
Interface Specifications

HKEX China Connect Central Gateway Platform

Binary Trading Protocol

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1. Document Control

1.1 Change History

Version Number	Issue Date	Section Number	Status
1.0	1 December 2016	All	First Version
1.1	5 January 2018	Introduction of Broker-to-Client Assigned Number (BCAN) field in the New Order Single message. Section 6.4, Section 7.6.1, Section 8.2.	Revised Version
1.2	15 February 2018	Update description for BCAN reserved values and BCAN data type in Data Dictionary. Section 6.4, Section 7.6.1, Section 8.2.	Revised Version
1.3	18 April 2018	Add the following sections: Appendix B - Reference of Rejection Codes from Home Market Appendix C - Rejection Code for BCAN Validation	Revised Version

1.2 Abbreviations

Terms and abbreviations referred to in this document are tabulated as follows:

BCAN	Broker-to-Client Assigned Number
BSS	Broker Supplied System
CCASS	Central Clearing and Settlement System
CCCG	China Connect Central Gateway
CSC	China Stock Connect System
EP	HKEX Cash Trading Exchange Participant
FIX	Financial Information eXchange
OCG	Orion Central Gateway - the market access platform for HKEX Securities Trading
SPSA	Special Segregated Account
SSE	Shanghai Stock Exchange
SZSE	Shenzhen Stock Exchange

2. Introduction

This document describes the binary interface of the HKEX China Connect Central Gateway (“CCCG”), the market access platform for the China Stock Connect trading service.

The CCCG provides a centralized, highly resilient, low latency, flexible and scalable platform for all Exchange Participants (EPs) to access HKEX China Stock Connect system (“CSC”) for northbound trading of designated stocks listed in the home market in Mainland China.

The CCCG mostly follows the interface and event model used in Orion Central Gateway (“OCG”), the market access platform for Hong Kong cash market.

The terminology used, message format, message flow and event models described throughout this document are similar to that of FIX 5.0 SP2 protocol specifications, where applicable, with some specific and explicit changes for performance and adaptability reasons.

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3. Connectivity

3.1 Session

Exchange Participants connect their broker supplied systems (“BSS” or “Client”) to the CCCG via subscription to one or more CCCG “Session”. This connection is a standard TCP/IP point-to-point connection.

EPs are expected to pre-register at least one IP address using which a client from their end would establish a Trading Session with the CCCG. For backup purposes EPs can optionally pre-register up to 3 additional IP addresses for each session.

A session can be established from only one of the pre-registered IP addresses for that session. EPs can pre-register any given IP address for more than one session such that the same BSS can be used to connect to CCCG through one or more sessions.

3.2 Comp ID

The client should use the Comp ID (a unique session identifier) provided by HKEX for each session in order to connect to the CCCG. A single client may have multiple connections to the CCCG i.e., multiple Binary sessions, each with its own Comp ID.

The messages sent to the CCCG should contain the Comp ID assigned to the client in the field Comp ID in the header section.

3.3 IP Address and Port Numbers

The client that wishes to connect to the CCCG will first connect to the Lookup Service by using one of the four (4) Lookup Service IP-port pairs published by HKEX. Two of these connection points represent the primary site Lookup Service and the other two represent the backup site Lookup Service

HKEX will provide these four (4) IP address and Port number pairs through a separate medium.

3.4 Lookup Service

The client connecting to the CCCG via the binary protocol must first connect to a predefined Lookup Service and request for a connection point (an IP address and port) to the binary trading gateway.

The client should attempt the Lookup Service connections in the following order:

- Primary site primary Lookup Service
- Primary site mirror Lookup Service
- Backup site primary Lookup Service
- Backup site mirror Lookup Service
- Cycle back to primary site primary Lookup Service

The backup site Lookup Service will not be open unless there is a failover.

The client can request for the Lookup Service via the Lookup Request message by specifying the Type of Service and the Protocol Type the client wish to connect to.

The Lookup Request must originate from an IP address allowed (i.e., one of the 4 IP addresses as mentioned in [Section 3.1](#)) for the Comp ID specified in the Lookup Request.

The Lookup Service will respond to a Lookup Request with a Lookup Response. If the Lookup Request is accepted, the Lookup Service will deliver two IP Address & Port pairs (one for the primary and one for the mirror) of the CCCG trading service to the client via the Lookup Response. The client is expected to always attempt the primary service first.

In the case where the Lookup Request is rejected, the Lookup Service will reply with a Lookup Response with Lookup Status set to Rejected (1). The reason for rejection of the Lookup Request will be reflected in the Lookup Reject Code field.

If Lookup Service can't be reached for reasons or the service rejects the request, client should observe a delay of 5 seconds before re-attempting.

3.5 Encryption

The binary protocol expects Password and New Password be encrypted when they are sent in the Logon message from the client to the CCCG.

To encrypt the password, the client is expected to use a 2048-bit RSA ([http://en.wikipedia.org/wiki/RSA \(algorithm\)](http://en.wikipedia.org/wiki/RSA_algorithm)) public key circulated (through a different medium) by HKEX. The binary output of the RSA encryption must be represented in Big Endian format (Padding scheme is PKCS #1) and then converted to an alphanumeric value by means of standard base-64 encoding (<http://en.wikipedia.org/wiki/Base64>) when communicating with the CCCG.

HKEX may periodically renew the public key used by the client and after a public key renewal; a client may continue to use the old key for a limited grace period. Both keys may be used during this time.

3.6 Password

The client should specify their password in the Password field of the Logon message. This password must be in encrypted form. For security reasons, the client is expected to prefix the login time, in UTC format (YYYYMMDDHHMMSS), to the password before encryption. The client must ensure that login time is in accurate UTC. The CCCG will extract the login time prefix from the decrypted password string and validate that it is within the configured tolerance of the actual current time. A Logon request that fails this validation is rejected by the CCCG.

The status of the password (i.e. whether it is accepted or rejected) will be specified in the Session Status field of the Logon sent by the CCCG to confirm the establishment of a binary connection.

Repeated failures in password validation may force HKEX to lock the client; the EP is expected to contact HKEX to unlock the client and reset the password.

3.7 Change Password

Each new Comp ID will be assigned a password on registration. The client is expected to change the password upon first logon whenever a password is (re)issued by HKEX.

Password change request can be made together with Logon request. The client should specify the encrypted new password in the New Password field and the current encrypted password in the Password field.

The new password must comply with HKEX password policy (refer to [Appendix A](#)). The status of the new password (i.e. whether it is accepted or rejected) will be specified in the Session Status field of the Logon sent by the CCCG to confirm the establishment of a binary connection. The new password will, if accepted, be effective for subsequent logins.

The client is required to change the password periodically. HKEX will set expiry duration for the password without exemption; a reminder will be sent indicating that the password is about to expire, through the Text field in the Logon response. Once the password has expired for a client, that client will not be allowed to logon, and the EP is required to contact HKEX to unlock and reset the client password.

3.8 Failure and Recovery

The system has been designed with fault tolerance and disaster recovery features that ensure that trading should continue in the unlikely event of a process or server outage.

If the client is unexpectedly disconnected from the Primary CCCG, it should attempt to re-connect to the Primary CCCG before attempting to connect to the Secondary CCCG. Even after these attempts if a connection can't be established, the client then should make use of Lookup Service to determine the connection points once again.

4. Session Management

4.1 Establishing a Binary Session

Each client will use the assigned IP address and port provided via the Lookup Service to establish a TCP/IP connection with the CCCG. The client will initiate a Binary session at the start of each trading day by sending the Logon message.

A client must identify itself using the Comp ID field. The CCCG will validate the Comp ID, password and IP address of the client.

Once the client is authenticated, the CCCG will respond with a Logon message with Session Status set to Session Active (0). If the client's Logon message included the field New Password and the client is authenticated, the CCCG will respond with a Logon message with Session Status set to Session Password Changed (1).

The client must wait for the Logon from the CCCG before sending additional messages. If additional messages are received from the client before the exchange of Logon messages, the TCP/IP connection with the client will be disconnected.

If a logon attempt fails for the following reasons, the CCCG will send a Logout or a Reject and then terminate the session; the Session Status of the Logout message will indicate the reason for the logout:

- Password failure
- Comp ID is locked
- Logon is not permitted during this time

For all other reasons, including the following, the CCCG will terminate the session without sending a Logout or Reject:

- Invalid Comp ID or IP address

If during a logon of a client (i.e., a Comp ID), the CCCG receives a second connection attempt while a valid binary session is already underway for that same Comp ID, the CCCG will terminate both connections without sending a Logout or Reject message.

Inbound message sequence number will not be incremented if the connection is abruptly terminated due to the logon failure.

If a session level failure occurs due to a message sent by the client which contains a sequence number that is less than what is expected and the PossDup is not set to 1 (Yes), then the CCCG will send a Logout message and terminate the Binary connection. In this scenario the inbound sequence number will not be incremented but the outbound sequence number will be incremented.

If the CCCG does not respond to the session initiation (client initiated Logon message), the client is expected to wait for a time period of **60 seconds** prior to terminating the connection. The client is expected to retry session initiation after an elapsed time period of **60 seconds**.

If a client is disconnected abruptly or via a Logout message from the CCCG, the client is expected to wait for a time period of **10 seconds** prior to reconnecting to the CCCG.

4.2 Message Sequence Numbers

Under the binary protocol, the client and CCCG will each maintain a separate and independent set of incoming and outgoing message sequence numbers. Sequence numbers

should be initialized¹ to 1 (one) at the start of the day and be incremented throughout the session. Either side of a binary session will track the:

- Next Expected Message Sequence number (starting at 1)
- Next To Be Sent Message Sequence number (starting at 1); with respect to the contra-party.

Monitoring sequence numbers will enable parties to identify and react to missed messages and to gracefully synchronize applications when reconnecting during a Binary session.

Any message sent by either side of a binary session will increment the sequence number unless explicitly specified for a given message type.

If any message sent by one side of a binary session contains a sequence number that is LESS than the Next Expected Message Sequence number then the other side of this session is expected to send a Logout message and terminate the Binary connection immediately, unless the PossDup flag is set to 1 (Yes).

A Binary session will not be continued to the next trading day. Both sides are expected to initialize (reset to 1) the sequence numbers at the start of each day. At the start of each trading day if the client starts with a sequence number greater than 1 then the CCCG will terminate the session immediately without any further exchange of messages.

4.3 Heart Beat and Test Request

The client and the CCCG will use the Heartbeat message to monitor the communication line during periods of inactivity and to verify that the interfaces at each end are available.

The heartbeat interval is expected to be set as **20 Seconds**.

The CCCG will send a Heartbeat anytime it has not transmitted a message for the duration of the heartbeat interval. The client is expected to employ the same logic.

If the CCCG detects inactivity for a period longer than **3 heartbeat intervals**, it will send a Test Request message to force a Heartbeat from the client. If a response to the Test Request is not received within a reasonable transmission time (recommended being an elapsed time equivalent to 3 heartbeat intervals), the CCCG will send a Logout and break the TCP/IP connection with the client. The client is expected to employ similar logic if inactivity is detected on the part of the CCCG.

4.4 Terminating a Binary Session

Session termination can be initiated by either the CCCG or the client by sending a Logout message. Upon receiving the Logout request, the contra-party will respond with a Logout message signifying a Logout reply. Upon receiving the Logout reply, the receiving party will terminate the connection.

If the contra-party does not reply with either a Resend Request or a Logout reply, the Logout initiator should wait for **60 seconds** prior to terminating the connection.

The client is expected to terminate each Binary connection at the end of each trading day before the CCCG service is shut down. However, all open Binary connections will be terminated (a Logout message will be sent) by the CCCG when its service is shut down. Under exceptional circumstances the CCCG may initiate the termination of a connection during the trading day by sending the Logout message.

¹ *Lookup service related messages (i.e., Lookup Request and Lookup Response) are expected to have a sequence number of 1 always; and these sequence numbers have no relationship with the sequence numbers for the session referred to here.*

If, during the exchange of Logout messages, the client or the CCCG detects a sequence gap, it should send a Resend Request.

4.5 Re-establishing a Binary Session

If a Binary connection is terminated during the trading day it may be re-established via an exchange of Logon messages.

Once the Binary session is re-established, the message sequence numbers will continue from the last message successfully transmitted prior to the termination.

4.6 Sequence Reset

The sequence reset could be done in two modes;

1. Gap-fill mode:

Gap-fill mode is expected to be used by one side when skipping session level messages which can be ignored by the other side.

