

ISE Trade Feed Specification

Version 1.0.3. January 9, 2023

Table Of Contents

| | |
|--|----|
| 1. Overview | 2 |
| 2. Architecture | 2 |
| 3. Data Types | 2 |
| 4. Message Formats | 3 |
| 4.1. System Event Message | 3 |
| 4.2. Option Directory Message | 4 |
| 4.3. Trading Action Message | 5 |
| 4.4. Security Open/Closed Message | 6 |
| 4.5. Ticker Message | 6 |
| 5. Support | 7 |
| Appendix A – Sample Messages | 8 |
| Appendix B – Document Revision Control Log | 11 |

1. Overview

The Nasdaq ISE Trade Feed is a direct data feed product in the Nasdaq ISE (ISE) systems offered by Nasdaq® that features the following:

- Ticker Messages: Displays last trade information along with opening price, cumulative volume, high and low prices for the day.
- Administrative and market event messages including:
 - Options Directory messages to be disseminated to relay basic option symbol and contract information for those securities traded on the options market.
 - Security Open Message to be disseminated for each security as soon as the opening auction process is completed to inform recipients that the option symbol denoted in the message is available for auto execution within the options market system.
 - Trading action messages to inform market participants when a specific security is halted or released for trading on the options market.

2. Architecture

The feed will be made up of a series of sequenced messages. Each message is variable in length based on the message type and is composed of binary and alphanumeric data. The messages that make up this protocol are typically delivered using a higher level protocol that takes care of sequencing and delivery guarantees.

The options system offers the data feed in two protocol options:

Protocol Option Number of Outbound Channels

SoupBinTCPv3.00 Multiple output channels, each channel supporting a subset of securities, the range defined by first letter of underlying
MoldUDP64v1.00 Multiple output channels, each channel supporting a subset of securities, the range defined by first letter of underlying

The feed is composed of a Multicast and Soup channel.

Please note that Nasdaq provides local redundancy in the NY Metro Area (local "A" and "B" feeds), as well as the remote Chicago Region ("C" and "D" feeds). The secondary "C" and "D" feeds are available for general use; however please note that performance characteristics will be reduced due to the remote location of these feeds.

Both the local primary ("A feed") and local secondary ("B feed") will be hosted by servers co-located with the local trading system and will have identical performance characteristics. The remote primary ("C feed") and remote secondary ("D feed") will be hosted by servers co-located with the remote trading system and will have identical (but reduced) performance characteristics. The messages in each of the "A", "B", "C" and "D" feeds are identical: Mold or Soup messages will have the same Mold or Soup sequence numbers across all of the streams.

In the event of disaster recovery, the "C" and "D" feeds should be used as primary feeds when order entry is switched from the NY Metro Area to the Chicago Region.

3. Data Types

All Alpha or Alphanumeric fields are left justified and padded on the right with spaces.

All Integer fields are unsigned big-endian (network byte order) binary encoded numbers unless otherwise specified. Integers may be 1, 2, 4 or 6 bytes long.

Prices are 2, 4 or 8 byte Integer fields. 2 byte Price fields are unsigned positive numbers. 4 and 8 byte Price fields are signed numbers. When an 8 byte price is converted to a decimal format, prices are in fixed point format with 12 whole number places followed by 8 decimal digits. When a 4 byte price is converted to a decimal format, prices are

in fixed point format with 6 whole number places followed by 4 decimal digits. When a 2 byte price is converted to a decimal format, prices are in fixed point format with 3 whole number places followed by 2 decimal digits.

Time is expressed as a 6 byte Integer, representing the number of nanoseconds past midnight of the current day.

4. Message Formats

This feed supports four basic types of messages:

- System Events
- Administrative Data and Market Events
- Announcements of new resting orders in the book
- Announcements of auctions

Within the system event and administrative types, the options system may support multiple message formats as outlined below.

