

SPECIFICATION

BIVA X-EXTERNAL ITCH SPECIFICATION

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Document History

VERSION	DATE	AUTHOR	SUMMARY OF CHANGES
1.01	2016-1-11	Carlos J. Hernandez, Eduardo Calderon	Based on internal specification 1.01, for member firms review.
1.02	2016-5-11	Rodrigo Jiménez	GLIMPSE Snapshot detail
1.03	2016-8-23	Carlos Arvizu, Carlos J. Hernandez, Rodrigo Jiménez	Based on internal specification 1.07, for member firms review.
1.04	2016-10-19	Juan J. Martínez	Based on internal specification 1.09. Added Listing Type to the orderbook directory message. Added trading action reason to indicate start of IOA on OPEL-B. Added new message for publishing reference prices. Added Orderbook Reference Price message [X] to the ITCH message set tables.
1.05	2017-10-19	Juan J. Martínez	Based on internal specification 1.11 Added Trading Action [H] reason codes 'E' for 'Expiry' and 'L' for 'Pending Live'. Offset correction on Orderbook Reference Price message [X] Removed reference to warrants directory. Updated messages per service, including GLIMPSE.

1.06	2017-08-31	Juan J. Martínez	Remove unused TradingAction reasons for Quote Bases Market Surveillance Suspension, Suspension by Market of Origin, and Non Compliance.
1.07	2017-12-13	Carlos Arvizu	<p>Added Reference Price type 'R' to Orderbook Reference Price message [X].</p> <p>Updated Message Kinematics / Update of Reference Price section to refer to this new message.</p> <p>Removed reference price from Add Order [A] documentation.</p> <p>Added Listing Exchange field to Orderbook Directory message [R].</p> <p>Removed entries for messages [a] and [e] from ITCH Message Sets tables.</p> <p>Quote Basis M, O and C were implemented again.</p>

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1 Context

1.1 Intended Audience

This document is intended for:

Member firms technical staff and vendors implementing the protocol for the member firms.

X-stream provides support for the standard INET protocols. The document will cover market data dissemination. ITCH is an efficient way of distributing market data in terms of bandwidth required.

1.2 Requirements

The INET ITCH protocol is widely used and considered an industry standard. This standard is ideal for a low latency messaging. X-stream should adhere, as closely as possible, to the latest published versions of both this fixed width message definitions.

The point-to-point transport layer for ITCH payloads will be SoupBinTCP.

SoupBinTCPv3.0 is required as it supports binary types in the payload. Binary types are employed in the latest ITCH and OUCH standards so required for X-stream.

The transport for one-to-many distribution of ITCH market data is MoldUDP64. The Mold protocol provides a sequenced and recoverable UDP multicast stream.

2 ITCH Data Types

Table 1 - ITCH Data Types

DATA TYPE	DESCRIPTION
Alpha	Left justified and right padded.
Integer	Unsigned big-endian binary encoded.
Null-Terminated Alpha	Left justified null terminated, i.e. variable length. Maximum length includes the null character.

3 ITCH Message Sets

Table 2 – ITCH Total View Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start.
S	System event message.
L	Orderbook price tick table.
M	Orderbook quantity tick table.
R	Orderbook directory.
F	Participant directory. (Defined for future use, but not to be implemented)
H	Trading action message.
A	Add order message.
E	Order executed.
C	Order executed with price.
P	Trade message.
B	Busted trade message.
D	Delete order.
U	Updated order.
I	Indicative price/quantity message.
G	GLIMPSE snapshot message
X	Orderbook Reference Price message

Table 3 – ITCH Basic Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start.
S	System event message.
L	Orderbook price tick table.
M	Orderbook quantity tick table.
R	Orderbook directory.
H	Trading action message.
P	Trade message.
Q	Best bid offer message.
X	Orderbook Reference Price message

Table 4 – ITCH News Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start.
S	System event message.
L	Orderbook price tick table.
M	Orderbook quantity tick table.
R	Orderbook directory.
F	Participant directory.
H	Trading action message.
N	News message.

