Complex Top of Market Feed

cToM Interface Specification

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1 Overview

MIAX Emerald Complex Top of Market (**cToM**) is a data feed that allows subscribers to receive real-time updates of the following information from the MIAX Emerald Options Market

- MIAX Emerald Options Strategies Best Bid or Offer (cEBBO): Best Bid or Offer price with aggregated complex order sizes of a strategy that can be displayed at that price. For purposes of this document, cEBBOs are not subject to quote mitigation processing.
- MIAX Emerald Strategy Last Sale (trades)

MIAX Emerald is referred to as Emerald in the rest of the document.

cToM Features:

CTOM messaging and the system architecture is designed for low latency and high throughput messaging. Some of the key features of the interface are:

- cToM uses binary numeric fields, fixed length ASCII fields and top of market messages in order to utilize bandwidth efficiently and assist in achieving **low latency**.
- Message formats are designed to use **less bandwidth**. Some examples: cToM uses a compact version of the Top of Strategy Market message for most quotes with small prices/sizes and uses the larger message only when necessary. cToM disseminates a separate Seconds message instead of sending this with every message. cToM messages use Strategy IDs in each message in place of a full canonical symbol.
- cToM uses binary message formats and bundles multiple application messages into a single packet in order to facilitate **high throughput**.
- cToM is offered with redundant multicast feeds (A Feed & B Feed) to provide single point of failure hardware and network fault tolerance and to provide an opportunity for recipients to arbitrate the two feeds to auto-fill gaps.
- cToM real-time messages are disseminated over multicast to achieve a fair delivery mechanism. cToM requires the use of MIAX proprietary SesM TCP IP protocol for retransmission lines in order to provide a **guaranteed delivery** mechanism for gap fills.
- The CToM retransmission service also provides a Last Value Refresh Service to facilitate fast intra-day recovery without a full day gap fill.
- cToM notifications provide current **electronic system status** allowing the subscribers to take necessary actions immediately.

This specification is intended to be used by Emerald cToM subscribers only.

1.1 Exchange related information

1.1.1 Hours of operation for MIAX Options Exchange

Please refer to MIAX website at http://www.MIAXOptions.com for details about times for each of these events.

Note: Times specified below are in United States Eastern Time zone.

Start of Session: Start of dissemination of messages. After 5:00 a.m.
Trading Session for Equity Options: 9:30 a.m. to 4:00 p.m. (ends at 1:00 p.m. on early closing days). Emerald may send trade related data following the end of trading session due to the issuance of manual trades, trade cancels, trade corrections or for various operational reasons as needed.

Trading Session for ETF and Index Options: 9:30 a.m. to 4:15 p.m. (ends at 1:15 p.m. on early closing days). Emerald may send trade related data following the end of trading session due to the issuance of manual trades, trade cancels, trade corrections or for various operational reasons as needed.

1.1.2 Obtaining more information

Information such as (but not limited to) membership, rules, data feeds, fees and support can be obtained by sending an email to Trading Operations or by referring to MIAX website at http://www.MIAXOptions.com.

1.2 Testing of cToM Subscription

MIAX can provide testing assistance on Emerald testing area for the retransmission interface.

Please contact MIAX Trading Operations at TradingOperations@MIAXOptions.com or (609)897-7302 to obtain more information about the aforementioned.

1.3 Answers to FAQs

Subscription: Please contact Trading Operations for details about subscribing to cToM.

Symbol and Strategy management: Subscribers to the data feed will get a list of all option symbols and strategies that will be traded and sourced on that feed at the start of every session. If firms cannot start listening to the feed in time for the normal symbol and complex strategy broadcast, they can connect to the cToM Retransmission service and request Last Value Refresh Service (see section 3.2.2) or request all messages published and then subsequently process only the symbol and strategy messages to build their symbol and/or strategy list. The Emerald assigned Product ID or Strategy ID of each option/strategy will be sent in every message so that firms can tie each message to an option symbol or strategy.