4.1. System Event Message

The system event message type is used to signal a market or data feed handler event. The format is as follows:

System Event Message

| Name | Offset | Length | Value | Notes |
|---------------|--------|--------|---------|--|
| Message Type | 0 | 1 | Alpha | "S" = System Event Message |
| Timestamp | 1 | 6 | Integer | The time, expressed as the number of nanoseconds after midnight. |
| Event Code | 7 | 1 | Alpha | Refer to System Event Codes below |
| Current Year | 8 | 2 | Integer | The current calendar year (example: 2016). |
| Current Month | 10 | 1 | Integer | The current calendar month, with values 1 to 12 inclusive, January=1, etc. |
| Current Day | 11 | 1 | Integer | The current calendar day, with values 1 to 31 inclusive. |
| Version | 12 | 1 | Integer | Version of this interface. Currently set to 1. |
| Sub-version | 13 | 1 | Integer | Sub-version of this interface. Currently set to 0. |

System Event Codes

| Code | Explanation | When (typically) |
|------|--|--|
| "O" | Start of Messages. This is always the first message sent in any trading day. | After ~ 12:00am |
| "S" | Start of System Hours. This message indicates that the options system is open and ready to start accepting orders. | After Start of Messages and before Start of Currency Opening Process |
| "F" | Start of Currency Opening Process. This message is intended to indicate that the options system has started its opening auction process for currency options. | 7:30:00am |
| "Q" | Start of Opening Process. This message is intended to indicate that the options system has started its opening auction process. | 9:30:00am |
| "N" | Start of Normal Hours Closing Process. This message is intended to indicate that the options system will no longer generate new executions for options that trade during normal hours. | 4:00:00pm |
| "L" | Start of Late Hours Closing Process. This message is intended to indicate that the options system will no longer generate new executions for options that trade during extended hours. | 4:15:00pm |
| "E" | End of System Hours. This message indicates that the options system is now closed. | ~5:15pm |

System Event Codes

| Code | Explanation | When (typically) |
|------|--|------------------|
| "C" | End of Messages. This is always the last message sent in any trading day. | ~5:20pm |
| "W" | End of WCO Early closing. This message is intended to indicate that the exchange will no longer accept any new orders or changes to existing Orders on last trading date of WCO options. | 12:00 Noon |

4.2. Option Directory Message

At the start of each trading day, the options system disseminates directory messages for all symbols eligible for trading in the options system.

Options Directory Message

| Name | Offset | Length | Value | Notes |
|---------------------|--------|--------|--------------|---|
| Message Type | 0 | 1 | Alpha | "D" = Directory Message |
| Timestamp | 1 | 6 | Integer | The time, expressed as the number of nanoseconds after midnight. |
| Option ID | 7 | 4 | Integer | Option ID for this option, assigned daily, valid for trading day. |
| Security Symbol | 11 | 6 | Alphanumeric | Denotes the option root symbol (security symbol) |
| Expiration Year | 17 | 1 | Integer | Last two digits of the year of the option expiration |
| Expiration Month | 18 | 1 | Integer | Expiration Month of the option (1-12) |
| Expiration Day | 19 | 1 | Integer | Day of the Month of expiration (1-31) |
| Strike Price | 20 | 8 | Integer | Explicit strike price in fixed point format with 12 whole number places followed by 8 decimal digits. |
| Option Type | 28 | 1 | Alpha | "C" = Call option "P" = Put option |
| Source | 29 | 1 | Integer | Identifies the source of the option, valid for the trading day. |
| Underlying Symbol | 30 | 13 | Alpha | Denotes the unique symbol assigned to the underlying security within the Exchange System. |
| Trading Type | 43 | 1 | Alpha | Indicates what kind of option this is: "E" = Equity "I" = Index "F" = ETF "C" = Currency |
| Contract Size | 44 | 2 | Integer | Underlying deliverable size |
| Option Closing Type | 46 | 1 | Alpha | Denotes which System Event is used to determine when trading ceases in this symbol. "N" = Normal Hours "L" = Late Hours |
| Tradable | 47 | 1 | Alpha | Denotes whether or not this option is tradable at the exchange: "Y" = Option is tradable "N" = Option is not tradable |
| MPV | 48 | 1 | Alpha | Minimum Price Variation for this option: "E" = penny Everywhere "S" = Scaled "P" = penny Pilot |

Options Directory Message

| Name | Offset | Length | Value | Notes |
|--------------|--------|--------|-------|---|
| Closing Only | 49 | 1 | Alpha | Closing position of the option: "Y" = Option is Closing Position Only. Only Market Maker origin orders can have open position "N" = Option is not Closing Position Only |

Options Directory Notes:

