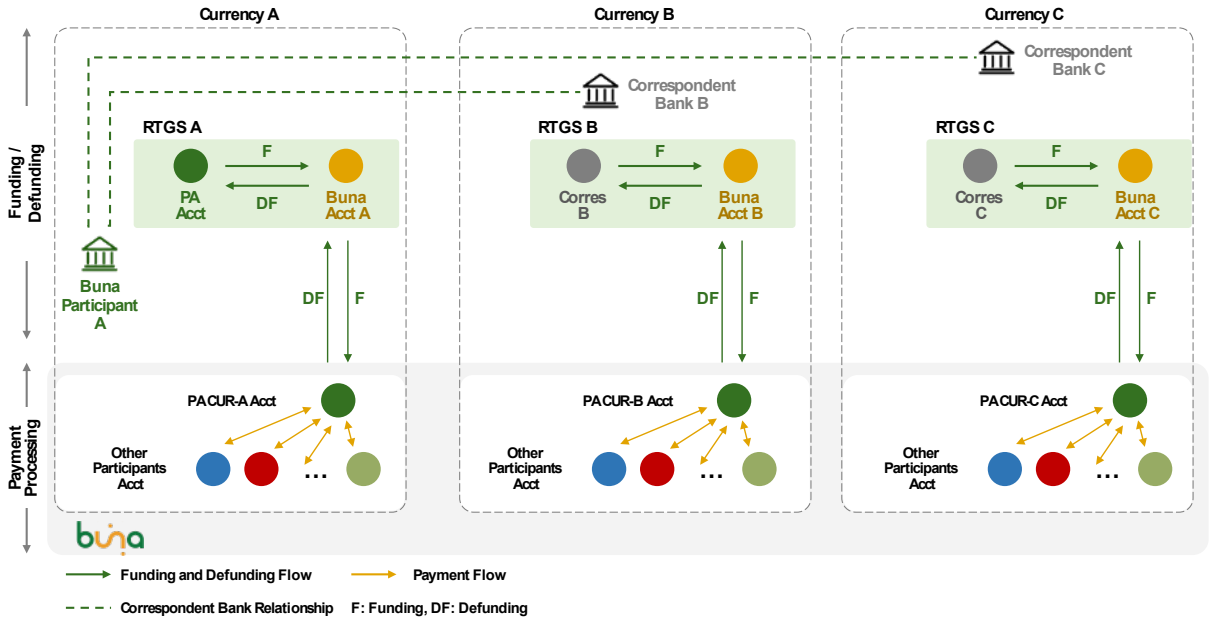

Figure 5 – Buna's funding model

3.2.3. Financial Crimes Compliance

Buna has established a Financial Crimes Compliance (FCC) program, clearly identified during the design stage, to promote the safety and efficiency of its operations and to ensure sufficient controls and measures are in place to combat money laundering and counter terrorism financing. This program has been implemented on top of the existing FCC obligations of participating banks.

The following diagram illustrates the additional checks run by the Buna system.

Figure 6 - Buna's compliance layer

The additional FCC layer provided by Buna consists in:

Sanction list screening: Buna conducts real-time and automated sanction screening of transactions against designated sanction lists,

Pattern-based controls: Buna also deploy a transactions monitoring tool to build behavioural profiles of participants and customers using data included in the payment messages,

Fraud prevention: Buna detects fraudulent transactions through payment analysis and transaction interception as part of its core platform.

3.2.4. High-level architecture

The Buna platform application architecture is designed to support distinct payment schemes, currently Real-Time Gross Settlement and Instant Payment. The main application components are:

The core processing engines (RTGS and IPS),
The participant portal, available via an agentless VPN connection over the internet,
The compliance application suite responsible for the sanction list and pattern-based controls as well as fraud prevention,
The SWIFT Alliance software suite that allows for secure transaction exchange over the SWIFT network.

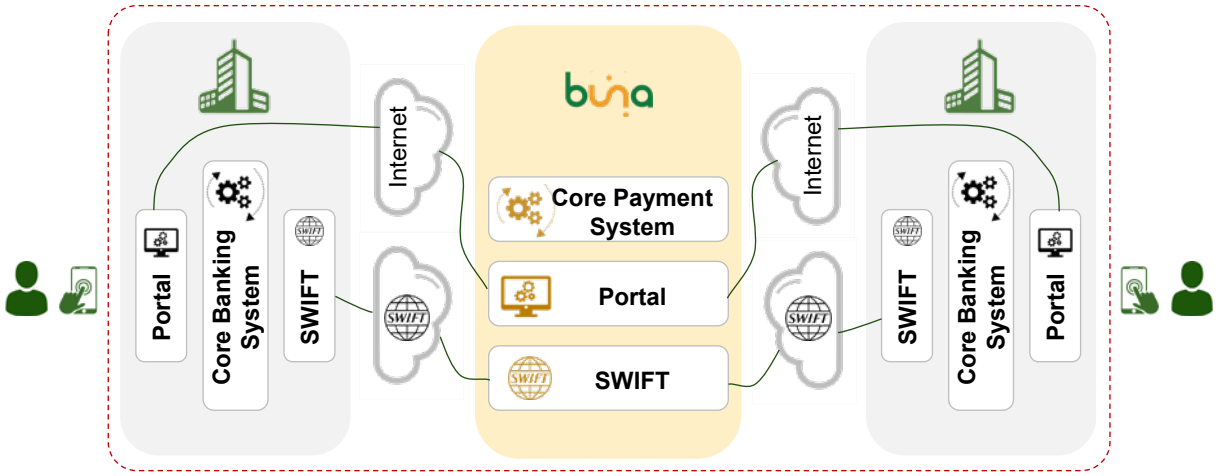

Figure 7 – Buna platform

3.2.5. Buna Instant Payments Service (IPS)

3.2.5.1. Overview

Whilst both Buna services offer a number of common features such as high speed, low cost, multi-currency support and the FCC program, Buna IPS differs by being available 24/7/365, providing payment confirmation from beneficiary participants and processing payments from initiation to delivery of confirmation in nearly 10 seconds.

The diagram below conceptually contrasts Buna IPS and RTGS:

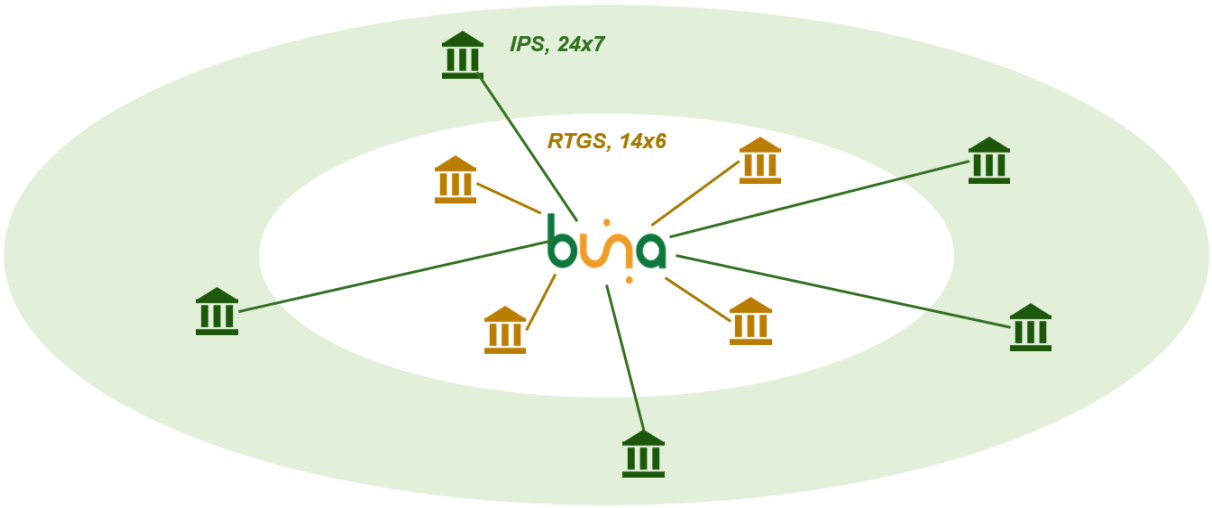

Figure 8 - Buna RTGS and IPS

3.2.5.2. Key features & benefits

Buna IPS supports diverse use cases such as credit transfers and Request to Pay, it allows end to end tracking, and enables optional features such as sending to aliases (with central addressing scheme capability). It also enables an optional feature to perform cross-currency operations (PvP) by participating FX providers within the system.

