Research on Net Settlement Practices in Retail, Real-Time Credit Push Payments Systems

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Glenbrook conducted a research project to identify best practices in net settlement for real-time credit push payments systems. One objective was to inform the ongoing evolution of the Level One Project Guide at the Bill & Melinda Gates Foundation.

The research identified that there are a broad range of practices in place in different countries. These fall into two categories: “net settlement” and “offset net settlement”.

“Net settlement” is the most commonly used approach. However, there are many different choices in system design within net settlement. What appear to be “best practices” include the use of dynamic, not static, multilateral net calculations at the switch; the use of a fully collateralized, systemically monitored DFSP-managed net debit cap, and fully automated (“straight through”) processing. These best practices together ensure that there is a near-zero risk of uncovered losses: this is favorable from a Level One point of view, as that can facilitate the entry of newer and smaller DFSPs into the system, as well as keeping compliance, operations, and other costs to a minimum.

If these best practices are not met, other forms of liquidity risk management need to be decided upon; and practices for managing any uncovered losses determined. This is complicated: there are multiple choices to be considered in the design of a net settlement system, and and one decision may affect subsequent options.

The identified alternative to net settlement, referred to in this report as “offset net settlement”, is used only in Mexico’s SPEI system (among the countries studied). This is an innovative and promising approach which eliminates liquidity risk and appears to support liquidity efficiency. This approach requires capabilities in switches, settlement services, and settlement bank posting that are not currently available in most countries. It may, however, be an indication of future directions in retail payments system settlement.

Executive Summary
<table>
<thead>
<tr>
<th>1</th>
<th>Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Basics &amp; Definitions</td>
</tr>
<tr>
<td>3</td>
<td>Net Settlement Models in the Market</td>
</tr>
<tr>
<td>4</td>
<td>Decision Model for Designing Net Settlement System</td>
</tr>
<tr>
<td>5</td>
<td>Best Practices in Net Settlement Systems</td>
</tr>
<tr>
<td>6</td>
<td>“World Tour”</td>
</tr>
<tr>
<td>7</td>
<td>Alternatives to Net Settlement</td>
</tr>
</tbody>
</table>
Introduction
Introduction

A credit push payment systems has the potential of making digital payments indistinguishable from cash and positioning digital payments as the most dominant means of payment in the future. However in order for this potential to be realized, credit push payment systems need to be efficient, secure and affordable. Settlement in credit push payment systems are at the heart of this issue.

**OBJECTIVE OF THE RESEARCH** is to look into settlement practices in eight countries, and identify best practices for settlement among DFSPs in a retail, real-time, credit push payment system

**EXCLUSIONS FROM THE RESEARCH** are gross settlement models, and end-party settlement practices
Basics & Definitions
Main Actors in Net Settlement

End Users hold accounts at the DFSPs that can be used for exchanging payments.

DFSPs maintain Settlement Accounts at the Settlement Bank. Note that small DFSPs may settle through a relationship with a Sponsor Bank.

DFSPs participate in a payment Scheme by agreeing to comply with the rules in order to exchange payments with other DFSPs.

End Users hold accounts at the DFSPs that can be used for exchanging payments.

Scheme provides Scheme Operating Rules, a common basis for exchanging payment transactions, deploys a transaction switching system.

DFSPs provide payment services and other services to End Users; perform End Party Settlement. End party settlement practices may be determined by Scheme Operating Rules, regulation, or market practices.

Settlement Bank does Inter-DFSP Settlements by posting Settlement Entries on the Settlement Accounts of the DFSPs.

Settlement Banks may provide overdraft facilities on the Settlement Accounts.

In some cases, the Settlement Bank is the operator of the Payment Scheme.

Switch is deployed by the Scheme and helps to “switch” transactions.

Switch calculates multilateral net position.

DFSPs "hire" Settlement Services (often from the Central Bank) to settle transactions made by various DFSPs on behalf of one another.

Schemes "hire" Settlement Services (often from the Central Bank) to settle transactions made by various DFSPs on behalf of one another.
Main Actors in Net Settlement

**DIGITAL FINANCIAL SERVICE PROVIDER (DFSP)**

Digital Financial Services Provider includes banks and those non-banks who are licensed in the country to provide Transaction Accounts (World Bank PAFI definition). Where relevant, we distinguish between Bank DFSPs and Non-Bank DFSPs.

**SETTLEMENT SYSTEM**

Settlement System is a term used to refer to the overall practices of settlement for a given Scheme, including both Scheme functions (e.g. Multilateral Net Settlement Calculations) and Settlement Bank functions (e.g. Settlement Service).

**SCHEME**

Scheme is an agreement among participating DFSPs to exchange payment transactions on a common basis.

**SWITCH (or) INTEROPERABILITY SERVICE FOR TRANSFER (IST)**

Switch is the operator of a transaction switching system; normally either hired by, operated by, or used by the Scheme: subject to Scheme Operating Rules. The Switch plays an important role in Multilateral Net Settlement Calculations.

**SETTLEMENT BANK**

Settlement Bank: the bank that Scheme participants hold accounts at for the purposes of inter-DFSP settlement; required by Scheme Operating Rules. Settlement Bank also often provides Settlement Services to Schemes.
Four Important Functions in Net Settlement

**FUNCTION 1: END PARTY SETTLEMENT** | Debiting and crediting payers and payees account respectively by the DFSP

**FUNCTION 2: SWITCHING** | The switch processes transaction requests and authorizations between DFSPs

**FUNCTION 3: SETTLEMENT CALCULATION** | The Switch records transactions within a Settlement Period and calculates DFSP net positions at the end of the Settlement Period and it is communicated to the Settlement Bank via the Settlement Service

**FUNCTION 4: INTER-DFSP SETTLEMENTS** | Settlement Bank posts settlement entries calculated by the Switch during Multilateral Net Settlement Calculations

Settlement Bank
- Settlement Account of Payer’s DFSP
- Settlement Account of Payee’s DFSP
- Switch
- Scheme

DFSP
- Payer
- Payee
Four Important Functions in Net Settlement

**FUNCTION 1: END PARTY SETTLEMENT**
End-party settlement refers to the transactions posted by the participating DFSP on the accounts of the end parties (payers and payees). Typically, in a net settlement system, the system rules may require that participating DFSPs post transactions to their end parties’ accounts before the inter-DFSP settlement occurs.

**FUNCTION 2: SWITCHING**
Switching involves processing transaction request and obtaining authorization to execute electronic payment instructions among any two participating DFSPs.

