Highlight of Changes of OAPI Client Application Development in Genium

HKEX

Version 2.6

Date December 2015

Table of Contents

1. Purpose of the Document 3
2. Audience 3
3. Reference Documents 3
4. Functional Changes Highlight 3
   - 4.1. Tailor-Made Combination 3
   - 4.2. Market Making 4
   - 4.3. Maximum Number of Items in MO96 4
   - 4.4. Trade Report Broadcast 4
   - 4.5. Ticker and Ticker Query 4
   - 4.6. Order Management 5
   - 4.7. Site-Failover 5
   - 4.8. Clearing Trades in AHFT Session 5
5. Programming Considerations 5
   - 5.1. Session Handle 5
   - 5.2. Compression and Encryption between OAPI Client and OMnet Gateway 6
   - 5.3. Concurrent Event Reading 6
   - 5.4. Delta Queries 7
   - 5.5. Char Array Fields 9
   - 5.6. “Omex version” 9
   - 5.7. “close_price_i” Fields 9
   - 5.8. Return Codes for HKATS Risk Controls and Functions 10
   - 5.9. Volatility Control Mechanism (VCM) 10
   - 5.10. Miscellaneous 12

Changes from Version 2.5 (July 2015) are highlighted in red.

1. Purpose of the Document

This document provides certain programming considerations for OAPI application development for Genium.

2. Audience

This document is intended for software developers who have experience in OAPI client applications for trading in Genium.

3. Reference Documents

This document only provides summary information. For complete and detailed information and specifications for developing Genium OAPI programs, please refer to the following documents:

- Genium INET OMnet Application Programmer's Interface Manual HKEX v2.0.0801
- Genium INET OMnet Message Reference HKEX v2.0.0801
- Genium INET OMnet Message Reference Introduction HKEX v2.0.0801

4. Functional Changes Highlight

4.1. Tailor-Made Combination

Tailor-Made Combinations (TMC) is introduced as a replacement for Non-Standard Combinations and Bulletin Board. The OAPI client may use the query DC3 to create a TMC. Genium will need a fraction of a second to get the new TMC series ready. Then trading in the TMC will be possible with the usual transactions such as MO31. A TMC is made up of two to four regular series with certain restrictions:

- All series must be from the same partition.
- All series must have the same number of price decimals.
- All series must be traded in the same currency.

- All series must have the same underlying.

4.2. Market Making

MO96 is introduced as a replacement for MO36. The data structure of MO96 is more compact which eliminates the need of submitting the previous order number. The previous quotes in the same instrument series will be automatically renewed. MO37 is a two-sided version of the obsolete price quotation transaction MO6.

Notes:

- DO NOT use MO31 for Market Making. MUST use MO37 or MO96.
- MO33 cannot alter quotes sent with MO37 or MO96.
- MO37 cannot replace quotes sent with MO96, and of course neither MO96 can replace quotes sent with MO37.
- MO37 removes quote by having 0 quantity and 0 price.
- MO96 removes quote by having **-1** quantity.

4.3. Maximum Number of Items in MO96

MQ99 returns the maximum number of items that can be included in one MO96. Please use the value of **max_block_order_size_i** for MO96. The other value is specific for MO36, which is not used in Genium.

4.4. Trade Report Broadcast

When the single-sided trade report MO75 is sent, the opposite party shall receive the corresponding notification broadcast BO55 so that responsive actions can be taken. See also MQ78 and MQ80, which are the corresponding queries for the outstanding trade report information.

4.5. Ticker and Ticker Query

The ticker broadcasts BD70 and BD71 are introduced. The information includes the deal prices and matched quantities of the instrument series. The tickers of the trading day can be queried through the corresponding queries TR70 and TR71. Please note that the company code will not be carried in BD70 and BD71.

4.6. Order Management

OAPI clients should rely on the Firm OB Update broadcast BO5 for tracking the changes of the orders placed in market.

Execution price of Combination Order against Combination order will be available in BO5, while the corresponding leg prices will be available in BD6.

4.7. Site-Failover

As a protection mechanism, all orders placed in the market will be cleared by the Exchange at site-failover of Genium. As always, the OAPI client programs should be prepared and make query to recover active orders (MQ8), inactive orders (MQ9) and traded orders (clearing trades CQ10) after reconnecting. It is therefore normal to have no active orders including GTC/GTD orders returned in MQ8 after a site-failover.

4.8. Clearing Trades in AHFT Session

To identify clearing trades that are created in the AHFT Session, the bit 31 of big_attention_u can be referred. See the description of big_attention_u in the Genium INET OMnet Message Reference Manual.

5. Programming Considerations

5.1. Session Handle

Always close the previous session handle and create a new one for every login attempt. Reusing the same session handle is not allowed and gives a completion status of -2019 upon login.

5.2. Compression and Encryption between OAPI Client and OMnet Gateway

All OAPI sessions must setup compression and encryption options as OMNIAPI_OPVAL_ANY during login. Sessions with options that do not match those of the OMnet Gateway will not be able to login.

