



Cross-currency instant payments

Note on the *Linked Transactions* settlement model

1. Introduction

The purpose of this note is to provide a detailed description of the so-called *Linked Transactions* settlement model, i.e. the one that the *Cross-Currency Technical Work Stream* considers as the preferred model – from a technical, functional and operational standpoint – amongst the three settlement models initially identified¹.

This document is organized as follows. Chapter 2 introduces and defines all relevant terms for the cross-currency settlement context, whereas Chapter 3 recalls how the two already existing mono-currency settlement models process payments. Against this background, Chapter 4 introduces the concept of Central Exchange Hub to support the identification of applicable exchange rates, whereas Chapter 5 illustrates in detail the processing of *cross-currency payments* according to the *Linked Transactions* settlement model. Finally, Chapter 6 focuses on the specific elements related to the settlement risk.

2. Terminology

This section provides some definitions of terms that appear in the remainder of this paper. All other terms used in this paper are defined as in the *TIPS Scope Defining Documents*. The definitions below are provided for description purposes only. More detailed definitions, to be adopted for the purposes of the legal documentation necessary for the provision of the cross-currency settlement service in TIPS, shall be provided at a later stage, also to ensure consistency with the TARGET Guideline and the TIPS legal framework.

Cross-currency payment - 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.

¹ For a detailed description of the three settlement models initially identified, see the note "*Cross-currency instant payments*", included in the background documentation for the MIB meeting on 9-10 September 2020.



Cross-currency payment message - The Originator PSP sends a *cross-currency payment message* to instruct an instant payment in which debited and credited accounts are denominated in different currencies.

Cross-currency payment confirmation message - The Beneficiary PSP returns a *cross-currency payment confirmation message* to accept a previously received *cross-currency payment message*.

Cross-currency settlement confirmation message - TIPS sends a *cross-currency settlement confirmation message* to notify the settlement of a previously received *cross-currency payment message*.

Mono-currency payment - 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 currency.

Mono-currency payment message - The Originator PSP sends a *mono-currency payment message* to instruct an instant payment which debits and credits two accounts denominated in the same currency.

Mono-currency payment confirmation message - The Beneficiary PSP returns a *mono-currency payment confirmation message* to accept a previously received *mono-currency payment message*.

Mono-currency settlement confirmation message - TIPS sends a *mono-currency settlement confirmation message* to notify the settlement of a previously received *mono-currency payment message*.

Linked payment message - The Originator PSP sends a *linked payment message* to instruct a (cross-currency or mono-currency) instant payment that TIPS may only settle simultaneously with another *linked payment message*.

Cross-currency PSP - A *cross-currency PSP* is a PSP holding accounts in multiple currencies in TIPS. This implies that a *cross-currency PSP* has to be setup as multiple parties in TIPS, one for each currency (although it is possible for the same legal entity to appear as more than one parties in TIPS). For example, a *cross-currency PSP* settling in euro and SEK has to be setup 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.

3. Mono-currency settlement models

This Chapter describes the two settlement models that are currently implemented in TIPS and that allow settlement of *mono-currency payments*.

3.1. Standard (STD) settlement model

The Standard (STD) settlement model is the TIPS implementation of the settlement model envisaged by the SCT-Inst scheme rulebook. For the time being, this model is used for euro payments only; with the on-boarding of the Swedish banking community, it may be used also for payments in SEK as of May 2022. The following table describes the processing steps of the STD settlement model:

Step	Description
1	The Originator PSP sends a <i>mono-currency payment message</i> to TIPS.
2	In case of successful validation of the <i>mono-currency payment message</i> received from the Originator PSP, TIPS reserves the amount to be debited on the account of the Originator PSP and forwards the <i>mono-currency payment message</i> to the Beneficiary PSP.
3	In case of acceptance of the <i>mono-currency payment message</i> received from TIPS, the Beneficiary PSP sends back to TIPS a <i>mono-currency payment confirmation message</i> .
4	In case of successful validation of the <i>mono-currency payment confirmation message</i> received from the Beneficiary PSP, TIPS settles the <i>mono-currency payment</i> as follows: <ul style="list-style-type: none">• it debits the Originator PSP account with the amount previously reserved,• it credits the Beneficiary PSP account with the same amount. Thereafter, TIPS sends back to the Originator PSP and to the Beneficiary PSP the relevant <i>mono-currency settlement confirmation message</i> .