**FUNCTION 3: MULTILATERAL NET SETTLEMENT CALCULATION**
Multilateral Net Settlement Calculations is a function performed by the Switch, to record transactions within a Settlement Period and to calculate DFSP net positions at the end of the Settlement Period.

**FUNCTION 4: INTER-DFSP SETTLEMENT (POSTING SETTLEMENT ENTRIES via SETTLEMENT SERVICE)**
Inter-DFSP Settlement is done through the Settlement Service, a function provided by the Settlement Bank, to post Settlement Entries calculated by the Switch during Multilateral Net Settlement Calculations. Settlement Entries are the net positions of DFSPs that are calculated by the Switch and communicated to the Settlement Bank’s Settlement Service.
Other Important Definitions

**Collateral:** a balance in an account that is pledged to support a DFSP’s Settlement Obligation.

**Credit:** a line of credit or overdraft supplied by a credit granting entity to a DFSP.

**Escrow or Trust Account:** an account held by a Non-Bank DFSP at a bank; normally a regulatory requirement to protect consumer deposits at the DFSP.

**Liquidity:** available balances in an account at a Settlement Bank that can be used to cover a Settlement Obligation. Liquidity Efficiency is a system design feature which lowers the balances a DFSP needs to keep in order to meet its Settlement Obligations.

**Reserve Account:** the account that a Bank DFSP is required to keep at its Central Bank in order to meet Central Bank requirements for reserve balances.

**Risk:** the various types of risks in settlement are defined in the section below.

**Scheme Operating Rules:** rules approved by the Scheme, which bind participating DFSPs. Scheme Settlement Rules are a party of Scheme Operating Rules.

**Settlement Account:** bank accounts maintained by a DFSP at the Settlement Bank in which settlement entries are posted. Note sometimes Reserve Account is used as a Settlement Account when Central Bank is acts as a Settlement Bank, and Settlement Accounts are usually not specific to one Scheme.

**Settlement Obligation:** the provision in Scheme Operating Rules that specifies that a participating DFSP is responsible for covering its Settlement Obligations created under the Scheme.

**Settlement Period:** the time period during which transactions accumulate prior to calculation of a net settlement position.

**Settlement Service:** a function provided by the Settlement Bank, to post Settlement Entries calculated by the Switch during Multilateral Net Settlement Calculations.

**Sponsor Bank:** a bank that an individual DFSP uses to access the Settlement Bank’s settlement services, if the DFSP is not permitted to hold an account at the Settlement Bank.

**Uncovered Losses:** Settlement Obligations that are not met by the responsible DFSP and are not discharged using collateral or other mechanisms.
1. LIQUIDITY RISK

This is the risk that the paying DFSP cannot meet their obligations to the other DFSPs in the system. There are a variety of ways in which these risks are covered or mitigated in different systems. Collateralization is a common way of mitigating this risk.

2. UNCOVERED LOSS RISK

This is the risk that a liquidity failure on the part of a DFSP is not fully covered by collateral or other mitigants. Uncovered loss risk may itself be fully or partially mitigated by a shared DFSP guaranty fund or scheme rules may dictate that any such loss is absorbed by other DFSPs in the scheme on some defined basis. It is not unusual for there to be no explicit rule or agreement about the management of uncovered loss risk. In such cases, the central bank will have to bear the loss eventually. In some legacy payment systems, a liquidity failure of this type results in reversing or “unwinding” the entire settlement for a settlement period, and recalculating net settlement positions for the remaining DFSPs. In the most extreme case, this can result in reversing credits or debits to end users’ accounts. In modern real-time, credit push systems, the receiving party’s credit is immediate and typically irrevocable, meaning that uncovered loss risk must be absorbed in some way by the participating DFSPs.

It is important, however, to understand that there are other risks that need to be considered and managed for a settlement system to be effective. Other risks include End User Transaction Risk, Credit Risk, Operational or Technical Risk, Operating Rules Compliance Risk, Legal and Regulatory Risk, Sponsor Bank Risk.
Other Risks

**End User Transaction Risk** - this is the risk that a payment transaction did not occur as expected: either a payment made is not delivered to the recipient, or the payment order is received at the switch but not delivered to the receiving DFSP. This risk would also exist if scheme rules permit unwinding and reversal of transactions.

**Credit Risk** - individual DFSPs may be extended credit for use in settlement by either the Settlement Bank, a Sponsor Bank, or a third party. Credit risk occurs if the DFSP avails themselves of this credit and fails to repay it. Scheme Operating Rules will typically not cover this subject.

**Operational or Technical Risk** - this is the risk that the settlement process fails due to operational or technical factors. Settlement processes using manual components are clearly more subject to these risks. System outages or other failures can lead to systemic risk.

**Operating Rules Compliance Risk** - this is the risk if an operating rule of the Scheme is ambiguous and weak resulting in unclear understanding of the rules by participating DFSPs, loopholes and unenforceability. This risk also includes the risk of participating DFSP failing to comply with an Operating Rule of the Scheme with respect to Settlement, and the Scheme's compliance monitoring procedures failing to recognize this and take action on a timely basis.

**Legal and Regulatory Risk** - this is the risk when the Scheme operates in a legal environment where it lacks well-founded legal basis under all relevant jurisdiction such as the law relating to contracts, payments, banking, debtor/creditor relationships, and insolvency. This risk also includes DFSP failing to comply with a government regulation, and the regulatory body's compliance monitoring procedures failing to recognize this and take action on a timely basis.

**Sponsor Bank Risk** - if a Non-Bank or small Bank DFSP is either required to, or chooses to (and Scheme Operating Rules permit), this DFSP may settle their Scheme obligations through a relationship with a Sponsor Bank. There are a variety of ways in which this can be structured. At its simplest, the Sponsor Bank assumes the Settlement Obligations of the other DFSP, and there are no additional risks (although there may be costs) to the arrangements. If Scheme and/or Settlement Rules or policies put additional obligations on the Sponsor Bank, however, there may be risks if these obligations are not monitored or met.
Net Settlement Models in the Market
**Type 1: Net Settlement Model without Offsetting**

A process in which all the credits and debits of a DFSP is aggregated during a period, totaled at the end of the period, and the remaining obligation is settled in net.
Illustration of Type 1: Net Settlement Model without Offsetting
Let’s assume a scheme, which has three participating DFSPs, that settles using a Net Settlement model.