1. The options directory messages are sent once per symbol, typically before the "Start of System Hours" System Event. Should it be necessary, intra-day updates to this message will be sent as they occur. In the case of an intra-day update, for a given Option Id, the canonical information for the option is invariant (will not change). The canonical information consists of Security Symbol, Expiration Year Month and Day, Strike Price and Option Type. Other attributes for the Option may change.
2. Firm should note that they will only receive Option Directory messages for the symbol range associated with the matching engine serving that connection.
3. The Underlying Symbol is in most cases the same as the industry standard ticker underlying. In rare cases, such as a special settlement symbol, the exchange assigns unique underlying symbols.
4. This is a sequenced message and therefore can be replayed upon re-connection.
5. If an Option is removed from the system intra-day, a new options directory message will be sent with "Tradable" field set to "N".
6. The Minimum Price Variation (MPV) has the following values:
 - a. "E" – All prices are in penny increments
 - b. "S" – Prices below \$3.00 are in increments of \$0.05, prices above \$3.00 are in increments of \$0.10
 - c. "P" – Prices below \$3.00 are in increments of \$0.01, prices above \$3.00 are in increments of \$0.05

4.3. Trading Action Message

The options system uses this administrative message to indicate the current trading status of an index or equity option within the options market.

Prior to the start of system hours, the options system will send out a Trading Action message. The options system will send out a Trading Action message with the "T" (Trading Resumption) for all options contracts that are eligible for trading at the start of the options market system hours. If a security is absent from the pre-opening Trading Action spin, firms should assume that the security is being treated as halted in the options platform at the start of the system hours. Securities may be halted in the options system for regulatory or operational reasons.

After the start of system hours, the options system will use the Trading Action message to relay changes in trading status for an individual security. Messages will be sent when an option is halted or is released for trading

Trading Action Message

| Name | Offset | Length | Value | Notes |
|--------------|--------|--------|---------|--|
| Message Type | 0 | 1 | Alpha | "H" = Trading Action |
| Timestamp | 1 | 6 | Integer | The time, expressed as the number of nanoseconds after midnight. |
| Option ID | 7 | 4 | Integer | Integer ID of the option, as defined in the Options Directory Message. |

Trading Action Message

| Name | Offset | Length | Value | Notes |
|-----------------------|--------|--------|-------|---|
| Current Trading State | 11 | 1 | Alpha | Reflects the current trading state for the options security in the options market. The allowable values are: "H" = Halt in effect "T" = Trading on the options system |

4.4. Security Open/Closed Message

The options system uses this administrative message to indicate when an option has completed the opening process and is now available for auto execution or when the option has closed and is no longer available for auto execution.

The system disseminates the Security Open/Closed Message for each option as soon as the opening is completed. Upon receipt of the message with "Open State" = "Y", the recipient is advised that the option denoted in the message is now available for auto execution within the options system. Upon receipt of the message with "Open State" = "N", the recipient is advised that the option is no longer eligible for auto-execution within the options system.

Security Open/Closed Message

| Name | Offset | Length | Value | Notes |
|--------------|--------|--------|---------|--|
| Message Type | 0 | 1 | Alpha | "O" = Security Open/Closed |
| Timestamp | 1 | 6 | Integer | The time, expressed as the number of nanoseconds after midnight. |
| Option ID | 7 | 4 | Integer | Integer ID of the option, as defined in the Options Directory Message. |
| Open State | 11 | 1 | Alpha | Reflects the current eligibility for auto execution of the options security in the options market. The allowable values are: Y = Open for auto execution N = Closed for auto execution |

Note: Recipients should continue to process the Trading Action message in order to determine if a contract is in a Halt state for the day. A security open message should not override the Trading action message indicating if an index or equity option is halted.

Recipients should use both messages in tandem to indicate if the issue is halted and/or or open for auto execution.

4.5. Ticker Message

The ticker message is used to real time trade information. The format is as follows:

Ticker Message

| Name | Offset | Length | Value | Notes |
|--------------|--------|--------|---------|--|
| Message Type | 0 | 1 | Alpha | "T" = Ticker |
| Timestamp | 1 | 6 | Integer | The time, expressed as the number of nanoseconds after midnight. |
| Option ID | 7 | 4 | Integer | Integer ID of the option, as defined in the Options Directory Message. |
| Last Price | 11 | 4 | Integer | Most recent price. |
| Size | 15 | 4 | Integer | Last traded quantity. |
| Volume | 19 | 4 | Integer | Total traded quantity. |
| High | 23 | 4 | Integer | High price for the day. |
| Low | 27 | 4 | Integer | Low price for the day. |

