THE LEVEL ONE PROJECT

DFSP Settlement in Real-Time Retail Payments Systems

A Level One Project

Research Report

Draft for Comment – June 2020

Glenbrook Partners for
The Bill & Melinda Gates Foundation

Executive Summary

- Inter-institutional settlement is a key component of interoperable payments systems. The goal of these settlement systems is to provide a mechanism for institutions to settle their obligations while minimizing risks and costs to individual institutions and to the whole system. Operational efficiency is a secondary goal.

- Current models are routed in historical, bank-centric practices. As more countries expand the set of financial services providers who can participate in a payments system – including non-bank entities such as eMoney issuers – it will be necessary to adjust these models if we want them to operate on a safe and low-cost manner.

- Trends towards faster inter-institutional settlement, including shorter net settlement windows, are beneficial and well aligned with the design principles of the Level One Project. A trend towards pre-funded settlement accounts also accords with a goal of minimize risks, but, as we will show in this report, executing a pre-funded settlement system has considerable complexities that a payment system needs to support. In some cases, the way in which a pre-funded model is implemented supports a bank-centric model and may work against Level One Project goals of enabling new classes of DFSPs to operate at low costs.

- Some jurisdictions, and some payments systems, are using or considering gross settlement models as an alternative to more traditional retail net settlement models. This does not appear to be a major trend, however, and we do not anticipate a wholesale adoption of this in the near future.

Contents

DFSP Settlement in Real-Time Retail Payments Systems

Introduction

Background: The Level One Project

An Initiative of the Bill & Melinda Gates Foundation's Financial Services for the Poor Team

- The Level One Project is an initiative to help level the playing field by working across public, private and nonprofit sectors to create inclusive, interconnected digital economies in every country around the world. It is a model for a country-level digital financial services system designed to bring the poor into the formal economy.   The Level One Project includes:

A ***vision for a real-time retail payments system*** that supports inclusive, interoperable digital economies, and the ***design principles*** to achieve this

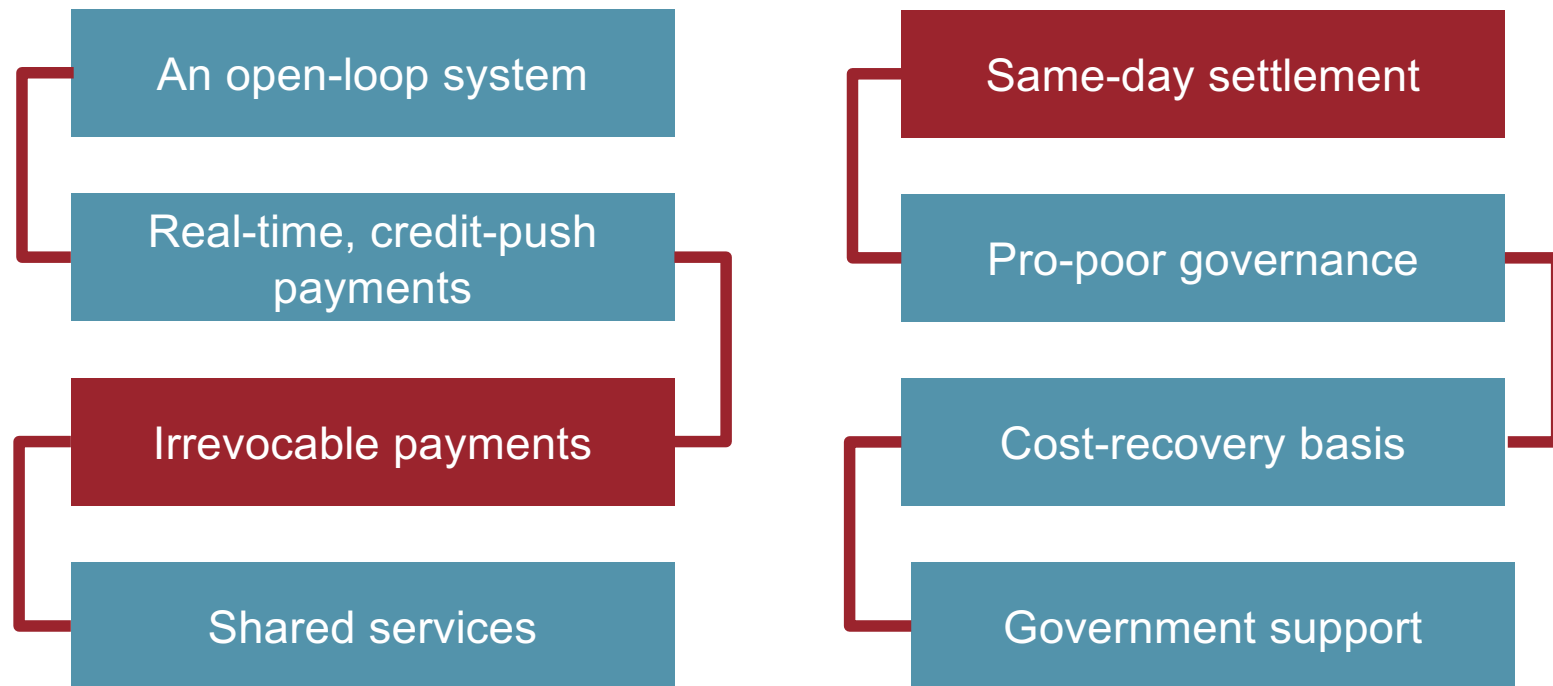A ***blueprint*** for how such a system could be configured within a country or region

A ***set of tools and resources*** to enable the implementation of a real-time retail payment system that is aligned with the Level One Project principles

- More information about the Level One Project can be found at ***leveloneproject.org***

The Design Principles of the Level One Project

These are the high-level principles critical for building a Level One aligned payment system. Two of the principles – that of irrevocable payments and same-day settlement, are important to the topic of institutional settlement.

An open-loop system	Same-day settlement
Real-time, credit-push payments	Pro-poor governance
Irrevocable payments	Cost-recovery basis
Shared services	Government support

Background: Real-Time Retail Payments (RTRP)

RTRP systems are being built and deployed in countries around the world.

- RTRP systems are designed to work on an immediate (real-time) basis. The payment is received by the payee directly after having been authorized by the payer.

- Although RTRP systems can work in either closed-loop or open-loop configurations, most country deployments are being done on an open-loop basis. This is in keeping with Level One design principles.

- Open-loop systems are also referred to as interoperable systems. They are designed to allow a financial institution holding the payer's end-user account to transfer money to another financial institution which holds the payee's account.

Payer → Financial Institution → RTRP System → Financial Institution → Payee
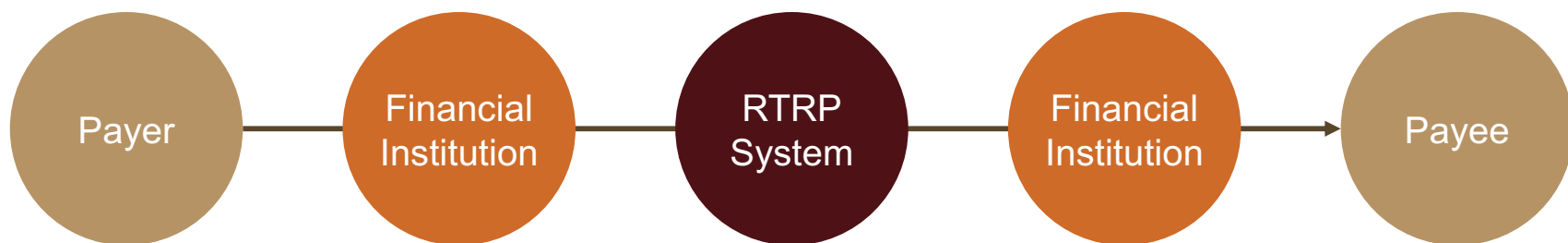
Scope and Definitions Used in this Report: DFSPs

- This research report focuses on institutional settlement in open-loop real-time retail payments systems.

- Traditionally, the financial institutions that have participated in interoperable payments systems have been only banks. The Level One Project, however, envisions more types of financial institutions (such as eMoney Issuers) who can also participate in these systems.

We use the term DFSP (digital financial services provider) to include both bank and non-bank participants in an RTRP system.
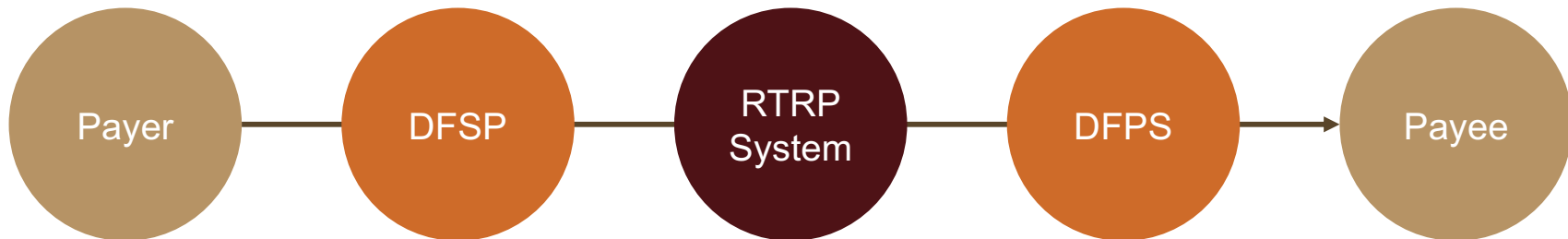
Scope and Definitions: Scheme and Platform

- The RTRP system itself consists of both a scheme and an interoperable platform.

    - The scheme is the body which writes the rules which bind the DFSPs participating in the system. These rules include the institutional settlement practices for the system.

