NCSD Exchange Gateway

A description of the automated feed of exchange trades to the VPC system

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2009-03-18 Version 1.7

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Contents

Document history

Date	Version	By	Description
2006-11-21	1.3	VPC Clearing & Settlement Services	Updated with information regarding NCSD Network
2007-05-12	1.4	VPC Clearing & Settlement Services	Information on reference number from Saxess have been moved to field :70E::SPRO
2007-10-09	1.5	VPC Clearing & Settlement Services	Updated regarding that internal trades are now also received from Saxess. Also update regarding the first position in the reference number.
2007-10-22	1.6	VPC Clearing & Settlement Services	Updates regarding the Saxess upgrade. The dissemination of the trade is delayed.
2009-03-18	1.7	Euroclear Sweden AB, Clearing & Settlement Services	Change to Euroclear Sweden layout

1. Introduction

Euroclear Sweden's participants are able to have their NASDAQ OMX Stockholm trades directly routed to the VPC System via the NCSD Exchange Gateway. The automated and direct routing to the VPC system increases the participant's possibility for STP, reducing need for manual intervention and enrichment.

The NCSD Exchange Gateway increases efficiency by giving the participants the option to specify the CSD account directly on the exchange order. The trades from Nasdaq OMX Stockholm are routed in real-time directly to the VPC system. Technically, the trade messages are converted into ISO15022 format and the instructions are processed according to the VPC system routines. The participant may also choose to receive settlement status and confirmations in ISO15022 format or in the proprietary format.

The implementation of the NCSD Exchange Gateway was one of the first outcomes of the Euroclear Sweden-Euroclear Finland merger, increasing STP and harmonising in the Swedish and the Finnish marketplaces. The NCSD Exchange Gateway is in Finland used for all Nasdag OMX Helsinki trades, a consequence of the market practice that all trades are directly fed into the Finnish Clearing and Settlement System.

For further details regarding Euroclear Sweden's clearing and settlement process, please see product description on www.euroclear.com. The website also contains information about Euroclear Sweden's technical interfaces, both in the proprietary and in the ISO15022 format.

1.1. Definitions

Exchange Gateway
This description only contains information about, and refers to, the Exchange Gateway used in Sweden, i.e. the automated routing of transactions from the Nasdaq OMX Stockholm to the VPC system.

Saxess system
The Saxess Exchange System is currently implemented in all Norex markets, i.e. Sweden, Finland, Norway, Denmark, Iceland and the Baltic states.

CSD account
The CSD account is the account in the VPC system, it can either be an owner account or a nominee account.

Trade message
The trade message is the Trade Clearing Unicast from the Saxess system.

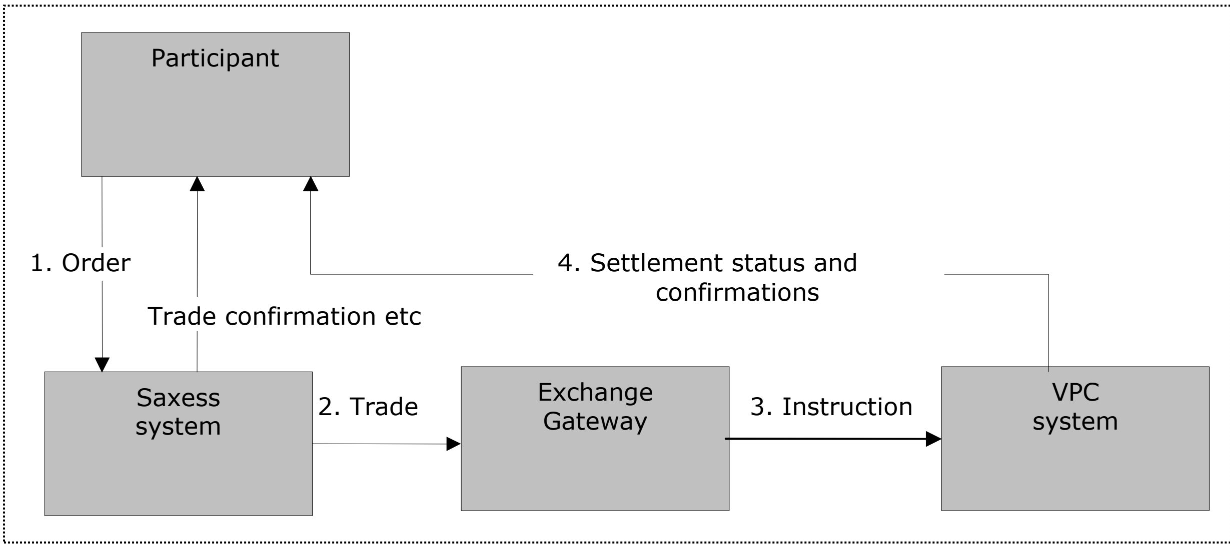
Base32
Base32 is a way of encoding data, used in various situations. In this application, it is used in order to fit the longer, unique Saxess reference numbers into the ISO15022 reference field which is a maximum of 16 characters. For further information regarding the ISO15022 standard and the different message types, please see information provided by SWIFT[1]. More information regarding Base32 is presented in the Technical description.

