



U.S. Options Opening Process Feed Specification

Version 1.0.0

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Contents

1	Introduction	4
1.1	Overview	4
1.2	Feed Connectivity Requirements	4
1.3	Gap Request Proxy and Message Retransmission	5
1.4	Spin Servers.....	5
2	Protocol	6
2.1	Message Format	6
2.2	Data Types.....	6
2.3	Message Framing.....	6
2.4	Sequenced Unit Header	7
2.5	Heartbeat Messages.....	7
3	Cboe U.S. Options Opening Process Feed Messages	8
3.1	Time	8
3.2	Options Auction Update.....	8
3.3	Auction Summary.....	9
3.4	Width Update.....	9
3.5	Symbol Mapping.....	10
3.6	End of Session	10
4	Message Types	11
5	Example Messages.....	12
5.1	Sequenced Unit Header	12
5.2	Time Message	12
5.3	Options Auction Update.....	12
5.4	Auction Summary.....	12
5.5	Width Update.....	13
5.6	Symbol Mapping.....	13
5.7	End of Session	13
6	Multicast Configuration	14
6.1	US Options Production Environment Configuration	14
6.1.1	C1 Options Unit Distribution.....	14
6.1.2	C1 Options Production Multicast Routing Parameters.....	15
6.1.3	C1 Options Production Address/Unit Distribution.....	15
6.2	US Options Certification Environment Configuration	17
6.2.1	C1 Options Certification Unit Distribution	17

U.S Options Opening
Process Feed Specification (Version 1.0.0)

6.2.2 C1 Options Certification Multicast Routing Parameters..... 18

6.2.3 C1 Options Certification Address/Unit Distribution..... 18

7 Connectivity 19

7.1 Supported Extranet Carriers 19

7.2 Bandwidth Recommendation..... 19

8 References 19

9 Support..... 19

1 Introduction

1.1 Overview

This specification will be the standard specification used for the Cboe U.S. Options Opening Process Feed on the Cboe Options (“C1”) Exchange platform.

Cboe customers may use the Cboe U.S. Options Opening Process Feed specification to receive real-time Opening Auction message information including auction updates and execution information.

The Cboe U.S. Options Opening Process Feed cannot be used to enter orders. For Cboe U.S. Options order entry, refer to the Cboe US Options [FIX](#) or [BOE](#) specifications.

A WAN-Shaped version of the Cboe U.S. Options Opening Process Feed is available from both of Cboe’s datacenters. Customers may choose to take one or more of the following feed options depending on their location and connectivity to Cboe.

Exchange	Shaping	Served From Data Center (Primary/Secondary)	Multicast Feed ID
C1 Options	WAN	Primary	CCO
C1 Options	WAN	Primary	CDO
C1 Options	WAN	Secondary	CEO

Cboe customers may also use Cboe U.S. Options Multicast PITCH, Cboe U.S. Options Multicast TOP, and Cboe U.S. Options Auction data feeds to receive opening process messages. Refer to the specifications for the respective feeds for more information.

1.2 Feed Connectivity Requirements

WAN Shaped feeds are available to customers with a minimum of 100 Mbs/s of connectivity to Cboe via cross connect or dedicated circuit.

Customers with sufficient connectivity may choose the WAN-Shaped feeds from any of the Cboe datacenters. It should be noted that feeds from the secondary datacenter will have additional latency for those connected with Cboe in the primary data center due to proximity and business continuity processing.

Cboe U.S. Options Opening Process Feed real-time events are delivered using a single published multicast address for all symbol ranges.

1.3 Gap Request Proxy and Message Retransmission

Recovery of missed data is not available on the Cboe U.S. Options Opening Process Feed as this feed contains only unsequenced messages.

1.4 Spin Servers

A spin is not available on the Cboe U.S. Options Opening Process Feed as this feed contains only unsequenced messages.

2 Protocol

C1 Options customers may receive the Cboe U.S. Options Opening Process Feed protocol over multicast to receive auction update and summary execution information.

2.1 Message Format

Cboe U.S. Options Opening Process Feed protocol messages are delivered unsequenced and may not be retrieved if missed.

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.