    - The platform is the operating switch that moves transactions between DFSPs. It includes a variety of other operating functions, some of which support settlement.
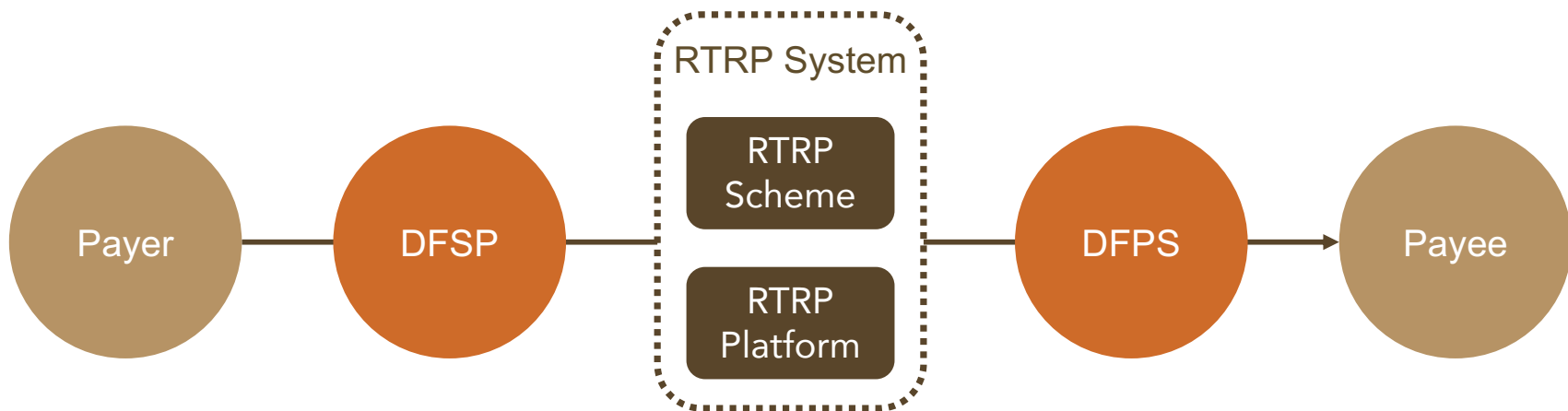
Scope and Definition: Institutional and End-User Settlements

- This report focuses on institutional settlement. That is the obligation that the sending DFSP incurs when making the transfer. The obligation is either to the receiving DFSP or to the scheme itself. If the latter, the scheme then has an obligation to the receiving DFSP.

- Institutional settlement is different than end-user settlement. End-user settlement is the timing of the debit to the payer's account at their DFSP, and the credit to the payee's account at their DFSP. End-user settlement may be defined by regulation, by scheme rules, or simply by market practice. It is physically separate from institutional settlement: it is possible for end-user accounts to be debited or credited either before or after institutional settlement occurs.

- Level One principles demand that end-user settlement be done on a real-time (near immediate) basis, and that institutional settlement be done on a same-day basis.

Scope and Definitions: Settlement Bank

- RTRP systems accomplish settlement through partnership or affiliation with a settlement bank. The settlement bank is typically the central bank of the country, although it is possible for a commercial bank to be used for this function. Note that in some countries, the central bank is both the operator of the system and the settlement bank.

- Actual settlement practices for an interoperable RTRP system are reached through agreement between the RTRP scheme and the settlement bank. These agreements are then reflected in the RTRP scheme rules.
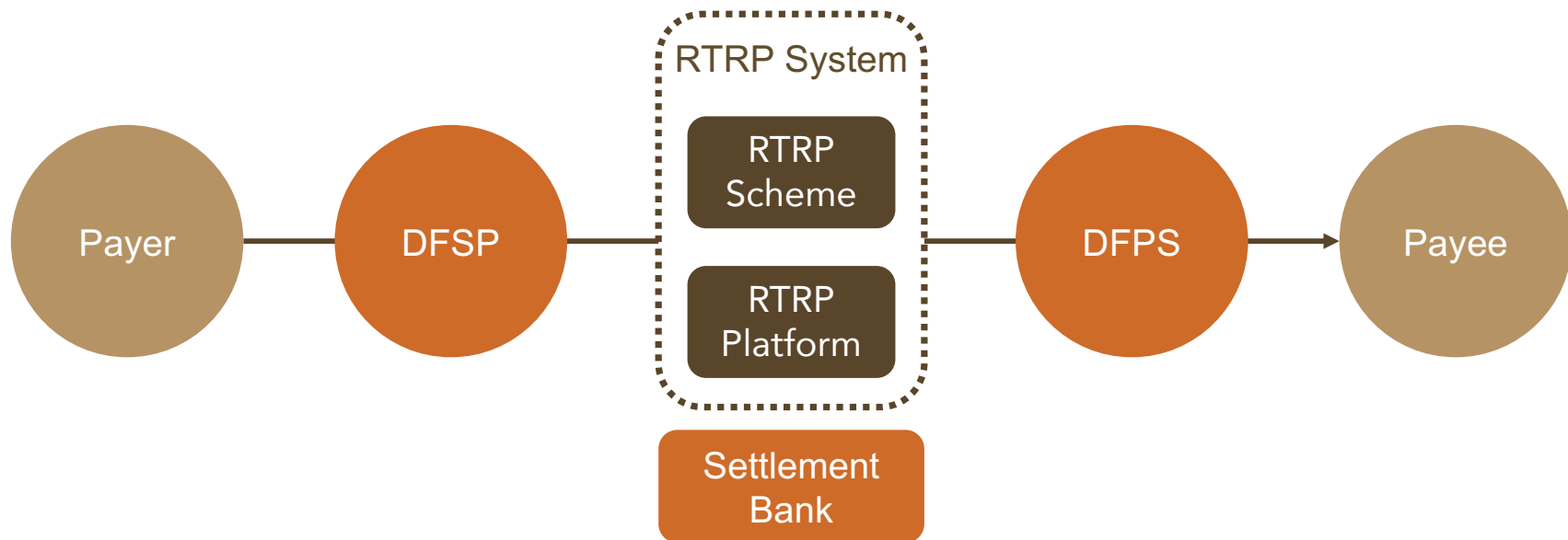
Scope and Definition: Risk

- Settlement risk is the risk that one of the participating financial institutions, or the scheme itself, is not able to meet its financial obligations. This is a type of liquidity risk.

    - The risk may short term: the participant has the funds, or will have them, but is unable to meet obligations on a timely basis, or

    - The risk may be more of a long term, or complete risk, in which the participant has no ability to meet their financial obligations

- Settlement risk can be managed by some combination of:

    - Prefunding: putting money "up front" to be used for later settlement obligations

    - Collateral or guarantees: having assets secured elsewhere, or guarantees from a trusted party, which are used to settle obligations if the participant can not do so on a timely basis

    - Other participant backing: the scheme may require all participants to collectively back the costs of certain types of failures to settle.

    - Judgement: the scheme and/or settlement bank may allow transactions for which the settlement risk coverage is not clearly defined, but is allowed by settlement bank or scheme policy based on judgements as to the likelihood of the risk.

Scope and Definitions

- Institutional settlement is a complex topic. This is because there are many possible variations on how it is done, and many different types of risks which need to be addressed.

- For this research project, we concentrate in the next section on the most typical configuration for RTRP systems. This is institutional, scheme-defined, multilateral, deferred net settlement for interoperable systems:

  − Institutional, rather than end-user settlement

  − Scheme-defined, rather than DFSP-defined settlement practices. These are subject to the agreement of the settlement bank.

  − Multilateral, rather than bilaterally calculated obligations for DFSPs. Multilateral" means that settlement obligations are calculated across the entire set of participants, rather than bilaterally between pairs of participants.

  − Net, rather than gross settlement. "Net" means that settlement obligations of participants are calculated as the net of obligations arising out of sending and receiving transactions. "Gross" means that transactions are settled immediately, with no netting (offsetting) of "ins" vs. "outs".

  − Deferred, rather than immediate settlement. "Deferred" means that the posting of settlement obligations to settlement bank accounts happens after the transaction occurs.

  − An interoperable, rather than closed-loop system

Multilateral Deferred
Net Settlement

Multilateral Deferred Net Settlement is the Primary Model Used for RTRP Systems

- This model is scheme-defined. The requirements for settlement are specified by the scheme in its business rules. Depending on the scheme governance model, these rules are either developed collaboratively with scheme participants, or are set by the scheme operator in consultation with scheme participants.

- Settlement rules always depend also on the policies of the chosen settlement bank, which is most typically the central bank of the country. Scheme management must work with the settlement bank to reach agreement on settlement practices.

- The basic multilateral deferred net settlement model has been used for decades in interoperable payments systems, including checks, ACH (direct debit and credit transfer) and card systems.

- Many RTRP systems are using variations of this model. There are important RTRP system differences, however, that need to be accounted for in settlement:

  - RTRP systems normally run continually, on a 24x7 basis

  - RTRP systems often include non-bank participants

  - The real time, irrevocable posting of credits to the payee's account

Multilateral Deferred Net Settlement – Components and Relationships

How settlement works for a given payment system is a balance between platform capabilities, scheme policies, and settlement bank capabilities and policies. In some cases, the scheme may create requirements for the platform: in other situations, platform capabilities define what the scheme supports. Note the RTRP Scheme and Platform may be the same or separate entities.

DFSP participants agree to participate in the scheme and follow its business rules. Participants open bank accounts at the settlement bank and agree to follow account requirements of the settlement bank. Participants develop operating functionality supporting settlement as specified in the scheme rules.

