
Interface Specifications
HKEX China Connect Central Gateway Platform
Binary Drop Copy 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 | Section 8.2 – update Data Dictionary | Revised Version |

1.2 Abbreviations

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

| | |
|-------|--|
| 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 drop copy interface of the HKEX China Connect Central Gateway platform (“CCCG”). The CCCG provides an application level interface to HKEX China Stock Connect System (“CSC”) for drop copy purpose.

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 model 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 CCCG drop copy session. 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 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

A 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 services 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 accepted, the CCCG will deliver two IP address & Port pairs (one for the primary and

one for the mirror) of CCCG drop copy 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 CCCG 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) public key circulated (through a different medium) by HKEX. The binary output of the RSA encryption must be represented in Big Endian (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 to the CCCG.

HKEX may periodically renew the public key used by the client and after a public key renewal; the 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 a 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. Logon requests that fails this validation are 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 a 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 the service should continue in the unlikely event of a process or gateway 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. Binary Session

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 **60 seconds** prior to terminating the connection. The client is expected to retry session initiation after a time of **60 seconds** has elapsed.

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 Maintaining a Binary Session

4.2.1 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 0) 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.

4.2.2 Heart Beat and Test Request

The client and CCCG will use the Heartbeat message to exercise 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 a 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 by 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.

4.3 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 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.

4.4 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.

4.5 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:

4.5.1 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.

4.5.2 When starting a new Session

4.5.2.1 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.

4.5.2.2 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.

4.6 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.

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).

4.7 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 Resets, Heartbeats and Test Requests 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 flags to indicate whether the messages were retransmitted earlier.

If PossDup flag is set to 1 = Yes, 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 to 1 = Yes, 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.

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 and the message will be processed without considering the value in the PossResend field.

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.

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.

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. Resent Request
6. Sequence Reset

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

5.7 Transmission of Missed Messages

The Execution Reports 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, all such messages 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.</p> <p>Range: 0 - 255</p> |
| 6. | Int8 | 1 | <p>Signed integer.</p> <p>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-Endian 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 | HKEX | | | | | | | |
| 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 e.g. consider an 8-bit field presence map included in the message header:

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------|-------------|-----------------|-----------|-----------------|-----|-----|-----|-----|
| Represented field | Security ID | 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. (Repeating block header field) |
| 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: <ul style="list-style-type: none"> 0 = Trade 1 = Make Market |
| 1 | Entitlement Indicator | 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 | Number of Market Segments (Repeating block header field) |
| | No Market Segment Scope Group Presence Map | This will indicate the fields/nested repeating blocks present in this repeating block |
| | 0 Market Segment ID | Identifies the Market in the entitlement scope. |
| 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 Entitlements' repeating block.

Message view:

| Order | Field | Value | | | | | | | | |
|-------|---|------------------------------------|----------|---------|--------------------|--------|-----|-----|-----|-----|
| 1 | No Entitlements | 1 (one repeating blocks indicated) | | | | | | | | |
| 2 | No Entitlements Body Field Presence map | 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.

6.4 Party Identification

Party Identification is defined as follows:

| ID | Description | Relevant Binary Field |
|--------------------|--|------------------------|
| Broker ID | 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 | The location ID of the member | Broker Location ID |
| SPSA Investor ID | Investor ID as assigned by CCASS for a Special Segregated Account (SPSA) | SPSA Investor ID |

6.5 Client Order ID

In a drop copy message Client Order ID field will be provided only if the original message submitted through the Trading interface had this field.

The same rule is applicable to Original Client Order ID field.

6.6 Order Handling

Order book updates such as new order, order cancel, resultant trade etc., will be published to the drop copy clients using Execution Report message.

6.7 Order ID

The CCCG will provide the Order ID field to identify an order in all the drop copy messages associated with order handling.

6.8 Trade ID

The CCCG will use the Trade Match ID field to identify a trade.

Trade Match ID field value is derived based on the corresponding value provided by the home market.

