



US Options
Complex Auction
Multicast PITCH Specification

Version 2.0.11

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1 Introduction

1.1 Overview

Note that this specification will be the standard specification to be used for complex auctions on the Cboe EDGX Options and C2 Options Exchange platforms.

Cboe customer may use Complex Auction Multicast PITCH to receive real-time auction update and execution information during complex options auctions.

Complex Auction Multicast PITCH cannot be used to enter orders. For order entry, refer to the appropriate US Options FIX or BOE Specifications.

A Gig-Shaped version of the the Complex Auction Multicast PITCH feed is available from both of Cboe's datacenters. Customers may choose to take one or more of the following Multicast PITCH feed options depending on their location and connectivity to Cboe.

Complex Auction Multicast PITCH Feed Descriptions:

Exchange	Shaping (Gig)	Served From Data Center (Primary/Secondary)	Multicast Feed ID
EDGX Options	Gig	Primary	EAB
EDGX Options	Gig	Primary	EBB
EDGX Options	Gig	Secondary	EEB
C2 Options	Gig	Primary	WAB
C2 Options	Gig	Primary	WBB
C2 Options	Gig	Secondary	WEB

1.2 Feed Connectivity Requirements

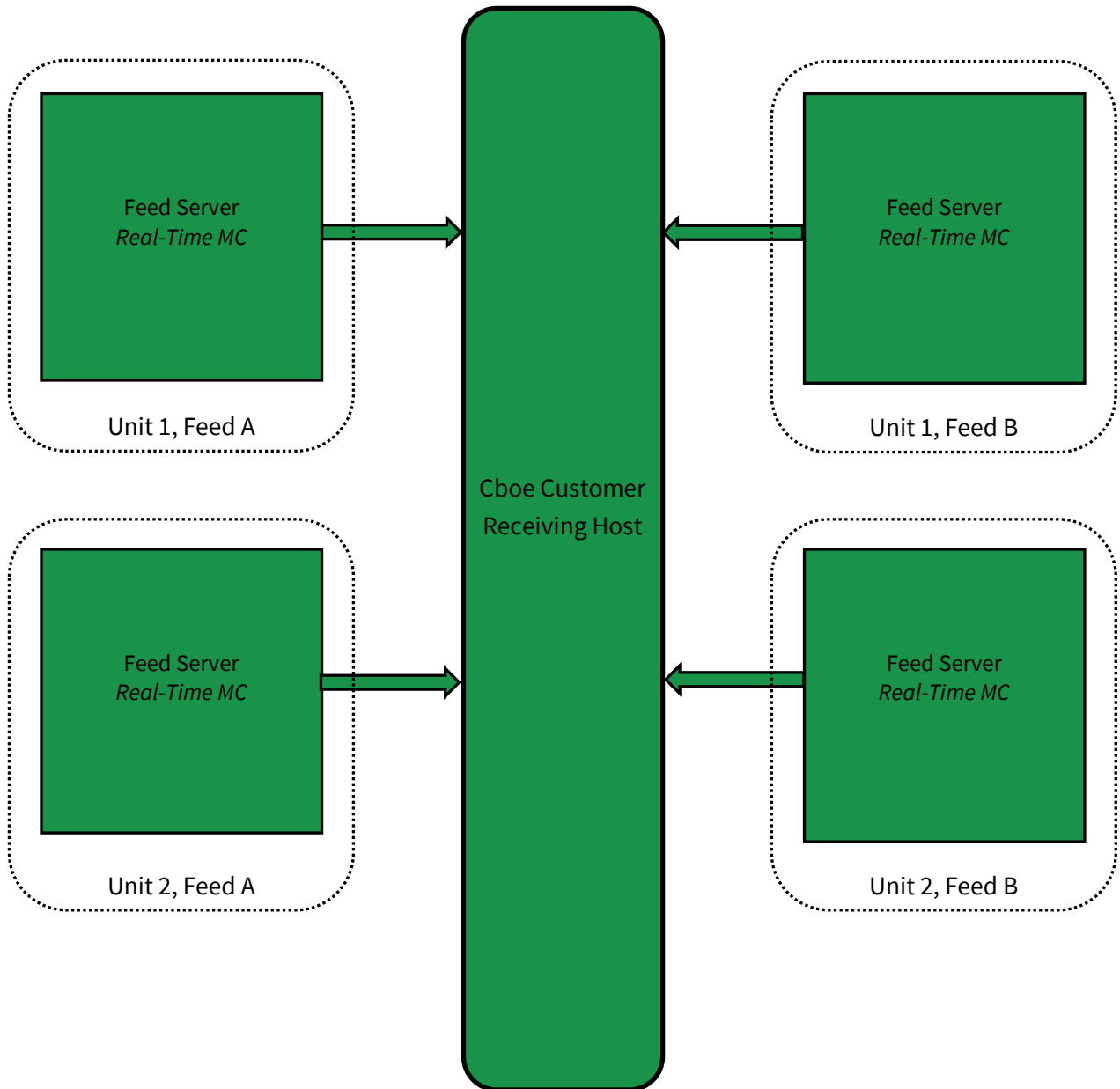
Gig Shaped feeds are available to customers with a minimum of 1 Gb/s of connectivity to Cboe via cross connect or dedicated circuit.