DFSP

RTRP System

RTRP Scheme

RTRP Platform

DFPS
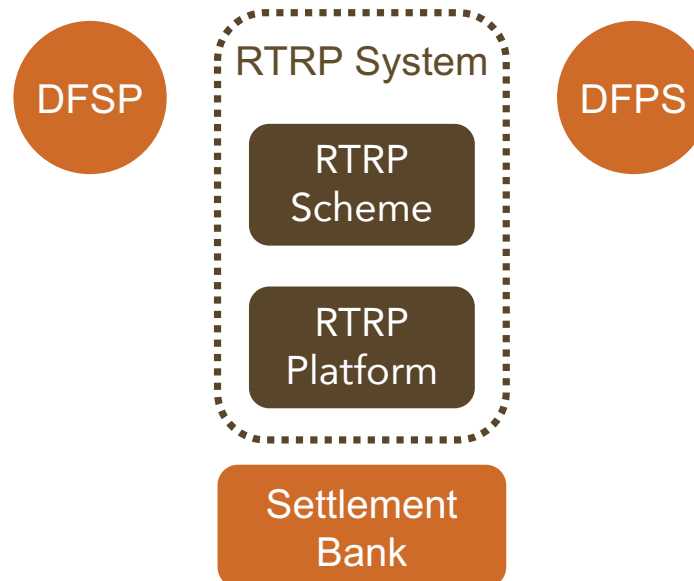
Settlement Bank

The **scheme** writes the business rules. Rules require each DFSP to open a bank account at the Settlement Bank*. Rules specify the settlement operating functions required of the RTRP Platform and participants.

The **platform** provides settlement operating functionality as specified in the scheme rules.

The **settlement bank** provides settlement bank accounts, and by agreement with the scheme provides operating functionality to support settlement requirements. Some central banks offer defined "Settlement Services" to support various payments systems in their jurisdiction.

Multilateral Deferred Net Settlement – Operations (High Level View)
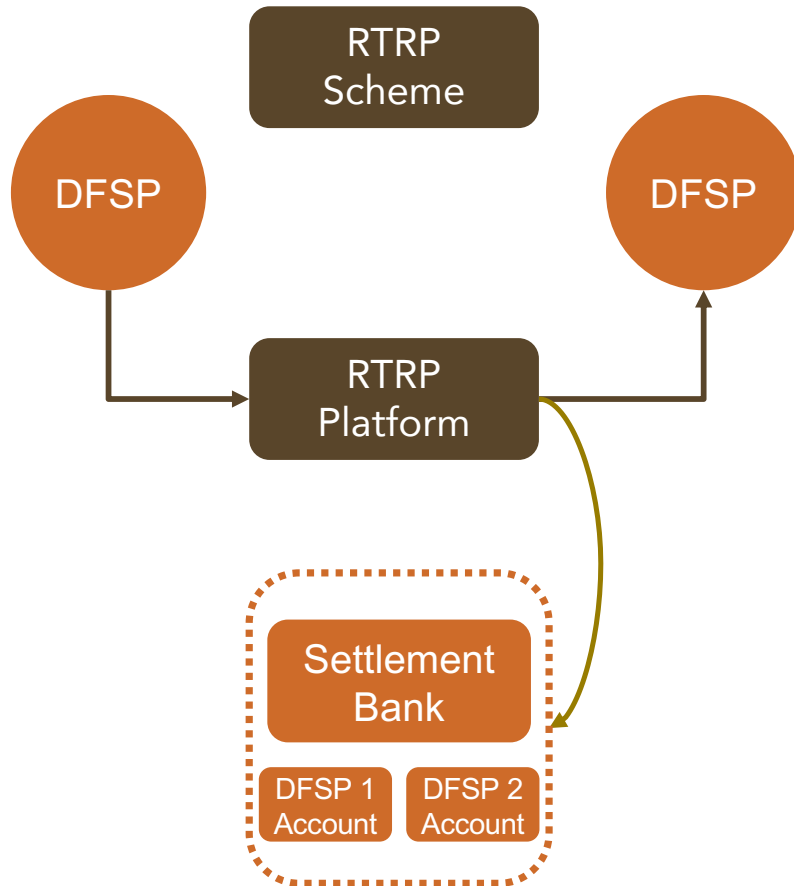
The **scheme** defines settlement windows: the periods of time during which executed transfers are aggregated for net settlement.

DFSPs fund their bank account with the settlement bank.

DFSPs send and receive transfers through connection with the platform.

The **platform** receives a transfer request from the sending DFSP, and if approved for settlement, sends it on to the receiving DFSP.

The **platform** keeps a ledger of all transfers: every transfer is a debit to one DFSP and a credit to another.

At the end of each settlement window, the **platform** calculates the net settlement amount for each participant and creates settlement entry transactions for each net settlement amount and sends these to the settlement bank.

The **settlement bank** receives settlement entry transactions and posts these to each DFSP's settlement bank account.

Settlement Model Practices

- Practices vary widely depending on scheme rules and settlement bank policies. Thiis section explains some of these practices and highlight current best practices for the following topics:

    1. **Settlement Windows**

    2. **The Participant Ledger**

    3. **Transaction Settlement Approval**

    4. **Setting Debit or Net Debit Cap Values**

    5. **Settlement Bank Accounts**

    6. **Posting of Settlement Entries**

    7. **Management of Settlement Risk**

    8. **Tiered Access for RTRP Systems**

Basic ① ② ③ ④ Advanced

Current best practices

Multilateral Deferred Net Settlement – Operations Detail

The frequency and length of settlement windows are set in scheme rules.

- Considerations: shorter settlement windows reduce liquidity requirements for participating institutions. However, the ability of the settlement bank to accept settlement entries on non-business days is a constraint.

Range of Market Practices – Settlement Windows

1 Standard for legacy interoperable systems: settlement windows are each business day for settlement bank

2 Settlement windows set multiple times per business day

3 Settlement windows set variably by transaction volume

4 Settlement windows set in seconds: transition to gross settlement

Current best practices

Basic   *Advanced*
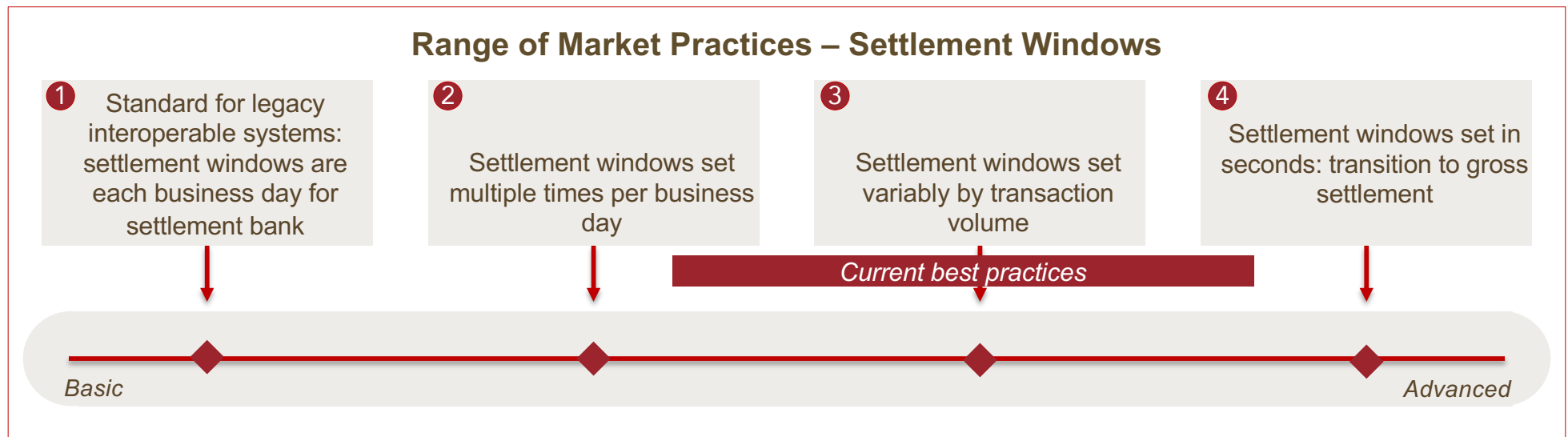
Multilateral Deferred Net Settlement – Operations Detail

The participant ledger is kept by the platform and records every transaction – as a debit to the sending DFSP's position and a credit to the receiving DFSP's position

- Considerations: the participant ledger may be used as the basis for controlling if a transaction is accepted for execution, as described on the next page. A dynamic ledger with accounting for provisional debits is necessary to enable that function. A dynamic ledger is also more liquidity-efficient for the participant, as it recognizes the value of incoming credits during a window.

Range of Market Practices – Participant Ledger

1 Simple transaction ledger used for end-of-window net position calculation.

2 Dynamic ledger keeps balance throughout window of a participant's position net of debits and credits.

3 Dynamic ledger also tracks provisional debits to sending DFSP's position: transactions requested but not yet executed.

Current best practices

Basic   *Advanced*
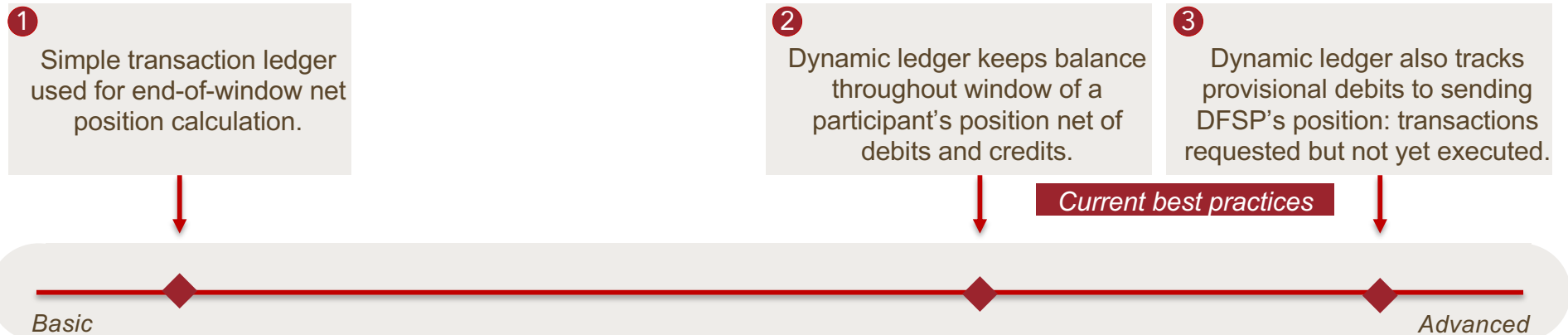
Multilateral Deferred Net Settlement – Operations Detail

Transaction settlement approval process at the platform and debit caps

- Most RTRP systems use a transaction settlement approval process at the platform to prevent transaction execution if it appears that the sending DFSP would not be able to meet their settlement obligations. (Note this is not the same as the transaction approval done by the payer, authorizing the transaction, or what may be done by the receiving institution, authorizing receipt of the transaction.)