The Cboe U.S. Options Opening Process Feed is comprised of a series of dynamic length un-sequenced 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 handle unknown message types and messages 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).
- **Binary Long Price** fields are unsigned Little Endian encoded 8 byte binary fields with 4 implied decimal places (denominator = 10,000).
- **Multiplier** fields are unsigned Little Endian encoded 4 byte binary fields with 1 implied decimal place (denominator = 10).
- **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

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 site. The content of the multicast across feeds (e.g. C/D WAN-Shaped) will be identical, but framing will not be consistent across feeds.

2.4 Sequenced Unit Header

The `Sequenced Unit Header` is used for all Cboe U.S. Options Opening Process Feed 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 unit field.

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

2.5 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 if no data has been delivered within 1 second. Heartbeat messages never increment the sequence number.

Outside of trading hours Cboe sends heartbeat messages are sent 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 Cboe U.S. Options Opening Process Feed Messages

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

3.2 Options Auction Update

`Options Auction Update` messages are used to disseminate price and size information during Opening and Re-Opening (halt) auctions. The `Options Auction Update` messages are sent every five seconds during an Opening or Re-opening period.

The `Options Auction Update` message has the following format:

Options Auction Update				
Field Name	Offset	Length	Type/(Value)	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field.
<i>Message Type</i>	1	1	0xD1	Options Auction Update Message
<i>Time offset</i>	2	4	Binary	Nanosecond offset from last unit timestamp.
<i>Symbol</i>	6	8	Printable ASCII	<i>Symbol</i> right padded with spaces.
<i>Auction Type</i>	14	1	Alphanumeric	G = GTH Opening O = RTH Opening H = Halt Re-Opening V = Volatility Opening
<i>Reference Price</i>	15	8	Binary Long Price	Collared auction only price.
<i>Buy Contracts</i>	23	4	Binary	Number of contracts on buy side at the <i>Reference Price</i> .
<i>Sell Contracts</i>	27	4	Binary	Number of contracts on sell side at the <i>Reference Price</i> .
<i>Indicative Price</i>	31	8	Binary Long Price	Opening Price computed on merged continuous and Auction Only book. This is the Opening Price if the series were to

U.S Options Opening
Process Feed Specification (Version 1.0.0)

				open instantaneously, and as such, may be a collared price.
<i>Auction Only Price</i>	39	8	Binary Long Price	Collared Volume Maximizing Imbalance Minimizing Price computed on combined Auction-Only and Continuous Book.
<i>Opening Condition</i>	47	1	Alphanumeric	O = Would open Q = Need quote to open B = Need more buyers S = Need more sellers
Total Length = 48 bytes				

3.3 Auction Summary

Auction Summary messages are used to disseminate the results of an auction. An *Opening* or *Re-Opening Auction Summary* message for each symbol is sent at the conclusion of its *Opening* or *Re-Opening* auction and represents the Cboe Opening Price.

The *Auction Summary* message has the following format:

Auction Summary				
Field Name	Offset	Length	Type/(Value)	Description
<i>Length</i>	0	1	Binary	Length of this message including this field.
<i>Message Type</i>	1	1	0x96	<i>Auction Summary</i> Message
<i>Time offset</i>	2	4	Binary	Nanosecond offset from last unit timestamp.
<i>Symbol</i>	6	8	Printable ASCII	<i>Symbol</i> right padded with spaces.
<i>Auction Type</i>	14	1	Alphanumeric	G = GTH Opening O = RTH Opening H = Halt Re-Opening V = Volatility Opening
<i>Price</i>	15	8	Binary Long Price	Auction price.
<i>Quantity</i>	23	4	Binary	Cumulative number of contracts executed during the auction.
Total Length = 27 bytes				

3.4 Width Update

The *Width Update* message is used to communicate the opening quote width multiplier. This message will be sent at the beginning of the day for all underlyings and in the event that the exchange decides to change the quote width multiplier on a per underlying basis. For complete details on the opening collars see the [Cboe Opening Process Specification](#).

U.S Options Opening
Process Feed Specification (Version 1.0.0)

Width Update				
Field Name	Offset	Length	Type/(Value)	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field.
<i>Message Type</i>	1	1	0xD2	Width Update Message
<i>Time Offset</i>	2	4	Binary	Nanosecond offset from last unit timestamp.
<i>Underlying</i>	6	8	Printable ASCII	Underlying right padded with spaces.
<i>Width Type</i>	14	1	Alphanumeric	R = Regular V = Volatility
<i>Multiplier</i>	15	4	Multiplier	Width multiplier.
Total Length = 19 bytes				

3.5 Symbol Mapping

A *Symbol Mapping* message is used to map the 6 character multicast feed symbol field to an OSI symbol. These messages are sent continuously through the day at variable rates as bandwidth allows.