Customers with sufficient connectivity may choose to take more than one Gig-Shaped feed from the Cboe datacenters. It should be noted that feeds from the secondary datacenter will have additional latency for those co-located with Cboe in the primary datacenter due to proximity.

Cboe Complex Auction Multicast PITCH real-time events are delivered using a published range of multicast addresses divided by symbol range units. It should be noted dropped messages cannot be recovered on this feed as this feed contains only unsequenced messages.

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The following diagram is a logical representation of Complex Auction Multicast PITCH feed message flow between Cboe and a customer feed handler that is listening to the “A” and “B” instances of two units:



1.3 Symbol Ranges, Units, and Sequence Numbers

Symbols will be separated by OSI Root into units by a [published alphabetical distribution](#). Symbol distribution will not change intra-day. Cboe does, however, **reserve the right to add multicast addresses or change the symbol distribution** with prior notice to customers. Care should be taken to ensure that address changes, address additions, and symbol distribution changes can be supported easily.

It is important to understand that one *or more* units will be delivered on a single multicast address. As with symbol ranges, unit distribution across multicast addresses will not change intra-day, but may change after notice has been given.

It should be noted that this feed only contains unsequence messages.

1.4 Complex Options Specific Symbol Processing

Cboe has implemented a Complex Instrument Creation (“CIC”) process due to the seemingly infinite number of combinations that can make up a complex instrument. This allows the Complex Auction Multicast PITCH specification to be consistent with the equities, standard options, and complex options Multicast PITCH specifications. This CIC process significantly reduces the size of the Complex Auction Multicast PITCH feed and allows customers to use the same feed handler for Cboe equity, options, and futures exchanges.

Real-time CIC messages are available on each unit’s multicast feed. `Complex Instrument Definition` messages are used to map the 6 character feed Complex Instrument ID (“CID”) to complex instrument definition. A complex instrument definition consists of two or more option legs. The complex instrument is valid only for the current trading date on which it was created. `Complex Instrument Definition` messages are unsequenced messages and can be sent from pre-market through the end of trading. Once a complex instrument is created, it cannot be deleted or modified for the remainder of the trading day.

1.5 Gap Request Proxy and Message Retransmission

Recovery of missed data is not available on the Complex Auction Multicast PITCH feed. There are two main reasons. First this feed contains only unsequenced messages. Second the complex option auctions are short lived by nature making recovery of dropped messages impractical.

Prior to the start of any new auction, the corresponding `Complex Instrument Definition` message will be sent to ensure the customer has correct complex instrument information.

1.6 Spin Servers

A spin is not available on the Complex Auction Multicast PITCH feed as this feed is unsequenced.

2 Protocol

Cboe users may use the PITCH 2.X protocol over multicast to receive auction update and execution information direct from Cboe.

PITCH 2.X cannot be used to enter orders. For order entry, refer to the appropriate US Options FIX or BOE Specifications.

2.1 Message Format

The messages that make up the PITCH 2.X protocol are delivered using Cboe `Sequenced Unit Header` which handles sequencing and delivery integrity. All messages delivered via multicast as well will use the `Sequenced Unit Header` for handling message integrity.

All UDP delivered events will be self-contained. Developers can assume that UDP delivered data will not cross frame boundaries and a single Ethernet frame will contain only one `Sequenced Unit Header` with associated data.

This PITCH data feed is comprised of a series of dynamic length unsequenced messages. Each message begins with Length and Message Type fields. **Cboe reserves the right to add message types and grow the length** of any message without notice. Customers should develop their decoders to deal with unknown message types and messages that grow beyond the expected length. Messages will only be grown to add additional data to the end of a message.

2.2 Data Types

The following field types are used within the `Sequenced Unit Header` and PITCH 2.X.