- The transaction approval process relies on the use of a debit cap for each participant – a value recognized by the scheme for each participant.

Range of Market Practices – Platform Transaction Approval

1 No transaction approval by platform: all transactions are passed on for execution and settlement.

2 The platform knows a fixed amount (debit cap) for each participant for each window, and refuses transactions when the aggregate of send (debit) transactions for a DFSP exceeds that limit.

3 The platform knows a fixed amount (net debit cap) for each participant for each window, and refuses transactions when the aggregate within-window net debit position of the participant would exceed that limit.

Current best practice

Basic   *Advanced*

Multilateral Deferred Net Settlement – Operations Detail

Calculation of the debit cap or net debit cap.

- The platform needs a debit or net debit value to perform the transaction approval process described on the previous page. Setting the debit or net debit cap value is the responsibility of the scheme. How does the platform know this value?

Range of Market Practices – Setting Debit or Net Debit Cap Values

1 The scheme manually enters the value periodically into the platform, based on their judgement of the participant's ability to settle that amount. That judgement may be based on average balances in the settlement bank account.

2 The scheme manually enters the value periodically into the platform, based on current available balances in the settlement bank account and/or the value of certain collateral assets of the participant. This may include scheme and/or participant-defined additional "safety margin" to this amount.

3 The platform dynamically access the current value in the participant's settlement bank account and uses this value as the net debit cap for a designated time period. The scheme may require the platform to add scheme and/or participant-defined additional "safety margin" to this amount.

Current best practices

Basic ⟶ Advanced

Multilateral Deferred Net Settlement – Settlement Bank Accounts

Scheme rules require each participant to have a bank account with the settlement bank – which is typically the central bank of the country.

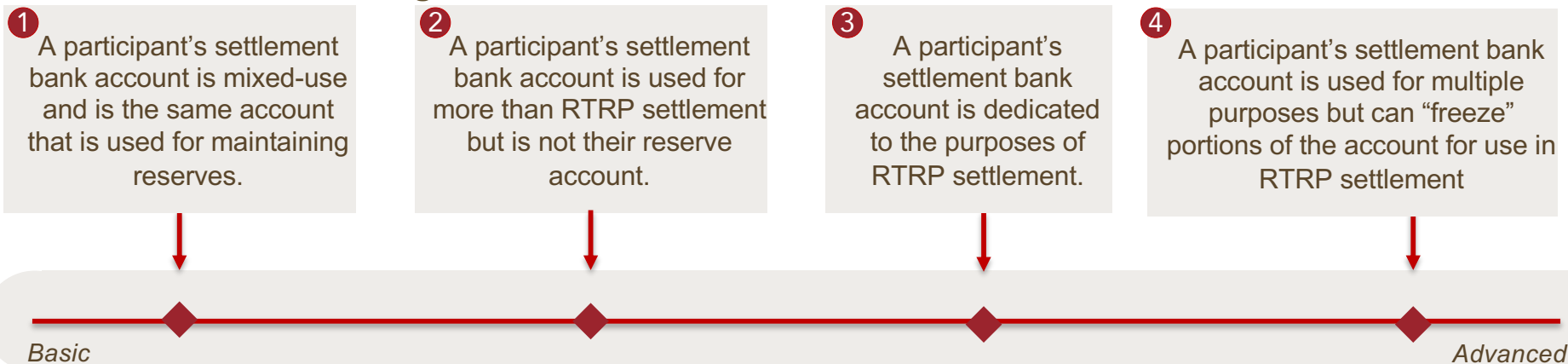- Considerations: national law and/or settlement bank practices may prevent non-banks from having a bank account at the settlement bank. If that is the case, some form of tiered access may be required for non-bank participants.

Range of Market Practices – Settlement Bank Accounts

1 A participant's settlement bank account is mixed-use and is the same account that is used for maintaining reserves.

2 A participant's settlement bank account is used for more than RTRP settlement but is not their reserve account.

3 A participant's settlement bank account is dedicated to the purposes of RTRP settlement.

4 A participant's settlement bank account is used for multiple purposes but can "freeze" portions of the account for use in RTRP settlement

Basic

Advanced

Current best practices are not clear. However, option 3 or 4 is necessary to support automated calculation of net debit caps.

Multilateral Deferred Net Settlement – Operations Detail

Posting of settlement entries.

- At the end of each settlement window, the platform calculates the net position of each participant. These amounts are then sent, as "settlement entries", to the settlement bank.

Range of Market Practices – Posting of Settlement Entries by Settlement Bank

1 The platform calculates the net position for each DFSP for the settlement window and creates a report. The report is sent to the settlement bank (sometimes by fax or email); the settlement bank then manually posts the entries to participant's settlement bank accounts.

2 A semi-automated process, in which the platform is automatically (and electronically) sending the settlement report to the settlement bank; the settlement bank's posting process is still manual.

3 The platform formats the settlement entries as RTGS instructions and sends these to the settlement bank; they are received and posted to participant's settlement bank accounts in real time. Note this only works where the settlement bank is the central bank, running an RTGS system.
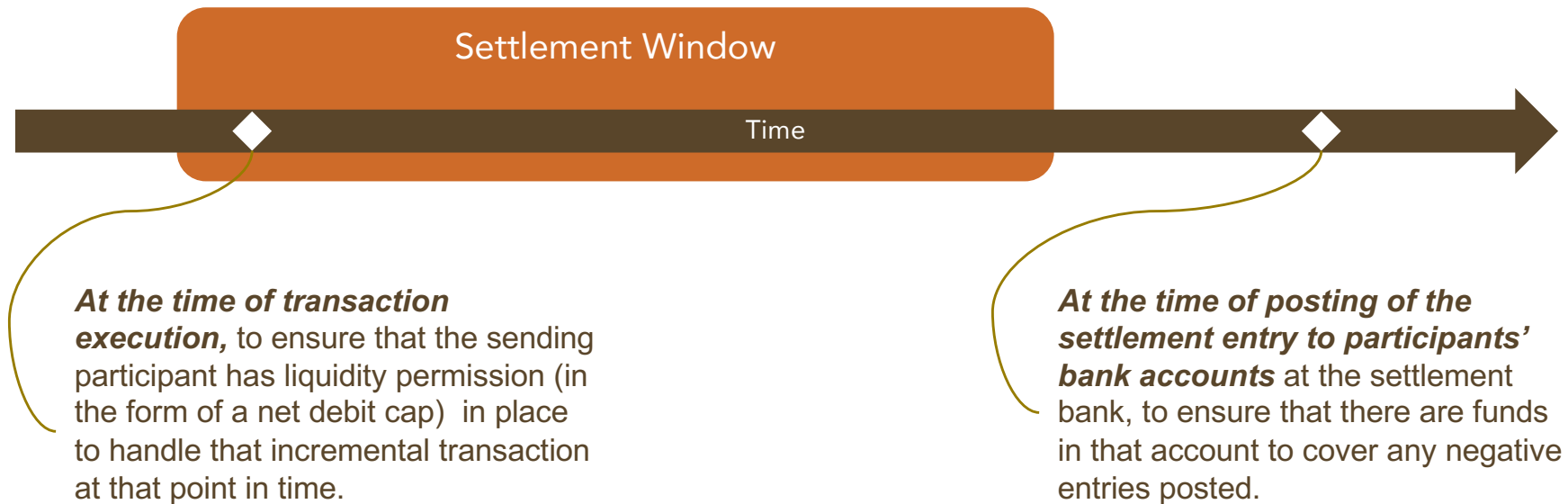
Current best practices

Basic   *Advanced*

Settlement Risk Management in Multilateral Deferred Net Settlement

Introduction: Two Points of Control are Needed

Settlement Window

Time

At the time of transaction execution, to ensure that the sending participant has liquidity permission (in the form of a net debit cap) in place to handle that incremental transaction at that point in time.

At the time of posting of the settlement entry to participants' bank accounts at the settlement bank, to ensure that there are funds in that account to cover any negative entries posted.

Even in a "prefunded" scheme, there is the risk that settlement funds that are in the settlement bank account at the time of the transaction are no longer there when the settlement entry is posted. Having multiple intra-day settlement windows and having settlement bank accounts which are used for multiple purposes, makes controlling this risk difficult.

Multilateral Deferred Net Settlement – Settlement Risk Management

How is settlement risk manage in a multilateral deferred net settlement model?

Liquidity risk is the risk that a DFSP does not have sufficient funds in their settlement bank account to offset a negative settlement entry posted to that account.