<table>
<thead>
<tr>
<th>Transactions</th>
<th>DFSP1</th>
<th>DFSP2</th>
<th>DFSP3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFSP1 to DFSP2</td>
<td>($30)</td>
<td>$30</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP3</td>
<td>($45)</td>
<td>$45</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP3</td>
<td>($60)</td>
<td>$60</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP3</td>
<td>($70)</td>
<td>$70</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP2</td>
<td>($22)</td>
<td>$22</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP2</td>
<td>($10)</td>
<td>$10</td>
<td></td>
</tr>
<tr>
<td>DFSP1 to DFSP2</td>
<td>($50)</td>
<td>$50</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$20</td>
<td>($20)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$37</td>
<td>($37)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$49</td>
<td>($49)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$13</td>
<td>($13)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$55</td>
<td>($55)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP3</td>
<td>($100)</td>
<td>$100</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP1</td>
<td>$200</td>
<td>($200)</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP3</td>
<td>($75)</td>
<td>$75</td>
<td></td>
</tr>
<tr>
<td>DFSP2 to DFSP3</td>
<td>($120)</td>
<td>$120</td>
<td></td>
</tr>
<tr>
<td>DFSP3 to DFSP1</td>
<td>$50</td>
<td>($50)</td>
<td></td>
</tr>
<tr>
<td>DFSP3 to DFSP1</td>
<td>$45</td>
<td>($45)</td>
<td></td>
</tr>
<tr>
<td>DFSP3 to DFSP2</td>
<td>$10</td>
<td>($10)</td>
<td></td>
</tr>
</tbody>
</table>

Multilateral Net Position: $182  ($547)  $365

Note: Payment instructions are released from the Switch to the receiving DFSP immediately after the Switch establishes that the DFSP has limit under NDC.
Type 2: Net Settlement Model with Offsetting

A process in which transactions for any DFSP are offset (netted) prior to the release of the transaction from the switch to the receiving DFSP. At the end of the offset Settlement Period, the net positions are posted to the DFSP's Settlement Account. If the Payer DFSP does not have sufficient funds in its Settlement Account to cover the Settlement Entry, the underlying transaction(s) are returned to the Payer DFSP or returned to the queue in the next Settlement Period. Settlement Periods for offset settlement need to be very short (several seconds).
Illustration of Type 2: Net Settlement Model with Offsetting

Let’s assume a scheme, which has three participating DFSPs, that settles using a Net Settlement model with Offsetting.

<table>
<thead>
<tr>
<th>Payment Instruction</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFSP 3 To DFSP 2</td>
<td>$10</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 2</td>
<td>$30</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$49</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 2</td>
<td>$10</td>
</tr>
<tr>
<td>DFSP 3 To DFSP 1</td>
<td>$50</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$200</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$20</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 3</td>
<td>$60</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 3</td>
<td>$45</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$37</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$55</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 3</td>
<td>$100</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 2</td>
<td>$50</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 3</td>
<td>$70</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 3</td>
<td>$120</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 2</td>
<td>$22</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 3</td>
<td>$75</td>
</tr>
<tr>
<td>DFSP 3 To DFSP 1</td>
<td>$45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,061</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offset</th>
<th>Net Offset</th>
<th>Net Settlement Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFSP 1 To DFSP 2</td>
<td>$112</td>
<td>DFSP 2 To DFSP 1</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 1</td>
<td>$374</td>
<td>$262</td>
</tr>
<tr>
<td>DFSP 2 To DFSP 3</td>
<td>$295</td>
<td>DFSP 2 To DFSP 3</td>
</tr>
<tr>
<td>DFSP 3 To DFSP 2</td>
<td>$10</td>
<td>$285</td>
</tr>
<tr>
<td>DFSP 3 To DFSP 1</td>
<td>$95</td>
<td>DFSP 1 To DFSP 3</td>
</tr>
<tr>
<td>DFSP 1 To DFSP 3</td>
<td>$175</td>
<td>$80</td>
</tr>
</tbody>
</table>

| **Tally**             | **$0**     |

Each participating DFSP sends payment instructions which are held in a central queue for a VERY SHORT period.

“Send” instructions for each DFSP are offset by “Receive” instructions.

Net Offset for each DFSP is calculated.

Multilateral Net Position of each DFSP is calculated which is entered in the Settlement Account.

If there is no enough liquidity in the Settlement Account the payment instructions are rejected or returned back to the queue.

Sum of credits and debits should be zero.

Note: Payment instructions are NOT released from the Switch to the receiving DFSP until the instructions are offset and the “net off the process” is successfully posted in the Settlement Accounts.
A Variation of Type 1: Hybrid Settlement Model

A net settlement process in which some transactions may be settled individually, as in real-time gross settlement, while others, usually less urgent payments, may be pooled together and netted.

STEP 0 | The balance in the Collateral Account defines the Net Debit Cap (NDC) for the DFPS in the ledger which can be up to "X" times the balance as per the Scheme Operating Rules

STEP 1 | Payer’s DFSP sends Payment Instructions to the Scheme

STEP 2 | The Switch checks if the DFSP has enough limit under the NDC to process the instruction. If yes, Payment Instruction is accepted and the DFSP’s Net Position is calculated. If not, the instruction is rejected

STEP 3 | The Scheme processes the Payment Instruction and instructs the Payee’s DFSP to credit the beneficiary’s account

STEP 4 | At the end of the Settlement Period, the Switch calculates Multilateral Net Settlement Position of DFPSs and communicates it to the Settlement Bank via the Settlement Service and Settlement Entries are posted on the DFSP’s Settlement Account

STEP 5 | After Settlement Entries are successfully posted, DFSP’s opening balance and NDC gets reset at the beginning of the next Settlement Period

Central Bank

Collateral Account

Payer’s DFSP’s Settlement Account

Payer’s DFSP

Payee’s DFSP

Switch

Settlement Scheme

Ledger

Central Bank

A Variation of Type 1: Hybrid Settlement Model

A net settlement process in which some transactions may be settled individually, as in real-time gross settlement, while others, usually less urgent payments, may be pooled together and netted.
Decision Model for Designing Net Settlement System
Understanding the Decision Model for Designing Net Settlement System

Designing a Net Settlement System requires deciding between multiple Design Options available under seven key components of a Settlement System. The Decision Model in the next two slides demonstrates the logical order of choosing the Design Options.