- **Alphanumeric** fields are left justified ASCII fields and space padded on the right.
- **Binary** fields are unsigned and sized to “Length” bytes and ordered using Little Endian convention (least significant byte first).
- **Signed Binary** fields are signed and sized to “Length” bytes and ordered using Little Endian convention (least significant byte first).
- **Binary Signed Short Price** fields are signed Little Endian encoded 2 byte binary fields with 2 implied decimal places (denominator = 100). The short price range is -327.68 to +327.67. Prices outside of this range will use the long price.
- **Binary Signed Long Price** fields are signed Little Endian encoded 8 byte binary fields with 4 implied decimal places (denominator = 10,000).
- **Bit Field** fields are fixed width fields with each bit representing a boolean flag (the 0 bit is the lowest significant bit; the 7 bit is the highest significant bit).
- **Printable ASCII** fields are left justified ASCII fields that are space padded on the right that may include ASCII values in the range of 0x20 – 0x7e.

2.3 Message Framing

Auction update and execution messages will be combined into single UDP frame where possible to decrease message overhead and total bandwidth. The count of messages in a UDP frame will be communicated using the `Sequenced Unit Header`. Framing will be determined by the server for each unit and site. The content of the multicast across feeds (e.g. A/B Gig-Shaped) will be identical, **but framing will not be consistent across feeds**. Receiving processes that receive and arbitrate multiple feeds cannot use frame level arbitration to fill gaps.

2.4 Sequenced Unit Header

The `Sequence Unit Header` is used for all Cboe Multicast PITCH messages.

This feed will deliver only unsequenced data using the `Sequenced Unit Header`. Unsequenced headers will have a 0 value for the sequence field and potentially for the unit field.

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Sequenced Unit Header				
Field	Offset	Length	Value/Type	Description
Hdr Length	0	2	Binary	Length of entire block of messages. Includes this header and <i>Hdr Count</i> messages to follow.
Hdr Count	2	1	Binary	Number of messages to follow this header.
Hdr Unit	3	1	Binary	Unit that applies to messages included in this header.
Hdr Sequence	4	4	Binary	Always zero.
Total Length = 8 bytes				

2.5 Execution IDs

The 1st character of an Execution ID (after converting to a 9 character base 36 number zero-padded on the left) may be used to differentiate between internal matched trades and internal auction fills as follows:

- 0 (zero) = Cboe Internal Match
- C = Auction Fill

2.6 Heartbeat Messages

The `Sequenced Unit Header` with a count field set to “0” will be used for heartbeat messages. During trading hours heartbeat messages will be sent from all multicast addresses if no data has been delivered within 1 second. Heartbeat messages never increment the sequence number for a unit.

Outside of trading hours Cboe sends heartbeat messages on all real-time channels with a sequence of “0” to help users validate multicast connectivity. Heartbeat messages may not be sent from 12:00 am – 1:00 am ET or during maintenance windows.

3 PITCH 2.X Messages

With the exception of `Complex Instrument Definition`, `End of Session`, and `Time` messages, each PITCH message reflects an auction notification, cancelation, or trade execution of an order in the system.

3.1 Time

A `Time` message is sent whenever the source time for a unit passes over a second boundary. All subsequent time offset fields for the same unit will use the new `Time` value as the base until another `Time` message is received for the same unit.

Time				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	<i>Length</i> of this message including this field
Message Type	1	1	0x20	Time Message
Time	2	4	Binary	Number of whole seconds from midnight Eastern Time
Total Length = 6 bytes				

3.2 Complex Instrument Definition

A `Complex Instrument Definition` message represents a complex instrument that is available to place orders. This message is sent just prior to every `Auction Notification` message.

The `Complex Instrument Definition` message will contain two or more repeating groups of leg definitions. There is a limit of 12 leg definitions.

The `Leg Offset` field is provided to support adding additional fields to this message between the offset field and the Leg definitions. A `Leg Offset` of 1 means the leg definitions begin immediately following the `Leg Offset` field.

Complex Instrument Definition				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	<i>Length</i> of this message including this field
Message Type	1	1	0x99	Complex Instrument Definition Message
Time offset	2	4	Binary	Nanosecond offset from last unit timestamp
Complex Instrument Id	6	6	Printable ASCII	Complex Instrument Id right padded with spaces
Leg Count	12	1	Binary	The number of legs in this complex instrument
Leg Offset	13	1	Binary	Leg definitions begin this many bytes past this field

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The following fields repeat <i>Leg Count</i> times (maximum of 12) for multi-leg strategies.				
Leg Ratio	13 + Leg Offset + (10 * Leg Index)	4	Signed Binary	Leg ratio (positive for buy-side, negative for sell-side)
Leg Symbol	13 + Leg Offset + (10 * Leg Index)	6	Printable ASCII	Option Symbol of leg right padded with spaces
Total Length = 13 + Leg Offset + (Leg Count * 10) bytes				

3.3 Auction Notification

Auction Notification messages are used to disseminate order details of a complex auction. Auctions will be available for a defined period of time known as the exposure period. The *Price* field is only valid on EDGX Options. It will always be set to zero on C2 Options.