2. Reset mode:

Reset mode is used only in exceptional scenarios to indicate a reset in the session's starting sequence number. This mode can ONLY be used by the CCCG. Client initiated resets would be rejected by the CCCG.

Following scenarios exist:

4.6.1 During a Session

The CCCG and the client may use the Sequence Reset message in Gap Fill mode if either side wishes to increase the expected incoming sequence number of the other party.

The CCCG may also use the Sequence Reset message in Sequence Reset mode if it wishes to increase the expected incoming sequence number of the other party. The Sequence Reset mode should only be used to recover from an emergency situation. It should not be relied upon as a regular practice.

4.6.2 When starting a new Session

4.6.2.1 Reset Initiated by the Client

Reset sequence (reset to 1) through the Logon Message will not be facilitated by the CCCG. In order to reset the sequence (reset to 1), the client should manually inform the HKEX Operations Desk.

4.6.2.2 Reset Initiated by the CCCG

The system has been designed with fault tolerance and disaster recovery technology that should ensure that the CCCG retains its incoming and outgoing message sequence numbers for each client in the unlikely event of an outage. However, the client is required to support a manual request by HKEX to initialize sequence numbers prior to the next login attempt.

4.7 Fault Tolerance

After a failure on client side or on CCCG side, the client is expected to be able to continue the same session.

In case of a catastrophic scenario, the binary gateway will restart from a higher sequence number considering the previous session or may start from sequence number 1.

If the sequence number is reset to 1 by the CCCG, all previous messages will not be available for the client side.

The client and the CCCG are expected to negotiate on the Next Expected Message Sequence number and Next To Be Received Sequence number through an alternate medium prior to initiating the new session (Manually setting the sequence number for both ends after having a direct communication with the client).

4.8 Checksum Validation

The CCCG performs a checksum validation on all incoming messages into the input services. Incoming messages that fail the checksum validation will be rejected and the connection will be dropped by the CCCG without sending a logout.

Conversely, the CCCG stamps an identically calculated checksum field on all outgoing messages from the input interfaces. In case of a checksum validation failure, the client is expected to drop the connection and take any appropriate action before reconnecting. Messages that fail the checksum validation should not be processed.

This checksum is a **CRC32C** value with the polynomial **0x1EDC6F41**, presented as a 32-bit unsigned integer (http://en.wikipedia.org/wiki/Cyclic_redundancy_check#CRC-32C).

5. Recovery

5.1 General Message Recovery

- A gap is identified when an incoming message sequence number is found to be greater than Next Expected Message Sequence number.
- The Resend Request will indicate the Start Sequence and End Sequence of the message gap identified and when replying to a Resend Request, the messages are expected to be sent strictly honouring the sequence.
- If messages are received outside of the Start and End sequence numbers, then the recovering party is expected to queue those messages until the gap is recovered.

During the message recovery process, the recovering party will increment the Next Expected Sequence number accordingly based on the messages received. If messages applicable to the message gap are received out of sequence then the recovering party will drop these messages.

- The party requesting the Resend Request can specify “0” in the End Sequence to indicate that they expect the sender to send ALL messages starting from the Start Sequence.

In this scenario, if the recovering party receives messages with a sequence greater than the Start Sequence, out of sequence, the message will be ignored.

- Administrative messages such as Sequence Reset, Heartbeat and Test Request which can be considered irrelevant for a retransmission could be skipped using the Sequence Reset message in gap-fill mode.

Note that the CCCG expects the client to skip Sequence Reset messages when replying to a Resend Request at all times.

- When resending messages, the CCCG would use either PossDup or PossResend flag to indicate whether the messages were retransmitted earlier.

If PossDup flag is set, it indicates that the same message with the given sequence number with the same business content may have been transmitted earlier.

In the case where PossResend flag is set, it indicates that the same business content may have been transmitted previously but under the different message sequence number. In this case business contents needs to be processed to identify the resend. For example, in Execution Reports the Execution ID may be used for this purpose.

5.2 Resend Request

The client may use the Resend Request message to recover any lost messages. This message may be used in one of three modes:

- (i) To request a single message. The Start Sequence and End Sequence should be the same.
- (ii) To request a specific range of messages. The Start Sequence should be the first message of the range and the End Sequence should be the last of the range.
- (iii) To request all messages after a particular message. The Start Sequence should be the sequence number immediately after that of the last processed message and the End Sequence should be zero (0).

5.3 Logon Message Processing – Next Expected Message Sequence

Upon receipt of a Logon message from a client, the CCCG will validate the Comp ID and the Password. If this validation results in an invalid Comp ID or invalid password the CCCG would terminate the session with the client without any further exchange of messages.

If the Logon request is validated successfully for Comp ID and password, the CCCG will move onto validate the Next Expected Message Sequence number of the incoming Logon message.

If the Next Expected Message Sequence number indicated is:

1. Greater than the CCCG's Next To Be Sent Sequence number, then the session will be terminated immediately after sending the logout message (i.e., manual intervention is required in this case).
2. Equal to the CCCG's Next To Be Sent Sequence number, then the CCCG will start sending message starting from the indicated sequence number
3. Less than the CCCG's Next To Be Sent Sequence number, then the CCCG would consider this as a gap-fill (i.e., the client has not received these messages and the CCCG has to resend them now²) and send messages starting from the indicated message up to the logon message sequence and skip the logon message sequence using a gap-fill and continue sending new messages from there on

If the Next Expected Message Sequence number indicated is valid then the CCCG will send a Logon signifying a logon reply specifying the Next Expected Message Sequence number from the client. Immediately following the logon reply, the CCCG would start message transmission as indicated above.

The client upon receipt of the Logon message from the CCCG is expected follow the exact steps as indicated above.

Neither side should generate a Resend Request based on the Sequence Number of the incoming Logon message but should expect any gaps to be filled automatically by following the Next Expected Sequence processing described above².

Note that indicating the Next Expected Message Sequence number in the Logon request is mandatory.

Note also that in the unlikely event of a failure & recovery of CCCG if the client chooses not to retransmit certain application messages upon detecting a gap while CCCG has lost the state of the original responses for those messages, the client may not receive any responses from CCCG for those application messages, which the client skipped from retransmitting during the recovery.

5.4 Possible Duplicates

The CCCG handles possible duplicates according to the Financial Information Exchange – FIX protocol.

5.5 Possible Resends

5.5.1 Client Initiated Messages

The CCCG does not handle possible resends for the client-initiated messages (e.g., New Order, Cancel Order, etc.) and the message will be processed without considering the value in the PossResend field. Any message with duplicate Client Order ID will be rejected based

² During the period where the CCCG is resending messages to the client, the CCCG does not allow another Resend Request from the client. If a new Resend Request is received during this time, the CCCG will terminate the session immediately without sending the Logout message.

on the Client Order ID uniqueness check and messages which conform to the uniqueness check will be processed as normal messages.

5.5.2 CCCG Initiated Messages

The CCCG may use the PossResend field to indicate that an application message may have already been sent under a different sequence number. The client should validate the contents (e.g., Execution ID) of such a message against those of messages already received during the current trading day to determine whether the new message should be ignored or processed.

5.6 Gap Fills

The following messages are expected to be skipped using gap-fills when being retransmitted:

1. Logon
2. Logout
3. Heartbeat
4. Test Request
5. Resend Request
6. Sequence Reset

All other messages are expected to be replayed within a retransmission.

5.7 Transmission of Missed Messages

The Execution Report, Business Message Reject and Reject messages generated during a period when a client is disconnected from the CCCG will be sent to the client when it next reconnects. In the unlikely event the disconnection was due to an outage of the CCCG, Business Message Reject and Reject messages may not be retransmitted, and the messages which will be retransmitted to the client will include a PossResend set to 1 (Yes).

6. Service Description

6.1 Data Types

The table below describes each data type included in all of the messages in the Binary Trading Gateway.

#	Data Type	Size in Bytes	Description
1.	Alphanumeric Fixed Length (n)	Length is n bytes (Fixed for a given field)	<p>These fields use standard ASCII character bytes. All fields of this data type will be null terminated and the length of the field will include this null character. If the field value does not occupy the full length of the field then data after the null termination should be discarded.</p> <p>For messages coming into CCCG:</p> <ul style="list-style-type: none"> if the field value occupies the full length of the field including the null character, CCCG will override the last character with null value. if the field value does not occupy the full length of the field and if there is no null termination character specified, CCCG will consider the full length excluding the null character as the field value. <p><i>In case the field is empty, the first byte will be null filled.</i></p> <p>Each Alphanumeric Fixed Length field will have its size indicated within the Data Dictionary section.</p> <p>Alphanumeric Fixed Length fields will support Multiple Values to be specified separated by a space.</p> <p>For applicable fields please refer the Data Dictionary.</p>
2.	Alphanumeric Variable Length	Variable	<p>These fields use standard ASCII character bytes. All fields of this data type will be null terminated and the length of the field will include this null character. If the field value does not occupy the full length of the field then data after the null termination should be discarded.</p> <p><i>In case the field is empty, the third byte will be null filled.</i></p> <p>The length of each Alphanumeric Variable Length field will be indicated in the first two bytes as UInt16.</p> <p>The length range of this field will be from 0 – 65,535.</p> <p>The Alphanumeric Variable Length fields will also support Multiple Values to be specified separated by a space.</p>
3.	Byte	1	A single byte used to hold any ASCII character.
4.	Decimal	8	<p>Signed Little-Endian encoded integer field with 8 implied decimal places.</p> <p>For example, 10000.03100012 the system will multiply this by 10^8 converting it to an integer and this integer will be bit encoded accordingly as a signed 8 byte binary number</p>
5.	UInt8	1	<p>Unsigned integer. Range: 0 - 255</p>
6.	Int8	1	<p>Signed integer. Range: -128 – 127</p>

#	Data Type	Size in Bytes	Description
7.	UInt16	2	Little-Endian encoded unsigned integer. Range: 0 – 65,535
8.	Int16	2	Little-Endian encoded signed integer. Range: -32,768 – 32,767
9.	UInt32	4	Little-Ending encoded unsigned integer Range: 0 – 4,294,967,295
10.	Int32	4	Little-Endian encoded signed integer. Range: -2,147,483,648 – 2,147,483,647
11.	Bitmap Fixed Length	32	Bitmap Fixed Length provides up to 256 representation options. To indicate availability set 1 to the applicable bit position and 0 for unavailability. Each bit in the presence map will represent a field and the sequence in which the fields should be included into the message will be based on the bit position (starting from the most significant bit position).
12.	Bitmap Variable Length	Variable	Bitmap Variable Length is used to indicate the presence of fields and nested repeating blocks in a repeating block. To indicate availability set 1 to the applicable bit position and 0 for unavailability. The length of the bitmaps used for different repeating blocks may vary. Each Bitmap Variable Length field will have its size indicated within the Data Dictionary section.
13.	Int64	8	Little -Endian encoded 64 bits signed integer Range: -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
14.	UInt64	8	Little -Endian encoded 64 bits unsigned integer Range: 0 to 18,446,744,073,709,551,615

6.2 Message Composition

Each message comprises of the following logical components:

1. Header
2. Body
3. Trailer

Fields within a message are formed in the same order as the composition given above.

Fields present within the body of the message is defined through a field presence map where the present fields are indicated as part of the header.

Fields which are part of the header and the trailer are considered mandatory.

6.2.1 Field Presence Map

The binary protocol provides a concept of field presence maps per each message type where using these bitmap fields available within the message, senders could indicate the fields available within the message in a dynamic nature.

Each bit in the presence map will represent a field and the sequence in which the fields should be included into the message will be based on the bit position (starting from the most significant bit position). All fields applicable to a particular presence map should be included into message immediately following the applicable presence map.

For example, consider an 8 bit presence map. Positions 1, 2 and 3 indicate Instrument, Client Order ID and Order Quantity respectively where rest of the positions has not been assigned to a field.

To indicate the presence of the fields Instrument and Order Quantity the presence map will be set as shown below:

Position	0	1	2	3	4	5	6	7
Represented field	Instrument	Client Order ID	Order Qty	N/A	N/A	N/A	N/A	N/A
Bit value (presence)	1	0	1	0	0	0	0	0

Message view:

Preceding fields of the message								
Presence Map	1	0	1	0	0	0	0	0
Instrument	ABCD							
Order Quantity	1000							
Succeeding fields of the message								

The applicable data types and lengths of the body fields are provided in the data dictionary. Based on the available fields as indicated by the field presence map, the recipient of the message is expected to decode the message accordingly.