Table 5 – ITCH Last Sale Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start.
S	System event message.
R	Orderbook directory
L	Orderbook price tick table.
M	Orderbook quantity tick table.
H	Trading action message.
P	Trade message.
X	Orderbook Reference Price message

4 ITCH Messages

This section describes the messages used by the ITCH market data feeds generated by X-stream.

Table 6 – ITCH Time Stamp – Seconds [T]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"T"	Time Stamp -Seconds Message Id.
Second	1	4	Integer	Number of seconds since midnight of the first day of the system cycle.

Table 7 – ITCH System Event Message [S]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"S"	System Event Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Group	5	8	Alpha	Id for symbol grouping (Board level only). Left blank if at System level or Orderbook level.
Event Code	13	1	Alpha	Event Code. Refer to System Event codes in table below.
Orderbook	14	4	Integer	Used to identify if the event applies to a single orderbook within the Group. Orderbook Code set to 0 if the event applies at a System level or Group level.

Table 8 – System Event Codes

SYSTEM CODE	EVENT	EXPLANATION
'O'		Start of Messages. This is the first message sent.
'S'		Start of System Hours.
'Q'		Start of Market Hours. Trading session. It indicates the Exchange is open and ready to start accepting orders.
'M'		End of Market Hours. End of Trading session.
'V'		Scheduled auction starts.
'U'		Scheduled auction closes.
'E'		End Of System Hours. It indicates that the Exchange is closed.
'C'		End of Messages. Last message sent.

Table 9 – ITCH Price Tick Size [L]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"L"	Tick Size Table.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Tick Size Table Id	5	4	Integer	Indicates the Tick Size Table id.
Tick Size	9	4	Integer	Price Tick Size.
Price Start	13	4	Integer	Start of Price for this Tick Size.

Table 10 – ITCH Quantity Tick Size [M]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"M"	Tick Size Table.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Tick Size Table Id	5	4	Integer	Indicates the Tick Size Table id.
Tick Size	9	8	Integer	Quantity Tick Size.
Quantity Start	17	8	Integer	Start of Quantity for this Tick Size.

Table 11 – ITCH Orderbook Directory [R]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"R"	Orderbook Directory Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier.
ISIN	9	12	Alpha	ISIN code
Sec Code	21	15	Alpha	Security code
Currency	36	3	Alpha	Trading currency
Group	39	8	Alpha	Id for symbol grouping (board only).
Minimum Quantity	47	8	Integer	Minimum Quantity
Quantity Tick Size Table Id	55	4	Integer	Quantity Tick Size Table. Cross reference to Quantity Tick Size table.
Quantity Decimals	59	4	Integer	Quantity Decimals.

NAME	OFFSET	LEN	VALUE	NOTES
Price Tick Size Table Id	63	4	Integer	Price Tick Size Table Id. Cross reference to Price Tick Size table.
Price Decimals	67	4	Integer	Price Decimals.
Delisting or Maturity Date	71	4	Integer	YYYYMMDD 0 represents no delisting date.
Delisting Time	75	4	Integer	HHMMSS Ignore if delisting date is 0 or if we have a Maturity Date ie debt security.
Turnover Ratio	79	1	Alpha	"H"igh, "M"edium or "L"ow.
Quotation Basis	80	3	Alpha	Quotation Basis indicator. Blank if not set.
Instrument	83	12	Alpha	The instrument name.
Listing Type	95	1	Alpha	"R" for regular securities "S" for SUB-RM securities
Listing Exchange	96	4	Alpha	Identifies the security's listing exchange. Possible values are "BIVA" or "BMV".

Table 12 – ITCH Participant Directory [F]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"F"	Market Participant Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Participant Id	5	4	Integer	Unique identifier for the market participant.
Company Name	9	12	Alpha	Company short name.

Table 13 – ITCH Orderbook Trading Action [H]

NAME	OFFSE T	LEN	VALUE	NOTES
Type	0	1	"H"	Orderbook Trading Action Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier.
Trading State	9	1	Alpha	Current trading state for orderbook. At the start of the system cycle "V" is sent for each symbol that are suspended otherwise "T" for the active orderbooks. Suspended intra-day with "V" then unsuspended with "T".
Reason	10	1	Alpha	Refer to reason in table below.