3.2. Single Instructing Party (SIP) settlement model

The Single Instructing Party (SIP) settlement model has been defined in the context of the on-boarding of the Swedish banking community. For the time being, this model is planned to be used as of May 2022 and only for payments in SEK; recently, the Eurosystem submitted to the EPC a change request of the SCT-Inst scheme, with the objective of facilitating the adoption of this model also for euro payments. The following table describes the processing steps of the SIP settlement model:

Step	Description
1	The Single Instructing Party sends a <i>mono-currency payment message</i> , received from the Originator PSP and already cleared with the Beneficiary PSP, to TIPS.
2	In case of successful validation of the <i>mono-currency payment message</i> received from the Single Instructing Party, TIPS settles the <i>mono-currency payment</i> as follows: <ul style="list-style-type: none">• it debits the Originator PSP account with the payment amount,• it credits the Beneficiary PSP account with the same amount. Thereafter, TIPS sends back to the Single Instructing Party the relevant <i>mono-currency settlement confirmation message</i> .

4. Central Exchange Hub

This Chapter describes the *Central Exchange Hub* (CEH) currency-trading model, which the *Cross-Currency Technical Work Stream* has identified as an optional feature for *cross-currency payments* in TIPS.

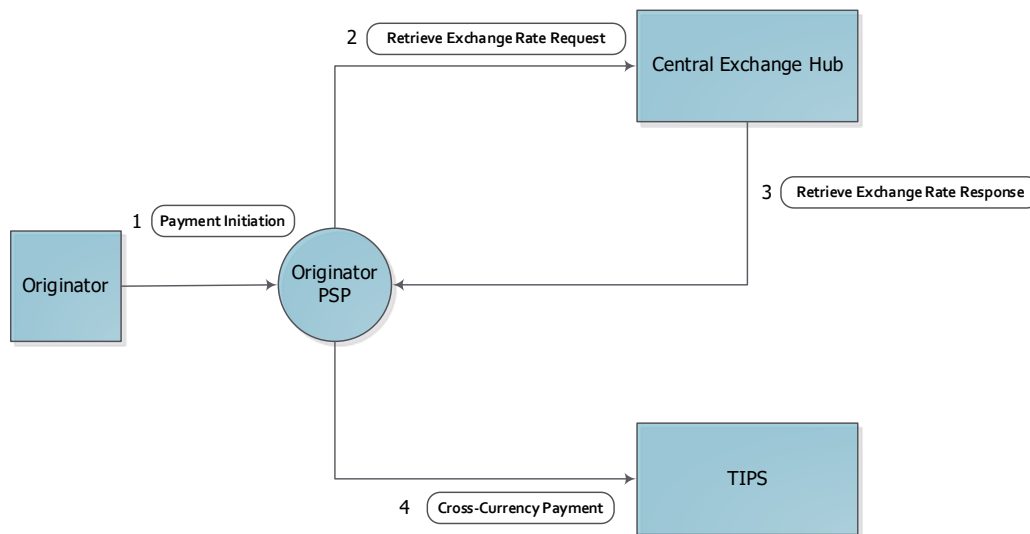
This currency-trading layer identifies the possible models by which the currency conversion rate for an instant payment transaction is defined prior to being sent to the TIPS technical platform for settlement. The currency conversion rate may be defined (i) in a decentralised manner outside of the TIPS technical platform (i.e. PSPs interact bilaterally between each other to define the currency conversion rate); or (ii) in a centralised manner based on a new functionality that the TIPS technical platform would provide.

The two aforementioned models (decentralised and centralised) are not mutually exclusive and may coexist in a real-life cross-currency ecosystem. As to the latter (centralised model), a CEH may be implemented, in order to offer the following features:

- to the Cross-Currency PSPs: the possibility to publish in the CEH the FX-rates² they offer to the Originator PSPs;
- to the Originator PSPs: the possibility to query the CEH in order to retrieve the available FX-rates and choose the best one for their transactions.