Bit position for a field that commonly appears in multiple messages may be different; each message will have its own bit position for individual fields present in that message.

6.2.2 Repeating Blocks and Nested Repeating Blocks

The binary protocol supports repeating blocks within the message body while also allowing nested repeating blocks within a repeating block.

When indicating a repeating block the field presence map will only indicate the presence of the repeating block. Based on the repeating block construct, the receiving party is expected to evaluate the field contents and the numbers of repeating blocks.

This specification describes the repeating block construct and the relevant field information such as the data types required to identify the message contents and also to calculate header and trailer information such as message length and checksums.

Each repeating block construct will have a repeating block header field which is immediately followed by a field presence map which will indicate the presence of the applicable fields in that repeating block and any nested repeating blocks included within.

For example, consider an 8-bit field presence map included in the message header:

Position	0	1	2	3	4	5	6	7
Represented field	Instrument	Client Order ID	Order Qty	No Entitlements	N/A	N/A	N/A	N/A
Bit value (presence)	1	0	1	1	0	0	0	0

The 3rd position indicates a repeating block which indicates the number of entitlement applicable to the particular message.

A sample 'No Entitlements' repeating block construct is given below:

No Entitlements		Number of repeating blocks. Valid values are 1 or 2. <i>(Repeating block header field)</i>
No Entitlements Body Fields Presence Map		This will indicate the fields/nested repeating blocks present in this repeating block
0	Entitlement Type	Absence of this field indicates the meaning of the entitlement is implicit. Else: ▪ 0 = Trade
1	Entitlement Indicator	Determines if the party is entitled for the specified Entitlement Type ▪ 0 = No ▪ 1 = Yes
2	No Market Segments	Number of Market Segments <i>(Repeating block header field)</i>
	No Market Segment Scope Group Presence Map	This will indicate the fields/nested repeating blocks present in this repeating block
	0	Market Segment ID
3	Entitlement ID	Unique identifier for a specific Entitlement Group instance

In the above message construct, 'No Market Segments' is a nested repeating block within the 'No Entitlements' repeating group.

The following provides an example message view when the nested repeating block is not present in the message. This is indicated in the Body Field Presence Map of the 'No Market Segments' repeating block.

Message view:

Order	Field	Value																											
1	No Entitlements	1 (one repeating blocks indicated)																											
2	No Entitlements Body Field Presence map	<table border="1"> <thead> <tr> <th>Position</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>Represented field</td> <td>Ent Type</td> <td>Ent Ind</td> <td>No Market Segments</td> <td>Ent ID</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Bit value (presence)</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Position	0	1	2	3	4	5	6	7	Represented field	Ent Type	Ent Ind	No Market Segments	Ent ID	N/A	N/A	N/A	N/A	Bit value (presence)	1	1	0	1	0	0	0	0
		Position	0	1	2	3	4	5	6	7																			
		Represented field	Ent Type	Ent Ind	No Market Segments	Ent ID	N/A	N/A	N/A	N/A																			
Bit value (presence)	1	1	0	1	0	0	0	0																					
3	Entitlement Type	0 = Trade																											
4	Entitlement Indicator	1 = Yes																											
5	Entitlement ID	TEST_01																											

6.3 Security Identification

Instruments will be identified using the Security ID field. It is required to specify Security ID Source as Exchange Symbol (8) and Security Exchange as either of the following 2 ISO MICs:

- **XSSC** = ISO Market Segment Code for Stocks listed in Shanghai Stock Exchange under Shanghai – Hong Kong Stock Connect
- **XSEC** = ISO Market Segment Code for Stocks listed in Shenzhen Stock Exchange under Shenzhen – Hong Kong Stock Connect

Security ID will carry the Security Code of an instrument as assigned by the home market. It is possible that different Exchanges may have same Security Code which should be distinguished by respective ISO MIC.

Security ID with leading zeros will not be accepted.

6.4 Party Identification

Party Identification is defined as follows:

ID	Description	Relevant Binary Field
Broker ID ¹	Identifier of the member the interest is submitted under	Owning Broker ID
Entering Broker ID	Identifier of the entering member the interest is submitted under	Submitting Broker ID
Contra Broker ID	Identifier of the Contra member the interest is submitted under	Counterparty Broker ID
BS User ID ²	The location ID of the member	Broker Location ID
<u>SPSA Investor ID</u> ³	Investor ID as assigned by CCASS for <u>the a</u> Special Segregated Account (SPSA)	SPSA Investor ID
<u>Broker-to-Client Assigned Number (BCAN)</u> ⁴	<u>Identifier for the client assigned by CCEP/TTEP for Northbound order submission.</u>	<u>BCAN</u>

Notes:

1. Any Broker ID with leading zeroes will be rejected
2. BS User ID if specified would be restricted to numeric digits only with possible range of values being 1 to 99,999,999; a value with leading zeroes will be rejected.
3. This is the SPSA Investor ID as assigned by CCASS; a value with leading zeroes will be rejected.
- 3-4. The valid range of BCAN for assignment to broker's specific individual or institutional clients is 100 to 9,999,999,999 while 0 to 99 are reserved by HKEX for specific BCAN type; a value with leading zeros will be rejected. -It should be noted that the BCAN would not be echoed back in any of the Execution Report messages.

6.5 Text Field

The Text Field sent in any business message from a client will be used as Broker Comment/Broker Reference field, and may not contain more than 10 characters; if the Text field contains more than this permitted number of characters, the additional characters will be truncated.

Additionally, this text field is expected to contain only printable characters excluding any punctuation mark.

6.6 Order Handling

6.6.1 Order Types

The client may submit the following order types:

Order Type	Description	Relevant Binary Field
Limit	An order that will execute at or better than the specified price. The remainder, if any, is added to the order book or expired in terms of its TIF	Order Type = 2 Max Price Levels = 1

6.6.2 Validity Types

The client may submit the following validity types:

Validity Type	Description	Relevant Binary Field
Day	An order that will expire at the end of the day.	TIF = 0 (Default)

6.6.3 Order, Trade and Execution Identifiers

6.6.3.1 Client Order ID

The client must ensure each Client Order ID to be unique per Submitting Broker ID as an identifier of the order. The client should comply with the Binary protocol and ensure uniqueness of Client Order IDs across all messages (e.g., New Order, Cancel Request, etc.) across trading days sent under a particular Submitting Broker ID. However during the initial launch (and until further notice) the uniqueness is required to be within a trading day and the contents of Client Order ID would be restricted to numeric digits only with possible range of values being 1 to 99,999,999. Client order IDs with leading zeroes will be rejected by CCCG.

The client must, in terms of the Binary protocol, specify the Client Order ID when submitting a New Order and Cancel Request.

6.6.3.2 Order ID

The CCCG will use the Order ID field of the Execution Report to keep track of orders with the matching system.

In terms of the Binary protocol, unlike Client Order ID which requires a chaining through amend requests and cancel requests, the Order ID of an order will remain constant throughout its life..

The client has the option to specify the Order ID when submitting a Cancel Request.

6.6.3.3 Trade ID

The CCCG will use the Trade Match ID field to identify a trade for usage, if any (subject to applicable rules), when the trade is to be (or once the trade has been) communicated to the client.

6.6.3.4 Execution ID

The CCCG will use the Execution ID field to affix a unique identifier for each Execution Report. Execution IDs will be unique per trading day.

6.6.4 Order Submission

Single sided orders can be submitted into the CCCG using the New Order and the updates to the order submitted will be published in the form of Execution Reports, Session Rejects or Business Message Rejects based messages.

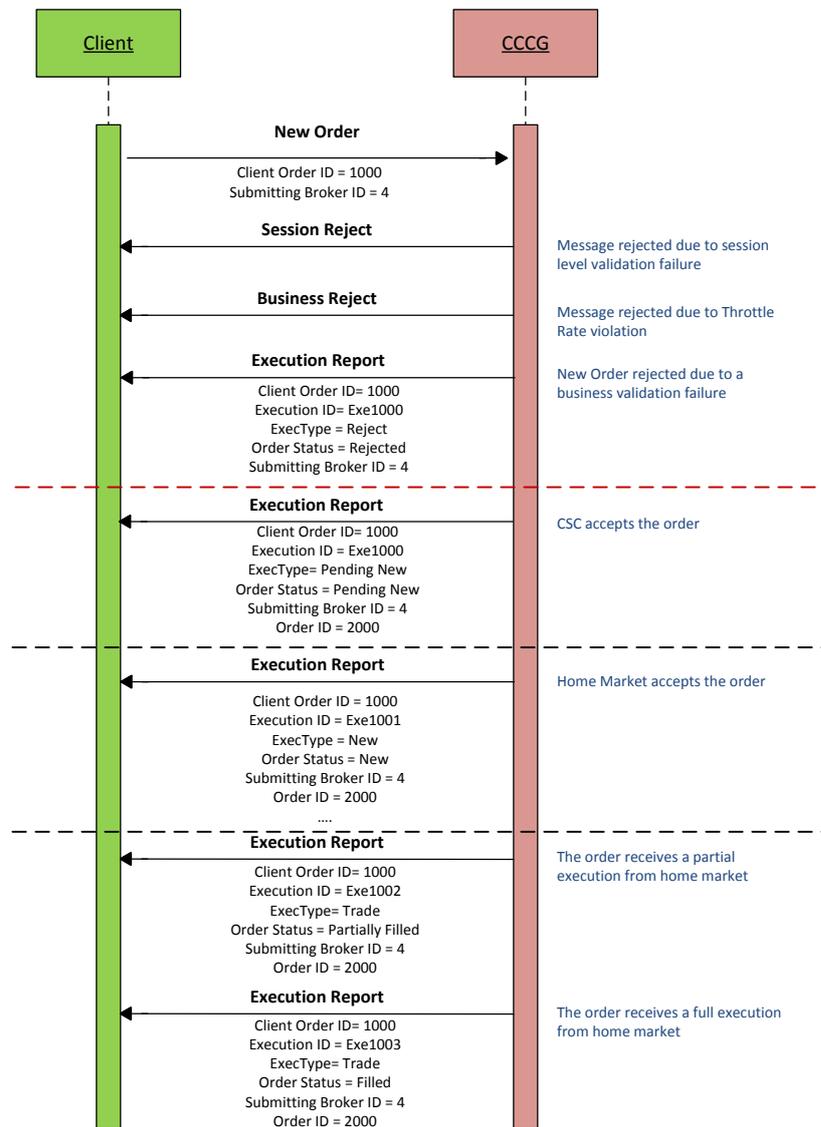
The CCCG will respond with an Execution Report to confirm the receipt of the request with Exec Type = Pending New or to indicate the rejection with Exec Type = Rejected.

On acceptance of such a New Order request, CCCG will subsequently send another Execution Report either to confirm

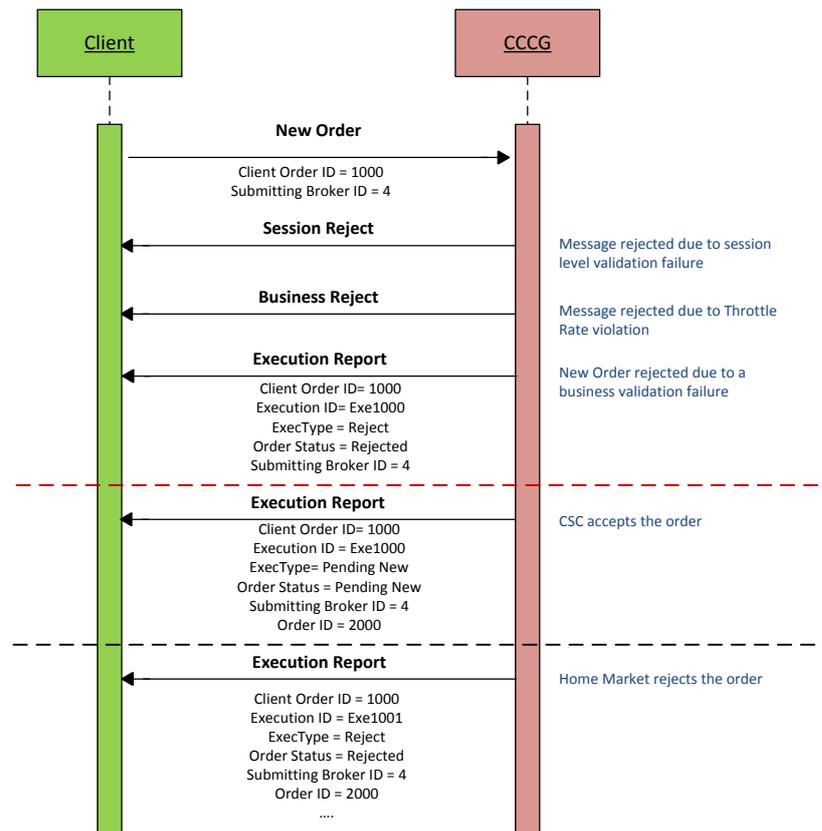
- (a) the actual acceptance of the order by the home market, with Exec Type = New or
- (b) rejection of the order by the home market, with Exec Type = Rejected.