Auction Notification				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field
Message Type	1	1	0xAD	<i>Auction Notification</i> Message
Time offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Complex Instrument Id	6	6	Printable ASCII	Complex Instrument Id right padded with spaces.
Auction ID	12	8	Binary	Day specific identifier assigned to this auction.
Auction Type	20	1	Alphanumeric	C = Complex Options (COA)
Side	21	1	Alphanumeric	B = Buy S = Sell
Price	22	8	Binary Signed Long Price	Auction price (EDGX Options only). This field will be set to zero for C2 Options.
Quantity	30	4	Binary	Instrument quantity.
Customer Indicator	34	1	Alphanumeric	N = Non-Customer C = Customer
ParticipantID	35	4	Alphanumeric	Executing Broker (optional) of firm attributed to this quote.
Auction End Offset	39	4	Binary	Nanosecond offset from last timestamp.
Total Length = 43 bytes				

3.4 Auction Cancel

Auction Cancel messages are used to disseminate the cancelation of an earlier *Auction Notification* message as a result of a user cancelation of the original complex auction, a user modification request to change the complex auction price or increase the original complex auction quantity, a fading of the NBBO or to cancel any remaining complex auction quantity from the original *Auction Notification* following the complex auction termination.

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A user request to modify the complex auction price or to increase the original complex auction quantity will result in a cancellation of the complex auction followed by a new `Auction Notification` message. `Auction Cancel` messages will not be issued for complex auction quantity decrements.

Auction Cancel				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field
Message Type	1	1	0xAE	<code>Auction Cancel</code> Message
Time offset	2	4	Binary	Nanosecond offset from last unit timestamp
Auction ID	6	8	Binary	Day specific identifier assigned to this auction
Total Length = 14 bytes				

3.5 Auction Trade

`Auction Trade` messages are used to disseminate executions resulting from a complex auction.

Auction Trade				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field
Message Type	1	1	0xAF	<code>Auction Trade</code> Message
Time offset	2	4	Binary	Nanosecond offset from last unit timestamp
Auction ID	6	8	Binary	Day specific identifier assigned to this auction
Execution ID	14	8	Binary	Day specific identifier assigned to this execution
Price	22	8	Binary Signed Long Price	Trade price
Quantity	30	4	Binary	Instrument quantity traded
Total Length = 34 bytes				

3.6 End of Session

The `End of Session` message is sent for each unit when the unit shuts down. No more auction messages will be delivered for this unit, but heartbeats from the unit may be received.

End of Session				
Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	<i>Length</i> of this message including this field
Message Type	1	1	0x2D	<code>End of Session</code> Message

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Timestamp	2	4	Binary	Nanosecond offset from last unit timestamp
Total Length = 6 bytes				

4 Message Types

4.1 PITCH 2.X Messages

0x20	Time
0x99	Complex Instrument Definition
0xAD	Auction Notification
0xAE	Auction Cancel
0xAF	Auction Trade
0x2D	End of Session

5 Example Messages

Each of the following message types must be wrapped by a sequenced or unsequenced unit header as described in [Section 2.4](#). Note that in the following examples, each byte is represented by two hexadecimal digits.

5.1 Time Message

Length	06	6 bytes
Type	20	Time
Time	98 85 00 00	34,200 seconds = 09:30 AM Eastern

5.2 Complex Instrument Definition Message

Length	22	34 bytes
Type	99	Complex Instrument Definition
Time offset	18 D2 06 00	447,000 ns since last Time Message
CID	43 30 30 30 31 32	C00012
Leg Count	02	2 legs
Leg Offset	01	One byte
Leg Ratio	01 00 00 00	1 = Buy 1
Leg Symbol	30 30 30 30 30 31	000001
Leg Ratio	FF FF FF FF	-1 = Sell 1
Leg Symbol	30 30 30 30 30 32	000002

5.3 Auction Notification Message

Length	2B	43 bytes
Type	AD	Auction Notification
Time offset	18 D2 06 00	447,000 ns since last Time Message
CID	30 30 6d 45 56 4f	00mEVO
Auction ID	05 40 5B 77 8F 56 1D 0B	631WC4000005
Auction Type	43	C = COA
Side	42	B = Buy Side
Price	E8 A3 0F 00 00 00 00 00	\$102.50
Quantity	64 00 00 00	100
Customer Indicator	43	C = Customer
ParticipantID	45 46 49 44	EFID
Auct. End Offset	38 73 0E 00	947,000 ns since last Time Message

