Cboe Japan Snapshot Recovery Service Specification (Binary)

Cboe Japan Trading System

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Version 1.0-05

CONTENTS

FIGURES

1 Introduction

Cboe Japan Trading System ("CTS") is a high performance, low latency trading system. The information processed by CTS is highly valuable to all the market players including participants, data vendors as well as investors. Therefore, a market data feed is one of the key services that is provided by CTS to disseminate such information.

Snapshot Recovery Service (SRS-Bin) allows clients to retrieve the latest snapshot of market data feed. Market data clients may use the service provided by SRS-Bin Server for large-scale data recovery (e.g. Major outage or late joiners).

Note: For recovery purpose, SRS-Bin must be used in combination with Cboe Japan Multicast Market Data Feed Binary version (CHIXMMD-Bin). As the snapshot contains an End message will indicate the next message that client should be received from CHIXMMD-Bin.

This document is meant to share information on these Cboe Japan venues:

- Alpha (Cboe Alpha or Chi-Alpha as the full name)
- Select (Cboe Select or Chi-Select as the full name)

1.1 Relevant documents

ITEM	TITLE	VERSION	DATE
1	JPCX-L3-D-035 Cboe Japan Multicast Market Data Feed Specification(Binary).docx	1.0-04	13-Dec-2021

Figure 1: Relevant Document(s)

1.2 Revision History

ITEM	REVISION HIGHLIGHT	DOCUMENT REFERENCE	CHANGE BY
1	Updated Connection Parameter (IP Address/Port)	2	Sam (version 1.0-1)
2	Updated Connection Parameter for SRS-Bin Server 3 Remove System Event 'N' and 'R'	2, 7.2.1	Sam (version 1.0-2)
3	Fixed typos on the HEX format	8.6	Sam (version 1.0-3)
4	Updated Network Parameters in Simulation	2	Newton (version 1.0-4)
5	Re-branding – logo and name reference change		Stanley (version 1.0-5)

Figure 2: Revision History

2 Network Configuration Parameters

The following table summarizes network address & parameter configurations needed for accessing the Snapshot Recovery Service.

Network Address Summary

Production Environment

	Primary Data Centre (Alpha)	Primary Data Centre (Select)	Secondary Data Centre (Alpha)
SRS-Bin Server 1			
IP Address	110.50.74.11	110.50.74.37	-
Port Number	12412	12422	-
SRS-Bin Server 2			
IP Address	110.50.74.12	110.50.74.38	-
Port Number	12512	12522	-
SRS-Bin Server 3			
IP Address	-	-	110.50.75.11
Port Number	-	-	12612

Figure 3: Network Address Summary (Production Environment)

Simulation Environment

	Secondary Data Centre (Alpha)	Secondary Data Centre (Select)
SRS-Bin Server 1		
IP Address	110.50.75.150	110.50.75.154
Port Number	12702	12722
SRS-Bin Server 2		
IP Address	110.50.75.156	110.50.75.158
Port Number	12802	12822
SRS-Bin Server 3		
IP Address	110.50.75.38	-
Port Number	12902	-

Figure 4: Network Address Summary (Simulation Environment)

3 Data Type

This section describes the available data types that are used in the SRS-Bin.

3.1 Numeric

Numeric fields consist of digits which are ASCII coded. They are presented in right justification and are space-filled from the left.

3.2 Alphanumeric

Alphanumeric text fields consist of alphabetical letters or digits (or both). They are presented in left justification and are padded with spaces to the right.

3.3 Prices

Price data fields are unsigned 8-byte big-endian binary encoded integer. After decoded, the last 7 digits are the decimal places and the remaining parts are digits. The maximum value of this type is 922,337,203,685.4775807 (0x7fffffffffffffff)

3.4 Integer

Integer fields are unsigned big-endian (network byte order) binary encoded numbers. These fields are either 2 bytes, 4 bytes or 8 bytes. The maximum value of 2-byte integer is 32,767 (0x7fff), the maximum value of 4-byte integer is 2,147,483,647 (0x7fffffff), and the maximum value of 8-byte integer is 9,223,372,036,854,775,807 (0x7fffffffffffffff).

4 Session

4.1 Session Protocol

1. Snapshot Recovery Service is built on a session layer on top of TCP/IP sockets. Sessions include sequenced and non-sequenced messages in which sequenced messages are the actual data, while the non-sequenced messages are the session level interfaces.
2. Sequenced messages include system event, stock status, add orders, etc.
3. Login, logout and heartbeat messages are the examples of non-sequenced messages.