3.2.5.3. Participants and accounts

The Buna Instant Payment System (IPS) accepts two types of participant.

Participant: A financial Institution that is also a participant of the Buna Real Time Gross Settlement (RTGS) service and has an RTGS settlement account.

Non-Settlement Participant: An institution having only a position account at Buna IPS and using the RTGS account of a Buna participant to cover its IPS payment processing needs.

Buna has a three-level account structure.

The first level is the **RTGS settlement account**, which contains the funding of a Buna participant of the RTGS service.

The second level is the Buna **IPS settlement limit account**, which corresponds to a reservation of funds within the Buna RTGS settlement account (level-1).

The third level is a series of Buna **IPS position accounts** within the IPS settlement limit account, dedicated to the participant itself or to non-settlement participants.

The diagram below shows the Buna RTGS and IPS account structure:

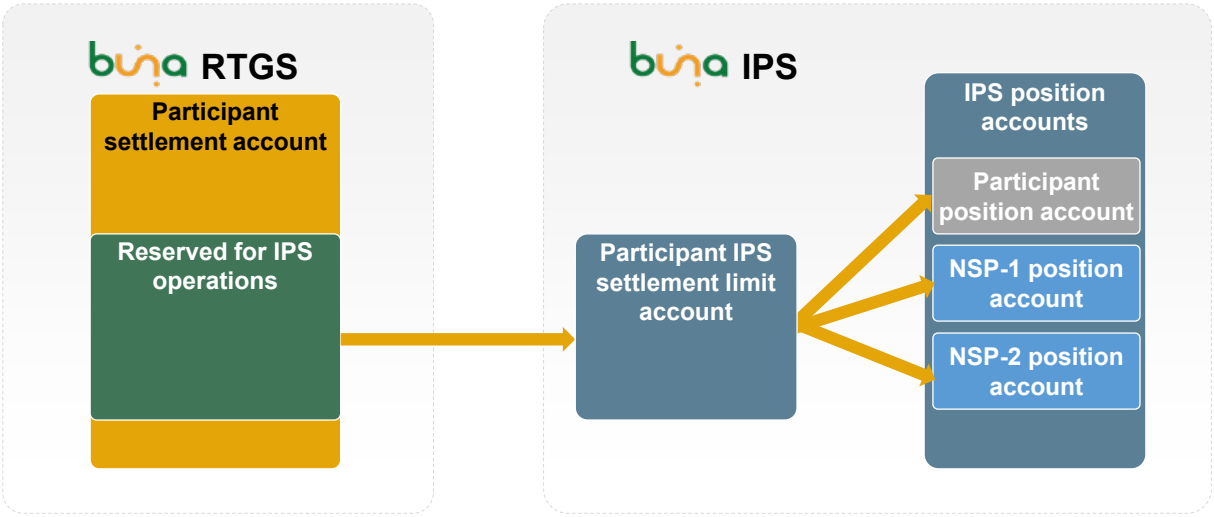

Figure 9 - Buna IPS and RTGS account structure

3.2.5.4. Transaction flow

The diagram below shows a typical transaction flow for a single customer credit transfer, which is the business use case considered for the Proof of Concept.

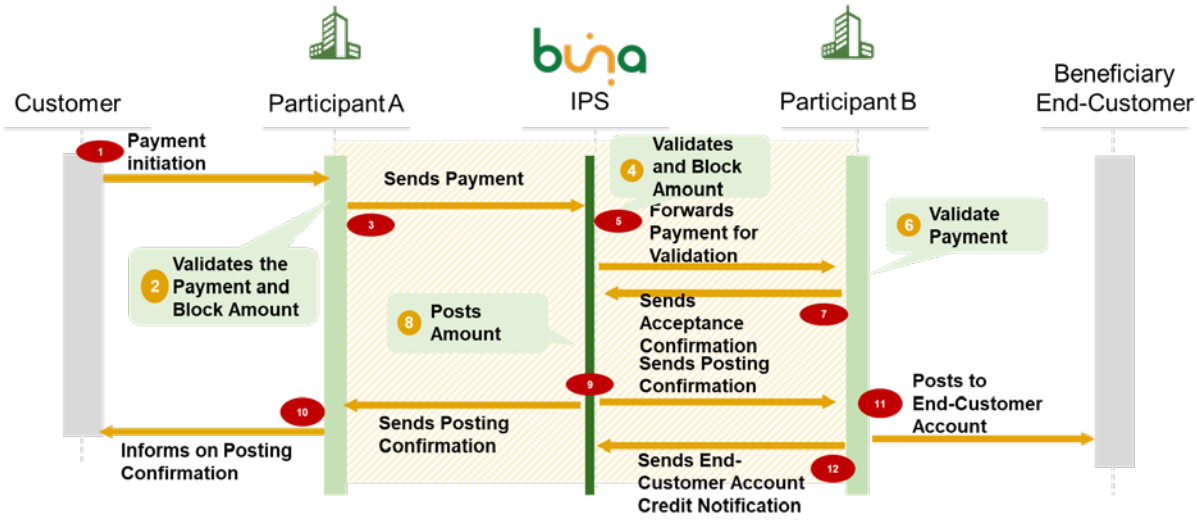

Figure 10 - Typical transaction flow for a credit transfer

3.2.5.5. High-Level Architecture

In addition to the generic architecture components as depicted in Section 3.2.4 above, the Buna Instant Payment Service (IPS) leverages the SWIFT Alliance Gateway Instant (AGI) module, which is specifically designed for the exchange of instant payment messages 24 x 7 x 365.

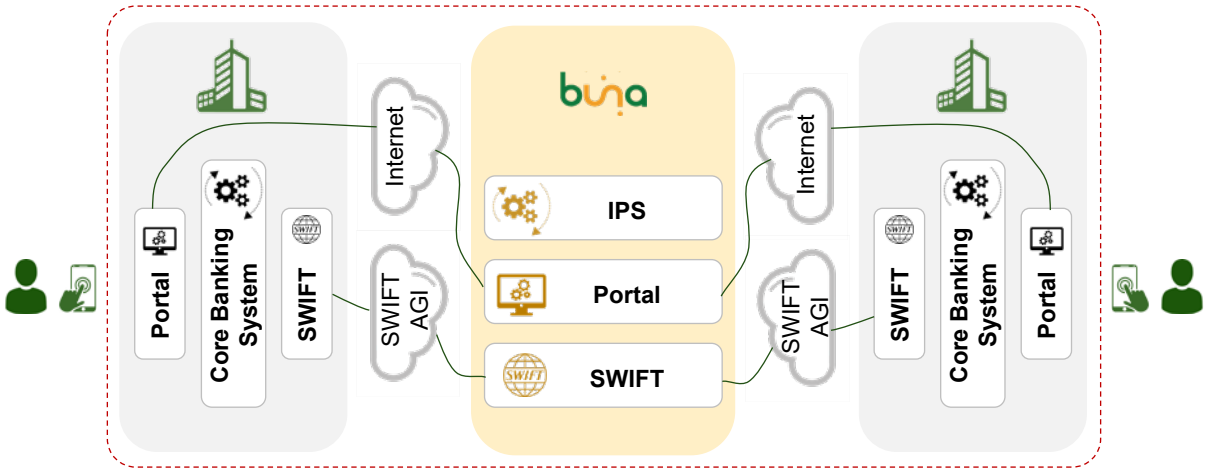

Figure 11 - Buna IPS high-level architecture

3.2.6. Operations & support

Operations and support occupy two distinct domains.