- omniapi_set_option_ex(…, OMNIAPI_OPT_COMPRESS, OMNIAPI_OPVAL_ANY) ;
- omniapi_set_option_ex(…, OMNIAPI_OPT_ENCRYPT, OMNIAPI_OPVAL_ANY) ;

Reference:
Genium INET OMnet Application Programmer's Interface Manual HKEX v2.0.0801
Section: 6.3.14 omniapi_set_option_ex

Note: Encryption is always disabled in the provided WinX64 library. The OAPI client may safely ignore the return code and continue to login. This will not affect trading.

5.3. Concurrent Event Reading

Concurrent Event Reading is an optional feature introduced. The conventional event reading function omniapi_read_event_ext_ex( ) is also retained in in Genium.

The OAPI session may use the omniapi_read_event_block( ) function to read events concurrently while sending certain transactions. The session must enable the following option before login in order to use this function.

- omniapi_set_option_ex(…, OMNIAPI_OPT_CONCURRENT_BDX, OMNIAPI_OPVAL_ENABLE) ;

Reference:
Genium INET OMnet Application Programmer's Interface Manual HKEX v2.0.0801
Section: 6.4 Concurrent Broadcasts and Transactions

Note: By enabling the Concurrent Event Reading feature, the OAPI client will create

two separate TCP channels for communications: one for broadcasts and one for transactions and queries. The “broadcast” channel is kept active by constantly reading broadcasts. However the “transaction” channel may become idle for some time (note: operating system dependent, e.g. default 2 hours on the Windows operating system) when not trading. Some client installed firewalls may terminate such idle sessions. If used, these firewalls must be configured appropriately to avoid terminating these idle sessions unnecessarily.

5.4. Delta Queries

Make a full query for reference data (underlying, instrument class, series and combos) at the start of a trading day. Set download_ref_number_q to -1 and full_answer_timestamp to 0. For example,

```
query_delta_t {
        transaction_type_t =    {"DQ124"}
        series_t =      {"0-0-0-0-0/0(19890000)-0"}
        segment_number_n =      1
        download_ref_number_q = -1
        time_spec_t {
                tv_sec =        0
                tv_nsec =       0
        } full_answer_timestamp
}
```

A successful query returns the full answer with a delta header in each segment. Keep the returned download_ref_number_q (N) and full_answer_timestamp (T) of the last full answer segment for future use.

```
answer_segment_hdr_t {
        transaction_type_t =    {"DA124"}
        items_n =       314
        size_n =        63892
        segment_number_n =      1
}
… …
item_hdr_t {
        items_n =       1
```

```
        size_n =       28
}
        sub_item_hdr_t {
                named_struct_n =       37001
                size_n =       24
        }
                ns_delta_header_t {
                        download_ref_number_q = 396260
                        time_spec_t {
                                tv_sec =       1353916011
                                tv_nsec =      399000000
                        } full_answer_timestamp
                        full_answer_c = (1)
                }
… …
```

In case of reconnection in the same trading day, the OAPI client may simply make a delta query for any missing reference data during the disconnected period. Set download_ref_number_q to N+1 and full_answer_timestamp to T.

```
query_delta_t {
        transaction_type_t =    {"DQ124"}
        series_t =     {"0-0-0-0-0/0(19890000)-0"}
        segment_number_n =     1
        download_ref_number_q = 396261
        time_spec_t {
                tv_sec =       1353916011
                tv_nsec =      399000000
        } full_answer_timestamp
}
```

Reference:
Genium INET OMnet Message Reference HKEX v2.0.0801
Section 3.1.54.4 Concept of Delta Queries and Broadcasts

5.5. Char Array Fields

All char array fields except fillers used in OAPI transactions and queries must be space padded to the right. NULL character should not be used.

```
char ex_client_s [10] ;
memcpy( ex_client_s, "C         ", 10 ) ;
```

Reference:
Genium INET OMnet Application Programmer's Interface Manual HKEX v2.0.0801
Section 4.2.7 String Formats

5.6. "Omex version"

The "omex version" returned by the following queries/transactions is for HKEx internal reference only. It should not be interpreted by the OAPI programs.

- omniapi_get_info_ex (OMNI_INFTYP_OMEXVERSION)
- UQ12 (omex_version_s)
- CQ68 (omex_version_s)

5.7. "close_price_i" Fields

For the field of "close_price_i" under OB_LEVELS_CLOSING (33031) structure, the retrieved information could be ignored and discarded.

