INVESTORS EXCHANGE TOPS SNAP SPECIFICATION

Version 1.2

Updated: October 19, 2021

Table of Contents

OVERVIEW

Participants of Investors Exchange ("IEX" or the "Exchange") may use TOPS to receive real-time top of book quotations, last sale information, short sale restriction status, regulatory trading status, and auction information direct from IEX. Market data distributors may use TOPS to feed dynamically updating stock tickers, portfolio trackers, trade alert programs, time and quote graphs, and other display systems.

The quotations received via TOPS provide an aggregated size and do not indicate the number or size of individual orders at the best bid or ask. Non-displayed orders and non-displayed portions of reserve orders are not represented in TOPS. TOPS also provides last trade price and size information. Trades resulting from either displayed or non-displayed orders matching on IEX are reported. Routed executions are not reported.

Complete depth of book market data can be received via the IEX DEEP protocol.

TOPS also provides short sale restriction and regulatory trading status information. For IEX-listed securities, TOPS provides current price, size, imbalance information, auction collar information, and other relevant information about upcoming auctions.

TOPS cannot be used to enter orders. For order entry, refer to the IEX FIX Specification.

The proposed TOPS SNAP service is intended to augment the current TOPS gap-fill retransmission service by adding a separate snapshot protocol to allow consumers to accelerate late-start recovery. It does not modify the existing TOPS feed or retransmission protocols.

For ordering information, contact IEX Market Operations at 646.343.2300 or mailto:marketops@iextrading.com or simply submit completed IEX Data Agreements and Forms.

TRANSPORT PROTOCOL OPTIONS

TOPS SNAP will use a new request-response TCP/IP unicast protocol.

Note: Snapshot Responses contain data messages detailed in the IEX TOPS Specification and the IEX Transport specification.

ARCHITECTURE

TOPS SNAP is a request-response protocol with no unsolicited messages (i.e. heartbeats). Applications would start to receive and buffer TOPS multicast before connecting to a TOPS SNAP server on a well-known port and would issue a SnapshotRequest Message.

In response the TOPS SNAP server will either provide a Snapshot Response or ErrorResponse Message.

A Snapshot Response provides a point-in-time snapshot of the TOPS top of book data and trading status data for all IEX Symbols along with the associated TOPS feed Sequence number.

On receipt of a Snapshot Response the applications would initialize their internal top of books for each Symbol using data from the Snapshot Response, then apply any buffered real-time updates with higher sequence numbers.

Applications would then disconnect from the TOPS SNAP server and continue to process the TOPS feed real-time multicast as normal.

Connections may be timed-out and disconnected by either client or server if no data has been transmitted for a significant period (10 seconds).

DATA TYPES

These are identical to the TOPS Specification:

- String: Fixed-length ASCII byte sequence, left justified and space filled on the right
- Long: 8 bytes, signed integer
- Price: 8 bytes, signed integer containing a fixed-point number with 4 digits to the right of an implied decimal point
- Integer: 4 bytes, unsigned integer
- Byte: 1 byte, unsigned integer
- Timestamp: 8 bytes, signed integer containing a counter of nanoseconds since POSIX (Epoch) time UTC
- Event Time: 4 bytes, unsigned integer containing a counter of seconds since POSIX (Epoch) time UTC

All binary fields are in **little endian** format.

Note that each byte is represented by two hexadecimal digits in the examples within this specification.

NETWORK DETAILS

TOPS SNAP TCP/IP

Snapshot Configuration

- Supported Retransmission Protocol(s): TCP
- Maximum Requests: Quota restricted (1000/day)
- Supported Request Type(s): SnapshotRequest

TOPS SNAP Server Addresses

SITE	XC Type	Server	Port	Credentials
IEX POP (Equinix NY5)	Primary (A)	23.226.155.163	11380	Contact Market Ops
	Secondary (B)	23.226.155.227	11380	Contact Market Ops
Disaster Recovery (Equinix CH4)	Tertiary (C)	23.226.155.250	11380	Contact Market Ops
IEX Testing Facility (Equinix NY5)	ITF (I)	23.226.155.19	33380	“TEST:password”

Please contact marketops@iextrading.com to procure TOPS SNAP credentials.

Please contact itfsupport@iextrading.com for support help related to the ITF.

MESSAGE FORMATS

SnapshotRequest Message (MessageType ‘r’)

The SnapshotRequest message is sent from the Client to the TOPS SNAP Server to authenticate and request a Snapshot Response.

Field Name	Offset	Length	Type	Description/Notes
Message Length	0	2	Integer	Length of message in bytes not including this field (41)
Message Type	2	1	Byte	‘r’ (0x72) – SnapshotRequest
Authentication Token	3	40	Byte	Token supplied by IEX MarketOps. Left justified string *user:password* space padded on right.
ChannelID	43	4	Integer	Channel Identifier.
SessionID	47	4	Integer	Session Identifier.
Minimum Sequence Number	51	8	Long	Minimum Sequence Number useable by client

Total Message Data length is 59 bytes.