Scheme rules may require "prefunding" of the settlement bank account – but that rule itself doesn't ensure that funds are there.
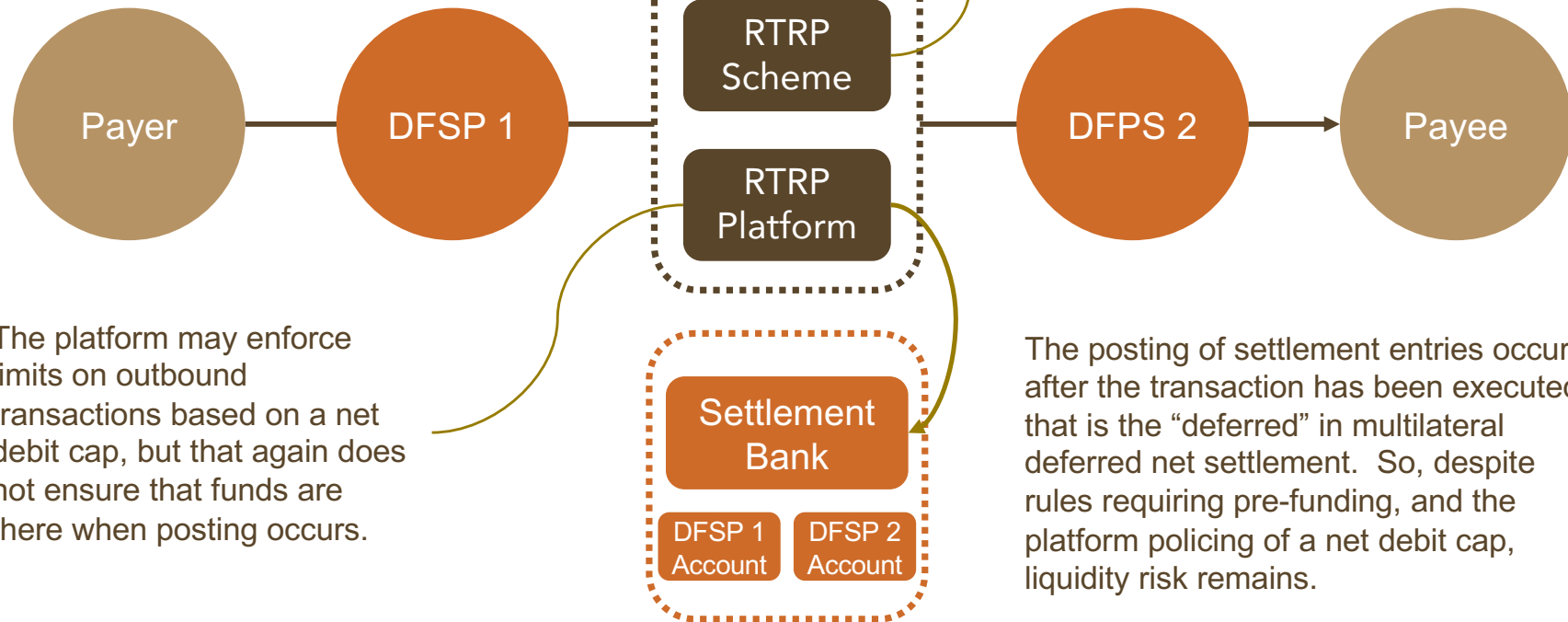
The platform may enforce limits on outbound transactions based on a net debit cap, but that again does not ensure that funds are there when posting occurs.

The posting of settlement entries occurs after the transaction has been executed – that is the "deferred" in multilateral deferred net settlement. So, despite rules requiring pre-funding, and the platform policing of a net debit cap, liquidity risk remains.

RTRP System
- RTRP Scheme
- RTRP Platform

Payer — DFSP 1 — DFPS 2 → Payee

Settlement Bank
- DFSP 1 Account
- DFSP 2 Account

Multilateral Deferred Net Settlement – Settlement Risk Management

- An important consideration is whether the scheme itself guarantees settlement to participants. If the scheme does this, any individual participant does not need to concern itself with the risk that the counterparties to its transactions may fail to settle. If the scheme does this, it needs to itself understand how it will manage the resulting exposure.

- Note that the models below require the settlement bank to give permission to a participant before that participant can withdraw funds from their settlement bank account.

Range of Market Practices –Management of Settlement Risk

1 In this practice, common in legacy payments systems, the settlement bank manually watches the participant's bank accounts and may extend daylight overdrafts to enable settlement. This relies on the central bank's supervision of the participating banks and knowledge of their credit status.

2 In this practice, the scheme and/or settlement bank requires that participants provide collateral (in the form of deposits at other financial institutions and/or guarantees) as a back-up to settlement failure. At the most extreme, if this collateral equals the net debit cap, liquidity risk is eliminated: however, the participant bears the cost of this liquidity guarantee.

3 In this practice, funds within the participant's settlement bank account can be "frozen" (held) for the purposes of settling a single window. This practice is made somewhat simpler if the bank account is used only for settlement for a single system. This is a liquidity efficient model but requires sophistication on the part of the settlement bank's system.

Current best practices

Basic ———————————————————————————————————— *Advanced*

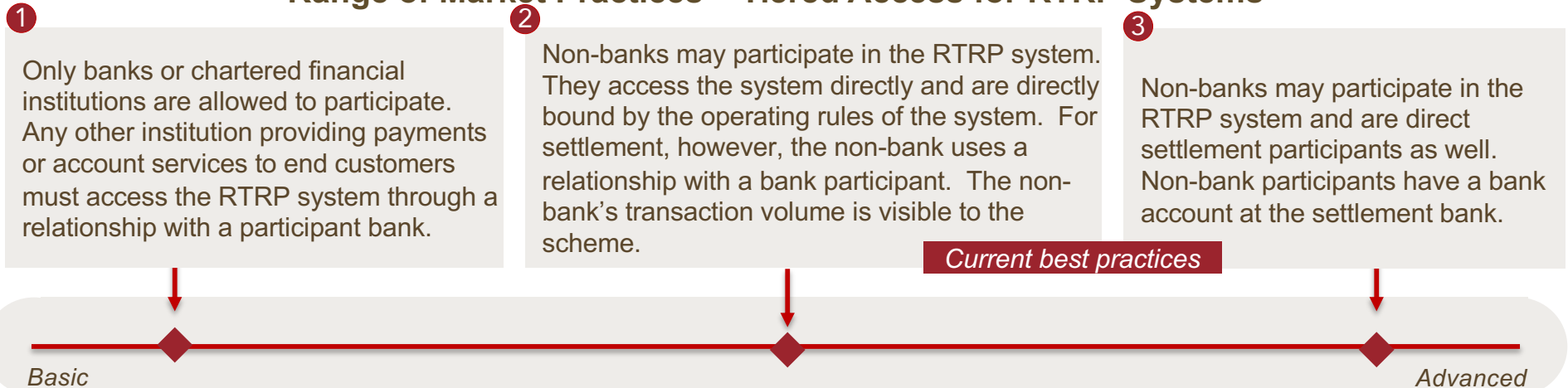# Multilateral Deferred Net Settlement – Tiered Access

- There is a long history of payments systems providing tiered access to participants. In legacy systems, this most often is used for small financial institutions. These institutions give their customers access to the payment system through a relationship the smaller institution has with a larger institution. Domestic correspondent banking relationships, and so-called "banker's banks" have business models that go beyond simple payments system access: the larger financial institution will often provide a variety of services to the smaller one. This practice is very lucrative for the large financial institution.

- For payments systems, tiered access is generally used to meet one or both of these goals:

    - Settlement management. The smaller institution either cannot or does not want to participate in settlement directly. Most typically, the larger financial institution manages the credit (liquidity) risk of the smaller institution's settlement.

    - Technical access. The smaller institution either cannot or does not want to meet the scheme's requirements for technical access and connectivity.

- Also in legacy systems, the larger financial institution typically meets the general scheme requirements for transactions sent by or received by the smaller institution. The smaller institution really is not a participant in the system, relying instead on the larger institution (sometimes referred to as the "Sponsor Bank"). Often, the scheme itself has no visibility into the activity of the smaller institutions.

Multilateral Deferred Net Settlement – Tiered Access in RTRP Systems

Which types of institutions may participate in a national RTRP System?

- Newer RTRP systems are challenging the thinking on traditional tiered access models. Many RTRP systems want to encourage direct participation by non-bank DFSPs; in some cases, these institutions are not small, and may have larger transaction volumes than traditional DFSPs. Also, regulators are concerned about "hidden" transactions: they want visibility into all participant transactions.

- Considerations: national law may prohibit central banks from opening bank accounts for non-banks. This appears to be changing, or exceptions to current law are being tolerated, to accommodate non-bank DFSPs.

Range of Market Practices – Tiered Access for RTRP Systems

1 Only banks or chartered financial institutions are allowed to participate. Any other institution providing payments or account services to end customers must access the RTRP system through a relationship with a participant bank.

2 Non-banks may participate in the RTRP system. They access the system directly and are directly bound by the operating rules of the system. For settlement, however, the non-bank uses a relationship with a bank participant. The non-bank's transaction volume is visible to the scheme.

3 Non-banks may participate in the RTRP system and are direct settlement participants as well. Non-bank participants have a bank account at the settlement bank.