Reference:
Genium INET OMnet Message Reference HKEX v2.0.0801
Section 5.11 OB_LEVELS_CLOSING

5.8. Return Codes for HKATS Risk Controls and Functions

Order rejections due to HKATS risk controls and functions will be notified by the associated OAPI return codes sent to the OAPI programs of Participants, there will be 4 new OAPI return codes introduced as follows:

#define RX_PRETRADE_USER_BLOCKED -850002 **User is in a blocked Pre Trade Risk state**	• **User is in a blocked Pre-Trade Risk State and is currently not allowed to trade** • **Triggered by the Stop function**
#define RX_PRETRADE_MAX_ORDER_RATE -850004 **User has breached Max. Order Rate limit**	• **User has breached Max. Order Rate Limit and the transaction is rejected.**
#define RX_PRETRADE_EXPOSURE -850006 **User has breached a Max. Intraday Exposure Limit**	• **User has breached a Max. Intraday Exposure limit and the transaction is rejected.**
#define RX_PRETRADE_MAX_ORDER_SIZE -850008 **User has exceeded Max. Order Size limit**	• **User has exceeded Max. Order Size limit and the transaction is rejected.**

5.9. Volatility Control Mechanism (VCM)

5.9.1. New Return codes

Order rejections due to order price outside price limit of Volatility Control Mechanism will be notified by the associated OAPI return codes sent to the OAPI programs of Participants. There will be 3 new OAPI return codes introduced for **combination orders** as follows:

Value	Description
18	• The whole order was closed
20	• The whole order was stored in the order book

22	• The order was partially stored in the order book and partially closed

Please note that VCM relevant return codes, 17 and 19, for outright series are currently available in the system. Users may refer to the description of field name "trans_ack_i" in section 7, Detailed Field Information, in OMnet Message Reference document for details.

5.9.2. New Session States

There will be 4 new session states relevant to VCM:

State_name_s	State_number_n	Reason	Applicable products
OPEN_DPL_VCM	23	Open session with VCM function enabled	Product with VCM and Dynamic Price Limit (DPL)
OPEN_VCM	24	Open session with VCM function enabled	Product with VCM but without DPL
VCM_COOL_OFF_DPL	25	Cooling off period	Product with VCM and DPL
VCM_COOL_OFF	26	Cooling off period	Product with VCM but without DPL

In broadcast BI41, Instrument Status Information BROADCAST, the value for the field "state_level_e" will be 1, 2 or 3 for states OPEN_DPL_VCM and OPEN_VCM. But the value of "state_level_e" for states VCM_COOL_OFF_DPL and VCM_COOL_OFF will be 4.

With reference to section 7, Detailed Field Information, in OMnet Message Reference document, a BI41 broadcast with "state_number_n" set to 0 and "state_level_e" set to 4 will be sent out by the system when the cooling off period ends (i.e. end of VCM_COOL_OFF_DPL or VCM_COOL_OFF). In other words, when the BI41 broadcast with "state_number_n" set to 0 and "state_level_e" set to 4 is received, it means the previous state ("state_number_n" as 25 or 26) is ended and the instrument goes back to inherit the trading state from its upper level (i.e. "state_level_e" as 1, 2 or 3).

5.9.3. New Market Message

There will be a new market message (through existing broadcast BI81, Market Announcement Information VIB) introduced for VCM to notify OAPI for the triggering of cooling off period of an instrument series. Relevant fields and values are as follows:

Field	Value
message_information_type_c	2
message_priority_c	4
message_header_s	Start of Volatility Control Mechanism cool-off period: [XXX]
text_line_s	Triggering time: [YYYYMMDD hh:mm:ss], Reference price: [www], Upper price limit: [xxx], Lower price limit: [yyy], End time: [YYYYMMDD hh:mm:ss]

Remarks:

"message_header_s"

- XXX is the series name and it is bracketed by "[" and "]" without space. The series name should equal to the value of "ins_id_s" from the answer of DQ124, Delta Instrument Series QUERY

"text_line_s"

- www is the reference price, xxx is the upper price limit, yyy is the lower price limit and YYYYMMDD hh:mm:ss is the triggering or end date and time
- www, xxx and yyy may contain decimal place which is depended on the price format of different product. User may refer to the value in "dec_in_premium_n" for each product from the answer of DQ122, Delta Instrument Class QUERY
- each of the field (i.e. www, xxx, yyy and YYYYMMDD hh:mm:ss) is bracketed by "[" and "]" without space

5.10. Miscellaneous

The following is a non-comprehensive list of programming notes that developers for Genium OAPI clients may be interested.

	OMex 19.1	**Genium**
Order Type for auction orders.	2	**3**
Exchange Order Type for orders in RHT and AHT.	512	**2048**
Exchange Order Type for orders not participating AHT.	0	**0**
Facility Type for Trade Reports Queries MQ78 and MQ80.	EP1	**EP0**
Time Validity for Single Sided Trade Reports MO75.	1536	**256**
Time Validity for Good-Till-Cancel orders.	512	**512**
Inst. Series Query returns only Regular Series.	e.g. HSIZ3, HSIH4 HSIZ3/H4	**e.g.** **HSIZ3,** **HSIH4**
Combo Series Query returns Standard Combos and TMC.	e.g. HSIZ3/H4	**e.g.** **HSIZ3/H4,** **TMC_HSI/001**

END