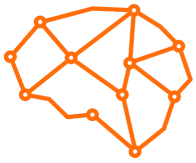

INTELLIGENTCROSS

IntelligentCross Market Data Recovery Specification

Version 1.05
Updated March 3, 2021

INTELLIGENTCROSS

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Introduction

This document describes how recipients of Intelligent Cross' IQX data feed may recover transmission of missed messages.

This specification is intended as a companion to the IntelligentCross Market Data Feed Specification. Please see http://iqx.imperativex.com/ for the latest specification version.

Supported Recovery Methods

IntelligentCross supports recovery of individual messages, as well as snapshot fast recovery of the current state of the books. Recipients may choose either recovery method at any time of the day depending on their technical requirements and preferences.

UDP Message Recovery

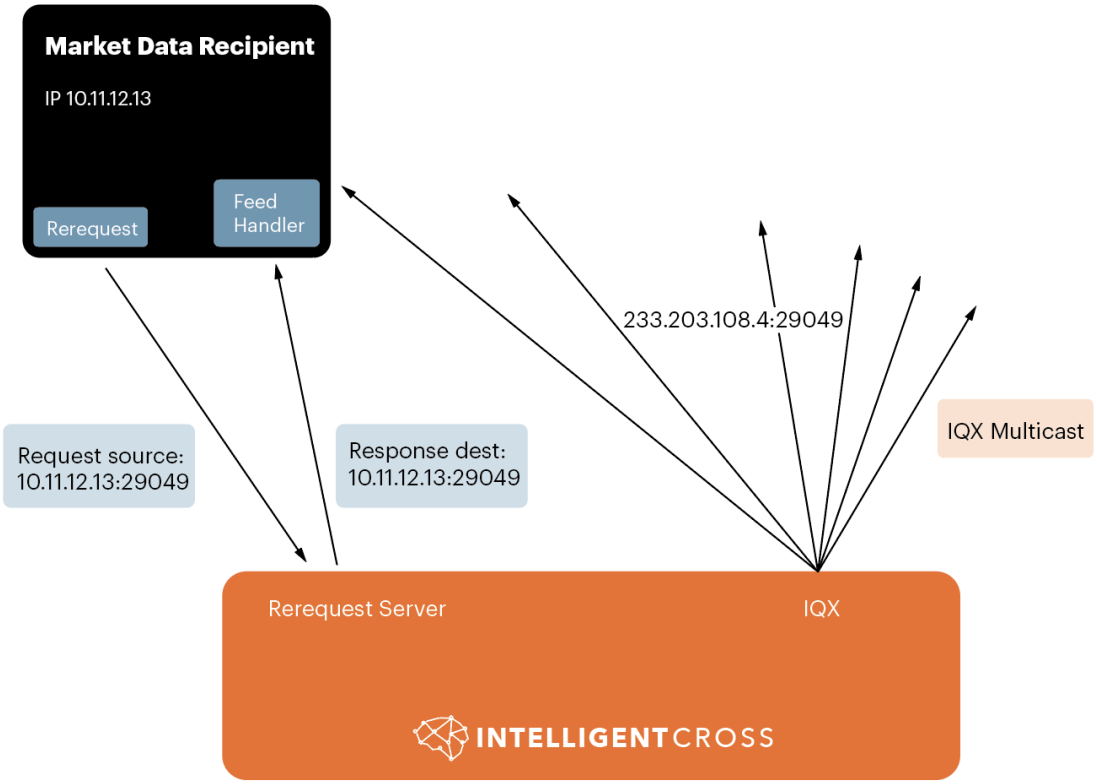
Missed messages may be rerequested using UDP. When a client sends a UDP rerequest, the rerequest server will reply with a single packet containing the requested messages. The packet will start at the requested Sequence, up to the requested Count of messages, capped by the number that would fit into a single packet. Note that the MTU of returned UDP packets will be capped at 1500 bytes.

Only a single UDP packet per request will be sent. Any messages that do not fit into that single UDP packet will not be sent until a subsequent request is made for them.

Response packets will be sent to clients at the IP address and Port contained in the source address IP header of the request packet. Request packets should be formed with the source port set to the desired return port. Users may, for example, choose their source port to be the same port as the live multicast feed destination port so that their feed handlers may process missed packets as they would normal feed packets.

There is no limit to the number of UDP rerequests. UDP recovery is intended to be suitable for full recovery even when a recipient starts their service late in the day.

Diagram



Note: IP addresses in the above diagram are for example only.

UDP Rerequest Header

Note, the UDP rerequest header is in the same format as the IQX multicast market data output feed header.

Field	Offset	Length	Type	Description
Market Day Identifier	0	9	Number	Must match current Market Day Identifier
Feed Identifier	9	1	Alpha	Must match Feed Identifier of rerequest server
Sequence	10	8	Integer	Sequence number for the first requested message
Count	18	2	Integer	Number of messages requested

Where to send rerequest packets

Users will be provided with the IP addresses and ports of available UDP rerequest servers.

TCP Snapshots

TCP Snapshot recovery allows users to rapidly catch up to the IQX market data output feed intra-day.

Users will receive all ***Market Event***, ***Symbol Information***, and ***Symbol State*** messages.

However, for order specific messages, only messages related to orders currently on the books will be sent: ***New Order Add***, ***Order Partial Cancel***, ***Order Cancel All***, ***Order Executed***, and ***Order Updated*** messages.

