**Global Concentration Engine**

**Business Architecture Document**

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# Introduction

Cash concentration is the transfer of funds from multiple accounts into a central account to improve the efficiency of cash management. The consolidation of cash into a single account allows a company to minimize idle cash balances, and to identify excess cash available for short term investments.

Global Concentration Engine (GCE) is a cash concentration solution for target balancing in a global context. GCE will provide GTS with a single rationalized platform for global target balancing that offers market leading capabilities to customers, and reduces operating costs. GCE will be the target platform for all domestic and cross border target balancing, for end of day concentration.

The application strives to provide following business capabilities of clients

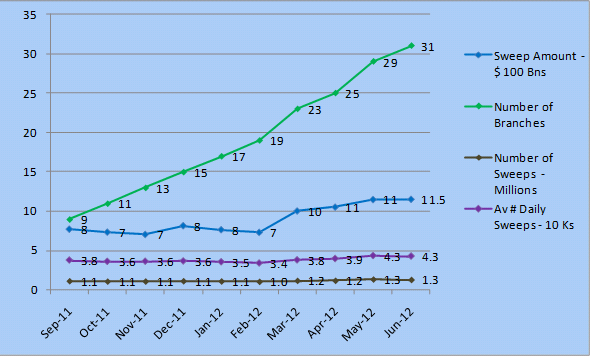
* Sweep cash from where it is to where it is desired
* Minimize deficit positions to reduce funding costs
* Maximize the return on surplus cash position
* Offer readymade or highly-customized solutions
* Operate on a true end of day basis
* Mobilize liquidity within the Citi network
* Provide interest reallocation strategy between participating entities

From Citi perspective, GCE create the following business values for Citi:

* Citibank pools the Customer’s funds and utilizes them for its internal and treasury needs.
* Citibank bills the customer for utilizing the liquidity solution of GCE.

GCE is connected to **52** branches across the globe out of which it has live customers in **31** branches spread across Asia, EMEA, and NA regions. It supports **9873** customer accounts set for concentration process contained in **2775** customer structures. The application on an average processes around 3500 sweeps in 4 minutes. GCE crossed an important milestone by facilitating fund movements in excess of **$1Trillion** on month to month basis this year.

Figure 1: Line Graph depicting the GCE performance as on December 2012



# Enterprise View

2. **Enterprise View**

## Partner Systems

GCE interacts with various systems/applications for its complete service offerings.

Figure 2: Business Architecture Diagram depicting the GCE interface systems as on December 2012



**GIW (Global Information Warehouse)**: Global information warehouse (GIW) is the global data repository for Citi. GCE receives account balances information from GIW. GCE sends GIW structure and liquidity feed on a daily basis. Structure and liquidity feed will be used by Citi-Direct to run customer reports.

**GBNP (Global Notional Pooling)**: GBNP calculates interest based on loan positions created by target balancing transactions (sweeps) and customer’s interest setups. A daily feed containing interest reallocation setup information and Loan position information is sent to GBNP for daily interest computations and monthly interest postings.

**DDA (Demand Deposit Account)**: Flexcube (Asia, EMEA), Citi Checking (US migrated to Flexcube) and Canada GL are Citi core bank platforms. DDAs have intraday and end of day connectivity with GCE. GCE receives end of day balance and transaction files and those files are used as gold copy for transaction and balance. GCE also posts sweep transactions to DDAs and receives post sweep balance.

**Billing**: Billing applications creates invoice and bills customers for target balancing service based on setups in global target balancing applications. GCE sends monthly feeds to Billing Information System (BIS) and Global Billing System (GBS) in BIS prescribed format and MBBS (a legacy billing platform) prescribed formats respectively.

## Actors (A) and Stakeholders (S)

**Corporate Clients(S)**: typically are multinationals with a global footprint. They are the customers of Citibank's liquidity service.

**Liquidity Product Team (S):** is responsible for creating innovative liquidity solutions to fulfill corporate clients’ needs.

**Liquidity Operations Team (A, S):** is the primary user who manage and operate liquidity solutions on behalf of corporate clients

**Branch Operations Teams (A, S):** are subject matter experts of country specific regulatory and banking essentials. They assist the liquidity operations team in specifying the branch specific liquidity requirements.

**GCE Production Support (A, S):** ensures the smooth functioning of GCE. They monitor batch process, investigate client issues on a need basis, provide status on how well the application is performing and mitigate chances of failures. They work with the GCE development team and operations team to provide the best in class service to the end customer.

**Regulatory Bodies (S):** ensures that the cash concentration transactions created by GCE do not violate any local or global regulations. The regulatory bodies propose rules that are mandated by local government or banking norms.

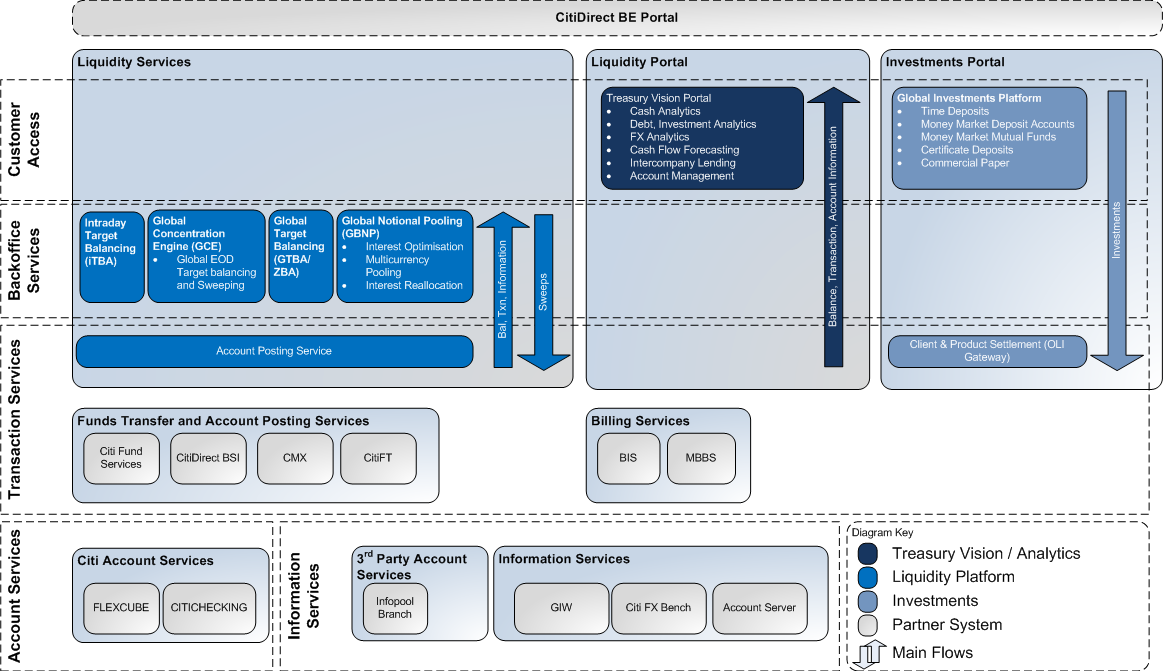
## Business Events

**Start of Day (SOD):** is a signal which refers to the Start of day/branch open. The DDA system sends the SOD signal to GCE.

**End of Day (EOD):** is a signal which refers to the End of day/branch closed. End of Day is a bank branch event sent by DDA system. EOD is when customers would have completed all their business operations.

## Domain Alignment

The following diagram illustrates the liquidity and investment domain.

Figure 3: Diagram depicting the role of GCE in Citi’s Business Enterprise portal as on December 2012

Citi offers a full range of cash concentration services through 4 applications **GCE**, **ITBA**, **GTBA** and **GBNP**.

**GCE** provides end of day cash concentration sweep capability for Citi customers spanning various regions globally. The application will substitute other regional target balancing capabilities such as GTBA/ ACT in Citi-Checking etc.

The **ITBA** (intraday Target Balance Application) application compliments GCE offerings by providing intraday target balancing capabilities to Citi customers. The application sources current balance from GCE Mart generates and posts transactions through Citi-Direct payment channel.

The **GTBA** application provides target balancing and investment sweep feature to mainly structures in EMEA region and few branches in Asia. This legacy application provides target balancing capability with limited flavor and minimal batch postings through Account server.

The **GBNP** application provides notional pooling products across the globe. It also provides interest computation services for target balancing customers in GTBA and GCE.

## Regulatory and Risk Considerations

All local and global institutions have to abide by the regulations set by enforcing authority. Certain geographies have specific regulations like Germany having a regulation of restricting lending of funds by a specific industry sector. Other geographies such as Australia have regulations which mandate reporting all cross border transactions. GCE has to respect all rules and generate transactions conforming to regulations.