Table 14 – Trading Action Reasons

TRADING ACTION REASON	EXPLANATION
'N'	Normal Trading
'H'	Volatility Auction
'A'	Continuous Auction Start
'B'	Continuous Auction End
'Q'	News Pending
'S'	Static Price Band Breach
'M'	Market Surveillance Suspension
'O'	Suspension by Market of Origin
'C'	Non Compliance
'I'	Start of Indication of Interest (IOA)
'E'	Expired security is unavailable for trading
'L'	No yet available for trading

Table 15 – ITCH Orderbook Reference Price [X]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"X"	Add Order Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	The unique reference number assigned to the new order.
Reference Price	9	4	Integer	The reference price. The price is 0x7FFFFFFF (hex) 2147483647 (dec) when the reference price is unavailable.
Price Type	13	1	Alpha	Refer to reference price type in table below.
Reason	14	1	Alpha	Refer to reference price reason in table below.

Table 16 – Orderbook Reference Price Types

ORDERBOOK REFERENCE PRICE TYPE	EXPLANATION
'C'	Close Price
'R'	Reference Price

Table 17 – Orderbook Reference Price Reasons

ORDERBOOK REFERENCE PRICE TYPE	EXPLANATION
''	None

Table 18 – ITCH Add Order Message [A]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"A"	Add Order Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Integer	The unique reference number assigned to the new order.
Order Verb	13	1	Alpha	"B"uy "S"ell
Quantity	14	8	Integer	The total quantity of the order being added to the book.
Orderbook	22	4	Integer	Unique orderbook identifier.
Price	26	4	Integer	The price of the new order. The price is 0x7FFFFFFF for a market order.

Table 19 – ITCH Order Executed [E]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"E"	Order Executed Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Integer	The unique executed order reference number.
Executed Quantity	13	8	Integer	The number of shares executed.
Match Number	21	8	Integer	The unique match identifier.
Trade Indicator	29	1	Alpha	'R'egular trade. 'U'nintentional self-cross.

Table 20 – ITCH Order Executed With Price Message [C]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"C"	Order Executed with Price Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Integer	The unique executed order reference number.
Executed Quantity	13	8	Integer	The number of shares executed.
Match Number	21	8	Integer	The unique match identifier.
Trade Indicator	29	1	Alpha	'R'egular trade. 'U'nintentional self-cross.
Printable	30	1	Alpha	Indicates if the execution should be reflected in volume calculations. 'N' = Non Printable 'Y' = Printable
Execution Price	31	4	Integer	The price at which the execution occurred.

Table 21 – ITCH Trade Message [P]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"P"	Trade Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Executed Quantity	5	8	Integer	The number of shares executed.
Orderbook	13	4	Integer	Unique orderbook identifier.
Printable	17	1	Alpha	Indicates if the execution should be reflected in volume calculations. 'N' = Non Printable 'Y' = Printable
Execution Price	18	4	Integer	The price at which the execution occurred.
Match Number	22	8	Integer	The unique match identifier.
Trade Indicator	30	1	Alpha	Indicates type of trade. <ul style="list-style-type: none"> • Intentional 'C'ross Trade • 'E'xceptional Cross - trade at VWAP • 'I'PO Cross • 'R'egular trade • 'U'nintentional self-cross <p>The orderbook is unique so trade on OPEL-B should be derived from the Orderbook field. For Trade Indicator of 'I', LTP should not be updated.</p>

Table 22 – ITCH Broken Trade Message [B]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"B"	Broken Trade Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Match Number	5	8	Integer	The X-stream match number of the execution that was broken.
Reason	13	1	Alpha	The reason the trade was broken. See currently supported Broken Trade Reasons table below.

Table 23 – ITCH Broken Trade Reasons

REASON	EXPLANATION
'S'	Supervisory – The trade was manually broken by the Exchange.

Table 24 – ITCH Order Delete Message [D]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"D"	Order Delete Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Integer	The reference number of the order being cancelled.