It should be noted that even if the CCCG has returned an Execution Report with Exec Type= Pending New, the subsequent but actual processing is left to the home market's governing rules and trading time table.

6.6.4.1 Message Flow – New Order



6.6.4.2 Message Flow – New Order – Rejected by Home Market



6.6.5 Cancellations

The remainder of a live order may be cancelled via the Cancel Request message. The CCG will respond with either:

- (a) an Execution Report to confirm the receipt of the request with Exec Type = Pending Cancel or
- (b) a Cancel Reject message to indicate the rejection of the cancellation request.

On acceptance of a Cancel Request, CCG will subsequently send either:

- (a) another Execution Report with Exec Type = Cancelled to confirm the actual cancellation by the home market or
- (b) Cancel Reject message for a rejection by the home market.

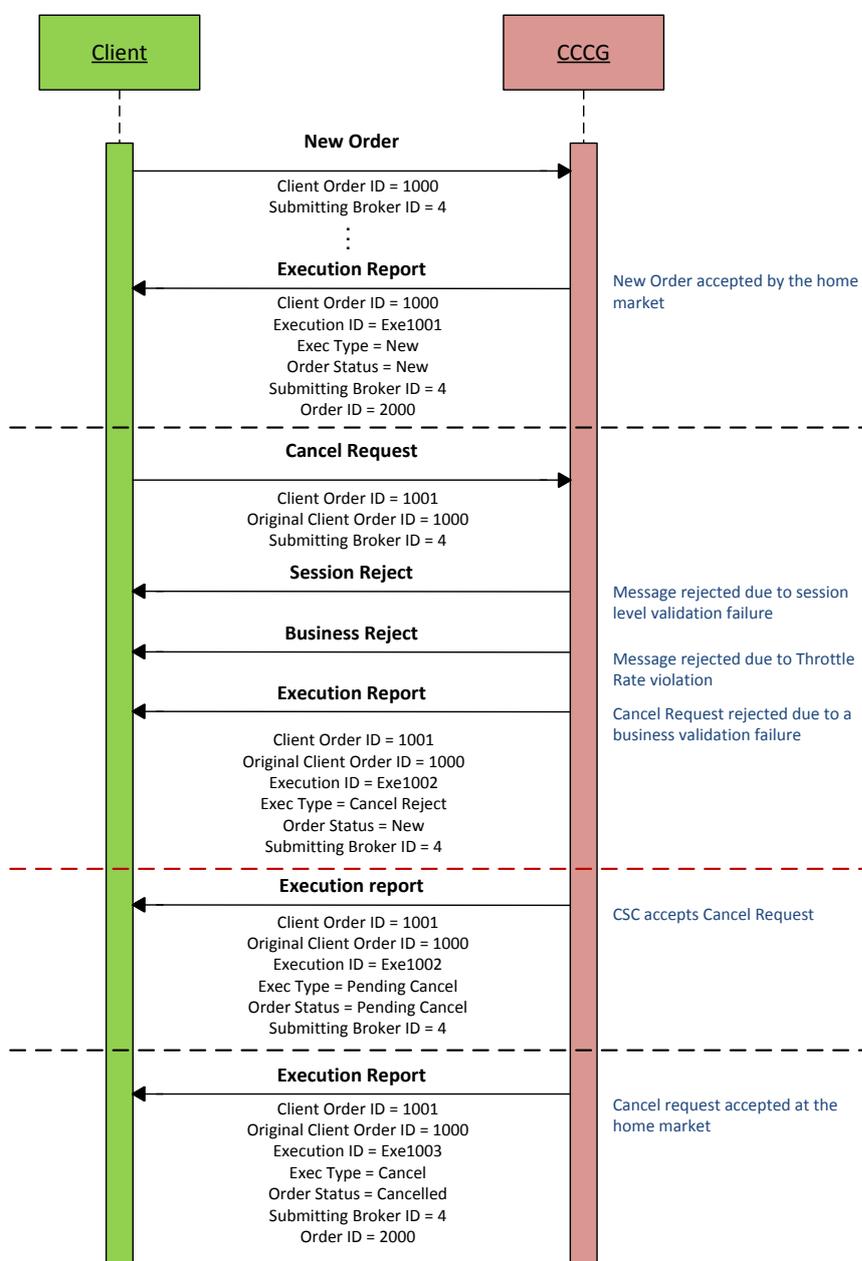
The client should identify the order being cancelled by its Original Client Order ID. The client can specify the Order ID in the Cancel Request message but it is not a mandatory requirement. If the Order ID is specified in the Cancel Request message, the system will validate the specified Order ID with the actual Order ID assigned to the particular order by the system (order is identified by the Original Client Order ID). The Cancel Request will be rejected if the specified Order ID is invalid based on this validation.

The client may not cancel an order that is fully filled or cancelled or expired. If the client sends a cancel request for an order for which a cancellation is already being processed the incoming cancel request will be rejected.

It should be noted that even if the CCCG has returned an Execution Report with Exec Type= Pending Cancel, the subsequent but actual cancellation processing is left to the home market's governing rules and trading time table.

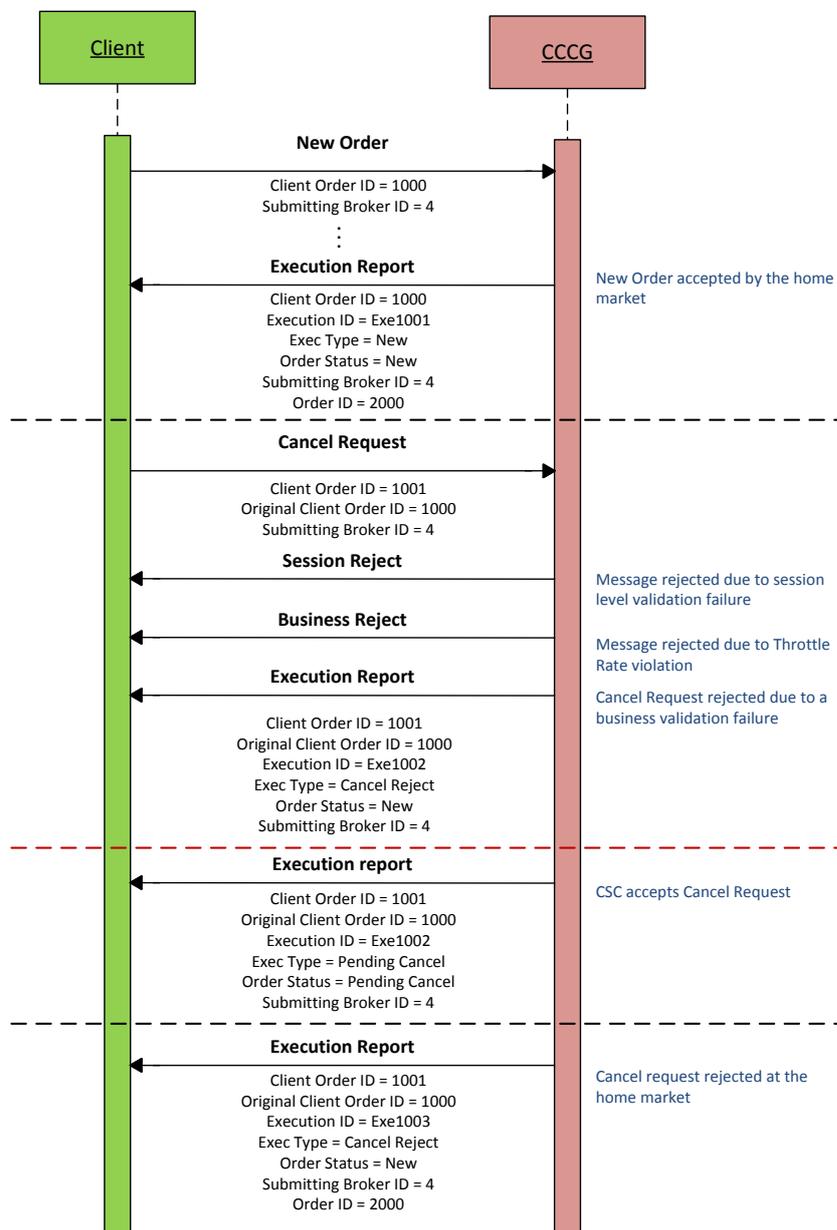
6.6.5.1 Message Flow – Cancel Request

General message flow:



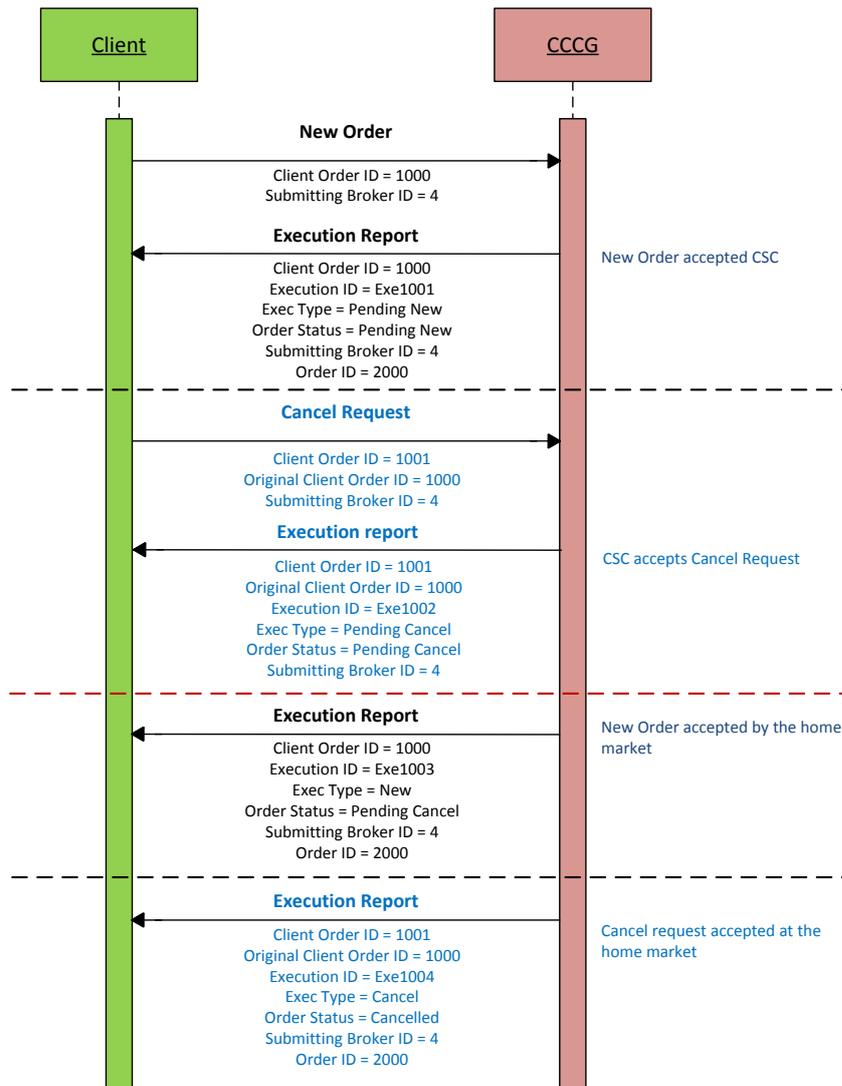
6.6.5.2 Message Flow – Cancel Request

Cancel Request is rejected by the home market:



6.6.5.3 Message Flow – Cancel Request

Cancel Request is submitted before home market accepts the order:



6.6.6 Mass Cancellation

Request for Mass order cancellation is not supported in CSC for the reason that China Connect markets do not offer such a function.