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5.4 Auction Cancel Message

Length	E	14 bytes
Type	AE	Auction Cancel
Time offset	18 D2 06 00	447,000 ns since last Time Message
Auction ID	05 40 5B 77 8F 56 1D 0B	631WC4000005

5.5 Auction Trade Message

Length	22	34 bytes
Type	AF	Auction Trade
Time offset	18 D2 06 00	447,000 ns since last Time Message
Auction ID	05 40 5B 77 8F 56 1D 0B	631WC4000005
Execution Id	34 2B 46 E0 BB 00 00 00	0AAP09VEC
Price	E8 A3 0F 00 00 00 00 00	\$102.50
Quantity	64 00 00 00	100

5.6 End of Session

Length	06	6 bytes
Type	2D	End of Session
Time offset	18 D2 06 00	447,000 ns since last Time Message

6 Multicast Configuration

6.1 Production Environment Configuration

6.1.1 Limitations/Configurations

The following table defines Cboe current configuration for network and gap request limitations. These limitations are session based. Cboe reserves the right to adjust the gap request limitations to improve the effectiveness of the gap request infrastructure.

Period/Type	Limit/Setting	Notes
MTU	1500	Cboe will send UDP messages up to 1500 bytes. Customers should ensure that their infrastructure is configured accordingly.
Gig-Shaped Throttle	1 Gb/s	The real-time and gap multicast head ends are configured to shape their output to this level to minimize packet loss.

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6.1.2 Unit/Symbol Distribution (Effective through 4/13/18)

The following table describes an updated Cboe symbol distribution across units for EDGX Complex Options Auction.

Unit	EDGX Symbol Range	C2 Symbol Range
1	A - ADRZZ	A - ADRZZ
2	ADS - AMZMZ	ADS - AMZMZ
3	AMZN - AOZZZ	AMZN - AOZZZ
4	AP - BACAZ	AP - BACAZ
5	BACB - CASZZ	BACB - CASZZ
6	CAT - CMGAZ	CAT - CMGAZ
7	CMGB - CYGZZ	CMGB - CYGZZ
8	CYH - DOWAZ	CYH - DOWAZ
9	DOWB - FASTZ	DOWB - FASTZ
10	FASU - FOWZZ	FASU - FOWZZ
11	FOX - GOLFZ	FOX - GOLFZ
12	GOLG - GPBZZ	GOLG - GPBZZ
13	GPC - HULZZ	GPC - HULZZ
14	HUM - IPAAZ	HUM - IPAAZ
15	IPAB - IWLZZ IWMA - LDLAZ	IPAB - IWLZZ IWMA - LDLAZ
16	LDLB - MCDAZ	LDLB - MCDAZ
17	MCDB - MTVZZ	MCDB - MTVZZ
18	MTW - NKEAZ	MTW - NKEAZ
19	NKEB - PCLMZ	NKEB - PCLMZ
20	PCLN - PCLNZ	PCLN - PCLNZ
21	PCLO - QQPZZ QQQA - REGNZ	PCLO - QQPZZ QQQA - REGNZ
22	REGO - SNEAZ	REGO - RUSZZ RUTA - RUTVZZ RUTWA - SNEAZ
23	SNEB - SPXZZ SPYA - TLLPZ	SNEB - SPXZZ SPYA - TLLPZ
24	TLLQ - TTMAZ	TLLQ - TTMAZ
25	TTMB - USFZZ	TTMB - USFZZ
26	USG - VRWZZ	USG - VRWZZ
27	VRX - WFLZZ	VRX - WFLZZ
28	WFM - XLP AZ	WFM - XLP AZ
29	XLPB - ZZZZZ	XLPB - ZZZZZ
30	IWM	IWM
31	QQQ	QQQ
32	SPY	SPY
33	N/A	RUT, RUTW

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6.1.3 Unit/Symbol Distribution (Effective 4/14/18)