- First step is to choose between A: Net Settlement without Offsetting and B: Net Settlement with Offsetting
- If A: Net Settlement without Offsetting is chosen, then the Decision Model navigates through seven key components of a Settlement System in a logical order, and presents Design Options under each component
- Many of the Design Options under each key component are interrelated; choosing a Design Option under one component will affect the availability of Design Options in subsequent components
  - For example: Under component #1: Settlement Bank, if Commercial Bank is chosen then Reserve (current) Account cannot be chosen under component #2: Settlement Account. Similarly, if “End of Day” is chosen under #3 Settlement Period then “Intra Day” is not longer an option under #4 Final Settlement
- If B: Net Settlement with Offsetting is chosen, the Decision Model which is represented in the form of a flow chart (continued in the subsequent slide) presents various Design Options that are available under this variant
**Decision Model: Net Settlement System**

1. **Settlement Bank**
   - a. Central Bank
   - b. Commercial Bank

2. **Settlement Account**
   - a. Reserves (current) Account
   - b. Settlement / RTGS Account
   - c. Escrow Account

3. **Settlement Period**
   - a. Intra-day
   - b. End of day
   - c. Transaction value/volume based cutoff

4. **Posting Settlement Entries**
   - a. Intra-day
   - b. End of day
   - c. Next day

5. **Settlement Calculations**
   - a. Dynamic (After every transaction)
   - b. Deferred (End of Settlement Period)

6. **Liquidity Risk Management**
   - a. Net Debit cap
     - i. Collateral = Net Debit Cap
     - ii. Collateral ≠ Net Debit Cap
     - iii. No Collateral
   - b. No Net Debit Cap

7. **Loss Management Mechanism**
   - a. Participants contributed loss recovery fund
   - b. Risk is spread across the entire base of participants
   - c. Payment Scheme or Central Bank assumes the risk

**Final Settlement can be volume/value based or time based**
*Note: Some systems allow participants to reserve part of their settlement account balance to settle peeled off payment instructions.

†Transactions can be prioritized on the basis of use case
Best Practices In Net Settlement Systems
Two models emerging as "best"

1. NET SETTLEMENT MODEL WITHOUT OFFSETTING

The Switch does dynamic calculation of multilateral net position and monitoring each DFSP's position. The Scheme set a “Net Debit Cap (NDC)” for each participating DFSP on the basis of historical average net position. Transactions in excess of NDC are refused at the switch. In best practices, the net debit cap amount is matched by collateral held in a separate account. In some cases, the net debit position is a multiple of the required collateral: in such cases, a mechanism needs to be in place to mitigate Uncovered Loss Risk (such as a shared guaranty fund).

+ -
- Longer settlement periods
- No loss exposure if collateral = NDC
- Less inefficient if NDC = ‘x’ times collateral
- Relatively liquidity inefficient
- Possibility of loss

Example: IMPS, India; Faster Payments, UK

2. NET SETTLEMENT MODEL WITH OFFSETTING

The Switch holds the transactions in a queue until the end of the (very short) Settlement Period. Transactions are offset (netted) between participating DFSPs, and the result net positions are posted to the Settlement Account. If a DFSP does not have sufficient funds in the Settlement Account, the transaction is returned to the queue during the next Settlement Period. Unsettled transaction(s) at the end of the system operating hours (or end of day) are returned to the Payer DFSP. The Payee DFSP may get a payment “intention” message but payment confirmation message is sent for settled transactions only.

+ -
- Liquidity efficient; no collateral balance required
- Completely avoids loss exposure
- Requires efficient mechanism for intraday liquidity provision for settlement to continue
- Requires a settlement period that is very short: several seconds

Example: SPEI, Mexico
# Best Practices in Net Settlement

1. **Dynamic calculation of Multilateral Net Position**
   - The function of the switch to calculate Multilateral Net Positions should be dynamic, updating with each transaction received and sent on to the receiving institution.

2. **Establish Net Debit Cap, and enforced by Switch**
   - Each participating DFSP has a “Net Debit Cap”, which is the maximum negative position it may have in the dynamic multilateral net settlement calculation and the Switch stops incoming transactions that would put a DFSP over its Net Debit Cap.

3. **Fully collateralized Net Debit Cap**
   - Scheme Operating Rules require participating DFSPs to have 100% of their Net Debit Cap held in collateral at a financial institution. Note that a fully collateralized Net Debit Cap system has no potential for an uncovered loss.

4. **DFSP self-management of collateral and Net Debit Cap**
   - Rather than having the scheme set a Net Debit Cap for a DFSP, and then have the DFSP keep collateral equal to that, the Operating Rules define the Net Debit Cap as the amount of collateralized funds held by that DFSP.

5. **Straight through settlement processing**
   - Calculation of the Multilateral Net Position, creation and delivery of Settlement Entries, and posting of Settlement Entries to Settlement Accounts should be done on fully automated basis, in as near to real time as is possible.

6. **System transaction limits**
   - Many systems set transaction limits for individual transactions. This can be done at the Scheme level but may also be done by individual DFSPs.
**BEST PRACTICE** DFSP should debit Payer’s account first before sending payment instruction to the Scheme/Switch, and hold the funds in a Clearing Account.

**BEST PRACTICE** The Switch calculates dynamic Multilateral Net Position and checks if the DFSP has limit under the ‘Cap’ to process the payment instruction. If yes, the payment instruction is cleared and sent to the Payee’s DFSP. If not, the payment instruction is rejected.

**BEST PRACTICE** Balance in the “Collateral Account” determines the DFSP’s Net Cap.

**TYPE I EXPOSURE:** Within the Settlement Period; when Dynamic Multilateral Net Position is not calculated, a DFSP may have a Net Debit Position that is more than the ‘Net Debit Cap’.

**TYPE II EXPOSURE:** After the Settlement Period; when there is no Collateral Account and a DFSP does not have enough liquidity in the Settlement Account to fulfill its Settlement Obligation.

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**Illustration of Best Practices**

- **DFSP**
  - Payer’s Account
  - Clearing Account
  - DFSP’s Net Debit Cap

- **Settlement Scheme**
  - Switch and Settlement Agent
  - DFSP’s Net Debit Cap

- **Central Bank as Settlement Bank**
  - Settlement Account of Payee’s DFSP
  - Collateral Account

- **Notes:**
  - DFSP maintains liquidity in its Settlement Account to meet Settlement Obligation.
  - The Switch instructs the Settlement Bank to use the cash held on DFSP’s Collateral Account to complete settlement.

