# XDP COMMON CLIENT SPECIFICATION

**NYSE XDP FEEDS**

**NYSE AMERICAN XDP FEEDS**

**NYSE NATIONAL XDP FEEDS**

**NYSE ARCA INTEGRATED FEED**

| Version | Date |
| --- | --- |
| 2.2 | December 3, 2018 |

# Preface

## DOCUMENT HISTORY

The following table provides a description of recent changes to this document.

| Version | Date | Change Description |
|---|---|---|
| **2.1** | Jan 24,2017 | Updated section 3.6 (Order IDs and Trade IDs)<br>Removed Trading Session Change msg. Security Status now communicates this.<br>Removed value 0x20 from Halt Condition field of the Security Status msg<br>Added values E & L to Security Status and Market State fields |
| **2.1a** | Feb 2, 2017 | Symbol Mapping & Security Status msgs: corrected msg sizes – same in all markets<br>Corrected MPV & Unit of Trade – populated in all markets |
| **2.1b** | May 26, 2017 | Section 10 – added ftp file path for NYSE American Symbol Mapping file<br>8.4.2 – Updated request quota information<br>5.2 Corrected packetization information for Message Unavailable messages<br>3.2 Updated Time Reference message usage<br>3.7 Clarified Symbol Index uniqueness and intraday usage<br>Updated links to the NYSE Symbology Spec |
| **2.1c** | Aug 11, 2017 | Updated links and contact information on page 3<br>Updated 3.6 Order ID's and Trade ID's<br>Corrected 8.4.2 guidance for handling exceeded quotas |
| **2.1d** | Sep 27, 2017 | Corrected execution ID correlation for NYSE Tape A in section 3.6<br>Corrected production hours in 9.4<br>Corrections to Security Status field content : Security Status & Halt Condition fields |
| **2.1e** | Sep 30, 2017 | Corrected usage in ftp symbol file, Listed Market and Ticker Designation fields, as well as in Symbol Index Mapping msg, Exchange Code field<br>Updated usage descriptions of the Source Time Reference message in section 4.4 |
| **2.1f** | Jan 29, 2018 | Updated for NYSE National Exchange (no change to substance of spec) |
| **2.1g** | Nov 8, 2018 | **No change to feeds.** Corrected startup time in 9.4 and added descriptive text. |
| **2.2** | Dec 3, 2018 | **No change to feeds. Spec clarifications/corrections only.**<br>Clarified that binary integers are unsigned unless otherwise specified<br>Corrected Exchange Code field in Symbol Index message: C is not a valid value<br>Corrected Security Type U for non-NYSE markets: U = Closed End Fund<br>Clarified definitions of Security Statuses I and G |

## REFERENCE MATERIAL

The following lists the associated documents, which either should be read in conjunction with this document or which provide other relevant information for the user:

- SFTI connectivity documents
- NYSE Symbology Specification
- IP Addresses

## CONTACT INFORMATION

**Service Desk**

- Telephone: +1 212 896-2830
- Email: support@nyse.com

## FURTHER INFORMATION

- For additional product information please visit, our NYSE Real Time Market Data pages
- For updated capacity figures, visit our capacity pages

# Contents

# 1. Introduction

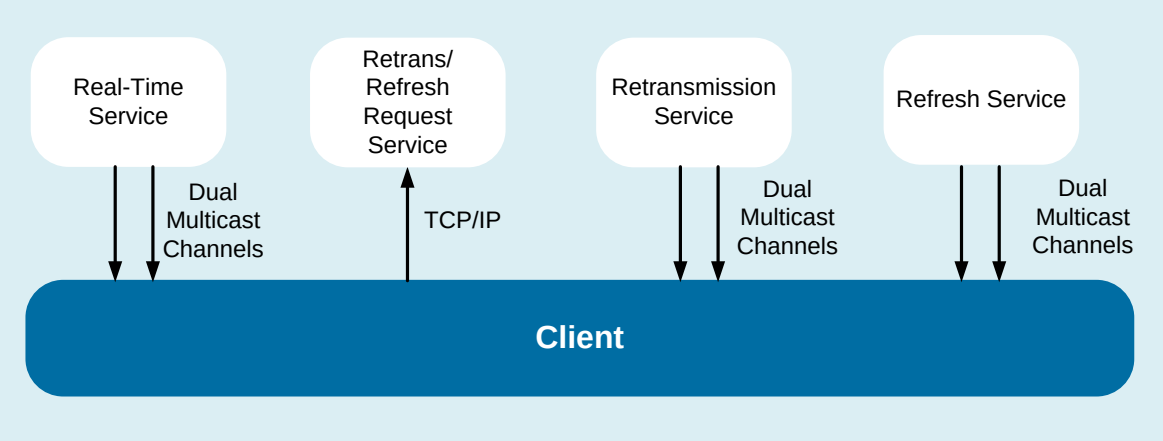
## 1.1 RECEIVING REAL TIME MARKET DATA

Real-time XDP data is published in the form of messages with fixed length fields. All fields are binary except a very small number that are in ASCII format. For efficient use of the network, the messages are bundled into application packets, and the packets are published via the multicast protocol.

For capacity reasons, packets are routed over a number of predefined data sets called channels. Each channel is duplicated and published to two distinct multicast groups for redundancy. The two redundant multicast groups per channel (called lines) are referred to as line A and line B. The union of the data in all channels that make up a product is called a feed.

The IP addresses and port numbers of the production and test channels for each XDP feed can be found at www.nyxdata.com/ipaddresses. A client application receives a product by subscribing to some or all of the channels that make up the feed.

## 1.2 RECOVERING FROM ERRORS




- In case of dropped multicast packets, the client can connect to a Request Server via TCP/IP to request retransmissions of missed messages.
- In case of client late start or intraday failure, the client can connect to the Request Server and request snapshot refreshes of the state of the market.
- At system startup, each channel publishes referential data about all symbols published on the channel. If a client process misses this initial spin of symbol data, he can connect to the Request Server and request a refresh of some or all of the missed data.

In response to these requests, retransmission and refresh data is published by the exchange over dedicated multicast channels which correspond one-to-one with the real-time channels.

See Error Handling and the Request Server for complete information.

# 2. Packets and Heartbeats

## 2.1 PACKET HEADER

All packets sent on any XDP feed have an XDP Packet Header followed by one or more messages (with the exception of Heartbeat packets which do not contain any messages).

The maximum length of a packet is 1400 bytes, so no message can be longer than 1400 – 16 bytes (max packet size - the length of the Packet Header).