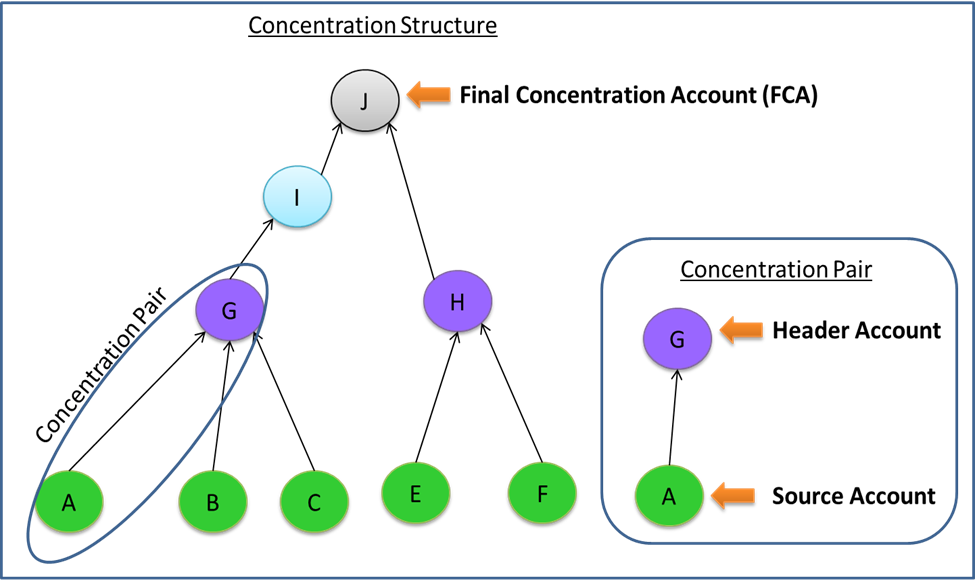
# Business Concepts



## Structure

Structure is a hierarchy of accounts. The top most account in the hierarchy is called Final Concentration Account (FCA). Each parent/child relationship in the hierarchy is called a concentration pair. Parent accounts are called header accounts and child accounts are called source accounts.

Figure 4: Diagram depicting an indicative concentration structure in GCE



## Product

A concentration product is a liquidity service that Citi trades/advertises/sells to its clients. Products can be pre-defined or customized. The pre-defined products can be used to create customized products for specific clients.

Concentration products are defined by three key components: concentration, fee and interest.

* Concentration Component

Concentration components will generate fund movements (sweeps) between source accounts and header accounts. These sweeps will help to achieve the desirable EOD (end of day) account balance for clients. A concentration component is defined by concentration strategies and concentration constraints.

Concentration strategies are a set of parameters that determine

1. The EOD ledger/available/value balance that needs to be achieved at a source account
2. The frequency on which the sweep should be executed. For Example, Daily, Weekly, Monthly, etc.
3. Whether the reverse flow of funds from the header to the source is allowed.
4. The processing logic for branch or currency holidays.
5. Whether to process the back value transactions.

Concentration constraints are conditions that control or restrict the movement of funds

* Between header accounts and source accounts or
* Across the entire structure.

These constraints could be driven by client/regulatory needs.

Following is a sample setup of a concentration component:

|  |  |
| --- | --- |
| Concentration strategies | Concentration Constraints |
| * Balance Type: Available Balance * Sweep Frequency: Weekly every Friday * Target Balance: 0 USD * Holiday Posting: if the sweep day is a holiday, sweep the previous day | * Min Amount Constraint: 100 USD * Structure Limit 1,000,000 USD |

* Fee Component

Fee components will dictate how clients will be charged for using GCE service.

Customers are billed for using the GCE cash concentration service. They are billed based on the nature of sweep (cross border, domestic and two way sweep), the number of accounts in their structures and whether the interest reallocation feature has been enabled for the concentration pair. The pricing model is confined to the billing systems and is agnostic to GCE.

* Interest Reallocation Component

Interest component is an optional component which will allocate interest based on customer defined rates to accounts in a structure. GCE does not calculate the interest; it only collects parameters for interest setup. The following are the key interest parameters:

1. Interest Re-allocation strategy – The only interest reallocation strategy is central strategy. The central strategy states that the interest or advantage calculated is credited to an account which may or may not be a part of the structure.
2. Interest Rate – The Interest rate that needs to be applied.
3. Interest Reallocation Effective Dates – The period within which the interest reallocation component will be effective.

## (Concentration) Arrangement

The Association of a structure with a product creates an arrangement. The association will be done to each concentration pair and those associations collectively define the legal binding agreement (arrangement) between Citi and clients, to run the cash concentration service.

All concentration pairs are defaulted to the standard product once the association is made with the structure. GCE allows the customers to customize the standard product for a particular pair as shown in the illustration bellow. Standard product is used for head account and source account 1, while customized product is used for header account and source account 2.

Figure 5: Indicative diagram depicting the product association with a concentration structure

Customized Product

Standard Product

Header Account

Source Account 1

Source Account 2

The concentration arrangement has an effective period. Its lifecycle begin from the effective start date till the effective end date. A temporary suspension is also available to discard the arrangement within the effective period for cash concentrations.

## Sweep

Concentration Component will generate fund movements between source and header accounts. Those fund movements are called sweeps.

Figure 6: Diagram depicting a sweep from London account to Dublin account

Sweep

Transfer 10,000 USD

The concentration sweep is normally generated during a branch EOD process and is sent to the DDA system. A sweep can be reversed, recovered, archived and re-swept.

From business perspective, Sweeps create loans between source accounts and header accounts and these loans are managed by GCE. The position of the loan is the cumulative amount of sweeps.

If the cumulative amount is positive (credit side), the source accounts borrow funds from the header accounts. If the cumulative amount is negative (debit side), the source accounts lends funds to the header account.

Following is a sample statement of a loan between source account A and header account B.

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Particulars | Sweep Amount | Cumulative Loan Position |
| Day 1 | Closing Balance |  | 0 USD |
| Day 2 | Sweep A to B 500 USD | 500 USD | 500 USD |
| Day 3 | Sweep A to B 650 USD | 650 USD | 1150 USD |
| Day 4 | Sweep B to A 400 USD | 400 USD | 750 USD |
| Day 5 | Sweep A to B 750 USD | 750 USD |  |

## Nostro Account

**Nostro Account:** An account that a bank holds with a foreign bank. Nostro accounts are usually in the currency of the foreign country. This allows for easy cash management because currency doesn't need to be converted. Nostro is derived from the Latin term "ours."

**Nostro Mirror Account:** For tracking of its Nostro account positions with other banks. Banks run a parallel account in its own books (system), which will reflect all the entries that occur in the Nostro account. This account is a notional account in the same currency as the Nostro account and is known as Mirror account.

If a client wants to sweep 1million dollars from its London branch account A to New York account B

London Branch will make the following entry in its DDA system

|  |  |  |  |
| --- | --- | --- | --- |
| Account A | $1,000,000 DR | USD Nostro Mirror Account (New York Branch) | $1,000,000 CR |

While New York will make the following entry in its DDA system

|  |  |  |  |
| --- | --- | --- | --- |
| Account B | $1,000,000 CR | USD Nostro Account (London Branch) | $1,000,000 DR |

**Settlement account:** An account which is used for processing transaction between different branches within a country (this account keeps track of transactions related to international assets).

**Wash Account:** A settlement account which is used for processing transaction between the Citi-checking branches.

## (DDA) Transaction

The transfer of funds between two accounts in a DDA system is known as a transaction.

Sweeps need to be translated into DDA transactions. If the source account and the header account are in the same branch, one DDA transaction will be generated. Otherwise, multiple DDA transactions will be generated with settlement account as intermediary.

Here is an example of how a sweep from London branch and Dublin branch is translated to multiple DDA transactions. Overall 3 DDA transactions are created for the sweep. The Nostro accounts of both branches in New York branch are used as intermediary to facilitate the sweep.

Figure 7: Diagram depicting conversion of a sweep to transactions in GCE

Sweep

Transfer 10,000 USD

**is converted to:**

Transfer USD

New York Branch

Transaction No.2

Transaction No.1

Transaction No.3

|  |  |  |
| --- | --- | --- |
|  | From | To |
| Transaction 1 | London Customer Account | USD Nostro Mirror London Account |
| Transaction 2 | USD London Nostro Account | USD Dublin Nostro Account |
| Transaction 3 | USD Nostro Mirror Dublin Account | Dublin Customer Account |

## Virtual Arrangement (Structure)

If an account of one arrangement is also a part of another arrangement, then the 2 arrangements are connected. All arrangements connecting to each other forms a virtual arrangement (structure).