Retransmission: Gap-fill packets generated as a response to retransmission requests are only disseminated on the retransmission TCP channels and not on the real-time multicast feeds.

Redundant Feeds: In order to achieve higher availability, Emerald offers the real-time cToM feed in two separate redundant and identical feeds named "A Feed" and "B Feed". Firms are advised to arbitrate between the two feeds in order to mitigate gaps and achieve higher availability. "A Feed" is the primary feed from the primary data center and "B Feed" is the secondary feed from the secondary data center.

Trading Status: The first Strategy Last Sale (Trade) or Complex Top of Market message of the day, or if either of the prior appears after a strategy halt, indicates a given strategy is open for trading at MIAX. Strategy Trading Halts are communicated as a complex top of market message with a condition of 'T'.

Refresh Service: Refresh service is provided only on the retransmission TCP channels and does not affect the real-time cToM feed.

1.4 Data Types

The following table describes the data types used in cToM messaging:

Note: Time fields in all messages are as per timings of United States Eastern Time zone unless specified otherwise.

Data Type	Description
BinaryS	Signed, Intel x86 byte-ordered (**little-endian**), binary encoded numbers
BinaryU	Unsigned, Intel x86 byte-ordered (**little-endian**), binary encoded numbers
BinaryPrc4S	BinaryS Field with the last 4 (right most) digit places being decimal places
BinaryPrc4U	BinaryU Field with the last 4 (right most) digit places being decimal places
BinaryPrc2S	BinaryS Field with the last 2 (right most) digit places being decimal places
SecTime	BinaryU field that contain transaction time in seconds since Epoch (January 1, 1970, 00:00:00 **UTC**)
NanoTime	BinaryU field that contain transaction time in nanoseconds since past second
Alphanumeric	Each place can contain characters or numbers. Left justified and space-padded on the right

2 cToM Architecture

Emerald Complex Top of Market (cToM) Architecture
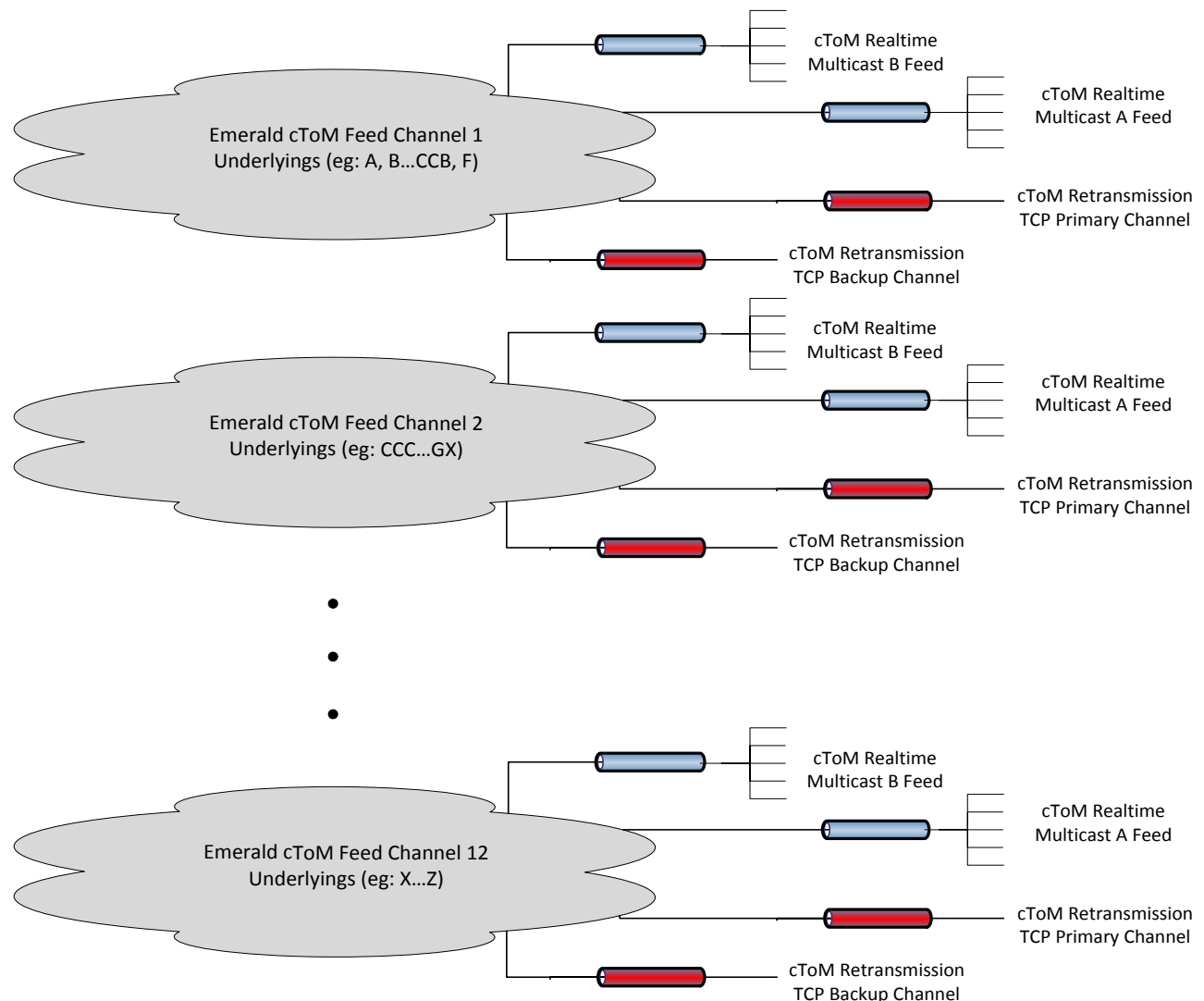
Highlights:

