



China-Hong Kong Stock Connect

China Connect Open Gateway Interface Specification for Broker Supplied System (BSS) (Part 1 – Technical Overview)

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Modification History

Version	Date	Ref.	Description and reason for modification	Changed Section
1.0	28 Apr 2014	N/A	For distribution to broker firms.	N/A
1.1	25 June 2014		<ul style="list-style-type: none"> Supported dynamic market data dissemination and related messages. Support dissemination of daily quota balance using System Message. Corrected the description of suspension flag in message 2101 in appendix A. Added CC OG port number information for BSS connection in appendix A. 	6.3 Market Information 7.1.4 Market Information Update 7.2.5 Dynamic Market Data Refresh 7.3 Recovery Operations – Invalidation of public market data. 8.1.3 Other Transaction Request (OG) – Public data download request 8.3 Market Information from OG Appendix A.
1.2	7 Nov 2014		<ul style="list-style-type: none"> Support shortsell and shortsell cover. 	8.1.1 Business Transaction Requests (CSC) <ul style="list-style-type: none"> Input Bid / Ask (M0001) Cancel Order (M0003) Appendix A.
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1.4	30 Oct 2015		Support the dissemination of the TradingPhaseCode information of SSE securities in market data for Mainland's circuit breakers.	Appendix A (item 15).
1.5	5 Apr 2016		Support Shenzhen Stock Connect <ul style="list-style-type: none"> Support order cancellation by SZSE backend trading system after the order has been accepted. If an order has been accepted but is then cancelled by SZSE trading system, a cancelled-by-market notification is sent to BSS. Added market code to the quota balance system message. 	8.2. Unsolicited Order and Trade Update from CSC <ul style="list-style-type: none"> Order Rejected / Cancelled by Market (U0012) Appendix E <ul style="list-style-type: none"> Order Update Notification (UOR). 8.3. Market Information from OG <ul style="list-style-type: none"> System Message

Version	Date	Ref.	Description and reason for modification	Changed Section
			Introduce multiple market groups for trading at different markets.	Update (B0013) Appendix A (item 15). 4.1. Throttle Control Appendix A (item 16).
1.5	5 Apr 2016		Support optional Institutional Investor ID in bid order input.	8.1.1 Business Transaction Requests (CSC) ● Input Bid / Ask (M0001) Appendix A (item 14).
1.5	5 Apr 2016		Support Central Trade Feed (CTF)	6.5 Host Notification 7.2.4. Order and Trade Notification Recovery 8.1.2. On-Request Enquiry Transactions ● Order and Trade Notification Recovery (M0042) Appendix A (item 10).

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1. Introduction

1.1. Overall BSS Interface Development Approach

The objective of the China Connect Open Gateway Interface Specification is to provide functional and technical information for brokers to develop interface between Exchange-provided China Connect Open Gateway (CC OG) and their in-house Broker Supplied System (BSS) for northbound trading in Shanghai-Hong Kong Stock Connect and in Shenzhen-Hong Kong Stock Connect (this will be referred to as Stock Connect throughout the document). This interface specification is derived from the AMS/3 Open Gateway Interface Specification and messages not relevant to CC OG are removed. This approach is to maintain the same Open Message specifications as much as possible to reduce the BSS enhancement effort.

The China Connect Open Gateway Interface Specification is organised into two parts: Technical Overview and Message Definition.

- **Technical Overview:** This is to provide information on CC OG interface architecture design, message protocol structure, application message flows, and system functions description relevant to the development of the BSS. Based on these information, broker firms can determine the implementation approach and perform high-level effort estimation for developing the BSS interface.
- **Message Definition Specification:** This is to specify the interface message definition to support detailed design and programming activities.

This issue of the China Connect Open Gateway Interface Specification will cover the Technical Overview only. The intended reader of this technical document is System Developer / Technical Support personnel responsible for the BSS interface development. This issue will be subject to minor revisions.

1.2. BSS Interface Design Summary

The content of this specification will provide relevant information for BSS interface developer to obtain an understanding on the followings:

- The approach to establish physical and network level communication between CC OG and BSS via LAN.
- Transaction flow control mechanism (i.e., throttle control and invitation mechanism) design in CC OG. This mechanism will provide a basis for BSS to design the approach to submit transaction via CC OG for northbound trading in Stock Connect.
- Standard and structure to be followed in the generation of BSS open messages.
- Handling approach (e.g. different usage of the message header, message flows and recovery mechanisms) for message communication mechanisms of different message types.

- Application processing flows of BSS such as session management, database download, data recovery;
- An inventory of system functions / events and the related message flows. These information would help the developer formulate the scope and develop effort estimation for the BSS interface.

1.3. Document Structure

Section 2	Stock Connect Overview
	This section gives an overview on northbound trading in Shanghai-Hong Kong Stock Connect and in Shenzhen-Hong Kong Stock Connect.
Section 3	Network Connection
	This section describes the network protocol and configuration that can be used by BSS to establish communication channel with CC OG.
Section 4	Transaction Flow and Security Control
	This section describes specific CC OG functionality, such as transaction flow control (i.e., throttle concept, message invitation mechanism), and tunnel control. Moreover, security control is also described in this section.
Section 5	Stock Connect Open Message Standard
	This section describes the open message standard adopted for the interface between CC OG and BSS. The structure of the BSS open message (i.e., open message header, body and trailer) is included.
Section 6	Message Protocol and Recovery Mechanism
	This section describes the message flow, use of header and message recovery mechanism for different categories of messages that are grouped according to the nature of their usage.
Section 7	BSS Daily Processing and Recovery Procedures
	This section describes the application processing requirements that are triggered through background functions (e.g., daily state flow, database download / refresh, start-up, recovery operations).
Section 8	System Functions / Events
	This section describes the application-level message flows for all business transaction events supported by the northbound trading in Stock Connect. This allows the broker firms to understand the message flow for each business transaction and the flow for each external event so as to determine the set of interface functions to be

developed in accordance with their business needs.

Appendix A Functional Differences Between Stock Connect system and AMS/3.8

This section describes the functional difference between the Stock Connect system and AMS/3.8. Brokers can make use of this information to modify their AMS/3.8 BSS to support Stock Connect system.

Appendix B Open Message Example

Examples of how the open messages actually look like are given.

Appendix C Open Message Header Allowable Values

This appendix explicitly indicates the allowable format in each open message header field (e.g., sender ID, message reference).

Appendix D Open Gateway Message Tunnel Block Behaviour

This appendix describes the blocking mechanism of Host (CSC) to BS, BS to Host (CSC).

Appendix E Host Notifications within the Order Processing Cycle

This appendix provides the mapping of the triggering events (e.g., order input, order cancellation) of typical host notification (e.g., order registered, trade update) and the corresponding contents of the host notification in the order processing cycle.

Appendix F Duplicate Transaction Detection Handling Examples

This appendix provides the sample duplicate transaction detection handling mechanism suggested for BSS reference:

- Host (CSC) Connection Failure (Lost of Order Input Response)
- Host (CSC) Connection Failure (Lost of Invalid Command Response)

Appendix G Stock Connect System Date and Logical Day Number Illustrations

This appendix illustrates the logical day number and Stock Connect Date/time as sent in the 2215 (Host Availability) in different connection status (CSC-OG-BSS) for reference

Appendix H BSS-Host (CSC)-OG Session Management Further Illustrations

This appendix provides further illustrations on the session management/ handshaking between the BSS with OG (/CSC):

- OG-Host (CSC) resumes connection on Start of Day/Change of Logical Trading Day
- OG-Host (CSC) resumes connection within the same logical trading day but there are changes in the market static data

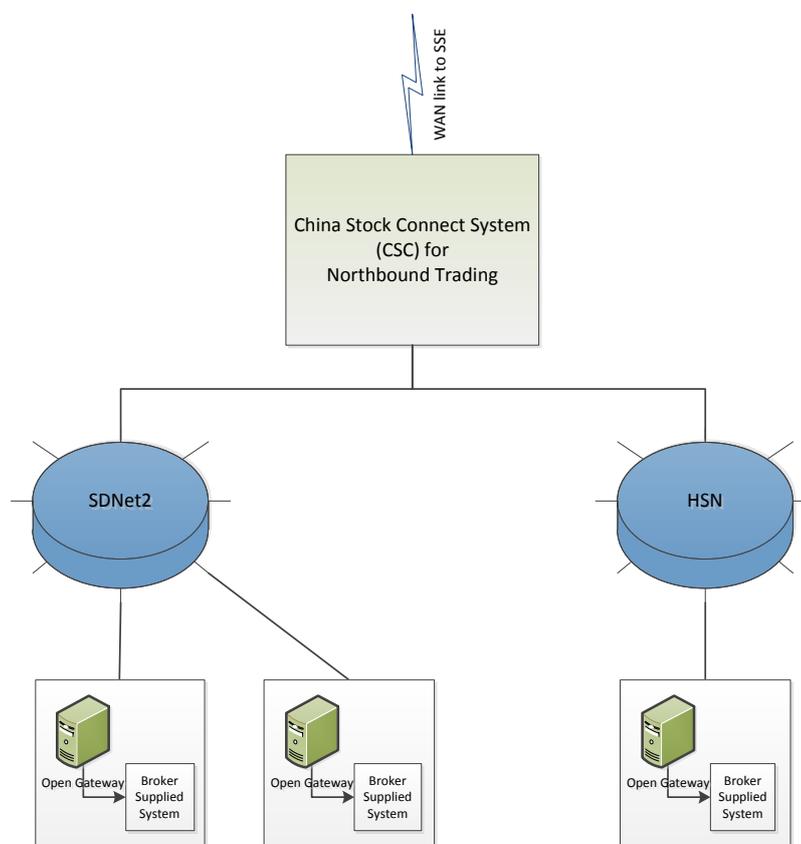
- OG-Host (CSC) resumes connection but no change in the static data

Appendix I Handling of the Market Group Assignment

This appendix is to further elaborate the Market Group concept in CSC and its association with three relevant messages 2221, 2122 and 2126.

2. Stock Connect System Overview

China Connect Open Gateway¹ (CC OG) is a Windows platform based device. It provides connection between Broker Supplied System (BSS) and China Stock Connect system² (CSC) for northbound trading. Similar to AMS/3.8 OGs, CC OG connects to China Stock Connect system via SDNet/2 or HKEx Hosting Service Network (HSN). CC OG does not equip with hardware security module and Smart Card Reader and it relies on the software based data encryption and message authentication to provide data security when transmitting message through the network. For CC OG connected to CSC via SDNet/2, it is located in broker's office or data center. For CC OG connected to CSC via HKEx Hosting Service Network, it is located in HKEx's Hosting Data Center. For trading facilities, CC OG will support an incoming TCP connection from BSS. Orders submitted by BSS are sent to CSC via CC OG, which will perform order validation and quota limit checking prior to forwarding to either Shanghai Stock Exchange (SSE) trading system or Shenzhen Stock Exchange (SZSE) trading system according to the stock code. Order confirmation returned from SSE/SZSE trading system is translated into Open Message before forwarding to the corresponding BSS. The following diagram gives an overview of the northbound trading in Stock Connect.



Note:

1. China Connect Open Gateway (CC OG) is also referred to as OG in this document.

2. China Stock Connect system (CSC) is also referred to as Host throughout this document.

3. Network Connection

This section describes the network protocol and network configuration that will be used by BSS to establish connection with CC OG.

3.1. Network Protocol

TCP/IP protocol will be used as the protocol for the connection between CC OG and BSS. The design of Open Messages is based upon delivery services provided by TCP/IP (e.g., using lower-level protocols and TCP keep-alive for detection of connection loss).

TCP/IP protocol will be used for all transaction requests, responses between BSS and CC OG. Unlike AMS/3.8, only the basic dynamic market data and the market reference data will be disseminated to BSS via CC OG.

The broker system will be responsible for establishing socket connection with CC OG using known IP address and port number.

3.2. Network Configuration

There are two basic technical configurations available in CC OG:

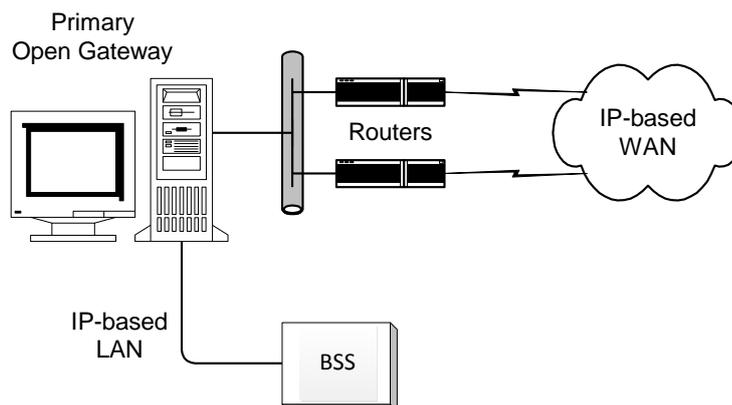
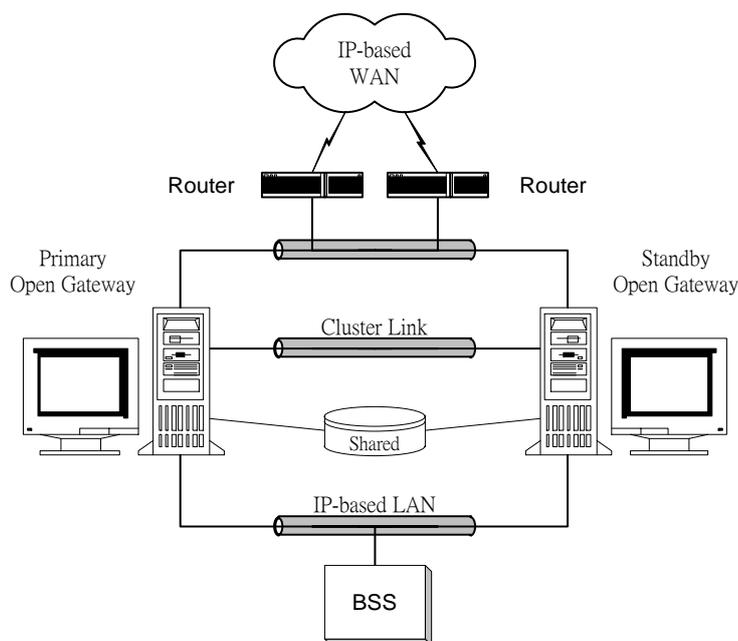
- Single-node configuration (standard option)
- Active-standby cluster configuration (high availability option)

These two configurations will have slightly different network configurations.

CC OG Configuration	Network Configuration
Single-Node Configuration	An Ethernet LAN segment is dedicated for communication between CC OG and broker system using TCP/IP protocol.
Active-Standby Cluster Configuration	For each node of the CC OG pair, an Ethernet LAN is dedicated for communication between CC OG and broker system using TCP/IP. Separate IP addresses would be set up for each node. To BSS, a single IP address would be used for establishment of socket connection with CC OG.

A higher investment cost will have to be paid by brokers who wish to choose the high availability option.

The following diagrams illustrate the set-up of the single-node and dual-node cluster configurations of CC OG:

Single-Node Configuration*Dual-Node (Active-Standby) Cluster Configuration*

In order to guarantee maximum bandwidth available for traffic between CC OG and BSS, it is recommended to separate the network segment between CC OG and BSS from other broker's in-house system.

3.3. Connection Loss

Connection loss can be caused by network failure or component failure. Any connection loss should be detected. Connection loss between two components is detected by either end of the connection using lower-level protocols.

It will be the responsibility of BSS to monitor its connection with CC OG and carry out appropriate recovery action upon detection of connection loss. For high availability configuration, if CC OG fails over to the secondary server, the BSS will be disconnected. BSS should detect the connection loss and reconnect to the clustered CC OG.

CC OG will also monitor its connection with CSC and BSS. It will inform BSS of changes in the connection status whenever there is a disconnection or connection re-establishment with CSC. If CC OG loses the BSS connection, it will perform a trading system logoff to CSC on behalf of the BSS and the BSS has to re-initiate the CSC logon upon reconnection.

4. Transaction Flow and Security Control

This section describes specific CC OG functionality such as throttle concept, message invitation mechanism, and tunnel control. Moreover, security control is also described in this section.

4.1. Throttle Control

Throttle Control is a mechanism used by CC OG to regulate the flow of transaction submission from CC OG to CSC. The implementation is effected in the form of an “Invitation Approach”.

As the throttle controller, CC OG will issue a throttle invitation to BSS to invite submission of transactions. BSS can only send a transaction to CSC for each invitation received. Business transaction messages submitted without an invitation will normally be rejected except for the sign-on message and some of the recovery messages.

The CC OG uses two types of invitations to regulate different types of business transactions in Stock Connect:

Rate Control Throttle: The invitation is based on a rate that determines the number of transactions that can be transmitted to CSC within a specific period of time. This control is applicable to order input (refer to the list in section 8.1.1 Business Transactions Request (CSC)).

Turnaround Control Throttle: The invitation is issued only when CSC has returned the response for the previous message and the readiness of the system to accept the next message. This type of throttle control applies to messages such as order cancellation and order activities enquiry (Refer to the lists in section 8.1.1 Business Transactions Request (CSC) and section 8.1.2 On-Request Enquiry Transactions).

The existence of two types of throttle invitations means that BSS can have two throttle control transactions outstanding at the same time per trading right entitlement. Moreover, the CC OG can be configured by the Exchange to issue multiple invitations simultaneously for both rate control and turnaround control according to the number of trading right entitlement associated with the broker firm.

The throttle mechanism described above is also designed to support the operation of multiple markets via the concept of market group. Each market group will issue its own throttle invitation for both the rate control and turnaround control throttles. The market group can be set-up to cover a single or multiple markets and have its own value of throttle rate. After the introduction of Shenzhen northbound trading, CSC will support both Shanghai market (market code: ASHR) and Shenzhen market (market code: ASZR). Because of the different market eligibility for CC OG devices to trade at both markets or to trade at a particular market only, different market groups will be created. One market will contain both Shanghai market and Shenzhen market and other market groups will contain either the Shanghai market or the Shenzhen market. Each CC OG will be assigned to only one market group based on the broker’s eligibility and

it will be configured by the Exchange to issue throttle invitations for that particular market group. Should additional market groups be assigned to a CC OG in the future, BSS will have to handle throttle invitations for more than one market groups and be able to select transactions of the right market in response to a throttle invitation for submission to CSC. For non-market specific transactions (such as Password Changes), the BSS is allowed to use the invitation for any market group. All throttle-controlled host (CSC) transaction messages with no mandatory security code and market code are classified as non-market specific. During the implementation of BSS, it is therefore important that the BSS be designed with the flexibility to handle multiple simultaneous throttle invitations associated with different throttle control types and different market groups. The throttle rate to be used for each market group will be published separately by the Exchange.

It should be noted that certain transaction messages from BSS to CSC (refer to the lists in section 8.1.1 Business Transaction Request (CSC) and section 8.1.2 On-Request Enquiry Transactions) are not subject to the throttle control described in the above.

4.2. Tunnel Blocking

CC OG acts as a device to allow message flow between BSS and CSC. The OG console provides a function for the administrator at the broker firm to input a command to block or un-block the tunnel for directional message flow between a pair of devices.

There are two tunnels to be controlled in CC OG:

Tunnel	Status
From Broker System to CSC	- Block or Un-block - Exchange can remotely lock / unlock this tunnel.
From CSC to Broker System	- Block or Un-block

If a tunnel is blocked, certain messages via CC OG through that tunnel will be rejected. The BSS is not required to implement any function to effect the tunnel blocking control, but it has to have a mechanism for handling transactions rejected by CC OG as a result of the blocking of the required transmission path. Please refer to Appendix D: "Message Tunnel Block" for the current CC OG tunnel block behaviour. However, this tunnel block behaviour will be subject to Exchange discretion and the changes, if any, will be published accordingly.

4.3. Security Control

In order to provide security control for access to the CSC, the following security control is imposed on the broker systems.

4.3.1. Trader Authentication

Before any trading activities can be forwarded to CSC, BSS must perform trading system sign-on.

When CC OG detects any connection loss with BSS, it would sign-off from CSC on behalf of BSS. When BSS reconnects to CC OG again, it must perform trading system sign-on.

4.3.2. Encryption/Decryption

There is no encryption / decryption for all messages between BSS and CC OG. On the other hand, message authentication and encryption will be provided for messages with sensitive information between CC OG and CSC. The message encryption and authentication are software based.

5. Stock Connect Open Message Standard

This section describes the Stock Connect open message standard for BSS to interface with CC OG. Different message types and detailed structures of the open message (e.g., open message header and body) are defined in this section. The open message standard is derived from the AMS/3.8 open message standard, with customization of messages and fields. The functional differences between CSC and AMS/3.8 are described in Appendix A, BSS developer should refer to this appendix for the changes required on their BSS to support northbound trading in Stock Connect via CSC.

5.1. Open Message Standard

The Stock Connect Open Message is platform-independent. It adopts a tag-based and ASCII-encoded message standard to allow broker firms a free choice of platforms for operating their BSS.

Message Types

a) Transactions

These messages include:

- Transaction requests from BSS to CC OG and responses from CC OG to BSS
- Transaction requests from BSS to CSC and responses from CSC to BSS

b) Market Information

These are the public market data sent from CSC / OG to BSS. These data can be used by BSS if it has to provide market information enquiry functions such as security price enquiry.

c) Control Command

These are the operational or system commands sent from CSC / OG to BSS such as database download and availability of CSC. Response will be returned by BSS.

d) Host Notification

These are the private trading information sent from CSC to BSS such as trade confirmation details when an order is matched.

Message Id

Each Stock Connect open message is identified by a 4-character value. The following table gives some examples of the messages:

Message Types		BSS-OG (Stock Connect related)
Transactions	TXN	<u>9</u> 099, 1500
Response to Transactions / Notifications	TXN(R)	<u>9</u> 199, 1572
Market Information	MIF	<u>2</u> 199
Control Command	CTL	<u>2</u> 299
Response to Control Command	CTL(R)	<u>2</u> 499
Host Notification	HNF	<u>2</u> 399, 6519

In the examples shown in above, messages with “99” as the last 2 digits of the message Id represent a group of messages each with a unique number within the same message type.

Field Tags

Data fields contained in a message are identified by labels called field tags. Each field tag is a 4 or 5-character value consisting of a 2-character tag pre-fix and a 2 or 3-character tag identifier.