6.9 Execution ID

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

6.10 Execution Reports

The Execution Report message is used to communicate many different events to the drop copy 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 |
| 8 = Reject | Order Rejected Indicates that an order has been rejected (by the home market). 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 |
| 4 = Cancel | Order Cancelled Indicates that an order cancel request has been accepted and successfully processed by the home market. 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. | <ul style="list-style-type: none"> 4 = Cancelled |

6.11 Message Rejection

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 (3) message (applicable to both the client and the CCCG).

6.12 Copy Message Indicator

Copy Message Indicator field will be set to 1 = Yes for each message sent through the Drop Copy sessions in order to indicate that the given message is a drop copy of another message.

6.13 Session Contents

The client enabled for the drop copy functionality will receive a copy of each eligible Execution Report (8).

A drop copy connection is configured to receive a copy of all the Execution Reports generated for the Broker ID(s) assigned to the Drop Copy session, irrespective of the access platform (e.g., CCOG service, CCCG Trading service) used by the given Broker ID for trading.

The drop copy client may have the privilege to subscribe to one of the following drop copy options:

- Trades Only

Under 'Trades only' option, the client will have access to Execution Reports related to trades.

- Orders & Trades

Under 'Orders & Trades' option, the client will have access to all order related Execution Reports.

A drop copy client must choose the required option when subscribing to the drop copy service with HKEX market operations. This option can't be changed intra-day.

The following table describes the contents for the two subscription options:

| Business Message Type | Order and Trades Option | Trades Only Option |
|---|-------------------------|--------------------|
| Execution Report | | |
| Exec Type = Pending New | √ | X |
| Exec Type = New | √ | X |
| Exec Type = Reject <i>(i.e., the New Order request is rejected before forwarding to home market)</i> | X | X |
| Exec Type = Reject <i>(i.e., the New Order request is rejected by the home market)</i> | √ | X |
| Exec Type = Trade | √ | √ |
| Exec Type = Pending Cancel | X | X |
| Exec Type = Cancel | √ | X |
| Exec Type = Cancel Reject | X | X |

7. Message Definitions

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 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 | This message is used by CCCG to reject a message at application level. |
| 11. | Execution Report | 10 | Indicates one of the following: <ul style="list-style-type: none"> Order Registered Order Accepted Order Rejected Order Cancelled Trade |

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 In-bound Messages

Only Session-level messages are expected.

7.3 Out-bound Messages

In addition to the Session-level messages, the following lists the messages that are sent by the CCCG to the client:

1. Business Message Reject (9)
2. Execution Report (10)

7.4 Message Header

All messages exchanged between the client and the CCCG have the following standard 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 session. |
| 8. | Body Fields Presence Map | Y | Indicates the list of fields that would be present immediately after this Body Fields Presence Map field. |

7.5 Message Trailer

All messages exchanged between the client and the CCCG have the following standard message trailer.

The checksum will take into consideration the full message (i.e., fields in both Header and Body).

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

7.6 Lookup Service

7.6.1 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"> 2 = Drop Copy |
| 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 expected to be set to 1 by the client.

7.6.2 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.

7.7 Administrative Messages

7.7.1 Logon (5)

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

| Bit Position | Field Name | Required | Description |
|--------------|--------------------------------|----------|---|
| 0 | Password | N | Encrypted Password assigned to the Comp ID. Required only if the message is initiated by the client. |
| 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.

7.7.2 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. |

7.7.3 Heartbeat (0)

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

7.7.4 Test Request (1)

This message can be initiated by both 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. |

7.7.5 Resend Request (2)

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

| Bit Position | Field Name | Required | Description |
|--------------|-----------------------|----------|--|
| 0 | Start Sequence Number | Y | Sequence number of the first message expected to be resent. |
| 1 | End Sequence Number | 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. |

7.7.6 Reject (3)

This message will be 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. |

7.7.7 Sequence Reset (4)

This message can be initiated by both client and 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 |

7.8 Business Messages – Execution Reports (10)

7.8.1 Order Registered

The CCCG 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. |
| 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: ▪ 10 = Pending New |

| | | | |
|----|------------------------|---|---|
| 23 | Exec Type | Y | Execution Type that indicates the reason for the generation of the Execution Report: ▪ 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: ▪ 2 = Round Lot |
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |
| 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.