### Packet Header Structure

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **PktSize** | 0 | 2 | Binary | The size of the packet in bytes, including this 16 -byte packet header |
| **DeliveryFlag** | 2 | 1 | Binary | A flag that indicates whether this is an original, retransmitted, or 'replayed' message. Valid values include:<br>▪ 1 – Heartbeat<br>▪ 10 – XDP Failover (see XDP Publisher Failover)<br>▪ 11 – Original Message<br>▪ 12 – Sequence Number Reset Message<br>▪ 13 – Only one packet in retransmission sequence<br>▪ 15 – Part of a retransmission sequence<br>▪ 17 – Only one packet in Refresh sequence<br>▪ 18 – Start of Refresh sequence<br>▪ 19 – Part of a Refresh sequence<br>▪ 20 – End of Refresh sequence<br>▪ 21 – Message Unavailable |
| **NumberMsgs** | 3 | 1 | Binary | The number of messages in this packet |
| **SeqNum** | 4 | 4 | Binary | The message sequence number of the first message in this packet |
| **SendTime** | 8 | 4 | Binary | The time when this packet was published to the multicast channel, in seconds since Jan 1, 1970 00:00:00 UTC. |
| **SendTimeNS** | 12 | 4 | Binary | The nanosecond offset from the Send Time |

## 2.2 HEARTBEATS

To assist the client in confirming connection health, application heartbeats are sent once a minute by the Request Server, and once a second by the real-time publishing servers (data, refresh and retransmissions channels).

A heartbeat consists of a packet containing a Packet Header and no messages. The Packet Header's Delivery Flag is set to 1 and Number Msgs is 0. Since a heartbeat packet contains no messages, a heartbeat does not increment the next expected sequence number. See Sequence Numbers.

Heartbeats sent by the Request Server must be acknowledged by the client. See Request Server.

# 3. Message Field Content

Messages are contiguous data structures consisting of fixed-length fields. No names or 'tags' appear in the message.

- Message fields align on 1 byte boundaries, so there are no filler fields for alignment purposes
- Binary fields are published in Little-Endian ordering
- Binary integer values are unsigned unless otherwise specified
- All ASCII string fields are left aligned and null padded
- Segmentation of messages across packets is not supported, so a message will never straddle a packet boundary.
- The length of a message as actually published may differ from the length of the message structure defined in the client specifications. See Msg Size Field below for details.

## 3.1 MESSAGE HEADER

The format of each message varies according to type, but each type starts with a standard 4-byte message header:

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | The size of this message in bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message |

### 3.1.1 Msg Size Field

In order to handle future releases of XDP feeds smoothly, clients should never hard code msg sizes in feed handlers. Instead, the feed handler should use the Msg Size field to determine where the next message in a packet begins.

This allows

- Support of XDP format variations among markets
- Client flexibility when revised message structures go live in production

In example 1 below, a message type is defined in the specification to have different lengths in different markets. The trailing field is not published in the Arca market. An Arca-coded client can process NYSE data correctly (but of course cannot use the trailing Volume field without field-specific coding).

Example 1: Message type with format variations across markets

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **Msg Size** | 0 | 2 | Binary | Size of the message.<br>**NYSE – 24 bytes**<br>**NYSE American – 24 bytes**<br>**NYSE Arca - 20 bytes** |
| **Msg Type** | 2 | 2 | Binary | The type of this message:<br>998 – Example 1 msg type |
| **SourceTimeNS** | 4 | 4 | Binary | |
| **SymbolIndex** | 8 | 4 | Binary | |
| **OrderID** | 12 | 4 | Binary | |
| **Price** | 16 | 4 | Binary | |
| **Volume** | 28 | 4 | Binary | Not published in Arca market |

Look at the Msg Size field to know where the next message starts.

Market-specific content

The variable message size can also insulate client code from future field additions that you may not need.

In example 2, an existing message type is 16 bytes long.

### Example 2: Release N

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **Msg Size** | 0 | 2 | Binary | Size of the message: 16 bytes |
| **Msg Type** | 2 | 2 | Binary | The type of this message:<br>999 – Price message example |
| **SourceTimeNS** | 4 | 4 | Binary | |
| **SymbolIndex** | 8 | 4 | Binary | |
| **Price** | 12 | 4 | Binary | |

Look at the Msg Size field to know where the next message starts.

In a future release, a four-byte volume field will be added, increasing the Msg Size to 20 bytes.

If the client wishes to delay upgrading his feed handler for the new content, no coding is needed at the time of the release. Proper coding of the MsgSize field up front allows the client to handle the unforeseen 20-byte format. On his own schedule, the client can upgrade his feed handler to process the new field.

### Example 2: Release N+1: a new field is added

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **Msg Size** | 0 | 2 | Binary | Size of the message: 20 bytes |
| **Msg Type** | 2 | 2 | Binary | The type of this message:<br>999 – Price message example |
| **SourceTimeNS** | 4 | 4 | Binary | |
| **SymbolIndex** | 8 | 4 | Binary | |
| **Price** | 12 | 4 | Binary | |
| **Volume** | 16 | 4 | Binary | New field |

Look at the Msg Size field to know where the next message starts.

Unmodified clients can handle longer message structure (but can't benefit from new content)

## 3.2 DATE AND TIME CONVENTIONS

Dates and times are in UTC (Universal Time, Coordinated), and are expressed in nanoseconds since the Unix Epoch (Jan 1, 1970 00:00:00). A complete timestamp consists of two 4-byte fields: seconds since the Unix Epoch, and nanoseconds within the current second, as in a Unix timespec structure.

The XDP Packet Header contains SendTime and SendTimeNS fields to show the time that the packet was published to the wire by the XDP Publisher.

Most XDP messages additionally contain a timestamp called Source Time to show the time of the Matching Engine event that caused the publication of this message.

Many of the higher-volume XDP feeds such as Integrated and BBO explicitly publish only the nanoseconds portion of the Source Time in each message. The seconds portion is explicitly published in a Source Time Reference Message (Msg Type 2) once a second.

**Source Time Reference messages are published per Matching Engine partition (per TXN, which is equivalent to the Integrated Feed channel number).**

## 3.3 SEQUENCE NUMBERS

Each message in a given channel is assigned a unique sequence number. Sequence numbers increase monotonically per channel, and can be used to detect publication gaps.

To optimize publication efficiency, the sequence number is not explicitly published in each message. Instead, the Packet Header contains the sequence number of the first message in the packet, along with the number of messages in the packet. Using these fields, the client can easily associate the correct sequence number with each message.

The sequence number combined with the channel ID form a message ID which is unique across the feed.

## 3.4 SYMBOL SEQUENCE NUMBERS

In addition to the sequence number, many message types explicitly include a field called Symbol Sequence Number, which identifies the message's position in the sequence of all messages published by the feed for a given symbol.

Clients who are tracking only a small number of symbols may opt to ignore sequence numbers and track only Symbol Sequence Numbers for each symbol of interest. If such a client ever experiences a Symbol Sequence Number gap, he can request a refresh for that symbol.

## 3.5 PRICES

All price fields are published as unsigned binary integers. To interpret a price correctly, the client must use the published price value as a numerator along with the Price Scale Code in the symbol's Symbol Index Mapping Message (Msg Type 3) as follows:

$$Price = \frac{Numerator}{10^{PriceScaleCode}}$$

For example, a price of $27.56 is represented as a published price field of 2756 and a PriceScaleCode of 2.