Business operations

- Service centre: the first line of support for users and participants with 24/7 working time to support IPS participants.
- Participant onboarding: assistance to candidate-participants throughout their onboarding journey with strong technical and teaching quality for smooth operations.
- Applications support: supporting, managing and testing the Core and Non-Core Software components.
- Monitoring and supporting participants' liquidity management with the proper reporting facilities.

Technical operations

- Infrastructure Operations: administration and support of network and platform components including OS, database, storage, back-ups and daily operations covering data centres and high-availability.
- Security services: management of security tools, monitoring and recording of security alerts, incident analysis and response, malware prevention and forensics.

3.3. Business scenarios and use cases

Below is a high-level schematic view of the business use case implemented for the Proof of Concept.

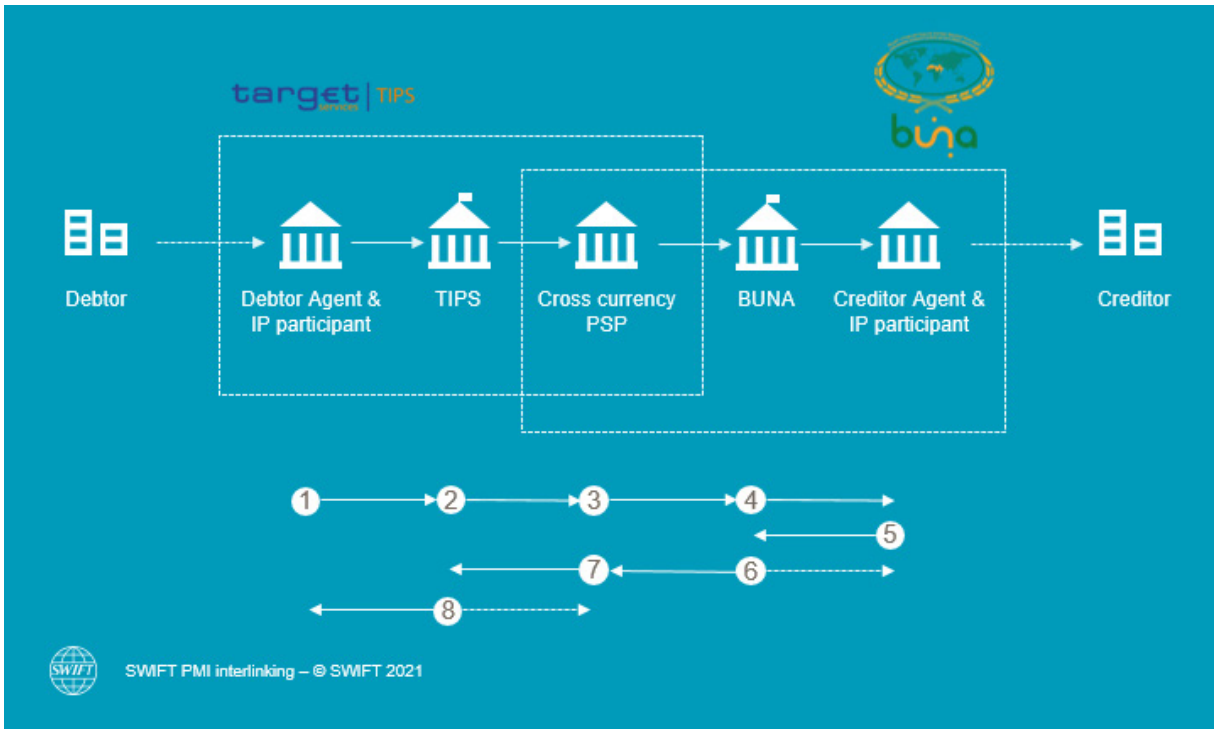

Figure 12 - Multi-CSM interlinking

In the scenario examined, the payer is located in Italy and sends an amount in euro (EUR) to a payee based in Jordan, who is ultimately credited in Jordanian dinars (JOD). The intermediation between the two transactions is achieved by means of a Cross-Currency PSP that takes care of the necessary currency conversion tasks.

According to the diagram shown in Figure 12 the following high-level steps are then completed.

- (1) After the Debtor instructs its Debtor Agent, the Debtor Agent sends a EUR instant payment to TIPS.
- (2) TIPS reserves the amount in EUR and forwards the payment to the Cross-Currency PSP.
- (3) The Cross-currency PSP converts to JOD and forwards the payment to Buna IPS.
- (4) Buna reserves the amount in JOD and forwards the payment to the Creditor Agent.
- (5) The Creditor Agent confirms the payment.
- (6) Buna settles the JOD payment and confirms to both parties.
- (7) The Cross-Currency PSP confirms the EUR payment to TIPS.
- (8) TIPS settles the EUR payment and confirms to both parties.

In the scenario studied, Intesa Sanpaolo and Jordan Ahli Bank agreed to connect their test environment infrastructures for the PoC execution. The two PSPs are active in their respective markets and provide instant payment services to their communities. For the purpose of the PoC, Intesa Sanpaolo acts as Originator PSP for the EUR transactions whereas Jordan Ahli Bank represents the Beneficiary PSP for the JOD transactions.

3.3.1. A simplified model

In the proposed model, the Cross-Currency PSP plays a pivotal role in the processing of the cross-border transactions for a variety of reasons. In fact, it actively participates in both CSMs carrying out the currency conversion task while at the same time it is capable of processing the ISO message languages[10] format and content in the two interconnected systems.

The absence of a player capable of meeting the very demanding technical requirements within the limited time allocated to the PoC, led to the decision to simulate the Cross-Currency PSP role by introducing the following simplified assumptions.

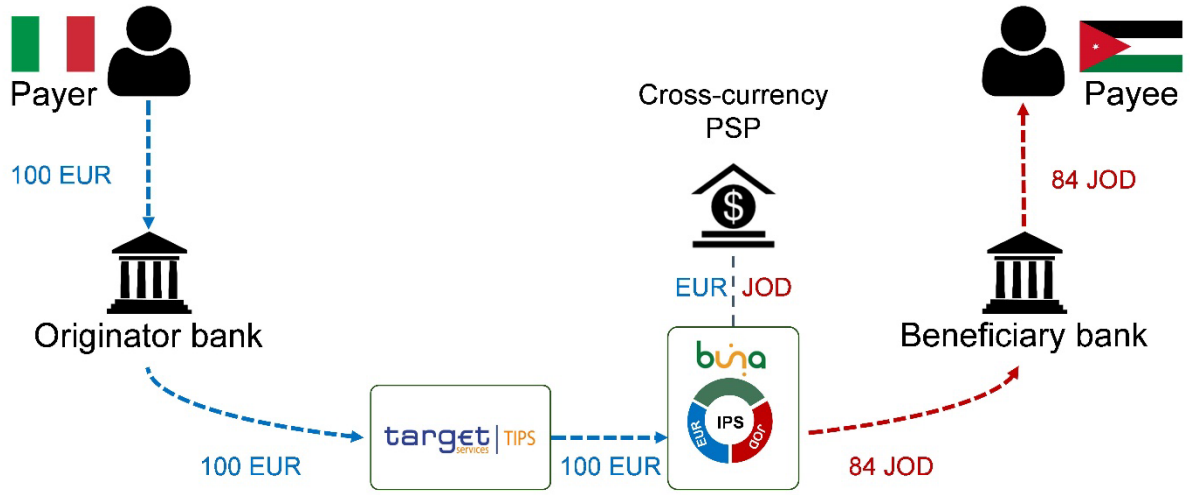

Figure 13 – High-level business model in use for the PoC

3.3.1.1. Network connectivity

From a connectivity viewpoint, TIPS and Buna systems were connected by enabling the mutual exchange of messages through an update of the respective SWIFT authorized Closed Group of Users (CGU). Consequently, Buna Distinguished Name (DN) was authorized in the TIPS CGU while at the same time TIPS DN was added into the Buna CGU.