² Typically, each Cross-Currency PSP using the CEH would offer FX-rates for all possible couples of currencies that are eligible for settlement in TIPS or only for a subset of them. Furthermore, for any given couple of currencies, each Cross-Currency PSP may offer different FX-rates, depending on the currency of the originator and of the beneficiary (e.g. the FX-rate for EUR->SEK payments may differ from the FX-rate for SEK->EUR payments). FX-rates may also differ depending on the amount of the transaction for which they will apply. Finally, each FX-rate would have a validity period, in order to allow Cross-Currency PSPs managing FX-rates variations over time.

The following diagram and table describe the processing steps that take place, prior to settlement, when the Originator PSP opts for using the CEH to trade an FX-rate for a given cross-currency instant payment³:



Step	Description
1	The Originator sends a cross-currency <i>Payment Initiation Request</i> to the Originator PSP. This step is out of the perimeter of the CEH and it may be implemented (and offered to end-users) differently for any given Originator PSP.
2	The Originator PSP sends a <i>Retrieve Exchange Rate Request</i> to the CEH. Based on the information included in the original <i>Payment Initiation Request</i> , this <i>Retrieve Exchange Rate Request</i> includes at least the transaction amount and the two currencies involved.
3	The CEH returns a <i>Retrieve Exchange Rate Response</i> to the Originator PSP. Based on the information included in the related <i>Retrieve Exchange Rate Request</i> , this <i>Retrieve Exchange Rate Response</i> includes the list of all currently valid and applicable FX-rates (each of them with the BIC of the relevant Cross-Currency PSP).
4	The Originator PSP sends a <i>Cross-Currency Payment</i> to TIPS for settlement. Based on the list of all currently valid and applicable FX-rates included in the <i>Retrieve Exchange Rate Response</i> received from the CEH, the Originator PSP selects the Cross-Currency PSP (with the related FX-rate) for the given transaction and send it to TIPS for settlement as a <i>linked cross-currency payment message</i> .

³ The details of the description of the steps provided in the table may change when the actual requirements for the CEH will be defined.

As highlighted at the beginning of this Chapter, the CEH would be an optional feature of the cross-currency settlement service in TIPS, which implies each Originator PSP and Cross-Currency PSP would be free to opt for a centralised model only (based on the CEH), a decentralised model only or both (e.g. using one model for certain types of transactions and the other one for other types of transactions). Regardless of the chosen currency trading model, all the steps listed before always takes place before the settlement process described in the following Chapter.

5. Cross-currency Linked-Transactions (LKT) settlement model

This Chapter describes the *Linked-Transactions* (LKT) settlement model, which the *Cross-Currency Technical Work Stream* has identified as the preferred settlement model for *cross-currency payments* in TIPS.

5.1. Settlement model overview

The LKT settlement 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). When processing a *cross-currency payment*, TIPS ensures that the two relevant transactions are settled at the same time.

Regardless the model used for identifying the exchange rate to be applied for the payment (i.e. with or without making use of the Central Exchange Hub), the selected exchange rate is included in the *cross-currency payment message* sent for settlement by the Originator PSP and it is checked and validated by the Cross-Currency PSP during the settlement process. For this reason, TIPS does not perform any check or validation on the exchange rate.

As in the most general scenario both mono-currency settlement models (i.e. the STD and the SIP) may be used for all currencies eligible in TIPS, the detailed processing steps of the LKT settlement model are illustrated in the next Sections for each scenario resulting from all the possible combinations of the two aforementioned mono-currency settlement models.

5.2. STD/STD scenario

The following table describes the processing steps of the LKT settlement model when both legs of the *cross-currency payment* are processed according to the STD settlement model:

