

## Delta1 OCTP Real-time Market Data Guide to Messages and Content

### Technical Specifications

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## Change Log

| Date              | Version | Description of Change  |
|-------------------|---------|--|
| January 23, 2015  | 1.8     | Added heartbeat message for line integrity.  |
| March 13, 2015    | 1.9     |  |
| March 23, 2015    | 2.0     |  |
| April 2, 2015     | 2.1     |  |
| May 6, 2015       | 2.3     |  |
| May 12, 2015      | 2.4     |  |
| June 9, 2015      | 2.5     |  |
| June 29, 2015     | 2.6     | Added sequence numbers for Level 1   |
| July 21, 2015     | 2.7     | Added clarity for GoodMorning message sequence reset.  |
| July 23, 2015     | 2.8     | Changed GoodMorning dissemination time to 05:10 CT.  |
| August 3, 2015    | 2.9     | Updated channel configuration tables.  |
| August 18, 2015   | 3.0     | No material changes.   |
| November 23, 2015 | 3.1     | Decommission EFP refresh channels. Add sample level 2 market data refresh message to appendix. Add position accountability. Introduced EntryLegPriceNear and EntryLegPriceFar for refresh and update messages. Added UAT C feed information. |
| January 11, 2016  | 3.2     | Instrument group trading session open and close time format change from HHMMSS to HH:MM:SS.  |

|                    |     |  |
|--------------------|-----|--|
| July 7, 2016       | 3.3 | Removed MPSecID breakdown, reference to block spreads, and strike price from field definitions in product catalog. |
| February 27, 2017  | 3.4 | Updated to reflect data center relocation from NJ2 to NY4.   |
| June 6, 2017       | 3.5 | Added guidance for field rounding and precision.   |
| February 26, 2018  | 3.6 | Added support for Block Spreads  |
| April 23, 2018     | 3.7 | General formatting update.   |
| August 6, 2018     | 3.8 | Updated Source Network and Rendezvous Point for A/B (Live) Channel Feed. Effective August 6, 2018.                 |
| September 28, 2018 | 3.9 | Updated definition of Underlying field.  |
| October 16, 2018   | 3.9 | Added definition of HaltReason.  |

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## Future Enhancements

The exchange reserves the right to make periodical system modifications that may result in changes to this guide. Such changes will be conveyed by way of a Software Change Notice and sent by email to all subscribers.

## Introduction

This document serves to provide guidance for consuming and processing market data in the Delta1 OCTP format. The Delta1 OCTP Realtime Market Data service provides event driven trade and order data, as well as instrument definition, summary and market state data for OneChicago's Delta1 markets. Please note that this document is to be supplemented by [A Guide to Delta1 - An Overview](#).



## Composition and Definitions

The Delta1 OCTP service publishes *packets*. Each packet has a header and a body. The body contains the Delta1 specific message, having a message type, groups, and fields. Such contents describe the Delta1 event.

### Primitive Type Encodings

| Primitive | Type   | Description      | Length (octets) |
|-----------|--------|------------------|-----------------|
| uint8     | 8-bit  | unsigned integer | 1               |
| uint16    | 16-bit | unsigned integer | 2               |
| uint32    | 32-bit | unsigned integer | 4               |
| uint64    | 64-bit | unsigned integer | 8               |

Supported values:

|        |                                 |
|--------|---------------------------------|
| uint8  | 0 to 255                        |
| uint16 | 0 to 65,535                     |
| uint32 | 0 to 4,294,967,295              |
| uint64 | 0 to 18,446,744,073,709,551,615 |

### Data Format

The Delta1 OCTP service data format uses both fixed byte and Google Protocol Buffers Version2 for message encoding.



For more information regarding Google Protocol Buffers (protobuf) please visit the Google Developers site <https://developers.google.com/protocol-buffers/>. The

Delta1 OCTP protobuf templates are available for download on the OneChicago FTP Site: <https://ftp.onechicago.com/development/OCTP/proto/>.

## Message Types

All message types have a corresponding message name defined in the proto template. Messages types are provided in the header of the message. Please see Message Header for more information regarding the header of the message.

| Name                      | Value | ASCII |
|---------------------------|-------|-------|
| Heartbeat                 | NULL  | 00    |
| Market Data Update        | 1     | 49    |
| Market Data Refresh       | 2     | 50    |
| Market State Notification | a     | 97    |
| Good Morning              | b     | 98    |
| Exchange Summary          | c     | 99    |
| Product Catalog           | d     | 100   |

## Message Groups Described

Additional information regarding the relevant fields for each group is in each message type definition where the group is present.

### MDEntryGroup

Contains all information to describe a market level, order, or trade event.

Messages present:

- Market Data Update (1)
- Market Data Refresh (2)

### Protobuf Template

```
message MDEntryGroup
{
  optional int32 EntryType = 510;
  optional double EntryPrice = 511;
  optional double EntrySize = 512;
  optional int32 EntrySide = 513;
  optional double EntryLegPriceNear = 514;
  optional double EntryLegPriceFar = 515;
  optional int32 SequenceNo = 516;
  optional fixed64 ReferenceID = 517;
  optional double EntryRate = 518;
  optional string TransactTime = 196;
  optional double NetChangePx = 448;
}
```

## InstrumentGroup

Definition for the instrument or used to reference an instrument.

Messages present:

- Market Data Update (1)
- Market Data Refresh (2)
- Market State Notification (a)
- Product Catalog (d)

### Protobuf Template

```
message InstrumentGroup
{
  optional string Symbol = 183;
  optional fixed64 MPSecID = 112;
  repeated string Underlying = 459;
  optional int32 ProductType = 147;
  optional string MaturityDate = 96;
  optional string MaturityDateBack = 97;
  optional string SecuritySubType = 173;
  optional int32 ProductSubType = 146;
  optional string OpenTime = 509;
  optional string CloseTime = 464;
  optional double ContractMultiplier = 61;
  optional int32 PositionLimit = 458;
  optional int32 TradingStatus = 195;
}
```

## InstrumentSummaryGroup

Symbol + MaturityDate trade summary statistics which includes trading activity in strategies. Individual legs of strategies are reflected in each of the Symbol + MaturityDate InstrumentSummaryGroup as either SSFVolume or BlockVolume. Field definitions are located in the Exchange Summary section of this document. For field values, please see the Enumerated Values section of this document.

Messages present:

- Exchange Summary (c)

### Protobuf Template

```
message InstrumentSummaryGroup
{
  optional string Symbol = 183;
  optional string MaturityDate = 96;
  optional string SecurityType = 173;
  optional double HighPx = 442;
  optional int32 HighPxIndicator = 519;
  optional double LowPx = 444;
  optional int32 LowPxIndicator = 520;
  optional double ClosePx = 445;
  optional int32 ClosePxIndicator = 521;
  optional double OpenPx = 443;
  optional int32 OpenPxIndicator = 522;
  optional double SettlePx = 446;
  optional double NetChangePx = 448;
  optional int32 BlockVolume = 451;
  optional int32 EFPVolume = 450;
  optional int32 SSFVolume = 523;
  optional int32 TotalVolume = 449;
  optional int32 OpenInterest = 452;
}
```

## Dissemination of Market Data

Delta1 OCTP disseminates data via the multicast network protocol and implements a parallel primary and secondary feed architecture. Content is pushed in a single direction from Delta1 to the consumer. Delta1 OCTP does not support retransmission requests. Access to multicast feeds is only available by single mode fiber direct connect to Delta1 at the dissemination site.