In the following example, Account A is the final concentration account of one arrangement and the source account of the other arrangement. GCE will form a virtual arrangement comprising both.

Figure 8: Indicative diagram depicting the formation of a virtual arrangement from two concentration structures.

Virtual Arrangement

New York Branch EOD Sweep

Dublin Branch EOD Sweep

Concentration Structures

London Branch EOD Sweep

Dublin Account

New York Account

London Account

GCE will execute sweeps for concentration pairs when EOD signal is received for a branch (EOD branch). A sweep will be executed for the EOD branch, if the Source account or header account or both accounts of the concentration pair domiciles in the EOD branch or the entire structure is tagged to be executed in the EOD branch. In the above example, when EOD signal is received from London branch, concentration pair B->A, C->A and A->X will be picked up for sweep generation. For a concentration pair C->A, the cross border sweep will be executed twice. First during London branch (Account A) EOD Process and the second during Dublin branch (Account C) EOD Process.

When multiple concentration pairs are executed for an EOD branch, the order of execution is important. For Example, assume when GCE receives EOD signal from London branch, closing balance of account A, B, C and X are 100, 200, 300 and 400 euro respectively. Assume the sweep strategy is 0 target balance for all concentration pairs.

**Example 1:** *Concentration Pair execution order 1*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Account A | Account B | Account C | Account X |
| Closing Balance | 100 | 200 | 300 | 400 |
| B->A | 300 | 0 | 300 | 400 |
| C->A | 600 | 0 | 0 | 400 |
| A->X | 0 | 0 | 0 | 1000 |

The above is the correct order, in which the desirable business is achieved when London accounts A and B are moved to New York account X.

**Example 2:** *Concentration Pair execution order 2*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Account A | Account B | Account C | Account X |
| Start Balance | 100 | 200 | 300 | 400 |
| A->X | 0 | 200 | 300 | 500 |
| C->A | 300 | 200 | 0 | 500 |
| B->A | 500 | 0 | 0 | 500 |

The above is the incorrect order, which will leave the 500 euro balance of account B & C in account A.

In order to achieve the correct target balance for all sources account domicile in the EOD branch, concentration pair of the same virtual arrangement has to be executed in the correct order, Lower level concentration pairs should be executed before higher level ones. For concentration pairs at the same level and have the same header account, they are executed based on sweep priority. According to this rule, the B->A need to be executed before C->A. And C-> A has to be executed before A->X.

While concentration pairs of different virtual arrangements can be executed independently of each other.

# Business Capabilities

## Administration

* Product Management

GCE provides the capability to inquire, create, modify and verify concentration products. Once a product is created or modified, it will be submitted for verification. GCE will enforce the maker-check process. This ensures that user verifying the product will be different from the user who submitted that product. The verifier can approve the product submitted or reject it. In the event the product is approved, the operations user can assign that product with one or more concentration structures to form the arrangements. In the event the product is rejected, it can be further modified and submitted again for verification.

There is no version for Products. Any modifications on product shall be saved on to the same product ID. A product can be modified until it is associated with an arrangement. After this point a product cannot be updated anymore (except for the ‘discontinue’ flag). Suppose a Product P1 is created and this product is being associated to an arrangement, then the product values cannot be further modified (except for the ‘discontinue’ flag). This restriction on Product Modification effectively curbs any change to the Product values and so there is no need for versioning.

Concentration products are defined by three key components: concentration, fee and interest.

* **Concentration Component**

The concentration component controls or influences the sweep generation. Some of the key attributes of the concentration components are:

* + *Sweep Frequency*

Sweep frequency determines for which dates (sweep execution dates) sweep should be generated. Sweep execution date determines the value date of the generated sweep. For example, a concentration pair may have a sweep frequency of ‘Weekly’ (Once a Week) on every Monday. Assuming that arrangement is effective from 1st Dec’12 to 31st Dec’12, the sweep execution dates will be 3rd Dec’12 (Monday), 10th Dec’12 (Monday), 17th Dec’12 (Monday), 24th Dec’12 (Monday) and 31st Dec’12 (Monday).

* + *Holiday Logic*

Holiday logic is an optional feature which defines how branch holiday will impact sweep generation. If sweep execution date is a normal branch working day, the post date of the generated sweep is the same as the sweep execution date.

However if the sweep execution date is a branch holiday, depending on the holiday logic there are 3 possibilities.

* **If the holiday logic is skip, GCE will not generate a sweep for the sweep execution date (branch holiday date). For Example, the sweep execution date for a concentration pair falls on 25th Dec ’12 (Tuesday) and Holiday Logic (posting method) is set as skip, the sweep on 25th Dec ’12 will not be generated.**
* If the holiday logic is previous, GCE will generate a sweep. The value date of the sweep is the branch holiday date. The post date of the generated sweep is the prior working day before the branch holiday. For Example, the sweep execution date for a concentration pair falls on 25th Dec ’12 (Tuesday) and Holiday Logic (posting method) is set as ‘Previous’, the sweep to be posted on 25th Dec ’12 will be posted on 24th Dec ’12 (Monday) with a value date of 25th Dec ‘12. Note: 24th Dec ’12 is a working day for the branch.
* If the holiday logic is next, GCE will generate a sweep with value date of the holiday date. Postdate is the immediate working day after the holiday date. For Example, the sweep execution date for a concentration pair falls on 25th Dec ’12 (Tuesday) and Holiday Logic (posting method) is set as ‘Next’, the sweep to be posted on 25th Dec ’12 will be posted on 26th Dec ’12 (Wednesday) with a value date of 25th Dec ‘12. Note: 26th Dec ’12 is a working day for the branch.



* + *Back Value Transactions (Optional Feature)*

When GCE receives a BVT (back value transaction) from a DDA system, GCE will check if its value date is prior or equal to the last sweep execution date for the concentration pair. If it is, GCE will put the BVT into the BVT backlog of the account; otherwise the BVT will be ignored.

As a business rule, GCE will wait until the next sweep execution date to generate sweeps for the entire BVT backlog, where next sweep execution date is next schedule date where the concentration pair is eligible for sweep. The value date of the sweep generated for a BVT will be the immediate execution date after the value date of the BVT. In the special case that the value date of a BVT is a sweep execution date, the value date of the sweep generated is the same as that of the BVT. If there are multiple BVT sweeps with the same value date, GCE will try to net them into a single BVT sweep.

**Example 1:** Assuming the current date to be 18th Dec 2012, let us assume that the account balance provided at the end of day for account B was 10,000 GBP CR. The sweep strategy is zero balance and sweep frequency is daily

On 18th Dec 2012, the following 4 BVTs are received.

|  |  |  |
| --- | --- | --- |
| **Post Date** | **Value Date** | **Amount** |
| 18th Dec 2012 | 17th Dec 2012 | 100 CR |
| 18th Dec 2012 | 17th Dec 2012 | 100 DR |
| 18th Dec 2012 | 14th Dec 2012 | 500 CR |
| 18th Dec 2012 | 14th Dec 2012 | 1000 CR |

GCE will generate the following 2 sweeps

|  |  |  |
| --- | --- | --- |
| **Post Date** | **Value Date** | **Amount** |
| 18th Dec 2012 | 14th Dec 2012 | 1500 DR |
| 18th Dec 2012 | 18th Dec 2012 | 8500 DR |

Note \* there is no sweep generated for value date 17th Dec 2012, as the net effect of the 2 BVT with that value date is zero. The 2 BVT sweeps with value date 14th Dec 2012 are combined into a single transaction. The amount available for sweep for 18th Dec 2012 is adjusted by 1500 DR.

The BVT sweep generated will also adjust the balance available

**Example 2:**

Figure 9: BVT example

Consider the above timeline, from 1st December 2012 to 1st February 2013 and a concentration pair, B->A with sweep frequency of Monthly (1st of every month, sweep execution data during the given period will be Dec 1, Jan 1 and Feb 1.) and sweep strategy is zero balance.

The following BVTs are received and put into the backlog.

|  |  |  |
| --- | --- | --- |
| **Post Date** | **Value Date** | **Amount** |
| 5th January 2013 | November 5th | 500 DR |
| 12th January 2013 | December 20th | 1000 DR |
| 19th January 2013 | January 4th | 2000 DR |

On 1st February 2013, EOD Closing Balance of source account B is 5000Cr

GCE will generate the following 3 sweeps:

|  |  |  |  |
| --- | --- | --- | --- |
| **Post Date** | **Value Date** | **Amount** | **Note** |
| 1 Feb 2013 | 1 Dec 2012 | 500 CR | 1 Dec 2012 is the immediate next sweep execution date after November 5th |
| 1 Feb 2013 | 1 Jan 2013 | 1000 CR | 1 Jan 2013 is the immediate next sweep execution date after December 2012 |
| 1 Feb 2013 | 1 Feb 2013 | 6500 DR | The BVT on 19th January 2013 is ignored and balance available for 1 Feb 2013 is adjusted by 1500 CR |

* ***Sweep Strategy***

The sweep strategy determines the initial sweep amount based on BVT adjusted EOD balance of the source account for the sweep execution date.

