Next Gen Unicast Market Data Manual

Version 0.1.5

1 Introduction

The Direct Edge Next Gen exchanges (NG-A and NG-X) provide both Unicast and Multicast depth of book feeds. This document describes the general operation of the Unicast feed, and specifies the protocols that members use to interact with that feed. The unicast depth of book feed is delivered over a TCP/IP connection, and is comprised of two protocols:

> **Direct Edge Session Management Protocol:** The Session Management Protocol provides a framework to authenticate clients and to distribute sequenced, discrete application level messages from the server to the client.
>
> **Direct Edge Depth of Book Protocol:** The Depth of Book Protocol provides the application level messages necessary for clients to build the full depth of book information for Direct Edge.

In the production environment, market data clients are authenticated with the Direct Edge Session Management Protocol and are sent a series of sequenced data messages. The payload of these sequenced data messages are Direct Edge Book Protocol messages. These protocols are similar (but not identical) to market data protocols used by other ECNs and market centers.

2 Direct Edge Session Management Protocol

2.0 General Operation

The Direct Edge Session Management Protocol is used to distribute sequenced messages from a server to a number of clients over TCP/IP. The server maintains one or more ordered sequences of messages called sessions. Clients join a particular session when they connect to the server, and receive sequenced messages in real-time as they are generated.

2.1 Data Types

Name	Valid Values	Description
Integer	0x40 – 0x49, 0x20	ASCII coded integer. Integer fields are right justified and left padded with spaces.
Character	0x00 – 0x09 0x0B – 0xFF	One or more ASCII coded characters. Must not contain 0x0A (ASCII Line Feed).
Message Terminator	0x0A	Indicates the end of a message.

2.2 Server to Client Messages

2.2.1 Debug Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x2B ('+') distinguishes a Debug Message.
Payload	1	var	Character	The payload must not contain 0x0A (LF).
Message Terminator	var	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

Debug messages are sent unsolicited from the server to the client. They contain a variable length payload string which may be ignored by the client application.

2.2.2 Login Accepted Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x41 ('A') distinguishes a Login Accepted Message.
Session	1	10	Integer	The session number that the client has joined.
Sequence Number	11	10	Integer	The sequence number of the next Sequenced Data Message.
Message Terminator	21	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

One Login Accepted Message will be sent from the server to the client in response to a Login Request Message if the client is successfully authenticated. The Login Accepted Message indicates which session the client has joined as well as the sequence number of the next Sequenced Data Message to be sent from the server to the client.

2.2.3 Login Rejected Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x4A (‘J’) distinguishes a Login Rejected Message.
Reason	1	1	Character	0x41 (‘A’): Not Authorized 0x53 (‘S’): Invalid Session
Message Terminator	2	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

One Login Rejected Client will be sent from the server to the client in response to a Login Request Message if the client is not able to be authenticated. After sending this message, the server will immediately close the client socket.

2.2.4 Sequenced Data Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x53 (‘S’) distinguishes a Sequenced Data Message.
Payload	1	var	Character	The payload must not contain 0x0A (LF).
Message Terminator	var	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

Sequenced Data Messages are sent unsolicited from the server to the client. The payload field of a Sequenced Data Message contains an application-specific message. Each Sequenced Data Message has an implicit sequence number. Upon joining a session, the sequence number of the first Sequenced Data message is known, and the sequence number for each subsequent message increases by one.

2.2.5 Server Heartbeat Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x48 (‘H’) distinguishes a Server Heartbeat Message.
Message Terminator	1	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

Server Heartbeat Messages are sent to indicate to the client that the server is still active in the absence of Sequenced Data Messages. The server will send a heartbeat to each client after no more than one second of inactivity.

2.2.6 End of Session

A session is closed with a zero-length sequenced data message (0x53 0x0A). No more sequenced data messages may be sent after the session is closed. A client that receives such a message may disconnect knowing that there are no more messages in that particular session.

2.3 Client to Server Messages

2.3.1 Login Request Message

Login Name and Password fields are left justified and right-padded with spaces. Session number and initial sequence number fields are right justified and left-padded with spaces.