[1] www.swift.com and www.ISO15022.org

2. Product description

2.1. Transactions flow

Figure 1



(1) **Order.** The participant enters an order into the Saxess system and receives a trade confirmation when a trade is executed.

(2) **Trade.** After execution, the trade message is fed into the Exchange Gateway.

(3) **Instruction.** The Exchange Gateway converts the trade message into ISO15022 format and transmits the settlement instruction into the VPC system.

(4) **Settlement status.** Euroclear Sweden provides settlement status and confirmations, either in the Euroclear Sweden proprietary format or in the ISO15022 format[2].

2.2. Order and trade

Please note that one order can result in multiple trades and subsequently settlement instructions. There is no one-to-one relationship between the order and the trade. It is the trade that is fed into the Exchange Gateway, via the trade message, and into the VPC system.

Each trade generates a receipt or delivery instruction in the VPC system. If the participant has bought securities, a receipt instruction is generated, and if the participant has sold securities, a delivery instruction is generated.

Also internal trades are sent to the VPC system for settlement. The internal trades are sent as a receipt instruction and a delivery instruction with the same counterparty for internal settlement in the VPC system.

2.3. Account instruction

The participant can choose different methods for instructing which account(s) that should be used for the securities deposits and withdrawals.

There are three alternatives for instructing which account the deposit/withdrawal is registered to/from;

[2] Either via SwiftNet or NCSD Network.

1) The participant states a default account, which is registered by Euroclear Sweden. All deposits/withdrawals will automatically be generated to/from this account. Please note that, even if a default account is registered, a CSD account indicated in the order to Nasdaq OMX Stockholm, will "override" the default account.

2) No default account is stated and the participant indicates a CSD account in a specific field in the order to Nasdaq OMX Stockholm. The securities deposit/withdrawal is registered to/from this account.

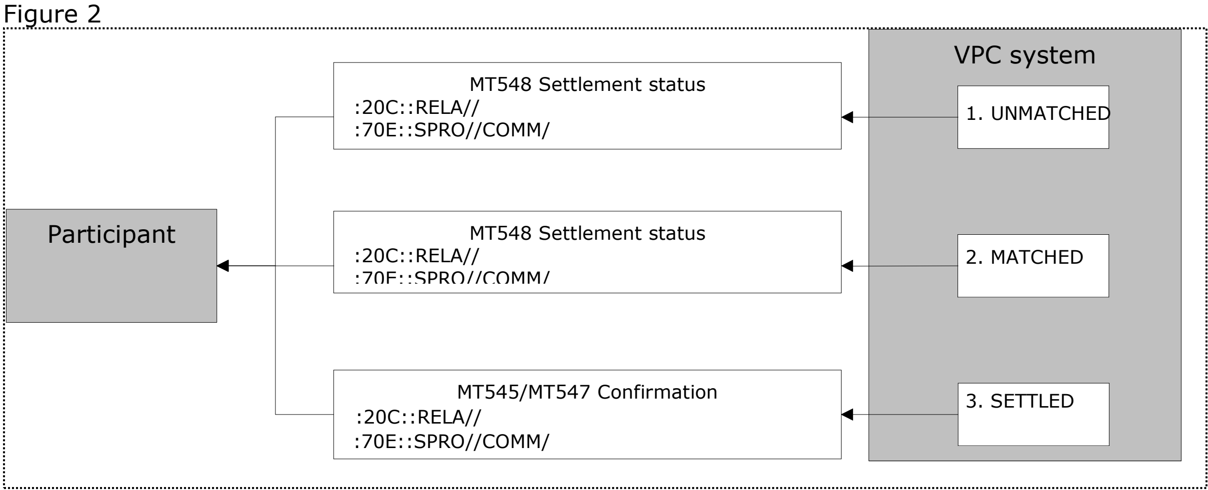
3) No default account is stated and no account is indicated in the order to Nasdaq OMX Stockholm. The participant must then instruct the deposits/withdrawals separately, either via Euroclear Sweden's proprietary interface or via ISO15022.