The Cross-Currency PSP was emulated by registering a new *not-connected* BIC (i.e. BUNNAEAA) representing a PSP of the United Arab Emirates, acting as a Cross-Currency PSP in both TIPS and Buna systems.

3.3.1.2. TIPS

The emulated Cross-Currency PSP was captured in the TIPS Reference Data, whereas the delivery/reception of messages was obtained by defining Buna DN as a technical receiver/sender on behalf of BUNNAEAA. The proposed set up exploits the Instructing Party model that allows a technical

[10] The two CSMs may have different ISO message schemas in use for Instant Payment processing. For this reason, a mapping of the most relevant fields may be needed to provide end-to-end settlement in a multi-CSM environment.

provider to inject and/or receive instant payments in TIPS on behalf of an indirect participant (namely a Reachable Party, in TIPS terminology).

3.3.1.3. Buna

The cross-currency conversion layer, typically embedded in the Cross-Currency PSP infrastructure, is emulated via a new dedicated software stub developed into the BUNA IPS system. The software stub also takes care of the transformation between the message types in use in TIPS (i.e. pacs.008.001.02 and pacs.002.001.03) and the ones supported by Buna IPS (i.e. pacs.008.001.08 and pacs.002.001.10).

The above-mentioned layer also takes care of the necessary mapping between (i) any diverging optional and/or mandatory fields and (ii) cross-currency specific information that is required to originate the JOD transaction from the information embedded into the EUR transaction.

3.3.2. The model in use for the Proof of Concept

The simplified model described so far is illustrated in the following diagram.

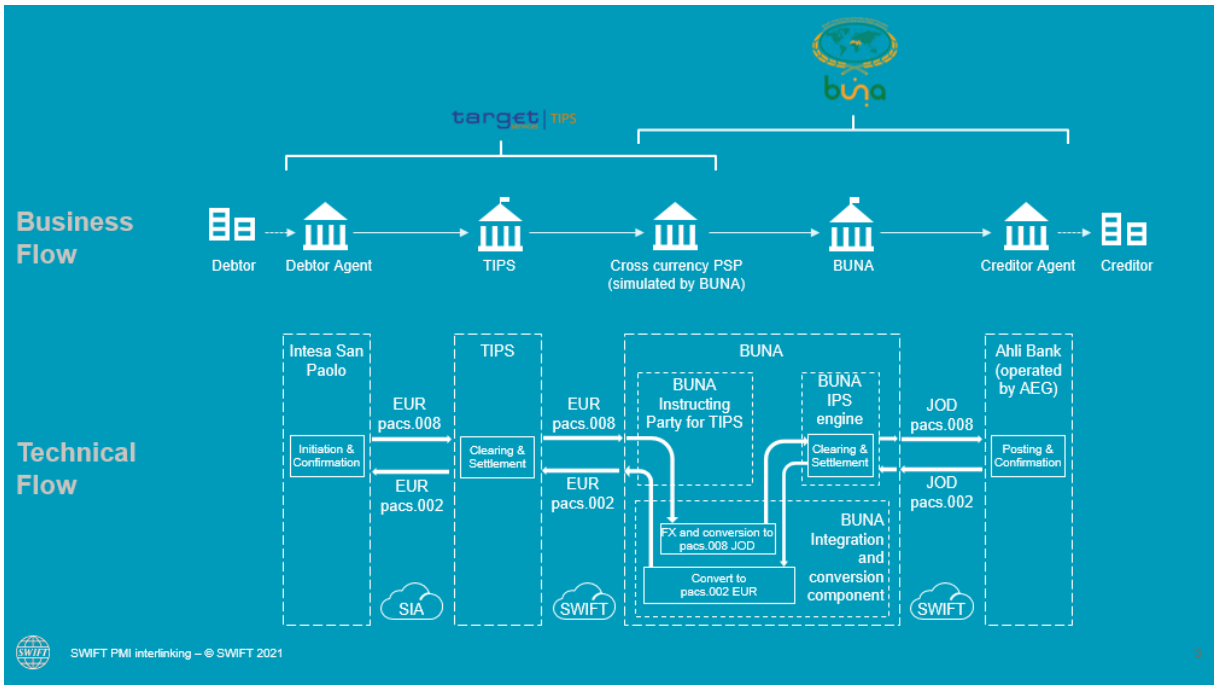

Figure 14 – Set up of the Proof of Concept

3.4. Reference data

For the PoC, the following actors were defined in the TIPS Common Reference Data Management (CRDM) component within the TIPS certification (CERT) environment:

An Originator PSP (i.e. Intesa Sanpaolo BCITITMMXXX) holding a TIPS Account in EUR,
A Beneficiary PSP (i.e. the Cross-Currency PSP BUNNAEAXXX), which

(i) holds an account in EUR within TIPS and
(ii) acts as a Cross-Currency PSP by also participating in Buna for JOD.

Besides the Party, a TIPS Account denominated in EUR was captured in the name of BUNNAEAXXX on the books of Banca d'Italia.

Moreover, the emulated Cross-Currency PSP in TIPS is managed directly by Buna as technical sender/receiver for all the A2A messages, acting in its capacity as instructing party. Therefore, the Buna DN (i.e. cn=buna-ips,cn=serv,o=bunnaeaa,o=swift) was captured both in the Certificate DN and the DN-BIC routing table linked to the BIC BUNNAEAXXX.

The interconnection between the TIPS and Buna IPS systems is achieved by including the DN of each system in the CGU of the other system (i.e. TIPS DN is included in the Buna CGU while at the same time Buna DN was added to the TIPS CGU).

The set up allows TIPS:

- to forward to Buna IPS the pacs.008 message received from Intesa Sanpaolo and forwarded to the Cross-Currency PSP in EUR and,
- to receive the related pacs.002 message as a confirmation. The initial pacs.008 also conveys all the relevant information that shall be used by the Originator PSP in Buna (i.e. the Cross-Currency PSP) to initiate the corresponding transaction in JOD within Buna IPS.

The necessary liquidity for the PoC was provisioned on Intesa Sanpaolo's TIPS Account by means of a Liquidity Transfer from TARGET2 CUST environment operated by Banca d'Italia.

3.5. Standards and message formats

ISO 20022 is a global standard that includes a common development methodology, a common process and a common repository suitable for use by all financial standards initiatives in the cross-border space or for domestic financial market infrastructures. The structure and the richness of ISO 20022 facilitate automation, straight-through-processing, transparency and compliance for any financial transaction, making it a key consideration in streamlining interoperability between domestic and cross-border payment flows.

For communication in A2A mode, both TIPS and Buna support XML messages compliant with the ISO20022 standard.

In particular, the following common set of messages is shared between the two platforms:

a) For Instant Payment usage cases
   FIToFICustomerCreditTransfer (pacs.008)
   FIToFIPaymentStatusReport (pacs.002)
b) For Recall usage cases
   FIToFIPaymentCancellationRequest (camt.056)
   PaymentReturn (pacs.004)
   ResolutionOfInvestigation (camt.029)

Even if the set is composed of shared messages, there are some differences in the ISO versions used and in the customizations applied, which have to be resolved in order to allow the proper interaction of the PoC and a potentially live operation.

The following sections describe the main differences between TIPS and Buna A2A message specifications for the pacs.008 and pacs.002 used for the settlement of an Instant Payment Transaction in the cross-border and cross-currency scenario.

3.5.1. Differences between TIPS and Buna message formats

Message specifications of TIPS and Buna were designed according to different sets of requirements and degrees of compliance. If, on the one hand, TIPS message specifications are compliant with the SEPA Instant Credit Transfer Scheme Interbank Implementation Guidelines, Version V1.0_1, 2019 (as for the TIPS Release 3.1), on the other hand, Buna message specifications are built applying a dedicated customization of the messages related to the ISO Maintenance Release 2019 (MR2019). Following a detailed comparison of the TIPS and Buna specifications for pacs.008 and pacs.002, the following main gaps were identified.