Step	Description
1	The Originator PSP sends a <i>linked cross-currency payment message</i> to TIPS.
2	In case of successful validation of the <i>linked cross-currency payment message</i> received from the Originator PSP, TIPS <ul style="list-style-type: none"> • [OPTIONAL]⁴ reserves the amount to be debited, expressed in the currency of the originator, on the account of the Originator PSP and • forwards the <i>linked cross-currency payment message</i> to the Cross-Currency PSP.
3	In case of acceptance ⁵ of the <i>linked cross-currency payment message</i> received from TIPS, the Cross-Currency PSP sends back to TIPS <ul style="list-style-type: none"> • a <i>linked cross-currency payment confirmation message</i> and • the corresponding <i>linked mono-currency payment message</i>, expressed in the currency of the beneficiary⁶.
4	In case of successful validation of the <i>linked cross-currency payment confirmation message</i> received from the Cross-Currency PSP, TIPS puts the original <i>linked cross-currency payment</i> on-hold. In case of successful validation of the <i>linked mono-currency payment message</i> received from the Cross-Currency PSP, TIPS <ul style="list-style-type: none"> • [OPTIONAL] reserves the amount to be debited, expressed in the currency of the beneficiary, on the account of the Cross-Currency PSP and • forwards the <i>linked mono-currency payment message</i> to the Beneficiary PSP.
5	In case of acceptance of the <i>linked mono-currency payment message</i> received from TIPS, the Beneficiary PSP sends back to TIPS a <i>linked mono-currency payment confirmation message</i> .
6	In case of successful validation of the <i>linked mono-currency payment confirmation message</i> received from the Beneficiary PSP, TIPS releases the original <i>linked cross-currency payment</i> and settles the <i>cross-currency payment</i> as follows: <ul style="list-style-type: none"> • it debits the Originator PSP account with the payment amount expressed in the currency of the originator, • it credits the Cross-Currency PSP account (denominated in the currency of the originator) with the same amount, • it debits the Cross-Currency PSP account (denominated in the currency of the beneficiary) with the payment amount expressed in the currency of the beneficiary, • it credits the Beneficiary PSP account with the same amount. Thereafter, TIPS sends back: <ul style="list-style-type: none"> • to the Originator PSP the relevant <i>linked cross-currency settlement confirmation message</i> and

⁴ The reservation of funds is considered optional from the functional, technical and operational standpoints. Legally, there is no requirement for the reservation of funds, as a mandatory step of the settlement process. However, unless the process involves a reservation of funds stage, the risk of settlement fails would increase. These considerations also apply to the remaining scenarios appearing in the rest of this document.

⁵ This includes checking and validating the correctness of the exchange rate specified in the message.

⁶ The Cross-Currency PSP calculates the amount in the target currency based on the amount (in the currency of the Originator) and the exchange rate specified in the original *linked cross-currency payment message*.

Step	Description
	<ul style="list-style-type: none"> to the Cross-Currency PSP and to the Beneficiary PSP the relevant <i>linked mono-currency settlement confirmation message</i>.

5.3.STD/SIP scenario

The following table describes the processing steps of the LKT settlement model when the first leg of the *cross-currency payment* is processed according to the STD settlement model, whereas the second leg is processed according to the SIP settlement model:

Step	Description
1	The Originator PSP sends a <i>linked cross-currency payment message</i> to TIPS.
2	In case of successful validation of the <i>linked cross-currency payment message</i> received from the Originator PSP, TIPS <ul style="list-style-type: none"> [OPTIONAL] reserves the amount to be debited, expressed in the currency of the originator, on the account of the Originator PSP and forwards the <i>linked cross-currency payment message</i> to the Cross-Currency PSP.
3	In case of acceptance ⁷ of the <i>linked cross-currency payment message</i> received from TIPS, <ul style="list-style-type: none"> the Cross-Currency PSP sends back to TIPS a <i>linked cross-currency payment confirmation message</i> and the Single Instructing Party (on the beneficiary side) sends to TIPS the corresponding <i>linked mono-currency payment message</i> (received from the Cross-Currency PSP and already cleared with the Beneficiary PSP), expressed in the currency of the beneficiary⁸.
4	In case of successful validation of the <i>linked cross-currency payment confirmation message</i> received from the Cross-Currency PSP, TIPS puts the original <i>linked cross-currency payment</i> on-hold. In case of successful validation of the <i>linked mono-currency payment message</i> received from the Single Instructing Party (on the beneficiary side), TIPS releases the original linked cross-currency payment and settles the cross-currency payment as follows: <ul style="list-style-type: none"> it debits the Originator PSP account with the payment amount expressed in the currency of the originator, it credits the Cross-Currency PSP account (denominated in the currency of the originator) with the same amount, it debits the Cross-Currency PSP account (denominated in the currency of the beneficiary) with the payment amount expressed in the currency of the beneficiary, it credits the Beneficiary PSP account with the same amount.

⁷ This includes checking and validating the correctness of the exchange rate specified in the message.