Current best practices

Basic　　　　　　　　　　　　　　　　　　　　　　　　　　*Advanced*

Multilateral Deferred Net Settlement – Settlement Bank Account Management
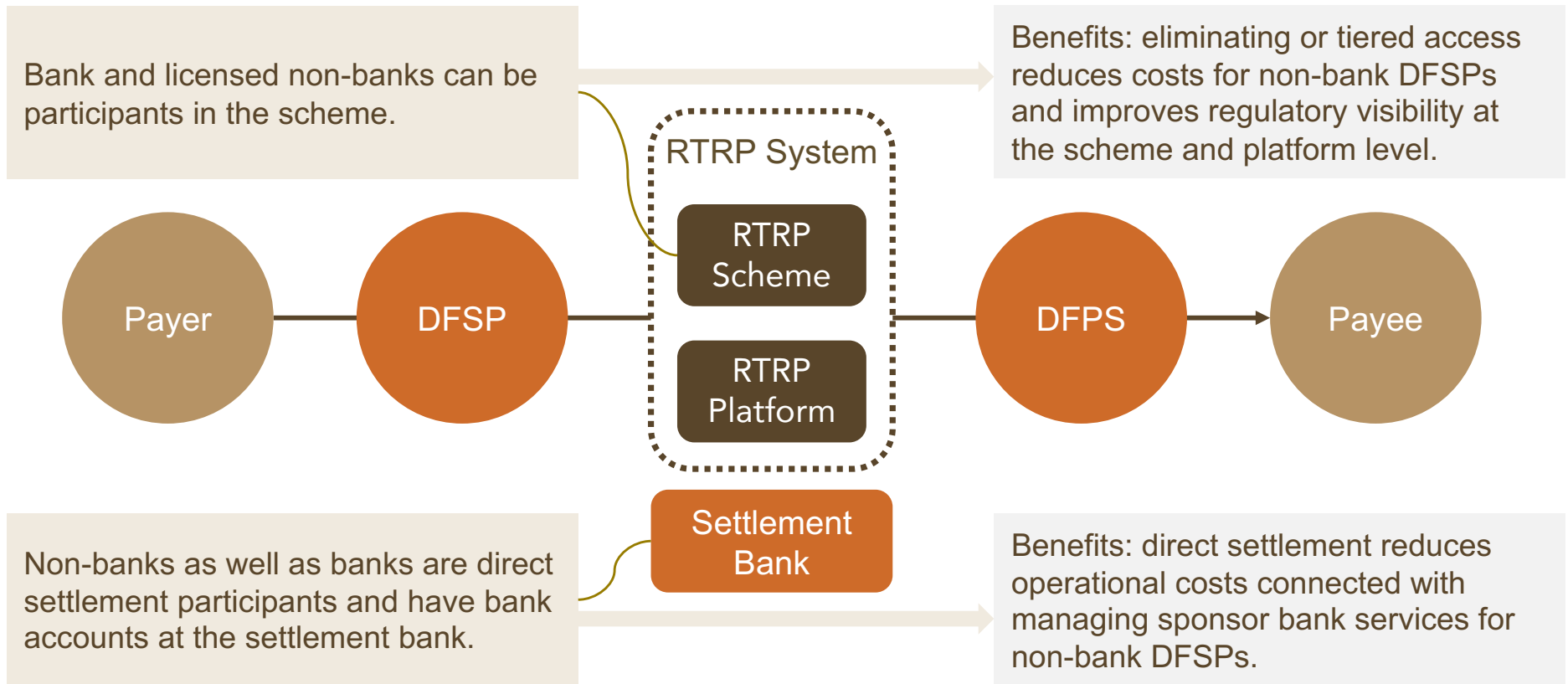
Bank and non-bank DFSPs have different concerns.

- Bank DFSPs participate in multiple different payments systems: checking, ACH, debit card, credit card, RTGS, and RTRP. Each of these systems may have different settlement requirements, but it is common for many of the systems to use the same settlement bank. Bank DFSPs are concerned about the overall cost of liquidity management across all payments systems. They don't like, for example, having to have multiple scheme-specific collateral requirements. They want flexibility in settlement management: a spike in their transaction volume in one system, for example, may increase their liquidity burden for that system: they would like to be able to offset this if they have excess liquidity in another payments system in which they participate.

- Non-bank DFSPs, most especially mobile money or eMoney issuers, may only participate in a single interoperable payment system. Their liquidity management requirements are therefore simpler in some ways. However, eMoney issuers face the problem of needing to reconcile trust account balances with transfer-related changes to their eMoney position.

- Both banks and non-banks are unhappy with needing to provide dual liquidity cover: this is the case when scheme rules require prefunded balances in settlement bank accounts AND a collateral balance elsewhere.

- Best practice systems have automated warning messages triggered for DFSPs if settlement balances are running low: more sophisticated systems have these warnings customizable for each DFSP.

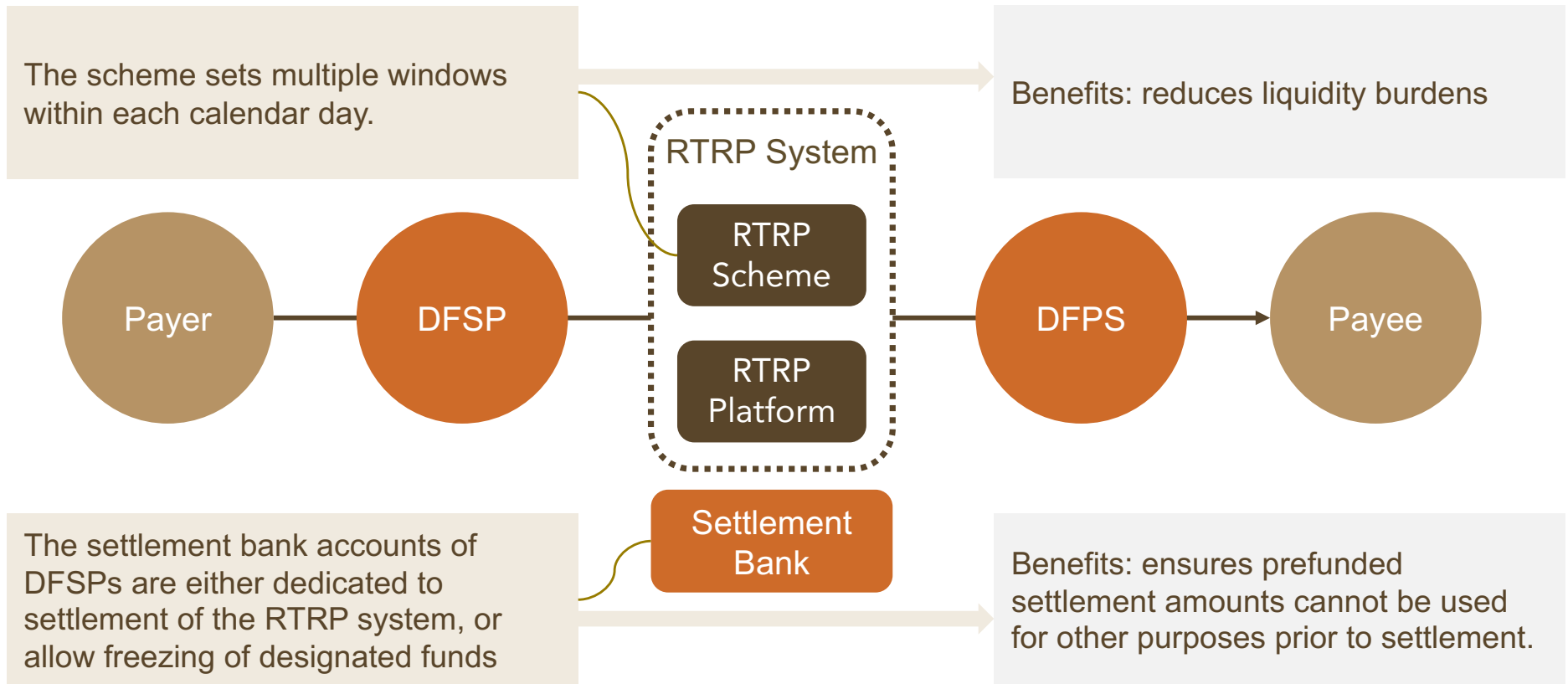# Multilateral Deferred Net Settlement – An Aspirational L1P Model

Given a myriad of design choices for settlement, what overall model would best reflect the design principles of the Level One Project?

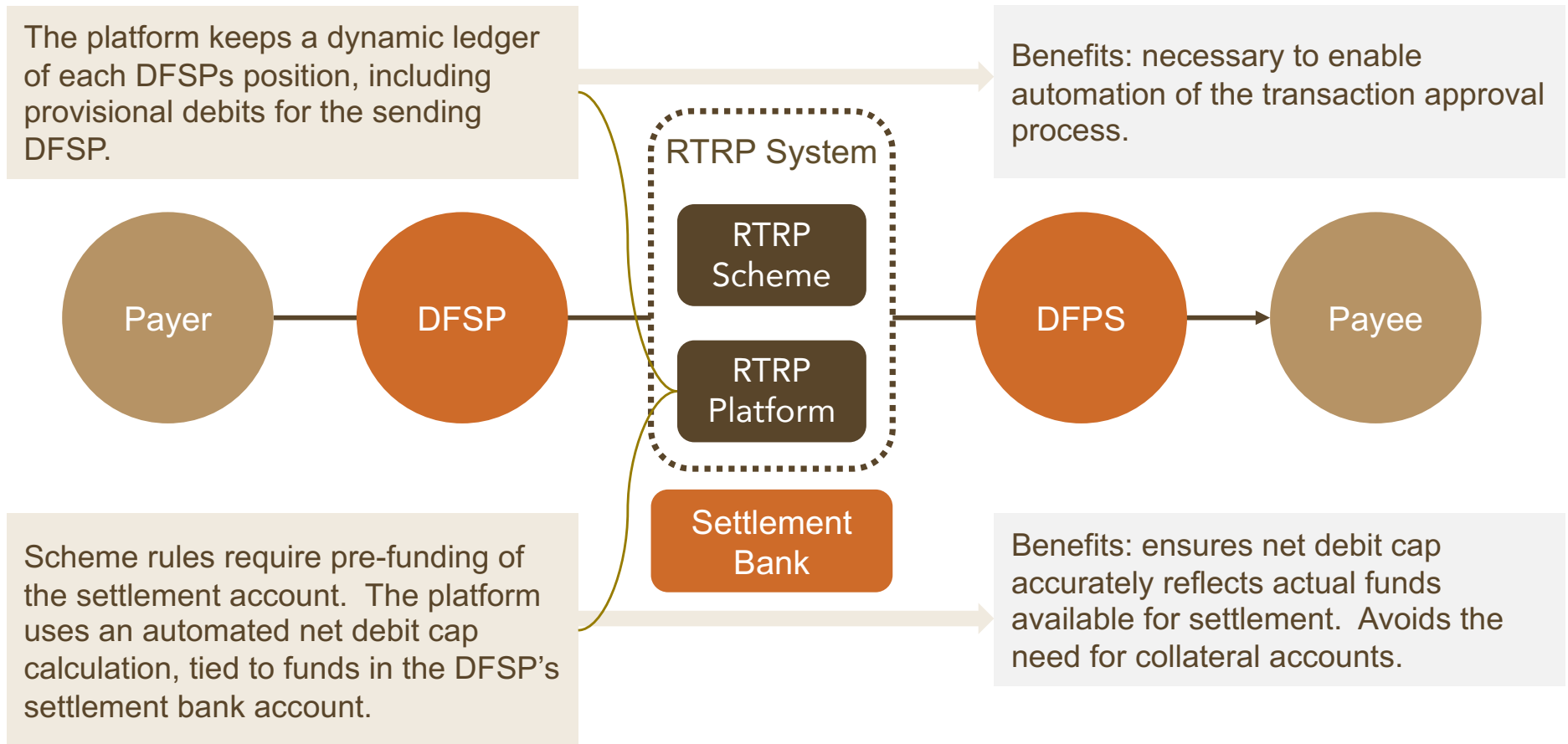| Generalized Goals for RTRP Settlement	Importance for an L1P Aligned RTRP System
Minimize Settlement Risk	Legacy payments systems may tolerate degrees of liquidity exposure; a central bank as settlement bank may be comfortable in tolerating this for large banks, which it knows and supervises. An L1P scheme ideally has a broader range of participants, including non-banks. Settlement exposure must be very tightly controlled to ensure comfort in including these participants.
Minimize DFSP Liquidity Costs	An interoperable RTRP system can be very liquidity-efficient, but not if a dual burden of collateral requirements is imposed. Also, very long settlement windows can increase liquidity costs.
Operational Efficiency	Fully automated posting of settlement entries, and an automated updating of the net debit cap used by the platform, can together greatly reduce operational costs for both the scheme, the settlement bank, and DFPSs.