The following diagram describes a typical snapshot recovery scenario:

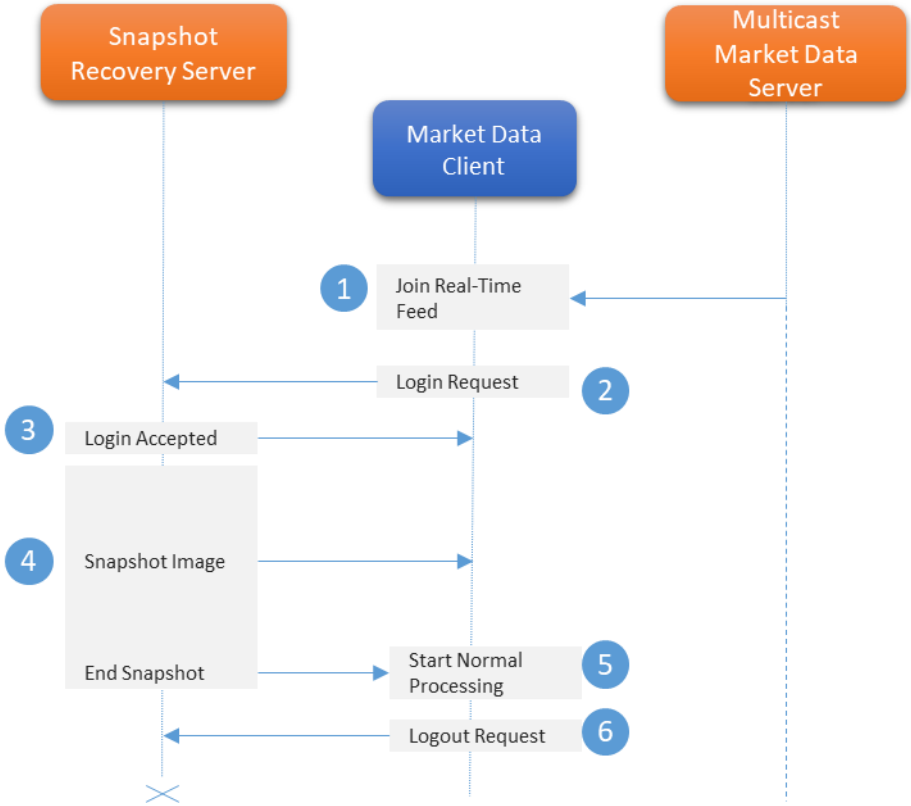

Figure 3: Example Snapshot Recovery Scenario

In the diagram, there are 6 steps involved in the snapshot recovery process.

Step 1: Market Data Client join the Real-Time Multicast Market Data Feed and buffer market data received.

Step 2: Market Data Client then establish a TCP connection with the Snapshot Recovery Server and format a Login Request message to request snapshot, the request mode may be

0: Trade Summary only

1: Order Book only

2: Trade Summary and Order Book

Step 3: After receiving the login request, the Snapshot Recovery Server will validate the user authentication information in the request. A Login Accepted message will be replied to the client to indicate the request is accepted and snapshot transmission will start soon.

Step 4: The Snapshot Recovery Server starts replying the snapshot.

Step 5: When the client receives the End Message, it should:

1. Discard market data with sequence less than the 'Sequence Number' in End Message
2. Process remaining buffered message
3. Start processing message from Real-Time Multicast Market Data Feed

Step 6: Client send a Logout Request to disconnect the recovery session. After the request is sent, the client may close the TCP connection immediately.

Snapshot Recovery Server will only reply the snapshot once for each connection. Only heartbeat message will be sent from the server once the snapshot is transferred. It will terminate the session after received Logout Request or a few seconds after sending out End Message.

5 Session Messages

5.1 Debug Message (Inbound)

- Debug Messages are used for giving useful information to developers assisting them in application development and troubleshooting. They are used during development processes only.

DEBUG MESSAGE				
Name	**Offset**	**Length**	**Value**	**Remarks**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"+"	Debug Message
Text	3	Variable	Alphanumeric	Free form text

5.2 Login Request (Outbound)

- Login Request Message is sent to the server when client tries to establish connection to the server by sending login request packet.
- Since data is sent in ASCII, it must be padded with spaces; for example, the field lengths of Username and Sequence are 6 and 10 alphanumeric characters respectively, if Username is "JOHN", it should be sent as "JOHN_ _", and if the mode is 1, it should be sent as "_ _ _ _ _ _ _ _ _ _1" ("_" represents a space).