* The most commonly used sweep strategy is the **Target Balancing** **strategy**, which generates a sweep to leave behind the desired account balance.
* The **Fixed Amount** **strategy** generates a fixed sweep amount, provided the account has sufficient balance.
* The **Residual Balance** **strategy** generates sweep only if the account balances is greater than the residual balance amount.
* Beside these 3 strategies is available another strategy, **Drain the Pool**, but it is not fully implemented in GCE.

**Example:**

Figure 10: Diagrams depicting the various sweep strategies performed by GCE

600

1500

1000

or

1000

**Target Balancing**

Product Setup:

If EOD Closing Balance is:

Then Post Sweep Balance is:

600

Post Sweep Balance is:

Then No Sweep

600

Post Sweep Balance is:

500

Sweep

1500

1000

1000

**Fixed Amount**

Product Setup:

If EOD Closing Balance is:

If EOD Closing Balance is:

Then No Sweep

500

Sweep

1500

600

Post Sweep Balance is:

Post Sweep Balance is:

600

1000

1000

**Residual Balance**

Product Setup:

If Excess Account Balance:

If Deficit Account Balance:

*Sweep Constraint*

Sweep constraints influence the final sweep amount. There are 2 different constraint categories

* Single Sweep Constraint: these constraints only take a single sweep into consideration (e.g. Minimum Amount, Maximum Amount and Lot Amount)
* A minimum amount constraint can be set as 100 EUR for a concentration pair, which will allow only sweeps more than 100 EUR amount. If a Sweep amount has been determined as 56.34 EUR, then the sweep will not be posted as it violates the Minimum amount.
* Balance based constraint. This constraint takes the cumulative effect of all sweeps into consideration (e.g. strategy ZBA, frequency daily, inter account limit 5000).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Day** | **Balance Before Sweep** | **ZBA Sweep Amount** | **Sweep Amount Actual** | **Balance After Sweep** | **Limit Utilization** | **Note** |
| 1 | -2000 | 2000 | 2000 | 0 | 2000 | Zero balance achieved |
| 2 | 1000 | -1000 | -1000 | 0 | 1000 | Zero balance achieved |
| 3 | -3500 | 3500 | 3500 | 0 | 4500 | Zero balance achieved |
| 4 | -1000 | 1000 | 500 | -500 | 5000 | ZBA sweep amount should be 1000, but this will cause the limit utilization goes up to 5500, the actual sweep amount is 500. |

* ***Sweep Order***

When there are multiple sweep constraints enabled for a product, the order of constraint processing should be in the following order:

1. DEBIT ONLY SWEEPS
2. CREDIT ONLY SWEEPS
3. BOTH
4. Posting Restriction
5. Sweep Counter
6. Min Amount
7. Max Amount
8. Lot Amount
9. Inter Account Limit
10. Cumulative Sweep Limit
11. Cumulative Fund Limit
12. Structure Limit
13. Header Overdraft Limit

Conceptually, EOD closing balance is passed to sweep strategy to determine the initial sweep amount. Then the initial sweep amount is passed to a sweep constraint pipeline. The position of a constraint in the pipeline is decided by sweep constraint order as mentioned above. The output amount of the previous constraint will be fed as input to the next constraint in the pipeline. The output of the last constraint in the pipeline will be the final sweep amount.

Figure 11: Diagram depicting the sweep generation process through the constraints pipeline



* Structure Management

GCE provides the capability to inquire, create, modify and verify a concentration structure (*See Section 3.1*). Once a structure is created or modified, it will be submitted for verification. GCE will enforce the maker-check process. This ensures that the user (verifier) verifying the structure will be different from the user who submitted that structure. The verifier can approve the submitted structure or reject it. In the event the structure is approved, a version is assigned to the structure and the operations user can assign that structure with a concentration product to form an arrangement. In the event the structure is rejected, it can be further modified and submitted again for verification.

Concentration structures are defined by parent child relationship of accounts to form an account hierarchy.

Only approved structure has a version. Any modification to an approved version of a structure would result in a new version. Note a structure does not have an effective start date and an end date and any version of the structure can be used for future arrangement creation. Only the latest version of the structure will be available for structure modification.

Structures are made of a collection of accounts and concentration pairs and don’t have an effective start date and an effective end date. The modification of a structure (e.g. adds new accounts or removes old accounts) will create a new version of the same structure.

Figure 12: Diagram depicting the structure status and its application

Submitted Structure

Sent for approval / rejection

Approved Structure

Available for arrangement creation (gets a version)

Rejected Structure

Can be modified and resubmitted for approval

**Example**: Few accounts are considered been linked to create a concentration structure. A structure is then submitted for approval/rejection. An approved structure will attain a structure version 1.0. Any modification will require approval. And upon such approval, the structure version would have value as 2.0.

* Arrangement Management

GCE provides the capability to inquire, create, modify and verify arrangements. The arrangement creation and modification goes through a maker and checker process.

Associating a product to all individual concentration pairs in a structure version will constitute an arrangement. User has the ability to alter the values that differ from the associated product to each of the individual concentration pairs in a structure. Arrangements have an effective start and an effective end date. Versioning is done at structure level, rather than on each individual concentration pair level.

When the arrangement is created for the first time it is allocated an arrangement id and a version number equal to 1. Version change can be induced:

* by changes to arrangement attributes
  + any modification of an existing arrangement will result in new arrangement version being created
* by changes in underlying structure
  + Any structure modification will trigger generation of new versions of arrangement. The last version of the arrangement will be used as a base for the new arrangement Structure modifications are seen as actions performed for the purpose of modifying arrangement(s). So, the change in structure will be linked to underlying arrangement modification by automating arrangement structure changes.

**Example:**

Suppose we have the following setup S1 version 1 which is being used in Arrangement A1 version 1 (status – approved), in case user modifies the structure version S1 version 1 to S1 version 2, then the action is seen as done with the purpose of modifying arrangement A1 version 1. Implicitly, the GCE application will ‘modify’ A1 version 1 to use the new version of structure (i.e.S1 version 2). So, a new version of the said arrangement ‘A1 version 2’ will be created at the time of S1 version 2 Approval with status – ‘Saved’. User can go and submit arrangement ‘A1 version 2’ for approval process.

Figure 13: Impact of Structure Modification and Arrangement changes



* Branch Management

A Citibank branch setup in GCE enables the customer accounts of that branch to participate in the liquidity sweeps domestically as well as on a cross border level. A Citibank branch in GCE is identified by its Citibank Branch Code (For example, London Branch Code: 600). The key branch level parameters are:

1. **Branch Interface Setup**
   1. Billing System Linkage – The two billing systems (GBS and BIS) are for the respective branch to denote the billing format to be followed.
   2. DDA System – The transaction posting interface (Flexcube, Citi Checking and Canada GL).
2. **Settlement Accounts** – The settlement accounts are captured at the branch level to cater to the maintenance of the settlement transactions amounts. For different currency, there exists a specific settlement account.
3. **Branch Holiday** – The weekly holidays are captured for a branch. For example, For US and European branches, the weekly holiday would occur on Saturday and Sunday; For MENA branches, the weekly holiday would occur on Friday. GCE also is intimated by the respective branches regarding the festival/local holidays through a daily feed (containing next 30 days working status)
4. **Transaction Processing Setup**
   1. Back/Future Value Processing
   2. Holiday Processing - to enable the branch to accept transactions with a value date on a holiday.
5. **Branch Online Window** – the working period of the branch where transaction will be posted intraday.

* User Management

A User Profile is a record of user-specific data that define the users working environment within the GCE Application. The record would include user details such as name, role and access settings.

User profiles accessing the GCE application would have restricted access to the screens present in GCE. User profile would define the access provided for a user id.

To set specific access rights to functional users, GCE will first set the entitlements (specific screen access); then assign entitlements to their roles (functional user) and then assign the roles with the users (SOE Id). For Example, Entitlement: Create Product; Role: Operational User (Assign Create Product to Operational User); User: ab12345 (Assign Operational User to ab12345).

An entitlement is linked to a Role. Flow for entitlements will follow in order:

1. Entitlement Creation,

2. Role Creation and

3. User Creation.

A role is defined by a role name and the entitlement associated with it. Role is then linked with a specific user id. Entitlements will be stored as a flag – enabled/disabled, the status of this flag will define the activities assigned to a role. This role id when gets linked to a particular user id will define the rights of that user.