Unit	BZX/EDGX Symbol Range	C2 Symbol Range
1	A – ADOZZ	A – ADOZZ
2	ADP – AMZMZ AMZNA – ANETZ	ADP – AMZMZ AMZNA – ANETZ
3	ANEU – BAAAZ	ANEU – BAAAZ
4	BAAB – BKNFZ	BAAB – BKNFZ
5	BKNG – BZZZZ	BKNG – BZZZZ
6	C – CLGXZ	C – CLGXZ
7	CLGY – CSXAZ	CLGY – CSXAZ
8	CSXB – DISAZ	CSXB – DISAZ
9	DISB – ETFBZ	DISB – ETFBZ
10	ETFC – FIVDZ	ETFC – FIVDZ
11	FIVE – GLDAZ	FIVE – GLDAZ
12	GLDB – GOOGZ	GLDB – GOOGZ
13	GOOH – HSXZZ	GOOH – HSXZZ
14	HSY – IWLZZ	HSY – IWLZZ
15	IWM – JNJAZ	IWM – JNJAZ
16	JNJB – LMTAZ	JNJB – LMTAZ
17	LMTB – MLNXZ	LMTB – MLNXZ
18	MLNY – MUA AZ	MLNY – MUA AZ
19	MUAB – NTESZ	MUAB – NTESZ
20	NTET – OXYAZ	NTET – OXYAZ
21	OXYB – QGENZ	OXYB – QGENZ
22	QGEO – RHAAZ	QGEO – RHAAZ
23	RHAB – SMGZZ	RHAB – RUSZZ RUTA – RUTVZ RUTWA – SMGZZ
24	SMH – SPXZZ SPYA – SYEZZ	SMH – SPXZZ SPYA – SYEZZ
25	SYF – TSKZZ	SYF – TSKZZ
26	TSL – UALAZ	TSL – UALAZ
27	UALB – VLOAZ	UALB – VLOAZ
28	VLOB – WDCAZ	VLOB – WDCAZ
29	WDCB – XLDZZ	WDCB – XLDZZ
30	XLE – ZZZZZ	XLE – ZZZZZ
31	AMZN	AMZN
32	SPY	SPY
33	N/A	RUT, RUTW

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Note - Cboe reserves the right to add units and/or change symbol distribution with 48 hours of notice and no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

6.1.4 EDGX Options Multicast Routing Parameters

Data Center	Rendezvous Point
NY5 Primary Data Center A feed	74.115.128.162
NY5 Primary Data Center B feed	74.115.128.163
CH4 Secondary Data Center E feed	174.136.181.240

6.1.5 C2 Options Multicast Routing Parameters

Data Center	Rendezvous Point
NY5 Primary Data Center A feed	74.115.128.176
NY5 Primary Data Center B feed	74.115.128.177
400SL Secondary Data Center E feed	170.137.16.134

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6.1.6 EDGX Options Address/Unit Distribution

The following tables describe the unit distribution across the EDGX Complex Options Auction Multicast PITCH feeds.

NY5 Primary Datacenter		Gig-Shaped [EAB] 174.136.164.32/28	Gig-Shaped [EBB] 174.136.164.48/28
Unit	IP Port	Real-time MC	Real-time MC
1	30651	224.0.131.160	233.130.124.160
2	30652		
3	30653		
4	30654		
5	30655		
6	30656		
7	30657		
8	30658		
9	30659		
10	30660		
11	30661		
12	30662		
13	30663		
14	30664		
15	30665		
16	30666		
17	30667	224.0.131.161	233.130.124.161
18	30668		
19	30669		
20	30670		
21	30671		
22	30672		
23	30673		
24	30674		
25	30675		
26	30676		
27	30677		
28	30678		
29	30679		
30	30680		
31	30681		
32	30682		

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration. Addresses in the gray area are pre-assigned but not available. Customers should not configure their networks or systems for these addresses.

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CH4 Secondary Datacenter		Gig-Shaped [EEB] 174.136.176.144/28
Unit	IP Port	Real-time MC
1	31651	233.19.3.144
2	31652	
3	31653	
4	31654	
5	31655	
6	31656	
7	31657	
8	31658	
9	31659	
10	31660	
11	31661	
12	31662	
13	31663	
14	31664	
15	31665	
16	31666	
17	31667	233.19.3.145
18	31668	
19	31669	
20	31670	
21	31671	
22	31672	
23	31673	
24	31674	
25	31675	
26	31676	
27	31677	
28	31678	
29	31679	
30	31680	
31	31681	
32	31682	

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

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6.1.7 C2 Options Address/Unit Distribution

The following tables describe the unit distribution across the C2 Complex Options Auction Multicast PITCH feeds.

NY5 Primary Datacenter		Gig-Shaped [WAB] 174.136.164.64/28	Gig-Shaped [WBB] 174.136.164.80/28
Unit	IP Port	Real-time MC	Real-time MC
1	30401	224.0.131.162	233.130.124.162
2	30402		
3	30403		
4	30404		
5	30405		
6	30406		
7	30407		
8	30408		
9	30409		
10	30410		
11	30411		
12	30412		
13	30413		
14	30414		
15	30415		
16	30416		
17	30417	224.0.131.163	233.130.124.163
18	30418		
19	30419		
20	30420		
21	30421		
22	30422		
23	30423		
24	30424		
25	30425		
26	30426		
27	30427		
28	30428		
29	30429		
30	30430		
31	30431		
32	30432		
33	30433		

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration. Addresses in the gray area are pre-assigned but not available. Customers should not configure their networks or systems for these addresses.