- **Type of Exposure Note:**
  - Type I Exposure: Within the Settlement Period; when Dynamic Multilateral Net Position is not calculated, a DFSP may have a Net Debit Position that is more than the ‘Net Debit Cap’.
  - Type II Exposure: After the Settlement Period; when there is no Collateral Account and a DFSP does not have enough liquidity in the Settlement Account to fulfill its Settlement Obligation.
“World Tour”
Schemes Studied

- **India**: Immediate Payment Service (IMPS)
- **UK**: Faster Payments
- **Mexico**: SPEI
- **Nigeria**: NIBSS Nigeria Central Switch (NCS)
- **Pakistan**: 1Link Inter-Bank Fund Transfer (IBFT)
- **Jordan**: JoMoPay
- **Egypt**: National Inter-Bank Payment System (NIBPS)
- **Peru**: Bim
## Schemes Demonstrating Best Practices and Notable Practices

<table>
<thead>
<tr>
<th></th>
<th>BEST PRACTICES</th>
<th>NOTABLE PRACTICES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dynamic calculation of Multilateral Net Position</td>
<td>Establish Net Debit Cap, and enforced by Switch</td>
</tr>
<tr>
<td>IMPS, India</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Faster Payment, UK</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>SPEI, Mexico</td>
<td>✔</td>
<td>NA</td>
</tr>
<tr>
<td>NCS, Nigeria</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>1Link, Pakistan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JoMoPay, Jordan</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>NIBPS, Egypt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bim, Peru</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

? Both NCS and JoMoPay have NDC. However, since the schemes do not calculate Multilateral Net Position on a dynamic basis, it will be difficult for the Switch to enforce NDC as well as fully collateralize NDC.
India: Immediate Payment Service (IMPS)

Design Configuration:
A, 1a, 2b, 3a, 4a, 5a, 6a(ii), 7a&b

Choose Net Settlement Model

1. Settlement Bank
   - Central Bank
   - Commercial Bank

2. Settlement Account
   - Reserves (current) Account
   - Settlement / RTGS Account
   - Escrow Account

3. Settlement Period
   - Intra-day
   - End of day
   - Transaction value/volume based cutoff

4. Posting Settlement Entries
   - Intra-day
   - End of day

5. Settlement Calculations
   - Intra-day (After every transaction)
   - Deferred (End of Settlement Period)

6. Liquidity Risk Management
   - Net Debit cap
     - Collateral = Net Debit Cap
     - Collateral ≠ Net Debit Cap
     - No Net Debit Cap

7. Loss Management Mechanism
   - Participants contributed loss recovery fund
   - Risk is spread across the entire base of participants
   - Payment Scheme or Central Bank assumes the risk

Final Settlement can be volume/value based or time based
### India: Immediate Payment Service (IMPS)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Settlement Calculation</td>
<td><strong>Dynamic</strong></td>
</tr>
<tr>
<td>2</td>
<td>Settlement Period</td>
<td><strong>Time-based; Intra-day</strong></td>
</tr>
<tr>
<td>3</td>
<td>Posting Settlement Entries</td>
<td><strong>Same day; Intra-day</strong></td>
</tr>
<tr>
<td>4</td>
<td>Settlement Bank</td>
<td><strong>Central Bank</strong></td>
</tr>
<tr>
<td>5</td>
<td>Liquidity Risk Management practice</td>
<td><strong>Collateralizing obligation</strong></td>
</tr>
<tr>
<td>6</td>
<td>Uncovered Loss Management practice</td>
<td><strong>Settlement Guarantee Fund</strong></td>
</tr>
<tr>
<td>7</td>
<td>Non-Bank DFSP participation</td>
<td><strong>Open; Indirect</strong></td>
</tr>
</tbody>
</table>
UK: Faster Payments

Design Configuration:
A, 1a, 2a, 3a, 4a, 5a, 6a(i), 7b

Settlement Bank
- Central Bank
- Commercial Bank

Settlement Account
- Reserves (current) Account
- Settlement / RTGS Account
- Escrow Account

Posting Settlement Entries
- Intra-day
- End of day
- Next day

Settlement Period
- Intra-day
- End of day
- Next day

Settlement Calculations
- Dynamic (After every transaction)
- Deferred (End of Settlement Period)

Liquidity Risk Management
- Net Debit Cap
- Collateral = Net Debit Cap
- No Net Debit Cap
- Collateral ≠ Net Debit Cap
- No Collateral

Loss Management Mechanism
- Participants contributed loss recovery fund
- Risk is spread across the entire base of participants
- Payment Scheme or Central Bank assumes the risk

Choose Net Settlement Model
- NET SETTLEMENT WITHOUT OFFSETTING
- NET SETTLEMENT WITH OFFSETTING

Choose Net Settlement Model
- A

Choose Net Settlement Model
- B

Final Settlement can be volume/value based or time based
**UK: Faster Payments**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Settlement Calculation</td>
<td>Dynamic</td>
</tr>
<tr>
<td></td>
<td>DFSP’s net position gets computed after every transaction by Faster Payments.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Settlement Period</td>
<td>Time-based; Intra-day</td>
</tr>
<tr>
<td></td>
<td>There are three Settlement Periods at specific time intervals each working day. Different Settlement Periods on weekends and public holidays.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Posting Settlement Entries</td>
<td>Same day; Intra-day</td>
</tr>
<tr>
<td></td>
<td>Settlement Entries are posted at 07:15, 13:00 and 15:45. A different schedule is followed during weekends and public holidays for posting entries.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Settlement Bank</td>
<td>Central Bank</td>
</tr>
<tr>
<td></td>
<td>Settlement Bank is Bank of England. Settlement Service is RTGS.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Liquidity Risk Management practice</td>
<td>Collateralizing obligation</td>
</tr>
<tr>
<td></td>
<td>DFSPs are required to hold cash in a separate ‘Reserves Collateralization Account’ (RCA) that determines the Net Debit Cap. The scheme can instruct the Bank of England to use the cash in RCA if any DFSP encounter difficulties meeting its Settlement Obligations.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Uncovered Loss Management practice</td>
<td>Liquidity and loss-sharing agreement</td>
</tr>
<tr>
<td></td>
<td>The NDC is set at a level that more than covers the anticipated maximum intra-cycle debit position for a DFSP. In addition, all participant banks are party to a liquidity and loss-sharing agreement (LLSA).</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Non-Bank DFSP participation</td>
<td>Open; Indirect</td>
</tr>
<tr>
<td></td>
<td>Other participants need a direct participant as sponsor to input transactions directly into the Faster Payments system’s central processing infrastructure; the direct participant remains responsible for end-of-cycle settlement with other participants.</td>
<td></td>
</tr>
</tbody>
</table>
Is it a "high priority" instruction?†

System attempts to settle Instruction(s) in gross*

Is there enough funds in Settlement Account?

System attempts to post Settlement Entries

Is it end of the system operating hours?

Transaction is rejected and DFSP is notified

Transaction is completed and DFSP is notified

*Participants are allowed to reserve part of their settlement account balance to "high priority" payment instructions.