### Channel Group Availability

Delta1 OCTP data is available from both Delta1 Production and Disaster Recovery Data Centers. Please note that the Disaster Recovery (standby) feeds are only available in a disaster scenario, as the usual state of such channels is down.

| Channel Groups | Environment          | State   | Site                  |
|----------------|----------------------|---------|-----------------------|
| A/B            | Production           | Live    | 755 Secaucus Rd (NY4) |
| A/B            | Production           | Standby | 350 E Cermak Rd (CH1) |
| C              | User Acceptance Test | Live    | 350 E Cermak Rd (CH1) |

The A/B channel groups are the primary and secondary sources and disseminate data for the production Delta1 trading network. In a disaster scenario, the A/B live groups are downed and the A/B standby groups begin disseminating data for the production Delta1 trading network running out of the disaster recovery site.

The C group is the primary source and disseminates data for the user acceptance testing (UAT) Delta1 network. Market participants interested in developing, testing, and conforming trading applications as well as Delta1 OCTP applications can use this channel group to interact with the Delta1 UAT sandbox. The exchange deploys all software releases to this environment prior to production.

## Network Configuration

Joining multicast groups requires PIM sparse mode with a statically defined rendezvous point (RP). Please see the multicast source networks and corresponding RPs by channel feeds below:

| Channel Feeds | Source Network   | Rendezvous Point  |
|---------------|------------------|-------------------|
| A/B (Live)    | 192.112.37.32/29 | 192.112.37.253/32 |
| A/B (Standby) | 10.38.65.131/29  | 10.38.65.254/32   |
| C             | 10.38.64.2/32    | 10.38.65.254/32   |

## Multicast Addresses

All multicast channels are in the **233.158.244.0/24** subnet. Provided in the table below is the last octet and port of the channel by feed.

| Channel               | A/B (Live) | A/B (Standby) | C          |
|-----------------------|------------|---------------|------------|
| <b>Event Driven</b>   |            |               |            |
| Main                  | .10:51000  | .110:53000    | .130:55000 |
|                       | .20:52000  | .120:54000    |            |
| Level 1               | .18:51008  | .118:53008    | .138:55008 |
|                       | .28:52008  | .128:54008    |            |
| Level 2               | .14:51004  | .114:53004    | .134:55004 |
|                       | .24:52004  | .124:54004    |            |
| <b>Refresh</b>        |            |               |            |
| Instrument Definition | .19:51009  | .119:53009    | .139:55009 |
|                       | .29:52009  | .129:54009    |            |
| Level 1 Non-Strategy  | .15:51005  | .115:53005    | .135:55005 |
|                       | .25:52005  | .125:54005    |            |
| Level 1 Strategy      | .17:51007  | .117:53007    | .137:55007 |
|                       | .27:52007  | .127:54007    |            |
| Level 2 Non-Strategy  | .11:51001  | .111:53001    | .131:55001 |
|                       | .21:52001  | .121:54001    |            |
| Level 2 Strategy      | .13:51003  | .113:53003    | .133:55003 |
|                       | .23:52003  | .123:54003    |            |

## Channels Described

Below describes each channel and the types of message events disseminated over the respective channel. For information regarding messages and their content please see the section in Message Types dedicated to that message. The term “MDEntry” is used to reference either an individual order or an instrument-side price level.

## Channel Feeds

A channel is broken into two groups (primary and secondary) where information is identical across the twin feeds. OCTP feeds are allocated across 9 channels, resulting in the 18 individual feeds.



## Main Channel

The main channel provides for time of day messages such as Product Catalog and Exchange Summary, as well as event driven Market State Notifications (Open, Close, Halt) for all instruments.

This channel also supports the Good Morning Message. For more information regarding this message and its use please see the Good Morning message definition.

### Message types:

- Good Morning
- Product Catalog
- Exchange Summary
- Market State Notification

### Types of Events

- Changes to the trading status of an instrument (open, close, halt)
- Start of day and end of day exchange summary (open, high, low, close, settlement, trading volumes, open interest)
- Initial product catalog dissemination

## Level 1

The Level 1 channel provides for event driven updates to the top of book (best bid and best offer). Instrument-side quantity is aggregated at the best price level. This channel disseminates updates when any order event results in a change at the greatest bid price level and the smallest offer price level.

Message types:

- Market Data Update

Types of Events

- Changes to the top of book
- Trades
- Trade Busts

**Dissemination frequency**

Event Driven

## Level 2

The level 2 channel provides for event driven updates to an instrument's order book for both bids and offers. Entries are disseminated on a per order level. Each MDEntry retains a unique identifier (Reference ID) and sequence number (Sequence Number). The MDEntry sequence number increments with each update event. Consumers looking to build a complete orderbook should assemble the book according to price-time priority by referencing the TransactTime, Side, and Price field values from each entry. Events resulting in a trade are grouped into a single Market Data Update with multiple MDEntry records described by Entry Type.

Message types:

- Market Data Update

Types of Events

- Changes to individual orders
- Trades
- Trade Busts

**Dissemination frequency**

Event Driven

## Instrument Definition

The Instrument Definition channel cycles through the product catalog disseminating individual product catalog messages for each instrument. The content on this channel is identical to the start of day publication of the product catalog sent over the Main channel. Any event that modifies an instrument definition will trigger a dissemination of an updated product catalog message over the Main channel and will be reflected in the next cycle of the instrument definition channel.

Message types:

- Product Catalog

|  |                                     |
|--|-------------------------------------|
| <b>Dissemination frequency</b>               | Refresh cycle best effort 2 minutes |
| <b>Average packet size (Product Catalog)</b> | 96 bytes                            |

Bandwidth calculation example:

Given 60,000 instruments, the channel will complete a full cycle every 120 seconds. This results in 500 packets/sec with an estimated bandwidth of 0.384 Mb/s.

## Level 1 Strategy and Non-Strategy Refresh

The Level 1 Refresh channels cycle through all markets, identified by MPSecID, disseminating the highest “best” bid and lowest “best” offer where quantity is aggregated at price level.

- **Non-Strategy:** Any MPSecID that has a single MaturityDate
- **Strategy:** Any MPSecID that has both MaturityDate and MaturityDateBack

The Market Data Refresh message contains two MDEntry groups identified by the EntrySide field (bid and offer). The TransactTime field provided in each MDEntry reflects the as of time for the current state of the published side-of-market. This value starts the day at the open time.

Message types:

- Market Data Refresh

|   |                                    |
|---|------------------------------------|
| Dissemination frequency                   | Refresh cycle best effort 1 minute |
| Average packet size (Market Data Refresh) | 162 bytes                          |

Bandwidth calculation example:

Given 30,000 instruments, the channel will complete a full cycle every 60 seconds. This results in 500 packets/sec with an estimated bandwidth of 0.648 Mb/s.

## Level 2 Strategy and Non-Strategy Refresh

The Level 2 Refresh channels cycle through all markets, identified by MPSecID, disseminating the complete order book by order.