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400SL Secondary Datacenter		Gig-Shaped [WEB] 170.137.17.96/29
Unit	IP Port	Real-time MC
1	31401	233.182.199.112
2	31402	
3	31403	
4	31404	
5	31405	
6	31406	
7	31407	
8	31408	
9	31409	
10	31410	
11	31411	
12	31412	
13	31413	
14	31414	
15	31415	
16	31416	
17	31417	233.182.199.113
18	31418	
19	31419	
20	31420	
21	31421	
22	31422	
23	31423	
24	31424	
25	31425	
26	31426	
27	31427	
28	31428	
29	31429	
30	31430	
31	31431	
32	31432	
33	31433	

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

6.2 Certification Environment Configuration

6.2.1 Unit/Symbol Distribution (Effective through 4/13/18)

The following table describes an updated Cboe symbol distribution across units for EDGX Complex Options Auction.

Unit	EDGX Symbol Range	C2 Symbol Range
1	A - ADRZZ	A - ADRZZ
2	ADS - AMZMZ	ADS - AMZMZ
3	AMZN - AOZZZ	AMZN - AOZZZ
4	AP - BACAZ	AP - BACAZ
5	BACB - CASZZ	BACB - CASZZ
6	CAT - CMGAZ	CAT - CMGAZ
7	CMGB - CYGZZ	CMGB - CYGZZ
8	CYH - DOWAZ	CYH - DOWAZ
9	DOWB - FASTZ	DOWB - FASTZ
10	FASU - FOWZZ	FASU - FOWZZ
11	FOX - GOLFZ	FOX - GOLFZ
12	GOLG - GPBZZ	GOLG - GPBZZ
13	GPC - HULZZ	GPC - HULZZ
14	HUM - IPAAZ	HUM - IPAAZ
15	IPAB - IWLZZ IWMA - LDLAZ	IPAB - IWLZZ IWMA - LDLAZ
16	LDLB - MCDAZ	LDLB - MCDAZ
17	MCDB - MTVZZ	MCDB - MTVZZ
18	MTW - NKEAZ	MTW - NKEAZ
19	NKEB - PCLMZ	NKEB - PCLMZ
20	PCLN - PCLNZ	PCLN - PCLNZ
21	PCLO - QQPZZ QQQA - REGNZ	PCLO - QQPZZ QQQA - REGNZ
22	REGO - SNEAZ	REGO - RUSZZ RUTA - RUTVZZ RUTWA - SNEAZ
23	SNEB - SPXZZ SPYA - TLLPZ	SNEB - SPXZZ SPYA - TLLPZ
24	TLLQ - TTMAZ	TLLQ - TTMAZ
25	TTMB - USFZZ	TTMB - USFZZ
26	USG - VRWZZ	USG - VRWZZ
27	VRX - WFLZZ	VRX - WFLZZ
28	WFM - XLPAZ	WFM - XLPAZ
29	XLPB - ZZZZZ	XLPB - ZZZZZ
30	IWM	IWM
31	QQQ	QQQ
32	SPY	SPY
33	N/A	RUT, RUTW

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6.2.2 Unit/Symbol Distribution (Effective 4/14/18)

Unit	BZX/EDGX Symbol Range	C2 Symbol Range
1	A – ADOZZ	A – ADOZZ
2	ADP – AMZMZ AMZNA – ANETZ	ADP – AMZMZ AMZNA – ANETZ
3	ANEU – BAAAZ	ANEU – BAAAZ
4	BAAB – BKNFZ	BAAB – BKNFZ
5	BKNG – BZZZZ	BKNG – BZZZZ
6	C – CLGXZ	C – CLGXZ
7	CLGY – CSXAZ	CLGY – CSXAZ
8	CSXB – DISAZ	CSXB – DISAZ
9	DISB – ETFBZ	DISB – ETFBZ
10	ETFC – FIVDZ	ETFC – FIVDZ
11	FIVE – GLDAZ	FIVE – GLDAZ
12	GLDB – GOOGZ	GLDB – GOOGZ
13	GOOH – HSXZZ	GOOH – HSXZZ
14	HSY – IWLZZ	HSY – IWLZZ
15	IWM – JNJAZ	IWM – JNJAZ
16	JNJB – LMTAZ	JNJB – LMTAZ
17	LMTB – MLNXZ	LMTB – MLNXZ
18	MLNY – MUA AZ	MLNY – MUA AZ
19	MUAB – NTESZ	MUAB – NTESZ
20	NTET – OXYAZ	NTET – OXYAZ
21	OXYB – QGENZ	OXYB – QGENZ
22	QGEO – RHAAZ	QGEO – RHAAZ
23	RHAB – SMGZZ	RHAB – RUSZZ RUTA – RUTVZ RUTWA – SMGZZ
24	SMH – SPXZZ SPYA – SYEZZ	SMH – SPXZZ SPYA – SYEZZ
25	SYF – TSKZZ	SYF – TSKZZ
26	TSL – UALAZ	TSL – UALAZ
27	UALB – VLOAZ	UALB – VLOAZ
28	VLOB – WDCAZ	VLOB – WDCAZ
29	WDCB – XLDZZ	WDCB – XLDZZ
30	XLE – ZZZZZ	XLE – ZZZZZ
31	AMZN	AMZN
32	SPY	SPY
33	N/A	RUT, RUTW