- Real-time dissemination is separated out on to 12 separate Feed channels.
- A Feed channel will contain sourced data for all options for a single underlying.
- Any options for any given underlying will only be sourced by a single feed channel on any given day.
- Each Feed channel sources independently from the other groups and hence has independent sequence numbers.
- All the messages on each feed channel will be published in FIFO sequence.
- cEBBO data is disseminated on same multicast group as Strategy Trades in each of these Feeds.

- High availability is achieved by disseminating identical data on an "A Feed" and "B Feed" for each Feed channel
- Underlyings may not be contiguously distributed according to symbol ranges in each Feed channel.
- Two separate TCP based retransmission channels for each Feed channel supply cToM retransmission via the cToM Retransmission service.

3   Session Level Protocol

3.1   Real-time cToM Feed

cToM real-time feed uses MIAX's proprietary **MACH protocol**. Each cToM Packet may have multiple application messages and each application message is encapsulated in a MACH protocol packet. Hence a single cToM packet may contain 1 or more sequenced MACH protocol packets.

Please refer to MACH document (available at MIAX website at http://www.MIAXOptions.com) for details about MACH protocol. This protocol layer offers low latency application messaging over multicast, sequencing of messages and heartbeats.

3.2   cToM Retransmission Interface

cToM Retransmission Interface uses MIAX's proprietary **SesM – TCP Session Management Protocol**. Please refer to the latest SesM TCP Session Management document (available at the MIAX website) for details about SesM session management protocol. This protocol layer offers session management capabilities such as authentication, application messaging over TCP/IP, sequencing of messages, heartbeats and gap fills.

Firms must first use the `Login Request` with a requested sequence number of **zero** to login to the Interface. After receiving a successful `Login Response`, the firm can choose either the SesM Gap Fill Service or Last Value Refresh Service.

3.2.1   SesM Gap Fill Service
Firms can use the **Retransmission Request** session management message, available in the SesM protocol, to request retransmission of a specific range of packets, identified by sequence numbers.