Field Format

Each field defined in the open message specification is composed of numeric characters, alphabetic characters, alphanumeric characters or any printable character. The following conventions are used in defining field format.

- n Numeric character only
- a Alphabetic character only
- ap Alpha numeric character
- x Any character of the permitted character set including spaces but excluding “carriage return” and “line feed”
- d Numeric values which always takes the same form. The integer part must contain at least one digit. The fractional part may be omitted but the decimal period must remain. Neither spaces nor any other symbols are permitted.
- bp Space

[N] Sign for numeric values.

t Date/Time type and contains numeric character only with fixed length.

Example: 1500 – Broker System Order Input

The followings are sample field contents defined in the open message 1500. Note that some of the field tags are 4-character values and some are 5-character values.

Field Tag	Tag Description
2035B	SCTY-CODE
4020	BS-ORDER-REF
3035A	ORDER-QTY-FORMAT
1032L	ORDER-PRICE
1072	BROKER-COMMENT
99191	ORDER-SIDE
99192	ORDER-TYPE
99045	CNFM-FLAG (must be set to 'N')

5.2. Stock Connect Open Message Structure

The following diagram depicts the Open Message Protocol Structure:

<Message Header>

<Message Body>

<Message Trailer>

Where <Message Header> contains sufficient information to identify the message, message length, sender and receiver IDs, and message reference. The open message header is fixed-length, with all fields being mandatory. In case when some fields are not used in certain situations, the fields will be filled with spaces.

<Message Body> contains tags with values for the message Id specified in the header.

<Message Trailer> is composed of a “-“ and an optional <Security Trailer>. The security trailer is not used in Stock Connect related messages and can be ignored.

5.2.1. BSS Open Message Header

The following table shows the message header of BSS Open Protocol.

Field	Status ^[1]	Format	Comment
Message Length	M	5n	The total length (header, body and trailer) of the message sent to or received from the TCP transport layer. This field allows the receiver to determine whether a

Field	Status ^[1]	Format	Comment
			message has been fully received. If not, the receiver issues continuous reads until the entire message is received.
Message Id	M	4x	Refer to “Open Message Standard”
Sender ID	M	10x	<p>Unique ID to identify the sender of the message. Used for routing of the message.</p> <p><u>Messages from BSS to CSC/OG</u> Sender ID = BSS ID</p> <p><u>Messages from CSC to BSS</u> Sender ID = CSC ID</p> <p><u>Messages from OG to BSS</u> Sender ID = OG ID</p>
Receiver ID	M	10x	<p>Unique ID to identify the receiver of the message. Used for routing of the message.</p> <p><u>Messages to BSS from CSC/OG</u> Receiver ID = BSS ID</p> <p><u>Messages to CSC from BSS</u> Receiver ID = CSC ID</p> <p><u>Messages to OG from BSS</u> Receiver ID = OG ID</p>
Message Reference ^[2]	M	8n	<p>Used for message transfer.</p> <p>Applicable to Transactions (TXN), Transaction Responses (TXN(R)) and Host Notifications (HNF) only.</p> <p><u>Transaction requests originated from BSS</u></p> <p>BSS should maintain only one set of sequence number for transactions to CSC and OG for all broker numbers. The message reference must be a unique number and in ascending order for update type transactions (refer section 7.2.7 for the list of transactions where duplicated transaction detection applied in CSC). This will be used by the CSC to detect duplicate transactions submitted by the BSS. In the transaction response, BSS may have to use the message reference to identify the response with the original request. It should be noted that value of the message reference to CSC must not be zero.</p> <p><u>Host notification messages</u></p> <p>This field specifies the sequence number of the host notification. BSS should make use of this field together with other fields in the header for detection of loss or duplicate host notifications from CSC. Refer to section 6.5.3 Message Recovery for more information.</p>
Throttle Invitation Number	M	8n	<p>For Rate Control Throttle and Turnaround Control Throttle transactions only.</p> <p>This number is generated by OG and is sent to BSS either through Rate Control Throttle Invitation message or Turnaround Control Throttle Invitation message. The two types of invitations are differentiated by different message Ids. The BSS should use this number to send the corresponding transaction to CSC via OG.</p> <p>This is applicable to throttle-invitation messages from OG and all transactions (TXN) to CSC only.</p>

Field	Status ^[1]	Format	Comment
Broker Number ^[3]	M	4n	<p>Applicable for Transaction messages to CSC (TXN), Transaction Responses from CSC (TXN(R)), and Host Notification messages (HNF) from CSC/OG.</p> <p><u>Transaction Request and Response Messages</u></p> <p>This field should contain the broker number of the broker who initiates the transactions, if applicable. Same broker number for transaction request and response.</p> <p><u>Host Notification Messages</u></p> <p>This field specifies the broker number of the related broker of the host notification. BSS should make use of this field together with other fields in the header for detection of loss or duplicate host notifications. Refer to section 6.5.3 Message Recovery for more information.</p>

^[1] M = Mandatory

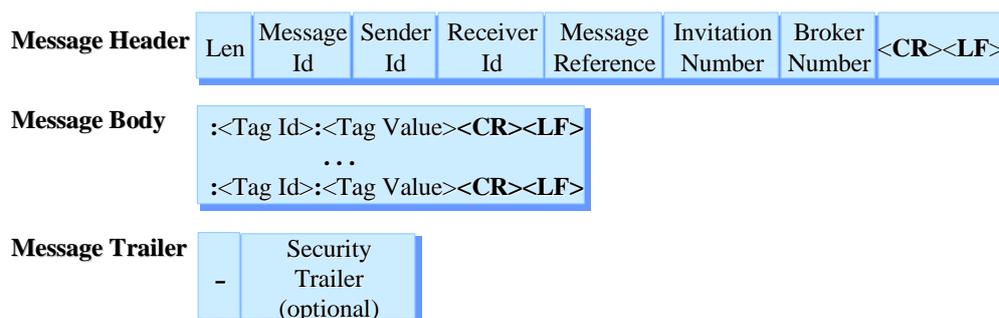
^[2] For messages related to market information, control command and its response, message reference would not be applicable.

^[3] Broker Number is applicable only to transaction messages and host notification messages.

5.2.2. BSS Open Message Body

The structure of the open message body will contain the applicable data defined in the message definition. Each data field will be consisted of a tag Id followed by the tag value.

To summarise, the following diagram depicts the structure of the open message:



It should be noted that the message body is of variable length as defined in the message header. The data fields contained in the message body have to be sequenced according to the order defined in the message standard. Optional fields are also allowed not to be included in the message if they are not relevant for a particular transaction. This means that even messages with the same message Id could have different message lengths.

5.2.3. BSS Open Message Trailer

The message trailer consists of a “-” character that signifies the end of the message body. The optional security trailer field is not used in Stock Connect transactions.

6. Message Protocol and Recovery Mechanism

This section describes different message communication mechanisms together with the associated message flows and recovery mechanisms.

6.1. General

Among all the messages to be handled by BSS, they are categorised into four groups based on the nature of their message flows:

Category	Message Flow Direction (Originator)	Message Type
Transaction	From BSS to OG / CSC	TXN, TXN(R)
Market Information	From OG to BSS	MIF
Control Command	From CSC / OG to BSS	CTL CTL(R)
Host Notification	From CSC to BSS (via OG)	HNF

6.2. Transaction

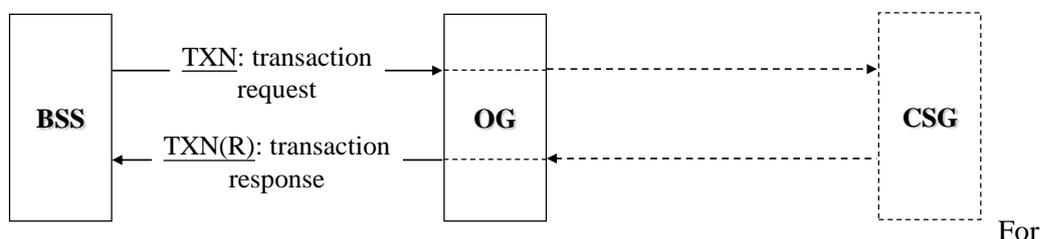
All of the transaction messages are originated from BSS to OG / CSC.

6.2.1. Message Flow and Use of Header

Transaction Messages (from BSS to OG / CSC)

Transactions originated from the BSS are designated to CC OG or Host (CSC).

The following diagram depicts the message flow for transactions originated from BSS:



each transaction request from BSS, a transaction response is returned.

The following table summarises the use of the header for the transaction flow.

BSS Open Message Header	Transaction Request – TXN	Transaction Response – TXN(R)
Message Length	Calculated by BSS	Calculated by OG
Message Id	Refer to section 5.1 Open Message Standard.	
Sender ID	BSS ID	OG: OG ID

		CSC: CSC ID
Receiver ID	OG: OG ID CSC: CSC ID	BSS ID
Message Reference ^[1]	e.g., 23100012	Same as transaction request (i.e., 23100012)
Throttle Invitation Number	OG: <Not Applicable> CSC: Invitation from OG, where applicable	<Not Applicable>
Broker Number ^[2]	OG: <Not Applicable> CSC: e.g., 3241	Same as transaction request, where applicable

^[1] The same message reference as the original request will be included in the response so that the original sender BSS can check the reply against the original request.

^[2] This is the broker number of the trader who initiates the transaction. The broker number is attached to each transaction to CSC (e.g., order input, trade input, order cancellation, enquiry requests), where applicable.

6.2.2. Message Recovery

Transaction request from BSS to CSC

The following table summarises the exception scenarios and recovery implications for the transaction requests submitted from BSS to CSC through CC OG.

Exception Scenarios	Implication
<u>Negative Acknowledgement</u>	
Rejected by OG – Format Error	BSS Program Bug
Rejected by OG – Exceeding Throttle Control	BSS to re-send the transaction upon receiving invitation from OG
Rejected by OG – BSS-CSC Tunnel Block	The tunnel block option for BSS-CSC tunnel is turned on in OG.
Rejected by OG – Host (CSC) Not Available	There is communication failure between CSC and OG due to network failure or CSC failure.
Rejected by OG – Other Error	Message Validation Error
Rejected by CSC	Transaction Validation Error
<u>Unacknowledged Transaction</u>	

Exception Scenarios	Implication
CSC Failure	<p>Under these scenarios, BSS cannot determine if the transaction request has been delivered to CSC. These unacknowledged transactions are considered as doubtful transactions.</p> <p>In such cases, the BSS should determine whether any of these doubtful transactions has to be re-submitted ^[1]. In section 7.2.7 Re-send Doubtful Transactions, the list of transactions that are subjected to duplicate transaction checking in CSC is included.</p> <p>Note that, duplicate-transaction detection only applies to update type requests such as order input and order cancellation. Other transactions will not be included in the duplicate detection mechanism. For enquiry transactions, the BSS can simply resubmit another request to CSC.</p>
OG Failure	Same as above.
Network Failure between BSS and OG	Same as above.
Network Failure between OG and CSC	Same as above.
Message time-out	BSS should implement a time-out mechanism to re-send a doubtful transaction if no acknowledgement is received after a certain period of time. If BSS has no invitation to re-send the doubtful transaction, the BSS can perform trading system logoff and then logon to obtain fresh invitations from the OG.

^[1] Both the broker number and message reference in the open message header are used by the CSC for duplicate transaction detection. On re-submission of doubtful transaction, BSS should re-send the transaction using the same broker number and message reference.

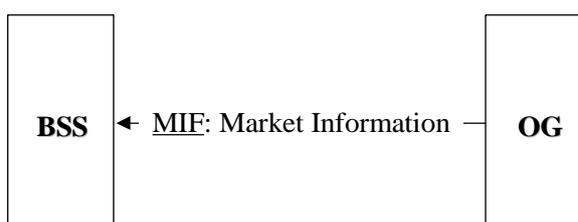
6.3. Market Information

Basic dynamic market information is provided by CSC. It is sent as market information (MIF) messages to BSS and such information can be used by BSS to provide market data enquiry functions.

Static market information can be obtained by BSS using database download request in the daily event and start-up process of BSS. Refer sections 7.1.2 database download and 7.2.3 static global and market data refresh for detailed description.

6.3.1. Message Flow

The following diagram shows the message flow for market information update from OG to BSS:



Market information is transmitted using the TCP/IP protocol and no application acknowledgement is required.

6.3.2. Use of Header

Market information messages are forwarded from OG to BSS for market information update. There is no acknowledgement for market information messages. The following table summarises the use of the header for market information:

BSS Open Message Header	Market Information – MIF
Message Length	Calculated by OG
Message Id	Refer to section 5.1 Open Message Standard.
Sender ID	OG ID
Receiver ID	BSS ID
Message Reference	<Not Applicable>
Throttle Invitation Number	<Not Applicable>
Broker Number	<Not Applicable>

Note that message reference, throttle invitation number and broker number in the open message header are not applicable for market information (MIF) messages.

6.3.3. Message Recovery

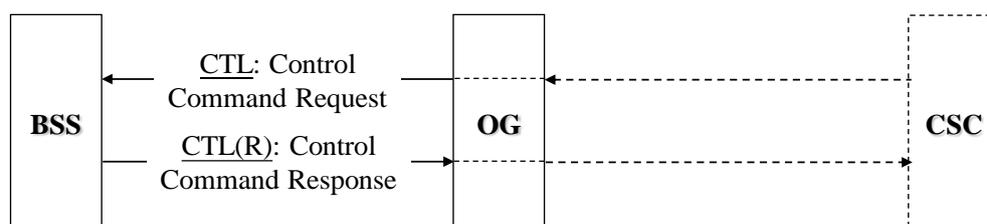
MIF messages are forwarded to BSS when there is broadcast update from CSC to OG. When OG detects any loss of broadcast messages from CSC, it would notify BSS of the missing information. The missing market information are recovered through the CSC background refresh.

6.4. Control Command

Control command messages are originated from either CSC or CC OG. They are the operational and/or system commands to BSS, including database download, end of day, data availability, handshaking information (e.g., CSC date/time, logical day number).

6.4.1. Message Flow

The following diagram depicts the message flow for control commands to BSS:



For each control command received from CC OG, BSS has to response with a CTL acknowledgement such that CSC will send the next control command after the CTL acknowledgement is received.

6.4.2. Use of Header

The following table summarises the use of header in message flow for control commands:

BSS Open Message Header	Control Command Request – CTL	Control Command Response – CTL(R)
Message Length	Calculated by OG	Calculated by BSS
Message Id	Refer to section 5.1 Open Message Standard.	
Sender ID	<i>OG:</i> OG ID <i>Host:</i> CSC ID	BSS ID
Receiver ID	BSS ID	<i>OG:</i> OG ID <i>Host:</i> CSC ID
Message Reference	<Not Applicable>	<Not Applicable>
Throttle Invitation Number	<Not Applicable>	<Not Applicable>
Broker Number	<Not Applicable>	<Not Applicable>

In order to allow the sender to identify the response for the control command request, the message Id in the header of the control command request and the message Id in the body of the control command response are used. BSS should include in the message body of control command reply the same message Id as the original request.

6.4.3. Message Recovery

CTL messages can be lost due to disconnection between CC OG and BSS, BSS system failure, or any other communication error. When BSS reconnects to CC OG, the latest status information contained in the CTL messages will be delivered to BSS on handshaking with CC OG.

6.5. Host Notification

Host notification messages sent to the BSS are divided into two types:

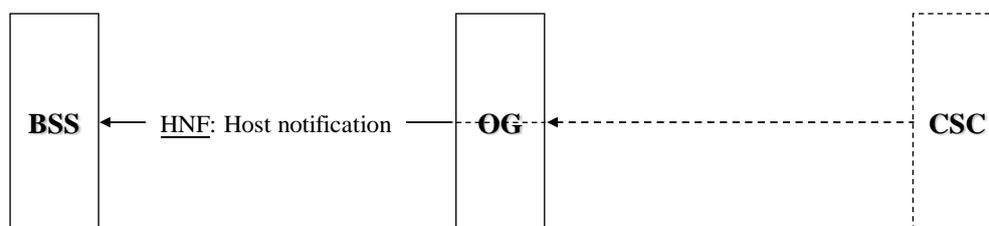
Confidential information related to order and trade confirmation (e.g., trade notification when order is matched, order update when order is cancelled)

Central trade feed information. Central trade feed allows the broker firm to centrally receive trade confirmations generated from various OGs. It should be noted that the central trade feed will not contain order confirmations.

Such messages can be used by BSS to maintain and monitor the latest order submission and trade execution status of its front office operation.

6.5.1. Message Flow

The following diagram shows the message flow for host notifications from CSC to BSS via CC OG:



CC OG would forward any host notification from CSC to BSS. No acknowledgement is required.

6.5.2. Use of Header

The following table summarises the use of header in the message flow of host notifications.

BSS Open Message Header	Host Notification – HNF
Message Length	Calculated by OG
Message Id	<u>HNF</u> : Two sets of message Ids are defined, one for ordinary order and trade confirmation, and the other for central trade feed ones.
Sender ID	CSC ID
Receiver ID	BSS ID
Message Reference	Sequence number of the host notification
Throttle Invitation Number	<Not Applicable>
Broker Number	Broker number to whom the host notification belongs

The two types of host notifications are indicated by the message Id in the host notification message. Two sets of message Ids are defined.

Types of Host Notifications	Message Ids
Ordinary Order and Trade Confirmation	6519, 7519, G519
Central Trade Feed	8519

6.5.3. Message Recovery

Host notification messages contain private and confidential order and trade information. These messages are safe-kept in CSC for retransmission to BSS if necessary.

It should be noted that, in order to receive the private host notification and central trade feed (if applicable), host notification recovery request needs to be sent to the CSC to inform it to start forwarding host notifications.

On the other hand, for a broker firm that is entitled to central trade feed, Exchange could still override and suppress the CTF in the CSC during the day, if indeed there is the need. In such scenario, a 9105 (invalid command response) will be returned as the response with the corresponding error text (e.g. “Device trade feed mode is off”).

Sequence number in host notification message

For each type of host notification, CSC would send host notification messages to each broker number in strict sequence number order. For BSS with multiple broker numbers associated, host notification messages of different broker numbers may come in any order. The two types of host notifications are distinguished by the message Ids.

Each BSS should maintain separate sequence numbers for the ordinary order and trade confirmation for each associated broker number (if the broker firm has multiple broker numbers). A separate sequence number should be maintained for central trade feed host notifications if the BSS is assigned to have central trade feed.

On receipt of a host notification message from OG, BSS should determine the type of host notification using the message Id in the header. The BSS should then use the sequence number maintained to check against the message header for detection of duplicate or loss of host notifications.

Detection of duplicate host notification message

BSS should be able to detect duplicate messages by using the following fields in the open message header:

- Message Id: to distinguish between ordinary or central trade feed
- Message reference: sequence number of each host notification
- Broker number

Duplicate messages are ignored.

Detection of loss of host notification message

Host notification messages might be lost due to network failure or component failure. BSS would detect gaps in the sequence number of the host notification messages for each broker number of each type.

On detection of any loss of host notifications for a particular broker number, the BSS should request CSC to re-send host notifications starting from the specified sequence number. In the recovery response, CSC would indicate the sequence number of the last notification to be recovered. The BSS should make use of this number to determine the end of the recovery.

It should be noted that after BSS submits the recovery request, there may be some host notification messages sent to the BSS, which are not considered as part of the recovery. BSS should ignore these in-transit host notification messages.

Disconnection from OG/CSC

Whenever BSS disconnects from OG/ CSC (system is unavailable) and reconnects to OG/CSC again (system is available), the BSS has to forward the host notification recovery request to CSC to inform it to start forwarding host notifications (if the BSS has to receive such notifications for the update of its order processing and trade

execution status). This also includes the case that BSS needs to forward the host notification recovery to the CSC on the start of new trading day.

6.6. Outstanding Transactions

A transaction is considered completed when the transaction response is received by the original sender. For different types of message flows described in this section, some of them require an acknowledgement. The following table summarises the number of outstanding transactions allowed for each category of messages:

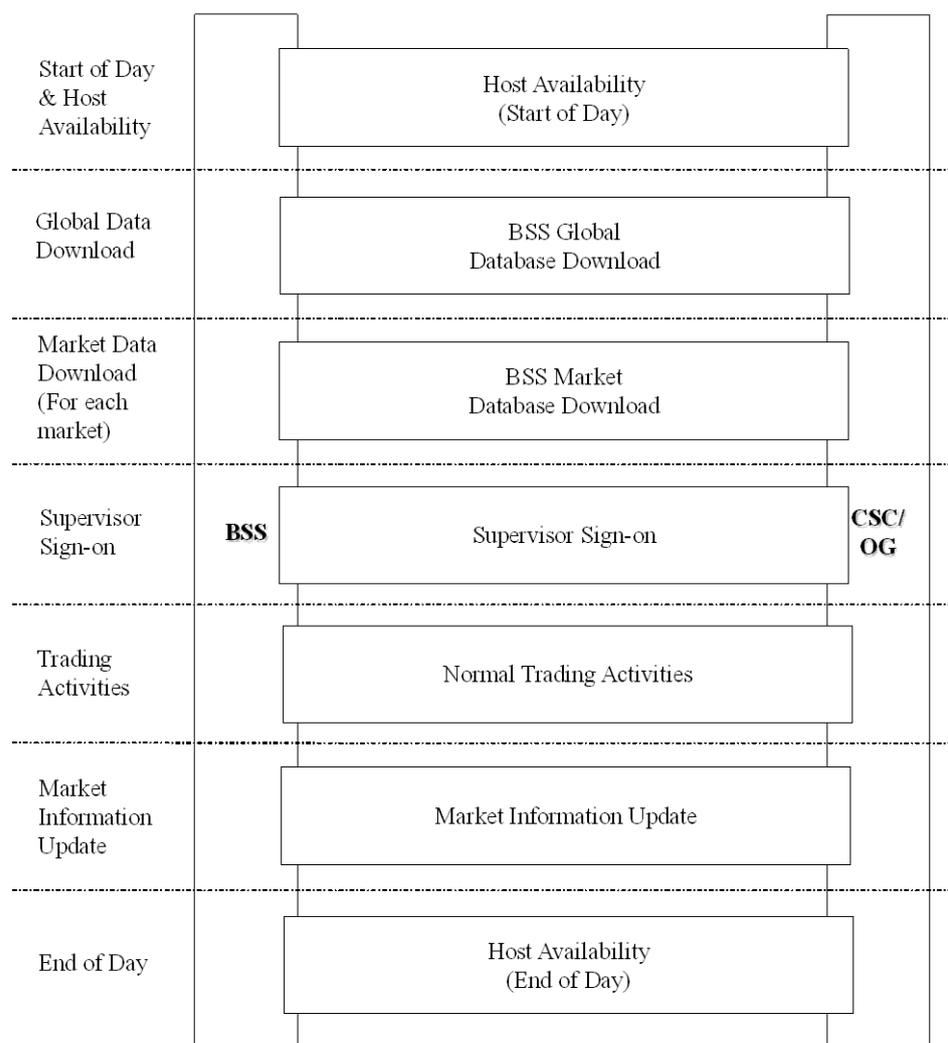
Category	Nature of Message Flow	Maximum Number of Outstanding Transactions
Transaction	Transaction messages (throttle control) originated from BSS to CSC	One or multiple according to throttle invitation from OG
	Transaction messages (no throttle control) originated from BSS to CSC	Multiple
Market Information	BSS submits request on static market information and OG replies the information to BSS.	Not applicable (No acknowledgement)
Control Command	Control command from CSC / OG to BSS	One by one (Acknowledgement is required before another control command is sent)
Host Notification	Host notifications from CSC to BSS	Not applicable (No acknowledgement)

7. BSS Daily Processing and Recovery Procedures

This section describes the application processing requirements in BSS such as database download, session management, recovery mechanism, etc.