- **Non-Strategy:** Any MPSecID that has a single MaturityDate
- **Strategy:** Any MPSecID that has both MaturityDate and MaturityDateBack

The Market Data Refresh message contains all MDEntry groups identified by the ReferenceID field for the given MPSecID. Update events are reflected by increments made to the SequenceNo field. The TransactTime field provided in each MDEntry reflects the last update time for the published state of the MDEntry. MDEntry groups are not sequenced in any order. Consumers looking to rebuild an orderbook from this feed should rebuild according to price-time priority.

Message types:

- Market Data Refresh

|   |                                    |
|---|------------------------------------|
| Dissemination frequency                   | Refresh cycle best effort 1 minute |
| Average packet size (Market Data Refresh) | N/A                                |

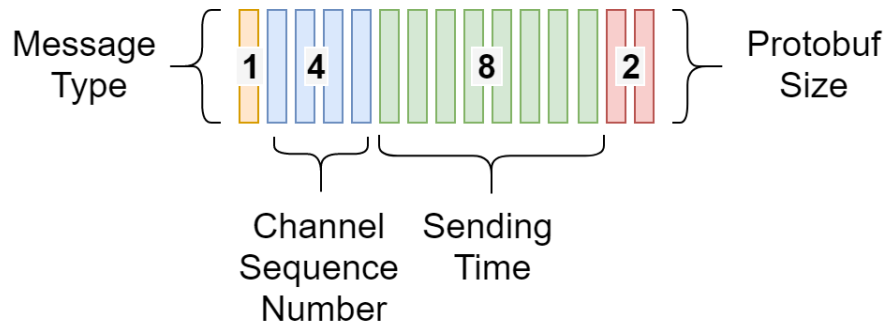
## Messages and Content

### Message Cycles and Events

| Event                               | Message                   | Channels              | Time of Day               |
|-------------------------------------|---------------------------|-----------------------|---------------------------|
| Trading Session Status Changes      | Market State Notification | Main                  | Per trading session hours |
| Channel Reset                       | Good Morning              | Main                  | 05:10 CT                  |
| Product Catalog for the Trading Day | Product Catalog           | Main                  | 06:00 CT                  |
| Start of Day Summary                | Exchange Summary          | Main                  | 06:15 CT                  |
| Instrument Definition Refresh Cycle | Product Catalog           | Instrument Definition | 07:00 CT<br>16:00 CT      |
| Level 1 Non-Strategy Refresh Cycle  | Market Data Refresh       | Level 1 Non-Strategy  | 07:00 CT<br>16:00 CT      |
| Level 2 Non-Strategy Refresh Cycle  | Market Data Refresh       | Level 2 Non-Strategy  | 07:00 CT<br>16:00 CT      |
| Level 1 Strategy Refresh Cycle      | Market Data Refresh       | Level 1 Strategy      | 07:00 CT<br>16:00 CT      |
| Level 2 Strategy Refresh Cycle      | Market Data Refresh       | Level 2 Strategy      | 07:00 CT<br>16:00 CT      |
| End of Day Summary                  | Exchange Summary          | Main                  | 16:45 CT                  |

## Message Header

The message header is fixed byte little-endian encoded. The total length of the message header is 15 bytes.



| Name             | Type   | Offset | Length | Description   |
|------------------|--------|--------|--------|---|
| Message Type     | char   | 0      | 1      | Identifies the proto message type to decode the message body. |
| Channel Sequence | uint32 | 1      | 4      | Incremented for each packet, unique per channel               |
| Sending Time     | uint64 | 5      | 8      | Millisecond UTC timestamp                                     |
| Body Length      | uint16 | 13     | 2      | Byte length of encoded protobuf in the message body           |

### Channel Sequence Number

Packet sequence numbers are unique per channel, where the first packet disseminated on the channel starts at 0 and is incremented by 1. Channel sequence numbers are scheduled to reset daily, triggered by a Good Morning message. If the sequence number reaches the maximum supported value for the assigned type, the sequence number will reset to 0. This event does not trigger a channel reset message.



## Heartbeat

Each channel guarantees a message every 5 seconds. This is accomplished by the heartbeat interval. After 5 seconds of channel inactivity, a heartbeat is disseminated. Heartbeat messages increment the channel sequence by 1. The Heartbeat message consists of a packet header and a 0 byte size protobuf body.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | NULL  | 00    |

### Sample Message

```
00 05 50 00 00 da 77 73 c2 60 01 00 00 00 00
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | NULL          |
| Channel Sequence | 20485         |
| Sending Time     | 1515090835418 |
| Body Length      | 0             |

### Protobuf Message Body

|  |
|--|
|  |
|--|

## Good Morning

The Good Morning message is sent to indicate a sequence reset for a given channel. The Good Morning message contains a Text field where Delta1 provides the reason for the sequence reset. Consumers should look to this field for information purposes only. The regular dissemination of this message occurs each day at the beginning of the trading day. As such, channel sequence numbers reset each day. The first message published on the Main channel is the Good Morning message and the Good Morning message will always have a channel sequence of 1.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | b     | 98    |

### Protobuf Template

```
message GoodMorning
{
  optional string TradeDate = 190;
  optional string Text = 186;
}
```

|                  |   |
|------------------|---|
| <b>TradeDate</b> | UTC timestamp indicating the time of sequence reset, in YYYY-MM-DDTHH:MM:SS format.<br>Example: 2018-01-04T19:12:06 |
| <b>Text</b>      | Message indicating the reason for the sequence reset  |

### Sample Message

```
62 01 00 00 00 e2 6e 96 c2 60 01 00 00 2e 00 d2
0b 15 4f 43 58 2e 54 50 20 4d 41 49 4e 20 43 48
2c 20 52 45 41 44 59 f2 0b 13 32 30 31 38 2d 30
31 2d 30 34 54 31 39 3a 31 32 3a 30 36
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | b             |
| Channel Sequence | 1             |
| Sending Time     | 1515093126882 |
| Body Length      | 46            |

### Protobuf Message Body

Text: "OCX.TP MAIN CH, READY"  
TradeDate: "2018-01-04T19:12:06"

## Market Data Update

The Market Data Update message reflects changes to either an order or the top market. When an MDEntry instance is an order, the ReferenceID field should be used to uniquely reference the entry. The ReferenceID persists throughout the lifetime of the order, and with each modification to the order, the SequenceNo increases by 1. When an MDEntry is used to reflect the changes to the top of book, simply look to the SequenceNo to indicate changes to the best bid or best offer. When an MDEntry is used to indicate a trade event, the ReferenceID is a universally unique trade identifier. On trade bust events, the ReferenceID is that of the previously disseminated trade. Events can be identified via the EntryType field. Please see the Enumerated Values section for all available EntryTypes.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | 1     | 49    |

### Protobuf Template

```
message MarketDataUpdate
{
  optional InstrumentGroup Instrument = 1029;
  repeated MDEntryGroup MDEntry = 1027;
}
```

#### Instrument

→ MPSecID

The InstrumentGroup is populated with only MPSecID and not the full definition of the instrument. This indicates the market for which the MDEntry groups apply.

#### MDEntry

The repeating group provides for multiple entries per message. Entries can be identified by the EntryType, EntrySide, and ReferenceID fields.

## Level 1: Book Update

The below example illustrates an update to the bid side of the book. Note that the Level 1 feed publishes only the affected side each time an update event occurs. With each event, the sequence number (by side) of the MDEntry increases. Late joiners should use the sequence number to synchronize updates with a full refresh cycle. We can see in the below examples that the top of book on the bid side has changed 17 (SequenceNo) times for the current trading session.