3.2.2   Last Value Refresh Service

3.2.2.1   Request Message to Emerald
Firms can use the **Unsequenced Data Packet,** available in the SesM protocol, to request a last value refresh of various EBBO market data and status information. The Refresh Request has the following format:

Field Name	Length	Data Type	Notes
SesM Packet Length	2	Binary	

Field Name	Length	Data Type	Notes
SesM Packet Type	1	Alphanumeric	*'U' – SesM Unsequenced Packet*
Request Type	1	Alphanumeric	"R" – Refresh
Refresh Message Type	1	Alphanumeric	"P" - Simple Series Update Refresh "C" – Complex Strategy Update Refresh "T" - Top of Strategy Market Refresh "U" – Underlying Trading Status Refresh "S" – System State Refresh

3.2.2.2 Response Message from Emerald

The Retransmission feed will respond to the Refresh request with a series of SesM-TCP "unsequenced packets" based on the `Refresh Message Type`. Each response message will have the *following format*:

Field Name	Length	Data Type	Notes
SesM Packet Length	2	Binary	
SesM Packet Type	1	Alphanumeric	*'U' – SesM Unsequenced Packet*
Response Type	1	Alphanumeric	"R" – cToM Refresh
Sequence Number	8	BinaryU	Original sequence number from live feed.
Application Message	varies	See section 4	Based on the message type requested.

The first SesM-TCP packet to be received by the firms will be the Emerald System Time Message (See section 4.1). The timestamp (combined with the nanosecond part in the subsequent messages) represents the most recent Matching Engine transaction time. It is **not** the original timestamp from the MACH sequenced messages in the live feed. *The sequence number in the refresh messages may be used to arbitrate with the sequenced packets from live feed (e.g.: data with higher sequence number from either the refresh or the live feed represents latest information).*

3.2.2.3 End of Refresh Notification from Emerald

When the refresh is complete MIAX will send the following message.

Field Name	Length	Data Type	Notes
SesM Packet Length	2	Binary	
SesM Packet Type	1	Alphanumeric	*'U' – SesM Unsequenced Packet*
Response Type	1	Alphanumeric	"E" – End of Request.
Refresh Message Type	1	Alphanumeric	from Refresh Request

3.2.3 Session Termination

After satisfying the retransmission request, ToM Retransmission Interface will send a `Goodbye Packet` and disconnect the TCP connection.

Note: Upon receipt of an unknown, malformed or illegal session message, Emerald will send a SesM "Goodbye Packet" with a human readable reason text string and Emerald will disconnect the line.

4   Application Message Formats

This section consists of format of messages sent over the cToM feed.

The time specified in the *Timestamp* field in all the messages below is the time at which the Matching Engine associated with that underlying group published the message. This is the same timestamp that will get included in the messages transmitted on the retransmission interface.

4.1   Emerald System Time Message

This is the message format that will be used to disseminate the "seconds" part of the timestamp that is applicable to all messages that are sent in the current second.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"1"
Time Stamp	4	SecTime	Seconds part of the time that applies to all messages that gets disseminated until this message gets sent again.

Points to note:

- Note that this message is only sent when there are any application messages that are going to be sent during any second. Firms are advised to not assume that there will be a message for every second of the day.

4.2   Simple Series Update

This is the message format that will be used to disseminate all Option series traded on Emerald for the current session.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"P"
Product Add/Update Time	4	NanoTime	Time at which this product is added/updated on Emerald system today.
Product ID	4	BinaryU	Emerald Product ID mapped to a given option. It is assigned per trading session and is valid for that session.
Underlying Symbol	11	Alphanumeric	Stock Symbol for the option.
Security Symbol	6	Alphanumeric	Option Security Symbol
Expiration Date	8	Alphanumeric	Expiration date of the option in YYYYMMDD format
Strike Price	4	BinaryPrc4U	Explicit strike price of the option. Refer to data types for field processing notes
Call or Put	1	Alphanumeric	Option Type "C" = Call "P" = Put