#	Gap	TIPS	Buna	To be solved for PoC	To be solved for Production
1	Use of the Business Application Header	Not allowed	Mandatory	Yes	Yes
2	ISO Message version	pacs.008 V02 pacs.002 V03	pacs.008 V08 pacs.002 V10	Yes	Yes
3	Mandatory fields needed for TIPS IP Processing – pacs.008 - Acceptance Date and Time	Mandatory	Not allowed	Yes	Yes
4	Mandatory fields needed for TIPS IP Processing – pacs.002 - Transaction Identification and Debtor Agent BIC	Mandatory	Optional	No	Yes
5	Error reporting messages	- admi.007 for technical NACK - pacs.002 for business NACK	- admi.002 for technical NACK - camt.025 for business NACK	No	Yes
6	Latin character restriction – pacs.002 and pacs.008	Applied	Not applied	No	Yes
7	Fields not used for processing but required by SCTInst	Mandatory	Optional	No	Yes

#	Gap	TIPS	Buna	To be solved for PoC	To be solved for Production
8	Field Settlement Method/Clearing System values	CLRG, INDA, INGA	CLRG	No	Yes
9	Field Service level code in pacs.008 and pacs.002	Mandatory with value SEPA	Not allowed	Yes	Yes
10	Field Local Instrument field in pacs.008	Mandatory with value INST	Not allowed	Yes	Yes
11	Field reason code in pacs.002	Mandatory	Not allowed	Yes	Yes
12	Missing fields to transport cross-currency specific information in pacs.008: - exchange rate; - amount in the destination currency; - destination currency; - Creditor Agent.	Not allowed	Optional	No	Yes
12	Missing fields to transport cross-currency specific information in pacs.002: - exchange rate; - amount in the destination currency; - destination currency	Not allowed	Not allowed	No	Yes

3.5.2. Proposed solutions for the identified gaps

The main gaps identified in Section 3.5.1 can be classified into two categories:

gaps influencing the PoC,
gaps whose resolution would be necessary for a potential future live operation between the two platforms.

The following sub-sections describe the two categories of gaps and possible solutions to overcome them.

3.5.2.1. Gaps influencing the PoC

This category of gaps necessarily requires an immediate resolution in order to allow the correct exchange of messages for the reduced set of business cases foreseen by the PoC. The set is composed of the following gaps:

1. non-uniformity of the use of the Business Application Header;
2. non-uniformity of ISO message version as the basis of the message customizations;

3. absence of fields mandatory in TIPS specifications:
   pacs.008 - Acceptance Date and Time;
   pacs.008 - Field Local Instrument;
   pacs.008 and pacs.002 - Service Level code;
   pacs.002 - Reason code;
4. absence of appropriate fields to convey specific information pertaining to the currency conversion.

To overcome these gaps and to allow the interlinking of TIPS and Buna for positive settlement of a cross-border cross-currency Instant Payment Transaction, three possible alternatives were identified:

a) the complete update of the specification of one platform in order to be compliant with the specification of the other;
b) a partial update of the specification of both platforms in order to allow the intercommunication;
c) the adoption of a message translator between TIPS and Buna, to enable online translation from one specification to the other for a correct intercommunication without the need to force changes to the platforms.

Considering that any changes on the TIPS side (solutions *a*, *b*) would cause the loss of compliance with the EPC SCT-Inst specifications, the strict timeline for the PoC and the need not to impact other customers sharing the TIPS Certification (CERT) environment, solution *c* (i.e. the adoption of a message translator between TIPS and Buna) is applied. The message conversion exercise is performed at the level of Cross-Currency PSP by a translator whose purpose is to convert messages from one specification to another: messages from TIPS (compliant with the TIPS specifications) are translated in order to make them compatible with the Buna specifications for the same message type, and vice versa.

Taking into consideration the simplified business case foreseen, the use of messages with a pre-agreed content is a simple way of overcoming most of the gaps to be solved for the PoC for a successful execution of the exercise. For example, the cross-currency specific information was inserted in the pacs.008 message using the *Remittance Information* block (Unstructured) to convey the information related to the exchange rate, the amount converted into the destination currency and the destination currency.

Moreover, due to the fact that the Cross-Currency PSP in TIPS was configured as Creditor Agent for Euro and captured in the relevant field of the pacs.008, the *Remittance Information* block is also used to convey the BIC of the ultimate Creditor Agent on the beneficiary side. The various pieces of information were aggregated in a single text string using the following pattern (i.e. elements separated by semicolons or commas):

UltimateCreditoAgentBIC11; ExchangeRate; ConvertedAmount; DestinationCurrency

Therefore, the abovementioned format was applied to the instant payment transactions following the formalism below, e.g. using an amount of 3.00 EUR converted into 2.52 JOD by applying an exchange rate equal to 0.84:

[…]<RmtInf>

<Ustrd>JONBJOAXXXX,0.84,2.52,JOD</Ustrd>

</RmtInf>[…]

Due to the absence of the *Remittance Information* block in the version of pacs.002 envisaged by the TIPS specification, the cross-currency specific information, while being of great interest for transparency reasons into a live operation, will not be included in the status report message for the PoC.

3.5.2.2. Gaps influencing a potential future real-life scenario of interconnection

This second category includes, in addition, gaps that do not require a resolution for the success of the PoC, but have to be addressed for a potential future complete communication scenario between the two platforms:

non-uniformity error reporting messages;
Latin character restrictions;
pacs.002 - Mandatory fields needed for TIPS Instant Payment Processing (Transaction Identification and Debtor Agent BIC);
fields not used for TIPS processing but required by SCT-Inst;
pacs.008 - Values to be used in the fields Field Settlement Method/Clearing System;
use of dedicated ISO fields to execute the cross-currency specific information.

These and some additional discrepancies are strictly related to the fact that TIPS is fully compliant with the SCT-Inst specifications, applying all the restrictions mentioned in the SEPA Instant Credit Transfer Scheme Interbank Implementation Guidelines, Version V1.0_1, 2019. [14] In this regard, it is important to note that the SCT-Inst specifications are built on ISO messages related to an old ISO Maintenance Release, while Buna applies a dedicated customization of the *pacs* messages related to the ISO MR2019.[11] Different ISO versions of the same message inevitably lead to differences in the applied customization.

The following sections present a non-exhaustive list of the discrepancies and restrictions applied by TIPS message specifications for both pacs.008 and pacs.002 due to the SCT-Inst rules mentioned in the Implementation Guidelines.

3.5.2.2.1. pacs.008

- Number of transactions allowed (limited to 1);
- How to identify the Agents (BIC only);
- How to identify an Instant Payment Transaction (Transaction Identification and Debtor BIC);
- Agents present in the messages;
- How to identify the accounts (IBAN only) and the account fields allowed for each Agent;
- How to report additional information (Instruction for Creditor Agent/Regulatory Reporting, Related Remittance Information).

[11] 2019 version of the ISO 20022 message standard.

3.5.2.2.2. pacs.002

- How to identify the Agents (BIC only);
- Number of transactions allowed (limited to 1);
- Status Reason info limited to one occurrence and mandatory;
- Reason code mandatory in negative confirmations.

A detailed comparison with the exhaustive list of differences between the Buna message specification and the TIPS ones (for pacs.008 and pacs.002 messages) are included in Annex I.

Other topics that ought to be addressed in order for cross-border instant payments to be successful in the future were identified in the area of timeout management conditions and compliance checking.

For the former, instead of altering the regional timeout, one possible approach would be to implement a process (or scheme) that does not affect the single regional schemes such as the SCT-Inst.

For the latter, the experiment was conducted without executing any compliance checking. More work is needed in this area to ensure that compliance checking is conducted successfully for the requirements of the regulations involved (e.g. different countries) and that the introduction of these checks does not affect the end-to-end latency.