⁸ The Cross-Currency PSP calculates the amount in the target currency based on the amount (in the currency of the Originator) and the exchange rate specified in the original *linked cross-currency payment message*.

Step	Description
	<p>Thereafter, TIPS sends back:</p> <ul style="list-style-type: none"> to the Originator PSP the relevant <i>linked cross-currency settlement confirmation message</i> and to the Single Instructing Party (on the beneficiary side) the relevant <i>linked mono-currency settlement confirmation message</i>.

5.4.SIP/STD scenario

The following table describes the processing steps of the LKT settlement model when the first leg of the *cross-currency payment* is processed according to the SIP settlement model, whereas the second leg is processed according to the STD settlement model:

Step	Description
1	The Single Instructing Party (on the originator side) sends a <i>linked cross-currency payment message</i> (received from the Originator PSP and already cleared with the Cross-Currency PSP ⁹) to TIPS.
2	In case of successful validation of the <i>linked cross-currency payment message</i> received from the Single Instructing Party (on the originator side), TIPS puts the <i>linked cross-currency payment</i> on hold.
3	The Cross-Currency PSP sends the corresponding <i>linked mono-currency payment message</i> , expressed in the currency of the beneficiary ¹⁰ , to TIPS.
4	<p>In case of successful validation of the <i>linked mono-currency payment message</i> received from the Cross-Currency PSP, TIPS</p> <ul style="list-style-type: none"> [OPTIONAL] reserves the amount to be debited, expressed in the currency of the beneficiary, on the account of the Cross-Currency PSP and forwards the <i>linked mono-currency payment message</i> to the Beneficiary PSP.
5	In case of acceptance of the <i>linked mono-currency payment message</i> received from TIPS, the Beneficiary PSP sends back to TIPS a <i>linked mono-currency payment confirmation message</i> .
6	<p>In case of successful validation of the <i>linked mono-currency payment confirmation message</i> received from the Beneficiary PSP, TIPS releases the original <i>linked cross-currency payment</i> and settles the <i>cross-currency payment</i> as follows:</p> <ul style="list-style-type: none"> it debits the Originator PSP account with the payment amount expressed in the currency of the originator, it credits the Cross-Currency PSP account (denominated in the currency of the originator) with the same amount,

⁹ This includes checking and validating the correctness of the exchange rate specified in the message.

¹⁰ The Cross-Currency PSP calculates the amount in the target currency based on the amount (in the currency of the Originator) and the exchange rate specified in the original *linked cross-currency payment message*.

Step	Description
	<ul style="list-style-type: none"> it debits the Cross-Currency PSP account (denominated in the currency of the beneficiary) with the payment amount expressed in the currency of the beneficiary, it credits the Beneficiary PSP account with the same amount. <p>Thereafter, TIPS sends back:</p> <ul style="list-style-type: none"> to the Single Instructing Party (on the originator side) the relevant <i>linked cross-currency settlement confirmation message</i> and to the Cross-Currency PSP and to the Beneficiary PSP the relevant <i>linked mono-currency settlement confirmation message</i>.

5.5.SIP/SIP scenario

The following table describes the processing steps of the LKT settlement model when both legs of the *cross-currency payment* are processed according to the SIP settlement model:

Step	Description
1	The Single Instructing Party (on the originator side) sends a <i>linked cross-currency payment message</i> (received from the Originator PSP and already cleared with the Cross-Currency PSP ¹¹) to TIPS.
2	In case of successful validation of the <i>linked cross-currency payment message</i> received from the Single Instructing Party (on the originator side), TIPS puts the <i>linked cross-currency payment</i> on hold.
3	The Single Instructing Party (on the beneficiary side) sends a <i>linked mono-currency payment message</i> (received from the Cross-Currency PSP and already cleared with the Beneficiary PSP), expressed in the currency of the beneficiary ¹² , to TIPS.
4	<p>In case of successful validation of the <i>linked mono-currency payment message</i> received from the Single Instructing Party (on the beneficiary side), TIPS releases the original <i>linked cross-currency payment</i> and settles the <i>cross-currency payment</i> as follows:</p> <ul style="list-style-type: none"> it debits the Originator PSP account with the payment amount expressed in the currency of the originator, it credits the Cross-Currency PSP account (denominated in the currency of the originator) with the same amount, it debits the Cross-Currency PSP account (denominated in the currency of the beneficiary) with the payment amount expressed in the currency of the beneficiary, it credits the Beneficiary PSP account with the same amount. <p>Thereafter, TIPS sends back:</p>

¹¹ This includes checking and validating the correctness of the exchange rate specified in the message.