6.6.7 Amending an Order

Amendment of an attribute of an order is not supported in CSC for the reason that China Connect markets do not accept such an amendment.

6.6.8 Cancel Auto-matched Trades

There is no applicable business scenario where an already concluded trade could be cancelled.

6.6.9 General Order Handling Notes

1. CCCG may accept an order handling request before respective home market is open. During this period, CCCG would return only an Execution Report to confirm the receipt of the request with Exec Type = Pending New for a request to submit a new order / Exec Type = Pending Cancel for a request to cancel an existing order, if this request passes through CSC's local validation rules. Subsequent processing results would be returned only after the respective home market is open and the request is processed by the home market.
2. The same behavior applies during the mid-day close of the respective home market.
3. For an order handling request submitted after the respective home market is closed for the day but before CCCG/CSC stops accepting further order handling requests for the day, CCCG would return the Execution Report to acknowledge the receipt of the request with Exec Type = Pending New for a request to submit a new order / Exec Type = Pending Cancel for a request to cancel an existing order, if this request passes through CSC's local validation rules; but there will be no further events for this request, such pending requests will be cleaned up by CSC at the end of the day and therefore these requests will not be carried forward to the next trading day.
4. An order may be cancelled by the trading system of the home market, after accepting this order, due to rules and validations governing the home market; CCCG would return an Execution Report to notify an unsolicited order cancel with Exec Restatement Reason = Cancelled by home market.

6.6.10 Execution Reports

The Execution Report message is used to communicate many different events to the client. The events are differentiated by the value in the Exec Type field as outlined below:

Exec Type	Description	Order Status Field
A = Pending New	Order Pending to be accepted by the Home Market Indicates that a new order has been accepted by CSC and forwarded to the home market.	<ul style="list-style-type: none"> ▪ 10 = Pending New
0 = New	Order Accepted Indicates that a new order has been accepted by the home market.	<ul style="list-style-type: none"> ▪ 0 = New ▪ 6 = Pending Cancel
8 = Reject	Order Rejected Indicates that an order has been rejected. The reason for the rejection is specified in the field Order Reject Code.	<ul style="list-style-type: none"> ▪ 8 = Rejected
F = Trade	Order Executed (Trade) Indicates that an order has been partially or fully filled. The execution details (e.g., price and quantity) are specified.	<ul style="list-style-type: none"> ▪ 1 = Partially Filled ▪ 2 = Filled ▪ 6 = Pending Cancel
6 = Pending Cancel	Order Pending to be Cancelled Indicates that an Order Cancel Request has been accepted by CSC and forwarded to the home market.	<ul style="list-style-type: none"> ▪ 6 = Pending Cancel
4 = Cancel	Order Cancelled Indicates that an order cancel request has been	<ul style="list-style-type: none"> ▪ 4 = Cancelled

Exec Type	Description	Order Status Field
	accepted and successfully processed. This message can also be sent unsolicited in which case the Execution Report may include the Exec Restatement Reason Field to indicate the reason for cancellation; Original Client Order ID field will not be provided.	
X = Cancel Reject	Order Cancel Rejected Indicates that an order cancel request has been rejected.	<ul style="list-style-type: none"> ▪ 0 = New ▪ 1 = Partially Filled ▪ 2 = Filled ▪ 4 = Cancelled ▪ 6 = Pending Cancel ▪ 8 = Rejected ▪ 10 = Pending New

6.7 Message Rejection

6.7.1 Session Level Reject

If an incoming message violates any message level validations such as data type mismatches or message structure mismatches, the messages are expected to be rejected back to the sender using a Reject message (applicable to both the client and the CCCG).

6.7.2 Business Message Reject

Business Message Rejects will be used in rejecting business messages due to application level validation failures such as MPS rate violations, conditionally required field violations, etc.

6.8 Cancel On Disconnect

This service will not be offered by CCCG.

6.9 Message Rate Throttling

HKEX has implemented a scheme for throttling message traffic where each Comp ID is only permitted to submit up to a specified number of business messages per second (MPS).

The client can request for message rate entitlement information pertaining to that client by sending a Throttle Entitlement Request (25) message and the CCCG will reply with a Throttle Entitlement Response (26) message to convey the message rate entitlement information.

Every message that exceeds the maximum rate of a Comp ID will be rejected via a Business Message Reject. In this situation, the remaining time for the present throttling interval will be indicated in the Reason text of the Business Message Reject.

HKEX reserves the right to drop the client session with or without sending a Logout (6) message to the client, if that client is found to be excessively violating the message rate.

6.10 Party Entitlements

The client can request for entitlement information for Broker IDs of that client via Party Entitlement Request Message. If the Request is accepted, Party Entitlement Report message will carry the entitlement information.

7. Message Format

7.1 Supported Message Types

All supported message types initiated by the client or the CCCG:

#	Message	Message Type	Usage
1.	Heartbeat	0	Allows the client and the CCCG to exercise the communication line during periods of inactivity and verify that the interfaces at each end are available.
2.	Test Request	1	Allows the client or the CCCG to request a response from the other party if inactivity is detected.
3.	Resend Request	2	Allows for the recovery of messages lost during a malfunction of the communications layers.
4.	Reject	3	Used to reject a message that does not comply with session level validations.
5.	Sequence Reset	4	Allows the client or the CCCG to increase the expected incoming sequence number of the other party.
6.	Logon	5	Allows the client and the CCCG to establish a Binary session.
7.	Logout	6	Allows the client and the CCCG to terminate a Binary session.
8.	Lookup Request	7	The Lookup Request can be used by a client to request for a connection point (IP/Port pair) to the CCCG.
9.	Lookup Response	8	The Lookup Response message is used by the CCCG in response to a valid Lookup Request sent by the client.
10.	Business Message Reject	9	Indicates that an application message could not be processed
11.	Execution Report	10	Indicates one of the following: <ul style="list-style-type: none"> ▪ Order Pending Acceptance ▪ Order Accepted ▪ Order Rejected ▪ Order Cancelled ▪ Order Cancel Rejected ▪ Trade ▪ Order Pending Cancellation
12.	New Order	11	Allows the client to submit a new order.
13.	Cancel Request	13	Allows the client to cancel a live order in the execution venue.
14.	Throttle Entitlement	25	Allows the client to request for throttle

#	Message	Message Type	Usage
	Request		entitlement details
15.	Throttle Entitlement Response	26	Response to the Request (25)
16.	Party Entitlements Request	27	Request entitlement information for Exchange participant
17.	Party Entitlements Report	28	Response to Party Entitlements Request (27)

Note: HKEX may add new data fields and/or new messages to serve new business requirements in the future and BSS should be designed to adopt these interface changes in a flexible approach.

7.2 Message Header

Order	Field Name	Required	Description
1.	Start of Message	Y	Indicates the starting point of a message. Always set to ASCII STX character
2.	Length	Y	Length of the messaging including all the fields in the message (i.e., length of all header, body and trailer fields)
3.	Message Type	Y	Message Type. Refer to Data Dictionary
4.	Sequence Number	Y	Message sequence number applicable to this message
5.	PossDup	Y	Message with the same sequence number may have been sent previously?
6.	PossResend	Y	Message with the same business data may have been sent previously?
7.	Comp ID	Y	Comp ID assigned to the client
8.	Body Fields Presence Map	Y	Indicates the list of fields that would be present immediately after this Body Fields Presence Map field.

7.3 Message Trailer

Each binary message includes a trailer at the end of each message. The trailer contents are given below. The checksum will take into consideration the full message (The calculation of checksum will include fields in both Header and Body).

Order	Field Name	Required	Description
1.	Checksum	Y	CRC32C based checksum.

7.4 Lookup Service

7.4.1 Lookup Request (7)

This message is initiated by the client.

Bit Position	Field Name	Required	Description
0	Type Of Service	Y	Type of service required for the client: <ul style="list-style-type: none"> ▪ 1 = Order Input
1	Protocol Type	Y	Type of message protocol required by the client in order to connect to the specified service: <ul style="list-style-type: none"> ▪ 1 = Binary

Note: Bit Position refers to the Bit Presence Map.

The sequence number of the Lookup Request is always set to 1 by the client.

7.4.2 Lookup Response (8)

This response message is initiated by the CCCG.

Bit Position	Field Name	Required	Description
0	Status	Y	Indicates whether the Lookup Request was accepted or rejected by the CCCG: <ul style="list-style-type: none"> ▪ 0 = Accepted ▪ 1 = Rejected
1	Lookup Reject Code	N	If request is rejected then a code to identify the rejection: <ul style="list-style-type: none"> ▪ 0 = Invalid Client ▪ 1 = Invalid service type ▪ 2 = Invalid Protocol ▪ 3 = Client is blocked ▪ 4 = Other
2	Reason	N	Textual reason for the Lookup Request rejection
3	Primary IP	N	IP Address of the primary service in case of a successful lookup
4	Primary Port	N	Port number of the primary service in case of a successful lookup
5	Secondary IP	N	IP Address of the secondary service in case of a successful lookup
6	Secondary Port	N	Port number of the secondary service in case of a successful lookup

The sequence number of the Lookup Response will always be set to 1 by the CCCG.

7.5 Administrative Messages

7.5.1 Logon (5)

This message is initiated by the client and the CCCG may respond with the same message.

Bit Position	Field Name	Required	Description
0	Password	N	Encrypted Password assigned to the Comp ID.
1	New Password	N	New encrypted Password for Comp ID
2	Next Expected Message Sequence	Y	Indicates the next expected message sequence number by the party initiating this message
3	Session Status	N	Status of the Binary session. Required if the message is generated by the CCCG.
4	Text	N	Text field will be used to convey the number of days to password expiry when the CCCG replies with a Logon message upon a successful logon attempt.
5	Test Message Indicator	N	The Test Message Indicator field will be used to indicate whether the binary client is connected to the 'Test' or 'Production Mode' of the system when the CCCG replies with a LOGON message upon a successful logon attempt. <ul style="list-style-type: none"> ▪ 0 = No (Production Mode) ▪ 1 = Yes (Test Mode)

Password (Bit Position 0) must be present in the Logon message initiated by the client.

7.5.2 Logout (6)

This message can be initiated by both client and the CCCG.

Bit Position	Field Name	Required	Description
0	Logout Text	N	Textual reason for the Logout
1	Session Status	N	Status of the Binary session. May be present if the message is generated by the CCCG.

7.5.3 Heartbeat (0)

This message can be initiated by both client and CCCG.

Bit Position	Field Name	Required	Description
0	Reference Test Request ID	N	Required if the Heartbeat is in response to a Test Request. The value in this field will echo the Test Request ID received in the test Request.

7.5.4 Test Request (1)

This message can be initiated by both the client and the CCCG.

Bit Position	Field Name	Required	Description
0	Test Request ID	Y	Identifier included in Test Request message to be returned in resulting Heartbeat.

7.5.5 Resend Request (2)

This message can be initiated by both client and the CCCG.

Bit Position	Field Name	Required	Description
0	Start Sequence	Y	Sequence number of the first message expected to be resent.
1	End Sequence	Y	Sequence number of the last message expected to be resent. This may be set to 0 to request the sender to transmit ALL messages starting from Start Sequence Number.

7.5.6 Reject (3)

This message is initiated by the CCCG.

Bit Position	Field Name	Required	Description
0	Message Reject Code	Y	Code specifying the reason for the rejection of the message
1	Reason	N	Textual reason for the reject.
2	Reference Message Type	N	Type of message rejected.
3	Reference Field Name	N	Name of the field (as per the data dictionary) which caused the rejection
4	Reference Sequence Number	Y	Sequence number of the message which caused the rejection
5	Client Order ID	N	Client specified identifier of the rejected message if it is available.

7.5.7 Sequence Reset (4)

This message can be initiated by both client and the CCCG.