Field Name	Length	Data Type	Notes
Opening Time	8	Alphanumeric	Expressed in HH:MM:SS format. Eg: 09:30:00
Closing Time	8	Alphanumeric	Expressed in HH:MM:SS format. Eg: 16:15:00
Restricted Option	1	Alphanumeric	"Y" = MIAX will accept position closing orders only "N" = MIAX will accept open and close positions
Long Term Option	1	Alphanumeric	"Y" = Far month expiration (as defined by Emerald rules) "N" = Near month expiration (as defined by Emerald rules)
Active on Emerald	1	Alphanumeric	Indicates if this symbol is tradable on MIAX in the current session: "A" = Active (tradable) on Emerald "I" = Inactive (not tradable) on Emerald
Emerald BBO Posting Increment Indicator	1	Alphanumeric	This is the Minimum Price Variation as agreed to by the Options industry (penny pilot program) and as published by Emerald
Liquidity Acceptance Increment Indicator	1	Alphanumeric	This is the Minimum Price Variation for Quote/Order acceptance as per Emerald rules

Emerald BBO Posting Increment Indicator table:

Indicator	BBO Increments	
	Price <= $3	Price > $3
"P"	Penny (0.01)	Penny (0.01)
"N"	Penny (0.01)	Nickel (0.05)
"D"	Nickel (0.05)	Dime (0.10)

Liquidity Acceptance Increment Indicator table:

Indicator	Quoting Increments	
	Price <= $3	Price > $3
"P"	Penny (0.01)	Penny (0.01)
"N"	Penny (0.01)	Nickel (0.05)
"D"	Nickel (0.05)	Dime (0.10)

Field Name	Length	Data Type	Notes
Opening Underlying Market Code	1	Alphanumeric	Options opening will be triggered on receipt of Opening quote/trade from this Underlying market:

Market Code	Description
A	NYSE Amex
B	NASDAQ OMX BX
C	National Stock Exchange
D	FINRA ADF
E	Market Independent (Any market that opens first)
I	International Securities Exchange
J	EDGA Exchange, Inc.
K	EDGX Exchange, Inc.
M	Chicago Stock Exchange
N	NYSE Euronext
P	NYSE Arca Exchange
Q	NASDAQ OMX (via UTP Feed)
T	NASDAQ OMX (via CTA Feed)
V	IEX
X	NASDAQ OMX PHLX
Y	BATS Y-Exchange, Inc.
Z	BATS Exchange Inc.

Field Name	Length	Data Type	Notes
Priority Quote Width	4	BinaryPrc4U	Maximum allowable width for a quote for this Option during regular trading in order to be considered as Priority Quote. 0 when Priority Quote Width is not applicable.
Reserved	8	BinaryU	** Reserved for future use **

Points to note:

- Entire Options list will be disseminated at the start of day.
- In each channel, firms will only receive the series associated with the Engine that is servicing that channel.
- Intra-day updates will also be published as they occur.
- In case of an intra-day reconnection, users can request all Options series data from the cToM retransmission line.
- The Priority quote width specified in this message is not applicable to Opening. Please refer Emerald rules and circulars for details about priority quote width applicable during Opening.