Symbol Mapping				
Field Name	Offset	Length	Type/(Value)	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field
<i>Message Type</i>	1	1	0x2E	<i>Symbol Mapping</i> Message
<i>Feed Symbol</i>	2	6	Printable ASCII	Symbol right padded with spaces
<i>OSI Symbol</i>	8	21	Printable ASCII	OSI Symbol
<i>Symbol Condition</i>	29	1	Alphanumeric	N = Normal C = Closing Only
<i>Underlying</i>	30	8	Alphanumeric	Underlying right padded with spaces.
Total Length = 38 bytes				

3.6 End of Session

The *End of Session* message is sent for the feed when all the units have shut down. No more auction messages will be delivered for this feed.

End of Session				
Field Name	Offset	Length	Type/(Value)	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field
<i>Message Type</i>	1	1	0x2D	<i>End of Session</i> Message
<i>Timestamp</i>	2	4	Binary	Nanosecond offset from last timestamp
Total Length = 6 bytes				

4 Message Types

0x20	Time
0x31	Trading Status
0xD1	Options Auction Update
0x96	Auction Summary
0xD2	Width Update
0x2E	Symbol Mapping
0x2D	End of Session

5 Example Messages

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

5.1 Sequenced Unit Header

Hdr Length	31 00	49 bytes, including header
Hdr Count	02	2 messages to follow
Hdr Unit	01	Unit 1
Hdr Sequence	00 00 00 00	Always set to zero

5.2 Time Message

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

5.3 Options Auction Update

Length	30	48 bytes
Type	D1	Options Auction Update
Time offset	18 D2 06 00	447,000 ns since last Time Message
Symbol	30 30 6D 45 56 4F	00mEVO
Auction Type	56	Volatility Auction
Reference Price	E8 A3 0F 00 00 00 00 00	\$102.50
Buy Contracts	64 00 00 00	100 Contracts
Sell Contracts	C8 00 00 00	200 Contracts
Indicative Price	E8 A3 0F 00 00 00 00 00	\$102.50
Auction Only Price	E8 A3 0F 00 00 00 00 00	\$102.50
Opening Condition	4F	O = Would Open

5.4 Auction Summary

Length	1B	27 bytes
Type	96	Auction Summary
Time offset	18 D2 06 00	447,000 ns since last Time Message
Symbol	30 30 6D 45 56 5F 20 20	00mEVO
Auction Type	4F	O = Opening
Price	E8 A3 0F 00 00 00 00 00	\$102.50
Quantity	4B 00 00 00	75

U.S Options Opening
Process Feed Specification (Version 1.0.0)

5.5 Width Update

Length	13	19 bytes
Type	D2	Width Update
Time Offset	18 D2 06 00	447,000 ns since last Time Message
Underlying	5A 56 5A 5A 54 20 20 20	ZVZZT
Width Type	52	R = Regular
Multiplier	0F 00 00 00	Multiplier of 1.5

5.6 Symbol Mapping

Length	26	38 bytes
Type	2E	Symbol Mapping Message
Feed Symbol	30 30 6D 45 56 4F	00mEVO
OSI Symbol	4D 53 46 54 20 20 31 30 30 31 31 36 43 30 30 30 34 37 35 30 30	MSFT 100116C00047500
Symbol Condition	4E	'N' - Closing Only
Underlying	4D 53 46 54 20 20 20 20	MSFT

5.7 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 US Options Production Environment Configuration

6.1.1 C1 Options Unit Distribution

The following table describes an updated C1 symbol distribution across units.

Unit	C1 Symbol Range
1	TBD
2	TBD
3	TBD
4	TBD
5	TBD
6	TBD
7	TBD
8	TBD
9	TBD
10	TBD
11	TBD
12	TBD
13	TBD
14	TBD
15	TBD
16	TBD
17	TBD
18	TBD
19	TBD
20	TBD
21	TBD
22	TBD
23	TBD
24	TBD
25	TBD
26	TBD
27	TBD
28	TBD
29	TBD
30	TBD
31	TBD
32	TBD
33	TBD
34	TBD
35	TBD

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.