## Operation



### Automated Operation

Prior section describes the administration of setup details for the GCE application. The setup information will be used for generating the sweeps during branch EOD process. All Automated operations including the sweep generation is described below.

* **Sweep Generation**

This section describes the generation process for a concentration pair for a given date.

Key attributes of sweeps are Sweep Id, Sweep Amount, Value Date, Sweep Status, GCE Transaction Reference and Transaction Code:

1. **Sweep Id:** This is a unique identifier for every sweep transactions that GCE creates between a source and header account. The first few characters in the sweep id are used to identify the sweep type. E.g.
   1. EOD Sweep-SWP600\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
   2. Two way reverse sweep-REVSWP600\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
   3. Back value sweep-BVSWP930\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*
2. **Sweep Amount:** Signed Amount of the sweep (+ for Credits and – for debits) is populated. This amount is derived after applying the strategy and various constraints as per setup done.
3. **Value Date:** Value date is typically the EOD business date for the EOD sweeps.
4. **Sweep Status:** The sweep status attribute provides the status of a sweep transaction at any point. When GCE creates a sweep, it is either in status ZERO or NONZERO. A zero sweep is a zero amount sweep. This sweep is of no value and it is ignored. The NONZERO sweep is the one which is picked and posted to DDA. The sweep status is also updated during posting and reconciliation. The status after posting is PENDING. Post reconciliation it is either SUCCESS or FAILED.
5. **GCE Transaction Reference:** This is the transaction reference that GCE will create for purposes of end to end traceability of the sweep transaction. This will have a 16 character format of <GCE><BR CODE<SEQNUMBER> GCE600XXXXXXXXXX. The sequence number will be a sequence number generated for the branch whose EOD process in on. This Sequence number will be unique and will be unique for every branch for every day. Hence if the sweeps processed on another day, the sequence number will be different.
6. **Transaction Code:** Transaction codes play a vital role in the concentration process. Transaction codes are the identifiers of transactions and govern the descriptions of the transactions and the codes that are sent to the customers. GCE populates the required transaction codes based on the following parameters
   1. Sweep Transaction Type (Domestic/Cross Border)
   2. Sweep Transaction Direction (Sweep or reverse sweep)
   3. Source/Target Account Branch code
   4. Direction of fund movement(Credit/Debit)

The following control diagram shows how GCE loops through the days for which it need to generate sweeps, the logic to group concentration pairs into virtual arrangements and generate sweeps for each concentration pairs in sequence.

GCE generates sweeps for the current working date (business date) and all holidays until next working date. For more details please see the below examples.

**Example**: EOD processing days for branch 600 based on the following calendar

**600 Branch calendar**

24.12.2013 Monday – Working date

25.12.2013 Tuesday – Holiday – Christmas

26.12.2013 Wednesday – Holiday – Christmas

27.12.2013 Thursday – Working date

28.12.2013 Friday – Working date

**Case 1:** EOD processing days in case of no holidays after current working date (business date)

On 27.12.2013 when GCE receives the EOD signal from DDA for branch 600 will trigger the EOD only for the business date equal to 27.12.2013.

**Case 2:** EOD processing days in case of holidays after current working date (business date)

On 24.12.2013 when GCE receives the EOD signal from DDA for branch 600 will trigger the following EODs in this order

600 EOD – Business date = 24.12.2013

600 EOD – Business date = 25.12.2013

600 EOD – Business date = 26.12.2013

To facilitate understanding, the following virtual arrangement is used as an example.

Figure 14: Virtual arrangement

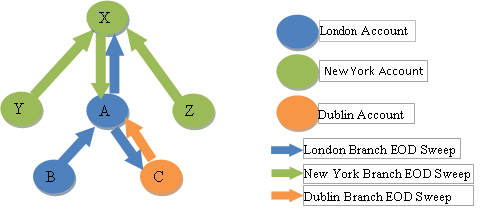


Figure 15: Control flow diagram



While the data flow diagram shows how each attribute of a sweep is decided.

Figure 16: Data flow diagram



* DDA Transaction Generation

Sweeps generated by the concentration engine is split into transaction legs (credit and debit legs together forms a transaction) by APS. If the sweep happens within the country or within the same branch for splitting into transaction legs are used the settlement accounts, otherwise Nostro and Vostro accounts are used. APS uses the same transaction creation logic for all sweeps received (created by GCE or created by GBNP).

* Domestic sweeps

Sweeps that happen within the same branch or between different braches within a country are classified as domestic sweeps. Domestic settlement accounts are used for sweeps across different branches within a country. The transaction legs for different scenarios are provided below.

**Scenario 1:Sweep within a branch( Sweep from account A to B)**

Figure 17: Sweep within a branch



**Scenario 2:Sweep between different branches within the country ( Sweep from a/c A in branch 1 to a/c B in branch 2)**

Different counties use different settlement accounts for domestic transactions. In the US wash accounts are used.

Figure 18: Sweep between different branches within the country



* Cross Border sweeps

Sweeps that happen between two branches from different countries are treated as cross sweeps. For Cross Border sweeps, additional movements are generated transferring funds between the appropriate Nostro/Vostro accounts. The Nostro account for a sweep currency is maintained in the currency centre branch. Currently GCE handles sweeps within Citibank accounts only. Also the current capability does not support multi-currency sweeps. The transaction legs created for each scenario is provided below. Vice-Versa holds true for source and header branch.

**Scenario 1:Source account branch ≠ Currency centre branch of the sweep currency = Header account branch(i.e. Source account is moving money to currency centre branch)**

Figure 19: Cross border sweep with currency center branch equal to header account branch



**Scenario 2:Source account branch ≠ Currency Centre branch ≠ Header account branch**

Figure 20: Cross border sweep with currency center branch different than header account branch and source account branch



* Local Currency Centre solution

There is a different routing introduced to cross branch domestic/cross border sweeps routing by local currency centre solution.

**Scenario 1**: This solution caters countries with more than one branch, where all cross branch movements within the country/outside will flow through the local clearing branch for that currency. The Nostro/Nostro mirror account details for settlement will be captured in the respective Local clearing branch for that currency.

**Example:**UAE has 3 branches Sharjah, Dubai and Abu Dhabi. Dubai is the currency centre and local clearing branch for all currencies for Sharjah and Abu Dhabi. Any cross branch money movement between UAE branches will flow through Dubai. A movement from Sharjah to Abu Dhabi branch is illustrated below

Figure 21: Cross border sweep using local clearing branch (scenario1 example)



**Scenario 2:** Some countries do not maintain direct Nostro relationship with respective currency centre branches. Such countries are dependent on other big branches as their local clearing branch for that particular currency.

**Example:** Vienna (branch 490) does not maintain a Nostro relationship with New York (branch 940) for USD currency. All USD currency settlements for Vienna should be settled through London. A sweep from Vienna to Paris in USD is illustrated below.

Figure 22: Cross border sweep using local clearing branch (scenari2 example)



* Sweep/ Transaction Reconciliation

Sweeps sent to APS have a unique Source reference number. APS will have another set of unique reference number (for e.g. AREF) assigned to every transaction that it processes for posting. Upon receiving confirmation from downstream DDA systems, status of transactions will be marked as success/ failure. The status of a transaction until the acknowledgement is received is pending.

Figure 23: Different possible status of a transaction



* Acknowledgement from DDA systems

The Acknowledgement process varies with different DDA systems. The acknowledgement process for Flexcube and Citi-Checking is provided below.

* + Flexcube Transaction Reconciliation Process

For EOD batch transactions, a single file containing the acknowledgements is sent for a branch for a given business date. In general for EOD batch transactions Flexcube sends only the successful transactions, but for Flex Asia, all transitions are sent with a status (success/failed). For Intraday transactions, every transaction’s acknowledgement is sent separately. The acknowledgement for each transaction contains the status of the transaction (Failed, Success).

* + Citi-Checking Transaction Reconciliation Process

For EOD transactions, a batch file is sent to Citi-Checking and for intraday individual transaction is sent. However for EOD transactions as well as Intraday Transactions, acknowledgment is sent at a transaction level. Citi-Checking also sends an end of transmission message to indicate acknowledgement is complete.

* APS reconciliation

As and when the acknowledgement from the DDA systems is received, the status is updated by APS for the respective transactions/transaction legs. The status of the transaction/transaction legs will be updated to successful or failed from earlier pending status.

