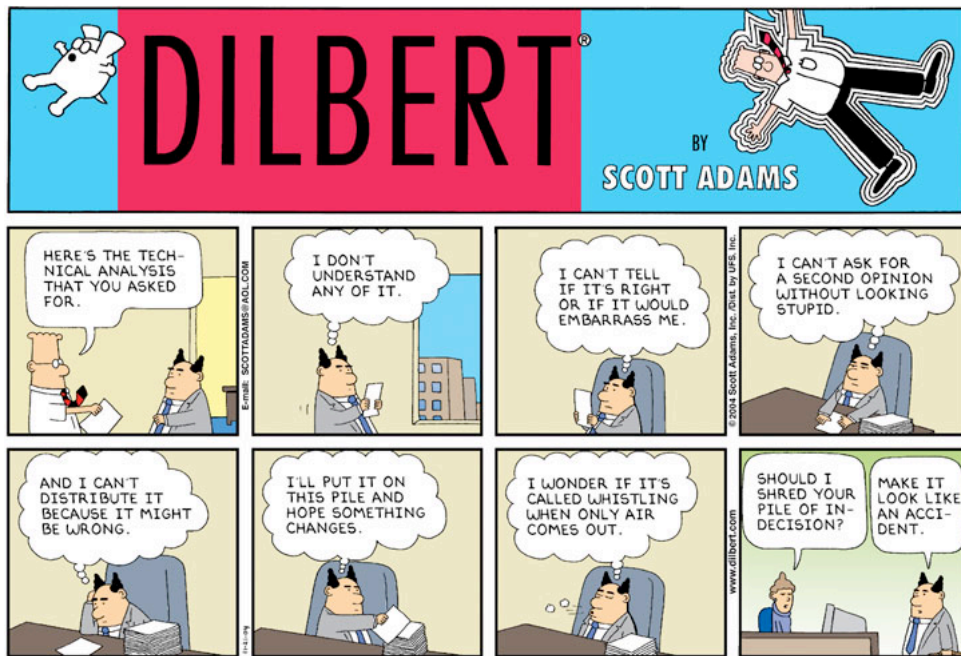

1. Introduction

There is considerable confusion among the XXX developers and testers with regard to balance information retrieved from XXX. A number of balance-related defects were reported in XXX that upon further analysis turned out to be caused by a badly understood, but correct, implementation of the XXX functional requirements.

This document provides a short course in XXX balances and how they relate to the various reports in the XXX.



2. Balance

Most people entertain a rather naïve concept of an account's balance. They envisage a small vault, filled with gold coins, being maintained by the bank on behalf of its customers. As transactions are executed, the amount of gold in the vault increases and decreases. In this view the balance at any given time equates the amount of gold that is currently in the vault, which can be determined by carefully counting the coins.



In reality there is no such thing as this vault. Instead, an account should be viewed as a key under which an endless flow of debit and credit instructions is settled. If you deposit money in the bank that money becomes property of the bank and you build up

a credit position against it. If you then transfer money to someone else's account your credit position with respect to the bank is changed to reflect this, and so is the credit position of the receiver. In this view of the world the balance in an account cannot be determined by counting gold coins, but must instead be calculated based on the transaction flows. This is what XXX does.

2.1. **Book balance and value balance**

Because balances exist in the virtual world of debit/credit position settlement all sorts of interesting bookkeeping tricks are available. These tricks are used to maximise interest earnings or to record future or past transactions (i.e. corrections). For instance I can instruct the bank to transfer an amount of money at a given date in the future. Or the bank can pretend to need a couple of days to transfer the amount (in the meantime, no interest has to be paid on the sum and it can be used to fund short term speculations by the bank).

This realisation has led to a difference in *book date* and *value date*. The book date reflects the date on which a transaction to transfer money has been booked in the bank's general ledger. The value date on the other hand reflects the date that the underlying change in your credit position takes effect. This may be today, in the future or in the past!!! This playing around with book and value dates also makes it possible for the bank to make corrections on past transactions by booking a new transaction with a suitable value date in the past.

Because each transaction has both a book date and a value date a balance calculation can focus on which transactions have been booked (the *book balance*) or on which transactions have become effective (the *value balance*).

Today's **value balance** reflects the amount of money the banks owes you¹ today (the interest bearing amount). The **book balance** reflects the amount of money that has been booked to/from your account (available for transfer). A change in the book balance tells you that the bank has processed a transaction (i.e. booked a transaction in its general ledger) and that you have more/less money to spend (transactions are balance checked against the intra-day book balance (which includes items that will be cleared and booked on the same day)).