LOGIN REQUEST MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"L"	Login Request Message
Username	3	6	Alphanumeric	Username
Password	9	10	Alphanumeric	Password
Session	19	10	Alphanumeric	Login requested session ID. Leave this field blank for initial login; and provide Session ID for subsequent logins.
Mode	29	10	Numeric	The requested information from snapshot "0" indicates trade summary only. "1" indicates order book only. "2" indicates trade summary and order book.

5.3 Login Accepted (Inbound)

- Login Accepted message is used for acknowledging a login request packet sent by client upon successful login.

LOGIN ACCEPTED MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"A"	Login Accepted Message
Session	3	10	Alphanumeric	The session ID currently logged into.

Mode	13	10	Numeric	The requested mode
Comma	23	1	","	Separator
Messages Total	24	10	Numeric	Always zero

5.4 Login Rejected (Inbound)

- Login Rejected message is used for acknowledging the failure of a login request packet sent by client.

LOGIN REJECTED MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"J"	Login Rejected Message
Reject Reason	3	1	"A" or "S" or "M"	Reason of the login rejection: "A" – Invalid username/password "S" – Invalid session ID "M" – Invalid mode

5.5 Logout Request (Outbound)

- Logout Request Message is used for sending session termination request to the server. Session will be closed immediately when receiving logout request packet sent by client.

LOGOUT REQUEST MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"O"	Logout Request Message

5.6 Server Heartbeat Message (Inbound)

- If session is left idle for more than one second, server will send a heartbeat message.

SERVER HEARTBEAT MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"H"	Server Heartbeat Message

5.7 Client Heartbeat Message (Outbound)

- Client Heartbeat Message is used for sending heartbeat messages to server from the client side on a regular interval. Since the server assumes the client is no longer active if it does not receive a heartbeat message from client for more than 15 seconds, the session will be terminated.

CLIENT HEARTBEAT MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"R"	Client Heartbeat Message

5.8 Sequenced Data Message (Inbound)

- Sequenced Data Message is the message sent by the server which contains actual snapshot content.

SEQUENCED DATA MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	“S”	Sequenced Data Message
Data	3	Variable	Snapshot Recovery Message	Snapshot Recovery Message

6 Snapshot Content

The following table describe the content to be included in the snapshot according to the request mode. The composition of the snapshot follows the table's order

	MODE 0	MODE 1	MODE2
Second Message	Y	Y	Y
System Event Message	Y	Y	Y
Stock Summary Message	Y		Y
Stock Status Message (Trading Status and Short Sell Price Check)		Y	Y
Add Order Message		Y	Y
End Message	Y	Y	Y

7 Snapshot Recovery Messages

7.1 Second Message

- Second Message will be sent for every second for which there is at least one payload.

SECOND MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Time - second	0	4	Integer	The number of seconds since mid-night
Message Type	4	1	"T"	Second Message

7.2 System Event Message

- System Event Message is used for signalling an event which affects all systems of CTS.

SYSTEM EVENT MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"S"	System Event Message
Event Code	5	1	Alphanumeric	Please see System Event Codes below

7.2.1 System Event Codes

SYSTEM EVENT CODE	DESCRIPTION	REMARKS
O	Start of Messages	This is the first message of the day
S	Start of Trading Session	This message indicates that CTS is open and accepting orders
E	End of System hours	This message indicates that CTS is closed and not accepting orders anymore. It is still possible to receive Broken Trade and Order Cancel messages after this.
C	End of Messages	This is the last message of the day

7.3 Stock Summary Message

This message indicates the summary of a stock. It is sent when clients request snapshot with trade summary from SRS-Bin.

STOCK SUMMARY MESSAGE				
Name	**Offset**	**Length**	**Value**	**Remarks**
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	“V”	Stock Summary Message
Stock	5	6	Alphanumeric	Stock Symbol
High Price	11	8	Price	Highest execution price
Low Price	19	8	Price	Lowest execution price
Open Price	27	8	Price	First execution price
Close Price	35	8	Price	Final execution price
Total Value	43	8	Integer	Total executed value
Total Volume	51	8	Integer	Total executed shares
Total Count	59	8	Integer	Total number of execution

7.4 Stock Status Message

This message indicates the current trading status of a stock. At the start of day, the feed will send out a stock status message with Trading Status set with 'T' – Trading or 'H' - Halted for each of the symbols trading on CTS. And then, the feed will send out stock status message with Trading Status set with 'A' or 'D' to indicate if Short Sell Price Check is activated or not for each of the symbols.