4.3   Complex Strategy Definition Message

This is the message format that will be used to disseminate stock option strategies traded on MIAX for the current session. The Strategy ID sent in this message is utilized by the Administrative Information Subscriber (AIS) Feed for Complex Liquidity Seeking Events, the MIAX Order Feed (MOR) for Complex Order dissemination, the Complex Top of Market Feed (cToM) for Complex Trade and Top of Market dissemination and the MIAX Express Interface (MEI) for Complex eQuotes.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"C"
Strategy Add Time	4	NanoTime	Time at which this Strategy is added/updated on Emerald system today.
Strategy ID	4	BinaryU	Emerald Strategy ID is assigned per trading day and is valid only for that day.
Underlying Symbol	11	Alphanumeric	Underlying Symbol for this strategy
Active on Emerald	1	Alphanumeric	Indicates if this strategy is tradable on Emerald in the current session: "A" = Active (tradable) on Emerald "I" = Inactive (not tradable) on Emerald
Reserved	1	BinaryU	** Reserved for future use **
Update Reason	1	Alphanumeric	"N" – New strategy created "U" – Strategy definition updated
Reserved	10	BinaryU	** Reserved for future use **
Number of Legs	1	BinaryU	Number of Legs. Variable from 2 to 8
➡ Product ID	4	BinaryU	*Option leg:* MIAX Defined Series. See Simple Series Update Message. *Stock leg:* 0 (zero)
➡ Leg Ratio Qty	2	BinaryU	The ratio of this individual leg. Number of option contracts or Number of stock shares for this leg is: LegRatioQty * OrderQty
➡ Leg Side	1	Alphanumeric	The side of this individual leg Valid values are: "B" = Bid "A" = Ask
➡ Reserved	8	BinaryU	** Reserved for future use **

Points to note:

- Strategies may be created intra-day as orders are placed at the Emerald Exchange or pre-defined before the market open.
- In each channel, firms will only receive the Strategies associated with the Engine that is servicing that channel.
- In case of an intra-day reconnection, users can request all Strategies definitions from the cToM or AIS retransmission lines.
- The length of this message is ***variable*** based on the number of legs.
- When underlying halts, all strategies for that underlying are in a halted state. Firms should process Underlying Trading Status notification to determine current state of the strategies.

- This message might be published more than once per day. When Update Reason is "U", the only field that can change is "Active on Emerald".
- The tradability of a strategy can be tracked with the status of the underlying (message type "H") or the individual series (message type "P").
- The Strategy ID and Product ID fields are separate and distinct fields with assigned ID's per trading day and valid only for the current day. Their scope is limited to each field.

4.4   System State

This message format is used to notify the firms of the state changes of the system. This is a notification that applies to each Underlying group. Firms can use notifications as triggers in their system to ensure electronic synchronization of systems.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"S"
Notification Time	4	NanoTime	Time at which this was generated by Emerald system.
cToM Version	8	Alphanumeric	Eg: CTOM01.00
Session ID	4	BinaryU	Emerald assigned ID for the current trading session
System Status	1	Alphanumeric	Current system status: "S" = Start of System hours "C" = End of System hours "1" = Start of Test Session (sent before tests). "2" = End of Test Session.

Points to note:

- Firms must ensure that messages sent on the cToM Feed from the beginning of "start of test session" to the end of "end of test session" will not affect their production session while allowing the firms to still be involved in production tests and dry runs.
- A change in Session ID will mean that restarting at MACH sequence number 1 for that Underlying group. Refer to MACH protocol specification for details about this. Firms must be able to handle more than one trading session in a single trading day.

4.5   Complex Top of Market (Best Bid or Offer) Message – Compact Format

This is the message format that will be used to disseminate each side of the Emerald Complex Top of Market for strategies with low Net Price and small aggregate Emerald Best Bid or Offer (MBBO) size.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"b" = Emerald Complex Top of Market on Bid side "o" = Emerald Complex Top of Market on Offer side
Timestamp	4	NanoTime	Nanoseconds part of the timestamp
Strategy ID	4	BinaryU	Emerald Strategy ID as defined by a previously

Field Name	Length	Data Type	Notes
			published Complex Strategy Update message. It is assigned per trading session and is valid for that session.
Price	2	BinaryPrc2S	Emerald Best price at the time stated in Timestamp and side specified in Message Type. The net limit price for the strategy If Side is Bid ("b"): - Positive number represents net debit - Negative number represents net credit If Side is Offer ("o"): - Positive number represents net credit - Negative number represents net debit Price of zero is net neutral transaction for either side.
Size	2	BinaryU	Aggregate size at Emerald Best Price at the time stated in Timestamp and side specified in Message Type
Priority Customer Size	2	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Price for the Complex Strategy
Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions

Points to note:

- Emerald will only disseminate the side on which the bid or offer changed.