7.1. Daily Events in Broker Systems

The following diagram shows the sequence of events of which a BSS has to go through for a cycle of one trading day.



This section will focus on the daily events for BSS under normal situation. It is assumed that BSS has performed logon to the CC OG prior to the start of a trading day and is pending for the availability of Host (CSC). If the BSS logon to CC OG occurs after CSC has completed its Start of Day events (refer to section 7.1.1 Host Availability (Start of Day) and section 7.1.2 Database Download), the BSS has to go through a different sequence of events and message flows as described in section 7.2 Start-up Flow.

7.1.1. Host Availability (Start of Day)

Host would notify BSS of its readiness for all markets for the next trading day by sending Host availability. The Host availability message could be sent out well before the commencement of the trading hours and it will contain the following information:

- CSC date/time and logical day number
- Availability of Host (CSC)

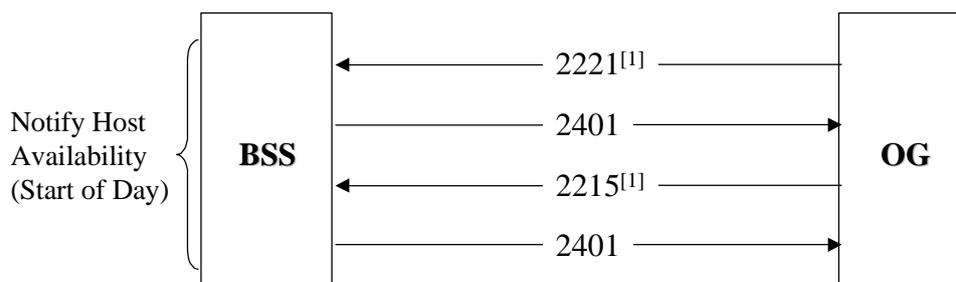
BSS should determine from the logical day number whether it is the next trading day. It should then perform necessary tasks to prepare for the day's trading activities including:

- Reset host notification sequence number of each broker to zero
- Reset central trade feed (if any) sequence number to zero

Moreover, latest CC OG configuration details would also be sent to BSS. Examples of CC OG configuration details include:

- List of broker numbers, mode of individual brokers (Normal Traders vs. Registered Traders, RT) and their trading eligibility (Registered trader is not supported in CSC)
- OG device ID
- OG tunnel blocking information
- List of all RT securities assigned and the minimum volume obligation and spread obligation associated with each RT security (Registered trader is not supported in CSC, so these information should not be available).

The following diagram summarises the message flow:

**Related Messages**

2215	(O-MHA)	Host Availability
2221	(O-MOC)	OG Configuration
2401	(O-MCA)	Control Command Acknowledgement

^[1] These messages will be sent in any order from OG.

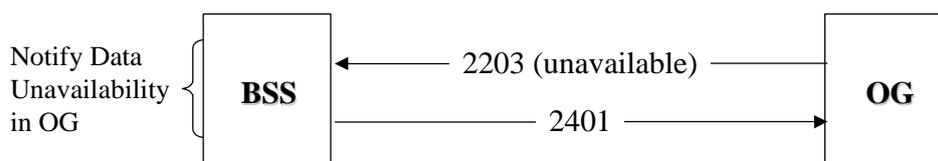
7.1.2. Database Download

In CSC, database download includes “global” and “market” database download. The download could be started closely after CSC has sent out its “Start of Day” message. Common, non-market specific data such as spread table are sent during global database download while market-specific data such as trading time table and securities data are sent during each market database download. Global database download is performed once a day, and it will be followed by database download for each of the markets.

For each database download, CSC will download the data to CC OG first. When the database download begins in CC OG, CC OG will notify BSS of the unavailability of the data. During the database download in CC OG, BSS will not be able to request for the data. When the database download is completed in CC OG, it will notify any connected BSS of the availability of the particular data. Upon receiving the notification of data availability, if BSS has to capture such data for its operation, BSS could send “Public Data Download Request” (9016) to CC OG specifying the requested data type. CC OG will then forward the corresponding data to BSS. The end of the data download process is indicated by “End of Database Download” (2204) message. BSS will then response with a generic acknowledgement (2401).

Data Unavailability

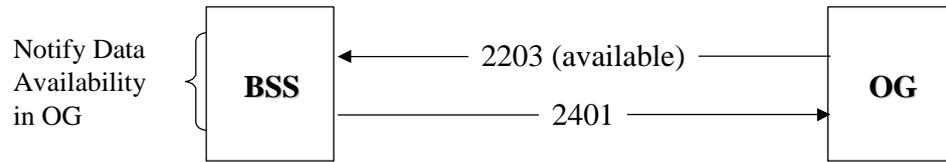
The following diagram depicts the message flow when CC OG notifies BSS of data unavailability at the beginning of database download.

**Related Messages**

2203	(O-MDA)	Data Availability
2401	(O-MGA)	Control Command Acknowledgement

Data Availability

The following diagram depicts the message flow when CC OG notifies BSS of the data availability after completion of database download from CSC.

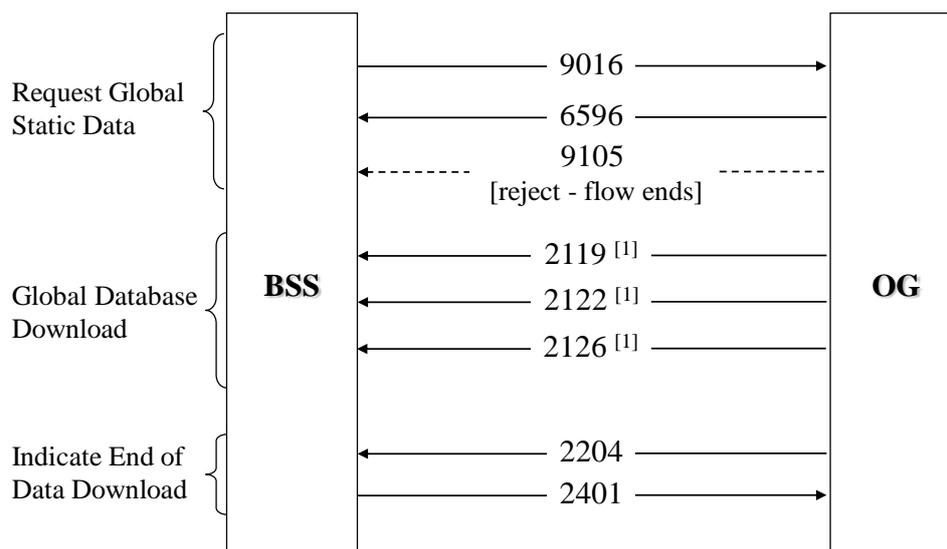


Related Messages

2203	(O-MDA)	Data Availability
2401	(O-MGA)	Control Command Acknowledgement

Global Database Download

BSS is required to perform the global database download so that it can make use of the mapping between market and market group to determine which invitation to use for submitting transactions to CSC. The following diagram depicts the message flow when BSS initiates global public data download after CC OG notifies it of the availability of global data.



Related Messages

9016	(O-EDR)	Public Data Download Request
6596	(O-RVC)	Valid Command Response
9105	(O-RIC)	Invalid Command Response
2119	(O-BSP)	Spread Table Information
2122	(O-BMS)	Market Static Information
2126	(O-BMG)	Market Group Information
2204	(O-MEL)	End Database Download
2401	(O-MGA)	Control Command Acknowledgement

[1] A number of messages may be sent.

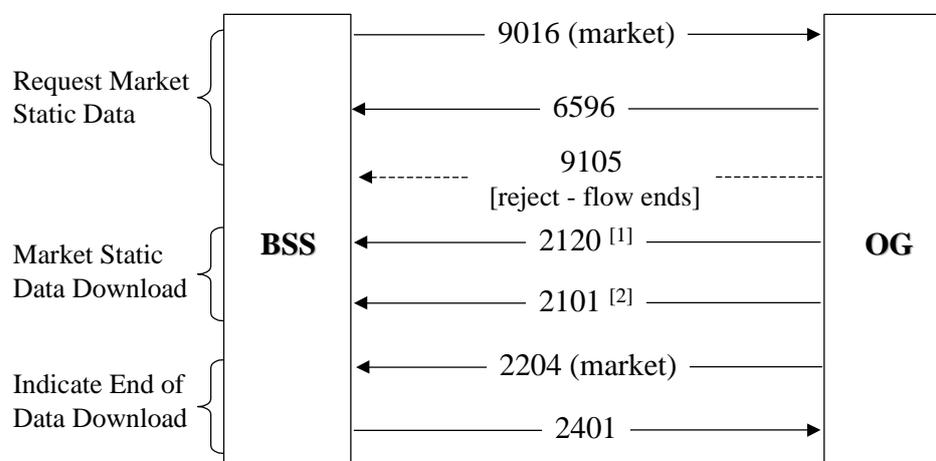
To summarise, the following information is sent during global database download:

- *Spread table information:* Spread table information includes the spread interval for each price range. This table can be used by BSS for verifying the price of an input order before the order is submitted to the CSC.
- *Market static information:* Static information of a market includes market code, market name, etc.
- *Market group information:* Market group information specifies what markets are contained in each market group. The market group is used by BSS to determine which invitations to use for submitting transactions to CSC.

Refer to section 8.3 Market Information from CC OG for the detailed description of these data sent to BSS during global database download.

Market Database Download

If BSS has to capture market data for its operations, it can perform market database download for relevant markets. The following diagram depicts the message flow when BSS initiates market public data download after CC OG notifies it of the availability of static data of a market.



Related Messages

9016	(O-EDR)	Public Data Download Request
6596	(O-RVC)	Valid Command Response
9105	(O-RIC)	Invalid Command Response
2120	(O-BTT)	Market Trading Timetable
2101	(O-BCS)	Security Static Information
2204	(O-MEL)	End Database Download
2401	(O-MGA)	Control Command Acknowledgement

[1] Trading timetable for each market may be sent in separate messages.

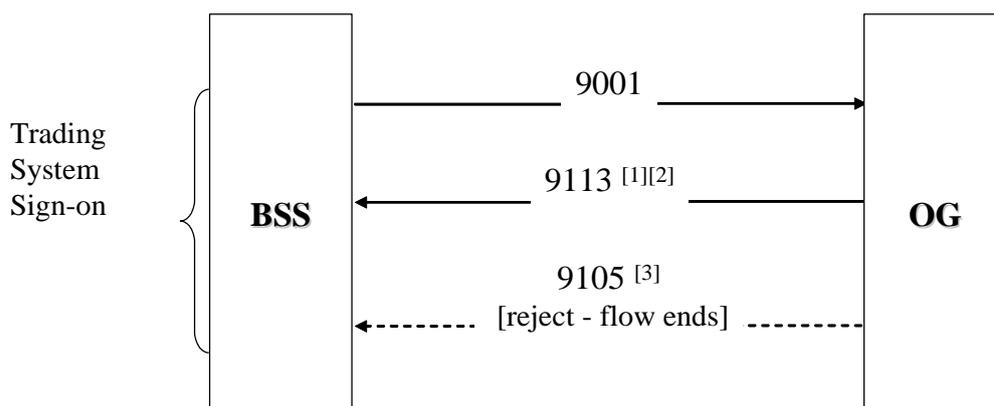
[2] Separate message is sent for each security static information

To summarise, the following information is sent during each market database download:

- *Market trading timetable*: No market trading timetable information is available in CSC, and the number of trading session for market is always 0.
- *Security static information*: Information of a security that are less likely to change during the day are included as part of the security static information. Security static information includes common security data (e.g., related market, security name, lot size) as well as instrument-specific data. This will be used by BSS if it has to provide price enquiry functions for securities.

Refer to section 8.3 Market Information from CC OG for the detailed description of these data sent to BSS during market database download.

7.1.3. Supervisor Sign-on



Related Messages

9001	(O-CGL)	Trader/BS Supervisor Sign-On
9113	(O-RGL)	Trader/BS Supervisor Sign-On Response
9105	(O-RIC)	Invalid Command Response

^[1] Last message reference number per broker number returned in BS Supervisor Sign-On Response is always set to zero.

^[2] BS Supervisor Sign-on Response carries the number of days before password expiry information. BSS user must change the password before its expiry.

^[3] Trader account will be suspended if there are 3 consecutive unsuccessful sign-on attempts due to incorrect password.

BSS have to carry out supervisor sign-on before any order requests can be forwarded to CSC. Once after the sign-on has been performed, CC OG would issue the invitations 9010(Rate-Control Throttle Invitation) and 9021(Turnaround Control Throttle Invitation) to BSS. BSS has to discard the throttle invitations received previously (e.g., in the previous trading day), if the invitations are still kept, and should use the newly issued throttle invitations. If BSS attempts to use the discarded invitations, the transactions will be rejected due to the invalid invitations.

Note:

1. The supervisor sign-on response carries a number which indicates the number of days remaining before the password expires. The BSS user must change his/her password before its expiry unless “No password expiry” exemption has been granted. The user account is suspended when the password expires.
2. If there are 3 consecutive unsuccessful sign-on attempts due to incorrect password for the same trader account, the trader account is automatically suspended.

7.1.4. Market Information Update

Basic dynamic market information update is provided in CSC. During the trading hours, securities information and price data would be updated as a result of market events. These updates are transmitted to BSS as market information update (MIF).

The following table summarises the list of messages that are forwarded from CC OG to BSS for any update on the public market information:

Message Id		Message Description
2101	O-BCS	Security Static Information
2102	O-BCD	Security Dynamic Information (price data)
2112	O-BBD	Security Dynamic Information (price data) in Binary Format ^[1]
2123	O-BSM	System Message

^[1] The security dynamic information message (2112) carries the same information as the message 2102 but its content is in binary format. Forwarding security dynamic data in binary format is an optional request specified in BS Session Logon to OG Message (9009).

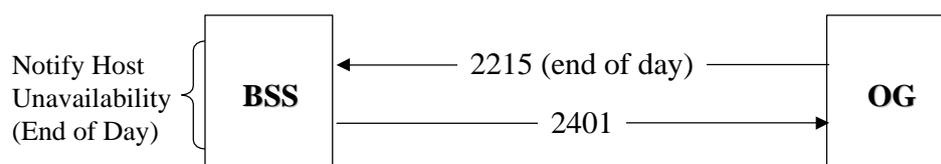
Note that security static and dynamic information are sent as separate messages respectively. Security static information (e.g., market code, security name, lot size) includes information of a security that are less likely to change during the trading hours. On the other hand, security dynamic information (e.g., latest trade price, best bid and best ask price) include information of a security that are likely to change during the trading hours.

Refer to section 8.3 Market Information from CC OG for more information.

7.1.5. Host Unavailability (End of Day)

Host (CSC) would notify BSS of the end of the trading day for all markets through Host unavailability message. After “End of Day” is received and before the beginning of the next trading day for all markets, CSC would perform housekeeping. Any CSC-related processing and enquiry transactions would be rejected.

The “end of day” status of CSC is sent to BSS through the “Host Availability” message with the “end of day flag” set to true.



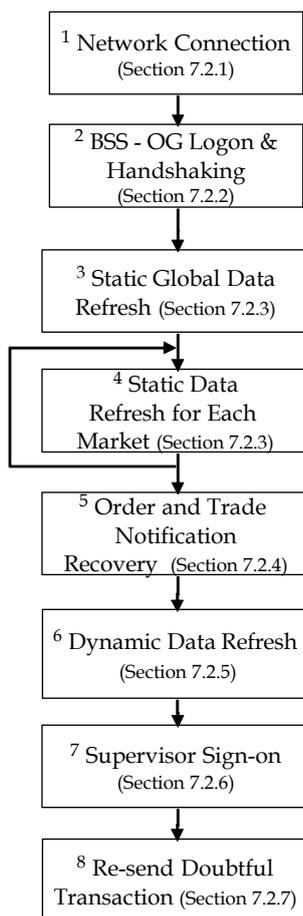
Related Messages

2215	(O-MHA)	Host Availability
2401	(O-MCA)	Control Command Acknowledgement

7.2. Start-up Flow

This section describes the system start-up procedures for BSS and its session/connection establishment with various components of the CSC.

The following diagram shows the high-level event flow for BSS start-up.



Note that each of the data refresh defined in the sequence above are optional and can be executed or omitted depending on the state of the BSS and the functions the BSS has to support.

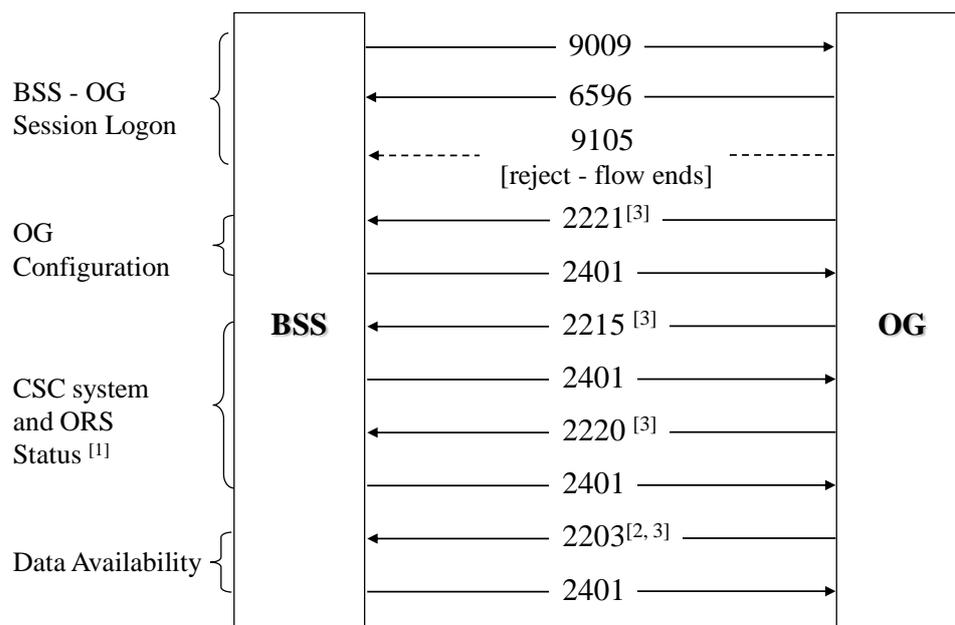
In order to minimise the time to resume trading, step 7 and 8 can be performed before the data refresh.

Each of these events is described in the following sub-sections.

7.2.1. Network Connection

On start-up, BSS will establish network connection with CC OG. If CC OG is not available, BSS should try to establish network connection with CC OG after a certain time.

7.2.2. BSS – OG Logon and Handshaking



Related Messages

9009	(O-CSL)	BS Session Logon to OG
6596	(O-RVC)	Valid Command Response
9105	(O-RIC)	Invalid Command Response
2221	(O-MOC)	OG Configuration
2215	(O-MHA)	Host (CSC) Availability
2220	(O-MOA)	ORS Availability
2203	(O-MDA)	Data Availability
2401	(O-MGA)	Control Command Acknowledgement

^[1] CSC system and ORS status messages are forwarded from OG to BS. The ORS availability is always set to 'N' in message 2220.

^[2] A separate data status message is sent for global data, and for each market

^[3] These messages can be sent in any order depending on OG.

BSS Session Logon to CC OG

“BSS Session Logon to OG” (9009) is sent from BSS to CC OG after a connection is established. In this message, BSS may optionally request to receive dynamic security information in tag based format or in binary format. If it is not specified in “BSS Session Logon to OG”, the default is to receive in tag based format. The optional tag for indicating whether BSS can support 18-digit order sequence number (tag 99863) is not used in CSC. The presence of the unused tag is to retain the message compatibility with AMS/3.8 broker system.

The following table shows the message definition of 9009:-

Tag Id	Description	M/O	Occurs	Format
99862	BINARY-SCTY-DYNAMIC-FLAG	O	-	1x
99863	LONG-OSN-SUPPORT-FLAG	O	-	1x

The following example shows the message content of 9009.

1	000729009BS00010212	00000201	<CR><LF>
2	:99862:Y<CR><LF>		
3	-		

On reconnection with CC OG, BSS should reset all throttle invitations received from CC OG during the last session.

Session Handshaking

If the session logon is accepted, the following information will be returned from CC OG to BSS.

- OG Configuration
 - List of broker numbers, mode of individual brokers and their trading eligibility
 - OG device ID
 - OG tunnel blocking information
 - List of all RT securities assigned, which is always empty as registered trader is not supported in CSC.
- Host status information ^[1]
 - Host (CSC) Availability
 - CSC date/time and logical day number
 - End of Day Flag
- ORS-OG connection establishment status is always set to 'N'.
- Market data availability for each type of global and market data

^[1] As described in section 7.1.1 Host Availability (Start of Day), BSS should make use of the CSC status information to perform necessary operations.

7.2.3. Static Global and Market Data Refresh

If BSS wants to obtain the latest market information from CSC for the support of market data enquiry functions, database refresh should be performed when BSS reconnects to CC OG every time. During session handshaking, CC OG will indicate which markets are available for download. BSS will perform data refresh for static global information and static market information for each market. CC OG would send corresponding market information to the brokers.