Ticker Message

| Name | Offset | Length | Value | Notes |
|-----------------|--------|--------|---------|---|
| First | 31 | 4 | Integer | Opening price for the day. |
| Trade Condition | 35 | 1 | Alpha | Same value as the Trade Condition sent to OPRA for this trade. To obtain a list of Trade Conditions, refer to the NOTE below. |

NOTE: The Trade Condition is the same as defined in the OPRA specification: http://www.opradata.com/specs/opra_input_binary_part_spec.pdf. The OPRA Trade Condition is enumerated in the "Message Type" field of the "Equity and Index Last Sale" message (Category "a") in the specification document. The specification has a table of the possible Message Types (Trade Condition) along with a detailed description of each type. Always refer to the www.opradata.com website to ensure the possible Trade Conditions sent out by this feed, which are consistent with the Trade Conditions defined by OPRA

5. Support

- For general product support for Nasdaq data feeds, please contact Nasdaq Market Data at clientsuccess@nasdaq.com.
- For technical support for Nasdaq data feeds, please contact Nasdaq Systems Engineering at devsupport@nasdaq.com.

Appendix A – Sample Messages

Each message defined in this protocol has an example to clarify how the message is parsed. Some points to consider:

- The encapsulating protocol defines the message length, in bytes. This can be used as an aid to parsing the messages;
- The first byte of the message is always message type. Once the type of the message is known, the rest of the message can be parsed from the definitions of the messages.

Example 1 – System Event Message

At 9:30:00.123456789 am, the system sends a System Event message which announces a Start of Opening Process event for date April 23, 2017. The version of this interface is 1.0.

System Event Message

| Name | Offset | Value | Hex Value |
|---------------|--------|-------------------|-------------------|
| Message Type | 0 | "S" | 53 |
| Timestamp | 1 | 9:30:00.123456789 | 1F 1A D6 35 BD 15 |
| Event Code | 7 | "Q" | 51 |
| Current Year | 8 | 2017 | 07 E1 |
| Current Month | 10 | 4 | 04 |
| Current Day | 11 | 23 | 17 |
| Version | 12 | 1 | 01 |
| Sub-Version | 13 | 0 | 00 |

Network byte stream (in hex):

- 53 1F 1A D6 35 BD 15 51 07 E1 04 17 01 00

Example 2 – Options Directory Message

At 6:30:00.234567891 am, the system sends an Options Directory message describing a tradable option having ID 85393 with the following properties: security symbol "OIH1", equity option, expiration date 1/20/2017, strike price \$29.10000000, type call option, underlying symbol "OIH", contract size 100, Option is Closing Position Only, normal closing hours, "Scaled" MPV, trading on the exchange on source 2.

Options Directory Message

| Name | Offset | Value | Hex Value |
|-------------------|--------|-------------------|---|
| Message Type | 0 | "D" | 44 |
| Timestamp | 1 | 6:30:00.234567891 | 15 48 4A AB 48 D3 |
| Option Id | 7 | 85393 | 00 01 4D 91 |
| Security Symbol | 11 | "OIH1" | 4F 49 48 31 20 20 |
| Expiration Year | 17 | 2017 | 11 |
| Expiration Month | 18 | 1 | 01 |
| Expiration Day | 19 | 20 | 14 |
| Strike Price | 20 | 29.10000000 | 00 00 00 00 AD 73 13 80 |
| Option Type | 28 | Call | 43 |
| Source | 29 | 2 | 02 |
| Underlying Symbol | 30 | "OIH" | 4F 49 48 20 20 20 20 20 20 20 20 20 20 |

Options Directory Message

| Name | Offset | Value | Hex Value |
|---------------------|--------|-------|-----------|
| Trading Type | 43 | "E" | 45 |
| Contract Size | 44 | 100 | 00 64 |
| Option Closing Type | 46 | "N" | 4E |
| Tradable | 47 | "Y" | 59 |
| MPV | 48 | "S" | 53 |
| Closing Only | 49 | "Y" | 59 |

Network byte stream (in hex):

- 44 15 48 4A AB 48 D3 00 01 4D 91 4F 49 48 31 20 20 11 01 14 00 00 00 00 AD

73 13 80 43 02 4F 49 48 20 20 20 20 20 20 20 20 20 20 20 20 20 20 45 00 64 4E 59 53 59

Example 3 – Trading Action Message

At 1:51:45.234567891 pm, the system sends a Trading Action message indicating that option with id 85393 has been halted.