4.6   Complex Top of Market (Best Bid or Offer) Message – Wide Format

This is the message format that will be used to disseminate Emerald Complex Top of Market for strategies with high net price or large aggregate Emerald Best Bid or Offer (EBBO) size.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"e" = Emerald Complex Top of Market on Bid side "f" = Emerald Complex Top of Market on Offer side
Timestamp	4	NanoTime	Nanoseconds part of the timestamp
Strategy ID	4	BinaryU	Emerald Strategy ID as defined by a previously published Complex Strategy Update message. It is assigned per trading session and is valid for that session.

Field Name	Length	Data Type	Notes
Price	8	BinaryPrc4S	Emerald Best price at the time stated in Timestamp and side specified in Message Type. The net limit price for the strategy If Side is Bid ("e"): • Positive number represents net debit • Negative number represents net credit If Side is Offer ("f"): • Positive number represents net credit • Negative number represents net debit Price of zero is net neutral transaction for either side.
Size	4	BinaryU	Aggregate size at Emerald Best Price at the time stated in Timestamp and side specified in Message Type
Priority Customer Size	4	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Price for the Complex Strategy
Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions

Points to note:

- Emerald will only disseminate the side on which the bid or offer changed.

4.7   Complex Double-Sided Top of Market (Best Bid and Offer) Message – Compact Format

This is the message format that will be used to disseminate both sides of the Emerald top of market for strategies (cEBBO) with low net price *and* small aggregate size.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"m" (lower case)
Timestamp	4	NanoTime	Nanoseconds part of the timestamp
Strategy ID	4	BinaryU	Emerald Strategy ID as defined by a previously published Complex Strategy Update message.
Bid Price	2	BinaryPrc2S	Emerald Best Bid net price. • Positive number represents net debit • Negative number represents net credit Price of zero is net neutral transaction.
Bid Size	2	BinaryU	Aggregate size at Emerald Best Bid Net Price
Bid Priority Customer Size	2	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Bid Price for the Complex Strategy
Bid Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions
Offer Price	2	BinaryPrc2S	Emerald Best Offer net price.

Field Name	Length	Data Type	Notes
			• Positive number represents net credit • Negative number represents net debit Price of zero is net neutral transaction.
Offer Size	2	BinaryU	Aggregate size at Emerald Best Bid Net Price
Offer Priority Customer Size	2	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Offer Price for the Complex Strategy
Offer Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions

4.8 Complex Double-Sided Top of Market (Best Bid and Offer) Message – Wide Format

This is the message format that will be used to disseminate both sides of the Emerald top of market for strategies (cEBBO) with net prices *or* aggregate sizes which cannot be specified in the compact format.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"w" (lower case)
Timestamp	4	NanoTime	Nanoseconds part of the timestamp
Strategy ID	4	BinaryU	Emerald Strategy ID as defined by a previously published Complex Strategy Update message.
Bid Price	8	BinaryPrc4S	Emerald Best Bid net price. • Positive number represents net debit • Negative number represents net credit Price of zero is net neutral transaction.
Bid Size	4	BinaryU	Aggregate size at Emerald Best Bid Net Price
Bid Priority Customer Size	4	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Bid Price for the Complex Strategy
Bid Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions
Offer Price	8	BinaryPrc4S	Emerald Best Offer net price. • Positive number represents net credit • Negative number represents net debit Price of zero is net neutral transaction.
Offer Size	4	BinaryU	Aggregate size at MIAX Best Bid Net Price
Offer Priority Customer Size	4	BinaryU	Aggregate size of Priority Customer contracts at Emerald Best Offer Price for the Complex Strategy
Offer Condition	1	Alphanumeric	Refer to Appendix A: Top of Strategy Market Quote Conditions

4.9   Strategy Last Sale (Trade) Message

This is the message format that will be used to disseminate Trades that are resulting from executions on Emerald during the current trading session.