### Sample Message

```
31 5e 03 00 00 44 ac 22 f4 62 01 00 00 4c 00 9a
40 3c a2 0c 15 32 30 31 38 30 34 32 33 2d 32 30
3a 31 30 3a 33 31 2e 33 37 33 f9 1f a1 f8 31 e6
ae ba 71 40 81 20 00 00 00 00 00 00 14 40 88 20
31 a0 20 11 b1 20 12 be f7 37 68 af 8e 3f aa 40
0a 81 07 80 45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 862           |
| Sending Time     | 1524514335812 |
| Body Length      | 76            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-20:10:31.373"
  EntryPrice: 283.6677
  EntrySize: 5
  EntrySide: 49
  SequenceNo: 17
  EntryRate: 0.014983
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Level 1: Trade + Book Update

In the below example, a bid has entered the market at the offer price, fully filling the offer and leaving a remaining size on the bid side. This results in two Level 1 messages. The first message (with an EntrySize of 0) indicates there is no longer a best offer. The second message reflects the new best bid and trade event.

### Sample Message

```
31 1f 00 00 00 9b 40 61 f4 62 01 00 00 4c 00 9a
40 3c a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 30 3a 33 37 2e 30 31 39 f9 1f 00 00 00 00
00 00 00 00 81 20 00 00 00 00 00 00 00 00 88 20
32 a0 20 05 b1 20 00 00 00 00 00 00 00 00 aa 40
0a 81 07 80 45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 31            |
| Sending Time     | 1524518437019 |
| Body Length      | 76            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-21:20:37.019"
  EntryPrice: 0.0000
  EntrySize: 0
  EntrySide: 50
  SequenceNo: 5
  EntryRate: 0.000000
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Sample Message

```
31 20 00 00 00 9b 40 61 f4 62 01 00 00 9c 00 9a
40 4d a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 30 3a 33 37 2e 30 31 38 81 1c 34 11 36 3c
bd 52 e0 3f f0 1f 04 f9 1f cb 10 c7 ba b8 ba 71
40 81 20 00 00 00 00 00 00 00 40 a9 20 45 ea 71
42 23 11 01 00 b1 20 dc 12 b9 e0 0c fe 8e 3f 9a
40 3c a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 30 3a 33 37 2e 30 31 38 f9 1f cb 10 c7 ba
b8 ba 71 40 81 20 00 00 00 00 00 00 08 40 88 20
31 a0 20 04 b1 20 dc 12 b9 e0 0c fe 8e 3f aa 40
0a 81 07 80 45 bb a4 81 98 ea 8e
```

## Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 32            |
| Sending Time     | 1524518437019 |
| Body Length      | 156           |

## Protobuf Message Body

```
MDEntry {  
  TransactTime: "20180423-21:20:37.018"  
  NetChangePx: 0.5101  
  EntryType: 4  
  EntryPrice: 283.6701  
  EntrySize: 2  
  ReferenceID: 300318113000005  
  EntryRate: 0.015133  
}  
MDEntry {  
  TransactTime: "20180423-21:20:37.018"  
  EntryPrice: 283.6701  
  EntrySize: 3  
  EntrySide: 49  
  SequenceNo: 4  
  EntryRate: 0.015133  
}  
Instrument {  
  MPSecID: 10298211180518000000  
}
```



## Level 2: New Order

In the below example, a new bid is entered into the market.

### Sample Message

```
31 65 00 00 00 e7 39 67 f4 62 01 00 00 59 00 9a
40 49 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 37 3a 30 38 2e 35 31 38 f0 1f 01 f9 1f 7d
3f 35 5e ba ba 71 40 81 20 00 00 00 00 00 00 f0
3f 88 20 31 a0 20 01 a9 20 93 b1 20 60 63 98 ea
8e b1 20 9e 95 b4 e2 1b 0a 8f 3f aa 40 0a 81 07
80 45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 101           |
| Sending Time     | 1524518828519 |
| Body Length      | 89            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-21:27:08.518"
  EntryType: 1
  EntryPrice: 283.6705
  EntrySize: 1
  EntrySide: 49
  SequenceNo: 1
  ReferenceID: 10298211050518000019
  EntryRate: 0.015156
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Level 2: Update Order

In the below example, an existing bid order is updated. The message reflects the updated state of the order. If this order size is part of the top of book, this event also triggers a level 1 update for the appropriate side of the market.

### Sample Message

```
31 71 00 00 00 81 2b 68 f4 62 01 00 00 59 00 9a
40 49 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 38 3a 31 30 2e 33 36 39 f0 1f 02 f9 1f 7d
3f 35 5e ba ba 71 40 81 20 00 00 00 00 00 10
40 88 20 31 a0 20 02 a9 20 93 b1 20 60 63 98 ea
8e b1 20 9e 95 b4 e2 1b 0a 8f 3f aa 40 0a 81 07
80 45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 113           |
| Sending Time     | 1524518890369 |
| Body Length      | 89            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-21:28:10.369"
  EntryType: 2
  EntryPrice: 283.6705
  EntrySize: 4
  EntrySide: 49
  SequenceNo: 2
  ReferenceID: 10298211050518000019
  EntryRate: 0.015156
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Level 2: Delete Order

In the below example, an existing bid order is deleted. If this order size is part of the top of book, this event also triggers a level 1 update for the appropriate side of the market.

### Sample Message

```
31 7d 00 00 00 4e 10 69 f4 62 01 00 00 38 00 9a
40 28 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 32 39 3a 30 38 2e 39 34 31 f0 1f 03 a0 20 03
a9 20 93 b1 20 60 63 98 ea 8e aa 40 0a 81 07 80
45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 125           |
| Sending Time     | 1524518948942 |
| Body Length      | 56            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-21:29:08.941"
  EntryType: 3
  SequenceNo: 3
  ReferenceID: 10298211050518000019
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Level 2: Trade + Updated Order + Delete Order

In the below example, an existing bid order is updated. The bid price is changed to meet that of the best offer. This results in two Level 2 messages. The first message refers to the specific order by ReferenceID and indicates the order has been removed from the book (EntryType = 3). The second message reflects the remaining quantity of the bid (by ReferenceID) as well as the trade entry.

### Sample Message

```
31 b5 00 00 00 72 49 6d f4 62 01 00 00 38 00 9a
40 28 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 33 33 3a 34 35 2e 37 31 34 f0 1f 03 a0 20 02
a9 20 96 b1 20 60 63 98 ea 8e aa 40 0a 81 07 80
45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 181           |
| Sending Time     | 1524519225714 |
| Body Length      | 56            |

### Protobuf Message Body

```
MDEntry {
  TransactTime: "20180423-21:33:45.714"
  EntryType: 3
  SequenceNo: 2
  ReferenceID: 10298211050518000022
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Sample Message