Subsequently, stock status messages will be sent when a stock is halted or is released for trading. Also, stock status messages will be sent when Short Sell Price check is activated for a stock.

STOCK STATUS MESSAGE				
Name	**Offset**	**Length**	**Value**	**Remarks**
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"H"	Stock Trading Action Message
Stock	5	6	Alphanumeric	Stock Symbol
Trading State	11	1	Alphanumeric	"H" = Halted, "T"= Trading, "A" = "Short Sell Price Check activate", "D" = "Short Sell Price Check deactivate"
Reserved	12	1	Alphanumeric	Reserved for future use

7.5 Add Order Message

- Add Order Message is used for acknowledging the acceptance of a visible order into the book in CTS. The message contains an Order Reference which is the unique key of the day assigned to the order by CTS.

ADD ORDER MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"A"	Add Order Message
Order Reference	5	4	Integer	Unique order reference number of the day.
Buy/Sell Indicator	9	1	"B" or "S"	"B" = Buy Order "S" = Sell Order
Shares	10	4	Integer	Total number of shares being added to the book. (The number of shares added to the book may be less than the actual number of shares entered because part of the order may trade before being posted to the book).
Stock	14	6	Alphanumeric	Stock symbol (which is right-padded with spaces).
Price	20	8	Price	The display price of the order.
Display	28	1	"Y"	"Y" = displayed in quote

7.6 End Message

This message indicate the snapshot is end. It includes the sequence number of CHIXMMD-Bin that should be continued for the snapshot.

END MESSAGE				
NAME	**OFFSET**	**LENGTH**	**VALUE**	**REMARKS**
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	“G”	End Message
Sequence Number	5	4	Integer	Next expected sequence number

8 Sample Data

8.1 CTS is opened and accepting orders

ACTION	HEX	MEANING
CTS is opened	27 3f 49 78 53 53	Time(Nanosecond): 658459000 Message Type: S Event Code: S

8.2 Snapshot with Stock Summary

ACTION	HEX	MEANING
Stock Summary Message indicate 1 trade on symbol 2531 with price 300 and quantity 1000	27 3f 80 28 56 32 35 33 31 20 20 00 00 00 00 b2 d0 5e 00 00 00 00 00 b2 d0 5e 00 00 00 00 00 b2 d0 5e 00 00 00 00 00 00 04 93 e0 00 00 00 00 00 00 03 e8 00 00 00 00 00 00 00 01	Time(Nanosecond): 658473000 Message Type: V Stock: 2531 High Price: 3000000000 Low Price: 3000000000 Open Price: 3000000000 Close Price: 3000000000 Total Value: 300000 Total Volume: 1000 Total Count: 1

8.3 Short Sell price check activated

ACTION	HEX	MEANING
Stock Status Message indicates symbol 2531 is tradable.	00 39 53 c8 48 32 35 33 31 20 20 54 4e	Time(Nanosecond): 003757000 Message Type: H Stock: 2531 Trading State: T Reserved: N
Stock Status Message indicates short sell price check activated for symbol 2531	17 26 41 18 48 32 35 33 31 20 20 41 4e	Time(Nanosecond): 388383000 Message Type: H Stock: 2531 Short Sell Price State: A Reserved: N

8.4 Short Sell price check deactivated

ACTION	HEX	MEANING
Stock Status Message indicates symbol 2914 is tradable.	01 de 7c 30 48 32 39 31 34 20 20 54 4e	Time(Nanosecond): 031358000 Message Type: H Stock: 2914 Trading State: T Reserved: N
Stock Status Message indicates short sell price check deactivated for symbol 2914	26 7e a1 28 48 32 39 31 34 20 20 44 4e	Time(Nanosecond): 645833000 Message Type: H Stock: 2914 Short Sell Price State: D Reserved: N

8.5 An order is placed on CTS

ACTION	HEX	MEANING
Buy of 2531 with 1000 shares entered at 1000. Order Reference 1 assigned.	13 3d fa c8 41 00 00 00 01 42 00 00 03 e8 32 35 33 31 20 20 00 00 00 00 b2 d0 5e 00 59	Time(Nanosecond): 322829000 Message Type: A Order Reference: 1 Buy/Sell Indicator: B Shares: 1000 Stock: 2531 Price: 3000000000 Display: Y

8.6 Snapshot End

ACTION	HEX	MEANING
Next sequence number to begin with the snapshot is 3686	27 3f 80 28 47 00 00 0e 66	Time(Nanosecond): 658473000 Message Type: G Next Sequence: 3686