Bit Position	Field Name	Required	Description
0	Gap Fill	N	Indicates whether the sequence number is to be interpreted in a RESET mode or a GAP-FILL mode. The default value will be set as ('N') RESET if this field is not present.
1	New Sequence Number	Y	Indicates the sequence number of the next message to be sent by the sender

7.6 Business Messages – Order Handling

7.6.1 New Order – Single (11)

This message is initiated by the client to send a new order.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order.
1	Submitting Broker ID	Y	The Broker ID of the user that is submitting the new order
2	Security ID	Y	Instrument identifier value of Security ID Source type.
3	Security ID Source	Y	Identifies the source of the Security ID. Required if: Security ID is specified
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol).
5	Broker Location ID	N	The location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated.
7	Side	Y	Side of the order <ul style="list-style-type: none"> ▪ 1 = Buy ▪ 2 = Sell ▪ 5 = Sell Short
8	Order Type	Y	Order type applicable to the order: <ul style="list-style-type: none"> ▪ 2 = Limit
9	Price	N	Price of order. Required if: Order Type = 2 (Limit)
10	Order Quantity	Y	Total order quantity of the order
11	Time In Force (TIF)	N	Time qualifier of the order. Absence of this field is interpreted as 0 = Day: <ul style="list-style-type: none"> ▪ 0 = Day (Default)
12	Position Effect	N	Indicates whether the resulting position after a trade should be an opening position or closing position: <ul style="list-style-type: none"> ▪ 1 = Close Applicable only if Side = 1 (Buy) to indicate covering a short sell.
14	Max Price Levels	N	Maximum number of price levels to trade through. Applicable if: Order Type = 2 (Limit) If present, this should be set as 1.

15	Order Capacity	N	Designates the capacity of the firm placing the order: <ul style="list-style-type: none"> ▪ 1 = Agency ▪ 2 = Principal
16	Text	N	Free Text
18	Disclosure Instructions	Y	Disclosure Instructions to convey, a bit map with each bit representing a specific disclosure type: <ul style="list-style-type: none"> ▪ Bit 0 = None (No specific information to disclose) <p>Each disclosure type can have only two possible values which will indicate the Disclosure Instruction as follows;</p> <ul style="list-style-type: none"> ▪ 0 = No ▪ 1 = Yes <p>All bits are required to be initialized to 0 (No) and only the required disclosure types will need to be set as 1 (Yes).</p> <p>If there is no specific information to disclose, bit 0 (None) must be set as 1 (Yes)</p> <p>If bit 0 is set as 1 (Yes), value in other individual bits will be ignored to consider this scenario as “Nothing to disclose”.</p> <p>(It is a mandatory field for future use; EP should specify bit 0 as 1 for completeness.)</p>
20	<u>SPSA</u> Investor ID	N	SPSA Investor ID
<u>21</u>	<u>BCAN</u>	<u>Y</u>	<u>Identifier of the client assigned by CCEP/TTEP for Northbound order submission.</u> <u>BCAN is enforced by the regulatory body and is mandatory to provide.</u> <u>Valid BCAN range for assignment to broker’s specific individual or institutional clients: 100 to 9,999,999,999</u> <u>Valid BCAN reserved values (refer relevant business rule):</u> <ul style="list-style-type: none"> ▪ <u>1 = for individual clients without client consent (for sell orders only)</u> ▪ <u>2 = for institutional clients without client consent (for sell orders only)</u> <u>A value with leading zeros will be rejected.</u>

Notes:

1. *Max Price Levels* is expected to be present in all New Order messages due to the order types supported by CCG at present.

7.6.2 Cancel Order (13)

This message is initiated by the client to cancel an existing order.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	New client specified identifier of the order

1	Submitting Broker ID	Y	The Broker ID of the user that is submitting the cancel request. This should be the same as in the original order.
2	Security ID	Y	Instrument identifier value of Security ID Source type. This must be the same as in the original order.
3	Security ID Source	Y	Identifies the source of the Security ID. Required if: Security ID is specified
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated.
7	Side	Y	Side of the original order: <ul style="list-style-type: none"> ▪ 1 = Buy ▪ 2 = Sell ▪ 5 = Sell Short
8	Original Client Order ID	Y	Client Order ID of the order being cancelled
9	Order ID	N	Order ID of the order being cancelled
10	Text	N	Free Text

7.6.3 Execution Report (10)

7.6.3.1 Order Registered

The CCG will send this execution report once the new order is registered in CSC and forwarded to the home market for processing.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the Security ID. Required if: Security ID is specified Must be the same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)

5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated. Format: YYYYMMDD-HH:MM:SS.sss
7	Side	Y	Side of the order
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated: <ul style="list-style-type: none"> ▪ 10 = Pending New
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: <ul style="list-style-type: none"> ▪ A = Pending New
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
27	Lot Type	N	Defines the lot type assigned to the order: <ul style="list-style-type: none"> ▪ 2 = Round Lot
40	SPSA Investor ID	N	SPSA Investor ID

Notes:

1. If Lot Type is absent then this execution report carries a board (i.e., round) lot order.

7.6.3.2 Order Accepted

The CCCG will send this execution report once the new order is accepted by home market.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order

1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the Security ID. Must be same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated. Format: YYYYMMDD-HH:MM:SS.sss
7	Side	Y	Side of the order
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated: <ul style="list-style-type: none"> ▪ 0 = New ▪ 6 = Pending Cancel
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: <ul style="list-style-type: none"> ▪ 0 = New
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
27	Lot Type	N	Defines the lot type assigned to the order: <ul style="list-style-type: none"> ▪ 2 = Round Lot

40	SPSA Investor ID	N	SPSA Investor ID
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Notes:

1. If Lot Type is absent then this execution report carries a board (i.e., round) lot order.

7.6.3.3 Order Rejected

The CCCG will send this execution report once the new order is rejected (either by CSC or by the home market).

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID. Must be same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated
7	Side	Y	Side of the order
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
20	Reason	N	Textual description of the rejection that is being communicated through this execution report
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated

22	Order Status	Y	Order status after applying the transaction that is being communicated: <ul style="list-style-type: none"> 8 = Rejected
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: <ul style="list-style-type: none"> 8 = Reject
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
26	Order Reject Code	N	Reject code indicating the reason for the order reject: <ul style="list-style-type: none"> 3 = Order Exceed Limit 6 = Duplicate order 13 = Incorrect Qty 22 = Short sell not permitted 99 = Other 101 = Price exceeds current price band (override not allowed)
40	<u>SPSA</u> Investor ID	N	SPSA Investor ID

7.6.3.4 Order Cancel Request Registered

The CCG sends this execution report once the Cancel Request for an order is accepted within CSC and forwarded to the home market.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID. Must be same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated
7	Side	Y	Side of the order
8	Original Client Order ID	Y	Original Client Order ID as specified in the incoming cancel request
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order

12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated: ▪ 6 = Pending Cancel
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: ▪ 6 = Pending Cancel
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity

7.6.3.5 Order Cancelled

The CCCG sends this execution report once the Cancel Request for an order is accepted by the home market.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID. Must be same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated

7	Side	Y	Side of the order
8	Original Client Order ID	Y	Original Client Order ID as specified in the incoming cancel request
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated: ▪ 4 = Cancelled
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: ▪ 4 = Cancel
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity

7.6.3.6 Order Cancelled – Unsolicited

The CCCG will send this execution report for an unsolicited cancel of an order.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID. Must be same as in the original order.

4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated
7	Side	Y	Side of the order
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
20	Reason	N	Textual description for the reason for unsolicited cancel
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated: <ul style="list-style-type: none"> ▪ 4 = Cancelled
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: <ul style="list-style-type: none"> ▪ 4 = Cancel
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
28	Exec Restatement Reason	N	Code to identify the reason for an Execution Report message with Exec Type= 4 (Cancel): <ul style="list-style-type: none"> ▪ 8 = Market Operation ▪ 99 = Other ▪ 105 = Cancel due to Broker suspended ▪ 106 = Cancel due to Exchange Participant suspended ▪ 107 = System Cancel ▪ 108 = Cancelled by home market

7.6.3.7 Order Cancel Rejected

The CCCG sends this execution report when an Order Cancel Request is rejected. This rejection may take place immediately after receiving the Cancel Order request, or after having sent “Order Cancel Request Registered” prior to this message.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated
7	Side	Y	Side of the order
8	Original Client Order ID	N	Original Client Order ID as specified in the incoming cancel request
9	Order ID	Y	Order ID assigned for the order
10	Owning Broker ID	N	Order owner’s Broker ID. Owner and Submitter could be the same Broker ID.
11	Order Type	N	Type of the order
12	Price	N	Limit price Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity
14	TIF	N	Time qualifier of the order
15	Position Effect	N	Indicates whether the resulting position after a trade should be a closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
20	Reason	N	Textual description of the rejection that is being communicated through this execution report
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated

22	Order Status	Y	Order status as at the time of this rejection: <ul style="list-style-type: none"> 0 = New 1 = Partially Filled 2 = Filled 4 = Cancelled 6 = Pending Cancel 8 = Rejected 10 = Pending New
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report: <ul style="list-style-type: none"> X = Cancel Reject
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
29	Cancel Reject Code	N	Reject code indicating the reason for the order reject: <ul style="list-style-type: none"> 0 = Too late to cancel 1 = Unknown Order 3 = Order already in Pending Cancel status 6 = Duplicate Client Order ID received 99 = Other (default)

Notes:

- Order Status is set to 8 = Rejected in the event of one of the following scenarios:
 - It's an unknown order.

7.6.3.8 Trade (Order Executed)

The CCCG sends this execution report for a trade concluded at the home market.

Bit Position	Field Name	Required	Description
0	Client Order ID	Y	Client specified identifier of the order.
1	Submitting Broker ID	Y	The Broker ID of the user that submitted the order for which the Execution Report is generated.
2	Security ID	Y	Instrument identifier value of security ID source type.
3	Security ID Source	Y	Identifies the source of the security ID. Must be same as in the original order.
4	Security Exchange	N	The market which is used to identify the security. Required if: Security ID Source = 8 (Exchange Symbol)
5	Broker Location ID	N	The Location ID of the Submitting Broker
6	Transaction Time	Y	The time at which the particular message was generated
7	Side	Y	Side of the order.
9	Order ID	Y	Order ID assigned for the order
11	Order Type	N	Type of the order.

12	Price	N	Limit price. Required if: Order Type = 2 (Limit)
13	Order Quantity	N	Total order quantity.
14	TIF	N	Time qualifier of the order.
15	Position Effect	N	Indicates whether the resulting position after a trade should be an opening position or closing position
17	Max Price Levels	N	The maximum number of price levels to trade through
18	Order Capacity	N	Designates the capacity of the firm placing the order
19	Text	N	The most recent text sent by the client will be echoed back to the client.
21	Execution ID	Y	Unique Execution ID assigned by the system for each Execution Report generated
22	Order Status	Y	Order status after applying the transaction that is being communicated <ul style="list-style-type: none"> ▪ 1 = Partially Filled ▪ 2 = Filled ▪ 6 = Pending Cancel
23	Exec Type	Y	Execution Type that indicates the reason for the generation of the Execution Report <ul style="list-style-type: none"> ▪ F = Trade
24	Cumulative Quantity	Y	Cumulative execution quantity
25	Leaves Quantity	Y	Open order quantity
27	Lot Type	N	Defines the lot type assigned to the order: <ul style="list-style-type: none"> ▪ 2 = Round Lot Absence of this field indicates a Round Lot order.
30	Match Type	N	The point in the matching process at which this trade was matched <ul style="list-style-type: none"> ▪ 4 = Auto Match
31	Counterparty Broker ID	N	The Broker ID of the user sitting on the opposite side of the trade
32	Execution Quantity	Y	Execution Size
33	Execution Price	Y	Execution price
38	Trade Match ID	N	Identifier assigned to a trade by the home market.
41	Trade Date	N	Indicates date of trading day. Absence of this field indicates current day.

Notes:

1. Counterparty Broker ID may or may not always be present.
2. Trade Date, if present, may carry a date different from current date, in "Test Mode".

7.7 Business Messages – Infrastructure

7.7.1 Business Message Reject (9)

Bit Position	Field Name	Required	Description
0	Business Reject Code	Y	Code specifying the reason for the rejection of the message: <ul style="list-style-type: none"> ▪ 0 = Other ▪ 1 = Unknown ID ▪ 2 = Unknown Security ▪ 3 = Unspecified Message Type ▪ 4 = Application not available ▪ 5 = Conditionally required field missing ▪ 8 = Throttle limit exceeded In case the Business Reject Code = 8 = Throttle Limit exceeded, then the Reason field will indicate the remaining throttle interval time in milliseconds.
1	Reason	N	Textual reason for the reject. If the rejection is due to an issue with a particular field its name will be specified.
2	Reference Message Type	Y	Type of message rejected.
3	Reference Field Name	N	Name of the field (as per the data dictionary) which caused the rejection
4	Reference Sequence Number	N	Sequence number of the message which caused the rejection
5	Business Reject Reference ID	N	Client specified identifier of the rejected message if it is available.