The message flows for static global and market data refresh are the same as that of BSS database download described in section 7.1.2 Database Download. That is, BSS would request from CC OG the particular type of data to download. CC OG would then

forward the data to BSS. The end of the data download request is indicated by the “End of Database Download” message.

7.2.4. Order and Trade Notification Recovery

On any re-connection with CC OG, if CSC is available, BSS may have to inform CSC to start sending host notifications through “Host Notification Recovery” message. The BSS may have to use order and trade confirmations from CSC to update the status and execution details for its orders. Moreover, the BSS has to send separate recovery messages to CSC for each broker number represented by it.

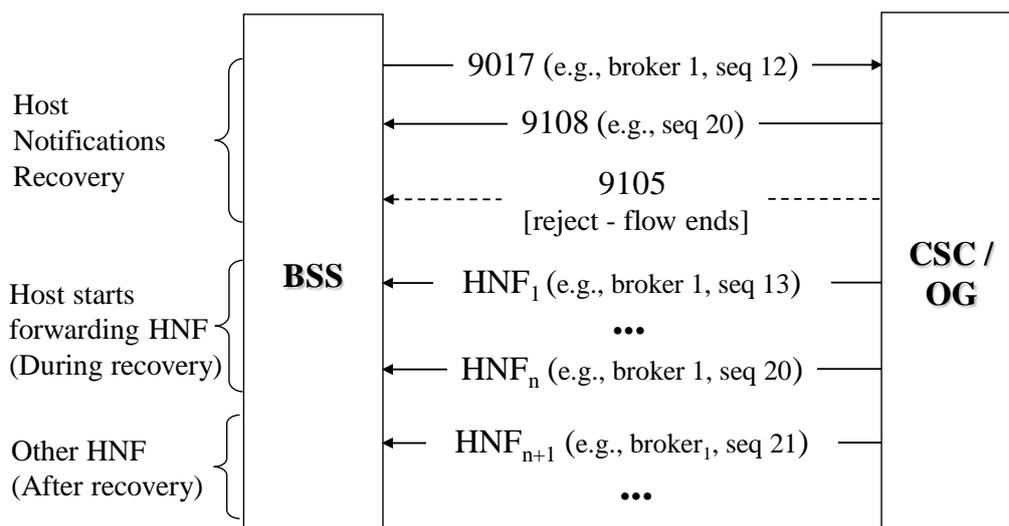
For each recovery request, BSS has to specify the sequence number of the last host notification received. In response to the recovery request, “Host Notification Recovery Response” is replied from CSC, which includes the sequence number of the last host notification to be recovered. CSC would then start forwarding notifications to the BSS for the specified broker from the sequence number following the “last host notification received” as provided by BSS, i.e., “last notification received” + 1.

When it is the beginning of a new trading day, BSS should request CSC to start forwarding notifications from the sequence number of zero. In this case, the response to the request will include a sequence number of zero.

On the other hand, on any re-connection with CC OG after beginning of the trading day, BSS should specify the sequence number of the last host notification received. For example, if the sequence number of the last received host notification is n, BSS should specify the sequence number of n in the recovery request.

Moreover, if the BSS accepts central trade feed information, it should also send “Host Notification Recovery” request for central trade feed host notifications.

The following diagram depicts the message flow for recovery of host notifications for each broker number or for central trade feed:



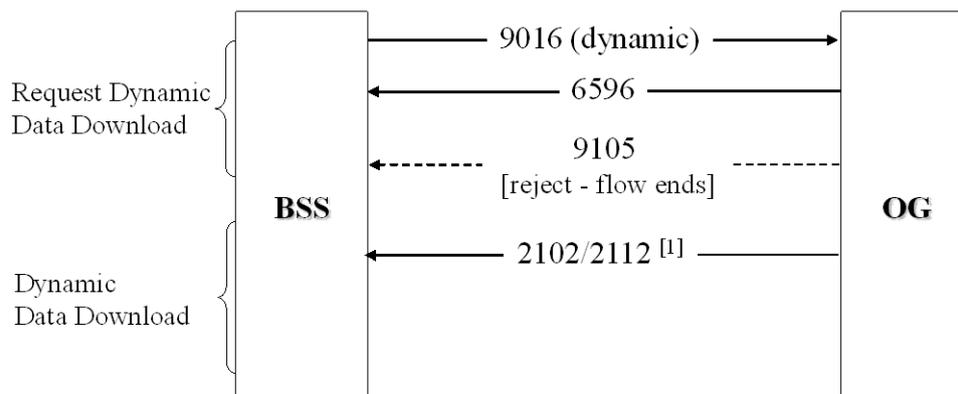
Related Messages

9017	(O-CNR)	Host Notification Recovery
9108	(O-RNR)	Host Notification Recovery Response
9105	(O-RIC)	Invalid Command Response

In the above diagram, BSS requests CSC to re-send host notifications for a broker by indicating the sequence number of the “last host notification received” is 12 , say broker 1. The response to recovery request indicates that the last host notification to be recovered will be of sequence number of 20. CSC would then start forwarding the host notification from sequence number of 13. When the BSS receives the host notification of sequence number of 20 for broker 1, the recovery of orders and trades for broker 1 has been completed.

7.2.5. Dynamic Market Data Refresh

BSS will not be able to receive market public data from CC OG on disconnection with CC OG. If BSS has to support price enquiry functions, all its local dynamic price data should be marked as outdated under such a case. After static global and market data refresh, BSS can then request for dynamic market data refresh from CC OG.

**Related Messages**

9016	(O-EDR)	Public Data Download Request
6596	(O-RVC)	Valid Command Response
9105	(O-RIC)	Invalid Command Response
2102	(O-BCD)	Security Dynamic Information
2112	(O-BBD)	Security Dynamic Information in binary format

^[1] Separate message would be sent for each security.

Once the market dynamic data recovery request has been received by CC OG, a snapshot of the current dynamic data for all securities will be sent. It should be noted that new broadcasts from CSC are forwarded to BSS once BSS has established session with CC OG. During dynamic market refresh, new broadcasts are also forwarded to the BSS at the same time. The dynamic market data refresh should be performed per market and CC OG would provide a snapshot of the corresponding market dynamic data to the BSS.

7.2.6. Supervisor Sign-On

When BSS is ready to start trading (i.e., after system-wide start of day, database refresh, orders and trades recovery), it can then perform trading system sign-on. This step is the same as that mentioned in section 7.1.3 Supervisor Sign-on^{[1][2][3]}. Once after the sign-on has been performed, CC OG would issue the invitations 9010(Rate-Control Throttle Invitation) and 9021(Turnaround Control Throttle Invitation) to BSS. BSS has to discard the throttle invitations received previously (e.g., in the previous trading day), if the invitations are still kept, and should use the newly issued throttle invitations.

^[1] Last message reference number per broker number returned in “BS Supervisor Sign-On Response” is always set to zero.

^[2] The supervisor sign-on response carries a number which indicates the number of days remaining before the password expires. The BSS user must change his/her password before its expiry unless “No password expiry” exemption has been granted. The user account is suspended when the password expires.

^[3] Trader account will be suspended if there are 3 consecutive unsuccessful sign-on attempts due to incorrect password.

7.2.7. Re-send Doubtful Transactions

Doubtful transactions (transactions with outstanding acknowledgement from the receiving system) exist in BSS as a result of network failure or other CSC component failure or time-out by BSS. After trading system sign-on to CSC, BSS should re-send the doubtful transaction based on the business need. CSC will reject the resent transaction as a duplicate if it has been previously received by the CSC prior to the point of failure.

Duplicate-transaction detection only applies to update type requests to CSC. Other transactions will not be included in the duplicate detection mechanism. The following table summarises the list of transactions where duplicate transaction detection applies in CSC:

Open Message Id	Description
1500	Order Input
4592	Order Cancel

For example, in BSS, any unacknowledged board lot order input would be re-sent to CSC. However, enquiry transaction need not be re-sent. Refer to section 6.2.2 Message Recovery for more information.

It should be noted that “Re-send Doubtful Transaction” is not required for a normal BSS start-up for the commencement of a new trading day.

7.3. Recovery Operations

This section would describe the recovery process for BSS on

- Component failure
- Network failure between BSS and CC OG
- Network failure between CC OG and Host (CSC)
- Recovery of All Orders and Trades
- Invalidity of Public Market Data

7.3.1. General

Recommended recovery approaches in BSS would be:

- Only necessary data for traders to carry on with their normal trading operations would be recovered. Host notification could be recovered by specifying the sequence number of last host notification received, so that the time for recovery can be reduced (Refer to section 7.2.4 Order and Trade Notification Recovery). Dynamic data should be recovered via database refresh (refer to section 7.2.5 Dynamic Market Data Refresh).

- BSS should request for complete database recovery (e.g. orders and trades recovery) if local database is corrupted.
- Local information such as client particulars and credit balances in BSS is recovered from tape backup on disaster failure.

7.3.2. Component Failure

Any failure in BSS should require performing the start-up procedures as described in section 7.2 Start-up Flow.

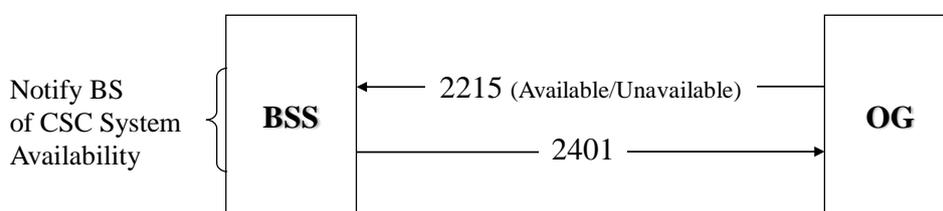
7.3.3. Network Failure between BSS and CC OG

Network failure between BSS and CC OG can happen as a result of network failure or CC OG component failure. In both cases, BSS should follow the start-up flow as described in section 7.2 Start-up Flow, including logon with CC OG, database refresh, orders and trades recovery, trading system sign-on, discard the previously received throttle invitations and accept the newly issued throttle invitations from CC OG, and re-send doubtful transactions.

7.3.4. Network Failure between CC OG and Host (CSC)

When there is any network failure between CC OG and CSC, CC OG would notify BSS of CSC unavailability. BSS would wait for CC OG to re-establish connection with CSC and notify BSS through the message “Host Availability” (available). As CC OG will discard all outstanding invitations as soon as the CSC is unavailable, therefore, BSS should not send these messages to the CC OG as it should already be aware that the CSC is not available. Otherwise, the initial CC OG validation will reject the message using the previously received invitation numbers with 'invalid invitation' as the error message. When CC OG reconnects to CSC, CC OG would perform the corresponding recovery/data integrity checking. And therefore, CC OG would always recover the global database to check the data integrity; hence, 2203 (Global unavailable) and 2203 (Global available) would always be sent out.

The following diagram shows the message flow for CC OG to notify BSS of Host (CSC) availability:



Related Messages

2215	(O-MHA)	Host Availability
2401	(O-MGA)	Control Command Acknowledgement

Upon notification from CC OG on Host (CSC) availability, BSS should perform the corresponding actions based on the following three different failure scenarios:

a) OG-CSC resumes connection on Start of Day/Change of Logical Trading Day

- This case would be the same as indicated in Section 7.1 Daily Events in Broker Systems where BSS would be notified that the trading day (logical day number) has changed in the host availability message.
- BSS should perform the global database, market static database rebuilt, Host notification recovery, supervisor sign-on as indicated in the Section 7.1. Daily Events in Broker Systems.

(Please also refer to “Appendix H - BSS-Host-OG Session Management Further Illustrations” for the details)

b) *OG-CSC resumes connection within the same logical trading day but there are changes in the market static data or the static data are corrupted*

- In the normal business operations, it is possible to have changes in the market static data, though rare, within the same logical trading day (*note: Global static database data would not be changed within the same trading day*) or with the static data corrupted. Therefore, CC OG would always first recover the Global static data to check for the data integrity.
- If CC OG determines there are changes in the market static data or the static data are corrupted, then CC OG would perform the recovery. During the recovery, CC OG would notify BSS on the unavailability of the data (through 2203). Upon completion, CC OG would notify the availability of the corresponding market static data
- For those static data without changes / uncorrupted, CC OG would notify the availability of the data (without sending out the corresponding data unavailability)
- BSS should recover the corresponding market static data (but could ignore static database download of the global database and the other market static database)
- BSS should perform host notification recovery, supervisor sign-on to CSC, discard the previously received throttle invitations and accept the newly issued throttle invitations from CC OG, and re-send doubtful transactions

(Please also refer to “Appendix H - BS-CSC-OG Session Management Further Illustrations” for the details)

c) *OG-CSC resumes connection but no change in the static data*

CC OG finds that there are no changes in the static data and therefore would notify the BSS the availability of all the static data (global and market static)

- It is not necessary for BSS to perform any static database refresh because there would be no changes in the static data.
- BSS should perform host notification recovery, supervisor sign-on to CSC, discard the previously received throttle invitations and accept the newly issued throttle invitations from CC OG, and re-send doubtful transactions

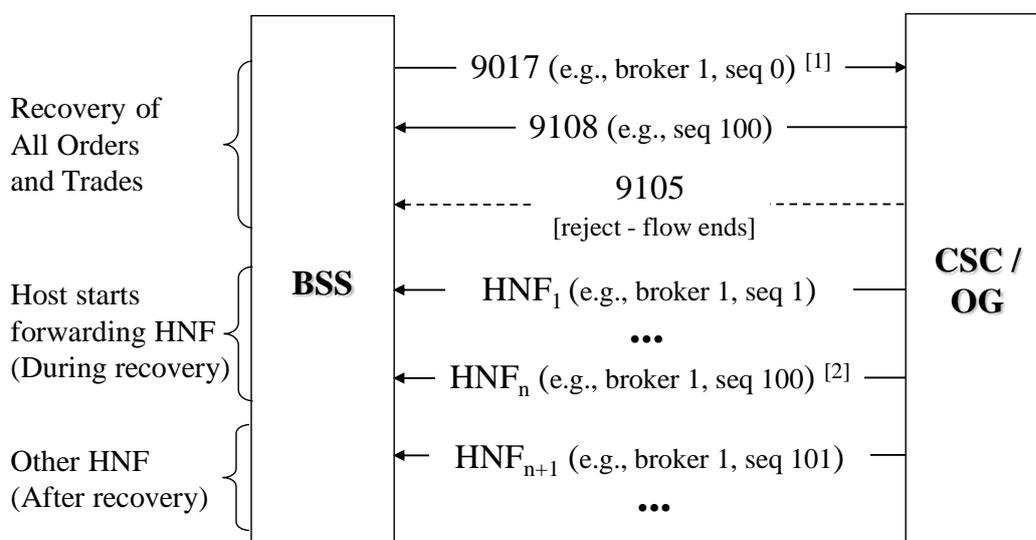
7.3.5. Recovery of All Orders and Trades

BSS will be allowed to perform recovery of all Order and Trade confirmations received from the CSC when its local order and trade data is corrupted.

Orders and trades recovery would be performed through host notifications recovery from CSC. BSS would send “Host Notification Recovery” transaction request to CSC for all host notifications of order and trade updates (i.e., with sequence number equals to zero) for each broker number. Included in the transaction response would be the sequence number of the last host notification to be recovered during orders and trades recovery. The BSS should make use of this sequence number to detect the end of orders and trades recovery. CSC would then re-send all orders and trades host notifications for each specified broker number.

As each BSS could be associated with more than one broker number, orders and trades recovery would be performed for each broker number.

The following diagram shows the message flow for BSS to perform orders and trades recovery for each broker number.



Related Messages

9017	(O-CNR)	Host Notification Recovery
9108	(O-RNR)	Host Notification Recovery Response
9105	(O-RIC)	Invalid Command Response

^[1] Separate recovery request would be sent for each broker.

^[2] When BSS receives this message, this indicates the completion of orders and trades recovery for the broker.

7.3.6. Invalidity of Public Market Data

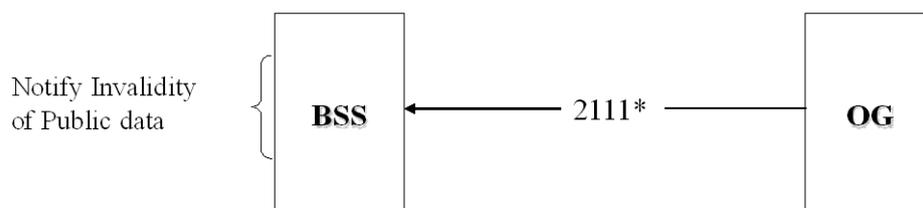
If public market data is maintained in BSS for the support of market data enquiry functions, such data will become invalid when broadcast messages from CSC are missed in CC OG.

There are two possible scenarios on loss of broadcast messages in OG:

- One or several broadcast messages are lost
- A lot of messages are lost

Scenario 1: One or several broadcast messages are lost

For the first scenario, OG would notify BSS of the invalidity of the security price data upon detection of loss of the related CSC broadcast messages using “Page Invalid Update”.



Related Messages

2111 (O-BPI) Page Invalid update

* Separate message would be sent from OG to broker system for each security of invalid public data.

On receipt of this message, BSS should mark the affected security’s data as invalid.

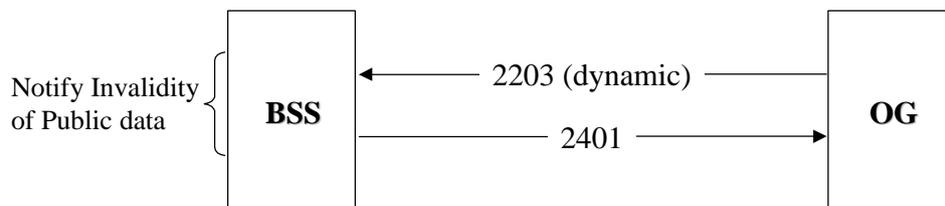
The following table summarises the list of public data of which CC OG would notify BSS of the invalidity:

Public Data	Open Message Id	Description
Security Dynamic Page	2111 (O-BPI)	Set SCTY-CODE to that of the related security.

After CC OG obtains the latest information from CSC, it will then forward the data to BSS as normal MIF messages. BSS could then change the status of the updated security page to valid.

Scenario 2: Many BCS messages are lost

When many BCS messages are lost in CC OG, CC OG would notify BSS of the invalidity of all public data through “Data Availability”.

**Related Messages**

2203	(O-MDA)	Data Availability
2401	(O-MCA)	Control Command Acknowledgement

On receipt of this message, BSS should mark all pages of public dynamic data as invalid.

These invalid public data will be become valid when:

- Subsequent broadcast updates are forwarded from CSC, such as when a security has an updated latest trade price.

8. System Functions / Events

This section describes the application-level message flows for each type of business functions, such as order input, as well as background functions or events, such as database download, session logon, host notifications and control commands.

The message flow diagrams included in this section describe the individual sequence of message flows of each system function. Note that messages shown on the message flow may not be received in the same order as shown in the diagram. For example, a UOI may be received before the ROI.

Moreover, as there can be multiple outstanding system functions at a time, during the message flow of system function (say A), it is possible that other messages triggered by a different system function may be sent to the BSS. For example, MIF for database download may be forwarded to BSS after 9016 is sent to CC OG but before message 6596 (Valid Command Response) is received in BSS.

The functional differences between CSC and AMS/3.8 are described in Appendix A, BSS developer should refer to this appendix for the changes required on their BSS to support northbound trading in Stock Connect via CSC.

8.1. Broker System-Originated System Functions

8.1.1. Business Transaction Requests (CSC)

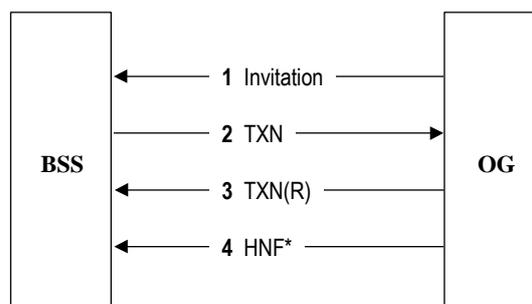
The following is an inventory of system functions that could be invoked by the BSS:

Category	System Function ID	System Function
Board Lot Order	M0001	Input Bid / Ask ^[1]
	M0003	Cancel Order
User Sign-On and Sign-Off	M0027	Change Host (CSC) Password
	M0032	Trading System Sign-on ^[2]
	M0033	Trading System Sign-off ^[2]

[1] Transaction requests of these system functions are Rate Control Throttle transactions.

[2] Transaction requests of these system functions are invitation free transactions. They are not subject to any throttle control but CSC allows only at most 10 concurrent invitation free transactions initiated by each BSS. All other transaction requests to CSC are Turnaround Control Throttle transactions.

The following diagram presents a generic flow diagram for the above system functions:



* Flow 4 is not applicable to all system functions.

For every transaction to CSC (except invitation free transactions), broker system must receive a throttle invitation from CC OG before forwarding the request to CSC. Each invitation¹ from CC OG would carry an invitation number in the header and it would belong to a market group. Broker system should send the appropriate transaction (i.e., belong to the same market group, where applicable) to CSC using the same invitation number. Note that for transaction where no market group is related, broker system can make use of any available invitation. If broker system forwards a throttle control request to CSC through CC OG without any invitation or with mismatched market group, the request would be rejected. Moreover, CC OG will consume the invitation number used, if applicable, and re-issue a new invitation number accordingly. Therefore, BSS should not re-use the used invitation number.

Normally, for those host (CSC) destined transactions with specific CSC response (e.g., order input response, 4596), BSS could relate the host notifications to the corresponding order/trade submitted by using the CSC supplied order/trade sequence number as would be returned in the response and if the response is returned first. The order/trade sequence number is a unique identifier for order/trade transactions but there is no particular ordering of these sequence numbers.

However, for some of the system functions, host notifications may be forwarded from CSC due to the events happening in SSE/SZSE trading system (e.g., order entered the SSE/SZSE trading system, order matched in the SSE/SZSE trading system). Flow 4 on the diagram indicates the message flow. It should be noted that response (Flow 3) and unsolicited host notification (Flow 4) may not be received in the same order shown in the above flow diagram (i.e., unsolicited host notification may be received before the response).