## 3.6 ORDER ID'S AND TRADE ID'S

The Order ID and the Trade ID in order-based feeds such as NYSE Integrated Feed are binary integers that uniquely identify an order or an execution. Order and Trade IDs are valid for the trading day only.

### 3.6.1 NYSE American, National and Arca (Pillar matching engine, Integrated Feed v2.1)

Trade IDs are 4 bytes long and correspond to the lowest 4 bytes of the 8-byte Deal ID field in the gateway Order Ack. The Trade ID is unique per ME symbol partition (System ID in the Symbol Index Mapping message), so unique per symbol. Prepend 3 fields to the Trade ID as discussed below to make a unique match across markets to the Deal ID field in the gateway Order Ack message.

Order IDs are 8 bytes long and correlate uniquely across markets to the 8 byte OrderID in the gateway Execution Report.

### 3.6.2 NYSE Tape A (UTP matching engine, NYSE legacy gateways, Integrated Feed v2.1)

Until NYSE Tape A symbol trading migrates to Pillar, Trade IDs are not used for order entry correlation. DB Exec IDs are 4 bytes long and correspond to the DBExecID field in the gateway Order Ack. The DB Exec ID is unique per ME symbol partition (System ID in the Symbol Index Mapping message), so unique per symbol. Prepend 3 fields to both the DB Exec ID and the Order Ack's DBExecID as discussed below to make a unique match across markets.

Order IDs are 8 bytes long, but the upper 4 bytes are not populated. The lower 4 bytes correspond to the 4 byte MEOrderID in the gateway Execution Report and are unique per matching engine instance. Prepend 3 fields to both the Order ID and the Execution Report's MEOrderID as discussed below to make a unique match across markets.

### 3.6.3 NYSE Tapes B and C (Pillar matching engine, NYSE legacy gateways, Integrated Feed v2.1)

Trade IDs are 4 bytes long and correspond to the DBExecID field in the gateway Order Ack. The Trade ID is unique per ME symbol partition (System ID in the Symbol Index Mapping message), so unique per symbol. Prepend 3 fields to both the Trade ID and the Order Ack's DBExecID as discussed below to make a unique match across markets.

Order IDs are 8 bytes long. Their lower 4 bytes correspond to the 4 byte MEOrderID in the gateway Execution Report. Prepend 3 fields to the Execution Report's MEOrderID as discussed below to make a unique match across markets.

**Matching 4-byte with 8-byte ID fields in the market data vs. the order entry messaging**

By combining a 4-byte Order ID, Trade ID or DB Exec ID with the Market ID and System ID from the Symbol Mapping message as shown below, you can obtain the corresponding 8-byte ID. The table assumes the client byte ordering is Little Endian. If the client byte ordering is Big Endian, the byte order is reversed.

| XDP FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| | 0 | 1 | Binary | 0 |
| **System ID** | 1 | 1 | Binary | Unique ID for a single matching engine instance (Pillar Symbol Partition or UTP TU). This value is found in the Symbol Index Mapping message's ID field |
| **Market ID** | 2 | 2 | Binary | ID of the Originating market in the Symbol Index Mapping |
| **OrderID, TradeID or DBExecID** | 4 | 4 | Binary | Contents of 4-byte field being disambiguated |

**Field sizes and correlation procedures for making unique matches across markets**

| | GATEWAY | | XDP V2.1 |
|---|---|---|---|
| American, National and Arca | **Order ID** | **8 bytes** | **8 bytes** |
| | **Trade ID** | **8 bytes** | 4 bytes, prepend 3 fields |
| | | | |
| NYSE Tape A | **Order ID** | 4 bytes, prepend 3 fields | 8 bytes, prepend 3 fields |
| | **DBExec ID** | 4 bytes, prepend 3 fields | 4 bytes, prepend 3 fields |
| | | | |
| NYSE Tapes B & C | **Order ID** | 4 bytes, prepend 3 fields | **8 bytes** |
| | **Trade ID** | 4 bytes, prepend 3 fields | 4 bytes, prepend 3 fields |

## 3.7 SYMBOL INDEXES

In all XDP feeds, symbol-specific referential data is published in a Symbol Index Mapping Message (Msg Type 3) at system startup. Symbol Index Mapping messages appear in each channel only for the symbols that appear in that channel.

Any client who misses this initial spin can request a refresh of Symbol Indexes by sending a Symbol Index Mapping Request Message (Msg Type 13) to the Request Server. The requested Symbol Index Mapping messages will be re-published over the Refresh channels.

The Symbol Index Mapping message includes the ASCII symbol in NYSE format along with a unique ID called a Symbol Index. Other symbol-specific messages such as Trade and BBO messages contain only the Symbol Index and no other referential data.

Symbol Indexes are the same for each symbol every day and the same across all Pillar-powered NYSE equity markets. Symbol Indexes for obsolete instruments are not re-used.

If more than one Symbol Index Mapping message is received for the same symbol within a trading day, the correspondence between the Symbol and the Symbol Index will not change, but other field values might. In this case, the latest field values override any earlier values, but do not apply retroactively.

# 4. Messages Sent by the Publisher

## 4.1 SYMBOL INDEX MAPPING MESSAGE (MSG TYPE 3)

This message is published over the real-time data channels at system startup or in the context of a refresh sequence after a Matching Engine or XDP Publisher failover. It provides referential data for a single specified symbol.

See Symbol Indexes for more information.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **Msg Size** | 0 | 2 | Binary | Size of the message: 44 bytes |
| **Msg Type** | 2 | 2 | Binary | The type of this message:<br>3 – Symbol Index Mapping Message |
| **SymbolIndex** | 4 | 4 | Binary | The unique ID of this symbol for all products within this market. This ID cannot be used to cross reference a security between markets. |
| **Symbol** | 8 | 11 | ASCII | Null-terminated ASCII symbol in NYSE Symbology. |
| **Reserved** | 19 | 1 | Binary | This field is reserved for future use |
| **Market ID** | 20 | 2 | Binary | ID of the Originating Market:<br>▪ 1 - NYSE Equities<br>▪ 3 – NYSE Arca Equities<br>▪ 4 – NYSE Arca Options<br>▪ 5 – NYSE Bonds<br>▪ 6 – Global OTC<br>▪ 8 – NYSE Amex Options<br>▪ 9 - NYSE American Equities<br>▪ 10 - NYSE National Equities |
| **System ID** | 22 | 1 | Binary | ID of the Originating matching engine server. |
| **Exchange Code** | 23 | 1 | ASCII | For listed equity markets, the market where this symbol is listed:<br>▪ A – NYSE American<br>▪ N – NYSE<br>▪ P – NYSE Arca<br>▪ Q – NASDAQ<br>▪ V - IEX<br>▪ Z – BATS<br>For Global OTC:<br>▪ B – Global OTC primary symbols<br>▪ U – OTCBB symbols<br>▪ V – Other OTC symbols |
| **PriceScaleCode** | 24 | 1 | Binary | Specifies placement of the decimal point in price fields for this security. See Prices . |
| **Security Type** | 25 | 1 | ASCII | Type of Security used by Arca, National & American:<br>▪ A – ADR<br>▪ C - COMMON STOCK<br>▪ D – DEBENTURES<br>▪ E – ETF<br>▪ F – FOREIGN<br>▪ H – US DEPOSITARY SHARES<br>▪ I – UNITS<br>▪ L – INDEX LINKED NOTES |