3.5.2.3. Ways forward to overcome the identified gaps

The analysis performed enables the complete list of differences between the TIPS and Buna message specifications to be described. If, on the one hand, the restricted perimeter of the PoC allows the side effects of some of the gaps to be avoided, on the other hand, in a potential future real-life scenario of interconnection between TIPS and Buna, all gaps need to be addressed. Most differences are due to the fact that TIPS message specifications for euro are based on messages that are part of an old ISO Maintenance Release (as with the current SCT-Inst specification), while the Buna ones are customized based on the ISO MR2019 messages.

Having a common set of messages customized based on the same ISO Maintenance Release would address basic gaps such as the non-uniformity of the message version. In addition, customization rules and the usage of dedicated fields must also be adopted uniformly, at least for core message fields used by the two platforms for processing payments and by the users for reconciliation purposes.

Considering the level of the ongoing standardization process on cross-border payments, the following scenarios merit further investigation:

> *Alignment of the TIPS message specifications for euro to the ISO MR2019 applying a new customization for TIPS*. This approach is subject to the migration of the EPC SCT-Inst specifications to the ISO MR2019, currently foreseen by November 2023 as for the EPC roadmap. As the change management cycle of the SEPA payment scheme rulebook is still ongoing (change requests may be submitted until the end of 2021), the SCT-Inst specifications will not be released until May 2022.[12] Considering that TIPS should be fully compliant with the

[12] Please see Clarification Paper on SEPA Credit Transfer and SEPA Instant Credit Transfer Scheme Rulebook EPC131-17 / Version 1.7 / 06 July 2021 https://www.europeanpaymentscouncil.eu/sites/default/files/kb/file/2021-07/EPC131-17%20v1.7%20Clarification%20Paper%20SCT%20and%20SCT%20Inst%20scheme%20rulebooks_0.pdf

EPC SCT-Inst specifications, its rule and customization principles, and due to the fact that the specifications have not been published yet, there is no certainty at this stage that the migration of TIPS to the new EPC SCT-Inst specifications in November 2023 will close all the gaps between TIPS and Buna message specifications;

Adopt new message specifications dedicated to cross-border payments on both sides (TIPS and Buna). In this regard, building block 14 of the G20 global roadmap for enhancing cross-border payments is about the definition of a harmonized version of ISO 20022 for message formats, including a common set of messages to be supported and, for each one, the core set of fields, as well as related format and usage. These specifications will be created using, as a base, among others, the current set of guidelines for cross-border transactions (CBPR+), High Value Payments Systems (HVPS+) and Instant Payments (IP+), in a common harmonization process in order to overcome the current fragmentation at message level for cross-border payments. Specifically, by June 2022, a new repository will be created for this global standard, which can be used for interaction between payment platforms in the cross-border scenario, specifically between TIPS and Buna.

3.6. Connectivity

SWIFTNet Instant can facilitate the connectivity layer between TIPS and their participants as well as between Buna and their participants.

Buna is recognized in TIPS as an Instructing Party, which allows them to send and receive TIPS instructions on behalf of a participant.

3.6.1. SWIFTNet Instant Messaging Service

- The SWIFTNet Instant Messaging Service (SWIFNet Instant) is the messaging platform to be used for sending and receiving instant payment flows. SWIFTNet Instant comes with low latency, high throughput, the highest levels of security and 24/7/365 availability.
- SWIFT Alliance Gateway Instant (AGI) is a software that enables access to the SWIFTNet Instant Messaging Service. In this regard, it re-uses the customer's existing connectivity packs (lines, routers, VPN boxes), HSMs, security mechanism (PKI, etc), operational models, provisioning, support and billing. The main role of the AGI is to facilitate integration with financial applications.

3.6.2. Connectivity and security

The PoC participants were able to re-use their existing SWIFT connectivity and security infrastructure, including their SWIFT VPN boxes, hardware security modules (HSMs) and connectivity to SWIFT's Secure IP Network.

4. Proof of Concept outcomes

This section will provide the reader with a comprehensive overview of the methodology adopted for the testing phase and the quantitative results obtained.

4.1. Test execution

The execution of the test to demonstrate the PoC took place in stages in order to maximize the effectiveness of the joint sessions. The following sessions were executed:

CSMs and network session between TIPS, Buna and SWIFT to provide evidence of the interlinking of the two systems;
Unit testing of the different legs in EUR and JOD, on both the TIPS and Buna side with their respective counterparts, Intesa Sanpaolo and Jordan Ahli;
Unit testing of the software stub developed by Buna to simulate the Cross-Currency PSP;
Plenary session in which all the stakeholders were asked to provide evidence of the end-to-end transactions.

4.2. Quantitative results

The plenary test session took place officially on 26 August 2021. During the session, four cross-currency transactions were settled end-to-end, following the model described in Section 3.3.1. The transactions were originated by Intesa Sanpaolo and settled in both TIPS and Buna IPS, by debiting Intesa Sanpaolo's TIPS Account in euro and crediting, as ultimate Beneficiary PSP, Jordan Ahli Bank's Account in Buna denominated in Jordanian dinars.

The four transactions originated by Intesa Sanpaolo are identified in TIPS by the transaction identifiers reported below (TxID). Furthermore, the response time evaluated by the Originator is also provided:

TxID :0121082612474530, settled in 15 seconds;
TxID :0121082612474533, settled in 14 seconds;
TxID :0121082612474535, settled in 17 seconds;
TxID :0121082612474537, settled in 13 seconds.

Each transaction followed all the steps described in Figure 14 resulting in the final confirmation delivered by TIPS back to Intesa Sanpaolo, after the settlement confirmation for the leg in Jordanian dinars was received from Buna. The average response time measured end-to-end for the above-mentioned four transactions is ~14.75 seconds, therefore still within the range of a timeout condition of 20 seconds mandated by the SCT-Inst scheme for instant payments in euro.

The following table shows the latency measured throughout all the payment chain during the PoC where Tx represents respectively:

T0: pacs.008 is generated by Intesa Sanpaolo;
T1: reception of pacs.008 in TIPS;
T2: conditional settlement phase (i.e. reservation of funds in euro) completed in TIPS;
T3: payment confirmation, originated in Buna, received by TIPS;
T4: payment transaction in euro settled in TIPS;
T5: reception of payment confirmation by Intesa Sanpaolo.

Transaction ID	T_0	T_1	T_2	T_3	T_4	T_5
Transaction #1	*10:46:52*	*10:46:52,163*	*10:46:52,205*	*10:47:04,784*	*10:47:04,828*	*10:47:07*
Transaction #2	*10:53:33*	*10:53:33,579*	*10:53:33,631*	*10:53:45,879*	*10:53:46,113*	*10:53:47*
Transaction #3	*10:58:02*	*10:58:02,534*	*10:58:02,572*	*10:58:18,275*	*10:58:18,318*	*10:58:19*
Transaction #4	*10:58:56*	*10:58:56,884*	*10:58:56,922*	*10:59:06,825*	*10:59:06,873*	*10:59:09*

For each transaction, a detailed log throughout all the chain was collected as evidence of the successful settlement of the cross-currency transaction. The logs collected during the experimentation can be consulted in Annex II.

5. Business considerations

5.1. The view of a European player

5.1.1. The Intesa Sanpaolo Group

The Intesa Sanpaolo Group is one of the top banking groups in Europe, with a market capitalization of €45.3 billion[13] and is committed to supporting the economy in the countries (more than 30) in which it operates.

Intesa Sanpaolo is the leader in Italy in all business areas (retail, corporate, and wealth management). The Group offers its services to 13.5 million customers through a network of approximately 4,700 branches distributed throughout the country with market shares of no lower than 12% in most Italian regions.

Intesa Sanpaolo has a strategic international presence, with approximately 1,000 branches and 7.1 million customers, comprising subsidiaries operating in commercial banking in 12 countries in Central Eastern Europe and Middle Eastern and North African areas and an international network of specialists who support corporate customers across 25 countries, in particular in the Middle East and North Africa and in those areas where Italian companies are most active, such as the United States, Brazil, Russia, India and China.