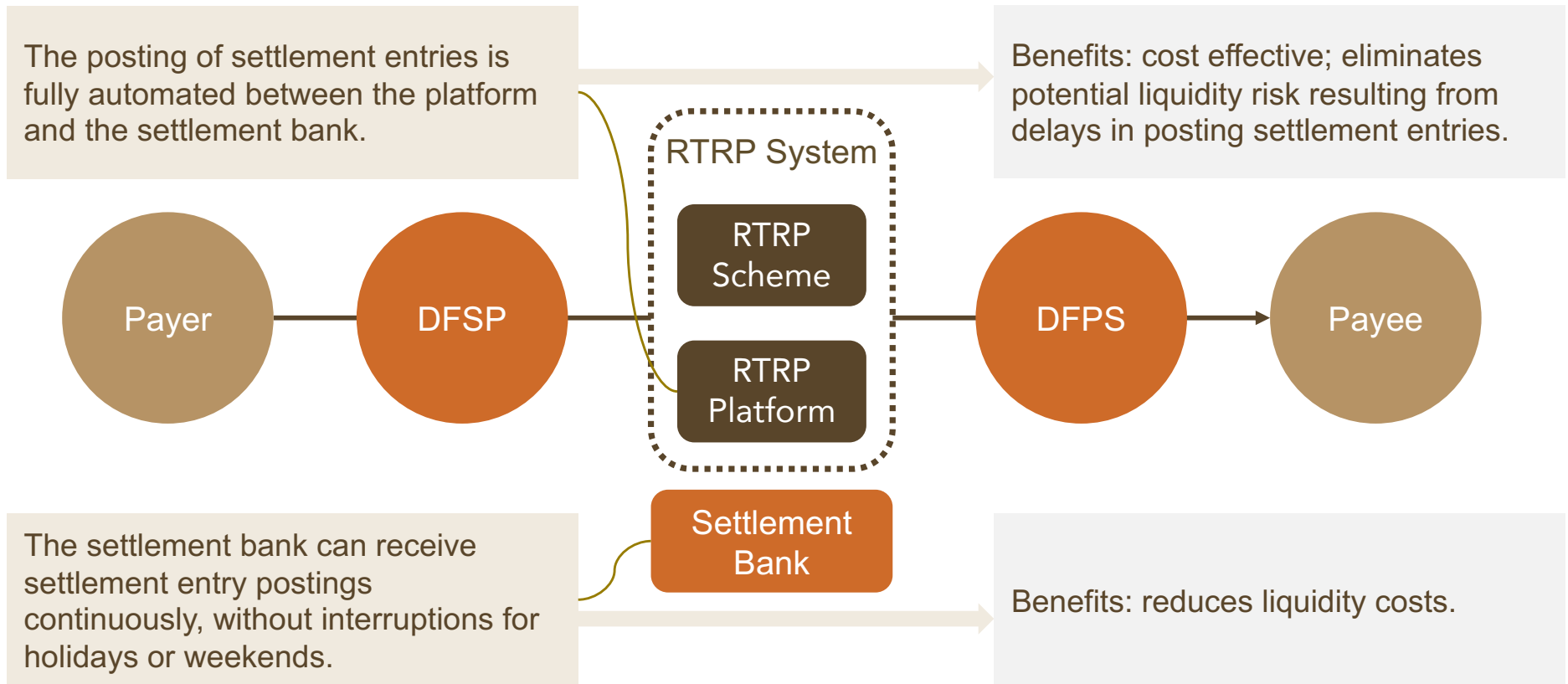# Multilateral Deferred Net Settlement – An Aspirational L1P Model

Bank and licensed non-banks can be participants in the scheme.

Benefits: eliminating or tiered access reduces costs for non-bank DFSPs and improves regulatory visibility at the scheme and platform level.

RTRP System

RTRP Scheme

RTRP Platform

Payer

DFSP

DFPS

Payee

Settlement Bank

Non-banks as well as banks are direct settlement participants and have bank accounts at the settlement bank.

Benefits: direct settlement reduces operational costs connected with managing sponsor bank services for non-bank DFSPs.

Multilateral Deferred Net Settlement – An Aspirational L1P Model

The scheme sets multiple windows within each calendar day.

Benefits: reduces liquidity burdens

RTRP System

RTRP Scheme

RTRP Platform

Payer — DFSP — DFPS — Payee

Settlement Bank

The settlement bank accounts of DFSPs are either dedicated to settlement of the RTRP system, or allow freezing of designated funds

Benefits: ensures prefunded settlement amounts cannot be used for other purposes prior to settlement.

Multilateral Deferred Net Settlement – An Aspirational L1P Model

The platform keeps a dynamic ledger of each DFSPs position, including provisional debits for the sending DFSP.

Benefits: necessary to enable automation of the transaction approval process.

RTRP System

RTRP Scheme

RTRP Platform

Payer

DFSP

DFPS

Payee

Settlement Bank

Scheme rules require pre-funding of the settlement account. The platform uses an automated net debit cap calculation, tied to funds in the DFSP's settlement bank account.

Benefits: ensures net debit cap accurately reflects actual funds available for settlement. Avoids the need for collateral accounts.

Multilateral Deferred Net Settlement – An Aspirational L1P Model

The posting of settlement entries is fully automated between the platform and the settlement bank.

Benefits: cost effective; eliminates potential liquidity risk resulting from delays in posting settlement entries.

RTRP System

RTRP Scheme

RTRP Platform

Payer — DFSP — DFPS → Payee

Settlement Bank

The settlement bank can receive settlement entry postings continuously, without interruptions for holidays or weekends.

Benefits: reduces liquidity costs.

Trends and Other Settlement Approaches

Trends and Other Settlement Approaches

- The evolution of settlement systems tends to move slowly. In many cases, central banks that are planning changes to settlement systems do not make these plans public during the deliberation process.

- That being said, there are a number of instances of innovations in settlement systems – or variations from the standard multilateral deferred net settlement approach – that are worthy of consideration.

Isolated implementations of gross or near-gross settlement of retail payments systems

Increasing permissions for non-bank participants in RTRP systems

Improvements in cross-payment system liquidity management

Exploration of "payment on payment" cross-system settlement

Gross Settlement

- In a gross settlement system, each individual transfer is posted to participating DFSP's settlement bank account. Wire transfer systems, often referred to as RTGS (real-time gross settlement) systems are the best examples of this. These are used for large-value, wholesale transactions.

  - There is no "netting" of transactions

  - There are no "settlement windows"

  - Posting may be immediate, or deferred: if deferred, the platform keeps a "shadow" settlement bank account during the deferral period. This occurs, for example, in an RTGS system that operates 24x7 but when the underlying settlement bank account system is not open continuously.

- In RTGS systems, the platform operator is usually the central bank, who also holds the settlement bank accounts. It is possible, however, to separate these function in a gross settlement system. An RTGS system works very much like a closed-loop payment system: an instruction arrives, and the settlement bank debits one participant's account on its books, and credits another's.

> The term "gross settlement" is somewhat of a misnomer: settlement itself implies some after-the-fact process, whereas in gross settlement systems the transfer processing and the settlement posting are the same: one could argue that gross settlement is "no settlement".

Gross Settlement for Retail Payments Systems

- There are good reasons why gross settlement has not been used, historically, for retail payments system settlement:

  - The deposit accounting systems used by central banks are not designed to handle high volumes of transactions posted

  - The transactions themselves were batch-processed

- The advent of real-time retail payments systems has led some central banks to rethink their position on this. Some of the considerations:

  - The deposit account systems in some central banks have been upgraded, often in conjunction with moving an RTGS system to 24 x 7 operations. Clearly, if one designed a new system with this in mind, it would be possible to accommodate high volume transaction posting.

  - The advantages of a gross settlement system include avoiding the complexities of settlement window management and reconcilement.

- Although there are some isolated (but interesting) examples in the market of implemented or planned gross settlement for retail payments systems, we cannot conclude that this is a trend. Most large-scale RTRP systems continue to use deferred net settlement and intend to do so for the foreseeable future.