Field Name	Offset	Size	Type	Type
Message Type	0	1	Character	0x4C ('L') distinguishes a Login Request Message.
Login Name	1	6	Character	The login name used by each member is assigned by the Direct Edge Operations staff. Login names shorter than 6 characters should be left-justified and right-padded with spaces.
Password	7	10	Character	The password used by each member is assigned by the Direct Edge Operations staff. Passwords shorter than 10 characters should be left-justified and right-padded with spaces.
Session Number	17	10	Integer	The session number that the client wishes to join.
Initial Sequence Number	27	10	Integer	The sequence number of the first Sequenced Data Message that the server will send to the client.
Message Terminator	37	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

2.3.2 Logout Request Message

Field Name	Offset	Size	Type	Remarks
Message Type	0	1	Character	0x4F ('O') distinguishes a Logout Request Message
Message Terminator	1	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

A Logout Request Message indicates that a Direct Edge Session Management client wishes to disconnect from the server. Upon receiving this message, the server will immediately close client's TCP socket.

2.3.3 Client Heartbeat Message

Field Name	Offset	Size	Type	Type
Message Type	0	1	Character	0x52 ('R') distinguishes a Client Heartbeat Message.
Message Terminator	1	1	Message Terminator	0x0A (LF) terminates a Direct Edge Session Management message.

Client Heartbeat Messages are used to indicate that a Direct Edge member is still active in the absence of other client to server communication. Members must send a Client Heartbeat Message to the server after no more than 1 second of inactivity.

3 Direct Edge Book Protocol

3.0 General Operation

Direct Edge maintains two distinct exchanges, each of which provides a separate depth of book feed. To receive the Direct Edge book feed, members should connect to the Direct Edge Book Server using the session management protocol described in section 2. In the login request message, the client should request session 0 (the default session). Each Book Protocol message will be carried inside of a Session Management Protocol sequenced data message (Section 2.2.4).

Members may track their visible limit orders in the depth of book feed. The order reference number used by the book feed is identical to the order identifier used in Direct Edge order entry sessions (API field "Order Reference Number", FIX field 37). However, members may elect to have a new, system-generated order reference number applied to the replenishment of a reserve order. To request this feature, contact FIXSUPPORT@directedge.com.

When hidden quantity executes, Direct Edge sends a Trade Message (Section 3.2.5). For this message, the order reference number will not correspond to the order identifier used in member's order entry sessions. Members wishing to identify their own hidden executions in the book feed should use the Execution Reference Number, which will be identical to the execution identifier in their order entry session (API field "Match", FIX field 17).

Timestamps are expressed milliseconds past midnight, US Eastern Time.

3.1 Data Types

Type Name	Valid Values	Type Description
Character (Base-26)	0x41 – 0x5A, 0x20	Character or character string. Multi-character fields are left-justified and right-padded with spaces
Integer (Base-10)	0x30 – 0x39, 0x20	ASCII coded integer. Integer fields are right justified and left-padded with spaces.
Alphanumeric (Base-36)	0x30 – 0x39, 0x41 – 0x5A, 0x20	ASCII coded string of characters and/or integers. Alphanumeric fields are left justified and right-padded with spaces.
Extended	0x20 – 0x7E	ASCII coded string. Extended fields are left-justified and right-padded with spaces.
UInt32	0x2B, 0x2F, 0x30 – 0x39, 0x41 – 0x5A, 0x61 – 0x7A	32 bit unsigned integer, base-64 encoded. Base-64 encoded numbers use the encoding string: "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/"
UInt64	0x2B, 0x2F, 0x30 – 0x39, 0x41 – 0x5A, 0x61 – 0x7A	64 bit unsigned integer, base-64 encoded. Base-64 encoded numbers use the encoding string: "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/"

3.2 Book Messages

3.2.1 System Event Message

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in millisecond past midnight, US Eastern Time.
Message Type	8	1	Character	0x53 (‘S’) distinguishes a System Event Message.
Event Code	9	1	Character	0x53 (‘S’): Start of Day. Indicates that Direct Edge will accept and match subscriber orders. 0x45 (‘E’): End of Day. Indicates that Direct Edge has stopped accepting and matching orders.