† Payment instructions can be tagged as "high priority"
<table>
<thead>
<tr>
<th><strong>Settlement Calculation</strong></th>
<th><strong>Dynamic</strong></th>
<th>SPEI is a settlement system wherein transactions are queued and settled against offsetting transactions every 1.9 seconds or 300 accumulated payment transactions.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Settlement Period</strong></td>
<td><strong>Every 1.9 seconds or 300 payment instructions</strong></td>
<td>The system runs the offsetting process every 1.9 seconds or 300 accumulated payment transactions, and the remaining transactions are aggregated and settled using participants' SPEI account balance.</td>
</tr>
<tr>
<td><strong>Posting Settlement Entries</strong></td>
<td><strong>Same day; Intra-day</strong></td>
<td>Posting of settlement entries happen after every Settlement Period in the participants' SPEI accounts.</td>
</tr>
<tr>
<td><strong>Settlement Bank</strong></td>
<td><strong>Central Bank</strong></td>
<td>Transactions are settled in participants' SPEI accounts held on the books of Banco de Mexico.</td>
</tr>
<tr>
<td><strong>Liquidity Risk Management practice</strong></td>
<td><strong>Offsetting transactions</strong></td>
<td>The funds used by the participants to make payments through SPEI come from incoming transfer orders or by means of prefunded balance in SPEI accounts.</td>
</tr>
<tr>
<td><strong>Uncovered Loss Management practice</strong></td>
<td><strong>Not Applicable</strong></td>
<td>SPEI is not exposed to credit or liquidity risks since it only settles payments that do not rely on overdrafts of their accounts. No settlement obligation is created at any point.</td>
</tr>
<tr>
<td><strong>Non-Bank DFSP participation</strong></td>
<td><strong>Open; Direct</strong></td>
<td>Direct participation of all regulated financial entities – banks and non-banks.</td>
</tr>
</tbody>
</table>
Nigeria: NIBSS Nigeria Central Switch (NCS)

Choose Net Settlement Model

Design Configuration:
A, 1a, 2b, 3a, 4a, 5b, 6b(ii), 7c

Final Settlement can be volume/value based or time based
### Nigeria: NIBSS Nigeria Central Switch (NCS)

<table>
<thead>
<tr>
<th></th>
<th>Settlement Calculation</th>
<th>Deferred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Settlement Periods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>every day with cut offs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at 2pm and 12 midnight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posting Settlement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Same day; Intra Day</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Settlement Bank</td>
<td>Central Bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Liquidity Risk</td>
<td>Collateralizing obligation</td>
</tr>
<tr>
<td></td>
<td>Management practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncovered Loss</td>
<td>Central Bank assumes the risk</td>
</tr>
<tr>
<td></td>
<td>Management practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Bank DFSP</td>
<td>Open; Direct &amp; Indirect</td>
</tr>
<tr>
<td></td>
<td>participation</td>
<td></td>
</tr>
</tbody>
</table>

|   | Multilateral Net Position is computed after the settlement period by NCS. |
|   | Two Settlement Periods every day with cut offs at 2pm and 12 midnight. |
|   | Positing of Settlement Entries will take place at 2pm and 8am. The Central Bank of Nigeria (CBN) effects the posting of the Settlement Entries of DFSPs into their CBN settlement accounts via RTGS. |
|   | Settlement Bank is Central Bank of Nigeria. Settlement Service is RTGS. |
|   | Each DFSP pledges securities that provide for 110% protection for their operations. Collateral can be in the form of Central Bank deposits, Federal Government Securities and more specifically T-Bills which gets reviewed every three (3) months. |
|   | Central Bank of Nigeria assumes the risk. |
|   | The CBN approves direct participation upon application and fulfillment of the criteria set by CBN. Any participant not approved by CBN as a direct participant will be an in-direct participant. In-direct participants must apply to a direct participant. |
Pakistan: 1Link Inter-Bank Fund Transfer (IBFT)

1. Choose Net Settlement Model
   - **NET SETTLEMENT WITHOUT OFFSETTING**
   - **NET SETTLEMENT WITH OFFSETTING**

2. Settlement Bank
   - **Settlement Account**
     - Reserves (current) Account
     - Settlement / RTGS Account
     - Escrow Account
   - **Central Bank**
     - Commercial Bank

3. Settlement Period
   - **Intra-day**
   - **End of day**
   - **Transaction value/volume based cutoff**

4. Posting Settlement Entries
   - **Intra-day**
   - **End of day**

5. Settlement Calculations
   - **Deferred** (End of Settlement Period)
   - **Dynamic** (After every transaction)

6. Liquidity Risk Management
   - **Net Debit Cap**
   - **Collateral = Net Debit Cap**
   - **Collateral ≠ Net Debit Cap**

7. Loss Management Mechanism
   - **Participants contributed loss recovery fund**
   - **Risk is spread across the entire base of participants**
   - **Payment Scheme or Central Bank assumes the risk**

8. Design Configuration:
   - A, 1a, 2b, 3b, 4c, 5b, 6b(ilia), 7c
<table>
<thead>
<tr>
<th><strong>Settlement Calculation</strong></th>
<th><strong>Deferred</strong></th>
<th>Multilateral Net Position calculations are made at the end of the Settlement Period by 1Link.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Settlement Period</strong></td>
<td><strong>Time-based; End of day</strong></td>
<td>One Settlement Period every day commencing at 12.00 am through 11.59 pm.</td>
</tr>
<tr>
<td><strong>Posting Settlement Entries</strong></td>
<td><strong>Next day</strong></td>
<td>Cut off time for 1Link to submit batches to State Bank of Pakistan (SBP) is 12:30 PM next day, and after that the Banking Services Corporation (BSC), subsidiary of SBP manually posts net Settlement Entries in the core banking system of SBP.</td>
</tr>
<tr>
<td><strong>Settlement Bank</strong></td>
<td><strong>Central Bank</strong></td>
<td>State Bank of Pakistan (SBP) is the Settlement Bank.</td>
</tr>
<tr>
<td><strong>Liquidity Risk Management practice</strong></td>
<td><strong>Not Available</strong></td>
<td>No procedure for managing Liquidity Risk.</td>
</tr>
<tr>
<td><strong>Uncovered Loss Management practice</strong></td>
<td><strong>Equally spread on all participants</strong></td>
<td>Risk of Uncovered Loss is equally spread among all participants.</td>
</tr>
<tr>
<td><strong>Non-Bank DFSP participation</strong></td>
<td><strong>Open; Indirect</strong></td>
<td>Non-bank DFSPs require Sponsor Banks to participate.</td>
</tr>
</tbody>
</table>
Intra-day Settlement Period