Table 25 – ITCH Order Replace Message [U]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"U"	Order Replace Message Id
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Original Order Number	5	8	Integer	The original order number of the order being replaced.

NAME	OFFSET	LEN	VALUE	NOTES
New Order Number	13	8	Integer	The new reference number for the order at the time of replacement.
Quantity	21	8	Integer	The new total open quantity, i.e. the balance of the new order.
Price	29	4	Integer	The new price for the order. The price is 0x7FFFFFFF (hex) or 2147483647 (dec) for a 'market' order.

Table 26 - ITCH Indicative Price/Quantity Message [I]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"I"	Indicative Price/Quantity Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Theoretical Opening Quantity	5	8	Integer	The total quantity eligible to be matched at the current Theoretical Opening Price.
Orderbook	13	4	Integer	Unique orderbook identifier.
Best Bid	17	4	Integer	The current best buy price.
Best Offer	21	4	Integer	The current best sell price.
Theoretical Opening Price	25	4	Integer	The current opening price for this orderbook.
Cross Type	29	1	Alpha	Cross Type code. Refer to Cross Type codes in table below.

Table 27 – Cross Type Codes

CROSS CODE	TYPE	EXPLANATION
'O'		Pre-opening session
'I'		Intraday Auction
'C'		Closing Auction

Table 28 – ITCH GLIMPSE Snapshot Message [G]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	“G”	GLIMPSE snapshot Message Id
SequenceNumber	1	8	Integer	The ITCH Total View sequence number when the GLIMPSE snapshot was taken.

Table 29 – ITCH Best Bid Offer Message [Q]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	“Q”	Best Bid Offer Quotation Message Id
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier.
Best Bid	9	4	Integer	The best buy price.
Best Bid Size	13	8	Integer	Total quantity at the best buy price.
Best Offer	21	4	Integer	The best sell price.
Best Offer Size	25	8	Integer	Total quantity at the best sell price.

Table 30 – ITCH News Message [N]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	“N”	News Item message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier. 0x7FFFFFFF indicates no orderbook identifier is requirement for this news.
NewsId	9	4	Integer	Unique news item identifier.

NAME	OFFSET	LEN	VALUE	NOTES
FirmId	13	max (30+ 1)	Null- Termin ated Alpha	Reference Firm
Title		max (80+ 1)	Null- Termin ated Alpha	News Title
Reference		max (255 +1)	Null- Termin ated Alpha	Reference for news item associated object (e.g. a URL, file pathname)
NewsText		Max (511 +1)	Null- Termin ated Alpha	News data.

5 Message Kinematics

5.1 Update of Reference Price

- An Orderbook Reference Price Message [X] with price type 'R' is used to indicate the reference price of an order book.
- Orderbook Reference Price Messages are sent after the Orderbook Directory message to indicate the initial reference price.
- A manual reference price update will generate an Orderbook Reference Price Message.
- Reference price changes due to auctions will not generate an Orderbook Reference Price Message.

5.2 **OPEL-B reference prices are not published, they should be taken from the same security on OPEL_E. Orderbook Trading Action [H]**

The Orderbook Trading Action will send the initial Trading State of Orderbooks.

All OrderBooks, that are trading, will have a Reason as 'N' for normal trading.

When a group of Orderbooks are suspended/unsuspended in X-stream INET then the Orderbook Trading Action [H] message will be sent for all Orderbooks in the group to indicate a change in Trading State.

The ITCH System Event [S] to be received with Event Code 'S' is sent after the first spin at the start of Pre-Open session.

5.3 Add Order [A] and Order Executed With Price [C]

During normal trading, when an incoming order gets in and matches, Order Executed [E] message is sent for the passive orders that match the incoming order (aggressor).

An Order Add message is sent with the outstanding balance for the incoming order; no message sent if fully matched. In the case of IOC incoming order, no message is sent for that order.

At the uncross of an auction, the Order Executed With Price [C] is sent for each executed order.

5.4 Event Message Flow

The ITCH System Event Message [S] will be sent as a result of X-stream trade events at the system group and Orderbook level. This will indicate the start of a scheduled auction.