2.4. Status and confirmations

Euroclear Sweden provides settlement status and confirmations either in the Euroclear Sweden proprietary format or in the ISO15022 format. If the participant uses SWIFTNet or MQ via NCSD Network, all status and confirmations are reported on a trade-by-trade basis in real time and includes the reference numbers, enabling the participant to reconcile the trades. If the participant uses FTP files, all status and confirmations are reported as batches.

The figure below illustrates a flow in the ISO15022 format.

Figure 2



(1) **Unmatched.** Immediately after the trade execution and the trade instruction has reached the VPC system, the first MT548 is sent with status unmatched. The following fields contains the reference numbers;
- :20C::RELA contains the converted reference numbers.
- :70E::SPRO contains all the reference numbers from the Saxess system and clearing reference number see below 3.1.2.

(2) **Matched.** After the instruction has been matched, the next MT548 is sent with status matched. The following fields contains the reference numbers;
- :20C::RELA contains the converted reference numbers.
- :70E::SPRO contains all the reference numbers from the Saxess system and clearing reference number see below 3.1.2.

(3) **Settled.** When the instruction is settled, the MT545/MT547 is sent. The following fields contain reference numbers;
- :20C::RELA contains the converted reference numbers.
- :70E::SPRO contains all the reference numbers from the Saxess system and clearing reference number see below 3.1.2.

2.5. Cancellations by Nasdaq OMX Stockholm

When an executed trade is cancelled, NASDAQ OMX Stockholm sends the same trade message but marks it as a trade cancellation. This message will follow the normal trade flow through the Exchange Gateway to the VPC system where the original instruction will be cancelled (if and when the conditions are fulfilled according to the rules in the VPC system).

3. Technical description

3.1. Trade reference description

The Exchange Gateway uses a Base32 conversion to convert the unique reference numbers from the Saxess system. The purpose is to fit the longer, unique Saxess reference numbers into the ISO15022 reference field which is a maximum of 16 characters. The converted reference will constitute the "transaction reference number" in the proprietary format. In the ISO15022 format, all status, confirmation and reconciliation messages from Euroclear Sweden will refer to this reference in tag :20C::RELA//.

3.1.1. Saxess system

In the Trade Clearing Unicast the following general information is used by the Exchange Gateway to create the transaction reference number in the settlement instruction.

Table 1

Field	Length	Description
Is this a cancelled trade	1	Yes or no flag (Y / N)
Trade notification	1	Yes or no flag (Y / N)
Order book id	9	Identity of the order book
Trade notification number	8	Unique per order book id
Trade number	8	Unique per order book id
Time of trade execution	14	Date and time

In the Trade Clearing Unicast, there is a field indicating if the trade is cancelled or not. If the field value is N (No), it is a new trade, if the field value is Y (Yes) it is a cancelled trade.

In the Trade Clearing Unicast there is a field indicating if the dissemination of the trade is delayed or not.

If set to 'N', it is a normal trade, no delayed dissemination, then;
1) Trade number will be received from Saxess.
2) Trade notification number will then be blank

If set to 'Y', the dissemination of the trade is delayed, then;
1) Trade notification number will be received from Saxess instead of the trade number.

2) Trade number will then be blank.

The fields used in the Base 32 conversion from the Trade Clearing Unicast are;

- Order book id
- Trade number or Trade notification number
- Time of trade execution

3.1.2. Exchange Gateway

In the first position in the reference number the Exchange Gateway will indicate if it as a new trade buy (B), new trade sell (S), cancellation buy (X) or cancellation sell (Y), not converting this to Base32.