7.8.2 Order Accepted

The CCCG will send this execution report once a new order, which has already been registered (refer to [Section 7.8.1](#)), is accepted by home market.

| Bit Position | Field Name | Required | Description |
|--------------|----------------------|----------|---|
| 0 | Client Order ID | N | Client specified identifier of the order. Would be present if the order is initiated through a CCCG session, may or may not be present if the order is initiated through other access platforms. |
| 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: ▪ 8 = Exchange Symbol |
| 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 | Time In Force (TIF) | N | Time qualifier of the order. Absence of this field is interpreted as 0 = Day |
| 15 | Position Effect | N | Indicates whether the resulting position after a trade should be a closing position |
| 17 | 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. |
| 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: ▪ 0 = New |
| 23 | Exec Type | Y | Execution Type that indicates the reason for the generation of the Execution Report: ▪ 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: ▪ 2 = Round Lot Absence of this field indicates a Round (i.e., Board) Lot order. |
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |
| 40 | SPSA Investor ID | N | SPSA Investor ID |

7.8.3 Order Rejected

The CCCG will send this execution report once the new order, which has already been registered (refer to [Section 7.8.1](#)), is rejected 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: ▪ 8 = Rejected |
| 23 | Exec Type | Y | Execution Type that indicates the reason for the generation of the Execution Report: ▪ 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: ▪ 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) |

| | | | |
|----|------------------------|---|--|
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |
| 40 | SPSA Investor ID | N | SPSA Investor ID |

7.8.4 Order Cancelled

The CCCG sends this execution report once the request to cancel an order has been accepted by the home market.

| Bit Position | Field Name | Required | Description |
|--------------|--------------------------|----------|---|
| 0 | Client Order ID | N | Client specified identifier of the order. Would be present if the order is submitted through a CCCG session, may or may not be present if the order is submitted through other access platforms. |
| 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: ▪ 8 = Exchange Symbol |
| 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. Would be present if the order is submitted through a CCCG session, may or may not be present if the order is submitted through other access platforms. |
| 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 | Time In Force | 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 |
| 27 | Lot Type | N | Defines the lot type assigned to the order: ▪ 2 = Round Lot Absence of this field indicates a Round Lot order. |
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |

7.8.5 Order Cancelled – Unsolicited

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

| Bit Position | Field Name | Required | Description |
|--------------|----------------------|----------|---|
| 0 | Client Order ID | N | Client specified identifier of the order. Would be present if the order is submitted through a CCCG session, may or may not be present if the order is submitted through other access platforms. |
| 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: ▪ 8 = Exchange Symbol |
| 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: ▪ 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 |
| 27 | Lot Type | N | Defines the lot type assigned to the order. Absence of this field indicates a Round Lot order. |
| 28 | Exec Restatement Reason | N | Code to identify the reason for an Execution Report message with Exec Type= 4 (Cancel) ▪ 8 = Market Operation ▪ 99 = Other ▪ 105 = Cancel due to Broker suspension ▪ 106 = Cancel due to Exchange Participant suspension ▪ 107 = System Cancel ▪ 108 = Cancelled by home market |
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |

7.8.6 Trade (Order Executed)

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

| Bit Position | Field Name | Required | Description |
|--------------|----------------------|----------|---|
| 0 | Client Order ID | N | 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: <ul style="list-style-type: none"> 8 = Exchange Symbol |
| 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 |
| 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 |

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|----|------------------------|---|--|
| 25 | Leaves Quantity | Y | Open order quantity |
| 27 | Lot Type | N | Defines the lot type assigned to the order: ▪ 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: ▪ 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 |
| 37 | Copy Message Indicator | Y | Indicates if the message is a drop copy. |
| 38 | Trade Match ID | N | Identifier assigned to a trade by the matching system |
| 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*”.