Trading Action Message

| Name | Offset | Value | Hex Value |
|-----------------------|--------|--------------------|-------------------|
| Message Type | 0 | "H" | 48 |
| Timestamp | 1 | 13:51:45.234567891 | 2D 63 77 C7 62 D3 |
| Option Id | 7 | 85393 | 00 01 4D 91 |
| Current Trading State | 11 | "H" | 48 |

Network byte stream (in hex):

- 48 2D 63 77 C7 62 D3 00 01 4D 91 48

Example 4 – Security Open/Closed Message

At 9:30:00.345678912 am, the system sends a Security Open/Closed message indicating that option with id 85393 is open for auto execution.

Security Open/Closed Message

| Name | Offset | Value | Hex Value |
|--------------|--------|-------------------|-------------------|
| Message Type | 0 | "" | 4F |
| Timestamp | 1 | 9:30:00.345678912 | 1F 1A E3 74 94 40 |
| Option Id | 7 | 85393 | 00 01 4D 91 |
| Open State | 11 | "Y" | 59 |

Network byte stream (in hex):

- 4F 1F 1A E3 74 94 40 00 01 4D 91 59

Example 5 – Ticker Message

At 3:58:44.891234567 pm, the system sends a Ticker message for option id 85393, last price \$1.1000, size 16, volume 127535, high \$1.8000, low \$0.9200, first \$1.0000.

Ticker Message

| Name | Offset | Value | Hex Value |
|-----------------|--------|--------------------|-------------------|
| Message Type | 0 | "T" | 54 |
| Timestamp | 1 | 15:58:44.891234567 | 34 51 0E B5 31 07 |
| Option Id | 7 | 85393 | 00 01 4D 91 |
| Last Price | 11 | 1.1000 | 00 00 2A F8 |
| Size | 15 | 16 | 00 00 00 10 |
| Volume | 19 | 127535 | 00 01 F2 2F |
| High | 23 | 1.8000 | 00 00 46 50 |
| Low | 27 | 0.9200 | 00 00 23 F0 |
| First | 31 | 1.0000 | 00 00 27 10 |
| Trade Condition | 35 | "<blank>" | 20 |

Network byte stream (in hex):

- 54 34 51 0E B5 31 07 00 01 4D 91 00 00 2A F8 00 00 00 10 00 01 F2 2F 00 00 46 50 00 00 23 F0 00 00 27 10 20

Appendix B – Document Revision Control Log

September 13, 2016: Nasdaq Gemini/ISE/Mercury Trade Feed - Version 1.00

- Initial specification.

October 12, 2016: Nasdaq Gemini/ISE/Mercury Trade Feed - Version 1.01

- Fixed Trading Type enumeration in Option Directory Message

January 13, 2017: Nasdaq Gemini/ISE/Mercury Trade Feed - Version 1.01

- Adjusted Start of Currency Opening Process enumeration from "W" to "F"
- Clarifying intra-day removal of option impact on option directory message

April 19, 2017: Nasdaq ISE/Nasdaq GEMX/Nasdaq MRX Trade Feed - Version 1.01

- Removing FX Opening System Event Enumeration as FX products will open at 9:30 with other options

May 30, 2017: Nasdaq ISE/Nasdaq GEMX/Nasdaq MRX Trade Feed - Version 1.01

- Adding system event enumeration "W" for early close on expiration day of WCO (FX) options

June 13, 2017: Nasdaq ISE/Nasdaq GEMX/Nasdaq MRX Trade Feed - Version 1.01

- Adjusting system event enumeration "O" Start of Messages to 12:30 AM

December 17, 2019: Nasdaq ISE/Nasdaq GEMX/Nasdaq MRX Trade Feed - Version 1.02

- Updated the Start of Messages (System Event Code "O") time to ~2:00 am.

November 3, 2022: Nasdaq ISE/Nasdaq GEMX Trade Feed - Version 1.02

- Removed any reference to Nasdaq MRX (MRX)

January 9, 2023: Nasdaq ISE/Nasdaq GEMX Trade Feed – Version 1.0.3

- Version updated to 1.0.3
- Clarifying the Data Types: Added "2 byte Price fields are unsigned positive numbers. 4 and 8 byte Price fields are signed numbers."

June 2, 2023: Nasdaq ISE/GEMX Depth of Market Feed - Version 1.03

- Start of Messages("O") event start time changed from "After ~2am" to "After ~12am"

November 13, 2023: Nasdaq ISE Trade Feed specification – Version 1.03

- GEMX Migration completed in Nov 2023. Removed GEMX from this spec as it no longer applies.