1. Choose Net Settlement Model
   - NET SETTLEMENT WITH OFFSETTING
   - NET SETTLEMENT WITHOUT OFFSETTING

2. Settlement Bank
   - Settlement Account
     - Reserves (current) Account
     - Settlement / RTGS Account
     - Escrow Account

3. Settlement Period
   - Intra-day
   - End of day
   - Transaction value/volume based cutoff

4. Posting Settlement Entries
   - Intra-day
   - End of day

5. Settlement Calculations
   - Dynamic (After every transaction)
   - Deferred (End of Settlement Period)

6. Liquidity Risk Management
   - Net Debit Cap
     - Collateral = Net Debit Cap
     - Collateral ≠ Net Debit Cap
     - No Net Debit Cap
     - No Collateral

7. Loss Management Mechanism
   - Participants contributed loss recovery fund
   - Risk is spread across the entire base of participants
   - Central Bank assumes the risk

Design Configuration:
A, 1a, 2a, 3b, 4b, 5b, 6a(i), 7c

Final Settlement can be volume/value based or time based.
<table>
<thead>
<tr>
<th></th>
<th>Settlement Calculation</th>
<th>Deferred</th>
<th><strong>Multilateral Net Position calculations are made at the end of the Settlement Period by JoMoPay.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Settlement Period</td>
<td>Time-based; End of day</td>
<td><strong>For the purposes of settlement, the business day starts from 15:00 until 15:00 on the next business day.</strong></td>
</tr>
<tr>
<td>3</td>
<td>Posting Settlement Entries</td>
<td>Same day; End of day</td>
<td><strong>Posting of Settlement Entries happen immediately after the Settlement Period ends (15:00).</strong></td>
</tr>
<tr>
<td>4</td>
<td>Settlement Bank</td>
<td>Central Bank</td>
<td><strong>Settlement bank is Central Bank of Jordan. Settlement Service is RTGS-JO or any other clearing and settlement system approved by the Central Bank of Jordan.</strong></td>
</tr>
<tr>
<td>5</td>
<td>Liquidity Risk Management practice</td>
<td>Collateralizing obligations</td>
<td><strong>Non-bank DFSPs need to deposit amount in a “Guarantee Account” at a Sponsor Bank which defines the Net Debit Cap. The Sponsor Bank shall use the funds from the “Guarantee Account” when there is a Liquidity issue.</strong></td>
</tr>
<tr>
<td>6</td>
<td>Uncovered Loss Management practice</td>
<td>Central Bank assumes the risk</td>
<td><strong>Central Bank assumes the risk of Uncovered Losses.</strong></td>
</tr>
<tr>
<td>7</td>
<td>Non-Bank DFSP participation</td>
<td>Open; Indirect</td>
<td><strong>Non-bank DFSPs require Sponsor Banks to participate.</strong></td>
</tr>
</tbody>
</table>
Egypt: National Inter-Bank Payment Systems

Design Configuration: A, 1a, 2a, 3a, 4a, 5b, 6b(ilia), 7c

**NET SETTLEMENT WITH OFFSETTING**

1. **Settlement Bank**
   - **Central Bank**
   - **Commercial Bank**

2. **Settlement Account**
   - **Reserves (current) Account**
   - **Settlement / RTGS Account**
   - **Escrow Account**

3. **Settlement Period**
   - **Intra-day**
   - **End of day**
   - **Next day**

4. **Posting Settlement Entries**
   - **Intra-day**
   - **End of day**

5. **Settlement Calculations**
   - **Deferred (End of Settlement Period)**
   - **Dynamic (After every transaction)**

6. **Liquidity Risk Management**
   - **Net Debit Cap**
   - **Collateral = Net Debit Cap**
   - **No Net Debit Cap**

7. **Loss Management Mechanism**
   - **Central Bank assumes the risk**
   - **Risk is spread across the entire base of DFSPs**
   - **DFSPs contributed loss recovery fund**

8. **Choose Net Settlement Model**

**NET SETTLEMENT WITHOUT OFFSETTING**
<table>
<thead>
<tr>
<th></th>
<th>Settlement Calculation</th>
<th>Settlement Period</th>
<th>Posting Settlement Entries</th>
<th>Settlement Bank</th>
<th>Liquidity Risk Management practice</th>
<th>Uncovered Loss Management practice</th>
<th>Non-Bank DFSP participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deferred</td>
<td>Time-based; Intraday</td>
<td>Same day; Intraday</td>
<td>Central Bank</td>
<td>No</td>
<td>Central Bank assumes the risk</td>
<td>Only banks</td>
</tr>
<tr>
<td>2</td>
<td></td>
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<td>3</td>
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<td>7</td>
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</tr>
</tbody>
</table>

1. Egyptian Banks Company (EBC) calculates DFSPs’ Multilateral Net Position at the end of the Settlement Period.
2. Two Settlement Periods per day.
3. Posting of Settlement Entries happen after every Settlement Period (within 30 minutes) in the DFSPs’ Reserves Account at the Central Bank of Egypt (CBE) via RTGS.
4. Central Bank of Egypt is the Central Bank. Settlement Service is RTGS.
5. No Liquidity Risk management practice. Planning to introduce Settlement Guarantee Funds that will be used for multiple scheme.
6. Central Bank of Egypt is guaranteeing all obligations.
7. Only banks are allowed to be eMoney issuers.
**Peru: Bim**

**Design Configuration:**
A, 1a, 2b, 3b, 4b, 5a, 6a(i), 7a
<table>
<thead>
<tr>
<th></th>
<th>Settlement Period</th>
<th>Time-based; End of day</th>
<th>One Settlement Period per day every 24 hours. Cut off at 12 noon.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Settlement Calculation</td>
<td>Dynamic</td>
<td>Pagos Digitales Peruanos calculates DFSPs Multilateral Net Position after every transaction.</td>
</tr>
<tr>
<td>2</td>
<td>Posting Settlement Entries</td>
<td>Same day; End of day</td>
<td>Posting of Settlement Entries are done on the same day done via RTGS operated by the Central Bank (Sistema de Liquidación Bruta en Tiempo Real (LBTR)) between 1pm and 3pm.</td>
</tr>
<tr>
<td>3</td>
<td>Settlement Bank</td>
<td>Central Bank</td>
<td>Banco Central De Reserva Del Perú (Central Bank) is the settlement bank. RTGS (LBTR) is the Settlement Service.</td>
</tr>
<tr>
<td>4</td>
<td>Liquidity Risk Management practice</td>
<td>Collateralizing obligation</td>
<td>All DFSPs are supposed to maintain a “custody” account which defines the Net Debit Cap. If the DFSP’s net position is more than the amount in the “custody” account “Payment Instruction” is not created.</td>
</tr>
<tr>
<td>5</td>
<td>Uncovered Loss Management practice</td>
<td>Escrow account &amp; Settlement guarantee fund</td>
<td>DFSPs are also expected to deposit cash equivalent of total eMoney in circulation in an Escrow Account at designated institutions. In addition, all banks contribute to a settlement guarantee fund managed by the Central Bank.</td>
</tr>
<tr>
<td>6</td>
<td>Non-Bank DFSP participation</td>
<td>Open; Indirect</td>
<td>Non-bank DFSPs require Sponsor Banks to participate.</td>
</tr>
</tbody>
</table>
Alternatives to Net Settlement
Alternatives to Net Settlement