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| | | | | ▪ M - MISC/LIQUID TRUST<br>▪ O – ORDINARY SHARES<br>▪ P - PREFERRED STOCK<br>▪ R – RIGHTS<br>▪ S - SHARES OF BENEFICIARY INTEREST<br>▪ T – TEST<br>▪ U – CLOSED END FUND<br>▪ W – WARRANT<br><br>Type of Security used by NYSE:<br><br>▪ A – COMMON STOCK<br>▪ B – PREFERRED STOCK<br>▪ C – WARRANT<br>▪ D – RIGHT<br>▪ E – CORPORATE BOND<br>▪ F – TREASURY BOND<br>▪ G – STRUCTURED PRODUCT<br>▪ H – ADR COMMON<br>▪ I – ADR PREFERRED<br>▪ J-ADR WARRANTS<br>▪ K – ADR RIGHTS<br>▪ L – ADR CORPORATE BOND<br>▪ M – NY REGISTERED SHARE<br>▪ N – GLOBAL REGISTERED SHARE<br>▪ O – INDEX<br>▪ P – FUND<br>▪ Q – BASKET<br>▪ R – UNIT<br>▪ S – LIQUIDATING TRUST<br>▪ U - UNKOWN |
| **Lot Size** | 26 | 2 | Binary | Round lot size in shares. |
| **PrevClosePrice** | 28 | 4 | Binary | The previous day's closing price for this security. |
| **PrevCloseVolume** | 32 | 4 | Binary | The previous day's closing volume for the security. |
| **Price Resolution** | 36 | 1 | Binary | ▪ 0 - All Penny<br>▪ 1 - Penny/Nickel<br>▪ 5 - Nickel/Dime |
| **Round Lot** | 37 | 1 | ASCII | Round Lots Accepted:<br><br>▪ Y – Yes<br>▪ N – No |
| **MPV** | 38 | 2 | Binary | The minimum increment for a trade price, in 100ths of a cent. Typically 1, or $0.0001, but for some Tick Pilot stocks, can be 500, or $0.05. |
| **Unit of Trade** | 40 | 2 | Binary | This field specifies the security Unit of Trade in shares. Valid values are 1, 10, 50 and 100 |
| **Reserved** | 42 | 2 | Binary | Reserved for future use. Disregard any content. |

## 4.2 SECURITY STATUS MESSAGE (MSG TYPE 34)

This message informs clients of changes in the status of a specific security, such as Trading Halts, Short Sale Restriction state changes, etc.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 46 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>34 – Security Status Message |
| **SourceTime** | 4 | 4 | Binary | The time when this msg was generated in the order book, in seconds since Jan 1, 1970 00:00:00 UTC. |
| **SourceTimeNS** | 8 | 4 | Binary | The nanosecond offset from the SourceTime |
| **SymbolIndex** | 12 | 4 | Binary | The unique ID of the symbol in the Symbol Index msg |
| **SymbolSeqNum** | 16 | 4 | Binary | The unique ID of this message in the sequence of messages published for this specific symbol. |
| **Security Status** | 20 | 1 | ASCII | The new status that this security is transitioning to.<br>The following are Halt Status Codes:<br>▪ 3 - Opening Delay (NYSE tape A only)<br>▪ 4 - Trading Halt<br>▪ 5 - Resume<br>▪ 6 - No open/no resume (NYSE tape A only)<br>The following are Short Sale Restriction Codes (published for all symbols traded on this exchange):<br>▪ A – Short Sale Restriction Activated (Day 1)<br>▪ C – Short Sale Restriction Continued (Day 2)<br>▪ D - Short Sale Restriction Deactivated<br>Market Session values :<br>▪ P – Pre-opening<br>▪ E – Early session<br>▪ O – Core session<br>▪ L – Late session (Non-NYSE only)<br>▪ X – Closed<br>If this security is not halted at the time of a session change, the Halt Condition field = ~. If this security is halted on a session change, Halt Condition is non-~, and the security remains halted into the new session.<br>The following values are the Price Indication values:<br>▪ T – T - Time<br>▪ I – Halt Resume Price Indication<br>▪ G – Pre-Opening Price Indication<br>▪ R – Rule 15 Indication. |
| **Halt Condition** | 21 | 1 | ASCII | ▪ ~ - Security not delayed/halted<br>▪ 0x20 – Not delayed/halted (NYSE Tape A only)<br>▪ D - News dissemination<br>▪ I - Order imbalance<br>▪ P - News pending<br>▪ M – LULD pause<br>▪ S - Related security (not used)<br>▪ X - Equipment changeover |

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| | | | | ▪ Z - No open/No resume<br>Market Wide Circuit Breakers:<br>▪ 1 - Market Wide Circuit Breaker Halt Level 1<br>▪ 2 - Market Wide Circuit Breaker Halt Level 2<br>▪ 3 - Market Wide Circuit Breaker Halt Level 3 |
| **Reserved** | 22 | 4 | Binary | Future use. Any field content should be ignored. |
| **Price 1** | 26 | 4 | Binary | Default value is 0.<br>▪ If securityStatus = A and this security is listed on this exchange, then this field is the SSR Triggering Trade Price<br>▪ If securityStatus = G, I, or R, then this field is the Indication Low Price. |
| **Price 2** | 30 | 4 | Binary | Default value is 0<br>▪ If securityStatus = G, I, or R, then this field is the Indication High Price. |
| **SSR Triggering Exchange ID** | 34 | 1 | ASCII | This field is only populated when securityStatus = A and this security is listed on this exchange. Otherwise it is defaulted to 0x20.<br>Valid values are:<br>▪ A – NYSE American<br>▪ B – NASDAQ OMX BX<br>▪ C – NYSE National<br>▪ D – FINRA<br>▪ I – ISE<br>▪ J – EDGA<br>▪ K – EDGX<br>▪ M – CHX<br>▪ N – NYSE<br>▪ P – NYSE Arca<br>▪ Q – NASDAQ<br>▪ S – CTS<br>▪ T – NASDAQ OMX<br>▪ V – IEX<br>▪ W – CBSX<br>▪ X – NASDAQ OMX PSX<br>▪ Y – BATS Y<br>▪ Z – BATS |
| **SSR Triggering Volume** | 35 | 4 | Binary | Default value is 0.<br>This field is only populated when securityStatus = A and this security is listed on this exchange |
| **Time** | 39 | 4 | Binary | Default value is 0.<br>Format : HHMMSSmmm (mmm = milliseconds)<br>▪ If securityStatus = A and this security is listed on this exchange, then this field is the SSR Trigger Time<br>▪ If securityStatus = T, then this field is the T-Time (mmm always = 000) |
| **SSRState** | 43 | 1 | ASCII | The current SSR state, which this msg updates if the Security Status field contains an SSR Code. Valid |

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| | | | | values:<br>▪ ~ – No Short Sale Restriction in Effect<br>▪ E – Short Sale Restriction in Effect |
| **MarketState** | 44 | 1 | ASCII | The current Market State, which this msg updates if the Security Status field contains a Market State Code. Valid values:<br>▪ P – Pre-opening<br>▪ E – Early session<br>▪ O – Core session<br>▪ L – Late session (Non-NYSE only)<br>▪ X -- Closed |
| **SessionState** | 45 | 1 | ASCII | Unused. Defaulted to 0x00. |

## 4.3 SEQUENCE NUMBER RESET MESSAGE (MSG TYPE 1)

This message is sent to reset the Message Sequence Number at start of day, or in response to failures.