```
31 b6 00 00 00 73 49 6d f4 62 01 00 00 a9 00 9a
40 49 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 33 33 3a 34 35 2e 37 31 34 f0 1f 02 f9 1f 78
9c a2 23 b9 ba 71 40 81 20 00 00 00 00 00 00 f0
3f 88 20 31 a0 20 02 a9 20 97 b1 20 60 63 98 ea
8e b1 20 b6 4b 1b 0e 4b 03 8f 3f 9a 40 4d a2 0c
15 32 30 31 38 30 34 32 33 2d 32 31 3a 33 33 3a
34 35 2e 37 31 34 81 1c 16 6a 4d f3 8e 53 e0 3f
f0 1f 04 f9 1f 78 9c a2 23 b9 ba 71 40 81 20 00
00 00 00 00 00 08 40 a9 20 47 ea 71 42 23 11 01
00 b1 20 b6 4b 1b 0e 4b 03 8f 3f aa 40 0a 81 07
80 45 bb a4 81 98 ea 8e
```

## Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 1             |
| Channel Sequence | 182           |
| Sending Time     | 1524519225715 |
| Body Length      | 169           |

## Protobuf Message Body

```
MDEntry {  
  TransactTime: "20180423-21:33:45.714"  
  EntryType: 2  
  EntryPrice: 283.6702  
  EntrySize: 1  
  EntrySide: 49  
  SequenceNo: 2  
  ReferenceID: 10298211050518000023  
  EntryRate: 0.015143  
}  
MDEntry {  
  TransactTime: "20180423-21:33:45.714"  
  NetChangePx: 0.5102  
  EntryType: 4  
  EntryPrice: 283.6702  
  EntrySize: 3  
  ReferenceID: 3003181130000007  
  EntryRate: 0.015143  
}  
Instrument {  
  MPSecID: 10298211180518000000  
}
```

## Market Data Refresh

The Market Data Refresh message contains a snapshot MDEntry groups. Note that the EntryType fields are not present in MDEntry groups for this message.

For Level 1, a single Market Data Refresh message contains 2 MDEntry groups, bid and offer. Similar to the Market Data Update message, these MDEntry groups aggregate the size and the price-side level.

For Level 2, a single Market Data Refresh message contains all bid and offer orders at all price levels. When using this message to rebuild an order book, look to the SequenceNo and EntrySide for Level 1 and SequenceNo and ReferenceID for Level 2. These messages should be synchronized with updates from the Level 1 and Level 2 channels.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | 2     | 50    |

### Protobuf Template

```
message MarketDataRefresh
{
  optional InstrumentGroup Instrument = 1029;
  repeated MDEntryGroup MDEntry = 1027;
  optional double LastPx = 84;
  optional double LastQty = 85;
  optional int32 LastMessage = 701;
}
```

|                                |   |
|--------------------------------|---|
| <b>Instrument</b><br>➔ MPSecID | The InstrumentGroup is populated with only MPSecID and not the full definition of the instrument. This indicates the market for which the MDEntry groups apply. |
| <b>MDEntry</b>                 | The repeating group provides for multiple entries per message. Entries can be identified by the EntryType, EntrySide, and ReferenceID fields.                   |
| <b>LastPx</b>                  | The price of the last trade event in the provided instrument. If a trade has not occurred both LastPx and LastQty will be 0.                                    |
| <b>LastQty</b>                 | The quantity of the last trade event for the provided instrument. If a trade has not occurred both LastPx and LastQty will be 0.                                |
| <b>LastMessage</b>             | In a stream of messages, the last message field indicates 0 if not the last message, and 1 if this is the last message and a refresh cycle has completed.       |



## Level 1: Market Data Refresh

The below example is a Market Data Refresh Message published on the Level 1 Non-Strategy channel. Provided, is both the bid and offer sides of the market. Note that the size is aggregated at the single best bid and best offer prices.

### Sample Message

```
32 c6 f6 00 00 f1 92 75 f4 62 01 00 00 a2 00 a1
05 78 9c a2 23 b9 ba 71 40 a9 05 00 00 00 00 00
00 08 40 e8 2b 00 9a 40 3c a2 0c 15 32 30 31 38
30 34 32 33 2d 32 31 3a 34 32 3a 32 31 2e 32 39
30 f9 1f cb 10 c7 ba b8 ba 71 40 81 20 00 00 00
00 00 00 08 40 88 20 31 a0 20 13 b1 20 06 46 5e
d6 c4 02 8f 3f 9a 40 3c a2 0c 15 32 30 31 38 30
34 32 33 2d 32 31 3a 33 39 3a 35 34 2e 36 32 32
f9 1f 7d 3f 35 5e ba ba 71 40 81 20 00 00 00 00
00 00 08 40 88 20 32 a0 20 0a b1 20 0c b2 65 f9
ba 0c 8f 3f aa 40 0a 81 07 80 45 bb a4 81 98 ea
8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 2             |
| Channel Sequence | 63174         |
| Sending Time     | 1524519768817 |
| Body Length      | 162           |

## Protobuf Message Body

LastPx: 283.6702

LastQty: 3

LastMessage: 0

MDEntry {

  TransactTime: "20180423-21:42:21.290"

  EntryPrice: 283.6701

  EntrySize: 3

  EntrySide: 49

  SequenceNo: 19

  EntryRate: 0.015142

}

MDEntry {

  TransactTime: "20180423-21:39:54.622"

  EntryPrice: 283.6705

  EntrySize: 3

  EntrySide: 50

  SequenceNo: 10

  EntryRate: 0.015161

}

Instrument {

  MPSecID: 10298211180518000000

}

## Level 2: Market Data Refresh

The below example is a Marked Data Refresh Message published on the Level 2 Non-Strategy channel. Provided are all bid and offer orders in the market. Note that there is no priority specified. Users looking to rebuild a book should simply sort each side based on price-time priority to determine fill order.

### Sample Message

```
32 9d 2f 01 00 86 80 76 f4 62 01 00 00 ff 00 a1
05 78 9c a2 23 b9 ba 71 40 a9 05 00 00 00 00 00
00 08 40 e8 2b 00 9a 40 46 a2 0c 15 32 30 31 38
30 34 32 33 2d 32 31 3a 34 32 3a 32 31 2e 32 39
30 f9 1f cb 10 c7 ba b8 ba 71 40 81 20 00 00 00
00 00 00 08 40 88 20 31 a0 20 01 a9 20 9b b1 20
60 63 98 ea 8e b1 20 06 46 5e d6 c4 02 8f 3f 9a
40 46 a2 0c 15 32 30 31 38 30 34 32 33 2d 32 31
3a 34 30 3a 35 34 2e 33 36 32 f9 1f 73 f9 0f e9
b7 ba 71 40 81 20 00 00 00 00 00 00 00 40 88 20
31 a0 20 01 a9 20 9a b1 20 60 63 98 ea 8e b1 20
7d 07 3f 71 00 fd 8e 3f 9a 40 46 a2 0c 15 32 30
31 38 30 34 32 33 2d 32 31 3a 33 39 3a 35 34 2e
36 32 32 f9 1f 7d 3f 35 5e ba ba 71 40 81 20 00
00 00 00 00 00 08 40 88 20 32 a0 20 01 a9 20 98
b1 20 60 63 98 ea 8e b1 20 0c b2 65 f9 ba 0c 8f
3f aa 40 0a 81 07 80 45 bb a4 81 98 ea 8e
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | 2             |
| Channel Sequence | 106827        |
| Sending Time     | 1524519951268 |
| Body Length      | 255           |

## Protobuf Message Body