7.9 Business Messages – Infrastructure

7.9.1 Business Message Reject (9)

This message will be initiated by CCCG and will be used to reject an application level message which fulfills session levels rules.

| 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 3 = Unspecified Message Type 4 = Application not available |
| 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. |

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 | Defines the message type: Value = Meaning <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 | |
| 6. | PossDup | UInt8 | Indicates possible retransmission of message with this sequence number: <ul style="list-style-type: none"> 0 – No (original transmission) 1 – Yes (possible duplicate) | |

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|----|------------------|--------|---|--|
| 7. | PossResend | UInt8 | Indicates that message may contain information that has been sent under another sequence number: <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 | Indicates the starting point of a message. Always set to the ASCII STX character (0x02). | |

8.2 Body Fields

| # | Field Name | Data Type | Description | Comments |
|----|------------------------------|-----------------------------------|---|----------|
| 1. | Broker Location ID | Alphanumeric Fixed Length (11) | The location ID of the Submitting Broker | |
| 2. | Business Reject Code | UInt16 | Code specifying the reason for the rejection of the business message: <ul style="list-style-type: none"> 0 = Other 3 = Unspecified Message Type 4 = Application not available | |
| 3. | Business Reject Reference ID | Alphanumeric Fixed Length (21) | The value of the business-level “ID” field in the message being referenced. | |
| 4. | Client Order ID | Alphanumeric Fixed Length (21) | Client specified identifier of the order. | |
| 5. | Copy Message Indicator | UInt8 | Indicates if the message is a drop copy: <ul style="list-style-type: none"> 1 = Yes | |
| 6. | Counterparty Broker ID | Alphanumeric Fixed Length (12) | The Broker ID on the opposite side of the trade | |
| 7. | Cumulative Quantity | Decimal | Cumulative execution quantity | |

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|-----|-------------------------|--------------------------------|---|-----------------------------|
| 8. | 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 | |
| 9. | 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 ▪ '8' = Reject ▪ 'A' = Pending New ▪ 'F' = Trade | |
| 10. | Execution ID | Alphanumeric Fixed Length (21) | Unique Execution ID assigned by the system for each Execution Report generated | |
| 11. | Execution Price | Decimal | Execution price | |
| 12. | Execution Quantity | Decimal | Execution Size | |
| 13. | 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 (for unsolicited admin / system cancel an order or trade) ▪ 99 = Other ▪ 105 = Cancel due to Broker suspension ▪ 106 = Cancel due to Exchange Participant suspension ▪ 107 = System Cancel ▪ 108 = Cancelled by home market | |
| 14. | 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 | |
| 15. | SPSA Investor ID | Alphanumeric Fixed Length (21) | Investor ID as assigned by CCASS for a Special Segregated Account (SPSA). | Limited to maximum 6 digits |
| 16. | Leaves Quantity | Decimal | Open order quantity | |

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|-----|---------------------|---|---|--|
| 17. | Logout Text | Alphanumeric Variable Length (Max = 75) | Textual reason for the logout. | |
| 18. | Lookup Reject Code | UInt8 | Code to identity 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 | |
| 19. | 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 | |
| 20. | Match Type | UInt8 | The point in the matching process at which this trade was matched: <ul style="list-style-type: none"> 4 = Auto Match | |
| 21. | Max Price Levels | UInt8 | The maximum number of price levels to trade through | |
| 22. | 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 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 | |
| 23. | New Password | Alphanumeric Fixed Length (450) | New password for Comp ID | |
| 24. | New Sequence Number | UInt32 | Indicates the sequence number of the next message to be sent by the sender | |

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|-----|--------------------------------|--------------------------------|---|--|
| 25. | Next Expected Message Sequence | UInt32 | Indicates the next expected message sequence number by the party initiating this message | |
| 26. | Order ID | Alphanumeric Fixed Length (21) | Order ID of the order | |
| 27. | Order Capacity | UInt8 | Designates the capacity of the firm placing the order <ul style="list-style-type: none"> 1 = Agency 2 = Principal | |
| 28. | Order Quantity | Decimal | Total order quantity of the order | |
| 29. | 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) | |
| 30. | 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 8 = Rejected 10 = Pending New | |
| 31. | Order Type | UInt8 | Order type applicable to the order. Applicable values: <ul style="list-style-type: none"> 2 = Limit | |
| 32. | Original Client Order ID | Alphanumeric Fixed Length (21) | Client Order ID of the order being amended or cancelled | |
| 33. | Owning Broker ID | Alphanumeric Fixed Length (12) | Order owner's Broker ID as defined within the CCG. | |