7.8 Party Entitlements

7.8.1 Party Entitlement Request (27)

The client sends this message to request for party entitlement details.

Bit Position	Field Name	Required	Description
0	Entitlement Request ID	Y	A unique identifier assigned to the Party Entitlement Request Message

7.8.2 Party Entitlement Report (28)

The CCCG sends this message in response to a request for entitlement details.

The CCCG will fragment this Party Entitlement Report per each Broker ID belonging to the client. The CCCG will use *Total No Party List* to specify the total number of Broker IDs for which the entitlement information is provided. The last message will have the *Last Fragment* set to 1 = Yes.

Bit Position	Field Name	Required	Description	
0	Entitlement Report ID	Y	A unique ID assigned to the Party Entitlement Report by the system	
1	Entitlement Request ID	N	Conditionally required if the Party Entitlement Report is in response to a Party Entitlements Request	
2	Request Result	N	Conditionally required if the Party Entitlement Report is in response to a Party Entitlements Request: <ul style="list-style-type: none"> 0 = Valid Request 1 = Invalid or unsupported request 2 = No data found that match selection criteria 5 = Request for data not supported 99 = Other 	
3	Total No Party List	N	The total number of Broker IDs to be returned across all fragments	
4	Last Fragment	N	Indicates whether this message is that last in a sequence of fragmented messages: <ul style="list-style-type: none"> 0 = No 1 = Yes 	
5	Broker ID	N	Broker ID for which the Entitlement details are applicable	
6	No Entitlements	N	The number of entitlements attached to the Broker ID specified	
	No Entitlements Body Fields Presence Map	N	This will indicate the fields/nested repeating blocks present in this repeating block. Requires to be present if No Entitlements > 0	
	0	Entitlement Type	N	Absence of this field indicates the meaning of the entitlement is implicit. Else: <ul style="list-style-type: none"> 0 = Trade
	1	Entitlement Indicator	N	Determines if the party is entitled for the specified Entitlement Type: <ul style="list-style-type: none"> 0 = No 1 = Yes
	2	No Market Segments	N	Number of Market Segments
		No Market Segment Scope Group Presence Map	N	This will indicate the fields/nested repeating blocks present in this repeating block
	0	Market Segment ID	N	Identifies the Market in the entitlement scope.
3	Entitlement ID	Y	Unique identifier for a specific Entitlement Group instance	

7.9 Throttle Entitlement

7.9.1 Throttle Entitlement Request (25)

The request messages can be used by a client to request for throttle entitlement details for this requesting client.

Bit Position	Field Name	Required	Description
0	User Request ID	Y	Unique identifier assigned for the User Request message
1	User Request Type	Y	Indicates the action required: <ul style="list-style-type: none"> ▪ 5 = Request Throttle Limit
2	User Name	Y	Comp ID assigned to the client.

7.9.2 Throttle Entitlement Response (26)

The response message is used by the CCCG as a response to a request to provide throttle entitlement details for the requesting client.

Bit Position	Field Name	Required	Description
0	User Request ID	Y	The User Request ID of the User Request message for which the User Response message is generated.
1	User Name	Y	The User Name provided in the User Request message for which the User Response message is generated.
2	No Throttles	N	TPS allocated to this user, as follows:
	No Throttles Body Fields Presence Map	N	This will indicate the fields/nested repeating blocks present in this repeating block
	0 Throttle Action	N	Indicates the action to be taken should the throttle limit be exceeded: <ul style="list-style-type: none"> ▪ 2 = Rejected
	1 Throttle Type	N	The type of throttle; <ul style="list-style-type: none"> ▪ 0 = Inbound Rate (Absolute Throttle Rate)
	2 Throttle No Messages	N	The maximum number of messages allowed by the throttle.
3	Throttle Time Interval	N	Indicates the interval of time in which the Throttle No Messages may be sent based on the Throttle Time Unit specified. Required if: Throttle Type = 0 (Inbound Rate)

	4	Throttle Time Unit	N	<p>Indicates the unit in which Throttle Time Interval is expressed:</p> <ul style="list-style-type: none"> ▪ 0 = Seconds(default if not specified) <p>Required if: Throttle Type = 0 (Inbound Rate)</p>
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8. Data Dictionary

8.1 Header and Trailer Fields

#	Field Name	Data Type	Description	Comments
1.	Body Fields Presence Map	Bitmap Fixed Length	Bitmap indicates the fields and repeating blocks present in the body of the message. To indicate availability set 1 to the applicable bit position and 0 for unavailability.	
2.	Checksum	UInt32	CRC32C based checksum. Polynomial used - 0x1EDC6F41	
3.	Comp ID	Alphanumeric Fixed Length (12)	Comp ID assigned to the sender of the message.	
4.	Length	UInt16	Length of the message including all the fields in the message (i.e. length of all header, body and trailer fields)	

5.	Message Type	UInt8	<p>Defines the message type:</p> <p>Value = Meaning</p> <ul style="list-style-type: none"> ▪ 0 = Heartbeat ▪ 1 = Test Request ▪ 2 = Resend Request ▪ 3 = Reject ▪ 4 = Sequence Reset ▪ 5 = Logon ▪ 6 = Logout ▪ 7 = Lookup Request ▪ 8 = Lookup Response ▪ 9 = Business Message Reject ▪ 10 = Execution Report ▪ 11 = New Order ▪ 13 = Cancel Request ▪ 25 = Throttle Entitlement Request ▪ 26 = Throttle Entitlement Response ▪ 27 = Party Entitlements Request ▪ 28 = Party Entitlements Report 	
6.	PossDup	UInt8	<p>Indicates possible retransmission of message with this sequence number:</p> <ul style="list-style-type: none"> ▪ 0 – No (original transmission) ▪ 1 – Yes (possible duplicate) 	
7.	PossResend	UInt8	<p>Indicates that message may contain information that has been sent under another sequence number:</p> <ul style="list-style-type: none"> ▪ 0 – No (original transmission) ▪ 1 – Yes (possible resend) 	
8.	Sequence Number	UInt32	Message sequence number applicable to the message.	
9.	Start of Message	UInt8	<p>Indicates the starting point of a message.</p> <p>Always set to the ASCII STX character (0x02).</p>	

8.2 Body Fields

#	Field Name	Data Type	Description	Comments
<u>1.</u>	<u>BCAN</u>	<u>Alphanumeric Fixed Length (21)</u>	<p><u>Identifier of the client assigned by CCEP/TTEP for Northbound order submission.</u></p> <p><u>Valid BCAN range for assignment to broker's specific individual or institutional clients: 100 to 9,999,999,999</u></p> <p><u>Valid reserved values (refer relevant business rule):</u></p> <ul style="list-style-type: none"> ▪ <u>1 = for individual clients without client consent (for sell orders only)</u> ▪ <u>2 = for institutional clients without client consent (for sell orders only)</u> <p><u>A value with leading zeros will be rejected.</u></p>	
1-2.	Broker ID	Alphanumeric Fixed Length (12)	The Broker ID of the User	As allocated by HKEX
2-3.	Broker Location ID	Alphanumeric Fixed Length (11)	The location ID of the Submitting Broker	Limited to maximum 8 digits
3-4.	Business Reject Code	UInt16	<p>Code specifying the reason for the rejection of the business message:</p> <ul style="list-style-type: none"> ▪ 0 = Other ▪ 1 = Unknown ID ▪ 2 = Unknown Security ▪ 3 = Unspecified Message Type ▪ 4 = Application not available ▪ 5 = Conditionally required field missing ▪ 8 = Throttle Limit exceeded 	
4-5.	Business Reject Reference ID	Alphanumeric Fixed Length (21)	The value of the business-level "ID" field in the message being referenced.	

<u>5-6.</u>	Cancel Reject Code	UInt16	<p>The reject code indicating the reason for the cancel/amend rejects.</p> <ul style="list-style-type: none"> ▪ 0 = Too late to cancel ▪ 1 = Unknown Order ▪ 3 = Order already in Pending Cancel status ▪ 6 = Duplicate Client Order ID received ▪ 99 = Other (Default) 	
<u>6-7.</u>	Client Order ID	Alphanumeric Fixed Length (21)	Client specified identifier of the order.	Limited to maximum 8 digits
<u>7-8.</u>	Counterparty Broker ID	Alphanumeric Fixed Length (12)	The Broker ID of the user sitting on the opposite side of the trade	
<u>8-9.</u>	Cumulative Quantity	Decimal	Cumulative execution quantity	
<u>9-10.</u>	Disclosure Instructions	UInt16	<p>Disclosure Instructions to convey.</p> <p>16 bit representations will be available with each bit representing a specific disclosure type:</p> <ul style="list-style-type: none"> ▪ Bit 0 = None (No specific information to disclose) ▪ Bit 1 – 15 = Reserved <p>The Disclosure Instructions field value will represent the Integer value of the 16 bit representation.</p> <p>Each disclosure type can have only two possible values which will indicate the Disclosure Instruction as follows;</p> <ul style="list-style-type: none"> ▪ 0 = No ▪ 1 = Yes <p>All bits are required to be initialized to 0 (No) and only the required disclosure types will need to be set as 1 (Yes).</p> <p>If there is no specific information to disclose, bit 0 (None) must be set as 1 (Yes).</p> <p>If bit 0 is set as 1 (Yes), value in other individual bits will be ignored to consider this scenario as “Nothing to disclose”.</p>	

10.11.	End Sequence	UInt32	Sequence number of the last message expected to be resent. This may be set to 0 to request the sender to transmit ALL messages starting from the Start Sequence	
11.12.	Entitlement ID	Alphanumeric Fixed Length (21)	Unique identifier for a specific Entitlement Group instance	
12.13.	Entitlement Indicator	UInt8	Determines if the party is entitled for the specified Entitlement Type <ul style="list-style-type: none"> ▪ 0 = No ▪ 1 = Yes 	
13.14.	Entitlement Request ID	Alphanumeric Fixed Length (21)	A unique identifier assigned to the Party Entitlement Request Message	
14.15.	Entitlement Report ID	Alphanumeric Fixed Length (21)	A unique ID assigned to the Party Entitlement Report by the system	
15.16.	Entitlement Type	UInt8	Absence of this field indicates the meaning of the entitlement is implicit. Else: <ul style="list-style-type: none"> ▪ 0 = Trade 	
16.17.	Exec Type	Byte	Execution Type that indicates the reason for the generation of the Execution Report <ul style="list-style-type: none"> ▪ '0' = New ▪ '4' = Cancel ▪ '6' = Pending Cancel ▪ '8' = Reject ▪ 'A' = Pending New ▪ 'F' = Trade ▪ 'X' = Cancel Reject 	
17.18.	Execution ID	Alphanumeric Fixed Length (21)	Unique Execution ID assigned by the system for each Execution Report generated	
18.19.	Execution Price	Decimal	Execution price	

19-20.	Execution Quantity	Decimal	Execution Size	
20-21.	Exec Restatement Reason	UInt16	Code to identify the reason for an Execution Report message with Exec Type= 4 (Cancel) or H (Trade Cancel): <ul style="list-style-type: none"> ▪ 8 = Market Operation ▪ 99 = Other (default) ▪ 105 = Cancel due to Broker suspended ▪ 106 = Cancel due to Exchange Participant suspended ▪ 107 = System Cancel ▪ 108 = Cancelled by home market 	
21-22.	Gap Fill	Byte	Indicates whether the sequence number is to be interpreted in a RESET mode or a GAP-FILL mode: <ul style="list-style-type: none"> ▪ 'N' = Reset ▪ 'Y' = Gap Fill 	
22-23.	Instrument Scope Operator	UInt8	Operator to perform on the instrument(s) specified in Instrument Scope Symbol: <ul style="list-style-type: none"> ▪ 1 = Include 	
23-24.	SPSA Investor ID	Alphanumeric Fixed Length (21)	Investor ID as assigned by CCASS for a Special Segregated Account (SPSA).	Limited to maximum 6 digits
24-25.	Last Fragment	UInt8	Indicates whether this message is that last in a sequence of fragmented messages <ul style="list-style-type: none"> ▪ 0 = No ▪ 1 = Yes 	
25-26.	Leaves Quantity	Decimal	Open order quantity	
26-27.	Logout Text	Alphanumeric Variable Length (Max Length = 75)	Textual reason for the logout.	
27-28.	Lot Type	UInt8	Defines the lot type assigned to the order. The absence of this field indicates a Round Lot order: <ul style="list-style-type: none"> ▪ 2= Round Lot 	