```
LastPx: 283.6702
LastQty: 3
LastMessage: 0
MDEntry {
  TransactTime: "20180423-21:42:21.290"
  EntryPrice: 283.6701
  EntrySize: 3
  EntrySide: 49
  SequenceNo: 1
  ReferenceID: 10298211050518000027
  EntryRate: 0.015142
}
MDEntry {
  TransactTime: "20180423-21:40:54.362"
  EntryPrice: 283.6699
  EntrySize: 2
  EntrySide: 49
  SequenceNo: 1
  ReferenceID: 10298211050518000026
  EntryRate: 0.015131
}
MDEntry {
  TransactTime: "20180423-21:39:54.622"
  EntryPrice: 283.6705
  EntrySize: 3
  EntrySide: 50
  SequenceNo: 1
  ReferenceID: 10298211050518000024
  EntryRate: 0.015161
}
Instrument {
  MPSecID: 10298211180518000000
}
```

## Market State Notification

The Market State Notification message is used to convey changes to the trading status of any market referenced by the MPSecID. Each day all instruments transition from open to close. In the event of a trading halt, an instrument transitions from open to halt, then back to open. If the instrument does not open prior to the trading session close, the instrument transitions directly from halt to close.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | a     | 97    |

### Protobuf Template

```
message MarketStateNotification
{
  repeated InstrumentGroup Instrument = 1029;
  optional int32 UpdateType = 524;
  optional fixed64 NotificationTime = 801;
  optional int32 TradingStatus = 195;
  optional string Text = 186;
  optional int32 HaltReason = 700;
}
```

#### Instrument

→ MPSecID

The InstrumentGroup is populated with only MPSecID and not the full definition of the instrument. This indicates the markets for which the notification applies. This is a repeating group so a single message may reference multiple instruments.

#### UpdateType

Indicates the reference field in the provided instrument groups for which the notification applies. The only supported value for this field is 2 (MPSecID).

#### NotificationTime

Microsecond UTC timestamp indicating the time at which the event occurred.

|                      |  |
|----------------------|--|
| <b>TradingStatus</b> | The new status of the referenced instrument.   |
| <b>Text</b>          | An optional message that may be provided by Delta1 indicating the reason for the notification. |
| <b>HaltReason</b>    | Present for TradingStatus types of 2 (Halt). Indicates the reason for the trading halt.        |

## Trading Status

As defined in the Enumerated Values section of this document, there are 3 statuses available for the TradingStatus field. Below described each status and the impact it has on trading an instrument.

|       |  |
|-------|--|
| Open  | Supports new order entry, order update, order cancel, and block/EFP trade reporting actions. |
| Close | All inbound order entry or trade reporting is prohibited.                                    |
| Halt  | Permits only order cancel actions.   |

## Trading Status Halt

The below example is a Market State Notification indicating a halt status for an MPSecID. Note that a halt event affecting a security which underlies an instrument will result in multiple halt events disseminated by MPSecID, as each MPSecID refers to a contract month or combination of contract months (strategy).

### Sample Message

```
61 21 b5 02 00 5e 93 ad c7 60 01 00 00 20 00 98
0c 02 e0 20 02 e0 2b 01 89 32 20 80 07 fe 0b 62
05 00 aa 40 0a 81 07 00 54 bd 96 09 23 e9 aa
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | a             |
| Channel Sequence | 177441        |
| Sending Time     | 1515178529630 |
| Body Length      | 32            |

### Protobuf Message Body

```
TradingStatus: 2
UpdateType: 2
HaltReason: 1
NotificationTime: 1515178529620000
Instrument {
  MPSecID: 12315413180112000000
}
```

## Trading Status Open

The below example is a Market State Notification indicating an open status for an MPSecID.

### Sample Message

```
61 b3 b7 02 00 9f 0f de c7 60 01 00 00 1d 00 98
0c 11 e0 20 02 89 32 a8 ed 6c bb 0c 62 05 00 aa
40 0a 81 07 c0 83 b6 17 ff e8 21 93
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | a             |
| Channel Sequence | 178099        |
| Sending Time     | 1515181707167 |
| Body Length      | 29            |

### Protobuf Message Body

```
TradingStatus: 17
UpdateType: 2
NotificationTime: 1515181707161000
Instrument {
  MPSecID: 10602011180119000000
}
```



## Trading Status Close

The below example is a Market State Notification indicating a close status for an MPSecID.

### Sample Message

```
61 f5 b7 02 00 86 7c de c7 60 01 00 00 1d 00 98
0c 12 e0 20 02 89 32 d0 5b 16 bd 0c 62 05 00 aa
40 0a 81 07 c0 83 b6 17 ff e8 21 93
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | a             |
| Channel Sequence | 178165        |
| Sending Time     | 1515181735046 |
| Body Length      | 29            |

### Protobuf Message Body

```
TradingStatus: 18
UpdateType: 2
NotificationTime: 1515181735042000
Instrument {
  MPSecID: 10602011180119000000
}
```

## Exchange Summary

The Exchange Summary Message has two primary publications throughout the day. Each publication event results in a stream of messages, the last in the stream indicated by the LastMessage field. The contents of this message contain the InstrumentSummaryGroup which provides for open, high, low, close, settlement, open interest, and trading volume figures. As MPSecIDs refer to combinations of product-contracts and types, the summary group provides the final outlook of trading activity taken place in any instrument that relates to a Symbol + MaturityDate. From time to time a price or value correction may require a second publication. This should supersede that which has already been received.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | c     | 99    |

### Protobuf Template

```
message ExchangeSummary
{
  optional InstrumentSummaryGroup InstrumentSummary = 1026;
  optional string TradeDate = 190;
  optional int32 LastMessage = 701;
}
```

|                               |  |
|-------------------------------|--|
| <b>InstrumentSummaryGroup</b> | Trading day summary statistics   |
| <b>TradeDate</b>              | As-of date for the trading statistics provided in yyyyymmdd format.  |
| <b>LastMessage</b>            | In a stream of messages, the last message field indicates 0 if not the last message, and 1 if this is the last message and the stream has completed. |

## Start of Day Summary

At the beginning of each day, a stream of Exchange Summary messages is disseminated. The InstrumentSummaryGroups provided in each message reflects the trading activity for the previous trading day. In this stream, the OpenInterest field is populated with the latest open interest figures for each Symbol + MaturityDate.

### Sample Message

```
63 38 d4 02 00 a7 da ce f3 62 01 00 00 85 00 f2
0b 08 32 30 31 38 30 34 32 33 e8 2b 00 92 40 74
82 06 08 32 30 31 38 30 35 31 38 ea 0a 03 46 55
54 ba 0b 06 43 53 43 4f 31 44 d1 1b ae 47 e1 7a
14 5e 46 40 d9 1b 80 b7 40 82 e2 47 46 40 e1 1b
ae 47 e1 7a 14 de 45 40 e9 1b 33 33 33 33 33 13
46 40 f1 1b 33 33 33 33 33 13 46 40 81 1c 14 ae
47 e1 7a 14 de bf 88 1c 8a 2d 90 1c 00 98 1c 00
a0 1c 8f 2d b8 20 31 c0 20 32 c8 20 01 d0 20 01
d8 20 8a 2d
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | c             |
| Channel Sequence | 185400        |
| Sending Time     | 1524508842663 |
| Body Length      | 133           |

## Protobuf Message Body