The Exchange Gateway will use the full length of the order book id and trade number/trade notification number. For the field time of trade execution, the Exchange Gateway will only use the 6 characters constituting the date (yymmdd), reducing the field to 6 characters.

When converting according to Base32, Euroclear Sweden will place trade number/trade notification number before orderbook id. In the right column, the converted reference is shown.

Table 2

Field	Length	Using	Base32
Buy, sell, cancel	1	1	1 (No conversion)
Trade number or Trade notification number	8	8	5
Orderbook id	9	9	6
Time of trade execution	14	6 (yymmdd)	4
Sum:	*32*	*24*	*16*

The transaction reference will always be 16 characters long;

- Position 1, is B=buy new trade, S=sell new trade, X=cancelled buy, Y=cancelled sell
- Position 2 to 6 is always trade number or trade notification number
- Position 7 to 12 is always order book id
- Position 13 to 16 is always trade date

Zeros and blanks are "padded" with 0.

All the reference numbers from the Saxess system – order book id, trade number or trade notification number and time of trade execution (the *full* time, 14 characters) - will be included in the ISO15022 field :70E::SPRO and in the field "comments" in the Euroclear Sweden proprietary interface. This enables participants to view the Saxess system reference numbers of the instruction in the VPC system. However, it will not be possible to determine based on the information on the settlement instruction in the VPC system if the dissemination of the trade was delayed or not.

<u>Clearing reference from Saxess</u>

The clearing reference number (16 characters long) in the Trade Clearing Unicast will also be included in the ISO15022 field :70E::SPRO and in the field "comments" in the Euroclear Sweden proprietary interface. This will be included in the end of the :70E::SPRO

3.2. Formula

Z = the original reference number to be converted
C = the new reference number after conversion
N = number of characters in the new reference number

$C_N = INT(Z/32^{N-1})$

$C_{N-1} = INT((Z-C_N * 32^{N-1})/32^{N-2})$

…….

$C_1 = INT((Z- C_N * 32^{N-1} - C_{N-1} * 32^{N-2} - C_{N-2} * 32^{N-3} .... - C_2 * 32^1)/32^0)$

3.3. Base32 alphabet

The Exchange Gateway uses the following Base32 alphabet;

Table 3, the Base 32 Alphabet

Value	Encoding	Value	Encoding	Value	Encoding	Value	Encoding
0	0	9	9	18	I	27	R
1	1	10	A	19	J	28	S
2	2	11	B	20	K	29	T
3	3	12	C	21	L	30	U
4	4	13	D	22	M	31	V
5	5	14	E	23	N	(pad)	0
6	6	15	F	24	O		
7	7	16	G	25	P		
8	8	17	H	26	Q		

A converter is available on Euroclear Sweden's website (http://www.ncsd.eu/858_ENG_ST.htm). The tool enables manual conversion via Base32 between the Trade Clearing Unicast and the transaction reference number in Euroclear Sweden's status, confirmation and reconciliation messages.

Example

The following example shows how a Trade Clearing Unicast is converted to the shorter reference via Base32.

Table 4

Field	Example	Base32
Buy, sell, cancel	S	
Trade number	12345678	
Order book id	000000080	
Time of trade execution	050118	

Buy, sell, cancelled buy, cancelled sell
The first character is not converted so it will in this example be S.

The trade number
C_5 = INT $(12345678/32^4) = 11$ Base32 = B
C_4 = INT $((12345678- C_5*32^4)/32^3 = 24$ Base32 = O
C_3 = INT $((12345678- C_5*32^4 - C_4*32^3)/32^2 = 24$ Base32 = O
C_2 = INT $((12345678- C_5*32^4 - C_4*32^3 - C_3*32^2)/32^1 = 10$ Base32 = A
C_1 = INT $((12345678- C_5*32^4 - C_4*32^3 - C_3*32^2 - C_2*32^1)/32^0 = 14$ Base32 = E

The converted trade number is BOOAE.

Order book id
The converted order book id is calculated in the same way. Result 00002G.

Time of trade execution
The converted time is calculated in the same way. Result 1GU6.

Result
The converted reference is SBOOAE00002G1GU6.

Table 5

Field	Example	Base32
Buy, sell, cancel	S	S
Trade number	12345678	BOOAE
Order book id	000000080	00002G
Time of trade execution	050118	1GU6