Therefore, BSS is recommended to use the “BS-ORDER-REF” to relate the host notification to order submitted by BSS as indicated in the corresponding message definition unless BSS is implemented with any particular processing to handle the two aforementioned cases (i.e., “host notification is returned before the response” and “only generic response is expected”).

To simplify the description on message flow, throttle invitation (Flow 1) is not included in the flow diagram described in this section.

¹ The two Invitation message, 9010 and 9021, are defined as TXN in the Stock Connect open message protocol, but no acknowledgement from BSS is necessary as indicated in the above flow diagram.

Input Bid / Ask (M0001)

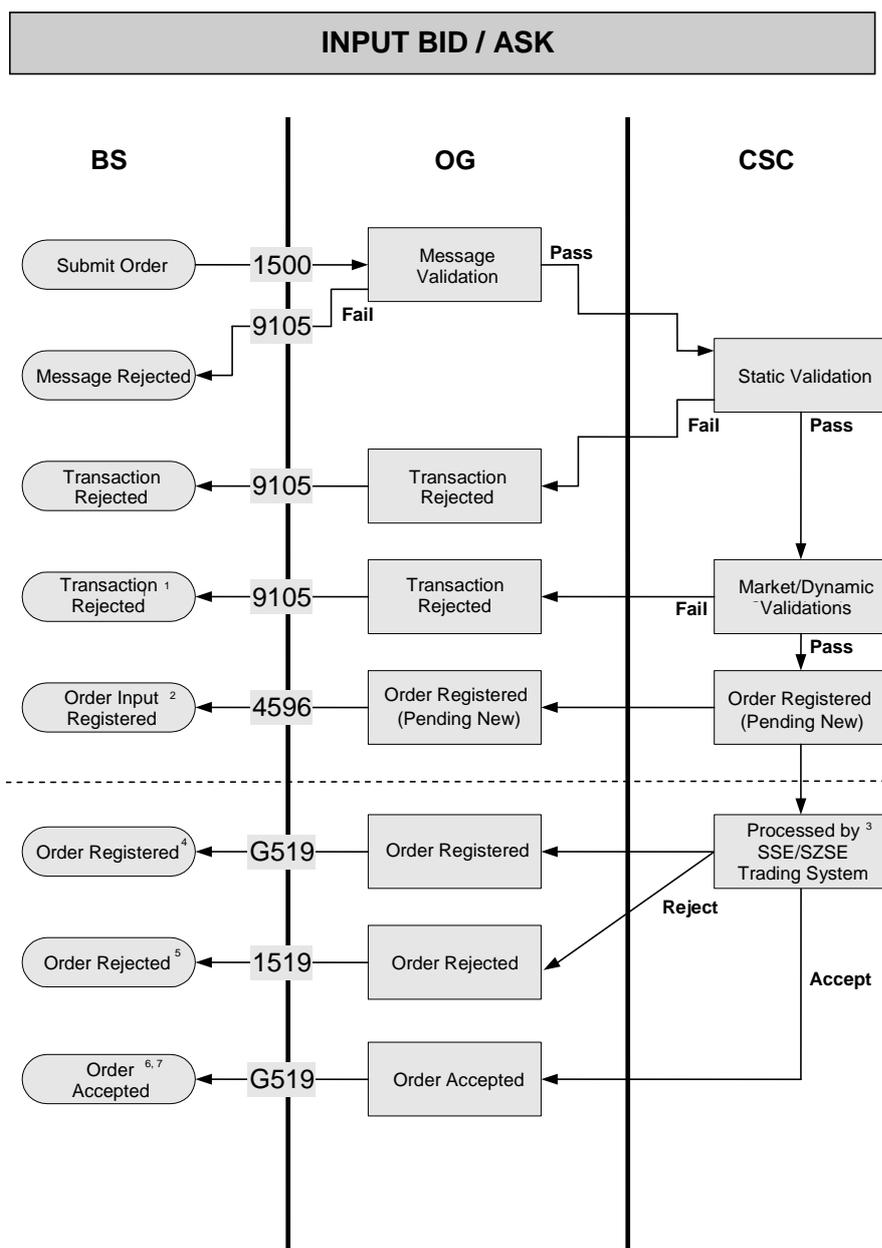
This function allows the trader to submit a Bid / Ask Order (board lot order) to the SSE/SZSE trading system through CSC. In CSC, limited values in some fields are supported in the board lot order input:

- Only Limit order type is allowed, so the value of order type (tag 99192) must be 'L'.
- All or nothing function is not supported, so the value of all or nothing (tag 99007) must be 'N'.
- No trade class origin (tag 99296) and trade class hedge (tag 99295) is available, so their values must be space ' '.
- CSC order input supports shortsell and shortsell cover. For non-shortsell order, the trade class shortsell (tag 99297) should be set to space ' ' or 'N'. For shortsell order and shortsell cover order, it should be set to 'Y' and 'C' respectively.
- The price and consideration warning is not supported, so the value of confirmation flag (tag 99045) must be 'N', and the trader ID (tag 99298) and password (tag 99206) fields are not required.

The board lot order input will be rejected by CSC if BSS has given the unexpected values in the above fields. Please refer to the system message report for details of errors that can be returned to BSS.

It should be noted that CSC may accept order requests before SSE/SZSE market is open. During this period, BSS would only receive order acknowledgement (Message ID: 4596) for order requests that pass CSC's local validation and no order confirmation (Message ID: G519) or rejection (Message ID: 1519) would be returned until the orders are forwarded by CSC after SSE/SZSE market is open and are processed by SSE/SZSE trading system. The same behaviour applies during the mid-day close of SSE/SZSE market. For orders submitted after SSE/SZSE market is closed and before CSC stops accepting orders, order acknowledgement (Message ID: 4596) would still be returned to BSS but there will be no order confirmation or rejection messages returned. These pending order requests will be cleaned up by CSC at the end of day and they will not be carried forward to the next trading day.

Institutional Investor ID is an optional field introduced in both bid and ask order input to identify the institutional investor for pre-trade checking purpose. If Institutional Investor ID is provided, validation will be performed to see if EP is authorized to trade for the specific institutional investor. To minimize the change in the interface message, the unused tag ID 99041 is assigned to the institutional investor ID.



Notes:

1. "Input Order" is subject to market / dynamic validation before it is registered in CSC. The validation includes security status, daily quota limit of broker, shares holding of broker, etc.
2. The input order is registered in CSC and ready to forward to SSE trading system.
3. The order is entered to SSE/SZSE trading system and waiting for order confirmation. If the order is accepted by SSE/SZSE trading system, one host notification will be generated. If the order is rejected by SSE/SZSE trading system, two host notifications will be generated. Please note that the host notification will be generated only after A-Share market is open.

4. This host notification will capture all information of the "Input Order" with status "registered" to indicate order rejection is coming. The message is essential for subsequent order recovery in BSS. It will be issued only if the order is rejected by SSE/SZSE trading system.

5. This host notification will indicate the order is rejected by SSE/SZSE trading system and include error code and message. CSC will forward this host notification to BSS.

6. This host notification will capture all information of the "Input Order" indicating order is accepted by SSE/SZSE trading system. The message is essential for subsequent order recovery in BSS.

7. There will be subsequent host notification generated from CSC to BSS when order is matched in SSE/SZSE trading system, please refer to the associated system functions (UNSOLICITED ORDER AND TRADE UPDATE FROM HOST) for automatch trade generated.

Cancel Order (M0003)

This function allows the trader to cancel an order (board lot order). Only orders inputted from traders can be cancelled.

If the Order being cancelled has been completely filled by the time the cancel request reaches the SSE/SZSE trading system, the request will be rejected.

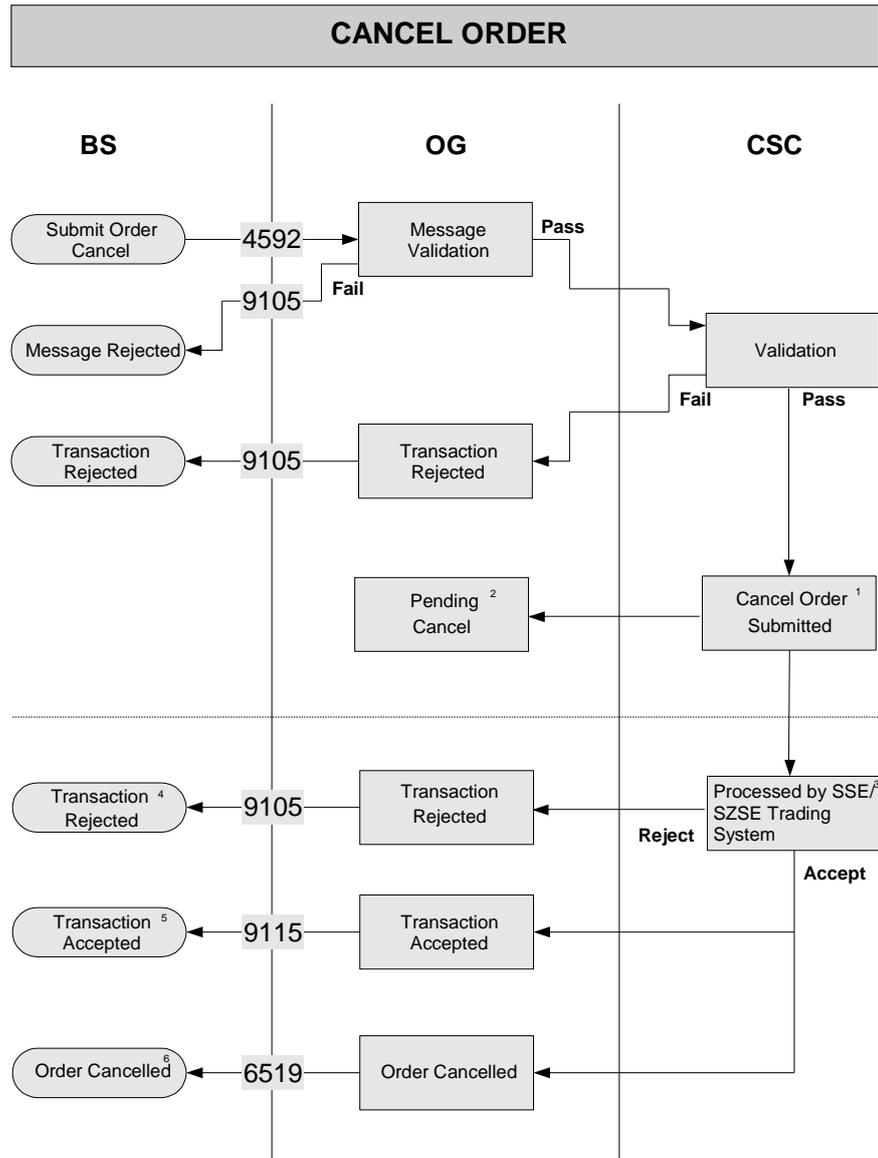
Once an order is cancelled, it cannot be recalled and must be re-input using Input Bid or Input Ask transaction.

Limited values in some fields are supported in the board lot order cancel:

- Only order cancel is allowed and order reduce is not supported, so the reduce quantity field (tag 99566) is not required and cancel indicator (tag 99373) must be 'Y'.
- No trade class origin (tag 99296) and trade class hedge (tag 99295) are support in CSC and their values must be set to space ' '.
- The trade class shortsell (tag 99297) indicator in an order cancel must be set to the same value as that in the original order input. Otherwise, it will be rejected by CSC.

The board lot order cancel will be rejected by CSC if BSS has given the unexpected values in the above fields. Please refer to the system message report for details of errors that can be returned to BSS.

It should be noted that CSC may accept order cancel requests before SSE/SZSE market is open. However, no order cancel response (Message ID: 9115) and order update notification (Message ID: 6519) can be returned to BSS until the requests are forwarded by CSC after SSE/SZSE market is open and are processed by SSE/SZSE trading system. The same behaviour applies during the mid-day close of SSE/SZSE market. For order cancel requests submitted after SSE/SZSE market is closed and before CSC stops accepting transaction requests, no order cancel response and order update notification will be returned to BSS. These pending requests will be cleaned up by CSC at the end of day and they will not be carried forward to the next trading day.

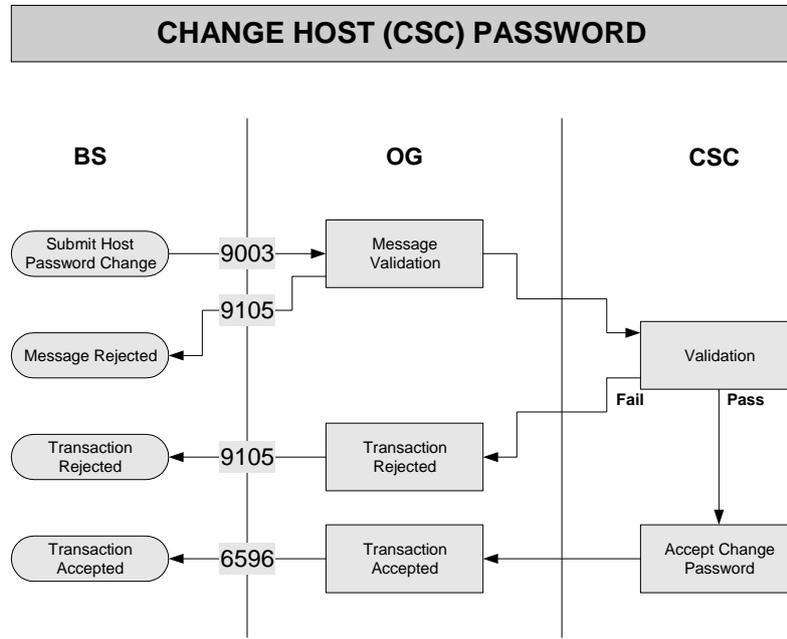


Notes:

1. Order cancellation is registered in CSC if it has passed the validation and it is then submitted to SSE/SZSE trading system. Before the cancel order is processed by SSE/SZSE trading system, the cancel order is in pending state and new incoming cancel request for the same order will be rejected by CSC.
2. Pending cancel acknowledgement is sent to OG from CSC, and this acknowledgement will not forward to BSS. OG will issue new turnaround throttle to BSS for new transaction after OG received this acknowledgement.
3. The cancel order is processed by SSE/SZSE trading system. Cancel order response and order update messages will be sent to BSS if the cancel order request is executed successfully by SSE/SZSE trading system. The reject message will be sent to BSS if the cancel order request failed the validation at SSE/SZSE trading system. Please note that cancel response and host notification will be generated only after SSE/SZSE market is open.
4. Order cancellation is rejected by SSE/SZSE trading system and the reject message is sent to BSS.
5. Order cancellation is accepted by SSE/SZSE trading system and the order cancel response is sent to BSS.
6. Order cancellation is completed and the host notification is sent to BSS. The host notification would be useful when BSS needs to recover the order from CSC.

Change Host Password (M0027)

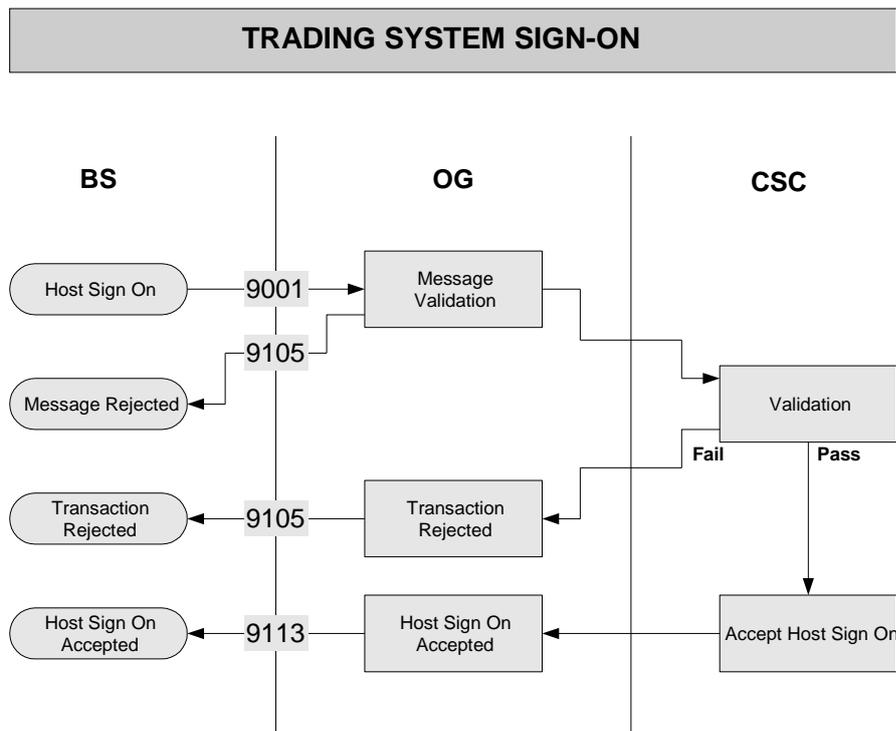
This function allows the trader to change the password that is used to perform Trading System Logon. This password is kept in CSC.



The new password must be composed of 6 alphanumeric characters (alphabetic and numeric passwords are allowed). Also, it must be different from the current password and the 2 most recent historical passwords. On a successful password change, the new password lifetime is set to 90 days.

Trading System Sign-on (M0032)

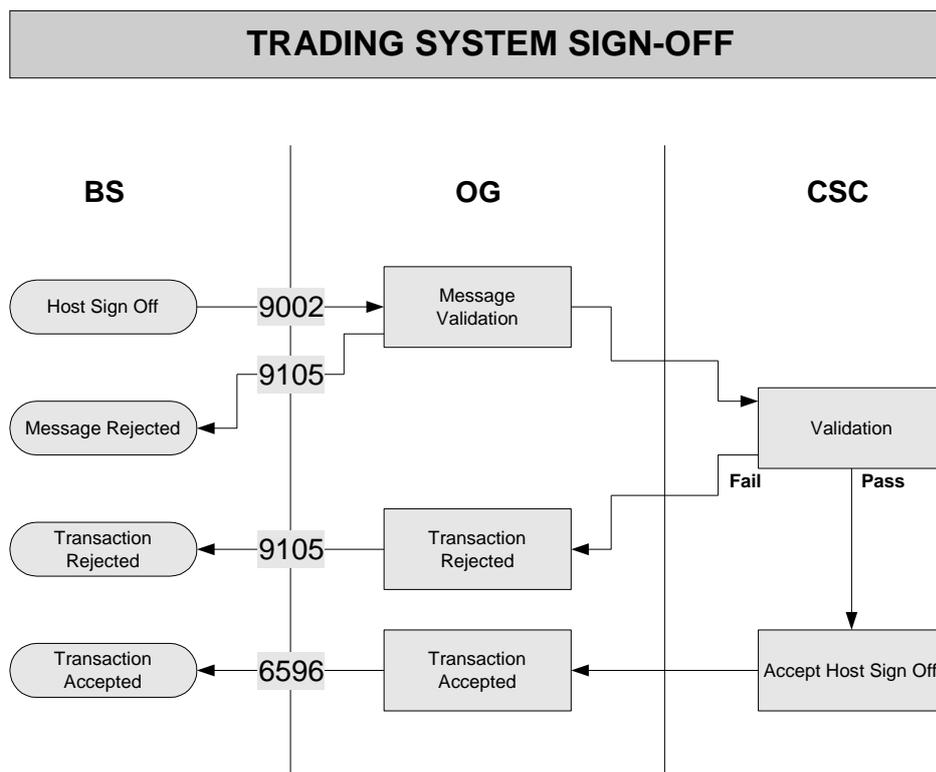
This function allows the broker system to gain access to the CSC in order to perform trading activities to SSE/SZSE trading system. In the sign-on message 9001, it is required to specify the trader ID, the 6-character alphanumeric password and the broker number(s) for sign-on. Upon a successful sign-on, the sign-on response message 9113 carries a number which indicates the number of days remaining before the password expires. The BSS user must change his/her password before its expiry unless “No password expiry” exemption has been granted. The user account is suspended when the password expires.



Trading System Sign-off (M0033)

This function allows the broker system to exit from the system in order to end the trading activities. In CSC, only one mode of sign-off i.e., Permanent Sign-off is supported for broker system.

When trading system sign-off is performed successfully, CSC does not cancel outstanding orders for all the Broker Number belonging to the broker system that submitted to SSE/SZSE trading system. Whilst the broker system is signed off, outstanding orders, if any, belonging to the Broker Numbers can still be matched in SSE/SZSE trading system. Trades can still be generated accordingly.



8.1.2. On-Request Enquiry Transactions

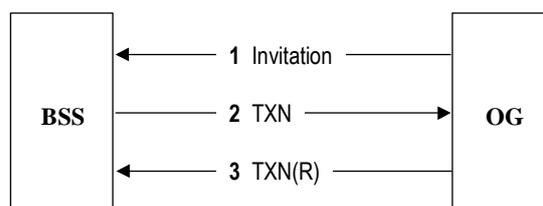
For On-Request Enquiry functions, updated information would be sent from CSC, to BSS only when a “request for information update” has been received by CSC. The request should be generated when user triggers the function.

The following is an inventory of enquiry functions that would be available in CSC:

Category	System Function ID	System Function
Board Lot Order	M0014	Order Activity Enquiry
Host Notification Recovery	M0042	Order and Trade Notification Recovery ^[1]

[1] Transaction requests of these system functions are invitation free transactions. They are not subject to any throttle control but CSC allows only at most 10 concurrent invitation free transactions initiated by each BSS. All other transaction requests to CSC are Turnaround Control Throttle transactions.

The following diagram presents a generic flow diagram for the above system functions:



As mentioned in section 8.1.1 Business Transactions Request (CSC), throttle invitation mechanism is also applied for enquiry transactions to CSC.

Response will be sent to broker system to indicate the completion of the request. System functions described in this section does not have unsolicited host notification. All the enquiry details will be included in the response.

To simplify the description on message flow, throttle invitation (Flow 1) is not included in the flow diagram described in this section.

[Remark: BSS can choose to implement the appropriate set of enquiry functions according to the needs of the broker firm. Apart from the host notification recovery function, BSS may not be required to handle the enquiry transaction if it does not provide enquiry functions, or it does not need the data for other usage.]

For Order Activity Enquiry, the enquiry results/response may span multiple pages (i.e., require multiple enquiry/response pairs to retrieve the data) based on the selection criteria as inputted by the trader. The response message would indicate that there are still data available (with the “MORE-FLAG” set) and therefore, the BSS needs to submit another enquiry message for the subsequent data retrieval.