3.2.2 Add Order Messages

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x41 (‘A’) distinguishes an Add Order Message (Normal Form).
Order Reference Number	9	12	UInt64	Order reference numbers may be re-used after an order has left the Direct Edge book.
Side Indicator	21	1	Character	0x42 (‘B’) indicates a Bid. 0x53 (‘S’) indicates an Offer.
Order Qty	22	6	UInt32	The number of quoted shares.
Security	28	6	Extended	The ticker symbol of the security. Symbol suffix translation scheme is given in Symbology (Section 3.3).
Price	34	10	Integer	All prices are given in US Dollars.
Display	44	1	Character	0x59 (‘Y’) indicates that the order is aggregated in the Direct Edge SIP quote.

Normal Form

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x64 ('d') distinguishes an Add Order Message (Extended Form).
Order Reference Number	9	12	UInt64	Order reference numbers may be re-used after an order has left the Direct Edge book.
Side Indicator	21	1	Character	0x42 ('B') indicates a Bid. 0x53 ('S') indicates an Offer.
Order Qty	22	6	UInt32	The number of quoted shares.
Security	28	8	Extended	The ticker symbol of the security. Symbol suffix translation scheme is given in Symbology (Section 3.3).
Price	36	10	Integer	All prices are given in US Dollars.
Display	46	1	Character	0x59 ('Y') indicates that the order is aggregated in the Direct Edge SIP quote.

Extended Form

The Add Order message indicates that a new limit order has been added to the Direct Edge book. The price field is a 10 digit ASCII encoded integer with 4 digits to the right of the implied decimal point. All prices are given in US Dollars.

There are normal and extended forms of the Add Order Message. The extended form uses an 8 character symbol field, allowing a 5 character symbol to have a 3 character suffix.

3.2.3 Order Executed Message

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x45 ('E') distinguishes an Order Executed message.
Order Reference Number	9	12	UInt64	The order reference number of the order that has executed.
Executed Shares	21	6	UInt32	The number of shares that have executed. The quantity remaining on the indicated order has been reduced by this amount.
Match Number	27	21	Alphanumeric	A day-unique string that identifies this execution. If the execution is subsequently broken, a Broken Trade Message (Section 3.2.7) will be sent with this match number.

The Order Executed message indicates that a limit order already in the Direct Edge book has executed. The visible quantity of the indicated order has been reduced by the number of shares in the "Executed Shares" field. When the visible quantity of the order reaches 0 it has been removed from the Direct Edge book.

3.2.4 Order Canceled Message

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x58 ('X') distinguishes an Order Canceled message.
Order Reference Number	9	12	Alphanumeric	The order reference number of the order that has been canceled.
Cancelled Shares	21	6	UInt32	The number of shares that have been canceled. The quantity remaining on the indicated order has been reduced by this amount.

The Order Canceled Message indicates that an order in the Direct Edge book has been canceled in whole or in part. The visible quantity of the indicated order is reduced by the number of shares in the "Canceled Shares" field. When the visible quantity of the order reaches 0 it has been removed from the Direct Edge book.

3.2.5 Trade Messages

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x50 ('P') distinguishes a Trade Message (Normal Form).
Order Reference Number	9	12	UInt64	The order reference number of the order that executed.
Side Indicator	21	1	Character	Indicates the liquidity adding side of the trade. 0x42 ('B') Resting order was a bid. 0x53 ('S') Resting order was an offer. 0X48 ('H') The liquidity adding side is not disclosed.
Shares	22	6	UInt32	The number of shares that executed.
Security	28	6	Extended	The ticker symbol of the order that executed. Symbol suffix translation scheme is given in Symbology (section 3.3).
Price	34	10	Integer	The price at which the execution occurred.
Match Number	44	21	Alphanumeric	A day-unique string that identifies this execution. If the execution is subsequently broken, a Broken Trade Message (section 3.2.7) will be sent with this match number.

Normal Form

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x72 ('r') distinguishes a Trade Message (Extended Form).
Order Reference Number	9	12	UInt64	The order reference number of the order that executed.
Side Indicator	21	1	Character	Indicates the liquidity adding side of the trade. 0x42 ('B') Resting order was a bid. 0x53 ('S') Resting order was an offer. 0X48 ('H') Liquidity adding side is Not disclosed.
Shares	22	6	UInt32	The number of shares that executed.
Security	28	8	Extended	The ticker symbol of the order that executed. Symbol suffix translation scheme is given in Symbology (section 3.3).
Price	36	10	Integer	The price at which the execution occurred.
Match Number	46	21	Alphanumeric	A day-unique string that identifies this execution. If the execution is subsequently broken, a Broken Trade Message (section 3.2.7) will be sent with this match number.