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"t" (lower case)
Timestamp	4	NanoTime	Nanoseconds part of the timestamp
Strategy ID	4	BinaryU	Emerald Strategy ID as defined by a previously published Complex Strategy Update message.
Trade ID	4	BinaryU	Unique Complex Trade ID assigned to every trade.
Net Price	8	BinaryPrc4S	The net transaction price of the complex package.
Size	4	BinaryU	Number of strategies executed in this trade
Condition	1	Alphanumeric	Valid Values: <table><tr><th>Condition Code</th><th>Description</th></tr><tr><td>S</td><td>Complex Order matched with another Complex Order</td></tr><tr><td>L</td><td>Complex Order matched (legged) with simple orders</td></tr></table>
Reserved	16	Alphanumeric	Reserved for future use

Points to Note:

- The Complex Trade ID is unique for all complex trades.
- The Complex Trade ID in the cToM specification and Simple Trade ID fields in the ToM Specification are separate and distinct fields with individually assigned ID's. Their scope is limited to each field.

4.10 Underlying Trading Status Notification

This message format will be used to notify firms of changes to the trading status of all the options of an underlying.

Message Direction: Emerald to Firm

Field Name	Length	Data Type	Notes
MACH Protocol Data			*Refer to MACH Protocol Specification*
Message Type	1	Alphanumeric	"H"
Timestamp	4	NanoTime	Time at which this was generated by Emerald system.
Underlying Symbol	11	Alphanumeric	Underlying Symbol
Trading Status	1	Alphanumeric	<table><tr><th>Condition Code</th><th>Description</th></tr><tr><td>H</td><td>Emerald has halted trading for this Underlying Symbol</td></tr></table>

Field Name	Length	Data Type	Notes	
			R	Emerald will resume trading (reopen) for this Underlying Symbol
			O	Emerald will open trading for this Underlying Symbol

Field Name	Length	Data Type		
Event Reason	1	Alphanumeric	**Condition Code**	**Description**
			A	This event resulted from automatic/market driven event
			M	Emerald manually initiated this event
Expected Event Time: Seconds Part	4	SecTime	Seconds portion of the expected time of the event. Always use in conjunction with the Nano-seconds part field.	
Expected Event Time: Nano-Seconds Part	4	BinaryU	Nano-seconds portion of the expected time of the event. Specifies number of nano-seconds since the seconds specified in "Expected Event Time Seconds" field.	

Points to note:

- When underlying trading status ="H", Expected Event Time Seconds/Nano-Seconds will be set to 0 (zero).
- When underlying trading status = "R" or "O", Expected Event Time (Seconds/Nano-Seconds Parts) will be set to the time at which the opening/reopening process will start for this Underlying Symbol.

Appendix A: Top of Strategy Market Quote Conditions

Condition Code	Description
A	Regular (Eligible for Automatic Execution)
T	Trading Halt
W	Wide Market Protection
S	Simple Market Auction or Timer in Progress
C	Complex Auction or cPRIME auction in Progress
M	Simple Market Protections, Strategy Match Blocked
L	Leg Market protection, Book Match Prevented

Appendix B: Emerald cToM Subscription/Connectivity Information

Please visit MIAX website at http://www.MIAXOptions.com to obtain the most up-to-date information about the following:

- Real-time Feed multicast groups, ports for A feed and B Feed
- Retransmission IP addresses and ports for primary and backup channels.
- Emerald contact list.

Appendix C: Revision History

Revision Date	Version	Author	Description
Sep 07 2018	1.0	Vinay Rao	First release.