Note that ***Trade***, and ***Trade Break*** messages are **not** sent as part of TCP Snapshots.

Connecting to the TCP Snapshot Server

Imperative Execution has both a Primary and a Secondary TCP Snapshot server. Typically only one Snapshot service will be running at any given time. You will be provided with both Primary and Secondary IP addresses and ports. We recommend that client software first try the Primary IP

address/port. If the Primary IP/port is unavailable, then the client software should next try the Secondary address.

Message Formats

With the exception of the End of Snapshot message, messages will be sent in the same format as the multicast IQS market data output feed. Please see the Market Data Output feed specification for the details.

End of Snapshot Message

An ***End of Snapshot*** Message will be sent once the snapshot has completed.

Note that the **End of Snapshot** message will be sent inside the *TCP Transport* **Binary Data** (‘**S**’) message.

Field	Offset	Length	Type	Description
Message Type	0	1	Alpha	'X'
Sequence	1	8	Integer	Sequence number of the IQX multicast output feed corresponding to the last message sent, the previous message to this one, where this snapshot ends.

Handoff from Snapshot to IQX Multicast

Customers may need to subscribe to IQX Multicast prior to or simultaneously with connecting to the Snapshot service. Due to possible delays over TCP, by the time the ***End of Snapshot*** message is received, the IQX feed may be already sending subsequent messages. Customers will likely want to already have processed these messages, or have them in their UDP receive queue awaiting processing, or avail themselves of the UDP recovery for times when after switchover from snapshot there are still missing messages.

Connecting to Intelligent Cross’ TCP Snapshot servers

Clients will be provided with Username, Passwords, and IP/port information for TCP Snapshot servers.

TCP Transport

TCP Snapshots are available over Intelligent Cross' TCPOut protocol. TCPOut is a simple encapsulation layer for outpoud data dissemination.

Messages from Client to Server

Login Message

The client must login to the server before it will receive data.

Field	Offset	Length	Type	Description
Length	0	2	Integer	Length of the message (49)
Message Type	2	1	Alpha	'L'
User	3	6	Alpha	Username
Pass	9	10	Alpha	Password
Market Day Identifier	19	9	Integer	Unique identifier for trading day
Feed Identifier	18	1	Alpha	Unique code for feed
Sequence	29	20	Alpha	Requested starting sequence. This number is in ASCII. 0 indicates that the client wishes to start at the latest message. **Note:** Snapshot connections ***must*** specify 1 to login.

Heartbeat

Clients should send heartbeats to the server at least once per second. Connections will be terminated by the server if it stops receiving heartbeats.

Field	Offset	Length	Type	Description
Length	0	2	Integer	The length of this message (3)
Message Type	2	1	Alpha	'R'

From Server to Client

Successful Login

Field	Offset	Length	Type	Description
Length	0	2	Integer	Length of the message (33)
Message Type	2	1	Alpha	'A'
Market Day Identifier	3	9	Integer	Unique identifier for trading day
Feed Identifier	12	1	Alpha	Unique code for feed
Sequence	13	20	Alpha	ASCII sequence number of the next ***Binary Data*** (‘*S*’) message.

Login Reject

Field	Offset	Length	Type	Description
Length	0	2	Integer	Length of the message (4)
Message Type	2	1	Alpha	'J'
Reason Code	3	1	Alpha	Reject Reason: 'A' : Invalid User/Password 'B' : Invalid Sequence 'S' : Invalid Market Day/Feed Id

Heartbeat

The server will send heartbeats to the client whenever there is otherwise no data for exa period of time. It is recommended that clients disconnect and attempt to reconnect in the event that they do not receive data from the server for one second.

Field	Offset	Length	Type	Description
Length	0	2	Integer	The length of this message (3)
Message Type	2	1	Alpha	'H'

Binary Data Messages

Field	Offset	Length	Type	Description
Length	0	2	Integer	Length of the message
Message Type	2	1	Alpha	'S'
Data	3	-	Binary	Data message of Length bytes

IP Address and Port Reference

The following table lists the current IP and port assignments for available recovery services.

UDP Rerequest

Site	Feed Identifier	IP	Port
PROD	A - Maker/Taker	162.247.110.37	49011
PROD	P - Fee/Fee	162.247.110.37	49012
PROD	Z - Taker/Maker (Inverted)	162.247.110.37	49013
UAT	B - Maker/Taker	162.247.110.46	49111
UAT	T - Fee/Fee	162.247.110.46	49112
UAT	Y - Taker/Maker (Inverted)	162.247.110.46	49113

TCP Snapshot

Site	Feed Identifier	IP	Port
PROD	A - Maker/Taker	162.247.110.37	49001
PROD	P - Fee/Fee	162.247.110.37	49002
PROD	Z - Taker/Maker (Inverted)	162.247.110.37	49003
UAT	B - Maker/Taker	162.247.110.46	49101
UAT	T - Fee/Fee	162.247.110.46	49102
UAT	Y - Taker/Maker (Inverted)	162.247.110.46	49103

Revision History

Version	Date	Change
1.00	June 9, 2020	Initial Revision
1.01	July 29, 2020	-Remove note about future UDP availability as UDP recovery is now available. -Removed Trade and TradeBreak messages from TCP Snapshots.
1.02	July 30, 2020	Updated logos.
1.03	July 31, 2020	Updated diagram.
1.04	November 25, 2020	Add note about Primary and Secondary market data recovery servers.
1.05	March 3, 2021	-Added IP address and port reference. -Expanded on diagram.