Applications will normally wait until they receive and start buffering TOPS Feed Multicast messages before connecting and sending a SnapshotRequest to the TOPS SNAP Server. The SnapshotRequest’s ChannelID, SessionID and Minimum Sequence Number fields should be populated with values from the TOPS FEED IEX TP-Header in the Multicast packet.

ErrorResponse Message (MessageType ‘e’)

Sent by the TOPS SNAP server to the client when a SnapshotRequest is rejected.

Field Name	Offset	Length	Type	Description/Notes
Message Length	0	2	Integer	Length of message in bytes not including this field (2)
Message Type	2	1	Byte	‘e’ (0x65) – ErrorResponse
Reject Reason Code	3	1	Byte	Reason the SnapshotRequest was rejected

Total Message Data length is 4 bytes.

Reject Reason Code

‘A’ (0x41) – Authentication Failure
‘C’ (0x43) – Incorrect ChannelID in SnapshotRequest
‘E’ (0x45) – Snapshot Request already active
‘Q’ (0x51) – Quota Exceeded
‘R’ (0x52) – Snapshot Not Yet Available (no snapshot >= requested Minimum Sequence Number is available)
‘S’ (0x53) – Incorrect SessionID in SnapshotRequest
‘U’ (0x55) – Snapshot Service Temporarily Unavailable

Snapshot Response

A Snapshot Response is sent from the TOPS SNAP server to the client when a client SnapshortRequest is successful. A Snapshot Response consists of a SnapshotStart message, followed by SnapshotData messages, and concluded by a SnapshotEnd message.

SnapshotStart Message (MessageType 's')

Field Name	Offset	Length	Type	Description/Notes
Message Length	0	2	Integer	Length of message in bytes not including this field (9)
Message Type	2	1	Byte	's' (0x73) –SnapshotStart
SnapshotLength	3	8	Long	Length in bytes of the complete Snapshot Response. Includes this SnapshotStart message, all SnapshotData messages and the SnapshotEnd message

SnapshotData Message (MessageType 'd')

Field Name	Offset	Length	Type	Description/Notes
Message Length	0	2	Integer	Length of message in bytes not including this field (variable)
Message Type	2	1	Byte	'd' (0x64) – SnapshotData
IEX-TP Header	3	40	Byte	see IEX Transport specification
IEX-TP MessageBlock Length	43	2	Integer	see IEX Transport specification
IEX-TP Message Data	45		Variable	see IEX Transport specification and IEX TOPS Specification

The IEX-TP Message Data will contain messages in IEX TOPS format and may include any TOPS message types.

SnapshotEnd Message (MessageType 'x')

Field Name	Offset	Length	Type	Description/Notes
Message Length	0	2	Integer	Length of message in bytes not including this field (9)
Message Type	2	1	Byte	'x' (0x78) –SnapshotEnd
Snapshot Sequence Number	3	8	Long	Sequence at which the Snapshot was created

TOPS Feed messages in Snapshot Response

The IEX-TP Message Data returned in the SnapshotData messages will contain TOPS Feed messages required to rebuild the current state of the TOPS Feed books for each symbol at the SequenceNumber the Snapshot was created.

Snapshot Content:

1. *SnapshotStart* message

2. For each IEX Listed symbol (at time of snapshot)

   - Latest **SecurityDirectory** Message

3. Latest **SystemEvent** message (if exists at time of snapshot)

4. For each symbol (at time of snapshot)

   - Latest **TradingStatus** Message (if exists at time of snapshot)
   - Latest **SecurityEvent** Message (if exists at time of snapshot)
   - Latest **OperationalHaltStatus** Message (if exists at time of snapshot)
   - Latest **ShortSalePriceTestStatus** Message (if exists at time of snapshot
   - Latest **OfficialPrice** Message (if exists at time of snapshot)
   - All **QuoteUpdate** Messages (that are active at time of snapshot)
   - Latest **RetailLiquidityIndicator** Message (if exists at time of snapshot)

5. *SnapshotEnd* Message (includes SnapshotSequenceNumber)

Note: All TOPS Feed messages (shown in **bold**) are wrapped within a TOPS SNAP *SnapshotData* Message that includes an IEX-TP Header providing TOPS Feed sequencing and timing information.

Note: **QuoteUpdate** Messages will not be in the original TOPS Feed Sequence or SendTime order.

REVISION HISTORY

Version	Date	Change
1.0	June 30, 2021	• Document created.
1.1	October 5, 2021	• Added interim Retail Liquidity Indicator message details with highlights.
1.2	October 19, 2021	• Removed interim highlights. • Added full support for Retail Liquidity Indicator message and associated details.