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|-----|---------------------------|---|---|--|
| 34. | Password | Alphanumeric Fixed Length (450) | Password assigned to the Comp ID. | |
| 35. | 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) | |
| 36. | Price | Decimal | Limit price of the order. Required if: Order Type = 2(Limit) | |
| 37. | 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 | |
| 38. | Primary IP | Alphanumeric Fixed Length (16) | The IP of the primary service in case of successful lookup, in x.x.x.x format. | |
| 39. | Primary Port | UInt16 | The port of the primary service in case of successful lookup | |
| 40. | Reference Field Name | Alphanumeric Fixed Length (50) | Name of the field (as per the data dictionary) which caused the rejection | |
| 41. | Reference Message Type | UInt8 | Type of message rejected. | |
| 42. | Reference Sequence Number | UInt32 | Sequence number of the message which caused the rejection | |
| 43. | 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. | |
| 44. | Reason | Alphanumeric Variable Length (Max = 75) | Textual description of the transaction that is being communicated through the Execution Report. | |

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|-----|--------------------|-----------------------------------|--|--|
| 45. | Security Exchange | Alphanumeric Fixed Length (5) | <p>The market which is used to identify the security:</p> <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 <p>Required if: Security ID Source = 8 (Exchange Symbol)</p> | |
| 46. | Security ID | Alphanumeric Fixed Length (21) | Instrument identifier value of security ID source type. | |
| 47. | Security ID Source | UInt8 | <p>Identifies the source of the security ID:</p> <ul style="list-style-type: none"> ▪ 8 = Exchange Symbol | |
| 48. | Secondary IP | Alphanumeric Fixed Length (16) | The IP of the mirror service in case of successful lookup | |
| 49. | Secondary Port | UInt16 | The port of the mirror service in case of successful lookup | |
| 50. | Session Status | UInt8 | <p>Status of the Binary session. Required if the message is generated by the CCGG:</p> <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 | |
| 51. | Side | UInt8 | <p>Side of the order:</p> <ul style="list-style-type: none"> ▪ 1 = Buy ▪ 2 = Sell ▪ 5 = Sell Short | |

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|-----|------------------------|---|---|--|
| 52. | Start Sequence | UInt32 | Sequence number of the first message expected to be resent | |
| 53. | Status | UInt8 | Indicates whether the Lookup Request was accepted or rejected by the CCG. <ul style="list-style-type: none"> 0 = Accepted 1 = Rejected | |
| 54. | Submitting Broker ID | Alphanumeric Fixed Length (12) | The Broker ID of the user that is submitting the new order | |
| 55. | Text | Alphanumeric Variable Length (Max = 50) | Free Text | |
| 56. | Time In Force – TIF | UInt8 | Time qualifier of the order. Absence of this field is interpreted as Day (0). Applicable values: <ul style="list-style-type: none"> 0 = Day (Default) | |
| 57. | 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 CCG replies with a LOGON message upon a successful logon attempt: <ul style="list-style-type: none"> 0 = No (Production Mode) 1 = Yes (Test Mode) | |
| 58. | Test Request ID | UInt16 | A unique ID applicable to the Test Request. | |
| 59. | Transaction Time | Alphanumeric Fixed Length (25) | The time at which the particular message was generated Format: YYYYMMDD-HH:MM:SS.sss, UTC | |
| 60. | Trade Match ID | Alphanumeric Fixed Length (25) | Identifier assigned to a trade by the matching system | |
| 61. | Trade Date | UInt32 | Indicates date of trading day (Format: YYYYMMDD) Absence of this field indicates current day. If present, may carry a date different from current date, in “ Test Message Indicator in Logon message = <i>Test Mode</i> ” | |

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| 62. | Type of Service | UInt8 | The type of service required by the client: <ul style="list-style-type: none"> ▪ 2 = Drop Copy | |
|-----|-----------------|-------|---|--|

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.