¹² The Cross-Currency PSP calculates the amount in the target currency based on the amount (in the currency of the Originator) and the exchange rate specified in the original *linked cross-currency payment message*.

Step	Description
	<ul style="list-style-type: none">to the Single Instructing Party (on the originator side) the relevant <i>linked cross-currency settlement confirmation message</i> andto the Single Instructing Party (on the beneficiary side) the relevant <i>linked mono-currency settlement confirmation message</i>.

6. Settlement risk

This Chapter provides details concerning the potential implications of the reservation of funds, described in the previous Chapter as an optional step of the LKT settlement model, on the overall settlement risk for the model itself.

For the considerations illustrated in the two following Sections, the *Settlement Risk* for a given settlement model is defined as the fail rate of instant payments due to lack of liquidity in TIPS for the account (or accounts) to be debited¹³.

6.1. The current (mono-currency) scenario

Based on the afore-mentioned definition, both (mono-currency) settlement models existing today in TIPS (i.e. the standard SCT-Inst model and the SIP model) entail the same settlement risk. In fact, for both settlement models the fail rate only depends on the likelihood that the Originator PSP does not hold sufficient liquidity in the account to be debited, regardless whether such liquidity is reserved or not during the settlement process.

The only difference between the two settlement models lays in the involvement of the Beneficiary PSP in case a transaction fails because of lack of liquidity. Indeed, with the SCT-Inst model the Beneficiary PSP is never involved in the processing (as the transaction fails for lack of liquidity during the reservation phase, i.e. before the payment is forwarded to the Beneficiary PSP), whereas with the SIP model the Beneficiary PSP becomes aware of a failure scenario due to lack of liquidity, as it occurs after the Beneficiary PSP has already confirmed (to the Single Instructing Party) the acceptance of the payment.

It is worth mentioning the Settlement Risk in TIPS is currently negligible in TIPS (its order of magnitude is 10^{-5}).

¹³ For example, a fail rate equal to 0.05 indicates that 5% of all transactions processed in TIPS with a given settlement model fails due to lack of liquidity on the debtor account (or accounts).

6.2. The future (cross-currency) scenario

Within any cross-currency settlement model (including the LTK model) the *Settlement Risk* as defined above increases, when compared to a mono-currency settlement model, simply due to the fact that two accounts (in two different currencies) have to be debited and they both might not hold sufficient funds for the settlement to take place.

More formally, if SR_{CUR-1} and SR_{CUR-2} are the *Settlement Risk* in TIPS for the two mono-currency settlement models related to the currencies CUR-1 and CUR-2 respectively, then the resulting *Settlement Risk* SR_{XCY} for any cross-currency settlement model in TIPS between the two currencies CUR-1 and CUR-2 is as follows:

$$SR_{XCY} = SR_{CUR-1} + SR_{CUR-2} - SR_{CUR-1} * SR_{CUR-2}$$

Assuming that both SR_{CUR-1} and SR_{CUR-2} are negligible (as it is the case today in TIPS for euro, SR_{XCY} is negligible as well).

Also in a cross-currency scenario, the fail rate only depends on the likelihood that there is not enough liquidity in the accounts to be debited (i.e. the account of the Originator PSP and the account of the Cross-Currency PSP denominated in the currency of the Beneficiary PSP), regardless whether such liquidity is reserved or not during the settlement process.

Obviously, also in a cross-currency scenario, the only difference between a settlement model with reservation of funds and another one without reservation of funds lays in the involvement of the Beneficiary PSP (for both legs of the transaction) in case a payment fails because of lack of liquidity.

In order to assess the optimal trade-off between the cost and the complexity of the cross-currency service to implement in TIPS and the operational burden for the Beneficiary PSP, the three following scenarios may be considered when preparing and assessing the Change Request related to the cross-currency settlement model:

- both legs settle with reservation of funds;
- both legs settle without reservation of funds;
- each leg settles using the underlying mono-currency settlement model (e.g. the euro leg settles with reservation of funds, whereas the leg in SEK settles without reservation of funds).