The data returned by CSC depends on the parameters

- Last Key (e.g., LAST-TIMESTAMP in Order Activity Enquiry)

- Num of Items

passed in the enquiry message. The rules are as follows (where "m" is the maximum number of items that can be returned in the message, and where "n" does not exceed "m"):

<u>Last Key</u>	<u>Num of Items</u>	<u>Records Returned in the Response</u>
None	0	m records starting from the beginning
None	n	n records starting from the beginning
Specified	0	m records starting from the record AFTER the specified Last Key (i.e. excluding the key)
specified	n	n records starting from the record AFTER the specified Last Key (i.e. excluding the key)

Order Activity Enquiry (M0014)

This function allows the trader to enquire all board order-related operations which have been performed by a Broker Number. Trader may also specify a particular market, security or both security and price as well as start time.

Order activities include:

- order input and cancel operations performed by the trader;
- order cancel operations performed by an Administration user on behalf of the trader;
- order rejections by CSC or SSE/SZSE trading system

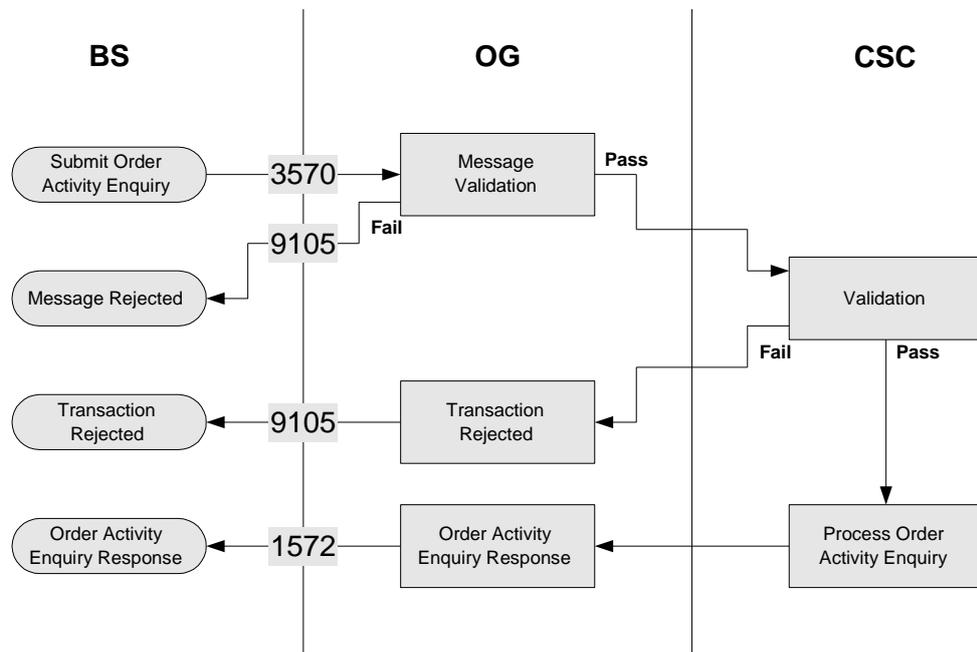
Broker system should send request to CSC recursively until there is no more data to retrieve.

Note that each successful board lot order appears in two entries in LOG-OPERATION-TEXT, first as "INPUT" when accepted in CSC, second as "ACCEPT" when accepted by SSE/SZSE trading system.

The trader can restrict the enquiry by specifying a start time. The application of start time on the enquiry is defined below:

- The default time is 00:00 and if not changed, the transactions starting from today 00:00 AM are displayed.
- If the specified time is less than the current time, then the transactions from the specified time of today are displayed.
- If the specified time is equal to or more than the current time, then the transactions of yesterday from the specified time (which includes all today's transactions) are displayed. For e.g. if the current time is 2 am and the trader specifies start time as 23:00, then the enquiry assumes that it should start from 23:00 "yesterday" because 2300 is greater than 0200.

ORDER ACTIVITY ENQUIRY

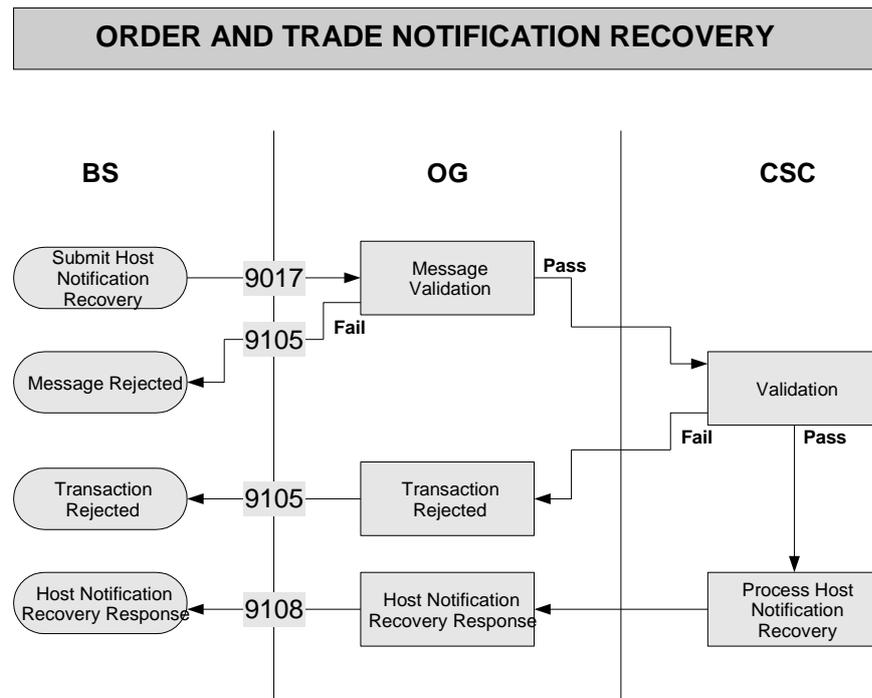


Order and Trade Notification Recovery (M0042)

This function allows the broker system to recovery host notification under the following scenarios:

- When BSS detects any gap in the message reference number for host notification associated with a particular broker number;
- When BSS wants to recover all orders and trades of the current trading day for a particular broker;
- When BSS reconnects to OG,
 - If it is the beginning of a new trading day, BSS should submit the recovery request to CSC with the recovery sequence number set to zero.
 - Otherwise, BSS should submit the recovery request to CSC with the recovery sequence number set to the last host notification received.

The recovery response will contain the sequence number of the host notification that is considered as the last message to be sent during the recovery. BSS should make use of this sequence number to determine the end of the host notification recovery. Upon receipt of the recovery request from BSS, CSC would then start forwarding the notification to BSS starting from the requested sequence number.

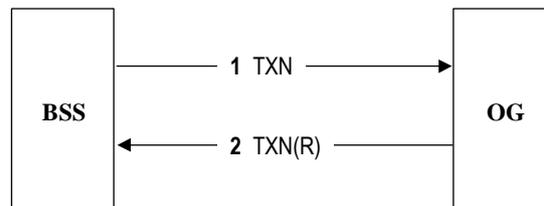


8.1.3. Other Transaction Requests (OG)

The following is an inventory of system functions that would be available in CSC to support session management and system operation between CC OG and BSS:

Category	System Function ID	System Function
Session Management	M0044	Session Logon
Database Download	M0046	Public Data Download Request

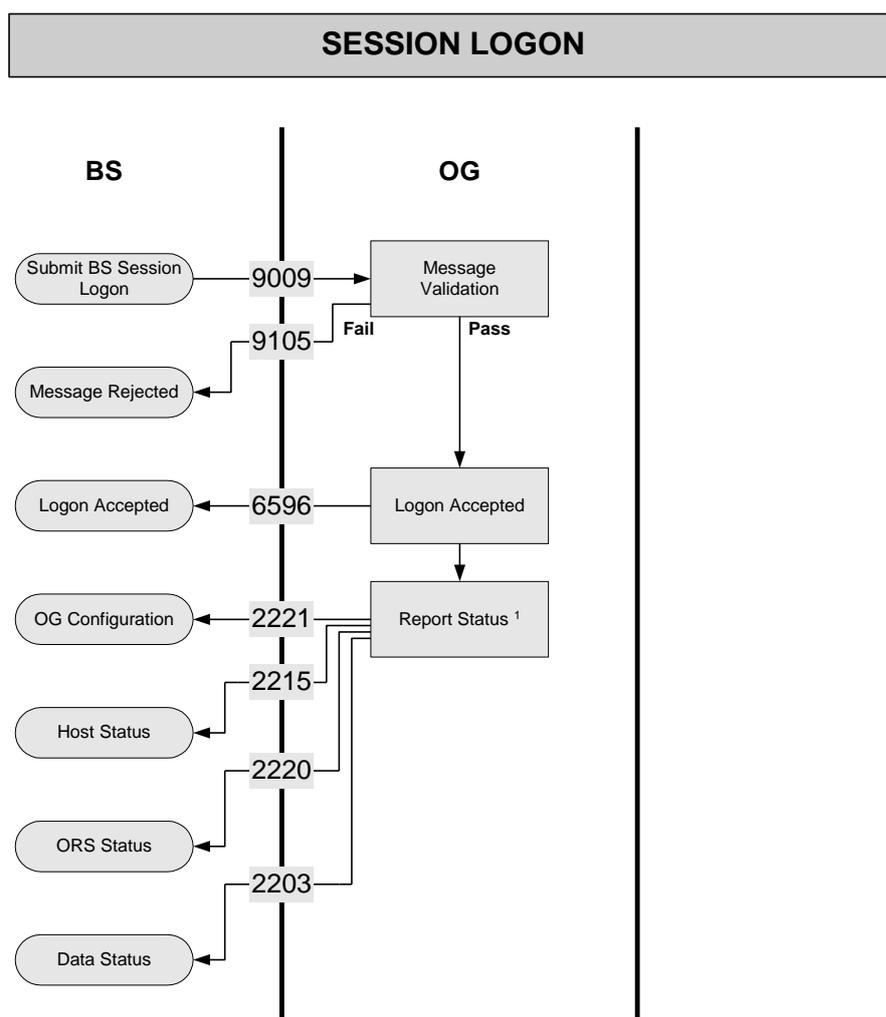
The following diagram presents a generic flow diagram for the above system functions:



Session Logon (M0044)

After BSS has established network connection with CC OG, it should perform session logon with CC OG. The broker system would send BS session logon request to CC OG. On reconnection with CC OG, BSS should remove all throttle invitations received from CC OG before the disconnection. Handshaking information (e.g., OG configuration information, Host (CSC) status and data availability) is then exchanged between the two systems.

Refer to section 7.2.2 BSS – OG Logon and Handshaking for more information.

**Notes:**

1. The OG returns status messages irrespective of the state of the respective components.
2. A separate Data Status message is sent for global data, and for each market.

Public Data Download Request (M0046)

This function allows the broker system to request public data from CC OG by specifying the type of data. If the data is available in CC OG, it will reply to BSS indicating the start of the database download. Otherwise, a negative response will be replied to BSS.

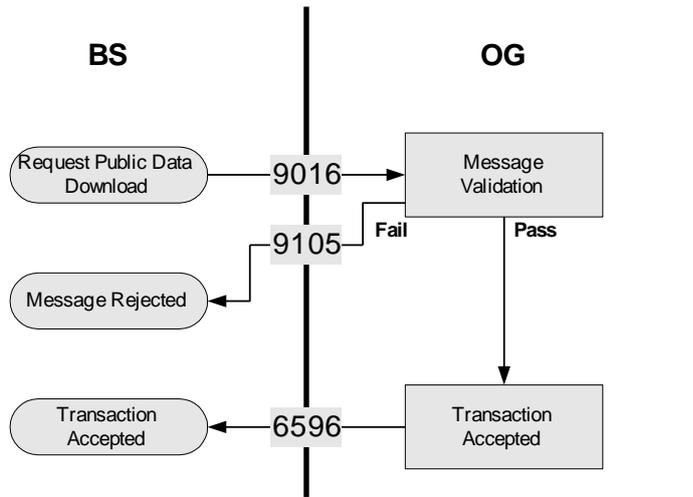
This transaction request is used under several situations:

- Request for global / market database download when CC OG notifies BSS of data availability at the start of a new trading day;
- Request for global / market database refresh on BSS start-up;
- Request for dynamic market data refresh on BSS start-up.

The public data download transaction is followed by corresponding database download / database refresh. The following table summarises the different types of data for request and the corresponding actions in CC OG upon receiving the request:

Types of Data	Action
Global Static Data	Global database download is then performed. OG would forward spread table information, market name and code, market group information. Refer to section 7.1.2 Database Download for more information.
Market Static Data	Market database download is then performed. OG would forward market trading timetable, and security static information. Refer to section 7.1.2 Database Download for more information.
Market Dynamic Data	Dynamic market data refresh is then performed. OG would forward a snapshot of the current dynamic market data to BSS. Refer to section 7.2.5 Dynamic Market Data Refresh for more information.

PUBLIC DATA DOWNLOAD REQUEST



8.1.4. Enquiry Transactions (Notification-based)

Apart from on-request enquiry (refer to section 8.1.2), brokers can choose to implement other enquiries that are based on real-time trading sent to the BSS through notification.

If the BSS is designed to maintain a local database for such real-time information received from the CSC, then it is possible for the BSS to provide different types of enquiry functions to satisfy the broker firm's front-office operation.

Notification-based enquiries refer to order and trades updates from the CSC (which are mostly broker specific information – refer to messages described in section 8.2).

The following is an inventory of these notification-based enquiry functions that should be considered to be provided by BSS:

Category	System Function ID	System Function
Board Lot Order and Trade Enquiry	L0001	Order Status Enquiry
	L0002	Outstanding Orders Enquiry
	L0003	Trades Enquiry / Trades Report
	L0004	Online Trade Journal

The following sections describe notification-based enquiry functions. To support this type of enquiry functions, the BSS should be able to capture notification messages from CSC to update its order and trade data (e.g., status, execution details). In case there is transmission loss of notifications message, the BSS has to perform recovery process.

Board Lot Order and Trade Enquiry (L0001 – L0004)

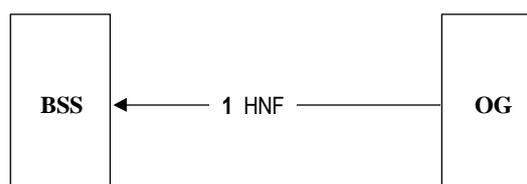
These functions support traders to enquire real-time order and trade information such as order status, trades details and order position for board lot orders. Refer to section 8.2 Unsolicited Order and Trade Update from CSC and section 7.2.4 Order and Trade Notification Recovery for technical details.

8.2. Unsolicited Order and Trade Update from CSC

The following is an inventory of CSC events that would trigger unsolicited order and trade update from CSC to the broker systems. These notification messages will enable the BSS to maintain the status and trade execution result of all orders submitted to SSE/SZSE trading system through CSC:

Event ID	Event
U0001	Order Input Registered/ Accepted
U0002	Automatch Trade Generated
U0008	Order Cancelled
U0012	Order Rejected / Cancelled by Market

The following diagram presents a generic flow diagram for the above CSC events:



BSS is recommended to use the “BS-ORDER-REF” or “BS-TRADE-REF” to relate the host notification to order/trade submitted by BSS as indicated in the corresponding message definition unless BSS is implemented with any particular processing to relate the host notification to the original entered order/trade given the host notification could be returned before the corresponding transaction response as indicated in Section 8.1.1: Business Transaction Requests (CSC).

Order Input Registered / Accepted (U0001)

Under normal cases, when order (Board Lot Order) is accepted in SSE/SZSE trading system, a host notification will be generated by CSC. This is the first host notification to be received for order entered into SSE/SZSE trading system.

Automatch Trade Generated (U0002)

When order is partially matched or fully matched in SSE/SZSE trading system, automatched trade is created. The trade update host notifications will be generated from CSC of the automatched trade.

Order Cancelled (U0008)

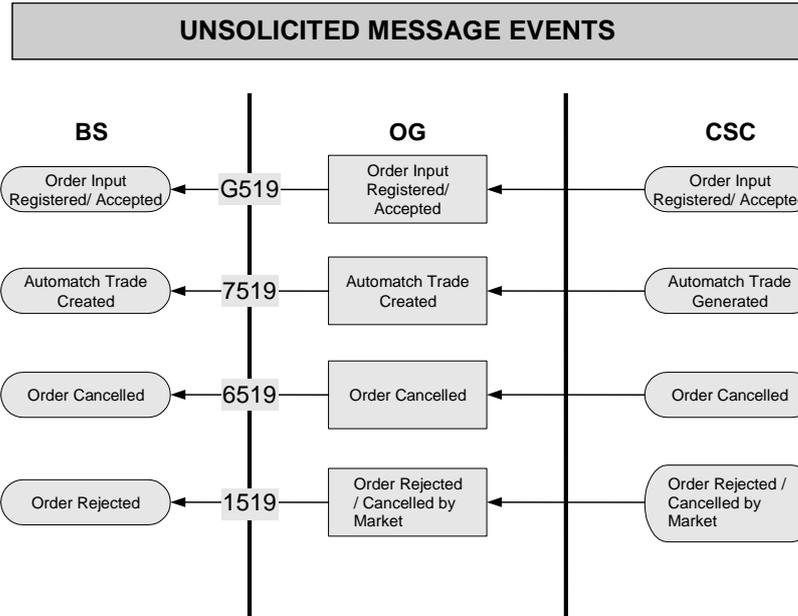
When order is cancelled, Order cancellation host notification will be generated from CSC. Broker as well as the Exchange Administrator of CSC can perform this operation.

Order Rejected / Cancelled by Market (U0012)

When order is rejected by CSC, an order rejection host notification will be generated from CSC. Error message code and text are provided in the reject message for broker's reference.

Also, an order sent to SZSE may be accepted first and is then cancelled by their backend trading system due to the unsuccessful order validation. In this case, the order is said to be Cancelled-by-Market and an order cancellation by market notification will be sent to the corresponding BSS.

The following diagram depicts the unsolicited Order and Trade update events from CSC.



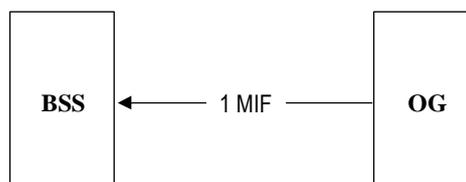
8.3. Market Information from OG

The following is an inventory of CSC events where market information update messages are sent to the broker system:

Event ID	Event
B0001	Security Static Information Update / Download
B0002	Security Dynamic Information Update
B0008	Spread Table Information Update
B0009	Market Static Information Download
B0010	Market Trading Timetable Download
B0013	System Message Update
B0015	Pages Invalid Update
B0016	Market Group Information Download

Note that some of these market information updates are sent to BSS during global and static database download while some others are sent to BSS during the trading day. Refer to section 7 BSS Daily Processing and Recovery Procedures for more information.

The following diagram presents a generic flow diagram for the above events:



[Remark: BSS may not need to process such market information messages if the BSS is not required to provide market data and security enquiry functions.]

Security Static Information Update / Download (B0001)

Security static information would be sent to BSS under three situations:

- During market database download at the start of a trading day;
- During market static data refresh when BSS is reconnected to CC OG;
- When the static information of a security changes in CSC during the trading day.
Note that this is less likely to occur.

Each security static information message would carry the static information of one and only one security. Static information of a security includes common security data and specific security data.

Common security data includes the associated market and sub-market codes, security name, lot size, currency information, previous closing price, listing status, electronic initial public offerings information, etc.

Moreover, specific security data includes instrument-specific data for securities belonging to different instrument types.

Related message: 2101 Security Static Information

Security Dynamic Information Update (B0002)

During the trading hours, CSC provides security information update. Each security dynamic information message would carry the dynamic information of one and only one security.

Basic dynamic information of a security such as its latest trade price, best bid and best ask price, etc are included.

The security dynamic information can be disseminated in either tag based format or binary format. BSS may request to receive the binary format^[1] by setting the optional tag field BINARY-SCTY-DYNAMIC-FLAG (Tag ID: 99862) to 'Y' in "BS Session Logon to OG" (Message ID: 9009) message. If the optional field is not provided or is set to 'N', the default is to disseminate security dynamic information in tag based format.

Related messages: 2102 Security Dynamic Information (tag based format)

2112 Security Dynamic Information (binary format)

^[1] The binary format security dynamic information message (2112) has the same message header as other market information messages. The message body consists of only 1 tag field (JK003), which encapsulates the binary data. Please refer to the Interface Message Report for details.

Spread Table Information Update (B0008)

Spread table information is sent to BSS as part of the global data. The spread table information is sent to BSS under two situations:

- During global database download at start of a trading day;
- During global static data refresh when BSS is reconnected to CC OG.

Each spread table is uniquely identified by a spread table code and it contains the spread interval for each price range. The mappings of spread table and securities are downloaded through the security static information update.

Related message: 2119 Spread Table Information

Market Static Information Download (B0009)

Market static information is sent to BSS as part of the global data. The market static information is sent to BSS under two situations:

- During global database download at start of the trading day;
- During global static data refresh when BSS is reconnected to CC OG.

Static information of a market includes market code and name. The market group is used by BSS to determine which invitations to use for submitting transaction requests to CSC.

Related message: 2122 Market Static Information

Market Trading Timetable Download (B0010)

Market trading timetable information is sent to BSS as part of the market data, but no trading session information is available in the market trading timetable message in CSC. The usage of this message is served for the compatibility of AMS/3.8 broker system. The market trading timetable information is sent to BSS under two situations:

- During market database download at start of the trading day;
- During market static data refresh when BSS is reconnected to CC OG.

Related message: 2120 Market Trading Timetable

System Message Update (B0013)

System messages are sent to BSS during the trading day. These system messages carry a timestamp and contain plain text which provides additional real-time information about the current status of the market. It is generated whenever there is a change in the market status. The system message may convey the following information:-

- a. Security re-activation. The message text format is as shown below:-

“2022 Security zzzzz9 has been re-activated”

- b. Security suspension. The message text format is as shown below:-

“2023 Security zzzzz9 has been suspended”

- c. Current daily quota balance. The message text format is as shown below:-

“2028 Northbound Daily Quota Balance <xxxx> : zzz,zzz,zzz,zzz,zz9”

Note:

- The decimal places of the daily quota balance are truncated.
- xxxx represents the market code. It is set to “ASHR” for Shanghai market and “ASZR” for Shenzhen market.