<u>28-29.</u>	Lookup Reject Code	UInt8	Code to identify the lookup request rejection: <ul style="list-style-type: none"> 0 = Invalid Client 1 = Invalid service type 2 = Invalid Protocol 3 = Client is Blocked 4 = Other 	
<u>29-30.</u>	Market Segment ID	Alphanumeric Fixed Length (20)	Identifies a market / market segment in the entitlement scope: <ul style="list-style-type: none"> ASHR = Market Segment for stocks listed in Shanghai, under Shanghai – Hong Kong Stock Connect. ASZR = Market Segment for stocks listed in Shenzhen, under Shenzhen– Hong Kong Stock Connect. 	
<u>30-31.</u>	Match Type	UInt8	The point in the matching process at which this trade was matched: <ul style="list-style-type: none"> 4 = Auto Match 	
<u>31-32.</u>	Max Price Levels	UInt8	The maximum number of price levels to trade through	
<u>32-33.</u>	Message Reject Code	UInt16	Code specifying the reason for the session level rejection: <ul style="list-style-type: none"> 1 = Required field missing 2 = Field not defined for this message 3 = Undefined field 4 = Field specified without a value 5 = Value is incorrect (out of range) for this field 6 = Incorrect data format for value 9 = Comp ID problem 11 = Invalid message type 13 = Field appears more than once 99 = Other 	
<u>33-34.</u>	New Password	Alphanumeric Fixed Length (450)	New password for Comp ID	
<u>34-35.</u>	New Sequence Number	UInt32	Indicates the sequence number of the next message to be sent by the sender	

35-36.	Next Expected Message Sequence	UInt32	Indicates the next expected message sequence number by the party initiating this message	
36-37.	No Entitlements	UInt16	The number of entitlements attached to a Broker ID specified in the Party Entitlement Report.	
37-38.	No Entitlements Body Fields Presence Map	Bitmap Variable Length (2)	This will indicate the fields/nested repeating blocks present in No Entitlement repeating block in the Party Entitlement Report.	
38-39.	No Market Segments	UInt16	Number of market segments in entitlement scope	
39-40.	No Market Segment Scope Group Presence Map	Bitmap Variable Length (2)	This will indicate the fields/nested repeating blocks present in No Market Segments repeating block in the Party Entitlement Report.	
40-41.	No Throttles	UInt16	The number of Throttles to follow in the User Response message.	
41-42.	No Throttles Body Fields Presence Map	Bitmap Variable Length (2)	This will indicate the fields/nested repeating blocks present in No Throttles repeating block in the User Response message.	
42-43.	Order ID	Alphanumeric Fixed Length (21)	Order ID of the order	
43-44.	Order Capacity	UInt8	Designates the capacity of the firm placing the order <ul style="list-style-type: none"> ▪ 1 = Agency ▪ 2 = Principal 	
44-45.	Order Quantity	Decimal	Total order quantity of the order	Limited to maximum 99,999,999 in the integral part.
45-46.	Order Reject Code	UInt16	Reject code indicating the reason for the order reject: <ul style="list-style-type: none"> ▪ 3 = Order Exceed Limit ▪ 6 = Duplicate order ▪ 13 = Incorrect Qty ▪ 22 = Short sell not permitted ▪ 99 = Other ▪ 101 = Price exceeds current price band (override not allowed) 	

<u>46-47.</u>	Order Status	UInt8	Order status after applying the transaction that is being communicated: <ul style="list-style-type: none"> ▪ 0 = New ▪ 1 = Partially Filled ▪ 2 = Filled ▪ 4 = Cancelled ▪ 6 = Pending Cancel ▪ 8 = Rejected ▪ 10 = Pending New 	
<u>47-48.</u>	Order Type	UInt8	Order type applicable to the order. Applicable values: <ul style="list-style-type: none"> ▪ 2 = Limit 	
<u>48-49.</u>	Original Client Order ID	Alphanumeric Fixed Length (21)	Client Order ID of the order being amended or cancelled	Limited to maximum 8 digits
<u>49-50.</u>	Owning Broker ID	Alphanumeric Fixed Length (12)	Order owner's Broker ID as defined within the CCGG.	
<u>50-51.</u>	Password	Alphanumeric Fixed Length (450)	Password assigned to the Comp ID.	
<u>51-52.</u>	Position Effect	UInt8	Indicates whether the resulting position after a trade should be an opening position or closing position <ul style="list-style-type: none"> ▪ 1 = Close Applicable only if: Side = 1 (Buy)	
<u>52-53.</u>	Price	Decimal	Limit price of the order. Required if: Order Type = 2(Limit)	
<u>53-54.</u>	Protocol Type	UInt8	The type of protocol required by the client in order to connect to the specified service: <ul style="list-style-type: none"> ▪ 1 = Binary 	

54-55.	Primary IP	Alphanumeric Fixed Length (16)	The IP of the primary service in case of successful lookup, in x.x.x.x format.	
55-56.	Primary Port	UInt16	The port of the primary service in case of successful lookup	
56-57.	Reference Field Name	Alphanumeric Fixed Length (50)	Name of the field (as per the data dictionary) which caused the rejection	
57-58.	Reference Message Type	UInt8	Type of message rejected.	
58-59.	Reference Sequence Number	UInt32	Sequence number of the message which caused the rejection	
59-60.	Reference Test Request ID	UInt16	Required if the Heat Beat is in response to a Test Request. The value in this field will echo the Test Request ID received in the test Request.	
60-61.	Reason	Alphanumeric Variable Length (Max Length = 100)	Textual description of the transaction that is being communicated through the Execution Report, etc.	
61-62.	Request Result	UInt16	Conditionally required if the Party Entitlement Report is in response to a Party Entitlements Request: <ul style="list-style-type: none"> ▪ 0 = Valid Request ▪ 1 = Invalid or unsupported request ▪ 2 = No data found that match selection criteria ▪ 3 = Not authorized to retrieve data ▪ 4 = Data temporarily unavailable ▪ 5 = Request for data not supported ▪ 99 = Other 	
62-63.	Security Exchange	Alphanumeric Fixed Length (5)	The market which is used to identify the security: <ul style="list-style-type: none"> ▪ XSSC = Stocks listed in Shanghai Stock Exchange under Shanghai – Hong Kong Stock Connect ▪ XSEC = Stocks listed in Shenzhen Stock Exchange under Shenzhen – Hong Kong Stock Connect Required if: Security ID Source = 8 (Exchange Symbol)	

63-64.	Security ID	Alphanumeric Fixed Length (21)	Instrument identifier value of security ID source type.	
64-65.	Security ID Source	UInt8	Identifies the source of the security ID: <ul style="list-style-type: none"> 8 = Exchange Symbol 	
65-66.	Secondary IP	Alphanumeric Fixed Length (16)	The IP of the mirror service in case of successful lookup	
66-67.	Secondary Port	UInt16	The port of the mirror service in case of successful lookup	
67-68.	Session Status	UInt8	Status of the Binary session. Required if the message is generated by the CCCG: <ul style="list-style-type: none"> 0 = Session active 1 = Session password change 2 = Session password due to expire 3 = New session password does not comply with the policy 4 = Session logout complete 5 = Invalid username or password 6 = Account locked 7 = Logons are not allowed at this time 8 = Password expired 100 = Password change is required 101 = Other 	
68-69.	Side	UInt8	Side of the order: <ul style="list-style-type: none"> 1 = Buy 2 = Sell 5 = Sell Short 	
69-70.	Start Sequence	UInt32	Sequence number of the first message expected to be resent	
70-71.	Status	UInt8	Indicates whether the Lookup Request was accepted or rejected by the CCCG. <ul style="list-style-type: none"> 0 = Accepted 1 = Rejected 	

71-72.	Submitting Broker ID	Alphanumeric Fixed Length (12)	The Broker ID of the user that is submitting the new order	
72-73.	Text	Alphanumeric Variable Length (Max Length = 50)	Free Text	
73-74.	TIF	UInt8	Time qualifier of the order. Absence of this field is interpreted as Day (0). Applicable values: ▪ 0 = Day (Default)	
74-75.	Test Message Indicator	UInt8	The Test Message Indicator field will be used to indicate whether the binary client is connected to the 'Test' or 'Production Mode' of the system when the CCCG replies with a LOGON message upon a successful logon attempt: ▪ 0 = No (Production Mode) ▪ 1 = Yes (Test Mode)	
75-76.	Test Request ID	UInt16	A unique ID applicable to the Test Request.	
76-77.	Total No Party List	UInt16	The total number of Broker IDs to be returned across all fragments of Party Entitlement Report.	
77-78.	Transaction Time	Alphanumeric Fixed Length (25)	The time at which the particular message was generated Format: YYYYMMDD-HH:MM:SS.sss; UTC.	
78-79.	Trade Match ID	Alphanumeric Fixed Length (25)	Identifier assigned to a trade by a matching system	
79-80.	Trade Date	UInt32	Indicates the date of trading day (Format: YYYYMMDD) Absence of this field indicates current day. If present, may carry a date different from current date, if " Test Message Indicator in Logon message = Test Mode "	
80-81.	Throttle Action	UInt8	Indicates the action to be taken should the throttle limit be exceeded: ▪ 2 = Rejected	

81-82.	Throttle No Messages	UInt32	The maximum number of messages allowed by the throttle	
82-83.	Throttle Time Interval	UInt16	Indicates the interval of time in which the Throttle No Messages may be sent based on the Throttle Time Unit specified. Required if: Throttle Type = 0 (Inbound Rate)	
83-84.	Throttle Time Unit	UInt8	Indicates the unit in which Throttle Time Interval is expressed: <ul style="list-style-type: none"> 0 = Seconds(default if not specified) Required if: Throttle Type = 0 (Inbound Rate)	
84-85.	Throttle Type	UInt8	The type of throttle: <ul style="list-style-type: none"> 0 = Inbound Rate (Absolute Throttle Rate) 	
85-86.	Type of Service	UInt8	The type of service required by the client: <ul style="list-style-type: none"> 1 = Order Input 	
86-87.	User Name	Alphanumeric Fixed Length (50)	Any free format text for user identification	
87-88.	User Request ID	Alphanumeric Fixed Length (20)	Unique identifier assigned for the User Request message	
88-89.	User Request Type	UInt8	Indicates the action required: <ul style="list-style-type: none"> 5 = Request Throttle Limit 	

Appendices

A. Password Policy

- Length is 8 characters.
- Must comprise of a mix of alphabets (A-Z and a-z) and digits (0-9)
- Must be changed on first-time logon or first logon after reset from HKEX market operations.
- New password can't be one of the previous 5 passwords.
- Can't be changed more than once per day.
- Session will be locked after 3 consecutive invalid passwords
- Expires every 90 days.

B. Reference of Rejection Codes from Home Market

1. When New order is rejected by home market, CCCG will send Execution Report (Order Rejected) with:
Order Reject Code=99
Reason="9101 Rejected by market back-end _____ nnnnn"
where nnnnn is the error code returned by the home market (SSE or SZSE)
2. When Cancel order is rejected by home market, CCCG will send Execution Report (Order Cancel Rejected) with:
Cancel Reject Code=99
Reason="9101 Rejected by market back-end _____ nnnnn"
where nnnnn is the error code returned by the home market (SSE or SZSE)
3. Error code returned by SSE can be referred to the latest version of the error code excel document provided in the Shanghai Stock Exchange's web site of the following link:
<http://www.sse.com.cn/services/tradingservice/tradingtech/home/>
Document name: "IS111 上海证券交易所报盘软件错误代码表 n.nn 版_YYYYMMDD"
4. Error code returned by SZSE can be referred to the latest version of the Error Code section of the SZSE Trading Interface document provided in the Shenzhen Stock Exchange's web site of the following link:
<https://www.szse.cn/main/rule/jszl/>
Document name: "深圳证券交易所 Binary 交易数据接口规范(Vern.nn) [YYYY-MM-DD]"
Relevant section: "委托申报拒绝原因代码"

Note: Error codes are subjected to change by the mainland stock exchanges and therefore CCEPs should always refer the latest version of error code documents available on the web sites of respective mainland stock exchanges.