```
TradeDate: "20180423"  
LastMessage: 0  
InstrumentSummary {  
  MaturityDate: "20180518"  
  SecurityType: "FUT"  
  Symbol: "CSCO1D"  
  HighPx: 44.7350  
  OpenPx: 44.5616  
  LowPx: 43.7350  
  ClosePx: 44.1500  
  SettlePx: 44.1500  
  NetChangePx: -0.4700  
  TotalVolume: 5770  
  EFPVolume: 0  
  BlockVolume: 0  
  OpenInterest: 5775  
  HighPxIndicator: 49  
  LowPxIndicator: 50  
  ClosePxindicator: 1  
  OpenPxIndicator: 1  
  SSFVolume: 5770  
}
```

## End of Day Summary

At the end of each day, a stream of Exchange Summary messages is disseminated. The InstrumentSummaryGroups provided in each message reflects the trading activity for the current trading day. In this stream, the OpenInterest field is not provided. The open interest for the Symbol + MaturityDate will be provided the next business day during the Start of Day Summary.

### Sample Message

```
63 30 0d 03 00 57 10 d1 f3 62 01 00 00 81 00 f2
0b 08 32 30 31 38 30 34 32 33 e8 2b 00 92 40 70
82 06 08 32 30 31 38 30 35 31 38 ea 0a 03 46 55
54 ba 0b 06 43 53 43 4f 31 44 d1 1b ae 47 e1 7a
14 5e 46 40 d9 1b 80 b7 40 82 e2 47 46 40 e1 1b
ae 47 e1 7a 14 de 45 40 e9 1b 33 33 33 33 33 13
46 40 f1 1b 33 33 33 33 33 13 46 40 81 1c 14 ae
47 e1 7a 14 de bf 88 1c 8a 2d 90 1c 00 98 1c 00
b8 20 31 c0 20 32 c8 20 01 d0 20 01 d8 20 8a 2d
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | c             |
| Channel Sequence | 199984        |
| Sending Time     | 1524508987479 |
| Body Length      | 129           |

## Protobuf Message Body

```
TradeDate: "20180423"  
LastMessage: 0  
InstrumentSummary {  
  MaturityDate: "20180518"  
  SecurityType: "FUT"  
  Symbol: "CSCO1D"  
  HighPx: 44.7350  
  OpenPx: 44.5616  
  LowPx: 43.7350  
  ClosePx: 44.1500  
  SettlePx: 44.1500  
  NetChangePx: -0.4700  
  TotalVolume: 5770  
  EFPVolume: 0  
  BlockVolume: 0  
  HighPxIndicator: 49  
  LowPxIndicator: 50  
  ClosePxindicator: 1  
  OpenPxIndicator: 1  
  SSFVolume: 5770  
}
```

## Product Catalog

The product catalog message contains the complete definition for each provided instrument. The MPSecID is the unique identifier for the instrument. Instruments are described by ProductSubType. Please see the Product Sub-Type Description section for additional information regarding possible values. Throughout the day the exchange publishes updates to instruments by way of the product catalog. The Instrument Definition refresh channel publishes all Instruments on a loop throughout the day.

| Name         | Value | ASCII |
|--------------|-------|-------|
| Message Type | d     | 100   |

### Protobuf Template

```
message ProductCatalog
{
  optional InstrumentGroup Instrument = 1029;
  optional int32 LastMessage = 701;
}
```

**InstrumentGroup** Complete definition for the instrument.

**LastMessage** In a stream of messages, the last message field indicates 0 if not the last message, and 1 if this is the last message and the stream has completed.

## Product Sub-Type Descriptions

Product types seek to further describe the tradable instrument. Below are the product sub-types available.

### SSF Product Type = 14

|              |   |
|--------------|---|
| <b>SSF</b>   | An outright single stock future that trades in the central limit order book.  |
| <b>Block</b> | An instrument by which participants can use to report off-exchange negotiated SSF transactions to the Delta1 Bilateral Matching Engine. |

### EFP Product Type = 15

|            |  |
|------------|--|
| <b>EFP</b> | An instrument by which participants can use to report off-exchange negotiated exchange future for physical transactions to the Delta1 Bilateral Matching Engine. |
|------------|--|

### STRATEGY Product Type = 16

|                              |  |
|------------------------------|--|
| <b>Calendar Spread</b>       | A single stock future spread that trades in the central limit order book and clears as two outright single stock futures transactions (legs).  |
| <b>Block Calendar Spread</b> | An instrument by which participants can use to report off-exchange negotiated single stock future spread transactions to the Delta1 Bilateral Matching Engine. Reported transactions clear as two outright single stock futures transactions (legs). |



## Strategy Instrument

Strategy instruments contain both MaturityDate front and MaturityDateBack. Look to the ProductType (16=Strategy) field to indicate the presence of a valid MaturityDateBack.

### Sample Message

```
64 3a 08 00 00 f5 a3 e2 f3 62 01 00 00 70 00 e8
2b 00 aa 40 6a e9 03 00 00 00 00 00 00 59 40 82
06 08 32 30 31 38 30 35 31 38 8a 06 08 32 30 31
38 30 36 31 35 81 07 07 27 d7 5a 90 b5 c0 8e 90
09 04 98 09 10 ea 0a 02 53 53 ba 0b 06 43 53 43
4f 31 44 98 0c 11 d0 1c ff ff ff ff ff ff ff
ff 01 da 1c 04 43 53 43 4f 82 1d 08 32 31 3a 30
30 3a 30 30 ea 1f 08 31 33 3a 33 30 3a 30 30
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | d             |
| Channel Sequence | 2106          |
| Sending Time     | 1524510139381 |
| Body Length      | 112           |

## Protobuf Message Body

LastMessage: 0

Instrument {

ContractMultiplier: 100

MaturityDate: "20180518"

MaturityDateBack: "20180615"

MPSecID: 10286421180518180615

ProductSubType: 4

ProductType: 16

SecuritySubType: "SS"

Symbol: "CSCO1D"

TradingStatus: 17

PositionLimit: -1

Underlying: "CSCO"

CloseTime: "21:00:00"

OpenTime: "13:30:00"

}

## Non-Strategy Instrument

A non-strategy instrument has only a MaturityDate. Look to the ProductType field with values of 14=SSF and 15=EFP to identify non-strategy instruments.

### Sample Message

```
64 34 08 00 00 c9 e8 dd f3 62 01 00 00 68 00 e8
2b 00 aa 40 62 e9 03 00 00 00 00 00 00 59 40 82
06 08 32 30 31 38 30 35 31 38 8a 06 01 30 81 07
80 c5 61 0c 78 ac c0 8e 90 09 00 98 09 0e ea 0a
01 53 ba 0b 06 43 53 43 4f 31 44 98 0c 11 d0 1c
ff ff ff ff ff ff ff ff ff 01 da 1c 04 43 53 43
4f 82 1d 08 32 30 3a 30 30 3a 30 30 ea 1f 08 31
33 3a 33 30 3a 30 30
```

### Message Header

|                  |               |
|------------------|---------------|
| Message Type     | d             |
| Channel Sequence | 2100          |
| Sending Time     | 1524509829321 |
| Body Length      | 104           |

## Protobuf Message Body