BSS should note that this free text message serves as a notification only and there will not be re-transmission in the case of broadcast lost.

Related message: 2123 System Message

Pages Invalid Update (B00015)

When there is missing host broadcast for security dynamic information, CC OG will notify BSS of the invalidity of these public data through the “Pages Invalid Update” message. Refer to section 7.3.6 Invalidity of Public Market Data for more information.

There is no enquiry request in CSC to recover the invalid page but CSC will refresh all security pages via broadcast regularly. The broker system will have to wait for the refresh of the invalid page from CSC through CC OG.

Related message: 2111 Pages Invalid Update

Market Group Information Download (B0016)

Market group information is sent to BSS as part of the global data. The market group information is sent to BSS under two situations:

- During global database download at start of the trading day;
- During global static data refresh when BSS is reconnected to CC OG.

Market group information specifies what markets are contained in a market group. The market group is used by BSS to determine which invitations to use for submitting transaction requests to CSC.

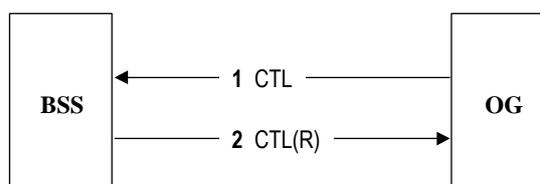
Related message: 2126 Market Group Information

8.4. Control Command from Host (CSC) / OG

The following is an inventory of CSC events where control commands are sent to the broker system:

Event ID	Event
C0001	End Database Download
C0002	Force Logoff / Logon (deleted)
C0003	Host Availability
C0004	OG Configuration
C0005	ORS Availability
C0006	Data Availability

The following diagram presents a generic flow diagram for the above events:



An acknowledgement for each control command is required. A generic acknowledgement message (2401) is used.

[Remark: BSS may have to process such messages if it wishes to keep track of the operational status of the CSC.]

End Database Download (C0001)

This control command is an indication of the end of the database download process. After the completion of each database download, CC OG will send this message to BSS specifying the download data type.

This control command is sent from CC OG under several situations:

- When global database download / refresh is completed;
- When market database download / refresh is completed;

Refer to section 7.1.2 Database Download for more information.

Related message: 2204 End Database Download
2401 Control Command Acknowledgement

Host Availability (C0003)

This control command is used to notify BSS of the availability of Host (CSC). CSC will be unavailable when there is network failure between CSC and CC OG or at the end of the trading day.

Apart from the availability of CSC, the message also includes the CSC date and time, logical day number, and a flag to indicate whether it is the “end of day” in CSC.

It should be noted that there is situation that BSS should ignore the 99600 END-OF-DAY-FLAG in 2215. When CC OG formats the 2215 to BS, it can be a response to 9009 BS Session Logon, or triggered by OG-to-CSC connection / disconnection while OG-BS remains connected, if the tag END-OF-DAY-FLAG is filled with "Y", there could be two possibilities:

- The CSC is indeed in End of Day state, the three optional date/time tags in 2215: 99010 CSC-DATE, 99011 CSC-TIME, and 99124 CSC-LOGICAL-DAY-NUM should be presented and filled with appropriate values.
- CC OG cannot determine if the CSC is in End of Day state (e.g. CSC disconnected) or not, but default the END-OF-DAY-FLAG tag with "Y", then the three date/time tags aforementioned should be absent in the 2215 message.

Hence BSS may use the presence of the CSC-LOGICAL-DAY-NUM field to determine if ignoring the END-OF-DAY value or not.

Refer to section 7 BSS Daily Processing and Recovery Procedures for the usage of the message.

Related message: 2215 Host Availability

2401 Control Command Acknowledgement

OG Configuration (C0004)

This control message is sent from CC OG to BSS whenever there is any change in the configurations of CC OG. Moreover, the message is also sent as part of the handshaking information when BSS establishes session with CC OG.

OG configuration includes OG tunnel blocking status, the list of broker IDs and mode of individual brokers (i.e., suspended).

When there is any change in OG tunnel blocking status, or any broker ID list update from CSC, the OG configuration message is forwarded to BSS.

Refer to section 7.2.2 BSS – OG Logon and Handshaking for more information.

Related message: 2221 OG Configuration
2401 Control Command Acknowledgement

ORS Availability (C0005)

The “ORS Availability” control command is not used in CSC. The presence of this message is to retain the message sequence compatibility with BSS when BS Session Logon (Message ID: 9009) is received by CC OG to reduce the change overhead on BSS.

Refer to section 7 BSS Daily Processing and Recovery Procedures for the usage of the message.

Related message: 2220 ORS Availability
2401 Control Command Acknowledgement

Data Availability (C0006)

This control command is used to notify BSS of the availability of the following types of data:

- Global Static Data;
- Market Static Data (for each market);
- Dynamic Market Data (unavailable only).

The following table summarises the corresponding actions of BSS upon receipt of the “Data Availability” message:

Type of Data	Available	Unavailable
Global Static Data	BSS requests for global database download from OG.	Any request to global static data is rejected.
Market Static Data	BSS requests for market database download from OG.	Any request to market static data for the market is rejected.
Market Dynamic Data	<Not Applicable>	BSS should mark all dynamic market data as invalid. Necessary recovery requests follow. Refer to section 7.3.6 Invalidity of Public Market Data for more information.

Related message: 2203 Data Availability
2401 Control Command Acknowledgement

Appendix A: Functional Differences Between CSC and AMS/3.8

This appendix summarizes the functional differences between CSC and AMS/3.8, brokers can make use of this information to modify their BSS to support CSC.

	CSC Functional Difference	Open Message Affected	Impact on BSS
1	<p>Only support board lot order input and order cancel business transactions, and board lot order activity enquiry transaction.</p> <p>Order input request can be submitted prior to market open and the order acknowledgement will be returned to BSS. The order confirmation will be returned only after the market is open.</p> <p>Order cancellation request can also be submitted prior to market open but there will not be acknowledgement and confirmation returned to BSS until the market is open.</p>	-	<p>CSC supports 2 board lot order transactions and 1 board lot order enquiry messages only:</p> <p>1500 O-COI (Order Input)</p> <p>4592 O-COC (Order Cancel)</p> <p>3570 O-EOA (Order Activity Enquiry)</p> <p>The following business transactions and enquiries in AMS/3.8 are not supported in CSC:</p> <p>2500 O-CLI (BS Odd-Lot Order Input)</p> <p>2592 O-CLC (BS Odd-Lot Order Cancel)</p> <p>3500 O-CLT (BS Odd-Lot Trade Purchase/Sale)</p> <p>3592 O-COB (BS Bulk Order Cancel)</p> <p>4500 O-CTI (BS Trade Input Purchase/Sale)</p> <p>6592 O-CXC (BS Cross Trading Device Order Cancel)</p> <p>9022 O-CQI (Quote Input/Change)</p> <p>9023 O-COM (Order Modification (with change in time priority))</p> <p>A592 O-CQC (Quote Withdrawal)</p> <p>B592 O-CXB (BS Cross Trading Device Bulk Cancel)</p> <p>1592 O-CTL (BS Trade Classification Change)</p> <p>5592 O-CTR (BS Trade Reject)</p> <p>1570 O-ECO (BS Cross Trading Device Orders Enquiry)</p> <p>2570 O-ECT (BS Cross Trading Device Trade Enquiry)</p>

			4570 O-EOM (Odd-Lot Market Enquiry) 9019 O-ERT (RT Security Enquiry)
2	A subset of AMS/3 values are supported in some fields in board lot order input.	1500 O-COI (Order Input)	<p>The affected fields in board lot order input in CSC are as follows:</p> <ul style="list-style-type: none"> • Only Limit order type is allowed, so the value of order type (tag 99192) must be 'L'. The Limit order in CSC northbound trading can be matched at the specified or better price. • All or nothing option is not supported, so the value of all or nothing (tag 99007) must be 'N'. • No trade class origin (tag 99296) and trade class hedge (tag 99295) is available, so their values must be space ' '. • Only non-shortsell, shortsell and shortsell cover are supported. The value of the trade class shortsell (tag 99297) can be set to space ' ', 'N', 'Y' and 'C'. • The price and consideration warning is not supported, so the value of confirmation flag (tag 99045) must be 'N', and the trader ID (tag 99298) and password (tag 99206) fields are not required. <p>The board lot order input will be rejected by CSC if it contains unexpected values in the above fields. Please refer to the system message report for details of errors that can be returned to BSS.</p>
3	A subset of AMS/3 values are supported in some fields in board lot order cancel.	4592 O-COC (Order Cancel)	<p>The affected fields in board lot order cancel in CSC are as follows:</p> <ul style="list-style-type: none"> • Only order cancel is allowed and order reduce is not supported. The reduce quantity field (tag 99566) is therefore not required and cancel indicator (tag 99373) must be 'Y'. • No trade class origin (tag 99296) and trade class hedge (tag 99295) are available. Their values must be set to space ' '. • The trade class shortsell (tag 99297) indicator in an order cancel must be set to the same value as that in the original order input. Otherwise, it will be rejected by CSC. <p>The board lot order cancel will be rejected by CSC if it contains unexpected values in the above fields. Please refer to the system message report for details of errors that can be returned to BSS.</p>
4	6-digit security code.	1500 O-COI (BS Order Input) 1572 O-ROA (Order Activity)	BSS and its backend applications will be required to support 6-digit security code.

		<p>Enquiry Response)</p> <p>2101 O-BCS (Security Static Information)</p> <p>2102 O-BCD (Security Dynamic Information)</p> <p>2112 O-BBD (Security Dynamic Information in binary format)</p> <p>2111 O-BPI (Pages Invalid Update)</p> <p>2221 O-MOC (OG Configuration)</p> <p>3570 O-EOA (Order Activity Enquiry)</p> <p>4592 O-COC (Order Cancel)</p> <p>4596 O-ROI (BS Order Input Response)</p> <p>7519 O-UTU (Trade Update)</p> <p>G519 O-UOI (Order Input)</p>	
5	Basic information is available in security dynamic messages.	-	<p>The following dynamic market data related open messages are supported in CSC:-</p> <p>2102 O-BCD (Security Dynamic Information)</p> <p>2112 O-BBD (Security Dynamic Information in Binary Format)</p> <p>2123 O-BSM (System Message)</p> <p>2111 O-BPI (Pages Invalid Update)</p> <p>Message 2102 and 2112 only carry the basic market information such as the opening price, latest trade price, best bid price, best ask price, number of shares for the best bid price queue, number of shares for the best ask price queue, shares traded, turnover, highest and lowest trade price. Mandatory numeric fields that are not applicable to CSC system will be set to value 0.</p> <p>The following dynamic market data related open messages are not available in CSC:-</p> <p>2103 O-BIN (Index Update)</p> <p>2106 O-BTM (Market Trading Status Update)</p> <p>2107 O-BNS (Structured News)</p>

			<p>Information)</p> <p>2110 O-BPG (Text Page)</p> <p>9029 O-ECP (Closing Price Enquiry)</p> <p>9121 O-RCP (Closing Price Enquiry Response)</p> <p>2125 O-BMC (Market Closing Price Availability)</p> <p>9008 O-ESD (Security Summary Dynamic Enquiry)</p> <p>9111 O-RSD (Security Summary Dynamic Enquiry Response)</p>
6	Basic information is available in security static, market trading timetable and market static messages.	<p>2101 O-BCS (Security Static Information)</p> <p>2120 O-BTT (Market Trading Timetable)</p> <p>2122 O-BMS (Market Static Information)</p>	<p>In Security Static Information message, the lot size (tag 99129) of security is changed to buy lot size. The sell lot size is not shown in message 2101 as it is always set to 1. The suspend flag (tag 99560) of security indicates the suspension status in SSE/SZSE market. However, CSC system may also suspend a particular security in CSC northbound trading and a notification will be sent to BSS as System Message. For Chinese stock name, only GB code (tag 99044) will be available.</p> <p>In Market Trading Timetable message, no timetable information is provided and the number of sessions in the market (tag 99383) is always set to '0'.</p> <p>In Market Static Information message, the value of index code (tag 99554) and index short code (tag 99006) are always empty or space. The maximum order size in SSE/SZSE market is 1 million shares and the maximum order size field (tag 99605) will show the equivalent number of board lots in message 2122.</p>
7	Global database download will not include page map information.	-	<p>In global database download, the following page map information message will not be available from CSC:</p> <p>2124 O-BPM (Page Map Information)</p> <p>BSS will receive the following global information messages during global database download from CSC:</p> <p>2119 O-BSP (Spread Table Information)</p> <p>2122 O-BMS (Market Static Information)</p> <p>2126 O-BMG (Market Group Information)</p>
8	Market database download will not include market trading	-	In market database download, the following market trading status update message will

	status update.		not be available from CSC: 2106 O-BTM (Market Trading Status Update) BSS will receive the following market information messages during market database download from CSC: 2120 O-BTT (Market Trading Timetable) 2101 O-BCS (Security Static Information)
9	ORS is not supported.	-	All ORS related functions are not supported.
10	Support CTF in CSC.	-	CTF function is made available in CSC starting from V1.5 of the interface message specification. CTF message supported:- 8519 O-UFU (Trade Update (CTF))
11	No Trade Classification Update and Trade Reject host notification.	-	The functions for Trade Classification Update and Trade Reject are not available in CSC. The following host notification messages will not be applicable: 2309 O-UTL (Trade Classification Update) E519 O-UTR (Trade Reject)
12	Daily quota balance	2123 O-BSM (System Message)	The CSC northbound daily quota balance will be disseminated to BSS as System Message.
13	OG downstream listen port number for BSS connection		The listen port number for CC OG is 2300.
14	Institutional investor ID	1500 O-COI (BS Order Input) G519 O-UOI (Order Input Confirmation)	The institutional investor ID is assigned the unused tag 99041, which was originally assigned to CCASS IP ID in AMS/3. This optional field is applicable to both bid order input and ask order input.
15	TradingPhaseCode	2101 O-BCS (Security Static Information)	The free text field (tag ID: 99082) is used to hold selected SSE's Trading Phase Code for circuit breaker in the format as shown below: Phase=<PhaseInfo> The free text field will be blank for SSE's Trading Phase Code unrelated to circuit breaker. The <PhaseInfo> is the 8-character trading phase code and only the 1 st and the 4 th characters are related to circuit breaker. ● <u>1st character</u> If it is set to 'M', it indicates the circuit breaker is activated and trading can be resumed after the circuit breaker period is over.

			<p>If it is set to 'N', it indicates the circuit breaker is activated and trading cannot be resumed.</p> <ul style="list-style-type: none"> ● <u>4th character</u> <p>If it is set to '1', it indicates order input can be accepted.</p> <p>If it is set to '0', it indicates order input cannot be accepted.</p> <p>For additional details, please refer to SSE's finalized interface specification for circuit breaker (竞价撮合平台市场参与者接口规格说明书).</p> <p>Remark: This field is derived based on the SSE's draft interface specification v1.33 (竞价撮合平台市场参与者接口规格说明书 1.33版【技术开发稿】) which is subject to SSE's finalization.</p>
16	Order cancellation by SZSE after an order is accepted	<p>1519 O-UOR (Cancelled by Market)</p> <p>1572 O-ROA (Order Activity Enquiry Response)</p>	<p>Introduced the new value 'Z' for tag 99126 (Order Operation) to indicate order cancelled by SZSE (Cancel-by-Market). This new value is applicable to Shenzhen Northbound Trading only.</p> <p>Also, the new value "MKTCAN" is added to tag 99012 (Log Operation Text) to indicate the order cancellation is initiated by the backend trading system.</p>
17	Introduction of multiple market groups	2126 O-BMG (Market Group Information)	Multiple market group information messages are sent to BSS, including the market groups that are not assigned to this CC OG device.

Appendix B: Open Message Examples

This appendix provides several examples on how the actual open message looks like:

General Format

Each open message is comprised of three parts: header, body and trailer. Each tag field is embedded by a pair of colons ':' followed by the tag value. Tags are separated from each other by carriage return and line feed.

The open message header will be fixed length.

The general format of an open message looks like the following:

```
<Header>
:<Tag Id>:<Tag value>
...
:<Tag Id>:<Tag value>
-
```

The CSC message trailer is composed of a hyphen '-' only.

Example 1: 1500 BS Bid Order Input

The following table shows a portion of the message definition of BS Bid Order Input:

Tag Id	Tag Description	M/O	Format
2035B	SCTY-CODE	M	6n
99191	ORDER-SIDE	M	1x
99192	ORDER-TYPE	O	1x
3035A	ORDER-QTY	O	[N]8n
1032L	ORDER-PRICE	M	[N]10d
1072	BROKER-COMMENT	O	10x
99045	CNFM-FLAG	M	1x

Refer to section 5.2.1 for the message header. The message will look like the following:

1	005121500BS00010212HT0000000000000001111122211204<CR><LF>
2	:2035B:5<CR><LF>
3	:99191:A<CR><LF>
4	:99192:L<CR><LF>
5	:3035A:4000<CR><LF>
6	:1032L:259.2<CR><LF>
7	:1072:C123<CR><LF>
8	:99045:N<CR><LF>
9	<other fields>

10	-
-----------	---

Line 1 is the header. The length of the message is 512 bytes (example only). Message Id is 1500. Sender ID is 'BS00010212'. Receiver ID is 'HT00000000'. Message reference is '00000001'. Invitation number is '11112221'. Broker number is '1204'.

The first tag in the message body begins at line 2. Tag Id is 2035B with value of '5'.

The last tag in the message body is line 8.

The end of the message is indicated by line 10, with a hyphen '-'.

Example 2: 2120 (O-BTT) Market Trading Timetable - Nested Loop

The following example shows a message with nested loop:

Tag Id	Tag Description	M/O	Format	Occurrences
99273	TIME-HHMMSS-24	M	6n	
99132	MARKET-CODE	M	4x	
99714	MARKET-LOGICAL-TRADING-DAY	M	8n	
99383	NUM-SESSIONS	M	[N]4n	
99128	LOOP-START	M	/	
99375	SESSION-TYPE	M	1x	30
99382	NUM-STATES	M	[N]4n	30
99128	LOOP-START	M	/	30
99421	TRADING-STATUS	M	2x	14
99303	TRADING-SESSION-START-TIME	M	6n	14
99127	LOOP-END	M	/	30
99127	LOOP-END	M	/	

The message will look like the following:

1	001252120OG00000001MW00000002	<CR><LF>
2	:99273:122422<CR><LF>	
3	:99132:MKC1<CR><LF>	
4	:99714:20050702<CR><LF>	
5	:99383:0<CR><LF>	
6	:99128:<CR><LF>	
7	:99127:<CR><LF>	
8	-	

Line 1 is the header. The length of the message is 125 bytes. Message Id is 2120. Sender ID is 'OG00000001'. Receiver ID is 'MW00000002'. Message reference, invitation number, and broker number are not applicable for market information update messages. These fields are left blank and filled with spaces.

This message contains information about the trading timetable of market 'MKC1', but trading session information is not available and the value of tag "NUM-SESSIONS" is 0, so no tag is included in the 'Loop-Begin' and 'Loop-End' tags.

Note that the tags 'NUM-SESSIONS' and the outer pair of 'Loop-Begin' and 'Loop-End' are mandatory, they would appear in the message even if the repetitive block does not have any element. However, if another repetitive block B occurs within another repetitive block A, if A does not have any element, the 'Loop-Begin' and 'Loop-end' tags for block B do not exist.

Please refer to the document of China Connect Open Gateway Interface Specification for BSS (Part 2- Message Definition) for more detailed on the standard of open message.

Appendix C: Open Message Header Allowable Values

This appendix explicitly indicates the allowable format in each open message header field (e.g., sender ID, message reference).

Appendix D: Open Gateway Message Tunnel Block Behaviour

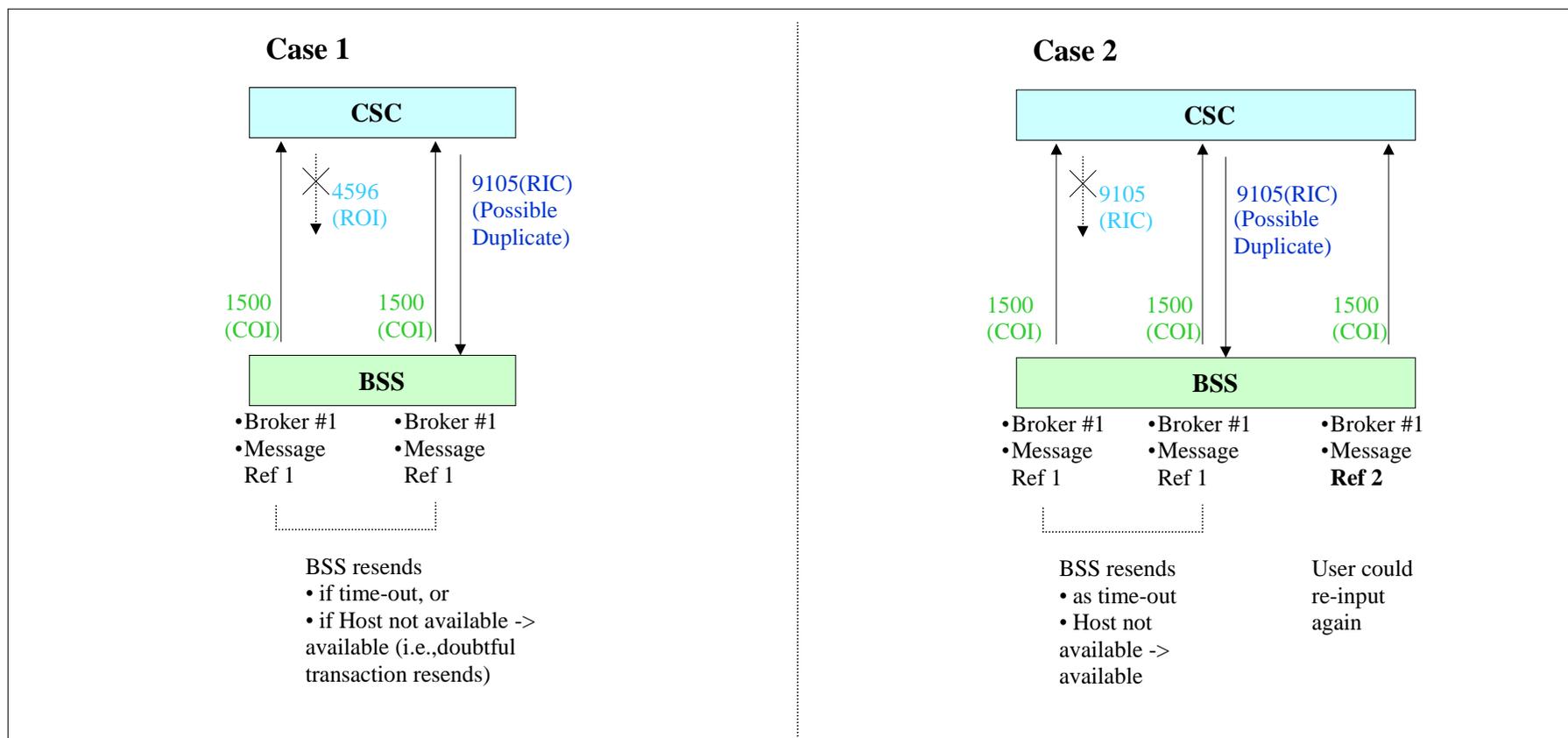
This appendix describes the blocking mechanism of CSC to BS, BS to CSC.