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6.2.3 Multicast Routing Parameters

Data Center	Rendezvous Point
NY5 Certification Data Center	74.115.128.129

6.2.4 EDGX Options Address/Unit Distribution

The following table describes the unit distribution across certification EDGX Complex Auction Multicast PITCH feeds out of the NY5 datacenter.

Primary Datacenter		Certification 174.136.174.176/28
Unit	IP Port	Real-time MC
1	32651	224.0.74.188
2	32652	
3	32653	
4	32654	
5	32655	
6	32656	
7	32657	
8	32658	
9	32659	
10	32660	
11	32661	
12	32662	
13	32663	
14	32664	
15	32665	
16	32666	
17	32667	224.0.74.189
18	32668	
19	32669	
20	32670	
21	32671	
22	32672	
23	32673	
24	32674	
25	32675	
26	32676	
27	32677	
28	32678	
29	32679	
30	32680	
31	32681	
32	32682	

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

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6.2.5 C2 Options Address/Unit Distribution

The following table describes the unit distribution across certification C2 Complex Auction Multicast PITCH feeds out of the NY5 datacenter.

Primary Datacenter		Certification 174.136.160.80/28
Unit	IP Port	Real-time MC
1	32401	224.0.74.158
2	32402	
3	32403	
4	32404	
5	32405	
6	32406	
7	32407	
8	32408	
9	32409	
10	32410	
11	32411	
12	32412	
13	32413	
14	32414	
15	32415	
16	32416	
17	32417	224.0.74.159
18	32418	
19	32419	
20	32420	
21	32421	
22	32422	
23	32423	
24	32424	
25	32425	
26	32426	
27	32427	
28	32428	
29	32429	
30	32430	
31	32431	
32	32432	
33	32433	

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

7 Connectivity

7.1 Supported Extranet Carriers

Cboe has certified a number of carriers defined in the [Cboe US Equity/Options Connectivity Manual](#) with respect to redistribution of Cboe Multicast data feeds. For more information on receiving Multicast PITCH through any of these providers, reach out to the vendor contact noted in the Extranet Providers section of the Connectivity Manual.

7.2 Bandwidth Recommendation

The Gig-shaped feeds require 1Gbps of bandwidth. Cboe will use 90% of these respective bandwidths for Multicast PITCH to allow customers to use the same physical connection for FIX order entry if desired.

7.3 Multicast Test Program

The ZIP file located at http://www.batstrading.com/resources/membership/mcast_pitch.zip contains a sample program that may be used to test Multicast PITCH feed connections and to troubleshoot Multicast issues. Refer to the included README file for build and usage information.

8 References

For more information on Cboe Symbology, please refer to the [Cboe Symbology Reference](#) document.

9 Support

Please e-mail questions or comments regarding this specification to tradedesk@bats.com.

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Revision History

Document Version	Date	Description
2.0.0	05/11/17	Initial draft in support of Complex orders for EDGX Options Exchange. Based on Bats Multicast PITCH 2.X.
2.0.1	05/15/17	Removed Trading Status message.
2.0.2	05/18/17	Various minor updates and clarification added.
2.0.3	07/28/17	Added Multicast IPs/Ports for Certification environment.
2.0.4	08/08/17	Added Multicast IPs/Ports for Production environment.
2.0.5	09/01/17	Added C2 Options references.
2.0.6	10/17/17	Cboe branding/logo changes.
2.0.7	10/25/17	Incorrect Multicast Feed IDs were fixed in sections 1.1, 6.1.5, and 6.1.6
2.0.8	11/24/17	Auction Price is only valid for EDGX Options and will be set to zero for C2 Options. Added C2 Options Certification IP and Port information. Added RUT, RUTW options (C2 Options Only) to distinct unit (unit 33).
2.0.9	02/05/18	Update C2 Options IP and Port information.
2.0.10	03/08/18	Updated Unit Distribution ranges.
2.0.11	03/23/18	Unit Distribution ranges Effective Date updated to 4/14/18.