Cross Type code in ITCH Indicative Price/Quantity Message [I] will map the auction session.

An ITCH Trading Action [H] with Reason code with Reason Code 'H' indicates the start of a volatility auction.

The table below shows the possible values of System Event Codes and Cross Type when a transition is triggered or during a particular trading session.

TRANSITION	SYSTEM EVENT MESSAGE [S] SYSTEM EVENT CODE (SYSTEM OR GROUP OR ORDERBOOK LEVEL)		ORDERBOOK TRADING ACTION MESSAGE [H] REASON (Orderbook Level)	INDICATIVE PRICE/QUANTITY [I] CROSS TYPE (Orderbook Level)
	'O' - "Start of Messages" First message sent.	S	'N' - "Normal Trading"	
AVAILABLE	'S' - "Start of System Hours"	G		
OPN_AUCT	'V' - "Scheduled Auction Starts"	G		'O' - "Open Auction"
OPN_AUCT_EN D	'U' - "Scheduled Auction Ends"	G		
DAY	'Q' - "Start Of Market Hours"	G		
During Trading (Scheduled Auction)	'V' - "Scheduled Auction Starts"	G O		'I' - "Intraday Auction"
During Auction (Scheduled Auction)	'U' - "Scheduled Auction Closes"	G O		
During Trading (Continuous Auction)			'A' - "Continuous Auction" triggered for SUB-20 or SUB-RM	'I' - "Intraday Auction"
During Auction (Continuous Auction)			'N' - "Normal Trading" where SUB-20 OrderBook has traded or 'B' trading action in other cases.	
During Trading (Volatility Auction)			'H' - "Volatility Auction"	'I' - "Intraday Auction"
During Auction (Volatility Auction)			'N' - "Normal Trading"	
BLK_AUCT	'V' - "Scheduled Auction Starts"	O		Note: Blind Market
BLK_AUCT_END	'U' - "Scheduled Auction Ends"	O		
CLS_AUCT	'V' - "Scheduled Auction Starts"	G		'C' - "Close Auction"
CLS_AUCT_END	'U' - "Scheduled Auction Ends"	G		

DAY_END	'M' – "End Of Market Hours"	G		
UNAVAILABLE	'E' – "End of System Hours"	G		
IPXS-EOM	'C' – "End of Messages" Last message sent.	S		
IPXS-ENDSESS				

Table 31 – ITCH Event Message flow

5.5 Static Reference Data

The Orderbook Directory Message [R] contains the unique integer Orderbook identifier for use in fast security lookup. Indexes will be included in the Orderbook Directory if they to be published via the ITCH protocol.

5.6 GLIMPSE Snapshot

5.6.1 Protocol Overview

GLIMPLSE is delivered via the point-to-point SoupBinTCP3.0 protocol. The GLIMPSE user will connect to its allocated TCP endpoint and must logon with a sequence number of 1.

A series of sequenced messages will be received enabling the user to create a snapshot view of the current state of all order books in the trading system.

The final sequenced message contains the sequence number with which the user will rejoin the live ITCH Total View stream whether SoupBinTCP3.0 or MoldUDP64.

5.6.2 Messages

When a user logs onto the GLIMPSE service, they receive the following reference data as per an ITCH TV session with a timestamp based on the system startup time:

- Start-of-messages System Event
- Price Ticks
- Quantity Ticks

- Orderbook Directory
- Warrants Directory
- Participant Directory
- Trading Actions

What follows is a replay of all System Event messages and all Trading Action messages, with the timestamp showing the time at which the original message was generated. These are generated in the order in which they occurred, and so are interleaved.

The ITCH Timestamp message may occur multiple times during the replay of System Events and Trading Action message. As with ITCH, the Timestamp message will only be sent if it is different from the last Timestamp message sent.

Finally, we send the messages which reflect the order books' current contents. These messages are time stamped with the time at which the snapshot is generated and include:

- Indicative Price and Quantity
- Reference Prices
- Open Orders

At the end of the spins, the Snapshot message is sent to indicate the point at which to start processing the ITCH Total View.