Mexico SPEI: a Hybrid System

- SPEI, introduced in 2004, is an RTGS operated by the central bank of Mexico system that is open for retail use as well as wholesale use. The use of SPEI is anticipated to grow due to the introduction of CoDI, the QR code payment capability that leverages SPEI.

- It has an innovative hybrid approach to settlement:
    - The platform holds all transactions for mini-windows (of several seconds) and nets incoming and outgoing amounts for the window.
    - The net amounts are then posted to participant's accounts on the SPEI system; these accounts are dedicated to SPEI settlement.
    - If a participant has insufficient funds in their SPEI account, the "mini batch" is not processed and the transfers are refused by the platform
    - At the end of the business day, balances in the SPEI account are transferred to participant's general accounts with the central bank.

- Notably, the central bank allows any regulated financial institution – including non-banks – to hold SPEI accounts directly.

Despite wide-spread admiration for this model, which has been successfully in operation for many years, it has not been copied by other central banks.

U.S. The Clearing House RTP: Continuous Gross Settlement

- The Clearing House in the United States is owned by the largest banks in the country and operates a variety of wholesale and retail payments systems. In 2017, it introduced RTP, a real-time retail payments system with a highly innovative settlement model, which they call "Continuous Gross Settlement".

- In this model, all participants in RTP are joint owners of a single bank account at the New York Federal Reserve Bank. The RTP platform, which operates 24x7, keeps a ledger of each participant's position in the system. That position consists of:

  - The starting funding amount in the joint account

  - Debits to a sending participant for each transfer

  - Credits to a receiving participant for each transfer

  - Additions to the joint account made by participants

  - Withdrawals to the joint account made by participants (and approved by platform)

- A participant's ownership share in the joint account, at any point in time, equals their position in this ledger as a percent of the sum of all participants' positions in the ledger.

Continuous Gross Settlement

Each DFSP owns a share of the pooled bank account at the Settlement Bank

Settlement Bank
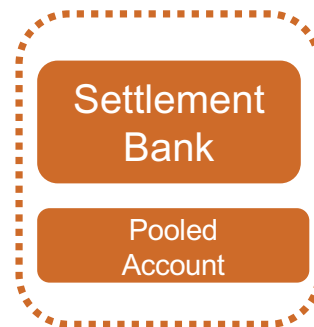
Pooled Account

DFSPs can add or withdraw funds from the pooled account – withdrawals with permission of the scheme.

DFSP 1

DFPS 2

The platform keeps a dynamic position ledger for each participant; as each transaction is processed the ledger goes down for the sending participant and up for the receiving participant

RTRP System

RTRP Scheme

RTRP Platform
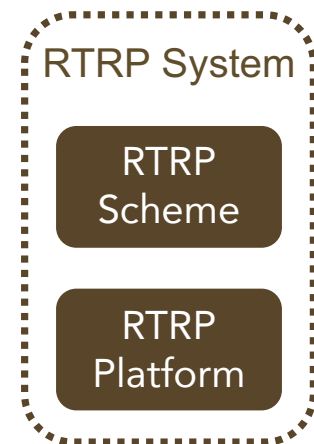
Each participant's ownership share in the pooled account, at any moment in time, is their current position in the platform ledger.

U.S. The Clearing House RTP: Continuous Gross Settlement

- The Continuous Gross Settlement model has several advantages:
  - It avoids the complexities of settlement windows and settlement entry postings; as a consequence it avoids the need to reconcile these processes
  - It operates 24X7, reflecting the operations of the platform, and does not require bank accounts at the central bank to be open 24X7.
  - Although in the United States only banks are participants in RTP, this model could work well in situations where a system wants non-banks to participate in RTRP settlement on a direct basis. Non-banks may, for example, be precluded from holding traditional RTGS accounts at a central bank but may be allowed to be participants in a jointly held account.

- This is an attractive model, but the very uniqueness of it presents challenges. Participants must be comfortable with the notion of a jointly owned account; so must the central bank or other settlement bank providing this capability. Participants must also trust that the platform ledger will be a trustworthy record of ownership.

RTRP Systems in Development Planning Gross Settlement

- There are indications that several large-scale RTRP systems in development will use gross settlement, however, the details of these systems and how they will work are not yet clear

  - In the United States, the FedNow systems being developed by the Federal Reserve bank will use gross settlement

  - In Brazil, the PIX system under development by the central bank will use gross settlement

Brazil PIX

"The SPI—to be developed, operated and managed by BCB—is the centralized and sole settlement infrastructure of the Brazilian IP ecosystem that will settle the transactions on a real time and gross basis, without generating financial exposure among participants. The SPI will be available 24 hours a day, seven days a week non-stop, and will have a centralized architecture based on the ISO 20022 messages standards, like similar systems in other jurisdictions."
Source: Banco Central do Brasil

U.S. FedNow

"The Federal Reserve Banks will develop the FedNow^{SM} Service, a new interbank 24x7x365 real-time gross settlement (RTGS) service with integrated clearing functionality, to directly support the provision of end-to-end faster payment services by depository institutions (or their agents)."
Source: FederalReserve.gov

Non-banks

- Non-banks are gaining increasing permissions to participate in RTRP systems worldwide. The evolution of the concept of "Tiered Access" is covered earlier in this report. But it is notable that some central banks are creating regulatory structures to link the the types of settlement used to the type of entity.

For example, Payments Canada's Modernization strategy includes a proposed division of settlement methods by participant category:

	Settlement Mechanism	Financial Risk Model	Credit Risk Coverage

Deferred Net Settlement Model	Exchange of payment items to occur on a real-time and continuous basis (24/7), and the settlement of those payment items to occur on a deferred multilateral net basis at end of each defined payment exchange cycle.	**Two options to address credit risk:**
		
		1. Pledge collateral to the Bank of Canada to affect settlement in the event of a default. Additional liquidity is required to affect daily settlement (available only to Category 1 participants); or
		2. Prefunding cash set aside to affect daily settlement (available to both Category 1 & 2 participants).
		
		Two categories of participants:
		• Category 1 – prudentially regulated entities
		• Category 2 – non-prudentially regulated entities
			1. For pledge of collateral, two options for default pool:
			  a) cover-all defaulter pay model; or
			  b) less than cover-all (defaulter pay model + loss sharing arrangements)
			
			*NOTE: The Bank of Canada has indicated that it supports a **cover-all settlement model** that would facilitate broad access to RTR.*
			
			2. For prefunding cash, it would provide for cover-all defaulter pay

Pre-Funded Real-Time Settlement Model	Settlement of each payment item to occur at the same time as payment exchange, on a continuous, real-time basis.	Settlement funds are fully pre-funded to affect real-time settlement, which would guarantee finality of each payment	By definition no credit risk exposure (credit risk fully covered), provides for cover-all defaulter pay model

Cross-System Liquidity Management Improvements

- Banks participate in multiple payments systems. Sometimes, these have system-specific settlement requirements; in other cases, a centralized settlement service offered by the central bank supports multiple payments systems. The costs of providing settlement liquidity across multiple systems is a concern to banks. The trend towards pre-funded settlement balances can make this worse: previously, a central bank may have tolerated "soft" liquidity management systems which allowed a pool of reserve balances to roughly support liquidity requirements across multiple payments systems.

- Managing liquidity positions during holidays and weekends, when central bank systems have traditionally not been available for account management transactions, has always been challenging. This has been exacerbated by the advent of RTRP systems, which are available on a 24 x 7 basis.

- Non-bank DFSPs often participate in only a single payment system, such as a mobile money system. It would appear that these institutions do not suffer from the same liquidity cost problems as do banks, however, in many cases the non-bank DFSP is using a bank as a settlement partner: the bank's charge to the DFSP will reflect its own costs.

Cross-System Liquidity Management Improvements

- There are a variety of efforts underway to improve cross-system liquidity management.

  - Vendors who supply multiple system software to central banks (usually ACH + RTGS + RTRP) are providing tools to allow banks to see and manage liquidity requirements across banks

  - Central banks are looking to upgrade settlement services to optimize liquidity management. For example, the U.S. Federal Reserve Bank's Payments System Improvement Program is considering:

    " Should (the Fed) consider developing a liquidity management tool that would operate on a 24x7x365 basis in support of services for real-time interbank settlement of faster payments…. Such a tool would enable movement of funds during hours when traditional settlement systems are not open (nonstandard business hours) between banks' master accounts at the Reserve Banks and an account (or accounts) at the Reserve Banks used to conduct or support 24x7x365 real-time settlement of faster payments.[29] A liquidity management tool could involve simultaneous liquidity transfers among multiple accounts that are coordinated by an authorized agent in the settlement process .... such a tool would enable transfers to support liquidity (or funding) needs associated with real-time settlement of faster payments during nonstandard business hours, such as weekends and holidays."

Payment on Payment

- Many payments between a payer and a payee are effected across multiple payments systems. This is virtually always the case with cross-border payments but may be the case with domestic payments as well.

- There is an inherent risk that settlement in one system may not occur, or may fail, when the transaction in the second system has already been completed. This is a well-understood risk, and there are a variety of commercial players, including banks, who happily stand in to take these risks. The costs associated with this are one reason for the very high end-user costs, for example, in cross-border transactions.

- There are a number of interesting initiatives to address this challenge. All of them have the potential to dramatically reduce the costs of cross-border transactions in particular.

  - Ripple's original cross-border services introduced the concept of an "atomic transaction" – a series of payments transactions that are cryptographically locked, so that all happen (or fail) together. These concepts have been further developed in the Interledger Protocol.

  - Mojaloop, an open source payments project designed to deliver on the concepts of the Level One Project, is working on cross-border protocols to accomplish this: the vision encompasses transfers both between two Mojaloop systems and between a Mojaloop and a non-Mojaloop RTRP system.

  - SWIFT's gpi service is connecting RTRP systems globally for instant cross-border payments.

The Level One Project

www.leveloneproject.org

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