This message always appears in its own dedicated packet with a Sequence Number of 1 (the new, reset number). The packet Delivery Flag is normally 12, as on system startup, but during failover events it is set to 10.

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTIO |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 14 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>1 – Sequence Number Reset message |
| **SourceTime** | 4 | 4 | Binary | The time when this msg was generated in the order book, in seconds since Jan 1, 1970 00:00:00 UTC. |
| **SourceTimeNS** | 8 | 4 | Binary | The nanosecond offset from the SourceTime |
| **ProductID** | 12 | 1 | Binary | The unique ID for this NYSE feed listed in the feed's client specification. |
| **ChannelID** | 13 | 1 | Binary | The ID of the multicast channel over which the packet was sent. |

## 4.4 SOURCE TIME REFERENCE MESSAGE (MSG TYPE 2)

For high-volume feeds such as the XDP Integrated and BBO feeds, this message is sent at the start of every second during periods of active data publication. Unlike some control messages, Source Time Reference messages can come in packets containing market data messages.

The client can concatenate the SourceTime field with the SourceTimeNS field in subsequent market data messages to get full 8-byte Matching Engine event timestamps. The contents of the ID field can be linked via the Symbol Index Mapping Message (Msg Type 3) to the applicable data messages.

See Date and Time Conventions for more information.

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 16 bytes |
| **MsgType** | 2 | 2 | Binary | The type of message:<br>2 – Source Time Reference Message |
| **ID** | 4 | 4 | Binary | ID of the originating Matching Engine partition to which this message applies. This usage will become standard across all products in future releases. |
| **SymbolSeqNum** | 8 | 4 | Binary | Reserved for future use. Ignore any content. This usage will become standard across all products in future releases. |
| **SourceTime** | 12 | 4 | Binary | The time when this msg was generated in the order book, in seconds since Jan 1, 1970 00:00:00 UTC. |

## 4.5 SYMBOL CLEAR MESSAGE (MSG TYPE 32)

In case of a failure and recovery of a Matching Engine or an XDP Publisher, the publisher may send a full state refresh for every symbol affected. This kind of unrequested refresh is preceded by a Symbol Clear message. The client should react to receipt of a Symbol Clear message by clearing all state information for the specified symbol in anticipation of receiving a full state refresh.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 20 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>32 – Symbol Clear |
| **SourceTime** | 4 | 4 | Binary | The time when this msg was generated in the order book, in seconds since Jan 1, 1970 00:00:00 UTC. |
| **SourceTimeNS** | 8 | 4 | Binary | The nanosecond offset from the SourceTime |
| **SymbolIndex** | 12 | 4 | Binary | The unique ID of the symbol in the Symbol Index msg |
| **NextSourceSeqNum** | 16 | 4 | Binary | The sequence number in the next message for this symbol |

# 5. Messages Sent by Refresh and Retrans Servers Only

## 5.1 REFRESH HEADER (MSG TYPE 35)

The first message in each packet of refresh messages published over the Refresh multicast channels is of this type.

Valid values for the DeliveryFlag in the PacketHeader are:

- 17 – Only one packet in Refresh sequence
- 18 – Start of Refresh sequence
- 19 – Part of a Refresh sequence
- 20 – End of Refresh sequence
-

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 16 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>35 – Refresh Header Message |
| **CurrentRefreshPkt** | 4 | 2 | Binary | The current refresh packet in the update |
| **TotalRefreshPkts** | 6 | 2 | Binary | The total number of refresh packets you should expect in the update |
| **LastSeqNum** | 8 | 4 | Binary | The last sequence number sent on the channel for any symbol. The refresh is the state of the order book as of this sequence number. |
| **LastSymbolSeqNum** | 12 | 4 | Binary | The last symbol sequence number sent for this symbol. The refresh is the symbol state of this symbol as of this symbol sequence number. |

### 5.1.1 Shortened Refresh Header

The first message in the first packet for a given symbol is a full 16-byte Refresh Header message.

Every other packet for the same symbol contains an 8-byte Refresh Header. The LastSeqNum and the LastSymbolSeqNum fields are removed so as not to send duplicate information in every packet.

### 5.1.2 Refresh Example

Assuming this refresh of a single symbol requires three packets:

The first, second and third Packet structures look as follows:

| | | | | | |
|---|---|---|---|---|---|
| PACKET HDR delivery = first | FULL REFRESH HDR | MESSAGE 1 | MESSAGE 2 | ... | MESSAGE N |
| PACKET HDR delivery = part | SHORT REFRESH HDR | MESSAGE 1 | MESSAGE 2 | ... | MESSAGE N |
| PACKET HDR delivery = last | SHORT REFRESH HDR | MESSAGE 1 | MESSAGE 2 | ... | MESSAGE N |

For a depth of book feed such as XDP Integrated or XDP ArcaBook, the sequence of refresh messages per symbol consists of the following message types:

1. Symbol Index Mapping Message (Msg Type 3)
2. Imbalance Message (Msg Type 105), if there is a current imbalance
3. Security Status Message (Msg Type 34)

4. Add Order Refresh (Msg Type 106), repeated as needed to specify the book state for this symbol

### 5.1.3 Header Fields in the Refresh Channels

#### 5.1.3.1 Refresh response to a request for all Symbol Index Mapping messages

There are no Refresh Header messages

- First packet Delivery Flag =18 (START of refresh)
- Intermediate packets Delivery Flag = 19 (PART of refresh)
- Last packet Delivery Flag = 20 (END of refresh)

#### 5.1.3.2 Refresh response to a request for a single Symbol Index Mapping message

There is no Refresh Header message.

- One packet is sent Delivery Flag = 17 (ONE packet in the refresh)

#### 5.1.3.3 Refresh response to a request for a full refresh of all symbols

Each packet contains messages for a single symbol only.

- All packets for the first symbol Delivery Flag =18 (START of refresh)
- All packets for intermediate symbols Delivery Flag = 19 (PART of refresh)
- All packets for the last symbol Delivery Flag = 20 (END of refresh)

The first message in each packet is a Refresh Header.