* GCE reconciliation

As soon as APS has update the status of transactions based on acknowledgement from the DDA systems, APS will trigger a reconciliation process and GCE will enquire about the posting status of the sweeps. APS provides feedback on status and the sweep status is updated based on rules provided in the table below.

|  |  |  |
| --- | --- | --- |
| **S. No** | **APS transactions** | **GCE Sweep status** |
| 1 | Source & header transactions are successful | Success |
| 2 | Source & header transactions are failed | Failed |
| 3 | Source & header transactions are pending | Pending |
| 4 | Either of Source/Header transaction is successful & other failed | Failed |
| 5 | Either of Source/Header transaction is successful & other pending | Pending |
| 6 | Either of Source/Header transaction is failed & other pending/success | Failed |

* SLA Window for Reconciliation

The window until which APS will wait for transactions to get acknowledged is the next SOD (Start of Day) of the branch that generated the EOD sweeps. After this cut off time APS will mark the transactions as failed.

* Exception Process

In case of exception at the branch level, the Operations user would be able to drill down to the transaction(s) responsible for the exception. These are the transactions for which the reconciliation is not successful. Operations along with Production support team would be able to investigate the cause for the failure and take necessary actions to set right the failure/exception.

### Human Intervention

* Manual Adjustment

Manual Adjustment is a user generated sweep without any restriction of the amount, date and value of the transaction. The purpose of a manual adjustment is to offset any error in the system generated sweep.

GCE offers the production support team a way to recover from EOD failures. If the actual EOD cash concentration process failed to complete successfully, production support users can go the GCE UI and submit a manual EOD request. GCE will check if it has received the balance and the transaction file for the branch and then starts the entire sweep generation process for that branch.

## Integration

* Account Posting Service

GCE through APS provides an interface to Citibank applications to post financial transactions across the spectrum of Citibank branches. APS can be considered to be a broker between GCE and core ledger systems in Citibank branches.

APS is receiving transactions from GCE and GBNP. The transactions are coming in batch during EOD processing. During intraday these transactions are coming either in a batch or in silos. APS is checking if the sweep currency is a valid currency and is applicable for the branch involved in the sweep. After validation a transaction is split into credit and debit legs.

* Structure Broker Feed

A daily feed containing an exhaustive data of all active customer setup information is pushed to Structure Broker component of the liquidity Mart in GIW. This information forms as a basis for structure related customer reports in CitiDirect. This feed is usually sent every day at 21:30 ET.

* Liquidity Mart Feed

Multiple incremental feeds are sent on daily basis to Liquidity Mart in GIW, containing details of transactions processed in GCE. This information forms basis for sweep transaction related customer reports in CitiDirect. Multiple feeds are sent every day at around 22:30 ET, 04:00ET, 08:00 ET and 12:00 ET.

* Billing Feed

GCE sends monthly feeds to Billing Information System (BIS) and Global Billing System (GBS) in BIS prescribed format and MBBS (a legacy billing platform) prescribed formats. GBS and BIS are billing systems which cater to customers in Europe and USA respectively.

The automated transactions being carried out by GCE on behalf of the customer is recorded and that information is sent as a feed to GBS and BIS billing systems.

* Interest Postings

The purpose of IRAL Interface (or IRAL feed) is to send loan positions, associated arrangements and account information to GBNP (Partner System). The GBNP calculates interest for accounts and sends interest information to GIW. The IRAL Interface is started once a day by Quartz scheduler job.

## Management Report

### Scheduled Report

Reports which are generated through scheduled intervals and also by trigger of another event are called as scheduled reports. It can also be accessed by the GCE User Interface. For example, Sweep Status Report, Interest Re-allocation summary report, etc.

|  |  |
| --- | --- |
| **Report name** | **Report description** |
| Sweep Status Report (Balance Mismatch Report) | This report gives a comprehensive overview of all sweep status for a particular date. The report can be run for EOD, intraday and both and by the branch wise. This can be achieved by the filter criterion in the Scheduler. The report process portrays the list of accounts and their balances (both GCE’s expected balance and GIW’s actual balance) and the mismatch amount (if any). The report will be generated only for successful sweeps. |
| Interest Reallocation Summary Report | This report shows the summary of the Interest reallocated between a header and the source account and details on the rate, reallocation strategy and other related details between the concentration pair. The report is generated monthly and will be available at the 1st of every month for the previous month data. |
| Interest Re-allocation Detail Report | This report shows the Interest reallocation detail between a header and the source account and details on the rate, reallocation strategy and other related details between the concentration pair. The report is generated monthly and will be available at the 1st of every month for the previous month data. |
| Interest Reallocation Prior Period Adjustment Detail Report | This report shows the Interest reallocation as part of BVT sweeps happened in the arrangement between a header and the source account and details on the rate, reallocation strategy and other related details between the concentration pair. The report is generated monthly and will be available at the 1st of every month for the previous month data. |
| Interest Failure Exception Report | This report shows the failed Interest reallocation of GCE arrangements that is being posted by the IS. The report is generated daily and will contain the list of Interest reallocation failed to process. |

### Inquiry Report

Inquiry reports are the reports that can be generated on demand by the user. All Excel reports can be fetched as per the business requirements. All *Inquiry reports* will have an UI to trigger the report. User can provide the date range/period and other criteria to generate the report. All the Inquiry reports are Excel reports.

|  |  |
| --- | --- |
| **Report name** | **Report description** |
| Predictor Report | This report provides the information regarding the amounts flowing in and out in a particular currency from a particular branch on the current business date. This is based on the available balance at the time of triggering the report. The report is used by the treasury to keep track of the demand for a particular currency in that branch in order to take suitable currency positions (buy or sell) in the market. This report is a Excel report. |
| Branch Movement Details Report | The Branch Movement Details Report gives the count of active sweeps of the branch, all the arrangements and accounts that are operational in the given input criteria. The report classifies the arrangements and accounts in further subtypes. This report is an Excel report |
| Branch Movement Summary Report | The Branch Movement Summary Report provides the user with the count of number of sweeps (EOD/Intra Day/ Both) that have swept successfully in the mentioned date range. The count for the summary report is done at the leg level (i.e. single sweep is broke up into debit leg and credit leg for domestic sweep). If it is cross border sweep, then the sweep is broke up to more than 2 legs (i.e. Debit Nostro, Credit Vostro, etc). This report is an Excel report. |
| Complete Report | This report shows all details of (active) structure/arrangement including structure information and arrangement attribute information for all arrangements in the branch (for all branches). Complete Report takes into account dependent arrangements and lists them in the following order – first the arrangements where an account is participating as an FCA are listed and subsequently the arrangement where the same account is acting as a source. This report is an Excel report. |
| Sweep Failure Exception Report | This report gives a comprehensive overview of all “failed” GCE sweeps including zero value sweeps for a particular date. The report can be filtered for EOD, intraday and both and by the branch wise. This can be achieved by the filter criterion in the UI. This report is an Excel report |
| APS Reconciliation Report | This report shows all payments/postings with status details per branch. APS is posting all transactions of GCE to downstream systems in through Direct Channel - comprising of Batch or Online mode.  All transactions that are posted through APS has to be reconciled whether it has reached the downstream system or not in the desired time frame and the payments/transactions that misses this, needs to be investigated upon to enable OPS team to take corrective actions. |

# Business Processes

## 5.1. Primary Process

GCE is the last application which executes in the customer account for a branch in a day.

### End of Day process (EOD)

The single most important process in the application is the End of Day process for a branch. It is also the most resource intensive and time-critical.

Figure 24: The high level flowchart diagram for the End of Day process



* Pre-loading (Create & store AWU)

This process gets initiated when a DDA System (FlexCube/CitiChecking/Canada GL) sends an End of Day (EOD) message to GCE. On receiving the message, GCE will fetch the details of the account concentration pair which will be participating in EOD and load them into database work tables.

For a concentration pair to participate, its header account or source account has to be held in the EOD branch or the whole concentration pair’s structure is tagged to be run in the EOD branch (the tagging functionality was provided in GCE 1.4 release). Hence there is a possibility that a concentration pair to be picked up for processing utmost 3 times in a day (Source branch EOD, Header branch EOD and tagged FCA branch EOD).

In addition, its sweep schedule is checked to make sure it is eligible to be run for the particular day (e.g. a concentration pair set up to be run on every Tuesday will not run on the other six days of a week). The EOD process also checks account status (whether account is open or closed) and whether the account has any posting restriction imposed on it that should be adhered.

The process then constructs virtual arrangement (aka virtual structure) if a final concentration account in an arrangement acts as a source in another arrangement. These concentrator pairs of the same virtual arrangements are grouped together to form an arrangement work unit (AWU). All participating concentration pairs in an AWU have to be executed in sequence, while concentration pairs in different AWUs can run in parallel.