Extended form

The Trade Message indicates that shares which were not shown on the Direct Edge book have executed. The Order Reference Number and Side Indicator fields in the trade message belong to the order which added liquidity.

3.2.6 Broken Trade Message

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x42 ('B') distinguishes a Broken Trade Message.
Match Number	9	21	Alphanumeric	Uniquely identifies the trade to be broken. See the Order Executed Message (3.4) and Trade Message (3.6).

The Broken Trade Message indicates that a previously published trade has been broken by Direct Edge. The broken trade is identified by the Match Number field.

3.2.7 Security Status Message

Field Name	Offset	Size	Type	Remarks
Time Stamp	0	8	Integer	Expressed in milliseconds past midnight, US Eastern Time.
Message Type	8	1	Character	0x48 ('H') distinguishes a Security Status Message.
Security	9	8	Extended	The ticker symbol whose status is changing. Symbol suffix translation scheme is given in Symbology (section 3.3).
Halted State	17	1	Character	0x56 ('T') indicates the security is now trading. 0x47 ('F') indicates the security is now halted. 0X53 ('S') indicates the security is trading with Short Sale Restrictions.

The Security Status Message indicates a change in the trading status of an individual security. All securities should be assumed to be in the "trading" state at the start of the day.

3.3 Symbology

The CQS and CMS representations of certain symbol / suffix combinations may be longer than the 6 character symbol field in the Direct Edge Book Protocol. Direct Edge uses the symbol suffix translation scheme shown in the table below to guarantee that all symbol names are 6 characters or less.

Suffix Description	CQS Suffix	CMS Suffix	DE Suffix
Called	/CL	CL	*
Class A	/A	A	.A
Class B	/B	B	.B
Class A Called	/A/CL	ACL	.A*
Class B Called	/B/CL	BCL	.B*
Class A When Issued	/Aw	AWI	.A#
Class B When Issued	/Bw	BWI	.B#
Convertible	/CV	CV	%
Class A Convertible	A/CV	ACV	.A%
Class B Convertible	B/CV	BCV	.B%
Preferred	p	PR	-
Preferred Class A	pA	PRA	-A
Preferred Class B	pB	PRB	-B
Preferred Class A Called	pA/CL	PRACL	-A*
Preferred Class B Called	pB/CL	PRBCL	-B*
Preferred Class A Convertible	pA/CV	PRACV	-A%
Preferred Class B Convertible	pB/CV	PRBCV	-B%
Preferred Class A When Issued	pAw	PRAWI	-A#
Preferred Class B When Issued	pBw	PRBWI	-B#
Preferred When Issued	pw	PRWI	-#
Preferred Class A When Distributed	pA/WD	PRAWD	-A$
Preferred Class B When Distributed	pB/WD	PRBWD	-B$
Preferred When Distributed	p/WD	PRWD	-$
Partial Paid	/PP	PP	@
Convertible Called	/CV/CL	CVCL	%*
Rights	r	RT	^
Rights When Issued	rt	RTWI	^#
Test	/TEST	TEST	~
Units	/U	U	=
Warrants	/WS	WS	+
Warrants Class A	/WS/A	WSA	+A
Warrants Class B	/WS/B	WSB	+B
Warrant When Issued	/WSw	WSWI	+#
When Distributed	/WD	WD	$
When Issued	w	WI	#

4 Revision History

0.1.0: (2009-09-21) Initial fork from ECN Scratch spec.
0.1.1: (2010-01-13) Added Extended forms of Add Order / Trade messages (3.2.2, 3.2.5).
0.1.2: (2010-03-26) Extended “Security” field in Security Status Message to 8 characters.
0.1.4: (2011-01-24) Extended the Security Status Message. Added New Halted State:
0X53 (‘S’) indicates the security is trading with Short Sale Restrictions.

In the Trade Message, a value was added to the Side Indicator field:
0X48 (‘H’) the liquidity adding side is not disclosed.

0.1.5 (2011-04-20 Order Reference Number description is added to Section 3.0 General Operations along with the Reserve Order replenishment instructions.