U.S Options Opening
Process Feed Specification (Version 1.0.0)

6.1.2 C1 Options Production Multicast Routing Parameters

Data Center	Rendezvous Point
NY5 Primary Data Center A feed	TBD
NY5 Primary Data Center B feed	TBD
CH4 Secondary Data Center E feed	TBD

6.1.3 C1 Options Production Address/Unit Distribution

The following tables describe the unit distribution across the C1 Options Opening Process Feed.

NY5 Primary Datacenter		WAN Shaped [CCO] TBD	WAN Shaped [CDO] TBD
Unit	IP Port	Real-time MC	Real-time MC
1	TBD	TBD	TBD
2	TBD		
3	TBD		
4	TBD		
5	TBD		
6	TBD		
7	TBD		
8	TBD		
9	TBD		
10	TBD		
11	TBD		
12	TBD		
13	TBD		
14	TBD		
15	TBD		
16	TBD		
17	TBD		
18	TBD		
19	TBD		
20	TBD		
21	TBD		
22	TBD		
23	TBD		
24	TBD		
25	TBD		
26	TBD		
27	TBD		
28	TBD		
29	TBD		
30	TBD		
31	TBD		
32	TBD		
33	TBD		
34	TBD		
35	TBD		

U.S Options Opening
Process Feed Specification (Version 1.0.0)

CH4 Secondary Datacenter		WAN Shaped [CEO] TBD
Unit	IP Port	Real-time MC
1	TBD	TBD
2	TBD	
3	TBD	
4	TBD	
5	TBD	
6	TBD	
7	TBD	
8	TBD	
9	TBD	
10	TBD	
11	TBD	
12	TBD	
13	TBD	
14	TBD	
15	TBD	
16	TBD	
17	TBD	
18	TBD	
19	TBD	
20	TBD	
21	TBD	
22	TBD	
23	TBD	
24	TBD	
25	TBD	
26	TBD	
27	TBD	
28	TBD	
29	TBD	
30	TBD	
31	TBD	
32	TBD	
33	TBD	
34	TBD	
35	TBD	

6.2 US Options Certification Environment Configuration

6.2.1 C1 Options Certification Unit Distribution

The following table describes an updated C1 symbol distribution across units.

Unit	C1 Symbol Range
1	TBD
2	TBD
3	TBD
4	TBD
5	TBD
6	TBD
7	TBD
8	TBD
9	TBD
10	TBD
11	TBD
12	TBD
13	TBD
14	TBD
15	TBD
16	TBD
17	TBD
18	TBD
19	TBD
20	TBD
21	TBD
22	TBD
23	TBD
24	TBD
25	TBD
26	TBD
27	TBD
28	TBD
29	TBD
30	TBD
31	TBD
32	TBD
33	TBD
34	TBD
35	TBD

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.

6.2.2 C1 Options Certification Multicast Routing Parameters

Data Center	Rendezvous Point
NY5 Certification Data Center	TBD

6.2.3 C1 Options Certification Address/Unit Distribution

The following tables describe the unit distribution across the C1 Options Certification Opening Process Feed.

NY5 Primary Datacenter		Certification TBD
Unit	IP Port	Real-time MC
1	TBD	TBD
2	TBD	
3	TBD	
4	TBD	
5	TBD	
6	TBD	
7	TBD	
8	TBD	
9	TBD	
10	TBD	
11	TBD	
12	TBD	
13	TBD	
14	TBD	
15	TBD	
16	TBD	
17	TBD	
18	TBD	
19	TBD	
20	TBD	
21	TBD	
22	TBD	
23	TBD	
24	TBD	
25	TBD	
26	TBD	
27	TBD	
28	TBD	
29	TBD	
30	TBD	
31	TBD	
32	TBD	
33	TBD	
34	TBD	
35	TBD	

7 Connectivity

7.1 Supported Extranet Carriers

The Cboe U.S. Options Opening Process Feed will be made available to customers through extranet carriers that have completed their multicast implementation and certified with Cboe on a per-market basis. Cboe has certified a number of carriers for redistribution of Cboe Multicast data feeds as outlined in the [Cboe US Equity/Options Connectivity Manual](#). For more information on receiving the Cboe U.S. Options Opening Process Feed through any of these providers, please refer to the vendor contact information noted in the Extranet Providers section of the Connectivity Manual.

7.2 Bandwidth Recommendation

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

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@cboe.com.

U.S Options Opening
Process Feed Specification (Version 1.0.0)

Revision History

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1.0.0	11/16/18	Initial version 1.0.0.