Figure 25: Example of creating a Virtual Structure/AWU

Virtual Structure/AWU

Concentration Structures

* Balance File Processing (i10 File)

DDA System sends an account balance file containing balances for all the accounts in the DDA system. GCE will then filter the Balance file for all active accounts. Active accounts are accounts that belong to arrangement that are effective on that EOD business date. This filtered file is stored into a work table.

When all the files have been received for the EOD branch, preloading is complete and no other branch’s EOD process is running, the filtered file is then picked up divided into multiple chunks and then processed in parallel jobs and results are updated to the database.

* Transaction File Processing (i7 File)

The DDA System sends a transaction file containing back value transactions to GCE. This file will contain ALL transactions on the DDA that are posted on that business date with a back value date. GCE will filter the file after receipt and remove the irrelevant transactions for the accounts that are not participating in EOD and that are not BVT enabled. This filtered file is then stored into the work tables.

When all the files have been received for the current EOD branch, preloading is complete and no other branch’s EOD process is running, GCE creates multiple chunks of the filtered transaction file and process them in parallel jobs using ComputeGrid Batch processing and store the processed information into the database.

* Generating Sweeps

Business rules processing starts after transaction and balance processing completes. GCE will fetch arrangement work units (AWU) stored during the preload step and process them in parallel using ComputeGrid framework.

Each concentration pair in an arrangement work unit is processed sequentially. Back value dated transactions will be generated as sweeps with value date in the past. They will also have an impact on today’s sweep amount, as the amount has to be adjusted by back value dated sweeps. Business rules in ILOG JRules is used to determine the sweep amount, value date and posting date dependent on concentration strategy, balance movement type and sweep constraint. If there are any two way sweeps, reverse sweeps are created for same amount, but from header to source with value date equal to the next common working date (*the immediate date on which both source branch and header branch are working*) of source and header. However the reverse sweeps are held back in GCE until the value date of the reverse sweep coincides with the business date of branch. On such coincidence the reverse sweeps are translated to respective transaction legs and posted to DDA system in intraday transaction format.

For accounts that are involved in the EOD process and whose balances are not present in EOD balance feed, GCE fetches balance information from GIW.

* Create DDA transactions

After completion of sweep calculation, the post processing component of GCE will fetch the sweeps from the work tables and generate an output file in XML format. This output file is then sent to APS which, in turn, sends it to the DDA system for posting. All data corresponding to the current EOD is then cleared from the work tables.

As part of generating the transaction file, the application does the following determination using built-in business rules logic. If the transaction request is inter branch movement then the APS module determines the settlement accounts or wash accounts to use and creates transaction postings accordingly. If the transaction request is cross border, APS determines currency center and the respective Nostro/Vostro accounts, creates transaction postings accordingly. As part of GCE 1.4 release scope, APS will provide the capability to route transactions for a branch through a local currency center instead of the default option of routing through the currency’s center. APS accepts sweeps from GCE and interest postings from GBNP in the form of a XML file. APS splits the sweeps into transactions and transactions into legs. Transaction will be split into 2 legs, one credit and one debit as detailed in *DDA transaction generation* section earlier in the document.

* Translate and Post Transactions

APS groups the transaction legs according to branch and posting date and sends them to the respective branches in a format agreed with each of those branches.

During an EOD process for a branch, APS would send a batch file containing the transactions comprising of the individual debit/credit legs. For transactions pertaining to non-EOD branch, the below process is followed for posting the transaction legs.

* If a branch status is online, then transactions to that branch can be sent individually (Intraday)
* If the branch is closed, the files shall be archived and will be posted on SOD (Start of the Day)

**Also reverse sweeps are held back in APS until the value date coincides with the business date to post them to DDA systems (for reverse sweeps value date and posting date are the same).**

* Acknowledgement and Reconciliation

DDA system sends acknowledgement back to GCE for EOD postings and APS reconciles transactions and updates GCE updates the status of sweeps. For further details please refer *Sweep/ Transaction Reconciliation* section earlier in the document.

* EOD Balance Reconciliation

After batch transactions are posted as part of EOD file interchange, the DDA application sends post sweep or True EOD balance file. This file is in i10 balance format and contains the true end of day balance as seen by customers.

As part of business reconciliation, the application automatically checks whether the GCE prescribed accounts in the file achieved its strategy (e.g. target balance, residual balance, etc.) or not. In cases where the closing balance does not equal target balance, the reconciliation process checks whether this is due to an agreeable exception such as a defined constraint. Cases where the exceptions could not be attributed automatically to known valid reasons are highlighted in reconciliation report for further investigation. Completion of the process at the earliest time ensures potential business impact cases are identified and acted upon thereby reducing or negating customer impact.

**Example**: Consider the below mentioned Domestic structure and its balance information. All the source accounts in the structure are expected to achieve target balance of zero after the NY EOD. However, account 4 closed with a non-zero balance. If the concentration pair (4, 2) had a MAX constraint of $25 then it goes on to explain that the application required a transaction of $75 to achieve target balance. Since the maximum amount the sweep transaction can contain is only $25, the remaining $50 is left in the account. This reason is automatically deciphered in the recon process and the exception is categorized as a valid exception requiring no additional investigation. However, if there are no constraints or the account balance cannot be explained by the known constraints, then the deviation (of account balance closing in non-zero balance) will be highlighted in the report triggering manual investigation.

Figure 26: Example of Balance reconciliation

Acc 1-USD-NY

Acc 2-USD-NY

Acc 3-USD-NY

Acc 4-USD-NY

Acc 5-USD-NY

$0

$0

$50

$0

After EOD Sweep

**$5**0

0

Acc 1-USD-NY

Acc 2-USD-NY

Acc 3-USD-NY

Acc 4-USD-NY

Acc 5-USD-NY

$100

-$50

$75

-$25

Before EOD Sweep

0

**Timing aspect**

In GCE are used two types of structures:

* **Follow the sun structures**

In “follow the sun” structures, the source branch EOD processing happens before the header EOD process. In this case the sweep happens only once as the source account EOD happened earlier and the source account has already achieved its strategy.

**Example:** Follow the Sun structure

The arrangement has a Dublin header a/c and a Frankfurt source a/c and for both accounts the sweep strategy is target balance equal to 0.

The order of EODs in GCE is Frankfurt followed by Dublin and details about each EOD can be found below.

Dublin

Frankfurt

**First EOD - Frankfurt (Header) EOD**

*Before EOD*

* Header a/c balance = 0 (Balance [A]=0)
* Source a/c balance = 0 (Balalnce [B]=100)

*During EOD*

* A sweep of 100 is generated between B and A. **B is debited with 100**.

*After EOD*

* Header a/c balance = 100 (Balance [A] = 100)
* Source a/c balance = 0 (Balance [B] = 0)

End Frankfurt branch is closed.

**Second EOD -** **Dublin (Source) EOD**

*Before EOD*:

* Header a/c balance = 100 (Balance [A]=100)
* Source a/c balance = 0 (Balalnce [B]=0)

*During EOD*

* The source a/c already achieved its stratedy and there is nothing left to sweep from Frankfurt source a/c during Dublin EOD. No sweep generated for the pair during this EOD

*After EOD*

* Header a/c balance = 100 (Balance [A] = 100)
* Source a/c balance = 0 (Balance [B] = 0)

End Dublin branch is closed.

**In this case the pair is executed only on source a/c branch EOD.**

* **Against the sun structures**

In “*against the sun*” structures, the source branch EOD processing happens after the header EOD process. In such cases, the money swept from source to header during the source branch EOD, will not reach the FCA on the same value date. In such cases GCE takes the onus of carrying the funds to the FCA, during source branch EOD. This is referred to as sweep propagation.

**Example 1**:Against the Sun structure

Frankfurt

Dublin

The arrangement has a Frankfurt header a/c and a Dublin source a/c and for both accounts the sweep strategy is target balance equal to 0.

The order of EODs in GCE is Frankfurt followed by Dublin and details about each EOD can be found below.

**First EOD - Frankfurt (Header) EOD**

*Before EOD*

* Header a/c balance = 0 (Balance (A)=0)
* Source a/c balance = 0 (Balalnce (B)=100)

*During EOD*

* A sweep of 100 is generated between B and A. **B is debited with 100**.

*After EOD*

* Header a/c balance = 100 (Balance (A) = 100)
* Source a/c balance = 0 (Balance (B) = 0)

End Frankfurt branch is closed.

**Between Frankfurt EOD and Dublin EOD**

The source a/c is credited by 250. This is possible because Dublin branch is open and the source a/c can be credited or debited at any time before Dublin EOD.

**Second EOD -** **Dublin (Source) EOD**

*Before EOD*:

* Header a/c balance = 100 (Balance (A)=100)
* Source a/c balance = 250 (Balalnce (B)=250)

*During EOD*

* A sweep of 250 is generated between B and A. **B is debited with 250**.