**For each symbol:**

- The currentRefreshPkt and totalRefreshPkts fields in the Refresh Header apply to this symbol only.
- The first packet contains a full Refresh Header (16 bytes). The LastSequenceNumber field contains the sequence number of the last message processed in this channel for any symbol. The LastSymbolSeqNum field contains the last Symbol Sequence Number processed for this symbol.
- All subsequent packets contain a short Refresh Header (8 bytes).

#### 5.1.3.4 Refresh response to a request for a full refresh of a single symbol

- If there are multiple packets in the response Delivery Flags = 19 (PART of refresh)
- If there is only one packet in the response Delivery Flag = 17 (ONE packet in the refresh sequence)

All packets begin with a Refresh Header message.

- The first packet contains a full Refresh Header (16 bytes).
- The first packet for a symbol contains a full Refresh Header (16 bytes). The LastSequenceNumber field contains the sequence number of the last message processed in this channel for any symbol. The LastSymbolSeqNum field contains the last Symbol Sequence Number processed for this symbol.
- All subsequent packets contain a short Refresh Header (8 bytes).

## 5.2 MESSAGE UNAVAILABLE MESSAGE (MSG TYPE 31)

This message will be sent over the Retransmission multicast channels to inform clients of unavailability of a range of messages (or part of a range) for which they may have requested a retransmission.

For any packet containing a Message Unavailable message, the Packet Header Delivery Flag will be set to 21.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 14 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>31 – Message Unavailable |
| **BeginSeqNum** | 4 | 4 | Binary | The beginning sequence number of the unavailable range of messages. |
| **EndSeqNum** | 8 | 4 | Binary | The ending sequence number of the unavailable range of messages. |
| **ProductID** | 12 | 1 | Binary | The unique ID of the feed for which the retransmission was requested (listed in the feed's client specification). |
| **ChannelID** | 13 | 1 | Binary | The ID of the multicast channel for which the retransmission was requested. |

# 6. Messages Sent by the Client to the Request Server

## 6.1 RETRANSMISSION REQUEST MESSAGE (MSG TYPE 10)

Clients who have experienced a sequence number gap and need a retransmission of the missed messages should send a Retransmission Request message via TCP to the Request Controller. A Request Response message will be sent over the TCP connection back to the client, and if the request was valid, the requested message(s) will be re-published over the relevant Retransmission multicast channel.

The retransmitted message(s) will have the same message format and content as the original messages that were missed.

Retransmission Requests should be sent in a packet whose Packet Header Delivery Flag is set to 11, and which contains a valid sequence number.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 24 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>10 – Retransmission Request message |
| **BeginSeqNum** | 4 | 4 | Binary | The beginning sequence number of the range of messages to be retransmitted. |
| **EndSeqNum** | 8 | 4 | Binary | The end sequence number of the range of messages to be retransmitted. |
| **SourceID** | 12 | 10 | ASCII | The ID of the client requesting this retransmission . This field is up to 9 characters, null terminated. |
| **ProductID** | 22 | 1 | Binary | The unique ID of the feed for which a retransmission is requested (listed in the feed's client specification). |
| **ChannelID** | 23 | 1 | Binary | The ID of the multicast channel on which the gap occurred. |

## 6.2 REFRESH REQUEST MESSAGE (MSG TYPE 15)

Clients who have experienced a failure and need a refresh of the state of one or all symbols in a specific channel should send a Retransmission Request message via TCP to the Request Controller. A Request Response message will be sent over the TCP connection back to the client, and if the request was valid, the requested message(s) will be published over the relevant Refresh multicast channel.

Retransmission Requests should be sent in a packet whose Packet Header Delivery Flag is set to 11, and which contains a valid sequence number.

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 20 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>15 – Refresh Request Message |
| **SymbolIndex** | 4 | 4 | Binary | The ID (from the Symbol Index msg) of the symbol for which a refresh is requested. To request a refresh for all symbols in the channel, set this field to 0. |
| **SourceID** | 8 | 10 | ASCII | The ID of the client requesting this refresh. This field is up to 9 characters, null terminated. |
| **ProductID** | 18 | 1 | Binary | The unique ID of the feed for which the refresh is requested (listed in the feed's client specification). |
| **ChannelID** | 19 | 1 | Binary | The ID of the multicast channel for which the refresh is requested. |

## 6.3 SYMBOL INDEX MAPPING REQUEST MESSAGE (MSG TYPE 13)

This message is sent by clients via TCP/IP requesting the Symbol Index Mapping messages for one or all symbols in a specified channel.

The Symbol Index Mapping Request messages should be sent in a packet whose Packet Header Delivery Flag is set to 11, and which contains a valid sequence number.

| FIELD NAME | OFFSET | SIZE (BYTES) | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 21 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>13 – Symbol Index Mapping Request Message |
| **SymbolIndex** | 4 | 4 | Binary | The ID (from the Symbol Index msg) of the symbol for which a refresh is requested.<br>To request a refresh for all symbols in the specified channel, set this field to 0. |
| **SourceID** | 8 | 10 | ASCII | The ID of the client requesting this symbol refresh. This field is up to 9 characters, null terminated. |
| **ProductID** | 18 | 1 | Binary | The unique ID of the feed for which the refresh is requested (listed in the feed's client specification). |
| **ChannelID** | 19 | 1 | Binary | The ID of the multicast channel for which the refresh is requested. |
| **RetransmitMethod** | 20 | 1 | Binary | The delivery method for the requested symbol index mapping information. Valid values:<br>▪ 0 – deliver via UDP |

## 6.4 HEARTBEAT RESPONSE MESSAGE (MSG TYPE 12)

Clients who remain connected to the Retransmission Server intraday must respond to a Heartbeat with a Heartbeat Response message within 5 seconds. If no timely client response is received, the connection will be closed.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 14 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>12 – Heartbeat Response message |
| **SourceID** | 4 | 10 | ASCII | The ID of the connected client . This field is up to 9 characters, null terminated. |

# 7. Messages Sent by Request Server

## 7.1 REQUEST RESPONSE MESSAGE (MSG TYPE 11)

This message will be sent immediately via TCP/IP in response to the client's request for retransmission, refresh or Symbol Mapping messages.