Appendix E: Host Notifications within the Order Processing Cycle

This appendix provides the mapping of the triggering events (e.g., order input, order cancellation) of typical host notification (e.g., order registered, trade update) and the corresponding contents of the host notification in the order processing cycle.

Appendix F: Duplicate Transaction Detection Handling Examples

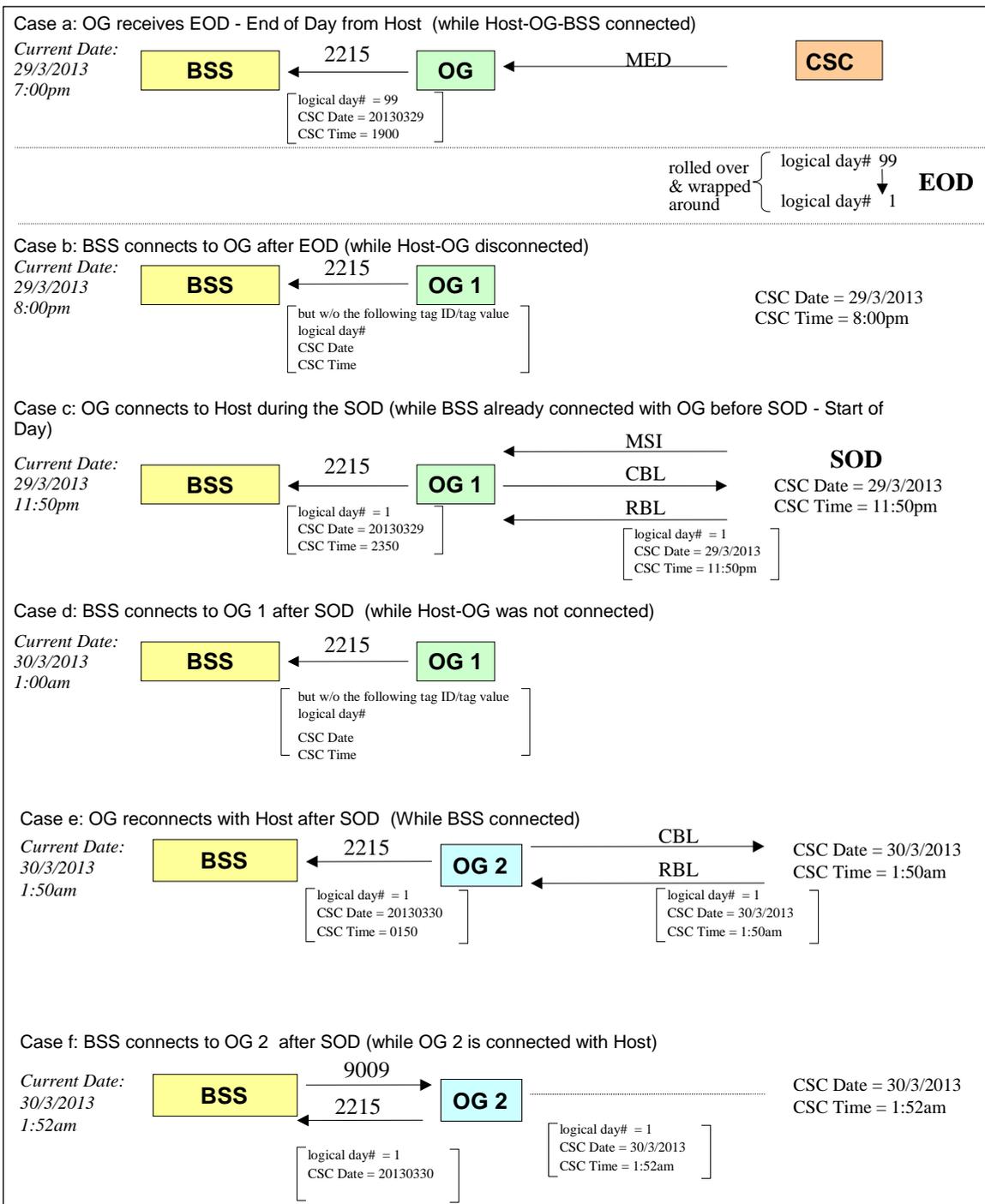
This appendix provides the sample duplicate transaction detection handling mechanism suggested for BSS reference. (Please refer to Section 6.2.2 “Message Recovery” and Section 7.2.7 “Re-send Doubtful Transactions” for the CSC duplication detection mechanism and transactions subject to the duplication detection)



Case 1 – Host (CSC) Connection Failure (Lost of Order Input Response)	Case 2 – Host (CSC) Connection Failure (Lost of Invalid Command Response)
<ul style="list-style-type: none"> • BSS submits an order input, however, that the message ROI (BSS Order Input Response) fails to reach BSS, e.g., there is connection problem between the CSC-OG • BSS has no ideas on what has happened (whether the order is accepted or rejected), therefore, BSS needs resubmits the order input transaction again using the same broker number and message reference on detecting the CSC is available/after the time-out. • CSC detects that the transaction has been accepted and it is now resent by the BSS, therefore, it rejects with the reason “Possible Duplicate BS message received” 	<ul style="list-style-type: none"> • BSS submits an order input, however, that the message RIC (Invalid Command Response) fails to reach BS, e.g., there is connection problem between the CSC-OG • BSS has no ideas on what has happened (whether the order is accepted or rejected), therefore, BSS needs resubmits the order input transaction again using the same broker number and message reference on detecting the CSC is available/after the time-out. • CSC detects that the transaction has been rejected (due to failing the static validation) and it is now resent by the BS, therefore, it rejects with the reason “Possible Duplicate BS message received” • BSS user could re-input again, if necessary, using a new message reference.

Appendix G: CSC Date and Logical Day Number Illustrations

This appendix illustrate the logical day number and CSC Date/time as sent in the 2215 (Host Availability) in different connection status (CSC-OG-BSS) for reference. (Please also refer to Section 7.1.1 “Host Availability (Start of Day)” for the corresponding/ necessary tasks to prepare for the day’s trading activities)



Cases	Descriptions
<p>Case a: OG received EOD – End of Day from Host (while Host-OG-BSS connected)</p>	<ul style="list-style-type: none"> The logical day number would be the current logical day number (same as the logical day number received in the Start of Day), CSC date and CSC time would be the current CSC date and time (which usually is the system clock unless changed, e.g., due to the testing activities) <p><i>Remarks</i> During the EOD process, CSC would increment the logical day number (e.g., 1->2, 2->3,..., 99->1) though the value would not be sent to the BSS till the Start of Day process). However, there would be a case the value would be incremented several times if there are multiple EODs performed (e.g., due to internal processing and housekeeping needs), therefore, BSS should detect if the value has changed, compared to the value received previously, to conclude if it is a new logical trading day.</p>
<p>Case b: BSS connected with OG after EOD (while Host-OG disconnected)</p>	<ul style="list-style-type: none"> If BSS connected to OG while CSC is still in the EOD state (i.e., OG would not be able to connect to CSC at this stage), the logical day number, CSC Date and CSC time would be absent in the 2215 message. <p><i>Please also refer to case d)</i></p>
<p>Case c: OG connects to Host during the SOD - Start of Day (while BSS already connected with OG before SOD)</p>	<ul style="list-style-type: none"> If OG connects to CSC on receiving the Start of Day signal while the BSS has already connected to OG previously, OG would notify BSS of the host availability (apart from the other handshaking information as depicted in the Section 7.1 – “Daily Events in Broker Systems”). The logical day number would be the new logical day number to indicate that it is a new logical trading day (BSS should detect the logical day number has changed compared to the value received previously, e.g., in the previous trading day) while the CSC Date and CSC Time would be the current CSC date and time. <p><i>Please also refer to case e)</i></p>
<p>Case d: BSS connects to OG after SOD (while Host-OG was not connected)</p>	<ul style="list-style-type: none"> On the case that BSS connects OG (while the host-OG remains unconnected), the logical day number, CSC Date and CSC Time would be absent in the 2215 message. <p><i>Please also refer to case b)</i></p>
<p>Case e: OG reconnects with Host after SOD (While BSS connected)</p>	<ul style="list-style-type: none"> If OG re-connects with CSC while the BSS is in the state of connected with OG, OG would notify BSS of the host availability (apart from the other handshaking information as depicted in the Section 7.2 – “Start-up Flow”). The logical day number would be the same logical day number as received during the start of day while the CSC Date and CSC Time would be the current CSC date and time. <i>Note the logical day number remains unchanged even the application date changes.</i> <p><i>Please also refer to case c)</i></p>
<p>Case f: BSS connects to OG after SOD (while OG is connected with CSC)</p>	<ul style="list-style-type: none"> On the case that BSS connects to OG while the Host-OG remains connected, the logical day number would be the same logical day number as received during the start of day while the CSC date and CSC time would be the current CSC date and time.

Remarks:

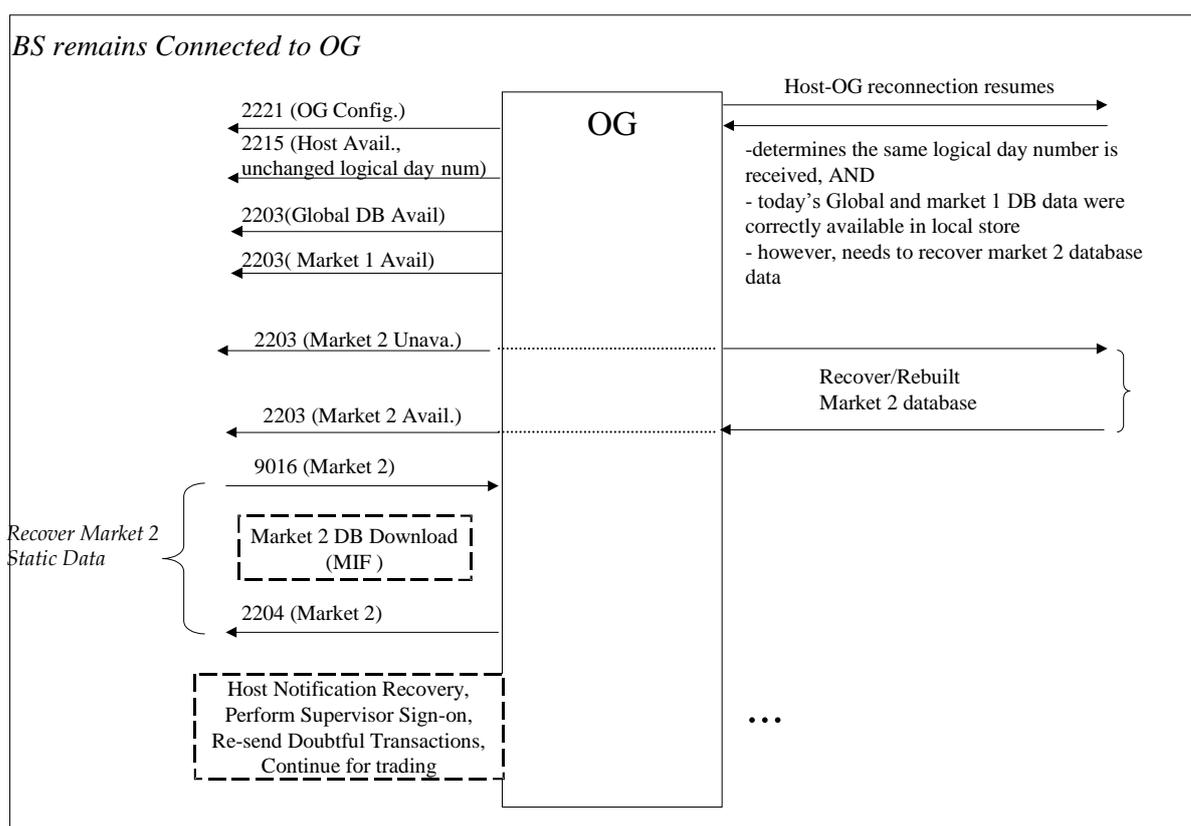
- The CSC date/time is used to synchronise the date and time across the CSC components
- The “Logical day num” is used to determine whether it is a new trading day by detecting if the logical day number has changed compared to the value as received previously.

2. Flow 2 - Host-OG resumes connections after there are changes in the market static data within the same logical trading day

In the normal business operations, it is possible to have changes in the market static data, though rare, within the same logical trading day. On reconnection to Host, e.g., after the network failure, if OG determines certain market static data is no longer valid (e.g., market 1 static data), then OG would perform the recovery on those outdated data.

For those static data without changes, OG would notify the availability of the data (without sending out the corresponding data unavailability - 2203). BSS could ignore the static database download of the global database and the other unchanged market static database.

For those static data identified to be outdated, OG would notify the connected BS, if any, on the unavailability of the data (through 2203) before the recovery. Upon completion, OG would notify the availability of the corresponding market static data for the BSS to recover. BSS should recover the corresponding market static data.



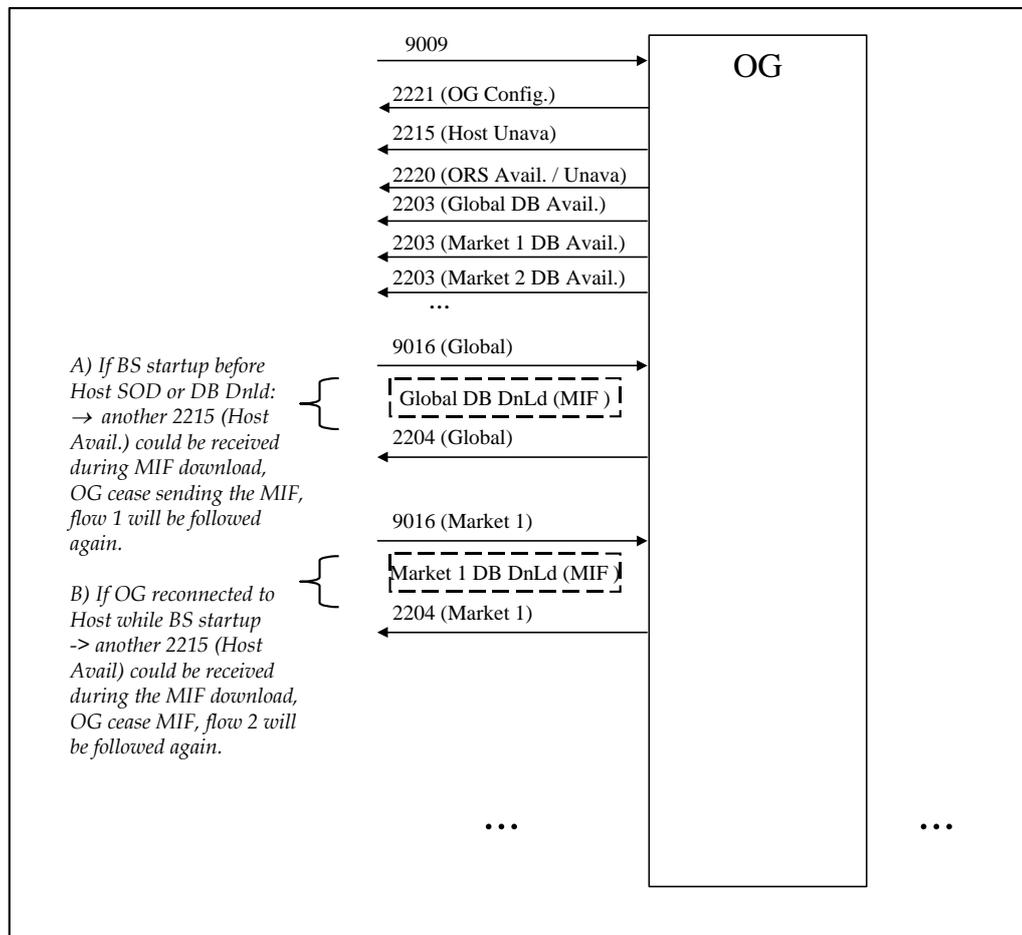
Note: Certain TXN(R) and CTL(R) are **NOT** shown above for simplicity.

3. Flow 3 – BSS connects to OG while OG reconnects to CSC/OG change states

BSS could connect to OG during the day even the CSC is not available. OG would notify BSS on the availability of the static data. BSS could determine if to download the static data or not. But there would be cases that OG would also change its state during the BSS-OG session establishment:

Case A: If BSS connects to OG while CSC is not available (and actually CSC soon would start the Start of Day process), then another 2215 (Host (CSC) Available, and, new logical day number) message could be received during the database download process. OG would cease the Market Information (MIF) forwarding (e.g., 2101 – security static in the market static database download) without any 2204 (End of Database download). Flow 1 would then be followed (i.e., Global Database unavailable, Market 1 database would be unavailable would be received).

Case B: If BSS connects to OG while CSC is not available (and actually OG is in the process to reconnect to the CSC), then another 2215 (Host (CSC) available, same logical day number) message could be received during the database download process. OG would cease the MIF forwarding (e.g. 2119 – Spread Table Information in the Global database download) without any 2204 (End of Database download). Flow 2 would then be followed (i.e., Global Database would be available received again....)



4. Market Static Data Refresh / Recovery Performance

For market consisting of vast securities, the market static data refresh process in BSS might take up quite some time, (in units of minutes,) to receive all the 2101s and update related datastore and GUIs.

If such market refresh is performed during trading hour, where at the same time there is order and trade update from CSC. To shorten the recovery time of BSS, the following facilitation is provided:

With reference to Section 7.1.2 Database Download, BSS start-up flow is to trigger 9016 (market) independently for each market, based on the “data availability” of each market 2203. Hence for such BS reconnection or static data recovery during trading hour, all these market static data should be available in OG, and BSS could send out 9016s (market) for all available markets independently and in parallel. Then OG will return the 2101s for each available market successively, moreover, OG will still ensure sending out all the 2101s for 1st market first, followed by those of 2nd market and onward.

There is also a Dynamic Order and Trade update (MIF) block-out mechanism in OG. If the BS is not processing the market static data refresh (9016 market) fast enough which in other word, the market static refresh message (2101) is queuing up in OG, OG will cease to forward dynamic order / trade update.

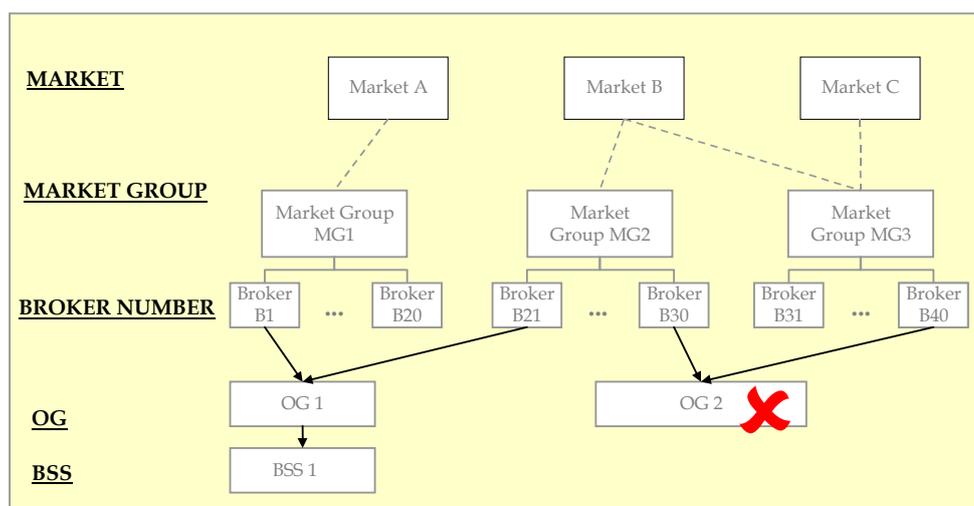
Appendix I: Handling of the Market Group Assignment

This appendix is to further elaborate the Market Group concept in CSC and its association with three relevant messages 2221 OG Configuration, 2122 Market Static Information and 2126 Group Information.

However, it should be noted that, although the Market Group – Market – Broker relationship in CSC is designed with flexibility in mind for future business definition and trading right set-up, in the initial launch, CSC would only be defined with one single market group.

1. Market groups assigned to any OG device will not contain overlapping markets. For example, OG2 could not have the broker B30 and broker B40 assigned because both market groups MG2 and MG3 contains the market code B.

Attached is a graphical depiction of the topology (illustration only, not the actual set-up):



2. Association to the messages 2221, 2122 and 2126:

Take the above illustrative set-up as an example, related market code/market group information are passed in

- i) 2221 - OG Configuration

- Broker 1 is eligible for MG1
- Broker 21 is eligible for MG2

The 2221 message provides information about whether the Broker ID(s) and their associated Market Group(s) are Valid or Suspended. The message also implies the markets that a device could trade – markets belong to those valid market groups.

- ii) 2122 - Market Static

This message contains the information of all the available markets (i.e. Market A, B and C, including those that might not be assigned to this broker device / firm.)

iii.) 2126 - Market Group

One market group information message for each market group is sent to BSS. Each message contains the mapping of markets to this market group:

- MG1 (Market A)
- MG2 (Market B)
- MG3 (Market B, Market C)

Hence, 2126 could include those market groups that might not be eligible for OG devices. It is also implied that the market groups specified in this message could possibly contain overlapping markets (though there shall be no such definition in initial CSC launch).