5.1.2. Intesa Sanpaolo's strategic view on activities relating to cross-border instant payments, including between different currencies

The cross-border payment scenario is being hit by profound structural changes: new innovative and aggressive competitors, technological advancements, new use cases and customers' habits and

[13] As at 30 June 2021.

regulatory pressures. For decades, Regional Banks have been the undisputed leaders in payments, which were mainly seen as a commodity.

Nowadays, new competitors are increasingly populating the market by aggressively disrupting the established business and introducing new business models, pushing banks to adapt to the new competitive arena:

- Card networks – trusted brands, they manage huge volumes on a global scale and invest heavily in innovation such as API Crypto;
- Payment platforms – first adopters of digital currencies which rely on blockchain DLT technology to offer a smooth and near-real-time service, or players offering new services for SMEs for corporate treasury management;
- Global Banks – trusted brands especially for large corporates, they have focused their business on cross-border payments with highly interoperable platforms;
- GAFA and Fintech – non-banks entering the market and growing through partnerships, they rely on an intuitive user experience and competitive fees.

Technological advancements are having a massive impact on Financial Services, helping to shape the next-generation payment systems. API, Artificial Intelligence and biometrics are some of the technologies that have spread during recent years. Other new technologies, such as Distributed Ledger, are giving rise to disruptive payment methods: digital currencies based either on stablecoins or Central Bank Digital Currencies, e.g. the 'Digital Euro' project investigation phase recently launched by the Eurosystem.

Customer habits are changing, influenced by experiences with internet players; clients are increasingly demanding lower fees, and a faster, more innovative user experience, including in payment services. The global cross-border payments market is also evolving, with particularly strong growth in the C2B and B2C business segments (2015-19 CAGR: 9% and 6.5%). The most promising use cases (higher growth rates) in cross-border payments include digital services, based on 'marketplace' and 'platform' models.

From a regulatory point of view, the Financial Stability Board (FSB) and Committee on Payments and Market Infrastructures (CPMI) published the 'Enhancing Cross-border Payments' documentation in 2020, to develop a roadmap to improve cross-border payments by coordinating relevant stakeholders.

In this crowded scenario, several different initiatives arose in recent months, which may push banks to review their existing, tried and tested correspondent banking model. Since this scenario appears very uncertain and rather unpredictable, every possible alternative and corridor should be evaluated, especially if combined with immediate payments, an area where Intesa Sanpaolo has done pioneering work with both SCT-Inst and GPI in recent years.

5.1.3. The expectations and experiences gained during the preparation of the Proof of Concept

In a context of the increasing diffusion of instruments such as SCT-Inst, the ability to apply it also to multi-currency and cross-border scenarios represented for us the natural evolution of the product.

The Proof of Concept underscored, once again, the importance of the adoption of standards in the payment process: the POC was possible thanks to the fact that both TIPS and Buna support XML messages that are compliant with the ISO20022 standard. Although there are gaps between the two structures, interoperability was still possible without distorting the messages, or converting them.

Another important confirmation was the flexibility of TIPS, conceived from the outset as a multi-currency platform and which has demonstrated, also thanks to this PoC, a high degree of versatility and applicability. Created as a tool to guarantee interoperability and the spread of instant payments in Europe, TIPS has now also made it possible to break down geographical barriers, while still guaranteeing extremely short execution times.

The TIPS-Buna PoC could be considered as just the first experiment in a multi-corridor layer that could enhance cross-border immediate payments all over the world, moving transactional services to a real-time world in which we are facing the paradox that (real) goods sometimes moves faster than (digital) money.

5.2. The view of a player from the Arab region

5.2.1. Jordan Ahli brief overview

Jordan Ahli Bank was established in 1955 and has played a pivotal role in the growth and evolution of the financial industry in the Kingdom of Jordan. Since its inception, the bank has worked to develop strategies and action plans that promote sustainable growth, while keeping pace with the rapid developments taking place in Jordan and throughout the world. The bank caters to numerous segments of the market, meeting a diverse range of banking needs and requirements through a wide array of specialized products and services. Jordan Ahli Bank strives to embody creativity and innovation to drive growth and to meet the changing needs of its clients.

5.2.2. Jordan Ahli strategic view on the cross-border/cross-currency instant payment settlement

In today's fast-paced digital world, it is very important for bank's services to be agile and digitally accessible to their customers 24/7. The current pandemic climate has accelerated this process even further.

For domestic payment services, consumer demand for agility and accessibility is being met through the emergence of domestic instant payment schemes such as CliQ in Jordan, Faster Payments in the UK, FedNow in the US, SCT-Inst in the Eurozone and other solutions in India, Australia, Singapore, to name a few.

For international payment services, in order to provide fast and frictionless cross-border, cross-currency instant payment services to customers, it is crucial that banks and financial institutions leverage this emergence of domestic instant payment schemes by achieving interoperability and universal connectivity between these domestic instant payment schemes based on globally interoperable standards and central infrastructures.

From a regional perspective, Jordan is a key market for sending and receiving cross-border, cross-currency payments, for example inbound remittances driven by Jordanian expats living abroad in the Arab gulf region, and in Europe and North America, represent a key contribution to the Jordanian economy. Similarly, outbound remittances from foreign expats living in Jordan to their home countries are also substantial. On the trade side, the Jordanian market has a number of key corridors where significant cross-currency payments flow into the neighbouring countries and worldwide, with SMEs and e-Commerce players becoming the new trends catalysing the transformation in payments. These trends emphasize the need for faster and more cost-effective experiences, with clients now expecting to be able to make cross-border payments in a similar way to domestic instant payments. Jordan Ahli Bank is ready to embark on a transformation to develop interoperable cross-border instant payments solutions to meet the increasing demand from its clients across all segments for instant cross-border payment options with 24/7 availability.

5.2.3. Jordan Ahli's experience with this particular experiment

The scope of the experiment was to test a cross-border instant payment transaction sent in ISO 20022 pacs.008 format by a bank in Italy in EUR currency through TIPS to BUNA for a beneficiary in Jordan Ahli Bank. Buna converted the payment from EUR to JOD by simulating the role of Payment Service Provider (PSP) and sent it to Jordan Ahli Bank through SWIFT Alliance Gateway Instant (AGI). Jordan Ahli Bank validated the transaction's details, credited the payment to the beneficiary's account and sent the response back in ISO 20022 pacs.002 format to Buna through SWIFT AGI and Buna communicated the response through the PSP Simulator to the Italian bank using TIPS.

The entire payment process was seamless, and the payment was credited to the beneficiary's account in a matter of seconds.

Based on the successful completion of this experiment between the Eurozone and the Arab region, we can conclude that interlinking instant payment schemes can enable banks to provide faster cross-border, cross-currency payments to customers across multiple geographies.

The success of the experiment has helped Jordan Ahli Bank to lay a strong foundation for building a robust and efficient solution and to be a pioneer amongst banks in the Arab region in offering cross-border, cross-currency instant payment services to its clients.

6. Legal considerations

The realization of a cross-currency functionality such as the one described in this paper obviously requires that certain legal aspects be considered *a priori* and, as regards risks or other concerns, adequately addressed. For this purpose, it is especially important to first outline the basic regulatory framework applicable, and second, to analyse the risks arising from the operation of a cross-currency functionality.

6.1. Regulatory framework

6.1.1. TIPS legal framework

From the Eurosystem's perspective, one aspect worth investigating is whether the development of a cross-currency payments functionality such as the one described in TIPS would be consistent with the current legal parameters of the system, as determined by the Governing Council at the time of its launch. To assess the legal parameters of TIPS, as decided, so far, by the Governing Council, and the extent to which cross-currency settlements would fit into its scheme, the original decision of the Governing Council to launch TIPS must be taken into consideration.