*After EOD*

* Header a/c balance = 350 (Balance (A) = 350)
* Source a/c balance = 0 (Balance (B) = 0)

End Dublin branch is closed.

**In this case the pair is executed twice, during Frankfurt EOD and during Dublin EOD.**

**Example 2**:Again the Sun structure between Flexcube and CitiChecking (Sweep Propagation, a special case of against the sun)

Frankfurt

Dublin

New York

The arrangement used for this example is presented above and has the following accounts: Frankfurt FCA a/c, Dublin intermediate a/c and New York source a/c.

The order of EOD in GCE is Frankfurt followed by Dublin and New York.

**First EOD -** **Frankfurt (FCA) EOD**

*Before EOD*:

* FCA a/c balance = 0 (Balance [A]=0)
* Intermidiate a/c balance = 100 (Balance [B]=100)
* Source a/c balance = 100 (Balance [C]=100)

*During EOD*

* A sweep of 100 is generated between B and A. **B is debited with 100**.

*After EOD*

* FCA a/c balance = 100 (Balance [A]=100)
* Intermidiate a/c balance = 0 (Balance [B]=0)
* Source a/c balance = 100 (Balance [C]=100)

And Frankfurt branch is closed.

**Second EOD -** **Dublin (Intermidiate) EOD**

*Before EOD*:

* FCA a/c balance =100 (Balance [A]=100)
* Intermidiate a/c balance = 0 (Balance [B]=0)
* Source a/c balance = 100 (Balance [C]=100)

*During EOD*

* A sweep of 100 is generated between C and B. **C is debited with 100**.
* A sweep of 100 is generated between B and A. **B is debited with 100**.

*After EOD*

* FCA a/c balance = 200 (Balance [A]=200)
* Intermidiate a/c balance = 0 (Balance [B]=0)
* Source a/c balance = 0 (Balance [C]=0)

And Dublin branch is closed.

**Between Dublin EOD and New York EOD**

The source a/c is credited by 250. This is possible because New York branch is open and the source a/c can be credited or debited at any time before New York EOD.

**Third EOD –** **New York (Source) EOD**

*Before EOD*:

* FCA a/c balance =200 (Balance [A]=200)
* Intermidiate a/c balance = 0 (Balance [B]=0)
* Source a/c balance = 250 (Balance [C]=250)

*During EOD*

* A Sweep of 250 is generated between C to B. B will be credited on next working date and value date will be equal to current business date (Dublin branch is already closed)

*After EOD*

* FCA a/c balance = 450 (Balance [A]=450)
* Intermidiate a/c balance = 0 (Balance [B]=0)
* Source a/c balance = 0 (Balance [C]=0)

And New York branch is closed.

**Failure scenarios & Recovery**

The sweep processing starts only if both the Balance file processing & the transaction file processing are successful. In case of any failure in the batch or any one of a parallel job, the EOD batch is re-triggered from pre-loading. The Production support team has the option to override this and restart the entire batch including pre-loading.

### Start of Day process (SOD)

Start of Day (SOD) process is triggered by the signal received from DDA system of specific branch. The signal signifies that the branch is “open” to accept transactions for the next business day. SOD signal triggers three key processes in GCE which are described below.

Figure 27: The high level flowchart diagram for the Start of Day process



* RECONCILIATION

GCE on the event of SOD signal for a branch reconciles sweep transaction status with APS. On receipt of the SOD signal, APS force updated previous day pending transactions to failed and shares the status of all transactions posted for the respective branch with GCE. This reconciliation is over and above the reconciliation that happens during the EOD process for that branch. Also sweeps that were held back the previous business day due to branch closure is posted and immediately reconciled.

Once this process is completed, the next process is to update loan positions.

* LOAN POSITION

A successful sweep means a beneficiary account has received money successfully from a remitter. It is fair to say a loan transaction has been completed. For the loan given, interest needs to be calculated. Hence GCE maintains the loan position. During the SOD loan position process, GCE computes and updates the loan position for all successful sweeps of a branch.

* A loan position is essentially the “loan” given by the source account to the header account. This is the amount that is swept between the two accounts as part of the end of day sweep or intra days sweep.
* There are two kinds of Loan positions that need to be retained for various purposes – used for primarily Interest re-allocation and customer reporting.
  + **Daily loan Position** – The daily Loan position essentially mirrors the sweep amount that takes place between the source and the header account. If funds are transferred from the source to the header, the daily Loan position for that date is considered positive. Otherwise if funds flow from the header account to the source account then the loan position is considered to be negative.
  + **Cumulative Loan position** -The Loan position as considered above is a ‘cumulative” position that applies for a given duration. The Loan position should be maintained for the duration as specified during the structure setup. On the expiry date (The date on which the loan is scheduled to get over) the Loan position needs to be reset (to Zero).
* The loan position is maintained by value date. Based on the cumulative loan position of each value date, interest is calculated and posted on month end.
* In the case where BVTs are processed and the Loan position has been reset to Zero between the Back Value date and the current business date, the Loan positions will be updated across ALL the days with the back value amount and the Starting Loan position on the reset date will change due to the back Value transaction.

**Example:** The following table depicts how loan position is maintained in GCE.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Value Date** | **Source A/c** | **Header A/c** | **Sweep Amount** | **Daily loan position** | **Cumulative loan position** | **Remarks** |
| 1-Apr-13 | A | B | 100 | 100 | 100 | 100 was swept from Source to Header |
| 2-Apr-13 | A | B | 100 | 100 | 200 | 100 was swept from Source to Header |
| 3-Apr-13 | A | B | 100 | 100 | 300 | 100 was swept from Source to Header |
| 4-Apr-13 | A | B | -100 | -100 | 200 | 100 was swept from Header to Source |
| 5-Apr-13 | A | B | 100 | 100 | 300 | 100 was swept from Source to Header |

Subsequently on 6th April there is a BVT for 100, with value date of1st April on Source a/c A. This will affect the cumulative loan position on Aprils 1st onwards and the loan position would accordingly change as reflected below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Value Date** | **Source A/c** | **Header A/c** | **Daily loan position** | **Cumulative loan position** | **Remarks** |
| 1-Apr-13 | A | B | 200 | 200 | Impact of BVT for 100 |
| 2-Apr-13 | A | B | 100 | 300 | Impact of BVT for 100 |
| 3-Apr-13 | A | B | 100 | 400 | Impact of BVT for 100 |
| 4-Apr-13 | A | B | -100 | 300 | Impact of BVT for 100 |
| 5-Apr-13 | A | B | 100 | 400 | Impact of BVT for 100 |

Post loan position update process, the reverse sweep process will start.

* REVERSE SWEEPS

During this SOD process, sweeps with a posting date of the SOD date will be posted. These sweeps include the reverse leg of a two way sweep. This process also posts recovery sweeps if any. These sweeps are sent to DDA system in an intraday file format for posting. These sweeps are immediately reconciled.

## 5.2. Supporting Processes

### 5.2.1. Client on boarding

A Citibank Corporate Customer requesting the services of automated cash concentration through GCE needs to be enabled and active in GCE. Also the accounts (of the customer) which will be participating in the automated sweeps should be part of a branch which is active in GCE.

### 5.2.2. Maker and Checker Process

Any Functional entity in GCE has a Maker Checker process. A functional entity like Arrangement has to be approved by an Approver (Checker), who is other than the creator (maker) of the arrangement. For Example, Product has a maker checker process; Branch has a maker checker process.

### 5.2.3. Access/Entitlement Review Process

GCE UI uses the Citi standard of SiteMinder for URL access protection. Our SiteMinder instance is backed by GCE’s own LDAP.

Adding a user to GCE is essentially a two steps process.

1. Request Application Manager to add the user to the LDAP to pass the SiteMinder authentication.
2. Request ISA team to assign the user to a particular role to manage authorization.

Below is a list of user roles defined in GCE.

|  |  |
| --- | --- |
| **Roles** | **Role Description** |
| Maintenance | User Maintenance |
| Override | Override |
| Admin | Branch & User Maintenance |
| Report | Reporting |
| Admin | Branch Administration |
| Inquiry | Access to Inquiry Screens |
| GCE Manual Control | Manual control access to GCE process |
| GCE Dashboard | View GCE Dashboard |

GCE feeds user data every night to EERS and EERS validates all the users and alerts the application manager in case an authorized user has gained access or a user is no longer valid.

Within the application, GCE implements standard Maker-Checker functionality for the creation and modifications of all account structures, concentration arrangements and manual adjustments/sweeps. Any transaction initiated by a maker is queued up in the checker’s queue. Checker validates the data and approves the transaction. Only on successful approval can the transaction take place. Entitlements ensure that each user has access to just the necessary functionality.

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