| FIELD NAME | OFFSET | SIZE | FORMAT | DESCRIPTION |
|---|---|---|---|---|
| **MsgSize** | 0 | 2 | Binary | Size of the message: 29 Bytes |
| **MsgType** | 2 | 2 | Binary | The type of this message:<br>11 – Request Response Message |
| **RequestSeqNum** | 4 | 4 | Binary | The sequence number of the request message sent by the client. This can be used by the client to couple this response with the original request message. |
| **BeginSeqNum** | 8 | 4 | Binary | For Retrans Request responses, the beginning sequence number of the requested retransmission range.<br>For responses to Refresh or Symbol Mapping Requests, 0. |
| **EndSeqNum** | 12 | 4 | Binary | For Retrans Request responses, the ending sequence number of the requested retransmission range.<br>For responses to Refresh or Symbol Mapping Requests, 0. |
| **SourceID** | 16 | 10 | ASCII | The ID of the client making the request. This field is up to 9 characters, null terminated. |
| **ProductID** | 26 | 1 | Binary | The unique ID of the feed for which the request was made (listed in the feed's client specification). |
| **ChannelID** | 27 | 1 | Binary | The ID of the multicast channel for which the request was made. |
| **Status** | 28 | 1 | ASCII | The reason why the request was rejected. Valid values:<br>▪ 0 – Message was accepted<br>▪ 1 – Rejected due to an Invalid Source ID<br>▪ 2 – Rejected due to invalid sequence range<br>▪ 3 – Rejected due to maximum sequence range (see threshold limits)<br>▪ 4 – Rejected due to maximum request in a day<br>▪ 5 – Rejected due to maximum number of refresh requests in a day<br>▪ 6 – Rejected. Request message SeqNum TTL (Time to live) is too old. Use refresh to recover current state if necessary.<br>▪ 7 – Rejected due to an Invalid Channel ID<br>▪ 8 – Rejected due to an Invalid Product ID<br>▪ 9 – Rejected due to: 1) Invalid MsgType, or 2) Mismatch between MsgType and MsgSize |

# 8. Error Handling and the Request Server

## 8.1 HANDLING SEQUENCE NUMBER GAPS

Since multicast is an unreliable protocol, messages can be dropped. For this reason, clients are advised to process both lines in a channel. If a gap occurs on one line, the gap can be filled immediately from the other.

If a gap occurs on both lines simultaneously, the client can send a Retransmission Request Message (Msg Type 10) via TCP to the Request Server. The Retransmission Request contains a unique client ID called a Source ID, along with the Product and Channel IDs and the sequence number range of the missing messages.

On receipt of a Retransmission Request message, the Request Server will send back a Request Response Message (Msg Type 11). If any of the fields of the the Retransmission Request contained malformed or meaningless information, the request is rejected. If the request is accepted, the Retransmission Server will re-send the requested messages via multicast over the Retransmission channels.

If the request is rejected for exceeding a predefined system limit, the client will be prevented from making any further requests. See Request Quotas. If further requests are required, please contact NYSE.

### 8.1.1 Retransmission Format

Retransmitted messages have the same message format and content as the originally published messages (including the Sequence Numbers, but they may be packetized differently for best efficiency.

Packets of retransmitted messages have special Delivery Flag values in the Packet Header:

- 13 – Only one packet in retransmission sequence
- 15 – Part of a retransmission sequence

## 8.2 RECOVERING FROM CLIENT LATE STARTS OR INTRADAY FAILURES

If a client process experiences a late start or an intraday failure, the client will usually want to receive snapshots of the current market state for each symbol before resuming processing of real-time data. To do this, the client requests a refresh from the Refresh Server.

Specifically, a late-starting or recovering client should

1. Subscribe to the Publisher multicast channels. Any messages received should be cached but not processed until all refresh information is processed.
2. Connect to the Request Server. This connection should be maintained all day.
3. Subscribe to the Refresh multicast channels
4. Send a Refresh Request Message (Msg Type 15) to the Request Server

The Refresh Request contains

1. A unique client ID called a Source ID
2. Product and Channel IDs
3. A Symbol Index, specifying a particular symbol to be refreshed or else if 0, specifying all symbols.

On receipt of a Refresh Request message, the Request Server will send back a Request Response Message (Msg Type 11). If any of the fields of the the Refresh Request contained malformed or meaningless information, the request is rejected. If the request is rejected for exceeding a predefined system limit, the client will be prevented from making any further requests. See Request Quotas. If further requests are required, please contact NYSE.

If the request is accepted, the Refresh Server will send the snapshot message(s) over the specific Refresh channel. All these messages should be used to rebuild the current state of the order book. Once all refresh messages are processed, messages from the Publisher can now be processed. Note that any messages received whose sequence numbers are lower than the LastSequenceNumber indicated in the refresh sequence should be discarded.

### 8.2.1 Refresh Format

Each refresh packet begins with a Packet Header, followed by a Refresh Header (Msg Type 35).

The Packet Header for a refresh packet has special Delivery Flag values:

- 17 – Only one packet in Refresh sequence
- 18 – Start of Refresh sequence

- 19 – Part of a Refresh sequence
- 20 – End of Refresh sequence

These Delivery Flag values are used as follows:

- **Refreshes of a Single Symbol** The Delivery Flags of all refreshes of a single symbol that span multiple packets contain 'Part' indications only. You use the PktNum and NumPkts fields to know when the complete refresh has been received.
- **Refreshes of All Symbols** Start, Part and End Delivery Flags are used for refreshes of all symbols. All packets of the first symbol are marked Start and all packets of the last symbol are marked End. This applies also to refreshes of all Symbol Index Mapping messages.

The Refresh Header identifies the position of the current packet is in this sequence of Refresh packets, along with the total number packets in this sequence. By use of the Delivery Flag and the packet sequence information in the Refresh Header, the client can know when the last packet of the refresh sequence has been received.

No dedicated retransmission service is available for the Refresh Server; if message loss is detected in a refresh channel, clients should submit another refresh request.

## 8.3 REFRESHING SYMBOL INFORMATION

At system startup, each channel publishes a Symbol Index Mapping Message (Msg Type 3) for each symbol published on this channel.

If a client process misses the initial spin of symbol information for whatever reason, he may wish to receive a refresh of some or all Symbol Index Mapping messages before resuming processing of real-time data. To do this, the client should follow the procedure described in Recovering from Client Late Starts or Intraday Failures, but send a Symbol Index Mapping Request Message (Msg Type 13) to the Request Server instead of a Refresh Request Message.

### 8.3.1 Symbol Index Mapping Refresh Format

Requested Symbol Index Mapping messages are published by the Refresh Server with the same Packet Header Delivery Flags used for Refresh publications. Refresh Headers are not used in Symbol Index Mapping refreshes.

## 8.4 REQUEST SERVER

It is possible to connect to the Request Server only as needed, disconnecting after each request, but it is recommended that you remain connected to the Request Server for the entire trading day.

The Request Service is subject to IP Table filtering in order to safeguard against events similar to denial-of-service attacks. The filtering prevents any client from making further connections to the RCF after the client has connected a truly excessive number of times.

Once a client establishes a TCP/IP connection, the Request Server will send a heartbeat to the client approximately every 60 seconds. Clients must respond to with a Heartbeat Response message within 5 seconds, otherwise the Request Server will assume the client or the network has failed and close the connection.

### 8.4.1 Request Queuing

Clients may send several requests at the same time with the same Source ID. There is no need to wait for one request to be fulfilled before requesting another one.

Responses to all requests are published in the order in which they are received, although overlapping requests may be de-duplicated for efficiency.

### 8.4.2 Request Quotas

The table below summarizes the retransmission/refresh request limitations that are enforced by the Request Server. The numbers represent thresholds per channel.