In June 2017, the Governing Council decided to begin the realization phase of TIPS, the pan-European platform for the settlement of instant payment transactions in central bank money. TIPS was set up with a multi-currency functionality, meaning that, with the agreement of the Governing Council, a non-Eurosystem central bank could decide to make its domestic (non-euro) currency available in TIPS through the conclusion of a CPA. The Governing Council's decision to launch TIPS as a multi-currency platform was informed by the earlier work of the European Payments Council (EPC) and the Euro Retail Payments Board (ERPB), and it is consistent with their policy aim of seeing a pan-European electronic instant retail payment solution emerge, where none existed before.

It can be concluded that TIPS was *ab initio* designed to cater for the settlement of instant payment orders in euro as well as in currencies other than the euro (i.e. multi-currency). However, the inclusion in TIPS of a cross-currency settlement functionality such as that envisaged in this paper would amount to a qualitatively new functionality. Accordingly, it is for the the Governing Council to decide, upon a reasoned proposal, in favour of or against its development and implementation.

6.1.2. FATF compliance

The FATF Recommendations set out a comprehensive and consistent framework of measures that countries should implement in order to combat money laundering and terrorist financing, as well as any financing of the proliferation of weapons of mass destruction.[15] Countries have diverse legal, administrative and operational frameworks and different financial systems, and cannot all take identical measures to counter these threats.[14]

As part of the Buna onboarding package for market participants, the 'Buna Rules' document states the following provisions with regard to AML/CFT:

- The head office of the Applicant must not be located in a jurisdiction or country that belongs to, or whose currency belongs to specific international sanctions lists;
- The Applicant must adhere to Anti-Money Laundering (AML), Combating the Financing of Terrorism (CFT), and anti-corruption compliance requirements, or any other relevant compliance requirements that the System Operator considers necessary for the protection of the System or its Participants or to comply with legal or regulatory requirements;

[14] [15] https://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html

- The Applicant must have adequate capabilities and procedures in place to detect illegal money laundering, the financing of terrorism and corruption activities of its customers or any other illegal activities;
- The Applicant must furnish to the System Operator such information, as may be reasonably requested by the System Operator based upon its determination that such information is relevant and necessary for the protection of the System or its Participants, or to comply with legal or regulatory requirements.

In addition to these requirements, Buna applies its own compliance controls on all transactions exchanged via the platform.

The European Union adopted robust legislation to counter and prevent money laundering and terrorist financing, with the fifth Money Laundering Directive (5MLD) coming into force on 10 January 2020 [10]. The directive takes into account the recomendations of the FATF.

From the perspective of the Eurosystem as TARGET2/TIPS Operator, it is worth noting that no specific AML/CFT control is performed, as this task is delegated to and performed by each participating NCB. However, should a suspicious activity be reported, the TARGET2/TIPS Operator, if requested by the Eurosystem, may suspend or terminate the account of the reported participant.

In particular, according to the TARGET2 Guidelines [13]: 'Participants shall be deemed to be aware of, and shall comply with, all obligations on them relating to legislation on data protection, the prevention of money laundering and the financing of terrorism, the proliferation of sensitive nuclear activities and the development of nuclear weapons delivery systems, in particular in terms of implementing appropriate measures concerning any payments debited or credited on their PM accounts'.

6.2. Legal risks

Another aspect of significant legal relevance is the identification of legal risks, if any, which the development and operation of a cross-currency payments functionality could give rise to, and the need to draw attention to any legal constraints, in view of the development of such a functionality.

As a preliminary remark, it is worth noting that a multi-currency functionality can, *a priori*, be a source of novel foreign exchange, credit and operational (including legal/litigation and reputational) risks. These risks can be mitigated through the careful selection of the model for the delivery of the service and the design of the accompanying legal framework based on which the Eurosystem is to provide cross-currency payment services to the non-Eurosystem central banks that have made their currencies available for cross-currency settlement.

6.2.1. Central Bank Money (CeBM) versus Commercial Bank Money (CoBM)

One possible source of operational risk is recourse to commercial bank money for the purpose of currency conversion processes, as opposed to the final settlement of transactions, which would take place in central bank money in the accounts of the corresponding central bank. Although safety is not the sole prerogative of central bank money, the Principles for Financial Market Infrastructures (PFMIs) issued by the Committee on Payment and Settlement Systems (CPSS) and the International

Organization of Securities Commissions (IOSCO) strongly recommend the use of central bank money in settlement 'where practical and available', given the perceived advantages of central bank money over commercial bank money settlement from the perspective of risk mitigation. It is ultimately a policy decision whether or not to accept the added risks that the use of commercial bank money will bring when the platform settles cross-currency transactions.

6.2.2. Third party risk

While the delivery of cross-currency settlement services (also) depends on the services that third parties may provide to their customers (such as, for instance, in the case of the currency trading and/or conversion services that PSPs would provide to the originators and beneficiaries of instant payments) the Eurosystem's exposure to, and possible mitigation of, legal risks will, in part, depend on the efficient distribution/assumption of legally binding obligations on/by those third parties, and on the contractual or other legal documentation between them and the central bank of the relevant non-euro, EU/EEA currency. The acts and omissions of third parties with which the Eurosystem has no direct legal relationship and over which it exercises no direct control, represent an added source of risk for the Eurosystem, which should be taken into account by the relevant decision-making bodies before they decide to offer cross-currency services.

6.2.3. Currency exchange risk

Another source of operational risk is linked to the foreign currency trading/exchange leg of the cross-currency instant payment transactions they would facilitate. This would be a novel source of risk for the Eurosystem in the operation of TIPS, which is absent from single currency transactions currently processed by the platform. In particular, should the foreign currency exchange/trading leg of a cross-currency transaction fail (for instance because of a delay in the provision of foreign exchange rates or in the actual currency conversion, resulting in the unavailability of foreign exchange funds in the currency of the beneficiary), the instant payment transaction itself would fail. The parameters of the contractual liability of a non-Eurosystem central bank (including its ceiling) will depend on the provisions of the contractual and other legal documentation governing the relationship between the relevant central bank and its counterparty Originator PSPs.

6.2.4. Jurisdiction and enforceability of judgements

Another source of legal risk is linked to the difference between the relevant jurisdictions and potential problems in ensuring the enforceability of judgements among the different countries involved.

6.2.5. Geopolitical risk

The so-called geopolitical risk, i.e. the risk associated with wars, terrorist acts, and tensions between States that affect the normal and peaceful course of international relations, should also be taken into account when evaluating a cross-currency operation. In order to manage this type of risk various mitigation measures should be deployed, encompassing technical solutions, operational procedures, and legal arrangements.

7. Conclusions

The results of this Proof of Concept demonstrate that different CSMs can interact with each other and exchange instant payment cross-border and cross-currency instructions in a matter of seconds. This means that the possibility of offering a new range of 24/7 services to firms and citizens exists, fostering interoperability, enlarging reachability beyond circumscribed geographical areas, and reducing costs.

The potential cost savings related in particular to cross-currency remittances are taken into consideration in the UN report on International Day of Family Remittances published in 2021. The report says that 'reducing costs to 3% globally could put an additional $20 billion per year into the pockets of remittance recipients'. [19]

On the technical side, the harmonization of message standards in the various CSMs, driven by the competent authorities with the support of the market players, is deemed one of the factors that could enable a reduction in complexity. However, despite recognizing that harmonization is desirable in principle, it is not strictly compulsory in a Multi-CSM scenario under the assumption that the Cross-Currency PSPs, in their role as participants in the different communities, may act as a catalyst by translating the different 'message dialects' of a given cross-currency transaction.

Besides the outstanding results of the Proof of Concept from both the technical and performance viewpoints, the experiment was also valuable for identifying technical enhancements to improve interoperability and foster transparency. These enhancements could be taken as starting points for a follow-up investigation phase, to pave the way for a potential expansion into a live operation.

One final interesting dimension for future analysis is the assessment of additional hurdles that need to be taken into consideration for cross-currency settlement when extending interoperability from a bilateral to multilateral scenario, i.e. when at least three CSMs are interacting.

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