```
LastMessage: 0
Instrument {
  ContractMultiplier: 100
  MaturityDate: "20180518"
  MaturityDateBack: "0"
  MPSecID: 10286411180518000000
  ProductSubType: 0
  ProductType: 14
  SecuritySubType: "S"
  Symbol: "CSCO1D"
  TradingStatus: 17
  PositionLimit: -1
  Underlying: "CSCO"
  CloseTime: "20:00:00"
  OpenTime: "13:30:00"
}
```

## Field Definitions and Enumerated Values

|                           |   |  |
|---------------------------|---|--|
| <b>BlockVolume</b>        | Total transacted volume for ProductSubType of Block and Block Calendar Spread for the trading day.  |  |
| <b>ClosePx</b>            | Last trade within 60 seconds of the close. Applies for only SSFs. If no trade occurs, an exchange derived theoretical value is published.                   | Decimal precision of 4 places              |
| <b>ClosePxIndicator</b>   | Describes the ClosePxIndicator value.   | 0 = Trade<br>1 = Reference Price (default) |
| <b>CloseTime</b>          | In the UTC time-zone, the trading session close time. See Trading Status for more information regarding what actions are available during this session.     | hh:mm:ss                                   |
| <b>ContractMultiplier</b> | Number of security deliverables per trading unit of size.   |  |
| <b>EFPVolume</b>          | Total transacted volume for ProductSubType of EFP for the trading day.  |  |
| <b>EntryLegPriceFar</b>   | The implied price of the back leg in a calendar spread. For trades, this is the price of the resulting back leg transaction.                                | Decimal precision of 4 places              |
| <b>EntryLegPriceNear</b>  | The implied price of the front leg in a calendar spread. For trades, this is the price of the resulting front leg transaction.                              | Decimal precision of 4 places              |
| <b>EntryPrice</b>         | The price of the entry described by the EntryType and/or Side. Can be the trade price, order price, or side of market price.                                | Decimal precision of 4 places              |
| <b>EntryRate</b>          | The implied rate of the order or trade event. This rate is expressed as a decimal. For example, a value of 0.003581 can be expressed as 35.81 basis points. | Decimal precision of 6 places              |

|                        |   |  |
|------------------------|---|--|
| <b>EntrySide</b>       | The side of the entry. Applicable for order and side of market price levels.  | 49 = Bid<br>50 = Offer   |
| <b>EntrySize</b>       | The price of the entry described by the EntryType and/or Side. Can be the trade quantity, order quantity, or aggregate size for a side of market price level.         |  |
| <b>EntryType</b>       | Describes the entry. New, update, and delete types are used when referencing an order entry event. Trade and trade bust types are used when referencing trade events. | 1 = New<br>2 = Update<br>3 = Delete<br>4 = Trade<br>5 = Trade Bust |
| <b>HaltReason</b>      | Indicates the reason for the trading halt.  | 0 = Not halted<br>1 = Regulatory halt<br>2 = Technology halt       |
| <b>HighPx</b>          | The highest and best actionable bid order on the day or the highest traded EFP (future leg), SSF, or for calendar spreads the derived price of the cleared leg.       | Decimal precision of 4 places                                      |
| <b>HighPxIndicator</b> | Describes the HighPx value.   | 9 = No Value (default)<br>0 = Trade<br>49 = Bid                    |
| <b>LowPx</b>           | The lowest and best actionable offer order on the day or the lowest traded EFP (future leg), SSF, or for calendar spreads the derived price of the cleared leg.       | Decimal precision of 4 places                                      |
| <b>LowPxIndicator</b>  | Describes the LowPx value.  | 9 = No Value (default)<br>0 = Trade<br>50 = Offer                  |
| <b>MaturityDate</b>    | The day of contract expiration or maturity.   | yyyymmdd   |

|                         |  |   |
|-------------------------|--|---|
| <b>MaturityDateBack</b> | For a strategy, is the day of contract expiration or maturity for the back leg.  | yyyymmdd  |
| <b>MPSecID</b>          | Marketplace Security Identifier is the universally unique id for referencing an instrument's actionable marketplace. This value is unique by Symbol, Maturity Date (front and back), and ProductSubType.   |   |
| <b>NetChangePx</b>      | Available for SSF transactions. Indicates the price difference between the last known settlement price and the trade price of the event it describes. When provided in a summary message, this field indicates the day to day settlement difference. | Decimal precision of 4 places   |
| <b>OpenInterest</b>     | Latest open interest figures for the published trading date. This field is only present for the start of day publication of the Exchange Summary.  |   |
| <b>OpenPx</b>           | First trade within 60 seconds of the open. Applies for only SSFs. If no trade occurs, an exchange derived theoretical value is published.  | Decimal precision of 4 places   |
| <b>OpenPxIndicator</b>  | Describes the OpenPx value.  | 0 = Trade<br>1= Reference Price (default)   |
| <b>OpenTime</b>         | In the UTC time-zone, the trading session open time. See Trading Status for more information regarding what actions are available during this session.   | hh:mm:ss  |
| <b>PositionLimit</b>    | Maximum number of contracts permitted to be carried by a single account.   | -1 = Position accountability: Traders who hold net positions greater than 22,500 may be requested by the exchange to provide additional information and consent to halt |

|                        |  |   |
|------------------------|--|---|
|                        |  | increasing their positions when so ordered by the exchange.   |
| <b>ProductSubType</b>  | Sub group category for types of products.  | 0 = SSF<br>1 = Block<br>2 = EFP<br>3 = Block Calendar Spread<br>4 = Calendar Spread<br>14 = Single Stock Future<br>15 = Exchange Future for Physical<br>16 = Strategy |
| <b>ProductType</b>     | Top level group for assigning instruments to products.   |   |
| <b>ReferenceID</b>     | A universally unique identifier which persists throughout the life of an order. For trades, this value is unique and passed through to clearing via Exchange Special Instructions. Trade busts contain the ReferenceID of the original trade record.   |   |
| <b>SecuritySubType</b> | Describes the ProductSubType code.   | B = Block<br>S = Single Stock Future<br>SS = SSF Calendar Spread<br>BS = Block Calendar Spread<br>E = EFP   |
| <b>SecurityType</b>    | Always FUT.  | FUT = Future  |
| <b>SequenceNo</b>      | Incrementally increases for each change to the entry. For top of book entries this value increases with each change to either price or aggregate size at the best price level. For order entries, this value increases with each modification to either price or quantity for a given ReferenceID. |   |
| <b>SettlePx</b>        | The official settlement price for the cleared SSF product.   | Decimal precision of 4 places   |



|                      |  |                                     |
|----------------------|--|-------------------------------------|
| <b>SSFVolume</b>     | Total transacted volume for ProductSubType of SSF and Calendar Spread for the trading day.   |                                     |
| <b>Symbol</b>        | An alphanumeric human readable symbol for the product. Strategies between two products appear as XXX/YYY.  |                                     |
| <b>TotalVolume</b>   | Total transacted volume for the trading day.   |                                     |
| <b>TradingStatus</b> | Indicates the status of tradability for an instrument. More information is in the Trading Status section of this document.   | 2 = Halt<br>17 = Open<br>18 = Close |
| <b>TransactTime</b>  | Human readable date-time stamp with millisecond precision.   | yyyymmdd-hh:mm:ss.000               |
| <b>Underlying</b>    | Symbol of the security underlying the future. In the case of a strategy where the front and back legs are not of the same SSF component, this field is populated with "N/A". |                                     |