2.2. **Forward available balance**

In cases where transactions are booked with value dates in the future the concept of a *forward available balance* arises. This is the predicted value balance for a given date in the future. Suppose you are almost broke (let's say only €100 left in your account) and the bank books your €2000 salary deposit on Friday with a value date of Monday. In that case on Saturday your value balance is €100 and your forward available balance for Monday is €2100. The bank likes to tell you on Friday that your salary deposit/transfer has been booked, because they hope that you start spending on Saturday so that you run a short-term debt on Saturday and Sunday. If you spend €500 on Saturday that transaction is booked immediately with a value date of Saturday! Saturday's value balance then becomes -€400 and the forward available balance of Monday is changed to €1600.

¹ Or, if you are in a debit position, the amount of money you owe the bank.

3. Swift messages

S.W.I.F.T. (a.k.a. “Swift”) is the Society for Worldwide Interbank Financial Telecommunication. Banks all over the world exchange information using Swift’s network services. Over the years the Swift network has become the backbone of the international financial world.



To help in exchanging information, Swift has defined a large number of standard message formats: the Swift messages. Banks use Swift messages to send financial information to each other and to customers.

For XXX and XXX two Swift messages are of particular interest: the MT940 (customer statement) and the MT942 (interim transaction report; intra-day). These messages are used to inform the receiver about booked financial transactions. XXX uses these statements to calculate the various balances of an account. XXX then retrieves some or all of this information from XXX.

(Swift messages contain information in certain fields, called *tags*. Each tag has a number-related key and a value. The Swift message definition contains the specification of which tags are contained in which message, what the syntax of the tag’s value should conform to and what the information in the value means.)

3.1. MT940 (Customer statement)

The Swift MT940 message is used to report on transactions (entries) that have been booked to an account. It is the definitive report by the bank about booked transactions and the information in the MT940 could be used to create a printed statement to be sent to the account holder.

An MT940 contains (among other things):

- Account number
- An opening (book) balance, containing:
 - Debit/credit marker
 - Book date
 - Currency
 - Amount
- Statement lines, each line containing (among other things):
 - Value date
 - Debit/credit mark
 - Amount
- A closing (book) balance, containing:
 - Debit/credit marker
 - Book date
 - Currency
 - Amount
- Closing available (value) balance, containing:
 - Debit/credit marker
 - Book date
 - Currency
 - Amount

- Forward available balance(s), containing:
 - Debit/credit marker
 - Book date
 - Currency
 - Amount

The MT940 message thus reports about transactions booked and contains reported value balances for “today” and specific dates in the future.

The following example comes from the Swift manual:

On 23rd June 1998 you receive a Swift message containing the following information:

- Opening (book & value) balance on 23-6-1998 is \$ 395,212,311.71 Credit
- Three statement lines:
 1. Value date of 23-6-1998: \$ 50,000,000.00 Credit
 2. Value date of 25-6-1998: \$ 5,700,000.00 Credit
 3. Value date of 26-6-1998: \$ 200,000.00 Credit
- Closing book balance on 23-6-1998 is \$ 451,112,311.71 Credit
(this is the sum of the opening balance and the three statements)
- Closing available (value) balance of \$ 445,212,311.71 Credit
(this is the available cash on 23-6-1998; it consists of the opening balance, plus the first statement)
- Forward available balance on 25-6-1998 is \$ 450,912,311.71 Credit
(this is the closing available balance, plus the second statement which will have become available on the 25th)
- Forward available balance on 26-6-1998 is \$ 451,112,311.71 Credit
(this is the previous forward available balance, plus the third statement which will have become available on the 26th)

3.2. MT942 (Interim transaction report; a.k.a. intra-day)

The MT942 (intra-day) message is sent as an interim report on booked transactions. It contains information on transactions booked since the last MT940 was received. The message definition also supports reporting only on a subset of transactions (above and beyond a floor/ceiling amount). **All transactions reported through an MT942 will eventually be reported through an MT940 as well.**

An MT942 contains (among other things):

- Account number
- A (book) date
- Statement lines, each line containing (among other things):
 - Value date
 - Debit/credit mark
 - Amount
- Total and number of credits in this MT942
- Total and number of debits in this MT942

Please note that the standard MT942 does not contain balance information²! The intra-day messages serve purely as a report on transactions that have been booked during the day. The effect on the balances is reported through a subsequent MT940. This way of working probably harks back to the past where intra-days were sent as transactions came in and the MT940 with all its complex balance calculations were generated in a nightly batch process.

² We use MT942 messages do contain balance information, but that is a local customization.