There are a number of alternative practices, either in use or being considered, for inter-institution settlement of positions in retail real-time payments.

In this section, we give a high level view of three alternatives:

1. Gross Settlement
2. Bilateral Settlement Through Prefunding
3. Settlement Through Distributed Ledger Technology
Alternative 1: A Simplified & Generalized Gross Settlement

**Settlement Bank**

- Settlement Account of Payer’s DFSP
- Settlement Account of Payee’s DFSP
- Settlement Bank

**Payer’s DFSP**

- Pooled Account
- Payer’s Account
- Settlement Report

**Payer**

- Payment Instruction
- Debit: Payer FI Settlement Account
- Credit: Payee FI Settlement Account
- Payment Message (instruction)

**Payer’s Account**

**Payee’s DFSP**

- Pooled Account
- Payee’s Account
- Settlement Report

**Payee**

- Payment Confirmation
- Credit: Payee FI Settlement Account
- Payment Message (acknowledgement)

**Scheme**

- Responsible for maintaining liquidity
Assessment of Gross Settlement

Suited for Systemically Important Payment Systems – In Gross Settlement, Switching and Inter-DFSP Settlement happens simultaneously. Said differently, no Settlement Obligation is created in a Gross Settlement System which helps to significantly reduce Uncovered Loss Risk making it suitable for Systematically Important Payment Systems.

Liquidity Inefficient – Gross Settlement systems are typically liquidity inefficient as transactions are processed and settled individually (without netting or offsetting) using Participants’ funds in their Settlement Accounts.

Design Configuration varies widely – Design Configuration of Gross Settlement models vary widely, particularly when it comes to treatment of transactions when there are no sufficient funds in Participants’ Settlement Accounts; Such transactions can either be rejected, held in a queued within the Payment System, or settled using a line of credit from the Settlement Bank.

Intraday Liquidity is an critical issue – As Gross Settlement systems are heavy on Liquidity requirement, availability of Intraday Liquidity tends to be a critical issue for the system to continue operating without frequent interruption. Participants must have an easy way to wire funds into their Settlement Accounts during the Settlement Period and/or there should be a well-designed line of credit available to the Participants from the Settlement Bank.
Alternative 2: Bilateral Settlement through Prefunding

1| DFSP 1 opens a Disbursement Account in DFSP 2's platform and prefunds it
2| Trust Account credited with the same prefunded amount
3| Sends Payment Instruction to send money to Payee
4| Amount debited from Payer’s Account and credited to DFSP 1’s Collection Account
5| Platforms communicate to exchange payment messages
6| Amount debited from DFSP 1’s Disbursement Account and credited to Payee’s Account
7| Payee receives payment confirmation

* Collection Account is rebalanced periodically to infuse liquidity in Disbursement Accounts
Assessment of Bilateral Settlement through Prefunding

Cumbersone and Difficult to Operate – Bilateral Settlement through Prefunding becomes cumbersome and difficult to operate as more DFSPs join the Scheme; each DFSP has to individually reconcile the transactions exchanged with the balance in its Disbursement Accounts at all other DFSPs, and calculate the fees it owes other DFSPs and vice versa.

Liquidity Inefficient - A considerable amount of liquidity will be tied up lying in various Disbursement Accounts. Each DFSP needs to promptly rebalance its Collection Account and Disbursement Accounts in order to remain liquidity efficient, which further adds to the complexity of the model.

Lacks Transparency – There is no central entity or a Switch that monitors liquidity in Disbursement Accounts. Therefore, it is unclear how DFSPs are informed when there is liquidity shortage in their Disbursement Accounts and how funds are added.

Uncovered Loss Risk - During situations of liquidity shortage, if the receiving DFSP is crediting beneficiary’s account to ensure instant availability of funds, and settling later, then there is high risk of Uncovered Losses in the model.
Alternative 3: Settlement through Distributed Ledger Technology

Distributed Ledger Environment

1. Transfers liquidity to Segregated Account
2. Payer’s Account debited and Segregated Account credited
3. The credit balance in Segregated Account also reflects as credit balance in Hold Account
4. Validator verifies Payer’s DFSP has put funds on hold
5. Validator instructs Payer’s DFSP to put funds on hold
6. Liquidity Provider’s Account debited and Hold Account credited
7. When the hold on both accounts are confirmed, the Validator triggers atomic settlement of funds - instructing both ledgers to release the holds and transfer the funds
8. Hold Account debited and Liquidy Provider’s Account credited

Reference: Ripple Solutions Guide, Ripple Solution 3.0, January 2017

*For a two-way flow, the liquidity provider would also pre-fund their Payer’s DFSP’s account and transfer some of the liquidity to the segregated account. But to demonstrate a one-way flow, it is not necessary to show this transaction.
Assessment of Settlement through Distributed Ledger Technology

**Promising alternative to bilateral settlement** – Settlement using Distributed Ledger Technology can be a useful alternative to the current bilateral settlement practices followed by some mobile money DFSPs. More importantly, the Distributed Ledger based settlement can be an efficient and low cost alternative to correspondent banking models used to settle cross border payments.

**Liquidity efficient** – The model helps participating DFSPs to allocate liquidity more efficiently. Particularly, in low-traffic corridors, the model allows DFSPs to make use of 3rd party liquidity providers rather than having to maintain separate Nostro and Vostro accounts.

**Ease regulatory burden** – Atomic payment flow with transaction immutability helps to reduce compliance complexity and regulatory burden.

**Usefulness as an alternative to net settlement unclear** – However, the usefulness of Distributed Ledger based settlement as an alternative to Net Settlement arrangement in a domestic payment setting is not clear yet.
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