Any client who has been blocked by exceeding these quotas can connect to the backup Request Server. This will reset all quotas. This only works once.

| CAPABILITY | DESCRIPTION |
|---|---|
| **Prevention of invalid subscribers** | Incoming requests from subscribers that are not in the enabled subscriber's source ID list will not be honored. |
| **Limitation of number of packets per Retrans Request** | Retransmission requests for more than 1,000 messages will not be honored. |
| **Limitation of timeliness of Retrans Requests** | Retransmission requests for sequence numbers more than 1,000,000 lower than the current sequence number will not be honored. |
| **Limitation of number of Retrans Requests in a day** | Retransmission requests from a client who has already made 5,000 retransmission requests today will not be honored, and the client will be blocked from making retransmission requests for the remainder of the day. |
| **Limitation of number of Refresh Requests in a day** | Refresh requests from a client who has already made 5,000 refresh requests today will not be honored. |

# 9. Operational Information

## 9.1 SYSTEM BEHAVIOR ON START AND RESTART

At system startup or at start of system recovery following a failure, XDP feeds send the following messages over each channel:

- Multicast priming from the primary Publisher's source IPs: a series of Heartbeat packets for several seconds with the Delivery Flag set to 1 and sequence number set to 1, the next expected sequence number.
- Sequence Number Reset Message (Msg Type 1), the sequence number is 1 and the packet DeliveryFlag is 12
- A full spin of Symbol Index Mapping Messages (Msg Type 3), for securities published on this channel

## 9.2 XDP PUBLISHER FAILOVER

When failing over to the backup XDP Publisher, the following refresh information is published.

Note: During the failover refresh, DeliveryFlag fields for all Packet Headers except Heartbeats are set to 10.

1. Multicast priming from the backup Publisher's source IPs: a series of Heartbeat packets for several seconds with the Delivery Flag set to 1 and sequence number set to 1, the next expected sequence number.
2. A Sequence Number Reset Message (Msg Type 1) is sent in its own packet
3. For each symbol, the following are published,
   - Symbol Index Mapping Messages (Msg Type 3)
   - Symbol Clear Message (Msg Type 32)
   - The last Security Status Message (Msg Type 34)
   - All required refresh messages
   - The last Source Time Reference Message (Msg Type 2)

Once all symbols have been refreshed, Packet Header DeliveryFlag fields return to the normal 11.

## 9.3 DISASTER RECOVERY SITE

All XDP feeds are published out of the NYSE Mahwah data center. In case of catastrophic failure in Mahwah, all affected systems including XDP feeds will be coldstarted at the Cermak Disaster Recovery site in Chicago. The Cermak configuration of channels and multicast groups is identical to Mahwah for all feeds, but of course the source IPs are different. The initial publication sequence is as described in System Behavior on Start and Restart.

## 9.4 XDP PRODUCTION HOURS (US EASTERN TIME)

| EVENT | NYSE TAPE A | NYSE TAPES B&C | ARCA | AMERICAN AND NATIONAL |
|---|---|---|---|---|
| **Sequence Number Reset** | 12:15am* | 12:15am* | 12:15am* | 12:15am* |
| **Symbol Mapping** | 12:15am* | 12:15am* | 12:15am* | 12:15am* |
| **Early Open Auction** | | 7:00am | 4:00am | 7:00am |
| **Core Open Auction and Open** | 9:30am | 9:30am | 9:30am | 9:30am |
| **Closing Auction and Close** | 4:00pm | 4:00pm | 4:00pm | 4:00pm |
| **End of Late Session** | | | 8:00pm | 8:00pm |

*System startup time. Actual message publication will not occur prior to this time, and will commence shortly afterward, when startup is completed.

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## 9.5 XDP TEST HOURS

UAT testing hours are approximately 1:00 AM until 8:15 PM.

# 10. Symbol Index Mapping File

For customers that would prefer to download the symbol index mapping from an FTP server, a file containing a subset of the index mapping information is made available via FTP by midnight ET every trading day at the following location.

- **NYSE**

Pipe-delimited: ftp://ftp.nyxdata.com/NYSESymbolMapping/NYSESymbolMapping.txt
XML format: ftp://ftp.nyxdata.com/NYSESymbolMapping/NYSESymbolMapping.xml

- **NYSE American**

Pipe-delimited: ftp://ftp.nyxdata.com/AmericanSymbolMapping/AmericanSymbolMapping.txt
XML format: ftp://ftp.nyxdata.com/AmericanSymbolMapping/AmericanSymbolMapping.XML

- **NYSE ARCA**

Pipe-delimited: ftp://ftp.nyxdata.com/ARCASymbolMapping/ARCASymbolMapping.txt
XML format: ftp://ftp.nyxdata.com/ARCASymbolMapping/ARCASymbolMapping.XML

- **NYSE National**

Pipe-delimited: ftp://ftp.nyxdata.com/NationalSymbolMapping/NationalSymbolMapping.txt
XML format: ftp://ftp.nyxdata.com/NationalSymbolMapping/NationalSymbolMapping.XML

### Symbol Index Mapping File Format

| FIELD NAME | FORMAT | DESCRIPTION |
|---|---|---|
| **Symbol** | ASCII | The full symbol in NYSE Symbology. |
| **CQS Symbol** | ASCII | The full symbol in CTS and UTP line format. See NYSE Symbology. |
| **SymbolIndex** | Numeric | The unique ID for this symbol. See Symbol Indexes. This ID is unique for products within each market. It cannot be used to cross reference a security between markets. |
| **NYSE Market** | Character | The market within the NYSE Group where this symbol is traded:<br>▪ N – NYSE<br>▪ P – NYSE Arca<br>▪ C – NYSE National<br>▪ A – NYSE American |
| **Listed Market** | Character | For listed equity markets, the market where this symbol is listed:<br>▪ A – NYSE American<br>▪ N – NYSE<br>▪ P – NYSE Arca<br>▪ Q – NASDAQ<br>▪ V - IEX<br>▪ Z – BATS<br>For Global OTC:<br>▪ B – Global OTC primary symbols<br>▪ U – OTCBB symbols<br>▪ V – Other OTC symbols |
| **TickerDesignation** | Character | The SIP tape on which this symbol is published:<br>▪ A – CTA Tape A<br>▪ B – CTA Tape B<br>▪ C – CTA Tape C |
| **UOT** | Numeric | The number of shares in a round lot. |

| FIELD NAME | FORMAT | DESCRIPTION |
|---|---|---|
| **PriceScaleCode** | Numeric | A code used to place the decimal point in all price fields for this symbol.<br>See section 3.5 for details on price handling. |
| **SystemID** | Numeric | The ID of the matching engine instance that handles this symbol. |
| **Bloomberg BSID** | Empty | Reserved field. No character between the delimiting pipe characters. |
| **Bloomberg Global ID** | Empty | Reserved field. No character between the delimiting pipe characters. |

*NOTE: The pipe delmited (.txt) version of this file has an additional pipe character at the end of the Bloomberg Global ID field, so every record in the file has three pipe characters after the System ID field.*